Hierarchical Management of Heterogeneous Power Supply and Storage Sources

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Inventors

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Background

Under increasingly greater pressure to cut energy costs and reduce their carbon footprint, data centers use energy buffering to store renewable and off-peak energy in energy storage devices (ESDs), such as batteries and ultra-capacitors, and appropriate power delivery to reduce electricity cost. A fundamental problem with energy buffering is coordinating variable power demand with lower cost energy and inconsistent green energy supply. Each energy source varies in cost, pricing fluctuations, and supply characteristic. Additionally, ESDs vary according to their discharge rate, inefficiencies, and charge storage capacities. Current solutions are able to leverage most long term variability. However, they ignore the tradeoff between efficiency of ESDs and close matching of power demand with energy resources, wasting up to half the available

Invention Description

Researchers at ASU have developed a method to optimize energy buffering while accounting for both short and long term variations by using a two-tier energy buffering and workload management framework with two types of ESDs. High power density capacitors quickly charge/discharge to leverage short term variation and high energy density batteries store large amounts of energy for long term duration. This method coordinates response times between power consumption and input workload to within minutes, maximizing the use of available renewable energy while reducing power demand. Results show that multi-tier energy buffering management could increase the utilization of renewable energy by 200%.

Intellectual Property Status:

Pending

Potential Applications

- Data Center Infrastructure Management
- Energy Buffering Optimization

Benefits and Advantages

- **Effective** – Potentially doubles the use of renewable energy.
- **Efficient** – Optimizes energy consumption in the presence of both short and long term variability.
- **Lower Costs** – Reduces draw off the power grid, especially during peak rate times.

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