Comments from Professor Jacqueline Rowarth, Waikato Management School, University of Waikato, Private Bag 3105, Hamilton 3240

Greetings
I appreciate the opportunity to comment on your report.
I have two major concerns.

One is the reliance on Saggar and Giltrap (2012 unpublished). I understand that it was a report to MPI, but effectively that make it all 'internal' review. One of the major concerns that is increasingly coming to the fore with OVERSEER is that it has no peer-reviewed papers attached to its name – just all updates at FLRC (with occasional explanations at NZGA and SIDE).

Response: International review: We have plans to submit a manuscript to an international peer review journal describing the approach and assumptions used in Saggar & Giltrap (2012) and in this current report. The following note has been added to at the end of Introduction section to address this concern:
*[*A manuscript describing the approach and assumption, and the proposed method of calculating nitrous oxide emissions from hill country grazed pastures is planned for submission in an international peer-reviewed Journal following the acceptance of this report by MPI].*

The second is the inclusion of deer with cattle. A weaner deer is maybe 70Kg (50 if it is Red) and a good ewe will be 65-70KG. A beef cow or steer will be nearer to half a tonne. A red deer hind will be 120-150 Kg. In addition, their intake is driven by photoperiod and is minimal during winter. Fawning is November December, in contrast to beef and sheep which are timed to drop young with spring grass growth. Another strand to the concern is that the form of deer faeces is more like sheep than cattle, and the quantity of urine is similarly more like sheep than cattle

Response: Deer with cattle: We have not included Deer with Cattle or Sheep. The amount of N excretion in sheep, deer and cattle varies significantly and is based on their feed intake (Table A1, Appendix 1). For example, in 2012 these values were 75.4, 29.62 and 16.19 kg N/head/y for cattle, deer and sheep. The N excretion rates estimated by the feed/energy intake model for 1990 to 2012 used in NZ national GHG inventory methodology takes into account the seasonal variations in feed intake for each animal type and were provided by MPI. For the use of EFs for deer, in the absence of emissions data for deer dung and urine we took a conservative approach and used higher EFs for beef rather than lower EFs for sheep.

Specific points:
Executive summary final sentence of paragraph one, why does sheep urine EF3 not change for slope though beef does?
Response: Sheep urine EF3 also changes with slope from 0.0055 at low slope to 0.0016 but there is no change in sheep dung EF3 (0.0011) with slope. These values have been calculated from the measured emissions data at low and medium slope categories.

P1, introduction 2nd para, 3rd sentence has two 'due to stock resting behaviour'.
Response: Agreed, corrected. Duplicate text 'stock resting behaviour' deleted.

3rd para 6th line statistical
Response: 'statistics' corrected to 'statistical'

4th para difficult to tell which studies involved actual data and which were models. Hoogendorn is particularly confusing as it looks like a review in the reference list, but says in the paragraph 'detected'

Response: Hoogendoorn et al. is not a review but actual measured data. This is clarified in the report.

P8, what is the reference for dung rolling down slopes? Sheep tend to track which slope is greater than approx. 23 degrees which stops rolling

Response: There is no reference but an observation made during the measurements at hill country. This has now been described in the report.

P14 I don't understand the rationale for using 2003 and 2004 data.

Response: The purpose for using 2003 and 2004 data was to determine the typical size of the discrepancy caused by using calendar year animal numbers with Jul–Jun based region and slope class distributions. In this case the calendar year 2004 was chosen as there was the largest difference in the % low slope land area between 2003 and 2004 and therefore likely to show the largest discrepancy

I do understand the sensitivity analysis but am not sure what the recommendation from it is.

Response: The discrepancy of 0.6% is likely to be small compared with other sources of error. In the case of the break points, these do not generally produce large effects in the total emissions or over the long term, but there is the potential to get the occasional anomalous result.