

SMART Buildings:  
How sensor and  
information  
technologies are  
transforming the built  
environment

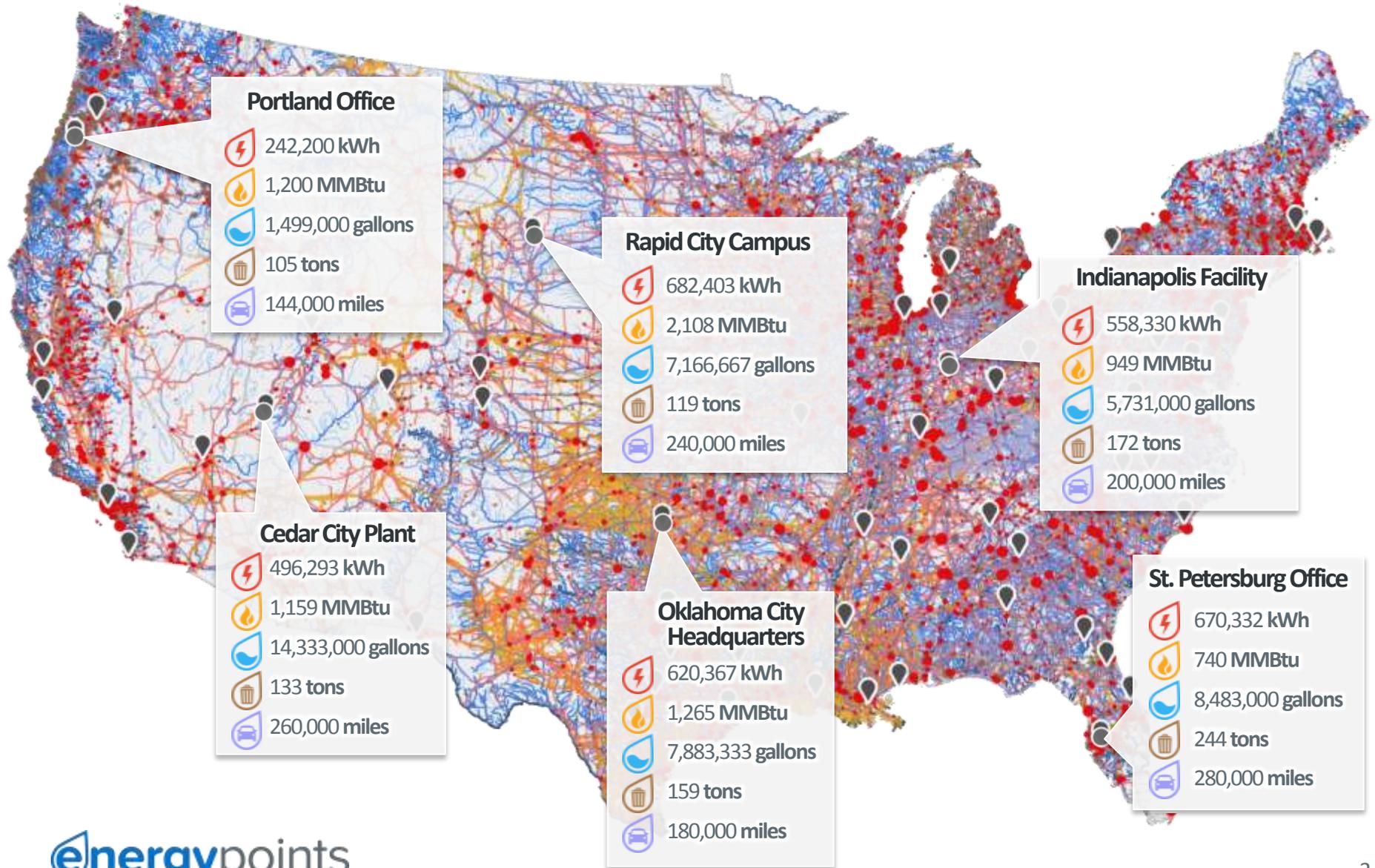
G. Sandy Diehl  
November 13, 2013  
NFPA Research Foundation  
Annual Conference

# Current Reality

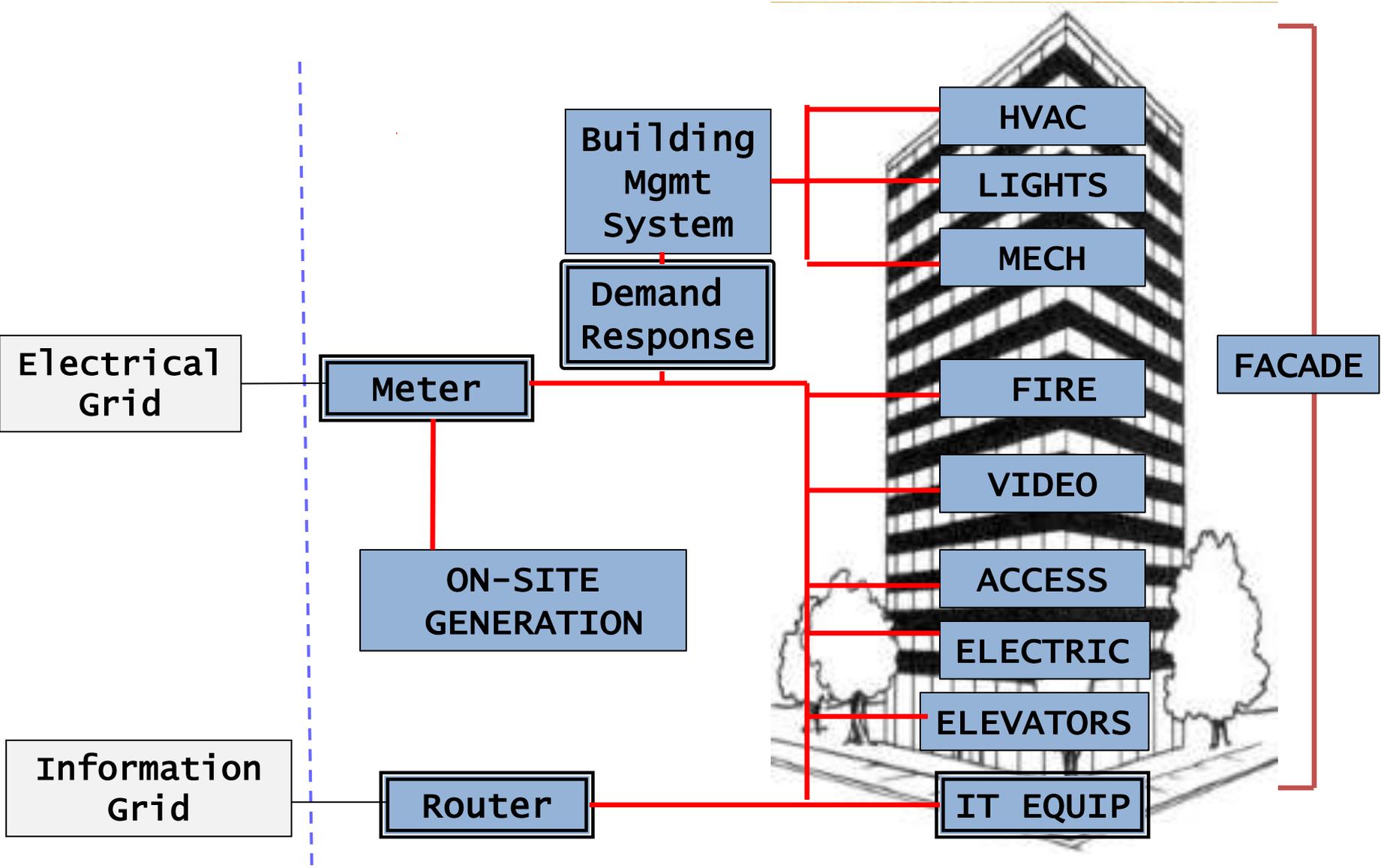
Now that smart buildings are leaving the realm of proprietary solutions and moving to a more open architected, interoperable, integrated, IP-centric platform, the need to design the correct network architecture is critical.

This webinar will address issues such as: network design, application segmentation, cable/fiber infrastructure, wireless systems, security, remote access, device connectivity, data normalization, integration strategies, redundancy and other network infrastructure related issues

# Enterprise-Wide Energy Management



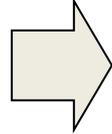
# Integrated Building System



# Building Controls

## From

Consulting engineers are the key influencer in purchase decision

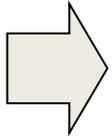


## To

Owners play an integral role in BMS vendor selection

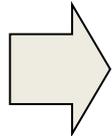
*"I care about 2 things - the façade and the BMS."  
- Building owner*

Hardware



Software

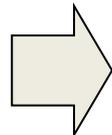
Controls purchased as discrete components (associated with underlying equipment)



Increasing integration of controls de-linked from underlying equipment

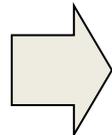
*"I want my BMS to talk to all my systems regardless of brand I choose for each of the key functions  
- Facilities manager*

Dedicated wiring



Networked Backbones

value is in the systems (e.g., HVAC)



value is in the controls

*"Our control systems have enabled us to become much smarter about how we run our systems  
- Facilities manager*

# “i-Building” Concept

Numerous new building user services can be imagined...

**Scenario: Building Portfolio Energy Management**

Customer benefits: Lower facility staff energy reduction enhanced attractiveness of leased space, increased ROI

Integration: HVAC, BMS, Security, Lighting, Elevators, Power, Enterprise Reporting

Sample Company: Wile-Corral - EEM UTC Position: Have some elements but not delivered as an integrated solution

**Scenario: Building diagnostics**

Customer benefits: Reduce cost of operations, lower satisfaction, enhance property value

Integration: HVAC, BMS, Security, Lighting, Elevators, Power, Enterprise Reporting

Sample Company: In-Build - BTM UTC Position: ITRC early TRL

**Scenario: Virtual BMS**

Customer benefits: Energy reduction, quick resolution of problems, lower operational costs

Integration: HVAC, Security, Lighting, Power, Enterprise Reporting

Sample Company: Accorium - B2M UTC Position: A/C based monitoring

**Scenario: Demand response**

Customer benefits: Lower utility cost, reduced energy consumption, reduced carbon footprint, access building value

Integration: BMS, HVAC, Lighting, Security, Elevators, Power, Enterprise Reporting

Sample Company: Phoenix - DRM UTC Position: A/D based contract solution

**Scenario: Occupancy based energy management**

Customer benefits: Streamlined energy usage, lower operating costs, improve satisfaction

Integration: Access control, Security, HVAC, Lighting, Power, Carbon capture

Sample Company: INGENIA/CI UTC Position: Requires product development

**Scenario: Office productivity**

Customer benefits: Eliminate energy waste, lower operating cost, improve productivity

Integration: Access control, Security, HVAC, Lighting, Power, Carbon capture

Sample Company: O2CO UTC Position: Components/Concepts

**Scenario: Fire detection and response**

Customer benefits: Reduced damage, improve brand reputation, reduce exposure, ability to enforce policies and procedures, self test

Integration: Fire panel, Security, CCTV, HVAC, BMS, e-mail, Enterprise Reporting

Sample Company: OIL - B2M UTC Position: Label monitoring

**Scenario: Early smoke detection and response**

Customer benefits: Reduce brand damage, reduce exposure, ability to enforce policies and procedures, automated self test

Integration: Security, CCTV, Fire panel, HVAC, BMS, e-mail, Enterprise Reporting

Sample Company: OIL - B2M UTC Position: Label

**Scenario: Suspicious activity**

Customer benefits: Inform employees, ability to enforce policies and procedures, automated self test

Integration: Security, CCTV, BMS, e-mail, Enterprise Reporting

Sample Company: FSTCI UTC Position: Label

**Scenario: Injured person**

Customer benefits: Reduce exposure, ability to enforce policies and procedures, automated self test

Integration: Security, CCTV, BMS, e-mail, Enterprise Reporting

Sample Company: Viteri - BTM UTC Position: Label

**Scenario: Startup and recovery**

Customer benefits: Streamline brand communication, prevent equipment damage, lower life cycle cost

Integration: HVAC, BMS, Security, Lighting, Elevators, Power, e-mail, Enterprise Reporting

Sample Company: BOSCH SENSORS UTC Position: Equipment specific

**Scenario: Facilities maintenance and repair**

Customer benefits: Reduce facility staff, ROI, lower satisfaction, optimize capital planning, lower life cycle cost

Integration: HVAC, BMS, Security, Lighting, Elevators, Power, e-mail, Enterprise Reporting

Sample Company: TRIRIGA - BTM UTC Position: B/I and equipment specific

# Fire Detection and Response

Customer benefits: Reduced damage, minimize tenant disruption, reduce exposure, ability to enforce policies and procedures, audit trail

Integration: Fire panel, Security CCTV, HVAC, BMS, e-mail, enterprise reporting



Fire



Alarm Activated



Text message and automated phone messages sent to emergency response team.



Security cameras automatically pan to the fire location.



On confirmation of fire, emergency services are contacted.

HVAC system set to vent smoke

Power in fire location is disconnected

Further access to the building is



Automated audit report generated.

# Early Smoke Detection and Response

Customer benefits: Minimize tenant disruption, reduce exposure, ability to enforce policies and procedures, automated audit trail

Integration: Security CCTV, Fire panel, HVAC, BMS, e-mail, enterprise reporting



Security camera using video analytics detects smoke in the building's auditorium.



An alert is generated causing the centralized monitoring service to assess the situation.

Central command - control integrates information from multiple sources on to one display to enable quick decision making.



Central monitoring operator confirms the event and initiates a local, emergency response.

An alert is triggered to evacuate the local area.

HVAC is set to vent smoke and local power is disconnected.



Problem is able to be resolved without needing to escalate the response and involve emergency services.



Local response team follows automated standard operating procedures to permit the affected area to be reoccupied.



Automated audit report generated.

# JCI's Panoptix Application Suite

## FILTER APPS

[View All](#)

- Recently Added
- Apps
- Services

+ Apps

+ Services

+ Category

+ By Company

+ Country

+ Industry



**EnCenter -  
Analytics for  
Submetering**

T4G



**Enterprise  
Services  
Manager**

Johnson Controls



**Tenant Bill  
Generator**

Johnson Controls



**Energy  
Efficiency  
Tracker**

Johnson Controls



**Total Energy  
ERP**

EnergyPoints



**Remote  
Building  
Analytics**

FirstFuel



**Portfolio  
Manager by  
BuiltSpace**

BuiltSpace



**Proteus MMX  
Asset Manager  
Free Edition**

Eagle Technology



**Proteus MMX  
Asset Manager**

Eagle Technology



**Predictive  
Energy  
Optimization by  
BuildingIQ**

BuildingIQ



**Building  
Dashboard  
Network**

Lucid



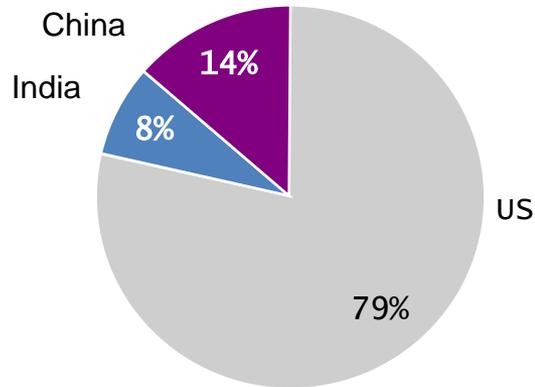
**Building  
Dashboard  
Kiosk**

Lucid

# Purchasers and Users

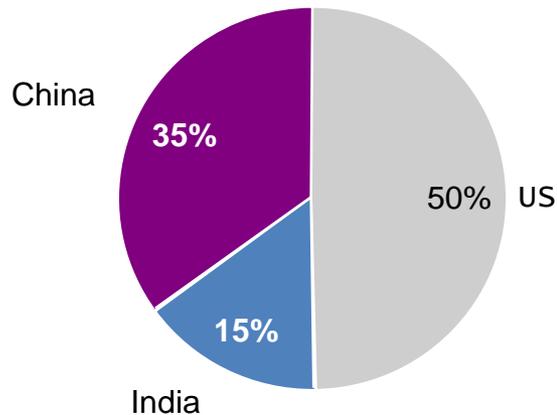
## Total respondents surveyed

N = 1273



## Respondents with integrated controls

N = 385



## Topics covered in survey

### Respondent background

- Geography
- Company, position, and industry
- Role in purchasing or using controls
- Building characteristics

### Type of controls system

- Brands used
- Integrated vs. standalone
- Functions controlled
- Capabilities available

### Purchasing process (buyers only)

- Decision-makers and influencers involved
- Functions and capabilities offered
- Reason for purchasing
- Customer satisfaction

### Day-to-day use (users only)

- Frequency of use
- Operating savings realized
- Customer satisfaction

# Prevalence of Integrated Controls

**% of customers with controls systems**

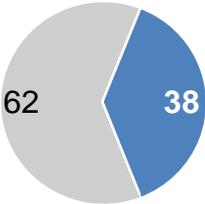
**% of controls customers with integrated controls**

■ Centralized controls  
■ No Centralized controls

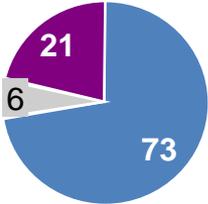
■ Single function  
■ Integrated across functions<sup>1</sup>  
■ Not integrated, option to integrate exists<sup>2</sup>

**All respondents**

N = 127  
3

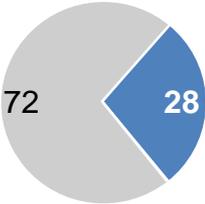


N = 489

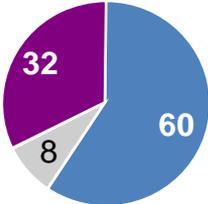


**US**

N = 100  
1

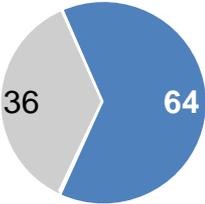


N = 282

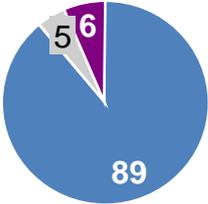


**India**

N = 9  
9

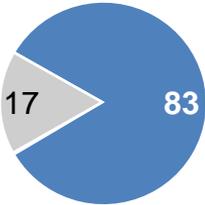


N = 6  
3

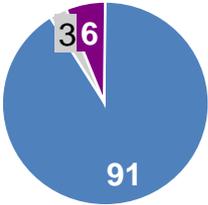


**China**

N = 173



N = 144

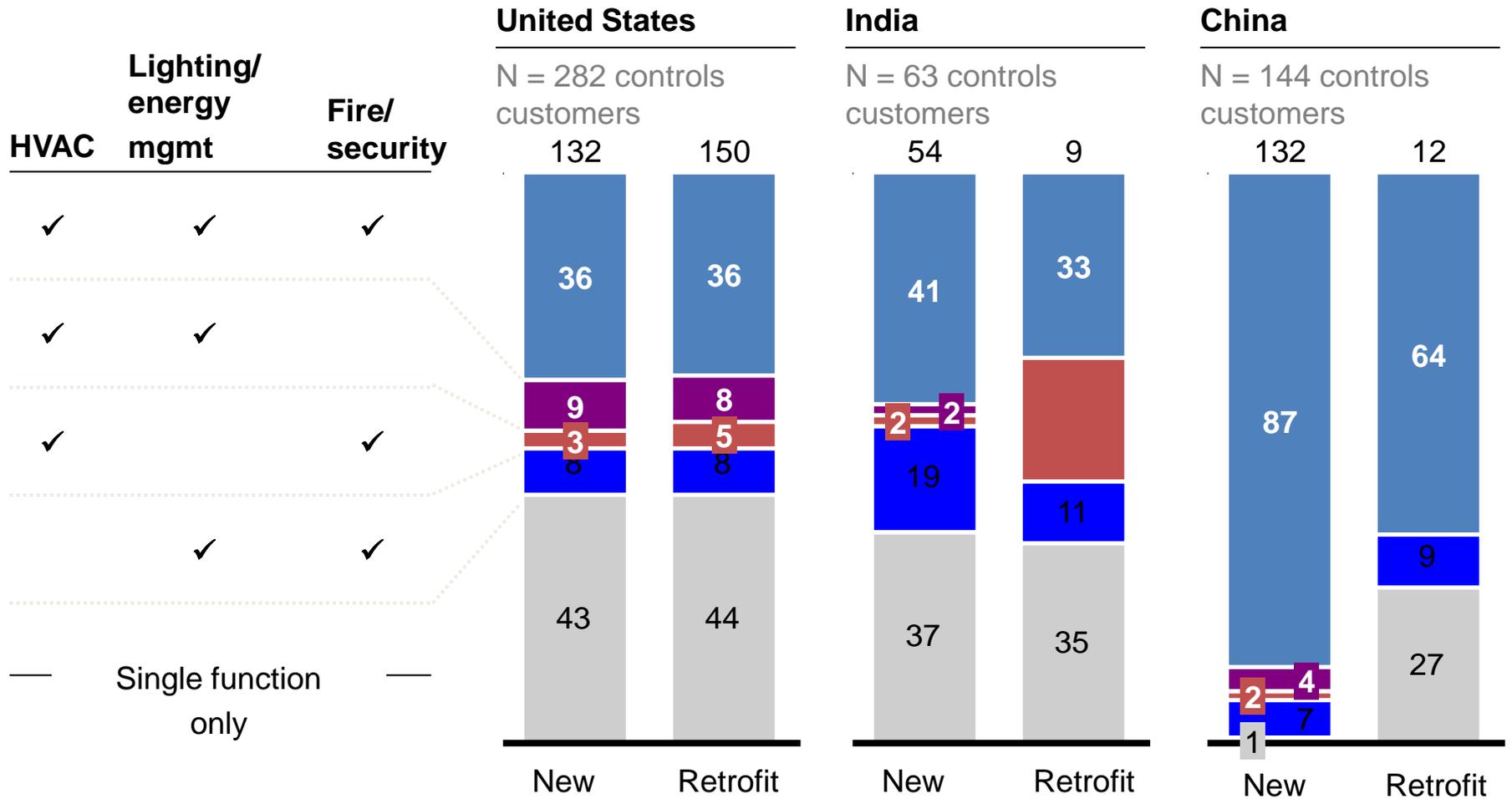


<sup>1</sup> Defined as BMSs that allow users to view and control multiple functions from the same application

<sup>2</sup> Defined as BMSs that are not integrated but that give users the options of doing so—e.g., JCI Metasys software that is only being used for HVAC

SOURCE: Survey of building owners and managers, McKinsey&Co.

# New vs. Retrofit



# 6 Emerging Trends

## Implication

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**1** Increased pressure on building operating costs

Customer need for single “platform” that enables control room consolidation and increased control over energy users

**2** Key players going to market with standard integrated offering

Integrated systems are becoming “industry norm” (especially in developing markets)

**3** Strong demand for integration in emerging markets

80% of building controls sold in China/India will involve integration across 2 or more functions

**4** Increasing growth of advanced lighting controls

Advanced lighting controls becoming increasingly attractive market

**5** Need to communicate with closed protocols in retrofits

Large market potential for integrated solutions(e.g. Tridium)

**6** Increased access to data creating new markets

Advanced capabilities (e.g. demand response) critical going forward

# Voice of Customer Summary

## Key findings

The area of *Situational Awareness* has very high attention and importance

Pervasive interest in sustainability by large customers

Customers want mobile and scalable solutions that can be easily updated

Product must be open architecture

Multi-vendor solutions will be favored (vs. one integrated system)

Growing awareness of network and BAS convergence

# Challenges

- Silos within building industry
- Customer ROI expectations
- Customer bandwidth
- Retrofits are difficult
- Codes
- Data overload