

CASE STUDY

Managing 128 Gigawatts of Renewable Energy with an AI/ML Platform



Impact Summary

Nuvalence architected and delivered Utopus' Scipher, a streaming data platform capable of ingesting 100+ billion wind turbine and solar panel telemetry signals per day. Through Nuvalence-built AI and stream analytics, Scipher is able to:

- Continuously predict and optimize power output for renewable energy farms moving from 24 hour to 5-minute interval granularity.
- Optimize maintenance activity by predicting equipment failures and aligning repairs with non-peak hours.

As a result, Scipher empowers Utopus' clients to capture additional profit by increasing farm-level revenue while driving down farm operating costs.

The Opportunity

Utopus Insights is the software, AI, and analytics subsidiary of Vestas. With over 29,000 employees and 837 gigawatts of renewable energy deployed worldwide, Vestas is one of the largest sustainable energy solution providers on the planet.

With renewable energy farms expanding rapidly, Utopus aimed to build a Software-as-a-Service (SaaS) platform to enable customers to run their farms more efficiently. For example, Utopus planned to employ Machine Learning (ML) and Artificial Intelligence (AI) technologies to forecast power output and predict when parts might fail in order to proactively schedule maintenance during non-peak hours.

Vestas's goal was to reduce the cost of producing renewable energy for their customers by pairing their industry-leading wind turbine hardware with this new AI/ML software platform. This would in turn enable Vestas to generate a new (and higher margin) software revenue stream. In fact, their ambition is to sell this software even to customers who purchased non-Vestas hardware, including solar panels and other renewable sources.

The Approach

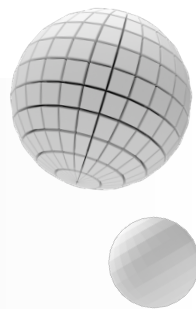
Several important technical considerations made capturing this opportunity challenging. The platform would need to:

- Support an initial scale of 55 billion signals per day (with the ability to cost-effectively dynamically scale to 10x), each of which needed to be aggregated, enriched, and normalized.
- Drive near real-time insight into the performance of wind and solar farms in order to be effective (batch cycles would not be sufficient).
- Have the ability to change data processing rules on a per farm/per device basis using pluggable formulas (i.e. using a no-code approach).
- Enable an ecosystem of licensed third parties that could extend the platform to non-Vestas devices.
- Run as a true multi-tenant SaaS solution with self-service onboarding.

Nuvalence engineers and product managers have experience building and shipping mission-critical platforms at companies like Microsoft, VMware, and Google. We applied the same techniques and commercial engineering rigor in delivering the Utopus platform.

Nuvalence designed and delivered an end-to-end solution running on the Amazon Web Services (AWS) cloud using Elasticsearch, AWS Kinesis, AWS EMR, and custom microservices built using a serverless architecture with AWS Lambda to power the back end. A set of responsive, localizable, and reusable front-end components were built to be shared across Utopus applications using the latest Angular framework.

“We have a great team here but Nuvalence’s deep expertise in building and bringing commercial-grade cloud platforms to market gave our team the skills and momentum that we needed.”



Architecture Diagram (Simplified)

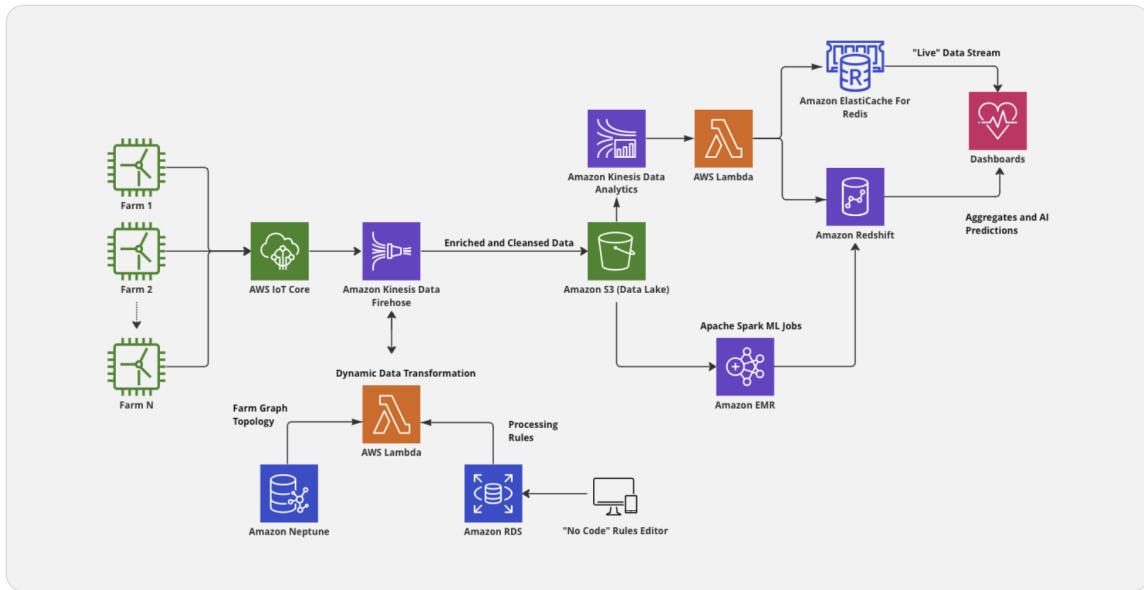


Exhibit 1: Architecture Diagram (Simplified)

Using these technologies alongside powerful AI/ML models and tools, Utopus was able to successfully deliver industry-leading software to pair with its renewable energy hardware as a complete and comprehensive solution.

Key Results

In partnering with Nuvalence, Utopus was able to launch Scipher. Scipher is Utopus' renewable energy management and AI-driven platform. It is the key in Vestas's strategy to lower the cost, increase the consumption, and simplify the management of renewable energy farms worldwide.

Since its launch, the Scipher platform has doubled the number of signals processed to over 100 billion per day. These signals come from 55,000 turbines and 128 gigawatts of renewable power currently under its management. This demonstrates not only commercial success with a new software revenue stream for Vestas, but it is also a validation of the underlying architecture and design of the platform.

About Us

Nuvalence is a next-generation consulting firm specializing in mission-critical, intelligent platforms for the world's most ambitious organizations.

Using our product-driven, AI-centric approach, we empower organizations to build for the intelligent digital future. Our elite team of product leaders, data scientists, designers, and software engineers enables our clients to solve their most complex technology product challenges and positively impact people and the world.

We don't just deliver software, we deliver outcomes.