Attachment C: Energy Conservation Measures

Prepared for Windsor Schools

Trane's Energy Saving Solutions are Designed To Address Your Needs

Trane's goal during an investment grade energy audit is to further research ways to help you reduce your annual costs of operation. The time spent during the investment grade audit allows us to further validate opportunities presented in the preliminary analysis, as well as to identify other possible improvements that provide long term financial and facility benefits. Generally speaking, Trane will follow the proceeding process during the detailed study:

- Trane team members analyze three years of actual utility data and use it to model building energy consumption and analyze the associated trends. We also check your utility billing for accuracy per the established rate schedules. Consideration will be given to any information available from existing energy management systems as well as any energy related studies previously prepared regarding your facility. We will also benchmark your facility against similar building types in the area, with similar usage patterns and purpose. (SEE PREVIOUS ENERGY ANALYSIS OF YOUR FACILITIES)

- Trane will verify hours of operation for your electric motors, lighting, air systems, chillers, heating equipment, and other energy related systems. In addition, we verify seasonal start up and shut down dates of the equipment as well as existing efficiencies. We will also estimate the load curves of your existing systems with variable capacity.

- Our team will verify existing quantities, wattages, and types of lighting systems. We examine ballasts to see if they might contain PCBs. We measure your lighting levels and actual electrical consumption for existing fixtures. Then we verify building hours of occupancy and special event schedules.

- Trane team members will work with you to determine equipment operation and maintenance practices and examine systems with known problems to see if they can be repaired. We also survey any existing energy management systems and pneumatic control systems in detail to determine if maintenance and modifications are required.

- Our team will also interview the maintenance staff and occupants to establish any outstanding facility environmental comfort / air quality concerns.

Once we collect the survey data, we begin our investment grade audit. Using the TRACE 700 Software program, we will calculate building loads and model utility consumption patterns at your building(s). We will then model various ECM strategies to calculate the impact on building loads and utility consumption patterns.

The next page depicts a sample energy utilization analysis that Trane will create in order to determine the current energy consumption levels, and to set realistic expectations as to the magnitude of the savings available.

We have included a sample survey form (below) that we use to discover current costs of operation and maintenance costs that are considered to be annual costs of operation, not asset management related costs.

A preliminary or sample cash flow spreadsheet has been included to provide a sample of what an annual allocation (savings) for asset replacement projects. The methodology depicted on this particular sample assumes you will replace a particular item at some point in the next 10 year window. You will also find a sample checklist we provide our survey engineers conducting our initial walkthrough audits to discover potential opportunities. We use such a checklist to ensure we are not overlooking potential ECMs.

Financial Analysis- Current Cost of Operations Profile

Facility Name:	
Point of Contact for Financial Information:	
Phone Number of Point of Contact:	
Square Footage of Facility (Conditioned):	

Instructions : Please fill out the following cost matrix and the adjacent replacement schedule-

	Budget Category/ Description	Typical Budget Categories/ Information	Data
1	Utility Costs		
	Relevant utility data and power distribution system information	1. Electricity	
		2. Natural Gas	
		3. Other fuels	
		4. Water	
		5. Current electric rate/ provider information	
		6. Waste disposal costs	
		7. Interruptible gas/ electric rate? yes/ no	
		8. Thermal storage system / Cogen System	
		9. Other	
2	Outsourced Services		
	Costs for contracted professional services.	1. HVAC maintenance services	
		2. Temperature control services	
		3. Energy Management System Support Services	
		4. Lighting Services	
		5. Mech and Plumbing services (non-HVAC)	
		6. Date of last group re-lamp	
		7. Date of last energy audit	
		8. Involved in a performance contract now?	
		9. Consulting firm used for mechanical projects	
		10. Do you have an AE firm on retainer?	
		11. Other	
3	Inventory Costs		
	Costs associated with maintaining a parts inventory.	1. Motors and Compressors	
		2. Pneumatic controls	
		3. Misc. small parts	
		4. Refrigerants- include type used.	
		5. Lighting-ballasts	
		6. Lighting- lamps	
		7. Water treatment chemicals / service agreeement	
		8. Tools/ measurement equipment	
		9. Other	
4	Major Equipment Repairs		
	Costs associated with major equipment repairs.	1. Chillers / Rooftop HVAC etc.	
		2. Air Distribution Equipment	
		3. Boilers	
		4. Air Compressors	
		5. Automation system enhancements	
		6. Upgrades to existing equipment (Capital Lease)	
		7. Overtime expense due to emergency repair work	
5	In-house Maintenance		
	Costs associated with annual maintenance activities.	1. HVAC	
		2. Electrical	
		3. Plumbing	
		4. General Construction	
		5. Design Engineering Resources	
		6. Staff	
		7. Other	

Energy Savings and Operational Condition Assessment *Checklist*

CENTRAL HEATING PLANT

- ☐ Convert Electric Boiler to Gas Fired Boiler
- ☐ Convert Steam Boiler to HW System & Steam Generator
- ☐ Hot Water Reset
- ☐ Purchase Transportation Gas
- ☐ Purchase Interruptible Gas Service
- ☐ Sequence Multiple Boilers
- ☐ Lead/Lag Boiler Control
- ☐ Install Low Load Boiler
- ☐ Utilize District Steam or Cogeneration Waste Steam

BOILERS

- ☐ Provide Hot Water Reset to Reduce overheating
- ☐ Reduce Steam Pressure
- ☐ Steam Pressure Reset
- ☐ Adjust Firing Rate to Building Load
- ☐ Preheat Combustion Air
- ☐ Duct Combustion Air
- ☐ Properly Size Combustion Chamber
- ☐ Interlock Combustion Air Intake with Burner Controls
- ☐ Repair Air Leaks in Combustion Chamber
- ☐ Adjust Burner Excess Air Settings
- ☐ Install Oxygen Trim
- ☐ Provide Dual Fuel Burners
- ☐ Install Oil Atomizing Burners
- ☐ Chemical Additives for Fuel Oil
- ☐ Reduce Stack Temperature (Stack Temp > 45O°F)
- ☐ Stack Heat Recovery (Stack Temp > 3OO°F)
- ☐ Seal Leaks in Natural Draft Stacks
- ☐ Install Stack Automatic Draft Dampers
- ☐ More Frequent Blowdown
- ☐ Prevent Burner Short Cycling
- ☐ Remove Soot from Combustion Surfaces
- ☐ Remove Scale from Wetted Surfaces
- ☐ Clean Air Filters

HOT WATER HEATING SYSTEMS

- ☐ Trim Pump Impeller
- ☐ Reduce Pump Motor Size
- ☐ Install Variable Speed Drive
- ☐ Provide Smaller Pump for Low Load Conditions
- ☐ Replace High Resistance Elements with Low
- ☐ Rebalance System to Minimize Overheating
- ☐ Reset Hot Water Temp to Minimize Overheating
- ☐ Repair Control Valves
- ☐ Repair Cavitated Pumps
- ☐ Minimize System Pressure
- ☐ Provide Air Control

CHILLED WATER PLANT

- ☐ Absorption vs. Centrifugal
- ☐ Replace Chillers w/Higher Efficient
- ☐ Sequence Multiple Chillers
- ☐ Install Time Clocks
- ☐ Install Low Load Chiller

CHILLERS

- ☐ Chilled Water Reset
- ☐ Conversion to Variable Flow System
- ☐ Provide Isolation Valves
- ☐ Install a Variable Frequency Drive
- ☐ Clean condenser/Evaporator Tubes
- ☐ Seal Refrigerant Leaks
- ☐ Seal oil Leaks
- ☐ Restore Refrigerant Levels
- ☐ Minimize Oil Migration
- ☐ Listen for Unusual Noises
- ☐ Pipe Chillers in Series (Add Bypass)
- ☐ Heat Pump Conversion
- ☐ Repair Compressor (Code Kit)

COOLING TOWERS

- ☐ Condenser Water Reset
- ☐ Discharge Building Air to Towers
- ☐ Install Closed Loop Free Cooling System
- ☐ Install Refrigeration Migration Free Cooling System
- ☐ Install Plate Heat Exchanger Free Cooling System
- ☐ Install Strainer Cycle Free Cooling System
- ☐ Repair Cooling Tower Fill and Drift Eliminators
- ☐ Unclog Spray Nozzles or Water Distribution Basins
- ☐ Reduce Pump Head by Lowering Water Discharge Height
- ☐ Improve Chemical Water Treatment
- ☐ Replace Air-Cooled Condensers w/ Water-Cooled
- ☐ Install Venturi Stack (Reduce Static Pressure, Reduce Recirculation)
- ☐ Install Variable Speed or Two Speed Cooling Tower Fan Motors
- ☐ Install Variable Pitch Blade Cooling Tower Fan

DUAL DUCT LOW VELOCITY SYS

- ☐ Hot/Cold Duct Temperature Reset
- ☐ Install Splitters to Funnel Return Air to Hot Deck

DUAL DUCT HIGH VELOCITY SYS

- ☐ Replace High Pressure Mixing Boxes with Low Pressure
- ☐ Minimize Hot/Cold Duct Damper Leakage
- ☐ Convert to VAV

VARIABLE AIR VOLUME SYSTEMS

- ☐ Install Inlet Vanes for Centrifugal Fan
- ☐ Install Variable Pitch Blade Fan for Vane Axial Fan
- ☐ Install Variable Speed Drive
- ☐ Control Fan Speed for Constant Static Duct Pressure
- ☐ Provide Supply Air Reset
- ☐ Provide Hot Water and Chilled Water Reset
- ☐ Delay Reheat Until Airflow is at a Minimum

INDUCTION SYSTEMS

- ☐ Reduce Primary Air Volume and Pressure
- ☐ Lower Primary Air Reheat Schedule
- ☐ Lower Secondary Hot Water Temperature
- ☐ Reduce Secondary Water Flow Rate
- ☐ Raise Primary Air Cooling Temp - Lower Secondary Water Temp
- ☐ Reduce Secondary Water Temperature
- ☐ Eliminate Primary Heating Air - Raise Secondary Hot Water Temp

RETURN AIR AND EXHAUST DUCT

- ☐ Match Exhaust Fan Volume with VAV Supply Fan
- ☐ Provide Toilet Exhaust Unoccupied Control
- ☐ Install Heat Recovery Makeup Air Units

FAN COIL AND UNIT VENTILATORS

- ☐ Convert 4-Pipe System to 2-Pipe
- ☐ Install Time Clocks
- ☐ Eliminate Fan During Unoccupied
- ☐ Minimize Outdoor Air Usage

WATER-TO-AIR HEAT PUMPS

- ☐ Install One Larger Unit Rather than Multiple Smaller Units
- ☐ See Condenser, Compressor, Fan, Pump, Piping, & Ductwork Measures

AIR-TO-AIR HEAT PUMPS

- ☐ Direct Building Exhaust to Inlet of Heat Pump
- ☐ Install Time Clocks
- ☐ Replace Compressors with EER less than 9 for cooling

BUILDING ENVELOPE

- ☐ Replace Window Glazing
- ☐ Clean Coils and Change Filters
- ☐ Reduce Air Volume
- ☐ Apply Window Film
- ☐ Rehang Misaligned Windows
- ☐ Repair Operable Window Seals/Latches
- ☐ Apply Window and Door caulking and Weather Stripping
- ☐ Install Revolving Doors
- ☐ Build Vestibules
- ☐ Install Air Curtains for Larger Entries
- ☐ Install Automatic Door Closers
- ☐ Post a Sign ("Keep Door Closed")
- ☐ Insulate Walls, Roof, Floor, Soffit, Slab Edge etc.
- ☐ Provide a Vapor Barrier for Walls, Roof
- ☐ Minimize Stack Effect
- ☐ Caulk Pipe Penetrations
- ☐ Seal Ceiling to Roof Gap
- ☐ Solar Radiation Reduction
- ☐ Apply Reflective Coating to Roof to Reduce Heat Gain

UTILITY SERVICE

- ☐ Convert Electric to Gas
- ☐ Purchase Transportation Gas
- ☐ Purchase Interruptible Gas Service (Dual Fuel Burners Required)
- ☐ Reduce Consumption (KWH) / De-energize Equipment with Time Clocks
- ☐ Reduce Peak (KW) Loads
- ☐ Correct Power Factor
- ☐ Investigate Utility Rebates / State Grant Programs
- ☐ Install Separate Meters and Monitor Efficiency

HEAT RECOVERY

- ☐ Install Heat Wheels
- ☐ Install Heat Pipes
- ☐ Utilize a Fixed Plate Heat Exchanger
- ☐ Utilize a Run-around Coil
- ☐ Install a Thermosiphon
- ☐ Recover Heat from Industrial Heat Producing Systems and Processes
- ☐ Recover Heat from Fume Removal Systems
- ☐ Recover Heat from Process HVAC Systems
- ☐ Recover Steam or Heat from Condensate
- ☐ Generate Heat Through Waste Incineration

LIGHTING

- ☐ Provide Unoccupied Time Clock
- ☐ Increase Light Delivered to the Task
- ☐ Reduce Light Levels Beyond Tasks
- ☐ Relamp with More Efficient Light Source
- ☐ Reposition Light Source Locations
- ☐ Install High Efficiency Ballasts
- ☐ Take Advantage of Day Light
- ☐ Delamp and Install Reflectors
- ☐ Increase Reflectance by Painting Surfaces White
- ☐ Lower Fixture Mounting Height
- ☐ Provide Uniform Lighting
- ☐ Install Dimmer Switches
- ☐ Install Task Lighting
- ☐ Install Motion Detectors

ADDITIONAL Energy Conservation Items

- ☐ Cogeneration
- ☐ Boiler Replacement
- ☐ Chiller Replacement
- ☐ Install a Facilities Management System
- ☐ Install an Alternative Energy System
- ☐ Install an Off-Peak Ice Storage System
- ☐ Generate Battery Reserves Off-Peak
- ☐ Industrial Process Control and Heat Recovery
- ☐ Clean Room Temperature and Humidity Control
- ☐ Computer Room Temperature and Humidity Control
- ☐ Pool Covers and Pool Heat Recovery
- ☐ Upgrade Elevators/Escalators
- ☐ Claim Avoided Maintenance
- ☐ Provide Predictive Maintenance

Other Measures

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SHOULD WE CONSIDER

- ☐ Primary power transformer efficiencies
- ☐ Two speed motors on Constant Volume Units
- ☐ Power Factor Correction
- ☐ Condenser coil condition on DX units
- ☐ Evaporator coil condition on DX units
- ☐ Water coil condition on hydronic systems
- ☐ Evaporator Pre-coolers on DX condensers
- ☐ The general condition of the dampers
- ☐ The current performance of the existing control systems
- ☐ Fan bearing condition
- ☐ Belts too tight
- ☐ Motor Amps <= Nameplate Amps
- ☐ Condition of fan blades
- ☐ Air & Water balance
- ☐ Are the air strainers and filters being maintained
- ☐ Are the expansion tanks properly charged
- ☐ Are the auto air vents working properly
- ☐ Pump seals leaking
- ☐ Pump alignment
- ☐ Power termination's to tight
- ☐ Pipe insulation & vapor barrier condition
- ☐ Gas burners tuned properly
- ☐ Vibration analysis
- ☐ Oil Test
- ☐ Eddy current test
- ☐ Power & Gas meters on the FMS

The following is a “laundry list” of energy conservation measures are typically considered during the investment grade audit process. The Middle School has the most potential for HVAC and control improvements due to it’s age and systems that are past their useful life expectancy. The energy projects will augment and enhance the operation and efficiency of the bond funded projects previously identified.

AIR DISTRIBUTION IMPROVEMENTS

Our recommendations include modifying your existing air distribution systems. The upgrade will reduce overall energy consumption and maintenance costs, improve comfort, enhance the learning environment and increase productivity and help manage the risks associated with indoor air quality.

- *Ceiling Fans*

  Ceiling propeller fans have a good application in areas with higher ceilings and the source of heat delivered at a high level (typical in some gymnasiums). Operation of the ceiling fan during heating periods helps limit the amount of stratification between the floor and ceiling level. Care should be taken in facilities with extremely high ceilings as the highest areas can actually be cooler depending on the configuration and distribution system.

- *Conversion of Inefficient HVAC Systems To VAV or Displacement Ventilation*

  Inefficient constant volume terminal units should be converted to variable volume types with conversion of the supply unit. Conversion of the terminal unit will provide for the air flow to be proportional to the requirements of the zone and eliminate mixing or reheating of air streams. Radiant heating and cooling systems may be incorporated decreasing the amount of air handling loads.

- *Conversion of Inefficient Terminal Devices*

  In terms of energy consumption, constant volume systems are costly as the fans operate continuously, delivering design airflow at part-load as well as full-load conditions. Comfort is maintained by modulating air temperature rather than the amount of air delivered. Air is often overcooled only to be reheated or mixed with a warm air stream. Exhaust systems and lab hoods don't provide any comfort to the space, however they do require HVAC systems to make up the air they remove from a building with new conditioned air.

  Converting these types of systems to VAV will reduce fan energy consumption and will minimize reheating and mixing costs.

  As an alternative for some constant volume systems (i.e., those with many small fans rather than a few large ones), fan cycling can provide one of the economic benefits of a VAV system - that of reducing energy consumption and costs by moving less air. It may be particularly desirable to reduce fan energy consumption in existing constant volume systems that move more air than is necessary. As with HVAC systems, similar savings can be achieved in exhaust and lab hood systems with variable volume retrofit strategies.

- *Duct and Pipe Insulation*

  Insulating ducts and pipes that run through air conditioned spaces or plenums is particularly important due to the extra energy wasted. Insulating pipes, ductwork, and tanks in non-conditioned environments also saves heating and cooling energy.

- *Indoor Air Quality Analysis*

  An indoor air quality study can uncover potential problems before they become catastrophic and expensive. Therefore, identifying problems early can actually reduce risk and save costs. However, if a study reveals that ventilation rates are not adequate, additional fresh air may need to be brought in and conditioned. Indoor air quality studies can also uncover mechanical repairs and maintenance issues that affect the quality of air being delivered. In some cases, IAQ improvement measures actually require more energy yet improve occupant comfort and reduce risk.

- *Repair or Replace Leaking Control Valves*

  Fixing valve leaks saves energy and improves system performance by eliminating additional energy required to condition overheated air. Improved comfort results from better control.

- *Replace Worn Sheaves*

  Replacing worn belt drive sheaves saves energy due to decreased friction and will improve belt performance.

- *Reseal or Replace Leaking Control Dampers*

  Bringing in unconditioned air due to control damper leakage results in wasted energy. Resealing or replacing control dampers optimizes the system performance and saves energy.

ARCHITECTURAL IMPROVEMENTS

Frequently, savings can be achieved by addressing a building's architectural components. Lack of or inadequate insulation and window leakage are two common areas where improvements result in savings. Our recommendation includes architectural upgrades that improve comfort, save energy and contribute to the financial performance of the project.

- *Building Insulation*

  Insulating a building retards conductive heat transfer. The greater the resistance of conduction, the greater the R-value of a building. Therefore, insulation will improve the overall R-value of a building and conserve energy. This ECM is often not cost effective in an existing building.

- *Doors - Replacement*

  Replace existing doors with new insulated core, low infiltration doors. Replacement doors can apply to standard building entrances and exits and overhead doors.

- *Doors—Weather - Stripping*

  This energy conservation measure consists of replacing or installing weather stripping on doors to prevent conditioned air from escaping or outside air from entering the building.

- *Roof—Add Insulation*

  Adding insulation to an existing roof can improve the thermal efficiency and decrease heating and cooling costs. In most cases it would probably make sense to evaluate a totally new roof in lieu of just adding insulation to an existing roof.

- *Roof - New*

  Adding a new well insulated roof can improve the thermal efficiency and decrease heating and cooling costs. Roof color should also be investigated when specifying a new roofing system. If a existing roof has been leaking the insulation is often damaged and has lost its thermal insulating properties..

- *Windows - Replacement*

  Replacing single pane windows with windows that entrap air, increases the building envelope resistance and conserves energy. Common replacement windows include double pane or triple pane windows. High performance glazings are available that consist of two panes of glass with an invisible thin mylar film suspended in between. The three surfaces, combined with the low-e film treatment, enable these windows to obtain R-values which are higher than can be obtained with standard triple glazing, while retaining the relative thinness and lightness of standard double glazing. High performance windows can be specified with films designed to selectively block invisible solar heat wavelengths, while allowing the transmission of visible wavelengths. This type of project does not normally pay for itself quickly through energy savings.

- *Windows—Solar Film / Shading*

  Integral window treatments for existing window retrofits are available in the form of reflective films that adhere to the interior or exterior of the existing window surfaces. Some solar films are effective in increasing the R-value of the window and help conserve energy.

- *Windows—Storms / Overglazing*

  Adding storm windows or overglazing systems to existing single pane windows produces the thermal advantage of a insulating layer of air and reduced infiltration. Overglazing systems are typically permanently attached to the exterior of the existing window systems.

- *Windows—Weather - Stripping*

  This energy conservation measure consists of replacing or installing weather stripping on windows to prevent conditioned air from escaping or outside air from entering the building.

ELECTRICAL IMPROVEMENTS

Frequently, savings can be achieved by addressing the quality and delivery of power within a building. Additional savings result from modifying or replacing consuming devices with higher efficiency devices. Our recommendation, where feasible, includes addressing your power service and upgrading motors to operate more efficiently.

- *Power Factor Correction Capacitors - Loads*

  The typical largest contributor to poor power factor is electric motors. Power factor correction capacitors that are installed at the load side of individual motor controls can save reactive power and improve power factor.

- *Two Speed Motors*

  Two speed motors can be used to replace single speed motors when the equipment that the motor operates has two different levels of loading. This allows the motor to more closely match its load with a resulting electrical efficiency.

- *Power Factor Correction Capacitors - Building*

  Utilities usually penalize customers with poor power factors. A common solution is to add power factor correction capacitors on the facility's incoming power.

- *Variable Speed Drives*

  Variable speed drives vary the speed of a motor by varying the frequency of the electrical current powering the motor. Motors that power variable loads such as HVAC fans and pumps are good candidates for VSD's as they are typically sized for maximum loads, which rarely if ever occur. These applications can also have the added benefit of reducing heating and cooling loads depending on the configuration and control of the HVAC equipment.

Environmental Control Improvements

A computerized facility management system can significantly improve your ability to optimize a building's performance. Strategies can be programmed into the system to lower utility costs, reduce equipment run hours, and provide data important to maintaining control in critical areas. Our recommendation includes integrating these features into your comfort systems. This system provides the tool necessary for facility staff to productively manage today's sophisticated buildings and customers.

- *Boiler/Hot Water Converter Optimization*

  These control strategies conserve energy in several ways. Boiler and pump operation are disabled based upon building system needs, school occupancy and outdoor air temperature. Resetting of converter water temperature and boiler supply water is based on the outdoor air temperature and building occupancy.

- *Chiller Optimization (Reset and Sequencing)*

  A chiller plant automation system provides the building operator with the tools necessary to balance the needs of building comfort/process requirements and the desire to lower operating and maintenance costs. The most common features provided by a chiller plant automation system are described in the following paragraphs.

  Enabling chiller system operation is typically based on time of day schedules, operator override requests, cooling requests from space requirements, cooling requests from other equipment (air handler or process machinery) or another control system. This assures that the chiller plant is operating only when required.

  System load monitoring to determine the amount of chilled water required is typically calculated using system supply and return water temperatures, chiller loads or system chilled water flows. Other methods should be supported with the use of custom programming. Load monitoring assures that only the chillers required to maintain the load are operating.

  Chiller rotation is provided by automatic (day of week) and operator request. Chiller rotation allows the operator to set up a method to equalize the run-time on all chillers. In addition, chiller rotation can be initiated by base, peak and swing chiller designation for optimum use of specific chiller system design and operating characteristics.

  Chilled water reset can be based on ambient conditions, system loads or temperatures, or directly on air handling loads to save energy and see that space comfort is maintained. The chiller plant automation system typically controls individual chiller set points to ensure desired system chilled water temperatures are achieved.

- *CO Monitoring and Control on Parking Garage Exhaust Fans*

  CO monitoring and control on parking garage exhaust fans. Parking garages with exhaust fan(s) can use CO monitoring to cycle the fan(s) on and off to maintain acceptable CO concentration levels within the facility. Typically garages with exhaust fans are either manually or time clock controlled which allows fans to operate at times when CO levels are well below required levels. CO monitoring captures fan motor electrical energy savings by running the exhaust fan only when required.

- *Cooling Tower Optimization*

  Energy is saved by continuous monitoring of condenser water temperature assuring that only the cooling tower fans needed to meet setpoint are operating. Cooling tower rotation is provided by automatic (day of week) and operator request. Cooling tower rotation allows the operator to set up a method to equalize the run-time on all cooling towers. In addition, cooling tower rotation can be initiated by base, peak and swing cooling tower designation for optimum use of specific cooling tower system design and operating characteristics. The setpoint of the condenser water control will be reset to provide for the optimum combination of cooling tower fan and chiller energy consumption.

- *Direct Digital Controls*

  Direct digital controls can save energy by providing more accurate control of temperature and humidity. However, direct digital control can sometimes result in increased energy consumption depending on the condition of the system under consideration. Generally, DDC saves energy and operating costs by flexible equipment scheduling. Decreased equipment run times also reduce repair costs and prolong equipment life. DDC are less costly to maintain therefore decrease operating costs.

- *Electrical Demand Limiting*

  Many times, the demand charge from utility companies can make up half the total monthly bill. Electrical demand costs can be reduced by metering kW consumption and during peak demand, turning off, disabling equipment or sequencing equipment as to not go above a specified demand. The purpose of duty cycling is to avoid setting unnecessary electrical demand peaks caused by synchronized equipment "on" times. This control strategy is particularly appropriate for HVAC systems with greater heating or cooling capacity than is needed to meet load conditions.

  For example, duty cycling can be used to stagger start-up of electric heating coils in the terminal units of VAV systems - particularly during morning warm-up. By preventing the coils from energizing simultaneously, the electrical demand peak can be reduced. This control strategy requires a good understanding of the building and business as to not disrupt facility operation.

- *Lowering of Static Pressure Control Points to Lowest Allowable Levels*

  This control strategy saves energy by decreasing the load on the fan. In addition, less energy is needed to condition lower volumes of air.

- *Mixed Air Dampers—Dry Bulb Economizer Control*

  An airside economizer cycle can lower utility costs by using outside air to help satisfy the building cooling load. When ambient conditions are such that the outside air will provide natural cooling, the economizer introduces this air directly into the building. This method of economizer is based on outside air temperature and return air temperature.

- *Mixed Air Dampers—Enthalpy Control*

  An airside economizer cycle can lower utility costs by using outside air to help satisfy the building cooling load. When ambient conditions are such that the outside air will provide natural cooling, the economizer introduces this air directly into the building. This method of economizer is common in humid climates and is based on comparison of outside air temperature and humidity and return air temperature and humidity.

- *Night (Unoccupied) Setback*

  This control strategy saves energy by controlling equipment for a cooler temperature in the winter and a warmer temperature in the summer. A typical setpoint may be set at 15 deg lower during unoccupied "winter" times and 15 deg higher during unoccupied "summer" times. Energy is saved by decreasing equipment run times.

- *Night Purge*

  Unoccupied ventilation not only enhances the quality of the indoor environment by purging many indoor contaminants from the building, but also offers a means of reducing utility costs by exploiting the thermal capacity of the building. That is, the building's thermal capacity makes it possible to use cool outside air brought into the building during unoccupied hours to offset the cooling load that develops at the beginning of each occupied period - analogous to a Thermos bottle.

- *Occupancy Sensor Control*

  A motion/sound device can be used to detect when a zone is occupied and activate the HVAC system to control for occupancy. Although difficult to quantify, significant energy can be saved during unpredictable unoccupied times.

- *Occupied-Unoccupied (Time of Day) Control*

  This energy saver is second only to lighting in potential for savings. It conserves fan power, minimizes ventilation heating and cooling and reduces heat gains and losses through exterior surfaces. Being able to control equipment for unoccupied times allows temperatures to be setup or setback, outside air can be eliminated or greatly reduced, and fans can be shut off or put in an automatic mode to cycle when needed.

- *Optimal Start/Stop & Ventilation Delay*

  This control strategy save energy by calculating the optimal time before occupancy the fan systems must turn on to meet temperature setpoint. Building heat transfer rate is continually measured to account for outside temperate variations.

- *Outdoor Air Reduction*

  Bringing in excess outside air due to damper leakage, incorrectly setup controls or uncalibrated controls costs money to condition. ASHRAE guidelines should be followed when considering outside air intake.

- *Sequencing of Heating, Mixed Air Dampers, and Cooling Controlled Devices*

  Sequencing of heating coil valves, mixed air control dampers, and cooling coil controls will save energy by eliminating simultaneous heating and cooling which results when there is overlap of pneumatic spring ranges, transducer setpoints, control sequences, etc.

- *Supply Air Reset*

  Good candidates for this energy saving retrofits are constant volume fan systems that have constant discharge air temperature settings at the cooling coil or at the cold and hot decks. Reducing simultaneous heating and cooling can be accomplished by resetting discharge air setpoint on chilled water coils to the highest possible setting and on hot water coils to the lowest possible setting. In terminal reheat systems where air is first cooled to 55 deg and then terminally heated up to meet zone setpoint, chilled water coil setpoint can be increased in accordance with the maximum cooling requirement of any zone.

- *Variable Speed Drive Control (VAV, Variable Pumping)*

  Converting a constant volume fan to variable air volume saves both fan energy and heating and cooling energy by the ability to vary fan flow rates according to occupancy or cooling loads. Methods of varying fan flow rates include discharge dampers, inlet guide vanes, variable speed motors and controlled pitch fans. The most efficient and accurate method of varying fan flow rates is by varying the fan speed through a variable speed drive.

Heating Plant Improvements

Keeping your occupants warm during cold weather is critical for business on a daily basis. Your heating equipment must be well maintained to operate efficiently and reliably. Our recommendation includes making changes to your heating plant, enabling it to operate more efficiently, reliably, and at a lower cost.

- *Conversion to Dual Fuel Burners*

  If the gas utility has a interruptible gas rate, consider installing a dual fuel burner with a alternate fuel for backup to take advantage of the cheaper interruptible rate.

- *Heat Recovery on Boiler Flue Stacks*

  Install heat recovery heat exchangers in the flue gas stack. Use the heat so collected to preheat combustion air in cold climates or feed water in any climate or domestic hot water make up in any climate. This requires a heat exchanger installed in the boiler stack and pumps, piping and valves installed in the boiler room. Some type of heat exchanger is installed in the fluid that will receive the heat. This can take the form of a domestic hot water storage tank with a tube bundle installed or a shell and tube heat exchanger for the boiler feed water or possibly an air coil for the combustion air.

  Heat recovery of boiler flue gases can be an effective way of preheating combustion air and/or boiler feed water. These installations, when properly engineered to avoid condensing corrosion problems, can provide quick paybacks.

- *Install Flue Dampers*

  Automatic flue dampers that open and close with boiler operation help keep hot air and residual heat within a boiler after the burner has shut down.

- *Install Turbulators*

  Boiler turbulators are properly sized metal baffles which are inserted directly into the firetube of a boiler. The turbulators break up the inner core of hot gases and causes them to make contact with the flue walls. This results in more heat from the gases being absorbed by the flue walls where it is transferred to the surrounding steam or hot water. Less heat is wasted up the boiler stack but the application should be studied to prevent the stack temperature from getting too low.

- *Lower Steam Pressure*

  The operating steam pressure is often raised on low pressure boilers to compensate for malfunctioning steam traps and other building problems. The steam pressure should be set at the lowest level once the problems have been addressed. Higher pressure steam systems should be analyzed to determine whether the delivery pressure is higher than required for the connected loads. Lower steam pressures result in lower boiler internal and stack temperature requirements, less heat loss from cooler steam pipes, and less steam leaks associated with lower pressures.

- *Optimize Boiler Blowdown*

  A close look at current blowdown practices is done to identify whether a reduction in frequency and/or quantities of boiler water blowdown can be accomplished. A standard operating practice of boilers is to routinely blowdown a quantity of water in the boiler to eliminate impurities, etc. in the boiler. Optimizing the frequency and amounts of water can save the energy required to heat the water, the water itself and the chemicals required to treat the water. All of these factors can result in significant operating cost savings for an average boiler.

- *Radiator Valves*

  Radiators and other heating terminal units that have manual valves usually result in overheated spaces. The occupants often counter the overheating by opening the windows. Self contained thermostatic valves provide for automatic control of the radiator based on the temperature at the valve's sensor.

- *Repair Vacuum Pumps*

  Vacuum pumps are often damaged due to malfunctioning steam traps. Once all steam traps have been repaired, the vacuum pump should be put back in service and the steam pressure reduced to proper levels.

- *Repair/Replace Steam Traps*

  Replacing faulty traps and an ongoing maintenance program can yield substantial energy savings. Steam traps are used in a distribution system to prevent the flow of steam beyond the point of use. When steam is present, the trap valve closes and when condensate is present, the trap valve opens allowing the condensate to return to the boiler. Steam traps are effective only if they are correctly sized and properly maintained.

- *Replace HVAC System With Ground Source Heat Pumps*

  A ground-source heat pump system uses the ground or ground water as a heat source during winter operation and as a heat sink for summer cooling. The stability of the subsurface temperatures results in year round energy efficiency. Waste heat can also be used for domestic hot water. Ground-source heat pump systems can be applied in virtually any category of climate or building. High first cost (First costs of GHP typically range between $2,500 to $ 4,000/ton) is typically the restraining factor when comparing GHP to conventional systems. GHP tends to be most cost-effective:

  - In new construction, or when equipment is at the end of its useful life.
  - In Climates characterized by high daily temperature swings
  - High natural gas costs compared with electricity (when cost of electricity is less than 3.5 times that of conventional heating fuels (per BTU).
  - Simultaneous heating and cooling occurs.
  - In facilities where multiple temperature control zones or individual load control is beneficial.
  - In areas where drilling costs are low.
  - In areas with a high soil moisture content or high ground-water level (reduces size of ground-coupling system smaller therefore improving the overall economics).

  Consideration must be given to the placement of the well field. The performance of geothermal heat pumps is greatly affected by soil type. It is essential that a thorough soil analysis be performed.

  Besides energy savings, considerable maintenance savings can be achieved and should be incorporated into the savings calculations. GHP systems eliminate the exterior fin-coil condensers of air-cooled refrigeration systems and eliminate the need for cooling towers (a key benefit in highly corrosive areas such as near the ocean). In closed-loop systems, the ground loop is virtually maintenance free, but should be routinely monitored for temperature, pressure, flow, and antifreeze concentration. The circulating pumps require routine maintenance.

- *Replacement Burners with Increased Efficiency*

  Boiler burners should be evaluated and replaced with higher efficiency units. The burner efficiency at both partial and full loads should be considered.

- *Trim Control*

  The efficient combustion of fuel in a boiler requires a optimum air/fuel ratio, providing for a percentage of total air sufficient to insure complete combustion of the fuel without over diluting the mixture and thereby lowering the boiler-burner efficiency. Optimum combustion efficiency varies continuously with changing loads and stack draft and can be closely approached only through analysis of flue gases with resultant control of the amount of excess air in the boiler.

- *Variable Speed Pumping (Secondary)*

  Using a hydraulically decoupled piping arrangement with parallel-piped boilers eliminates the control difficulties caused by the variable relationship between boiler and system flow rates. The decoupled piping system provides constant water flow through the boilers while they are operating, and permits variable flow on the distribution side of the system.

  Of these methods, the variable-speed drive controlled by a differential pressure transducer is the most energy efficient.

KITCHEN IMPROVEMENTS

Our solution includes modifying your kitchen equipment to operate more efficiently. The energy, heat, and steam produced by kitchens can be a source of savings.

- *Conversion of Electric Booster Heaters to Natural Gas*

  Conversion of electric kitchen booster heaters to gas fired can be effective depending on availability of gas in the facility and the electrical rate structure. Significant savings can result if the booster heater operation is part of the building peak electrical load.

- *Conversion of Hoods & Makeup Air Systems to Efficient Types*

  Building codes mandate a significant amount of dedicated exhaust from kitchen cooking areas. The methods by which the exhaust makeup air is conditioned and delivered can have potential for optimization. The most efficient kitchen makeup air systems just partially preheat the makeup air and introduce it directly at the exhaust hood.

- *Coolers—Air Strip Systems*

  Adding flexible strip curtains help minimize losses when cooler and refrigerator doors are open.

LIGHTING UPGRADES

Our solution includes addressing your facility lighting. High efficiency lamps and ballasts will be used to retrofit existing fixtures. This will reduce overall energy consumption and therefore lower your operating budget.

- *Ambient Lighting Control*

  Use of ambient light to supplement or eliminate the use of artificial light in buildings. Ambient light levels may also be used to control the light level of dimmable lights to reduce lighting energy consumption. Ambient light is a free source of light energy that can be effectively used in many building designs. Ambient control is typically used with other lighting retrofits to maximize their overall effectiveness.

- *Conversion of Fluorescent Fixtures*

  Conversion of fluorescent fixtures to T-8 lamps and energy efficient ballasts is a very effective way to reduce energy consumption. Each new T-8 lamp requires 12-20% less electricity than the standard lamp it replaces and improves color rendition. Replacing a standard magnetic ballast with an energy efficient electronic ballast can save anywhere between 10-40%.

- *Conversion of Incandescent Fixtures*

  Incandescent lamps can be replaced by compact fluorescent lamps and compact halogen lamps

- *Conversion of Mercury Vapor Fixtures*

  Mercury vapor lighting should be replaced with more efficient HID sources such as metal halide. Metal halide fixtures may also be upgraded to T8 or T5 high-bay fluorescent fixtures.

- *Delamping with Reflector Installation*

  Areas that have higher than recommended light levels can benefit from delamping (in conjunction with conversion to T-8 lamps and energy efficient ballasts). Specular reflectors can improve fixture light output and provide for repositioning of remaining lamps.

- *Dimming Control*

  Fluorescent dimming systems are becoming more competitively priced and are providing for more control options. Dimming ballasts are available which provide for a variety of automatic and manual control options.

- *HID Dimming Control*

  Dimming systems are available as retrofit kits for existing HID lighting. The systems dim the lights in concert with occupying sensing devices.

- *Occupancy Sensor Control*

  Ultrasonic, infrared , or combination sensors are available to determine occupancy and turn on/off lights accordingly. Energy savings can be significant but often difficult to calculate due to the unpredictability of area occupancies. Occupancy sensors are frequently used to control lighting in washrooms, offices and conference rooms.

- *Outdoor Parking/Security Lighting Retrofit*

  Many facilities have light fixtures outside of the building which may also benefit from high efficiency lighting retrofits. Many facilities have mercury vapor lamps that can be converted to higher efficiency HID or sodium style lamps. Time clock/scheduling (Energy Management System) and/or photocell control may also be applied to light fixtures under manual control.

Maintenance & Repair

Taking regular care of your facility's comfort systems will prolong its useful life, reduce or eliminate costly repairs and improve its performance. Routine maintenance cannot be emphasized enough as a strategy to keep your facility operating efficiently.

- *Automatic Controls Calibration*

  Calibrating controls can save anywhere between 5-10% of the energy used to condition the space. Comfort levels will also improve.

- *Boiler Combustion Efficiency Checks & Calibration*

  Boiler tuning consists of adjusting the burner for the proper fuel to air mixture and cleaning the heat transfer surfaces if needed. Boilers that have not been tuned annually are prime candidates for this ECM. Boiler efficiency improvements of only a few percent can yield substantial energy cost savings in large boiler plants.

- *Change HVAC Filters*

  Dirty filters reduce efficiency and effect the quality of air being delivered. Dirty filters can restrict air flow causing reduced air delivered to space. On many HVAC systems additional energy is required to move air through the filters. Replacing filters regularly improves the quality of air and saves energy.

- *Clean Air Cooled Condenser Coils*

  Power washing air cooled condensing units eliminate accumulating dirt, leaves, etc. that can dramatically effect equipment efficiency and performance.

- *Clean Chiller Tubes*

  Accumulated scale in chiller tubes reduce efficiency and waste energy. Punching tubes annually and water treatment improves the reliability and performance of the chiller and saves energy.

- *Clean HVAC Coils*

  Accumulated debris on heating and cooling coil fins reduce efficiency. Dirty coils can restrict air flow causing added load on fan motors and reduce air delivered to space. Additional energy is required to condition the air and move it through the coils. Cleaning coils regularly improves performance of the air handling unit and saves energy.

- *Cooling Tower Maintenance*

  The cooling tower should have proper water treatment (described elsewhere) and associated blowdown. Evaporative cooling towers should be cleaned on a regular basis to minimize growth of bacteria. The tower fill and drift eliminators need to be maintained. Check for even flow through distribution system.

- *Correct Water Treatment*

  Water treatment is required to maintain proper heat transfer, maintain proper flow rates, and protect equipment against corrosion and rapid wear of moving parts. Proper water treatment will prevent against corrosion, scale, and biological growths which lead to the above problems.

- *Raise/Lower Room Setpoints*

  Maintaining a cooler temperature in the winter and a warmer temperature in the summer saves energy. A typical setpoint of 72 deg should be maintained during "winter" occupied periods and 55 deg during "winter" unoccupied periods. A typical setpoint of 76 deg should be maintained during "summer" occupied periods and 85 deg during "summer" unoccupied periods. Energy is saved by decreasing equipment run times.

- *Repair Leaking Pump and Equipment Seals*

  Leaking pump and equipment seals should be repaired to prevent loss of medium, corrosion of equipment and facility, and provide for safer work environment.

- *Turn Lights Off*

  Turning lights off when an area is not occupied saves energy and prolongs the life of the bulbs and ballasts. Posted signs can assist as a reminder in facilities.

Operational Savings

Trane will assist you in determining if you have the opportunity to reduce not only your utility costs, but also operational costs in areas outside your utility budget. These types of savings are frequently overlooked, but they reflect the true financial benefits of implementing our recommendations. Trane has identified potential savings for in one or more of the following areas:

- *Administration*

  By addressing existing comfort problems through equipment installation, maintenance and/or control system upgrades, will spend less administrative time addressing complaint calls.

- *Capital*

  Flexible PACT funding mechanisms allow to save significant capital dollars over the term of the PACT contract.

- *Control Repair*

  A new or upgraded building automation system will save the current expense of repairing the old, unreliable system.

- *Facility Monitoring/Control*

  A new automation system will provide the facility operators of with tools to centrally monitor and control the building, increasing efficiency and thereby reducing costs.

- *Lighting Repair*

  Installing new, longer-lasting lighting will save a portion of the cost you currently incur to continually replace your lighting systems.

- *Maintenance*

  By installing new equipment or redesigning a system, will avoid the higher cost of maintaining older systems.

- *Mechanical Repair*

  By installing new mechanical equipment, will not have the financial burden of continually repairing old, unreliable parts.

- *Reporting*

  The automated reporting functions provided by a new building automation system will eliminate the costs associated with handling this function manually and may provide the ability to monitor data not previously available.

PERFORMANCE MANAGEMENT

To ensure that project results meet the expectations of , Trane will implement a performance management program for the duration of the Agreement. We will develop a program in cooperation with you that provides the right level of risk management and support for overall project objectives.

- *Consultation*

  During each scheduled visit, a Trane representative will meet with a representative from to discuss the installations operations, any problems, applications, etc.

- *Monitoring (Continuous Metering)*

  On a monthly basis, Trane measures the savings at by analyzing utility costs and consumption compared to an established baseline. We incorporate utility information and weather pattern data into our analysis to determine actual energy savings.

- *Monitoring (Point Source)*

  Trane will monitor and demonstrate actual savings. To do so, we will make required field measurements and enter them into system performance modeling programs and spreadsheets.

- *Operations & Maintenance*

  Outsourcing of all or part of your facility operations allows you to focus your resources on your core business. Trane has the experience and knowledge to help operate and maintain your facility at the least cost without affecting comfort. Our recommendation includes operating and maintaining a portion of your facility.

- *Preventive Maintenance & Repair*

  Taking regular care of your facility's comfort systems will prolong its useful life, reduce or eliminate costly repairs and improve its performance. Outsourcing associated repairs adds a layer of risk management and provides a predictable method for budgeting. Our recommendation is to provide a program supplying preventive maintenance and repairs that protects the investments of and provides a predictable technique for budgeting.

- *Preventive Maintenance*

  Taking regular care of your facility's comfort systems will prolong its useful life, reduce or eliminate costly repairs and improve its performance. Our recommendation is to provide a preventive maintenance program that integrates into your long range facility plan and achieves these goals.

- *Project Operation Inspection*

  Trane will perform regular visual inspection of equipment at to make sure that operating problems do not adversely affect performance and savings.

- *Reports*

  To ensure you are achieving the savings expected, Trane will provide an annual report containing performance data necessary to substantiate the results of the guarantee.

PLUMBING UPGRADES

Trane's affiliation with its parent company, American Standard Inc., gives us a unique insight into potential water/sewer savings. We recommend addressing your facility's plumbing fixtures to improve functionality and reduce consumption.

- *Eliminate Once Through City Water Condensing Circuits*

  Many older facilities have once through well or city condenser water cooling system(s) installed on refrigeration equipment. Once the water passes through the condenser it is dumped into the sewer. Retrofitting systems with closed condensing water loops is recommended to eliminate this situation. The savings from water and/or sewer charges can be significant and in many cases eliminates a potential code issue. Many local and state regulations require the eventual elimination of once through circuits.

- *Low Flow Faucet Aerators*

  Low flow controls are available for faucets to limit the maximum water flow. New American Standard Faucets are available with 2.2 GPM aerators. In addition American Standard has .5 GPM and 1.5 GPM flow controls that fit various faucets.

- *Low Flow Fixtures*

  A typical toilet with a gravity tank consumes 5 GPF (gallons per flush). The National Energy Policy Act calls for 1.6 GPF as a maximum for new toilets. American Standard has both 1.6 & 3.5 GPF model toilets available. American Standard also has .5 & 1.0 GPF urinals available.

- *Low Flow Shower Fixtures*

  A typical shower head consumes about 3-5 GPM during the typical shower. The National Energy Policy Act calls for 2.5 GPM as a maximum flow for new shower heads. Models are available in the 1.5-2 GPM range. Care must be taken in facilities that have hard water and no water treatment to prevent plugging of the low flow devices.

- *Preheat Domestic Hot Water*

  Various sources of excess heat can be used to preheat domestic hot water, especially the makeup which is typically city or well water at fairly cool temperatures. Typical sources of excess waste heat are refrigeration compressors, boiler blowdown, chiller condensers, heat pump loops, etc.

- *Proximity Sensor Control on Fixtures*

  Use of proximity controls on lavatories, urinals and toilets can provide for automatic and economical operation.

- *Separate Meters for Makeup and Irrigation Water Supplies*

  Many facilities can benefit by installing separate water meters on system that require large amounts of make up water, such as pools and irrigation systems. Most utilities base their sewer charges on the amount of water used, separate meters allows a customer to separate out water use that does not go in the sewer. Typically utilities will then only charge for the water use and not sewer use when this strategy is applied. Depending on what your locale is this simple strategy can save significant amounts on your sewer charges.

TRAINING

Effective training is often a critical component to the success of an energy conservation project. We will train your staff on any or all of the following topics:

- System changes or additions
- Anticipated facility operations, such as scheduling and set points
- Operations and maintenance on any new equipment

This training can be conducted at your site, at a local Trane office, or at our other corporate training facilities.

UTILITY NEGOTIATIONS

The energy consumption of the facility can change over time due to aging technology, changes in the function, use or occupancy of a facility, the mixture of energy used in the facility, power quality and reliability, and other energy management issues. Additionally, with the onset of deregulation in many states and the availability of more competitive rates, rate schedules available to the facility can and will change, and may in fact be lower than current rates.

Our recommendations might include examining the current rate schedule and identifying a more advantageous schedule based on the needs of the facility.

- *Consolidated Billing*

  Paying bills for multiple meters and different service providers is inefficient and costs money. This method also makes catching errors more difficult. Our recommendation includes consolidating your utility bills to take advantage of improved rates and reduce the cost of administration.

- *Convert to Alternate Source of Energy*

  If a facility uses electricity for all of their space heating, lighting, etc., many utilities offer discounted rates due to their ability to even out their demand between the cooling and heating seasons. Converting equipment from electric to gas may also offer fuel savings.

- *Convert to Interruptible Electric Rate*

  For facilities that can afford an interruption or curtailment in their normal utility supply, many electric utilities offer attractive rates. The load reduction is either controlled by the utility or facility and usually lasts between 15 and 60 minutes.

- *Installation of Separate Meters*

  Installing a separate meter to measure the consumption of a particular piece of equipment can provide valuable information. Isolating a large consuming device allows for decisions to be made based on demand costs, performance and need. Our recommendation includes installing a separate meter in your facility to reduce costs and to provide valuable facility information management.

- *Purchase Natural Gas at the Wellhead*

  Federal deregulation of the gas industry has given consumers the ability to purchase gas directly from the gas producers or other gas suppliers. In many cases this type of "transportation gas" can be purchased for 10-25% less that that available from the local utility.

- *Real Time Pricing*

  Many utilities are starting to experiment with programs that will charge the customer according to the utilities actual "real time" cost of generating electricity.

- *Cogeneration*

  Cogeneration systems are used to reduce overall energy costs by generating electricity on the building site and capturing the waste heat produced by the engine. Since the cost of the locally generated electricity, alone, is often higher than that provided by the utility, the system's economic advantage is derived from appropriate use of the waste heat.

  Commonly, waste heat produced in a cogeneration system is used to satisfy hot water loads, whether domestic or process-related. Alternatively, it can serve as a heat source for maintaining proper space conditions during the heating season.

  Where appropriate, the full economic potential of waste heat can be exploited with an absorption chiller that provides chilled water for comfort or process cooling applications.

- *Peak Load Shaving Generator Installation*

  Some utilities offer reduced rates to customers who can reduce their KW load during times when the utility is experiencing high KW demand loads. Customers can reduce their load by using generators to take them off line or reduce their load to a predefined level with the utility company. Typically customers agree to reduce their KW load for a prescribed quantity of time at the discretion of the utility (typically they call and give a ½-1 hr notice to turn generators on). The rate structures offered with these type of programs are very attractive and can justify the cost of the generator. Customers that require emergency/backup generation can benefit most from this strategy.

- *Geo-Exchange, Solar, Wind, Fuel Cells, and other Renewable Energy Systems*

  The state of Colorado and Xcel Energy are promoting various renewable energy systems that may be applicable for schools across Colorado. Trane is also a founding partner in the Clinton Climate Initiative which is promoting “Carbon Neutral” buildings. We will work closely with the State of Colroado’s “Governor’s Energy Office” to apply and investigate all related grants, rebates, incentives, credits for efficienct and practical and cost effective options for Windsor Schools.

- *LEED/Energy Star/GBI Energy Efficient Building Programs*

  The United States Green Building Council and the LEED or Green Building programs have become an integral part of Trane’s comprehensive solutions projects. We will coordinate our recommendations and provide the district with many options for obtaining environmentally responsible solutions. Trane is committed throughout our organization to reducing the Carbon Footprint and Ozone Depletion as recognized recently (Sept 2007) for winning the EPA’s “Best of the Best Award” for our efficient Centrifugal Chillers.