

WASTE AUTHORITY LIMITED

of TONGA

REQUEST for PROPOSALS

from

INDEPENDENT ENERGY FROM WASTE POWER PRODUCERS

for the

FINANCING, INSTALLATION AND OPERATION

of an

ENERGY FROM WASTE PLANT

for the

KINGDOM OF TONGA

15 MAY, 2018

WASTE AUTHORITY LIMITED

NOTICE TO BIDDERS

REQUEST FOR PROPOSALS

ISSUE DATE: 15 MAY, 2018
PROJECT: **ENERGY FROM WASTE PLANT**
Producing electricity for the local grid
CLOSING DATE 10 JUNE, 2018

Waste Authority Limited requests proposals from qualified Independent Power Producers utilising proven Energy from Waste technologies to generate electricity for the local grid.

All responses, proposals and requests for further information about this Request for Proposals to be submitted to following persons:

Gregory Story
Partner, Sustainable Energie Partners
gstory@senpart.com

Martin Brocke
Senior Engineer, Sustainable Energie Partners
mbrocke@senpart.com

INSTRUCTIONS TO BIDDERS

Waste Authority Limited reserves the right to:

1. Reject all proposals and/or reissue a new or amended Request for Proposals or addenda as deemed necessary by Waste Authority Limited.
2. Request additional information from any Bidder.
3. Select a Bidder based on other than “least cost” (e.g. capability to complete work in a timely fashion or proven technical capabilities)
4. Negotiate a contract with the Bidder(s)
5. Waive any non-material violations of rules set up in this Request for Proposals at its sole discretion.

Bidders to provide responses **BY EMAIL** to the above persons in three Stages as follows;

1. Stage 1 – Prospective Bidders

Please respond within 5 days to confirm receipt of this Request for Proposal and advise if you are interested in Bidding.

2. Stage 2 – Interested Bidders

Interested Bidders to advise, within 10 days, if they have the technology solution for an EfW Plant producing electricity to suit the Tongatapu conditions as follows;

- a. Quantity of Metropolitan Solid Waste of 15,000 tonnes per annum.
- b. Composition of at least 50% organic (green and food waste).
- c. Net Calorific Value of 6 MJ/kg.
- d. To be located in Tonga.
- e. Single process to accept all waste without the need for prior processing.
- f. Disclose the technology and overview of the process proposed.
- g. Advise any further requisitions for additional information.

3. Stage 3 – Firm Bidders

Bidders to provide, within 20 days, their Proposal in accordance with Section 5 on page 5 below.

PROPOSAL INVITATION
WASTE AUTHORITY LIMITED

ISSUANCE DATE: 15 MAY, 2018

INSTRUCTIONS: This Request for Proposals requires submissions **by EMAIL** as detailed above.

NOTE TO BIDDERS:

This Request for Proposals is subject to the attached Terms and Conditions.

Bidders, being Independent Power Producers (“IPPs”) of Energy from Waste (“EfW”) Plants, may include additional information, including company and product brochures.

TECHNICAL PROPOSAL:

Waste Studies:

Waste Authority Limited has completed a detailed Waste Study for Tongatapu detailing sources, quantity and composition of waste. Such Report will be made available to selected Bidder(s) following close of the RFP.

A further waste study may be undertaken in conjunction with the successful Bidder to confirm any further details required. See Appendix B for details.

Technology:

WAL is of the opinion that the appropriate EfW technology is incineration utilising either moving grate or rotary kiln.

Bidders may consider utilising alternative technologies provided they can demonstrate their commercial and technical suitability with an operating track record. Please refer to Appendix A for further information on technologies.

Bidders will fund the construction of the EfW plant and will be paid for the despatch of electricity to the grid and sold to Tonga Power Limited.

Ability and flexibility to accept supplementary feedstock such as biomass is advantageous.

The Successful Bidder shall be required, **AT A LATER DATE**, to be advised to submit a Technical Proposal comprising;

- (i) **Technical System Design and Specifications** – Technical description of the proposed system. Technical drawings at a minimum shall include the following:
 - (a) Layout of the proposed facility at the site
 - (b) Electrical Line Diagram
- (ii) **Technical System Monitoring** – The Technical description shall include full details of the EfW Plant, monitoring and operating information.
- (iii) **EfW Plant System Capacity and Energy Production** – The Technical description shall include the system generating capacity (MW), capacity factor, energy (MWh) performance benchmarks, proposals for grid stability. The Bidder shall submit tables and forms outlining matrixes of the EfW Plant system on capacity and energy production.
- (iv) **Bidder’s Professional and Installation Team** – The Bidder shall describe the individuals and qualifications of the project team with assigned tasks.

Request for Proposals
from
Independent Energy from Waste Plant Operators and Power Producers

GENERAL TERMS AND CONDITIONS

1. Overview

The Waste Authority Limited of Tonga (“WAL”) is soliciting proposals from qualified Bidders to design, fabricate, fund, deliver, install, operate and maintain an EfW Plant producing electricity for export to the Tonga electricity distribution network pursuant to a Power Purchase Agreement (“PPA”).

The Bidder must demonstrate the ability to perform the work described in the Scope of Services set forth in this RFP and have significant experience successfully performing comparable work.

This RFP seeks responses from suitably qualified technology providers, developers, manufacturers and EfW Plant operators from which WAL intends to select one, or more, Bidder(s) to negotiate a Power Purchase Agreements (“PPA”) and to install an EfW Plant and generation facilities that best fit WAL’s needs.

The successful Bidder will be responsible for operating and maintaining all facets of the EfW Plant and for generating the agreed contracted energy production.

The successful Bidder will be entirely responsible for financing, designing, engineering, constructing, installing, operating, and maintaining the EfW Plant.

The scope of services requested in this RFP shall include, but not be limited to providing all labour, services and equipment necessary to design, procure, install, construct, test, commission, monitor, operate, and maintain the fully operational EfW Plant.

The successful Bidder will, **at a later date** to be advised, provide a detailed explanation of the complete project and a delineation of all work tasks to be performed by the successful Bidder and its Contractor(s).

WAL will provide the land suitable for the EfW Plant and secure all sites, permits and approvals from governing agencies.

This Request for Proposal (RFP) does not commit WAL to the award of a contract or contracts, nor to pay any cost incurred in the preparation and submission of proposals in anticipation of a contract.

2. Background

Tonga, located in the South Pacific Ocean, depends on a landfill site for the disposal of all waste and relies upon imported diesel fuel for power generation. Increasing concerns about environmental impacts, growth in waste production and oil price volatility create urgent needs for providing a path toward less dependence on landfill and imported oil for a lower environmental impact and sustainable energy future for Tonga.

Waste Authority Limited (WAL) is the sole waste collection and disposal utility operating in Tonga and is a State owned entity of the Government of Tonga (“GoT”). WAL is proposing to install an EfW Plant to counter the following immediate challenges:

- **Environmental protection:** potential groundwater and surface water pollution from the current landfill.
- **Landfill disposal space:** at current disposal rates WAL believe Tonga is rapidly running out of landfill space as the current landfill site is constrained. Reducing waste disposed to the landfill is considered the highest priority by WAL.
- **Energy security:** currently, there is a high dependence on diesel power generation on Tongatapu, with approximately 90% of power generated by diesel. There is very low potential for hydropower or other forms of base load energy. Solar power and wind power are developing, but cannot provide base-load due to battery storage being prohibitively expensive. An EfW solution has the potential to provide dispatchable and dependable power generation as well as reduce need for expanded land fill.

3. **Basis for Selection**

Each Proposal will be subject to a technical and financial due diligence and evaluation by WAL management and the Board of Directors and subject to Government of Tonga approval.

4. **Power Purchase Agreement**

Selected Bidder(s) will be invited to negotiate a Power Purchase Agreement (“PPA”) for a 25 year term with Tonga Power Limited (“TPL”) which is the sole generator and distributor of electricity and is a Government of Tonga owned entity.

5. **Evaluation Criteria**

WAL is seeking Proposals from Bidders who will fully fund, construct and operate the EfW Plant. The EfW Plant will produce electricity to be sold to TPL and despatched to the electricity grid. TPL will pay a tariff per KWh for the electricity despatched to the grid by the EfW Plant. TPL will enter a long term Power Purchase Agreement with the successful Bidder.

WAL is prescribing below the assumptions for Bidders to use in their financial modelling to provide WAL with offers which can be readily compared with all other Bids.

The preferred, but not mandatory, proposal requested by WAL is for an electricity tariff as follows:

Bid Criteria:

Bidders are to submit a proposal nominating an **electricity tariff and plant capacity** in accordance with the following criteria;

- The fixed electricity tariff price per kWh AC for 25 years paid monthly in arrears.
- Such tariff to be denominated in TOP (Tongan pa’anga).
- The capacity of the electricity generation plant in MW AC based upon continual uninterrupted despatch of electricity on a 24/7 operational basis.

Assumptions to be used by all Bidders in preparing their Proposals and the electricity tariff price and plant capacity are as follows:

Financial Assumptions:

- Ownership of the facility reverts to WAL for nil Residual Payment at the expiry of 25 years.
- No cost to Bidders for the use of required land.
- Land will be cleared and ready for construction by WAL.
- All necessary approvals and regulatory requirements will be provided by WAL.
- The Bidder performs entire EPC.
- No cost to Bidders for connection to the grid.
- No corporate tax paid by the Bidder in Tonga by the Tongan SPV.
- No import duties paid by the Bidder on equipment.
- Customs clearances arranged by WAL.
- No cost for the waste provided by WAL.
- No cost for transportation of the waste is required.
- EfW Plant will be constructed at the existing waste disposal site.
- Bidder to fund the construction and O&M of the EfW plant.

Waste Assumptions

- Available waste is 15,000 tonnes of Municipal Solid Waste (“MSW”) per annum.
- Composition of at least 50% organic (green and food waste).
- Net Calorific Value (“NCV”) of 6 MJ/kg.

WAL will also consider the following issues not necessarily listed in the order of importance:

- Experience.
- Financial Capacity.
- Proven technology already deployed
- Strength of Development & Construction Plan.
- Strength of Operations & Maintenance Plan.
- Financial Strength of Bidder & Other Project Participants.

6. Term of the PPA

Bidders shall enter into a PPA agreements with Tonga Power Limited for a term of twenty-five years (25).

Under the PPA, projects will be required to achieve the Commercial Operation Date by the sixth month or sooner after execution of the PPA.

7. Scope of Work

The scope of work to be performed by the successful Bidder and the costs to be included in the Proposal shall include all tasks required to design, fabricate, transport, deliver, install, operate, and maintain the EfW Plant and electricity generating system for WAL and TPL under a PPA.

The successful Bidder and WAL will jointly undertake a detailed waste review and assessment prior to finalisation of the PPA.

WAL will secure all permits and approvals from governing agencies for the construction and operation of the EfW Plant. WAL will provide the land, cleared and ready for construction at no cost to the Bidder.

A. Technical Information

The technical information/specification applicable for the proposed project must comply with all relevant NZ and/or Australian Standards or other acceptable standards.

The successful Bidder will be required, **at a later date**, to be advised, to provide the following information prior to concluding a PPA:

- Detailed Scope of Work.
- Technical information for the facility including technology type, model, make, configuration, plant layout diagrams, nameplate capacity rating, net plant capacity, annual net output, forecast capacity factor, commercial operation date, service/design life, etc.
- DC and AC capacity rating and expected energy production in kWh, annual production throughout the PPA term based on expected production output due to maintenance etc.
- For Grid Stability the range of sizes and flexibility of energy generation should be clearly explained, including any special modularity and scalability features
 - Proposals shall demonstrate a proven, comprehensive data acquisition system with current and historical data available remotely through a real-time internet site capable of tracking.
- Performance specifications and curves.
- A comprehensive timeline indicating the ability to achieve commercial operation within required timeline.
- Construction warranties, including balance of plant warranties.
- Evidence that the proposed technology and equipment would meet or exceed all currently applicable and proposed International safety and interconnection standards. All equipment components must be listed or recognized by an appropriate safety laboratory (e.g., Underwriter's Laboratory [UL]), and meet existing facility structural and fire safety requirements.
- Electrical interconnection to TPL grid and metering requirements
- Any facility limitations that may constrain operation.

B. Electrical Interconnections

Successful Bidder will build a security fence. TPL and WAL will supply and install all equipment required to interconnect the EfW Plant systems to the TPL distribution system from the security fence. Bidder will fulfil all application, studies, and testing procedures to complete the interconnection process.

C. Commissioning and Acceptance Testing

During the pre- commissioning and start-up phase, WAL, and/or its Contractor, shall observe and verify each system performance in conjunction with WAL representatives. Required commissioning and acceptance test services to be agreed. Detailed acceptance and test plans will be developed by the successful bidder to the satisfaction of WAL

D. Monitoring

Monitoring of system performance shall be integrated to the TPL SCADA system. The Bidder is to provide a turnkey data acquisition and display system that allows TPL to monitor, analyse, and display historical and live electricity generation data. The regularly collected data should reflect, but not be limited to, the following:

- System performance
- System availability
- Average and accumulated output
- Capacity factor

The data acquisition system shall be designed for turnkey, remote operation. Data shall be transmitted via Internet or telephone from the site to a server. Data storage, management, and display will be the responsibility of the successful Bidder.

E. Plan for Regulatory and Environmental Compliance

The successful Bidder must comply with the Tonga building standard codes, utility requirements as well as Occupational Health and Safety requirements.

WAL will obtain and maintain all required permits, licenses, approvals and/or variances, current or future. Bidders are required to demonstrate that they are capable of meeting standards required by all permits and licenses.

F. Codes, Standards, and Methodologies

All products and components outlined herein must conform to the applicable codes, standards, and rating methodologies as per NZ and Australian Standards or equivalent.

8. Qualifications

Company Overview

Bidder are required to provide the following information:

- Status (private/publicly-held, Corporation, Joint Venture, LLC, etc.)
- Number of employees
- States and countries in which you do business
- Target customers (residential, commercial, industrial, Government, etc.)

Project team profile, including:

- Resumes of personnel to be directly involved with the development of the proposed systems
- Team leader identification for the entire Proposal, including full contact information
- Identification of each entity, sub-contractor, person or firm involved in the Proposal and their role/responsibility, e.g. design, installation, permitting, equipment supply by component, operations and maintenance
- Identification of the lead person responsible for each of the entities or firms described in above Team organization chart

Experience and References

Bidders must provide comprehensive information for three (3) commercial electricity grid-connected EfW projects installed over the last five (5) years. Experience will not be considered unless all the reference data in the following table is provided completely, including at least one (1) customer reference for each project listed. WAL may solicit, from previous customers, relevant information concerning the Bidder's record of past performance. Bidders are required to also include project profiles for each listed project. In any of these projects can be reviewed on-line, please provide the URL for such project.

Experience and Reference Information	Referenced Project #1 (Required)	Referenced Project #2 (Required)	Referenced Project #3 (Required)	Referenced Project #4 (Required)	Referenced Project #5 (Required)
Exact role(s) your organization performed for the project					
Name of lead contractor					
Location					
Application description					
Date installed					
Project cost					
kW rating					
Cumulative kWh produced since system installation					
Current operational status of system					
Customer Name					
Customer Title at time of Project					
Customer's Role in Project					
Customer's Address					
Customer's Telephone					
Customer's Email					

9. Financial Capability

The successful Bidder must demonstrate the financial viability of the Proposal to provide assurance that the Bidder, and any other party involved in the proposal, has adequate financial capability to execute the project. In narrative format, each Bidder must include the following information at a minimum:

- Description of any current credit issues raised by rating agencies, banks, or accounting firms
- Proposed financing structure for the project, including all sources, uses and timing
- Financial guarantees from affiliates or others, as appropriate

Legal Actions

The successful Bidder must provide a listing and description of all legal actions of the past three (3) years in which the Bidder or any team member has been:

- A debtor in bankruptcy;
- A defendant in a lawsuit for deficient performance under a contract;
- A defendant in an administrative action for deficient performance on a project; and

- A defendant in any criminal action.

List all lawsuits, regulatory proceedings, or arbitration in which the Bidder or its affiliates or predecessors have been or are engaged in that could affect Bidder's performance of its bid submission; Identify the parties involved in such lawsuits, proceedings, or arbitration, and the final resolution or present status of such matters. WAL will take into consideration the nature and frequency of all legal actions in their selection process.

APPENDIX A

Waste collection on Nuku'alofa, Tonga

Background

Tonga, located in the South Pacific Ocean, is a kingdom comprised of more than 170 islands. The capital city, Nuku'alofa, is located on the largest island, Tongatapu. The population of Tonga was 100,745 according to preliminary 2016 census data (Statistics Department Tonga, 2017); with 74,685 people (74%) residing on the island of Tongatapu. Overall population change was -2.4% in 2016, with a negative growth rate of -1.0% on Tongatapu (Statistics Department Tonga, 2017).

The economy of Tonga is mainly driven by subsistence agriculture and increasing tourism, with weather conditions and, to a lesser extent, worldwide commodity prices being major driving forces. In recent years, local farms have moved towards the production of cash based crops for international export. Major exports include squash, bananas, vanilla beans and copra (derived from coconuts). Other major industries include fishing and construction. GDP (gross domestic product) growth was 3.1% per annum in 2016 (Asian Development Bank, 2017).

Waste management on Tongatapu

Municipal solid waste (MSW) generated on Tongatapu is currently collected by Waste Authority Limited (WAL) from residents, municipal functions and some commercial and industrial premises via a fleet of six collection vehicles.

Current estimates for key waste streams / potential feedstocks are as follows:

- 14,600 to 18,250 tonnes of Municipal Solid Waste (“MSW”) per annum, with a composition thought to be at least 50% organic (green and food waste) and an approximate Net Calorific Value (“NCV”) of 6 MJ/kg

Appropriate technology

There are multiple kinds of EfW technology potentially suitable to process waste; the two main categories comprise advanced thermal treatment (ATT, which primarily includes gasification and pyrolysis) and forms of incineration (rotary kiln, moving grate and fluidised bed).

- Advanced thermal treatment is still largely unproven for processing of mixed waste (such as MSW), and typically requires a NCV in the region of 12 MJ/kg or more for effective operation. In contrast, moving grate incineration, and to a lesser degree, rotary kiln incineration, are considered well proven for processing of mixed waste (whereas fluidised bed incineration is best for homogenous waste).
- Incineration is more flexible than ATT with regards to feedstock; the potential to supplement MSW with other fuel such as biomass should not be an issue in a moving grate or rotary kiln incinerator.

Therefore, either moving grate or rotary kiln incineration is considered to be the most promising option for energy from waste.

Detailed Waste Study

MSW is considered the priority waste stream regarding alternative waste management. A high-level assessment of alternatives to landfill disposal has been undertaken paying regard to the NCV and composition of MSW available, as well as the quantity. On this basis, Energy from Waste is considered the best potential option, as it should be able to accept all MSW with little or no pre-treatment and has the potential to generate electricity for distribution back into the local grid.

The bidder and WAL will undertake the following waste study.

- A detailed waste audit on MSW, to obtain up to date primary data on the composition of MSW on Tongatapu. This will involve taking representative samples of waste over multiple time periods and manually sorting into categories. The results from this audit can then be collated with weighbridge records at the landfill to inform updated quantity estimates of each waste fraction within the MSW
- Confirm supplementary sources of waste / feedstock:
 - The priority should focus on wood biomass from forestry and confirming the quantities and properties of the residues currently produced. This will require further consultation with the forestry mill and other processors in Tonga
 - Other supplementary sources include MSW already deposited within the landfill, sewage waste and residues from crop production / energy crops. These should be viewed as secondary feedstocks and will require separate detailed assessment to assess suitability and potential volumes



Figure 1 Waste in-situ in the active cell at Tapuhia landfill

Considering the visual observation and the identified secondary data, the MSW deposited at Tapuhia landfill is estimated to have the composition and NCV in Table 1.

Table 1: Assumed indicative composition and NCV of MSW

Fraction	% composition (by weight)	Quantity at 14,600 tpa	Quantity at 18,250 tpa	Net Value MJ/kg	Calorific (NCV)
Mixed organic waste (incl. food waste and green waste)	50.0	7,300	9,125	4.0	
Mixed plastics	10.0	1,460	1,825	22.0	
Paper/card	5.0	730	913	10.0	
Metals	10.0	1,460	1,825	N/A	
Glass	5.0	730	913	N/A	
Textiles	5.0	730	913	14.0	
Diapers	10.0	1,460	1,825	5.0	

Fraction	% composition (by weight)	Quantity at 14,600 tpa	Quantity at 18,250 tpa	Net Value MJ/kg	Calorific (NCV)
Other	5.0	730	913	2.0	
Total	100	14,600	18,250	6.0	

Disposal

There are no waste transfer stations located on Tongatapu consequently all MSW collected by WAL is disposed of directly to the landfill located at Tapuhia, which opened in 2006. The landfill area is divided into four cells. Cell 1 of the landfill was filled in approximately 10 years and has been capped. Depositing of MSW in Cell 2 began in January 2017.

The landfill currently operates one front loader to offload waste and one compactor. Daily cover is not currently applied..

Assessment of alternatives

Estimates of MSW are in the region of 14,600 to 18,250 tonnes of MSW per annum, with a composition thought to be at least 50% organic (green and food waste) and an approx. NCV of 6 MJ/kg. The population of Tongatapu is in slight decline, however, WAL anticipate MSW quantities may increase as the awareness and effectiveness of their waste management system increase.