



**Decentralized Energy Generation, Rural
Electrification and Smart Grid Solutions at the
Brazilian Power Sector: An Overview of the
Improvements, Bottleneck and Incentives
Established through New Regulatory
Framework (2009-2013)**

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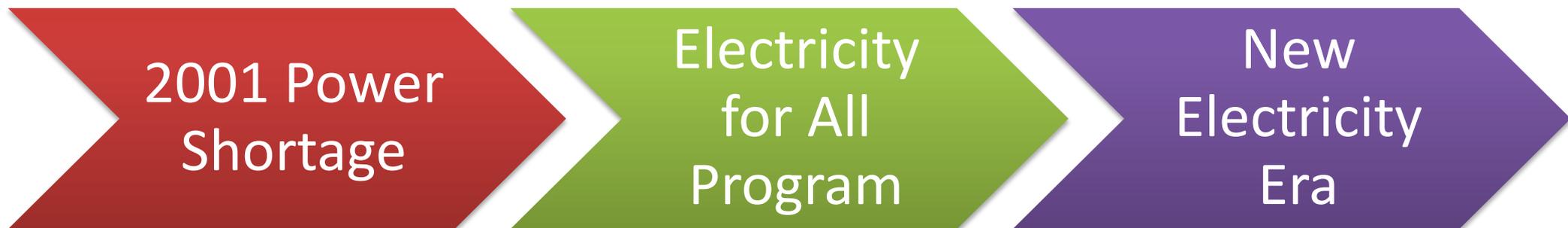


Summary

- Introduction and Paper Main Objective
- Methods Applied
- Regulatory Framework Evolution Since Act n^o 12.111
- Decentralized Energy Supply Investments in Brazil
- Conclusions

Introduction

- From 2001-2015 Brazilian electricity industry faced three big challenges:





Introduction

- The Program Initial goal was to provide electricity for 10 million people, and it was achieved in 2009;
- By February 2015: 15,3 million people were attended!
- But during the Program development it was found that there were more people lacking of electricity
- So the program was extended until 2018.

Introduction

- Most of the attendance was done just by extending the existing network, but to a great number of areas this approach was too expensive;
- In those cases electricity was provided by individual generation systems or by minigrid generation systems
 - Power supply ranging from 13 kWh/month until 45 kWh/month
- Initially most of the projects were for individual systems but after 2009, it has changed and collective systems were also developed.⁵



Introduction

- DSO main complaint was the lack of a solid regulation framework on the matter and also systems and equipment standardization (Normative Res. Nº 83/2004).
- So ANEEL and MME decided to build a robust regulation framework considering issues like: smart grid systems, net metering and balance and also decentralized energy supply, both connect and disconnected.

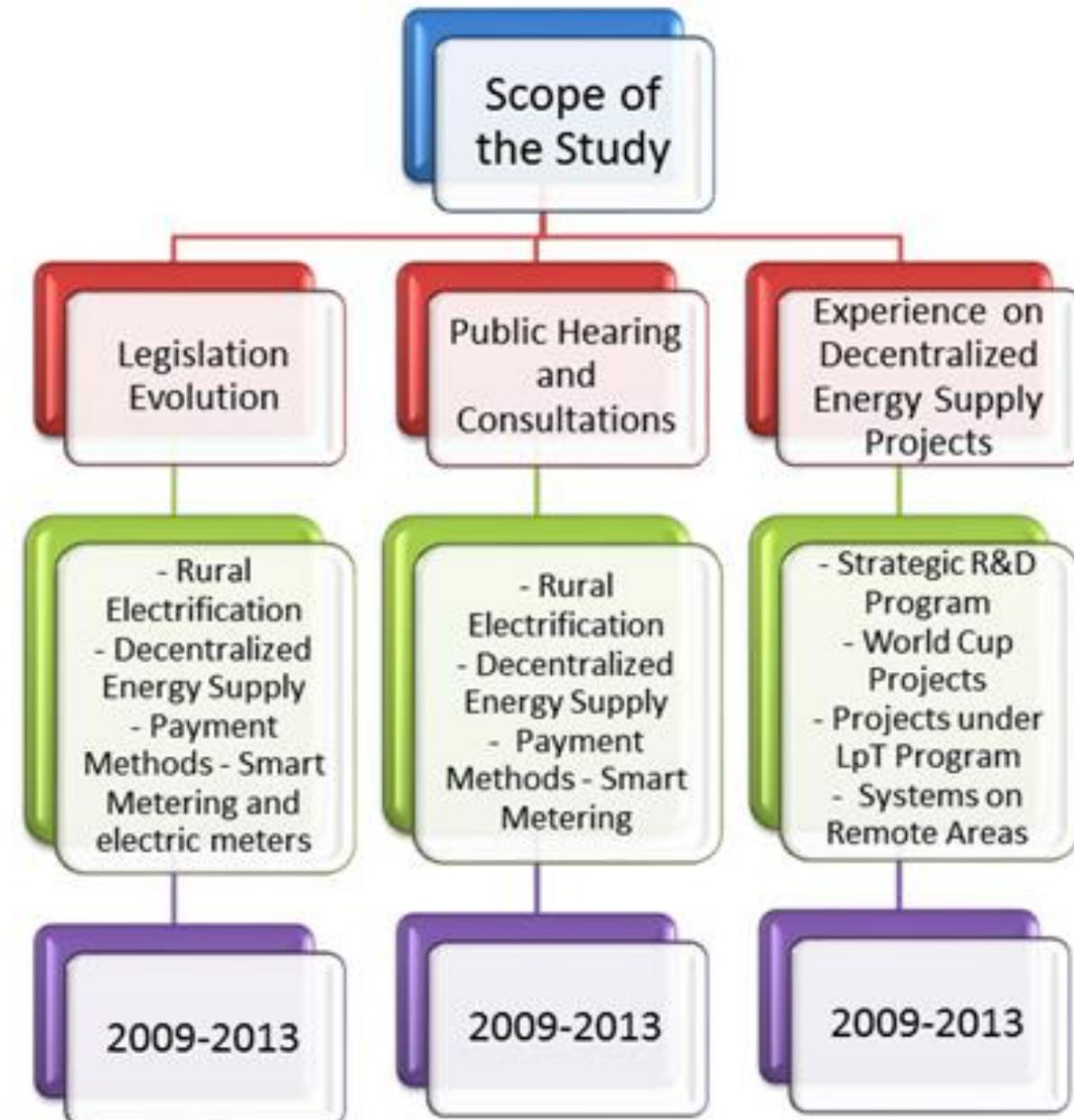


Objective

- And from this come the main objective of the article:
 - To try to visualize the regulatory framework enhancements for the promotion of decentralized energy supply and correlated issues;
- Themes like: Payment methods, Decentralized Energy Supply and Distributed Generation from renewable resources, Extension of Energy for All Program and smart grid were discussed in the last 4 years.

Methodology

- The regulatory framework improvements were studied considering information from 2009 until 2013.
- And divided on three topics:
 - Electricity For All Program
 - Distributed Generation and Smart Metering
 - Reference Project Auction's

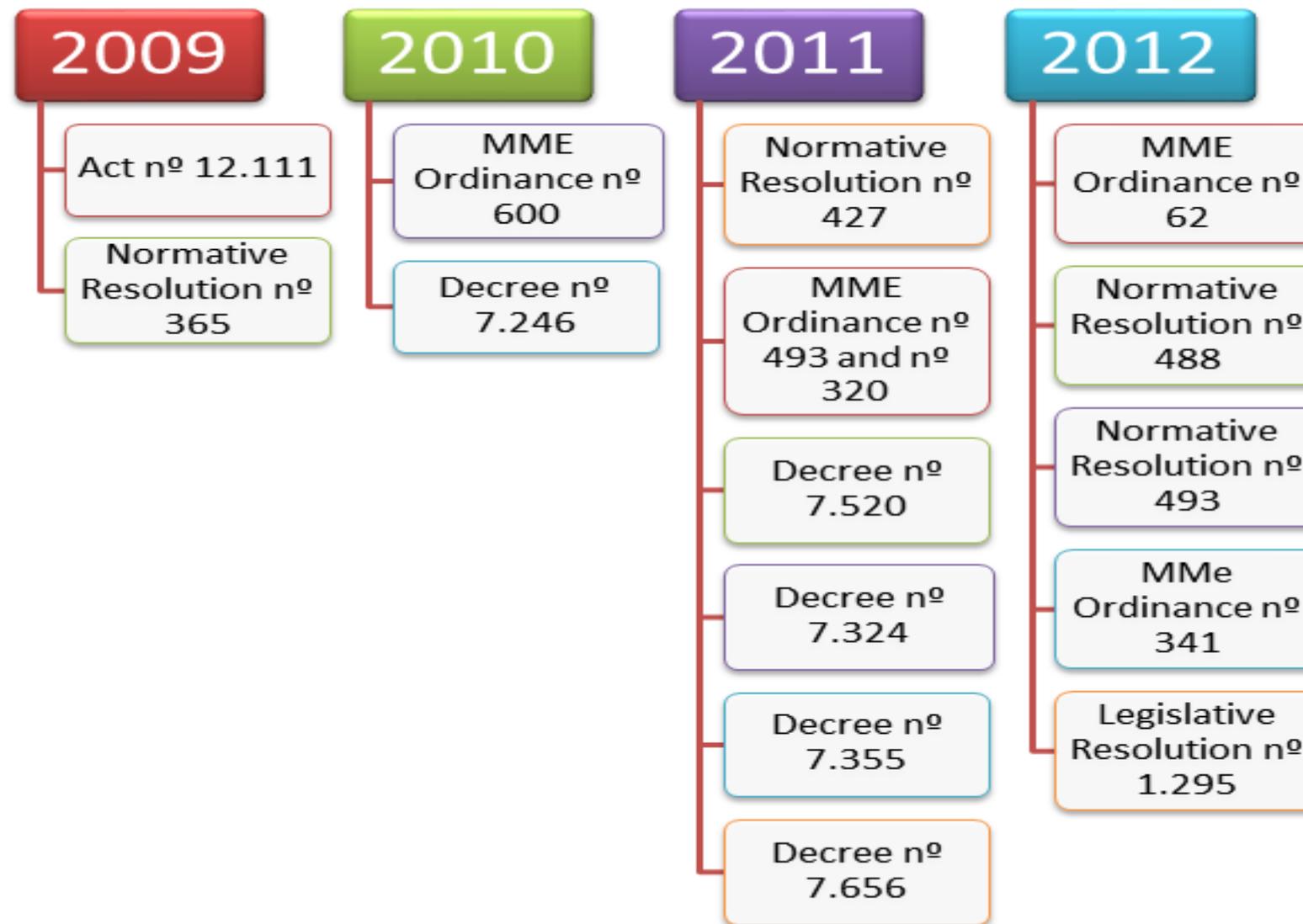




Act n° 12.111/2009 – Starting the Regulatory Framework Change

- Before 2009, the projects to supply electricity on remote or isolated areas were implemented just by ANEEL authorization and with a combination for LpT Program and DSOs Investments.
- Since Act n° 12.111, all the projects need to pass through an auction process to define which company will be responsible for the generation project and the system management.
- Projects could be done by individual and collective systems
- Projects should preferably use renewable energy

Regulatory Framework Evolution Since Act nº 12.111



Investments on Decentralized Energy Supply in Brazil

- Brazil has done a number of initiatives to promote the use of decentralized electricity generation:
 - Strategic research and development projects leveraged by ANEEL
 - Electricity for All Program Projects and Reference Projects
 - World cup stadium solar plants.
- Amazonas Energia DSO has a 12 mini distributed generation facilities on 12 communities located on six cities in Amazonas (photovoltaic systems).

Investments on Decentralized Energy Supply in Brazil

- CELPA reference project named RESEX will provide electricity supply to 10 communities with collective systems (149 households) and 1.202 households with individual systems (solar+diesel)
- Urban Decentralized Energy Supply:
 - 18 R&D authorized projects with installed capacity range from 0,5 MWp – 3 MWp
 - Solar World Cup Stadium Projects: 6 of World Cup Arena implemented



Conclusion

- The recent regulatory framework improvements made intending to promote the decentralized energy supply, also now government and private companies are starting to invest.
- Besides from the rural decentralized energy supply projects with solar energy, wind and diesel, also urban decentralized energy supply is being developed.