Advanced RE Asset Management

AVEVA™ Technology Partner

Renewables Installations will break Records this year !

2021

Coal 44%
Renewable 6%
Hydro 16%
Nuclear 11%
Oil 3%
Gas 20%

22,346 TWh

2035

Coal 30%
Renewable 27%
Gas 17%
Oil 2%
Nuclear 11%
Hydro 13%

32,437 TWh
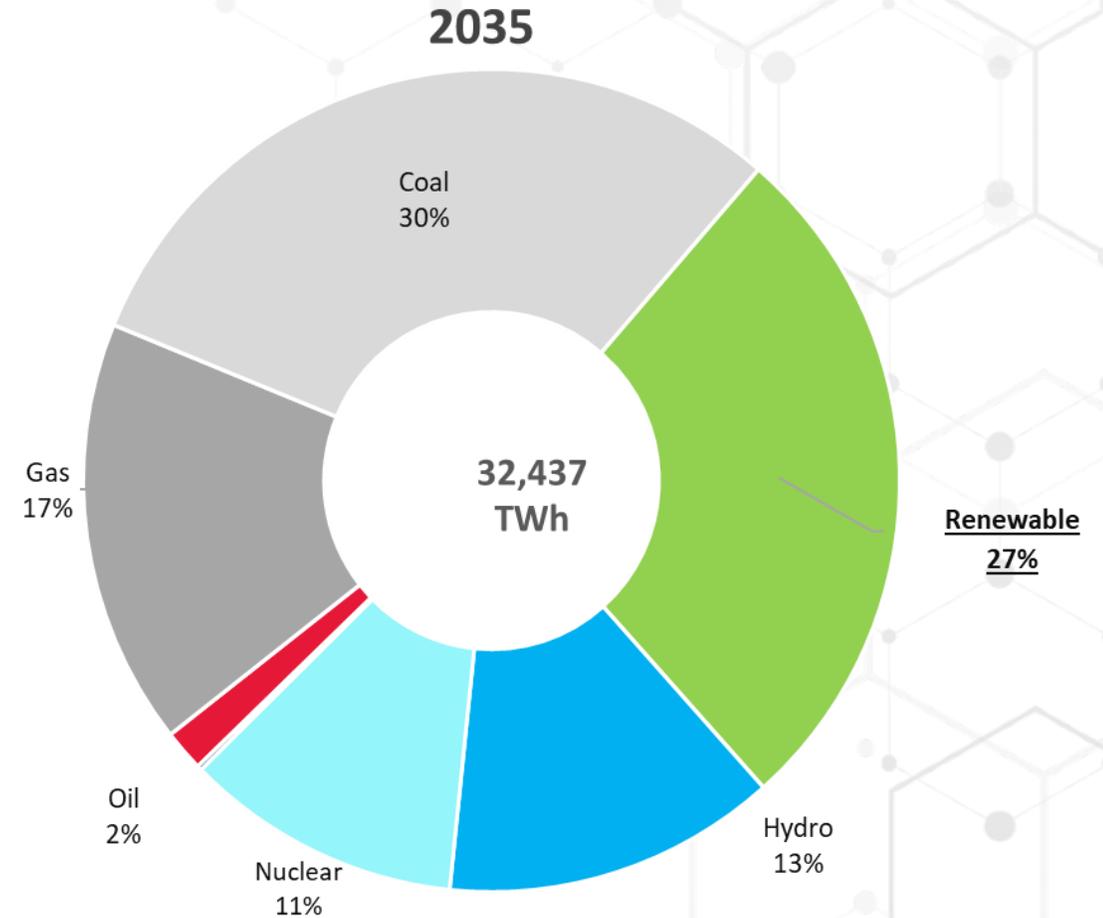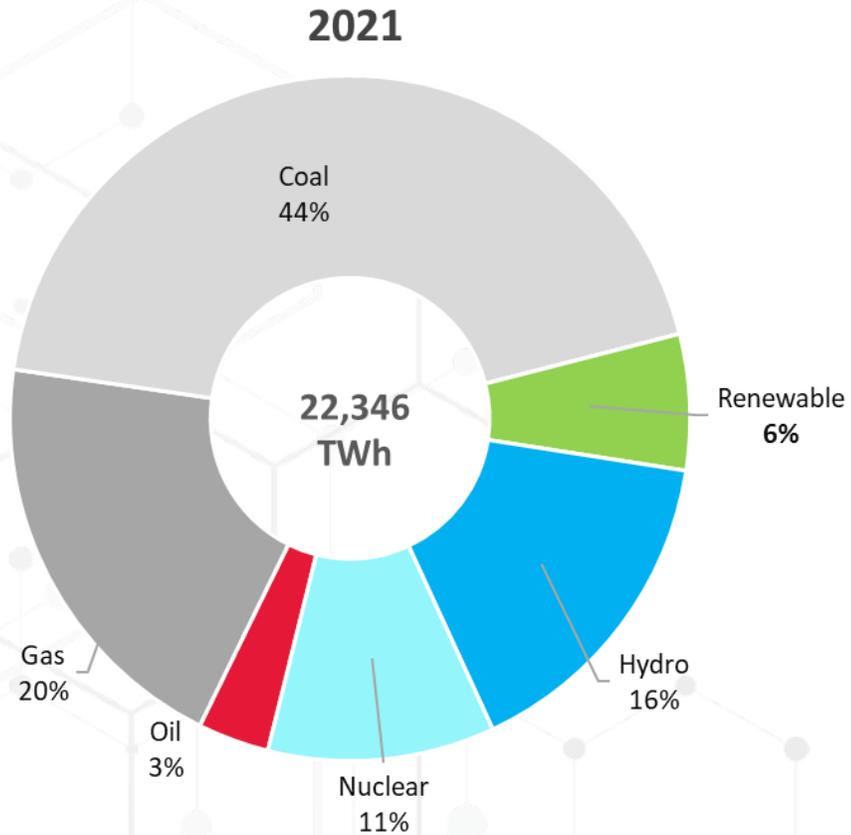
In a RE first case – IRENA forecasts a 7-fold jump of RE in Annual installation and 60% of Energy supply from Renewables

But the RE Asset Owners have Big Pain points

The 2020 SGI report is the largest industry-wide energy validation study. The report analyzed over **30% of the market's non-residential systems in the United States** and found that on average, systems underperformed their initial estimates by **6.3% on a weather-adjusted basis**. The report concluded that performance estimates are systemically over-estimated and that assets are often not yielding the expected returns.

Solar projects are underperforming by 6.3%: New report suggests better assessment standards

By Kelly Pickerel | October 5, 2020

kWh Analytics today released the "2020 Solar Generation Index" (SGI) in collaboration with ten of the industry's 15 largest solar asset owners. In parallel, the company announced that it issued the industry's first Solar Technology Asset Risk (STAR) Comps reports with leading sponsors and asset owners to use industry data to validate solar production estimates on more than 1 GW of solar assets.

The 2020 SGI report is the largest industry-wide energy validation study. The report analyzed over 30% of the market's non-residential systems in the United States and found that on average, systems underperformed their initial estimates by 6.3% on a weather-adjusted basis. The report concluded that

SPW DIGITAL EDITIONS

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Biggest Pain Points of the RE Asset Owners

Underperformance

■ Expected
■ Actual
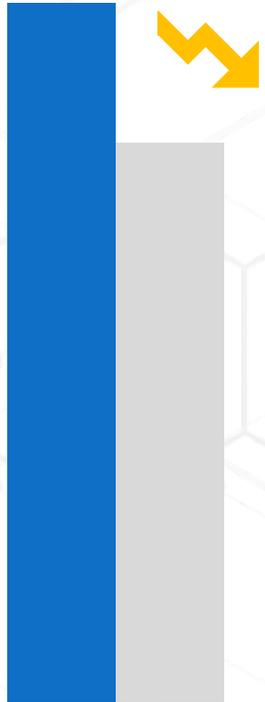
Uncontrollable Loss
- Higher Temperature
- Lower Irradiation
- Grid Failures

Controllable Loss
- Equipment Failure
- Lack of Maintenance
- Equipment Under-performance
- Spare Part Unavailability
- Human Error – Vegetation / Soiling / Snow Removal delays

Unknown Failures & Delays

The IPP knows only when the generation stops – **Delay in Fault identification** is common !

Considering the remote locations, and large areas for Solar PV and Wind plants - O&M teams many times could miss out on certain maintenance or delay responding to a downtime.

This could result in downtime losses up to **5 % - 10%**

Fragmented Data

No single source of truth

Multiple Tools – Multiple Locations - Multiple Team members – Multiple OEMs

Manual Analysis is the only option for most – which can take up to 4 hours/day even for an experienced **performance analysts and can be prone** to human errors.

Apollo can eliminate all the pain points while digitalizing the entire Asset Management journey !

What is Apollo ?

Apollo™ is comprehensive software suite for your Asset Management with **Advanced Analytics** solution to the RE Asset Owners powered by our **patented solar PV digital twin,** AI & ML, pattern recognition to drive business value !

5250 MWp
UK, MENA and India

1 Mn+
Equipment Analyzed Daily

1 K +
Insights generated daily

Apollo™ Impact

- Higher Generation by ~ **7%**
- Reduce Operational Costs ~ **20%**
- Reduce Stakeholders Risks ~ **$10Mn +**
- Improve productivity by **50% +**

Apollo doesn't need any additional hardware !

SITE

H/W

Apollo Data Acquisition Adapter

API	Database	FTP
OPC UA	OPC DA	MQTT

**Apollo SaaS**

SCADA

Apollo's Cloud instance for every customer is a different Virtual Machine – **100% Data Privacy** !

Apollo™ delivers value always : Payback period < 1 Year

Performance Maximization

- Maximize performance of every Turbine and Inverter
- Typical Generation upside of ~ 7% or **$ 24000 / MWp** within 1 year

Team Optimization

- The team you have today stays the same for the next 5 years !
- Zero manpower requirement for Events, Reports, Analysis
- **With Apollo 2 team members can manage 1000 MWp++**

Risk Avoidance

- Ensure **100% maintenance of all your Equipment** on time, done correctly
- **Save risk of a major component failure** in advance and stop your plant for Weeks of Downtime
- The loss could be to the tune of a few Hundred Thousand USD when a Transformer fails & needs replacement

Task Automation

- **Automate key tasks** and ensure 100% governance
- Whether it is writing a custom alarm and getting an alert on your mobile or creating a report every week, consider it done.
- **No more Manual work** or running behind people to get something done !

But more importantly Apollo also gives back to the Society

Water Saved

- Each module needs about 2 Litres of water to be cleaned – so in a year about **72,000 Litres / MW** !
- With integration of Dry cleaning robots and Apollo we could save - **57.6 Billion Litres** of water for the World capacity today through **intelligent cleaning process**

Spreading smiles

- Automate key tasks and ensure **ZERO repetitive manual work**
- Increases the morale site Engineers and Technicians – **40% of** their time goes in **Non-Value Adding** activities **today !**
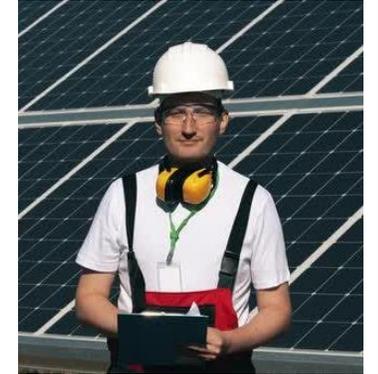
Smaller Carbon Footprint

- **Apollo** can increase the generation of a RE plant anywhere between 2% - 15%
- Considering a 7% increase in generation for the Indian Solar and Wind plants – we can look at additional **434,000 MT of CO2 displaced just in India** capacity

Enabling Lives

- **Apollo's** additional generation can empower lives !
- As India continues growth the Per Unit Energy demand will increase
- The additional generation for India's RE capacity can power **5.25 Million households** enabling lives
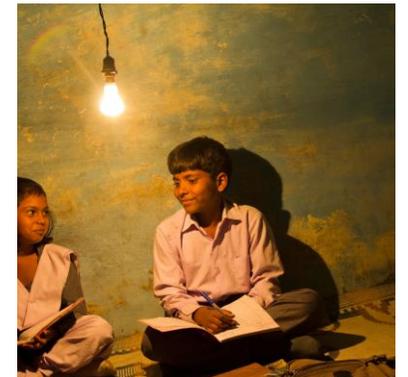
Case Studies and Impact

Case Study – Transformer Failure Prediction

10 MW Solar PV Plant , India

30,000 PV Modules
20 Inverters
5 Transformers
50 Acres of Area

Variety – 100s Tag types
Velocity – Collected every 15 minute
**Volume** – 10k + Tags / Day

Apollo™ Impact in ~ 180 Days

1. **Transformer Failure** prediction 6 Days in advance
2. Loss Saved – **USD 0. 37 Mn**

Transformer Failure Prediction

Major Fault & Anomaly in Winding Temperature

Failure Point of Transformer
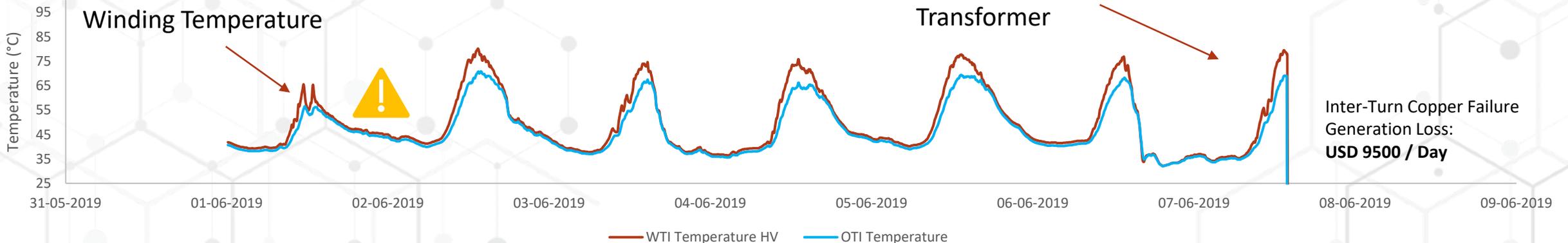
Inter-Turn Copper Failure
Generation Loss:
USD 9500 / Day

WTI Temperature HV   OTI Temperature

Case Study – Underperformance Detection

400 MW Solar PV Plant , Middle East

1,000,000 PV Modules
1,600 Inverters
108 Transformers
2,250 Single Axis Trackers
1,200 Acres of Desert Land

Variety – 1000s Tag types
Velocity – Collected every 1 minute
Volume – 1 Bn + Tags / Day

Apollo™ Impact in ~ 45 Days

1. Generation gain by **3.4 %**
2. Productivity increase by **50%**
3. Annual Loss Saved – **USD 3.2 Mn**

Plant System Loss Analysis

P1-02-B04-IVT28

Power Inverter AC (kW) [Inverter P1-02-B0
POA (20% Factor)
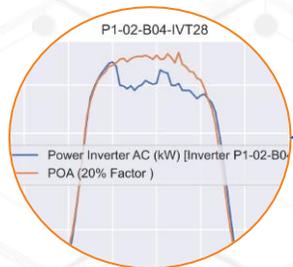
Generation Gain:
USD 5,100 / Day
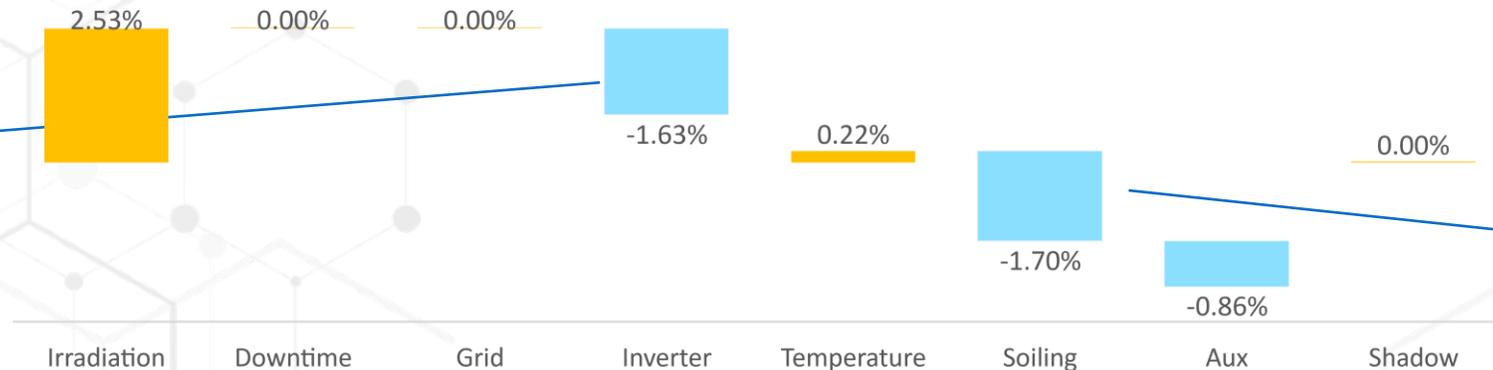
Generation Gain:
USD 5,336 / Day

Irradiation	Downtime	Grid	Inverter	Temperature	Soiling	Aux	Shadow
2.53%	0.00%	0.00%	-1.63%	0.22%	-1.70%	-0.86%	0.00%
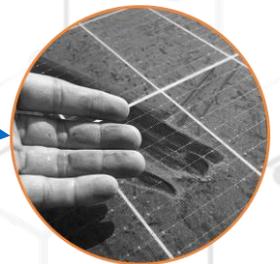
Case Study – Digital Twin in Action

50 MW Solar PV Plant , India

150,000 PV Modules
50 Inverters
14 Transformers
230 Acres of Desert Land

Variety – 1000s Tag types
Velocity – Collected every 15 minute
Volume – 100,000 + Tags / Day

Apollo™ Impact in ~ 12 Months

1. Generation gain by **6.5 %**
2. Annual Loss Saved – **USD 0.24 Mn**

The Digital Twin is an electrical replica of the Solar or Wind power plant and uses both historic and current behavior using sensors, and data combined with modeling and simulation.

Traditional Remote Monitoring and SCADA are limited in their impact since they don't consider actual weather, air mass, sea level, the equipment design, placements, ageing, damage history, and individual performance of components and **hence can't inform if there is under-performance LIVE.**

Apollo™ identifies the gap between the Actual vs Digital Twin Expected


02 April 2022

www.apolloenergyanalytics.com

Apollo™ helps the customer bridge the Gap increasing generation 5%+

Digital Twin and Actual
1 % or lesser deviation

08 June 2022

Apollo™ raises an Alert even when the deviation for one Disaggregated equipment is less !

EVENT ANALYTICS

Event Name : **Low Performance**   Device Type : **Inverter**   Start Date & Time : **16-09-22 14:51**
Severity : **Low**   Device Name : **ICR09-INV01**   Duration : **96 mins**
Relevance : **Alert**   Category : **Performance**

Summary

Inverter low performance compared with digital twin, \n Deviation Threshold - 10%

Event Analytics

Probability : **0** in next **7 Days**   Occurence : **21 Times** in last **7 Days**
Availability Loss : **0 %**   Down Time : **0 min**

Event Parameters Trend

Inverter Specific Power, Inverter Specific Power Predicted
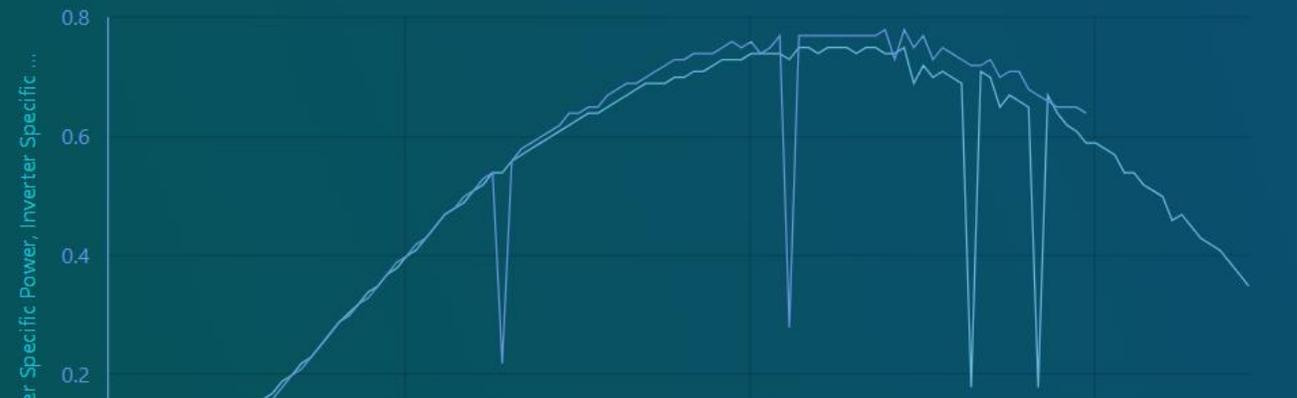
Apollo – Competitor Analysis

Radar chart comparing Apollo, QOS energy, fleximc, SynaptiQ (3E), and AlsoEnergy (A stem Company) across: Dashboards, Alarms, Failure Prediction, Digital Twin, CMMS (scale 0–9).
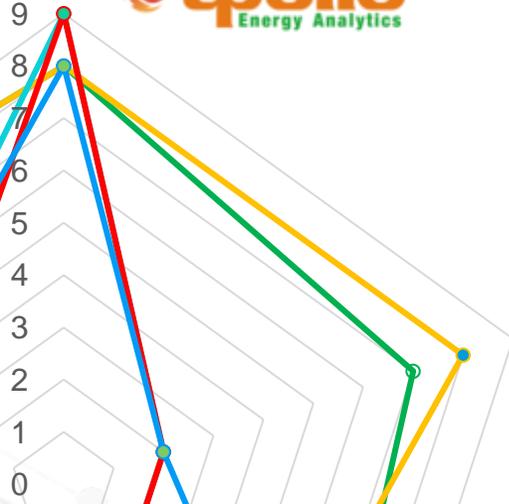
Apollo™ Innovations and Differentiators

- **Portfolio of 5250 MW** in just 2 years
- Only Company to have a **Patent** on Solar PV Digital Twin WO2020202184A1
- **Automated** and seamless workflow : Anomaly – Alert – Work Order - SLAs / TATs
- Equipment **Failure Prediction** - 4 Weeks in advance for Transformer and Inverters
- Decision Tree based **Equipment Health Models** – Residual Life

Patented Digital Twin

ISGF – India Smart Grid Forum

Smart Start-Up of the Year Award Winner

RE ASSETS 2020 – Service Excellence Rising Star Award Winner

RE ASSETS AWARDS 2022 – Best Service Provider of the Year- Solar Analytics

NASSCOM ENGINEERING & INNOVATION EXCELLENCE AWARDS 2021 – Nex-Gen Product of the Year

Our customers trust us !

Apollo Footprint MW

2020	2021	2022
206	1696	5188

8X   3X
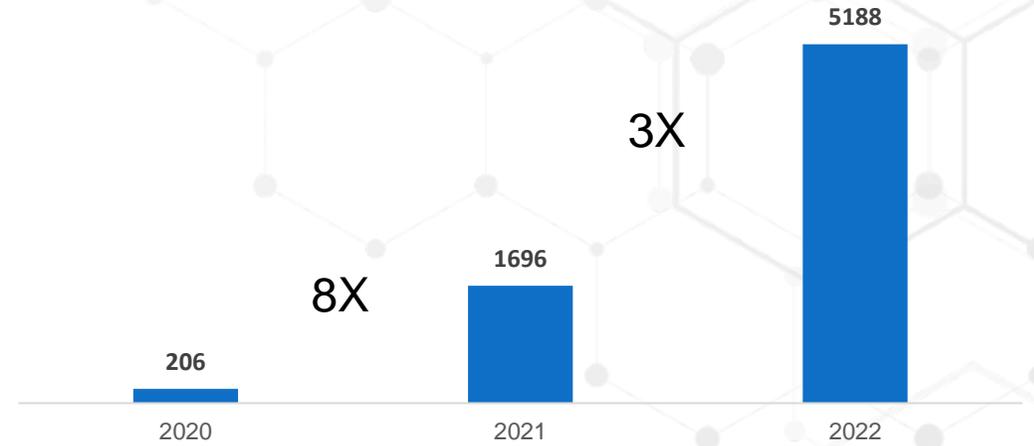
Worldwide Presence - Over 10 Countries
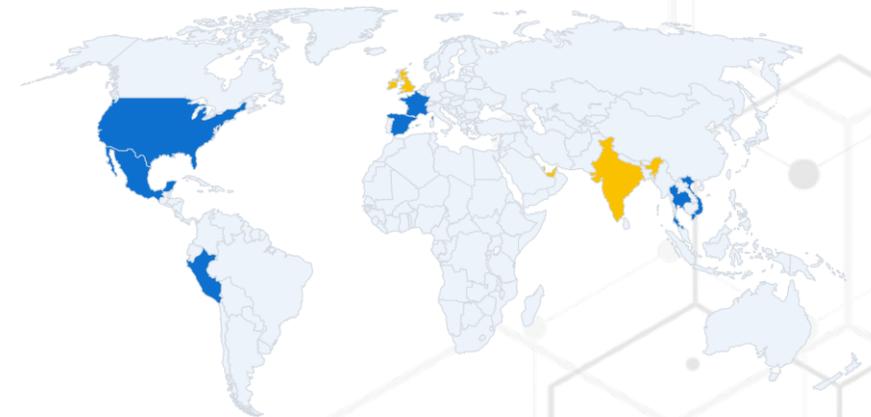
■ Customer / Office Location   ■ Sales Partner

AVEVA is convinced we are the next Big thing!

AVEVA

Industries   Solutions   Resources   About Us

Integration of AVEVA Insight with Helios' Apollo™ enables customers to optimize their solar energy production through performance and efficiency monitoring of assets and streamlined operations and maintenance.

London, United Kingdom, 8 November 2021 – AVEVA, a global leader in industrial software, driving digital transformation and sustainability, announced that it has signed a technology partnership with Helios IoT Systems, a specialized company with domain expertise in the renewables energy sector for

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Communications Specialist

What do you think?

All Cutting Edge Technologies - To help your team deliver !

Performance Analytics
Automated performance bench-marking for your plants & its assets

Operations & Maintenance (CMMS)
Streamline Maintenance Activities of your entire portfolio

Energy Loss Analysis Benchmark Energy Losses in the Power Plant

Health Insights
Predict asset failure & health detorioration

Report & Custom Analysis
Carry your own custom analysis
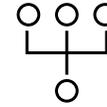
Remote Operations Centre (ROC)
Real-time monitoring of your portfolio plant & its assets.
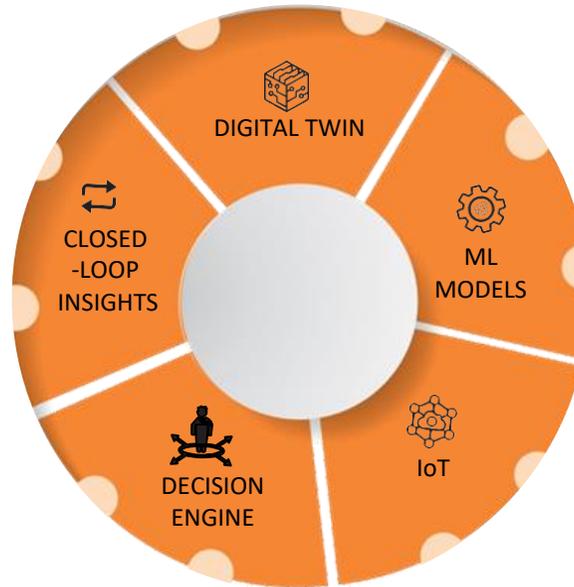
Power Forecast
Manage the regulatory requirements & reduce penalties

Event Analytics
Discover anomalies in your assets for predictive maintenance
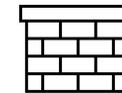
Plant Configurator
Digitize your entire portfolio
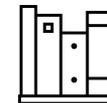
Master Equipment Library
Setup master data of OEM devices specifications

DIGITAL TWIN

ML MODELS

IoT

DECISION ENGINE

CLOSED -LOOP INSIGHTS

THANK YOU !

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