How IOT Solutions Enable Building Energy Efficiency

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Schneider Electric, the Global Specialist in Energy Management and Automation

€26.6 billion
FY 2015 revenues

~5%
of FY revenues devoted to R&D

160,000+
people in 100+ countries

Four integrated and synergetic businesses
FY 2015 revenues

Balanced geographies – FY 2015 revenues

27%
North America

26%
Western Europe

29%
Asia Pacific

18%
Rest of World

Buildings & Partner
Industry
Infrastructure
IT

45%
21%
20%
14%
Energy is the base of life.

Life Is On
when energy is on……

We ensure energy is on by making it

• Safe
• Reliable
• Efficient
• Connected
• Sustainable
Buildings are the bedrock of cities... and totally rely on electricity and energy.

Buildings consume 33% of world energy.

Buildings consume 53% of world electricity.

Electricity consumption in buildings will grow by 80% by 2040.

Source: IEA, 4Degree Scenario
Buildings are complex systems …that are different in every country

Multiple Silo Systems

- Multiple networks from multiple vendors
- Too many systems to learn
- Complex troubleshooting
- Higher capital and operational expenditures
- Obstacles to achieving energy efficiency

Multiple Standards

- International
- Regional
- Local
- HVAC
  - International: ISO 16813
  - US: ASHRAE
  - UK: CIBSE
  - Australia
  - India
...Homes and Buildings show a huge untapped potential for more…

**Energy Efficiency**

- **82% untapped Energy Efficiency potential in Buildings and datacenters**
- **30-50% energy efficiency potential** through active control of the building space

**Operational Efficiency**

- **75% of a building's lifetime costs** go to maintenance and operations
- Proactive, predictive maintenance and analytics can save up to **20% per year** on maintenance and energy costs*

* Energy and Water systems

**Untapped energy efficiency potential by segment**

- **58% Industry**
- **79% Infrastructure**
- **82% Buildings & Data Centers**

**Typical Maintenance Program Used in all facilities**

- **1X Reactive**
- **5X Preventive**
- **10X Predictive**

**Lifetime ROI of different approaches to maintenance**

Source: US Department of Energy, August 2010

1: World Energy Outlook 2012, OECD / IEA, Internal analysis
New disruptive technologies are catalysts for huge efficiency gains

### Internet of Things
- **In Buildings:** Number of connected devices
  - 2014: 1.7bn
  - 2020: 5.5bn (X3)
- **In Homes:** Number of connected device shipments
  - 2014: 0.14bn
  - 2019: 1.8bn (X13)

### Renewable & Storage
Solar PV and Storage have seen drastic improvements in their economics over the past 5 years...

<table>
<thead>
<tr>
<th>Year</th>
<th>Solar PV LCOE ($/MWh)</th>
<th>Li-ion Battery Costs ($/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>1000</td>
<td>359</td>
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<tr>
<td>2010</td>
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<tr>
<td>2018</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>2019</td>
<td>25</td>
<td>15</td>
</tr>
</tbody>
</table>

**Resulting in drastic increase in PV annual installed capacity**

- 2014: 0.14bn
- 2019: 1.8bn (X13)

### Building Lifecycle Management
- % of players using BIM (Building Information Modeling) on more than 60% of their projects

- Architect
- Engineer
- Contractors
- Building Owner

Source: Autodesk
- Source: Lazard 2014, BNEF 2014
- Source: Schneider Electric
- Source: Solar Power Europe - Global market outlook 2015

Source: Memoori
- Source: BNEF 2014
- Source: BNEF 2014
The Internet of Things landscape

The integration of a comprehensive and distinct set of capabilities is essential to benefit from digitization.
Symbiotic combination of **energy, automation, and software**

- **Energy**
  - Busways and enclosures
  - Circuit breakers and contactors (ACB, MCCB, FD)
  - Switches and sockets

- **Automation**
  - HVAC controllers, sensors, valves, and actuators
  - Power factor correction and power meters
  - Smart space controls
  - Voice data image

- **Software**
  - Security Management
  - Building Management
  - Power Management
  - Resource Advisor
  - Building Analytics

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*Life Is On* Schneider Electric
Through an integrated architecture for buildings
To achieve up to a 30% energy reduction through systematic energy monitoring and real time energy usage control
Example: Intelligent Room Controller for Hotel Application
Example: Wireless mini-BMS System for Office Application

**Architecture**
- Communication: Wireless and Wired
- Web BMS User Interface
- Cloud
- 100 Branches Dashboard Aggregation

**Managers (MPM)**
- One MPM is all you need to gain control of your building
- Multiple MPMs can be networked for scalability
- Controller, gateway, and Web server capabilities all in one box

**StruxureWare™ Building Expert**
- Mini-BMS hosted directly by MPM devices
- Included for out-of-the-box functionality
- No license fees
- Remote access via the Web

**Lower Installation Cost**
- Simple wireless system
- Easy installation
- Minimize downtime

**Operational Flexibility**
- Portable and reusable system (ideal for rental branches)
- Easy to expand by adding additional devices
- 3rd party BMS integration
- BMS data transfer to Energy Cloud

**Lower Operational Cost**
- Precise temperature control
- Built-in occupancy sensor
- Built-in scheduled timer

EcoStruxure™ Web Services, FTP, Modbus®, CANbus™, ZigBee®, EnOcean®, BACnet®, and oBIX®
Mid-size building

From grid to floor space, we ensure operational efficiency

Software & Analytics


Energy

Busways and enclosures

Circuit breakers and contactors (ACB, MCCB, FD)

Switches and Sockets

Automation

HVAC controllers, sensors, valves, and actuators

Power factor correction and power meters

Smart space controls

Voice data image

EcoStruxure

Energy  Automation

Building Management

Resource Advisor

Building Analytics

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Enabling workplace efficiency

- Occupant comfort & safety
- Building & energy management
- Energy savings

Up to 30% energy savings for buildings of all sizes
Connectivity and collaboration

- Exponential growth of “big data”
- Leveraging the cloud
- Software-as-a-Service

Over 3 billion users worldwide now access Internet
Example: Multi-sites Energy Management via cloud based software platform

Access to energy and site information through real time monitoring and control or on-line services

**StruxureWare Energy Operation**

- Friendly to use and customized dashboard
- Multi-site and multi-customer application
- Energy consumption tracking
- Asset monitoring

![Diagram of StruxureWare Energy Operation](image)
Creating the Homes & Buildings of tomorrow which Sense, Think & Adapt

Some of Schneider Electric references & supported projects

**Green Office Meudon**
France
The world’s largest positive-energy building

**TNT Center**
Netherlands
Carbon neutral headquarters
One of Europe’s most sustainable buildings

**GROW Home**
Solar Decathlon
Seasonally adaptive
Positive energy home

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**More Reliable & Safe**
100 years reliability track record in electrical distribution

**More Connected & Secure**
IP Connected Devices + Analytics uncovering efficiency opportunities
Enhanced and more robust cyber security

**More Renewable**
Onsite Renewable Integration
Near Zero/ NetZero, Positive Energy Buildings

**More Collaborative**
Collaboration through Digital Twins & Building Information Modeling in Design, Build, Operate

**More Efficient**
Active Energy Efficiency
Preventive/Predictive Maintenance

**More Flexible & Comfortable**
Activity Based Workspaces, Workspace on demand
Optimum lighting, temperature and indoor air quality
From grid to living space, we enable comfort and safety

### Energy
- Luminous storage units
- Uninterruptible power supplies, surge protectors, and power conditioning
- Solar power systems
- Main circuit breaker
- Switches and sockets, weather-proof switches and sockets
- Solar Power systems
- Luminous storage units

### Automation
- Connected home system
- Motion and light sensors
- Indoor and outdoor light control
- Smoke detector
- Door entry system
- Temperature sensor
- Curtain control
- Indoor and outdoor light control
- Temperature sensor
- Curtain control

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Increase energy awareness with monitoring solution

Multi-energy monitoring

Electricity  Gas  Water  Calorie

Panelboard  Alarming  Simple Load Control
Energy University by Schneider Electric

Energy University is a FREE, online, educational resource, offering more than 200 vendor-neutral courses on energy efficiency and data center

www.myenergyuniversity.com
Combining an unmatched portfolio of core electrical offers and building automation with digital innovation to create Buildings that can sense, think and adapt making them safer, more reliable, efficient, comfortable and sustainable Buildings, where we spend most of our lives, where Life is On.
ensuring that everywhere, for everyone and at every moment.