# Embracing Change While Creating a New Market: A View on Distributed Generation

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When power markets first opened to competition in the nineties, no regulator could have imagined the challenges these markets face today. Distributed generation (DG) and storage were seen as promising technologies, but few believed in their commercial potential, so there was no reason to worry about their impact on generation, transmission, distribution, and supply. However, falling prices of solar photovoltaic modules and batteries have changed the picture completely. Practically all regulators in the world now face the need to reshape their regulatory framework to accommodate these new technologies without jeopardizing the revenue flows of transmission, distribution, or base load technologies, still needed to maintain the system's balance.

Although penetration of distributed energy systems is not as widespread as in other countries, Mexico is not an exception to this global trend. What's more, the opening of electricity markets to competition following the 2013 energy reform is fueling the interest of private companies to invest in these technologies. In fact, the recent experience of Mexico's Energy Regulatory Commission (CRE) shows that distributed energy systems are one of the top interests of private companies and investors' agendas.

The possibility to reduce energy costs, their relatively speedy construction, and the flexibility offered by DG are some of the reasons why companies are interested in these technologies. Moreover, in countries like Mexico, where there is an obligation on clean energy consumption,[1] DG is an attractive alternative to comply with the requirement while becoming a 'prosumer.' At the system level, DG is also considered to provide valuable ancillary services and defers the need for investments in new assets.

At the network level, DG may have opposing effects: on the one hand, DG may reduce distribution and transmission needs during peak hours; hence, decreases the costs of maintaining, upgrading, or replacing these networks in the long run. On the flip side, DG projects located on sites with no system limitation, such as network congestion, might actually lead to additional spending on network assets or procurement of ancillary services to manage frequency variations in the case of intermittent sources [1]. It is crucial that regulation considers factors that lead to one outcome or the other and creates market signals for participants and investors to ensure DG deployment is beneficial for the system.

With this in mind, CRE has worked recently to define *'Abasto Aislado'* (translated as 'Isolated Supply'), a legal figure for energy generated or imported to meet onsite needs, or for exporting, without using the National Transmission Network or the General Distribution Network. In other words, the instrument to regulate distributed generators including embedded, behind the meter and even off-grid systems.

In this article, we discuss the main concerns and outcomes faced by the Mexican regulator in the process of drafting a comprehensive DG regulation, with the purpose of contributing to the global debate on how to integrate and cope with distributed energy in the electricity markets of the future.

## What is Distributed Generation?

The definition of DG varies across jurisdictions (Table 1). Hence, throughout the article we will abide

1. Mexico has the following legally binding goals in terms of clean energy generation: 35 percent by 2024, 37.7 percent by 2030, and 50 percent by 2050.

by the definition presented by Ackerman et al. in 2001, that is, "Distributed generation is an electric power source connected directly to the distribution network or on the customer side of the meter." [2]

**Table 1—Examples of Definitions Given to DG or Distributed Energy Resource across Different Markets**

| Institution or regulator | Definition |
|---|---|
| North American Electric Reliability Corporation (NERC, United States of America) | "A Distributed Energy Resource is any resource on the distribution system that produces electricity and is not otherwise included in the formal NERC definition of the Bulk Electric Systems [3]." |
| Office of Gas and Electricity Markets (OFGEM, Great Britain) | "DG is also known as embedded or dispersed generation. It is electricity generating plant that is connected to a distribution network rather than the transmission network [4]." |
| California Energy Commission (CEC, United States of America) | "Electricity production that is on-site or close to a load center and is interconnected to the utility distribution system [5]." |
| Energy Networks Association (ENA, Australia) | "Distributed or embedded generation is any form of generation which is connected to (or embedded in) an electrical distribution networks [6]." |
| Joint Research Center of the European Commission (JRC, EU) | "DG is an electric power source, connected to the grid at distribution level voltages, serving a customer on-site or providing support to a distribution network [7]." |

Mexican law uses a specific figure called *'Generación Distribuida,'* which literally translates into *Distributed Generation*, but it only encompasses generation systems up to 500kW of capacity, leaving out medium and large-scale systems that could fit perfectly in the DG definition we adopted. CRE published the regulation for this particular figure in February 2016, including three compensation schemes[2] that were positively received by users. Although we believe *'Generación Distribuida'* is a much needed and popular figure in the Mexican regulation that promotes small-scale distributed technologies such as residential solar panels, the definition proved too restrictive for the broader discussion about the risks, challenges, and benefits of moving toward a more decentralized energy system.

As mentioned before, *Abasto Aislado* is the other figure where the particularities of distributed generation are recognized in Mexican post-reform regulation and will be the focus of the present article. Mexican legislation previous to the reform allowed for other legal schemes that could fit DG projects (*'Cogeneración'* and *'Autoabastecimiento'*), but as permits of this kind are no longer granted, we will not discuss them any further in the present article.

## Net versus Gross Charging

One of the most polemic issues in the discussion on how to recognize Abasto Aislado's particularities was whether to charge for network usage and other related services, on a net or gross basis. This issue only concerns systems interconnected to the national electric system for the purpose of buying or selling energy or using the grid as a backup. Off-grid systems, of course, are exempted from these charges.

Supporters of net charging, that is charging of transmission and distribution services only for the energy that was injected or extracted from the grid, argue that this type of charge recognizes the positive impact that reducing demand at the point of consumption has on overall system performance. In this sense, energy under *Abasto Aislado* is perceived as 'negative demand' instead of generation.

According to this vision, the Commission agreed that the following services will be charged on a net basis for systems in *Abasto Aislado:* transmission and distribution services, market operation and system control services, surveillance costs, ancillary services outside the wholesale electricity market such as reactive reserves, reactive capacity, emergency starting services, island operation, and dead bus connection.

We are convinced that net charging is the right approach, as the impact on the network is defined for

2. The three allowed compensation schemes are net metering, net billing, and total energy sales.

what is going in and out at the point of connection, not behind. This approach is used in other markets and supported by specialized studies such as the 'Utility of the Future' 2016 report from the Massachusetts Institute of Technology Energy Initiative: *"Cost-reflective electricity prices and regulated charges should be based only on what is metered at the point of connection to the power system-that is, the injections and withdrawals of electric power at a given time and place, rather than the specific devices behind the meter."* [8]

Nevertheless, there is still concern that other issues, such as locational signals or a potential capacity cap for accessing net treatment, were overlooked. The worst-case scenario may lead to inefficient investments and increased system costs. Furthermore, as it is currently defined, *Abasto Aislado* does not provide additional payments—as other markets do—to recognize distributed generators that help defer transmission investment.

## International Experience

The international experience reviewed for this article shows that in advanced markets DG systems are subject to net treatment on charges, such as transmission network use or ancillary services. A summary of the benefits given to embedded generators in other jurisdictions is presented in Table 2 based on the findings of Frontier Economics' 2006 report [9].

**Table 2—Treatment of Charges for Embedded Generation Systems in Different Markets (2006).**

| Countries | Net/Gross for Reserve, Ancillary & Market Admin Charges | Cap on Net Treatment | Date commenced |
|---|---|---|---|
| Australia | Net | None | NEM start (1998) |
| Great Britain | Net | 100 MW | Pool start (1990) |
| PJM (US) | Net | 1,500 MW | May 6 Order (2004) |
| New Zealand | Gross | - | NZEM start (1996) |

In the case of network charges, according to the same report, Australia and Great Britain used to charge on a peak demand (MW) and net consumption basis (MWh). This arrangement was supposed to ensure that peak demand-based charges recovered network long-run costs, whereas net consumption-based charges reflected potential savings on upstream costs, such as avoided network expansion [9].

## DG Payments in the UK: Continued but Reduced

Great Britain's energy regulator, OFGEM, has recently reviewed its mechanism and changed its transmission charging arrangement for embedded generators below 100MW capacity. Under the former mechanism, eligible generators were paid by suppliers—Transmission Network Use of System (TNUoS) Demand Residual Payments—for generating energy during triad periods, that is the three half-hour periods of highest transmission demand between November and February, separated by at least 10 days. Moreover, embedded generators in this range were also not charged for TNUoS generation residual or Balancing Services Use of system (BSUoS) generation charges, being only charged for BSUoS demand charge payments on a net consumption basis [10].

An assessment performed by OFGEM showed that TNUoS Demand Residual Payments (TDR) were costing regular customers 370 million GB pounds per year (around 490 million US dollars), a quantity that could nearly double by 2021 if no actions were taken [10]. After a consultation and review process, OFGEM finally decided to reduce the level of TDR payments for embedded generators under 100MW capacity. The rest of the benefits provided to these generators remained unaffected by OFGEM's recent decision. The regulator has already announced its intentions to review them to fairly reflect the fact that, even if it is only a few times, DG uses and benefits from the network and should contribute to recover its sunk costs through fair residual charges [11].

## Takeaways from Australia

Australia has undergone a series of changes to its National Electricity Rules (NER) to incentivize efficient investment in, and use of, DG. These adjustments aim at recognizing that value of investments in non-network solutions, such as DG, depends on different aspects. Hence, Australia's NER now allow for cost-reflective distribution and consumption network tariffs, network support payments for embedded generators up to 5MW, avoided TNUoS charges, regulatory investment test for distribution and transmission, capital expenditure sharing scheme, the efficiency benefit sharing scheme, and the small generation aggregator framework [1].

Regarding avoided TNUoS charges, the Australian Energy Market Commission recognizes that if a customer reduces its consumption from the network at peak hours by installing DG, he should pay lower network charges as this entails a benefit to the system. However, the Australian Commission acknowledges that these benefits are highly dependent on the generator's ability to meet any on-site demand, or to export electricity, when the network is constrained. In contrast, if DG is located on areas with plenty of network capacity and no system limitations, it might actually increase network costs, representing a risk instead of a benefit to the grid [1].

## Back to the Mexican Case: Is Asset's Ownership Relevant?

According to the Mexican law, the power generated or imported through the Abasto Aislado scheme is exclusively to meet a load's 'needs.' Hence, to narrow the concept of someone's 'needs,' CRE determined that to be considered *Abasto Aislado*, the load and the generation asset must be owned by the same person or by different members of one corporate group.

Feedback from the industry pointed out that this definition could curb access to financing for some projects, and leave out successful business models, such as leasing and service-based schemes promoted by Energy Services Companies (ESCOs). In fact, the 2014 report of the Energy Center of Wisconsin, 'Third-Party Distributed Generation: Issues and Challenges for Policymakers," states, "In physical sense customer-owned and third party distributed generation systems are often indistinguishable. Yet, the third party ownership option is a critical factor in that it provides financing flexibility to customers interested in on-site generation." [12]

Moreover, CRE realized that this interpretation of *Abasto Aislado* did not acknowledge that most distributed energy users are not involved—and have no interest—in entering the business of electricity generation and retailing, therefore, being more willing to enter in third-party ownership business models with companies such as ESCOs.

To overcome this issue, CRE defined an additional scheme under the Generation figure, named *'Generación Local'* or 'Local Generation.' *Generación Local* acknowledges the benefits that generating electricity near the consumption point might add to the system, without regard to the ownership of the generation asset. Under this definition, it is also possible to share the electricity produced with other companies (not necessarily members of the same corporate group) near the production site through a private network. Generation systems under Generación Local are subject to the same net treatment as that of Abasto Aislado, which has been already explained in this article.

Nevertheless, *Generación Local* is also subject to additional requirements. For instance, the transactions between the distributed generator and the consumers must occur through a qualified supplier,[3] current market rules require all users (with the exception of market participant qualified users) to be represented in the wholesale electricity market. Even considering the case when the electricity produced and consumed never leaves the private network, its 'sale' would still need to be done through a qualified supplier as the law does not explicitly exclude this type of deal from being a wholesale market transaction, contrary to the case of *Abasto Aislado*.

However, is it necessary to have a qualified supplier in this transaction? What are the actual benefits to consumers and to the system as a whole? Are these benefits worth the extra costs set on consumers from *Generación Local*?

We believe the asset ownership requirement to qualify as *Abasto Aislado* is not as efficient as using other requirements to set aside large scale DG from traditional generators. Frontier Economic's report said *"In our view, the merits and demerits of the various options discussed above for recovering costs do not depend on whether the embedded generator and load are located on the same premises or are owned by the same person. Ownership and proximity of the embedded generator are only relevant to the policy issue of 'what is transmission'."* [9]

3. Under Mexican law, a qualified supplier is the electricity supplier that serves end users with a load or an aggregation of loads with over 1MW capacity.

## Embracing Change to Move into the Future

The 2013 energy reform introduced two new figures where DG projects could fit in Mexican regulation: *Abasto Aislado* and *Generación Distribuida*. Both of these figures were defined in the law with certain specifications: a 500kW capacity limit for *Generación Distribuida* and the condition to meet individual needs in the case of *Abasto Aislado*, which led to the creation of a new figure within the existing Generator figure called *Generación Local*. The latter is an effort to recognize business models common in DG projects, but unable to enter in the definitions established by law.

Considering all these findings, we would like to put forward the following recommendations aimed at rethinking the way DG is currently defined and regulated in Mexico. The objective is to be more effective and cope with the potential disruption from higher penetration of distributed technologies:

1. Unless we have more evidence that asset ownership requirements have a positive impact on the market and on network's performance, we should stay open to propose redefining *Abasto Aislado*—as the legal figure that comprises distributed systems over 500kw—so that it does not preclude alternative property arrangements and business models.

2. Consider recovering the name *Generación Distribuida,* leaving systems under 500kW capacity with its associated benefits under a special category within this scheme, for instance, *'Micro y Pequeña Generación Distribuida'* ('Micro and Small Energy Generation' in English).

3. Distinguish between systems connected to the distribution network and those located behind the meter as both have different implications on the system's performance and on associated network costs and potential savings. Probably through a capacity cap (e.g., 100MW in the UK or 20MW in California) defined by a thorough evaluation of the national network's characteristics and performance.

4. Acknowledge net treatment to be a reasonable approach for charging ancillary or network services only in conjunction with locational signals. Currently, we do not think that *Abasto Aislado, Generación Local*, or even *Generación Distribuida* effectively take into account this aspect. Location is a relevant factor to recognize DG benefits but also its costs.

5. Evaluate the implementation of a capacity-based fixed charge to ensure Transmission and Distribution Network Operator recover sunk costs, even if distributed generation increases considerably.

6. Assess the possibility of implementing a financial scheme to pay distributed generators that are in fact contributing to long-term reductions in network construction, maintenance or substitution costs. An evaluation mechanism to identify these generators and estimate the long-run cost reductions associated with them needs to be done simultaneously.

We are fully aware of the regulator's responsibility to send stability signals to the market. We also believe regulation is a living entity that needs to evolve so it can better accommodate new technologies and business models that promote higher market efficiencies, and thus better prices for end users. We believe regulators should not be afraid of making changes, as long as these are thoughtful and aimed at improving efficiency and benefits to consumers.

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Montserrat was appointed Commissioner of Mexico's Energy Regulatory Commission by the Senate of the Republic on September 18, 2014 for a five-year period, ending on December 31, 2019.

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