

# USEA CCUS Roadshow Webinar

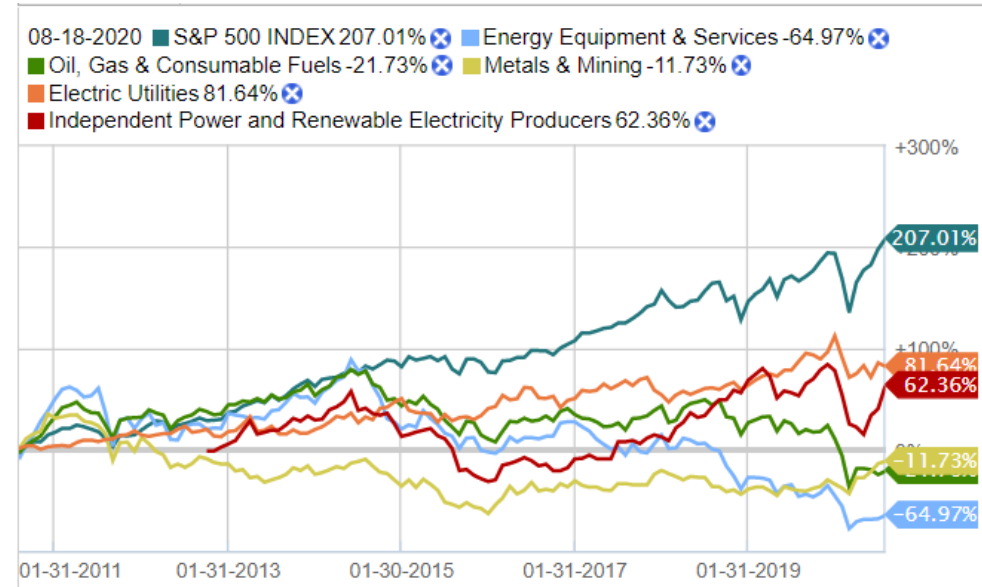
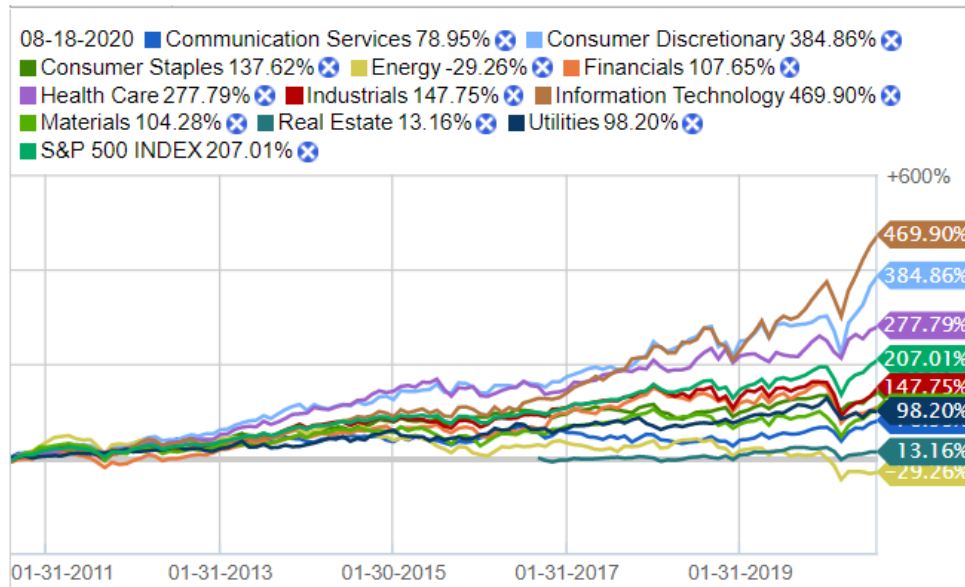
Nigel Jenvey, Global Head of Carbon Management

Gaffney  
Cline



# The energy sector performance for investors over the last 10 years...

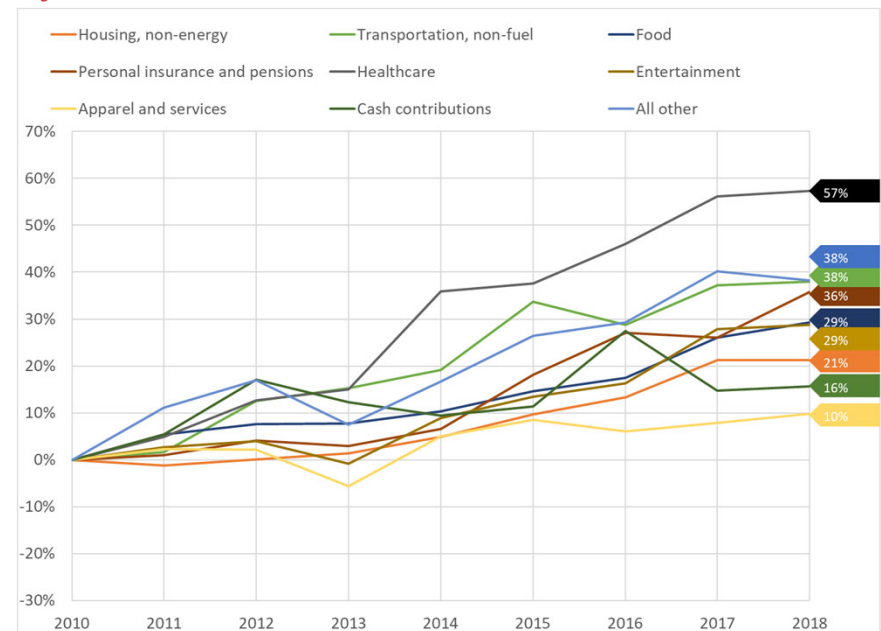
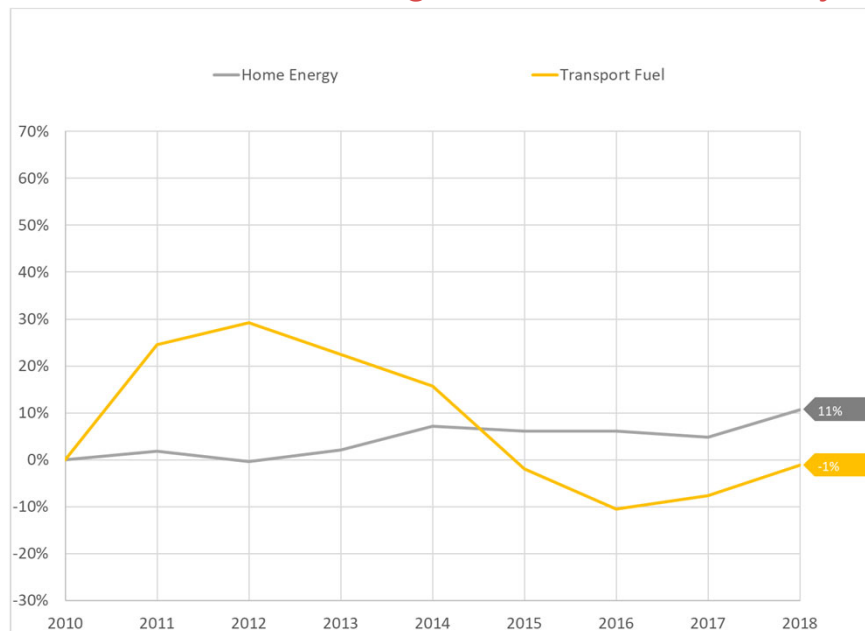
...has underperformed against other sectors due to commodity price cycles impacting returns



Fidelity

# However the U.S. energy sector performance for customers has been very effective to manage costs...

...but this is not recognized or rewarded by society



# Oil and Gas companies have new visions for the future...

...but is it enough to bring back the investors and maintain their social license?



Reduce net carbon footprint by 20% (2035) and 50% (2050)



Net zero target (2050), large structural reorganisation to achieve



Carbon neutral (2030), reduce net CI by at least 50% (2050)



Reduce CI by 40% (2040)



Carbon neutral for Scope 1 & 2 emissions (2030)



Carbon neutral (2030)



Reduce emissions by 52% per kWh of energy production (2030)



Target net zero on upstream operations (2030)

**Parliament pension fund cuts fossil fuel investments**

The Guardian, 24 Mar 2020

**CITING CLIMATE CHANGE, BLACKROCK WILL START MOVING AWAY FROM FOSSIL FUELS**

The New Yorker, 16 Jan 2020

**Norway's Government Pension Fund Global gets go ahead to divest \$13bn of investments**

The Guardian, 12 Jun 2019

**World Bank to end financial support for oil and gas extraction**

The Guardian, 12 Dec 2017

**European Investment Bank to phase out fossil fuel financing**

The Guardian, 15 Nov 2019

***Global Financial Giants Swear Off Funding an Especially Dirty Fuel***

The New York Times, 12 Feb 2020

**Danish pension provider ATP to halt fossil fuel investments via external funds**

Reuters, 04 Feb 2020

**JP Morgan to withdraw support for some fossil fuels**

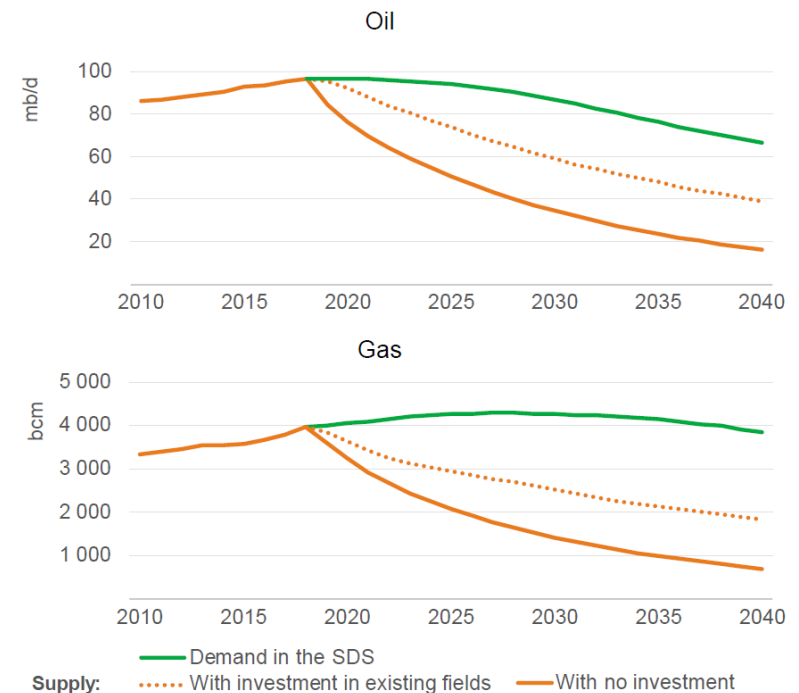
The Guardian, 25 Feb 2020

# Continued investment in oil and gas is needed through the Energy Transition...

...in both existing and new fields to offset natural decline

- Existing field production decline at ~8% per year is larger than any plausible fall in global demand
- However the type of resources, how they are developed and operated will need to be significantly different
- Markets will become increasingly competitive. Those with lower-costs and better environmental performance will benefit
- Large resource holders may attempt to gain market share while there is still scope to do so

Global demand in the SDS and decline in supply from 2019

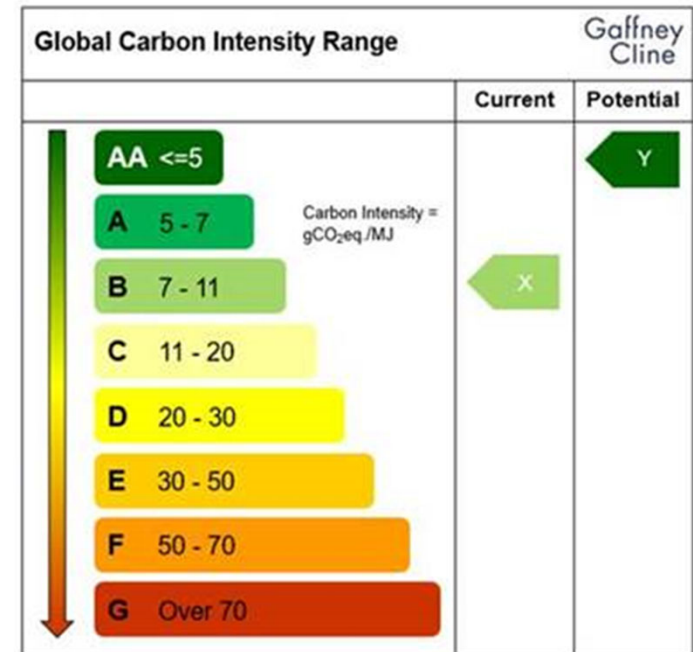


iea

# Carbon emissions from oil and gas supply are about 15% of global energy sector GHG emissions...

...but can vary considerably as not all oil and gas is created, developed or operated equally

- The global average carbon intensity (CI) of oil production is 10 gCO<sub>2</sub>e/MJ but this can be as much as 15 times higher, doubling the emissions from end-use combustion
- ~50% reduction in the average CI from oil and gas operations is required by 2030 for the IEA Sustainable Development Scenario
- Ratings for current and potential CI performance can clarify improvements (e.g. energy efficiency, methane management, and CCUS) and allow current/future benchmarking of assets, regions, portfolios and corporate performance





# Quantification and certification of Carbon Intensity is need to provide clarity...

...to improve societal acceptance, reduce investment risks and ease stranded asset fears

Science

ENERGY AND CLIMATE

**Global carbon intensity of crude oil production**

New data enable targeted policy to lessen GHG emissions

By Mohammad S. Masmoudi, Hassan M. El-Horjazi, Dominik Schwanck, Yungui Li, Jacob G. Engelender, Alhassan Indakshah, Jean-Christophe Mondert, James E. Anderson, Timothy J. Wallington, Josée A. Bergman, Deborah Gordon, Jonathan Kommy, Steven Prasanna, Inés L. Azevedo, Xiaotao L. Bi, James E. Duffy, Garvin A. Heath, Gregory A. Knecht, Christopher McGuire, D. Nathan Morahan, Sonia Yeh, Fengyi Yin, Michael Wang, Adam R. Brandt

Reducing transportation and refining crude oil into fuels such as gasoline and diesel accounts for ~12 to 40% of the “well-to-wheel” life-cycle greenhouse gas (GHG) emissions of transport fuels (1). Reducing emissions from petroleum production is of particular importance, as current transport fleets are almost entirely dependent on liquid petroleum products, and many uses of petroleum have limited prospects for near-term substitution (e.g., air travel). Better understanding of crude oil GHG emissions can help to quantify the benefits of alternative fuels and identify the most cost-effective opportunities for oil-sector emissions reductions (2). Yet, while regulations are beginning to address petroleum sector GHG emissions (3-5), and private investors are beginning to consider climate-related risk in oil investments (6), such efforts have generally struggled with methodological and data challenges. First, no single method exists for measuring the carbon intensity (CI) of oils. Second, there is a lack of comprehensive geographically rich datasets that would allow evaluation and monitoring of life-cycle emissions from oils. We have previously worked to address the first challenge by developing open-source oil-sector CI modeling tools (DICE2 (7, 8), supplementary materials (SM) 1,1). Here, we address the second challenge by using these tools to model well-to-refinery CI of all major active oil fields globally—and to identify major drivers of these emissions.

We estimate emissions in 2015 from 6066 upstream oil fields in 30 countries (SM 1,1,4,4). These oil fields represent ~99% of 2015 global crude oil and condensate production. This analysis includes all major reservoir classes (e.g., onshore/offshore and

wide scaling of an estimate for 2015 from the International Association of Oil and Gas Producers (based on datasets comprising 28% of global production with uneven geographical coverage). See SM 2 for explanation of the differences between our analyses.

Emissions shown in the first figure can vary substantially over time (9), but time-series data are generally missing for a global basis and are not explored here. In general, oil production declines with oil field depletion but is also accompanied by a substantial increase in per MJ GHG emissions due to use of enhanced recovery practices. Other factors (e.g., oil price, geopolitics) could also affect oil production and thus the temporal CI (9).

Gas flaring (burning) practices have a considerable influence on the CI. If not economically viable, this gas is either flared, rejected, or vented (directly emitting methane). The estimated share of flaring emissions in the global volume-weighted-average upstream CI is 12% (i.e., 2.2 g CO<sub>2</sub>/MJ). Flaring data are not widely reported by governments or companies, so for most regions, our analysis relies on satellite-estimated values computed using nighttime radiometry (SM 1,1,4 and 1,1,5,1,5). Some important conventional crude oil producers with above-average global CI, such as Algeria, Iraq, Nigeria, Iran, and the United States, are also among the top 10 countries in flaring observed via satellite. The contributions of routine flaring to the total volume-weighted-average CI of these countries are estimated herein to be ~41, 40, 36, 21, and 18%, respectively. Variability between flaring data sources results in greater uncertainty for countries with high contribution of flaring to their CI. Figure S27 shows that gas venting instead of flaring increases the estimated GHG emissions substantially (SM 1,1,4 and 2,1). However, currently there is no reliable remote-sensing technology for measuring gas venting.

As the major global producers of conventional heavy oils, Venezuela and Canada have high country-level CI. This is due to energy- and CO<sub>2</sub>-intensive heavy oil extraction and upgrading. Enhanced oil recovery by steam flooding contributes to high CI in other locations, such as Indonesia, Oman, and California (USA).

Although some giant North Sea offshore fields have above-average flaring per MJ (~4.7 and ~3.7), with country-level intensities ranging from 3.3 (Denmark) to 20.3 (Algeria) g CO<sub>2</sub>/MJ, Carbon dioxide and methane contribute on average 60% and 24% of total CO<sub>2</sub>-eq. emissions, respectively (SM 2,2). The total petroleum well-to-refinery GHG emissions in 2015 are estimated to be ~17 Gt CO<sub>2</sub>-eq., ~7% of total 2015 global fuel combustion GHG emissions. This estimate of total emissions is ~45% higher than an industry

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**Factoring Greenhouse Gas Emissions in Upstream Portfolio Decisions**

BY FLORENT ROUSSET AND FERNANDO ROLLA

**Introduction**

The reduction of greenhouse gas (GHG) emissions has increasingly become a priority for the business community, including companies active in the oil and gas supply chain. According to the IEA, 13% of global energy sector and GHG emissions are associated with oil and gas supply, about 3,000 million tonnes (Mt) in CO<sub>2</sub> equivalent (CO<sub>2</sub>e). In Exploration and Production (E&P) activities, the majority of emissions are associated with the venting, flaring and fugitive emissions of natural gas, associated with the production of oil, which represent significant emissions into the atmosphere. While CO<sub>2</sub> and CH<sub>4</sub> have significantly different GHG impacts, their combined effects can be aggregated as a single unit measured in tonnes of CO<sub>2</sub> equivalent (TCO<sub>2</sub>e).

According to the World Bank, 20% of global emissions are currently subject to carbon pricing regulation, ranging from \$1 to \$17/TCO<sub>2</sub>e with an average of \$7/TCO<sub>2</sub>e. Even in jurisdictions where no such carbon tax is currently in effect, E&P companies are increasingly applying a cost to their future CO<sub>2</sub>e emissions, in order to factor into project economics a hypothetical cost associated with GHG emissions.

The purpose of the illustrative case study that follows is to demonstrate that factoring in the economics of GHG emissions from the initial decision points of new projects can yield significant value.

The first scenario presented here is intended to highlight the potential for the economic attractiveness of early stage investments to be materially impacted by the cost of GHG emissions. This in turn could result in increased effectiveness of investments, to deployed capital to other resource development. The second scenario is designed to highlight how the assessment of GHG emissions in development concepts can materially improve project economics and mitigate the lifecycle economic risks of such assets.

For the purpose of this illustrative case study, a more useful for exploration decision making has been utilized, namely, where there are a number of factors that are assessed in this context, the Expected Monetary Value (EMV) is one of the most commonly used metrics for evaluating exploration opportunities.

**Methodology**

In this study, an illustrative exploratory offshore oil project was designed to assess the impact of applying a carbon price to emissions on the EMV. Two scenarios were considered, one where the development concept, should a discovery be made, would entail flaring all of the associated gas and the other where all of the associated gas would be re-injected in the reservoir.

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PETROLEUM ECONOMIST

Independent Analysis For Energy Leaders



Alastair O'Dell  
Senior Editor  
5 February 2020

## Carbon audits to ease stranded asset fears

The calculation of carbon intensity can be the starting point for making even seemingly uneconomic fields viable

The oil and gas industry would benefit from having a standardised method of calculating carbon intensity to support its investment decisions and smooth relations with financiers, investors and regulators, according to an industry authority on carbon management.

The traditional model of reserve-based lending, where a company's value and ability to borrow money is predicated on the estimated future value of its reserves, will increasingly be impacted by views of assets' carbon footprint in a world with a finite carbon budget, according to Nigel Jenney, global head of carbon management at consultancy Gaffney, Cline & Associates (GCA).

In order to ensure the quality and independence of reserve estimates, third-party assessments have long had a role. "The same is now going on with emissions, as they become important indicator in the assessment of a company's value," he says.

Some hydrocarbon sources, such as Canadian oil sands, have attracted a negative public perception due to their perceived carbon intensity

Once carbon risk—in particular, the risk of future legislation and regulation making a field uneconomic—certain oil and gas discoveries can appear to become stranded assets.

"But it is not as simple as that," says Jenney. "There are a lot of solutions that can be applied to counter original perceptions. That is really what we are trying to do—to derisk continued oil and gas investment during the energy transition."

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