

ENERGY BUSINESS REVIEW

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JUDITH CURRY,
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CLIMATE FORECAST
APPLICATIONS NETWORK
RAMPING UP THE ACCURACY OF
WEATHER FORECASTING

\$15



Climate Forecast Applications Network



**TOP 10
ENERGY
TRADING
SOLUTIONS
PROVIDERS
2022**

*The annual listing of 10 companies that are at the forefront of
providing Energy Trading solutions and impacting the marketplace*

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CLIMATE FORECAST APPLICATIONS NETWORK

RAMPING UP THE ACCURACY OF WEATHER FORECASTING

By Jade McDonald

Weather is a primary driver for commodity prices in energy, impacting both energy consumption and production. It is therefore critical for energy traders to have a clear indicator of future weather conditions when making energy buying or selling decisions. Assisting them in this endeavor is Climate Forecast Applications Network (CFAN), a leading company in the weather and climate sector that is developing innovative weather forecast products for energy trading.

CFAN is driven by an expert scientific team, which comprises world leading researchers specializing in extended range prediction of weather and climate extremes. The company's active engagement in research enables rapid diffusion of the latest research and model developments into its forecast products.

CFAN's innovations in weather forecasting leverage ensemble forecast methods, machine learning, and artificial intelligence to provide the most accurate probabilistic forecasts ranging upto four weeks. CFAN's forecasts particularly focus on extreme weather events, including probabilities of heat and cold waves and wind droughts that are relevant for energy trading.

Visual analytics and cognitive computing techniques offered by CFAN further help



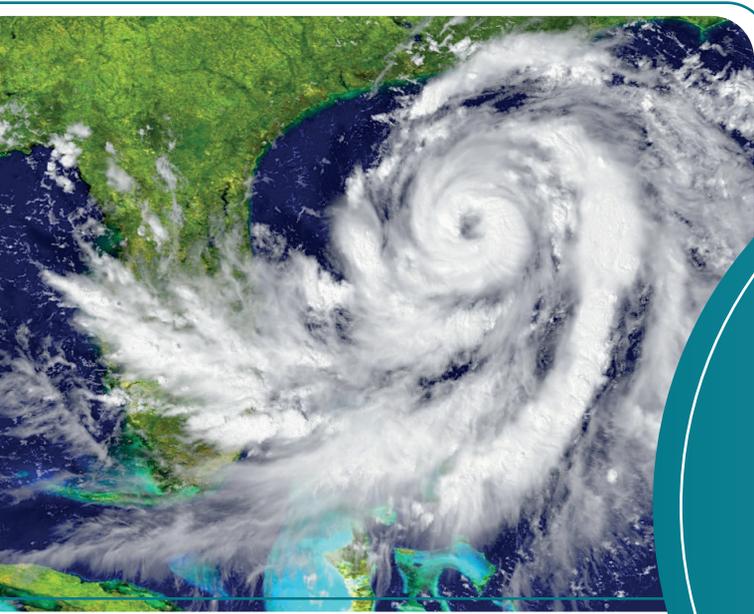


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clients easily and quickly interpret forecast information on web-based dashboards to make optimal and timely decisions. CFAN continuously works with the clients to develop new products and address their most challenging problems and lucrative opportunities.

CFAN's President, Judith Curry, attributes CFAN's success to a combination of superior forecast accuracy, depictions of forecast uncertainty, and a client-centered approach that supports decision making.

Curry states, "CFAN provides a true synergy between research, forecasts, and decision support. This produces a culture of innovation and client support that is unique among weather and climate forecast providers."



The Journey from Revolutionary Research to World-Changing Applications

The inception of CFAN can be traced back to the mid-2000s when Peter Webster and Judith Curry—two faculty members at the Georgia Institute of Technology—were conducting academic research on tropical meteorology, climate dynamics, and ensemble weather prediction.

CFAN was formed under Georgia Tech's Enterprise Innovation Institute. The original aim behind the establishment of CFAN was to better manage Webster's humanitarian work on forecasting floods in Bangladesh that was supported by USAID and CARE. In 2016, Webster received the International Creativity Prize for Water, recognizing his work. The award was presented by UN General Secretary Ban-Ki Moon in a ceremony at United Nations headquarters.

Another giant leap in CFAN's growth occurred in 2005. Following the destruction caused by Hurricane Katrina in the

oil producing and refining region of the Gulf of Mexico, a major company in the petroleum industry challenged CFAN to develop extended range, better-than-market hurricane forecasts. They sought improved hurricane forecasts to anticipate disruptions to energy supply, drilling, refining, and transport activities, in support of energy trading and sales. CFAN responded to this challenge by translating its tropical cyclone research into an innovative forecast product for North Atlantic Hurricanes, which became operational in 2007. CFAN's forecast models quickly proved their worth when forecasting Hurricane Dean's 2007 landfall in Mexico, allowing the client to profit from the natural gas trading market that anticipated a Texas landfall. In 2008, CFAN's early forecast of Hurricane Ike's landfall in Houston also enabled the petroleum company to plan for emergency management and business continuity.



**AT CFAN, OUR AIM IS TO
LEVERAGE ENSEMBLE FORECAST
METHODS, MACHINE LEARNING,
AND ARTIFICIAL INTELLIGENCE
TO PROVIDE MORE ACCURATE
PROBABILISTIC FORECASTS AT
LONGER LEAD TIMES**

CFAN built upon the success of its hurricane forecasts to develop OmniCast, a platform for energy traders that expanded the product suite to include daily, weekly, and seasonal forecasts for the major energy markets across the U.S. and Europe. Along with surface temperature, wind and solar forecasts, CFAN developed probabilistic forecasts of streamflow and hydropower for the Columbia River Basin. OmniCast uses machine learning to calibrate the ensemble

forecasts from global weather models and advanced ensemble interpretation techniques, which are key elements in CFAN's superior forecast accuracy. With CFAN, assessment of forecast uncertainty and confidence is provided for each forecast.

More recently, CFAN has developed innovative weather forecasts products for the insurance sector, including extended range forecasts of hurricane landfall impacts, fire weather, and severe convective weather. These forecast products are at the forefront of incorporating artificial intelligence techniques into forecast modules driven by ensemble weather forecast models.

"CFAN's clients in the insurance-linked securities market have grown to represent firms holding 25 percent of Insurance-Linked Securities assets under management globally," says Curry.

CFAN has recently launched a new weather forecast platform to support smallholder farmers in India and Pakistan. CFAN is working with a precision agriculture company to provide forecasts of rainfall, temperature, and severe convective weather to support decision making on cropping, planting, fertilizing, irrigation, and harvesting. CFAN's forecasts, along with critical crop specific information, are communicated to the farmers by cell phone.

Aiding Utilities in Disaster Planning and Management

There is growing concern about extended electric power disruptions particularly from hurricanes, and electric utilities are under pressure to restore power as quickly as possible. In 2013, CFAN began working with a large electric utility company in a hurricane-prone region of the southeast U.S. to support their strategy of mitigating electric power disruption from landfalling hurricanes. In response to their needs, CFAN developed a customized high-resolution probabilistic landfall wind forecast product, out to 7 days.

CFAN's landfall wind forecasts are used to drive outage models that estimate the size of the repair crews, and the placement of the crews and other emergency management assets. Being able to deploy and pre-position these workers, along with mobile command units, several days prior to hurricane landfall enables the utility agencies to efficiently deal with the aftermath of the adverse events.

CFAN has constructed an extensive catalog of landfall winds from historical hurricanes to stress test the utility's emergency response. The company has created over 1000 synthetic storms, which cover the full range of possible hurricanes that the utility could face.

Providing Support to Tackle the Changing Climate

Climate change and the growth of renewable energy are having substantial impacts on strategic planning, infrastructure, capacity building, and needs for technology development. Apart from any physical risks associated with climate change, risks to electric utilities are also associated with the transition to lower carbon sources of electricity.

CFAN's climate impact assessments include historical analyses of extreme weather and climate events. CFAN has developed a climate-dynamics based method for formulating decadal-scale scenarios of future climate variability that can be used to drive risk assessment models. CFAN's scenarios of future climate change integrate projections of human-caused climate change with natural modes of climate variability. Extreme event scenarios consist of frequency distribution of regional extreme events over the target time interval, as well as worst-case scenarios



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of individual events. Considering a range of possible climate scenarios provides a framework for evaluating decisions that are robust across a range of possible outcomes, and allows for focus on scenarios in the vicinity of the client's vulnerability thresholds.

CFAN's climate scenario projections and impact assessments are supporting power plant siting and investment decisions, insurance decisions for utility infrastructure, estimates of future electric power demand, and renewable energy supply, assessments of vulnerability to severe weather, and coastal adaptation planning.

To address the growing need for climate risk assessment and management, CFAN's President, Judith Curry, has written a forthcoming book entitled *Climate Uncertainty and Risk*, which provides the foundation for understanding climate risk, developing regional scenarios for weather and climate extremes, and principles for systemic risk management and decision-making under deep uncertainty. **EB**

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