Managing Factory Operations with the Internet of Things

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Sustainability Solutions

@AutodeskGreen

Learning Objectives

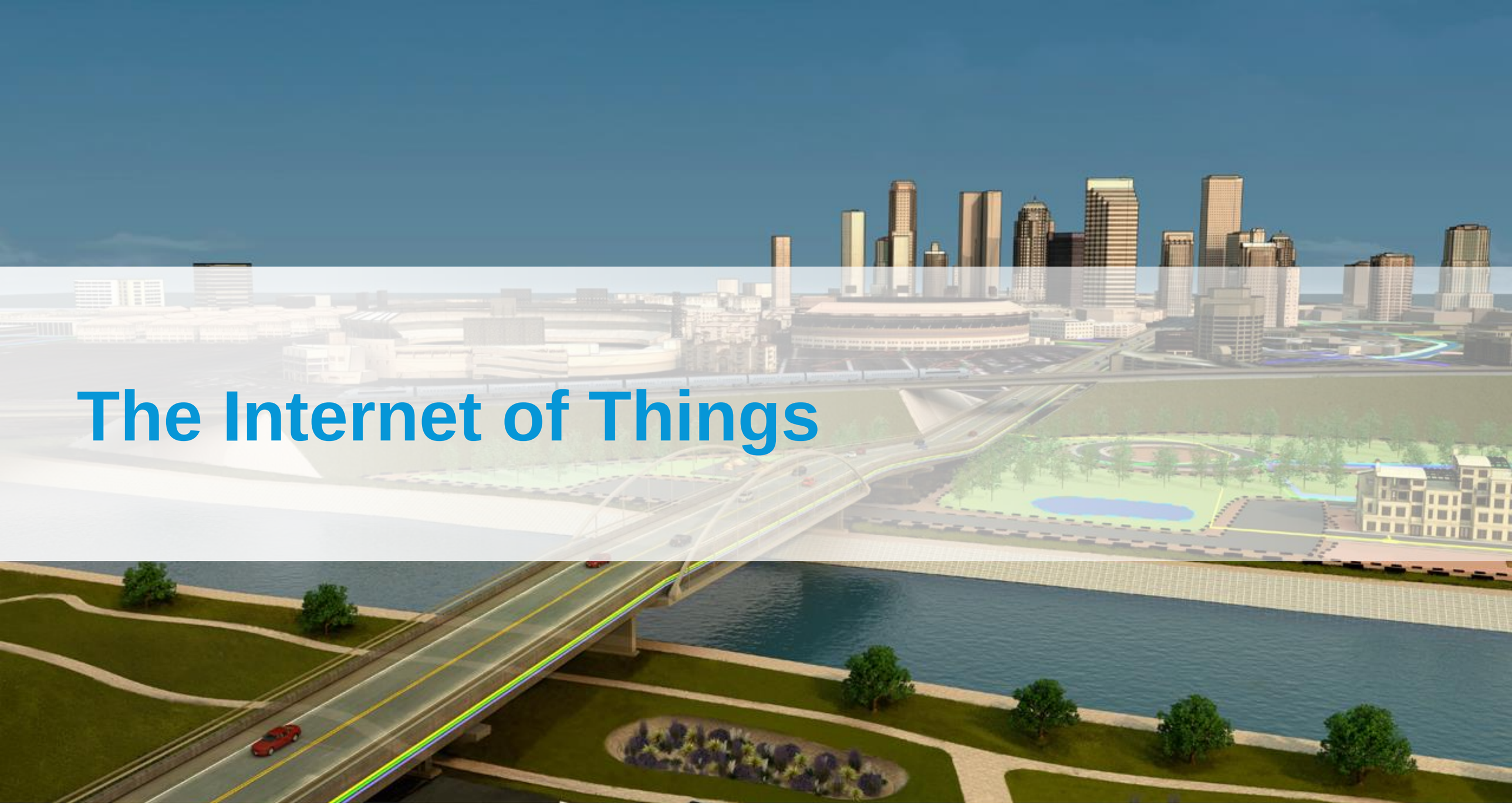
At the end of this class, you will be able to:

- Determine how the Internet of Things can help factory owners reduce energy consumption and costs
- Learn how to access performance analytics for the production floor
- Discover energy-intensive processes and idling equipment
- Discover how high-frequency sensor information can help reduce maintenance costs

Safe Harbor Statement

We may make statements regarding planned or future development efforts for our existing or new products and services. These statements are not intended to be a promise or guarantee of future availability of products, services or features but merely reflect our current plans and based on factors currently known to us. These planned and future development efforts may change without notice. Purchasing decisions should not be made based upon reliance on these statements.

These statements are being made as of December 1, 2015 and we assume no obligation to update these forward-looking statements to reflect events that occur or circumstances that exist or change after the date on which they were made. If this presentation is reviewed after this date, these statements may no longer contain current or accurate information.



The Internet of Things

Growth in the Internet of Things

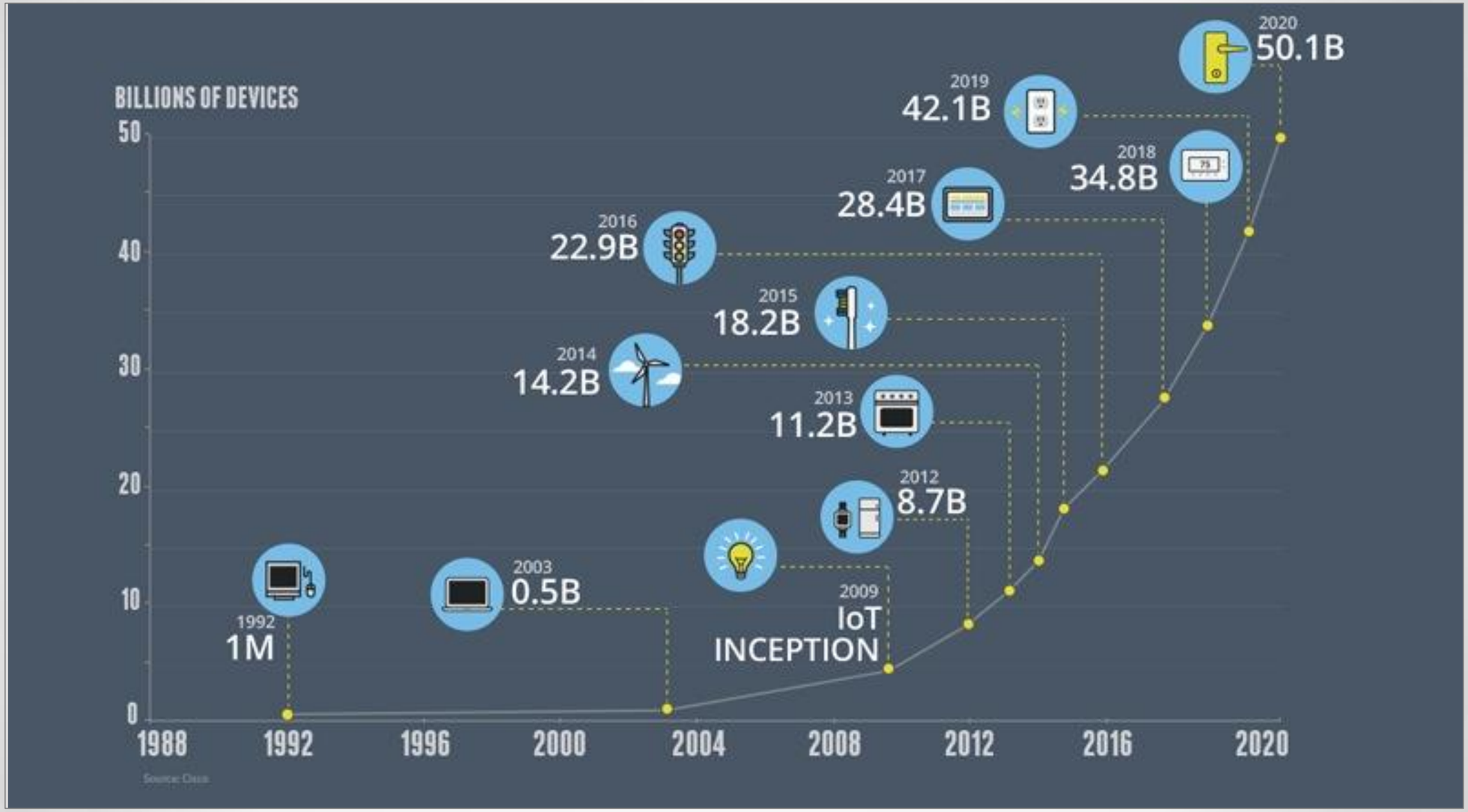
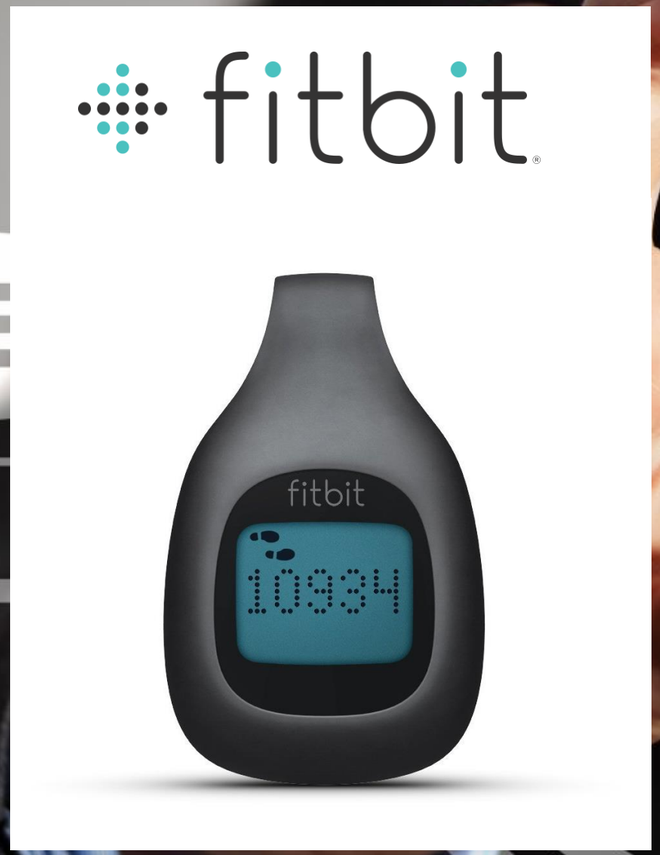


Image Source: Cisco Systems

Wearables



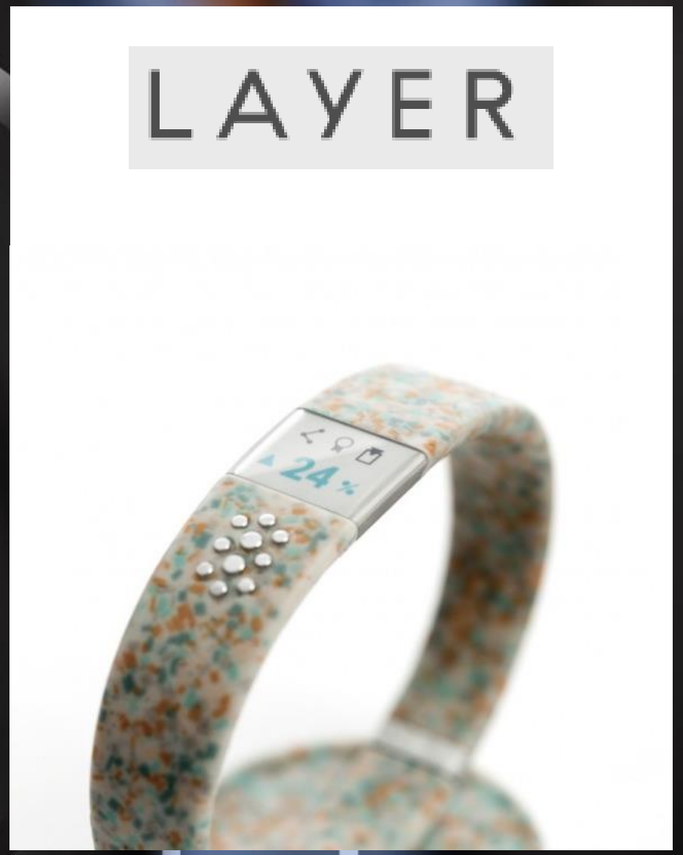


Image Sources: Amazon and Layer

Sensors

Software

Image Source: Chevrolet.com

Are you prepared for the Fourth Industrial Revolution?

Figure 1:
The four stages of
the Industrial Revolution

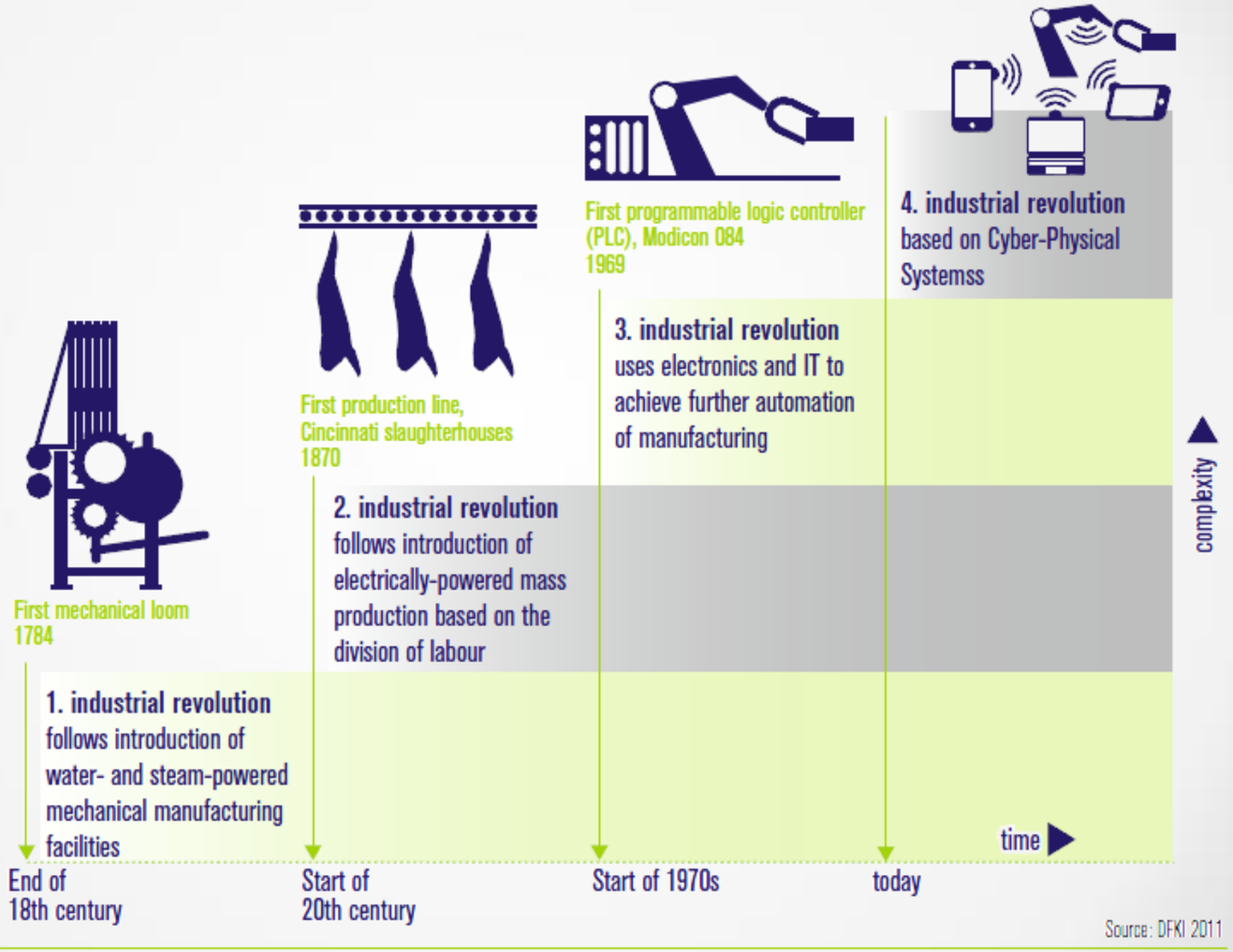


Image Source: DFKI (German Research Center for Artificial Intelligence, 2011)

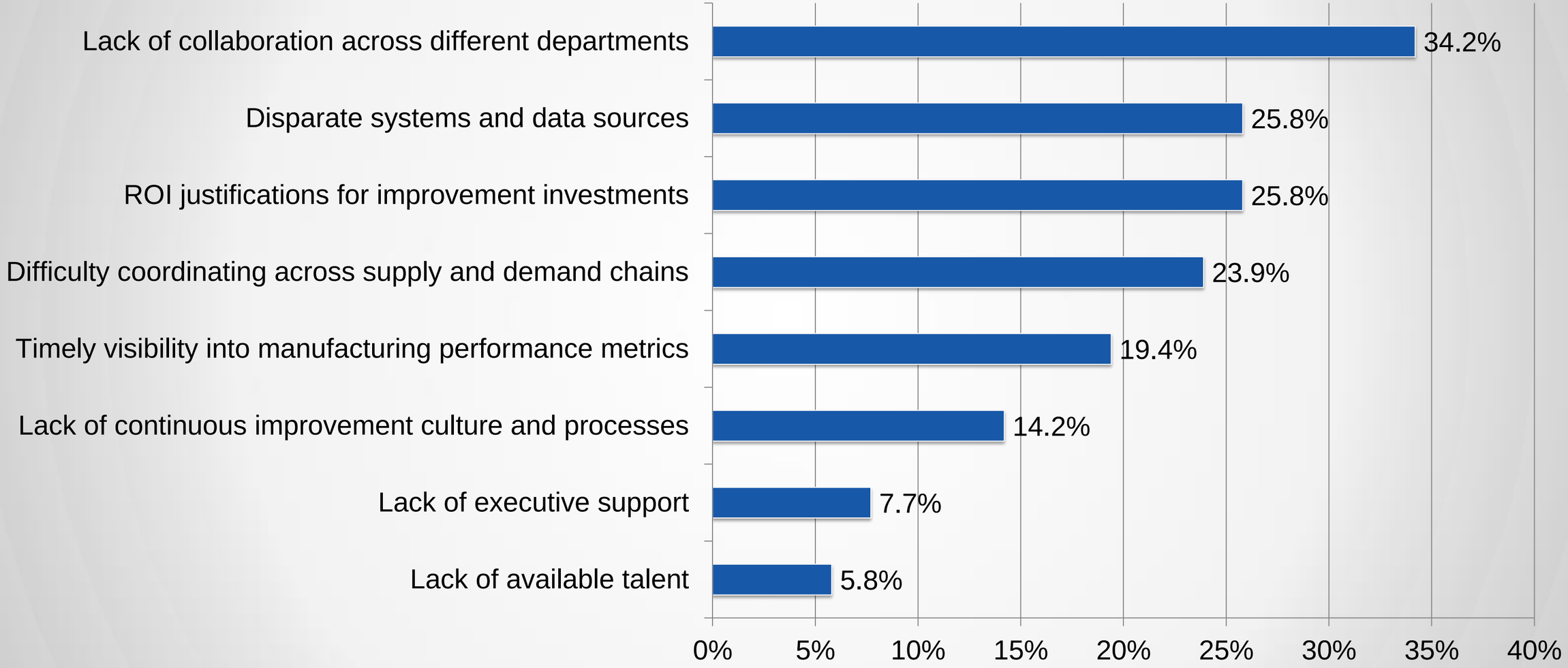
Data Streams from a CNC Machine Tool

Big Data & Analytics

- Electricity consumption
- Machining temperature
- Vibration of the spindle
- Oil consumption
- Spindle speed and feed rates

Data Source: A. Vijayaraghavan (2015) “The Internet of Manufacturing Things”

Top Manufacturing Challenges



Data Source: LNS Research (2014) “Smart Connected Operations: Capturing the Business Value of the Industrial IoT” (n=500+)


Project
Aquila
Sensors
Big Data
&
Analytics
Software
AUTODESK

Who will benefit from Project Aquila?


Plant Manager


Sustainability Manager


Industrial Engineer


Project Manager


Facilities Manager


Manufacturing Engineer


Layout Engineer


Maintenance Engineer


Facilities Engineer

How will you benefit?

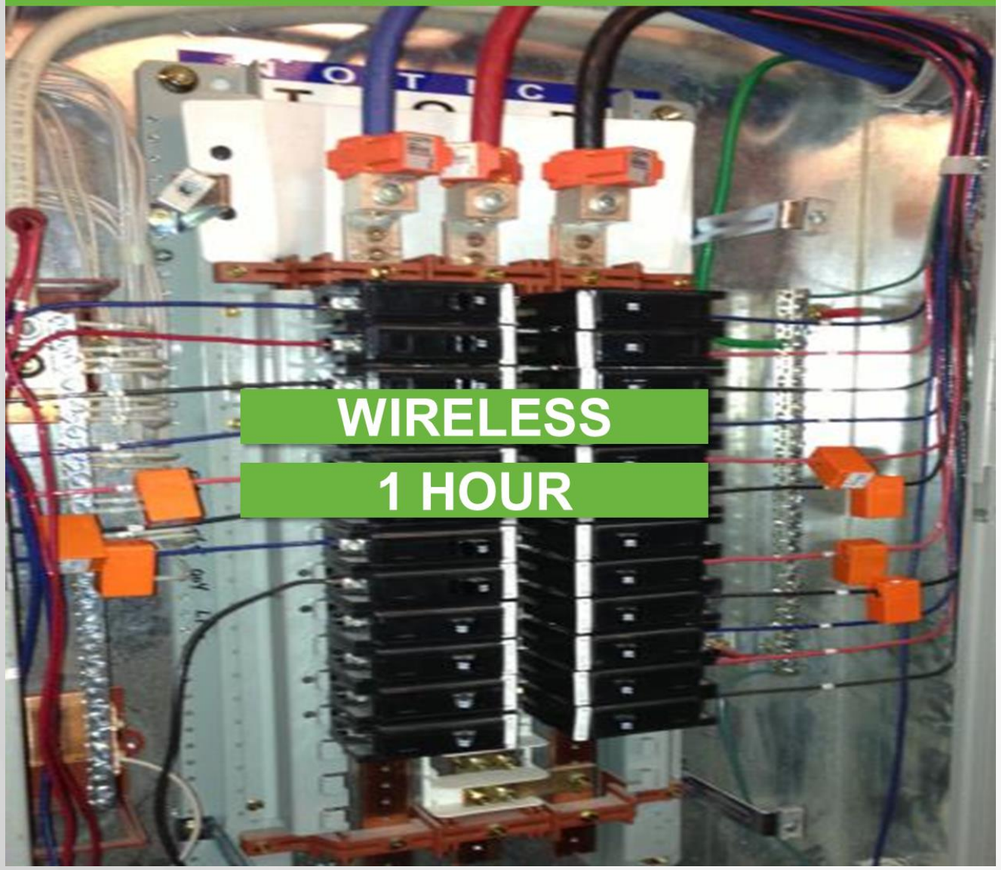
- Manage energy footprints through access to real-time, circuit-level data and alerts
- See this information in context by mapping them in 2D floorplans, photographs and 3D models
- Analyze potential energy savings and missed savings opportunities
- Conduct financial analysis on desired energy conservation measures

Panoramic Power Sensors provide the heart beat

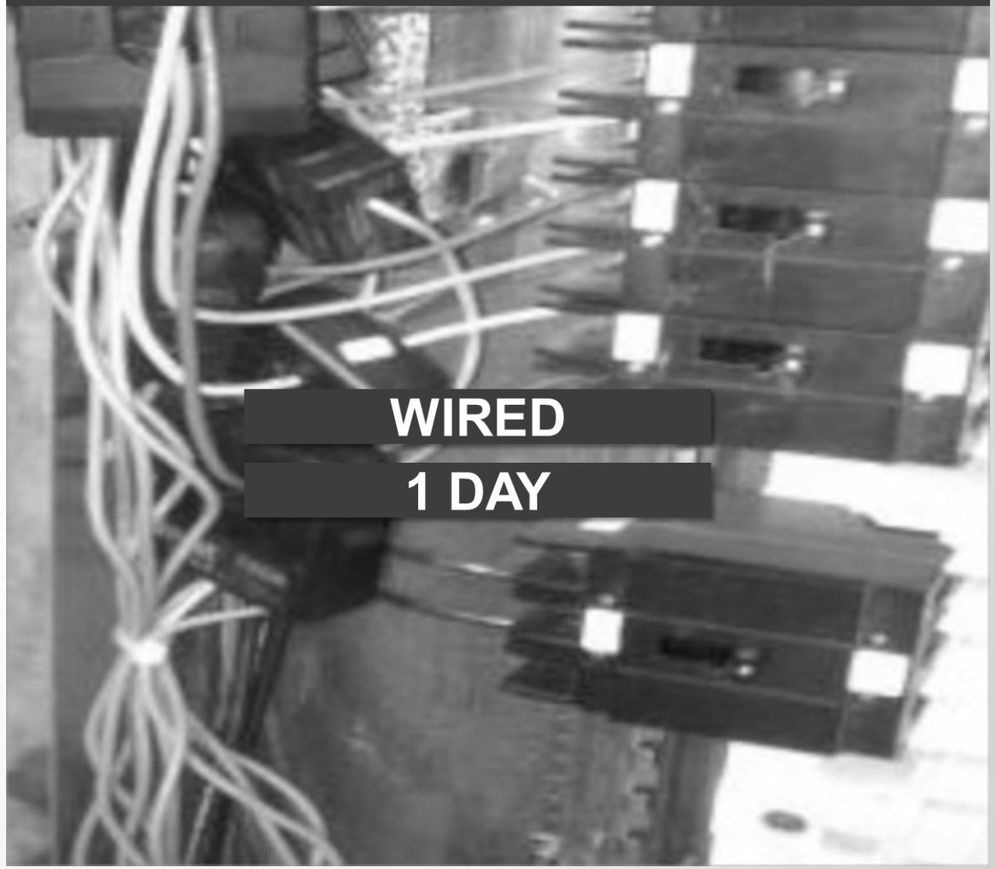
- Wireless
- Self-Powered
- Non-Invasive
- Maintenance Free
- Cost Effective

Easy to deploy in a couple of hours

Panoramic Power



Competition



Four Steps to Improved Facility Operations

1 Snap

- Easy install
- Wireless
- No disruption
- No maintenance
- Unlimited scale

2 Connect

- Plug & Play
- Cellular or WiFi

3 Set Up

- Role definition
- Executive reports and alerts
- Set goals
- Measure benchmarks

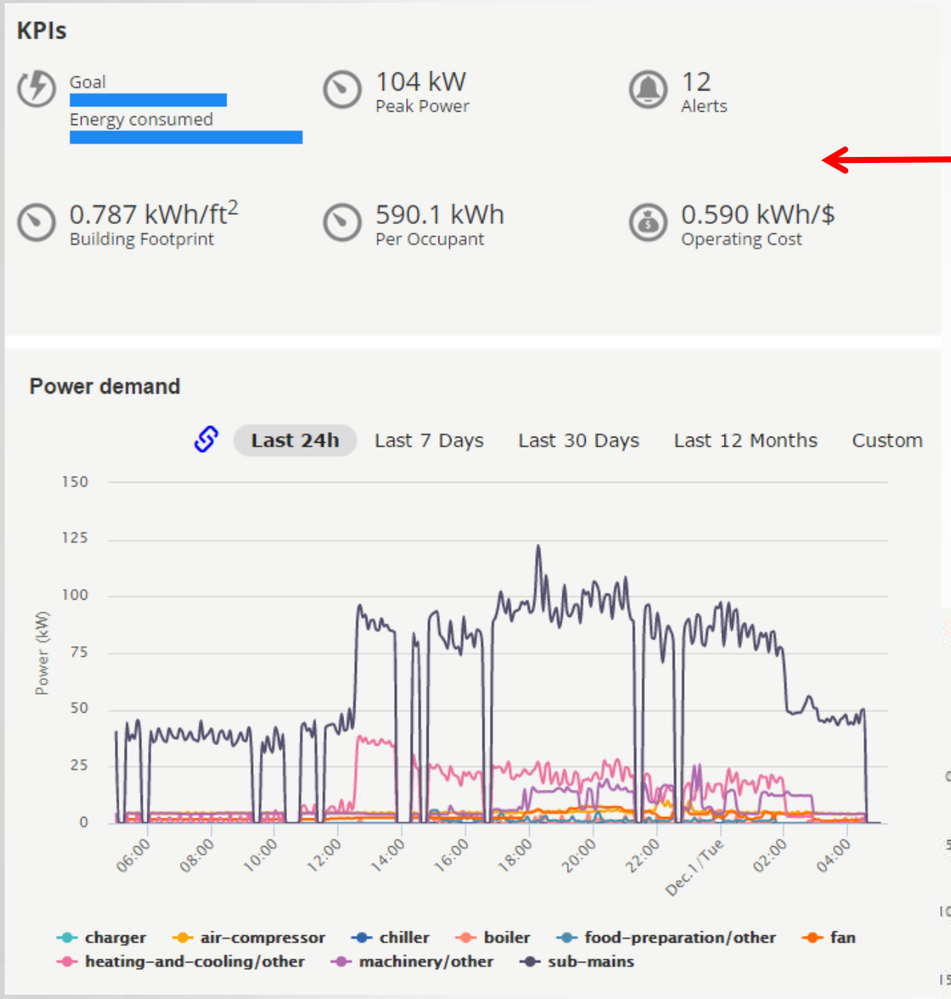
4 Start Saving

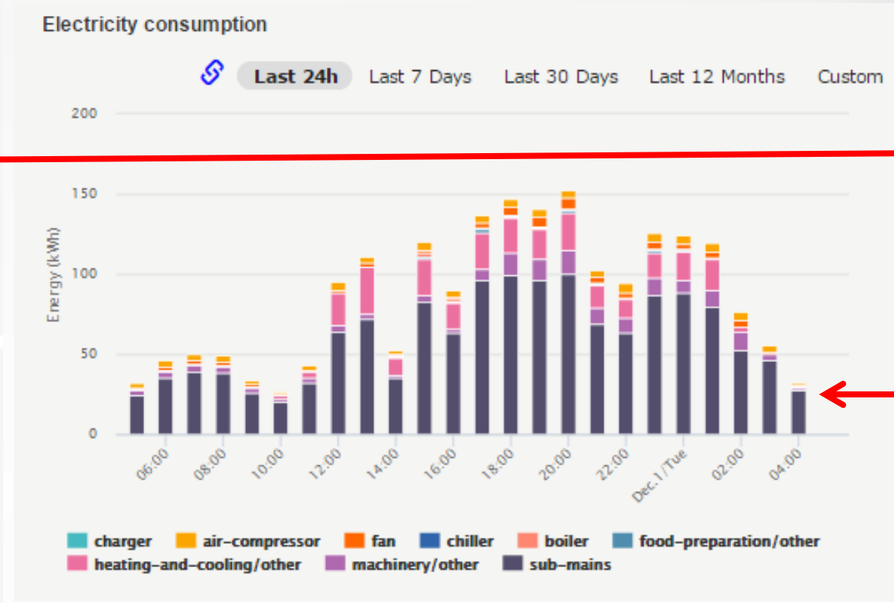
- Scheduled reports
- Real time alerts
- Online analytics
- Manage chain-wide

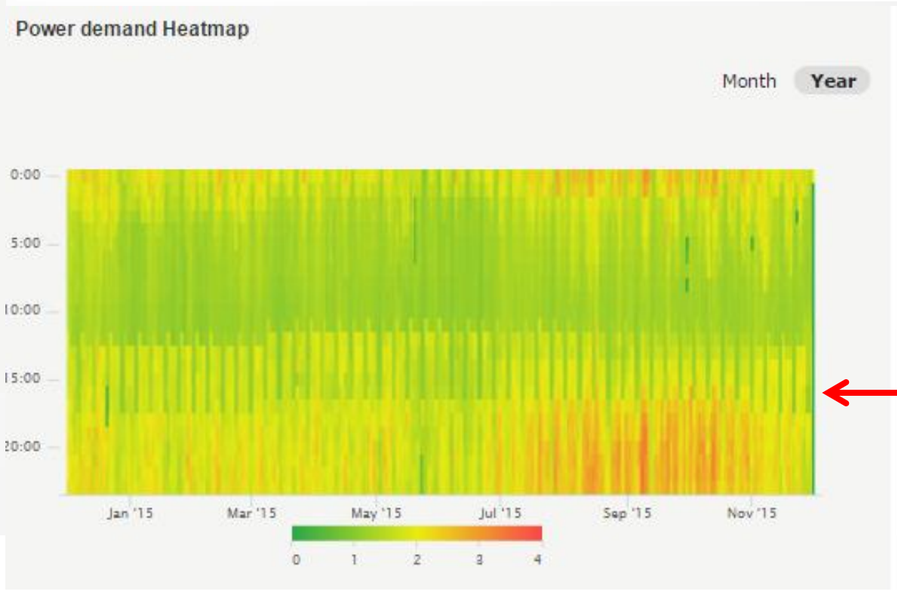
Actionable Insights for Energy and Operational Savings

Reduce your Energy Footprint

Track your energy consumption







Are KPIs not meeting your goals?

Which loads are the energy hogs?

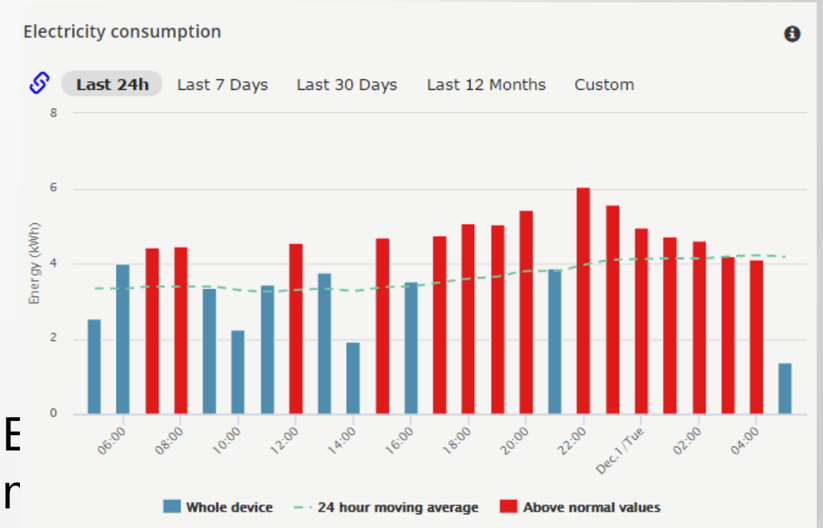
Suboptimal operating schedules?

Get real-time alerts

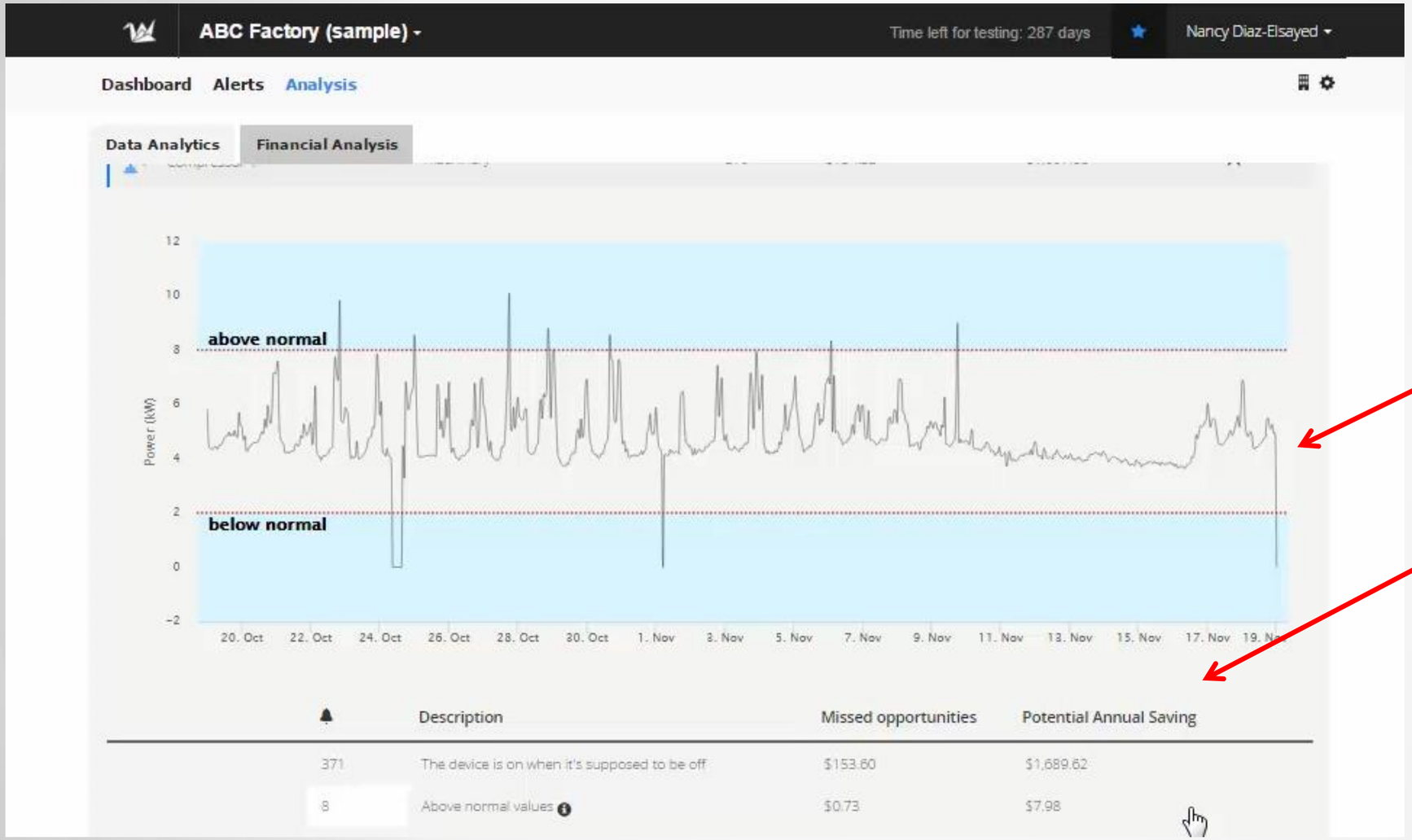
Dashboard Alerts Analysis

Search

Device	Category	Current power demand (kW)	1-day energy consumptions (kWh)	Alert type	Alert status
Temp Sensor #8 - E2E251A4				too-cold	64
Temp Sensor #7 - E2E251AC				too-cold	63
Temp Sensor #6 - E2E451C0				too-cold	66
Temp Sensor #10 - E2E2517 ...				too-cold	65
Temp Sensor #12 - E2E451D ...				too-cold	66
Temp Sensor #3 - E2E451C8				too-cold	64
Temp Sensor #1 - E2E2519C				too-cold	67
Meta Beam Laser Cutter	machinery	0.312246	1.67375	off-hours-consumption	active
Dust Collector	machinery	7.93679	15.9169	off-hours-consumption	active
Kitchen Hood Fan	heating-and-cooling	1.1447	0.961287	off-hours-consumption	active



Understand issues and potential energy savings



Automatic detection of abnormal performance

Potential Savings and Missed Opportunities

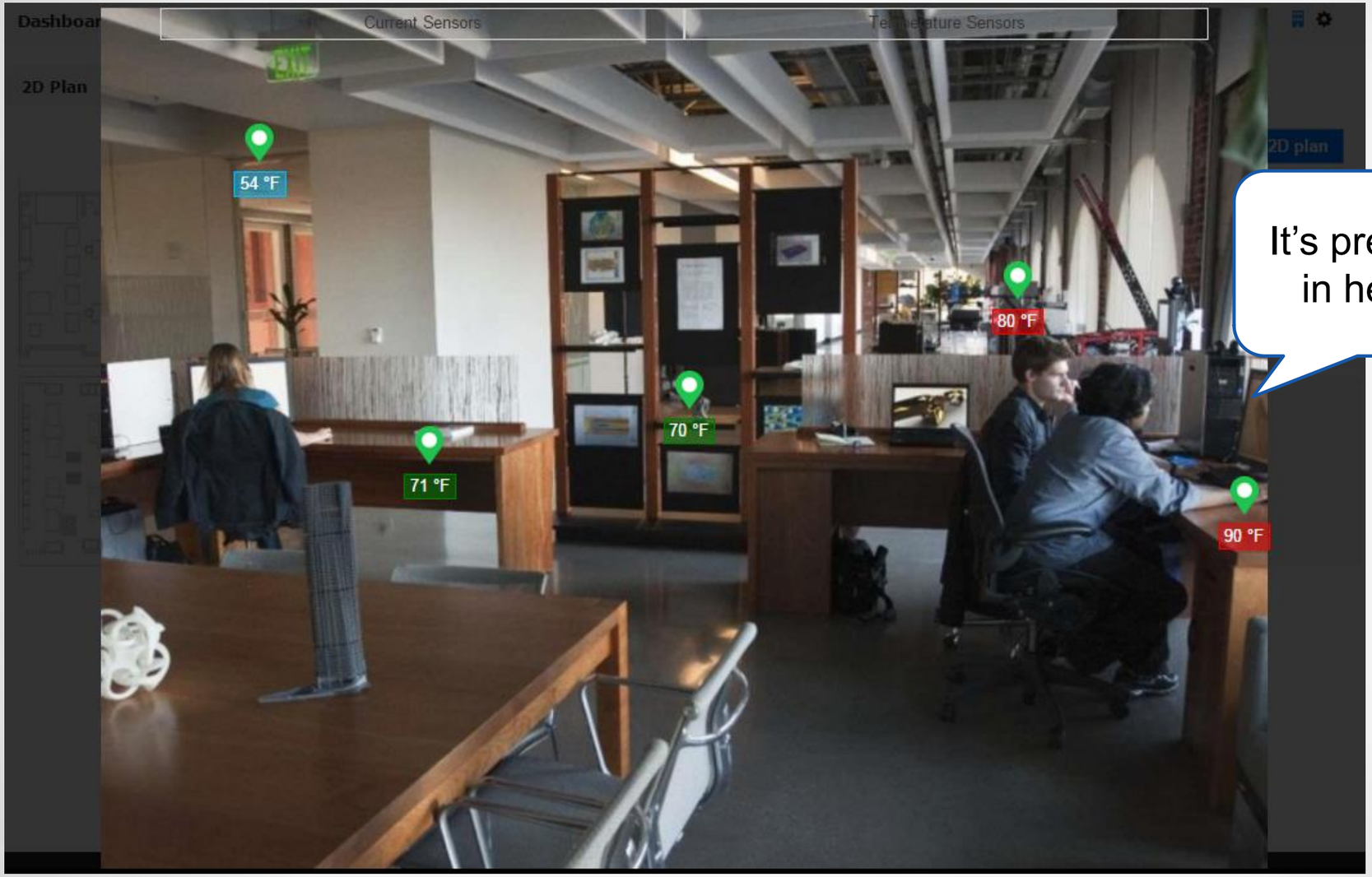
Alerts regarding:

- Consumption during “off hours”
- Idling devices
- Above normal values

Improve Occupant Comfort

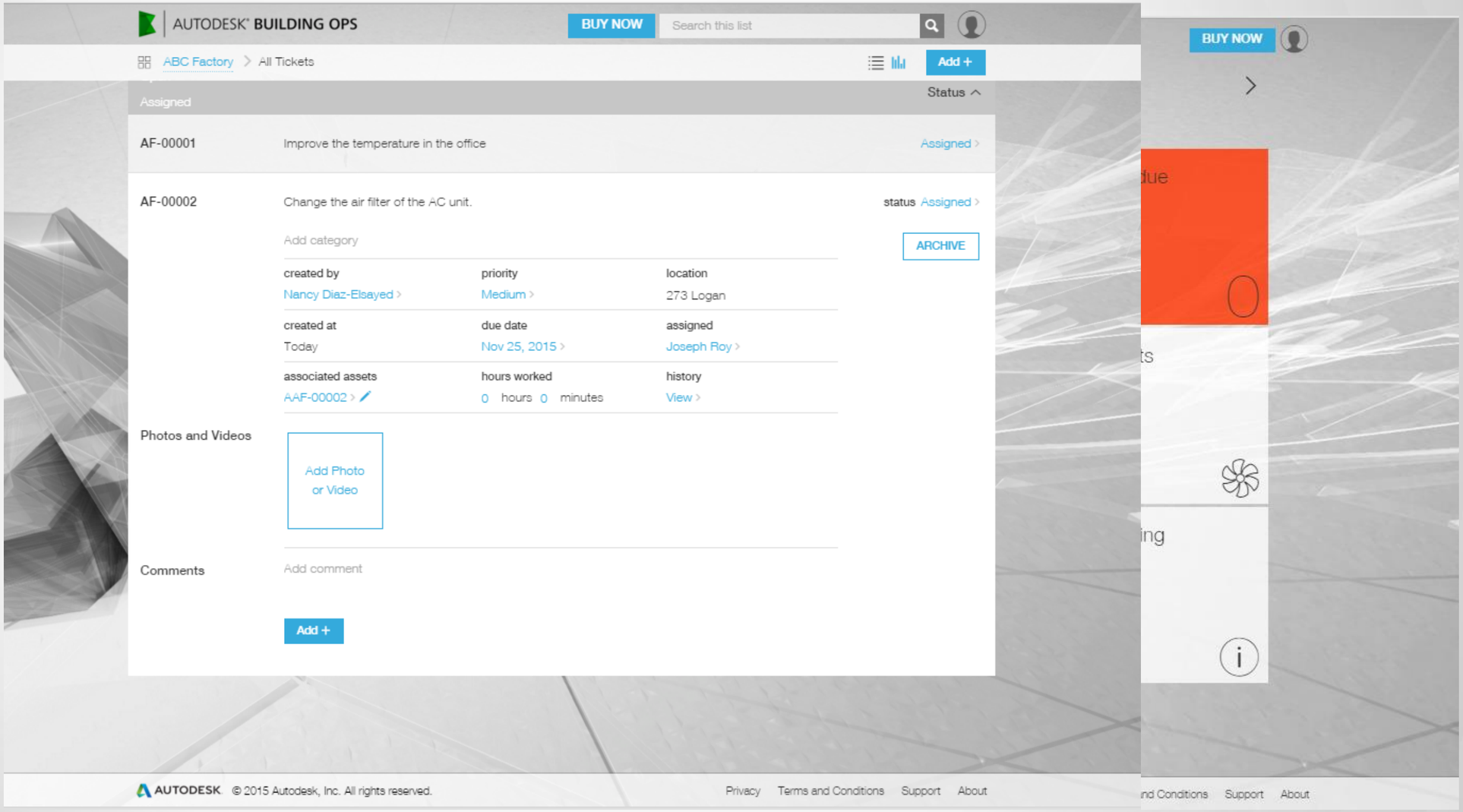
Facilities Manager

Review Occupant Comfort

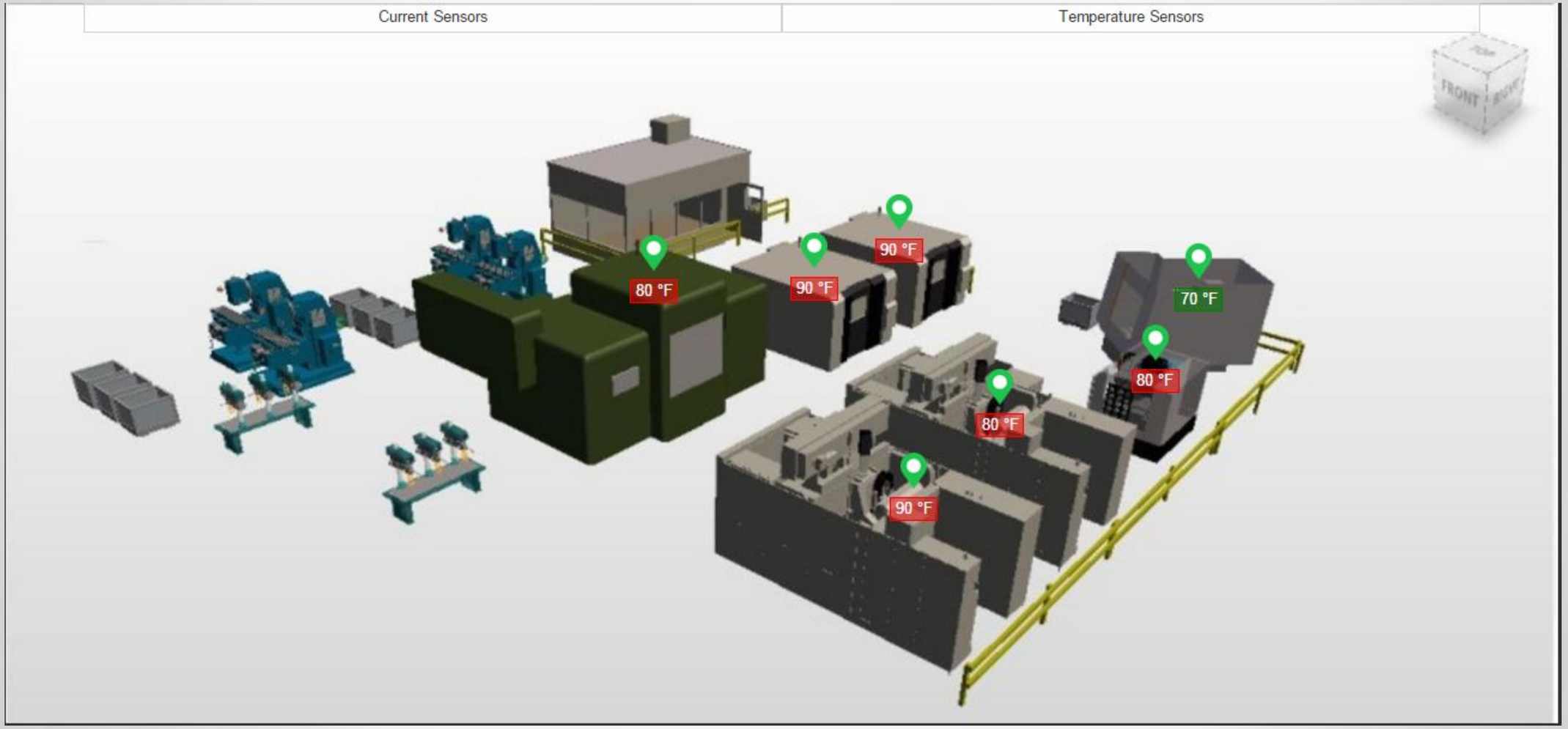


Take Action to Improve Thermal Comfort

Create and manage a ticket

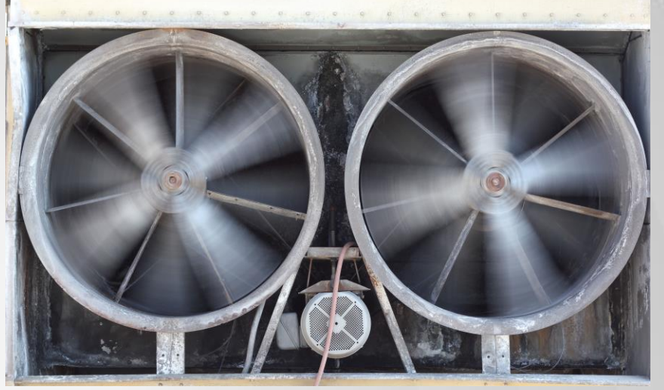


Manage the Temperature on Your Production Floor



Conduct Financial Analysis on desired energy conservation measures

Evaluate Financial Metrics
And compare Multiple Scenarios



Inputs

Incremental Capital Investment ($):	10,000
Desired energy savings (%):	96.47

Financial Metrics

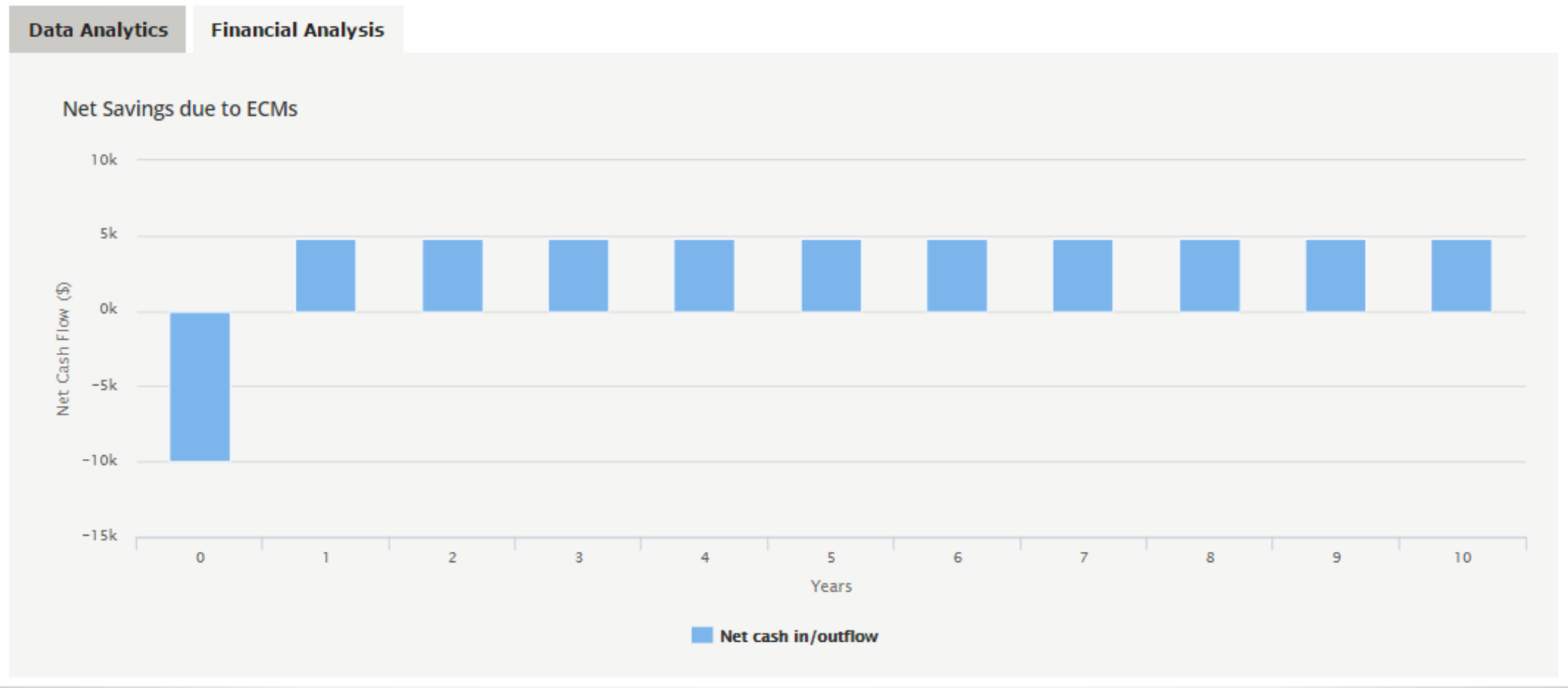
	Average	Per sq ft
Upfront Costs:	$10,000.00	$0.13/sq ft
Annual Energy Cost Saved:	$4,823.69	
Discounted Payback (years):	3	
Net Present Value over investment:	$19,639.49	$0.26/sq ft
IRR over investment horizon:	47.23 %	

Basic Assumptions ›

Advanced Assumptions ›

Refresh data | Save current scenario

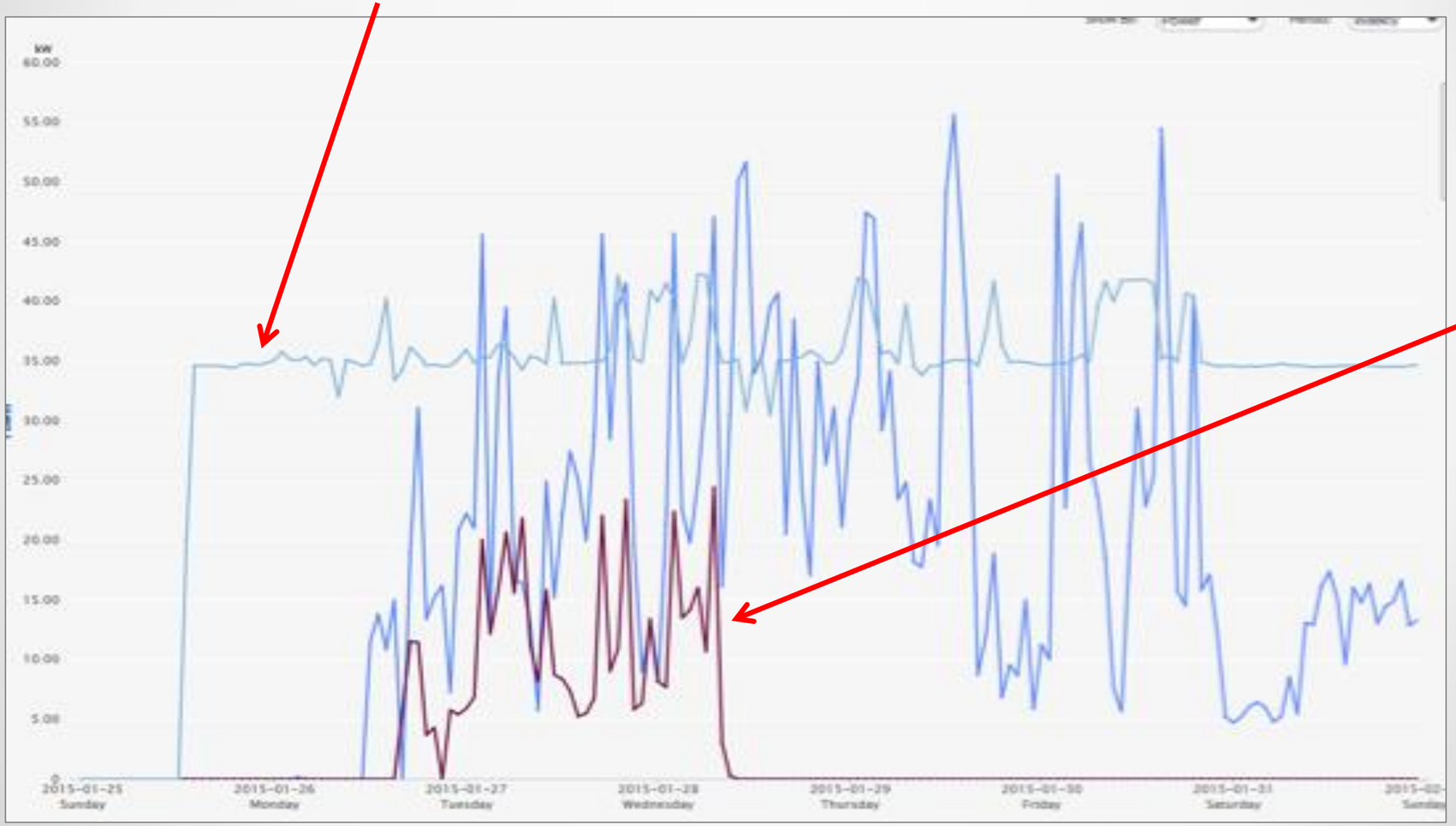
Understand the effect on your cash flow



Managing Your Assets

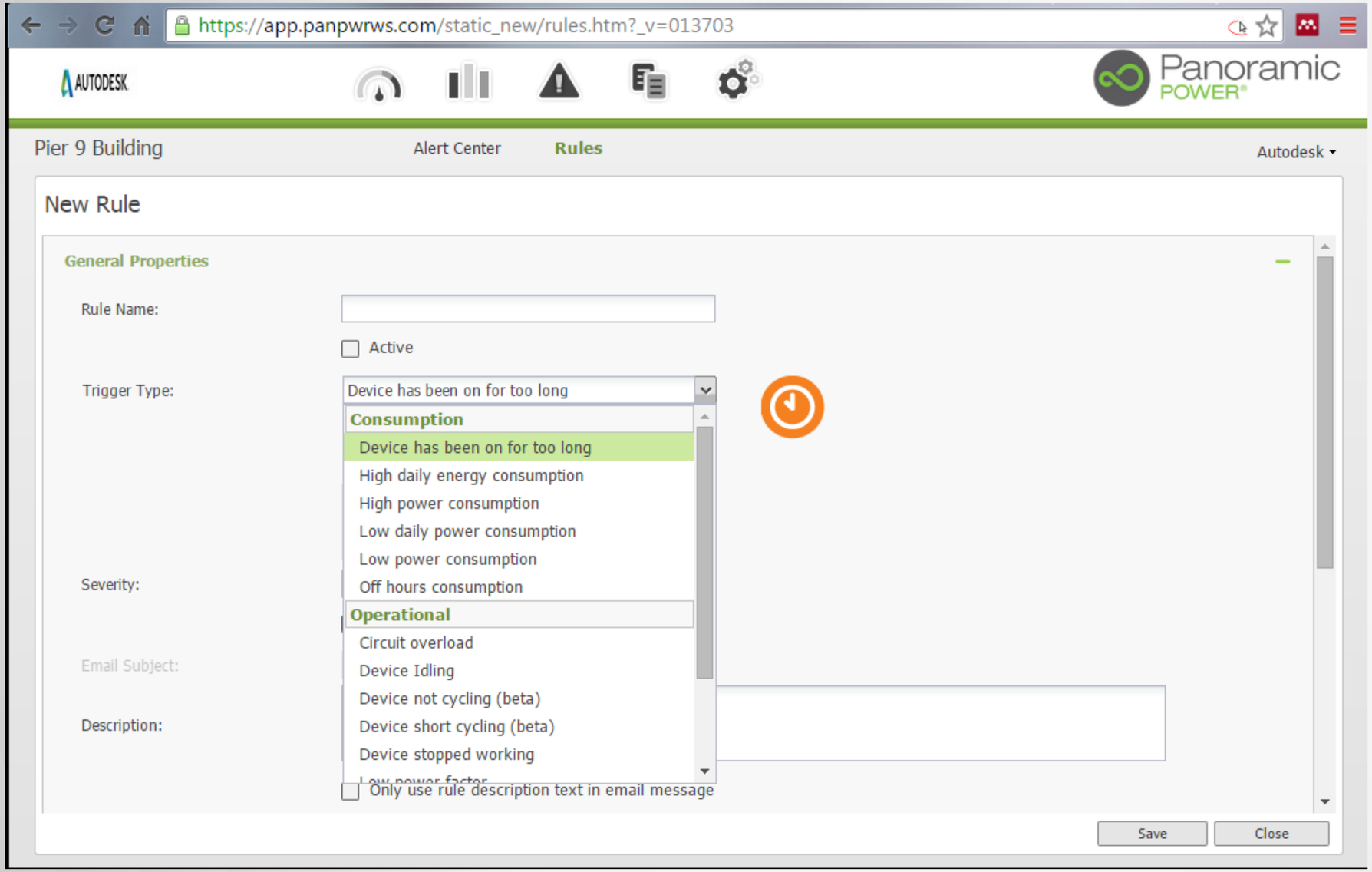
Process Sequence and Fault Detection

Pump at constant operation
regardless of chiller operations

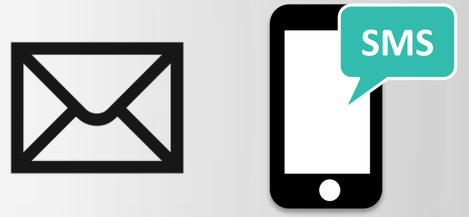


Chiller #2
stopped working

Configure Rules for Equipment Maintenance



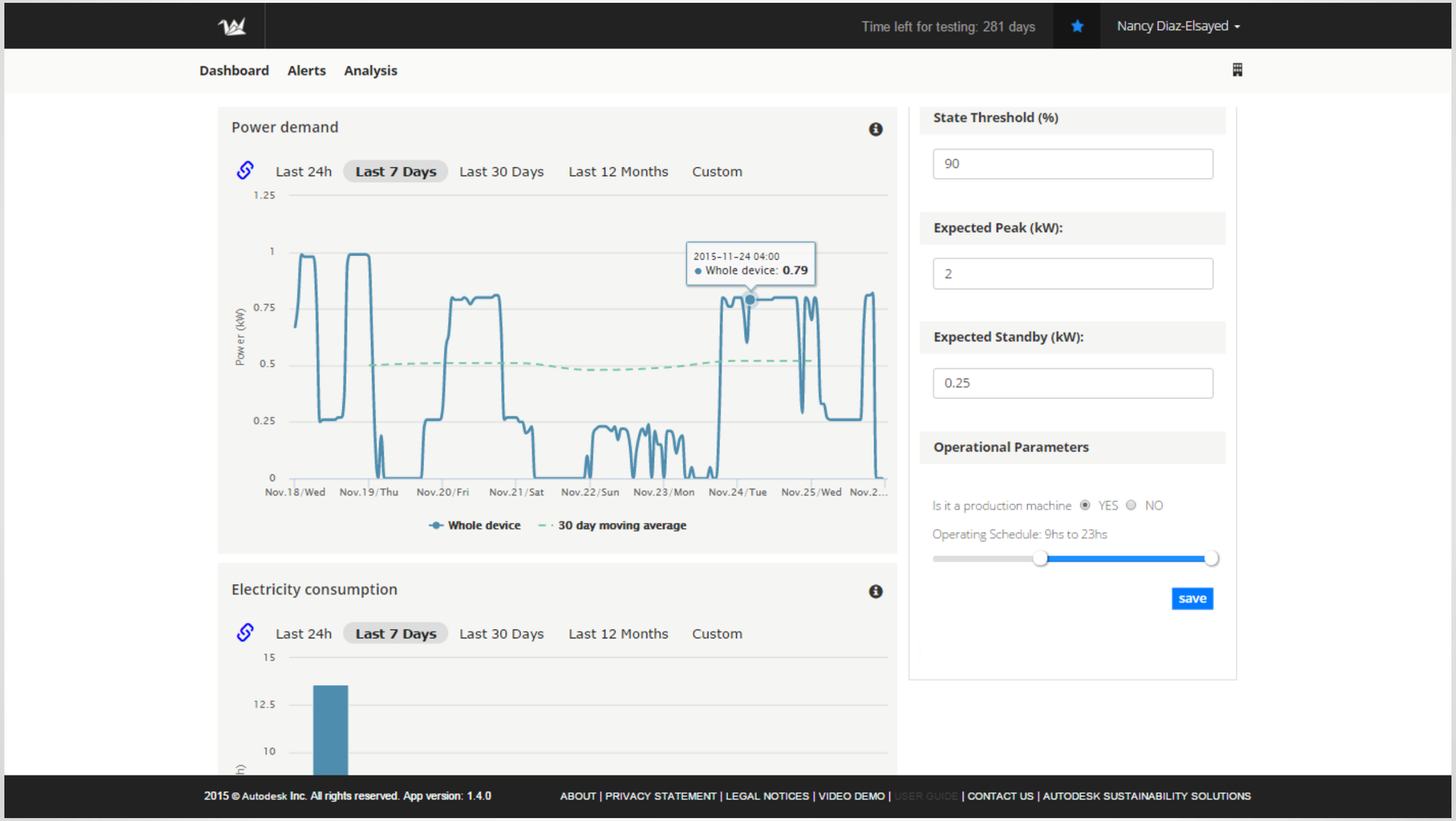
Get notified…



BUILDING OPS

Visualize Alerts in the Context of the Factory

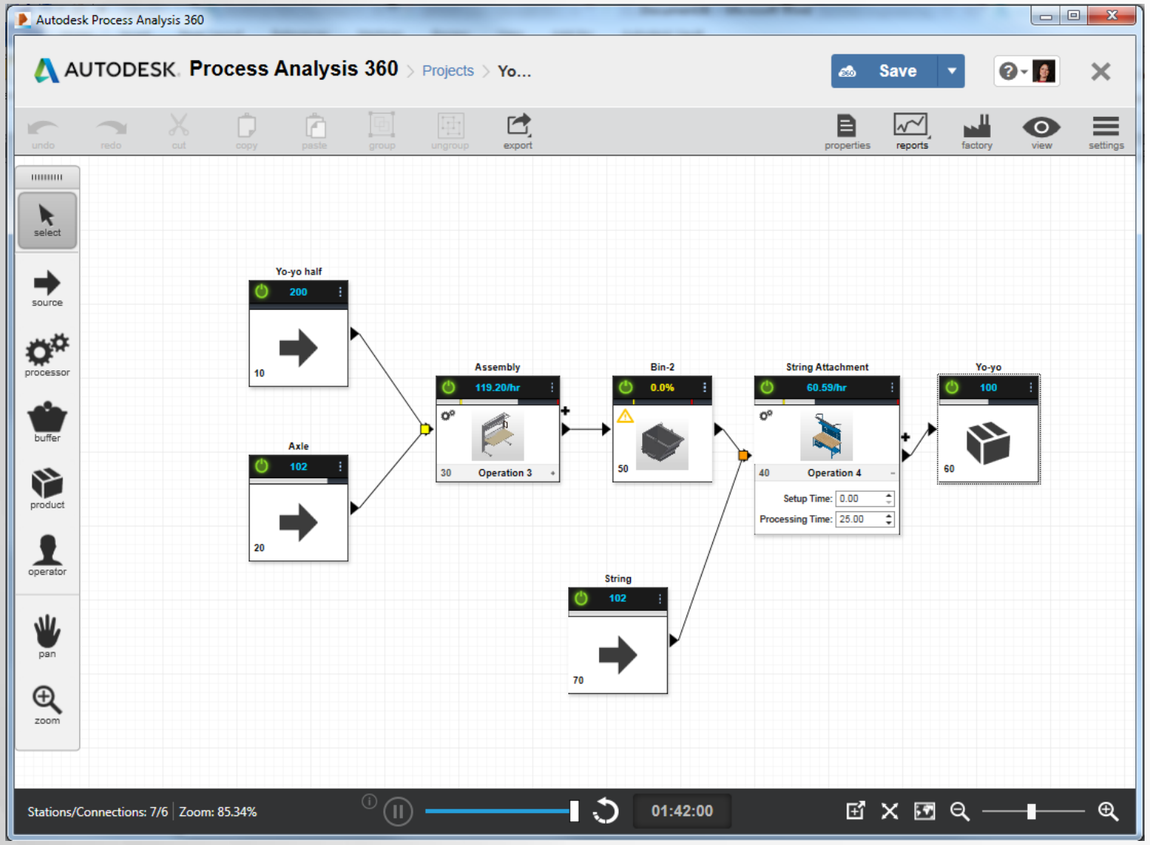
Access Historical Data on the Production Floor

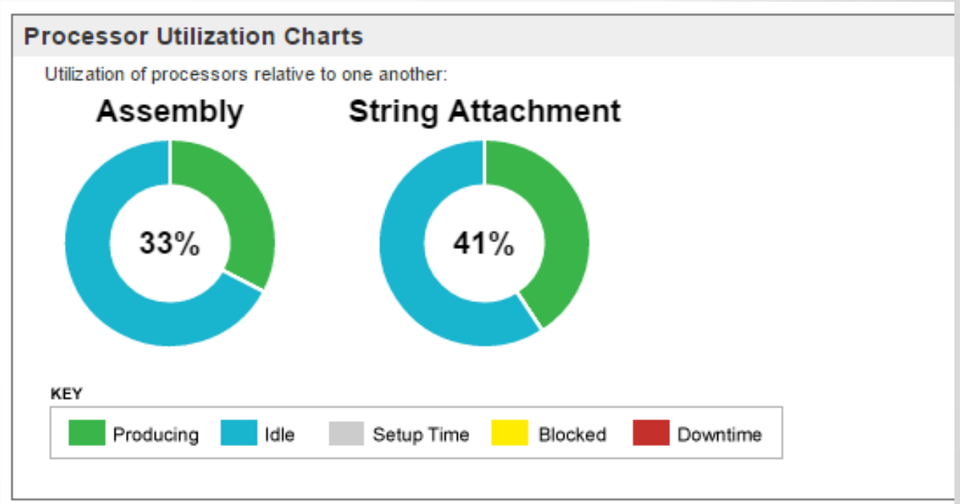


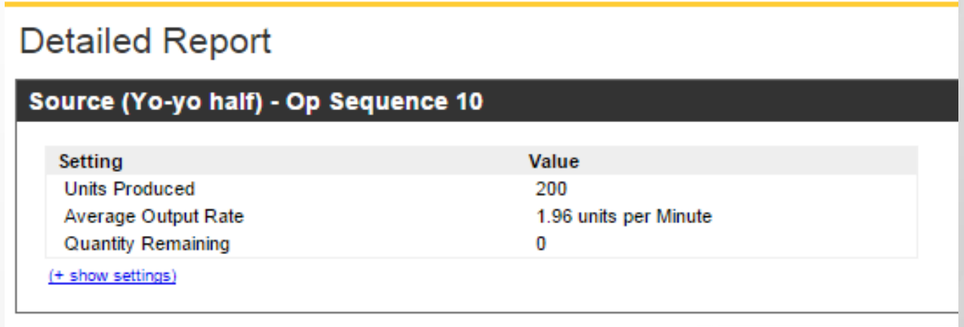
Insight into Asset Utilization

How is asset utilization typically modeled?

PROCESS ANALYSIS 360

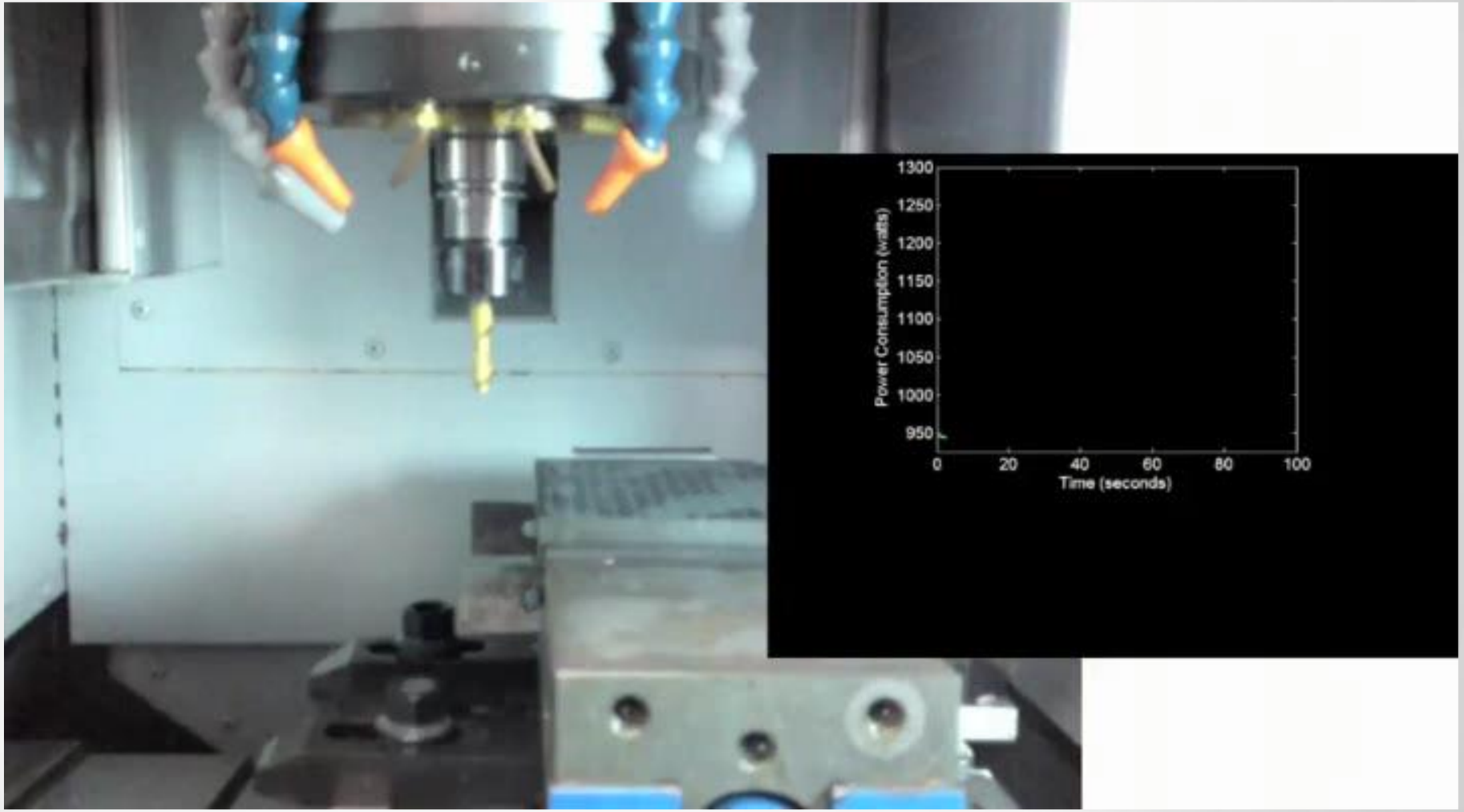






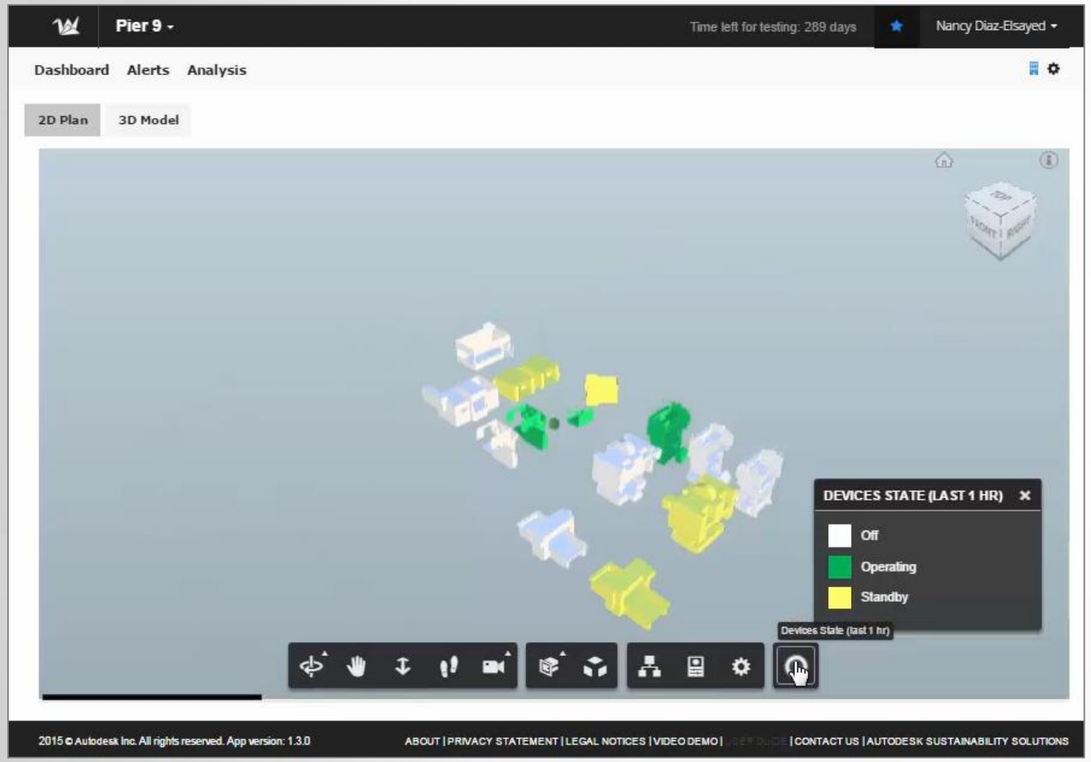
The Power of a CNC Machining Center

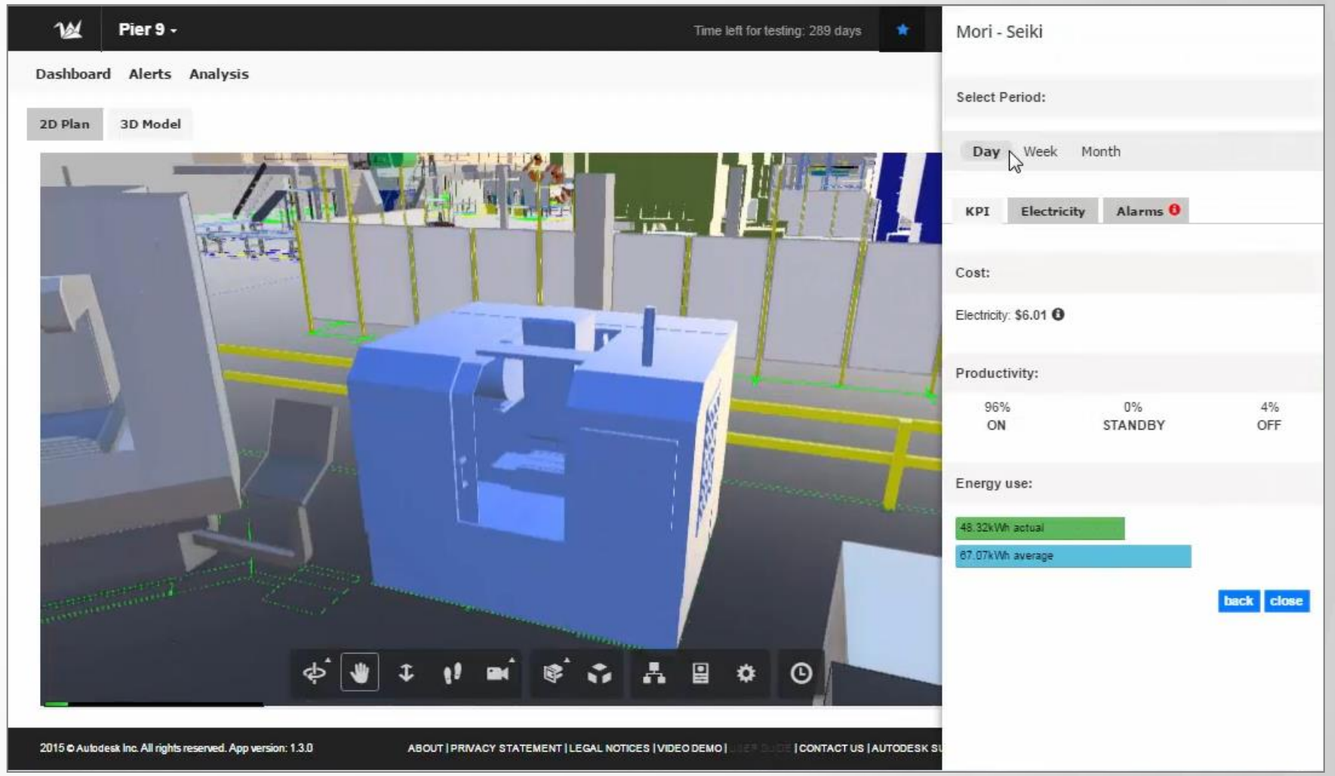
Mori Seiki NVD 1500



Video source: Laboratory for Manufacturing and Sustainability, (2010) “Energy Consumption During Machining”, http://youtu.be/_UOtoTBpex4

Gain Access to Performance Analytics



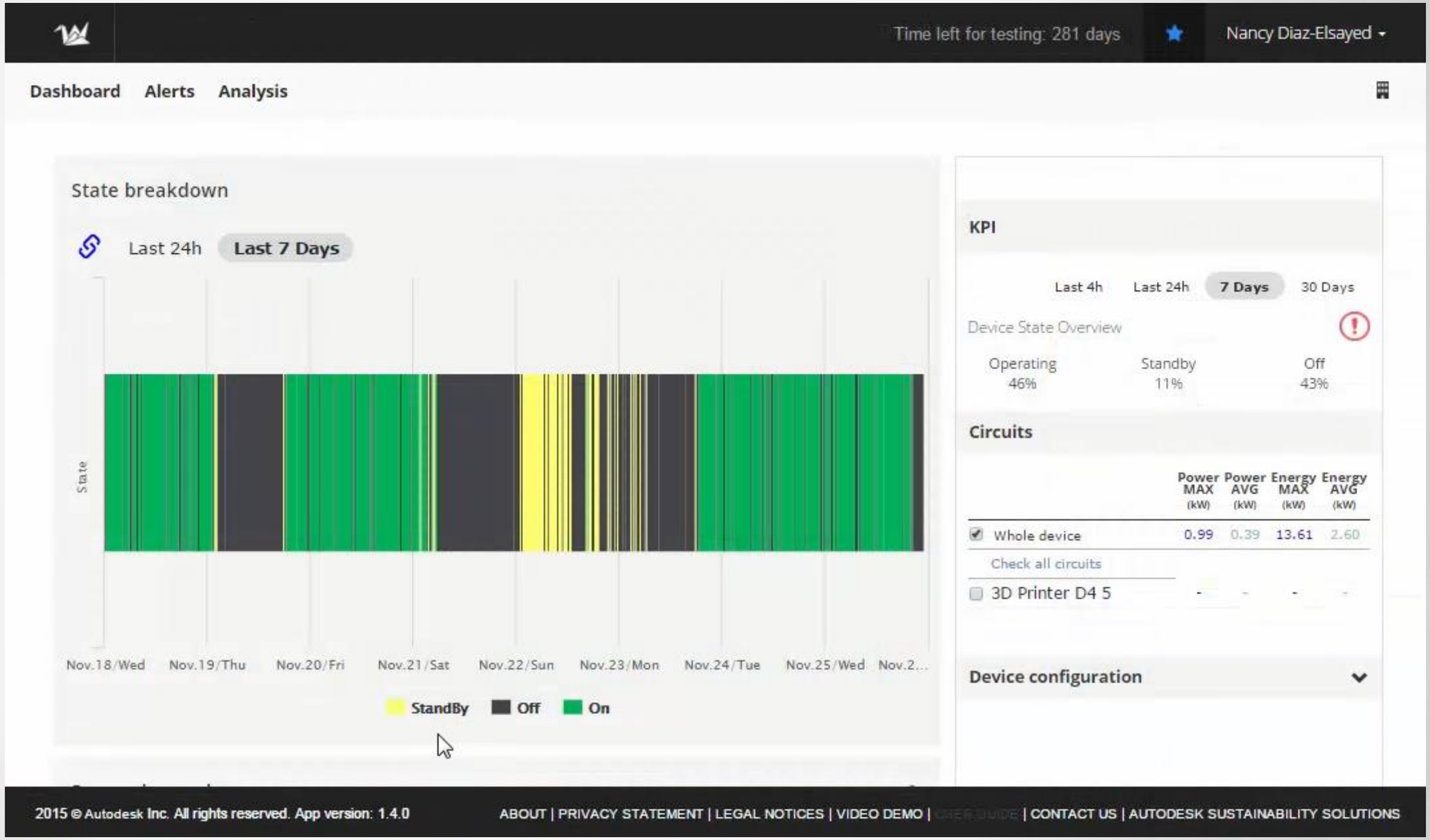


Overview of asset utilization via the 3D model viewer

Device-level information about equipment performance

Gain Access to Performance Analytics

Access 5 min interval data regarding asset utilization



Project Aquila: Insight at Your Fingertips


Plant Manager


Sustainability Manager


Industrial Engineer


Project Manager


Facilities Manager


Manufacturing Engineer


Layout Engineer


Maintenance Engineer


Facilities Engineer

Project Aquila

Operational Energy Management for Buildings & Factories

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Sample Pilot Project

Our general Proof of Concept includes planning, deployment support, data analysis, technical support, and on-going project management for a 90 day trial. The exact scope of monitoring will be determined once we meet with you, but typically range from devices including HVAC, lights, pumps, boilers, exhaust fans, etc. Panoramic Power will provide the following:

- Up to 100 device sensors
- Up to 7 Basic Bridges
- 2 Analyst Reports
- Installation support
- Deployment tools
- Dashboard set up (with alerts if applicable)
- Access to customer-configured real-time energy monitoring dashboard
- Full warranty and support on all hardware
- Proposal does not include: electrician and internet connectivity cost
- Integration capabilities with Project Aquila
- Payment terms: Upon proposal signature

Proof of Concept = $10k-$15k

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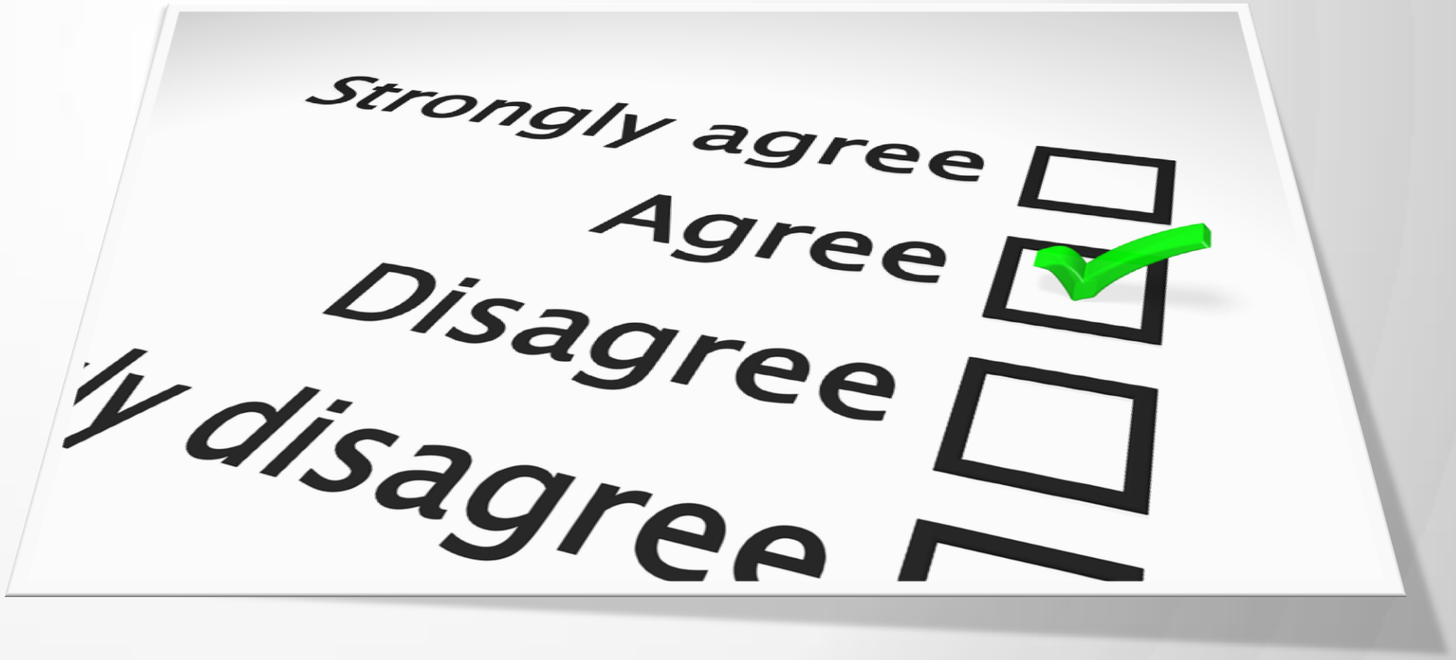

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