APCOW2024

Wind Energy Institute of Tokyo, Inc.

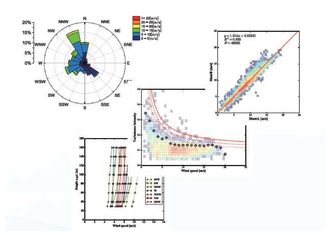
Engineering Consulting Service in Wind Energy

Overview of our Services

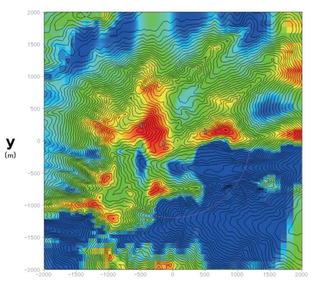
- Wind Resource Assessment
  - Flow simulations, Measurement data analysis
  - Annual Energy Production (AEP), Extreme events
  - Analysis and evaluation of operational data(SCADA)
  - Windfarm certification, other conformity assessment
- Offshore Wind Design Consulting
  - Metocean Condition Analysis
  - Normal and extreme conditions for wind （typhoons）, turbulence, waves, tides, currents
  - Engineering Support for Project Certification (bottom-fix, floating)
- Wind turbine design
  - Computer simulations for offshore turbines
    - Servo-aeroelastic, wave,　etc.
  - Earthquake response, aerodynamic noise
  - IEC compatible simulations
- Engineering Research on Wind Energy
  - Government Contracted research projects
  - IEA Wind TCP Secretariat for JP
  - Wind turbine recycling

Wind Resource Assessment

- Measurement data analysis
  - Evaluation of site wind conditions such as annual average wind speed, turbulence intensity, wind shear, etc.
  - Normalization of the meteorological conditions using measured data at met masts, LIDARs and national met stations, as well as numerical reanalysis of met data.



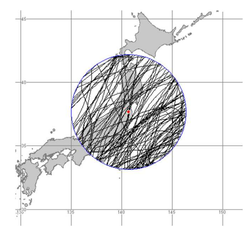
- Assessment for AEP
  - Prediction on wind resource and energy production using the wind measurement data at the potential site.
  - Evaluation of prediction uncertainties and exceedance probabilities.



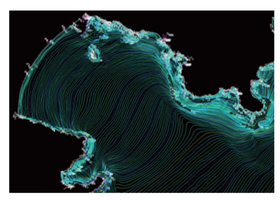
- Consulting for windfarm certification and site conformity assessment
  - Engineering Support for Windfarm Certification
  - Estimation of extreme conditions at the windfarm site

Offshore Wind Consulting

- Meteorological Condition Analysis
  - Estimation of wind speed probability distributions, turbulence intensities, wind shear exponents and inflow inclination angles, based on the site measurement and CFD calculations.
  - Estimation of extreme wind condition of 50-year recurrence period based on IEC standards.
  - Other recurrence periods upon request.
- Oceanic Conditions Analysis
  - Estimation of average/extreme oceanic conditions such as tides, waves, currents, based on measurement data and/or numerical simulations.

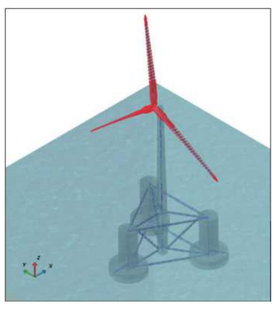


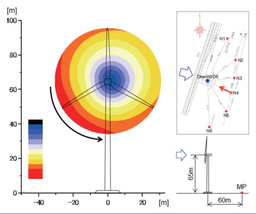
- Other offshore wind services
  - Construction and O&M operability estimation
  - Support for certification body's　application reviews



Load Simulations

- Dynamic simulations for Offshore Wind Turbines
- Bottom-fixed and Floating
  - Load simulations and response analysis under site-specific conditions
  - Reference Wind Turbine model
  - RNA design support and failure mode analysis
- Earthquake response, aerodynamic noise
  - Dynamic simulation of wind turbines under actual seismic wave conditions
- Load evaluations based on IEC standards and other national guidelines
- Structural and multibody dynamic analysis
  - Drivetrains and other main components





REMTEST: Testing Laboratory

- Renewable Energy Measurement and Testing, Inc
- Type testing of wind turbines
  - Testing completed: 2 large turbines, 1 small turbine
  - Field testing compliant to the IEC/JIS standards
  - Power performance measurement (IEC 61400-12 series)
  - Preparing for Test Lab Accreditation (ISO/IEC17025）
  - Load measurement (IEC 61400-13)
  - Redundant data storage, evaluation of measurement uncertaintie
  - Other filed testing
  - Noise measurement, safety and function test, gearbox test

- Small wind field testing (distributed wind)
  - Duration test according to IEC 61400-2/JIS C1400-2
- Meteorological measurements
  - Supply sensors, data loggers and LIDARs, Traceability of calibration for all sensors
- Offices in Nagasaki and Tokyo

New Services and Projects

- Windfarm Production Forecast (short term prediction)
  - Numerical meteorological model and statistical models including AI
  - Forecast power output of the following day at 30min intervals
  - Continuous system operation and validation at windfarms
  - Commercial release by Spring 2025
- Key for trading at the Wholesale Power Exchange
  - FIP and post-FIT Windfarms
  - Spot Market (day-ahead) and Hour-ahead Market
  - For minimum imbalance penalties
- Ocean Condition Forecast
  - Forecast for pinpoint offshore wind site
  - For safe maintenance operations
  - As a part of regional contribution for local fishing industry
- Wind Assessment by satellite images
  - Evaluation of Offshore wind resource using SAR satellite images
  - Indirect wind measurement using Synthetic Aperture Radar
  - Support coverage expansion of floating LIDAR data
- Research fund from Tokyo City Government
  - Support project for creating advanced services using digital technology
  - Oct 2024 to Jan 2026
- Development of utility-scale wind turbine
  - Designing a 2MW turbine
  - Basic designing in the digital space
  - Digital technologies
    - Aeroelastic simulation models
    - Digital Twins and other virtual modeling
  - Target : Prototype by 2030
  - Cooperation with Japanese manufacturers to stimulate the domestic market.