Into the Known/Unknown

Simon Bennett, Head of Research & Innovation

We offer a powerful combination of technology and teamwork

10+
R&D Centers

6,500
Employees

22+
Project Centers

4,300
SI Partners

2,000+
R&D Capacity

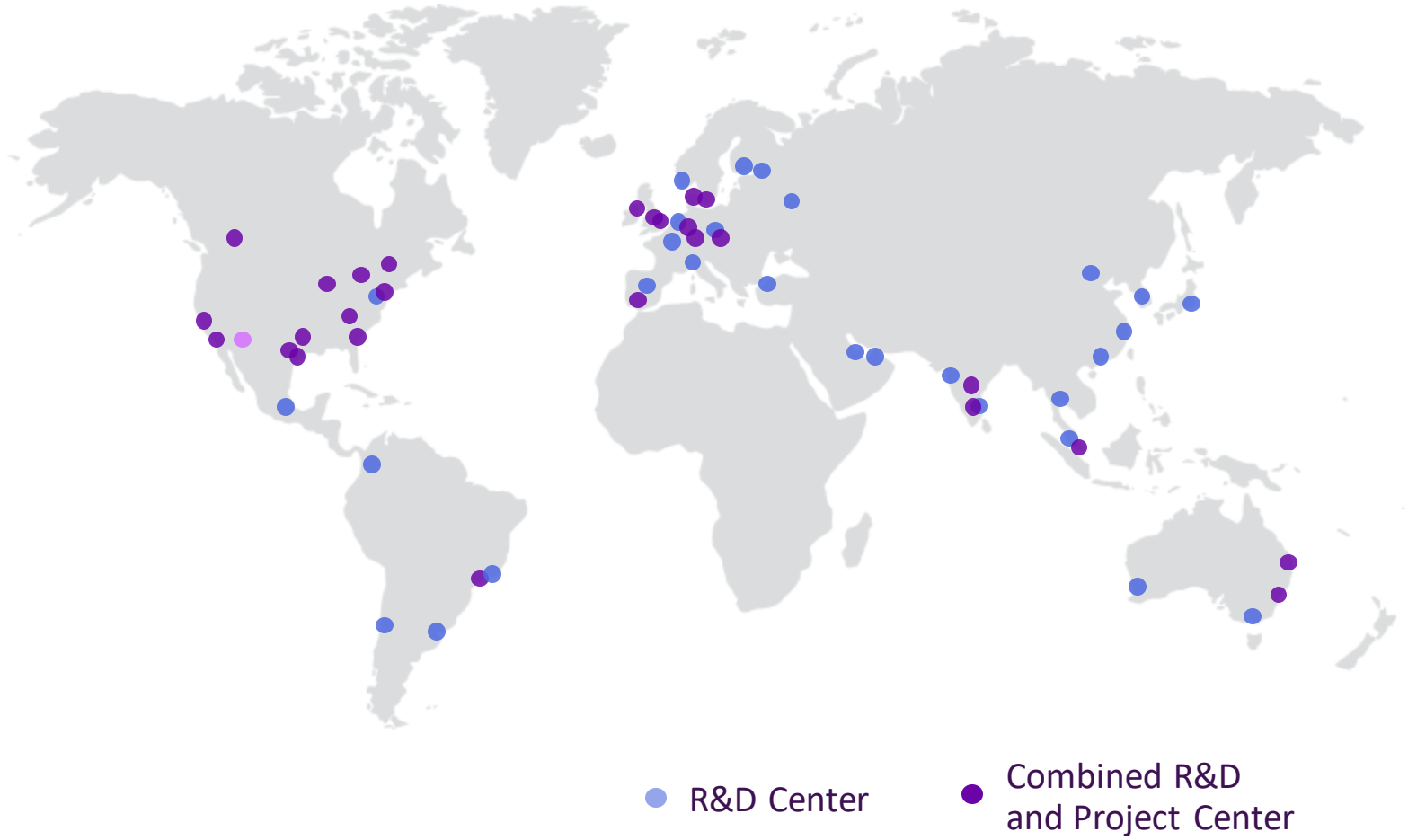
120+
Sales Partners

16%
of Revenue reinvested in R&D

250+
Tech Partners

85%
Projects include Next-Gen tech

20+
Alliance Partners



Deep customer relationships drive our innovations

CHEMICALS

49
of top 50 chemicals producers

FOOD, BEVERAGE AND CPG

All 25
of the top 25 F&B and CPG companies

INFRASTRUCTURE

3,500+
customers

MARINE

The world's
10
largest shipyards

MINING & METALS

10
of the top ten leading mining & metals companies

ENERGY

75%
of daily oil, natural gas & liquids throughput

POWER

1,000+
power plants

500,000+
MW of electricity monitored

MANUFACTURING

16,000+
manufacturing sites and smart factories

WATER AND WASTEWATER

1,400+
water customers

AVEVA

Our software drives transformation for 20,000 customers

Energy

- ExxonMobil
- bp
- ADNOC
- ConocoPhillips
- PEMEX
- Shell
- equinor
- Reliance Industries Limited
- Chevron
- IDEMITSU

Power

- nationalgrid
- enel
- Southern Company
- TATA
- TATA POWER
- EDF
- DUKE ENERGY.

Food, Bev, CPG, Life Sciences

- pepsi
- gsk
- Nestlé
- Xcellerex
- Genentech
- Amadori
- المراعي Almarai

Chemicals

- BASF
- Air Liquide
- covestro
- SCG
- ASCEND
- DSM
- سابك sabic
- INEOS

Infrastructure

- nayaraipur नया रायपुर
- مؤسسة قطر Qatar Foundation
- aena aeropuertos
- NEW PORT PROJECT
- PIMA COUNTY WASTEWATER RECLAMATION
- GRTgaz

Mining

- Peabody
- BHP
- NUCOR It's our Nature.
- CODELCO
- Rox Hill Iron Ore

Marine

- DAEWOO
- MV WERFTEN
- HYUNDAI HEAVY INDUSTRIES CO.,LTD.
- IRVING Irving Shipbuilding, Inc.
- Kawasaki Kawasaki Heavy Industries, Ltd.
- SAMSUNG
- ADMA

EPC

- Petrofac
- wood.
- Worley energy | chemicals | resources
- NPCC
- MCDERMOTT
- TechnipFMC

AVEVA

We have set an ambitious and credible carbon targets

OPERATIONAL FOOTPRINT

We are committed to supporting the transition to a net-zero economy in line with a 1.5°C future

	Suppliers *Scope 3 upstream*	Business Travel *Scope 3 upstream*	Other *Scope 3 upstream*	AVEVA's Operations *Scope 1&2*	Customers *Scope 3 downstream*	Customers *Saved & Avoided*
2020 CO_2 footprint	23,232 tCO_2	26,580 tCO_2	18,294 tCO_2	10,246 tCO_2	306,420 tCO_2	Saved & Avoided CO2 baseline & target under development

2030

Net-zero CO2 Operations (Max 10% CO2 offsets)

-50% End-to-End Value Chain (Scope 3 upstream & downstream)

Target aligned to 1.5°C trajectory

2050

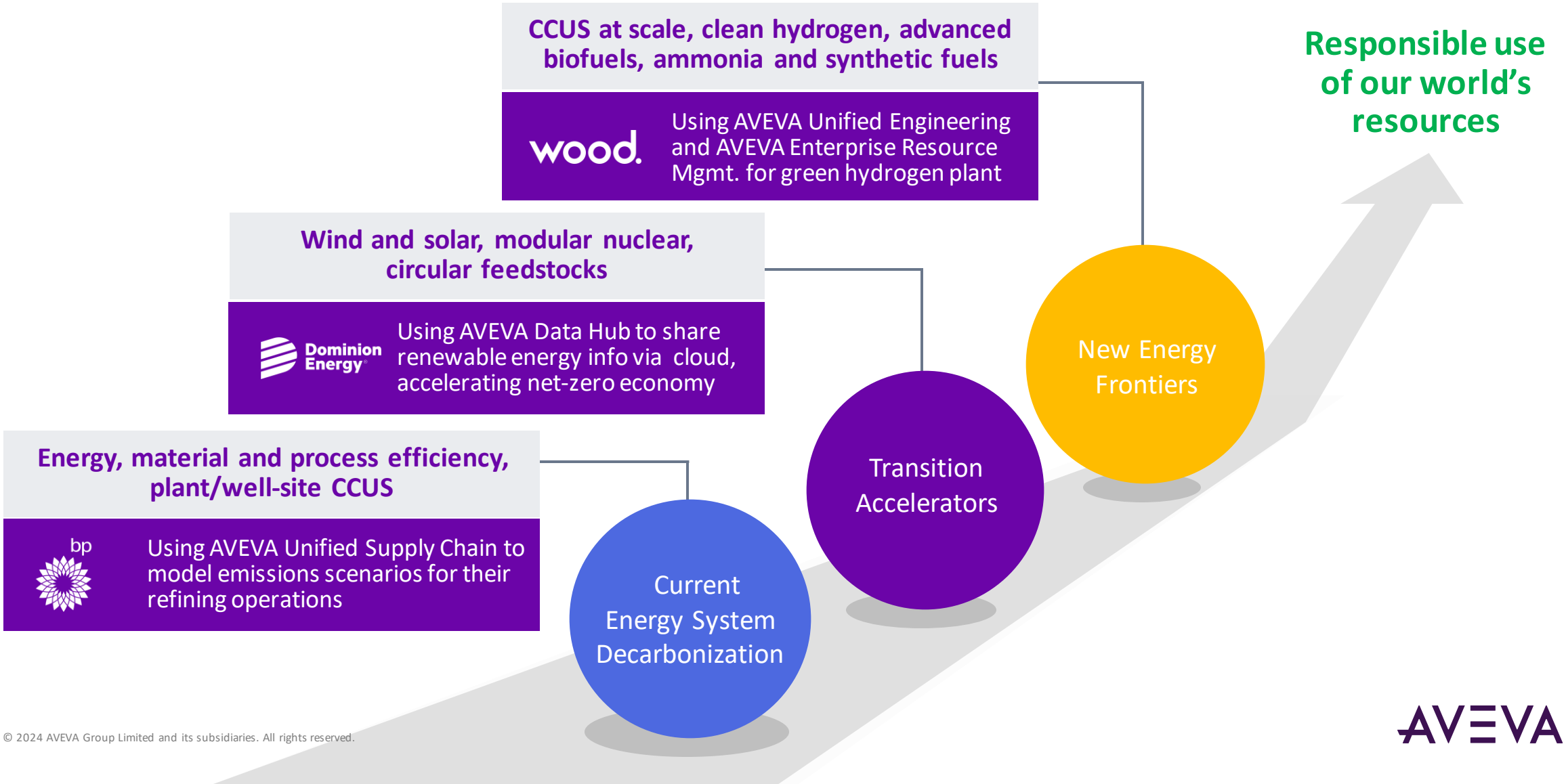
Net-zero CO2 Value Chain (Max 10% CO2 offsets)

BUSINESS AMBITION FOR 1.5°C

SCIENCE BASED TARGETS

AVEVA

We are uniquely positioned to accelerate the transformation of the energy sector



What We Know

Data Structures

Data Quality

Data Volumes

Data Disparity

Research at AVEVA

Partnering with leading universities on research and innovation

West Virginia University

"Development of Comprehensive Membrane-Based Unit Operation Models"

technische universität dortmund

"Modelling of Reduction of Sour Gases Using Amine Gas Treatment"

UNIVERSITY OF CAMBRIDGE

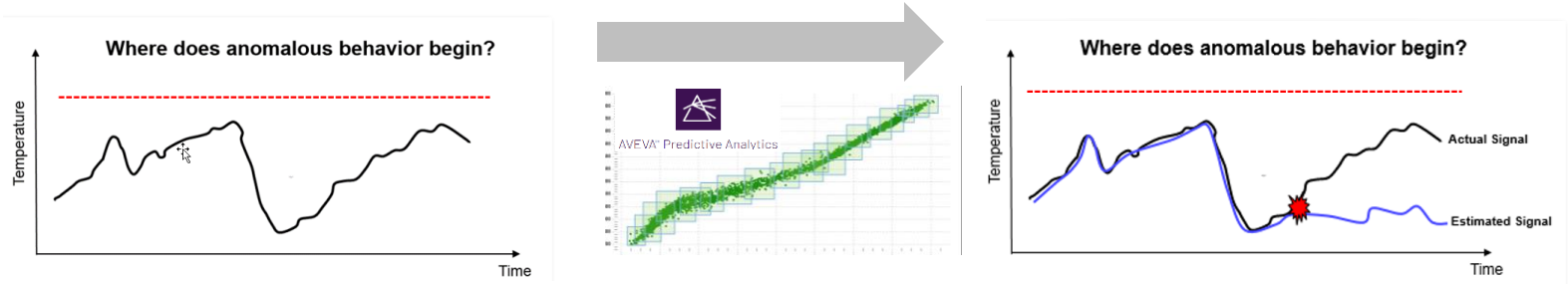
"Tackling challenges in Resilient Infrastructure across traditional disciplines"

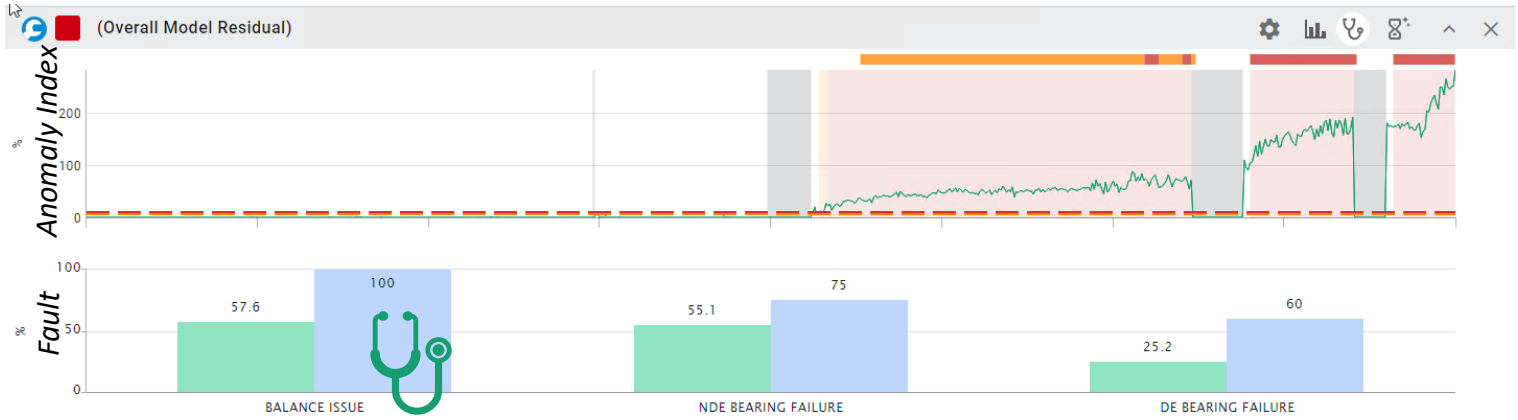
AVEVA

AI & Sustainability

AVEVA Predictive Analytics

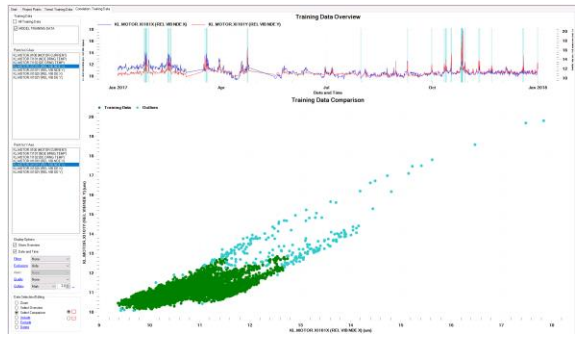
- AVEVA™ Predictive Analytics machine learning to continuously monitor critical asset and process behavior
- Learns past good performance and compares current behavior

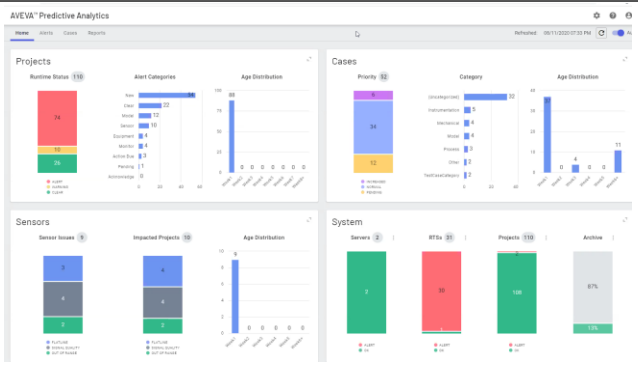




- Early identification of process / equipment deviations via Anomaly Index
- Drill-down to identify contributing parameters
- Pattern matching diagnostics to identify known faults and corrective actions

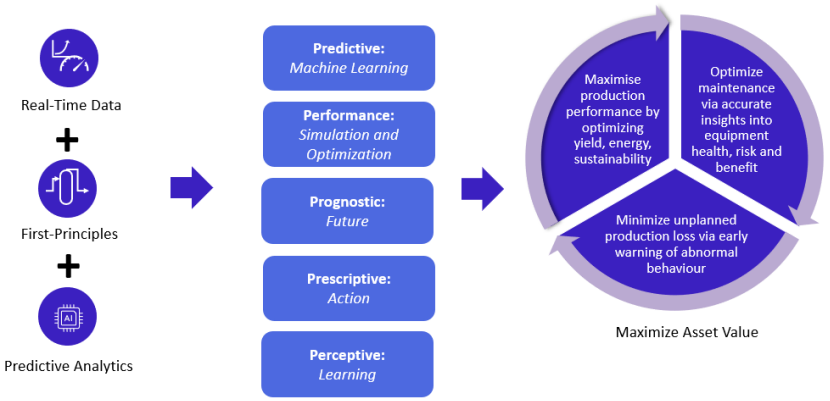
- Model building via intuitive graphical UI
- Web monitoring to facilitate fleet-scale deployment

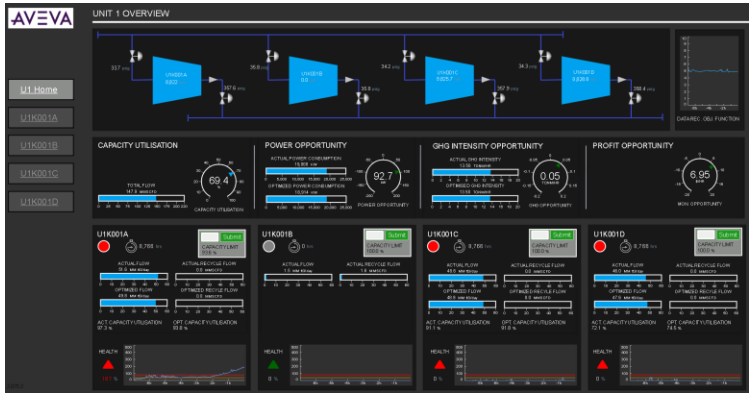




AVEVA Predictive Asset Optimization

- Solution to transform operating data into actionable outcomes, via accurate real-time insights into risks, opportunities and maintenance priorities
- Combines Predictive Analytics for equipment health monitoring with on-line Process Simulation and Optimization





- Use Case: Gas compressors
- Optimize load distribution between compressors to reduce energy consumption and green-house gas emission.
- Obtain complete 360 degree view of asset health from mechanical and process perspectives
- Simulate impact of maintenance strategies on energy consumption and production

- Saudi Aramco: Challenges: How to manage and improve asset reliability and major equipment performance across dozens of distributed sites? How to predict asset failure in advance in order to optimize resource planning and maintenance schedules?
- Solution: AVEVA Process Simulation and AVEVA Predictive Analytics connecting to existing Pi system for 2500 rotating assets

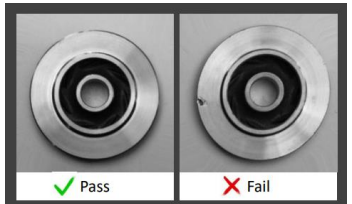
> "We have used technology as an enabler to be more responsive, more adaptive, and more intelligent."
>
> *Abdulaziz Alzahrany – IT System Analyst, Aramco*

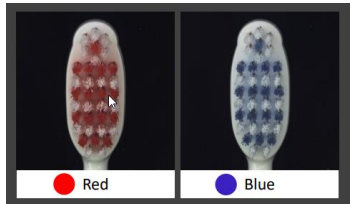
أرامكو السعودية
saudi aramco

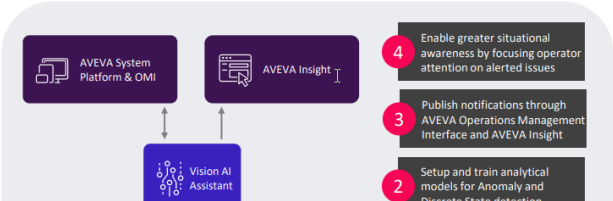
AVEVA

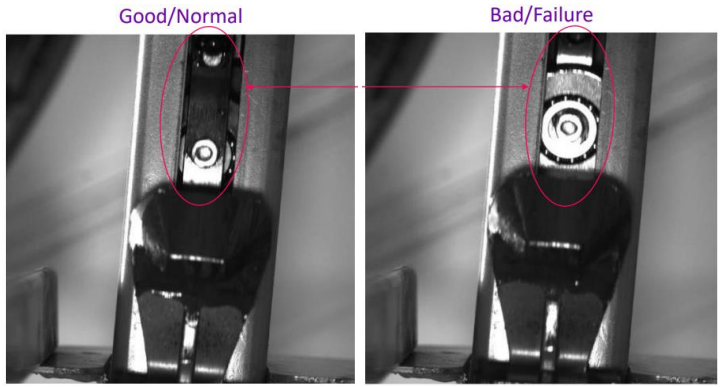
AVEVA Vision AI Assistant

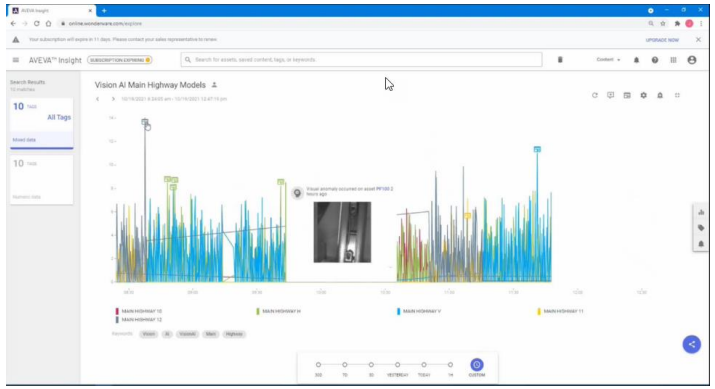
- AVEVA™ Vision AI Assistant applies image processing models to real-time camera feeds automatically identifying anomalies or inconsistencies from learned image states
- Integrated with AVEVA System Platform and AVEVA Insight





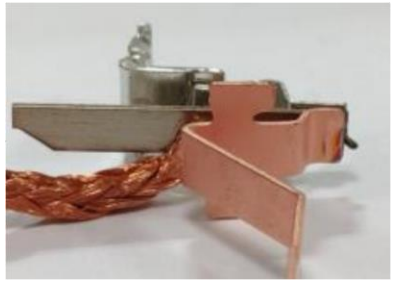


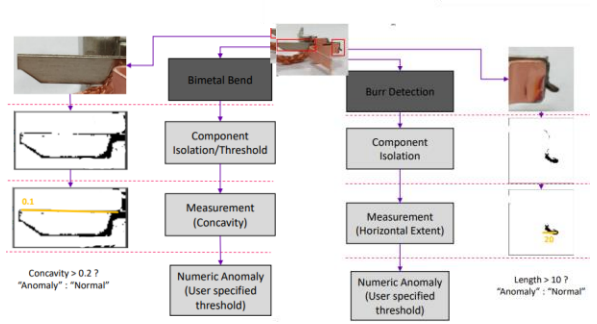




- Use Case: Production line uses a chain driven overhead monorail system to transport parts around the facility
- Chain links fail; human inspection is intermittent and prone to inaccuracy due to 'hypnosis'
- Vision AI Assistant monitors in real time with high accuracy

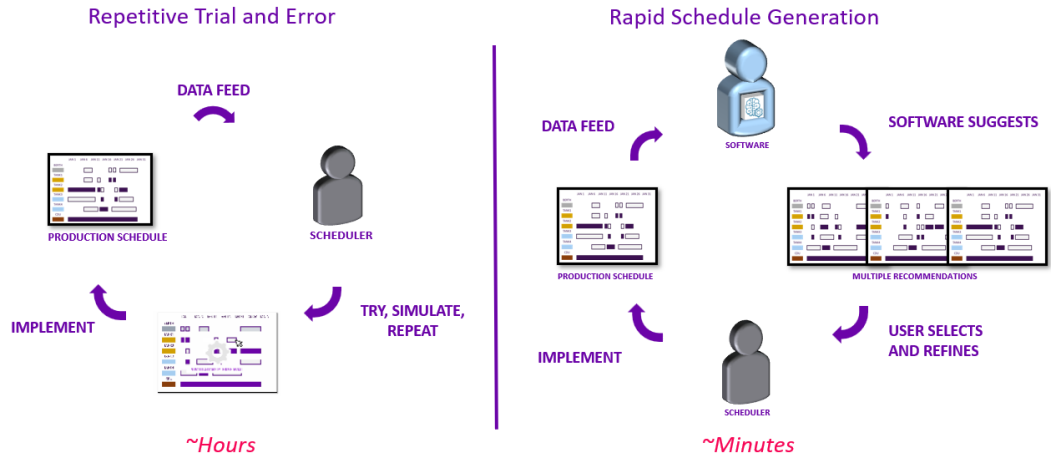
- Use Case: Process inspection pipeline for a bimetallic electrical component
- Vision AI Image performs image alignment / bur detection / length measurement / concavity measurement

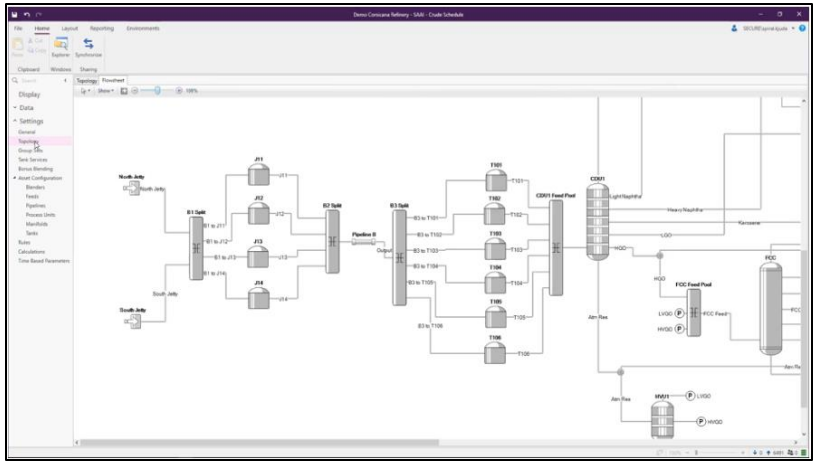


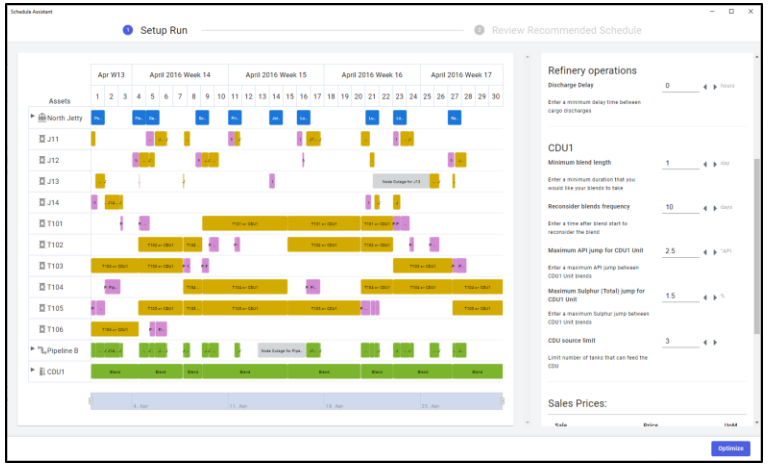


AVEVA Schedule AI Assistant

- AVEVA™ Schedule AI Assistant rapidly generates multiple optimized schedules that navigates hours or days of schedulers work in minutes
- Integrated with Unified Supply Chain Schedule blends AI and simulation to transform scheduling
- Cloud deployment and high-performance computing for fast decision making from anywhere



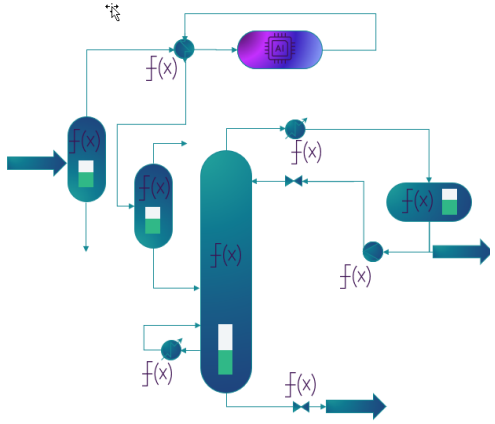


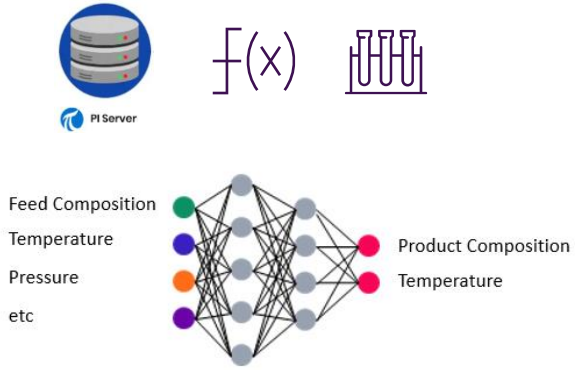


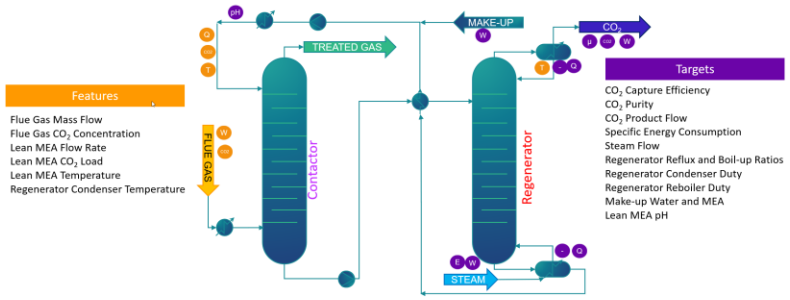
- Use Case: Scheduling to CDU
- Challenge:
  - Legacy schedule optimization tools: slow and hard-to-use systems resulting in non-optimal operations
  - High operational risk due to personalized and non-standardized manual scheduling tools
  - Low confidence and inefficiencies: inability to co-ordinate and optimize complex multiple scenarios

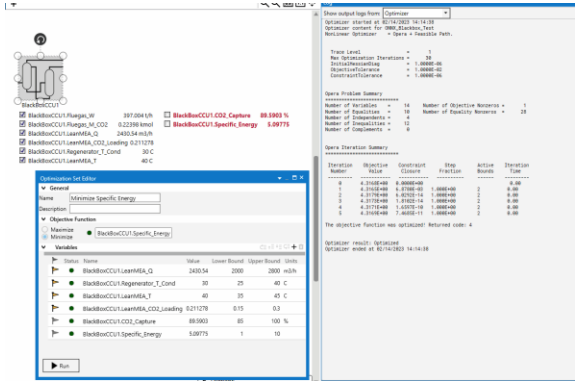
Grey / Black Box Modelling

- Machine learning model to replace process simulation component or entire system
- Improvement in simulation speed, ability to predict where first principles model is inaccurate, or to obscure 3rd party IP
- Training from historical operating data, first principles generated data or laboratory data









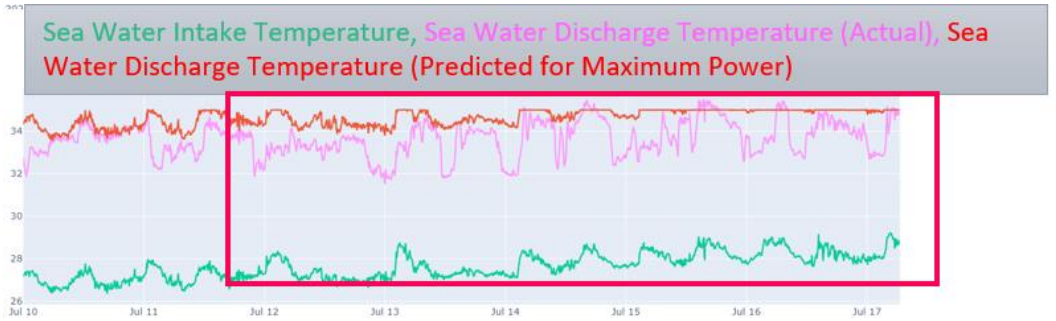
- Use Case: Amine scrubbing carbon capture model. Energy intensive process and complex which takes 10-20 seconds to solve via rigorous first principles model
- Fast ML model trained from simulation generated data set
- Resulting optimisation run takes less than a second to find the minimum energy consumption by adjusting amine flow rate and other parameters compared with tens of seconds for the rigorous first principles model

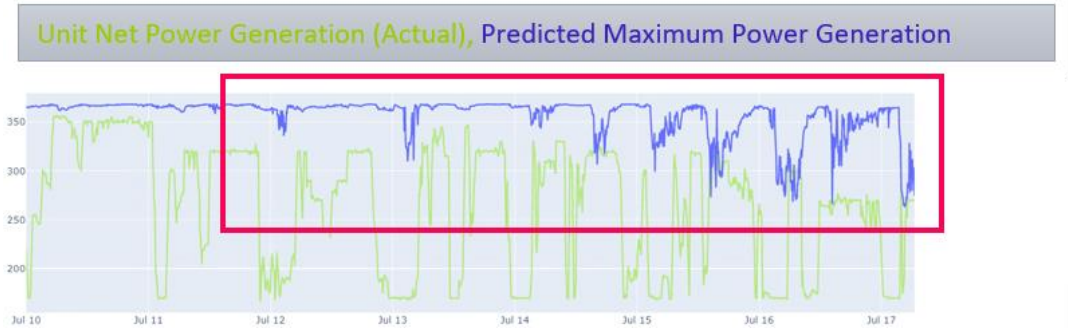
Grey / Black Box Modelling

- Use Case: Power plant predicted maximum power generation. High summer ambient temperatures cause the power plant to have to de-rate to avoid breaching environmental limit for cooling water
- Goal is to predict maximum dispatchable power generation for next 48 hrs based on weather forecast inputs
- Entirely black-box model trained to give power prediction and cooling water discharge temperature

Inputs (Features) e.g. Ambient Temperature, Sea Water Temperature etc

Power Prediction Sea Water Discharge Temp (Targets)





What We Don’t Know

AI Policies

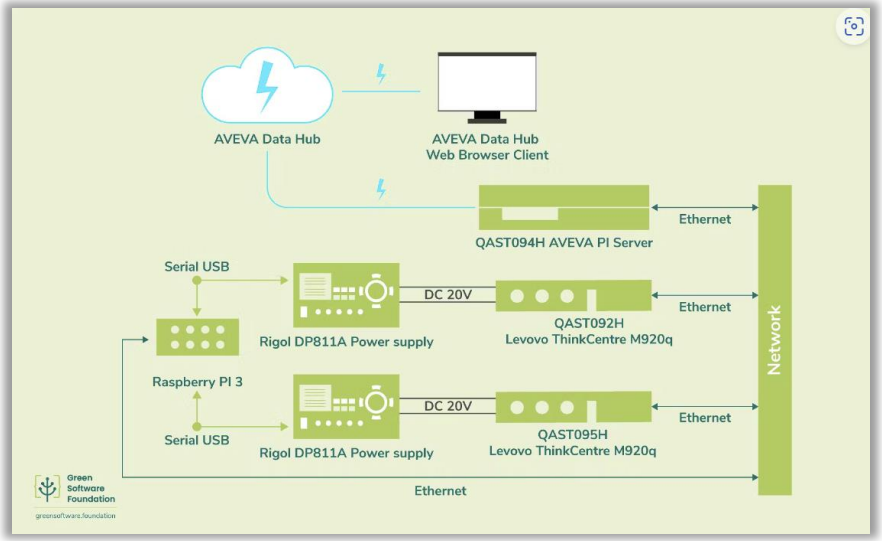
Human – AI Interactions

Energy Consumption from AI applications

ECO-AI – Understanding Energy Requirements

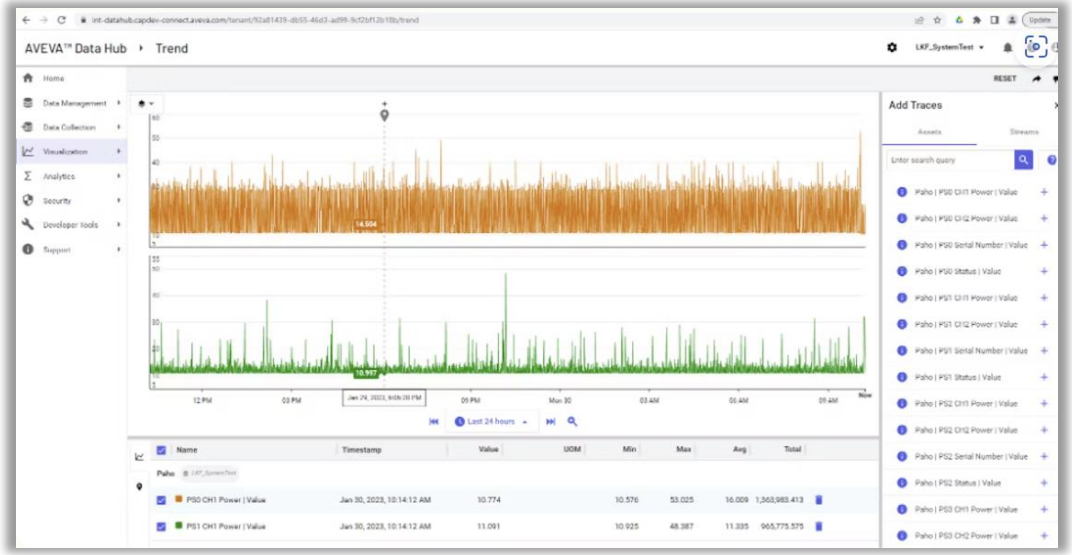
Committed to Green Software

- World Economic Forum: 70% of the new value created in the economy over the next decade is expected to be based on digitally enabled business platforms
- We are committed to developing software following “green” software engineering principles - Member of Green Software Foundation
- One of the most profound challenges in green software is measuring energy consumption
- Separating our compute from that of OS and separating again from PC usage, Monitors, fans etc.
- The solution is generic and allows for separating the carbon emissions the software is responsible for from the hardware embodied emissions



Committed to Green Software

- We have measured the emissions of our top ten products, and early results indicate a significant reduction in actual emissions compared to previous estimates across all measured products
- They are currently working on their green product guidelines and definitions based on internal learnings and findings from the GSF
- Considerations include
  - promoting more energy-efficient coding,
  - encouraging apps to work more when cleaner electricity is available,
  - reducing the amount of data and distance travelled across networks,
  - and avoiding unnecessary database lookups or avoidable data movement



From TRL 7 to Customer

Challenges for Rapid Productisation of AI in Sustainability

AVEVA

Industrial Intelligence

Exceptionally quality expectations from customers

Value to customer is directly related to their data quality, availability

Rapid changing technology and policy landscape

Competing priorities for development (existing versus new)

linkedin.com/company/aveva

@avevagroup

ABOUT AVEVA

AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

Learn more at www.aveva.com