Tuesday 12th November 2019

Dear Resident,

We have reviewed the objections made by residents and non-residents of Balcombe to the proposed works at the Lower Stumble site and in addition we have taken to heart the more detailed questions by your Parish Council in our Community Liaison Group meetings.

The bulk of the objections concern potential pollution of air, ground and water, increased traffic and continuously elevated noise. We have addressed each of these and more in the attached paper which is also on our website together with "links" to a great mass of technical data and literature.

I wanted to draw immediate attention to some misconceptions.

1. Angus has encountered **no evidence of "heavy metals"** or other extreme pollutants in either the oil, the formation water or the drilling fluids which we are recovering other than trace levels encountered in surface soil everywhere. We will not be introducing any ourselves.

2. At Balcombe at least, There is no evidence to suggest **background radiation levels** could be naturally higher in the Kimmeridge**,** indeed downhole measurements suggest the Kimmeridge limestone that we will be producing from has very low background radiation. It should be no different from levels in the water table or on the surface.

3. Total **nitrous oxide (NOx) emissions –** the result of combusting any fuel in air as with your motor car or boiler or our flare and generator - have been carefully modelled, on an hourly basis, by environmental consultancy, RSK, and found, on a worst case basis, to be within acceptable guidelines even at the closest residential property some distance from the village.

4. Not to be confused with these emissions, the injection of **Nitrogen (N2)** (for "lifting" the oil) does not involve any significant chemical reactions and any Nitrogen escaping to atmosphere is irrelevant as 77% of the air around you is just that – Nitrogen.

5. **The sound levels** from the site are predicted to be, when measured from the nearest possible residential dwelling, around 43 dB. That's less than the noise emitted by a modern fridge and we may, after site tests with members of the Parish Council, use sound baffling to lower that further.

6. We have not found any public record of pollution of **the water table** resulting from oil moving between layers underground in the last 25 years in the onshore UK. The reasons for this are many and varied but, in the main, there is a great distance between the reservoir and any potable water layers. The cap rock under which oil accumulates is of necessity impermeable, and well casings cemented throughout are designed precisely to avoid this eventuality. On decommissioning special attention is given to this matter and the reservoir is generally depressurized by virtue of extraction of oil so water from other intervals would tend to migrate into the oil reservoir not the other way around.

7. Neither our nor any other Weald operations presently involve **"fracking or "acid fracking"**. We do not intend to in the future. Studies conducted by the Oil and Gas Authority have found no causal connection between local seismic activity and any of the conventional hydrocarbon operations going on in the Weald today. We are not aware of any recorded **earthquakes** in the Weald over the last few hundred years having been of sufficient strength to threaten the integrity of the steel well casings that are cemented into the rock. Nor have there been any such casing breaches to our knowledge. We do check well integrity regularly and have been monitoring the ground water since 2014 using a dedicated borehole.

8. Whilst the initial works involve putting some heavy equipment on and off site (no more equipment than last time and possibly less), we genuinely anticipate that the ongoing works should involve no more than two or three tankers coming to and from the site once a day ("6 two way movements") although **our traffic management plan** shows 11.5 ("23 two way") tankers as a worst case. Given these tankers are designed to handle combustible materials and will move relatively slowly through the village it is almost impossible to conceive of an accident which could result in a spillage of oil or saline water.

9. Routines for fire management and fire safety have been honed over the last century as has planning for the prevention of spills or egress of any fluids, other than rainwater, from the site. These involve a series of drains, culverts and interceptor tanks which your Parish Council will have opportunity to inspect. Angus always maintains up to £15 million insurance from an A rated insurer against catastrophic failure and liaises closely with emergency services from the outset of operations.

10. Angus also has a published approach to abandonment and restoration provisioning for the end of life which involves either full cash reserving upfront or over the life of a field.

The onshore UK oil industry is an old industry and has developed routines, sophisticated monitoring by Environment Agency and Health & Safety Executive and, generally speaking, an outstanding safety record. Without becoming too involved in a political debate, as a company, we do approach our work with an ethical outlook and pride in our professionalism and what we do. We do employ British personnel and contribute to the maintenance of an ecosystem of highly skilled contractors, engineers and designers.

It is true that a growing proportion of our oil is used as jet fuel, as opposed to petrol or diesel for cars, as there is no other way, for the foreseeable future, to make jumbo jets fly. However the oil is also used as a feedstock for the petrochemical industry to make fabrics, heart pumps, syringes, chairs, toys, lipsticks, kitchenware and a great variety of medical and control instrumentation which will still be needed long after the 'plane, and the culture of ski and beach holidays abroad, has gone. For so long as there is demand for any of these goods or services, stopping UK production will only export pollution to other countries often with abysmal environmental standards and appalling safety records.

Whilst WSCC consider our application and subsequently, if approved, we undertake to continue to work with your Parish Council to maintain good communication, organise site visits and answer questions wherever and whenever possible. We won't be the neighbour you want but we can be a good neighbour nonetheless.

With kind regards,

George Lucan
Managing Director, Angus Energy plc

QUESTIONS ON THE SCOPE OF OPERATIONS

1. **What are you planning to do at the Balcombe Site?**

Angus Energy are looking to go back to the Balcombe site in order to ascertain whether the Balcombe 2Z well can flow hydrocarbons at a commercial rate over a commercial time scale. This involves flowing the well and collecting extensive data over a period of time in order to assess the potential of the well to be a long-term producer. During this testing phase we will alternate periods of flowing the well, and then shutting the well in. This way we can measure how the pressure in the reservoir recovers, and what potential volume of oil in the ground that the well is 'connected' to. The operation will happen in two stages and is proposed to last 2-3 years in order to collect sufficient data. The submitted planning application can be found here:

https://westsussex.planning-register.co.uk/Document/Download?module=PLA&recordNumber=1635&planId=36421&imageId=3&isPlan=False&fileName=Planning%20Statement.pdf

2. **We are told there are two stages. What are they?**

There is no drilling to be done in either stage. The first stage simply involves pumping out what we believe to be drilling fluids left behind in the borehole and formation from earlier drilling work in 2013. If the well begins to flow after this stage – expected to take only 2-3 days for the pumping but 2-3 weeks for the whole operation – we will lay down the necessary additional equipment for the second stage of well testing.

3. **Was this the formation water you encountered when you tested the well in Autumn 2018?**

No, the water we encountered in the testing of the well in Autumn 2018 was not formation water. The water recovered to surface was in fact drilling fluids that were used when the well was drilled in 2013 and brine and treatments used to wash the formation. When a well is drilled, fluids are circulated around the hole during drilling to ensure that the hole does not collapse in on itself. It is very common for some of these drilling fluids to be lost to the surrounding rocks as the well is drilled. In the case of Balcombe 2Z the drilling fluid used was essentially salty water, and it was this salty water that was recovered to surface during the previous test.

We know that this was not formation water (natural water residing in the rocks) due to the salinity matching exactly that of the drilling fluid used in 2013. Therefore, we have seen no formation water in the well.

4. What exactly is a 'Well Test'? And isn't it just production under another name?

A well test is an operation on a hydrocarbon well to ascertain whether the well can in the first instance flow at a commercial rate, and in the second instance whether the well can maintain this rate over a commercial period of time. In order to do this the well needs to be flowed at different rates and over different lengths of time to see whether it will be economically viable.

It is true that during a testing period there will be oil produced to surface, however the site is a 'PEDL' (Petroleum Exploration and Development Licence') as defined by the OGA and the field is not licensed for long term production. The OGA will give permission for the well to be tested for a certain period of time, and if the test is successful only then can the well and field be put into production. This would require a full Field Development Plan and further licensing from our regulatory bodies.

5. Why do you need to test the well for so long? Can't you just see how many barrels the well will flow and then decide whether it is commercial or not?

In a well test it is crucial to collect enough data to be able to forecast the flow rates of the well. The only way to gather enough information to do this is to carry out a test over a long period of time. This is even more crucial in this case due to the fractured limestones at Balcombe in which the well is drilled. For example, we will flow the well for a certain period of time and measure the oil flow rates as well as collect pressure data. However, when we shut the well in, we will then measure how long the pressure takes to recover in the well which indicates the rate at which fluid is flowing back into the fractures that have been emptied by the flowing period. Collecting this information takes a long time in order to then be able to come to a decision at the end of the test as to whether the well is commercial.

With well understood conventional reservoirs the test period is generally of the order of 90 days. However, whilst we are drilling in a conventional manner, we are dealing with an unconventional and largely unaddressed reservoir – the Kimmeridge clay formation – and in the only other successful operation in the Kimmeridge, at Horse Hill, the Operator has also sought and obtained an extended period of time to collate data.

6. Will you be using acid in the operation? And isn't this just fracking under another name?

We hope that we will not need to use acid to help the well to flow: however it is a contingency option if required. Acid washing is carried out in almost every water well as well as oil wells in carbonate reservoirs and is a very common technique. An acid wash simply involves 'washing' the reservoir rock with the acid to remove any near-well debris that may have built up, and to clean out the fractures. The acid is not put under any pressure and once reacted the spent acid is pumped back to surface and disposed of safely. Once the well is flowing normally acid will not be used on site.

This process is entirely different to an acid frack. An acid frack involves pumping the acid down to the reservoir *under pressure* in order to squeeze it in to the fractures and create new fractures. It is this use of high pressures which concerns campaigners against fracking as there is perceived risk of consequent seismic activity. Angus will not be doing this.

QUESTIONS ON TRAFFIC

7. Is there going to be an increase in traffic during the operation?

There will be an increase in HGV movements during the operation, however this is only likely to be noticeable during the 'set up' phase of stage 1 and stage 2. The link below is to the Traffic & Transport Technical Note, and the table on page 4 outlines the potential HGV movements. As a rule of thumb, during the flow periods, should we achieve 300 barrels a day of dry oil this would equate to two or three tankers going once (described as 4 or 6 two-way trips) to and from the site each day – manifestly less than the estimates for flow periods in the Technical Note.

The numbers in the table give the very Worst-Case Scenario for movements based on the previous Autumn 2018 work and will not be as high as these figures. The trucks will follow a specific council approved route, and there will, as requested by the Parish Council, be additional signage and a banksman to guide deliveries into the site as they arrive. Further to this, in order to avoid any unnecessary traffic and disruption all deliveries will be held approximately half an hour away from the site and called to carry out their delivery by the banksman when appropriate.

In reading the numbers, it is important to clarify that the *daily* estimated average is the *expected* number of movements per day based on previous operations. The estimated *total* number of movements for each phase includes a contingency number and therefore appears higher than the average multiplied by the number of days in each phase. Again, all numbers are worst case scenario.

https://westsussex.planning-register.co.uk/Document/Download?module=PLA&recordNumber=1635&planId=36428&imageId=10&isPlan=False&fileName=Traffic%20%26%20Transport%20Technical%20Note.pdf

8. Exactly what classification of vehicle (FHWA) are your oil/chemical tankers and the large ones that take all the pieces of big equipment?

Principally we will be using fluid tankers from a local contractor that Angus Energy and many other local companies (oil companies and otherwise) use regularly. All tankers from this company are made of **316** stainless steel (a strong chromium-nickel steel designed specifically to be highly corrosion resistant) and can hold 34,000 litres of crude oil (~213 barrels). The vehicles are fully ADR so can carry hazardous liquids, and are safety inspected every 8 weeks by an independent advisor. Furthermore, the trucks are MOT'd and ADR'd annually, tank tested every 3 years and hydraulically pressure tested every 6 years. Contractors bringing large pieces of equipment to the site will arrange their own haulage carriers which will be appropriately safety compliant as required.

9. **What is the risk of accidents during transportation?**

All tankers that carry fluids from the site will be ADR certified fluid tankers such as in the images below and overleaf. This certification system is an international one (the ***A****ccord européen relatif au transport international des marchandises* ***D****angereuses par* ***R****oute)* and has been developed over 70 years to ensure the safe carriage of various types of hazardous or combustible materials.

The tankers are designed to survive routine traffic accidents – perhaps not motorway collisions but certainly anything they are likely to encounter moving at 10-20 mph through Balcombe. Remember too that the tankers are not carrying hydrogen sulfide, heavy metals or irradiated material. With the exception of at most one tanker carrying away spent acid from initial works, the tankers will be carrying crude oil or saline water and nothing else.

The ordinary garage petrol supply tankers are a more serious hazard as petrol is much more combustible than crude oil.

QUESTIONS ON POLLUTION OF WATER AND SOIL

10. Will your operations effect my drinking water and cause contamination of the water courses?

There will be no effect to any drinking water due to the operations we will be carrying out. The original Balcombe well, Balcombe 1, has been fully abandoned and sealed downhole to ensure no movement of fluids from one zone to another.

The new well, Balcombe 2Z, has been lined in steel which has been cemented, with several hundred metres of cement, into the rock. The quality of that seal has been verified by downhole logging tools and is tested regularly. All potential potable water aquifers are several hundreds of metres above the reservoir, which itself is sealed by many layers of impermeable rock.

There is therefore no realistic possibility of fluid movements between aquifers and the oil reservoir. Indeed, we are unaware of any onshore UK incident which has involved oil seeping into the water table as a consequence of hydrocarbon operations. Finally Balcombe is rare in having a unique dedicated borehole to test the water table. Using that we also carry out groundwater monitoring on the site during both operational and non-operational times to ensure the quality of water is maintained.

11. How do you handle on-site spillages?

Any spillage at the site is carefully insulated from the local environment by a system of bunds, linings, culverts, drains and interceptor tanks.

12. What size is the bunded area and will a secondary membrane (protecting the soil) be installed across the site?

The bunded area will be sized appropriately to meet the latest CIRIA guidelines once the exact size and volume of fluid storage is confirmed. The bund design and construction will be inspected by the Environment Agency and comply with all permit conditions. Should the long-term nature of the test require a secondary membrane by the Agency then this can be installed.

13. If the site is to run for 3 years would a production quality bunded area (concrete apron) be more suitable rather than the sleeper arrangement intended for short term use?

A more permanent concrete bund will be built should the site move into long term production following a successful well test. This level of construction and long-term facility installation would require a commercially declared oil field and further regulatory permissions.

14. How do the oil interceptors work?

Whilst we do not wish to disclose every detail of the water and oil system on site, as advised by security consultants, we will invite the Parish Council to inspect the system designs during a site visit and, if approved by WSCC, the Parish Council will also have the opportunity to see it in operation.

15. What about the drilling fluids and heavy metals? What's in the ground?

The drilling fluids used when this section was drilled were water mixed with potassium chloride. The latter is a non-hazardous chemical and is the main ingredient in low salt dietary condiments. We have not encountered, injected or recovered any heavy metals.

16. What sort of other toxic waste could come out from the site?

The waste from the site will principally include wastewater from well clean-up operations. This is generally brine and other completion fluids that is taken away by tankers to approved disposal facilities. There could be one tanker load of spent hydrochloric acid from initial works but none subsequently. There will be no heavy metals or other toxic waste needing to be removed. Produced oil will be tankered away. A large bunded area, approved by the EA, will be constructed on the site in which the main storage tanks will sit.

QUESTIONS ON POLLUTION OF AIR

17. What about sources of air pollution such as NOx?

There is a flare and a generator both of which, like ordinary cars and boilers, produce NOx. The flare is dealt with in a separate question below. To operate the pump and maintain security lights we will have a generator. Using a study by Kings College, a diesel generator rated at 60kVA operating at maximum rated capacity for 24 hours will produce 3.3 g NOx/kwhr or 4,752 grams NOx in the course of that day.

http://www.clec.uk/sites/default/files/Generator%20Fuel%20Analysis%20Final%20Report.pdf

This is approximately equal to the emissions of two and a half idling diesel truck engines according to peer reviewed papers in the Journal of the Air & Waste Management Association.

See https://www.tandfonline.com/doi/pdf/10.3155/1047-3289.59.3.354.

18. What will you be doing with any gas? Doesn't flaring also cause significant NOx pollution?

During the flowing periods of the well we are expecting some associated gas to be produced with the oil, and this will be flared using the Environment Agency approved flare. This is the safest way to deal with gas produced at this testing stage. If the test is successful, then a long-term solution to utilise the gas will be implemented if the field moves to production following regulatory permissions.

"Associated gas" is gas, overwhelmingly methane, which is dissolved in the oil while it is in the reservoir due to being under pressure. As the oil is produced up the wellbore, as the pressure drops so the gas exsolves out of solution. At Balcombe there is no gas cap expected which is sometimes found on top of a conventional oil reservoir.

19. What is the overall impact of these NOx sources on Air Quality?

These are given by the Air Quality Report submitted to WSCC and which can be found here.

https://westsussex.planning-register.co.uk/Document/Download?module=PLA&recordNumber=1635&planId=36429&imageId=11&isPlan=False&fileName=Air%20Quality%20Assessment.pdf

The conclusion of the consultants was that the impact on the nearest residential property was negligible.

20. Can monitors be placed on the flare and the generator?

This is not practicable due to the great heat produced from the flare. Instead air quality monitors are placed around the site during operations. It is by extrapolation from known and rated output of flares and generators in controlled conditions that the air quality consultants model the dispersion of the pollution in air and wind. The sensors placed around the site will, assuming the works proceed, give

a reasonable reference point to the air quality further away during the course of operations and we undertake to make this data available to the Parish Council.

21. The Air Quality report states that the hourly mean NO2 concentration will be 4 times background in certain conditions. How can this be negligible?

Four times background level is still 18% of the Air Quality Standard objective and, quoting the consultants, the pollution at Kemps Farm "is 18% of the relevant AQS objective which would be classed as a 'moderate adverse' magnitude of change using the EPUK-IAQM criteria. However the 99.79th percentile results assume the plant (flare and two generators) are operational for an entire year as a worst-case scenarios, when in reality the flare will only operate when the well is flowing and only one generator is expected to be operational at any one time. Taking the conservative nature of the assessment into account and the total predicted concentrations which are well below the relevant objective, the impact on 1 hour mean NO2 concentrations is considered to be of negligible significance."

This assessment reflects the fact that, in practice, for significant periods of time, extending to several weeks at a time, the well will be shut in with no flaring and the generator set on low power mode supplying only security lights and welfare systems.

22. The application includes the possible use of nitrogen (N2) to help the well to flow if it does not in the first instance, is this normal?

Using Nitrogen, N2, to help 'lift' the well is a common practice and is a contingency option should the well not flow immediately. This is not to be confused with NOx which are compounds of nitrogen formed by combusting any fuel in air which is mostly nitrogen. N2 is used precisely because, like the nitrogen which forms 78% of the air we breathe, it is relatively inert at temperature ranges associated with life and its uses here, and so the molecule does not form nasty compounds.

23. What about Hydrogen Sulphide? We heard that this was encountered at Brockham.

We have few detailed reports on the presence of hydrogen sulphide at Brockham other than that it was produced in very small quantities by the action of bacteria in pipework and tanks under a previous Operator. This gas above a certain quantity is immediately fatal to employees and contractors and great care is taken to use sensors and alarms which will detect even the smallest of quantities. Hydrogen sulphide is produced in any dangerous quantity only from so called "sour gas" reservoirs but the Portland and Kimmeridge layers are known to contain only small amounts of dissolved "sweet gas" so this is neither a concern for us nor for you.

24. **The odour management plan appears to be just about managing leaks and breaking containment what about managing releases of gases from the tank vent? Why is there no tank vapour recovery system? Can you please provide a copy of the written plan submitted to the EA for vapour recovery under pre-operational condition PO5 of the 2018 permit?**

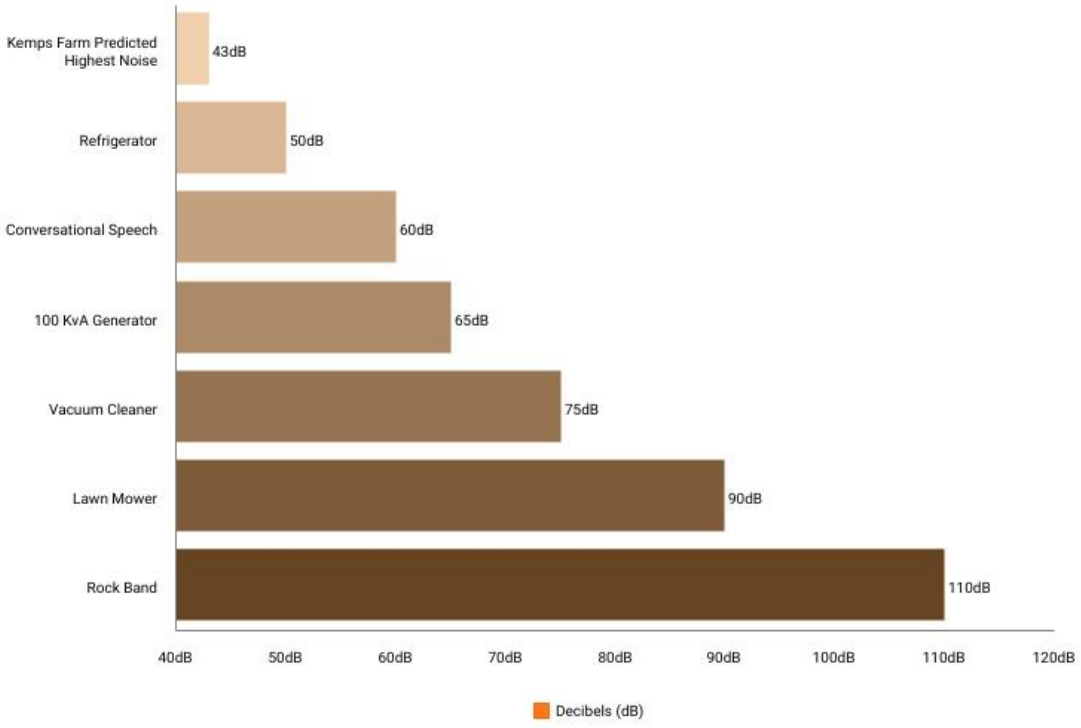
There will be a vapour recovery system during operations as per PO 05 in the EA 2018 permit. The Compliance Assessment Report issued by the EA confirms that they are happy with the PO 05 Vapour Recovery Plan, and that venting from the tanks themselves is purely a safety measure in order to prevent any over pressurisation of the system. In any case, by this stage the gas from the tanks is negligible given that fluids from the well have passed through a highly efficient 3-phase separator, and then diverted to the flare.

25. **When will you provide the data collected from the Autumn 2018 well test on noise, water and air quality?**

We have provided planning discharge documents from the Autumn 2018 well test which contain information on the baseline data collected and other planning information. Further reports collected during the test will be published shortly.

QUESTIONS ON NOISE POLLUTION

26. How noisy will your operations be?



Noise will be kept to a minimum during all operations, and an extensive third-party noise report has been compiled by RSK (see link below). This report models the potential noise at 5 of the closest properties to the site, the closest being Kemps Farm. The report predicts noise levels of only 43dB during operations at Kemps Farm, and a comparison of this value can be seen in the chart above. On site generators will be the loudest item of equipment at ~65 dB (at source) which is quieter than many standard household appliances. Nevertheless, Angus intends to install 'echo barriers' around the generators to keep even the low level of noise to a minimum.

Graph Sources:

Source: https://www.noisehelp.com/noise-level-chart.html

Source: https://www.matherandstuart.co.uk/temporary-power/generator-hire/100-kva-diesel-generator-hire

Source: https://westsussex.planning-register.co.uk/Document/Download?module=PLA&recordNumber=1635&planId=36427&imageId=9&isPlan=False&fileName=Noise%20Manangement%20Plan.pdf

QUESTIONS ON WILDLIFE

27. Will your operations have an impact on wildlife in the area?

We are highly conscious of our impact on the environment and take wildlife extremely seriously. In preparation of submitting our planning application we commissioned several third-party reports to analyse the impact on the nature around the site. This included Bat Activity and Ecology, as well as wider environmental reports on the Landscape, Air Quality and hydrology. These reports can be read at the following link under the 'Application Documents' tab:

https://westsussex.planning-register.co.uk/Planning/Display/WSCC/071/19

QUESTIONS ON EARTHQUAKES

28. Doesn't even conventional oil & gas activity cause earthquakes?

No. Following the Newdigate earthquake swarm there was a thorough investigation by the OGA and several academic institutions to ascertain the seismic risk of oil & gas activities. The conclusion was that there is no causal link between conventional hydrocarbon extraction and earthquakes in the Weald. An academic peer-reviewed paper and the conclusions of the OGA can be found at the links below.

https://www1.gly.bris.ac.uk/~gljpv/PDFS/Hicks_etal_2019_SRL.pdf

https://www.ogauthority.co.uk/media/5769/2018_11_23-newdigate-workshop-summary-finalv4.pdf

QUESTIONS ON TECHNICAL DETAIL

29. What is the separator operating pressure range?

MAWP 1440 psig

30. Why is the shut off valve closed on the outer separator during operation? It is a hydrocarbon separator so it can be left open?

Here we are reaching levels of detail where any answers we give will only give rise to further questions. We would be delighted to invite the curious to spend a day or two on site talking to the technicians.