# GUATEMALA: DISTRIBUTED GENERATION

2010

**CHAPTER 12: Distributed Generation**

# GUATEMALA: BUILDING OF A REGULATORY FRAMEWORK FOR DISTRIBUTED GENERATION

In the last years, Guatemala's regulatory framework has been modernized in order to promote investment in new renewable energy projects. One of the most important changes to the regulatory framework has been the introduction of the concept of Distributed Renewable Generation (DRG) in the Rules of the General Electricity Law (hereafter, DRG Rules). The regulator, the Comisión Nacional de Energia Eléctrica (CNEE) (formed in 1997 as the Regulatory Authority of the electricity sector in Guatemala) played an active role in the adoption of the DRG Rules and the creation of the technical Norm that followed, the Norma Técnica para la Conexión, Operación, Control y Comercialización de la Generación Distribuida Renovable (Technical Standard for the Connection, Operation and Marketing Distributed Renewable Generation), referred to hereafter as NTGDR.

The DRG Rules were adopted in response to needs identified by electricity market actors for regulation of renewable generation below 5 MW and for improvement of the electrical parameters in the distribution lines that are not in close proximity to distribution stations. The goal was to create a framework that would encourage and promote small renewable energy projects under 5 MW. The electricity sector regulator along with other market actors was part of the early consultation stage, which allowed for comments on the proposed rule and several outreach activities. The NTGDR was approved by the CNEE in compliance with the provisions of the amendments to the Regulations of the General Electricity Law approved by Government Agreement 68-2007.

This supporting Norm that followed in 2008, the NTGDR, enables distributed generation access to the distribution grid, taking into consideration size, geographical location, and distribution companies' actual infrastructure and voltage level. The NTGDR is designed to promote construction of renewable energy power plants that are economical and feasible from a technical and market perspective. To achieve this, the NTGDR creates a framework for investment in small distributed generation (less than 5 MW), requiring that distribution companies allow such power plants to connect to the distribution network at the generator's cost, after approval of a capacity study. The NTGDR also enables distributed generators to participate in public tenders for supply of the distribution companies' electricity demand or to sell their electricity in the Guatemala spot market.

This country profile looks at how the regulator's actions over the last several years have served to shape distributed generation reform and specifically facilitated the creation of a technical norm to promote investment in DRG in Guatemala.

# IDENTIFYING NEEDS AND BARRIERS

Guatemala has a population of almost 13 million and the largest economy in Central America, though poverty remains high. Firewood is used as an energy source by 80% of rural families. As of 2009, Guatemala's electricity mix was 46.6% thermal (fuel oil and coal), 36.1% hydro, 3.5% geothermal, 13.3% cogeneration (sugar cane) and 0.5% imports. The Renewable Energy and Energy Efficiency Partnership (REEEP), an international non-profit that advocates for sustainable reform in the energy sector, estimates 5,000 MW of hydro is available. *The Solar and Wind Energy Resource Assessment*, a United Nations Environment Programme, provides ready access to credible renewable energy data to stimulate investment in, and development of, renewable energy technologies, estimates 7,800 MW of wind is possible and geothermal resources of up to 1,000 MW can also be developed.[i] Though the potential for RES development is great, Guatemala currently imports fossil fuels for up to 60% of its electric energy generation needs.

Use of distributed generation to utilize Guatemala's abundant domestic resources provides one solution to this situation. Distributed generation is defined in the new DRG Rules, discussed in more detail below, as:

> *electric generation…produced by generating technologies that use renewable resources and that are connected to distribution installations, with installed capacities of less than 5 megawatts; … technologies with renewable resources are those using solar, wind, water, geothermal, biomass and other determined by the Ministry of Energy and Mines*

How to encourage investment in DRG however was a stumbling block, until the CNEE conducted an analysis, receiving input from market stakeholders as to the various reasons that renewable power plants, mainly the small ones, were not being developed. CNEE identified the following as key reasons, ultimately determining that these could be addressed through a new regulatory framework for DRG:

- The existing framework (before 2006 when DRG efforts began in earnest) failed to offer proper "signals" for the construction of small power plants that use renewable resources or DRG. Some of the reasons were the existence of long term PPA´s, signed under emergency conditions in the 1990´s between distribution companies and private generators with fossil fired power plants (resulting in distribution companies to be over-contracted); the brief duration (two years) of these new PPA´s sent short-term signals for the contracting of electricity, mainly resulting in the construction of (lower cost) oil fired power generation plants. Another reason was that incumbent generators were resistant to bringing in new investments.

- Stakeholders and potential investors reported that the existing framework was difficult to understand and to interpret, with limited guidance as to the current regulation around this important issue to help promote investments specifically in DRG. General public and investor perception was that the current regulation was too complex and did not allow for generators with installed capacities of less than 5 MW to participate in the electricity market; though this was in fact

not the case, CNEE found the misunderstanding was prevalent and that it was necessary to change perceptions and facilitate access to information so that regulation became more comprehensible to potential developers of DRG.

# Regulatory Action: Taking Steps To Effect Change

CNEE began a concentrated effort of investigating DRG in early 2006, through a program of consultation with state market actors, regulatory and business counterparts in Latin America, and a study visit to California.

## Consultation with State Market Actors

Work began at the government level in Guatemala, with outreach and consultation periods seeking input from all state market actors. In 2006, the Ministry of Energy and Mines formed a Committee, where CNEE participated, in order to analyze the Regulation of the General Electricity Law and Regulation of the Wholesale Market Administrator. One of the objectives was finding alternatives to promote the development of new renewable energy investments in Guatemala. CNEE actively participated and proposed that the concept of DRG should be included, not in a lot of detail (as this should be developed in a technical norm), but nevertheless as a definition in the Regulation of the Electricity Law. This was proposed in order to give more support to DRG.

Review of the Rules was conducted during 2006 and the first two months of 2007; amendments were approved by government decision and published on 5 March 2007, entering into force on 6 March of the same year. CNEE had been working on elaboration of NTGDR, which was approved by CNEE and published in the Official Gazette on 16 September 2008 via Resolution 171–2008. Although this Norm was designed and approved by the CNEE, receipt and assessment of ongoing input from agents in the electricity sector and related experts were a constant priority for CNEE. For instance, CNEE conducted two major forums, sent the first draft in writing to Guatemala's leading universities and the Chamber of Commerce, and presented the draft in numerous other forums, such as the School of Engineers of Guatemala and ANACAFE, which is the National Association of Coffee in Guatemala, (whose members (small, medium and large coffee producers) have a 400 MW potential to generate hydro electricity with small generators (less than 5 MW)). Guatemala has a maximum demand of 1,500 MW.

The Norm, ultimately designed to promote investments through clear and comprehensive rules and regulatory mechanisms, received input from current or potential investors with business knowledge. Having in mind that particular interests are involved when outside agents are asked for comments, the regulator is challenged to balance these interests with efficient regulatory principles and a "just and reasonable" approach for the market, a difficult task due to the imperfectness of the market and the imperfectness of regulation.

## Study Tour to California and Consultation with Spanish Counterparts

In February of 2006, CNEE representatives visited the State of California in the United States to look at how businesses addressed DRG, visiting Southern California Edison, the Municipal Electric Company of California, the Municipal Electric Company of River Side and the Wind Generating Park in Palm Springs. With respect to DRG in particular, CNEE drew lessons from the use of isolated generation and net metering in River Side. In addition, CNEE learned about practices involving the use of combined cycle generators, energy efficiency measures (including improvement of efficiency in generating plants through the use of methane gas, increasing the efficiency of such plants to achieve up to 68% plant factor (normal for a plant of this type is 40%)), use of existing photovoltaic plants that fed an exclusive grid for air conditioning load for the city, and wind power generation (from Palm Spring Park), which generated about 400 MW of firm power efficiently, with large investments, and connected to an interconnected power system.

In May 2006, staff from CNEE visited the Spanish regulator in Madrid along with the Central Control of Wind Generation. The main focus of the visits to Spain was not distributed generation as such, but a discussion of the impact of wind generation on the operation of the network system and the cost of wind projects, leading to the conclusions that large wind generation impact on the electricity system and the way these projects should be managed would have to be addressed in the future; and that a more detailed technical analysis of DRG was going to be needed. Collectively, these efforts led to the conclusion that Guatemala would benefit from a unique approach that limits the maximum size of DRG to 5 MW, while restricting production to renewable energy and providing corresponding incentives. In many other countries, for example, there is no size limitation or exclusivity for renewable energy. In Guatemala, the abundant RE resources and the needs of rural businesses, such as coffee farms, point to the need for rules that regulate businesses that self-generate and have surplus that will allow sale to the national electricity market.

In developing the Norm, CNEE and counterparts assessed the primary objectives, namely to encourage investment in small renewable power stations, and to connect these small renewable energy projects below 5 MW to distribution networks. Prior to enactment of the Norm, quality of product in some parts of the country was low, so the development of the Norm and its incorporated incentives were also aimed at improvement in product quality. A vital development in the Norm was the incentive to the investor of not paying for the use of distribution networks as long as the energy supplied by their power plant to the distribution grid is against the direction of the prevailing flow of electricity in that part of the system. Development of the Norm relied in part on technical references in IEEE Standard 1547, which offered direction as to the minimum protective equipment for power plants below 5 MW.

# SUMMARY OF THE LEGAL REFORMS TO SUPPORT DRG

In 2007, the Guatemalan government published the *Acuerdo Gubernativo 68-2007* which amended the General Electricity Law, and the *Acuerdo Gubernativo 69-2007*, amending the wholesale market rules (reforms to the Rules of the Administrator of the Wholesale Market),

with the goal of increasing competition, investment, coverage and improving service and developing distributed generation. This amendment set forth the DRG Rules, which included the definition of DRG as discussed above, and general rules for the connection and regulation of DRG, including Article 16, which gives CNEE authority to approve rules to regulate the connection, operation, control and marketing conditions:

> *"The Distributors are compelled to allow connections to their installations and the performance of the necessary modifications or enlargements in order to allow the operation of the Renewable Distributed Generators, for which they have to determine the capacity of the point of connection and the necessary enlargements of their installations. Before the authorization, the Commission will evaluate the appropriateness of the scope of the modifications and enlargements of the installations of the Distributor, likewise, the respective cost and the benefits from the improvement of the quality of the distribution service and from the reduction of losses. The costs of the enlargements, modifications, transmission line and equipment, necessary to reach the connection point with the distribution network, will be on the account of the Renewable Distributed Generator. The Commission will elaborate general stipulations and standards for the regulation of connection, operation, control and commercialization conditions of the Renewable Distributed Generator, including payments or credits by concept of toll and saving on losses, as pertinent and applicable and in accordance with the Law and this Regulation. In case of operations not under contract, the Distributor will become the purchaser of the electricity generated by the Renewable Distributed Generator, by fulfilling the stipulations of the Law. The remuneration of power will be a ceiling price equal to the Price of Opportunity of the Power in the Wholesale Market; and will be considered the effective reduction of the losses."*

In September 2008, on the basis of its empowerment via the DRG Rules, CNEE's Board of Directors adopted the NTGDR to further the Government's plan to utilize the country's large hydropower potential and lessen its dependence on fossil fuels. In all, the adoption of NTGDR took approximately 14 months and involved an ongoing process of review, consultation and redrafting.

In sum, general policy features of the NTGDR include:

- Incentives for the following renewable energy sources: biomass, wind, geothermal, hydro and solar
- Limitation on the size of the power plants (distributed generators) to 5 MW or less
- Connection to the distribution power lines at the generator's cost after approving a capacity study, and distribution company maintenance of the power lines
- Distribution line access via a request to the distribution companies with the necessary information to reinforce the power lines if necessary; distributed

generators are able to participate in public tenders to supply the distribution companies' electricity demand or to sell their electricity in the Guatemalan Spot market

Some advantages are:

- This policy was published on September 2008 and since then nine projects have been authorized by CNEE for a total of 10.93 MW; all are hydropower plants.
- The national coffee association in Guatemala estimates that in the areas of coffee plantations a total of 500 MW hydroelectric potential could be exploited in the near future.
- Distribution losses will be reduced and the quality of the service will be improved.
- Distributed generators are exempted from paying transmission fees.

## DISTRIBUTED GENERATION PROJECTS IN GUATEMALA: DRIVING REFORMS AND DRIVEN BY REFORMS

The Renewal Energy Incentives Law was enacted in 2003; though some investors came into the market after the adoption of the law, they continued to push for reforms after this time, particularly for rural communities, leading to the development of supporting rules and ultimately to development of the technical Norm. The law's passage encouraged investment, though in the early years, most funding was from international donor agencies seeking to support the legislative changes and initiate the path toward renewable energy investment in rural communities in particular. In 2004, for example, 180 solar PV systems were installed in six rural communities of Guatemala's Northern Quiche region for household, commercial and community use. The program was led by Fundación Solar, in collaboration with the Global Environmental Facility, UNDP, the Ixil Project, USAID, the Sandia National Laboratories of the US Department of Energy, the Guatemalan Ministry of Environment and Resources, the Guatemalan Ministry of Energy and Mines and the local organization, Asociación de Desarrollo Integral de Multiservicios (Association for Integrated Multiservice Development, an organization which promotes economic and social development of former communities of populations in resistance in Sierra de Chamá and Chajul, Quiche).

An important and recent project regarding distributed generation is "Kaplan Chapina," a 2 MW hydropower plant which started construction in 2006. The electricity to be produced by this power plant is expected to reach 3.5 GWh per year, following operation start-up in October 2009. The Kaplan Chapina project took advantage of Guatemala's recently adopted policies, designed to facilitate development of renewable power plants and distributed generation. These policies enabled the power plant to build a transmission line and connect directly to the distribution network. Mr. Arimany, former chairman of Papeles Eleaborados, S.A., the company that constructed the project, identified the NTGDR as one of the two policies that encouraged

the construction of this project (the other was a 2003 law published by the Congress of Guatemala that exempts the payment of valued aggregated, income and importing taxes to companies that invest in renewable energy projects for a 15-year-period).

As noted, following adoption of NTGDR, nine hydropower projects have been approved by CNEE; the following table offers a description of each project:

*Table 3. Approved Distributed Renewable Generators in 2009 and 2010:*[ii]

| No. | Name | Location | MW |
|---|---|---|---|
| 1 | Santa Elena | Escuintla, Escuintla | 0.70 |
| 2 | Kaplan Chapina | Pueblo Nuevo Viñas, Santa Rosa | 2.00 |
| 3 | Hidroeléctrica Los Cerros | San José El Rodeo, San Marcos | 1.25 |
| 4 | Hidroeléctrica Cueva María | Cantel, Quetzaltenango | 1.50 |
| 5 | HidroPower | Escuintla, Escuintla | 2.16 |
| 6 | El Prado | Quetzaltenango, Colomba | 0.5 |
| 7 | Jesbon Maravillas | San Marcos, Malacatán | 0.72 |
| 8 | Covadonga | Retalhuleu, Nuevo San Marcos | 1.6 |
| 9 | Finca Las Margaritas | Sn. Francisco Zapotitlán, Suchitepéquez | 0.5 |
| **TOTAL** | | | **10.93** |

Development of distributed generation is expected to have the added benefit of reducing distribution network losses.

## LESSONS LEARNED: GRANTING COMPETENCIES TO THE REGULATOR IN PRIMARY LEGISLATION

The Electricity Law gives CNEE explicit powers to develop Technical Norms related to the electricity sector. According to the regulator, because other parties, each with its own interests, knew that the regulator was clearly acting within its competencies and with an identified goal of having a more efficient generation mix in the future, CNEE's authority in this area was not contested. The Electricity Law empowers the regulator to:

> *"Issue technical standards for the electricity industry and monitor their compliance in accordance with internationally accepted practices" and "Issue directives and rules as required to safeguard unrestricted access to transmission lines and distribution systems, in accordance with this law and regulations hereunder."*

One important lesson learned in Guatemala is that General Laws, in this case the General Electricity Law (approved by Congress), must remain "General," establishing only the foundations or basic principles that will be later developed in more detail through Regulations and Norms. This allows the technical staff to develop the concepts in a more comprehensive way and in a manner consistent with sector expertise and knowledge.

With a new framework for distributed generation in place, Guatemala is looking forward to improving supply and service, particularly for its rural population.

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[i] See http://www.reeep.org/index.php?id=51&content=2659:

> The nation has the capacity to generate all its own energy using renewable and non-renewable sources. Reviewing the data, the Guatemalan Ministry of Energy and Mines has pointed out Guatemala's huge range of untapped resources. Guatemala could generate around 13,800 MW itself using hydro, wind, biogas, biodiesel, bioethanol as well as fast-growing energy crops, sustainable forestry, industrial and agroforestry waste.
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> Water, sun, wind, biomass and geothermal are abundant enough to produce, supply and export energy to all of Central America. Available water resources and the large, small, private and state owned hydroelectric projects have the capacity to generate some 10,000 MW of energy for nearly 40 million Central Americans, but to date only 7% of this capacity has been used. The Guatemalan sun could generate up to 5 kWh per square kilometre – which would satisfy the region's energy needs for the next five or six years.

[ii] *Changes in the Regulatory Framework in Order to Promote Distributed Renewable Generation in Guatemala*, by Carlos Eduardo Colom Bickford, President CNEE, Guatemala´s Electricity Sector Regulator, June 2010