

Notes of discussions between Patricia Thornley (Supergen Bioenergy Consortium) and Matt Georges (Environment Agency) relating to the EA's report "Minimizing Greenhouse Gas Emissions from Biomass Energy Generation"

Meeting at MRC, London, 28 July 2009

**Additional discussions and clarifications via e-mail and telephone conversations
June-September 2009**

Introductions

PT explained her main interest in the EA's recent report was that the work reported overlapped somewhat with work carried out in the Supergen bioenergy consortium, but some of the results and conclusions were conflicting. Having now looked in depth at the report and supporting calculations the main reasons for this appeared to be system assumptions in the report which were not representative of common practice in the UK.

MG explained that the EA has a statutory duty to act as an advisor to the government on issues concerning the environment and that its management is encouraging it to be more proactive in providing strategic guidance in areas such as this. The EA has a climate change team, which has traditionally focused on adaptation measures (including flooding etc.), but is increasingly interested in mitigation. As the EA regulates around 45% of the UK's greenhouse gas emissions and has an energy efficiency role within PPC, they are increasingly being asked to focus on mitigation of greenhouse gas emissions. The environmental impacts and trade-offs involved in reducing GHGs is a key issue from this perspective. Therefore, as well as this work on bioenergy systems, the EA has also recently been looking at: the carbon and energy payback periods of small hydro schemes; regulation of carbon capture and storage; the definition of 'capture ready'; regulation of open loop ground source heating and cooling systems; ways to streamline regulation of renewables whilst maintaining environmental protection; links between water treatment and use and GHG reductions, and the cap level for the Carbon Reduction Commitment, amongst others.

Issues for discussion

1. Reference data for comparison of fossil fuel systems with biomass systems

PT raised concerns over the scope and accuracy of the reference data used for fossil fuel systems in BEAT2. Judith Bates from AEA had provided a reference document for this, but it was based on 1993 figures and included, for example, a figure for the carbon intensity of grid electricity of 654 g/kWh, compared to more recent Defra recommended figures of 430 g/kWh. It is not clear to what extent and how the 1993 figures have been updated in the report.

MG later consulted with Judith Bates (JB) at AEA to clarify as follows: The 1993 fuel mix figures were updated to 2006 figures using data from DUKES. The figures were updated in two ways: first to take account of improvements in generating efficiencies in each class of generation (oil, coal etc) and second to

take account of the changed energy mix. The 654g/kWh figure is the one from the 1995 report (using 1993 data), the 2006 figure used in the report came out at 586 grammes of GHGs (not just CO₂) over the lifecycle. The 430g/kWh figure is the long term marginal factor for electricity generation, but the 2006 figure for average carbon intensity of the Grid was 562g/kWh, with a Grid rolling average of 537 g/kWh.

PT also considered it was doubtful whether carbon emissions related to other forms of renewables have been taken into account, which would seem sensible to get a sense of perspective on the issue i.e. the report shows bioenergy systems to have a noteworthy GHG emission factor – how does this compare to other renewable technologies? – if carbon abatement is to be quantified as part of the RO eligibility it should be for all technologies not just one, but it is unlikely that sufficient data exists to do this. MG responded that indications from the EA’s work on small-scale hydro is that most systems pay back the energy from their construction in a matter of months. He understands that research on large wind turbines has shown that a number of years – something like 7 – are required. Meanwhile, research on biofuel lifecycle emissions indicates that some fuel chains are not particularly good in GHG terms (to put it mildly). So, while the point is taken on this issue MG believes it is renewable fuels that need more investigation than construction emissions. Further, since there is a step change in investment in biomass facilities taking place and nobody had, until our report, published any detailed numbers on this issue the EA felt it reasonable to concentrate their limited resources on this particular area.

2. Transparency and ease of modification of assumptions in BEAT2 calculation tool

PT commented on how difficult it is to access and modify the BEAT2 assumptions compared to other equivalent models, such as the RTFO calculator, where inputs and references were instantly visible on screen. MG is working with a BEAT2 users group on issues such as this and would like to have a tool which is closer to the RTFO one.

3. Framework/boundaries for BEAT 2 compared to other tools/legislation

PT noted the differences in scope and boundaries of the BEAT2 tool compared to other (UK and European) frameworks. MG acknowledged this and pointed out that they were, to some extent, waiting on a European lead on this. However, the EA would be proactive in terms of steering the discussion towards a common scope.

4. Agronomic assumptions: how close are they to “real world” cases

The agronomic assumptions related to the default, best and worst cases in BEAT2 were discussed in detail. PT pointed out that there was no logic or rationale in putting all the worst case figures together and calling that a worst case – in fact this resulted in some inconsistencies that would be practically unbelievable. An

example is fertilizer-yield combinations: PT considered it unthinkable that any farmer would apply the very high fertilizer rates assumed and obtain such poor yields. MG subsequently clarified that AEA considered that on poor soils in dry conditions these high fertilizer rates could be justified, but it really is a worst case scenario, which is how it is labeled.

The agronomic assumptions had been reviewed in detail by Andrew Riche at Rothamstead Research (also part of the Supergen Bioenergy consortium) and PT will send details of Andrew's comments to MG. PT also pointed out that BEAT2 does not consider application of sewage sludge to land, which is common in energy crop agronomy in the UK. Work by the Supergen bioenergy consortium indicates that the GHG impact of this is very significant and worthy of consideration by the EA, particularly as they were probably in a good position to make LCA comparisons to other sewage disposal options.

5. LCA allocation procedures and their impact on results

Both parties agreed that some form of allocation procedure is necessary when dealing with co-products. PT pointed out that financial allocation (as used by BEAT2) produces a very volatile partitioning, so that the apparent carbon benefits of a particular system become dictated by price patterns in world commodity markets. From a scientific perspective this does not make sense and it would be difficult for developers and investors to plan coherently if their ROC eligibility was dependent on future cereal prices. It was difficult to see a way around this but it was agreed that there was a need to look at the sensitivity of BEAT2 to variations in market prices (particularly the influence of wheat prices on straw carbon savings).

6. Processing/logistic/transportation assumptions: relevance to "real world" cases (e.g. drying, losses, pelletisation etc.)

A detailed review of some of the assumptions highlighted concerns with regard to harvesting and transportation losses in the worst case scenarios. These are covered under the comments by Andrew Riche. MG subsequently responded that there are references available for the losses, they're just difficult to find in the tool. If you go to the unit flow chart on the excel spreadsheet for the particular fuel you are interested in you will see a letter at the top left of the box holding the percentage figure for losses. That takes you to the relevant reference. Admittedly some of these data are more robust than others but they do have a basis in the literature. Additionally the tool is being reviewed by a group which includes Nigel Mortimer and MG expects he will comment on these assumptions if appropriate.

7. Potential uncertainties attached to key calculation steps

PT highlighted the importance and difficulty in dealing with uncertainty in all these calculators. There are many areas where the error bands related to the scientific assumptions are significant (e.g. soil emissions, N₂O, land-use change). If generators are to be rewarded on the basis of carbon savings there should be some way of acknowledging the uncertainties in the calculations, but few tools

attempt this. MG responded that BEAT does give uncertainty ranges but these weren't used in the report. Given the ranges introduced by changing assumptions the EA felt that to add further uncertainty ranges would confuse the picture and make it difficult to get our message across in a report aimed at policy-makers. On reflection this perhaps could have been included, especially in the land use charts.

8. Methodology for comparison of CHP and non-CHP cases on an even basis

MG explained that there had been long discussions about how best to represent and assess the CHP cases and there did not seem to be a perfect solution. PT agreed and a discussion ensued on the merits of biomass CHP vs. heating vs. power generation. The importance of comparing to oil fired heating as well as natural gas was emphasized and PT is to send on results from some of the Supergen phase work on carbon reductions associated with power only and CHP systems.

9. Practicality of carrying out analysis for “real” systems/plants

PT questioned the practicality of using BEAT2 for real power stations, particularly for smaller developers. MG is working with a BEAT2 users group to address this.

10. Importance of incentivising modest near-term GHG reductions with biomass vs value of deeper cuts in the longer term

PT emphasized the urgency of obtaining greenhouse gas reductions and argued that getting some reduction in the near term was as valuable as getting deeper cuts in the longer term. Consequently it was important to encourage technologies that were available now and could deliver substantial cuts by providing a supportive, stable, long-term financial framework. MG responded that the facilities being built now would in all likelihood still be generating energy in 2050 when the UK's electricity (and to a large extent heating) systems would need to be almost completely decarbonised. There is a danger in locking in higher carbon technologies, but there is a corresponding danger of this thinking preventing decisive action now.

PT had previously sent MG a copy of the paper (Making bioelectricity economic in the UK), which she had presented on behalf of Supergen Bioenergy at the recent European biomass conference in Hamburg. It examined the impact of bioenergy banding in the RO and demonstrated how that improved the economic case for large, bioenergy power generation plants. The number of proposals for very large facilities using imported woodchips has partly given rise to the EA's concern over the actual GHG impact from these. Discussion then ensued on the relative merits of different types of bioenergy facilities and the importance of properly targeting policy mechanisms in this respect.

The EA is liaising with a number of NGO's (including EEB and Birdlife International) who are working on an event likely around 12 November in Brussels to attempt to influence MEP's in this area prior to the Commission's December report and legislative

discussions in 2010. If Supergen Bioenergy have appropriate data MG would like to receive it as part of the EA's preparation for this process.

Actions:

PT to forward AR's comments on agronomy and provide his contact details

PT to send paper on integrated assessment of bioelectricity - done

PT to send preliminary LCA results on agronomy/sewage/fertilizer application to MG

PT to send carbon reduction figures from Supergen 1 work on bioelectricity and CHP systems

MG to indicate to PT whether or not any additional information would be helpful to support the EA in their discussions.

MG to keep PT informed of progress with European groups in this area