How would the footprint of a shale gas operation compare with the footprint of other ways of delivering a similar quantity of energy?

There are many dimensions to a "footprint". In this blog, I'll look at land area, vertical height, and vehicle movements.

I'll compare a **shale gas pad** (which might produce 0.9 billion cubic metres of gas over 25 years) with a 174-MW **wind farm** and a 380-MW **solar park**, both of which would deliver roughly 9.5 TWh of electricity over 25 years – the same amount of energy as the chemical energy in 0.9 billion cubic metres of gas.

In this table I've highlighted in bold the "winning" energy source for each of the footprint metrics.

	Shale gas pad (10 wells)	Wind farm 87 turbines, 174 MW capacity	Solar park 1,520,000 panels, 380 MW capacity
Energy delivered over 25 years	9.5 TWh (chemical)	9.5 TWh (electric)	9.5 TWh (electric)
Number of tall things	1 drilling rig	87 turbines	**None**
Height	26 m	100 m	**2.5 m**
Land area occupied by hardware, foundations, or access roads	**2 ha**	36 ha	308 ha
Land area of the whole facility	**2 ha**	1450 ha	924 ha
Area from which the facility can be seen	**77 ha**	5200-17,000 ha	924 ha
Truck movements	**2900**-20,000	7000	7600

The **total land area** of the facility is smallest for the shale gas pad, and largest for the wind farm. The **land area** actually occupied by stuff is smallest for the shale gas pad, and largest for the solar park – the wind farm has lots of empty land between the turbines, which can be used for other purposes.

In terms of visual intrusion, the wind turbines are the tallest, and could be seen from a land area of between 52 and 170 square km, depending how they are laid out. (To roughly estimate an area of visual influence, I computed the land area within which the drilling rig or a wind turbine would be higher than 3 degrees above the horizon.) By this measure, the shale gas pad creates the least visual intrusion. Moreover, the drilling rig might be in place for only the first few years of operations at the shale gas pad. The solar panels are the least tall, but the solar facility occupies 450 times as much land area as the shale gas pad. (I've assumed that the wind farm and solar parks wouldn't require any additional "intrusive" electricity pylons.)

When it comes to truck movements, all three energy facilities require lots! I've assumed that solar panels are delivered at a rate of 400 panels per truck; for the

wind farm, my estimate is dominated by the delivery of materials for foundations and roads at 30 tonnes per truck; the estimates for the shale gas pad are from DECC's recent Strategic Environmental Assessment and from the Institute of Directors' report "Getting Shale Gas Working". The shale gas pad might require the fewest truck movements, if all water is piped to and from the site. But if water for the fracking is trucked to and from the site, then the shale-gas facility would require the most truck movements.

What can we take from these numbers?

Well, perhaps unsurprisingly, there is no silver bullet – no energy source with all-round small environmental impact. If society wants to use energy, it must get its energy from somewhere, and all sources have their costs and risks. We need to help the public deliberate these trade-offs as we keep pushing The Carbon Plan forward.

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Details of these back-of-envelope calculations are available on request – david.mackay@decc.gsi.gov.uk.

What are your thoughts on this way of putting shale gas in perspective?

Photo: Wytch Farm, on the perimeter of Poole Harbour in Dorset, is the largest onshore oil and gas field in Western Europe. It is located in an Area of Outstanding Natural Beauty. The photograph shows the 34-metre-high extended-reach drilling rig, from which boreholes longer than 10 km have been drilled.