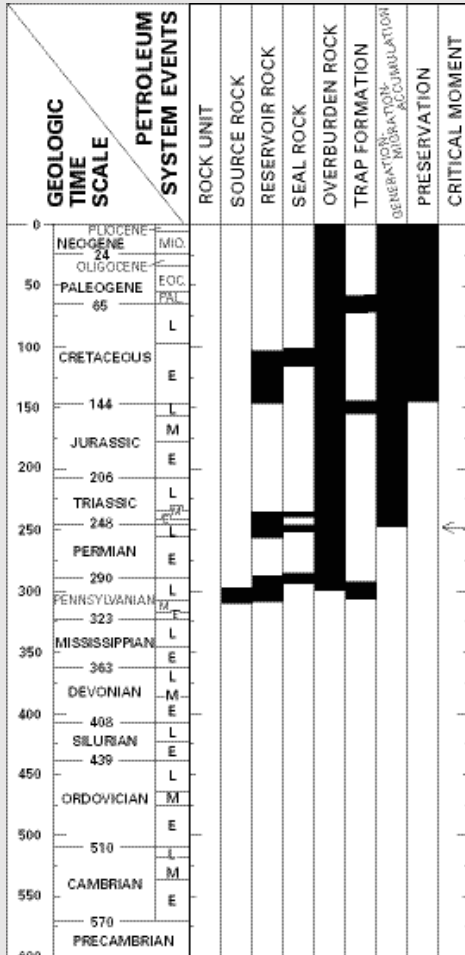


BRITISH OIL AND GAS AND THE FUTURE

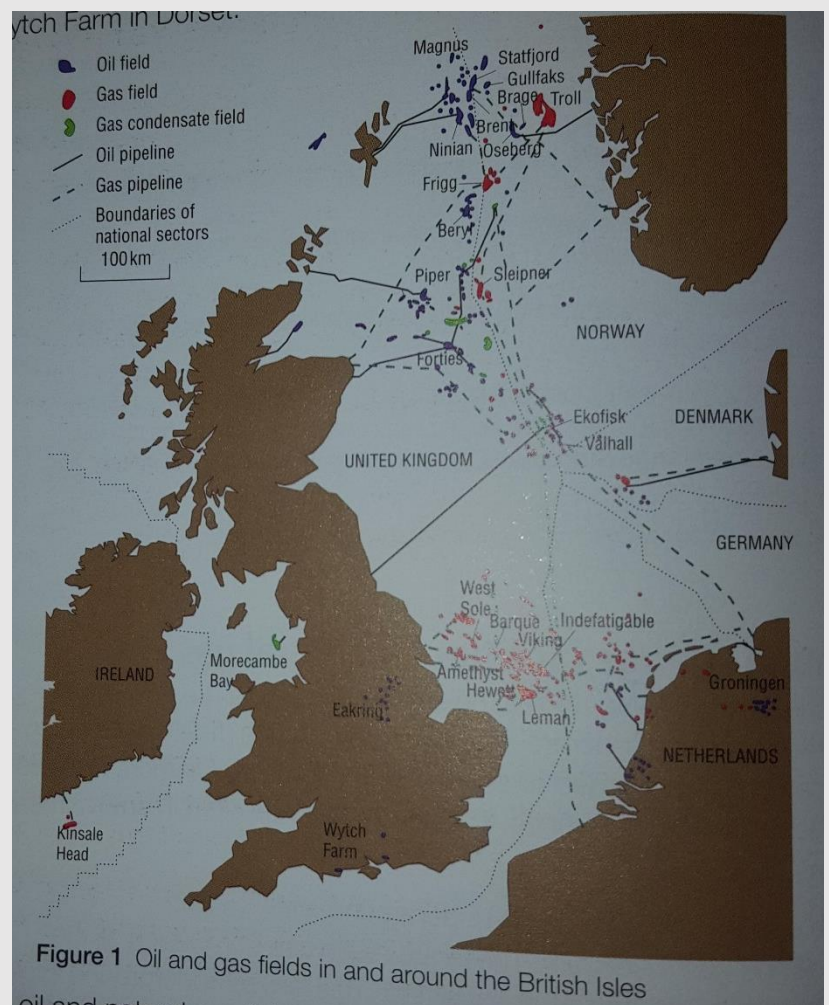
OIL AND NATURAL GAS IN AND AROUND THE BRITISH ISLES

- Most occurs in offshore areas, **particularly the North Sea.**
- Offshore gas fields** are also present in the **Irish Sea.**
- There are a number of **onshore oil/gas fields.** The largest of which is in **Dorset** (@ Wytch Farm).



Nearly **all oil and natural gas** fields in and around the **British Isles** are in the **Mesozoic and Cenozoic age sedimentary basins.**

It is the rocks older than this which are unlikely to contain **hydrocarbons** due to the effect of deep burial; **greater compaction** and temperatures in **excess of 200°C**. Moreover, there is a greater chance the rocks have experience tectonic movements which have **faulted** and released hydrocarbons.



North Sea oil was discovered first in 1960s and the first production well came into service in 1971. Conditions in the North Sea make extraction expensive. The rise in oil prices in the 1980s meant oil became more economic to extract. Depending on the depth of water and subsurface geology, an oil well offshore would have cost ~ £5 to £15 million to put into production during the 1998.

The North sea is a **shallow, continental ocean** which experience **crustal extension** when the Atlantic opened up in the **Mesozoic**. Faulting produced a number of **linear horsts and grabens** which **controlled sedimentation**. The North Sea is separated by a **ridge/high** that **trends east-west**, resulting in two sedimentary basins.

Characteristic	Northern North Sea basin	Southern North Sea basin
Fields	Gas and oil	Gas (and coal measures)
Main source rock	Jurassic Kimmeridge clays	Carboniferous coal measures
Main reservoir rocks	Marine sandstones and fractured chalk	Desert sandstone
Cap rocks & traps	Mainly clays with a variety of traps	Often evaporites. The traps are mostly salt domes with associated anticline.

SUSTAINABILITY

- **Renewable** = a resource that can be used over and over again because it is being replenished on a human timescale.
- **Non-renewable** = resources take millions of years to form and cannot be replenished on human timescale.
- **Sustainable development** = a method of progress that does not waste resources and looks after the needs of today without damaging the resources of the future.
- **Unsustainable** = resources are those used in a way that cannot continue into the future.

Fossil fuels are **non-renewable resources** that once combusted, are released as gases to the atmosphere which cannot be recycled on a human timescale.

As a result, the use of fossil fuels is ultimately **unsustainable**.

As reserves fall each year, the **production of oil and natural gas declines** steadily every year. New initiatives include the development of **underground gas storage facilities** to store **imported** gas. There is also the possibility of exploiting petroleum from **unconventional sources**.



UNCONVENTIONAL PETROLEUM

Unconventional sources: **oil shales, tar sands and coal-bed methane**.

Such methods have higher production costs so used to be uneconomical methods of production, but as global reserves decline, these methods are becoming more economical.

1. Oil shale is a general term for **any fine-grained sedimentary rock**, containing significant amounts of **kerogen**, that did not undergo enough **maturation** to produce petroleum. This oil shale can be processed by **injecting steam** underground to produce oil that can be pumped out. Alternatively, oil shale can be **processed chemically** above ground to form **synthetic crude oil**. Oil shale may also be burnt as a **low-grade fuel**.

The **Kimmeridge clay** is the richest oil shale in the British Isles. It was used in the 1850s in the Midland valley of Scotland with the oil being used in street lamps for Edinburgh.

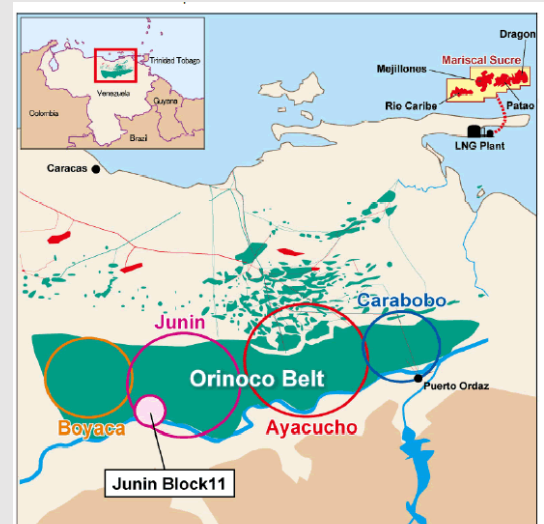
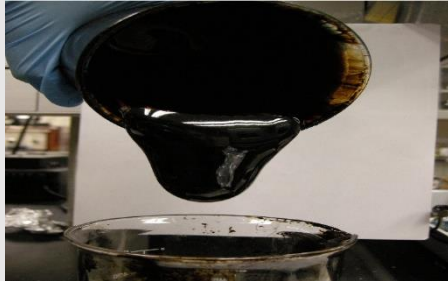


2. Large deposits of tar sands occur in **Canada and Venezuela**. The **Athabasca tar sands** of **Northern Alberta** (in Canada) cover an area of 141 000 km² with reserves estimated at 133 billion barrels, it should last for another 400 years (allowing for projected increase in production).

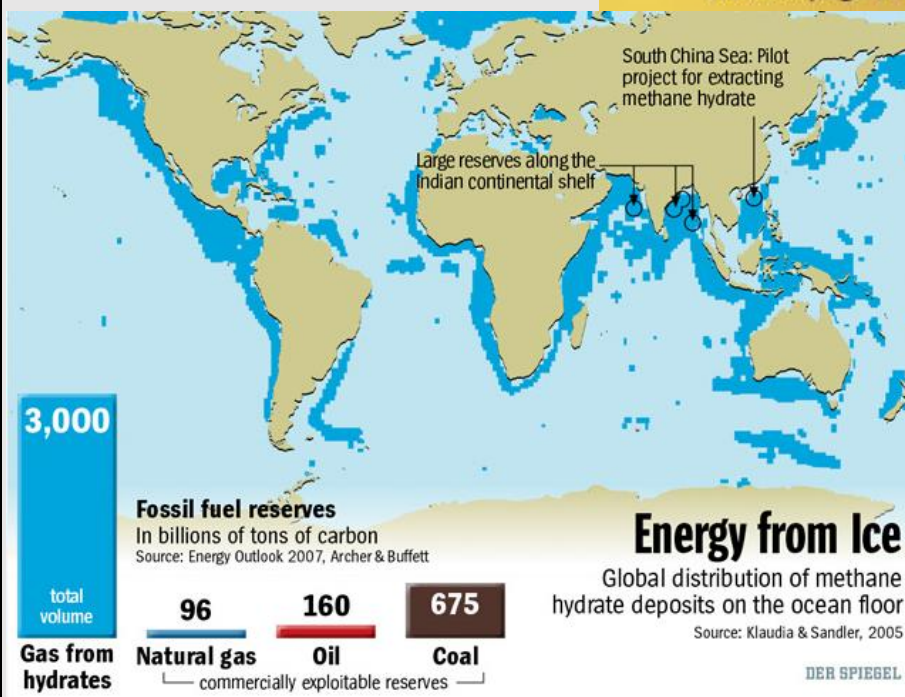
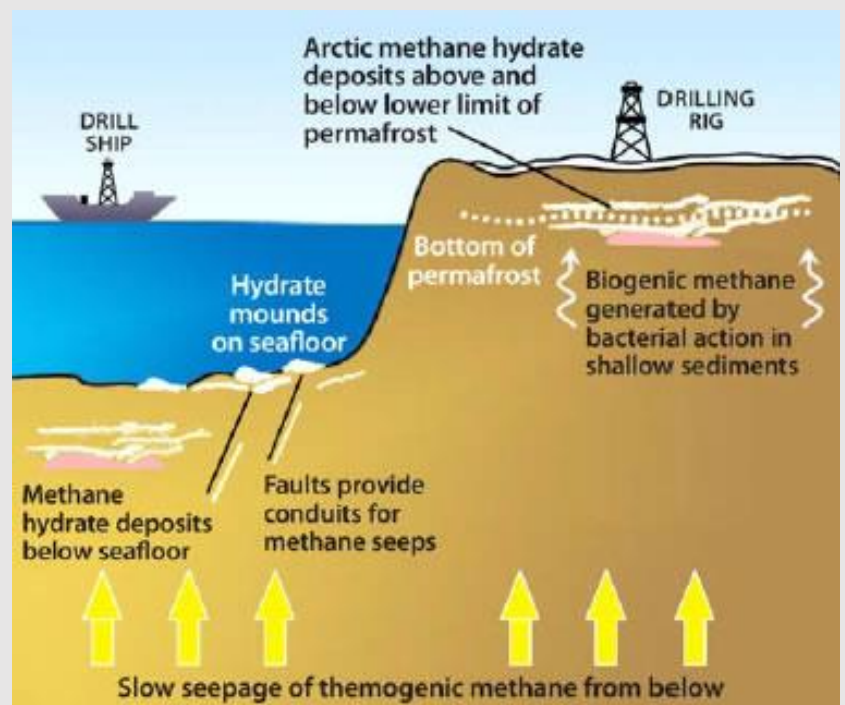
Environmentalists however point towards negative impacts already seen on the **Athabasca River** and the **increase in carbon dioxide** and other **greenhouse gas emissions**.



3. The Orinoco Oil Belt of Venezuela contains **90%** of known reserves of 'extra heavy' crude oil, which have a **lower viscosity than tar sands**. An emulsion of Orinoco oil and water called **Orimulsion** is burned in some British power stations despite environmentalist opposition.



4. Frozen gas hydrates present in **ocean floor sediments and permafrost** could also be a future energy resource. They produce large amounts of **methane gas when melted**. Methane hydrates are compounds with large amounts of methane **trapped in the crystal structure** of water, forming a solid similar to ice. They form by the migration of gas along geological faults from the deep, followed by precipitation or crystallization, on contact of the rising gas with sea water.



Wytch Farm is the largest onshore oilfield in Europe, with estimated reserves of 480 million barrels of oil, making it one of the top 10 UK oilfields. It comprises of 3 oil fields that underlie Poole Harbour, Dorset. The oilfield is operated by BP and has 103 wells which operate to extract a net of 50,000 barrels a day.

Oil is stored and extracted from reservoir rocks including Jurassic Bridport Sandstone and Triassic Sherwood Sandstone. The source rock is Lower Jurassic Blue Lias clay.

BP must adhere to strict environmental protection policies given that the oilfield is located in an area of natural beauty.

- They must give careful consideration to the siting of operations, some of which are on Furzey Island in the centre of Poole Harbour.
- They must employ landscaping and screening operations using trees.
- The air quality and ground quality must be regularly monitored.
- Ecology surveys are conducted to assess any environmental impacts made.

The policy is so effective that most people visiting Poole Harbour have no idea of the large scale operations of commercial oil exploitation going on beneath ground. The area remains a wildlife sanctuary for red squirrels, sand lizards, warblers, smooth snakes. Etc.

