

IOOS and Electricity Generation, Transmission, and Distribution

What does IOOS do?

IOOS (Integrated Ocean Observing System) is a **multidisciplinary** system designed to provide weather, climate, ocean, and coastal data in the formats, rates, and scales required for decision-making, based initially on the **integration** of existing private, federal, state, and local systems. Consisting of three major subsystems (see figure at right), IOOS will constantly evolve according to user needs. IOOS will focus initially on a series of high priorities. For example, IOOS information on sea surface winds can help utilities and value-added weather companies predict sea breezes that have a sudden impact on electric load.

Currently, numerous ocean and weather data collection systems useful to electric utilities are maintained by scores of federal, state, and non-governmental agencies and organizations (see Table 1 for a few examples). IOOS is gathering these useful but disparate and isolated data sources into integrated systems, giving users ready access to all ocean-related data gathered by all possible sources. In addition, IOOS will allow any compilation of data specified by the user to be manipulated using myriad existing forecasting models, thereby turning raw numbers into actionable information relevant to the user's specific concerns. Finally, IOOS is seeking new research and enhancements to add to its already-extensive catalog of products. In this way, IOOS becomes a flexible, adaptable system capable of keeping up with new developments while maintaining the reliable delivery of data, analyses, and forecasting results.

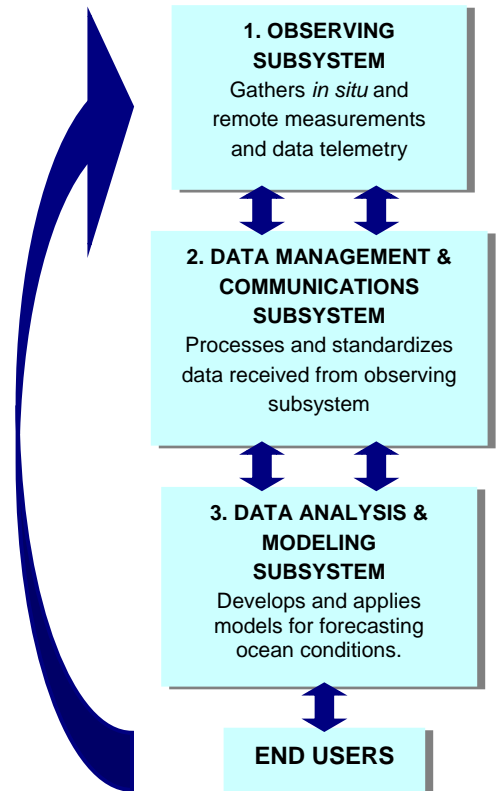


Table 1. Examples of already-existing data collection systems relevant to electricity generation and transmission

Existing Data Source	Measurements Collected by Data Source	Representative Outcomes
Coastal Ocean Observation Laboratory (COOL) Room (http://marine.rutgers.edu/coolroom/)	Sea surface temperature, surface currents, coastal wave measurements	Forecasts of coastal weather fronts at high-resolution scales used by local energy utility to adjust operations and deploy service fleets.
Central and Northern California Coastal Ocean Observing System (CeNCOOS) Monterey Bay Surface Wind Demonstration Product (http://www.cencoos.org/data_winds.htm)	Near real-time surface winds from a mesoscale atmosphere model together with winds measured at four ocean buoys and seven coastal stations from various institutions that are collaborating with CeNCOOS	Enhance sea-breeze forecasts for coastal areas

How can IOOS Help the Electric Power Sector?

Through enhanced weather and climate forecasting and modeling, the electric power sector can increase productivity by more accurately estimating load. IOOS can be instrumental for electricity generation, transmission, and distribution not only by making readily available a network of relevant real-time data for coastal areas, but by applying these data to models and other forecasting tools to reliably predict future conditions. By utilizing more accurate, reliable, and timely forecasting information, the electric power sector can optimize operations and streamline expenditures. Some of the potential benefits to electric utilities of improving the day-ahead weather forecast by just 1 degree Fahrenheit have been estimated as about \$20

million to \$25 million per year for a Northeast regional transmission authority, and about \$1 million to \$2 million per year for a large regional distribution company.¹

Due to declining reliability and the ever-increasing concern about emissions and climate change impacts, the electricity generation, transmission, and distribution sector has perhaps the most significant need for accurate weather and climate data in the entire energy industry. Under deregulation, the responsibility for ensuring reliability is dispersed to multiple institutions, with utilities, independent system operators, independent power producers, customers, and markets all playing a role. One unfortunate result is a reduction in reliability. With IOOS, accurate and consistent data and modeling products for coastal areas can be supplied to all entities in a controlled manner, and the reliability of the electric power market can be enhanced.

Changes in weather and climate directly affect the demand for electricity and, therefore, weather-related interruptions are felt immediately in all residential and commercial communities. In this way, and many others listed below, IOOS can directly and indirectly benefit the electric power sector of the energy industry.

- Improved demand forecasts in coastal areas can allow companies to determine in advance the best and most **cost-efficient mixture of electricity generation**, prevent starting up and shutting down operations, and can allow demand projections to be tailored to a specific region of the country.

Errors in the forecasted temperature account for 40-90% of electricity demand estimation errors.

By using an integrated system like IOOS to acquire and analyze temperature information, data from multiple, previously unconnected, sources can be collected and assessed using multiple different modeling techniques. Load forecasting errors can therefore be decreased by maximizing the data pool and capitalizing on the inherent strengths of multiple modeling products.

- The design and siting of transmission and distribution systems can benefit from an understanding of the **likelihood and nature of severe weather events**, thereby minimizing risk and potentially saving downtime and repair costs.
- **Accurate ice predictions** can help predict areas that may need more attention during cold weather and accurate forecasts of potential **power surges and outages** can reduce customer downtime.
- Weather-sensitive energy firms can reduce risk to revenue by hedging with **weather risk management tools**.

- To avoid exceeding **emissions targets** and to prevent the **over-purchasing of power**, buyers can use temperature, humidity, precipitation, and storm forecasts to estimate necessary volumes.
- On the business side of the electricity sector, weather data and model analyses can be used to adjust energy sales and peaks to normal conditions, freeing **financial projections** from the effects of weather-related sales variations and providing a realistic view of business growth.

What Can the Electric Power Sector Do?

The value added from the integrating and sustaining power of IOOS can be realized with regional association **participation**. Electric power stakeholders should get involved with a Regional Association (RA) (www.ocean.us/regional_associations). RAs are critical for engaging private and public user groups to identify regional data and information needs. Additionally, RAs can be high-value entry points for a user to get involved with specific IOOS pilot projects (many of which are happening right now) through which users help improve and refine IOOS. Pilot projects and RAs can facilitate data sharing, the cornerstone of IOOS, between previously unconnected parties. Even by sharing small amounts of data, users can reap significant benefits through invaluable forecasting results.

¹ Altalo, M.G., T.D. Davis, and M. Hale, Northeast Energy Network Performance Analysis In Support of An Improved Energy Transmission Regime, Science Applications International Corporation, August 2003.