



RYSTAD ENERGY

WHAT IT TAKES TO NET ZERO?

RYSTAD ENERGY

MUCHED NASSIF – LEAD ANALYST, LATIN AMERICA POWER MARKET

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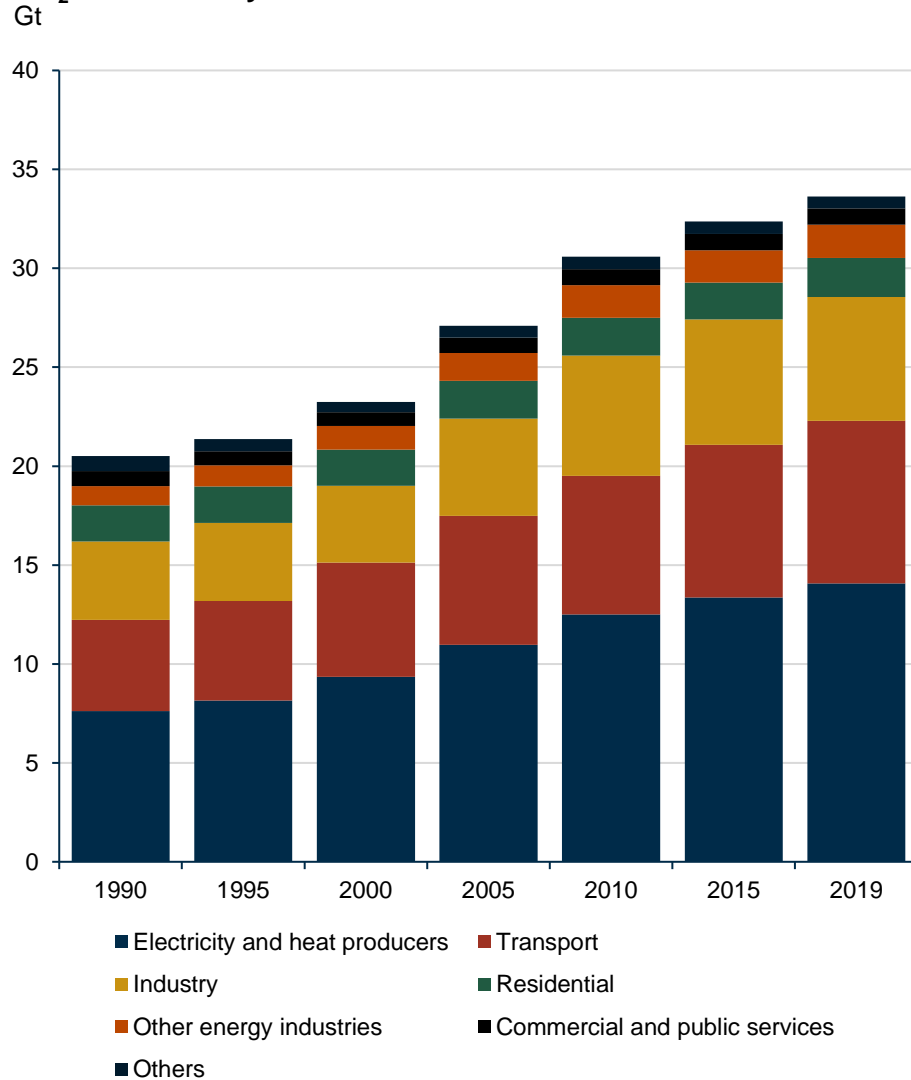
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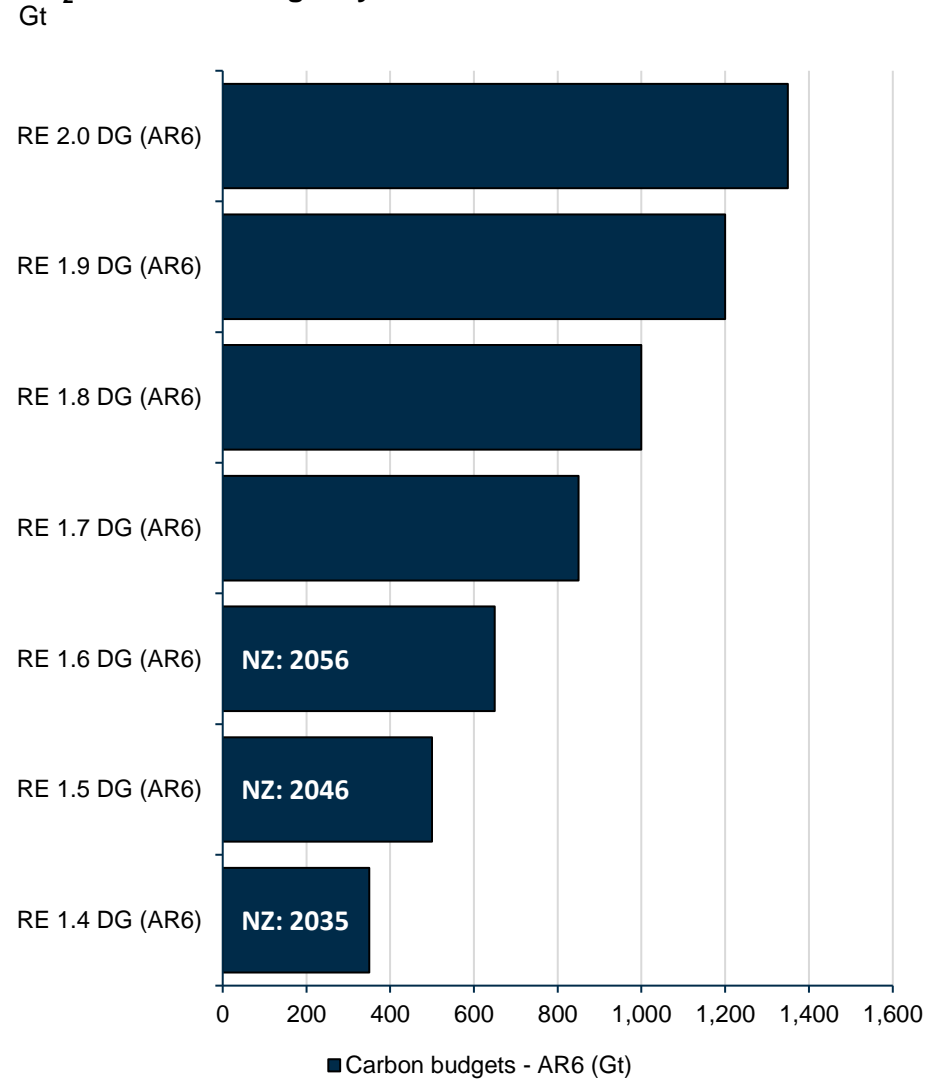
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Limiting global warming to 1.5°C by 2050 requires a sharp decline in CO₂ emissions

CO₂ emissions by sector



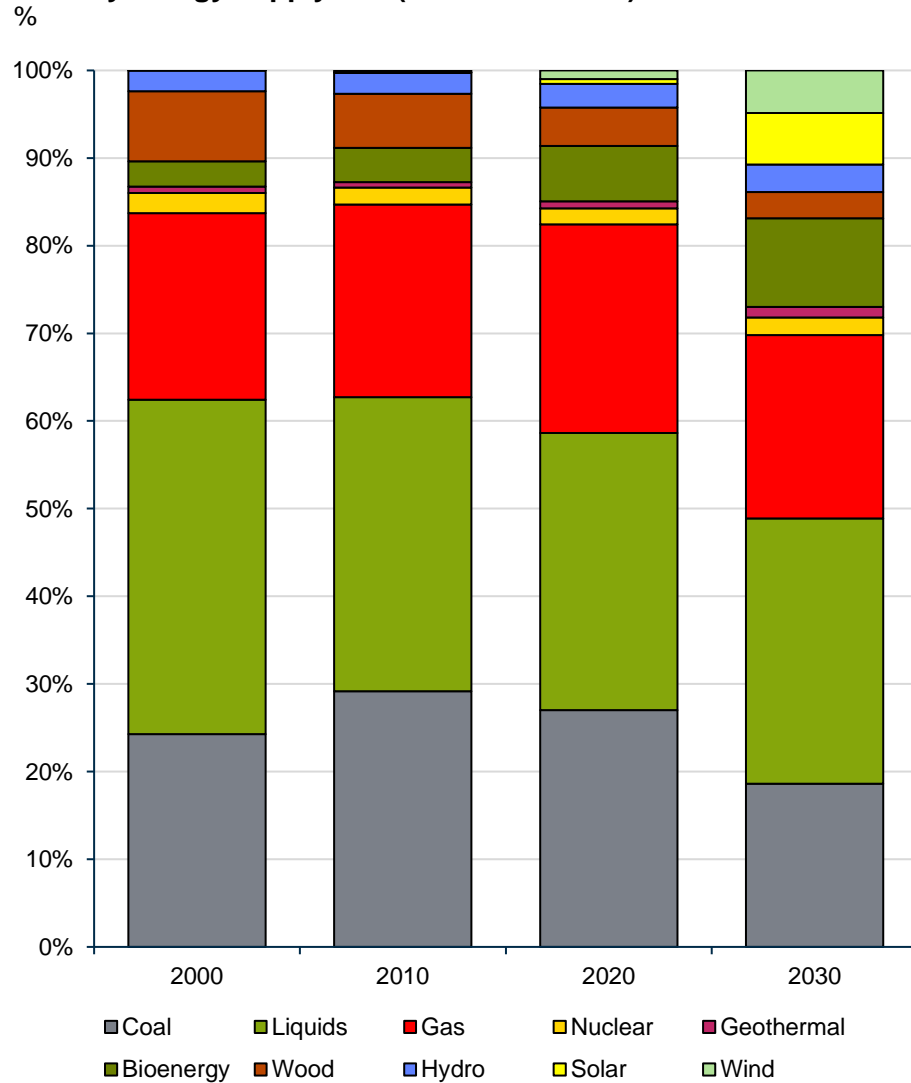
CO₂ emissions budget by scenario



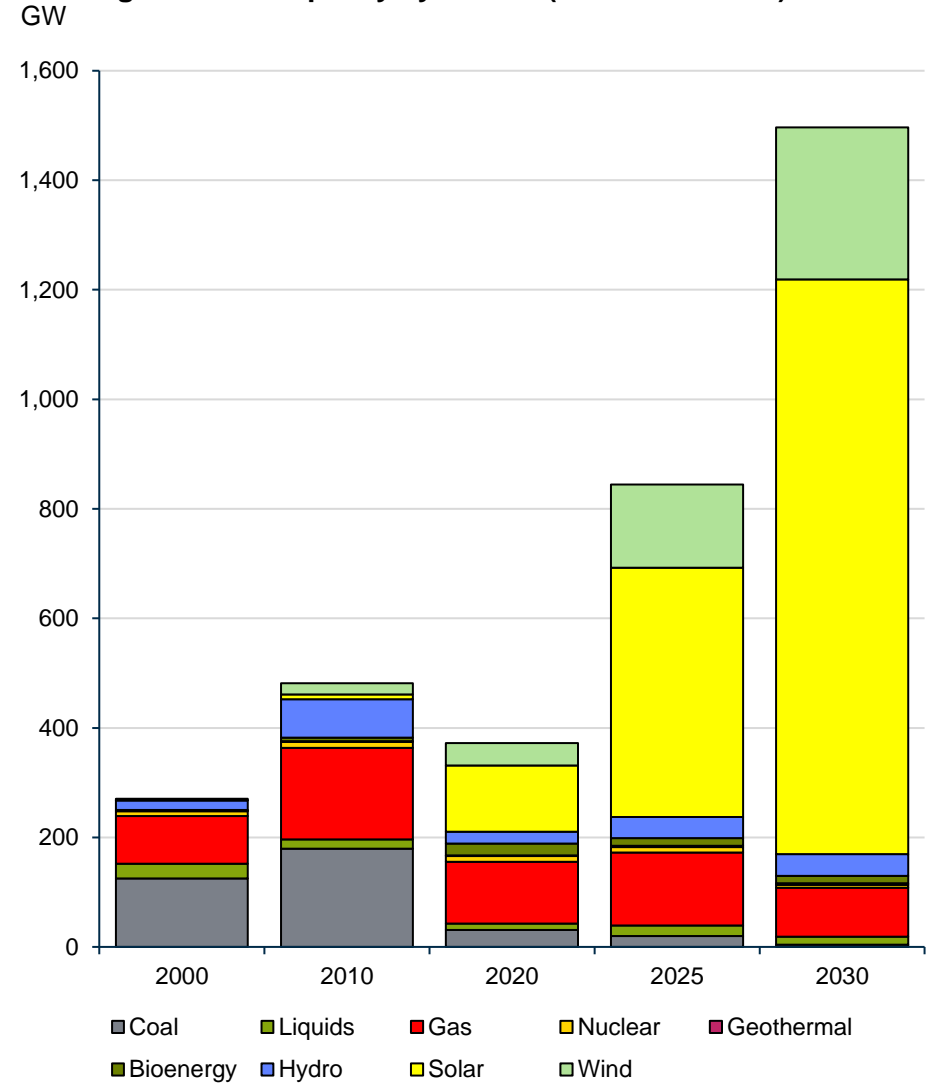
Source: Rystad Energy, IEA

The quest for reducing emissions in the energy sector will challenge policy makers and manufacturers, however it will bring great opportunities for renewables developers

Primary energy supply mix (Scenario RE 1.6)



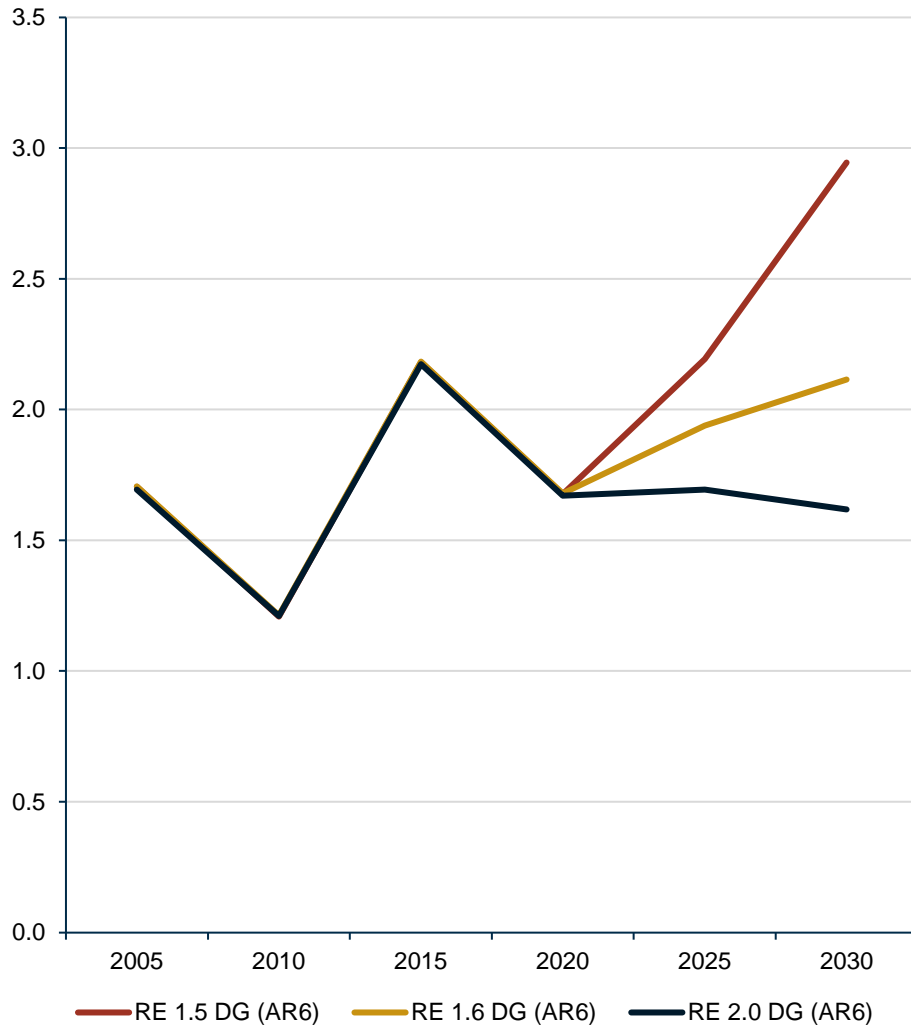
Power generation capacity by source (Scenario RE 1.6)



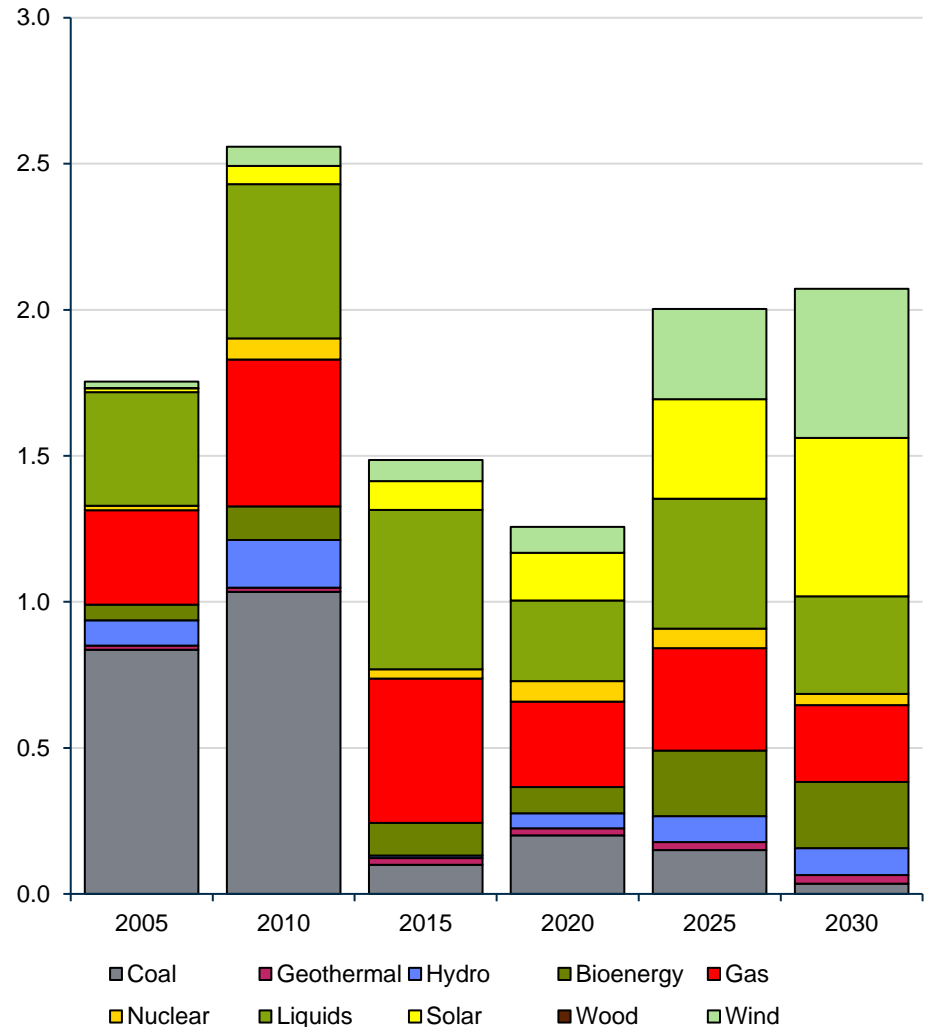
Source: Rystad Energy

For this decade, the 1.6°C scenario will require annual investments in primary energy at the same levels of the past decade

Primary energy total investment by scenario
Trillions USD



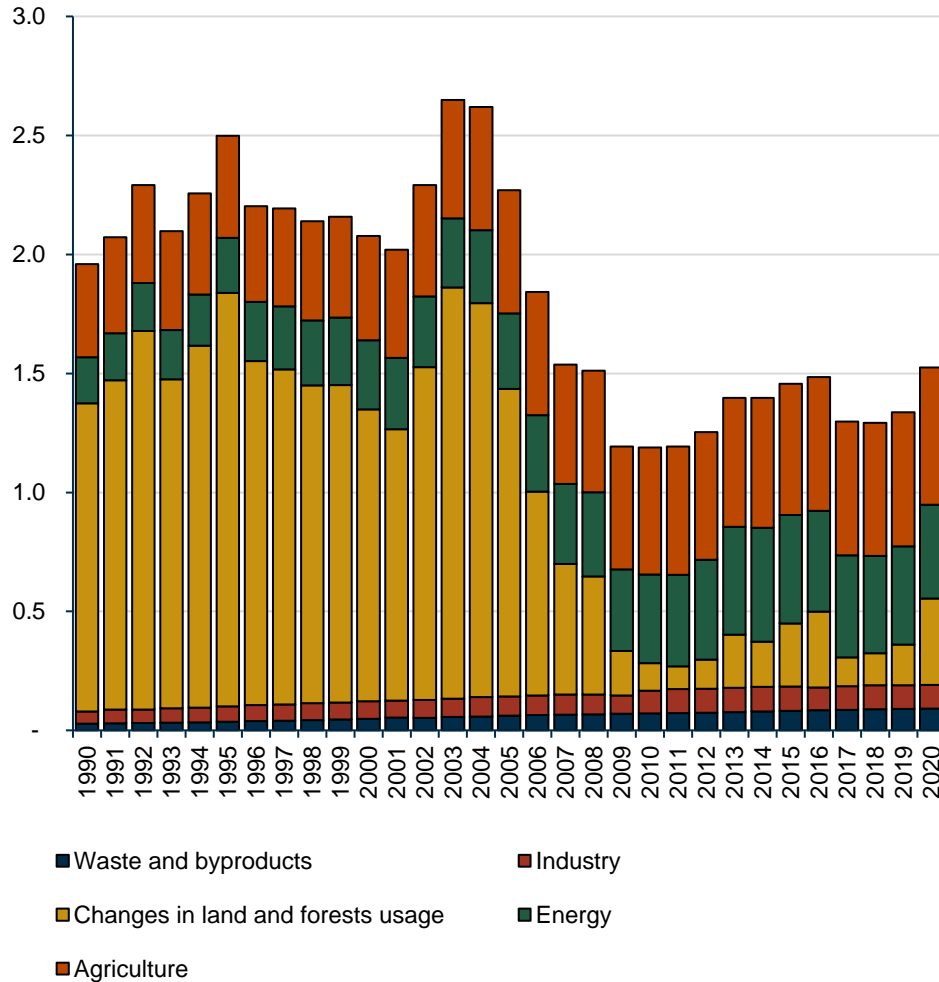
Primary energy total investment by source (RE 1.6°C)
Trillions USD



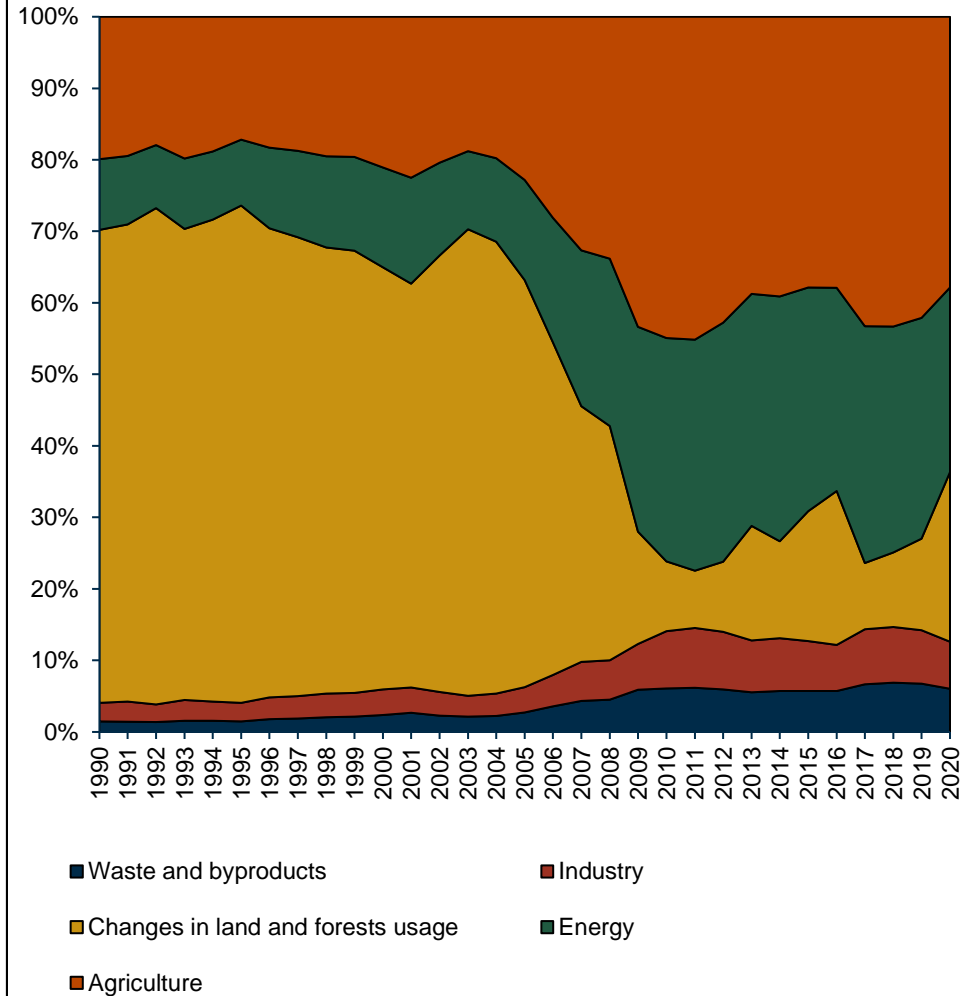
Source: Rystad Energy

Differently from the global landscape, emissions in Brazil are not led by the energy sector

Net CO₂ emissions by sector
Gt



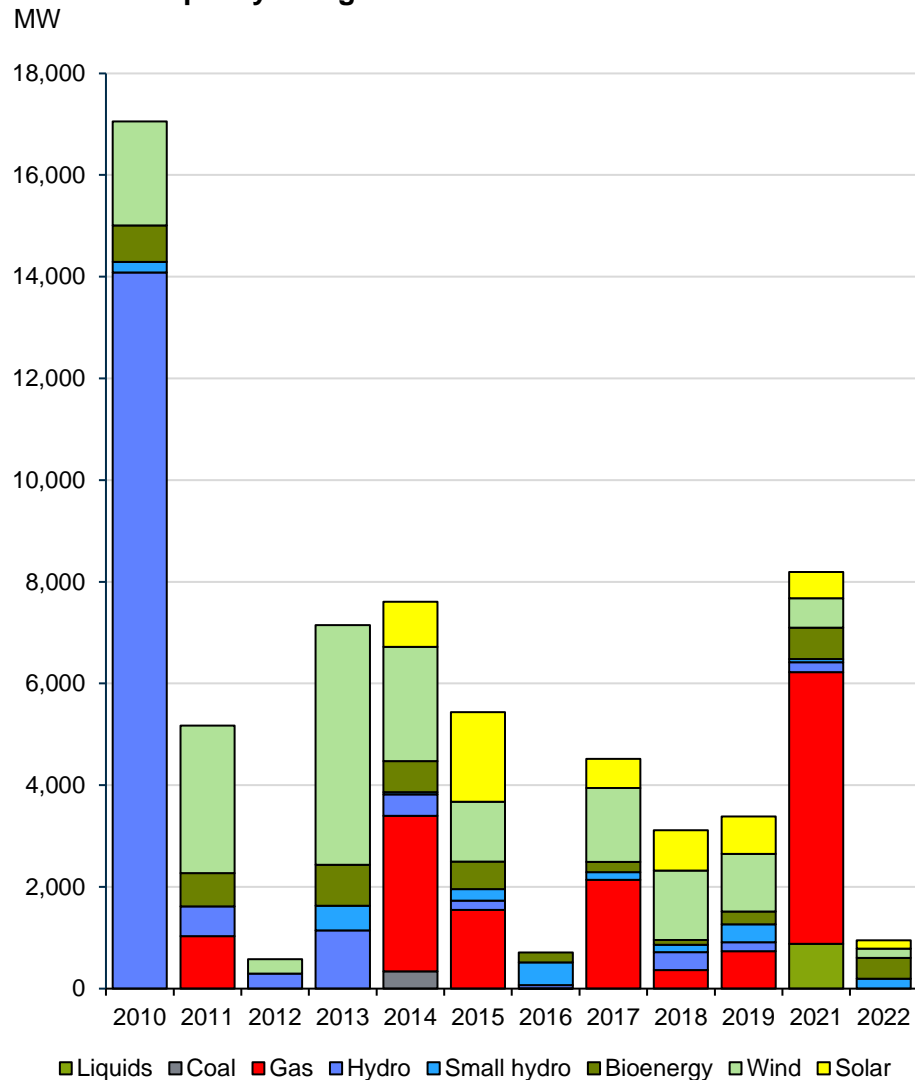
Net CO₂ emissions share by sector
%



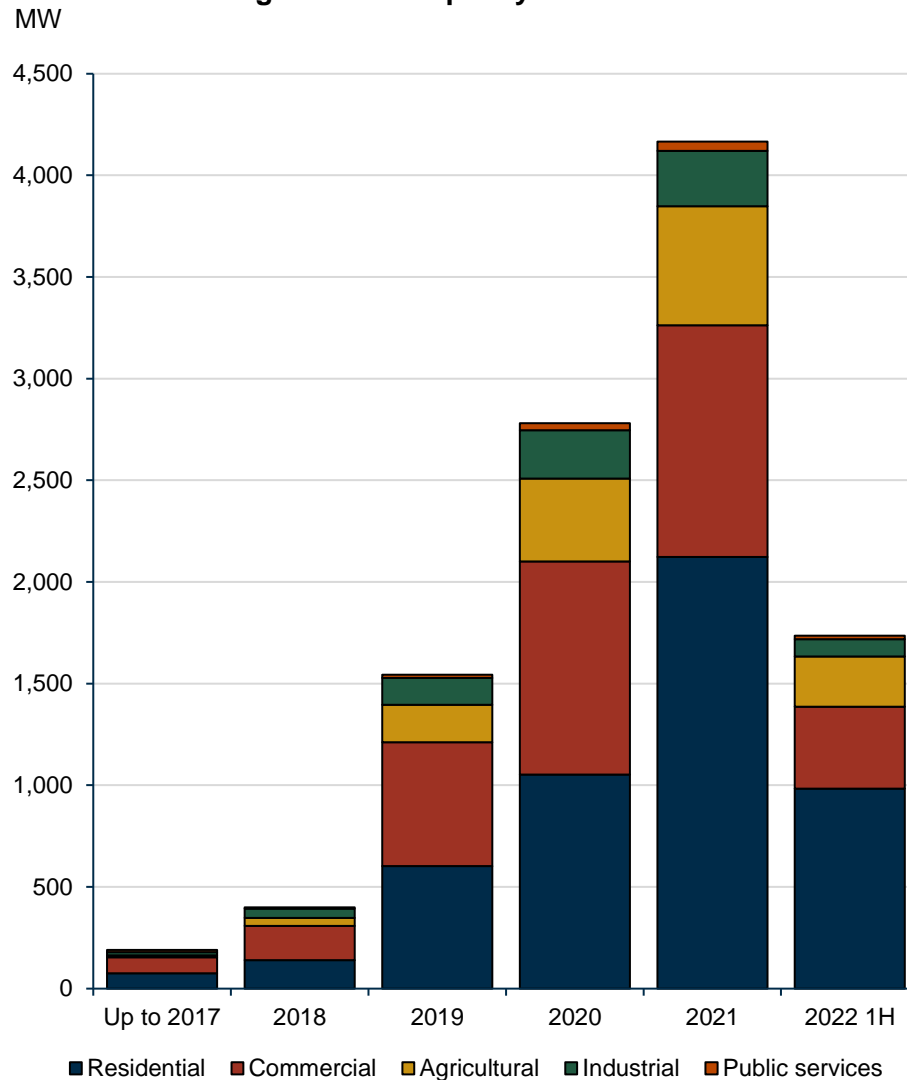
Source: Rystad Energy, SEEG

The Brazilian power system is shifting from a centralized and hydro-based system towards a diversified and decentralized supply mix

Procured capacity in regulated auctions



Solar distributed generation capacity additions



Notes: Auctioned capacity include existing plants procured in the Capacity Reserve Auction (LRC)
Source: Rystad Energy, Aneel, CCEE

Key market developments will favor renewables penetration over the decade

Limited power demand

- Power demand growth should remain timid over the shorter-term, given the political and economic uncertainties.
- As a result, the lower required capacity additions should limit renewables additions.

Free-Market migration

- Due to high power tariffs and to lower access requirements in recent years, there has been a massive migration towards the Free Market (ACL), which now represents 35% of the market.
- The ACL has become an important driver for renewables projects.

Renewables penetration

- Renewables are not only cleaner, but also cheaper than most technologies. From the cost perspective, they will take most of the market, reducing the opportunities for other technologies.

Capacity as product

- The separation between energy and capacity will increase transparency and optimize resource allocation over the coming years. Depending on the terms of this new market, it could represent an additional revenue stream for renewables.
- A new market for environmental attributes should be developed and increase renewables competitiveness.

Eletrobras privatization

- Eletrobras privatization law (14,182) imposes the addition of 8 GW of new gas-fired capacity, with a minimum 70% of inflexibility, to come online by 2030. It represents an additional annual gas consumption of 26 MMcm/d.
- The law also creates a market reserve for small hydro power plants in future A-5 and A-6 regulated auctions.



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Headquarters

Rystad Energy
Fjordalléen 16, 0250 Oslo, Norway

Americas +1 (281)-231-2600

EMEA +47 908 87 700

Asia Pacific +65 690 93 715

Email: support@rystadenergy.com

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