

The background is a solid blue color with a subtle pattern of white lines that create a sense of depth and movement, resembling a stylized horizon or a grid. On the right side, there is a large, stylized white outline of a wind turbine. To the left of the turbine, there are three white outlines of clouds. A bright cyan line starts from the top left, passes through the clouds, and extends towards the turbine's hub. On the right side of the turbine, there are four white plus signs arranged vertically.

Driving real competitive advantage through the use of digital technology in O&M

Imagine...

Imagine if there was a way that technicians could have all of the correct data, readily available, with a solution intelligently guiding them through causes, turbine history, and recommended solutions for a fault. This world with intelligent digital technology is now emerging.

... The Possibilities

Downtime and efficiency improvements:

19 % reduction in lost kWh per hour of downtime

34 % drop in average downtime per incident

35 % time reduction across top 10 maintenance faults

10 % cost reduction via part replacement prevention

Improvements in use of spare parts

Improved knowledge sharing, technician retention and ability to scale

Introduction

A Perspective on Windfarm O+M

The wind energy industry has come of age. As governments have wound down subsidy schemes, wind farms are having to find ways to drive down costs to stay competitive. There is a growing focus on boosting the efficiency of existing assets alongside installing new generating capacity.

According to research by Accenture¹ the potential for operations and maintenance (O&M) to impact the bottom line has typically been underestimated and not sufficiently factored into decision making. This is despite the fact that it accounts for about 20% of the levelised cost of energy (LCOE) of a wind farm, the consultants found.

With workforce costs comprising the largest chunk of the O&M cost component, Accenture's report highlights a significant opportunity to cut costs by improving the efficiency of technicians, with the biggest opportunity for this in the use of digital technologies. Accenture states: "This will be the key to shifting O&M from a cost centre to becoming a true value driver, supporting real competitive advantage."

High O&M costs are caused by sub-optimal processes and tools. Wind turbines are large and complex, and often sited in remote locations, making them inherently difficult and expensive to maintain.

Fragmented systems, manual processes, and guesswork in diagnosis on the part of the technician all add to the time taken to fix problems, which increases the downtime of the turbines, and therefore the LCOE.

However, technologies now coming to the fore hold significant opportunity for efficiencies and cost reductions. Modern digital technologies that incorporate Artificial Intelligence (AI), Machine Learning, Natural Language Processing and collaborative tools can be combined to create a powerful tool for technicians – an Intelligent Digital Assistant (IDA).

1. <https://www.accenture.com/us-en/insights/utilities/future-onshore-wind-operations-maintenance>

How an Intelligent Digital Assistant Can Transform O&M

So, what does an IDA look like? It is now possible to use the latest digital technologies to assimilate turbine instructions, repair manuals, operational data and even hand-written notes. An IDA can provide the technician with everything they need in one user-friendly device, whether within a computer, tablet, or mobile device.

With the right combination of current technologies, an IDA can perform tasks such as skilled analysis, pattern recognition, image and speech recognition, analyse massive amounts of data, and guide sophisticated decision making and troubleshooting. The technician can thereby receive intelligent, real-time solutions to their device – anywhere, any time – even in the most inaccessible turbine locations.

Use of an appropriate IDA will help to overcome the following problems:

- **Inaccurate or incorrect prognoses**
- **Skills, knowledge, experience and support limitations**
- **Insufficient, over-scoped or non-compliant repairs and service procedures**
- **Premature component/ subsystem failures**
- **Correct information not being available at point of failure**

An IDA works by guiding the technician at all stages of the maintenance process, providing advanced troubleshooting capabilities to enable rapid fault resolution. It is the connecting tissue between technicians, disparate systems, organisational data, and subject matter expertise.

An IDA is able to ingest an organisation's data with speed and accuracy, solving a large issue within the wind turbine sector of not being able to efficiently access historical data without sufficient time and effort. This also includes being able to ingest and digitise handwritten and PDF documents with ease.

Guesswork, incorrect job sheet data entry, and trips back and forward to identify an issue and repair a fault can become a thing of the past.

Empowering Technicians in the Field

As well as supporting technicians to rapidly find the right solution to a problem, an IDA supports technicians in a number of other ways, including, making their jobs easier, improving the quality of repairs, and freeing up their time to cover a larger number of turbines, or to tackle other tasks.

An IDA captures a technician's problem solving paths systematically. A technician can also enter maintenance data while physically at the turbine, rather than having to go back to a site office to do this manually at the end of the day, increasing the risk of mistakes occurring and reducing pressure on the technician.

Technicians can also use the IDA to add notes for their own (or colleagues) future reference, for example, information about a particular component, or a

shortcut taken. An IDA's algorithms will rationally cleanse and correct existing data, avoiding the risk of errors and thus improving the overall data quality. Technicians are thereby empowered to learn and grow on the job.

Importantly the AI inherent within the IDA enables learning not only the technical information ingested, but also from the behaviour of an individual asset and even the technician; it becomes more intuitive and intelligent over time. For example, an IDA will know if a specific turbine has had a particular fault in the past, and can then inform the technician if the same problem recurs. Technicians don't need to change the way they work as an IDA adjusts to their methods thereby negating the requirement for change management.

An IDA makes it easier for operators to scale and train their maintenance workforce, since they will have solutions to problems readily available at their fingertips. This provides operators with more options when their turbines are coming off warranty.



Collaboration People and Technology

Accenture state: "In the future, the ability for digital to move the integration of commercial optimisation processes to the next level is a key factor that will distinguish success for industry players. The extension and re-design of the digital experience can also enable businesses to tap into the scale of currently available technology and create close collaboration between people and technology, empowering operations with technology-enabled, high-impact capabilities". ([Digital unlocks hidden value for renewable energy](https://www.accenture.com/us-en/insights/utilities/industryx0-renewables)²).

It is common for technicians to experience difficulties in collaborating and connecting to other staff members within their organisation. This can be accentuated when working remotely to fix a critical asset, connecting with

supervisors and managers, or even collaborating with experts from locations when field trips are not possible.

Any barrier to communication leads to inefficiencies in the O&M process, increasing delays and costs. A lack of simple collaboration in the workplace can also leave technicians feeling disempowered in their daily tasks. A valuable component of an IDA is a collaboration feature. This feature allows technicians to communicate, collaborate and consult directly with anyone in their organisation or wider ecosystem – colleagues or other experts that will be saved making a field trip to the wind farm where the problem has occurred. Communication takes place via the IDA, and colleagues are able to view shared information or images on what problem the technician is working on, and what actions have taken place so far.

A collaboration feature also allows a technician to form teams, collaborate in real-time, work within the same context, hand over and share tasks, generate reports and capture data from the field using digital capabilities.

"In the future, the ability for digital to move the integration of commercial optimisation processes to the next level is a key factor that will distinguish success for industry players."

2. <https://www.accenture.com/us-en/insights/utilities/industryx0-renewables>

EDP Renewables: Use of the Lex^X IDA

After being awarded as overall winner of EDP's Global Innovation Award at the Lisbon Web Summit, Lex^X Technologies began a trial of its IDA platform with EDPR in North America. The team worked at EDPR's Illinois wind farm to validate a set of field troubleshooting and performance management objectives, ahead of wider deployment.

The trial established that the Lex^X IDA:

- **Strongly engaged technicians, who found that the Lex^X IDA empowered them and reduced their workload**
- **Demonstrated linkage of troubleshooting and performance analysis**
- **Returned high accuracy of auto correct and auto classification, with some results better than human interpretations**
- **Provided a single searchable interface to disconnected datasets linked to faults and turbines**
- **Enabled better capture of turbine behaviour and technician behaviour through the learning feature**
- **Enabled algorithmic work order classification by resolution type and auto-correction functionality**
- **Enabled the generation of reports addressing a sample of performance analysis questions, and consumption trends of spares and tools**
- **Overall, the Lex^X IDA enabled improved availability and efficiency of wind turbine equipment.**

Key Metrics from the EDPR Trial of an IDA

1 Downtime and efficiency metrics

- An 18.77 % reduction in lost kWh per hour of downtime
- A 34% drop in average downtime per incident
- Average of 35% time reduction across top 10 maintenance faults

2 Improvements in use of spare parts

- 10% cost reduction via part replacement prevention

3 Improved knowledge sharing and retention

- Technician empowerment by providing them virtual assistance to make decisions and act with confidence

- Improved connectivity and collaboration between technicians, which improves teamwork
- Increased job satisfaction for technicians

4 Metrics from surveyed technician participants

- 84% agreed Lex^X improved reliance on data, taking the guesswork out of troubleshooting
- 86% agreed Lex^X increased the reliance on digital tools while on the tower
- 90% agreed Lex^X improved quality of repairs and allowed better utilisation of individual skills of technicians

"My only regret is that this program was not available sooner! If all technicians have this, it is going to help save a lead technician's time, it is very helpful. We needed this years ago."

Senior EDPR wind farm technician

For more information on the Lex^X IDA go to [the website](https://www.lexxtechnologies.com) or contact hello@lexxtechnologies.com to request a meeting with their team