Overview	
Biennium	2012-2014
Budget Round	Introduced Bill
Request Origin	Previously Submitted
Agency	208: Virginia Polytechnic Institute and State University
Project Title	Construct Chiller Plant, Phase II
Project Type	New Construction
Facility/Campus	Blacksburg Main Campus
Project Location	Roanoke Area
Building Name	Chiller Plant
Building Name	
Building Function	Higher Education - Campus Infrastructure 60% E&G and 40% Auxiliary Enterprise
Contains significant energy costs?	No
Contains significant technology costs?	No
Infrastructure Element	Site Heating/Cooling Distribution

Supporting Documents				
File Name	File Size (Kb)	Uploaded By	Uploaded Date	Comment

Narrative	
Description	Project Description: This project has been on the university's plan since 2005 and is included as a top priority in the first biennium to continue the strategic infrastructure advancements initiated by the Chiller Plant, Phase I project (Chapter 1/874). This Phase II project request covers three key strategic needs for shifting the campus to lower resource consuming cooling service: (1) replace outdated, inefficient existing non-centralized chilled water capacity on campus; (2) update machines in the existing central plant to maximize the existing centralized plant footprint and refrigerant use; and (3) and install the necessary thermal distribution networks to accommodate campus growth and retirement of the non-centralized facilities in the north and east portions of campus. This project is a critical component of a strategy developed by the university and detailed in its Chilled Water Master Plan to make a strategic shift toward utility and energy management practices that optimize long-term cost control and resource management. Under the Chilled Water Master Plan, the university follows a core principle that a centralized chilled water approach at Virginia Tech provides the best long term solution by replacing existing, outdated, costly stand-alone equipment with centralized equipment and operations. The timing of this request is important because many of the existing building-specific chillers have reached the end of their useful life and no longer respond to normal maintenance and repairs; thus, if the centralized strategy is not implemented now, the university would need to replace the building-specific chillers in-kind. This would extend an inefficient, high overhead practice for another 20 years; thus, the timing of the Chiller Plant Phase-I and Phase-II projects is optimal for the university, Commonwealth, and the students. Implementing the centralized plant strategy with the Chiller Plant Phase-I project, which is underway, and this Phase II project will end the current practice which brings high one-time and ongoing overhead costs of installing, operating, and maintaining stand-alone chillers and cooling towers within the scope of new building construction budgets. The scope of this Phase II project follows up on the Chiller Phase I project by replacing outdate chiller equipment the northeast plant

and installing distribution infrastructure to link chiller substations. The envisioned improvements include a combination of installing state-of-the-art, optimally sized equipment in the existing central chilled water facility footprint and the construction of a new central facility of an approximately 16,000 gross square feet to house to house 15,000 tons of cooling capacity for the campus chilled water system. Without this project, the This approach will allow for an on-going phasing out of existing outdated, inefficient individual building chillers that do not meet LEED standards due to refrigerant types along with the benefits listed below:

(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 savings of a central plant compared to stand-alone chillers are significant. As an illustration, 10 campus buildings using the stand-alone strategy will require two 450-ton chillers each, for a total of 20 chillers and 9,000 tons of operational cooling systems. Chillers operate most efficiently near their peak capacity and stand-alone chillers are generally operating at only about 75 percent of their capacity. Under a central plant strategy, these same 10 buildings would require only 6,750 tons of chilling capacity. To quantify anticipated energy reduction and improved efficiencies, the chillers of the central plant on the northeast side of campus are 94 percent more efficient than the individual building chiller systems on the southeast side of campus.

Justification

Program Description
As the campus moves toward developing the northeast 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.

Recently authorized construction projects in the northeast area of campus, known as the academic precinct, precipitate the immediate need for a northeast campus regional chiller plant that does not exist today. This is the area of campus where the next wave of 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 shifting to a regional central plant concept is an important priority for the university. Establishing a central plant in the northeast region of campus and the installation of distribution networks on campus is the next step 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.

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 area currently has several 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. The new distribution system will link the central chiller equipment allowing this transition. 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 funding split is 60 percent General Fund and 40 percent nongeneral fund based on the overall campus allocation of space.
Alternatives considered	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.

Funding Request

Phase	Year	Subobject	Fund	Amount
Pre-Planning	FY 2013	2322 - Construction, Buildings	0100 - GENERAL FUND	$226,000
Detail Planning	FY 2013	2322 - Construction, Buildings	0100 - GENERAL FUND	$1,356,000
Construction	FY 2014	2322 - Construction, Buildings	0100 - GENERAL FUND	$11,403,000
Construction	FY 2014	2322 - Construction, Buildings	0815 - 9(D) DEBT SERVICE - CONSTRUCTION COSTS	$9,040,000
Equipment Purchase	FY 2015	2295 - Undistributed Equipment	0100 - GENERAL FUND	$575,000
				$22,600,000

Methodology

Methodology	The costs are based on internal estimates developed by university staff based on historical comparables of on-campus work including the current Southwest Chiller Plant project that has completed design and Construction Manager at Risk costing and an internal project costing analysis. The project is anticipated to have average site conditions and is planned to use delivery method appropriate for the project size and complexity. 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

Cost Type	Total Project Costs	Requested Funding
Acquisition Cost	$0	$0
Building & Built-in Equipment	$15,600,000	$15,600,000
Sitework & Utility Construction	$1,560,000	$1,560,000
Construction Cost	$17,160,000	$17,160,000

Design & related Services	$2,101,000	$2,101,000
Inspection & Testing Services	$437,000	$437,000
Project Management & Other Costs	$1,641,000	$1,641,000
Furnishings & Movable Equipment	$575,000	$575,000
Construction Contingency	$686,000	$686,000
Total Project Cost	$22,600,000	$22,600,000

Capacity			
Cost Type	Unit of Measure	Units	Cost Per Unit
Acquisition Cost			
Construction Cost	square feet	17,550	
Total Project Cost	square feet	17,550	

Other Costs		
Cost Type	Total Project Costs	RequestedFunding
Design & Related Service Items		
A/E Basic Services	$1,713,000	$1,713,000
A/E Reimbursables	$15,000	$15,000
Specialty Consultants (Food Service, Acoustics, etc.)	$0	$0
CM Design Phase Services	$215,000	$215,000
Subsurface Investigations (Geotech, Soil Borings)	$40,000	$40,000
Land Survey	$0	$0
Archeological Survey	$0	$0
Hazmat Survey & Design	$0	$0
Value Engineering Services	$0	$0
Cost Estimating Services	$14,000	$14,000
Other Design & Related Services	$104,000	$104,000
Design & Related Services	$2,101,000	$2,101,000
Inspection & Testing Service Items		
Project Inspection Services (inhouse or consultant)	$373,000	$373,000
Project Testing Services (conc., steel, roofing, etc.)	$64,000	$64,000
Inspection & Testing Services	$437,000	$437,000
Project Management & Other Cost Items		
Project Management (inhouse or consultant)	$327,000	$327,000
Work By Owner	$26,000	$26,000
BCOM Services	$19,000	$19,000
Advertisements	$3,000	$3,000
Printing & Reproduction	$5,000	$5,000
Moving & Relocation Expenses	$15,000	$15,000
Data & Voice Communications	$132,000	$132,000
Signage	$6,000	$6,000
Demolition	$0	$0
Hazardous Material Abatement	$0	$0
Utility Connection Fees	$0	$0
Utility Relocations	$557,000	$557,000
Commissioning	$156,000	$156,000
Miscellaneous Other Costs	$395,000	$395,000
Project Management & Other Costs	$1,641,000	$1,641,000

O & M Costs						
Cost Type	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018

GF Dollars	$84,240	$84,240	$86,760	$89,400	$92,100	$94,800
NGF Dollars	$56,160	$56,160	$57,840	$59,600	$61,400	$63,200
GF Positions	0.41	0.41	0.41	0.41	0.41	0.41
NGF Positions	0.27	0.27	0.27	0.27	0.27	0.27
GF Transfer	$0	$0	$0	$0	$0	$0
GF Revenue	$0	$0	$0	$0	$0	$0
Layoffs	0	0	0	0	0	0

O & M Costs
Planned start date of new O&M costs (if different than the beginning of the fiscal year)

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