



# Carbon Capture and Storage as a CO<sub>2</sub> Mitigation Solution

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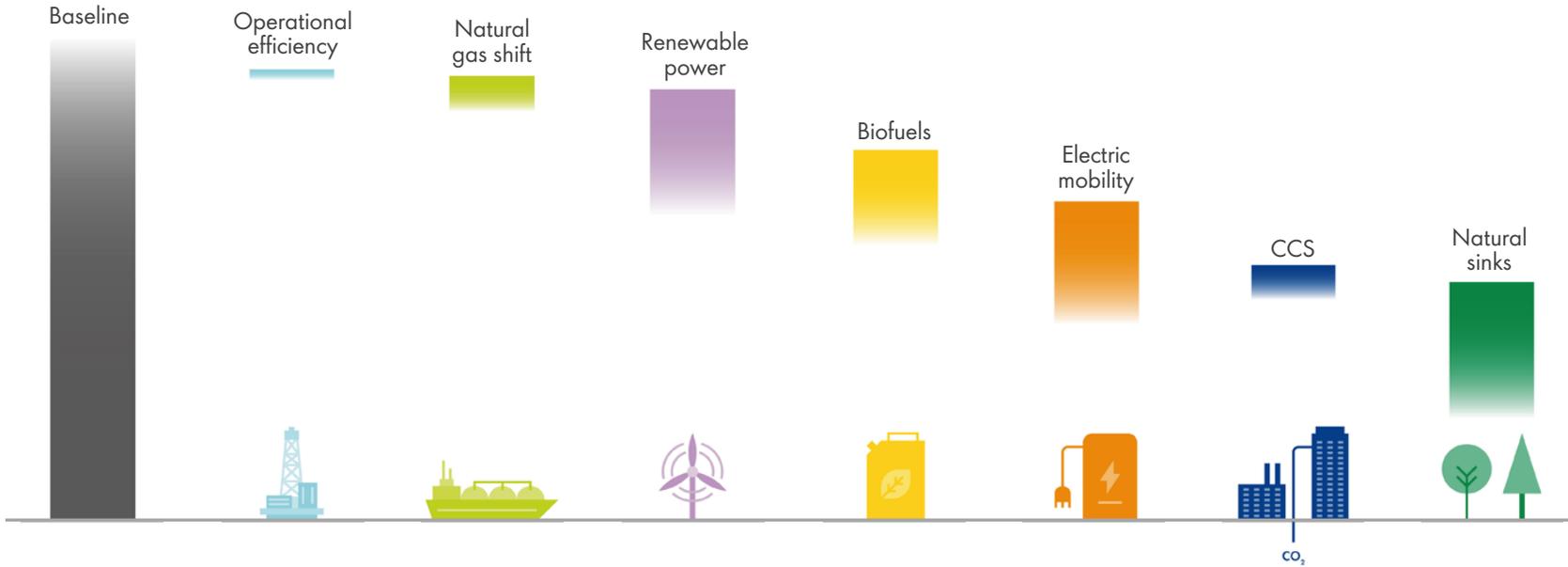
This presentation contains data and analysis from Shell’s new Sky scenario. Unlike Shell’s previously published Mountains and Oceans exploratory scenarios, the Sky scenario is based on the assumption that society reaches the Paris Agreement’s goal of holding the rise in global average temperatures this century to well below two degrees Celsius (2°C) above pre-industrial levels. Unlike Shell’s Mountains and Oceans scenarios, which unfolded in an open-ended way based upon plausible assumptions and quantifications, the Sky scenario was specifically designed to reach the Paris Agreement’s goal in a technically possible manner. These scenarios are a part of an ongoing process used in Shell for over 40 years to challenge executives’ perspectives on the future business environment. They are designed to stretch management to consider even events that may only be remotely possible. Scenarios, therefore, are not intended to be predictions of likely future events or outcomes and investors should not rely on them when making an investment decision with regard to Royal Dutch Shell plc securities.

Additionally, it is important to note that Shell’s existing portfolio has been decades in development. While we believe our portfolio is resilient under a wide range of outlooks, including the IEA’s 450 Scenario (World Energy Outlook 2016), it includes assets across a spectrum of energy intensities, including some with above-average intensity. While we seek to enhance our operations’ average energy intensity through both the development of new projects and divestments, we have no immediate plans to move to a net-zero emissions portfolio over our investment horizon of 10-20 years. Although we have no immediate plans to move to a net-zero emissions portfolio, in November of 2017, we announced our ambition to reduce our Net Carbon Footprint in step with society’s progress toward the Paris Agreement’s goal of holding global average temperature to well below 2°C above pre-industrial levels. Accordingly, assuming society aligns itself with the Paris Agreement’s goals, we aim to reduce our Net Carbon Footprint, which includes not only our direct and indirect carbon emissions associated with producing the energy products which we sell, but also our customers’ emissions from their use of the energy products that we sell, by around 20% in 2035 and by around 50% in 2050. The use of the term Shell’s “Net Carbon Footprint” is for convenience only and not intended to suggest these emissions are those of Shell or its subsidiaries.

We may have used certain terms, such as resources, in this presentation that the United States Securities and Exchange Commission (SEC) strictly prohibits us from including in our filings with the SEC. U.S. investors are urged to consider closely the disclosure in our Form 20-F, File No 1-32575, available on the SEC website [www.sec.gov](http://www.sec.gov).

# Net Carbon Footprint

## CCS is one of potential tools to achieve our ambition



- Ambition to reduce the Net Carbon Footprint of the energy products we sell by around 20% by 2035 and by around 50% by 2050, in step with society



Flare reduction



Increased LNG



Wind power



Raízen biofuels



Shell Recharge and New Motion



Quest CCS



Nature-based offsets

# Shell is involved in a number of CCS projects in different phases of development



Projects in operation

Projects under planning

Involvement through Shell Cansolv technology – no Shell equity



1

Quest



2

TCM



3

Gorgon



4

Pernis CCS



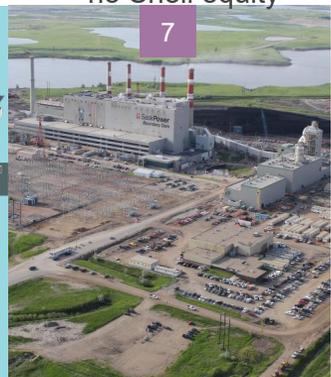
5

Net Zero Teesside



6

Northern Lights



7

Boundary Dam

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## Quest CCS – Collaboration to drive future CCS development

- Shell collaborated with the Government of Alberta and regulator to establish CCS protocols / frameworks
- All detailed information on Quest design, operations, and lessons learned is publicly available
- Quest demonstrates that large-scale CCS works well, is safe, and demonstrates pathways for reducing cost

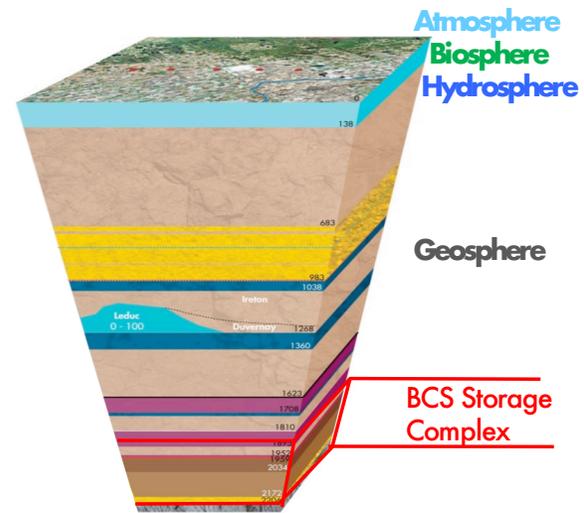


# Measure, Monitor & Verify (MMV)

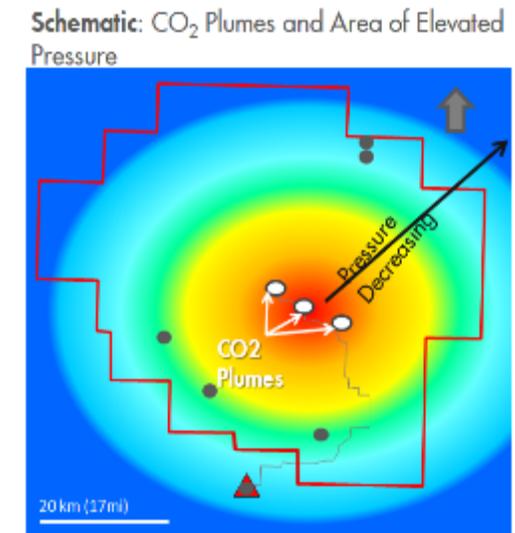
Demonstrate CO2  
Inventory Accuracy



Ensure Containment



Ensure Conformance



# Quest Costs: From Demonstration to Commercialization

1

What was the estimated cost per tonne CO<sub>2</sub> sequestered?

**INITIAL ESTIMATES WERE AROUND**



2

What was the actual cost per tonne CO<sub>2</sub> sequestered?

**ACTUAL COST PER TONNE CO<sub>2</sub> SEQUESTERED**



3

In the first few years of operation we've seen



4

We believe that total cost for a future project would be around

**THE SIGNIFICANT REDUCTION IS DUE TO RE-USING PUBLICLY AVAILABLE ENGINEERING AND DESIGN, RE-USING EXISTING INFRASTRUCTURE, AND OPTIMIZING DESIGN, CONSTRUCTION, AND OPERATIONS.**



# CCS cost reduction through collaborative technology innovation

Solids rather than liquids capturing CO<sub>2</sub> from industrial flue gas

## ViennaGreenCO<sub>2</sub>

	State of the art liquid amines	Solid Sorbent Technology
CO <sub>2</sub> Purity	>95%	>95%
CO <sub>2</sub> Recovery	>90%	>90%
Emissions		
Cost		up to 25% lower



- Innovative separation technique co-invented by Shell and TUWien
- Next step: Scale to a 150 tonne per day plant capturing CO<sub>2</sub> from bio plant for reuse

