ITAIPU BINACIONAL
Integração que gera energia e desenvolvimento

WHEC 2018
22nd World Hydrogen Energy Conference
Rio de Janeiro

Rio de Janeiro
June 17 to 22, 2018

# *ITAIPU Hydropower Energy Production and its Potential for Hydrogen Production*

**Antonio Carlos Fonseca Santos Jr.**

***Works Superintendent***

1. Brazilian Energy Matrix
2. ITAIPU Hydroelectic Power Plant
3. ITAIPU and the Hydrogen Economy
4. Conclusions

# BRAZILIAN ENERGY MATRIZ

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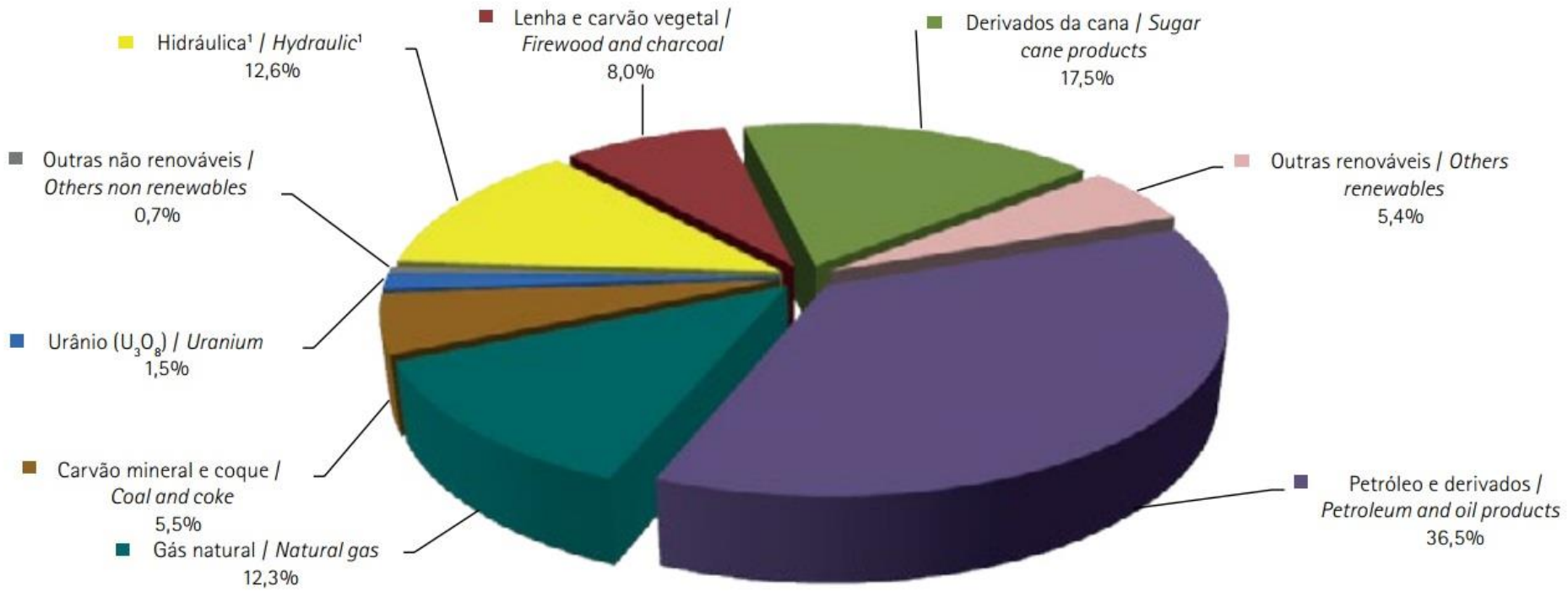
# BRAZILIAN ENERGY MATRIZ

## Domestic Energy Supply



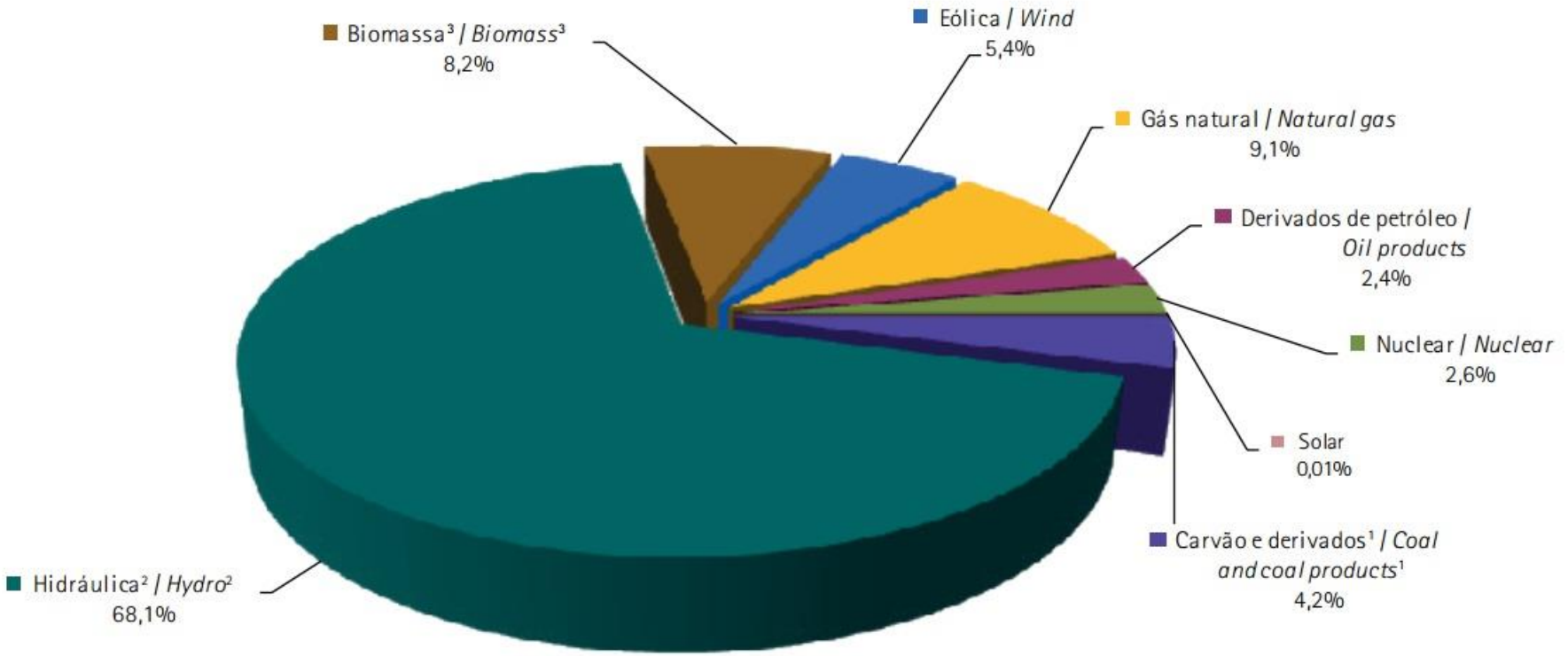

**Renewable: 43.5%**

**Non Renewable: 56.5%**

*Fonte: BEN – Balanço Energético Nacional – 2017 (Dados 2016)*

# BRAZILIAN ENERGY MATRIZ

## Domestic Electricity Supply by Source

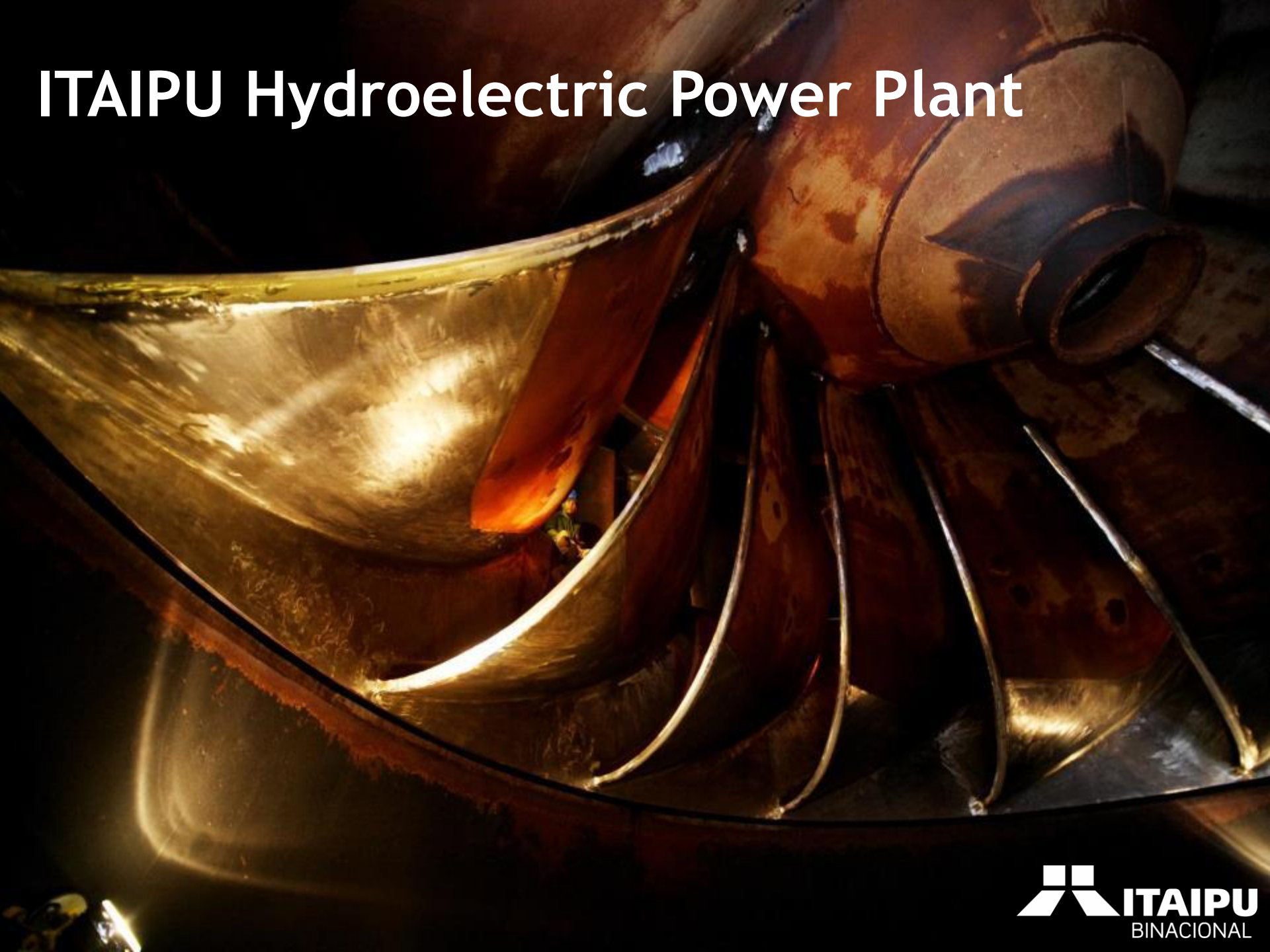



**Renewable: 81.7%**

**Non Renewable: 18.3%**

*Fonte: BEN – Balanço Energético Nacional – 2017 (Dados 2016)*

# ITAIPU Hydroelectric Power Plant



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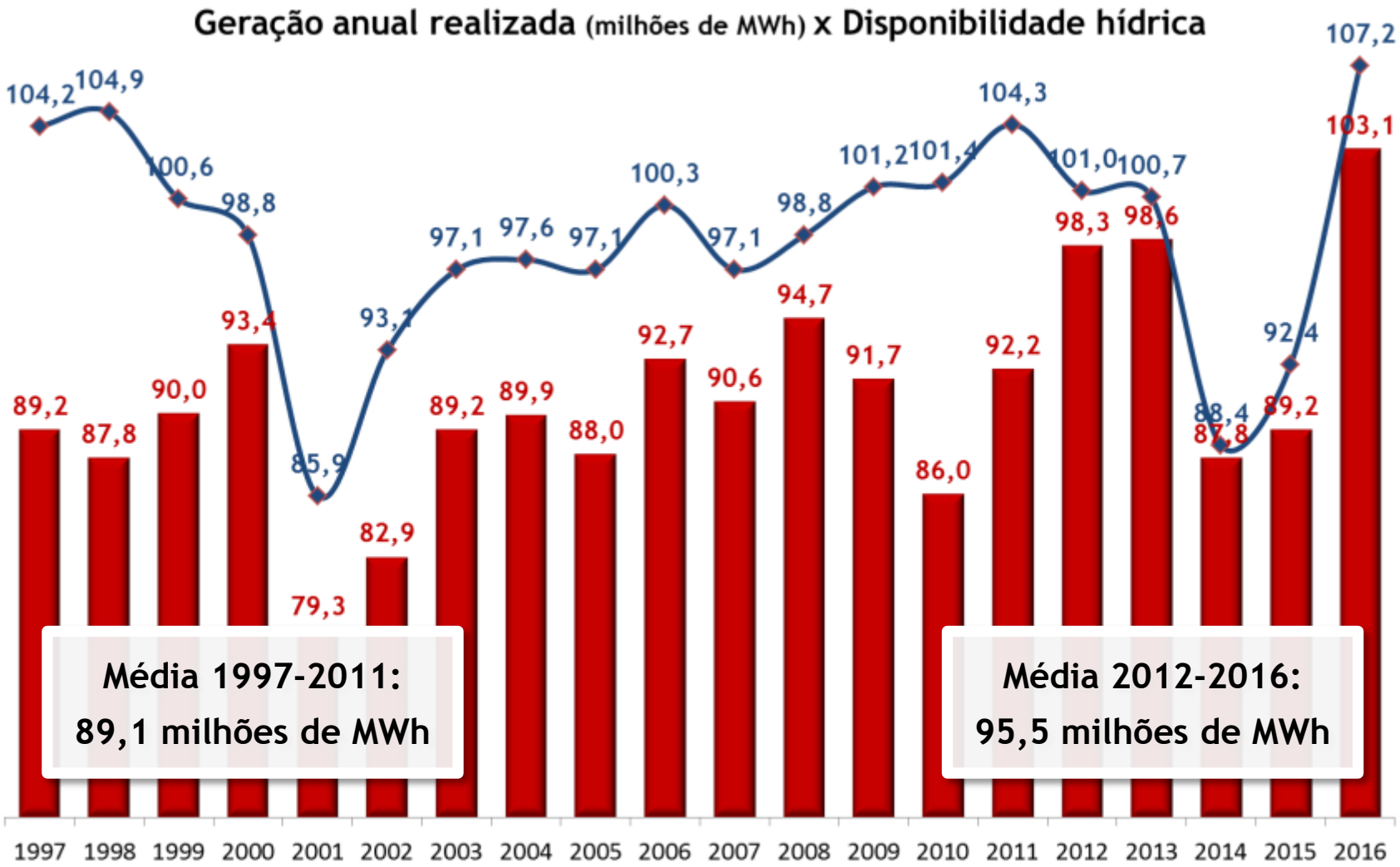
# ITAIPU Binacional

## MISSION

*Generate electricity with quality, with social and environmental responsibility, boosting sustainable economic, tourism and technological development in Brazil and Paraguay*

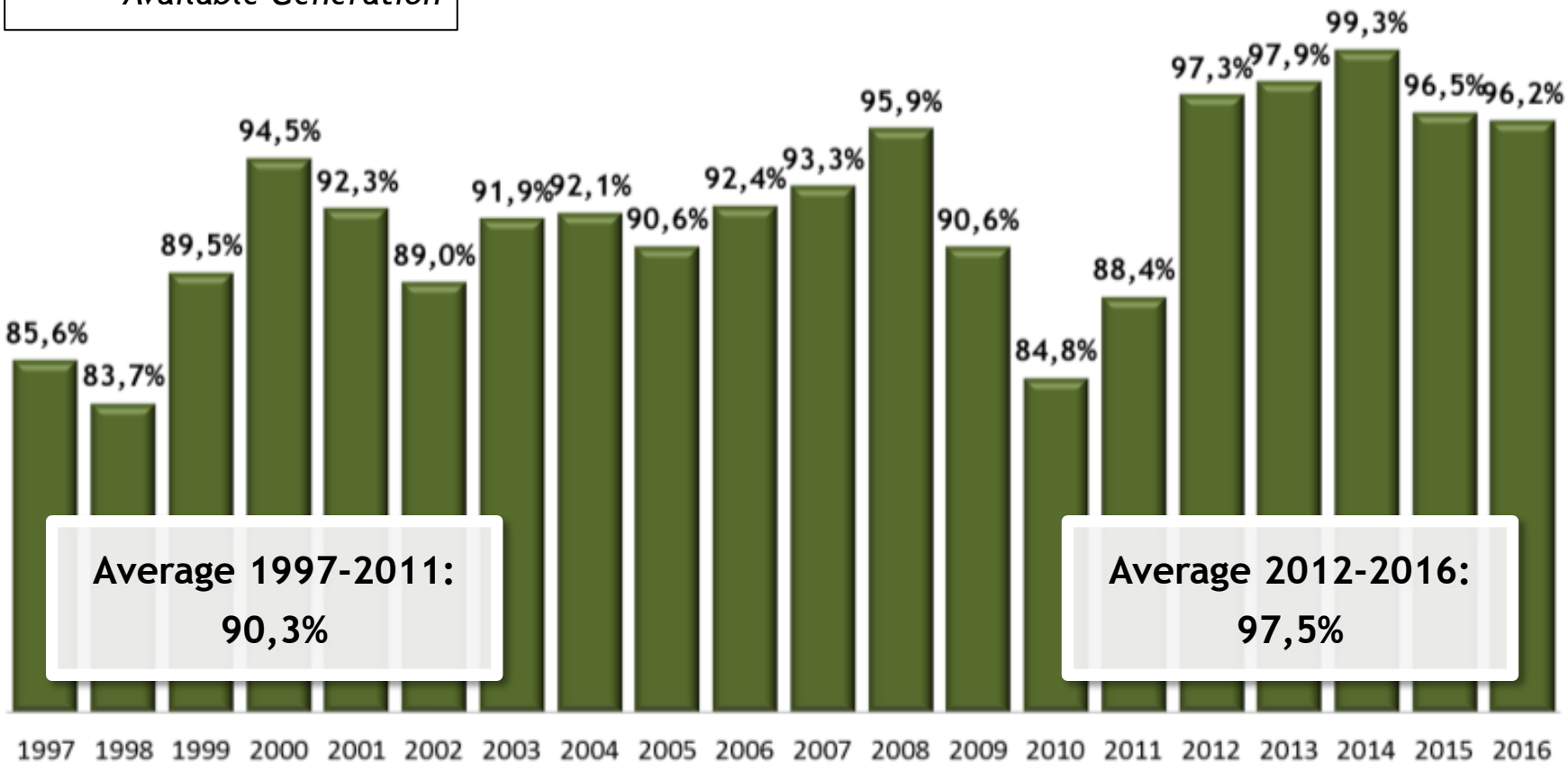
- Share Capital: 50% Eletrobras e 50% ANDE
- Paraná River – 14.000 MW
- 20 Units 700 MW: 10 - 50 Hz, 10 - 60 Hz
- Energy divided equally between countries
- Right to acquire the energy not consumed by the other country (energy transfer)
- Acquisition of electricity services by ANDE and Eletrobras (cost and power tariff)
- Power Generation 2016: **103.098.366 MWh**
- Market Participation 2016: 76% do Paraguai
  17% do Brasil

# Energy Production and Availability



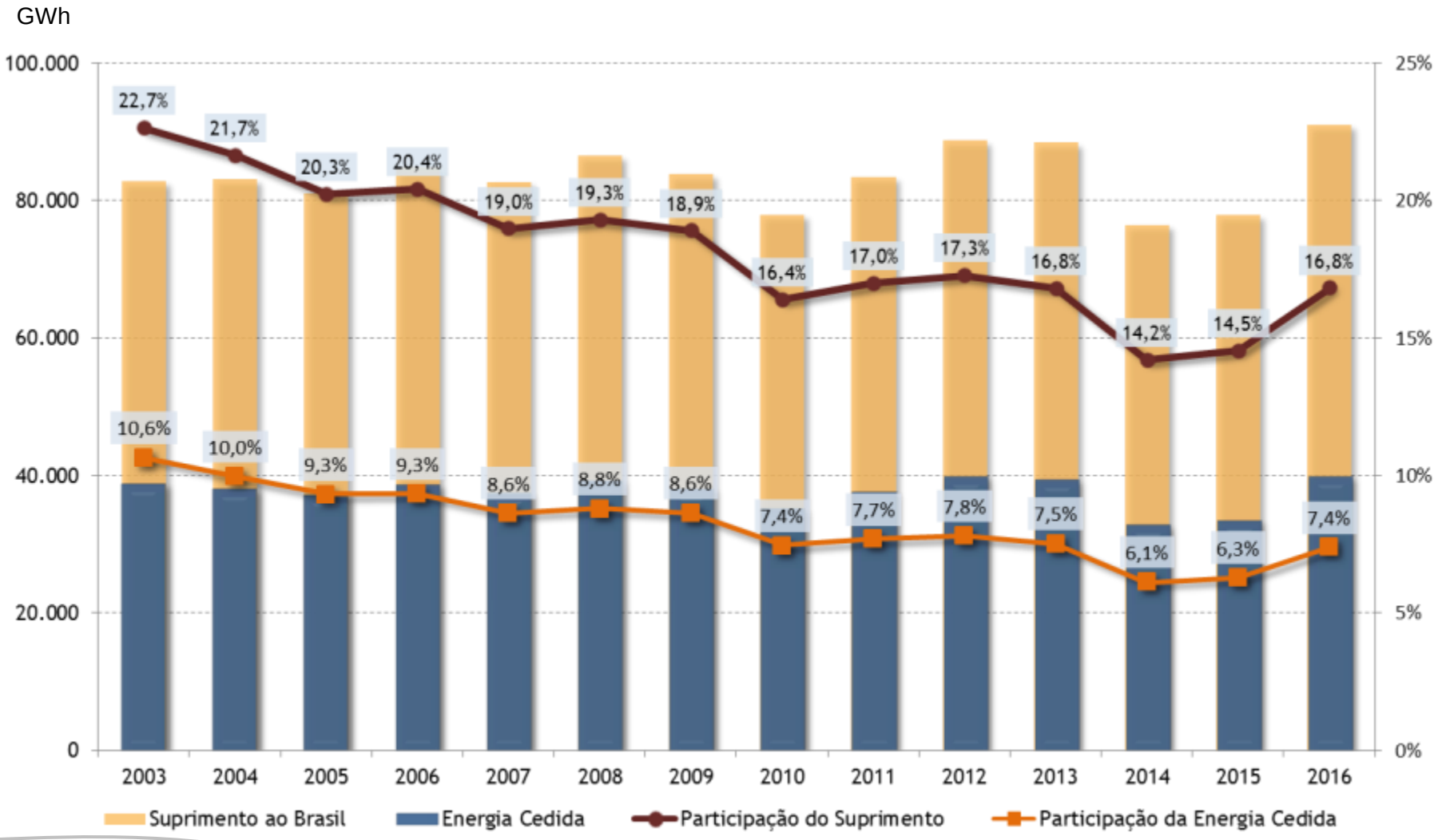
# Relative Performance

$$\% = \frac{\textit{Actual Generation}}{\textit{Available Generation}}$$




*Spilled non Turbinable Energy Discounted*

# Participation in the Brazilian Market



# ITAIPU and the Hydrogen Economy

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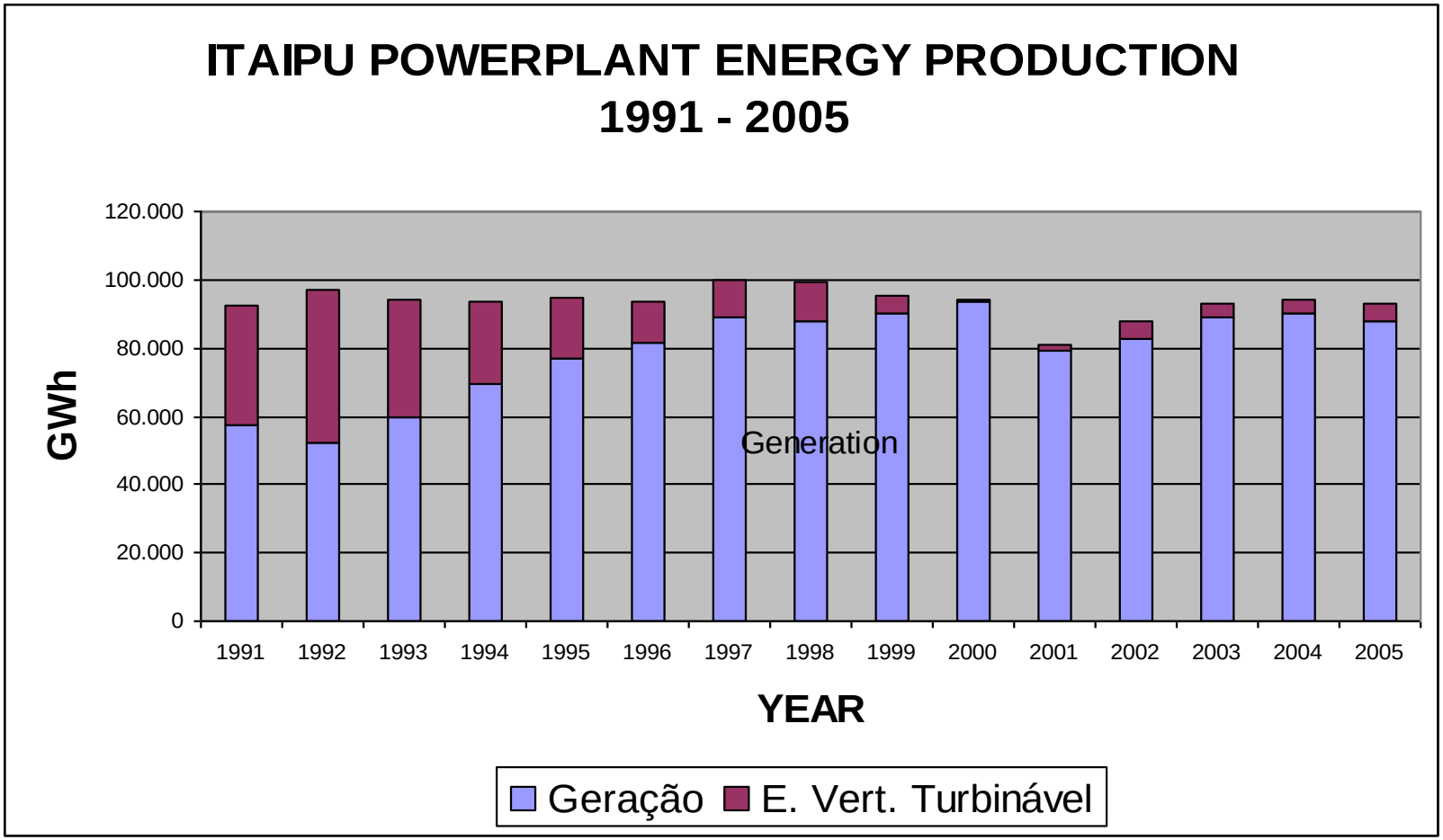
# ITAIPU ENERGY PRODUCTION



# Hydrogen Project

## Project Overview

Hidroelectricity

Electricity
(50 kW)

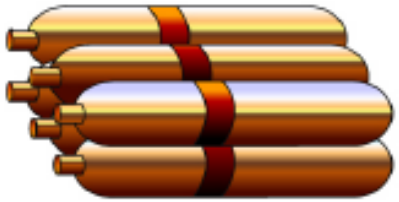
Water

Oxigen

Hidrogen
Production: 10 Nm³/h
Compression: 350 bar

Electrolyser and Compressor

Hydrogen Storage
(800 Nm³)



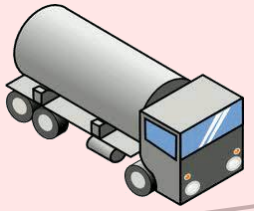
### Electric Vehicles

Núcleo de Pesquisa do Hidrogênio (NUPHI)

PTI
Parque Tecnológico Itaipu

### Other Aplications

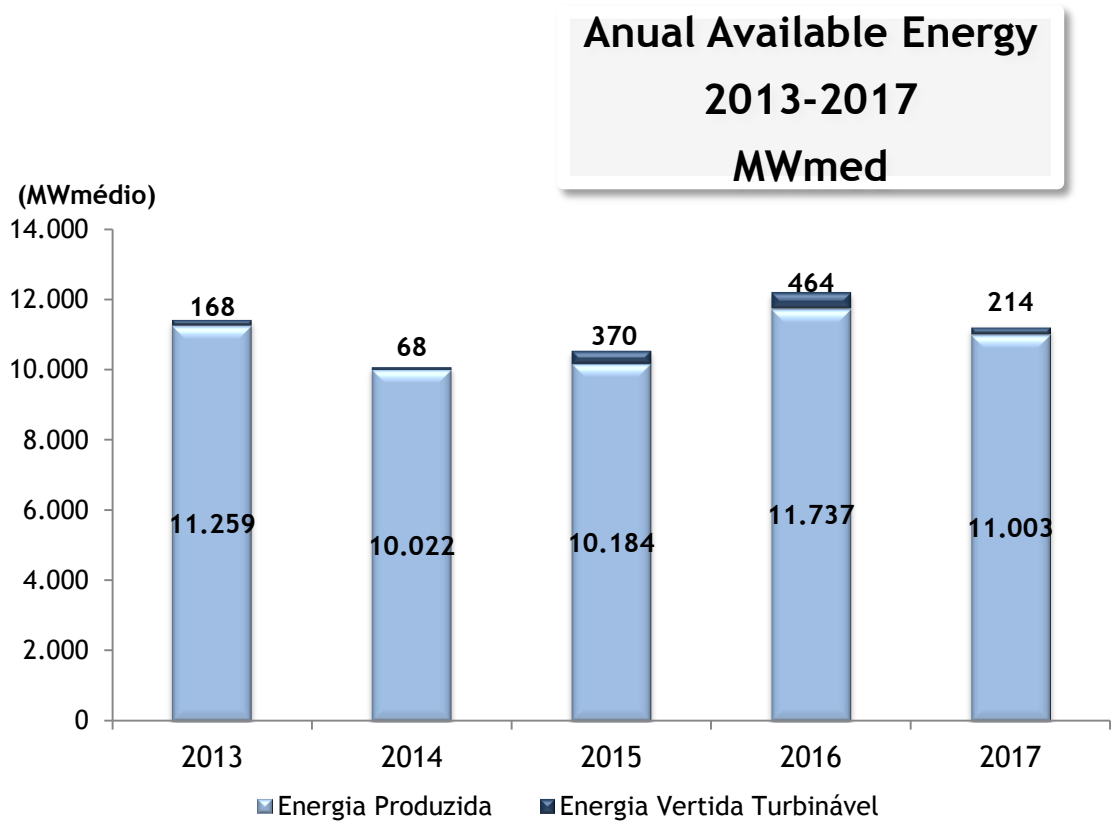
Hydrogen Transportation



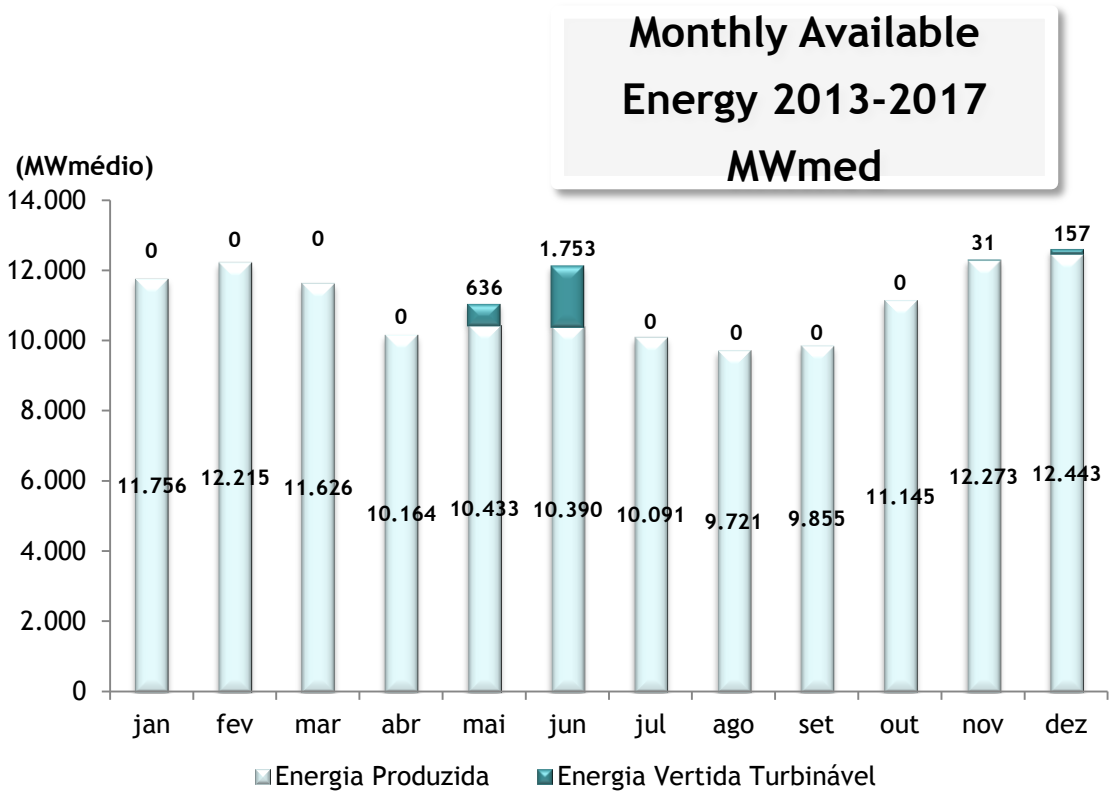
Fuel Cells - Distributed Energy Production

# Hydrogen Project

# Energy Production



# Energy Production



# Conclusions

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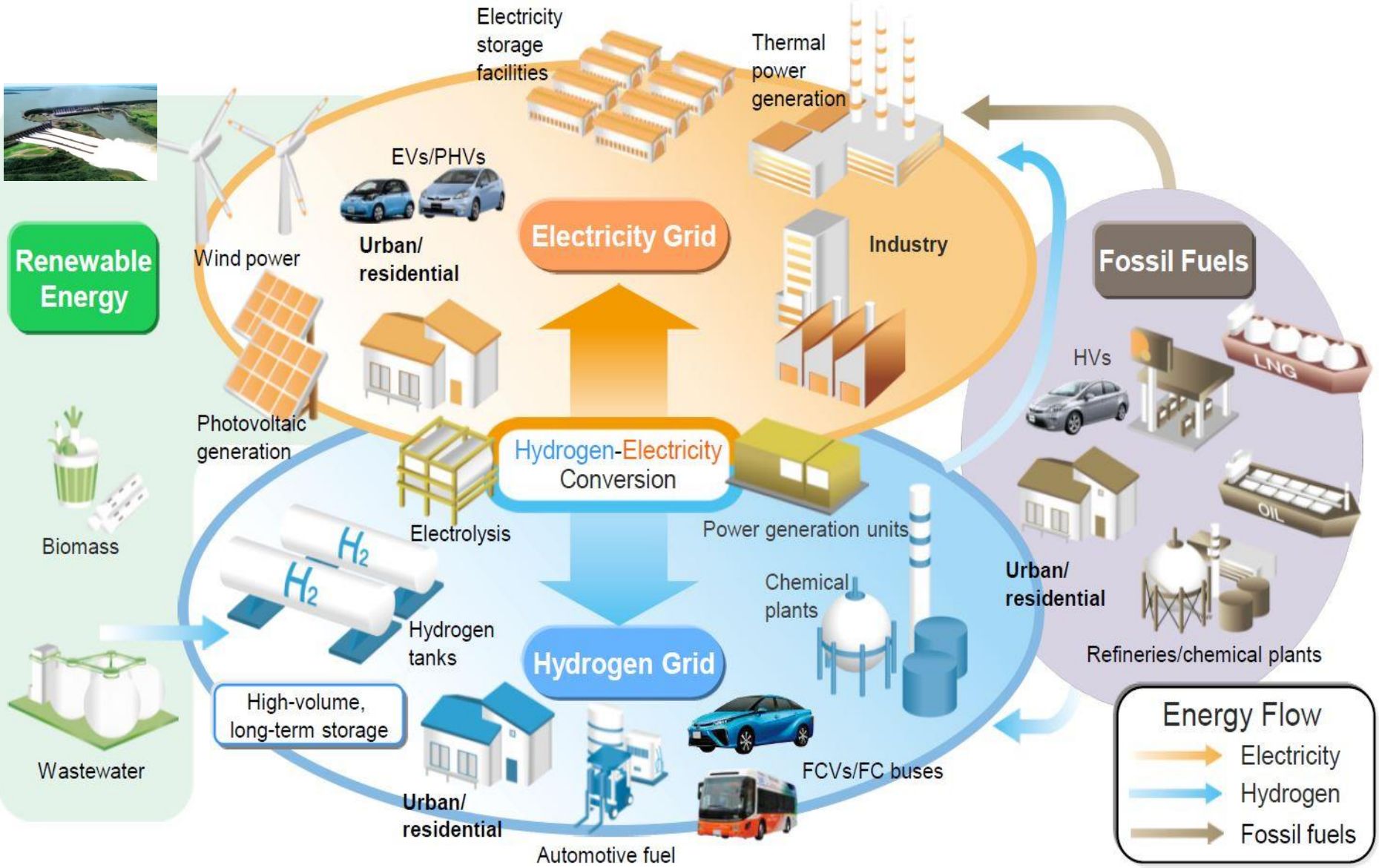
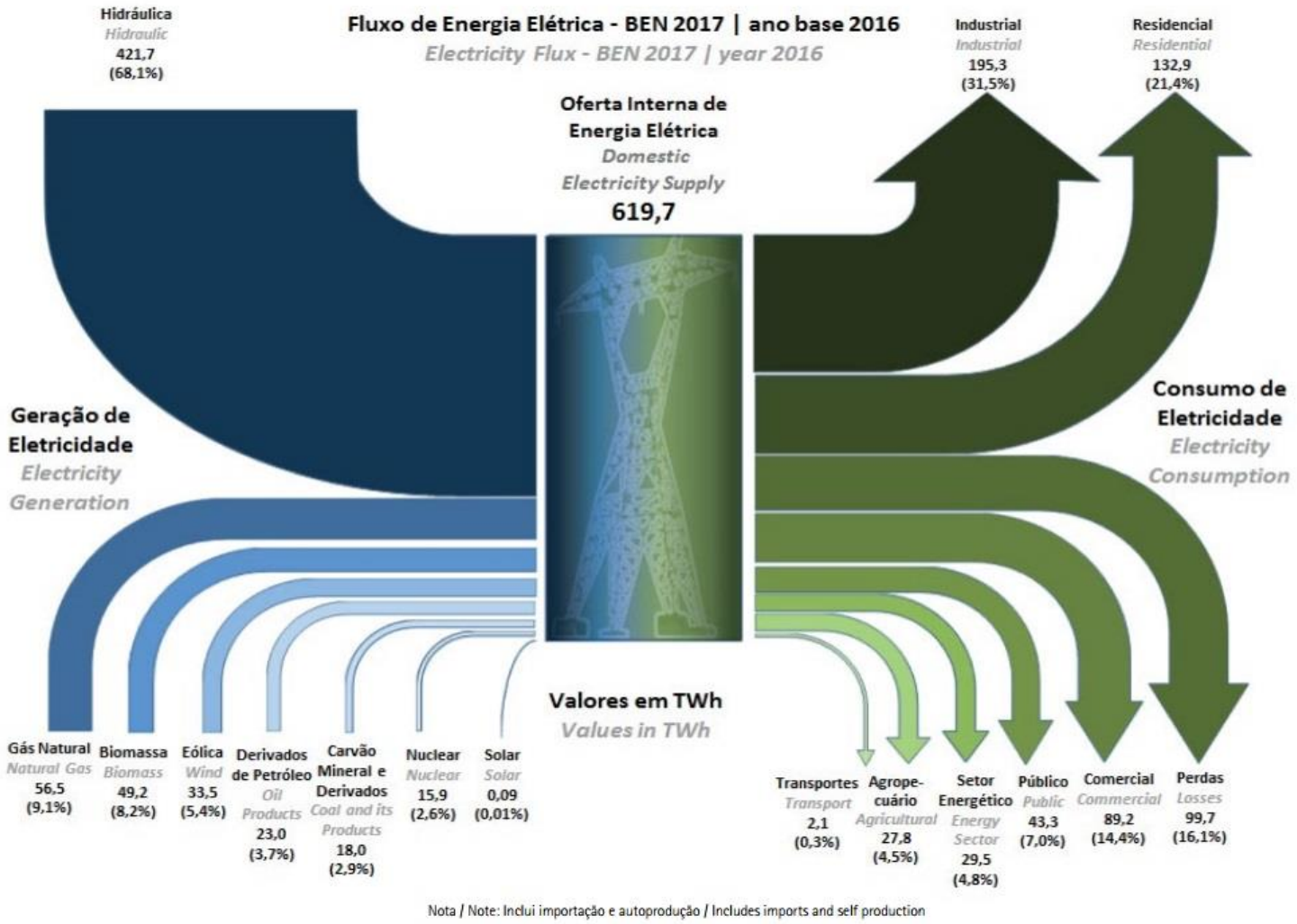
# Hydrogen Economy Scenario




https://newenergytreasure.com/2014/06/28/hydrogen-production-in-the-new-hydrogen-economy/

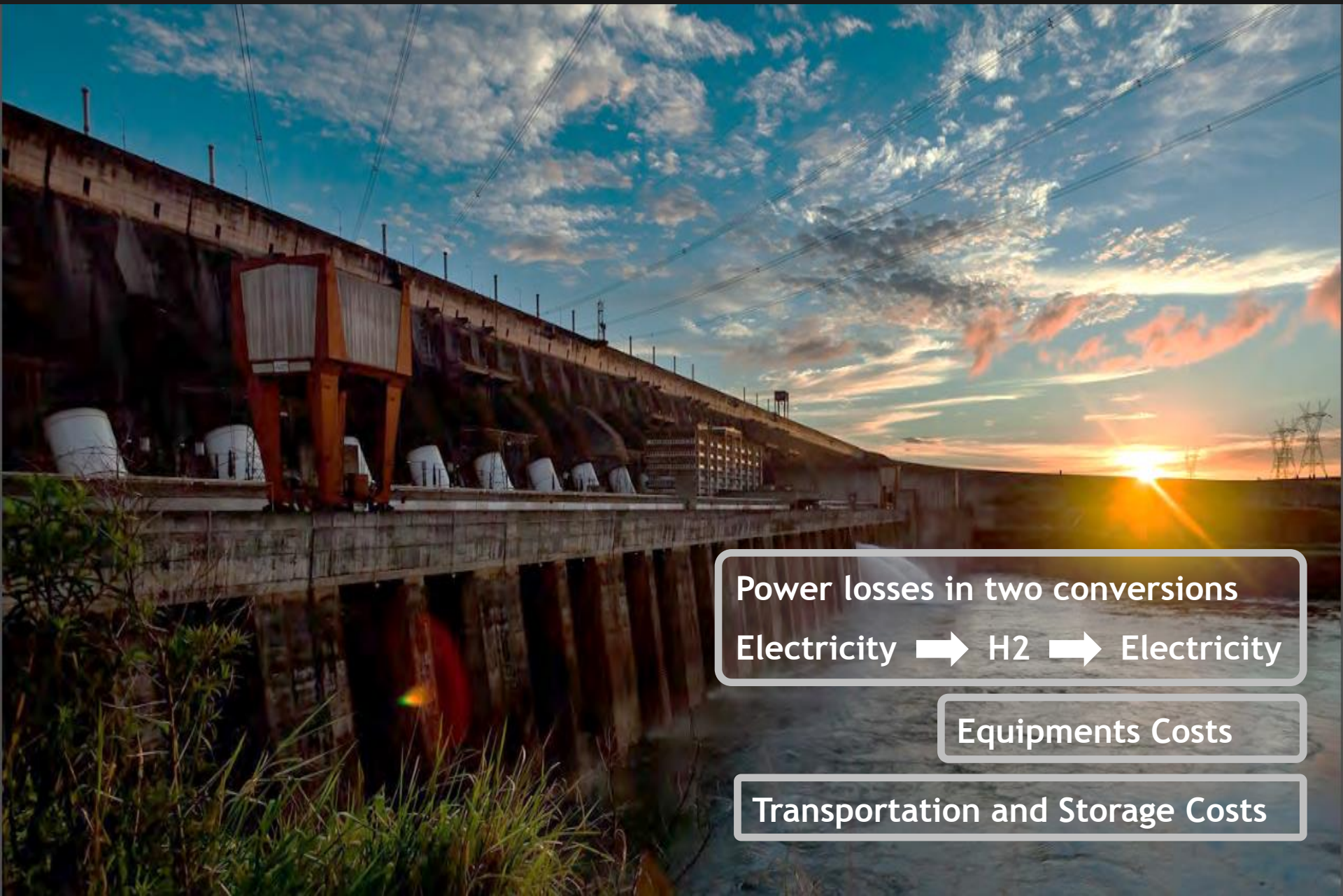
# Brazilian Electrical Energy Flow




Nota / Note: Inclui importação e autoprodução / Includes imports and self production

*Reference – Balanço Energético Nacional – BEN 2017 (Dados 2016)*

# Challenges


Power losses in two conversions
Electricity → H2 → Electricity
Equipments Costs
Transportation and Storage Costs

# Thank You!

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