Commentary: US budget bill may help carbon capture on track

12 March 2018

quarters of the CO2 capture capacity built in the last decade and operating today has been on hydrogen production, gas fermentation (Photograph: Shutterstock)

The authors of this commentary are IEA Energy Technology Analysts Simon Bennett and Tristan Stai

The 2018 US Budget Bill, passed by the House and Senate in mid-February, will shape funding for er for the next decade. Alongside the extension of renewable tax credits and credits for energy efficien cells, the bill contains a provision that could provide the first significant stimulus to the global fortur for several years. It is an example of how relatively small policy incentives can tip the scales towards the infrastructure and industrial conditions are already in place, as the United States is leveraging ar pipeline network for enhanced oil recovery (EOR).

The Budget Bill aims to stimulate investment in carbon capture by expanding incentives to compani captured CO_2 and reduce emissions as a result. It raises the existing so-called "45Q" tax credit for st permanently underground from USD 22 today to USD 50 in 2026. The figure below shows the level c different combinations of CO_2 sources and uses.

Level of credit available for different combinations of CO_2 sources ar

IEA Analysis

Type of CO_2 storage/use	Minimum size of eligible carbon capture plant by type ($ktCO_2$/yr)			Relevant level of tax credit in a give (USD/tCO_2)					
	Power plant	Other industrial facility	Direct air capture	2018	2019	2020	2021	2022	2023
Dedicated geological storage	500	100	100	28	31	34	36	39	42
Storage via EOR	500	100	100	17	19	22	24	26	28
Other utilisation processes[1]	25	25	25	17[2]	19	22	24	26	28

[1] each CO_2 source cannot be greater than 500 $ktCO_2$/yr

[2] Any credit will only apply to the portion of the converte shown to reduce overall emissions

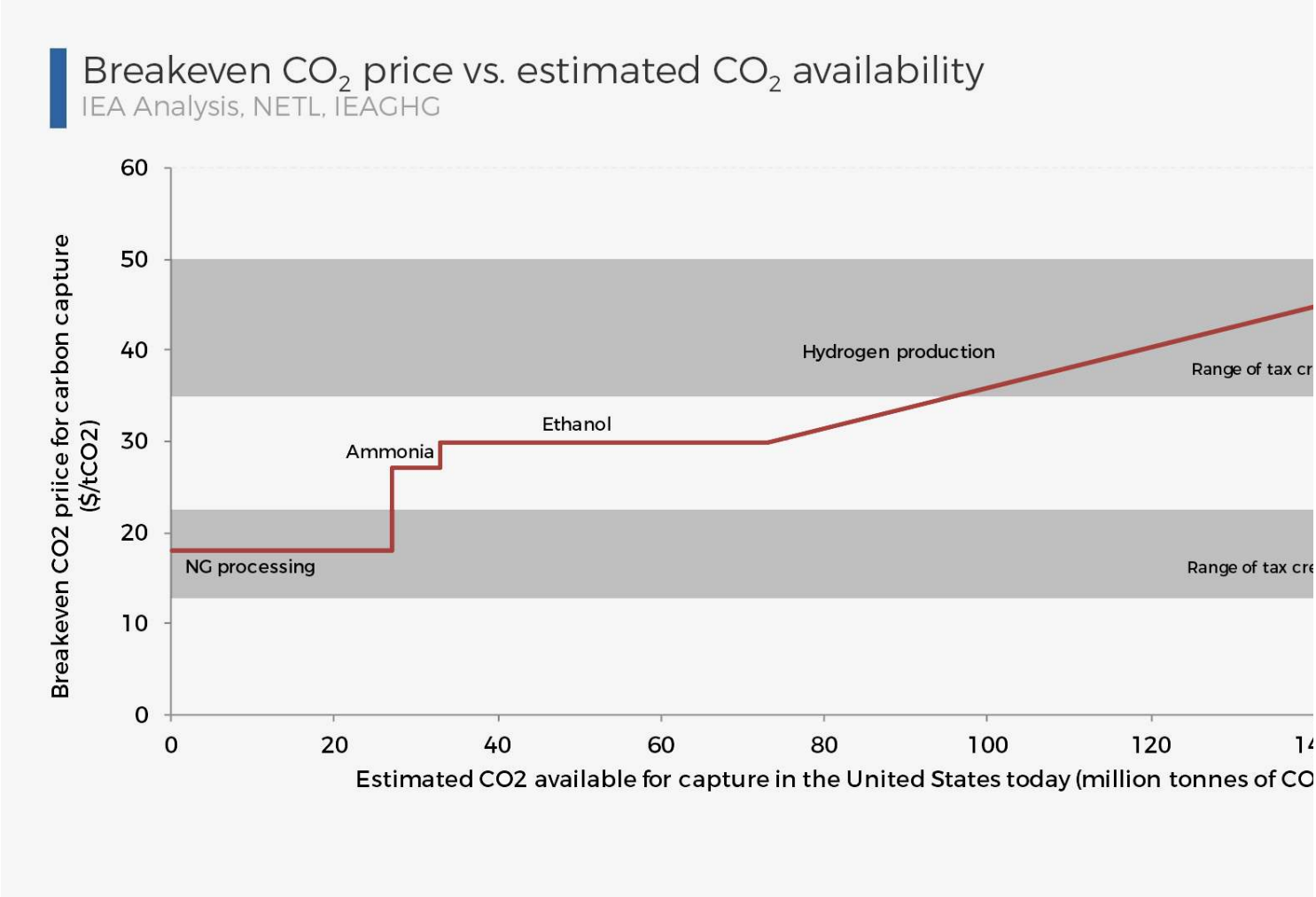
IEA analysis suggests it could trigger the largest surge in carbon capture investment of any policy ins Based on the above levels of revenue support for commercial carbon capture projects, we estimate could lead to capital investment on the order of USD 1 billion over the next six years, potentially adc tonnes or more of additional CO_2 capture capacity, potentially increasing oil production by 50 to 10(per day. This would increase total global carbon capture by around two thirds and, by incentivising i lowest-cost projects, could be cheaper than projects already operating around the world. The annua taxpayer by 2026, supporting CAPEX and OPEX, would be under USD 800 million.

Carbon capture refers to the separation of carbon dioxide (CO_2) from industrial processes before it can be released to contribute to climate change. It is a key part of the climate change mitigation toolbox because it can tackle emissions s other technologies are out of the lab and commercially available. These include industrial processes for production of range of fuels, from gasoline to bioethanol and hydrogen. By retrofitting carbon capture to existing polluting facilities they have the option of continuing operation with lower emissions, potentially overcoming political and economic obs transformation.

Of course, something must be done once the carbon is captured. Very large volumes can be injected deep undergrou for the long term. CO_2 can also be trapped underground while being used in enhanced oil recovery (EOR), for which 6 purchased each year by the oil and gas industry and injected into oil fields to increase their productivity. Today, 80% o natural underground CO_2 deposits and its use has no beneficial impact on greenhouse gas emissions reduction. Using would otherwise have been emitted instead of natural CO_2 therefore gives an environmental benefit and, extending th oilfields. Besides EOR, smaller volumes of CO_2 can be purchased for economic use in chemical processes but may not emissions reduction as underground storage if the process is energy intensive or the final product is combusted, relea

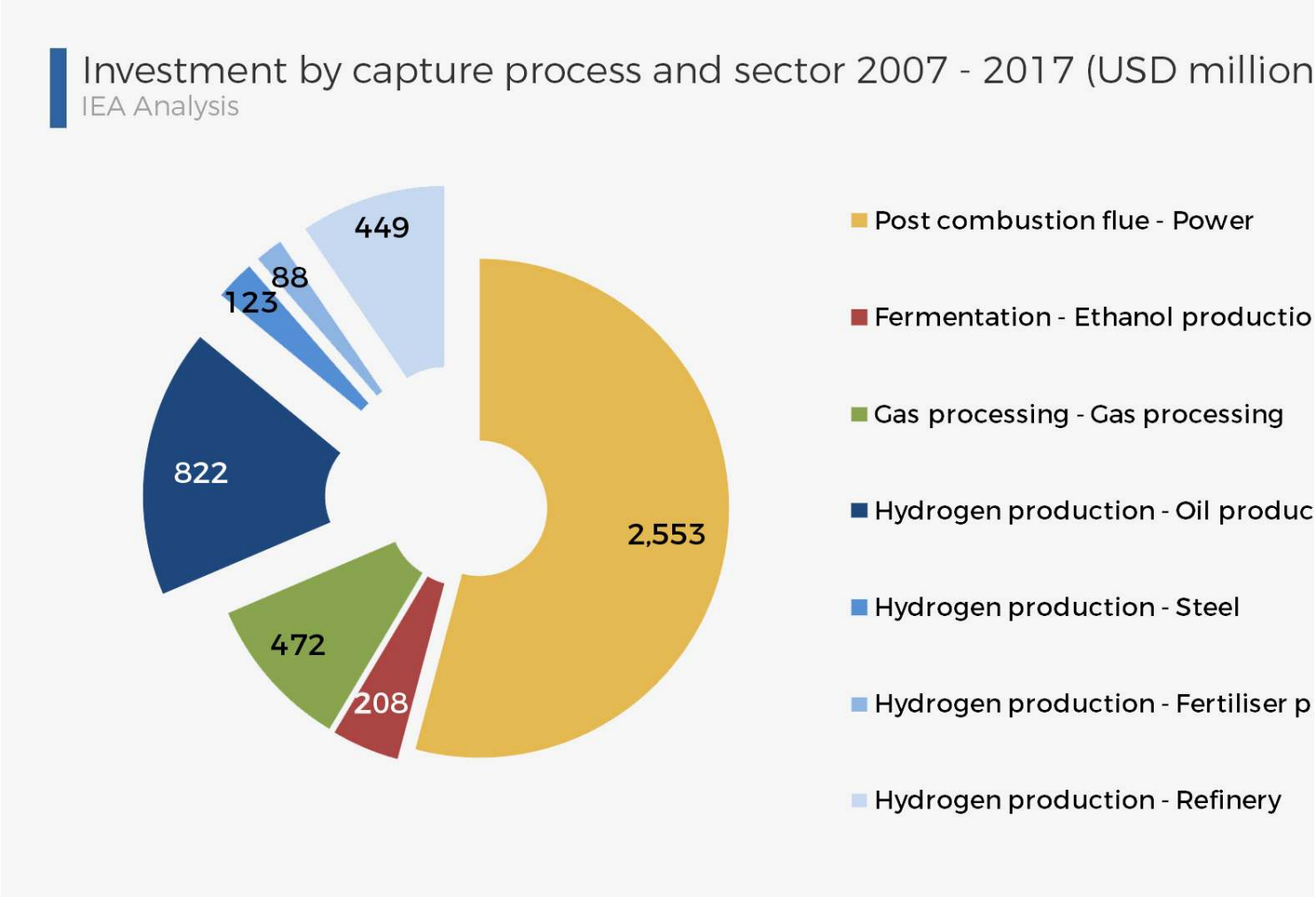
For achieving the goals set out in the Paris Agreement on Climate Change, any boost for carbon capture utilisation and be welcome. The IEA recently noted that there has been a slump in new projects, with no new projects in the pipeline has been a clear leader accounting for around half of the total investment in CCUS in the decade to 2017.

The biggest opportunities are likely to be in the capture of CO_2 from hydrogen plants at refineries a processing facilities. Along with hydrogen production at fertilizer plants and bioethanol mills, these cost sources of CO_2 at large scale and, unlike the fertilizer and bioethanol industries; they tend to be existing CO_2 pipelines for transporting CO_2 to oilfields. In general, the lowest cost opportunities for via CCUS reflect the concentration of CO_2 in the flue gases.



Represents estimates of breakeven costs today for average facilities in the US.

Deployment of new carbon capture facilities in these sectors would reflect experience to date. Three capture capacity built in the last decade and operating today has been on hydrogen production, gas ethanol fermentation, all high purity sources of CO2. This represents almost half of all investment in last decade, providing a strong indication of the sectors for CCUS that are favoured by the market. T tonnes of CO2 are captured today from large industrial sources, 87% of these are used for EOR, of w US.



The overall impact of the 45Q tax credit on stimulating a more sustainable CCUS industry will depen uncertain factors. We think the following factors are mostly upside risks:

1. CO2 demand for EOR

   Our estimate of the impact of the tax credit assumes that neither CO2 demand nor supply are factors. The 45Q incentive should reduce the price of CO2 from carbon capture facilities to a le from natural CO2 deposits and unlock demand that is currently limited by the constraints on n these constraints into account, the shift of the supply curve resulting from this price reduction any future EOR growth is based on captured CO2, not further production of natural CO2 that is harmlessly underground. From the supply side, it seems feasible that the construction of carbo could ramp up quickly enough by 2024 to meet much of this demand as long as CO2 offtake co extensions can be put in place to trigger investment. Ultimately, however, this will depend on t oil price – which is currently below the level needed for some, but not all, EOR projects – and th capital between light tight oil plays and EOR at mature fields.

2. CO2 demand for non-EOR uses

   While the new legislation opens up the tax credit to industrial uses of CO2 – and, by changing t industrial uses of carbon monoxide (CO) – the extent of uptake from these businesses is uncer be limited. In addition to being in construction by 2024, three conditions need to be satisfied to

carbon oxide would have otherwise been released to the air; over 25 000 tonnes per year from capture facility must be converted to products; a life cycle assessment by the regulator must sh climate and the tax credit reduced accordingly if the benefit is lower than for long-term CO2 st

For carbon monoxide, which already has economic value as a fuel and chemical, we think the t high enough to divert much to new uses. For example, $35 per tonne of CO is around $12 per outbid the fuel value of CO. Using CO2 to convert hydrogen to hydrocarbon fuels could potent annual volume condition by 2026, to help overcome the difficulties with storing electricity as hy have a harder time with the life cycle assessment condition. Because the carbon is released wh burned, we foresee less than half of the tax credit (no more than $17) being available for such probably need to be combined with other incentives to kick start an industry (a price of €300 p suggested by German industry).

3. The speed with which dedicated CO2 storage sites can be developed

Given that it can take 5-10 years to develop a storage site, with considerable capital put at risk most CO2 captured to be used for EOR in the near term. Dedicated storage sites, particularly in CO2 pipelines or EOR production, may start to come on line as the tax credit approaches $50. (opportunities for using the 45Q tax credit is to capture CO2 from bioethanol plants, which are in the United States but emit CO2 of biogenic origin –as a result, storing this CO2 effectively pu atmosphere. Many of these plants are not near CO2 pipelines for EOR but the CO2 could be st underground and qualify for the higher level of tax credit, as at Decatur in Illinois. $22-52 is cer cover the levelised costs of CO2 storage over the long term, but the geology is not ideal in ever

4. Longer term developments

The level of credit rises over time, and then is inflation linked after 2026. As such, 45Q will have the next few years and investment will target carbon capture projects coming online in the mid higher level of tax credits will be available. Any electricity sector projects – such as coal or gas p not be expected until the second half of next decade and, even at USD 50, would be limited in additional policy measures. Policy measures that could combine with 45Q to significantly multi low carbon fuel standards, in discussion in California, and modifications to the treatment of pr and master limited partnerships in this area. For direct capture of CO2 from the air, which has in excess of $200 per tonne, a higher level of additional policy support would likely be needed. plans to remove carbon from the atmosphere will likely see 45Q as a “nice-to have”, rather tha market for guilt-free CO2. In a supportive move on the other side of the Atlantic, EU legislators 2018 to let fuels produced from hydrogen combined with CO2 count towards renewable policy CO2 is captured from ambient air.