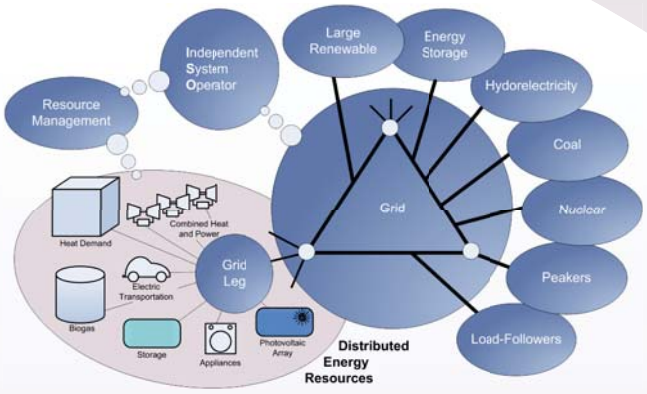
RESCO: Roadmap to Renewable Energy Security

OVERVIEW

The Renewable Energy Secure Community (RESCO) project is a program sponsored by the California Energy Commission to explore the technical, economic and regulatory requirements needed to integrate renewable energy generation and advanced technologies into communities, and the implications for the larger grid system.



Community Structure: Communities can interact with the grid to provide support using the dispatch of their resources.

The state of California has mandated that investor-owned utilities generate 20% of total electricity procurement from renewable sources by 2010, and 33% by 2020.

Integration of renewables into the grid presents challenges from both economic and technical points of view. Provision of electricity must be reliable, low-cost, and environmentally friendly. Renewables are traditionally higher cost than conventional technologies and introduce intermittencies that must be managed by other grid resources.

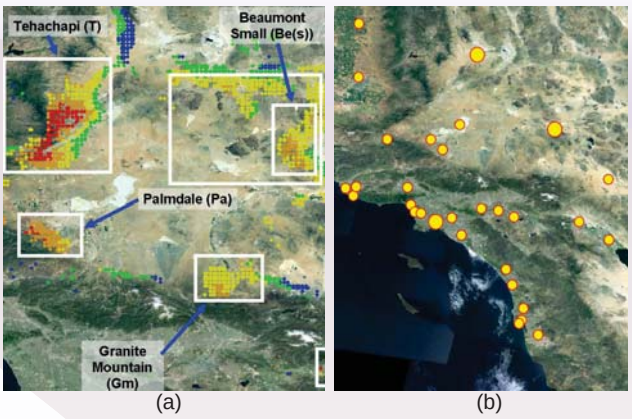
GOALS

The goals of the research program are to establish:

- An energy infrastructure (electricity, transportation, waste, building) roadmap for the UCI community that will maximize the deployment and utilization of renewable energy resources while satisfying reliability criteria, enhancing and sustaining power quality, and minimizing the cost-of-electricity (COE)
- A roadmap for communities in general following the same methodology as that of the UCI community roadmap
- Recommendations for policymakers and industry leaders regarding the technical limitations and requirements for implementation of renewable energy resources

RESULTS

In support of RESCO, the behavior of each resource has been characterized over a temporally coincident time period (i.e., hourly resolution of 2005). Wind, solar, geothermal, and hydroelectric are among the renewable resources that have been included.

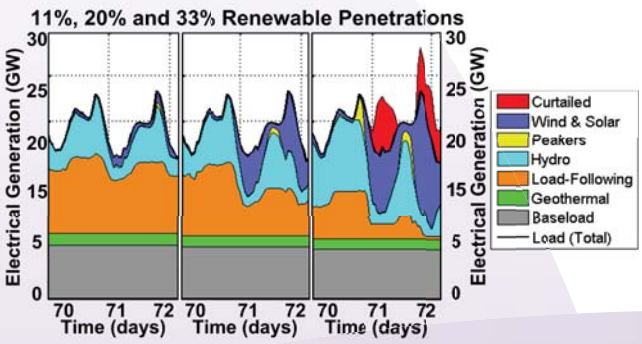


(a) (b)

Renewable Resource Maps for California: (a) Wind resource (source: NREL wind integration dataset) and (b) Solar resource (source: NSRDB)

RESULTS (continued)

Further, an energy resource allocation and dispatch model has been developed with the capability to balance communities' electrical demand with baseload, load-following, peaking, and other dispatchable generation resources. This tool optimizes the implementation of renewables for different cost functions including; minimum cost, maximum capacity factor, and minimum resource curtailment.



Time resolved generation portfolio for California separated by each of the major resource types

This work will shed light on integration and management challenges facing communities regarding their electricity, transportation, waste, and building needs, particularly with increased penetrations of renewable energy.

RECENT PUBLICATIONS/PAPERS

Tarroja, B., Mueller, F., Eichman, J.D., Brouwer, J., Samuelsen, S., Spatial and temporal analysis of electric wind generation intermittency and dynamics. Renewable Energy, (2011). Vol. 36 No. 12, pp. 3424-3432.

PERSONNEL

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