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By
2050...

34%

Growth in
population, 9.1
billion people



80%

Growth within
cities, 6.3
billion people



70%

Will live
in cities,
up from
50% today



Our population is rapidly increasing

The Challenges of Growing Cities



Increased
resource
demand

Reliable
service
delivery



Managing
waste
streams

Capacity
constraints



Opportunities are Significant

Building
Owners



- ▶ Reduce energy consumption
- ▶ Reduce operating costs
- ▶ Attract and retain tenants

Utilities



- ▶ Reinforce Energy Conservation programs
- ▶ Improve ability to anticipate and influence demand

City
Governments



- ▶ Attract long-term investments with efficient foundation
- ▶ Attract employees with growing business sector
- ▶ Attract citizens with a sustainable, high quality of life

Start with Energy Efficiency



Petroleum/Gas



Nuclear

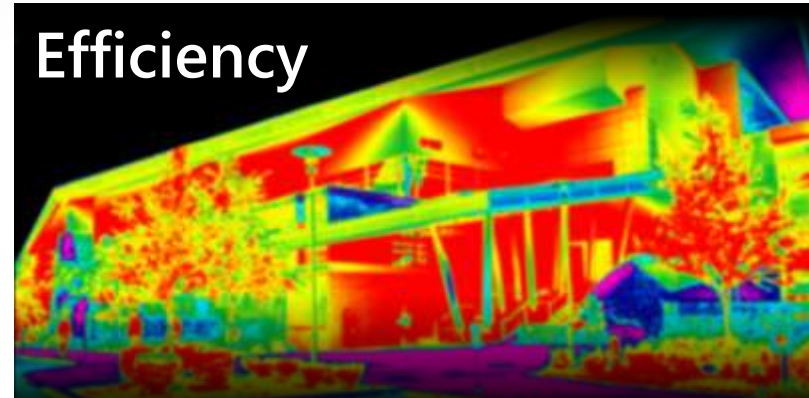


Coal



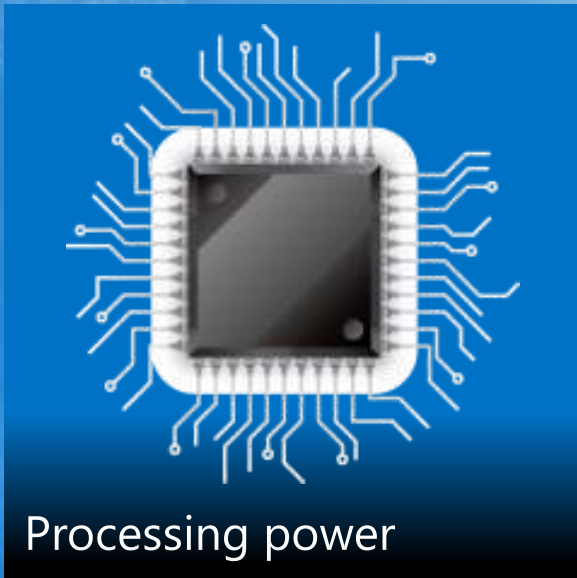
Renewable

Efficiency

A thermal imaging image of a building's exterior, showing a color-coded map of heat distribution. The colors range from purple (cooler) to red and yellow (warmer), indicating areas of high energy loss or heat gain.

“
Some call it the “fifth fuel”. It could even be called **energy ingenuity**—applying greater intelligence to consumption.
”

“The Quest: Energy, Security and the Remaking of the Modern World,” Daniel Yergin, 2011



Processing power



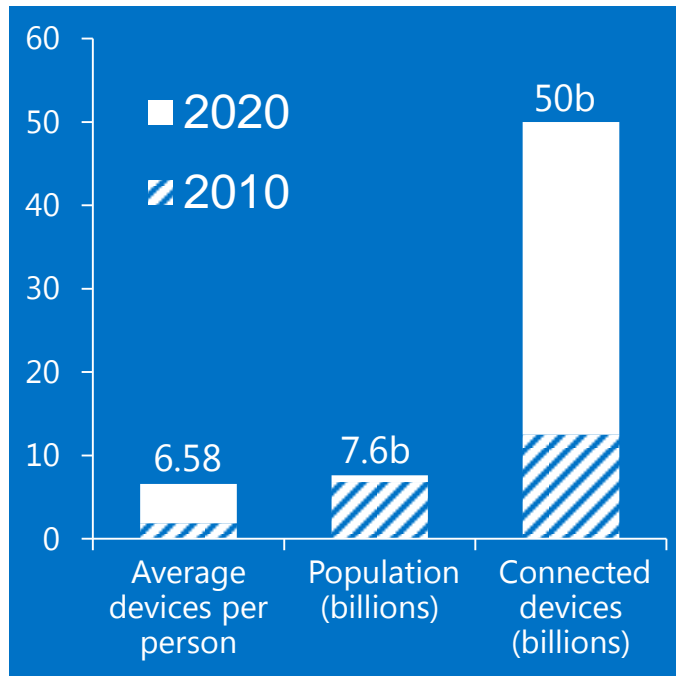
Storage



Connectedness

The cloud offers possibility

Abundance of Data is an Opportunity

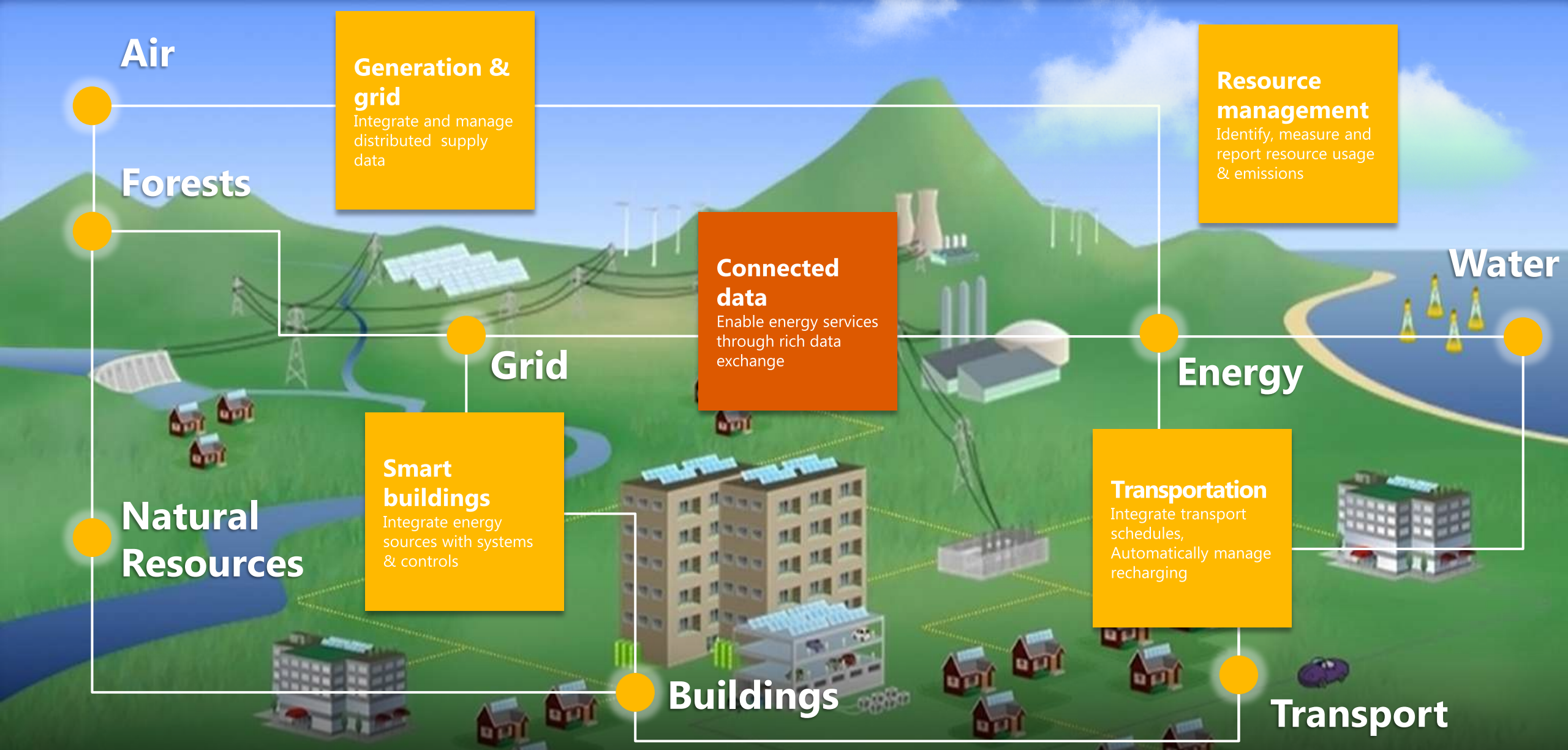


An explosion in connected personal devices...



...plus new connections to a broad range of devices

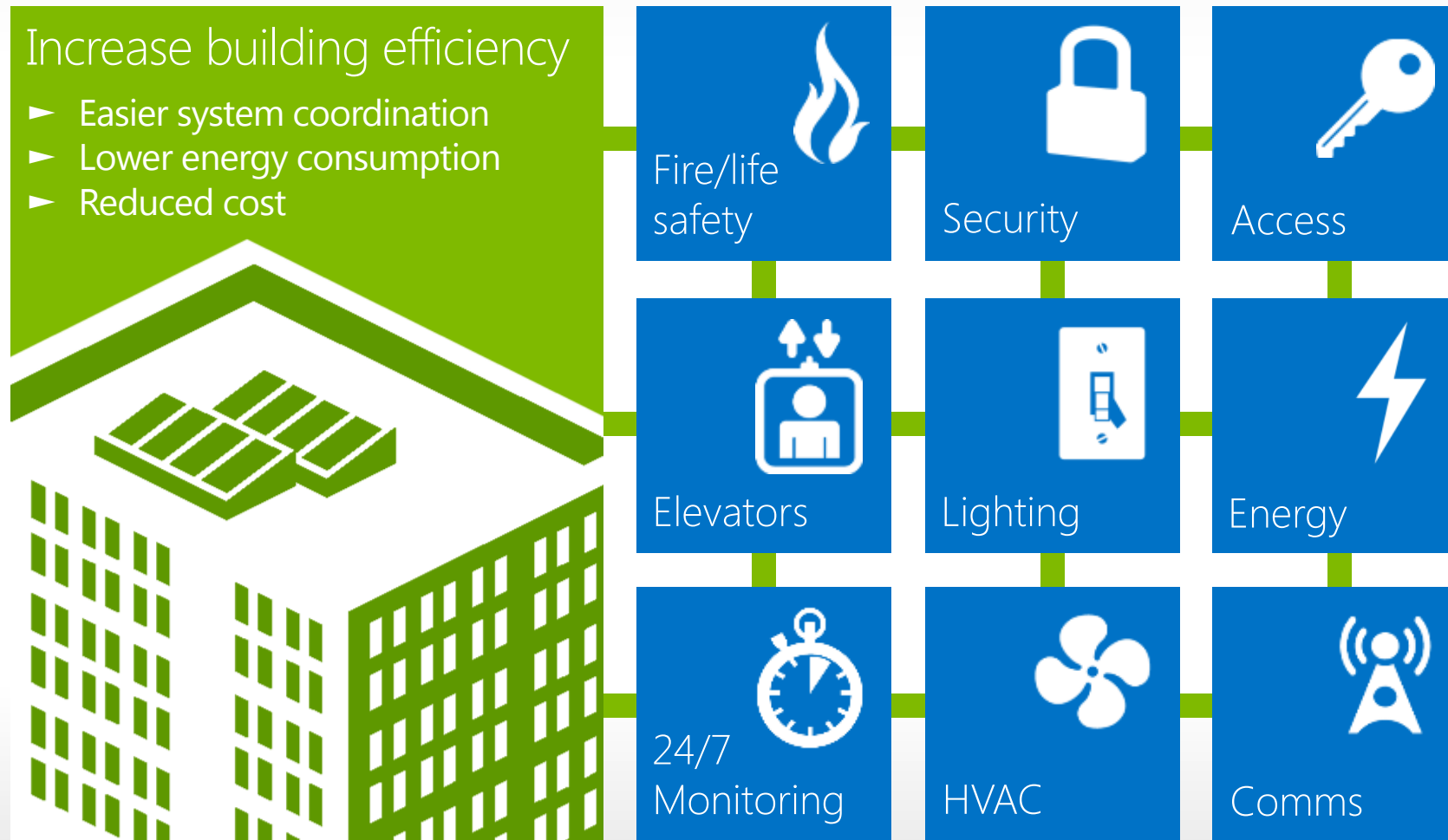




The transformative potential of data

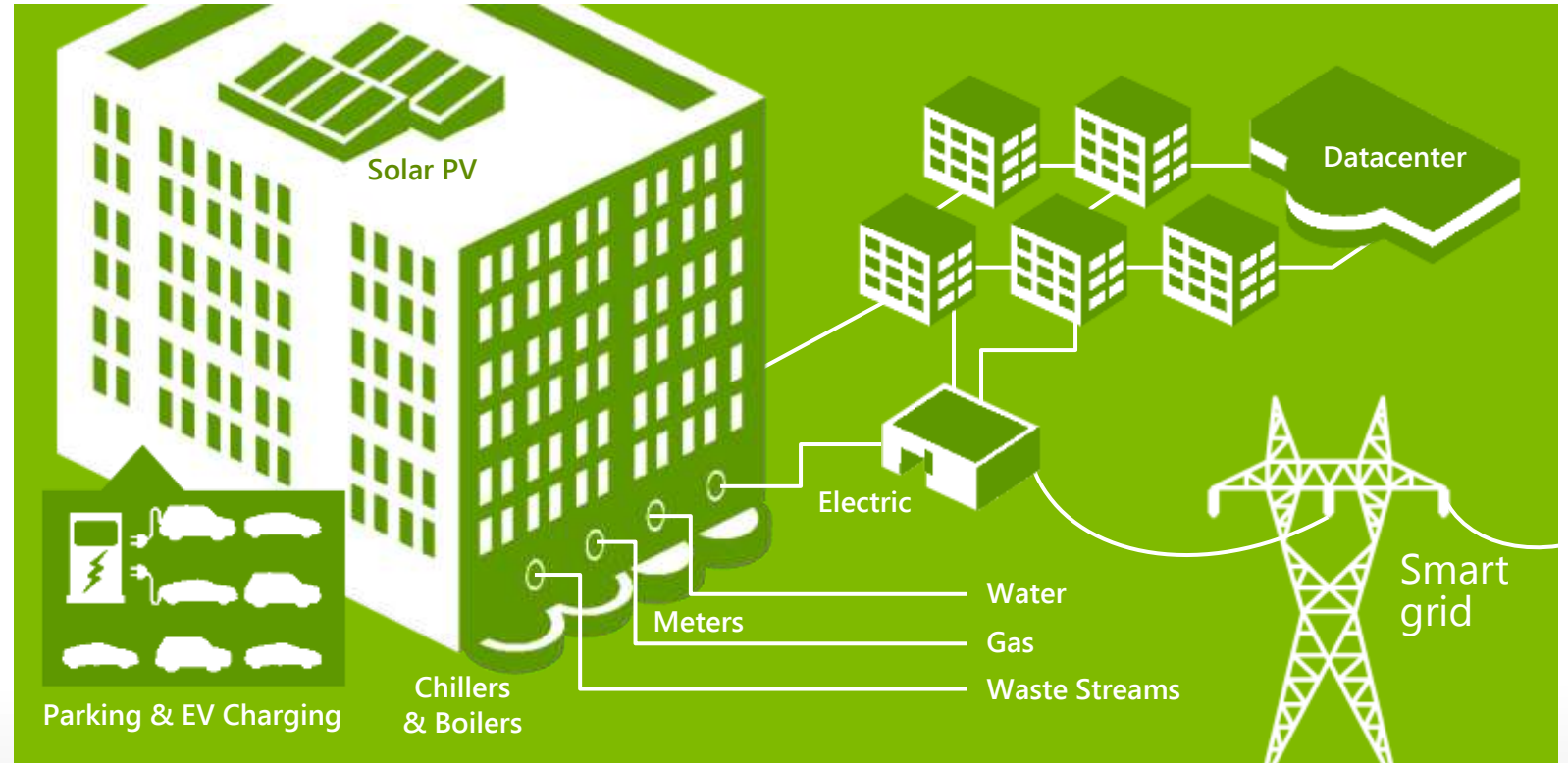
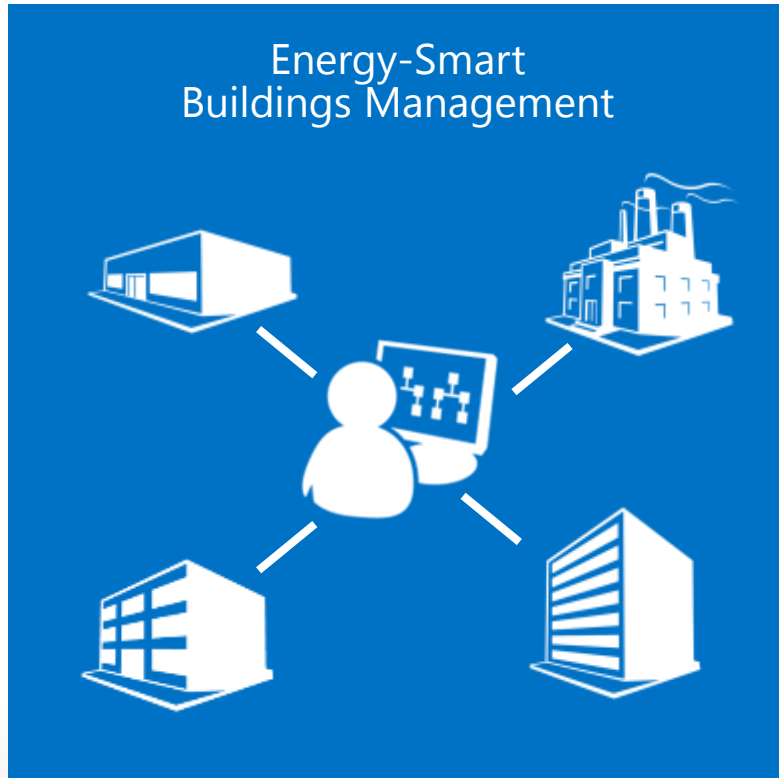
Connecting Systems Within a Building

Providing a holistic view of a building by unifying systems management data



Connecting Multiple Buildings

Optimizing energy performance across a campus or portfolio of buildings





15m ft²
across
118 buildings

35k
pieces of
mechanical
equipment

7
Major
building
management
systems

500m
data points
collected daily

Learning by doing @ Microsoft

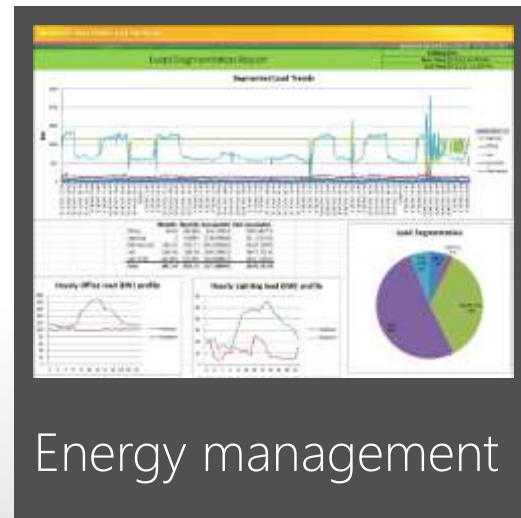
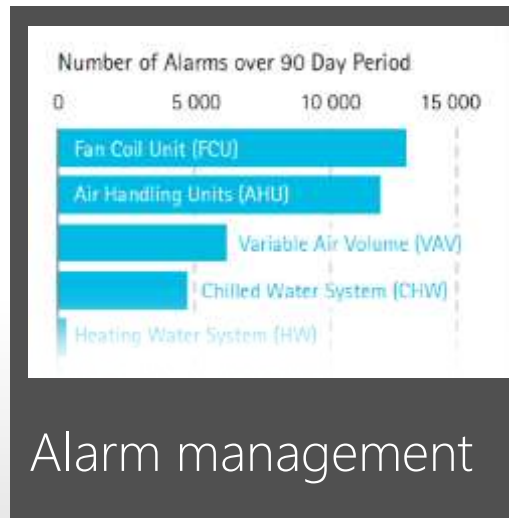
Focus of Our Smart Buildings Pilot

Building	Bldg. Cluster	Equipment	Fault and Diagnosis	Priority	Estimated Savings*
Bldg 58	Cluster E	AHU - 012	Leaking chilled water valve	High	\$11,291
Bldg 58	Cluster E	AHU - 003	Damper position fault	High	\$4,782
Bldg 53	Cluster E	VAV - 022	Over cooling	High	\$2,235
Bldg 58	Cluster E	CHI - 002	Changes to set points	Medium	\$895

Fault detection and diagnosis

Campus-wide building energy management

- ▶ Software-based solution
- ▶ No physical retrofit of building equipment
- ▶ No disruption of building occupants



“

By using software to harness the data from our diverse building systems, we kept upfront capital expenditure to less than 10 percent of our annual energy costs, and are projecting \$1 million in energy savings and payback in 18 months.

Darrell Smith, Senior Operations Manager
Real Estate & Facilities, Microsoft

”

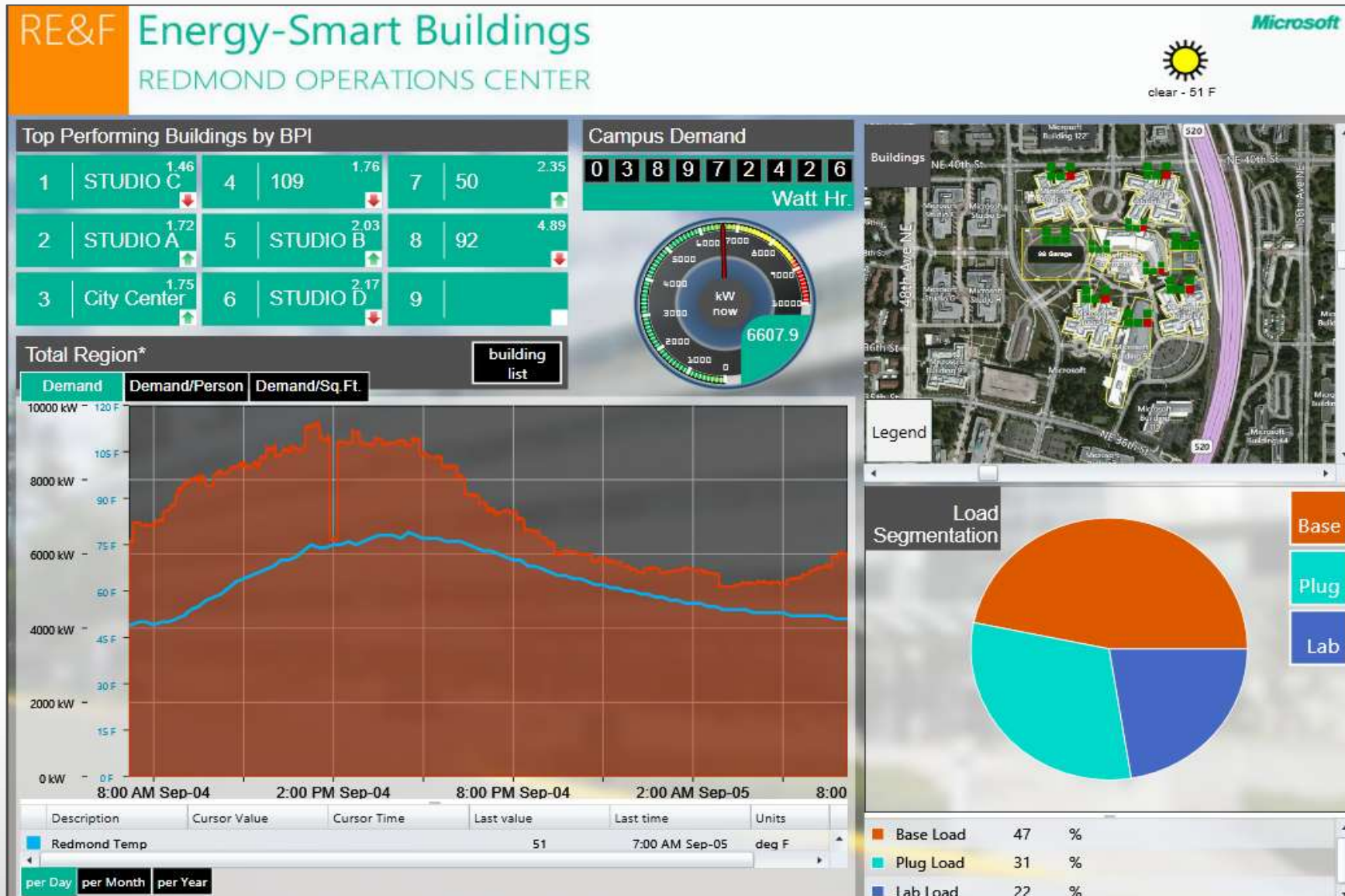


Inside the ROC




Testing Interoperability

Energy-Smart Building Solution

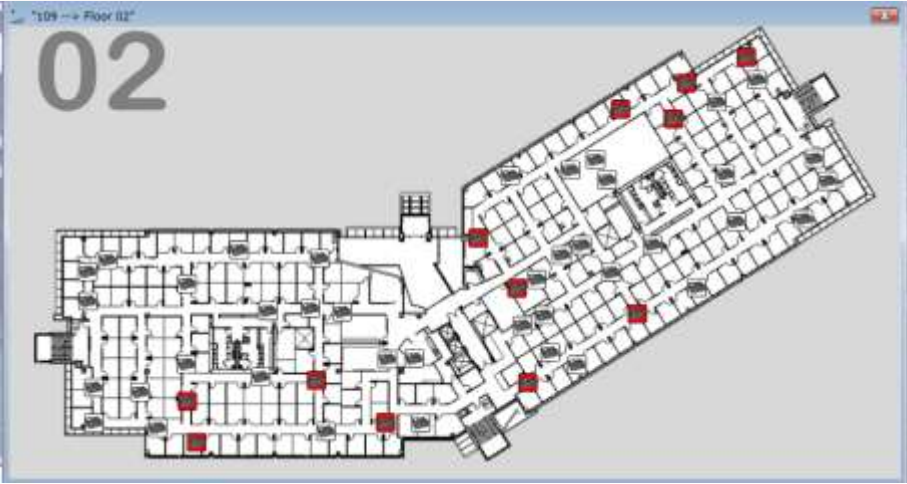


Energy-Smart Building Solution

Bldg. 109 Redmond, WA



Developer Building	211,731 Floor Space sq. ft.	1279 persons Headcou	Floor04	VAV
			13	0
AC, HP in building, Labs	Open Trend 660.00 Demand kW	Open Trend 52.20 OAT deg F	Floor03	Lab
			17	0
System Type	Open Trend 660.00 Demand kW	Open Trend 52.20 OAT deg F	Floor02	Lab
			13	0
			Floor01	Lab
			18	0
			AC 01	AC 02
			AC 03	



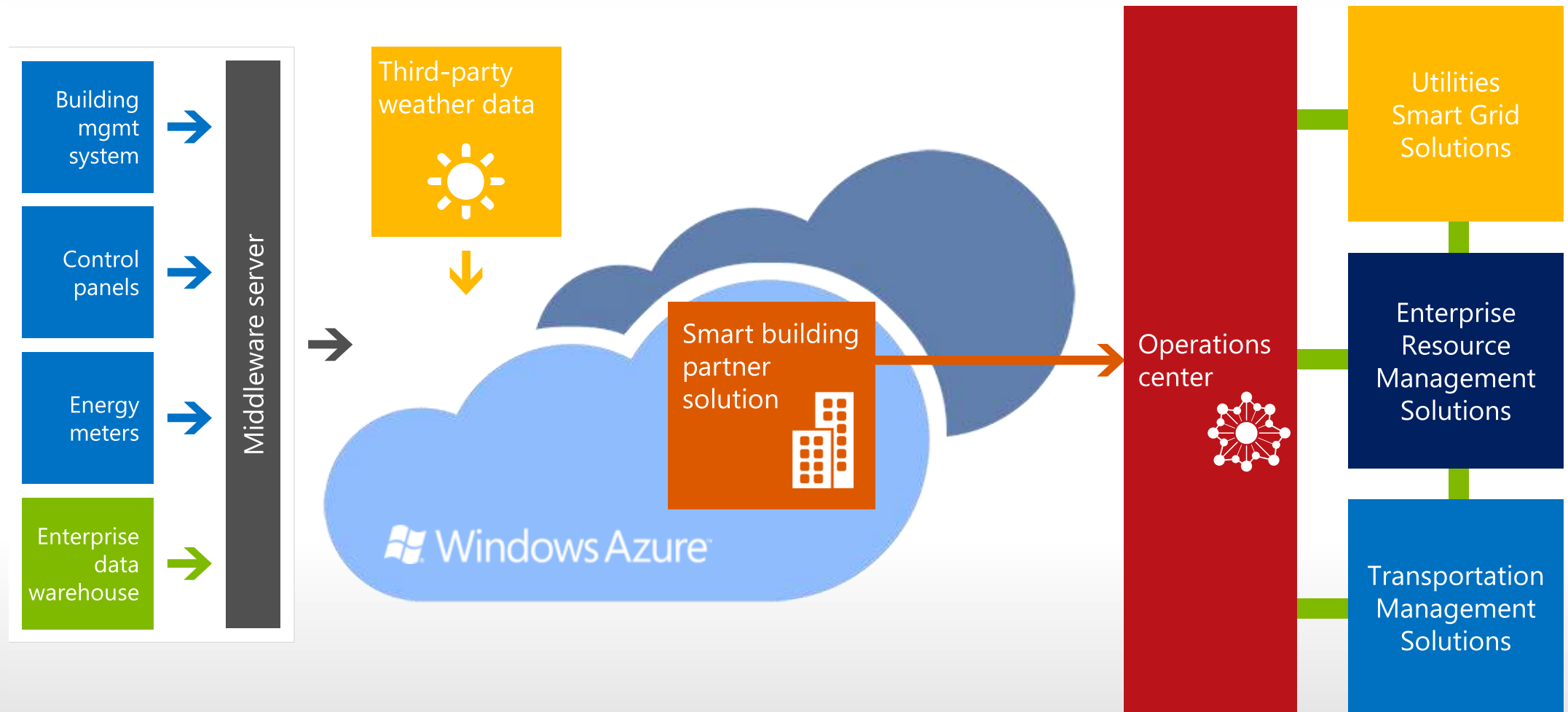
109 --> Floor 02 --> VAV 133

B109 -- VAV -- L02 -- Unit 133

72.00 OCCUPIED SETPOINT	72.40 SPACE TEMP	0.00 DAY_NGT	74.00 CURRENT CLG STPT	0.00 COOLING SIGNAL
400.00 DESIRED AIRFLOW	0.00 AIR VOLUME	100.00 DMPR COMD	71.00 CURRENT HTG STPT	0.00 HEATING SIGNAL

Time / Date	Tag	PR	Fault Savings
07/15/2012 21:28	PugetSound.RemoteCampus.109.L02.VAV.133.Flow Fault	3	N/A
07/15/2012 21:28	PugetSound.RemoteCampus.109.L02.VAV.133.Damper Stuck Closed Fault	3	N/A

Microsoft Energy-Smart Building Architecture





Situation

- 2030 District goal of reducing energy consumption 50% by 2030
- Commercial buildings account for 54% of Seattle's energy usage; projected to increase 44% by 2030
- 67% of that usage comes from HVAC and Lighting systems
- Energy rates increasing over the next few years.

Solution

- Focus on wide-scale energy conservation
- Partnership between Seattle OED, Seattle City Light, Seattle 2030 District, private building owners, Accenture, Microsoft
- Utility Customer Portal
- Energy Use Intensity Engine
- Energy Management Systems
- Smart Buildings solution

Projected Benefits

- Starting with 9 million sq. ft. (10%) of Seattle 2030 District buildings
- Reduce addressable building energy loads by 25%
- Demonstrate leadership and innovation, and bolster regional economy

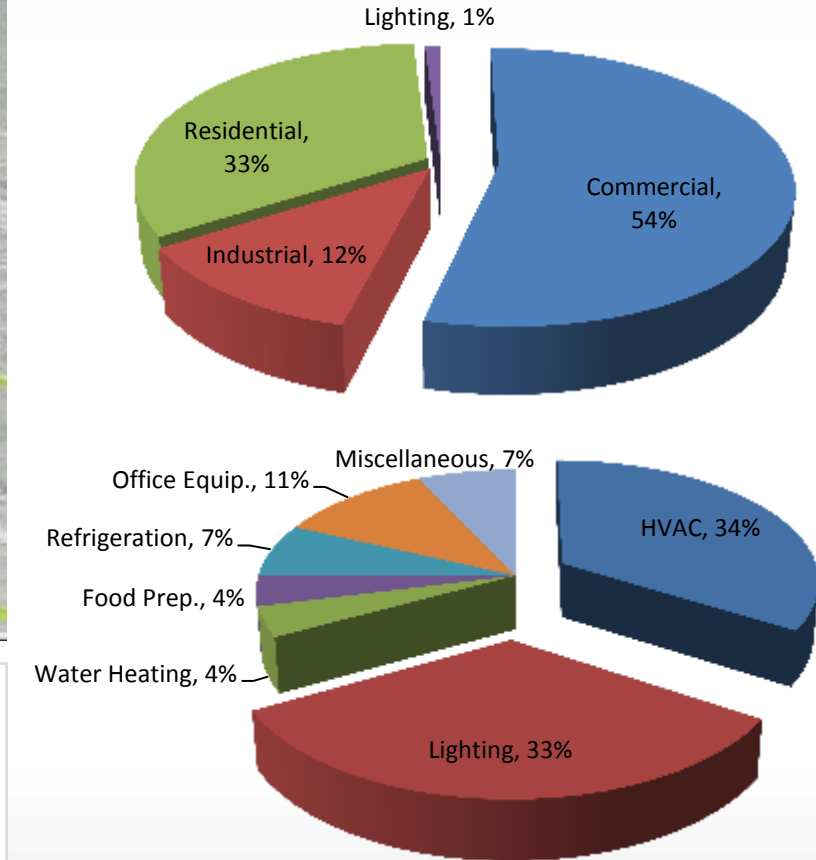
Seattle, Washington, USA

Seattle 2030 District

Aiming to dramatically reduce environmental impacts of building construction and operations



- Seattle 2030 District covers about 90 Million Sq. ft. of building space.*
- Energy, water and CO2e reduction target for existing buildings and infrastructure is a 50% reduction below the national average by 2030, with incremental targets.**
- Commercial buildings make up the majority of the SCL service area
- HVAC and Lighting make up 67% of commercial building electricity use in Seattle.



Sources:

* <http://www.luciddesigngroup.com/news/lucid-partners-with-seattle-2030-district-to-dramatically-reduce-commercial-building-energy-usage-in-downtown-seattle.php>

** <http://2030district.org/seattle/district-goals>

Pie graphs from Seattle City Light Conservation Potential Assessment, May 29, 2012

Situation

- High energy and maintenance costs for running city street lighting and other infrastructure
- Local government organizations spend € billions annually on street lighting
- Increasing complexity of ICT requires integration

Solution

- Logica **IBOR** cloud-based service
- Smart lighting (targeted switching off, dimming of street lighting)
- Centralized or on-site control (via smartphone)
- Scenarios for emergencies, rescue operations, events
- Built on Windows Azure, Bing Maps, Silverlight, Windows 7/Phone, Surface

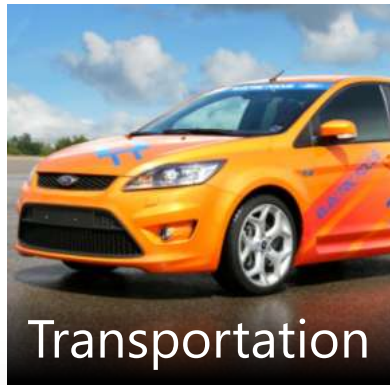


Benefits

- Increased energy savings, quality of life, public safety
- 30% - 40% electricity savings; 15% savings on maintenance
- Remote control, monitoring & fault detection
- Cost effective pay per use model
- Increased security via emergency lighting scenarios
- Reduced grid load, CO₂ emissions

Utrecht, The Netherlands

Our Partners Are Making a Difference



A grid of logos for various partners, including:

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- SClenergy
- iconics
- Schneider Electric
- TELVENT
- ALSTOM
- esri
- osisoft.
- carbonsystems
- Infosys
- Leland Stanford Junior University (1891)
- The University of California (Davis)
- Johnson Controls
- Coulomb Technologies

Our Systems Are All Connected



Where to start?

How we can help



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Sustainability

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[microsoft.com/
utilities](http://microsoft.com/utilities)

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- ▶ Energy-Smart Buildings: Demonstrating how information technology can cut energy use and costs of real estate portfolios



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