EU Climate Goals Are Hard To Reach Without Carbon Capture

By **Hunter Johnston and Jeff Weiss** (November 20, 2020)

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Decarbonization of the world economy presents many critical challenges. After early attention focused on production of electricity with renewable energy technologies, many policymakers are now considering how the world can reduce carbon emissions by using renewable and low-carbon feedstocks throughout the industrial sector.

The scale of this challenge ensures that it will take many years to accomplish — but in the meantime, there is an opportunity to immediately and substantially reduce the emissions profile of fossil fuels. This can be achieved through the wide-scale deployment of carbon capture, utilization and storage, or CCUS, technologies and products.

So-called blue fuels — fuels produced using CCUS — are increasingly available at scale, and can be readily deployed in the short term. As a consequence, they can make a major contribution to transitional decarbonization goals within the 2030-2050 timeframe.

That said, there are legal, commercial, regulatory and policy issues in the European Union, the U.S. and elsewhere that must now be resolved to fully support the deployment of CCUS technologies and products.

This is the second part in a four-part article about CCUS. This installment reviews key decarbonization developments in the EU. **The first part** of this four-part article discusses the need and new momentum for CCUS. The third part will look at the potential for CCUS and decarbonization in the U.S. The final installment will consider how the interests of multiple stakeholders may align around CCUS, identifies some issues that must be resolved and makes recommendations that may help promote global adoption of CCUS and decarbonized supply chains.

Decarbonization Policy in the European Union

The EU's 2050 Carbon Neutrality Commitment

Perhaps the most important global development related to adoption of carbon intensity standards is the European Green Deal, adopted in December 2019.[1] The Green Deal is a political commitment to make the European economy sustainable: specifically, no net emissions of greenhouse gases in 2050, which would make the EU the first climate-neutral region.

While the EU has set aggressive green economy goals, its failure thus far to more fully embrace blue fuels produced by CCUS, and related standards frameworks, may hinder achievement of the required carbon intensity reductions in major industries.

To implement its green commitments, the EU is considering several measures that could have massive implications for global trade and supply chains:

- A carbon border adjustment mechanism, or CBAM;

- Extending the EU Emissions Trading System, or ETS, to international aviation, shipping and buildings;
- Setting methane performance standards for natural gas and liquefied natural gas, or LNG, sold into the EU;
- Incentivizing the use of renewable energy through the 2018 Renewable Energy Directive, or REDII;
- Improving energy efficiency of EU building stock through renovation; and
- Replacing more fossil fuels with hydrogen and other low-carbon gases and liquids.[2]

Legislation to turn the political commitment of the Green Deal into a legal obligation, and to detail the steps needed to get there, is expected to be adopted in 2021. This new EU climate law would make the 2050 emissions target binding, and is also expected to set a 2030 target of a 55% or even 60%[3] GHG reduction from 1990 levels.

On Oct. 14, the European Commission released a strategy to reduce emissions of methane, a potent GHG, to help the EU meet its goal of cutting overall emissions 55% by 2030 and to net zero by 2050. As part of the plan, the EU challenges its trading partners to reduce methane emissions as well, vowing to explore the feasibility of imposing an import standard on the level of methane from gas exported to the EU.[4]

The commission also indicated that it will support the establishment of an international methane observatory, to compile data on countries' methane emissions and help buyers of fuels make informed choices.[5]

Some of these measures, which are currently in very early stages of development, will have implications for CCUS and renewable energy pathways that are not yet fully understood. For example, a methane standard could in effect create a two-tiered system of LNG according to carbon intensity, where less carbon-intensive green methane — produced entirely from renewable energy — and blue methane are valued more highly than grey methane produced by conventional means.

The implications of such a two-tiered policy were evident when the French government intervened in October to force a domestic company to delay signing a potential $7 billion deal with a U.S. liquefied natural gas company, over concerns that its U.S. shale gas was too dirty.[6] Although the U.S. company has plans to use CCUS to lower the carbon intensity of its LNG, the concerns over methane leakage were enough to put a stop to the transaction.

These concerns are causing an explosion of interest in how to decarbonize LNG in order to meet green ESG commitments. The nascent green LNG market is comprised of approaches to either reduce GHG emissions or offset GHG emissions associated with some or all of the LNG value chain — from upstream gas production and pipeline transportation, through to liquefaction, ocean transport, regasification and downstream use of the natural gas.[7]

Companies in the LNG value chain can reduce GHG emissions in a number of ways, including using biogas for feedstock; reducing emissions from upstream, pipeline and liquefaction facilities; using renewable energy to power their liquefaction facilities; and using CCUS technologies.

LNG sellers can offset their GHG emissions by purchasing offsets to compensate for all or part of their GHG emissions, or by engaging directly in activities that offset GHG emissions — e.g., afforestation or reforestation, or investment in renewable energy.[8]

Blue Hydrogen in the EU

Given the fact that almost all hydrogen is produced from methane or coal, the implications of a CBAM will be significant. If the use of hydrogen produced from methane is still permitted under a CBAM, the EU will need to specify a methodology to determine its carbon intensity, as well as the means by which gas exporters in the U.S. and the Russian Federation can demonstrate compliance with the requirements.

Blue hydrogen has been referenced as a transition fuel by the European Commission in meeting decarbonization objectives in a transition to green hydrogen. The commission has indicated that while the priority is to develop clean, renewable hydrogen, "in the short and medium term, other forms of low-carbon hydrogen are needed."[9]

Blue hydrogen is produced from natural gas, with CCUS technology capturing carbon dioxide that would be otherwise released by the process. Green hydrogen, in contrast, is produced by using renewable electricity to power an electrolyzer that splits the hydrogen from water molecules.

In its communication earlier this year on a hydrogen strategy for a climate-neutral Europe, the EU detailed some of its potential plans for use of blue hydrogen as a transitional fuel. The communication notes that it would need to implement an EU-wide regulatory system that would include:

> [A] common low-carbon threshold/standard for the promotion of hydrogen production installations based on their full life-cycle greenhouse gas performance, which could be defined relative to the existing ETS benchmark for hydrogen production. In addition, it would include a comprehensive terminology and European-wide criteria for the certification of renewable and low-carbon hydrogen possibly building on the existing ETS monitoring, reporting and verification and the provisions set out in the Renewable Energy Directive. This framework could be based on the full life-cycle greenhouse gas emissions, considering the already existing CertifHy methodologies developed by industry initiatives, in consistency with the EU taxonomy for sustainable investments. The specific, complementary functions that Guarantees of Origin (GOs) and sustainability certificates already play in the Renewable Energy Directive can facilitate the most cost-effective production and EU-wide trading.[10]

REDII is currently subject to a review in the EU. The first step of the review was through an inception impact assessment[11] that was submitted for public consultation from Aug. 3 to Sept. 21. The European Commission plans to publish a final impact assessment in the second quarter of 2021 before developing a formal regulatory proposal.

This review addresses potential needs for an amendment of REDII and defines among others, the following objective:

> Consideration of elements emanating from the Energy System Integration and Hydrogen strategies, where appropriate, including to foster electrification and renewable fuels such as green hydrogen. This could possibly include looking at the following elements:
>
> - Increase the deployment of renewables in the power, heating and cooling, and transport sectors;
> - Better use waste heat (for instance from industry or data centres) in a more "circular" energy system;
> - Better integrate renewables in buildings in the context of the Renovation Wave initiative;
> - Promote further development and use of renewable and other low-carbon fuels including advanced biofuels, synthetic liquid and gaseous fuels and hydrogen, in hard-to-decarbonize sectors such as industry and heavy duty transport, aviation and shipping, in synergy with the upcoming Strategy on Sustainable and Smart Mobility and related initiatives for RefuelEU aviation and maritime.

Even though the inception impact assessment only presents a very early snapshot of potential amendments to the REDII, low-carbon fuels are presented as a key tool in the transition toward green energies, particularly in the transport sector.

Blue Hydrogen, Ammonia and Methanol and the EU Emissions Trading System

Meanwhile, the EU's commitment to extend the ETS to shipping has its own issues with respect to blue hydrogen and the zero-emissions targets.

Because hydrogen is difficult to store and transport, many shipping companies are considering e-methanol and e-ammonia, fuels that are derived from a green hydrogen pathway, as the fuels of the future for shipping to comply with emissions targets.

However, estimates of the production costs and manufacturing capacity for such fuels, if produced from biomass, solar or wind, lead to the conclusion that products such as blue hydrogen and blue methanol may be far more viable alternatives to green products to meet decarbonization targets, due to scale and cost considerations.[12]

Nevertheless, many analysts see a bright future for the conversion of the shipping industry from high-carbon bunker fuels to green and blue fuels. Methanol and ammonia are considered to be leading candidates for new pathway fuels to meet EU target commitments.[13] Blue ammonia is being actively marketed by the Ammonia Energy Association as a major component of a blue fuels future.[14]

A recent article in Business Insider put it this way:
Lesser known but also extremely promising for the global energy transition, blue ammonia is another feedstock currently under development as part of emerging green energy schemes. Ammonia is a chemical compound that contains three hydrogen molecules and one nitrogen molecule, and, like hydrogen, it releases no carbon dioxide when burned in a thermal power plant. The blue ammonia itself can be used as a feedstock for sustainable hydrogen. As the "blue" part of the name would suggest, the ammonia itself is made using natural gas (and in some cases coal), but is still considered to be a greener form of energy production thanks to its potential for carbon capture and sequestration (CCS).[15]

The fast-changing dynamics of the low-carbon fuels market were further illustrated by the recent announcement of the first shipment of blue ammonia by Saudi Basic Industries Corp. to Japan, with support from the Japanese Ministry of Economy, Trade and Industry.[16]

And on Oct. 29, CF Industries Holdings Inc. — a leading global manufacturer of hydrogen and nitrogen products for clean energy, emissions abatement, fertilizer and other industrial applications — announced a commitment to green and blue ammonia and hydrogen as important contributors to meeting 2050 net-zero carbon commitments, specifically referencing the role of carbon capture and sequestration, as well as electrolysis, in developing low-carbon fuels.[17]

Blue Steel and an EU Carbon Border Adjustment Mechanism

In addition to blue hydrogen, blue ammonia and blue methanol, blue concrete and blue steel are often mentioned as major energy-intensive products which — if manufactured using CCUS — could lead to rapid decarbonization. The cement and steel industries present some of the greatest opportunities for avoiding emissions through the employment of carbon capture.[18]

The steel industry is a major emitter of carbon dioxide, accounting for 7% of global direct energy-related emissions. The International Energy Agency's Sustainable Development Scenario targets average direct CO_2 emissions intensity of steel production to decline 60% by 2050, with a 90% cut in emissions by 2070.[19]

The IEA has further stated that without targeted measures to reduce demand for steel where possible, and an overhaul of the current production fleet, CO_2 emissions are projected to continue rising, despite a higher share of less energy intensive secondary production, to 2.7 gigatons per year of CO_2 by 2050, which is 7% higher than today.[20]

Accordingly, the need for the CBAM — which will likely be applied to steel and cement — to support the manufacture of blue steel and blue concrete is critically important, since less carbon-intensive steel and concrete production is a requirement for the sustainable development scenarios identified by the IEA.

The European Commission is set to publish its legislative proposal for the CBAM in the second quarter of 2021.[21]

Potential Issues with EU Implementation of the Green Deal

Although the EU is moving quickly to establish green economy milestones and objectives, the EU's failure to date to fully embrace the need for blue products and measurement tools has stunted the development of blue product trade and the adoption of blue economy principles.

EU adoption of a policy to promote green feedstocks as the only qualified means to achieving emissions reductions, while ignoring the role of blue product pathways, is not supported by science or international sustainable development pathways, which demonstrate the need for CCUS in meeting emission reduction targets.

Members of the global scientific community — including the U.K.'s Committee on Climate Change, the UN Intergovernmental Panel on Climate Change and the International Energy Agency — agree that to realistically limit warming to 1.5 degrees Celsius by 2050, the EU will need to rely on CCUS.[22]

Global hydrogen production uses some 205 billion cubic meters of natural gas and 107 million tons of coal each year, and emits some 830 million tons of CO2 into the atmosphere, according to the IEA's Future of Hydrogen report.[23] To clean up those emissions will require major investment in CCUS as a start, while scaling up renewable resources for later stages of the process.

To date, Europe has no large-scale CCUS storage facilities. Meanwhile, a scale-up to an estimated additional 40 gigawatts of renewable energy production by 2030 will be required to meet the EU's production targets for fully green hydrogen, which increase from 1 million tons in 2025 to 10 million tons in 2030.

In sum, exclusion of blue hydrogen and other blue products from the global strategy to reduce carbon emissions would make little scientific or economic sense. Lower-carbon policies and objectives should be technology-neutral, in the sense that the market should determine, on a cost and scale basis, how best to achieve the required carbon intensity reductions in major industries.

There is also a need for the development of international standards to measure carbon intensity. For example, CertifHy is a standard and certification scheme being developed in the EU to guarantee that any hydrogen labeled as green actually has been produced with renewable energy.

The European Commission has referenced CertifHy as a potential basis for the common measurement of carbon,[24] and efforts are being made by other countries outside of the EU to harmonize their certification systems with CertifHy.[25] However, the development of standards needs to go beyond blue hydrogen, to include the full slate of blue products, and should be undertaken through an international standards development process.

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[1] The Green Deal Communication and its Action Plan are available at https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1596443911913&uri=CELEX:52019DC0640#document2.

[2] See also https://news.bloomberglaw.com/environment-and-energy/cleaning-up-lng-becomes-a-target-of-eu-in-blow-to-u-s-shippers?usertype=External&bwid=00000175-99a8-d8cc-ab75-9da92cca0003&qid=7006567&cti=LFVL&uc=1320012809&et=NEWSLETTER&emc=neve_nl%3A43&source=newsletter&item=read-button®ion=digest&access-ticket=eyJjdHh0IjoiTkVWRSIsImlkIjoiMDAwMDAxNzUtOTlhOC1kOGNjLWFiNzUtOWRhOTJjY2EwMDAzIiwic2lnIjoiRk1xa1dIR1RQWUxJcjNnNGZNRE1MWndhRHBRPSIsInRpbWUiOiIxNjA0NjYzOTk0IiwidXVpZCI6IklUUFViRmZ0VUtjS2Z2am4yN28rd3c9PVBYTGZBc09KdHVmd3JHSmhhZHk0YkE9PSIsInYiOiIxIn0%3D (discussing EU efforts to pressure global exporters of liquefied natural gas to reduce their greenhouse gas footprint as part of the Green Deal and as the bloc tightens its climate goals and looks to scale up innovative energy technologies such as hydrogen).

[3] As the European Parliament is calling for. See https://www.europarl.europa.eu/news/en/press-room/20201002IPR88431/eu-climate-law-meps-want-to-increase-2030-emissions-reduction-target-to-60.

[4] https://www.washingtonexaminer.com/policy/energy/daily-on-energy-us-lng-could-face-pressure-from-eus-new-methane-plans.

[5] https://ec.europa.eu/energy/sites/ener/files/eu_methane_strategy.pdf.

[6] See Politico 10/21/20, "French government blocks U.S. LNG deal as too dirty."

[7] https://www.forbes.com/sites/thebakersinstitute/2020/10/26/green-lng--a-pathway-for-natural-gas-in-an-esg-future/#2562386366e9.

[8] Id.

[9] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, "A hydrogen strategy for a climate-neutral Europe," COM(2020) 301 final, Brussels, 8.7.2020. Available at: https://ec.europa.eu/energy/sites/ener/files/hydrogen_strategy.pdf?utm_source=emailmarketing&utm_medium=email&utm_campaign=european_commission_announces_hydrogen_strategy_energy_systems_integration_strategy_and_clean_hydrogen_alliance&utm_content=2020-07-08&cid=ZhfSKdVyHkBPuOBOg9SXRatph6Ou3AfI6NtS8N7tDOIFlz5BhtM5M-xJX558ahT8lO8JS_gl6cGKs7Oq25Gj6Q (see page 5: "the use of fossil fuels and carbon capture is clearly distinguished from the idea of a renewable or non-emitting source. As a consequence, the development of hydrogen produced "using mainly wind and solar energy" is advanced as the priority. However, the communication highlights that "in the short and medium term, however, other forms of low-carbon hydrogen are needed, primarily to rapidly reduce emissions from existing hydrogen production and support the parallel and future uptake of renewable hydrogen"). See also: https://euobserver.com/environment/149719.

[10] Communication From the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Brussels 8.7.2020. Available at: https://eur-lex.europa.eu/legal-content/ES/TXT/?uri=COM:2020:301:FIN.

[11] Inception impact assessment on the Revision of Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources. Available at: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12553-Revision-of-the-Renewable-Energy-Directive-EU-2018-2001.

[12] See https://www.enapter.com/media-coverage/h2-view-exclusive-calculating-the-cost-of-green-hydrogen.

[13] Methanol Marine Fuel Overview, Sept. 2020. Available at: https://methanol.sharepoint.com/Shared%20Documents/Forms/AllItems.aspx?id=%2FShared%20Documents%2FADMIN%2FMI%20Templates%2FPPT%20Template%2FMethanol%20Marine%20Fuel%20Overview%20Sept%202020%2Epdf&parent=%2FShared%20Documents%2FADMIN%2FMI%20Templates%2FPPT%20Template&p=true&originalPath=aHR0cHM6Ly9tZXRoYW5vbC5zaGFyZXBvaW50LmNvbS86YjovZy9FUllFUzJBdzRtRkxueF9LVkMycVU4c0J0bGppd0tKZjBCSll4Q1JYMmNkTThnP3J0aW1lPTBNUjBDbnVOMkVn.

[14] https://www.ammoniaenergy.org/articles/technology-advances-for-blue-hydrogen-and-blue-ammonia/. With the addition of CCUS, blue feedstocks are expected to set the low-cost benchmarks for low-carbon storable energy commodities. Blue ammonia is very much included in this frame of reference, since CCUS could be applied to the CO2 waste stream from the Haber-Bosch process. But neither blue hydrogen nor blue ammonia are sure things; a variety of technical, financial, regulatory and social issues could stand in the way of their widespread adoption.

[15] https://markets.businessinsider.com/news/stocks/blue-ammonia-another-major-breakthrough-for-hydrogen-power-1029642337#.

[16] https://www.middleeastmonitor.com/20200929-aramco-announces-first-blue-ammonia-shipment-for-low-carbon-energy-future/?fbclid=IwAR0SJs1FBK8hD-QWs2PEMNbjtk6I8yi1yKFbKZAdUiAANSK5u7sn5mdn1zU.

[17] https://www.cfindustries.com/newsroom/2020/commitment-to-clean-energy-economy.

[18] See e.g. https://rhg.com/research/industrial-carbon-capture/.

[19] IEA Iron and Steel Technology Roadmap report, Oct. 8, 2020.

[20] Id.

[21] Commission 2021 work program. See https://eur-lex.europa.eu/resource.html?uri=cellar%3A91ce5c0f-12b6-11eb-9a54-01aa75ed71a1.0001.02/DOC_2&format=PDF.

[22] https://www.greentechmedia.com/articles/read/europes-green-hydrogen-revolution-is-turning-blue.

[23] https://webstore.iea.org/login?ReturnUrl=%2fdownload%2fdirect%2f2803.

[24] https://www.fch.europa.eu/page/certifhy-designing-first-eu-wide-green-hydrogen-guarantee-origin-new-hydrogen-market.

[25] https://www.ips-journal.eu/topics/environment/eu-mena-hdrogen-4723/.