NORTHERN ENERGY TASKFORCE

IPPR North

MAKING THE MOST OF OUR GEOLOGICAL RESOURCES

A NORTHERN ENERGY TASKFORCE WORKING PAPER ON CARBON CAPTURE AND STORAGE AND SHALE GAS

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ABOUT THE NORTHERN ENERGY TASKFORCE

The Northern Energy Taskforce has been established to oversee an ambitious programme of work over the next 18 months that will develop an energy strategy for the northern powerhouse. The Taskforce is chaired by Sir John Harman, who will be supported by a number of high-profile figures with expertise across infrastructure, engineering, finance, academia and local government. It is supported by IPPR staff in a research and secretariat capacity.

The taskforce has three central objectives.

- Develop a plan for the northern energy system to 2030, addressing the key needs and challenges facing energy consumers and businesses in the North.
- Create an economic vision for the northern energy sector in 2030 and a practical roadmap for how to get there, addressing the opportunities for businesses, higher education institutions and the public sector in the energy sector.
- Set out a plan for 'energy devolution' that will consider whether and how various powers and responsibilities for energy issues should be devolved to different pan-northern, sub-regional and lEocal levels.

DISCLAIMER

While this report reflects the deliberations of the Northern Energy Taskforce on these issues, it does not represent the view of all members and some disagree with the consensus position. Analysis and recommendations contained within this paper should therefore be attributed to the taskforce as a whole rather than any individual member.

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MAKING THE MOST OF OUR GEOLOGICAL RESOURCES

A NORTHERN ENERGY TASKFORCE WORKING PAPER[1] ON CARBON CAPTURE AND STORAGE AND SHALE GAS

INTRODUCTION

The UK has long seen efforts to take advantage of the geological assets that these islands possess. This dates from lead and gold mining in Roman times, to the mechanisation of deep mining for coal that helped fuel the Industrial Revolution and, more recently, the opportunities for oil and gas extraction from the North Sea. It is only right that any nation, or region, should seek to assess the best use of its natural resources for the current and future wellbeing of its people.

Today, what we now consider '*best use*' is changing from an approach that sought to maximise extraction (or use) for economic gain to one that recognises extraction has impacts on the locality and on the wider environment.

This short paper, prepared on behalf of the Northern Energy Taskforce , considers what might be described as the next generation of geological resource technologies, i.e. Carbon Capture & Storage (CCS), and Shale Gas recovery through fracking. In the paper we consider the relative merits of both technologies from an economic point of view but also bear in mind their potential impacts upon our future emissions and our legislative ambitions to decarbonise the whole of the UK economy.

CARBON CAPTURE & STORAGE (CCS)

CCS refers to the collection of infrastructure through which carbon emissions produced by industrial processes and energy generation are trapped, transported and then stored, typically in offshore geological formations (CCSA, 2016).

If the UK is to continue burning gas for power, whether extracted onshore, from the North Sea or imported, then it needs deal with the associated carbon emissions. The Committee on Climate Changes central scenario used in their assessment of shale gas assumes CCS (CCC, 2016). If this is not established, then gas consumption would need to drop drastically.

Plans were under way to trial commercial CCS through a government competition, but have since fallen away when the competition was abruptly halted. Nonetheless, organisations such as Teesside Collective

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have continued to develop their plans and have presented a blueprint for industrial CCS in the UK (Teeside Collective, 2015).

However, as was argued in the interim report of the Northern Energy Taskforce – *Leading, Adopting or Drifting* – embracing the energy transition does not just make environmental sense, it should be an economic imperative too and additional to its environmental benefits, CCS will unlock a number of economic opportunities (IPPR, 2017). It is the only way to decarbonise heavy industry, making it globally competitive and establishing an industry with the opportunity to export to nations who are confronting the same challenge.

Beyond this it has been suggested – for example by Professor Averil Macdonald OBE, former chair of industry group UK Onshore Oil & Gas – that CCS could be used to manufacture hydrogen as a low or zero carbon fuel for heat and transport (APPGCCP, 2016).

The UK could be a key player in CCS, being well placed to develop the technology (TUC, 2014). Geologically, the UK has access to a large amount of spent offshore gas fuels, which could sustain CCS projects for the next 100 years. The industrial users who would utilise these assets are also conveniently clustered in the Tees Valley, Merseyside and the Humber. These sites are close together, adding to the feasibility of establishing projects (TUC, 2014). The UK also has the necessary engineering skills, developed through the offshore gas industry, professional services capacity and research bases, as well as assets to maximise its potential in this field (TUC, 2014). The is also particularly well suited to shipping captured carbon (Gibbins, 2017).

CCS is estimated to bring between 2bn and 4bn in GVA to the UK economy by 2030 and create up to 30,000 jobs (TUC, 2014). What is more, it could protect jobs in carbon intensive industries whose future viability is threatened in the future necessarily carbon constrained world. Much of the planning to make this idea a practical and fully costed plan for roll out has occurred in the North of England. Northern Gas Networks H21 project has assessed the capacity of the existing gas network in Leeds – already undergoing upgrade – to run on hydrogen, finding that for an estimating minimal cost to consumers in additional bill costs, and no major change to gas pipes, the scheme could be implemented (Northern Gas Networks, 2016).

Northern Gas Networks (2016) argues that hydrogen can be created through utilising Carbon Capture systems. The plan proposes to create a pan-Northern supply chain, with production in the Tess Valley, storage in Humberside and sale and usage in Yorkshire. This leads Northern Gas Networks to argue that this has the potential to create a hydrogen economy, with its base in the North, which will export to the rest of the country and overseas. Additionally, hydrogen has been identified as a potential source of energy for electricity generation and as fuel for vehicles (E4tech, 2015), suggesting that a hydrogen network may have additional advantages in decarbonising other sectors. Other parts of the North are also developing plans for the development of hydrogen, including Liverpool City Region in relation to industrial use around Ellesmere Port. (Protos, 2017).

SHALE GAS EXTRACTION BY FRACKING

Hydraulic fracturing, more commonly known as fracking, is the injection of a high pressure mix of sand, water and chemicals through a drilling well into underground deposits of shale (a type of sandstone), which causes the shale to microscopically fracture, releasing trapped natural gas, which is then extracted by way of a network of pipes leading to a well-head on the surface. There are currently 2,000 wells drilled onshore in the UK over 120

sites and 10% of these have been hydraulically fractured. However, fracking has not, as yet, been used to extract gas commercially in the UK and is still at 'testing' stage (UKOOG, 2017).

Shale gas is the same as the natural gas commonly used in the UK, which has been extracted from the North Sea. It can be used to heat homes, generate power in gas-fired stations and as a commercial feed stock. The British Geological Survey, an arm's length body of government which monitors and studies the UKs landmass and continental shelf, have estimated that there could be as much as 1,329 trillion cubic feet of natural gas contained in the shale of the Bowland Basin (a deep geological feature that stretches across the North, spanning from Wrexham and Blackpool in the east to Scarborough in the West).

It is these estimates that have stoked a belief that onshore gas extraction through fracking could unlock a domestic industry, reduce the UKs reliance on imported gas, and reduce energy costs for businesses and households. The Institute for Directors (IoD), for example, has suggested that the UK shale industry could create around 35,000 jobs (IoD, 2013). In addition, the IoD has highlighted the potential for this natural asset to rebalance the economy given its presence in areas which have suffered most from the structural shift in the UK economy.

However, fracking has proved to be contentious and the opposition it garners is much greater than that of other methods of extracting gas. Public opposition to fracking has often centred around environmental concerns related to the method of gas extraction. There are fears that the water used to fracture the shale bed may be toxic and leak, contaminating the aquifer. Research has shown that, while possible, it is unlikely that this will occur if environmental regulations are followed (Davies et al 2012). Concerns have also been raised that fracking may cause earthquakes. A tremor in Blackpool led the company Caudrilla to halt drilling. However, again, research suggests that while fracking may cause tremors, these are unlikely to be anywhere near significant enough to cause any structural damage above ground (Davies et al., 2013).

Additionally, some objections to fracking centre around the imposition of industrial structures on the natural environment and the accompanying traffic and infrastructure. This has been felt particularly strongly in the North of England where potential fracking sites are located close to or in National Parks and areas of outstanding natural beauty.

In response to concerns about fracking a number of groups have organised locally to oppose planning applications. After successful lobbying by a local group of activists, Lancashire council turned down a planning application by firm Caudrilla to frack at a site near Preston. Shortly after, in response to an appeal by the firm, the Department for Communities and Local Government overturned the council's decision and granted permission for fracking.

Aside from concerns about local environmental impacts, recent research shows that such a scale of extraction, and thus deployment, is unlikely to be the case. Clancy et al. (2017) at the universities of Durham and Newcastle have shown that, when limits to the locations of well-pads (from which drilling takes place) are factored in, the likely recoverable shale gas reserves reduce to only a quarter of that previously expected. This more limited projection is not insubstantial and could still meet UK demand requirements for more than 25 years. But shale gas must also be considered in the context of wider energy objectives and, in particular, our carbon commitments.

Perhaps most fundamentally, there are concerns about the compatibility of extracting shale gas – a fossil fuel that would otherwise go unburnt – with the need to meet carbon targets. This relates both to the methane released in extraction and in its consumption. It is in response to this that the Committee on Climate Change (CCC) (2016) has argued that three key tests must be met if shale gas extraction is to go ahead:

- 'Emissions must be strictly limited during shale gas development, production and well decommissioning. This requires tight regulation, close monitoring of emissions, and rapid action to address methane leaks'
- 'Overall gas consumption must remain in line with UK carbon budgets. The production of UK shale gas must displace imports, rather than increase gas consumption'
- 'Emissions from shale gas production must be accommodated within UK carbon budgets. Emissions from shale exploitation will need to be offset by emissions reductions in other areas of the economy to ensure UK carbon budgets are met'.

CONCLUSIONS

CCS and shale gas fracking both have the potential to offer some economic benefits, and benefits that could be realised in and for the North. But each runs the risk of being presented as a panacea and needs to be considered in a wider context. In the short to medium term, shale gas – along with other forms of natural gas – could represent a valuable source of 'local' energy for heat. However, in the longer term it is also clear that, if we are to meet our climate change ambitions and commitments as a nation, we cannot depend upon shale gas in the ways some suggest. If the North of England is to secure both economic and environmental benefits, now and into the future, these two technologies might best be considered as mutually beneficial and self-reinforcing with CCS the higher priority in the longer term.

As regards the development of CCS, the establishment of combined authorities and the new Northern mayors presents an opportunity for these devolved powers to take a lead and establish CCS as a key Northern climate change technology, facilitating jobs and growth of its own accord and offering new opportunities to establish a hydrogen economy too. The government's new Industrial Strategy and in particular its 'sector deals' process, presents a great opportunity to realise a successful northern CCS sector. The North needs to take this opportunity.

Leading with CCS, albeit requiring significant long-term investment in comparison with shale gas extraction, presents the most rational way for the region and the UK government to support any further efforts on the extraction of shale gas. Doing so will not only mean that the gas can be used in industrial processes or power generation in a low carbon way but that it could also be used in plans to decarbonise heat through hydrogen production.

Therefore, if the government is to retain its manifesto commitment to pursue onshore shale gas extraction, then the Northern Energy Taskforce calls on the relevant secretaries of state to do four things:

1. **Re-instate or update support for CCS technology, to include consideration of a CATAPULT Centre for CCS in the North.** This should be funded by the Department for Business, Energy and Industrial Strategy as part of their wider industrial strategy programme. It should be delivered by local actors in region, as a partnership between relevant Local Economic Partnerships, those in industry, universities and research institutions. This needs to be established over the next parliament to ensure that the UK does not lose its opportunity to lead the work in CCS technology.
2. **To lay out a clear, consistent and universally applied regulatory framework for shale gas extraction, under the auspices of the Environment Agency.** Already the Environment Agency has the responsibility over (BEIS, 2017):
    - protecting water resources, including groundwater (aquifers) as well as assessing and approving the use of chemicals which form part of the hydraulic fracturing fluid
    - appropriate treatment and disposal of mining waste produced during the borehole drilling and hydraulic fracturing process
    - suitable treatment and management of any naturally occurring radioactive materials (NORM)
    - disposal of waste gases through flaring.

A consultation should take place between the Department for Business, Energy and Industrial Strategy and the Environment Agency to ensure the latter has the necessary regulatory tools to fully conduct its role and appropriately regulate these areas. This should be completed prior to any shale gas being exploited.

3. **To ensure that shale gas use displaces, rather than adds to imported gas consumption, as argued by the Committee on Climate Change (2016).** This will be the responsibility of a wide range of stakeholders. Plans from central and government and industry to transition away from fossil fuels should not be halted or slowed by the availability of onshore gas and any downward effect on prices it may have. Utilising the receipts from shale gas extraction as in the next recommendation will support this.
4. **To establish a Sovereign Wealth Fund to 'bank' the benefits of government revenues on shale gas and use them to forward fund the continued development of the energy system of the North, as well as offering individual and community benefits.** Current proposals for a Sovereign Wealth Fund aim to pool a certain proportion of receipts from shale gas revenues before redistributing this in the form of community grants and direct payments to residents in areas of extraction (HMTreasury, 2016). We propose that this model be extended, to fund other low carbon technologies as well and, in particular, to fund CCS projects. However, it is not possible to wait until receipts are collected and banked before building this vital infrastructure. For this reason, this investment should be made up front with the expectation it will later be offset by shale gas revenues.

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