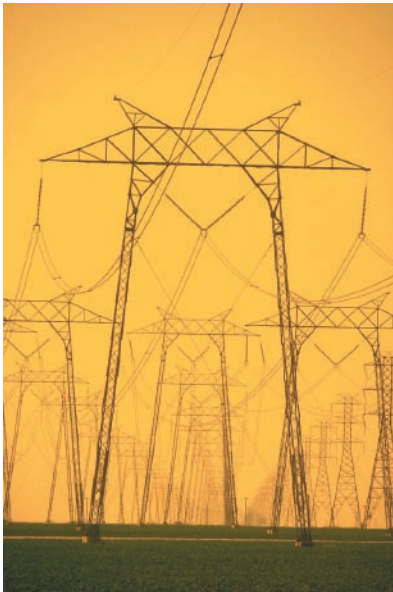


# BRIDGING SCRIPPS SCIENCE AND INDUSTRY



## SCRIPPS INSTITUTE OF OCEANOGRAPHY *UC San Diego*

ON HOT SUMMER AFTERNOONS, RESIDENTS OF CALIFORNIA'S CENTRAL VALLEY SOMETIMES FIND RELIEF FROM A WIND KNOWN AS THE DELTA BREEZE. SOME DAYS THEY'RE NOT SO LUCKY. TO THE STATE'S INDEPENDENT SYSTEM OPERATOR (ISO), THE DIFFERENCE TRANSLATES TO 500 MEGAWATTS OF INCREASED AIR CONDITIONER USE AND AN ADDITIONAL \$250,000 IN ENERGY PRODUCTION COSTS. IF THE ISO KNEW NOT TO EXPECT THE BREEZE, IT COULD SUBSTANTIALLY REDUCE THOSE COSTS BY ENACTING VOLUNTARY OR MANDATORY POWER SAVING MEASURES.



This was one of many issues that formed the basis for a study involving a consortium of industrial and academic partners including the California Energy Commission. Scripps Institution of Oceanography at UC San Diego scientists worked together with other stakeholders on a project called CalEnergy to leverage advances in climate science. It was an effort to supply knowledge to help energy officials more efficiently plan for electricity demand, such as in hot summer months when power needs surge, or when variations in local weather conditions affect electrical loads.

Based on Scripps-operated climate models and applied climate research, Scripps scientists created forecasting tools tailored to the needs of water, electric, and natural gas industries. CalEnergy became viable when advances in climate forecasting achieved a level of reliability useful in management decisions. This program was a part of a larger Scripps effort to incorporate climate science into the everyday routine of resource managers

Long-term prediction has been viewed skeptically in the war rooms of power providers, who are accustomed to seeing only one to two weeks into the future, the limit of weather forecasts. Yet longer time scales can be predictable when phenomena such as the Pacific Decadal Oscillation are considered. For example, this climate pattern can evolve in summer or fall then tend to bring frequent Arctic winds to the western United States the following winter. This climate pattern also leads to linkages between spring temperatures and summer irrigation pump use in the Pacific Northwest.

In the past decade, climate forecasting has achieved a level of reliability that enables its use as a management tool. Climate prediction tools give probabilistic, season-ahead forecasts of phenomena such as El Niño and the Pacific Decadal Oscillation, both of which affect summer and winter energy use. Besides forecasting phenomena like the Delta Breeze, Scripps



researchers have also created prediction tools to help energy officials plan for nighttime heatwave episodes and better control rates at which California's dams release water.

CalEnergy featured many individual deliverables and resulted in a significant number of publications in respected academic journals. A few of the results and conclusions from the study were:

- **A set of statistical models** that demonstrated significant skill for predicting summertime cooling degree days, average temperature and number of maximum temperature extremes based on Pacific Ocean sea surface temperatures.
- **A catalog of conditional probabilities** for summer temperatures across dozens of California zones based upon the springtime pattern of the Pacific Decadal Oscillation. For example, when the Pacific Decadal Oscillation is below normal in March, April and May, the subsequent June, July, and August period only has a 12 percent chance of being warmer than normal in the San Diego zone.
- **The Pacific Decadal Oscillation's impact** on wintertime temperatures was quantified through statistical modeling as well as dynamic atmospheric simulation. This technique was simultaneously used to test El Niño's impact on both summer and winter weather regimes. The Pacific Decadal Oscillation was found to have a stronger impact than El Niño on temperature patterns and warm California winters are more likely in "positive" phases of the Pacific Decadal Oscillation while colder winters are likely in "negative" phases.
- **Irrigation pump loads** in parts of the rural western states make up a large part of their electrical load, and vary widely from year to year. A method of predicting summer pump loads was based on spring conditions, along with a characterization of the skill and uncertainty in the forecast. This allowed one energy utility to factor the forecast information into its springtime planning for whether to obtain long-term energy supply contracts ahead of time, or to buy energy on the spot market as the summer progressed.

The CalEnergy deliverables themselves can lead to breakthroughs in energy risk management but this study also discovered an equally important outcome. Products from academic research, such as those above, must be made useful to non-scientist decision-makers. Communications between scientists and industry participants have traditionally been hampered because the two professions often use different methodologies and terminology. In addition, it has not been common for university-based scientists to interact directly with utility executives or water district officials.

CalEnergy established vehicles between climate research academics and industry. Industry representatives identify key decisions that can be influenced by weather and climate, and the climate scientists in return develop appropriate forecasts and associated estimates of uncertainty. The two groups come together in the end to establish an ongoing rapport and educational network through which industry professionals learn to best utilize the products from research scientists.

For a full report including links to further reading, please see [scripps.ucsd.edu/special/business/news](http://scripps.ucsd.edu/special/business/news).

## CONTACT

**STEPHEN BENNETT**

**Scripps Director of Business Development,**

**Executive Director of SPHEAR**

**Phone: 858-246-0065**

**Email: [stephenbennett@ucsd.edu](mailto:stephenbennett@ucsd.edu)**

**Web: [scripps.ucsd.edu/business](http://scripps.ucsd.edu/business)**