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(54) **INTEGRATED ENERGY STORAGE SYSTEM INCLUDING A THERMAL ENERGY STORAGE COUPLED WITH A LIQUID METAL BATTERY STORAGE AND A CRYOGENIC ENERGY STORAGE**

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(57) **ABSTRACT**

Integrated energy storage system including a thermal energy storage coupled with a liquid metal battery storage and a cryogenic energy storage and related methods are described. An example integrated energy storage system includes a liquid metal battery storage, a cryogenic energy storage configured to store energy using a liquefied cryogen, a thermal energy storage, and a control system. The control system is configured to cause selective transfer of heat from the thermal energy storage to at least one battery unit associated with the liquid metal battery storage. The control system is configured to during a first mode associated with the cryogenic energy storage, cause selective transfer of heat from the cryogenic energy storage to the thermal energy storage. The control system is configured to during a second mode associated with the cryogenic energy storage, cause selective transfer of heat from the thermal energy storage to the cryogenic energy storage.