PEER REVIEW REPORT

HUMAN HEALTH RISK IMPACT REPORT
FOR NUCLEAR 1 ENVIRONMENTAL IMPACT ASSESSMENT

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CONTENTS

1 INTRODUCTION

Dr C A R Bain Pri. Sci. Nat. Consultant was appointed by Gibb (Pty) Ltd. To undertake a peer review of specialist report "Human Health Risk Impact Report October 2010" (referred to subsequently as the Report) compiled by INFOTOX (Pty) Ltd for the proposed Nuclear 1 Power Station project which covers the three sites situated at Thyspunt in Eastern Cape Province and Bantamsklip and Duynefontein in the Western Cape Province of South Africa. A complicating factor for the reviewer is the five year gap between the issued date of the Report and the current review. There may be terms of reference that the reviewer is unaware and certain criteria have changed.

2 SCOPE OF WORK

The scope of work as supplied by Gibb for this review study is the following:

1. Assess the document/ Report in terms of its fulfilment of its Terms of Reference set;
2. Consider whether the Report is entirely objective;
3. Consider whether the Report is technically, scientifically and professionally credible;
4. Consider whether the method and the study approach is defensible;
5. Identify whether there are any information gaps, omissions or errors;
6. Consider whether the recommendations presented are sensible and present the best options;
7. Consider whether there are alternative viewpoints around issues presented in the Report and if these are clearly stated;
8. Consider whether the style of the Report is written so as to make it accessible to non-specialists, technical jargon is explained and impacts are described using comparative analogies where necessary; and
9. Report on whether normal standards of professional practice and competence have been met.

3 REVIEW FINDINGS

3.1 Fulfilment of Terms of Reference

The terms of reference are derived from the Report's stated Purpose of Study and the Study Approach. The stated purpose is ambiguous in that it states "… assess potential radiological impacts … at the three candidate sites" while in fact the Report gives the how and what of a radiological impact assessment. No site specific data is given except for one Figure of air dispersion contours at Thyspunt. The study approach outlines methodologies, describes radiation effects on human health and discusses regulatory requirements. The primary health impacts of ionizing radiation on the human body is well presented together with all the different steps needed to derive a dose to the critical group. The regulatory aspects are addressed together with accident frequencies, various dose limits, exposure pathways and dose assessment. The Report has only partially fulfilled the expectation of site specific assessments but has fulfilled most of the methodology requirements. This should be read in context of this reviewers comment in the introduction above.

3.2 Report Objectivity

In broad terms the methodology is aligned with technical, dose assessment and regulatory requirements both locally and internationally and follow those norms objectively. The three sites are not evaluated or ranked at this stage so objectivity in this regard is irrelevant. The Report is considered to be wholly objective.

3.3 Technical, Scientific and Professional Credibility

The subject matter is of a high technical and scientific content together with regulatory requirements and is covered in a comprehensible well-structured manner. The Report is well supported with diagrams and tabulations. Extensive references are cited, but several date to early 1990's. Those relating to dose coefficients may be rather dated. The choice of tritium to illustrate air dispersion for radionuclide potential impacts is unfortunate since tritium needs explicit types of models to be used reliably. Overall professional credibility is shown.

3.4 Defensibility of Methodology and Study Approach

The purpose, approach and structure of the report is given. Methodologies are extensively discussed. Health effects are clearly linked to levels of exposure and regulatory dose limits. A brief description of sites is given with mention of air dispersion studies but land use is not described which may better define critical

groups. The methodology depends on a knowledge of the various regulatory requirements from government and National Nuclear Regulator which is outlined and linked to international criteria. Initiating events and accident frequencies lead on to discussion of dose limits and the ALARA principle and presentation of NNR dose criteria for the public. Deterministic and probabilistic assessment techniques are described. The additional steps for the dose compliance assessment include the source term of radionuclide discharges from the power plant and the potential pathways of exposure which are illustrated for main cases of air, water and sea. The dose assessment further needs use of various dose coefficients to relate radionuclide concentration in the food chain to internal and external human dose. All these factors go into the dose assessment process and illustrate the complexity involved. The overall process is defensible as it rests on international best practice. The details of actual implementation at each stage will be the crux to achieving the goal of assessing the actual radiological impact to members of the public.

3.5 Information Gaps, Omissions or Errors

Typographical: Generally small grammatical errors are not noted. The following few typographical, layout errors are noted.

P ix: in Glossary the item Initiating is misspelt and in the description “even initiators” to read “event initiators”.

Possible Gaps

The main missing element is the detail of the actual calculation of the dose values. Will some computational model, or spreadsheet based matrix be used? This is the crux of the dose calculation and any calculation methodology will be subject to NNR Verification and Validation control.

Very little is discussed about the marine discharge pathway. The diagram for pathways for sea discharge does not include sediment uptake where significant concentration for certain nuclides occurs and in turn allows bioaccumulation in filter feeders passing the dose to consumers. There is no site specific descriptions of land or marine use that could characterize critical group and hence dose profiles. Dose limits to the public from a nuclear facility are for the dose above natural background so knowledge of each sites natural background variation is needed for calculation. This site aspect is missing. The only site specific data that is obvious is wind data for air dispersion calculations, but extent of data is not mentioned. In general site data is sparse.

3.6 Sensibility of Recommendations and Presentation of Best Options

The main recommendation of the human health risk impact is that the approach described in the Report should be accepted. The basic methodology is acceptable in that it is based on international radiological norms and standards and as adopted by the National Nuclear Regulator. The annual dose limit (0.250mSv) and accident frequencies (at time of issue 5 years ago) are the benchmarks to aim at as these are acceptable and to do so is sensible. The details to do the actual calculation are not given.

3.7 Alternative Viewpoints Presentation and Clarity of Statement

There are no significant alternative viewpoints presented in the Report.

3.8 Accessibility of Style of Report to Non-specialists

The style of the report is effective in communicating the complexities of the subject to the non-specialist. The overview of ionizing radiation, its biological effects on cells and DNA and ultimately on human health is very well presented. The frequent mention of the ALARA principle alerts the public that the limits set are very much an upper bound with actual values much lower. There are several diagrams and tabulations that cover the details of a complex topic. The flow charts of pathway evaluation for different nuclear discharges assist greatly in appreciating the environmental interconnectedness from source to human dose. This is supported with a helpful glossary, list of abbreviations and detailed referencing.

3.9 Meeting of normal Standards of Professional Practice and Competence

The Report meets the normal standards of professional practice and competence. Aspects that are not covered adequately are indicated in relevant section.

4 CONCLUSIONS

The review process has addressed all 9 points of the Scope of Work and is satisfied they have been met to the extent indicated in each section.