OTHER UNCONVENTIONAL FOSSILFUELS

BELOW IS A QUICK SUMMARY OF SOME OF THE LESS WELL KNOWN UNCONVENTIONAL FOSSIL FUELS:

Enhanced oil and gas recovery (EOR/EGR); extra-heavy crude; deep water oil and gas; Arctic oil and gas; and geopressurised zones.

Enhanced Oil and Gas Recovery (EOR/EGR)

When conventional oil and gas deposits are exploited, only a certain amount can be extracted using drilling. A large percentage of the oil or gas remains underground. Enhanced oil and gas recovery techniques can be used to increase the amount recovered from the deposit. The terms enhanced oil or gas recovery are also used to refer to methods of extraction (such as fracking or steam assisted gravity drainage) of unconventional fossil fuel deposits (such as shale gas and tar sands).

Methods for increasing the amount of oil or gas recovered from conventional deposits include the injection of gases such as CO_2, nitrogen or natural gas, the injection of other chemicals to aid the flow of oil, heating the deposit, or injecting water. Microbial EOR involves injecting microbes into a deposit (or stimulating existing ones) which then enhance oil recovery by producing carbon dioxide, partially digesting the oil and/or plugging up pores in the rock.

EOR/EGR increases the amount of fossil fuel that can be recovered, and while this may be good news for oil companies its very bad news for the climate.

As EOR/EGR techniques require more energy, the resulting fuels have significantly higher lifecycle greenhouse gas emissions than conventionally produced oil and gas.[1]

EOR is sometimes used in conjunction with Carbon Capture Storage technologies (CCS – see separate CCS factsheet). CCS involves pumping CO_2 into underground storage sites, as a way of reducing emissions. However, the injection of CO_2 into oil fields is primarily about extracting more oil rather than a way of addressing climate change.[2] In addition the injection of CO_2 for EOR has been linked to earthquakes, which undermines the concept of CCS technologies in general, as earthquakes are likely to create fractures allowing the CO_2 to escape to the atmosphere.[3]

Many EOR methods also produce large amounts of brine (salty waste water), which can contain toxic and radioactive substances leached from the rock.

Over the next decade or so more fossil fuels are likely to be produced using EOR than through other unconventional methods. This is because the infrastructure is already there and EOR has better financial returns than other unconventional forms of fossil fuel production.

Extra-heavy crude

Extra heavy crude is is a dense, thick form of oil. It is similar to bitumen (see Tar Sands factsheet), but flows slightly more easily. Around 90% of the world's proven extra-heavy crude reserves are in Venezuela,[4] mainly in the Orinoco Belt. Venezuela's heavy and extra-heavy crude reserves are estimated at 220 billion barrels (220 Gb), giving it total oil reserves of 296 Gb, more than Saudi Arabia (265 Gb).

Extracting and processing extra-heavy crude requires significantly more energy than drilling and refining conventional crude oil. Removing it can require multilateral drilling or energy intensive 'in-situ' (in place) extraction techniques. It also needs to be upgraded, requiring further energy. As a result it has much higher lifecycle greenhouse gas emissions, estimated at 30.8 kg CO_2E/MMBtu*,[5] almost as much as the Canadian tar sands (estimated by the same study as 34 kg CO_2E/MMBtu), compared with conventional crude oil at about 18 kg CO_2E/MMBtu

*kg CO_2E/MMBtu is emissions in the equivalent weight in carbon dioxide per million british thermal units – it is a measure of a fuels greenhouse gas emissions per unit energy.

Mainly due to the huge investment and infrastructure required, as well as technical and political obstacles, Venezuela's extra-heavy crude resources remain largely unexploited. However, they have enormous value and are seen as vital to the future economy of Venezuela. The government and state owned oil company Petroleos de Venezuela have plans to expand production.

Heavy oil/crude is also sometimes included as an unconventional fossil fuel. It is more dense and viscous than conventional crude, but less so than extra-heavy crude.

Exploiting the world's heavy and extra-heavy crude resources would add an estimated 81 Gigatonnes of carbon to the atmosphere.[6]

Deep water oil and gas

Definitions vary as to what constitutes 'deep water' drilling. Anything at depths of greater than 500 feet (152 metres) used to be considered deep water, but the definition now refers to greater depths sometimes over 500 metres (1640 feet). Estimates of the amount of oil and gas in deep water fields also vary significantly. Energy giant Total puts the amount of oil and gas at 330 billion barrels (330Gb) oil equivalent – that's 7% of the world's oil and gas resources.[7] Others have estimated the amount of deep-water oil as being 150 Gb.[8]

Our thirst for energy is pushing oil and gas extraction to ever deeper waters, but working in these

Deepwater Horizon offshore drilling unit on fire

extreme environments involves significantly increased risks. The Deep Water Horizon platform spectacularly demonstrated this in 2010, when the failure of a blowout preventer resulted in a disaster that killed 11 workers, and caused the largest off shore oil spill in history resulting in massive environmental damage.

Deep water deposits can be found around the world, but there is a 'golden triangle' between the offshore regions of West Africa, Brazil and the Gulf of Mexico that holds the bulk of the deep-water resources.

Exploiting the world's deep water oil and gas resources would add an estimated 40 Gigatonnes of carbon to the atmosphere.[9]

Arctic oil and gas

It has been known for a long time that there are significant oil and gas resources in the Arctic but it has always been considered too difficult to exploit them due to the extreme conditions. However, things are changing: due to melting Arctic ice, high oil prices and energy security concerns (not to mention the huge profits to be made) several governments and companies now have plans to drill for oil and gas in the Arctic. The US geological survey estimated in 2008 that the Arctic's technically recoverable resources include 90 billion barrels of oil and 1,670 trillion cubic feet (47 trillion cubic meters) of natural gas.[10]

There are concerns that if an oil spill were to occur in the Arctic environment it could have a devastating impact. The logistical difficulties, sensitive ecosytems and lack of bacteria to digest and break down the oil mean that a spill in the Arctic could have significantly more serious consequences than in other locations.[11] [12] The extreme technical difficulties of Arctic oil exploration were recently demonstrated when, following a host of other problems, Shell's Arctic exploration rig, the Kulluk ran aground and Shells plans for 2013 had to be put on hold.

There are also various competing claims over countries' rights to extract resources from the Arctic, and fears that this may fuel military conflict in the future.[13]

There is a cruel irony at play in the Arctic: burning fossil fuels is warming the atmosphere, melting the ice caps and opening up access to yet more fossil fuels. Extracting them will cause further CO_2 emissions, warming the atmosphere even more. If we are to end this vicious cycle we must reduce energy consumption, move to renewable energy sources and leave the fossil fuels in the ground, in the Arctic and around the world.

Exploiting Arctic oil and gas resources would add an estimated 39 Gigatonnes of carbon to the atmosphere.[14]

Countries involved in development of Arctic oil and gas resources include: Norway, Russia, Denmark, Canada, US and China. Notable companies involved in Artic oil and gas include: Shell, BP, Exxon, Gazprom, Rosneft and Statoil.

Geopressurised Zones

Geopressurized zones are deposits of natural gas under very high pressure, found at depths of about 3,000 to 7,500 metres below the earth's surface either inland or under the sea. There is a particularly high concentration of geopressurised zones in the Gulf Coast region off the United States, which have been estimated to hold large gas resources.[15]

There has been some exploratory drilling of geopressurised zones, however, and due to the difficulties of extreme pressure and depth no commercial extraction has yet taken place. Despite the extremely large estimated global resources,[16] geopressurised natural gas remains an undeveloped energy source.

Shell's Arctic exploration rig, the Kulluk, after running aground in 2013

ENDNOTES

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