Short Introduction
Framing the decarbonization challenge with a few numbers

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**EU GREENHOUSE GAS EMISSION TARGETS**

**2030**
GHG -55%
RELATIVE TO 1990

**2050**
CLIMATE NEUTRALITY

State of the Union: Commission raises climate ambition and proposes 55% cut in emissions by 2030

Committing to climate-neutrality by 2050: Commission proposes European Climate Law and consults on the European Climate Pact
Greenhouse gas emissions*, EU-27

1990 4.9 Gton

- 55%

2018 3.9 Gton

- 21%

2030 2.2 Gton

- 43%

We need to cut 2x in 1/3 of the time:
Overall we need to run 6x FASTER
in the next decade for the 2030 target

*EUROSTAT - Greenhouse gas emission statistics, 2021
A HUGE CHALLENGE
INTERNATIONAL SHIPPING

220,000 tons
Average trip China-Europe: 30 days
1 trip
9000 ton “bunker fuel”

About 3000 ton H$_2$
(LIQUID!)@

Green H$_2$

150 GWh electricity*

*An additional 50 GWh would be needed for the liquefaction process and for temperature maintenance along the journey

@Conversion would be technically complex, see e.g. Energy Environ. Sci. 2021, 14. 815-843
This estimate is intended only to give an idea of the huge scale of the effort required
FUKUSHIMA HYDROGEN RESEARCH FIELD

Electrolyzer: 10 MW
PV plant: 20 MW
18 ha
(26 football fields)

H$_2$ produced:
900 ton/y

This facility should work 3 YEARS continuously for ONE refill of a supercargo

Alkaline electrolyzer
IN SHORT ...

Decarbonization means
1) A dramatic ACCELERATION
2) A process on a GARGANTUAN SCALE
A standard videoconferencing service uses about 2.5 GB/hr and has a carbon footprint of 157 g CO2e/hr*

**TODAY WEBINAR**

157g $\times$ 5h $\times$ 250 people $\approx$ 0.2 tons of CO$_2$eq

By flight (90 kg/hr CO$_2$ per passenger)

90 kg $\times$ 2h (round trip)# $\times$ 250 people = 45 tons of CO$_2$

**We have emitted > 200 TIMES less CO$_2$ than flying to Brussels!** (considering only flying ...)


#Assuming 1h flight to Brussels