

REAL WORLD - REAL SOLUTIONS  
2003  
Energy

## Automated Facility Energy Management

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**AdvanTek**

## STRATEGY

Fully Integrated,  
Multiple Facility,  
Building Automation System

- ◆ Personal Comfort
- ◆ Energy Efficiency
- ◆ Reduced Expenses

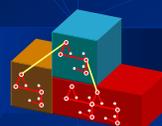
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## VISION

Clusters of buildings aggregated and managed as a *Single Facility*, by an intelligent computer network that optimizes comfort and energy costs in response to occupant needs, equipment performance, and energy price signals; and alerts and debriefs O&M personnel whenever intervention would be beneficial.

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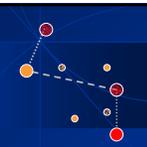
## BENEFITS



- ◆ Extended energy manager reach and influence
- ◆ Reduced energy consumption and costs
- ◆ Lower power demand and charges
- ◆ Aggregated energy purchasing power
- ◆ Minimally invasive emergency response
- ◆ Improved indoor environmental quality
- ◆ Increased productivity of facilities staff

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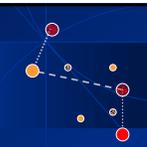
## Today's Situation



- ◆ Commissioning rarely happens
- ◆ Building design doesn't match actual usage
- ◆ Run to failure prevails
- ◆ Service life is severely compromised
- ◆ Energy is wasted throughout the reduced system life

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## Today's Situation




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## Today's Situation



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## Today's Situation



## Today's Situation

**Most buildings are essentially unsupervised**

- ◆ Energy Management functions are limited by distances
- ◆ Problems go undetected until failure occurs
  - ◆ "Emergency" O&M is the normal modus operandi
  - ◆ Cannot curtail loads or defuse power emergencies
  - ◆ Power quality is not monitored or managed
- ◆ Incompatible proprietary systems from many vendors
  - ◆ No capability to track energy efficiency (other than bills)
  - ◆ Little or no interconnection between buildings
  - ◆ No capability to optimize comfort and energy use

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## How Did We Get Here?

- ◆ Numerous designers and design approaches
- ◆ Primary system / equipment selection criteria is usually *low first-cost*
- ◆ O&M staff concentrated at large buildings and HQ
- ◆ Controls typically not upgraded to keep pace with technology, vendors don't support legacy systems, many are non-functional, operate in manual override
- ◆ **Energy O&M is only a fraction of facility manager's responsibility**
  - ◆ Usually lower priority than mission-oriented tasks

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## How Did We Get Here?

- ◆ Most energy audits biased towards replacement: it is easier to simply replace one with another one, not people dependent
- ◆ Optimal O&M requires a more intense approach, is harder to implement, and needs lots of data.
- ◆ About half of Federal O&M is contracted out
  - ◆ No performance based incentives
  - ◆ Typical contract term is 3 to 5+ years

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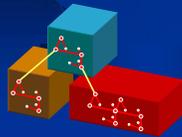
## Where can Automation take us?

- ◆ Enable one person to monitor and manage virtually every system in many buildings from his/her desk
  - ◆ Simplified non-technical graphical user interface
  - ◆ Software learns and automates repetitive actions
  - ◆ Required staff time is minimized
- ◆ **Automatically take action** without involving facilities staff whenever possible
- ◆ **Automatically reach the best compromise** between environmental conditions and energy use

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## When can we go?

- ◆ Feasible *now* by integrating current EMCS products
  - ◆ Web server based system with TCP/IP and XML
  - ◆ Utilization of web browser allows local control via PLC
  - ◆ Use existing facility Ethernet LAN, VPN, and/or Internet
  - ◆ EMCS bandwidth usage is extremely small
  - ◆ LonWorks, BACnet, and/or MODBus components



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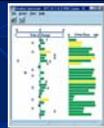
## Integrated BAS Functionality

- ◆ Monitoring HVAC Equipment
- ◆ Facility Operations
- ◆ Enterprise Energy Management



## Monitoring HVAC Equipment

- ◆ Monitoring typically means manual sensor readings and looking for abnormal conditions.
- ◆ *Checking HVAC equipment operation should be done routinely.* In reality, such tasks are left for mythical slow times, and are usually skipped for weeks or months. Degrading performance is the result.
- ◆ An automated BAS condenses and prioritizes data, highlights conditions that need attention from an operator, makes contact via e-mail or cell phone, and provides a debrief on the condition and corrections.



## Facility Operations

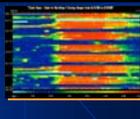
- ◆ Operation and service are typically done in a reactive manner in response to comfort complaints.
- ◆ Response involves diagnosing the problem and making manual adjustments and/or repairs.
- ◆ An automated BAS anticipates equipment failure from trends and historical data. A consolidated report of relevant values expedites troubleshooting decisions.



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## Enterprise Energy Management

- ◆ Support of Energy Purchasing
  - ◆ An aggregate load is presented to utility company as one meter to qualify for lower rates and leverage negotiations
  - ◆ Needs forecasting allows buyers to take advantage of lower day-ahead and hour-ahead energy rates
- ◆ Benchmarking and Monitoring Energy Usage
  - ◆ Automated verification of utility bill's complex rate tiers
  - ◆ Ranking and comparison of buildings by type, usage, etc.
  - ◆ Easy identification of potential savings opportunities
- ◆ Demand Limiting and Load Shedding
  - ◆ Load curtailment spread over many buildings so that any changes go unnoticed by occupants



## The Energy Industry is Changing

- ◆ Trading and hedging energy, power, and transmission is becoming increasingly common
  - ◆ 34% of wholesale power was traded in 2002. This figure will reach 90% by 2008.
- ◆ More differential between off-peak and on-peak rates
  - ◆ For example, PEPSCO (MD) off-peak rates averaged \$0.02/kWh while on-peak rates reached \$0.19/kWh.
- ◆ Distributed power generation is becoming a reality
  - ◆ Facilities are being paid premium rates to generate and/or curtail load during on-peak times.

**Taking advantage of the new energy market requires sophisticated BAS capabilities.**



## Hardware Basis



**INTERFACES TO EXISTING CONTROL SYSTEMS**



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## KEY POINTS



**Integrated Building Automation System**

- ◆ **Links Systems and Buildings**
  - ◆ Thermal Comfort, Energy Efficiency, Reduced Expenses
- ◆ **Applies Computer Power to O&M**
- ◆ **Cross-Functional**
  - ◆ HVAC Equipment Monitoring
  - ◆ Facility Operations
  - ◆ Enterprise Energy Management

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## Automated Facility Energy Management

**Thank you!**

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