SAP Innovation Awards 2021 Entry Pitch Deck

Intelligent Technologies for Renewable Energy

Engie

PUBLIC

SAP Innovation Awards 2022

THE BEST RUN SAP

Company Information

ENGIE in 2019
- **171,100** employees worldwide
- **€60bn** in revenues
- **-59%** of CO₂ emissions between 2015 and 2019
- **1st** independent power producer in the world (in 100% installed capacity)
- **1st** producer of onshore wind and solar power in France
- **1st** in underground gas storage in Europe
- **+3GW** of additional installed renewable capacity in 2019

Headquarters La Défense, Courbevoie, France

Industry Energy sector

Web Site https://www.engie.com/en

Our group is a global reference in low-carbon energy and services. Our purpose ("raison d'être") is to act to accelerate the transition towards a carbon-neutral world, through reduced energy consumption and more environmentally-friendly solutions, reconciling economic performance with a positive impact on people and the planet. We rely on our key businesses (gas, renewable energy, services) to offer competitive solutions to our customers.

With our 171,100 employees, our customers, partners and stakeholders, we are a community of Imaginative Builders, committed every day to more harmonious progress.

The close collaboration developed between SAP and our SAP internal Center of Excellence enables our people to connect and envision new possibilities not only with SAP S/4HANA ® but also with the Cloud suites. Our group is attempting to run as an Intelligent Enterprise by connecting Business with senior digital experts. Design thinking and process mining are crucial phases to identify pain points and explore new ways of working. Our main objective to secure digital transformation program is to apply proven methodology, best practices and internalize SAP transformation program know-how to reach the expected value.

The perspective of improving our employees and customers daily life through easy mobility, process automation, chatbot and also dashboarding is a great journey.

In all regions, the latest SAP solutions are rolled out e.g. SAP S/4HANA® cloud in Latin America, SAP Ariba ®, SAP Concur ®, SAP Central Finance ®, SAP S/4HANA Asset management ®.

Moving to renewable energy with predictive maintenance in solar farms

ENGIE

Challenge

How Technology can help us saving human time, costs and useless carbon emission ?

- With currently hundreds of solar installations around the world, ENGIE aims at doubling the capacity and production of solar power supply by investing in innovative solutions that can harness solar power - including concentrated solar power plants and organic photovoltaic, centralized, and decentralized production solutions, sometimes combined with energy storage

- To ensure ENGIE's reliable, efficient, and sustainable electricity mix, ENGIE's growing solar capacity needs to operate reliably and efficiently

- Maximizing the delivery of solar power without any disruption ensures ENGIE's economic value

Solution

A Digital Twin of our solar farms, using machine learning and IoT, to predict and optimize maintenance

- Pairing real-world data with a virtual representation of the asset provided ENGIE with a bird's-eye view of the entire power system's health, down to the component level, remotely

- Integrating this virtual representation of the asset into ENGIE system for maintenance management (SAP-PM), allowed a very insightful combination of data for optimizing maintenance activities using costs-benefits evaluation

Outcome

Freeing workers from repetitive tasks, saving carbon emission by avoiding unnecessary travels, anticipating maintenance spends.

- The accuracy of the digital twin enabled the ENGIE team to successfully determine the precise location of several broken fuses at the very moment of their failure, and schedule maintenance accordingly

- The predictive nature of the physical model in the digital twin permitted the extrapolation of measurement data to actionable failure detections

- Powered with an accurate digital twin ENGIE determined the precise location of a broken fuse

- The digital twin would also provide ENGIE with the ability to anticipate component failures and optimize maintenance activities of their assets

100% Generated alerts were 100% real and reliable for our solar plant

7600 solar panels in the scope of the digital twin project

**45%** Overall cost reduction for solar panels and inverters maintenance

*With our ambition of accelerating **our transition to carbon neutrality**, we believed in exploring the **newest concepts to transform and optimize** the way we were managing maintenance activities in our solar power plants: using a Digital Twin. The results were exciting and promising: **100% real and accurate remote recognition of production losses**, but also a systematic evaluation of the impact of the executed maintenance activities on the plant performance.*
*Our Digital Twin was able to give us **useful insights** about what to do to **be more efficient**.*

Gabriel Marcuz
COO ENGIE
Energía Chile

Business Challenges and Objectives
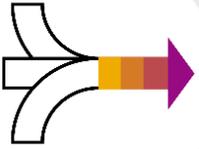
Business Challenges

- In the context of the transition to zero carbon, renewable energy plants increase every day, the main objective is to continue being competitive by improving energy efficiency and reducing losses, on the other hand, assets have low failure rates and maintenance tasks to maintain optimal operation of each of these are not complex but repetitive such as cleaning and minor component replacement
- **Getting insight with data**
  - **Large amount of data** available: from real-time sensors and from maintenance records of the main assets of the plant
  - Use it in an intelligent way to **generate reliable and insightful alerts** that allow optimizing the effectiveness of maintenance activities, whether corrective and / or preventive

Project Objectives

- **Show that the Digital Twin concept can help in optimizing maintenance activities for Photovoltaic (PV) plants**
  - Combine strong growth in renewables with improved asset **efficiency**
  - Create **synergies** across the Group by leveraging local best practices

- **Prove that SAP provides scalable technologies to support the industrialization of the Digital Twin and Asset Management concept throughout ENGIE**
  - Be perceived as an **innovation** partner for asset management, leveraging our strong footprint
  - Get **business buy-in** to help in scaling local initiatives at corporate level
  - Help ENGIE ambition on renewable energies (50GW in 2025 and 80GW in 2030)

Project or Use Case Details
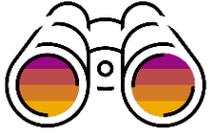
Use Engineering and Simulation techniques to predict thermal and electrical photovoltaic plant output based on real meteorological data

Detecting if the behavior of the plant is normal or anormal

Recommend Maintenance activity to go back to normal behavior

Validate and generate maintenance order

- Each physical sensor is paired with its equipment as defined in Asset Central (an exact replication of equipment as defined in SAP PM)

- An Engineering Model of the PV plant has been built. This Engineering model is injected into EPD (Enterprise Product Development)

- Based on temperature, solar radiation, or wind speed this model calculate, on regular basis, the theoretical performance of the PV plant

- Then anomaly detection function is used to compare the theoretical performance with the real performance and, with the help of all sensors data, detect an anomaly

- Finally, machine learning is used for identifying the best maintenance activity to be performed.

Business Process Details
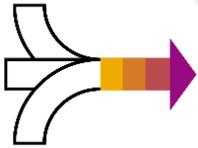
Process Before

Stressful environment
Engie Engineers maintained large plant without any technical assistance and had to fix failure when they happened with lot of stress and reactivity

Loosing time
Most of the time plants are far from engineer's activities. They have to multiply travel to the solar plant with no maintenance strategy

Loosing money
Due to several failures during their lifetime, solar plants activity is not maximal. Also engineer time is not optimized for the plant maintenance

Uncertain outlook
Very hard to anticipate any failure and then to organize team activity and optimize maintenance for each solar plant

Process After

360° control
Thanks to intelligent technology, ENGIE has now the ability to monitor and control its solar plant in a 360° mode

Greener
Solar plant activity is optimized. This helps ENGIE and the world on the road to deploy as much as possible renewable energies and to a global carbon neutral activity

Saving cost
Thanks to anticipated needs, Engineers travel is optimized, and solar plant is more efficient

New gains
First step into this new way of maintained plant at ENGIE. This predictive maintenance will be tested and deployed in the future into many other renewable plants

Exciting outlook
Engineers focus on added value activities

Benefits and Outcomes

Business or Social

- **#Simplification!** Advanced data modelling and simple reporting

- **#SavedTime!** Reduce Plant inspection : solar plants are often located in desolate locations

- **#Recognition!** Intelligent reporting & simulation tool enabling the workforce to calculate potential cost optimization

- **#Green/Renewable!** Working on renewable solution is good for the planet et give motivation to people

- **#CostReduction!** Cost reduction for plant maintenance with predictability and maintenance task reduction
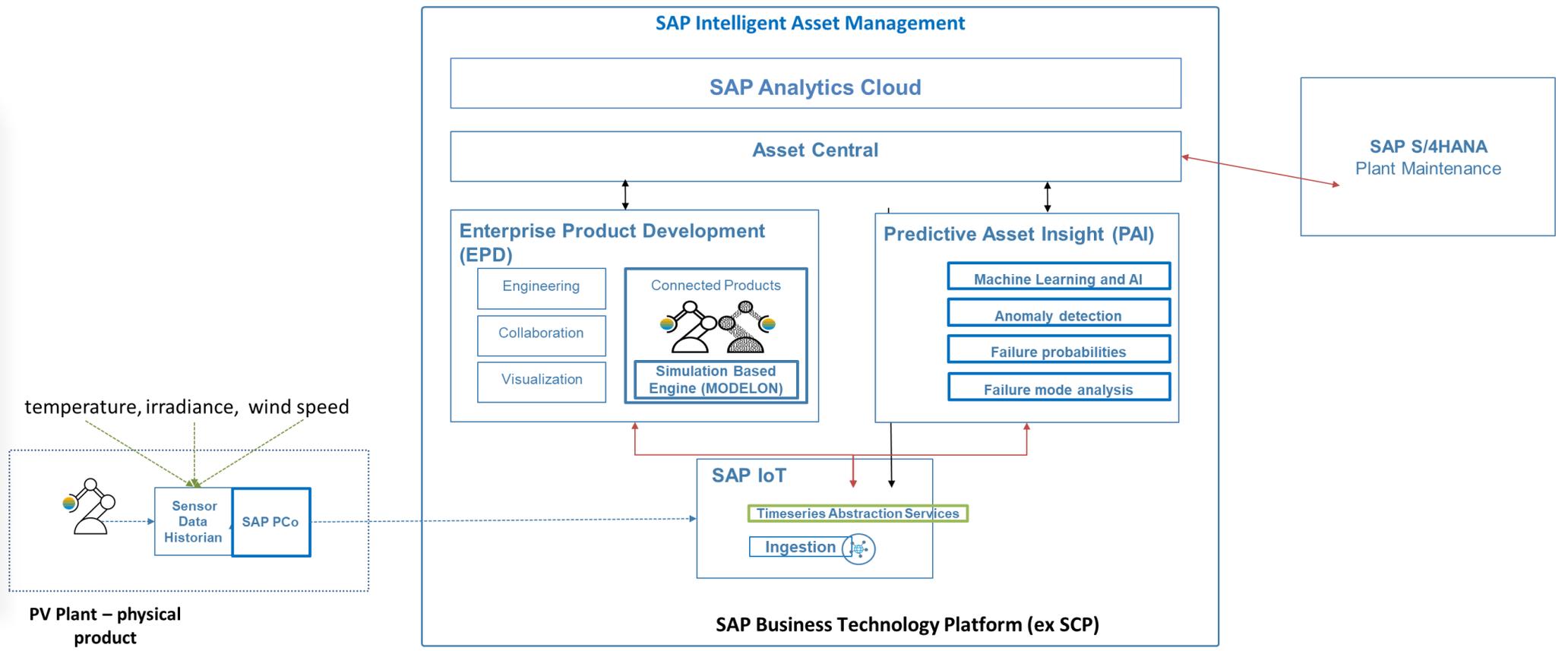
IT*

- **#Scalability!** Robust and sustainable architecture using the power of the SAP BTP and SAP SAC in order to provide the right architecture

- **#Innovation!** IoT, machine learning, cloud, analytics…this project embedded the latest innovation

- **#Data!** Large amount of data available, from real-time sensors and from maintenance records of the main assets of the plant. Use it in an intelligent way to generate reliable and insightful alerts that allow optimizing the effectiveness of maintenance activities, whether corrective and / or preventive

- **#Reliable!** Trusted information from the digital model built in SAP

Human Empowerment

- **#Enthusiasm!** Teamwork and real and measurable benefit around renewable activity

- **#Attractivity!** IT excellence and proactivity in supporting Engie Business, led to a higher attractivity of SAP talented experts

- **#Smile!** Intelligent Technologies help our workers to focus on their real added value

- **#Profitability!** Increased productivity with a global solution that provides recommendation for plant engineers

- **#BestRun!** Simple reporting and monitoring for all stakeholders

* IT benefits are required if you are using SAP Business Technology Platform products

Architecture

SAP Intelligent Asset Management

SAP Analytics Cloud

Asset Central

Enterprise Product Development (EPD)

Engineering

Collaboration

Visualization

Connected Products

Simulation Based Engine (MODELON)

Predictive Asset Insight (PAI)

Machine Learning and AI

Anomaly detection

Failure probabilities

Failure mode analysis

SAP S/4HANA Plant Maintenance

temperature, irradiance, wind speed

SAP IoT

Timeseries Abstraction Services

Ingestion

Sensor Data Historian

SAP PCo

PV Plant – physical product

SAP Business Technology Platform (ex SCP)

Deployment status Live

Date March 2021

Number of end users N/A

Number of customers N/A

Transaction Volume N/A

SAP® technologies used:

	SAP product	Primary product	Deployment status LIVE or POC [proof of concept]	Contribution to project
1	**SAP S/4HANA**	Ⓧ	LIVE	Back-end system to provide master data and all information to support the end-to-end process
2	**SAP Integration Suite** (powered by SAP BTP)	Ⓧ	LIVE	**Analytics + Integration** Intelligent Platform for all SAP components and third-party application providing agility, value-creation and innovation
3	SAP Intelligent Asset Management		LIVE	Asset Central : an exact replication of equipment as defined in SAP PM Simulation is run in EPD module, i.e. Enterprise Product Development, which calculates, on a regular basis, the theoretical performance of the solar plant Anomaly Detection function is used to compare the theory with the reality, with the help of all sensors data. This is run on the "Predictive Asset Intelligence" module
4	SAP Analytics Cloud		LIVE	Enhance reporting capability for end-users
5	SAP Predictive Asset Insight		LIVE	Anomaly Detection function is used to compare the theoretical performance with the real performance and, with the help of all sensors data, detect an anomaly. Finally, machine learning is used for identifying the best maintenance activity to be performed.

The following offerings from SAP Services and Support were utilized during the implementation or deployment phase

[X] SAP MaxAttention™

[ ] SAP ActiveAttention™

[ ] SAP Value Assurance

[ ] SAP Advanced Deployment

[ ] RISE with SAP for Industries

[ ] Other:

[ ] SAP Advisory Services

[ ] SAP Customer Experience Solutions

[X] SAP Innovation Services

[ ] SAP Innovative Business Solutions

[ ] SAP Preferred Success

[ ] SAP Enterprise Support

[ ] SAP Solution Manager

[ ] SAP Cloud ALM

Contribution to the project

Continuous technology support and a common project to deliver value.

Prove that SAP provides scalable technologies to support the industrialization of the Digital Twin and Asset Management concept throughout ENGIE

Advanced Technologies (1 of 2)

The following **advanced technologies** were part of the project.

	Technology or use case	Product *	Contribution to project and how product used integrates with SAP products
1	**Intelligent technologies** **A) Machine learning or artificial intelligence** Conversational AI, AI-based knowledge graph, AI Business Services, Robotic process automation	SAP S/4HANA, SAP Intelligent Asset Management, Predictive Asset Insight (PAI)	To compare the theoretical performance with the real performance and, with the help of all sensors data, detect an anomaly. Finally, machine learning is used for identifying the best maintenance activity to be performed.
	B) Blockchain	N/A	
	C) Internet of things	SAP IoT (powered by SAP BTP)	Connected sensor on each solar panel
2	**Intelligent data management** Multi-cloud and or hybrid deployment, data virtualization & governance, privacy compliance, cloud data lake service	Big Data (powered by SAP BTP)	Large amount of data available: from real-time sensors and from maintenance records of the main assets of the plant

*If this is not an SAP product, explain how it integrates with SAP products.

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|	Technology or use case	Product *	Contribution to project and how product used integrates with SAP products
3	**Advanced cloud integration** New business models using API's, Connecting business partner(s) with API's, Integration Advisor, Digital integration hub architecture, Event Mesh	SAP Integration Suite (powered by SAP BTP)	Intelligent Cloud integration between all components
4	**Advanced and augmented analytics** Real-time and streaming analytics, spatial analytics, natural language processing, machine learning to identify trends, patterns, and outliers, predictive analytics and planning)	SAP Analytics Cloud	Intelligent reporting and enhance reporting capability for end-users
5	**Combined transactions and analytics on single data set** Reduce data latency and footprint from dedicated data marts, data warehouses and data lakes (> 1TB)	N/A	

*If this is not an SAP product, explain how it integrates with SAP products.

Additional Information

The real plant in Chile with more than 7600 solar panels
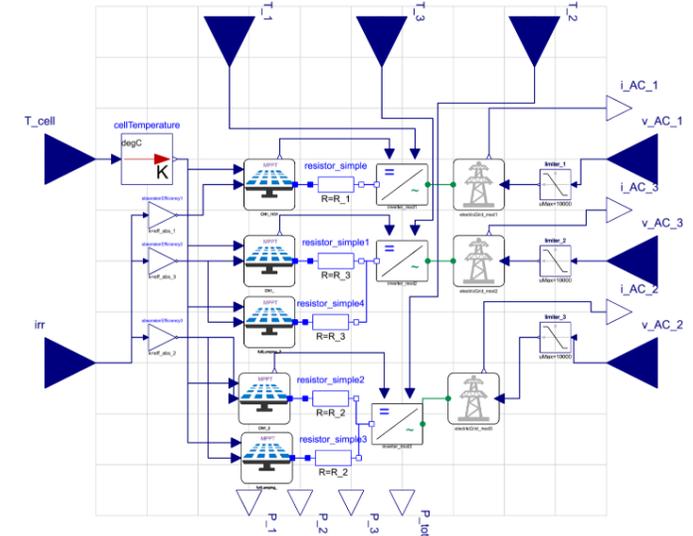
The digital twin / Virtual Plan build on SAP
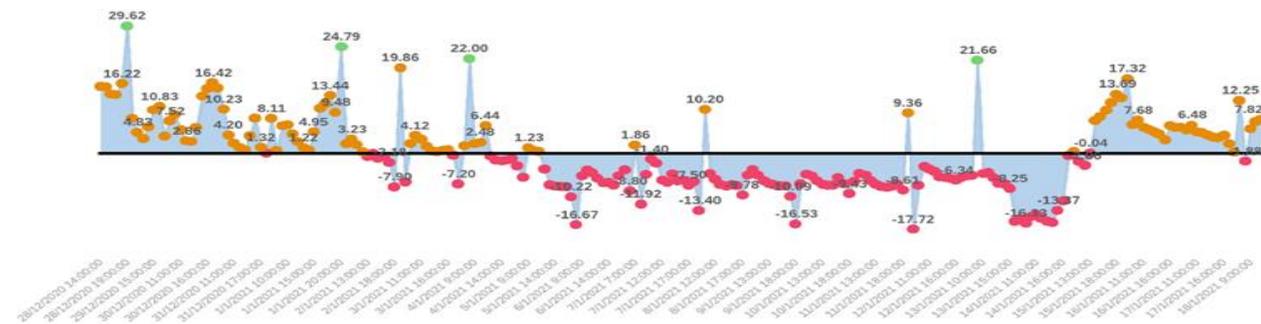
The predictive modelization to track any fuse replacement