



20 2025 2030 2035 2040 2045 2050 2055 2060 2065 2070 2075 2080

 **Shell Scenarios**
Sky
 Meeting the Goals of the Paris Agreement

David Hone, Chief Climate Change Advisor, Shell International Ltd.

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The slide features a timeline from 2020 to 2080 at the top. Below the timeline is a collage of images: a blue sky with clouds, an industrial refinery, a person in a hard hat, a close-up of a valve, a modern building, a dense urban area, a tall skyscraper, and a lush green forest. The Shell logo is on the left, and the title 'Shell Scenarios Sky' is in the center. Below the title is the subtitle 'Meeting the Goals of the Paris Agreement' and the name 'David Hone, Chief Climate Change Advisor, Shell International Ltd.' The bottom left corner has the copyright notice 'Copyright of Shell International B.V.' and the bottom right corner has the number '1'.



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David Hone
Chief Climate Change Adviser,
Shell International Ltd.



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WARNING: Uncertainties ahead

This presentation contains data from Shell's new Sky Scenario. Unlike Shell's previously published Mountains and Oceans exploratory scenarios, the Sky Scenario is targeted through the assumption that society reaches the Paris Agreement's goal of holding global average temperatures to well below 2°C. 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 accordance with society's implementation of 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 20% in 2035 and by 50% in 2050.

The companies in which Royal Dutch Shell plc directly and indirectly owns investments are separate legal entities. In this presentation "Shell", "Shell group" and "Royal Dutch Shell" are sometimes used for convenience where references are made to Royal Dutch Shell plc and its subsidiaries in general. Likewise, the words "we", "us" and "our" are also used to refer to subsidiaries in general or to those who work for them. These expressions are also used where no useful purpose is served by identifying the particular company or companies. "Subsidiaries", "Shell subsidiaries" and "Shell companies" as used in this presentation refer to companies over which Royal Dutch Shell plc either directly or indirectly has control. Entities and unincorporated arrangements over which Shell has joint control are generally referred to as "joint ventures" and "joint operations" respectively. Entities over which Shell has significant influence but neither control nor joint control are referred to as "associates". The term "Shell interest" is used for convenience to indicate the direct and/or indirect ownership interest held by Shell in a venture, partnership or company, after exclusion of all third-party interest.

This presentation contains forward-looking statements concerning the financial condition, results of operations and businesses of Royal Dutch Shell. All statements other than statements of historical fact are, or may be deemed to be, forward-looking statements. Forward-looking statements are statements of future expectations that are based on management's current expectations and assumptions and involve known and unknown risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied in these statements. Forward-looking statements include, among other things, statements concerning the potential exposure of Royal Dutch Shell to market risks and statements expressing management's expectations, beliefs, estimates, forecasts, projections and assumptions. These forward-looking statements are identified by their use of terms and phrases such as "anticipate", "believe", "could", "estimate", "expect", "goals", "intend", "may", "objectives", "outlook", "plan", "probably", "project", "risks", "scheduler", "seek", "should", "target", "will" and similar terms and phrases. There are a number of factors that could affect the future operations of Royal Dutch Shell and could cause those results to differ materially from those expressed in the forward-looking statements included in this web page, including (without limitation): (a) price fluctuations in crude oil and natural gas; (b) changes in demand for Shell's products; (c) currency fluctuations; (d) drilling and production results; (e) reserves estimates; (f) loss of market share and industry competition; (g) environmental and physical risks; (h) risks associated with the identification of suitable potential acquisition properties and targets, and successful negotiation and completion of such transactions; (i) the risk of doing business in developing countries and countries subject to international sanctions; (j) legislative, fiscal and regulatory developments including regulatory measures addressing climate change; (k) economic and financial market conditions in various countries and regions; (l) political risks, including the risks of expropriation and renegotiation of the terms of contracts with governmental entities, delays or advancements in the approval of projects and delays in the reimbursement for shared costs; and (m) changes in trading conditions. No assurance is provided that future dividend payments will match or exceed previous dividend payments. All forward-looking statements contained in this presentation are expressly qualified in their entirety by the cautionary statements contained or referred to in this section. Readers should not place undue reliance on forward-looking statements. Additional risk factors that may affect future results are contained in Royal Dutch Shell's Form 20-F for the year ended December 31, 2017 (available at www.shell.com/investor and www.sec.gov). These risk factors also expressly qualify all forward-looking statements contained in this presentation and should be considered by the reader. Each forward-looking statement speaks only as of the date of this presentation 19th September 2018. Neither Royal Dutch Shell plc nor any of its subsidiaries undertake any obligation to publicly update or revise any forward-looking statement as a result of new information, future events or other information. In light of these risks, results could differ materially from those stated, implied or inferred from the forward-looking statements contained in this web page. We may have used certain terms, such as resources, in this presentation that 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. You can also obtain this form from the SEC by calling 1-800-SEC-0330.

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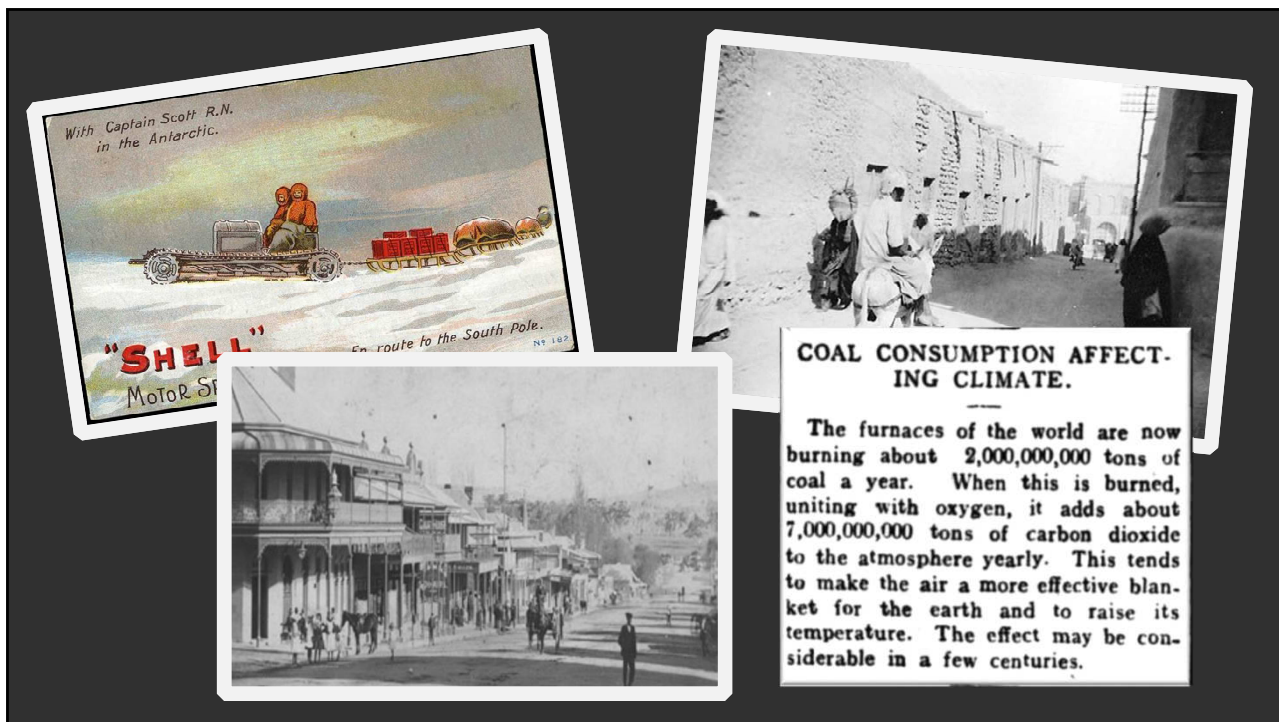
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Setting the scene

Energy, climate and
the Paris Agreement

Part 1

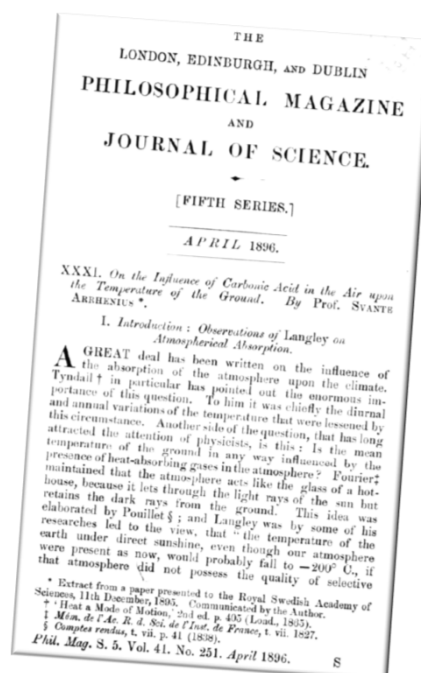
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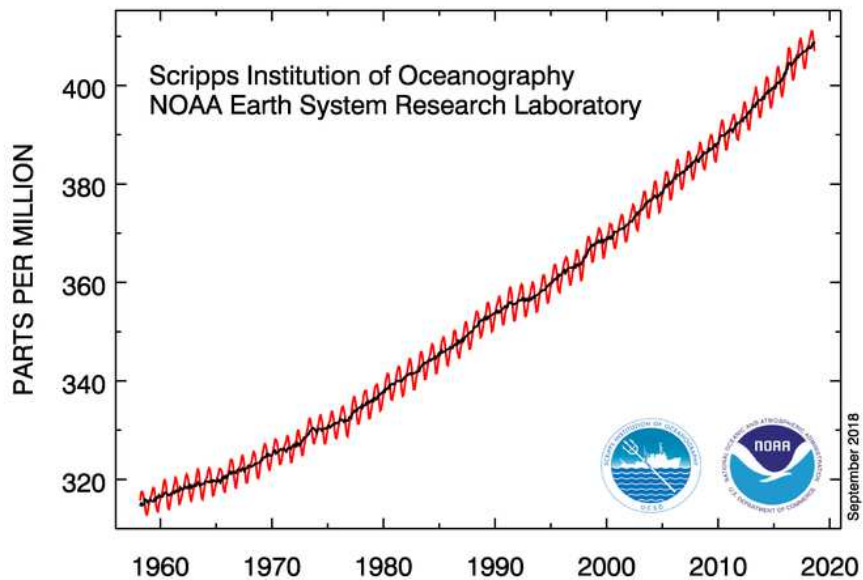
Svante Arrhenius, 1896



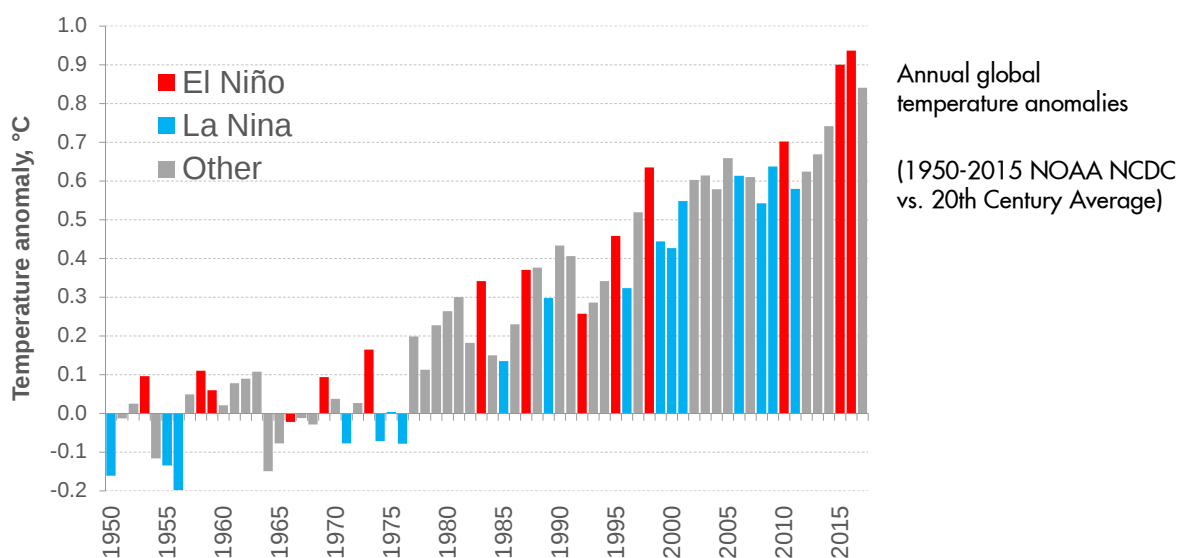
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Atmospheric CO₂ record at Mauna Loa Observatory

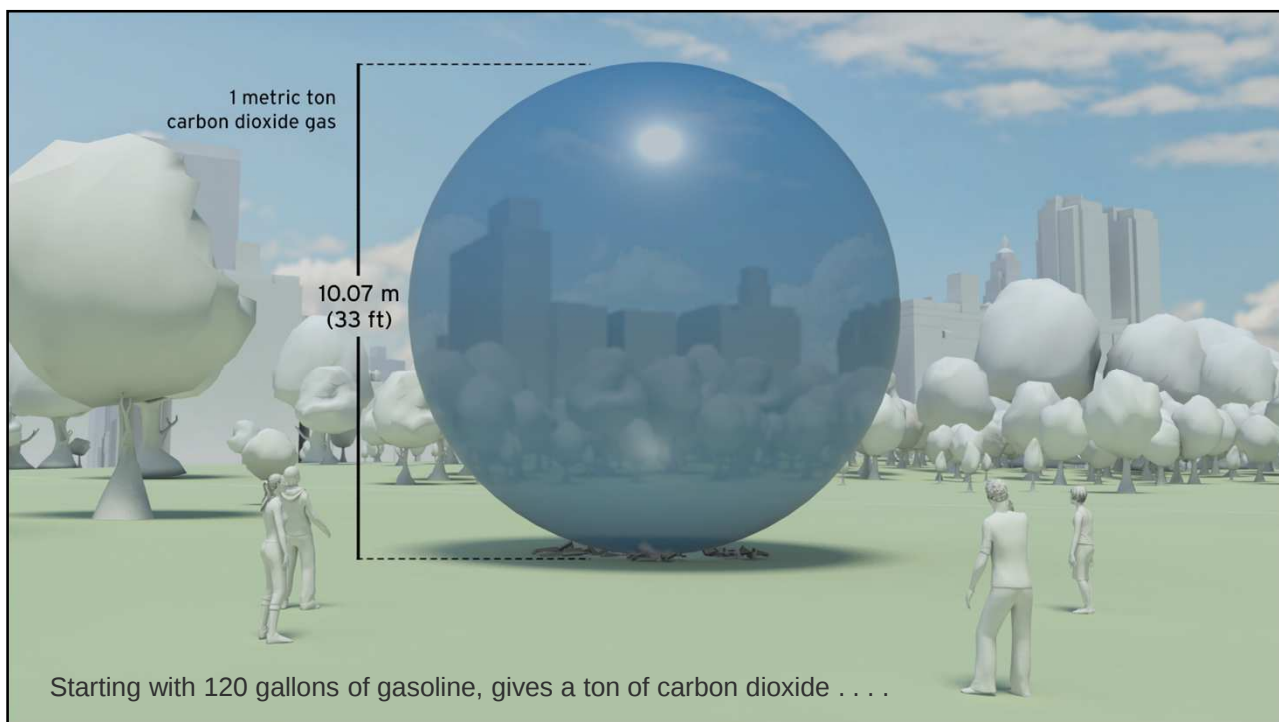
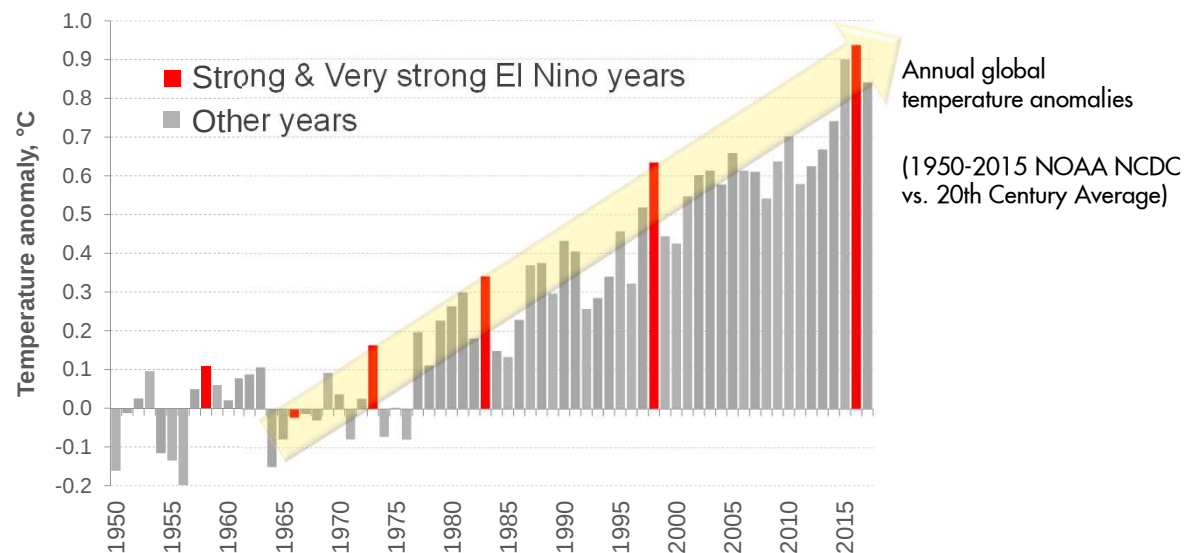


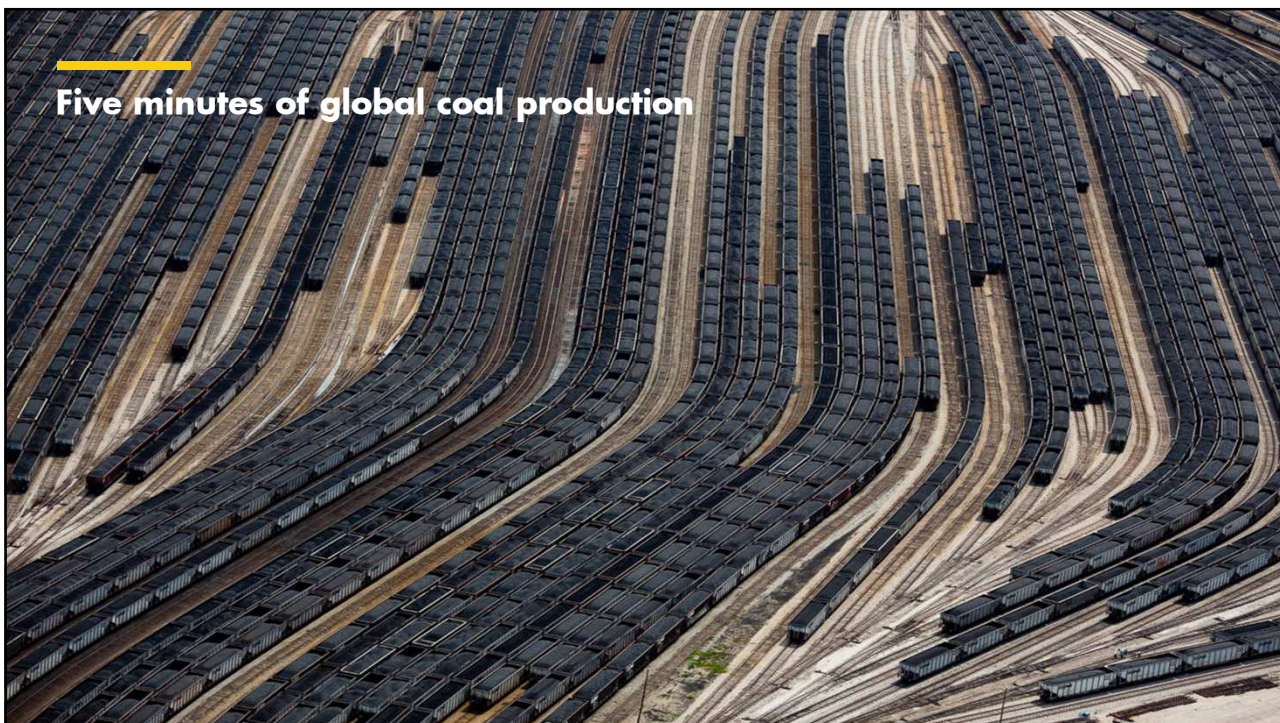
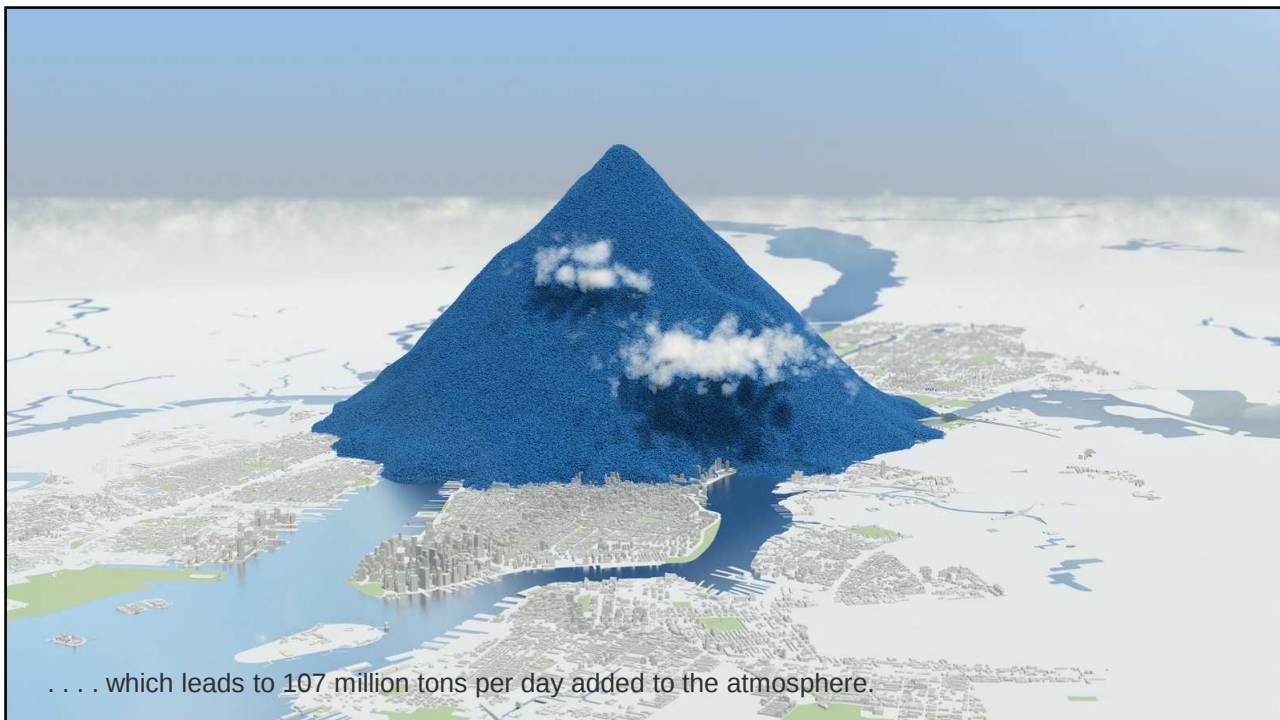
2017: The hottest non-El Nino year recorded



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Source: NOAA NCDC

A worrying long term trend of $\sim 0.19^{\circ}\text{C}$ per decade



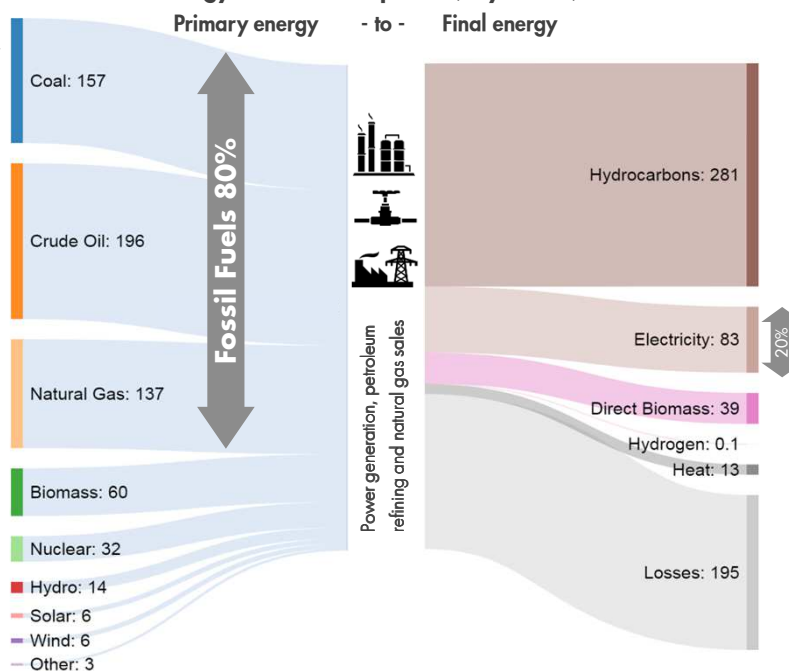


The energy system today

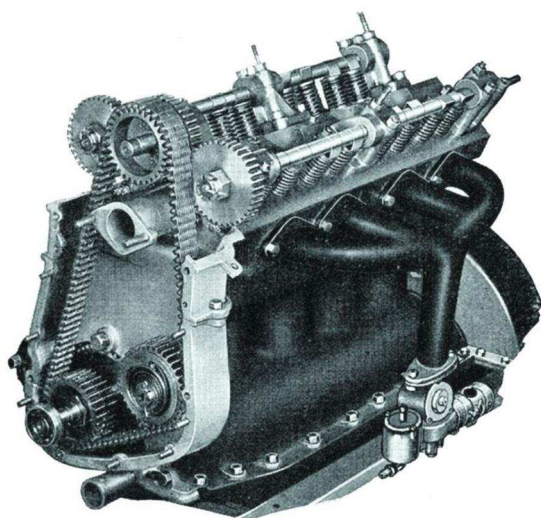
- Primarily fossil fuels
- Final energy is about 20% electricity; so 80% of the energy we use is not electricity
- Continuing to grow as population increases and economies expand
- Current energy system has been evolving over the last 150 years
- A person from London or New York in 1920 visiting today would recognize much of what they see (in the energy system)

Source: Shell analysis, Sky scenario
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Energy flows in Exajoules (Sky 2020)



100 years of progress?



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The goals of the Paris Agreement

Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels

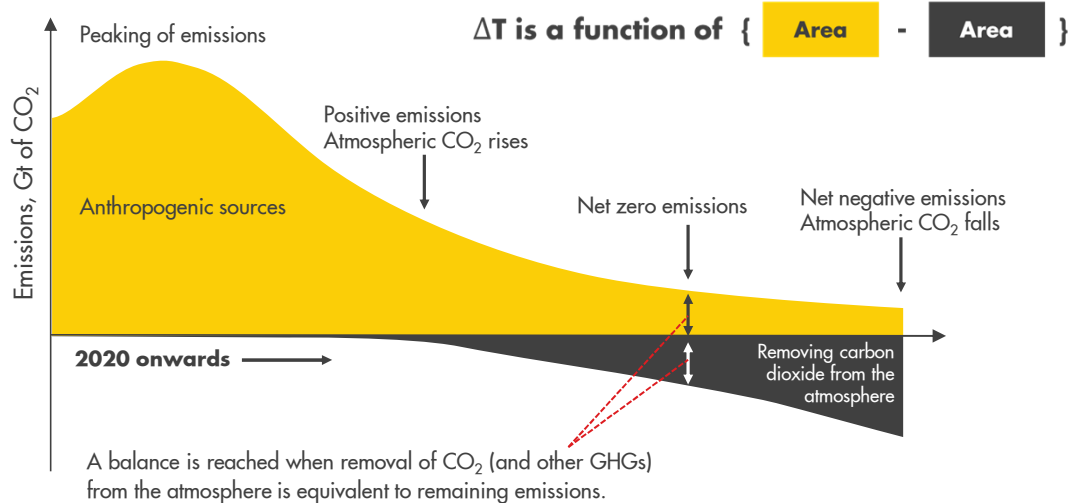
...aim to reach global peaking of greenhouse gas emissions as soon as possible;

...achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century.

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Elements of the Paris Agreement



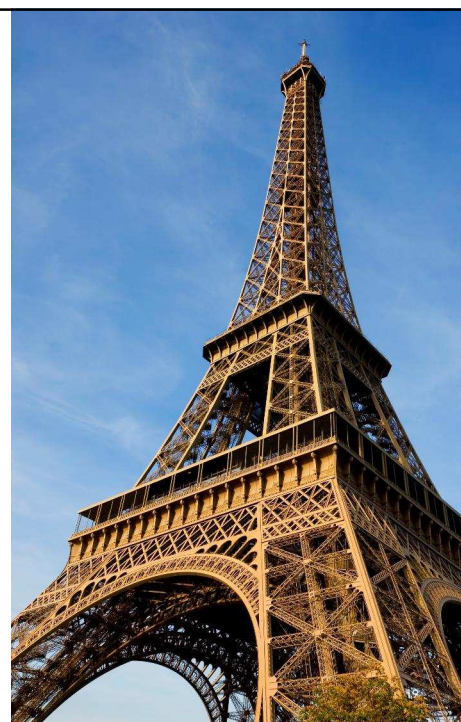
Source: Shell schematic
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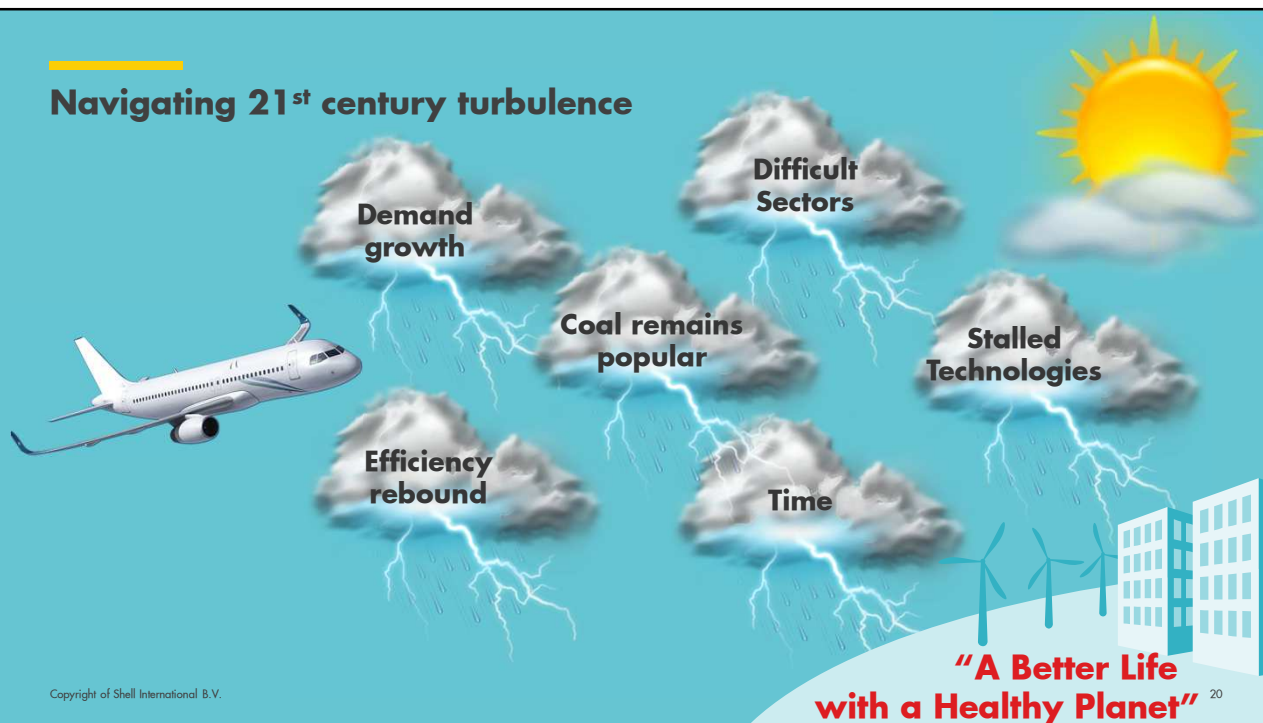
The Paris Agreement – review, assess and improve by countries



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Navigating 21st century turbulence



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Sky Scenario

A new story for the 21st century

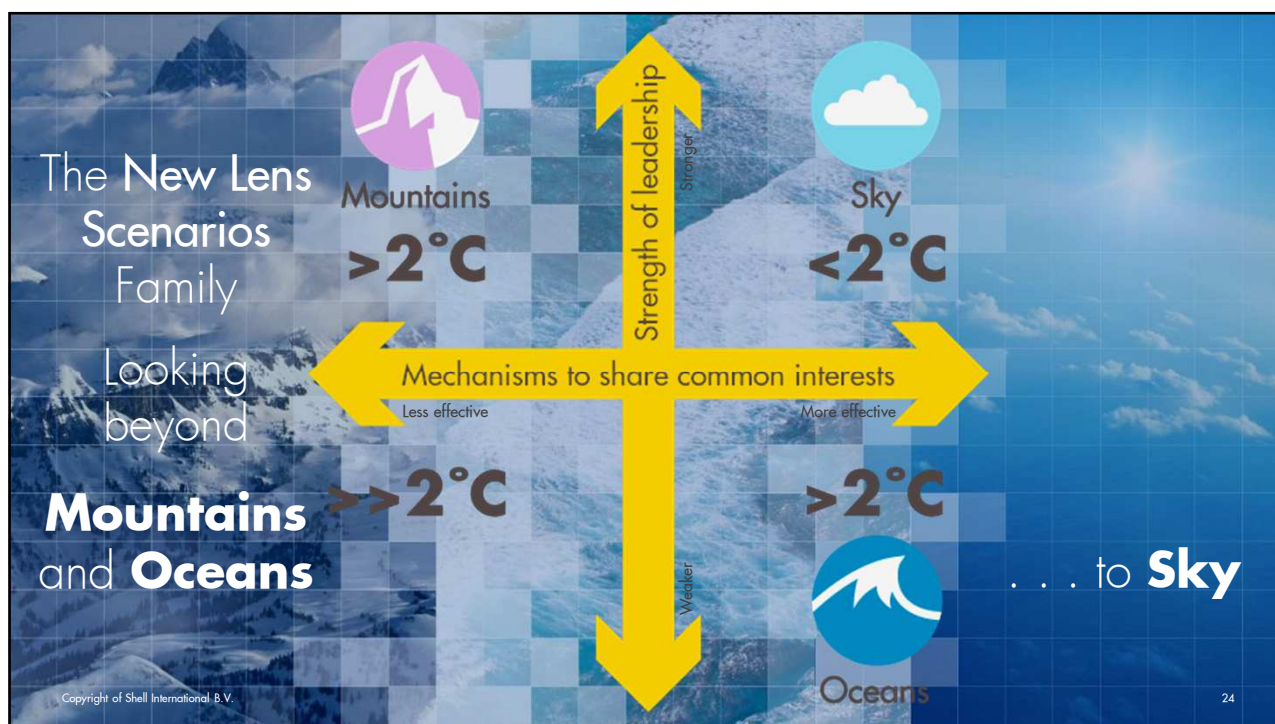
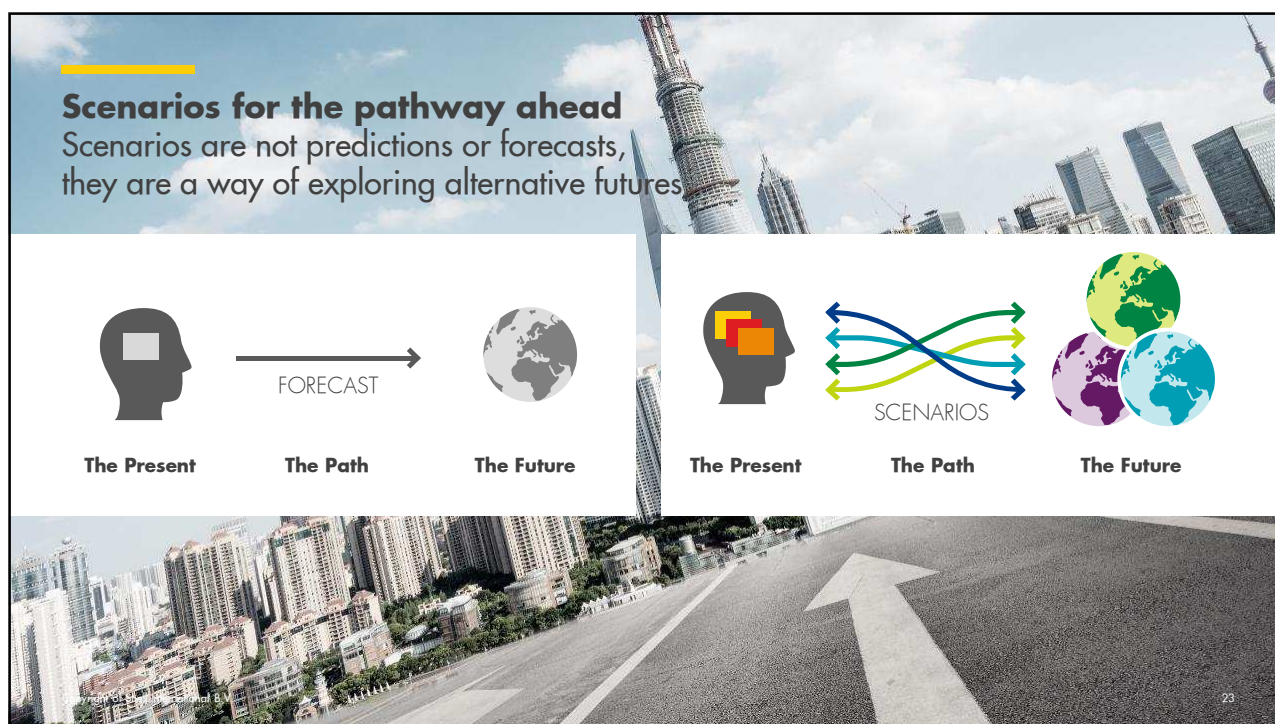
Part 2

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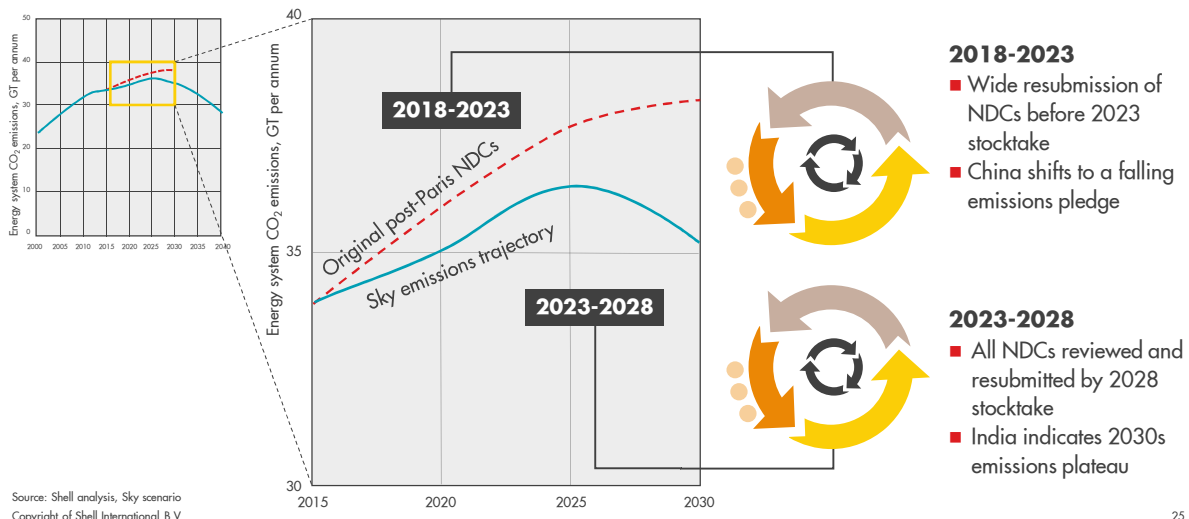


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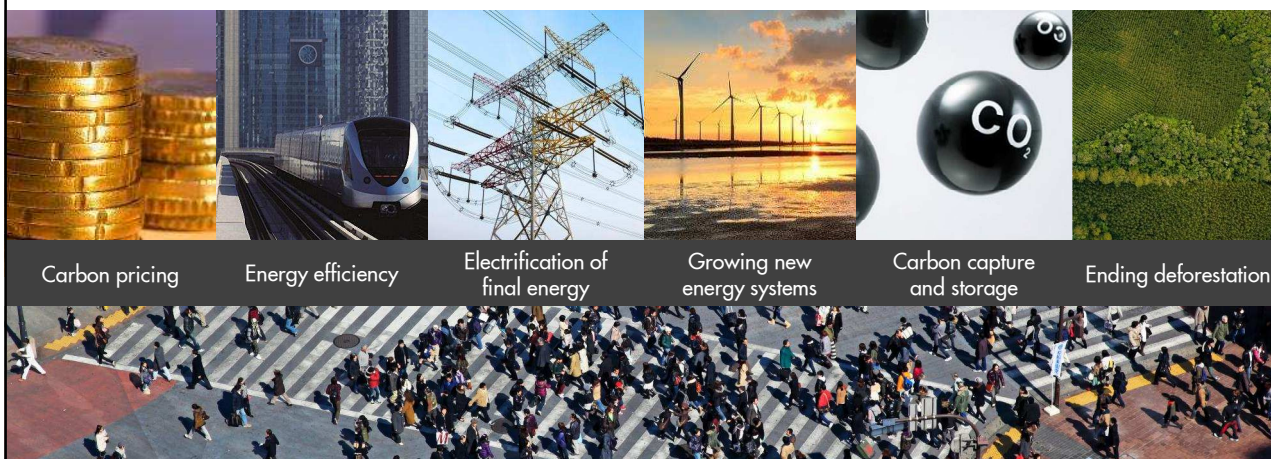


Sky begins in today's economic & policy realities, ratchets up action, then goal-seeks within techno-economic possibilities



25

In Sky, six big steps forward from now to 2070 . . .



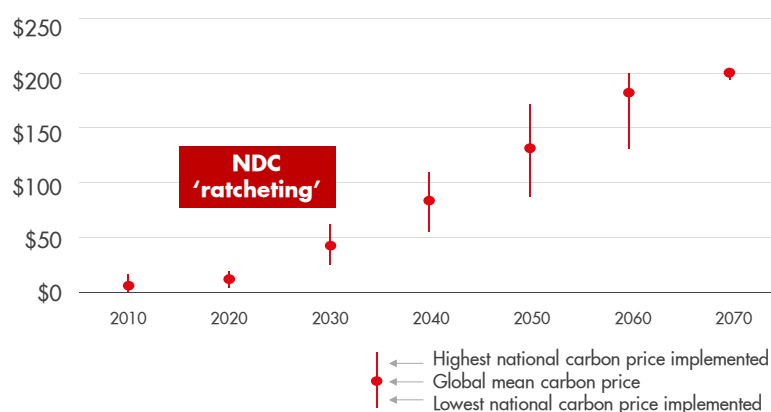
. . . underpinned by a changing consumer mind-set and societal license for change.

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Step 1 – Carbon pricing is essential within a broad policy framework

Carbon prices in Sky, \$/tonne CO₂



Source: Shell analysis, Sky scenario
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Unwavering acceleration and coordination:

- Market & fiscal mechanisms
- Standards & mandates
- Investments in infrastructure & technology

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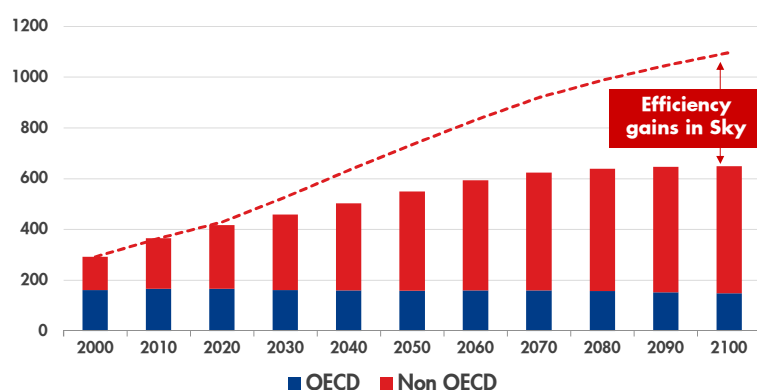
In Sky, examples of ongoing action by government in nine areas

	Power Generation & Industry	Transport	Built Environment
Discover and Develop	• Foster energy research institutes • University grants • STEM in education	• Foster transport research institutes • University grants • STEM in education	• Encouraging radical design (e.g. competitions) • University grants • STEM in education
Technology cost reduction through early projects	• Technology mandates and project incentives (e.g. tax credits) • Support for infrastructure (e.g. grids & pipelines)	• City level action (e.g. low emission zones) • Consumer incentives (e.g. EV rebate on purchase)	• Urban planning decisions (e.g. regeneration programmes) • Education and awareness
Long run deployment in the economy	• Carbon pricing systems • Long term energy sector goals • 'Fast-track' planning processes	• Carbon pricing systems (taxes, CORSIA etc.) • Long term mandates (e.g. for EV uptake) • Public transport investment	• Efficiency standards • Building codes • Requirement for electrification • City planning

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Step 2 – Efficiency is important for limiting demand growth

World total final energy consumption, EJ/year



Source: Shell analysis, Sky scenario
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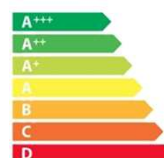


- Rising incomes in developing regions drive global energy demand
- This is moderated by significant energy efficiency improvements

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Efficiency has doubled over the last 55 years and needs to double again, or better, over the next 55 years

At least matching historical progress



To make 1 tonne of steel, enough to build one car



To travel 350 km your car uses



Your fridge uses in 1 year



To light your living room for 1 year

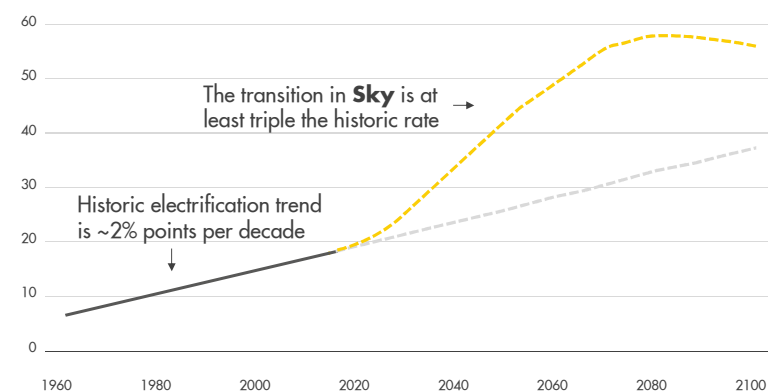
	To make 1 tonne of steel, enough to build one car	To travel 350 km your car uses	Your fridge uses in 1 year	To light your living room for 1 year
1960	24 GJ	2 GJ	3 GJ	0.8 GJ
2015	12 GJ	1 GJ	1 GJ	0.3 GJ
2070	7 GJ	0.3 GJ	0.3 GJ	0.03 GJ

Source: Shell analysis, Sky scenario
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Step 3 – A major ramp-up in electrification

Electricity as a % of final energy use

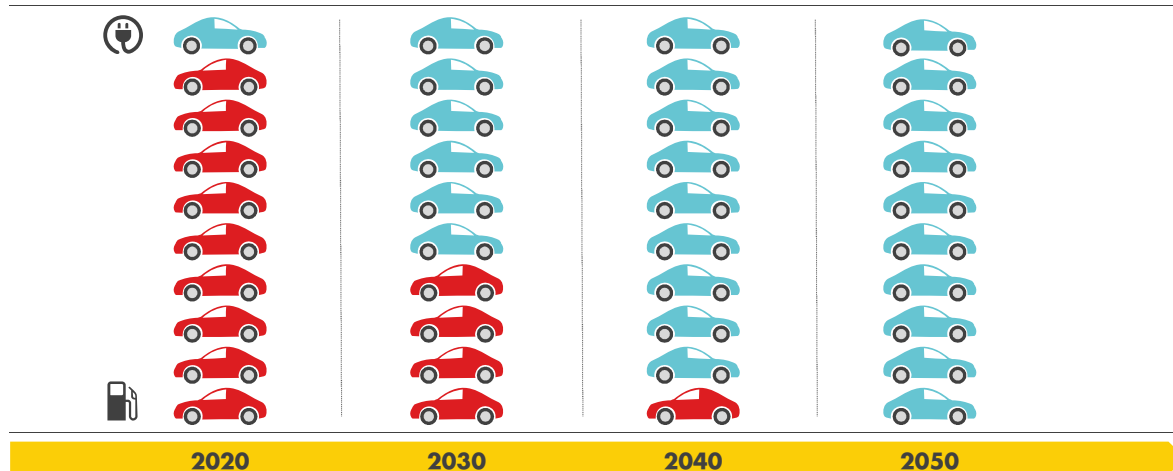


Source: Shell analysis, Sky scenario
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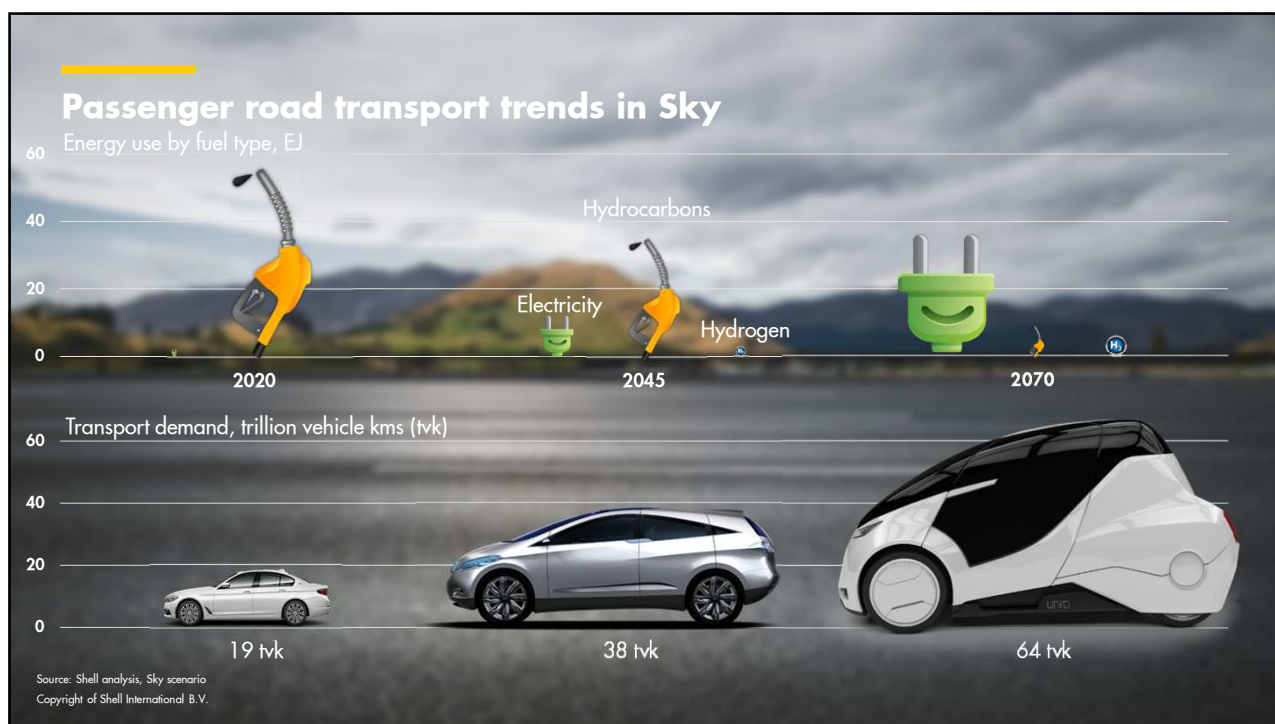
So as early as 2030 in Sky, more than half global passenger car sales will be EVs

By 2050, you would not be able to buy a new gasoline car anywhere in the world



Source: Shell analysis, Sky scenario
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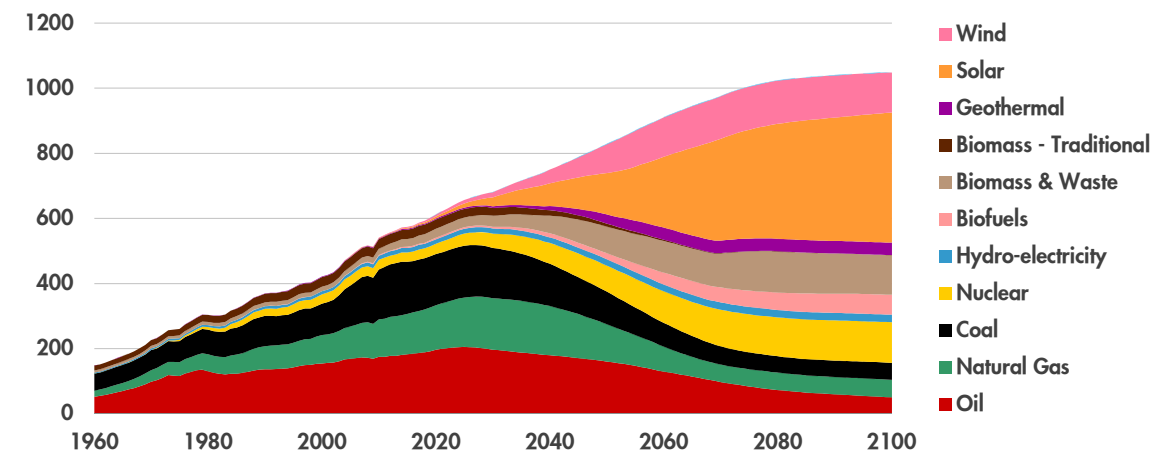
32



Step 4 – New energy systems emerge

The major sources of primary energy shift in Sky

World total primary energy by source, EJ/year

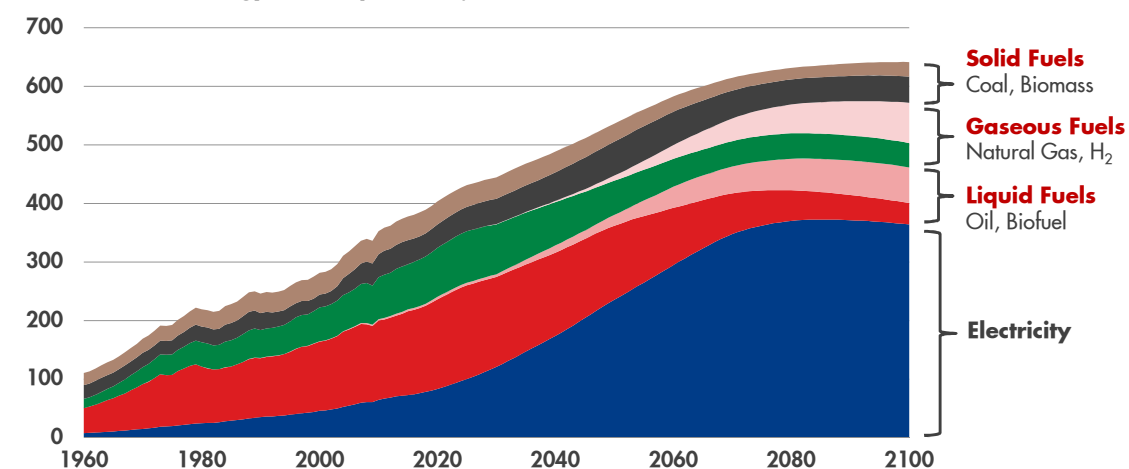


Source: Shell analysis, Sky scenario
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In Sky, deep electrification, but molecules remain important

Global end-use energy consumption, EJ/year



Source: Shell analysis, Sky scenario
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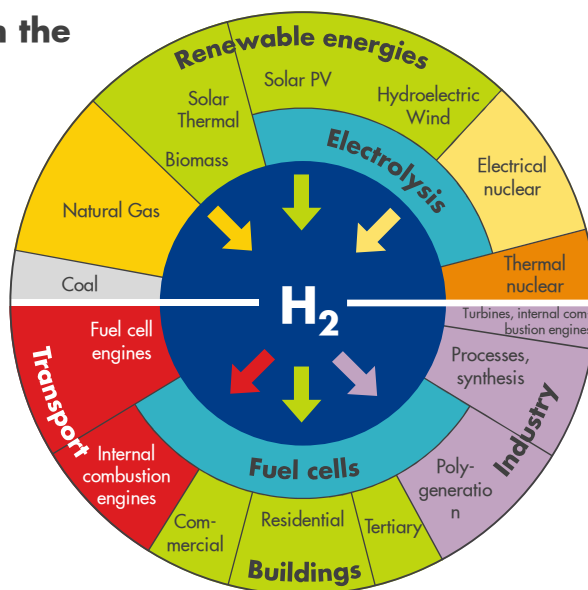
Hydrogen becomes significant in the second half of the century

A hydrogen based energy delivery system

Supply



Demand

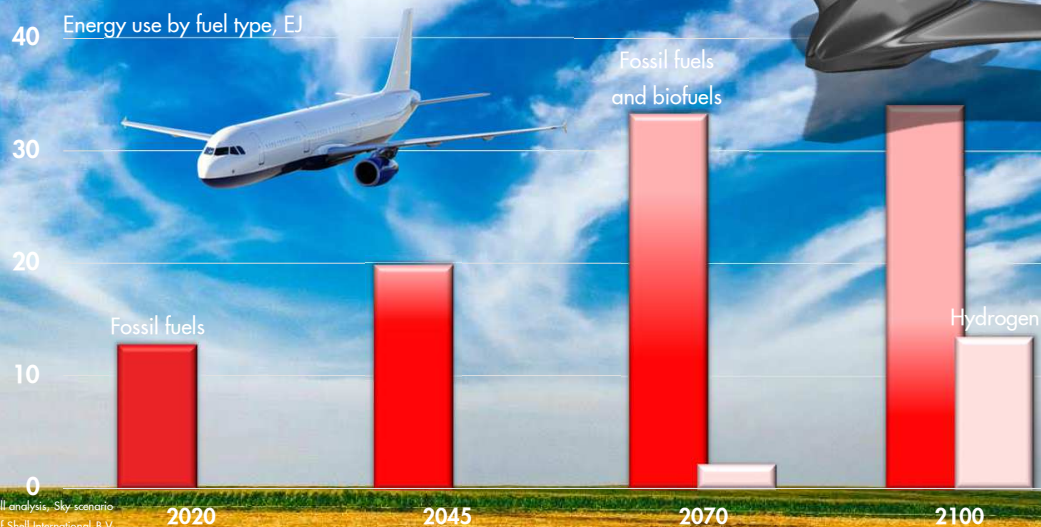


Source: Shell schematic
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Aviation fuel trends to 2100 in Sky

Energy use by fuel type, EJ

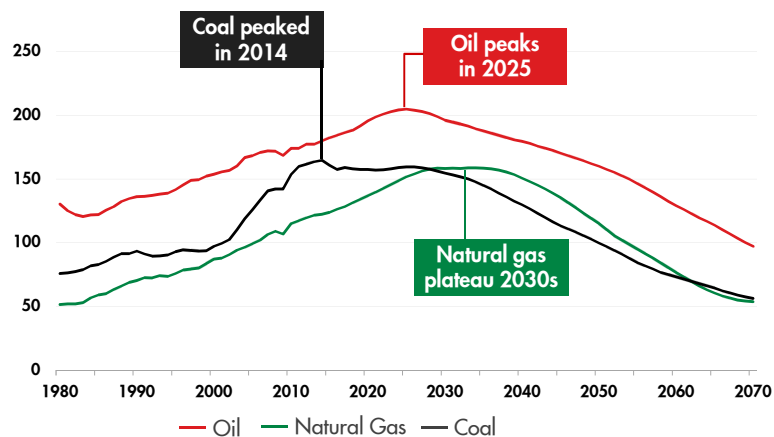


Source: Shell analysis, Sky scenario
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In Sky, big changes for fossil fuels

Needs continue where substitution is difficult

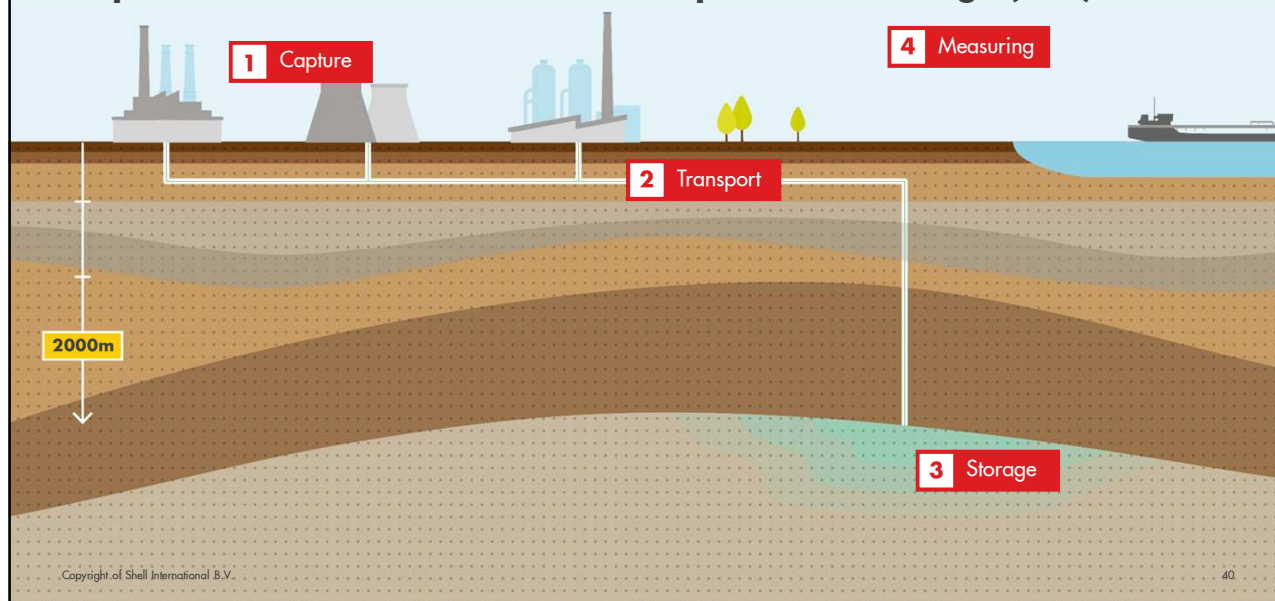
World total primary energy, EJ/year



Source: Shell analysis, Sky scenario
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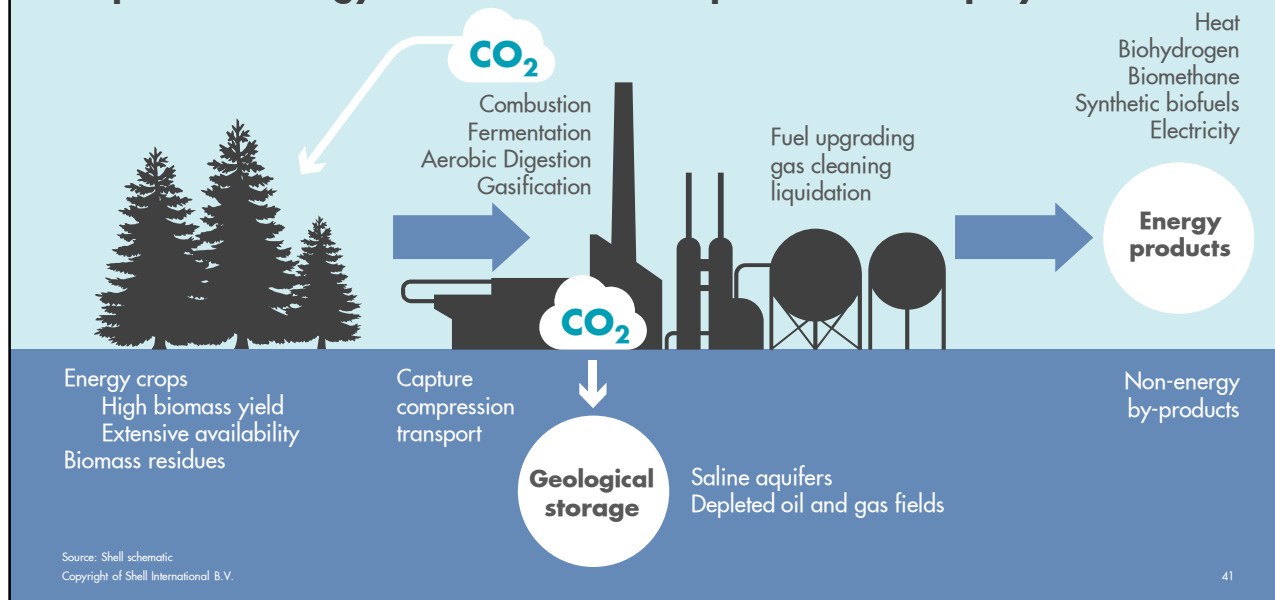
Step 5 – A man-made sink: Carbon capture and storage (CCS)



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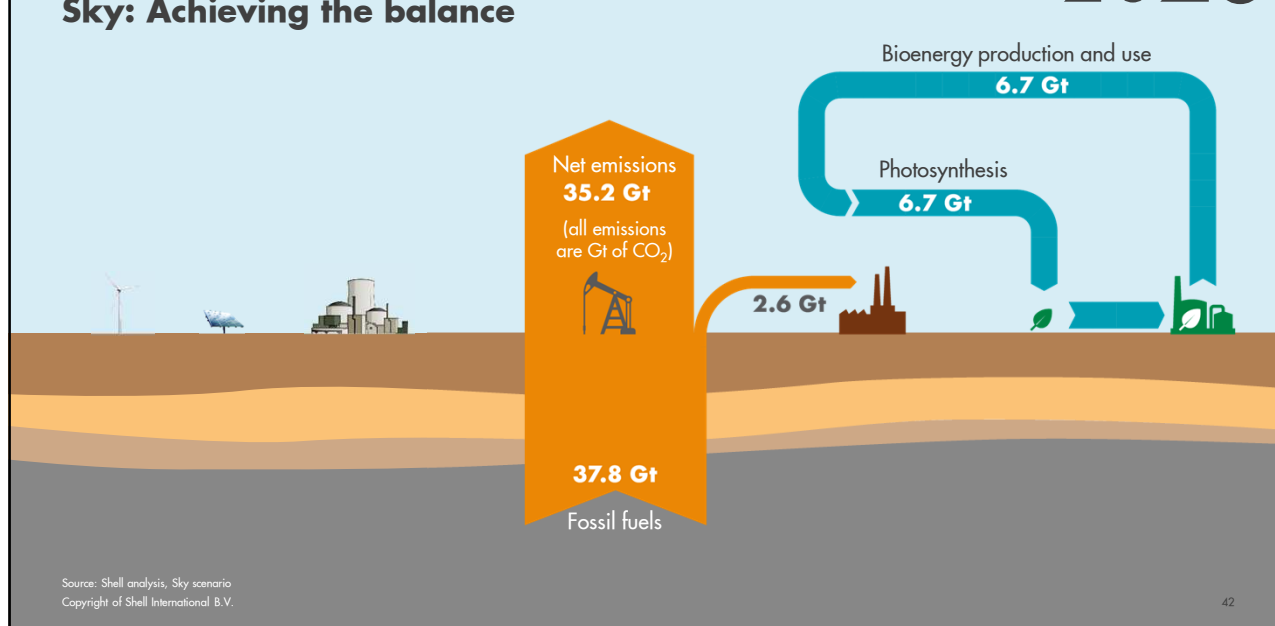
Step 5 – Bioenergy with CCS has an important role to play



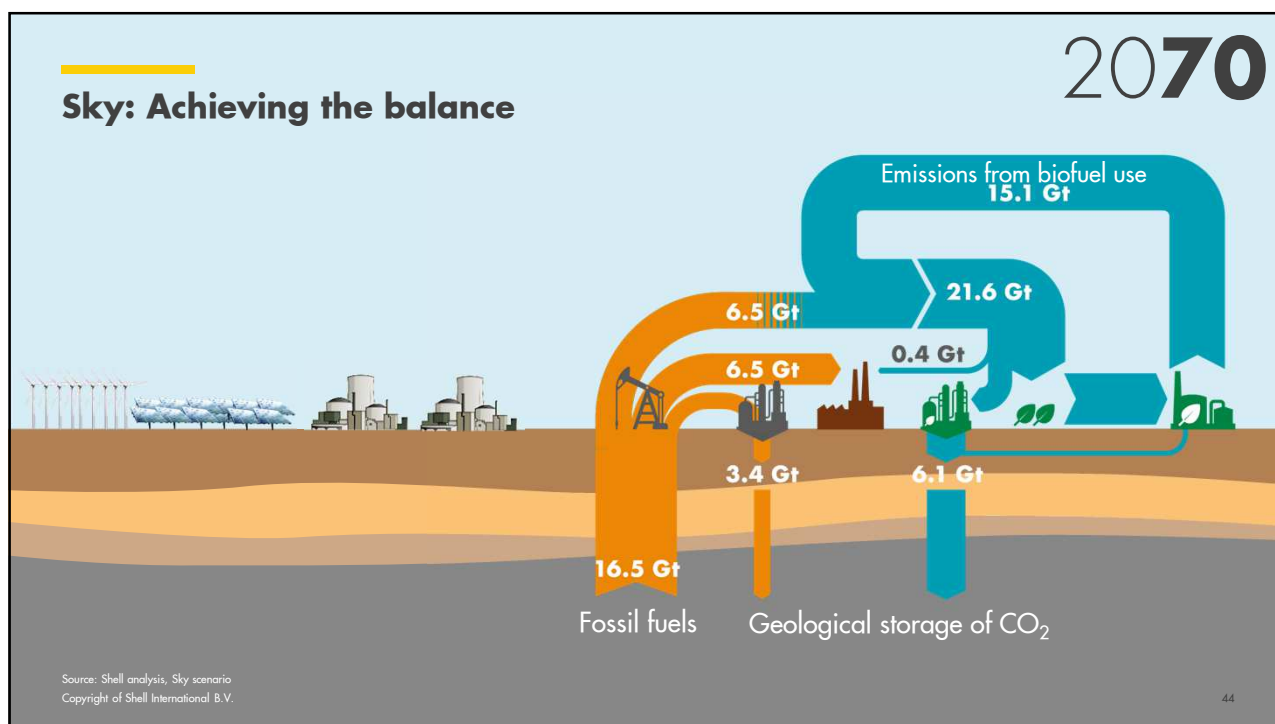
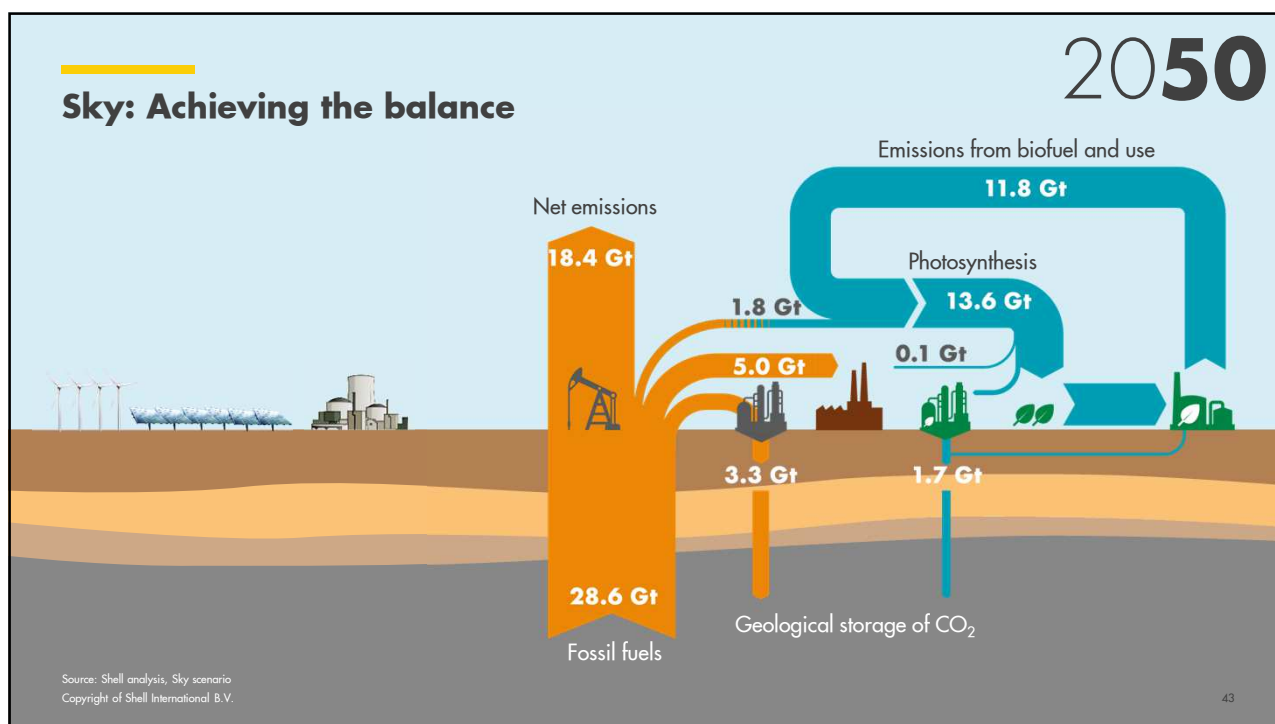
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Sky: Achieving the balance

2020

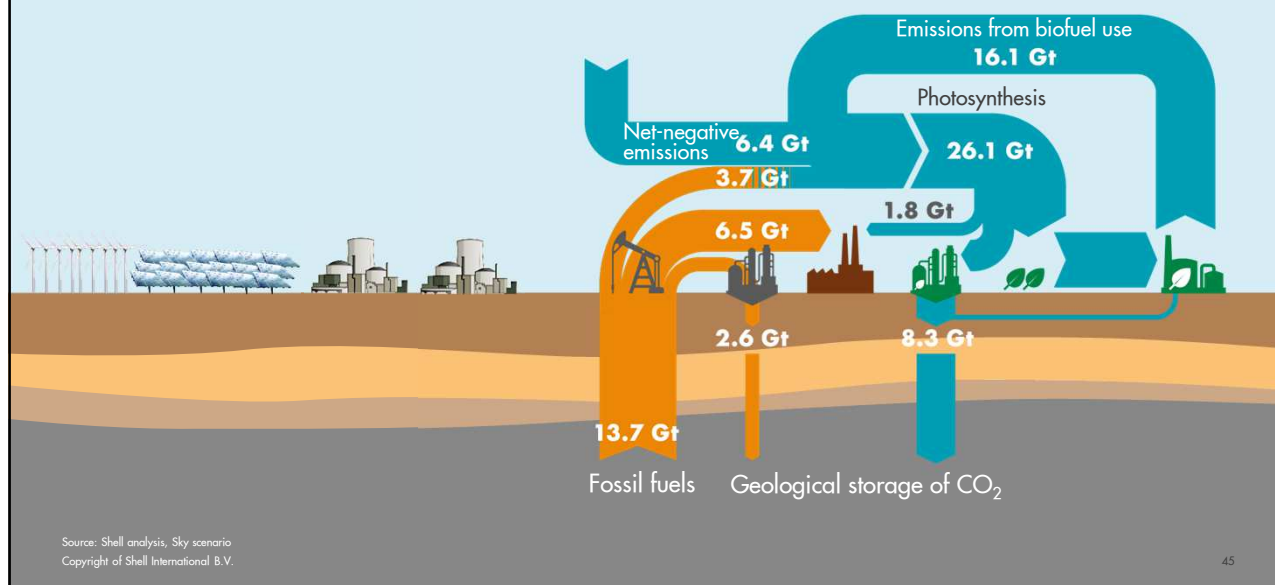


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Sky: Achieving the balance

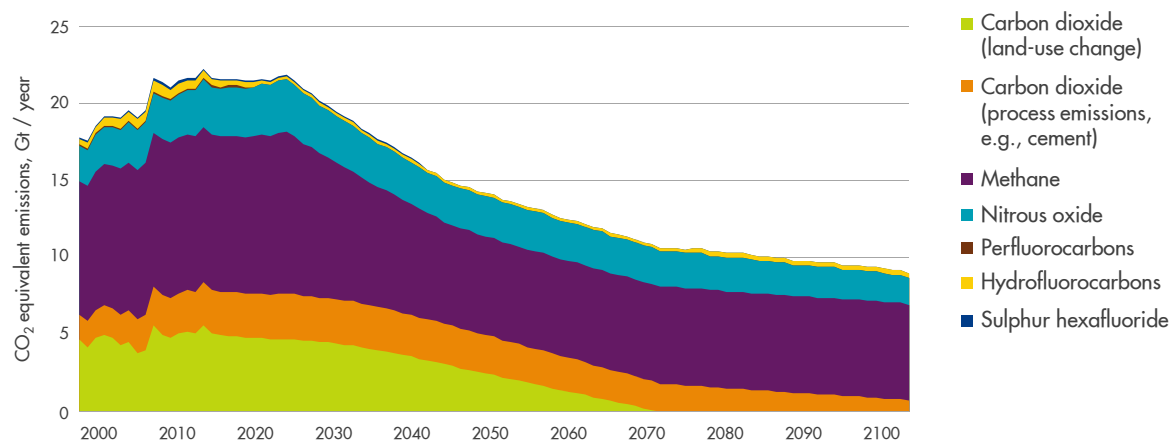
2100



Step 6 – An end to deforestation by 2070



In Sky, other greenhouse gases decline sharply as well



Source: Shell analysis, MIT
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End game

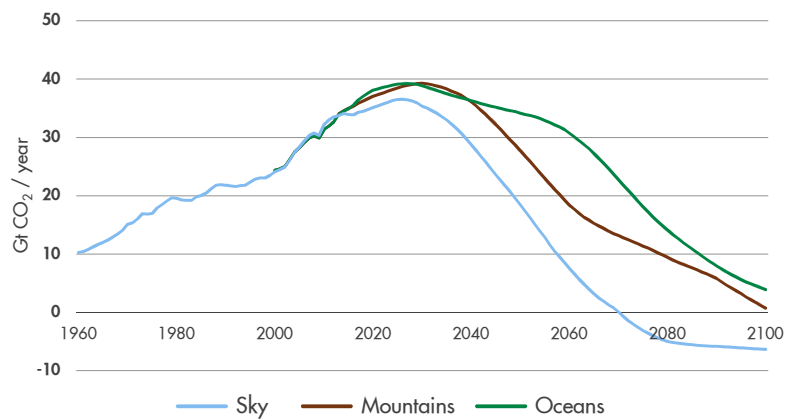
Emissions, temperature and direction

Part 3

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Sky: Energy-related emissions

Emissions profiles: Energy-related CO₂ (all energy)



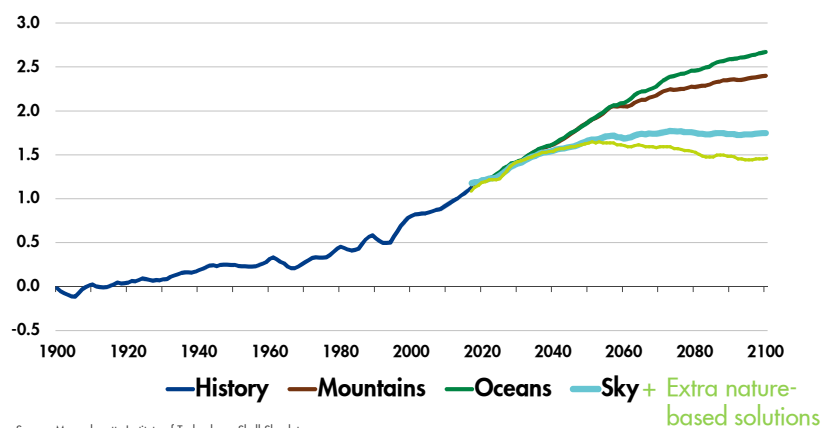
Source: Shell analysis, Sky scenario
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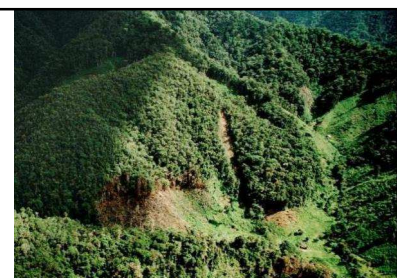
Sky meets the Paris goal

MIT assessment of climate impact

Average global surface temperature rise (°C)

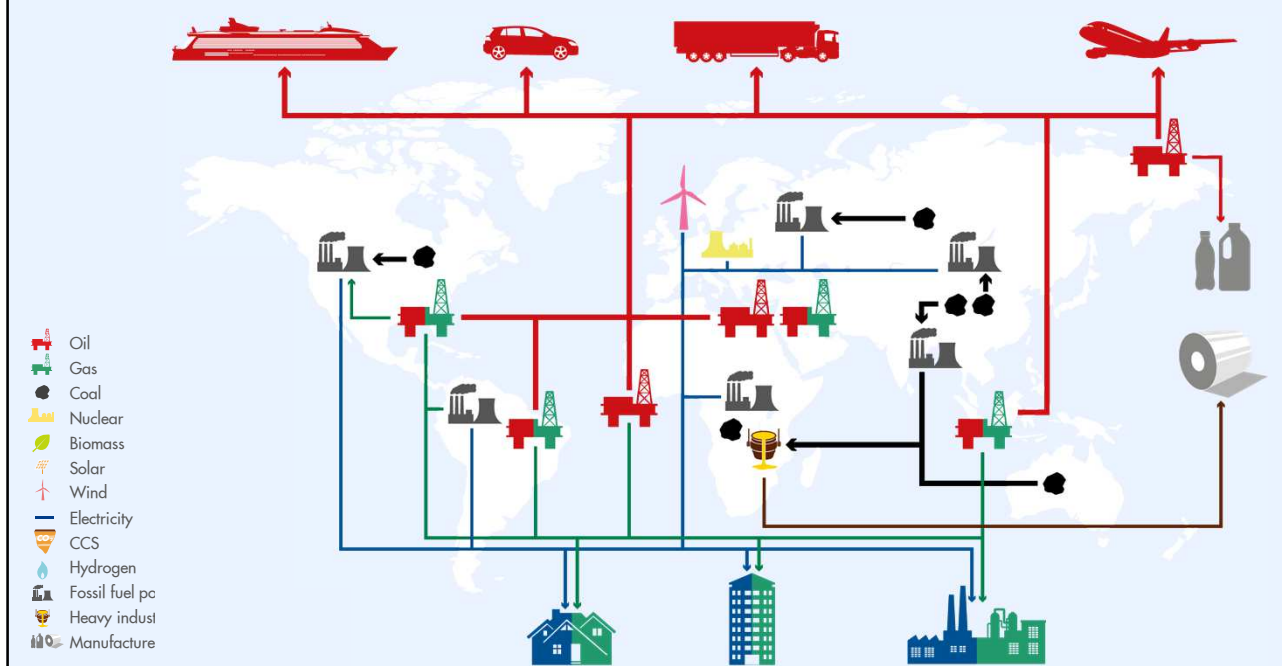


Source: Massachusetts Institute of Technology, Shell Sky data
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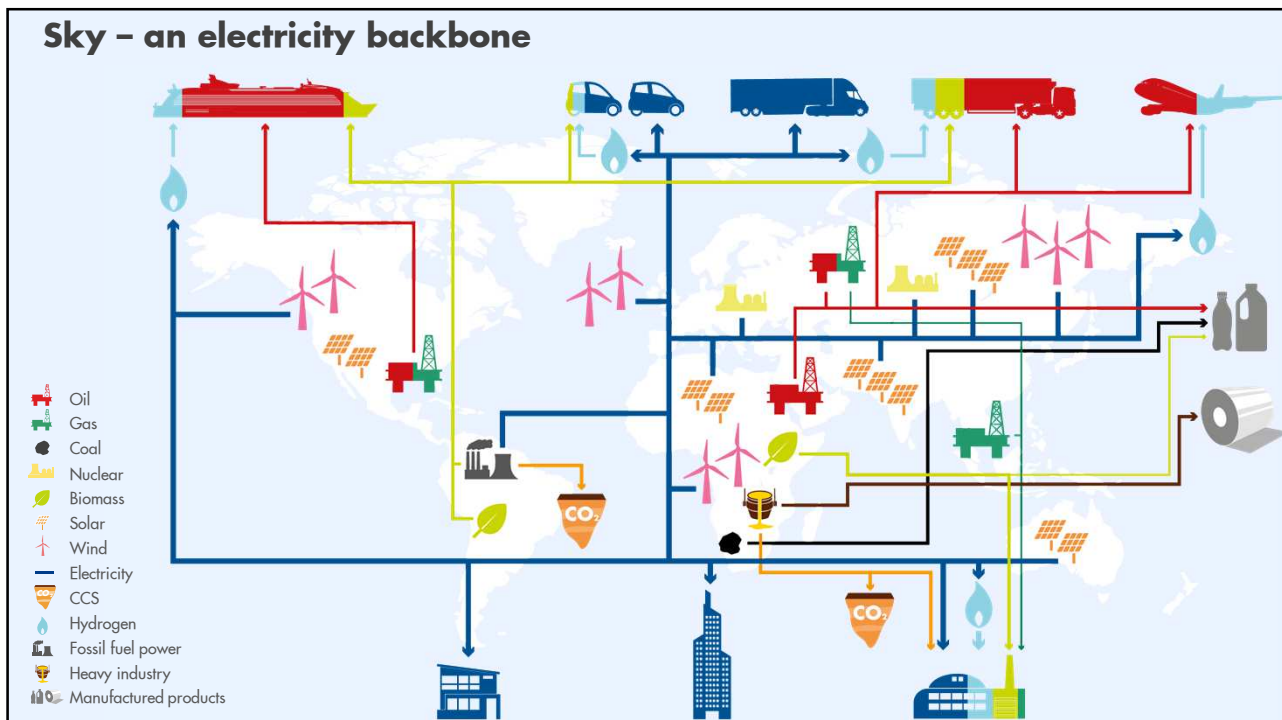


In addition, increasing global forest coverage by an area the size of Brazil offers potential to deliver the stretched 1.5°C ambition of the Paris Agreement

Today – a fossil fuel backbone



Sky – an electricity backbone



Additional reading and the Sky dataset

Available at
amazon



www.shell.com/skyscenario

