

DEVELOPING THE ENERGY-RELATED BRAZILIAN NATIONALLY DETERMINED CONTRIBUTION (NDC)

*Workshop em modelagem e simulação de cenários
de longo prazo no setor de energia e emissões de
gases de efeito estufa associadas no Brasil*

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SUMMARY

- *BRAZILIAN NDC AND DOMESTIC ENERGY SECTOR*
- *SOCIO-ECONOMIC SCENARIO*
- *ELETRICITY CONSUMPTION & GENERATION*
- *FUEL CONSUMPTION*
- *ENERGY MATRIX, GHG EMISSIONS & INDICATORS*
- *CURRENT DEVELOPMENT ACTIONS*

BRAZILIAN NDC AND DOMESTIC ENERGY SECTOR

BRAZILIAN NATIONALLY DETERMINED CONTRIBUTION (NDC)

CONTRIBUTION

*Reduce greenhouse gas emissions by **37%** below 2005 levels in 2025*

SUBSEQUENT INDICATIVE CONTRIBUTION

*Reduce greenhouse gas emissions by **43%** below 2005 levels in 2030*

TYPE

Absolute target in relation to a base year

COVERAGE

100% of the territory, economy-wide, including CO₂, CH₄, N₂O, perfluorocarbons, hydrofluorocarbons and SF₆

REFERENCE

2005

TIMEFRAME

Single-year target for 2025; indicative values for 2030 for reference purposes only

METRIC

100 year Global Warming Potential, using IPCC AR5 values

Brazil's NDC is economy wide and therefore is based on flexible pathways to achieve the 2025 and the 2030 objectives.

In that sense, this presentation is meant to be for clarification purposes only.

BRAZILIAN NDC – Energy Sector

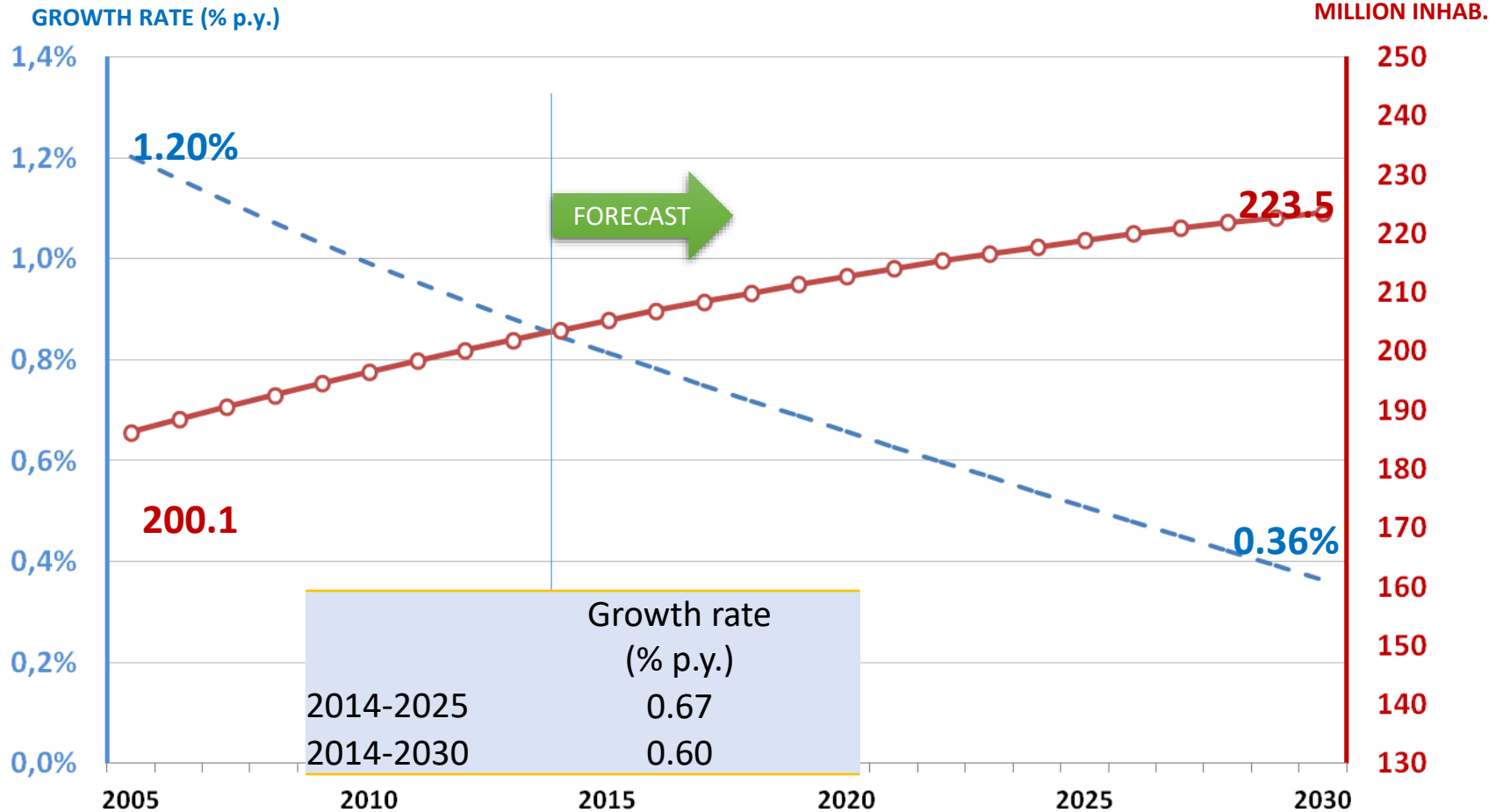
- What is the level of effort for the Energy sector?
 - The economic scenario and the commitment
 - The role of energy efficiency
 - New path for distributed generation
 - Hydropower: the importance for the commitment

SOCIO-ECONOMIC SCENARIO

POPULATION




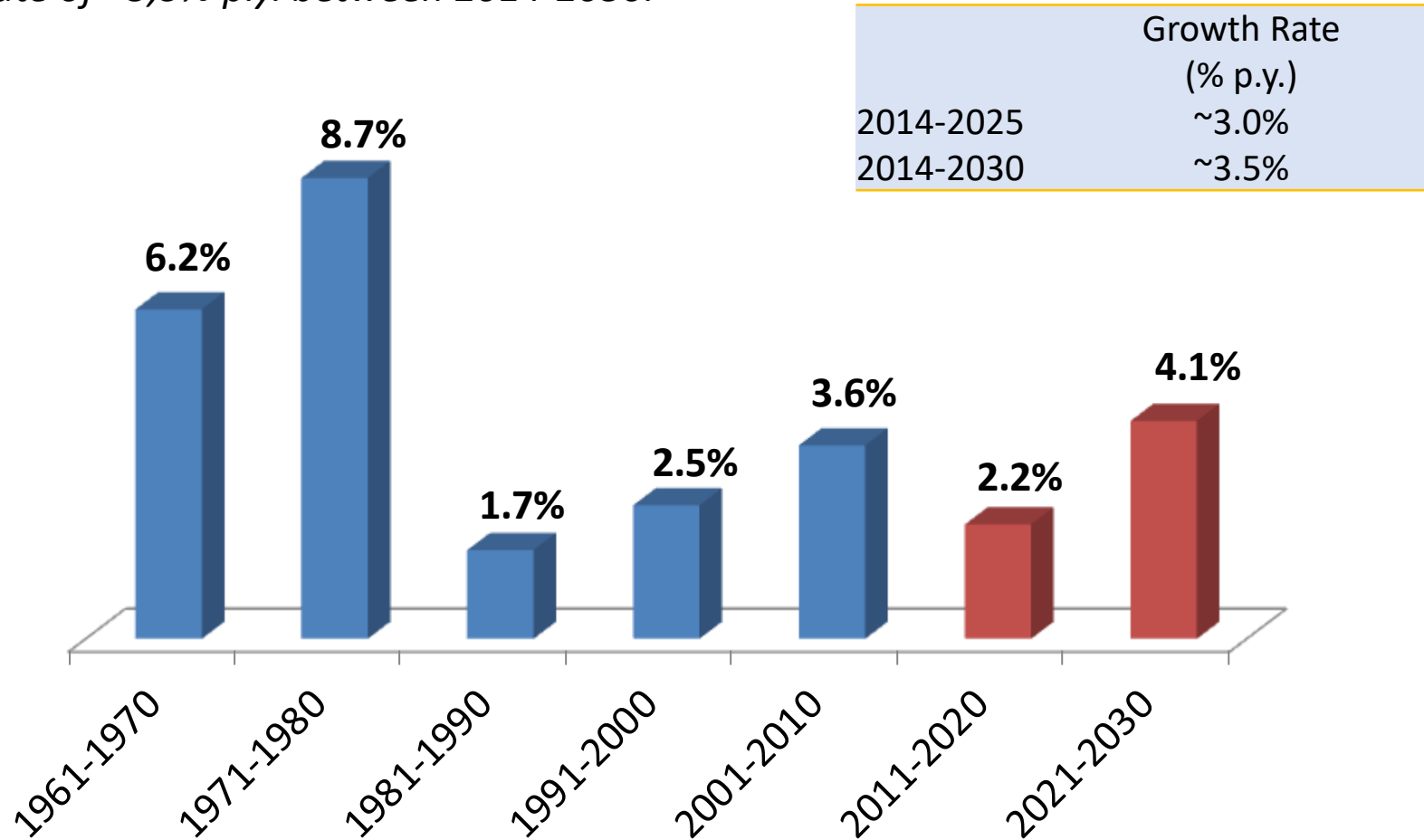
Until 2030, Brazilian population increase - near 20 million, equivalent to current Australia population.



Source: EPE

GDP SCENARIO

 Brazilian economy will be 1,7 times of 2014, growth rate of ~3,5% p.y. between 2014-2030.



Source: EPE

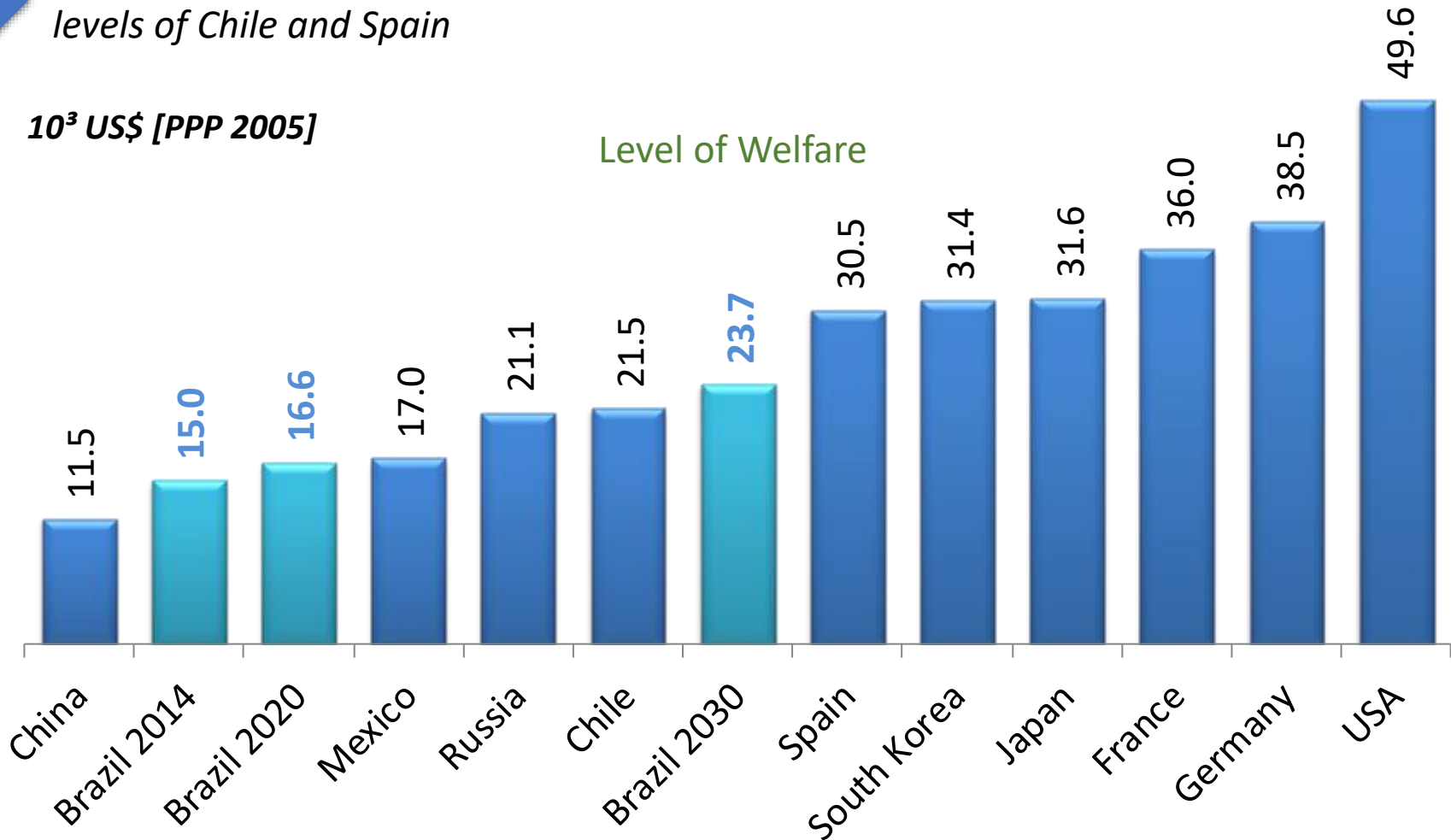
GDP PER CAPITA



Average growth rate - Brazilian GDP: 3.4% p.y., current levels of Chile and Spain

10³ US\$ [PPP 2005]

Level of Welfare

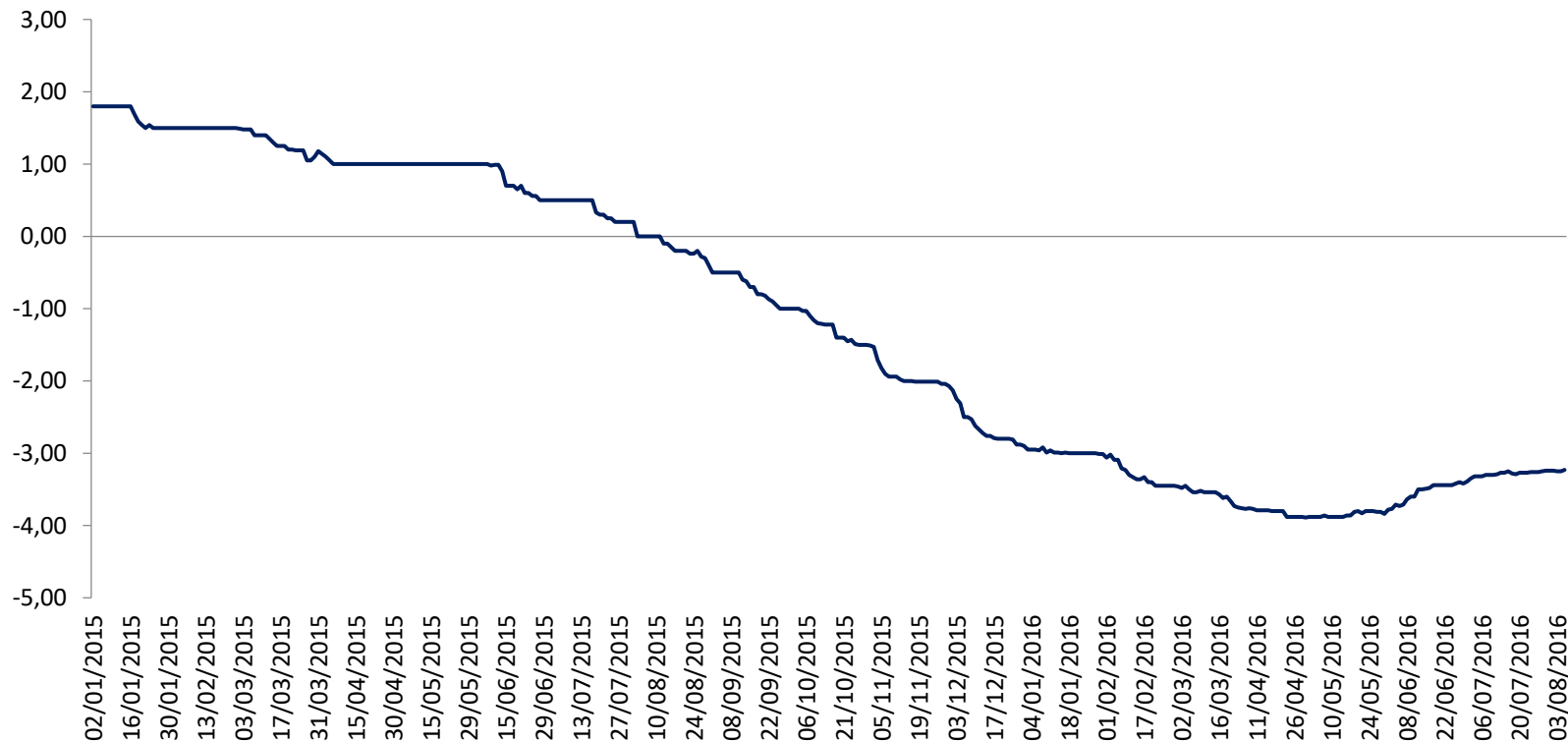


Source: Brazil Data: EPE; International Data: IEA

* International data of GDP per capita for 2014.

GDP GROWTH

2016 MARKET FORECASTS - Uncertainty



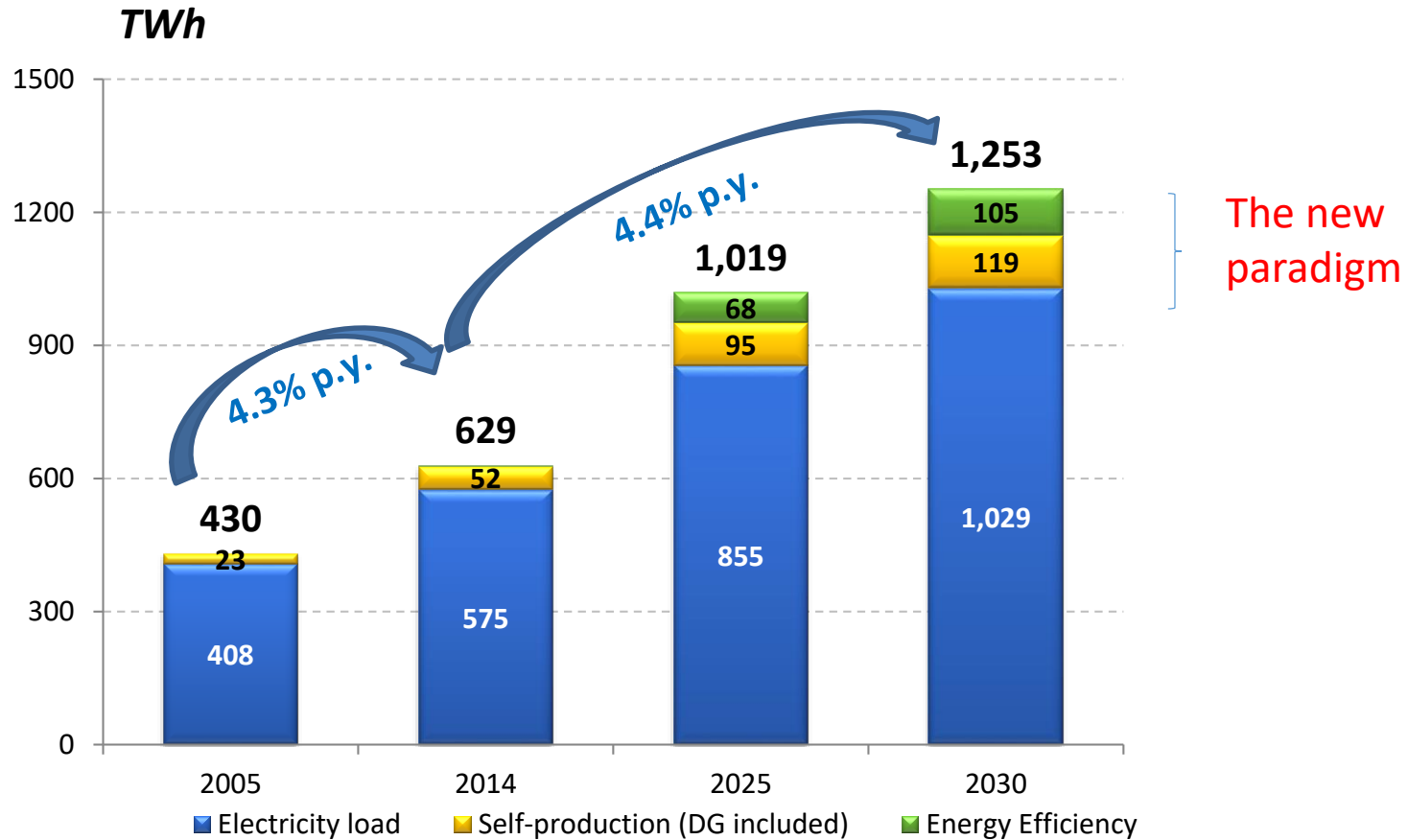
Evolução da projeção do crescimento do PIB de 2016

Fonte: Bacen, 2016. Boletim FOCUS

ELETRICITY CONSUMPTION & GENERATION

TOTAL ELECTRICITY CONSUMPTION

➔ Electricity consumption in Brazil will be twice until 2030 (compared to 2014).
Energy efficiency and distributed generation will have fundamental role.



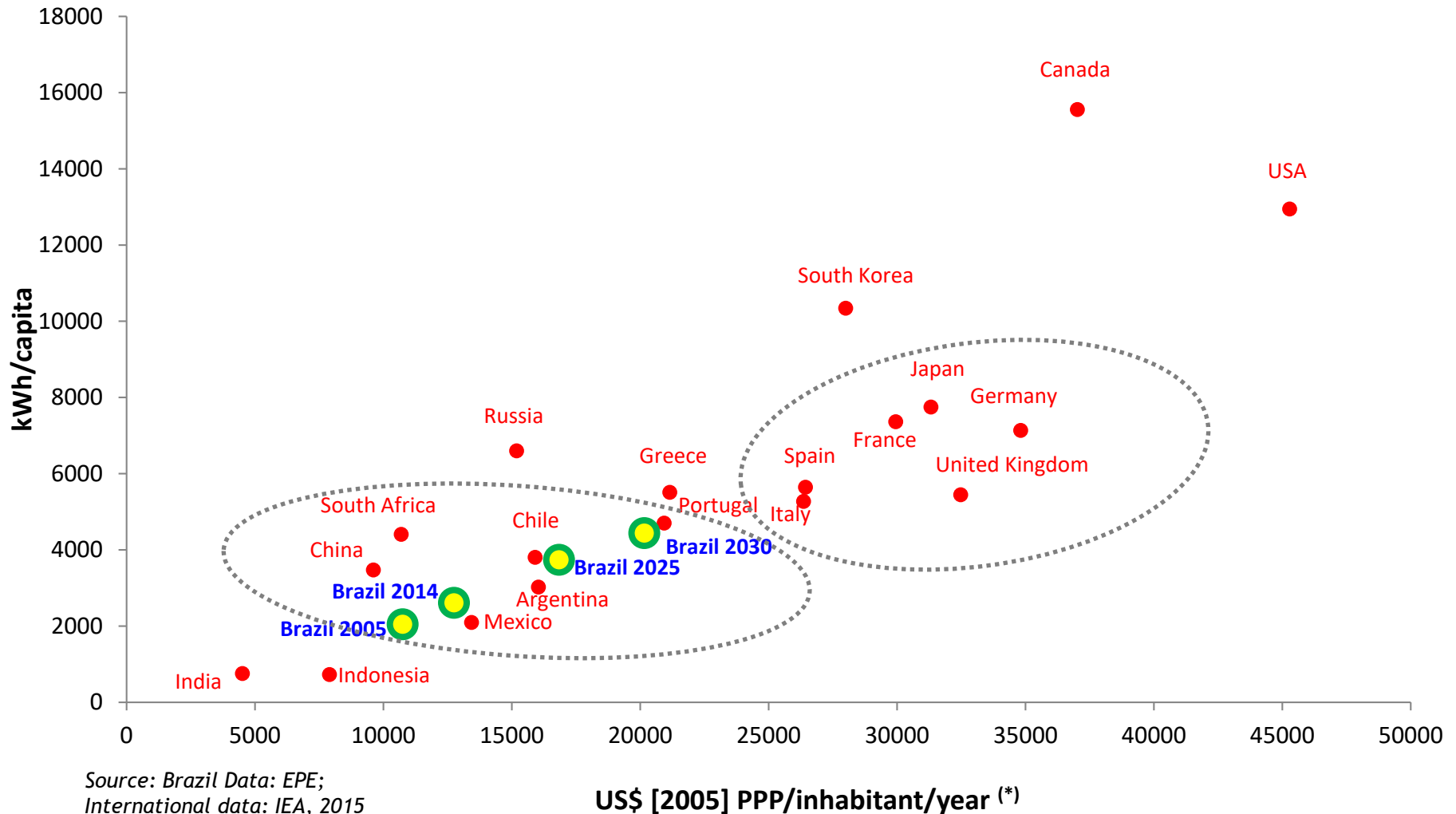
Source: EPE

Note: Electricity load includes electricity consumption and losses

PER CAPITA CONSUMPTION OF ELECTRICITY

INTERNATIONAL COMPARISON

Despite the increase of electricity per capita consumption, Brazil still remains far from current levels of OECD countries



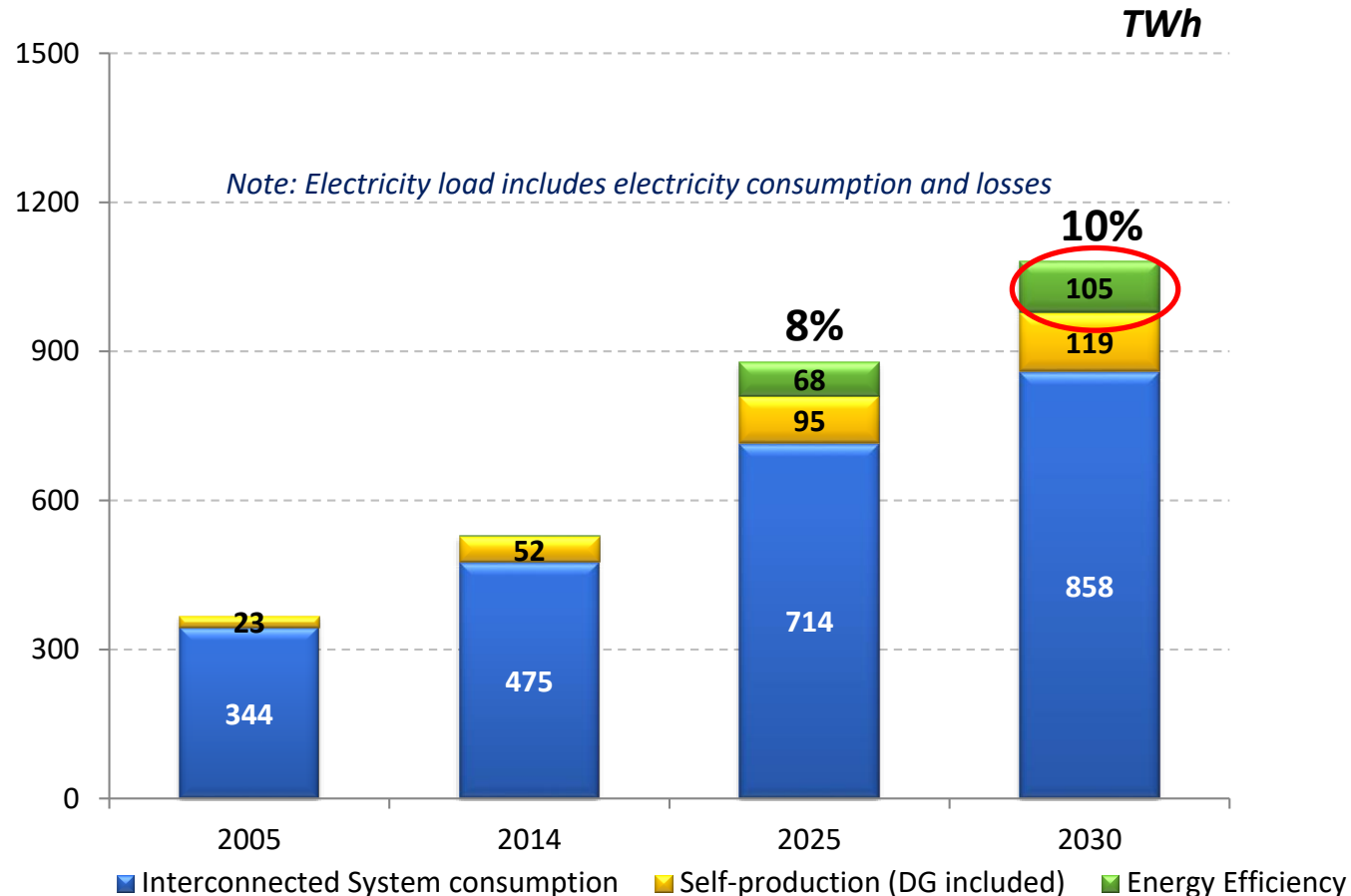
Source: Brazil Data: EPE;
International data: IEA, 2015

US\$ [2005] PPP/inhabitant/year (*)

ELECTRICAL EFFICIENCY



For the NDC: Achieving 10% efficiency gains in the electricity sector by 2030.



Source: EPE

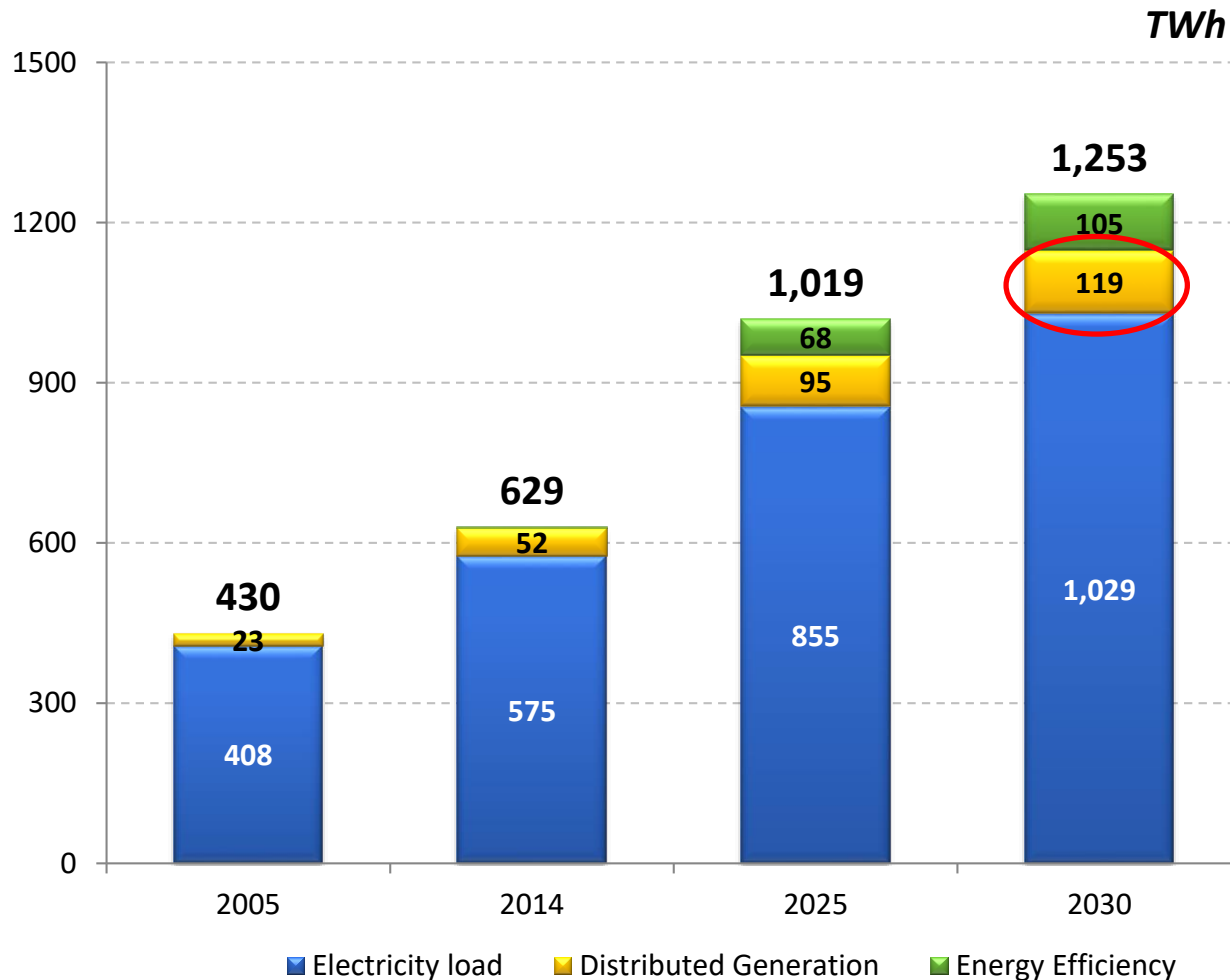
Note 1: Refers to total electricity consumption. Losses are not accounted for energy efficiency estimates.

Note 2: 2013 is the base-year.

DISTRIBUTED GENERATION



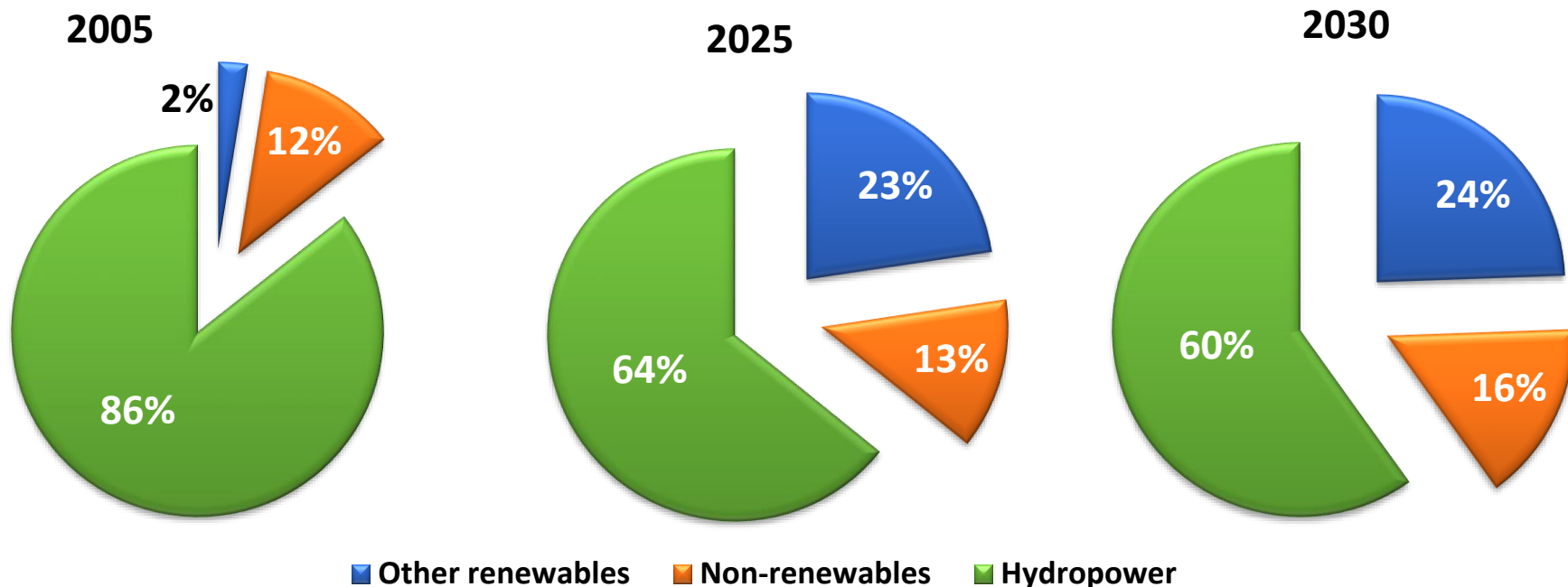
Distributed Generation contributes for about 10% of future electricity needs in Brazil



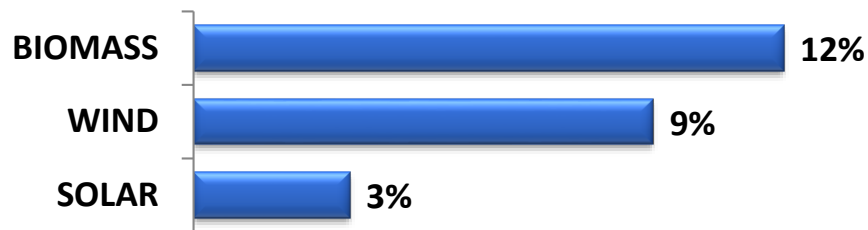
Source: EPE

RENEWABLES IN ELECTRICITY SUPPLY

For the NDC: Increasing the share of renewables (other than hydropower) in the power supply to at least 23% by 2030 (share of wind, biomass and solar)



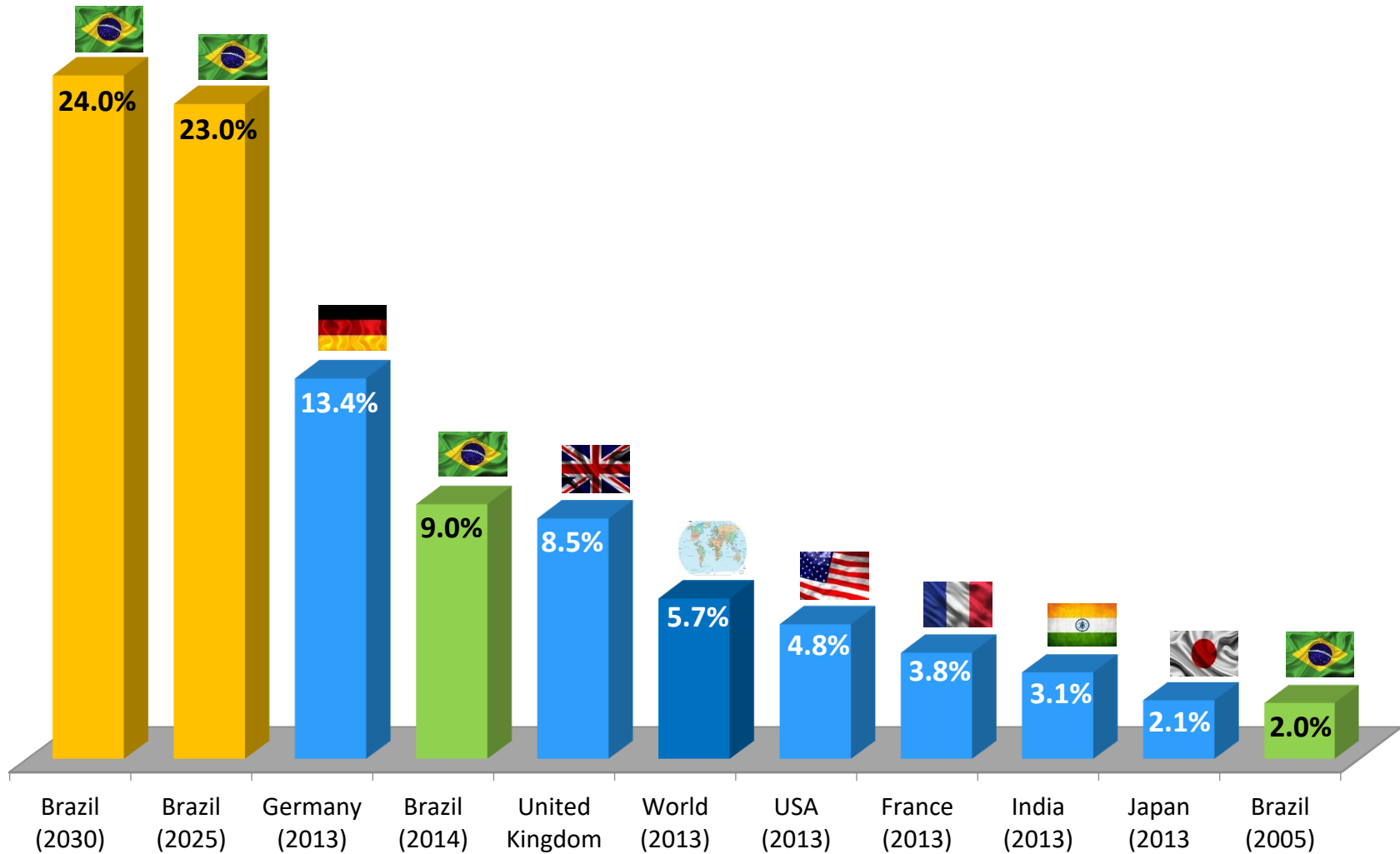
Share of renewables (other than hydropower) in 2030



Source: EPE

RENEWABLES IN ELECTRICITY SUPPLY

(% EXCLUDING HYDROPOWER)



Source: EPE (Brazil data); IEA (International data) (2013)

HYDROPOWER IN ELECTRICITY SUPPLY (TWh)

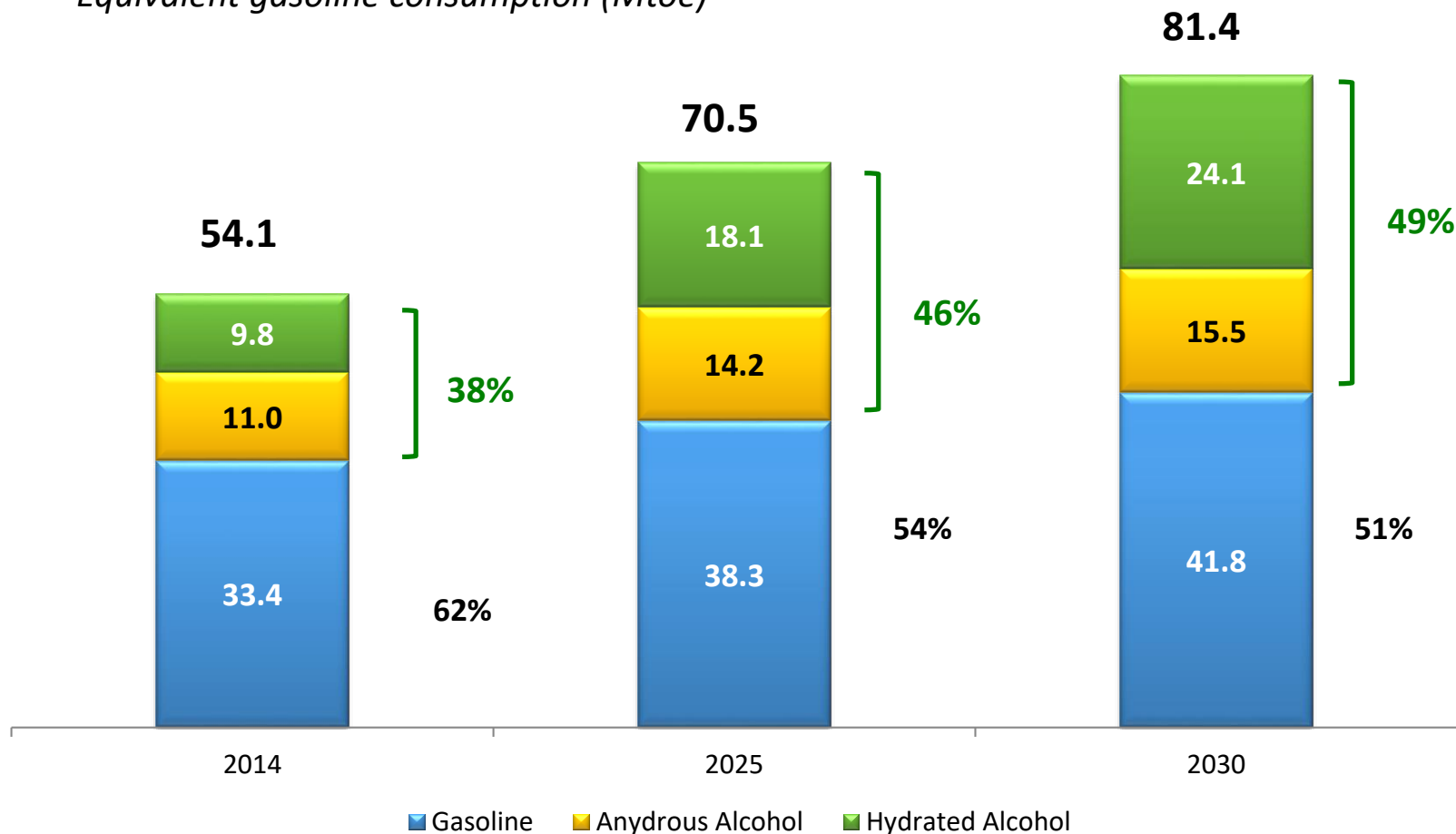
Electricity Generation	2014		2030	
	TWh	%	TWh	%
Hydropower	404	71	690	66
Natural Gas	72	13	76	7
Coal	11	2	17	2
Nuclear	15	3	39	4
Biomass	18	3	76	7
Wind	12	2	105	10
Solar (power plants)	0	0	26	3
Others	39	7	4	0,4
Biogas (distributed gen.)	0	0	3,1	0,3
Solar (distributed gen.)	0	0	9,4	1
Total	572	100	1.045	100

Source: EPE

FUEL CONSUMPTION

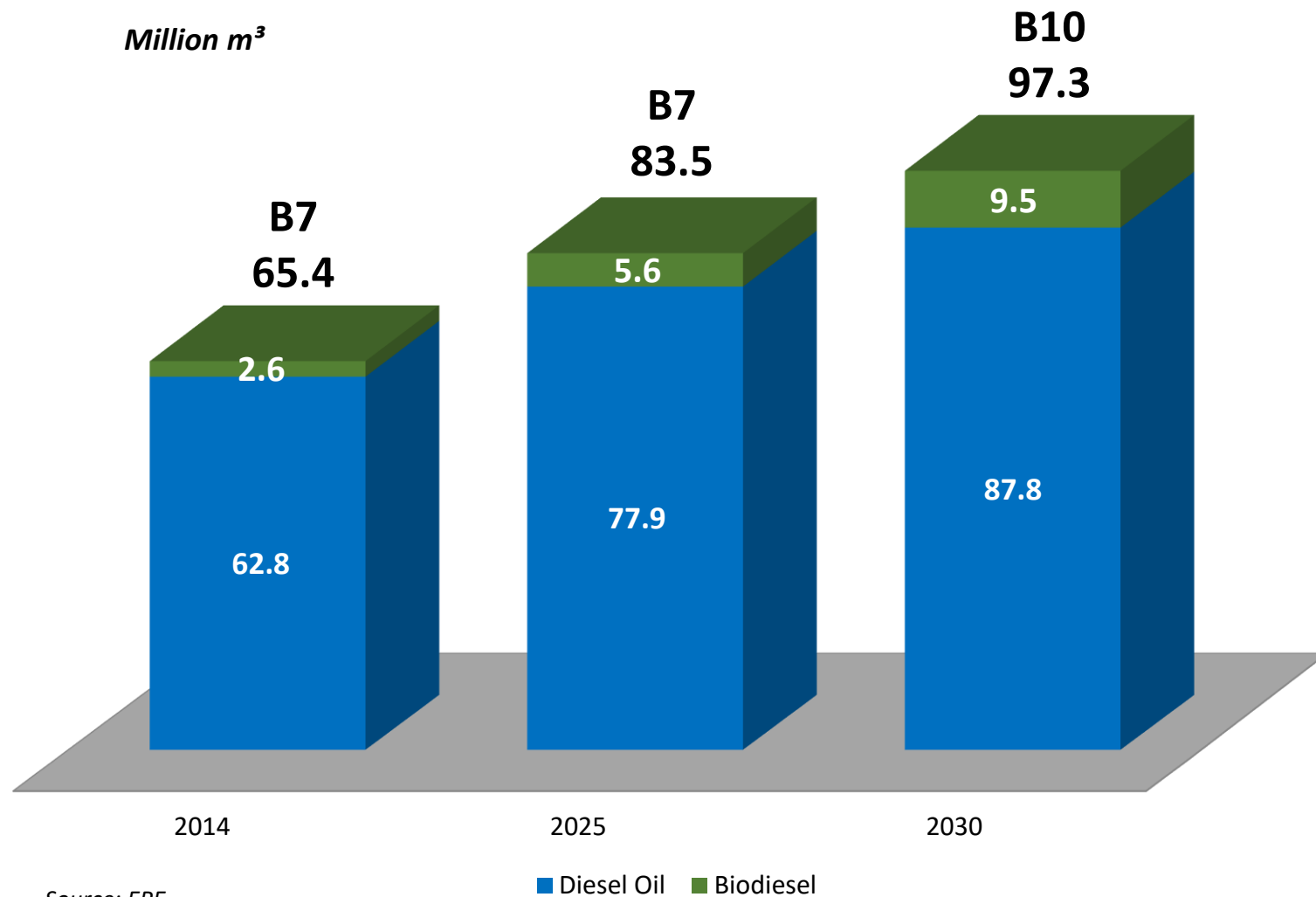
ETHANOL & GASOLINE CONSUMPTION

Equivalent gasoline consumption (Mtoe)



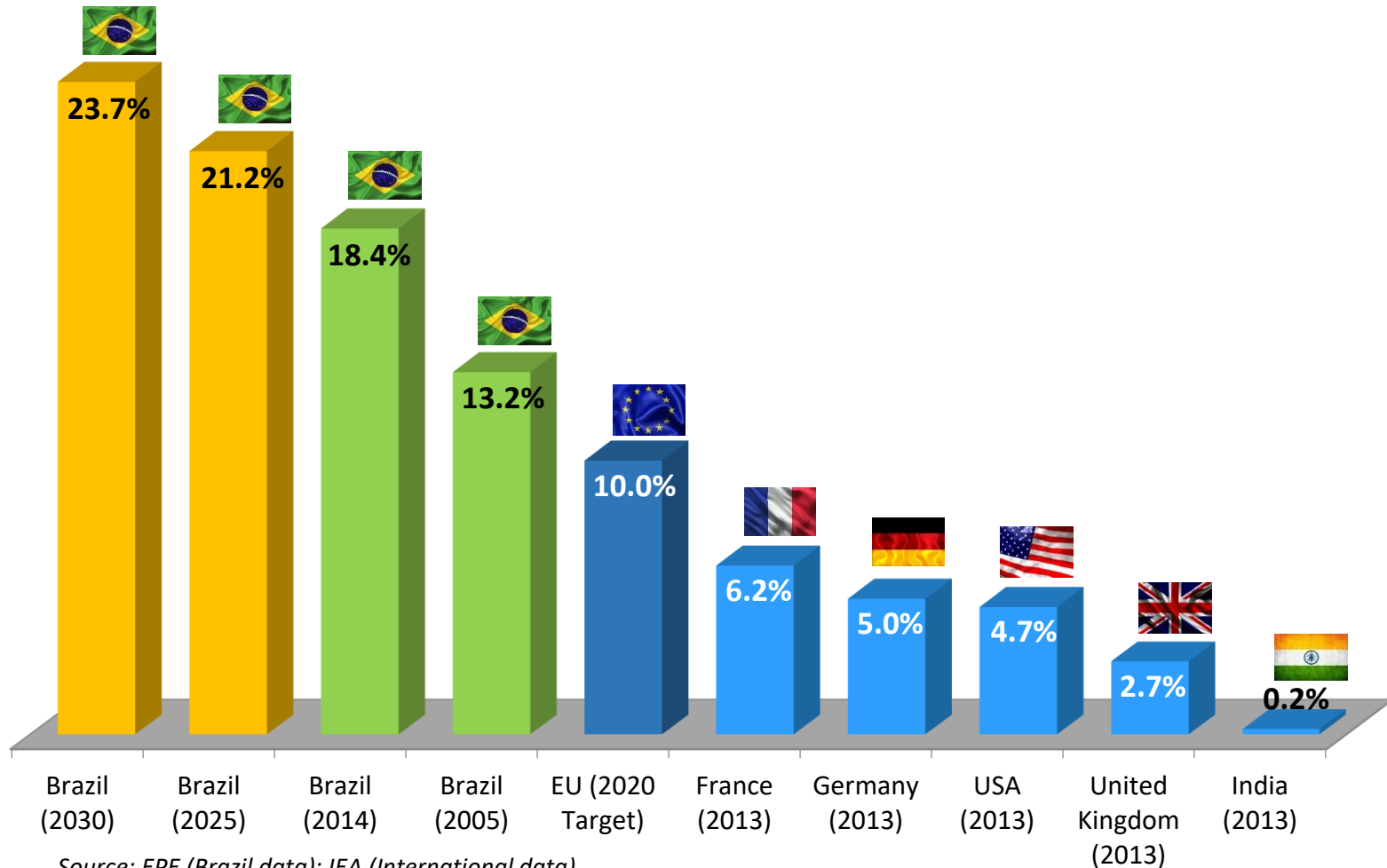
Source: EPE

BIODIESEL CONSUMPTION



Source: EPE

SHARE OF BIOFUELS IN TRANSPORTATION ENERGY CONSUMPTION



Source: EPE (Brazil data); IEA (International data)

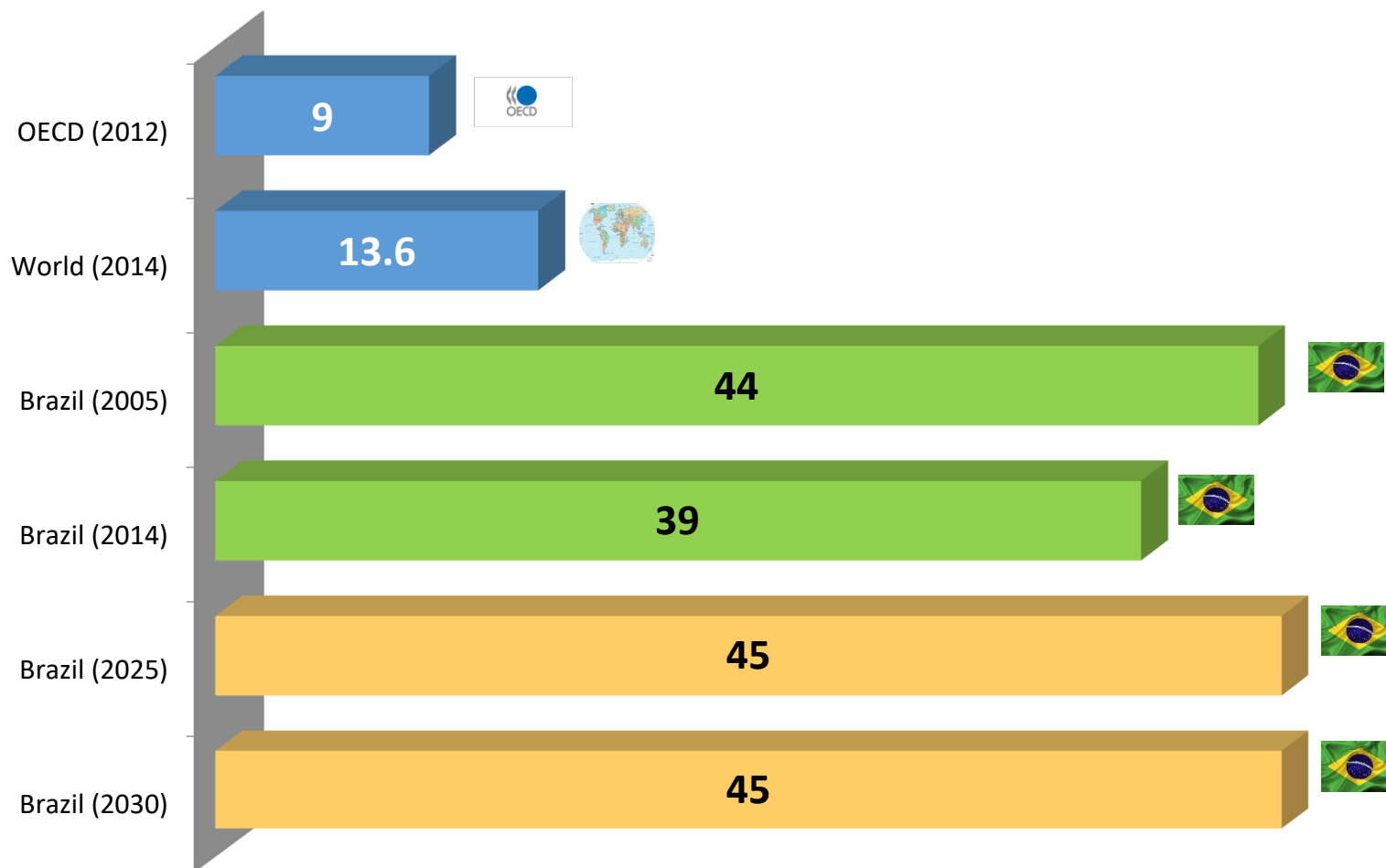
Note1: For Brazil, includes ethanol and biodiesel.

Note2: Corresponds to biofuels and waste data.

ENERGY MATRIX, GHG EMISSIONS & INDICATORS

SHARE OF RENEWABLES ON ENERGY MATRIX

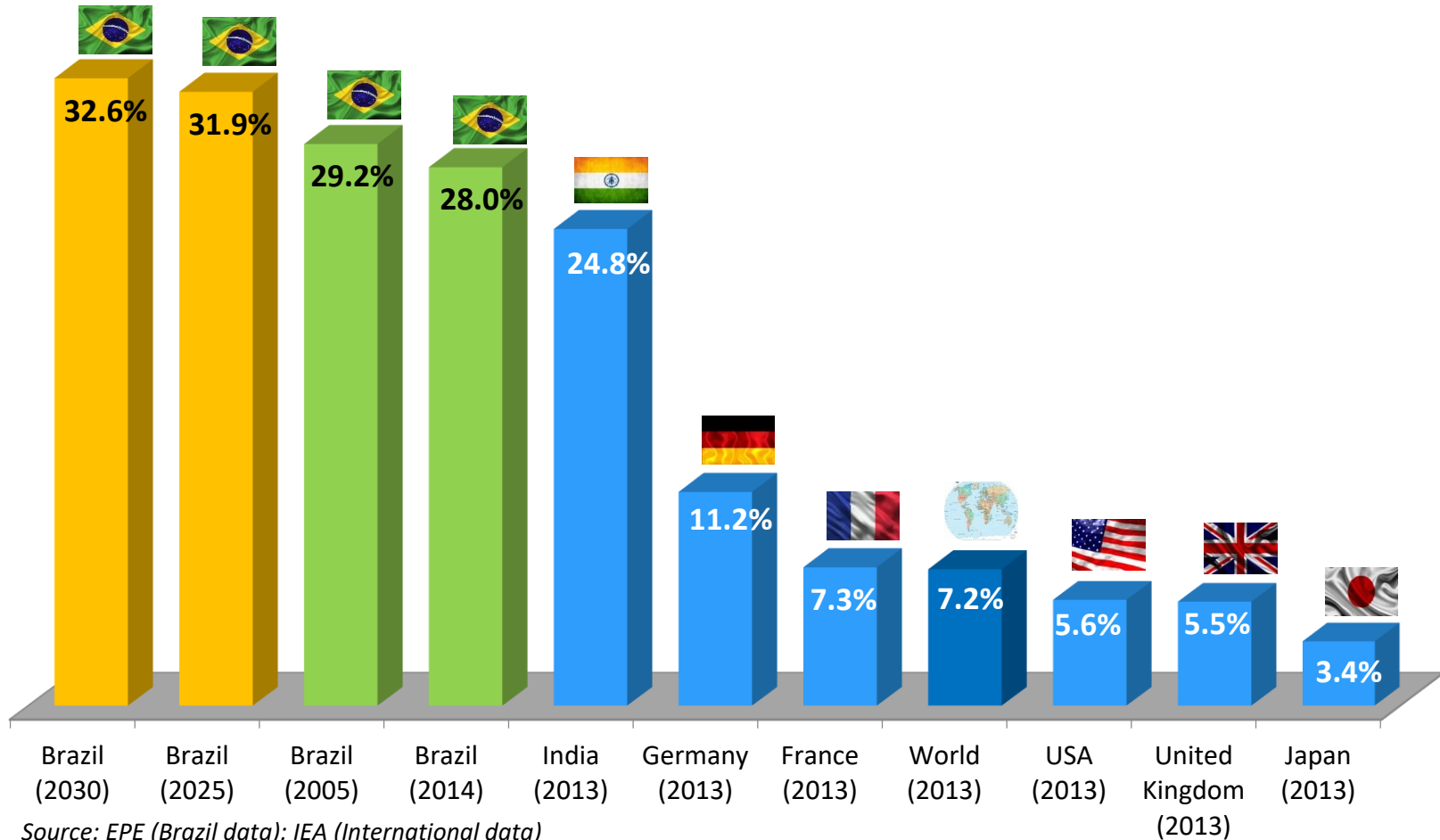
For the NDC: Achieving 45% of renewables in the energy mix by 2030.



Source: EPE; IEA

SHARE OF RENEWABLES IN TOTAL PRIMARY ENERGY SUPPLY (TPES) EXCLUDING HYDROPOWER/ELECTRICITY

For the NDC: Expanding the use of renewable energy sources other than hydropower in the total energy mix to between 28% and 33% by 2030.



Source: EPE (Brazil data); IEA (International data)

Note: For Brazil, includes ethanol and biodiesel.

For other countries corresponds to biofuels and waste

CURRENT DEVELOPMENT ACTIONS

EPE'S CONTRIBUTION FOR BRAZILIAN NDC

• MAIN FOCUS

- Renewable Power Generation
 - Hydropower
 - Intermittent Sources (solar, wind)
- Energy Efficiency
- Biofuels

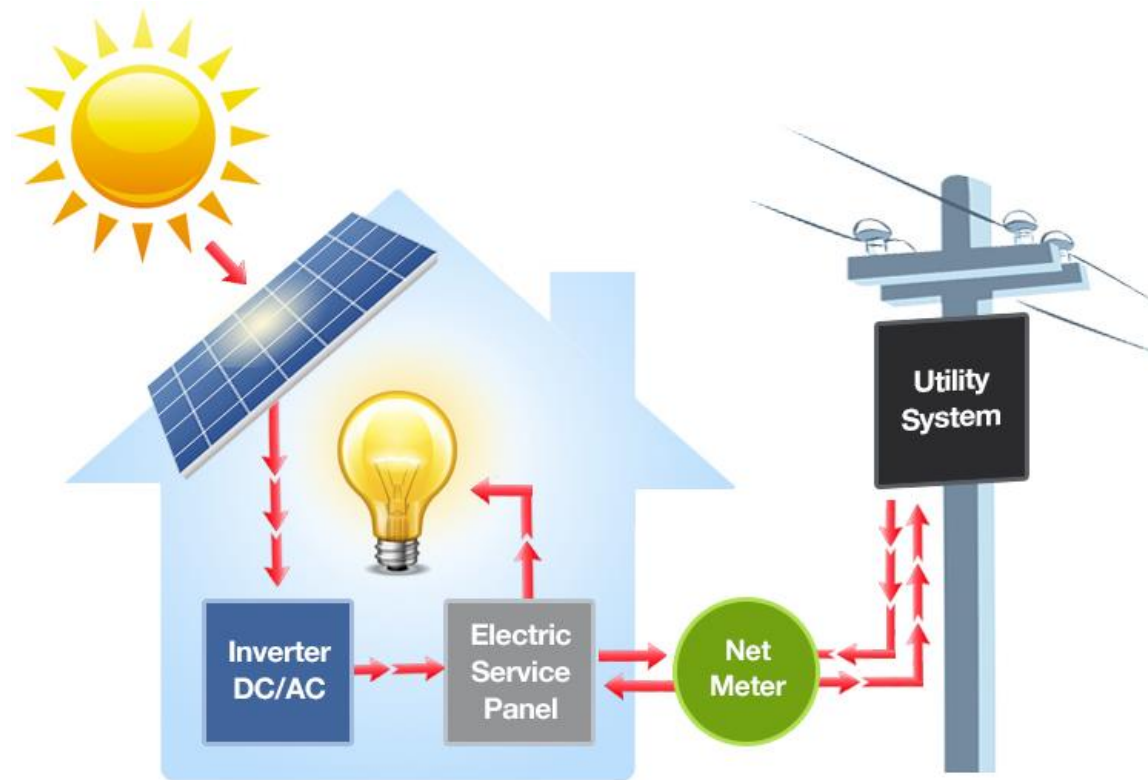
• CURRENT ACTIONS

- Strengthen the role of hydropower in electricity matrix
- Studies for supporting Energy Efficiency Plan
- Biodiesel share increasing
- Biofuture Platform

DISTRIBUTED GENERATION

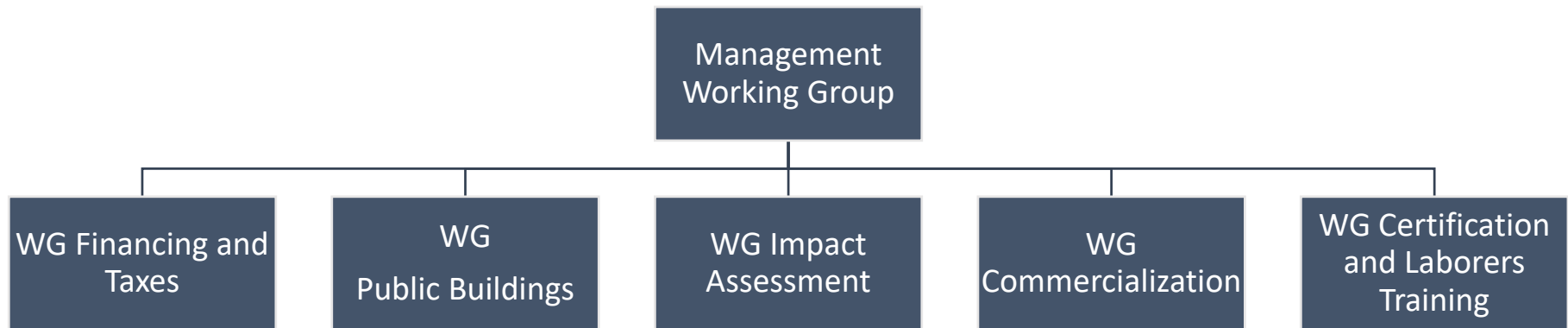
REGULATORY FRAMEWORK FOR DISTRIBUTED GENERATION IN BRAZIL

- Net Metering Model was approved in Brazil in 2012;
- In 2015 there was a review of the regulation, which brought several improvements, as:
 - higher power limit;
 - new business models;
 - reduced deadlines;
 - standardization of procedures.
- Valid for any renewable and cogeneration source;
- Up to 5 MW (3 MW for hydropower).



ProDG

- Federal Program to foster renewable distributed power generation and cogeneration;
- Under the umbrella of the ProDG initiative, a working group (WG) has been created to identify means to meet the program objectives;
- It was divided into five specific working groups:



- Several recommendations were made by the working groups → on track to be implemented.

VRES (Specific Value for DG)

- Set specific acquisition tariffs for electricity generated from some sources as solar photovoltaics and natural gas-based CHP
- Utilities can buy at higher prices than they buy from electricity auctions
- Electricity companies can contract through voluntary auctions and include all values in final consumer tariff
- Up to 10% of this total market

ENERGY EFFICIENCY

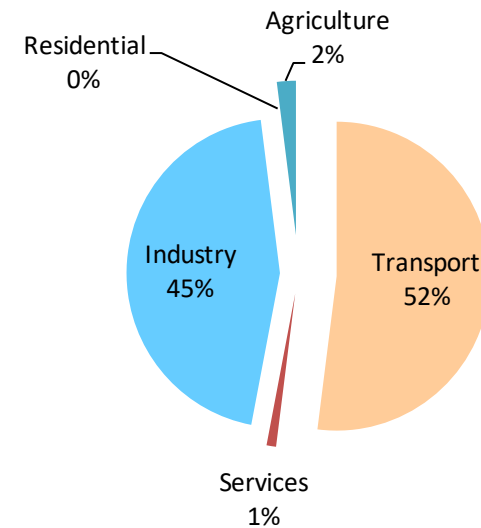
ENERGY EFFICIENCY 2030: ELECTRICITY CONSUMPTION

Contribution the overall electrical efficiency by sector



But considers also...

Contribution of each sector to the overall energy efficiency



Possible mechanisms:

- Labelling programs
- Demand response
- Energy Efficient Buildings
- Energy Auditing Programs
- Autonomous actions

MAIN ACTIONS IN ENERGY EFFICIENCY IN BRAZIL

LABELLING PROGRAM



PBE
INMETRO

1984

NATIONAL PROGRAMS OF
ENERGY CONSERVATION
(ELECTRICITY AND FUELS)



PROCEL

1985



conpet

1991

UTILITIES ENERGY
EFFICIENCY PROGRAM

**PEE – Programas de Eficiência das
Concessionárias de Energia Elétrica**

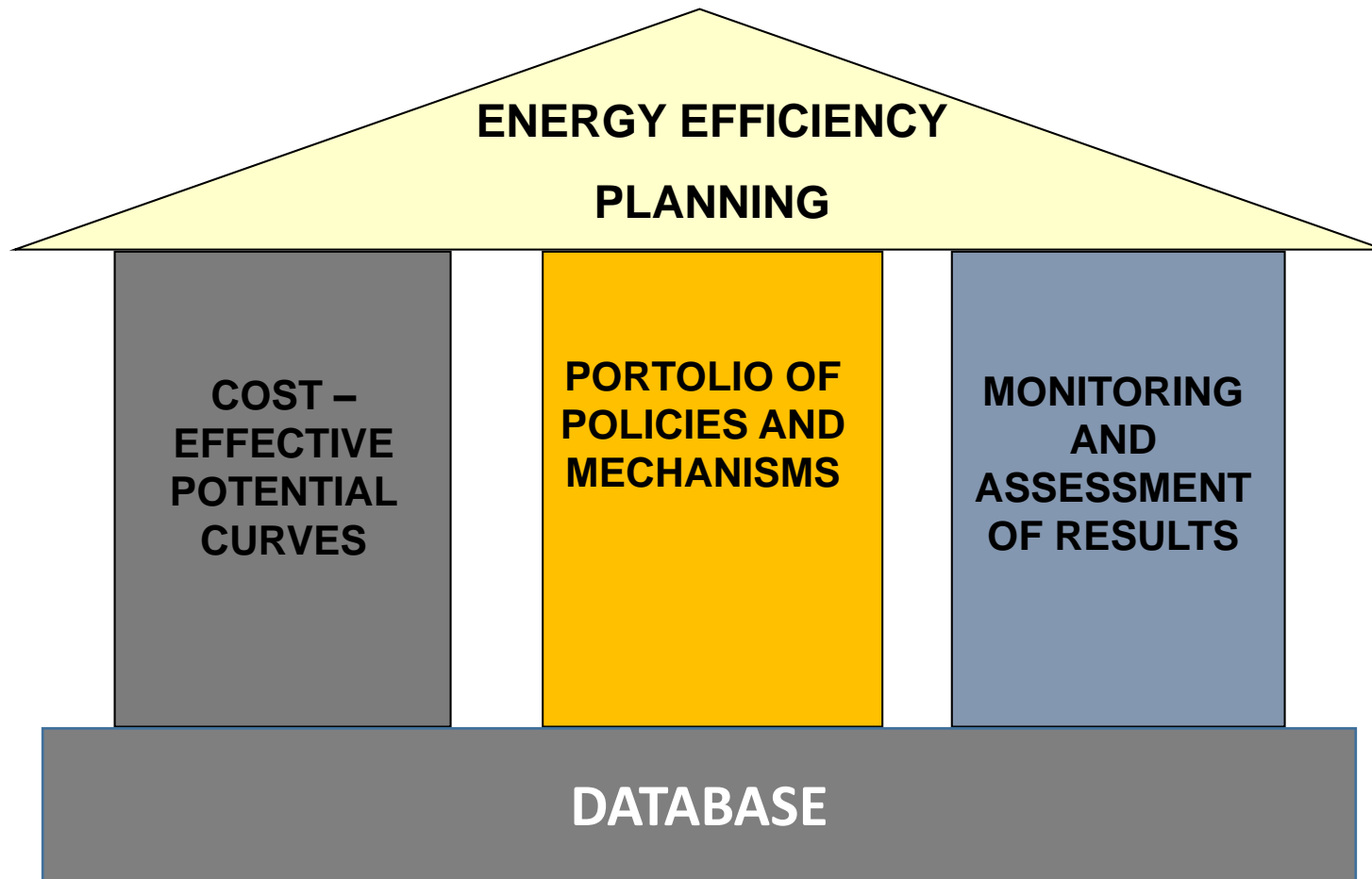
2000

MINIMUM EFFICIENCY
STANDARDS Standards

Lei de Eficiência Energética
(nº 10.295, de 17 de outubro de 2001)

2001

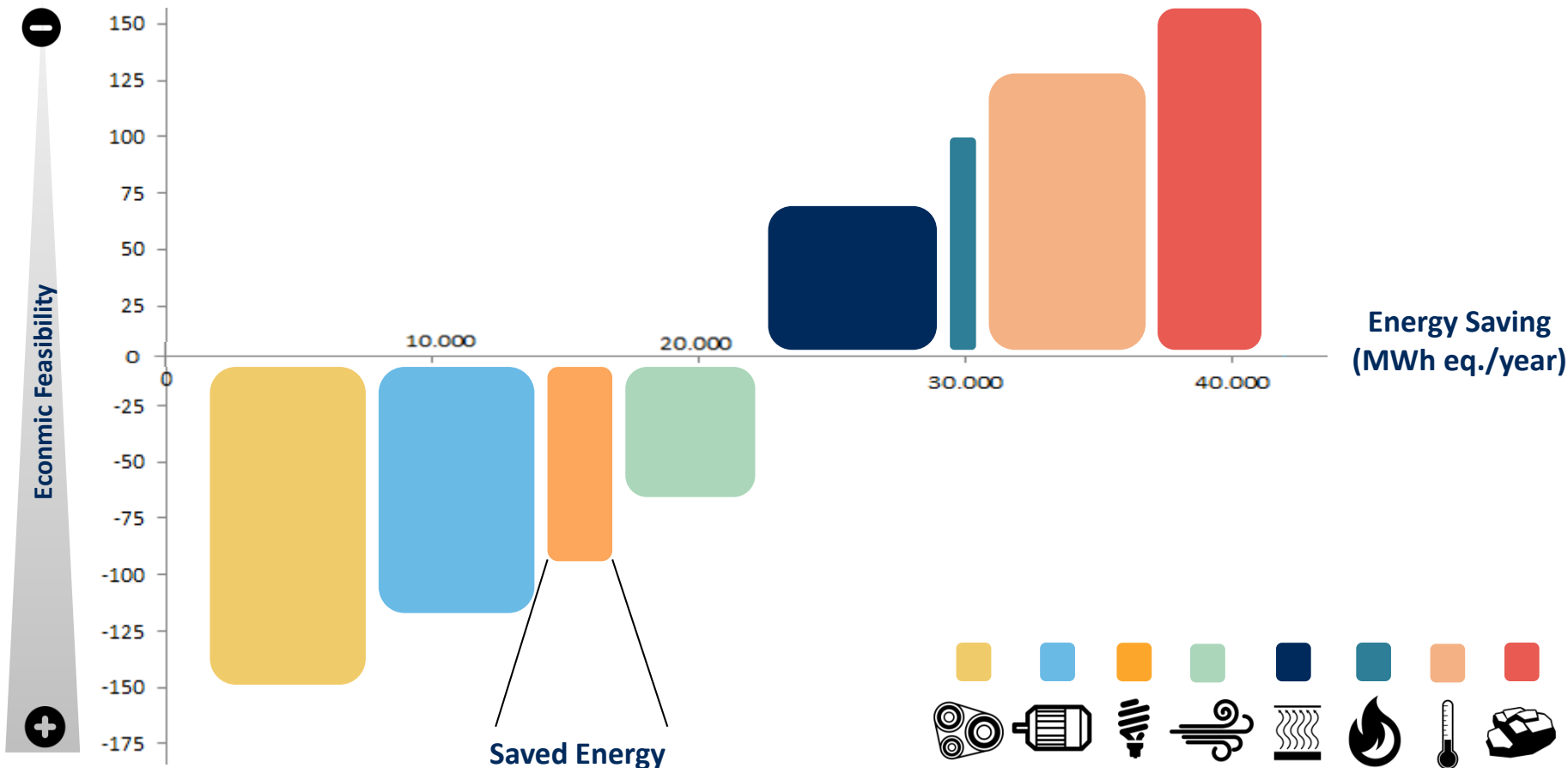
GENERAL APPROACH FOR ENERGY EFFICIENCY



COST POTENTIAL CURVES FOR ENERGY EFFICIENCY

Cost of Saved Energy = (R\$/MWh eq.)

$$\text{Incremental CAPEX} + \text{Incremental OPEX} - \text{Energy price}$$



COST POTENTIAL CURVES FOR ENERGY EFFICIENCY

Developed Studies

✓ *Iron & Steel*

✓ *Ferro-alloys*

✓ *Pulp & Paper*

✓ *Ceramics*

✓ *Alumina*

✓ *Chemicals*

✓ *Food & Beverages*

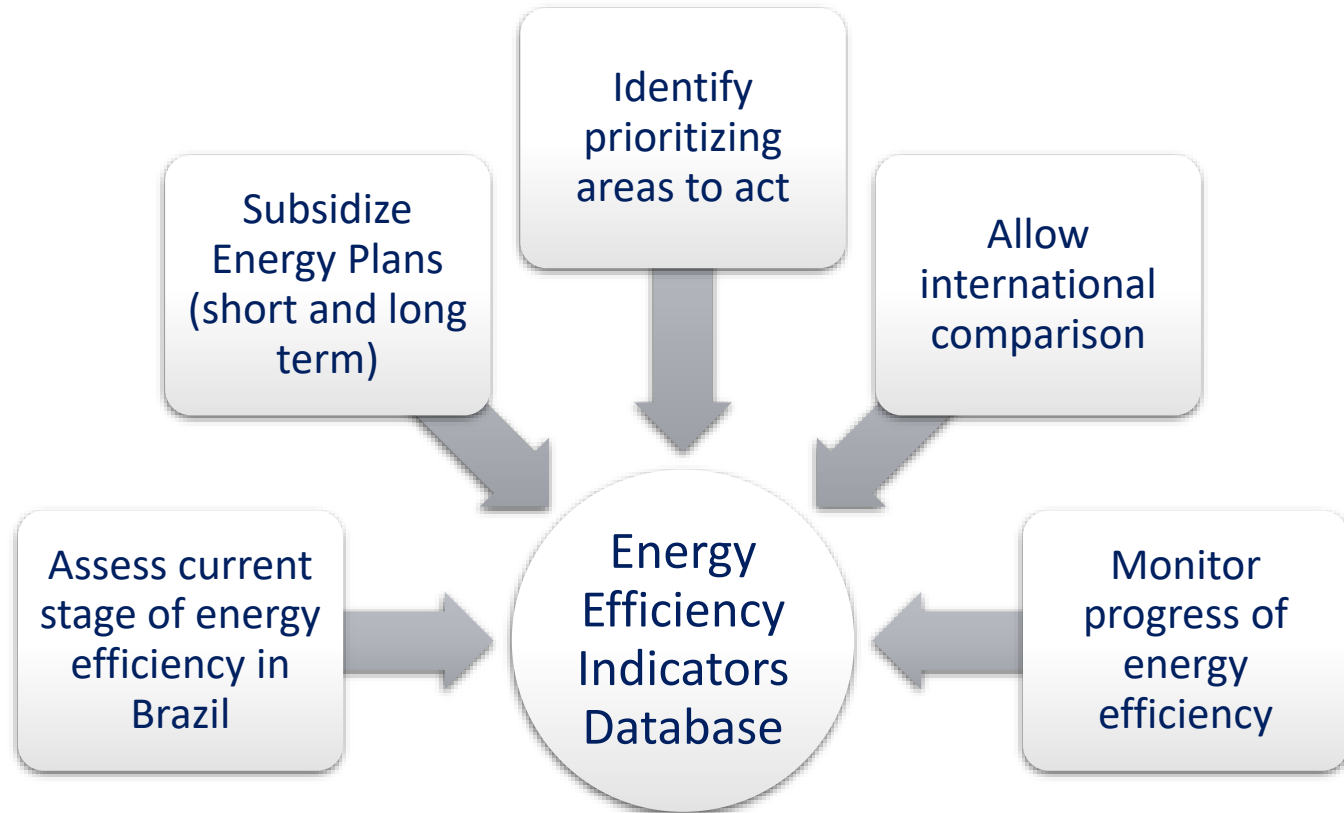
✓ *Cement*

✓ *Mining*

✓ *Commercial Buildings*

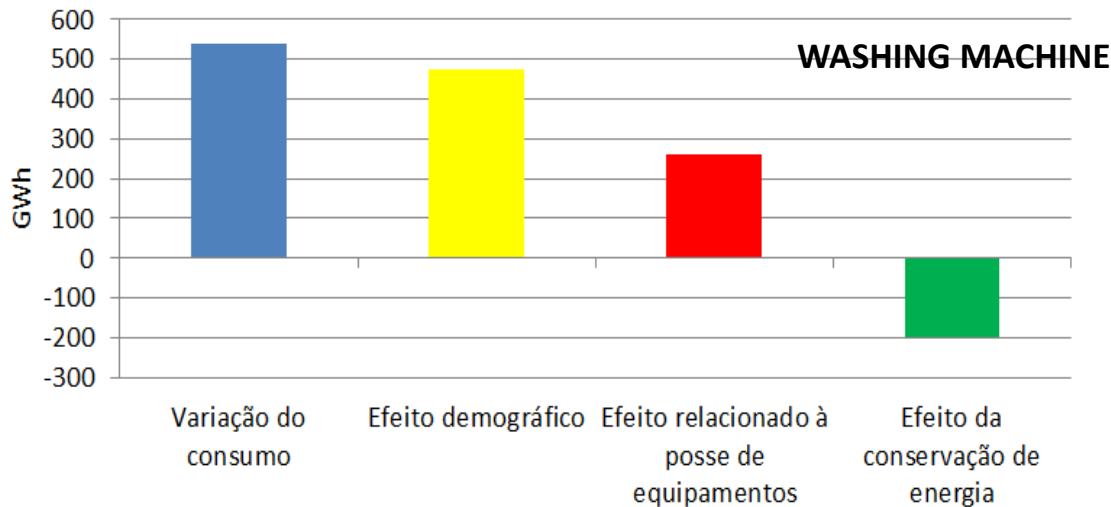
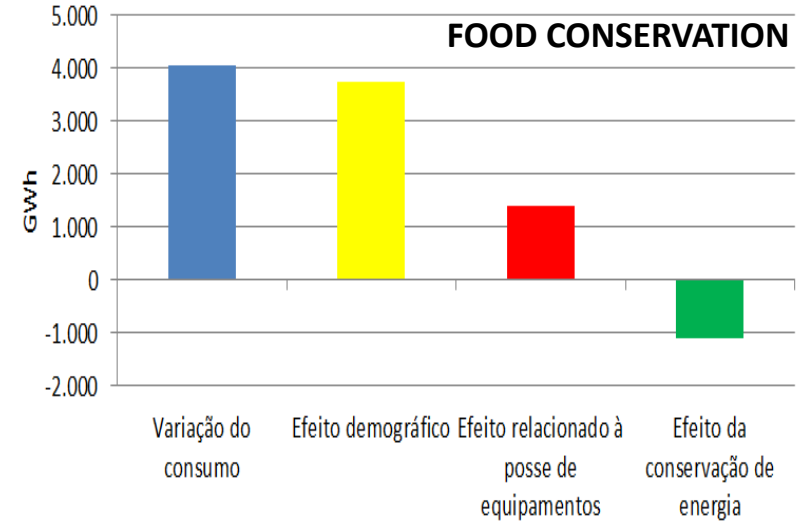
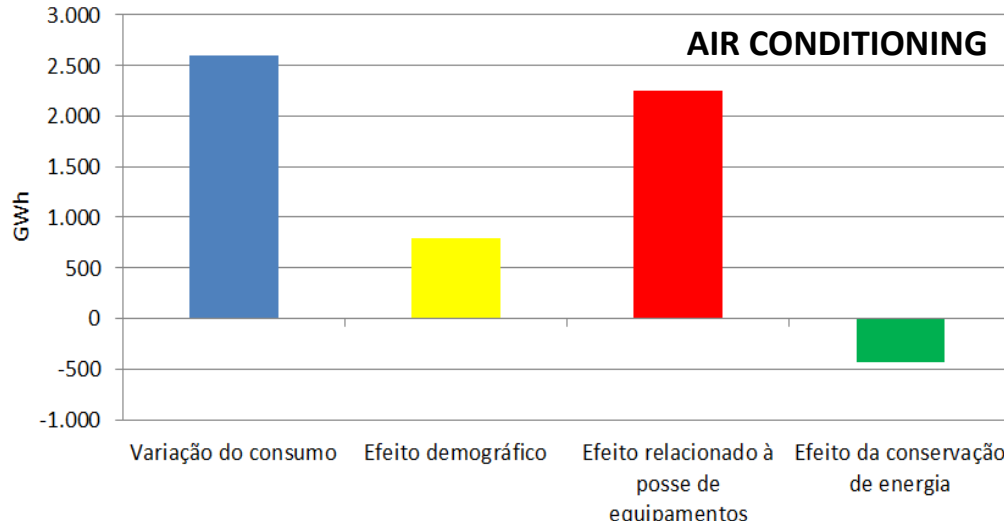
MONITORING PROGRESS OF ENERGY EFFICIENCY

- Evaluate impact of mechanisms and policies for Energy Efficiency in Brasil



MONITORING PROGRESS OF ENERGY EFFICIENCY

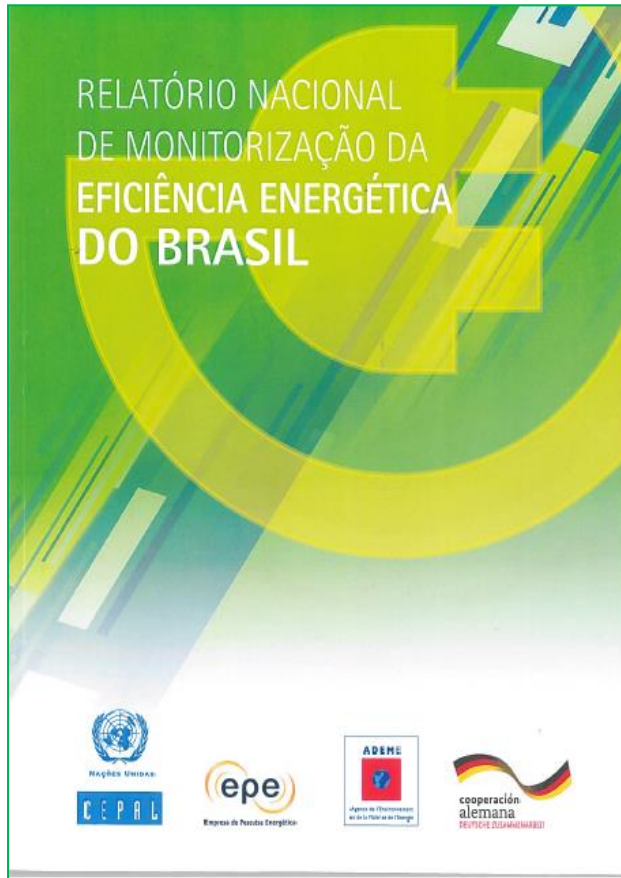
HOUSEHOLD SECTOR



Fonte: EPE (2014). Energy consumption in Brazil. Sectoral Analysis

MONITORING PROGRESS OF ENERGY EFFICIENCY

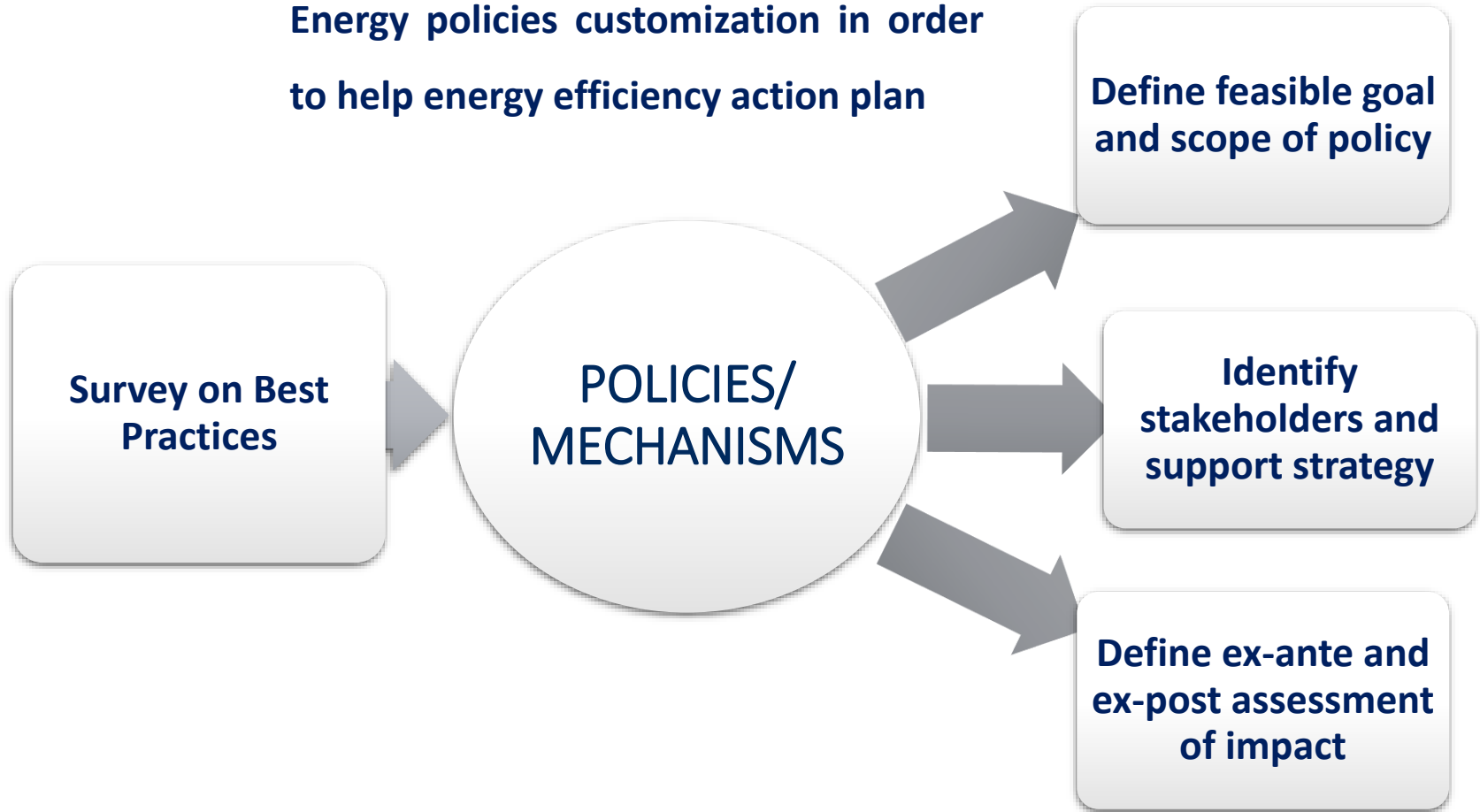
- **CONCLUDED RESULTS**



- Establishment of Energy Efficiency Indicators Database according to best practices (ODYSSSE)
- Publishing bi-annual reports on Energy Efficiency Indicators for Brazil

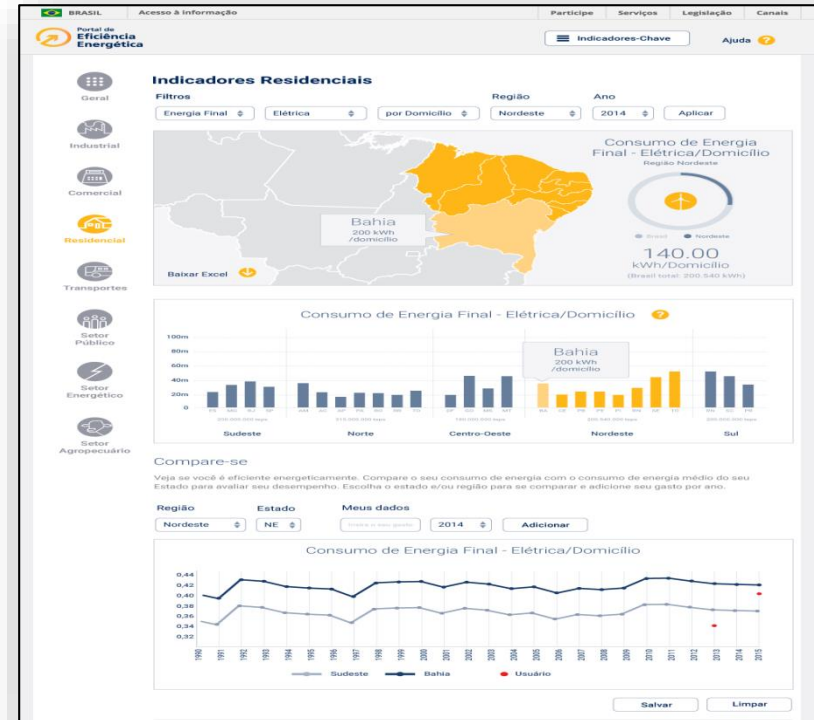
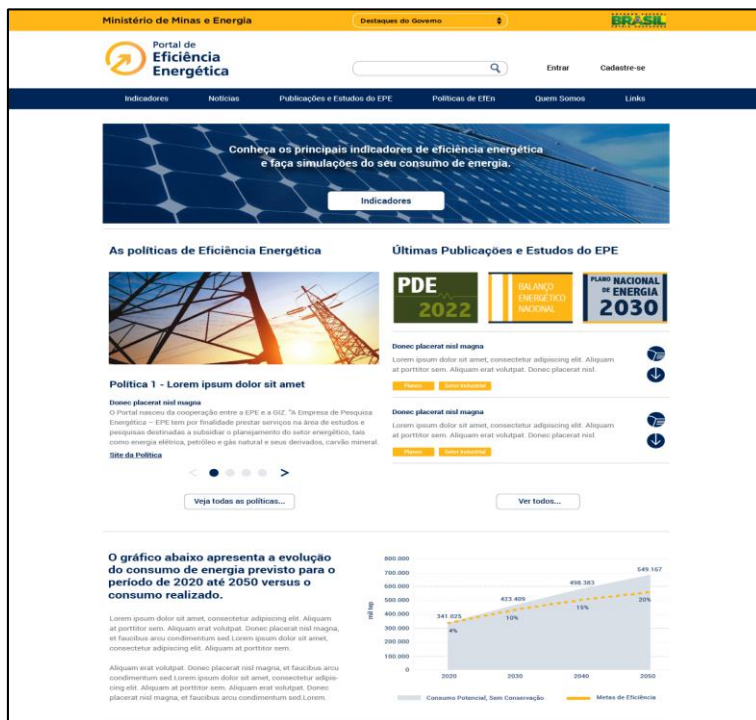
POLICIES/MECHANISMS PORTFOLIO FOR ENERGY EFFICIENCY

Energy policies customization in order to help energy efficiency action plan



COMMUNICATION STRATEGY: PORTAL

- **SCOPE**
 - Intends to be a bi-directional channel on energy efficiency information (data, studies etc.)
 - Communication tool
 - Partnership to collect data from stakeholders
- **IN PROGRESS**
 - Conceptual project of website (concluded)
 - Next steps: Programming development



THANK YOU FOR YOUR ATTENTION!

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