

## 2010 Regional Seminar Series Presents:

Using PI for Energy Monitoring and Facilities Management in World Class Data Centers



Enrique Herrera

Industry Market Development Manager

Microsoft Corporation

January 21, 2010

## What We Bring to the Table

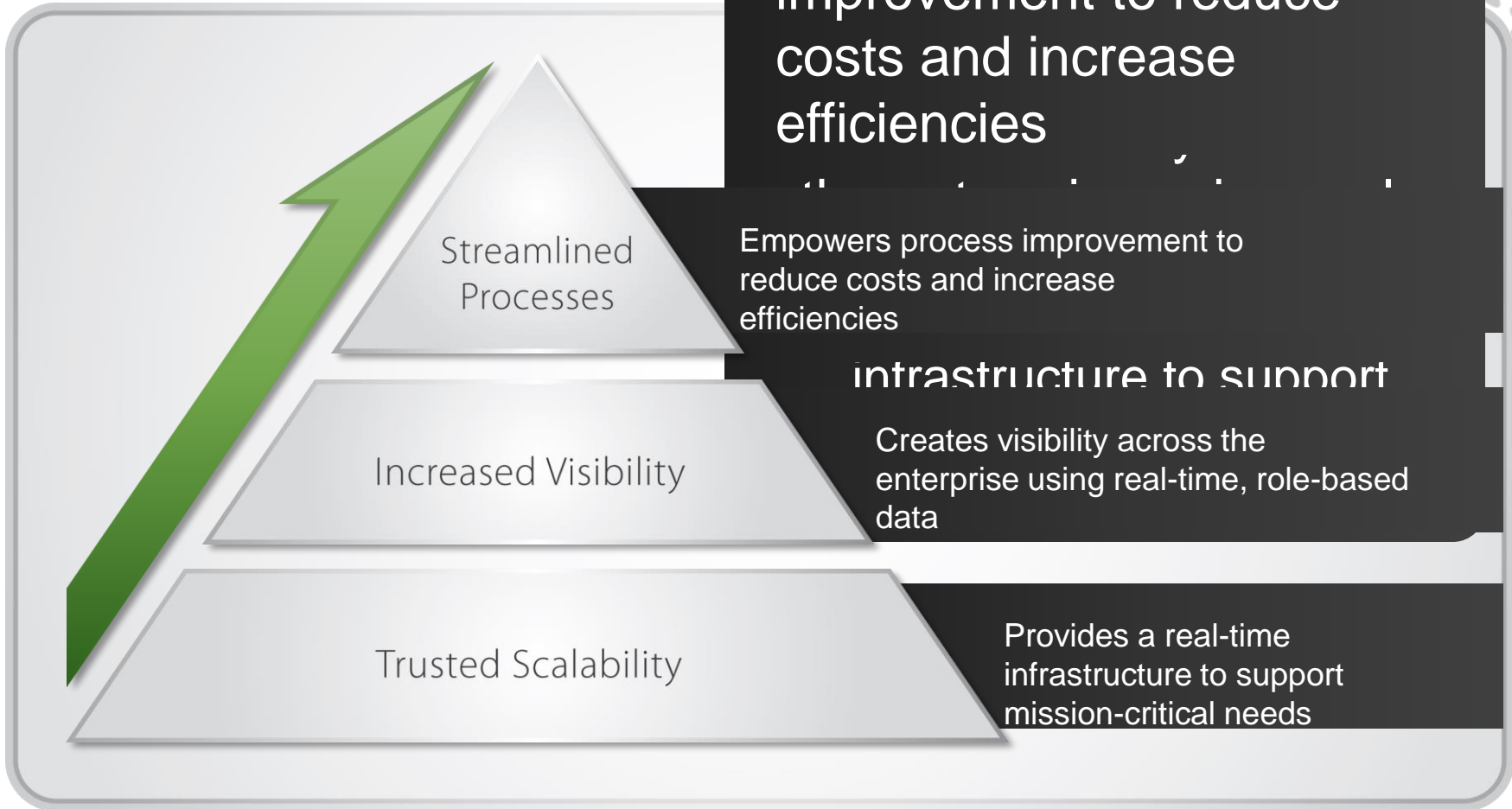


Provides operational visibility through real time data and event infrastructure.



Connects you with information to make informed business decisions via familiar tools.

# Our Vision

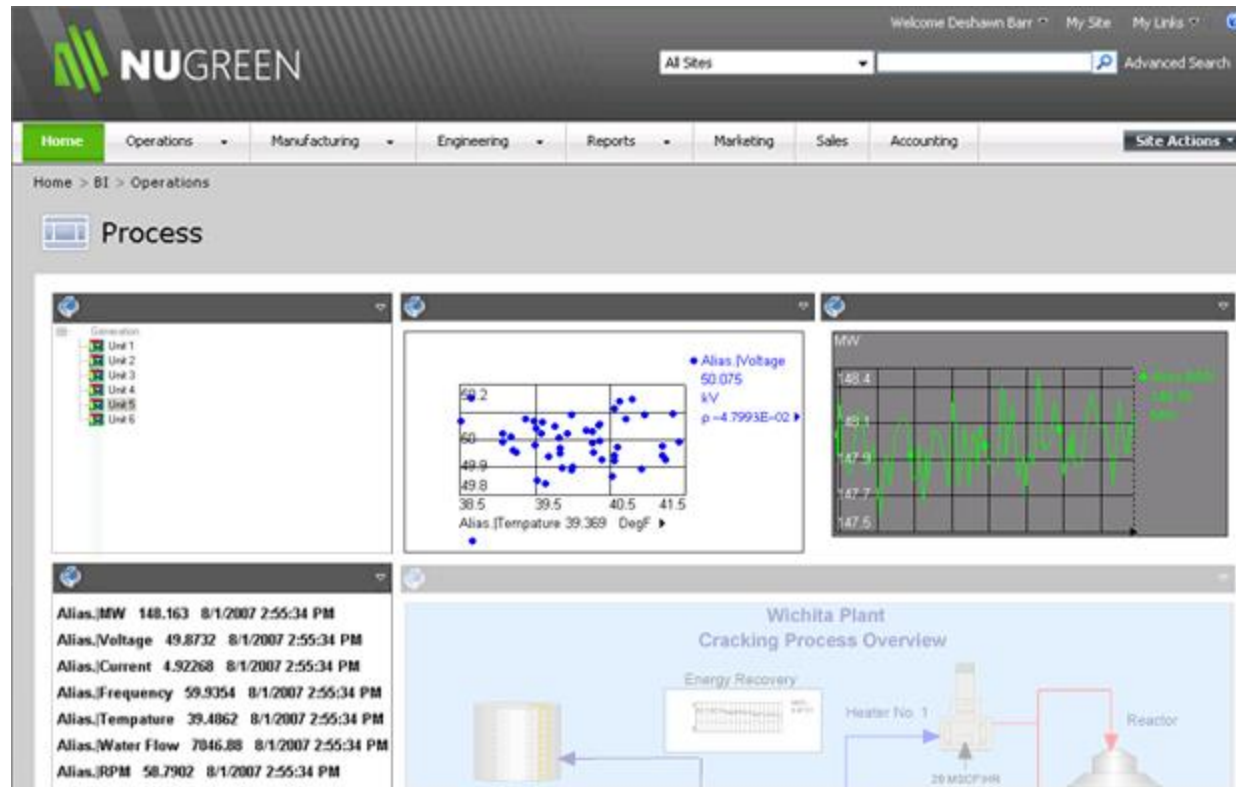


# Enterprise Technology Tools


- Platform for Integration and Collaboration
  - Microsoft Office SharePoint 2007 & 2010
  - RtWeb Parts (PI Infrastructure)
- Business Intelligence
  - Microsoft SQL Reporting Services, PerformancePoint
  - DataLink for Excel Services
  - Power Pivot
- Real-Time Notifications
  - Microsoft Unified Communications
  - PI Notifications

# ProcessBook Graphics

=> Real-time SharePoint Web Parts



# Technology Integration - MOSS Enterprise



Welcome John Smith | My Site | My Links | ?

Home
Operations
Manufacturing
Engineering
Reports
Marketing
Sales
Accounting
Site Actions

View All Site Content

Documents

News

Offices

Departments

Search

Help

Manufacturing

Engineering

Support Team

**Wichita Operations**

- Fred Smith
- Carol Berger

**Cracking Technology**

- Deshawn Barr
- Wilson Adams

**Production Logistics**

- Carrie Frederickson

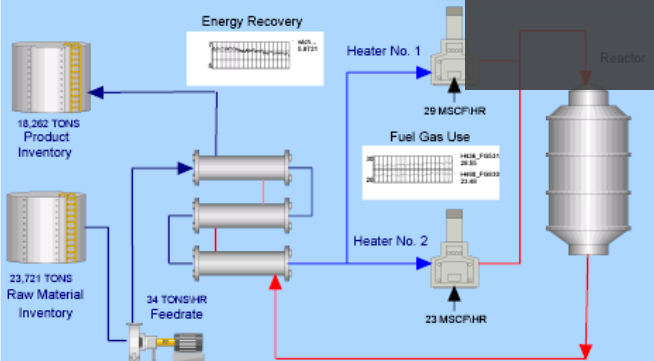
### Production Schedule Worksheet

Open | Update

### Cracking Production Schedule

	Current Inventories			Today's Performance				
	Raw Material	Product	Sales	Energy	Reliability	Quality		
	Tons	Days	Tons	Days	T/day	2%	95%	98%
<b>Houston</b>	30,141	35.9	9,353	7.8	1200	<span style="color: orange;">●</span> 0.5%	<span style="color: green;">●</span> 95.1%	<span style="color: green;">●</span> 97.4%
<b>Tucson</b>	30,166	47.1	8,136	8.1	1000	<span style="color: green;">●</span> 1.9%	<span style="color: green;">●</span> 96.0%	<span style="color: green;">●</span> 97.3%
<b>Wichita</b>	21,300	26.6	17,300	23.1	750	<span style="color: red;">●</span> -0.3%	<span style="color: orange;">●</span> 94.3%	<span style="color: orange;">●</span> 94.3%

### Wichita Plant Cracking Process Overview

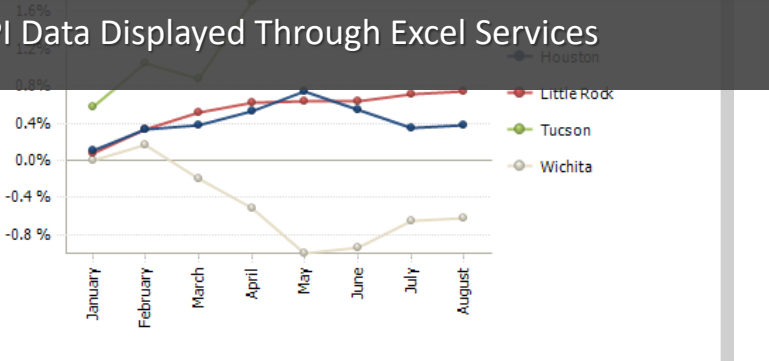


34 TONS/HR Feedrate

29 MSCF/HR Fuel Gas Use


23 MSCF/HR

### PI Data Displayed Through Excel Services



Month	Houston	Little Rock	Tucson	Wichita
January	0.0%	0.2%	0.4%	0.0%
February	0.1%	0.3%	0.4%	0.1%
March	0.2%	0.4%	0.4%	0.2%
April	0.3%	0.4%	0.4%	0.3%
May	0.4%	0.4%	0.4%	0.4%
June	0.3%	0.4%	0.4%	0.3%
July	0.4%	0.4%	0.4%	0.4%
August	0.4%	0.4%	0.4%	0.4%

# Technology Integration - Business Intelligence



Welcome John Smith | My Site | My Links | ?

Home
Operations
Manufacturing
Engineering
Reports
Marketing
Sales
Accounting
Site Actions

View All Site Content

- Documents
- News
- Offices
- Departments
- Search
- Help
- Manufacturing
- Engineering
- Support Team
  - Wichita Operations
    - Fred Smith
    - Carol Berger
  - Cracking Technology
    - Deshawn Barr
    - Wilson Adams
  - Production Logistics
    - Carrie Frederickson

### Operations Performance Scorecard

	Houston				Little Rock			
	To Date	Today	Target	Trend	To Date	Today	Target	Trend
Safety	0	0	●	→	0	0	●	→
Environment	97.1	97.0	●	↗	99.0	98.6	●	↗
Energy Savings	0.4%	0.4%	▲	→	0.5%	0.7%	▲	→
Quality	97.6	97.9	●	↗	97.3	97.6	●	↗
Reliability	95.7	96.4	●	→	95.6	96.3	●	→

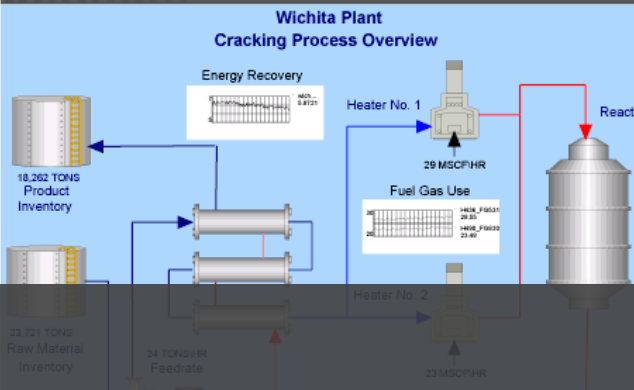
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Open | Update

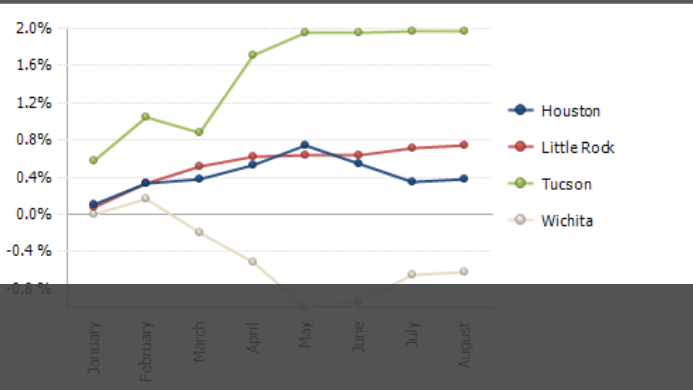
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Wichita	21,300	26.6	17,300	23.1	750	● -0.3%	● 94.3%	● 94.3%

### Process Overview



### Energy Savings by Time



Microsoft SharePoint Server is the foundation

7

Empowering Business in Real Time.

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OSIsoft\_PI\_PowerPivot\_Demo - 2.xlsx - PowerPivot

Refresh Data Sources  
This method will refresh the data source.

Manual Calculate  
PivotTable Switch to Workbook View

[Hour]      fx =hour([timestamp])

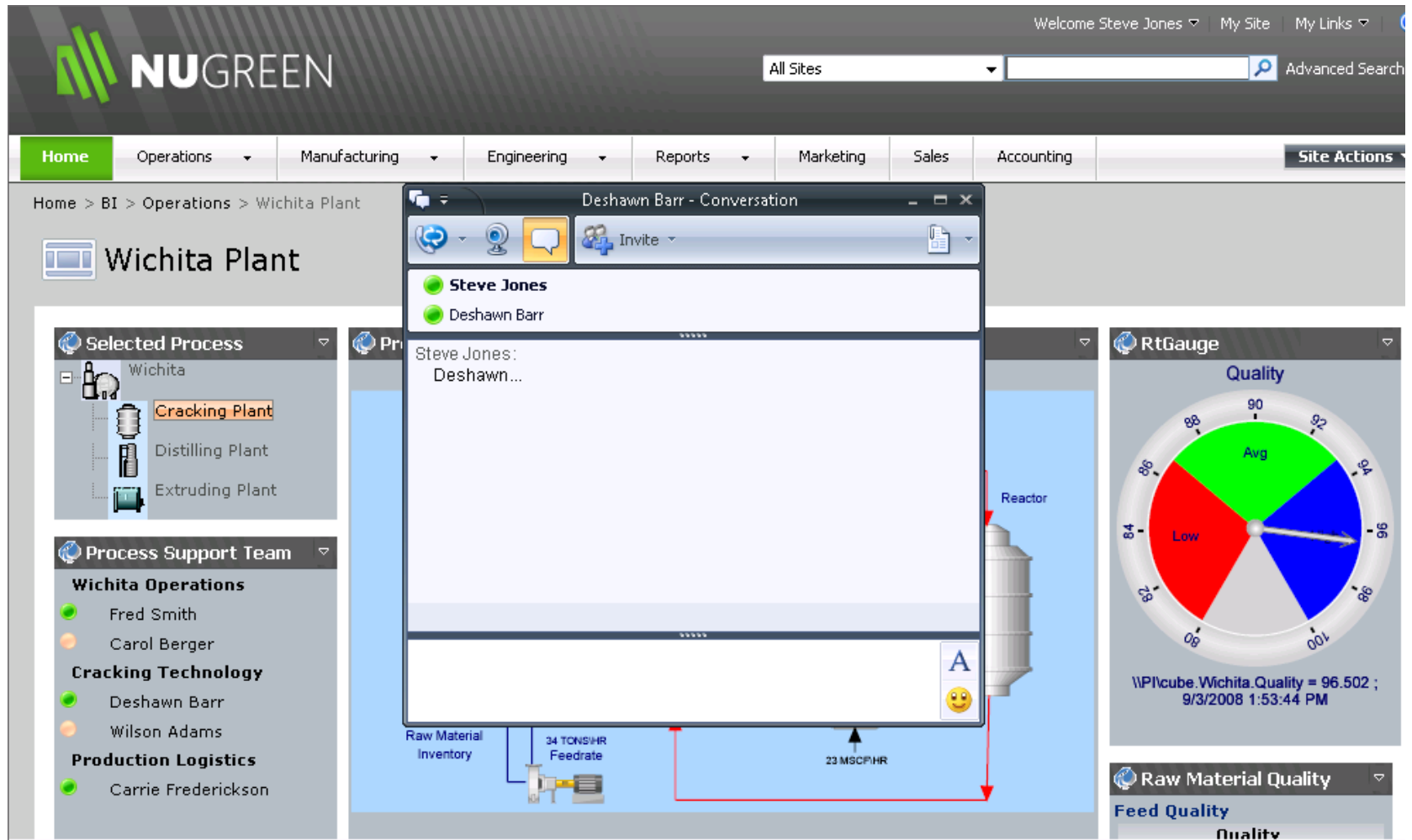
EquipmentName	Timestamp	Power	ElectricRate	Date	Hour
F-560	5/3/07 7:00	9.8	0.02117	5/3/2007	
F-560	5/11/08 22:00	9.80001	0.02347	5/11/2008	
F-560	5/1/08 0:00	9.80001	0.02347	5/1/2008	
F-560	6/26/09 1:00	9.80007	0.02577	6/26/2009	
F-560	2/17/07 4:00	9.80009	0.02117	2/17/2007	
F-560	12/19/07 14:00	9.8001	0.02117	12/19/2007	
F-560	2/28/08 4:00	9.80017	0.02347	2/28/2008	
F-560	10/18/09 2:00	9.8002	0.02577	10/18/2009	
F-560	12/8/07 7:00	9.80021	0.02117	12/8/2007	
F-560	12/27/08 14:00	9.80021	0.02347	12/27/2008	
F-560	7/21/09 8:00	9.80023	0.02577	7/21/2009	
F-560	7/1/07 22:00	9.80024	0.02117	7/1/2007	
F-560	4/10/07 14:00	9.80026	0.02117	4/10/2007	
F-560	11/10/09 0:00	9.80029	0.02347	11/10/2009	

Time\_Hour | Time\_Date | Equipment | EquipmentPower

Record: 9 of 1,681,920



# Technology Integration - Communications Server



The screenshot displays the NUGREEN software interface for the Wichita Plant. The top navigation bar includes 'Home', 'Operations', 'Manufacturing', 'Engineering', 'Reports', 'Marketing', 'Sales', 'Accounting', and 'Site Actions'. A user profile for Steve Jones is visible in the top right.

The main dashboard is divided into several sections:

- Selected Process:** A tree view showing 'Wichita' with sub-items 'Cracking Plant', 'Distilling Plant', and 'Extruding Plant'.
- Process Support Team:** A list of team members categorized by function:
  - Wichita Operations:** Fred Smith, Carol Berger
  - Cracking Technology:** Deshawn Barr, Wilson Adams
  - Production Logistics:** Carrie Frederickson
- Process Diagram:** A central area showing a 'Reactor' with associated 'Raw Material Inventory' and 'Feedrate' (34 TONS/HR) and 'MSP/HR' (23 MSP/HR) data points.
- RtGauge Quality:** A circular gauge showing quality levels: 'Low' (red), 'Avg' (green), and 'High' (blue). The needle points to approximately 96. Below the gauge, it reads: 'WPI/cube.Wichita.Quality = 96.502 ; 9/3/2008 1:53:44 PM'.
- Raw Material Quality:** A section for 'Feed Quality' and 'Quality'.

Overlaid on the center is a 'Deshawn Barr - Conversation' window. It shows a chat interface with participants Steve Jones and Deshawn Barr. The chat history shows a message from Steve Jones to Deshawn Barr. The window includes an 'Invite' button and a text input field.

## Value Now Scenario: Condition Based Maintenance



**“Instead of operating in a ‘run to failure’ mode, we’ve succeeded in capturing system knowledge in intelligent systems that allow us to identify problematic equipment before a failure.”**

# With Democratization of Data People Get the Right Information

Process Engineer



Plant Manager



Information Worker



Vice President



Partner



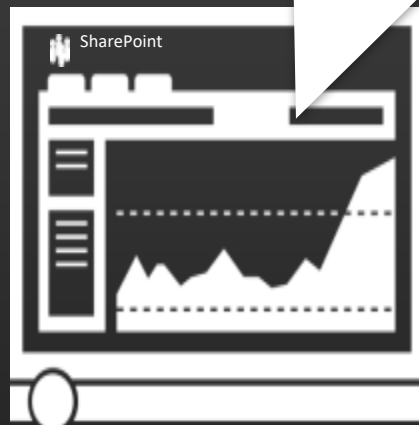
# Condition Based Maintenance

Process Engineer




# Condition Based Maintenance

SEARCH Compressor Issue



## SharePoint Search Results

-  \_\_\_\_\_
-  \_\_\_\_\_
-  \_\_\_\_\_
-  \_\_\_\_\_
-  \_\_\_\_\_

# Condition Based Maintenance:

## SharePoint Search Results

-  \_\_\_\_\_
-  \_\_\_\_\_
-  \_\_\_\_\_
-  \_\_\_\_\_
-  \_\_\_\_\_

## Office Communicator

**Process engineer:**  
My compressor is acting up...

**Regional Manager:** We're aware.  
Replace the bearings, here are details: [link](#)

-  
-  

# Condition Based Maintenance:

## SharePoint Search Results



=====  
=====



=====  
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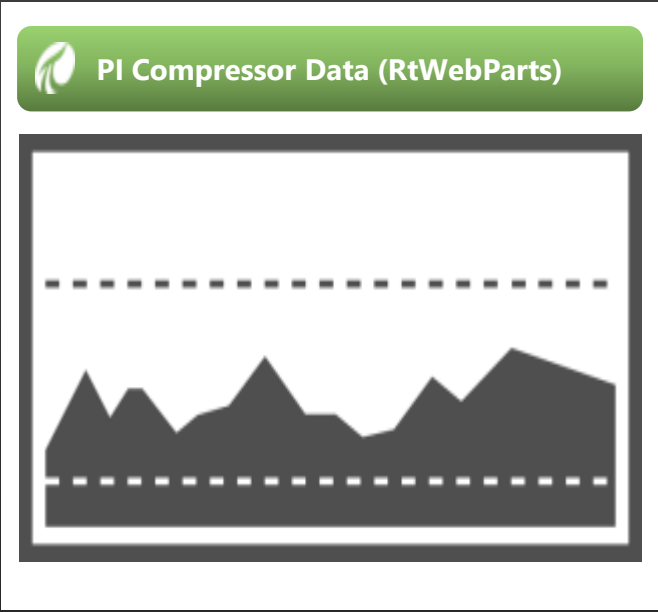
## Compressor Performance History

Compressor 1			Compressor 2	
===== =====	===== =====	===== =====		
===== =====	===== =====	===== =====		
===== =====	===== =====	===== =====		

# Condition Based Maintenance:

## SharePoint Search Results

-  \_\_\_\_\_
-  \_\_\_\_\_
-  \_\_\_\_\_
-  \_\_\_\_\_
-  \_\_\_\_\_





# Condition Based Maintenance:

## SharePoint Search Results

SharePoint search results interface showing a list of items with icons and text placeholders.

- Item 1: Person icon, text placeholder
- Item 2: Document icon, text placeholder
- Item 3: Water icon, text placeholder
- Item 4: SAP logo, text placeholder
- Item 5: Group of people icon, text placeholder

### SAP Work Order Form

X

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Compressor Bearing

SUBMIT

# Condition Based Maintenance:

## SharePoint Search Results

-  \_\_\_\_\_  
\_\_\_\_\_
-  \_\_\_\_\_  
\_\_\_\_\_
-  \_\_\_\_\_  
\_\_\_\_\_
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-  \_\_\_\_\_  
\_\_\_\_\_

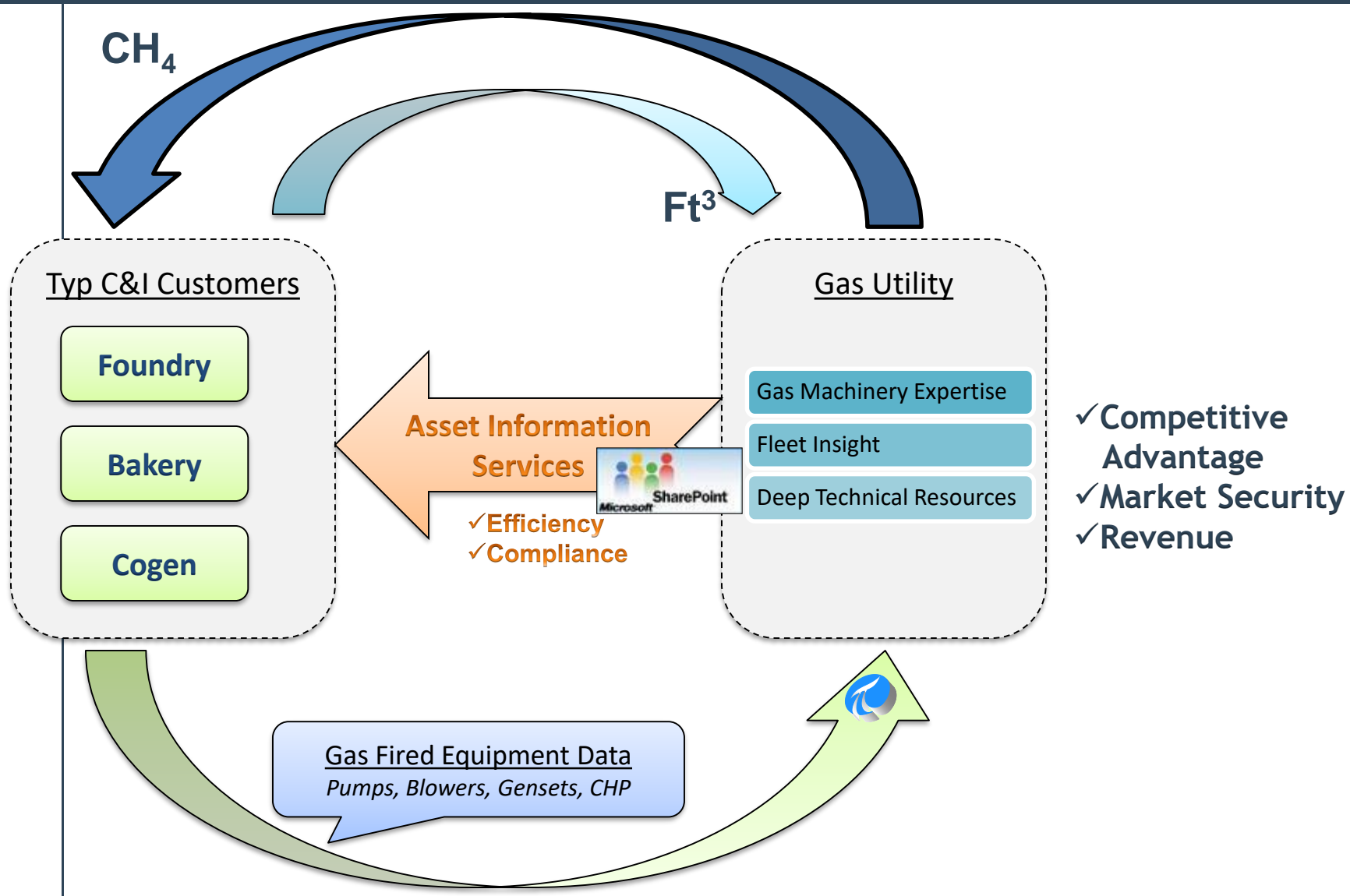
## SharePoint Wiki Post

3/31/2009

### Known Compressor Issue

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_





*“We expect to see the solution support a 5 percent increase in our revenues. Given the more than billion-dollar size of our market, that could be a substantial revenue increase.”*

Terry Burleson, Vice President,  
Downstream Energy Services, Nalco



## Process services firm aims to significantly boost profits for its customers

### *Customer Business Challenge*

- Nalco used a manual and time-consuming data collection process at customer sites
- It wanted a real-time, automated solution
- Its goal: better customer support, satisfaction, and loyalty

### *Solution*

- To integrate the OSIsoft PI enterprise infrastructure with the Microsoft® application platform and its own systems
- Solution can securely upload customer data over the Internet for detailed analysis and reporting.

### *Customer Results/Benefits*

- Cuts time-to-market in half, provides new capabilities
- Contributes to double-digit revenue growth
- Meets customer needs better, faster

# Cloud Computing: A History

- The Internet
- On premise hardware and software no longer needed
- On demand, subscription based



*"The future is about having a platform in the cloud and delivering applications across PCs, phones, TVs, and other devices at work and in the home."*

**Microsoft CEO  
Steve Ballmer**

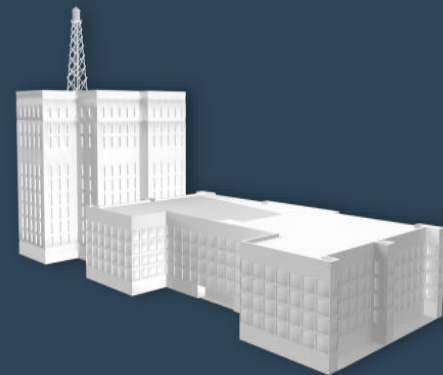
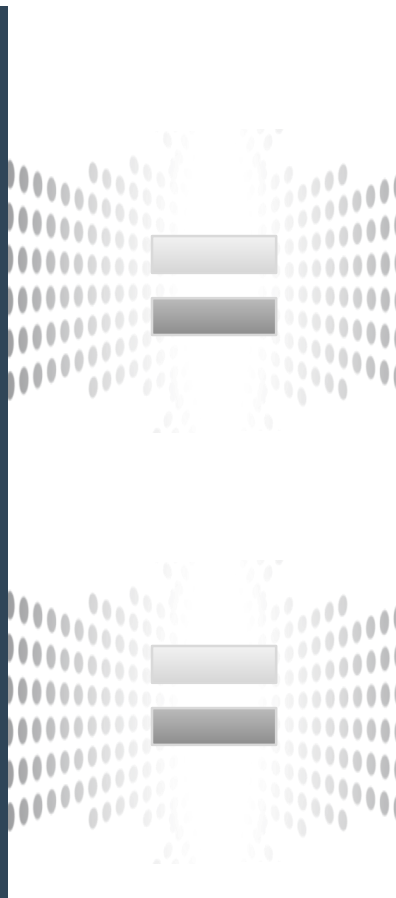
# The Data Center is a 21<sup>st</sup> Century Plant



**Plants & Operational Facilities**

**Complex Processes**

- Pulp & Paper
- Oil & Gas
- Pharmaceuticals
- Power

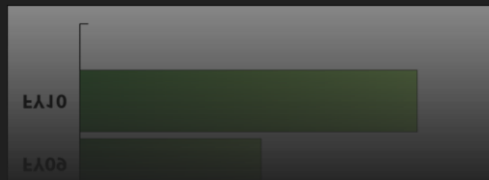
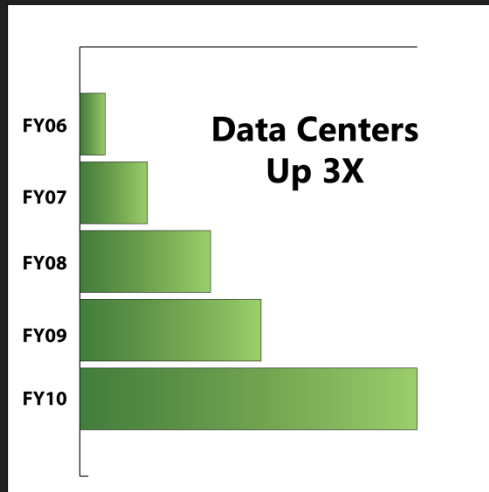


**Data Center**

**Complex Processes**

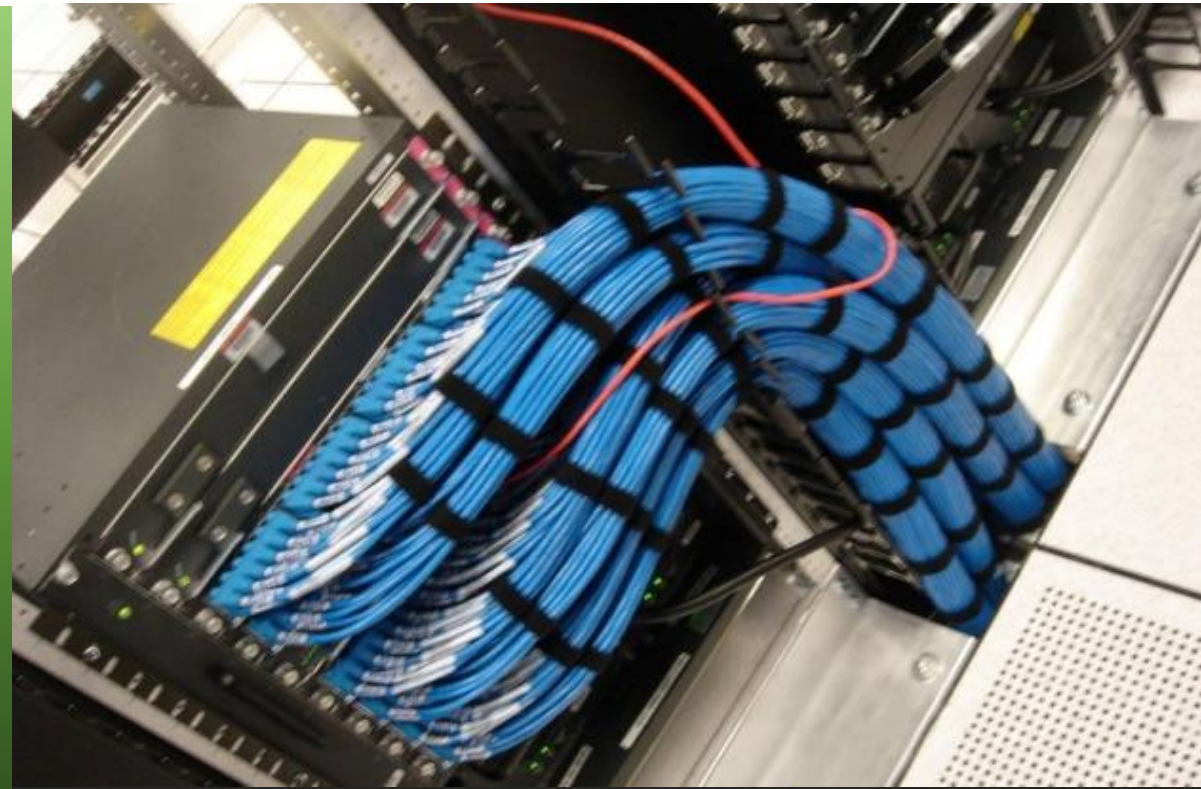
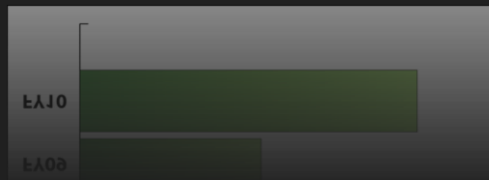
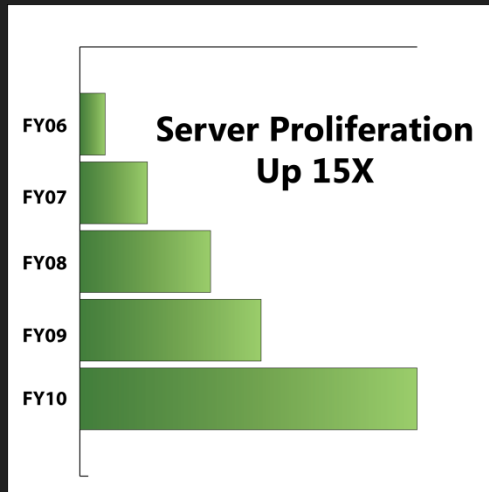
- Bits and Bytes
- Data
- Information
- Power

# Keeping up with Demand



*New Microsoft Data Centers will consume **50% less energy** for the same level of output as ones built **just 3 years ago**.*

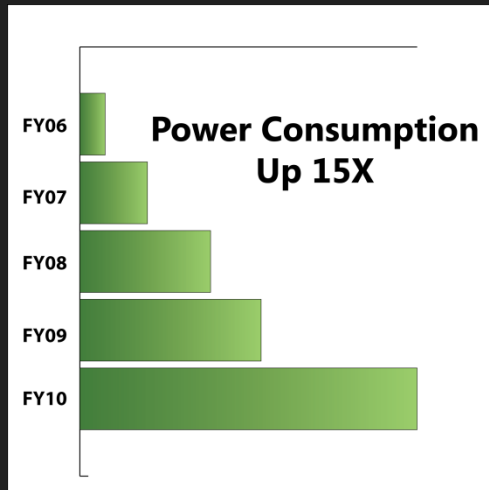
# Server Proliferation



*Microsoft has over **150,000 servers** running in our Data Centers.*

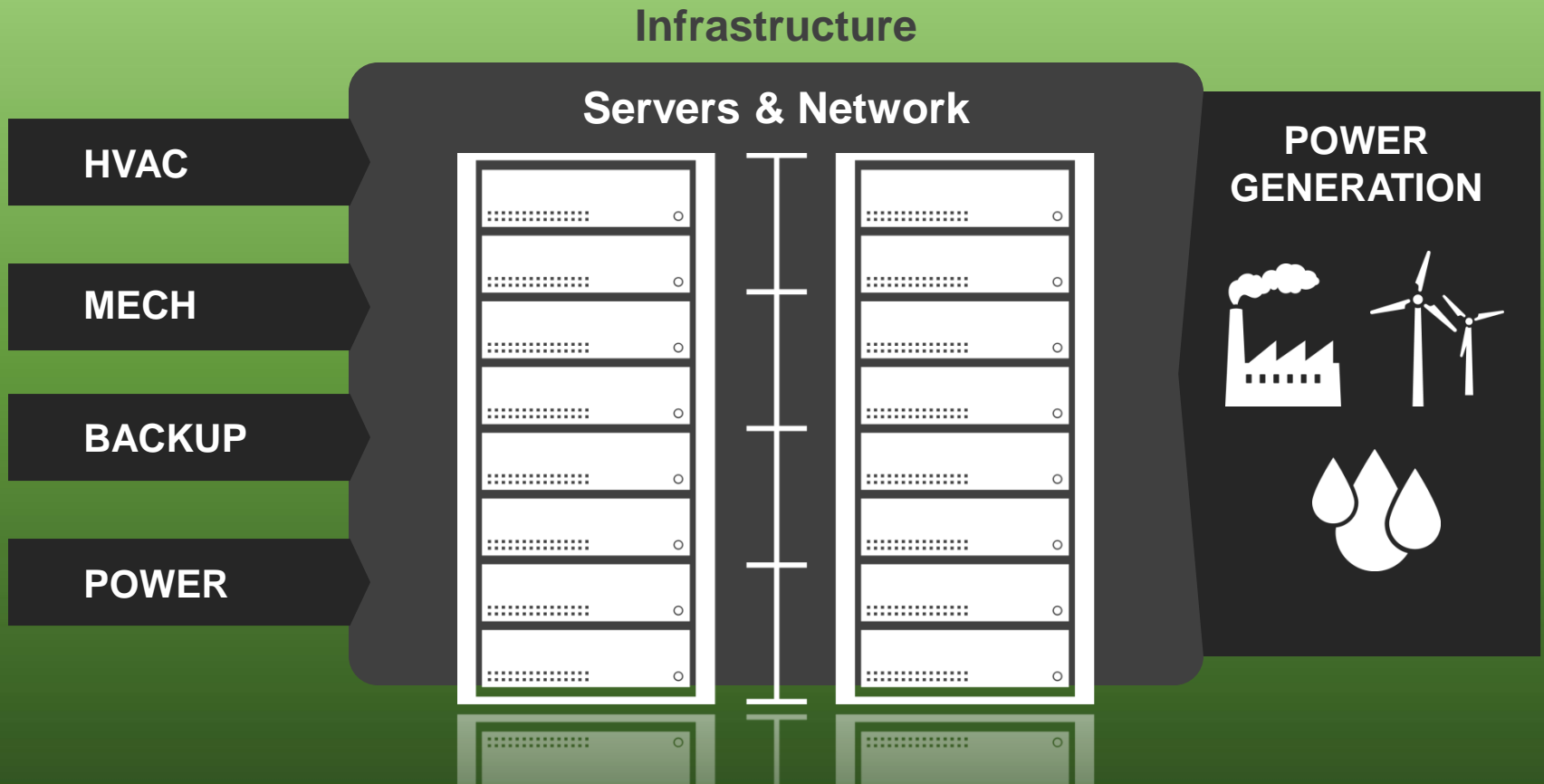


# Power Consumption



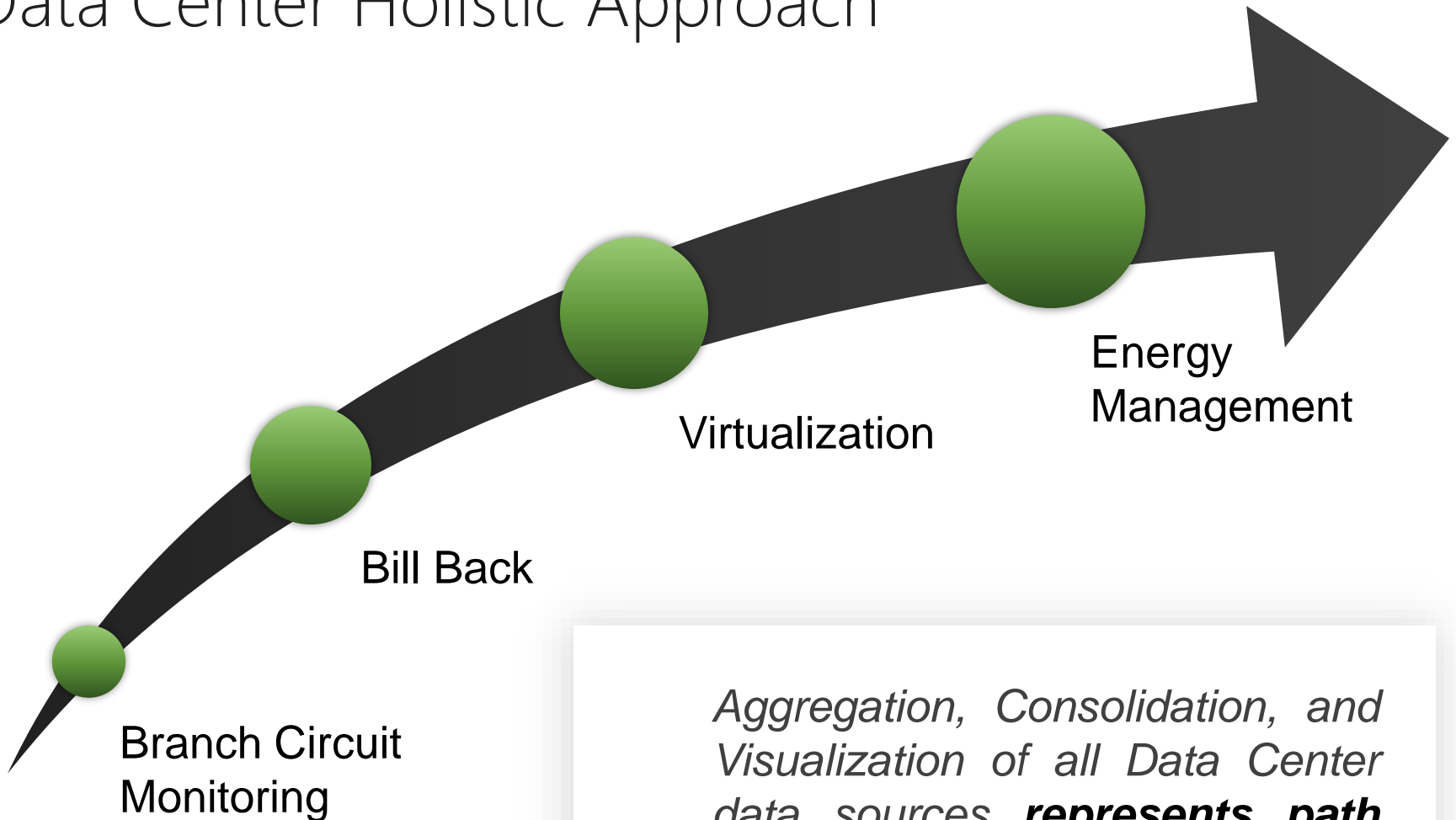
*If the status quo continues, by 2011, data centers will consume **100 billion kWh** of energy, at a total annual cost of **\$7.4 billion**.*

# Complexities in our Data Centers



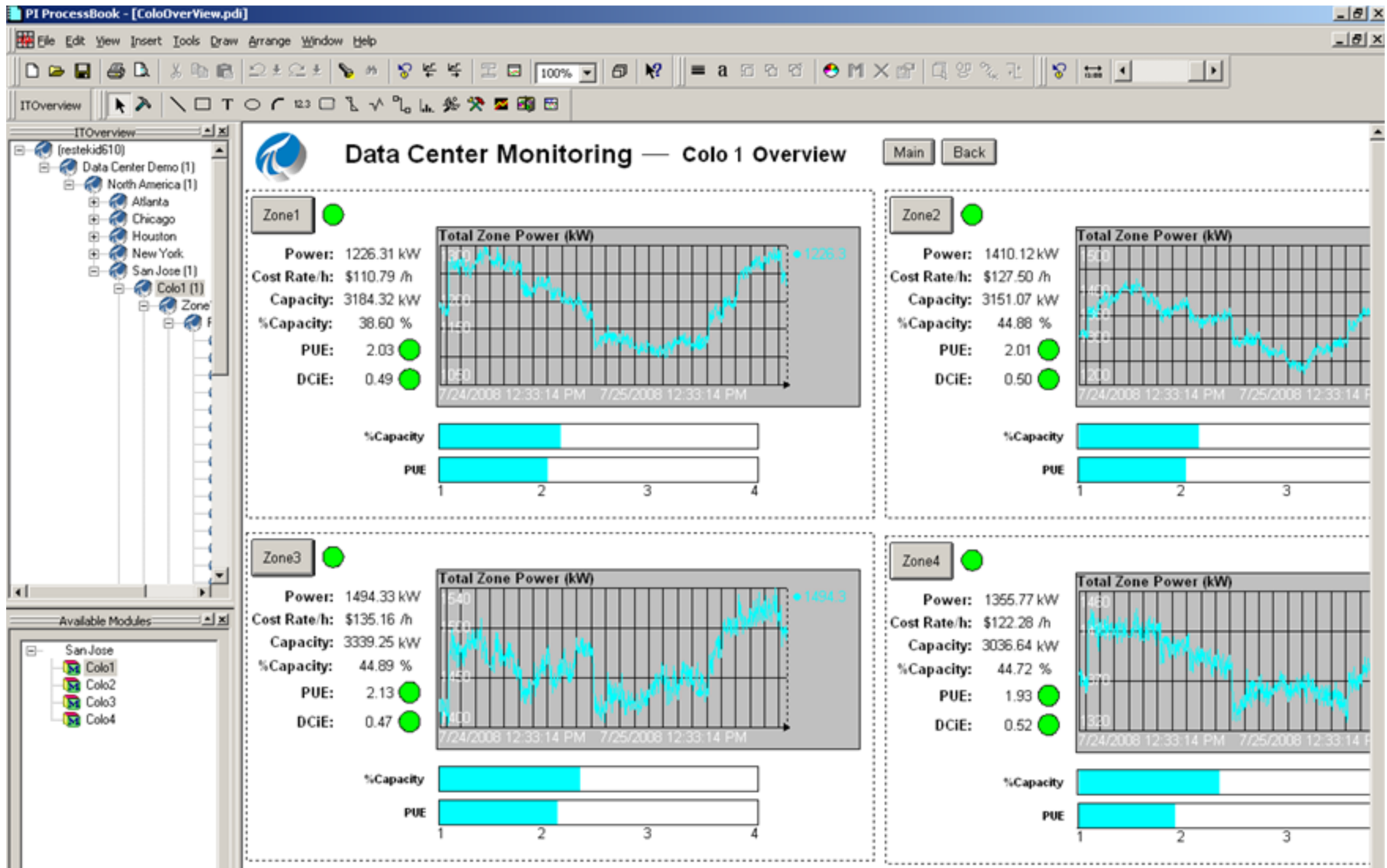
- Quincy– 100% renewable hydropower from Columbia River Basin
- San Antonio – city’s recycled water program, wind power as primary source
- Dublin – leverages outside air as primary cooling

# Data Center Holistic Approach

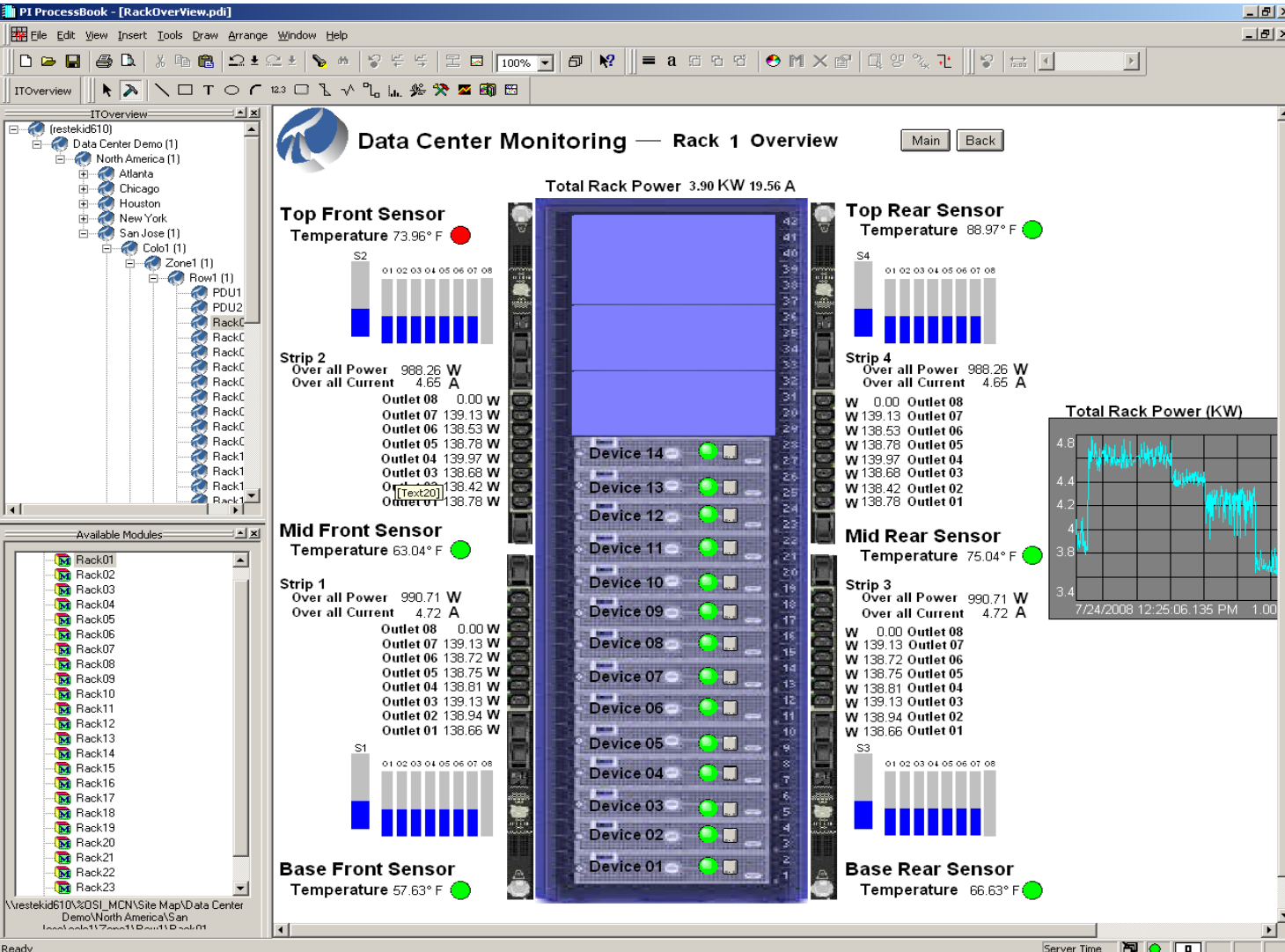


*Aggregation, Consolidation, and Visualization of all Data Center data sources **represents path to success.***

# Power Usage

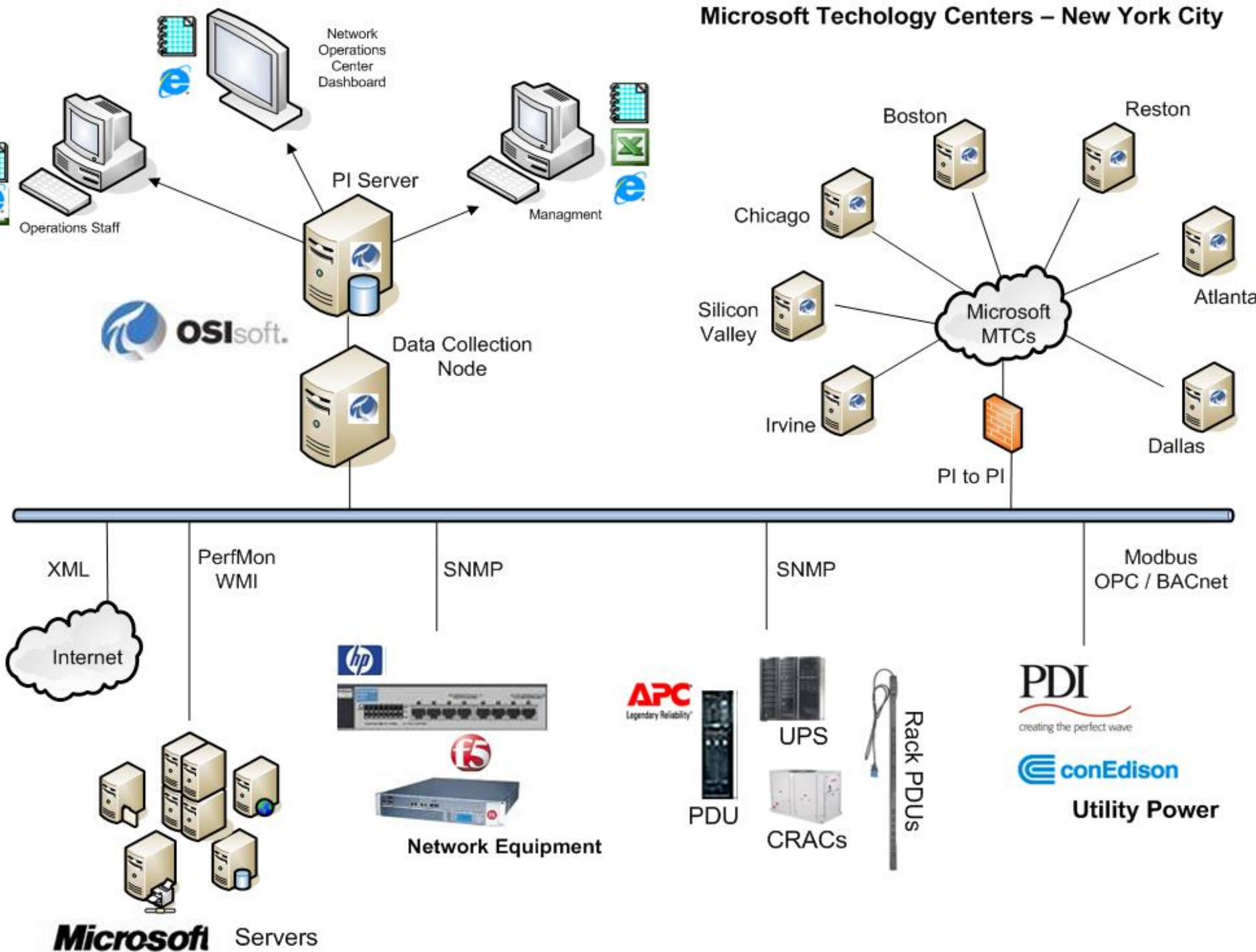


# Rack Detail

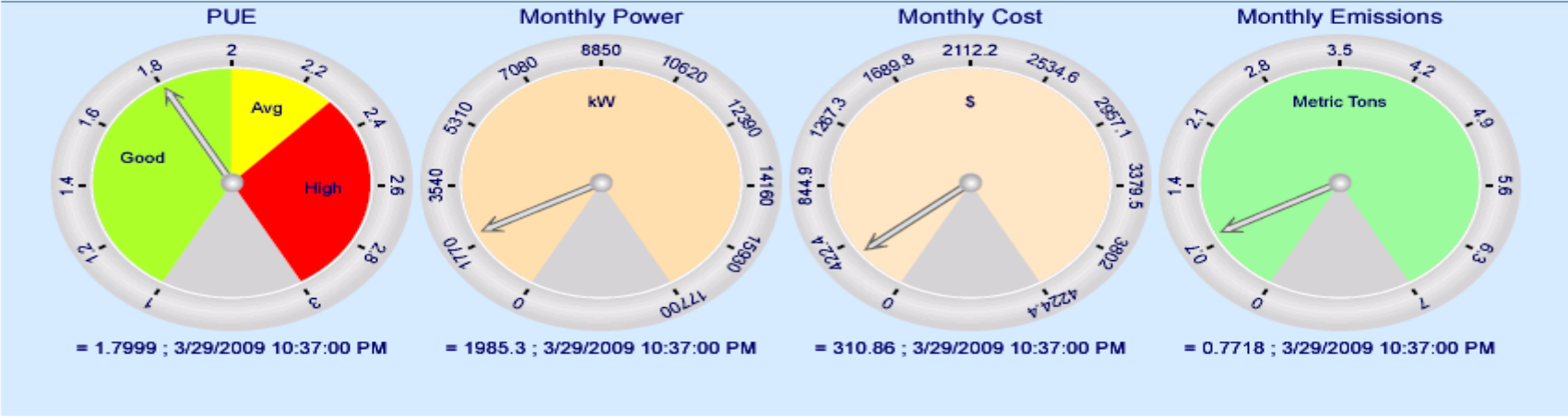


- Power
- Temperature
- Humidity
- Capacity

# Microsoft Technology Centers – New York City



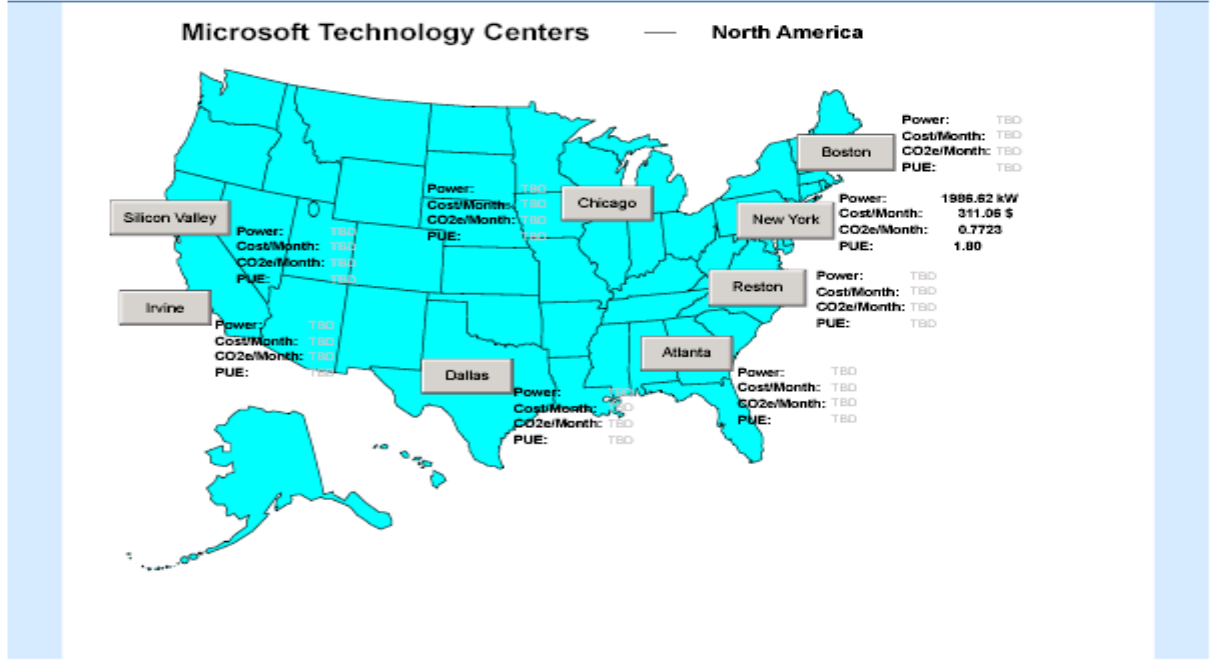
### North America KPIs



### Tree View

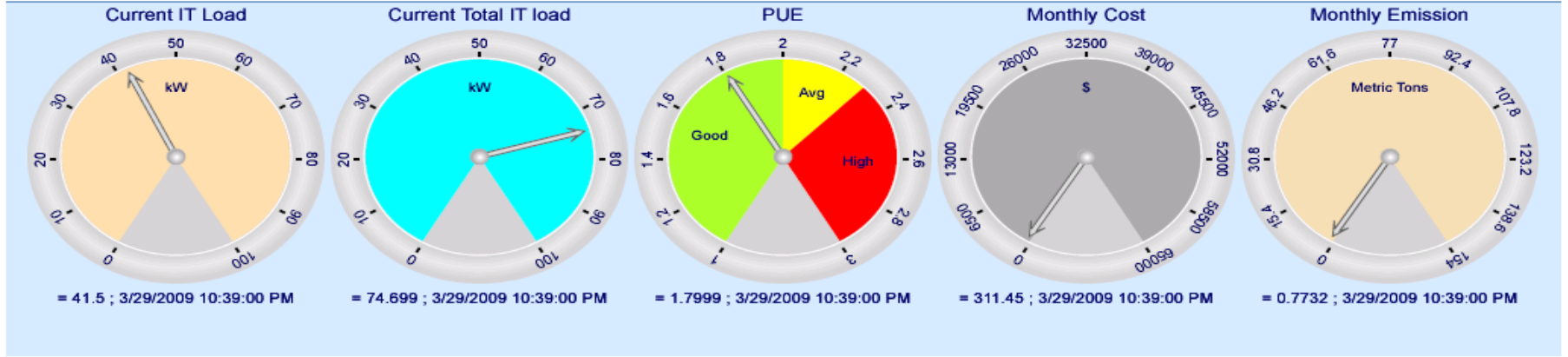
- North America
  - Atlanta
  - Boston
  - Chicago
  - Dallas
  - Irvine
  - New York
  - Reston
  - Silicon Valley

### MTCs



# NewYork

## New York PKIs



## Tree View

- New York
  - APC Products
    - CRACs
      - 192.168.1.15
      - 192.168.1.16
    - PDUs
      - 192.168.1.17
    - Racks
      - Rack 1
      - Rack 10
      - Rack 11
      - Rack 12 Short
      - Rack 12 Tall
      - Rack 13 Short
      - Rack 13 Tall
      - Rack 14
      - Rack 2
      - Rack 3
      - Rack 4
      - Rack 5

## New York Data Center

**Messages [1]**

**APC UPS: THORC456**

<b>Model:</b> Symmetra 80K	Phase 1 Output Load%: 63	Basic Battery Status: Normal
<b>Basic Output Status:</b> online	Phase 2 Output Load%: 62	Battery Run Time Remaining: Over Range
<b>selfTest</b>	Phase 3 Output Load%: 59	Battery Replace Indicator: noBatteryNeedsReplacing
<b>Total Output Load %:</b> 64	Output Current: 125 Amps	Battery Last Replace Date: 05/23/07
<b>SwitchGearStatus:</b> OK	Output Voltage: 121 Volts	Battery Voltage: 218 Volts
	Output Frequency: 60 Hz	Battery Temperature: 32 C

**Trends**

**Switchgear Status**

SwitchGear Input Switch Status: closed    SwitchGear Output Switch Status: closed    SwitchGearBypassSwitchStatus: opened



## Microsoft on PI in the Data Center

“We are using the **OSIsoft PI System to monitor all the critical points within our data centers**, and in turn are laying the foundation for a **high-availability, global Live infrastructure**,”

“**The return on investment is tremendous**. We are enabling innovation through increased collaboration, social networking and commerce—leading to breakthroughs in software plus services. We are setting industry standards **with increased utilization of facility resources, real time business continuity, and green computing technologies**. As we continue to expand our Live services, the combination of **OSIsoft and Microsoft technologies** are bringing new levels of performance and reliability to our world-class data centers.”



# Thank You!

Enrique Herrera

[eherrera@microsoft.com](mailto:eherrera@microsoft.com)



**Microsoft®**