



State Energy Conservation Office

**South Texas Association of  
Schools Maintenance Officials**

**2008-2009**

**3<sup>rd</sup> ANNUAL SCHOOL MAINTENANCE  
WORKSHOP & TRADE SHOW**

**April 28, 2009**

**“SAVING ENERGY BEST PRACTICES”**

**Presented by:**

**Saleem Khan, P.E., CxA**

**Texas Energy Engineering Services Inc. (TEESI)**

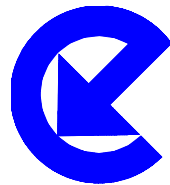
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## ***Outline***

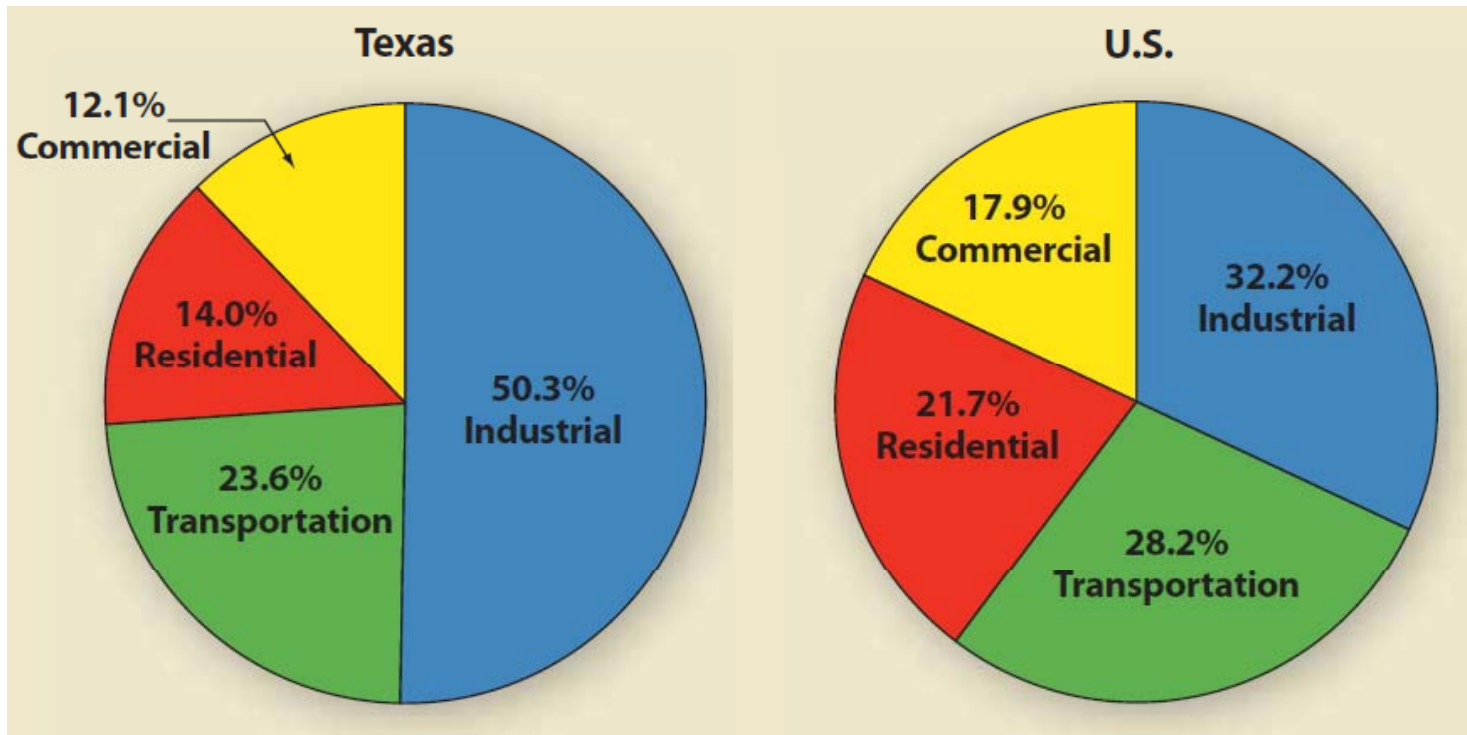
- ***Introduction***
- ***Energy Consumption by Sector & Renewable Resources***
- ***Saving Energy Best Practices***
- ***Typical Energy Cost Reduction Measures***
- ***Discussion***



## ***Introduction***

- **STATE ENERGY CONSERVATION OFFICE (SECO)**
- **Division of the Texas Comptroller of Public Accounts Office**
- **Administers Energy Programs**
  - **Local Government Technical Assistance Program**
  - **Schools & Hospitals Technical Assistance Program**
  - **Other Programs**
- **<http://www.seco.cpa.state.tx.us/>**
- **<http://www.seco.cpa.state.tx.us/sch-gov.htm>**

## *Energy Consumption by Sector*

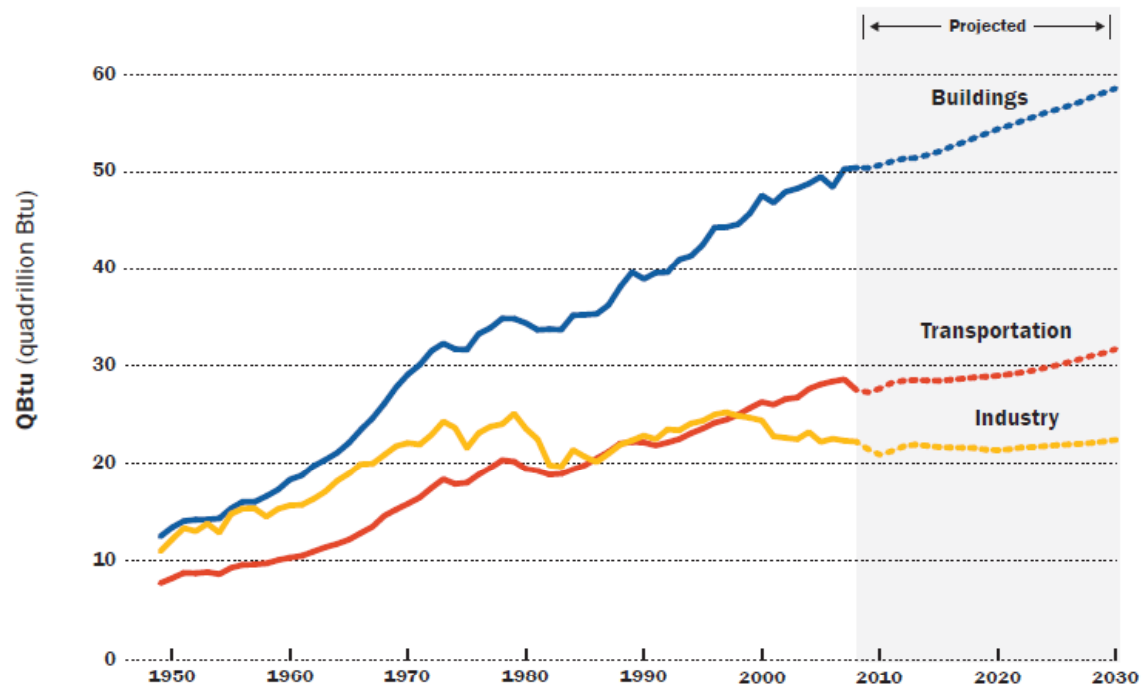


Source: The Energy Report May 2008, TX Comptroller of Public Accounts



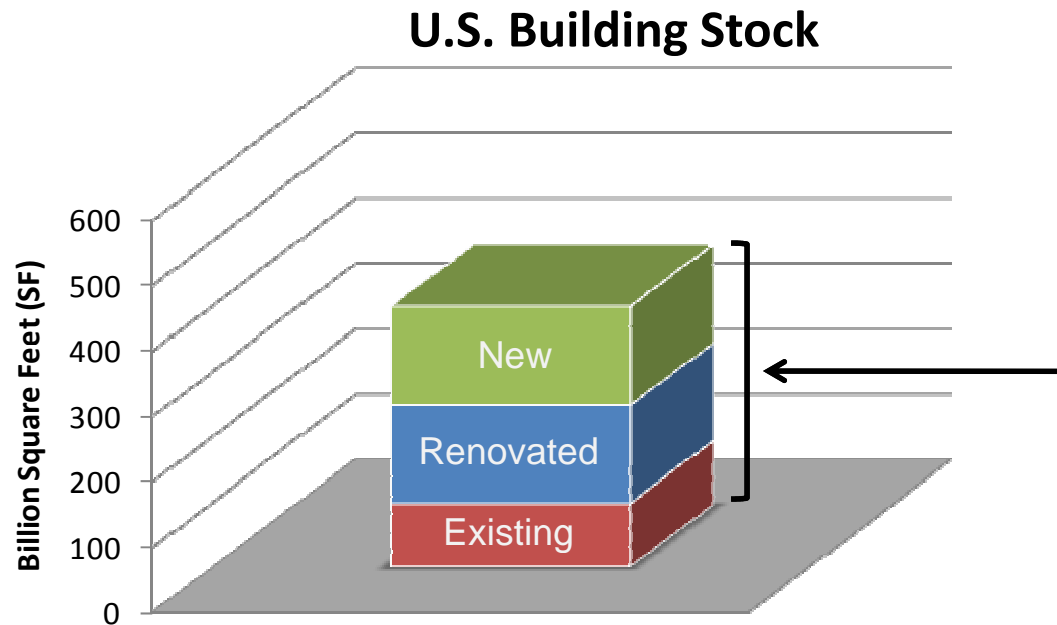
## *Energy Consumption by Sector (cont.)*

### U.S. Energy Consumption by Sector (Historic / Projected)



Source: Graph Presented in 2030 Challenge, [www.architecture2030.org](http://www.architecture2030.org)  
based on data from the U.S. Energy Information Administration

## *U.S. Building Sector (cont.)*



Source: Graph Presented in 2030 Challenge, [www.architecture2030.org](http://www.architecture2030.org) based on data from the U.S. Energy Information Administration

It is estimated that by year 2035, three quarter of the U.S. Building Stock will be new or renovated.

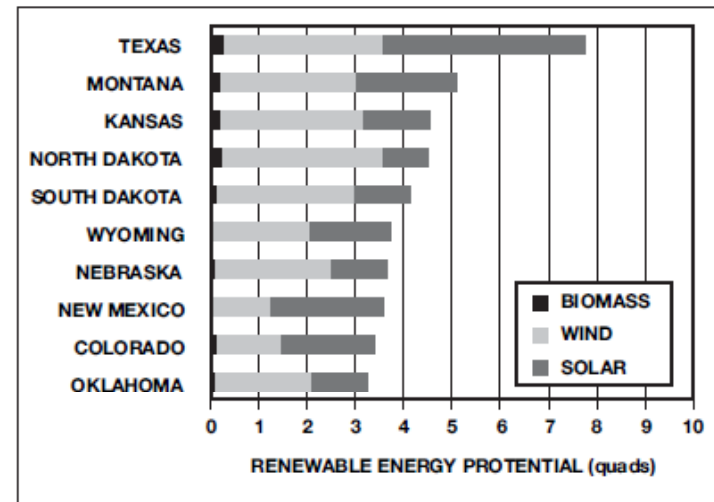
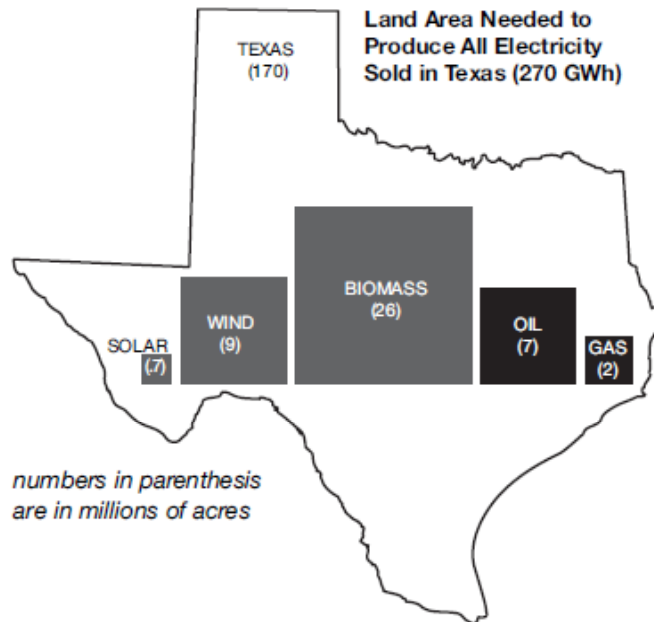
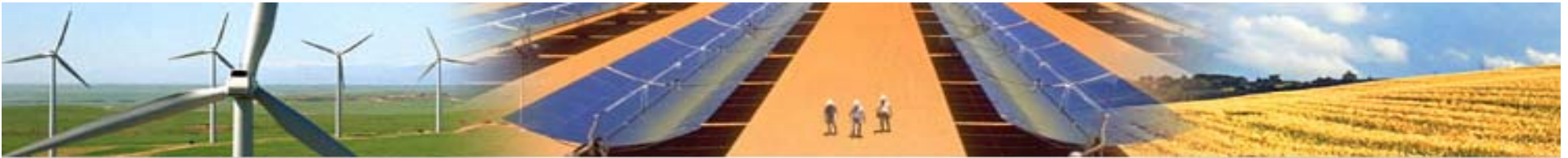
Building offer the greatest opportunity for Energy Conservation.

Historic opportunity to improve energy efficiency and promote sustainable building practices.



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## Texas Renewable Energy Resources



**TEXAS IS #1 IN RENEWABLE POTENTIAL** This figure, based on a study done for the United Nations, shows that Texas can develop more clean, renewable energy than any other state.

Source: SECO Infinitepower.org

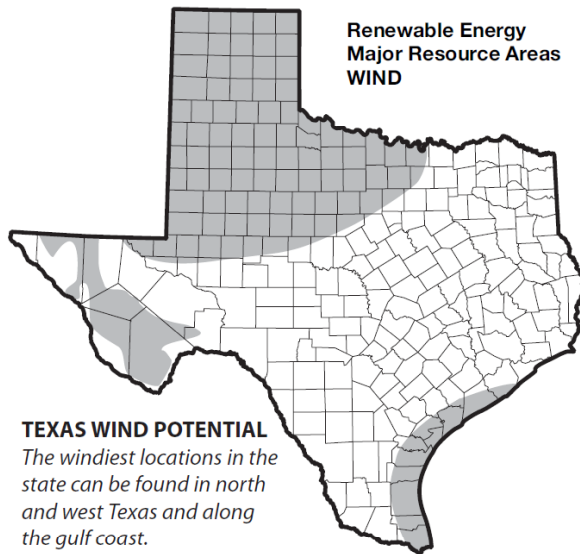


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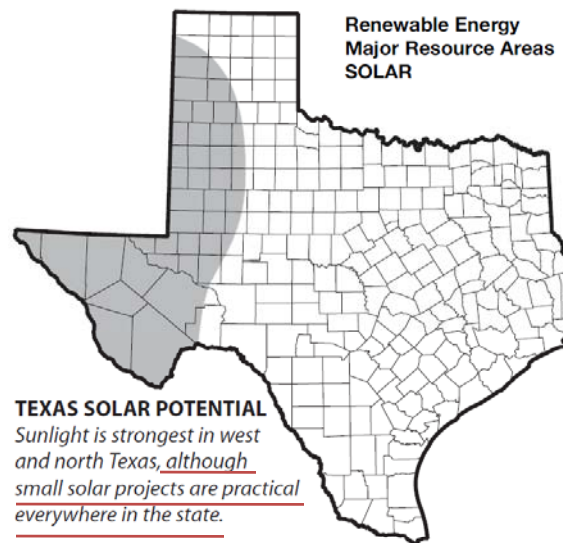
## Texas Renewable Energy Resources (Cont.)



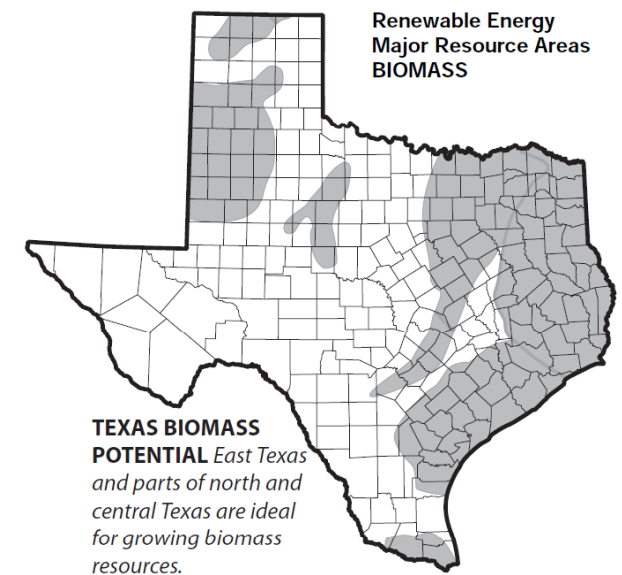
### WIND



### SOLAR



### BIOMASS



Source: SECO Infinitepower.org

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## **Saving Energy Best Practices**

- 1. Energy Management Plan
- 2. Establish Energy Performance Indices (Benchmarking)
- 3. Technology/Data Center Room Layout & HVAC
- 4. Program Promotion and Recognition
- 5. Utility Meters Mapping
- 6. Walkthrough Audits
- 7. Energy Management System Use
- 8. Lighting Systems
- 9. Commissioning
- 10. Resources Identification and Utilization



## ***1. Energy Management Plan***

- **Board Adopted Plan**
  - **Establish Guide Lines**
    - **Temperature**
      - **Occupied**
      - **Unoccupied**
      - **Heating /Cooling Dead Band**
    - **Afterhours Use**
  - **Utility Data Tracking & Reporting**
  - **Delegate Authority and Responsibility**
    - **Energy Management Functions**
    - **Maintenance Functions**
    - **Campuses**
    - **Integrated Approach**

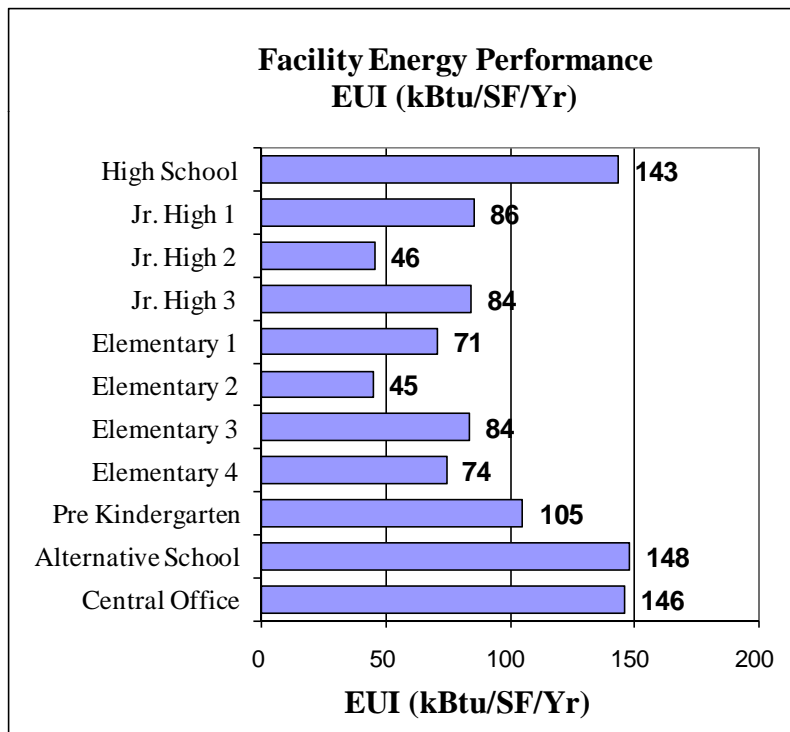


## ***2. Establish Energy Performance Indices***

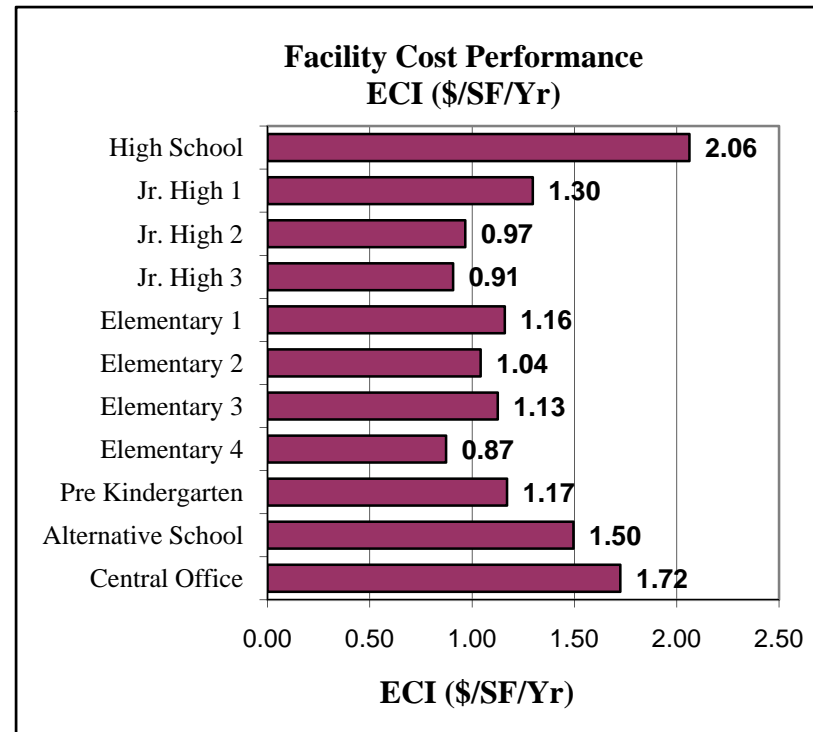
- **Energy Use Index (EUI)**
  - All forms of energy consumption not just electric
  - Total annual electric and natural gas usage
  - Btu/SF/Year
- **Energy Cost Index (ECI)**
  - Total annual electric and natural gas cost
  - \$/SF/Year
- **Used to compare building energy performance**
- **Other indices**

## *Establish Energy Performance Indices (cont.)*

### Energy Utilization Index



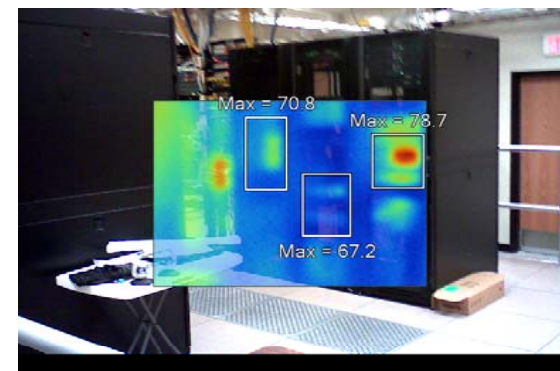
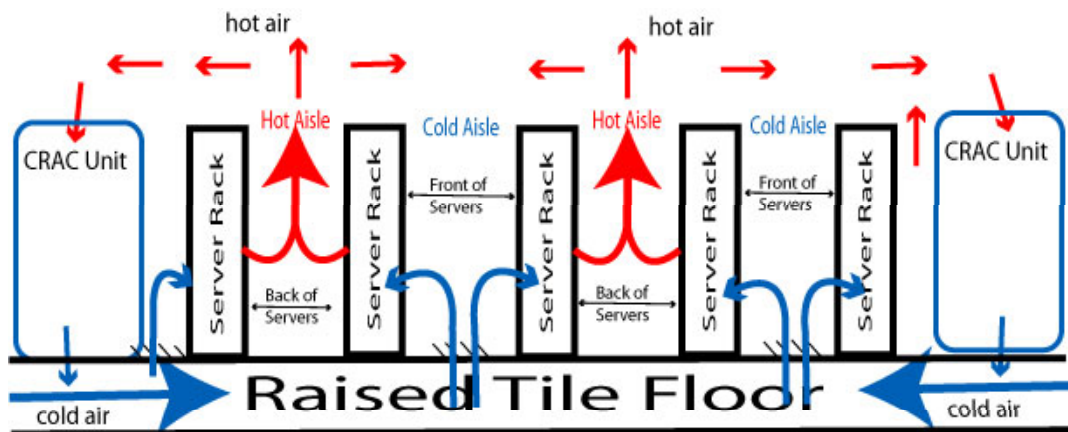
### Energy Cost Index



## EXAMPLE SCHOOL FACILITIES

### 3. Technology/Data Center Room Layout & HVAC

- Room and Equipment Layout
- HVAC Considerations
  - Air Diffusion
  - Temperature Setpoint
- Energy Savings Implications





## ***4. Program Promotion and Recognition***

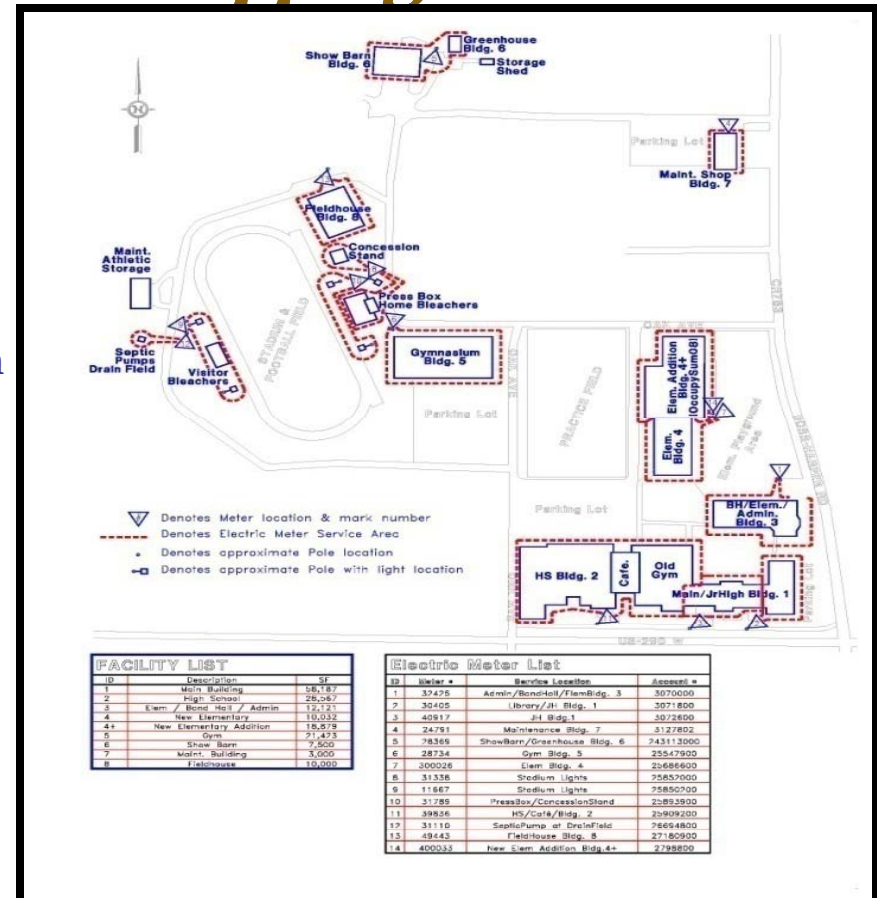
- **Newsletter**
- **Local Media**
- **District Website**
- **Effective Program Communication Essential for Success**



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## 5. Utility Meter Mapping

- Meters Inventory
  - Electric
  - N. Gas
  - Water
- Meter Identification with Location
  - Load profile
  - Tracking & Benchmarking



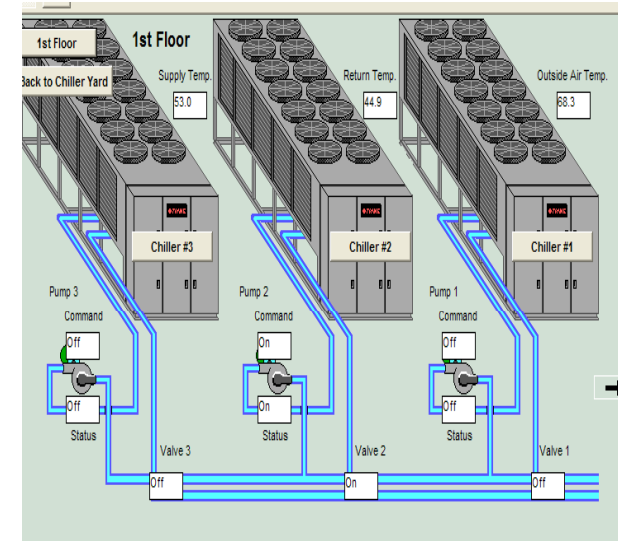
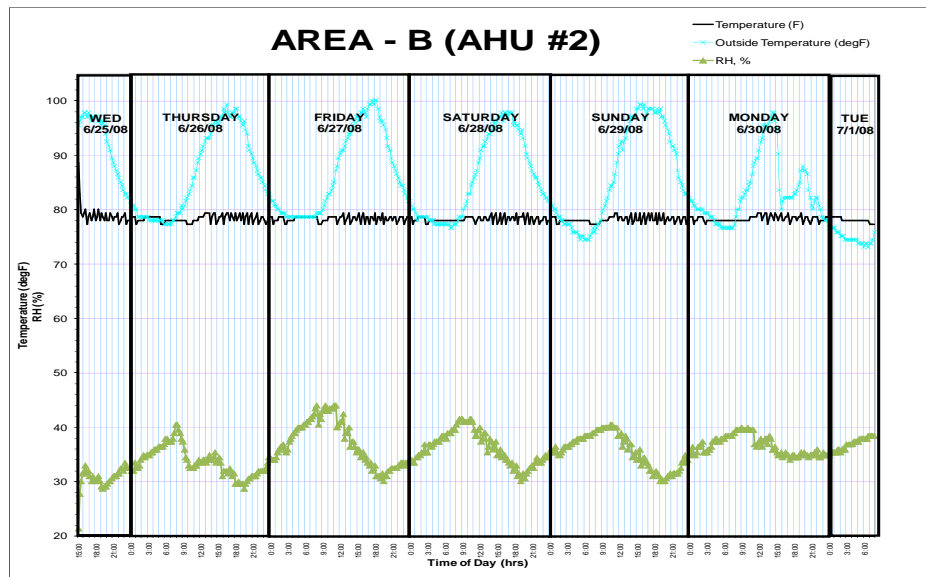


## ***6. Walkthrough Audits***

- **Walkthrough the Buildings**
- **Develop Forms and Checklist**
- **Communicate with Building Occupants**
- **Look For:**
  - **Lighting System Operations & Controls**
  - **Simultaneous Heating and Cooling**
  - **Infiltration**
  - **Exhaust**
  - **Temperature Settings**
  - **Area use Patterns and Schedules**

## 7. Energy Management Systems Use

- Ensure Primary Function as an Energy Management Tool
- Secondary Function as a Maintenance Tool
- Audit Schedules and Temperature Setpoints regularly
- Watch AHU Optimized Start/Stop Function

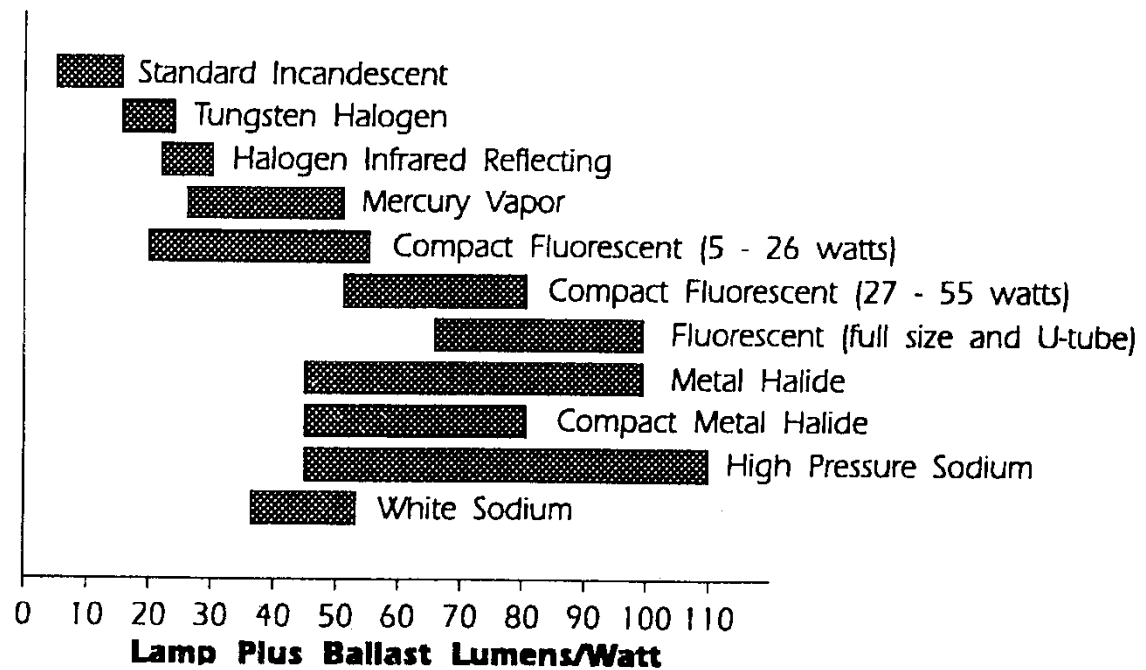




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## 8. Lighting Systems

- Low Wattage T8
- T5 Applications
- Controls



Source: US DOE Building Energy Code Program



## ***9. Commissioning (Cx)***

***Industry sources indicate that on average the operating costs of a commissioned building range from 8% to 20% below that of that of a non-commissioned building***

***(GSA the building commissioning guide)***

- **Various types of Commissioning Services**
  - **Choose type, Provider and Scope carefully**
  - **Benefits may far exceed any associated costs of services**



## 10. Resources Identification and Utilization

- **SECO “School and Hospital Energy Program“ provides FREE technical assistance to public school districts, hospitals and community colleges.**

SECO Program Manager – **Glenda Baldwin**  
(512) 463-1971  
[glenda.baldwin@cpa.state.tx.us](mailto:glenda.baldwin@cpa.state.tx.us)

TEESI Program Manager – **Saleem Khan**  
(512)328-2533  
[www.teesi.com](http://www.teesi.com)

- **EPA/DOE - Energy Star Portfolio Manager**  
[www.energystar.gov](http://www.energystar.gov)
- **Texas Energy Managers Association (TEMA)**
  - Recently Formed
  - For Information and Membership go to:  
[www.texasema.com](http://www.texasema.com)





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## **Resources (Cont.)**

Associated Air Balance Council (AABC) & ACG (AABC Cx Group)

- [www.commissioning.org](http://www.commissioning.org)

Building Commissioning Association (BCA)

- [www.bcxa.org](http://www.bcxa.org)

American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)

- [www.ashrae.org](http://www.ashrae.org)

National Institute of Building Sciences

- [www.nibs.org](http://www.nibs.org)

U.S. Green Building Council

- <http://www.usgbc.org/>

U.S. Department of Energy

- <http://www1.eere.energy.gov/buildings/commercial/commissioning.html>



## ***Typical Energy Cost Reduction Measures (ECRM's)***

### ***Building Systems***

- |   |               |
|---|---------------|
| ➤ Low Cost/No Cost Measures               | 0 – 6 months  |
| ➤ Compact Fluorescent Lamps               | 1 to 3 years  |
| ➤ T-8 Lamps/Electronic Ballasts           | 2 to 6 years  |
| ➤ Controls (Motion Sensors, Day-lighting) | 2 to 8 years  |
| ➤ LED Exits                               | 1 to 3 years  |
| ➤ DX Unit Replacement                     | 7 to 15 years |
| ➤ Chiller Replacement                     | 8 to 18 years |
| ➤ Variable Speed Fans and Pumps           | 3 to 8 years  |



## ***Typical ECRM's (cont.)***

### ***Building Systems***

- |   |                       |
|---|-----------------------|
| ➤ <b>Cooling Tower Replacement</b>            | <b>8 to 14 years</b>  |
| ➤ <b>Dual Duct to VAV Conversion</b>          | <b>6 to 14 years</b>  |
| ➤ <b>Thermal Storage</b>                      | <b>7 to 15 years</b>  |
| ➤ <b>Energy Management Systems</b>            | <b>4 to 12 years</b>  |
| ➤ <b>Insulation</b>                           | <b>8 years +</b>      |
| ➤ <b>Solar Control (Window film, shading)</b> | <b>6 years +</b>      |
| ➤ <b>Steam Systems</b>                        | <b>3 years +</b>      |
| ➤ <b>Power Factor Improvements</b>            | <b>3 – 8 years</b>    |
| ➤ <b>Commissioning</b>                        | <b>1.5 to 5 years</b> |



## ***Discussion***