Advancing Technologies
Making Big Progress with Small Steps

Dan Wendl, PE
Vice-President, Trane Commercial Systems
5 August 2007
More Building, More Energy Use

- Heating, Ventilation & Air-Conditioning comprises between 30 – 50 percent of a buildings energy consumption
- Lighting accounts for more than 30 percent of electricity costs
- Advanced technologies today improve building performance and lower costs

Global Energy Demands and Costs Will Remain High, HVAC Plays A Part
Commercial Buildings GHG Emissions

State Commercial GHG Emissions in 2003
CO2, CH4, N2O

Energy and Climate Change are Connected to our Building Performance
The Implications of More Buildings

- Growing concerns about environmental impact and climate change
- Developing countries have the least stringent environmental requirements
- Demands from developing countries are changing the global energy landscape and even here at home demand for electricity is outstripping supply
- “Green Building” is a growing trend in developed countries
- Corporate Social Responsibility and socially responsible investing trends are resulting in greater environmental considerations in building
- Two strategies can address the problem:
  1. Find new energy supplies
  2. Reduce electricity consumption through new technologies
- Opportunities for dramatic energy improvement available using existing industry applications

Smart, Sustainable Energy Solutions and Policies Are Needed
Advanced Technology solutions

- Energy analysis – building automation systems; energy management systems
- Distributed electric generation (cogeneration, peak shaving, emergency)
- Lighting and lighting controls
- Use of renewable energy
- Integrated HVAC systems
- Ice and thermal storage
- Predictive maintenance

If every centrifugal chiller was 15% more efficient, annual power plant emissions would be reduced by...

- Nearly 17 billion lbs. of CO$_2$
- Over 64 billion grams of SO$_2$
- Over 27 billion grams of NO$_x$

Which is equivalent to…

✓ Planting nearly 500 million trees each year

Dramatic Improvements Can Be Made with Today’s Technology
Thermal Storage
“Putting Credit Suisse on Ice”

- Water is frozen at night, used for cooling during the day
- Proven energy and environmental solution
- Reduces peak energy demand by shifting to off-peak hours
- Reduces overall energy use by 2.15 million kW hours per year
- Reduces cost by $750K per year
- Earned $820K investment incentive from NY State

Shifting To Off-Peak Hours Helps Reduce Overall Power Generation Requirements
Coca-Cola’s Energy Diet

- Refrigerant and compressor upgrades provide profound energy benefits
- Improved energy efficiency from 0.952 kW per ton to 0.589 kW per ton – a 40% reduction in energy use
- Chillers, heat exchangers and equipment room remain unchanged
- Improved system reliability through modern Trane controls

Significant Energy Savings Opportunities in Nearly All Existing Buildings
Performance Contracting Earns Top Grades from Arkansas School

- Many inefficient HVAC systems in schools and government buildings
- Capital budgets are limited, upgrades are a challenge
- Performance Contracting solutions allow for upgrades – companies are paid through energy savings
- New system provides:
  - Improved indoor air quality
  - Annual energy savings of $130K
  - Improved environmental performance
  - Better learning environment
High Performing Buildings Strike a Balance to Meet Demands

Why Green Buildings?

- 30-70% ENERGY SAVINGS
- VERIFIED PERFORMANCE
- ENHANCED PRODUCTIVITY
- INCREASED VALUE
- INDOOR AIR QUALITY & COMFORT

**VERIFIED PERFORMANCE**
Green Building – More than Image

- Green Building organizations, such as the United States Green Building Council (USGBC) and Green Building Institute (GBI) are growing
- Company reputation and responsible energy use are being linked by investors and consumers
- Certification programs are increasingly valuable for ensuring consistency
  - LEED (Leadership in Energy and Environmental Design) is the dominant building certification program of the USGBC
  - LEED’s menu-driven program provides design flexibility, rewarding many forms of energy efficiency
- States are increasingly leading by example by mandating public buildings achieve green certification
- Increasing number of states provide incentives to private sector

Customer and Consumer Expectations for Environmental Performance are Rising

11
Opportunities To Make An Impact

➢ Policies and Laws

- Energy Audits and Performance Contracting needed
  • Mandate Energy Audit on old buildings and encourage energy performance upgrade
  • Ability to guarantee energy efficiency savings and financial rewards
  • Performance contracting opportunities limited in many states
  • Model legislation exists in five states (AR, FL, OH, IN, PA)

- Accelerated Depreciation Legislation
  • Current 39-year federal depreciation discourages upgrades to efficient equipment

- U.S. Energy Law of 2005 showed promise, but limited in effectiveness
  • Tax credits for HVAC energy improvements are largely unattainable
  • Desired behavior not achieved

- Building Codes
  • Most recent national energy efficiency standards and codes should be adopted and enforced

- Green Buildings
  • Meaningful legislation that provides incentives/credits and includes public buildings

“One Issue” Solutions Will Not Solve Energy Issues or Climate Change
Thank you!