CLAIMS

1. A method for a battery safety system, the method comprising:

receiving sensor data relating to one or more battery modules, the sensor data including a measurement of an off-gas released by the one or more battery modules;

calculating one or more parameters based on the sensor data;

comparing one or more parameters to a respective threshold value, wherein the one or more parameters are associated with characteristics of the battery module;

configuring a first thermal regulation system if the sensor data indicates presence of an off-gas, wherein the presence of an off-gas is indicative of an upcoming thermal runaway event; and

configuring a second thermal regulation system if any of the one or more parameters exceeds the respective threshold value, wherein one or more of the parameters exceeding the respective threshold value is indicative of the one or more battery modules entering a thermal runaway event, wherein configuring the first thermal regulation system upon presence of an off-gas reduces the likelihood of the one or more parameters exceeding the respective threshold value.

2. The method of claim 1, wherein configuring the first thermal regulation system and/or the second thermal regulation system decreases the temperature of one or more battery cells in at least one of the battery modules.

3. The method of claim 1, wherein the first thermal regulation system comprises a cooling circuit that provides coolant to one or more battery modules to thereby decrease the temperature of the one or more battery modules.

4. The method of claim 3, wherein the second thermal regulation system configures the cooling circuit to provide maximum cooling power to at least one of the battery modules.

5. The method of claim 1, wherein the first thermal regulation system controls the electric current provided to and/or from at least one of the battery modules.

6. The method of claim 1, wherein the second thermal regulation system is configured to provide one or more fire suppressant materials to the one or more battery modules.

7. The method of claim 1, wherein at least a component of the first thermal regulation system and/or second thermal regulation system can be manually controlled by a user.

8. The method of claim 1, wherein the parameters comprise one or more of: electrical parameters associated with at least one battery module, and temperature parameters associated with at least one battery module.

9. The method of claim 1, wherein the parameters are associated with one or more of a state of charge for one or more battery modules; a state of health for one or more battery modules; a state of function for one or more battery modules; the power availability for one or more battery modules; a total power cycles for one or more battery modules; an energy throughput for one or more battery modules; a cell impedance for one or more battery modules; and the battery core temperature for one or more battery modules.

10. The method of claim 1, wherein each parameter is associated with one or more operation values that define a safe operation range for the battery.

11. The method of claim 10, wherein one or more of the parameters exceeding the respective operation values is indicative of mechanical, electrical, and/or thermal abuse conditions.

12. The method of claim 1, further comprising electrically isolating one or more battery modules with a manual service disconnect.

13. The method of claim 1, further comprising providing one or more internal barriers between adjacent battery modules to reduce the propagation of thermal energy.

14. A battery safety system comprising:

a plurality of sensors for providing sensor data relating to one or more battery modules, the plurality of sensors including one or more off-gas sensors;

a battery management system for comparing one or more parameters associated with the sensor data to a respective threshold value; and

a first thermal regulation system and a second thermal regulation system;

wherein the first thermal regulation system is configured if the sensor data indicates presence of an off-gas, wherein the presence of an off-gas is indicative of an upcoming thermal runaway event, and the second thermal regulation system is configured if any of the

one or more parameters exceeds the respective threshold value, wherein the one or more of the parameters exceeding the respective threshold value is indicative of the one or more battery modules entering a thermal runaway event, wherein the first thermal regulation being configured upon presence of an off-gas reduces the likelihood of the one or more parameters exceeding the respective threshold value.

15. The battery safety system of claim 14, wherein one or more of the first thermal regulation system and the second thermal regulation system comprises a cooling circuit configured to remove thermal energy from one or more battery modules.

16. The battery safety system of claim 15, further comprising a battery thermal management system configured to control the cooling circuit.

17. The battery safety system of claim 16, wherein the cooling circuit comprises one or more cooling plates.

18. The battery safety system of claim 14, wherein the first thermal regulation system comprises one or more of an isolation monitoring system, an active circuit breaker, and an electrical current interrupting device configured to interrupt electric current to the one or more battery modules.

19. The battery safety system of claim 18, wherein the one or more current interrupting devices comprises a high voltage contactor, a fuse, a manual service disconnect and/or a pyrotechnic fuse.

20. The battery safety system of claim 14, wherein the second thermal regulation system comprises a fire suppressant module configured containing a first fire suppressant material.

21. The battery safety system of claim 20, wherein the first fire suppressant material is a fire suppressant aerosol.

22. The battery safety system of claim 14, wherein the second thermal regulation system comprises one or more dry break couplings configured to provide a second fire suppressant material to the one or more battery modules.

23. The battery safety system of claim 22, wherein the second fire suppressant material is fresh water or a fire-suppressant foam.

24. The battery safety system of claim 14, further comprising one or more valves configured to enable the release of an off-gas, the one or more valves being in communication with an off-gas ventilation manifold.

25. A battery system according to any of claims 14 to 24, further comprising one or more battery modules.

26. The battery system of claim 25, further comprising a battery rack support structure configured to receive the one or more battery modules to form a battery rack.

27. The battery system of claim 26, further comprising at least one flexible connector between adjacent battery racks.

28. The battery system of claim 25, further comprising a liquid absorption pad.

29. The battery system of claim 25, further comprising a battery enclosure for containing the sensors and battery modules.

30. The battery system of claim 25, wherein the battery enclosure provides protection against the ingress of fluid and/or particles from outside of the enclosure.

31. The battery system of claim 25, wherein at least one of the battery modules comprises at least one Li-ion battery cell.