

## Annexure-I

### Technical Specifications for Regenerative Dynamic Battery Emulator System

#### **Applications/End use:**

To emulate/perform charge-discharge cycle tests of battery modules and packs or other power electronics components for electric vehicle(EV) applications.

#### **Regenerative Dynamic Battery Emulator** with following minimum specifications:

1. Minimum power rating of the system: 20 kW
2. Number of channels required : 4 or 8
3. Each channel power : 5 kW or higher (for 4 channels configuration) or 2.5 kW or higher (for 8 channels configuration)
4. Voltage Range : For 4 channel configuration: At least 2 channels 500V or higher & other channels 200V or higher  
For 8 channel configuration: At least 4 channels 500V or higher & other channels 200V or higher
5. Voltage resolution: 20 mV or better
6. Voltage Accuracy : 0.05% Full Scale (FS) or better
7. Current ratings: For 4 channel configuration: Minimum 20A per channel for 500V channels and Minimum 50A per channel for 200V channels  
For 8 channel configuration: Minimum 10A per channel for 500V channels and Minimum 25A per channel for 200V channels
8. Current resolution: 10mA or better
9. Current Accuracy : 0.05 % FS or better
10. Power resolution: 0.5 W or better
11. Power accuracy: 0.25% FS or better
12. All the channels must be able to work in source or sink mode. The transition time from source to load and vice versa should be 10 ms or less.
13. Each channel must be able to source or sink independently of rated capacity.
14. System must have modularity for paralleling all the channels or any combination of channels by mix and match to work in source or load mode - within the same unit.
15. The system should be an integrated solution and programmed through one controller.
16. The system should be modular for channel paralleling for higher number of channels in one controller for future up gradation in power/currents.
17. The system should provide automatic switching between source and load without any interrupt. There should be no overshoot during the transition.
18. The system must be supplied with necessary hardware and computer interface with following minimum configurations: HP/DELL or equivalent, latest generation processor and operating system, 8 GB RAM, 1 TB hard drive, 23" Monitor, keyboard, mouse, Ethernet port, USB 3 Drive or latest version
19. The system must be supplied with integrated software for measurement, monitoring, data logging, display and control of all relevant parameters.

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20. System should be able to perform charge-discharge cycle tests with constant current (CC), constant voltage (CV), constant resistance (CR) & constant power (CP) modes. System should have inbuilt driving cycle simulation facility to simulate real conditions of EV battery pack under quick and un-regular current condition. It should be able to Import dynamic charge/discharge power or current waveforms to simulate the DRIVE CYCLE or actual application. It should provide results on suitable data/ Excel (xls) format.
21. The system should have battery pack simulating function to simulate for multi-channel battery pack, battery pack charging/discharging, battery behavior curve setting, starting voltage and capacity initializing, battery pack total capacity setting, charging and discharging efficiency setting, battery DC resistance simulation, battery pack initialization cycle simulation, single channel bidirectional power supply simulation etc.
22. System should be air-cooled using variable speed fans.
23. The individual channel must have inbuilt protection and safety features for over current, over voltage, battery HV/power Warning, battery LV/Power warning, battery OVP/OPP, Battery HVP/LVP, over charging, over discharging, overheating/over temperature etc.
24. Data recovery protection (after power failure): In the event of power failure, the system should continue from the point where power failure occurred on resumption of the power.
25. Regeneration energy discharge efficiency: 80% or higher, Total Harmonic Distortion (THD)  $\leq 5\%$ , Power factor (PF)  $\geq 0.9$
26. The system should be supplied with necessary software, cables/connectors and interfaces (such as Ethernet, USB etc) for data logging using third party data logger (such as NI/Labview etc).
27. The system cabinet should be roller-wheeled.
28. Power Supply: Single/Three Phase, AC 220/ 440 V, 50-60Hz.
29. Installation, commissioning and demonstration: The system is required to be installed, commissioned and demonstrated at the buyer's site by factory trained engineer. Maintenance and training manuals should be supplied.

#### Warranty:

- ❖ One year comprehensive onsite warranty (including spares) from the date of installation.
- ❖ Additional two years extended warranty should be quoted separately and this amount **will not be considered** for evaluation of lowest bidder. However, if opted, the amount of extended warranty will be paid on year-to-year basis.

#### AFTER SALES SERVICE:

- ❖ During warranty period every support call must be attended within 72 hrs.
- ❖ Product support and spares for period of minimum five years after warranty period, to be ensured by OEM.
- ❖ Relevant software/hardware information in case of updating of the model of the supplied system should be provided.

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**ESSENTIAL, EXPERIENCE AND TECHNICAL CAPACITY CRITERIA TO BE MET BY  
THE SUPPLIER**

1. ~~Vendors may quote a system best suitable to the indented specification. The other items and accessories may be quoted as optional.~~ *Santosh. Sir*
2. The OEM/Bidder should provide the breakup of the items, model number along with full technical specifications etc.
3. The OEM/Bidder must enclose proper printed documentary evidence such as datasheet, catalogue, technical brochure etc in support of technical specifications or compliance of the quoted items/product.
4. The bidder should have sold and/or installed at least three such multichannel systems (4 channel or higher) to any of the leading institutions and national laboratories in India such as IISc/IIT's/CSIR/IISER/NIT/Central Universities/DRDO/DAE/MNRE/ISRO and other Govt. establishments within last 7 years. User list and satisfactory letters from three or more users or PO copies are required to be enclosed. Failing to meet the above may lead to the rejection of bids.
5. The details of factory trained engineers and service centre locations need to be included in the technical bid.
6. The bidder, other than OEM, must enclose authorization certificate from the OEM.