Julie Whitsell

Hi Bill.

What I provided for you was hard data based on history. Once the project is complete and in full operation, the estimated energy savings is 12% or more of the current usage or a reduction of 2,065,291 kwh's which equates to a reduction of $167,288 at the current pricing of .081.

This would also reduce our overall projected kwh's to 15,152,386 for the year based on 2011 usage. The new kwh's of 15,152,386 at a cost of .081 current rate equals 1,227,343 or a difference of $227,286 at an MCPE rate of .066. Using these numbers the County's overall savings would be a reduction of $167,288 in kwh usage in addition to $227,286 price difference with MCPE for a total savings of $394,574 per year or/ROI of 13 months.

At this time the Central Plant is not equipped to proceed with a MCPE contract due to the valve design and sequencing. The Central Plant must be able to operate on thermal storage for a minimum of four (4) hours within the window of 3:00 p.m. to 7:00 p.m. for the lower pricing. We reap the benefits of a lower rate due to reducing the kw load during these peak hours each day. We also have to have better control and data from the satellite buildings to reduce energy consumption, so the Central Plant will know how to function. This affects the GPM and length of time the thermal storage tank can be used.

MD ENGINEERING LLP

Central Plant Energy Optimization

for the

Collin County Judicial Complex

Prepared for

Mr. Dan James
Collin County Facilities Maintenance Department

Central Plant
4600 Community Ave.
McKinney, TX 75071

March 1, 2012

Submitted by:
MD Engineering, LLP

MD Engineering was hired to provide a report and sketches to identify the options that would allow for optimal performance of the existing central plant equipment for energy conservation. The current sequence of operations, piping schematics, and installed piping and valves were all evaluated for ways to save energy and allow the county to maintain certain energy related contracts which reduce overall operating costs. It is the intent of this report to allow the central plant to operate either off the chillers or thermal storage system with minimum pump losses at anytime of the year. We also looked outside the plant to identify energy reduction measures that could be implemented. MD Engineering discussed plant operations with the staff and controls integrator and received pricing assistance from a local contractor.

The following items are areas that we believe should be addressed to meet the goal to increase the energy optimization of the central plant:

- Utilize the existing and future Thermal Storage Tank (TST) for decoupling the constant volume pumping system for the central plant from the variable volume pumping system for the buildings.
- Increase the thermal storage water temperature (when combined with the above mentioned modification) from 39°F to 42°F.
- Utilize the existing heat exchangers and their associated pumps to provide a water side economizer (free cooling during winter months) without having to utilize the Thermal Storage Tanks or Existing chillers.
- Simplify hardware and software to the Thermal Storage System for optimized utilization. This modification will reduce pumping brake horsepower and therefore reduce energy. This will reduce objectionable pressure and flow variances that are a result of the multiple valve changeovers to switch from chiller to thermal storage or back. By simplifying the control sequences and piping a future tank can be added without interruption to the existing plant and allow one Thermal Storage Tank (TST) to discharge at a time extending the time on thermal storage and not requiring a chiller to run during peak electrical demand periods.
- Modify the Energy Management System (EMS) sequence by adding a motorized valve to control the return water temperature increasing the efficiency of the chillers. With the return water temperature increased the chillers will achieve better part load efficiencies at a more stable lower load operating condition.
- Modify the Energy Management System (EMS) sequence of operations to closely match the cooling load of the campus and charge the Thermal Storage Tanks (TST) when the chillers are providing a portion of chilled water for the campus.
- Revise the controls throughout the campus onto a single platform which will increase the Central Plant's automation level and operational versatility.
- Add pumps at outlying buildings to reduce pumping pressure and capacity at the plant to allow the Central Plant to operate at the capacity required by the cooling requirements of the buildings served by the central plant.

The above recommendations allow the operational efficiency of the plant to be increased by reducing chiller load to actual load and reducing charge time for the Thermal Storage Tank System. Several of the options reduce the brake horsepower required for pumping, eliminating energy usage while helping maintain tighter control over pressure and flow out of the central plant.

The above recommendations should be implemented in four phases with the first two phases modifying the central plant piping and controls to allow for optimization of the equipment and control strategies utilized to operate the central plant. The second two phases would allow for fine tuning of the central plant by improving the chilled water delivery and controls to the satellite buildings fed by the central plant through mechanical and control implementation. The scope for the phases is outlined below and followed by a budget price for each phase.

Phase 1 – Mechanical Improvement to the Central Plant.
This phase would implement the work scope indicated on MD Engineering's M2.1 (see appendix). This plan allows for the plant to be optimized by modifying piping and control devices to allow the existing heat exchanger to be used for "free" cooling in winter months, adding a control valve to optimize the return water temperature for optimum chiller operation, and utilize the thermal storage tanks to assist in decoupling the piping system between the central plant and the satellite buildings.

Phase 2 – Automate Control Room for improved Central Plant Control
This phase would implement the work scope indicated on MD Engineering's M2.2. This phase is predominately implementing control programming and updating controllers to communicate with the central plant. This phase would take the control devices installed in Phase 1 and provide the programming and integration to allow for the central plant equipment to be controlled efficiently and effectively. This scope would address the thermal storage water temperatures, control return water temperature allowing the chiller(s) to operate in their most efficient manner, and recommission existing and outdated controls in the central plant.

Phase 3 – Mechanical Improvements at Satellite Buildings for Central Plant Tuning.
This phase would provide for mechanical modifications in the pump rooms of the satellite buildings (Courthouse, Administration, Sheriff's Office/Jail, Juvenile, etc.) to allow for improved control of the chilled water being delivered to the buildings. This work would require bypass at most buildings to allow the central plant to provide only the amount of cooling required for each building, preventing over cooling and excessive running of the chillers or depletion of the thermal storage tank. Pumps would be added at the Sheriff's office to allow for tighter control in the plant of pressure and flow.

Phase 4 – Control Communication between Satellite Buildings and Central Plant.
This phase would incorporate the control programming and strategies to implement the mechanical improvements from Phase 3 which will control the secondary loop chilled water decouple components for the various campus buildings. This will allow the buildings to operate at with exact chilled water load requiring less work and energy consumption by the central plant

Summary of Phases and Associated Costs

The phases would need to be completed in this order to provide the greatest payback and control for the operation of the central plant. The estimated cost for each phase is indicated in the table below.

Phase	Phase Description	Cost ($)
Phase 1	Central Plant Mechanical Improvements	73,027
Phase 2	Automate Control Room for Improved Central Plant Control	99,139
Phase 3	Mechanical Improvements at Satellite Buildings for Central Plant Tuning	165,250
Phase 4	Control Communication between Satellite Buildings and Central Plant	45,947
	2% Add for TCPN	7,668
	Engineering Documentation and Construction Administration	5,900
	Total Project Cost	**$ 396,931**

Please let us know if there are additional questions regarding this summary report or we can be of further service.

Respectfully,
MD Engineering

Michael Smith, P.E.

3/1/2012