10.1071_ISSN0311-4546EC110p7

Power and prediction

Dr Jack Katzfey of CSIRO Atmospheric Research is using a new numerical model that literally squares the global sphere to predict the weather at a regional scale.

The predictions, published daily in a commercial newsletter, are used in energy forecasting by industry subscribers in southern Australia.

Energy consumption can fluctuate sharply with sudden weather changes, so reliable forecasts are vital for matching generation to demand. And in the new era of privatised power generation and supply, energy forecasting is linked to profit.

Companies operating power stations in Victoria, South Australia and NSW can now sell their electricity anywhere in eastern Australia. Every 30 minutes, they bid against each other for the right to sell energy to the National Electricity Management Consortium (NEMCO).

'They decide how much they are going to generate, from what sources, and how much they want to charge,' Katzfey says. 'The lowest bid is for the bulk capacity required to meet basic demands, but they will also enter a high bid that will only be accepted if there is very high demand.

'If you know what the temperature will be, you can estimate demand. Knowing what the demand is likely to be, you can make more money from your bid.'

NEMCO estimates total energy demand from a Bureau of Meteorology forecast, issued twice a day, and extending out to eight days. But the 30-minute bidding interval makes it advantageous for power-generating companies to move to half-hourly forecasts.

In tomorrow's more open energy market, in which prices will reflect demand, Dr Katzfey says half-hourly forecasts looking several days ahead might also be useful for large industries with heavy power loads. They could develop production schedules to take advantage of cheaper power at times of low demand, or reduce their consumption when demand and prices are high, and there is a risk of 'brownouts' disrupting production.

Katzfey uses a model developed by colleague Dr John McGregor, which involves projecting a sphere – the globe – onto a cube. The planar surface containing Australia is then divided into equal 60-km squares.

Europe and North America are depicted at relatively coarse, 700 km grid spacing, making it possible to model weather around the globe while 'zooming in' on a city the size of Melbourne or Sydney for high-resolution forecasting.

'The model uses a sophisticated land-surface scheme that represents ground temperatures and soil moisture, which are important in modelling exchanges between the ground and atmosphere,' Katzfey says.

'It also represents physical processes such cloud formation and radiation fluxes between the ground and atmosphere. From the output we can predict any aspect of the weather: temperature, humidity, wind speed and direction, and rainfall.'

The model runs on data on the 'state of the global atmosphere'. This comes daily from the National Oceans and Atmospheric Administration's Environmental Prediction Centre in Washington, DC. It integrates measurements from orbiting satellites, radiosondes, ships at sea and arrays of moored buoys in the oceans.

'The model is compact enough to run on a laptop computer, and takes about an hour to make its predictions,' Dr Katzfey says. 'The data set is refreshed at 12-hourly intervals.'

The CSIRO model can produce regional forecasts for anywhere on the globe, and Katzfey says it is attracting interest overseas.

He is already working with a yachting syndicate campaigning for the world's most prestigious event, the America's Cup.

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More information on the new regional weather-prediction system can be found on the web at: www.eweatheronline.com.

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