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Asset Based Energy Optimisation for Facilities
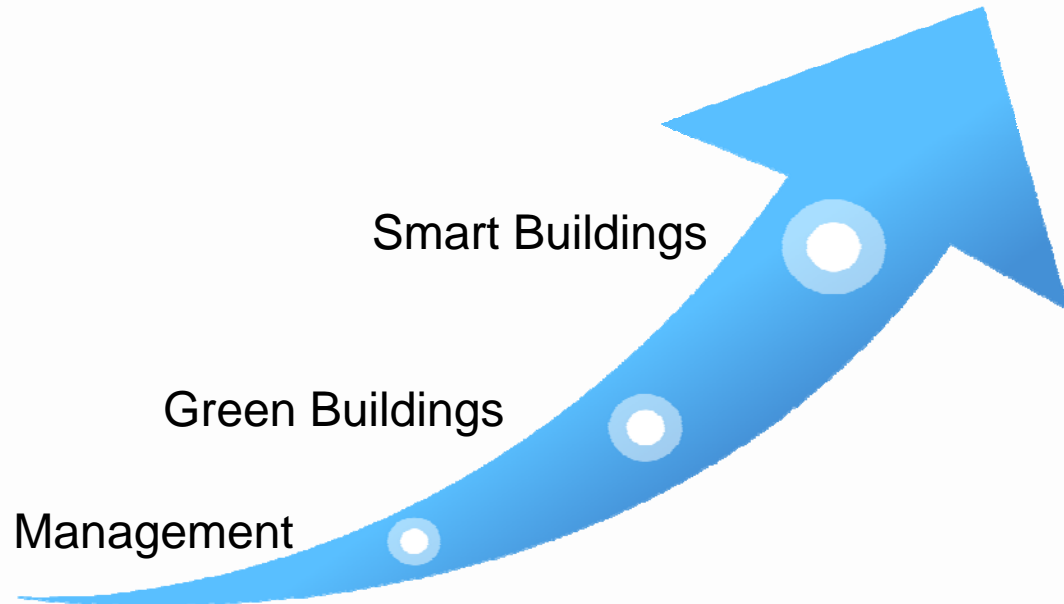
Rick van Driel

Facilities Management Solution Executive

IBM, Asia Pacific

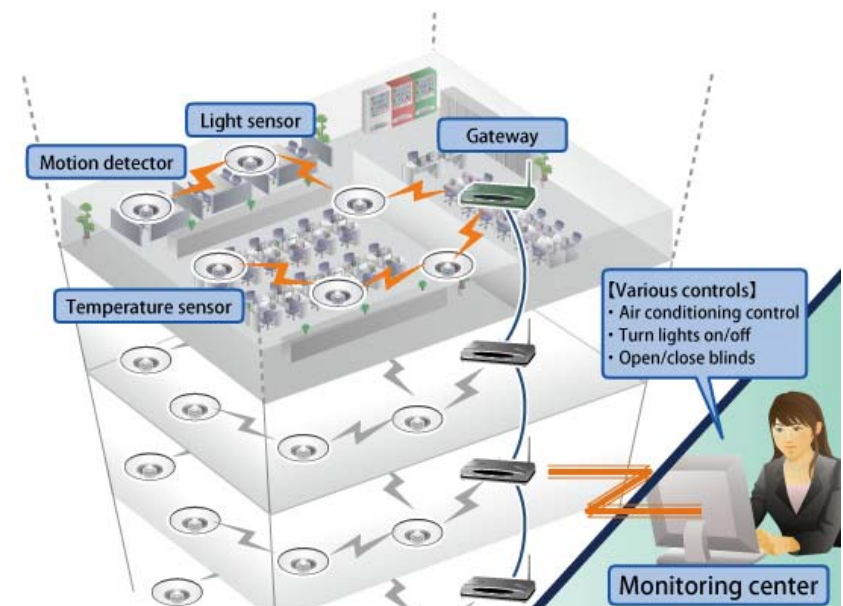**rvandrie@au1.ibm.com**

Smart Buildings

Green Buildings

Facilities Management

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About IBM and Smarter Buildings

- **Industry Leader in Provision of Solutions, including;**
  - Maximo for Facility Management (Leader in Gartner Magic Quadrant (EAM))
  - Tririga IWMS (Leader in Gartner Magic Quadrant (IWMS))
  - IIBM (New Solution Offering, released June 2011)

- **FM Customer Base WW**
  - 1,000+ FM Customers
  - Cross Industry
  - FMMUG 500+ Members

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Education and Higher Ed

Calgary Catholic School District

KU

Penn State

Purdue University

Carnegie Mellon

FIU — Florida International University

Health Care

University of Utah Health Care

John Muir Health

Alberta Health Services

Hospitality

Only Vegas

Disney

NBC Universal

Service Providers

Grubb & Ellis — From Insight to Results

Coor Service Management

Unicco UGL

GSH

IAP Worldwide

Fluor

Johnson Controls

Manufacturing

Texas Instruments

intel

Boeing

General Dynamics

Retail

IKEA

Target

JCPenney

Public Sector

GSA U.S. General Services Administration

Department of Veterans Affairs

Sandia National Laboratories

Broward County Florida

APS

Berkeley Lab

SRP — Delivering more than power

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- **IBM Property**
  - 10million square metres of Real Estate
  - Energy Initiatives - $370m cost reduction
  - 5.1b Kilowatt hours – total reduction
  - 3.4m Tons Carbon Reduction (20years)

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The **need** for progress is clear

2

Real estate is the second largest expense on the income statement for most companies.

3

In most organizations the real estate portfolio is on the balance sheet as the third most valuable or expensive single asset.

30 percent

Facilities investments and operating costs can be more than 30% of corporate annual spending.

2025

By 2025, buildings worldwide will become the top energy consumers.

42 percent

Worldwide, buildings consume 42% of all electricity – up to 50% of which is wasted.

1

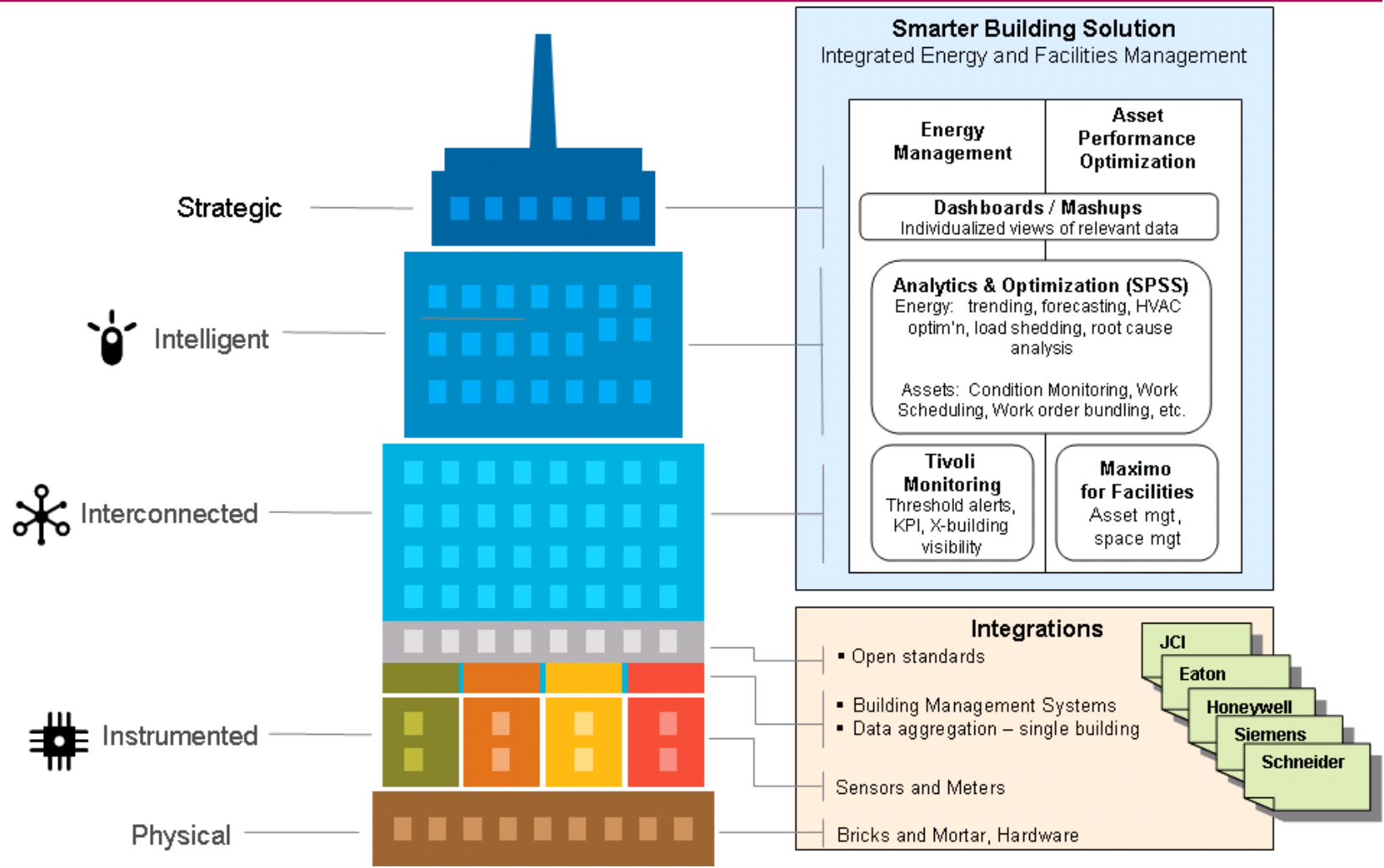Buildings are the number 1 contributor to global CO2 emissions.

So Where is the 50%, How do we Go Green

- Starts with Design, design can reduce as much as 30% alone
  - New Buildings, arguable, additional investment
  - Existing Building, retrofit,
- Includes;
  - Passive Design, Double Glazing, Alt Power, etc
  - Active Elements; BMS', CMMS &/or IWMS, etc

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## Integrate, Analyse, Optimise

Smarter Building Solution
Integrated Energy and Facilities Management

Energy Management	Asset Performance Optimization
Dashboards / Mashups Individualized views of relevant data	
Analytics & Optimization (SPSS) Energy: trending, forecasting, HVAC optim'n, load shedding, root cause analysis Assets: Condition Monitoring, Work Scheduling, Work order bundling, etc.	
Tivoli Monitoring Threshold alerts, KPI, X-building visibility	**Maximo for Facilities** Asset mgt, space mgt

- Strategic
- Intelligent
- Interconnected
- Instrumented
- Physical

Integrations
- Open standards
- Building Management Systems
- Data aggregation – single building
- Sensors and Meters
- Bricks and Mortar, Hardware

JCI
Eaton
Honeywell
Siemens
Schneider

Air Handling Units

- **One of the Highest Energy Consuming pieces of plant in the built environment**
- **Have the capacity to lose large volumes of air through poor design implementation such as duct sealing.**
- **Consists of a large number of smaller plant based components; Filters, Pumps, Coils, Fans, etc…**
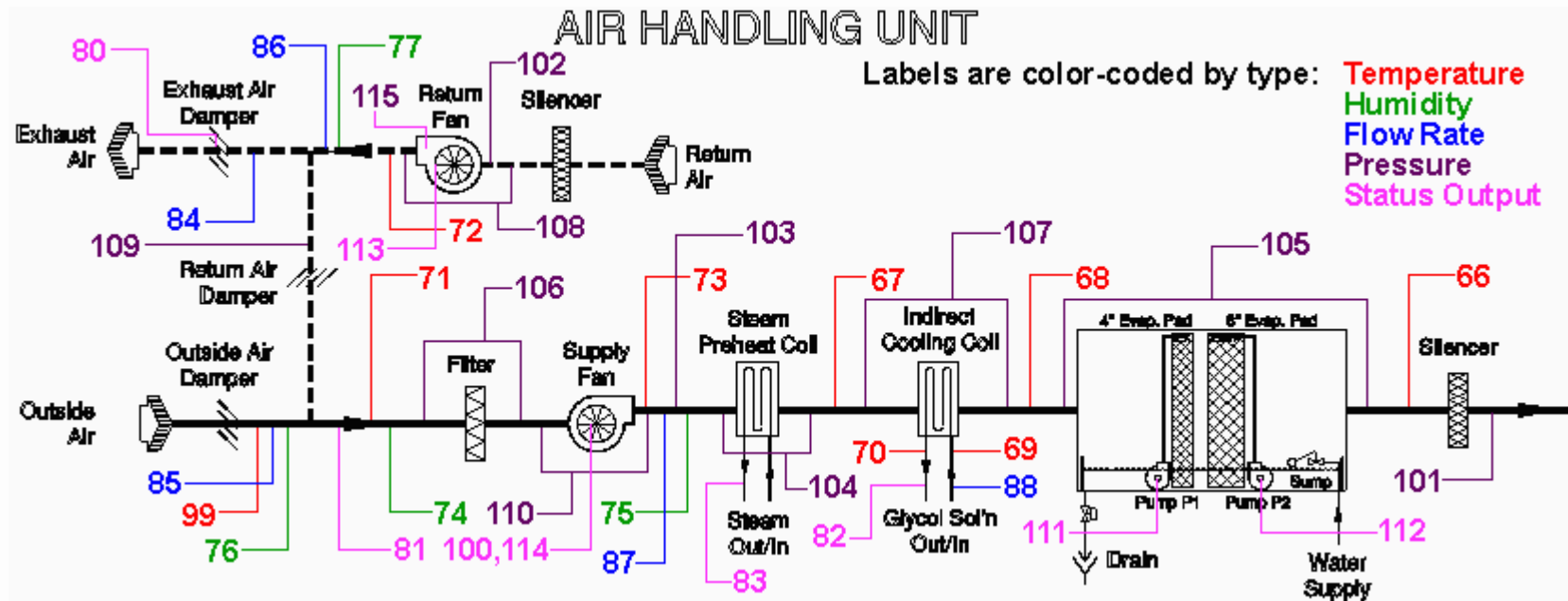- **Each component, uses energy, has the potential to fail, has maintenance requirements**
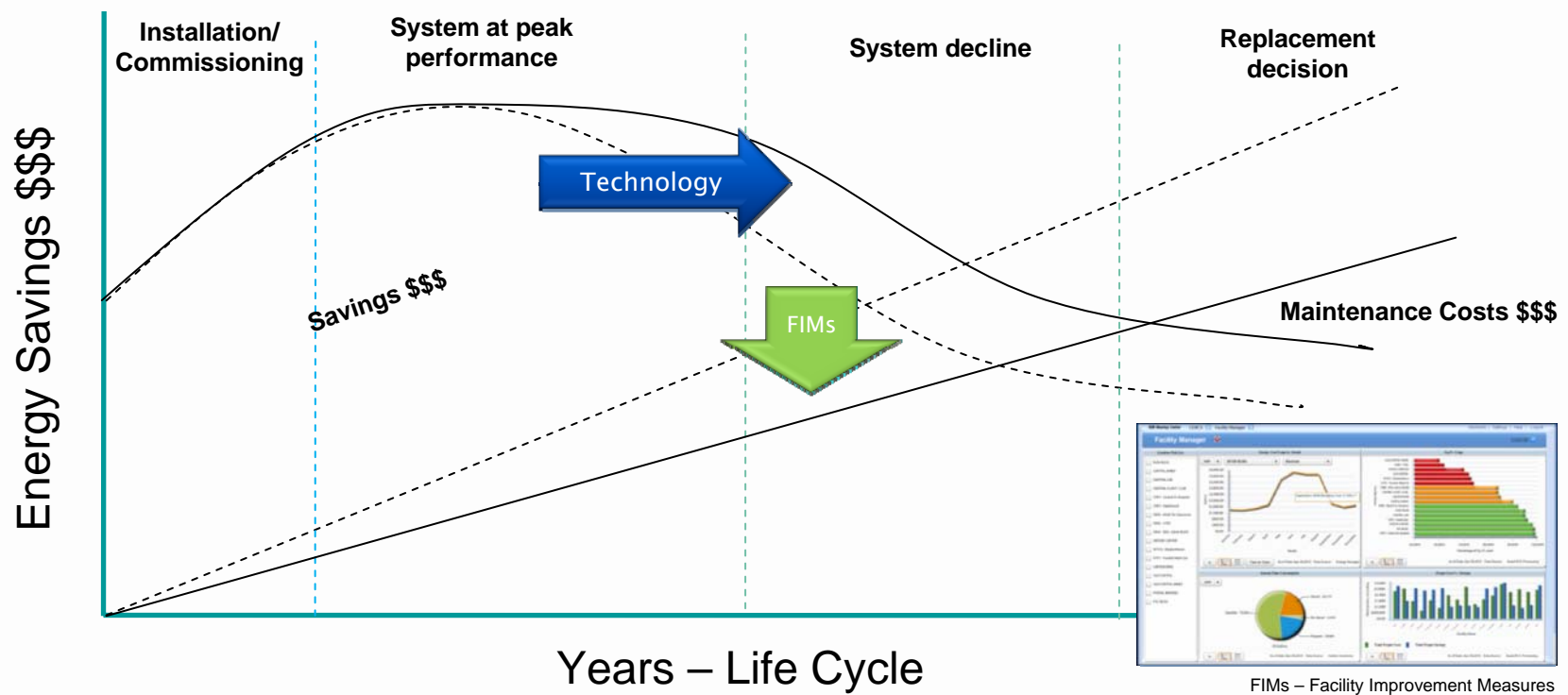

AIR HANDLING UNIT
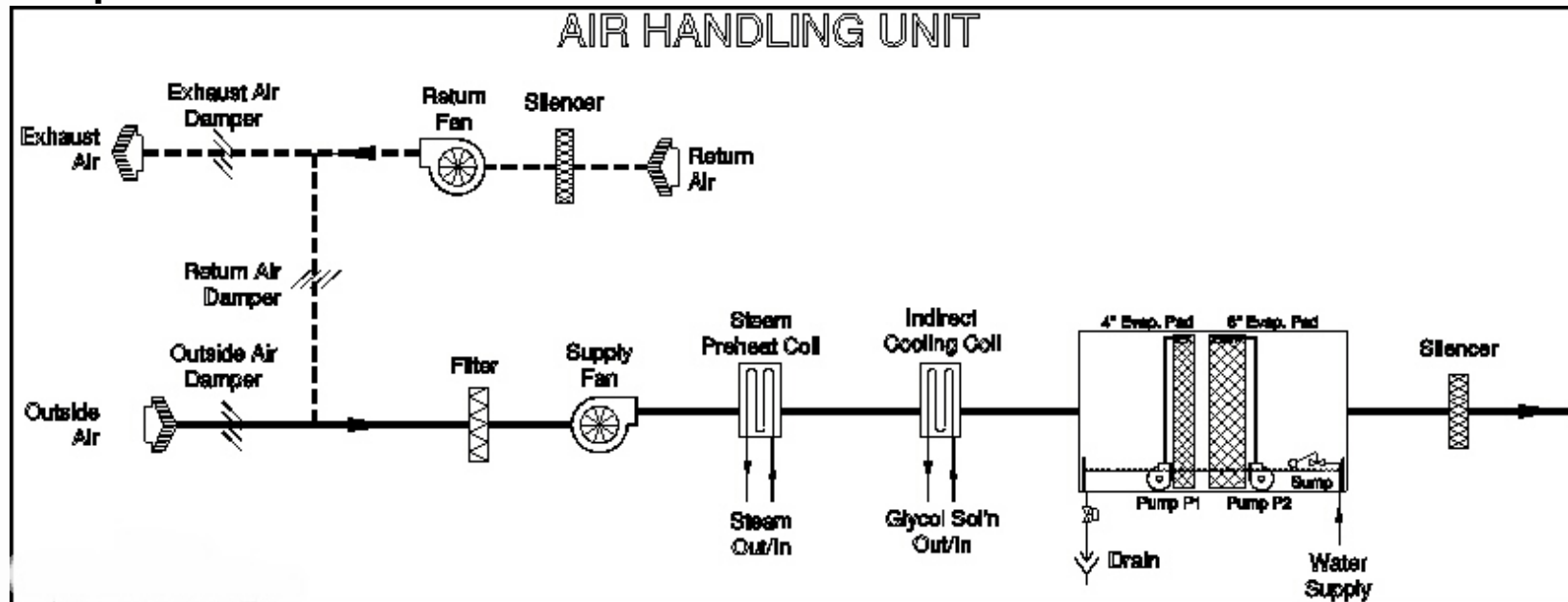
Getting the most out of your AHU

- Monitor the correct elements
- Maintain all data; readings, maintenance, Faults
- Analyse the data
- Proper Maintenance strategies

AIR HANDLING UNIT

Labels are color-coded by type:
Temperature
Humidity
Flow Rate
Pressure
Status Output

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The application of technology, information to make better decisions and facility improvement programs that deliver measured results.

Installation/Commissioning — System at peak performance — System decline — Replacement decision

Energy Savings $$$

Technology

Savings $$$

FIMs

Maintenance Costs $$$

Years – Life Cycle

FIMs – Facility Improvement Measures

The Average Return on Investment for Energy Efficiency Projects is > 20%

Green Sigma ™ analytics are key component for managing intelligent buildings

1. **Sensing-Monitoring**

Agnostic software solution
Can push data from any BMS
No requiremen

Targeted data acquisition

2. **Data Store**

Enterprise Reporting Feed

5. Sustainability &
Re

Rule	2a	2b	3a	3b	4c	4d	4e	6a	7a	7b	8a	8b	8c	8d	10a	18	19	21e	21f	Time Period
Severity (5=Highest)																				Rolling 7 days

Smith
Logout

B 3 Boiler 1 Performance : Gas Usage per Boiler % Loading

$y = 1357.6x$
$R^2 = 0.9127$
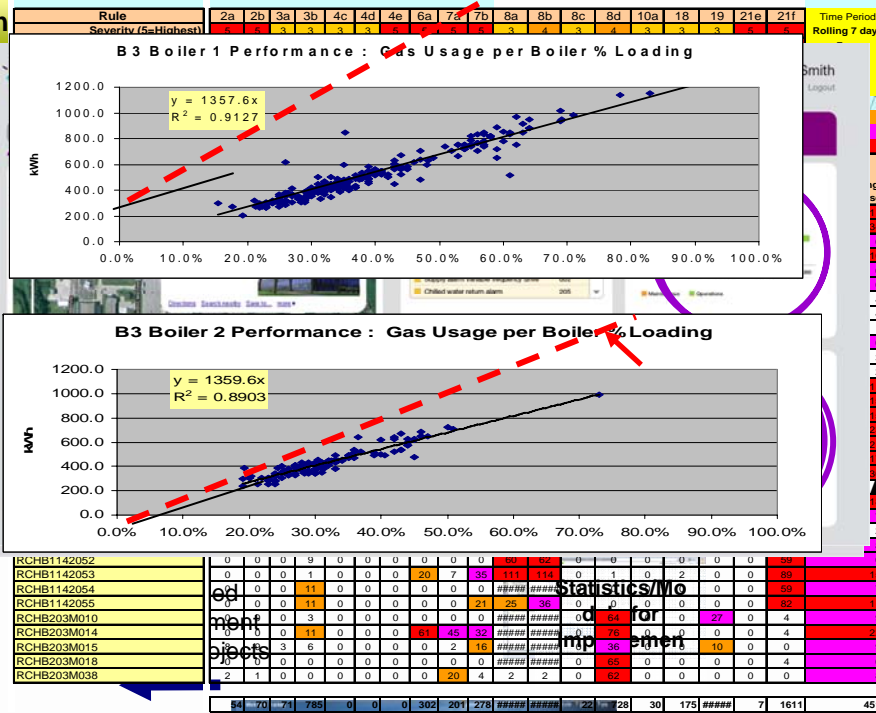
Meta-data model
• **Contextualization**
• **Interrelationships**

B 3 Boiler 2 Performance : Gas Usage per Boiler % Loading

$y = 1359.6x$
$R^2 = 0.8903$

Analytics

4. Improvement

Statistics/Mo
d   for
Imp   emen

RCHB1142052												60	62						59	
RCHB1142053	0	0		1	0	0	0	20	7	35	111	114		0	1	0	2	0	0	83	154
RCHB1142054	0	0	11	0	0	0	0	0	0	0	####	####	0	0	0	0	0	0	0	53	70
RCHB1142055	0	0	11	0	0	0	0	21	25	36			0	0	0	0	0	0	0	82	114
RCHB203M010	0	3	0	0	0	0	0	0	0	0	####	####	0	84	0	0	0	0	4		98
RCHB203M014	0	0	11	0	0	0	461	45	32	0	####	####	0	76	0	0	0	27	0	4	229
RCHB203M015	3	6	0	0	0	0	0	2	16	0	####	####	0	36	0	0	0	10	0	0	90
RCHB203M018	0	0	0	0	0	0	0	0	0	0			0	65	0	0	0	0	4		69
RCHB203M038	2	1	0	0	0	0	20	4	2	2	0	0	0	62	0	0	0	0	0		89
	54	70	74	785	0	0	0	302	201	278	####	####	0	22	28	30	175	####	7	1611	4513

Work Orders,
Excel, Browser,
Planning

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Something profound is happening…
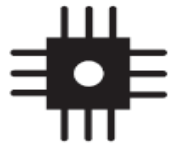
INSTRUMENTED

We now have the ability to **measure, sense** and see the exact condition of **practically everything in near real-time.**

+

INTERCONNECTED

People, buildings, campuses, cities, etc. are now **interacting in entirely new ways.**

+

INTELLIGENT

All this **information** can be used to make optimal **decisions** that are based on historical **trends and predicted events.**

=

SMARTER

We can gather, synthesize and apply this **information** to **achieve financial, environmental and operational benefits** in buildings.

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The Green Sigma™ Coalition

Helping define Smarter Building KPIs and standards

▸ Working together to deliver proven solutions for sustainability

▸ Collaborating on customer projects across many industries

IBM works with array of partners, and builds solutions with capability to integrate with them seamlessly.

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- **Property Characteristics**
  - 280,000 sq. feet
  - Opened in September, 1997

- **Scope**
  - Metering
  - PLC – BMS integration
  - Advanced analytics
  - Fault detection & diagnostics
  - Dashboard for energy, carbon, maintenance, space, etc.

- **Property Characteristics**
  - 3.3M sq ft multi-building mixed use light industrial campus
  - Facilities date to the 1950s

- **Scope**
  - BMS/metering integration
  - HVAC sensors/metering point integration
  - Lighting management
  - Perimeter pre-heat
  - Chiller optimization
  - Advanced analytics/FDD.
  - Dashboard for energy, carbon, maintenance, space, etc.

First IBM implementations.

Expected 5+% energy cost reduction in already efficient buildings that have seen 7% reductions/ year for the last 10 years.

Achieved 8%

Operational cost reductions expected from condition-based maintenance and prioritization of preventive maintenance.
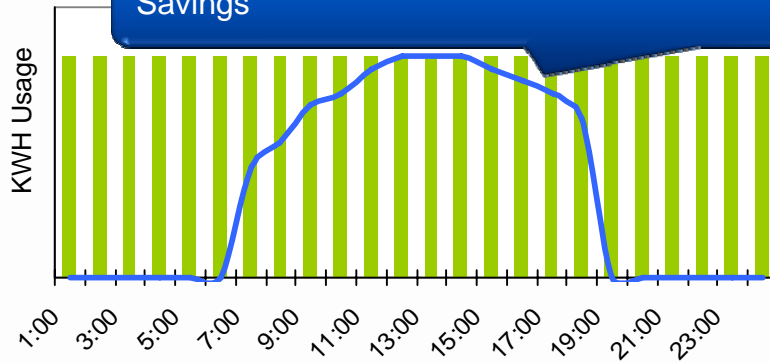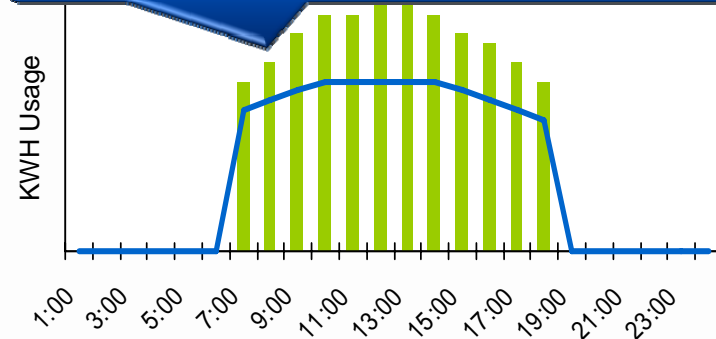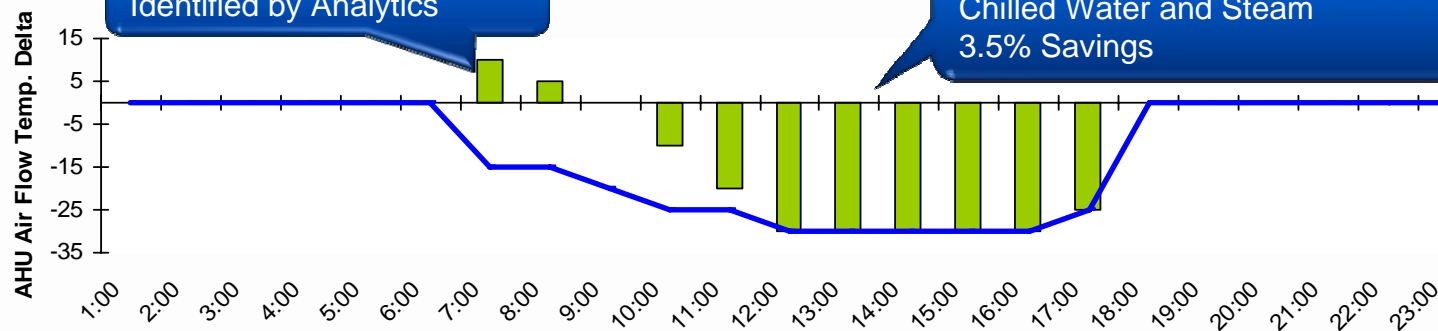
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Customer Projects

- **Tulane University – New Orleans (You Tube Video)**
  - Post Hurricane Katrina Rebuild
  - School of Architecture, Living Laboratory
  - Integration of Building Systems
  - Listed/Protected Building

- **Cloister Museum – New York (Medieval Branch)**
  - Sensitive Environment
  - Critical Nature Assets
  - Wireless Sensor Network
  - Environmental Prediction for Preservation Focus

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Smarter Buildings on Campus
Ave Maria University, Florida

- **Greenfield construction opened to students and faculty in 2007**

- **Convergence of 23 technology systems on one IP backbone**
  - **Building management**
  - **Security and surveillance**
  - **IT systems**
  - **Fire/ and life safety**
  - **HVAC equipment**
  - **Audio/visual systems**

- **IBM Maximo Asset Management integration with Metasys™ BMS for automated work- order generation and management**

- **Cisco high-speed networking**

Saved $1.5M in infrastructure costs

Saved $600K/year in energy costs

Saved $350K/year in staffing costs

IBM

AND THANK YOU!

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