



Construct Chiller Plant, Phase I

project 1 of 1

Virginia Polytechnic Institute and State University (208)

General Information

Project Type: Project Code: Start Year:

Agy Priority: Location: Facility:

Building #: Building Name:

Building Function:

Is this an Umbrella Project? OR a higher education blanket project?

Projected time to submit working drawings: months

Projected time to occupy facility or complete project: months

Projected time to award construction contract: months

Included in the existing Six Year Capital Plan

Contact Information

Name:

Email:

Phone:

Agency Narrative

Description

The Chiller Plant, Phase I project was a University top priority request in the 2008 budget session, and the state placed it in the tier two funding section of Chapter 1, 2008 with \$480,000 of detail planning funds. The planning funds have been allotted under project code 17657 and schematic design is underway. Under the planning work, the University has determined with a high degree of confidence that a project meeting the original scope that justified the planning funds may be accomplished for the proposed total budget of \$20.1 million, including the \$480,000 of detail planning funds authorized in Chapter 1.

This project has been on the University's capital plan since 2005 and is included as a high priority University initiative to shift to a high efficiency central plant cooling strategy for the entire campus. The envisioned project is phase one of a long-range three part strategy. This phase proposes to construct a central chiller plant building on the southwest area of campus with a potential installed capacity of approximately 15,000-tons, initially install approximately 2,000 tons of capacity to satisfy immediate needs, and install distribution piping in support of this plant and other areas of the campus. The distribution piping of this project also initiates the infrastructure to eventually integrate and mass the decentralized facilities on campus.

The project is on schedule for an August 2010 construction start date, and the University is requesting authorization and funding in the 2010 budget session to move the project to the construction phase to continue an efficient project implementation.

Justification

Program description:

As the campus moves toward developing the southwest area of campus and updating existing facilities with cooling service, a centralized chiller program will require substantially less incremental future resources to operate than stand-alone a chiller program. The total savings of installing centralized regional chiller plants compared to stand-alone chillers benefit the University in several ways including the following: reduced primary pieces of equipment, more efficient machine selection and operating ranges, economies of scale with procurement and construction, reduced mechanical room space per facility, lower building power requirements, and possibly a reduced structural component. A detailed study was performed in 2005 which demonstrates these efficiencies with an estimated cost avoidance of about \$20 million over the next 20 years for the campus using 2005 dollars.

Recently authorized construction projects in the southwest area of campus, known as the life sciences corridor, precipitate the immediate need for a southwest campus regional chiller plant that does not exist today. This is the area of campus where the next wave of science instruction and research buildings on the University's Six-Year Capital Plan may be located. Additionally, with the existing stand-alone chillers on campus reaching the end of their useful lives and the significant increase of cooling demand by other new construction projects outside the southwest region on campus, shifting to a regional central plant concept is an important priority for the University. Establishing a central plant in the southwest region of campus and the installation of distribution networks on campus is the first priority in the long range vision of a complete, centralized campus cooling system. The overall, long range vision includes establishing four new centralized regional energy plants in coordinated regions of campus and then linking the four plants together with the currently installed regional plant.

In summary, the University proposes to shift the entire campus to central cooling plant strategy with the southwest area of campus being the first of three phases to implement the initiative. The approach includes the construction of a new centralized chilled water plant and distribution systems that will provide a centralization of cooling operations by developing a new underground chilled water distribution system to link all existing and future campus buildings in the southwest area. The central plant strategy has several benefits as compared to stand-alone cooling systems:

- (1) Reduced operating/maintenance costs.
- (2) Lower installed capacity due to diversity of multiple building loads.
- (3) Improved redundancy and reliability.
- (4) Lower life cycle costs.
- (5) Consolidation of cooling tower noise and water vapor emissions.
- (6) Reduced building square footage required by mechanical and electrical equipment

The mission statement of Virginia Tech as a public land-grant University serving the Commonwealth of Virginia, the nation, and the world community includes discovery and dissemination of new knowledge central to its mission. Through its focus on teaching and learning, research and discovery, and outreach and engagement, the University creates, conveys, and applies knowledge to expand personal growth and opportunity, advance social and community development, foster economic competitiveness, and improve the quality of life.

The University's strategic plan includes three scholarship domains: Learning, Discovery, and Engagement; and three Foundational Strategies: Development of the Organization, Investment in the Campus Infrastructure, and Effective Resource Development, Allocation, and Management. This project supports the key foundational strategies of Investment in the Campus Infrastructure and Effective Resource Development, Allocation, and Management as listed below. These foundational strategies provide the structural underpinnings required for a successful academic program.

Foundational Strategies: (1) Effectively manage the University's space and land resources for learning, living, and work; and (2) Enhance health, safety, and security operations to support the University's discovery, learning, and engagement endeavors.

Existing facilities:

The University has a central chiller plant and infrastructure system on the northeast corner of campus. This system includes an approximately 8,500 gross square foot facility that produces approximately 7,000 tons of cooling capacity with 5 chillers. This central plant serves 22 buildings on the northeast section of campus with about 2 million gross square feet. This system is highly efficient with a cooling output of 300 square feet per ton.

The northeast plant does not have capacity or infrastructure to serve the buildings located on the southwest area of campus. The current strategy to cool the southwest buildings is to use stand-alone chillers (two per building) with associated cooling towers. The use of stand-alone or building-specific chillers is proving to be significantly more costly than the strategy of a central plant. The existing stand-alone chillers require significantly more maintenance, have shorter life-cycles, and higher energy consumption for output as compared to chillers in a central system.

The southwest area currently has 20 buildings using the stand-alone chiller systems. Several of the stand-alone chillers are reaching the end of their useful lives and will need to be replaced over the next six years. The proposed project will shift these buildings to a central plant and away from the stand-alone systems.

Funding Plan:

This project is a central infrastructure improvement; thus, the funding plan calls for General Fund support for the E&G buildings and nongeneral fund support for the auxiliary enterprises. The proposed split is 60 percent General Fund and 40 percent nongeneral fund based on the overall campus allocation of space.

Options Considered

The options considered include continuing the practice of building specific stand-alone chillers or deferring the project. The practice of stand-alone chillers is not the selected option because it is proving far more costly than a central system strategy, especially in the long-term. Deferring the project to a later biennium is not selected because of the significant sunk investment of stand-alone chillers that would be required for upcoming projects until the central plant is established. To get the most benefit from the central plant and to avoid unnecessary costs of stand-alone chillers in new buildings, the central chiller plant needs to be established first.

Costing Methodology

The costs are based on internal estimates developed by University staff based on historical comparables on-campus projects and a feasibility study performed by AEI Consultants. Virginia Tech has secured the services of Burns and Roe to develop a pre-planning analysis for the expansion and improvements to the existing campus chilled water infrastructure. The University is currently in the process of developing an RFP to solicit the services of a Criteria Consultant to assist with defining performance specifications for a Design-Build project delivery. The consultant is currently developing a cost estimate for the project scope, which is expected to be completed in late June 2009. The total project budget remains at \$20.1 million. Project costs are estimated to the mid-point of construction using three percent escalation in accordance with the instructions for developing the Six-Year Capital Outlay Plan.

Project Costs

1. Aquisition of Property:	\$0
2. Acquisition of Plant	\$0
3. Building and Built-in Equipment	\$11,118,000
4. Sitework and Utilities	\$5,202,000
5. Architectural and Engineering Fee	\$1,921,000
6. Loose Furnishings and Equipment	\$0
7. Contigencies	\$653,000
8. Project Inspection	\$467,000
9. Other Costs	\$739,000
Total Cost	\$20,100,000

The following items (10, 11, 12) are included in above costs

10. Estimated Total Planning Costs:	\$1,814,000
11. Estimated New Construction Costs:	\$16,604,000
12. Estimated Improvements Costs:	\$0

Itemized "9. Other Costs"

1. Project Management In Capital Project Budget:	\$164,000
2. Special Consultants (if not included in A & E fees):	
A. Scheduling Consultant	\$0
B. HVAC Commissioning	\$29,000
C. Furniture Design	\$0

3. Asbestos and lead based paint survey and design:

5. Independent Cost Estimates:

6. Value engineering

7. Subsoil investigations:

8. Construction testing services:

9. Printing

10. Advertisements

11. Work by owner

12. Signage

13. Miscellaneous utility charges

4. Asbestos abatement:

\$0
\$14,000
\$0
\$41,000
\$84,000
\$4,000
\$3,000
\$278,000
\$6,000

14. Moving expenses

15. Miscellaneous other costs (itemize):

A. Review Process

B. Other

C. _____

D. _____

Operating and Maintenance Costs

	1st Year	2nd Year
1. Personal Services	\$44,855	\$53,826
2. Nonpersonal Services	\$95,400	\$114,480
3. Equipment	\$15,000	\$3,000
Total O and M	\$155,255	\$171,306
4. FTE Employees:	1.00	1.00
5. One Time Costs:	\$12,000	\$0
6. Cost Savings	\$0	\$0
7. FTE Savings	\$0	\$0

8. Planned start date of new O and M costs (if different than the beginning of the fiscal year)

Funding Requests

F Year	GF	NGF	Tax Debt	9c Debt	9d Debt	Total Request
2011	\$11,580,000	\$8,040,000	\$0	\$0	\$0	\$19,620,000

Funding Phase: Construction

Prior Funding

Biennium	Appropriation Act	Act Item	Funding Source	Project Code	Amount
2008-10	Chapter 1	Enactment 3 - Sec. 1	General Fund	17657	\$480,000

Project Scope

1. Acquisition - Property Sq. Ft. / Acres Cost per Sq. Ft. or Acre

2. Acquisition - Plant	<input type="text" value="0"/>	Sq. Ft.	Cost per Sq. Ft.	<input type="text" value="n/a"/>
3. New Construction	<input type="text" value="18,000"/>	Sq. Ft.	Cost per Sq. Ft.	<input type="text" value="\$922"/>
4. Improvements	<input type="text" value="0"/>	Sq. Ft.	Cost per Sq. Ft.	<input type="text" value="n/a"/>
5. Capacity	<input type="text" value="0"/>	Beds/Units	Cost per bed/unit	<input type="text" value="n/a"/>

Capital Lease

Name of Lessor:

Space Requirements:

Need for Leased Space:

Time Period

Proposed Effective Date of Lease: Proposed Duration: months

Include Periodic Renewal: Renewal at option of: Renewal Extension Period: months

Lease payments that would be made during the six year capital planning period

Fund	Year1	Year2	Year3	Year4	Year5	Year6
<i>subtotals</i>	\$0	\$0	\$0	\$0	\$0	\$0

Total lease payments for six year period:

Total payments for the duration/terms of the lease:

Energy Component

Energy Component Description

Annual Energy Operating Costs by Energy Type and Fund Source

Energy Type	Fund Source	Cost
	Total	\$0

Cost Estimate for Energy Component

Subcomponent	Cost
Materials Cost	\$0
Labor Cost	\$0
Engineering & Design Cost	\$0
Total	\$0

Annual Cost Savings for Energy Component

Fund	Savings
	\$0
Total	\$0

PID: 5546