

Abstract

A smart grid is an energy grid network upgrade to a system that captures waste heat, adds detail and visibility to household monitoring techniques, allows for compatibility with remote alternative energy sources, and transfers data from meters to communication towers, also known as Data Collector Units (DCUs) using wireless technology. California is mandated to provide 33 percent of statewide energy from renewable sources by 2020. An energy network upgrade to a smart grid would facilitate the remote storage and transfer onto the grid that are necessary for solar and wind farms, which are often located far away from dense urban centers. Past research on smart grid development has focused on maintaining optimal meter to communications tower readings through analysis of distance to meters, spacing throughout a region, elevation and slope. Some site suitability research has focused on optimizing wind turbine placement so as to reach customer regions while simultaneously not offending nearby residents and staying clear of housing viewsheds. One particular power plant site suitability study used an ArcGIS weighted overlay analysis to return a score of one to 10 as a final site suitability predictor. This project incorporated ideas from each of these analysis approaches by including a viewshed analysis of meter-to-communication tower dynamics, communications tower site acquisition variables needed for placement objectives, and a pass/fail scoring system reflecting each variable. The site suitability tool meets the meter visibility objective of quantifying line-of-sight, nearest feature association, and distance between utility meters and communications towers. Three site acquisition objectives were considered: (1) pinpointing tower locations within 20 ft of a publicly-maintained street; (2) placing towers a minimum of ten feet from power lines for safety reasons; and (3) determining location(s) that are likely to avoid tree obstructions, so that radiation is sufficient to meet the needs of communication tower solar panels.