# APPENDIX A - RFI Respondent Form

The Respondent should complete and submit the Respondent Form (including all supporting documents), inserting additional pages as is necessary.

## CATEGORY 1: The Project

The project is for the establishment of a Solid Waste Treatment Facility (SWTF) on Aruba. The intention is to perform materials recovery for recycling purposes, energy recovery, and residual waste handling. Respondents are requested to provide detailed proposals based on the solid waste information provided in Appendix B.

The facility shall be designed to incorporate a MRF and a WTEF based on thermo-chemical (e.g. combustion, gasification or pyrolysis) processes. The WTEF shall be connected to the utility company’s existing gas line and/or electrical grid.

**Information about Serlimar** Sui Generis

Serlimar Sui Generis (Serlimar) is the largest waste management company in Aruba, with the Aruban Government as the only shareholder. Serlimar provides refuse collection services to residential and commercial customers. Currently the waste collected by Serlimar is brought directly to the Parkietenbos Landfill & Containerpark, also operated by Serlimar. The facility has been Aruba’s official public refuse dumping-site since the 1960s and is organized in two main deposit sections, the container park and the landfill. The container park is a residential Public Transfer Station (PTS) intended for waste materials separation with the purpose of materials recycling. Materials such as wood, tires, cardboard, paper, glass, green & yard waste, construction waste and metals can be brought to the container park. Hazardous or flammable materials such as car batteries, waste oil, asbestos containing materials, acid containing materials, and animal carcasses are not accepted with household waste; and need to be transported separately to the container park at Parkietenbos. The envisioned future of Serlimar is to achieve a modernized waste management solution that is sustainable from both an environmental and economic point of view.

**Information about W.E.B. Aruba N.V.**

Water- en Energiebedrijf Aruba N.V. (WEB) is one of the pillars of Utilities Aruba N.V. Utilities Aruba N.V. is a holding company, with the Aruban Government as the only shareholder. WEB is responsible for the production and distribution of water and generation of electricity that is delivered to N.V. ELMAR, the national electricity distribution company. The envisioned future of WEB is to be cleaner, greener and fuel oil free by 2020. To achieve this goal WEB needs to engage in cleaner and greener technologies (renewables) for a more sustainable energy and water supply. Cleaner technologies will lead to less emissions and therefore reduce carbon foot print and have a positive impact on the environment.

Aruba’s current average demand is 106 MW with an average peak demand of 135 MW.

The installed power generation capacity is approximately 280 MW and consists of the following components including the respective feedstock as per Table 5

Table - Current installed capacity at WEB.

|  |  |  |
| --- | --- | --- |
| Method | Installed capacity | Feedstock |
| Steam turbines | 136 MW | Steam from HFO fired boilers |
| Reciprocating (RECIP) engines | 92 MW | Heavy Fuel Oil (HFO) |
| Gas Turbines | 22 MW | Light Fuel Oil (LFO) |
| Wind Turbines | 30 MW | Wind |

If the SWTF produces steam as an output product, then the steam conditions should be specified. For reference, the steam process conditions at WEB are as per Table 6.

Table - WEB steam requirement

|  |  |
| --- | --- |
| **Item** | **Data** |
| Pressure | 61 Bar (a) |
| Temperature | 480 °C |

If the SWTF produces electricity as an output product, then the following Electrical Output Quality should be considered: 13.8 kV, 60 Hz and a step-up transformer 13.8 kV- 60kV, for the transmission voltage level. The facility could be tied-in on the WEB 13.8 kV switch gear. The Respondent shall supply and install the electrical system necessary for the electrical tie-in, including switchgears, transformer(s), MCC, VFDs, filters, cabling and wiring.

If the SWTF produces syngas as an output product, Respondent shall supply the syngas specification.

## CATEGORY 2: Characterizing Respondent

1. Name and Contact Details of Respondent:
   1. First Name
   2. Last Name
   3. Company Name
   4. Business Address
   5. Telephone Number
   6. Email Address
2. Submit your company/ organization profile.
3. Specify the locations where you do most of your work.
4. Please provide the following information regarding your previously executed Waste to Energy project(s) in Table 7 . You may provide information of up to three (3) representative projects.

Table - Past Projects

| Description | Project #1 | Project #2 | Project #3 |
| --- | --- | --- | --- |
| 1. Project name |  |  |  |
| 1. Facility location |  |  |  |
| 1. Solid waste treated annually (ton) |  |  |  |
| 1. Overall facility gross power output (MW) |  |  |  |
| 1. Project duration - months |  |  |  |
| 1. Project cost - USD/MW |  |  |  |
| 1. Project cost - USD/MT |  |  |  |
| 1. Facility cost estimate - USD/MW |  |  |  |
| 1. Facility cost - USD/MT |  |  |  |
| 1. Facility Technology Life Cycle - years |  |  |  |
| 1. Facility Economic Life Cycle - years |  |  |  |
| 1. Type of contracting strategy |  |  |  |
| 1. Project financing strategy |  |  |  |
| 1. Project reference person contact information |  |  |  |

## CATEGORY 3: Technical information

**Input requirements**

1. What are the utilities (i.e. water, steam, fuel, electricity etc.) that need to be supplied to the solid waste separation facility?
2. What are the utilities (i.e. water, steam, fuel, electricity etc.) that need to be supplied to the waste to energy conversion facility?
3. What are the quantities and main characteristics of these required utilities?
4. What are the waste characterization information that you need for a detailed SWTF design?
5. Which types of materials are not accepted for processing in your SWTF?
6. How would you perform an in-depth analysis of the solid waste and a feasibility study based on this analysis?
7. Provide other preliminary requirements that must be in place for facility detailed design and construction.

**Materials recovery and RDF**

1. What are your options and typical steps in the solid waste separation process for materials recovery?
2. Based on the given solid waste profile, what is your estimated percentage (range) of solid waste that could be recycled?
3. What are the typical separated recyclable and non-recyclable products (streams) obtained from your solid waste separation process in successfully completed projects? Please indicate the typical destinations for these separated recyclable and non-recyclable products.
4. What is the percentage of the given solid waste profile that would be suitable for a thermo-chemical energy recovery process?
5. What are your typical RDF quantity, composition, and form factor for the given solid waste profile?
6. Provide technical waste separation limitations (and efficiency reduction %) details as well as related operational conditions.
7. What are your experiences on the international markets of solid waste and recyclable materials import/export?

**Waste To Energy Conversion**

1. What are the typical energy recovery units used for the given solid waste profile?
2. Provide details of the types of options and operating ranges available per energy conversion unit.
3. Provide technical energy conversion limitations (and efficiency reduction %) details as well as related operational conditions.
4. What is the minimum amount and composition of solid waste (in ton per day) needed for your waste to energy solutions?
5. What are the types of energy streams produced by your thermo-chemical process?
6. What are the typical quantities and main characteristics of these produced energy streams based on the provided solid waste profile? What is the expected generation of electrical energy in kWh/ton for the given solid waste profile?
7. What is the optimal heat rate (Btu/kWh) achieved and on which size/class/frame size of machine?
8. Heat production for household heating systems is not required in Aruba. How will excess heat be recovered to produce useful energy streams? Provide a typical facility heat balance for the given solid waste profile.
9. What are your solutions for the dissipation of energy produced by the WTEF in situations where there the demand is insufficient or zero?
10. What are possible solutions in case of structural local over- or underproduction of RDF as compared to the energy conversion capacity of the WTEF?

**Other Facility characteristics**

1. Provide a typical plot plan layout, configuration, PFD.
2. What are your common process configuration experiences for a facility that entails both recyclable materials recovery and energy recovery?
3. Provide a typical control system architecture showing all components for a typical solid waste to energy facility, including solid waste separation units, energy recovery units and auxiliary units.
4. List what typical equipment is used to create your DCS e.g. PLC, servers, HMI, etc.
5. Are there any communication limitations of your equipment interfacing with other/different equipment control systems? Provide previous interface successes.
6. Indicate your experience with design and construction in tropical, marine, saline, corrosive and high UV environment. Provide references.
7. What are your typical stack height and contour area dimensions (including clearance zone) for the given solid waste profile?
8. Provide details about design considerations or improvements that come standard as part of the product portfolio.
9. Provide sufficient details of design aspects unique to your solution offering.
10. Provide typical Reliability, Availability, Maintainability (RAM) figures (proven by operation) for the various machine classes/sizes.
11. What are the safety mechanisms built in your SWTF against destructive incidents and permanent damage (e.g. due to overheating, short circuit, flooding, overpressure, control failure, etc.)?
12. What are the scalability characteristics (capability to be changed in size or scale based on future supply/demand developments) of the facility?

**Environmental aspects**

1. What are the environmental laws, regulations, conditions of operation and other compliances (e.g. vibration, odor, etc.) that are valid for your SWTF? According to which environmental standards is your WTEF designed?
2. Indicate possible environmental impacts.
3. What is the percentage of waste reduction (residual vs input solid waste) that can be expected from your SWTF, based on the provided solid waste profile?
4. How will the residual waste resulting from the processes be handled?
5. How does your handling of residual waste comply with the best environmental practices and standards?
6. What are the area/environment characterization information that you need for a detailed SWTF design?
7. What technologies do your WTEF utilize to conform to best practice emission requirements and standards, e.g. particulate matter, NOx, SOx, etc.

**Operation and maintenance**

1. Provide details on the operating philosophy possible for your products e.g. base load, peaking etc.
2. Provide your predictive and preventive maintenance guidelines.
3. Provide a typical Operation & Maintenance organization requirement to operate the facility.
4. What is the estimated number of personnel required to operate the SWTF for the given solid waste profile?
5. What are the training and competence requirements for personnel to operate the facility? Please indicate how the required skills and competencies can be developed.
6. What are your guidelines and solutions regarding occupational health and safety for personnel working in the facilities? Please specify the applied international standards.
7. How does the operation of your WTEF support grid stability?
8. Provide a typical start up support structure required from client.
9. Provide details of the failure mechanisms that drive the necessity for the intervals in the above-mentioned question.
10. What are your maintenance and outages schedules/intervals for a typical MRF and WTEF?

**Economics related data**

1. What is the estimate average capital cost per annual ton of capacity (USD/annual ton) for the given solid waste profile, location and a 24-hour operation?
2. What is the estimate average capital cost per power output (USD/MW) for the given solid waste profile, location and a 24-hour operation?
3. What are the operational costs (in USD/annual ton) of the SWTF for the given solid waste profile?
4. What are the estimate amount, composition and potential economic value of the recyclable materials and residual waste resulting from the waste to energy process?

**Technical data**

1. Provide the requested data/values as per Table 8 below:

Table -Technical data

| Item | Query | Materials Recovery Facility (MRF) | Waste To Energy Facility (WTEF) |
| --- | --- | --- | --- |
|  | Facility Foot print – m2 |  |  |
|  | Economical Facility Life cycle – years |  |  |
|  | Technical Facility Life cycle – years |  |  |
|  | Facility availability - % |  |  |
|  | Cold start-up time requirement (to full load) – min |  |  |
|  | Start-up time requirement (after trip) – min |  |  |
|  | Shutdown time – min |  |  |
|  | Unit efficiency at minimum turndown - % |  |  |
|  | Unit efficiency heat rate – BTU/kWh |  |  |
|  | Net electric efficiency - % |  |  |
|  | Provide ramp up and ramp down capability – MW/Sec |  |  |
|  | Total facility equipment weight – kg |  |  |
|  | Operation & Maintenance cost – USD/MW/Year |  |  |
|  | Parasitic load/auxiliary – kWh |  |  |
|  | Plant air – scfh |  |  |
|  | Instrument air – scfh |  |  |
|  | Other |  |  |

## CATEGORY 4: Project Management & Contracting Strategy

1. What is the typical completion period for the project; from Engineering to completion of construction?
2. What are the typical bottlenecks and how can they be eliminated?
3. Does your company perform Hazard and Operability assessments of the units?
4. What are the guarantees, warranties that you offer for your SWTF?
5. What contracting strategy do you recommend?
6. Indicate the budgetary estimated cost per the following contracting strategies:
   1. Engineering, Procurement, Construction (EPC).
   2. Engineering, Procurement, and Construction by the Government of Aruba (EP).
   3. Build Own Operate (BOO).
   4. Build Operate Transfer (BOT), with estimates to cover transfer period after 4, 8, 12 years.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Contracting Strategy** | **Transfer periods** | | | |
| **4 years** | **8 years** | **12 years** |  |
| BOT |  |  |  |  |

* 1. Build Lease Transfer (BLT); design & build the SWTF and lease it to the Government of Aruba who will operate and maintain the SWTF. At expiry of lease agreement, the SWTF will be transferred to the Government of Aruba.

## CATEGORY 5: Financial Aspect of Project

1. The Government of Aruba is currently exploring multiple financing options and is therefore requesting respondents to clearly provide capital financing options your company can provide and proposals regarding financing possibilities. Financing options should include percentage of interest rate for each option.
2. Respondents to include a recommendation on a Lease to Purchase option whereby Respondent finances, designs & constructs the SWTF and the Government of Aruba leases the facility from the respondent. The Government of Aruba will operate and maintain the facility.
3. Provide a general background on how you intend to finance this project if chosen for the finance option:
   1. Company Profile, financial and management capacity to handle a project as described above.
   2. What local government support do you anticipate being required to optimize the financing for the Project?

## CATEGORY 6: Other Considerations

1. Provide the economic benefits (e.g. value creation through energy, recyclable materials, carbon credits) of your proposed solutions.
2. Provide the environmental benefits of your proposed solutions versus other waste management solutions and energy production solutions (e.g. HFO-based power plants).
3. Provide the economic and/or environmental challenges resulting from your proposed solutions.
4. Provide any novel or alternative technology that may benefit this project.
5. Propose an integral waste management plan that includes the end-to-end value chain for cost recovery.
6. For waste separation at the source, propose a solution that may facilitate or improve the treatment of Municipal Solid Waste (MSW), Commercial Waste (CW), and Construction and Demolition Waste (C&D) further in the value chain.
7. How can your company support the development of a business model and financing structure that validates the proposed integral waste management plan and value chain?
8. How will your company provide a socio-economic, public health and environmental impact assessment?

## CATEGORY 7: Alternative proposal

1. Please provide any comments on other creative project scope ideas, procurement options, technical considerations, etc. that have proven to be successful and that would be of interest to The Government of Aruba.