



Welcome to the first edition of **P2N0** covering the drive to reduce greenhouse gas (**GHG**) emissions to net-zero (**NZE**) from the Baker Botts team. In addition to **P2N0**, it is anticipated that articles on matters relevant to **NZE** will be published quarterly. At the moment, we anticipate publishing articles on **Carbon Capture Utilization and Storage** (during Q4 of 2023) and **Carbon Credits and developing Voluntary Carbon Markets** (during Q1 of 2024).

P2N0 identifies significant news items globally, reporting on them in short form, focusing on policy settings and project developments. **P2N0** will not cover news items relating to climate change generally, M&A activity, or that are negative.

Thought of the quarter: “**E-fuels** are less energy efficient than hydrogen which, in turn, is less energy efficient than electrification: so decarbonization pathways must focus on electrification first, renewable hydrogen second, and thirdly using **e-fuels** in those sectors which cannot be directly electrified”. [Taken from whitepaper by Ørsted]

Headlines May through end of July 2023

News from around the World:

- Africa, Middle East and South Asia;
- Americas;
- APAC;
- Europe and the UK; and

Helpful publications and data bases.

(The numbers throughout the publication (for example ¹) connote endnotes, which provide further information.)

Edition 1: May 1, 2023 to July 31, 2023 (covering news items arising during this period)

HEADLINES MAY THRU END JULY 2023

During July 2023:

- **G20 Leaders meet and greet:** On **July 28, 2023**, after a week of G20 meetings in **Goa, India** (Energy Ministers) and **Chennai, India** (Environment and Climate Sustainability Ministers), it was reported that agreement had **not** been reached on two central matters to address climate change.

Ahead of **COP-28** (and the next G20 leaders meeting in September 2023), it had been hoped that agreement would be reached about: **1.** Achievement of peak emissions by 2025 (critically, through the phase-down, and, eventually, the phase-out, of the use of coal-fired power); and **2.** The need to triple renewable electrical energy use by 2030. The two objectives go hand-in-hand. While there is consensus on the need to achieve peak emissions as soon as possible and to accelerate the rate of roll-out of renewable electrical energy, there is no consensus on timing.

- **Germany approves revised Hydrogen Strategy:** On **July 26, 2023**, the **German Federal Government** approved a revised hydrogen strategy for Germany. The headline is that Germany is to import somewhere between 50% and 70% of its demand for hydrogen.

A link to the revised hydrogen strategy is [attached](#). Among the incidences of the revised strategy are:

- 1. Germany will run annual auctions:** “500 MW of installed electrolysis capacity will be put out to tender annually in the years 2023 to 2028 for the generation of system-friendly green hydrogen”; and
- 2. Germany color-blind:** “In order to ensure rapid development, and ramp-up, of the hydrogen market and to cover the expected needs, especially in the transformation phase, and thus to enable the technological switch to hydrogen, other colors of hydrogen will ... be used, at least until sufficient green hydrogen is available – in

particular low-carbon hydrogen from waste [turquoise hydrogen] and natural gas [blue hydrogen] in combination with CCS”.

- The **International Energy Agency (IEA)** published its [Critical Minerals Market Review 2023](#) on **July 11, 2023**. The purpose of the **Review** is to provide a sense of the price and investment trends, and production profiles.

As might be expected, the **Review** surfaces the dynamics arising from increased demand, price volatility, supply chain bottlenecks, with an overlay of geopolitics and security of supply. The publication takes as its base the **IEA** publication, the [Role of Critical Minerals in Clean Energy Transition](#), and the [IEA Critical Minerals Explorer](#).

The publication is well-worth a read, providing an overview of the production and use of critical minerals, and emerging policy settings, including the **Critical Raw Materials (CRM) Act** in the **European Union (EU)**, and the **Inflation Reduction Act** in the US, and the **Critical Mineral Strategies** of Australia and Canada.

CRITICAL MATERIALS / MINERALS COVERED IN THE IEA AND IRENA PUBLICATIONS

IEA covers	IRENA covers
Cobalt (Co), Copper (Cu), Graphite (C), Lithium (Li), Nickel; (Ni), Platinum (Pt) and Zinc (Zi), and rare earths.	Cobalt (Co), Copper (Cu), Dysprosium (Dy), Graphite (C), Iridium (Ir), Lithium (Li), Manganese (Mn), Neodymium (Nd), Nickel (Ni) and Platinum (Pt). ¹

- The **International Renewable Energy Agency (IRENA)** published [Geopolitics of The Energy Transition, Critical Minerals](#). The publication provides informed reflection on the current dynamics of critical minerals, including a summary for policy makers. The overarching themes appearing to be that: **1.** the Energy Transition will be a main driver of demand for critical minerals, **2.** supply disruptions have had minimal impact on energy security, but have had an outsized impact on the Energy Transition, **3.** while there is no scarcity of reserves of critical minerals needed for the Energy Transition, capabilities for mining, and refining them, are limited, and capacity building is required, and **4.** each critical mineral has a unique geography of trade.

Late **July 2023**, the US **Department of Energy (DOE)** published its [Critical Materials Assessment](#). The **DOE** publication is excellent, although at over 250 pages is one to be read on screen. The graphic on page 22 provides a great visual representation of key themes identified by the **DOE**.

- **bp** published its [Energy Outlook 2023 \(BPEO\)](#). As is the case the **IEA** and **IRENA** flagship publications, the **BPEO** considers **three scenarios for decarbonization and the energy transition: Accelerated, Net Zero and New Momentum**. The **BPEO** notes that the **Energy Outlook 2022** has been updated in the ordinary course, and to take account of two major developments: the **Inflation Reduction Act** and the conflict in Ukraine.

While each scenario is considered, the **BPEO** identifies matters relevant to all scenarios: **1.** The carbon budget is running out; **2.** Greater government support is required; **3.** The conflict in Ukraine has emphasized the importance of addressing the energy trilemma – affordability, security and sustainability; **4.** The focus on energy security has invigorated the rate of progress toward renewable electricity energy development and deployment; **5.** The transition from hydrocarbons to lower, low and no carbon energy and fuel sources requires technological change and development; **6.** The decline in oil demand is modelled under the **BPEO**, with the modelling showing that oil will continue to play a major role for at least another 10 to 15 years; **7.** The demand for natural gas will fall in more developed economies, and rise in developing economies; **8.** The price volatility for energy will require planning, and investment in the upstream will continue for a further 30 years; **9.** The scale of the task in transitioning to renewable electrical energy requires acceleration; **10.** The use of bioenergy needs to increase; **11.** Low carbon hydrogen has a critical role to play; **12.** The use of CCS is central to enabling rapid decarbonization trajectories; and **13.** A range of carbon dioxide removal (**CDR**) solutions will need to be developed.

While there is nothing new in these matters, they provide continued confirmation of that which needs to be done.

FuelEUMaritime initiative: On **July 26, 2023**, the **European Council** agreed final provisions to decarbonize shipping. **GHG** emissions arising from shipping transiting within, and to and from member states of, the **EU** are to be subject to the **EU ETS**. The **EU ETS** provides a price on carbon. The **FuelEUMaritime** initiative provides a route to avoid that price on carbon. As time progresses, estimates of the cost to the shipping industry abound, including one estimate at around **€10 billion** a year. This level of cost provides a clear basis for the industry to continue to decarbonize (see below under **Alternative fuels to power and propel container carriers**).

Under the **FuelEUMaritime** initiative (effective from January 1, 2025), the **EU** has put in place policy settings intended to reduce GHG emissions arising from the maritime sector, working the “carrot” of incentives for the increased production and use of lower, low and no carbon fuels across the sector² (see below under **EU Maritime and Tax Regulation** for the reductions in carbon intensity), and the “stick” of the **EU ETS**.

- **Alternative fuels to power and propel container carriers:**

July 2023 saw an increase in the greening of the maritime sector with the following news items worthy of note:

- On **July 26, 2023**, **The Maritime Executive** (at <https://maritime-executive.com>, under **China Launches First 700 TEU Electric Containership for Yangtze Service**) reported on the floating, on **July 26, 2023**, of a 700 TEU containership built for **COSCO Shipping Heavy Industry** powered and propelled by electrical energy³. A world first. The containership is to commence sea trials in September 2023, and will ply its trade along the Yangtze.
- On **July 13, 2023**, it was reported widely that **Evergreen Marine** had committed **USD 5 billion** to procure **24 dual-fuel** powered and propelled container carriers. The procurement is split, with **16, 16,000 TEU** container carriers being procured from **Samsung Heavy Industries** (for circa **USD 3.1 billion**) and 8, 16,000 TEU container carriers from **Nihon Shipyard** (a joint venture between **Imabari Shipbuilding Co., Ltd** and **Japan Marine United Corporation**);
- On **July 12, 2023**, **Clarksons Research** reported that it estimates that around 44% of orders for new carriers during the first half of 2023 were for alternative fueled (including LNG) or dual-fueled (methanol).
- On **July 12, 2023**, **A.P. Moller Maersk** announced that it had taken delivery of its first container carrier to be powered and propelled using green methanol: the 2,100 TEU box-ship was delivered at the **Hyundai Mipo Dockyard**. On **July 16, 2023**, **OCI** completed the bunkering of the box-ship: loading 1,000 metric tonnes of **OCI HyFuels**, being ISCC certified green methanol. The bunkering took place at the **Odfjell Terminal Korea (OTK)**, located at the Port of Ulsan. The bunkering with green methanol is a world first. A second world first (!) took place in Singapore on **July 27, 2023**, with the Singapore registered tanker, MT Agility, bunkering the box-ship with 300 metric tonnes⁴ of ISCC certified green methanol to allow it to continue on its maiden voyage⁵.

The methanol bunkered box-ship is sailing to Copenhagen, Denmark, for its official naming (on September 14, 2023) by its designated godparent, Ursula von der Leyen, the President of the European Commission.

- On **July 7, 2023**, **MAN Energy Solutions** and **Seaspan** and **Hapag-Lloyd** agreed on a program (firm and optional) to retrofit container carriers with dual-fuel ME-LGIM engines capable of using green methanol. In addition, **MAN Energy Solutions** has tested successfully its ammonia fueled engine.

In the context of progress of greening of the maritime sector there has been clear sighted analysis. One of the more telling analyses relates to the consequences of the electrification of activities using renewable electrical energy (including of the mobility sector) on the volume of shipping to carry energy vectors by sea, principally, the transportation of coal and petroleum products. By some estimates, the volume of sea-borne carriage of energy vectors will decrease by up to a half by 2050.

- **China and US on climate change:** On **July 7, 2023**, **US Treasury Secretary, Janet Yellen**, on a visit to Beijing, recognized the need for China and the US to work together closely on climate change finance. The **Treasury Secretary** noted:

“As the world’s two largest emitters of greenhouse gases and the largest investors in renewable energy, we have both a joint responsibility – and ability – to lead the way.

“Both our economies seek to support partners in emerging markets and developing countries ... ”.

- **Natural Hydrogen** (or native or white hydrogen) featured in a number of news items:
 - In France, **La Francaise d’Energie** and **GeoResources** reported a large find of natural hydrogen in the Lorraine region of France at a depth of 1,000 metres.
 - On **July 17, 2023**, Jorgo Chatzimarkakis, CEO of **Hydrogen Europe**, penned a piece outlining the potential of natural hydrogen, noting the resources that exist around Europe.
 - On **July 18, 2023**, the good folk at **The Business Times** (under [Could ‘white hydrogen’ change everything for shipping – and everybody else?](#)) provided a helpful analysis.

Also in **July 2023** a number of news items reported on natural hydrogen, including on the plans of Kolonia to drill for natural hydrogen. Among others, Kolonia is backed by Bill Gates’ Breakthrough Energy. For further reading, **Science** published an article entitled [Hidden Hydrogen Does Earth hold vast stores of a renewable, carbon free fuel?](#) back on February 16, 2023. And in July 2023, [Ryze Hydrogen](#) provided a further perspective under [Are we sitting on the clean energy of the future?](#)

- **The need to green agriculture and wood:** During **July 2023** the agriculture and wood sectors drew attention for their GHG emission profiles.
 - The agriculture, forestry and other land use (**AFOLU**) sector globally gives rise to between 9 and 10 billion tonnes (or 9 and 10 giga-tonnes) of CO₂-e emissions a year (equating to nearly a third again of CO₂-e emissions that arise in the US). Between 5.5 and 5.8 billion tonnes arising from **AFOLU** arise within the farm gate (crops and livestock).
 - The wood sector globally emits upwards of 3.5 billion tonnes (or 3.5 giga-tonnes) of GHG emissions a year (equating to more than the GHG emissions arising across Russia). The wood industry comprises the production of lumber and pellets, and paper and pulp, and the combustion of wood as fuel. (See report in [Nature](#) in the first week of **July 2023**.)

The **AFOLU** and wood sectors may be regarded as the sectors most difficult to decarbonize, and the sectors most likely to be last to decarbonize. This said, there appears to be an increasing awareness of the need to make a start in decarbonizing both sectors.

During June 2023:

- the **International Renewable Energy Agency (IRENA)** published its [World Energy Transitions Outlook 2023 – 1.5°C Pathway \(WETO\)](#)⁶; and
- the [Energy Institute Statistical Review of World Energy](#) was published by the **energy institute**, in partnership with **KPMG** and **Kearney**.

Each publication is excellent, and their key findings are to be found below under the **Helpful Publications and Data Bases** section. Each publication provides a clear basis to understand the scale and speed at which progress to reduce **GHG** emissions needs to be made.

REDIII home and hosed (nearly): On **June 28, 2023**, the **European Parliament (ITRE Committee)** voted to approve the text of the revised [Renewable Energy Directive \(REDIII\)](#) agreed by the **Council of the European Union** on **June 16, 2023**. A link to the final text of **REDIII** is [attached](#). The headline under **REDIII** is that by 2030 a minimum of **42.5%** of energy used will be renewable electrical energy, with a stretch target of **45%**. It is estimated that to achieve this target, each year more than 100 GW of renewable electrical energy will have to be installed across the **European Union (EU)**. The next stage in the progress of **REDIII** is a vote in plenary session of the **European Parliament** in autumn / fall of 2023.

Renewable hydrogen definition, good to go: During **June 2023**, the four-month objection / scrutiny period in respect of the rules for **renewable hydrogen** (contained in two delegated acts⁷) expired. The expiry of this period allowed the publication (in the Official Journal) of the two delegated acts. Publication took place on **June 20, 2023**. The two delegated acts came into effect under the [Renewable Energy Directive \(RED\)](#) on **July 10, 2023**. The headline is that all renewable fuels of non-biological origin (**RFNBO**) must be produced using power from renewable electrical energy sources. This provides certainty for investors, critically, for the purposes of the production of **10 million metric tonnes** of **renewable hydrogen** within the **EU**, and the import of **10 million metric tonnes** produced outside the **EU**, consistent with the **REPowerEU Plan**.

The **Voluntary Carbon Market Integrity Initiative (VCMI) Code of Practice** was highly anticipated. It dropped on **June 28, 2023**. The purpose of the [Claims Code of Practice](#) is to guide credible voluntary use of carbon credits and associated claims. The [Claims Code of Practice](#) has been received positively, including because it provides balanced and workable concepts, including a Four Step approach to guide whole of enterprise claims: **Step 1:** Comply with Foundational Criteria, **Step 2:** Select which **VCMI Claim** is to be made, Silver, Gold or Platinum; **Step 3:** Meet the required carbon credit use and quality thresholds; and **Step 4:** Obtain third-party assurance following the **VCMI Monitoring, Reporting and Assurance (MRA) Framework**. (On **May 12, 2023**, the **VCMI** issued its **VCM Access Strategy Toolkit**, including the role of VCM in achieving NDCs. The **Claims Code of Practice** will be covered in an article on **Carbon Credits and developing Voluntary Carbon Markets** during Q1 of 2024.)

To add to the increasing sense of the need for high quality carbon credits, on **July 27, 2023**, the **Integrity Council for the Voluntary Carbon Market (ICVCM)** released its [CCP Framework](#), allowing those that issue carbon credits to apply for a **CCP Assessment**. This provides a means of benchmarking high-quality carbon credits: **CCP** standing for **Core Carbon Principles**. The release of the **CCP Framework** followed the release in March 2023 of the [ICVCM Core Carbon Principles, Assessment Framework for carbon-credit programs, and Assessment Procedure](#).

On **July 31, 2023**, the good folk at the **VCMI** acknowledged and welcomed the “huge work” done by the **ICVCM**. On **August 3, 2023**, the good folk at **RMI** and **Climate Collective** published [Voluntary Carbon Market Landscape Guide](#), which is both helpful and timely. It is clear that a number of corporations and other organizations that have made GHG reduction commitments are considering the use of carbon credits as a means of achieving net-reductions.

ISSB Standards at large: On **June 26, 2023**, the **International Sustainability Standards Board (ISSB)** published the first two sets of its [IFRS® Sustainability Disclosure Standards: S1 General Requirements for Disclosure of Sustainability-related Financial Information](#), and [S2 Climate-related Disclosures](#)⁸. (The **ISSB** was established at **COP-26**.) The **ISSB** standards have developed thinking arising from the work of the **Climate Disclosure Standards Board (CDSB)**, and the **Task Force on Climate-related Financial Disclosures (TCFD)**. The **ISSB** standards address reporting in respect of **Scope 1** and **Scope 2** emissions, with work continuing on standards to report on **Scope 3** emissions⁹. It is to be expected that over time monitoring, measuring, reporting and verifying **Scope 3** emissions will become mandatory¹⁰, currently, regarded as best practice, and optional. The Baker Botts team presents on the form and substance, and the significance, of the **ISSB Standards**.

The 4 D's of accelerating the transition: Ditch Disclosures, go Directly to Decarbonization: On **July 4, 2023**, **Harald Walkate** and **Kumar Venkat** published an article in which they note that emissions accounting and disclosures has exploded into a large and growing industry of SaaS platforms, data providers, consultants and ESG ratings services. The authors note that Scope 3 emissions can exceed 80 to 90% of total emissions, and note that the challenges, indeed the intractability, of assessing and Scope 3 emissions.

“Let us talk hypothetically for a moment. What if every company in the world simply focused on its own scopes 1 and 2 so that there would be no need to account for or reduce supply-chain emissions? Everyone’s scope 1 and 2 is someone else’s scope 1 and 2 after all. What would that do – could that be a solution? Well, it would greatly simplify the reporting. Good news! But it would not get us any closer to decarbonization.”

The publication provides a common sense and practical assessment of this hypothesis and is worth a read.

European Sustainability Reporting Standards: On **June 9, 2023**, the **European Commission (EC)** published the **European Sustainability Reporting Standards (ESRS)**, for the purposes of the **Corporate Sustainable Reporting Directive (CSRD)** of the **European Union**.

On **July 31, 2023**, the **EC** adopted the **ESRS**. The **ESRS** must be used by corporations that are the subject of the **CSRD** (it is estimated over 50,000 corporations will be subject to the **CSRD**). The **EC** website states that:

“The [ESRS] cover the full range of environmental, social and governance issues, including climate change, biodiversity and human rights. They provide information for investors to understand the sustainability impact of the companies in which they wish to invest. They also take account of discussions with the [ISSB] and the [GRI] in order to ensure a very high degree of interoperability between the EU and the global standards to prevent unnecessary double reporting by companies”.

The headlines are that the **ESRS** must be adopted by each **Member State** (of the EU) during 2023, with reporting under the **CSRD** to be mandatory from 2024, with first reports based on **CSRD** due in 2025. Given that it is necessary for a corporation to demonstrate that climate change risk is not material, it is expected that most corporations the subject of the **CSRD** will report, in detail: one of the key features of the **CSRD** is that corporations must report on the climate risks that **may be material** to its business, and the climate risks to which its business **may give** rise (so called, **double-materiality** reporting). In contrast, under **ISSB** materiality is financial.

On **September 18, 2023**, the **Taskforce for Nature-related Disclosures (TNFD)** framework will be launched. Following the road well-travelled, including by the **Taskforce Climate-related Financial Disclosures**, together they will provide a comprehensive framework to assess climate-related and nature-related disclosures. The fact that progress has been made across the **ISSB**, the **CSRD** and the **TNFD** in a relatively short period of time provides cause for cautious optimism.

Bonn Conference: From **June 5 to June 15, 2023**, the **Bonn Climate Change Conference** took place. The **Bonn Conference** is important – it sets the agenda for the **UN Climate Change Conference of Parties** (this year to be held in Dubai from **November 30, to December 12, 2023**, as **COP-28**). As reported, progress was made on: **1. the global stock-take**¹¹; **2. climate finance**¹²; **3. loss and damage**¹³; and **4. adaptation and mitigation**.

Bonn Meetings: A little ahead of the **Bonn Conference**, the good folk comprising the **Supervisory Board for Article 6.4 of the Paris Agreement (SB.6.4)** met for their fifth meeting in Bonn. Please click [here](#) to access the materials from the **SB.6.4** meeting¹⁴. The sixth meeting of **SB-6.4** was held on **July 10 to July 13, 2023**, with progress reported on the standards and procedures for activities currently under the Clean Development Mechanism to transition to **Article 6.4** of the Paris Agreement. The next meeting will take place **September 19 to 22, 2023**. The article on **Carbon Credits and developing Voluntary Carbon Markets** from Baker Botts will cover mitigation contribution units under **Article 6.4**, key to the development **Voluntary Carbon Markets**.

EU Sustainable Finance: On **June 13, 2023**, the **European Commission** published a fact sheet entitled **Sustainable finance – Investing in a sustainable future**. The fact sheet provides a clear sense of the various parts that go to make up, and to implement, policy settings in the **European Union (EU)**, including describing the effect of the amendments made to the **Taxonomy Climate Delegated Act** and the **Taxonomy Disclosures Delegated Act**.

EU Sustainable Finance provision: The **EU** is committed to invest **€10 billion** in Latin America and the Caribbean through its **Global Gateway Investment** initiative (as part of the **REPowerEU Plan**).

- **Chile Hot:** On **June 14, 2023**, the **EU** committed to provide (see [Statement by President von der Leyen with Chilean President Boric](#), at <https://ec.europa.eu>) **€225 million** in funding to seed a **Fund for Renewable Hydrogen**. On **June 29, 2023**, the **World Bank** (under the [Chile Green Hydrogen Facility](#)) approved a **USD 150 million loan** to Chile to allow Chile to promote the development of Green Hydrogen production projects.
- **Brazil Greening:** On **June 12, 2023**, the **EU** committed to provide **€2 billion** in funding in respect of the development of **Green Hydrogen** projects in **Brazil**. The commitment was made at a meeting between the President of Brazil, Luiz Inacio Lula da Silva, and the President of the European Commission, Ursula von der Leyen.

The **EU** funding commitments are consistent with the aim of the **EU** to secure up to **10 million metric tonnes** of Green Hydrogen production for import into the **EU**. In addition to the funding commitments to Brazil and Chile, the **EU** outlined available funding under the **Global Gateway Investment** initiative under a Memorandum of Agreement with Argentina: under **the Energy Transition Measure**, funding for investment will be available for Green Hydrogen production capacity, with a clear basis for obtaining all approvals to allow development and, in due course, export of hydrogen.

Energy Efficiency – low hanging fruit: On **June 8, 2023**, the **International Energy Agency (IEA)** held a conference to discuss **energy efficiency** (under [At IEA conference, 45 governments endorse goal to of doubling global energy efficiency progress by 2030](#)). This was the **8th Global Conference on Energy Efficiency**. The **ministerial statement** provides a sense of the matters discussed, and the commitment “to double [the rate of] progress on [energy] efficiency between now and 2030” across the 45 governments in attendance.

Japan revises its Basic Hydrogen Strategy:

- Throughout **May 2023**, it was anticipated that the **Japanese Government** would release its revised **Basic Hydrogen Strategy (BHS)**. The key revisions signaled were an increase in the target for hydrogen use by **10 million metric tonnes** a year, to **12 million metric tonnes by 2040**, at an estimated cost of **USD 110 billion**, and targeting use of **20 million metric tonnes** by 2050. Ahead of the revision of the **BHS**, the **Japanese Government** continued its strategic partnerships at a government-to-government level, with the execution of a **memorandum of understanding (MOU)** with **Poland** during the first week of May. As reported, the **MOU** covers hydrogen and carbon capture and storage. In December 2022, **Japan** signed a memorandum of cooperation with the **EU**.
- On **June 6, 2023**, the [revised BHS](#) was released. The substance of the **revised BHS** was as had been forecast. In terms of detail, the **revised BHS** prioritizes an increase in electrolyser capacity to **15 GW by 2030**, consistent with the increased target of **12 million metric tonnes** of hydrogen use a year by 2030. In addition to prioritizing electrolyser capacity, energy storage and energy carriers are prioritized under the **revised BHS**.

Paris Plastics Conference: From **May 29** to **June 2, 2023**, the good folk comprising the **Intergovernmental Negotiating Committee** met (for their second session, **INC-2**), in Paris, France, to continue their work to agree on how to address plastic pollution. There was unanimous agreement to progress a draft global plastic pollution treaty in time for the next meeting of the Committee in November 2023, with a view to finalizing the treaty during 2024.

During May 2023:

World Energy Investment 2023: On **May 25, 2023**, the **IEA** published one of its flagship reports, [World Energy Investment 2023](#). The publication reports on investment made in 2022, and the emerging dynamics in 2023. The publication is part of the global stock-take being undertaken by the **IEA** ahead of **COP-28**. (For other **IEA** reports in this context, see [Global Energy Transitions Stocktake](#).) The headline from the publication is that investment in clean energy is continuing to increase, and has exceeded investment on fossil fuel energy since 2017, with the gap widening. It is noted, however, that spending on fossil fuels has increased consistently since 2020. In the words of the **IEA**: “**For every**

dollar invested in fossil fuels, about 1.7 dollars are now going into clean energy. Five years ago, this ratio was one-to-one". These findings are illustrated in the bar chart in the following [link](#).

Neom Green H2 and NH₃ project achieves FID: On **May 22, 2023**, it was reported widely that the **2.2 GW** Green Hydrogen and Green Ammonia located proximate to **Neom, Saudi Arabia**, had taken a positive final investment decision to progress to develop **the world's first giga-sized Green Hydrogen and Ammonia production facility**.

NSTA awards 20 CCS licenses: On **May 18, 2023**, the UK **North Sea Transition Authority (NSTA)** **announced** that it had awarded **20 licenses**, to **12 corporations**, in the UK's first carbon storage licensing round¹⁵. The licensing of carbon storage capacity is to allow acceleration of the capture of CO₂¹⁶ and its storage permanently.

As if by way of immediate proof of purpose of this policy setting, on **May 23, 2023**, **RWE** announced plans to prove-up **three carbon capture projects**, two retrofits in respect of existing gas-fired power stations at Pembroke and Staythorpe, and a new build carbon-capture gas-fired power station at Stallingborough, North-East Lincolnshire. As stated by the **CEO of RWE, Markus Krebber**: "**These projects would secure up to 4.7 GW of generation while capturing a staggering 11 million [metric] tonnes of CO₂ per year. To put that into perspective, this equals the removal of about 2.2 million petrol [i.e., gasoline] cars from the road**".

World Bank Carbon Price Trends: On **May 17, 2023**, the **World Bank** published [State and Trends and Carbon Pricing 2023](#), providing a global overview of existing and emerging carbon pricing, and trends surrounding the development and implementation of carbon pricing instruments. Carbon pricing is considered in a broad sense, including the use of carbon taxes, emission trading schemes, and carbon crediting and off-setting mechanisms. Many of the issues arising will be covered in the **Baker Botts Carbon Credits, and developing Voluntary Carbon Markets** article scheduled for Q1 of 2024.

G7 Summit May 19 and 20, 2023, Hiroshima, Japan:

- **G7 mobilizes IEA on CMMM:** On **May 15, 2023**, the **IEA** reported that the G7 had asked it to provide support through its **Voluntary Critical Mineral Security Program**, with the G7 supporting the **Program** and the **Five-Point Plan for Critical Mineral Security**. Critical metals are, and mineral security is, key for many countries; for example, in the week before the G7 meeting the French Government backed the establishment of a **€2 billion Critical Metals Fund** by **InfraVia Capital Partners**: as **announced** by **InfraVia**, the purpose of the fund is to invest in the critical metals sector to support the energy transition and to secure supply chains.
- **Climate Change, Biodiversity Loss and Pollution:** Climate change, biodiversity loss and pollution were on the agenda at the G7 Summit, and are addressed in the [communiqué](#) released on **May 20, 2022** (at paragraphs 18 to 29). While there were no new policy settings in the communiqué, it provided clarity about the focus required of G7 countries if the objectives of the Big Three Conventions¹⁷ are to be achieved. It is clear from the communiqué that the G7 is taking is placing great trust in the work of the **IEA** and the **IRENA**.

European Hydrogen Bank to run auction during Q4 2023: On **May 16, 2022**, the **European Commission (EC)** ran a workshop during which the **EC** reported on the consultation process undertaken to **May 11, 2023**¹⁸. During the workshop, the **EC** stated that it expected the **European Hydrogen Bank** to run the first auction in Q4 of 2023, and it confirmed that only projects producing **renewable hydrogen**¹⁹ would be eligible to bid. In addition to **renewable hydrogen** production facilities in **Member States** (of the **EU**), it is understood that projects located in Iceland and Norway (each a member of **European Economic Area**, but not Member States) will be eligible to participate in the auction process.

CO₂ emissions from power plants: On **May 11, 2023**, the **Biden-Administration** outlined its plan to reduce **GHG** emissions emitted by power plants. The plan is to impose **GHG** emission limits on existing and new power plants. To achieve the emissions limits, power plants will have to adapt, using **CCS** and clean hydrogen (i.e., low emissions hydrogen) or transition to renewable electrical energy. For example, existing and new natural gas power plants will install **CCS** to remove at least 90% of CO₂ emissions by 2035 or co-fire with 30% clean hydrogen by 2032 and 96% by 2038.

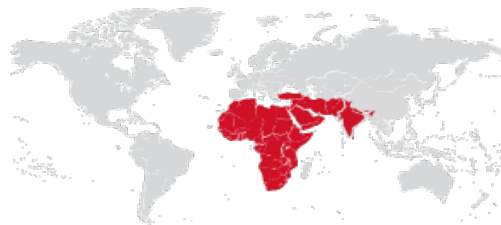
Colorado world first: On **May 9, 2023**, the US State of **Colorado** legislature passed [House Bill 23-1281](#) (Concerning Measures to Advance the Use of Clean Hydrogen in the State). The new law provides for a tax credit of up to USD 1 per kg for users (as opposed to producers of) clean hydrogen. This is a world first.

KSA and PRC to develop iron and steel plant: On **May 8, 2023**, it was announced that **Aramco** and **PIF** (each as a 25% participant), and **Baosteel** (as 50% participant), had entered into a joint venture to develop a **1.5 million metric tonne iron and steel production plant** in the **Kingdom of Saudi Arabia (KSA)**. As reported, the production plant will use electric-arc furnace technology, the production plant expected, overtime, to switch to from natural gas for (high-heat temperature) to hydrogen.

EU Maritime and Tax Regulation: The process for the development of **EU** laws can appear convoluted²⁰, having a distinct pace. As noted above, it is expected that the **Fuel EU Maritime Regulation** will be adopted formally late 2023. On adoption, the **Regulation** will result in increased use of low-carbon, and renewable fuels as a result of imposing **well-to-wake GHG** emission intensity requirements for ships trading in the **EU**: from 2025 **GHG** intensity (measured in g CO₂-e / MJ) will be required to be 89.3, reducing to 85.7 (by 2030), 77.9 (by 2035), 62.9 (by 2040), 34.6 (by 2045), and 18.2 (by 2050).

EU Taxation Directive: One **EU Directive** on which progress needs to be made is the revision of the Directive for the taxation of energy products and electricity 2003 (**ETD**). As part of the **EU Fit for 55** package of initiatives, announced in July 2021, the **EC** proposed a revised **ETD**. Under the proposed revision, “fuel [was to be] taxed according to [its] energy content and environmental performance”. As understood, while some progress has been made, consensus has yet to be reached on minimum levels of tax and the periods of time that Member States will be given to transition from existing (levels of tax and exemptions from tax) to revised arrangements. It is recognized that one of the hardest sectors will be the maritime sector, which has exemptions currently. **P₂N₀** will follow progress. During **June 2023**, the good folk at **H2Accelerate** published [Policy position on heavy-duty hydrogen transport](#), at page 2 (of the seven pages), a helpful **schematic** is included, placing the **ETD** in its broader policy setting, including, the **EU ETS** and **CBAM**, and **RED**.

NEWS FROM AROUND THE WORLD



Africa, Middle East and South Asia

TATA and Cummins to ICE it: On **July 31, 2023**, it was reported widely that **Tata** and **Cummins** had agreed to develop jointly a **USD425 million factory** to manufacture internal combustion engines (**ICEs**) to be fired by hydrogen. The **ICE** factory is to be located in the State of Jharkhand, India.

UAE National Hydrogen Strategy: On **July 4, 2023**, it was reported widely that the **United Arab Emirates (UAE)** had approved its revised [National Energy Strategy](#). One of the statements of strategic intent emerging from the revised **National Energy Strategy** is the [National Hydrogen Strategy](#), intended to place the **UAE** as a key producer, and exporter, of low-carbon hydrogen by 2031. For these purposes, the **UAE** intends to invest up to **USD 54 billion** by 2030. (For further reporting see <https://www.thenationalnews-com>, under **Updated energy plan and hydrogen strategy affirm UAE’s commitment to sustainable economy.**)

India in its element:

- On **July 3, 2023**, it was reported widely that **India** and the **EU** were discussing the potential supply of up to **10 million metric tonnes** of renewable hydrogen a year from India to the **EU**. Other reporting indicates that **India** is in discussions with **Singapore** about the supply of up to **five million metric tonnes** of Green Ammonia a year (requiring the production of one million metric tonnes of Green Hydrogen which would then be combined with Nitrogen). Also, on **July 3, 2023**, it was reported widely that the **Government of India** had approved the

establishment of a carbon market, the [Carbon Credit Market Scheme](#). A **National Steering Committee** is to be formed to formulate guidance on the issue of carbon credits under the Scheme.

- On **July 10, 2023**, it was reported widely that the **Government of India** had opened the bid process under which it is offering to subsidize the cost of production of **450,000 metric tonnes** of Green Hydrogen a year. As reported, the bid process is open through **September 7, 2023**.
- On **June 29, 2023**, it was reported widely that **India** intends to subsidize the production of **Green Hydrogen** in amounts equal to **USD0.60 per kg** for the first of three years of production, **USD 0.49 per kg** for the second year, and **USD 0.37 per kg** for the third year. On **August 20, 2023**, the definition of **Green Hydrogen** was announced by the **Government of India**: the core of the definition is that **Green Hydrogen** is hydrogen that is produced from electrolysis of water or from the gasification of biomass if the GHG emissions do not exceed **2 kg of CO₂-e per 1 kg of H₂** produced, measured, as an average, over 12 months.

India receives WB funding: On **June 29, 2023**, the **World Bank** approved the provision of **USD 1.5 billion** of funding to India (under its [First-Low Carbon Energy Program](#)). The funding is intended to allow India to progress the development of low-carbon energy investments and solutions, including renewable electrical energy and Green Hydrogen. The **World Bank** country director India, **Auguste Tano Kouame** stated that: "The program will support the successful implementation of the [National Green Hydrogen Mission](#) that aims to stimulate \$100 billion in private sector investment by 2030".

Egypt updated its NDC: On **June 25, 2023**, the **Arab Republic of Egypt** released its updated **Nationally Determined Contribution** for the purposes of Article 3 of the Paris Agreement: [Egypt's Second Updated Nationally Determined Contribution](#). The headline is that **Egypt** has brought forward its NDC to reduce GHG emission **42% by 2030**, in contrast to the previous commitment of a 42% reduction by 2035.

DEWA received bids: On **June 8, 2023**, it was reported widely that the **Dubai Electricity and Water Authority (DEWA)** had received bids from **ACWA Power** and **Masdar** to provide renewable electrical energy sourced from photovoltaic solar capacity for **Phase 6 of the Mohammed bin Rashid Al Maktoum Solar Park**. As reported, **Masdar** submitted the lowest bid at **US 1.62145 cents per KWh** for the **1.8 GW project**.

India extends waiver of transmission charges: On **June 1, 2023**, it was reported widely that **India** is to waive all charges to convey renewable electrical energy across the **inter-state transmission system (ISTS)** from the point of generation to the point of use to power electrolyzers to produce Green Hydrogen and Green Ammonia (combining Green Hydrogen with Nitrogen). As reported, the waiver will apply for 25 years in respect of any Green Hydrogen or Green Ammonia project commissioned before 2030.

Egypt approves hydrogen incentive law: On **May 18, 2023**, **Zawya** (under [Egypt approves new draft law to promote green hydrogen projects](#)) reported that on **May 17, 2023**, the **Egyptian Cabinet** had approved a draft law providing incentives, including an "incentive equivalent to 33% to 55% on the tax paid on income generated from the project", and for equipment and materials to be exempt from value added tax.

Egypt moves to green methanol production: On **May 14, 2023**, it was reported widely that the **Alexandria National Refining and Petrochemicals Company** and **Scatec ASA** (working with the **Egyptian Bioethanol Company**) had signed a joint development agreement to progress the development of a **USD 450 million** green methanol production facility at **Damietta Port, Egypt**, with initial production capacity of 40,000 metric tonnes, to increase to 200,000 metric tonnes.

The **fDi Report 2023 – Global greenfield investment trends** published by **fDi Intelligence** (a publication from The Financial Times' stable) ranked Egypt "**as the largest destination for mega projects by amount of capital investment thanks to a handful of large-scale projects in green hydrogen**". The good folk at **Rystad Energy** have developed a helpful [graphic](#) outlining the green hydrogen and hydrogen-based fuel projects in Egypt.

Oman progressing renewable energy: On **May 14, 2023**, **Zawya** (under [OQ Alternative Energy plans 2 GW of renewable projects in Oman](#)) reported that **OQ Alternative Energy** (part of the **OQ Group**) is to develop **2 GW** of

renewable electrical energy capacity, with the capacity to be used to power Green Hydrogen and Green Ammonia projects within the **Sultanate of Oman**²¹. **Hydrogen Oman SPA (Hydrom)** has signed three agreements granting the blocks to allow the development of these projects. The three agreements are with **Amnah, BP Oman, and Green Energy Oman**.

As noted below, under **Helpful publications and data bases**, on **June 12, 2023**, the **IEA** published [Renewable Hydrogen from Oman](#).

India seeking to address impact of CBAM: On **May 7 and 8, 2023**, it was reported widely that **India** is seeking to address the impact on exports from **India** into the **EU** ahead of the introduction of the **Carbon Border Adjustment Mechanism (CBAM)** on January 1, 2026. Under **CBAM**, producers of specified products (and electrical energy) imported from countries that do not have a price on carbon equivalent to the **EU** will have to pay an equivalent price on carbon based on the **GHG** emissions arising in the production of those products, i.e., a price for embedded carbon. As noted above, **India** is developing a **Carbon Credit Trading Scheme for Decarbonization**, pricing carbon through **Carbon Credit Certificates**. The good folk at **The Oxford Institute for Energy Studies** recently have published [Building the Indian Carbon Market: A Work in Progress](#) providing helpful background and context.

Israel BESS buildout: On **May 3, 2023**, it was [reported](#) that the **Israeli Ministry of Energy and Infrastructure** had announced four large-scale battery electric storage system (**BESS**) projects, each with 200 MW and 800 MWh (i.e., each with storage capacity of 200 MW for four hours). At around the same time, a draft plan for the coordinated development of renewable electrical energy and **BESS**, and its regulation. (As of mid-August 2023, the draft plan had been developed further, and is expected to be approved by the Government.)

12,000 e-buses for Nigeria: On **May 2, 2023**, it was [reported](#) that the **Oando Clean Energy Limited** is working with Yutong to deploy 12,000 e-buses (and associated recharging and stabling infrastructure) across Nigeria by 2030.



Americas

BOEM announces three final Wind Energy Areas (WEAs): On **July 31, 2023**, the US **Bureau of Ocean Energy Management (BOEM)**, announced three **WEAs** off the Central Atlantic Coast of the US: the first, WEA (A-2), is 101,766 acres, located 26 miles from Delaware Bay, the second, WEA (B-1), is 78,285 acres, located 23.5 miles from Ocean City, Maryland, the third, WEA (C-1), is 175,506 acres, located 35 miles from Chesapeake Bay, Virginia.

Maine line to OWF: On **July 27, 2023**, it was reported widely that the **State Legislature of Maine** approved a bill under which the **State of Maine** may procure up to **3 GW** of floating OWF capacity by 2040.

Gulf of Mexico OWF auction: On **July 20, 2023**, the **US Department of Interior** announced the auction of OWF leases. As announced, the lease areas to be auctioned cover an area that will allow the development and installation of up to **3.7 GW** of OWF capacity²². As with other OWF auctions undertaken in the US, the **US Bureau of Ocean Energy Management (BOEM)** will administer the auction, which was undertaken on August 29, 2023 (and will be covered in the next edition of **P₂N₀**). The Gulf of Mexico OWF lease area auction continues the implementation of the **Biden-Harris Administration** policy setting of the installation of 30 GW of OWF capacity by 2030.

Demand side subsidies: The center piece of US **Department of Energy (DOE)** supply side clean hydrogen production program is its **USD 7 billion hydrogen hub** development support program. Under the program the **DOE** is planning to select between **six to ten hydrogen hubs** (the **H₂ Hubs**). On **July 5, 2023**, the **DOE** announced its intention (under a Notice of Intent and Request for Information) to set-up a "new initiative to help ... private sector partners address bottlenecks and other project impediments – helping industry unlock the full potential of [clean hydrogen] and

supporting the long-term success of the **H₂ Hubs**". The new initiative (with consultation to **July 24, 2023**) involves the provision of up to **USD 1 billion** in demand-side subsidies. The form of the demand-side subsidies, and how they will be offered and awarded, is yet to be defined.

California commits USD 1.5 billion to green ports: During the first week of **July 2023**, it was reported widely that the **US State of California** had committed to the provision of **USD 1.5 billion** in funding towards greening of ports and logistics (including USD 450 million for zero-emission infrastructure, locomotives, vehicles and vessels). The **Governor of California, Gavin Newsom** is reported to have stated: "The investments ... will modernize our ports, reduce pollution, eliminate bottlenecks and create a more dynamic distribution network".

Epsilon Advances: On **June 27, 2023**, **Battery Industry** (at <https://batteryindustry.tech>) reported that **Epsilon Advanced Materials** is to develop a **USD 650 million** giga-factory to produce **synthetic graphite anodes** for use in the power and propulsion systems of BEVs.

GM and Samsung to develop giga-factory: On **June 15, 2023**, it was reported widely that the **Governor of Indiana, Eric Holcomb**, had announced the development of a **USD 3 billion, 30 GWh battery cell**²³, giga-factory by **GM** and **Samsung**, the giga-factory is to be built in **St Joseph County, Indiana**.

Cement plant with CCS opens: On **June 14, 2022**, **Heidelberg Materials** announced that it had opened its new cement production plant in **Mitchell, Indiana**, the second largest cement plant in North America. The cement plant will deploy carbon capture technology to capture up to 95% of the CO₂ arising from the manufacture of cement at the plant.

DOE agrees conditional loans:

- On **June 23, 2023**, it was reported widely that the **US Department of Energy (DOE) Loan Programs Office** had offered to provide funding to **Blue Oval SK** (a joint venture between Ford and SK) of up to **USD 9.2 billion** in loans on a conditional basis, to support the development of **three giga-factories**²⁴ with capacity to produce **120 GWh** annually²⁵; and
- On **June 12, 2023**, it was reported widely that the **DOE Loan Programs Office** (under the Advanced Technology Vehicles Manufacturing loan program) had agreed, conditionally, to provide a **USD 850 million** loan to **Kore Power** in respect of the development of its **6 GWh** lithium-ion²⁶ giga-factory located in **Buckeye, Arizona, KOREPlex**, to produce **NMC**²⁷ and **LFP**²⁸ batteries.

Chile hot to trot:

- **Chile de-risking:** On **June 13, 2023**, **Hydrogeninsight** (at <https://www.hydrogeninsight.com>) reported that the **Government of Chile** intends to open a **USD 728 million** fund early in 2024 to de-risk private sector investment in the development of Green Hydrogen projects within Chile, and, in so doing, allow the private sector to take positive final investment decisions in respect of Green Hydrogen projects.
- **Chile storage:** On **June 6, 2023**, **energy storage** (at <https://www.energy-storage.news>) reported that the **Government of Chile** is to progress legislation that will provide for a **USD 2 billion** procurement of large-scale energy storage systems for commissioning in 2026. The procurement recognises that Chile needs to be able to store electrical energy sourced from installed photovoltaic solar and wind capacity.

US National Clean Hydrogen Strategy and Roadmap: On **June 5, 2023**, the **US Department of Energy** published the [US National Clean Hydrogen Strategy and Roadmap](#). The **Roadmap** is based on giving priority to three strategies to ensure that clean hydrogen is developed and adopted as an effective tool for the maximum benefit of the US: **1.** Target strategic, high-impact uses for clean hydrogen; **2.** Reduce the cost of clean hydrogen; and **3.** Focus on regional networks. The **Roadmap** provides the direction to produce up to 50 million metric tonnes of clean hydrogen a year by 2050, and in so going contributing a 10% reduction in GHG emissions compared to 2005 levels. The **Roadmap** may be regarded as primary course reading, followed by the **Pathways to Clean Hydrogen: Commercial Liftoff**.

Form Energy takes shape: On **June 2, 2023**, **Jennifer Granholm** (US Secretary of Energy) posted an announcement providing details of the decision of **Form Energy** to develop a **USD 750 million** giga-factory located in **Weirton, West Virginia** on the site of a former iron and steel production facility.

ExxonMobil and Nucor store: On **June 2, 2023**, it was reported widely that **ExxonMobil** had contracted with **Nucor Corporation** in respect of the capture, transportation, and storage of **800,000 metric tonnes a year of CO₂** from the **direct reduced iron (DRI)** plant of **Nucor** located at **Convent, Louisiana**. (See link to ExxonMobil announcement at <https://corporate.exxonmobil.com>, under [ExxonMobil signs carbon capture agreement with Nucor Corporation, reaching 5 MTA milestone.](#))

Toyota Doubling Up: On **June 1, 2023**, **AP** (at <https://apnews.com>) reported that **Toyota Motor Corporation** is to invest a further **USD 2.1 billion** in the development of its battery factory located at **Greensboro, North Carolina**, with the batteries manufactured at **Greenboro** to be supplied to the **Toyota EV and hybrid vehicle plant** at **Georgetown, Kentucky**. The plant in **Georgetown** is scheduled to see first EV assembly in early 2025.

TE and TES e-NG: On **May 31, 2023**, [hydrogeninsight](#) reported that **TotalEnergies (TE)** and **Tree Energy Solutions (TES)** had announced the development of an **e-methane (e-NG)** project in the US. As reported, **TE** and **TES** intend to take a final investment decision (**FID**) in 2024: the project will have capacity of up to **200,000 metric tonnes a year**, deploying a **1 GW electrolyser** powered by **2 GW of photovoltaic solar and wind**, with the Green Hydrogen produced to be combined with biogenic CO₂ (derived from biomass) to create CH₄, as **e-NG**.

Hyundai and LG to develop Giga-factory in Georgia: On **May 26, 2023**, it was reported widely that **Hyundai Motor Group** and **LG Energy Solution Ltd** are to develop, in joint venture, a **USD 4.3 billion 30 GWh** battery cell **giga-factory** in **Bryan County, Savannah, Georgia**, producing battery cells sufficient to power and propel 300,000 BEVs.

North Dakota NIDC approves CCS project: On **May 25, 2023**, the **North Dakota Industrial Commission (NIDC)** announced (under [North Dakota Industrial Commission approves fourth Class VI carbon capture and storage project](#)) that the US State of **North Dakota** had approved the storage geologically of CO₂ from the **Blue Flint ethanol production facility**. As announced by the **NIDC**, this is the fourth approval for a Class VI well for CCS projects²⁹ in North Dakota.

JP Morgan Chase CDR purchase: On **May 23, 2023**, it was reported widely that **JP Morgan Chase** had contracted in respect of the removal and storage of **800,000 metric tonnes of CO₂ removal (CDR)**, for a value of **USD 200 million**. See **JP Morgan Chase's** press release [here](#). In addition, **JM Morgan Chase** has issued its [Carbon Market Principles](#), as the sub-titled suggests, providing its perspective on strengthening the voluntary carbon market.

Enel finds home in Oklahoma: On **May 22, 2023**, it was reported widely that **Enel SpA** is to invest around **USD 1 billion** in the development of a **photovoltaic solar cell giga-factory** in the **US State of Oklahoma**. This may be regarded as another illustration of the impact of the **Inflation Reduction Act**: the Act provides for a tax credit of 10% of project cost if solar panels are manufactured in the US.

SK Ecoplant takes 20%: On **May 17, 2023**, it was reported widely that **SK Ecoplant** is to take a participating interest in the **World Energy GH2** project – the **Nujio'qonik Project**, in **Newfoundland, Canada**. As reported, the **Nujio'qonik Project** will produce **200,000 metric tonnes** of Green Hydrogen a year, using **1.5 GW** of renewable electrical energy capacity, sourced from **3 GW** of installed wind capacity.

Electric Hydrogen in New England: On **May 5, 2023**, it was announced that **Electric Hydrogen (EH₂)**, backed by **Bill Gates**, is to develop a **1.2 GW giga-factory** located in **Devens, Massachusetts**. As reported, the giga-factory is to manufacture an electrolyser having **100 MW** capacity, stated to be the largest capacity electrolyser in the world.

NEL in Michigan: On **May 4, 2023**, it was announced that **NEL** is to develop a **4 GW giga-factory** in the **US State of Michigan**. As a leading manufacturer of electrolysers (using both alkaline and proton-exchange membrane (**PEM**) technologies), the **NEL giga-factory** will manufacture alkaline and **PEM** electrolysers, and is its largest electrolyser giga-factory announced to date.

Louisiana to become third state with Class VI Primacy: During the first two weeks of **May 2023**, the **US Environmental Protection Agency** found that **Louisiana's Underground Injection Control (UIC)** satisfied its requirements, allowing Louisiana to assume primary control for enforcement of Class VI injection wells, used to inject CO₂ into geological underground storage.



APAC

GCL-Si Giga-factory opens: On **July 31, 2023**, it was reported widely that **GCL-Si** had opened its **20 GW** solar cell giga-factory located at **Wuhu, Anhui Province, China**.

CO₂ capture and use in methanation plant: On **July 31, 2023**, it was reported widely that **Mitsubishi Heavy Industries**, working with the **City of Yokohama** and **Tokyo Gas**, is to capture **CO₂** from a waste-to-energy facility (operated by the City of Yokohama, the Tsurumi facility), transport that captured **CO₂** to the **Tokyo Gas** methanation facility (at Tokyo Gas Yokohama Techno Station), with the methanation facility powered by renewable electrical energy from waste-to-energy facilities. If the concept is realized, it provides a means to the creation of a **methanation loop** or a **methanol loop**.

By way of background to methanation:

Methanation involves the use of **CO₂** (and **CO**) to produce **CH₄** (methane) through the combination of **CO₂** (and **CO**) with hydrogen, producing synthetic **CH₄**. If the hydrogen is Green Hydrogen, the **CH₄** produced from its combination with recycled **CO₂** is **e-NG**.

Alternatively, **methanol (CH₃OH)** can be produced, as **e-methanol**.

E-NG is in gaseous form at room temperature, **e-methanol** is in liquid form. The key variables are the mass of **H₂** and the amount of renewable electrical energy required to produce **e-NG** or **e-methanol**, and as such its cost of production.

It is clear that methanation and the production of **e-NG** and **e-methanol** have a role to play, with the **International Energy Agency (IEA)** suggesting that **e-NG** may provide fuel for up to 10% of global energy demand by 2040. While the combustion of **e-NG** and **e-methanol** gives rise to **CO₂**, if that **CO₂** is captured, the synthetic production of **CH₄** or **CH₃OH** could continue. **E-NG** can be liquefied to produce **e-LNG**, And of course **e-methanol** (as a liquid) is ready for use.

For those involved in the energy industry, cost and efficiency go hand-in-hand. The production of **e-methane** (or **E-NG**) is neither as cost effective nor as efficient as other uses for Green Hydrogen and renewable electrical energy. **So why produced e-methane and e-methanol?** There is one reason: there is a market for **e-methane** now, and there is a growing market for **e-methanol**. As yet, there is not a market for Green Hydrogen or Green Ammonia that is the size of the **e-methane** or **e-methanol** market. This is likely to change over time, but at the moment the demand side for **e-methane** is established, and the demand side for **e-methanol** is growing (driven in part by the need for **e-methanol** for dual fueled sea-going carriers).

As markets for **Green Hydrogen** and **Green Ammonia** develop (and demand side develops new equipment and infrastructure for its storage, transportation and use), it is more than likely than not that those producing Green Hydrogen and Green Ammonia will make a choice of market at that time, and may use the benefit of scale and experience to serve both markets.

National Energy Transition Roadmap (NETR) for Malaysia: On **July 27, 2023**, the Government of Malaysia, Ministry of Economy, published Part 1 of the **NETR Flagship Catalyst Projects and Initiatives**. **Part 1** of the **NETR** outlines 10 initiatives, all of which will contribute to decarbonization and the energy transition, including through biomass demand

creation, carbon capture and storage, co-firing of ammonia and hydrogen, energy efficiency, security and storage, future fuel and mobility, and a renewable energy zone.

Shanghai FCEV targets: On **July 21, 2023**, **hydrogeninsight** (at <https://www.hydrogeninsight.com>, under [Shanghai unveils target for 10,000 fuel-cell vehicles and 70 hydrogen refuelling stations by 2025](#)) reported that **Shanghai** intends to deploy 10,000 FCEVs, and to develop at least 70 hydrogen refueling stations, by 2025. The focus of the deployment of FCEVs will be heavy-goods-vehicles / trucks and refrigerated trailers, public transport (i.e., buses) and refuse collection / sanitation vehicles. As reported, these plans are contained in the **Shanghai Transportation Field Hydrogen Energy Promotion and Application Plan** (2023-25).

Keppel Sakra Cogen Plant construction: On **July 19, 2023**, construction commenced on the development of a new **600 MW "hydrogen-ready"** gas-fired power facility, on **Jurong Island, Singapore**. The "hydrogen-ready" facility is able to co-fire a blend of natural gas (70%) and hydrogen (30%). As reported, the facility is scheduled to reach completion during H-1 2026.

Abbott Point Hub Progressing: On **July 17, 2023**, it was reported widely that the **Hanguk-Hoju Hydrogen Consortium**, comprising **Ark Energy** (a subsidiary of Korea Zinc), **Hanwha Energy** and **SK Gas** are to undertake a feasibility study in respect of the prospective development of a **Green Hydrogen Hub** at **Abbott Point, Queensland**.

INPEX hydrogen and ammonia production plant: On **July 13, 2023**, **Offshore Energy** (at <https://www.offshore-energy.biz>, under [Inpex moves forward with its clean hydrogen / ammonia project in Japan](#)) reported that **INPEX Corporation** is to develop its clean hydrogen and ammonia production plant in the **Hirai district of Kashiwazaki City, Niigata Prefecture, Japan**. As reported, the feedstock for the production of the hydrogen is natural gas and, with the hydrogen produced from the natural gas to be combined with nitrogen to produce ammonia. The natural gas is to be sourced from the Nigashi-Kashiwazaki gas field, with the CO₂ arising on the steam reforming of the natural gas to be captured, pressurized and injected back into the gas field. The Blue Hydrogen arising will be used to generate electrical energy.

Da'an underway: On **July 11, 2023**, **hydrogen insight** (at <https://www.hydrogeninsight.com>, under [World's largest? Construction begins at China's biggest green ammonia plant](#)) reported that **Jilin Electric Power** had commenced construction of the **Da'an Wind and Solar Green Hydrogen and Synthesis Ammonia Integration Demonstration Project**, located in the **City of Da'an, Jilin Province**. As reported, the Project will produce 32,000 metric tonnes of Green Hydrogen, and 180,000 metric tonnes of Green Ammonia, a year.

South Korea home to H₂ to power JV: On **July 6, 2023**, it was reported widely that on July 5, 2023, the **Fair Trade Commission (FTC)** of South Korea had approved the establishment of a joint venture to develop and to operate hydrogen power plants (**SL Energy Solutions**) in the context of the **Clean Hydrogen Power Generation Mandatory System**. As reported, the joint venture comprises **LS Electric** and **SK Energy** (each having a 29.9% interest), and **Daehan Green Partners** (having a 25.3 interest) and **Samchully Asset Management** (having a 14.9% interest).

POSCO and China CNGR giga-factory plans: On **July 6, 2023**, it was reported widely that **POSCO Holdings Inc** and **China CNGR** had committed **USD 1.5 billion** to develop a nickel refinery and a precursor factory in Pohong, South Korea, with the production of **50,000 metric tonnes of nickel**, and **110,000 metric tonnes** of precursors a year to be used to manufacture nickel batteries / cells for BEVs.

China is home to the largest:

- **Kuqa Facility producing:** On **June 30, 2023**, it was reported widely that **Sinopec** had commenced production at its Green Hydrogen production facility located in **Xinjiang province (Kuqa Project)** comprising **260 MW of electrolyser** capacity (comprising 52, 5 MW electrolysers). The electrolysers are powered by dedicated photovoltaic solar capacity. As reported, initially, the **Kuqa Project** will produce **10,000 metric tonnes** of Green Hydrogen a year (with around 360 MW of installed photovoltaic solar), moving to **20,000 metric tonnes** (reflective of the development of up to 1 GW of installed photovoltaic solar). One of the distinguishing features of the **Kuqa Project**

is that it has 210,000 m³ of storage capacity, and with having a 28,000 (standard) m³ of send-out capacity an hour through a hydrogen transmission pipeline.

- **Hybrid hydroelectric and PV solar:** In the final week of June the **South China Morning Post** (<http://amp-scmp-com.cdn>, under **In China, world's largest solar-hydro plant produces electricity on Tibetan Plateau**) reported that the **Kela power plant** on the **Yalong River plateau (Kela Project)**, in **Sichuan province**, had commenced operation, generating electrical energy from **1 GW** of installed photovoltaic solar, and **3 GW** of hydroelectric, generation capacity. As reported, the **Kela Project** is the first of a series of like hybrid developments planned along the **Yalong River**.

This continues the progress being made in China along the road of the energy transition: as of February 2023, China had installed a little over **1,200 GW** of renewable electrical generation capacity.

On **June 29, 2023**, **The Straits Times** reported (at <https://www.straitstimes.com>, under **China on track to blow past Xi's clean power goal 5 years early, thanks to booming solar sector**) that China is "on track to [double almost] its wind and solar capacity by 2025". The narrative is that "China has announced or begun construction on enough projects to [reach likely] 1,371 GW [of additional installed capacity] by 2025". On **June 30, 2023**, **offshorewind.biz** (at <https://www.offshorewind.biz>) reported that **China** has **31.4 GW** of offshore wind field capacity installed.

Importance of China: On **June 28, 2023**, the **World Economic Forum (WER)** published a **compelling³⁰ article** (at <https://www.weforum.org>). The article provides a reminder of the industrial capacity of China: the industrial sector in China accounts for more than half of global production capacity, and in 2020 the industrial sector gave rise to 40% of global **GHG** emissions from the sector. The article states that the rate of electrical energy use in the industrial sector in China will increase, and that the deployment of **on-site self-generation** and **green power trading** will be critical in allowing this increase without a commensurate increase in **GHG** emissions.

In addition, during **June 2023**, the **WER** published **Green Hydrogen in China: A Roadmap for Progress, White Paper, June 2023**, being a publication developed with **Accenture** and **China Hydrogen Alliance**. In the executive summary of the publication key objectives are set, as follows: **1.** Reduce the cost of the generation of renewable electrical energy to power electrolyzers, and reduce the cost of electrolyzers; **2.** Establish common procedures and standards and reduce the cost of common infrastructure; **3.** Develop demand for hydrogen in the transportation sector and develop multiple end-user applications; **4.** Develop and improve regulatory and law requirements and standards for Green Hydrogen; **5.** Develop research and development capacity to adapt and improve electrolyser technology; and **6.** Accelerate the development of, and progress under, the national hydrogen strategy.

There is nothing new in these objectives, but the clarity with which they are expressed makes the publication well-worth a read. The focus on electrolyser cost and technology development may be regarded as particularly pertinent.

SEG Solar goes giga in Indonesia: On **June 28, 2023**, it was reported widely that **SEG Solar** is to develop a **USD 500 million) 5 GW solar cell and 3 GW photovoltaic module giga-factory** in Batang, Central Java, Indonesia.

METI supporting CCS: On **June 26, 2023**, it was reported widely that the **Ministry of Economy, Trade and Industry (METI)** and **Japan Oil, Gas and Metals National Corporation (JOGMEC)** is to support **seven CCS projects** (in the context of the **CCS Long-term Roadmap**) with capacity to store up to **13 million metric tonnes of CO₂** a year. The **seven CCS projects** are reported as involving: **1.** ENEOS, JX Oil and J-Power; **2.** INPEX, Nippon Steel, and Kanto Natural Gas; **3.** Itochu, Nippon Steel, Taiheiyo Cement, Mitsubishi Heavy Industries, INPEX, and Taisei Corporation; **4.** JAPEX, Idemitsu and Hokkaido EPC; **5.** JAPEX, Tohoku EPC, Mitsubishi Gas, Hokuetsu (Paper Mill), and Nomura Research Institute; **6.** Mitsui & Co; and **7.** Mitsubishi Corp, Nippon Steel, and ExxonMobil Asia Pacific.

In summary, the funding support covers CCS projects to capture CO₂ arising from cement, chemical, hydrocarbon processing and production, iron and steel, and pulp and paper industries.

Ratification of the amendment to the London Protocol: On **June 2, 2023**, an **Australian Federal Parliamentary Committee** (the Standing Committee on Climate Change, Energy, Environment and Water) recognized the importance of carbon capture and storage to Australia to the achievement of regional climate change, and recommended that

Australia ratify the 2009 and 2013 amendments to the **London Protocol**: the amendments to the **London Protocol** provide for the transboundary transportation and storage of CO₂. This ratification is proceeding.

OWF Australia³¹:

- **3 GW OWF**: On **June 14, 2023**, it was reported widely that the **Leeuwin Offshore Wind Farm project (Copenhagen Energy)** had been awarded lead agency status by the **Government of Western Australia**: lead agency status will help facilitate the progress of projects through the approvals and licensing processes in Western Australia.
- **2 GW OWF**: On **June 8, 2023**, it was reported widely that the **Bass Offshore Wind Energy Project** (Equinor and Nexsphere) and the **Government of the State of Tasmania** (Australia's island state) had signed a memorandum of agreement under which the Government of Tasmania supports the declaration of **northern Tasmania** as an **Offshore Renewable Energy Zone** by the **Federal Government of Australia**.
- **2.5 GW OWF**: On **May 30, 2023**, it was reported widely that a consortium comprising **AGL, Direct Infrastructure, Mainstream Renewable Power, and Reventus Power** had made an application for a feasibility license in respect of the prospective development of a **2.5 GW offshore wind field** off the coast of the **State of Victoria, Australia**.

The Federal Government of Australia **Ministry for Climate Change and Energy** had previously declared an area of 15,000 km² off Victoria (the **Gippsland Declared Area**) as the first offshore renewable energy zone, inviting applications for feasibility licenses³².

On **June 28, and 29, 2023**, respectively, the **Federal Government of Australia**:

- commenced consultation in respect of the declaration of a third **offshore renewable energy zone** to be located in **the Southern Ocean** (with capacity to install up to **14 GW** of offshore wind field capacity), from **Port MacDonnell to Warrnambool**. The consultation period runs from **June 28, 2023, to August 31, 2023**; and
- continued the roll-out of the **6 GW Capacity Investment Scheme (CIS)** with the announcement that the **States of South Australia and Victoria** would undertake auctions for energy storage capacity during **October 2023**.

Kawasaki Carrier Development: On **June 6, 2023**, it was reported widely that **Kawasaki Heavy Industries Ltd** had completed the development of a liquid hydrogen (**LH₂**) cargo containment system for use on larger **LH₂** carriers. The development represents the next step in the long-stated plans for Kawasaki to develop a 160,000 m³ **LH₂ carrier**, the **LH₂ carrier** to have four spherical containment tanks, each tank with capacity for 40,000 m³ of **LH₂**.

The **MV Suiso Frontier** (with capacity of 1,250 m³ of **LH₂**) has been doing the rounds, (mooring in the Sultanate of Oman on August 14, 2023). The MV Suiso Frontier is the world's first **LH₂ carrier**, and it carried the first **LH₂** cargo from Port of Hastings, Victoria, Australia, to Kobe, Japan, in early 2022. The first **LH₂** cargo **proved-up** the concept of **LH₂** carriage by sea, with **scale-up** now required.

By way of background:

A 160,000 m³ **LH₂ carrier** equates to around **11,200 metric tonnes** of **LH₂** (one m³ of **LH₂** has a mass of 70 kg). Each metric tonne of **LH₂** has a useable energy content of 33 MWh or around 113 MMBtu, and as such each **LH₂** cargo comprises around 372,960 MWh (0.37 GWh) or around 1.270 TBtu.

By contrast, a 160,000 m³ **LNG carrier** equates to around **74,450 metric tonnes** of **LNG** (one m³ of **LNG** has a mass of around 465 kg), each metric tonne of **LNG** has a useable energy content of 15.23 MWh or 52 MMBtu, and as such each **LNG** cargo comprises around 1,133,873.50 MWh (or 1.13 GWh) or around 3.870 TBtu.

Because of the differing **energy density** of **LH₂** and **LNG**, an **LH₂** carrier of 480,000 m³ would be required to carry an equivalent heating value of **LH₂** to a 160,000 m³ **LNG** carrier carrying **LNG**.

BlueFloat all aboard: On **June 2, 2023**, it was reported widely that **BlueFloat Energy** had contracted with the **Department of Energy** in respect of sites offshore of **The Philippines** to allow the development of floating offshore

wind field capacity. As reported, the sites are offshore of **Central Luzon, South Luzon, Northern Luzon** and **Southern Mindoro**, together having the scope for the installation of **7.5 GW** of capacity.

China CCS:

- On **June 2, 2023**, **XinhuaNet** (at <https://english.news.cn>) reported that **the China Energy Investment Corporation (China Energy)** commenced operation of its **500,000 metric tonnes a year CO₂ capture facility** at its coal-fired power station located in **Taozhou, Jiangsu Province**. As reported, the CO₂ captured is to be off-taken for use, including to produce dry-ice and shielding gases for welding.
- On **June 1, 2023**, **China Daily** (at <https://chinadaily.com.cn>) reported that the **China National Offshore Oil Corporation (CNOOC)** commenced operation of its **1.5 million metric tonnes a year CO₂ storage site**, located in a geological formation approximately 800 metres below the seabed. The storage site stores CO₂ captured from the Enping 15.1 oil production facilities.

Keppel Infrastructure green play: On **May 25, 2023**, it was reported widely that **Keppel Infrastructure** was to join the consortium developing the **Central Queensland hydrogen (CQ-H2)** project. At the same time, **Keppel Infrastructure** is reported to have signed a memorandum with **Incitec Pivot** to assess the development of green ammonia production facility. On **May 30, 2023**, the **CQ-H2** project received funding support from the **Federal Government of Australia** to progress FEED work. Further reporting has indicated that **Keppel** and **Incitec Pivot** are to develop a **renewable ammonia production facility** with capacity to produce **850,000 metric tonnes a year**.

Early works on CopperString 2.0³³: On **May 23, 2023**, **Mick de Brenni** (Minister for Energy, Renewables and Hydrogen for the State of Queensland) announced that early works will start during 2023 in respect of the development of the **AUD 5 billion** CopperString project: **"CopperString will connect vast renewable ... resources with critical minerals mining and processing that can be used to make batteries and renewables in North Queensland [Australia]"**.

Excellent article from pv magazine: On **May 20, 2023**, **pv magazine** (under [Weekend Read: China's solar century](#)) published an excellent article on the journey undertaken by China's photovoltaic industry over the last 20 years.

Indonesia ultra-low GHG emission pink ammonia plant: On **May 19, 2023**, **Topsoe** announced (under [Topsoe signs Memorandum of Understanding for ultra low emission ammonia project in Indonesia](#)) that it had signed a memorandum of understanding with **Aalborg, Alfa Laval, Copenhagen Atomics, Pertamina New & Renewable Energy**, and **Pupuk Kaltim** to assess the possible development of an **ultra-low GHG emission pink ammonia** production facility in **Bontang, Indonesia**. As announced, the production facility will produce pink hydrogen using solid-oxide electrolyser cell (**SOEC**) technology supplied by **Topsoe**, with nuclear power technology supplied by **Copenhagen Atomics** used to generate the electrical energy to power the electrolyzers.

Sembcorp Industries to develop multi-utilities centre: On **May 18, 2023**, [The Straits Times](#) reported that **Sembcorp Industries** is to develop a **SGD 900 million** (USD 670 million) multi-utilities centre on **Jurong Island, Singapore**. The centre will include the development of a **600 MW hydrogen-ready gas-fired power plant**, which **Mitsubishi Power Asia-Pacific** and **Jurong Engineering** will construct, and which **Mitsubishi Power** will maintain.

Neste expansion complete: On **May 17, 2023**, **JTC Corporation** announced that **Neste** had opened its expanded refinery in **Tuas South, Singapore**. The completion of the expansion means that the **Neste** refinery now has an annual

production capacity of **2.6 million metric tonnes**, of which **1 million metric tonnes** can be sustainable aviation fuel (SAF), placing Singapore as the home to the largest SAF production facility in the world.

Green Light for Green Methanol: On **May 16, 2023**, the government of **Inner Mongolia** approved the development of a **500,000 metric tonnes** a year Green Hydrogen and Green Methanol production facility at **Bayannur**. The electrolyzers will be powered by photovoltaic solar and wind renewable electrical energy.

Cummins running in China: On **May 10, 2023**, it was reported that the **1 GW PEM electrolyser giga-factory** developed in joint venture by **Cummins Inc** and **Sinopec** (the **Cummins Enze joint venture**) had commenced production of its first electrolyzers. The **PEM electrolyser giga-factory** is located in **Foshan, Guangdong Province**.

Australia committed to Large-scale Hydrogen and Big BESS:

- On **May 9, 2023**, the **Federal Government of Australia** committed **USD 1.35 billion** to support the acceleration of “**large-scale renewable hydrogen projects**” through the provision of “**revenue support for investment in renewable hydrogen production through competitive production contracts**”. As reported, this support will allow the progress of three large-scale projects having combined production capacity of **1 GW**.
- On **May 11, 2023**, the **State Government of Western Australia** committed to fund the development of **2.8 GWh** of two additional BESS (one of 500 MW / 2,000 MWh, the other 200 MW / 800 MWh) as part of a broader **USD 2 billion** commitment to renewable energy generation, storage and transmission development across Western Australia.

Indonesia carbon trading:

- On **May 5, 2023**, it was reported widely that **Indonesia** intends to launch a **carbon exchange** during H2 2023. The head of the **OJK** (the financial services authority) stated: “**We are preparing [to launch] the carbon exchange ... to support the early retirement of coal fired power plants**”. As reported, the carbon exchange will work hand-in-hand with a cap-and-trade scheme: with emissions allowances issued under the cap-and-trade scheme to be traded on the carbon exchange.
- On **May 3, 2023**, the **World Bank** proposed policies and investments in respect of Indonesia’s development and climate goals in its [Indonesia Country Climate and Development Report](#).

GS Energy and Uljin County scope NuScale Power SMR to produce hydrogen: On **May 4, 2023**, **GS Energy** and **Uljin County** (in North Gyeongsang Province, South Korea) signed a memorandum of understanding under which they are to work together to undertake a feasibility study for the construction of a **NuScale VOYGR-6 small modular reactor (SMR)** within the **Nuclear Hydrogen National Industrial Complex**. (The use of nuclear power to power electrolyzers and the steam as feedstock produces purple and pink hydrogen.)



Europe and the UK

Acorns to Oaks & Viking to Sail: On **July 31, 2023**, the UK Government (**Department for Energy Security & Net Zero**) announced **Acorn** and **Viking** as **CCS Track-2** projects.

By way of background:

On **March 10, 2023**, it was reported widely that that the **UK Government** had committed to providing funding support at a rate of **GBP 1 billion** a year for **carbon capture and storage (CCS)** for **20 years**.

While reported on **March 10, 2023**, the **Clean Energy Reset** was announced formally in the UK budget on **March 15, 2023**. On **March 15, 2023**, the **UK Government** outlined its Budget for 2023/24, including for CCS:

“The government will ... provide up to [GBP] 20 billion funding for early deployment of Carbon Capture, Usage and Storage (CCUS), to help meet the government’s climate commitments. This ... level of funding for the sector will unlock private investment and job creation across the UK, particularly on the East Coast and in the North West of England and North Wales. ... A shortlist of projects for the first phase of CCUS deployment will be announced later [in March 2023]. Further projects will be able to enter a selection process for Track 1 expansion launching this year, and 2 additional clusters will be selected through the Track-2 process, with details announced shortly”.

Both **Acorn** and **Viking** participated in the **Track-1** process, which resulted in award to the **East Coast Cluster** (Humberside and Teesside) and **HyNet North-West** (North West of England and North Wales) as **Track-1** projects, with the **Scottish Cluster**, including **Acorn**, as the “reserve cluster”. It is good to see progress on award of **Track-2** projects.

EC approves: On **July 31, 2023**, it was reported widely that the **European Commission (EC)** had approved a **€246 million** scheme under which the **Dutch Government** will provide grant funding for a “7-to-15 year period” to incentivize the production of Green Hydrogen. The scheme will be open to corporations and other organizations established within EU (Member States), and Iceland, Norway and Liechtenstein.

CO₂ and H₂ infrastructure: On **July 21, 2023**, it was reported widely that **BASF, Gasunie, OGE** and **Shell** had signed a **Letter of Intent** under which they intend to work together to develop the **Delta Rhine Corridor (DRC)** project; as envisaged currently the project will involve the development of infrastructure to transport CO₂ and H₂ between Germany and the Netherlands, and, in due course, Belgium (see below at **Belgium to fund H₂ pipeline system development**). It is helpful to consider the development of the **DRC** in the context of the development of the **European Hydrogen Backbone (EHB)**. On **July 28, 2023**, **Enagas** announced that it would run a **Call for Interest** process on **September 14, 2023**, to help to scope the **Spanish Hydrogen Backbone Network**. (On **July 10, 2023**, the **EHB** provided an up-to-date [map](#) of the **EHB**. It is well-worth checking the **EHB** website on occasion to follow progress of the **EHB**.)

Federal German Government Greens Steel: On **July 21, 2023**, it was reported widely that the **European Union (EU)** had approved around **€2 billion** in state aid from the **Federal German Government** to **Thyssenkrupp AG** in respect of the development of green steel project developments.

Romania 3 GW OWF framework: On **July 19, 2023**, the **Ministry of Energy** in **Romania** published draft legislation contemplating the development of **3 GW** of OWF capacity by 2035. The draft legislation (subject to public consultation for 30 days), is expected to proceed, allowing the development of OWF capacity in the **Black Sea**.

Belgium to fund H₂ pipeline system development: On **July 17, 2023**, it was reported widely that the **Council of Ministers for Belgium** had approved in principle the provision of **€250 million** of public funding to commence the development of a network of hydrogen pipelines across Belgium.

Greece – Bulgaria H₂ pipeline: On **July 14, 2023**, the operator of the national grid in **Greece, DESFA**, announced that it intended to develop a **€ 1 billion, 540 km hydrogen pipeline**, from **Greece** to **Bulgaria**.

GeZero in Geseke, Germany: On **July 13, 2023**, **Heidelberg Materials** announced that it is to develop a cement plant with CCS to capture **700,000 metric tonnes** of CO₂ annually (the **GeZero Carbon Capture and Storage Project**). The clinker and cement production plant will capture CO₂, purify and liquify it (and will offer purification and liquefaction services to other emitters of CO₂), following which it will be delivered by rail car to **Wintershall Dea** at Wilhelmshaven. The development of the Project is to receive funding support from the **EU Innovation Fund**.

The **GeZero Carbon Capture and Storage Project** was one of **41 large-scale** clean technology projects awarded funding support from the **EU Innovation Fund**, in the third round of awards. Details of all **41 large-scale** projects awarded funding support are to be found at <https://ec.europa.eu>, under **Innovation Fund: EU invests €3.6 billion of missions trading revenues in innovative clean tech projects**.

EU Member States agree installation plan for alternative fuels infrastructure (AFIR) roll-out: Late on **March 27, 2023**, the **European Union (EU) Member States** agreed to develop and to deploy **AFIR** for hydrogen in 424 major cities, at airports, ports and rail terminals, and 233 at least every 200 km along the core **Trans-European Transport Network (TEN-T)**. The **AFIR** is to provide hydrogen fueling / refueling infrastructure for buses, cars and heavy-duty goods vehicles / trucks. In addition, the **AFIR** provides for **recharging stations for battery electric vehicles**, with recharging stations every 60 km along the **TEN-T** (and every 100 km along an expanded **TEN-T**).

On **July 12, 2023**, the **European Parliament** approved the regulation to give effect to the **AFIR**, and on **July 25, 2023**, the **European Council** adopted the regulation.

Germany awards 4 OWF concessions: On **July 12, 2023**, the **German Federal Government** announced the successful bidders in its **7 GW OWF** dynamic tender round.

- **BP** was awarded **two OWF areas** (N-12.2 and N-11.1), to comprise up to **4 GW** of installed capacity in the German sector of the North Sea. As reported, **BP** bid **€3.66 billion** and **€3.12 billion** for the respective OWF areas.
- **TotalEnergies** was awarded the other **two OWF areas**, one located in the German sector of the North Sea (N-12.1), for which it bid **€3.12 billion**, and the other in the German sector of the Baltic Sea (O-2.2) for which it bid **€2.07 billion**.

Lithuania award OWF concession: On **July 13, 2023**, the **Lithuania Government** announced the successful bidder for the development of **700 MW** OWF capacity: as announced, **Ignitis Group** was successful with its bid of **€20 million** for the **120 km²** concession area.

Pause for thought: in **mid-July, 2023**, the good folk at **Bellona** published [Hydrogen DRI for Steel in a Resource Constrained Europe](#). The publication outlines the scale of the development of renewable electrical energy to decarbonize the iron and steel industry within the **EU**.

As assessed by **Bellona**, up to **85 GW** of wind farm or field capacity is required to decarbonize the activities of iron and steel producers that have committed to producing green steel. The publication is rich in facts and stats, and outlines three "alternative routes" to avoiding and reducing GHG emissions arising from iron and steel production: **1.** CCS to capture CO₂ arising on iron and steel production (**Blue Steel**) at DRI production plants; **2.** Increased recycling of scrap iron and steel (using **EAF technology**); and **3.** optimizing iron and steel use, including through reduced use, and therefore less production than business as usual.

Germany energy transition funding:

- On **July 5, 2023**, it was reported widely that the **German Federal Government** (Ministry of Economic Affairs and Climate Action) intended to launch formally its **climate protection contract** initiative as part of the broader **National Energy and Climate Plans (NECP)**.
- Also during the first week of **July 2023**, the **German Federal Parliament** considered the legislation needed to allow the development of the hydrogen transmission network. While this is the first stage of a process that will take some time, it is foundational.

The concept of the **climate protection contract** is not new: **climate protection contracts** encourage industries that are difficult to decarbonize, including cement, glass, iron and steel, pulp and paper, to adopt carbon capture and storage technologies and solutions by compensating those who adopt (carbon capture and use CO₂ storage) for the cost difference between use of capture and storage, and business as usual. It is understood that the **climate protection contracts** will be for a term of 15 years, and will be awarded to the lowest bidders.

This approach is consistent with other policy settings: the term of 15 years allows progress to decarbonization, supports the development of carbon and storage capacity, and encourages use of more, or most, efficient technology. It is understood the amount of the funding support available under climate project contracts may be up to **€50 billion**.

Engineered CO₂ removal in the UK: In the context of the conclusion of consultation (and the publication of [Developing the UK Emissions Trading Scheme: Main Response](#)), on **July 4, 2023**, the outcomes of the **Main Response** were reported widely, critically that the UK Government had set the UK ETS cap at a level consistent with the top of the NZE range, is to expand the scope of the UK Emissions Trading Scheme (**UK ETS**) to include energy from waste, and to incorporate Greenhouse Gas Removal (**GGR**) technologies, including engineered **GGR** technologies such as **DAC (Direct Air Capture)** and **BECCS (Bioenergy Carbon Capture and Storage)**. The inclusion of **GGR** technologies will be subject to further consultation, with recognition that a robust monitoring, reporting and verification (**MRV**) regime will be required. The implication of this initiative is that **GGR** will give rise to rights to offset under the **UK ETS**.

Engineering an RTS: The concept of an emissions **Removal Trading System**, being a mandatory market for carbon dioxide removal (**CDR**), appears to be subject to some level of development, and impetus. The thesis in the **European Union (EU)** appears to be taking shape to impose an obligation on those that have emitted GHG historically to remove emissions from the climate system or to purchase RTS permits issued in respect of activities and projects that have removed, or are removing, emissions. Watch this space!

H2 Green Steel: On **July 4, 2023**, it was reported widely that **H2 Green Steel** and **ZF** had entered into a **seven (7) year €1.5 billion** contract under which, from 2026, **H2 Green Steel** is to supply **near zero emissions** steel to **ZF**.

Government of Ireland – National Hydrogen Strategy: In early **July 2023**, the **Government of the Republic of Ireland** published its [National Hydrogen Strategy \(NHS\)](#). The **NHS** outlines the **Policy Drivers**, its **Purpose**, **Key Questions** that it addresses, the **Main Takeaways** from it, the **Hydrogen Development Timeline**, and **Implementation Strategy**. The **NHS** is well-worth a read: while there is nothing new as such, the concept of energy security is enlivened.

Deforestation Regulation goes live: On **June 30, 2023**, the **European Union Deforestation Regulation** entered into force. The **Regulation** imposes obligations on ensure that products sold within the **EU** have not resulted in degradation of forest or deforestation, with those selling products to undertaken due diligence to be able to state that a product has not resulted in degradation of forest or deforestation.

In addition, the **EU Parliament** passed the **Nature Restoration Law** on **July 12, 2023**: the **Nature Restoration Law** will continue through the EU legislative process over the balance of 2023.

SA alignment:

- On **June 27, 2023**, **Germany** and **South Africa** agreed to partner to “assist in creating business to business opportunities between ... developers [of Green Hydrogen projects in South Africa] as well as off-takers in Germany”.
- This follows the announcement of the establishment of the **SA-H2 Fund** on **June 20, 2023**, The Netherlands and South Africa agreed to establish a **USD 1 billion** fund to invest in hydrogen projects in South Africa (**SA-H2**).

The Netherlands auctions funding for Green Hydrogen: On **June 26, 2023**, the **Government of the Netherlands** announced plans to run an auction seeking tenders for up to **€1 billion in funding support** (from its Climate Fund) for the development of Green Hydrogen project developments. This auction is one of the policy settings of the Government of the Netherlands to provide up to **€9 billion in funding support through to 2032**.

Portugal proposes to auction up to 3.5 GW of OWF: On **June 26, 2023**, a group working (on plans to develop OWF capacity to provide renewable electrical energy from OWF sources) reported to the **Portuguese Government**, recommending the auction of areas in **Figueira de Foz**, **Leixoes**, and **Viana do Castelo** to allow the development of up to **3.5 GW** of OWF capacity. The working group suggests that the auction should take place within 2023, with a further **6.5 GW** of OWF to be auctioned so that by 2030, **10 GW** of OWF capacity will have been installed.

France CCUS Strategy: On **June 23, 2023**, it was reported widely that **France** had developed its strategy for **Carbon Capture, Storage and Use**, and had commenced consultation, to continue through **September 29, 2023**. The scale and scope outlined is to capture and to store permanently between **4 and 8.5 million metric tonnes of CO₂ a year by 2030**, **15 to 20 million metric tonnes of CO₂ a year by 2023**, captured from the industrial sector, with a further 10 million metric tonnes to be captured and stored for other sectors.

Another Swedish OWF development: On **June 22, 2023**, **Riviera** (at <https://www.rivieramm.com>) reported that **Freja Offshore** had submitted an application to develop a **2 GW** (to generate up to 10 GWh of renewable electrical energy annually) offshore wind field in the **Swedish sector of the Baltic Sea**.

Hungary for BESS: On **June 20, 2022**, the **European Commission** approved the provision of up to **€1.1 billion** in state aid (under the EU Temporary Crisis and Transition Framework) by the **Government of Hungary** to fund support for **large-scale energy storage projects** across Hungary.

Switzerland commits to NZE: On **June 18, 2023**, the good folk of Switzerland voted in a referendum on a number of matters, including on climate to change, **committing Switzerland to achieving net-zero GHG emissions by 2050**.

Denmark OWF:

- On **June 1, 2023**, the **Danish** and **German** governments agreed to connect **Bornholm Energy Island (BEI)** to Germany to allow the delivery of **2 GW** of renewable electrical energy to the German grid, and **1.2 GW** to the Danish Grid, with **50Hertz** and **Energinet** (transmission network operators) to share the development costs of the transmission network and system.
- On **May 30, 2023**, the **Danish Parliament** reached agreement in respect of the development of up to **14 GW** of offshore wind capacity, including around **6 GW** in four fields **North Sea I** (3 GW), **Kattegat II** (1 GW), **Kriegers Flak II** (640 MW) and **Hesselo** (800 MW to 1.2 GW), and a further **3 GW** at **BEI**³⁴. At the moment, there is around 2.3 GW of installed offshore wind field capacity in Danish waters.

Germany - ever developing policy settings:

- On **May 31, 2023**, it was reported widely that Germany is to provide an additional **€1 billion** in funding for its **H2Global** policy for the purchase of Green Hydrogen from countries outside the **EU**, with consideration being given to folding **H2Global** into the **European Hydrogen Bank** initiative (see above under **European Hydrogen Bank to run auction during Q4 2023**). On **August 3, 2023**, it became apparent that Germany is inviting other **Member States** to join the **H2Global** import scheme. The invitation was made as the Federal German Government firmed up a number of initiatives and policy settings at the start of August. As might be imagined, the reasoning is informed by the buying power of the EU and the increased scale that comes with exercise of increased buying power.
- On **May 25, 2023**, **wallstreet on-line** (under [Germany to Get Comprehensive Hydrogen Distribution Infrastructure](#)) reported that the Cabinet of the **German Federal Government** had approved plans to develop a distribution network across Germany. This is a world first.

Innovation Projects³⁵ **sign-up:** On **May 22, 2023**, it was reported widely that each of the five **Innovation Projects** awarded in **March 2023** had signed an exclusivity agreement with **The Crown Estate of Scotland**, marking the first step in the prospective development of each **Innovation Project**.

Ørsted awarded CCS contract: On **May 15, 2023**, **Ørsted** announced that the **Danish Energy Agency (DEA)** had awarded it a 20-year contract to capture and to store permanently CO₂ at the **Ørsted Kalundborg Hub** up to 430,000 metric tonnes of CO₂ a year. The CO₂ will be captured at **Ørsted's** wood-chip fired **Asnæs Power Station** and the straw-fired **Avedøre Power Station** (bio-genic CO₂), each a combined heat and power plant. The carbon capture technology is provided by **Aker Carbon Capture**. (For further detail, see **Ørsted awarded contract – will capture and store 430,00 tonnes of biogenic CO₂**, at <https://orsted.com>.)

Italy, Germany and Austria support South₂ Corridor: On **May 14, 2023**, it was reported widely that the energy ministries of **Italy, Germany and Austria** signed a letter of support for the development of the **South₂ Corridor** by **Snam, Trans Austria Gasleitung and Gas Connect Austria**, and German **bayernets GmbH**. The letters will support applications for **Important Project of Common European Interest (PCI)** status for each part of the **Corridor** under which funding support will be sought for the development of the **3,300 km Corridor** as part of the **European Hydrogen Backbone**. As reported, the **Corridor** will have capacity to transport up to **4 million metric tonnes** of hydrogen from North Africa and Southern Italy.

Northvolt Heide gigafactory supported by government: On **May 12, 2023**, it was announced that the **German Federal Government** and the **State Government of Schleswig-Holstein** will support the development of a **60 GWh giga-factory for battery cells** to be developed by **Northvolt** in **Heide, Germany**. On **May 19, 2023**, **Northvolt** announced that it had completed construction of **its giga-factory, Northvolt Dwa, in Gdansk, Poland**.

EU Parliament approved anti-greenwashing directive: On **May 11, 2023**, the **EU Parliament** approved the introduction of a directive that will strengthen the regulation of **green claims** (for example, proscribing phrases and words such as **carbon neutral** and **CO₂ natural, biodegradable, eco** and **environmentally friendly**, and **natural** (and the like)), with green claims to be in a prescribed form based on official certification.

ORESS-1³⁶ auction process concludes:

- On **May 11, 2023**, four offshore wind field (**OWF**) development projects were successful in their bids under the first ORESS auction (**ORESS-1**), with a combined electrical energy capacity of **3.1 GW** awarded 20-year renewable electrical energy supply contracts. The successful bids were: **1.3 GW Codling Wind Park** (EDF and Fred Olsen), **824 MW Dublin Array** (RWE and Saorgus Energy), **500 MW North Irish Sea Array** (CIP and Statkraft), and **450 MW Sceirde Rocks** (Corio Generation and Ontario Teachers' Pension Plan).
- As reported, the average price under the renewable electrical energy supply contracts is **€86.05 per MWh**. The average price, and the scope for the development of further **OWF** capacity, provides the **Republic of Ireland** with a basis for the development of an industrial development strategy: the plan is to develop at least **37 GW** of **OWF** capacity by 2050, which will underpin the **National Industrial Strategy for Offshore Wind** (scheduled for publication in Q1, 2024).

The success of **ORESS-1** has given rise to activity in preparation for **ORESS-2.1**, with **ESB** and **Ørsted** reported to have combined to develop jointly off-shore wind field capacity of up to **5 GW**.

Gas-fired grid stability plant: On **May 10, 2023**, **GE Gas Power** and **RWE** commenced operation of the **Biblis gas-fired power plant** (comprising 11 turbines) to provide dedicated grid system integrity and stability services. This is a world first.

Match and Connect: On **May 10, 2023**, **Gasunie** announced that it is providing a service to match hydrogen supply with hydrogen demand (**Match and Connect**). Under **Match and Connect**, participants will be able to locate supply and demand across the nascent trading market in the **EU**.

UK publishes Energy Bill:

- On **April 20, 2023**, the UK published its **Energy Bill**, including to provide for the licensing of CO₂ transport and storage and the commercial arrangements for capture of carbon capture and storage, and for the production of hydrogen.
- On **April 25, 2023**, the **Energy Bill** was introduced to the House of Commons (the equivalent of the House of Representatives in the US), with its second reading commencing on **May 9, 2023**. Among other things, the **Energy Bill** reflects the view of the **Climate Change Committee (CCC)** that **CCS** is a "**necessity, not an option**" for the UK to achieve net-zero by 2050. (As of **July 31, 2023**, the Energy Bill was continuing to progress through the legislative process.)

Sweden, France and Switzerland, pavements and tracks: During **May 2023**:

- **Sweden** announced that it was electrifying roads (**e-roads**): the first **e-road** (route E20, connecting the cities of Gothenburg, Malmo and Stockholm) will allow vehicles to recharge while travelling. The technology to be used has yet to be decided³⁷.
- **France** announced that it is to develop an **e-road** along a 4 km stretch of a motorway near Paris. The **e-road** will test two technologies – wireless induction pads embedded in the road surface to charge battery coils on the underside of vehicles and an electric rail on the road surface.
- **Switzerland** announced that photovoltaic solar panels were to be installed along railway tracks.

HELPFUL PUBLICATIONS AND DATA BASES

Circular Steel production: On **July 28, 2023**, the **International Renewable Energy Agency (IRENA)** published [Towards a Circular Steel Sector](#). The publication was prepared at the request of the **Government of India**, the current chair of G20. As reported, the findings of the publication were considered and discussed at the meeting of Environment and Climate Sustainability Ministers held in Chennai, India. The publication is excellent.

IEA commentary: On **July 21, 2023**, the good folk at the **International Energy Agency (IEA)** published a commentary entitled [Tripling renewable energy capacity by 2030 is vital to keep the 1.5°C goal within reach](#). The information and themes in the commentary are entirely consistent with other publications and reports referred to in this edition of **P₂N₀**.

Electricity Market Report – Update 2023: On **July 18, 2023**, the **International Energy Agency (IEA)** published its [Electricity Market Report – Update 2023](#). This **IEA** publication drops annually providing an assessment of information and trends. This year five key matters arise for the publication: **1.** While the demand for electricity is expected to continue to grow, the impact of the energy crisis in 2022 is likely to have an on-going impact, with the result that growth in demand will be moderate; **2.** The decarbonization of new electrical energy generation capacity is now established, with new demand being matched by new renewable electrical energy capacity; **3.** While peak demand for electrical energy has been passed in many developing countries, demand for electrical energy continues to grow in countries whose economies continue to grow (most clearly illustrated by China and India); **4.** Declining demand for electrical energy is manifest in Europe, where the impact of the energy crisis continues to impact economic activity; and **5.** The progress of renewable electrical energy is continuing, and globally in 2024 more load will be matched by renewable electrical energy generation than by coal-fired electrical energy generation.

While the fifth key point gives rise to optimism that optimism needs to be tempered – in 2022 the total mass of GHG emissions arising from the generation of electrical energy was an all-time high – 12,431 million metric tonnes (or 12.43 giga-tonnes). The reason is that the supply and demand for electrical energy continues to increase, and while the rate of increase in renewable electrical energy capacity is outstripping thermal electrical energy, thermal electrical energy is still being developed.

In addition, during **July 2023** the **IEA** published its [Coal Market Update – July 2023](#). The publication is companion reading to the **Electrical Market Report**. Consistent with what is noted above, demand for coal is set to continue at the record high levels of 2022 during 2023.

Renewable Energy Statistics 2023: On **July 13, 2023**, the **International Renewable Energy Agency (IRENA)** published [Renewable Energy Statistics 2023](#). **IRENA** publishes this data rich statistics report annually, providing a good sense of progress in the development and deployment of renewable electrical energy globally.

CCS and Inflation Reduction Act: During **July 2023**, the good folk at **The Oxford Institute For Energy Studies** published [Will the US Inflation Reduction Act \(IRA\) push Carbon Capture and Storage \(CCS\) and Carbon Dioxide Removal \(CDR\) technologies over the line?](#) The publication is well-worth a read for those with an interest in CCS and CDR.

As noted above, on **June 22, 2023**, the **International Renewable Energy Agency (IRENA)** [World Energy Transitions Outlook 2023 – 1.5°C Pathway \(WETO\)](#).

The key finding of the report is that renewable electrical energy capacity must be added at a rate of 1,000 GW a year if we are to limit the increased in global average temperatures to 1.5°C compared to pre-industrial times. In other words, globally, each year, we need to install an amount of renewable electrical energy capacity roughly equivalent to the total renewable electrical energy installed in China as of February 2023. Two graphics in particular are useful – see Figure 1.2 on page 36 and Figure 1.5 on page 40.

On **June 21, 2023**, the **IEA** and the **International Finance Corporation (IFC)** published [Scaling up Private Finance for Clean Energy in Emerging and Developing Economies](#). The publication is excellent, providing the combined perspectives of the **IEA** and the **IFC**, recognising the need for private finance.

On **June 21, 2023**, **IRENA** published [Innovation Landscape for Smart Electrification – Decarbonising End-Use Sectors With Renewable Power](#). The publication is excellent, outlining the key innovations that are likely to form the basis of smart electrification strategies, and describing the pathways to end-use electrification in power to mobility, power to heat and cooling, and power to hydrogen production.

Ember Grid Map: On **June 14, 2023**, **Ember** (at <https://ember-climate.org>, under **Electricity Interconnection in Europe**) published an [interactive map](#) of electricity interconnection across Europe contemplating different energy transition scenarios. The interactive map is a good addition to the commonwealth of data bases at large.

Renewable Hydrogen from Oman: On **June 12, 2023**, the **IEA** published [Renewable Hydrogen from Oman – A producer economy in transition](#). The publication places the announcements of hydrogen production projects in Oman in a global context, including that hydrogen exports are likely to be in the form of ammonia initially, and that, for these purposes, ammonia infrastructure needs to be developed. The publication is excellent.

Green Hydrogen from Deloitte: On **June 12, 2023**, **Deloitte** published [Green hydrogen: Energizing the path to net zero](#). The publication canvasses a number of broad themes, and hones-in on the key dynamics, in particular, the dynamics for the production of hydrogen to gain momentum across global trade. The publication is well-worth a read.

IEA Renewable Energy Market Update: On **June 1, 2023**, the **IEA** published its [Renewable Energy Market Update](#) (see <https://www.iea.org>, under **Renewable power on course to shatter more records as countries around the world speed up deployment**). Among other things, the publication states that on current projections during 2023 the deployment of photovoltaic solar and wind will increase, in absolute terms, at the greatest annual level to date.

Our World in Data on CO₂: In **May 2023**, **Our World in Data** published [Greenhouse Gas Emissions](#). The publication is authored by **Hannah Ritchie** (legendary for work done to date) and **Max Roser**. For those wanting to get a sense of the big picture as to the scale and size of GHG emissions, the publication makes compelling reading.

Mapping the landscape of Clean Hydrogen: On **May 24, 2023**, the **Industrial Innovation Initiative (I³)** published [The Landscape of Clean Hydrogen – An Outlook for Industrial Hubs in the United States](#). The publication is well-worth a read, providing a clear perspective on the need for the upscaling of clean hydrogen production.

ASEAN Critical Minerals: On **May 18, 2023**, the **Intergovernmental Forum on Mining, Minerals and Metals and Sustainable Development** published [ASEAN-IGF Minerals Cooperation: Scoping study on critical mineral supply chains in ASEAN](#). The publication provides an assessment of the role of **ASEAN** as a provider of critical metals and minerals, and the opportunities that may arise within **ASEAN**.

Low-Cost Finance for the Energy Transition: On **May 12, 2023**, **IRENA** under the current chair of G20, India (working closely with the **Ministry of New and Renewable Energy (MNRE)**), published [Low-Cost Finance for the Energy Transition](#). The headline from the publication is that to achieve the 1.5°C objective of the Paris Agreement, the share of renewable energy in the primary energy mix will need to increase to 75%. The publication is well-worth a read. On **June 14, 2023**, the **Business Times** (at <https://www.businesstoday.in>, under [How setting up its own carbon trading market can help India with its green goals](#)) provided an informed perspective on how a “carbon credit trading

scheme can help India Inc. and the country reduce its greenhouse gas emissions, while driving innovation and tech advancements”.

Hydrogen Insights 2023: On **May 11, 2023**, the current edition in the [Hydrogen Insights](#) series from the **Hydrogen Council** and **McKinsey & Company** was published. The headlines are: **1.** 1,000 large-scale hydrogen production projects are contemplated; **2.** The development of projects faces headwinds along supply chains, higher interest rates, and inflation; **3.** North America continues to forge ahead, with the tailwind provided by the **Inflation Reduction Act**, and, in this context, the publication takes a deeper dive into the North American market.

Finland Energy Policy Review:

- On **May 5, 2023**, the **IEA** published its [Finland Energy Policy Review](#). The publication is comprehensive (including a targeted set of recommendations), and it provides a helpful perspective in the context of the **Climate Change Act** (amended in July 2022) providing **legally binding commitments to achieve carbon neutrality by 2035**. The publication is excellent, and well-worth a read for those interested in policy settings.
- On **June 27, 2023**, **H2Cluster Finland** published **Clean Hydrogen Strategy for Finland**.

DNV Energy in Transition: On **May 3, 2023**, **DNV** published [Transport in Transition – A deep dive into fuels, electricity, and infrastructure](#). The publication notes that the transport sector’s share of overall **GHG** emissions will move from 25% today to 30% by 2050. The publication states that the route to decarbonization is clear: **“electrify what can be electrified; what cannot be electrified in the near term should be switched to sustainable advanced biofuels; and prepare for hydrogen-based new fuels to scale through local and regional ecosystems to a global ecosystem by 2035”**. The publication provides a **fuel-by-fuel** analysis of current, and anticipated, use across the transportation sector.

Excelling in Hydrogen: On **May 3, 2023**, [Excelling in Hydrogen – NL Hydrogen Guide](#) was published. The publication is the work of **TKI Nieuw Gas**, **Netherlands Enterprise Agency**, and **FME** (the Dutch employer’s association in the technology sector). The publication takes “as a given” the importance of the development of the hydrogen industry in the Netherlands, with the purpose and focus of the publication being on how to achieve **“the large-scale adoption of clean hydrogen”**. The publication is well-worth a read: while the publication provides a guide to the development of the hydrogen industry across the Netherlands, and the import and distribution of hydrogen (and hydrogen-based fuels) within the Netherlands, it provides a coherent **“whole-of-country”** plan on which other countries and areas can draw.

DACs in EU: On **May 1, 2023**, the **European Commission, Joint Research Centre (JRC)**, provided an assessment of the role of **direct air capture (DAC)**. The publication is titled [The Role of Direct Air Capture in EU’s Decarbonisation and Associated Carbon Intensity for Synthetic Fuels Production](#). Technologies are considered in detail, as is the use of captured CO₂ to produce synthetic methane, methanol, and diesel. The report is well-worth a read. On **May 11, 2023**, the **IEA** (in a **commentary piece**) asked [Unlocking the potential of direct air capture: Is scaling up through carbon markets possible?](#)

Mining accounting: During the first week of **May 2023**, **BHP** published [Natural Capital Accounting for the Mining Sector](#). The publication explains that **natural capital accounts** measure environmental assets and their condition. In the context of this developing area, the publication is well-worth a read, with the findings on habitat and species, net-gain in carbon storage, and improved ground water quality each capturing the attention of the reader.

Costs of carbon: In an article entitled [How Investors Can Incorporate Carbon Into Their Decision Making](#), the good folk at **BCG** provide a helpful summary of the basis for assessment, varying by geography and sector, of the cost of carbon: **1.** Regulated carbon costs; **2.** Internal Carbon Costs; **3.** Indirect carbon cost impact; **4.** Decarbonization value creation; and **5.** Carbon-adjusted multiple.

Other helpful publications and data bases

[Breaking free from fossil gas – A new path to a climate-neutral Europe](#) published by **Agora, Energiewende**, incl. fossil fuel alternatives to reduce CO₂-e.

Other helpful publications and data bases

<u>The Green Future Index 2023</u>	published by MIT Technology Review Insights - a review of 76 economies against low carbon objectives.
<u>Technology and Innovation Report 2023</u>	published by UNCTAD - a review of 166 economies' preparedness for the introduction and the use of green technology.
<u>Hydrogen Valley Map</u>	published by Clean Hydrogen Partnership Mission Innovation - a map of each hydrogen valley announced globally.
<u>Emissions from Oil and Gas Operations in Net Zero Transitions</u>	published by the IEA - a review of the actions that may be taken to reduce GHG emissions.
<u>Stainless Steel: Considerations for making green steel using CCS and H2 solutions</u>	published by The Oxford Institute for Energy Studies , provides an assessment of the need for CCS and hydrogen solutions to avoid, reduce and remove GHG emissions from iron and steel making, and the challenges of doing so.
<u>Hydrogen Market Attractiveness Report</u>	published by Aurora Energy Research provides an assessment of the developing hydrogen market.
<u>Hydrogen: A Viable Option for a Net-Zero Canada in 2050</u>	published by the Standing Committee on Energy, the Environment and Natural Resources , provides an assessment of the use of hydrogen in Canada.
<u>Hydrogen Market and Assessment Report for Denmark and Germany</u>	published by Energinet and Gasunie , provides a high-level assessment of how Denmark and Germany might work together to develop supply of and demand for hydrogen.
<u>A review of Net Zero Energy and Industrial Zones – Preliminary Report May 2023</u>	published by Australian Petroleum Production and Exploration Limited , provides an outline as to how energy, industrial and manufacturing sectors may work together to progress to a net-zero economy ³⁸ .
<u>Fuelling the decarbonisation of iron ore shipping between Western Australia and East Asia with clean ammonia</u>	published by Global Maritime Forum , provides concise analysis of a scenario under which clean ammonia is used to power and to propel vessels from 2028 through 2050 to full decarbonisation. The decarbonisation of the iron ore and iron and steel industry is key to progressing to net-zero, and decarbonizing carriage by sea is integral to this.
<u>Advancing Offshore Wind Energy in the United States</u>	published by the US Department of Energy providing an overview of the development and deployment of 30 GW by 2030 and 110 GW by 2050 of offshore wind field capacity.
<u>Building the Indian Carbon Market: A Work in Progress</u>	published by The Oxford Institute for Energy Studies , provides a progress check on the development of thinking around carbon credits and the carbon market in India.
<u>Renewables Pathway to Decarbonise the Shipping Sector by 2050</u>	presented by IRENA at Green Shipping Conference , Manila, May 16, 2023, providing a helpful overview of hydrogen and hydrogen-fuels globally and in the context of the shipping industry.
<u>CDR across the 50 US States</u>	published by Carbonfuture providing an assessment of carbon dioxide removal (CDR) policy settings and regulation across the 50 US States.
<u>Modelling the Economics of Article 6 (A Capstone Report)</u>	published by the University of Maryland School of Public Policy, Center for Global Sustainability and IETA provides an assessment of the potential for GHG emissions using the mechanism to contribute to the mitigation of greenhouse gas emissions contemplated by Article 6.4 of the Paris Agreement.
<u>Leading the way on CCUS in the EMEA region</u>	an article published by SPECTRA (a Mitsubishi publication) on May 15, 2023 , provides a punchy summary of the state of play across the CCS sector.
<u>Establishing a National Hydrogen Standard</u>	published by dena , the German Energy Agency , provides guidance to whether to develop a national energy standard or to adopt an international hydrogen standard at a country level.
<u>The State of Clean Technology Manufacturing</u>	published by the IEA (An Energy Technology Perspectives Special Briefing) is stated as designed to provide policy makers with strategic insights as to how best to develop manufacturing capacity, focusing on batteries, electrolyzers, heat pumps, photovoltaic solar, and wind.
<u>The MSCI Net-Zero Tracker – A periodic report on progress by the world's listed companies toward curbing climate risk</u>	published by MSCI , provides an assessment of the alignment of the world's listed corporations with limiting the increase in the average global temperature to 1.5°C compared to pre-industrial levels. The key findings are to be found on pages 4 and 5 of the publication.
<u>An initial framework for organizational climate mitigation strategies</u>	published by Gold Standard provide "a consolidated series of principles and criteria, which provide a credible framework for organizational climate mitigation strategies ... and an outline of which criteria require further development support in terms of

Other helpful publications and data bases

<u>net zero: Initial framework for organisational climate mitigation strategies</u>	supporting tools and guidance” and “supplementary input to organisations applying the framework”.
<u>Philippines – EIC Country Report</u>	published by the Energy Industry Council (EIC) provides a helpful outline of the oil and natural gas development anticipated in The Philippines in the near to medium term.
<u>The Future of Gas</u>	published by the European Academies Science Advisory Council (EASAC) provides and overview of the use of natural gas, and its impact in GHG emissions in the climate system, with particular focus on its global warming potential.
<u>Potential development of renewable hydrogen imports to European markets until 2030</u>	published by The Oxford Institute for Energy Studies provides an overview of the possible sources of hydrogen in the context of the EU target to import 10 million metric tonnes of hydrogen a year by 2030.
<u>Low-Cost Finance for the Energy Transition</u>	published by the IRENA under the current chair of G20, India (and working closely with the Ministry of New and Renewable Energy (MNRE)). The headline from the publication is that to achieve the 1.5°C objective of the Paris Agreement, the share of renewable energy in the primary energy mix will need to increase to 75%. The publication is well-worth a read.
<u>Renewable Hydrogen Import Routes into the EU</u>	published by The Oxford Institute for Energy Studies provides an overview of the possible sources of renewable hydrogen to match the EU target for the import of 10 million metric tonnes of renewable hydrogen by 2030.
<u>Energy Transition Report – Geothermal Market Outlook</u>	published by Rystad Energy provides an overview of the scale of the potential for the use of geothermal energy as a source of renewable electrical energy.
<u>Embodied CO₂ Emissions in Steel Imports to the US</u>	published by Global Efficiency Intelligence , as A White Paper on Steel Trade, Carbon Competitiveness, and Decarbonisation .
<u>Decarbonising Europe’s hydrogen production with biohydrogen</u>	published by European Biogas Association as a white paper detailing the role of sustainable hydrogen in the total energy mix .
<u>Our progress towards net zero</u>	published by Shell plc , and sub-titled Energy Transition Progress Report 2022 .
<u>Renewables 2023 Global Status Report</u>	published by REN21 Renewables Now provides an overview of markets and policy settings globally, and in so doing provides a clear assessment of the state-of-play.
<u>The cluster effect</u>	published by Green Alliance provides a cogent argue for, as the sub-heading states, Why the UK needs a place-based green industrial strategy.
<u>Top 10 Emerging Technologies of 2023</u>	published by the World Economic Forum among other emerging technologies identifies flexible batteries and sustainable aviation fuel.
<u>Financing Reductions in Oil and Methane Emissions</u>	published by the IEA , as a World Energy Outlook Special Report on the Oil and Gas Industry and COP-28 .
<u>A Common Path to Improve European Climate Risk Stress Testing and Scenarios Analysis</u>	published by the Association for Financial Markets in Europe & Oliver Wyman , outlining the increasing use, and importance, of risk stress testing as a key tool for the banking sector.
<u>Power-to-X: Morocco’s roadmap to exporting hydrogen; A strategic vision or a shattered dream</u>	published by the Centre for Energy, Petroleum and Mineral Law and Policy , University of Dundee, and The Oxford Institute for Energy Studies .
<u>Gigatack Phase 2: Pioneering UK Renewable Hydrogen – Public Report</u>	published by Department for Business, Energy & Industrial Strategy outlines Phase 2 of this UK flagship program.
<u>Hydrogen in aviation</u>	published by Arup, Hydrogen in Aviation , provides an assessment of the role that hydrogen will play in the context of the UK aviation industry in progress to achieving net-zero carbon across the aviation sector.
<u>Levelised cost of hydrogen</u>	published by Agora Industry and Agora Energiewende provides a helpful assessment of the levelized cost of hydrogen. Among many pertinent points made, is the need to integrate electrolyser into energy systems with fewer full-load hours. This point appears to be on the radar of some folk devising and setting policy.
<u>Voluntary Carbon Markets – A Critical Piece of the Net Zero Puzzle</u>	published by Citi GPS: Global Perspectives & Solutions provides a timely synopsis of the VCM ahead of the increasing anticipation of the development of the VCM. The time has come for the accelerated development of the VCM.

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* Michael is the author of **P2No**. Any errors are Michael's. **P2No** is written early each Saturday morning. In writing **P2No**, Michael sources from original material where possible. If a news item is covered broadly, the words **reported widely** connote that two or three (or more) publications have covered that news item. If there is only one source that is not the original material, that source is named.

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¹ In addition, p.102 of the publication has a complete list of all minerals relevant to the Energy Transition.

² The **FuelEU Maritime** initiative requires the use of fuels a GHG intensity to reduce over time, a 2% reduction by 2025, and an 80% reduction by 2050. The initiative is supported by incentives to transition to lower, low and no carbon fuels.

³ As reported, this electric-drive-only container carrier is powered and propelled by batteries in containers, swapping charged for depleted as required.

⁴ As reported, during the green methanol bunkering drones with methanol detectors and infrared cameras were used to monitor for any release of methanol, monitoring for methanol leaks to the climate system and methanol flames.

⁵ The CEO of the **Maritime and Port Authority of Singapore (MPA)** made an [announcement](#) in respect of the "world's first ship-to-containership methanol bunkering operation", name checking all organizations involved.

⁶ On **March 28, 2023**, **IRENA** published the **WETO preview**. The preview provided high-level insights from **WETO 2023**. This is one of the flagship reports each year, along with the **BloombergNEF – New Energy Outlook (NEO)**, **bp Energy Outlook**, and the **IEA's Net Zero by 2050 – A Roadmap for the Global Energy Sector**.

⁷ On **February 13, 2023**, the **European Commission (EC)** adopted two **REDIII Delegated Acts** on **Additionality** and **GHG intensity**. The adoption of the two **Delegated Acts** was required under the **RED**. The **Delegated Acts** are part of the broader regulatory framework for hydrogen. The headline is that the **Delegated Acts** will ensure that all **renewable fuels of non-biological origin (RFNBO)** are derived / produced from renewable electrical energy sources.

The **first Delegated Act** (entitled **Delegated regulation on Union methodology for RNFBOs**) defines the requirements in respect of **RFNBO** two key criteria to provide certainty in respect of the requirement that to qualify as Green Hydrogen that Green Hydrogen must be produced from the use of additional renewable electrical energy (so called **additionality**).

The second Delegated Act (entitled **Delegated regulation for minimum threshold for GHG savings of recycled carbon fuels and annex**) provides a methodology for determination of life-cycle GHG emissions arising from the derivation / production of **RFNBOs**.

⁸ Some of the key takeaways: The **IFRS® Sustainability Disclosure Standards** provide a single, global, baseline for standardized disclosure of matters going to sustainability related risks; additional requirements will be developed to augment the single, global, baseline; there is exclusive focus on capital markets, with decision-useful information going to material and proportionate matters; there is a focus on avoiding duplicative reporting; there is a focus on allowing cost-effective, reliable and robust communication about sustainability related risks (and sustainability related opportunities) across jurisdictions; allowing reporting alongside financial statements; requiring and reflecting an inclusive and transparent due diligence process; and allowing interoperability with GRI Standards (being the GRI Sustainability Reporting Standards used to measure carbon footprints).

⁹ **Scope 3 emissions** are best defined / described as all emissions arising or occurring indirectly (not included as Scope 2 emissions) in the supply / value chain of any business, both upstream and downstream: **upstream**: for example, business travel; capital goods, employee communication; energy and fuel related activities; leased assets; purchase of goods and services; transportation and distribution, and waste generation and disposal, and **downstream**: for example, end-of-life treatment of products sold; sourcing, processing and production of products sold; transportation and distribution of products sold; use of products sold, franchise activities, and investment and leased assets.

¹⁰ There are a number of stated reasons to prefer, and to require, mandatory reporting, including as follows: it ensures that corporations and other organizations are aware of, and as such able to take responsibility for, GHG emissions; it ensures that tracking of GHG emissions globally is possible and accurate; with knowledge of GHG emissions providing a basis to assess how best to address them, and as such to allow the avoidance, reduction and removal of them; with knowledge comes the ability to frame a clear understanding of that which is possible; allows corporations and other organizations to effect accurate disclosure, and in so doing achieve transparency; and allow a corporation or other organization of achieve compliance.

¹¹ The process by which each Party to the Paris Agreement reviews its nationally determined contribution with a view to increasing the rate at which **GHG** emissions are avoided, reduced or removed.

¹² The provision of finance by more developed countries to less developed countries to allow the less developed countries to achieve their **nationally determined contributions** or **NDCs**.

¹³ On **Sunday November 20, 2022**, an historic outcome was concluded at **COP-27**, with developed countries agreeing to contribute to a fund to provide funding to compensate countries impacted by climate change to address loss and damage: the agreement is in principle, and work has been done since, including at the **Climate Ministerial** that took place on **March 20 and 21, 2023**, with the continued aim to have the **Loss and Damage Fund** operational before the conclusion of **COP-28**. At the Bonn Conference in June, 2022, it was clear that **loss and damage** caused by climate change would be a key theme at **COP-27**, with countries suffering loss and damage as a result of climate change seeking to be compensated for that loss and damage. In addition, mitigation and adaptation was identified as key, and a new **Mitigation Work Programme** was launched at **COP-27**. After the Bonn Conference in June 2022 there was considerable coverage of the development of **National Adaptation Plans**, being plans that set out the actions that a country is to take in response to the impact of climate change, with actions to be taken on the basis of sound data and information, and embedded in policy settings address adaption action across medium and long-term plans. Accompanying the **National Adaptation Plans** will be **Adaptation Communications** (ADCOMs) providing a clear basis of the 'commitment of a country to adaptation action to be shared.

¹⁴ In addition, **Eve Tamme** (Senior Advisor, Climate Policy) provides insightful and thought-provoking commentary, and is well-worth following.

¹⁵ On **September 22, 2022**, it was reported widely that 26 bids had been received for carbon storage licenses in the first carbon storage licensing round for carbon storage capacity sites located off-shore of the UK – Aberdeen, Lincolnshire, Liverpool and Teesside. (The first carbon storage licensing round commenced in June 2022, with bids to be received by September 13, 2022.) On **December 21, 2022**, the **NSTA** published **documents** providing guidance in respect of carbon storage licence applications, and noted that it intended to award carbon storage licenses early in 2023. The award of a carbon storage licence is not the only step in the development of a carbon injection and storage facility, with any successful tenderer having to obtain a lease from either The Crown Estate or Crown Estate Scotland (depending on the location of the carbon storage site licensed).

¹⁶ In **November 2021**, the **HyNet cluster** and the **East Coast cluster** were selected as **Track 1 Clusters** (with the Scottish Cluster in reserve). On **March 22, 2023**, the UK Government identified 20 shortlisted projects that satisfied eligibility criteria to be considered under the Phase 2-CCS cluster process.

¹⁷ The **Big Three Conventions** being, the **United Nations Framework Convention on Climate Change (UNFCCC)**, the **United Nations Convention on Combatting Desertification (UNCCD)** and the **United Nations Convention on Biological Diversity (UNCBD)**.

¹⁸ **Action processes under consideration**: On **March 31, 2023**, the **EC Innovation Fund** announced that **competitive bidding** (auction) was to be used to award support to successful bidders. As reported, contracts for differences (**CfD**), carbon contract for differences (**CCD**)¹⁸, and fixed premium contract models were being considered. The **EC Innovation Fund** published a **draft of the economic terms and conditions of the 2023 Innovation Fund pilot auction**. The auction process will be a key pillar of the **European Hydrogen Bank**. The consultation process was undertaken, with feedback sought by May 11, 2023, and a workshop planned for May 16, 2023. It is good to see adherence to the timetable.

¹⁹ For these purposes, **renewable hydrogen** is Green Hydrogen using 100% renewable electrical energy sources that satisfy the additionality and match renewable electrical energy source generation to Green Hydrogen production.

²⁰ On **October 19, 2022**, the **European Parliament** agreed its position on the **Fuel EU Maritime Regulation**, taking the first steps to achieve the use of alternative and low carbon fuels in the shipping industry. The **European Parliament** voted in favour of requiring shipping to cut GHG emissions by 2% by 2025, 20% by 2035, and 80% by 2050, in each case compared to 2020 levels.

²¹ **USD 20 billion hydrogen projects for Oman**: On **March 14, 2023**, it was reported widely that the **Sultanate of Oman**, through a corporation called **Hydrogen Oman SPC** (a subsidiary of **Energy Development Oman (EDO)**) had previously signed term sheets to provide the framework for the development of **six** Green Hydrogen and Green Ammonia production facilities, which will deploy **15 GW of electrolyser capacity**.

As reported, the **six** term sheets contemplated development under concessions (with terms of 47 years, 7 years to allow development and 40 years of production). The term sheets are understood to represent the first round of auctions held by Oman, with six areas of land in the south of Oman to be the location of the six production facilities within a 1,500 km² area within the governorates of Al Wusta and Dhofar.

Location(s) of area of land / project	Corporation (s) awarded concession
Dhofar (427 km ²) and Duqm (320 km ²)	BP Alternative Energy Investments Limited awarded two concessions
Hyport Duqm (2 sites / projects)	DEME, OQ, and Uniper awarded concessions
Green Energy Oman Hub (337 km ²)	Intercontinental Energy awarded one concession

SalalaH2 Green (419 km ²)	Dubai Transport, Linde and OQ
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On **June 1, 2023**, **Saudi Gulf Projects** at <https://www.saudigulfprojects.com>, under **Oman Signed Agreements Worth \$20 bn to Develop Green Hydrogen Projects**, provides additional reporting which provides detail in respect of the three contracts reported as signed: first, a block was awarded to a consortium comprising Copenhagen Infrastructure Partners, Blue Power Partners and Al Khadra, to develop a 200,000 metric tonnes a year Green Hydrogen production plant, powered by 4.5 GW of installed renewable electrical energy capacity; secondly, a block was awarded to BP Oman to develop a 150,000 metric tonnes a year Green Hydrogen production plant powered by 3.5 GW of installed renewable electrical energy capacity, and thirdly, a block was awarded to a consortium comprising OQ, Oman Shell, EnerTech, InterContinental Energy and Golden Wellspring Wealth for Trading, to develop a 150,000 metric tonnes a year Green Hydrogen production plant powered by 4 GW of installed renewable electrical energy capacity.

²² As reported, the Final Sale Notice included the following a 102,480 acre area off Lake Charles, Louisiana, and two areas off Galveston, Texas, one of 102,480 acres, the other of 96,786 acres.

²³ The batteries will be nickel-rich prismatic and cylindrical cells.

²⁴ Located in in the States of Georgia (two phase development), Kentucky and Tennessee.

²⁵ In addition to Blue Oval SK, Ultium Cells (a joint venture between GM and LG Energy Solution) is developing three gigafactories with up to 130 GWh of capacity.

²⁶ Lithium-ion battery = a battery that uses reversible reduction lithium technology. The elements comprising a lithium-ion battery determine its costs, energy density, and other performance, and its safety.

²⁷ NMC = Lithium Nickel Manganese Cobalt Oxide.

²⁸ LFP = Lithium Iron Phosphate, used in energy storage systems and shorter-range EVs, having long-life cycle and being safe.

²⁹ **North Dakota** was the first US State to receive primacy of Class VI wells from the US Environmental Protection Agency in 2018.

³⁰ The article is entitled **Clean power across industry is key to China achieving net zero. Here are two approaches that can accelerate its use.**

³¹ There are six proposed **offshore renewable energy zones** that are regarded as key, Gippsland (the Gippsland Declared Area), Northern Tasmania, the Hunter and the Illawarra (offshore the State of New South Wales), and Perth / Bunbury (offshore of the State of Western Australia).

³² From **January 23, 2023**, applications for offshore wind field licences are being accepted for offshore wind field projects within the Gippsland Declared Area. The period of applications running from January 23 to April 27, 2023, the applications made during this period then assessed under the **Offshore Electricity Infrastructure Regulations 2022**.

³³ **CopperString 2.0:**

In mid to late 2000s, in **Queensland Copper-string 1.0** was planned. On **November 17, 2022**, **PV Magazine** (at <https://www.pv-magazine-australia.com>, under **Federal government gives Copper-string transmission project tick of approval**) reported that the **Australian Federal Government** had granted approval to allow the development of the **USD 1.6 billion, 1,110 km transmission network** from **Mount Isa** (and the broader North West Minerals Province) to the transmit renewable electrical energy to the **grid at Townsville** in northern Queensland, Australia.

On **March 7, 2023**, the **State of Queensland** announced that it was to deliver and own the **AUD 5 billion Copper-string project** so as to open up the potential for the development of **6 GW** of renewable electrical energy capacity in the **North Queensland Renewable Energy Zone**.

³⁴ The **BEI** has been proposed to in concept since late 2020, early 2021. The **BEI** is not to confused with another energy island that is being considered for development of an energy island off the coast of Jutland (**JEI**). On **June 28, 2023**, it was reported widely that the development of the **JEI** is being considered because of the estimated cost its development.

³⁵ On **March 24, 2023**, it was reported widely that **The Crown Estate of Scotland** had awarded 13 lease options in respect of the development of up to **5.5 GW of offshore wind field capacity development** for the purposes of the **INTOG** leasing round: **IN** standing for **Innovation**, and **TOG** standing for **Targeted Oil & Gas**. The **INTOG** leasing round sought bids to allow the development of innovative renewable electrical energy projects of 100 MW of installed capacity or less, and that reduce the GHG emissions arising from oil and gas activities in the North Sea.

Successful bidders in TOG	Award
Cerulean Winds	Three lease areas, each with 1 GW of capacity
Flotation Energy & Vargronn	Two lease areas, with 1.35 GW and 560 MW of capacity
Harbour Energy	Two lease areas, each with 15 MW of capacity
TotalEnergies	One lease area of 3 MW
Successful bidders in IN	Award
Blue Float & Renantis Partnership	Two lease areas, each of 99 MW
BP Alternative Energy Investments	One lease area of 50 MW
ESB Asset Development	One lease area of 100 MW
Simply Blue Energy	One lease area of 100 MW

³⁶ On **December 23, 2022**, the **Republic of Ireland** announced the issue of **Maritime Area Consents** (each a **MAC**) for **Phase 1** offshore wind field areas as follows: **Arklow Bank 2** (SSE Renewables), **Codling Wind Park** (EDF and Fred Olsen), **Dublin Array** (RWE and Saorgus), **North Irish Sea Array** (Statkraft), **Oriel Wind Park** (ESB and Parkwind), and **Sceirde Rocks** (Corio Generation). Each **MAC** allowed the holder of it to seek planning permission to develop offshore wind fields, and to participate in the **ORESS-1** (offshore wind auction under the **Renewable Electricity Supply Scheme (RESS)**). In late 2022, it was anticipated that **ORESS-1** would procure the supply of up to **2.5 GW** of offshore wind field capacity.

³⁷ The technology will be any of overhead (catenary), ground based (conductive), or buried (inductive), or may be more than one, possibly all three.

³⁸ The **Safeguard Mechanism** imposes GHG emission limits on the **largest GHG emitters** in Australia (reported as giving rise to 30% of the GHG emissions arising in Australia), requiring these emitters to reduce their GHG emissions by 4.9% a year to 2030, either by absolute reductions or through the use of carbon credits (in Australia ACCUs) or Safeguard Mechanism Credits (issued in respect of emitters that have reduced GHG emissions below the required level) to set-off GHG emissions so as to achieve net-reductions.