Recent trends indicate that, in the medium term future, the electric infrastructure will become more decentralized, with small and medium distributed energy resources augmenting or even replacing large power generation capacity. Most of these resources will be located downstream of the power distribution substations, and will be controlled by various entities, including utilities, aggregators and even end users. Several demonstration projects related to distribution-level energy systems are currently operating at Mesa del Sol, a growing greenfield planned community in the Albuquerque, NM metropolitan area. These include a utility-scale photovoltaic array with battery storage, a microgrid serving a large commercial building, and two building-scale PV arrays with storage. If well coordinated, distributed resources of this kind could alleviate some of the problems common to the electric grid today, including stress resulting from peak demand in the summer and power quality issues related to high PV penetration. Moreover, distributed resources can be used to provide grid services and to absorb transmission-level renewables. A power distribution simulator was used to calculate voltage disruptions caused by the integration of various resources similar to those operating at Mesa del Sol, including large and small PV, battery storage, a microgrid, several large thermal storage devices and residential HVAC. It is shown that, while distributed systems can deliver the expected benefits, it is necessary to consider system-wide coordination to ensure that the benefits are not accompanied by unintended consequences.

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