Fostering Renewable Electricity Markets in North America

Commission for Environmental Cooperation

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Un résumé est disponible en français–Un resumen ejecutivo está disponible en español

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SECTION I. INTRODUCTION

Renewable electricity is derived from naturally regenerating energy resources such as the sun, wind, water, biomass and heat from the Earth's interior. Hereafter, the term "renewable electricity," or simply "RE," will be used to refer to all renewable energy technologies for the generation of electricity. Although all hydroelectricity is renewable, this paper is limited to low-impact hydro. While definitions of low-impact hydro vary by jurisdiction, they generally include hydropower facilities that meet all regulatory licenses and adequately protect or mitigate impacts on river flows, water quality, fish passage and protection, watersheds, threatened and endangered species, cultural resources, and public access and recreation opportunities. Other renewable energy applications, such as thermal biomass and biogas applications, biofuels such as ethanol, solar thermal or geothermal heating and cooling, are outside the scope of this paper.

There is tremendous opportunity for renewable electricity to meet an increasing proportion of the North American electricity market. Many states and provinces in the United States and Canada have adopted some type of target for the supply of renewable electricity. At the same time, there has been an upsurge in the growth of the voluntary market[1] from large corporate and other commercial purchases, particularly in the United States. Rising prices for natural gas and other fossil fuels have allowed suppliers to position renewable electricity as a hedge against fuel price volatility- demonstrating the economic value of renewables beyond environmental benefits. In Mexico, two new pieces of legislation will address some of the legal and market constraints on renewables if they are enacted and private developers find creative ways to develop wind electricity projects. These and other factors show great promise for a continued growth of a renewable electricity market in North America.

Notwithstanding these achievements and positive trends, there is still room for improvement. Effective public policies supporting renewables need to be more widely implemented and lessons-learned about programs that worked or did not work need to be more widely disseminated. More effort needs to be made to bring low-impact hydro renewables on par with non-renewable generators in terms of subsidies, tax incentives and other favorable government financing policies. Consumer understanding of the value of renewable electricity and their green pricing options is low, and voluntary markets for renewable electricity are still in their infancy in all three countries.

The purpose of this paper is to assist governments of the three North American countries in supporting renewable electricity development by addressing informational and transactional barriers that add to renewable electricity costs, and by more actively assisting with policy implementation. This paper provides an overview of the key market demand and supply-side drivers for renewable electricity in each of the three North American countries. The paper identifies regulatory mandates, voluntary purchases, self-supply and financial incentives as the most important drivers of a renewable electricity market in North America today. The authors then explore the opportunities for growing the renewable electricity market in each of the three

[1] An energy market that allows consumers to voluntarily select whether their electricity is supplied by renewable sources or nonrenewable ones.

countries. This paper concludes with a series of brief recommendations for the market overall and for the Parties of the North American Agreement on Environmental Cooperation (NAAEC) to help foster a North American renewable electricity future.

1.1 Current Policy Framework for Renewable Electricity in Canada

In Canada, provinces have jurisdiction over resource development, including electricity, and as a result most aspects of energy policy and regulation reside with them. Any regulatory initiatives to increase production or to set resource targets also originate with the provinces. The federal government has jurisdiction over nuclear energy and, through the National Energy Board, regulates electricity exports and international electricity lines.

The structure and role of electric utilities in Canada varies by province. Most electric utilities are provincial Crown Corporations owned in total or in part by the provinces. However, there is an increasing number of private electric utilities. There is wide variation regarding utility control of the transmission and distribution system province-wide. For example, in Quebec, Saskatchewan, Manitoba, and the Maritime Provinces, a single utility is responsible for electricity distribution throughout the province. In Alberta, there are four distribution utilities, in British Colombia there are two, and in Ontario, many. Alberta has a "fully restructured" electricity system, meaning that electricity generation, distribution, and retail sales have all been separated. Ontario started down the path of restructuring and split the Crown utility into three parts, but stopped there. Thus, a very large part of the Ontario generation system is still government-owned, and most consumers are not exposed to market prices. New Brunswick, Quebec and British Colombia have adopted certain aspects of the competitive model, while retaining a Crown utility. In the other provinces, the utilities are vertically integrated, where the utility is responsible for the generation, transmission and retail distribution of electricity.

In addition to the seventeen major electric utilities in Canada, about sixty industrial establishments generate electricity, mainly for their own use. A few also sell energy to municipal distribution systems or utilities. These establishments are concentrated in three sectors: pulp and paper, mining, and aluminum smelting. In 1997, industrial establishments owned about six percent of total capacity and produced about eight percent of the total electricity generated in Canada.

Renewable electricity marketing is restricted to the provinces with a fully open electricity market while renewable electricity pricing could be offered by any of the utilities in any market (fully open or not), though it has been limited thus far.

Though the costs of renewable electricity have declined significantly over the past two decades, the availability of abundant conventional energy resources in Canada, including large hydro electric facilities, natural gas and coal, contribute to continued low prices for electricity that make it difficult for renewable electricity to compete on a cost basis, without explicit price corrections for environmental and social costs associated with conventional fossil based electricity sources. As one industry representative said: “Electricity in Canada is undervalued

and renewable electricity is really undervalued." This very low electricity price is the greatest barrier to renewable electricity development in Canada.

Eighty-one percent of Canada's GHG emissions come from energy production and consumption. Canada is currently developing an environmental agenda that will address GHG and air pollutant emissions. It is anticipated that this agenda will help foster renewable electricity generation.

Often one of the main drivers for renewable electricity development at the provincial level is air pollution, as this tends to fall under provincial jurisdiction. For example, the emissions trading system in Ontario is designed to reduce NO_x and SO_2 levels and renewable electricity projects can be issued credits through a set-aside process. Other drivers include local economic development and increased energy security.

1.2 Current Policy Framework for Renewable Electricity in the United States

The US electricity market is governed by the Federal Energy Regulatory Commission (FERC) and the state public utility commissions. FERC is an independent government agency, officially organized as part of the Department of Energy. It is responsible for regulating the interstate transmission of electricity, regulating the wholesale sales of electricity, and licensing and inspecting hydroelectric projects, and monitoring energy markets and companies to protect customers from market manipulation. Individual state public utility commissions regulate retail sales of electricity, approve all utility resource plans, and generally regulate utility operations, ensuring that consumers and the public are protected from the possible adverse effects of a natural monopoly. More than half of the US states are vertically integrated, meaning that the local utility company is responsible for the generation, distribution and retail sale of electrical energy to consumers within their service territory. Twenty-one states have "restructured" their electricity markets to allow consumers direct retail access. In general, this means that the local utility continues to provide transmission and distribution (delivery of energy) services, but consumers may choose their own supplier of generation energy services.[2]

In both restructured and vertically integrated states, renewable electricity generation can be procured in one of three ways: One, the utility or the retail electricity supplier can develop their own renewable generation projects. In this instance, they may either build the generation themselves or pay someone to do it for them. In either event, the utility owns the generation asset and is reimbursed for their investment through rates including a reasonable return to the shareholders. Two, the utility can buy the electricity from an independent power producer and recover the costs through rates. In this instance, the utility does not own the generation asset, but enters into longer-term contracts for the delivery of the electricity into their service territory. Third, the utility may purchases RECs and combine them at the point of sale to "green-up" their system electricity fuel mix.

[2] California repealed direct access, but not the restructuring legislation. The state's local utilities are largely divested of their generation assets, yet there is no direct access for individual electricity customers. California does offer community aggregation, where an entire community can opt to purchase retail electricity services from competitive suppliers, although no communities have taken advantage of this limited form of direct access.

Current renewable electricity policy activity in the United States at the federal level includes the Production Tax Credit (PTC), the Energy Policy Act of 2005 (EPACT 2005), the Farm Bill (Title IX), and presidential Executive Order 13423 "Strengthening Federal Environmental, Energy, and Transportation Management." The PTC has been a strong Federal incentive for renewables, primarily wind, although it expires every two years and requires reauthorization. The PTC is discussed in more detail in Section 3.2.2.1. The EPACT 2005 has a number of incentives for renewables, including the reauthorization of the PTC, the availability of up to $800 million in clean renewable energy bonds for renewable generators, an increased business investment tax credit for solar and geothermal, and a new residential solar tax credit. The Farm Bill establishes several programs and grants which include assistance to eligible farmers, ranchers, and rural small businesses in purchasing renewable energy systems. Executive order 13423 sets goals for federal agencies in the areas of energy efficiency, acquisition, renewable energy, toxics reductions, recycling, renewable energy, sustainable buildings, electronics stewardship, fleets, and water conservation.

These federal programs aside, nearly all renewable policy activity is occurring at the state level. Currently twenty-one states plus the District of Columbia have passed RPSs, and these have been some of the most significant policy drivers for new renewable resources. In addition, state clean energy funds have made significant contributions to the growth of the renewable electricity industry by providing financial programs that support new renewable projects of all sizes, as well as funding market preparation, infra-structure building activities, and demand-side drivers like consumer education and marketing. States have also aggressively enacted net metering laws, voluntary renewable electricity programs, and a variety of financial incentives and regulatory provisions to encourage new renewable energy development. Overall, however, the impact of these state-level actions is still modest relative to the potential impact of more aggressive federal policy.

1.3 Current Policy Framework for Renewable Electricity in Mexico

In Mexico, since 1960, the generation, transmission and distribution of electricity for the public good are, according to the Constitution, the responsibilities of the federal state, accomplished through its two vertically integrated utilities, the *Comisión Federal de Electricidad* (Federal Electricity Commission, or CFE) and *Luz y Fuerza del Centro* (Central Light and Power, or LyFC).[3] Energy policy is determined by the federal government with virtually no state-level involvement. Following amendments introduced in 1992, the Public Electricity Service Act (LSPEE) allows private sector participation in the generation of electricity in the form of self-supply, co-generation (combined heat and power), independent production and small production (not exceeding 30 MW); as well as import and export of electricity under conditions established

[3] LyFC covers the Federal District and the surrounding region in central Mexico, while CFE covers the rest of the country. CFE is in charge of 97% of the total generation capacity in Mexico (excluding self-supply) and provides electricity to meet most of the electricity needs of LyFC. Although in practice CFE is responsible for contracting virtually all new public sector capacity in Mexico (with the exception of a set of natural gas-based distributed generation plants that LyFC will soon install), any reference to CFE in this document applies in principle to LyFC as well.

for each case (*Ley del Servicio Público de Energía Eléctrica,* Art. 36, 1993), regulated by the *Comisión Reguladora de Energía* (Energy Regulatory Commission, or CRE).

In this framework, electricity generation projects in Mexico can fall into four different categories:

1. The projects included in CFE's expansion planning. These in turn can be:
   - Utility-owned projects. In the past, CFE built its own projects but now they also develop turn-key projects, financed and built by the private sector, and then handed over to CFE.
   - Privately-owned projects built for public service. An increasing capacity in Mexico is based on independent power producers (IPP) that generate electricity for exclusive sale to CFE. (Currently there are no renewable electricity IPP projects in operation).
2. Privately-owned electricity export projects. (Currently, there are no renewable electricity export projects).
3. Grid-connected self-supply projects. Since the LSPEE Act prevents the trade of electricity, all partners of a self-supply project need to constitute a single entity, and therefore the exchange of electricity is an internal transaction. According to the regulatory framework, self-supply projects can be either on-site or remote (by means of the wheeling services of the grid).
4. Off-grid projects. These in turn can be:
   - Private mini-grids. In this case the same self-supply rules apply, i.e., consumers must be partners of the project.
   - Home systems. Likewise, since the trading of electricity is not permitted, the consumer must own or co-own the generating device.

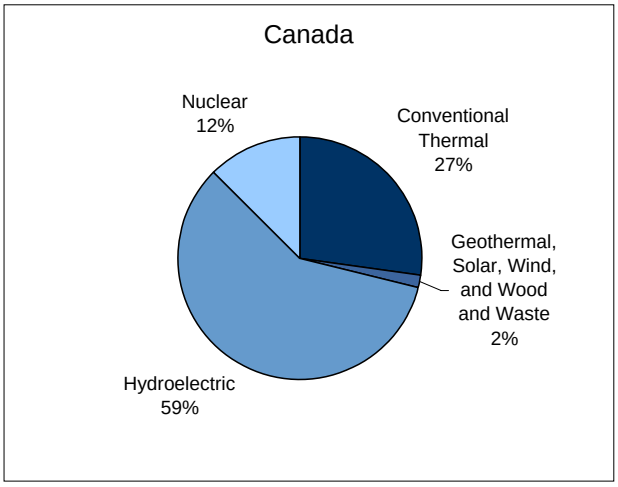
In addition, the LSPEE Law establishes a fifth category of projects: Small producers (under 30 MW) that generate electricity exclusively for CFE (public service) but are not included in its expansion planning. This category does not exist in practice, since the tariffs paid by CFE (short-term marginal cost and no capacity payment) are too low to enable the projects' financial viability.

1.4 Electricity Generation in North America

The graphs below depict the current mix in electricity generation in Canada, Mexico and the United States. Table 1 shows the installed electricity generation capacity for the three North American countries.

Figure 1. Electricity Generation in Canada, 2003

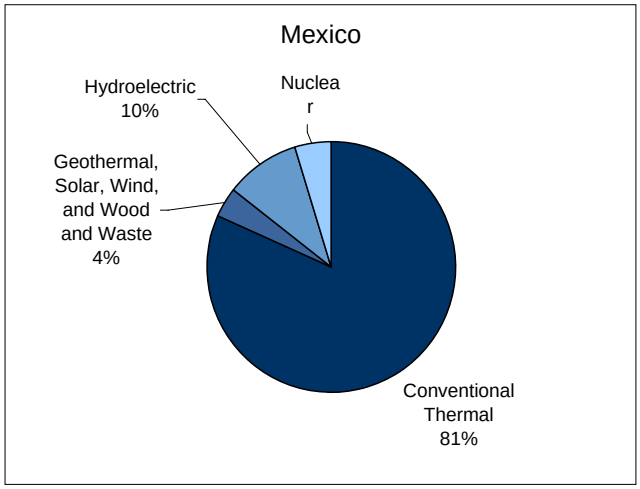
Total: 569.4 billion kilowatt-hours



Source: Energy Information Administration, *International Energy Annual 2004*, <http://www.eia.doe.gov/iea/elec.html>.

Figure 2. Electricity Generation in Mexico, 2003

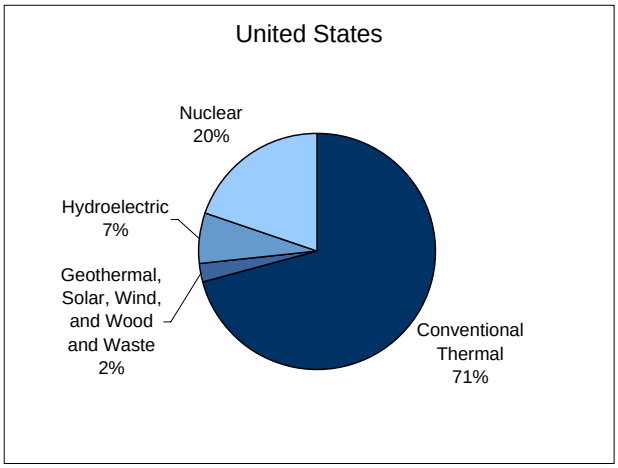
Total: 206.7 billion kilowatt-hours



Source: Energy Information Administration, *International Energy Annual 2004*, <http://www.eia.doe.gov/iea/elec.html>.

Figure 3. Electricity Generation in the United States, 2003

Total: 3891.7 billion kilowatt-hours



Source: Energy Information Administration, *International Energy Annual 2004*, <http://www.eia.doe.gov/iea/elec.html>.

Table 1. Installed Electricity Generation Capacity in North America, 1 Jan. 2004
(Million Kilowatts)

	Canada	Mexico	United States
Conventional Thermal	34.863	37.559	745.446
Geothermal, Solar, Wind, and Wood and Waste	2.419	0.979	19.462
Hydroelectric	70.197	9.650	77.641
Nuclear	10.615	1.365	99.628
Total	118.094	49.553	942.178

Source: Energy Information Administration, *International Energy Annual 2004*, <http://www.eia.doe.gov/iea/elec.html>.

SECTION II. CURRENT RENEWABLE ELECTRICITY MARKET DEMAND DRIVERS

The purpose of sections II and III is to give the reader an understanding of the current size and projected growth of the renewable electricity market in North America. The analysis will focus on both demand (Section II) and supply (Section III) drivers in each of the three countries.

2.1 Regulatory and Voluntary Drivers

Regulatory drivers refer to governmental laws and regulations and other initiatives that require the use of renewable resources (such as RPS) or that may be major drivers for renewables (such as the Kyoto Protocol). An RPS is that establishes a target quantity of renewable electricity to be included in an electric service provider's portfolio by a certain date. RPS can be implemented in a number of different ways, and as with most public policies, the design of the program is critical to its success.

Of the three countries, the United States probably has the most governmental mandates, particularly at the state and local levels while Mexico has the least. At the national level, Canada has made a commitment to reducing GHG emissions as well as air pollution, which will likely create drivers for renewable electricity. Canada also has a number of RPSs or RPS-like targets instituted by provincial and local governments.

The following section describes the governmental mandates of each country and attempts to estimate the size of the market for renewables that might result.

2.1.1 Canada

2.1.1.1 Federal Government

Canada is committed to reducing greenhouse gas (GHG) emissions and air pollutants and is in the process of developing a plan to achieve these objectives. Since renewable electricity does not produce greenhouse gases or other air pollutants when it is brought into the electricity supply mix to replace existing or potentially new fossil generation, renewables can become an important tool to meet tangible emissions reductions.

If Canada's electricity market proceeds like those of other countries, we can expect a significant portion of its low-impact hydro renewable electricity projects to be built and financed by independent power producers (though mostly through long-term contracts with the utilities).

A number of climate change programs and initiatives, including those that focus on renewable energy, are currently under review. The Canadian government is in the process of developing a made-in-Canada approach to address GHG emissions and air pollution.

2.1.1.2 Provincial Procurement and Portfolio Mandates

Three provinces have renewable electricity mandates in place in Canada as of September 2005: New Brunswick, Nova Scotia, and Prince Edward Island.[4] These are most likely to be fulfilled through a utility's purchase of renewable electricity from local facilities. However, rules could change in the future and allow for the purchase of unbundled RECs from anywhere. Most of the provincial mandates or targets are all inclusive and count any renewable electricity generated in the province whether sold through regular utility sales, purchased to meet government procurement mandates or purchased by end-use customers in the voluntary market.

In addition to these provincial RPS programs, seven provinces and three territories have voluntary renewable energy targets. These include: Alberta, British Colombia, Manitoba, Newfoundland and Labrador, Ontario, Quebec, Saskatchewan, Yukon, Northwest Territories, and Nunavut. The levels of the provincial/territorial mandates and targets are shown in Figure 4. Quebec and Ontario have used quite aggressive requests for proposals as a means to increase the electricity generation from renewable energy sources. As well, Ontario is the first jurisdiction in North America to introduce standard-offer contracts (a form of the feed-in tariffs used in Europe) for projects less than 10 MW, including solar photovoltaic (PV). Under the standard-offer contract, eligible projects could enter into 20-year contracts, offering electricity prices as high as 11 cents per kilowatt-hour (kWh) for wind, biomass, small hydro and 42 cents per kWh for solar PV.

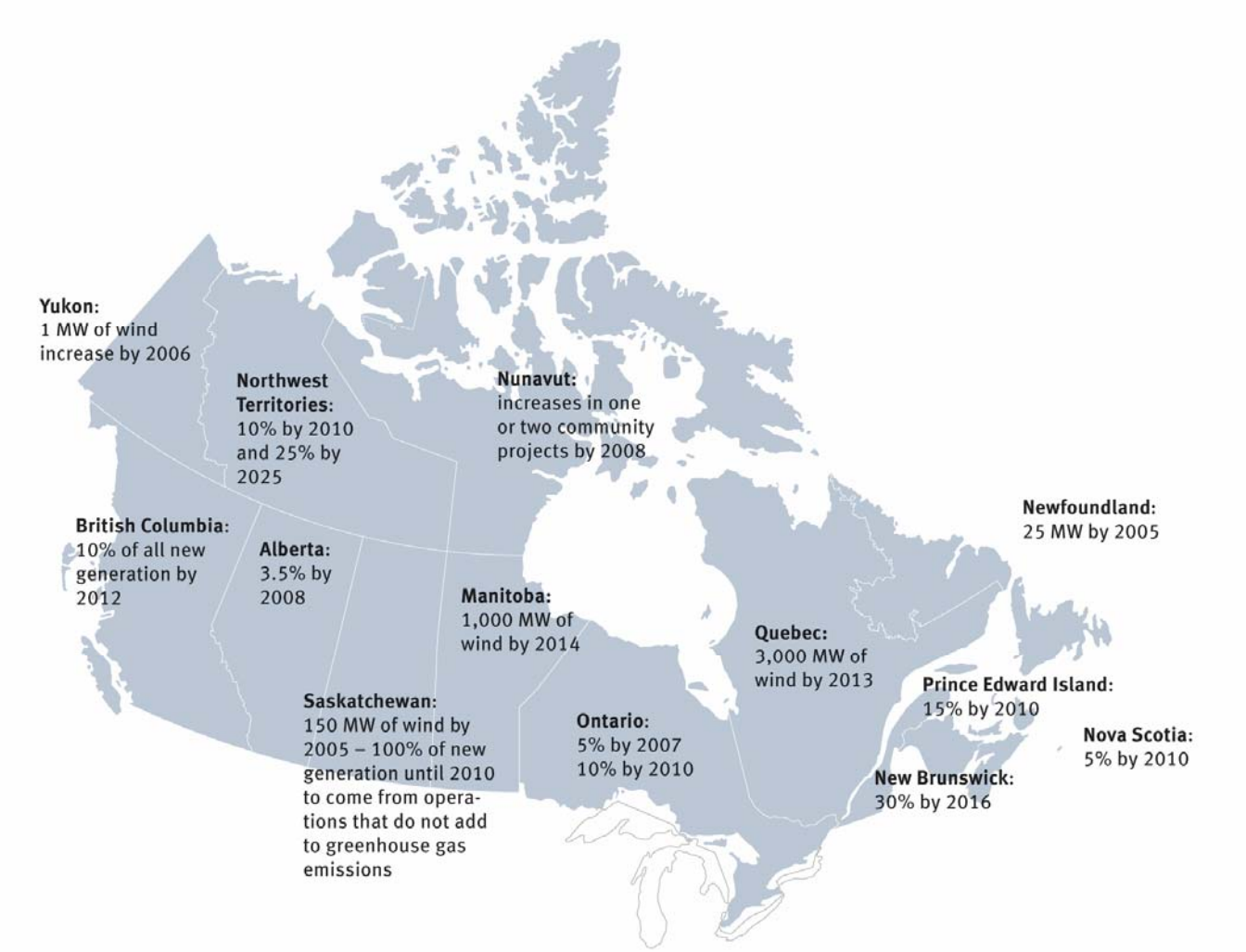
In provinces with traditional, vertically integrated utilities (without wholesale competition), electricity generated from renewables can command a premium over the prevailing wholesale market price only if those facilities are owned by independent power producers that have contracted their output through some form of power purchase agreement. The various federal government incentive programs are expected to help reduce the costs of renewables at the provincial level and support momentum toward reaching these renewable targets.

While it is technologically feasible for Canadian renewable electricity projects to export their electricity to the United States for the purposes of meeting US RPS mandates, there are only a few limited instances of this occurring. All of the US states bordering or near Canada with a RPS require a physical energy delivery into the state or regional power pool in order for the generation to be eligible for the RPS. This means that the generation unit must be located such that there is a clear path of delivery from the renewable generation unit to the US state or regional power pool. However, because of the sizable demand being created by Canadian provincial mandates, it appears that most new renewable electricity being generated in Canada are being used in the domestic market instead of exporting to the United States.

[4] Pollution Probe. *Green Power Provincial/Territorial Targets and Policies.* September 2005.

The estimated amount of renewables expected from provincial RPS programs and provincial targets is 9,140 MW by 2017.

Figure 4. Canadian Renewable Electricity Standards and Targets as of September 2005



Source: Pollution Probe. 2005

2.1.2 United States

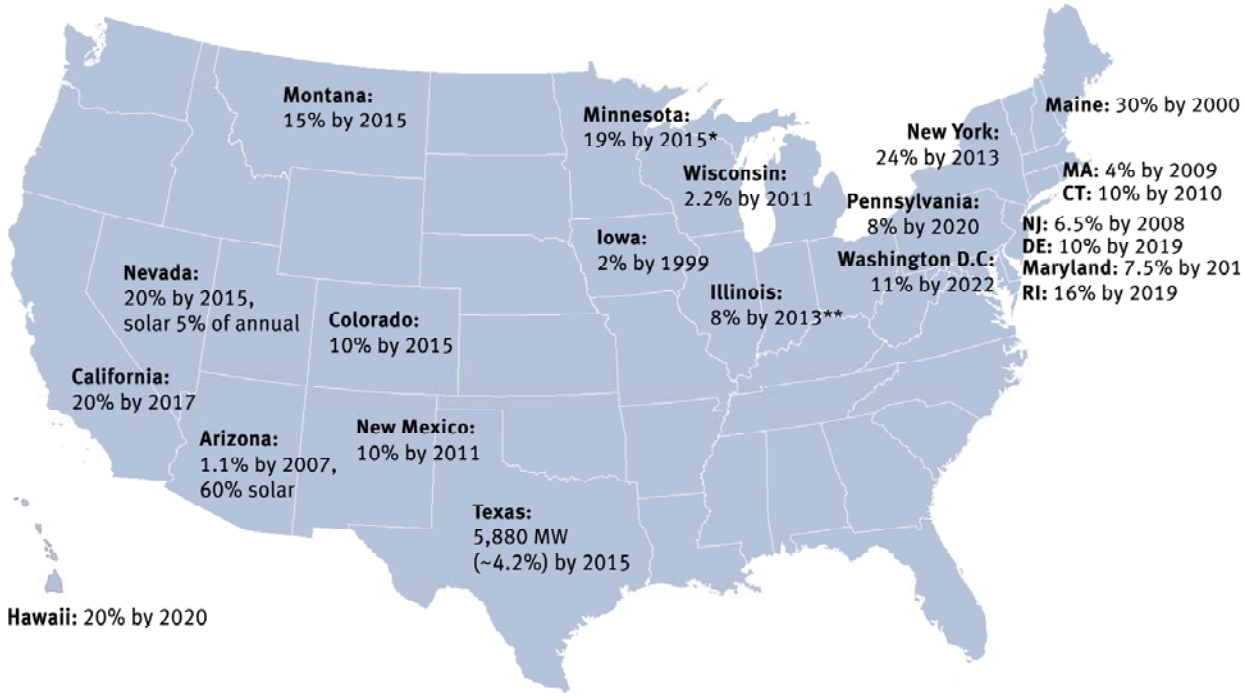
2.1.2.1 State Renewable Portfolio Standard

In the United States, the enactment of state RPSs has been a major driver in the demand for renewable electricity and for the development of new renewable generation facilities. In general, the most successful RPSs have output-based targets (as opposed to capacity targets)

that are long-lasting and increase over time. Currently in the United States, there are twenty-one states plus the District of Columbia that have enacted a RPS.

The demand for renewable electricity from state RPSs is dramatic, and has been the largest boon to the renewable electricity market in the United States since the enactment of the Public Utilities Regulatory Policy Act (PURPA) in 1978. According to the Union of Concerned Scientists, the demand for both existing and new renewable electricity from state RPS will total approximately 37,175 MW by 2017.[5] Of this amount, 32,000 MW will be from new renewable electricity.

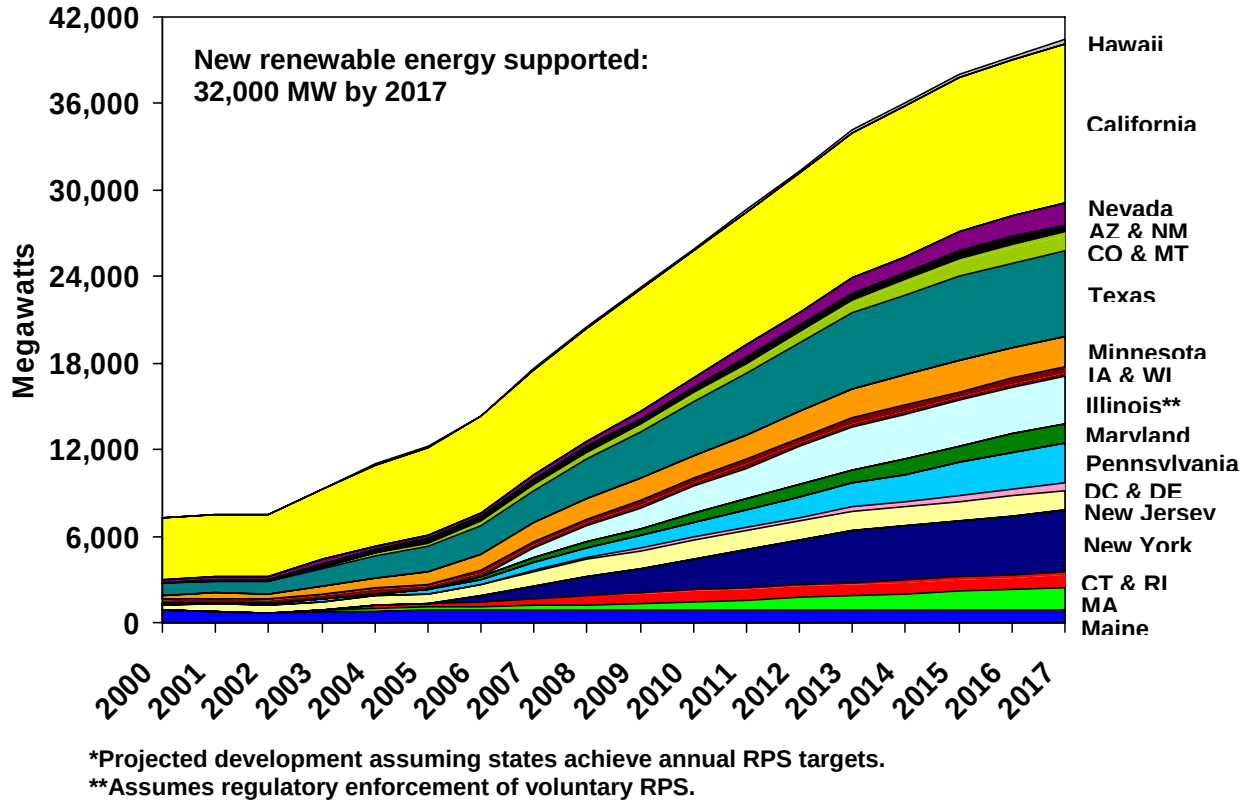
Figure 5. United States Renewable Electricity Standards as of January 2006



*Includes requirements adopted in 1994 and 2003 for one utility, Xcel Energy. **No specific enforcement measures, but utility regulatory intent and

[5] From interview with and documents received from Steve Clemmer, Research Director, Union of Concerned Scientists <www.ucsusa.org>.

Figure 6. New and Existing Renewable Electricity Demand Expected from US State Standards[6]



***Projected development assuming states achieve annual RPS targets.**
****Assumes regulatory enforcement of voluntary RPS.**

Source: Union of Concerned Scientists 2005b.

2.1.2.2 Existing and Proposed Emissions Regulation

Twenty-three states have enacted programs and policies to monitor and or reduce greenhouse gas emissions that are likely to impact the demand for renewable electricity. Policies to limit greenhouse gas emissions that impact the demand for renewable electricity include, setting limits for greenhouse gas emissions from power plants, introducing carbon adders to utility resource planning processes, and setting targets for statewide CO_2/greenhouse gas emissions. Finally, some states now mandate reporting of greenhouse gas emissions and several have established greenhouse gas registries for voluntary action.

Greenhouse Gas Emissions Limits

Several states are undertaking efforts to set limits or target offsets for the emissions of CO_2. The efforts have primarily been targeting the electricity sector, but recent efforts in New Jersey and California could possibly include fossil fuel burning facilities outside of the electricity sector.

[6] Projected development assumes states achieve annual procurement targets.

Massachusetts issued a rule in 2001 requiring a ten percent reduction in the CO_2 emission rates by 2006 compared to 1997–1999. The rule applies to the six highest emitting power plants in Massachusetts. The companies can apply for credits to the program resulting from investments in carbon sequestration and renewable electricity. New Hampshire established a cap on CO_2 emissions from power plants in the State in July of 2002. The law sets an annual cap for emissions in 2006 equal to CO_2 emissions in 1990. Starting in 2007 and continuing through 2010 the cap is set at a level seven percent below 1990 emissions. The law allows for the issuing of allowances for investments in energy efficiency, new renewable energy projects, conservation and load management. Oregon and Washington have implemented programs to require new power plants to offset portions (seventeen percent in Oregon, twenty percent in Washington) of their anticipated CO_2 emissions.

Finally, seven states from the northeastern and mid-Atlantic regions of the United States recently agreed on a multi-state Regional Greenhouse Gas Initiative (RGGI). The states involved are Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, and Vermont. The agreed framework targets a stabilization of CO_2 emissions from the region's power plants at 2009 levels from 2010–2015 and a ten percent reduction below 2009 levels by 2019. The specific allocation of emissions allowances is to be determined state-by-state. The allowance mechanism could have a dramatic impact on the voluntary market, positively or negatively, depending on how the program is implemented in each of the states. A worse case scenario is that renewables would not be able to make any carbon claims; a best-case scenario is that all renewable sales and purchases can make carbon reduction claims. In reality, the implementation is likely to be somewhere in between, where some claims can be made in limited circumstances, not altogether killing the voluntary renewable market but hurting it somewhat from today. Maryland, Massachusetts, Pennsylvania and Rhode Island are observers to the process and could join at a later time.

The question of whether greenhouse gas emission limits on the electricity sector may encourage renewable electricity depends on the specific design of the scheme and its allocation process. If greenhouse gas emitters are required to pay for the privilege of emitting carbon, then the program will increases the cost of fossil fuel generation, making it less competitive, while the price of renewable generation will remain constant. However, studies in the northeastern United States show that if pollution allowances are given on a free basis to the greenhouse gas emitters the value of the allowances will be worth more to the polluter than the cost of reducing greenhouse gases to comply with the cap.[7] These issues are still being debated in the Northeast and California.

Carbon Adders

Some states have implemented versions of "carbon adders" to encourage electricity providers to take into consideration the potential future cost of mitigating carbon dioxide emissions. A carbon adder is a sum of money that is added to the procurement costs of fossil fuel

[7] Burtraw, Dallas; Karen Palmer; and Danny Kahn. *Allocation of CO_2 Emissions Allowances in the Regional Greenhouse Gas Cap-and-Trade Program*. Washington, DC: Resources for the Future. <http://www.rff.org/rff/Documents/RFF-DP-05-25.pdf>, p. 4.

generation during a utility's resource planning process. The carbon adder explicitly takes into account the social cost of carbon emissions from electricity generation facilities when comparing prices of fossil fuel and renewable generation. California adopted a carbon adder of $8/ton CO_2 in April of 2005. Colorado's Public Service Commission set a carbon adder for a specific utility's procurement plans in 2003 as part of an agreed settlement with environmental groups. The carbon adder was set at $9/ton but it did not change the utility's resource selection. Oregon requires that regulated utilities include an analysis of carbon costs in their resource planning. The required analysis has not led to any changes in resource selection by utilities to date.[8]

Greenhouse Gas Targets

Several states have set targets for their future greenhouse gas emissions. Some targets are economy-wide while others are focused more specifically on the electricity sector. Some of the targets have been set by state governors, while others are bound in law. In 1998 New Jersey issued an administrative order targeting a three and a half percent reduction in greenhouse gas emissions by 2005, compared to 1990 levels. The state expects to surpass this goal, although the reductions have primarily been due to factors unrelated to the state's greenhouse gas policy initiatives.[9] Maine passed a law in 2003 requiring that the state reduce its greenhouse gas emissions to 1990 levels by 2010 and twenty percent below 1990 levels by 2020.[10] In 2005, California's governor issued an executive order setting targets for California's greenhouse gas emissions: "by 2010, reduce greenhouse gas emissions to 2000 levels; by 2020, reduce greenhouse gas emissions to 1990 levels; by 2050, reduce greenhouse gas emissions to eighty percent below 1990 levels."[11] Also in 2005, New Mexico's governor issued similar goals targeting a reduction of the state's greenhouse gas emissions to 2000 levels by 2012, ten percent below 1990 levels by 2020 and seventy-five percent below 1990 levels by 2050.[12]

The impact of greenhouse gas targets on the development of renewable electricity is dependent on the implementation strategies pursued by the states. In California, the goal of thirty-three percent RPS is one of the main strategies envisioned in order to meet the near-term goals.

Other Greenhouse Gas Initiatives

Several states have established working groups or commissions to develop climate change plans and policies for their state, including Arizona, California, New Mexico, North

[8] See Pew Center for Climate Change, State and Local Net Greenhouse Gas Emissions Reduction Programs: <http://www.pewclimate.org/states.cfm?ID=54>; <http://www.pewclimate.org/states.cfm?ID=56> and <http://www.pewclimate.org/states.cfm?ID=57>.

[9] An increase in nuclear power generation being one of the main reasons for the lower GHG emission in the states <http://www.pewclimate.org/states.cfm?ID=42>.

[10] See Pew Center for Climate Change, State and Local Net Greenhouse Gas Emissions Reduction Programs: <http://www.pewclimate.org/states.cfm?ID=52>.

[11] State of California. *EXECUTIVE ORDER S-3-05 by the Governor of the State of California.* California: 1 June 2005.

[12] State of New Mexico. *EXECUTIVE ORDER 2005-033 by the Governor of the State of New Mexico.* New Mexico: 9 June 2005. <http://www.governor.state.nm.us/orders/2005/EO_2005_033.pdf>.

Carolina, Oregon and Washington. California is considering a proposal to require mandatory greenhouse gas reporting for all large sources of greenhouse gas emissions. This is seen as a first step to a broad cap-and-trade scheme. Wisconsin has mandated CO_2 emissions reporting from all facilities that emit more than 1,000,000 tons of CO_2 per year, since 1993. New Jersey was the first state to classify carbon dioxide as a pollutant in 2005. Whether these initiatives result in incentives or drives for increased renewable electricity generation will depend on how the initiatives are implemented.

2.1.3 Mexico

Even though there is no explicit, quantitative mandate for the scale-up of renewable electricity in Mexico, this is one of the priorities set forth by the current six-year energy sector strategic planning program.[13] The draft Law for the Use of Renewable Sources of Energy (LAFRE) is a current effort to establish a quantitative goal for the development of RE. LAFRE establishes the creation of a Program for the Use of Renewable Energy Sources of Energy. LAFRE also established a minimum contribution of eight percent renewable energy to total power generation as a goal for 2012 (does not include large hydroelectric plants).

Despite the least-cost mandate embedded in the LSPEE Act (Art. 36 bis), energy policy guidelines have enabled CFE to include renewable electricity utility-owned projects in its expansion plan. One such project is under construction: La Venta II (83.5 MW wind power).

The development of renewable resources for exclusive sale to CFE will be further encouraged by the GEF-funded Large-Scale Renewable Energy Development Project (LSREDP).[14] In its first phase, due to begin in 2006, the LSREDP will provide a US$20M performance-based financial incentive (about US$11/MWh during the first five years of operation) to the La Venta III 101 MW wind project, to be bid in 2006. The LSREDP will also provide US$5M for a range of technical assistance activities aimed at facilitating the incorporation of renewable electricity into the Mexican electricity sector.

Unlike all previous renewable electricity CFE projects, La Venta III is a privately-owned, independent power producer. In compliance with its least-cost mandate, CFE will not pay more than its avoided cost for the electricity generated by La Venta III, and the LSREDP will cover the difference between the avoided costs and the price of the wind power.

A phase II of the LSREDP is foreseen with a further US $45M GEF grant. It seeks to support the installation of approximately 400 MW with a smaller per-MWh incentive.

With another GEF grant for US$50M, CFE will soon commission the construction of a turn-key hybrid solar/natural gas (combined cycle) power plant in the Northern state of Sonora. The concentrated solar electricity component will have a capacity of approximately 30 MW.

[13] *Secretaría de Energía* 2001.
[14] World Bank 2003.

2.1.4 Summary of Cumulative Demand from Existing Mandates 2005–2017

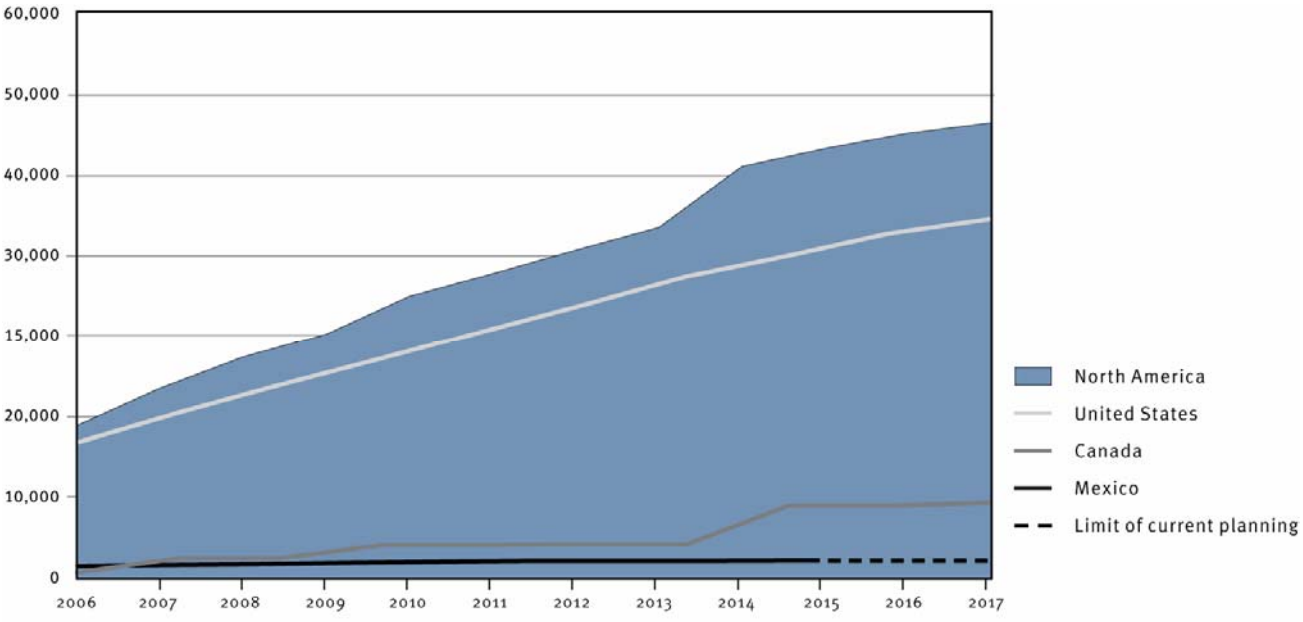
In Canada, several provinces have initiated aggressive measures, such as mandatory or voluntary renewable energy targets, RFPs, government procurement and standard-offer contracts for renewable energy.

The estimated amount of renewables expected from provincial and territorial RPS programs and targets is 9,140 MW by 2017.

In the United States, the state RPSs are currently the only significant regulatory drivers for new renewable development. The estimated demand for both new and existing renewable electricity will be 37,175 MW by 2017. Of this amount, approximately 32,000 MW will be from new renewable electricity.

In Mexico, current planning calls for the installation of an additional capacity of 642 MW in wind and geothermal projects between 2006 and 2014. Expansion of capacity beyond that point has not yet been planned.

Figure 7. Cumulative Renewable Electricity Demand in North America from Regulatory Mandates



Source: Canadian Wind Energy Association 2005, Pollution Probe 2005, Union of Concerned Scientists 2005b.
Current planning in Mexico does not extend beyond 2014.

Table 2. Cumulative Renewable Electricity Demand in North America from Regulatory Mandates (in MWs)

Year	Mexico (MW)	Canada (MW)	US (MW)
2006	1271	395	14381
2007	1356	1745	16967
2008	1356	2406	19520
2009	1457	2406	21866
2010	1559	4006	24143
2011	1710	4006	26450
2012	1812	4079	28761
2013	1913	4079	31171
2014	1913	8760	32949
2015	1913	8760	34854
2016	N/A	9140	36094
2017	N/A	9140	37175

(Data for Figure 7.)

2.2 Voluntary Market Drivers: Green Pricing, Renewable Electricity Marketing, RECs and Voluntary Carbon Reduction

The 'voluntary renewables market' includes: (1) green pricing programs (renewable electricity that is offered by the utility to their customers through a special green tariff); (2) renewable electricity marketing that is offered by energy service providers in restructured electricity markets (e.g., the renewables are offered by marketers in competitive markets); (3) renewable electricity certificates that can be offered to customers in either a traditionally regulated or in restructured electricity markets. A renewable certificate represents the renewable attribute of electricity generated by a renewable resource and is sold separately from the underlying electricity. One renewable certificate equals the generation of one MWh of renewable electricity, but since the trading of it is not constrained by the transmission grid, it provides for a much more fluid and national market. What customers are paying for when they buy a renewable certificate is an equivalent amount of renewable electricity generation that displaces non-renewable sources from the regional or national electric grid; (4) voluntary greenhouse gas reduction programs where businesses and industries voluntarily reduce their greenhouse gas footprint by buying renewable electricity, installing renewable electricity either on site or off-site (covered in the next section of this report) or by purchasing renewable certificates; and (5) other voluntary air pollutant reduction programs that might result in the purchase of electricity or renewable certificates from renewables as a pollution reduction strategy.

2.2.1 Canada

The voluntary renewable electricity market in Canada is relatively small and immature, primarily due to a lack of consumer understanding and awareness about renewable electricity offerings. That said, there are several 'utilities' offering renewable electricity to their customers (primarily commercial/industrial customers): BC Hydro offers "Green Power Certificates," to domestic commercial customers, ENMAX offers renewables through its Greenmax Program to the residents of the City of Calgary, and the Ontario Power Generation Company's Evergreen Power is offering renewables to commercial customers. Prince Edward Island has a small green pricing program through Maritime Electric's Green Power Program. In addition the following also have bundled renewable electricity programs: SaskPower, Toronto Hydro, Energy Ottawa, Select Power and Nova Scotia Power. There are a couple of renewable electricity programs (e.g., Energy Ottawa) that sell only to the federal government and are included in the Government Procurement (Section 2.3) part of this report.

There are only a handful renewable electricity marketers in Canada: two are new renewable electricity marketers in Ontario (a restructured electricity market), Select Power, and Bullfrog Power. The third, Vision Quest, sells to customers in Alberta and the United States. In addition, several groups sell renewable electricity certificates: Pembina Institute, Canadian Hydro Developers, EPCOR, Oakville Hydro; Gray Bruce Energy Co-op, Canadian Renewable Energy Corporation, and JD Irving.

Ontario has a 'set-aside' of tradable emission allowances for renewable electricity projects for sulfur dioxide (SO_2) and nitrogen oxides (NO_x) that has been operating since the beginning of 2002. These allowances can be sold to Ontario Power Generation (OPG), to the owners of other facilities or to other interested parties that may formally retire them. This set-aside represents a limited financial incentive to renewable projects, depending on the market value of the allowances. In order to have the intended emission reductions effects, retailers of renewable electricity and renewable certificate products in Ontario must apply for the SO_2 and NO_x allowances for the source facilities and then transfer the allowances to their customers or retire them on behalf of their customers. Otherwise unclaimed allowances will revert to OPG that can then use them to produce additional emissions. These tradable emission allowances may provide extra revenue to eligible renewable generators but they are not incremental to the Ontario provincial target.

The Environmental Choice Program, EcoLogo, reported to us that they certified 1,800 MW of Canadian-owned renewables at 155 facilities in 2004.[15] However, most of this comes from plants whose electricity is sold directly to utilities and is generally not available in the voluntary market, except in limited instances where the certificates are resold by the utility. The voluntary market for renewables in Canada today is probably less than 500,000 MWh/year and is counted as part of the provincial targets. Because of this fact, the authors estimate that the voluntary market will not produce any significant incremental demand for renewable electricity above and beyond the provincial targets.

[15] Personal communication with TerraChoice.

2.2.2 United States

2.2.2.1 Voluntary Renewable Sales: Green Pricing, Renewable Electricity Marketing and RECs

Voluntary sales of renewable electricity in the United States take place in two different markets. The largest and the one that has been in existence the longest is the offering of renewable electricity by utilities and competitive electricity suppliers. For this market customers sign up with either their local utility or, if the electricity market has been deregulated, with an energy service provider (ESP) that offers a renewable electricity product. Generally, customers can choose to purchase discrete blocks (e.g., 100 kWh blocks) or a percentage (e.g., 25, 50 or 100 percent) of their electricity usage from renewable resources. In 2005 more than 600 utilities and competitive marketers offered more than 150 renewable electricity products across the United States.

The other market for renewable electricity is the market for renewable electricity certificates.[16] This market is of more recent status but it has experienced tremendous growth in the last few years. More than a third of the utilities which offer renewable electricity products to their customers buy renewable certificates to supply their sales.[17]

Renewable certificates have become a preferred method of purchasing renewable energy among large national companies and organizations. In fact, most of the "Top 25" purchasing members in the EPA's Green Power Partnership include RECs in their purchase.

Greenhouse Gas Offset Products
In 2005, several organizations began offering greenhouse gas offset products in the United States. This approach is in its early stages and the potential benefits for the renewable electricity market have not been fully assessed.

Size of the Voluntary Market
The voluntary market for renewable electricity products has grown dramatically over the last years as seen in Table 3. Renewable electricity products provided by utilities and ESPs have grown from supplying approximately half a million MWh in 2000 to almost 4.5 million MWh in 2004. The number of customers has been increasing steadily while the sales volumes have experienced an exponential growth. This is evidence of the growing importance of purchases by businesses, government agencies and other organizations. In 2004, one-fourth of the volume of electricity products sold by utilities and ESPs was bought by non-residential customers and the rest by residential customers.

[16] RECs are also known as "green tags" and Tradable Renewable Certificates (TRCs).
[17] Bird, Lori and Elizabeth Brown. *Trends in Utility Green Pricing Programs.* (Colorado: National Renewable Energy Laboratory 2004).

Table 3. Renewable Electricity Sales[18]

		2000	2001	2002	2003	2004	2005
Utility and ESPs	Sales (MWh)	454,000	1,532,000	2,331,000	3,180,000	4,490,000	4,600,000
	Customers	290,000	280,000	380,000	440,000	470,000	570,000
RECs	Sales (MWh)	-	-	150,000	600,000	1,720,000	3,890,000
	Customers	-	-	<10,000	<10,000	<10,000	<10,000
Total	Sales (MWh)	454,000	1,532,000	2,481,000	3,780,000	6,210,000	8,490,000
	Customers	290,000	280,000	380,000	440,000	470,000	570,000

The renewable certificate market is of a much more recent nature and the earliest estimates of the market size are from 2002. The volume of sales in 2002 represented the generation of 150,000 MWh, which increased to 3,890,000 MWh in 2004. The year 2005 marked the first year that the majority of green power sales were made to nonresidential customers, representing 65% of sales, up from about 45% in 2004.[19]

Projections of the voluntary market are very difficult since the market can be impacted significantly by policy changes within the electricity sector as well as by regional or national policies to mitigate greenhouse gas emissions. The price of other generation sources also plays a role in determining the demand for renewable electricity products. At the end of 2005, sales of renewable energy in voluntary markets represented a generating capacity equivalent of about 2,500 MW, with more than 2,000 MW from new renewable energy sources.[20]

Market Factors

The tremendous expansion in volumes sold in the voluntary market can be tied to increases in the availability of renewable electricity products, cheaper renewable resources and recognition among businesses, government agencies and other organizations of the value of buying renewable electricity.

More than half of all electricity customers in the United States have the option of purchasing renewable electricity from their electricity provider,[21] and all electricity customers can purchase renewable certificates and carbon offset products, which are available nationwide.

[18] The table represents a compilation of data from Bird and Swezey: *Green Power Marketing in the United States: A Status Report Ninth Edition* (Colorado: National Renewable Energy Laboratory, 2006); Center for Resource Solutions. *Verification Report Year 2000* (California, 2000) 2; Center for Resource Solutions. *Verification Report Year 2001* (California, 2002) 3; and Center for Resource Solutions. *Verification Report Year 2002* (California, 2003) 5.

[19] Bird and Swezey, p. 5

[20] Bird and Swezey, p. 5

[21] Bird and Swezey, p. 2

In general the longer a renewable electricity product has been offered the greater its participation rate, as it takes time for companies to spread the message about their product.[22]

Several factors have made renewable electricity and renewable certificate products more affordable and more accessible. The continued advance in renewable electricity technologies have led to significant drops in the price of generating electricity from renewable resources. Because of the lower costs for acquiring resources, more companies are willing to offer renewable electricity products to their customers. There have also been changes to the way that renewable products are priced that has attracted corporations to buying and/or installing renewable electricity. The fact that the price of renewable electricity is not dependent on fuel supplies has attracted corporations that are concerned about volatile energy costs. This is discussed in more depth in Section 2.4. Corporations are also increasingly focused on their direct and indirect greenhouse gas emissions and view the procurement of renewable electricity as an efficient and relatively inexpensive way of reducing their greenhouse gas footprint. Finally, companies are increasingly marketing their commitment to renewable electricity by labeling their products with "Made with Renewables" and similar branding in order to differentiate their products in the marketplace.[23]

A couple of other factors that have been important in supporting the growth of the voluntary market are related to the reliability and transparency of the market. Independent certification of renewable electricity products, especially in the case of renewable certificates, provides certainty to a market that is not regulated by any government.[24] Regional tracking systems have been established and several more are under development in the United States adding to the transparency and integrity of the market. Finally, it is important that customers are clearly informed about what they are purchasing and that the competing products are somewhat comparable. There are regional variances in what is considered renewable often as a consequence of specific state legislation unrelated to the voluntary market. Information and educational materials are available from organizations such as the Center for Resource Solutions' Green-e Program, the US EPA Green Power Partnership, and others.

A related issue is the ability for renewable suppliers to make air quality benefit claims when marketing their products. While cap-and-trade schemes for NO_x and SO_2 have either eliminated or severely limited the renewable generators' ability to make claims about these pollutants, no such scheme has been implemented for greenhouse gas emissions, though this may change soon. Several states are working towards carbon cap-and-trade schemes (see Section 2.1.2.3) and unless renewables are granted allowances, these policies could work to undermine the voluntary renewable market. Under the federal SO_2 cap-and-trade program and most regional NO_x cap-and-trade programs in the United States, emitters are given allowances under the cap. The only way a project can reduce the total quantity of a pollutant emitted in this type of program is to retire allowances. If a new renewable project comes on-line, and as a result a fossil power plant reduces their operations and thus their emissions, the power plant is then free to sell their excess emission allowances to another emitter. Thus the

[22] Wiser, Olson, Bird and Swezey, p. 24
[23] Center for Resource Solutions 2005
[24] World Resources Institute 2004, pp. 6–7.

new renewable project has no impact in the overall amount of emissions under the cap. There are a few exceptions to this rule, where renewable projects are granted allowance set-asides, but these instances are very limited. This impacts the voluntary renewable electricity market because marketers cannot make any claims with regards to reducing capped pollutants. The ability to advertise and show the air quality benefits of renewable electricity is an important sales and marketing strategy in the United States.

2.2.2.2 Voluntary Carbon Reduction Measures: Greenhouse Gas Registries

California, Maine, New Hampshire and Wisconsin have established voluntary greenhouse gas registries. Wisconsin's registry is for more than just greenhouse gases and the State is currently involved in establishing a more regional registry involving the States of Illinois, Indiana, Michigan and Ohio. The US EPA and the Department of Energy have also established registry programs. All of these registries have primarily been focused on inventorying current greenhouse gas emissions. Whether purchases of renewable electricity and renewable certificates will be included as one option to reduce emissions depends on the design of their specific protocols. Since several companies that are currently participating in registry efforts are also major purchasers of renewables, it is likely that registries could adopt rules that include and thereby promote the renewable market.

2.2.3 Mexico

Currently, there is no green pricing scheme in Mexico. However, companies willing to get renewable electricity can generate electricity either on-site or remotely, via the self-supply model (discussed in Section 3.1.3.1.)

A survey made with the largest electricity consumers in Mexico shows that a green pricing scheme would likely be successful. According to the results of this survey, commissioned by the National Commission for Energy Conservation (*Comisión Nacional para el Ahorro de Energía*, Conae) and funded by the Commission for Environmental Cooperation, 54 out of the 100 largest consumers would be ready to pay a premium tariff for renewable electricity.[25]

2.2.4 Summary of Cumulative Voluntary Demand in North America

The voluntary market in Canada is extremely small and immature. Although a handful of provinces have utility green pricing programs or renewable electricity marketing programs, there is little demand right now for such products, given the current regulatory uncertainty. In general, most voluntary renewable purchases in Canada will be counted toward provincial and territorial targets, and therefore, the authors estimate little additional demand from voluntary markets.

The voluntary market for renewable electricity in the United States has experienced exponential growth since its inception in the mid-1990s. This has been a result of increased

[25] *Comisión Nacional para el Ahorro de Energía* 2002.

availability of products, the development of new products (such as RECs), the decreasing price of renewables and the increased awareness of the benefits of renewable electricity. In 2004, 6.2 million MWh were sold in the voluntary market, of which almost half were to commercial, industrial and non-federal governmental customers. Altogether, voluntary purchases represented more than 2000 MW of installed capacity. Some experts project that the voluntary market will support more than 7,000 MW of capacity by 2010.[26]

In Mexico there is currently no green pricing scheme.

2.3 Government Procurement

Government procurement of renewable electricity refers to purchases made by a branch of the federal or state/provincial government of either renewable electrical energy (such as that delivered by the local utility to a particular building or site), or the purchase of renewable certificates to 'green' the electrical energy used by that government agency or site.

Government procurement is most commonly undertaken to replace or 'green' the electricity used in government buildings, and for government services such as water pumping and purification, street lighting, etc. Governmental entities often set procurement targets and then issue requests for proposals from renewable electricity suppliers in order to obtain the electricity or renewable certificates needed at the best price available. Both the United States and Canada have various government procurement programs.

2.3.1 Canada

The Canadian government has a renewable electricity procurement target of twenty percent of federal electricity being procured from renewable energy. It was approved through Cabinet and is expected to be 450,000 MWh/year when complete in 2010. Eligible electricity must be generated and delivered to the province where the purchases are being made. The ownership of the environmental attributes associated with the generation of that electricity must be delivered to the Canadian Government. This federal procurement is incremental to provincial targets.

The Government of Alberta purchases the equivalent of ninety percent of its electricity consumption from renewables (ramped over a two-year period). Toronto has made a twenty-five percent commitment but they have not yet fulfilled it. In general, cities and provinces in Canada are more likely to negotiate a purchase for renewable electricity and, based on that purchase, then announce their target. One exception is the British Colombia, where the provincial government set a fifty percent clean energy target and BC Hydro was given ten years to meet it. The energy must come from renewable resources and meet Ecologo criteria.

[26] Based on MWh projections from Holt and Bird, p. 36

Currently, total purchases of electricity from emerging renewable energy sources, at all levels of governments in Canada, are estimated to be more than 600,000 MWh/year. However, most electricity is not "procured" per se, since it is provided as part of monopoly utility service. Only 147 000 MWh/year of the 450,000 MWh/year commitment by the federal government have been purchased to date.

2.3.2 United States

On 8 June 1999, President Clinton issued Executive Order 13123 requiring federal agencies to increase their use of renewable electricity.[27] Subsequently, the Secretary of Energy set a goal for federal agencies to source two and a half percent of their electricity from renewable energy by 2005.[28] In September 2005, the Department of Energy announced that the goal had been reached and even exceeded. A total of 2.4 million MWh of renewable electricity is being used by the federal government on an annual basis in 2005.[29] A list of the largest purchasers of renewable electricity in the United States reveals that four of the top nine purchasers of renewable electricity are federal agencies. The four agencies combined buy more than 1,500,000 MWh annually.[30]

New federal renewable procurement goals were established by the Energy Policy Act of 2005. Federal agencies are directed to obtain three percent of their electricity from renewable sources in fiscal years 2007 through 2009, rising to five percent in fiscal years 2010 through 2012 and seven and a half percent thereafter.[31]

On January 24 2007, President Bush issued Executive Order 13423 establishing a policy for Federal agencies to conduct their environmental, transportation, and energy-related activities in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner. The order sets goals for the Federal agencies for several areas, including reductions in energy intensity and increases in purchases of renewable energy from new renewable sources.[32]

A few states, including as Arizona, New York, Maryland, Pennsylvania and New Jersey have instituted similar procurement policies. In 2005 Arizona's Governor issued an Executive Order requiring "all new state funded-buildings...to derive at least ten percent of their energy from a renewable resource."[33] The New York Executive Order mandates that State agencies purchase no less than ten percent of the overall State facility energy requirements from renewable electricity sources by 2005. The mandate will increase to twenty percent by

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[27] Federal Register 1999: Executive Order 13123 of 3 June 1999. *Greening the Government Through Efficient Energy Management.*
[28] See <http://www.eere.energy.gov/femp/technologies/renewable_fedrequire.cfm>.
[29] US Department of Energy, November 3, 2005, *Federal Government Increases Renewable Energy Use Over 1000 Percent since 1999; Exceeds Goal*, <http://www.energy.gov/news/2615.htm>.
[30] See <http://www.epa.gov/greenpower/partners/top25.htm>.
[31] *Growing Renewable Energy*. Recommendations from New England Roundtable (Worcester: 19 July 2005) 13.
[32] Federal Register Vol. 72, No. 17: Executive Order 13423 *Strengthening Federal Environmental, Energy, and Transportation Management.* See <http://www.ofee.gov/eo/EO_13423.pdf>.
[33] Arizona, Executive Order 2005-05: "Implementing Renewable Energy and Energy Efficiency in New State Buildings" <http://www.governor.state.az.us/eo/2005_05.pdf>, p.1.

2010.[34] Similarly Maryland has an aggressive renewable procurement goal of twenty percent, of which at least ten percent must be derived from wind generation, solar voltaic or solar thermal sources.[35] Pennsylvania and New Jersey are supplying ten percent and twelve percent, respectively, of their state governments' electricity usage from renewable sources.[36,37]

Municipal and state government entitles have also been very active in purchasing renewable electricity. As of June 2005, thirty-eight municipal and local governments were purchasing a total of 295,000 MWh/year.[38]

2.3.3 Mexico

There is no federal government initiative to purchase renewable electricity.

2.4 Other Demand Drivers

2.4.1 United States

2.4.1.1 Public Benefits Funds

A Public Benefits Fund (PBF) is a fund that is collected through a surcharge on electricity rates or electricity generators and that is used to directly support public purposes related to the electricity sector. There are fourteen US states that offer PBFs; of these six have programs to increase the demand of renewable electricity by providing customer incentives to switch to renewable electricity, providing customer education, offering direct support for renewable electricity marketers, and setting up programs to encourage government and institutional purchases of renewable electricity. Although individually these kinds of programs are not enough to stimulate a dramatic increase in demand for renewable electricity, combined with other state funding and incentives they can cumulatively transform the market in a significant way by creating a sustained demand and raising awareness among potential customers.

2.4.1.2 Shift in the Relative Prices of Renewable Electricity and Fossil Fuels

One of the greatest demand drivers in the United States is the reduction in the consumer price gap between renewable electricity and the default electricity offering. Many landfill gas and wind facilities are currently generating electricity at prices below or equal to combined cycle

[34] State of New York, June 10, 2001, *Governor Announces Creation of Greenhouse Gas Task Force*, <http://www.ny.gov/governor/press/01/june10_01.htm>.
[35] Maryland Department of General Services, 9 October 2002, *State Buying More Green Power*, <http://www.dgs.maryland.gov/press/2002/100902.htm>.
[36] Commonwealth of Pennsylvania, 14 October 2004, *Pennsylvania Doubles 'Green' Electricity Purchase to 10 Percent*, <http://www.ahs.dep.state.pa.us/newsreleases/default.asp?ID=3150&varQueryType=Detail>.
[37] <http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=NJ02R&state=NJ&CurrentPageID=1>.
[38] Personal communication between Meredith Wingate and Matt Clouse, EPA's Green Power partnership, 17 January 2006.

natural gas facilities.[39] This can be attributed to a number of factors working together: lower costs for wholesale suppliers due to market maturation and economies of scale, economies of scale on the retail side as demand increases, and higher prices for natural gas and other fossil fuels used to generate the default electricity mix.

2.4.1.3 Value of Renewables as a Price Hedge

Unlike conventional energy resources whose costs vary with the fluctuations of fuel input prices, renewable energy sources typically have fixed and known prices. Some utilities and marketers are structuring renewable electricity offerings to appeal to customers that want a hedge against rising fuel costs. Most renewable electricity products are priced as a premium above the default service electricity offering while some require customers to pay a "fuel charge adjustment" fee where fossil fuel cost increases are captured. In either case, when fossil fuel prices increase, then so too does the price for the renewable product. As a departure from this, a handful of utilities have decided to let their renewable electricity customers take advantage of the price stability of renewables. They either price their renewable products independently from the default electricity service, or they have eliminated the "fossil fuel adjustment" surcharge.[40] Austin Energy, Oklahoma Gas & Electric, Xcel Energy, and Eugene Water and Electric Board are examples of utilities that have used this strategy. Austin Energy's renewable electricity rate is guaranteed to be stable for ten years, which is an important selling point for energy-intensive corporate customers with long-term concerns about the risks in their electricity bills.[41]

[39] Hamrin, Jan and Ray Dracker. 2004. *Renewable Energy Options & Opportunities - Bay Area Rapid Transit District*, (San Francisco: Center for Resource Solutions) 24.
[40] Bird and Brown, p. 15
[41] With the rising price of natural gas this pricing structure resulted in customers paying less for the renewable energy product than for the standard offer for electric service in two of these regions. For more details on an example of this pricing structure, see World Resources Institute. 2004. *Corporate Guide to Green Power Markets. Developing "Next Generation" Green Power Products from Corporate Markets in North America. Installment 6.* (Washington, DC) 9.

SECTION III. ANALYSIS OF SUPPLY-SIDE DRIVERS

3.1 Self-Supply, On-Site Distributed Generation and Off-Grid Generation

Self-supply refers either to the generation of electricity on the customer's site, known as on-site distributed generation, or (in the specific case of Mexico) to customers that have off-site generation and pay wheeling services to the distribution grid. The most common forms of on-site distributed generation include co-generation (combined heat and electricity), emergency generators, photovoltaics (PV), and small biomass or wind generators; off-site projects can be based on wind, hydro or biomass electricity. All three countries in North America stand to benefit from an increase in the amount of installed MWs of self-supply. This section focuses on the policies and opportunities for increasing the size of this market.

Small-scale, on-site distributed generation has a number of benefits for both the owner and society. Benefits to the owner include potential for lower electricity costs over time, higher service reliability, high electricity quality, increased energy efficiency, and energy independence. The benefits to society at large include significant environmental benefits from cleaner electricity production, a reduced reliance on the aging grid, peak electricity demand reduction (seasonal and time of day), avoided distribution and transmission system losses, increasing lifespan of existing generation (reducing the need for additional baseload generation plants), and the ability to provide electrical services to remote rural populations.

3.1.1 Canada

Most policies and programs to encourage self-generation in Canada are on the provincial level as provinces have jurisdiction over the electricity generation, transmission and distribution. They include eliminating the sales tax on small renewable energy equipment, net metering laws, such as those in Ontario, Québec, British Colombia, and Manitoba, and streamlined interconnection standards.

As an example, in August 2005, the Ontario Minister of Energy issued a directive to the Ontario Power Authority and the Ontario Energy Board asking the two agencies to "co-operate in developing terms and conditions for a standard offer program for small generators embedded in the distribution system that use clean or renewable resources." The letter encouraged those involved to work on overcoming barriers currently impeding the development of renewable energy and distributed generation. In 2006, Ontario announced a new Standard-price contract that is likely to produce 1,000 MW over the next 10 years. The contracts and fixed-price tariff (like a feed-in tariff) are open to all and sets the tariff level at: C$0.11/kWh for wind, biomass and small hydro; and C$0.42/kWh for solar photovoltaics.[42]

[42] For more information, see:
<http://www.energy.gov.on.ca/index.cfm?fuseaction=english.news&body=yes&news_id=124>; or

In addition, the Canadian Standards Association is working to establish a national set of standards for distributed generation interconnection. Finally, the federal government is convening a group of experts to discuss the potential impact of widespread proliferation of distributed generation. Some of the topics being discussed include:

- Impact of large-scale integration of distributed generation;
- Communication systems for distributed electricity resources;
- Distributed generation regulatory assistance program; and
- Interconnection requirements, standards and guidelines for distributed generation technologies.

Some industrial plants in Canada, especially in the forest products and mining sectors, generate electricity for their own use from biomass or small hydro facilities. According to the Pembina Institute's February 2003 report, there are also individual consumers using small wind turbines or PV arrays that are not included in any net-metering programs.[43] However, the authors were not able to collect any data on the size of this sector.

3.1.1.1 Net Metering in Canada

Net metering is a program where any surplus electricity generated on a customer's site and not immediately consumed is fed into the grid (this happens at certain times of the day and seasons of the year). These small electricity generators can then take back that excess electricity at another time thus the consumer is only charged for the net amount of electricity consumed. The utilities allowing net metering at this time are BC Hydro, Hydro One, Manitoba Hydro, Hydro-Québec, Nova Scotia Power, Toronto Hydro, and Maritime Electric (Prince Edward Island). The amounts of electricity involved are very small compared to other types of renewable programs discussed in this report.

3.1.2 United States

In the United States, there are four main drivers for the installation of on-site distributed generation: (1) reduced costs due to technology advancements and state and federal incentive programs, (2) favorable net-metering and interconnection policies, (3) market demand for RECs, particularly from solar installations that command a premium in some compliance markets, and (4) customer's belief that renewable distributed generation can help stabilize their costs, particularly as natural gas and electricity prices continue to rise. That is, on-site renewable distributed generation offers an attractive price hedge.

3.1.2.1 Net-Metering Policies in the United States

Most US net-metering policies allow a customer to receive a monthly credit for excess electricity generated on-site such that they are only billed for the net amount of electricity

<http://www.powerauthority.on.ca/Page.asp?PageID=1224&SiteNodeID=161>.
[43] See Pape-Salmon et al. 2003.

drawn from the grid over a period of time, usually one year. Net metering laws are usually accompanied by other policy features that are designed to encourage the installation of on-site distributed generation units. In particular, some states offer preferential pricing for electricity that is delivered to the grid, e.g., crediting the customer with the retail rate for electricity instead of a wholesale generation rate and the avoidance of transmission, distribution, ancillary service fees and stranded costs.

Net metering laws have been enacted in thirty-nine separate states plus the District of Columbia. Though most discussions of net metering focus on solar installations, net metering is also very important for small on-site wind installations. Fuel cells and, in some cases, small cogeneration are also eligible for net metering in about ten states. Other renewable technologies, though often eligible for net metering, are not generally available at the right scale to take advantage of net metering, for example, biodigester or animal waste facilities. [44]

Net metering alone is an important but insufficient strategy to drive an increase in on-site distributed generation. Most potential on-site renewable generators need financial incentives to help overcome the high technology and administrative costs. Therefore, many states combine net metering policies with other types of distributed generation incentives.

3.1.2.2 Interconnection Policies for On-Site Distributed Generation

The policies controlling grid interconnection requirements can either encourage or discourage small-scale renewable electricity installations. Many utilities have implemented conservative interconnection policies for distributed generation resources because of safety concerns and electricity quality concerns. Nationally, there is a wide variation among standards for small-scale renewable electricity installations, and even within a single state, policies controlling interconnection can vary between individual utilities. Recently, there have been efforts to simplify, standardize, and expedite the interconnection of renewable electricity systems. Generally, these efforts address issues such as the interconnection application and review processes, timelines and fees, technical and operating requirements, metering and billing options, and other issues. Such policies add certainty to the interconnection process, and they ensure that utility-imposed requirements are not overly conservative. In addition, many states are raising the size of systems that can take advantage of simplified interconnection to anywhere from 1-5 MW. However, despite the progress being made on generalized interconnection protocols and the proliferation of "tool kits" and other resources to help on-site generators navigate the maze of requirements, most distributed electricity developers today still must negotiate interconnection agreements directly with local utilities or regional transmission organizations (RTOs).

FERC has taken some action to remedy this problem by developing an interconnection rule for small generators up to 20 MW in size. The rule, established in May 2005, includes two components: the Small Generator Interconnection Procedures, which describes the technical

[44] Database of State Incentives for Renewable Energy, <http://www.dsireusa.org/library/includes/type.cfm?Type=Net&Back=regtab&CurrentPageID=7&Search=TableType>.

procedures that utilities and customers shall follow, and the Small Generator Interconnection Agreement, which defines the legal rights and obligations of each party, addresses cost responsibility, lays out milestones for completing the project, and sets forth a process for dispute resolution. Much of the rule is based on pre-existing state policies, and the FERC rule may serve as a model for states newly adopting interconnection standards. Both factors could help improve consistency throughout the nation. Although there has not been enough time to see the impact, advances in standardization at the federal level are very important.

3.1.2.3 State and Federal Incentives for Renewable Distributed Generation

One of the greatest drivers for small scale renewable installation is the availability of financial incentives to help overcome the initial high costs of small renewable systems. The types of state financial incentives vary, and many states have a combination of incentive programs to encourage a variety of installations. The most common type of incentives are buy-down programs (rebates), grants, or low-interest loans. Twenty-four US states have rebate programs for small distributed renewable generation installations or have some sort of loan program.45 More recently some state funds have tried different program approaches such as conducting competitive solicitations for on-site projects, building distribution channels to help companies market their product to buyers, providing equity investments in distributed generation manufacturers, purchasing PV systems in bulk and reselling them to buyers, and leasing the on-site technology to potential hosts. With regards to federal incentives, the EPACT 2005, created a new residential solar tax credit for thirty percent of the qualified PV system expenditures up to a maximum tax credit limitation of $2,000. Under the Farm Bill, the U.S. Department of Agriculture offers loan guarantees and partial-cost grants for rural areas. Since 2001 this program has stimulated the installation of 117 large-scale wind turbines (totaling 1.3 billion kWh per year), 102 anaerobic digesters for methane-to-electricity and/or heat (totaling 0.36 billion kWh per year), and numerous small-scale solar and wind projects.

Individually, these programs may not make a significant impact, but cumulatively, they are having a large impact on the number of renewable projects deployed, and thus the economies of scale for renewable distributed generation.

3.1.3 Mexico

3.1.3.1 Large-Scale Grid-Connected Self-Supply

A large number of grid-connected self-supply projects are currently operating in Mexico, including several small hydro projects and one landfill methane project. In addition, future renewable electricity projects with a combined capacity of 1,240 MW have obtained a license from the Energy Regulatory Commission (CRE).[46]

[45] DSIRE, Financial Incentives <http://www.dsireusa.org/summarytables/financial.cfm?&CurrentPageID=7>.
[46] *Comisión Reguladora de Energía* 2006a.

The electricity consumers that have developed or seek to develop self-supply projects are driven by their environmental concerns, and by lower and more stable tariffs (hedging against tariff fluctuations). In addition, self-supply projects can benefit from CDM resources (see Section 3.2.3.2) and the accelerated depreciation allowance (see Section 3.2.3.1).

Some of these projects are the result of a commercial agreement between a generator and one or more consumers; who together form a single legal entity by means of a cross-shareholding deal. This allows them to remain in compliance with the LSPEE Act because there is no trading of electricity between them, but rather a mere internal transaction.

The current regulatory framework allows the remote self-supply, i.e. projects where the generation and the consumption are located in different locations, and the electricity is transmitted from one to the other by means of a wheeling arrangement with CFE.

In order to favor remote, intermittent renewable electricity self-supply projects (notably wind), CRE issued in January 2006 a revised special interconnection contract[47] known as the New Interconnection Agreement for Self-Supply from Intermittent Sources of Energy with credited capacity. This new agreement incorporates a methodology to estimate and credit the capacity contribution of RE sources of energy to the national electric system and sets the following provisions:

- The capacity used for the wheeling charges is defined as the average rather than the maximum capacity.
- The grid acts as an energy bank, allowing the self-supply project to deliver energy at one time and withdraw it at a different time, and to exchange energy between the different time periods (peak, base and intermediate), via a formula based on electricity tariffs.
- The capacity contribution of intermittent electricity generation is assessed as the monthly average generation during one hour per day (peak time) in working days. This capacity is then subtracted from the demand of the consumer(s), in order to determine the applicable demand charges.

In addition, in order to ensure adequate transmission capacity for self-supply projects (especially in the Isthmus of Tehuantepec, where a transmission bottleneck exists), the Energy Regulatory Commission (CRE) has developed an *open season* proposal, aimed at defining the required transmission infrastructure. CFE would build it and then recover the investment by means of wheeling charges.[48]

3.1.3.2 Small-Scale Grid-Connected Self-Supply

According to the LSPEE Act, self-supply under 0.5 MW does not require a permit. However, no regulatory procedures exist to enable the connection to the grid of these small-scale self-

[47] This new contract substitutes a previous version of September 2001, which did not include the capacity recognition provision, thereby preventing the feasibility of self-supply projects with industrial customers that need to pay demand charges. See: *Comisión Reguladora de Energía*, 2006b.
[48] *Comisión Reguladora de Energía* 2006c.

suppliers. The Regulatory Commission and the Electrical Research Institute (*Instituto de Investigaciones Eléctricas*, IIE) are currently analyzing ways to address this gap. IIE is carrying out the "Fotored 100" project, aimed at installing 100MW of grid-connected photovoltaic systems in the northwestern part of the country.[49]

3.1.3.3 Off-Grid Self-Supply

The off-grid market for renewable electricity is mainly driven by the demand of governmental programs, often with the assistance of bilateral or multilateral cooperation agencies, which have provided capital incentives for the procurement of renewable electricity technologies—mainly photovoltaic and some wind electricity systems. A combined amount of approximately 50 million dollars has been invested in these programs.[50]

The main ongoing program is the one carried out by the Agricultural Shared-risk Trust Fund (*FIRCO*), with GEF funds (*Fideicomiso de Riesgo Compartido* 2006). It is geared towards productive rural applications such as water pumping or electric cattle fencing.

In addition, the Secretariat of Energy (Sener) with the joint participation of the Commission for the Development of Indigenous People and the governments of four states of southern Mexico are starting the Integrated Energy Services for Small Communities in Rural Mexico Project (IESCRM), with a mix of funds that include a GEF grant, a World Bank loan, and state and federal contributions. The IESCRM is aimed at providing electricity from renewable energy sources or hybrid systems within the next five years to 50,000 rural households isolated from the national electric grid, in the states of Chiapas, Guerrero, Oaxaca and Veracruz.[51]

3.2 Other Market Supply Drivers

This section includes any other market drivers that were not captured in the three previous subsections, including production tax credits, system benefit funds and some air shed issues such as smog and particulate emission policies.

3.2.1 Canada

Canada has several supply-side drivers that encourage renewable energy. They include:

3.2.1.1 Accelerated Capital Cost (Depreciation) Allowance

The accelerated capitol cost (depreciation) allowance allows taxpayers an accelerated write-off of up to thirty percent per year of equipment generating electricity from eligible renewables. The federal government currently offers two tax incentives aimed mainly at

[49] Jorge Huacuz. Personal communication, February 2006.
[50] Jorge Huacuz. Personal communication, February 2006.
[51] See <http://www.sener.gob.mx/wb2/Sener/Sene_1702_electrificacion_rura>.

promoting investment in alternative renewable energy projects: Capital Cost Allowance Class 43.1 in the Income Tax Act, and the Canadian Renewable Conservation Expense.

Established in the 1994 Budget, Class 43.1 allows an accelerated write off of certain equipment that is designed to produce energy in a more efficient way or produce energy from alternative renewable sources. Budget 2005 further accelerates the capital cost allowance rate from thirty percent to fifty percent for certain high efficiency co-generation equipment and the full range of renewable energy generation equipment currently included in Class 43.1. Budget 2005 also extends the range of equipment eligible for Class 43.1 capital cost allowance treatment, and proposes that qualifying start up expenses of projects using these additional technologies be made eligible for treatment as Canadian Renewable and Conservation Expenses. The changes proposed by Budget 2005 represent an estimated $295 million in enhanced tax incentives.

The Canadian Renewable and Conservation Expense, created in the 1996 Budget, is a category of fully deductible expenditures associated with the start up of renewable electricity (such as wind farms) and energy conservation projects for which at least fifty percent of the capital costs of the property would be described in Class 43.1. Expenditures under this category are fully deductible, and can be financed using flow through shares. As well, the acquisition and installation of test wind turbines for a project, in cases where the device's primary purpose is to test the site's level of electrical energy production, also qualify for this assistance.

3.2.1.2 Wind Power Production Incentive (WPPI)

The Wind Power Production Incentive (WPPI) provides production incentive payments of 1 cent/kWhr the first ten years of operation to wind power generation facilities over 500 kW in size that are commissioned before April 1, 2007. The WPPI was established through the 2001 Budget, which provided $260 million to stimulate the development and installation of 1,000 MW of wind power capacity. This program is administered by Natural Resources Canada (NRCan).

3.2.1.6 Provincial Incentives

Provincial governments are increasingly active in promoting the deployment of emerging renewable energy. Several supply-side initiatives have been implemented or are in the process of being developed. For example, **Alberta** has specified that 3.5 percent (approximately 500 MW) of total electricity be met by renewables by 2008.

BC Hydro has already surpassed its voluntary target of meeting 10 percent of new energy requirements from "clean" energy. Electricity distributors in British Columbia will now pursue a voluntary goal of acquiring 50 percent of incremental supply from clean electricity over the period until 2012.

Manitoba Hydro is committed to producing 1,000 MW of wind power by 2010, primarily through the use of voluntary power purchase agreements.

Saskatchewan has pledged to have 172 MW of wind power and 45 MW of "Environmentally Preferred" generation, by 2007. This amounts to 6 percent of current capacity and 100 percent of new capacity additions. The Environmentally Preferred electricity (e.g., biomass, biogas, solar, low-impact hydro, waste heat, etc) will be added in three 15 MW solicitations by 2007. As specified in SaskPower's Green Power portfolio, all of Saskatchewan's new electricity requirements until 2010 must be met from environmentally friendly sources, so as to avoid the release of greenhouse gas emissions.

Ontario is committed to reducing its own electricity use by at least 10 percent by 2007. Moreover, it has enacted a renewable portfolio standard (RPS) of 5 percent by 2007 and 10 percent by 2010, which stipulates 1,000 MW of wind power. To help meet these targets, the government created a new entity, the Ontario Power Authority (OPA), which requires the private sector to build new generation capacity through a competitive, transparent process. OPA has recently announced a new Standard Offer Program for projects less than 10 MW, in addition to the existing Requests for Proposals for about 1,600 MW. Moreover, Ontario provides several tax incentives for "clean, alternative and renewable" electricity generation facilities.

In June 2005, the **Quebec** government announced that it will authorize Hydro-Quebec to issue request-for-proposals (RFPs) for 2,000 MW of wind power, an amount twice that which had previously been planned for. Bids must be submitted by April 2007, with delivery to begin in 2009 and finish in 2013. Accordingly, Quebec's *Ministre des ressources naturelles et de la faune* (MRNFP) has launched a program to allocate public land for wind farm construction. Additionally, Quebec intends to have 300 MW of biomass capacity installed by 2012. The preceding installations will bring the province's total to almost 4,300 MW by 2015, which will account for approximately 7 percent of electricity sold by Hydro-Québec. In May 2006, Quebec announced a new energy strategy that would support the implementation of 4,500 MW of new hydro projects, allow remote and aboriginal communities to go ahead with hydro projects (50 MW and less) as an opportunity for social and economic developing in their region, set a total of 4,000 MW wind energy target by 2015, out of which 500MW would be set aside for projects less than 25 MW for local and remote communities, and plan to design programs for the promotion of solar and geothermal technologies for heating and cooling. Other wind projects will be launched at the rate of development of Québec's hydroelectric potential and of technological progress in the field.[52] Furthermore, the Québec's Energy Strategy aims, between now and 2015, to increase the overall energy efficiency target by a factor of eight compared to current targets.

New Brunswick has specified that an additional 10 percent of the electricity consumed in the province must originate from renewable sources by 2016. This would increase the share of renewables to about one-third, as such sources currently account for about 23 percent of electricity.[53] As such, a legislated RPS is being established in that province. The most

[52] *Ministère des Ressources naturelles et de la Faune* 2006
[53] However, these sources include the Mactaquac hydro dam and Pt. Lepreau Nuclear Generating Station.

common forms of RE that will contribute to reaching this target are wind, biomass, hydro and electricity generated from landfill gases. Significantly, New Brunswick is increasing its wind energy target from 100 MW by 2010 to 400 MW by 2016.

Nova Scotia has enacted a voluntary RPS of 50 MW by 2005 and a legislated RPS of 5 percent by 2010.

Prince Edward Island has enacted an RPS requirement for electricity. It has established legislation requiring at least 15 percent of capacity to be met by renewables by 2010. Given the favourable wind conditions prevalent in PEI, this will be achieved through the creation of an additional 40 MW of wind capacity. Moreover, the province intends to evaluate the possibility of having 100 percent of its electrical capacity (200 MW) facilitated by renewable energy by 2015.

All of these incentive programs help to bring down the cost of renewables and hopefully will increase installation and production of electricity from renewable facilities though not beyond what is included in government targets discussed above

By 2020, the authors estimate that Canada's emerging renewable electricity market will be approximately 61,000,000 MWh/year, representing over 9 percent of Canada's total electricity generation.[54]

3.2.1.7 Other Potential Funding Sources

In addition, there are several programs that may provide financing for some emerging renewable technologies though they are not specifically designed for renewables and it is not possible to estimate how much of these funds will support renewables. They include:

- Atlantic Canada Opportunity Agency – Atlantic Innovation Fund – A program designed to strengthen the economy of Atlantic Canada by increasing activity in and to build capacity for innovation and research and development that leads to the commercialization of research and development outputs.
- Sustainable Development Technology Canada – SCTC finances and supports the development and demonstration of clean technologies. It has an investment fund of $550 million.
- Technology Early Action Measures – TEAM is a technology investment program established under the federal government's Climate Change Action Plan. TEAM supports late-stage development projects and first-time demonstration projects designed to reduce greenhouse gas emissions. Several federal government departments and agencies operate delivery programs that recommend projects for TEAM funding, as do certain regional development agencies.

[54] This estimate was derived from the following assumptions. The known provincial targets amount to roughly 8,000 MW of capacity demand. To this number, the authors added 2000 MW to allow for increases in provincial targets, federal government procurement (which may or may not be captured in the provincial targets) and the possibility that Kyoto implementation will be resolved favorably for renewables, as well as the current level of about 5,827 MW. The authors also assume a 41 percent average annual capacity factor for renewable projects from all emerging renewable energy sources.

3.2.2 United States

3.2.2.1 Production Tax Credit

The US Production Tax Credit or PTC is a tax credit based on annual production of electricity that historically has been available to wind and some biomass resources but was expanded to other renewable resources in the Energy Policy Act of 2005. The PTC has been a critical component of the economic equation for wind developers over the past ten years and has given a major boost to the US wind market and other renewable technologies to a lesser extent. "Production tax credits on wind farms are worth roughly thirty-five percent of the capital cost of a typical wind project. That is the present value of such savings from claiming such credits."[55] The PTC, currently valued at 1.9 cents per kWh for the first ten years of operation for wind and "closed loop" biomass projects, 1.9 cents per kWh for the first five years of operation for new geothermal and solar plants, and 0.9 cents per kWh for new "open-loop" biomass.[56] The PTC has been subject to a series of expirations and retroactive extensions, typically two-year periods. This has resulted in a certain market uncertainty that has in turn led to surges of new development as companies struggle to get their project started before the PTC expires. The PTC was recently extended through December 2007 as part of the Energy Policy Act of 2005.[57]

3.2.2.2 Public Benefits Funds (PBFs)

Many US state funds have programs that address both supply-side and demand-side obstacles. Fourteen state PBFs have funds to support renewable electricity. These fourteen PBFs are collecting and spending more than US$300 million per year on renewable electricity.[58] This section will focus on programs established by state funds that help to drive the supply side of the renewable electricity market.

PBFs are used to fund electricity-related public benefit programs such as renewable electricity, research and development, energy efficiency, and low-income customer assistance. PBFs can be collected from a variety of sources, with the most common being a surcharge on end-use electricity rates (i.e., a "wires" or "distribution" charge).

Bolinger et al. (2001) observe that PBF programs for renewable electricity can be categorized into three different models: The Project Development Model uses financial incentives such as production incentives and grants to directly subsidize and stimulate renewable electricity project installation. Most PBFs use this model to some degree. For the most part, these PBFs utilize production incentives, buy-downs/rebates, or other forms of grants as a means of distributing funds, rather than loans or other investment vehicles. Two, the Industry and Infrastructure Development Model uses business development grants, marketing support

[55] "PTC Most Obvious Benefit in New Energy Bill." *North American Wind Power,* September 2005.
[56] *North American Wind Power,* p. 8.
[57] *North American Wind Power,* p. 1.
[58] Bollinger et al, 2004. p. 1.

programs, research and development grants, resource assessments, technical assistance, education, and demonstration projects to build industry infrastructure. Three, the Investment Model uses loans, near-equity and equity investments to support renewable energy companies and projects. The PBF programs in Connecticut, Pennsylvania, and Massachusetts have explored this approach.

States have developed a multitude of programs using PBF money. One common approach is to use funds to support large utility-scale renewable electricity projects, such as wind, biomass and geothermal. Support typically comes in the form of cash incentives for electricity production based on a dollar-per-megawatt-hour payment, though other approaches are also used (e.g., direct grants, low-interest loans, etc.). These incentives are often auctioned to those projects that need the lowest incremental amount of support to succeed. In aggregate, through 2004, state PBFs have obligated nearly $399 million in construction and operational support to support 2,288 MW of such projects; 707 MW of these projects are already on line, with 1,550 MW in the planning stage (See Table 4). The vast majority of these projects are wind power facilities. Although they are not as important as RPS policies in this regard, state renewable electricity funds are beginning to be a significant driver of large project installations.

States have also used PBFs aggressively in order to support distributed generation, especially solar PV. In fact, PBFs have been important to the recent growth in the PV marketplace in the United States and have become the nation's primary driver for PV expansion. A large number of states have developed rebate programs for rooftop, grid-connected solar installations. These rebates range from around $2/watt to as high as $6/watt. [59] In total, state funds are obligating about $200 million in support of solar PV on an annual basis, with the largest programs operating in California. In California, the state is obligating $150 million per year in support of solar PV. Approximately 110 MW of new renewable distributed generation has been supported by PBFs; of this amount 83 MW has been supported by California's PBF.[60]

Table 4. Summary of State Support for Utility-Scale Renewable Projects

Project Location	# of Projects	Original Dollars Obligated ($)	Current Dollars Obligated ($)	Capacity Obligated (MW)	Capacity Cancelled (MW)	Capacity Pending (MW)	Capacity On-Line (MW)
CA	60	$243,573,376	$193,019,993	1,285.3	30.6	830.1	424.5
IL	4	$9,305,000	$9,305,000	101.6	0.0	51.2	50.4
MA	4	$19,469,093	$19,469,093	49.6	0.0	49.6	0.0
MN	68	$61,841,977	$61,841,977	124.9	1.7	91.7	31.5
NH*	1	$2,378,930	$2,378,930	50.0	0.0	50.0	0.0
NJ	5	$14,590,000	$14,590,000	41.1	0.0	41.1	0.0

[59] Bolinger, Mark and Ryan Wiser. "Customer Sited PV: A Survey of Clean Energy Fund Support." Clean Energy Group. May 2002. p. 3.
[60] California Energy Commission. "Data Showing Completed Systems up to January 1, 2005." Updated: July 26, 2005. and "Data Showing Approved and Completed Systems Since January 1, 2005." Updated: January 9, 2006. Available at: <http://www.energy.ca.gov/renewables/emerging_renewables.html>.

NY	12	$26,560,000	$26,560,000	325.2	0.0	283.6	41.6
OR	1	$3,800,000	$3,800,000	41.0	0.0	0.0	41.0
PA	8	$17,600,000	$14,000,000	269.6	0.0	151.1	118.5
Total	**163**	**$399,118,376**	**$344,964,993**	**2,288.1**	**32.3**	**1,548.4**	**707.4**

*New Hampshire does not currently have a clean energy fund. The single project located in New Hampshire is receiving support from Massachusetts' clean energy fund.
Source: Clean Energy States Alliance and Lawrence Berkeley Laboratory, September 2004.[61]

Although some success has been gained, political factors will influence the future effectiveness of PBF policies. One problem is that funds are prone to re-appropriation to satisfy short-term governmental budget needs. Also, because of the difficulty in establishing new "taxes" in the United States, few new PBFs have been created since 2001.

3.2.2.3 Purchasing Tariffs or Feed-In Tariffs

Purchasing tariffs, also know as feed-in tariffs, can be an effective supply-side driver where access to wholesale markets is a problem or where wholesale market prices do not value renewables adequately. The Public Utilities Regulatory Policy Act (PURPA) is one example of a type of feed-in policy that was aggressively implemented in California, and also prominent in Maine, New York, and several other US states. The policy in California and less so in other states was based upon standard long-term contracts and a mandatory fixed-price for some or all of the contract term. This created a market environment in the early to mid 1980s in which renewable energy developers could secure financing for projects because they could sell their output at attractive contract terms (the purchase price of the California contracts began at 4 cents/kWh and increased to 13 cents/kWh by the tenth year of the contracts). As a result of these contracts, a sizable market and manufacturing capacity developed for wind, geothermal, biomass, small hydro and solar technologies in California. Even today, California remains one of the leaders in installed renewable electricity capacity. Other states also brought significant renewable capacity into operation during this period. For example, over forty-five percent of Maine's electricity supply comes from renewable electricity sources, much of which was developed during the 1980s under PURPA contracts.[62]

In general, fixed price feed-in laws have fallen out of favor with US policymakers that increasingly prefer market mechanisms that stimulate competition and minimize cost. However, they are making a comeback in two states, Washington and Minnesota, that offer feed-in tariffs for small scale or community based renewable projects. Washington State passed a law in May 2005 that offers a production incentive for small solar and wind electricity systems. Homes and businesses can earn up to 15 cents per kWh credit for a fixed ten-year period, capped at $2,000 per year. Renewable system owners can earn more if

[61] Bolinger, Mark et al. The Impact of State Clean Energy Fund Support for Utility Scale Renewable Energy Projects. Berkeley Lab and Clean Energy States Alliance, October 2004. p. 3.
[62] Wiser et al., June 2002.

project components are manufactured in-state. In Minnesota, qualifying owners can receive 2.7 cents per kWh net present value over the 20-year life of the electricity purchase agreement. Although it is too soon to predict a trend towards feed-in tariffs, it is important to note that feed-in tariffs have shown to be an effective supply-side driver of renewable electricity markets.

3.2.2.4 Renewable Energy Bonds

With the passage of the Energy Policy Act of 2005, "clean renewable energy bonds," known as CREBs, were added to the Internal Revenue Code for certain electric cooperatives, state and locally-owned utilities, and Indian tribal governments. These bonds represent a tremendous incentive for the construction of new renewable facilities by qualifying electric service providers, particularly since these entities do not pay taxes and therefore cannot take advantage of the PTC. Renewable energy bonds are issued by or on behalf of these electric service providers for the purpose of financing capital expenditure for facilities producing renewable electricity. The benefit is that the issuer is entitled to a tax credit for the amount of the interest of the bond. The bonds must be issued by 2007, but the electric service providers have five years to spend the majority of the proceeds, and they can petition for a longer timeframe. Unlike the two-year cycle of the PTC, this longer time horizon provides more certainty and financial stability for potential developers. Another benefit is that the bonds do not limit who owns the facility, who operates the facility, or where the electricity is sold, so there are real opportunities for private developers to partner with these electric service providers. The Secretary of the Treasury can allocate up to $800 million in CREBs to qualified projects.[63]

3.2.2.5 State Tax Incentives

Eleven states have some type of corporate tax incentive for grid-connected, utility-scale renewable electricity facilities. Four states, Iowa, Massachusetts, New Mexico and Oklahoma have production tax incentives, similar to the federal production tax incentive, which pays a fixed amount per kWh of renewable electricity production. Six other states have tax deductions for capital expenditures or equipment. Such incentives range in the amount of the tax benefit, and thus range in their ability to be a driver of new renewable supply.[64] Montana has a tax credit for up to thirty-five percent of income earned from the operation of the renewable facility.[65] In general, while state tax incentives may be helpful for a renewable project, they are generally not drivers for utility-scale large renewable projects for a number of reasons. Project owners may not have much tax liability in that particular state, and state taxes are usually lower than federal taxes, therefore a portion of the tax credit may go unused. Second, most tax incentives are not incremental to the federal PTC, which tends to be much more valuable. This means that the developer can take advantage of the PTC or the state tax credit, but not both.[66]

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[63] *North American Windpower*, p.8.
[64] These states include North Dakota, Oregon, Utah, West Virginia, Hawaii, and North Carolina.
[65] All information in this subsection was taken from <www.dsireusa.org>.
[66] Personal correspondence of Meredith Wingate with Mark Bolinger, 11 January 2006.

3.2.2.6 Other Federal Incentive Programs: Business Investment Tax Credit and Accelerated Depreciation

Other federal incentives for renewable suppliers include business investment tax credit and accelerated depreciation. The business investment tax credit allows businesses that invest in solar or geothermal energy systems to take a thirty percent tax credit to offset the first costs of these systems. This program was authorized under the EPACT 2005, but will expire in 2007 unless reauthorized. There are also several provisions in Federal Tax Code that promote renewable energy through accelerated depreciation. The "Modified Accelerated Cost Recovery System" sets timelines over which renewable generation equipment can be depreciated. Most such equipment can be depreciated over five years. The Job Creation and Worker Assistance Act of 2000 speeds up the allowed depreciation for some technologies.

3.2.3 Mexico

Two general supply drivers for renewable electricity can be identified in Mexico. The first one is the accelerated depreciation allowance for renewable energy investments, and the second one is the Clean Development Mechanism.

3.2.3.1 Accelerated Depreciation Allowance

Since 2005, the accelerated depreciation allowance, included in the Income Tax Law,[67] allows for depreciating the full amount of the investment in "machinery or equipment for the generation of energy from renewable sources." The depreciation can only be made to the extent that income tax is due. In other words, if the depreciation is larger than the income tax, the taxpayer will need to continue depreciating the investment in the ensuing years.[68]

This allowance benefits in particular the off grid and on-grid self-supply projects. It may be a further driver for the inclusion of renewable electricity projects in CFE's expansion planning, if and when CFE considers this variable in its planning. Since CFE is not an income tax payer, this allowance does not favor utility-owned projects.

3.2.3.2 Clean Development Mechanism (CDM)

The second driver is the Clean Development Mechanism. The CDM is acting as a driver mainly for the on-grid self-supply projects. With regard to the off-grid projects, CDM is unlikely to become a significant driver, given the negligible scale of the emission reductions. Finally, insofar as the public service projects (included in CFE's expansion planning) are concerned, since the utility is already considering this income in its planning, CDM is also becoming a driver for these projects.

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[67] Article 40, paragraph XII, of the Income Tax Law (*Ley del Impuesto Sobre la Renta*, 2005). In order to prevent the misapplication of this allowance, Paragraph XII establishes that the investments need to remain operational during a five-year term.

[68] Due to this, the accelerated depreciation allowance is particularly beneficial for large firms with other in-country operations. Self-purpose vehicle companies will typically need more than five years to fully depreciate green power investments.

SECTION IV. REGULATORY AND LEGAL OPPORTUNITIES IN MEXICO

A number of proposals for adjusting the current policy framework of the electricity sector have been made during the last decade in Mexico. Some initiatives have suggested that the state-owned utilities (CFE and LyFC) should be unbundled (i.e. split into generation, transmission and distribution companies) and/or partially or fully privatized. Others believe that they should remain under the control of the State, but that more opportunities for the private sector should be opened in the generation business, for example, by allowing private generators to sell electricity to large industrial consumers. However, an important contingent believes that the State should keep the control of the electricity sector and recover the terrain it has lost since the 1992 amendments to the LSPEE Act. The future of the Mexican energy sector (including both the oil and the electricity industries) has then become one of the most controversial issues in the Mexican political arena.

4.1 The LAFRE Bill and Article 253-B

Despite this lack of political consensus about what, if any, changes the legal framework the Mexican electricity sector should have, a growing consensus has emerged among a range of stakeholders during the last few years about the need to foster renewable energy. A number of bills have been proposed in Congress, most of which suggest amendments to the LSPEE Act. However, due to political deadlock and the fact that any amendment to the LSPEE Act involves opening a Pandora's Box, a group of members of the Lower Chamber of Congress (*Cámara de Diputados*) brought forward a new law bill—the Renewable Energy Act (LAFRE)—that could co-exist with the former LSPEE Act. This bill was approved by the Lower Chamber in December 2005 (*Cámara de Diputados* 2005a), and is likely going to be sanctioned by the Senate .

The LAFRE bill includes among other instruments the creation of a Renewable Energy Fund (FAFRE Fund) that would give financial incentives to renewable energy projects. However, the origin of the resources for the FAFRE Fund would need to be established by means of a separate law instrument, such as the Article 253-B bill.

The Article 253-B bill, proposed in October 2005 at the Lower Chamber of Congress, would create a special levy on fossil fuels, proportional to their carbon contents, i.e. to the carbon dioxide emissions these fuels will cause when burned (*Cámara de Diputados* 2005b). The levy, equivalent to $3.30 Mexican pesos (US¢30) per ton of CO_2, would have a negligible impact on fuel prices (0.2 percent in average) and is expected to raise approximately one billion pesos per year that would be directed to the FAFRE Fund.

The LAFRE bill establishes that the fund resources will be used in the following way over the first year of operation:

- 55% for the "Green Fund," to foster the use of RE mature technologies
- 6% for the "Emergent Technologies Fund" (electrical applications)

- 10% for the "Rural Electrification Fund"
- 7% for the "Biofuels Fund"
- 7% for the "General RE Fund" (for non-electrical applications)
- 15% for the "Research and Technological Development Fund (FIDTER)"

Finally, it establishes that at least 20 percent of the Fund resources will be granted for the assessment of national RE potential (*Secretaría de Energía* 2006).

4.2 The Potential Effects of the LAFRE Bill

The LAFRE bill is mainly focused on the electricity sector, but also includes instruments for promoting the production of bio-fuels, as well as other non-electrical applications of renewable energy. If approved, it would radically change the prospects for the development of renewable electricity in Mexico.

4.2.1 Regulatory Mandate

The LAFRE bill would give CFE an explicit mandate to increase the inclusion of renewable electricity projects within its expansion planning, and, for the sake of regional and industrial development, one part of the new renewable electricity capacity would need to be reserved for small producer (under 30 MW) projects.

CFE would make bids for the procurement of renewable electricity (with simplified procedures in the case of small producer projects). Long-term power purchase agreements would be signed between CFE and independent power producers or small producers, and the tariffs would be fixed (fixed in real terms—i.e., adjustable only according to the inflation and/or foreign currency exchange rates).

In compliance with the LSPEE Act's least cost principle, CFE would pay for renewable electricity at its long-term avoided cost, including:

- The value of the long-term price stability of renewable electricity.
- The value of the reduction of the loss-of-load probability (LOLP), as a proxy for capacity contribution.[69]

Performance-based financial incentives would be available through the FAFRE Fund to cover the gap between CFE's avoided costs and the prices of renewable electricity.[70]

[69] The use of the LOLP approach avoids dealing with the concept of capacity, which proves elusive, particularly in the case of intermittent green power technologies, such as wind and solar.

[70] The LAFRE bill follows the same principles than the LSREDP (see section 2.1.3); the incentives would be given during the first years of project operation.

The LAFRE bill establishes a goal of eight percent of electricity generation from renewable energy sources, excluding large hydro (over 30MW), by the end of 2012. This goal includes all project types (utility supply for public service, as well as on-grid and off-grid self-supply), and it can be assumed that all types would have a similar share. This means that renewable electricity would cover eight percent of the public service generation. This assumption involves that, out of the total electricity generation of 328 million MWh/year (328 TWh) foreseen by the current electricity planning (*Secretaría de Energía* 2005b) for 2012, renewable electricity would supply 26 million MWh, or 19 million MWh more than the current annual generation of 7 million MWh of renewable electricity.

4.2.2 Voluntary Green Pricing Scheme

The LAFRE bill would establish the creation of voluntary green tariffs and a system for issuing renewable certificates, thereby paving the way for a voluntary renewable electricity market.

4.2.3 Large-Scale Grid-Connected Self-Supply

The LAFRE bill does not foresee any financial incentives to self-supply projects. However, it would provide the following benefits to these projects:

- The sale of surplus electricity to the grid would be based on CFE's avoided costs, and these costs would be published on an annual basis.
- The possible contribution of the projects to the grid in terms of providing voltage control or reactive electricity would be valued and compensated.

4.2.4 Small-Scale Grid-Connected Self-Supply

The LAFRE bill would pave the way for on-site, small-scale self-supply schemes, by giving CRE the mandate to establish technical standards and an economic energy exchange procedure (e.g., net-metering) for these projects.

4.2.5 Off-Grid Self-Supply

The LAFRE bill would provide financial incentives to off-grid renewable electricity projects that benefit the poor population in isolated rural areas, by means of renewable energy sources.

In addition to off-grid projects, these incentives would be given as well to grid-connected renewable electricity projects built in remote areas and whose connection to the grid includes distribution lines that enable providing electricity to villages that otherwise would go without electricity service (this instrument intends to build on the potential synergy between rural electrification and the harnessing of local renewable energy sources).

4.2.6 Other Instruments

4.2.6.1 Small Producer Projects

The LAFRE bill would open the way and provide incentives to small producer projects (under 30 MW) that are not included in CFE's expansion planning. The specific mechanics for the access to these incentives remain to be defined, but could adopt the form of a capped feed-in tariff.

4.2.6.2 Access to CDM Resources

The LAFRE bill establishes that the FAFRE Fund would act as an intermediary for CDM resources. This is particularly relevant in the light of the recent decision of the climate negotiations in Montreal, which allows for project activities under a program of activities to be registered as a single Clean Development Mechanism project activity. The FAFRE Fund would then be able to bundle small-scale projects. This may be especially relevant for off-grid and small producer projects.

4.2.6.3 Resource Assessment and Research Activities

The LAFRE bill would offer an additional supply driver to all renewable electricity projects by virtue of the resource assessment, research and development activities it would fund.

4.2.6.4 Studies on Environmental Externalities from Electricity Generation

Recent studies in Mexico, prepared by Semarnat and ECLA, have demonstrated that electricity prices do not reflect the externalities of conventional electricity generation. It is important to conduct such studies to highlight the environmental advantages of renewable electricity compared to fossil fuel resources.

4.3 Wind Power Environmental Standard

A further regulatory instrument under development that is set to favor renewable electricity projects is the wind power environmental standard. This standard would ease the environmental licensing process by setting clear guidelines to be followed by wind power projects.

SECTION V. OPPORTUNITIES FOR GROWING THE RENEWABLE ELECTRICITY MARKET

This section discusses the opportunities to expand the renewable electricity market in both the supply and demand sides in each of the three countries. The authors look at specific obstacles to renewable development and offer country-specific recommendations and trinational recommendations for the Parties to the NAFTA and NAAEC to promote renewable electricity markets in North America.

5.1 Canada

The overall recommendation for Canada is the development of a comprehensive renewable electricity vision and strategy through federal-provincial-territorial cooperation and stakeholder participation. The specific recommendations for Canada include:

5.1.1 Financial Incentives

The successful implementation of renewable energy projects requires access to appropriate financing instruments, including equity, debt and venture capital. Most renewable energy projects require high up-front capital costs while the variable cost (fuel) is relatively low, stable or free. While some programs such as WPPI and REDI currently exist, their future level of funding is unknown. There is also a need to ensure a level playing field vis-à-vis conventional energy sources.

Recommendations:

- Develop innovative financing mechanisms, to be tested through pilot projects;
- Capitalize on opportunities for renewable energy projects with provincial and territorial governments that have policies to encourage the generation of electricity from renewable energy sources;
- Adjustment of tax policies for development expense write-offs and depreciation of project assets.

5.1.2 Address Regulatory Issues / Institutional Barriers

Development of renewable resources may require additional expansion of the electricity grid since renewable resources are often located in a different region from either load centers of traditional central station power plants. In addition, resolving issues associated with integration of intermittent renewable resources (such as wind and solar power), as well as adjusting the operating rules associated with grid access are all important topics to be resolved. Lastly, there are a number of issues associated with net metering and the integration of distributed renewable energy into the overall supply mix that must be addressed in order to bring distributed generation into broader use.

Some of these recommendations fall under the responsibility of the provincial/territorial governments. As such, there is a need for some national coordination, as recommended below under Section 5.1.3.

Recommendations:

- Initiate a process for analysis and recommendations concerning the funding of transmission line extensions and upgrades;
- Support the development of national interconnection standards or refine net metering programs and interconnection standards where they exist.

5.1.3 Develop Capacities / Engage Canadians

The emerging nature of renewable energy industries and the associated commercialization of new technologies have led to concerns over the future availability of adequate numbers of qualified personnel. Unfortunately, the emerging nature of the sector also means that a comprehensive and reliable portrait of its human resources issues and related skill requirements is not available.

In addition, communicating the benefits and opportunities associated with renewable resource development is essential to gain widespread public support for national and provincial/territorial policies and targets if those programs are to be successful. Currently, there is a lack of general information about renewable technologies and lack of information on suppliers and resource availability in Canada. A successful outreach and engagement strategy generally requires a combination of bottom-up and top-down strategies including community engagement, business education/acquisition programs, various types of market incentives, as well as a comprehensive public education and outreach strategy.

Recommendations:

- Create a national coordinating body or network with representatives from provincial, territorial, and federal government officials as well as key stakeholders;
- Establish Centers of Excellence to address technology and policy development;
- Develop Technology Road Maps that will help the private sector select and develop the best technology options to meet technical, environmental and market needs;
- Develop a comprehensive public education and outreach strategy to inform all segments of Canadian society about provincial/territorial and municipal renewable energy targets as well as renewable energy benefits and available options.
- Identify information gaps and lay the foundation for future plans and actions to address human resources and skills issues.

5.2 United States

5.2.1 Advancing Industrial, Commercial, and Institutional Procurement

Industrial, commercial and institutional procurement, such as universities and local government, has been the major driver of the voluntary market in the US initiatives to assist these entities in making renewable purchases should continue. In a study done by Holt et al (2001) on non-residential demand for renewable electricity, a survey was conducted to assess the barriers to purchasing renewable electricity. Surprisingly, all of the barriers the researchers perceived might be there, such as lack of information, difficulty in having their specific electricity needs met, internal resistance by key decision-makers, fear of increased scrutiny by environmental groups and conflicts with state regulations were relatively insignificant to potential purchasers. Only the extra cost of renewable electricity was a moderate barrier, receiving a ranking of 2.3 out of 5 (1=not at all problematic, 5 =very problematic). The researchers then looked at the motivation of renewable electricity purchasers, and the number one reason that companies cited for purchasing renewable electricity is that it is consistent with their organization's values. Other reasons cited in descending order of importance were civic responsibility, employee morale, public image and a desire to cater to environmentally-oriented customers.

Since the time of this survey, several market conditions have changed that might improve the climate for large commercial purchases of renewable electricity or renewable certificates. More large non-residential purchasers are developing greenhouse gas inventories to assess environmental performance and subsequently purchase renewable electricity to address the emissions associated with their purchased electricity. The use of renewable electricity as a tool to address indirect emissions has improved the value proposition of renewable energy. The price of renewables has dropped in the United States and the accessibility of renewable electricity has increased through an increased number of renewable electricity offerings in both competitive and monopoly markets, and through the development of a renewable certificate market. Although renewable certificates make it significantly easier for some non-residential purchasers to buy renewable electricity, renewable certificates increase the need for adequate verification and tracking systems to provide the necessary validation of renewable certificates ownership and assurances against double-counting. According to the Green-e Program, seventy percent of all non-residential Green-e certified sales were renewable certificate-only sales.[71] Another factor is the increase in natural gas prices and the impact that will have on electricity rates. A small, but growing number, of utilities are offering fixed price renewable products as a hedge against volatility in the electricity market. Given these factors, a number of recommendations emerge to advance renewable procurement by commercial and institutional customers.

[71] Certificate-only sales are sales of the renewable certificates without the accompanying electricity. In such a sale, the electricity is sold to another party. Center for Resource Solutions. 2004. *Green-e Verification Report Year 2004* (San Francisco) 4.

Recommendations

- Help advance the creation of a national certificate tracking network across the United States so that large buyers can feel confident of the renewable certificate purchases;[72]
- Explore how the CEC's North American Green Procurement Initiative may help promote further deployment of renewable electricity technologies and purchases of electricity or renewable certificates at federal, state and local government sites;
- Increase federal and state support for and involvement in renewable electricity outreach efforts such as the EPA Green Power Partnership.

5.2.2 Financial Incentives

Current financial incentives like the PTC, the Farm Bill, and the state funds, have been making an impact in terms of new renewable generation systems installed or under development. However, there are many other types of financial programs that could be developed to support more renewable project development and to provide more financial certainty for investors. Listed below are recommendations for financial incentives that could boost a US renewable market.

Recommendations

- Explore the creation of a federal program to allow use of tax-exempt bonds for private developers of renewable electricity projects;
- Explore broadening existing incentive options or creating new ones at the state and federal level for renewable distributed generation and supporting renewable industry and infrastructure development.

5.2.3 Maintaining Effective State RPS Programs

Well-designed state RPS programs can be a major driver for new renewable development across the United States. Recently, a number of state RPS programs have taken a step backwards with regards to RPS implementation policies and have promulgated policies that could hurt the voluntary renewable market. Chief among these is a policy that allows a utility to count green pricing sales towards their state RPS mandate. The problem with allowing this is that it removes the ability for voluntary renewable electricity purchases to be additional to RPS mandates, thus removing an important incentive for renewable electricity buyers.

Another area that is potentially problematic is the interface of renewable electricity programs with emissions cap-and-trade programs. As discussed in Section 2.1.2.3, when a pollutant is capped and traded, the only way that emissions are reduced is when an emission allocation is retired. In general, the only way that renewables can claim to reduce capped pollutants is if they are granted allowances or set-asides under the cap. If state, regional or federal carbon regulation follow a similar cap-and-trade model, it will be to the detriment of renewable

[72] Center for Resource Solutions is starting a new organization, known as the North American Association of Issuing Bodies, designed to help network North American tracking systems and to address compatibility issues.

marketers who use air quality and carbon benefits as their primary selling point. Likewise, a large proportion of the voluntary commercial buyers are motivated by the carbon reduction benefits of renewables.

Recommendations:

- Encourage states to explore options for encouraging renewables through their air policy, including design of cap-and-trade programs.

5.2.4 Expanding Public Understanding of Renewable Electricity Beyond the Environment

As noted above, some buyers and a few marketers of renewables are increasingly recognizing the value of renewables as a hedge against fuel price volatility. This presents a real opportunity in a number of areas. At the utility resource planning level, increasing renewables in a utility's portfolio has real benefits of diversifying the generation portfolio and thus increasing reliability and lowering the risk from fuel volatility. At the individual purchaser's level, on-site renewable distributed generation can also lower the risk of ballooning energy costs, and can improve local reliability, particularly in areas when the aging electrical grid is vulnerable. Overall, an opportunity to change public perception of renewables away from a boutique commodity with appeal only to those with environmental concerns to a much broader audience and potential market should be exploited.

Recommendations:

- Continue educating audiences about all the benefits of renewables in addition to their environmental value;
- Encourage the use of renewables as a financial hedge against volatile fuel prices.

5.3 Mexico

5.3.1 Opportunities in CFE's Expansion Planning Process

The inclusion of new hydro, solar, wind and geothermal power plants in CFE's expansion planning is a very positive signal. Likewise, by considering the flow of CDM resources in its expansion planning process, CFE will be able to internalize this global environmental value of renewable electricity.

If approved, the LAFRE bill would build on the ongoing effort of CFE and strengthen it, in order to further accelerate the inclusion of renewable electricity in the planning process, so as to revert the current decline in its share of total public service electricity supply.

In particular, the LAFRE bill would:

- Give an explicit mandate to CFE to include renewable electricity in its expansion planning, as well as quantitative targets;
- Provide financial incentives for projects that deliver renewable electricity to CFE, thereby compensating the positive externalities;

- Recognize the capacity contribution of intermittent renewable electricity sources—notably wind;
- Favor small producer (under 30 MW) projects in two ways: (i) by giving CFE the mandate to include some small projects in its expansion planning; (ii) by providing incentives to projects not included in CFE's planning (thereby offering a supply driver for these projects).

On the other hand, by means of its technical assistance activities, the LSREDP is also expected to favor the large-scale incorporation of renewable electricity by fostering changes in critical departments of CFE (e.g., the dispatch center Cenace).

Likewise, the project "Action Plan for Removing Barriers to the Full-Scale Implementation of Wind Power in Mexico," funded by the GEF, implemented by the United Nations Development Programme and executed by the Electrical Research Institute (*Instituto de Investigaciones Eléctricas*, IIE) is expected to provide incentives to pilot small-scale wind power projects (that would supply electricity to CFE).

In order to further favor the inclusion of renewable electricity projects in CFE's expansion planning, an additional opportunity lies in the revision of the methodology for determining the fossil fuel price forecasts that the Secretariat of Energy (Sener) provides to CFE. This is in effect a key factor that influences the whole planning process, and Sener might in particular include risk (price fluctuations) considerations in its methodology.

Recommendations:

- Support the approval of the LAFRE bill;
- Review the methodology for determining the fossil fuel price forecasts.

5.3.2 Opportunities in Green Pricing Schemes

Green pricing represents a significant opportunity to finance renewable electricity projects in Mexico.

The LAFRE bill would enable the creation of voluntary tariffs and a certificate system. If these tariffs were designed by including some sort of long-term stability guarantee (along the lines of what is described in Section 2.4.1.3), they would become even more attractive for potential customers, especially energy-intensive industries.

Recommendation:

- Create green tariffs with a long-term stability guarantee.

5.3.3 Opportunities for Government Procurement of Renewable Electricity

A further opportunity for fostering renewable electricity lies in federal government procurement. It is interesting to note that the federal government is already paying for its own

electricity consumption a tariff that is 2.5 times larger than the tariff paid by other consumers in the same conditions, as a result of a decision taken in 2002 to address the deficit of CFE. It is estimated that this involves an additional payment of approximately 8 billion pesos per year. Despite this decision being temporary, it has not been revoked.

Recommendation:

- Consider redirecting any electricity premiums paid by the federal government toward the purchase of renewable electricity. In particular, the central offices of the Environment and Energy Ministries (Semarnat and Sener) might pioneer such an initiative.

5.3.4 Supply-Side Opportunities to Increase Grid-Connected Renewable Electricity in Mexico

The "Action Plan for Removing Barriers to the Full-Scale Implementation of Wind Power in Mexico" (referred above) presents a number of opportunities to foster renewable electricity (with a focus on wind power), by means of a range of technical, policy and project development activities.

The Action Plan has identified the need to develop a special administrative simplification and coordination effort by the federal, state and municipal authorities, in order to facilitate the procurement of the required licenses (land use, archaeology clearances, water use, etc.). In particular, a special effort of the federal, state and municipal governments would be welcome in the Isthmus of Tehuantepec, where an excellent wind resource is available. Such an endeavor would provide all stakeholders with adequate information (e.g., about the financial terms of land-leasing agreements) and to dispel any possible myths about the impacts of wind power.

The LAFRE bill represents some additional opportunities to introduce supply drivers for renewable electricity. It would in particular:

- Provide financial support for the assessment of the potential of renewable energy sources nationwide, thereby overcoming the lack-of-information barrier for all renewable electricity projects.
- Address public awareness, public participation and social responsibility, thereby contributing to foster social acceptance.

Recommendations:

- Promote administrative simplification and coordination by the federal, state and municipal authorities, in order to facilitate the procurement of the required licenses for new projects;
- Undertake awareness-raising activities in resource-rich areas.

5.3.5 Opportunities to Increase On-Grid Self-Supply of Renewable Electricity in Mexico

With the new interconnection contract issued by CRE, new opportunities arise for grid-connected, remote, intermittent renewable electricity self-supply projects.

In addition, the LAFRE bill would benefit this market by valuing the contribution of self-supply projects to the grid in terms of voltage control, reactive power, etc.

Recommendation:

- Strengthen the role of development banks (e.g., Banobras) in the provision of guarantees for municipalities in self-supply agreements;

5.3.6 Opportunities to Increase Off-Grid Self-Supply of Renewable Electricity in Mexico

The Integrated Energy Services for Small Communities in Rural Mexico (IESCRM) project will foster at a pilot level off-grid renewable electricity projects in four states, by:

- Offering financial resources and mobilizing existing resources of municipalities and state governments.
- Creating multi-stakeholder committees to ensure program sustainability beyond government administrations at federal, state and local levels.
- Establishing financial schemes such as micro-credit.
- Developing local capacity to ensure appropriate project management, operation and maintenance.
- Fostering the productive uses of energy, in order to ensure poverty reduction impacts.

Recommendation:

- State governments and other institutions might closely follow-up and replicate the experience of the IESCRM project elsewhere, with existing financial resources or with the additional resources that would be available if the LAFRE bill is enacted.

SECTION VI. RECOMMENDATIONS

6.1 Recommendations for the NAAEC Parties

The NAAEC Parties should be commended for their commitment to reduce the impacts of electricity generation and trade on the environment by supporting the increased deployment of renewable electricity technologies. In the previous section, the authors developed country-specific recommendations for enhancing a market for renewable electricity in each of the three countries. This section lists recommendations for activities that may support a North American renewable electricity market.

These recommendations are intended to facilitate information sharing among the three countries in order to foster greater cooperation towards encouraging the deployment of more renewable electricity across North America. The recommendations below fall into three main categories: (1) informational materials designed to address areas where lack of information or understanding is a potential barrier to greater renewable deployment in each country, (2) tools, such as databases or guidebooks, that can be used by practitioners in each country to help foster market development, and (3) programs that may promote voluntary purchases of renewable electricity in each country. The core issues that these recommendations address include:

- need for greater understanding of how to integrate renewable generation into the North American electricity grid, particularly by utilities in each country;
- need for greater understanding of the non-environmental benefits of renewable generation, particularly by utilities and large purchasers of electricity;
- opportunity for an increase in the voluntary purchases of renewable electricity and RECs in all three countries;
- opportunity for the increased deployment of on-site renewable electricity technologies;
- opportunity for increased federal procurement of renewable electricity in each country; and
- opportunity for increased REC trading across North America.

1. Compile best practices for electricity system dispatch, and integration of intermittent and distributed resources. Foster trinational information sharing on best practices in a form that is most likely to be effective and useful.

2. Prepare a report that quantifies the financial value and public benefit of renewables as a hedge against fuel costs, a mechanism to increase portfolio diversity. The findings of the report would be tailored to two main audiences: utility integrated resource planners and large-volume electricity users that may not fully appreciate the price stability of renewables.

3. Help advance programs that will provide recognition to commercial, industrial and institutional purchasers of renewable electricity, such as the EPA Green Power Partnership,

or “Made with Renewables” or similar product labeling initiatives. Support trinational information-sharing on how to best develop a buyers’ recognition program.

4. Develop case studies of the most successful programs for encouraging companies to buy renewable electricity, install on-site renewable generation, or become equity owners in utility-scale generation projects. Identify the most compelling motivational factors for these electricity users. Investigate opportunities for enhancing, expanding or replicating such programs in relevant markets.

5. Help advance the development and expansion of a North American market for RECs. Assist the development of compatible standards for REC integrity and initiatives to prevent double counting of RECs used in voluntary and mandatory markets.

6. Help advance federal government renewable electricity procurement initiatives in each of the three countries.

7. Develop a compendium of policies, examples, best-practices, and “how-to guides” for off-grid distributed renewable generation that would provide practical guidance for small groups, e.g., indigenous populations, to select, finance, and install renewable distributed generation.

8. Help advance work to update and expand user functionality of the North American Renewable Energy Directory.

9. Prepare a report focusing on the development, deployment and market drivers for renewable energy technologies.

10. Increase international cross-border trading of renewables between the three countries on short- and long-term markets.

To implement these recommendations, the authors recommend establishing a group of energy experts and government officials from the Parties to share lessons learned and experience, identify needs, and to determine how to collaborate to: a) further expand renewable energy generation in the countries, and b) how to expand the trade renewable energy or certificates across North America, and c) how to optimize the environmental benefits of such efforts.

ABBREVIATIONS AND ACRONYMS

Banobras	*Banco Nacional de Obras y Servicios Públicos* (National Bank of Public Works and Services, Mexico)
CCGT	Combined-cycle gas turbine
CDM	Clean Development Mechanism
Cenace	*Centro Nacional de Control de Energía* (National Energy Control Center, a department of CFE in charge of dispatch)
CFE	*Comisión Federal de Electricidad* (Federal Electricity Commission, Mexico)
CO_2	Carbon dioxide
Cofemer	*Comisión federal de Mejora Regulatoria* (Federal Regulatory Improvement Commission, Mexico)
Conae	*Comisión Nacional para el Ahorro de Energía* (National Commission for Energy Conservation, Mexico)
CRE	*Comisión Reguladora de Energía* (Energy Regulatory Commission, Mexico)
CRS	Center for Resource Solutions
CSP	Concentrated solar power
DG	Distributed generation
EIA	Energy Information Administration
EPA	Environmental Protection Agency
EPS	Emissions Portfolio Standard
ERCOT	Electric Reliability Council of Texas
FAFRE	*Fideicomiso para el Aprovechamiento de las Fuentes Renovables de Energía* (Renewable Energy Fund, established within LAFRE)
FERC	Federal Energy Regulatory Commission (US)
FIRCO	*Fideicomiso de Riesgo Compartido* (Agricultural Shared-risk Trust Fund)
GEF	Global Environment Facility
GHG	Greenhouse gas
GIS	Generation Information System
IESCRM	Integrated Energy Services for Small Communities in Rural Mexico Project
IPP	Independent power producer
ISO	Independent system operator
LAFRE	*Ley para el Aprovechamiento de las Fuentes Renovables de Energía* (Renewable Energy Act, Mexico—not yet approved)
LOLP	Loss-of-load probability
LSE	Load-serving entity
LSPEE	*Ley del Servicio Público de Energía Eléctrica* (Public Electricity Service Act, Mexico)

LSREDP	Large-scale Renewable Energy Development Project
LyFC	*Luz y Fuerza del Centro* (Light and Power of the Center, Mexican state-owned utility)
MW	Megawatt (unit of power)
MWh	Megawatt-hour (unit of energy)
NAAIB	North American Association of Issuing Bodies
NO_x	Nitrogen oxides
PBF	Public Benefits Fund
PEMEX	*Petróleos Mexicanos* (National Mexican Oil Company)
PURPA	Public Utility Regulatory Policy Act
QF	Qualifying facility
REC	Renewable Energy Certificate (generic)
RPS	Renewable Portfolio Standard
RTO	Regional Transmission Organization
Semarnat	*Secretaría de Medio Ambiente y Recursos Naturales* (Secretariat of the Environment and Natural Resources, Mexico)
Sener	*Secretaría de Energía* (Secretariat of Energy, Mexico)
SO_X	Sulfur dioxide
TRC	Tradable Renewable Certificate
WPPI	Wind Power Production Incentive
RPPI	Renewable Power Production Incentive
REDI	Renewable Energy Deployment Incentive

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