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Performance of Low Income Energy Efficiency Projects (2008 - 2013)

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ANEEL's Energy Efficiency Program (PEE)

- The Energy Efficiency Program was released in 1998 by the brazilian National Electric Energy Agency (ANEEL), but it was only regulated in 2000, by the Law Nº 9.991, establishing that 0,5% of the net operating revenues of power utilities had to be invested in energy efficiency projects (BRAZIL, 2000);
- Elaboration and execution of PEE projects are carried out by the power utilities at their consumers' facilities, improving the energy efficiency of equipment, processes and end use of energy;

ANEEL
Agência Nacional de Energia Elétrica | Programa de Eficiência Energética - PEE

ANEEL's Energy Efficiency Program (PEE)

Typology	Number of projects	Energy Savings (GWh/year)	Peak Demand Reduction (MW)	Total Cost (US$)
Solar Heating	27	2,1	4.7	3,512,962.53
Low Income	254	1059.5	386.8	245,080,516.47
Commerce and Services	139	45.1	9.5	14,010,506.30
Educational	44	9.2	2.8	21,387,523.26
Municipal Energy Management	9	15.9	0.4	28,055,744.65
Public Lighting	3	2.4	0.6	8,504,198.49
Industrial	42	125.8	9.8	20,104,491.45
Sypply-side	1	0,6	0.2	1,320,385.03
Public Power	290	255.0	52.8	62,944,550.52
Pilot Projet	8	44.2	8.1	3,564,019.73
Residencial	78	209.7	70.1	39,120,713.16
Rural	26	15.6	11.0	6,812,037.36
Public Services	105	115.4	25.0	33,903,867.05
TOTAL	1026	1900.5	581.8	488,321,515.99

Since the publication of NR 300/2008, more than 1600 energy efficiency projects have been registered (until 03/2016), with 1026 energy efficiency projects concluded by June 2018.

Law Nº 12.212 / 2010

Table 1 - List of completed projects from 2008 to 2016
Source: ANEEL (2018c)

MOTIVATION AND OBJECTIVE

PEE is currently considered the largest energy efficiency investment program in Brazil. However, there are no systematic evaluations of it, which would be necessary to justify investments and even to assist and direct the utilities and partners involved to make better use of their resources.

This study aimed to evaluate Low Income typology projects through Energy Efficiency Indicators, that reflect the cost of the program to **save energy and to remove demand at the peak**, comparing them with **the Marginal Expansion Cost of the Brazilian Electricity Sector**, in order to identify if the program is being economically efficient, that is: less money was spent to save energy and reduce peak demand than would be necessary to expand the electricity sector in Brazil?

METHODOLOGY

The study universe was established as the projects of the Low Income typology, completed and with values approved by ANEEL, between the years 2008 and 2013. The material was found in Technical Notes on the Agency's website, from 104 projects.

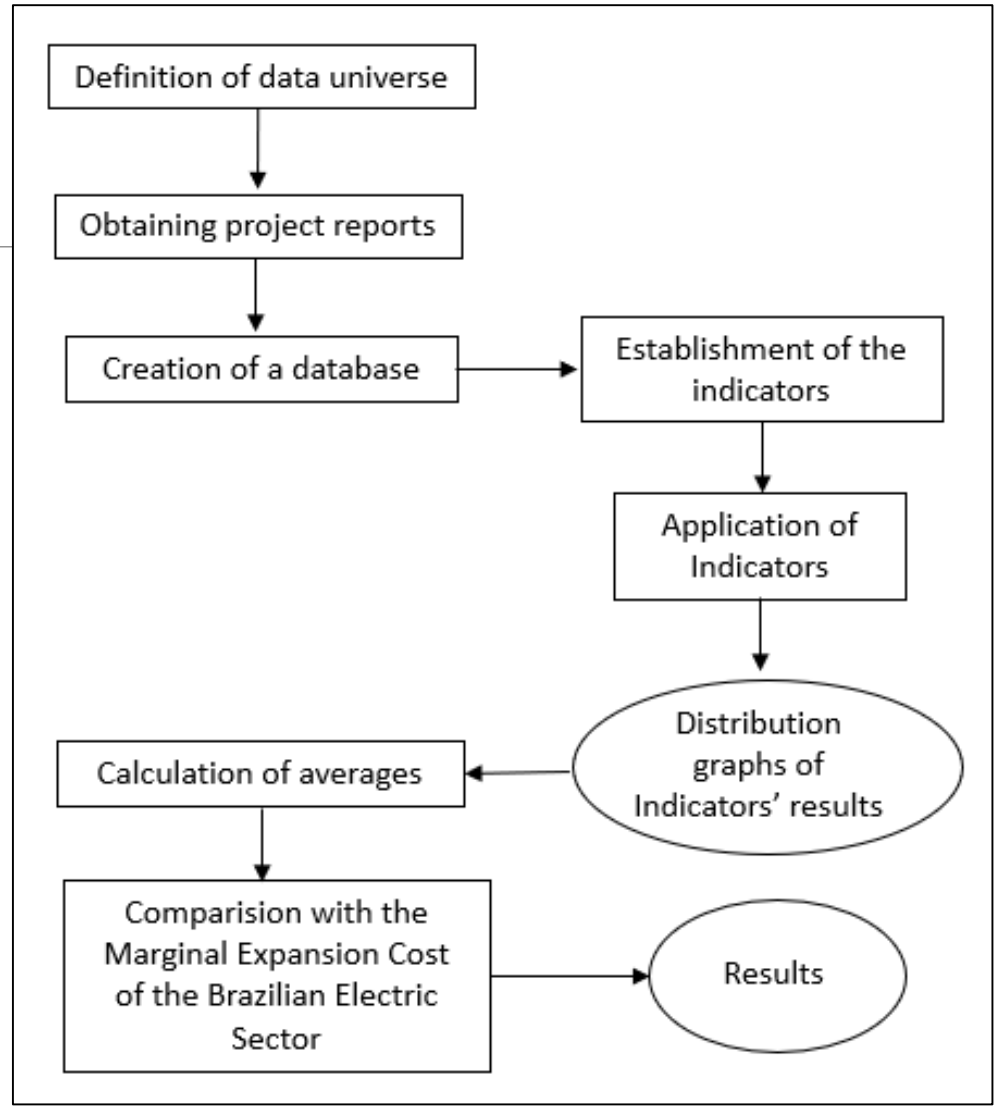


Figure 1 – Methodology's steps

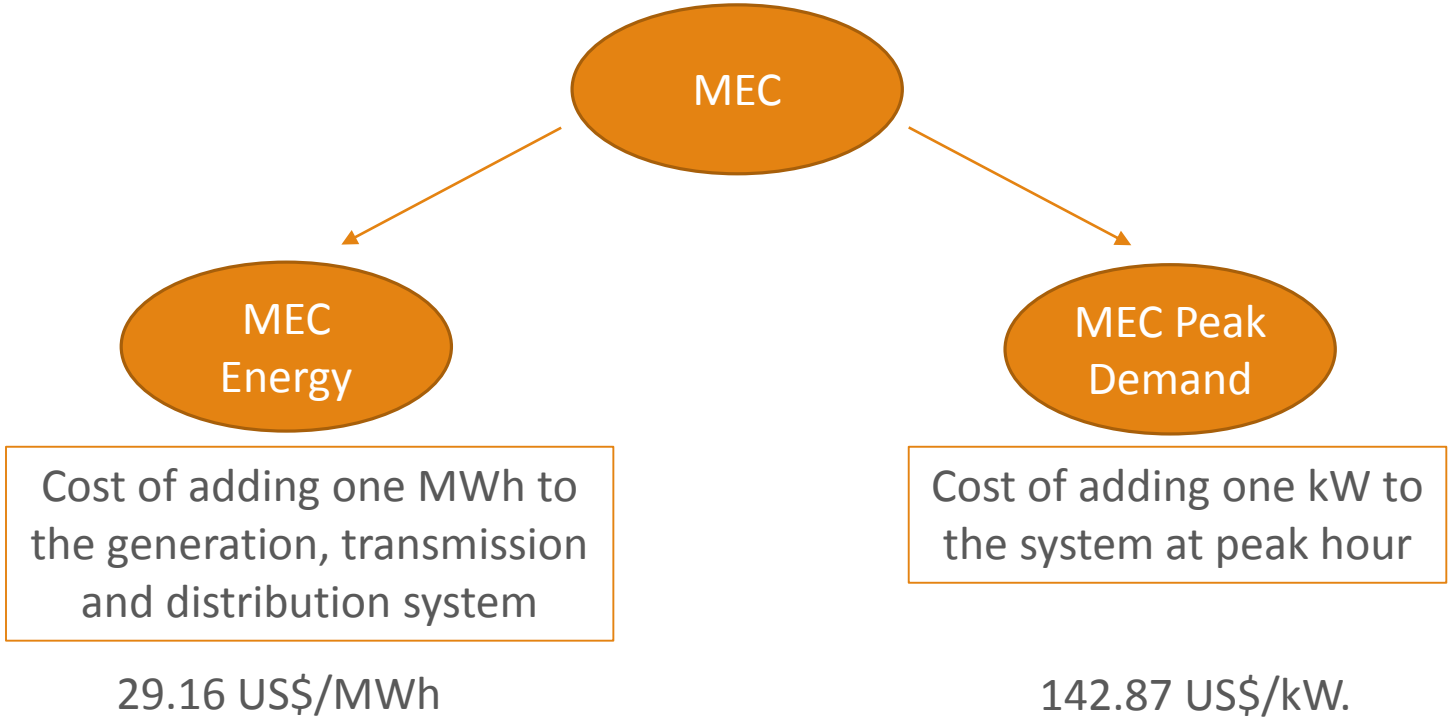
METHODOLOGY

Indicator 1 - $\frac{TAC}{ES} = \frac{Total\ Annualized\ Cost\ \left[\frac{US\$}{year}\right]}{Energy\ Savings\ \left[\frac{MWh}{year}\right]}$

Indicator 2 - $\frac{TAC}{PDR} = \frac{Total\ Annualized\ Cost\ \left[\frac{US\$}{year}\right]}{Peak\ Demand\ Reduction\ [kW]}$

These indicators show the **cost of saving one MWh per year** and **reducing one kW during peak hours**, considering the life of the equipment. They characterize the investment efficiency of a project, and **the smaller the indicators results, the more efficient is the project.**

Marginal Expansion Cost



Source: EPE (2017)

RESULTS

Total Cost	Energy Saving	Peak Demand Reduction
US$ 113 million	**537 GWh**	**174 MW**

Table 2 - Low Income Projects with recognized values - 2008 - 2013

In this universe there are unitary and composite projects, which are classified according to the quantity of end use employed. The most common in the Low Income typology are: **lighting, refrigeration, shower change and bath water heating.**

RESULTS

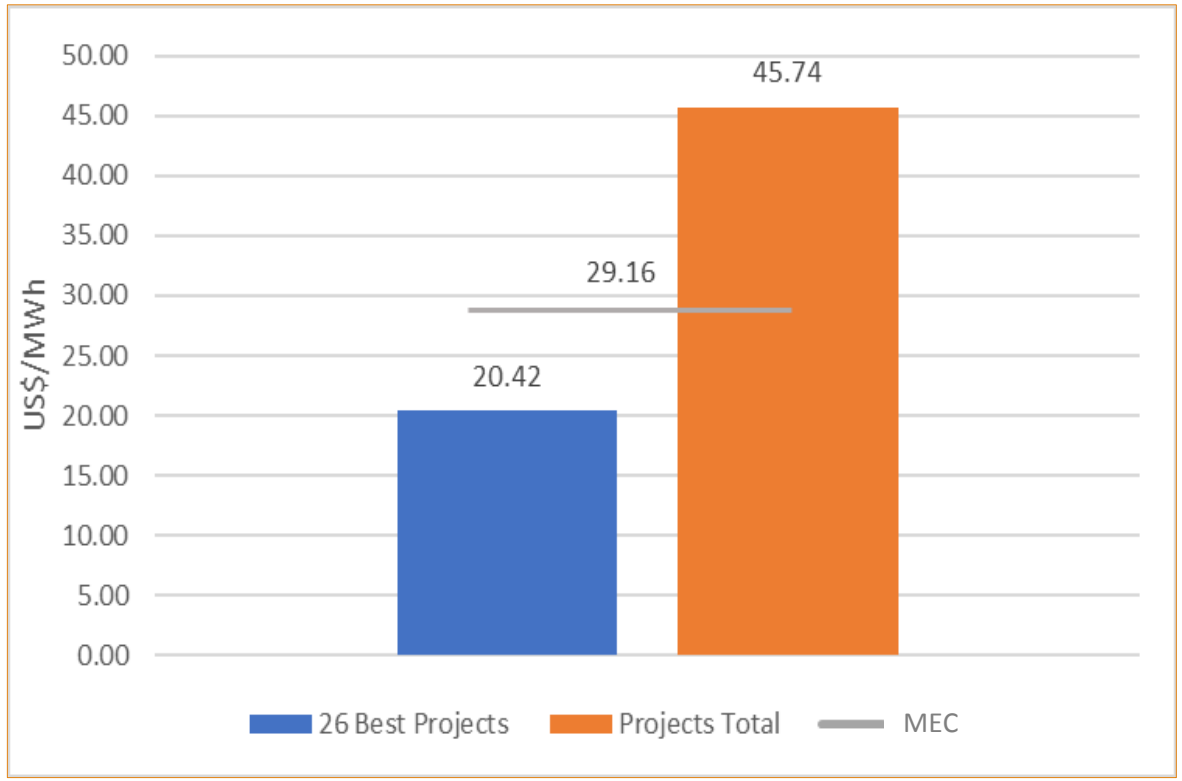


Figure 4: TAC/ES averages x MEC Energy

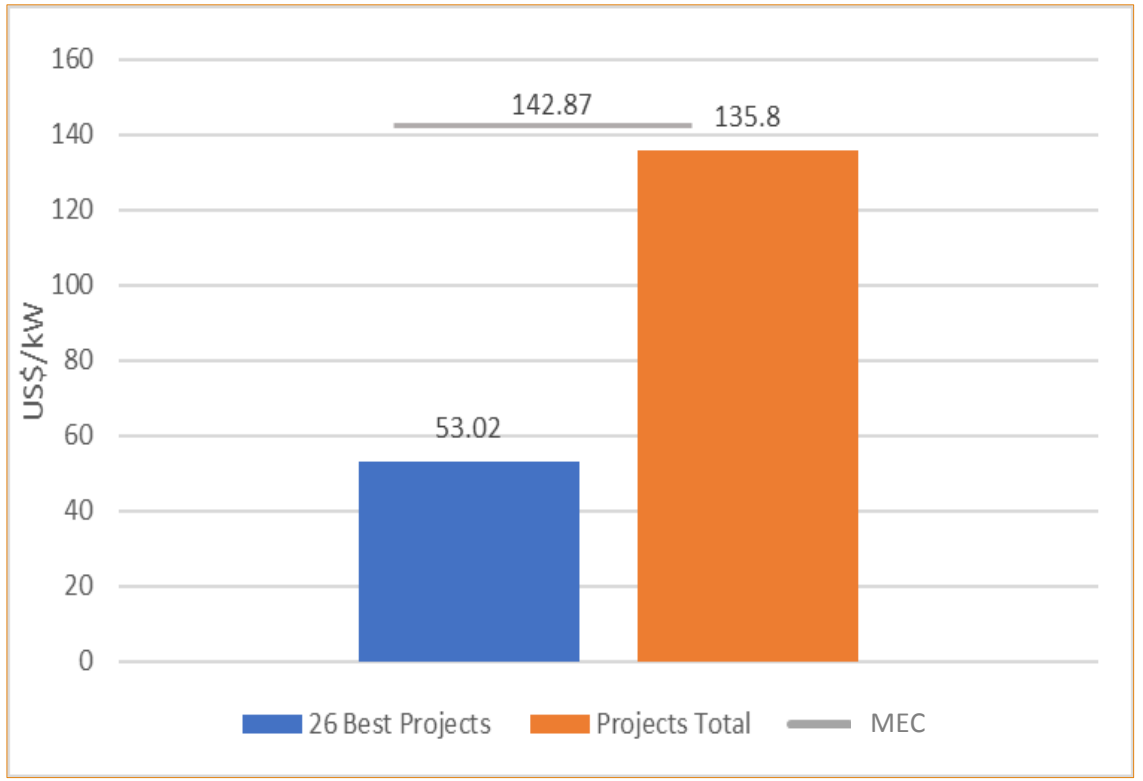


Figure 5: TAC/PDR averages x MEC Peak Demand

25 projects have TAC / ES less than MEC Energy and 63 projects have TAC / PDR less than MEC Power.

RESULTS

Indicator I				Indicator II			
ANEEL's code	Utility	EE MWh/year	CAT/EE US$/MWh	ANEEL's code	Utility	DRP kW	CAT/DRP US$/kW
PE-5379-0001/2010	CETRIL	3,113.64	6.90	PE-5379-0001/2010	CETRIL	1,038.91	20.68
PE-6898-0001/2009	CERBRANORTE	366.47	11.70	PE-6898-0001/2009	CERBRANORTE	153.54	27.93
PE-0397-0008/2009	RGE	14,179.63	11.84	PE-0397-0008/2009	RGE	5,917.96	28.37
PE-0072-0004/2008	CLFSC	1,204.24	13.31	PE-0071-0001/2009	CPEE	797.03	31.06
PE-0046-0003/2009	SULGIPE	2,191.91	15.07	PE-0073-0001/2009	CSPE	845.55	34.03

*MEC Energy 29.16 US$/MWh / MEC Peak Demand 142.87 US$/kW

CONCLUSION

- Despite the existence of a Manual defined by ANEEL for the elaboration and execution of projects, the scope of the analyzed projects are very different, as well as their results. There are some well executed projects, with efficient investment, but on the other hand, many projects are still spending more to do energy efficiency actions than would be necessary to expand the electric system;
- It is necessary to improve economic performance of future projects and ensure that the vast majority are economically efficient;
- Energy Efficiency Projects are really important in our current scenario of energy demand increase. Brasil has still a large potential for energy efficiency actions;
- The best evaluated projects show that it is possible to have high standard efficiency projects. These can be used as benchmark for utilities to learn from each other, focusing on best practices and performance, and achieving the optimum level of investment, energy savings and peak demand reduction.

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