



# Lifetime Extension Services

Understanding the true  
remaining useful life of your  
wind turbines.



Empowering Trust™



## Lifetime Extension of Wind Turbines

Extending the operation of a wind turbine equates to increased revenue, which is gaining significant importance in established wind markets. Lifetime Extension (LTE) also incorporates potential challenges that may lead to higher O&M costs and an increased risk of structural failures, which are more likely associated with additional cost, also considering the corresponding safety risks.

Growing investments in renewable power plants, aging fleets, and the desire for safety while maximizing asset value all drive companies to UL's asset management services. We help you evaluate and optimize your projects' operations and maintenance, contracts, health and safety and remaining useful life. Our goal is to help you maximize energy production, reduce downtime and O&M costs, help ensure project safety, and support key decisions around asset life and repowering.

UL offers a variety of services for lifetime extension from standard reports to

comply with regulations to insightful analyses to help wind farm owners optimize their ROI and plan for safe extended operations.

Standard services include reporting on the analysis of climatic and operational conditions, loads and fatigue modeling, and results per component including the respective uncertainty calculation.

Optional services include:

- Damage modeling per sector including yield/damage ratios to improve WSM strategies
- Additional testing campaigns to minimize uncertainty on loads modeling
- Non-structural components review including failure rates projections per component
- CAPEX/OPEX modeling to perform an in-depth aging plan
- Inspections plan optimized to help ensure safe operation at minimum cost
- Custom services upon request.

### Why UL?

Because we're the most trusted independent experts in wind and solar technology. We've been doing groundbreaking work in renewable energy since the industry's nascence, helping our clients mitigate risk and navigate complexity.

Our clients trust that we will detect issues not found by others, that we will advise them on the correct path forward, and help them to obtain a better return on their renewable investments.

#### More Information:

For more information on UL's Lifetime Extension Services and how it can improve your contact us at: [renewableenergyservices@ul.com](mailto:renewableenergyservices@ul.com) or visit [ul.com/renewables](http://ul.com/renewables).

UL has performed  
**LIFETIME  
EXTENSION  
ANALYSIS**

*on more than*  
**11GW** of



**GLOBAL WIND  
ENERGY ASSETS**

*and is the preferred  
supplier for global  
plant owners and  
investors.*

# Lifetime Extension in Europe

UL's standard for Lifetime Extension of Wind Turbines, UL4143, is an ANSI approved standard used in compliance with DIBt and BPW requirements. It is also one of the main references for IEC61400-28, the international guideline for Lifetime Extension that UL experts are deeply involved with and is currently in development.

We serve the European market from our offices in France, Germany and Spain, performing the entire process of assessing lifetime extension, which is accomplished in three steps:

**1** An analytical evaluation based on the site condition to determine the remaining useful life (RUL) for each structural relevant component (i.e. rotor blade, blade joint, hub, shaft, main frame and tower (incl. bolted connections). The site conditions are defined through UL's wind and site products and software which have been a reference for global investments in wind energy. This ensures the lowest possible uncertainty in

RUL calculations.

The analyses include running UL's aeroelastic models (time series), rain flow counting, DEL calculations and RUL estimation per component. Both analyses include input data such as:

- Building permits
- Maintenance and inspection records
- SCADA data, operating manuals and log books
- Modifications, repairs and retro-fits
- Power curtailment / multiple power modes
- Type certificate / type approval Construction and commissioning protocols

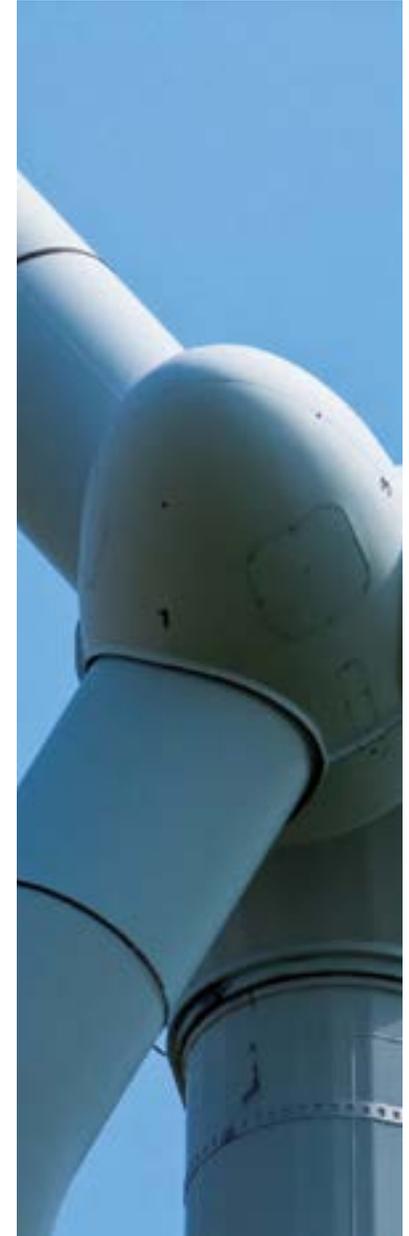
**2** An onsite wind turbine inspection focused on structural integrity is conducted. The inspection is optimized by focusing on areas identified by a weak point analysis.

UL Renewables is accredited by IAS (under AA-759) according to ISO/IEC 17020:2012 as "Inspection Agency - Type A (Third-Party)

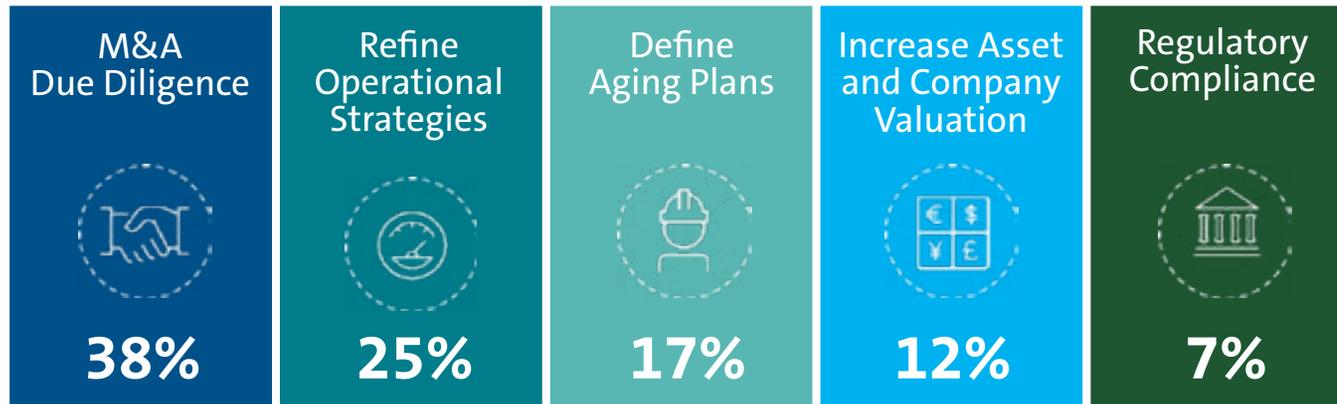
Inspection Body." The accreditation of our compliance with standards provides the recognition that our policies, practices and procedures are consistent with the standard in terms of quality, independence, transparency and conformity, and that we have the necessary expertise in the provided services.

**3** The outcome is summarized in a final report defining the remaining useful life and the conditions under which it can be achieved (i.e. component exchange, regular maintenance, power mode adjustment).

UL adapts to the various local mandatory requirements. For example, in Germany, UL is an independently accredited certification body according to DIN EN ISO 17065 which includes the DIBt standard in its accreditation scope – a mandatory requirement in Germany for carrying out an evaluation to this standard. The report is issued by UL's DEWI OCC, a Certification Body accredited by DakKS.



## Why are LTE Assessments Requested?



# Key Office Locations



## AFRICA

Johannesburg, SOUTH AFRICA

## ASIA PACIFIC

Melbourne, AUSTRALIA  
Beijing, CHINA  
Suzhou, CHINA  
Bangalore, INDIA  
Ise, JAPAN  
Tokyo, JAPAN  
Seoul, KOREA  
Bangkok, THAILAND

## EUROPE

Lyon, FRANCE  
Copenhagen, DENMARK  
Bremen, GERMANY  
Cuxhaven, GERMANY  
Hamburg, GERMANY  
Oldenburg, GERMANY  
Wilhelmshaven, GERMANY

Milan, ITALY

Warsaw, POLAND

Ansoain (Navarra), SPAIN

Barcelona, SPAIN

Stockholm, SWEDEN

Izmir, TURKEY

London, UNITED KINGDOM

## LATIN AMERICA

Buenos Aires, ARGENTINA

São José dos Campos,

BRAZIL

Rio de Janeiro, BRAZIL

Bogotá, COLOMBIA

Mexico City, MEXICO

## NORTH AMERICA

Albany, New York, US

Northbrook, Illinois, US

San Diego, California, US

San Jose, California, US



[UL.com/Renewables](https://www.ul.com/renewables)

UL and the UL logo are trademarks of UL LLC © 2019.