

Biofuels bringing Sustainability & Longevity to Traditional Fuels

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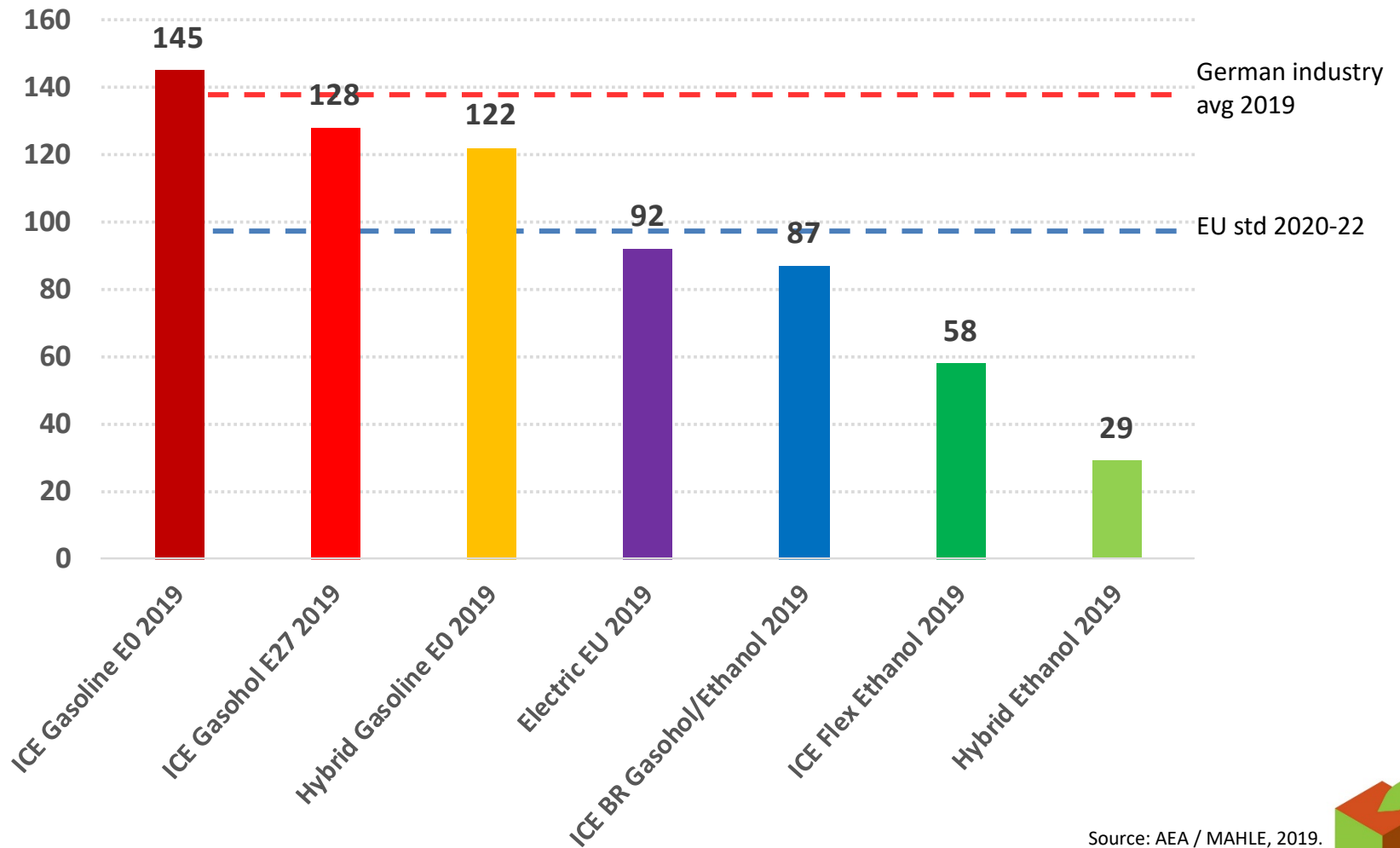
FGV Energia Webinar

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Based on the
Well-to-Wheel (WtW) Concept,
Motorization options that use
Ethanol + Gasoline
For a long time already meet
EU Emission Standards until 2022

Comparison of GHG Emissions under WtW - 2019

Total GHG Emissions in gCO₂e/km - 2019

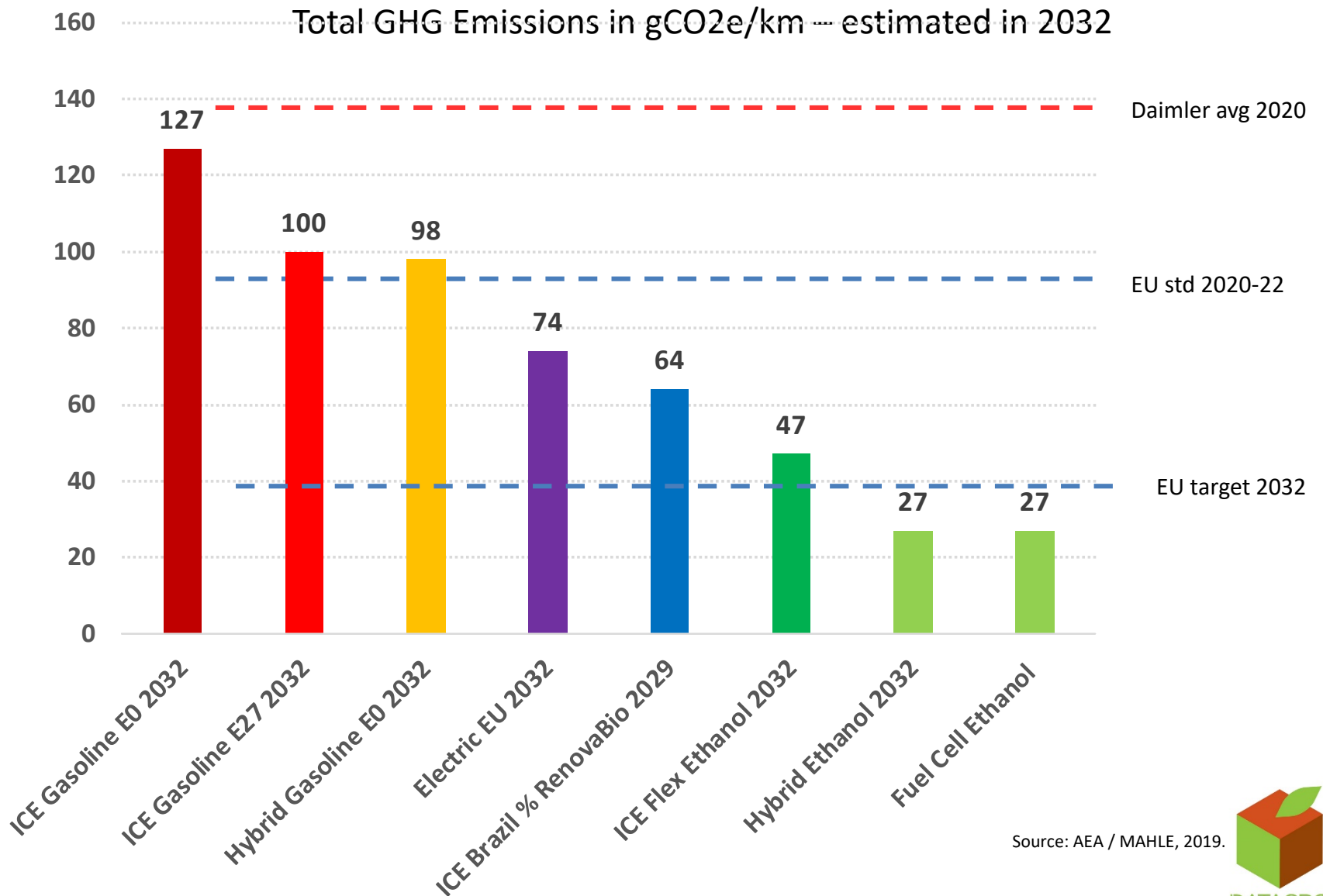


Source: AEA / MAHLE, 2019.



And will continue so,
after 2032 ...

Comparison of GHG Emissions under WtW - 2032

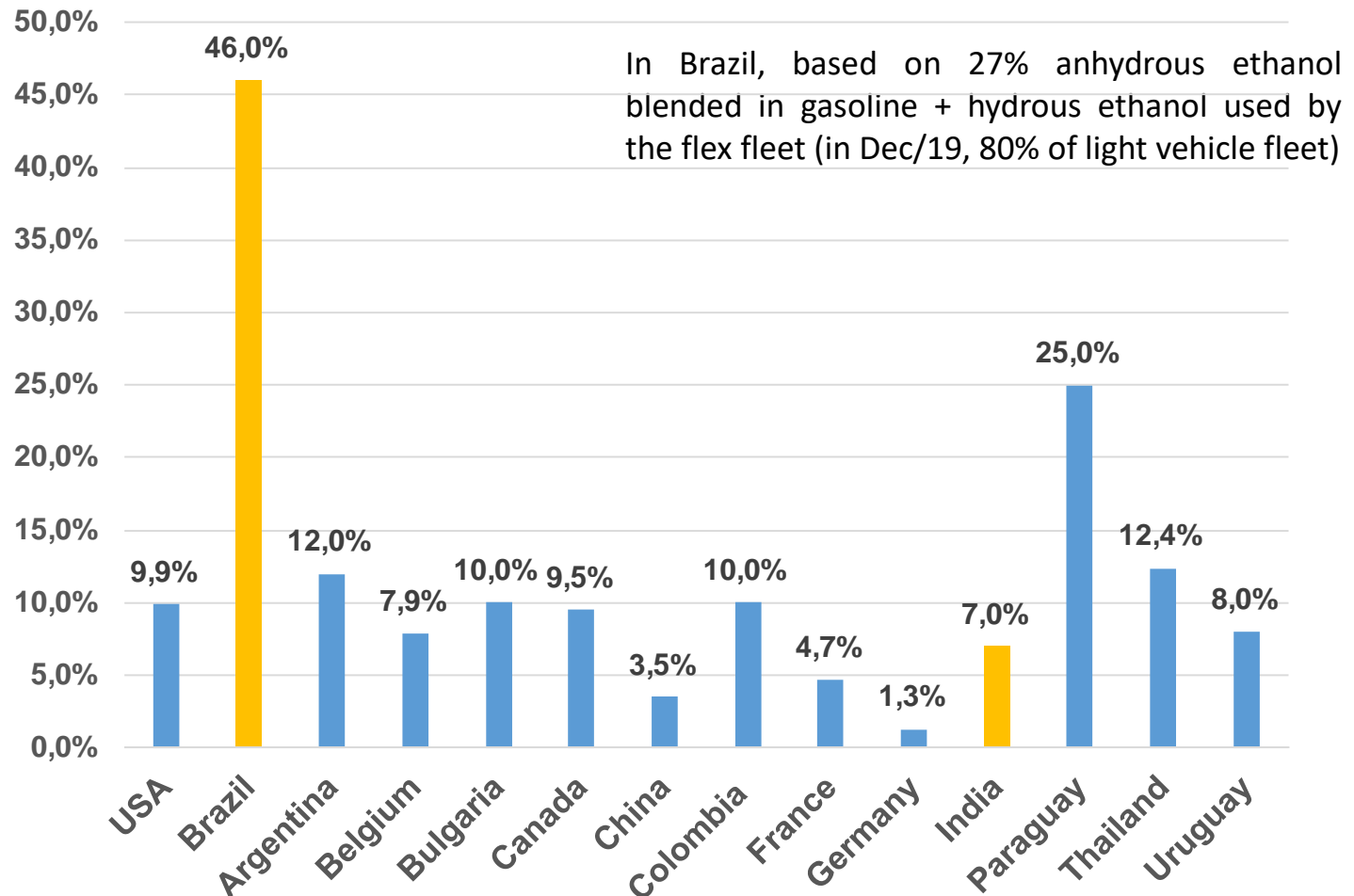


Brazil is already substituting 46.0% (2019) of its gasoline with bioethanol, & other countries are in pursue of increased levels as well

Brazil's Otto cycle fuel consumption in 2019: 51.5 billion liters gasoline eq.
CAGR (2019): +3.9% p.a.



% of Ethanol in Consumption of Otto Cycle Fuels, 2019



Source: DATAGRO, in gasoline equivalent.

Strategic Vision for the Future of Mobility

- It is possible to enlarge the use of high-density low-carbon liquid fuels, stimulating higher energy efficiency and lower environmental footprint,
- Complementing in a virtuous way renewable and traditional fuels,
- Using the existing infrastructure, and
- Promoting local technologies in fuel production and in automobile technology for local use and exports.

COP23-Fiji in Bonn



Declaration of Vision, by 19 Nations representing over 50% of world population, 37% of world GDP + IEA + IRENA
Bonn, November 16, 2017

Target for 2030 (to achieve the 2-Degree Scenario)

- % of **Bioenergy** in world energy demand must **double**.
- % of sustainable low carbon **Biofuels** in transport fuels, including sea and air transport, must **triple**.

Scaling up the bioeconomy is possible, given smart agricultural practices, better use of rural and urban waste, and proper policies.



From now on Sustainable Mobility
will be based on

Multi-solution alternatives adapted to
each country's condition

But, options must be ranked under
same criterion

We are moving towards the Age of Hydrogen

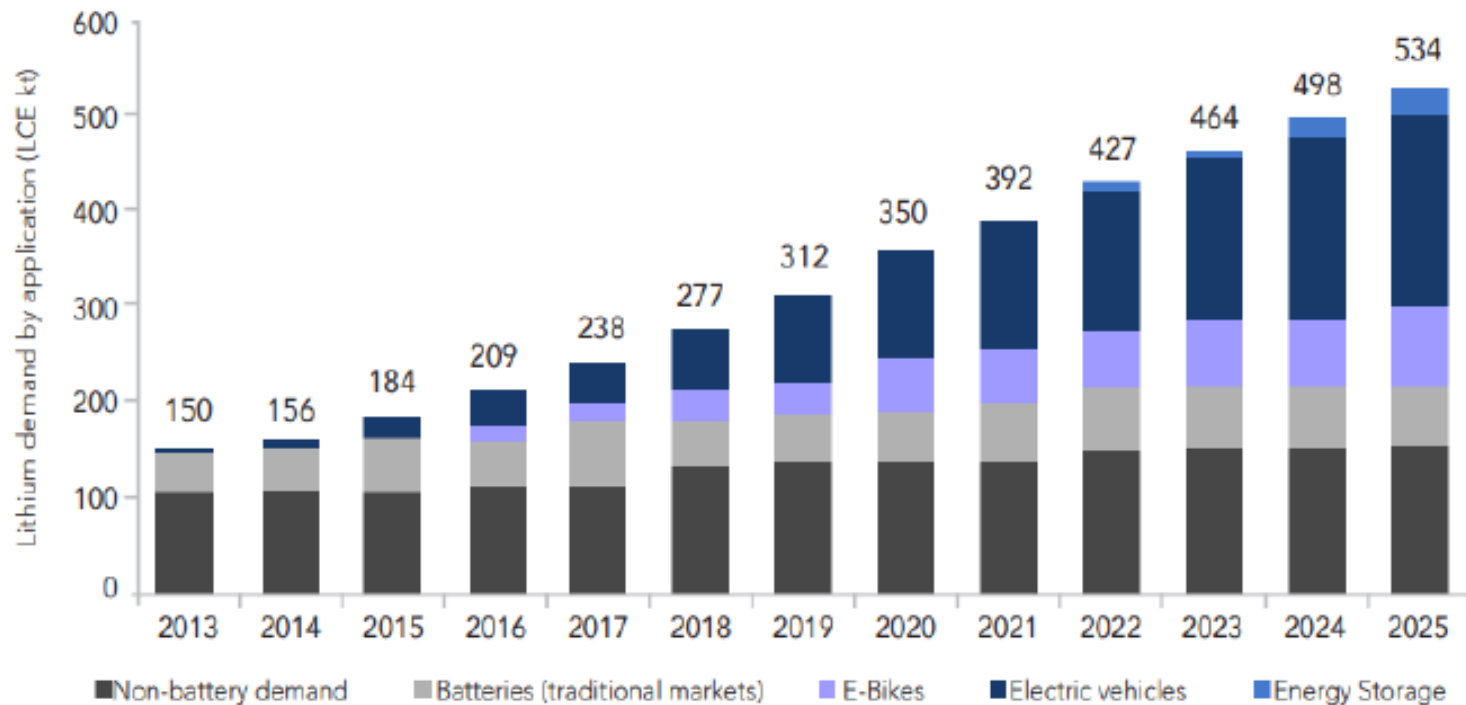
Not Hydrogen captured and stored in high-pressure, costly and risky Titanium tanks,
but Hydrogen represented by high-density,
low carbon footprint, sustainably produced
Advanced Biofuels such as
Ethanol, Biogas & Biomethane that bring
Sustainability & Longevity to
Traditional Sources of Energy



Combination of Biofuels & Traditional Fuels is strategic because it is:

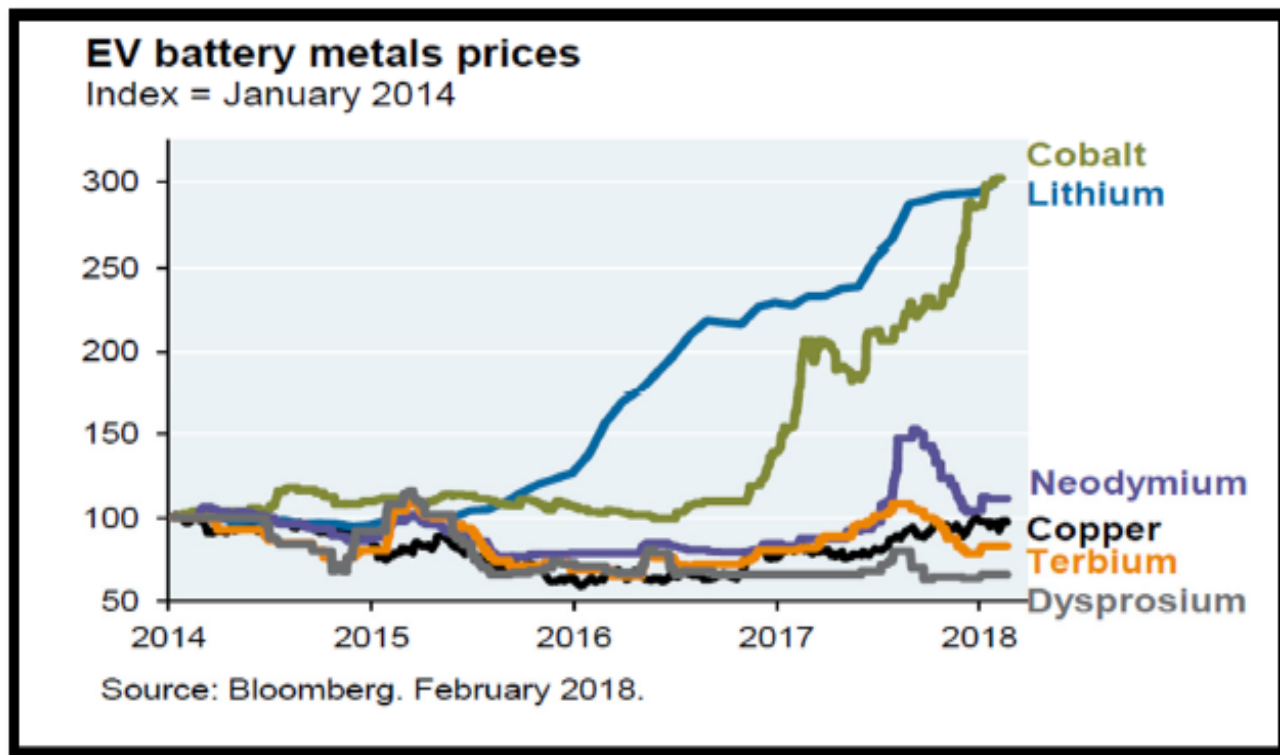
- Clean
- Replicable
- Scalable
- Accessible (in price) to Consumers
- Uses existing Infrastructure
- Drop-in, allows immediate implementation.

Projeção da Demanda Global por Lítio



Fonte: Deutsche Bank (2016)

Evolução dos preços de insumos de baterias para veículos elétricos



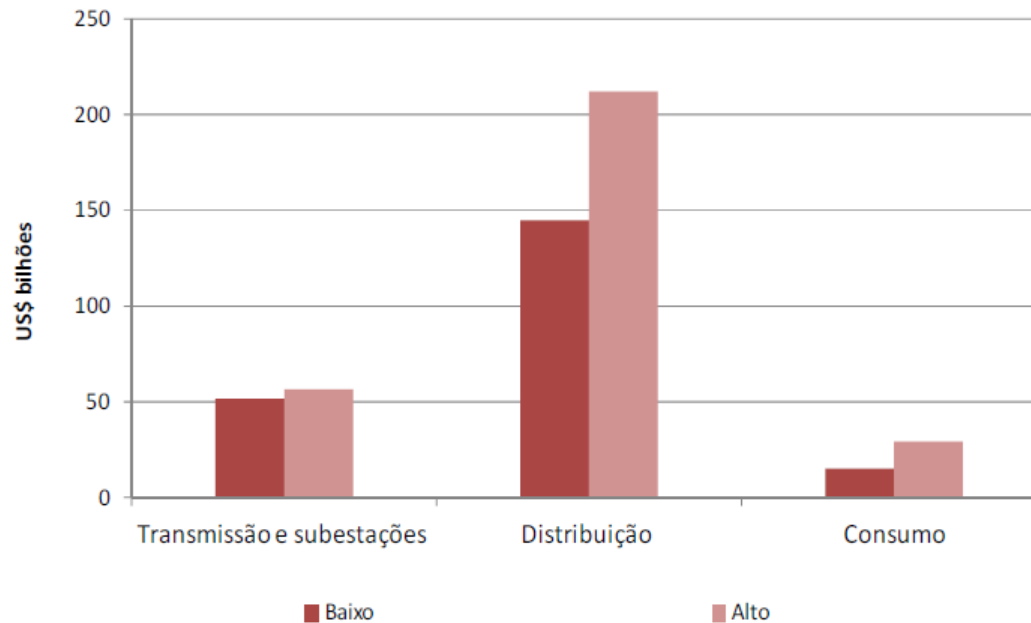
Fonte: JP Morgan (2018)

Custo total e per capita de implantação de smart grid nos EUA

Nível da cadeia	Total (US\$ bilhões)		Per capita (US\$/hab.)	
	Baixo	Alto	Baixo	Alto
Transmissão e subestações	82	90	267	294
Distribuição	232	339	755	1106
Consumo	24	46	77	151
Total	338	476	1100	1551

Fonte: EPRI, 2011; U.S. Census Bureau, 2011.

Estimativas de custos de implantação de smart grid no Brasil



Fonte: EPE

Custo de implantação do smart grid no Brasil é estimado entre **US\$ 210 e US\$ 300 bilhões**



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