PAYNE INSTITUTE FOR PUBLIC POLICY
COLORADO SCHOOL OF MINES

(GEO)POLITICS OF ENERGY TRANSITION
5 November 2019

Wim Thomas
Chief Energy Advisor, Shell International BV
WARNING: uncertainties ahead

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 preindustrial 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 aboveaverage 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 netzero emissions portfolio over our investment horizon of 100 years. Although we have no immediate plans to move to a netzero 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 preindustrial 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 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.

Also, in this presentation we may refer to Shell’s “Net Carbon Footprint”, which includes Shell’s carbon emissions from the production of our energy products, our suppliers’ carbon emissions in supplying energy for that production and our customers’ carbon emissions associated with their use of the energy products we sell. Shell only controls its own emissions. But, to support society in achieving the Paris Agreement goals, we aim to help such suppliers and consumers to likewise lower their emissions. 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.

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Sky: Emissions from energy use need to peak by 2030

World – CO₂ Emissions from energy

~50% reduction by 2050

Net zero by 2070

Source: Sky Scenario, Shell analysis
Sky energy outlook

Changes in consumer patterns drive a shift in the primary energy mix

### Global end-use energy consumption – Sky scenario

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- **Solid**
  - Coal – Biomass
- **Gaseous**
  - Nat. Gas – Biogas – H₂
- **Liquid**
  - Oil – Biofuels
- **Electricity**
  - Fossil – Nuclear – Wind – Solar

- 40% Efficiency gains

**Source:** Shell analysis, Sky scenario
Sky: Decarbonisation needs to be pursued simultaneously in Demand & Supply Sectors

**World total CO₂ emissions from energy by sector**

- **Peak CO₂ before 2030**
- **~50% reduction**
- **Shipping is 6% of total and 18% of Heavy Duty Transport**

- **2015**
  - 11%
  - 39%
  - 19%
  - 23%
  - 8%

- **2030**
  - Fuels Production
  - Industry
  - 100% of new car sales are EVs in Europe, China and Japan

- **2040**
  - 20%

- **2050**
  - 20%

- **2060**
  - 20%
  - 10%

- **2070**
  - 20%
  - 10%

- **2080**
  - 20%
  - 10%

- **2090**
  - 20%
  - 10%

- **2100**
  - 20%
  - 10%

**Overall Net Zero Emissions**

**Source:** IEA historical data, Sky Scenario, Shell analysis
Net Carbon Footprint

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.

Baseline
Operational efficiency
Natural gas shift
Renewable power
Biofuels
Electric mobility
CCS
Natural sinks

Flare reduction
Increased LNG
Wind power
Raizen biofuels
Shell Recharge and New Motion
Quest CCS
Nature-based offsets

Source: Shell
Sky data is online

Online material available
www.shell.com/skyscenario

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