

APPENDIX H – POTENTIAL ENERGY CONSERVATION MEASURES FOR EXISTING BUILDINGS

This listing is primarily designed for retrofitting of existing County facilities and should be used as a guide for conserving energy. Most common Energy Conservation Measures (ECM) are found in the following thirteen (13) categories. Within each category typical ECM's are presented, but are by no means complete.

Once potential ECM's are determined, the technical and economic analyses should be conducted for each project and priorities can be established for implementation.

1. Building Envelope

- a. Install double/triple glazing.
- b. Permanently installed storm windows.
- c. Reduce glass area (wall up/close off).
- d. Install solar shading.
- e. Replace clear glass with reflective glass.
- f. Install insulated doors.
- g. Install airlocks, vestibules.
- h. Wall up/close off unneeded openings.
- i. Install insulation (*roof, ceiling, wall, floor*).

2. Heating

- a. Replace inefficient boilers.
- b. Use modular units.
- c. Decentralize system.
- d. Downsize system.
- e. Replace inefficient burners.
- f. Install automatic flue dampers.
- g. Replace pilot lights with electronic ignition.
- h. Preheat combustion air/make up water with waste heat.
- i. Recover waste heat from exhaust air, flue gas, laundry, kitchen, engine exhaust, condenser, cooling tower.

3. Cooling

- a. Replace inefficient chillers.
- b. Install window air conditioners for local load requirements.
- c. Install economizer cycles.
- d. Utilize evaporative/dehumidification cooling.
- e. Manifold chillers in parallel and sequence.
- f. Isolate off-line chillers and cooling towers.
- g. Replace air-cooled condensers with cooling towers.

4. Ventilation/Distribution

- a. Reduce air volume.
- b. Reduce air Stratification.
- c. Convert to variable air volume.
- d. Insulate pipes and duct work.
- e. Install automatic dampers.
- f. Consider zoning modifications.
- g. Reduce outside air percentage.
- h. Shutoff/reduce heat to lobbies, stairwells, hallways.
- i. Reduce/eliminate air to unoccupied areas.
- j. Utilize outside air for free cooling.
- k. Eliminate simultaneous heating and cooling.

5. Lighting

- a. Convert incandescent to fluorescent or high-intensity discharge.
- b. Convert mercury vapor to metal halide or sodium vapor.
- c. Modify fixtures (add reflectors, lower height).
- d. Employ task lighting.
- e. Install occupancy sensors (infrared, ultrasonic).
- f. Install local switches.
- g. Install skylights.

6. Domestic Hot Water

- a. Install flow restrictions.
- b. Install self-shutoff faucets.
- c. Decentralize hot water heating.
- d. Add piping and tank insulation.
- e. Install booster heaters for hot water in lieu of central system use.
- f. Add preheat from waste heat source.

7. Laundry

- a. Install heat reclamation system on laundry wash water.
- b. Install heat reclamation system on dryers.
- c. Install makeup air supply for exhaust.
- d. Install local booster heater.
- e. Add/improve insulation.

8. Kitchen

- a. Install high-efficiency steam control valves.
- b. Install makeup air supply for exhaust.
- c. Install heat reclamation system for exhaust heat.
- d. Install nighttime automatic steam cut off.
- e. Utilize chemical dishwashing system.
- f. Add/improve insulation.

9. Utility Plant Systems

- a. Reduce steam distribution pressure.

- b. Increase boiler efficiency.
- c. Insulate boiler and boiler piping
- d. Install economizers.
- e. Install air preheaters.
- f. Install blow down controls.
- g. Modernize boiler and chiller controls.

10. Electrical Equipment

- a. De-energize equipment when not in use.
- b. Reduce loads when not required.
- c. Install capacitors or synchronous motors to increase power factor.
- d. Reduce transformer losses by proper loading and balancing.
- e. Convert to energy efficient motors.
- f. Install variable-speed motors.
- g. Replace oversized motors.

11. Controls

- a. Install automated energy management system.
- b. Install temperature/pressure reset devices.
- c. Install stop/start devices.
- d. Install night setback devices.
- e. Install load-shedding devices.
- f. Install system optimizing capability.
- g. Install enthalpy controls.
- h. Replace hand valves with automatic valves.

12. Renewables

- a. Install active or passive solar hot water system.
- b. Install active or passive solar space conditioning.
- c. Utilize photovoltaics.
- d. Convert to wood.
- e. Convert to biomass.
- f. Convert to refuse.
- g. Utilize wind energy.
- h. Utilize water power.
- i. Utilize geothermal.
- j. Utilize tidal energy.

13. Miscellaneous

- a. Install cogeneration system.
- b. Install thermal storage system.

There are a number of provisions to be considered in recommending various ECM's. These considerations can deal with specifying state-of-the-art equipment, health and safety, occupant comfort, compatibility with existing equipment, and hazardous waste disposal among others.

The following is a list of considerations to be addressed in finalizing a recommended ECM.

LIGHTING

1. Converting Incandescent to Fluorescent
 - a. Use energy-efficient ballast and lamps.
 - b. Consider using electronic ballasts and compatible lamps (T-8 Optron).
 - c. Verify that new light levels will meet state codes.
2. Replacing Standard Magnetic Ballast and Lamps with Energy-Efficient Ones
 - a. Lamp must be compatible with the ballast.
 - b. Verify that new light levels meet state codes.
 - c. Consider using electronic ballasts and lamps.
 - d. Address disposal costs if the old ballasts contain polychlorinated biphenyls (PCBs).

BUILDING ENVELOPE

1. Wall Up Windows
 - a. Be aware of any historical building preservation requirements.
 - b. Verify that the new light level meets the state codes.
 - c. Conduct an in-house check by blocking the light from the windows with dark plastic sheeting.
 - d. Check for proper outside air ventilation requirements.
2. Install Storm Windows
 - a. They must be permanently attached.
 - b. Check for proper outside air ventilation requirements.
3. Install Roof Installation
 - a. Existing roof must be leak proof.
 - b. If the roof is to be replaced, obtain assurance that it will be completed prior to installing insulation.

AIR CONDITIONING

1. Recommend chiller replacement ECM's be charged with non-CFC refrigerants. A viable option would be that the replacement chiller, supplied with a CFC refrigerant, is also compatible with HCFC or HFC refrigerants. This changeover should be accomplished without chiller hardware modifications or lubrication changeout.
2. In replacing a water condensing chiller, ensure that the existing condenser water loop is clean . Consider replacing the cooling tower.
3. Ensure that existing components such as pumps, motors, fans, etc., are properly sized for the new chiller.

HEATING

1. In replacing an old boiler, check out the composition of the old insulation for asbestos.
2. If asbestos is present, allow adequate funds for removal and disposal cost, which could be substantial.

VENTILATION

1. In recommending reduction of outside air, do not go below:
 - a. 15 cfm/person outside air for classrooms
 - b. 20 cfm/person outside air for office areas
 - c. 25 cfm/person outside air for patient rooms.

ELECTRIC MOTORS

1. Base motor efficiency rating on IEEE 112 Method B.
2. Specify energy efficient motors when replacing existing motors.
3. When replacing pumps, fans, or compressors, change out their standard motors with energy-efficient units.
4. Check out the possibility of using a smaller drive motor when changing to an energy-efficient pumps, fan, or compressor.
6. Check the power factor of the new motor.

CONTROLS

1. In the installation of an energy management control system (EMCS), ensure that the controlled equipment is in good operating condition.
2. Be comfortable that the responsible institution person(s) is capable or can be trained in the operation and maintenance of the proposed EMCS.

WATER FOUNTAINS

1. In all ECM's dealing with refrigerated water fountains, check for an unsafe lead level (greater than 5 ppb) in the drinking water.

Source: Energy Auditor/Technical Assistance Analyst Training Manual, State Energy Office, State of Florida.