



2020 2025 2030 2035 2040 2045 2050 2055 2060 2065 2070 2075 2080



Shell Scenarios **Sky**

Decarbonizing the Industrial Sector

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

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", "schedule", "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 12th November 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.

Navigating 21st century turbulence



**Demand
growth**

**Difficult
Sectors**

**Coal remains
popular**

**Stalled
Technologies**

**Efficiency
rebound**

Time



**"A Better Life
with a Healthy Planet"**

In Sky, six big steps forward from now to 2070 . . . illustrating the interplay of technology innovation, public policy, market forces, and human behaviour



Carbon pricing



Energy efficiency



Electrification of
final energy



Growing new
energy systems



Carbon capture
and storage



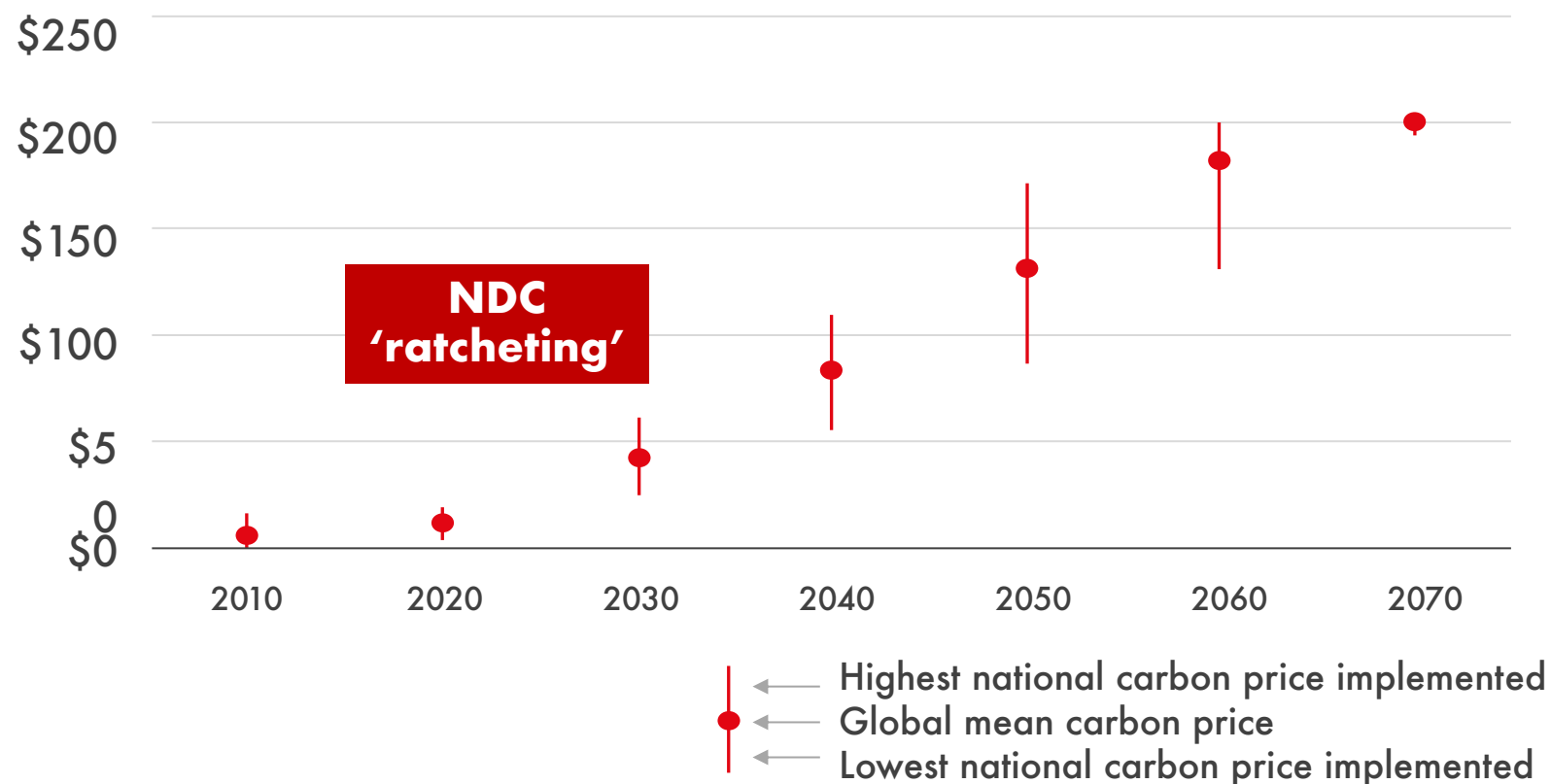
Ending deforestation



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

Carbon pricing is an important driver for change in the industrial sector

Carbon prices in Sky, \$/tonne CO₂



Source: Shell analysis, Sky scenario
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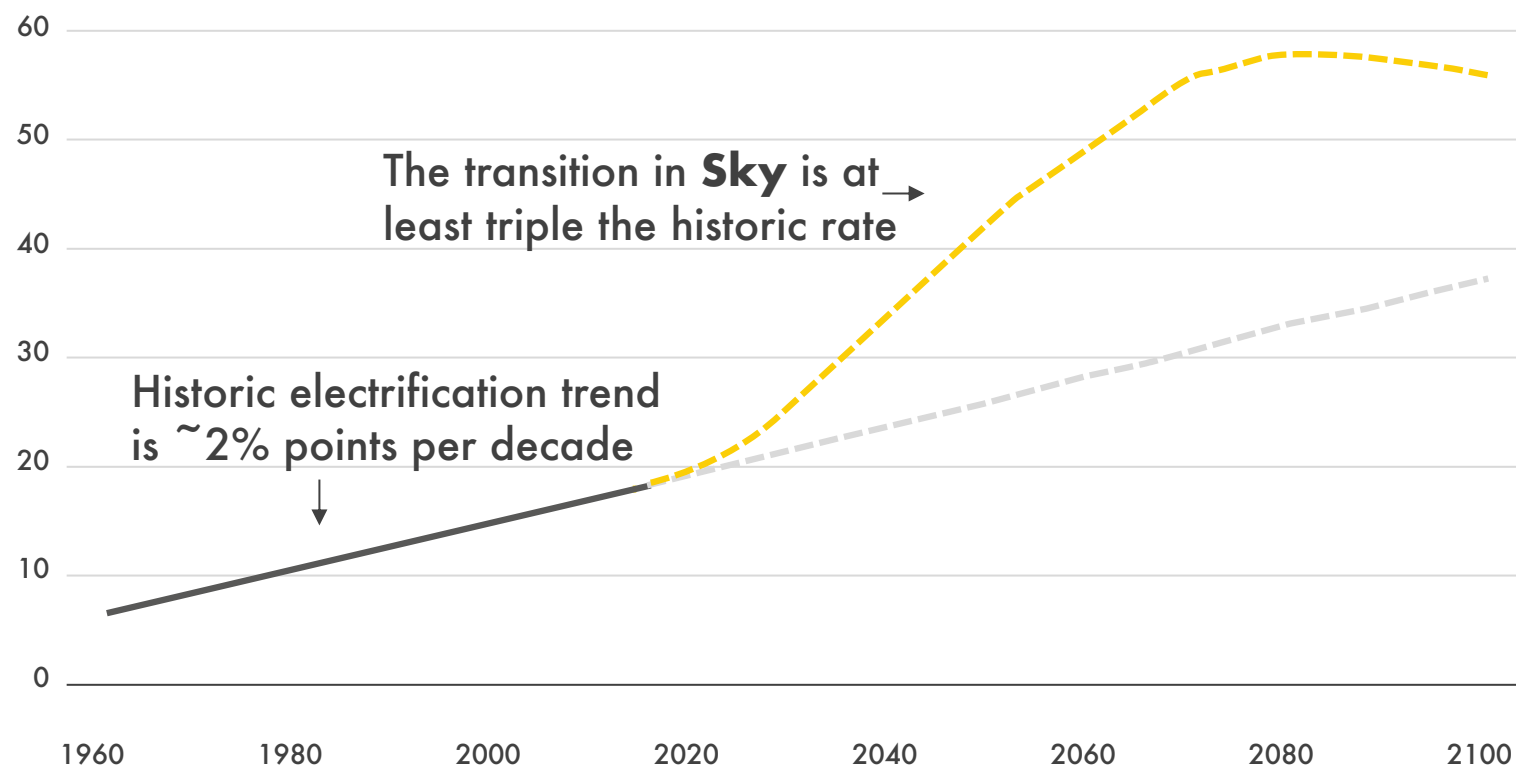


Unwavering acceleration and coordination:

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

Sky sees a major ramp up in electrification, including within industry

Electricity as a % of final energy use



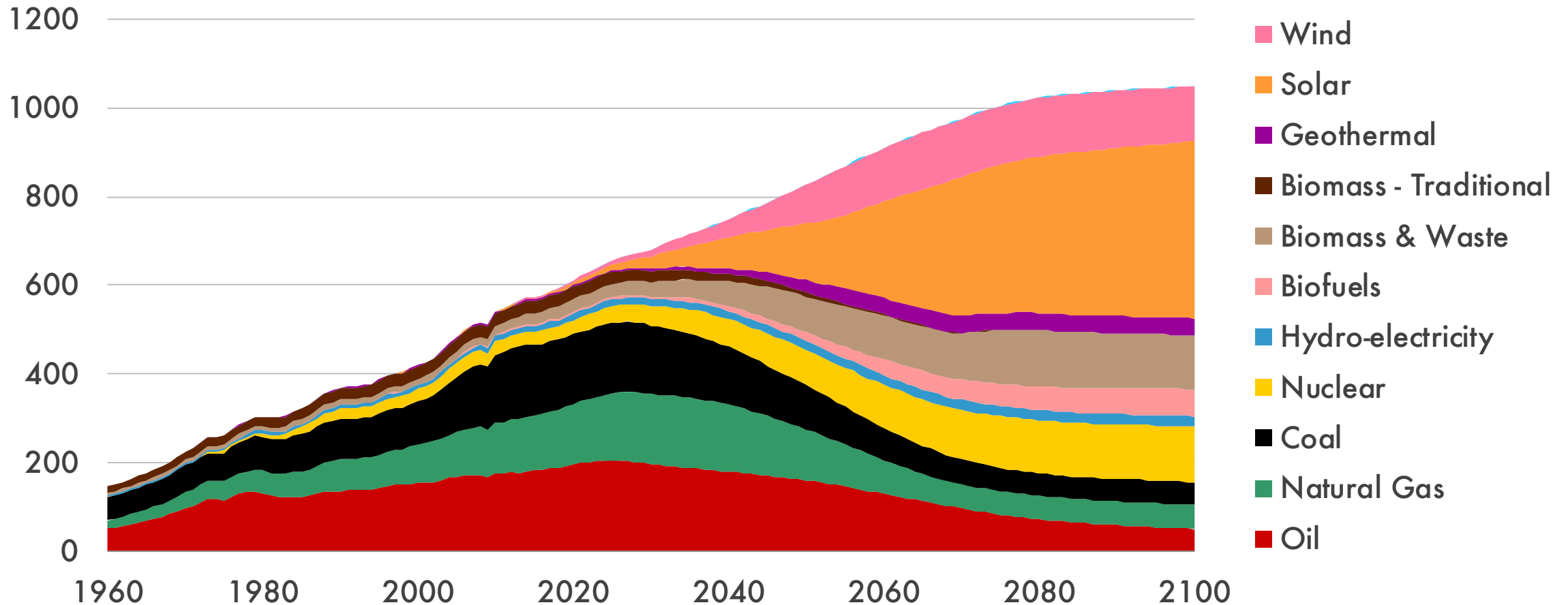
Source: Shell analysis, Sky scenario
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Step 4 – New energy systems emerge

The major sources of primary energy shift in Sky

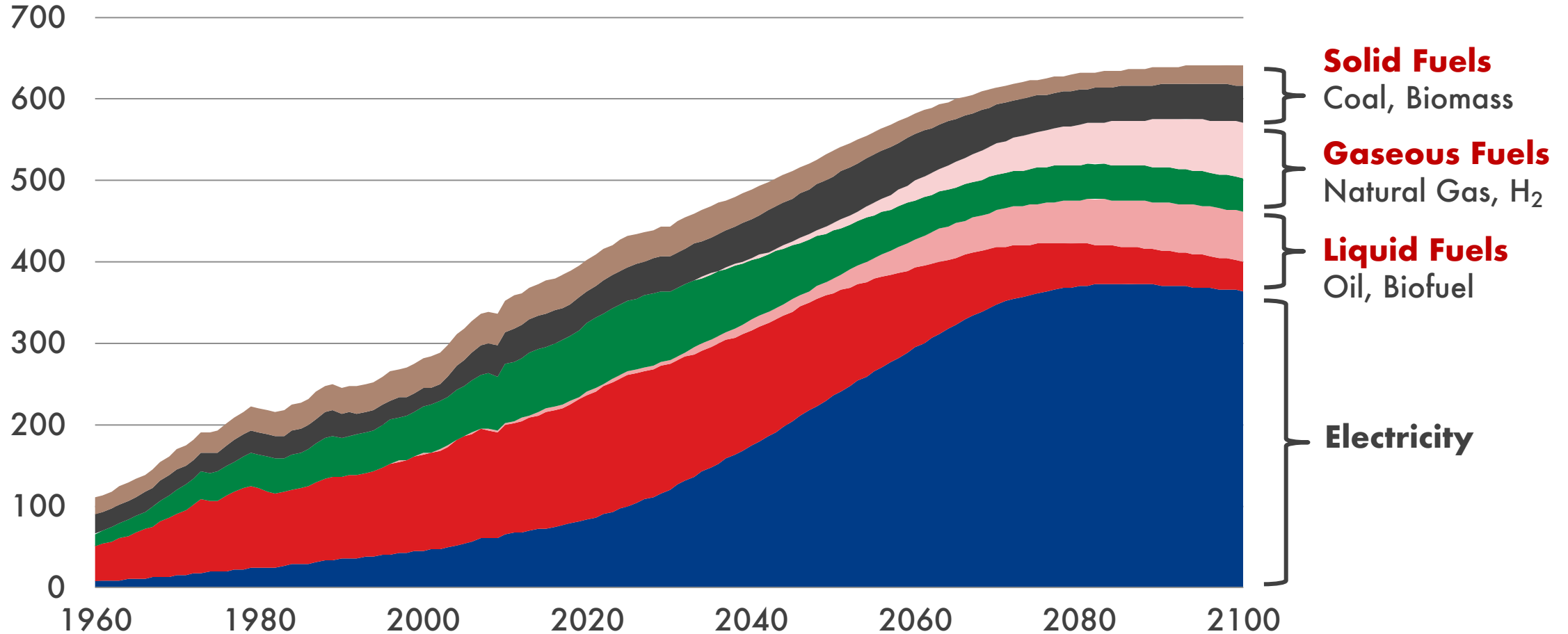
World total primary energy by source, EJ/year



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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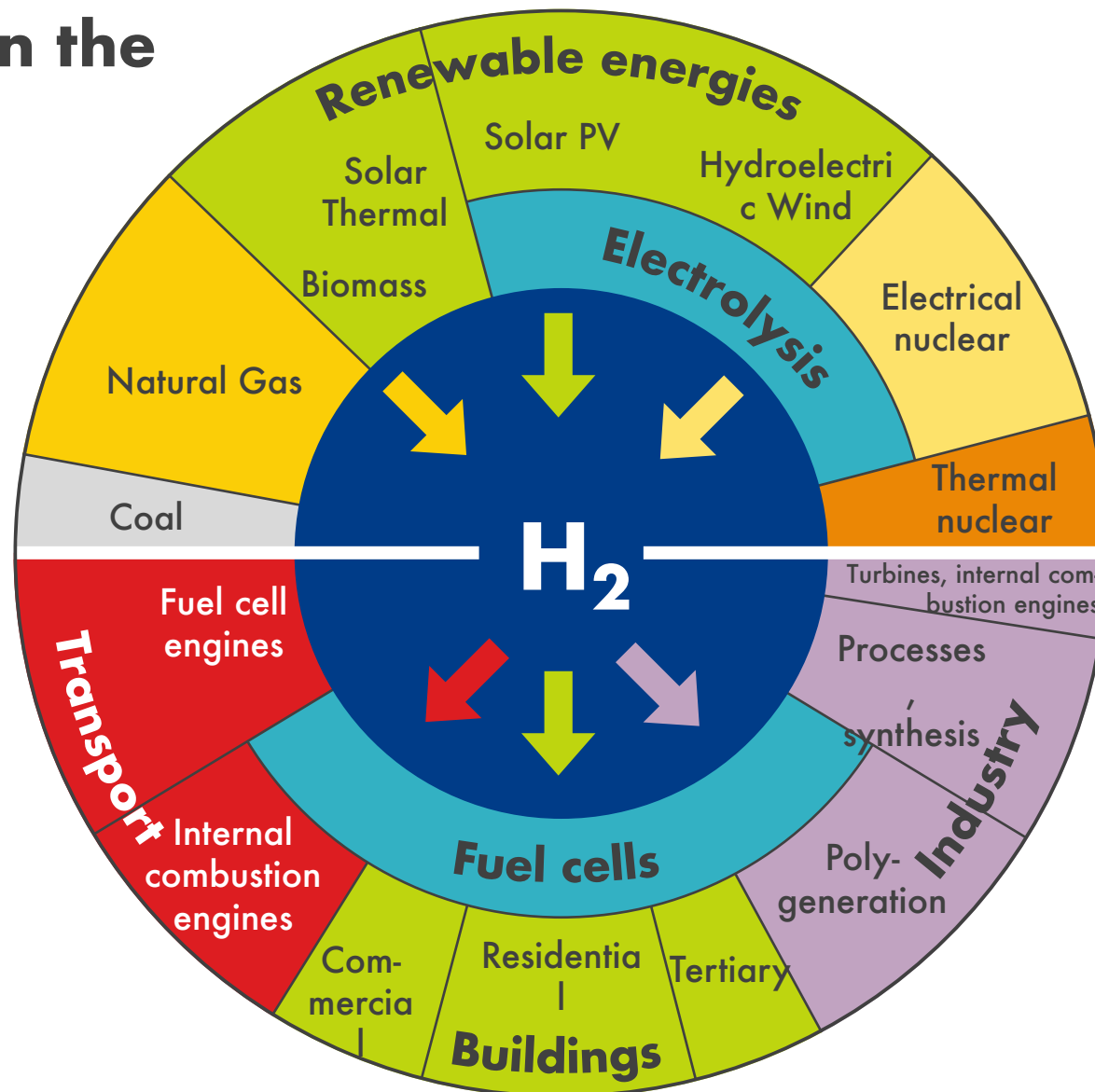
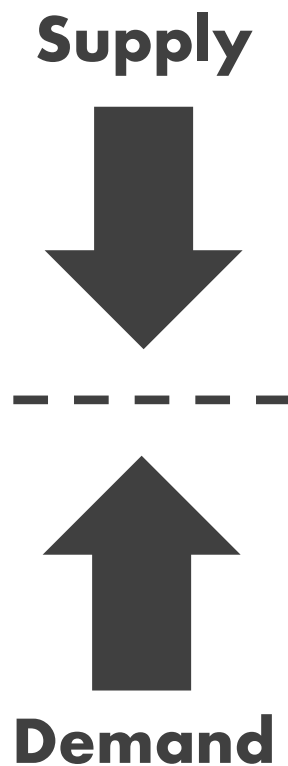
An incremental path for industry in Sky driven by carbon pricing

- Efficiency improves continuously
- Product substitution plays a role
- From 2020 to 2040, many light industries shift to electricity
- By 2050, hydrogen has also appeared in light industry
- From 2030, CCS appears in heavy industry
- After 2050, hydrogen emerges in the heavy industry sector, eventually backing out some CCS
- Remote sinks, such as BECCS, play some role for industry in the second half of the century

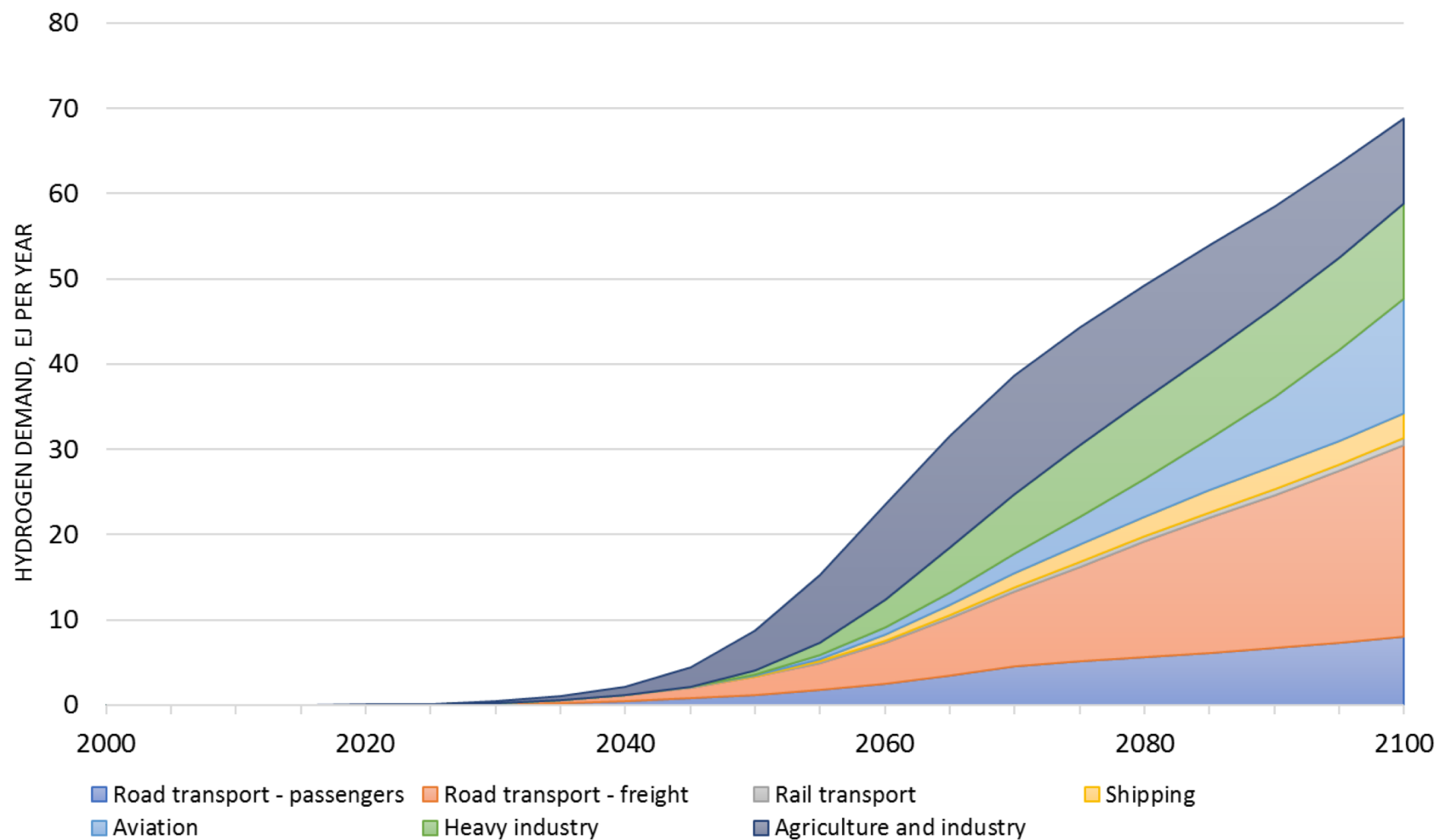


Hydrogen becomes significant in the second half of the century

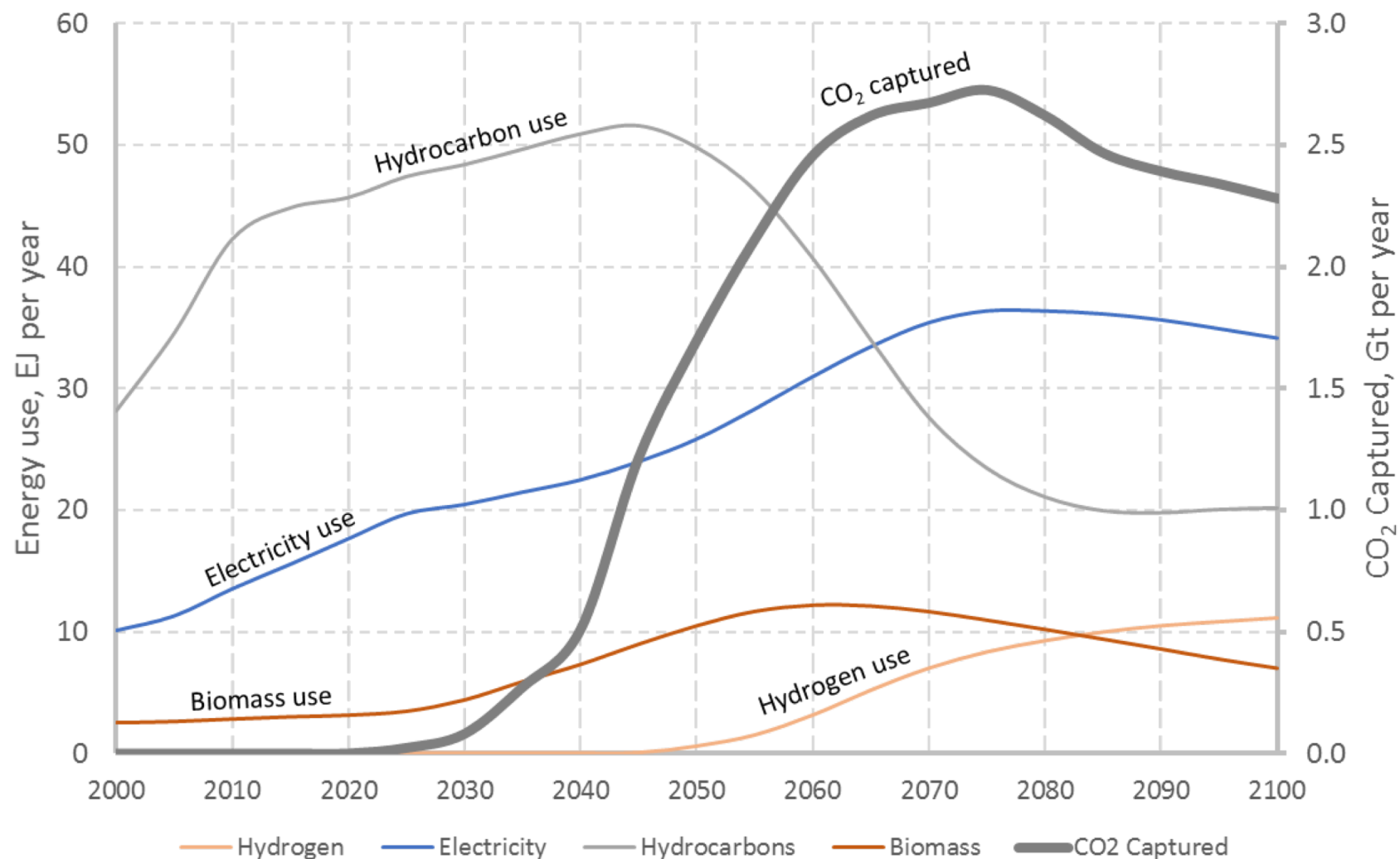
A hydrogen based energy delivery system



Hydrogen emerges at scale in the 2030s



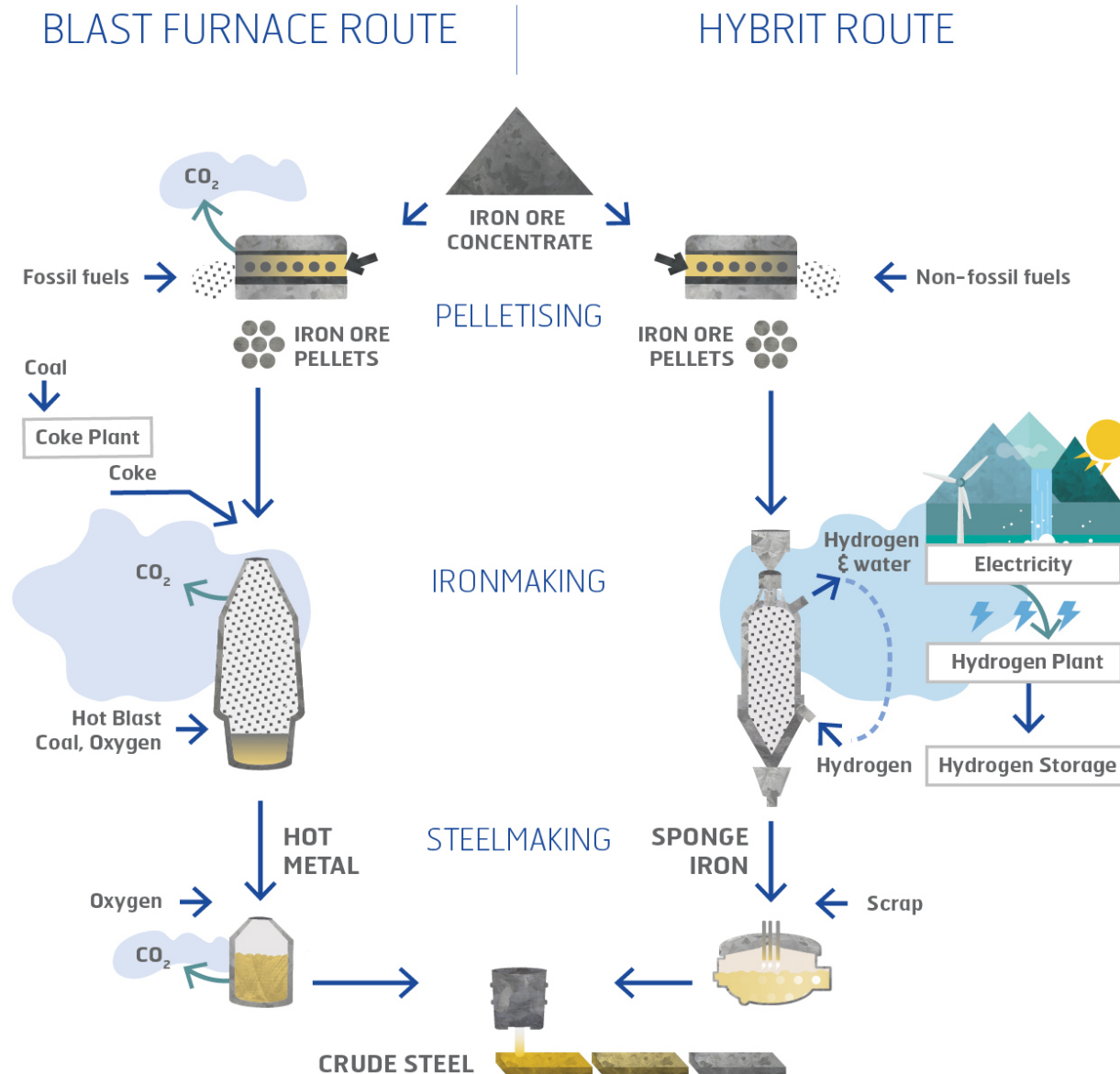
The heavy industry story in Sky



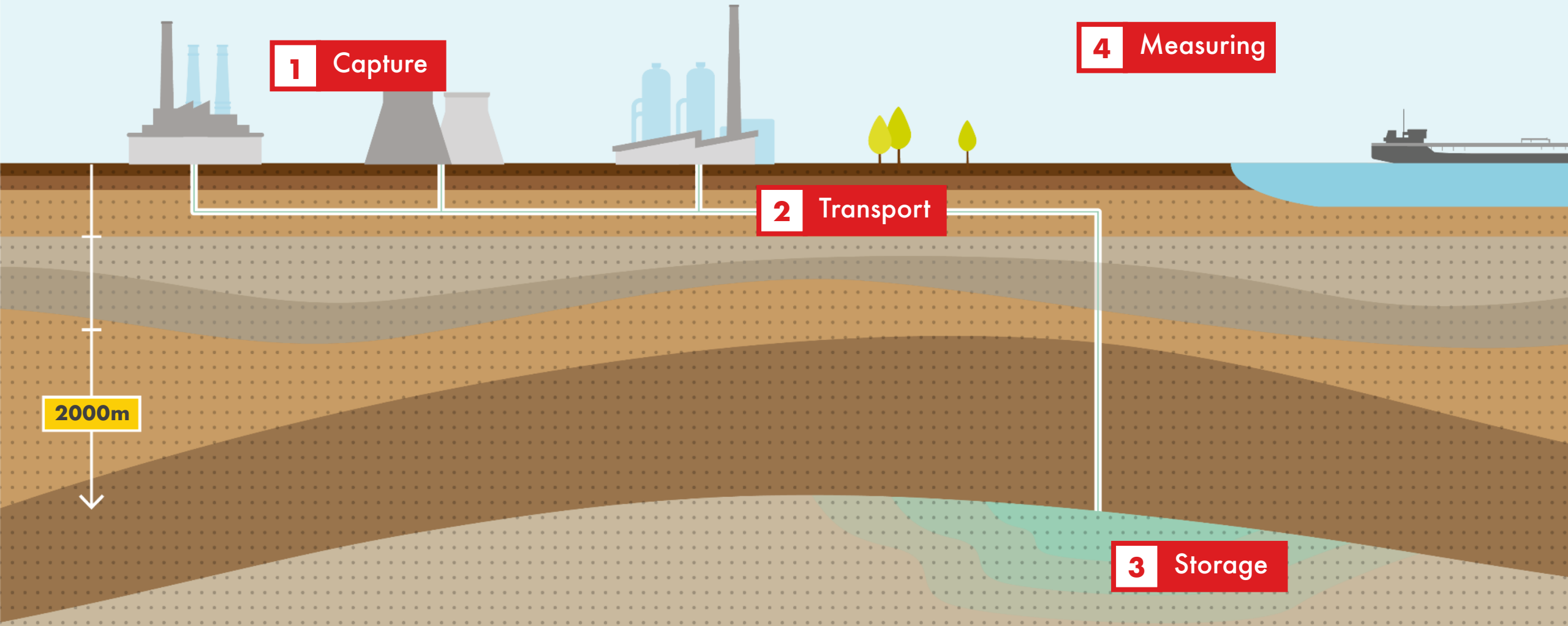
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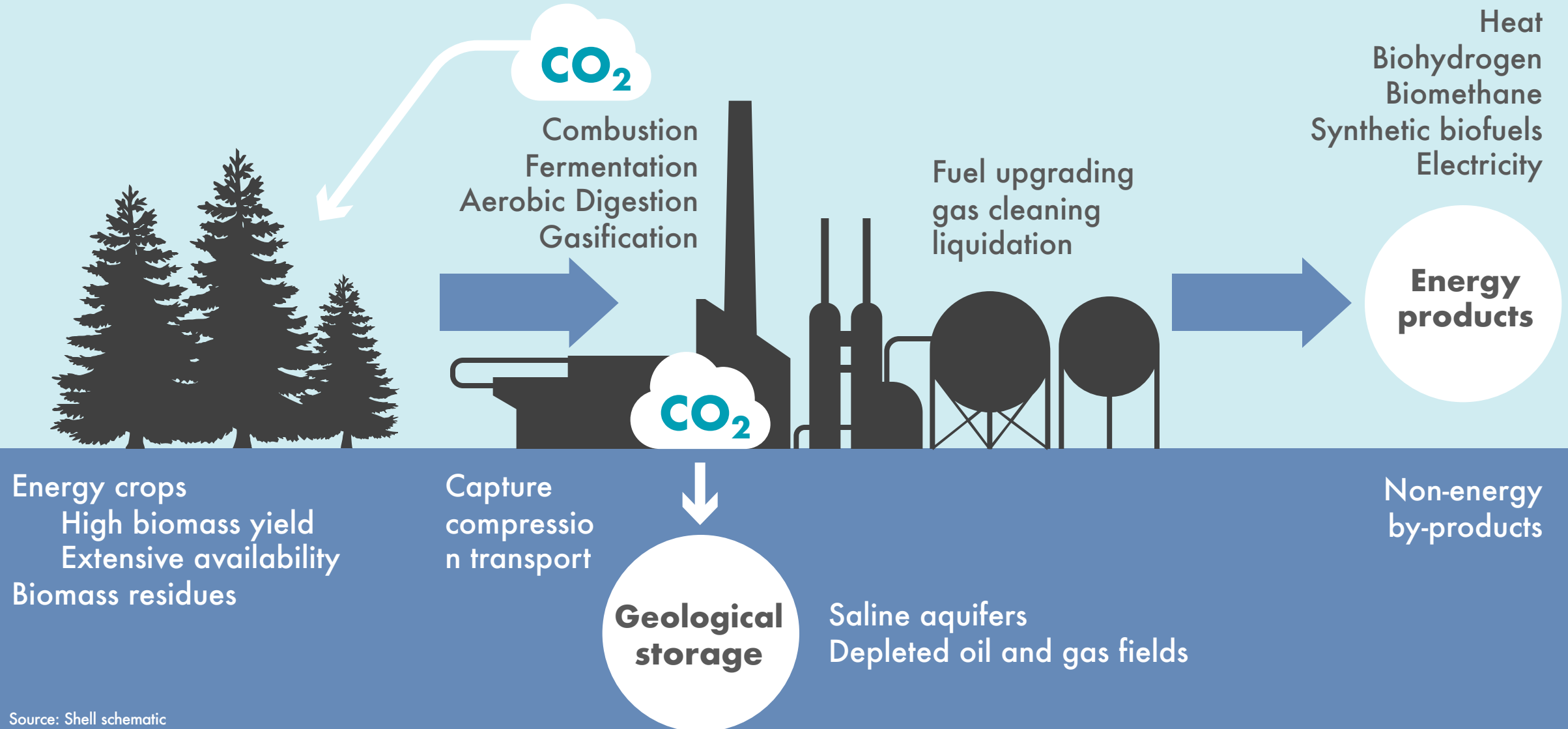
Hydrogen for iron ore smelting



A man-made sink: Carbon capture and storage (CCS)

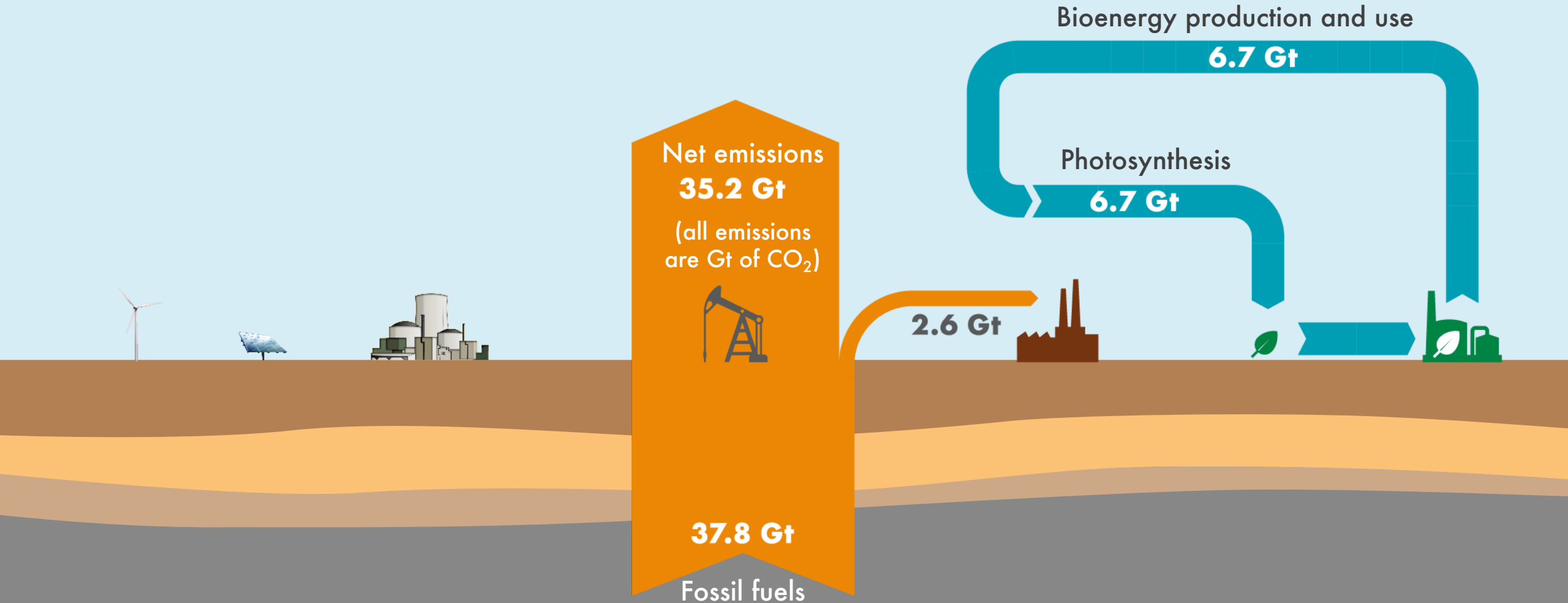


Bioenergy with CCS has an important role to play



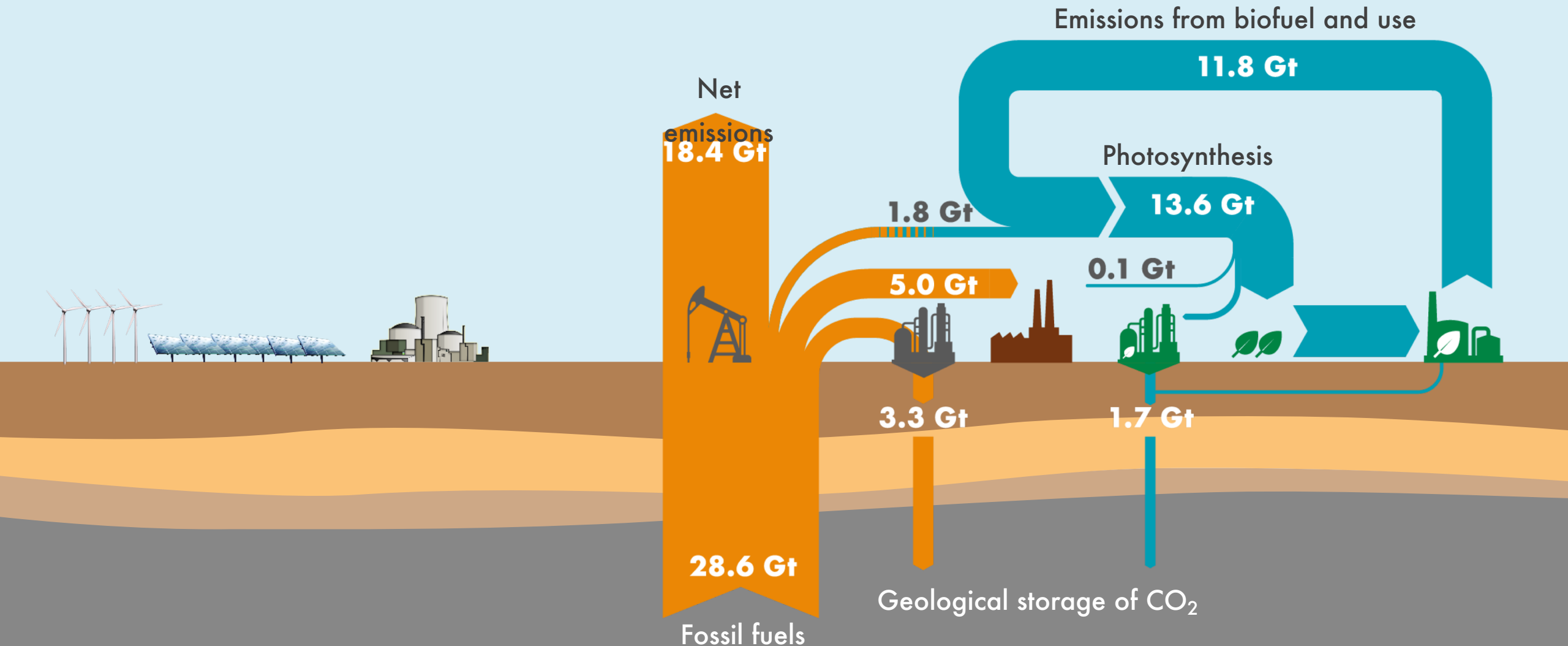
2020

Sky: Achieving the balance



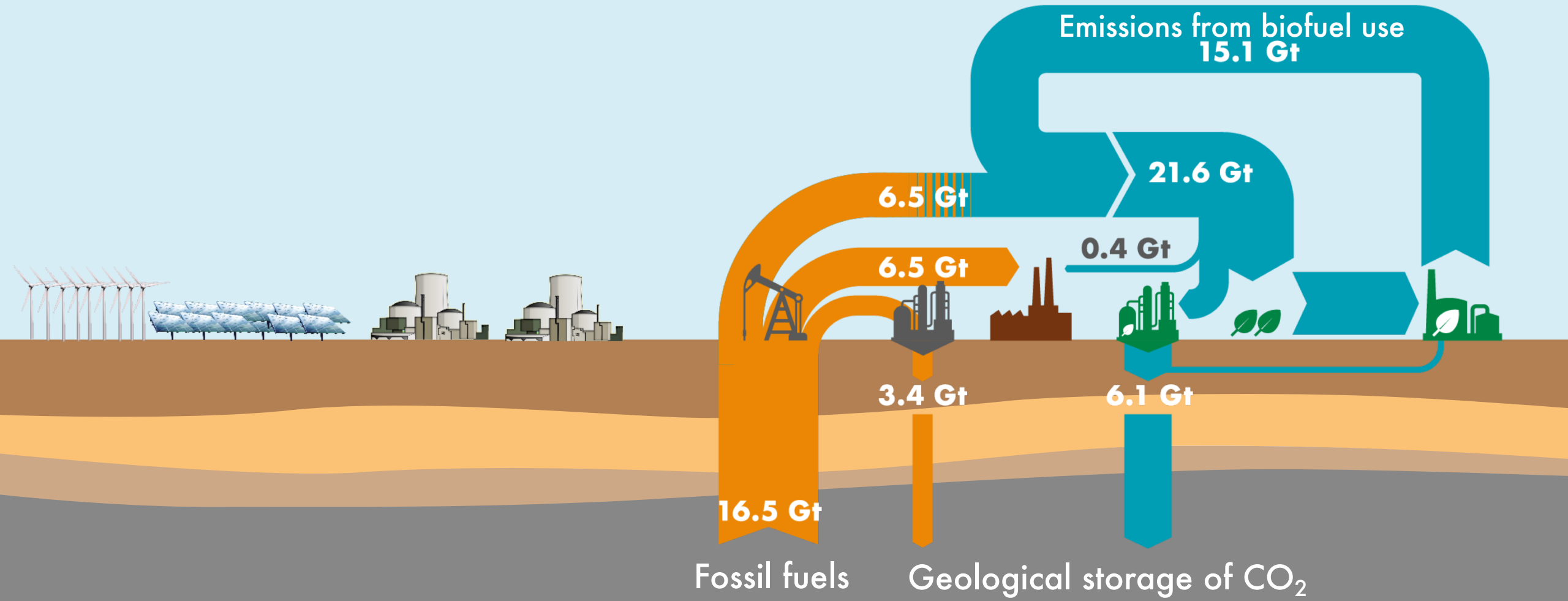
2050

Sky: Achieving the balance



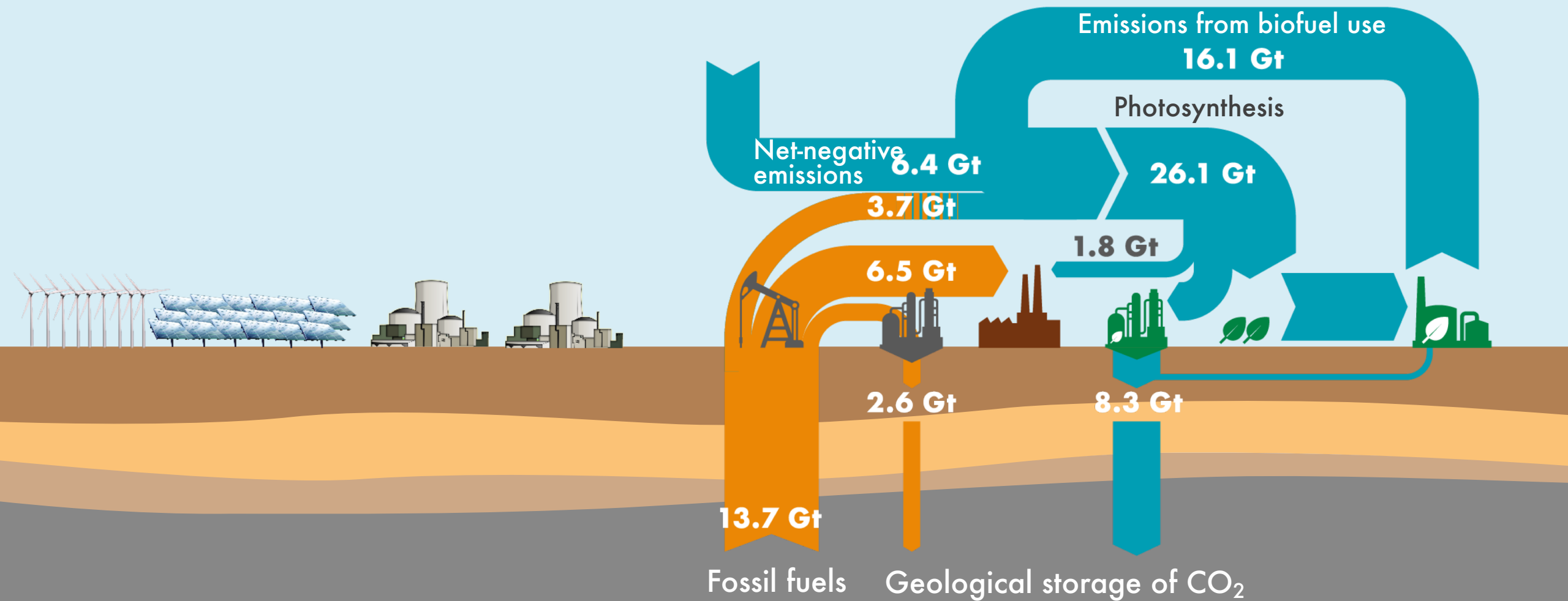
2070

Sky: Achieving the balance

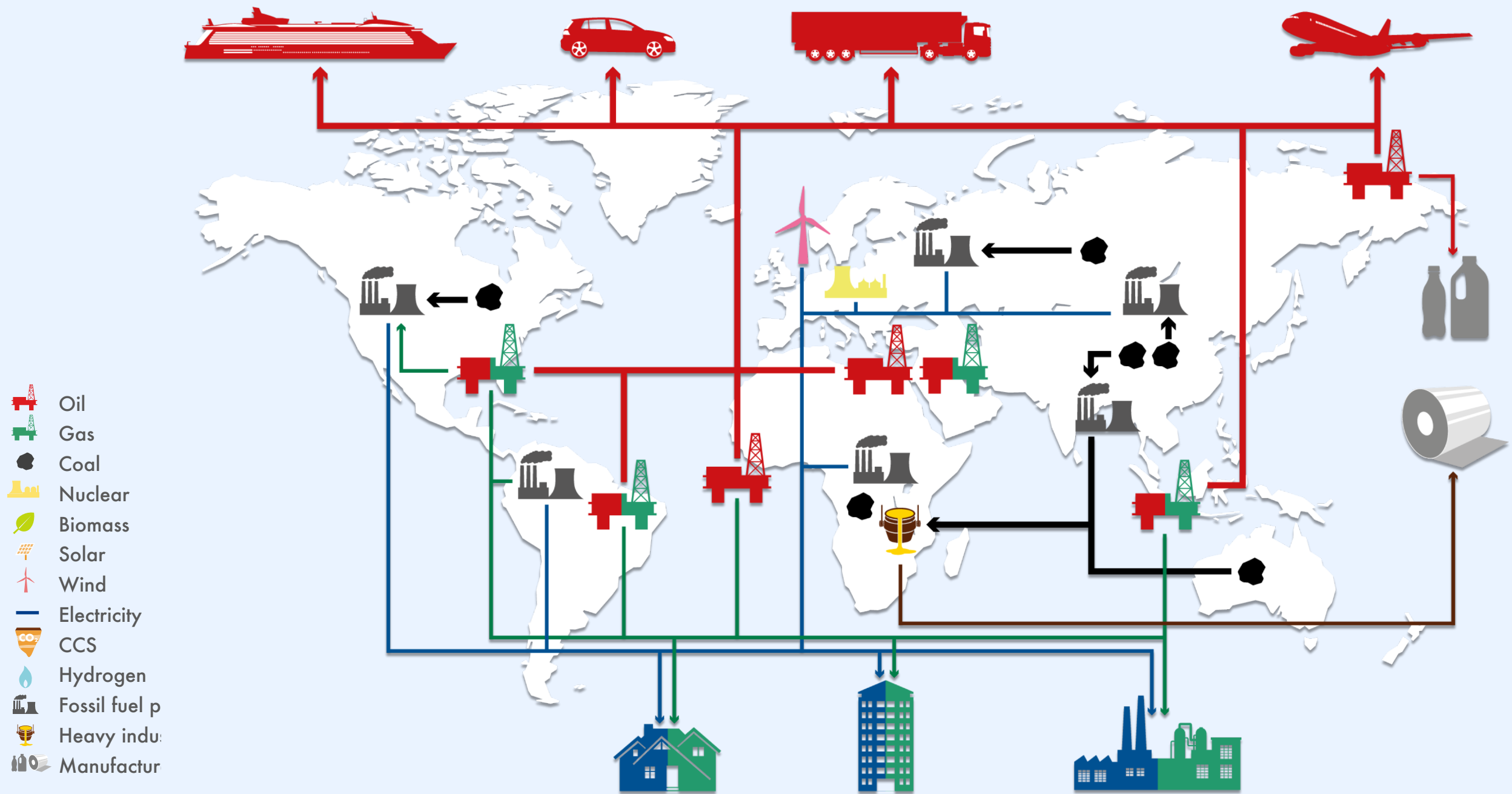


2100

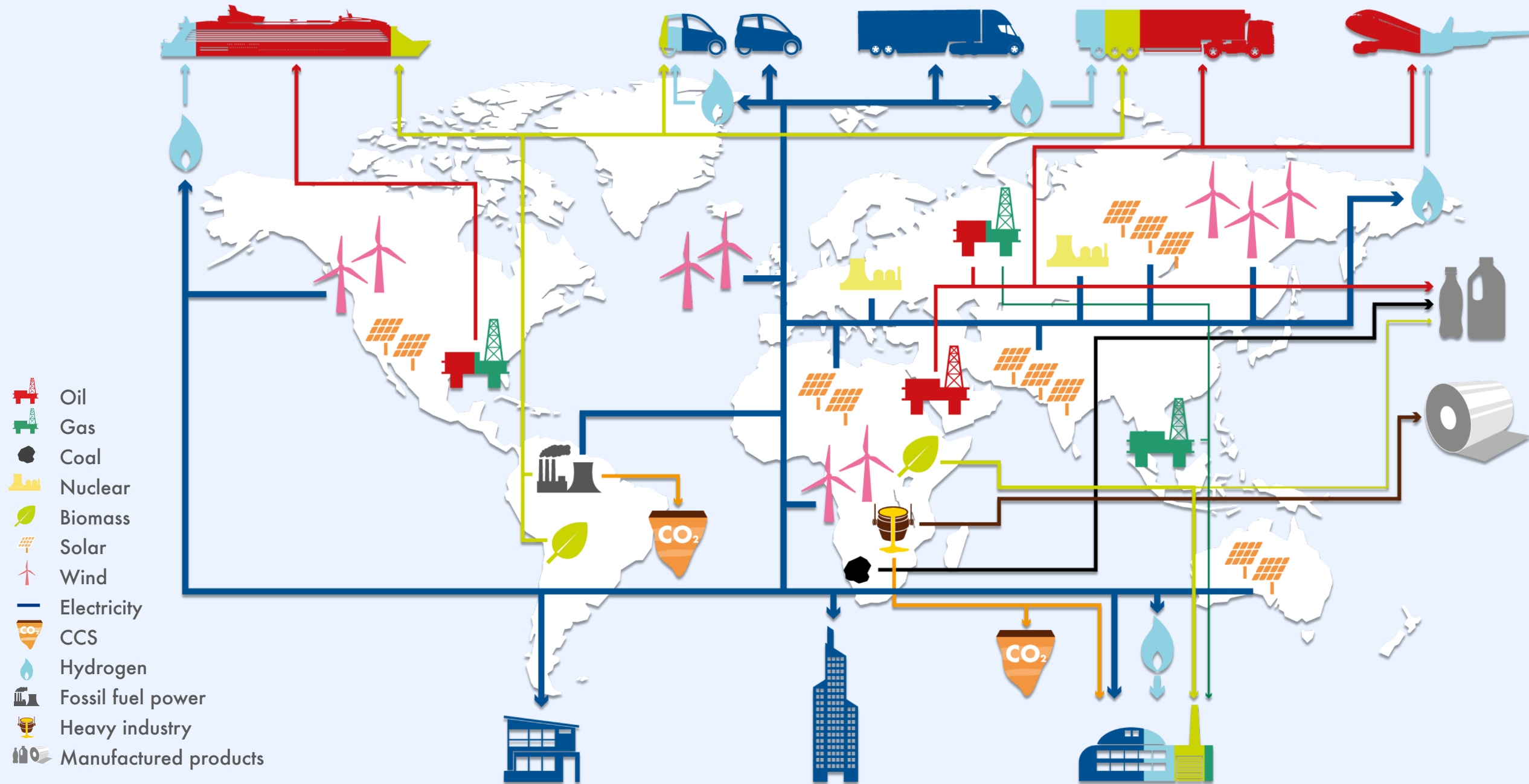
Sky: Achieving the balance



Today – a fossil fuel backbone



Sky – an electricity backbone



Additional reading and the Sky dataset



www.shell.com/skyscenario

Year	1985	1985	1985	1985	2005	2035	2050	2055	2060	2065	2070	2075
3 Total Final Consumption - By Sector	(GJ / year)											
1 Heavy Industry	36.27	31.41	29.74	42.84	42.02	31.42	64.25	27.05	15.55	15.26	15.79	15.22
2 Agriculture & Other Industry	53.21	48.22	55.55	45.15	44.22	31.42	37.43	32.88	34.21	33.85	33.67	33.52
3 Services	16.53	17.77	18.83	24.68	25.31	37.51	58.54	51.78	54.72	58.45	62.55	67.41
4 Passenger Transport - Ship	0.22	0.24	0.25	0.47	0.50	0.54	0.72	0.55	1.05	1.06	1.09	1.11
5 Passenger Transport - Road	0.04	0.27	0.35	2.86	0.87	0.22	0.22	2.78	2.81	0.84	0.37	0.82
6 Passenger Transport - Road	24.14	32.30	33.74	31.24	27.60	40.51	45.74	51.27	57.41	62.35	67.15	71.75
7 Passenger Transport - Air	4.84	6.22	6.22	5.51	7.00	8.74	9.31	9.68	9.55	10.36	11.39	12.27
8 Freight Transport - Ship	5.59	5.23	5.51	5.84	7.77	0.84	0.27	10.02	10.82	11.52	12.24	13.24
9 Freight Transport - Road	2.49	2.74	1.73	4.20	4.30	1.72	1.41	1.54	1.22	1.07	1.54	1.73
10 Freight Transport - Road	12.30	12.33	12.33	21.20	24.22	27.49	29.72	34.27	35.44	40.31	42.22	42.72
11 Freight Transport - Air	1.07	1.12	1.42	1.85	1.91	2.12	2.12	2.52	2.85	2.81	2.70	2.82
12 Residential - Heating & Cooking	49.72	55.71	53.71	25.66	42.96	49.57	20.71	71.87	74.64	75.77	73.14	71.52
13 Residential - Lighting & Appliances	8.00	8.54	8.87	7.26	8.70	10.71	10.71	14.15	17.64	17.46	18.20	19.27
14 Non Energy Use	14.81	16.57	20.02	22.45	25.05	20.59	22.92	29.51	32.54	40.18	47.49	52.52
Total	206.30	236.54	254.64	271.54	266.11	308.45	344.85	383.51	416.61	445.36	470.39	491.73