

A close-up photograph of a technician wearing a white hard hat with a headlamp and safety glasses, a dark jacket with a high-visibility vest, and black gloves. The technician is focused on a large, vertical, cylindrical metal component. They are using a blue spirit level to ensure the component is perfectly vertical. An orange metal clamp is being used to secure a thick, braided metal cable to the side of the cylinder. The background shows a blurred outdoor setting with some snow on the ground.

# Renewables Power Performance Testing



## About us

### Leaders in Global Services for Renewable Energy

UL Solutions is a trusted independent advisory, testing, inspection and certification body for a broad range of industries. In the renewable energy space, UL Solutions works to help manufacturers, developers, owners, investors, lenders, utilities and policy makers navigate the risk and complexity associated with renewable resources. We have become a trusted advisor by providing access to proven science and expert engineering, and by offering innovative solutions to meet the unique challenges of the renewable energy industry. We pride ourselves on being accessible, flexible and keenly responsive to the needs of our clients.

UL Solutions now delivers an even more extensive portfolio of renewable energy services, through the acquisitions of AWS Truepower (2016) and DEWI (2012). With offices in over 140 countries, a team of over 500 experts and 35 years of experience, we advise on wind and solar projects as well as battery and energy storage technologies, helping our clients make them safer, compliant and perform to the highest standards. Our goal is to empower trust in renewable energy throughout the project lifecycle and across the supply chain.

UL SOLUTIONS  
OPERATES IN  
MORE THAN  
**140**  
COUNTRIES



**35+**  
YEARS OF  
RENEWABLE  
ENERGY  
EXPERIENCE

**200,000+ MW**  
TOTAL MEGAWATTS ASSESSED

**500+** RENEWABLE  
ENERGY EXPERTS



**ADVISED 90%**  
OF THE WIND INDUSTRY'S TOP PROJECT  
DEVELOPERS AND PLANT OWNERS



INDEPENDENT/OWNER'S  
ENGINEER FOR  
**500+**  
WIND AND SOLAR  
PROJECT SINCE 2012



FORECAST PROVIDER FOR  
**70+**  
**GIGAWATTS**  
OF INSTALLED RENEWABLE  
ENERGY PROJECTS





## Power Performance Testing

The success of your wind project relies heavily upon the wind potential and the performance of the selected turbines. The manufacturer often guarantees the performance of the turbines; however, many contracts require an independently performed power performance test to obtain the guarantee. Additionally, some power curves vary based on terrain and local conditions. UL Solutions can help you calibrate and verify site-specific power curves in order to benchmark and manage performance expectations with turbine suppliers.

We will test turbines for power performance based on the IEC standards for wind turbine operations. We identify appropriate turbines at the site to perform obstacle and terrain analysis, site calibration, and performance test set-up and execution.

### UL Solutions Accreditations / Quality Agreements

The following accreditations are valid for the UL Solutions locations, test and calibration procedures mentioned in the certificates. The certificates are available on request or at [www.dakks.de](http://www.dakks.de).



# How does UL Solutions test wind turbine power performance?

Testing performance is essential to ensuring that turbine and plant performance meet expectations and contractual obligations. Put simply, Power Performance Testing is measuring wind speed, measuring a turbine's power output, then plotting the power versus wind speed and comparing that to the warranted power curve. While the concept is simple, the actual testing requires numerous in-depth steps. The steps to complete a Power Performance Measurement campaign vary somewhat depending on the client and situation, but generally they include:

## Engineering and Design

- Power Performance Measurement Plan
- Including Met Mast Design
- Power Performance Measurement Plan Approval
- Installation Plan
- Installation Plan Review & Approval

## Met Instrumentation and Commissioning

- Procure and Install Met Towers
- Order Equipment
- Equipment Lead Time and Assembly
- Ship Equipment to Site
- Instrumentation Installation
- Met Tower Commissioning
- Provide Complete Commissioning Documentation

## Power Measurement Instrumentation and Commissioning

- Order Equipment
- Equipment Lead Time
- Equipment Assembly
- Equipment Shipped to Site
- Power Measurement Equipment Installation
- Power Measurement Equipment Commissioning
- Provide Complete Commissioning Documentation

## Power Performance Measurement Data Collection, Analysis and Reporting

- Data Collection and Monitoring
- Data Analysis
- Prepare Final Power Performance Test Report

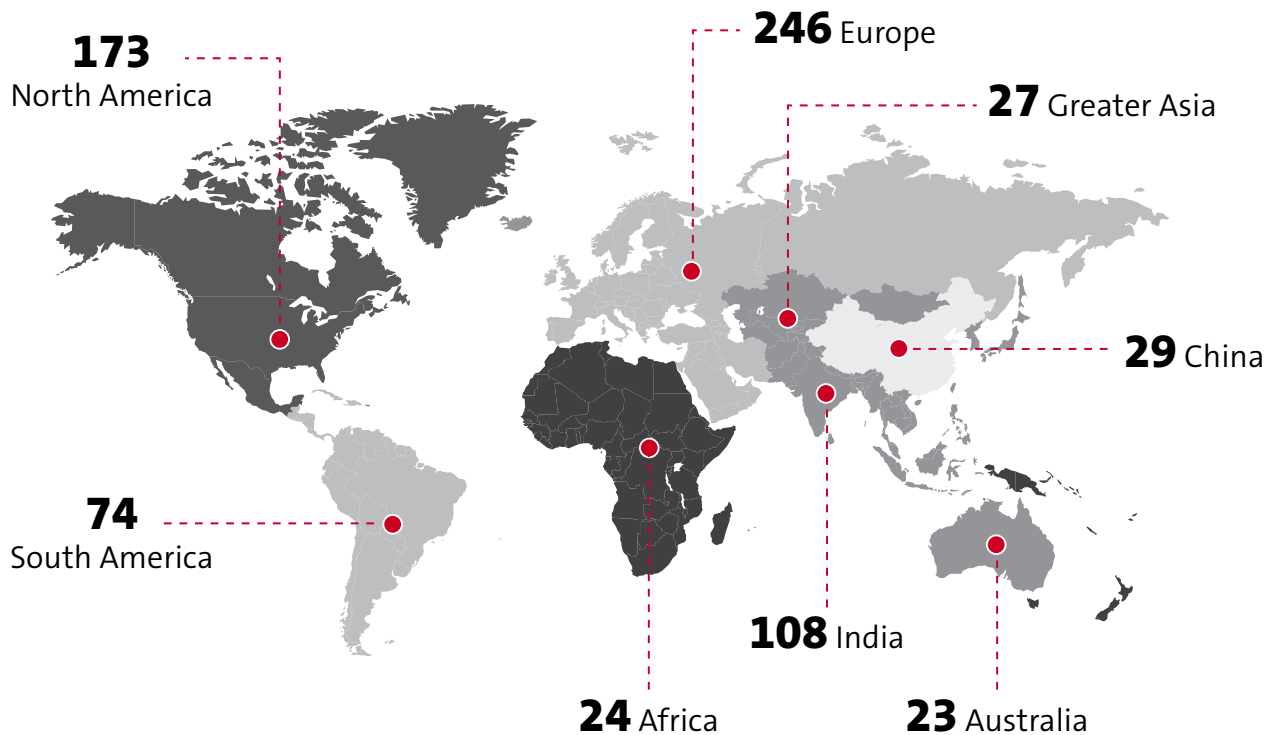
UL Solutions brings a flexible and communicative approach to the power performance testing effort, which has earned us a reputation of being both highly responsive and technically excellent within the field of power performance testing.



**UL SOLUTIONS HAS COMPLETED POWER PERFORMANCE TESTS ON 350+ WIND PROJECTS**

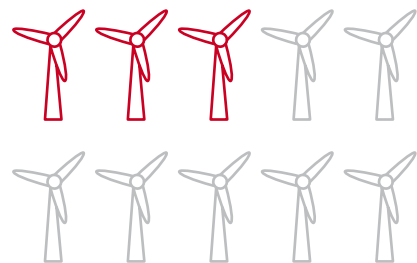
**700+** POWER PERFORMANCE TESTS PERFORMED

WIND TURBINE POWER PERFORMANCE TESTS PERFORMED BY REGION



**200+** WIND TURBINE MODELS TESTED

	# of turbine models assessed	# of turbine tests performed
ENERCON	12	20
GE/ALSTOM	28	146
GOLDWIND	6	14
NORDEX/ACCIONA	16	109
SIEMENS/GAMESA	28	124
SUZLON	14	59
VESTAS	19	108
OTHERS	87	124



UL SOLUTIONS HAS PERFORMED POWER PERFORMANCE TESTS ON

**60+** WIND TURBINE MANUFACTURER BRANDS

Information reflects project database values as of September 2017.



**LOCATION:** Nebraska, United States

### **Power Performance Measurement for Nebraska Wind Project**

For a confidential client with a project in Nebraska, UL Solutions tested three GE 1.5 MW wind turbines in accordance with IEC specifications. The initial work included a terrain and obstacle analysis, which led to a site calibration. Then we installed and commissioned the power measurement equipment on the three selected turbines and monitored their performance for three months. The conclusions were delivered in a comprehensive report to the client.

**LOCATION:** China

### **Type Testing for Wind Turbine Manufacturers in China**

UL Solutions has been conducting power performance measurements for a number of wind turbine manufacturers as part of type testing activities in China. These turbines range in size from 2-5 MW with rotors over 150 m in diameter. The work included preparing a test plan detailing the equipment, configuration, and methodology to be used for testing, as well as procuring and installing the power measurement equipment as part of a larger type testing exercise. The power performance data was analyzed and summarized in a final report in accordance with IEC 61400-12-1.

**LOCATION:** Spain

### **Power Performance Measurement Programs in Spain**

UL Solutions conducted power performance measurements for manufacturers and developers in Spain. The turbines ranged in size from 600 kW to 5 MW with rotors over 130 m in diameter. The work included preparing a test plan detailing the equipment, configuration, and methodology to be used for testing, as well as procuring and installing the power measurement equipment. The power performance data is analyzed and summarized in a final report in accordance with IEC 61400-12-1.



# Key Office Locations



## **AFRICA**

Johannesburg, South Africa

## **ASIA PACIFIC**

Melbourne, Australia

Beijing, China

Shanghai, China

Bangalore, India

Jakarta, Indonesia

Ise, Japan

Tokyo, Japan

Seoul, Korea

Manilla, Philippines

Singapore

Taipei, Taiwan

Bangkok, Thailand

Ho Chi Minh City, Vietnam

## **EUROPE**

Lyon, France

Bremen, Germany

Oldenburg, Germany

Warsaw, Poland

Ansoain (Navarra), Spain

Barcelona, Spain

Izmir, Turkey

Glasgow, United Kingdom

## **LATIN AMERICA**

Buenos Aires, Argentina

Sao Paulo, Brazil

Bogota, Colombia

Mexico City, Mexico

## **MIDDLE EAST**

Dubai, United Arab Emirates

## **NORTH AMERICA**

Albany, New York, US

Northbrook, Illinois, US

San Diego, California, US

San Jose, California, US

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