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**Title: Providing Customer and Environmental Benefits with Residential Distributed Energy Resources and Innovative Tariffs**

**Abstract:** Distributed energy resources (DERs), especially solar PV, electric vehicles and battery storage have become more widely deployed in households. This has created opportunities for new technologies that manage DERs to decrease customer costs while improving grid efficiency by shifting demand from periods of higher costs and higher net loads to periods of lower costs and lower net loads. Accordingly, in this study we present key findings from the “Smart Home Study” which evaluated the potential impacts of the Residential Distributed Energy Resource Management System (RDERMS) for 100 volunteer homeowners in San Diego Gas & Electric (SDG&E) utility territory. We evaluated the RDERMS impact on customer costs and grid impacts using SDG&E residential rates and California Independent System Operator (CAISO) wholesale market prices. We also examined opportunities to maximize renewable energy benefits by modifying SDG&E’s Electric Vehicle-Time-Of-Use-5 (EV-TOU-5) tariff and applying the proposed Load Shifting Resource (LSR) product that could incentivize customers to shift energy use to consume more renewable energy and decrease curtailment. The results show that the EV-TOU-5 rate structure brings the greatest benefits to customers (up to \$1,236 per year) and the grid compared to other SDG&E rates through RDERMS optimization. The results also show minor modifications to EV-TOU-5 can increase the consumption of renewable energy without affecting utility costs. Finally, we show that the customer benefits associated with participation in the LSR product is likely insufficient to encourage customers to shift their load to times of high renewable generation. These results can be used to inform improvements to current rate policy and market mechanisms to maximize customer benefits and increase the consumption of renewable energy.