

10th SMART GRID FORUM LATIN AMERICA

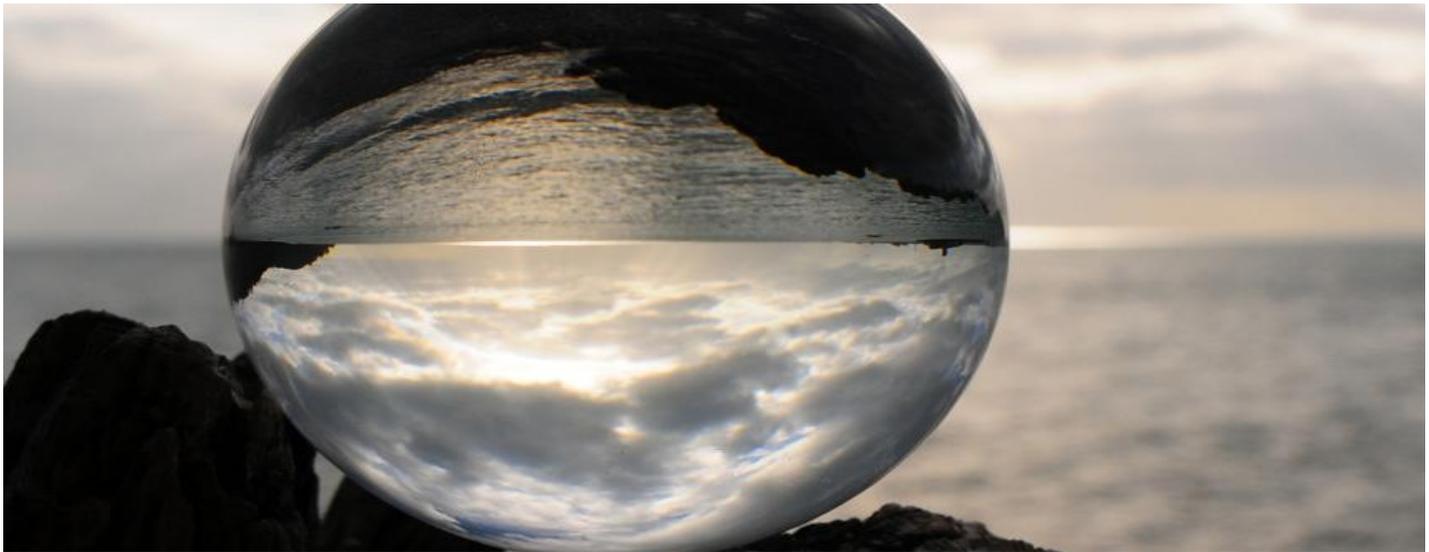
SMART GRID[®]
FORUM/2017

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"THE UTILITIES OF THE FUTURE: THE NEW MARKET AND REGULATION MODELS FOR THE TECHNOLOGICAL TRANSITION AND DISTRIBUTED ENERGY RESOURCES INTEGRATION ON GROWING SCALE"



The major paradigm shift in the energy sector



*Cyro Vicente Boccuzzi **

Since the last decade of the past century, there has been an increased global collective consciousness of the finiteness of natural resources and the need to combat climate change as the only effective measure to prevent the extinction of the human race on the planet. Most of the world's governments have since imposed increasing measures and pressure to reduce emissions and the use of hydrocarbons and other petroleum products, as well as strongly encouraged the environmental consideration and the concept of sustainability to evaluate ventures and progress definition.

This increased awareness and values change has boosted the development of clean and alternatives energies to make a progressive replacement of fossil fuels and the energy matrix on a global scale, which is still dependent on petroleum, especially for vehicular use and the production of cold and heat. As a result, there was an impressive boost to new renewable and clean energies, mainly wind and solar. The same happened on the energy efficiency industry: either by introducing new technologies such as electronic bulbs and later LEDs, or by energy and demand management for intelligent automation systems for building, industrial and commercial, increasingly accessible to a growing number of consumer groups.

These innovations have systematically experienced cycles of development and dissemination, both because of its prioritization and due to its availability occurring almost simultaneously on a global scale. To get an idea of this

growing adoption acceleration, we can remember that the telephone technology, invented in 1876, took 89 years to reach a market of 150 million users. Already television, invented in 1925, took "only" 38 years to reach the same audience, while the cell phone took "only" 14 years, Facebook and Napster reached the same audience in "only" 5 years and more recently the Instagram in just 3 years!

Similarly, the clean energy sector experienced an exponential fall in prices and an efficiency duplication every couple of years, similarly to Moore's Law, applied to computer chips, which explains the rapid popularization of computers and mobile devices such as smartphones, which currently sell for \$ 25 in China. In the case of solar power, prices dropped from approximately \$ 77.00 / W in 1977 to around \$ 0.50 / W in early 2017, and expected to reach \$ 0.35 / W by the end of the year.

About a decade ago, smart grids concept was the natural evolutionary concept of public energy systems, considering a modernization movement that migrated from utilities to final customers. Intelligent rates would consider the costs of supply throughout the year, weeks and times of day, associated with advanced network and workforce automation, incorporating a host of other sensing, monitoring, communication, and information technologies to transform centralized electricity service into a more efficient and dependable productive activity.

"Smart" technologies also included so-called distributed energy resources (DERs), which are decentralized renewable generation technologies (usually solar or wind) on a small scale, closer to the load; energy efficient by the adoption of more efficient final use equipment (bulbs, pumps, refrigerators, heating and cooling systems, etc.); demand management systems avoiding simultaneous customers' equipment operation. All these technologies aimed to improve the overall efficiency of collective use of the networks, bringing more economics, control and reliability in the services provision. Still under development, but with not yet competitive costs for large-scale deployment, ten years ago it was imagined that these technologies would go live the same way as ever, reaching consumers through energy companies.

Although, the path that has been covered in the last decade is quite another. In several countries, and not differently in Brazil and Latin America, the most impressive and vertiginous movement of DERs technologies are in fact coming from the clients to the electric service companies, that is, the adoption of DERs by customers is happening before the companies could be prepared to integrate these resources into their operations. The above-mentioned technologies, related to energy efficiency and micro-generation, are becoming increasingly popular and accessible. Technologies such as building automation systems, co-generation and back up automated systems, energy storage systems and demand flexibility offered on a value proposition basis to the clients as well as the expected, but still timid, evolution of the electric vehicle industry, since more than 80% of city pollution is vehicular in origin.

Part of the phenomenon and the speed of penetration can be understood by a culture of a new society of the 21st century, made possible by the internet of people and even more potentiated by the so-called internet of things, where values traditionally adopted in the capitalist world undergo a profound still ongoing and not completed transformation. The milenials, generation that is reaching the adult age, unlike their capitalist ancestors, are increasingly valuing freedom and the possibility of being inclusive and having access (sharing) more than exclusivity, ownership and possession (famous contemporary dilemma: own car or mobility?). They also choose another culture of power, previously hierarchical and pyramidal for lateral, collaborative and shared. The identity of the new generation also shifts from a local consciousness to a global consciousness, more aligned with common social values that guarantee the preservation of the species.

Thus, while it was expected that smart grids would be deployed from the enterprise to the customers, what has been perceived is a faster, more agile, viable and widespread adoption of new technologies, especially distributed energy resources, by customers, out of the companies and regulators' control.

This now perceived trend in the energy sector has already happened in a large number of other industries and is changing a series of consolidated old paradigms in the more than centenary electricity industry. Utilities,

monopolistic and centralized, begin to see their previously captive markets being disintermediated by new technologies, reducing or stagnating their growth for the future. On the other hand, the new forms of energy generation for customers, renewable and distributed, imply the implementation of anticipated investments and lower variable cost throughout its operation, ie, wind and sun are fuels and almost maintenance free. Once the fixed cost is paid, the marginal cost is practically zero! Even considering the financing costs involved, the price parity of solar energy with the utility have already achieved in various parts of the world, including in Brazil and Latin America. It is important to note that the current regulations trends prescripts the surplus produced by each customer and not locally consumed to be accounted in customer's favor for the same price as the service charged by the utility, to be transported to other consumers in the vicinity. Public networks and enterprise management and operation systems weren't designed for this and need to be urgently modernized, requiring qualified short-term investments.

The use of these DER solutions by the customers limits their consumption of the public network, and inject new sources of energy in the existing system, compromising revenues of the utilities devoted to the amortization of past investments and also necessary to the service rendering, if it is still necessary, as renewable energies are intermittent. For example, solar power is not available at night, but customers need the public network to continue supplying them at these times, when their resources are unavailable, to a smaller overall payment than previously. As a result, utilities end up receiving lower revenues to amortize their investments and pay for their services, and they need to rebalance their energy tariffs with other customers that remain exclusively supplied, losing even more competitiveness with new technologies and encouraging an increasing number of clients in their adoption. This cyclical movement is the "spiral of acceleration loss of competitiveness" of companies that do not adapt to the new reality. In addition, utilities have to make increasing investments so that the networks can enable to host growing volumes of dispersed generation in their lines, in a secure and reliable way, in order to absorb the surplus produced by their clients.

All of these combined factors imply the growing importance of energy companies as well as their consumers to manage the capacity and demand of energy systems in a real time basis, as variable unit costs are lowering and pushing the tariffs to grow, by reducing global sales and for increasing investments in modernization and control.

In this scenario, it is possible to detail some macro trends of the electricity industry.

The first impact is in the business expansion planning methodologies. Traditional assets require investment and construction cycles that require between 2 and 10 years anticipation: for example, between forecasting the need for a new transmission substation and putting it into service, it may take between 2 and 5 years, depending on the capacity and regions involved. The first ingredient in these studies is the projection of future markets, whose drivers are no longer the same as previously used in a monopoly regime. Planning for market expansion now needs to change from centralized and to integrate, incorporating customer resources as well. Companies cannot continue to make increasing investments if demand is stagnant or decreasing. Regulators need, for the reasons outlined above, to work on incentives for companies to decouple sales from tariffs, rewarding efficiency gains and investments in distributed and energy-efficient resources. Since 2007 the United States and some European Union countries adopted decoupling, allowing utilities to recognize prudent investment in the new energy economy of the 21st century, instead of simply continuing to expand the networks' service capacity, as if it were the only alternative for the customers.

In addition to the incorporation of DERs, planning models need to be sophisticated to consider the current capacity of existing networks to host these distributed resources and to model future scenarios of disintermediation and growth of DER adoption by clients in a georeferenced and spatial manner. Errors in these evaluations can bring investments in assets that will not have the counterpart of revenues incurring into traps like stranded assets or loss of competitiveness (leapfrogging). Due to lack of agility and prices, traditional expansion may quickly loose competitiveness for the distributed solutions, whose implementation times are much shorter, going from a few months to less than 2 years.

Firms also have more and more the need to deploy advanced Active Network Management (ANM) systems that allow the maximization of the selective uptake of distributed resources aiming to increase the capacity to expand the hosting capacity within appropriate power quality parameters (voltage and frequency).

Another trend is for energy companies to shift from capital-intensive investments ("heavy" assets) to more technologically "lightweight" solutions, including microgeneration, energy efficiency, automation, storage and other DER technologies offered to final customers individually or in condominiums, neighborhoods or districts. These solutions have shorter terms return on investments, and can be sold as a service offering and the assets, although dedicated to end customers, still have some level of recovery and can be reused in part if they are relaxed, implying lower risk of "stranded assets" than the traditional ones, of greater cost, specificity and time of installation and return. Most utilities and larger energy groups have already realized this trend for the transformation of their businesses and started specific operations of service companies, which should compete with each other in the market, and progressively replace traditional companies.

Another trend is also the Utility companies progressively abandon the traditional centralized operation, with closed systems, from where they control the entire operation of the service. They should progressively follow the same guidance as the more modern organizations, from other sectors, that end up offering much more value to customers by developing platform-based strategy and working to build complementary service networks from sharing systems and management partners.

Platform-oriented companies have often created and mastered arenas in which buyers, sellers, and a variety of third parties work connected in real-time: digital platforms enable developers to create applications that make it easier and faster than ever to collaborate, workflow and value between industries and geographies.

Innovators realize that their prosperity depends not only on their own successful efforts ("me"), but also on the success of the entire ecosystem ("we"), ie, the actors in their platform, which may include competitors, vendors, employees, developers, consumers, or all of the above. Digital Platforms facilitate competition as well as coordination.

Finally, all these transformations and the escalation of the use of platforms, integrating a growing number of things, such as equipment and sensors, and agents, such as power producers, consumers, aggregators, service providers and others, bring the growing concern and need for cyber security and privacy solutions. A new industry is born, promoting comfort, credibility, security and privacy of operations, and the emergence of opportunities and applications of new cyber security technologies with technologies devoted to certification and validation, like the block chain.

However, the essential aspect for massive adoption of these new paradigms is not to point out sophisticated technologies, but the necessary delivery of value to interested groups in this transformation compared to conventional utilities technologies. The challenge is to incorporate innovative technologies as real investment options into evolution plans of the existing utilities networks and end-user energy systems, aligned with regulatory mechanisms and business models and processes. Thus, the new paradigm involves a wide variety of stakeholders like regulators, consumers, dealers and other interested groups in power systems. To this end, the Latin American Smart Grid Forum has been discussing for ten years practical ways to implement this evolution. The Forum has greatly contributed to the dissemination of many nowadays commercially popular technologies in Latin America, such as advanced revenue protection systems for large customers, medium and low voltage automation, workforce mobility systems, distributed generation solutions, asset condition monitoring systems, and storage and cogeneration systems.

THE SMART GRID LATIN AMERICAN FORUM

Working in the electrical sector and following the best practices in a global scale for over 34 years, the author has always believed that it is feasible to improve energy services by employing better technologies, innovation, contract intelligence and regulation knowledge, in a sustainable economic basis and with final competitive costs in relation to so-called "conventional technologies". His company, ECOee, has been working for 10 years to provide greater efficiency, profitability and cost reduction in the society energy final use, with a vocation to be one of the pioneering energy companies of the 21st century.

The SMART GRID LATIN AMERICAN FORUM started in 2008 to share the author's expertise and knowledge across a broad international network to implement and accelerate the introduction of new energy technologies and innovations in a sustainable manner in Brazil and Latin America. Its mission is to promote the periodic and systematic exchange of information and the ongoing relationship with similar initiatives that study the deployment of these innovative technologies in other continents and countries of the world, always in order to apply these technologies in a way focused in Latin America, considering specifics and regional realities.

The Forum has developed an important role of articulation and institutional synthesis, with a vision mainly guided by value for all interest groups and society as a whole, and not exclusively by technology. In addition, the Forum is a NEUTRAL, INDEPENDENT and INCLUSIVE vehicle, to mobilize the widest possible array of stakeholders, and maintained in action by its Annual Conference.

The Forum seeks the engagement of technology companies, utilities and governments in conducting programs for the modernization of electricity networks and engages the world-wide debate on the search for a new business model for electric energy generation, transmission, distribution and trade.

The Conference of the Latin American Forum of Smart Grid for more than 9 years has become part of the worldwide roadmap of the main events on the area. Its 10th anniversary Edition, will be held on November 28 and 29, 2017, in São Paulo, Brazil, and simultaneously will be promoted the 1st. SMART GRID WORLD FORUM, which will feature a large number of international entities invited to discuss these new technologies and associated business models in the energy sector. In this sense, the Forum is proud to be the only global entity that has been able to carry out its annual International Conference uninterruptedly in these 10 years, always guiding the discussions of the regulatory issues associated with each evolutionary cycle for the next period. The following headline will shape discussions for the commemorative edition of the Forum's 10th. Anniversary: "The Energy Companies of the Future: the new market models and regulation for the technological transition aiming at the integration of Distributed Energy Resources on an increasing scale"



**CYRO VICENTE Boccuzzi tem 34 anos de experiência no setor de energia. Trabalhou e fez carreira por mais de 28 anos em concessionárias no Brasil ocupando posições de Vice-Presidente na AES Eletropaulo e na ENERSUL. Foi também Diretor Executivo da Consultoria Andrade & Canellas. Ao longo de sua carreira também ocupou cargos e funções diretivas em várias entidades do setor e em conselhos de administração de empresas de energia e de instituições de pesquisa. Desde 2007 Cyro é o Sócio-Diretor da ECOEE, empresa de engenharia e consultoria de energia, sendo empresa brasileira pioneira com expertise em sistemas avançados e tecnologias inteligentes de energia. Cyro é fundador e Presidente do Fórum Latino Americano de Smart Grid e membro da Diretoria da Divisão de Energia, do Departamento de Infraestrutura da FIESP - Federação das Indústrias do Estado de São Paulo. É engenheiro eletricista pela Universidade Mackenzie, pós-graduado em Administração de Empresas pela Fundação Getúlio Vargas - FGV e possui MBA em Finanças e Controladoria pela Universidade de São Paulo - USP.*

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