PROSPECTS AND CHALLENGES FOR THE DEPLOYMENT OF SMART GRID IN BRAZIL

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CURRENT ENERGY CONTEXT

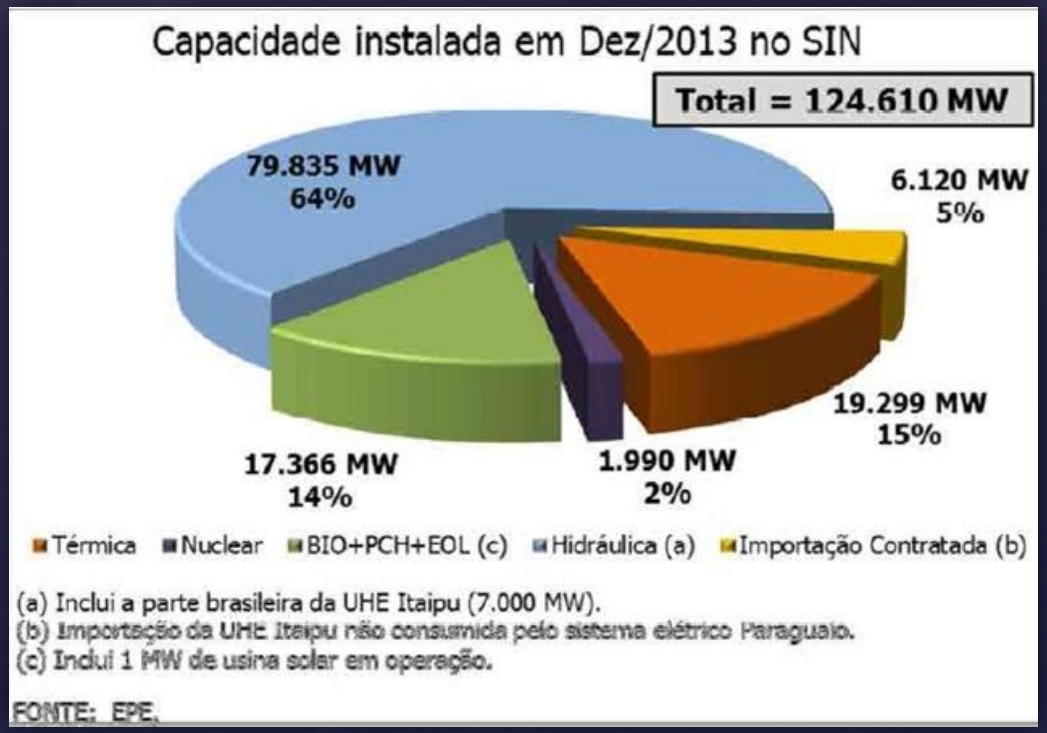
- Energy production is explored by a public concession regime, through a bidding process. To become operational, the projects need a contract to sell energy and a certificate with the physical generation capacity, as well as an environmental license. Bids are determined by ordinance of the Ministry of Mines and Energy (MME). Energy is sold in auctions held by the Electric Energy Trading Chamber (CCEE), as delegated by the Brazilian Electricity Regulatory Agency (ANEEL), in order to achieve reasonable tariffs.

- The model introduced competitive generation, commercialization of open access and the expansion of parks as being the responsibility of the agents.

  In the 90s, with the privatization and modernization of the State, there was an increase in generation and marketing competitiveness, with regulated distribution and transmission tariffs maintained by ANEEL, with the replacement of the regime "cost plus" to "price cap".

- Sector planning is the responsibility of the Energy Research Company (EPE).
  The Brazilian system is the largest in Latin America, with an installed capacity of 132GW (EPE, 2014) and a current consumption of 470TW/h. The share of renewables in the energy mix is 42%. The generator system is operated by the National System Operator (ONS), in order to distribute power between the regions and monitor the risks of generation.

- Hydroelectric plants account for 66% of installed capacity. The other sources that diversifying the country's energy mix are: natural gas, coal, nuclear, oil, wind and solar. Biomass, cogeneration production of ethanol from sugar cane, and also from wood, is emerging as a new competitive source.



- The production of the electricity sector comes from plants with capacity ranging between 30 MW and 14.000 MW (which is the Binational Itaipu plant, on the border with Paraguay, since the largest enterprise, the Belo Monte plant, auctioned in 2010, is not yet operational). Most of the potential of 250GW is in the Amazon River Basin and could interfere in environmental preservation areas and indigenous lands.

- Planning for expansion of energy is based on standards from the National Committee on Energy Policy (CNPE). The latest Decennial Plan for Energy Expansion (PDE) provides for a planned 20 hydroelectric plants with an increase of about 30,000MW power installed in the Brazilian electric park, but provides nothing for microgeneration (until 100 kw) and minigeneration (from 100 kw up to 1,000 kw) or for the deployment of smart grids.

- Socio-environmental problems and nowadays, an unprecedented hydrological crisis, are the reason that thermal power plants have been operating, without interruption, since 2012 making the sector tariff one of the most expensive in the world. The cost of using thermal power plants increase the tariff of the distribution sector. This requires a new configuration of the energy mix and the deployment of the Smart Grid.

- Renewable energy sources are already present in the reserve energy auctions that meet the aims of the energy policy and do not have time for funding as the main auction and the additional auction have.

- The first auction for the solar source occurred in November, but with a small share of projects.

Evolution of installed capacity in the Decennial Plan for Energy Expansion (PDE) 2023

	2014		2023	
	MW	**%**	**MW**	**%**
Renewable sources	110.335	83,2	164.135	83,8
Hydroelectric power	88.661	66,9	116.894	59,7
Eolic	5.452	3,0	22.438	11,5
Others (PCH, Biomass and Solar)	16.222	11,4	24.802	12,7
Non-renewable sources	22.224	16,8	31.748	16,2
Total	**132.559**	**100,0**	**195.883**	**100,0**

There is no way to expand or stimulate renewable sources without differential treatment in funding and specific auctions.

- **Investment in automated distribution, along with smart metering and distributed generation, will reduce the costs and improve the system provided, but this is dependent on the goodwill of the government, because there are no tax incentives nor consistent studies to determine whether to increase or reduce the tariff. Government at the same time as authorizing the use of a reduced tariff, in the transmission and distribution system (TUST/TUSD) for enterprises of solar source, did not reduce the tax burden, even for the compensation of energy on DG.**

- It is important to stipulate tariff revenues, compatible with the service, to create reliability in a market shared by so many different agents.

- “Feed-In tariffs” (FiT), the decoupling between tariffs and sales, as well as the criteria for monitoring and sharing assets and connecting distributed generation to the centralized distribution, need to be defined.

- The problem is that tariffs are calculated to provide companies with minimum revenue guarantees to cover their operating costs and a return on investment. While this stimulates expansion of distribution networks it discourages the search for productivity since expenses are covered. The decoupling tariffs promote energy efficiency but as the return on investment and revenues are based on unharnessed energy sold, it is not compatible with the conventional regulatory model.

- The designed tariffs require information, standards and codes, both suitable to the distributors managing demand and helping consumers choose the best model. They need to be instructive on the use of equipment, offering discounts and increasing the need for reduced consumption.

- The system of smart tariffs, to be provided by the distributor, with the use of controllers, sensors and the next generation of electronic switching requires a better integration plan between networks that only the government can mandate.

THE BENEFITS OF THE SMART GRID

1. Control the system in real time
2. Increase in efficiency and energy demand management
3. Use additional power generated on a small scale
4. Use the latest generation sensors to store energy and electronic keys for intelligent tasks
5. Enable lower long-term investments
6. Reduce emissions and environmental impact

WHAT NEEDS TO BE DONE

1.Public policies for the development of Smart Grid

2. Mapping of the national and international industry, distributors and supply chain

3. Standardization of equipment in economic scale and adaptable to global system

4. Reset tariffs (dynamic pricing) with consistent studies on the impact of automation in tariffs

5. Stimulate the development of renewable sources, with specific auctions and different prices for source

6. Integration plan between networks with connecting factors between the centralized and distributed generation

7. Stimulate investors and the productive chain through tax incentives

8. Mechanisms to protect consumers and energy bills, through cyber-security

9. Use of underground distribution networks

10. Education on the new model

WHAT HAS BEEN DONE

1. MME and ANEEL created a working group for the implementation of Smart Grid in Brazil

2. Ministry of Science, Technology and Innovation conducted a study on the challenges and economic impacts of the use of Smart Grid

3. Pre paid electricity service authorized for consumers to gradually purchase power, but concise regulations are necessary

4. The third tariff review cycle in 2011 created tariff flags, which shall be effective from 2015 due to the extra cost to distributors because of the thermal power plants

5. ANEEL Resolution 481/2012 extended reduced tariffs in the transmission and distribution system (TUST/TUSD) for enterprises of solar source entering into commercial operation from 2017. ANEEL Resolution 482/2012 regulated the small-scale DG, setting the rules for compensation of energy from renewable generation or co-generation qualified up to 1000 KW, in the net metering system

6. ANEEL Resolution 502/2012 regarding electronic metering

- INOVA ENERGY is a plan funded by BNDES, the official investment bank, ANEEL and FINEP, totaling R$ 7.2 billion that will invest in R & D, engineering and technology absorption, and grant credits for projects in smart grid, transmission of ultra/high voltage, power generation through alternative sources, hybrid vehicles and vehicle efficiency

PRIVATE SECTOR INITIATIVES

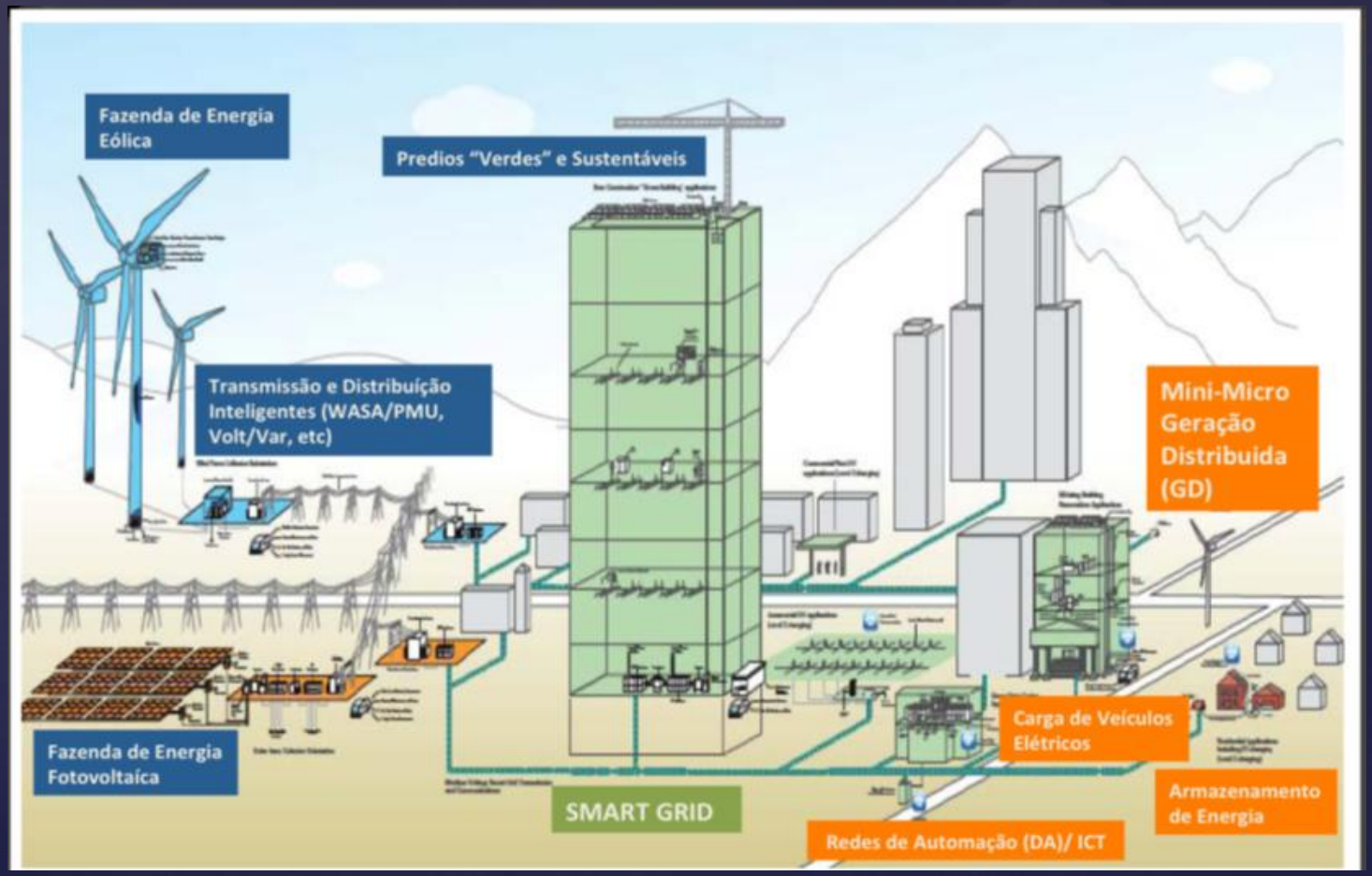
1. Brazilian Association of Energy Distributors (ABRADEE) created an R & D, which evaluated the costs and benefits as well as the need for funding for the deployment of the Smart Grid in Brazil

2. Pilot projects developed by private companies (Energisa and Cemig - Minas Gerais; Light -Rio de Janeiro; CPFL e AES Eletropaulo - São Paulo)

3.National Initiative for Innovation, coordinated by the National Confederation of Industry (CNI) - plan to innovate and conduct R & D activities

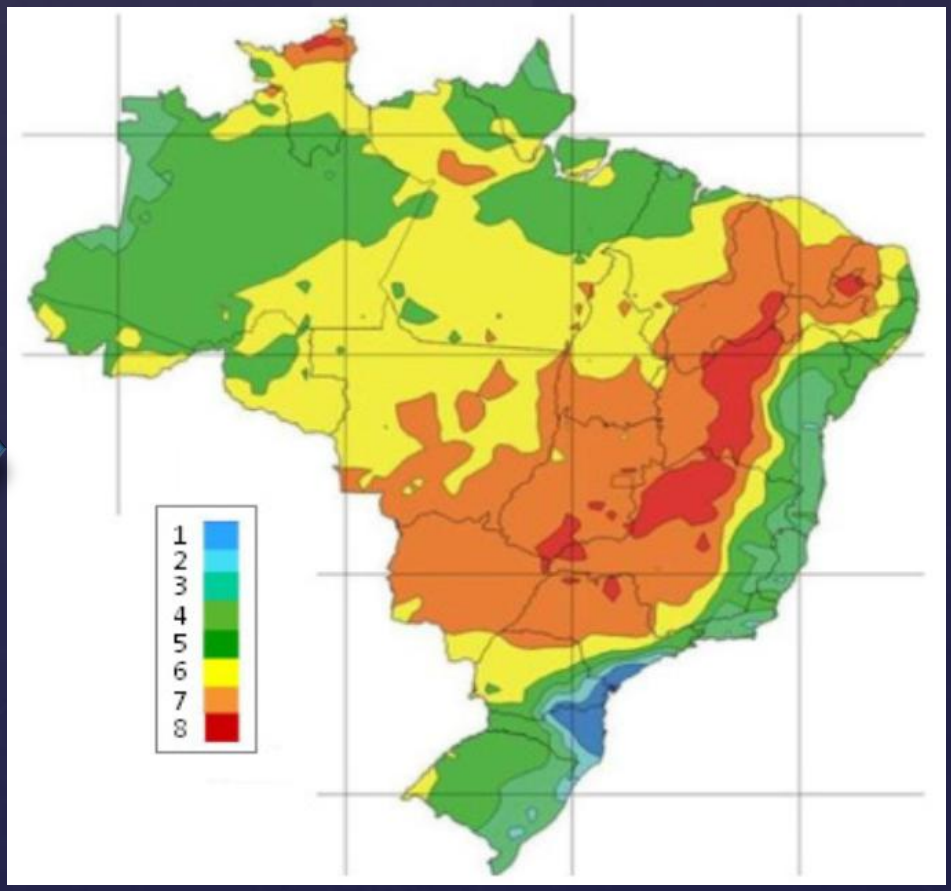
4. Institute for Development of Alternative Energy in Latin America (IDEAL), with support from the German Cooperation for Sustainable Development conducted a study concluding that many installers and distributors are in the process of learning and adapting to the new market provided by ANEEL Resolution 482/2012

- Initiatives are isolated and only contribute to the development of the Smart Grid in Brazil when there is a public policy incentive in order to integrate networks.

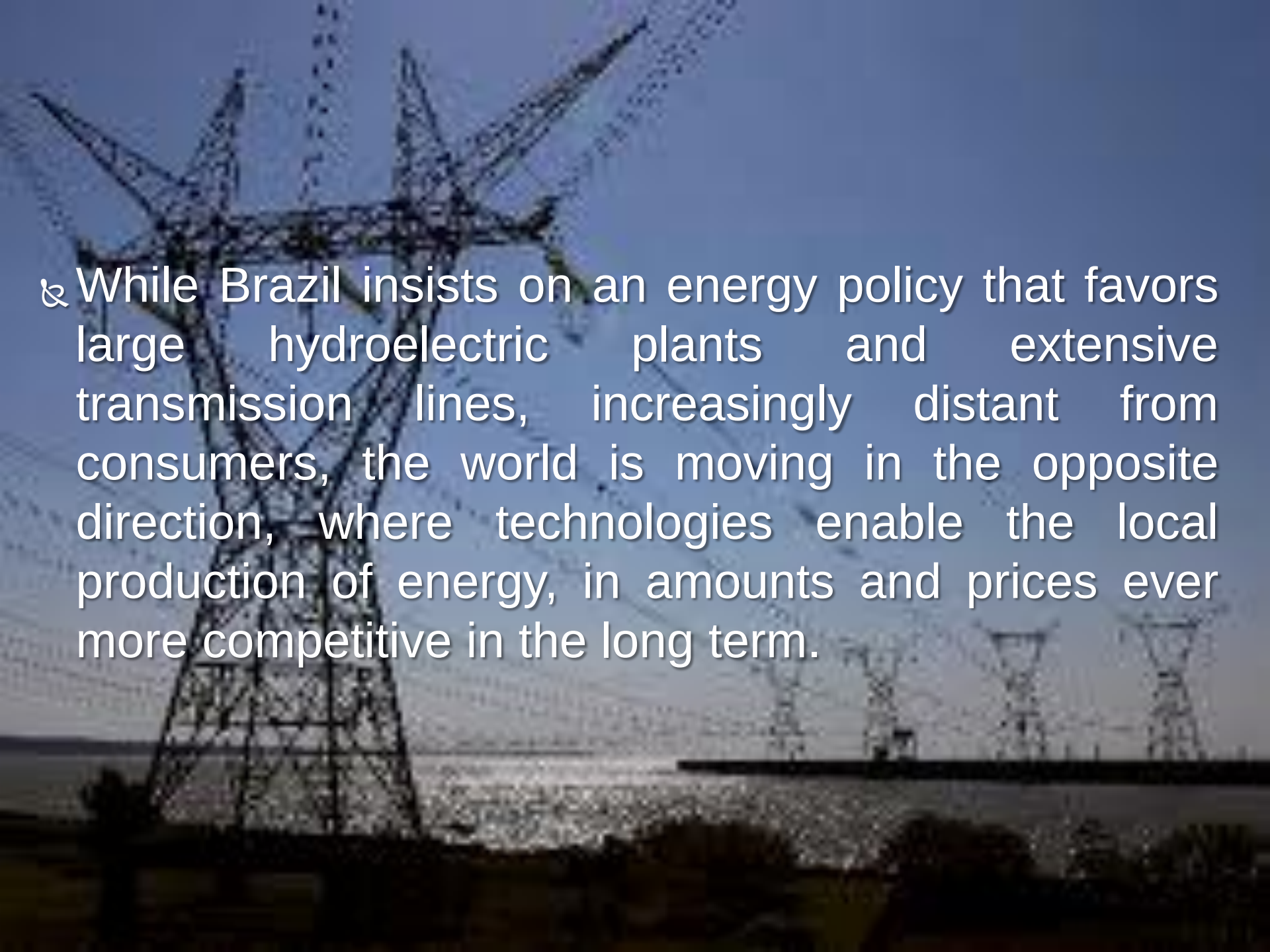


- Brazil has growing consumption, the cleanest energy matrix in the world, biofuels, discoveries of oil and gas, in deep waters, that influence the competitive dynamics between different energy sources, inclusive services and a nationwide telecom network, excellent levels of solar radiation and one of the world's largest reserves of quartz.

Brazil's Solar Radiation
Fonte: Atlas Brasileiro de Energia Solar



- Despite having almost unlimited natural resources, the country has one of the most expensive energy systems in the world. Recently, it dropped one position in the ranking of the largest producers of hydroelectric power, according to the 2014 Statistical Report of BP (BP Statistical Review of World Energy 2014), due to hydrological problems, but also due to social-environmental and regulatory problems.



- While Brazil insists on an energy policy that favors large hydroelectric plants and extensive transmission lines, increasingly distant from consumers, the world is moving in the opposite direction, where technologies enable the local production of energy, in amounts and prices ever more competitive in the long term.

- Even with challenges such as the lack of definition of a regulatory framework and lack of political incentives, the Smart Grid system can lead to new opportunities in the energy sector. Public managers and entrepreneurs need to reinvent the centralized energy power system, integrating the new and efficient systems of minigeneration and microgeneration, which will be the solution to the growing demand of energy existing in the country.

THANK YOU!

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