

Low Carbon Pulse - Edition 29

GLOBAL DEVELOPMENTS IN PROGRESS TOWARDS NET-ZERO EMISSIONS



Welcome to **Edition 29** of Low Carbon Pulse – sharing significant current and recent news on progress towards net-zero greenhouse gas (**GHG**) emissions (**NZE**). This edition is split into two parts:

- the Friday Edition: covering Government announcements and policy issues; and
- the Sunday Edition to include all project announcements for the period from Monday October 4, 2021 to Saturday October 30, 2021 (inclusive of each day).

Please click [here](#) for **Edition 28** of Low Carbon Pulse, and click [here](#) for the **Low Carbon Pulse Compendium**, which comprises **Editions 1 to 28** of Low Carbon Pulse. Click [here](#) and [here](#) for the sibling publications of Low Carbon Pulse, the **Shift to Hydrogen (S2H2): Elemental Change** series and [here](#) for the first feature in the **Hydrogen for Industry (H24I)** features.

On **October 19, 2021**, an **Anniversary Edition** of Low Carbon Pulse was published reflecting on the 12 months since the publication of Edition 1 on October 6, 2020, and looking forward to the next 12 months.

On **November 16, 2021**, normal service will be resumed with **Edition 30** of Low Carbon Pulse covering news in the period from Saturday October 30, 2021, to Sunday November 14, 2021. The Appendix to **Edition 30** will include the Reports on Reports for September and October. **Edition 31** of Low Carbon Pulse will be published in the usual two week cycle on November 30, 2021. **Edition 32** (*The Magic Johnson Edition*) will be published on Friday December 17, 2021 and **Edition 33** (*The Larry Bird Edition*) on Friday January 14, 2021, after the Christmas and western New Year holiday season.

Progress to COP-26:

- **Expectations – somewhere between heightened and sky high:**

- **New York, Milan and Glasgow – Great Cities, Great Expectations:**

After the weeks beginning September 20, 2021 (in New York), and September 27, 2021 (in Milan), the great and the good continued to prepare for the 26th session of the Conference of Parties (**COP-26**) of the United Nations Framework Convention on Climate Change opening this coming Sunday, October 31, in Glasgow, Scotland. The great and the good have been gathering in Glasgow for the last few days, and en route many of the great and good have been making announcements and caucusing.

As US Special Climate Change Envoy, Mr John Kerry, said in Milan: "*The bottom line is, folks, as we stand here today, we believe we can make enormous progress in Glasgow, moving rapidly towards new goals that science is telling us we can achieve*".

President of **COP-26**, Mr Alok Sharma, set out the UK Government Goals for **COP-26**, the fourth of those Goals including the finalisation of the **Paris Rulebook**. Mr Sharma has been quoted as saying that reaching agreement of the **Paris Rulebook** will be more difficult than achieving agreement of the Paris Agreement.

One senses that Mr Sharma is right, and yet just because something is difficult does not mean that it is not pursued. Third time lucky with the **Paris Rulebook**!

- **COP-26 Countdown:**

During this week-beginning October 25, 2021, five [Low Carbon Pulse – COP-26 Countdown features](#) have been published dealing with the four key goals outlined for **COP-26** by the UK Government as the host of **COP-26** (the **Four Pillars**).

This Edition 29 of Low Carbon Pulse does not repeat the **Four Pillars** or the subject matter of them.

- **Top line to bottom line:**

30 years and counting: It is a little over 30 years since the United Nations Intergovernmental Panel on Climate Change (**IPCC**) released its [First Assessment Report](#) in 1990. In a little over 30 years, the mass of **GHGs** present in the climate system has doubled. Among other things, this reflects increasing population, prosperity and urbanisation.

The bottom line is that by 2030, **GHG** emissions need to be reduced by 45% (at least) to ensure that average increases in global temperatures stay within the bottom end of the responsible range between the **Stretch Goal** and the **Stabilisation Goal** i.e., between **1.5°C** to **2°C** (**Responsible Range**), and a reduction of 50% is required to achieve the **Stretch Goal**. This analysis is drawn from the [UNFCCC NDC Synthesis Report](#) which synthesises information from the 164 latest nationally determined contributions (**NDCs**) communicated by the 191 Parties to the Paris Agreement as at July 30, 2021. While it is known that **GHG** emissions must be reduced, **GHG** emissions are projected to increase.

In the week leading up to **COP-26**, the **Commitment and Production Gap** has probably received more concerned coverage in news feeds and opinion pieces than any other matter.

Commitment and Production Gap: The United Nations Environment Programme (**UNEP**) publishes a [2021 Production Gap Report](#) (**PGR**) annually. Each **PGR** assesses the gap between **NDCs** and the planned and projected fossil fuel production. The authors of the **PGR** published on October 20, 2021, note that as countries have made **NZE** commitments and increased their **NDCs**, they, "... have not explicitly recognised or planned for the rapid reduction in fossil fuel production that these targets will require".

GHG emission reduction gap: The **PGR** notes that given current plans and projections, by 2030, the production of fossil fuels will exceed levels consistent with the **Stretch Goal**; by 240% more in the case of coal, by 57% more in the case of oil and by 71% more in the case of natural gas. The "policy setting hand" and the practical, real world hand, are not coordinated. As a result, there is a gap.

If the gap is not bridged or narrowed, it is expected that the current bottom line (as projected) will result in at least a 16% increase in **GHG** emissions by 2030. This is not consistent with the **Stretch Goal**, rather it aligned with what United Nations Secretary General, Mr Antonio Guterres has termed a **Catastrophic Pathway**.

Tracking to 2.7°C: United Nations Secretary General, Mr Antonio Guterres, pulled no punches in his address to the United Nations General Assembly in September. Mr Guterres expressed extreme concern, critically, that the world is on a catastrophic pathway to a **2.7°C** increase in average global temperatures compared to pre-industrial times (**Catastrophic Pathway**) without significant and immediate increases in the rate of **GHG** emission reductions. As is readily apparent from the science based reports: greater **GHG** emission reductions are needed, and the rate of those reductions needs to increase. No matter the direction from which discussion is approached, the discussion needs to coalesce around "greater and faster reductions".

The First Pillar (of the **Four Pillars**) of **COP-26** contemplates staying within the **Responsible Range**, while "keeping in touch" with the **Stretch Goal**.

"Faster, Higher, Stronger Together": Earlier in 2021, Mr Thomas Bach, President of the Olympic Committee, suggested the addition of the word "**Together**" to the Olympic motto, **Faster, Higher, Stronger**. The rate of reduction in, and the rate of removal of, **GHG** emissions need to be faster and higher, and the commitments stronger.

More than this, Article 2.2 of the Paris Agreement provides: "*This Agreement will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances*".

- **Reducing the GHG emission reduction gap:**

Functioning rule book required: Increased **GHG** reduction commitments (through increased **NDCs**) will bridge or narrow the gap in concept, but equally important as **NDCs** is the use of an accepted and common monitoring and reporting framework in compliance with which reductions in **GHG** emissions will be monitored, and, through that monitoring, measured, determined, and those determinations verified.

This will be achieved by the bolstering of the [2018 Paris Rulebook](#) (developed but not finalised at COP-24 in Katowice, Poland, and COP-25 in Madrid, Spain) with the bolstered Rulebook being the **Paris / Glasgow Rulebook**. The **2018 Paris Rulebook** was agreed in part in December 2018 at COP-24, and provides guidelines for countries to achieve the outcomes provided for in the Paris Agreement. Because the **2018 Paris Rulebook** was agreed in part, it is incomplete, critically around key elements of accounting and accountability for **NDCs**.

As has been noted by many commentators, because the Paris Agreement is a bottom-up agreement, Parties to the Paris Agreement set their own targets (i.e., their **NDCs**), set policies as the means of achieving those targets, set the standards used to account for them, and as such to monitor and to report on their achievement. Ideally, the **Paris / Glasgow Rulebook** will provided for standardisation.

Trust and verify: For the author, while not headline grabbing, progress on the **Paris / Glasgow Rulebook** is the the most pressing outcome in achieving progress to **NZE**, along with increased **NDCs** and commitments to development and deployment of renewable electrical energy, critically, to monitor achievement to respond to circumstances in which progress is not being made, and to verify what progress has been made.

At the moment, the **2018 Paris Rulebook** does not require countries to narrow or to bridge the gap. It is possible to see some folk seeking to "paper over the gap" by use of **International Market Mechanisms** under Article 6 of the Paris Agreement (see more below). Papering over a crack is not advisable. Papering over a gap, even less so.

One of the most debated areas, if not the most debated area, is the use of carbon credits (and cross-border emissions trading), including to bridge or to narrow the gap. This debate appears set to take centre stage.

- **The 2021 Report:** The point of reference for the author continues to be the **IPCC Sixth Assessment Report – Climate Change, The Physical Science Basis (2021 Report)**. It is understood that the **2021 Report** is in the *Final Government Distribution phase*, a phase that is to end on November 26, 2021, being a date after **COP-26** finishes.

During the weeks leading up to **COP-26**, a number of news outlets have reported on "leaks" of correspondence arising from the consultation process as part of the *Final Government Distribution phase*. While the author has not seen any of the correspondence, given the nature of the *Final Government Distribution phase*, the author does not read too much into the reported correspondence: the science will not change; how to achieve **NZE** is the subject of debate.

By mid-February 2022, the Summary for Policymakers will be pretty much finalised. (The **2021 Report** comprised a Summary of Policymakers in draft – see Edition 24 of Low Carbon Pulse.)

The **2021 Report** is the oracle – it provides the range of outcomes from which **COP-26** is choosing.

- **A reminder of the key provisions of the Paris Agreement:** While frequent readers of Low Carbon Pulse will be familiar with the key provisions of the Paris Agreement, for convenience they are set out below:

KEY PROVISIONS OF THE PARIS AGREEMENT FOR COP-26	
<p>Article 2.1:</p> <p>This Agreement ... aims to strengthen the global response to the threat of climate change ... including by:</p> <p>(a) Holding the increase in global average temperatures to well below 2°C [Stabilisation Goal] above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C [Stretch Goal] above pre-industrial levels, recognising that this would significantly reduce the risk and impacts of climate change;</p> <p>(b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production; and</p> <p>(c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.</p>	<p>Article 4:</p> <p>In order to achieve the long-term temperature goal set in Article 2, Parties aim to reach <i>global peaking of greenhouse gas emissions as soon as possible</i>, ... and to undertake <i>rapid reductions thereafter in accordance with best available science</i>, so as to achieve a balance between anthropogenic emissions by sources and removals to sinks in greenhouse gas in the second half of this century</p> <p>Article 6:</p> <p>1. Parties recognise that some Parties choose to pursue voluntary cooperation in the implementation of their nationally determined contributions to allow for higher ambition in their mitigation and adaptation actions and to promote sustainable development and environmental integrity.</p> <p>2. Parties shall, where engaging on a voluntary basis ... promote sustainable development, and ensure ... integrity and transparency ... and shall apply <i>robust accounting</i> ... to ensure .. <i>avoidance of double counting</i> consistent with guidance adopted by the Conference of Parties</p>

Progress to COP-26:

• Top Agenda Items:

Four Pillars: As noted above, during this week beginning October 25, 2021, Low Carbon Pulse – published five **COP-26 Countdown features** dealing with the four key goals outlined for **COP-26** by the UK Government as the host of **COP-26** (the **Four Pillars**).

The **Four Pillars** are as follows:

1. Secure global net zero by mid-century and keep 1.5 degrees within reach;
2. Adapt to protect communities and natural habitats;
3. Mobilise finance; and
4. Work together to deliver.

It follows from the **Four Pillars** that the agenda items at or towards the top of folks' lists are likely to be:

- **NDCs** and **Paris Rulebook:** Commitments to **NDCs**, or commitments to increased **NDCs**, accompanied by the **Paris Rulebook** to provide a clear, monitorable and verifiable pathway towards **NZE**, are key to the success of **COP-26**. Progress on these matters will be a clear indication of the success of **COP-26**.

Commitments to, or commitments to increased **NDCs**, represent the first step for some countries, and longer strides for others. To avoid miscalculation of progress to achieving **NDCs** and **NZE**, the **Paris Rulebook** is needed, both to monitor (and to provide the basis for measurement and determination) and to verify reductions in **GHG** emissions, and achieve efficient deployment of technologies and initiatives on a basis that recognises and responds to any non-achievement of reduction commitments.

Also the **Paris Rulebook** is needed to provide a clear basis to monitor and to verify the use of carbon credits to offset compliance or mandatory obligations or to allow corporations to use carbon credits to manage their progress towards **NZE**.

- **Hydrogen, Here and Now:** Defined commitments to the development of: (i) Carbon Capture and Storage (**CCS**), and Carbon Capture Use and Storage (**CCUS**) including to allow the development of Blue Hydrogen production capacity; and, (ii) renewable electrical energy capacity, solar and wind (off-shore and on-shore),

to develop sufficient renewable electrical energy to allow the production of Green Hydrogen as soon as practicable, are needed. (See Editions [26](#) and [27](#) of Low Carbon Pulse, including under [Government needed to guide to achieve timely development](#).)

- **Solar, Here, There and Everywhere:** The ever declining cost of photovoltaic solar electrical energy may be regarded as a function of markets working at their best, and critically, to lower the cost of producers of equipment, supplying domestic and international markets, allowing the deployment of photovoltaic solar at a scale that results in the lowest electrical energy costs in history, and the increasing development of battery electric storage systems (**BESSs**). In some markets, these outcomes have been achieved before use of photovoltaic solar has been incentivized.

As a result of these dynamics, the Levelized Cost of Energy (**LCOE**) for photovoltaic solar electrical energy has become the lowest of any source of electrical energy in many markets.

From **COP-26**, it is hoped that developing countries, including those in Africa, East Asia, South East Asia and the Pacific Islands, will emerge with funding support programs to maximise deployment of photovoltaic solar development, both roof-top and utility. Further, it is hoped that President Xi Jinping's proposal for a global high voltage direct current (**HVDC**) renewable energy network receives the "air-play" that it deserves.

- **Article 6 Agenda:** It is clear that a number of countries and organisations attending **COP-26** will seek to focus on carbon credits and trading in them, including to allow off-set against emission reduction commitments and liabilities, and the development of carbon credit trading. As noted above (and below), increased carbon credits, in theory, will narrow the gap between the projected increase in **GHG** emissions and the **NDCs** of some countries.

It is critical to keep in mind that the use of carbon credits, while important, will not achieve the level of **GHG** emission reductions required to achieve **NZE**. The effective use of carbon credits, and the development of trading platforms for high-quality carbon credits, will "buy time" for the corporations purchasing them and for the rest of us by slowing the rate of increase in **GHG** emissions.

The slowing of the rate of increase in **GHG** emissions will slow the rate at which we deplete the global carbon budget, but ultimately decarbonisation activities giving rise to **GHGs** are required.

- **A price on carbon:** A number of commentators have suggested that a global price on carbon should be on the **COP-26** agenda.

While a global price on carbon would link directly to the market for carbon credits, the author does not consider that a price on carbon is an appropriate agenda item for **COP-26** or any Conference of Parties.

This is not because a price on carbon is not a good idea in the right setting, but the imposition of a global price on carbon would have to take account of current policy settings (including current customs and excise duties and taxes on fossil fuels) in each country, and is "a third rail" that is best left untouched.

A carbon price is a tool used to encourage participants in markets to move to lower, low or no carbon technologies. In some countries a carbon price makes sense, but it makes sense only if it is set at a level that encourages the development and deployment of lower, low or no carbon technologies – this is the logic for any carbon price, whether set through an emissions trading scheme or as a carbon tax, or both.

The price on carbon versus technology debate is one the Federal Government of Australia has been propounding for a while: technology, not a carbon price (or in Australian parlance, a carbon tax), will result in progress to achieving **NZE**. The Federal Government of Australia is committing tax-payer money to support the development of technologies which the Government hopes will find a market.

The debate that the Federal Government of Australia has been propounded is incomplete in that it ignores the rate at which reductions in **GHG** emissions need to be achieved, and that a price on carbon provides a benchmark for the cost of a lower, low or no carbon technology displacing carbon. This debate will no doubt continue.

- **Global energy demand and markets:** On **October 6**, 2021, S&P Global Platts reported on the assessment of the **US EIA** (the **US Energy Information Administration**). The S&P Global Platts [report](#) notes that the projection of the **US EIA** in its **International Energy Outlook (IEO)** is that global energy demand will grow by 47% by 2050, and oil and natural gas will remain the largest source of energy.

The assessment of the **US EIA** "underscores the stark challenges ahead for transitioning away from fossil fuels and curbing global warming emissions".

The **IEO** is stark. It is the counterfactual to the aspirational **NZE**, and emphasises the importance of the reduction of **GHG** emissions by 45% (or more) by 2030, if not sooner. As noted in previous editions of Low Carbon Pulse, leaving decarbonisation to markets will not result in **NZE**.

As noted above, there is a **Commitment and Production Gap**. **COP-26** will not resolve the **Commitment and Production Gap**, but this gap needs to be discussed, and the **Paris Rulebook** needs to address how Parties to the Paris Agreement will address this gap.

In the week leading up to **COP-26**, the **Commitment and Production Gap** has probably received more concerned coverage in news feeds and opinion pieces than any other matter.

• **Papers, Reports and Studies – Thick and Fast:**

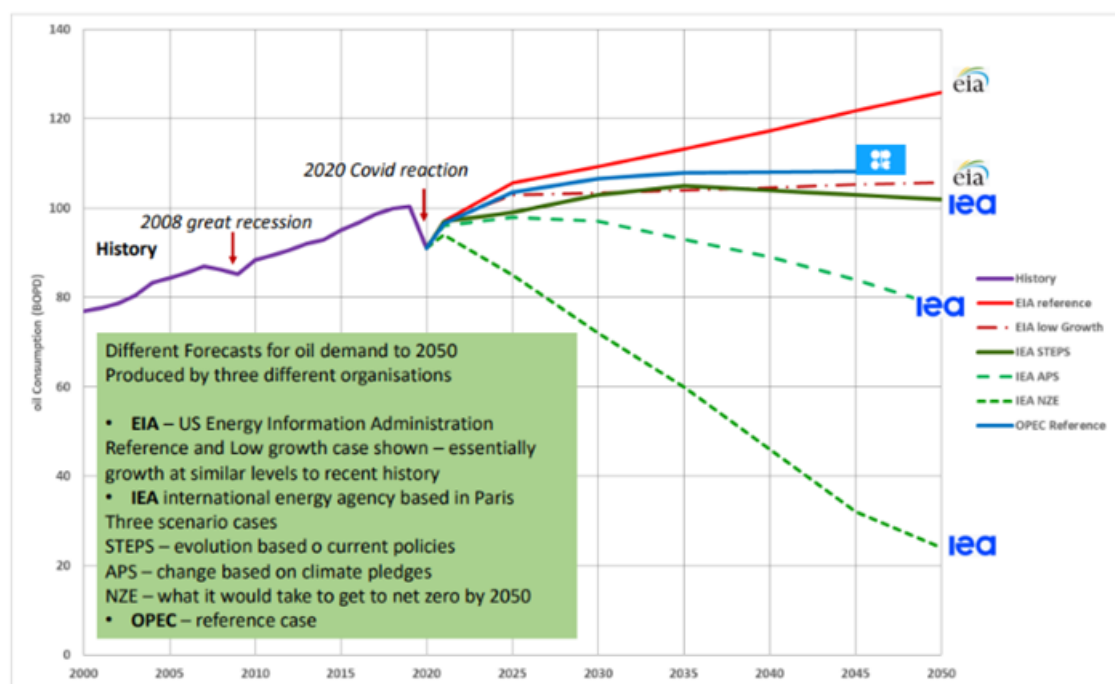
- **A good year for publications:** Throughout 2021 the mass of and the speed at which publications have been released has increased, in part in anticipation of **COP-26**. This has been the case, in particular, since May 18, 2021.

Since May 18, 2021, in addition to the **2021 Report**, the following reports have been published, earliest first, most recent last (all summarised in Low Carbon Pulse):

- **International Energy Agency - [Net Zero by 2050 – A Roadmap for Global Energy Sector \(IEA Roadmap\)](#);**

- **International Renewable Energy Agency** - [World Energy Transitions Outlook \(IRENA WETO\)](#);
 - **Wood Mackenzie** - [How to scale up carbon capture and storage](#);
 - **BloombergNEF** - [New Energy Outlook, 2021](#); and
 - **S&P Global Platts** - [Platts Global Integrated Energy Model – Strategic Planning for a world in transition](#).
- **Paper, Paper everywhere – too much to drink in:** In the lead up to **COP-26**, many papers, reports and studies have been published. In the context of **COP-26** the following seem the most relevant:
- **IEA GH2R:** On October 5, 2021, the International Energy Agency (**IEA**) continued its prolific year with the publication of its [Global Hydrogen Review 2021 \(IEA GH2R\)](#).
As always with **IEA** publications, the **IEA GH2R** is both helpful and informative, and as such well-worth a read, and continues the consistent engagement of the **IEA** (see [The Future of Hydrogen Report](#)). Of particular interest to the author is the **Hydrogen Projects Database**.
The key message from the **IEA GH2R**, in particular for the purposes of **COP-26**, is one that will be familiar to readers of Low Carbon Pulse: the role of Government is central to the development of both the Blue Hydrogen and Green Hydrogen industries, and as such the associated development of hydrogen-based fuels. This key message is consistent with the messaging from the **IEA** since well before Edition 1 of Low Carbon Pulse. Edition 27 of Low Carbon Pulse (under [A role for Government in the development of supply and demand for hydrogen](#)) referenced an opinion piece from Wood Mackenzie: "... [COP-26] must go far far beyond setting new emission targets. Ensuring that hydrogen is not just a "fuel of the future", but a fuel that needs to be ... implemented into global society from today [and] should be top of the agenda".
The **IEA GH2R** will be considered in detail in the *October Report on Reports* (in the Appendix to Edition 30 of Low Carbon Pulse).
 - **US EIA - IEO:** On October 6, 2021, the **US EIA** published its [International Energy Outlook \(IEO\)](#). As noted above, the **IEO** may be regarded as an assessment of what supply and demand will be given current policy settings, and as such without material and significant initiatives that change this direction of travel. (The **October Report on Reports** will consider the **IEO** in detail.)
It is a read for the positive realist, determined to press for progress on the basis of higher and faster **GHG** emissions, stronger enforcement, together. This said, the positive realist needs to understand that the **US IES** may be regarded as plotting a demand / consumption curve above those plotted by others in the recent past:

Comparing Different Oil Demand Forecasts to 2050



Is there a cultural bias to producing future energy scenarios?

- **IEA - CCH4R:** On October 7, 2021, the **IEA** published its [Curtailling Methane Emissions from Fossil Fuel Operations \(CCH4R\)](#). It will be no surprise to readers of Low Carbon Pulse that the headline from the **CCH4R** is that the reduction in methane (**CH₄**) emissions is "among the most impactful ways to combat near-term climate change".

As noted in the **Anniversary Edition** of Low Carbon Pulse, one of the areas of progress since October 2020 has been the recognition of the need to address **CH₄** emissions, culminating in the **Global Methane Pledge**,

signed by the European Commission (**EC**) and the US on September 17, 2021. As at noon on October 29, 2021, 24 countries have committed since then, including Argentina, Indonesia, Italy, Mexico, and the UK, with New Zealand considering joining.

The **IEA** has been advocating consistently for a focus on **CH₄** emissions for some time, and will no doubt continue to do so.

The **IEA** notes in the **CCH4R** (as it has noted on a number of occasions), that: "*Methane has contributed around 30% of the global rise in temperature to date ... Emissions from fossil fuel operations present a major opportunity [to limit global warming in the near term] since the pathways to reduction are both clear and cost-effective*".

The **CCH4R** will be considered in detail in the *October Report on Reports* (in the Appendix to Edition 30 of Low Carbon Pulse).

In passing, it is important to note that while the focus of the **CCH4R** is **CH₄** arising from the extraction, production and transportation of fossil fuels, **CH₄** arises from agriculture, forestry and other land use (**AFOLU**) and waste and waste water. At the same time as **CH₄** emissions from fossil fuel operations are being targeted, **CH₄** emissions from waste and waste water need to be addressed (see below **A role for Government in decarbonising AFOLU** and **A role for Government in the development of Bioenergy**).

As noted in other editions of Low Carbon Pulse, **AFOLU** is challenging, but addressing waste, in particular landfill, and waste water should be alongside **CH₄** emissions from fossil fuel production, but this requires policy settings and implementation from Government to align with the waste management chain.

- **IEA - IEA WEO**: On October 13, 2021, the **IEA** published its [World Energy Outlook 2021 \(IEA WEO\)](#). The key message from the **IEA WEO** is that the world is in energy transition but the rate of progress towards energy transition, and the achievement of progress towards **NZE**, needs to increase.

The **IEA WEO** will be considered in detail in the *October Report on Reports* (in the Appendix to Edition 30 of Low Carbon Pulse).

- **IRENA - DESS Roadmap**: On October 13, 2021, the International Renewable Energy Agency (**IRENA**) published its [A Pathway to Decarbonize the Shipping Sector by 2050 \(DESS Roadmap\)](#).

The **DESS Roadmap** notes that currently the shipping sector uses fossil fuels, and that it is necessary to displace fossil fuels so as to reduce **CO₂** emissions. The **DESS Roadmap** provides a description of the ways and means to the displacement of fossil fuels so as to achieve an 80% reduction in **CO₂** emissions by 2050.

Director General of **IRENA**, Mr Francesco La Camera provides a clear picture: "*[The DESS Roadmap] clearly shows that cutting CO₂ emissions in such a strategic, hard to abate sector, is technically feasible through [the use of] green hydrogen fuels.*"

IRENA contemplates that up to 70% of the fuels used in the shipping sector by 2050 will be hydrogen-based fuels. Without necessarily wanting to pick winners, **IRENA** suggests that the use of e-ammonia could provide close to 45% of the energy demand from the shipping sector by 2050.

In some ways, the **DESS Roadmap** may be regarded as conservative given the initiatives already "on the water", critically, the progress that the shipping industry is making in the use of hydrogen-based fuels (see Editions [26](#) and [27](#) of Low Carbon Pulse).

The shipping sector is increasing, some might say intensifying, efforts to reduce the **GHG** emissions arising from the sector. By way of a reminder, the shipping sector gives rise to up to 3% of global **GHG** emissions (expressed in **CO₂-e** terms), with the International Maritime Organisation suggesting 2.9% and **IRENA** suggesting around the same. A recent [article](#) (entitled [Enduring waves of climate change: Maritime Decarbonization, a tempest before the calm](#)) from the ever accurate S&P Global Platts provides a balanced perspective, noting the scale of the task, balanced with the achievability of the task.

The *October Report on Reports* (contained in Appendix to Edition 30 of Low Carbon Pulse) will consider the **DESS Roadmap** in detail.

- **IEA - UAC Paper**: On October 19, 2021, the **IEA** published its paper [Phasing Out Unabated Coal – Current status and three case studies \(UAC Paper\)](#). The **UAC Paper** carries forward one of the key findings in the **IEA WEO** – critically, the need to end investment in new unabated coal-fired power plants, and to retrofit, and to repurpose, existing coal-fired capacity.

As is typical in **IEA** publications, the **UAC Paper** contains a number of recommendations: **1**. Allow sufficient time for consultation and implementation of phase out plans; **2**. Provide support for affected communities, including workers; **3**. Ensure that security of electrical energy supply is maintained as "a cornerstone of phase-out policies"; **4**. Implement carbon pricing; **5**. Improve the climate for investment in clean electricity and the necessary infrastructure; and **6**. Consider conversion of coal generation assets.

Recommendations **1** to **3**, and **5** and **6** will come as no surprise.

The implementation of recommendation **4** (Implementing carbon pricing) may come as a surprise given the need to accelerate the retirement of coal-fired power generation is more about development of new renewable electrical energy capacity as soon as practicable.

- **IEA - NZE ES Report**: On October 20, 2021, the **IEA** published its report [Achieving Net-Zero Electricity Sectors in G7 Members \(NZE ES Report\)](#). The **NZE ES Report** was requested by the UK (which holds the **G7** this year). As might be expected, the **NZE ES Report** builds on the finding from the **IEA Roadmap** published on May 18, 2021.

The **NZE ES Report** will be considered in detail in the *October Report on Reports* (in the Appendix to Edition 30 of Low Carbon Pulse).

- **The Economist weighty reflection:**

In the October 9, 2021 edition of The Economist, the venerable publication reflected on the size of the current hydrogen industry, at 90 million metric tonnes per annum (*mmtpa*) and USD 150 billion.

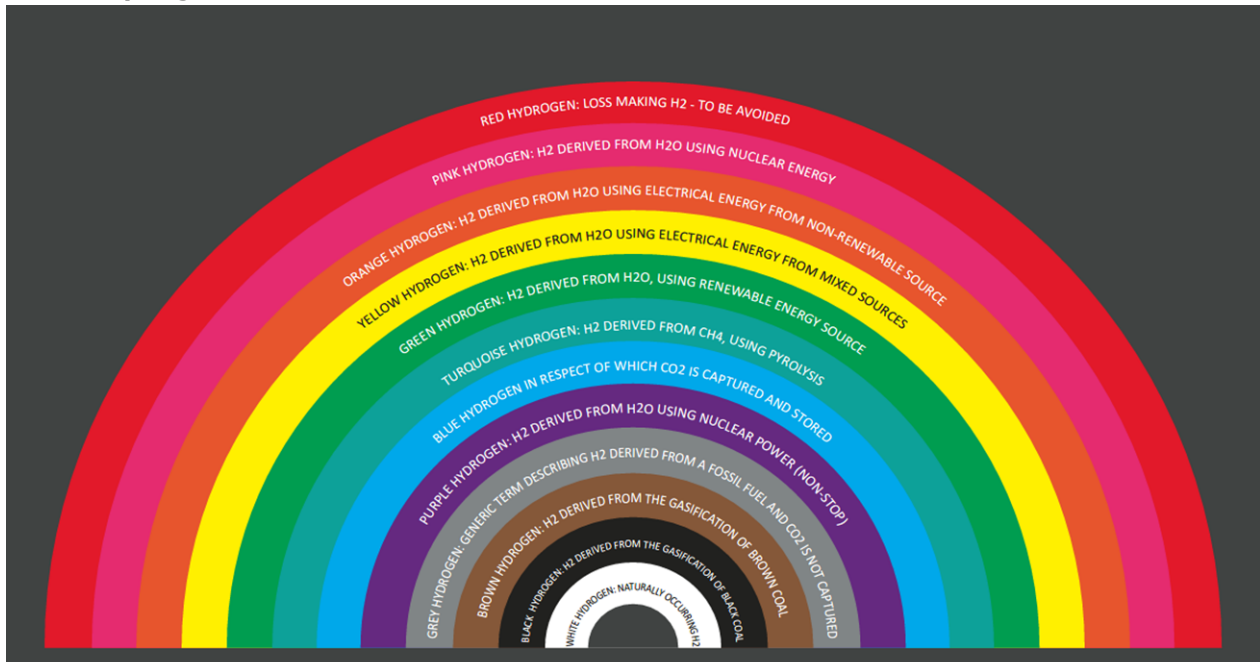
Given current technologies (steam methane removing, grey hydrogen production and gasification, black or brown hydrogen production), around 6% of the natural gas and 2% of coal production is used each year to produce this 90 *mmtpa* of hydrogen.

The production of the 90 *mmtpa* gives rise to between 850 and 900 *mmtpa* of *GHG* emissions, or around 1.8% of the 50 Giga-tonnes *CO₂-e GHG* emissions arising each year.

As such, hydrogen produced using these technologies is not going decarbonise the production of energy carriers to displace hydrocarbons; rather CCS / CCUS to produce Blue Hydrogen and electrolysers and renewable electrical energy will do this.

The Economist notes the degree of difficulty and the scale of the endeavour.

Ashurst Hydrogen Rainbow:



The **Ashurst Hydrogen Rainbow** (a creation of the author of Low Carbon Pulse), is intended to provide an aide memoire to the reader. It is noted that the author of Low Carbon Pulse took liberties with both the colour coding of hydrogen and the spectrum: adding Red Hydrogen (at the top of the **Rainbow**) to represent the difficulty of making a return on any early stage clean or low hydrogen project, and adding Grey, Brown, Black and White (at the bottom of the **Rainbow**) for completeness of the colours that are used to describe hydrogen.

- **G20 activity and commitments in the lead up to COP-26:**

- **UK All Green Electrons by 2035:** On October 4, 2021, UK Prime Minister, Mr Boris Johnson announced that by 2035 all electrical energy dispatched to satisfy load in the UK would be matched by renewable electrical energy. This is the perfect response to the impact of the shortage of natural gas on the electrical energy prices in the UK: the best cure for higher prices is higher prices, resulting in increased supply or in a switch to another technology or increased use of an existing technology.

Stating the obvious, the switch to an existing technology is occurring, and needs to accelerate. Until the switch reaches a tipping point, the UK Government, like many countries around the world, needs an energy security policy (sufficient supply side to avoid sustained higher prices).

While an inconvenient truth, the UK and **EU** countries may need more gas-fired power stations to provide required energy storage, and those gas-fired power stations will have to be developed with CCS / CCUS. As frequent readers of Low Carbon Pulse, and sister publications of Low Carbon Pulse, will know, this is a long-standing perspective of the author of Low Carbon Pulse.

- **UAE comments to NZE by 2050:** On October 7, 2021, the United Arab Emirates (**UAE**) committed to reduce its *GHG* emissions to **NZE** by 2050 – see below (under **GCC Countries update**) for more detail.
- **Turkey ratifies the Paris Agreement:** Edition 28 of Low Carbon Pulse noted the good news arising from the United National General Assembly during the week beginning September 20, 2021, that Turkey had committed to ratify the Paris Agreement. The commitment had to be ratified by the parliament of Turkey. On October 8, 2021, the parliament of Turkey ratified the accession of Turkey to the Paris Agreement.
- **ROK increases NDC:** On **October 18, 2021**, the Republic of Korea (**ROK**) increased its **NDC** from 26.3% to 40% by 2030, compared to 2018. This is considered in more detail below under **Republic of Korea (ROK) News**.
- **Saudi Arabia commits to NZE by 2060:** On October 24, 2021, the Kingdom of Saudi Arabia (**KAS**) committed to reduce its *GHG* emissions to **NZE** by 2060 – see below (under **GCC Countries update**) for more detail.

- **Pakistan commits to new NDC:** On October 26, 2021, Pakistan increased its **NDC** to commit to a 50% reduction in **GHG** emissions by 2020.
- **Australia commits to its version of NZE by 2050:** As note in Edition [28](#) of Low Carbon Pulse, the Federal Government of Australia has been the subject of scrutiny by the international community and its own citizens because it had not committed to the achievement of **NZE** by 2050. On October 26, 2021, the Federal Government of Australia announced its commitments to **NZE**.
- **UK Global investment Summit:** The UK Government hosted the UK Global Investment Summit (**GIS**), on October 19, 2021. Notable announcements from the **GIS** are captured in the following press release – click [here](#) – from the UK Government providing a high level overview of the outcomes and commitments from the **GIS**. During the week of the **GIS**, the UK Government announced its strategies – **Net Zero Strategy: Build Back Greener** and **Heat and Building Strategy**. These strategies will be considered in the *October Report on Reports*.

Roles to be played to reduce GHG emissions:

As foreshadowed in previous editions of Low Carbon Pulse, ahead of **COP-26**, current and relevant matters would be considered, including the roles to be played by key players.

Edition [28](#) of Low Carbon Pulse contemplated that Edition 29 would cover the Role of Government in decarbonising Agriculture Forestry and other Land Use (**AFOLU**) and the development of bio-energy. It also contemplated that the Role of Carbon Credits and Coal would be considered. We have covered Carbon Credits, but not Coal.

• A role for Government in decarbonising AFOLU:

- **Decarbonising AFOLU:** Edition [28](#) of Low Carbon Pulse noted that **AFOLU** is hard to decarbonise. In many countries, some may say in most countries, agriculture has cultural, political and social significance. In the interests of food security and political expediency, in many countries agriculture receives direct and indirect funding support, including policy settings intended to ensure maintenance of the value of certain crops. Given these dynamics, the decarbonisation of the **AFOLU** sector is best regarded, and is best calibrated, on a country by country, area by area, basis.
- **Do no harm, but do it quickly!** In this context, there is a role for Government in ensuring that it "does no harm" having regard to the areas within a country in which it seeks to set policies that will result in a reduction in **GHG** emissions. In the context of "doing no harm", there is a role for Government at a number of levels. In the collection of waste, rather than crop burning (over 3.5% of **GHG** emissions expressed in **CO₂-e** terms), and providing value to landholders to avoid deforestation (close to 2.5% of **GHG** emissions). In these areas alone, there is close to 7% of the total mass of **CO₂-e GHG** emissions "in play". In addition, Governments can encourage afforestation and reforestation and wilding of land, and practices to reduce **GHG** emissions arising, including to provide value for these forms of land use, including by use of carbon credits. The activities have value in that they remove **GHG** emissions from the climate system. The removal of **GHG** emissions from the climate system means that the rate at which our global carbon budget is being depleted will slow. Governments are now acting on the ability of certain trees and crops to absorb **CO₂**.
- **Giving value to GHG land use that removes GHGs:** The principal **GHG** emission arising from agriculture is **CH₄**, including raising livestock (around 5.8% of **GHG** emissions expressed in **CO₂-e** terms) and growing certain crops (up to 2.2%). **CH₄** is more potent than **CO₂** (see Edition [27](#) of Low Carbon Pulse). As noted above, initiatives to collect waste, to change land use and to remove **GHG** emissions from the climate system will allow progress to decarbonising the **AFOLU** sector, but given the potency of **CH₄**, more needs to be done. What needs to be done in terms of **CO₂** removing activities needs to be determined and planned by governments. And countries that export products that have given rise to **CH₄** need to do more still.
- **Government to assess and to plan:** A key part of planning needs to consider the trees, and other vegetation (**green carbon**), that can achieve the highest levels of **CO₂** absorption (**sequestration capacity**) on a sustainable basis within the areas of countries. Governments are ideally placed to map and to monitor trees and other vegetation to assess the sequestration capacity of trees and vegetation, above and below ground. In addition, the use of coastlines and the nearshore in certain regions of the world offer potentially vast sequestration capacity (**blue carbon**). For example, mangrove forests and swamps, and areas with sea-grasses and tidal marshes, provide ecosystems that can absorb **CO₂**. For Government, the task is to assess how much of the coastlines and the nearshore can be used to progress the development of **blue carbon** sequestration capacity.
- **Blue carbon v. Green Carbon:** It is estimated that one mangrove tree will absorb 12.4 kg of **CO₂** a year on average. Taking the benchmark of the Kingdom of Saudi Arabia to plant 50 billion trees (see Edition [13](#) of Low Carbon Pulse), 50 billion mangrove trees will absorb 620 million metric tonnes (**mmt**) per annum (**mmtpa**). It is possible to plant 5,000 mangrove trees per hectare, with each hectare absorbing 62 metric tonnes (**mt**) per annum (**mtpa**) of **CO₂**. 50 billion mangrove trees could be planted on 10,000,000 hectares. In contrast, a palm tree will absorb around 2.3 kg of **CO₂** a year. On October 25, 2021, the US State of Florida announced plans to replace palm trees with native canopy trees, which absorb a greater mass of **CO₂**. Palm oil trees are different, and the data on their ability to absorb **CO₂** has quite a spread. Taking the highest estimate of the spread at 57.6 **mtpa** per hectare, palm oil trees appear comparable with mangrove swamps. This is not to suggest deforestation and planting of palm oil trees (the broader challenges with palm oil are well known and beyond the scope of this Edition 29 of Low Carbon Pulse), rather it is to provide a point of comparison.

By way of further comparison, a pine tree will absorb around 10 kg of **CO₂** a year. On the basis that there are approximately 1,000 trees per hectare, the pines trees in that hectare will absorb 10 **mtpa** of **CO₂**.

- **Bamboo a super-absorber:** "Higher, Faster, Stronger" is a good description for bamboo: bamboo is a super-absorber of **CO₂**, storing **CO₂** in its biomass, particularly its root system (its extensive root system being good for soil quality, preventing soil erosion and assisting in the restoration of soil-depleted areas). For these reasons, the planting of bamboo is regarded as integral to long-term agricultural redevelopment and agroforestry.

As with the reporting on the capacity of palm oil to absorb **CO₂**, the reporting on the capacity of bamboo to absorb **CO₂** varies somewhat. At the higher end, one hectare of bamboo is reported to be able to absorb between 17 and 20 **mtpa** of **CO₂**. Bamboo is fast growing, and mature groves of bamboo can be established within two to three years. Bamboo is an effective above ground carbon and below ground carbon absorber.

For every 10 million hectares of land used to grow bamboo, between 170 and 200 **mtpa** of **CO₂** will be absorbed each year. India is estimated to have around 12.4 million hectares of bamboo groves.

- **Assessment of AFOLU:** For each country, the assessment and analysis of the use of trees, other vegetation and crops, best suited to the environment in which they are grown, including the return of land to the wild (and paying for the benefit of doing so), should be an immediate focus, because it will yield an understanding of optimal land use, from both an economic and environmental perspective, and a means to realise value from carbon credits.

- **A role for Government in the development of Bioenergy:**

- **Background:**

The **IEA Roadmap** and the **IRENA WETO** both identified the development of bio-energy capacity as key to achieving **NZE** under the scenarios the subject of them. As noted in previous editions of **Low Carbon Pulse**, **bio-energy** is energy derived or produced from biomass, whether that energy is in gaseous, liquid or solid form. Bio-energy is derived from organic matter, but not fossilised organic matter.

The sources of biomass for use as feedstock or fuel are many and varied, but in the context of **GHG** emissions, the organic waste stream arising from human activities provides a renewable resource that, if collected, processed and used, can reduce **GHG** emissions, avoiding or reducing **CH₄** (and **CO₂**) on the decomposition of that organic matter, and the displacement of fossil fuels with that bio-energy.

The importance of the reduction in **CH₄** emissions is explained in Edition 27 of **Low Carbon Pulse**. Reflecting this, the **EU** and **US** have recently committed (in the **Global Methane Pledge**) to reduce **CH₄** emissions by a third within the next decade (see Edition 27 of **Low Carbon Pulse**).

- **Bio-energy and carbon:**

For the production of bio-energy to be carbon-neutral, it must be combined with carbon capture and storage, **BECCS**, or with carbon capture and use or storage, **BECCUS**. For **BECCS** to make a contribution to a reduction in **GHG** emissions, it must displace another electrical energy source or energy carrier source, and, in any event, it must result in a carbon neutral outcome (rather than a carbon removal outcome) so as not to give rise to an increase in **GHG** emissions.

This is where Government has a role to play. As has been noted in respect of **CCS / CCUS** in the context of carbon clusters (invariably located around ports and the hinterlands of ports), the storage of **CO₂** is likely to require Government funding support, and also Government risk support. It is no surprise that both the **IEA Roadmap** and the **IRENA WETO** contemplate tying the development of the bio-energy to **CCS / CCUS** to capture and to store the **CO₂** arising from the production of bio-energy.

- **Waste management plans and systems required:**

Progress towards achievement of **NZE** is not a zero sum game. More than that, it is to be expected that there will be increased scrutiny of the life-cycle and **GHG** emission footprint of asset and infrastructure life, and responsibility for recovery and recycling of organic matter giving rise to **GHG** emissions (in the same way as with metals and mineral and plastics, which is a topic for another edition of **Low Carbon Pulse**).

Across all human activities, waste arises and **GHG** emissions arise. Globally, Government has a role to play in the development of waste management systems from the point of the waste arising to the point of recycling, re-use, or disposal, including in this context, the recycling and re-use of biomass, and the disposal into storage of **CO₂**.

- **Bio-energy and AFOLU sector:**

The broader **AFOLU**, waste and waste water sectors are estimated as giving rise to up to 95% of anthropogenic **CH₄** emissions globally. Given the impact of **CH₄** emissions on climate change, there is an immediate and present reason to capture the life-cycle of carbon in the broader **AFOLU** and waste and waste water cycles. Organic matter in waste and waste water decomposes. The rate of decomposition varies. On decomposition, **CH₄** and **CO₂** arise.

Capturing the life-cycle of carbon is best framed and achieved through Government collection and consolidation initiatives. These will include the derivation and production of biogas, and biomethane for pipeline gas, from waste to displace natural gas over time. Further, if **CO₂** arising on the production and use of biogas or any other biofuel is captured and used, and matched by new growth biomass to absorb an equivalent mass of **CO₂** arising on oxidation / use of that biogas or other biofuel, the promise of bio-energy will be realised.

In the agricultural sector, policy settings of this kind become the core of an environmentally and economically sustainable sector, including by use of the digestate arising from the derivation and production of bio-gas, and the use of cover crops and perennial crops.

- **Interface with progress to NZE and progress to Net-Zero Waste:**

While this piece is intended to identify the role of the Government in the development of bio-energy, the author thought that it may be helpful to outline the role of Government more broadly in the waste sector as progression is made towards the achievement of **NZE**, and as such policy settings that are emerging and will emerge.

The mass of waste arising on the extraction of metals and minerals, on the manufacture of equipment and infrastructure, on the transportation and installation of that equipment and infrastructure, and at the end of the life-cycle of that equipment and infrastructure, will increase as progress is made towards the achievement of **NZE**. The most prominent waste streams from progress towards the achievement of **NZE** are solar panels and wind-turbines, **Net-Zero Waste** if you will (not to be confused with its existing use as to describe another policy setting – Net-Zero Waste to landfill).

More broadly, the policy settings for the management of **E-Waste** and **Net-Zero Waste** are very much in the process of being re-based in the context of **E-Waste** and formulated in the context of **Net-Zero Waste**. The phrase **E-Waste** is used to describe waste that arises from electronic equipment used for business, domestic, industrial or scientific use, including equipment needed for Information and Communications (**ICE**). In a recent [report](#), it is estimated that between 2.1 and 3.9% of global **GHG** emissions arise from equipment that becomes **E-Waste**. In part, this reflects that the production of **ICE** gives rise to **GHG** emissions (including some of the more potent), housed in plastics that are not designed for recycling, using heavier metals, the life-cycle of which needs to be understood and captured. Ultimately, all residual materials needs to be captured for safe and sustainable disposal.

Improved and new policy settings are needed if extraction and manufacturing is to be decarbonised in the case of **ICE**, and if **GHG** emissions are to be avoided in the case of equipment and infrastructure manufactured and developed, for the purposes of achieving progress towards **NZE**.

In addition, recovery, recycling and disposal of materials arising at the end of life-cycle needs to be contemplated sooner rather than later, and developed by Government or with its support, and its use mandated.

Note: At the moment, **Net-Zero Waste** is not a concept, but for present purposes it includes waste that arises from the extraction, manufacture, transportation and use of equipment and infrastructure developed for the purposes of reducing **GHG** emissions, including on the extraction of metals and minerals used in the manufacture of solar panels and wind towers and turbines, and energy storage systems (including **BESSs**) on the manufacture of those panels, towers and turbines, and systems, and on recovery and recycling of resources from them at the end of their life-cycles, and the means of disposal of any material that cannot be recovered or recycled.

- **Role of carbon credits in progress to achieving NZE:**

- **Background:**

There has been considerable coverage around the role of carbon credits in achieving **NZE**, not least because of the record high prices being paid for carbon credits in both compliance / mandatory markets (**Mandatory Markets**) and in voluntary markets (**Voluntary Markets**).

In **Mandatory Markets** (typically, in the context of an emissions trading scheme structured as a cap-and-trade), carbon credits have value if they can be used to acquit, i.e. can be used to offset, an obligation to match the **GHG** emissions arising from the activities of a corporation with emissions trading permits (**ETPs**) that the organisation is required to acquire under that emissions trading scheme. In this context, the value of carbon credits will be a function of the operation of the **Mandatory Market**, including the market price of **ETPs** and the consequences (including liability) under that emissions trading scheme for not acquitting or being able to offset.

In **Voluntary Markets**, carbon credits have value to corporations that have committed to achieving **GHG** emission reductions (and in the longer term **NZE** on the basis of carbon neutrality). Previous editions of Low Carbon Pulse have covered the uses of words and phrases in this context, but ultimately, decarbonisation takes time, and needs to be achieved across Scopes 1, 2 and 3 emissions. To buy the time, while still reducing **GHG** emissions on a net-basis, corporations buy carbon credits. In this context, the value of carbon credits is less well-defined than in a **Mandatory Market** and will tend to depend on the position of the corporation buying the carbon credits, and whether the carbon credits are going to underpin a transaction (for example, the sale of carbon neutral cargo of liquified natural gas or oil).

- **Carbon credits and decarbonisation:**

Acknowledging that some folk will debate this, the perspective of the author is that ultimately decarbonisation of activities is the only means of achieving **NZE**, and as such the role of carbon credits is to place a value on activities that remove **CO₂** from the climate system: the value is quantified in mass, with one metric tonne of **CO₂** having a value. As **NZE** is achieved, the carbon sinks absorbing **CO₂** the subject of the carbon credits should be used to remove **CO₂** in the climate system on an absolute basis.

- **The value of CO₂ removal:**

The benefit of the removal of **CO₂** from the climate system is that it reduces the rate at which the global carbon budget is depleted, and in the case of **CO₂** that is removed from the climate system that is not subject to a carbon credit scheme, that removal of **CO₂** gives rise to a net-reduction in the **GHG** emissions.

- **The challenges with carbon credits:**

Generally the challenge with carbon credits is the monitoring, measurement and determination, and auditing and verifying (**accounting and accountability**) the mass of **CO₂** actually removed from the climate system and sequestered in a carbon sink. As noted in Edition 16 of Low Carbon Pulse, it is thought that the mass of **GHG** emissions assumed to be sequestered in carbon sinks is greater than the actual **CO₂** that is being sequestered in those sinks. This is important, because they need to be the same. If they are not the same, the purpose of carbon credits is not being achieved.

Specifically, the challenge with carbon credits issued in some countries (developed and developing) is that carbon credits are issued in respect of activities that do not remove **CO₂** emissions from the climate system. Further, the basis of **accounting and accountability** in some countries does not provide a level of assurance that **CO₂** is being removed. For those purchasing carbon credits, this matters. The fact that there is an increasingly segmented market for carbon credits tends to reflect that this matters.

- **Greater rigour around carbon credits:**

Carbon credits are issued by Governments, reflecting the policy settings of those Governments. It is hoped that at **COP-26**, there is discussion and progress as to the basis upon which carbon credits should be issued so as to provide a level of consistency globally.

Further, it is hoped that the basis of standards of **accounting and accountability** to be applied are developed, and that those standards are carried forward in the laws and regulations of each country issuing carbon credits, and compliance with those standards will be required so as to access the higher prices that are being paid for high-quality carbon credits.

- **Visual Capitalist background material:**

- The Visual Capitalist provides a [Voluntary Markets 101](#) outline, among other things, outlining the four key participants in the voluntary carbon credit markets, project developers, standards bodies, brokers and end buyers. The link is accessed with a click. The link has an accompanying descriptive narrative. In passing, it is noted that Governments are key, both as framers and as possible participants in voluntary carbon credit markets.

- In addition to the Visual Capitalist, Shell has recently published [Exploring the Future of the Voluntary Carbon Market](#), developed by it in collaboration with BCG. The publication is well-worth a read, providing a balanced perspective. The *October Report and Reports* will consider the publication in more detail.

Climate change reported and explained and Visualisation and Listening Platforms and Tools, and useful materials:

At this point in recent Editions of Low Carbon Pulse, sections have been included on **Climate change reported and explained** and **Visualisation and Listening Platforms and Tools, and useful materials**. To manage the length of this Edition 29 of Low Carbon Pulse, these sections are not included, but will return in future Editions.

GCC counties update:

- **United Arab Emirates commits to NZE:** On October 6, 2021, the United Arab Emirates (**UAE**) became the first Gulf Cooperation Council (**GCC**) country to commit to achieving **NZE** by 2050. This is a materially significant commitment in a global context, and for the **UAE** it will spark a once in a generation, or possibly even, as some have noted, a one-of-a-kind shift in the economy of the **UAE**, driven and effected by the level of investment required to effect the shift to what will be a photovoltaic solar and Blue Hydrogen and Green Hydrogen economy.

The **UAE** is ahead of the curve in many ways, having already realised capital through its program selling interests in infrastructure assets and selling down interests in operating businesses, including on listing of them.

- **Engie firm perspective:** In Arab News on October 9, 2021, Chief Executive of Engie in the Kingdom of Saudi Arabia (**KAS**), Mr Turki Al-Shehri, expressed considerable enthusiasm around the development of Green Hydrogen, contrasted with caution around the development of Blue Hydrogen projects because these projects have become "*much more difficult*" to finance.

While a number of commentators may have questioned the development of Green Hydrogen, those at the forefront of the development of Green Hydrogen projects are convinced of the need and that progress is occurring: "*... it's a global energy changer. Green hydrogen is coming. Even before it was a buzzword, [Engie has been spending roughly] €60 million a year on green hydrogen research around the world*".

The **KAS** has some of the best renewable electrical energy resources, and as a result, some of the world's lowest cost electrical energy: **KAS** has reliable sunshine rates during the day, and reliable winds at night. This was proved up further on October 18, 2021 as the **KAS** announced the Round 3 of the **NREP** (see **KAS shortlists bidders on Round 3 of renewables** below).

- **Masdar in the news:**

- **Republic of Turkmenistan closer ties:** On October 10, 2021, Masdar (Abu Dhabi Future Energy Company) announced that it had signed a strategic agreement to explore renewable energy opportunities in the Republic of Turkmenistan. This builds on the commitment that Masdar has demonstrated regionally. As noted previously in Low Carbon Pulse, Masdar is a member of the elite club of global "go to investors" in the renewable energy sector.

- **Masdar credit rating:** Consistent with the role of Masdar as a member of the elite club of global "go to investors", Masdar has obtained a credit rating to assist in its facilitation of, and investment in, projects.

- **Egyptian Ammonia Plant:** On October 14, 2021, it was announced that Fertiglobe (a joint venture between ADNOC and OCI Chemical (world leading producer of soda ash)) and Scatec (a leading renewable electrical energy producing corporation) have entered into an agreement with the Sovereign Wealth Fund of Egypt (**SFE**) to develop a 50 – 100 MW electrolyser to produce Green Hydrogen as feedstock for the production on Green Ammonia.

The Green Hydrogen production facility is to be located near Ain Sokhna, close to existing facilities of a subsidiary of Fertiglobe, EBIC. Under the agreement, Scatec is to build, operate and own (a majority interest) the Green Hydrogen facility, with the Green Hydrogen to be supplied to EBIC to produce Green Ammonia.

See: [Scatec partners with Fertiglobe and the Sovereign Fund of Egypt to develop green hydrogen as feedstock for ammonia production in Egypt](#); [Fertiglobe Partners with Scatec and the Sovereign Fund of Egypt to Develop Green Ammonia Project in Egypt](#)

- **New hydrogen production plant in KAS:** On October 11, 2021, the Saline Water Conversion Corporation and Cummins announced that they intend to develop a hydrogen production facility in the **KAS**.
See: Cummins [website](#); Saline Water Conversion Corporation [website](#)
- **KAS home of the world's biggest BESS:** On October 16, 2021, Huawei Digital Power (**HDP**) and SEPCOIII (EPC contractor for the Red Sea Project as part of the development of NEOM) signed a contract under which HDP is to supply a 400 MW / 1,300 MWh BESS.

See: [Huawei to Power the World's Largest Energy Storage Project](#)

- **OQ signs JDA:** On October 17, 2021, it was reported widely that OQ (the Omani state-owned energy company) had signed a Joint Development Agreement with Dutco, Linde and Marubeni to undertake feasibility studies to assess the development of a 400 MW Green Hydrogen and Green Ammonia production facility (**SalalahH2 Project**) within the Salalah Free Zone in Oman. The **SalalahH2 Project** will make use of OQ's existing ammonia plant at Salalah.

As reported in previous editions of Low Carbon Pulse (see Editions [18](#), [20](#) and [26](#)), OQ is progressing a Green Hydrogen within the Duqm Special Economic Zone with DEMA (leading Belgium corporation).

- **KAS shortlists bidders on Round 3 of renewables:** Edition [14](#) of Low Carbon Pulse reported on the Round 2 of the National Renewable Energy Program (**NREP**). At the inauguration for the Sakaka IPP on April 8, 2021, Crown Prince Mohammad bin Salman bin Abdulaziz announced the results of the tenders for seven large-scale solar capacity projects under. The seven new projects are to be located in Jeddah, Madinah, Quarayyat, Rafha, Rebigh, Al Shuaiba and Sudair.

The 600 MW Al Shuaiba photovoltaic project is reported as being awarded on the basis of a world record low bid price for electrical energy of USD 0.0104 kWh (a little over 1 cent per kWh, or USD 10.40 per MWh). The Sudair photovoltaic project was awarded with the second lowest bid price of USD 0.01239 (1.239 cents per kWh or USD 12.39 MWh). On development, the Sudair photovoltaic project will be the Kingdom's largest solar project, comprising around 1.5 GW of installed capacity. Approximately 3.6 GW of energy was contracted under Rounds 1 and 2 of the **NREP**.

On October 18, 2021, it was reported widely that **KAS' Renewable Energy Project Development Office (Repdo)** had shortlisted bidders for Round 3 of the **NREP**, with 1.2 GW to be contracted under this Round. There two categories of project in Round 3, Category A and Category B.

Category A projects are the 120 MW Wadi al-Dawasir PV IPP (**WADIPP**) and the 80 MW Layla PV IPP (**LIPP**). It is understood that TotalEnergies and Tamasuk Holding Company and the Acwa Power Consortium (comprising Acwa Power, SPIC (Huamghe Hydropower Development Company) and WEHC (Water and Electric Holding Company) ranked first and second on the **WADIPP** and Acwa Power Consortium and Alfanar ranked first and second on the **LIPP**.

Category B projects are the 700 MW Al-Rass PV IPP (**ARIPP**) and the 300 MW Saad PV IPP (**SIPP**). It is understood that the Acwa Power Consortium and Jinko Power ranked first and second on the **ARIPP** and that Jinko and Masdar ranked first and second on the **SIPP**.

As noted above, the Round 2 of the **NREP** resulted in a world record low bid price. Round 3 of the **NREP** has not quite resulted in the same outcome, but the pricing is nevertheless at a level that continues the narrative about low photovoltaic solar costs. It is reported that the levelized cost of electricity (**LCOE**) bids have tariffs at the following: **WADIPP** US cents 1.9 kWh, **LIPP** US cents 3 kWh, **ARIPP** US cents 1.5 kWh and **SIPP** US cents 1.5 kWh.

- **Qatar and Shell look to the UK:** On October 19, 2021, on the sidelines of the UK Global Investment Summit (see section entitled **G20 activity and commitments in the lead up to COP-26** above), Qatar Energy (formerly Qatar Petroleum, the state owned leading international energy corporation) and Shell (leading global international energy corporation) signed an agreement under which they will pursue jointly a Blue Hydrogen and Green Hydrogen project in the UK in which they can invest jointly.
- **KAS targets NZE by 2060:** On October 24, 2021, Crown Prince Bin Salman announced that the **KAS** would reduce its **GHG** emissions to **NZE** by 2060, with a reduction of 278 million metric tonnes per annum (**mmtpa**) of **GHG** emissions by 2030. The financial capacity of the **KAS** makes the achievement of **NZE** by 2060 a high probability. For these purposes, the Crown Prince announced that the **KAS** would invest USD 186 billion, join the **Global Methane Pledge** (see Edition [27](#) of Low Carbon Pulse), plant 450 million trees by 2030 and rehabilitate 8 million hectares of land. It is estimated that the planting of trees and the rehabilitation of land will reduce the **CO₂** emissions by 200 **mmtpa**. This initiative of itself will make a meaningful contribution to progress towards **NZE**.
- **Saudi Aramco targets NZE by 2050:** On October 24, 2021, the world's largest corporation, Saudi Aramco, announced that it would target the reduction in **GHG** emissions to **NZE** by 2050.
- **Saudi Aramco Future Investment Initiative:** On October 27, 2021, Saudi Aramco announced that it had signed a memorandum of understanding with InterContinental Energy and Modern Industrial Investment Holding Group to develop Green Hydrogen and Green Ammonia production facilities in Saudi Arabia. As readers of Low Carbon Pulse will be aware, InterContinental Energy is involved in large scale renewable electrical energy and Green Hydrogen and Green Ammonia projects in Australia and in the **UAE**.

India moves to centre stage:

- **India PV solar scalable:** Recent editions of Low Carbon Pulse have outlined the policy settings and the private and public sector investment initiatives in India. On October 7, 2021, [pv magazine](#), reported on a study from Lappeenranta-Lahti University (often mentioned in Low Carbon Pulse) and Wärtsilä.

The headline from the study is that using an all renewable electrical energy system (with 76% photovoltaic solar), and appropriate levels and location of **BESS**, the cost of electrical energy in India could be reduced by up to 50% by 2050, while at the same time making a major contribution to progress towards **NZE**.

The study (and other publications) tend to feed confidence that in respect of the development, the renewable electrical energy progress is likely to be made to achieve **NZE** across the electrical energy sector. This should not be taken for granted, but it is possible for the optimist to conclude that we will get there. The electrical energy sector is however the easiest part of the global economy to decarbonise. The difficult to decarbonise sectors (including cement, chemical and petrochemical, glass and iron and steel) and the transport sector (aviation, road freight and shipping) remain. On October 6, 2021, Fortescue Future Industries, reminded us of this.

- **India and UK to strengthen Clean Hydrogen Partnership:** Edition [19](#) of Low Carbon Pulse reported that on June 1, 2021, India and the UK had enhanced their existing partnership to provide for cooperation in sharing thinking around policy settings, which in turn will respond to, and drive, technology development and investment as both countries progress to electrified and hydrogen economies, driven by the development of renewable electrical energy. More broadly, and in the context of specific outcomes, the provision and sourcing of sustainable finance will be a key part of electrification and the development of a hydrogen economy, in particular clean energy and clean transport technologies and solutions, and the shift to green and to greened businesses.

On October 11, 2021, [h2-view.com](https://www.h2-view.com), reported that India and the UK intend to build on, or rather refine further, their collaboration, through a Government-to-Government agreement so as to contribute to the acceleration of progress towards the development clean energy capacity. The Government-to-Government agreement was formalised at a meeting of India's Minister for Power and New & Renewable Energy, Mr Raj Kumar Singh, and UK Energy Secretary, Mr Kwasi Kwarteng on October 8, 2021. It is understood that in the context of **COP-26**, the ministers discussed the launch of the India and UK Government **Global Green Grid – One Sun One World One Grid Initiative**.

The Government-to-Government agreement with the UK follows the announcement from the meeting of the Quad countries (US, India, Japan and Australia) in late September as which it was agreed: **1.** to cooperate to allow the development of a green-shipping network, with each country to work with each other country to reduce **GHG** emissions arising from the shipping value chain; **2.** to establish a Clean Hydrogen Partnership, including for the purposes of technology development and scaling up of hydrogen production on an efficient basis, with the intention to stimulate demand to accelerate trade in clean hydrogen in the Indo-Pacific region; and **3.** to increase the Indo-Pacific region's resilience to climate change by improving climate change information sharing and disaster-resilient infrastructure.

Australia – Weighted Progress:

- **Background:** Edition [28](#) of Low Carbon Pulse included a piece entitled, **Australia – A Curate's Egg**. This description appears unlikely to be revised any time soon.
- **International Monetary Fund (IMF) clear as to Lucky Country's Promise:** On October 13, 2021, the **IMF** released its [Word Economic Outlook](#). In addition to the role of Australia as a key producer of iron ore, the **IMF** noted the importance to the cobalt, nickel and lithium resources of Australia for the purposes of the required expansion of resources to supply the global battery industry. The **IMF** notes that demand for the supply of these key metals will increase dramatically as the scale of the renewable electrical energy industry increases, and an associated increase for battery storage arises, principally for battery electric vehicles (**BEVs**) and battery electric storage systems (**BESSs**).

By way of background or as a reminder, the five key metals in the "battery age" (at least for the time being) are aluminium, copper, cobalt, nickel and lithium. It is anticipated that demand for: **1.** aluminium will increase to allow "light-weighting" to occur, particularly across the transport sector; **2.** copper will increase, with demand for **BEVs** and grids and infrastructure (distribution and transmission) and machinery generally; **3.** cobalt is less certain, with its demand profile dependent on technology development; **4.** nickel will increase, with increased supply of nickel effectively responding to the new demand, and in the context of increased demand for (and therefore use of) stainless steel production will be the primary driver; and **5.** lithium will increase to satisfy demand for lithium-ion batteries, in particular in the stationary energy sector, critically for **BESSs**.

- **Scrutiny of Australia:** In Edition [28](#) of Low Carbon Pulse, it was reported that the Federal Government of Australia had yet to commit to meaningful **GHG** emission targets or to **NZE** by 2050. As a result, for some time, the Federal Government of Australia has been under scrutiny by the international community and its own citizens: at once both the lucky country and the recalcitrant country, a country that could lead but a country that chooses not to do so.

On October 26, 2021, the Federal Government of Australia committed to achieving **NZE** by 2050. This commitment was not accompanied by meaningful **GHG** emissions targets on route to **NZE**. The approach manifest in the commitment to **NZE** by 2050 is consistent with the technology versus carbon tax debate that the Federal Government of Australia has been sharing (see section entitled **A price on carbon**).

The commitment to **NZE** has been criticised from all sides. For those in favour of the commitment to **NZE**, the means of achieving **NZE** has been described as more "prayer than policy" due a lack of meaningful commitments to **GHG** emission reductions before 2030, and an absence of a staged pathway to achieving **NZE** by 2050. For those not in favour the commitment to **NZE**, the criticism is best described as variable, and none of it capable of withstanding reasoned scrutiny.

On October 13, 2021, Premier Annastacia Palaszczuk committed her State of Queensland to progressing to **NZE** by 2050. This commitment followed a vote the Queensland Parliament on October 12, 2021. This commitment came in a week packed full of announcements about the development of the Green Hydrogen industry across Queensland.

PRC continues to lead the way:

- **PRC energy mix visualised:** Previous editions of Low Carbon Pulse have covered the policy settings for energy transition in **PRC**. On October 10, 2021, the [visualcapitalist.com](https://www.visualcapitalist.com), published five graphics that allow the viewer to visualise the transition from now to 2060 (the year by which the **PRC** has committed to achieve **NZE**).



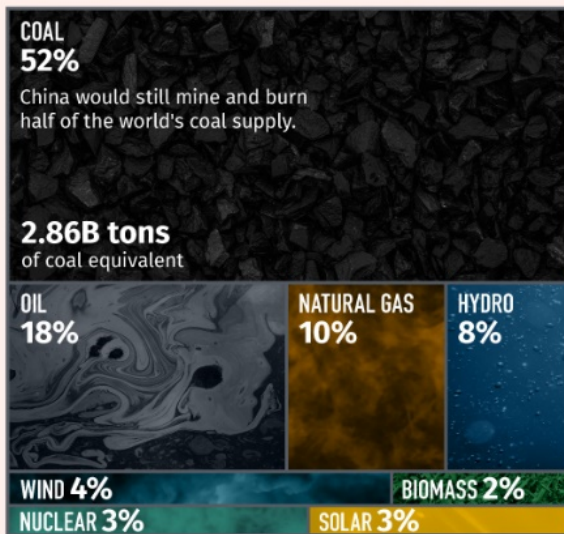
VISUALIZING CHINA'S ENERGY TRANSITION IN 5 CHARTS

CHINA HAS AN AMBITIOUS PLAN TO COMPLETELY CHANGE ITS ENERGY MIX AND REDUCE ITS CARBON EMISSIONS.

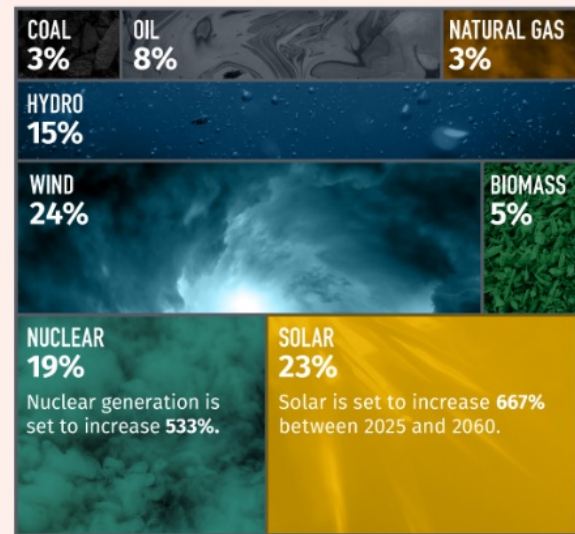
This graphic uses data from Tsinghua University's Institute of Energy, Environment, and Economy, which details how the world's largest consumer of energy expects to achieve carbon neutrality by 2060.

CHINA'S EVOLVING ENERGY MIX

2025

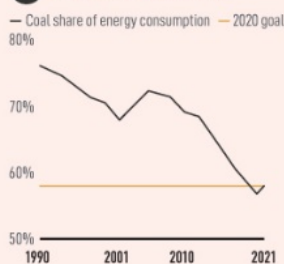


2060



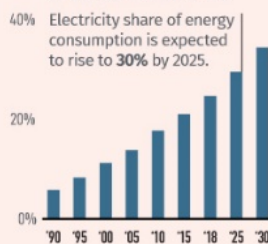
Despite China's continued reliance on on fossil fuels in 2025, the country's energy mix is already moving towards its long term goal of carbon neutrality.

THE DECLINE OF COAL USE



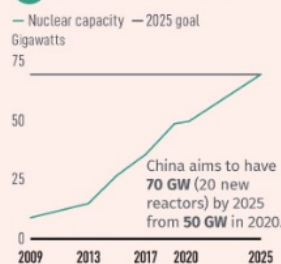
Source: National Bureau of Statistics

ELECTRICITY'S SHARE OF ENERGY CONSUMPTION



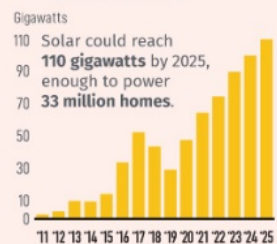
Source: International Energy Agency; State Grid Corp. of China

CHINA'S NEW NUCLEAR PLAN



Source: Bloomberg; National Energy Administration

CHINA SOLAR CAPACITY GROWTH



Source: China Photovoltaic Industry Association

Source: Tsinghua University Institute of Energy, Environment and Economy; U.S. Energy Information Administration (EIA)

- President Xi at the helm:** On October 12, 2021, President Xi Jinping made a [speech](#) to the fifteenth conference of the parties to the Convention of Biological Diversity. President Xi confirmed the commitment of the **PRC** to achieve peaking of **GHG** emissions by 2030, and **NZE** by 2060. (Edition 30 of Low Carbon Pulse will include a one page summary of the outcomes from COP-15 to the Convention of Biological Diversity.)

To deliver on these commitments, President Xi said that it would be necessary to introduce policy settings (named "**I+n**") to achieve peaking of **GHG** emissions and then **NZE**. For these purposes, President Xi noted the need to increase the installation of photovoltaic solar and wind in desert areas of the **PRC**. This is not new (having been noted in Edition [21](#) of Low Carbon Pulse), but it may be regarded as further demonstration of the commitment of the **PRC** to mobilise sufficient renewable energy resources to achieve peaking and **NZE**, and consistent with the prospect of use of High Voltage Direct Current (**HVDC**) cables to deliver renewable electrical energy.

Republic of Korea (ROK) News:

- **ROK increases NDC:** Edition [3](#) of Low Carbon Pulse reported on the commitment of **ROK** to achieving **NZE** by 2050. Since the commitment to **NZE** made on October 28, 2020, there has been expectation that **ROK** would increase its **NDC** from 26.3% by 2030 compared to 2018.

On October 18, 2021, the **ROK** increased its NDC to 40% by 2030 compared to 2018. As with the increased **NDC** to which Japan committed in April 2021, this may be regarded as a challenging target for **ROK**. Nevertheless, it is a target that **ROK** will be able to achieve.

- **Blooming good news:** On October 25, 2021, it was announced that Bloom Energy and SK are to expand their blooming partnership to fortify their market leadership in the use of fuel cell technology to generate electrical energy and to establish leadership in the hydrogen economy. The budding and then growing nature of the relationship between Bloom Energy and SK has been covered in Low Carbon Pulse (see Editions [4](#), [17](#) and [22](#)).

Leaving the poor puns to one side, the expansion of the partnership is good for each corporation and more broadly – both organisations are at the forefront of early adoption of fuel cell technology and first movers in the development and deployment of it. The arrangements underpinning the expansion include SK contracting for equipment supply and service provision (estimated at USD 4.5 billion), and a further equity investment by SK in Bloom Energy.

See: Bloom Energy's [announcement](#)

- **World's Largest Fuel Cell Power Plant opened:** On October 26, 2021, it was reported widely that Korean Southern Power (**KOSPO**) had opened the new Incheon Bitdream Fuel Cell Power Plant (**Bitdream FCPP**). The **Bitdream FCPP** uses fuel cell technology supplied by POSCO Energy and Doosan Fuel Cell. The **Bitdream FCPP** is reported to have capacity of 78.96 kWh, which can be used to supply electrical energy to up to 250,000 households and hot water for up to 40,000 households.

The opening of **Bitdream FCPP** is further realisation of the use of the power companies to use fuel cell technology (see Edition [2](#) of Low Carbon Pulse).

NZE reports:

As noted above, at the end of future editions of Low Carbon Pulse, reports that have been reviewed for the purpose of that edition of Low Carbon Pulse will be listed, by organisation, title / subject matter, and link.

ORGANISATION	TITLE / SUBJECT MATTER
BloombergNEF	New Energy Outlook, 2021
Euromia Research & Consulting	CCUS Development Pathway for the EfW Sector
IEA	Global Hydrogen Review 2021
IEA	Curtailling Methane Emissions from Fossil Fuel Operations
IEA	World Energy Outlook 2021
IEA	Net Zero by 2050 – A Roadmap for Global Energy Sector
IEA	Achieving Net-Zero Electricity Sectors in G7 Members
IEA	Phasing Out Unabated Coal – Current status and three case studies
IMF	World Economic Outlook
IRENA	A Pathway to Decarbonize the Shipping Sector by 2050
IRENA	World Energy Transitions Outlook
Lancaster University and Small World Consulting	The real climate and transformative impact of ICT: A critique of estimates, trends, and regulations
S&P Global Platts	Platts Global Integrated Energy Model – Strategic Planning for a world in transition.
Shell	Exploring the Future of the Voluntary Carbon Market
United Nations	UNFCCC NDC Synthesis Report
United Nations	2021 Production Gap Report
US EIA	International Energy Outlook
Wood Mackenzie	How to scale up carbon capture and storage

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Low Carbon Pulse – Edition 29 – October 29, 2021. The author of (and researcher for) each edition of Low Carbon Pulse is Michael Harrison.