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A Load Managing Controller for Solar Photovoltaic Systems

A common feature in solar photovoltaic (PV) systems is that their power output is unpredictable and unstable in nature (intermittent). Various storage technologies can smooth the stochastic power output levels, but are neither cost-effective nor efficient. In addition, solar PV systems are typically connected to the power grid, letting users feed any excess electricity back into the grid. However, achieving this requires costly power electronics that permit electricity flow in both directions, further increasing cost and reducing efficiency. Scientists are now looking to manage the load connected to the solar system in order to match the intermittent power and result in increased efficiency and decreased cost.

Researchers at ASU have developed a concept for solar PV systems comprising an actively managed load using a controller. The controller changes the number of sub-loads connected to the PV system without conditioning or managing the power itself. The performance of the load-managing controller depends on the number of sub-loads in the system (i.e. more sub-loads yields higher system efficiency). Moreover, the purpose of managing or conditioning power is to match the required input power of the load. However, this can be done by matching the load to the intermittent power from the PV system. Managing the load instead of the power eliminates the need for storage devices and power electronics, reducing the cost of traditional systems by over 50% and enabling a system efficiency of over 95%.

Issued Patent: [U.S. Pat. No. 10,399,441](#)

Potential Applications:

- Solar Electricity
- Large-Scale Solar-Powered Irrigation Systems
- Solar Refrigeration Systems

Benefits and Advantages:

- Lower Cost – Cost reduced by over 50% in traditional solar PV systems due to active load management framework
- Efficient –
 - The system eliminates the need for power management or conditioning, thereby avoiding power losses and enabling a system efficiency of over 95%
 - Actively managing the load allows users to increase the number of sub-load components, thus increasing controller performance

- Innovative – The novel load-managing controller can apply to numerous industries including solar-powered electrolysis for production of raw materials, large-scale irrigation systems, and solar refrigeration systems