

CHEMISTRY THAT MATTERS™

DECARBONISATION IN ENERGY INTENSIVE CHEMICAL INDUSTRIES – CASE STUDY

NEPIC CLEAN GROWTH CONFERENCE 20/9/22

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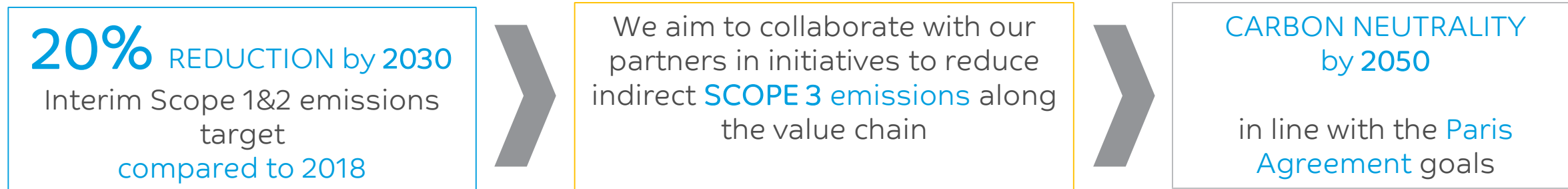
SABIC ON TEESSIDE



TEESSIDE



SABIC'S CARBON NEUTRALITY ROADMAP AIMS AT FULL CARBON NEUTRALITY IN 2050



WHAT ARE WE CONSIDERING IN OUR 2050 CARBON NEUTRALITY ROADMAP?



RELIABILITY, ENERGY EFFICIENCY & IMPROVEMENTS

- Technology improvement
- Energy efficiency
- Asset improvement & reliability
- Asset rationalization

RENEWABLE ENERGY

- Increase renewable energy share in imported energy mix
- Approved strategy of facilitating 4 GW by 2025 and 12 GW installed capacity by 2030

ELECTRIFICATIONS

- Using renewable energy
- Electrification of different steam driven rotating equipment
- Electric cracking furnaces for olefins and aromatic based products

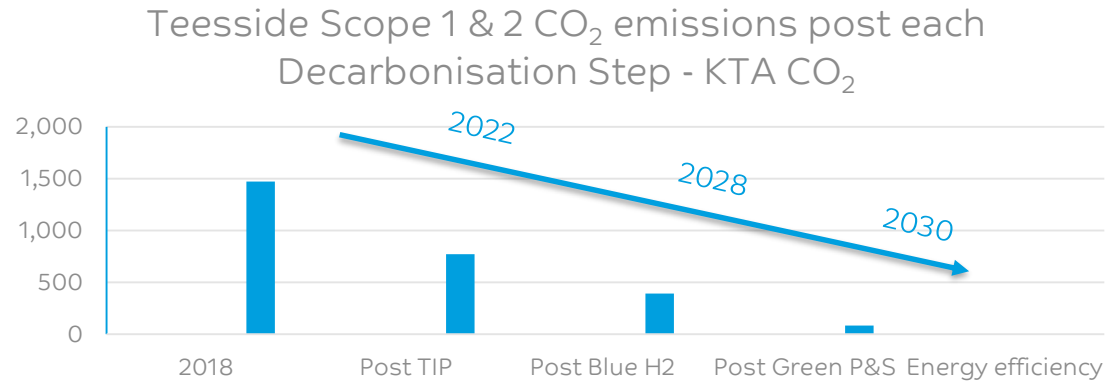
CARBON CAPTURE

- High concentration streams potential for utilization - Leveraging KSA CO2 Hub
- CCUS collaborations

GREEN/BLUE H2

- Commercially available solutions and under early R&D

WHAT DOES THIS MEAN FOR SABIC ON TEESSIDE?



Ethylene crackers have high energy intensity

– typically 18 GJoules to make 1 tonne of ethylene

Note:

- 1te of Methane releases 2.75te CO₂ when burned.
- 1te of hydrogen releases 0te CO₂ when burned – easy!!

Blue Hydrogen as fuel

- Blue Hydrogen Enabled by NetZero Carbon Capture & future phases of Hydrogen economy
- Can be integrated with SABIC operations
- Technology readily available compared to other options and can be implemented
- Solves Scope 1 emissions

Other options considered for decarbonisation

- Electrification (of furnaces and other equipment)
- Direct carbon capture
- Renewable fuels for electricity/steam import (scope 2)



TECHNICAL CONSIDERATIONS



Burner Design

- Burners are available for 100% Hydrogen
- Fuel gas composition – nat gas to 100% Hydrogen
- Ignition and Flame detection
- Effect on CO & NOx emissions
- Flame speed and pattern and effect on heat transfer
- Increased water vapour in flue gas
- Ongoing maintenance and cleaning

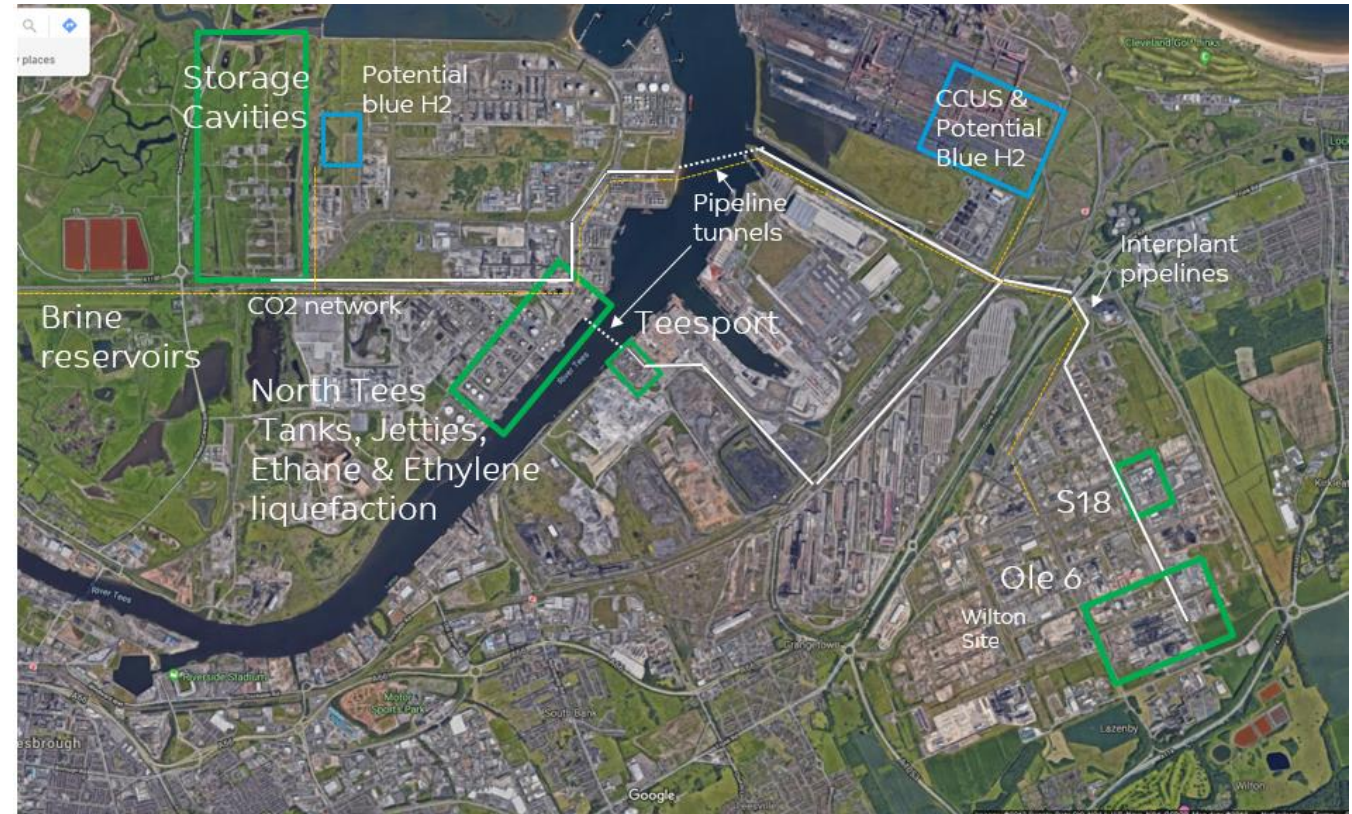
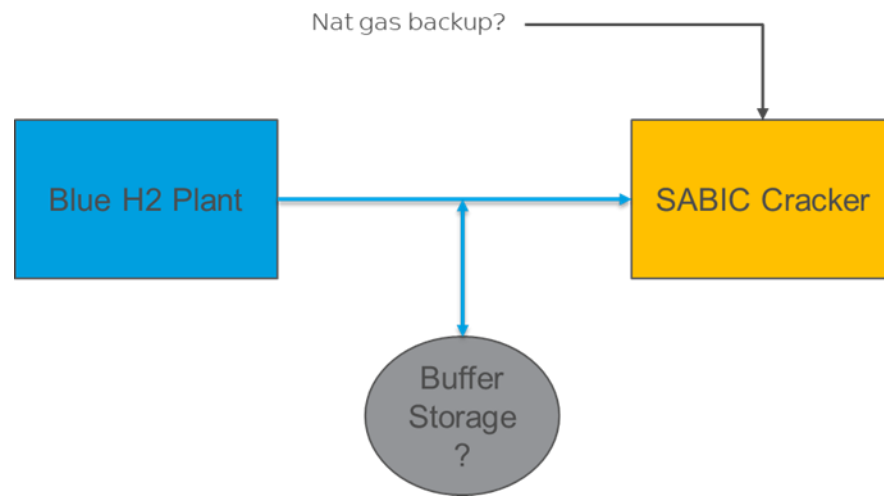
Fuel Gas System

- Suitability of IBL fuel gas system to operate on hydrogen (eg flow velocities)
- Capability to operate on full range of nat gas/ hydrogen compositions

INTEGRATION AND SUPPLY SECURITY

Supply Security

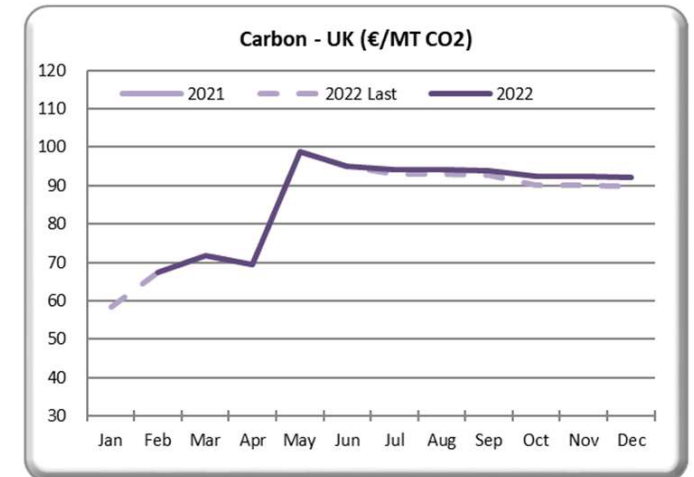
- Process industries are continuous operations
- Supply side reliability/availability is crucial
- 97% availability is not enough
- Resilience against short term interruption – Buffer storage?
- Periodic Overhauls/Start up – Nat Gas backup?



- Utilisation of piping corridors and networks
- Integration with CO2 CCS network

CONCLUSIONS

- **Blue Hydrogen** can offer the most implementable route for decarbonization on SABIC Teesside facilities
 - Technology is readily available, but needs demonstration
 - Enabled by NZT Carbon Capture & Blue Hydrogen facilities.
 - **UK Govt commitment** and funding is critical
 - Supply **security & availability** are crucial
 - **H2 Pricing mechanism** needs certainty
 - Hydrogen price delta vs nat gas + CO2 ETS costs must be economically viable
 - Fuel vs mobility vs feedstock use
 - Time to realization and **exposure to ongoing cost of carbon** – major uncertainty
 - ETS CO2 price is rising while high volume industry allocations are falling.
 - 2018 it was ~£5/te. Now ~£90/te. Projections >£130/te
 - Proportion of free allocation to emissions will drop under UKGov commitments, further increasing cost of credits





THANK YOU

