SUBJECT: SDSU Utility Tunnel, Steam/Condensate Infrastructure Repair and Modernization – Facility Design Plan

South Dakota State University requests approval of its Facility Design Plan for design and construction of the Utility Tunnel, Steam/Condensate Infrastructure Repair and Modernization project at an estimated cost of $13,320,000. This project was approved by the 2012 Legislature as part of HB1051. SDSU’s Preliminary Facility Statement for this project was approved in March 2012 and the project’s Facility Program Plan was approved in December 2013. The Building Committee approved the design plan on February 19, 2014.

The first phase of this project will consist of the construction of a new chiller plant north of the current Animal Science Complex. The gross square footage of this new plant is approximately 8,736 square feet. The plant will house three chillers, cooling towers, pumps and auxiliaries for a capacity of approximately 2,250 tons of cooling. The chilled water capacity in the plant will replace existing decentralized chillers at each building that are at the end of their useful life.

Along with construction of the new chiller plant, the following project segments are included in the estimated cost:

- Construction of a new walk-through utility tunnel in the northwest part of campus. This tunnel will connect to the existing tunnel near the Ethel Austin Martin building, head north to the Animal Resource Wing and branch tunnels to Northern Plains Biostress, the Animal Science Complex and the Animal Disease Research and Diagnostic Lab.
- The new chilled water plant will have a capacity of 2,250 tons. This will support the cooling loads of the Animal Science Complex, Animal Disease Research and Diagnostic Laboratory, Animal Resource Wing, The Northern Plains Biostress and will provide capacity for future buildings such as the football stadium.

(Continued)
- Install chilled water mains to extend from Animal Science Complex to the northeast corner of Northern Plains Biostress. These lines will be sized for future loads as well.
- Connect chilled water lines to Northern Plains Biostress to replace the decentralized chillers currently serving the building. The two existing roof-mounted chillers are undersized for the current load and are at the end of their useful life.
- Extend chilled water piping from the northeast corner of Northern Plains Biostress to the east for future connection to the football stadium and other buildings in that area of the campus.

Additional infrastructure repair and upgrades will be needed for the following items, however, these items will require additional funding beyond the current Facility Program Plan request: 1) extend chilled water mains from Animal Science Complex to the south; 2) in the Central Heating Plant - demolish the baghouses and ash handling systems associated with boilers #5 & #6; demolish coal silos, coal elevators and all coal and ash conveying systems; add a new deaerator tank; replace water treatment equipment; 3) connect chilled water to Facilities and Services from the main line headed to the football stadium; 4) connect chilled water to the Human Performance Facility from the main line headed to the football stadium; 5) and, connect chilled water to Dykhouse Student Athlete Center from the main line headed to the football stadium.

Additional details of this project can be found in SDSU’s attached Facility Design Plan document and drawings.

Funding for this phase of the project will be $7,000,000 in 2013 HEFF bond proceeds and $6,100,000 in HEFF M&R funding with an allocation of $2,000,000 in FY15, with $2,500,000 in FY16, and $1,600,000 in FY17. The remaining $220,000 will come from future general fund M&R allocations. SDSU expects the remaining scope of work not included in this project will be funded from FY17 and later HEFF M&R allocations.
South Dakota State University (SDSU) requests approval of this Facility Design Plan for full design and construction of the Utility Tunnel Steam/Condensate Infrastructure Repairs and Modernization project. The Facility Design Plan was approved by the Building Committee on February 19, 2014.

A. Architectural, Mechanical & Electrical Schematic Design

This project will include design of the entire project but bid packages will be prepared to phase construction to fit project funding availability. The scope of the project remains consistent with the scope described in the Facility Program Plan (site analysis, key building features).

The first phase of this project will consist of the construction of a new chiller plant north of the current Animal Science Complex and connection of the plant to existing loads in Animal Science Complex, Animal Disease Research and Diagnostic Lab, and the Animal Resource Wing through underground piping. The proposed program would construct a chiller plant of approximately 8736 gross square feet. The plant will house three chillers, cooling towers, pumps and auxiliaries for a capacity of approximately 2,250 tons of cooling. The chilled water capacity in the plant will replace existing decentralized chillers at each building that are at the end of their useful life and lacking capacity for adequate cooling on peak days. A central plant approach takes advantage of diversity in the loads and provides redundancy at a single point rather than having to provide it at multiple buildings. Two illustrations are attached illustrating the site and floor plan of the new facility.

Other major components of the project’s scope will be separated out as individual construction packages to match funding availability and project timelines of other projects on the campus. They are listed below. Of these components, items 1-5 are anticipated to be funded by the $13.32 million dollars currently allocated. Items 6-10 are likely going to require funding beyond the $13.32 million allocated for the project:

1. Construct a new walk-through utility tunnel in the northwest part of campus. The tunnel would connect to the existing tunnel near Ethel Austin Martin building, head north to Animal Resource Wing with branch tunnels to Northern Plains Biostress, Animal Science Complex and Animal Disease Research and Diagnostic Lab. The tunnel will house two parallel high pressure steam lines and two parallel condensate return mains. Branch tunnels would include single steam and condensate return lines to each building. The new tunnel and parallel steam lines will replace a single 20 year old direct buried steam and condensate system that has reached the end of its useful life and had recently began to fail. Parallel lines will provide much needed redundancy to the critical lab buildings in the north part of campus. New steam and condensate piping within the
tunnel system will have significantly longer service life than direct buried piping and will allow for piping replacement without major excavation in the future.

2. The new chilled water plant will have a capacity of 2,250 tons. This will support the cooling loads of the Animal Science Complex, Animal Disease Research and Diagnostic Laboratory, Animal Resource Wing, the Northern Plains Biostress and will provide capacity for future buildings such as the football stadium.

3. Extension of the chilled water mains installed in the initial phase from Animal Science Complex to the northeast corner of Northern Plains Biostress. Main lines will be sized for future loads.

4. Connection of the chilled water lines to Northern Plains Biostress to replace the decentralized chillers serving the building. The two existing chillers on the roof are undersized for the current load and at the end of their useful life.

5. Extension of the chilled water piping from the northeast corner of Biostress to the east for future connection to the football stadium and other buildings in that area of campus.

6. Extend chilled water mains from Animal Science Complex to the south, following the excavation for the steam tunnel and cap the lines at the south side of the tunnel near the Ethel Austin Martin building to allow for future interconnection of the two chilled water plants.

7. In the existing Central Heating Plant:
   a. Demolish the baghouses and ash handling systems associated with Boiler #5 & #6.
   b. Demolish coal silos, coal elevators and all coal and ash conveying systems within the Central Heating Plant.
   c. Add a new deaerator tank in the Central Heating Plant in the space vacated by the baghouses.
   d. Replace water treatment equipment within the plant.

8. Connect chilled water to Facilities and Services from the main line headed to the Stadium.

9. Connect chilled water to the Human Performance Facility from the main line headed to the Stadium.

10. Connect chilled water to Dykhouse Student Athlete Center from the main line headed to the Stadium.

B. Changes from Facility Program Plan
There are no changes from the Facility Program Plan.

C. Impact to Existing Building or Campus-Wide Heating/Cooling/Electrical Systems
As described in the Facility Program Plan we anticipate the net results of the project scope to be almost near zero in overall utility resource consumption and costs. No changes are anticipated from those described within the Facility Program Plan.

The new chiller plant will replace the building chillers in the Animal Science Complex, Animal Disease and Diagnostic Laboratory, Northern Plains Biostress, and the Animal Resource Wing. The plant will operate much more efficiently than the existing decentralized building chillers will for the same load. We do anticipate the aggregate campus electrical load to increase slightly when the need for cooling is at its highest. However, the higher efficiencies within the plant are anticipated to offset the increase in the load and result in overall energy costs very similar to existing energy costs.
Other operational costs within the chiller plant are anticipated to be similar to the existing systems they are replacing.

The tunnel with parallel steam distribution and condensate return piping will replace existing direct buried steam and condensate distribution piping. The existing piping has fairly significant heat losses due to insulation systems that don’t equal today’s standards. They have also been compromised due to deterioration and damage from leaks in the system. New piping within utility tunnels will have much improved insulation systems and will result in a net reduction of heat loss from the steam and condensate distribution system.

Piping contained within the utility tunnels will allow for quicker leak detection, preventative maintenance, and less expensive repairs of any future leaks. Tunnels will ensure piping has a much longer service life. Reduced energy losses in the steam distribution system are anticipated to result in no net increases to the operating cost of the central heating plant and steam distribution system.

The operational expenses within the existing Central Heating Plant are not anticipated to change as a result of the work within the Heating Plant. We should see a decrease in load and energy consumption within the plant because of the reduction in heat loss through the distribution system compared to the direct buried system being replaced.

D. Total Estimated Construction Costs:

The estimated project costs for scope items 1 through 5 remain unchanged from the Facility Program Plan. The Facility Program Plan approved at the March 2012 BOR meeting was for $13,320,000 project cost with $7,000,000 coming from HEFF bonds and the remainder from HEFF M&R Funding.

The division of project costs is shown in the following table.

<table>
<thead>
<tr>
<th>PROJECT COST ESTIMATE</th>
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<tbody>
<tr>
<td>Preliminary Construction Estimate</td>
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<tr>
<td>Site Development *</td>
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</tr>
<tr>
<td>Total Construction Costs</td>
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<tr>
<td>Contingency (10%)</td>
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<tr>
<td>A/E Fees **</td>
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<td>Commissioning Fees</td>
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<td>OSE Fees</td>
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<td>Testing and Survey</td>
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<td>** TOTAL PROJECT COST ESTIMATE **</td>
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* Site Development Costs are included in the Preliminary Construction Estimate
** Includes the $82,000 in A/E fees spent doing the preliminary planning
Funding for design and construction of the initial phases of the project is projected as follows:

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>HEFF M&amp;R</th>
<th>Bonded HEFF</th>
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<td></td>
<td>$6,100,000</td>
<td>$7,000,000</td>
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<td>$13,320,000</td>
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</table>

Additional funding and construction phases are expected to cover the entire needed scope of work in excess of the $13,320,000 currently budgeted. Those additional funds will be from FY2017 and later HEFF M&R.

**E. Changes from Cost Estimates for Operation or M&R Expenses**

As described in the Facility Program Plan, the ongoing operation, and maintenance and repair expenses will be a net zero change from existing. As noted, the central chillers will have a longer useful life. The distribution system piping will have a longer life (25+ years). This new plant will replace the decentralized building chillers that have reached the end of their useful life and eliminate the backlog of maintenance and repairs associated with those chillers.

The tunnel enclosed steam distribution piping will have a significantly longer life than the direct buried piping it replaces. It will be insulated to be more thermally efficient. Repairs will be more cost effective and no longer require extensive excavation and temporary piping to maintain service. The new distribution piping will decrease the backlog of maintenance and repairs associated with the existing piping and eliminate the expensive emergency temporary repairs made to the existing system within the last 3 years.