

Semiconductor
Climate Consortium
FOUNDING MEMBER

Digitalization: The Blueprint for Sustainable Fabs

Henri Berthe: Mobility and Semiconductor Segment President



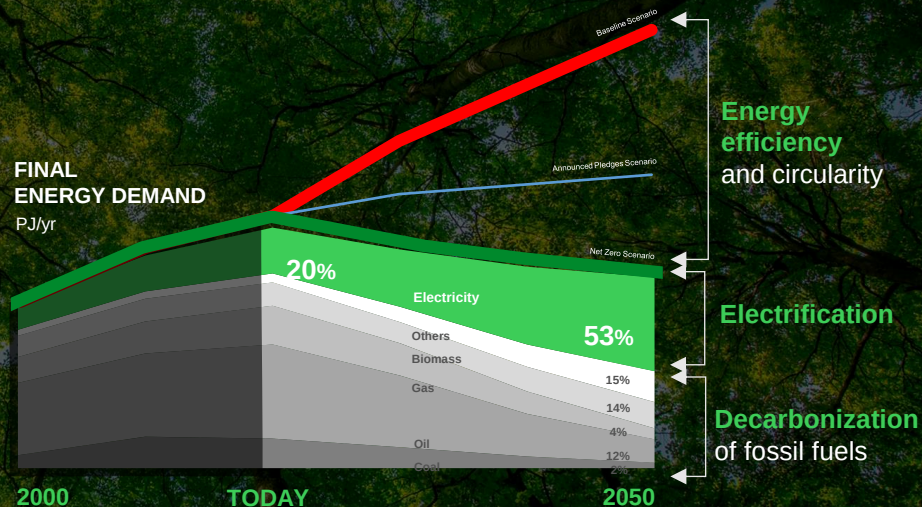
Fast-forward to **Net Zero 2050**

Bring **Energy to 3Bn** people + **Curb Emissions** radically

TODAY **2050**

8BN	World Population	9.8BN
800Mn	People Without Access to Energy	ZERO
3BN	Middle Class Population	7BN

Sources: Net Zero by 2050, International Energy Agency; Announced Pledges Scenario, International Energy Agency; Back to 2050, Schneider Electric Sustainability Research Institute; Oxford University Press

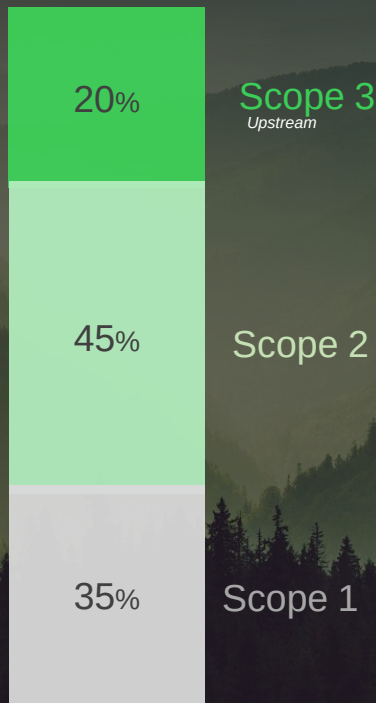


The carbon footprint of the semicon industry is massive and will expand if no immediate action is taken

100 Mt

2021 CO₂ emissions from the
semicon industry
(Scope 1 & 2) based on the SCC

Semicon Fab Emissions by Scope (CO₂)



237 TWh

Estimated electricity
consumption by 2030²

¹SEMI Blog 2020.

²Greenpeace Energy Consumption Report, 2023

But the Semiconductor Industry is set to become a trillion \$ industry

\$1T

The semiconductor industry is on track to reach
\$1Trillion in global revenue by 2030

500 Fabs

Existing globally

103 Fabs

300 nm and 200 nm Fabs coming online
globally between 2023-2027

The Semicon Sustainability Paradox

→ Higher demand, more fabs, and a more sustainable future?



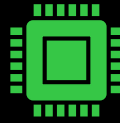
Increase in daily use of technology has **increased demand**

Digitalization is the answer to increasing production while trying to reduce carbon emissions



Many countries worldwide are working to regain **technological autonomy in semicon manufacturing**

100+ new fabs will come online in the next 10 years increasing the demand for smart and energy efficient technologies in all new greenfield facilities



Advanced chip technology consumes more energy during manufacturing

Estimated **7.7 Twh** of energy annually for advanced 3nm chip manufacturing



50% reduction in energy consumption by 2030 to successfully reach 1.5 degree commitment

Digitalization can help achieve up to **30% in energy cost savings** at a 300 mm fab, improve **efficiency by 30%** and reduce **greenhouse gases by 15%**



Continuously ensuring **supply chain resilience** and **manufacturing excellence**

AI and Machine learning technologies can optimize **manufacturing efficiency by 40%**. AI and ML can also contribute to **10 -20% of energy consumption reduction**

Digital Solutions can help reduce up to 15% in greenhouse gas emissions

Digital disrupts
Sustainability &
Efficiency

Efficiency
Optimized Fabs
Transparency

³*Semiconductors Helping solve the climate challenge*

Technologies also already exist to make companies more efficient and resilient



Accuracy of data
extracted by AI & ML
from unstructured data



Reduction in energy
consumption can be
achieved through AI
& Analytics alone



The use of AI in
semiconductor
manufacturing can
boost productivity by
up to 20%

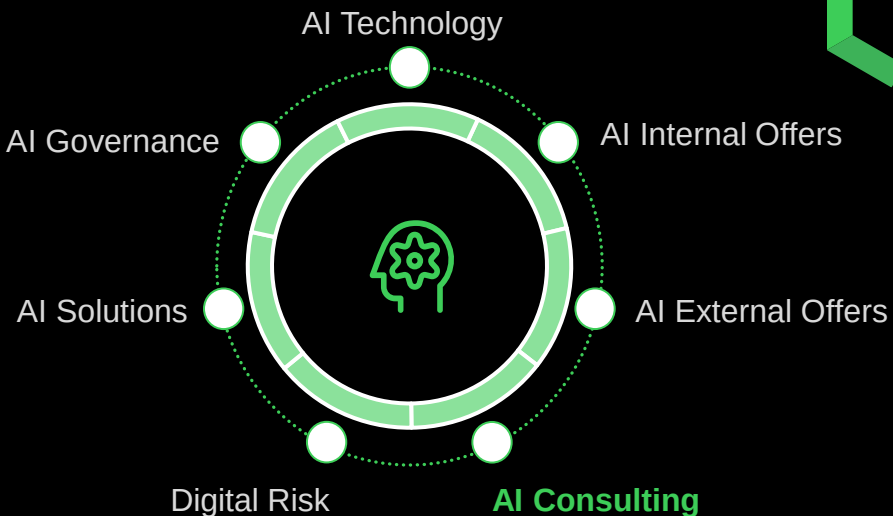


AI can reduce
overall product
development time in
the semicon
industry by
approximately 40%

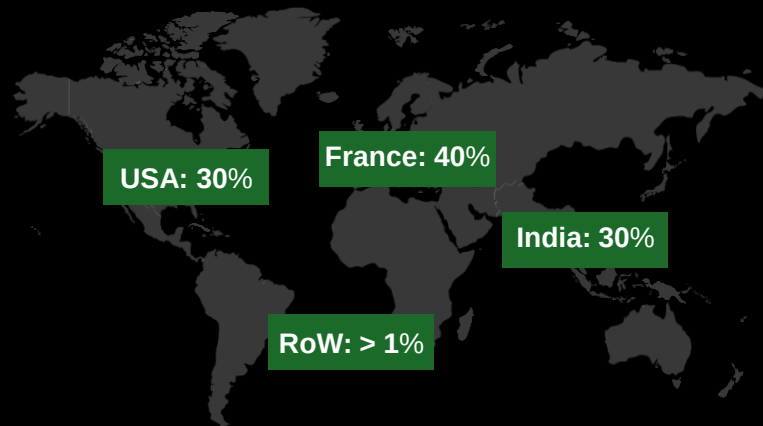
Schneider's AI Hub Landscape

AI Hub

300+
Members



- Customer Facing AI Consultants “From Industry”
 - First to Do Something New or Difficult
 - Follow Fast & Value Driven Methodology



Strategic partnerships



Microsoft

AVEVA



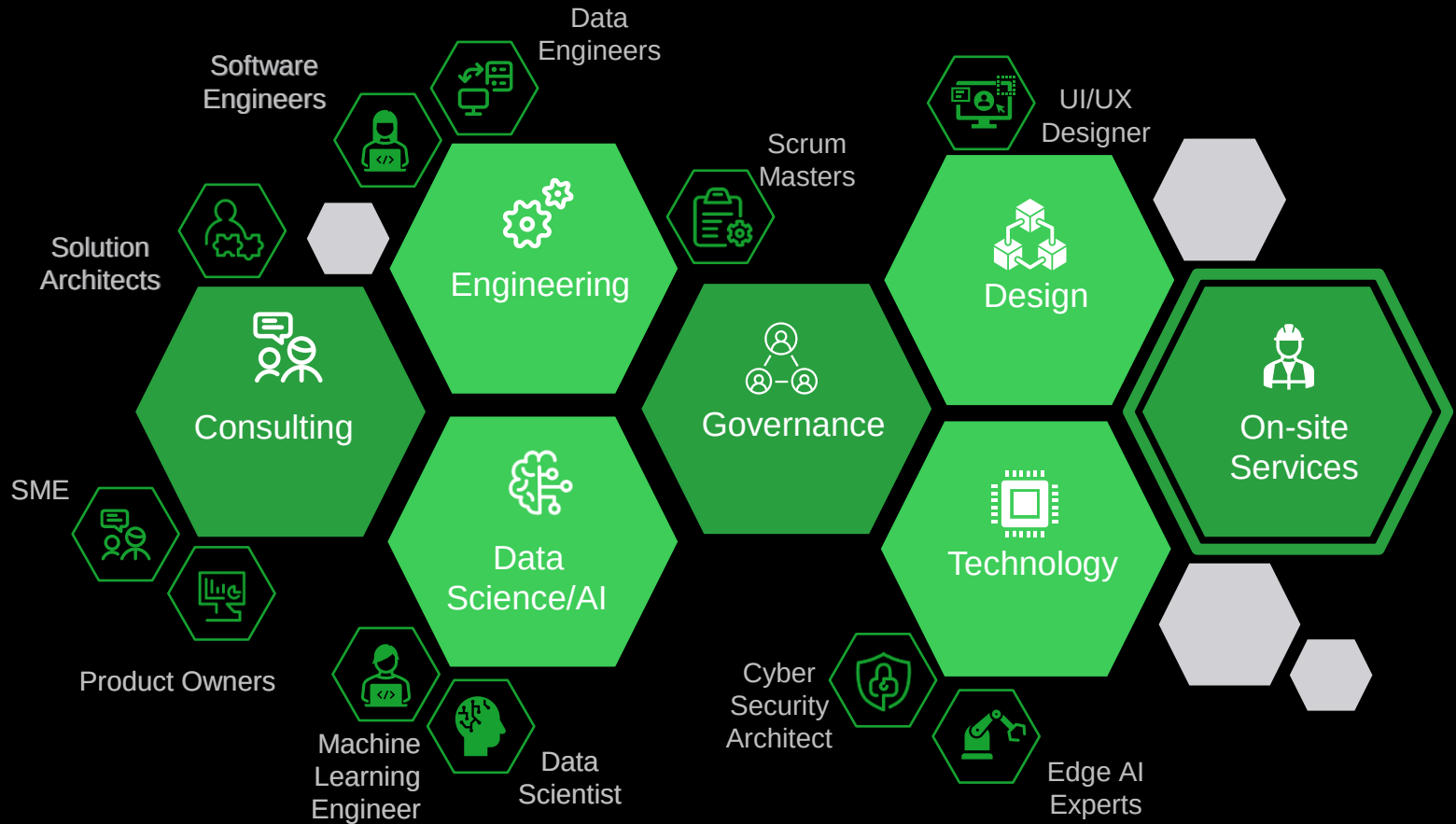
aws



Life Is On



Flexible AI Project Support **End-to-End**



Semiconductor Fab of the Future: resilient, efficient, sustainable

1. Energy + Automation



Power Quality monitoring and correction

- Power & Energy meters
- Active Harmonic Filtering

Connected MV & LV distribution systems

- SF6-free MV switchgears
- LV switchgears with MasterPact MTZ
- Plug & Play I-Line panelboards for process tools

High efficiency Galaxy UPS

Automation devices (Modicon M580 PAC, Altivar VSDs..)

- Seamless integration with AVEVA software using EcoStruxure™ Automation Expert

2. End Point > Cloud

Data Management, Visualization and Predictive Analytics



PI system
Data Hub

Condition-based maintenance for power distribution systems



EcoStruxure
Asset Advisor

5. One Directional Supply > Supply & Demand Integration



EcoStruxure
Microgrid Advisor



EcoStruxure
Microgrid Operation



EcoStruxure
Resource Advisor

Energy & Sustainability Services,
Power Purchase Agreements
Climate Change Consulting Services

3. Design & Build > Operate & Maintain

Design & Build



Operate, Maintain, and Optimize



EcoStruxure
Power Monitoring Expert



EcoStruxure
Power Advisor



EcoStruxure
Power Operation



EcoStruxure
Water Advisor

Introducing

EcoStruxure Industrial Advisor
- Predictive Energy



4. Site-by-site > Integrated Company Management

Facility Monitoring & Control System (FMCS)

AVEVA System Platform

Enterprise Visualization

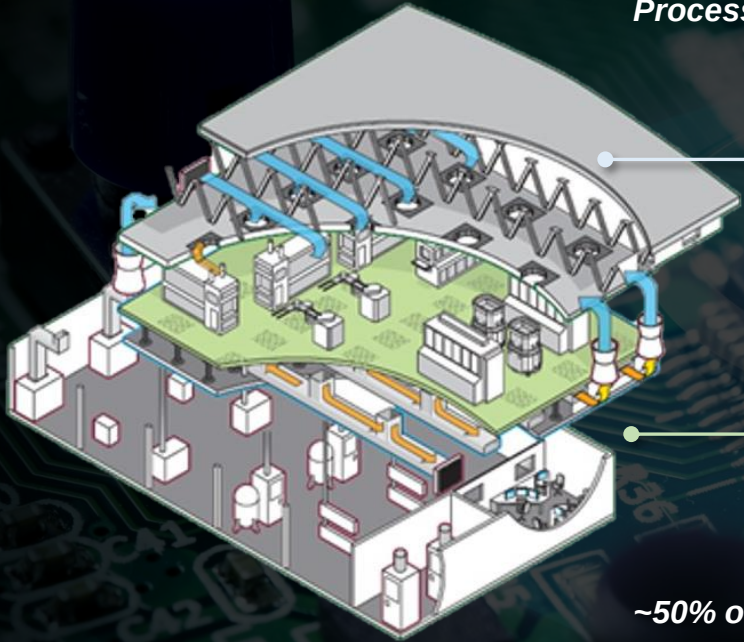
AVEVA Unified Operation Center



Asset Performance

AVEVA Asset Information Management

Digitally Transformed



~50% of energy is consumed by the Process tools

Post more challenges to optimize

- Manufacturing process dependent
- High risk in impacting production yield
- Potentially higher CapEx investment

~50% of energy is consumed by the Facility systems

Growing focus in optimizing utility operations with the use of advance data analytics (AI/ML)

- Significant energy use (SEU) systems
- Chilled Water Production (Chillers, Cooling Tower, Pumps)
 - Air Handling Units (AHU)
 - Make Up Air Units (MAU)
 - Compressors

Exploring the Facility systems – Improving chilled water production

(~20 % of overall Fab energy consumption)

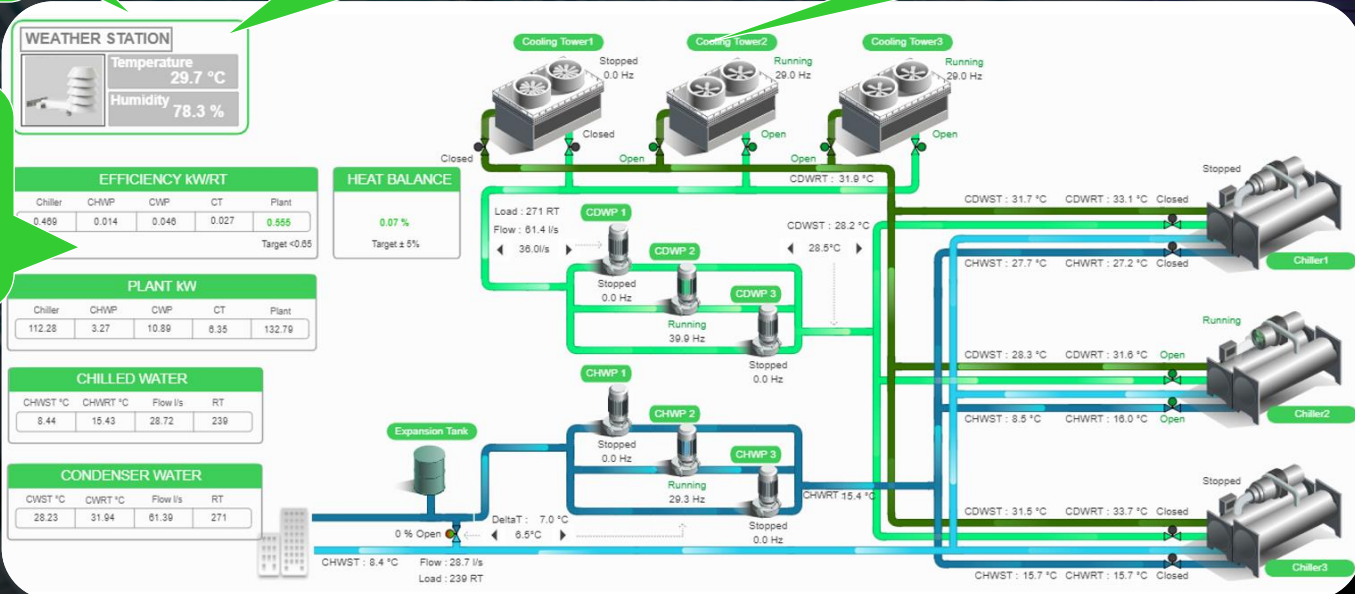
How are the indoor and outdoor temperature and humidity affecting the performance of my chilled water plant?

What if I adjust the Cooling Tower outlet temperature?

What if I adjust the CDWP and/or CHWP speed?

What's the COP of my chillers?
How many chillers, which combination and at which load they should run for max efficiency?

Which optimal cooling temperature range to use?

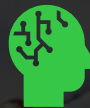
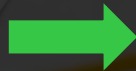


Addressing your Semiconductor Manufacturing needs



Common Customer Challenges

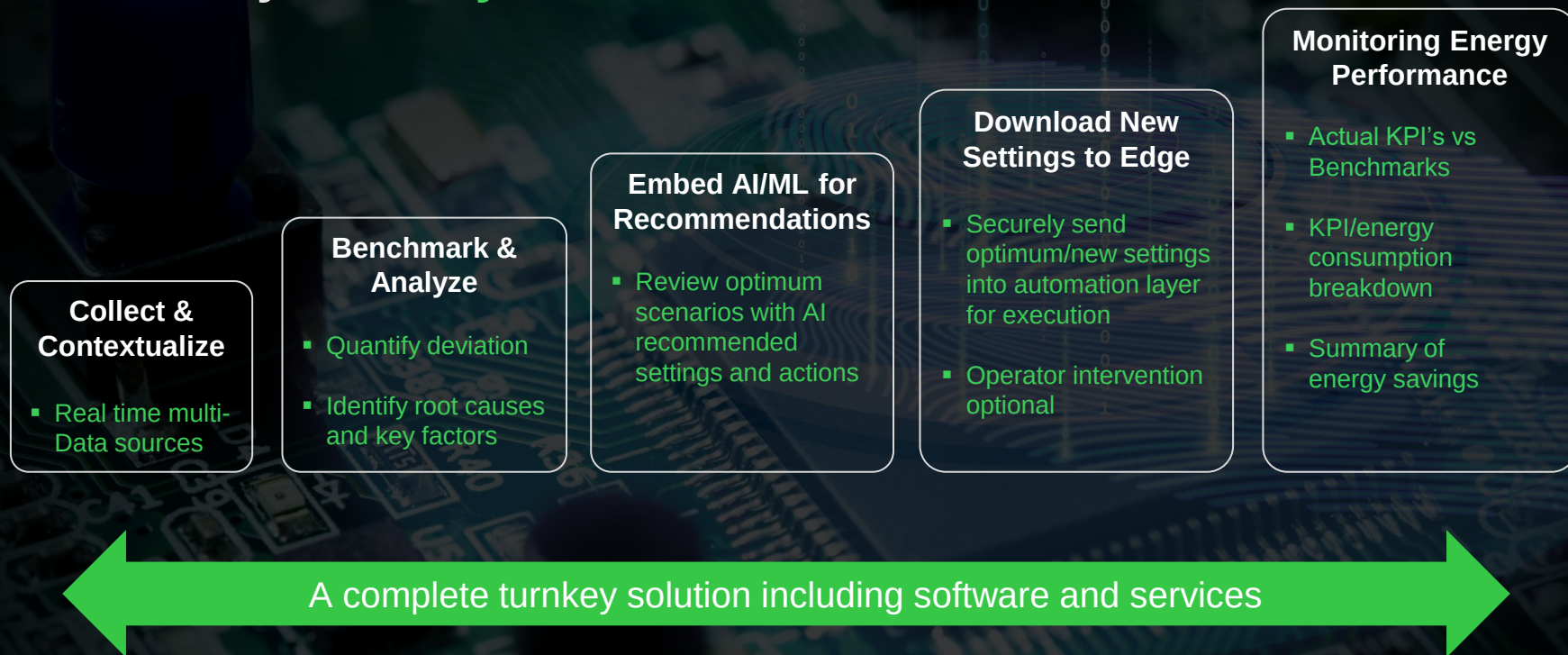
- Lack of common IIoT platform resulting in major gaps in energy data and inefficient energy reporting
- Unsuccessful self initiated Machine Learning solution, difficulties to scale Machine Learning solutions
- Energy domain and technical skill gap



Addressing your main Priorities with EcoStruxure™ IA-PE

- Comprehensive Solution providing real time visibility of KPI's from shop floor to Enterprise level
- AI ML models to facilitate energy and other use cases and real-time recommendations
- Enable analytics to detect consumption anomalies across various assets
- Minimize dependency on diverse suppliers
- empowering users for self service capability
- ROI $\leq$ 2 years

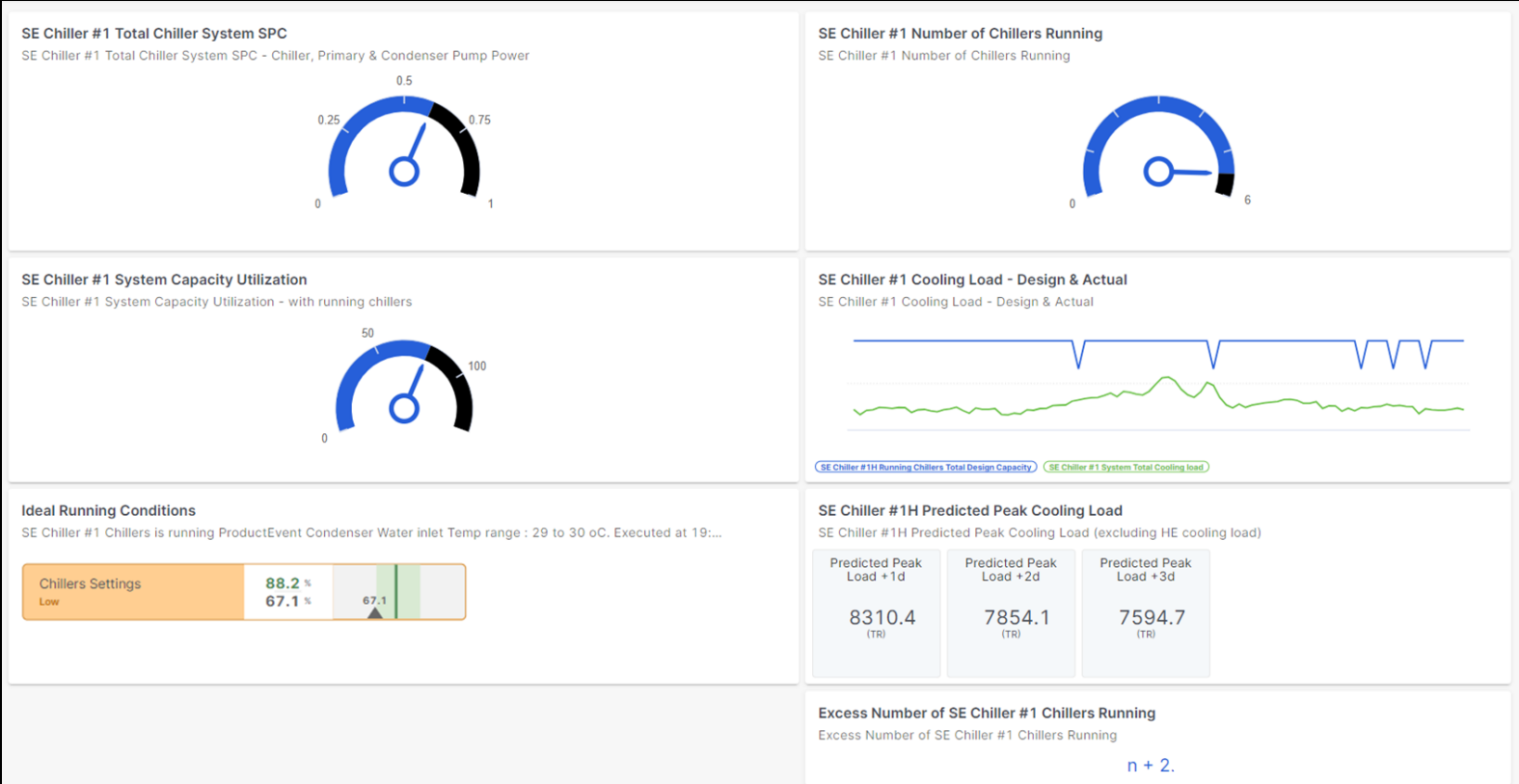
Reduce your facility utility energy consumption and drive sustainability across your Fab



Collect & Contextualize to Benchmark & Analyze



Embed AI/ML for Recommendations

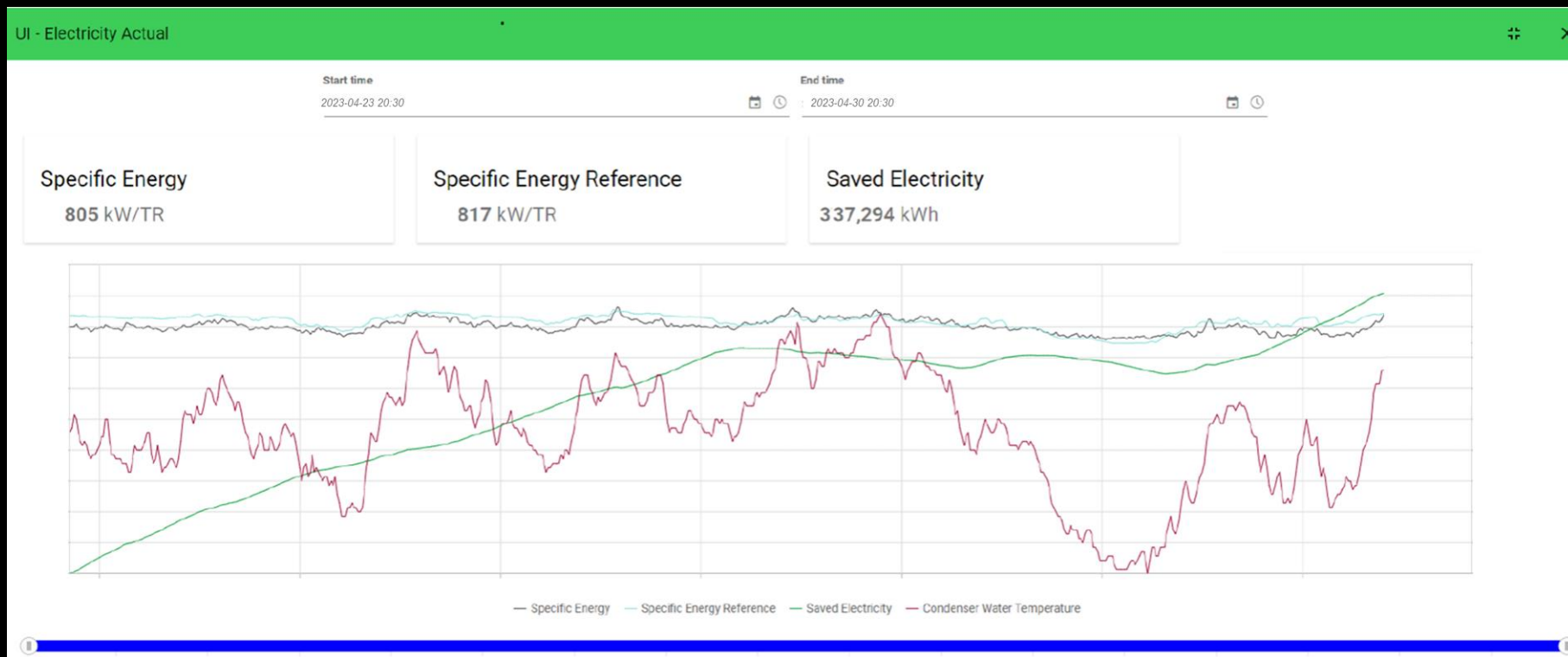


Transfer New Settings to Edge Operational Level

Best Settings to Apply				
Calculated 2024-08-20 18:55:16				
Name	New Settings to apply	Cloud to Edge (Channel)	Instruction	Status
Ideal Number of Chillers	-2	Edge Carros #1	Send	
Temperature Chillers	29°C	Edge Carros #2		Acknowledged
Valve Position	3	Edge Carros #1		Acknowledged

EcoStruxure Plant Plug-In Cloud to Edge				
English				
Schneider Electric				
Aveva Tools				
Data Sources				
Data Selection Read				
Data Endpoints				
Data Selection Write				
Monitoring				
EcoStruxure Plant Plug-In - Cloud to Edge				
EcoStruxure Plant Hosted Foundation				
AVEVA Connect Data Services				
EcoStruxure Plant Plug-In - Cloud to Edge - Data Selection (Write)				
Enrolled				
Timestamp	Log Level	Correlation ID	Message	Status
Aug 20, 2024 21:16:42	INFO	9ad18300-4160-418b-bb60-5d36f7caa771	Number of Chillers has been modified. -2.5 has been added to the variable	Success

Monitoring Energy Performance



Case study of EcoStruxure Industrial Advisor - Predictive Energy

1 + M\$

Annual savings in first production site



Increases **profitability** thanks to energy costs savings. *50% projected savings realized in first 6 months*

18,000 MWh

Energy savings a year per production site



Help meet ambitious sustainability plans: decrease **energy consumption** by 10% and **carbon emissions** by 40%.

~10 kTons CO₂

Reduction of about 10 kTons CO₂ /year /plant



< 6 months

ROI in less than 6 months



Accelerates the IIoT solutions deployment and **maximizes ROI** with a pre-packaged solution

Life Is On

