AMERESCO

Ameresco Scope of ECMs:

- ECM L.1.1: Lighting Upgrades
  Ameresco upgraded the lighting in 49 buildings which included research facilities, academic buildings, central power plants and office buildings. This included upgrading of 68,613 fixtures and installation of 165,750 lamps.

- ECM W.1.1:High Flow Plumbing Fixture Upgrades
  Ameresco upgraded high flow plumbing fixtures in 36 buildings including research facilities, academic buildings and office buildings. This included upgrading 765 water closets, installation of 202 faucets, installation of 514 faucet aerators, and the upgrade of 519 urinals.

- ECM W.1.2: Process Water Recovery at the Medical Heating and Cooling Plant
  The Scope of work included adding two (2) pumps, controls and copper piping to cool the existing process equipment that serves steam boilers listed below with cooling tower water. Domestic potable water was used only once to cool the equipment then discharged to the sanitary plumbing system. Piping was extended from the bottom of the existing cooling tower sump to equipment listed below. Duplex inline pumps with check valves, domestic water emergency feed tap were provided and installed. Isolation/balancing valves and one (1) emergency drain were installed.

  - Three (3) air compressors
  - Bearings on coal stokers
  - Bearing coolers on induced draft fans
  - Bearing coolers on forced draft fans
  - Feed water pump coolers
  - Impeller coolers on forced draft fans water cooled

- ECM W.1.3: Steam Sterilizers
  Ameresco installed a valve package on the sterilizers that reduced the amount of city water required in four medical buildings. The valve package monitors discharge temperature of the steam sterilizers and tempers the water before being discharged to the sanitary drain.

- ECM W.1.4: Solar Water Heating
  Ameresco installed 8 solar panels, a new hot water storage tank, controls at the Poundstone Ag. Regulatory building. The heated water is used domestic and process washing of Agricultural seeds.

- ECM M.1.1: Steam Trap Replacement
  This ECM included the replacement of 101 steam traps in 29 buildings and underground concrete tunnels between buildings.

- ECM M.1.2: Insulation
  Ameresco installed permanent insulation and removable jackets for maintenance access in 61 buildings and underground concrete tunnels between buildings.

- ECM M.1.3: Utility Monitoring
  Ameresco installed meters in 61 buildings, 89 power meters, 52 condensate meters and 57 chilled

water BTU meters. These meters are connected back to the main campus control center where the data is monitored on a continuous basis.

- ECM M.1.4: Fume Hood Controls
  Ameresco upgraded 110 fume hoods in 43 classrooms in the Chemistry-Physics Building. Scope included adding new fume hood exhaust valves and zone presence sensors. Zone presence sensors allow for reduced airflow during unoccupied times.

- ECM M.1.5: AHU Variable Frequency Drives
  Ameresco installed 31 air handling unit variable frequency drives in 5 buildings. The motors were running 100%. VFDs allow the motors to ramp down as the duct static pressure builds up during low load times in occupied spaces.

- ECM M.1.7: Upgrade Chilled Water Pumping
  Ameresco provided all required design, labor and material (turnkey) to decouple the building chilled water loop from the central plant distribution loop for 10 buildings. The new valves, pump and controls separates building pressure from distribution pressure and allows to blend supply with return and recirculate chilled water in buildings until reaches setpoint. This results in a warmer chilled water return back to the central plants (total of four on campus). Work also included removal of abandoned chillers in 3 buildings. The scope of work details are as follows for each building:
    - Furnish and install DDC controls for one (1) new Chilled Water Decoupled Loop
    - Includes one (1) VFD for chilled water pump
    - Includes two (2) NELES high pressure chilled water control valves
    - Includes chilled water pressure transmitters and temperature sensors
    - Furnish/Install Johnson Controls (1) DX-9100 Control Panel with XP Expansion Module – install transducer
    - New concrete maintenance pads

- ECM M.1.9: Underground Steam Condensate Piping
  Ameresco provided turnkey replacement of approximately 400 linear feet of underground steam condensate piping by Bosomworth medical research facility. The piping was approximately 6' deep. All of the steam condensate was being dumped into sanitary piping due to existing condition of the underground piping. Summary of scope is as follows:
    - Pre-insulated schedule 80 steam condensate piping that meets current UK specifications
    - Sidewalk and road repair along with seeding was included

- ECM M.1.10: Boiler Turbulators
  Ameresco installed turbulators in two hot water boilers resulting in more efficient gas combustion. The Turbulators are installed in the tubes to increase gas turbulence thus resulting in more burning of natural gas.

- ECM M.1.11: Steam Water Heater
  Ameresco replaced the existing water heater with a new instantaneous steam water heater. The water heater was beyond its useful life.

- ECM M.1.12: AHU Replacements
  Ameresco replaced 3 AHUs in the Sanders-Brown Center on Aging research facility. The facility remained open during construction.

- ECM M.1.13: Ultraviolet Air Handling Tubes
  Ameresco installed Purgenix ultraviolet tubes for two (2) air handling units in the Law Building and the two (2) in Sanders-Brown Center on Aging research facility. The ultraviolet tubes will help keep the chilled water coil clean and improve indoor air quality. The ultraviolet light kills bacteria.

- ECM E.1.1: Substation Capacitor Banks
  The electric power company changed billing structure for UK. The new rate is based on a ratchet and power factor rate. UK owns four substations that serve the campus. The power factor before the project was approximately 0.91. Capacitor banks and controls was installed in the substations to bring the campus power factor to 0.975. Current trending of the campus power factor indicates a value to approximately 0.990.

Ameresco identified the above ECMs during its energy audit for UK and provided basic and detailed engineering for each ECM.