Derbyshire and Derby Minerals Local Plan 2022 – 2038

Background Paper: Conventional Oil and Gas Background Paper

January 2023

Derby City Council

DERBYSHIRE County Council

Contents

1. Introduction and Background

1.1 This paper provides information about oil and gas obtained from conventional sources whilst corresponding papers focus on unconventional sources such as gas from coal and shale gas. The production of separate papers reflects the issues that have been raised in previous consultation exercises and the views expressed to the County and City Councils in response to publicity for individual planning applications. Some of the issues and legislative provisions are common to all three forms of hydrocarbon developments and therefore there is some level of duplication in the papers but this is necessary to ensure that each one provides a comprehensive review of the issues for those who read them individually.

1.2 Oil and gas (forms of hydrocarbons) are important sources of energy in the UK where they are primarily used as fuel, although some components are also used as a raw material for the petro-chemical industry and in the manufacturing of drugs and plastics. Oil and gas are regarded as minerals and development proposals to extract them from sites in Derbyshire (excluding the Peak District National Park area) are the responsibility of Derby City Council or Derbyshire County Council as each respective Mineral Planning Authority. There are numerous methods of extracting oil and gas and each has different land use planning implications. This paper focuses on the issues involved in extracting oil and gas from conventional sources.

Conventional Hydrocarbons

1.3 Hydrocarbon is a compound of hydrogen and carbon. Hydrocarbons are of great importance as they include minerals such as oil and gas which provide a significant proportion of our energy supplies. They are also used as raw materials for the petro-chemicals industry and in the manufacture of drugs and plastics. The geological conditions where these resources are found, and the methods used to extract them have resulted in two categories of hydrocarbons, conventional and unconventional.

1.4 Conventional deposits are contained in porous rocks with interconnected spaces, such as limestone and sandstone. These interconnected spaces give rise to permeability that allows oil or gas to effectively flow through the reservoir to the well. Conventional reserves therefore can usually be exploited by drilling a well, with oil or gas then flowing out under its own

pressure, although hydraulic fracturing (commonly referred to as 'fracking') can also be used in certain circumstances. Unconventional oil and gas deposits are contained in impermeable rocks, such as shale or coal deposits. In these cases, the oil or gas cannot easily flow through the reservoir. Further information regarding unconventional hydrocarbons, and the methods used to extract them, can be found in the following papers:

- *Derbyshire and Derby Mineral Local Plan (2022 – 2038): Pre-submission Draft Plan Spring 2023 Consultation: Background Paper Unconventional Gas – Gas from Coal*
- *Derbyshire and Derby Mineral Local Plan (2022 – 2038): Pre-submission Draft Plan Spring 2023 Consultation: Background Paper Unconventional Gas – Shale Gas*

2 Geology

2.1 Oil and natural gas originate in petroleum source rocks, i.e. sedimentary rocks that were deposited in very quiet water, usually in still swamps on land, in shallow quiet marine bays, or in deep submarine settings. Source rocks are comprised of very small mineral fragments. In between the mineral fragments, are the remains of organic material, usually algae, small wood fragments, or pieces of the soft parts of plants. When these fine-grained sediments are buried by depositions of later, overlying sediments, the increased heat and pressure resulting from the burials turns the soft sediments into hard rock strata. If further burial ensues, then temperatures continue to increase. When temperatures of the organic-rich sedimentary rocks exceed 120o Centigrade, the organic remains within the rocks begin to be 'cooked' and oil and gas are formed from the organic remains expelled from the source rock. It takes millions of years for these source rocks to be buried deeply enough to attain these maturation temperatures and additional millions of years for sufficient volumes of oil and gas to form commercial accumulations as the oil and gas are expelled from the source rock into adjacent reservoir rocks. Oil and gas formed in this manner are referred to as thermogenic oil and gas.

2.2 If the organic material within the source rocks is mostly wood fragments, then the primary hydrocarbon generated is natural gas. If the organic material is mostly algae and the soft parts of land plants, then both oil and gas are formed. By the time the source rock is buried deeply enough so that temperatures are above 150o Centigrade, the organic remains have produced most of the oil they are able to. Above these temperatures, any oil remaining in the source rock or any oil that has been trapped in adjacent reservoirs will be broken down into natural gas.

2.3 Some organic-rich sedimentary rock can generate gas through bacterial processes at shallow burial depths before thermal maturation temperatures are attained. In this process, referred to as biogenic gas generation, the organic-rich source rocks are never buried deeply enough and do not attain temperatures necessary for the thermogenic production of gas. Instead, anaerobic bacteria generate gas in shallow source rocks that are generally located around the basin margins. Biogenic processes produce less gas per unit of sediment than thermogenic processes. Gas wells associated with biogenic gas are

usually low volume. Most accumulations of biogenic gas occur at depths of less than 60 metres.

2.4 Oil and gas reservoir rocks are porous and permeable. They contain interconnected passageways of microscopic pores or holes that occupy the areas between the mineral grains and the rock. When oil and gas have been naturally expelled from the source rocks, they enter or migrate into the adjacent reservoir rocks. Most oil and gas reservoir rocks are sandstones, limestones or dolomites.

2.5 Potential source rocks for hydrocarbons (oil and gas) occur in many areas of the UK, including the best known, the Kimmeridge Clay formation found offshore in the North Sea and which extends across southern England to the south coast. This resource has provided the UK with major oil and gas reserves that have been exploited since the early 1970s. However, oil and gas have only been discovered and produced in commercial quantities from specific sedimentary basins onshore. These are where the required reservoir rocks and source rocks that gained adequate maturity were deposited and where trapping structures now exist (impermeable caps halting the movement of the reserve enabling the formation of a reservoir).

2.6 The eastern part of Derbyshire is on the western margin of the East Midlands oil and gas province. This province comprises a series of major Carboniferous rift basins (Silesian sandstones and fractured Dinantian limestones), within which sequences containing important source and reservoir rocks were deposited during Namurian and Westphalian (late Carboniferous) times. Also known as the East Midlands Petroleum Province, it covers the petroliferous geological area across the north-eastern part of the East Midlands region.

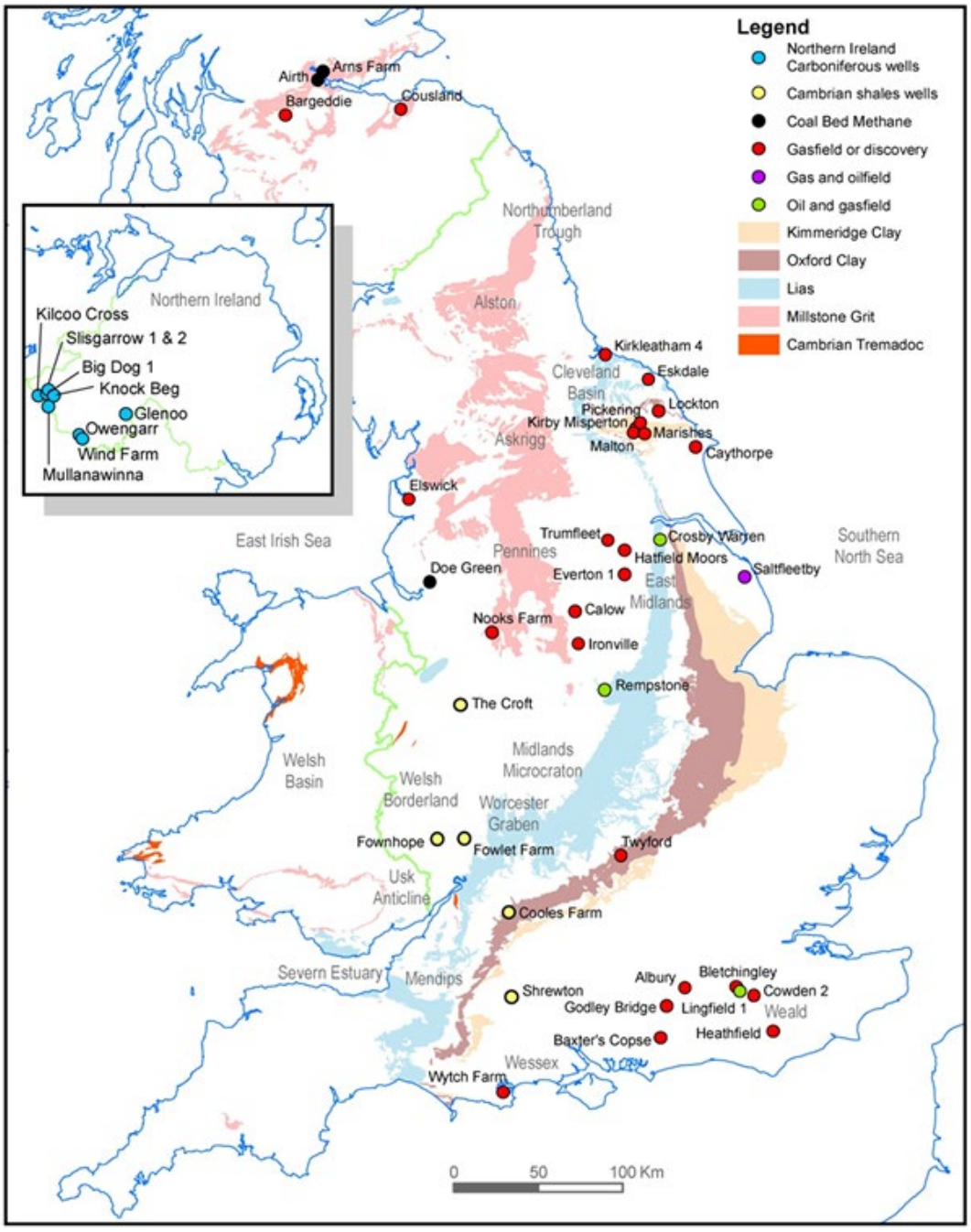
2.7 Early exploration led to the discovery of oil at Kelham, Nottinghamshire in the 1920s with further reserves in Eakring (also Nottinghamshire) in 1939. Oil and gas have both been exploited in Derbyshire at Heath and Calow (gas), and Hardstoft (oil) and exploratory wells have been sunk at four other sites at Whitwell, Bramley Moor, Golden Valley and Sawley. At the end of 2009 it was estimated that the remaining recoverable reserves of oil in the East Midlands province were almost 22 million barrels.

2.8 Geological conditions are such that it is possible that further oil or gas accumulations, in commercial quantities, could be found in the area east

of Calow, Hardstoft and Ironville. The area to the west is somewhat less prospective, as the main East Midlands reservoir sandstones (the Crashaw Sandstone and the Chatsworth Grit) are absent or only shallowly buried.

Figure 1: Principal UK Onshore Hydrocarbon Provinces 2010

Outcrop of main black shale formations in UK and selected oil and gas wells and gas fields



3. National Planning Policy and Guidance

3.1 The following section reviews the main publications which currently apply to the extraction of conventional hydrocarbons and the guidance they provide on future developments. This review focuses on the aspects of guidance which are pertinent to town and country planning and the production of the minerals plan rather than the wider, more technical aspects.

National Planning Policy Framework (NPPF)

3.2 National guidance for the extraction of minerals, including hydrocarbons, is set out in the NPPF[1]. In general terms, the NPPF states at paragraph 209 that, *'It is essential that there is a sufficient supply of minerals to provide the infrastructure, buildings, energy and goods that the country needs. Since minerals are a finite natural resource, and can only be worked where they are found, best use needs to be made of them to secure their long-term conservation*.' The policy advice on mineral development generally (paragraph 210) is that mineral planning authorities should have planning policies that '*a) provide for the extraction of mineral resources of local and national importance*,' and '*f) set out criteria or requirements to ensure permitted and proposed operations do not have unacceptable adverse impacts on the natural and historic environment or human health, taking into account the cumulative effects of multiple impacts from individual sites and/or a number of sites in a locality.'* Paragraph 211 requires '*when determining planning applications, great weight should be given to the benefits of mineral extraction, including to the economy.'*

3.3 Specific but limited guidance on hydrocarbons is set out in Paragraph 215 of the NPPF which states that, "Minerals Planning Authorities should …when planning for on-shore oil and gas development, clearly distinguish between, and plan positively for, the three phases of development (exploration, appraisal and production), whilst ensuring appropriate monitoring and site restoration is provided for". In addition, it states that mineral planning authorities should: 'encourage underground gas and carbon storage and associated infrastructure if local geological circumstances indicate its feasibility' and 'encourage the capture and use of methane from coal mines in active and abandoned coalfield areas'.

[1] National Planning Policy Framework, (July 2021) National Planning Policy Framework - Guidance - GOV.UK (www.gov.uk)

BGS has carried out investigations into suitable areas in the UK for potential underground gas and carbon storage. Derbyshire has not been identified as a potential suitable area.

3.4 When determining planning applications, the NPPF (at paragraph 216) states that "…mineral planning authorities should ensure that the integrity and safety of underground storage facilities are appropriate, taking into account the maintenance of gas pressure, prevention of leakage of gas and the avoidance of pollution."

Planning Practice Guidance, March 2014 (PPG)[2]

3.5 PPG encourages mineral planning authorities to make appropriate provision for hydrocarbons in local mineral plans, based on emerging information, to allow them to highlight areas where proposals for extraction may come forward, as well as managing potentially conflicting objectives for the use of land.

3.6 Where mineral planning authorities consider it is necessary to update their local plan and they are in a Petroleum Licence area, PPG[3] states that they are expected to include Petroleum Licence Areas on their policies maps and include criteria based policies for each phase; that is exploration, appraisal and production, setting clear guidance for the location and assessment of hydrocarbon extraction within those areas. Existing hydrocarbon extraction sites should be identified in local plans, through the local plan site allocation process, where appropriate, and mineral planning authorities may include specific locations should the oil and gas industry wish to promote specific sites. In contrast to the practice established for other minerals resources, the guidance does not advocate the creation of formal safeguarding areas for hydrocarbons due to the depth of those reserves, the ability to use drilling equipment and the small surface area required for the installations.

3.7 PPG[4] provides a description of the different operations involved in the three phases, the technical issues associated with hydrocarbon working and the planning issues which arise from hydrocarbon developments. It includes an explanation of the role of the planning system in obtaining

[2] Planning Practice Guidance Planning practice guidance - GOV.UK (www.gov.uk)
[3] PPG Minerals Paragraph: 106 Reference ID: 27-106-20140306 Revision date: 06 03 2014
[4] PPG Minerals, Paragraphs 092 – 103, Reference IDs: 27-092-20140306 – 27-103-20140306, March 2014

permission together with a summary of the role of the other official regulators also involved in the process.

3.8 With regard to the determination of development proposals, mineral planning authorities are advised to assess applications for each phase on their respective merits and applications for the exploratory stage of development should not involve the consideration of the potential impacts of extraction. Mineral planning authorities should take account of Government energy policy, which indicates a preference for energy supplies to be obtained from a variety of sources, including onshore oil and gas. Mineral planning authorities should use appropriate conditions, having regard to the issues for which they are responsible, to mitigate against any adverse environmental impact. PPG provides some examples of model conditions in Annex C[5]. It states that above ground separation distances would be acceptable in specific circumstances where it is clear that, based on site specific assessments and other forms of mitigation measures (such as working scheme design and landscaping) a certain distance is required between the boundary of the minerals site and the adjacent development. Operators and mineral planning authorities are also encouraged to seek appropriate restoration schemes for sites once mineral extraction is completed.

National Energy Policy

3.9 There have been several important stages in the evolution of current national energy policy which, increasingly, have recognised the need to adapt to climate change whilst maintaining secure energy supplies. The Department of Trade and Industry (DTI) paper, Meeting the Energy Challenge, 2007[6] states that England, Wales and Scotland's substantial remaining coal resources, including gas contained within the coal, have the potential not only to help meet our national demand for coal and to reduce our dependence on imported primary fuels, but also to contribute to the economic vitality and skills base of the regions where they are found.

3.10 Energy policy since 2008 has been influenced by The Climate Change Act 2008 which set in legislation the UK's approach to tackling and responding to climate change. It introduced the UK's long-term legally binding 2050 target to reduce greenhouse gas emissions by at least 80%

[5] Paragraph 139, Reference ID: 27-139-20140306, March 2014
[6] Meeting the Energy Challenge, A White Paper on Energy, DTI, May 2007

relative to 1990 levels and introduced 'carbon budgets' which cap emissions over successive 5-year periods which must be set 12 years in advance.

3.11 The draft National Policy Statement for Energy, published in 2009, built on the 2007 Energy White Paper. Together they formed an evolving international and domestic energy strategy in response to the changing circumstances in global energy markets. They set out to address the long-term energy challenges of security of supply, whilst acknowledging the implications of climate change. Whilst recent emphasis has been on the development of renewable energy supplies the Government recognised the important and continuing role that indigenous sources of coal, oil and gas will play in meeting national energy requirements. This was reaffirmed in the Overarching National Policy Statement for Energy (EN-1) July 2011[7] which provided further clarification of the Government's plans for a transition to a low carbon economy and in the Gas Generation Strategy 2012[8] which made it clear that gas will continue to play a major role in the UK electricity mix over the coming decades, alongside low-carbon technologies as the electricity system is decarbonised.

3.12 This policy is set against the background of changes in the sources of our energy requirements. By 2004 the United Kingdom became a net importer of natural gas and a net importer of oil in 2010. It was estimated that, by 2020, the UK would be importing about three-quarters of its energy supplies.

3.13 In December 2013 the Government published its long-term infrastructure investment plans which included investment in gas, as well as low-carbon technologies, in order to replace the UK's aging energy infrastructure and maintain secure energy supplies. The plan indicated that a key role for gas is consistent with the need to decarbonise our economy. It is regarded by the Government as the cleanest fossil fuel, and much of the new gas capacity needed would be replacing the ageing coal capacity. Gas is also seen as important for balancing the increasing levels of intermittent and inflexible low-carbon energy on the system. Delivery of the plan, including the role that gas would play in the provision

[7] DECC, Overarching National Policy Statement for Energy (EN-1), July 2011
[8] DECC, Gas Generation Strategy, December 2012

of national energy infrastructure, was subsequently set out in the National Infrastructure Delivery Plan (NIDP)[9], published March 2016.

Energy Act 2013

3.14 The Energy Act received Royal Assent on 18 December 2013. The Act has several objectives and in relation to hydrocarbons it seeks to make provision for the setting of a decarbonisation target range and duties in relation to it; or in connection with reforms to the electricity market for the purposes of encouraging low-carbon electricity generation, or ensuring security of supply. It is also about the designation of a strategy and policy statement concerning domestic supplies of gas and electricity. It does not actually prescribe a new strategy or policy at this stage but instead sets the procedural requirements for doing so. It is likely however that future policy and strategy will reflect the overall objective of the Act to reduce our carbon footprint and in turn this will affect the future demand for minerals including fossil fuels.

Written Ministerial Statement November 2015, 'Priorities for UK Energy and Climate Change Policy'

3.15 This Written Ministerial Statement (WMS) was presented to Parliament in November 2015 by the Secretary of State for Energy and Climate Change. The WMS does not change national planning policy or guidance but it does set out Government thinking on the approach to energy supply. The Secretary of State stated that "*Affordable, reliable clean energy is critical to our economy, our national security, and to family budgets. We need secure energy so people can get on with their lives and businesses can plan for the future. Affordable energy so the people that foot the bill get a good deal, and clean energy to safeguard our future economic security and ensure we can meet our climate change commitments*." She added "*New nuclear and gas will be central to our energy secure future…'.* The WMS goes on "*one of the greatest and most effective contributions we can make to emissions from electricity generation is by replacing coal fired power stations with gas*.". The programme was to be subject to consultation but indicated a restriction on the use of coal by 2023 and the possible closure of all coal-fired power stations by 2025. This was subject to the development of the infrastructure to enable the shift to take place. This could have

[9] Infrastructure and Projects Authority 'National Infrastructure delivery Plan 2016-2021'

implications for the UK onshore oil and gas industry and the utilisation of indigenous resources.

Paris Agreement, December 2015

3.16 In December 2015 the UK, as part of UN negotiations and along with other 190 other countries, drafted the Paris Agreement to tackle climate change. The Agreement, which came into force at the end of 2016, aims to limit global warming to well below 2°C and pursue efforts to limit it to 1.5°C. It also requires all parties to put forward their best efforts through the production of nationally determined contributions and to strengthen these efforts in the years ahead. There are requirements for Parties to report regularly on their emissions and on their implementation efforts, with a global 'stocktake' every five years to assess collective progress

DBEIS Written Ministerial Statement HCWS690 May 2018, - Energy Policy

3.17 This WMS was presented to Parliament in May 2018 by Greg Clerk Secretary of State for Business, Energy and Industrial Strategy. It states that there are potentially substantial benefits from the safe and sustainable exploration and development of our onshore oil and gas resources. It adds that *'the UK must have safe, secure and affordable supplies of energy with carbon emissions levels that are consistent with the carbon budgets defined in our Climate Change Act and our international obligations. We believe that gas has a key part to play in meeting these objectives both currently and in the future. In part as a result of the UK's diverse range of energy sources, which include natural gas, we have had competitively-priced energy since 1990 whilst reducing carbon emissions across the economy by 49% – a leading performance among developed nations. Gas still makes up around a third of our current energy usage and every scenario proposed by the Committee on Climate Change setting out how the UK could meet its legally binding 2050 emissions reduction target includes demand for natural gas. As set out in the Clean Growth Strategy, innovations in technologies such as Carbon Capture Usage and Storage (CCUS) have the potential to decarbonise this energy supply still further and prolong its role in our energy mix.*

3.18 However, despite the welcome improvements in efficiency and innovation from companies operating in the North Sea, the ongoing decline in our offshore gas production has meant that the UK has gone

from being a net exporter of gas in 2003 to importing just under 50% of gas supplies in 2017 and estimates suggest we could be importing 73% of our gas by 2035 . Our current import mix, via pipelines from Norway and Continental Europe and LNG terminals that can source gas from around the world, provides us with stable and secure supplies. However, the Government believe that it is right to utilise our domestic gas resources to the maximum extent and exploring further the potential for onshore gas production from shale rock formations in the UK, where it is economically efficient, and where environment impacts are robustly regulated.'

The UK's Draft Integrated National Energy and Climate Change Plan (NECP) January 2019

3.19 In the context of planning ahead for withdrawal from the EU the draft stated that, "On energy, the UK is seeking co-operation with the EU to support the delivery of cost efficient, clean and secure supplies of electricity and gas, based on competitive markets and non-discriminatory access to markets." On climate change it stated "that the UK recognises the shared interest in global action on climate change and the mutual benefits of a broad agreement on climate change co-operation."

3.20 The paper provides a review of important statements on energy and climate change (for example the Clean Growth Strategy October 2017) which set the framework, objectives and targets. It reaffirms the need to ensure energy security and energy efficiency, the approach to decarbonisation and the policies and measures relating to these and other issues. Whilst it addresses a wide range of energy and climate change issues the only direct minerals reference is to unconventional gas resources, including shale gas development.

The Climate Change Act 2008 (2050 Target Amendment) Order 2019

3.21 The amendment in this Order has the effect that the minimum percentage by which the net UK carbon account for the year 2050 must be lower than the 1990 baseline (the baseline of net UK emissions of targeted greenhouse gases) is increased from 80% to 100%.

3.22 In terms of meeting the carbon budgets, the first (2008-2012) was outperformed by 1% and the second (2013-2017) by 14%. The Government's energy and emissions projections 2018 (published April

2019)[10] predicted that the third (2018-2022) would be outperformed by around 3% but predicted a projected shortfall of around 6% and 10% against the fourth (2023-2027) and fifth (2028-2032) budgets respectively. These predictions were before the more stringent target amendments.[11]

More information about climate change and its effects can be found in the following background paper:

Derbyshire and Derby Mineral Local Plan (2022 – 2038): Pre-submission Draft Plan Spring 2023 Consultation: Background Paper Climate Change

National Grid: Future Energy Scenarios July 2020

3.23 National Grid, which operates GB's electricity and gas networks, produce an annual report on Future Energy Scenarios which suggest four credible pathways for the future of energy to 2050. Each scenario considers how much energy we might need and where it could come from. Three of the four scenarios achieve the net zero greenhouse gas emission target by 2050 i.e. a 100% reduction compared to 1990 levels. The fourth scenario labelled 'Steady Progression' achieves a 68% reduction; the use of shale gas is only present in this scenario. The report notes that shale gas is not present in the three net zero scenarios due to reduced support from government and consumers.

HM Government, The Ten Point Plan for a Green Industrial Revolution, November 2020

3.24 This document sets out the Government's approach to tackling climate change via ten action points including the investment in clean technologies, power generation and the natural environment. Of particular relevance to hydrocarbons is the stated commitment to drive the growth of low carbon hydrogen (point 2). Hydrocarbons have traditionally used in the production of hydrogen at an industrial scale although not in a low carbon form. Subject to CCS technologies being developed which would trap carbon emissions, there is potential for the continued use of conventional oil and gas in this industry.

3.25 The document also makes reference to a suite of more detailed strategies, including the Energy White paper (2020), the Hydrogen

[10] DBEIS, Updated energy and emissions projections 2018, April 2019

strategy (2021) and the Industrial Decarbonisation strategy (2021) all of which are likely to have relevance to the need for conventional oil and gas. One of the suite of documents referred to in the Ten Point Plan, the National Infrastructure Strategy, was also published in November 2020. Further information is set out in paragraph 3.28 below.

National Infrastructure Strategy (NIS), November 2020

3.26 Building on the themes set out in the Ten Point Plan, the NIS sets out the Government's proposals for investment in infrastructure over the next few years. One of the main tenets of the NIS is decarbonising the economy and adapting to climate change. Clean energy, including the prioritisation of low carbon hydrogen, nuclear or gas with carbon capture and storage (CCS) power sources are prioritised along with renewable energy sources. The NIS also indicates that the use of low carbon hydrogen is seen as a potential means of decarbonising heavy industry. Investment in methane reformation with CCS to produce 'blue' hydrogen would require a continued supply of natural oil and gas in order as feed material.

Energy White Paper (December 2020)

3.27 In December 2020 the Government published its Energy White Paper[12] entitled Powering our Net Zero Future; in terms of the way in which we produce and use energy it promotes a decisive shift away from fossil fuels, as far as it is possible to do so, to using clean energy technologies such as renewables, nuclear and hydrogen. Nevertheless, the paper anticipates that oil and gas will still form part of the energy mix in 2050 and therefore it is important to plan for their continued supply. A Government Written Ministerial Statement (WMS)[13] published in November 2019 stated, "*the Government continues to recognise the importance of natural gas as a source of secure and affordable energy as we aim to reach net zero emissions by 2050*". The Statement sets out that the Committee on Climate Change (CCC) predicts that we will still be consuming about 70% of the gas that we consume today in 2050 under our net zero target as significant reductions across building, industry and power are offset by demand for gas to produce hydrogen and therefore, continued good access to natural gas from both domestic and international markets is seen as critical.

[12] DBEIS Energy White Paper Powering our Net Zero Future December 2020
[13] DBEIS WMS HCWS68 Energy Policy Update November 2019

HM Government, Industrial Decarbonisation Strategy, CP399, March 2021

3.28 The strategy sets out the Government's policies and proposals for the decarbonisation of the industrial sector to enable the UK to meet its net-zero targets by 2050. Specifically, with regard to fossil fuels, including gas, the strategy sets out that the UK will need to replace them with low carbon fuels such as hydrogen, electricity and bioenergy, unless they (fossil fuels) are combined with carbon capture. To be on track to deliver net zero, we expect that the minimum, in all future scenarios, is 20 TWh per year of fossil fuel use which would be replaced with low carbon alternatives by 2030. The strategy also explores options for the decarbonisation of the cement sector in dispersed locations, including a number of cement plants/kilns located within the Plan Area, through the use of a 'zero-carbon' fuel mix.

UK Energy Security Strategy April 2022

3.29 The strategy sets out the how the UK Government envisages Great Britain will accelerate homegrown power to ensure greater energy independence. It includes the following identified measures:

- Low carbon power- Target of providing 95% of UK electricity from low carbon sources by 2030 and to fully decarbonise electricity by 2035.
- Nuclear - increasing capacity from 8 GW today to 24 GW by 2050. This target could see the building of up to eight new reactors.
- Offshore Wind - increasing capacity from 11 GW today to 50 GW by 2030, including 5 GW of floating offshore wind.
- Onshore Wind - increasing capacity from 14 GW today in line with local community views. Expansion will be incentivised by offering lower electricity prices to those living near future wind farms
- Oil and Gas recognised as essential transition fuel and increase in domestic production supported:
- Offshore Gas - new licensing round launched in autumn (first since 2020) focus on faster development times.
- Onshore Gas - review of seismic activity on shale gas geological science commissioned from BGS. Report sent to DBEIS awaiting publication.

- Low Carbon technologies - commitment remains to deliver carbon capture and storage utilisation by 2030.
- Hydrogen - increasing the previously set target from 5 GW to 10 GW by 2030 with at least 5 GW of green hydrogen.

3.30 The Strategy is current the subject of an Inquiry by the Business, Energy and Industrial Strategy (BEIS) committee. In addition to examining how the strategy was finalised, the Inquiry is also examining the relationship between the Strategy and other policy objectives laid out by the Government in its 2020 Energy White Paper and the Net Zero Strategy.

National Grid: Future Energy Scenarios July 2022 (FES 2022)

3.31 National Grid, which operates GB's electricity and gas networks, produce an annual report on Future Energy Scenarios. The Future Energy Scenarios (FES 2022) sets out four credible ways that the UK can achieve Net Zero by 2050, as well as the UK Government's commitment to a decarbonised electricity system by 2035. Each scenario considers how much energy we might need and where it could come from. Three of the four scenarios achieve the net zero greenhouse gas emission target by 2050 i.e. a 100% reduction compared to 1990 levels. The fourth scenario labelled 'Falling Short' achieves a 80% reduction (an improvement on the 68% reduction predicted in the FES 2020 fourth scenario); the use of shale gas is only present in this scenario.

Local Planning Policy

3.32 **Derby and Derbyshire Minerals Local Plan**

The current Minerals Local Plan states that all proposals for the extraction of oil and gas will be considered against the general policies set out in the Plan, and the detailed criteria in Policy MP35 Oil and Gas which states that:

'*Proposals for the development of oil and gas, including facilities associated with the production, processing or transporting of oil or natural gas will be permitted only where they can be carried out in an environmentally acceptable way, and provided that:*

- *any irreparable damage to interests of acknowledged environmental importance is outweighed by a proven need for the development in its proposed location*
- *the proposal is consistent with an approved overall scheme for the appraisal of, or production from the area*

- *the proposed location of the development is the best having regard to geological, technical and environmental considerations*
- *satisfactory arrangements have been made for the avoidance of seepage pollution, the off-site disposal of drilling mud and other drilling residues and the flaring and disposal of unwanted gas'.*

4 Regulatory System

Key Regulators

4.1 Anyone seeking to carry out operations for the extraction of hydrocarbons, from conventional or unconventional sources involving traditional or new technologies, has to obtain approval from the appropriate regulatory bodies. The key regulators for all hydrocarbon extraction operations are:

- **North Sea Transition Authority** (NSTA) - The NSTA regulates the licensing of exploration and development of England's onshore oil and gas resources. The NSTA issues well consents, development programme approvals, completion of work programme approvals and production consents. Before a company can carry out onshore exploration for oil and gas, a company needs to apply to the NSTA for a Petroleum Exploration & Development License (PEDL). The Petroleum Act 1998 vests all rights to the nation's petroleum resources in the Crown, but the NSTA can grant licenses that confer exclusive rights to 'search and bore and get' petroleum. Whilst a licence holder is obliged to maximise recovery from the licence area, the award of a licence does not confer exemption from other legal and regulatory requirements, including the need to obtain planning permission. A number of PEDL straddle mineral authority boundaries, but liaison under the Duty to Co-operate enables any cross-boundary impacts to be taken into account and monitored.
- **Mineral Planning Authorities** – grant planning permission for the location of any wells and well pads and impose conditions to ensure that the impact on the use of the land is acceptable.
- **Environment Agency** – protect water resources (including groundwater aquifers), ensure appropriate treatment and disposal of mining waste, emissions to air, and suitable treatment and manage any naturally occurring radioactive materials; and
- **Health and Safety Executive** – the HSE regulates the safety aspects of all phases of extraction, in particular responsibility for ensuring the appropriate design and construction of a well casing for any borehole.

Other bodies which may be involved in the consenting of the process include:

- **The Coal Authority**, whose permission will be required should drilling go through a coal seam and which has responsibility for any subsidence in ex-mining areas
- **Natural England**, who may need to issue European Protected Species Licences in certain circumstances
- **The British Geological Survey**, who need to be notified by licensees of their intention to undertake drilling and, upon completion of drilling, must also receive drilling records and cores, and
- **Hazardous Substances Authorities**, who may need to provide hazardous substances consents.

Additional consents and orders, such as stopping up rights of way or temporary road orders, may also be required.

Obtaining Planning Permission and Other Approvals

4.2 Apart from a few exceptions, which are covered by the Town and Country Planning (General Permitted Development) (England) Order 2015, all development associated with the extraction of hydrocarbons requires planning permission. The process of obtaining planning permission to drill a well is the same whether the well is targeted at conventional gas resources or unconventional gas (e.g. shale gas). The process involves three separate stages; exploration, appraisal and extraction, and planning permissions are required for each stage, although an applicant can seek approval for two or more stages in one application.

4.3 The exploratory phase seeks to acquire geological data to establish whether hydrocarbons are present. The appraisal stage takes place when the existence of oil or gas has been confirmed, but where the operator needs further information about the extent of the deposit or its characteristics to establish whether it can be economically extracted. The production stage normally involves the drilling of a number of wells and may also involve the installation of ancillary equipment such as pipelines, processing facilities and storage tanks.

4.4 Before a company can carry out onshore exploration for oil and gas, it needs to apply to the NTSA for a Petroleum Exploration & Development License (PEDL). Licences are issued in competitive offerings (Licence Rounds). They do not give permission for drilling or any other operations; rather, they grant exclusivity to licensees, in relation to hydrocarbon

exploration and extraction (including for shale gas but also for other forms), within a defined area.

4.5 The DBEIS Regulatory Roadmap England: Onshore Oil and Gas Exploration in the UK: Regulation and Best Practice, December 2015 (with updates to 2018), contains the following checklist which identifies that before commencing drilling operations for all onshore oil and gas development the operator must have:

- obtained a petroleum exploration and development licence (PEDL) from NSTA
- secured a lease from the landowner
- submitted relevant Petroleum Operations Notices (PON) to NSTA
- secured planning permission from the MPA/LPA/DLUHC
- discharged any relevant conditions placed on the planning permission
- obtained a permit from the Coal Authority if the well will encroach on coal seams
- informed the British Geological Survey (BGS) of the intention to drill
- completed the necessary consultation process with all the statutory/relevant consultees
- obtained the necessary permits from the Environment Agency
- notified HSE of the intention to drill (minimum 21 days' notice)
- provided HSE with details of the proposed well design that have been examined by an independent and competent well examiner (minimum 21 days' notice)
- agreed data-reporting methods with NSTA
- agreed a method for monitoring induced seismicity and fracture growth height with NTSA, (where hydraulic fracturing is planned)
- received approval for an outline fracturing programme from DBEIS (where hydraulic fracturing is planned).

Further details of this process are summarised below.

4.6 The submission of an application to the mineral planning authority triggers the need to determine if an Environmental Impact Assessment (EIA) is required. An EIA will be required if the scale of the proposed development exceeds certain thresholds, or if, depending on the nature,

scale and location, the development may have significant environmental impacts. If an EIA is required, it must be completed by the applicant and submitted to the mineral planning authority before the authority decides on the application. Operators are encouraged to engage in pre-application discussions with the mineral planning authority where the need for an EIA and the matters to be addressed in it can be determined before an application is prepared and submitted. Government policy also encourages would-be applicants to undertake community engagement. Applicants are advised to inform local communities about their proposals and, where appropriate, amend those proposals in response to the feedback they receive.

4.7 Following a consultation in September 2013 and Government response in January 2014, changes were made to the system of how landowners and tenants should be notified by applicants of applications for onshore oil and gas development. The requirement to serve notice on individual owners and tenants of land on the above ground area where works are required was retained, but the requirement for owners of land beyond this area i.e. the owners of land where solely underground operations may take place, was removed. This was implemented by the Town and Country Planning (Development Management Procedure and Section 62A Applications) (England) (Amendment No.2) which came into force from 13 January 2014 and has subsequently been incorporated into the Town and Country Planning (Development Management Procedure) (England) Order 2015 at Article 13(3).

4.8 Once the MPA has granted planning permission to drill, and at least 21 days before drilling is planned, the Health and Safety Executive (HSE) must be notified of the well design and operation plans to ensure that major accident hazard risks to people from well and well related activities are properly controlled, and are subject to the same stringent regulation as any industrial activity. HSE regulations also require verification of the well design by an independent third party. Notification of an intention to drill has to be served to the environmental regulator under S199 of the Water Resources Act, 1991.

4.9 The NTSA (or any successor) will then check that the other regulators have no objections before consenting drilling operations. If hydraulic fracturing is intended, the NTSA will require that a hydraulic fracturing plan to address the risk of induced seismicity is submitted and will review this plan before these operations are permitted (see Unconventional Gas

– Shale Gas Background Paper for more information on this process in relation to proposals for hydraulic fracturing and the need to obtain Hydraulic Fracturing Consent as a further step in the consent process).

4.10 If the operator wishes to drill an appraisal well or propose to start production operations, they start again with the process described above; the landowner's consent, permissions and planning consent, (which may require EIA and approval from the EA, the HSE, NSTA and DBEIS)

4.11 The planning and other regulatory regimes are separate but complementary. The planning system controls the development and the use of the land in the public interest and this includes ensuring that new development is appropriate for the location taking account of the effects, including cumulative effects, of pollution on health, the natural environment, general amenity and the potential sensitivity of the area or proposed development to adverse effects from pollution (see paragraphs 185 of the NPPF). The focus is on whether the development is an acceptable use of the land, and the impacts of those uses, rather than the control of the processes involved and health and safety. The information above briefly outlines the regulatory responsibilities for these issues.

4.12 All planning applications have to be assessed on the individual merits of the case, taking account of national and local policy. This applies to all proposals for oil and gas extraction from both conventional and unconventional sources using traditional or new techniques. In the early part of 2013, media coverage of proposals for hydraulic fracturing for shale gas led to concerns that such developments would be dealt with by the fast-track route for nationally significant business and commercial development proposed in the Growth and Infrastructure Bill by submitting applications to the Planning Inspectorate rather than to local councils. However, on 19 July 2013 in a Ministerial Statement, Baroness Hanham confirmed that *"… responsibility for the determination of planning applications for onshore oil and gas, including for the exploration of shale gas, will be with the local authority. Decisions will therefore continue to be taken in accordance with local plans and the National Planning Policy Framework."*

4.13 The situation changed following the publication on 13 August 2015 of a joint statement from the then Department of Energy and Climate Change

(now DBEIS) and the Department for Communities and Local Government (now DLUHC) in which the new measures include:

- The Communities Secretary actively considering calling in on a case by case basis shale planning applications and considering recovering appeals
- Identifying councils that repeatedly fail to determine oil and gas applications within the 16 week statutory timeframe requirement (unless applicants agree to a longer period). Underperforming council's gas and oil planning applications could be determined by the Communities Secretary
- Adding shale applications as a specific criterion for recovery of appeals, to ensure no application can 'fall through the cracks'
- Ensuring planning call ins and appeals involving shale applications are prioritised by the Planning Inspectorate
- Taking forward work on revising permitted development rights for drilling boreholes for groundwater monitoring.

4.14 Coverage of recent hydrocarbon operations in the press and media, especially those involving hydraulic fracturing, have focused on a number of important issues, including seismic risks and the chemical content of hydraulic fracturing fluid. PPG states that whilst these issues may be put to the mineral planning authority, the responsibility for assessment rests with other regulators. Mineral planning authorities have to assume that these other regulators will carry out their duties and responsibilities. They do not have to undertake their own assessments and should rely on the assessments of these regulators. Prior to granting planning permission, however, the mineral planning authority will need to be satisfied that these issues can and will be adequately addressed by taking advice from the appropriate regulator.

5. Licensing of Oil and Gas Exploration and Development

5.1 The Petroleum Act 1998 vests all rights and ownership of the petroleum resources (oil and gas) of Great Britain and the United Kingdom territorial waters in the Crown. The Secretary of State for Trade and Industry (DTI) (or successor) grants licences to persons that confer exclusive rights to 'search and bore for and get' these resources. The Department for Energy and Climate Change (successor to DTI) had a regular timetable of licencing rounds, with generally one onshore round per year. Licences are awarded to those bids promising to optimise the exploitation of the UK's petroleum resources. This function has now passed to the NSTA which has published guidance[14] on the current licencing system.

5.2 The main objectives of the licencing regime are to secure the comprehensive exploration and appraisal of UK oil and gas resources and the economic development of discovered reserves. The rights granted by landward licences do not include any rights of access, and the onus is upon the licensee to obtain all the relevant authorisations and planning permissions from the respective authorities and landowners.

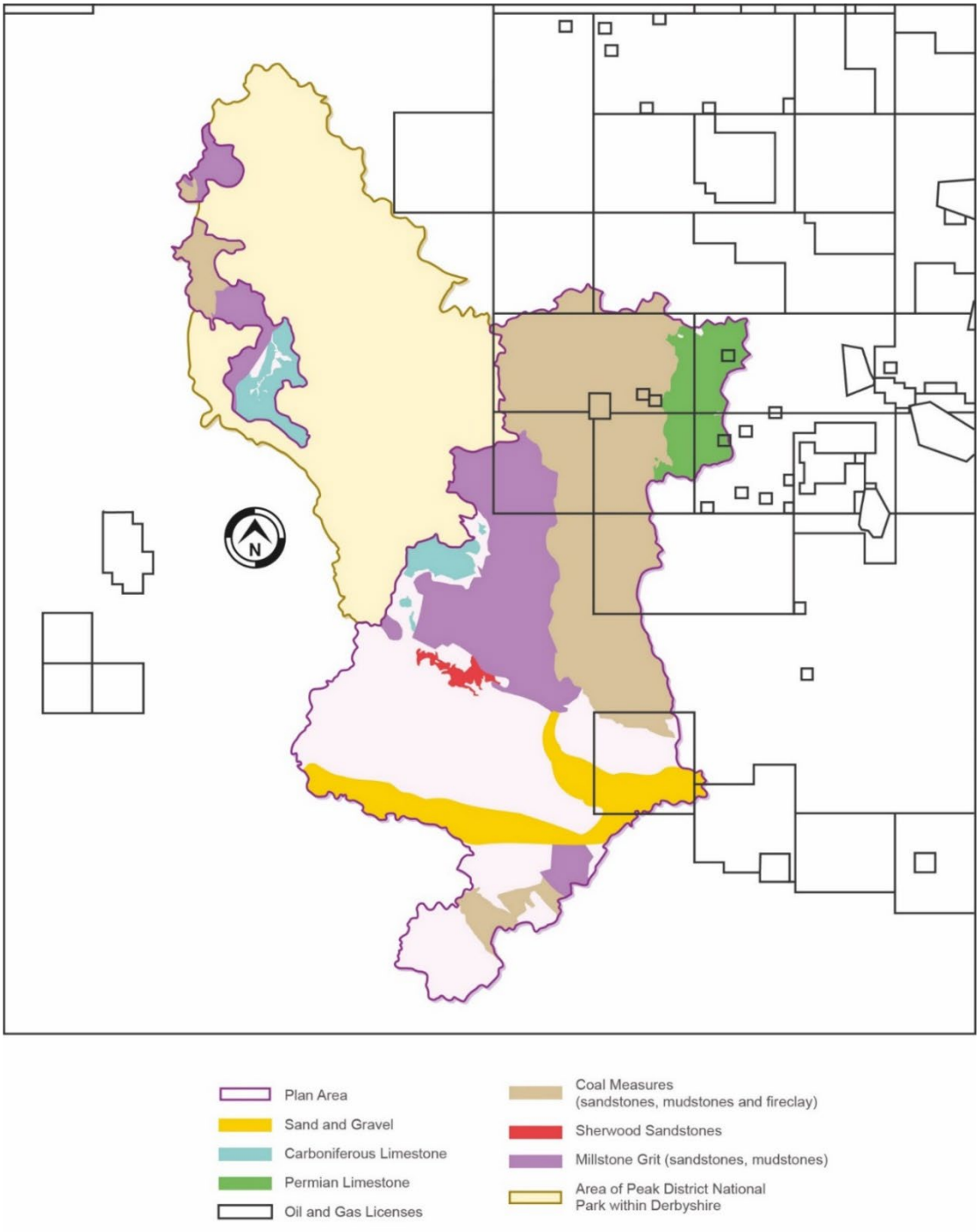
5.3 As a result of the long history of legislation, several types of onshore licence existed. To simplify this situation, the DTI in 1996 commenced the issue of Petroleum Exploration and Development (PEDL) Licences at the 8th Licensing Round. These carry a three-term lifetime: a six-year Initial Term allows completion of an agreed Work Programme, which is a pre-condition of entry into the five-year Second Term. Successful completion and approval of a development plan is a pre-condition of entry to the Third Term for production, which is granted for a period of 20 years, although the Secretary of State has the discretion to extend this period if production is continuing.

5.4 Following the announcement of a new round of licensing offers, applications are made for a PEDL over unlicensed areas (blocks) which correspond to the 10 km by 10 km Ordnance Survey grid. Many licences cover more than one block. Licensees are entitled to surrender a Licence, or part of the acreage covered by it, at any time after the Initial Term and the Work Programme have been completed, with a minimum

[14] OGA Consolidated Onshore Guidance Version 2.2 June 2018 consolidated-onshore-guidance-compendium_vfinal12062018.pdf (nstauthority.co.uk)

relinquishment required at the end of the Initial Term. Details of the existing licence areas and those to be conferred under the 14th Onshore Oil and Gas Licensing Round are shown on Figure 3 below.

Figure 3: Current PEDL areas within the Plan area



6. Exploration, Assessment, Working and Reclamation

6.1 The production of oil and gas is subject to the same planning controls which are applicable to any other mineral development. PPG provides a comprehensive summary of the latest planning procedures relating to the winning and working of oil and gas from both conventional and unconventional sources and the inter-relationship of the planning regime with other regulatory systems which have a role in the overall determination of such proposals (see Regulatory System above).

6.2 The three phases of all hydrocarbon extraction operations are exploration, appraisal and production. Planning permission is required for each phase, although some initial seismic work may have deemed planning consent. The provisions of the Town and Country Planning (General Permitted Development) (England) (Amendment) Order 2016 allow during a period not exceeding 28 consecutive days the drilling of boreholes for the purposes of (a) carrying out groundwater monitoring; (b) seismic monitoring or (c) locating and appraising the condition of mines, which in each case is preparatory to potential petroleum exploration. This right is subject to a number of exceptions (for example where drilling would be carried out within a National Park or protected groundwater source area) and a number of conditions (including no operations between 6pm-7am, and notification to the Environment Agency). This work can be carried out to establish baseline information on the groundwater environment without the need for planning permission, although other regulatory consents, such as a PEDL, would still be required.

Exploration

6.3 The exploratory phase seeks to acquire geological data to establish whether hydrocarbons are present. The main method of determining whether an area has potential traps for petroleum is seismic exploration. Seismic sections provide images of the sub surface. Once detected, a potential trap can be mapped in detail using 3-D seismic data to define its shape and thickness of petroleum-bearing parts of the reservoir. Porosity and permeability of the reservoir rock determined by direct measurements of exploration-well samples then allow the volume of oil and gas that can be recovered to be estimated.

6.4 Geological data can also be obtained by exploratory drilling. For onshore situations, exploratory drilling is a short-term, but intensive activity. Typically, site construction drilling and site clearance (if no further development) will take between 12 to 25 weeks. Oil drilling rigs are generally capable of drilling through several thousand metres of rock. They require a power source to rotate the drill and drive the pumps needed to circulate drilling mud (slurry) through the drill bit and well casing to cool and remove the rock cuttings while a well is drilled.

Appraisal

6.5 The appraisal phase takes place following exploration when the existence of oil or gas has been proved, but the operator needs further information about the extent of the deposit or its production characteristics to establish whether it can be economically exploited. This phase can take several forms, including additional seismic work, longer-term flow tests, or the drilling of further wells. This may involve additional drilling at another site away from the exploration site or additional wells at the original exploration site.

Working (extraction)

6.6 The production phase normally involves the drilling of a number of wells. This may be wells used at the sites at the exploratory and/or appraisal stages, or from a new site. Associated equipment such as pipelines, processing facilities and temporary storage tanks are also likely to be required.

6.7 Primary recovery of oil occurs in two stages; 1) the oil flows to the surface through natural reservoir pressure and 2) following initial flow and after the natural pressure is depleted, oil is pumped to the surface, often using the familiar beam pumping units, commonly referred to as ‘nodding donkeys’. Primary recovery methods produce up to 30% of the oil present but normally this method retrieves only 10% of the oil.

6.8 Secondary recovery refers to simple water flood to displace and drive out remaining oil, or reservoir pressure maintenance through re-injection of natural gas often produced at the same time. Water or gas is injected as a continuous force to the reservoir formation to maintain reservoir pressures. Many oilfields now routinely inject sour gas (containing a proportion of H_2S) back into the reservoir to enhance oil recovery. A growing option is the injection of gases such as nitrogen and CO_2. These

dissolve in the oil, lowering the viscosity and increasing mobility. These techniques can boost oil recovery to about 20%.

6.9 A third stage (Tertiary) of enhanced oil recovery may be carried out, potentially increasing the proportion extracted to 30 to 60%. This is a more expensive and utilises less conventional techniques, including thermal recovery (steam injection), chemical injection to increase the effectiveness of water flood or the use of detergents.

6.10 Gas is also obtained by drilling into the host rock. This is accompanied by a variety of techniques to help release the gas from the rock and to create the pressure required to drive the gas up the drill hole to the surface. One method is to re-inject dried gas fee of condensate to maintain underground pressure and allow re-evaporation and extraction of more gas. Another method is to send electric charges down the well, which affect the rock around it. After the charges are set off, a highly pressurised liquid fracking solution is sent down the well which breaks up the rocks, releasing the gas.

Reclamation

6.11 When all the reserves have been extracted the equipment has to be removed and the site has to be restored to an appropriate condition and a beneficial use. The responsibility for restoration and subsequent aftercare rests with the operator and is normally a requirement of the relevant planning permission or as stipulated in a legal agreement such as a Section 106 Agreement.

6.12 The form of restoration is determined on a site-by-site basis where the original conditions and uses will be important factors. Typical restoration forms include, the creation of new habitats and biodiversity, uses for agriculture or forestry or recreational activities.

Processing

6.13 Crude oil is essentially a mixture of hydrocarbons with varying molecular weights and differing from one another in structure and properties. These various forms are separated into groups, or fractions by a process of distillation called oil refining. The oil is first heated to a vapour, and then passed upwards through a tower containing trays at various levels. The vapours are very hot at the bottom, but become cooler as they rise, so that different fractions condense in the trays at different heights. The lighter the fraction the higher it condenses. On average, crude oil

fractions, beginning with the lightest, are: dissolved gases, petroleum ether, gasoline, kerosene, gas oil, lubricating oils, fuel oils and asphalt.

6.14 Further breaking down of the larger heavier molecules of the heavier fractions can be achieved in a process called 'cracking', whereby these fractions are subjected to higher temperatures and pressure or a chemical catalyst. This enables the creation of high-octane blending components from low octane naphtha's (e.g. paraffins and olefins).

6.15 At the end of 2020, five major and one minor refineries were in operation in the UK, with a combined capacity of approximately 91 million tonnes per year[15] (the equivalent of 456.25 million barrels), which was somewhat higher than the country's consumption. The refineries occupy large sites strategically distributed around the coast at sites where they can receive large oil tanker ships. The network of storage facilities is more urban based, closer to the product users.

6.16 Gas extracted from the ground normally contains some impurities which have to be removed to ensure a consistent product in a usable condition. Impurities include water and water vapour and carbon dioxide which affect the calorific value of the gas. Some natural gases (sour gas) contain hydrogen sulphide. The gas has to be processed to remove these impurities. An initial stage of processing is undertaken at the well head to remove free liquid water and gas condensate. The gas is then normally transported via a pipeline to a larger, industrial scale processing plant to remove any further impurities.

[15] Energy Insight: Refining: UK refining distillation capacity & refinery addresses (DSS07) | Record Page (energyinst.org)

7. Economic, Social and Environmental Issues

7.1 In accordance with the advice in the NPPF and PPG, the new Minerals Local Plan will address economic, social and environmental issues. All three dimensions of sustainable development will be reflected in the new Plan and, where relevant, will be taken into account in the determination of development proposals. This section concentrates on the principal environmental issues of hydrocarbon extraction that should be addressed by mineral planning authorities. In addition, it provides a summary of the main issues to be addressed by other regulators.

Potential Impacts of Oil and Gas Developments

7.2 Oil and gas developments are subject to regulatory controls in addition to those of the planning system. Some of the potential environmental impacts fall to the other regulatory bodies to administer and the planning system can only address those issues which are within the scope of planning legislation. The NPPG advises that the principal issues (potential impacts) that mineral planning authorities can and should address, bearing in mind that not all issues will be relevant at every site, to the same degree, are those which have been identified in the Local List (Local list of information requirements required to support planning applications).

7.3 Generally, the site area required to facilitate the extraction of onshore oil and gas is significantly different from other forms of mineral extraction. In most cases the site area required to accommodate the drilling equipment and the well-head, together with the limited level of ancillary facilities, is very small compared to developments for the extraction of other minerals such as limestone or sand and gravel. This may affect the scale and nature of impacts created by the respective developments. Information complied by the British Geological Survey indicates that the oil and gas developments in Derbyshire during the first part of the 20th century were small scale with erratic production records and, in some cases, short-term operations but there are no records of the impacts of these developments.

7.4 Irrespective of the duration of the extraction period, the drilling activities are normally a continuous operation, where drilling occurs 24 hours per day for the duration of that activity. This has the potential to generate unacceptable levels of noise, particularly at night time. Additional noise could be generated by other ancillary on-site activities and also off-site

from lorry movements. Due to the small sites areas involved, the level of ground disturbance is modest compared to other mineral extraction operations and this should reduce the potential for dust emissions, although dust emissions could be an issue for some specific operations.

7.5 The visual impact of developments is an important consideration. The drilling equipment and well-head structures are normally several metres in height and these could be visually intrusive in sensitive or exposed locations. The choice of location for the surface operation will be influenced by the need to maximise the volume of oil and gas that can be extracted, taking account of the geological conditions between the surface and the resource, but where there is some flexibility, the final choice of site could be selected to minimise any visual intrusion. This flexibility could also be used to minimise any adverse impact on landscape, ecological or archaeological features in the area.

7.6 The NPPF advises that mineral extraction development proposals should be formulated to avoid or minimise any adverse impact on areas of high quality agricultural land, areas at risk of flooding and any important features of ecological value. In some cases it may not be possible to completely avoid all biodiversity interests, and in cases where the benefits of the development outweigh such adverse impacts, the replacement of such features should be an integral part of the restoration plans.

7.7 The NPPG indicates that other potential adverse impacts which are particularly associated with oil and gas developments are those concerning pollution risks. Pollution risks include the spillage of oil at the surface, seepage pollution from below ground to the surface and the disposal of drilling mud and other drilling residues which could be contaminated. An additional issue is the potential need to dispose (probably flare) unwanted gas. The management of these issues are mainly the responsibility of other regulators but they are matters of relevance to the planning process.

Issues to be Addressed by Other Regulators

7.8 PPG identifies those issues which are the responsibility of other regulatory regimes and states that mineral planning authorities should assume that these regimes will operate effectively. It acknowledges that some of these issues may be relevant to minerals planning authorities in specific circumstances. For example, it refers to the Environment Agency

having responsibility for ensuring that risk to groundwater is appropriately identified and mitigated but acknowledges that, where an Environmental Statement is required, mineral planning authorities can and do have a role to play in preventing pollution of the water environment from hydrocarbon extraction, principally through controlling the methods of site construction and operation, robustness of storage facilities, and in tackling surface water drainage issues.

7.9 It states that whilst some of these issues may be put before minerals planning authorities, they should not need to carry out their own assessment and can rely on the assessment of other regulatory bodies. However, before granting planning permission they will need to be satisfied that these issues can or will be adequately addressed by taking the advice from the relevant regulatory body. The following are some of the major issues which are the responsibility of other regulators:

- Mitigation of seismic risks – this falls to the Oil and Gas Authority and is administered through the licence consent regime.
- Well design and construction – this falls to the Health and Safety Executive (or any successor body).
- Well integrity during operation – again HSE.
- Operation of surface equipment on the well pad – also HSE.
- Mining waste – this falls to the Environment Agency through the environmental permit regime.
- Flaring or venting – this falls to the Department of Energy and Climate Change (now OGA).
- Well decommissioning/abandonment – falls to the HSE.

8. Production, Consumption and Reserves

Global

8.1 In 2021, global production of oil was approximately 89.9 million barrels of oil per day, equivalent to some 4.2 billion tonnes over the course of the year[16]. Proven global reserves of oil (at end of 2020) stood at some 1732 billion barrels, down 2 billion barrels from 2019[17]. This equates to approximately 50 years of current production.

8.2 In 2021, global production of gas was approximately 4.03 trillion cubic metres, up from 3.86 trillion cubic metres in 2020[18]. Proved reserves of gas (at end of 2020) stood at some 188.1 trillion cubic metres; about 48.8 years of current production[19].

National

8.3 Prior to the first onshore oil being discovered at Hardstoft in Derbyshire in 1919, Britain had an important oil shale industry in the Midland Valley of Scotland, which was established in 1851 and continued until 1962. Peak production was during the First World War. The systematic search for onshore oil began in 1918, following concerns about supplies from overseas due to the disruption experienced during the war. Modest oil fields were discovered in a number of regions, particularly those in the East Midlands.

8.4 This situation changed in the mid-1960s when significant reserves of oil and gas were discovered offshore, most notably in the North Sea. Thereafter the production of oil, gas liquids and liquid products increased markedly over the next few decades to a peak of 137 million tonnes (1027.5 million barrels) in 1999, of which crude oil production was 936 million barrels. Production has since declined to 370 million barrels a year (47.5 million tonnes in 2016).

8.5 Most UK oil and gas activity is concentrated offshore in the UK Continental Shelf where production has been in decline in recent years.

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[16] BP Statistical review of World Energy 2022, 71st Edition, pp15-16 Statistical Review of World Energy 2022 (bp.com)
[17] BP Statistical Review of World Energy 2021, 70th edition https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/oil.html
[18] BP Statistical review of World Energy 2022 , 71st Edition Statistical Review of World Energy 2022 (bp.com)
[19] BP Statistical Review of World Energy 2021 70th edition, https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/natural-gas.html.html#natural-gas-reserves

Figures obtained from Oil and Gas UK Activity Survey 2014, indicate that production declined by 31% between 2010 and 2012, although the rate of decline itself fell in 2013 when the area produced an average of 1.43 million barrels of oil equivalent per day (boepd). Of this, 0.86 mboepd was oil/liquids and 0.57 mboepd was gas. During 2021, the UK produced just over 874,000 barrels of oil per day (equivalent to 40.9 million tonnes per year), a decrease of 16.6% on 2020 production levels[20]. UK production of natural gas for the same period amounted to 32.7 billion cubic metres (a decrease of 16.9% on 2020 levels)[21]. The UK remains a major gas producing country in Europe, second only to Norway[22] Proven UK reserves of oil and gas at the end of 2021 were estimated by NTSA to be in the region of 4.0 billion boe down from an estimated 4.4 billion boe at the end of 2020[23].

8.6 One of the most significant areas for onshore production is Dorset where initial searches were in the 1930s and the first commercial discovery was at Kimmeridge in 1959. The discovery of a significant oilfield at Wytch Farm in 1973 intensified the search for further oil throughout southern England. The extent of reserves discovered in the Wytch Farm area (including those under Poole Bay) led to it becoming the most productive onshore field in Europe, reaching output levels of 110,000 barrels per day, although this has now fallen to 10 – 20,000 barrels per day (Bournemouth, Dorset and Poole Minerals Core Strategy). Other major commercial onshore oilfields are found in an area between central Nottinghamshire and north-west Lincolnshire.

Derbyshire

8.7 Derbyshire is of historical importance as a source of onshore oil, and to a lesser extent, gas. It was one of the first areas in Britain to be explored for oil in an attempt to shore up the nations supplies during the First World War. Oil and gas have been exploited in Derbyshire at Heath and Calow (gas), and Hardstoft, near Pilsley (oil). Recent developments have been intermittent and small-scale. The scale of resources remaining underground in Derbyshire are also very limited in national and global

[20] BP Statistical review of World Energy 2022, 71st Edition Statistical Review of World Energy 2022 (bp.com)
[21] BP Statistical review of World Energy 2022, 71st Edition Statistical Review of World Energy 2022 (bp.com)
[22] BP Statistical review of World Energy 2022, 71st Edition Statistical Review of World Energy 2022 (bp.com)
[23] NTSA, UK Oil and Gas Reserves and Resources (September 2022) UK Oil and Gas Reserves and Resources report 2022 (nstauthority.co.uk)

terms, but the need to maximise the development of indigenous sources of energy and the move towards carbon reduction means that future development proposals are likely and remain an issue for the new Minerals Local Plan to address.

9. Other Issues

Need for Oil and Gas

9.1 The UK economy is highly dependent on oil and gas as primary sources of energy. They are also of great importance to our everyday lives as the major sources of energy we use in our homes, the products we use and how we move about.

9.2 Whilst the contribution from renewable sources is increasing, a significant proportion of our energy needs are still met by fossil fuels. Natural gas is used to generate electricity. In 2019 the proportion of overall electricity generated in the UK with gas as the fuel was 40%, a figure substantially up from 30% in 2015[24]. The increased demand is predominantly due to the decline of coal in power generation. Products derived from petroleum continue to be used to satisfy the requirements of modern society. Petrol, diesel and kerosene obtained from oil are essential fuels for transport and for both oil and gas used for domestic heating. Many everyday products are made from the chemical processing of oil and gas, many of which may not be immediately obvious.

9.3 The discovery of oil and gas in the North Sea, combined with the supply of indigenous coal, enabled the UK to provide for its own energy needs. The supply of oil and gas from the offshore resources peaked in the late 90s but has been in steady decline since 2000. After 30 years of self-sufficiency, including a period when the UK was a net exporter of oil and gas, the country became a net importer of gas in 2004. Most of our energy requirements are increasingly reliant on imported supplies which, in 2021, for net imports increased by 30 per cent compared with 2020 to meet demand amid low production[25]. Gas and oil are now world-wide commodities and prices can fluctuate significantly and very quickly which has implications for our economic competitiveness.

Storage Capacity

9.4 Whereas crude oil has to be processed before it can be used for energy production and in manufacturing, which has led to the development of a substantial storage infrastructure system, the position with gas is very different. Extracted gas requires comparatively little processing and

[24] DBEIS, Digest of UK Energy Statistics (DUKES) 2022, DUKES 2022 (publishing.service.gov.uk)
[25] DBEIS, Digest of UK Energy Statistics (DUKES) 2022 DUKES 2022 (publishing.service.gov.uk)

treatment prior to use and has been supplied in a more direct manner from the offshore extraction facilities. As a result the volume of gas stored onshore is very limited. Following the closure of the Rough gas storage facility in 2017, the UK was left with a supply of only nine terawatt hours[26]. This made the industry particularly vulnerable to fluctuations in the scale and price of imported supplies as was made apparent following Russia's invasion of Ukraine and the decision to cut gas supplies to Europe via its Nordstream 1 pipeline. A direct consequence of this is that Rough was brought back into use in Autumn 2022, resulting in an increase of about 50% UK gas storage capacity[27].

Alternatives to Oil and Gas

9.5 Part of our current energy requirements are met from alternatives to oil and gas and the contribution from these sources is likely to become an increasingly important issue in the overall debate about our future energy policy. Other fossil and non-fossil fuel sources of electricity generation include coal, nuclear power and renewable energy sources such as hydroelectricity and wind power. The long-term availability of coal, the ability to increase our supplies from renewable sources and the respective benefits and environmental impacts of all these forms of energy production will be elements of that debate.

9.6 Natural gas is a favoured fuel for electricity production because it has a lower sulphur content compared to coal and produces lower carbon dioxide emissions per unit of electricity produced. New technologies and ways of generating electricity from renewable sources are being advanced but as yet these facilities do not have the capacity to meet our energy demands. Oil and gas are finite resources but as a result of the complexity of the current energy infrastructure and the long lead-in time for replacements, it is inevitable that they will continue to form a major part of our energy supplies for the foreseeable future. The security and price of these resources are therefore very important aspects in the formulation of the national energy policy.

9.7 Alternative fossil fuels, sometimes known as unconventional hydrocarbons, may present a viable, if only partial alternative to conventional fuels. Information concerning these fuels is presented in the background papers set out in paragraph 1.4 above. In summary the

[26] How the UK's low gas storage capacity leaves it vulnerable - New Statesman
[27] UK's biggest gas storage site reopened to boost winter energy supplies | Centrica | The Guardian

alternatives fall into three distinct types. The first is methane from coals, including gas recovered from active and abandoned mines, as well as methane recovered from undisturbed coal seams (known as coal bed methane). The second is shale gas, which is a natural gas recovered from mudrocks and shales. The third source of gas involves combustion of underground coal seams in situ to produce synthetic gas known as 'syngas'. This process is commonly known as underground coal gasification. Information about the scale of these resources and how much will prove to be commercially recoverable is increasing but remains limited at present.

Transportation

9.8 Oil is generally pumped to the surface for short-term storage prior to it being transported via lorry, rail or possibly by pipeline. In some places oil produced at small satellite fields is piped or taken by road tanker to gathering stations for onwards transport to the refineries. Gas is more readily usable in its natural state and presents fewer transport issues. It may be used directly on site to generate electricity for the National Grid or piped to another generating station.

9.9 The use of rail or pipelines will reduce road traffic but there may be other environmental impacts, particularly where they involve the construction of a new pipeline. The economic viability of these alternatives will also be an important issue.