Wind Farm Analytics

## Machine learning drives optimal business results

Nokia Wind Farm Analytics helps renewable energy generating companies lower operating costs, improve generation revenue, and optimize return on assets.

In a comprehensive analytics application, Wind Farm Analytics employs machine learning and integrates into your existing IT infrastructure to create and adjust asset maintenance programs in real time.

Wind farms offer perhaps the most challenging environment for work crew scheduling. Distant work sites, unavoidable climb times, repair skill and spare part availability challenges, and unpredictable weather all factor into a workday being a success or a lesson in frustration. Optimizing a work schedule for all these variables, which change constantly, is beyond the capacity of people to achieve alone.

Wind Farm Analytics uses machine learning to perform **optimization under uncertainty** to provide insights, recommend actions, and make decisions to improve predictive maintenance, maintenance/repair schedule optimization, capital planning optimization, and reliability and regulatory compliance.

Wind Farm Analytics takes inputs about your crew, turbine operations, failure time predictions, energy demand and generation forecasts, parts availability, maintenance records and requirements, weather, traffic, and more to find the optimal schedule for each asset, worker, and wind farm.
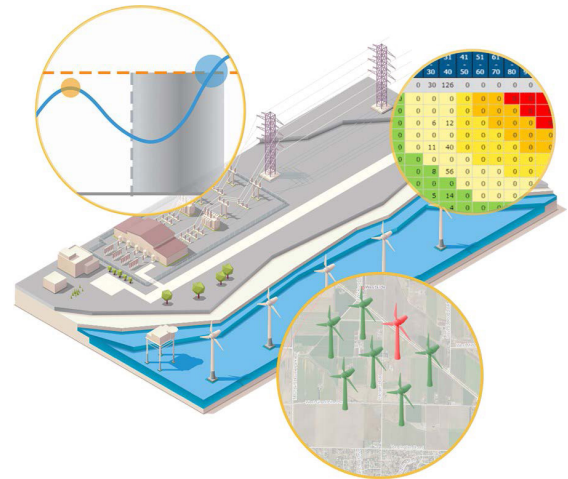
Why Wind Farm Analytics

- A proven solution - Currently saving wind farm operators millions of dollars per year in crew hour costs

- Reduce unplanned downtime - Adjust in real time scheduled maintenance based on projected asset maintenance needs

- Increase operational efficiency - Optimize work crew schedules as conditions change and events unfold, based on current and forecasted conditions

- Reduce operational costs - Avoid costly overtime or hiring new workers as crews are routed with the right parts in the most efficient schedule each day

Machine learning optimizes individual crew deployments and entire wind farm maintenance schedules, accounting for such factors as:

- Crew skills and certifications
- Crew safety records
- Travel time to and from the turbine
- Climb time up and down turbines
- Parts and tool availability
- Weather conditions and forecasts

The application easily integrates with your existing IT support systems including SAP and IBM Maximo, receiving asset maintenance records and work orders and sharing crew and priorities for asset maintenance scheduling.

Wind farm operators generate more efficient and accurate schedules that are built in a fraction of the time. The schedules can be updated in real time as asset conditions warrant. With better maintenance schedules, your turbines operate at peak performance. Our customers have proven that more power generation, fewer accidents, and less wasted time can all add millions to the bottom line.

Adjusting schedules to incorporate weather forecasts is especially challenging. The weather is a key component of wind farm maintenance scheduling, but accounting for its unpredictability is near impossible for all but the most robust machine learning engines. Nokia's Wind Farm Analytics keep crews safe and minimizes unproductive time by continuously analyzing local weather forecasts and updating optimal maintenance schedules accordingly.

What you get	How it helps you
Machine learning models that optimize asset crew schedules, down times, and other maintenance activities.	Extended asset life, increased return on invested capital, and reduced maintenance and operating costs
Supports optimization of both **centralized or decentralized scheduling**	Flexible operating model can accommodate the **most demanding analytics requirements**
Optimization algorithms account for both **current and forecasted conditions**	Delivers the highest **accuracy, efficiency, and cost-effectiveness**
Integration and correlation of data from major asset management systems (IBM Maximo, SAP EAM)	**Reduced risk of asset failure**, leading to lower liability and higher reliability
Easy-to-understand operational formats highlight important data through maps, charts, and other visualizations	**Faster, simpler decision-making** for effective planning and operations