Building Data: Mining Critical Building Operational Information in an Era of IT Security

Our buildings talk, we need to listen

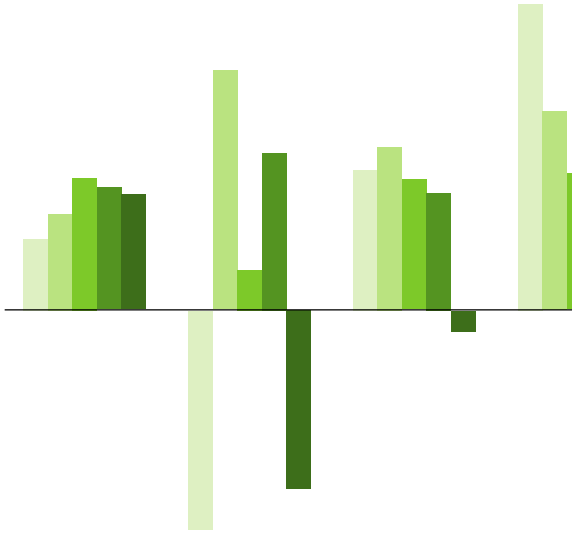
What is a Smart Building

A Smart Building integrates major building control systems onto a common network

Building systems share data and functionality to improve:

- *energy efficiency*
- *operational effectiveness*
- *occupant satisfaction*

Why Smart Buildings



- Material Changes: Smart Buildings are in large part about catching up with reality (…there is a lot of technology that snuck up on us over the years)
- Risks: Doing nothing presents real risks to performance, sustainability and competitiveness.
- Budgets: We must deal with the financial paradox of need to lower operating expense without spending a lot of capital dollars

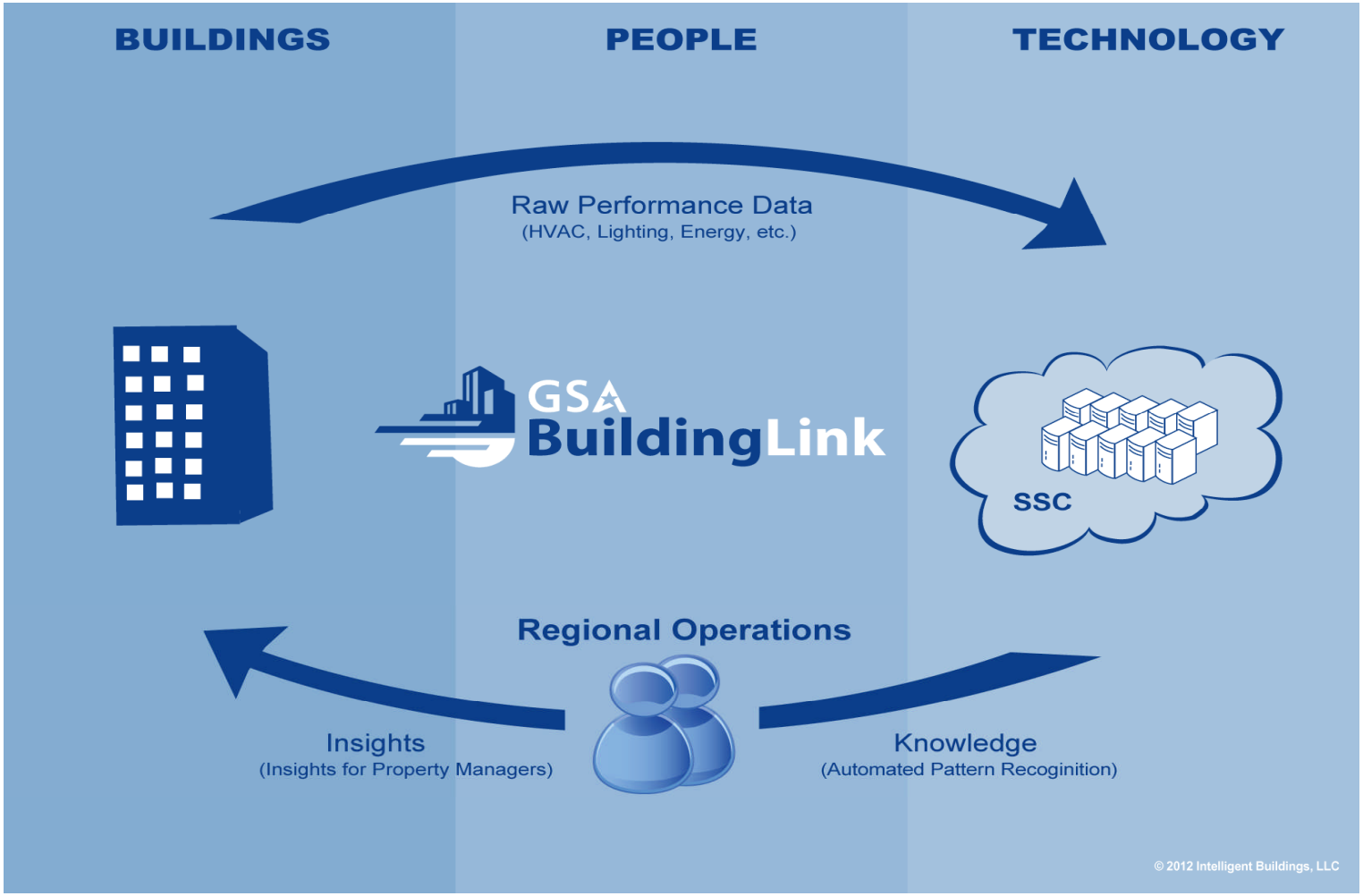
Smart & Sustainable Buildings Strategy

- Buildings: We created updated “open” standards for all building controls purchases to reflect this …starting with Recovery projects
- People: We made significant organizational changes and added training to account for technology, security and facility management issues
- Technology: We are enabling data driven buildings in new projects as well as existing buildings through our GSA BuildingLink program.

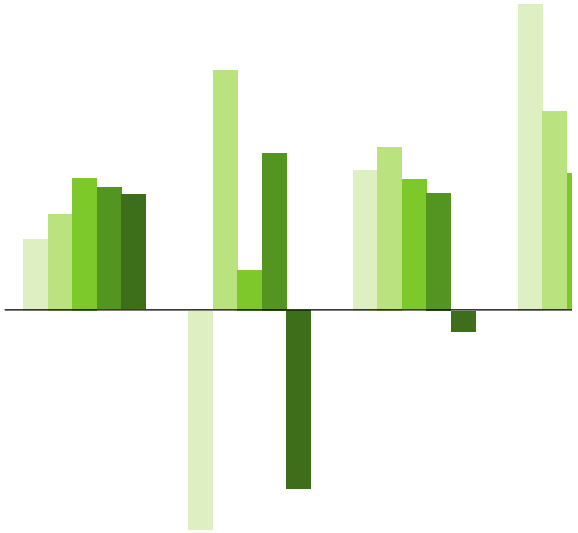
GSA

Smart Buildings

Operational Model



Smart Building Standards

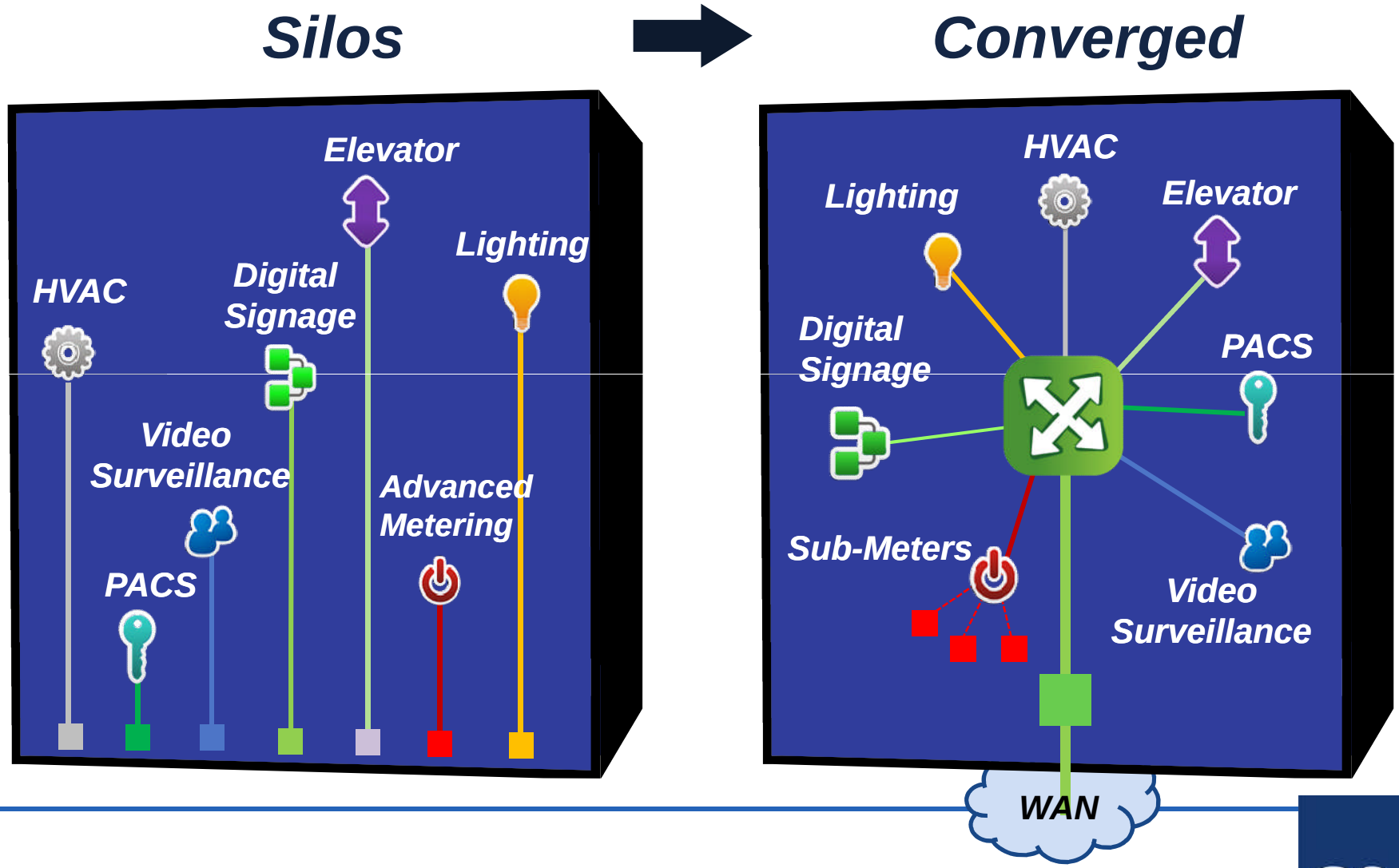


- **Open** Communication Protocols - Non-proprietary building controls that give GSA greater building management flexibility and reduce service costs

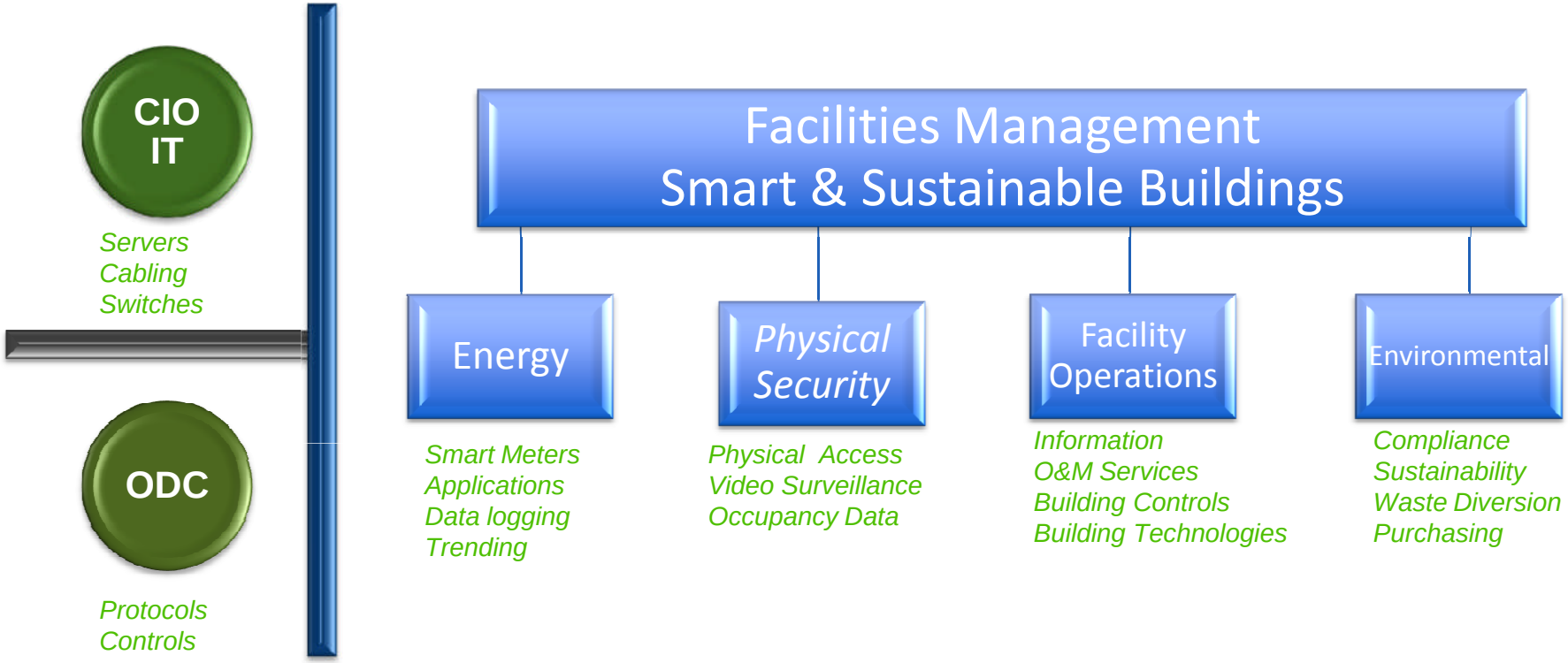
- **Converged** Control Systems Networks (IT backbone) - Elimination of unnecessarily redundant controls infrastructure such as conduit, cables, switches, and UPS's that will then allow interoperability and security compliance

- **Normalized** Data for Systems Communications - Different controls manufacturers or even disparate systems can "talk" to each other allowing for data collection and analysis and more flexibility and management control

Building Smarter



Organizational Alignment



1. ***Silos and separation*** *in reporting and life-cycle management*
2. *Each Department has fast growing* ***IT*** *risks and opportunities*
3. *Really aggressive performance commitments that* ***demands cooperation****.*

- *EPAct 2005: 30% more efficient than ASHRAE 90.1*
- *EO 13423: Energy Use 30% below 2003 baseline by 2015*
- *EISA 2007: Zero fossil fuel use by 2030; 65% cut by 2015; 80% cut by 2020*
- *EO 13514: Federal Leadership in Environmental, Energy, and Economic Performance.*

GSA

Organizational Alignment

A new way to design, Build & Operate

- ***PBS POLICY***

GSA

Date: March 31, 2011

Technology Policy for PBS-Owned Building Monitoring and Control Systems

Purpose. This document establishes PBS policy for smart building technologies that allow for more cost-effective, near real-time visibility and control of all building systems. PBS' goal is to converge a building's monitoring and control (M&C) systems infrastructure to enable smarter and more efficient operations.

Lawrence A. Melton
Assistant Commissioner,
Facilities Management
and Services Programs

William J. Guerin
Assistant Commissioner,
Design and Construction

Philip E. Klokis
PBS Chief
Information Officer

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Requires Education & Support

Educate

Program Development

- *Initial Kick-Off Meeting*
- ***Smart Buildings Team Role***
- *D&C PM Role*
- *Regional IT Role*
- *Business Case Requirements*

Follow Up Meeting (2)

- *Policies Review (P100, IT)*
- *Best Practices Review*
- *GSA PBS CIO Role & Process*
- *Contracting Officer Role (RFP, EULA Language)*
- *SSB Assessment/Risk Rating*
- *Document Tech Reqs*
- *Refresh Expanded Team On SSB/IT Roles/Process*
- ***CC Specs Review***

Design/Build

(3)

- *Facilitate Project Team Discussion on IT Processes (BSN, GFE Hardware , Device Cert, HSPD-12, etc.)*
- ***Design Review & Comment (50% DD, 100%, Submittals)***
- *Share Levels 2-3 Building Spec Supplements /Narratives*
- *Agree on MEP 'Converged' building systems network drawing*

(4)

- *Support Project PM with Coordination Expertise (PBS CIO network design, GFE, BSN Install, Servers, Circuits, etc.)*

Install, Test, Validate

(5)

- *Planning For On-Going Ops (**Turnover Package** – As-Built, Port Matrix, Warranty Info, Support Structure)*

(6)

- *Job Site Inspection*
- *Commissioning Agent Support*
- *SSC Building Points Transfer Testing*
- ***SSC Platform Testing & Certification***

***Audience**: Owner, Developer, Architect, Design Consultants, General Contactor, Mechanical Engineers, Sub Contrac*
Property Managers, Regional and Central IT Team

GSA

Federal Courthouse

Billings, Montana

- Converged on GSA Building Systems Network
- Open (BACNet IP) Protocols
- Virtual and local GSA Servers
- Integrated Building Automation, lighting, advanced metering
- BuildingLink-ready facility

Federal Center South

Seattle, Washington

- Converged on GSA Building Systems Network

- Open (BACNet IP) Protocols
- Virtual and local GSA Servers

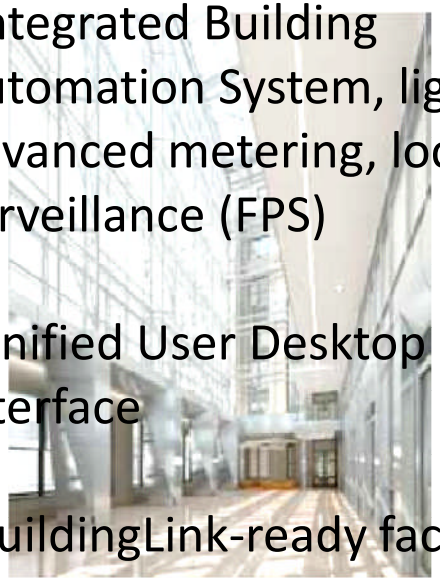
- Integrated Building Automation, lighting, advanced metering, local video surveillance (FPS)

- BuildingLink-ready facility

GSA Headquarters

Washington, DC

- Converged on GSA Building Systems Network
- Open (BACNet IP) Protocols
- Virtual and local GSA CIO servers
- Integrated Building Automation System, lighting, advanced metering, local video surveillance (FPS)
- Unified User Desktop Widget Interface
- BuildingLink-ready facility



Wayne Aspinall FB& CH

Grand Junction, Colorado

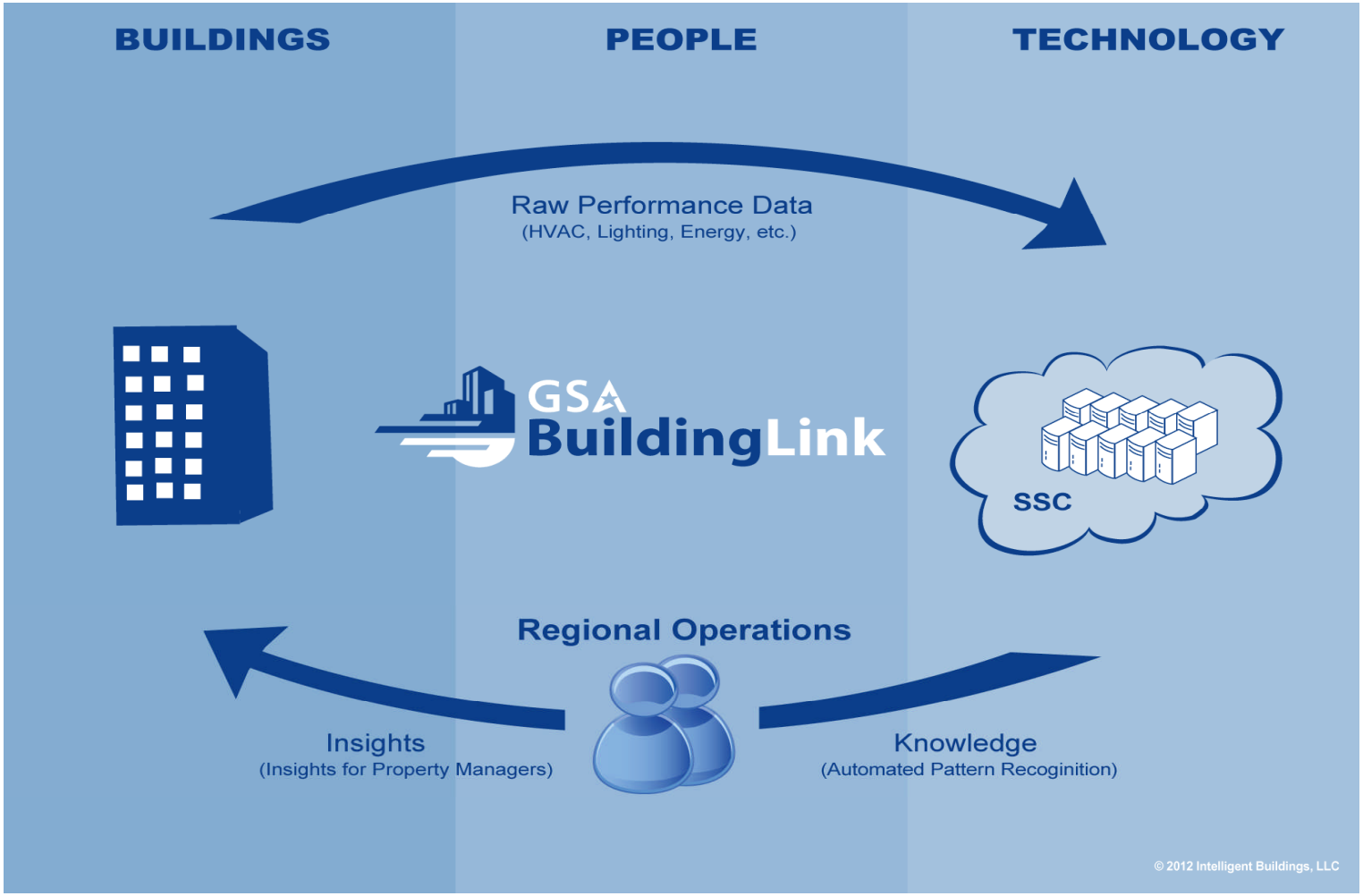
- Converged on GSA Building Systems Network
- Open (BACNet IP) Protocols
- Virtual and local Servers
- Automation System, lighting , Advanced Metering, significant renewables (Geo-Thermal, Solar PV)
- Energy generation is exceeding demand by 6% as of fall, 2012
- BuildingLink-ready facility

Open, Converged, . . .

- Converged on GSA Building Systems Network
- Open (BACNet IP) Protocols
- Virtual and local Servers
- BuildingLink-ready facility

Smart Buildings

Operational Model



GSA BuildingLink
Solution Approach

•**COTS Solution:** Design, develop, and implement using COTS packages TRIRIGA, SkySpark, Niagara

•**Open Design:** Solution will adapt open standards and protocols such as HTTP, XML, SOAP, and oBIX.

•**Security:** BuildingLink will use GSA's existing Single Sign-on Infrastructure for Authentication and Role Based Access Controls.

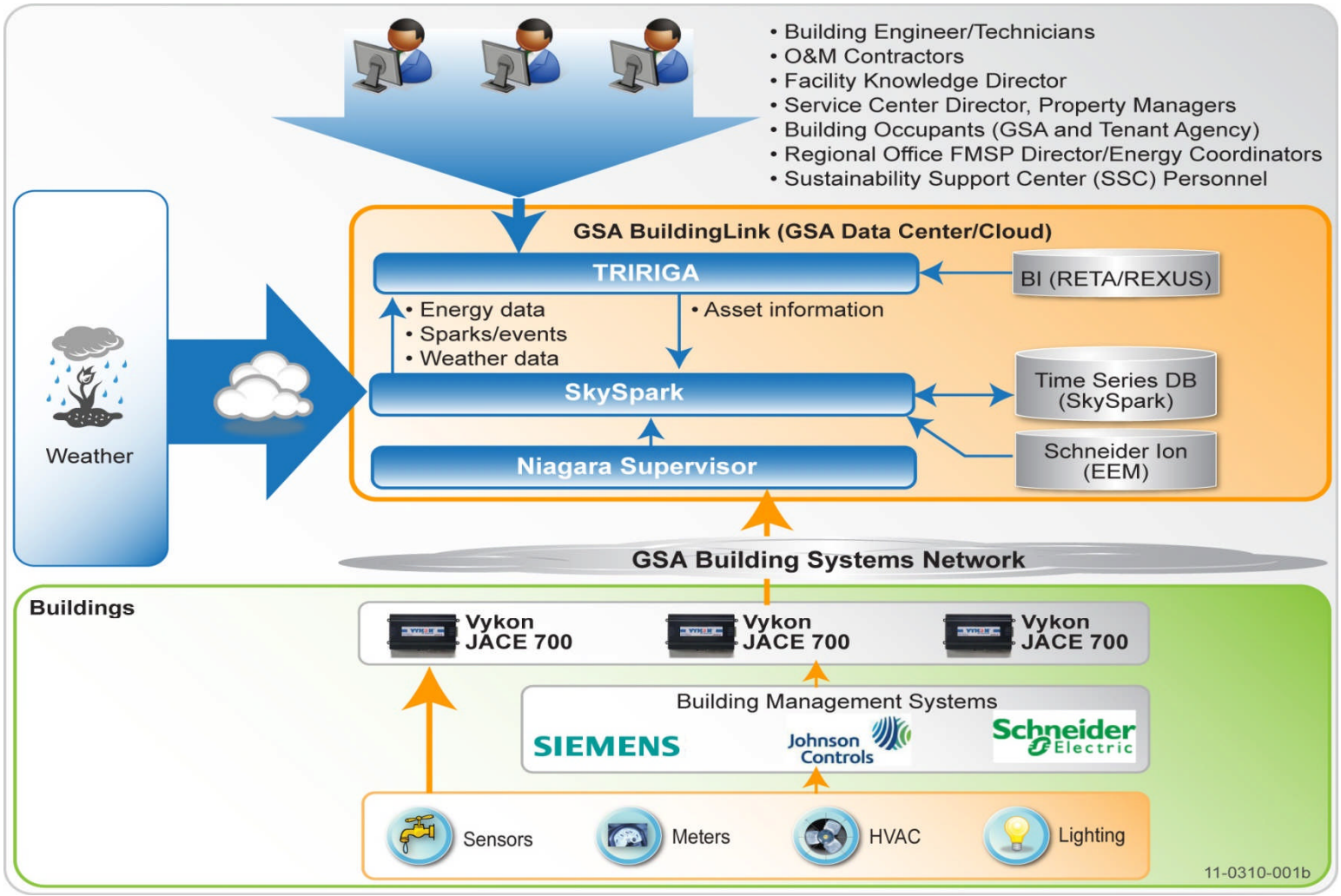
•**Scalability:** BuildingLink will provide the ability to scale for GSA's needs. If required, TRIRIGA can be scaled both horizontally and vertically and Niagara can be scaled horizontally to meet 99% uptime.

•**Manageability:** BuildingLink TRIRIGA, SkySpark, and Niagara will provide centralized product management with flexibility to manage, control, and operate their buildings according to local policies and procedures.

•**Compliance:** Solution will be implemented in compliance with GSA IT policies and procedures. GSA to approve for system security and HW/SW certification.

GSA

GSA BuildingLink



GSA

GSA BuildingLink

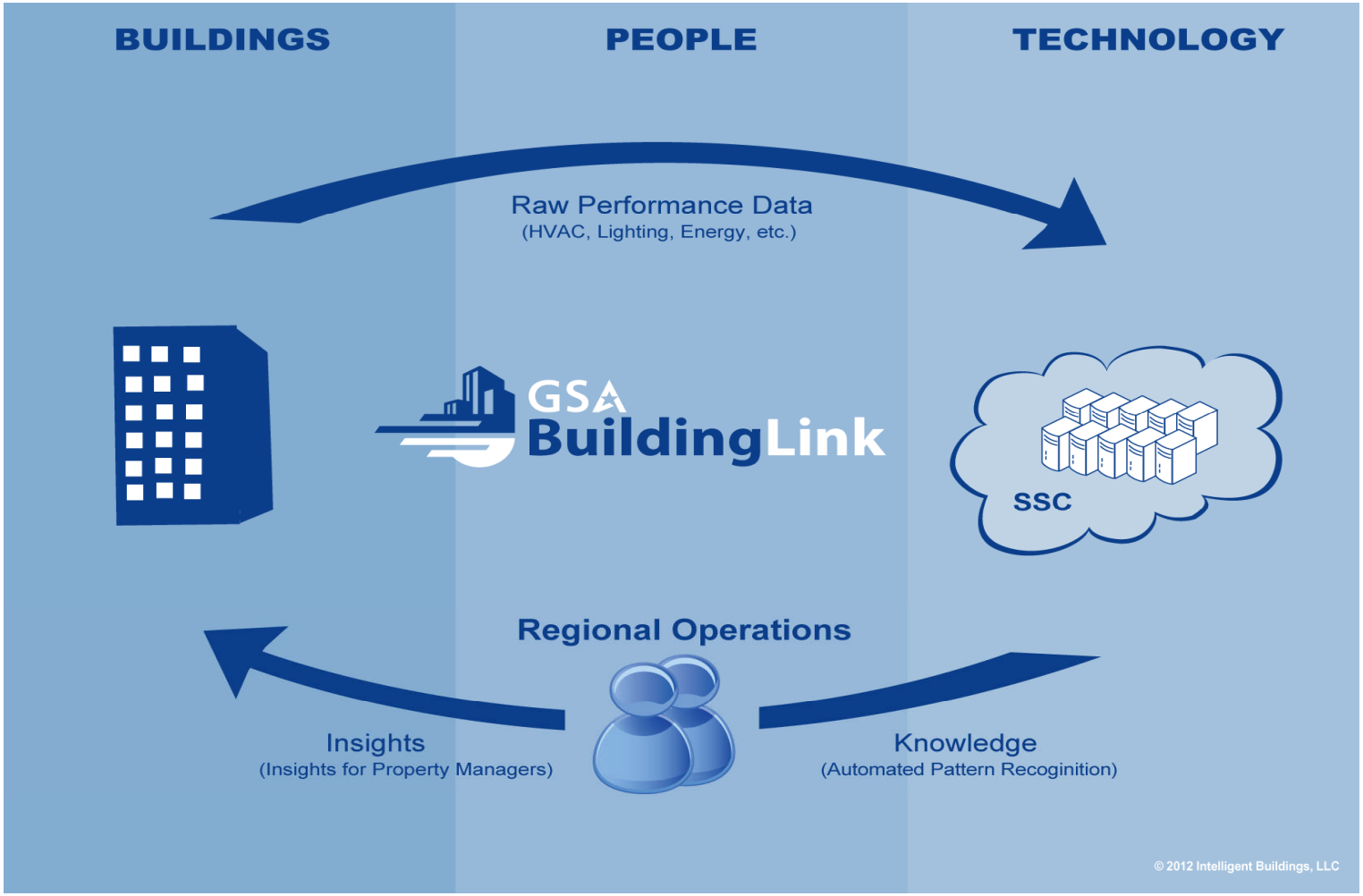
Fast Facts

- Targeting 200 most energy intensive building in GSA (75% of total energy use)
- Looking to capture 80% of Energy Use in Data Points
- These are “covered” facilities with advanced meters
- First phase rolling out in 50 buildings representing 30 MM SF
- Every region is represented with connected buildings
- Phase II will encompass another 50 building representing 25 MM SF
- Industry awards and recognition for analytics at scale

GSA

Smart Buildings

Operational Model



Smart Buildings = Smart People

Building Occupants

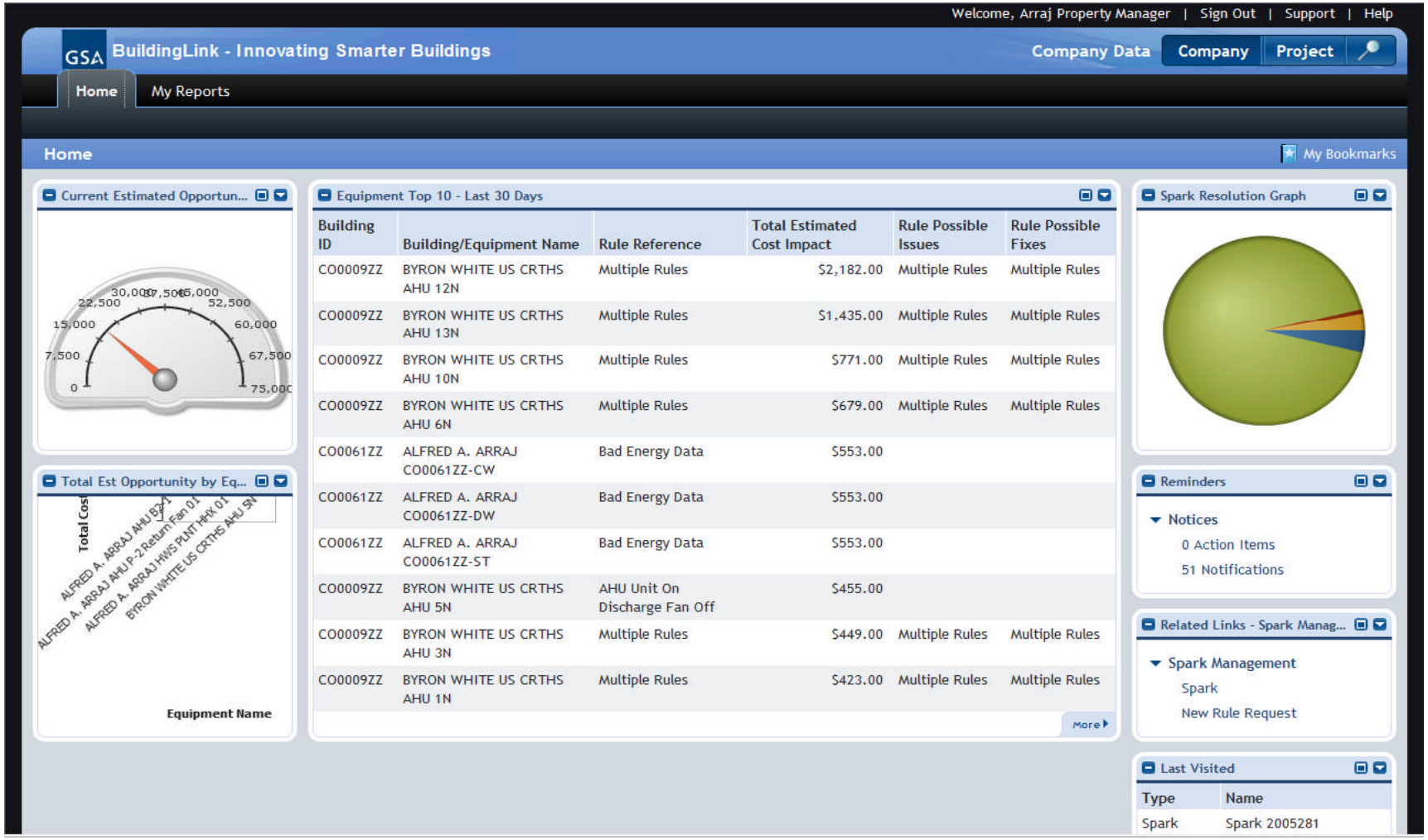
Property Manager

Tenant Agency

Regional Executive

Central Office

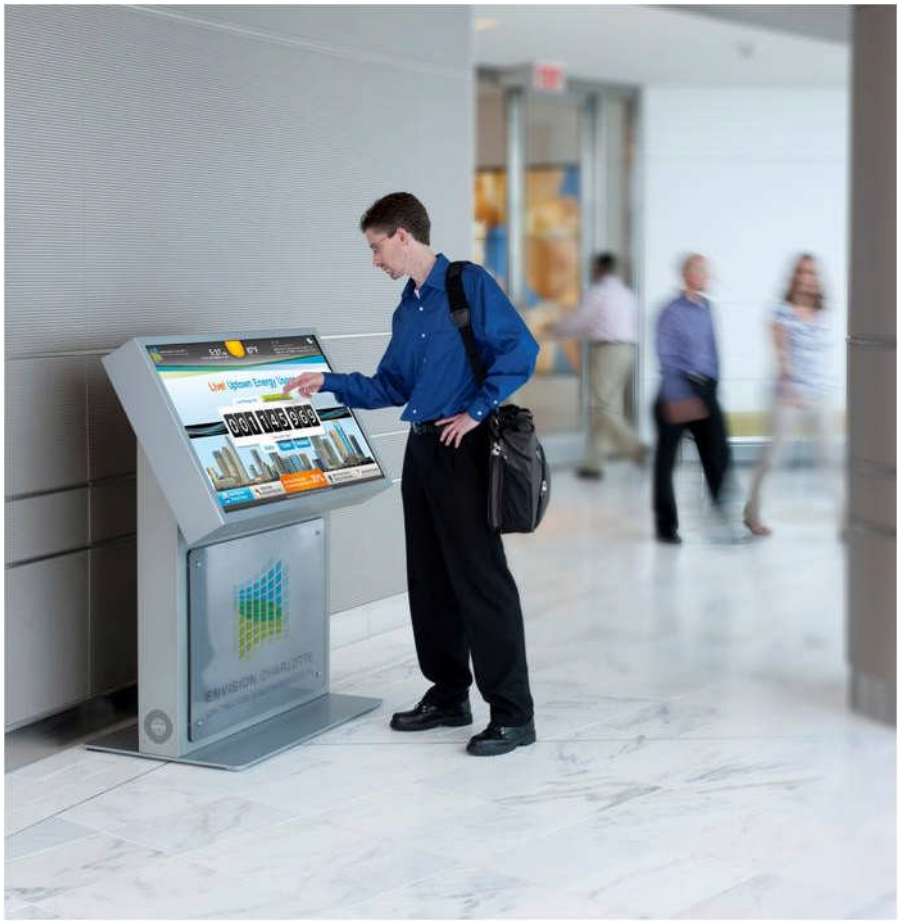
Building Link - Prototype



Building Link – Underlying Analytics

Instill Positive Behaviors

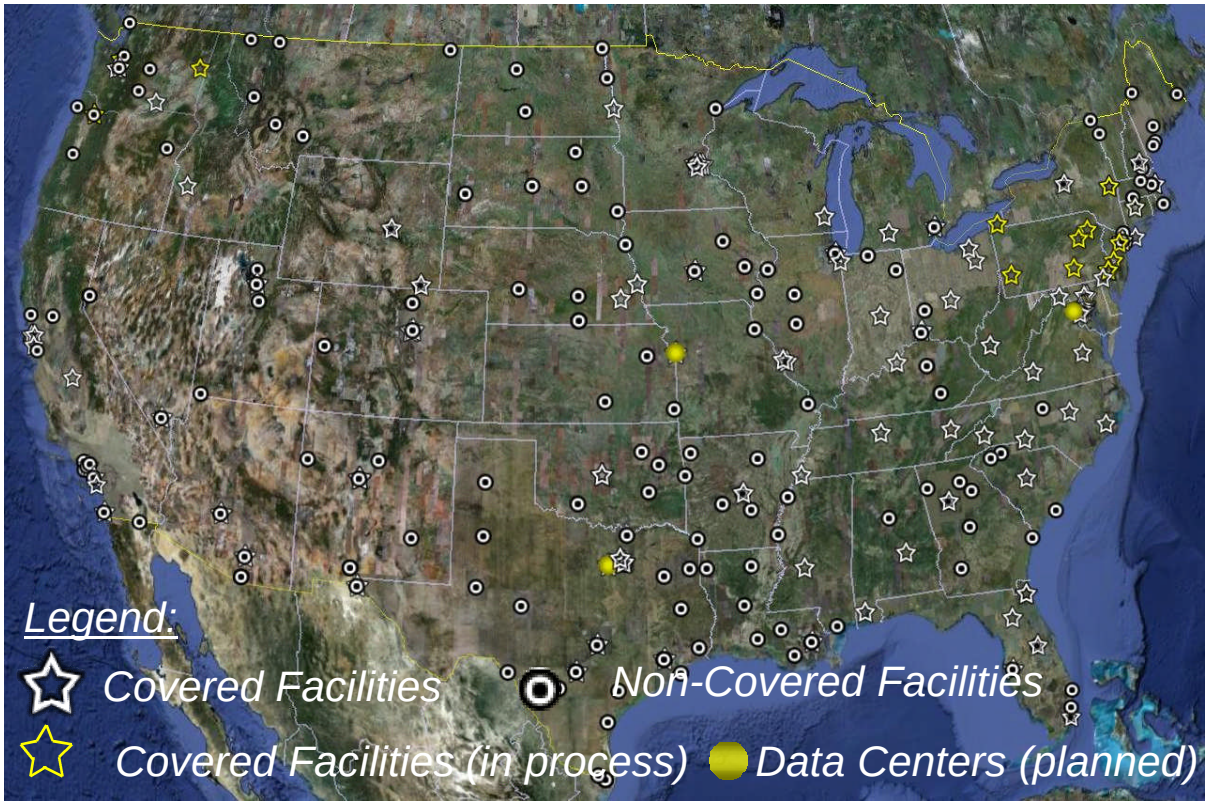
Building Occupants



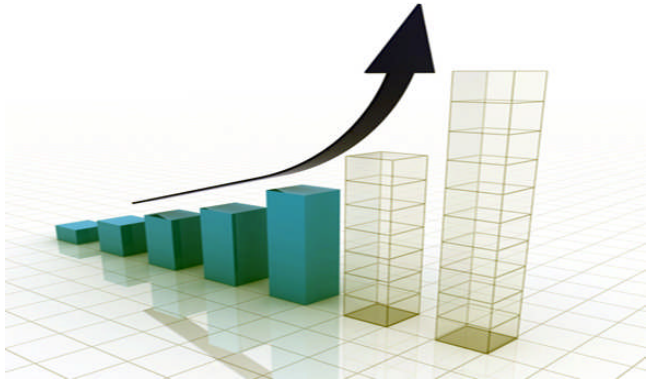
Meters

Advanced Meters Base Building

- 450 Facilities with Advanced Meters
- 80% of GSA's total electricity consumption
- 1871 physical sources (Elect, Gas, Water, Steam)

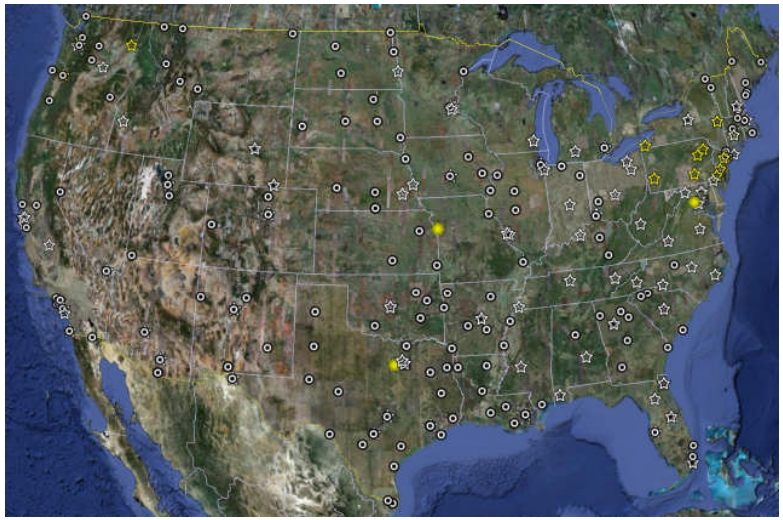


Meters



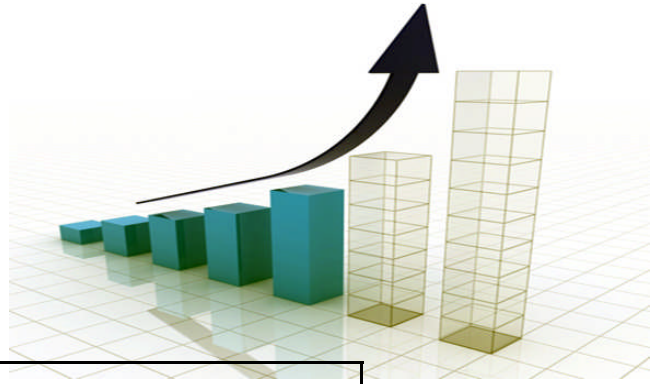
"*There's Gold in those hills*"

- 1871 Points (451 Meters)
- 15 minute Intervals
- 24 Hours a Day
- 365 Days a year
- 65,559,840 Data Points Annually



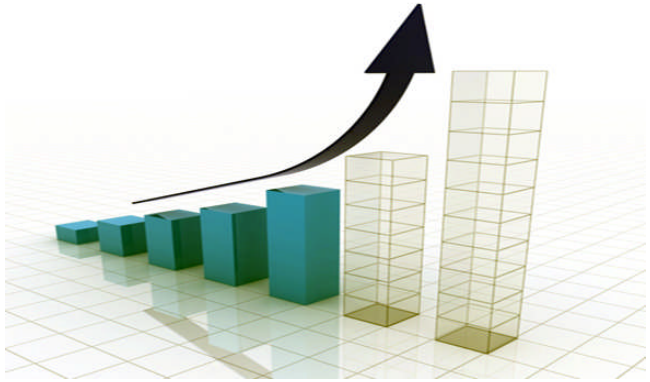
Meter Use

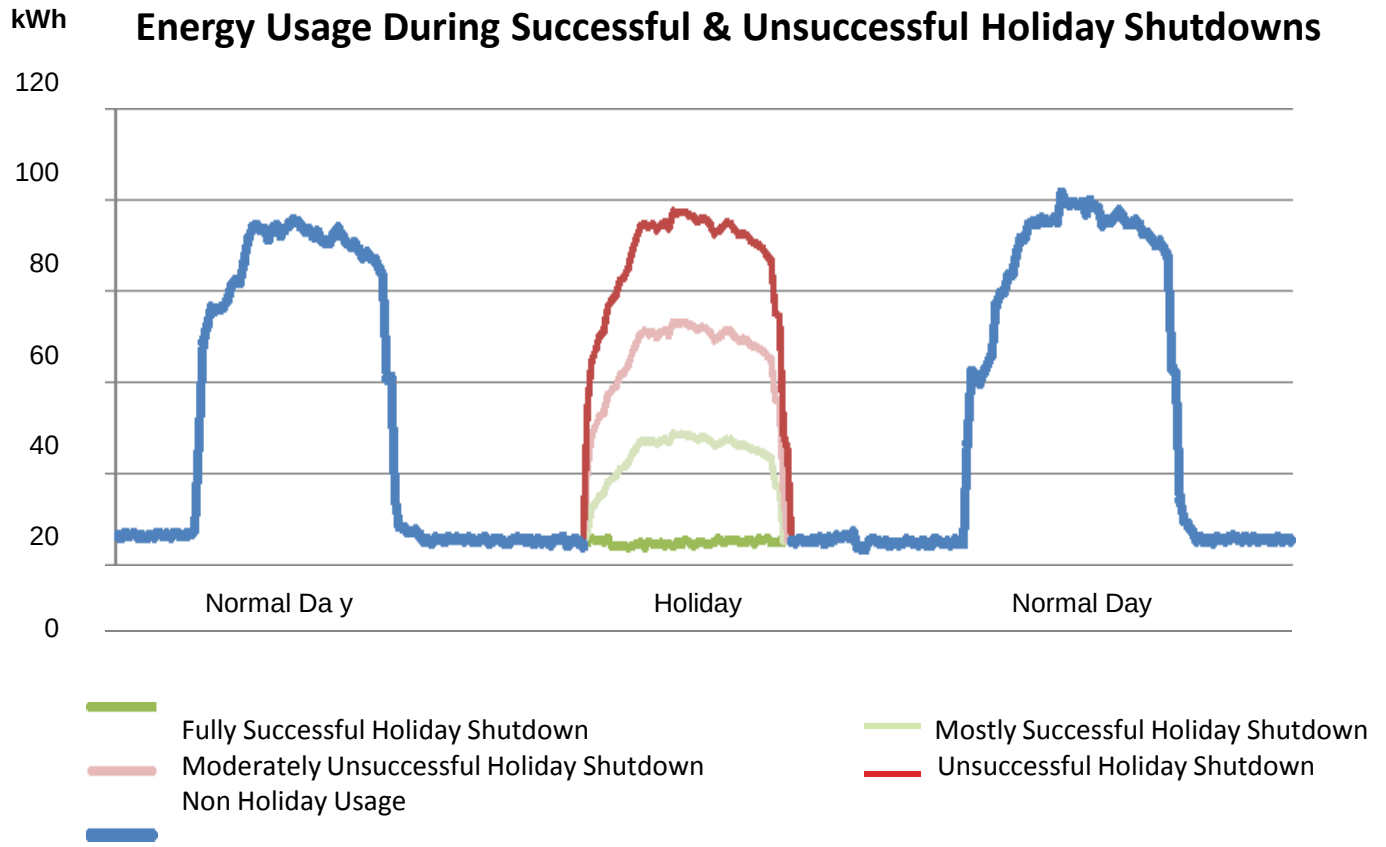
Holiday Analysis



Year	Date	Holiday
2012	Monday, May 28	Memorial Day
2012	Wednesday, July 4	Independence Day
2012	Monday, September 3	Labor Day
2012	Monday, October 8	Columbus Day
2012	Monday, November 12	Veterans Day
2012	Thursday, November 22	Thanksgiving Day
2012	Tuesday, December 25	Christmas Day
2013	Tuesday, January 1	New Year's Day
2013	Monday, January 21	Birthday of Martin Luther King, Jr.

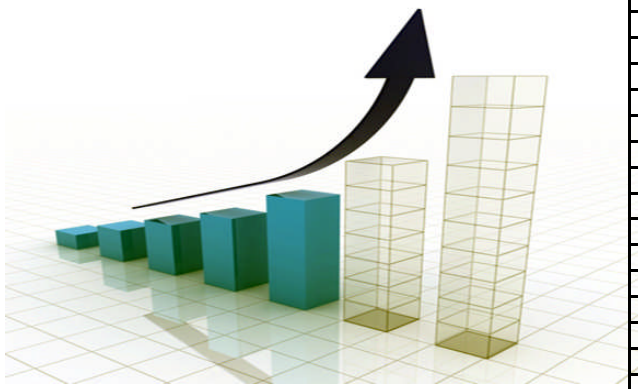
Meter Use
Holiday Analysis





Meter Use

Holiday Analysis



Building	Service Center	GSF	Memorial Day 2012	Independence Day 2012	Labor Day 2012	Columbus Day 2012	Veterans Day 2012	Thanksgiving 2012	Christmas 2012	New Year's Day 2013	Martin L. King Jr. Day 2013
IL0032ZZ	GC SC	279,320									
IL0000CF	GC SC	189,520									
IL0302ZZ	GC SC	51,680									
IL0303ZZ*	GC SC	839,461									
IN0096ZZ	GC SC	135,972									
IN0300ZZ	GC SC	314,519									
IL0054ZZ†	GC SC	681,862									
IL0205ZZ	GC SC	1,464,191									
IL0235FC	GC SC	288,125									
IL0236FC	GC SC	1,419,039									
MI0000MC	MI SC	1,283,961									
MI0029ZZ†	MI SC	771,905									
MI0072ZZ	MI SC	80,431									
MI0073ZZ	MI SC	126,840									
MI0118ZZ	MI SC	111,951									
MI0137ZZ	MI SC	278,426									
MI0000DI	MI SC	59,228									
MI0724SB††	MI SC	88,256									
MI0000BC†	MI SC	928,640									
MN0015ZZ	MN/WI SC	189,042									
MN0036ZZ	MN/WI SC	152,010									
MN0000TC	MN/WI SC	699,905									
MN0087ZZ	MN/WI SC	415,309									
MN0092ZZ	MN/WI SC	738,649									
WI0044ZZ	MN/WI SC	543,511									
WI0350ZZ	MN/WI SC	75,312									
OH0028CN	OH SC	542,825									
OH0046ZZ	OH SC	282,879									
OH0189CN	OH SC	791,748									
OH0194ZZ	OH SC	425,515									
OH0195ZZ	OH SC	169,129									
OH0000CL	OH SC	465,181									
OH0215ZZ	OH SC	44,608									
OH0301ZZ*	OH SC	770,802									
OH0302ZZ	OH SC	52,254									
OH0000DD	OH SC	206,859									
OH0192ZZ†	OH SC	1,482,775									
OH0033ZZ†	OH SC	245,368									
IL0000ES	S. IL/IN SC	145,619									
IL0154ZZ	S. IL/IN SC	116,877									
IL0173ZZ	S. IL/IN SC	166,047									
IL0200ZZ	S. IL/IN SC	35,634									
IL0214ZZ	S. IL/IN SC	5,912									
IN0031ZZ	S. IL/IN SC	130,917									
IN0048ZZ	S. IL/IN SC	554,241									
IN0133ZZ	S. IL/IN SC	630,966									
IN1703ZZ	S. IL/IN SC	1,660,346									
IL0240ZZ**	S. IL/IN SC	39,019									

Building Security Network

- A virtual network
- Makes GSA's physical IP network
- An organization of Virtual Local Area Networks
- Remediation of IP devices through Scanning
- Partitions Business Application from Building Control Systems
- Requires HSPD-12 Clearance and Authorization to Access the Network