



PROTECT WYRE GROUP

Fleetwood Action Group Fleetwood Civic Society
Fleetwood Chamber of Trade & Commerce
Over Wyre Action Group
Poulton Historical & Civic Society Poulton Residents Association
Thornton Action Group

Supported by:

Ben Wallace MP ~ Eric Ollerenshaw MP ~ Paul Maynard MP

Secretary of State
National Infrastructure Consents Team
Department of Energy and Climate Change
2nd Floor Kings Buildings
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9th September 2014

Dear Secretary of State

Preesall Saltfield Underground Gas Storage - EN030001 - Our reference: 10015132

Further to the letter from Giles Scott (DECC) on 31st July 2014 inviting interested parties to make representations on an independent geological report produced by Senergy (GB) Limited, the Protect Wyre Group (PWG) has requested and been supplied with additional information which allowed us to undertake a comprehensive examination of Senergy's "*independent geological report*".

PWG's geologist, Howard Phillips, has compiled a detailed assessment of Senergy's findings and comments and his report is appended to this letter.

PWG has been opposed to the various iterations of the proposed Canatxx/Halite development due primarily to the lack of information available and it has been felt from the outset that Canatxx/Halite has adopted a speculative role in its assessment of the amount of gas that could be safely stored in the salt layers beneath and adjacent to the River Wyre, aka the Preesall Saltfield.

The Group has consistently campaigned over the last 12 years for additional geological information from Canatxx/Halite with which they could support their volumetric expectations; some has been supplied but it has never been enough. It's interesting to note that even at this late stage and some 12 years after Canatxx/Halite first embarked on this venture that Senergy comments in its Executive Summary that...

"...the data that Senergy received was sometimes incomplete or late and delivered in obscure formats. It is not known why this was so. Examples of this are missing or very late arriving log data, no check shot or Vertical Seismic Profile (VSP) data received, improperly formatted seismic data, seismic interpretations at Base Salt with mis-ties, an absence of fault interpretations, and an absence of the intra-salt mudstone interpretation within the geological model; the report is necessarily limited to the data received".

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We would also place on record the fact that the Seismic Surveys undertaken by Halite were done after the Inspectorate's Examination and its subsequent report was concluded.

This late submission is, we suggest, of particular relevance and we suggest that if the seismic lines data and the subsequent conclusions been placed, as evidence, before the Examining Panel then planning permission would almost certainly have been recommended for refusal based on insufficient proven volumes.

As it stands, without the benefit of examining this late data, the Inspectorate recommended a subjective approval of the Halite scheme but it was subject to many provisos, one of which was that the scheme should be demonstrated to be able to accommodate a minimum of 300 million sm³ of working gas. An extraction of the relevant paragraphs from the Panel's report to the Secretary of State, 21st January 2013 are shown below...

9.26 We propose therefore that the criterion to be met in the first instance is a minimum volume of gas storage on the basis that if the geology cannot support such a level, then it throws into question some elements of the surface infrastructure which the application contains, and particularly the size of the GCC. (Page 131)

9.27 We acknowledge that the draft Order provides for a working capacity of gas of up to 600 Mcm (i.e. without a lower limit) and therefore allows for much flexibility to develop the detailed design of cavern construction and indeed their number within the Preesall Halite deposit. But we consider that if only a materially lower volume of gas capacity can be achieved it may not give sufficient benefit to outweigh the adverse impacts of the project.

9.28 This leads to the question of the working volume of gas that the Applicant would have to demonstrate is achievable to outweigh the adverse impacts. This would be a minimum threshold of stored gas which is capable of being stored in the UGS caverns in the two polygons when the design parameters given in Requirement 6 are applied. We have adopted a figure of 300 Mcm for the minimum working capacity because we consider that a working capacity of less than this is materially different from the volume applied for (and in that eventuality it is likely that some of the surface infrastructure would be oversized.

9.29 We accept that there are elements of the infrastructure which are not in a linear relationship as the sizes are based on flow rates rather than stored gas volumes. But we are of the view that the GCC could be reduced in scale if it was only needed to handle a much smaller quantity of gas, and arguably its impact on the landscape would be reduced commensurately. If the minimum threshold cannot be met it would mean the development would not be permitted to proceed any further. This would ensure that the community and the environment would not be subjected to a large construction project, or subsequently disrupted by decommissioning when the infrastructure was removed, if the project was found not to be capable of achieving the quantities of gas storage and hence the benefits projected.

9.36 We recommend therefore that two new sub paragraphs are inserted at the beginning of Requirement 6 in Schedule 9 of the Order as follows:

- (1) No stage of the authorised development shall commence until
 - (a) a geological survey of the "area for cavern development" shown on the approved development plan with reference A-1000-030 Rev B has been carried out to confirm the top and bottom levels of the halite deposit and the presence of any faulting to a confidence limit of ±5 m;*
 - (b) the working capacity of Work No 1A has been calculated taking account of the results of the geological survey and sub-paragraph 4(a) to (h) of this requirement; and*
 - (c) the results of the geological survey and the working capacity calculation have been submitted to and agreed by Lancashire County Council.**
- (2) No authorised development shall be carried out if the working capacity of Work No 1A as agreed by Lancashire County Council pursuant to sub-paragraph 1(c) is less than 300 million standard cubic metres at the standard temperature and pressure.*

The Senergy Report suggests that there is a less than 2% probability of Halite achieving a working gas volume of 300 million sm^3 but there is a 90% probability of only achieving 124 million sm^3 .

PWG's appended report shows that the achievable working gas storage could be as little as 87 million sm^3 .

On the basis of the above, PWG contends that the application should be refused as, using the Panel's own words,

"If the minimum threshold cannot be met it would mean the development would not be permitted to proceed any further".

We also contend that the Secretary of State made the correct decision with his first refusal and that had the Applicant placed the necessary information before him and the Panel then the High Court challenges and the subsequent Judicial Review would have been unnecessary.

Yours sincerely

Ian Mulroy
Chair PWG

Protect Wyre Group response to the Independent Geological Assessment for the Preesall Gas Storage Project conducted by Senergy (GB) Ltd for DECC.

(Report Prepared by Howard Phillips)

Protect Wyre Group (PWG) welcomes the findings of the Senergy Assessment regarding the volume of gas which could be safely stored in the Preesall Salt Basin. It notes that

- 1 This volume is based purely on the depth and thickness of the salt as revealed in the seismic lines (including 8 surveyed in 2013 for Halite) and bore holes.

The Secretary of State is asked to note that the Halite 2013 lines were only undertaken after the refusal of planning permission and until now the results have not been made available to PWG or the general public.

- 2 The data received by Senergy from Geostock (the company engaged by Halite to report on the seismic surveys) was inadequate, notably because there is an "*an absence of fault interpretations*" (Executive Summary p iii).

Section 2.2.4. (p7) of the Senergy Assessment reveals that "*the fault interpretation developed by the BGS during their seismic interpretation was not brought into this version of the geological model. Instead the faults were built using a 'fault omission' approach using the depth-converted Top and Base Salt horizons. No information as to the methodology used to map the faults between seismic lines (i.e. fault length) was made available for this current assessment*".

PWG will show the importance of fault lines in assessing true volumetric calculations.

- 3 The Senergy Assessment finds that

"... the Base Salt is not adequately imaged by the new seismic in parts of the proposed polygon areas and there are no bore hole data to confirm seismic picks within the development polygons".

"This leaves considerable uncertainty in the volumetric calculations" (Executive Summary p iii).

Indeed Section 3.3.2 (Syn-Depositional Faults) states

"Given the lack of image at the base of the salt, it is not even possible to determine whether or not the current seismic spacing is sufficient to map all key geological features" (Senergy Assessment pp 15-16).

- 4 The Senergy Assessment raises the issue of the loss of integrity of the caverns caused by fractures in the salt deposits (Section 4.2 p27). "*Regarding the total number of 19 caverns, the risk is estimated to represent a loss of 1 to 2 caverns caused by loss of integrity of the cementation of salt fractures*".

Volumetric Calculations and the IPC Panel's report to the Secretary of State 21st January 2013.

The application from Halite is for planning consent to construct up to 19 caverns to provide a working capacity of up to 600 mcm of working gas.

The IPC acknowledges (IPC Report 9.27 p132) that this

"allows for much flexibility".

"But we consider that if only a materially lower volume of gas capacity can be achieved it may not give sufficient benefit to outweigh the adverse impacts of the scheme".

The IPC Panel adopted a figure of 300 mcm for the minimum working capacity (9.28 p 132).

"If the geology cannot support such a level, then it throws into question some elements of the surface infrastructure which the application contains and particularly the size of the GCC" (9.26 p 131).

Following this ruling from the IPC Panel, Halite carried out a further survey of 8 seismic lines, during the summer of 2013, to establish more clearly the depth to the top and base of the salt bed and the location of faults and to confirm the calculations of the volume of gas which could be stored.

These new surveys were incorporated with the previous seismic lines and bore hole data by Geostock (Report GKF.O.J. 0003) in order to calculate a revised volume of 324 mcm for the storage of working gas. That volume, if true, would mean that Halite would have fulfilled the IPC Panel's requirement of a minimum of 300 mcm of working gas.

However, the Independent Assessment from Senergy using the same data is very critical of the findings of the seismic surveys and the interpretation which Geostock uses in its calculations. Senergy's estimate is a working gas volume of 203 mcm, with less than a 2% probability of achieving a working gas volume of 300 mcm.

PWG will show that when faulting is taken into account, the working gas volume is reduced to c100 mcm or less. All this evidence shows that the original Halite application wildly exaggerates the amount of gas which could be stored, because of its inadequate investigation of the geology.

Even the reduction to 300 mcm of working gas is considered by the Independent Senergy Assessment as having less than a 2% probability of being achieved.

This clearly shows that the surface infrastructure will have to be scaled down and the number of caverns and their location will have to be reassessed and then presented by means of a new and realistic application.

Re-appraisal of the PWG evidence on geology presented to the IPC Inquiry, in the light of the Senergy Assessment.

In its letter to the DECC dated 7th May 2014, PWG refers to the Open Hearing of the 17th October 2012 and the evidence given by Howard Phillips which summarises the PWG concerns that the geological information presented by Halite to the Examining Authority was insufficient to justify approval.

Indeed the subsequent seismic surveys have shown that the Halite 3D Geological Model (2009) was in fact wrong, leading to an over estimation of the volume of gas which could be stored.

PWG identified 5 areas of contention between Halite and PWG regarding the 2009 Model. Halite failed to give any clear answers to the issues raised by PWG and the subsequent questions from the IPC Panel.

1 Northern Polygon - caverns 1 to 6, Bore Hole E1 and the Burn Naze Fault

This fourth application for gas storage from Canatxx/Halite encompassed an area which had never been previously considered as suitable for gas storage. Yet without any seismic investigation or new bore hole evidence, Halite proposed to construct 6 caverns with heights ranging from 120m to 220m in a halite bed with a claimed thickness ranging from 176m to 260m.

The nearest bore hole E1 shows the halite bed to be only 81m thick.

The response from Halite was that

"it appears that the Burn Naze Fault runs through bore hole E1 and is why the salt is thin in that location versus nearby wells and cavern locations".

Halite persisted with this interpretation of the E1 bore hole data despite evidence to the contrary produced by PWG regarding the mudstone interbeds in the salt bed, the evidence of a marl and rock salt layer in the mudstones under the salt bed and the fact that adjacent brinewell records do not show a thickening of the salt bed westwards as conjectured by Halite.

Seismic lines HEG 13-06 and 13-07 show a fairly simple synclinal structure with no evidence of a major fault. Thus the Burn Naze Fault must lie to the west of the Wyre Estuary.

Moreover, the seismic line HEG 13-07 confirms the bore hole data from E1 and vindicates the position of PWG.

"Salt thickness in the E1 borehole is shown to be correct suggesting that the salt thins quite significantly onto the western margin of the basin" (Senergy Assessment p15).

The Senergy Assessment (p13) also states

"there is a risk that the fault juxtaposes Sherwood Sandstone against the Preesall Halite near the base of the salt. Any risk for exchange of fresh or saline fluids across the fault and the possible impact of this should be assessed".

This worrying scenario was pointed out by PWG in its draft document on Geology (7th April 2012).

PWG is in agreement with the Senergy Assessment volumetric calculations of 37.9 mcm of working gas for caverns 1-6. This is considerably less than the 145 mcm claimed by Halite in its application.

2 The Northern Polygon - caverns 8, 10 and 11.

Evidence from the BGS 3D Geological Model (2009) and the Coat Walls Bore Hole (Top Salt only) indicated that the salt bed lies at a shallower depth than the figure used by Halite to calculate to volume of gas to be stored in these caverns.

The Senergy Assessment shows that PWG was right to be concerned about the over estimation of gas which could be stored in caverns 8,10 and 11, given that caverns 10 and 11 in particular lie on the steeply dipping eastern limb of the syncline.

Senergy estimates a total of 18.6 mcm of working gas compared with the Halite calculation of 48 mcm.

3 The East-West Fracture Zone

PWG drew attention to the transposition of salt top and bottom faults in the fault zone north and south from Arm Hill. This transposition is clearly shown in the indicative cavern location plan and occurs 300m south of Arm Hill along northing 464. PWG suggested that for this to happen there has to be an E-W zone of movement along this line. Such a zone would affect the integrity of caverns 11, 13 and 14.

PWG notes that the Senergy Geological Model does not use the fault interpretation developed by the BGS during its seismic interpretation. What is clearly evident is that the Senergy Model which incorporates the HEG 2013 seismic lines differs dramatically from the 2009 BGS Model.

The Senergy Model shows that the salt bed is divided into two basins roughly along northing 464, a fact not revealed in the BGS Model. It means than caverns 12, 13 and 14 according to Senergy are only capable of storing 25.3 mcm of working gas compared with the Halite assertion of 78 mcm.

The N-S seismic HEG 13-08 crosses the eastern side of the southern polygon demonstrating the existence of a separate basin in the Barnaby's Sands area (*misnamed Burrow's Marsh on the Senergy maps following the mistake made in naming the Burrow's Marsh Bore Hole*). However, that seismic line skirts the smaller Arm Hill Basin and thus does not reveal whether the two basins occur because of faulting. Thus PWG continues to maintain that an E-W fracture zone is a distinct possibility. Its existence would affect the safety of caverns 12, 13 and 14.

4 The thickness of the halite bed underlying Barnaby's Sands to the west of the Burrow's Marsh (sic) Bore Hole.

PWG drew the attention of the IPC Panel to the unusual thickness of the halite bed immediately west of the East Barnaby's Sands Fault in the centre of the southern polygon.

The Burrow's Marsh (sic) Bore Hole was drilled vertically to a depth of 119m then deviated south westwards beneath the salt marsh at an angle of 28 degrees through halite beds dipping westwards at an angle of 14 degrees. The top of the salt was encountered at a depth of 371m, the bottom at 754m, giving a true vertical thickness of 320m. The Senergy Model too uses this data.

However, PWG has questioned the borehole data and suggested the possibility of the bore hole passing across the N-S East Barnaby's Sands Fault which has a down throw to the west and so leading to an over calculation of the thickness of the salt bed immediately west of the fault.

PWG believes that the true thickness of the salt bed at this location is 220m which is arrived at because the top of the salt lies at 534m. The Top Salt map of Senergy shows the depth to be

c385m whereas the bore hole evidence shows the depth to be 434m. The use of the recalculated Top Salt for the location of the base of the Burrow's Marsh Bore Hole would create a model of the Top Salt which reflects the pattern revealed by the Base Salt Model.

It would have been hoped that one of the E-W seismic lines would have crossed the southern basin where the salt is at its thickest and revealed the true thickness of the salt immediately west of the Fault.

As the Senergy Assessment points out, "a 550m 'gap' exists" between HEG 01 and 02. At the midpoint of this 'gap' is the 'Burrow's Marsh' trench. PWG considers that at a number of cavern locations on the eastern side of the southern polygon, the thickness of the halite has been overestimated by an amount of up to 100m.

5 The N-S Fault (Western Heads Fault) and its impact on the suitability of the southern polygon to store gas safely.

There is a major fault with a downthrow of c143 m to the east which runs N-S across the western end of the Heads Peninsula and which PWG contends extends northwards under Barnaby's Sands and would prevent the construction of caverns in the southern polygon. This is explained in the PWG draft document on Geology (7th April 2012).

Halite dismissed the occurrence of such an extension by reference to the fact that it is not picked out in seismic line GC 81-336. That line was shown as not fit for purpose and it is noted that it was not included in the evidence used by Senergy to construct its model.

The fault can be identified in the Senergy salt thickness map which shows a very dramatic change in salt thickness in the south western part of the southern polygon. As the base salt map shows, this change is a consequence of the change in depth of the base salt. This is exactly what is revealed in the bore holes to the south on the Heads.

The halite bed at the Hay Nook Bore Hole lies at a depth of 304m to 557m, giving a thickness of 273m. This bore hole was drilled in the same field as Brine Well 130. Whilst the top of the salt lies at approximately the same depth in the two bore holes, the base of the salt shows a difference of 143m.

That this N-S fault extends across the whole of the southern polygon is demonstrated in lines HEG 13-02 (Figure 3.4 Senergy Assessment) and HEG 13-03 (Figure 3.5).

The existence of this fault compromises the safety of caverns 14-19 because these caverns would be sited on or near to a major fault line. This reduces the volume of working gas able to be stored in these caverns (using the Senergy calculations) by 99.2 mcm.

The possibility that caverns 12 and 13 are also compromised reduces the working gas storage capacity by a further 16.5 mcm.

Summary

PWG accepts in broad terms the volumetric calculations of the Senergy Assessment which suggests a total working gas volume of 202.8 mcm.

PWG questions whether the figure of 8% used by Senergy (Senergy Assessment p33) for the insoluble content of the salt beds and interbedded mudstone is not set too low. The GSR from Halite considers this to be between 5 and 21% (GSR 4.3.1. p34).

Moreover, the extension of the N-S Western Heads Fault across the southern polygon compromises the safety of caverns 14-19, by using Professor Rokahr's rule of 3 maximum cavern radii, which was accepted and used by Halite in its application (GSR 5.4.4 p52). That reduces the working gas total to 103.6 mcm.

With the possibility of caverns 12 and 13 being compromised by an E-W fracture zone it leaves just 87.1 mcm of working gas which it would be possible to store.

This means that it is possible to store less than one third of the minimum amount of working gas which Halite was required to demonstrate could be stored.

Halite has failed to do this and so the application must be refused on the grounds set out by the IPC Panel.