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Prepare for a golden age of gas

 By Martin Wolf

The world is in the midst of a natural gas revolution. Even the sober International Energy Agency refers to a scenario it calls a "golden age of gas". If such optimism proves right, the implications would not only be far greater than those of the eurozone's painful dissolution, but would also be economically positive. Never forget that ours is a civilisation built on cheap supplies of commercial energy. The economic rise of emerging countries is bound to make the demand for commercial energy increase dramatically in the decades ahead. Gas matters.

This revolution has a name: "hydraulic fracturing", colloquially known as "hydrofracking" or just "fracking". As is true of nearly all of the technological revolutions of the past century, this one also originated in the US. The US Energy Information Administration explains that "[t]he use of horizontal drilling in conjunction with hydraulic fracturing has greatly expanded the ability of producers to produce natural gas from low permeability geologic formations, particularly shale formations."*

While some innovations date to the 1970s, the EIA notes that "the advent of large-scale shale gas production did not occur until Mitchell Energy and Development Corporation experimented during the 1980s and 1990s to make deep shale gas production a commercial reality in the Barnett Shale in North-Central Texas." But, by now, it adds, "[t]he development of shale gas has become a 'game changer' for the US natural gas market."

The new activity has increased dry shale gas production in the US from 0.39tn cubic feet in 2000 to 4.8tn cubic feet in 2010, or 23 per cent of US dry gas production. Vastly more is to come. The EIA estimates 860tn cubic feet of "technically recoverable" US shale gas against just 273tn cubic feet in today's "proved reserves". If this estimate is correct, shale gas on its own would give the US 40 years of gas consumption, at current rates.

How large are the world's shale gas reserves? The EIA asked consultants to examine 48 shale gas basins in 32 countries. Their report estimates "technically recoverable" global shale gas resources at 6,600tn cubic feet, roughly equal to today's proved reserves. The largest identified resources, apart from those of the US, are in China (1,275tn cubic feet), Argentina (774tn), Mexico (681tn) South Africa (485tn), Australia (396tn), Canada (388tn), Libya (290tn), Algeria (231tn), Brazil (226tn), Poland (187tn) and France (180tn). Regions excluded from this analysis include Russia, central Asia, the Middle East, south-east Asia and central Africa. Global potential should be far larger still.

What difference might the abundance of natural gas (including of more conventional gas) make to the global energy future? In its World Energy Outlook 2011, the IEA remarks that "[i]n all the scenarios examined ... natural gas has a higher share of the global energy mix in 2035 than it does today". Under its "golden age" scenario, gas demand grows by 2 per cent a year between 2009 and 2035. Even under a more cautious scenario, which it calls "new policies", demand grows at 1.7 per cent a year

or by a total of 55 per cent over this period. As a result, gas substitutes for other fuels, particularly in electricity generation and heating. Gas also has substantial potential as a fuel for transportation. Overall, argues BP in its latest Energy Outlook, by 2030 gas might come to rival coal and oil as a primary energy source.

The substitution of gas for coal or oil is desirable from the point of view of emissions of greenhouse gases and many other pollutants. Gas emits slightly more than half as much carbon dioxide as coal and 70 per cent as much as oil, per unit of energy output. Emissions from gas of carbon monoxide are a fifth as much as from coal. Emissions of sulphur dioxide and particulates are negligible. In any plausible scenario for managing emissions of greenhouse gases, natural gas will have to substitute for other fuels, though development of cheap carbon capture and storage would also strengthen the case for coal. For China, in particular, with its burden of pollution from its use of coal, a "dash for gas" seems to make sense.

So is shale gas the beneficial transformation its proponents claim? Maybe not. The controversial aspect of the new technologies is the impact on the environment. In an article in the November 2011 Scientific American, Chris Mooney, a writer on science, notes that "horizontal fracking requires enormous volumes of water and chemicals. Huge ponds or tanks are also needed to store the chemically laden 'flowback water' that comes back up the hole after wells have been fractured." A single lateral shaft requires 2m to 4m gallons of water and 15,000 to 60,000 gallons of chemicals. It is little wonder that critics allege the new technology threatens severe pollution of groundwater and is, for this reason, an environmental nightmare. The article suggests that it is not yet known whether such contamination has occurred. At this stage, it concludes, risks are uncertain. The activities of the new industry need to be rigorously monitored, everywhere.

The wisdom of proceeding rapidly with this technology globally will depend on several considerations: first, the local opportunity costs of water; second, the abilities and reliability of the operators; third, the capacity of the regulators; fourth, the benefits of any extra gas, compared with those of alternative fuels (or conservation), including for security; and, fifth, better knowledge of the impact of the technologies. To take one example, the competing demand for water and dangers of pollution might make large-scale extraction of gas from Chinese shales dangerous.

Shale gas underlines the ingenuity of those engaged in finding new sources of energy. It also suggests the welcome possibility of cheap natural gas for many decades. But this revolution could prove to be a Faustian bargain. Care needs to be taken over how – and how swiftly – the technology is introduced: environmental costs might prove heavy. "Make haste slowly", as the ancient Romans used to say.

**World Shale Gas Resources: An Initial Assessment of 14 Regions Outside the United States, April 5 2011, www.eia.gov*