Smarter Physical Infrastructure

Sanil Nambiar,
Global Technology services, IBM India
sanil.nambiar@in.ibm.com

Business without **LIMITS 2012**

[30th Aug 2012, ,Bangalore, India]

DISCLAIMER:

- IBM’s statements regarding its plans, directions, and intent are subject to change or withdrawal without notice at IBM’s sole discretion.
- Information regarding potential future products is intended to outline our general product direction and it should not be relied on in making a purchasing decision.
- The information mentioned regarding potential future products is not a commitment, promise, or legal obligation to deliver any material, code or functionality. Information about potential future products may not be incorporated into any contract. The development, release, and timing of any future features or functionality described for our products remains at our sole discretion.
- Performance is based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput or performance that any user will experience will vary depending upon many factors, including considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve results similar to those stated here.

Who Depends on Physical Infrastructure?

Business

People

Society

An Unusual scenario played out last month in India

- 3 out of 5 Indian Regional Grids collapsed
  - Northern Regional grid (NR)
  - Eastern Regional grid (ER)
  - North Eastern Regional grid (NER)

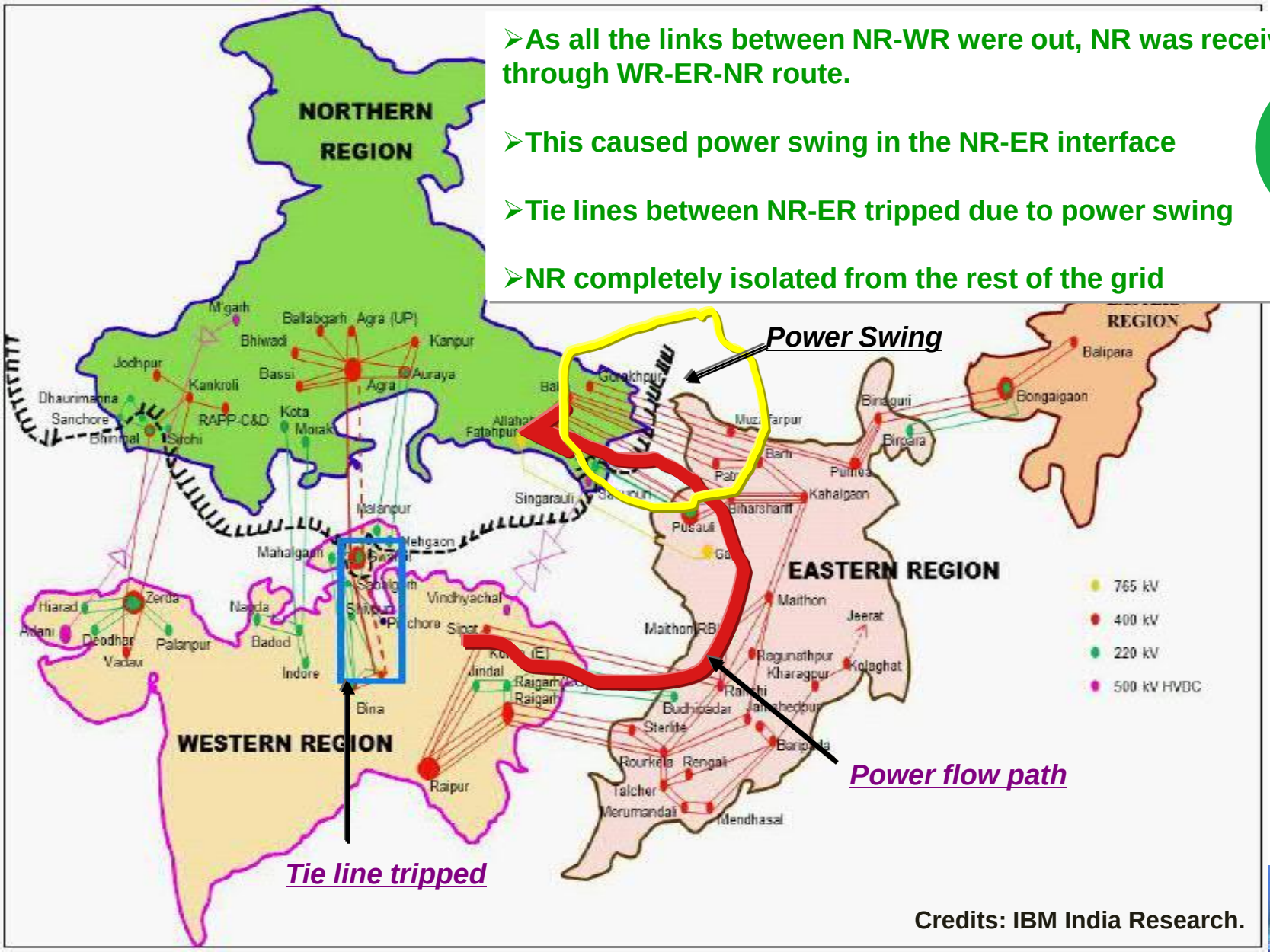
- Impact
  - 600 million people in 22 states without power[1]
  - 200 coal miners got trapped[1]
  - 300 trains came to a grinding halt[1]
  - Presumptive losses in Crores

[1] http://www.indianexpress.com/news/power-grid-fails-again;-blackout-blankets-half-of-india/981887/0

Credits: IBM India Research.

Physical Infra Events on the Grid on July 30th 2012

- As all the links between NR-WR were out, NR was receiving power through WR-ER-NR route.
- This caused power swing in the NR-ER interface
- Tie lines between NR-ER tripped due to power swing
- NR completely isolated from the rest of the grid



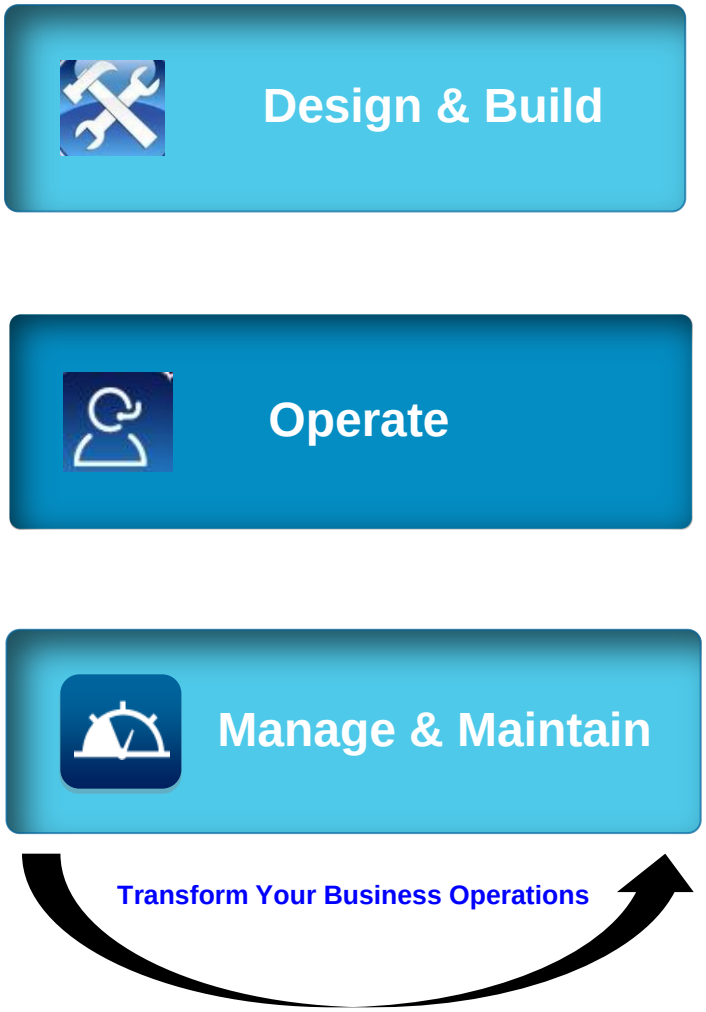
Credits: IBM India Research.

Enquiry committee recommendations for preventing blackouts

- Hardware Based
- Regulation based
- IT based
  - (among other things….)
  - Coordinated outage planning
  - Real time congestion management
  - Analyzing the present grid conditions and predicting anticipated scenarios which might lead to any such disturbances in future

….resulting in a Smarter Physical Infrastructure

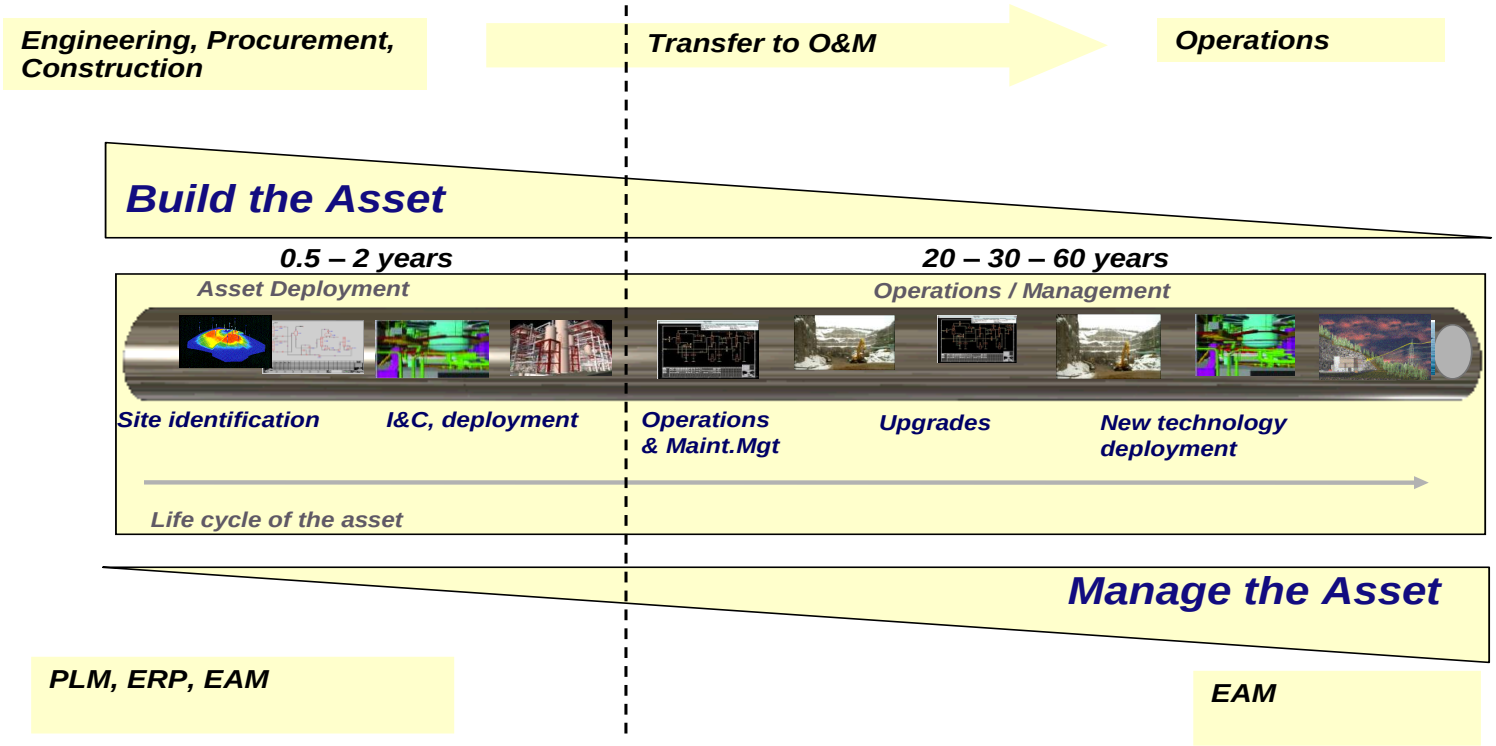
- **Today's progressive global organizations are:**
  - **Transitioning to smarter, flexible infrastructures**
  - **Enabling more intelligent enterprise assets**
  - **Delivering insight, recommendations, performance, and optimization across their organization**



Overview

- **Physical infrastructure is an asset-intensive business**
  - **Lifecycle : Asset deployment, followed by provision of space, power and services to customers (internal or external) over many years**

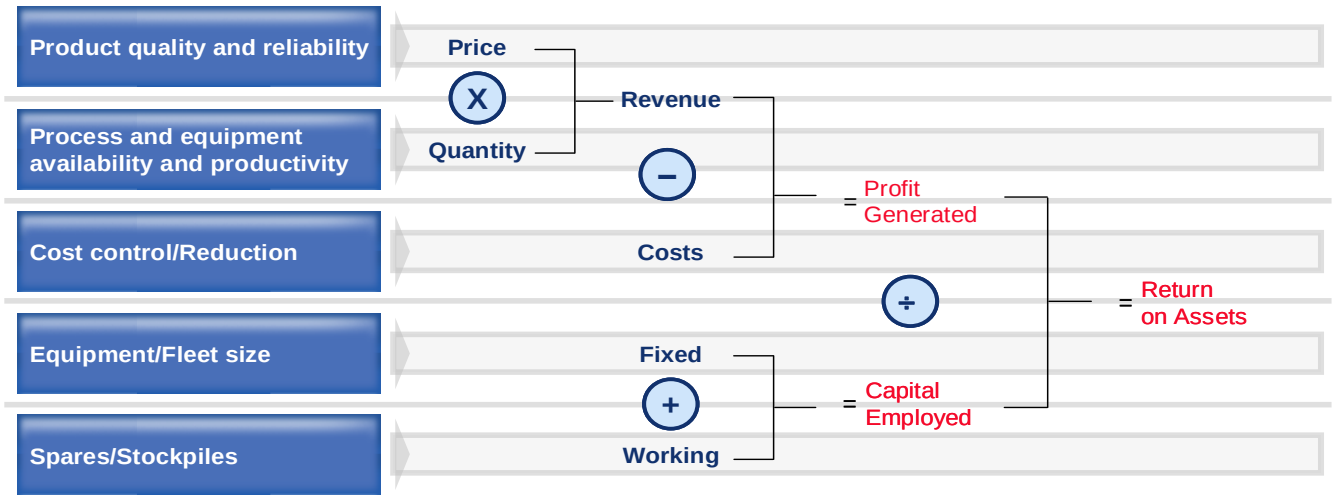
- **In steady-state, business performance is directly linked to capex and opex productivity**



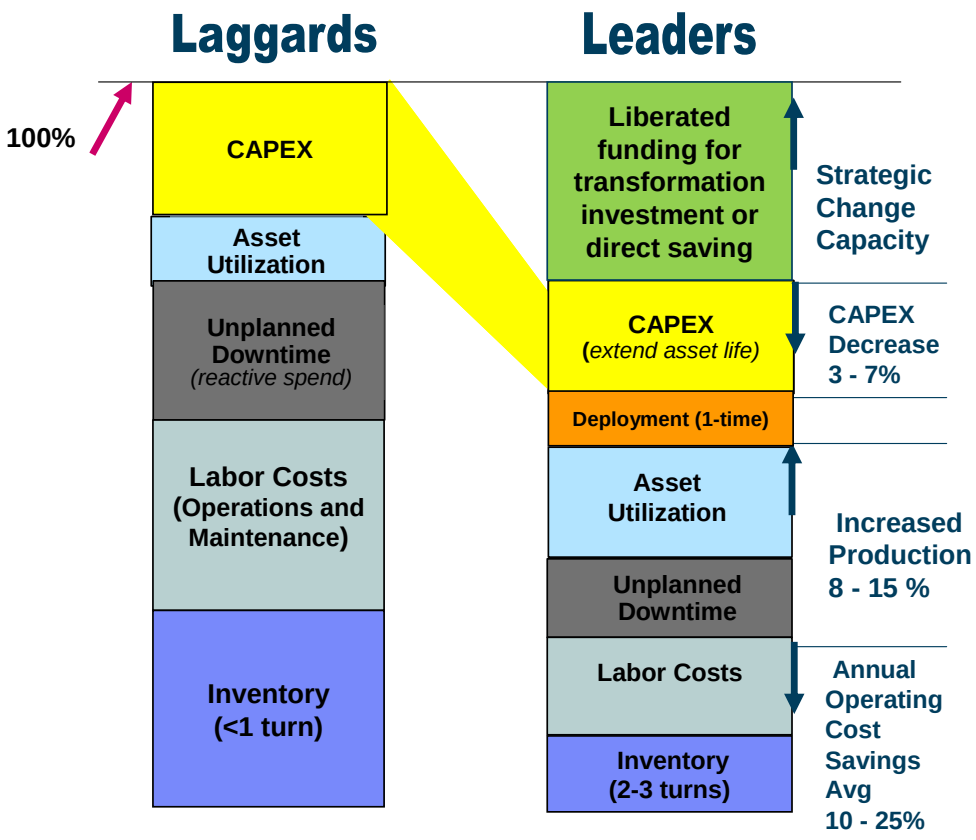
Key business performance drivers

- **Capex productivity**
  - **Asset Lifetime and performance**
  - **Tenancy (Ex: In Buildings, Mobile Tower Sharing)**

- **Opex productivity**
  - **Energy and fuel**
  - **Labor**
  - **Spares and inventory**

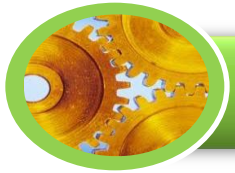


IBM PoV - Impact on capital-intensive businesses



Where can IBM help?

Smart Physical Infrastructure Applies Across Industries



Manufacturing

- Plants and production lines
- Warehouses

Transportation

- Roads, bridges, vehicles
- Rails, trains
- Airports, aircraft

Energy

- Transmission and distribution networks
- Power plants
- Drilling platforms and wells
- Refineries

Buildings

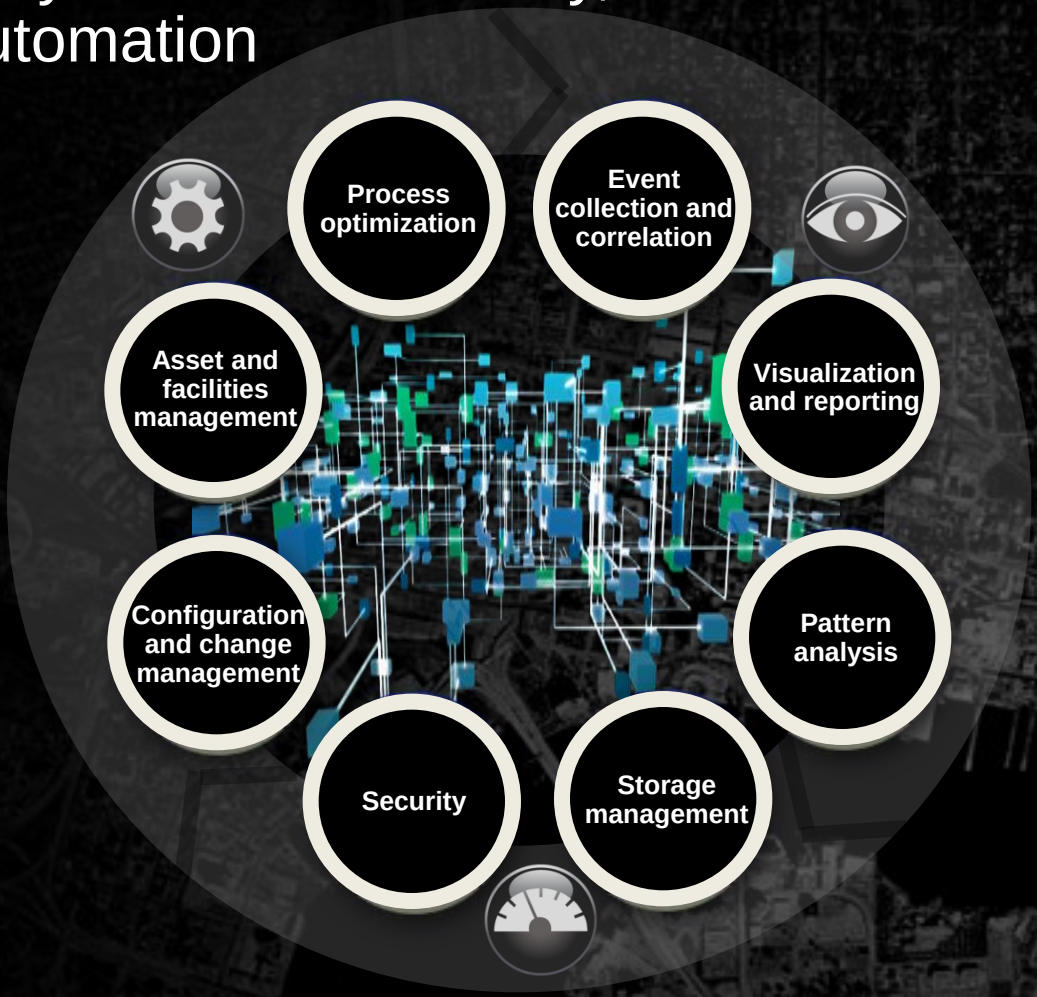
- Commercial offices
- Government buildings
- Schools and college campuses
- Hospitals

Water

- Wells and dams
- Treatment plants
- Pipes and valves

How do we Help?

Real-time, analytics-based visibility, control and automation



Decisions based on fact & insight.

In India, IBM is engaged with clients to build

- Smarter Buildings
- Smarter Telecom Infrastructures
- Smarter Supply Chain
- Smarter Transmission Grids
- Smarter Cities
- ……

What does it mean to be a Smarter Building?

The interconnection of physical assets and information technology can optimize efficiency, production and consumption in many types of buildings.

Smarter Commercial Building

- Provides integrated facilities operations information for owners/operators in order to optimize energy usage and services based on tenant's needs.

Smarter Cell Tower

- Integration of active and passive management enables optimized operations to reduce truck rolls.

Smarter Data Center

- Integrated facilities and IT insight to energy efficiency of datacenter and the correlation of IT and facilities information.

Smarter Campus

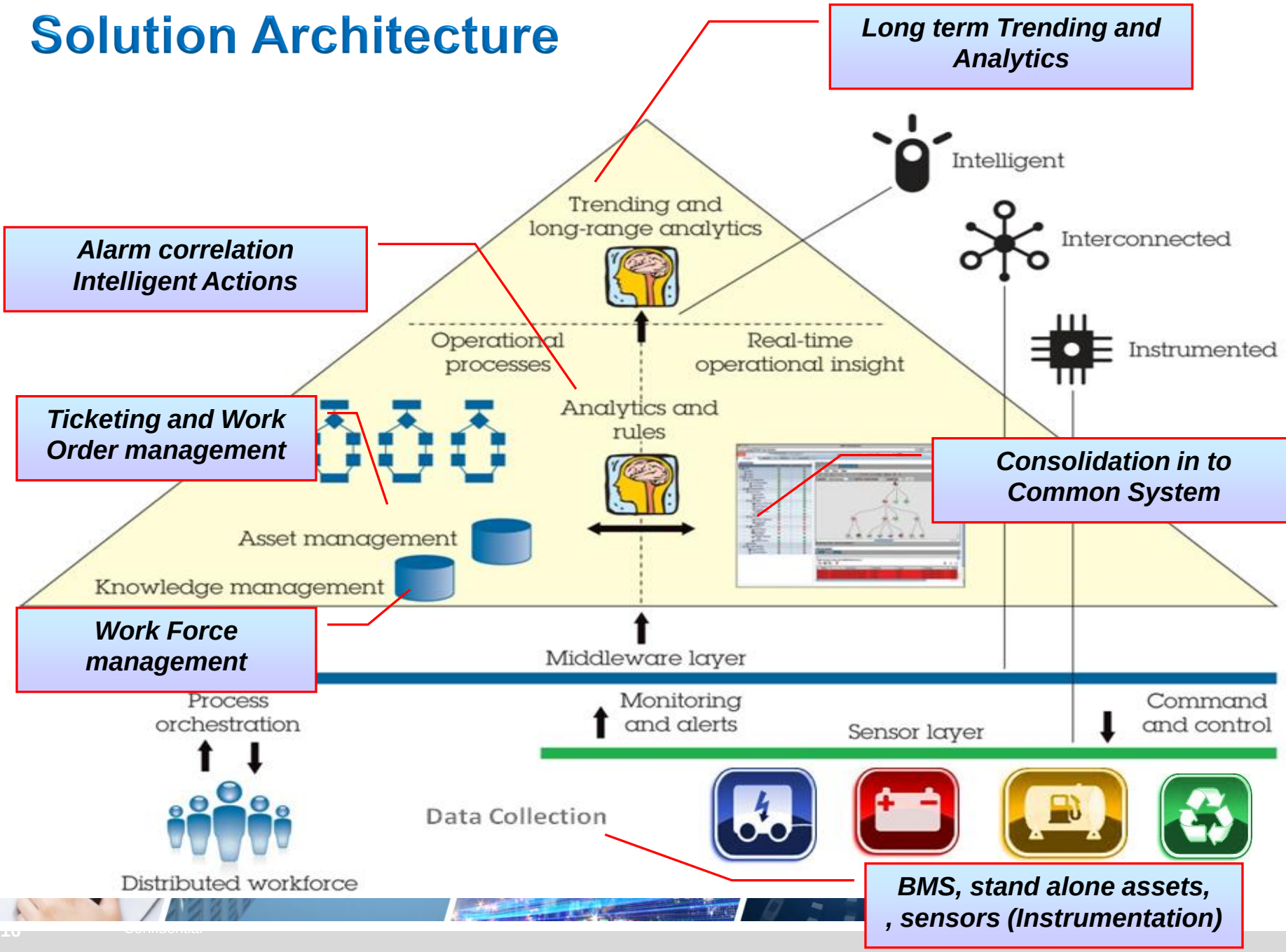
- Intelligent infrastructure platform and tools to manage plug-in electric vehicle stations, buildings, badging, central utility plant

Smarter Buildings

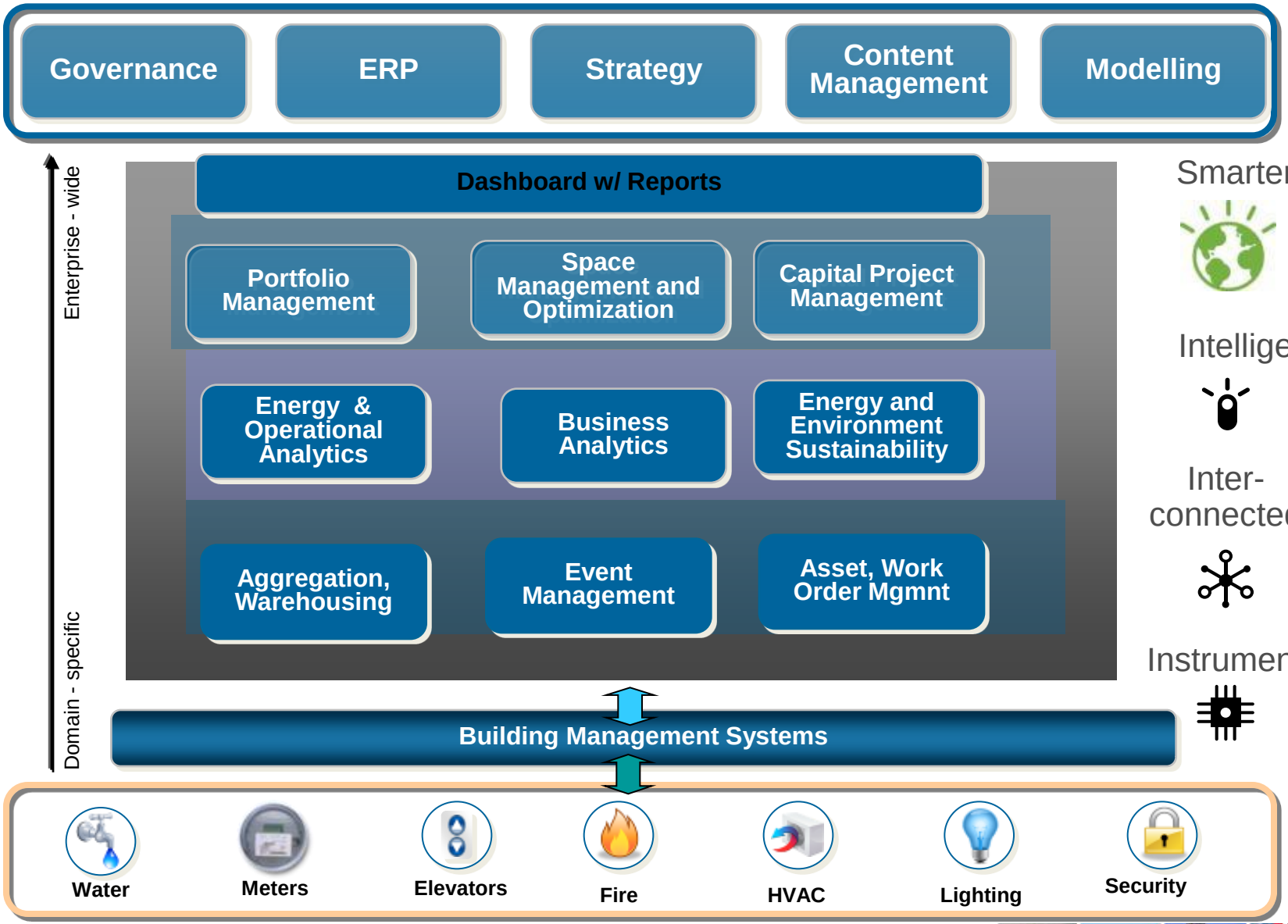
IBM TRIRIGA ENERGY OPTIMISATION

Business without **LIMITS 2012**

Solution Architecture



Architectural view of IBM's smart building Solution



Smarter buildings require continuous improvement

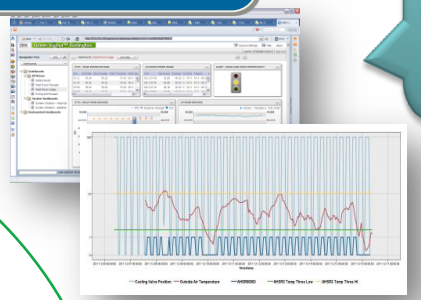
Instrumentation

Historical Data

Complex, inter-related data sets provide new insights

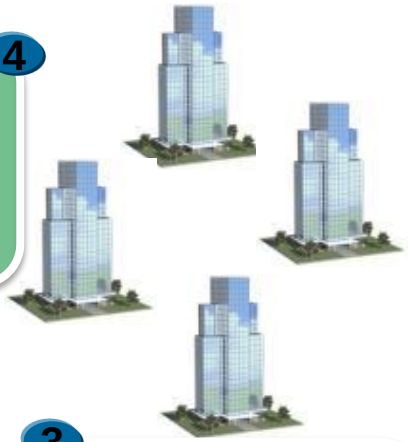
Enables collection of large data sets

1 Collect Data



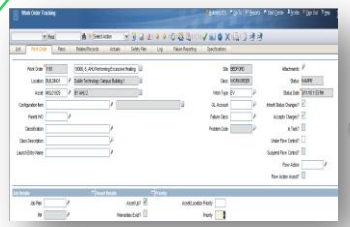
Reports

4 Monitor, Measure, Maintain Results



2 Analyze, Identify, Act

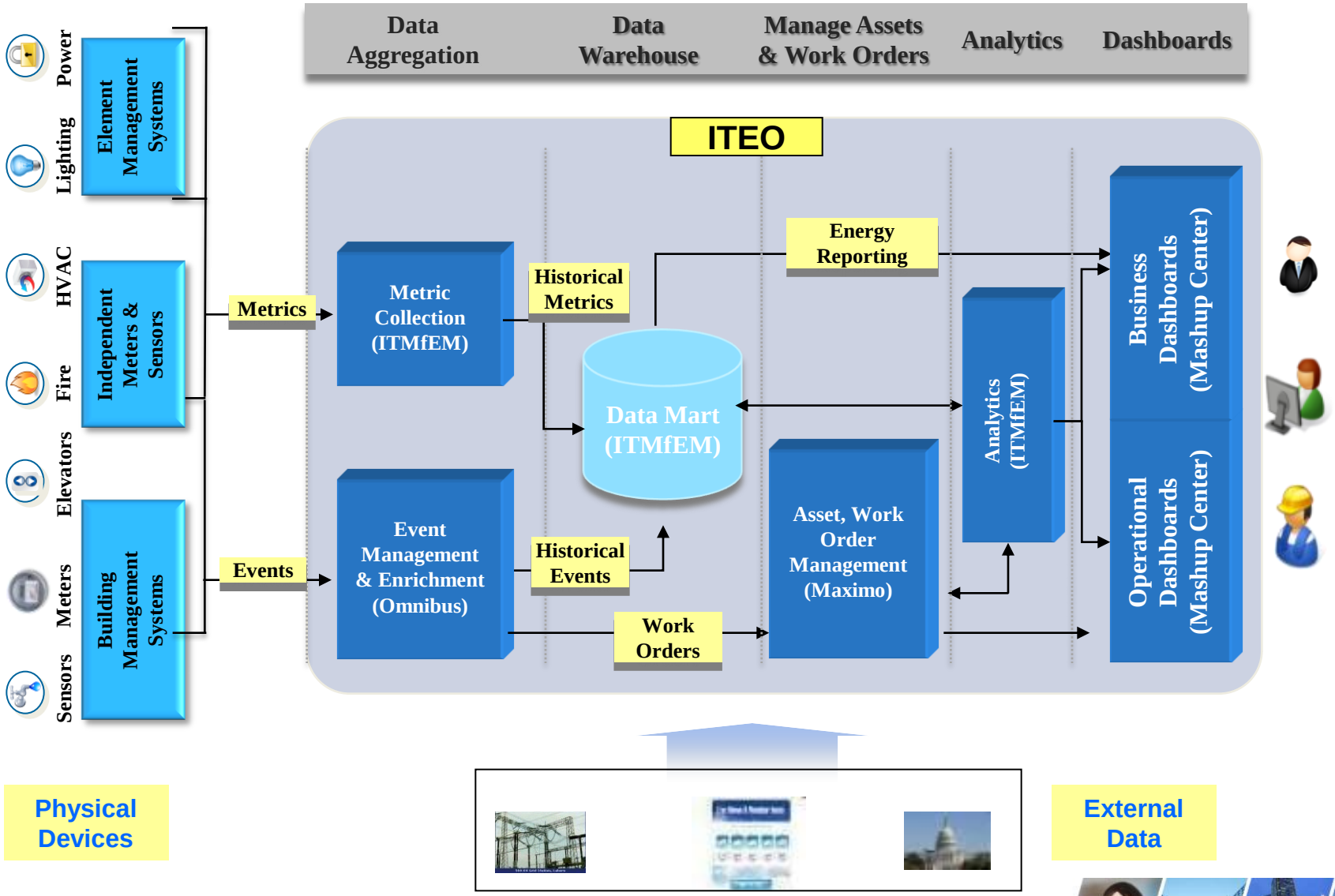
3 Apply Changes



Deliver and maintain best practice, efficiency and cost reduction

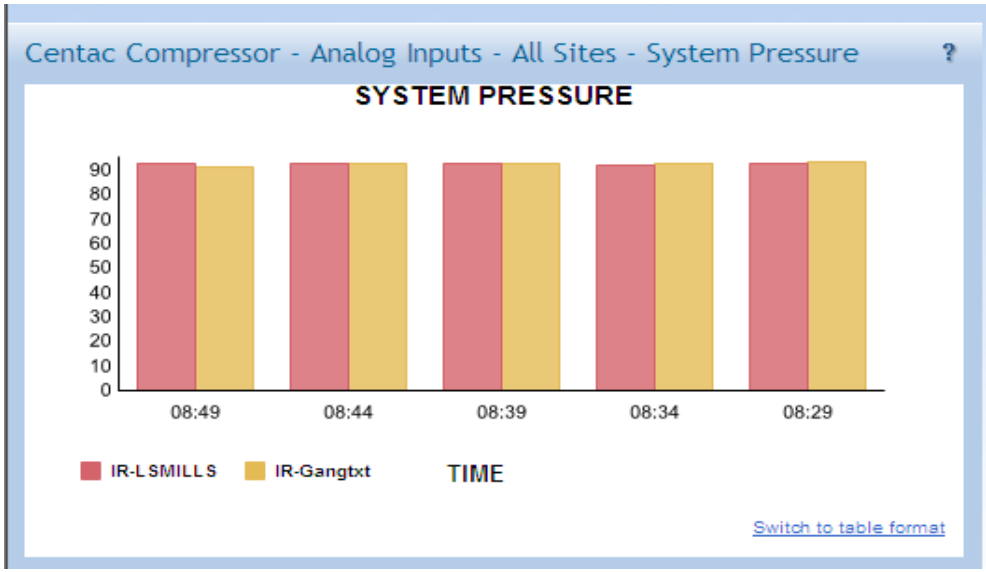
Transform current practices

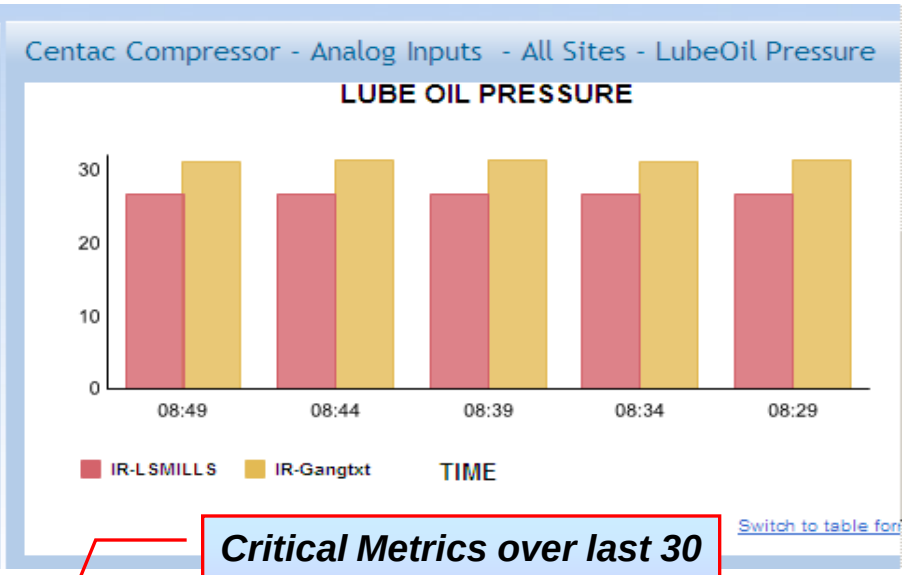
IBM Tririga Energy Operations Architecture



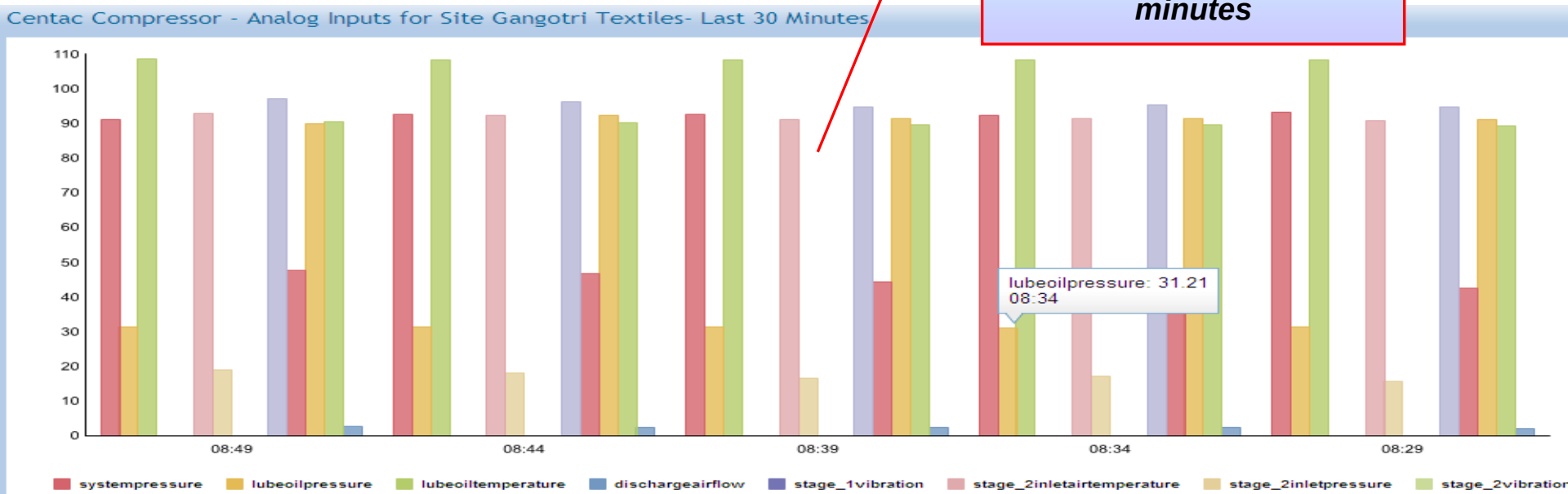
Real IBM Smarter Building (ITEO) implementations -

Widgets are Hosted within Lotus Mashup center to show real time data from the physical assets. Any Flash / HTML5 charting can be used. .

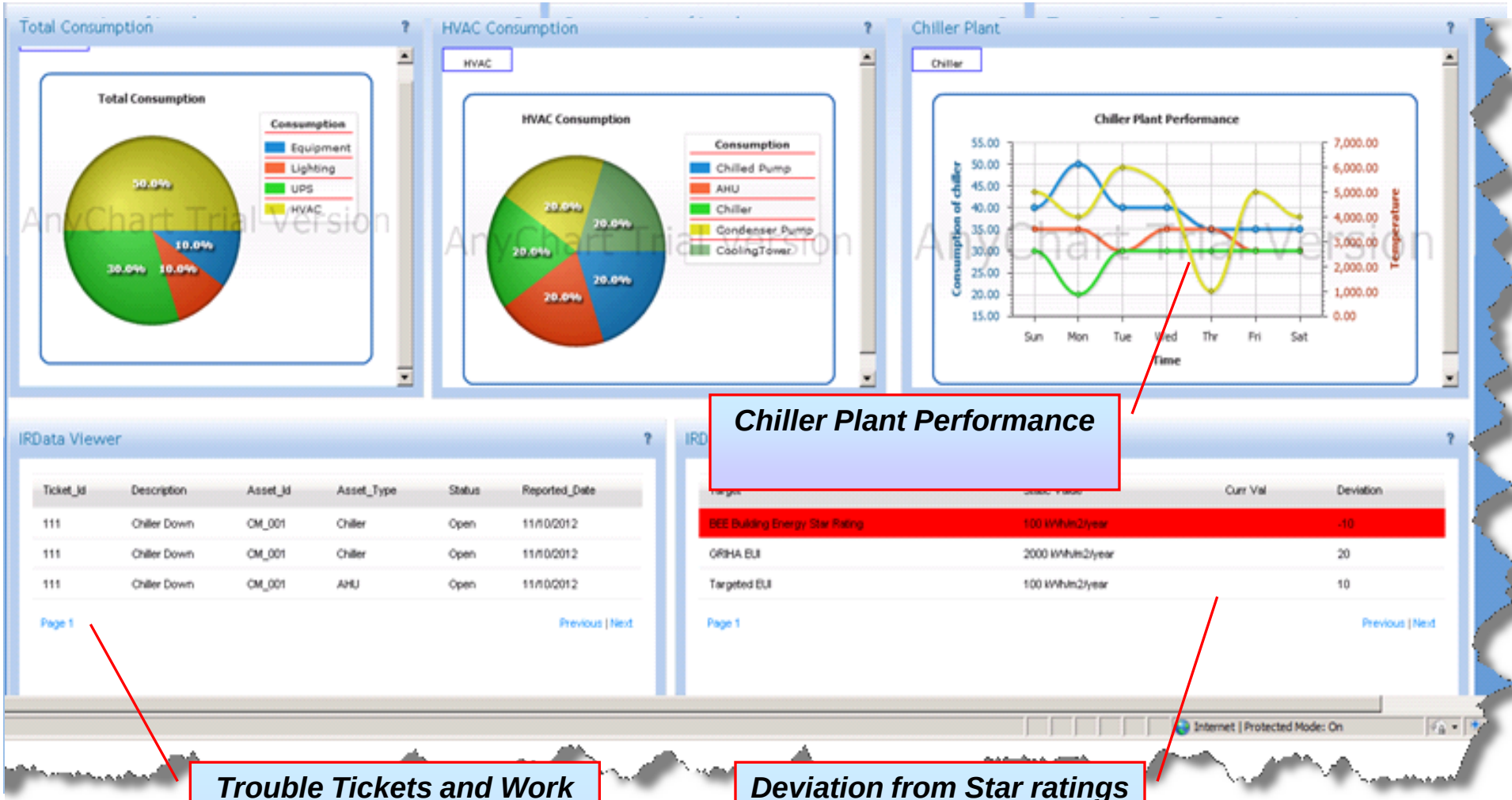




Critical Metrics over last 30 minutes



Interactive Charting hosted within LMC showing Building Health



Chiller Plant Performance

Trouble Tickets and Work Orders generated by the System or Manually

Deviation from Star ratings and Energy Benhcmarks

In built Analytics

Analytical Rules are shipped with the product nd are added with every release. With appropriate licensing, Clients can add new rules

- AH00001 - AHU simultaneously heating and cooling - Based on valve positions
- AH00003 - AHU cooling control alert - High building zone temp, rolling 2 hrs
- AH00004 - AHU heating control alert - Low building zone temp, rolling 2 hrs
- AH00005 - AHU temperature sensor drift detected
- AH00006 - AHU operating in override mode, rolling 2 hrs
- AH00007 - AHU operating outside of weekday office hour schedule, rolling 2 hrs
- AH00008 - AHU operating outside of weekend office hour schedule, rolling 2 hrs
- AH00009 - AHU excessive loading of variable frequency drives, rolling 2 hrs
- AH00013 - AHU cooling valve passing - Leakage detection, rolling 3 hrs
- AH00014 - AHU heating valve passing - Leakage detection, rolling 3 hrs
- AHSR00001 - AHU heating coil for multi-zone unit in operation where OAT > SAT
- AHSR00002 - AHU heating control alert - Heating valve open where OAT > supply air temp, rolling 2 hrs
- AHSR00003 - AHU cooling control alert - Cooling valve open where OAT < min threshold temp, rolling 4 hrs
- AHSR00004 - AHU cooling control alert - AHU cooling when in free cooling mode, rolling 2 hrs
- AHSR00005 - AHU economiser mode alert - Not in free cooling mode
- AHSR00006 - AHU economiser mode alert - Not in optimal mechanical cooling mode (With CO2 sensing)
- AHSR00007 - AHU economiser mode alert - Not in optimal mechanical cooling mode (Without CO2 sensing)
- CR00003 - Chiller low supply temperature
- CR00004 - Chiller cooling substance temperature delta
- CR00005 - Chiller efficiency
- CR00012 - Chiller cooling substance temperature setpoint comparison
- CRSR00001 - Chiller free cooling not being utilized
- HXSR00001 - Perimeter heater detected operational where OAT > min threshold temp
- ……

IBM smarter buildings case studies & benefits

Tulane University
Smart is: Collecting, managing and analyzing data from buildings to gain intelligence and insight to energy and facilities management for a significant projected energy savings.

IBM Real Estate Site Operations
Smart is: Consistently achieving energy cost reduction on equipment monitored of between 10-15% and reactive maintenance decreased by 16%

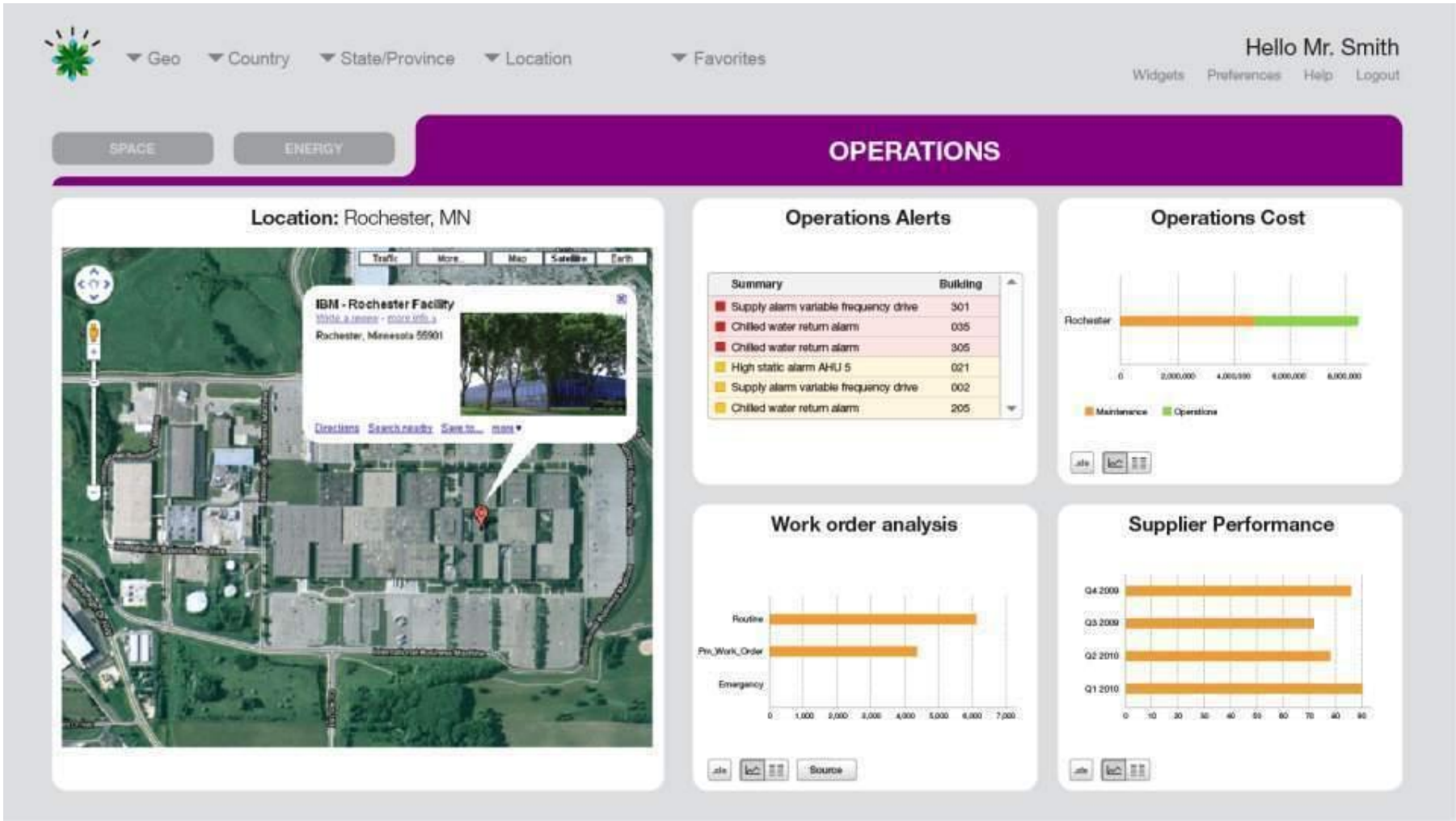
MOSWOS extended to Buildings!

Global 20 Company
Smart is: Improved operational processes and performance management resulting in reported real estate cost savings of $925 million within first four years.

IBM Rochester Campus

IBM Rochester, 3.3M sq ft multi-building mixed use light industrial campus. Facilities date to the 1950s. Consistently achieved year on year energy reductions of 5% to 7% over the last 10 years.

- Reactive maintenance decreased by 16%
- Hours per work order reduced by 34%
- Total number of work order hours decreased by 49%
- Energy cost reduction on equipment monitored of between 10-15%



IBM Smarter Building Rollout

As of YE 2011 we have over 100 buildings, 20M sq ft and 800+ AHUs being optimized by IBM Intelligent Building Management

2009

Dublin, Ireland

- *Legacy Mfg Plant*
- *Initial Green Sigma Rules Development*

Silicon Valley Lab, CA

- *Software Development*
- *Initial Test Location*

2010

Rochester, MN

- *3.2M SF Multi-Use Facility*
- *6th Largest IBM Energy Consumer*
- *Full Functionality Pilot*

Armonk, NY

- *Global Corp-orate HQ*
- *Smarter Building Showcase*

2011

Austin, TX
Boulder, CO
Fishkill, NY
Poughkeepsie, NY
Raleigh, NC
Southbury, CT
Yorktown, NY

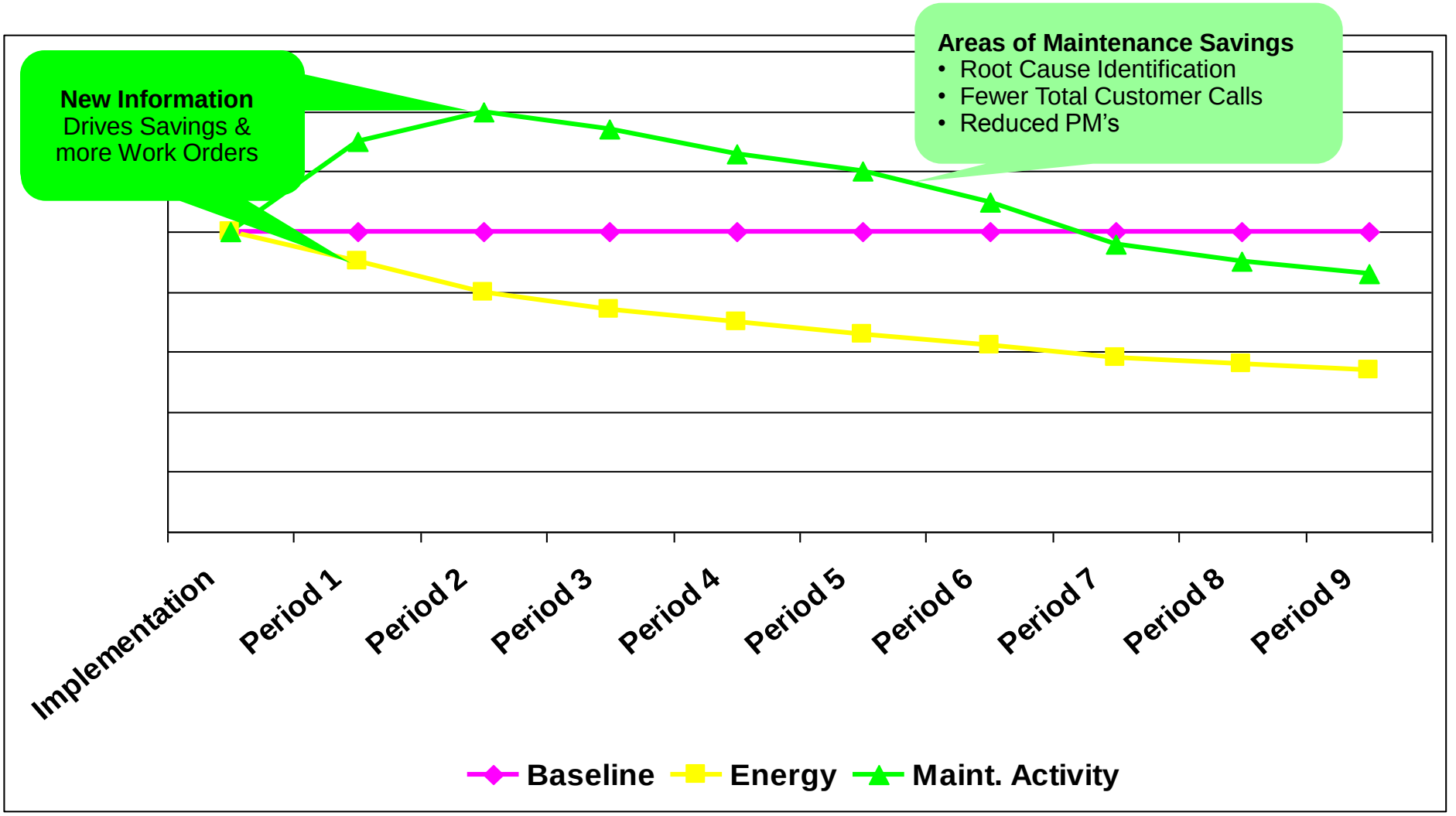
- *Deploy At Highest Energy Consuming Locations*

2012

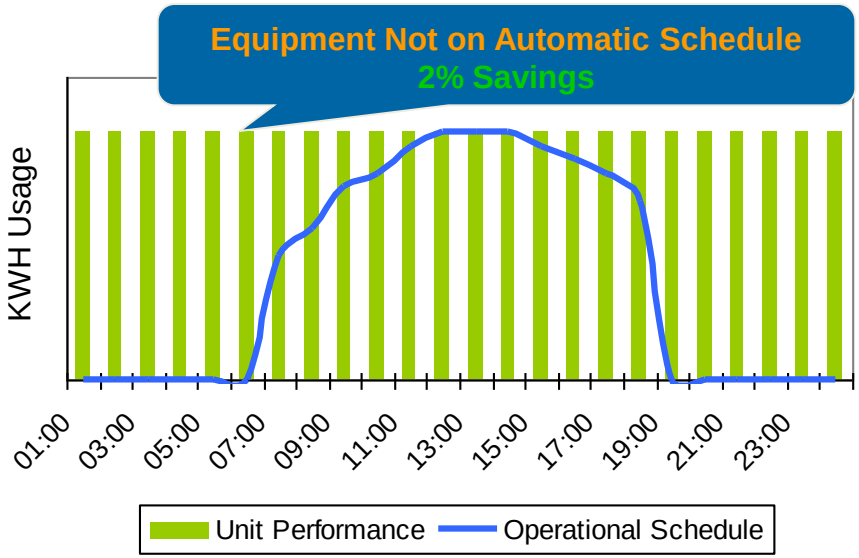
Makuhari, JP
Emb Golf Links, IN
Emb Manyata, IN
Ehningen, Ger
Montpellier, FR
Hursley, UK
Lennox Wood, UK
Portsmouth, UK
South Bank, UK
Hortolandia, BR
Bromont, QU
Burlington, VT
Columbus, OH
Gaithersburg, MD
Markham, ON
Sterling Forest, NY
Almaden, CA
Tucson, AZ

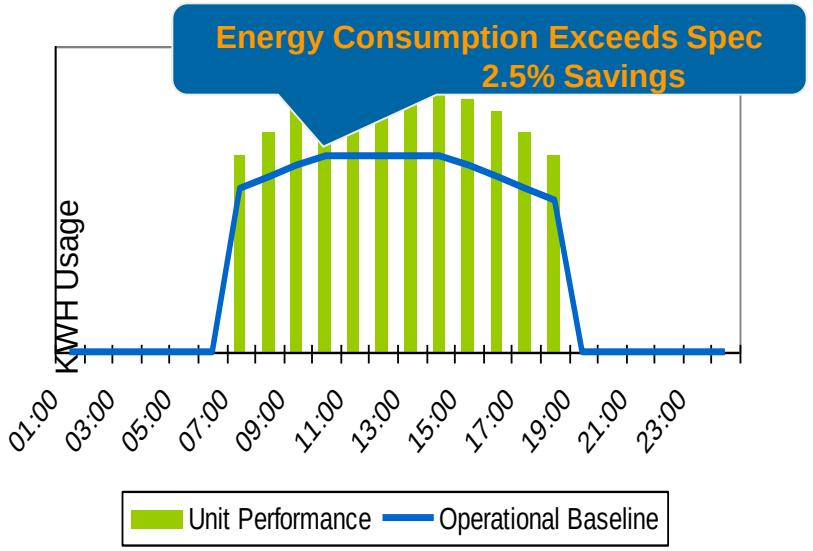
- *Deploy at High Energy Consuming Locations & across all geographies*

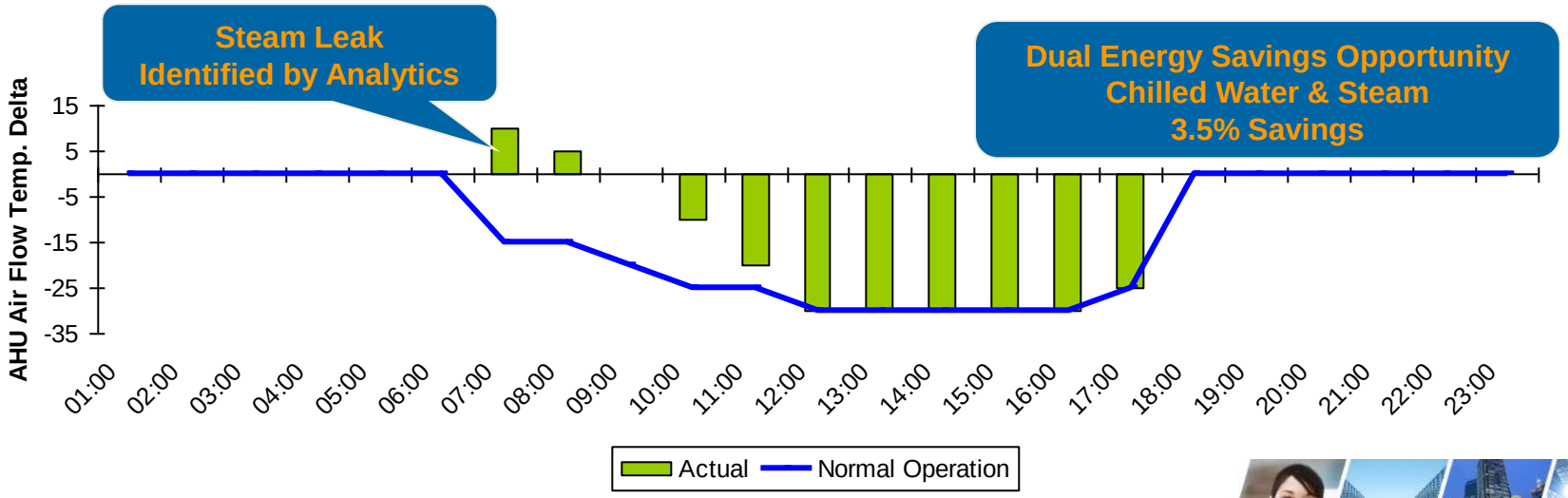
Work Order Related savings



IBM Energy Savings







How can we engage? – The ROI Tool is a good starter

Current Capabilities	
Energy Management	✔
Facilities Operations	✔
Emissions reductions	✔
Single and Multiple-similar building scenarios	✔
Investment Payback Period	✔

Sources of information used in building this tool

- **IBM Internal resources**
  - Case studies from IBM Rochester and IBM Armonk implementations
  - IBM RESO
  - IBM Center for Applied Insights
  - IBM Business Value Assessments (GBS)
  - IBM SWG (Tivoli Maximo + IIBM architects and product management)
  - IBM STG

- **External resources**
  - US Department of Energy
  - Environmental Protection Agency
  - LEED, BREEAM, EN ISO16001 standards
  - Lutron Electronics
  - Associated General Contractors of America

Acknowledgements, Disclaimers and Trademarks

The information contained in this publication is provided for informational purposes only. While efforts were made to verify the completeness and accuracy of the information contained in this publication, it is provided AS IS without warranty of any kind, express or implied. In addition, this information is based on IBM's current product plans and strategy, which are subject to change by IBM without notice. IBM shall not be responsible for any damages arising out of the use of, or otherwise related to, this publication or any other materials. Nothing contained in this publication is intended to, nor shall have the effect of, creating any warranties or representations from IBM or its suppliers or licensors, or altering the terms and conditions of the applicable license agreement governing the use of IBM software.

References in this publication to IBM products, programs or services do not imply that they will be made available in all countries in which IBM operates. Product release dates and/or capabilities referenced in this presentation may change at any time at IBM's sole discretion based on market opportunities or other factors, and are not intended to be a commitment to future product or feature availability in any way. Nothing contained in these materials is intended to, nor shall have the effect of, stating or implying that any activities undertaken by you will result in any specific sales, revenue growth, savings or other results. All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Information concerning non-IBM products and services was obtained from a supplier of those products and services. IBM has not tested these products or services and cannot confirm the accuracy of performance, compatibility, or any other claims related to non-IBM products and services. Questions on the capabilities of non-IBM products and services should be addressed to the supplier of those products and services.

All customer examples cited or described are presented as illustrations of the manner in which some customers have used IBM products and the results they may have achieved. Actual environmental costs and performance characteristics may vary by customer and will vary depending on individual customer configurations and conditions. Nothing contained in these materials is intended to, nor shall have the effect of, stating or implying that any activities undertaken by you will result in any specific sales, revenue growth or other results.

Prices are suggested U.S. list prices and are subject to change without notice. Starting price may not include a hard drive, operating system or other features. Contact your IBM representative or Business Partner for the most current pricing in your geography.