

Capitol Campus Design Advisory Committee

September 15, 2016

Campus Combined Heat and Power Plant

Purpose: Update, Discuss and Feedback

The purpose of this agenda item is to update the Capitol Campus Design Advisory Committee (CCDAC) on the Campus Combined Heat and Power Plant proposal. Ron Major, Resource Conservation Manager, will present the agenda item.

Summary:

The Capitol Campus steam heating system installed in the 1920s is past the end of its useful operating life.

1. The technology is obsolete. The steam distribution pipes are corroded and routinely leaking. Many high pressure vessels were installed prior to modern testing and rating systems. They do not meet current standards or codes.
2. The steam system wastes two thirds of the energy it consumes. The State spends approximately \$640,000 per year for natural gas but the system only delivers about \$215,000 worth of benefit.
3. The campus cooling system is split between east and west, resulting in reduced efficiency and increased operating costs. The east campus system alone will require over \$10 million in estimated capital renewal expenditures within the next 10 years.
4. Both the heating system and west campus cooling system reside in the historic power house at the base of the bluff on the shore of Capital Lake. Both systems are thus susceptible to risk of earthquakes, landslides and flooding.

The Capitol Campus Combined Heat and Power Plant project proposes to construct a new central plant facility on east campus to replace the current steam system. The project will:

- Include a 2.6 MW combined heat and power plant (CHP), hot water distribution piping and a central chilled water plant with associated distribution piping to serve all of the Capitol Campus buildings (2.2 million sq. ft.).
- Provide an estimated \$129 million in avoided costs over 50 years
- Avoid an estimated \$18.5 million in projected capital renewal costs
- Provide capacity for future campus expansion, as identified in the Capitol Campus Master Plan
- Support the continuity of state government operations
- Allow DES's to meet the agency's carbon reduction goal of 36.5% by 2035 from 2005 levels
 - [RCW 70.235.050](#) and [RCW 70.235.060](#)
- Provide a pathway to a net zero Capitol Campus

Investment Grade Audit:

University Mechanical Contractors, Inc. (UMC) was hired to complete an Investment Grade Audit (IGA) for the District Energy Project. The IGA included engineering analysis of converting the existing end-of-life steam system to a hot water distribution system with an integrated combined heat and power (CHP) plant. Such a system would meet the campus heating needs and efficiently convert waste heat into electricity.

The DES Energy Program and UMC worked together to complete the scoped primary analysis. The team then enhanced the analysis by also evaluating chilled water system improvements for both the east and west campuses. The study included a risk valuation to continuity of government operations should a natural disaster strike.

UMC evaluated various scenarios using the OFM 50 year life cycle cost analysis tool, including:

- A. Business as Usual (BAU) – continued operation of steam boilers located at the existing Central Plant with repairs provided to the existing steam distribution system.
- B. Hot Water System Located at the *Existing Power House* – hot water generated by a combined heat and power system, new hot water distribution piping and campus building modifications to connect to the new system.
- C. Hot Water System Located at a *New Central Plant* – hot water generated by a combined heat and power system at an east campus site, new hot water distribution piping and building modifications to connect to the new system.

Recommendation:

The DES/UMC development team recommends option C above, the hot water system located at a new central plant with inclusion of a chilled water (CHW) system. This recommendation combines asset preservation, energy efficiency, carbon reduction, disaster preparedness and life safety improvements in one single, cost effective package

The proposed project will:

- Convert the existing steam system to hot water
- Install new hot water distribution piping to serve all campus buildings
- Include a 2.6 MW combined heat and power plant
- Provide a new central chilled water plant plus distribution piping for all campus buildings
- Provide capacity for future campus expansion, as identified in the Capitol Campus Master Plan
- Provide an estimated \$129 million in avoided operating costs over 50 years when compared to BAU
- Avoid an estimated \$18.5 million in capital renewal costs
- Support the continuity of state government operations
- Yield a carbon reduction of 54% compared to business as usual operation
- Be completed as a turn-key energy performance contract through the DES Energy Program
- Have a total project budget of \$125 million

Table #1: Business As Usual compared to a New Capitol Campus Combined Heat and Power (CHP) Plan

	Business As Usual (BAU)	Recommended Project
Project Description	Steam heat + existing chilled water configuration. Central system on west campus and a distributed system on east campus	CHP+ CHW <ul style="list-style-type: none"> • Co-located in new building • future expansion for heating and cooling
Capital Project Cost	\$15,892,000	\$125,000,000
Average Annual Avoided Energy Costs		\$1,258,000
Average Annual Avoided Operating Costs		\$1,324,000
Total Average annual Avoided Cost		\$2,582,000
50 Year Total Cost of Ownership	\$281,358,000	\$264,651,000
50 Year Avoided Energy Cost		\$62,903,000
50 Year Avoided Operating Cost		\$66,198,000
Total: 50 Year Avoided Cost		\$129,101,000
50 Year Carbon Emissions	423,083	192,814
Carbon Reduction from BAU		54%

Conclusion:

Investing in a new central plant located on east campus with CHP and chilled water that will reduce operating costs – energy, water, labor and equipment renewal – by an estimated \$129 million dollars over the next 50 years, provide an average annual avoided cost of \$2.5 million and cut carbon emissions by 54%. The recommended project clearly meets the goals of DES, the Governor and those set forth by the legislature in statute.

The Campus Combined Heat and Power Project:

- Combines asset preservation, energy efficiency, carbon reduction, disaster preparedness, and life safety improvements in one single cost effective package.
- Guarantees energy savings, equipment performance and the project cost through Energy Savings Performance Contracting.
- Provides both short and long term financial benefits.
- Allows limited capital dollars to be leveraged by COPs, and utility incentives with the opportunity for federal grants.
- Reuses vacated space in the basement of OB2 where the state data center used to reside.
- Replaces end of life HVAC equipment in six campus buildings and nine east campus chillers.

- Provides for efficient operations with a new plant designed for optimal space utilization and efficiency of systems.
- Provide a pathway to a net zero Capitol Campus
- Mitigates environmental risks of operating the existing plant at an environmentally sensitive area.
- Allows limited capital dollars to be leveraged with COPs and utility grants with the opportunity to apply for federal grants.

Next Steps

- Hold a public meeting on Thursday, September 15 at 6:00 p.m., to present to and seek feedback from stakeholders and the community on the Campus Combined Heat and Power Plant project.
- Present CCDAC's recommendations to SCC at the October 6, 2016 meeting for consideration and decision.
- Continue to provide information and support to OFM as this important infrastructure project is considered for inclusion in the Governor's 2017-2019 capital budget request.