WORLD RESOURCES INSTITUTE

CORPORATE GUIDE TO
GREEN POWER MARKETS

SUSTAINABLE ENTERPRISE PROGRAM

Developing "Next Generation" Green Power Products for Corporate Markets in North America

INSTALLMENT 6

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Summary

U.S. firms are increasingly interested in switching to green power, electricity from renewable resources such as solar, wind, and biomass. For many large corporate energy buyers, however, "current generation" green power products are not sufficiently attractive. Most products are too expensive and do not provide enough value to justify their premiums.

Retail electricity providers can address this market shortcoming by introducing a suite of "next generation" green power products specifically tailored to the needs of corporate customers in voluntary markets. Examples of such products include:

- *Green power using nationally sourced RECs:* Local retail electricity providers can bundle conventionally generated electricity with renewable energy certificates (RECs) from renewable power facilities located elsewhere in the country instead of only using locally generated renewable power. By accessing RECs from the most cost-competitive facilities in the nation, electricity providers can lower the cost of green power as well as increase renewable resource options for customers.
- *Long-term fixed-price green power:* Capitalizing on the predictable, low-to-zero fuel costs of electricity from renewable resources, retail electricity providers can offer green power at a fixed, long-term (5–10 year) price. This provides customers with environmentally friendly power that also stabilizes corporate energy costs or serves as a hedge against volatile electricity rates.
- *Green contract for differences (CFD):* A green CFD is a financial contract that allows a customer to support renewable energy development, acquire RECs, and hedge against fluctuating electricity rates—but does not involve the customer receiving physical power. Rather, the contract sets up an exchange of payments between a power consumer and a renewable generator that hinges upon an agreed price for power. In a green CFD, each party is obligated to pay or receive from the other the difference between the agreed price and the actual market price for electricity. As the payments are settled, RECs are transferred from the generator to the customer.

This installment of WRI's *Corporate Guide to Green Power Markets* introduces these three next generation products. The report describes each product, discusses benefits to both retail electricity providers and corporate customers, and includes case examples.

The *Corporate Guide* analyzes these three products first in the U.S. context (sections II, III, and IV), including both regulated and deregulated states.

Next generation green power may also be attractive in other national markets. To explore this potential, the report reviews the applicability of these products in Canada (section V) and Mexico (section VI). Given that both countries are geographically contiguous to the U.S. and are partners in the North American Free Trade Agreement, significant cross-border trade exists in both primary energy and electricity. In addition, many U.S. companies interested in buying green power have operations in Canada and Mexico. Such factors increase the potential for replicating these next generation green power products.

This *Corporate Guide* considers issues of concern for all those involved in renewable energy markets, including both suppliers and consumers of green power. The discussions of green power using nationally sourced RECs and long-term fixed-price green power are particularly relevant to retail electricity providers. The discussion of green CFDs is especially applicable to renewable generators and large corporate or institutional energy buyers.

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I. THE NEED FOR A "NEXT GENERATION" OF GREEN POWER PRODUCTS

Working with a number of leading companies on sustainable energy issues, WRI has observed that many U.S. firms are interested in reducing their consumption of fossil fuel-generated electricity by switching to green power. **Green power**[1] is electricity produced from renewable resources such as solar, wind, geothermal, low-impact hydro, biomass, and landfill gas.[2] Corporate energy users aspire to make this switch to capture business benefits, such as strengthening customer relationships, building a "green" image, meeting environmental targets, or reducing their dependence on power from resources susceptible to volatile price fluctuations.

Companies can obtain green power in multiple ways. The most direct approach is to install a renewable power generation system—such as a solar photovoltaic array—at a corporate facility. With an on-site system, the generated electricity is delivered directly to and consumed by the facility.

Companies also can purchase green power through a retail electricity provider.[3] In states with regulated electricity markets, many utilities offer their customers the option of buying electricity from renewable resources through "green pricing" programs. In states with deregulated electricity markets, many competitive electricity suppliers or power marketers offer customers the option to purchase green power.

What buying green power entails

When a company signs up to buy green power from its retail electricity provider, it supports renewable power generation and meets its electricity needs. The physical power the company receives, however, does not necessarily come directly from a particular renewable power facility. This is because electricity from renewable and conventional power facilities typically blends together on the grid (*Figure 1*, *A*). All customers drawing power in a particular market receive the same mix of physical electricity regardless of whether they have contracts for green or conventional power.

What buying green power does entail is that the retail electricity provider guarantees that power from a renewable generator in the amount of the customer's demand is delivered to the wholesale power market or grid. Any premium paid by the green power customer helps cover the incremental cost (if any) of renewable electricity generation over conventional power generation. In return, the customer can claim to have "greened up" its electricity supply in proportion to the amount purchased.

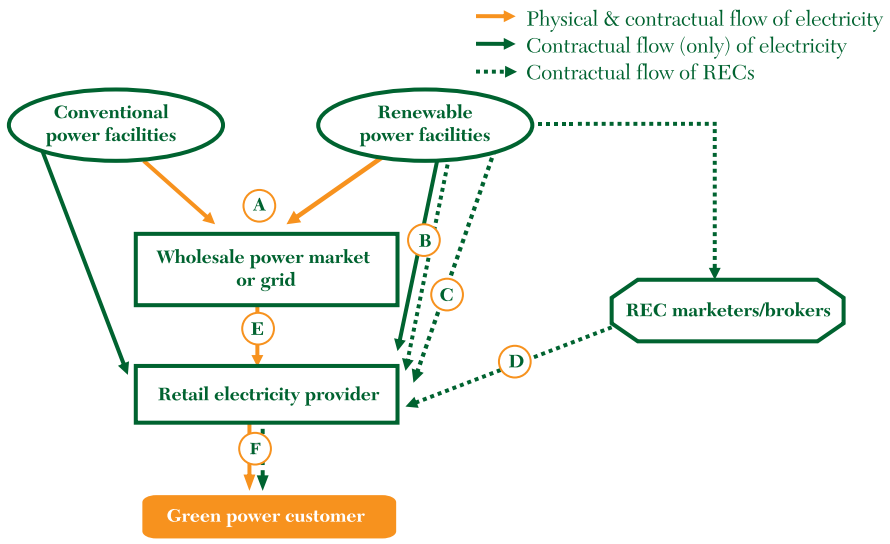
When buying green power, a customer essentially is purchasing two products bundled together: (1) electricity; and (2) a set of environmental and other benefits. These benefits are largely due to the fact that for every megawatt-hour (MWh) of power generated from renewable resources, there is one less MWh of power from conventional sources. As a result, renewables increase energy diversity and avoid numerous air emissions (such as carbon dioxide and particulate matter) that conventional fossil-fired plants would have emitted. Renewable energy markets can now package these benefits into a distinct product called a "renewable energy certificate," or REC.[4] Each REC reflects the benefits associated with one MWh of electricity from renewable resources; this is what makes green power "green."

"Current generation" green power products

Given the emergence of RECs, retail electricity providers have several options for how they create their green power products. For instance, some providers (especially in regulated states) own renewable power facilities from which they source power. Others have contracts for the output of electricity (and for the RECs) from a local renewable generator (*Figure 1*, *B*).

Alternatively, RECs can be contractually separated from their original MWh of electricity. The "unbundled" REC can be sold on the marketplace, leaving the underlying electricity as "commodity" or "generic" power. This feature allows a retail electricity provider to source unbundled RECs from renewable power facilities (*Figure 1*, *C*) or

Figure 1 **Simplified Mechanics of How Green Power Can Be Designed**



from REC marketers/brokers (*Figure 1, D*), "rebundle" them with generic power purchased on the wholesale market (*Figure 1, E*), and sell the resulting green power to its retail customers (*Figure 1, F*).

The vast majority of current generation green power products rely on local renewable resources. For instance, for approximately two-thirds of green power sales in regulated U.S. markets, the retail electricity provider sources electricity and RECs directly from a local or regional renewable generator.[5] For nearly all of the remaining green power sales, the retail electricity provider sources locally or regionally generated RECs from a wholesale REC marketer or broker and rebundles them with local electricity to create green power.[6] Only a small share of green power is created with RECs from renewable facilities outside the region. The dominance of locally generated green power appears to be similar in deregulated markets,[7] and reflects the fact that electricity suppliers have a long tradition of sourcing even conventional power from nearby facilities.

Market shortcomings

Experience with WRI's Green Power Market Development Group (*Box 1*) suggests that a significant share of current generation green power products offered by retail electricity providers are not sufficiently attractive to many large corporate customers. In particular, the price premium of green power relative to conventionally generated electricity is often prohibitively high. For example, the average premium for green power in regulated electricity markets in the U.S. is 2.5 cents per kilowatt-hour (kWh) or $25 per MWh. In deregulated markets, the premium is 2.1 cents per kWh ($21 per MWh).[8] This would entail a 30 to 35 percent price increase for a company that typically pays 7.0 cents/kWh for conventional power.

Furthermore, while the current generation of green power products may help companies improve their public image or meet voluntary environmental goals, few offerings provide any additional quantifiable business benefits. Many green power products thus do not provide customers with enough value to justify the premiums. Many large firms perceive a 30 to 35 percent premium as too much to pay for just "green PR." Besides, there are other, less expensive strategies a company can pursue to demonstrate environmental stewardship and build a "green" brand, such as energy efficiency or recycling initiatives.

As a result, the vast majority of companies have not switched to green power despite surveys indicating strong corporate interest.[9] The average penetration rate of green power products among corporate customers in the U.S. continues to hover at just 1 percent, even though many products have been available for five or more years.[10]

The Green Power Market Development Group's experience in the marketplace suggests that there are several **next generation green power** product designs that electricity suppliers could introduce to address these shortcomings. *Green power using nationally sourced RECs* can reduce price premiums and thereby attract price-sensitive corporate and other large electricity

Box 1 The Green Power Market Development Group

Convened in 2000 by the World Resources Institute, the Green Power Market Development Group is a unique commercial and industrial partnership dedicated to building corporate markets for green power. The Group is transforming energy markets to enable corporate buyers to diversify their energy portfolios and reduce their impact on climate change. The Group seeks to develop 1,000 MW of new, cost-competitive green power by 2010—enough energy to power 750,000 homes. Group partners are Alcoa Inc., Cargill Dow LLC, Delphi Corporation, The Dow Chemical Company, DuPont, FedEx Kinko's, General Motors, IBM, Interface, Johnson & Johnson, Pitney Bowes, and Staples.

More information about the Group and its activities can be found at **www.thegreenpowergroup.org**. This website includes publications, background information on various green power technologies, and an on-line green power marketplace. The website also contains the Green Power Analysis Tool, a Microsoft Excel-based tool designed to help managers evaluate green power projects from an integrated financial and environmental perspective.

customers. *Long-term fixed-price green power* provides corporate customers with the additional business benefit of a hedge against volatile electricity prices. Likewise, *green contracts for differences* allow both renewable power generators and corporate energy users to hedge against fluctuating electricity rates. Sections II, III, and IV describe these three product designs in more detail.

II. GREEN POWER USING NATIONALLY SOURCED RECS

To reduce the price premium of green power, a retail electricity provider can introduce a product using RECs that are sourced nationally instead of locally. To create such a product, the provider would purchase on the wholesale market low-cost RECs that come from a renewable power facility located in some other region of the country and that have been "unbundled" (that is, made available for sale separately) from their originally associated electricity. The electricity supplier then would "rebundle" these certificates with local, conventionally generated electricity and sell the packaged product as green power to its retail customers.

Benefits to corporate energy buyers

Green power using nationally sourced RECs often can have a lower price premium than green power using locally sourced RECs because the former allows a retail electricity provider to access RECs from regions of the country where renewable power generation is more cost-competitive. For example, wind power generators in the Great Plains typically will have lower production costs (and thus REC prices) than those in the Southeast. These regional pricing disparities are due in part to differences in the abundance of renewable resources; the wind blows with more force and consistency in Iowa than in Georgia.[11] Sourcing nationally thus allows a utility in the Southeast to purchase lower cost RECs wholesale from wind facilities in the Great Plains.[12]

The lower cost nature of green power comprised of nationally sourced RECs can be attractive to corporate energy users interested in "greening up" their electricity supply in an economic fashion. This type of green power also can be attractive to corporate buyers because it increases the breadth of renewable resources available to customers. Firms are no longer limited to buying green power from just resources that are locally present. For instance, with this type of product a company that wants to support wind power but is located in a region where the only renewable resource available to its utility is biomass can still achieve its goals.

Green power using nationally sourced RECs may not be attractive to *all* corporate energy buyers. Some firms, particularly small or local ones, may prefer green power from nearby generators. This is because they may want to support local renewable resources and jobs or improve regional air quality. They also may want to be able to "point to" a nearby source of their green power, one that is visible to both customers and employees.

Other companies, particularly large national ones, may be more comfortable with buying green power using nationally sourced RECs. For example, firms with national brand name recognition or facilities in operation across the country often are less tied to one particular locale.

Moreover, firms are likely to have a presence wherever the renewable facility generating the RECs is located. In addition, for many national or global companies, a key environmental issue they are seeking to address through a green power purchase is greenhouse gas (GHG) emissions, especially carbon dioxide (CO_2). Since regional fuel mixes vary, the amount of CO_2 emissions per MWh that a renewable facility avoids varies between regional power pools. Local renewable power facilities may not reduce the most CO_2 emissions; there are regions of the country where avoided CO_2 emissions are higher and thus where supporting renewable generation provides greater climate benefits.

Benefits to retail electricity providers

This next generation product also can provide benefits to retail electricity providers. First, it gives electricity providers the ability to diversify their product portfolio and offer both "national" and "local" green power products instead of relying on a "one size fits all" program. This allows providers to meet a variety of customer needs in the voluntary market.[13]

Second, green power using nationally sourced RECs enables retail electricity providers to better compete against REC marketers and brokers to win the business of large corporate customers. This is an important benefit in light of recent trends. Purchasing unbundled RECs, as opposed to green power, is becoming increasingly popular among major corporate energy buyers. Green-e® certified[14] retail REC sales to corporate and other non-residential customers in the U.S. voluntary market grew to 332,000 MWh in 2003, a fivefold increase over the previous year.[15] This burgeoning growth in certificate sales is at least partly due to the lower cost that unbundled RECs often have relative to current generation (local) green power.[16] In contrast, sales of Green-e® certified green power to non-residential customers recently have stagnated; 2003 sales of 212,000 MWh were approximately the same as 2001 sales.[17]

Nationally sourced RECs could help invigorate green power sales by enabling retail electricity providers to supply green power at a premium that is *less* than the price corporate customers would pay if they were to buy unbundled RECs on their own. This is possible because electricity suppliers are likely to purchase a larger volume of RECs (and perhaps for a longer term) than most corporate customers typically would, and therefore suppliers can receive better volume discounts. To illustrate, suppose a company interested in "greening" its electricity supply is able to purchase 10,000 RECs on the retail market for $7/MWh. Suppose that the company's utility, however, is able to purchase 500,000 of the same RECs on the wholesale market for $3/MWh. The utility then could use these RECs to create a rebundled green power product at a premium of $5/MWh for its customers. Both the utility and its corporate customer would be better off with the latter product. The utility avoids losing a customer's renewable energy business and still makes a profit. The customer reduces the environmental impact of its energy consumption at a lower cost than it would have incurred if it were to purchase unbundled RECs on its own.

Developing the product

Building green power products using nationally sourced RECs need not be administratively complex. There are a number of wholesale REC marketers and brokers that can supply retail electricity providers.[18] This alleviates the need for an electricity provider to establish a multitude of relationships with owners of renewable power projects, and it can help lower transaction costs. Some electricity providers might even want to consider outsourcing green power product design and management to a REC marketer. In such an arrangement, the electricity provider maintains control of the customer interface and billing, while the marketer takes care of developing new green power product designs, sourcing the RECs, and passing them on to the retail electricity provider to bundle with the power.[19]

Another factor to consider when developing this new type of green power is product certification. One concern that companies and other energy buyers often raise when evaluating a green power purchase is "How can I be certain that the

green power I buy actually has been generated, comes from a publicly acceptable renewable resource, and has not been sold to another buyer?" To ensure customer confidence in green power using nationally sourced RECs, retail electricity providers should use RECs that have been certified by a respected renewable electricity certification program. The Green-e® program in the U.S., for instance, independently audits renewable electricity production to verify that the power and RECs were produced by the purported renewable generation facility, delivered in the amount specified, created by a renewable resource accepted by numerous stakeholders, and not "double sold" or claimed by more than one party. Green power using nationally sourced RECs would be considered Green-e® certified as long as the RECs are certified.[20]

Companies and other large electricity customers can play an active role in encouraging the introduction of this novel product into the marketplace. A customer can successfully approach its supplier, communicate that "off-the-shelf" products do not sufficiently meet its needs, and negotiate with the supplier to introduce green power using nationally sourced RECs (*Box 2*). Large electricity buyers such as corporations, universities, military bases, and government agencies have the purchasing scale to entice retail electricity providers to respond to such requests.[21] Likewise, suppliers, especially those in deregulated markets, should find it in their interest to satisfy such demands in order to build customer loyalty or increase market share.

Box 2

A Corporate Customer Takes the Lead

In 2003, the Tower Companies— a major commercial and residential developer in the Washington, D.C. metro area that is recognized for its green building designs—started purchasing green power for 25 percent of the annual load for seven apartment complexes and for 50 percent of the load for six large office buildings. This 16 million kWh per year deal was the first by a private developer in the nation's capital. However, it was not a typical green power transaction.

When Tower first expressed interest in buying green power, its retail electricity provider offered its off-the-shelf product. The supplier, Pepco Energy Services (PES), had wholesale power contracts with several local projects that were producing electricity from landfill gas. PES was offering this landfill gas-based green power to retail commercial and residential customers. However, the premium price charged for this electricity was too high for Tower's budget.

Working with the World Resources Institute and the consulting firm Think Energy, Tower requested PES to create a new, alternative green power offering that would meet Tower's high volume demand but at lower prices. One option was for PES to partner with a REC marketer to source lower cost RECs that could form the basis of this new product. PES responded by structuring a deal with REC marketer Sterling Planet, which agreed to supply RECs wholesale to PES from biomass-fueled power facilities located in several states across the country. In turn, PES rebundled these nationally sourced RECs with conventionally generated electricity to form a new retail green power product. The cost of the RECs would be incorporated seamlessly into the customer's monthly electricity bill.

By proactively engaging its electricity supplier, Tower was able to receive green power that met its requirements. Most notably, the cost of the green power using nationally sourced RECs was lower than that of the existing product. By responding to Tower's request, PES strengthened its relationship with a major customer and expanded its portfolio of green power options.

Green power using NAFTA-sourced RECs

In the future, retail electricity providers might want to consider creating green power using "NAFTA-sourced" RECs. Given the integration of electricity markets in the NAFTA region,[22] green power markets could increasingly integrate as well. For instance, a U.S. utility could offer wind-based green power comprised of inexpensive wind RECs from Alberta. A Canadian utility could offer geothermal-based green power that uses low-cost geothermal RECs from California or even Baja California. Such NAFTA-based green power could be an attractive, new product for retail electricity suppliers to consider offering to large corporate customers who have operations throughout North America or who are very price sensitive.

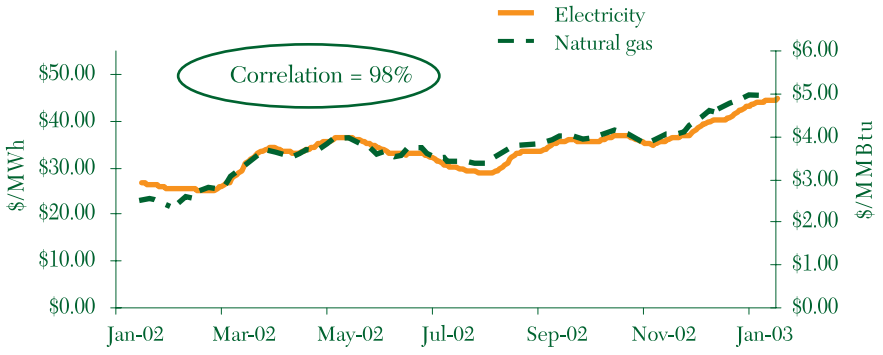
To ensure the integrity of NAFTA-based products, compatible green

power certification programs and electronic REC tracking systems are needed among the NAFTA partner countries. Large corporate energy buyers may be hesitant to purchase green power using NAFTA-sourced RECs without some consistency in certification practices (for example, similar guidelines for eligible resources and auditing procedures). A REC tracking system consists of a coordinated set of databases that track and register certificate generation, sales, and ownership. It reduces the cost of tracking and verifying the wholesale transactions of the RECs that constitute green power. To ensure compatibility across countries, REC tracking systems should meet the minimum standards being developed by the North American Association of Issuing Bodies.[23]

III. LONG-TERM FIXED-PRICE GREEN POWER

A shortcoming among the current generation of green power products is that the business benefits to a corporate customer are often limited to improving the company's public relations or helping the company meet its environmental goals. If a significant premium is attached to the product, these benefits may be insufficient to justify a purchase for many potential customers. One strategy retail electricity providers can pursue to address this shortcoming is to introduce green power products with fixed pricing for extended terms (ideally five or more years). Such products could provide the additional benefit of a hedge against volatile fossil-based electricity rates and therefore spur greater product demand among corporate energy users.

Figure 2 **Correlation between Natural Gas and Retail Electricity Prices in Texas Power Market**



Note: Data reflects 10 trading day electric and gas average and megawatt daily 5x16 standard product (12-month average) from January 2, 2002–February 4, 2003.
Source: Association of Electric Companies of Texas (AECT), Inc. 2003. Wholesale Electric Prices Rising. Austin, TX: AECT.

How it works

With long-term fixed-price green power, a retail electricity provider has a contract to provide green power to a customer for a number of years at a price that remains fixed or flat. Such contracts are ideally suited for power from renewables such as wind, geothermal, solar, and low-impact hydro because the fuel is "free." Consequently, there is little if any volatility in the cost of generating power from these resources.[24] The major cost drivers, rather, are the up-front capital expenses. As a result, renewable generators have a strong interest in lining up long-term contracts for power to help finance new projects, and they can subsequently offer power at a fixed price with no risk of fuel price volatility.

Contracts for long-term fixed-price green power can function as a hedge against rate volatility of electricity generated by fossil fuels (coal, oil, and natural gas). Fossil fuel prices rise and fall in response to demand and supply conditions in the energy markets. In some markets, price changes in these primary fuels show up in the price for electricity and are passed on to retail electricity customers. In particular, natural gas has experienced significant price volatility in recent years, driving electricity rate fluctuations in power markets such as Texas (*Figure* 2). In 2003, the average monthly price for industrial-use natural gas in the U.S. ranged from $4.80 to $8.01 per million cubic feet, a 67 percent swing that included a one-month price spike of 22 percent between February and March.[25] Natural gas price volatility is expected to continue, since the fuel is in high demand for power generation and

other industrial uses and low-cost supplies are being exhausted.[26]

The extent of the hedge from fixed-price green power is tied to the amount of power that is purchased. To illustrate, suppose a corporate energy manager buys 10,000 MWh per year of fixed-price green power for a factory, representing 20 percent of the location's projected annual load. Only 20 percent of the facility's electricity demand will be protected against price fluctuations in the power market. The factory will still be exposed to volatility for the balance of its electricity needs.

The value of the hedge can be significant when considering the cost that corporate energy consumers could incur if they chose to structure financial or other conventional long-term hedges to cover natural gas price risk. For example, energy consumers can structure natural gas futures or swaps to manage price risk, though typically only for short durations (less than five years) and at some incremental cost due to transaction costs and/or a risk premium. Over the past few years, however, prices of long-term forward natural gas contracts have traded at a premium of about $5 per MWh over comparable long-term forecasts of spot natural gas prices.[27] This implies that there is a cost to hedging with conventional instruments—a cost that would not be incurred when using a green power product that achieves the same hedge. A green power buyer can factor this into the purchasing decision. For instance, if the green power product is priced at $45 per MWh, the buyer could potentially rationalize the cost, for example, as $40 per MWh for green power plus $5 per MWh for the hedge. Because green power usually costs more than conventional power, it is possible for the green power premium to be offset by the value of the hedge.

One of the advantages of having a hedge is that it provides an administrative benefit to corporate energy managers, since cost stabilization eases the management of energy budgets. For most companies, electricity is an indispensable resource that must be purchased regardless of the price. In economic terms, this means the demand for electricity is relatively "inelastic." Some firms are capable of changing production schedules or shutting down a production line when prices become very high. For most companies, however, when price spikes do occur, energy managers can exhaust their budgets quickly and run over-budget to cover ongoing energy expenses. Fixed-price power, on the other hand, provides cost stability and predictability for managing budgets.

Where would it be attractive?

Currently, long-term fixed-price green power is not common in either regulated or deregulated electricity markets. The vast majority of retail green power contracts are neither long-term nor designed specifically to provide a hedge against electricity rate volatility. In which markets, then, would this next generation product be attractive?

Regulated markets provide some opportunity for fixed-price products. A utility can procure wholesale green power on long-term fixed-price contracts, thus managing its own fuel price risk, and then directly pass the cost stability on to its corporate customers. Austin Energy, for example, is a utility that has successfully introduced such a product (*Box 3*). Some utilities have traditionally emphasized electricity rate stability, however, and kept rates fairly constant. In the absence of rate volatility in these service territories, there would be less demand for green power products that provide hedge value.

In comparison, deregulated electricity markets may be more attractive for long-term fixed-price contracts because these markets can be susceptible to price volatility depending on how deregulation is implemented, the resource mix, and other factors. In these markets, the retail price of power can rise and fall according to supply and demand without buffering by a regulated utility. In fact, three regions of the U.S. that have undergone electricity deregulation—Texas, California, and the Northeast—have traditionally been the most expensive power markets, the most dependent on natural gas as a fuel source, and have experienced significant price volatility at times.

Markets that are in transition from a monopoly to a competitive environment also could be opportune for introducing long-term fixed-price green power products. If the contract

Box 3

Stabilizing Electricity Costs: Austin Energy's GreenChoice® Program

Austin Energy, a regulated municipal utility serving Austin, Texas, launched the nation's first long-term fixed-price green power product for both commercial and residential customers in 2000. In designing the product, called GreenChoice®, Austin Energy locked in its own long-term fixed-price contracts for wholesale power from a variety of renewable energy projects. GreenChoice® is approximately 80 percent wind, 18 percent landfill gas, and 2 percent small hydropower, all of which is generated in Texas.

An Austin Energy electric bill typically includes four different charges: fossil fuel, energy (overhead and transmission), peak demand, and taxes. The fossil fuel charge is typically variable. In the past, Austin Energy adjusted the fuel charge about once per year to reflect fossil fuel costs, but these adjustments became more frequent starting in 2000 with the volatility in natural gas prices. In the past four years, Austin Energy has had to increase its fuel charge several times in relatively short intervals. With the GreenChoice® product, though, the normal fossil fuel charge is replaced by a "green power charge" proportional to the amount of renewable energy that a customer chooses to buy. Unlike the fluctuating fossil fuel charge, the green power charge is fixed for either 5 to 10 years depending upon customer preferences.

Austin Energy offered two batches of green power, each available in April 2001 but at different prices. The green power charge for Batch 1, which was subsidized by the City of Austin, was 1.7 cents/kWh. Batch 1 totaled 100,000 MWh/year and was fully subscribed six months prior to actual availability. Batch 2 totaled 260,000 MWh/year with a green power charge of 2.85 cents/kWh. Batch 2 was fully subscribed by January 2004, at which time Austin Energy began offering a third batch of green power.

In contrast to the fixed green power charges, Austin Energy's fossil fuel charges have ranged between 1.3 and 2.8 cents/kWh (*Figure 3*). These fluctuations generally follow changes in the price for natural gas, which is widely used in Texas for electricity generation and other industrial purposes. Austin Energy, in particular, uses natural gas for 30 percent of its power generation. As the fossil fuel charge rises above 1.7 cents/kWh, customers that signed up for Batch 1 green power actually pay less for their renewable energy than for conventional energy. Even without the government subsidy, Batch 2 green power sells at near parity with conventional power and may be less expensive in later years depending on changes in natural gas prices.

The experience of IBM illustrates the hedge value of GreenChoice®. In March 2001, IBM signed a five-year contract for 5.25 million kWh per year from Batch 1. At the time, the company predicted that the green power would actually cost a premium of $30,000 per year, but opted for the purchase anyway due to three leading factors. First, the fixed-price nature of the contract provided a hedge in the face of unpredictable energy markets and IBM believed that at some point the deal would pay off. Second, the cost stability provided by the deal made it easier for the company to manage its energy budget. Third, buying green power was an opportunity for the company to reduce the greenhouse gas emissions associated with its business operations.

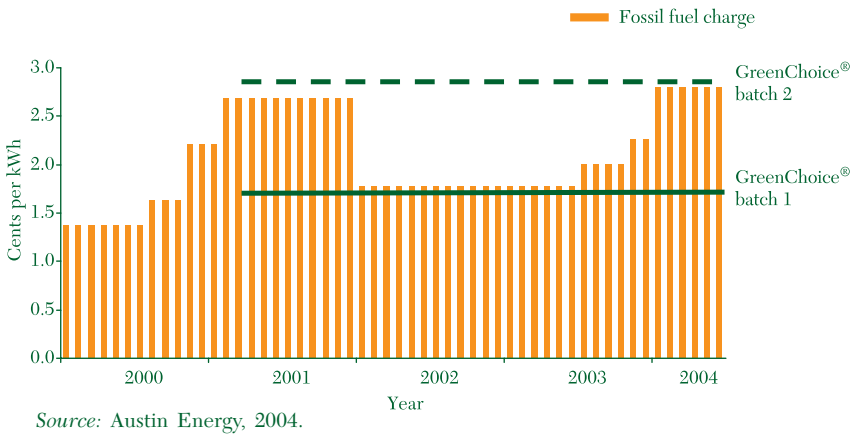
Austin Energy's fuel charge for conventional power spiked in 2001 and IBM saved $20,000 in its first year in the program. During 2002 and 2003, GreenChoice® cost slightly less than conventional power. The fossil fuel charge rose again in 2004 and IBM expects to save over $60,000 for the year.

Given the business benefits it provides, GreenChoice® quickly has become the nation's largest green power program among regulated utilities and almost double the size of the second largest program in terms of MWh sold per year.[1] But the Austin Energy approach has not yet been widely replicated. Only a handful of utilities in the U.S. have developed green electricity programs that protect customers from some variable charges.[2] To build successful green pricing programs and meet the interests of commercial and industrial energy buyers, utilities should review the Austin Energy experience and consider approaches to integrating green power hedge value into their offerings.

Notes

1. U.S. Department of Energy. 2003. Energy Efficiency and Renewable Energy, Green Power Network. Available at: http://www.eere.energy.gov/greenpower/markets/pricing.shtml?page=3.
2. Bird, L., B. Swezey, and J. Aabakken. 2004. Utility Green Pricing Programs: Design, Implementation, and Consumer Response. NREL/TP-620-35618. Golden, Colorado: U.S. Department of Energy National Renewable Energy Laboratory.

Figure 3. Austin Energy's Fossil Fuel Charge vs. GreenChoice® Charge



Source: Austin Energy, 2004.

WRI's *Corporate Guide* Series

This publication is the sixth installment of the *Corporate Guide to Green Power Markets* series, which is based on WRI's experience with the Green Power Market Development Group. Previous installments are:

1. *Introducing Green Power for Corporate Markets: Business Case, Challenges, and Steps Forward*
2. *Opportunities with Landfill Gas*
3. *Corporate Greenhouse Gas Emissions Inventories: Accounting for the Climate Benefits of Green Power*
4. *Introducing the Green Power Analysis Tool*
5. *Renewable Energy Certificates: An Attractive Means for Corporate Customers to Purchase Renewable Energy*

Each of these *Corporate Guides* can be found at www.thegreenpowergroup.org/publications.html.

were to span the transition period, this type of green power could allay corporate customer concern about electricity price spikes when the regulated price caps are lifted.

IV. GREEN CONTRACT FOR DIFFERENCES

A third next generation green power product that could provide corporate energy users with additional business benefits beyond good public relations is a green contract for differences (CFD). A green CFD is a long-term (perhaps 5 to 10 years or more) financial contract between a retail power consumer and a renewable power generator that protects both parties from price fluctuations in competitive power markets. As with long-term fixed-price green power, a green CFD uses renewable energy as a hedge against price volatility of electricity generated by fossil fuels. Despite this similarity, though, the green CFD is fundamentally different and may offer several distinct advantages.

A CFD is a common financial instrument used in energy and other markets and involves an exchange of payments between two parties. In the case of a green CFD, the exchange of payments is between a retail power consumer and a renewable power generator, and it hinges upon an agreed price for power. It also involves a transfer of RECs from the generator to the consumer. The agreed price—known as the "strike price"—is compared to the fluctuating price for power in an electricity spot market. In a green CFD, each party is obligated to pay or receive from the other party the difference between the strike price and the actual market price.

A CFD is not an agreement for power; it exists in parallel to existing electricity contracts. The renewable generator continues to sell its power into the local market, while the power consumer (the CFD counterparty) continues to buy power from its retail electricity provider with no effect by the CFD. As a result, a green CFD has some advantages over long-term fixed-price green power products. A CFD does not involve scheduling the physical delivery of power, which can be a market barrier to corporate green power purchases. It also allows the customer to maintain all of its existing power contracts and arrangements relative to energy purchasing, which may be attractive to companies with multiple locations. Lastly, from the power consumer's perspective, a green CFD could potentially lessen the credit requirements for the renewable generator as compared to long-term fixed-price power contracts. A green CFD is a hedge and not a contract for physical power. As a result, issues of power reliability and possible supply interruption are diminished to some extent, and thus the power consumer may be less concerned with the generator's financial condition.

For the renewable generator, the key benefit is that a CFD guarantees its price for power and thus secures the revenue stream necessary for project financing. For the electricity customer, the CFD provides a hedge against electricity price spikes in a deregulated power market. Since the renewable generator transfers the RECs it creates to the customer, a green CFD can be a way for corporate energy users to "green" their power supply as well.[28] Furthermore, the fact that a CFD can be structured for terms of 10 years or more can be an advantage to corporate customers when compared against other hedging options, such as forwards, that become more expensive to structure as the term is extended.

Figure 4 How a Green Contract for Differences Works

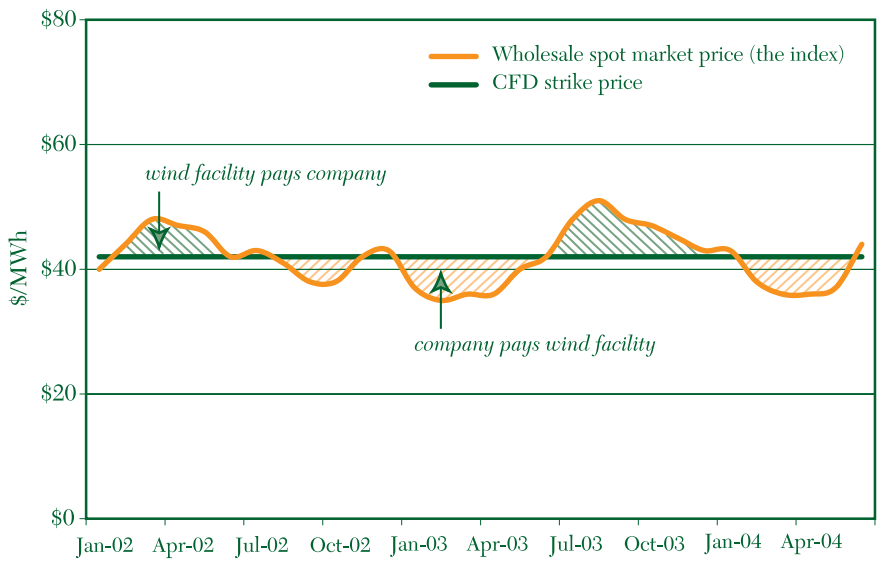


Figure 4 illustrates how a green CFD works using wind power.[29] Suppose a company were to enter into a 10-year CFD with a wind power facility and the two parties were to agree on a strike price of $42 per MWh. The strike price is compared against an index, specifically the hourly spot market price for power in a wholesale power market that has liquidity and price transparency. If the spot price for power were to increase to $50 per MWh, the generator would receive $50 for each MWh it sells on the spot market but would then pay the company $8 per MWh. This protects the company against price increases for the electricity it buys on the market. Conversely, if the spot price were to drop to $35 per MWh, the generator would receive $35 per MWh for the power it sells on the spot market but would receive from the company $7 per MWh. Thus the generator's net revenue per MWh is guaranteed and fixed.

Since RECs are transferred with the payments, the REC prices are essentially "floating" and can even be negative. The frequency with which the payments and REC transfers are settled is a point of negotiation between the two parties. For example, the settlements could occur monthly or quarterly.

A CFD does involve risk stemming from differences in the location of the consumer and the generator. The two parties may face different spot market prices. If the two markets are not perfectly correlated in the rise and fall of electricity prices, then there is a variance that may reduce the effectiveness of the CFD. For an intermittent resource such as wind, there is the additional risk that the wind may not blow at the ideal time for the corporate consumer, specifically when the spot market price is high and the customer is looking for protection against volatility. Despite these challenges, initial research suggests that wind-based CFDs can provide a good, if not perfect, hedge that can cut price variability in half for corporate customers.[30]

Green CFDs are relatively new. Although they have been successfully completed in Canada (*Box 4*), no green CFDs have been completed in the U.S. to date.

As Box 4 illustrates, next generation green power products may be applicable in markets outside the United States. Canada and Mexico, partners with the U.S. in the North American Free Trade Agreement (NAFTA), are good candidate markets. The increased dialogue between these partners as they integrate markets provides an opportunity for the import and export of new electricity product design concepts that help build markets for renewable energy. The following two sections will explore opportunities for introducing next generation green power in these two countries.

V. Opportunities for "Next Generation" Green Power Products in Canada

Canada has vast potential for renewable energy. The nation's electricity generation is currently dominated by hydropower, although fuel sources vary between provinces (*Figure 5*). "New" renewable

Box 4

Breaking Ground with Green CFDs in Alberta, Canada

The concept of a green CFD has been put into practice in Alberta, where wind- and biomass-based CFDs have been structured in the wake of market deregulation.

Wholesale electricity market restructuring began in Alberta in 1996. In 2000, power prices spiked, at one point reaching a 500 percent increase over prices at the start of the year. Price volatility was hitting power markets throughout western North America due to a combination of factors, including the California electricity crisis, natural gas price increases, capacity and transmission issues, and gaming by market participants. As Alberta moved to full deregulation for both wholesale and retail markets in January 2001, energy buyers understood the value of hedging against electricity price volatility.

In September 2001, Calgary Transit of the City of Calgary began a 10-year green CFD based on wind power. The wind generator is VisionQuest, a division of the TransAlta power company. In addition, the retail power supplier, ENMAX, serves as an intermediary owing to its existing customer relationship, although it has no risk exposure in the contract. The CFD covers a load of 26,000 MWh per year and is indexed to Alberta's spot electricity market (there is only one spot market in the province). The strike price for the contract is in the range of 7 cents Canadian per kWh. Since contract inception, the spot price for power has fluctuated above and below the strike price, meaning both parties have made and received payments.

In addition, the Province of Alberta purchased a 10-year green CFD based on wind power and a 20-year green CFD based on biomass. The renewable generators are VisionQuest and ENMAX for the wind and Canadian Hydro for the biomass. The contracts cover a total load of 210,000 MWh per year (105,000 MWh each) and are indexed to the Alberta spot electricity market.

resources such as wind, solar, and biomass are responsible for approximately 1 percent of the nation's power generation. Nonetheless, the opportunity for increasing electricity generated by new renewables is significant. For example, Canadian wind resources could support at least 10,000 MW of new wind generation facilities by 2010.[31] Over 1,600 MW of new, small-scale hydro projects are economically feasible using current technologies.[32] Forest residues, energy crops, and agricultural wastes could supply over 5,000 MW of new biomass-to-energy facilities.[33] Additionally, there are significant opportunities for wave and tidal power generation, especially along the country's Atlantic coast, once these technologies begin to mature.[34]

Retail green power sales to corporate customers can play a role in helping Canada realize this renewable energy potential. In particular, market conditions appear to be right for each of the next generation green power products to be an attractive option for both electricity suppliers and corporate buyers.

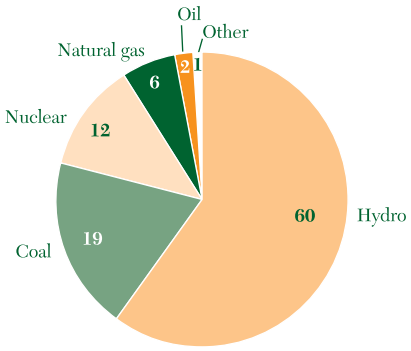
Green power using nationally sourced RECs

Similar to the U.S., Canada has a market in which households, companies, and other institutions can voluntarily purchase green power and in turn help support the development of "new" renewable resources. Since the launch of its first product in 1998, the voluntary green power market in Canada has grown to support 775 MW of renewable energy capacity by the end of 2003.[35] Ten retail electricity providers now offer products based on wind, solar, biomass, and other renewable resources.[36] All of these Canadian providers source their green power from generators whose facilities are located within the provider's service territory or province.[37] For example, wind and biogas facilities near Toronto supply Ontario PowerGen's "Evergreen Green Power." SaskPower's "GreenPower" comes from a wind farm in southwest Saskatchewan.

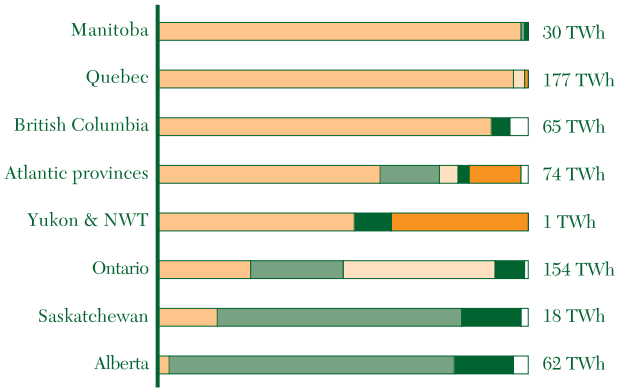
As with "current generation" products in the U.S., Canadian green power can be expensive. Although prices can vary significantly, the average green power premium is approximately U.S. 4.1 ¢/kWh (U.S. $41/MWh).[38] Relative to average Canadian conventional power rates, this represents a 60 percent premium for commercial customers and a 90 percent premium for industrial customers.[39] The premiums typically are higher in provinces dominated by low-cost hydropower and lower in other provinces (*Figure* 5). Such high prices help explain why the penetration rate of most green

Figure 5 **Profile of Canadian Electricity Generation by Fuel Type**

Net Canadian electricity generation – 2002
Percent, 100% = 581 TWh



Net electricity generation by province/region – 2002
Percent, 100% = 581 TWh



Source: Statistics Canada 2002. Report on Energy Supply-Demand in Canada. Ottawa, Canada: Statistics Canada.

power products among corporate customers in Canada remains below 1 percent.[40]

Green power designed with nationally sourced RECs could help reduce these premiums and, in turn, increase the attractiveness of green power to energy users and help electricity providers acquire new corporate customers. Suppose a company in Ontario seeks to purchase wind-based green power but finds the premium of the local, "off-the-shelf" product too high. The company's retail electricity provider could satisfy the customer's needs by sourcing wind RECs from a province such as Alberta that has more abundant and lower cost wind resources than Ontario. The provider then could rebundle these RECs with local, generic electricity to create a new, less expensive green power product.

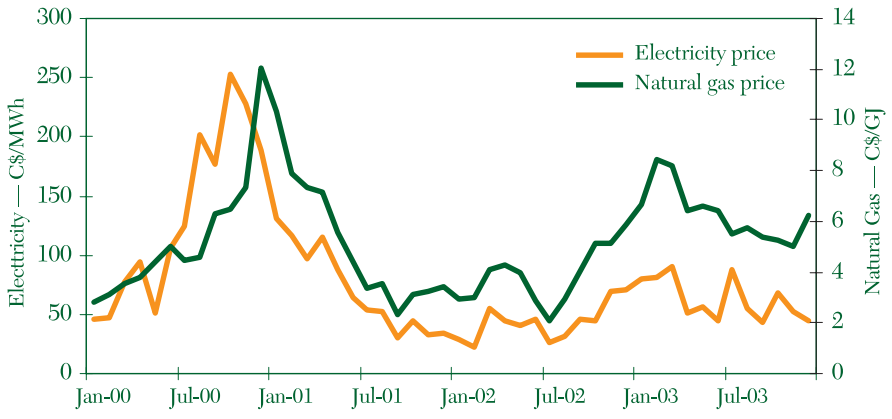
Green power designed in this fashion is not currently being offered in Canada, but several factors could make it a viable product for retail electricity providers to introduce. First, Canada has regional differences in renewable resource abundance and cost that retail electricity providers can leverage. Second, many electricity providers already are familiar with REC markets and therefore are one step closer to being prepared to purchase certificates on a wholesale basis across provinces and then rebundle them with local electricity. Third, a green power certification program, EcoLogo™, has already been established in the country.[41] This would help instill buyer confidence in rebundled green power products. Finally, given the advent of competition in the Alberta and Ontario power markets, retail electricity providers have an incentive to introduce products that meet customer demands. Likewise, corporate customers could have some degree of "buyer power" to encourage their electricity providers to introduce this next generation product.

Long-term fixed-price green power

Another retail electricity product that could be attractive to Canadian corporate electricity customers is long-term fixed-price green power. The applicability of this product will vary by province, depending upon the potential for volatility in electricity prices.

In some provinces, electricity rates historically have been low and stable. For example, large corporate customers in the regulated market of Manitoba have had the same low

Figure 6 **Trends in Alberta Electricity and Natural Gas Prices**



Note: Natural gas prices are simple monthly average NGX Intra-AB same day settlement prices.
Source: Alberta Electric System Operator, Energy Trading System; online data available at http://ets.powerpool.ab.ca. Canadian Natural Gas Focus. 2001, 2002, 2004. Calgary, Alberta: GLJ Energy Publications.

electricity rates (approximately U.S. 1.5 ¢/kWh) for over 10 years.[42] The abundance of hydropower in these provinces is a leading factor underlying these rates.

Electricity rate escalation and volatility is possible, however, in provinces where hydropower is not as abundant and where natural gas is the fuel of choice for new generation capacity. In the regulated market of Saskatchewan, for example, SaskPower's corporate customers recently have been experiencing rate hikes. The utility raised rates 3–8 percent in 2002 and is proposing increases of 8–14 percent in 2004 and 2–4 percent in 2005. This price escalation is due in part to rising fuel costs as the utility changes its generation mix by increasing its use of natural gas.[43]

Similar developments are occurring in the two provinces experimenting with electricity market deregulation, Ontario and Alberta. Electricity rate changes over the past several years in Alberta have been closely tied to fluctuations in natural gas prices (*Figure 6*). In the future, Ontario and Alberta are expected to add 5,000 and 2,000 MW, respectively, of natural gas-fired generation capacity by 2007. For Ontario, the share of the province's power generation from natural gas therefore will rise from 13 percent today to 30 percent.[44]

Although Canada produces more natural gas than required for domestic use, it is part of an integrated North American market and exports nearly 60 percent of its gas to meet growing U.S. demand. Canada's natural gas production is projected to grow at a rate of only 0.5 percent annually, while its own domestic consumption grows at 2.2 percent.[45] These trends suggest an increasing disparity between supply and demand[46] and increased prices for natural gas.

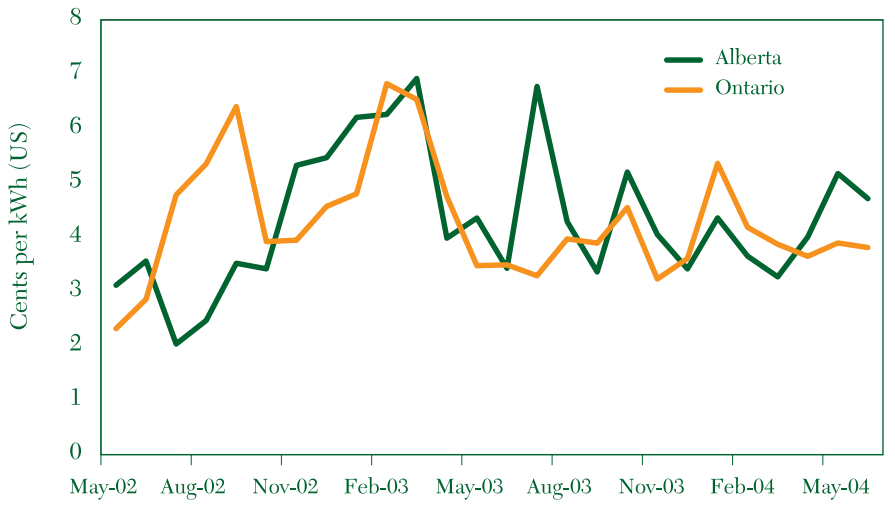
The net result of these developments is that corporate customers in several Canadian provinces, especially Alberta, Ontario, and Saskatchewan, are increasingly exposed to the risk of electricity price increases. Therefore, there is a good market opportunity for retail electricity providers to introduce long-term fixed-price green power for their large corporate customers as a hedge against electricity rate volatility. A product with such business benefits could help electricity suppliers expand their green power programs.

Green contract for differences (CFDs)

Green CFDs could be an attractive product for Canada's deregulated markets. A few Canadian firms already have experience with structuring CFDs (*Box 4*). The recent price volatility in these markets could spur demand from corporate energy users.

Electricity market deregulation has occurred in Canada to varying degrees and with mixed results. Alberta and Ontario are the most advanced in implementing full wholesale and retail competition, while other provinces are moving to some form of wholesale competition only. In 1995, Alberta introduced deregulation in an effort to spur new generation capacity while containing

Figure 7 **Alberta and Ontario Electricity Price Fluctuations, 2002-04**



Source: Alberta Electric System Operator, Energy Trading System; online data available at http://ets.powerpool.ab.ca. Independent Electricity Market Operator, Hourly Ontario Energy Price Monthly Average; online data available at http://www.theimo.com/imoweb/marketData/marketSummary.asp.

costs. However, as wholesale competition gave way into full market deregulation in 2001, power rates spiked and fluctuated widely. As a result, the government intervened and installed price caps for residential customers. Large business consumers did not receive price caps and consequently experienced substantial increases in their electricity costs, though these were partially offset by government rebates.[47]

Ontario introduced legislation for deregulation in 1998 and moved to open its electricity markets completely in 2002. Like Alberta, Ontario experienced significant price escalation and volatility in the aftermath of deregulation. The government moved to install price caps for residential and other small consumers, but has maintained an open market for commercial and industrial consumers since March 2003.[48] Although price caps effectively eliminated competition at the retail level, large-volume customers can still negotiate prices directly with generators or power marketers or purchase at the spot market price.[49] Large customers who buy electricity at the wholesale price are eligible for a government rebate of roughly half the difference between the market price and 3.8¢ per kWh.[50] This rebate is in effect until April 2006.

The price spikes in these provinces are generally attributed to a tight supply/demand balance, higher natural gas costs, and higher electricity import prices, which were partly driven by problems in California.[51] Electricity price fluctuations throughout western North America in 2001 have also been attributed partly to gaming by market participants.[52] As Figure 7 illustrates, significant price fluctuations have continued in both Alberta and Ontario into 2004.

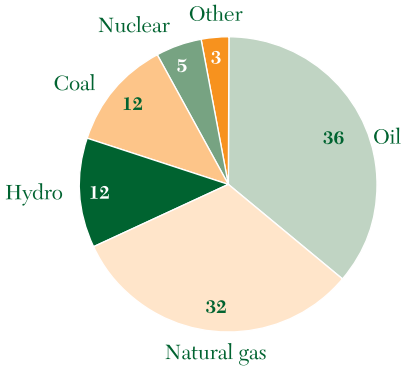
Going forward, price volatility seems likely to persist in Canada's deregulated markets. Both Alberta and Ontario have plans for increased use of natural gas, which could contribute to volatility. If governments decide to proceed with further market deregulation, price caps for residential customers and rebates for industrial consumers may be disbanded. While the effects of these changes are hard to predict, they add uncertainty and can contribute to short-term price swings. With a track record of persistent volatility, Canada's deregulated provinces appear to be good markets in which large corporate customers and renewable power generators could consider establishing green CFDs.

VI. Opportunities for "Next Generation" Green Power Products in Mexico

The Mexican electricity market is potentially attractive for at least two of the "next generation" green power products. The opportunity is qualified, however, by several features of the Mexican market that differ from those of U.S. and Canadian markets. First, existing power generation in Mexico is dominated by fuel oil and natural gas. Over two-thirds of power generation comes from these two fuels (*Figure 8*), a significant difference from the

Figure 8 Mexican Electricity Generation — 2002

Percent, 100% = 215 TWh



Note: Figures reflect net generation (excluding parasitic demand)
Source: International Energy Agency (IEA). 2004. Energy Balances of OECD Countries, 2002. Paris, France: IEA.

dominance of coal in the U.S. and hydro in Canada. The prevalence of oil and natural gas suggests that there is an opportunity for green power to serve as a hedge against fuel price volatility in Mexico.

Second, a voluntary retail green power market does not yet exist in Mexico. Although 3 percent of the country's electricity is generated by non-hydro renewable resources, it is delivered to the grid and sold only as generic power.[53] No Mexican retail electricity supplier currently is offering green power to corporate or other customers. Nevertheless, this does not preclude the emergence of voluntary markets in the future. In fact, given the country's legislative requirement that utilities must source power from the lowest cost supply when providing their standard offer, voluntary markets for green power may become critical for spurring new renewable power generation.

Third, electricity supply in Mexico is dominated by just two state-owned companies and therefore is more highly concentrated than in its northern neighbors. The Federal Commission of Electricity (Comisión Federal de Electricidad or "CFE") and the Central Electric and Power Company (Luz y Fuerza del Centro or "LFC") are state utilities that generate and deliver the vast majority of electricity in Mexico. CFE produces over 80 percent of the nation's power and controls 96 percent of the country's transmission and distribution (T&D) network. LFC generates approximately 2 percent of the country's power and controls the remainder of the T&D system.[54] LFC serves Mexico City and municipalities in several nearby states,[55] while CFE serves the rest of the country. The remaining generation comes from independent power producers, Petróleos Mexicanos (mostly for its own use), and companies with their own on-site generation.[56] The Public Electricity Utility Law excludes private companies from providing power directly to end customers; this is the realm of CFE and LFC only. The electricity sector reforms of 1993 opened the market to independent power producers, but only as long as they either consume the power themselves,[57] export it outside of Mexico, or sell it to CFE.[58] Therefore, under the existing market structure, whether or not "next generation" green power products will be offered in Mexico is dependent upon CFE and, to a lesser degree, LFC.

Fourth, the Mexican electricity market is still regulated by the national government. In the late 1990s, former President Zedillo outlined an industry deregulation plan that would have increased private sector participation in generation and distribution services. However, the proposal was resoundingly rejected by the legislature,[59] and some observers have concluded that deregulation of the Mexican electricity market is unlikely in the foreseeable future.[60] Therefore, at least for the time being, products like a green contract for differences will be less relevant for Mexico, since there is no spot market price for wholesale electricity against which a renewable generator and a corporate energy user can hedge.

However, several realities of demand and supply suggest that Mexico has the potential for corporate markets for green power. On the demand side, companies in Mexico have expressed interest in purchasing renewable energy. According to a June 2002 Gallup Mexico survey of executives from the country's top 100 electricity-consuming companies, 94 percent of respondents said they would purchase renewable energy if given the option. Some 54 percent of respondents said they would be willing to pay more for green power, although the average acceptable premium was only 11 percent.[61] Despite the fact that U.S. market experience indi-

cates there is a disparity between surveyed intentions and actual behavior, this 94 percent favorable response rate in Mexico is higher than that in similar surveys conducted in the U.S.[62]

In particular, multinational corporations (MNCs) might have an interest in purchasing green power for their Mexican operations. WRI's experience with MNCs indicates that some recognize the need for pursuing sustainable business practices in *all* countries in which they have facilities, not just in their home markets. Operations outside the U.S. increasingly are seeking to capture the same business benefits green power can provide, such as strengthened customer relationships or reduced greenhouse gas emissions. At the same time, WRI's observations suggest that in order to be attractive, green power in Mexico will need to be priced competitively given the price sensitivity exhibited by MNCs.

On the supply side, the country's ample domestic renewable resources are relatively untapped. Although Mexico currently only has less than 10 MW of installed wind capacity, the government estimates that the country has the potential to install at least 5,000 MW capable of generating wind power at an economically attractive 3.5–4.0 U.S. ¢/kWh.[63] Good wind regimes are located in Mexico's mountain and coastal regions, particularly Oaxaca, as well as the states of Baja California, Yucatán, Zacatecas, and along the U.S. border.[64] Likewise, the country currently has less than 1,000 MW of installed geothermal capacity, but an additional 2,400 to 8,000 MW is possible in Baja California and in the central and northwest regions of the country.[65] Although the potential for small-scale hydropower (<5 MW capacity) nationwide has not been fully evaluated, 400 MW could potentially be developed in the states of Veracruz and Puebla alone.[66] In light of their large scale and lower generation costs, wind and geothermal likely will be the primary renewable resources capable of supplying retail green power markets.[67]

Additional market factors suggest that introducing two of the "next generation" products, green power using nationally sourced RECs and long-term fixed-price green power, could be a promising strategy for retail electricity providers to build their businesses and help accelerate markets for renewable electricity in Mexico.

Green power using nationally sourced RECs

Given that regions with the greatest renewable resource potential are not always co-located with major industrial areas, green power using nationally sourced RECs may be an attractive product to offer corporate customers in Mexico. The federal district of Mexico City, for instance, has significant corporate electricity demand, but relatively few renewable resources. Local supply is likely insufficient to satisfy local corporate green power demand. In fact, some of the most abundant and lowest cost renewable resources are located in regions of the country that are distant from major centers of corporate electricity demand. Wind-rich Oaxaca (on the Pacific coast in southern Mexico) and geothermal-rich Baja California, for example, are located hundreds of miles from Mexico City and from the manufacturing regions along the Texas border. Transmitting renewable electricity from generators to end users would add significant costs to the power.

Green power using RECs sourced from across Mexico would overcome these challenges. For instance, the utility LFC could bundle wind RECs from Oaxaca with locally generated generic power. This strategy would circumvent the lack of local wind resources and the need for costly long-distance power transmission. This, in turn, would allow LFC to offer an attractive product that provides customers with a relatively inexpensive means of "greening" their electricity supply. Furthermore, it would provide a revenue stream to help support the wind facilities.

Long-term fixed-price green power

Long-term fixed-price green power is another potentially attractive product for Mexican corporate electricity customers. Since 1997, electricity tariffs have been adjusted on a monthly basis by the Ministry of Finance to reflect the cost of power production. Tariffs are indexed against inflation, the exchange rate, and international fossil fuel prices.[68]

Table 1 Impact of Primary Fuel Price Changes on Electricity Prices

Primary fuel	Fuel price in 11/01 (USD/MMBtu)	Impact on high voltage tariff of doubling respective fuel price	Monthly fuel price volatility from 11/01–02/04
Domestic fuel oil	$2.69	16.9%	9%
Natural gas	$3.00	11.9%	22%
Imported fuel oil	$3.54	5.4%	11%
Domestic coal	$2.12	3.7%	n/a
Imported coal	$1.64	2.1%	5%
Industrial diesel	$6.02	1.0%	8%

Source: Llamas, A., F. Firamontes, O. Probst, R. Reyna, A. Morones, and M. Gonzales. 2004. The Mexican Power Sector and Dependence on Natural Gas. Monterrey, NL: Monterrey Institute of Technology.

Among the fossil fuels, changes in the wholesale prices of domestic fuel oil and natural gas have the most significant impact on electricity rates (*Table 1*). In addition, natural gas has been the most volatile in recent years.

Electricity rates for both commercial and industrial customers recently have exhibited a moderate degree of volatility. From 2000 through early 2003, retail industrial electricity rates fluctuated +/- 13 percent from the period's average price of U.S. 6.3 ¢/kWh (61 centavos/kWh). Over the same period, commercial rates fluctuated +/- 8 percent from to the period's average price of U.S. 14.3 ¢/kWh (138 centavos/kWh).[69]

In the future, volatility in Mexican corporate electricity rates could increase due to the country's growing reliance on natural gas for power generation. More than 70 percent of planned Mexican power generation capacity additions from 2003 through 2012 are natural-gas-fired combined-cycle plants.[70] This reliance on natural gas is more acute in the industrial northern states, where more than 95 percent of planned capacity additions are combined-cycle facilities.[71] As in many other countries, combined-cycle plants are the technology of choice, since they can be built more quickly, have lower capital and operating costs, release fewer emissions per MWh, and achieve higher efficiencies relative to conventional steam plants.[72]

Such rapid growth is expected to increase national demand for natural gas by 10.5 percent annually through 2012.[73] This rise in demand is projected to outpace growth in domestic supply. The share of total Mexican natural gas consumption that is imported is expected to climb from under 10 percent today to over 25 percent by 2012.[74] Thus, Mexican electricity rates over time are likely to become increasingly affected by volatility in domestic and international natural gas markets.

The net result of these developments is that commercial and industrial customers in Mexico increasingly risk exposure to escalating rates for their conventionally generated electricity. In this context, long-term fixed-price green power would be attractive for the Mexican market. It would provide a valuable business benefit to corporate energy users as a hedge against rate volatility. The country has sufficient wind and geothermal resources, which have zero fuel costs and are amenable to long-term fixed-price contracts. Furthermore, as the Austin Energy experience indicates (*see Box 3*), retail electricity providers are able to offer this type of product even if they are regulated.

CFE and LFC should consider introducing both types of green power. The products can be readily developed, are attractive to corporate customers, and are an attractive means for both electricity suppliers to start building voluntary green power markets in Mexico. Furthermore, they would increase private sector funding for the country's renewable energy projects, thereby complementing funding from public sector sources such as the World Bank and the Global Environment Facility. When preparing these products, nevertheless, Mexican electricity market participants should consider establishing a green power certification program, as well as an electronic REC tracking

Table 2 Summary of Next Generation Green Power Products and NAFTA Markets

	Value proposition to customer beyond improving stakeholder relations & meeting environmental goals	Conditions ripe for product introduction	Attractive regions by country		
			USA	Canada	Mexico
Green power using nationally sourced RECs	Lower green power premiums	Markets with price sensitive customers, markets where low cost renewable power generation and customer demand not co-located	Entire country	Entire country	Entire country
Long-term fixed-price green power	Hedge against volatile electricity rates	Markets where end customer electricity rates can be volatile	Markets where natural gas is major primary fuel. Markets in transition to deregulated status	Alberta, Ontario, Saskatchewan	Entire country
Green CFD	Hedge against volatile electricity rates	Deregulated markets where end customer electricity rates can be volatile	Selected states (e.g., NY, TX)	Alberta, Ontario	Not applicable without a market index

system to facilitate transactions and strengthen corporate buyer confidence in these new products.[75]

VII. SUMMARY PERSPECTIVES

Many corporate energy users are interested in having their facilities switch to electricity generated by renewable resources such as solar, wind, and biomass. But for many large buyers, the business benefits provided by existing green power products do not justify the price premiums. To overcome this market shortcoming, retail electricity providers need to develop a set of next generation green power products that are more attractive to corporate customers than the current generation.

Table 2 outlines three new products that are good candidates. *Green power using nationally sourced RECs* can lower price premiums while increasing renewable resource options for customers. *Long-term fixed-price green power* provides customers with environmentally friendly power that also stabilizes corporate energy costs or serves as a hedge. Similarly, *green contracts for differences* can serve as a hedge against fluctuating electricity rates. These products could be attractive in many markets in the U.S., Canada, and Mexico. Whether or not they realize their potential, however, will depend upon retail electricity providers proactively developing and introducing them to the market.

Going forward, as these NAFTA partners continue to integrate electricity markets, the opportunity for cross-border green power deals could become more prevalent. Corporate customers in Canada, for instance, may one day purchase green power using RECs sourced from wind facilities in Mexico. Companies in the U.S. may one day purchase long-term fixed-price green power from neighboring electricity suppliers in Canada. As a result, these next generation products could help retail electricity providers and their corporate customers build a sustainable energy future across all of North America.

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The authors alone are responsible for the views and perspectives expressed in this publication.

NOTES

1. The term "green power" is used in the marketplace in a number of different ways. Sometimes "green power" refers to environmentally preferable energy and energy technologies, both electric and thermal. In this *Corporate Guide*, the term "green power" refers solely to electricity from renewable resources.
2. Landfill gas is a mixture of methane, carbon dioxide, and trace gases that is released when organic materials (e.g., yard trimmings, food) decay in landfills. It can be captured and burned as a fuel to generate either heat or electricity.
3. Also commonly called a "load-serving entity" ("LSE") or "electric generation supplier" ("EGS") in some states.
4. RECs have several alternative names, including certificates, green tags, green certificates, green tickets, renewable energy credits, and tradable renewable certificates. For more discussion of RECs and REC markets, see Hanson, C. and V. Van Son. 2003. Renewable Energy Certificates: An Attractive Means for Corporate Customers to Purchase Renewable Energy. Washington, D.C.: World Resources Institute.
5. Bird, Lori. National Renewable Energy Laboratory, personal communication, August 5, 2004.
6. Bird, Lori. National Renewable Energy Laboratory, personal communication, August 5, 2004.
7. Rudy, Bruce. Green Mountain Energy, personal communication, August 5, 2004. Data on green power sales in deregulated markets is not publicly available.
8. Data on green power premiums are from the U.S. Department of Energy, 2004. Summary of Green Pricing Programs and Competitive Electricity Markets. Available online at: http://www.eere.energy.gov/greenpower/markets/. Accessed July 5, 2004.
9. Friedman, B. 2003. "Making the C&I Sale: Targeting Businesses and Helping Them Over the Fence." Paper presented at the Eighth National Green Power Marketing Conference, Chicago, Illinois, November 4, 2003.
10. In regulated electricity markets. Participation rate figures not available for deregulated markets. Source: Bird, L., B. Swezey, and J. Aabakken. 2004. Utility Green Pricing Programs: Design, Implementation, and Consumer Response. Golden, Colorado: National Renewable Energy Laboratory.
11. Regional pricing disparities for RECs also might be due to differences in the market rate for conventional power. The minimum average price for a REC is typically the cost difference between generating power from renewable resources relative to the market rate for conventional power. In theory, therefore, RECs from generators located in regions with high conventional power rates could be inexpensive. However, most of these regions in the U.S. (such as the Northeast) include states with renewable portfolio standards (RPS); that is, government requirements that a certain percentage of the state's power supply must come from renewable resources. In many of these RPS states, there is an undersupply of renewable energy generation relative to mandated demand and thus high REC prices.
12. Of course, a utility in the Great Plains may not need to source RECs nationally in order to be able to provide a low-cost wind power product, since the best wind resources are nearby.
13. Although green power using nationally sourced RECs may be attractive for the voluntary market, it may not be eligible for mandatory markets; that is, green power used to satisfy state renewable portfolio standards or "RPS." Retail electricity providers should review state RPS guidelines to determine if there are geographic limitations on green power or REC eligibility.
14. Green-e® is the nation's first voluntary certification and verification program for renewable electricity products. Since 1997, Green-e® has been a nationally recognized certification program to help consumers identify green power and RECs that meet strict environmental and consumer protection standards. For more information, visit http://www.resource-solutions.org. Industry observers generally agree that Green-e® certified RECs comprise at least 90 percent of all unbundled REC sales in the voluntary U.S. market.
15. Center for Resource Solutions. 2004, 2003, 2002. Green-e Verification Reports. San Francisco, CA: Center for Resource Solutions.
16. For more information about the advantages to corporate customers of purchasing unbundled RECs, see Hanson, C. and V. Van Son. 2003. Renewable Energy Certificates: An Attractive Means for Corporate Customers to Purchase Renewable Energy. Washington, D.C.: World Resources Institute.
17. A factor underlying these flat Green-e® certified green power sales figures is that California terminated its customer credits for renewable energy purchases in early 2003. Center for Resource Solutions. 2004, 2003, 2002. Green-e Verification Reports. San Francisco, CA: Center for Resource Solutions. (The Center for Resource Solutions did not track REC sales for 2001.)
18. A list of wholesale REC marketers and brokers can be found at http://www.eere.energy.gov/greenpower/markets/certificates.shtml?page=2
19. For an example of this arrangement, see http://www.sterlingplanet.com/utilityPartners.php
20. Hamrin, Jan. Center for Resource Solutions, personal communication, October 28, 2004.
21. In some situations, 10,000 MWh per year of green power demand can be a sufficient volume for encouraging electricity providers to design a new product.
22. For instance, Canada exports 7–9 percent of its electricity generation to the U.S. National Energy Board. 2003. Canadian Electricity Exports and Imports. Calgary, Alberta: National Energy Board.
23. For more details, see Hamrin, J., M. Wingate, and L. Campbell. 2003. The Potential for Using a Renewable Energy Certificate System to Encourage Renewable Energy Development in Mexico. San Francisco, CA: Center for Resource Solutions.
24. The cost of electricity from landfill gas or biomass can behave in the same manner if the generator has long-term fixed-price contracts for these fuels.
25. Energy Information Administration. 2004. July 2004 Monthly Energy Review. Washington, DC: Energy Information Administration. Available at: http://tonto.eia.doe.gov/dnav/ng/hist/n3035us3m.htm.
26. Global Insight. 2003. Perspectives on a U.S. Natural Gas "Shortage". Lexington, MA: Global Insight. Available at: http://

www.globalinsight.com/Highlight/HighlightDetail448.htm.

27. Bolinger, M., R. Wiser, and W. Golove. 2003. Accounting for Fuel Price Risk: Using Forward Natural Gas Prices Instead of Gas Price Forecasts to Compare Renewable to Natural Gas-Fired Generation. Berkeley, CA: Lawrence Berkeley National Laboratory.
28. A CFD can be structured without transfer of RECs (a "brown CFD"). Such a contract would still support renewable power generation, but it would not give the renewable generator a guaranteed revenue stream for its RECs, nor would it allow the retail corporate customer to claim any of the positive environmental benefits from the renewable power.
29. A CFD can be structured for all types of renewable generation, including dispatchable resources that are not affected by intermittency (like wind power). Resources such as biomass have variable fuel costs, though, which would need to be taken into account. CFDs can also be structured around non-renewable power generation such as coal, which, like biomass, has variable fuel costs. One of the attractive aspects of a green CFD is that some renewable resources such as wind have no fuel costs and therefore have greater potential for long-term cost stabilization. Furthermore, the transfer of RECs in a green CFD allows the retail consumer to support green power.
30. Bolinger, M., R. Grace, D. Smith, and R. Wiser. 2003. Using Wind Power to Hedge Volatile Electricity Prices for Commercial and Industrial Customers in New York. Albany, NY: New York State Energy Research and Development Authority.
31. Energy Information Administration. 2004. Canada: Environmental Issues. Washington, DC: Energy Information Administration. Available at: http://www.eia.doe.gov/emeu/cabs/canenv.html#RENEWABLE.
32. Natural Resources Canada. 2000. Hydroelectric Energy Resource Assessment. Ottawa, Ontario: Natural Resources Canada. Available at: http://www.canren.gc.ca/resou_asse/index.asp?CaId=54&PgId=274.
33. Pollution Probe. 2002. Promoting Green Power in Canada. Toronto, Ontario: Pollution Probe. Available at: http://www.pollutionprobe.org/Publications/Energy.html.
34. Pollution Probe. 2002. Promoting Green Power in Canada. Toronto, Ontario: Pollution Probe. Available at: http://www.pollutionprobe.org/Publications/Energy.html.
35. Whitmore, J. and M. Bramley. 2004. Green Power Programs in Canada - 2003. Drayton Valley, Alberta: Pembina Institute.
36. Whitmore, J. and M. Bramley. 2004. Green Power Programs in Canada - 2003. Drayton Valley, Alberta: Pembina Institute.
37. Based on a review of each retail electricity provider's green power program as described on provider web sites.
38. Whitmore, J. and M. Bramley. 2004. Green Power Programs in Canada - 2003. Drayton Valley, Alberta: Pembina Institute. Equivalent to 5.3 Canadian cents/kWh (53 Canadian $/MWh). Assumes an exchange rate of 1.00 USD = 1.30 CAD.
39. Hydro Quebéc. 2003. Comparison of Electricity Prices in Major North American Cities. Rates in effect May 1, 2003. Montreal, Quebéc: Hydro Quebéc. Available at: http://www.hydroquebec.com/publications/en/comparison_prices/2003/index.html.
40. Whitmore, J. and M. Bramley. 2004. Green Power Programs in Canada - 2003. Drayton Valley, Alberta: Pembina Institute.
41. For more details about Canada's Environmental Choice™ Program, see http://www.environmentalchoice.ca.
42. Collins, Keith. Manitoba Ministry of Energy, personal communication, July 14, 2004; Manitoba Hydro. 2004. Energy Rates. Available at: http://www.hydro.mb.ca/your_service/er_monthly_rates.shtml.
43. SaskPower. 2004. SaskPower Rate Proposal Summary. Available at: http://www.saskpower.com/Summary%20Rates.pdf.
44. Calculations based on: Independent Electricity Market Operator. 2004. 10 Year Assessment: An Assessment of the Adequacy of Generation and Transmission Facilities to Meet Future Electricity Needs in Ontario. IMO REP0172v2.0. Toronto, Ontario: Independent Electricity Market Operator. Available at: http://www.theimo.com/imoweb/pubs/marketReports/10YearOutlook_2004mar.pdf.
45. Energy Information Administration. 2004. International Energy Outlook 2004. Washington, DC: Energy Information Administration. Available at: http://www.eia.doe.gov/oiaf/ieo/nat_gas.html.
46. Natural gas supply could stabilize in North America with liquefied natural gas imports from overseas and new gas pipelines connecting the gas fields in Alaska and the Northwest Territories. These new sources, if developed, may take years to impact the market, however, and may be more expensive than existing sources.
47. National Energy Board. 2001. Canadian Electricity Trends and Issues. Calgary, Alberta: National Energy Board.
48. Energyshop.com. Undated. Electricity in Canada – Where are Prices Going? Richmond Hill, Ontario: Energyshop.com. Available at: http://www.energyshop.com/es/business/ele/direction.cfm?c.
49. National Energy Board. 2004. A Compendium of Electric Reliability Frameworks Across Canada. Calgary, Alberta: National Energy Board.
50. Independent Electricity Market Operator. 2004. Market Year Review 2003-2004. Toronto, Ontario: Independent Electricity Market Operator. Available at: http://www.iemo.com/imoweb/marketdata/marketSummary.asp.
51. National Energy Board. 2001. Canadian Electricity Trends and Issues. Calgary, Alberta: National Energy Board.
52. Walkom, T. 2001. "Private power plan spells public pain for Albertans." *The Star*, April 1, 2001.
53. International Energy Agency (IEA). 2004. Energy Balances of OECD Countries, 2002. Paris, France: IEA.
54. Secretaría de Energía. 2004. Renewable Energies in Mexico. Mexico City, DF: Secretaría de Energía.
55. Including municipalities in Puebla, Morelos, and Hidalgo.
56. Secretaría de Energía. 2004. Industria Eléctrica Mexicana. Mexico City, DF: Secretaría de Energía.
57. Mexican laws allows a private company or a consortium of companies to generate power for their own use (self-supply or "autobastecimiento"). On-site renewable power systems qualify as a means by which companies can supply their own electricity. This publication will not address these opportunities, but rather will focus on green power supplied by retail electricity providers.
58. Breceda, Miguel. 2000. Debate on Reform of the Electricity Sector in Mexico. Montreal, Quebec: North American Commission for Environmental Cooperation.

59. Breceda, Miguel. 2000. Debate on Reform of the Electricity Sector in Mexico. Montreal, Quebec: North American Commission for Environmental Cooperation.
60. Shields, D. 2002. The Future of Mexican Energy Reform. Presentation to the Ninth Border Energy Forum, Saltillo, Coahuila, Mexico. October 25, 2002.
61. North American Commission for Environmental Cooperation. 2001. Backgrounder: Market for Renewable Electricity in Mexico's Industries. Montreal, Quebec: North American Commission for Environmental Cooperation. Available at: http://www.cec.org/pubs_docs/documents/index.cfm?varlan=english&ID=373.
62. Friedman, B. 2003. Making the C&I Sale. Presented at the 8th National Green Power Marketing Conference, Chicago, Illinois, November 4, 2003.
63. Secretaría de Energía. 2003. Prospectiva del sector eléctrico 2003-2012. Mexico City, DF: Secretaría de Energía. Available at: http://www.energia.gob.mx/wb/click.jsp?idelemento=539&idseccion=65&idtipoUsu=-1.
64. Secretaría de Energía. 2003. Prospectiva del sector eléctrico 2003-2012. Mexico City, DF: Secretaría de Energía.
65. U.S. Department of Energy. 2003. An Energy Overview of Mexico. Washington, DC: U.S. DOE. Available at: http://www.fe.doe.gov/international/mexiover.html; Secretaría de Energía. 2003. Prospectiva del sector eléctrico 2003-2012. Mexico City, DF: Secretaría de Energía.
66. Secretaría de Energía. 2004. Renewable nergies in Mexico. Mexico City, DF: Secretaría de Energía.
67. Mexico has opportunities for power from solar, landfill gas, and biomass resources, but usually not to the scale of the other options. In some situations, these resources could be attractive for on-site energy production systems. This publication, however, does not discuss on-site systems, but rather focuses on green power products sold by retail electricity suppliers.
68. For instance, the Ministry uses the TETCO and EPGT indices from the south of Texas as the reference for natural gas. Llamas, A., F. Viramontes, O. Probst, R. Reyna, A. Morones, and M. Gonzalez. 2004. The Mexican Power Sector and Dependence on Natural Gas. Monterrey, NL: Monterrey Institute of Technology.
69. Based on constant 2002 centavos per kWh. Secretaría de Energía. 2003. Prospectiva del sector eléctrico 2003–2012. Mexico City, DF: Secretaría de Energía.
70. Reflects gross planned additions and therefore excludes capacity reductions (e.g., retirement of steam plants using fuel oil) and capacity additions for which the fuel and technology have not yet been assigned. Secretaría de Energía. 2003. Prospectiva del sector eléctrico 2003–2012.
71. Secretaría de Energía. 2003. Prospectiva del sector eléctrico 2003–2012. Mexico City, DF: Secretaría de Energía.
72. Breceda, Miguel. 2000. Debate on Reform of the Electricity Sector in Mexico. Montreal, Quebec: North American Commission for Environmental Cooperation.
73. Secretaría de Energía. 2003. Natural gas market outlook 2003–2012. Mexico City, DF: Secretaría de Energía.
74. Secretaría de Energía. 2003. Natural gas market outlook 2003–2012. Mexico City, DF: Secretaría de Energía.
75. For more details, see Hamrin, J., M. Wingate, L. Campbell. 2003. The Potential for Using a Renewable Energy Certificate System to Encourage Renewable Energy Development in Mexico. San Francisco, CA: Center for Resource Solutions.

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