RFI - Battery Shredding Products and Services

Annex A – Company and Technical

Questionnaire

The following questionnaire (which is a fillable PDF document) is intended to collect responses from companies involved in a variety of battery shredding components including, but not limited to:

- Battery shredding equipment and operational requirements
- Battery shredding facilities
- Battery storage and requisite holding facilities
- Operational support for battery shredding equipment and/or facilities
- Maintenance support for battery shredding equipment and/or facilities
- Battery disassembly training
- Battery shredding-as-a-service

RFI respondents are at a minimum requested to provide information on battery shredding equipment offerings and operational requirements. Companies that can provide a holistic suite of battery shredding related services through partnerships or sub-contracting arrangements are encouraged to submit a single, consolidated RFI response by one company representing the consortia outlining their combined capabilities.

The “Technical Information and Services” section of this Annex contains questions pertaining to multiple components of battery shredding. All questions are optional – please submit responses for questions applicable to the services your company(ies) offers.

Definitions:

1. Battery shredding:
    a. The process of mechanically processing battery packs or modules into fine powder. This is usually performed when an EV battery reaches end-of-life (EOL). Shredding the battery enables the subsequent separation of the output into valuable fractions, such as black mass, which contain battery cathode minerals. The process can involve additional preprocessing steps such as discharging, disassembly, electrolyte removal from batteries to ensure safe operations, and postprocessing to separate black mass from the rest of the shredding output.
2. Black mass
    a. A product of the battery shredding process – rich in cathode minerals used in lithium-ion batteries (e.g., lithium, nickel, cobalt, or manganese, depending on the battery chemistry). Black mass is further processed, usually by hydrometallurgical processes, to recover battery grade minerals or mineral salts. Black mass can have hazardous or non-hazardous properties, depending on the ancillary steps performed during the shredding stage.

ORGANIZATION INFO		
Company Name:		
Parent Company Name (if any):		
Company address:		
City:	State/Province:	Postal Code:
Country:		
Contact Name:	Contact Title:	
Contact Phone:	Contact Email:	
Website:		

ORGANIZATION DETAILS	Responses
Type of business (*i.e., corporation, LLC, sole proprietorship, partnership):*	
Date of formation/incorporation:	
State and country of incorporation:	
Parent company date of formation/incorporation:	
Parent company state and country of incorporation:	
Number of battery shredding projects supported to date:	
Countries in which operations or business related to battery shredding have been conducted:	
Total size of the team supporting any battery shredding projects:	
Please list the team's relevant areas of expertise to support a battery shredding project:	
Please specify the services you will be able to provide for supporting battery shredding operations in Bermuda (e.g. equipment provider, facilities engineering/construction, battery disassembly training, facilities operation and/or maintenance, battery-recycling-as-a-service, project financing, etc.):	

PROJECT REFERENCES *Below please list the most relevant, verifiable battery shredding projects supported by your company (either as equipment provider, project financing, engineering/procurement/construction, battery recycling-as-a-service, or any combination of mentioned services)*	
Battery shredding: Project 1	
Contract type:	
Project name:	
Project location:	
Construction dates (or projected completion date):	
Contract amount (USD):	
No. of years operating (if already commissioned):	
Relevant contractor information:	
Percent owned by responding company:	
Battery shredding capacity:	
System description and component details:	
Battery Shredding: Project 2	
Contract type:	
Project name:	
Project location:	
Construction dates (or projected completion date):	
Contract amount (USD):	
No. of years operating (if already commissioned):	
Relevant contractor information:	
Percent owned by responding company:	
Battery shredding capacity:	
System description and component details:	

PROJECT INFORMATION

Part A: General Information

Business Models

Please describe the business model for products and/or services offered by your company. Provide details on any additional service your business could offer to support a battery shredding operation in Bermuda. If you are able to offer multiple business models (e.g equipment supply/supply and installation/supply, install and operate) related to your battery shredding product or service, please include all options. Include any specifics on project financing, if applicable.

Please describe any partnerships, sub-contracting, or other working agreements related to your battery shredding company (e.g., equipment and certification training, engineering and construction, equipment or facilities maintenance, etc.).

Please describe an indicative timeline (in months) for battery shredding implementation in Bermuda for the products or services offered.

Equipment procurement:
Construction and commissioning:

Geographic Considerations
Please describe your company's ability to, and challenges associated with, commissioning and/or operating on a small island nation.
What recommendations do you have on how Bermuda may reduce its cost (e.g., sizing optimization, seasonal/timing of procurement and/or construction, etc.)?
Other
When developing a battery shredding facility, what are potential fatal flaws associated with project development? With operations?

In order to respond accurately to a future request for proposal (RFP), what additional information or data would you require? (e.g., local waste management regulations, site visit, etc.)
Aside from the Basel convention and U.S. EPA regulations around shipping and handling battery waste, are there other international and national regulations governing shipping and transportation of battery waste or shredding products applicable to your services offered?
Please describe any other considerations or recommendations for Bermuda as they begin planning for this project.

Part B: Technical Information and Services

Battery Shredding Equipment

Please provide details of the capability of the shredder in terms of battery sizes and chemistries that can be shredded; and if any preprocessing is required before batteries enter the shredder.

What is the makeup of the shredded output? Can the shredded output be exported from Bermuda as non-hazardous waste per the Basel Convention, and U.S. EPA hazardous waste regulations? Does the battery shredding setup include additional pre-treatment or post-processing to ensure safety of operations, non-hazardous output, and waste treatment of byproducts?

Battery pre-treatment prior to shredding:

- Battery discharging operations
- Dismantling or component removal operations

Post-processing of shredded output:

- Remove fluorinated compounds and toxic material (e.g. by neutralization)
- Separation into black mass and other shredded output (e.g. magnetic separation, sieving, etc.)
- Waste treatment of process byproducts before discharge into environment
- Impurity or contaminant reduction in black mass for easier downstream recovery steps

Storage:

- Containers for holding EOL EV batteries before shredding
- Containers for holding shredded output
- Containers for any other byproducts from the shredding process

Safety:

- Sensors or other equipment required to ensure safe storage and equipment operation

Preparation for shipping:

- Packaging for shipping
- Any additional steps needed to ensure regulatory compliance

What are the annual battery volumes that can be handled by the equipment that is offered by your company? If there are various equipment sizes available – please specify the range in sizes, or a recommended equipment size for handling the anticipated volume in Bermuda of about ~500 MT/yr of end-of-life batteries.

What energy and material inputs will be necessary for performing battery shredding and any pre- or post-processing activity? Please describe the input needs in terms of volumes required per metric ton (MT) of batteries shredded or similar.

OPERATIONAL REQUIREMENTS	VOLUMES	REFERENCE QUANTITY (e.g., shredder capacity, per metric ton (MT) of battery material, etc.)	REMARKS
Reagents			
Energy			
Water			
Others			

Facility

Please state the estimated size of facility (in square feet) needed to house the shredding equipment? Account for space needed for any pre- or post-processing steps, battery holding and storage facilities, and for any auxiliary systems need for handling, safety, waste treatment, etc. Participants are encouraged to submit additional renderings of the facility needed to house the shredding equipment. Due to email attachment size limitations all technical drawings of the equipment will need to be uploaded to a secure Dropbox folder created for each respondent. Creation of and access to this folder can be requested by emailing the Procurement Lead, Aran McKittrick, batteryrecycling@gov.bm

How should the batteries be staged or pre-processed before shredding, and would this be included in the proposed facility?
What safety protocols should be considered for any battery handling facilities (i.e., shredding, storage, dismantling, etc.)?
Please describe any other considerations or recommendations for Bermuda related to a battery shredding facility.

Operations and Safety
How many employees are needed to operate the shredder? Are there training and certifications needed for operating the shredder? If so, please provide details.
Please describe the safety systems, waste treatment system, and any auxiliary system needs (e.g., cranes, special handling tools) that are required for safe shredding operations.
What are the waste materials generated by battery shredding operations? Please detail any environmental impacts from the waste generated. If applicable, please list any additional services or logistical support that your company can provide for byproduct disposal.

Please describe the durability and safety characteristics of your equipment, structural design, and/or facility considering hurricane risk, high salinity in the air, and other factors. What is the expected lifetime of the equipment/facility?
Please mention any industry standards and certifications applicable to the shredding equipment or facility in terms of operational safety, performance of equipment, environmental impact, and operator training (if needed).
Please provide details of any maintenance and servicing activity that will be needed for a battery shredder and/or requisite facilities.

Please describe any post-commissioning operation and maintenance requirements. Are these services offered by your business?
What product warranties are available, if any?
Please describe any additional considerations for Bermuda relevant to operations and commissioning of battery shredding and/or requisite facilities.

PART C: COST INFORMATION

Please provide your budgetary estimates for the following in USD *(NOTE: any pricing will be used for fiscal budget planning purposes only and will not be used to evaluate, elevate, or eliminate any interested bidder from a future tender)*

Please note, the figures requested should be total turnkey estimates for shipping to and construction in Bermuda, excluding local unknowns such as permitting, VAT, custom duties, etc.

BATTERY SHREDDING EQUIPMENT COSTS	COST	UNIT or QUANTITY	REMARKS
Shredder			
Any optional or auxiliary shredding equipment (e.g. post processing separator)			
Handling equipment, if needed			
Sensors, if needed			
Safety equipment, if needed			
Waste treatment equipment, if needed			
Other, please describe:			

OPERATIONAL COSTS	COST	UNIT or QUANTITY	REMARKS
Reagents			
Post-commissioning operational support			
Other, please describe:			

FACILITY COSTS	COST	UNIT or QUANTITY	REMARKS
Engineering and construction for shredder facility			
Engineering and construction for battery storage facility			
Battery storage safety equipment			
Other, please describe:			

ADDITIONAL SERVICES COSTS	COST	UNIT or QUANTITY	REMARKS
Engineering/Procurement/Construction			
Training and certification – equipment operation			
Post-commissioning maintenance support			
Support and/or training for battery removal, disassembly			
Other, please describe:			

If any "Other" costs are indicated above, and not included in the main components, please specify: