

## Loud and Clear Appendix

### Quotes from Nuclear Economics Consulting Group review of Jacobs MCM Report<sup>1</sup>

p 9: The scenarios developed in the Jacobs MCM Report show that under **certain** assumptions the Project **could be** economically **viable**.

p10: the Jacobs MCM Report is a "preliminary opportunity assessment"

p12: **NECG considers it would be premature to decide on the commercial viability of this Project based only on the Jacobs MCM Report**

p12: Consistent with the nature of the Jacobs MCM Report, **there are a range of simplifying assumptions made in that Report** about the nature of the Project, the potential market size, prices that can be charged, costs of the Project, timing, and other factors... **Reducing complexity in this way tends to underestimate factors that could increase costs, limit the prices that can be charged, and/or reduce or limit market size.**

p13: **..considerable work on Project details is needed to develop a credible value proposition**

p13: The Jacobs MCM Report includes assumptions (explicit and implicit) about the political, legal and regulatory context of enabling the Project. As a general matter, the report does not fully explore the time and costs related to these issues. **These issues have significant serious potential to adversely impact the Project and its commercial outcomes** (examples follow)

p15: A significant implicit assumption in the Jacobs MCM Report is that the Project provides a product/service that meets the needs of a significant number of client countries. ..as the Project is considered in more detail, it is important to note that **the Project product/service offering may not reflect the actual requirements, needs, or preferences of some or all potential client countries.**

Deep geologic permanent repository disposal of spent nuclear fuel appears to be the solution to HLW disposition in some (or even most) countries. However, other approaches, including long-term surface storage of HLW in dry casks, reprocessing of HLW to recover useable fissile and fertile materials (i.e., uranium and plutonium) and reduce the amount of HLW for disposition, and the use of HLW as fuel in advanced power reactor designs, are being considered.

Project timing in the baseline scenario (i.e., commencing deliveries of HLW in year 11) may not fit well with the needs or requirements of some client countries. In many instances, spent nuclear fuel may be safely and inexpensively stored in spent fuel pools and/or dry casks at nuclear power plants until the end of power operations and for some time after the end of power operations. Some decommissioning approaches assume that spent nuclear fuel can be safely stored at the reactor site for decades after power operations have ended.

p18: **NECG's view is that the current WTP estimates are overly general and optimistic.**

p21: Figure 2 shows that High and Baseline WTP estimates have amounts that are higher than most or all national repository cost estimates noted in the Jacobs MCM Report and that the Low WTP estimate has prices that are higher than some of the national repository cost estimates.

**This comparison suggests that the selection of a baseline WTP amount may not be supported by the national repository cost estimates and that a lower baseline WTP scenario may be more appropriate. The same comparison suggests that some client countries may seek a WTP that is lower than the low PTC scenario, especially if these countries see the low national repository estimates as indicative of their own national repository costs.**

**On the other hand, the low WTP scenario has prices that are close to estimated Project cost. If WTP amounts are overstated, Project profitability is seriously at risk.**

p23: The Jacobs MCM Report adopts the MS2 scenario (i.e., a 50% capture of the available market) as the baseline market capture scenario with little support or justification as to why 50% is

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<sup>1</sup> available at <http://www.parliament.sa.gov.au/Committees/Pages/Committees.aspx?CTId=2&CId=333>

a better baseline than 25% or 75% (or any other assumption). **NECG considers this approach ... is not a reliable assessment of realistic currently accessible markets on the one hand, nor of likely future nuclear power capacity (and potential Project market) on the other hand.**

The list of planned reactors appears to be somewhat theoretical, based on disparate national announcements. More work should be done to assess the feasibility of these plans and the likelihood that the reactors will be built. **Some of the countries on the list would not be considered as having credible nuclear power plans.**

p 24: The planned reactor list may also under-estimate the countries that are considering or that have agreed to use Russian nuclear power plants designs that are bundled with a long-term nuclear fuel leasing agreement. This fuel leasing approach takes back spent nuclear fuel, resolving the nuclear power plant host country's HLW disposition issues. Other countries competing to sell nuclear power plants in the international market, such as China, may offer similar nuclear fuel leasing arrangements.

If the Project were to “capture” a large market share (i.e., as in the MS2 scenario selected as the base case), it would be required to have agreements with many client countries with different political, contractual, technical, regulatory and other issues:

- Multiple negotiations and legal/contractual arrangements are needed for contracts with multiple client countries, all of which will take considerable time;
- Transport and storage solutions would have to accommodate a range of nuclear fuel types and transport/storage casks;
- A single standardized design/approach to transport and storage of spent fuel and other HLW may not be possible and each approach used would need to be licensed/certified in relevant client countries and in Australia;
- Specifications for ILW (treatment, matrix/packaging) from different national programs would have to be accommodated in Australia; and
- The Project would need technical infrastructure to handle and manage the range of spent fuel and high-level waste types and storage/transfer container types.

These issues have implications on Project licensing, timing, capital and operating costs, revenues, and profitability.

**The assumptions for market capture, client country requirements, and timing scenarios suggest that the Project would require a larger, more complex infrastructure than has been assumed in the streamlined cost scenarios**

**The cost assumptions made (and the benchmarks used to develop these assumptions) are optimistic, especially in the context of a new large, first-of-a-kind, radioactive waste storage and disposal facility in Australia.** Although not clearly substantiated (duly noting the implications of the Class 5 estimates), the various costs under consideration appear to be based on a set of “most favorable” assumptions (e.g. simple facility, streamlined operations, low licensing requirements, supportive foreign exchange rates, favorable cost escalation, etc.)

p 25: **a more detailed assessment of the market will likely mean that Project cost, timing, and revenue are very different** from Project parameters based on broad assumptions.

p26: the Jacobs MCM Report notes that the **cost estimates do not consider regulatory risk, something that is (and has been) a very significant issue in every nuclear industry project to date** and that has been a significant issue in other national nuclear waste repository projects.

A 25% contingency was added to the base Class 5 cost estimates, based on experience with delays and cost overruns in actual non-nuclear Australian projects. **The delays and cost overruns arising in nuclear projects are likely to be much greater than in non-nuclear projects**, due to safety regulation, public approval, and related issues. It is also important to distinguish between different types of nuclear projects, with the issues leading to potential delays and cost overruns for nuclear power plant projects being different than the issues related to the siting, construction and operation of radioactive waste storage and disposal projects.

The cost estimates include “a notional amount expected to be spent on obtaining various licensing and permitting approvals.” **This is likely to understate Project licensing and permitting costs.**

Australia's nuclear safety authority may not currently have the appropriate skills, staff, experience, etc. to consider applications for the required Project facilities and for the over-land handling and transport of radioactive waste in a timely manner. Putting the necessary suite of laws, regulations, and treaty commitments into place, enhancing the capabilities and procedures of the nuclear safety regulator, and the licensing process for Project facilities and activities will take considerable time and will require Commonwealth Government support and actions.

p27: A significant Project assumption in the baseline scenario that has an impact on the timing of Project cash flow and NPV is that client country payments will be received on delivery of waste (i.e., starting in year 11), but major Project expenditures to develop and build the ILW and GDF facilities will be made much later.

**If Project revenue is delayed until the repositories are completed and placed into operation, as in Configuration Scenarios 2 and 3, Project profitability is negative in the Jacobs MCM Report and financial model.**

p28: The Jacobs MCM Report has adopted an inflation/escalation rate (i.e., "CPI") assumption of 2.5% that is a reasonable amount for use as an assumption for inflation, but may be low for cost escalation in nuclear projects (i.e., that may be greater than inflation).

The Reserve Fund is assumed to earn a real return of 2.4% for a very long period of time. **The returns on the Reserve Fund appear to be higher than returns available in the market.**

The Project Reserve Fund, in the baseline scenario, does not commence accruals until year 45, well after the commencement of Project operations. **If Project revenue stopped for any reason after year 45, the Reserve Fund may not provide sufficient coverage of future costs and any costs not covered by the Reserve Fund would need to be covered by the State.**

p29: The Jacobs MCM Report appears to ignore the potential costs (or risks) to the Project and/or to the State and Commonwealth Governments related to third party liability, Project default, or other events.

p 29-31: Four important risks are understated in the Jacobs MCM Report..

#### **Delays and cost increases**

**The risk of delays and/or cost increases in the Project may not be fully reflected in the Jacobs MCM Report analysis.** In addition to delays and/or cost increases due to natural hazards, **almost all nuclear industry projects have experienced delays and/or cost increases** due to public acceptance, regulatory approvals leading to a license to start construction of ILW and HLW repositories, political issues, and nuclear safety oversight of construction.

**The potential for delays and/or cost increases in the Project is significant, due to the Project's location in Australia, a country with limited experience with such facilities, and to the potential complexity of the overall arrangements.**

#### **Variety of waste types**

The risk and complexity of accepting spent nuclear fuel, HLW and ILW from a wide range of reactor designs, reactor types (i.e., both light water reactors and heavy water reactors), and countries, with this radioactive waste packaged in a variety of storage and transportation containers, is not discussed in detail in the Jacobs MCM Report. **The variety of radioactive waste types may require additional facilities, may increase capital and operating costs, and may delay the movement of HLW to Australia and within South Australia.**

#### **Reputational Risk**

Reputational risk at the local, State, Commonwealth, and international level is important but difficult to quantify. **The Jacobs MCM Report assumes that community engagement and consultation will proceed with little uncertainty as to timing or outcomes.**

**The reputational risk with respect to South Australia, where major economic activity is based on tourism and wine production, has not been assessed or modelled.**

Reputational risk also relates to the perception of the Project and the need to implement Project-related activities to the highest standards. Australia is not a party to any international nuclear liability conventions and the Australian Nuclear Safety Regulator has not regulated complex nuclear projects, creating perception issues that may go well beyond commercial considerations.

#### **Nuclear accident/incident**

Although it is unlikely, **there remains a possibility of a nuclear incident or accident related to the Project that results in the release of radioactivity.** Readiness to respond to such an accident or incident would require the Project to have law enforcement and emergency response personnel, facilities, and protocols in place (i.e., as appropriate for a waste storage or repository facility) and **developing this would increase Project cost.**

In addition, the Jacobs MCM Report does not provide an outline of:

- What type of nuclear incident/accident could (theoretically) happen;
- What risk mitigation programs, including insurance and limits on liability, could (should) be considered;
- Who the key stakeholders under a nuclear incident/accident scenario would be; and
- What role the State Government and/or the Commonwealth Government would play (i.e., insurer of last resort).

p32: Development and analysis of a legal, political, regulatory and contractual framework for the Project has not been completed.

**This leaves a serious gap**, in that many of the assumptions made in the Jacobs MCM Report that must be adjusted to reflect the legal, political, regulatory and contractual framework that would be necessary to support the Project. **This gap means that the assumed timelines for decision making, siting, and establishing a suitable infrastructure, agreeing on terms for waste transfer with client countries and obtaining international consents, and other activities may not be reasonable or even feasible** (unless the law changes). How such issues are sorted will then have an impact on risk allocation and ultimate Project costs.

p34: Commitments will be required from State and/or Commonwealth Government to take on any financial liability that might arise in the future. **The State and/or Commonwealth Governments must be willing (and obligated) to backstop the Project if things go wrong. The resulting long-term obligations and liabilities are not discussed in the Jacobs MCM Report.**

**Once nuclear waste is delivered to South Australia and ownership/liability has been transferred to the Project company, the nuclear waste cannot be returned and the client country may have no contractual obligations to assume any financial or other obligations.**

NECG has reviewed the financial model. The NECG review was not a complete audit of the model and, therefore, we cannot state that all aspects of the financial model are correct, that the output of the model is robust under all inputs, or that there are no errors in the model.

p35: **One of NECG's concerns is that it may be difficult to convince client countries to deliver and pay in advance for radioactive waste storage and disposition starting in year 11 (i.e., when port facilities and ISF are completed), while ILW facility is not scheduled to start accepting delivers until year 24 and the GDF is not scheduled to start accepting HLW until year 28.**

NECG used the financial model to assess how the economics of the Project would change if client countries only started delivering ILW and HLW when the permanent facilities were completed and accepting deliveries.

Using the Jacobs MCM Report financial model with baseline scenario inputs and assumptions gives a Project NPV of AUD 11.52 billion pre-tax if the HLW and ILW deliveries and revenues start in year 11.

**When the HLW deliveries are started in year 28 (i.e., delayed for 17 years from the original timing), the Project NPV drops to a negative AUD 1.01 billion.**

**If the ILW deliveries are also delayed to start in year 24 (i.e., delayed for 13 years from the original timing), the Project NPV drops to a negative AUD 1.802 billion.**

p36-7: The baseline CS4 scenario has about AUD 600 million in capital expenditures in the first six years. These costs appear to be related to the “Facilitation” activities in the timeline in Figure 3.1 (page 201) in the Jacobs MCM Report.

All these activities are likely to be required, at a minimum, to support a Financial Investment Decision (FID) under the current view of the Project and the total cost estimated for these activities seems reasonable. **Under some Project approaches, even more activities and costs may be required. Reaching a greater level of certainty regarding the licensing and construction of the GDF and IDR are likely to be required and would add cost and time.**