CARBON CAPTURE COALITION

Environmental Benefits of Carbon Reuse

FEDERAL POLICY SUPPORT FOR CARBON REUSE

Carbon reuse, also referred to as carbon conversion, or its statutory term, utilization, is the reuse of carbon oxides (CO_2, or its precursor, CO) captured from industry, power, and directly from the atmosphere to produce valuable products. In 2018, Congress significantly restructured the federal Section 45Q tax credit with the enactment of the Furthering Carbon Capture, Utilization, Technology, Underground storage, and Reduced Emissions (FUTURE) Act. Among these changes were the inclusion of these utilization pathways (i.e. non-enhanced oil recovery) as a way to claim tax credit.

In the FUTURE Act, Congress broadly defines carbon utilization as the physical, chemical or biological conversion of captured carbon to produce a wide variety of products. This captured carbon can be reused as valuable products, such as low- and zero-emissions fuels, building materials, and other products that reduce greenhouse gas emissions as compared to incumbent processes or products.

The FUTURE ACT paired credit levels for carbon utilization projects with those of enhanced oil recovery at $35 per metric ton (see our 45Q Primer). These levels were increased in 2022 to $60 per metric ton for utilization of carbon captured from industry and power and to $130 per metric ton for carbon captured via direct air capture (DAC). **The tax credit is only available for the volume of carbon oxide demonstrated to be stored permanently as a carbon-based product or displaced compared to the incumbent product.** It is not awarded based on the total amount of carbon dioxide captured at the industrial or power source, rather is awarded based on the net carbon oxide emissions reduction of a particular utilization process or pathway.

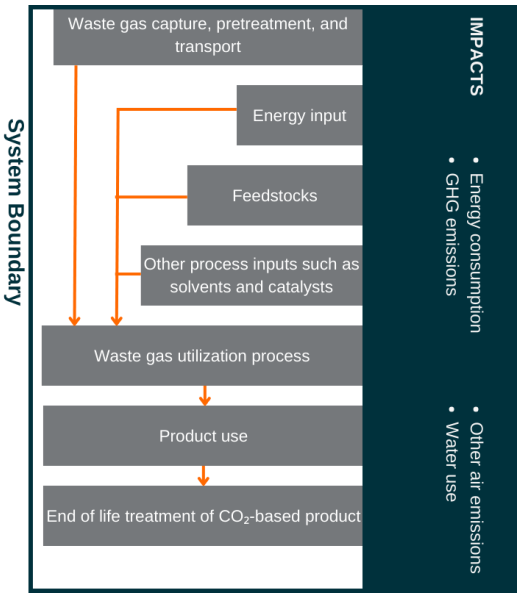

Figure 1: Processes Involved in a System Boundary of a Carbon Utilization Life Cycle Assessment (Adopted from the National Academy of Sciences)

HOW DO CARBON UTILIZATION PROJECT DEVELOPERS DEMONSTRATE THE SECURE STORAGE OR DISPLACEMENT OF CARBON OXIDES?

Utilization project developers intending to claim 45Q must perform a life cycle assessment (LCA) of the project through a professionally licensed independent third-party entity to demonstrate the displacement or storage of qualified carbon oxides. In early 2021, the U.S. Department of Treasury and the Internal Revenue Service (IRS) issued final regulations for claiming 45Q, including preliminary guidance for electing the tax credit for utilization projects. Taxpayers must submit their LCA using a standard format and use the National Energy Technology Laboratory (NETL)'s CO_2 Utilization LCA Guidance Toolkit for conducting the LCA of the end product. NETL guidance requires project developers to conduct a cradle-to-grave LCA that considers emissions associated from upstream emissions to downstream effects (see Figure 1). Claimants must submit the LCA report to the IRS and DOE. The IRS subsequently consults with the EPA and DOE and decides whether to approve a pathway application based on technical review and recommendations made by DOE.

CARBON-BASED PRODUCTS ARE NECESSARY FOR MODERN LIFESTYLES

Carbon-based materials are the building blocks of modern life and require feedstocks, of which fossil fuels readily provide the majority today. As a molecule, carbon dioxide's properties are responsible for its versatility and outstanding durability, and hence, ubiquity in essential materials. While low- and zero-emissions sources of energy will provide a transition opportunity for much of the economy to reach net-zero goals, the goods and materials we use daily will continue to rely on carbon-based feedstocks. Captured carbon oxides that reduce emissions at industrial or power facilities, or remove legacy carbon emissions from the air can be reused as feedstocks to produce a range of carbon-based products such as fuels for aviation and heavy transport, medical devices, plastics, building materials, and even the coatings and paints that protect other materials. For example, it has been estimated that carbon-based products such as aggregates, fuels, concrete, methanol, and polymers could displace 7 gigatonnes of CO_2 annually, the equivalent of approximately 15 percent of current annual global CO_2 emissions.

In addition to reducing emissions, certain carbon reuse applications have the potential to store carbon permanently, including concrete and polymers, ultimately preventing associated carbon emissions from entering the Earth's atmosphere. Even in products where captured carbon is not permanently stored, these materials can offset greenhouse gas emissions by displacing traditional sources of carbon. If the carbon feedstock is removed from the atmosphere, the resulting products can be climate neutral or even provide net-negative emissions, depending on the full product life cycle.

Bottom line: Carbon utilization projects have enormous potential for substantial climate and economic benefits.

Utilization Market	Carbon Based Product	Annual Market Opportunity by 2050	Annual CO_2 Utilization Potential (Million tonnes)
Building Materials	Concrete	-	100 – 1400
	Precast concrete	$623 – 666 billion	24 – 1300
	Aggregate	$182 – 337 billion	1000 – 9500
Fuels	Liquid fuels	-	1000 – 4200
	Jet fuel	$5 – 1849 billion	14 – 10,200
	Methane	$16 – 214 billion	260 – 4,400

Figure 2: Estimate of the annual market opportunity for carbon-based products and annual CO_2 utilization potential