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Macquarie Generation
34 Griffiths Road,
Lambton, NSW, 2299.

Attention Mr John Marshall

Dear John

BAYSWATER B ENVIRONMENTAL ASSESSMENT
RESPONSE TO DEPARTMENT OF PLANNING LETTER CONCERNING GREENHOUSE GAS ASSESSMENT

Please find attached our response to the Department of Planning letter (dated 28/10/09) concerning the Bayswater B Greenhouse Gas Assessment

Regards
WorleyParsons

T. Jones
Senior Consultant

1. Introduction

In its letter dated 28/10/09, the Department of Planning requested responses to several matters concerning the Greenhouse Gas Assessment for Bayswater B. WorleyParsons has been engaged by Macquarie Generation to provide engineering support.

The following information is provided in response to the Department of Planning letter.

2. Section 3.2 of the Independent Review Report – Further Justification for Technology Selections for Gas and Coal Options

The Independent Review states that the Bayswater B gas fired option is not the best achievable practice. In assessing available technologies, factors considered included requirements for proven, commercially available technologies, highest environmental performance, performance in terms of annual sent out output and efficiency at Bayswater B site conditions (compared to design or ISO conditions), capital and operating costs, impact of various plant configurations and equipment options.

The EARs required the project to be conceptualised on a realistic basis. As such, the design presented in the EA is deemed to represent a more realistic and practical model of the proposed power station. The Independent Review has assumed a series of technical aspects which are not believed to represent economic feasibility of the available technologies. Some of those specific factors are outlined in more detail below.

Gas Fired Option

In nominating the H class gas turbines as the best achievable practice, the Independent Review has not considered:

- Only two manufacturers produce H class gas turbines, so competitive tendering is limited,
- H class gas turbines are not proven technology with only limited service hours,
- F class machines currently incorporate many features of H class machines and have comparable performance,
- H class gas turbines have a higher pressure ratio than F class machines, increasing gas compressor auxiliary demand,
- The small capital cost differential between the developmental H class gas turbines and proven F class gas turbines,
- The use of exotic materials and coatings increases the maintenance cost of H class gas turbines.

Performance comparisons for Bayswater B between the GE 109H and Siemens SCC5-4000F combined cycle plants with air cooled condensers indicate the annual sent out thermal efficiency for the F class gas turbine plant is equivalent to the H class plant, contrary to claims made in the Independent Review.

Coal Fired Option

The Review also asserts that the coal fired technology is not the best achievable practice. In nominating the Theoretical High Efficiency Thermal Design as best achievable practice, the Independent Review has not considered:

- The impact of the disproportionately higher capital cost associated with additional feedwater heaters and larger air cooled condensers,
- The major impact of capital cost on project economic viability,
- The increased auxiliary loads associated with larger air cooled condensers,
- Reduced sent out electricity due to larger auxiliary loads.

Based on the above considerations, the Independent Review assessment regarding H class gas turbines and high efficiency thermal design, while theoretically representing high efficiency performance, does not consider the Director General's EARs that require that the project be conceptualised on a practical operational basis to underpin a reasonable and meaningful suite of technical assessments.

3. Sections 4.3 - 4.4 of the Independent Review Report - Greenhouse Gas Offsets and/or Renewable Augmentation

Section 4 of the Independent Review deals with measures to reduce or offset GHG emissions. The EA for Bayswater B has been prepared for Concept Approval purposes only. Measures to reduce and/or offset emissions are matters for the final Project Approval process to address.

Solar Thermal Augmentation (Independent Review Section 4.4)

Macquarie Generation has contributed capital to a world first application of solar thermal technology at its Liddell Power Station to produce renewable energy. The Liddell Solar Thermal facility is experimental in nature and its commercial viability is not yet proven. Whilst valuable experience has been gained, the capital cost is very high for a limited return as the Hunter Valley sunlight conditions are very marginal for solar energy purposes. Macquarie Generation supported by significant government (renewable energy) funding, is considering expanding the current plant to be able to better assess its solar thermal performance and assist with the industry development. This expanded plant is likely to cost in excess of $9 million and deliver less than 0.25% of the energy produced by one of Liddell's four generating units.

Solar augmentation is currently not viable for Bayswater B. While the EA indicates shading is an issue, with the site being some 100 m lower than surrounding hills, other issues considered include:

- High capital cost. The capital cost of Liddell solar thermal augmentation would be at least five times more expensive than the main plant on an annual continuous output basis. This is in line with the high capital cost reported for new solar thermal plants being built (eg the 50 MW Andasol plant in Spain). Economic feasibility is threatened by high capital expenditure and low capacity utilisation and therefore energy output more so than by other cost parameters,
- Insufficient data is available to properly project future operating and maintenance costs at this time,

- Solar Thermal plants require very large areas of land if they are to produce significant output. Available land area for augmentation is limited with Saltwater Creek and tributaries and existing vegetated areas quarantining much of the site, while sloping topography impacts other areas.

Biomass Co-Firing (Independent Review Section 4.4)

For Bayswater B, the conceptual design is based on the selection of proven, commercially available technologies and manufacturers' standard reference design power plants in order to minimise capital cost and plant performance risks. The inclusion of biomass co-firing would increase the capital costs of the plant. It would involve the use of non standard technology and undoubtedly degrade the value of plant suppliers' performance guarantees.

Contrary to the claims made in the Independent Review, the quantity of saw mill residue and vegetable oil co-fired at Bayswater and Liddell was less than 1% by mass due to limited supplies of biomass and plant performance issues. Furthermore biomass had to be sourced from distances up to 300 km incurring prohibitive transport costs. An additional concern was the increasing use of diesel fuel consumed (with associated GHG emissions) for the transport of the biomass.

Macquarie Generation does not currently fire biomass at Bayswater and Liddell due to the impact the low energy fuel has on plant output, the high cost of transport and handling which makes it uneconomic and concerns about the sustainability of outcomes.

The lack of available locally sourced biomass and its high cost make biomass co-firing not viable for Bayswater B. It is understood that the future availability of sawmill waste is threatened as a result of the declining native timber hardwood industry. The specific energies of softwoods are significantly lower resulting in little if any useful heat release.

4. Section 5 of the Independent Review Report - Impact of Carbon Pollution Reduction Scheme

Carbon Capture and Storage (Independent Review Section 4.5)

The comments made in the Independent Review are noted. It is emphasised again that given the technology is not commercially available it is impossible to provide meaningful estimates of cost and potential timing of implementation at this time. As a result, the EA proposed a mechanism of review which DECCW has recommended be every three years.

Evaluation of Project under the CPRS (Independent Review Section 5)

The EA for Bayswater B has been prepared for Concept Approval so only basic assessment has been included. This was also in accordance with the Director General's EARs however. Evaluation of the project under the CPRS would be provided by the project developer as part of the final Project Approval. Details concerning the proposed power station and more information on the impact of the CPRS would be available by then, however there are some reservations concerning the level of assessment that is practical and reasonable.

The Independent Review analysis incorrectly asserts that there is enough publicly available information which would support a much more comprehensive review of the impacts of the CPRS. A more comprehensive review is more appropriate to be undertaken when detailed and confirmed information is known, rather than the current speculation. Notwithstanding this, it is believed that the level of detail presented meets the Director General's EARs.

The Independent Review does not consider the practical operation of the NEM. There is currently a significant level of uncertainty about the impact of the CPRS on electricity prices. The long run marginal cost of a project for example only provides part of the information to determine commercial viability.

In order to fully assess the impact of CPRS on Bayswater B, detailed analysis and modelling of both costs and electricity prices in the NEM would be needed under numerous scenarios. At this stage:

- There is insufficient certainty about the CPRS for a useful assessment, particularly as the project is only at concept stage.
- Such assessment is far more relevant to the final project developer.
- The technology of CCS is not yet defined such that cost and performance are uncertain. As a result any current analysis is not helpful.

Prepared by: T. Jones

Reviewed by: W Lambert.