

IGEM/G/101
Communication 1766

Onshore Natural Gas extraction and route to use



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Communication 1766

Onshore Natural Gas extraction and route to use



Price Code: CI
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ISBN 978 1 905903 42 9

ISSN 0367 7850

Published by the Institution of Gas Engineers and Managers

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SECTION 1 : INTRODUCTION

- 1.1 This Guidance is part of a series of Institution of Gas Engineers and Managers (IGEM) publications, for all sectors of the gas industry providing practical guidance to support the Borehole Sites and Operations Regulations (BSOR), Offshore Installations and Wells (Design and Construction, etc) Regulations, Gas Safety (Management) Regulations (GS(M)R), and the Pipelines Safety Regulations (PSR). It has been drafted by an IGEM Working Group, which included representatives of the Department of Energy and Climate Change (DECC), gas extraction and gas monitoring companies and independent consultants, appointed by IGEM's Gas Transmission and Distribution Committee, and has been approved by IGEM's Technical Co-ordinating Committee on behalf of IGEM's Council.
- 1.2 This Guidance is the basis for good practice for the industry, including but not limited to:
- Gas exploration and production companies
 - Gas transmission and storage companies
 - Local Authorities
 - Gas exploration and production companies
 - Gas transmission and storage companies
 - Local Authorities
 - The Health and Safety Executive (HSE)
 - Environmental Agency.
- 1.3 This Guidance has been prepared in the light of exploration for Shale gas in the UK.
- 1.4 In view of the increased governmental and industry involvement in the exploration and exploitation of unconventional gas over the next few years there will be revised and new advice being issued by DECC and the Environmental Agencies, therefore the latest information should be accessed by referencing the relevant government websites.
- 1.5 This Guidance makes use of the term "must":
- the term "must" identifies a requirement by law in UK at the time of publication.
- Such terms may have different meanings when used in legislation, or Health and Safety Executive (HSE) Approved Codes of Practice (ACoPs) or guidance, and reference needs to be made to such statutory legislation or official guidance for information on legal obligations.
- 1.6 It is now widely accepted that the majority of accidents in industry generally are in some measure attributable to human as well as technical factors in the sense that actions by people initiated or contributed to the accidents, or people might have acted in a more appropriate manner to avert them.
- It is therefore necessary to give proper consideration to the management of these human factors and the control of risk. To assist in this, it is recommended that due regard be paid to HSG48 and HSG65.

- 1.7 Requests for interpretation of this Guidance in relation to matters within its scope, but not precisely covered by the current text, should be addressed to Technical Services, IGEN, IGEN House, High Street, Kegworth, Derbyshire, DE74 2DA. Such requests will be submitted to the relevant Committee. Any advice given by or on behalf of IGEN does not imply acceptance of any liability, and does not relieve any party of their obligations.
- 1.8 This Guidance was published in August 2013.

SECTION 2 : SCOPE

- 2.1 This Guidance provides information on the current legislative framework that is in place which governs the drilling for exploration of oil and gas in the UK along with the health, safety and environmental considerations for the extraction, storage and transportation to the user or gas transporter, supplier or conveyor.
- 2.2 This Guidance provides local authorities and the public assurance that regulation and process controls are in place to ensure the safe extraction and supply of Natural Gas from on-shore wells to the point of use.

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SECTION 3 : CONTEXT

3.1 EXTRACTING UNCONVENTIONAL GAS

Exploration of unconventional gases is at a very early stage in the UK. Recent technological advances mean that it could be economically viable for industry to explore the potential for extracting 'unconventional' gas from the following sources (see Figure 1):

- shale
- coal bed or coal seams.

Using the following processes:

- shale gas extraction
- coal bed methane extraction.

3.2 UNCONVENTIONAL GASES AND EXTRACTION METHODS

The composition of unconventional gases depends on their source. Shale gas and coal bed gas are predominately methane like conventional natural gas.

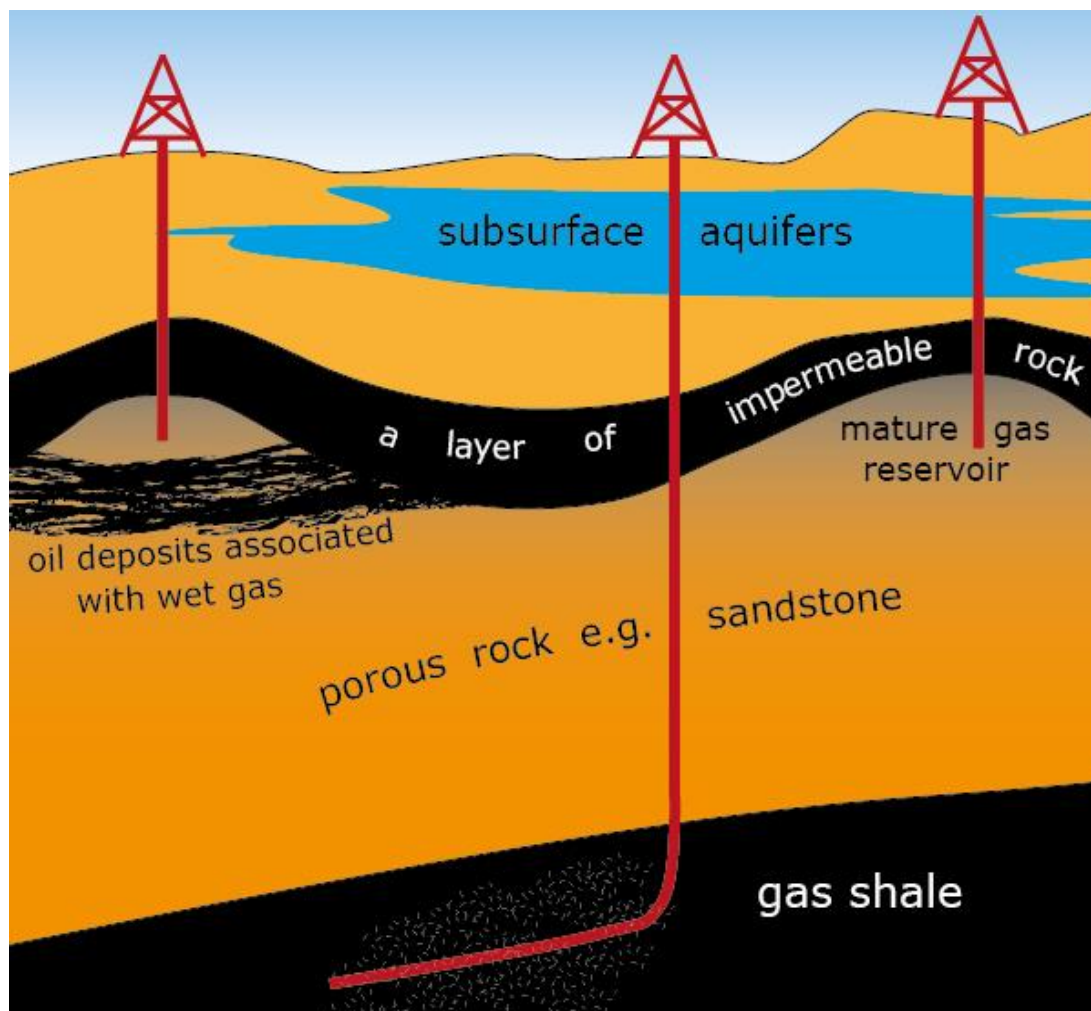
'Unconventional' refers to their source, that is, in Shale or Coal Bed which have not traditionally been exploited for gas production.

3.2.1 Shale gas

Shale was originally mud that has over millions of years been compacted and hardened into a fine-grained, sedimentary rock composed of clay minerals and tiny fragments of other minerals, especially quartz and calcite. Shale gas extraction involves extraction of the natural gas held in fractures, pore spaces and adsorbed on to the organic material of shale.

3.2.2 Coal Bed Methane (CBM)

Coal is a combustible black or brownish-black sedimentary rock normally occurring in rock strata in layers or veins called coal beds or coal seams. These are often referred to as CBM and are different to typical sandstone or other conventional gas reservoirs, as the methane is held within the coal by a process called adsorption. CBM extraction works by releasing pressure in coal seams.



Note: From left to right - an associated conventional well, a shale well, a non-associated conventional well.

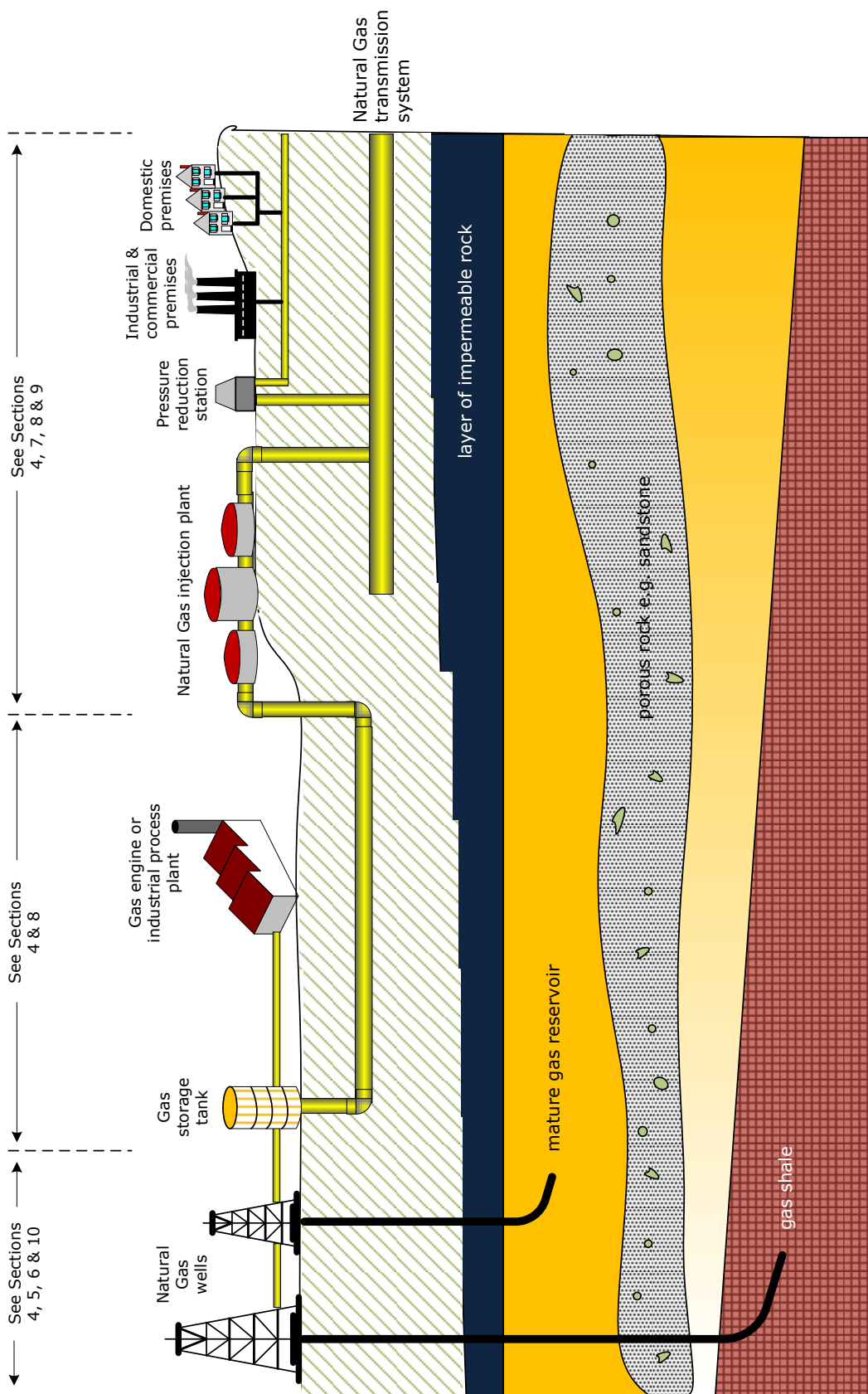
FIGURE 1 - SCHEMATIC GEOLOGY OF NATURAL GAS RESOURCES

3.3 STORAGE, TRANSMISSION, DISTRIBUTION AND USE OF NATURAL GAS

3.3.1 Natural Gas has been used throughout the UK since the 1960's. During this time, extensive research and development and experience has been gained which has enabled industry to be produced to describe the requirements for safely storing, transmitting, distributing and using Natural Gas. Much of this written guidance has been vested in IGEM and since the breakup of the industry in 1986 signalled by the Gas Act, the Institution has continued to review and revise the original guidance and write new documents with the support of industry. This has resulted in Standards that offer assurance to those who design, construct and use the Natural Gas system and it has resulted in a secure and safe supply of energy to homes and businesses across the UK.

Note: The range of legislation and guidance across the industry from extraction of the Natural Gas to its use is depicted in Figure 2.

LEGISLATION AND GUIDANCE



Note: All these processes come under existing UK Legislation and Guidance through HSE, IGM Standards and relevant industry bodies.

FIGURE 2 - SCHEMATIC SHOWING NATURAL GAS EXTRACTION TO POINT-OF-USE

SECTION 4 : LEGAL AND ALLIED CONSIDERATIONS

4.1 GENERAL

4.1.1 This Guidance is set out against a background of legislation in force in UK at the time of publication. The devolution of power to the Scottish, Welsh and Northern Ireland Assemblies means that there may be variations to the legislation described below for each of them and consideration of their particular requirements must be made. Similar considerations are likely to apply in other countries where reference to appropriate national legislation is necessary.

4.1.2 All relevant legislation must be applied and relevant Approved Codes of Practice (ACoPs), official Guidance and referenced codes, standards, etc. will be taken into account.

Note 1: The Department of Energy and Climate Change (DECC) provide up to date information on their website <https://www.gov.uk/government/organisations/department-of-energy-climate-change>.

Note 2: Appendix 2 is relevant in this respect.

Where British Standards, etc. are quoted, equivalent national or international standards, etc. equally may be appropriate.

4.1.3 Health and safety legislation must be observed, especially those requirements which are concerned with the duties of Employers, not only to their own employees, but also to members of the public who may be affected.

4.1.4 Unless otherwise stated, the current editions of legislation and standards apply.

4.1.5 In the absence of specific legislation, it is essential that installations are designed, constructed, installed, operated and maintained so as to be safe.

4.1.6 The legislation appropriate to any installation will depend largely upon its location. Advice will need to be sought from the relevant Authorities.

4.1.7 The primary responsibility for compliance with legal duties rests with the Employer. The fact that certain employees, for example 'responsible engineers', are allowed to exercise their professional judgement does not allow Employers to abrogate their primary responsibilities. Employers must:

- have done everything to ensure, so far as is reasonably practicable, that there are no better protective measures that can be taken other than relying on the exercise of professional judgement by people in roles that are expected to exercise that professional judgement
- have done everything to ensure, so far as is reasonably practicable, that people in roles that are expected to exercise professional judgement have the skills, training, experience and personal qualities necessary for the proper exercise of their professional judgement
- have systems and procedures in place to ensure that the exercise of professional judgement is subject to appropriate monitoring and review
- not require people in roles that are expected to exercise professional judgement to undertake tasks which would necessitate the exercise of professional judgement that is not within their competence. There should be written procedures defining the extent to which people in such roles can exercise professional judgement. When people in roles that are expected to exercise professional judgement are asked to undertake tasks which deviate from this they should refer the matter for higher review.

4.1.8 Safety Case duty holders are required to put in place a competence assurance system that includes competence standards, assessment and reassessment. The HSE also requires duty holders to link safety critical activities, work roles and responsibilities with a comprehensive management system.



4.2 PRIMARY LEGISLATION

The Primary Legislation that applies to the gas industry includes:

- Gas Act
- Environmental Act
- Environmental Assessment (Scotland) Act
- Environmental Protection Act
- Health and Safety at Work Act
- Oil and Pipelines Act
- Town and Country Planning Act
- Town and Country Planning (Scotland) Act
- Traffic Management Act.

4.3 SECONDARY LEGISLATION

4.3.1 Borehole Sites and Operations Regulations (BSOR)

BSOR impose requirements, not covered by other legislation, of the European Directive on Boreholes (92/91/EEC) concerning the minimum requirements for improving health and safety of workers in the mineral extracting industries through drilling. For oil and gas borehole sites including shale gas, notification to HSE is required for all drilling operations, abandonment operations, any operation which would make a significant alteration to the well and any operation that would involve a risk of fluids (including gas) from the well or reservoir. In addition, there are two other requirements unrelated to the Directive. These are:

- Operators are required to give notice of drilling operations and in some cases subsequent abandonment of the borehole
- Operators are required to give notice of prospect drilling operations to meet a requirement of the Mines and Quarries Directive 92/104/EEC.

Note: Further guidance is available from HSL72.

4.3.2 Construction (Design and Management) Regulations (CDM)

CDM impose duties on designers, clients (and their agents), developers, CDM Coordinator and principal contractors. Not all the regulations apply to all construction projects. Further information is given in HSL144. For a notifiable project (as defined in CDM) the CDM Coordinator must notify HSE before construction work commences. Construction includes the alterations, repair redecoration, maintenance, decommissioning or demolition of a structure.

4.3.3 Control of Major Accident Hazard Regulations (COMAH)

The COMAH Regulations implement the Seveso II Directive except for the land-use planning requirements which are implemented by changes to planning legislation. They replaced the Control of Industrial Major Accident Hazards Regulations 1984 (CIMAHA) and came into force on 1st April 1999. The Regulations are amended from 30 June 2005 to reflect changes to Seveso II.

Information on various aspects of the COMAH regime is also available on the following web sites:

- Scottish Environment Protection Agency
- The Environment Agency for England and Wales.

Their main aim of COMAH is to prevent and mitigate the effects of those major accidents involving dangerous substances, such as chlorine, liquefied petroleum gas, explosives and arsenic pentoxide which can cause serious damage/harm to people and/or the environment. The COMAH Regulations treat risks to the environment as seriously as those to people.

The main effect of the COMAH (Amendment) Regulations in 2005 is to broaden the scope COMAH through changes to Parts 2 and 3 of Schedule 1. These include:

- the addition of new named substances
- changes to some existing named substances and generic categories of substance, including revised qualifying quantities;
- changes to the aggregation rule where several dangerous substances may be present; and
- a broadening of scope at mines quarries, boreholes and landfill sites.

COMAH does not apply to borehole sites where a mineral, including natural gas, is extracted through the borehole, except where the site includes oil and gas reception (see COMAH Regulation 3(3)(c.) and paragraph 105 of the Guidance on COMAH).

The Competent Authority (CA) charges for work it undertakes on COMAH. Charges are made on an actuals basis i.e. the recovery of the full costs of the time spent by the CA in carrying out COMAH-related activities for a particular establishment.

Note: Further guidance is available from HSL111 and HSG191

4.3.4 **Dangerous Substances and Explosive Atmospheres Regulations (DSEAR)**

These Regulations incorporate:

- ATEX Directive 94/9/EC (ATEX 95) – Safety of Apparatus
- ATEX Directive 99/92/EC (137A) – Safety of Installation
- Chemical Agents Directive (CAD) 98/24/EC.

DSEAR are concerned with protection against risks from fire, explosion and similar events arising from dangerous substances used or present in the workplace. DSEAR require that risks from dangerous substances are assessed, eliminated or reduced. They contain specific requirements to be applied where an explosive atmosphere may be present and require the provision of arrangements to deal with accidents, emergencies etc. and provision of information, training and use of dangerous substances. DSEAR also require the identification of pipelines and containers containing hazardous substances.

The following publications contain details of DSEAR and their application:

- HSL134
- HSL135
- HSL136
- HSL137
- HSL138
- INDG370.