

OPPORTUNITIES FOR 21ST CENTURY METEOROLOGY: New Markets for Weather and Climate Information

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1. Introduction

Duke Energy is a diversified multinational energy company, managing a portfolio of natural gas and electric trading, delivery and supply businesses – generating revenues of nearly \$22 billion in 1999. Duke Power, a Duke Energy business unit, provides electricity to approximately 2 million customers across a 22,000-square-mile service area in central and western North Carolina and South Carolina.

The electric utility industry is undergoing a transition from a regulated industry to a competitive, market-driven industry that will allow customers to choose their electricity provider. Whether in a regulated or competitive environment, however, the company's focus is on managing costs and on maintaining and improving customer service. Electricity suppliers – the power plant owners – focus on reducing generation costs through increased operating efficiencies. Transmission and distribution companies – the companies responsible for operating and maintaining the electricity delivery systems – focus on ensuring the reliable delivery of electricity to customers. Timely and accurate weather forecasting is important to both areas.

The ability to project weather patterns over both the short term

(several hours) and long term (several days to several months) allows suppliers to market the most cost-efficient generation mix for meeting customers' expected use of electricity (the electricity "load"). The ability to forecast severe weather events that could disrupt electric service to customers allows the power distribution company to take proactive measures that will minimize outage times. Ensuring both adequate supply and reliable delivery aims at excellence in customer service, one of the company's core business strategies.

2. Weather impact on power generation

Duke Power bases its daily generation needs on the forecasted power demand for its respective regions. This "load forecast" models the relationships among power demand, time of day, season and weather. Of weather variables – temperature, dew point, wind speeds, cloud cover and precipitation – the load is most sensitive to ambient temperatures.

Duke Power's meteorological staff utilizes a load-forecast model that takes hourly forecasts of these variables and projects them for a week or longer. System operators use the load projections to determine the appropriate economic dispatch of the available generation resources. Seasonal projections

assist with the scheduling of routine maintenance to ensure maximum plant availability at crucial demand times. Since a temperature projection only five degrees off the actual peak-season ambient temperature can significantly affect the company's generation costs, improvements in short-term and mid-term temperature forecasts can go a long way to help reduce those costs. Accurate temperature projections could save the company and its customers several million dollars annually in generation startup-shutdown costs alone. Utilities with hydroelectric operations make use of precipitation forecasts to optimize the availability and use of their water resources. Duke Power uses six-day rainfall forecasts to better manage both the movement of water through its 25 conventional hydroelectric stations and the operations of its two pumped storage reservoirs.

While hydroelectric power generation is a relatively small portion of Duke's total system capability, it provides an important means of power generation during peak periods (times when customers' use of electricity is at its greatest – typically the hottest parts of summer days and the coldest parts of winter days). By effectively using accurate rainfall forecasts in our hydro operations, Duke Power can save several million dollars annually in preventing “wasted” water – water moved past the hydro station (over a spillway, for example) but not used for hydroelectric generation. Minimizing the impact of high water on shoreline property is another

important benefit of efficiently using good precipitation forecasts.

Continued improvements in numerical model precipitation forecasts can supplement efficient day-to-day operations and provide additional opportunities for water resource and hydroelectric managers to better manage costs.

3. Impact of weather on customer service

Interruptions of electric service due to severe weather are the most visible weather-related impacts on customer service. In the utility industry, “severe weather” is considered to be a weather event that directly causes widespread damage to the electric transmission or distribution systems, interrupting service to tens of thousands-to-hundreds of thousands of customers. Over the years Duke Power has experienced several major weather events that have caused extensive damage to Duke's electrical distribution system and resulted in large numbers of outages. In September 1989, Hurricane Hugo caused sufficient damage to interrupt electrical service to almost 700,000 customers (about half the total number of customers in 1989). Since then, the company and its customers have experienced seven storms that have each interrupted service to more than 200,000 customers (and two of those to more than 500,000 customers each).

Duke Power uses severe weather forecasts to plan and mobilize its resources (people and materials) to

meet the challenges of restoring service to customers as quickly as practical. Being able to pre-stage crews and materials across our widespread service area is a significant factor in reducing the total storm-related outage time for our customers. Improvements in severe weather forecasts of major events such as hurricanes, winter storms, and severe thunderstorms can aid utility managers in better resource scheduling and materials management, which ultimately reduces costs.

4. Private sector opportunities panel questions

As part of the First Presidential Policy Forum, which will discuss opportunities for the 21st Century Meteorology, the following questions were provided to the panelists on the Private Sector Opportunities Panel:

What are the new weather and climate service opportunities in your industry or economic sector?

Because of the rapid changes in the energy business due to an increasingly competitive power supply market, a number of opportunities exist for the meteorological and climate communities to provide new products and services that will increase efficiencies and reduce costs:

- ?? Improving forecast accuracy, both in the short term and medium range, to enable the utility business

to better meet varying demands and reduce weather-related risks;

- ?? Improving precipitation forecasting to allow for more efficient and cost-effective water resource management;
- ?? Improving real-time hydrological models with better inputs to NEXRAD sites;
- ?? Adapting real-time weather processing systems within the energy industry to process and display weather data including radar, satellite, forecasts, and other fields to fit the dynamic business needs;
- ?? Developing weather-related decision-support systems tailored to specific energy business needs. These would include integrating GIS platforms with weather data in an energy management system.
- ?? Developing systems to increase the use of seasonal climate forecasts for weather derivatives and hedging markets and for earnings projections in industries that are highly weather sensitive.

What factors could enhance the use of weather and climate products to assist your industry or economic sector?

The biggest factor would be an improved confidence in seasonal climate forecasts. These forecasts are becoming more commonly available from a variety of vendors. The weather derivatives and hedging market is expected to expand greatly in the coming years as more companies that are affected by weather attempt to reduce their risks. Improvements

in seasonal forecasts will greatly enhance their usefulness to energy companies.

As energy markets become less regulated and more competitive, energy companies will look for ways to increase operating efficiencies and reduce their weather-related risks. This will increase the use of industry specific weather forecasts and climate products targeted to specific industry sectors. Retail supply providers and load aggregators will search for hedges and insurance to manage weather-related risks.

What aspects of the policy framework could facilitate success for applications of those products for your industry or economic sector?

Public and private sectors working together for the benefit of our society is one of the hallmarks of our nation and, quite probably, its single greatest strength. Policies alone cannot induce collaboration – true partnerships are built on rolling up our sleeves and working together. Forums such as this can open doors to continuing dialogue. They forge a confluence of public research with emerging private sector needs. They precipitate ideas and destroy barriers.

Private sector representatives will no doubt, leave the Presidential Policy Forum much better informed about the AMS and the status of climatological research. That alone will give us ideas of ways your expertise and research can be applied in our businesses. And I'm confident that public and private

sector meteorologists will leave the forum with a stronger vision of what business and industry need of them. We'll all leave with increased knowledge of products that are available, gaps that need to be filled and a better understanding of ways we can combine forces.

