

Comment on review by Professor Andrew Aplin (RC1)

Background and research interests of the reviewer

Andrew Aplin is Professor of Unconventional Petroleum, Director of CeREES in the Department of Earth Sciences, University of Durham. The ShaleUK 2016 Summit programme reads:

“Andy Aplin has a BSc in Environmental Science from the University of East Anglia and a PhD in Marine Geochemistry from Imperial College. He was a Royal Society European Research Fellow at CRPG in Nancy, before spending six years with BP. He was Professor of Petroleum Geoscience at Newcastle University until 2013, when he moved to Durham University to become Professor of Unconventional Hydrocarbons. Shales have been the focus of most of Andy’s research over the last 20 years.”

Professor Aplin's list of recent and current grants includes the following funding sources (collaborative partners omitted):

2012 - 2015; GeoPOP Phase 3	Industry
2010 - 2013; Caprocks Phase 3	Industry
2009 - 2012; GASH (Shale Gas Europe)	Industry
2008 - 2011; Shale Gas Canada	Industry
2008 - 2011; CASE Studentship	NERC and Shell
2007 - 2010; Quartz Cementation	EPSRC and BP
2006 - 2009; Caprocks: Phase 2	consortium of 6 Oil Majors
2005 - 2008; Ph.D. Studentship	NERC and BP
2005 - 2008; Treatment of extractive industry drainage	NERC
2006 - 2008; Caprocks: Phase 2	consortium of 6 Oil Majors
2004 - 2007; UK CCS Consortium	NERC
2002 - 2005; Caprocks: Phase 1	consortium of 8 Oil Majors

Main issues to which I have already responded

- The 'negative result' of finding that less than two dozen or so US shale wells are within 5 km of a through-penetrating fault; explanation – foreland basin; why it is difficult or impossible to publish the data underlying this result; those who question this finding need only find one counter-example to refute.
- Irrelevance of limited frack growth height to problem of through-going pre-existing faults

(why Hammack et al. not cited).

- Commitment to include and discuss Birdsell et al. more fully.
- Bradford County case history; detailed re-examination (in view of comments by Dr Engelder) with new data; strengthens case for direct link from fracked Marcellus to contaminated water wells *via* fault.
- Clarification of comments about image 'manipulation', showing that no such manipulation took place.
- Extended discussion about faulting at Preese Hall-1; evidence for faulting at Balcombe-2z.
- Clarification why UK regulatory failures should be discussed in an earth science forum such as SED; they cannot be discussed in a non-scientific journal due to their technical nature.
- Evidence for potable water below the MMG in the Fylde; EA failure to consider this possibility; EA (with BGS) failure to pin down location of the crucial Woodsfold Fault.

Professor Aplin's comment on the hydrogeology of the Fylde

I quote just one example from Professor Aplin's review:

“Section 3.2 concerns the hydrogeology of the region. However, it contains almost no hydrogeology (e.g. hydraulic head data, fluid flow measurements), just some rather random salinity data which alone are not relevant to discussions on regional fluid flow or the possibility for upwards fluid flow, which is a central issue in this paper.”

The “*rather random salinity data*” are in fact the crucial (because only) data, which come from the Kirkham well, and which were used by the EA to conclude, incorrectly, that there is no potential groundwater resource in the SSG below the Fylde. I would not refer to that as random.

The EA decision is highly relevant to the potential for harm to a groundwater source, and at the same time illustrates the technical failure of the EA in coming to its decision to issue permit approval to the developer. Professor Younger has tried to criticise my view (SC6), using erroneous analogies (e.g. that the SSG groundwater below the MMG in the Cheshire basin is saline). In my response to Professor Younger (AC8) I have provided more detail (which, admittedly, Professor Aplin would not have had the opportunity to review), and which should go into the revised paper.

Conclusion

I leave it to the reader to judge for him/herself whether my discussion paper should or should not be rejected, as Professor Aplin recommends, based on my already-made responses to the many points raised in what is undoubtedly a controversial topic.