

Claims

1. A hybrid storage system for a cooling system, hybrid energy storage system
5 comprising:
a thermal storage system;
said thermal storage system arranged to provide cold energy to a cooling
medium of the cooling systems so as to generate chilled water, and;
an energy storage system;
10 wherein said storage systems are arranged to operate cooperatively such that the
thermal storage system is arranged to discharge energy for continual or slow
demand variability and the energy storage system is arranged to discharge for
rapidly changing demand.
- 15 2. The hybrid storage system according to claim 1, wherein the hybrid storage
system is arranged to be activated by a signal, said signal indicating any one of
grid frequency lower than nominal, an intermittency of the mains electricity
supply or a cut-off of the mains electricity supply.
- 20 3. The hybrid storage system according to claim 2, wherein the thermal storage
system is arranged to increase production of chilled water upon activation, the
chillers arranged to progressively reduce chilled water production, such that a

cumulative volume of chilled water generated by the thermal storage system and the chillers is equal to an end user demand.

4. The hybrid storage system according to claim 1, wherein the energy storage
5 system is arranged to maintain at a state of charge at idle state according to a predetermined support time during reserve service.

5. The hybrid storage system according to claim 4, wherein the state of charge is
50%, 75% or 100%.

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6. The hybrid storage system according to any one of claims 1 to 5, wherein the thermal storage system includes an ice tank for a district cooling system.

7. The hybrid storage system according to any one of claims 1 to 6, wherein the
15 energy storage system includes a battery, having a battery controller for managing the discharge and re-charge of said battery.

8. The hybrid storage system according to any one of claims 1 to 7, further
including at least one isolation transformer arranged to selectively electrically
20 isolate the energy storage system from the grid supply.

9. The hybrid storage system according to claim 7 or 8, the controller includes an uninterruptable power supply system arranged to continue operation in the event of the main power supply being lost.
- 5 10. A method of supplying energy for a cooling system by a hybrid storage system, the method comprising the steps of:
discharging cold energy for the generation of chilled water for slow demand variability by a thermal storage system, and;
discharging power for rapidly changing demand by an energy storage system.
- 10 11. The method according to claim 10, further including the steps of:
the thermal storage system increasing production of chilled water upon activation by a signal;
the chillers progressively reducing chilled water production, such that a
15 cumulative volume of chilled water generated by the thermal storage system and the chillers is equal to an end user demand.
12. The method according to any one of claims 10 to 11, further including the steps,
prior to the discharging steps, of:
20 detecting a fall in grid frequency below a pre-determined value, and;
sending an activation signal to the hybrid energy storage system.

13. The method according to claim 11 or 12, wherein the progressively reducing step includes the step of progressively shutting down each chiller, so as to progressively reduce demand by the electrical power requirement of each chiller.
- 5 14. A method of control for an integrated cooling network comprising:
receiving a predictive analysis of future demand;
determining strategies for the discharge and recharge of a thermal storage
system so as to optimize timing of either action relative to the predictive analysis;
and
10 monitoring and controlling a discharge of a fast response energy storage system
so as to ensure the availability of energy for discharge by the fast response
energy system according to said predicted demand.
- 15 15. A method of integration of an integrated cooling network comprising:
receiving predicted analysis of future demand for the cooling network;
receiving optimization strategies for the discharge and recharge of a thermal
storage system; and
implementing said strategies so as to control hardware for said cooling network
as well as timing for discharge and recharge of the thermal energy system and/or
20 fast response energy system.