Intelligent Buildings in an Intelligent Grid

IEEE Ottawa
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A Smarter Electricity Grid – “different things to different people”

- Electricity grid no longer just an energy broadcast system
- The *Energy Internet* will route watt-hours to various users at various times
- Watt-hours will have attributes
- New Business Opportunities from a Smarter Grid

**Energy Packet**

<table>
<thead>
<tr>
<th>Time</th>
<th>Source</th>
<th>Customer</th>
<th>CO₂e t/Wh</th>
<th>Energy (Wh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:15, Nov 10, 09</td>
<td>Hydro1</td>
<td>Customer # 1</td>
<td>0.54</td>
<td>45</td>
</tr>
<tr>
<td>00:30, Nov 10, 09</td>
<td>Bullfrog Power</td>
<td>Customer # 2</td>
<td></td>
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</table>
Triacta - at the Edge

Smart Grid Service Offerings

In the building → I ← at the edge of a Smarter Grid
What We Sell

Triacta provides “networked meter points” and value-added software to offer smarter services off a smarter grid

Main Markets

- Multi-tenant SMART metering
- Intelligent Building infrastructure (SMART Buildings)
Why More Intelligent Buildings

Energy costs are the largest and fastest growing facility cost behind tax and insurance.

<table>
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<tr>
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<tbody>
<tr>
<td>Total Income</td>
<td>23.56</td>
<td>$24.03</td>
<td>22.72</td>
<td>19.33</td>
<td>17.26</td>
<td></td>
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<tr>
<td>Cleaning</td>
<td>1.43</td>
<td>1.2</td>
<td>1.17</td>
<td>1.2</td>
<td>1.15</td>
<td>0.28</td>
</tr>
<tr>
<td>Repairs &amp; Maintenance</td>
<td>1.8</td>
<td>1.45</td>
<td>1.37</td>
<td>1.55</td>
<td>1.38</td>
<td>0.42</td>
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<tr>
<td>Utilities</td>
<td>2.42</td>
<td>2</td>
<td>1.86</td>
<td>1.87</td>
<td>1.84</td>
<td>0.58</td>
</tr>
<tr>
<td>Roads, Grounds &amp; Security</td>
<td>0.95</td>
<td>0.71</td>
<td>0.68</td>
<td>0.61</td>
<td>0.5</td>
<td>0.45</td>
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<tr>
<td>Administrative</td>
<td>1.38</td>
<td>1.28</td>
<td>1.18</td>
<td>1.12</td>
<td>0.9</td>
<td>0.48</td>
</tr>
<tr>
<td>Tax and Insurance</td>
<td><strong>3.89</strong></td>
<td>3.2</td>
<td>3.14</td>
<td><strong>2.98</strong></td>
<td>2.84</td>
<td><strong>1.05</strong></td>
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<tr>
<td>Total Expenses</td>
<td>11.87</td>
<td>$9.84</td>
<td>9.40</td>
<td>9.33</td>
<td>8.61</td>
<td>3.26</td>
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<tr>
<td>Net Operating Income</td>
<td>11.69</td>
<td>$14.19</td>
<td>13.32</td>
<td>10.00</td>
<td>8.65</td>
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2008 BOMA Experience Exchange Report, All Buildings
Pay-Back Time Decreasing

Payback time has decreased 30% over 5 years due to increase in energy prices

- Example based on a US commercial building project
- DOE - US Average Retail Cost of Electricity 1993 thru 2007
The Intelligent Building – What Is It?

- IT Systems & Business Applications
- Energy/Resource Management
- Building Automation
- Metering Fabric
The Intelligent Building — 1st Phase

IT Systems & Business Applications

Energy/Resource Manager

Operations Rules

Building Automation

Manual control

Metering Fabric

Real-time information

Benchmarking, problem identification, notification

Business Layer

Services Layer

Physical Layer
The Intelligent Building — 2nd Phase

IT Systems & Business Applications

Energy/Resource Manager

Operations Rules

Automated Work Flow

Manual control

Building Automation

Metering Fabric

Benchmarking, problem identification, notification

Real-time information
Phase 2 – Energy Awareness
Implementation of Target Curves

Benchmarking, problem identification, notification
Phase 2 – Energy Awareness
Alarms via PowerHawk Mgr

Benchmarking, problem identification, notification

Consumption outside set operating limits are coloured ‘

Meterpoints with excessive wh consumption 2 - 1.20 %
Meterpoints with excessive litres consumption 1 - 0.60 %
Phase 2- BAS Integration

PowerHawk 6X12 - Watt-Hour & VAR-Hour Metering
- 8-24 meter points (24 CT’s total)
- Wh, VARh, VAh, W, VAR, VA, V,I
- Programmable Interval data
  - 1min. to 60 min.
- Native Ethernet,
- ModBus TCP/IP
- BACnet TCP/IP
- 2 Pulse Inputs (Gas/Water Meters)
- Modem Module, RS-232
- Expanded Socket Modem Position for Wireless, PLC integration(future)
- S/W Configurable (remote or local)
- 120/240V, 240/416V - higher with external PT’s
- Measurement Canada Approved
- 50/60 Hz
- 1Ph,2Ph & 3Ph Applications
- -40 to +70°C
- mV, mA or 5A CT’s Native
The Intelligent Building — 2\textsuperscript{nd} Phase

IT Systems & Business Applications

Energy/Resource Manager

Operations Rules

Automated Work Flow

Manual control

Building Automation

Metering Fabric

Benchmarking, problem identification, notification

Real-time information
The Intelligent Building — 3rd Phase

- Energy Markets
- GHG Markets
- Real-time Pricing
- Demand/Response
- Billing/Cost Allocation

Energy/Resource Manager

- Operations Rules
- Automated Work Flow
- Manual control
- Building Automation

Metering Fabric

Benchmarking, problem identification, notification

Real-time information

Business Layer

Services Layer

Physical Layer
Why Executives will Care

- Energy “visibility” will be a must have for mgmt
- CEO’s/CFO’s will need to know their carbon footprint
- Energy legislation/mandates will be widespread and enforced
- Continuous Commissioning will be widespread
Triacta – a Unique Vantage Point

- GHG Markets
- Energy Markets
- Demand Response
- Real-time Pricing
- Energy Billing

- Energy/Resource Manager
- Operations Rules
- Automated Work Flow
- Manual control
- Building Automation
- Metering Fabric
- Energy Awareness
- Energy Measurement

- Business Layer
- Services Layer
- Physical Layer
The Intelligent Building — The Players

Business Layer:
- IBM
- Sun
- Oracle

Services Layer:
- EDS (an HP company)
- Cisco
- Dell
- Gridlogix
- Schneider Electric

Physical Layer:
- General Electric
- Tridium
- Siemens
- Honeywell

Systems & Business Applications:
- Siemens & Business Applications

Building Automation:
- Building Automation

Metering Fabric:
- Metering Fabric
A shared vision with the big Intelligent Building players that Energy Management (Load Management and Shaping) is an IT play not a Facilities play.
Why Cisco and others care

- US Building stock of 4.4 million non-residential in 2008
- Buildings constructed after 1970 consume significantly more energy/sq. ft as compared to older buildings. These comprise of 60% of building stock
- Sectors with highest retrofit opportunity are education and office (about 50% of all retrofit activity)
- Retrofit activity expected to increase over 10-15 years after major legislative, competitive drivers force building owners to engage in retrofit projects to address climate change

The next large network build-out is happening today
Thank You

Wes Biggs

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