Appeals Convenor

Environmental Protection Act 1986

REPORT TO THE MINISTER FOR ENVIRONMENT

APPEALS IN OBJECTION TO THE REPORT AND RECOMMENDATIONS OF THE ENVIRONMENTAL PROTECTION AUTHORITY (REPORT 1513)

EAST ROCKINGHAM WASTE-TO-ENERGY AND MATERIALS RECOVERY FACILITY

PROPONENT: NEW ENERGY CORPORATION PTY LTD

Appeal numbers 119 to 121 of 2014

NOVEMBER 2014

Appeal summary

This report considers three appeals lodged in objection to the content of, and recommendations in, the report of the Environmental Protection Authority (EPA) in relation to a proposal by New Energy Corporation Pty Ltd (proponent) to build and operate a waste-to-energy and materials recovery facility in the City of Rockingham.

The appellants raised a number of concerns in respect to the proposal's impacts and the EPA's assessment process, which are broadly summarised under nine grounds:

1. Air Quality / Human Health: air quality and emissions data, independent testing, fine particulate matter/nanoparticles, contributing/influencing factors, monitoring during commissioning, cumulative impact of an additional proposed facility, impacts to human health, and greenhouse gases;
2. Inland Waters Environmental Quality: management and disposal of waste water;
3. Amenity: increased traffic congestion and accidents;
4. Recommended Conditions: monitoring reports should be made publicly available;
5. EPA's Assessment Process: by providing information to the proponent the EPA is not acting objectively;
6. Sustainability and Waste Hierarchy: principle of waste minimisation, justification of the need for the proposal, assurance around waste sorting and recycling;
7. Waste Feedstock: composition of feedstock, assurance that only residual waste is proposed to be used;
8. Technology (Entech): selection of case studies to demonstrate success of Entech technology, failure of similar facilities; and
9. Section 16(e) Advice on Waste-to-Energy: whether the proposal meets the 21 recommendations.

In considering the appeals, the Appeals Convenor noted that:

- in April 2013 the EPA and Waste Authority published strategic advice on the environmental and health performance of waste-to-energy technologies (WtE Strategic Advice), which concluded that modern waste-to-energy facilities can operate within strict emissions standards with acceptable environmental and health impacts to the community when a facility is well designed and operated using best practice technologies and processes;
- the EPA's assessment found that all criteria pollutants were predicted to be compliant with the National Environment Protection Measure standard and other relevant guidelines for standard operation and emergency shut-down scenarios, and that the proposal satisfactorily meets the recommendations in the WtE Strategic Advice;
- in respect to emissions, the proposed facility's construction and staged commissioning can be regulated by the DER to meet the requirements of the European Union's Waste Incineration Directive for key pollutants through a works approval, and its operation can be regulated by the DER through a licence.

Recommendation

The Appeals Convenor recommends that the Minister dismisses the appeals.

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INTRODUCTION

This report considers three appeals lodged by the Conservation Council of WA (119/14), Alliance for a Clean Environment (120/14) and Mr James Mumme (121/14) in objection to the content of, and recommendations in, Report 1513[1] of the Environmental Protection Authority (EPA) in relation to a proposal by New Energy Corporation Pty Ltd (proponent) to build and operate a waste-to-energy and materials recovery facility (proposal; proposed facility) in the City of Rockingham. Appellants sought for the Minister for Environment (Minister) to remit the proposal to the EPA for re-assessment of the matters raised in the appeals.

By section 100(1)(d) of the *Environmental Protection Act 1986* (EP Act), any person who disagrees with the content of or recommendations in a report of the EPA in relation to a proposal may lodge an appeal in writing, setting out the grounds of that appeal. The environmental appeals process is a merits based process. For appeals in relation to an EPA report and recommendations, the Appeals Convenor normally considers the environmental merits of the assessment by the EPA, based on objectives set by the EPA, as well as other environmental factors. The appeals process considers environmental significance, relevance of factors, additional information not considered by the EPA, technical errors and attainment of policy objectives.

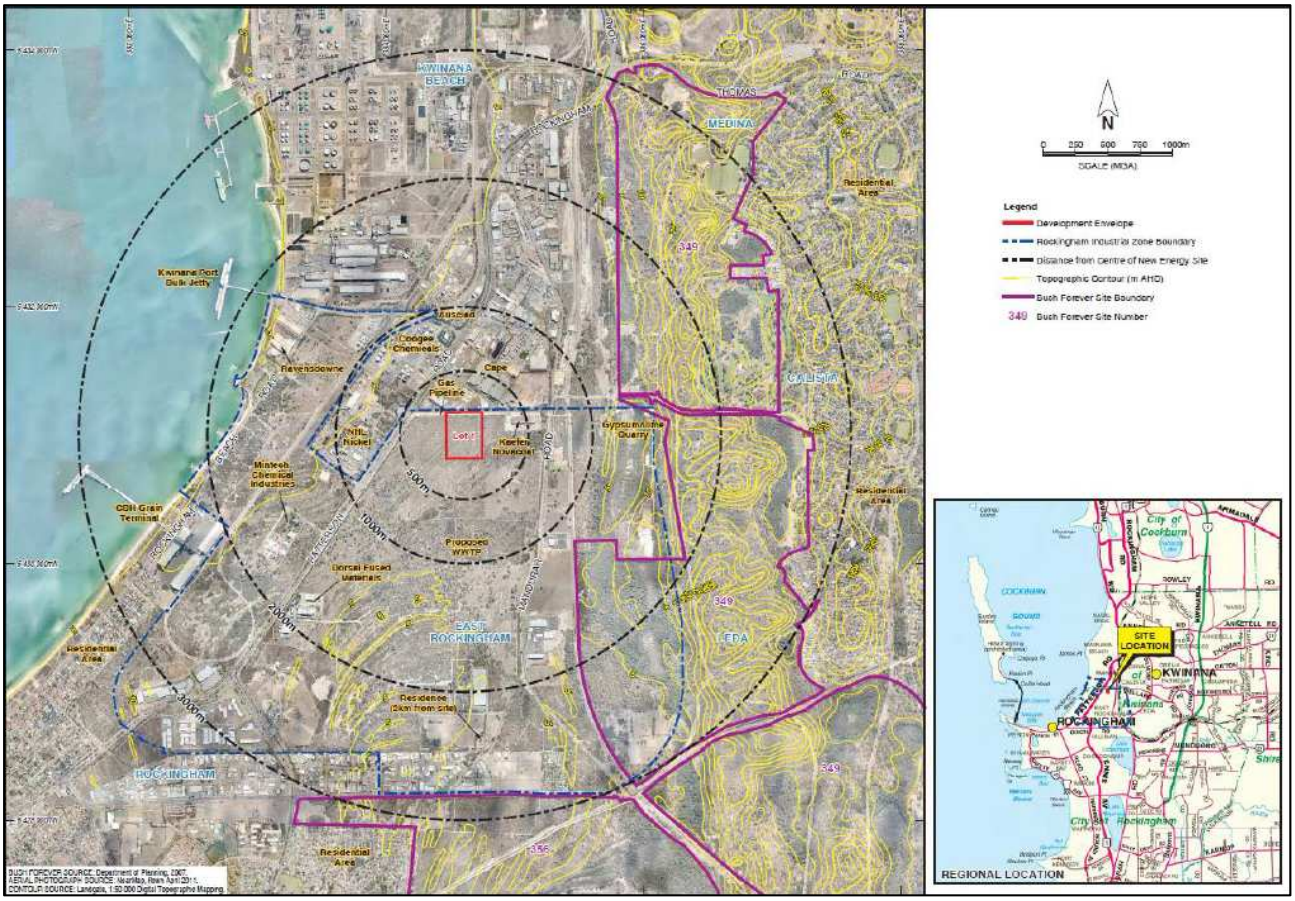
In accordance with section 106 of the EP Act, a report was obtained from the EPA in relation to the matters raised in the appeals. The proponent also provided advice on the appeals, which contains detailed information about the proposal and has been incorporated into this report to provide context and clarification on particular issues (including some which do not directly relate to the EPA's report and therefore the right of appeal). During the appeals investigation, staff of the Office of the Appeals Convenor met with two appellants and the proponent, and one appellant provided further information to support their appeal. This report provides the Appeals Convenor's recommendations to the Minister for Environment in respect to the appeals, and is given under section 109(3) of the EP Act.

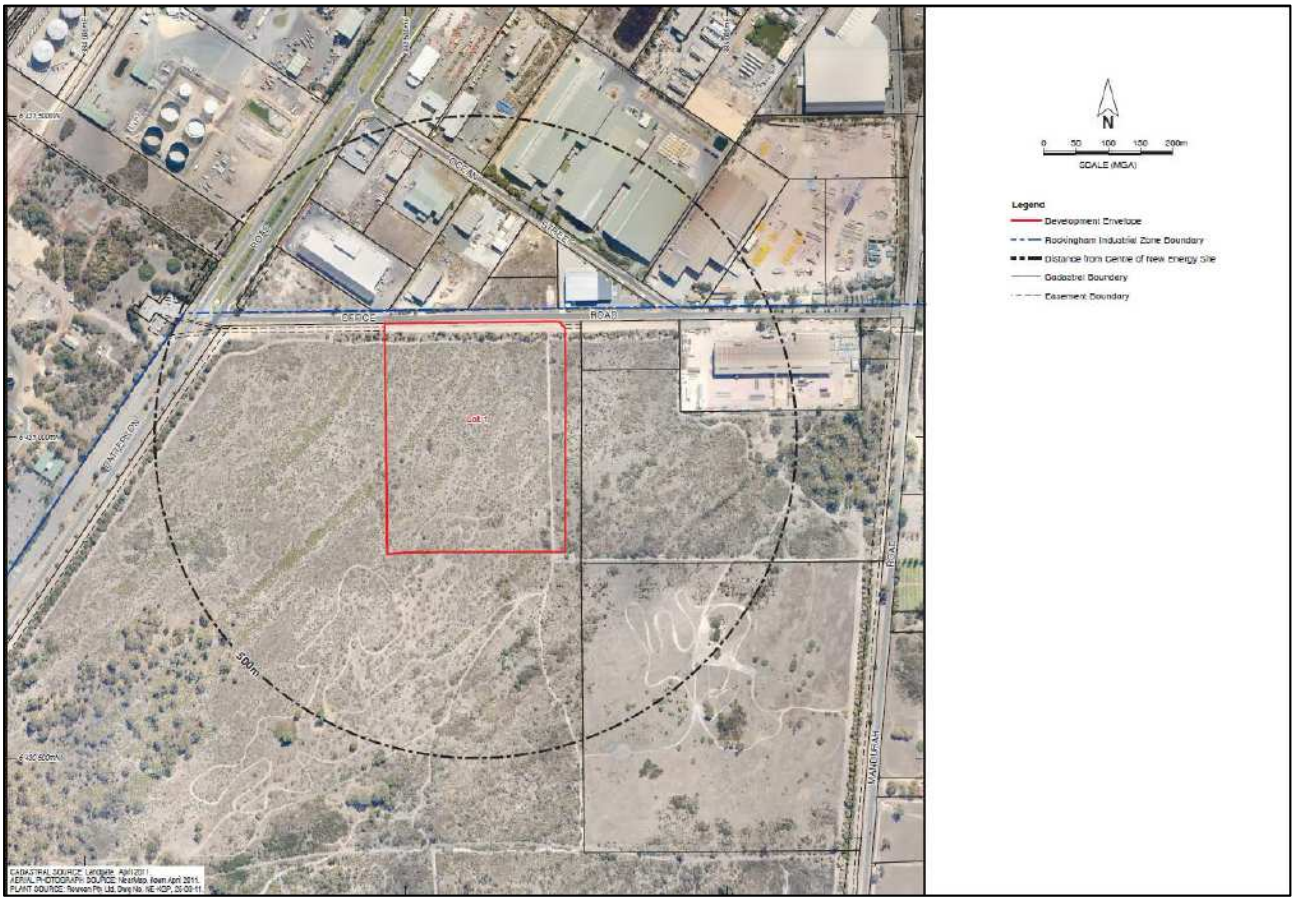
The proponent proposes to build and operate a materials recovery (MR) and waste-to-energy (WtE) facility on Lot 1 Office Road, three kilometres (km) north-east of Rockingham in the Rockingham Industrial Zone (refer to Figures 1(a) and (b)). Accepted wastes would be sorted; the proposed MR facility would recover recyclables and incompatibles, and the remaining waste would be baled and converted to electrical power in the proposed WtE facility using Entech WtGas-RES^{TM} ('waste-to-gas renewable energy solutions') gasification technology. A Continuous Emissions Monitoring System (CEMS) would be installed to monitor air emissions. The EPA set the level of assessment for the proposal at 'Public Environmental Review' (PER) in October 2011. The proponent's PER document[2] (PER Document) was advertised for public consultation in November 2013 for a period of six weeks and 15 submissions were received. The EPA considered that the key environmental factor relevant to the proposal was 'Air Quality'. The EPA published Report 1513 in June 2014, concluding that it is likely that its objective for 'Air Quality' would be achieved provided there is satisfactory implementation by the proponent of the recommended conditions.

In considering these appeals, it is noted that the EPA and the Waste Authority published Report 1468 *Environmental and health performance of waste to energy technologies*[3] in April 2013 which provided advice to the then Minister under section 16(e) of the EP Act (WtE Strategic Advice). It was also noted that there are a number of other proposals and/or appeals in respect to similar facilities. These are outlined in Appendix 1 of this report.

[1] Environmental Protection Authority (2014) *Report and recommendations of the Environmental Protection Authority: East Rockingham Waste to Energy and Materials Recovery Facility: New Energy Corporation Pty Ltd*. Report 1513, 16 June 2014. Government of Western Australia.
[2] New Energy Corporation Pty Ltd (2013) *Public Environmental Review: East Rockingham Waste to Energy and Materials Recovery Facility*. Dated October 2013.
[3] Environmental Protection Authority (2013) *Environmental and health performance of waste to energy technologies: Advice of the Environmental Protection Authority to the Minister for Environment under Section 16(e) of the Environmental Protection Act 1986*. Report 1468, April 2013. Government of Western Australia.

Figures 1(a) and (b): Proposal location and development envelope





(Source: Report 1513 Figures 1 and 2)

GROUNDS OF APPEAL

The matters raised in the appeals are summarised under nine grounds: Air Quality / Human Health, Inland Waters Environmental Quality (Waste Water), Amenity (Traffic), Recommended Conditions, EPA's Assessment Process, Sustainability and Waste Hierarchy, Waste Feedstock, Technology (Entech), and Section 16(e) Advice on Waste-to-Energy.

GROUND 1: AIR QUALITY / HUMAN HEALTH

Appellants raised concerns around a number of matters relating to air quality and greenhouse gas production, including the data used for modelling, fine particulate matter, contributing/influencing factors, monitoring, cumulative impacts, impacts to human health, and greenhouse gases. These matters are discussed under subsections within this ground.

The EPA's objective for the factor 'Air Quality' is "*To maintain air quality for the protection of the environment and human health and amenity*". It is noted that the EPA considered 'Air Quality' to be a key environmental factor for the proposal, warranting discussion and evaluation in the assessment report.

The EPA's objective for the factor 'Human Health' is "To ensure that human health is not adversely affected". It is noted that the EPA considered 'Human Health' to be a preliminary environmental factor which was relevant to its assessment of the proposal, but did not consider this factor to be a key environmental factor warranting discussion and evaluation. It is noted that Appendix 3 of Report 1513 states "Potential impacts from emissions on human health are considered under the factor air quality".

It is noted that section 7.10 of the PER outlines air quality in the context of the existing environment, and that sections 9.5 and 9.6 consider the proposal's impacts in respect to air quality and greenhouse gas emissions (respectively). Section 9.5.3 identifies three main operational sources of emissions to air as fugitive odour emissions from the waste receival bay, emissions from the main stack under normal operating conditions, and emissions from the emergency bypass stack during extreme facility upset conditions. Section 9.5.3 identifies additional sources of potential impact as particulate emissions during construction works, and gaseous emissions during a fire. Section 9.6.3 identifies three main sources of the greenhouse gases carbon dioxide (CO_2) and nitrous oxide (N_2O) as machinery/vehicle movements during construction (estimated at <1,500 tonnes per annum (tpa) of CO_2-e), and waste gasification to produce electricity generation and transportation and distribution of fuel during operations.

The PER states that reported emissions of concern from WtE facilities are: oxides of nitrogen (NO_x); low levels of particulates, metals and volatile and semi-volatile organics including trace levels of dioxins; carbon monoxide (CO); CO_2; formaldehyde and other hazardous air pollutants including dioxins and furans and other complex organic compounds (both halogenated and non-halogenated); water vapour (H_2O); trace levels of acid gases including hydrogen chloride (HCl) and oxides of sulphur (SO_x); and odour.

Report 1513 states that during the gasification process and burning of syn-gas, a number of air pollutants would be produced dependent on the feedstock, including SO_x, NO_x, CO, acid gases, metals and air toxicants (e.g. polyaromatic/chlorinated hydrocarbons).

Sections 9.5 and 9.6 of the PER outline a number of air emissions monitoring and management measures, including the following:

- monitoring (CEMS): installation of a CEMS which will monitor, log and report on a range of parameters (including furnace temperature, system pressure, particulates, flue gas outlet temperature, water vapour content, dust, CO_2, oxygen (O_2), total organic carbon (TOC), HCl, hydrofluoric acid (HF), SO_x, NO_x, ammonia (NH_3), N_2O, water (H_2O) and CO), and provide early warning of any non-standard operating conditions;

- monitoring (stack testing): regular stack testing of emissions using US EPA protocols[4] to assess particulates, acid gases, volatile organic compounds (VOCs), and hazardous air pollutants (HAPs) such as heavy metals;
- monitoring (heavy metals, dioxins and furans): one measurement every 3 months for the first year of operation for heavy metals, dioxins and furans; and two measurements per annum for heavy metals, dioxins and furans (reduced to once every two years if performance is proven);
- management (Environmental Management System (EMS)): development and implementation of an EMS for the proposed facility which incorporates procedures for waste acceptance (criteria), start up and shutdown, operation in emergency conditions, all aspects of monitoring, commissioning, and assessing and handling solid residues;
- management (dust): regular watering of unsealed roads, exposed surfaces and active construction areas; development of a Construction Environmental Management Plan that includes controls on the extent of clearing, topsoil stockpiles and vehicle movements, wind fencing, monitoring using visual and hand held instrumentation, and implementation of complaints handling procedures; and mulch/spread cleared vegetation;
- management (process): selection and control of waste streams; sorting and assessment of wastes streams to divert potentially hazardous wastes; management and packaging of feed stocks to provide a feed that is relatively uniform in calorific value, density, moisture content and chemical composition; use of a low temperature gasifier design and best available technology in syn-gas burner systems; gas cleaning systems, including a bag filter;
- management (fire): an automatic fire detection and alarm system linked with automatic fire control systems in key areas; development of on-site Fire and Emergency Plan which includes staff training, regular fire drills and links to waste acceptance protocols for the proposed facility; fire breaks; water storage tanks; and on-site fire fighting equipment;
- management (commissioning): after successful cold/dry and hot/dry commissioning, full wet commissioning will involve the progressive feeding of waste to full capacity subject to careful monitoring of all systems to detect any unusual or abnormal emissions during commissioning and to ensure that the Air Quality Control System (AQCS) is fully functional;
- management (greenhouse gases): design features such as configuration of infrastructure such as *in-situ* reforming, optimal boiler volumes, promoting greater heat recovery through upgrade of equipment, utilising improved catalyst technologies and use of other suitable technologies as they become available; development of a National Greenhouse and Energy Reporting Scheme (NGERS) reporting program;
- management (contingency): integration of the CEMS data into the proposed facility EMS to adjust conditions in the gasifiers, syngas burner, boiler and air quality control systems on a continuous basis; establishment of conservative set points for critical control parameters (around 60% of critical levels); visual and audible alarms where parameters are exceeding 80% of the critical level to alert the operator of the need for manual intervention, which may include progressive or rapid reduction of waste feed and shutdown of one or more gasifiers, provision of additional fuel or combustion air to the syngas burners to ensure optimal destruction efficiency, activation of standby pumps or blowers as required to ensure that the AQCS continues to function optimally, and/or increasing reagent flows in the AQCS as appropriate; and
- management (contingency longer-term): up-sizing individual elements of the AQCS; and waste diversion to storage areas until issues are resolved.

It is understood that a number of matters relating to air quality and human health were also raised in public submissions on the proposal, which the proponent considers in its response to those submissions[5] (Response to Submissions).

[4] United States Environmental Protection Agency (1998-2006) *AP-42 Compilation of Air Pollution Emissions Factors*. Fifth edition, available for download at www.epa.gov.

It is understood that the Department of Environment Regulation (DER) can regulate emissions targets, limits and monitoring requirements through the works approval and licensing process under Part V of the EP Act, and has responsibility for the licensing and registration of prescribed premises, and for monitoring and auditing compliance with works approvals, licence conditions and regulations. It is also understood that the proposed facility would be subject to requirements for a works approval prior to construction and operation. It is noted that the PER states that specific source emission monitoring and verification for particulate matter, HCl, heavy metals, NO_x and SO_x are managed through this process, and that the frequency of monitoring and the parameters to be monitored will be detailed in an Air Quality Monitoring Plan development in consultation with the DER prior to commissioning of the proposed facility.

The EPA advised that it and the Waste Authority released the WtE Strategic Advice in 2013, which concluded that it has been demonstrated internationally that modern WtE facilities can operate within strict emission standards with acceptable environmental and health impacts to the community. The EPA advised that the key characteristics in the recommended environmental conditions state that emissions shall not exceed the emission limits specified in Annex V of the European Union (EU) Waste Incineration Directive (WID) 2000/76/EC[6] or its updates.

1.1: Air quality and emissions data

Appellants submitted that the background air quality data relied on by the proponent is out of date and does not include those industrial emission sources that have been established since 2010. Appellants submitted that the proponent could have supplied background air quality data from at least 2012 given the long lead up and engagement with the EPA, for the release of their PER Document. Appellants submitted that the EPA should require the proponent to undertake a current 12 month background air quality study. Appellants submitted that it is unclear how the emissions data was derived, including the regime for monitoring, types of emissions monitored, and whether the analysis was executed objectively.

During a meeting with staff of the Office of the Appeals Convenor, appellants submitted that the proponent identifies a WtE facility in Poland as an example of success, however has not provided evidence of emissions monitoring or data to support this claim. Appellants claimed that the US EPA protocols for stack testing are up to 50% inaccurate for dioxins and furans.

It is noted that Technical Appendix E of the PER Document contains an assessment of ground level air quality impacts associated with the proposed construction of a 72 mega-watt thermal (MWt) gasification facility in East Rockingham[7] (Air Quality Impact Assessment), and an addendum[8] to the Air Quality Impact Assessment (Addendum), which addresses issues raised by the former Department of Environment and Conservation (DEC) in respect to a sensitivity analysis and discrepancies in emission values. It is noted that the Air Quality Assessment modelled two emission scenarios using the Ausplume v6.0 regulatory approved dispersion model, and concludes "*The results from this study demonstrate the calculated air quality impacts in the region surrounding the proposed facility will comply comfortably with the various regulatory criteria for both of the two scenarios modelled*". It is noted that the Addendum concludes that all ground level concentrations "… *still fall well within relevant acceptance criteria for all scenarios*", and that "*The calculations and report were checked and no discrepancies were identified*".

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[5] Office of the EPA (2014) *East Rockingham Waste to Energy and Materials Recovery Facility: Public Environmental Review Assessment No. 1910: Summary of Public Submissions*. Government of Western Australia.

[6] European Union Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste (corrected 31 May 2001; amended 22 October 2008; updated by EU Directive 2010/75/EU).

[7] Synergetics Environmental Engineering (2013) *Final report: Air quality impact assessment of the proposed waste gasification power station in East Rockingham, Western Australia for New Energy Corporation Pty Ltd*. Unpublished report prepared for New Energy Corporation Pty Ltd, v4 dated October 2013.

[8] Synergetics Environmental Engineering (2013) *Draft addendum report: Air quality impact assessment of the proposed waste gasification power station in East Rockingham, Western Australia for New Energy Corporation*. Unpublished report prepared for New Energy Corporation Pty Ltd, vCD03 dated September 2013.

The matter of background air quality data was raised in public submissions on the proposal. It is noted that the Response to Submissions (pages 46-48) states that the proponent has quoted background data where published information is available through either the DER, or the Kwinana Industries Council (KIC) which hosts the Kwinana Ambient Air Quality Monitoring Network that monitors background concentrations of key pollutants on a continuous basis. The Response to Submissions also states "*Given the very small incremental increase over existing background concentrations resulting from plant emissions in normal conditions, the absence of background data for all parameters is not regarded as a significant matter* …".

In response to the appeals, the proponent advised that the 2013 WA Air Monitoring Report[9] indicates that ambient air quality for monitoring sites associated with Kwinana and Rockingham were compliant with the National Environment Protection Measure (NEPM) standards for carbon monoxide, nitrogen dioxide, sulfur dioxide and particles (PM_{10} and $PM_{2.5}$). The proponent advised that the Rockingham Holiday Village (147 Dixon Road) is 2.4 km to the south of the proposed WtE facility and the Cee and See Caravan Park (2 Governor Road) is 2.5 km to the south-west, and that these caravan parks are a similar distance from the proposal as the residential areas in Leda and Medina.

It is understood that the proposed facility will incorporate a CEMS which will comply with best available technology standards referenced in the European Commission's *Reference Document on the Best Available Techniques for Waste Incineration*[10], and that emissions will be readily attributable to the relevant facility. The proponent advised that the frequency and method for the monitoring of dioxins have not been predicted in the absence of an Australian Standard, however it is aware of the monitoring parameters outlined in the EU WID criteria (Article 11), and has committed to monitoring as outlined above.

The proponent advised that the frequency of monitoring will be increased or decreased based on a review of monitoring data. The proponent advised that it envisages that the monitoring schedule for metals and other HAPs would occur on a similar basis to that for dioxins unless there are concerns that emissions performance is not satisfactory. It is understood that the proponent is a member of the KIC, and that it will have access to the KIC's monitoring data.

In response to the appeals, the EPA advised that background air quality data collected from a number of monitoring stations throughout Perth, Kwinana, south-west of WA, Kalgoorlie and Midwest regions by the former DEC between 2005 and 2010 was used for the modelling. The EPA advised that the DER considered this data to be appropriate (as indicated on page 12 of Report 1513). The EPA advised that Entech has engaged suitably qualified independent consultants to undertake the emission tests in accordance with applicable guidelines. The EPA advised that stack emissions testing can only be conducted with the equipment that conforms to relevant standards and guidelines and a detailed knowledge of procedures. The EPA advised that it considers that the DER has the appropriate legislative powers to ensure the proposed facility is suitably managed. The EPA advised that it has provided recommendations to the DER in Section 5 "Other Advice" of its report to assist the DER in ensuring acceptable performance of the proposed facility under the works approval and licensing process under Part V of the EP Act.

Noting the above, it is considered that the EPA has had regard for the currency of air quality data used in the modelling, and for Entech's emissions testing data, in its assessment of the proposal. It is also considered that the DER can set air quality limits and requirements for monitoring, and regulate emissions, through its works approval and licensing process.

[9] Department of Environment Regulation (2014) *2013 Western Australia Air Monitoring Report – Written to comply with the National Environment Protection (Ambient Air Quality) Measure*. Dated May 2014. Government of Western Australia.
[10] European Commission (2006) *Integrated Pollution Prevention and Control: Reference Document on the Best Available Techniques for Waste Incineration* (European Commission, 2006). Prepared in accordance with EU Directive 96/61/EC of the European Parliament and of the Council of 24 September 1996 on integrated pollution prevention and control (replaced by EU Directive 2008/1/EC of 15 January 2008 of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control; updated by EU Directive 2010/75/EU).

1.2: Independent testing

Appellants submitted that the proponent's response to public submissions[11] (Response to Submissions) states "*Synergetics indicated that the emission rates used for source configuration were derived from the Entech design report based on heat and mass balance calculations*". Appellants submitted that independent testing of gaseous emissions was not conducted for the technology proposed.

The proponent advised that it commissioned an independent engineering review of the Entech technology as part of its due diligence process for project investors. It is understood that the review contained commercially sensitive information which cannot be released publicly, however it is noted that the proponent provided the executive summary of the review[12] to the EPA as Attachment 2 of the Response to Submissions. The proponent advised that the review endorses the claimed performance of the technology and was of the view that it is unrealistic to expect fully independent verification of detailed design information that is commercial in confidence. The proponent considered that it has disclosed more detailed design information than any similar facility has been assessed in WA, and that it expects that it will be judged by the performance claims it has made and be held to them through the permitting and approval process. The proponent advised that if the performance information used in the design and cited in the PER Document are not realistic, then the proposed facility will not be able to operate.

It is noted that a peer review of the Air Quality Impact Assessment and its Addendum has been undertaken. The EPA's advice that Entech has engaged suitably qualified independent consultants to undertake the emission tests in accordance with applicable guidelines is noted. It is understood that stack emissions testing can only be conducted with the equipment that conforms to relevant standards and guidelines and with a detailed knowledge of procedures.

1.3: Fine particulate matter

Appellants submitted that the PER Document states "*It is clear that all thermal combustion processes including gasification have the potential to emit nanoparticles …*". Appellants submitted that some dangerous emissions, such as fine particulate matter, have not been considered and have been excluded from monitoring requirements. Appellants submitted that it appears that the proponent may be required to measure PM_{10} particulates, but nothing smaller. Appellants submitted that the EPA should require the proponent to report on emissions of $PM_{2.5}$ and $PM_{0.1}$ particulates.

It is noted that sub-section 9.5.4.6 of the PER Document considers nanoparticles. It is noted that Technical Appendix H of the PER Document contains a nanoparticle literature review[13] (Nanoparticle Literature Review), which states "… *the literature clearly shows that particles in the sub 100 nm range can be generated and emitted from gasification processes*". The Nanoparticle Literature Review concludes "*Therefore, in the absence of regulatory approved methods and assessment framework, it is recommended that the available (and evolving) technologies for sampling, monitoring and end-of-pipe removal of submicron particulates are reviewed periodically. That will ensure NEC is well prepared in the event that future environmental regulations include nanoparticle emissions*".

[11] Office of the Environmental Protection Authority (2014) *East Rockingham Waste to Energy and Materials Recovery Facility – Public Environmental Review – Assessment No. 1910 – Summary of Public Submissions*. Government of Western Australia.
[12] Hyder Consulting Pty Ltd (2013) *New Energy Corporation – Summary Report: Technical Due Diligence on Entech Gasification Technology*. Unpublished report prepared for New Energy Corporation Pty Ltd; dated 6 December 2013. Attachment 2 of the Response to Submissions.
[13] Synergetics Environmental Engineering (2012) *Review of literature on gasification derived nanoparticles for New Energy Corporation Pty Ltd*. Unpublished report prepared for New Energy Corporation Pty Ltd, dated July 2012.

It is noted that the matter of nanoparticles was raised in public submissions on the proposal, and that the Response to Submissions (pages 41-45) states that the proponent sought guidance from the Department of Health (DoH) prior to preparing the PER Document, and that the proponent will monitor developments in nanoparticle measurement and risk assessment to ensure that future regulatory requirements can be addressed.

The Response to Submissions (page 40) also notes the DoH's comments that the PER Document addresses air emission parameters to its satisfaction that it does not require monitoring for nanoparticles at this time, and that the DoH is monitoring developments of potential risks to health from leaching of nanoparticles from inappropriate handling of bottom ash.

The proponent advised that long-term monitoring in the Kwinana air shed for $PM_{2.5}$ indicated that the highest 24 hour average concentration was 31.6 µg/m^3 on 18 July 2006, which was associated with bushfire and or fuel reduction burns to the south and/or east. The proponent advised that the annual average for Kwinana and Rockingham was 7.5 µg.m^3, which is less than the NEPM advisory standard of 8 µg/m^3.

The proponent was of the view that truck movements attributed to the proposal will not significantly impact air quality, including PM. It is understood that the proponent consulted with the DER and the DoH in formulating the PER Document, and was advised that standards were not in place for fine particulate matter (PM_1, $PM_{2.5}$, nanoparticles) and that monitoring efforts should be directed to PM_{10}. It is noted however that the proponent has committed to undertaking monitoring of nanoparticles in the event that standards change. Such monitoring is required under the terms of an operating licence, and the proponent holds a similar position in terms of monitoring for either PM_1 or $PM_{2.5}$.

Consistent with the response to submissions, during the appeal investigation, the proponent advised that it will monitor developments in nanoparticle measurement and risk assessment to ensure that future regulatory requirements can be addressed. The proponent noted the DoH submission on the PER Document which stated that DoH does not require monitoring for particles at this time, but is monitoring developments of potential risks to public health from nanoparticles (e.g. inappropriate handling of bottom ash), and that this position is also supported in the WtE Strategic Advice. The proponent was of the view that most studies into the sources of atmospheric nanoparticles identify natural sources and internal combustion engines used in transport as the major sources of nanoparticles and it contended that due to the sophisticated AQCS required for WtE facilities, point sources such as the proposed facility proposed are a lesser concern. It is noted that this position is also endorsed in the WtE Strategic Advice.

In response to this ground, the EPA advised that the DoH considered that the PER Document addresses the air emission parameters to its satisfaction, and advised that monitoring for nanoparticles is not required at this time. The EPA advised, however, that the proponent should be made aware that the DoH is monitoring developments of potential risks to health from leaching of nanoparticles from inappropriate handling of bottom ash.

Noting the above, it is considered that the EPA has had regard for emissions of fine particulate matter in its assessment of the proposal and consistency with the WtE Strategic Advice. The proponent's commitment to monitor developments in nanoparticle measurement and risk assessment is also noted. It is also noted that the design and commissioning of the proposed facility will be regulated by the DER under Part V of the EP Act through the works approval and licensing process, and that emissions will be considered by the DER in its assessment and regulated accordingly.

1.4: Contributing/influencing factors

Appellants submitted that the impacts from rain and other factors including increased emissions from traffic have not been considered in the emissions modelling. Appellants submitted that it is possible that rainfall, in removing toxins from the airshed, might actually concentrate toxins on or in the soil. Appellants submitted that the EPA should require the proponent to investigate emissions from vehicles accessing the proposed facility.

It is noted that sections 5.9 (page 44) and 9.3.4 (page 89) of the PER Document indicate that the majority of the proposed facility's surface will comprise a sealed hardstand with bunding as appropriate, and that stormwater runoff from the hardstand will be directed to lined settling ponds prior to discharge to infiltration basins to quarantine spills.

It is noted that the impacts of wind dispersion and rain on emission deposition was raised in public submissions on the proposal. The Response to Submissions states that the modelling represents worst case predictions using meteorological data accepted by the DER as representative of the Kwinana area, and that predicted concentrations comply with relevant criteria (page 11). The Response to Submissions also states that modelling undertaken by Synergetics used the Ausplume model with hourly meteorological data sourced from information collected by the KIC, and that rain is not considered to be a significant factor compared to those used in the modelling (wind and terrain) (page 61).

The EPA advised that the modelling conducted predicts worst case conditions and assumes contaminant concentrations conservatively, including that they do not decompose, deposit on the ground or get washed out by rain. The EPA advised that the proponent considers that inclusion of factors including atmospheric deposition or washout by rain will further reduce the predicted airborne concentrations. The EPA advised that increased emissions from traffic were considered unlikely to have a significant impact on traffic congestion or pollution and have not been included in the modelling, and that it is expected that Patterson Road will only result in a 0.38% increase in traffic congestion as a result of the proposal. It is noted that Report 1513 notes that the air dispersion modelling results predicted compliance with the relevant air quality criteria for operational and emergency shutdown events.

In response to the appeals, the proponent advised that there is no evidence that rain is likely to concentrate pollutants and cause greater health issues than when it is airborne. The proponent advised that notwithstanding this, predicted concentrations of airborne emissions comply with relevant assessment criteria.

It is noted that the proponent's modelling has taken into account worst case conditions, including the impacts of rain. It is also considered that the EPA has had regard for contributing/influencing factors including rain, and for the modelling's consideration of these, in respect to pollutant impacts.

1.5: Monitoring (commissioning)

Appellants submitted that the proponent claims there is a contractual requirement to demonstrate achievement of the design emissions performance after 24 months of operation, and submitted that there is uncertainty regarding the process for monitoring the performance of the proposed facility during commissioning.

Appellants submitted that there is uncertainty regarding the time taken for carbon conversion to syn-gas and the emissions produced following cessation of waste. Appellants submitted that the PER Document states that up to 80% of the carbon will be converted to syn-gas in the first 15 minutes, however elsewhere the proponent claims this time is 5 minutes.

Appellants submitted that the EPA should require the proponent to clarify the nature of emissions during the 60-minute period between cessation of waste feed and standby with no emissions, and these should be factored into the total emission data for worst case scenarios.

In respect to the monitoring of the proposed facility's performance during commissioning, it is noted that section 5.7.2.2 of the PER Document refers to the AQCS and CEMS stages of the process, and states that specific source emissions monitoring and verification can be implemented through the works approval and licensing process under Part V of the EP Act and consistent with the EU WID (pages 40-41).

It is noted that the matter of monitoring during commissioning was raised in public submissions on the proposal, and is addressed in the Response to Submissions (pages 49-50 and 56).

The proponent advised that all recent Entech projects incorporate a contractual requirement for Entech to demonstrate achievement of the design emissions performance after 24 months of operation and that failure to achieve this performance requirement results in a contractual default, however there have been no examples where such a default has occurred despite more than 46 installations since the early 1990s. The proponent referred to section 5.7.2 of the PER Document, which states that periodic measurement of emissions into air and water must be carried out representatively and according to European Committee for Standardisation standards, that details relating to this will be addressed with the DER during the licencing process under Part V of the EP Act, and that emissions results will be published on its project website (page 41). The proponent considered that stack testing will be performed by an independent contractor/consultant.

The EPA advised that the Air Quality Impact Assessment modelled emissions data corresponding to two scenarios of operation and emergency shutdown. The EPA advised that for each scenario, the emission rates of the pollutants were calculated using a heat and mass balance analysis and an assumed waste composition typical of unsorted municipal waste, and that the emission rates for the by-pass operation were calculated on an hourly basis by applying appropriate weighting to the three time-intervals in the by-pass cycle for up to 60 minutes. It is understood that the emissions from the gasification facility for both operational and by-pass scenarios were modelled by assuming a continuous 24 hour operation for the entire year, although a by-pass event is expected to be less than one hour every five years. It is also understood that key pollutants analysed included CO, NO_x, sulphur dioxide (SO_2), particulate matter, chlorine (Cl), fluorine (Fl), organic compounds, dioxins, heavy metals, mercury (Hg), cadmium (Cd) and thallium (Tl).

In respect to the times for carbon conversion to syn-gas, it is noted that section 5.7.2.1 of the PER Document states "*The process control system will be capable of charging a metered quantity of waste to each gasifier unit every 15 minutes in an hour long cycle that produces a uniform volume of syngas to the syngas burner and results in stable energy delivery to the boiler/alternator system*" (page 37).

It is understood that Entech advised the proponent that approximately 80% of the volatile materials in each batch of fuel, including most of the acid gases, are released within 15 minutes of the fuel entering the pyrolytic gasification chamber. The proponent referred to section 5.7.2.2 of the PER Document, which describes the process in the event of a boiler failure (page 43).

In respect to emission rates during operational and emergency shutdown, it is noted that sections 5.7.2.2 and 9.5.5.5 of the PER states refer to the shutdown process, and state that up to 80% of the carbon will be converted to syn-gas in the first 15 minutes with the remainder being created over the remaining residence time of the waste in the gasifier, and that overall gas flows to the syngas burner are reduced to around 20% of normal flows within 15-20 minutes of the cessation of waste feed (pages 43 and 109). It is also noted that section 9.5.3.2 states that gas volumes will further reduce to less than 10% of normal operational flows within 60 minutes (page 95).

The proponent advised that emission rates during shutdown are shown in Table 38 of the PER Document (page 99). The proponent advised that if an emergency shutdown occurs through the bypass stack, it is anticipated that emissions will continue for a maximum duration of approximately 60 minutes from the initiation of the shutdown event. The proponent advised that within 60 minutes syn-gas production will drop to a level where the gasifiers can be shut down and supplementary firing of the syn-gas burner will cease. The proponent advised that this approach means that during the 60 minutes following activation of the by-pass stack, the emission quality from the by-pass stack will rapidly approach that of a natural gas boiler as syn-gas production decreases and supplementary firing increases. The proponent advised that once it is safe to shut down completely, emissions will halt. The proponent advised that despite the increased emission concentrations, modelling shows that ambient assessment criteria are not exceeded even when based on the conservative assumption of continuous emissions from the by-pass stack, and that this is largely because of enhanced plume rise associated with the emissions from it.

The EPA advised that a waste residence time of between 16 hours and 24 hours in the pyrolytic gasification chamber ensures that all waste is fully gasified and any resultant ash is suitably inert. This allows process conditions to be monitored and changes affected when required. The EPA advised that the proposed facility would be shut down before any breach of ambient air quality has occurred.

In assessing the proposal, the EPA were satisfied that the DER can specify in the works approval under Part V of the EP Act that the proposed WtE facility be constructed and commissioned to meet the requirements of the EU WID for key pollutants. In this regard, it is noted that the proponent will adopt a staged commissioning approach and emissions performance would be demonstrated at each stage prior to moving onto the next stage. This will be regulated by the DER through the works approval and licensing process under Part V of the EP Act, and would ensure that the proposed facility can achieve the design performance stated and that all emissions comply with the EU WID.

Details of the works approval and licensing process for the proposed facility, particularly in relation to staged commissioning, are provided in Appendix 5 of Report 1513.

It is noted that Part V of the EP Act provides for public comment on applications for works approvals and licences, and an opportunity for third party appeals in respect to the conditions applied to those instruments if issued. It is also noted that if the DER's assessment of an application determines that the environmental risks posed are unacceptable the DER can refuse to issue a works approval or licence, and that if an instrument is issued it will be subject to appropriate conditions to mitigate environmental impacts.

Noting the above, it is considered that the EPA has had regard for matters relating to monitoring during commissioning, and the key pollutants, in its assessment of the proposal. As discussed above, it is also noted that the DER can regulate air quality limits and requirements for monitoring and regulate emissions through its works approval and licensing process, and can require a staged commissioning approach to ensure that the proposed facility can operate in an environmentally acceptable manner.

1.6: Cumulative impacts (additional facilities)

Appellants submitted that the EPA has not thoroughly assessed the cumulative air quality impacts of the proposal in combination with the proposed Kwinana WtE facility. Appellants submitted that the proponent has incorrectly claimed that the distance between the proposed facilities suggests there will be little overlap in emissions profiles, and that it is not possible for it to account for the emissions of the proposed Kwinana WtE facility, on the basis that the PER document for the Kwinana WtE facility was published before the EPA published Report 1513. Appellants submitted that the wind variability may result in mingling of emissions.

It is noted that the cumulative impacts of two proposed WtE facilities in the Rockingham/Kwinana area (including in respect to traffic) was raised in public submissions on the proposal. The Response to Submissions addresses this matter through reference to the modelling and predicted ground-level concentrations, installation of CEMS and emission control systems, monitoring by the Kwinana Ambient Air Quality Monitoring Network, emissions criteria, and separation distance (pages 16 and 19), and states that the traffic study indicates that the potential increase in traffic for both facilities is not expected to have a significant impact on traffic congestion or diesel pollution (pages 83-85).

It is understood that the proposed Kwinana WtE facility will need to meet similar standards as this proposal to comply with the EU WID emission criteria, and that the limit values set by the EU WID are designed to prevent or limit negative effects on the environment and risks to human health.

The proponent advised that best available techniques for the combustion of municipal solid waste and air pollution control ensure that actual emissions from modern WtE facilities are well within EU WID and the EU Industrial Emissions Directive 2010/75/EU[14] limits. The proponent advised that both proposed facilities have low levels of emissions and do not significantly add to the background contaminant levels in the Kwinana and Rockingham airsheds, and was of the view that the combined emissions would unlikely to deleteriously affect air quality for the region. The proponent advised that there is a 4 km separation distance between the two proposed facilities and that their plumes will seldom coincide (except in the case of infrequent northerly winds, which would result in the plume being directed to the south over the Rockingham Industrial Zone).

The proponent reiterated its advice that the KIC's Kwinana Ambient Air Quality Monitoring Network will continue to monitor background concentrations of key pollutants on a continuous basis and that it will have access to this data. The proponent also advised that will negotiate with the DER during the works approval process under Part V of the EP Act in respect to an environmental monitoring program which will provide key data including emissions and ambient monitoring.

The EPA advised that the proposed Kwinana WtE facility is located approximately 4 km north of the proposal, and is currently under assessment at the level of PER which is the highest level of assessment. The EPA advised that as noted in Report 1513, proponents are expected to detail and predict through modelling, the impacts of their proposals, including cumulative impacts. The EPA advised that assessment of the proposed Kwinana WtE facility will need to address cumulative impacts from existing sources and the proposal.

Noting the above, it is considered that the EPA has had regard for the cumulative impacts of the two proposed WtE facilities within the Rockingham/Kwinana area in its assessment of the proposal. The EPA's advice that the proponent of the proposed Kwinana WtE facility is required to address cumulative impacts, is also noted, as is the EPA's advice to the DER in Report 1513 that it supports the continued implementation by the DER and industry of the program to address ongoing issues of cumulative impacts of emissions.

1.7: Impacts to human health

Appellants submitted that the EPA has not properly considered the cumulative impacts of emission limit values of pollutants on human health, the potential for the proposal to contaminate nearby crops, or epidemiological evidence of health issues affecting residents of Kwinana, and has not required the proponent to undertake studies of the health effects of combinations of up to 22 toxic pollutants that may be unavoidably emitted when the proposed facility is operating. Appellants submitted that the proposal is located too close to residences, workplaces and nearby caravan parks to be considered safe, and should be relocated to a more suitable and remote location.

[14] European Union Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control).

Appellants also submitted that the precautionary principle[15] has not been asserted appropriately as incinerators have been linked to health and environmental impacts.

During a meeting with the staff of the Office of the Appeals Convenor, appellants submitted that the EPA has not considered the impact of accumulated toxins and combinations of toxins on human health, both of nearby residents and of workers in the area, or the deposition and accumulation (and subsequently the impacts on human health) of particulates within soil.

In respect to general health impacts related to air pollution from incinerators, the proponent considers that it would be meaningless to compare different technology or emission outputs with Entech WtGas-RES™ technology.

In respect to the appropriateness of the proposal's location, the separation/buffer distance between the proposal and residences/sensitive receptors, and the exposure of workers in industrial areas, it is noted that these matters were raised in public submissions on the proposal.

The Response to Submissions (page 15) states that the Rockingham Industrial Zone was planned to provide adequate buffers for industrial purposes, and that the proposal's location meets the recommended separation distance of 500-1,000 metres for industry based on incineration stated Guidance Statement No. 3 *Separation Distances between Industrial and Sensitive Land Uses*[16]. The Response to Submissions states that (predicted) air and noise emissions from the proposed facility comply with all relevant assessment criteria and will not impact adversely on health, amenity or the environment. The Response to Submissions also states that the Entech design incorporates low NO_x burners and flue has recirculation, that NO_x are within the recommended emission criteria, that modelling and specifications from Entech indicate that emissions can be adequately controlled and will not impact on the health of the Kwinana and Rockingham communities, and that works approval and licensing conditions will ensure this.

The proponent considers that the Rockingham Industrial Zone is appropriately zoned and infrastructure plans in place to allow environmentally approved projects to be located within it, and has ready access to roads, water, natural gas, power and port facilities. The proponent was of the view that the zoning incorporates buffers to residential areas to ensure that adequate separation distances are in place. The proponent advised that the close proximity of power transmission infrastructure and ready access to major road haulage routes were key factors in site selection as this will reduce the environmental and economic costs of operating the proposal.

The proponent advised that the modelling and specifications from Entech indicate that emissions can be adequately controlled and will not impact on the health of the Kwinana and Rockingham communities. The proponent considers that modelling demonstrates that emissions from the proposal will have minimal impact on air quality anywhere in the local airshed, and that conditions imposed by the DER during the works approval and licencing process under Part V of the EP Act will ensure this position is maintained throughout the operational life of the proposed facility. The proponent was of the view that, given the extensive operating experience with the gasification system and the proven track record of modern AQCS for WtE facilities, the proposed facility will operate reliably and will not have an adverse impact on the amenity or environment of two caravan parks located within 2.5 km of the proposed facility. The proponent advised that bottom ash from the gasifier will be discharged inside sealed buildings into enclosed bins and stored pending sampling and analysis, that solid residues from the ACQS will be handed similarly, and that there is no risk for these materials to become airborne outside the proposed facility.

[15] *Environmental Protection Act 1986*: section 4A Object and principles of the Act: 5. The precautionary principle: Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decisions should be guided by (a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and (b) an assessment of the risk-weighted consequences of various options.

[16] Environmental Protection Authority (2005) *Guidance for the Assessment of Environmental Factors Western Australia (in accordance with the Environmental Protection Act 1986): Separation Distances between Industrial and Sensitive Land Uses*. Guidance Statement No. 3, dated June 2005. Government of Western Australia.

It is understood that solid waste from the AQCS and bottom ash from the gasifiers will be tested for composition before disposal method is determined, and that preferentially the material will be used for a beneficial use or recycled. If contaminant levels indicate that this is not possible, the material will be appropriately disposed of in a Class 2, 3 or 4 landfill; the ash will not be exposed to situations where it is likely to become wind borne.

The EPA's advice in respect to the proposal's location and separation distances mirrored that presented in the Response to Submissions. The EPA advised that while the proposal is based on gasification technology, it is satisfied that the proponent has justified its location with reference to the 500-1000 metre separation distance recommended for industry based on incineration.

In respect to analysis of the cumulative impacts of pollutants, it is noted that section 9.5.4.3 of the PER Document states that the predicted ground-level concentrations at the off-site receptors considered for operational and by-pass emission scenarios in the Air Quality Impact Assessment fell within the assessment criteria (page 100). Section 9.5.4.7 of the PER Document states that the long-term emissions of air toxics were also considered in the Air Quality Impact Assessment, and that an assessment of the potential for bio-accumulation of emissions is not necessary because the air quality standards for persistent pollutants set limits that are sufficiently low that they will not cause adverse health effects if individual are exposed to them on regular basis (page 106). Section 9.5.4.7 also states that the DoH advised that emissions, including secondary routes of exposure which can arise as a consequence of bioaccumulation and ingestion of foods grown on nearby properties, are unlikely to cause health effects provided they remain consistently below the recommended air quality health based references for the life of the proposed facility.

It is noted that the matter of ground-level concentrations of pollutants was raised in public submissions on the proposal, and that the Response to Submissions (page 46-47) states "*Given the very small incremental increase over existing background concentrations resulting from plant emissions in normal conditions, the absence of background data for all parameters is not regarded as a significant matter*" and "*The pollutants that have been assessed in the New Energy proposal are ubiquitous in the environment and have been extensively studied. Most, if not all are already present in the natural soils of the Kwinana area or are emitted to the atmosphere or soil as a result of combustion and other processes from industry and transport sources* …".

The proponent advised that modelling presented in the PER Document indicates that the emission control systems will prevent unacceptable discharge of pollutants to ensure that cumulative impacts are adequately managed. It is understood that the modelling was assessed by the DER's Air Quality Branch and the EPA and found to be "accurate and protective of the environment". The proponent advised that best practice technologies will be employed, under both steady state and non-steady state operating conditions to meet the equivalent of the emissions standards set in the EU WID. It advised that compliance with the EU WID is considered to provide adequate protection to human health and the environment by ensuring that the risk of toxic emissions is minimised through layers of control measures, and that the use of CEMS at the proposed facility and an Emissions Modelling System (EMS) will maintain a high standard of operation and maintenance.

The EPA also noted that air quality modelling and assessment demonstrates that air quality impacts in the region surrounding the proposed facility will comply with the National Environment Protection Measure (NEPM) standard and other relevant guidelines for standard operation and emergency shut-down scenarios. The proposed facility will also require a works approval and licence from the DER under Part V of the EP Act, which will specify emission limits and monitoring requirements including compliance with the EU WID emission standards.

The EPA advised that it and the Waste Authority released their strategic review on the environmental and health performance of WtE technologies in the WtE Strategic Advice, which concluded that modern WtE facilities can operate within strict emission standards with acceptable environmental and health impacts to the community. It is noted that the recommendations from this strategic review were taken into consideration during its assessment of the proposal.

In respect to the precautionary principle, the proponent advised that the process of planning for the proposed facility and preparation of the PER Document has resulted in detailed and rigorous investigations, modelling and examination of data. The proponent is of the view that the systems that are proposed, including ongoing monitoring via a licenced process will ensure that the proposed facility meets its stated targets.

Noting the above, it is considered that the EPA's assessment of the proposal considered impacts on human health, including from the cumulative impacts of emissions, bioaccumulation of pollutants, and separation distances.

1.8: Greenhouse gases

Appellants submitted that the data presented in the PER Document did not account for the greenhouse benefits derived from diverting recyclable materials through the proposed MR facility. Appellants submitted that the Waste and Resource Assessment Tool for the Environment (WRATE) system used to analyse carbon dioxide production was designed for comparing different management systems for the treatment municipal solid waste, but not for comparing with alternative energy generation. Appellants submitted that greenhouse gases generated in transporting wastes to the proposed facility, or energy lost through the burning of combustibles, have not been considered.

It is noted that greenhouse gas is discussed in section 9.6 of the PER Document. Section 9.6 outlines expected sources of greenhouse gas emissions, and provides calculations of estimated CO_2-e emissions. Section 9.6 concludes "*The establishment of this facility is consistent with the EPA's objective of reducing emissions of greenhouse gases*". Appendix 17 of the PER Document contains greenhouse (carbon) emissions methodology and calculations[17,18]; it is noted that the proponent used the National Greenhouse and Energy Reporting System Technical Guidelines[19] section on waste incineration to calculate carbon emissions for the proposal.

It is noted that greenhouse gas emissions was also raised in public submissions on the proposal, and that section 6 of the Response to Submissions addresses this matter. It is noted that the Response to Submissions includes a greenhouse gas assessment undertaken by SLR Consulting Australia Pty Ltd (undated)[20] (Greenhouse Gas Assessment), which concludes that the proposal "… *will result in a significant reduction in greenhouse gases when compared to the current practice of landfilling waste. It also provides a better outcome over other alternative waste treatment options and is consistent with the EPA's objective of reducing emissions of greenhouse gases*".

The proponent was of the view that the proposal will result in a significant reduction in greenhouse gases when compared to the current practice of landfilling waste, and that it provides a better outcome over other alternate waste treatment options, consistent with the EPA's objective of reducing greenhouse gas emissions.

The proponent asserted that the Greenhouse Gas Assessment is valid in its assessment of greenhouse gas emissions and savings relative to waste being sent to landfill. It is understood that greenhouse gas emissions for trucks transporting waste have not been included in calculations as transport of the waste would also have occurred if the material was sent to landfill and typically over greater distances.

[17] New Energy Corporation Pty Ltd (undated) *Carbon Emissions Methodology*. Appendix 17a of the PER Document.
[18] New Energy Corporation Pty Ltd (undated) *Greenhouse Emissions Calculations*. Appendix 17b of the PER Document.
[19] Department of Industry, Innovation, Climate change, Science, Research and Tertiary Education (2013) *National Greenhouse and Energy Reporting System Measurement - Technical Guidelines for the estimation of greenhouse gas emissions by facilities in Australia*. Australian Government.
[20] SLR Consulting Australia Pty Ltd (2013) *New Energy's East Rockingham Resource Recovery Facility – Greenhouse Gas Assessment*. Unpublished report prepared for New Energy Corporation Pty Ltd, dated November 2013.

The EPA advised that the Greenhouse Gas Assessment determined that the proposed facility will be a carbon sink over its life and considered that the proposed facility will emit significantly less carbon dioxide compared to waste being disposed to landfill. The EPA advised that the proposed facility is also designed to operate as a base load facility, hence comparisons of greenhouse gas emissions have been compared to coal fired power generation, which is the main base load power source in the South West Interconnected System.

It is understood that the WRATE is a peer reviewed assessment tool developed by the United Kingdom Environment Agency, and is used for modelling carbon and environmental impact of waste. The EPA advised that the Greenhouse Gas Assessment has compared the carbon impact of four waste management scenarios, including landfill, mass burn incineration, and gasification with and without an MR facility. The EPA is of the view that this is considered reasonable as the WRATE is designed for use to compare different management systems for the treatment of municipal solid waste.

It is also understood that the transport of waste is not anticipated to significantly increase greenhouse gas emissions, as traffic movements of waste to landfill would be redirected to site.

Noting the above, it is considered that the EPA has had regard for greenhouse gases in its assessment of the proposal.

Recommendation

Noting the above, it is considered that the EPA correctly identified 'Air Quality' (including in respect to 'Human Health') to be a key environmental factor relevant to its assessment of the proposal. It is also noted that the issues of background air quality data, nanoparticles, the impacts of wind dispersion and rain on emission deposition, monitoring during commissioning, the cumulative impacts of two proposed WtE facilities in the Rockingham/Kwinana area, the proposal's location, the separation/buffer distance to residences/sensitive receptors, exposure of workers in industrial areas, ground-level concentrations of pollutants, and greenhouse gas emissions, were previously considered by the EPA through public submissions on the proposal.

It is understood that the proposed facility and its commissioning will be regulated under Part V of the EP Act, and that the DER will require staged commissioning and set emissions limits and targets and monitoring requirements through the works approval and licencing process to ensure that the proposed facility can operate in an environmentally acceptable manner. It is also noted that ongoing monitoring of air quality in the area will be undertaken by the Kwinana Ambient Air Quality Monitoring Network, and that the proponent has committed to installing a CEMS and to monitor developments in respect to nanoparticles.

It is therefore recommended that the Minister dismisses this ground of appeal.

GROUND 2: INLAND WATERS ENVIRONMENTAL QUALITY (WASTE WATER)

Appellants submitted that the proponent and the EPA should specify the quantities of 'blow-down' waste water that are to be disposed of into the sewer system, and the toxic pollutants that are contained within it. Appellants questioned whether the sewer is an appropriate method of disposing of the waste water given it will end up in the water off Shoalwater and may contaminate aquatic plants, animals and people.

The EPA's objective for the factor 'Inland Waters Environmental Quality' is "*To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected*". It is noted that the EPA considered 'Inland Waters Environmental Quality' to be a preliminary environmental factor which was relevant to its assessment of the proposal, but did not consider this factor to be a key environmental factor warranting discussion and evaluation. It is noted that Appendix 3 of Report 1513 states:

> All waste received at the MRF will be delivered in sealed containers or covered vehicles and sorted within enclosed buildings. Liquid waste from the plant would be injected into the gasifier, collected for offsite disposal or disposed via a sewer. **Not considered to be a key environmental factor.**

It is noted that sections 5.17.2 and 9.5.3.1 of the PER Document discuss the management of waste water, and that section 9.7.5.5 outlines the management of Liquid Wastes generated on the proposed facility including sewerage and grey water, wash-down water, and reject water from the water treatment system.

It is noted that matters relating to waste water management were raised in public submissions on the proposal. The Response to Submissions notes that [some] waste water will be directed to the Woodman Point Waste Water Treatment Plant discharging though the Sepia Depression Ocean Outlet Landline at Peron Point (page 32). The Response to Submissions states that the Site Drainage and Groundwater Management Plan will further develop contingencies for management of water from fire-fighting activities (page 33), and that where feasible, wash-down water will be captured, treated and reused or injected into the gasifiers for disposal, that clean stormwater will be kept separate from process water and directed to ponds for treatment and infiltration, that a lined pond will allow for isolation of polluted water in case of an emergency or spill, and that waste water generated by the administration building will be directed to the reticulated sewer system (pages 34-35).

The proponent advised that blow-down waste water produced from the boiler will be recovered, treated and re-used where possible, and that when the desired water quality cannot be achieved for re-use, the blow-down waste water will be managed via one of three methods: evaporation through the gasifier; thermal evaporation using waste heat from the gasifier; or disposal to reticulated sewer. The proponent advised that 2.5 kilolitres (kL)/day will be used as wash-down water in waste handling areas, and that 5-7 kL of water will be blown down from the boiler steam circuit and recovered by blending with incoming scheme water entering the treatment facility to reduce the quantity of reject water from the reverse osmosis facility (if reverse osmosis technology is used). It advised that the Water Corporation has acceptance criteria for waste water entering the reticulated system, which is determined case by case based on the National *Guidelines for Sewerage Systems: Acceptance of Trade Waste (Industrial Waste)*[21], and that this detail will be determined during the works approval process.

It is understood that groundwater monitoring will be undertaken quarterly for the first two years with subsequent six monthly monitoring.

[21] Agriculture and Resource Management Council of Australia and New Zealand and the Australian and New Zealand Environment and Conservation Council (1994) *Guidelines for Sewerage Systems: Acceptance of Trade Waste (Industrial Waste)*. November 1994. Commonwealth of Australia.

In response to appeals, the EPA also advised that waste water generated from the proposed facility will be directed to the reticulated sewer system subject to meeting Water Corporation requirements, and will not be treated onsite. It is understood that minimal quantities of leachates generated from the waste storage area are expected, due to the highly absorptive nature of waste. The EPA also advised that small quantities of liquids that are generated will be tested before being directed to either the sewer or the gasifier system.

Recommendation

Noting the above, it is considered that the EPA has had regard for the disposal of waste water in its assessment of the proposal. It is also noted that the issue of waste water management was previously considered by the EPA through public submissions on the proposal.

It is considered that the proponent's adherence to its commitments to test and re-use or appropriately dispose of process water will ensure that contaminated waste water is not inappropriately disposed of off-site. It is understood that the discharge of process water to the environment may require approval under Part V of the EP Act.

It is therefore recommended that the Minister dismisses this ground of appeal.

GROUND 3: AMENITY (TRAFFIC)

Appellants submitted that the EPA has not had proper regard for the proposal's impacts in respect to increased traffic congestion and motor vehicle accidents in the area.

The EPA's objective for the factor 'Amenity' is "*To ensure that impacts to amenity are reduced as low as reasonably practicable*". It is noted that the EPA considered 'Amenity' to be a preliminary environmental factor which was relevant to its assessment of the proposal, but did not consider this factor to be a key environmental factor warranting discussion and evaluation. It is noted that Appendix 3 of Report 1513 states:

> New Energy has provided further information regarding sound power levels and noise amelioration measures. The DER has confirmed that the facility can meet the noise regulations provided the noise amelioration measures proposed by the proponent are included. New Energy has provided clarification regarding the odour report. Worst case scenario odour contours will not extend over the northern boundary of the development envelope. Comments relating to odour have been addressed in detail in the Response to Submissions document in Appendix 6. **Not considered to be a key environmental factor.**

It is noted that section 5.12.1 of the PER Document (page 44) states "*It is anticipated that approximately 90 trucks (typically 20 to 36 tonne capacity) will arrive at the facility per day, six days per week to deliver waste. Based on the operating hours of 06:00 hours to 16:00 hours, this equates to nine trucks per hour attending the weighbridge. In addition to trucks bringing waste to the facility, up to five trucks per week will enter and depart the facility to transport materials and remove gasification unit residue for disposal*". It is also noted that section 7.12.3 (page 81) refers to traffic and transport,

It is noted that impacts to traffic was raised in public submissions on the proposal. The Response to Submissions states that traffic on Patterson Road will increase by 0.38% or 142 movements from 37,161 movements per week (page 66), and that consideration of all vehicular movements generated by the operation (inbound and outbound) will include 182 truck movements per day, and 60 light vehicle movements per day, six days per week (page 83-86). It is also noted that Attachment 9 of the Response to Submissions contains a transport impact assessment[22] (Transport Impact Assessment) which analysed intersection capacity of Mandurah Road/Office Road and Patterson Road/Office Road.

The proponent was of the view that the Transport Impact Assessment predicted that the changes in operational performance of the affected intersections associated with the proposed development are minimal in the context of the boundary road network intersections with only minor impacts on the existing vehicular queuing and delays. It is understood that the Transport Impact Assessment concluded that the road network around the proposed facility has been designed to accommodate increases in background traffic associated with development of the Rockingham Industrial Zone, which will be fully implemented over time. The proponent was of the view that the proposal design will easily accommodate the site specific traffic generated by the project.

The EPA advised that, according to the Transport Impact Assessment, the roads that will be used for access to the proposed facility include the Kwinana Freeway, Mundijong Road (including proposed western extension), Mandurah Road and Office Road; that trucks leaving the site will veer left into Office Road and then into Patterson Road; that it is predicted that all vehicular movements from operations would include 182 truck movements and 60 light vehicle movements per day, six days per week; and that the anticipated increases in traffic on the boundary road network would amount to an increase of 1.5% daily traffic on Mandurah Road, a 3.5% increase on Office Road, and a 0.36% increase on Patterson Road. The EPA considered that significant impacts on the existing traffic operations are not expected.

[22] Shawmac Pty Ltd (2013) *Transport Impact Assessment – Proposed Materials Recovery and Waste Conversion Facility – Lot 1, Office Road, East Rockingham*. Unpublished report prepared for New Energy Corporation Pty Ltd, v2 dated September 2013. Attachment 9 of the Response to Submissions.

Recommendation

Noting the above, and having regard to the findings of the Transport Impact Assessment, it is considered that the EPA has had due regard in its assessment of the proposal for potential increases in traffic as a result of the proposal's implementation, and was satisfied that the proposal is not likely to result in significant impacts on existing traffic operation. It is also noted that the issue of impacts to traffic was previously considered by the EPA through public submissions on the proposal.

It is therefore recommended that the Minister dismisses this ground of appeal.

GROUND 4: RECOMMENDED CONDITIONS

Appellants noted that recommended condition 5-2 provides for data, such as breaching of emission limits, to be considered 'confidential commercially sensitive information', and submitted that reports of ongoing monitoring should be made publicly available.

It is noted that Report 1513 states "*In order to provide transparency, the EPA recommends that the proponent makes near to real time data on emissions publicly available. This could be achieved by displaying the emissions on the proponent's website or at the site entrance*".

The proponent advised that data relating to any breach of emissions limits would not be considered 'confidential commercially sensitive information' in terms of reporting to the EPA/DER.

The EPA advised that recommended condition 5 ensures public availability of all environmental data relevant to the assessment of the proposal, subject to recommended condition 5-2 which provides an exclusion for data which may be considered a secret formula or process or is confidential commercially-sensitive information. The EPA advised that emissions data would not be considered to meet the confidential criteria, and that in order to provide transparency, Report 1513 recommends that the proponent makes near to real time data on emissions publicly available.

Recommendation

Noting the above, it is considered that the EPA has had regard for the public availability of non-sensitive data in its assessment of the proposal, has identified that emissions data is not likely to be confidential, and has recommended in Report 1513 that the proponent makes emissions data publicly available.

It is therefore recommended that the Minister dismisses this ground of appeal.

GROUND 5: EPA'S ASSESSMENT PROCESS

Appellants submitted that the EPA is not acting objectively, as it had previously provided the proponent with a US Navy review which was complementary to the technology provider for the proposal. Appellants submitted that it should be the proponent's own responsibility to locate this supporting information.

It is understood that the review to which appellants refer is that described in Technical Report TR-2367-ENV[23], which considered WtE technologies and made seven recommendations which generally support the diversion of waste from landfill.

In respect to the EPA's assessment process, Part IV of the EP Act makes provision for the EPA to undertake environmental impact assessment of significant proposals, strategic proposals and schemes. The scope of the EPA's assessment report is outlined in section 44(2) of the EP Act. In brief, if the EPA decides to assess a proposal, it must report to the Minister on the key environmental factors it has identified in the course of the assessment, whether or not it considers the proposal may be implemented, and any conditions which should apply to implementation of the proposal. The *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2012*[24] (Administrative Procedures) set out the principles and practices adopted by the EPA for dealing with referrals and assessing proposals under Part IV of the EP Act.

The EPA advised that Technical Report TR-2367-ENV is publicly available on the Department of Public Works of the County of Los Angeles website. The EPA advised that it and Office of the EPA frequently provide documents to proponents for information, particularly where it is contemporary and relevant to the assessment of the proposal.

The EPA advised that it aims to deliver the best environmental outcome for all proposals under its assessment, and a recommendation for a proposal is only made following a thorough environmental assessment to ensure its environmental objectives can be met. The EPA advised that it is an independent authority, and its operations are governed by the EP Act, which stipulates that its objective is to use its best endeavours to protect the environment and to prevent, control and abate pollution and environmental harm.

Recommendation

Noting the above, the question around the EPA's objectiveness in providing the proponent with information relating to its proposal, noting the environmental impact assessment provisions of the EP Act and the EPA's advice that it undertakes thorough environmental assessment of proposals prior to making recommendations in respect to them, appears to be without merit.

It is therefore recommended that the Minister dismisses this ground of appeal.

[23] Tseng, E. (2011) *Initiation Decision Report (IDR): Waste to Clean Energy*. University of California at Los Angeles Engineering Extension report to the United States Navy Naval Facilities Engineering Command Engineering Service Center (NAVFAC ESC), Technical Report TR-2367-ENV, dated 20 September, 2011.
[24] Environmental Protection Authority (2012) *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2012*. Government Gazette No.223 Special, 7 December 2012. Government of Western Australia.

GROUND 6: SUSTAINABILITY AND WASTE HIERARCHY

Appellants submitted that the waste hierarchy places energy recovery as the least desirable and least sustainable option which should only be utilised after all reuse and recycling options have been exhausted. Appellants submitted that minimising the generation of municipal solid waste should be the goal of the proposal, consistent with the principle of waste minimisation[25]. Appellants submitted that the need for the proposal is not adequately justified, and questioned the motives of the proponent and its major shareholder in the context of the principle of waste minimisation. Appellants also submitted that conditions should be recommended to ensure effective sorting of waste, to specify minimal proportional quantities for recovery of recyclable materials, and to ensure accountability for minimising the production of waste.

During a meeting with staff of the Office of the Appeals Convenor, appellants also submitted that the concept of WtE through thermal combustion destroys the resource, promotes a 'linear' (rather than 'circular') economy, and relies on plastics that could otherwise be recycled for their fossil fuel component. Appellants submitted that by recommending the proposal for approval, the EPA has not had regard for the matter of embedded energy and is undermining recycling opportunities.

It is understood that a waste hierarchy is set out in the *Waste Avoidance and Resource Recovery Act 2007*. It is noted that the WtE Strategic Advice identifies a number of principles key to the successful operation of WtE facilities including that waste sourced must target genuine residual waste that cannot feasibly be reused or recycled. The WtE Strategic Advice also states under recommendation 5 that the waste hierarchy should be applied, only waste that does not have a viable recycling or reuse alternative should be used as feedstock, and that conditions should be set to require monitoring and reporting of the waste material accepted over the life of a facility. In this regard it is understood that an operating licence will be required under Part V of the EP Act for the proposed facility, and that any licence issued by the Department of Environment Regulation (DER) can include conditions relating to monitoring and reporting of the waste material.

It is noted that section 4.2.1 of the PER Document (page 22) makes reference to waste sustainability in the context of policy framework, and notes that the *Western Australian Waste Strategy*[26] (WA Waste Strategy) utilises the waste hierarchy which promotes avoiding the generation of waste as the most favoured option, followed by maximising the use of existing materials by their reuse, reprocessing and recycling into alternative products, including recovery of any energy content, in preference to disposing of the material. Section 4.2.1 also states that the proponent acknowledges that the waste hierarchy considers 'energy recovery' as being only one step up from landfill in the waste hierarchy, and that due to Perth's remoteness from recycling markets and the high transport costs involved, access to the higher levels on the hierarchy (recycling and re-use) is impractical. Notwithstanding, it is noted that section 9.7.6 of the PER Document (page 118) states that the proponent "will manage all wastes in accordance with the waste hierarchy. In addition, the management approach for all wastes handled or generated on the site will be consistent with EPA objectives and will prevent adverse environmental impacts".

It is noted that energy recovery in the context of the waste hierarchy was also raised in public submissions on the proposal. The Response to Submissions refers to the Waste Authority's position statement on WtE[27] "*The waste hierarchy places energy recovery ahead of disposal*". The Response to Submissions also states that the proponent supports this position statement and echoes its intent, and that recycling initiatives will continue to be developed but will need to be economically feasible before they can contribute to overall waste management (pages 72-73).

[25] *Environmental Protection Act 1986*: section 4A Object and principles of the Act: 5. The principle of waste minimisation "*All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment*".
[26] Waste Authority (2012) *Western Australian Waste Strategy: "Creating the Right Environment"*. Dated March 2012. Government of Western Australia.
[27] Waste Authority (2013) *Waste to Energy Position Statement (Thermal Treatment)*. Position Statement, dated May 2013. Government of Western Australia.

In respect to WtE facilities creating a barrier to recycling and sustainable waste management, the proponent advised that the WA Waste Strategy states that steps are required to reduce the amount of material being sent to landfill, and that if recyclable materials are removed from the waste stream prior to energy recovery, the WtE process is a valid part of the waste hierarchy. The proponent advised that it is predominantly targeting waste streams that are being directed to landfill because they are unable to be recycled due to being co-mingled or so contaminated with organic materials that they are not marketable. The proponent advised that in contrast to mass burn incineration systems, the proposal incorporates a front-end MR facility to allow recovery of recyclable materials (such as ferrous and non-ferrous metals from municipal solid waste) that will be directed off-site where suitable markets can be established.

In respect to setting a requirement to recycle a set proportion of waste, the proponent was of the view that this would not be practical as most waste will be pre-sorted to remove recyclables prior to delivery, however municipal solid waste will be processed in the proposed MR facility to remove recyclable materials prior to waste being fed into the gasifiers.

In respect to criteria for materials recycling, the proponent referred to section 2.1 of the PER Document (page 5) which states that around 25% of municipal solid waste, 37% of commercial/industrial waste and 14% of construction/demolition waste was recovered in WA in 2006/07[28]. The proponent advised that a 2012/13 Census of the waste and recycling services provided by local government indicates that metropolitan local governments have a recovery rate of 39%[29]. The proponent reiterated its advice that its proposal is based on accepting wastes that have been processed to recover recyclables.

In respect to a requirement for measures to minimise waste, the proponent was of the view that that the proposal will not retard the many measures and initiatives which are in place to reduce waste production (e.g. reduce packaging, increase recycling). It advised that source separation will occur prior to construction/demolition waste and commercial/industrial waste receival at the proposed facility, and that municipal solid waste will be sorted in the proposed MR facility using equipment designed by a major shareholder (Instant Waste Management Pty Ltd) which designed, built and operates the only commercial/industrial waste sorting facility in WA.

The EPA advised that the waste hierarchy is a principle used to guide sustainable waste management, and is considered in current waste management practices. The EPA advised that currently many materials in the waste stream are sent to landfill and are either not recoverable or are not recovered. The EPA advised that the West Australian population is expected to increase significantly in the next few decades and that establishment of the proposed facility would assist in managing the increased demand for waste management. The EPA advised that the utilisation of these materials either through recycling or in a WtE process will reduce the volume of waste going to landfill. The EPA advised that WtE facilities would divert waste from landfill, which would reduce environmental impacts associated with landfilling, including emissions of greenhouse gases and potential contamination of soil and groundwater, consistent with the WA Waste Strategy.

Recommendation

Noting the above, it is considered that the EPA has had regard for sustainability and the waste hierarchy, including the re-use and recycling of materials and the need to divert waste from landfill, in its assessment of the proposal. It is also noted that the issue of energy recovery in the context of the waste hierarchy was previously considered by the EPA through public submissions on the proposal.

It is therefore recommended that the Minister dismisses this ground of appeal.

[28] Waste Authority WA (2010) *Waste Strategy for WA*. Draft 2, dated March 2010. Government of Western Australia.
[29] Waste Authority WA (2014) *Western Australia Local Government Waste and Recycling Census 2012-13*. Dated April 2014. Government of Western Australia.

GROUND 7: WASTE FEEDSTOCK

Appellants submitted that the type of feedstock for the proposed facility is not clearly defined, and a range of materials including green waste and plastics with high calorific value, as well as potentially hazardous materials, could be used. Appellants submitted that typical municipal solid waste contains mostly recoverable materials, and that there would be minimal recovery of recyclable material prior to use as feedstock for the proposed facility. Appellants also submitted that emissions from the proposed facility could be affected by the processing of inappropriate waste, particularly as the feedstock (municipal solid waste) is unlikely to be homogeneous and the composition unknown. Appellants submitted that conditions should be recommended to ensure maximum resource recovery and to ensure that only genuine residual waste is used as feedstock for the proposed facility.

During a meeting with staff of the Office of the Appeals Convenor, appellants submitted that the burning of polyethylene terephthalate (PET) plastics uses approximately 24% more energy than recycling would. Appellants submitted that the component materials of the waste types (being municipal solid waste, construction/demolition waste and commercial/industrial waste) are not specified, and may include persistent organic pollutants (POPs) which are classified pollutants and are found in items such as mattresses. Appellants submitted that POPs, non-residual and non-permitted materials may be missed by the MR facility and find their way into the gasification chamber. Appellants submitted that burning POPs would be in contravention of the Stockholm Convention. Appellants also questioned whether the proponent has experience in operating an MR facility, and whether it has established markets for the acceptance of the non-residual wastes.

It is noted that feedstock composition is discussed in sections 2.5.3, 5.4.3 and 5.5 of the PER Document (pages 10, 30 and 36).

It is noted that matters relating to the composition of feedstock were also raised in public submissions on the proposal. The Response to Submissions makes a number of references to feedstock sources, sorting of the waste streams and separation of specific wastes, emissions standards, and the proposed facility shut-down process.

It is noted that recommended condition 6 specifies waste acceptance criteria.

In respect to the definition of ‘residual waste’, the proponent advised that it defines residual waste as calorific material remaining after recyclable and excluded wastes are removed from the waste stream. The proponent advised that some wastes that are potentially recyclable but are not currently economic to recycle will be included as residual waste until such a time that reuse is technically or economically viable (e.g. mixed, contaminated and co-mingled plastics). The proponent advised that the figure of 80% of municipal solid waste by weight does not take into account that municipal solid waste is collected at the kerbside where waste has already been largely separated into recyclable and non-recyclable bins, and that it expects that approximately 20% of the municipal solid waste sent to the proposed facility or otherwise unsuitable for gasification. The proponent also advised that green waste accounts for 9.8% of waste which will be received by the proposed facility.

In respect to the consideration of unsorted municipal solid waste, the proponent advised that polyvinyl chloride (PVC) plastics will be removed from construction/demolition waste and commercial/industrial waste at source as much as practical, with 111 tpa of PVC plastics is likely to go through gasifiers (as shown in Table 14 of the PER Document), its potential content of the waste feed has been calculated at 0.0384% Wt compared to a limit on chlorine content of 1% W/W that is specified for the AQCS. The proponent advised that recyclable plastics and PET plastics would be recovered for recycling and not directed to the gasification system. The proponent advised that the mixed plastics (low and high density) directed to the gasifiers would either not be suitable for recycling due to either an inherent unsuitability, contamination or form (e.g. shredded or co-mingled state), or currently do not have a recycling market.

In respect to waste acceptance criteria and the composition of municipal solid waste, the proponent referred to section 5.5.1 of the PER Document (page 31), and advised that the proposed MR facility will incorporate metering equipment, density separators, separation screens, eddy currents, ferrous-removing magnets, optical sorters and trommels to remove recyclable and potentially hazardous waste, and that there will be at least two employees in the tipping area and several in the proposed MR facility in positions that allow redirection of potentially hazardous materials. The proponent also advised that heat and mass balance and emissions calculations have taken into account that some contaminants may be fed to the gasifiers in small quantities (e.g. PVC plastics, batteries, halogens and heavy metals) and have concluded that the system can assimilate these without deleterious effects (Table 15 of the PER Document).

In respect to the recyclability of feedstock, the proponent advised that construction/demolition waste and commercial/industrial waste will be pre-sorted to separate calorific waste from non-calorific waste (e.g. rubble) but will also allow for removal of excluded wastes such as tyres, scheduled wastes (e.g. polychlorinated biphenyl (PCB) and organochlorine wastes), liquid and oily wastes, asbestos, highly corrosive or toxic liquids/gases (e.g. strong acids, chlorine or fluorine) or explosive materials, prior to receival at the proposed facility. The proponent advised that bagged waste will be processed through the proposed MR facility where bags will be split open and the contents sorted into various waste streams.

The EPA advised that currently, the majority of the residual waste stream from waste processing facilities is going to landfill, and that the proponent proposes to process municipal solid waste and recover recyclable material and separate any organic rich stream which would be directed off-site for composting. The EPA's response was similar to the proponent's in that it confirmed that the proposal incorporates an MR facility which would sort recyclables and incompatible materials from the waste stream to be sent off-site to be recycled or disposed of at a licensed facility, and that the remaining waste would be baled and used to generate electrical power in a WtE facility.

The EPA advised that the waste types that would be accepted at the proposed facility will be low hazardous material from known sources with a moderate to high calorific value and a low contamination level, including construction/demolition waste, commercial/industrial waste, municipal solid waste, green waste and non-recyclable residues from material recycling facilities, waste transfer stations/depots and biological waste treatment facilities. The EPA advised that any non-standard waste received at the proposed facility will be accompanied by a detailed chemical analysis of representative samples of material. The EPA advised that the proposed facility would not accept hazardous waste such as scheduled wastes, as defined by the *National Strategy for the Management of Scheduled Waste*[30], medical waste, radioactive waste, asbestos, liquid and oily wastes, contaminated soils, tyres, animal carcasses, waste with a halogen content greater than 1%, highly corrosive or toxic liquids or gases such as strong acids or chlorine or fluorine, and explosive materials.

The EPA advised that it has recommended condition 6 to ensure that the listed hazardous wastes would not be processed at the proposed facility, and the proponent would be required to prepare and implement a Waste Acceptance Monitoring Plan.

Advice was also obtained from the DER with respect to waste acceptance criteria. The DER confirmed that prohibited wastes can be adequately regulated using regulatory controls such as waste acceptance specifications, process controls, management plans and emission limit values. In this regard, it is noted that the acceptance of waste will need to be assessed and justified by the proponent as part of any application for a works approval or licence under Part V of the EP Act. It is understood that the ability of the proponent to source and accept certain waste types will be limited by the requirement to meet best practice standards in relation to technology, operating and management techniques, and emission limit values.

[30] Australian and New Zealand Environment and Conservation Council (1992) *National Strategy for the Management of Scheduled Waste*.

Recommendation

Noting the above, it is considered that the EPA has had regard for waste feedstock its assessment of the proposal. It is also noted that the issue of feedstock composition was previously considered by the EPA through public submissions on the proposal.

It is considered that the proponent's adherence to its commitments in respect to sorting waste streams, its compliance with the requirements of recommended condition 6, and its compliance with emissions limits and targets and monitoring requirements set through the DER's works approval and licensing regime under Part V of the EP Act, will ensure that inappropriate waste types are not used as feedstock.

It is therefore recommended that the Minister dismisses this ground of appeal.

GROUND 8: TECHNOLOGY (ENTECH)

Appellants submitted that WSP Environmental Ltd, the proponent and the EPA were selective in the choice of case studies used to demonstrate that the Entech technology is proven and safe, and that WSP Environmental Ltd has not analysed the 15 case studies against other research to investigate apparently contradictory claims. Appellants submitted that there is little mention of similar facilities that have failed and the subsequent effects (e.g. increased risk of cancer) on human health. Appellants submitted that the EPA should have considered other studies (cited in appeal) regarding safety and viability, and appropriate location away from populated areas.

It is noted that the WtE Strategic Advice was prepared in response to the then Minister for Environment's request that the EPA and the Waste Authority investigate the environmental and health performance of WtE technologies internationally, and that the information gathered be from full-scale, commercial facilities that process municipal solid waste. It is understood that to assist with this investigation, WSP Environmental Ltd was engaged to undertake a technical review of international WtE facilities. WSP Environmental Ltd provided its results in three reports; it is noted that the second report[31] states that the choice of 15 case studies was based on the following selection criteria: (1) modern facilities with higher than normal thermal efficiency; (2) modern facilities achieving low environmental impacts; (3) facilities gaining acceptance via innovative architectural treatments; (4) modern facilities employing state-of-the-art furnace design; (5) modern facilities employing alternative thermal technologies, such as fluidised bed and gasification.

The Entech website[32] states that its WtGas technology is "*based upon a low temperature gasification process that converts waste from its solid to gaseous form of syn-gas (a methane like gas), so that it can be fired to generate energy; with emissions that are cleaner than firing of any fossil fuel (including natural gas)*", and provides a comparison of thermal degradation alternatives and a description of the gasification process. The Entech website also claims that its WtGas-RES™ technology does not contribute to biomass harvesting and does not have sludge or waste water discharges, and produces gaseous emissions from firing of the syn-gas and small quantities of solid residue in the form of ash.

Table 4 in the PER Document lists a number of different waste streams treated using Entech gasification technology at 46 facilities around the world.

It is noted that Report 1513 states "*It should be noted that the Entech technology relates to the gasification chambers, gas accumulations vessel/burner and CEMS. Other components such as the EUHX/steam boiler, steam turbine and power generation system and AQCS are robust well-proven technologies, and would be provided by other vendors*". Report 1513 also states that the proposed facility will have an 'R1' efficiency of 0.68, which the EPA considers appropriate to satisfy the EU Best Available Technology – Energy Efficiency Regulation.

It is understood that the proposed technology was also raised in public submissions on the proposal. The Response to Submissions contains discussion around this matter, and includes a company profile of Entech and its gasification technology, and a consultant's report on technical due diligence of the technology proposed to be used for the proposal.

In respect to the method of combustion, the proponent advised that the proposal will use gasification, which comprises thermal degradation under sub-stoichiometric conditions to produce a volatile gas that is referred to as syn-gas. The proponent considers that, by comparison, incineration produces a high and potentially unpredictable suite of pollutants. As discussed under Ground 1, the proponent considers that it would be meaningless to compare different technology or emission outputs with the Entech WtGas-RES™ technology.

[31] WSP Environmental Ltd (2013) *Review of State-of-the-Art Waste-to-Energy Technologies: Stage Two – Case Studies*. Report prepared for the Department of Environment and Conservation; dated January 2013. Government of Western Australia.
[32] Entech Renewable Energy Solutions website: www.entech.com.au (accessed 25 August 2014)

In respect to comparing emission performance of similar facilities, the proponent advised that it is difficult to provide comprehensive information on this as Entech is a technology supplier and not the operator of the facilities. The proponent advised that the Entech technology has been in commercial use since 1990, and that over that time the level of emission control specified for the design of the gasifiers and associated gas cleaning equipment has varied substantially.

The EPA advised that Entech WtGas-RES™ gasification technology is proposed and that Entech gasification systems have been installed in a large number of facilities around the world, although generally at smaller capacities and with varying waste feeds. It is understood that all recently-constructed Entech facilities comply with the European Union emission standards (the latest facility was commissioned in Poland in 2012). It is noted that the EPA previously assessed and reported on the Port Hedland WtE and MR facility in April 2013, which is the first Entech gasification system to be approved in Australia, and that the proposal will use the same technology, size and design as the Port Hedland WtE and MR facility.

The EPA advised that a staged commissioning approach will be adopted for this proposal and emissions performance must be demonstrated at each stage prior to moving onto the next. This will be regulated by the DER through the works approval and licensing process under Part V of the EP Act which will ensure that the proposed facility can achieve the design performance stated and that all emissions comply with the WID.

The EPA acknowledged that large waste incinerators operating in the 1970s without pollution control equipment gained a poor reputation for hazardous pollutants, and stated that WtE facilities are often opposed by the community due to this history. It is noted however that there are stringent emission standards for WtE facilities from the European Commission and the United States Environmental Protection Agency.

It is noted that the proposed facility is of a larger scale than other Entech plants. It is further noted that the DER provided advice to the EPA while the assessment of the proposal was being conducted. Officer level advice was also obtained from the DER during the appeal investigation. The DER reiterated its advice outlined in Appendix 5 of Report 1513 that its process for works approvals and licensing of WtE proposals will ensure that new WtE facilities comply with best practice criteria in relation to environmental performance and management. In respect to staged commissioning, it is noted that the DER will require a Commissioning Plan to be submitted as part of the works approval application, which is to include (but is not limited to) details of the commissioning stages and expected timescales, expected emissions for each stage, an emissions management plan and monitoring protocol to be used during commissioning, mitigation actions for any exceedences, and contingency plans.

It is understood that the DER will only issue a works approval once a proponent has satisfactorily demonstrated that the proposal meets specified criteria and that potential environmental impact is acceptable. It is also understood that conditions are set for the commissioning phase, which allow a works approval holder to test, trial or operate a facility for a limited time and to discharge or emit waste into the environment without a licence. It is noted that the commissioning phase brings a facility into operating condition for the first time in order to measure the parameters which are to be monitored during operation.

The DER confirmed that a licence allowing the operation of a facility will only be issued once the DER is satisfied that all works have been completed appropriately and all conditions of the works approval have been met. The licence will also contain a number of conditions ensuring the proposed facility operates in accordance with the requirements of the best practice criteria, as per the WID. Sections 2.10 and 2.11 of the DER's *Guide to Licensing*[33] also outline the DER's process in respect to staged works approvals and commissioning.

[33] Department of Environment Regulation (2014) *Industry Regulation Licensing – Guide to Licensing – Environmental Protection Act 1986*. Government of Western Australia.

In respect to the location of the proposed facility, and impacts to human health, these matters are discussed under Ground 1.

Recommendation

Noting the above, it is considered that the EPA has had regard for the proposed use of Entech technology in its assessment of the proposal and that in forming this view, the EPA was satisfied that the DER can appropriately regulated the proposed facility and set air quality limits and requirements for monitoring, and a staged approach to commissioning, through its works approval and licensing process under Part V of the EP Act. It is also noted that the issue of the proposed technology was previously considered by the EPA through public submissions on the proposal.

As discussed under Ground 1, it is understood that the proposed facility and its commissioning will be regulated under Part V of the EP Act, and that the DER will require staged commissioning and set emissions limits and targets and monitoring requirements through the works approval and licencing process to ensure that the proposed facility can operate in an environmentally acceptable manner.

It is therefore recommended that the Minister dismisses this ground of appeal.

GROUND 9: SECTION 16(E) ADVICE ON WASTE-TO-ENERGY

Appellants submitted that as the WtE Strategic Advice forms the basis for the EPA's assessment of the proposal, the technical review of international WtE facilities undertaken by WSP Environmental Ltd on which the WtE Strategic Advice is based should have been cross-examined. Appellants submitted that WSP Environmental Ltd has not analysed the long term social and environmental benefits of thermal WtE technologies compared to non-thermal waste technologies and strongly suggests that a deficiently scoped study resulted in a biased report. Appellants submitted that the WtE Strategic Advice fails to acknowledge or support the waste hierarchy or to support the principles of sustainability. Appellants submitted that the proposal does not meet the 21 recommendations made in the WtE Strategic Advice. Appellants also submitted that there is lack of opportunity to appeal its inadequacies.

During a meeting with staff of the Office of the Appeals Convenor, appellants submitted that by recommending the proposal for approval, the EPA has not applied its own standards and recommendations in the WtE Strategic Advice. Appellants submitted that WSP Environmental Ltd did not have regard for a major Japanese study.

It is noted that the WtE Strategic Advice was prepared by the EPA as strategic advice to the Minister under section 16(e) of the EP Act, and states that WtE is recognised as a recovery option in the waste hierarchy and is expected to play an important role alongside other waste management options in contributing to Western Australia's resource recovery targets.

It is noted that Table 23 of the PER Document (pages 58-60) outlines the proponent's views on how the proposal complies with the 21 recommendations made in the WtE Strategic Advice. In response to appellants' specific concerns in respect to how the proposal complies with these recommendations, the proponent provided additional advice outlined in Appendix 2 of this report.

The EPA advised that it considered the principles and recommendations in the WtE Strategic Advice during its assessment of the proposal, and was satisfied that the proposal meets the recommendations in the WtE Strategic Advice. The EPA advised that its assessment identified 'Air Quality' as a key environmental factor, and considered that emissions are likely to comply with the relevant air quality standards and can be managed under Part V of the EP Act. The EPA advised that it has recommended an environmental condition for the preparation and implementation of a Waste Acceptance Monitoring Plan to ensure that hazardous waste is not processed.

Recommendation

It is considered that the EPA has had regard for the recommendations in the WtE Strategic Advice in its assessment of the proposal. It is noted that the content of the WtE Strategic Advice is not a matter that can be considered as part of the investigation of these appeals.

It is therefore recommended that the Minister dismisses this ground of appeal.

CONCLUSION AND RECOMMENDATION

In undertaking this appeals investigation, it was evident that the primary concerns raised by appellants related to the potential health issues as a result of emissions from the use of gasification technology, and sustainability (waste hierarchy, waste minimisation). It is also noted that many of the issues raised in the appeals were previously considered by the EPA through public submissions on the proposal. For this reason, this report includes detailed information provided by the proponent about the proposal to provide context and clarification on particular issues (including some which do not directly relate to the EPA's report and therefore the right of appeal).

In considering the information obtained during the investigation of the appeals lodged in objection to Report 1513, it is noted that:

- the WtE Strategic Advice concluded that modern WtE facilities can operate within strict emissions standards with acceptable environmental and health impacts to the community when a facility is well designed and operated using best practice technologies and processes;
- the proponent has committed to installing a CEMS and to monitor developments in respect to nanoparticles, and ongoing monitoring of air quality in the area will be undertaken by the Kwinana Ambient Air Quality Monitoring Network;
- the EPA's assessment found that all criteria pollutants for the proposal were predicted to be compliant with the National Environment Protection Measure standard and other relevant guidelines for standard operation and emergency shut-down scenarios;
- the EPA's assessment found that the proposal satisfactorily meets the 21 recommendations contained in the WtE Strategic Advice;
- the types of waste accepted at the proposed facility can be regulated by the EPA through the recommended conditions;
- in respect to emissions, the construction and staged commissioning of the proposed facility can be regulated by the DER to meet the requirements of the WID for key pollutants through a works approval under Part V of the EP Act;
- in respect to emissions, the operation of the proposed facility can be regulated by the DER through a license under Part V of the EP Act;
- Part V of the EP Act provides for public comment on applications for works approvals and licences, and an opportunity for third party appeals in respect to the conditions applied to those instruments where issued; and
- if the DER's assessment of an application for a works approval or licence determines that the environmental risks posed are unacceptable, the DER can refuse to issue an instrument, and if the DER issues a works approval or licence, that instrument will be subject to appropriate conditions to mitigate environmental impacts.

The EPA's findings in Report 1513 that the proposal could be managed to meet its environmental objectives provided there is satisfactory implementation by the proponent of the recommended conditions, is supported. It is therefore recommended that the Minister dismisses the appeals.

Kelly Faulkner
APPEALS CONVENOR

Investigating officer:

Emma Bramwell, Senior Environmental Officer

APPENDIX 1: RELATED APPEALS / PROPOSALS

On 8 December 2000 the Environmental Protection Authority (EPA) published Bulletin 1004 in respect to a proposal by Global Olivine Western Australia to build and operate a waste-to-energy and water facility at Lot 15 Mason Road in the Kwinana Heavy Industrial Area (Town of Kwinana), which was assessed at the level of 'Public Environmental Review' (PER). No appeals were received in objection to the report.

In 2001 the EPA published its decision to assess a proposal by Brightstar Environmental Partnership to construct a solid waste-to-energy recycling facility at Lot 280 Kelvin Road in the Maddington Industrial Estate (City of Gosnells), and set the level of assessment at PER. Twenty appeals (88-103/01 and 105-108/01) were received in objection to the report, seeking for the level of assessment to be raised to an 'Environmental Review and Management Program' (ERMP) on the basis of high level of public interest, concerns in respect to emissions, pollutants, traffic, waste feedstock and other matters. On 25 October 2001 the then Minister for the Environment and Heritage allowed the appeals to the extent that the proposal be assessed at the level of ERMP.

On 4 April 2013 the EPA published Report 1469 in respect to a proposal by New Energy Corporation Pty Ltd to develop and operate a materials recovery and waste-to-energy facility in the Boodarie Industrial Estate (Town of Port Hedland), which was assessed at the level of PER. No appeals were received in objection to the report. Ministerial Statement 935 was published on 21 May 2013 for the proposal's implementation.

On 22 July 2013 the EPA published Report 1487 in respect to a proposal by the Eastern Metropolitan Regional Council to develop and operate a materials recovery facility at the Red Hill Waste Management Facility (City of Swan). Three appeals (167, 168 and 171/13) were received in objection to the report, in respect to air emissions, the ability of the gasification technology to meet international emission and waste-to-energy efficiency standards, impacts to nearby environmentally sensitive areas and water resources, the waste management hierarchy, waste disposal by incineration, community consultation processes, and the adequacy of the regulatory framework. On 2 April 2014 the Minister for Environment dismissed the appeals. Ministerial Statement 976 was published on 9 July 2014 for the proposal's implementation.

On 31 March 2014 the EPA published its decision to assess a proposal by the Eastern Metropolitan Regional Council to develop a 4 megawatt wood waste-to-energy facility in Hazelmere, and set the level of assessment at PER. On 5 May 2014 the EPA published an environmental scoping document to define the requirements of the PER document for the proposal, which is to include a four week public comment period. The proposal is currently under assessment by the EPA.

On 22 October 2012 the EPA published its decision to assess a proposal by Phoenix Energy Australia Ply Ltd to develop the Kwinana Waste to Energy Project at Lot 14 Leath Road, Kwinana Beach, and set the level of assessment at PER. On 9 June 2014 the EPA published an environmental scoping document to define the requirements of the PER document for the proposal, which is to include a six week public comment period. The proposal is currently under assessment by the EPA.

APPENDIX 2: CONSISTENCY WITH RECOMMENDATIONS IN THE WTE STRATEGIC ADVICE

In response to appellants' specific concerns in respect to how the proposal complies with recommendations made in the WtE Strategic Advice (Ground 9), the proponent provided the advice outlined below to supplement information contained in Table 23 of the PER Document (pages 58-60).

Table 1: Proponent advice in respect to recommendations in the WtE Strategic Advice

EPA recommendation (WtE Strategic Advice)	*Proponent's response to specific concerns raised by appellants*
1. Given the likely community perception and concern about waste-to-energy plants, a highly precautionary approach to the introduction of waste-to-energy plants is recommended.	The proponent advised that the Entech technology was cited in Technical Report TR-2367-ENV as commercially available thermal conversion technology for treating mixed waste and/or refuse derived fuel, and currently proven commercial non-incineration technology for treating wastes of the following types: agricultural, forestry, food processing residues; municipal solid waste organics; medical, industrial, quarantine and hazardous wastes. The proponent advised that the Entech technology was subject to an independent engineering review as part of a due diligence process for project investors (as discussed under Ground 1), which endorses the claimed performance of the technology. The proponent advised that standards of operation will be regulated by the DER through the works approval and licencing process under Part V of the EP Act.
2. As part of the environmental assessment and approval, proposals must address the full waste-to-energy cycle - from accepting and handling waste to disposing of by-products, not just the processing of waste into energy.	The proponent advised that waste product sources have been identified, and that greenhouse gas emissions from the proposal compared to sending the waste to landfill have been addressed. The proponent advised that by-products will be disposed of appropriately and represent a significant saving of material sent to landfill. The proponent advised that the proposed facility will complement other renewable energy and waste treatment processes such as composting, recycling, and wind and solar energy.
3. Waste-to-energy proposals must demonstrate that the waste-to-energy and pollution control technologies chosen are capable of handling and processing the expected waste feedstock and its variability on the scale being proposed. This should be demonstrated through reference to other plants using the same technologies and treating the same waste streams on a similar scale, which have been operating for more than twelve months.	The proponent advised that Entech has demonstrated that the gasification pollution control technologies are adequate for the scale of the proposed facility with incorporation of multiple gasifier units to make up the required capacity of the proposed facility. The proponent advised that other pollution control features representing best available technology will be used, including an AQCS, a CEMS and associated EMS. In respect to failures of WtE facilities in Scotland and Germany, the proponent advised that Entech has not constructed facilities in these countries, and that research shows that the Scottish example utilises a batch gasification technology sourced from a company trading as Enerwaste which is unrelated to Entech.
4. Waste-to-energy proposals must characterise the expected waste feedstock and consideration made to its likely variability over the life of the proposal.	The proponent advised that extensive work has been done to characterise the expected waste stream, and this information has been used in the Entech design. The proponent advised that the proposal has an advantage over mass burn-type incineration processes in that all waste received will undergo a front-end sort that allows unsuitable material to be diverted from the feed stream, and that in addition a significant proportion of the waste stream will be sourced as residuals from other facilities where it has already undergone sorting and screening for unsuitable materials.

5. The waste hierarchy should be applied and only waste that does not have a viable recycling or reuse alternative should be used as feedstock. Conditions should be set to require monitoring and reporting of the waste material accepted over the life of a plant.	The proponent advised that the proposed facility focusses on processing waste that currently goes to landfill, and that 50,000-60,000 tpa of feedstock will be derived from residual waste sources. The proponent advised that recyclable materials (estimated 21,653 tpa) will be removed in the proposed MR facility, and that application of the waste hierarchy in such cases supports recovering energy from such wastes through a modern WtE facility.
6. Waste-to-energy operators should not rely on a single residual waste stream over the longer term because it may undermine future recovery options.	The proponent advised that as waste generation is currently increasing with population growth, it is not considered that improved recycling, reuse or other waste treatment advances pose a risk to the proposal, and considered that alternative and development waste treatment processes will complement it.
7. Regulatory controls should be set on the profile of waste that can be treated at a waste-to-energy plant. Plants must not process hazardous waste.	The proponent reiterated its advice in respect to bagged waste (refer ton Ground 7), and advised that the proposed facility will not target hazardous waste streams and the regulatory profile is therefore appropriate (as discussed in sections 5.5 and 5.17.5 of the PER Document).
8. In order to minimise the discharge of pollutants, and risks to human health and the environment, waste-to-energy plants should be required to use best practice technologies and processes. Best practice technologies should, as a minimum and under both steady state and non-steady state operating conditions, meet the equivalent of the emissions standards set in the European Union's Waste Incineration Directive (2000/76/EC).	The proponent advised that section 2.5.1 of the PER Document cites project reference 1162 in Malaysia as being a 14 MWt facility processing high calorific value hazardous waste, which was commissioned in 2008 and is still operating. The proponent advised that as a result of the demonstrated operation of the proposed facility using a 14 MWt gasifier module, and its approach to scale up using multiple 18 MWt gasifier modules to achieve a combined output of 72 MWt, it is confident that the scale up of the design can be achieved. The proponent advised that the gas cleaning train and boiler will be sourced from third party suppliers with demonstrated experience in WtE facilities, and that these items will have been demonstrated commercially at a similar scale. The proponent advised that Entech has not constructed an integrated facility of the scale proposed by it, and as a result it has appointed Kiewit Corporation (Engineering Procurement and Construction Contractor) which has a proven track record in successfully implementing WtE facilities.
9. Pollution control equipment must be capable of meeting emissions standards during non-standard operations.	The proponent advised that the scaling up of the proposed facility is based on multiple numbers of proven gasifier modules and a stack configuration which has a known track record for its ability to meet emissions standards during nonstandard operations (e.g. emergency shutdown) (as discussed in section 9.5.4.3 of the PER Document).
10. Continuous Emissions Monitoring must be applied where the technology is feasible to do so (e.g. particulates, TOC, HCl, HF, SO_2, NO_x, CO). Non-continuous air emission monitoring shall occur for other pollutants (e.g. heavy metals, dioxins and furans) and should be more frequent during the initial operation of the plant (minimum of two years after receipt of Certificate of Practical Completion). This monitoring should capture seasonal variability in waste feedstock and characteristics. Monitoring frequency of non-continuously monitored parameters may be reduced once there is evidence that emissions standards are being consistently met.	The proponent advised that a CEMS will be installed to monitor a wide range parameters consistent with the EU WID standard, and will also undertake monitoring of emissions in line with WID criteria (refer to Ground 1). The proponent advised that monitoring details will be determined by the DER through the works approval and licencing process under Part V of the EP Act.

11. Background levels of pollutants at sensitive receptors should be determined for the Environmental Impact Assessment process and used in air dispersion modelling. This modelling should include an assessment of the worst, best and most likely case air emissions using *appropriate air dispersion modelling* techniques to enable comparison of the predicted air quality against the appropriate air quality standards. Background monitoring should continue periodically after commencement of operation.	The proponent advised that the PER Document included the most up-to-date at the time background air quality data from the DER (2005-10), including the 2013 WA Air Monitoring Report (refer to Ground 1). The proponent advised that the modelling work presented by it in the PER Document demonstrates that the air emissions from the proposed facility add a small incremental loading to the Kwinana and Rockingham airsheds even under worst case meteorological conditions. The proponent also reiterated its monitoring commitments (refer to Ground 1).
12. To address community concerns, proponents should document in detail how dioxin and furan emissions will be minimised through process controls, air pollution control equipment and during non-standard operating conditions.	The proponent advised that it is well aware of community concerns regarding dioxin and furan emissions, and that it adopted the Entech technology because its unique design features minimise dioxin emissions (as discussed in section 5.18.6 of the PER Document). In respect to appellants' references to de novo synthesis of dioxins in the stack and post-stack, the proponent advised that it is well established that de novo synthesis of dioxins occurs predominantly in a narrow temperature band (250-500^{o} Celsius) and that once exhaust gases have cooled below 250^{O} Celcius there is little ability to produce dioxin by de novo synthesis. The proponent advised that evidence also suggests that the process is catalysed by the presence of significant levels fly ash particulates in the exhaust gas stream. The proponent also referred to the cleaning system to remove acid gases, metals and any residual particulates so that the building blocks for dioxin formation are no longer present (as described in section 9.5.3.2 of the PER Document).
13. Proposals must demonstrate that odour emissions can be effectively managed during both operation and shut-down of the plant.	The proponent advised that odour modelling has been undertaken to predict odour levels and appropriate management tools. The proponent referred to a number of design features to minimise fugitive odour emissions (as discussed under sections 5.5, 5.8 and 9.5.3.1 of the PER Document). The proponent advised that it is recognised that odour emission rates can vary substantially and for this reason a conservative approach has been adopted in terms of odour levels and odour treatment efficiency.
14. All air pollution control residues must be characterised and disposed of to an appropriate waste facility according to that characterisation.	The proponent referred to is procedures for handling solid wastes generated at the proposed facility (as discussed under section 9.7.5.4 of the PER Document).
15. Bottom ash must be disposed of at an appropriate landfill unless approval has been granted to reuse this product.	The proponent advised that it has committed to testing the ash and arranging disposal to an appropriate class of landfill, and that should it be determined that there could be a beneficial use for this residue, it will investigate possible uses.
16. Any proposed use of process bottom ash must demonstrate the health and environmental safety and integrity of a proposed use, through characterisation of the ash and leachate testing of the by-product. This should include consideration of manufactured nanoparticles.	The proponent advised that solid waste from the AQCS and bottom ash from the gasifiers will be tested for composition before a disposal method is determined, and that based on the current knowledge of the waste stream, it considers that the ash will be suitable for disposal in either a Class 2, 3 or 4 landfill.

17. Long term use and disposal of any by-product must be considered in determining the acceptability of the proposed use.	(Refer to proponent's response to recommendation 16)
18. Standards should be set which specify the permitted composition of ash for further use.	(Refer to proponent's response to recommendation 16)
19. Regular composition testing of the by-products must occur to ensure that the waste is treated appropriately. Waste by-products must be tested whenever a new waste input is introduced.	(Refer to proponent's response to recommendation 16)
20. Waste-to-energy plants must be sited in appropriate current or future industrial zoned areas with adequate buffer distances to sensitive receptors. Buffer integrity should be maintained over the life of the plant.	Appropriate zoning with buffers exists. Modelling for emissions and odour indicates that existing buffers are adequate for the operation.
21. For a waste-to-energy plant to be considered an energy recovery facility(i.e. not a disposal facility), a proposal must demonstrate that it can meet the R1 Efficiency Indicator as defined in WID.	The proponent advised that the R1 efficiency threshold (according to Directive 2008/98/EC[34] Annex II) is 0.65 if a facility is to be classed as a 'recovery' operation. The New Energy facility will have a R1 efficiency of 0.68, which complies with the status of a recovery operation.

[34] European Union Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.