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About the bulletin

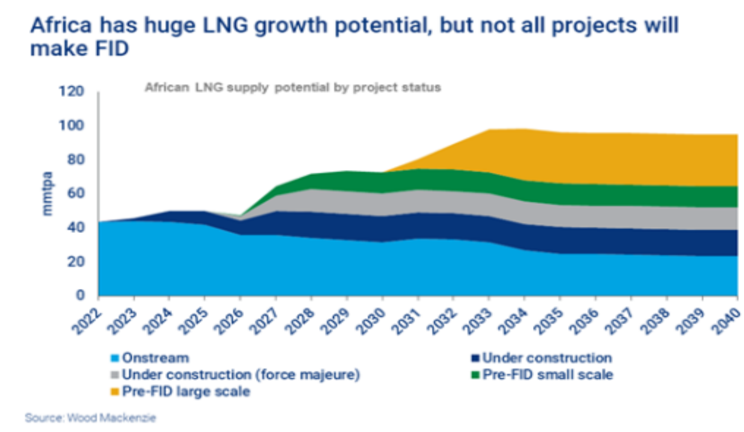
This bulletin has been written by students of the Center for Energy Economics & Management (CEEM) of IFP School, members of the "Energie & Marchés" and "Energy Technology Economics & Management" programs, under the supervision of the CEEM academic faculty (see Authors on page 4).

The CEEM trains more than 150 students every year in graduate and executive programs to prepare them to become actors of the ongoing energy transition.

The content and views expressed in this document reflect only the opinion of the authors and do not necessarily represent the views of the Faculty, the Center for Energy Economics & Management or IFP School in any way.

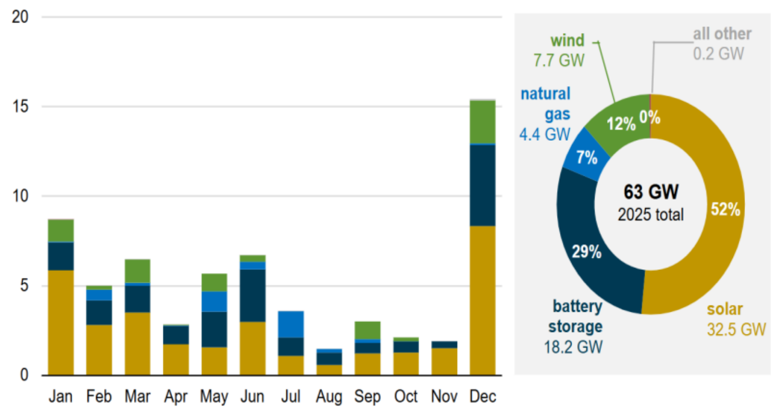
Climate & Energy data at a glance

Graph 1: Africa LNG supply potential by project status



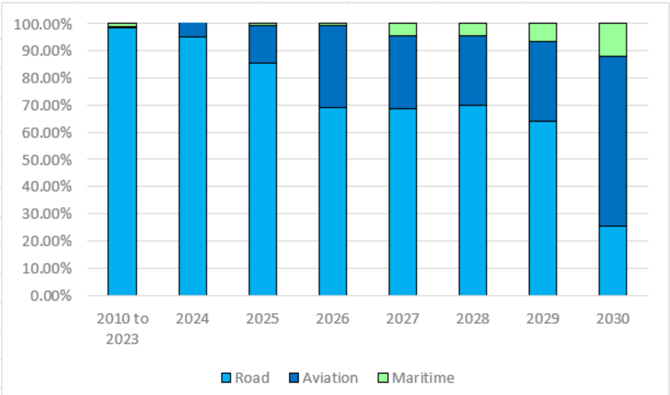
Source: Wood Mackenzie.

Graph 2: US planned utility-scale electricity-generating capacity additions (2025) in gigawatts



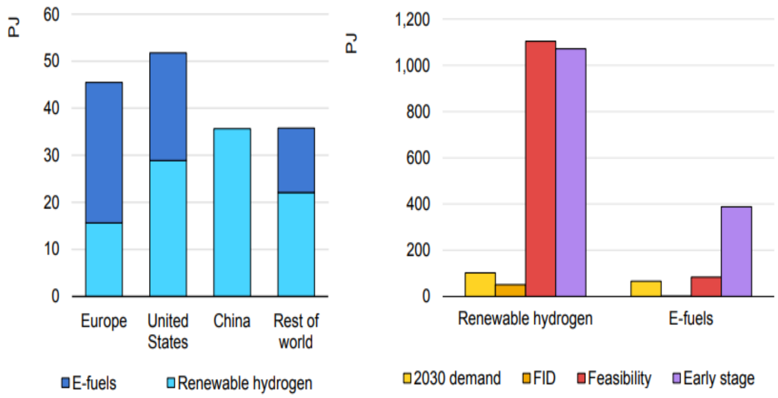
Source: US energy information administration Feb 24, 2025.

Graph 3: Annual liquid biofuel demand growth share by sector, 2023-2030



Source: IEA, Renewables 2024.

Graph 4: Renewable hydrogen and e-fuel demand (left), and capacity dedicated to transport (right), 2030



Source: IEA Global Hydrogen Review 2024.

The emerging energy triangle: How Senegal, Mauritania, and Mozambique are reshaping global gas markets

"GTA First gas flow is a material example of supporting the global energy demands of today... Africa's significance in the global energy system is growing, and these nations now have enhanced roles to play"

Gordon Birrell, EVP of Production & Operations at BP – 2 January 2025

Gas discoveries in Senegal, Mauritania, and Mozambique are transforming the global energy landscape, positioning these African nations as significant players in the liquefied natural gas (LNG) market, see **graph 1**. The Greater Tortue Ahmeyim (GTA) project in Senegal and Mauritania, led by BP and Kosmos Energy, aims to produce 2.5 million tonnes per annum (MTPA) initially, with plans to double output. This project is expected to boost local economies through job creation, infrastructure development, and export revenues[9]. Meanwhile, Mozambique's Rovuma Basin holds over 180 trillion cubic feet of recoverable gas reserves, with major LNG projects led by ExxonMobil TotalEnergies, and Eni targeting substantial annual production[11].

Geographically, Senegal and Mauritania's Atlantic access positions them to supply Europe, which may reduce its dependence on Russian gas and other LNG sources. The GTA project's proximity to European regasification terminals and low break-even costs enhance its strategic importance. In contrast, Mozambique's Indian Ocean location is ideal for supplying both Europe and Asian markets like China, Japan, and India. ExxonMobil and TotalEnergies are securing long-term contracts with Asian buyers, ensuring steady revenue streams[10].

Investment and geopolitical factors are crucial for these LNG ventures. Senegal and Mauritania have attracted significant foreign direct investment (FDI), while Mozambique has secured over $50 billion in commitments despite security challenges in the Cabo Delgado region. Political stability in Senegal and Mauritania fosters investor confidence. As the global energy transition progresses, these nations must balance fossil fuel developments with renewable energy initiatives to meet environmental, social, and governance (ESG) criteria. In recent years, investors increasingly prioritize sustainability and ethical practices, by integrating ESG factors into their financial strategies[12]. In fact,capital flow to "cleaner" fossil fuels. ESG frameworks favor lower-carbon options. As coal gets defunded, gas becomes more attractive, particularly when paired with methane leak reduction. Definitly, the success of these projects will depend on strategic risk management, continued infrastructure investments, and strong regulatory frameworks, potentially redefining Africa's role in global energy markets.

Impact of policy shifts on offshore wind energy in the United States

Will policy reversals derail America's offshore wind ambitions or reignite the push for clean energy leadership

The offshore wind industry in the United States is facing a period of turbulence following recent policy reversals under the Trump administration. One of the most impactful moves came in February 2025 when President Trump signed an executive order suspending new offshore wind leases and freezing the approval of pending projects. This decision, justified by the administration on economic and environmental grounds, has caused a sudden slowdown in offshore wind development[14]. A major consequence of this policy shift has been the stalling of more than 60 gigawatts of planned offshore wind capacity, delaying billions of dollars in investment. Companies such as TotalEnergies SE have put large-scale projects on hold, particularly those planned along the East Coast. With this regulatory uncertainty, many investors are re-evaluating their commitments, leading to financial strain on developers and disruptions in the supply chain[15].

Beyond financial concerns, the suspension of offshore wind projects has put thousands of jobs at risk, particularly in sectors related to construction, engineering, and maintenance. Many industry experts warn that this shift could erode investor confidence, prompting capital to flow toward European and Asian markets instead of the U.S. The economic consequences could be severe, with delays in job creation and weakened momentum for domestic clean energy manufacturing[16].

Moreover, these policy reversals jeopardize national decarbonization efforts. The previous administration had set ambitious targets, aiming to deploy 30 gigawatts of offshore wind energy by 2030 as part of broader climate goals. With the current freeze on new projects, states that had made significant investments in offshore wind, such as New York and Massachusetts, now face uncertainty in their clean energy roadmaps. If these restrictions persist, the U.S. may struggle to meet its emissions reduction targets, increasing reliance on fossil fuels[16]. The coming years will be crucial in determining whether the U.S. can regain momentum in offshore wind development or if it will cede leadership to other nations actively advancing their clean energy sectors, see **graph 2**[14].Despite recent setbacks, policy reversals may not sink U.S. offshore wind ambitions but instead ignite a clean energy showdown. States like New York are pushing back, and pro-renewable coalitions could emerge stronger. This moment will test the nation's resolve to stay on course toward climate goals amid growing political and economic pressure[14][16].

Focus: Rise of e-fuels and e-methanol as energy solutions

Synthetic fuels, the precursor to modern e-fuels, have been in development for over a century. Germany pioneered synthetic fuel production during World Wars I and II due to crude oil shortages, reaching 124,000 barrels per day by 1944 through the Fischer-Tropsch process and Bergius hydrogenation. Today, the urgency has shifted to combating climate change. The World Meteorological organization confirms 2024 as warmest year on record at over 1.5°C above pre-industrial level, yet progress toward net-zero emissions by 2050 remains slow[17]. While energy efficiency, electrification, and renewables dominate the transition, sectors like heavy transportation remain difficult to decarbonize, particularly maritime shipping, see **graph 3**.

E-fuels, especially e-methanol, offer a promising solution. Produced by capturing CO_2 and combining it with green hydrogen, they are carbon-neutral and compatible with existing engines and infrastructure. Their key benefits include:

- Drop-in compatibility : works with current fossil fuel systems.
- Scalability : suitable for shipping, aviation, and heavy transport.
- Energy storage : e-methanol enables easy storage and transport of renewable energy.

Both hydrogen and e-fuels offer solutions for achieving CO_2-neutral mobility. While hydrogen powers fuel cell vehicles, e-fuels can be used in traditional combustion engines, allowing the continued use of existing vehicle fleets and infrastructure. However, hydrogen transportation infrastructure remains less developed compared to that of e-fuels, see **graph 4**. The main challenge in scaling up e-fuel production is commercial viability. Producing green hydrogen and capturing CO_2 are expensive, and regulations like Europe's Delegated Acts could drive costs even higher by setting strict standards for renewable fuels of non-biological origin(RFNBO)[2]. While demand for low-carbon fuels exists, the cost of production remains much higher than what buyers are willing to pay. But is this the full picture?

The demand for E-fuel is at 22 EJ which is 5% of the global energy demand in industry, building and transport sectors, exceeding the total solar PV and wind generation in 2023[1]. Battery electric vehicles (BEVs) are twice as efficient as hydrogen-powered fuel cell vehicles. This means that to travel the same distance, a fuel cell vehicle requires twice as much renewable energy as a BEV – and nearly four times more if the vehicle runs on liquid e-fuels in an internal combustion engine[3]. As a result, a large-scale shift to hydrogen and e-fuels would significantly increase renewable energy demand. For instance, if half of all heavy-duty trucks were powered by hydrogen and the other half by e-diesel, their energy consumption in 2050 would be 151% higher than if they were directly electrified[3].

However, in sectors where batteries are not practical, such as aviation and shipping, hydrogen and e-fuels will be essential due to their higher energy density. However, hydrogen and e-fuels for transport beyond these sectors might not be the most logical approach. If pursued for road vehicles, it could prevent the economies of scale needed to bring the cost of EVs down, making the transition to electric mobility less cost-effective. That said, the environmental impact of green hydrogen and e-fuels depends entirely on their production methods. The only truly sustainable and scalable way to produce them is through 100% renewable electricity. However, supporting their production requires a significant increase in installed renewable capacity while ensuring that this expansion does not divert clean energy resources from other critical sectors.

In the realm of hydrogen and e-fuel advancements, Germany is making significant strides. The AquaVentus project is leading Europe's offshore wind-to-hydrogen efforts with a 10 GW electrolyzer capacity goal by 2035. Expected to generate over 1 million tons of green hydrogen annually, the initiative will power up to 10 million households and decarbonize industries such as steel and chemical manufacturing[6]. Its €30 billion investment includes AquaPrimus, integrating electrolysis into turbines, and AquaDuctus, a pipeline set to transport 1 million tons of hydrogen per year, replacing an estimated 12 million tons of CO_2 emissions annually, equivalent to reducing Germany's industrial carbon footprint by 8%[6]. Germany is also at the forefront of e-fuel and e-methanol production. INERATEC is leading the development of industrial-scale e-fuel production with its upcoming Frankfurt facility, set to produce up to 2500 tons of e-fuels annually. The plant will utilize green hydrogen and captured CO_2 to create sustainable aviation fuel (SAF), e-diesel, and e-gasoline, reducing reliance on fossil-based fuels in aviation, shipping, and road transport. By integrating power-to-liquid (PtL) technology, this project aims to cut over 10,000 tons of CO_2 emissions per year, supporting the decarbonization of the mobility sector[5]. Meanwhile, Hy2gen's BECCS-M project, designed to be a carbon-negative e-methanol production facility. Using biomass energy with carbon capture and storage (BECCS), this initiative will remove more CO_2 than it emits, providing an estimated 500,000 tons of e-methanol annually. This production will primarily target the shipping and aviation sectors, helping reduce the global maritime industry's emissions by up to 1.5 million tons of CO_2 per year[8].

Germany's dual investment strategy in hydrogen and e-fuels demonstrates a commitment to net-zero goals, ensuring a mix of solutions for diverse energy demands. With €38 billion+ in combined investments, these projects could remove over 20 million tons of CO_2 per year, representing 5% of Germany's total emissions reduction target for 2030[6][5][8]. Where is the conclusion on to what extent should we use efuel/emethanol? As a conclusion, e-fuels and e-methanol should be strategically used in hard-to-electricity sectors,such as aviation and maritime shipping, where their high energy density offers clear advantages. However, their use in road transport should be limited, as it increases renewable energy demand and undermine EV cost reduction. Their large scale deployment must be paired with a rapid expansion of renewable electricity to ensure sustainability, e-fuels are a complementary solution, and not universal.

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