Jam Tomorrow:

Unconventional Gas and Britain's Energy Future

A presentation/discussion on shale gas, coal-bed methane, gas "fracking" and the future of Britain's energy economy

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This presentation is about the gap which exists between the reality of our present energy situation, and the facts about present policy choices.

"The rule is, jam tomorrow and jam yesterday – but never jam today."

"It MUST come sometimes to 'jam today,'" Alice objected.

"No, it can't," said the Queen. "It's jam every OTHER day, today isn't any OTHER day".

Fracking & Coalbed Methane

Unconventional gas in the UK

Sheet **E11**

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When gas fracking and other "unconventional" energy resources[1] are discussed in the media the focus is usually on the technology used to produced the energy, or the impact this might have[2] on the environment. In fact, the significant feature of the exploitation of unconventional energy resources is that our present energy situation is so precarious that companies and governments consider these valid energy sources; public interest demands that this aspect of the problem be examined[3]. Unconventional energy resources are being developed to supplement existing fossil fuel resources, but arguably, due to their lower energy return and high ecological impacts, they exacerbate the energy crisis by giving a false sense of energy security.

Depending upon who you listen to, unconventional gas resources such as shale gas/gas fracking and coalbed methane are either an economic boom for Britain[4] or another step on the road to ecological Armageddon[5]. As conventional gas production in Europe declines, the energy industry is pushing large sums of money into promoting[6] everything from trans-European pipelines and electricity grids to unconventional gas resources in order to maintain and expand Europe's energy consumption. Both sides in this argument focus on the minutiae of the technologies involved, and their ecological impacts. Instead, we should look at the energy system as a whole, and how these resources work within the structure of our energy systems.

Also, with the popularity of documentaries such as *Gasland*[7], or The Ecologist's recent short documentary[8] on hydraulic fracturing, much of the information that is "out there" looks at the experience in the USA. In this sheet we look at the potential of shale gas, coalbed methane and underground coal gasification in the UK. These three technologies represent the last technological wave in fossil fuel extraction, and all have problematic economic and ecological impacts.

Shale gas geology

To understand the difficulties of producing gas (and oil) from shale we must first look at how we produce the bulk of the oil and gas we produce today – via "conventional" drilling and production.

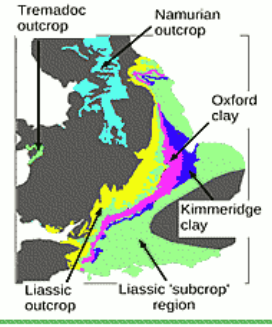
Hydrocarbons – *oil and gas* – are produced from the geological "cooking" of organic matter. When organic matter in river sediments is buried and heated by the geothermal heat from the Earth's core, the plant material breaks down to produce tar and oil compounds. Heat those materials to even higher temperatures and the hydrocarbons break down further to produce gas. What happens to the oil or gas produced by this process is dependent upon what the source rock[9] is composed of and how the rocks in the region are folded and fractured. Whilst the formation of oil and gas might be a common geological process, the conditions that allow it to be easily tapped and produced are not.

Shale gas resources in the UK

What determines the suitability of rocks to produce gas is the materials that they contain, and the age and geological history of the rocks. Like conventional oil and gas production, the rocks must have been buried to a sufficient depth, and held there for enough time, to allow geothermal heat to cook the organic matter contained in the rocks to produce oil and gas.

The map below shows the distribution of rock strata in England and Wales that have the potential to produce shale gas (Scotland only has a small area of Namurian rocks between Edinburgh and Glasgow). These are mostly hard shale and impermeable clay which require methods such as hydraulic fracturing to extract the gas they contain. There are many non-geological restrictions on the ability to produce gas too – from land values to the designations of national parks – and the locations where gas plants might be developed is dependent upon these local factors.

The next round of onshore oil and gas licensing (see map on page 5) is concentrating on these areas – in the hope that they might offset the decline in conventional gas production from the North Sea.



E11. Fracking & Coalbed Methane
http://www.fraw.org.uk/fwd?e11

Fracking, *Do Something!*

Action on unconventional gas

Sheet **A1**

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As we reach the limits to growth[1] the certainties that underpin the modern economic system are failing. As "easy to produce" oil and gas deplete the energy industry is seeking more extreme fuel sources, from deep ocean drilling to tar sands. "Unconventional gas" is a series of technologies that seek to get natural gas from hard to produce/unconventional sources of rock. This sheet looks at the legal and procedural issues related to the development of unconventional gas in the UK, and how the public can intercede at each stage in order to oppose these developments.

Let's jump ahead of ourselves towards one possible end of a campaign against fracking. A company sends in the earth movers to begin development of an unconventional gas production facility and someone decides to jump on the equipment. The police are called and they're charged with *aggravated trespass* under section 68 of the *Criminal Justice and Public Order Act 1994*[2], and removed from the site under the powers given to police in section 69. Aggravated trespass is defined section 68 as –

> A person commits the offence of aggravated trespass if he trespasses on land in the open air and, in relation to any lawful activity which persons are engaging in..., does there anything which is intended by him to have the effect –
>
> (a) of intimidating... them so as to deter them or any of them from engaging in that activity,
>
> (b) of obstructing that activity, or
>
> (c) of disrupting that activity.

The most important words in the above quote are "lawful activity". If the activity isn't lawful, then not only can a charge of aggravated trespass not be brought, but those involved have a legal defence for any "reasonable" action that they took to prevent such unlawful activities taking place.

However, it's not that simple in practice! Whether or not an activity is "lawful" depends upon the chain of events, documents, consultations and the issuing of various legal and procedural forms which demonstrates that the activity is legal – and the only way you're going to know about that is if you check with the relevant agencies first.

That's what this sheet is about. We'll look at:

- The process which should take place before an unconventional gas development gets built and becomes operational;
- Where the public should be involved in that process, and what they can do;
- How the various legal authorities make their decisions; and finally,
- We'll look at what the impacts of these developments are and how to tackle them.

Unconventional gas and the law

Whilst there's a lot of environmental law on the books in the UK, many of these laws are practically enacted in a way that is "seen to be done" rather than "done to be seen". Often you'll find that certain requirements are poorly or partially enacted, and are sometimes ignored.

Gas fracking (both shale and coal seam gas) and underground gasification represent a different problem because the law and official guidance hasn't yet caught up with their unique effects. That means the existing law and policy guidance doesn't automatically consider the peculiarities of these technologies. In the interim we have to use the guidelines which do exist more 'creatively' to stop or obstruct these developments.

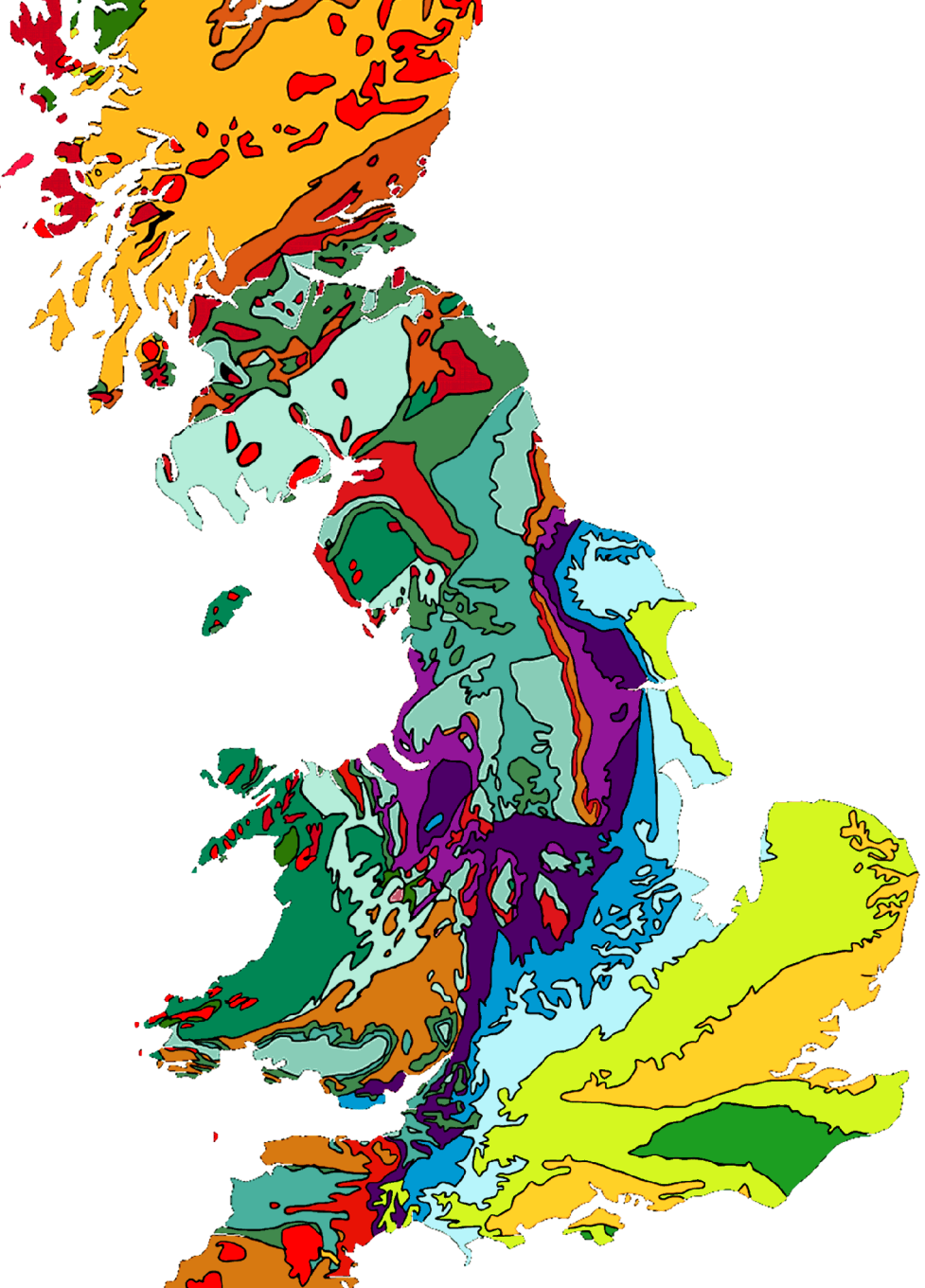
Our job, as active citizens, is to use the tools that the system has created to influence the future course of development – even if that means stretching the law through direct action in order to get our point across. No complex system is able to govern itself precisely according to the rules; if it did chaos would be the result because rigid rules can never anticipate what can happen in a complex system. That means that the whole body of law and government guidance often has contradictory viewpoints on the same issue – and it's by using the contradictory checks and balances that we can get decisions made which favour the environment.

The problem for mainstream environmentalism is that, for at least the last ten or fifteen years, it's prime indicator of sustainability has been carbon – and this over-emphasis on carbon and climate change above all other issues has weakened the ability of the movement to tackle those issues which cut across many different and significant types of ecological impact. For example, the nuclear issue has divided the movement because the over-emphasis on carbon, and reducing carbon emissions, has overridden consideration of the other impacts inherent in running the nuclear fuel cycle.

Tackling unconventional gas requires a multidisciplinary approach. Just like the present difficulties with nuclear power, if we are to understand the effects of unconventional gas then we have to look at far more than the issues of carbon and climate change. That requires that we think more broadly about the using the law/legal tactics, and how we can use the law as a campaigning tool to change the way decisions are made.

A1. Fracking, Do Something!
http://www.fraw.org.uk/fwd?a1


This presentation raises some difficult realities about our future choices...



“Unconventional” resources

Unconventional oil and gas can't migrate to form underground reservoirs because the source rock has a low permeability. Instead the rock strata where the oil/gas is formed must be mined directly.

The existence of unconventional oil and gas is related to the types of rocks that make-up the UK. Like other minerals, unconventional fuels can only be worked where they are found – and so we have to start by looking at a geological map of Britain.

Sources of unconventional gas:

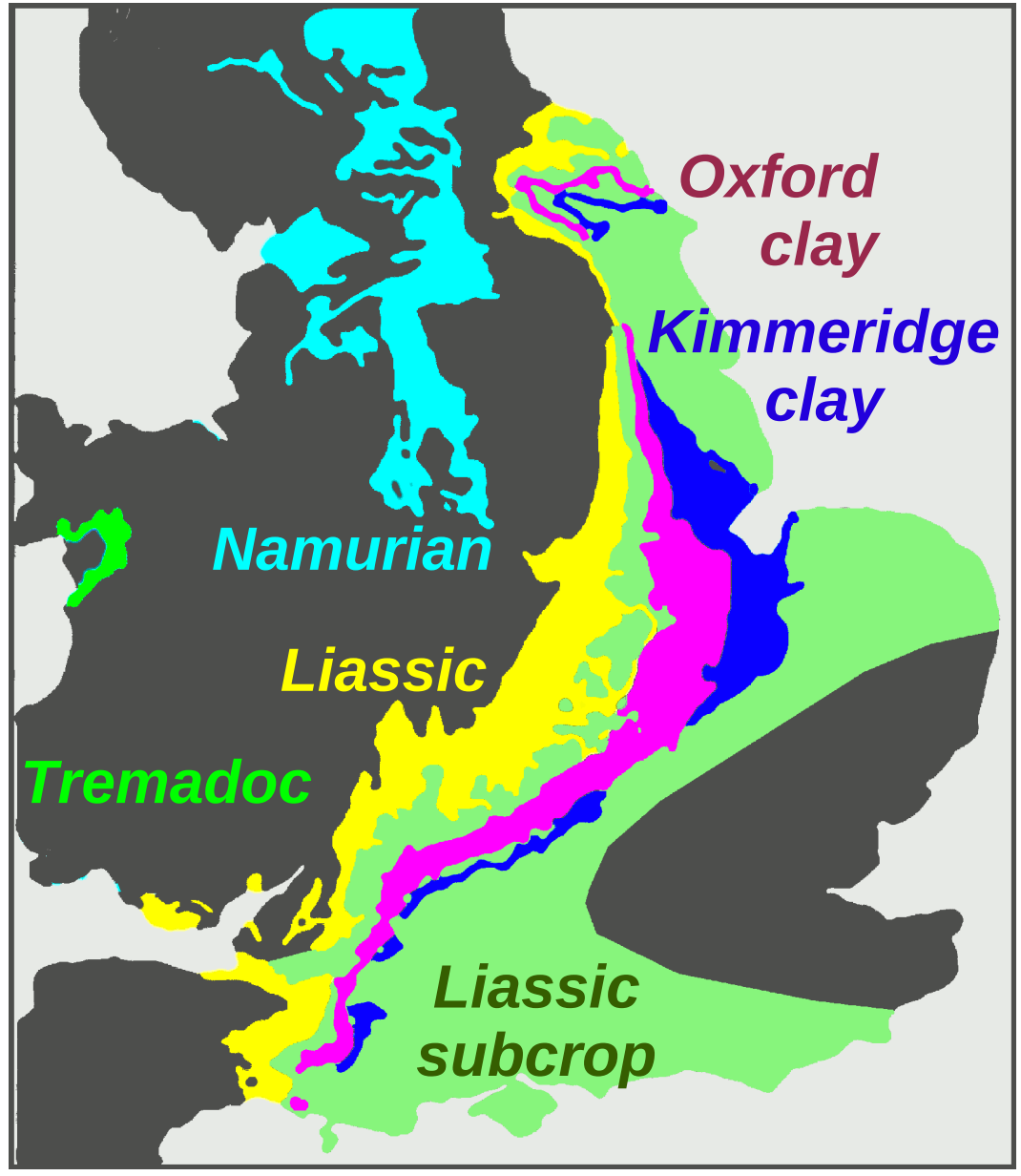
Shale gas	Produced from impermeable “black” shales, mud-stones and clays – all of which have a high organic content. Impermeable nature of the rock prevents migration of the gas generated to a reservoir strata.
Coal-bed methane (CBM/CSG)	Methane gas trapped in coal. Due to variations in coal seams and their history, not all coal seams contain usable gas, and variations in geology give very differing quantities of gas.
Underground coal gasifi-cation (UCG)	Gasifying the coal in-situ underground, starved of oxygen, to produce methane, hydrogen & carbon monoxide rich “syngas”.

Shale gas

The generic term "shale gas" is used to cover methane gas which can be recovered from a number of different low permeability rocks – shales, mudstones, siltstone and clays.

The most important characteristic is that they have a high organic content that has been "cooked" through the gas window – older rocks may contain more gas, younger rocks less.

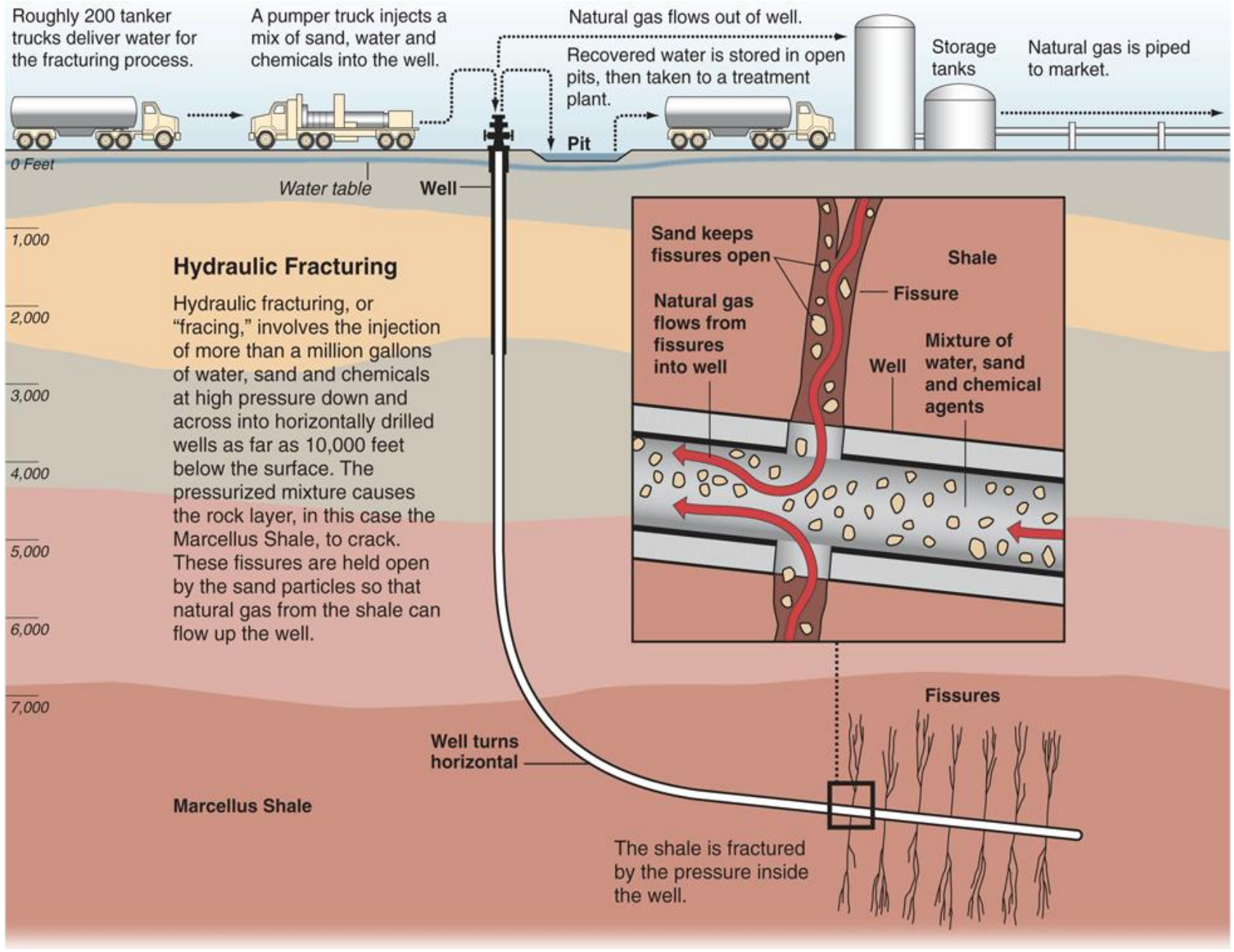
Shale gas is produced using hydraulic fracturing (aka. 'fraccing' or 'fracking') processes.

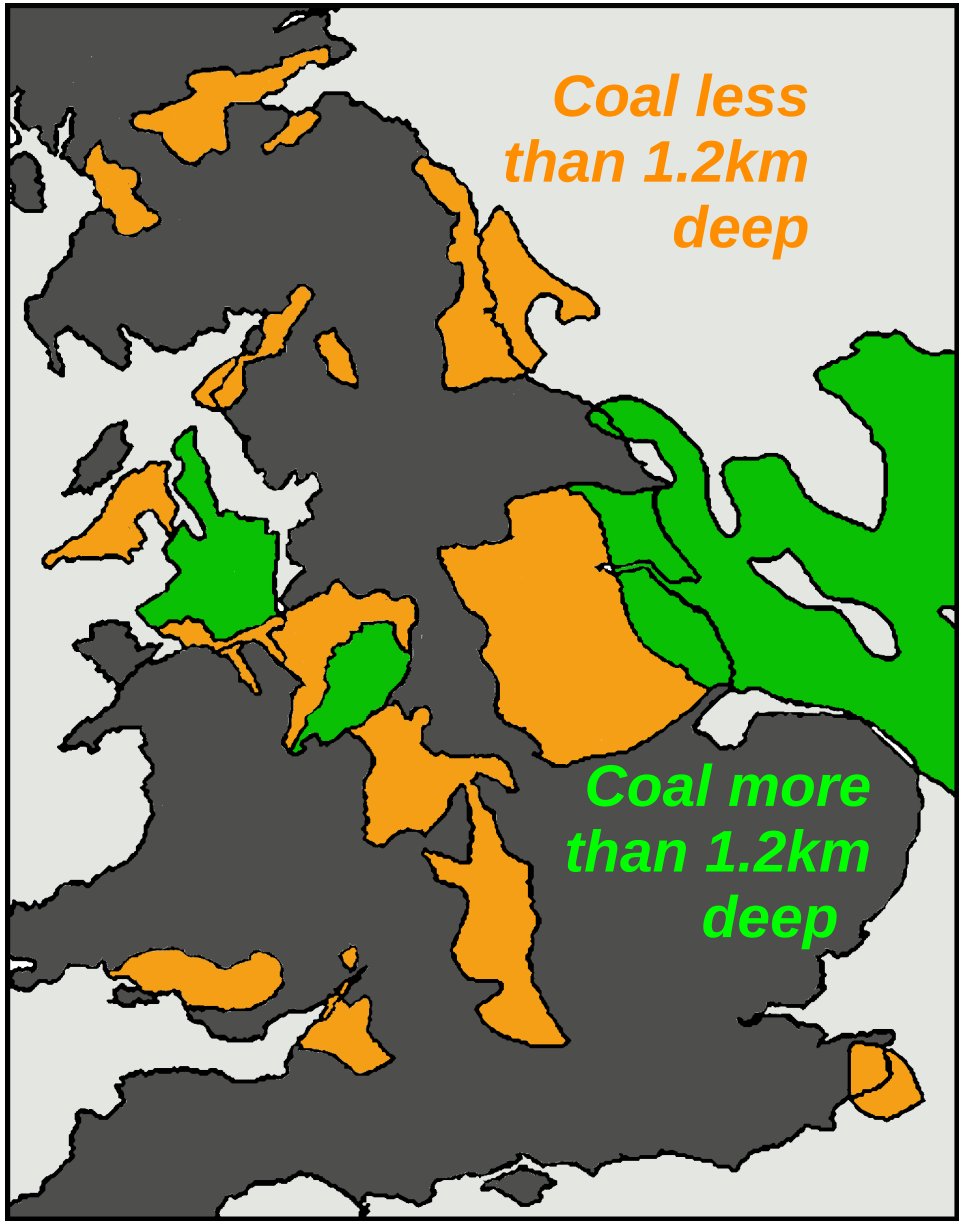


Shale gas

Most media representations show a directional well, or talk of earthquakes. This is a major under-estimate of the impacts of the fracking process.

The most impactful parts of the process have little to do with the gas well.





Coal-bed methane

Coal-bed methane (CBM, but in Australia usually called 'coal seam gas', CSG) uses similar techniques to shale gas wells to remove methane trapped in coal seams.

Rather like home water filters, the carbon in coal mops up the methane and binds it within the rock; CBM systems use drilled wells and chemicals to dislodge the gas and extract it. This can use 'fracking' technology, but need not where gas levels are high.

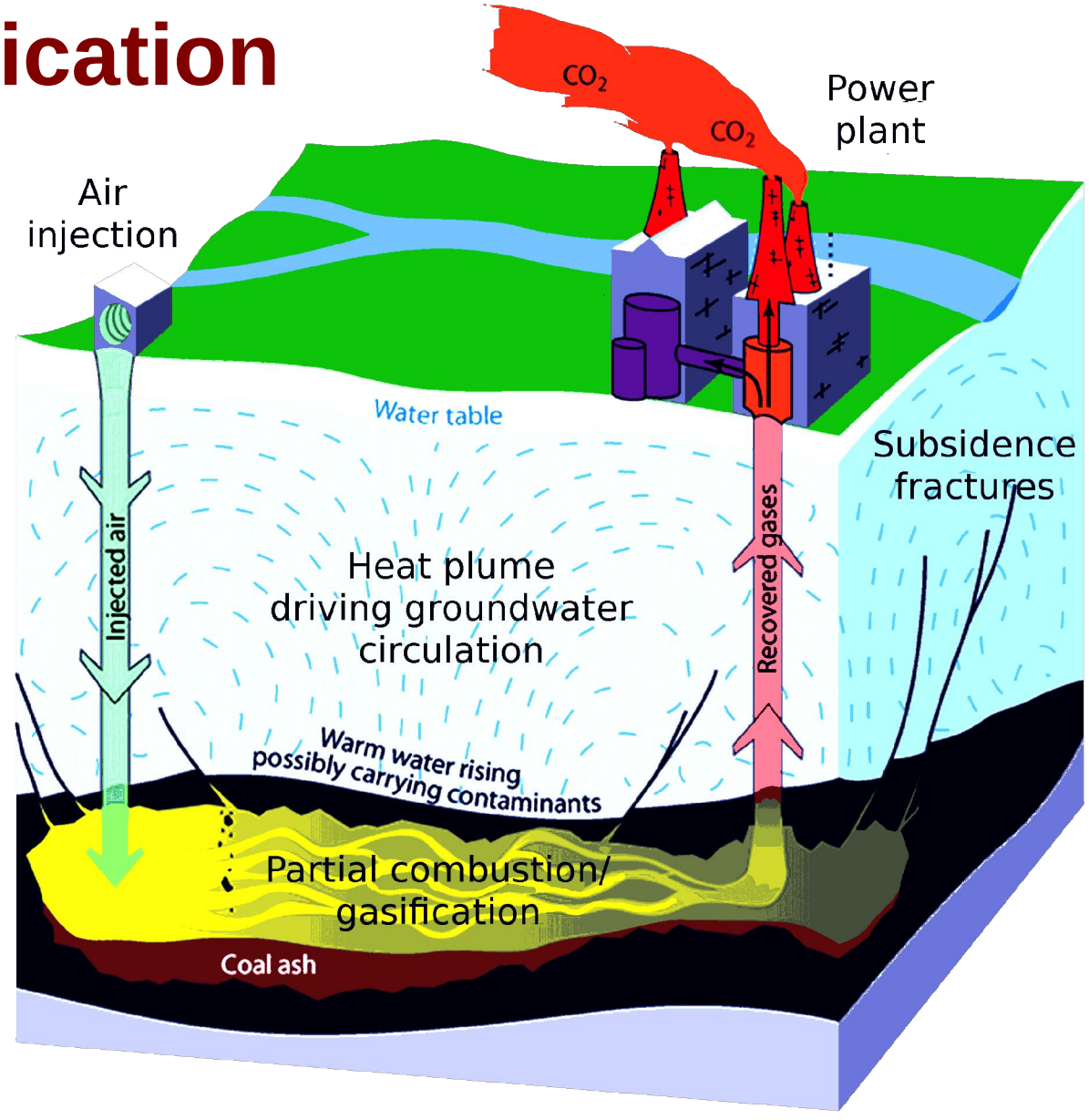
In the UK CBM currently being considered in former coalfield areas.

Underground coal gasification

Underground gasification "burns" the coal underground, starved of oxygen. This creates a mixture of carbon monoxide, hydrogen and methane gases – called syngas.

Rather like the process of making 'town gas', this option creates a complex mixture of pollutants. The pollution from gasification can be flushed from the coal seam by groundwater movement.

UCG is not a stable technology, and can be considered the most 'extreme' of extreme energy sources.

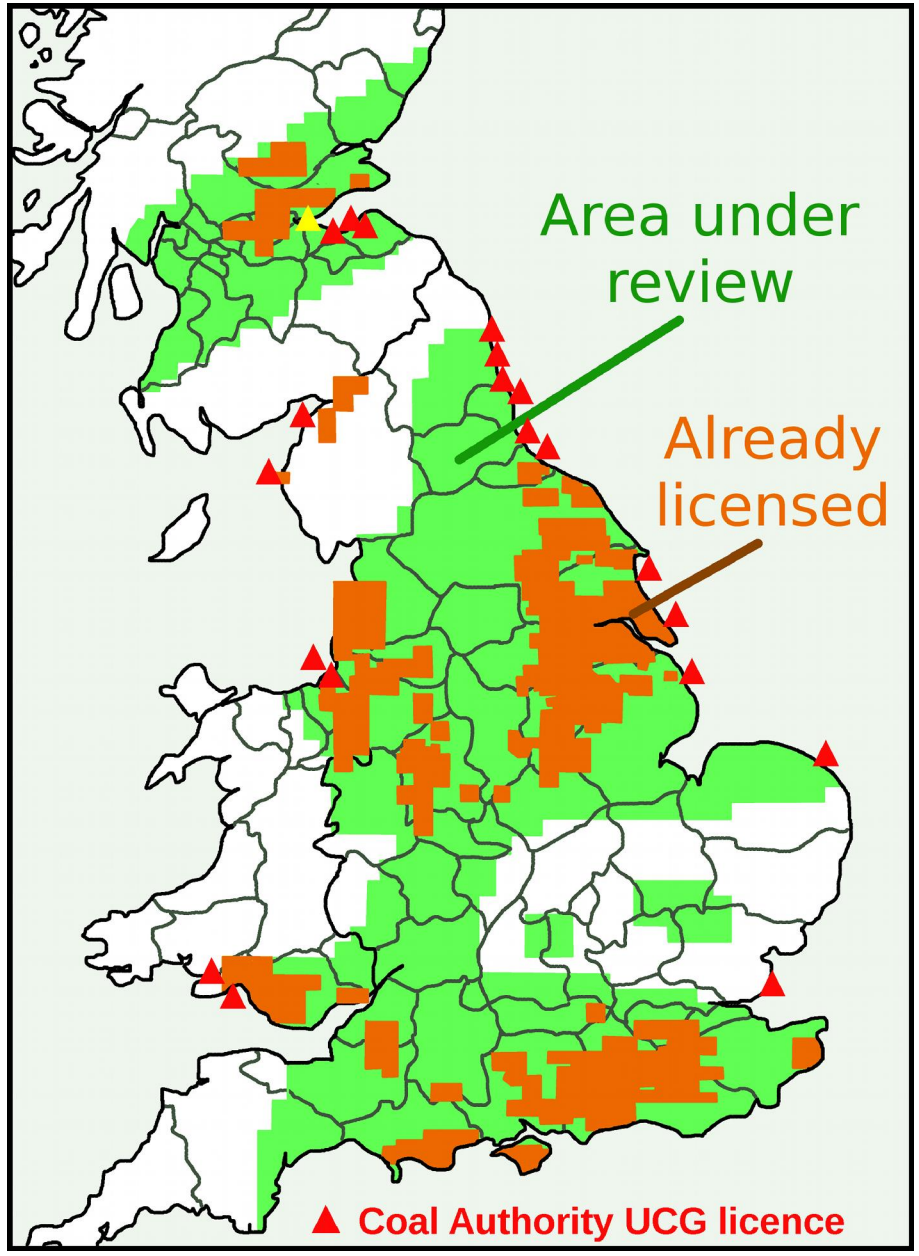


14th Onshore Licensing Round

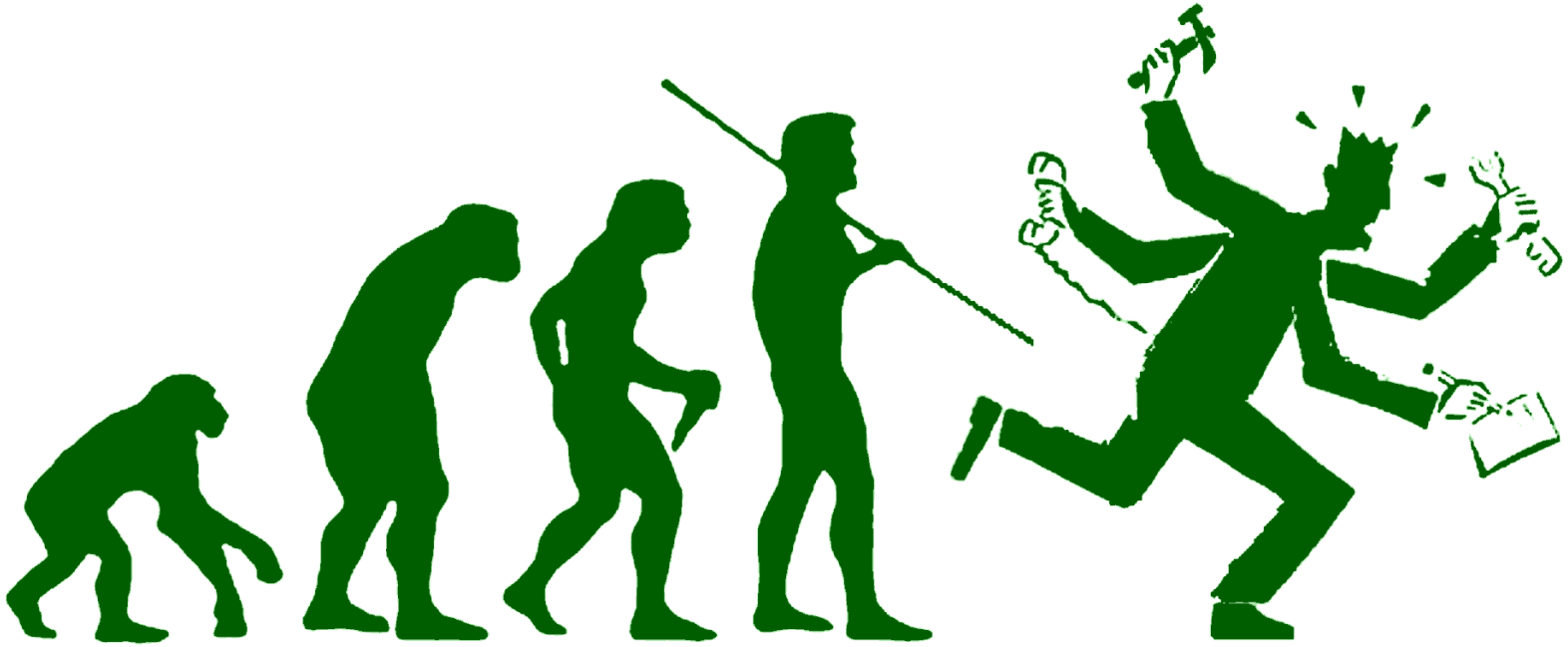
In the UK most mineral rights are controlled by the state. The rights to exploit minerals are auctioned-off in regular "rounds". Many areas of Britain are already licensed, mostly for oil and gas (the North East and the Weald).

The last round granted licences for shale gas and CBM in Somerset, Lancashire, Wales, Nottinghamshire, Derbyshire & Scotland. The 14th round seeks to open-up the rest of the UK to unconventional gas extraction.

The 14th round licences were due to be announced in 2012. The controversy over fracking has delayed that process, and the results have still not been announced.

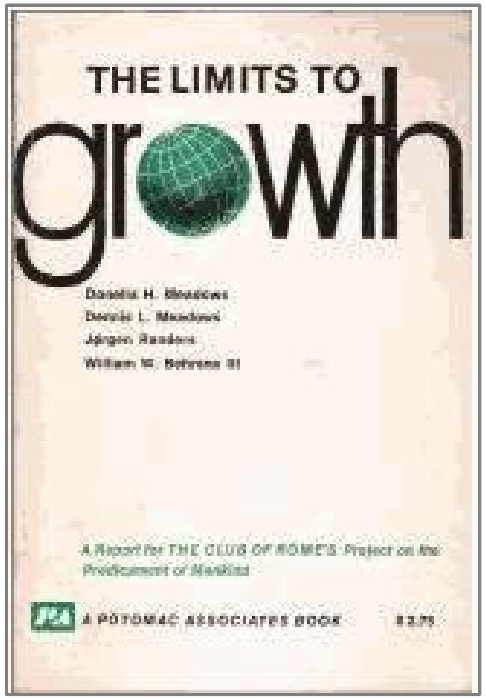


...but we're missing something very important here.



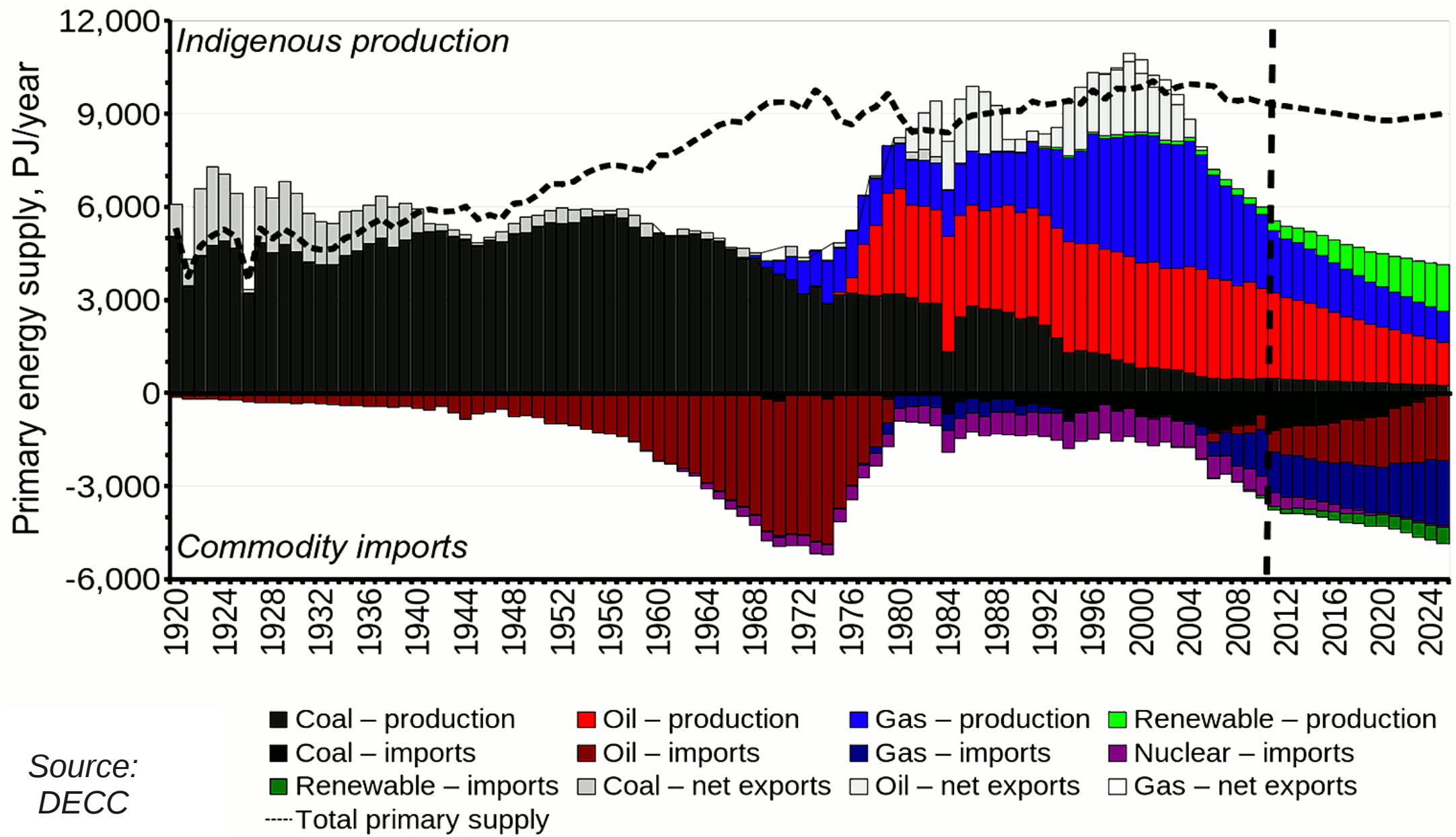
Why are we trying to exploit “unconventional” energy sources in the first place?

We're reaching the “Limits to Growth”



Energy is not like other resources – it's an essential pre-requisite of economic activity and growth. The problems foreseen by the 1972 *Limits to Growth* report are happening roughly as predicted; the shift from “conventional” to “unconventional” energy and mineral resources is an indication of the limits to human development.

Planning a sustainable future requires that the political process accepts there are limits to growth. Unfortunately the political world chooses to ignore the growing body of evidence on these trends.


Indigenous production
Commodity imports
Primary energy supply, PJ/year
12,000
9,000
6,000
3,000
0
-3,000
-6,000
1920
1924
1928
1932
1936
1940
1944
1948
1952
1956
1960
1964
1968
1972
1976
1980
1984
1988
1992
1996
2000
2004
2008
2012
2016
2020
2024
Coal – production
Oil – production
Gas – production
Renewable – production
Coal – imports
Oil – imports
Gas – imports
Nuclear – imports
Renewable – imports
Coal – net exports
Oil – net exports
Gas – net exports
Total primary supply

Source: DECC

Unfortunately politics is in denial

"...government can still be far too slow at getting stuff done...
I am determined to change this. Here's how:

- Cutting back on judicial reviews.
- Reducing government consultations.
- Streamlining European legislation.
- Stopping the gold-plating of legislation at home.

Well, this country is in the economic equivalent of war today – and we need the same spirit. We need to forget about crossing every 't' and dotting every 'i' and we need to throw everything we've got at winning in this global race."

David Cameron's speech to the CBI
Monday 19th November 2012

When “there is no alternative”, when we are in “the economic equivalent of war”, any level of dissent is by its nature a threat to “business as usual”

We are entering a time when even well-founded objections are no longer valid if they cast doubt upon the over-riding goal of economic growth at all costs

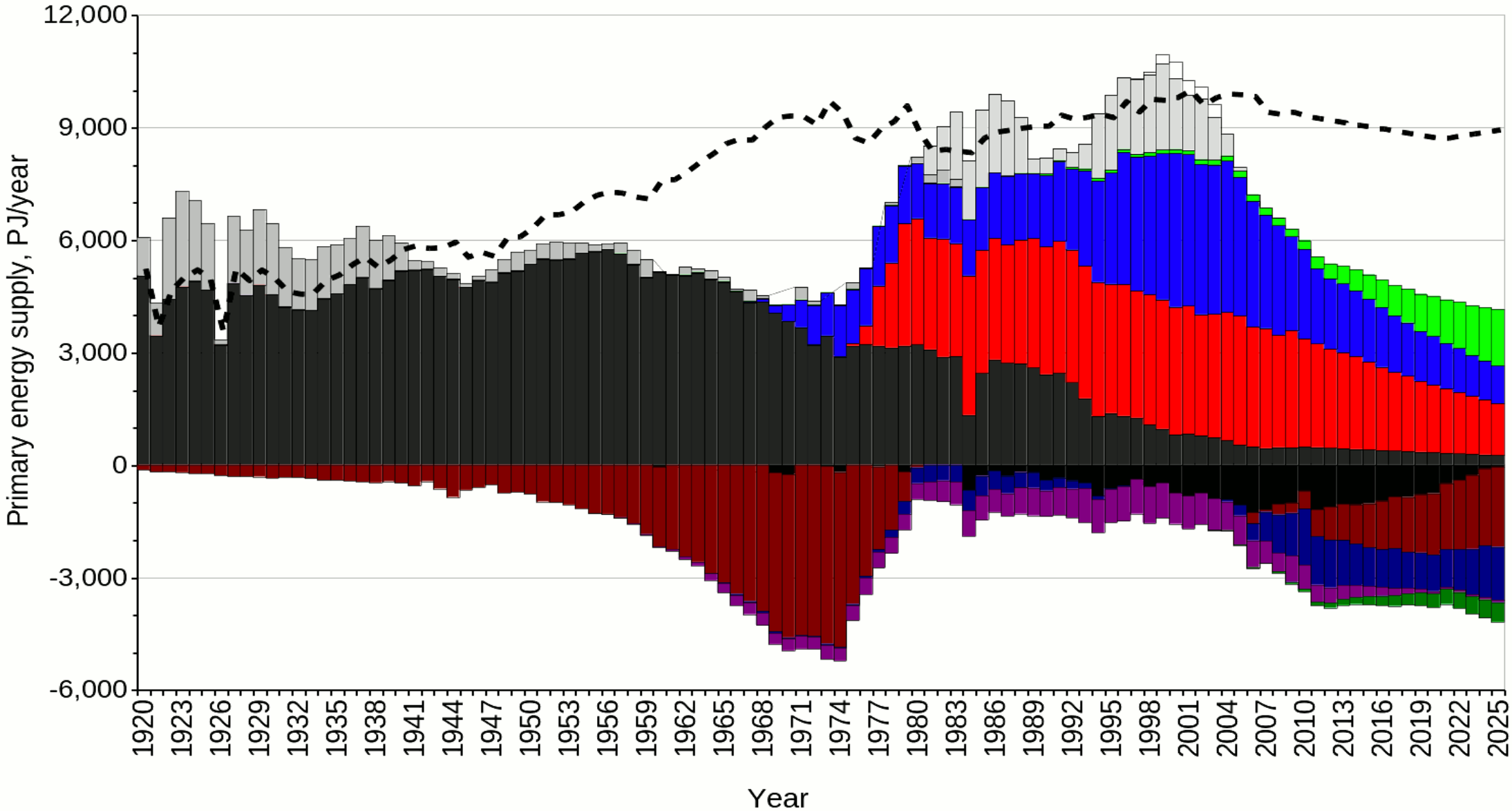
What difference will shale gas make?

Let's base our projections on Cuadrilla's reported shale gas find in Lancashire... ***5.6 trillion cubic metres***

Only 10% of the gas is likely to be produced (15%-20% at best), so 10% of the figure is... ***0.56 trillion cubic metres***

In terms of energy, the total calorific value of that volume of gas is around 20 exa-joules (EJ) of energy, or around *five times annual gas use*. However, it'll take 20 to 30 years to get the gas out, so the average contribution is about 0.67EJ/year, or ***17% of annual gas consumption.***

Just to replace the gas production lost from the North Sea following "peak gas" in 2003 requires 3 Lancashire-sized fields, each developed sequentially to their average output value in four or five years – *and that doesn't address the problems with oil – and after 30 years it's gone!*


12,000
9,000
6,000
3,000
0
-3,000
-6,000
Primary energy supply, PJ/year
1920
1923
1926
1929
1932
1935
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1941
1944
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1962
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1968
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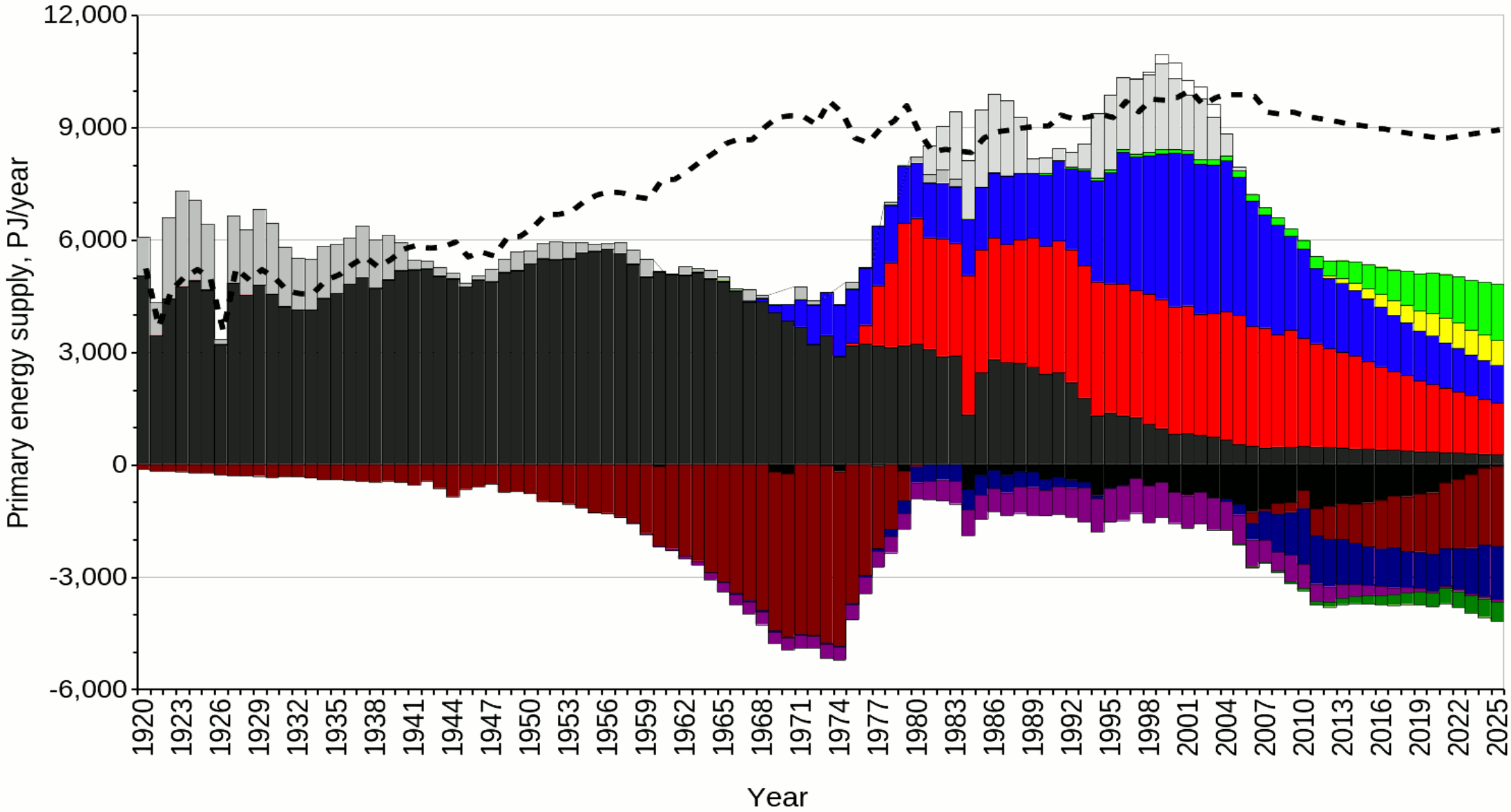
Year


12,000
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Primary energy supply, PJ/year
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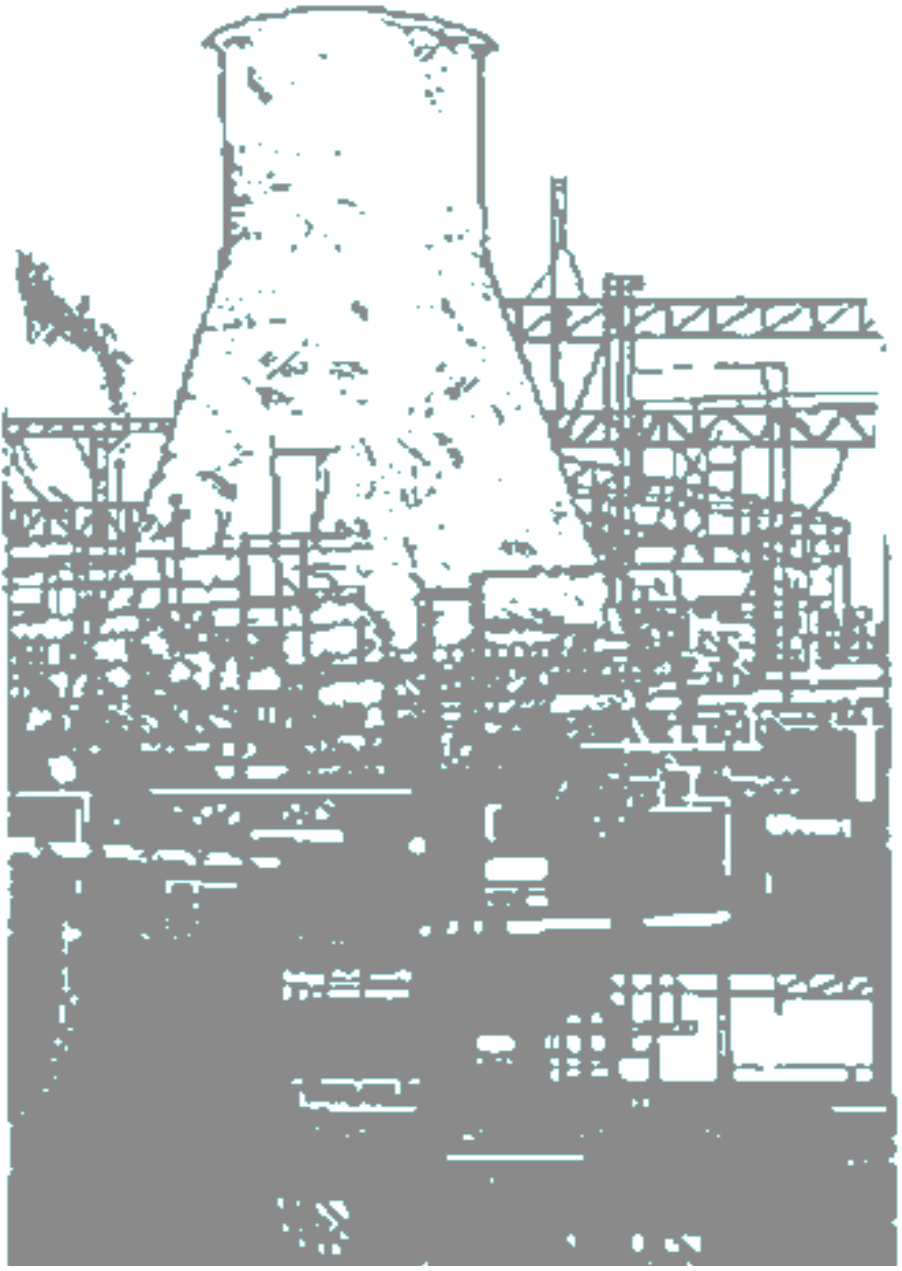
Year

What will shale gas do for us?

× **Energy security?**	*We'll still have to import significant quantities of energy from outside the UK, especially oil (or uranium if the government tries to go nuclear).*
× **Prices?**	*The market is fully globalised, so we'll still pay a price related to global oil/gas prices – unconventional gas doesn't mean lower domestic gas prices.*
× **Economy?**	*Economic problems are created by high global energy and resource prices – simply increasing UK energy supply isn't the solution.*

The current debate ignores the fact that the demand for resources is rapidly depleting supply – *we're at the "limits to growth"*



To conclude...

Our present economic difficulties will not go away if we try to apply the “old” economic rules – developed in an era where limits did not apply.

Our future economy depends on internalising ecological limits to our demand for energy and resources.

What we're talking about is not “de-industrialisation”, it's a retooling of economics and commerce to work within ecological limits...

Developing every last drop of fossil fuels does not help to do this.