

*Electromobility and Oil & Gas
companies' strategies over energy
transition*

*Carlos Arentz
UERJ*

Or how I tried to avoid getting myself into big trouble...

What was I asked to address?

- Audience would like to hear your contributions on Petrobras' positioning as an energy provider, its performance in the field of renewable energies and the company's potential as a possible player in a future scenario of electric buses in Brazil.

Two thoughts came to my mind:

I am doomed....

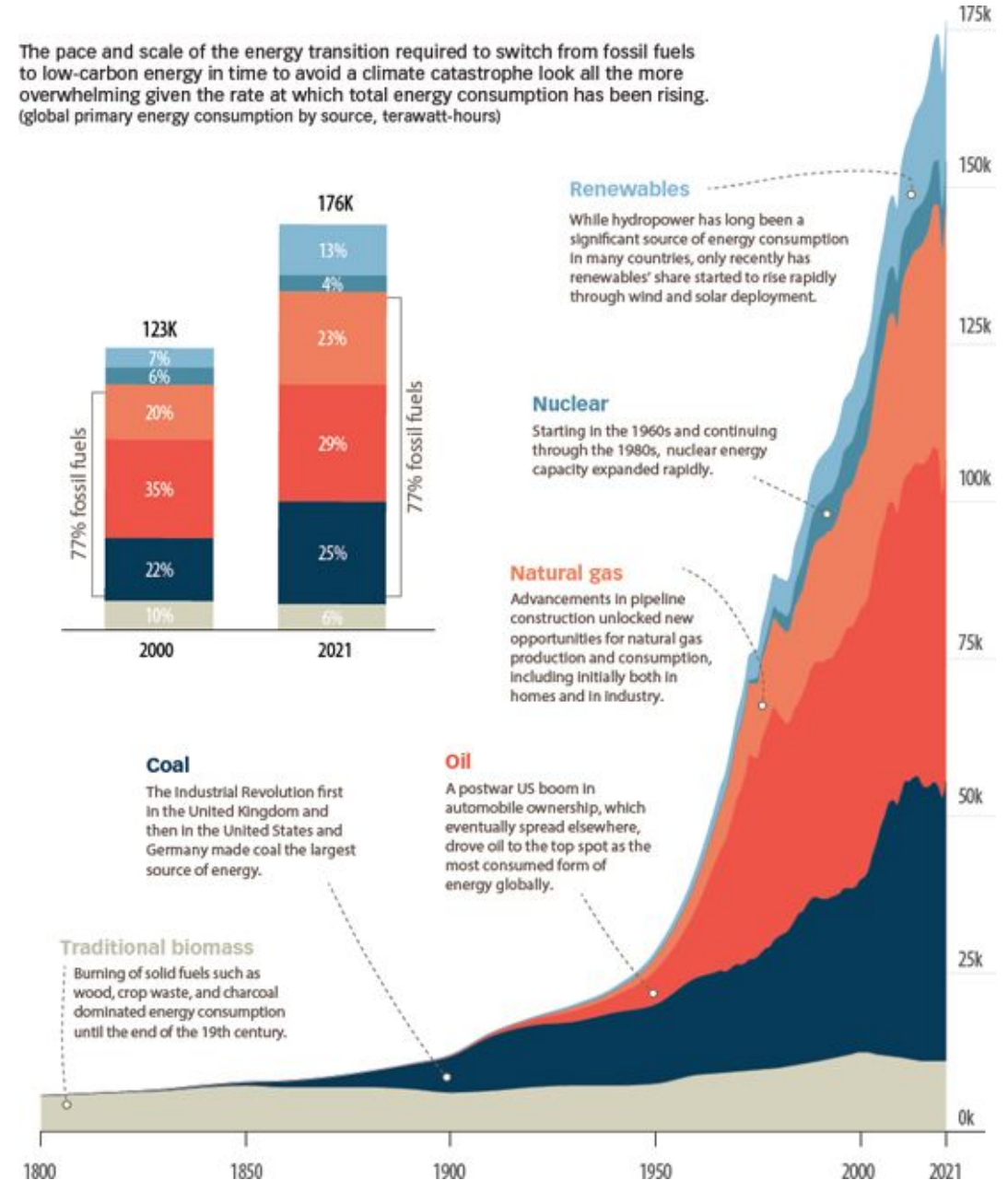
But on the other hand...I remembered a verse from the Holy Bible:

*And ye shall know the truth, and the truth shall make you free.
John 8:32*

First things, first...

Energy transition? Or addition?

- Humanity only grows
Our demand Of well-being too
Approximately 2 and a half billion people do not have access to modern energy
So they still live in the 15th century
- Sustainable Development Goal 7 - Affordable and Clean Energy to ALL until 2030
... and we have never abandoned an energy source
So let's be honest
It is not Energy Transition ...
It is Energy Addition



The energy trilemma.....



ENERGY SECURITY

Reflects a nation's capacity to meet current and future energy demand reliably, withstand and bounce back swiftly from system shocks with minimal disruption to supplies.

ENERGY EQUITY

Assesses a country's ability to provide universal access to affordable, fairly priced and abundant energy for domestic and commercial use.

ENVIRONMENTAL SUSTAINABILITY

Represents the transition of a country's energy system towards mitigating and avoiding potential environmental harm and climate change impacts.

A Broadening View How Oil Companies Are Confronting the Energy Transition?

Company	Core Business Focus	Low-Carbon / Transition Investments	Strategic Posture
Saudi Aramco	Largest crude producer; integrated upstream & downstream	Carbon capture, blue hydrogen, efficiency upgrades	Gradual transition while maximizing oil leadership
PetroChina	Integrated oil & gas; strong Asia-Pacific presence	R&D in renewables, hydrogen, and CCUS	Balancing growth with debt-financed diversification
CNOOC	Offshore oil & gas	Limited renewables; selective overseas divestment	Focus on domestic energy security, cautious on green shift
ExxonMobil	Global upstream & downstream	CCS hubs, low-carbon fuels, lithium for EV batteries	Technology-led decarbonization, oil & gas core intact
Chevron	Upstream-heavy, global	Renewable fuels, CCS, geothermal	Incremental diversification, leveraging core assets
Shell	Integrated energy	Offshore wind, solar, EV charging, hydrogen	Aggressive renewables pivot, customer-centric energy solutions
BP	Integrated energy	Offshore wind, solar, bioenergy, EV charging	Accelerated renewables growth, aiming for 50 GW by 2030
TotalEnergies	Integrated energy	Solar, wind, LNG as transition fuel	Balanced portfolio with strong renewables pipeline
Enbridge	Pipelines & midstream	Renewable natural gas, hydrogen, CCS	Infrastructure decarbonization, low-carbon transport fuels
Petrobras	Brazil's state-controlled oil & gas leader; deepwater expertise	US\$16.3B (2025-29) in low-carbon initiatives — wind, solar, biofuels, green hydrogen, CCUS; refinery upgrades for lower emissions	“Dual track” — maintain oil & gas leadership with one of the lowest upstream carbon intensities globally, while scaling renewables and bioproducts in line with Brazil's energy goals

But a narrowing focus

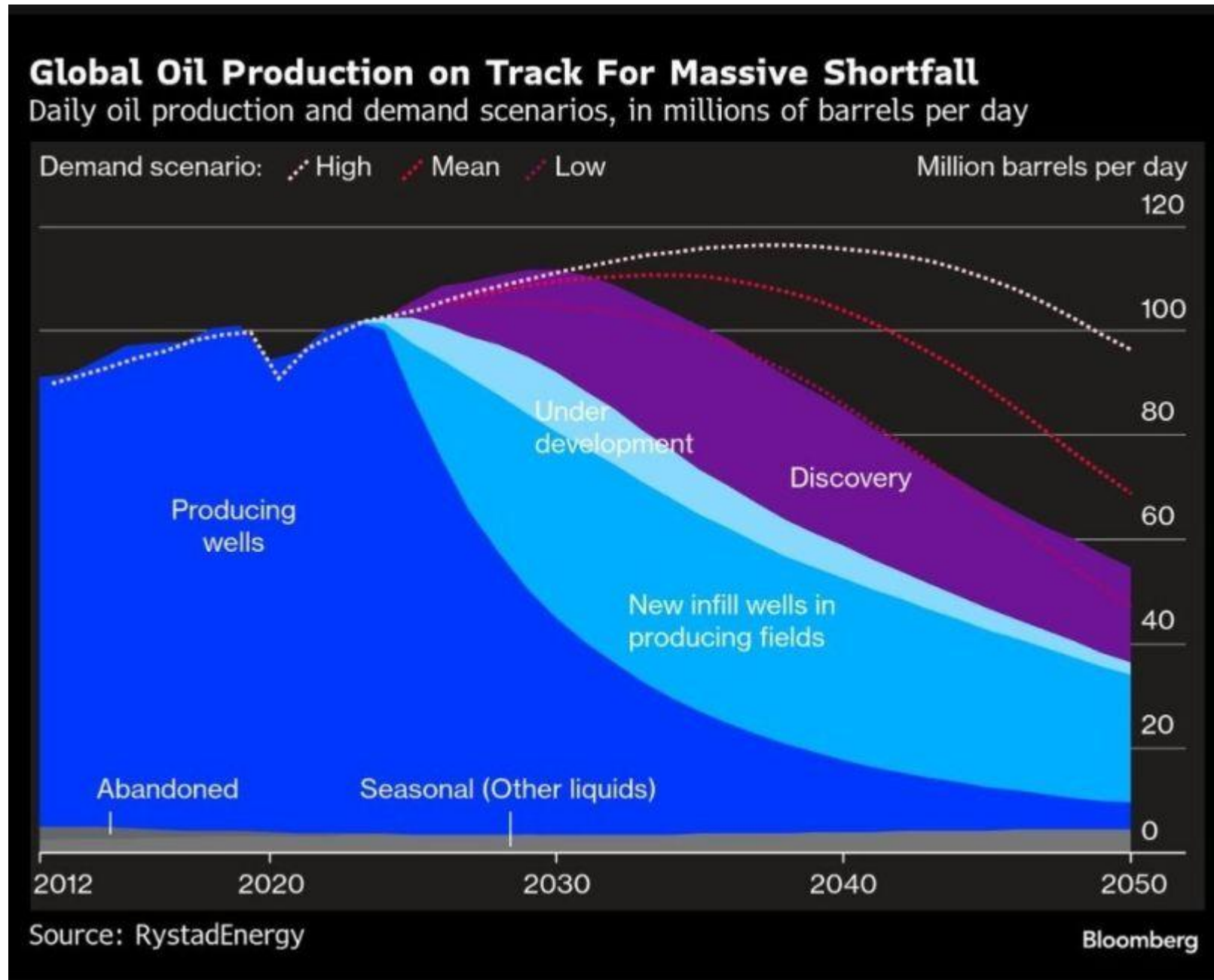
How Oil Companies Are Facing electromobility?

Company	Key EV Initiatives	Geographic Focus	Strategic Edge
Shell	Targeting 500,000+ charging points by mid-decade; partnerships with automakers; ultra-fast chargers with ABB	Europe, North America, China	Leveraging global retail network to scale EV charging
BP	Expanding BP Pulse ultra-fast charging; integrating renewable power into charging hubs	UK, EU, Australia, US	Strong brand in both fuel & electricity retail
TotalEnergies	Large-scale charging hubs; battery storage integration; renewable-powered stations	France, EU, Africa	Combining solar/wind assets with EV infrastructure
Eni (Plenitude)	EV charging network tied to renewable generation	Italy, EU	Vertical integration from generation to charging
Repsol	Public charging network; green hydrogen for heavy transport	Spain, Latin America	Early mover in Iberian EV infrastructure
Petrobras (emerging)	Pilot EV charging projects in Brazil	Brazil	Testing market potential in Latin America

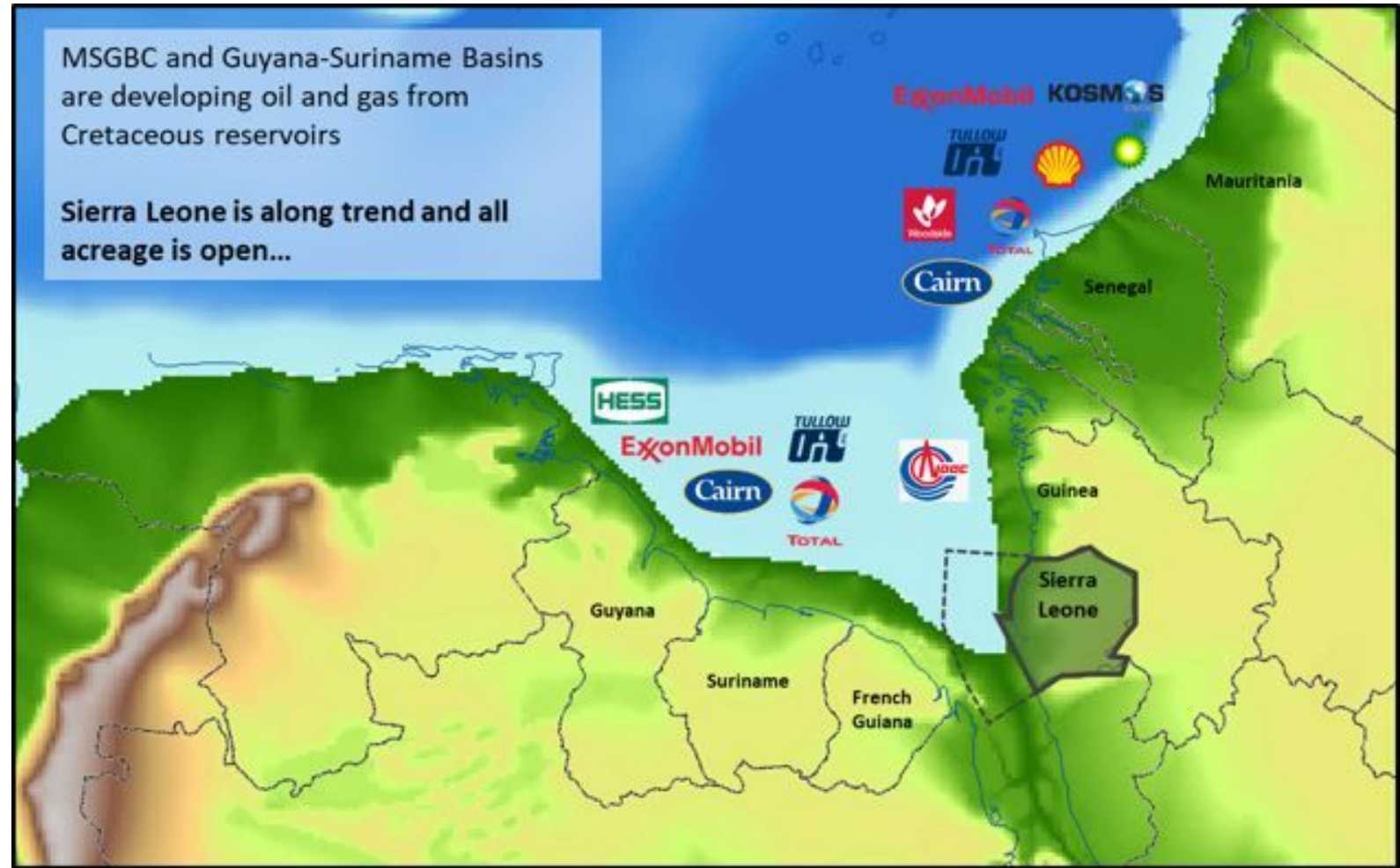
Why Oil & Gas Companies Care About Electromobility ?

- Declining Fuel Demand
- Global EV sales growth, potentially cutting oil demand
- That's a structural threat to their core business.
- Government & Investor Pressure
- Climate targets, net-zero pledges, and ESG-focused investors are pushing oil majors to diversify into cleaner energy.
- New Revenue Streams
- EV charging, renewable electricity, and mobility services offer growth opportunities in a booming market.
- But also...

Signs of oil reserves depletion in the near future



And because of that all oil companies are looking for their piece of the equatorial margin...

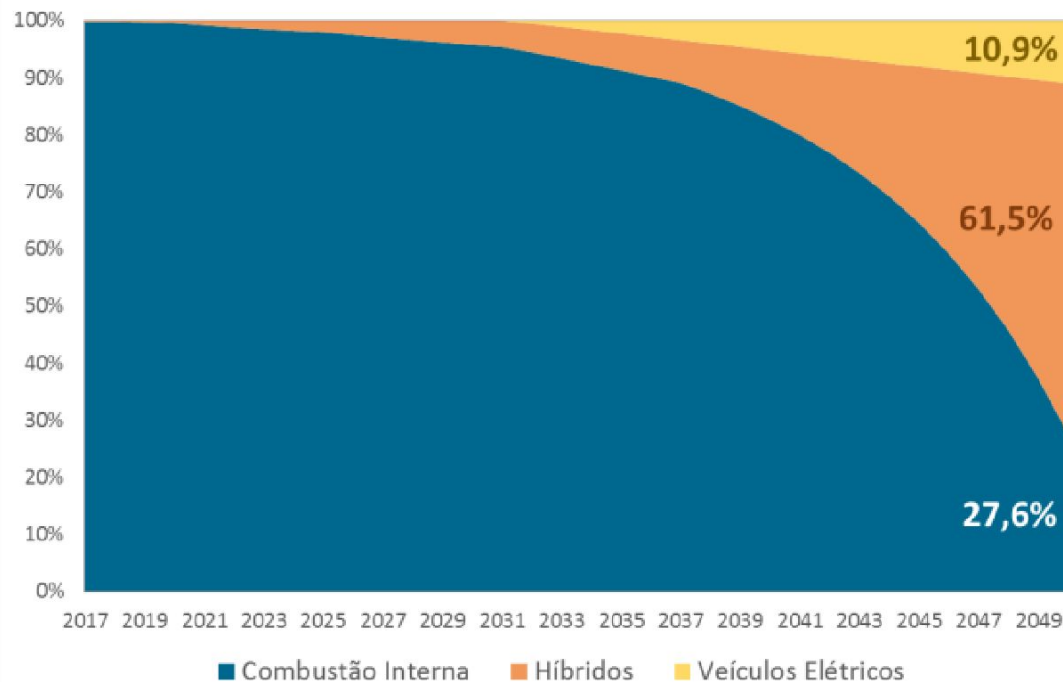


What is the forecast of Electromobility dawn?

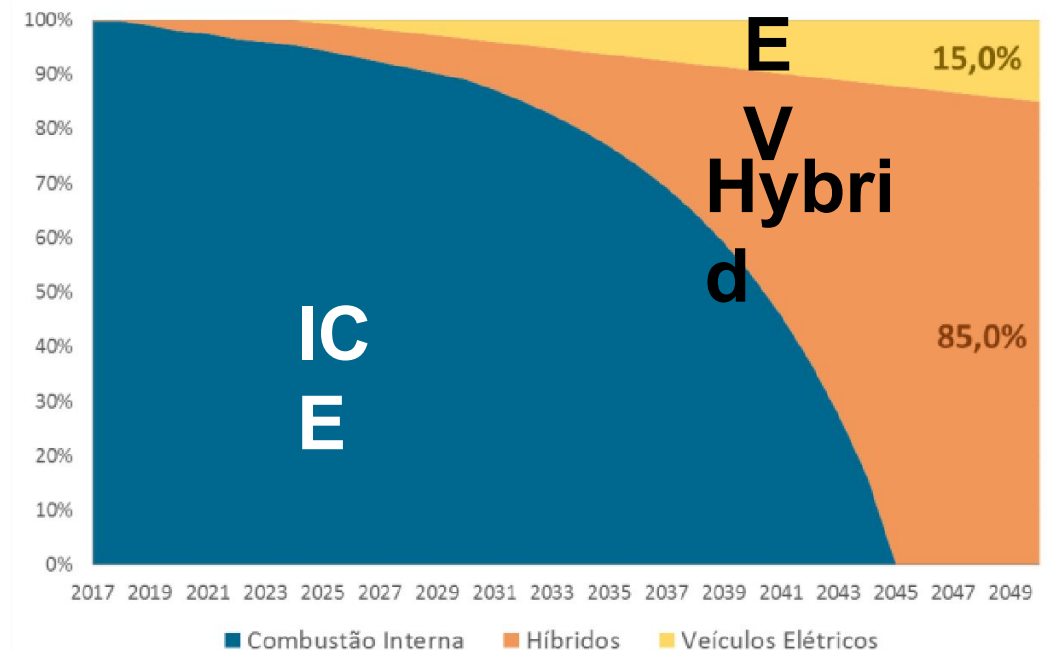
- in Brazil it apparently still it takes time...

Electrification of light vehicles - two perspectives: Penetration curve of technologies in the licensing of light vehicles

Progressive hybridization



Greater



Why that delay on Electromobility in Brazil?

- fuel in Brazil is already at least a quarter from biomass
Great demand for investments - Fleet, infrastructure etc
Lack of mastery of technology in the country, which increases external dependence
- Hybridization can take the best of both worlds
In addition, the issue of the trade off between environmental impacts cannot be ruled out

The trade-off for Electromobility (specially light vehicles)

involves balancing significantly lower operational greenhouse gas (GHG) emissions with:

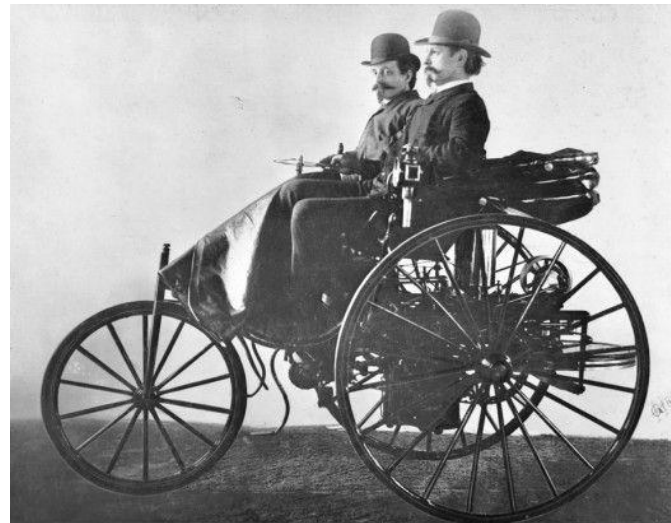
- increased environmental impact of mining for battery materials like lithium, cobalt, and nickel, which consumes large amounts of water and can produce toxic waste.
- While EVs are greener during use, their overall sustainability depends on a combination of cleaner electricity grids, improved mining and manufacturing practices, and better battery recycling to mitigate these negative aspects.

Electromobility in Rio – a future, back to the past



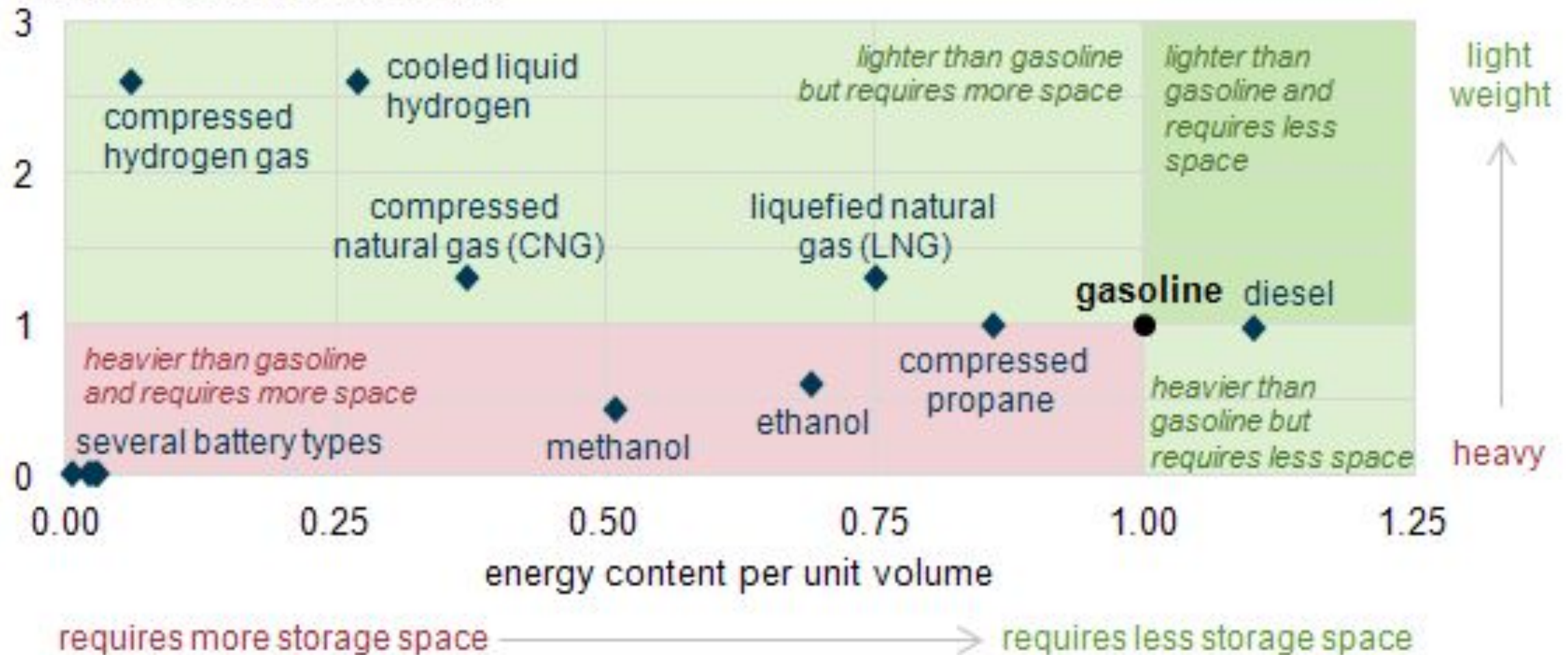
- On May 21, 1963, the last trams circulated in the South Zone of Rio de Janeiro, on the lines of the neighborhoods of Flamengo, Laranjeiras and Cosme Velho. That same month, the operation of the first bus station in the South Zone began, in the counterflow of Visconde de Pirajá and Ataúlfo de Paiva avenues. This allowed the circulation of CTC's electric buses in both directions. At the same time, Bartolomeu Mitre, Ataúlfo de Paiva and Visconde de Pirajá streets were paved, replacing the brick stone pavement. The novelty pleased the population, because it shortened distances. However, it generated problems because people could not hear the approach of the electrical buses and the buses circulated in the opposite direction. The signals were sparse and those who did not pay attention could be seriously injured. In May 1967, the city had 121 private companies, operating a fleet of 3,800 buses, in addition to a public company with 625 buses. In November 1968, the State of Guanabara had 78 bus companies, with a fleet of 4,238 diesel vehicles distributed in 242 lines. CTC's electric bus system had 198 heritage vehicles, including 11 trolleybuses in operation on 9 lines in the South Zone and 50 trolleybuses on 5 lines in the North Zone.

Talking about the past -The mobility options of the early twentieth century



Energy density comparison of several transportation fuels (indexed to gasoline = 1)

energy content per unit weight



Conclusion???

Findings....

- Energy is essential for economic, social and environmental aspirations
 - its value will always be subject to variations in the balance of these dimensions
- Environmental sustainability is not limited to reducing emissions
 - they should not be replaced by other impacts (water and soil)
- The energy transition depends on and impacts these same dimensions
 - Oil, natural gas, and coal still offer more immediate advantages
 - Regarding various renewables
 - Energy efficiency ?
 - Energy density?
 - Technological mastery ?
 - How will the future contemplate socioeconomic and environmental balance?

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Carlos Augusto Arentz Pereira



Chemical Engineer, Master in Production Engineering (Transport and Logistics), PhD in Public Policy, Strategies and Development from the Institute of Economics of the Federal University of Rio de Janeiro (2014). Experience of 33 years at Petrobras, having worked in several areas and activities such as 10 years in refineries, environmental control, energy conservation and economic performance evaluation. At the company's headquarters in economic evaluation, energy efficiency, development of products and services related to the use of natural gas and energy. He was a director of two energy trading companies of the Petrobras Group. Currently, in addition to his consulting activity, he is an Adjunct Professor at the Faculty of Engineering of the State University of Rio de Janeiro, responsible for the discipline of Energy Planning and Renewable Resources.