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*National and regional gas turbine markets;  
opportunities and challenges towards a hydrogen economy*

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ETN's 10th International Gas Turbine Conference (IGTC)  
October 13<sup>th</sup>, 2021

## Equinor launches a multibillion-dollar blue hydrogen plan

By LARS ERIK TARALDSEN on 10/8/2021

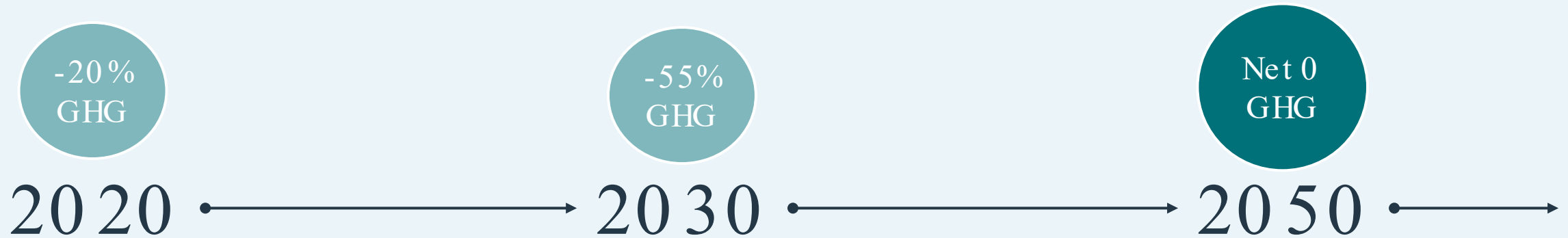


OSLO (Bloomberg) --Equinor ASA, the flagship producer of oil and gas giant Norway, is investing billions of dollars in blue hydrogen on a bet that it can make the fuel more cleanly than anyone else.

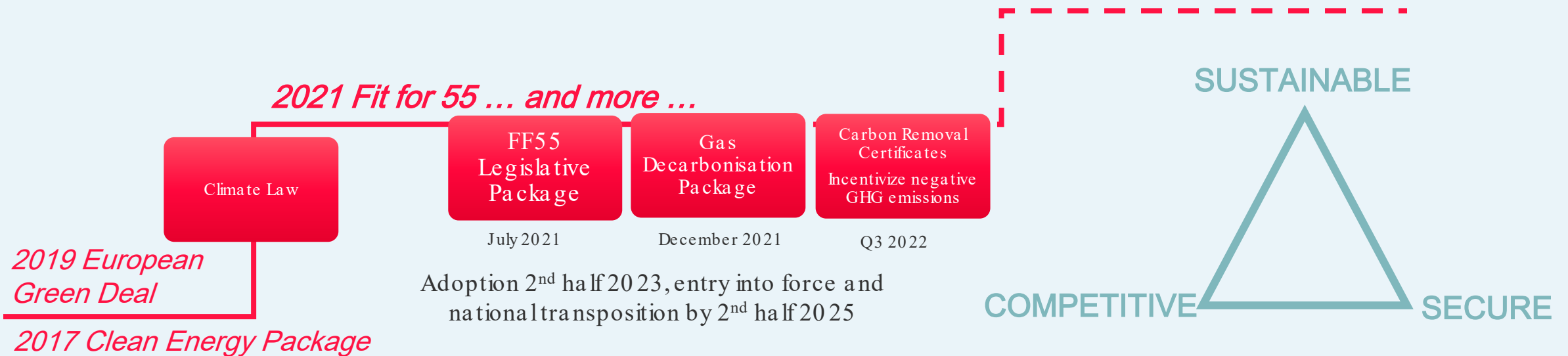
The state-controlled oil firm is among energy companies across Europe stepping up plans for hydrogen as mounting pressure to fight climate change spurs massive shifts in investment. Equinor believes it has the edge in the race to commercialize the industry because it leaks less methane than its rivals.

[Link](#)

# EU: The road to Net-Zero



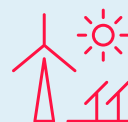
*Sustainability is in the EU's DNA it is Treaty bound*



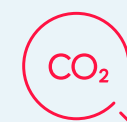
# Accelerating Equinor's transition



Optimised oil & gas portfolio



High value growth in  
renewables



New market opportunities  
in low carbon solutions

>10 %

Production growth  
2021-26

>70 0 KBOE  
PER DAY

New production 2026

40 %

Reduce net carbon intensity by  
2035

50 %

of gross investments to renewables  
and low carbon solutions by 2030

12-16 GW

Installed capacity by 2030

Equinor share

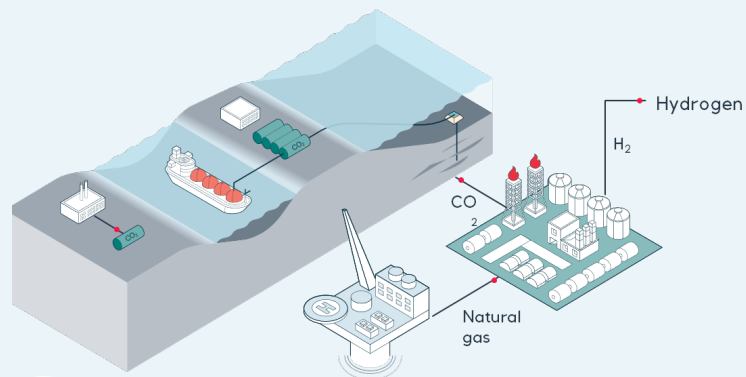
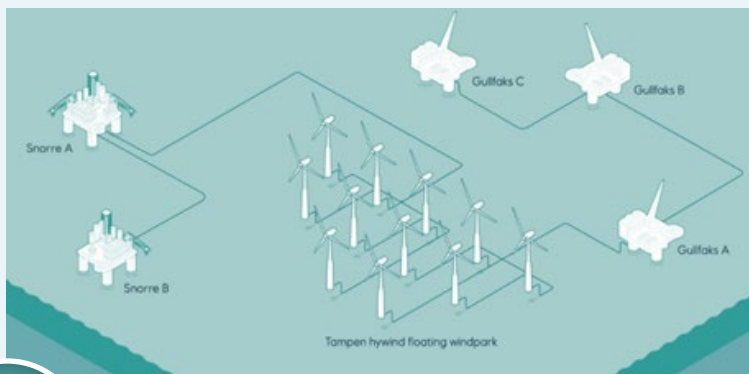
15-30 MTPA  
CO<sub>2</sub>

Transport and storage  
capacity by 2035

3-5 MAJOR  
INDUSTRIAL  
CLUSTERS

Clean hydrogen projects by  
2035

# New value chains for long term value creation



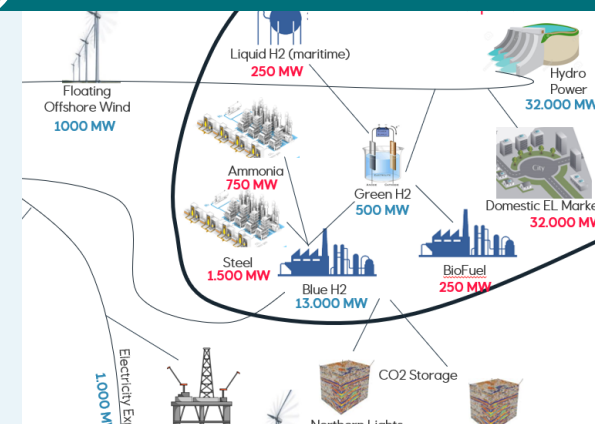
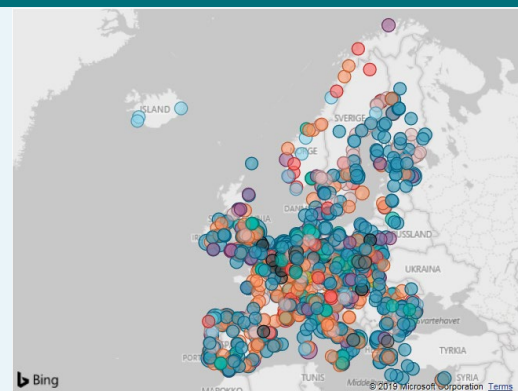
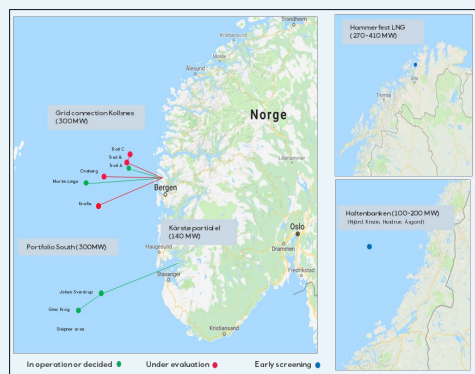
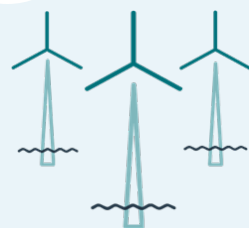
Offshore wind



CO2 capture and storage

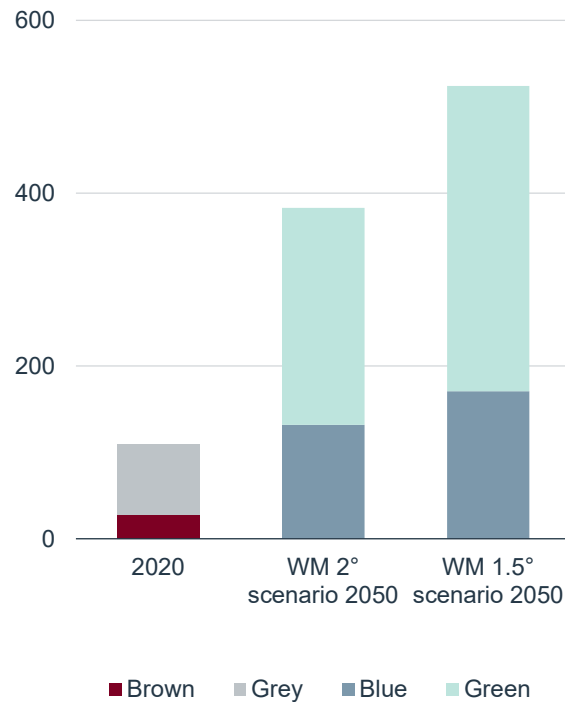


Hydrogen (Ammonia)



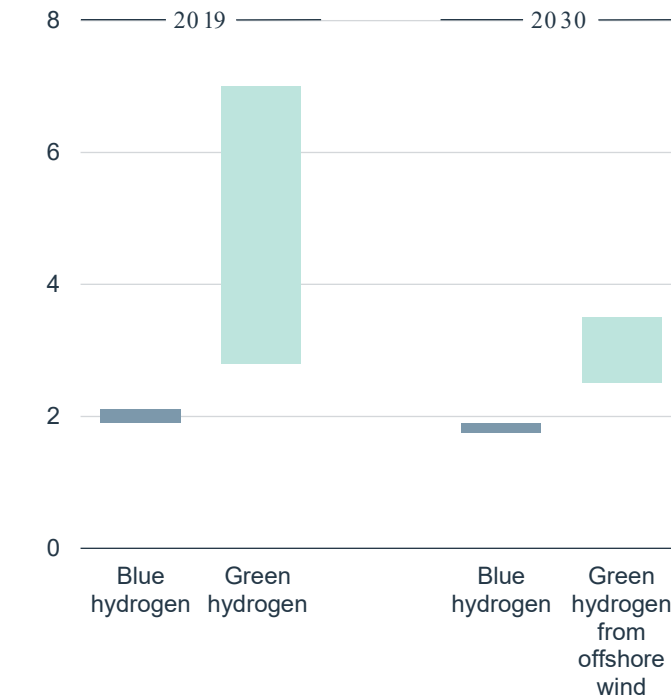
# Net zero driving demand for clean hydrogen

**Global clean hydrogen production**  
Million tonnes per year



Source: Wood Mackenzie

**Hydrogen production costs in northwest Europe**  
EUR per kg



Source: IEA NWE hydrogen report April 2021



# A unique portfolio across segments and key markets

- Equinor well positioned to create value from low carbon solutions towards a net zero future
- Competitive edge founded on experience, infrastructure and customers
- Focus on large projects in major industrial clusters

Project name	Project type	Country	Decarbonisation segments			
			Industry	Power	Heat	Transport
Northern Endurance	Infrastructure	UK	●	●	●	●
Northern Lights	Infrastructure	NO	●			
Net Zero Teesside	CCGT+CCS	UK		●		
Keadby 3	CCGT+CCS	UK		●		
Peterhead	CCGT+CCS	UK		●		
H2H Saltend	H2 fuel switch	UK	●	●	●	●
Keadby Hydrogen (2/4)	H2 fuel switch	UK		●		
H21	H2 fuel switch	UK	●		●	
H2M Magnum	H2 fuel switch	NL		●		
North2	Green hydrogen	NL, BE, DE	●			●
H2morrow Steel	H2 feedstock switch	DE	●			
Liquid Hydrogen Maritime	Green hydrogen	NO				●
Clean Hydrogen to Europe	H2 fuel switch	NO	●	●	●	●
Barents Blue	Blue ammonia	NO	●			●

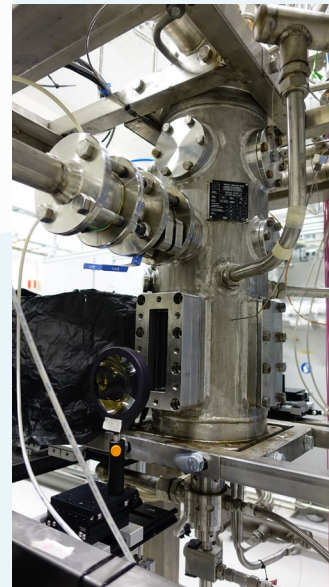
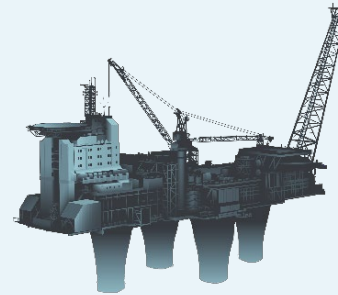
# Hydrogen Gas Turbines; key end-user technology



Clean Hydrogen for the energy intensive segments



flexible power generation



SINTEF's HIPROX (HP combustion testing)

PRESS RELEASE

**Mitsubishi Power to Develop Ammonia Combustion Systems for Thermal Power Plant Boilers**  
 -- To achieve optimal combustion characteristics for mixed and single fuel operations --

"BIG H2(Phase III)"

«Enabling safe, clean and efficient utilization of hydrogen and ammonia as the carbon-free fuels of the future»

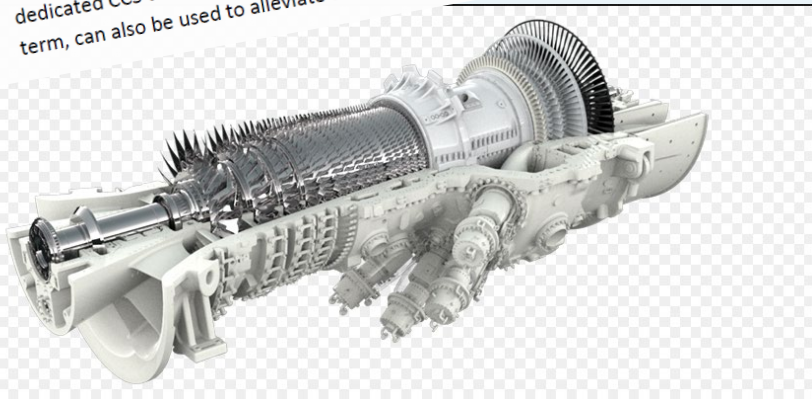


PRESS RELEASE

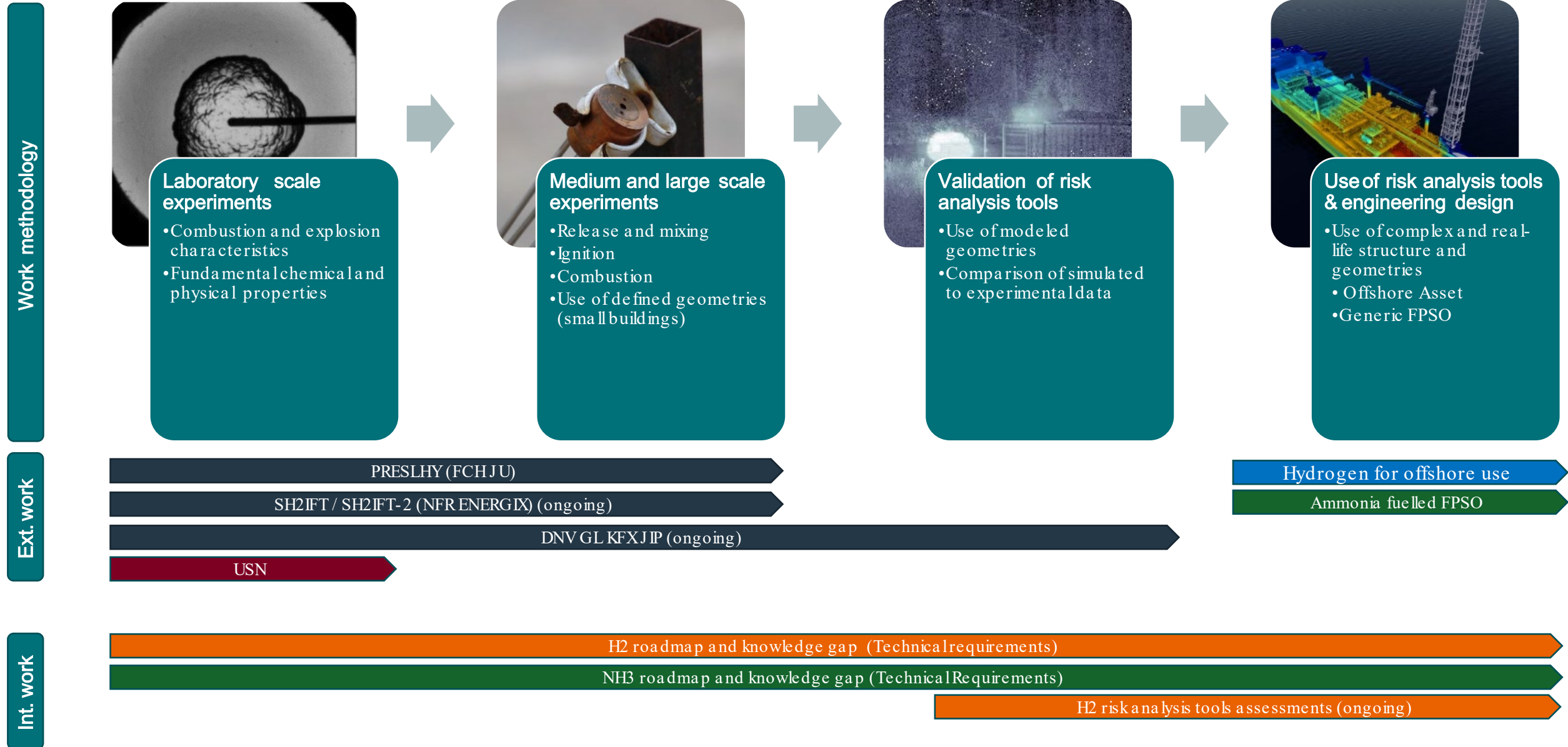
Genoa, October 24th, 2019

**Ansaldo Energia and Equinor collaborate on validation of 100% hydrogen gas turbine combustor**

Climate change is one of today's most important environmental and social concerns. In order to achieve the Paris Agreement's goals, decarbonization of the power generation sector is essential. Hydrogen-fired gas turbines allow for CO2-free dispatchable power generation. CO2-free hydrogen can be either produced via electrolysis using renewable power (green hydrogen) or from natural gas applying dedicated CCS technology (blue hydrogen). The capability to store energy in hydrogen for medium to long-term, can also be used to alleviate variations in renewable power generation.



# Safety is key!





# Key Messages

- To solve the climate challenge all sectors within the energy system need to be decarbonised rapidly and cost effectively
- Heavy industry, long distance transport and heat and power require large-scale hydrogen production => industrial volumes required towards 2030 and beyond
- Equinor involved ingreen H<sub>2</sub> projects and low carbon (blue) H<sub>2</sub> based on NG with CCS => all measures required to reach climate goals and Equinor is advocating for a technology neutral approach
- Hydrogen Gas Turbines key enduser technology in realizing the hydrogen society
  - ⇒ Large/small scale GT, onshore/offshore application
  - ⇒ Other low carbon solutions also relevant (CCS, Biofuels, Ammonia)
- Safety focus is essential
  - ⇒ Fundamental understanding – experimental work - modelling - safety-in-design

