STUDY

GHG Emission Intensity of Crude Oil and Condensate Production

> *ICF, commissioned by the National Ocean Industries Association (NOIA), has conducted a comprehensive analysis to shed light on the greenhouse gas (GHG) emission intensity of U.S. offshore oil production versus that of other oil-producing regions worldwide. The results are in, and they show that U.S. oil, especially that produced in the Gulf of Mexico, has significantly lower GHG emissions intensity than many other parts of the world.*

A Comprehensive Analysis of Global GHG Emissions

ICF conducted perhaps the most robust public analysis of various oil producing locations around the world. This study was able to address many of the common shortcomings of similar studies by looking at virtually all the world's oil production with a consistent scope and analytic method. The report includes:

- An "apples to apples" comparison of global GHG emissions for all global oil production;
- Emission profiles of 103 countries, including various U.S. and Canada producing regions, as well as other groupings such as OPEC and OECD nations;
- Analysis by type of hydrocarbon, covering 13 separate API Gravity classifications;
- Sensitivity analyses of methane emissions from the U.S. Gulf of Mexico, total U.S., Canada, and the rest of the world; and
- ICF estimates GHGs from each component of production, including drilling and completing wells, construction of production facilities, flaring and wellhead venting, oil stabilization, and storage tank fugitives.

23%

The reduced GHG emissions from U.S. oil production play a crucial role in the fight against climate change while ensuring energy is accessible and affordable. **According to ICF's estimate, if U.S. oil production were increased enough to offset foreign crude or condensate, it would result in a significant 23% reduction in the international carbon intensity for the displaced oil.** This translates to removing 5.7 CO2e kg/bbl from the global average of 24.4 CO2e kg/bbl. By harnessing the climate advantage of U.S. oil production, we can make meaningful strides towards reducing global GHG emissions.

46%

The Gulf of Mexico stands out as a region with an even greater climate advantage for U.S. oil production, with much lower carbon intensity compared to other oil-producing areas in the world. **According to ICF, if U.S. Gulf of Mexico production were to increase enough to offset foreign crude or condensate, the resulting reduction in carbon intensity would be significant: a 46% decrease in the international average carbon intensity for the displaced oil,** which is equivalent to removing 11.3 CO2e kg/bbl from the current global average of 24.4 CO2e kg/bbl. This underscores the critical role that U.S. oil production can play in addressing climate change while also improving energy accessibility and affordability

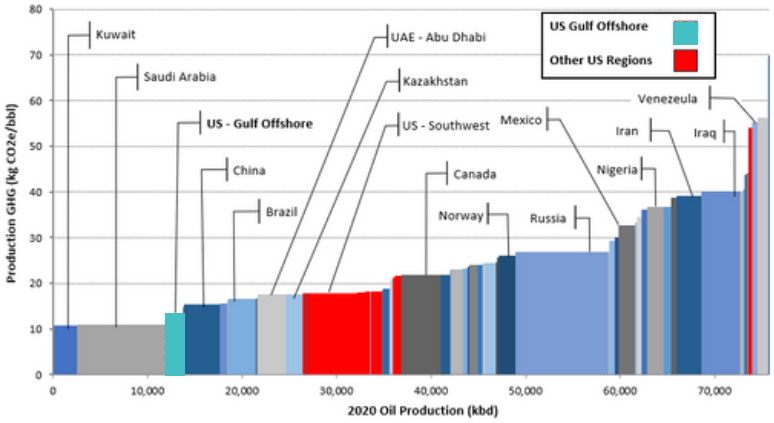
50%

The magnitude of the expected GHG reduction is even larger when increasing the production and use of the U.S. Gulf of Mexico's largest crude category (API Gravity 37.5) in place of similar crudes from outside of the U.S. and Canada. ICF estimates that the "real" difference of an increase would result in a 50% reduction in the average international carbon intensity for the displaced oil. This means 12.8 CO2e kg/bbl would be subtracted from the global average of 25.5 CO2e kg/bbl.

continued

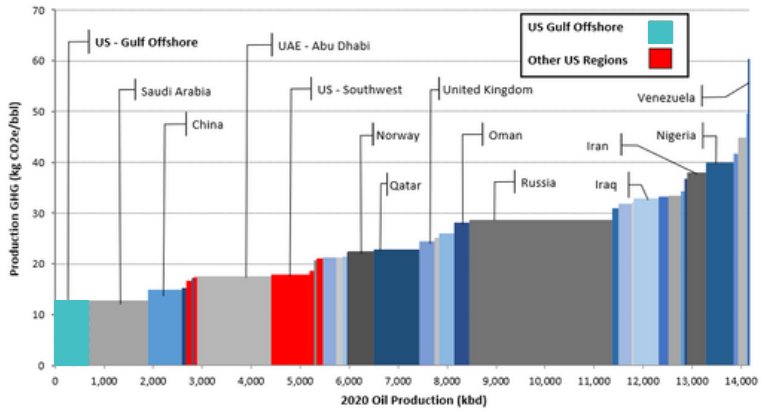
Comparison of Production Volumes and Production GHG Emission Intensity for Gulf of Mexico and Other US Regions and Other Countries Crude Oil across all API gravity categories

> *The quantity of oil for each US region and foreign country is indicated by the width of each rectangle. Worldwide production of this category of crude is 75.6 million barrels per day. The gray and blue rectangles are individual foreign countries.*



Comparison of Production Volumes and Production GHG Emission Intensity for Gulf of Mexico and Other US Regions and Other Countries Crude Oil in API 37.5 Category

> *The quantity of oil in the API 37.5 category for each US region and foreign country is indicated by the width of each rectangle. Worldwide production of this category of crude is 14.2 million barrels per day. The gray and blue rectangles are individual foreign countries.*



U.S. Gulf of Mexico Production and Lower Carbon Intensity Energy: *A Global Energy Solution*

The significant production volumes of offshore projects enable them to achieve average greenhouse gas (GHG) emissions that are considerably lower than the initial construction and development costs over the project's lifespan. Thanks to a spirit of relentless innovation, the U.S. Gulf of Mexico outperforms several other nations such as Russia, China, Brazil, Venezuela, Iran, Iraq, and Nigeria when it comes to production. Three key factors enable this remarkable achievement:

- Higher Well Productivity
- Less Energy Used Per Unit of Production
- Lower Methane Emissions

Innovation, Efficiency, Continuous Improvement, and Regulatory Oversight in the U.S. Gulf of Mexico

Due to the scale and level of investment, sophistication and technology, the U.S. Gulf of Mexico provides among lowest carbon barrels of oil when compared to other oil producing regions thanks in part to methane management. Methane emissions are tightly controlled for offshore operations and are very low when compared to other producing regions. Venting and flaring is directly regulated by the U.S. Department of the Interior. Companies are required to recover and sell all produced gas. Venting and flaring is limited to certain unique situations and is not authorized to exceed 48 hours without approval of the regulator. In addition, gas detection systems are deployed widely on facilities to quickly detect and address leaks. Through research, development, and demonstration, companies are deploying advanced technologies that include Forward Looking InfraRed (FLIR) cameras, drones, and advanced software systems.

Exhibit 3: Sensitivity Analyses of Methane Emissions and Methane GWP

Region	All GHG in Kilograms CO2e per Barrel of Oil (Year 2020)			
	Base Case (GWP=25)	Base Case CH4 Volumes but GWP=34	IEA CH4 Volume Multipliers for All Countries (GWP=25)	IEA CH4 Vol. Multipliers + GWP=34
US GOM	13.1	15.0	18.5	22.4
US Total	18.7	20.6	23.9	27.6
Canada	77.2	81.3	84.0	90.6
Rest of World	24.4	27.3	41.1	49.9
World Average	26.5	29.2	40.9	48.8
Gap Between GoM and World Average	**-13.4**	**-14.2**	**-22.4**	**-26.4**

Notes: Production only. Excludes crude transportation, petroleum refining, petroleum product distribution, dispensing and use.

ICF includes a sensitivity analysis of global methane emissions by incorporating different methodologies based upon different factors from other organizations. Under the other methodologies, U.S. production, especially in the Gulf of Mexico, perform much better relative to the global average in terms of emissions intensity even when estimated using different measurement methodologies.