#H2OffThePress

The case of CO2 Capture

A license to ramp up emissions or a real mitigant to climate change?

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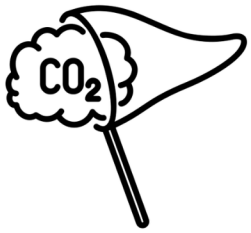
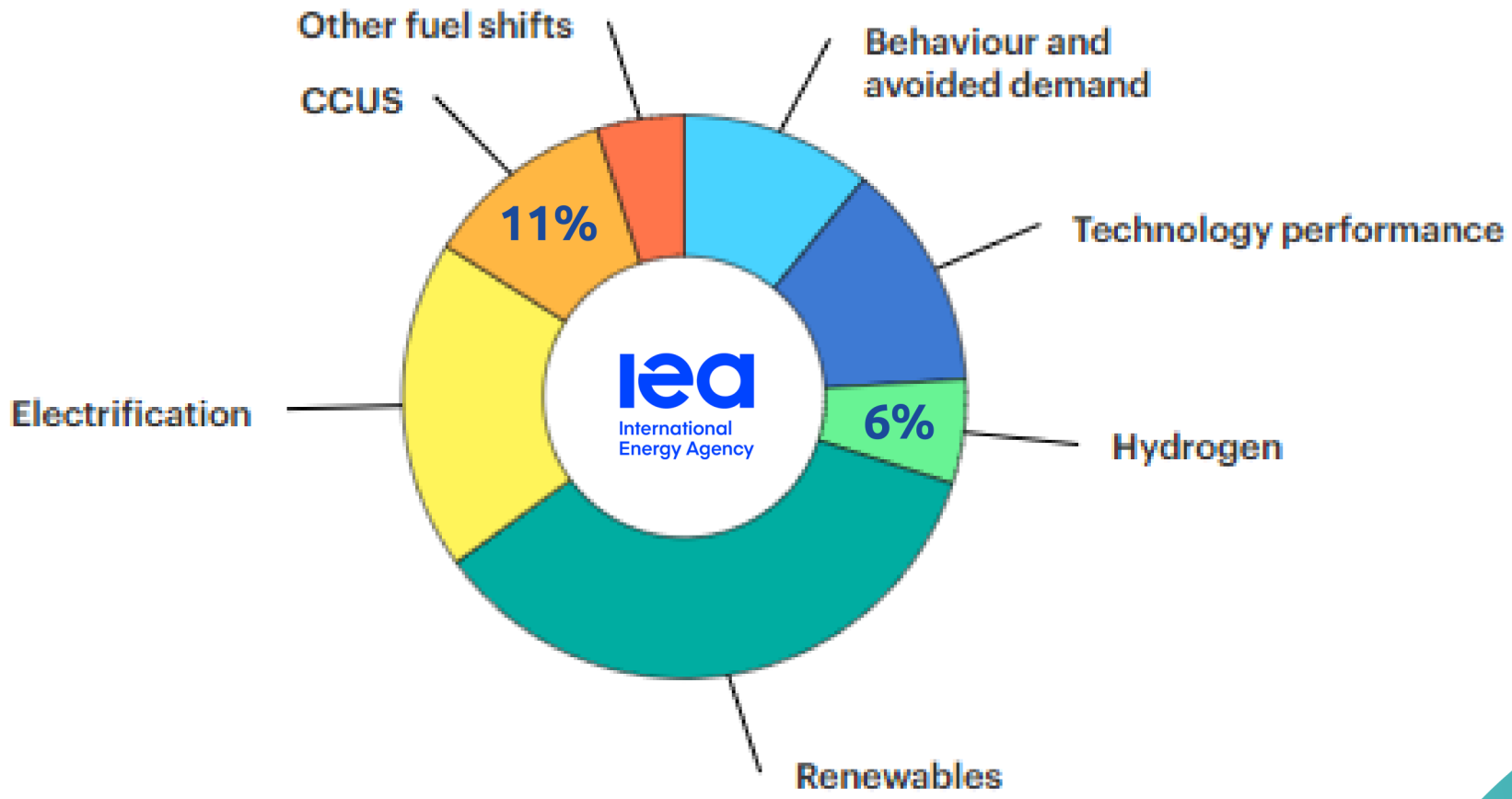
Carbon capture, a crucial piece in the net zero puzzle



Capturing CO2, one of the main greenhouse gases, is expected to form a key pillar in the race for Net Zero

According to the IEA, **Carbon Capture Utilisation and Storage (CCUS)** is expected to contribute to **11% of all emissions reduction needed to reach Net Zero**, between 2021 and 2050*



**IEA, 2021 Cumulative emissions reduction by mitigation measure in the Net Zero Scenario, 2021-2050*

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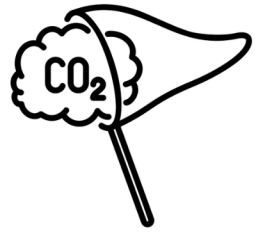
Mixed reactions for the use of carbon capture in the hydrogen industry

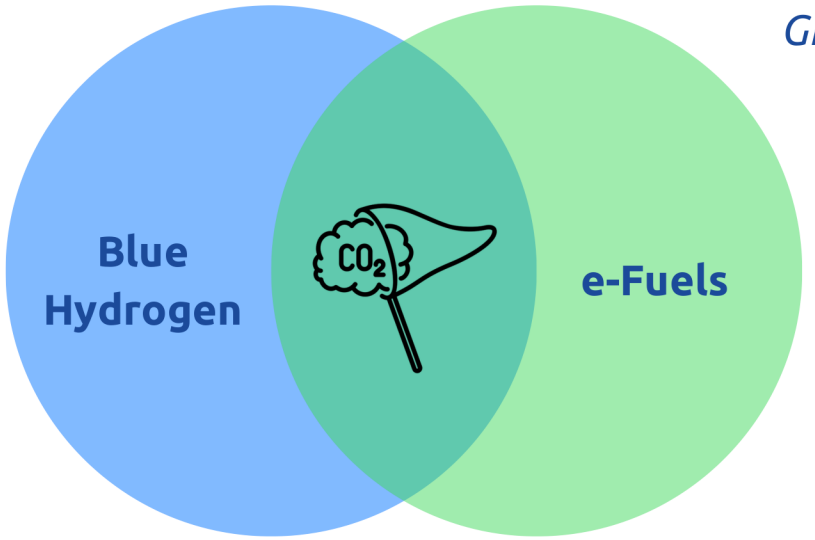


In the hydrogen industry, CO2 capture is mainly used in 2 ways

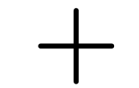
Grey H2 production
Steam methane reforming

CO2 capture

Blue hydrogen



Green H2 production
Water electrolysis



Captured CO2

e-Fuels

Can be perceived as a tool used by emission heavy industries to **maintain polluting projects** and **entertain carbon lock-in**

CO2 used as a feestock to e-fuels, a necessary tool for **heavy mobility decarbonization**

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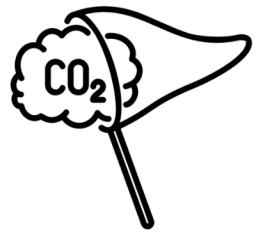
So, what is carbon capture?



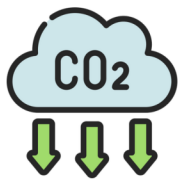
Carbon capture refers to the mitigation of CO2 emissions either

→ **From "point sources" (e.g. industrial facilities) ...**

Technology	***Post combustion*** *Separating CO2 from the flue gas using a solvent*	***Oxy-fuel*** *Burning a fuel with almost pure O2 to produce CO2 and steam*	***Pre combustion*** *Converting the fuel into a gas mixture and separating the CO2 and the H2 rich fuel*
Use cases	***Retrofit*** *existing power plants and industrial facilities*	***New*** *power plants and industrial processes*	*Integrated gasification combined cycle* ***(IGCC) power plants*** *and hydrogen production processes*
Maturity	*+++*	*+*	*+*

CO2 is deemed 'biogenic' *when the point source engages in the production or combustion of biofuels, bioliquids or biomass (waste-to-energy , biofuels, paper,...)*

→ **... or by a direct capture in the atmosphere, where CO2 is much more diluted**



Direct Air Capture (DAC)

Capture of CO2 thanks to a solid adsorbent (Solid DAC) or an aqueous basic solution (Liquid DAC)

High energy requirements and low scalability

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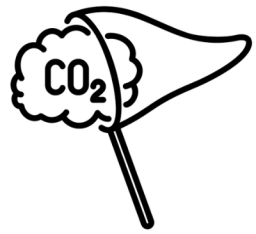
Large-scale carbon capture is starting to be a reality



Carbon capture industry is still not at scale due to supply chain issues, but there are promising advances recently

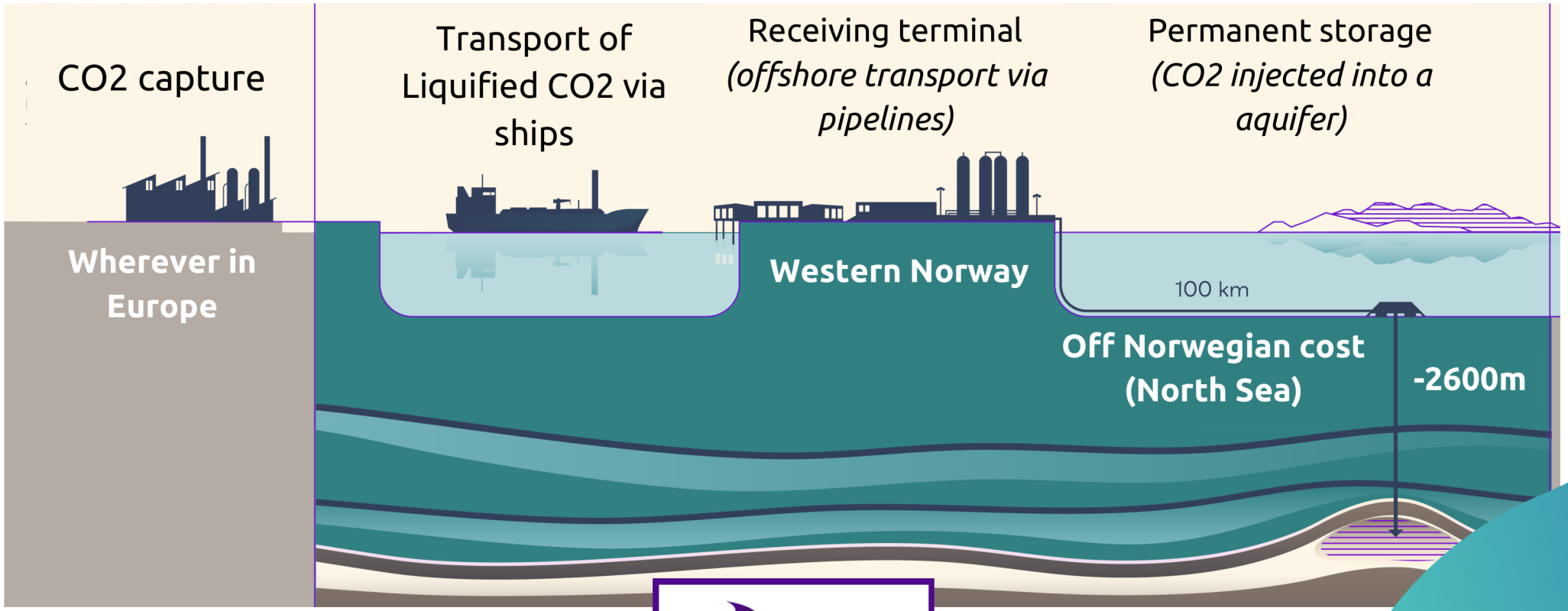
30 projects in operation, 11 under construction and 153 in development*

The Northern Lights project emerges as one of the hottest prospects in the full scale commercialisation of carbon capture and storage

COD: 2024

Capacity: 1.5 mn tons CO2/year (up to 5 mn in 2026)

Current CO2 sources: Waste to energy and cement plants



Northern Lights

equinor

TotalEnergies

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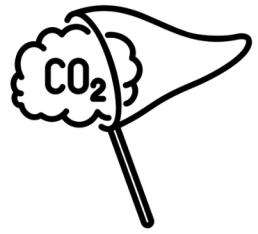
*The Global CCS Institute, 2023 Global Status of CCS 2022

The 'green' CO2 bottleneck

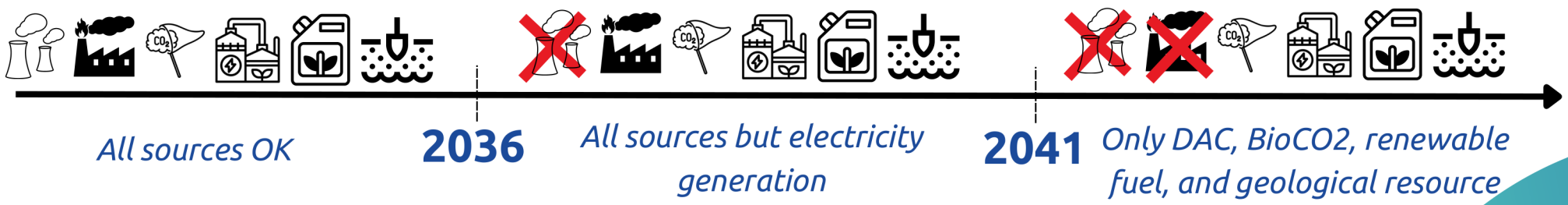


With the need to decarbonize mobility with e-fuels, there arises the question of **which CO2 source qualifies as 'green CO2'**

The European Union discriminates CO2 sources into 6 categories* ...

- **Point source from 'fossil' industries**
- **Point source from electricity generation**
- **Direct air capture (DAC)**
- CO2 captured from the production or the combustion of **biofuels, bioliquids or biomass**
- **CO2 from combustion of renewable fuels**
- **CO2 from a geological resource**

... and defines the 'green CO2' sources for e-fuels production as



→ Hence current e-fuels projects based on **industrial CO2**, but there is a need to find other feedstocks to prepare for post-2041

*Commission Delegated Regulation (EU) 2023/1185

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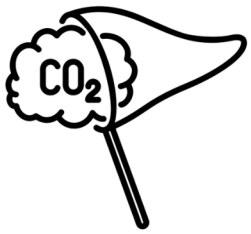
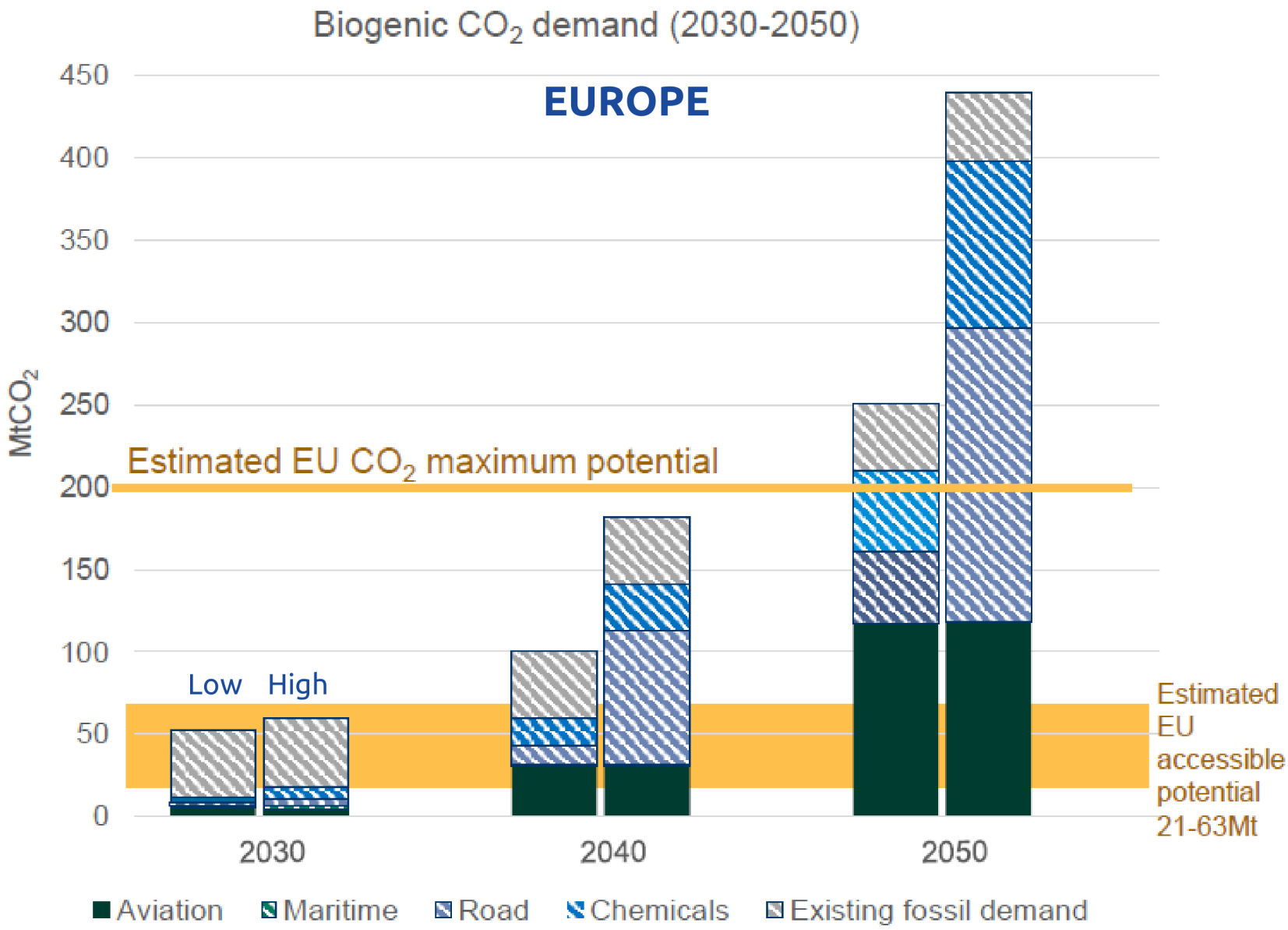
Will there be enough for everyone?



Potential total **biogenic CO2** demand could be large, **outstripping the accessible and maximum potentials**, but is very uncertain



ERM, Assessment of European biogenic CO2 balance for SAF production, Nov 2022

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