Dear Mr Hudson

Following my representation on 8 February 2012 I have attached further details in respect of this submission.

Referring to Mr Greenwood's contribution to my submission set out in his letter to Tom Carpen dated 9 May 2012, he has carried out research to establish the date the ICI pipes fractured at Preesall about 30 years ago. Knowing this date the magnitude of the earthquake which probably caused the breakage can be determined.

A former manager recalls plant records being sent to the ICI Head Office when the Hillhouse and Burn Hall sites closed. However, as the company no longer exists the records may have been destroyed. Also, the incident was so long ago that those involved cannot recall the exact date when the plants due to the breakage closed.

In an attempt to trace this date Mr Greenwood obtained earthquake data for several years from the British Geological Survey as a basis for searching the local press archives but it does not appear to have been reported. When these pipes broke the fire service were called to a hotel in Blackpool when the same earthquake caused a glass dome to collapse. Again to find the date involves trawling through a vast number of records and the fire service cannot justify the expenditure.

There does appear to be a correlation between earthquakes and these incidents at the brine field, which Roger Musson of the British Geological Survey suspects had their origin in a brine cavern collapse.

I have attached a copy of Roger Musson's email and set out my opinion based on the above representation.

Yours faithfully

Mark Hamer

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In some countries the gas storage market is arranged to be a very profitable operation for speculators. Given that this situation exists in the UK, it is unrealistic to assume that all local support and funding from USA are based on the goal of securing gas supplies for the UK.

Canatxx Gas Storage Ltd made several unsuccessful Planning Applications for a gas storage facility. In addition to changing its name to Halite Energy Group the company has a new board of directors. Halite Energy's Company Secretary was formerly the Chief Executive of Wyre Borough Councill until 2003 when he joined Canatxx. The current application is to form a smaller volume of new caverns for gas storage.

Each of the redundant Imperial Chemical Industries (ICI) caverns at Preesall is mostly filled with brine; some are as large as a football pitch and one and half times the height of Blackpool Tower. Because the brine is of lower density than the surrounding halite there is a net compression force of 300 to 600 tonnes per square metre acting on the cavern walls. Over time this force is sufficient to cause a slow distortion of the halite (creep) which reduces the dimensions of the caverns and increases the brine pressure.

The collapse of the Preesall salt workings were regularly monitored when they were under the control of ICI. Any excess brine pressure was slowly discharged; in some cases discharges had to be carried out every two weeks whilst other caverns took longer for pressure to build up. A variation in the creep rate within a single site is quite normal.

Subsidence of the ground eventually fills the voids formed around the caverns as they contract in size. There are indications that this process is accelerated by earthquakes which cause damage to the caverns and their infrastructure. This will apply to the proposed caverns with subsidence continuing for a thousand years or more.

In the late 1970’s three large cast iron pipes carrying brine and fresh water to the Imperial Chemical Industries (ICI) plant shattered at the time of an earthquake. The plant was closed for several days whilst the pipes were repaired. When questioned on this at a public consultation the Halite Energy Group representatives had no knowledge of the incident.

Roger Musson of British Geological Survey advised that a magnitude 6 would generally be needed to fracture underground pipes. As there have been no such earthquakes during this period he took the view that subsidence could explain the breakages. This would be consistent with the opinion that cavern contraction eventually results in ground subsidence. It seems that earthquakes can trigger a dynamic form of subsidence where the sudden movement causes extensive damage.

In 2011 three weeks after two minor earthquake cavern No 45 began discharging large quantities of brine. Because the halite is unstable, the earthquake could have induced subsidence and cavern contraction which in turn increased the brine pressure. An extensive area and volume of ground above the caverns was contaminated when the brine was forced out through the weak point in the pipe work.
The large ICI pipes which fractured and cavern number 45 which discharged brine appear to have been caused by small earthquakes of about 2 on the Richter scale. A larger earthquake is likely to have a more damaging effect on the salt caverns.

There is always a risk of movement damaging a cavern but at Preesall this is compounded by the relatively shallow depth and the high number of faults in the halite. The Halite Energy Group anticipates a second phase of caverns. The depth to the top of the halite beds in this area of interest at Preesall range from a minimum of 280m to just over 400m. With a roof salt of up to 50m, this puts the top of any proposed caverns at between 320m and 450m depth. They would be amongst the shallowest in the UK and indeed, elsewhere in the world.

There is an argument that the same earthquake consideration should be given to storing a volatile gas in caverns close to residential areas, as that applied to a nuclear plant.

In designing nuclear plants a 1 in 10,000 year earthquake is taken into account. In the UK this is assumed to be in the order of 6.5 to 7 on the Richter scale. In March 1843 an earthquake of magnitude 5 occurred with its epicenter about 40 kilometers from Preesall which caused damage around the area. An earthquake at Preesall of about 7 would have serious consequences for the existing and the proposed gas storage caverns.

If the gas storage proposal goes ahead there will be over 150 caverns in the Preesall halite. It is assumed that the existing faults in the halite will not be reactivated by an earthquake. However, with so many caverns weakening the salt bed and the creep that is taking place; a large earthquake could precipitate catastrophic failures of the caverns.

Such an event could affect the stability of the proposed gas storage caverns. A route for gas to escape to atmosphere could be formed around the pipe work to the cavern. If this aperture is large enough, the escaping gas would self ignite and create a death trap for anyone within 250 metres of the flame. At the same time faults and fissures could open up and make a passage for gas to escape to the nearby sewage treatment works on Jameson Road. From here gas could migrate through the sewage tunnels leading to explosions west of the River Wyre as far away as Blackpool.

After the ICI brine workings closed, thorough monitoring of the caverns ceased. However, following the incident at Cavern No 45 the Halite Energy Group claim they are now carrying out checks throughout the site which together with added security is costing £200,000 per year. When all the natural gas has been consumed or the caverns reach the end of their working lives, this expenditure will have to continue for a thousand years or more.

An alternative would be for adequate guarantees and financial resources to be put in place to make all the redundant caverns safe by decommissioning. The eventual collapse of these caverns cannot be prevented unless they are decommissioned by filling with a material of similar density to halite.

Halite Energy Group has now come to the conclusion that the earlier proposals submitted by Canatxx were high risk. Given the instability of the ground, the incidents which have occurred, the reduced safety standards and the seismic data omissions; it is very questionable if the current application can be judged to be safe.
In the salt mining industry the practice is not to form caverns within 100 metres of a known fault. Halite Energy Group plan to form caverns at a distance of one and a half diameters from their centre to a known fault. The proposed caverns of less than 100 metres diameter will not comply with the accepted safety standard.

The Halite Energy Group intends to carry out more seismic survey work when Planning Permission is granted. When this data is available the size and number of caverns shown in the Planning Application may not be achievable. A reduced storage capacity could prompt Halite to apply for a relaxation of the safety standards to make the project viable. It should be made clear at the outset that this will not be an option.

Decommissioning the caverns by filling them with material such as sand would not be commercially sensible if the cost can only be offset against the increased value of the land. To make this ground safe for general use an alternative method of funding would be needed.

A Fleetwood Tidal Power Plant could provide the solution. The generating capacity of the plant could be increased by pumping dredged material from the river into the redundant salt caverns. The decommissioning cost would then be offset against the increased value of the land and additional sales of electricity.

The Plant could be the forerunner to advance tidal range technology. However, if approval is given for gas storage at Preesall the potential risk of gas leaks from the caverns could cause a planning application for a tidal power plant to fail.

In the UK we generate almost twice as much of our electricity from natural gas as France and Germany combined. Generating power from tidal range would reduce our dependence on natural gas and as a consequence the need for gas storage.

Gas storage at Preesall could be a very a high risk venture affecting the safety of a hundred thousand people or more. The Project could inhibit the development of renewable power generation on the River Wyre. Subsequent tidal range projects could produce half the electricity used in the northwest from the east side of the Irish Sea. The economic advantages of tidal range power for the construction, manufacturing and leisure industries could be lost if the gas storage project is approved.

Mark Hamer

Date 21 May 2012
Dear Mr Greenwood

I have been doing some detective work. The Appendix F is not in a BGS document, and is apparently confidential, but I can confirm that it does not contain anything that is remotely connected to the matter in hand.

The only quake < 3 recorded in the area in the 1970s up to the end of 1980 was a magnitude 2.5 on 4 Oct 1970 - epicentre offshore, but probably not too accurately recorded.

I have also checked the paper archives in case any event was reported as felt but not recorded (there not being any close-by instruments). An earthquake strong enough to cause damage would have been felt by thousands in the area, and I think it is inconceivable that we would have no record of it.

I strongly suspect that the ultimate origin of these reports is a brine cavern collapse.

Locating the 1843 earthquake is not straightforward, as this has to be done from felt reports, which are necessarily from onshore settlements. Given the extent to which it was felt on the Isle of Man and in Ulster, I think that the epicentre was probably in Morecambe Bay, about 50 km west of Blackpool.

About the mapping of faults, I cannot advise.

Best regards

Roger Musson