

Evaluating the economics of photovoltaics in a demand-side management role

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This paper examines current efforts to assess the economic viability of photovoltaics (PV) from a demand-side management (DSM) perspective. The benefits associated with dispatchable peak shaving PV DSM systems are discussed along with recent modelling efforts. Preliminary analysis, conducted at the Center for Energy and Environmental Policy (CEEP) together with Delmarva Power and Light, indicates that PV is closer to cost effectiveness, when assessed as a DSM option, than previously thought. PV DSM systems under investigation by CEEP include rooftop, non-dispatchable PV DSM and the integration of PV arrays and storage to provide dispatchable peak shaving capabilities. Analysis to date, on five case study utilities, shows that PV DSM systems can offer substantial value to utilities and their customers. Several policy options for promoting PV DSM are described along with a unique utility-customer partnership for the purpose of purchasing PV DSM systems.

Keywords: Photovoltaics; Demand-side management (DSM); Economic analysis

The availability of solar energy in several parts of the USA appears to correlate well with the types of days on which summer peaking utilities experience their highest demand (Perez *et al*, 1993). Summer peak loads tend to be driven by air conditioning requirements on long, hot sunny days, precisely the time when high solar insolation is also available. As a result, the effect of rooftop photovoltaic (PV) demand-side management (DSM)¹ systems on building load curves looks very much like a high efficiency heating, ventilation and air conditioning (HVAC) system upgrade (Wenger *et al*, 1992). DSM programmes that reduce a utility's peak demand, like high efficiency HVAC DSM programmes, tend to have higher value to utilities than other utility DSM pro-

grammes (Byrne *et al*, 1992). It is this high value PV opportunity that is modelled and evaluated below.

The economics of PV DSM

PV DSM systems can have both energy value (ie the system's ability to save energy) and capacity value (in the form of coincident peak demand reduction). The energy value credited to a PV DSM system is a function of the PV array's size and efficiency, and the availability of the solar resource. By producing energy on sunny days, rooftop systems can directly displace at least a portion of a building's needs from the utility.

Coincident peak demand savings from the deployment of PV DSM systems depend on the type of system used. A PV only system, in which storage is not included, would achieve demand reductions based on the output of the system at the time that the utility or the building is experiencing

¹Because PV in a peak shaving role is similar to (and will have to compete with) conventional DSM technologies such as direct load control of electrical equipment or HVAC efficiency upgrades, we will use the term PV DSM to represent the application.

