

Rough gas storage undertakings review

Final decision

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Final decision

1. Background to the review

Background

- 1.1 On 17 October 2017, the Competition and Markets Authority (CMA) announced its decision to appoint a Group to undertake a review, under paragraph 16 of Schedule 24 to the Enterprise Act 2003, of the undertakings given in December 2003 by Centrica Storage Limited (CSL) and Centrica plc (Centrica), and amended on 3 April 2006 and on 5 March 2012 and on 26 May 2016, in relation to the completed acquisition by Centrica of Dynegy Storage Limited and Dynegy Onshore Processing UK Limited ('the undertakings').¹
- 1.2 The CMA launched a review of the undertakings because, having considered the evidence presented by CSL, it considered there was a realistic prospect of finding a change of circumstances.
- 1.3 The review has been undertaken by a group of CMA panel members, appointed by the CMA Panel Chair, and comprising: Martin Cave (Chair), Anne Fletcher, Jayne Scott and Jon Stern. The group of panel members has been advised by a case team of CMA staff. The CMA has liaised with Ofgem, the sector regulator of gas and electricity markets in the UK.²

The Rough gas storage facility

- 1.4 Rough is the largest gas storage facility in Great Britain, used by market participants to store gas in the summer and deliver that gas to meet peak demand in the winter.
- 1.5 The Rough field commenced gas production and processing in 1975. In 1985, the gas field was converted by its then owners (British Gas) to store gas to meet seasonal supply/demand imbalances. There are seasonal variations in demand, which are a consequence of overall demand for gas in the winter being higher than in the summer. Variations in demand are particularly

¹ See the [decision statement](#) (October 2017).

² Consistent with paragraph 3.16 [Remedies: Guidance on the CMA's approach to the variation and termination of merger, monopoly and market undertakings and orders \(CMA11\)](#), which provides that: 'Where undertakings or orders under review relate to a regulated sector, and especially where a sectoral regulator has a role in monitoring compliance with the undertakings or order, the CMA will liaise with the relevant sectoral regulator as appropriate'.

pronounced in relation to domestic customers.³ CSL, which owns and operates the facility, reports that Rough can meet approximately 10% of the UK's peak day demand.⁴

- 1.6 The Rough reservoir is a depleted gas field located approximately 29km (18 miles) off the east coast of Yorkshire, in Rotliegendes sandstone, 2.7km (9,000 feet) under the Southern North Sea bed. The reservoir itself is approximately 10km (6 miles) long by 3km (1.8 miles) wide and varies from 24 metres (80 feet) to 36 metres (117 feet) in depth.
- 1.7 The reservoir is relatively rare geologically, being formed of rock with broadly uniform porosity. This enables gas to flow through it. Most other reservoirs tend to be more 'compartmentalised', or small man-made caverns in the case of underground salt reservoirs. The porous rock that forms Rough is surrounded by non-porous rock, meaning that gas can be pumped into the rock formation and held under pressure (from the rock above), but cannot escape unless intentionally released. The gas is refined after it comes out of Rough to remove dirt and condensate.
- 1.8 When Rough is operated as a storage facility in normal circumstances, gas is injected and extracted by CSL via up to 30 wells, which have been drilled from the offshore platforms down into the reservoir below the seabed. The Rough facility comprises two offshore installations (47/3 Bravo and 47/8 Alpha), and a terminal at Easington, which is used for the injection and withdrawal of gas to and from the Rough reservoir (Figure 1.1):
 - (a) Gas is injected and withdrawn via the 47/3 Bravo (47/3B) platform. This is the main offshore complex, operating 24 wells across 3 linked platforms. This installation was built in the 1980s to enable gas storage (ie to permit gas injection as well as withdrawal).
 - (b) 47/8 Alpha (47/8A) has 6 wells. It was used to maintain deliverability of gas (ie withdrawal) from the field during peak demand days but was permanently withdrawn from service in September 2016. This smaller installation was the original platform, completed in 1975.
 - (c) The Easington terminal's main functions are to receive and separate natural gas from Rough and Centrica's York field.⁵ The terminal processes the gas by separating it from a paraffin-like liquid condensate

³ Competition Commission (2011), Review of Undertakings given by Centrica following its acquisition of the Rough Gas Storage Facility. See the Competition Commission's final report on the [CMA's webpages](#).

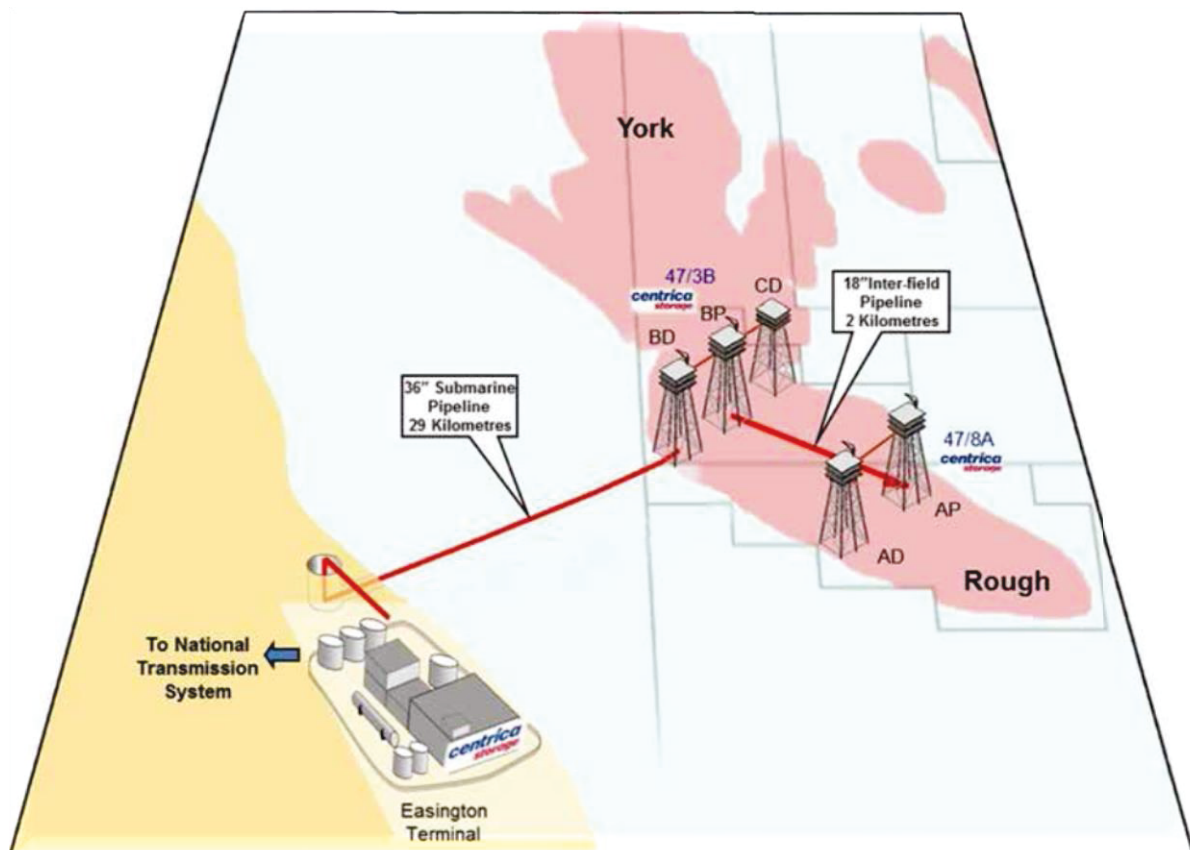
⁴ [CSL website](#).

⁵ In 2013, CSL started to operate a new gas processing stream, separate to that used for Rough facility, to process gas from Centrica's York field.

(which is treated and stabilised for use in the petrochemical industry). The gas enters the National Transmission System (NTS) through an entry point next to the terminal.⁶

- 1.9 During gas injection the installation uses one or two compression units to raise the gas to the pressure of the reservoir. During withdrawal mode it uses the gas pressure from within the reservoir to deliver gas to the onshore installation.

Figure 1.1: The Rough Gas Storage Facility



Source: CSL, [Rough Gas Storage Facility – An Operational Overview Version 4](#), December 2015.

- 1.10 Rough acted as a storage facility for gas shippers, gas producers, gas suppliers and traders allowing them to nominate gas for withdrawal into the NTS and inject gas into the reservoir on demand.⁷ Any gas within the NTS is

⁶ The NTS is the high pressure gas network which transports gas from the entry terminals to gas distribution networks, or directly to power stations and other large industrial users.

⁷ Gas shippers buy gas from gas producers for sale to gas suppliers (which sell gas to businesses and consumers). Gas traders buy and sell gas before it reaches the consumer. See the Glossary for more information.

effectively homogenous⁸ and can be traded at a single notional point – the National Balancing Point (NBP).

- 1.11 CSL's customers generally used Rough in a seasonal fashion, injecting gas in the summer when prices are low and withdrawing during periods of high demand (typically winter) and on days when prices are favourable. Weather has an important influence on prices – for instance, warmer winters will typically mean lower winter prices and lower spreads and thus less value in storing gas.
- 1.12 The gas in the Rough reservoir comprises:
- working gas, which comprises:
 - gas injected by CSL customers from the NTS; and
 - operational stock – gas held by CSL to meet its contractual obligations and its regulatory obligations to ensure the facility's integrity and efficiency (eg to maintain steady flows and to allow for outages); and
 - cushion gas – residual gas following conversion of the field, retained to provide pressure support. Some of this gas is recoverable, while the rest is unrecoverable.
- 1.13 Because Rough is an offshore gas field, its operator requires a gas production licence from the Oil and Gas Authority (OGA).
- 1.14 Rough is also subject to health and safety regulation by the Energy Division of the Health and Safety Executive (HSE) (responsible for the offshore oil and gas industry on the UK Continental Shelf). A primary requirement for an offshore installation operator is to operate the installation safely. Rough is subject to the Offshore Installations and Wells (Design and Construction, etc) Regulations 1996. This requires that wells be operated safely with health and safety risks as low as is reasonably practicable (ALARP)⁹ and requires independent verification of the condition of the well.^{10 11} This framework is underpinned by guidance published by the HSE and industry guidance published by [Oil & Gas UK](#), a body representing the UK offshore oil and gas

⁸ Gas entering the NTS is subject to quality checks and must conform to certain parameters, some of which are specified in the Gas Safety (Management) Regulations 1996.

⁹ Regulation 13 (General Duty), the Offshore Installations and Wells (Design and Construction, etc) Regulations 1996.

¹⁰ Regulation 18 (Arrangements for examination), the Offshore Installations and Wells (Design and Construction, etc) Regulations 1996. Well examination relies on verification of a well's condition through record checks rather than physical inspection.

¹¹ See [The Offshore Installations and Wells \(Design and Construction, etc.\) Regulations 1996](#). The HSE publish [guidance](#) on the application of the regulations. Regulation 18 has been replaced by equivalent regulations in the [2015 Safety Case Regulations](#), but in key aspects the requirement is essentially unchanged.

industry. While following such guidance is not compulsory, owners and operators would abide by this industry guidance or be in a position to explain why they had departed from it ('comply or explain').

The Rough undertakings

- 1.15 In November 2002, Centrica acquired from Dynegy Inc (Dynegy), a US energy company, two companies which owned and operated the Rough gas storage facility and associated assets: Dynegy Storage Ltd and Dynegy Onshore Processing UK Ltd.
- 1.16 In February 2003 the Director General of Fair Trading recommended that the merger be referred to the then Competition Commission (CC) because there was a significant prospect that the merger gave Centrica the ability and incentive to increase the price of storage through withholding capacity, and weakened the incentive to expand capacity at Rough. As Centrica was vertically integrated, with a leading position in several downstream markets, the Director General of Fair Trading considered that the acquisition might also lead to some lessening of competition in those markets.
- 1.17 In August 2003, the CC published its report on the completed acquisition.¹² The CC found that competition in the markets for flexible gas and domestic gas supply would be weakened as a result of the merger, with the likely consequence that prices would be higher than in the absence of the merger. The CC also concluded that innovation and investment at Rough would be lower than under another owner. Although there was some benefit to the public interest from Centrica owning Rough (being a known quantity with regard to operational experience, reputation and financial strength), the CC did not consider that this outweighed the adverse effects and concluded that the merger may be expected to operate against the public interest.¹³ The CC concluded that to remedy the adverse effects identified, Centrica should offer undertakings regarding its behaviour as owner of Rough.
- 1.18 Following the 2003 report, undertakings were given by Centrica and CSL and accepted by the Secretary of State for the purpose of remedying or preventing

¹² Competition Commission, Centrica plc and Dynegy Storage Ltd and Dynegy Onshore Processing UK Ltd: a report on the merger situation, August 2003.

¹³ The merger was referred to the CC under the merger provisions of the Fair Trading Act 1973 (FTA). The FTA was based on a public interest test, although in practice the underlying issue in the public interest test was a lessening of competition. This is based on the "Tebbit Doctrine" set out in 1984 by the then Secretary for State for Trade and Industry Norman Tebbit - '*references to the Monopolies & Mergers Commission would be made primarily, but not exclusively, on competition grounds, taking into account the international dimension of competition.*' See <http://researchbriefings.files.parliament.uk/documents/SN05374/SN05374.pdf> section 2. The CMA (and the CC before it) now takes its decisions using a 'substantial lessening of competition' (SLC) test under the merger provisions of the Enterprise Act 2002 (the Act).

the adverse effects on the public interest specified in the 2003 report. Key aspects of these included:

- ensuring non-discriminatory access to Rough for users;
- restrictions on Centrica's access to capacity; and
- the legal, financial and physical separation of CSL from Centrica.

- 1.19 In November 2005, Centrica requested a variation of the original undertakings in order to enable a minor group restructuring of the Centrica Group. After considering advice on the proposed variation prepared by the OFT, the CC accepted the variation and the new, amended, undertakings ('the amended undertakings') came into force on 3 April 2006.
- 1.20 In 2011, following a request from Centrica to be released from the undertakings by reason of a change of circumstances, the CC conducted a review and decided to make a small number of variations to the undertakings, primarily in relation to Centrica's access to capacity.¹⁴
- 1.21 In March 2015, following technical reports on the integrity of its wells, CSL announced a decision to limit the maximum operating pressure in Rough from 3,500 pounds per square inch (psi) to 3,000 psi while it conducted tests to establish that it could operate the wells at the higher pressure. Following a request from Centrica to vary the undertakings by reason of this change of circumstances, the CMA conducted a review and, in April 2016, decided to vary the capacity obligations in the existing undertakings to take account of the potential for increasing variability in the performance of the facility.

The main elements of the undertakings

- 1.22 The main provisions of the undertakings currently in force are that CSL will be maintained legally, financially and physically separate from all other businesses of Centrica and that CSL must:
- (a) offer all Rough capacity for sale on a non-discriminatory basis;
 - (b) unless otherwise agreed with Ofgem, retain the Storage Services Contract (SSC)¹⁵ for all sales of Rough capacity;

¹⁴ CC (2011), Review of Undertakings given by Centrica following its acquisition of the Rough Gas Storage Facility. See the CC's final report on the [CMA's webpages](#).

¹⁵ The Storage Services Contract (SSC) is CSL's standard contract, to ensure all customers purchase on the same terms. CSL are only allowed to negotiate with customers on price, term (length of contract) and volume. The SSC can only be varied with the agreement of Ofgem and following consultation with market participants. See: Centrica Storage Ltd Contracts [webpage](#).

- (c) unless otherwise agreed with Ofgem, sell Minimum Rough Capacity (MRC) in Standard Bundled Units (SBUs) comprising combined rights to fixed units of space, injection and withdrawal;
- (d) sell the following 'Obligated Capacity' before the start of the Storage Year (1 May):
 - (i) 455 million SBUs of MRC; and
 - (ii) at least 1.534 TWh of Additional Space (AS);
- (e) not sell more to Centrica per year than a maximum 'Specified Capacity' of:
 - (i) 25% of MRC; and
 - (ii) 1.534 TWh of AS;

Centrica can access no incremental capacity in terms of space unless 34.7 TWh of space will be made available to the market ahead of the Storage Year, but may access 100% of incremental capacity above this level;

- (f) offer at least 20% of MRC (equivalent to 91 million SBUs) on annual contracts;
- (g) auction all unsold Obligated Capacity one month before start of the next Storage Year at a marginal cost reserve price;
- (h) offer for sale capacity that becomes available during the Storage Year;
- (i) facilitate the efficient operation and development of a secondary market in Rough capacity;
- (j) disclose information on storage operations to all market participants simultaneously;
- (k) ensure that no commercially sensitive information arising from the operation of Rough is passed directly or indirectly to any business of either Centrica or any other member of the Centrica Group; and
- (l) provide sales and operational information to Ofgem and the CMA for compliance monitoring purposes.

1.23 The undertakings also include an adjustment mechanism which allows Ofgem to increase or decrease either MRC or AS for the next and/or subsequent

Storage Years upon the application of CSL or on its own initiative on the basis of the following factors:

- (a) there has been, or will be, a substantial change in Rough Capacity;
- (b) provided that the sum of the varied MRC and AS must be at least the Maximum Technical Storage Capacity of Rough (and not more than 31.834 TWh); and
- (c) the variation as between MRC and AS must be an appropriate offer for customers of CSL.

The request to review the undertakings

1.24 On 19 June 2017, the Centrica board approved CSL's recommendation that it could not continue to operate the Rough gas storage facility as a storage facility and should seek all necessary consents to produce all recoverable gas from the field.¹⁶ CSL's recommendation was based on:

- (a) the results of CSL's independent well testing program (conducted between March 2015 and June 2017) which demonstrated that the Rough wells are susceptible to a range of unpredictable age-related failures and any return to injection operations would pose an unacceptable health and safety risk. Further, the offshore platforms and onshore Easington terminal are also showing substantial age-related deterioration;
- (b) the only technically viable option for reducing the risk associated with injection operations using the current Rough wells and offshore and onshore assets to an acceptable low level ('as low as reasonably practical' - ALARP) is to abandon the existing Rough wells and drill new wells into the Rough field and to substantially rebuild the offshore and onshore assets; and
- (c) making the asset safe for injection operations in this way is not economic.

1.25 As a consequence, CSL is seeking the appropriate consents from relevant government bodies (in particular, the CMA and the OGA) to allow it to recognise the permanent cessation of all storage activities and to produce all recoverable gas from the Rough reservoir.

1.26 Centrica and CSL have told us that their decision to permanently end storage operations at Rough constituted an irrevocable and fundamental change of

¹⁶ See [Centrica press release](#).

circumstances. Consequently, they told us, the undertakings were no longer appropriate in dealing with the competition problem which they were designed to remedy and should therefore be terminated as soon as practicable.¹⁷

The review of the Rough undertakings

- 1.27 The CMAs assessment of the evidence provided to it provided grounds for the CMA to consider that there was a realistic prospect of finding a change of circumstances relating to the continued operation of the undertakings. On 17 October 2017, the CMA therefore announced its decision to appoint a Group to undertake a review, under paragraph 16 of Schedule 24 to the Enterprise Act 2003.¹⁸

The focus of the review

- 1.28 In conducting a review whether by reason of a change of circumstance, an undertaking is no longer appropriate and should be varied or released, it is important to consider the context of the original merger inquiry.
- 1.29 The undertakings were put in place in 2003 to address the adverse effects of a merger. In 2003, the undertakings were considered by the CC to be a necessary and measured response to those adverse effects and were subsequently adopted by the Secretary of State.
- 1.30 The Group has reviewed whether the information now available on the state of the Rough wells, as well as the offshore and onshore facilities, lead to the conclusion that there has been a change of circumstances (such that Rough can no longer safely be operated as a gas storage facility in the absence of considerable capital expenditure which, if incurred, would make the Rough gas storage facility uneconomic). The Group has also considered whether any such change of circumstances would be sufficient to cause it to determine that the undertakings, whether in whole or in part, are no longer appropriate and should be varied or released.
- 1.31 Three parties responded to the CMA's decision to review the undertakings.¹⁹ Their responses have been taken into account by the Group in its review.
- 1.32 The review staff team held meetings with Ofgem, the OGA and BEIS.

¹⁷ See [CSL request for a review of undertakings](#).

¹⁸ See the [decision statement](#) (17 October 2017).

¹⁹ The submissions can be found on the case page of our [website](#).

2. Consideration of the change of circumstance

Introduction

- 2.1 In a review of undertakings, the CMA will consider whether there has been a change of circumstances such that the undertaking is no longer appropriate in dealing with the competition problem and/or adverse effects which it was designed to remedy.²⁰
- 2.2 In this section we consider whether there has been a change of circumstances such that the current undertakings are no longer appropriate. In this instance, CSL has told us that the Rough assets were no longer capable of injection operations without a substantial refurbishment. It told us that, based on prevailing and expected market conditions, the level of investment required to meet the obligation to operate safely was not economically viable and that it had therefore taken the decision to permanently end storage operations at Rough. CSL told us that this constituted an irrevocable and fundamental change in circumstances that meant the undertakings were no longer appropriate and justified the CMA releasing Centrica and CSL from them.

Nature of the change in circumstance

- 2.3 In the 2015-16 review of undertakings, the immediate change of circumstance was a limitation on the maximum operating pressure of the Rough wells from 3,500 psi to 3,000 psi while it conducted tests on the wells to see if they could be operated at the higher pressure. This was based on a report from Chris Dykes International Ltd, CSL's Independent Wells Examiner, in February 2015 which stated that the Maximum Allowable Annual Surface Pressure (MAASP) of the Rough wells' A-annuli had been calculated to be 3,000 psi.²¹
- 2.4 Following the decision to limit the operating pressure of the Rough wells, CSL initiated an extensive well testing program. The intention of the well testing

²⁰ Remedies: Guidance on the CMA's approach to the variation and termination of merger, monopoly and market undertakings and orders (CMA11), paragraphs 2.4 & 2.5

²¹ Following the Piper Alpha disaster in 1988, the UK legislative framework was changed to require operators of oil and gas wells in the North Sea (and onshore) to put in place mechanisms to ensure best practice well design, construction, operation and eventual abandonment by 'independent and competent persons'. Regular reporting to CSL by its Independent Wells Examiner is part of that process.

²² See [Rough gas storage undertakings review final decision \(22 April 2016\)](#), paragraphs 3.5 to 3.15, for an explanation of MAASP, annuli and how pressure containment is supposed to function in the Rough wells in order to prevent a blow-out (ie a substantial release of hydrocarbons either at the seabed or at the platform, with consequent risk to life of staff on the platform).

program was to determine whether CSL could safely return Rough to a maximum operating pressure of 3,500 psi.

- 2.5 In November 2015 CSL tested well B11 and identified a failure in the production tubing (the primary barrier). In June 2016, the secondary barrier of well C6 failed during the testing procedure. Well C6 was an operational well (i.e. it was not plugged) and its secondary barrier failed at a pressure below 500 psi, significantly below the then prevailing reservoir pressure of circa 2,200 psi.
- 2.6 These test results were of particular concern to CSL because:
- (a) Had the failure of the primary barrier and secondary barrier occurred in the same well, it would have exposed the B Annulus (tertiary barrier) to the full pressure of the reservoir; and
 - (b) As the MAASP of the B Annulus is 1,500 psi, the failure of the secondary barrier would have exposed the B Annulus to pressures in excess of its MAASP, which is unacceptable from an operational and safety point of view.
- 2.7 On 15 July 2016, in response to the failures in B11 and C6 (and having conducted further investigations into the wells), CSL announced that it would cease all injection operations until the well testing program was completed. By 20 June 2017, the date on which CSL announced that it could not return Rough to storage operations, it had conducted calliper surveys on 22 wells and conducted pressure tests on 21 of the 47/3B wells.
- 2.8 The results of the well testing program were summarised by CSL²³ as follows:

²³ See [CSL request for a review of undertakings](#).

Eight secondary containment failures	<p>Four failed a 3,000 psi test (B9z, C1z, C3, C10), three failed a 2,000 psi test (B1, B5, C5) and one failed to hold 500 psi (C6).</p> <p>Of the five that failed a 3,600 psi test, two were tie-back wells, where the tie-back seals (located at the seabed) were the most likely cause of the failure. In well C1z, this hypothesis was given weight by deploying hydrophones, the information from which suggested a leak in a repair to the production casing below the tie-back system.</p> <p>Note: because two of the three tie-back wells failed, the third well, C2, was also taken out of service even though it passed the 3,600 psi A-annulus test.</p>
One primary containment failure	<p>The first well tested was B11, with severe production tubing corrosion observed; this was deduced to be on the outside of the production tubing (in the A-annulus). This well passed its 3,600 psi secondary containment test.</p> <p>Note: B3 appeared to have an Extenda Joint²⁴ seal failure previously. However, this leak could not be replicated during testing. C9 appeared to have a primary containment failure through a suspected tubing hanger²⁵ seal failure. However, once plugged, this failure could not be replicated with a hydraulic test. (Note: this well's secondary containment had not been tested).</p>

2.9 This equates to:

- (a) One confirmed primary containment envelope impairment (well B1) out of 21 wells (pressure tested) = 5% (well B3 not confirmed)

²⁴ Stresses imposed on wells during injection are more likely to result in loss of primary containment than stresses imposed during normal production. This is because the higher surface pressures required to push the gas into the reservoir result in the production tubing 'ballooning' slightly (expanding radially under pressure). This, together with the cooling effect of the colder grid gas being pumped down the wells, causes the production tubing to contract axially (the bottom of the well tries to move upwards). To counteract the stresses imposed by injection service, all Rough wells are fitted with telescopic joints at the bottom of the wells known as Extenda Joints; the product name is applied by the Baker Oil Tools company who supplied the telescopic joints. These Extenda Joints have elastomeric seals in them that will eventually fail in time. At 30 years old they are already passed their 25 year design life.

²⁵ A tubing hanger is a component used in the completion of oil and gas production wells. It is set in the tree or the wellhead and suspends the production tubing and/or casing.

- (b) Eight confirmed secondary containment envelope impairments out of 21 wells = 38%

These results demonstrate that around one in every two of the 47/3B wells has some form of identified failure (or an unacceptable likelihood of failure in the case of well C2). It also demonstrates that there are a number of different forms of well integrity issues across the well stock.

2.10 In addition to CSL's summary of the results of the well testing program referred to above, we also examined:

- (a) a paper submitted by CSL to the board of Centrica dated 19 June 2017;
- (b) a Rough field operational feasibility report dated 28 July 2017, prepared by CSL's well engineering manager;
- (c) a CSL well integrity review dated 13 February 2017 prepared by Centrica Exploration and Production's Global Wells Technical Authority; and
- (d) a report on Rough prepared on behalf of Ofgem by Axis Well Technology dated 7 March 2017.²⁶

2.11 All of the documents referred to in paragraph 2.10 were consistent with CSL's summary of its well testing program and (with the exception of the Axis Well Technology report) concluded that the risk associated with operating the Rough wells in injection mode, absent a field redevelopment program, was unacceptable. The Axis Well Technology report, which was prepared prior to completion of the well testing program and in the context of an application to Ofgem to reduce capacity available for sale in the 2017-18 storage year, concluded that if reinjection to the reservoir via existing wells was to be considered in the future, the well asset management policies and systems must be reviewed and updated to make provision for the ongoing assessment of the ageing, degradation and deterioration processes and the need to link specific maintenance and inspection requirement to these important aspects. It recommended that suitably detailed 'fitness for purpose' evaluations should be carried out on all wells prior to reintroducing gas injection. CSL's Independent Wells Examiner also wrote to us on 27 October 2017²⁷ that it concurred with CSL's decision not to return the wells to injection and storage operations and agreed that the only viable option for reducing the risk to an

²⁶ Axis Well Technology is an independent wells engineering consultancy which was appointed as expert adviser to Ofgem to advise on the merit and accuracy of the July 2016 application by CSL to cease gas injection and so reduce the amount of Rough capacity CSL is obliged to sell under the undertakings for the 2017-18 storage year. 14 wells had been tested at the time the Axis Well Technology report was prepared.

²⁷ See the case page on our [website](#).

acceptable level was to cease further gas injection operations and move towards timely full well abandonment.

Options for addressing well degradation

- 2.12 CSL told us that it had considered a number of possible remedial measures which could potentially allow it to continue to inject gas through the ‘in-service’ wells. These included: continuous monitoring of all well annuli; installation of a remote actuated emergency venting system (controlled release of any gas reaching the A-annulus to atmosphere through a platform vent stack); and a remote actuated emergency kill system (push gas reaching the A-annulus back into the production tubing by pumping treated seawater into the well).
- 2.13 CSL told us that each of these options had its own disadvantages but, significantly, each would result in CSL operating in a manner where it would react to the consequences of known well integrity issues rather than correcting the well integrity issues themselves. Further, given that the elastomeric seals in the Extenda Joints would fail in time, CSL did not consider this approach to be ALARP.
- 2.14 CSL considered that the only remedial measure which would mitigate all risks to an acceptable level was to drill new wells and rebuild the whole offshore facility. It told us this conclusion had been verified by the Centrica Group Wells Technical Authority. CSL had calculated the costs of rebuilding Rough to create a safe facility with broadly similar characteristics and had an independent expert (Genesis Oil and Gas Consultants Ltd) verify these costs. CSL told us it had determined that these works would cost in the order of £1 billion and would take around five years to complete.
- 2.15 CSL told us that, since 2011, the economic environment for storage operators had been challenging. It told us that, in relation to long term storage such as Rough, the summer to winter gas price differential (particularly quarter one, January to March – the summer-Q1 spread) was the key driver of the value of storage products. CSL told us that spreads had been under 13 pence per therm since 2011 and in the range of about 6 to about 7 pence per therm for the past two storage years. Based on the forward market, spreads were expected to remain below 8 pence per therm until at least 2021. At these prices, it was not economic to invest circa £1 billion to allow for the resumption of storage operations, and prices would need to rise to well above current and forecast levels to generate even a modest return on investment.

- 2.16 In response to our provisional decision,²⁸ CSL reaffirmed that changes in the gas market over recent years, including increased and diversified sources of supply combined with decreasing demand for natural gas, had resulted in a significant decrease in the price of seasonal spreads. It also reaffirmed that the age and degradation of the wells and other facilities at Rough meant that Rough was no longer capable of safe injection operations without substantial refurbishment, which was not economically viable.
- 2.17 ScottishPower, which operates the much smaller Hatfield gas storage facility in South Yorkshire, told us in a letter dated 31 October 2017²⁹ that the market conditions for operating gas storage sites was presently very challenging and the returns were significantly below new entrant costs.

Conclusion on change of circumstance

- 2.18 We carefully considered all the evidence which had been put to us. We concluded that the age and degradation of the wells and other facilities at Rough (including likely future degradation, for example failure of the Extenda Joints) mean that the Rough assets are no longer capable of safe injection operations without a substantial refurbishment. We also concluded that, based on prevailing and expected market conditions, the level of investment required to meet the legal obligation to operate safely³⁰ is not economically viable. We concluded that this constitutes a change of circumstance.

3. Addressing the change of circumstance

- 3.1 Having concluded that there has been a change of circumstance, we now determine what appropriate steps the CMA needs to take. These are whether the undertakings need to remain in place in their current form, or whether they need to be revised, or whether CSL and Centrica need to be released from them. We have been guided by the approach set out in the CMA's adopted guidance [CC8: Merger Remedies: Competition Commission Guidelines](#).
- 3.2 Our conclusion that the Rough assets are no longer capable of safe injection operations without a substantial refurbishment means that, if the existing undertakings were to remain in place, we need to determine whether it is reasonable and proportionate in the circumstances to require CSL to invest in such a refurbishment, despite CSL submitting it not being economic to do so under current and projected market conditions. Our guidance states that we

²⁸ See the case page on our [website](#).

²⁹ See the case page on our [website](#).

³⁰ Section 11A(2)(a) of the Gas Act 1986 requires CSL to operate Rough in a manner calculated to ensure that the facility is safe, reliable and efficient so far as it is economical to do so.

should consider the cost of remedies and that any remedy we impose should be proportionate to the harm caused by the substantial lessening of competition arising from the merger.

- 3.3 Transition Energy Capital, an investment management company with a focus on the European energy infrastructure sector, submitted that Rough was an asset of strategic importance. It told us that Ofgem should consider the need to carry out a public consultation on the proposed closure of Rough so that the industry could assess the impact on the broader energy sector and its impact on consumers. It further told us that, under alternative undertakings and regulatory arrangements, it considered Rough could attract private capital for the repair of the facility that would be commercially acceptable to Rough shareholders and demonstrate a positive net social benefit.
- 3.4 As described in paragraph 2.1, in a review of merger undertakings, the CMA's review will consider the competition problem and/or adverse effects the undertaking was designed to remedy. However, as the UK's largest gas storage facility, we are aware the removal of Rough could have potential implications on the future security of gas supply for the UK. We liaised with the Department for Business, Energy and Industrial Strategy (BEIS), the OGA and Ofgem on this point. BEIS told us that it had recently published a strategic assessment of the security of gas supply in the UK.³¹ The report finds that the UK has a wide range of gas supplies and sources. This includes significant levels of domestic gas production, access via pipelines to Norwegian gas production, interconnection with the Continent through the IUK and BBL pipelines and some of the largest and most modern LNG infrastructure in Europe. BEIS told us that, in its view, the UK had sufficient security of gas supply even in the absence of Rough. It told us that it was aware that refurbishment of Rough was not economically viable in current market conditions and that, when set against a possible call on public funds in order to make such a refurbishment viable, it was content to see Rough close as a gas storage facility. The OGA told us that it had also liaised with BEIS and, given that BEIS said they were 'comfortable with Rough's closure', it too was content. Ofgem told us that Britain had diverse sources for gas supplies and was not dependant on any one piece of infrastructure, including Rough.
- 3.5 We have concluded that it would not be reasonable or proportionate in this case to retain the undertakings unchanged and so require CSL/Centrica to invest a significant amount of money in a project, which was unlikely to be economically viable, to restore Rough to gas storage operations. This is because our finding that it would be unlikely to be economically viable was

³¹ [UK Risk Assessment on Security of Gas Supply 2016](#).

based on our view that the decision not to make such an investment would be likely to have been made by any other reasonable storage operator.

- 3.6 ScottishPower, in its response to our decision to review, told us that it was not aware of any risks to competition which should prevent the CMA from agreeing to CSL's request to revoke the undertakings but told us it might be prudent to make any release of the undertakings subject to conditions so as to keep a route open to re-impose competitive safeguards should CSL decide to recommence operations at the facility.
- 3.7 We considered this submission against the change of circumstance we had found concerning the age and degradation of the wells and other facilities at Rough. We have concluded that, given forward projections of summer/winter gas price spreads, on a balance of probabilities it was unlikely over the timeframe Rough's gas will be produced for it to become economically attractive for CSL to make the required investment to reinstate Rough as a gas storage facility. In order to preserve this option, CSL would need to invest to mothball the facility rather than produce all the recoverable cushion gas. To mothball the facility with a guaranteed ability to return to storage operations, CSL would have to retain cushion gas in the Rough reservoir to prevent water ingress into the reservoir formation. With the issues concerning the pressure containment system of many of the wells identified in paragraphs 2.3 to 2.9, and the likelihood that wells would continue to deteriorate further over time, it would need to make investments it has told us are not economically viable. In light of CSL's submission that it will produce the recoverable cushion gas, we have concluded that the CMA does not need to seek to vary the undertakings to allow for mothballing of the facility.
- 3.8 In light of the conclusion on change of circumstance, that the age and degradation of the wells and other facilities at Rough (including likely future degradation) mean that the Rough is no longer capable of safe injection operations without a substantial refurbishment which is not economically viable, we have found that the undertakings on Centrica and CSL to offer storage facilities are no longer appropriate. As described in paragraphs 1.16 to 1.18, the undertakings were accepted to address Centrica's incentives in the storage market and to remedy the potential adverse effects of Centrica's ownership of the Rough storage facility. As Centrica and CSL will cease to offer storage, we have decided that CSL and Centrica should be released from the undertakings.

Conclusion on addressing the change of circumstance

- 3.9 The CMA has concluded that the age and degradation of the wells and other facilities at Rough (including likely future degradation) mean that Rough is no

longer capable of safe injection operations without a substantial refurbishment which is not economically viable, and that this constitutes a change of circumstance which means the undertakings are no longer appropriate and the relevant parties can be released from the undertakings.

Glossary

Additional Space	Space into which gas can be injected over and above the Minimum Rough Capacity . Under the current undertakings, it must be at least 1.534 TWh per year. Additional Space is quantified before the beginning of each Storage Year .
Annulus / Annuli	In gas well structure, a well is made up of concentric pipes of tubing. The central tube is the production tubing (where gas flows through). The space between tubes are annuli , and act as lines of defence, should the central tube break/leak.
ALARP	As Low As Reasonably Practical. ALARP describes the level to which the HSE expects to see workplace risks controlled.
BCF	Billion cubic feet. A measure of volume. Rough's working volume is approximately 135 bcf.
BEIS	Department for Business, Energy and Industrial Strategy.
Centrica	Centrica is the parent company of CSL , and is active in gas production, trading, storage and supply. CSL 's trading and supply entities (eg British Gas) are customers of CSL 's gas storage products.
CSL	Centrica Storage Limited. CSL is the company that operates the Rough gas storage field. It is legally, financially and physically separate from its parent company, Centrica .
Cushion Gas	Gas that must remain in a storage facility to maintain sufficient pressure for it to operate.
HSE	Health and Safety Executive. The HSE is the regulatory body for ensuring the safety of offshore rigs and production sites. To this end, it enforces the offshore installations and wells (design and construction etc.) regulations 1996.
Incremental Capacity	Capacity created at Rough through investment in storage operations by CSL . The current undertakings place no limits on how much Incremental Capacity Centrica can purchase from CSL (see Specified Capacity).

LNG	Liquefied Natural Gas. LNG is natural gas (predominantly methane, CH ₄) that has been converted temporarily to liquid form by cooling it to around -160C for ease of storage or transport.
MAASP	Maximum Allowable Annular Surface Pressure. Rough wells have three annuli . The limit on the pressure in the annuli is the MAASP.0
MRC	Minimum Rough Capacity. The capacity that CSL has to offer for sale each Storage Year , as required in the undertakings. It comprises 455m SBU s.
NBP	National Balancing Point. A notional point on the NTS where gas can be traded between counterparties and their daily imbalances are calculated. Shippers face charges based on the cost of balancing the system if they are out of balance and are therefore incentivised to balance their own portfolios by the end of each day through changes to flows and trading at the NBP .
NTS	National Transmission System. High-pressure gas system consisting of terminals, compressor stations, other pipeline systems and offtakes. The origin and destination of the gas in the NTS is irrelevant: once the gas has entered it, it can exit anywhere; and gas for a specified exit can come from any entry point. Any gas within NTS is effectively homogenous, so it can be traded at single notional point – see NBP .
Obligated Capacity	MRC plus at least 1,534 TWh of Additional Space . CSL is obliged to offer this capacity to the market yearly, in accordance with the current undertakings.
OGA	Oil and Gas Authority. The OGA has taken over some of DECC 's responsibilities in relation to oil and gas production and storage licences. Its role is to regulate, influence and promote the UK oil and gas industry.
PSI	Pounds per square inch. A measure of pressure.
Operational stock	Gas held by CSL to meet its contractual and regulatory obligations to ensure the facility's integrity and efficiency (eg to maintain steady flows and to allow for outages).

Producer	A company that extracts gas from an onshore or offshore field and delivers it to a terminal.
Production Tubing	The central tube in a well through which gas is injected and withdrawn.
Shipper	A company holding a shipper's licence granted by Ofgem. Gas shippers buy gas from producers and sell the gas onto suppliers . They are defined as an entity which introduces, conveys and takes out gas from a pipeline system.
Specified Capacity	The amount of Minimum Rough Capacity and Additional Space that CSL is allowed to sell to Centrica ahead of the Storage Year . Under the current undertakings, Specified Capacity is 25% of MRC and 1.534 TWh of Additional Space .
SBU	Standard Bundled Unit. An SBU comprises of a specific amount of daily injection rights, daily withdrawal rights and space.
SSC	Storage Services Contract. The standard contract CSL is required to use when negotiating storage contracts. CSL can only negotiate with customers on price, term (length of contract) and volume.
Storage Year	The Storage Year runs from 1st May to the following 30th April and consists of an injection season (during the summer) and a withdrawal season (during the winter), although customers can choose to use their injection/withdrawal rights whenever they wish. CSL sells capacity at Rough on annual or multi-year contracts (typically comprising a combination of injection rights, withdrawal rights and space).
Supplier	A company holding a supplier's licence granted by Ofgem. Suppliers contract with producers to buy gas that is then shipped through National Grid network (by a shipper) for supply to consumers. A supplier may also be licensed as a shipper .
Therm	Unit of heat energy approximately equivalent to the energy generated by burning 100 cubic feet of natural gas.

TWh/GWh

Terawatt hour/Gigawatt hour. Units used to measure energy (including the energy content of gas). 1,000 GWh equates to 1 TWh.