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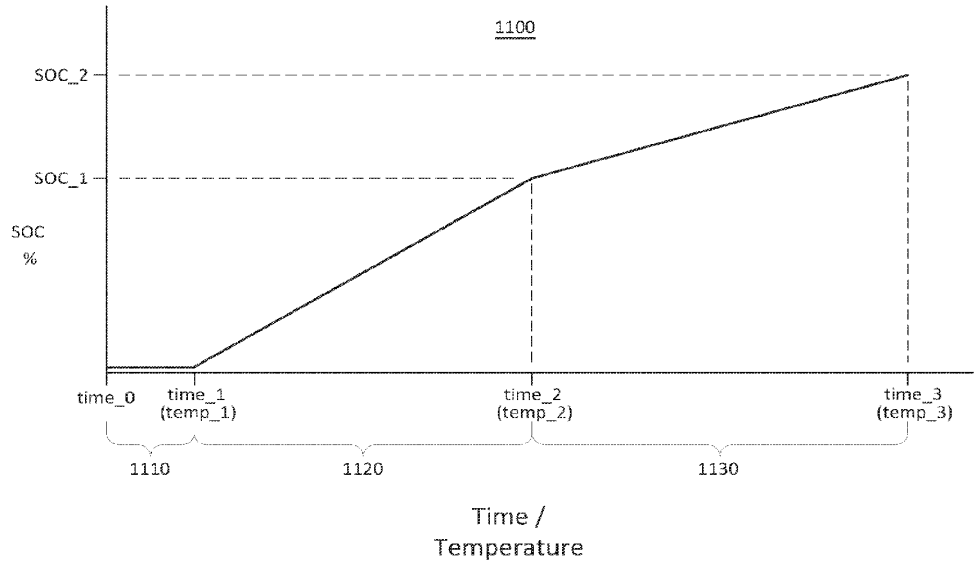


FIG. 11A

(57) **Abstract:** Embodiments that provide advanced charging of energy source arrangements for energy storage applications are disclosed. The embodiments can be used within energy storage systems having a cascaded arrangement of converter modules. The embodiments can include the application of pulses to an energy source of each module of the system. The pulses can be applied for charging and preheating purposes. Feedback based pulse control embodiments are also disclosed.

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