Final comments (26TH Sept 2016)

Main points.

1. The EIS states quantities of schedule 15 materials are above the threshold and that the facilities will need to be licenced as a MHF. The proponent must notify SWNSW in accordance with Clause 536 in the WHS regulation.

2. Confirm that the whole of Jemalong Station (15,478 ha) is the proposed MHF site, as stated in page 6 of the PHA, and not a smaller area.

3. If item 2 above is confirmed, how will access to the 15,478 ha MHF site be controlled? Noted that it seems that only the 165 ha plant area is proposed to be fenced.

4. Will the proposed 30MW plant be connected into the existing 6MW pilot plant (or any part of it)?
   As the pilot plant is understood to be within the proposed MHF boundaries for the 30MW plant, it needs to be included in the MHF risk assessment. If this understanding is correct, all schedule 15 materials (including any aircraft fuel) will need to be included in the notification to SWNSW.

5. If a QRA is required to be prepared for planning, it is strongly recommended that all scenarios are included and that the QRA be used to produce the contours for on-site as well as off-site risk. This will then help satisfy the WHS regulatory requirements to consider cumulative (on-site and off-site) risks. On-site risk to people would include those using accommodation, polo facilities and the airfield.

6. HAZARD AND OPERABILITY STUDY.
   A Hazard and operability Study (HAZOP) for the whole plant together (including pilot and new plant if any interconnections / common elements) shall be performed and chaired by an independent qualified person approved by the Secretary of Planning prior to the commencement of the study. The study shall be carried out in accordance with the Department's *Hazardous Industry Planning Advisory Paper No. 8, 'HAZOP Guidelines'*. The study report must be accompanied by a program for the implementation of all recommendations made in the report. Safety related recommendations must be included into the final design of the development. If the Applicant intends to defer the implementation of a recommendation justification must be included.

   There is a normal requirement for the HAZOP chairperson, to judge and ensure that attendees have sufficient detailed knowledge to conduct an effective HAZOP. This is worth mentioning due to the novel nature of the plant and general lack of experience in operating one with large sodium inventory.
   See extract from EIS in point 9 below.

7. HAZID: The existing HAZID for the 6MW pilot plant does not mention corrosion as a threat, (except for the steam generator). For the remaining parts of the plant, it is not clear if it has been considered and ruled out. There is no reference to a process of selection of materials of construction, inspection and maintenance strategy. Confirm material selection will take corrosion into account.

8. Explanation of the meaning of "remaining" in Section 5.4.3 of the EIS: does this mean it won't be integrated into detailed engineering already done? The word "remaining" should be removed.

5.4.3 Safeguards and mitigation measures

Health and safety impacts are proposed to be addressed via the following mitigation measures.

Table 5-11 Safeguards and mitigation measures for health, hazard and risk

C: Construction; O: Operation; D: Decommissioning

Safeguards and mitigation measures	C	O	D
All design and engineering would be undertaken by qualified, competent persons with the support of specialists as required.	X		
The findings from the PHA, HAZOP and HAZID studies are to be integrated into the remaining detailed engineering, design and procedures.	X	X	X

9. The following statement from section 3.2 of the PHA highlights the need to understand larger scale sodium fires. The results would be used to ensure safety in design. Will the results from the research be available in time to include in the design to ensure that risks are reduced SFARP?

"Because of the inexperience in Australia with handling of molten sodium in large quantities, and precipitated by the 2015 fire at Jemalong, Vast Solar is sponsoring a collaborative research program with the Australian National University (ANU) and NSW Fire and Rescue. ANU is constructing a test laboratory to gain better understanding in the following areas:

- Sodium fire hazard identification and risk mitigation as it pertains to the sodium laboratory.
- Testing levels of smoke with respect to the rate of sodium combustion in an enclosed area with volume corresponding to the volume of the ANU laboratory and under various exhaust conditions
- Defining a robust emergency response procedure in the event of a sodium fire.
- Ensuring combustion by-products are contained to the immediate laboratory area.
- Identifying and conducting novel experiments with sodium fires to contribute to the existing literature on sodium fire propagation and mitigation.
- Gaining practical experience with igniting and extinguishing sodium fires.
- Sodium fire hazard identification and risk mitigation as it pertains to the Vast Solar demonstration plant and the planned 30MW plant.
- Defining a robust emergency procedure in the event of a sodium fire.
- Gaining practical experience with igniting and extinguishing sodium fires.
- Defining a general emergency response approach for all possible scales and severities of sodium fires.
- Supervising fire tests conducted by The ANU and Vast Solar."

10. The Executive Summary in the EIS states: "The proposal is the culmination of Vast Solar's CSP technology development and commercialisation. While it is designed to have a 25 year operating life, the proposal is first-of-its-kind, and is therefore likely to involve continuing refinement of technology and operations."

There is inherent potential risk in continual refinement of a MHF plant.

Confirm that all the site and corporate management and staff fully understand the requirements of the Management of Change process including document control.

Reference should be made to the underlying causes to the Sodium release and fire in the Pilot plant in 2015 and implementation of lessons learned from this.

Additionally, include in the EIS a report detailing this sodium release and fire including the investigation, causes identified, recommendations and all learnings as they would apply to

the design and or operation of the new proposed plant, and how the recommendations are being actioned. This would include considering:

- Response to possible pipe leak of sodium - elevation of piping above grade makes application of soda ash difficult)
- Leak / fire response during rain, or when water on the ground
- Access for soda ash application
- Access to site for vehicles when wet
- Where to store soda ash and how to safely apply (it is hazardous)

11. Comments on consequence analysis
    a. Cumulative risk needs to be assessed including escalation, eg, a scenario would be a jet fire from the LPG system impinging onto molten sodium containing equipment causing loss of containment of the sodium. The emergency response would be difficult as the LPG fire would require nearby equipment, eg, other LPG tank, to be sprayed with water, yet water should not be applied near the sodium leak.
    This analysis, and a Fire Safety Study needs to be done prior to detailed design.
    Ground under LPG vessels should slope away from under LPG vessels. Separate LPG vessels from sodium and molten salt, as much as possible. They are both planned to be in the 1 ha "Power Island".
    Will planned 0.3 m bund around the power island (to reduce flood impact) keep LPG vapour trapped and prevent dispersion significantly?

    b. Similar to the above point, a steam explosion is possible, and mentioned as a key hazard in table 5 in PHA, but not mentioned in the consequence analysis. It could initiate one of the incidents, eg, cause a LPG leak.

    c. Reflected light from heliostats is included in Table 5 with a consequence of temporary blindness (or grass fire page 19 PHA). In the hazop of the pilot plant it is stated that there is a consequence of loss of containment of sodium, upon overheating of receiver (due to low sodium flow, for example). This consequence should be included in table 5, ie, list the potential damage from the concentrated thermal energy, including not just the receiver, in case of misdirection.

12. Further information/clarification required
    a. Process Flow Diagram
    b. Proposed layout of plant and equipment
    c. Composition and properties of the molten salt solution, there are only examples given in the EIS.
    d. Appendix A.3 (risk assessment matrix) referenced on Page 68 of the EIS (cannot locate the Appendix).
    e. Is piping stress analysis part of piping design, considering the large temperature range?
    f. Is LPG propane or propane / butane mix. It is referred to as LPG and propane in Table 8.
    g. How is potential temporary blindness issue to be handled with respect to occupants of the MHF as well as pilots, noting commercial airport is in the vicinity?
    h. Minor inconsistences between tables of hazards, DG's.
    i. The RAM on Page 68 has a likelihood column but, eg, for Remote there is a <1% chance of occurring, but the timespan is not mentioned. Is it <1% over life of plant or per year?
    j. How are pipes and infrastructure to be armoured (See section 2.2.3 in EIS)

k. Are the flood levies (not the vast ones, but the district ones) a critical barrier? Credit is taken implicitly as they reduce the frequency of floods.
l. Will design take flooding into account (including buoyancy effects)
m. Will there be sufficient firewater available in case of LPG leak and fire, will it be available quickly enough to prevent escalation?
n. Strategy for placement of isolation valves in the molten sodium circuit to reduce quantity able to leak out in case of loss of containment.

Safety case to address the need for the following – some of which is required as part of the detailed design phase.

a. Corrosion loop study leading to materials selection and inspection strategy
b. Asset register with details of all critical equipment and required inspection and maintenance
c. List of critical procedures (under control of MoC)
d. Safeguarding narrative, and SIL assessment of trip systems

Questions / comments on documents
The existing P&ID for 6MW Pilot Plant

e. Lines should have an individual line number on P&IDs which include pressure rating and materials of construction (specification)
f. The cold HTF tank has a LL pressure trip and LL and HH level trip. Both these are initiated from the same instrument as the controller. Normally if a trip was required it would be driven from an independent instrument. Has the trip been SIL assessed?

SAFETY MANAGEMENT SYSTEM requirement.
A document setting out a comprehensive Safety Management System , covering all on-site operations and associated transport activities involving hazardous materials. The document shall clearly specify all safety related procedures, responsibilities and policies, along with details of mechanisms for ensuring adherence to the procedures. Records shall be kept on-site and shall be available for inspection by the Secretary upon request. The Safety Management System shall be consistent with the *Department's Hazardous Industry Planning Advisory Paper No.9, 'Safety Management'* and also comply with the requirements of the Work Health and Safety Regulation 2011; in particular, clause 568 and schedule 17.