# Unit Level AHJ Checklist

# Laboratory Checks:

- 1. The lab is ISO 17025 accredited.
- 2. The unit construction details and specifications were provided.
- 3. The number of cells and location of cells failed at the unit level was the same as what was used at the module level.
- 4. The thermal runaway method used to initiate propagation was the same as the method used at the cell level and module level test.
- 5. Mitigation devices that are not part of the module/system construction were not introduced during the test to impact the outcome. (*Example: external barriers introduced around the external heater on the cell.*)
- 6. Critical information on any fire mitigation means employed in the system was provided and is consistent with the intended installation.
- 7. Testing was done at an indoor facility unless the ESS was for outdoor installations only.

## **Test Setup:**

- 8. A summary of the critical data from the cell test is provided (vent temperature, thermal runaway temperature, and gas data is available).
- 9. A summary of the critical data from the module test is provided (thermal runaway temperature, propagation occurrence, peak heat release rate, convective heat release rate, peak smoke release rate, gas data).
- 10. Test walls and test rooms were built using 5/8 inch drywall and painted flat black except for outdoor ground mounted residential applications or outdoor wall mounted residential applications which need to be tested with 3/4 plywood.
- 11. The test layout matched the intended installation layout with regard to separation distances from walls and other units.
- 12. The system was at maximum operating state of charge, which was checked prior to initiation of the test.

## **Test Method:**

- 8. Test outcome did not rely upon operation of integral electrical devices such as the BMS, fans or coolant pumps.
- 9. Temperatures were measured on walls and did not exceed 97°C of temperature rise above ambient unless intended for only noncombustible installations.
- 10. Temperatures measured on target units did not exceed the onset of cell venting temperature measured during the cell test.
- 11. Heat flux measured on walls and target units were measured and recorded.
- 12. The report indicated whether there was evidence of explosions, flying debris during the test or reignitions after the test.
- 13. For residential systems except for the outdoor ground mount installations, the report noted whether the cheesecloth indicator was charred as a result of flame during testing.
- 14. The report indicated whether or not the performance criteria of the unit level test were met.

Yes	No
Yes	No
Yes	No

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#### **Gas Measurements:**

- 1. The total hydrocarbon (THC) gas volume was measured and recorded for both the pre-flaming period and after start of flaming during the test using flame ionization detection (FID).
- 2. The total volume of carbon monoxide (CO) and carbon dioxide (CO2) gases were measured using nondispersive infrared spectroscopy (NDIR) and recorded for both the pre-flaming period and after initiation of flaming during the test.
- 3. The volume of hydrogen (H2) was measured using a solid state hydrogen sensor during the pre-flaming period and after initiation of flaming during the test.
- 4. Smoke release rate measured with white light source and photo detector for the duration of the test was provided.

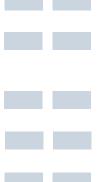
### **Supporting Documentation:**

- 8. Profiles showing the temperatures of initiating cells and nearby cells within the initiating module, modules in the initiating unit are provided.
- 9. Profiles showing that temperatures on target units do not exceed the cell vent temperature are provided.
- 10. Profiles showing heat flux measurements are provided showing that they do not exceed 1.3 kW/m2 at the egress path for non-residential applications and outdoor ground mounted residential applications.
- 11. Profile showing the heat release rate (Chemical & Convective heat release rate) versus time data for non-residential applications was provided.
- 12. The report provided photos taken during the test to show the progress of the initiating thermal runaway as well as diagrams and photos to show the test layout.

#### **UL Resources:**

Access additional information online at the below links: UL 9540A test method: https://www.ul.com/offerings/ul-9540a-test-method Energy storage testing and certification: <u>https://www.ul.com/offerings/energy-storage-system-testing-and-certification</u> UL Field Evaluations (FE): <u>https://www.ul.com/offerings/field-evaluations</u> Code authority resources: https://code-authorities.ul.com/about/technical-resources/application-guides/

# Yes No Yes No



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