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CampusEnergy2018

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How the Connected Plant Impacts Modern Power-Plant Operations

Tom McDonnell
Power and Energy Industry Leader
March 07, 2018

PUBLIC

Allen-Bradley • Rockwell Software

Rockwell Automation

Agenda

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Digital Transformation / Connected Power Plant / Connected Campus

Impact on Workforce and Operations

Smart Equipment

Summary

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2015 Power Mag Reinvention Award at **Colorado Energy Nations Boiler 5 Upgrade Project**

2015 Plant of the Year – **Kemper County**

2016 Power Gen Int. CHP Plant of the year – **Eight Flags**

CHP Microgrid Hospital, NY

Point Technology Solutions for ACIS, SCR, TIAC

50 MW CSP India

Large Scale Hydro Globally

Remote Monitoring and Control of Wind and Solar

20 MW CHP
2016 CHP Plant of the Year

4 Simple Cycle Units, TX

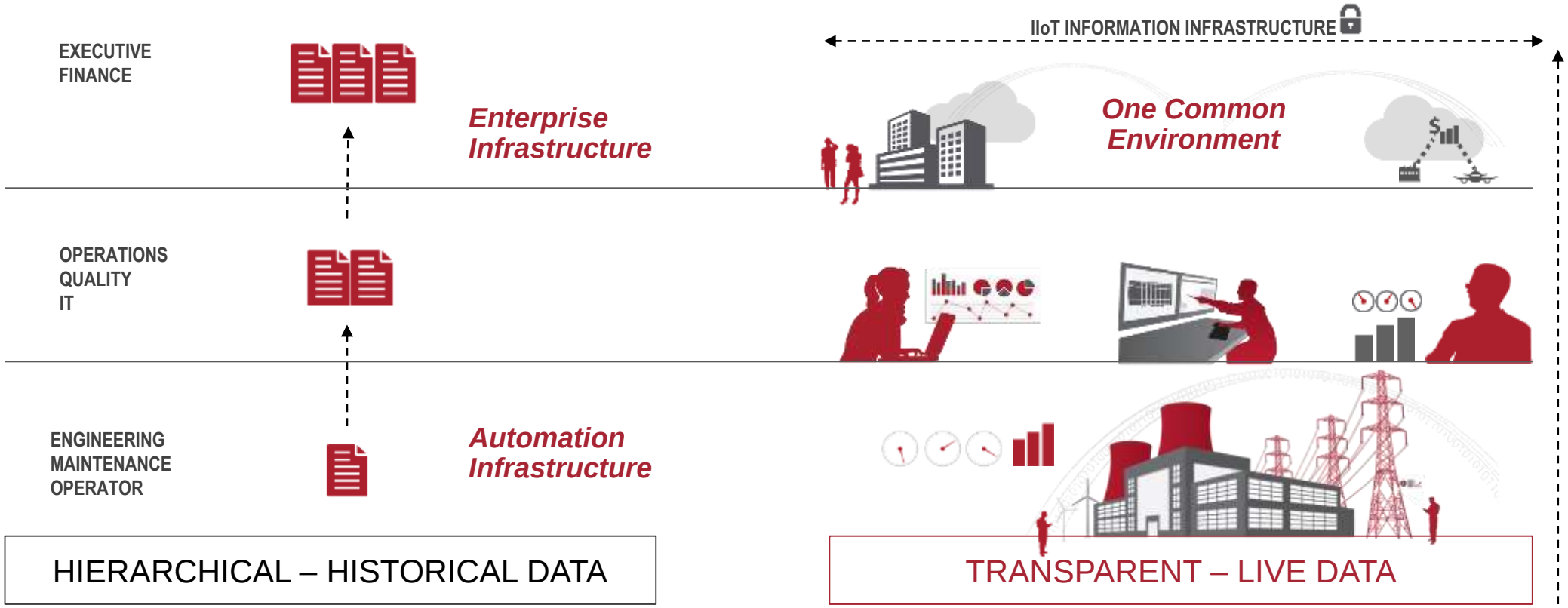
2 6x1 CCGT 840 MW Israel

- Leading supplier of control, power, safety, & information solutions
- Domain-knowledgeable employees and extensive global partner network
- Full life cycle services: safety consultancy, engineering design services, safety and control solutions, customer support

Rockwell works in all phases of Power Generation and Distributed Energy

Rockwell Automation

DIGITAL TRANSFORMATION



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Designing and Enabling for the Future

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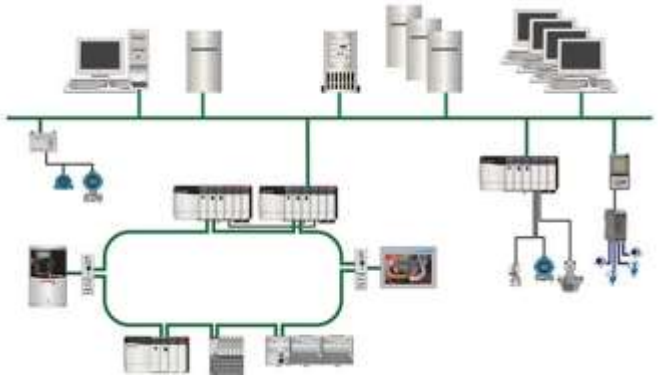
Key trends and technologies to design for future operations and future workforce

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



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*.

Changing Environment

CHANGING WORKFORCE AND DEMANDS

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.**

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

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

*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.

**Deloitte Analysis on BLS Data* ⁺*World Bank*

Digital Worker / New Workforce

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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

Improve Visibility to Energy Usage to Reduce Costs

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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

20% Energy Savings Can be Achieved Through Energy Usage Awareness

Making Intelligent Decisions

Energy information for making intelligent decisions

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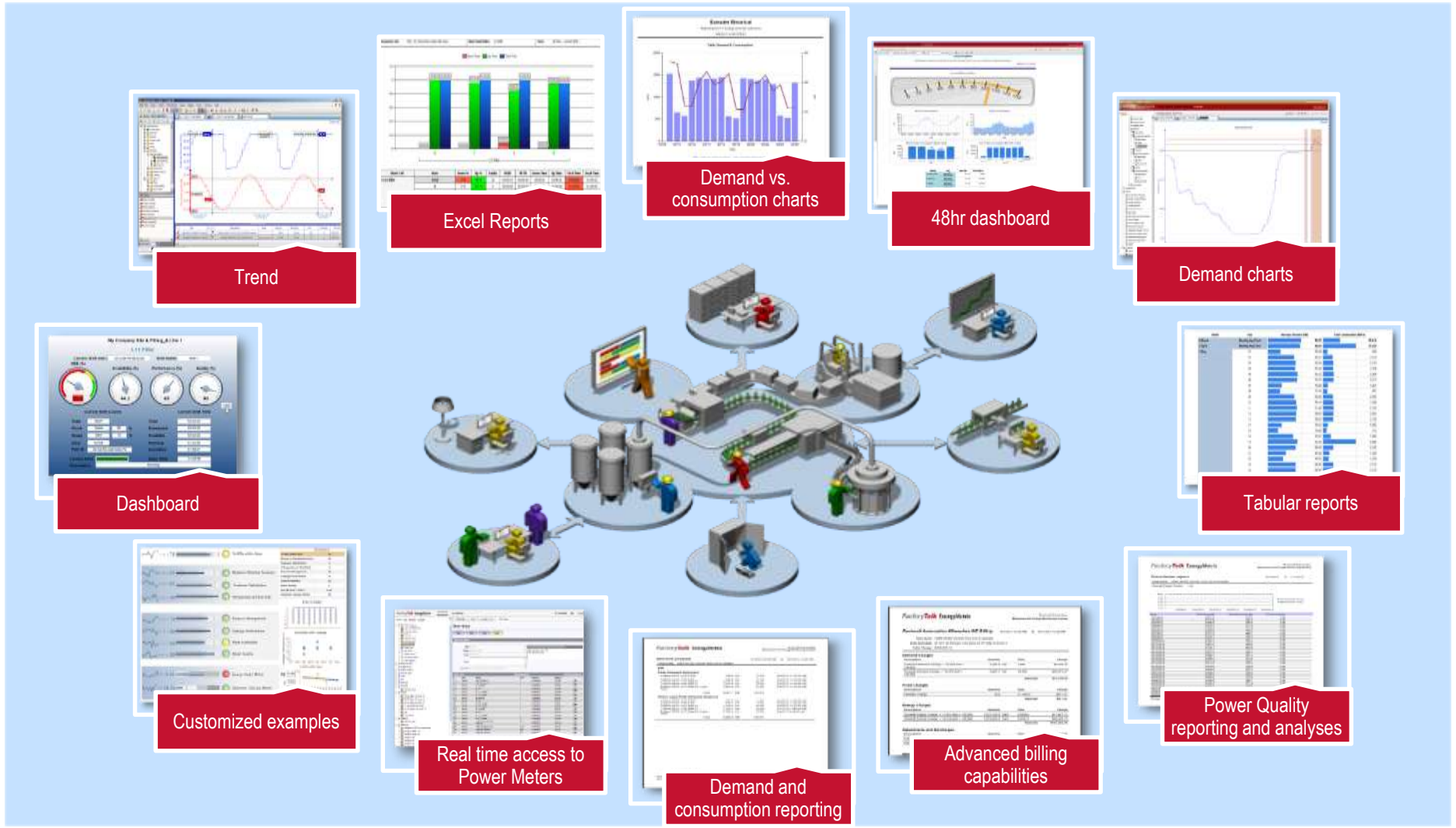

Analytics Real Time Optimization

Dispatch Chillers, Pumps, Boilers, Turbines and Compressors. Intelligently and Economically.

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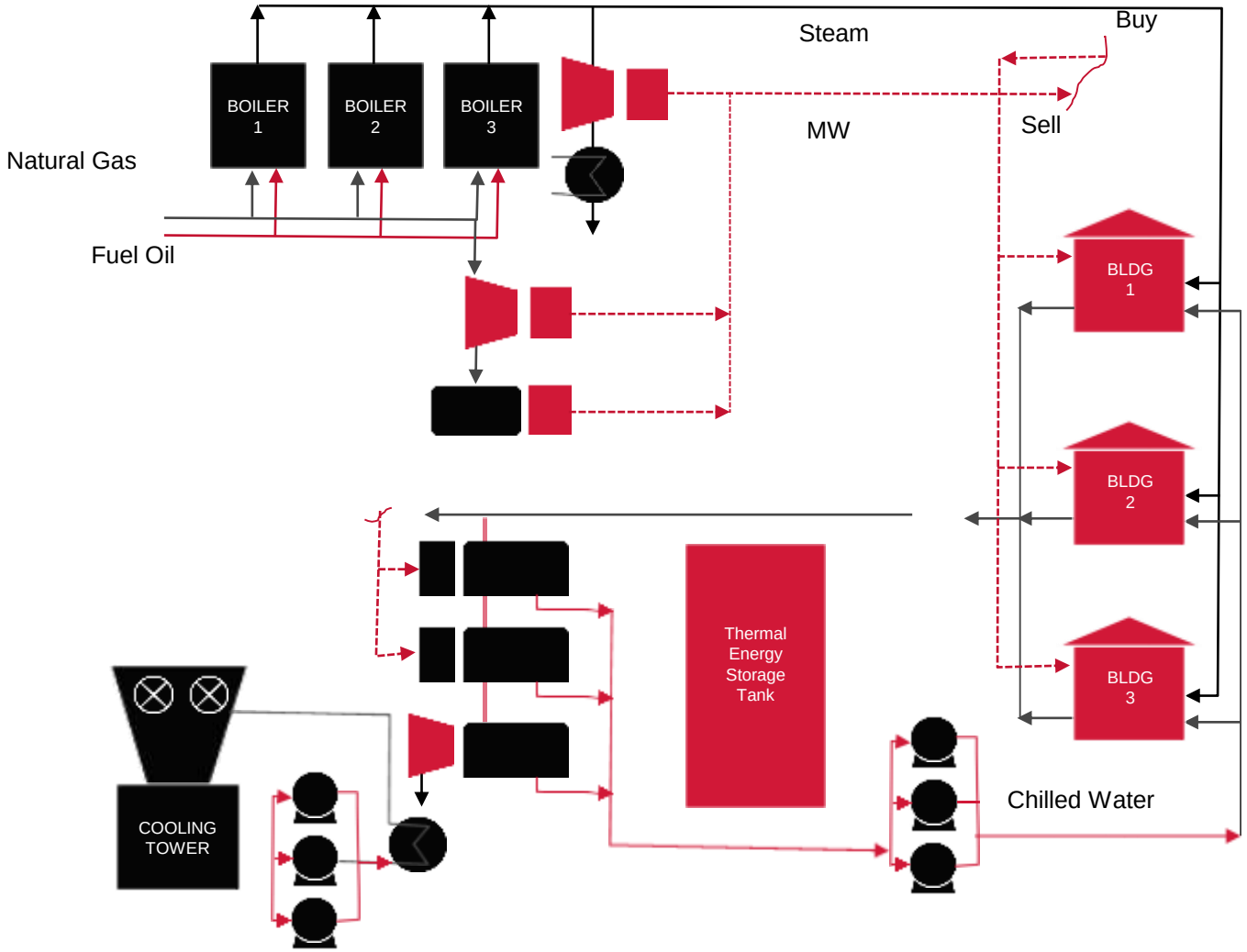
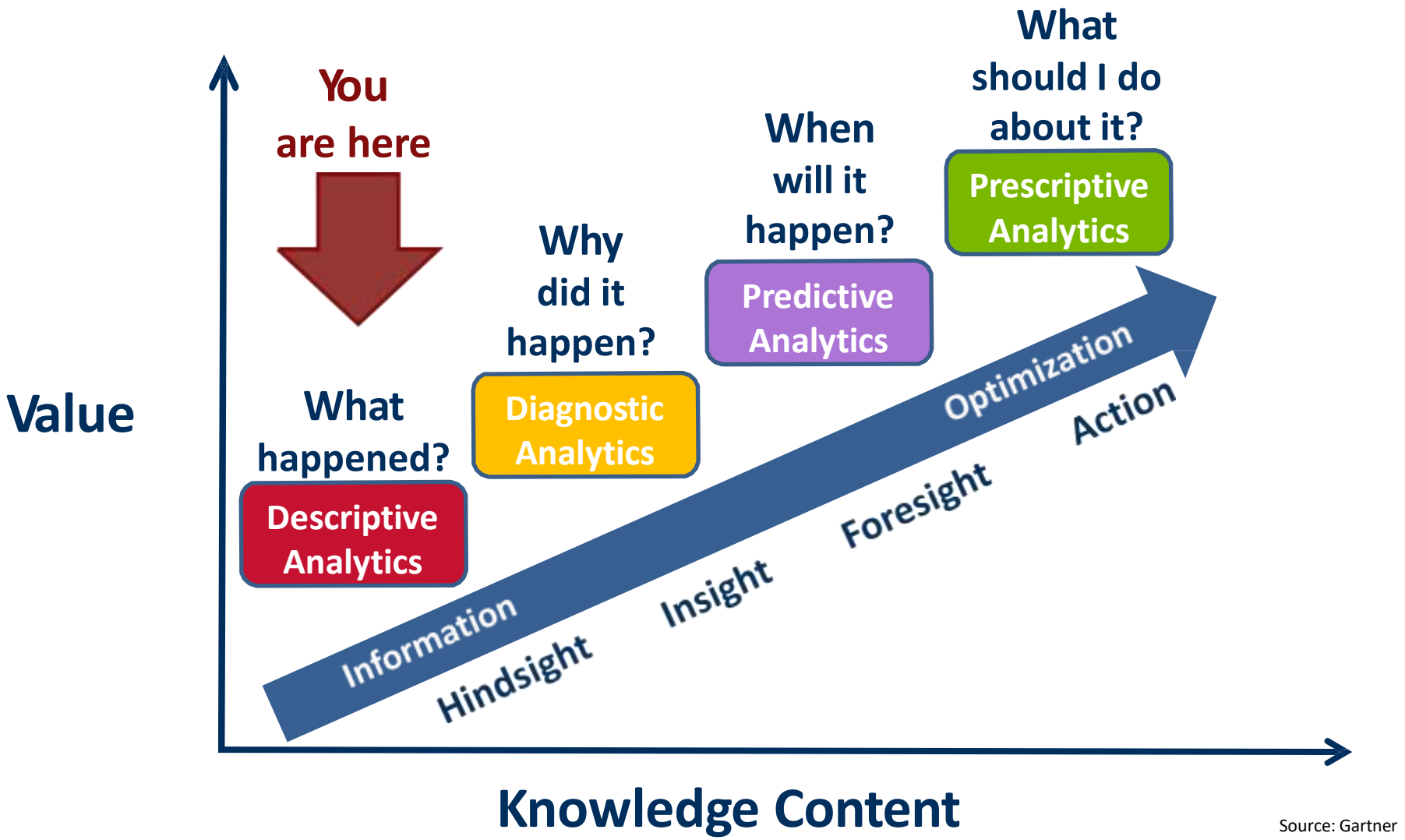
- **REDUCE** utility center energy costs.
- **OPERATE** equipment within limits.
- **FORECAST** future demand
- Maximally **USE** free/low-cost energy
  - Graphically layout equipment
  - Automatic model updates
  - Reconcile data for accurate results



Opportunity is Knocking

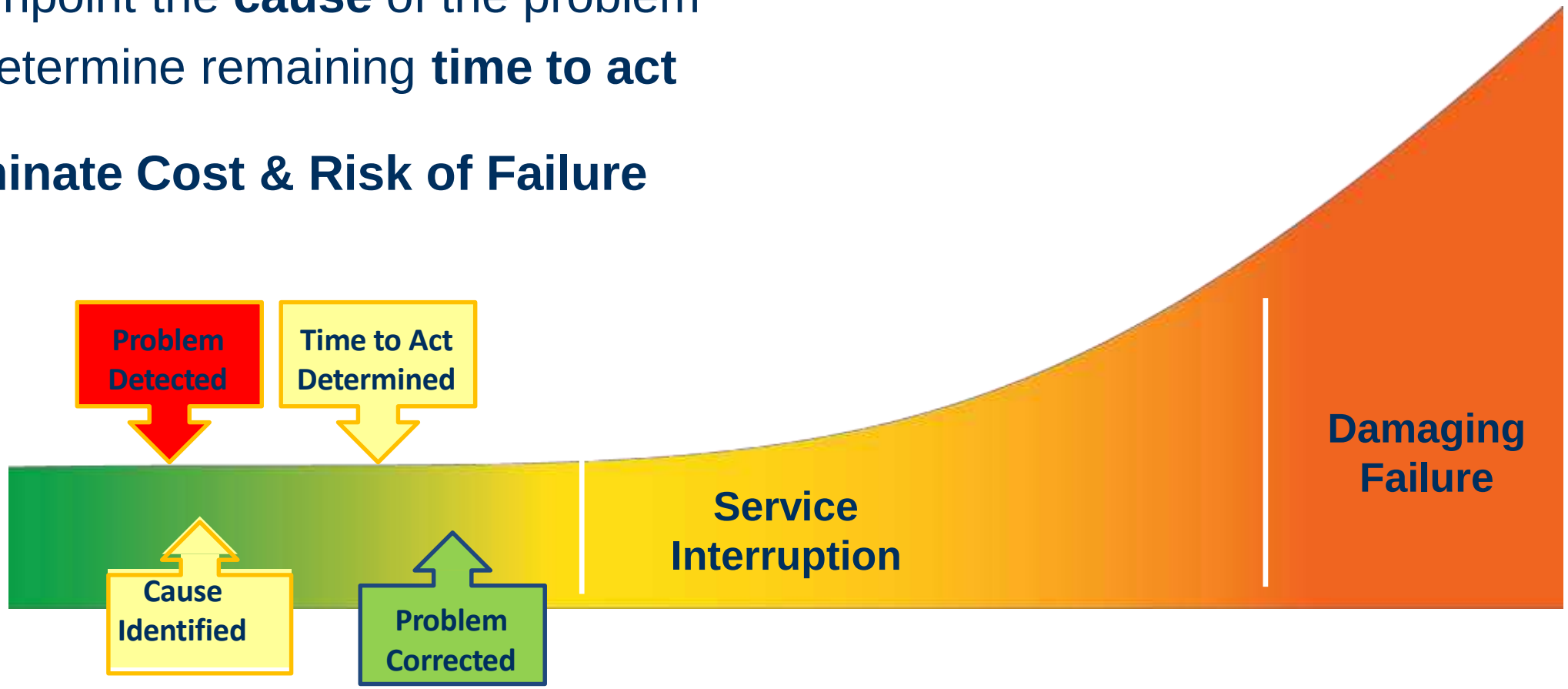


Source: Gartner

Detecting a Problem

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

Eliminate Cost & Risk of Failure






DETECT	DIGITIZE	ANALYZE	ACT

PREVIOUSLY TO DO DIAGNOSTICS WITHOUT ANALYTICS…

>3 hours	**>3** days	**>1** week	**>1** month

NOW IT'S DONE IN

MINUTES

Combined Scalable Analytics Landscape

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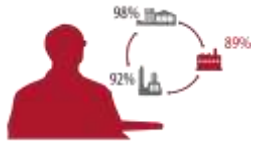
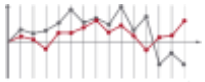
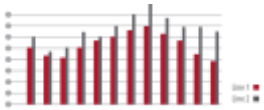
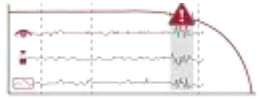
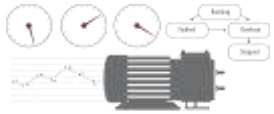
	DESCRIPTIVE	DIAGNOSTIC	PREDICTIVE	PRESCRIPTIVE
ENTERPRISE	 Which plant performed the best?	 Why is Site A throughput below plan?	 Will I meet plan today? Tomorrow?	 How can I change operations to improve Profitability? Yield? Quality?
SYSTEM	 Is the system running ok?	 Why is Line 1 quality affected?	 Will the process be stable?	 How do I adjust to maintain/ improve process stability?
DEVICE	 Am I running ok?	 Why is this happening?	 What's the likely next device state? When will it occur?	 What maintenance action is required? When?

Predictive Maintenance and Analytics

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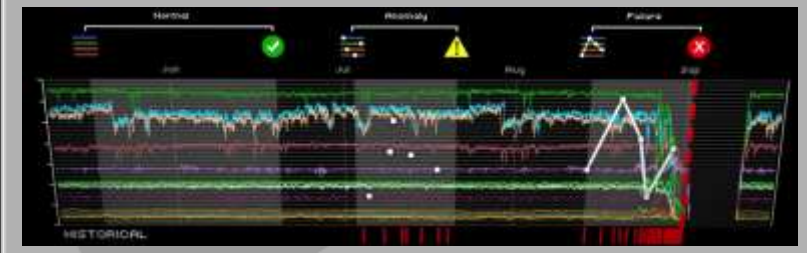
Technology



Connected Services

Design	Implement
Train	Support
Monitor	Admin
Respond	Re-Tune

Outcomes

- Increase Productivity
- Maximize Uptime
- Optimize Production

Combining Technology and Services to Delivery Outcomes

Smart Equipment

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REAL-TIME DATA
Voltage, Kwh, Running Time,
Temperature, Vibration

INFORMATION
Contextualization
Energy/Product

OPTIMIZE

KNOWLEDGE
Analytics
Predict Bearing will Fail in 10 Hours

SCALABLE COMUPTING
Control, Edge, Cloud

TECHNOLOGY + PROCESS + PEOPLE

All within a Secure Network Infrastructure

Digital Transformation and AI

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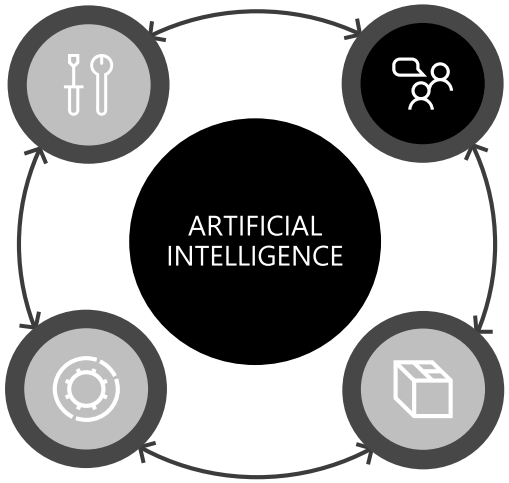
DIGITAL TRANSFORMATION & AI

- Engage customers
- Empower employees
- Optimize operations
- Transform products

Digital transformation & AI

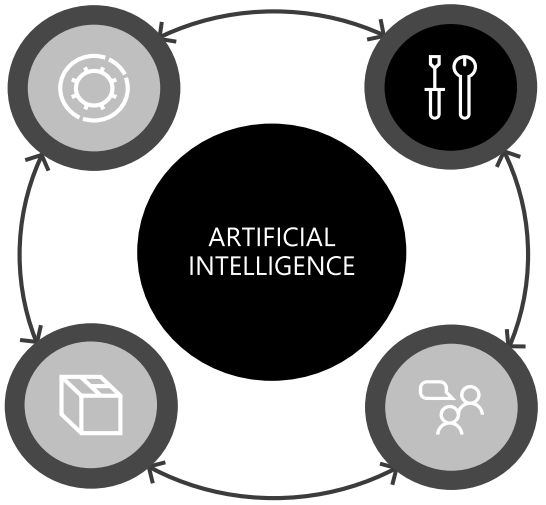


Engage customers

Conversational agents

Customized experiences

Customer analytics

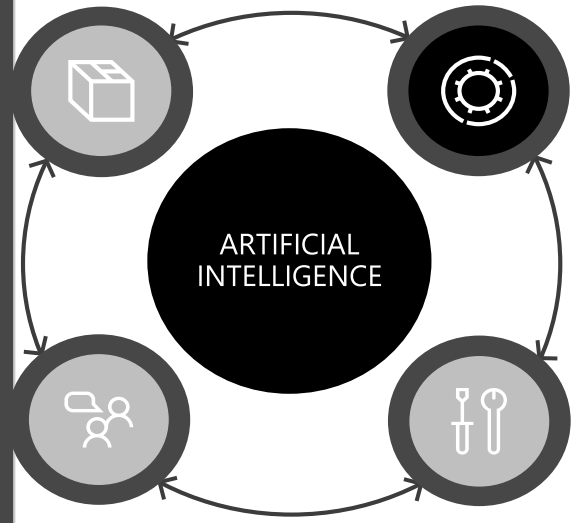


Enable your employees

Employee productivity

Business data differentiation

Organizational knowledge

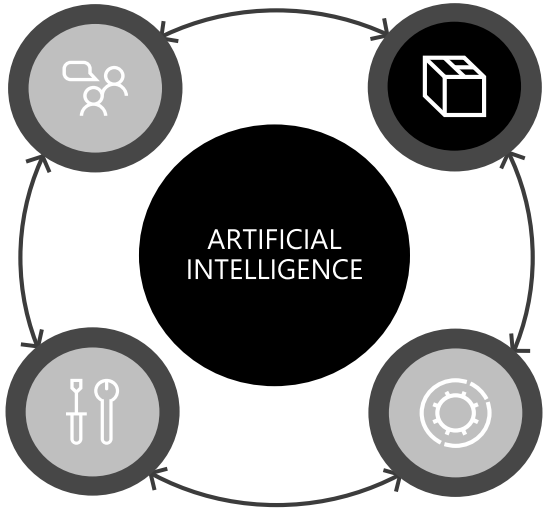


Optimize your operations

Intelligent predictions

Operational efficiency

Deep insights



Transform your products

Product innovation

Differentiated experiences

New scenarios

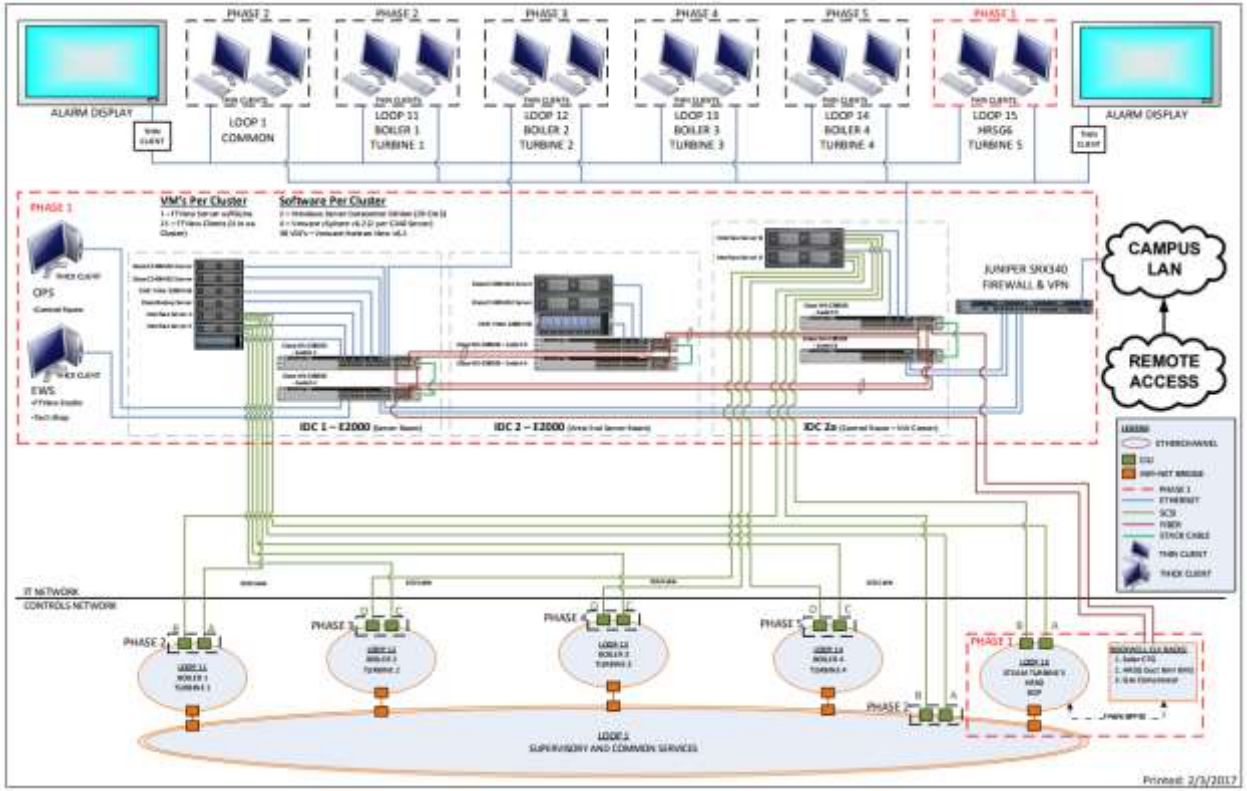
SMART

GENERATION

- Highly Responsive to Market Demand
- Improve Plant Availability & Reliability
- Compliance to Regulations
- Enable Secure Access
- Reduce Operational Costs

MSU

Modern System Architecture



MSU
T.B. Simon Power Plant

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- University owned/operated CHP plant supplying steam and electricity to 5200 acre campus
- 545 buildings, 22.3 million square feet, 50,000+ students
- Built in 1965, 5th in series of MSU plants
- 1.2 million lbs./hr. of steaming capacity at 900lbs
- 4 Gas fired Steam Boilers and 1 HRSG
- 100MW Electric Generation capacity
- 5 Steam Turbine Generators and 1 CTG
- 100MW grid interconnection with local utility

T.B. Simon Power Plant

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.
- Must enhance worker safety and productivity – 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

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Thank You For Your Time!

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