



**Rockwell
Automation**

Convergence of IT and OT Across Information and Control in Modern Campus Power-Plant Operations

Tom McDonnell

Power and Energy Industry Leader

February 27, 2019



CampusEnergy2019

February 26 - March 1, 2019 | New Orleans, LA | Hilton New Orleans Riverside

ROCKWELL AUTOMATION IN POWER AND ENERGY

World's **largest** company focused
on industrial automation.



Point Technology
Solutions for
ACIS, SCR, TIAC



CHP Microgrid
Hospital



50 MW CSP



Large Scale
Hydro Globally

Remote Monitoring &
Control of Wind
and Solar



20 MW CHP
(2016 CHP Plant of the Year)



Simple Cycle



2 6x1 CCGT
840 MW

SMALL / SUBSYSTEMS

SCALABLE

LARGE SYSTEM

Rockwell Automation supplies technology and services in all phases of Power Generation and Industrial / Institutional Energy

Trends and Pressures



MARKET

Global Competitiveness

Opportunities and challenges in changing global landscape



WORKFORCE

Talent Shortages & Skills Gap

Global challenge hiring and retaining



RISKS

Changing Risk Patterns

Highly publicized and expensive incidents worldwide



TECHNOLOGY

Industrial Internet of Things

IoT value at stake and growth of internet enabled assets

220,000

New engineers every year until 2022 to connect the unconnected

The World Bank Studies

70%

Suffered a security breach in the last year

Ponemon Institute Survey

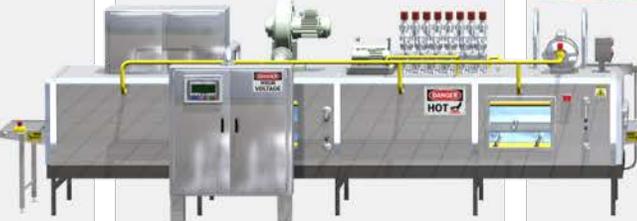
11%

Of world's economy in 2025 will be provided by IoT

McKinsey & Co

Business Risks and Drivers

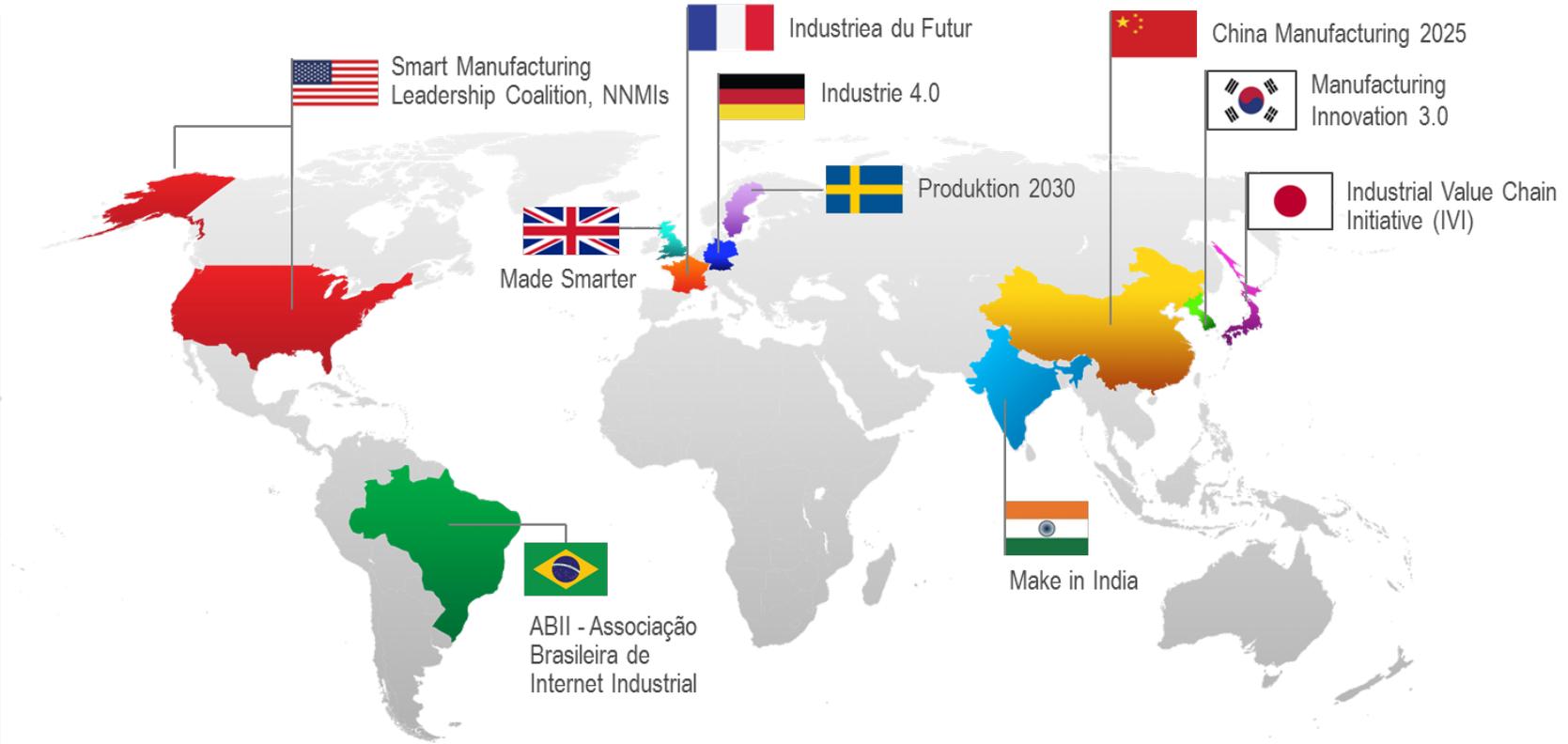
Realizing Smart Operations has become a business imperative

<p>\$65B Automation systems reaching end of life</p>  <p>SOURCE: ARC</p>	<p>~75% U.S. plants are more than 20 years old</p>  <p>SOURCE: IndustryWeek</p>	<p>\$20B cost of unscheduled downtime</p>  <p>SOURCE: ARC</p>	<p>2 Exabytes Big data generated in manufacturing</p>  <p>SOURCE: McKinsey</p>	<p><14 % US Plants completely integrated</p>  <p>SOURCE: IndustryWeek</p>	<p>21% Suffered a loss of IP in the past year</p>  <p>SOURCE: Kaspersky (2014)</p>
--	--	---	---	---	---

Global Initiatives

INTENDED OUTCOMES

-  Faster Time to Market
-  Lower Total Cost of Ownership
-  Enterprise Risk Management
-  Improved Asset Utilization



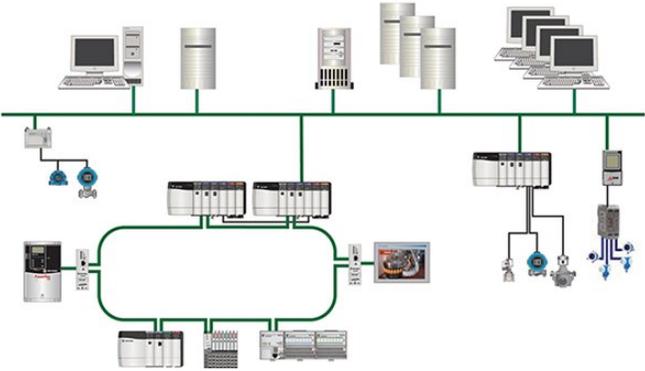
INDUSTRY CONSORTIA



Designing and Enabling for the Future

Key trends and technologies to design for future operations and future workforce

- The Connected Plant
- Mobility and remote access
- World of big data
- Cyber security today and future
- Integrated and intelligent packaged power
- Virtualization
- Thin Clients



The Modern DCS is essential in the evolution of the Connected Plant as the foundation for transforming data into business value for improved asset utilization. Across all power generating assets, a Modern DCS is the source of the data with its single integrated platform to aggregate data. Historically, a plant control system provided an infrastructure that captured, analyzed, and contextualized data at its source. With the convergence of information technology (IT) and operational technology (OT) systems and the increase of intelligent devices, the *ecosystem of data is expanded exponentially.*

The Role of the Connected Plant

Tom M. Dwyer
World America Power Generation Industry Leader
Rockwell Automation

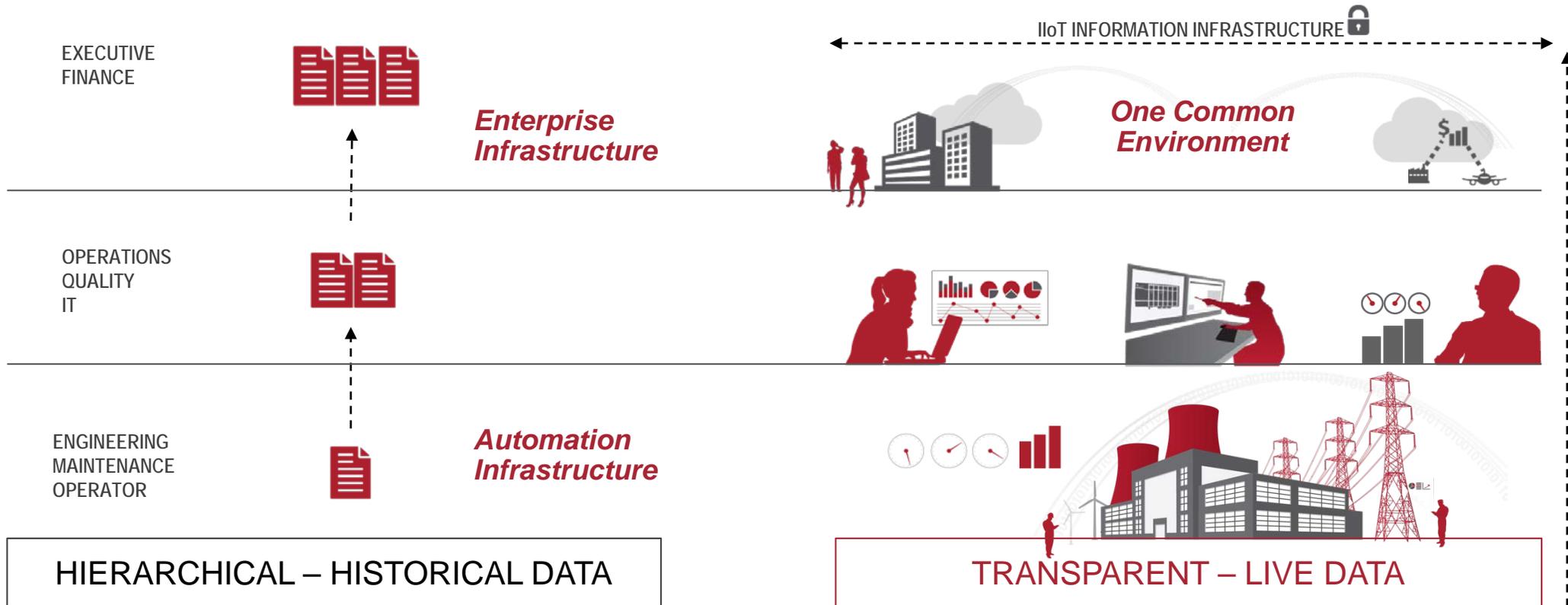
The role of a Distributed Control System (DCS) in a power plant has traditionally served to provide a "connected atmosphere" between the operator and the entire powerplant. Its function centralized plant operations to allow control, monitoring, and reporting of the individual process areas. A modern DCS goes further to offer a deep understanding of each process area and human capital together as never before. By connecting the physical and virtual worlds, the industrial Internet of Things has become the basis of the enabling technology for a connected plant.

The Rockwell Automation PlantWise Modern DCS is essential in the evolution of the Connected Plant as the foundation for transforming data into business value for improved asset utilization. Across all power generating assets, PlantWise is the source of the data with its single integrated platform to aggregate data. Historically, PlantWise provided an infrastructure that captured, analyzed, and contextualized data at its source. With the convergence of information technology (IT) and operational technology (OT) systems and the increase of intelligent devices, the ecosystem of data is expanded exponentially.

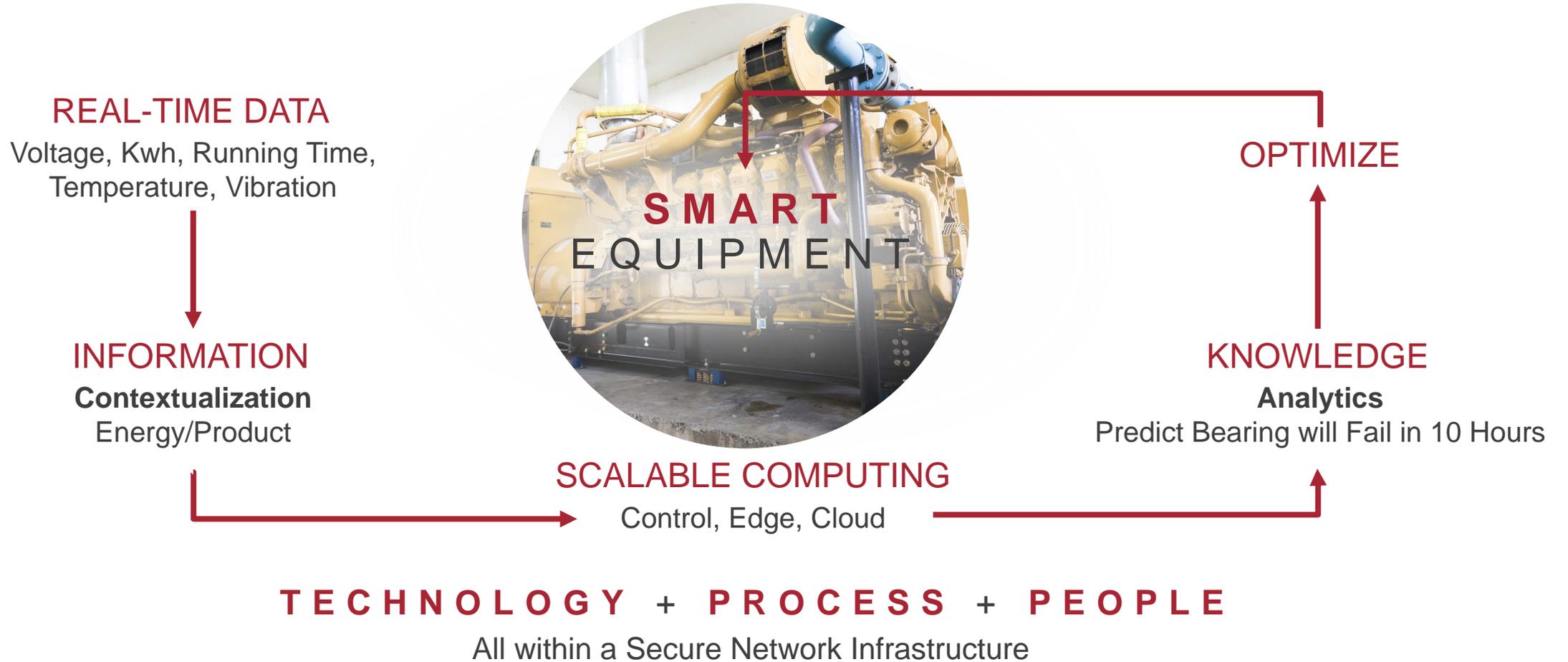
More and more business operations are becoming mobile, enabling users to implement scenarios and operations closer to real time. Applications and systems, such as integrated intelligent electrical devices and smart instrumentation, can be used to monitor and analyze data to uncover the data with its single integrated platform to aggregate data. Historically, PlantWise provided an infrastructure that captured, analyzed, and contextualized data at its source. With the convergence of information technology (IT) and operational technology (OT) systems and the increase of intelligent devices, the ecosystem of data is expanded exponentially.

With the Connected Plant, IT and OT staff and systems are no longer completely isolated. This creates a new era of customer convergence and collaboration - having big data interact and intelligent data.

DIGITAL TRANSFORMATION



GENERATION ASSET



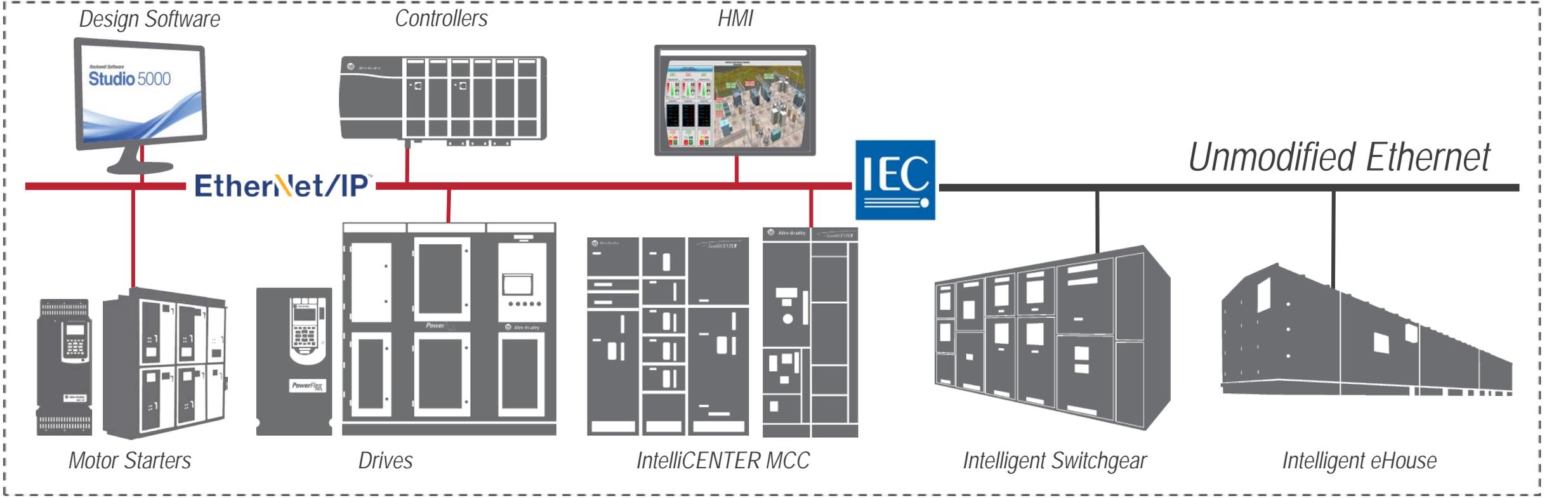
INTEGRATED POWER & AUTOMATION

SYNCHRONIZES

Facility-Wide Data

SINGLE NETWORK

High-Accuracy Data Stamping



INTELLIGENT MOTOR CONTROL

INTELLIGENT PACKAGED POWER

Improve Visibility to Energy Usage to Reduce Costs

Challenges:

- Reduce energy consumption
- Limited ability to collect WAGES process data for analysis and decision-making leading to inefficient resource usage

Solutions:

- Utilize existing automation devices and systems currently installed to gather data for Water, Air, Gas, Electricity & Steam usage
- Reduce energy costs by knowing how much, when & where you are using energy and deploying low cost / no cost operational changes



Energy Savings Can be Achieved Enabling Technology that Provides Energy Usage Awareness

Digital Worker / New Workforce

Safety

- Employee Health - Wearable Biometric Monitoring
- Equipment Identification - Geolocation or Scanning
- Real-time Equipment Status – Trend Overlays
- Remote SME – Face Time
- Briefings – Walkthrough Before Execution

Efficiency

- Work Management – Paper Reduction
- Operator Inspections – Real Time Entry
- Inventory Access – Part Availability in the Field
- Access to Media – Component Information

Effectiveness

- Documentation of Conditions – Work Management
- Condition Based Maintenance – Provide Feedback
- Reduce Rework - Accuracy in Repair
- Training – AR/VR in the Classroom



Real-Time Dispatch Optimization

Real-Time Optimization™ sits above control

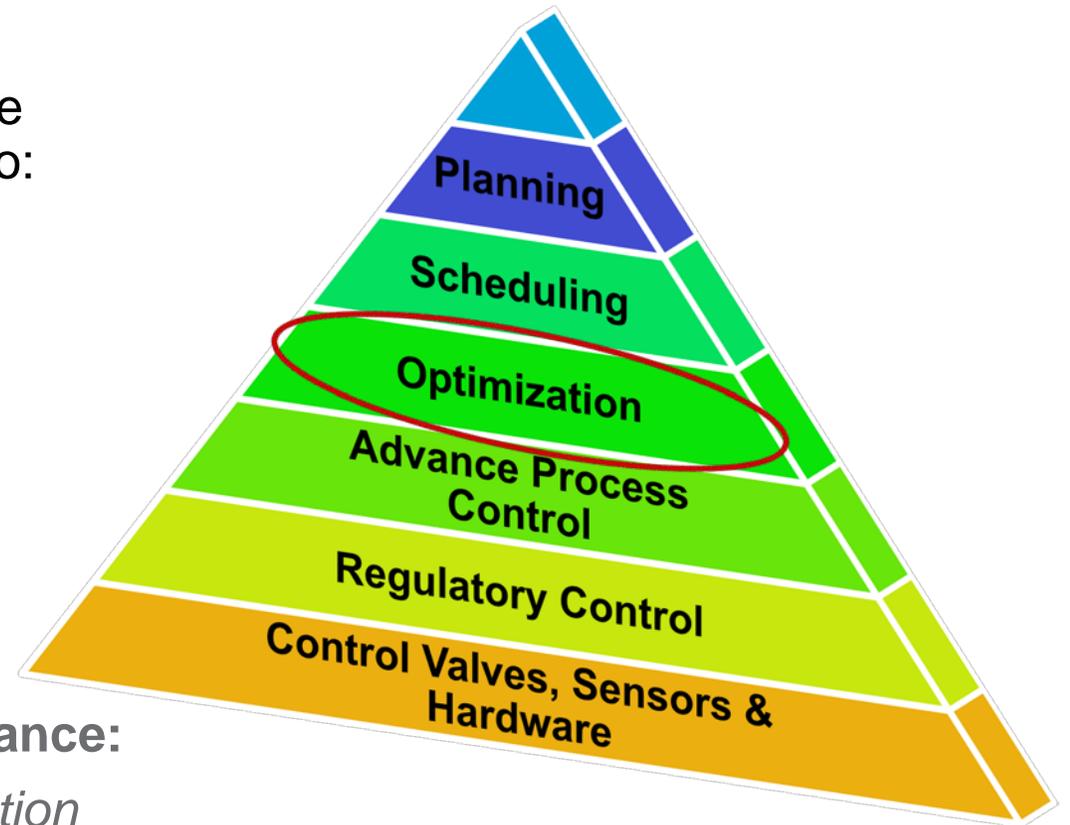
- Calculates optimization at the plant level
- Uses equipment models, business requirements, plant-wide operating conditions, forecast and scheduling information to:
 - Predict optimal products (energy) to make in a plant
 - When to make them
 - What are the best operating conditions to maximize profitability

Reads real-time data and sends targets to a control system

- **Where control maintains operations at targets:**
- *Optimization determines best targets*

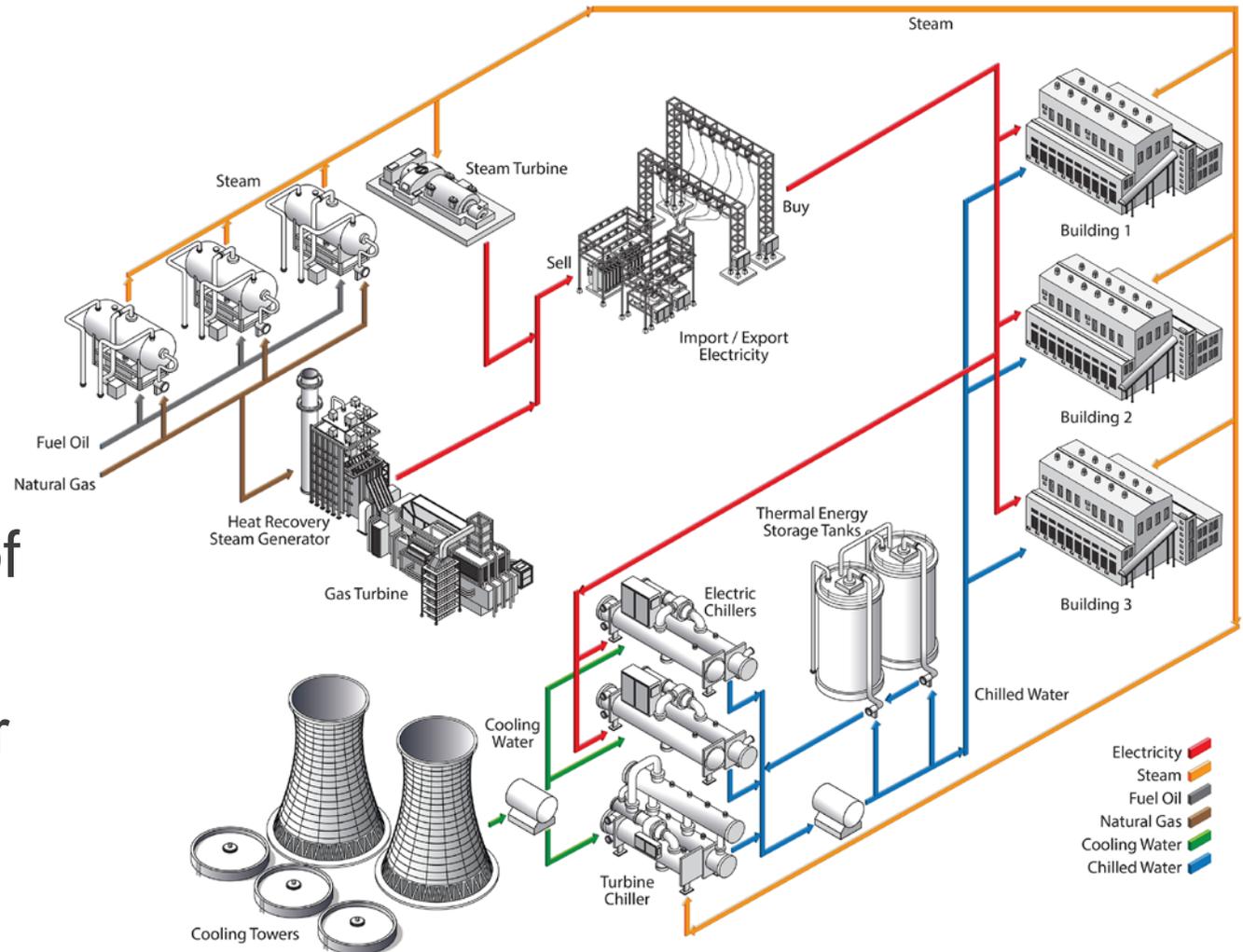
Where advanced control provides best operator performance:

- *Optimization calculates best performance and only optimization identifies new ways to operate*



Optimization of Plant Energy Systems

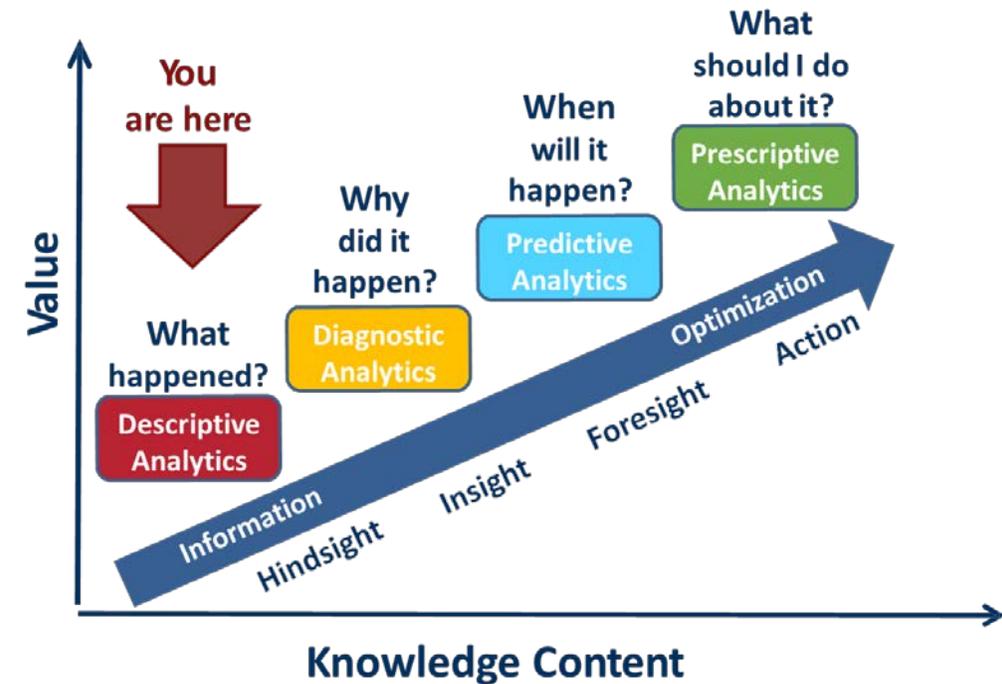
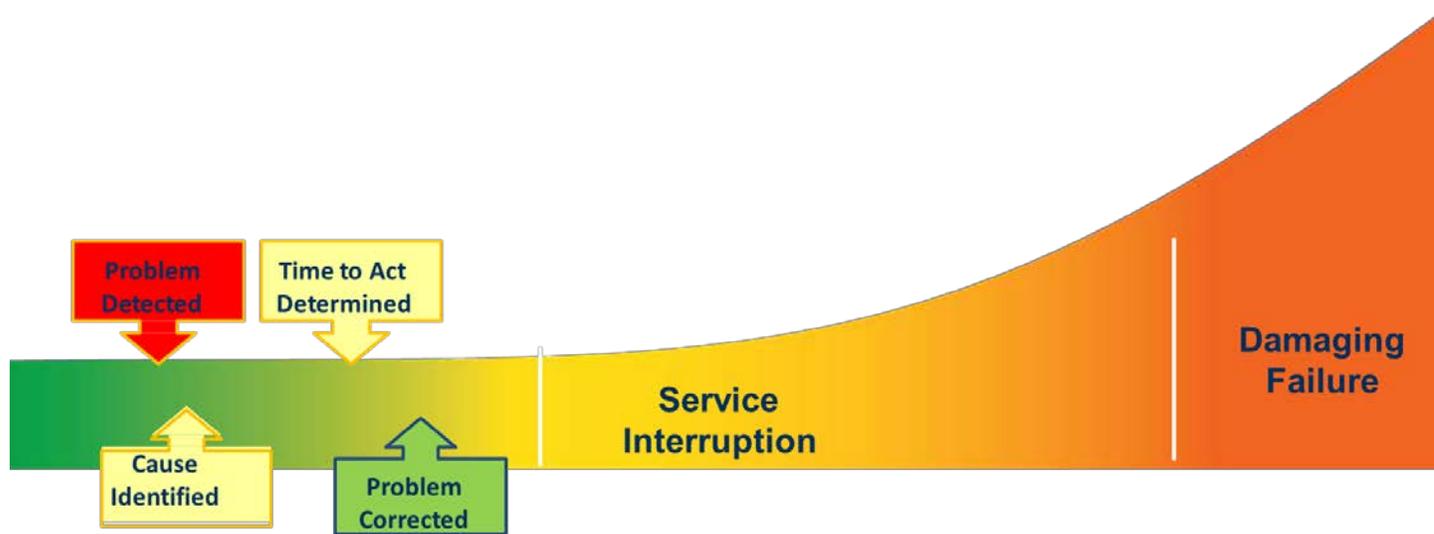
- Graphically drive to Economic Optimization of overall utilities
- Consider System Holistically
 - Electricity, steam, chilled water, refrigeration, fuel
- Optimize against current and forecast operating conditions of the plant
- Automated model retraining for simplified maintenance and accuracy.



Detecting a Problem

- Detect an emerging problem **immediately**
- Pinpoint the **cause** of the problem
- Determine remaining **time to act**

Eliminate Cost & Risk of Failure



Digital Transformation and AI



D I G I T A L T R A N S F O R M A T I O N & A I



Engage customers



Empower employees



Optimize operations



Transform products

CHANGING WORKFORCE AND DEMANDS

Academy of Advance Manufacturing

The Skills Gap is Widening Bringing Unique Challenges to the Owners/Operators



*Every job in manufacturing creates another 2.5 jobs in local goods and services.**



More than 1M new engineers are needed globally in the next 5 years.†



*78% of manufacturing leaders believe the talent gap will hurt their ability to adopt new technologies and increase productivity.**



*Over the next decade, more than 3.5M US manufacturing jobs will be needed. 2M are expected to go unfilled.**

The Way People Work and Interact with the Process Has Changed.

Academy of Advanced Manufacturing

Industry leaders, partnering to build tomorrow's Advanced Manufacturing workforce by upskilling U.S. Veterans

Talent is Hard to Find

- Time to fill for technicians: 70-120 days
- On pace for 2 million manufacturing jobs to go unfilled by 2025 in the U.S.

+

There's a Skills Mismatch Resulting In...

- Costly training to close the gap
- Longer time to productive employee: 90 days - 2 years
- Attrition – cycle starts again

+

It's Going to Get Worse

- 21% of manufacturing workers retire in next 8 years
- 75% of employers say new skills required over the next 2 years...and many cannot define them

The Workforce Skills Gap and the Risk to Productivity

The costs to source, recruit, assess, select and train are escalating rapidly. Skill requirements are evolving fast, making it harder for organizations to keep up, and the increased time to find and develop quality talent is negatively impacting your productivity.

Our Solution

The Advanced Academy of Manufacturing is an intensive 12-week program that certifies highly-skilled veterans for work in the high-demand role of Instrumentation & Automation Controls Technician (IACT).

THE BUSINESS IMPACT

- Job Ready, Day 1**
- Current + Future Skills**
- Consistent Standard Across Talent Pool**
- Eliminates Time to Fill**
- Enables Employers to Hire Qualified Veterans**
An Affirmative Action Priority

Contact us at AAM@ra.rockwell.com for information

Summary

- Universities with their large physical infrastructure are prime to take advantage of the Connected Campus.
- The Digital Transformation bridges the intelligence gap between people and machines
- The right approach is crucial - from the right application of technology to the right “app” to get the job done.
- The right platform and technology is critical to the future state.
- Worker safety and productivity must be enhanced – cannot risk situational awareness or be overly complicated.
- Employee benefit as well as utility value must be considered- field workers have to be involved in development



**Rockwell
Automation**



CampusEnergy2019

February 26 - March 1, 2019 | New Orleans, LA | Hilton New Orleans Riverside

Thank you



www.rockwellautomation.com