

E-fuels – Powering the Future of Global Shipping

Understanding E-fuels

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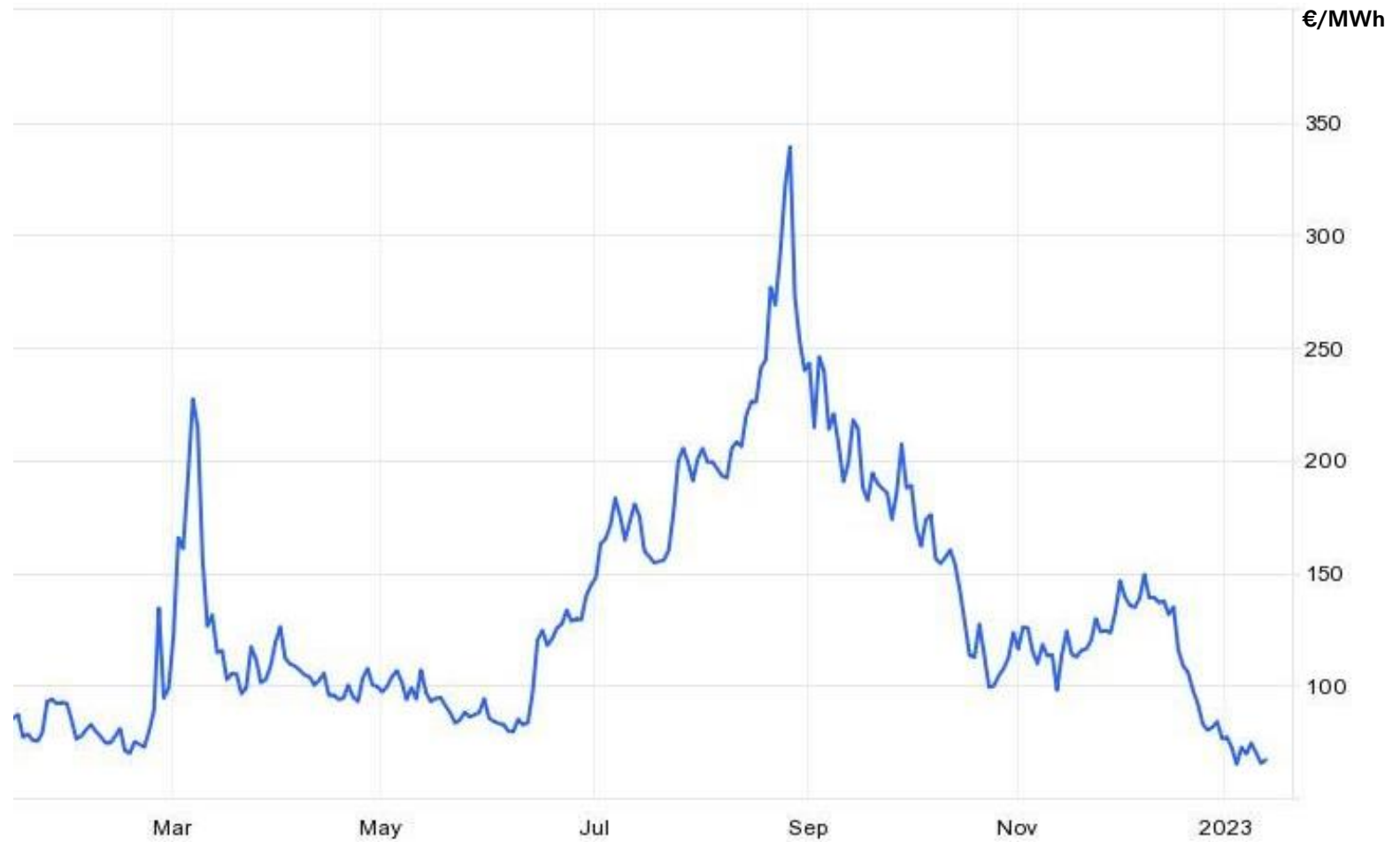
The Energy Framework

High
fluctuations of
natural gas
price

Increase of
renewable
energy capacity

Decrease of
renewable
electricity price

The natural gas price development in Europe



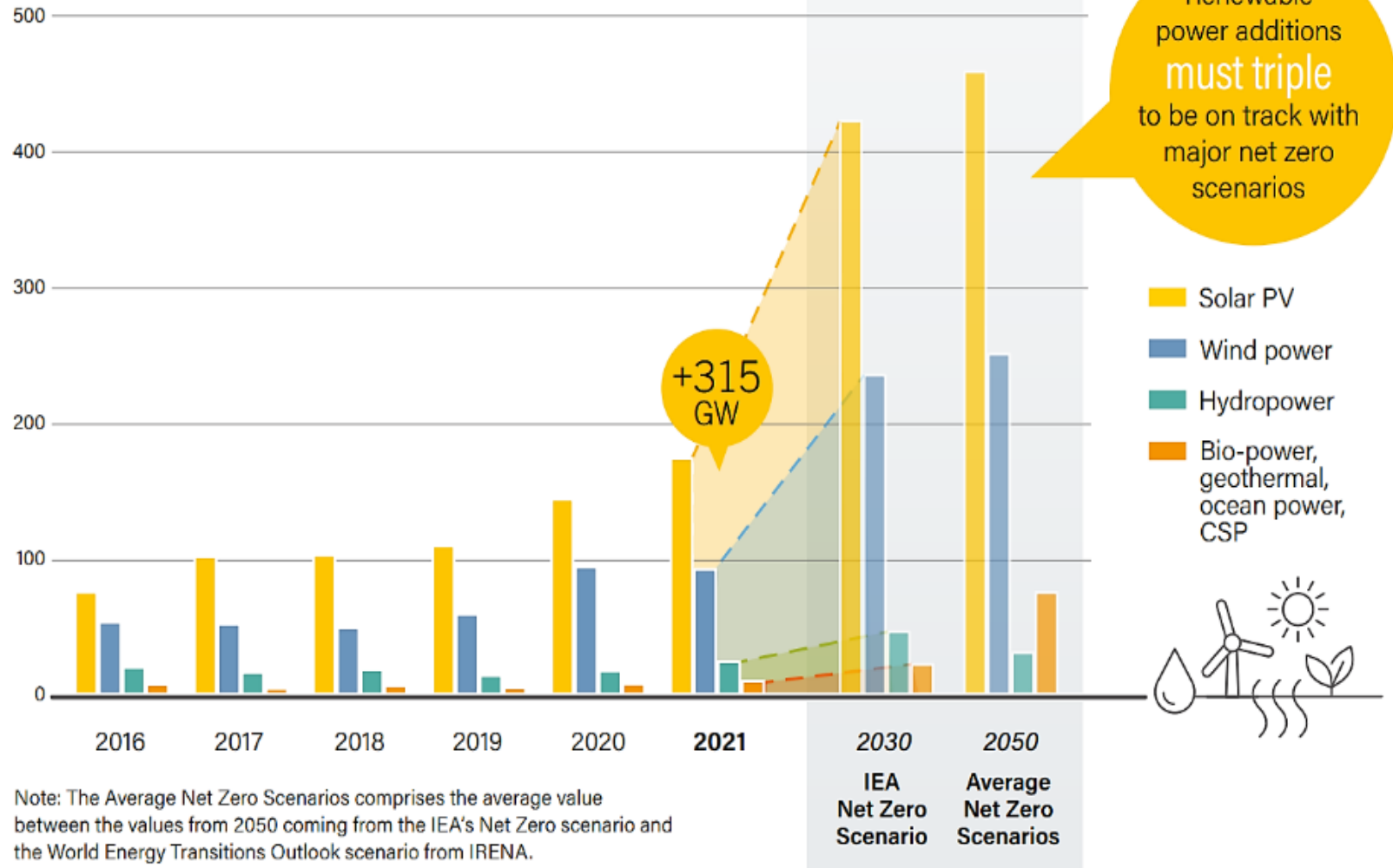
Natural gas prices in Europe express in euro per megawatt hour [€/MWh].
(Source: Trading Economics)

The rise of renewable energy



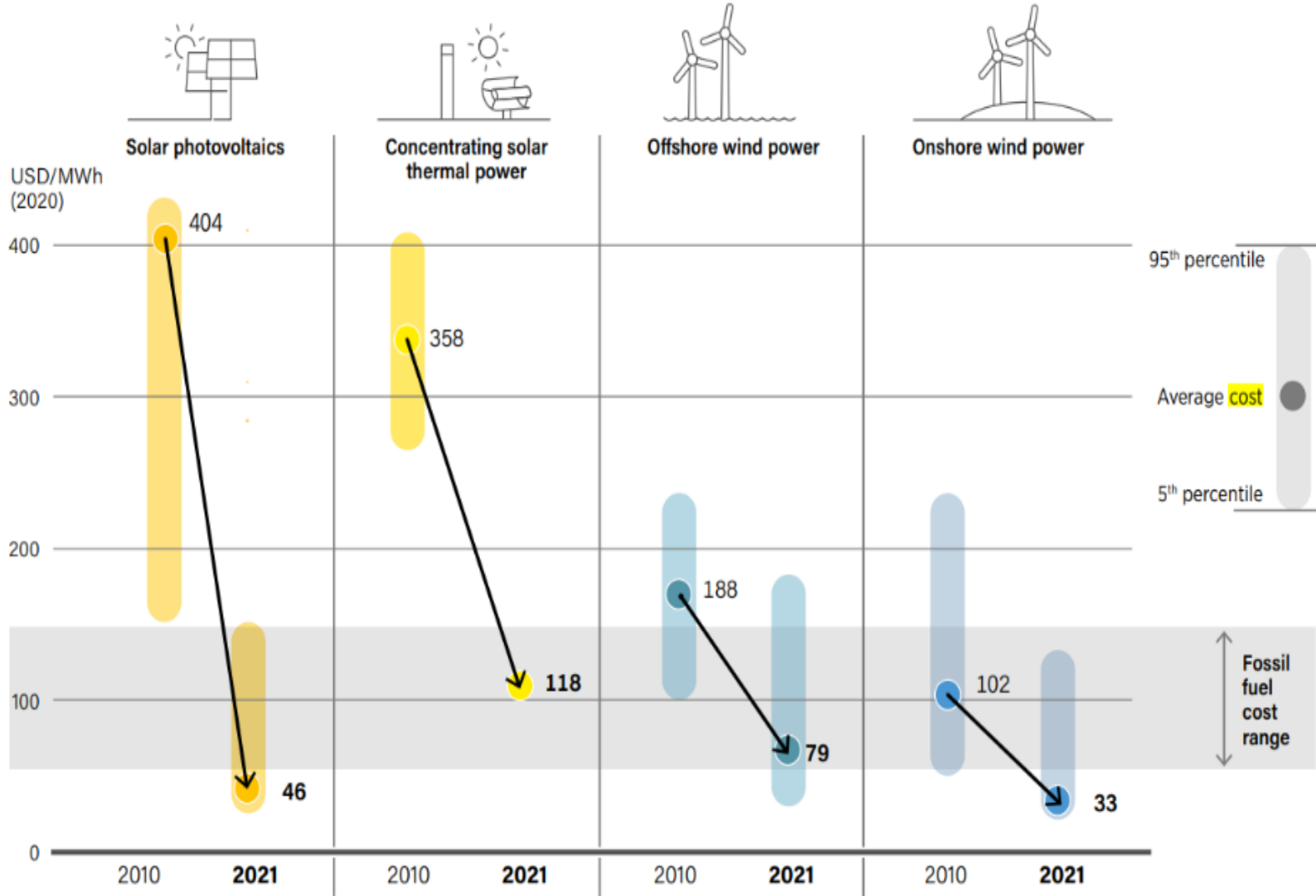
Annual Additions of Renewable Power Capacity, by Technology and Total, 2016-2021, and to Achieve Net Zero Scenarios for 2030 and 2050

Additions by technology (Gigawatts)



Annual additions of Renewables Power Capacity by technology and total, 2016-2021 to achieve Net Zero scenarios for 2030 and 2050. (Source: REN21)

The renewable electricity costs are reducing



Global Weighted-Average Levelized Cost Of Electricity (LCOE) from newly commissioned, Utility-scale Renewable Power Generation Technologies 2010-2021 (Source: REN21)

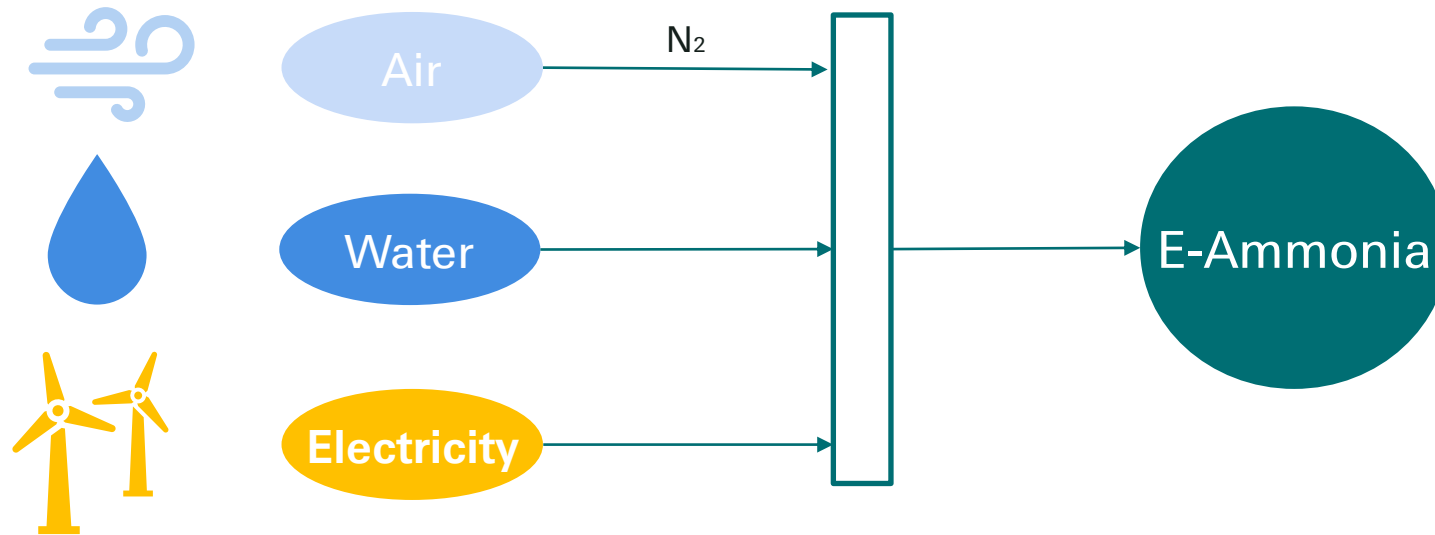
Why E-fuels?

Diversification
of **energy**
supply

No major
changes in
supply chains

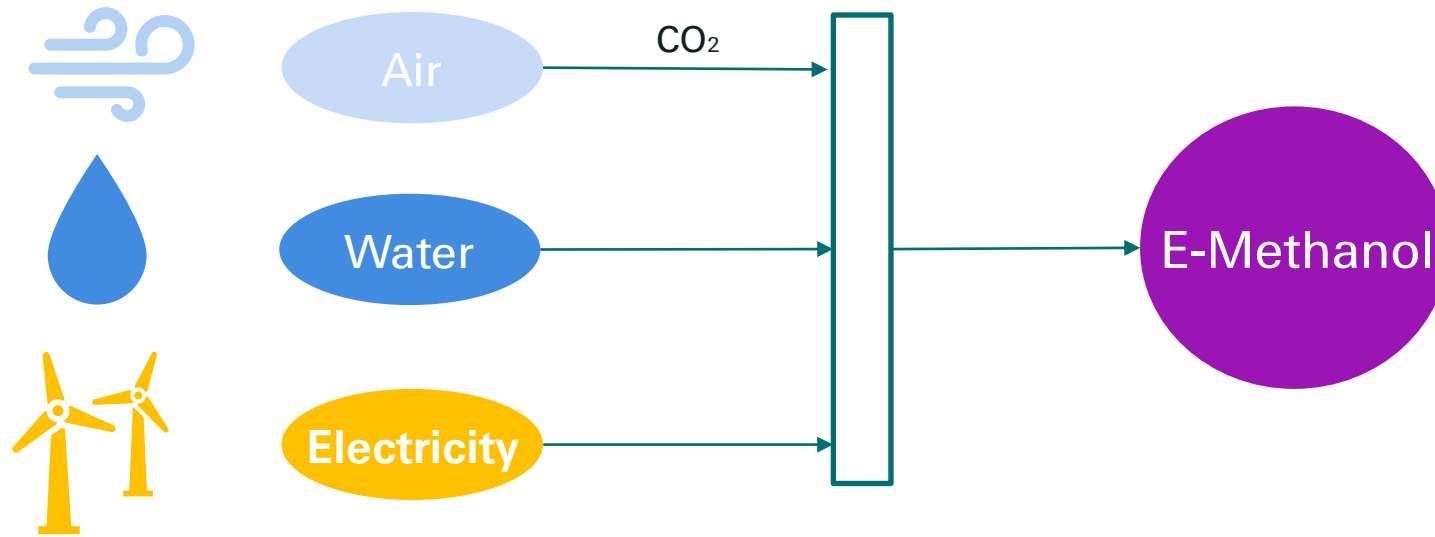
Decarbonizing
“Hard-to-abate”
sectors

The production of E-Ammonia (or e-NH₃)



Ammonia combustion does not release CO₂

The production of E-Methanol (or e-CH₃OH)



Methanol combustion releases CO₂

Risk comparison – Ammonia vs. Methanol

	Transportation and Storage	Fire and Explosion	Toxicity
Ammonia	Low	Low	High
Methanol	Low	Medium	Medium

Conclusion

E-fuels = fuels
**chemical &
physical properties**

E-fuels \neq fuels
**production &
CO₂ emissions**

Overcoming
limits of
battery
systems

Similar
infrastructure
can be
maintained

Thank you for your attention!





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