STEAM AND CHILLED WATER SUB-ELEMENT

Inventory and Analysis of Existing Conditions (Steam)

1.a Existing Steam Production Equipment

Steam production equipment consists of large, dual-fuel fired, water tube, high-pressure steam boilers. Steam is generated and distributed at approximately 100 psi in the winter and 70 psi in the summer.

Boiler No. 1 and Boiler No. 3 are each rated for 70,000 lbs/hr. Boiler No. 2 is rated for 80,000 lbs/hr.

Boiler No. 1 and Boiler No. 3 (70,000 lbs/hr) were replaced in 1994 and are in good working order. Boiler No. 2 was replaced in 2011 and is in good operational condition.

Existing Steam Production Support Systems

The plan has a water softening and chemical treatment system. The existing fuel oil tanks were cleaned, inspected and re-certified in 2010.

1.b Existing Steam Distribution Equipment

The east campus distribution system consists of two 8” mains. An 8” normally open cross section connection creates a loop east campus network. The west campus distribution system consists of a 12” main and an 8” main. An 8” normally closed cross connection creates the potential to have a looped west campus network. The northwest main continues as a 10” main after the cross connection. Approximately 5,000 ft. of tunnel contains most of the larger steam main piping. The more recently installed mains and the individual building run-outs are typically direct buried.

1.c Steam Metering and Monitoring

Building steam metering has been upgraded by campus maintenance. Reliable and accurate vortex shedding meters are installed in all buildings.

1.d Steam Production Capacity Evaluation

Based on comparison of steam demand and plant capacity, there appears to be adequate central plant equipment to handle substantial future additional loads with the three boilers operable.

The chart below summarizes peak load totals, estimated steam demand, and current steam plant capacity.

TABLE 10.1.1 Existing Steam System Connected Loads

Year	Diversified Demand (lbs/hr)	Plant Equipment (lbs/hr)	Capacity Shortfall (lbs/hr)	Capacity Surplus (lbs/hr)
2014	121,900	179,000	---	57,100

* AIR PERMIT RESTRICTS TOTAL CAPACITY TO THE 2010 LEVELS

1.e Steam Distribution System Analysis

The steam distribution piping system was analyzed in a previous study by a computer modeling of the system. The utility is divided into east campus and west campus distribution systems. The analysis is likewise divided into east and west campus systems. Both the existing and the future cases were analyzed.

Inspection of flow diagrams in the study indicated that the system was generally adequate for planned expansion.

A significant portion of the steam and condensate piping is installed in steam tunnels. However, the majority of the steam piping is direct buried.

Leaking pipes in the steam tunnels and leaking piping or valves in manholes are easily detected since visible steam will be present. However, leaking buried piping is not readily apparent until the leak becomes fairly severe.

Future Needs/Requirements (Steam)

2.a Steam Distribution System Analysis

The steam distribution piping system was analyzed in a previous study by computer modeling of the system. The utility is divided into east campus and west campus distribution systems. The analysis is likewise divided into east and west campus systems.

2.b Piping System Capacity

Inspection of flow diagrams in the study indicated that the system was generally adequate for existing loads.

2.c Piping System Condition

A significant portion of the steam and condensate piping is installed in steam tunnels. However, the majority of the steam piping is direct buried.

Leaking pipes in the steam tunnels and leaking piping or valves in manholes are easily detected since visible steam will be present. However, leaking buried piping is not readily apparent until the leak becomes fairly severe.

The Utilities and Engineering Services has a 5 year capital plan that projects annual steam pipe replacement needs.

The system is well maintained. Annually, the campus has an annual one week steam outage. Manholes with failed steam traps, piping, or valves are repaired or replaced. All steam traps are inspected annually.

Inventory and Analysis of Existing Conditions (Chilled Water)

1.a General Description

Construction of the University's central chilled water utilities was first completed in 1977. Until that time, primary cooling equipment consisted of individual building chillers.

1.b Existing Chilled Water Production Equipment

Chilled water production equipment consists of large, well water-cooled, electric-driven, multistage centrifugal water chillers. The Central Plan operates four 1200-ton high efficiency chillers in 1999. The R-11 refrigerant was saved for use in other existing chillers as required. A fifth chiller, having a rated capacity of 1250 tons was installed in 1988, bringing the chilled water plant capacity to 6050 tons.

Two additional 1200-ton chillers were added to the Central Plant in 1990. In 2019 CH-6 and CH-7 were replaced with 1200-ton high efficiency chillers, and CH-5 was demolished. The current plant capacity is 7200 tons.

A satellite chilled water plant was constructed in 1994 on the west side of the campus. This plant had initial capacity of 2400 tons using two 1200-ton chillers. Four additional 1200-ton chillers have been added in 1996 for a total present day capacity of 7200 tons.

A third utility plant was constructed as part of the University Center Complex. Four 550-ton chillers were installed in the University Center chilled water plant in 1994 for a total capacity of 2200 tons. These chillers serve Buildings A, B, and C in the University Center and the Coyle Moore Athletic Facility. The University Center Plant was renovated in 2015. The four 550-ton chillers were replaced with three 850-ton high efficiency chillers. The new plant capacity is now 2550 tons.

A new 300-ton chiller replaced the existing chiller in the B. K. Roberts Law Building. In addition, piping is currently being installed so that this chiller can serve the Law Library as well. It is expected that the Law Rotunda will also be connected to this chiller in the future. This chiller is currently not connected to the campus chilled water distribution loop.

A second satellite chilled water plant went on-line in the Spring of 2007. The plant initially had two 1500-ton chillers; two additional 1500-ton chillers were installed in 2008 and 2011 respectively. Two more 1500-ton chillers were again added in 2019, bringing the plant capacity to 9000 tons.

1.c Existing Chilled Water Distribution Equipment

Plant pumping systems consist of a primary chiller pumping loop and a secondary distribution system loop with by-pass to decouple the loops. Original Central Plant distribution system pumps consisted of two pumps operating at approximately 4500 gpm and one operating at 2250 gpm. The total original (1977) distribution system pumping capacity was approximately 11,250 gpm. An additional large distribution pump was added in 1988 bringing plant total distribution capacity to approximately 15,000 gpm. The distribution system was completely renovated in 1991 with the installation of six 200-horsepower pumps with variable speed drives. Each pump is rated at 4000 GPM 140' head.

The conversion of chilled water pumps from constant flow to variable flow in individual buildings is now complete.

In addition, the satellite chilled water plant has six pump capable of a total of 30,000 gpm. The Satellite Chilled Water Plant II now has six 3200-gpm distribution pumps.

1.d Existing Chilled Water Distribution Piping

The majority of the existing chilled water distribution piping (approximately 17,000 linear feet) was installed in the late 1970's. This piping was constructed of transite that is a non-corrosive material with excellent flow characteristics. All of this piping is in excellent condition with many years of remaining service life. Unfortunately transite contains asbestos fibers and is not acceptable for future installations.

As long as this pipe remains covered by the earth it is not considered a health hazard. However, caution must be exercised whenever new taps are made and care must be taken to avoid accidental breakage of this pipe when new utility trenches are constructed.

The remainder of the existing chilled water pipe (approximately 4,000 linear feet) is schedule 40 black steel with foamglass insulation. This pipe is also in excellent condition as it has been in service only a few years. This piping is expected to have a minimum 30-year service life. Recently, the campus standard has been revised to allow pre-insulated pipe that also uses schedule 40 steel carrier pipe.

1.e Chilled Water System Loads

General

Existing building design loads were taken from reliable and accurate flow meters.

TABLE 10.2.1 Existing Chilled Water Loads Peak Loads Demand (total for all plants)

	Peak Loads Demand (total for all plants)	
Year	**tons**	**gpm**
2020	25,950	68,200

The summation of individual building design peak loads is not the demand experienced by the central utility. Based on historical data the actual demand at the Central Plant is expected to be about 75% of the individual peak loads for each building.

Future Needs/Requirements (Chilled Water)

2.a Chilled Water Production Capacity Evaluation

Plant Capacity and Demand Comparison

The existing capacity for the Central Plant and the Satellite Plant is 25,950 tons. The current policy requires the chilled water production system to have enough capacity to meet the peak load with two chillers not operational. The east campus system is fully loaded, therefore any significant addition to the chilled water load in that part of campus will require a significant amount of infrastructure. The west campus has adequate capacity for the current buildings, but the addition of space would most likely require the addition of a chiller to the Satellite II chilled water plant.

2.b Chilled Water Distribution System Evaluation

In order to assure adequate distribution capacity as new buildings come on line, computer modeling of the system is analyzing the chilled water distribution piping system during the building program phase.

ELECTRICAL POWER AND OTHER FUELS SUB-ELEMENT

1. Inventory and Analysis of Existing Conditions

1.a Existing Electric Power Supply and Distribution System

The existing electrical distribution system on the Florida State University Campus primarily consist of 12.47kV circuits with 4.160kV circuits for mechanical purposes at the central and satellite plants. FSU is dual-fed 12.47kV from the City of Tallahassee Substation No. BP-13 at the Main Substation south of the Central Utilities Plant. There are two lines of 15kV switchgear to provide the 12.47kV service to the facilities throughout the campus. The circuits are routed in underground duct banks to facility transformers.

1.b Other Fuels Distribution

There are no other FSU owned fuels distribution systems on campus.

1.c Electric Service to the University

The City of Tallahassee added a new transformer in 1992 to go with the existing transformer in their portion of the substation serving FSU. Both transformers are 18,000 kVA with two stages of fan cooling that will provide 24,000 kVA and 30,000 kVA. The original transformer serves FSU through the West Main Breaker and the new transformer serves FSU through the East Main Breaker. The peak demand within the last fiscal year to the University was approximately 33 MW as recorded by the City of Tallahassee electric utility bill.

2. Future Needs/ Requirements

Projected Electric Power Supply and Distribution System

A study of the electrical distribution system entitled “BP-13 Status Report” was provided to FSU from City of Tallahassee Power Delivery Division, dated November 20, 2017. The report suggests that both 30MVA transformers be replaced with 50MVA, a second substation and tie be built, and capability for a mobile station hookup.

The campus is currently replacing the existing paper insulated lead covered (PILC) cables with ethylene propylene rubber (EPR) cables for the 15kV distribution system. The full campus should be complete by 2021.

Most projects considered over the next 5 years (through 2025) can be reasonably served off existing feeder circuits close to their proposed locations. Additional campus expansions in the Arena District and the West Campus Research campus could potentially require some localized upgrades. The analyses must determine circuit load balances and redundancy through loop feeds.

The peak electrical demand required by the University has increased from 27,000 kilowatts in 2014 to 33,000 kilowatts in 2019. The rate of growth has slowed to less than 1% annually due to energy conservation efforts. It is likely that we will need to consider additional transformers for the main campus within the next 5-10 years if existing redundancy is to remain. Since the demand exceeded 30,000 kilowatts, the ability to handle the service through one transformer in emergencies is now in jeopardy.

TELECOMMUNICATIONS SYSTEMS SUB-ELEMENT

Inventory and Analysis of Existing Conditions

The mission of Florida State University Information Technology Services (ITS) is to provide a comprehensive, sustainable and secure information technology infrastructure to deliver world-class technology services to support the teaching, research and administrative mission of the University. ITS partners with the FSU community to make technology easy and accessible to the students, faculty and staff who learn, teach, conduct research, and work at FSU. Information regarding ITS's Strategic Initiatives may be found on its website: www.its.fsu.edu.

ITS is the coordinator and provider of all network and telecommunications infrastructure for University departments, both on and off campus. This includes but is not limited to all inside and outside copper, coaxial, and fiber optic cabling, dial tone, voice services, wireless technologies, frequency coordination, electronic door locks, security cameras, WiFi, Internet, network switching, and routing. Support is provided in the following blocks of service:

Core Backbone Services

The campus core network provides connectivity to all campus buildings. The core network is comprised of redundant Cisco ASR9000 routers with remote service shelfs located at seven (7) fiber optic demarcation nodes on main campus and Innovation Park. A 100 Gbps link to the Florida Lambda Rail connects the core network to the Internet.

ITS is responsible for the management and monitoring of the enterprise network. This includes allocation of resources such as IP addresses, DNS names, and DHCP services. Network security services are centrally provided, including firewalls, access control lists and various monitoring and protective services for both network and end-computing devices.

Wireless Services

FSU has 6,000 WiFi access points deployed on the main campus, providing a full canopy of indoor and outdoor coverage. Additional access points are deployed at off-campus locations. The WiFi network is comprised primarily of equipment manufactured by Hewlett Packard/Aruba Networks with a lesser quantity by Cisco Systems. On a typical day over 40,000 wireless devices connect to the network with an average of 90,000 logins. Peak sustained usage exceeds 6 Gbps.

Cellular coverage is provided via eleven (11) campus rooftop and monopole sites owned and operated by Verizon, AT&T and T-Mobile.

Edge Networking

FSU has approximately 58,000 wired Ethernet ports. Approximately 14,000 operate at 100 Mbps, 43,000 at 1,000 Mbps, and 1,000 at 10 Gbps. Over 33,000 of these ports are managed by ITS. The Ethernet switches are manufactured by Brocade Networks, Cisco Systems, Hewlett Packard, and others.

Voice Services

FSU has approximately 9,100 telephones provisioned on campus. 7,100 are VoIP (Voice over Internet). These connect to an Avaya Aura PBX system owned and operated by the University. The remaining 2,000 are analog/digital and connect to the local Centrex exchange. These are used for various legacy applications. ITS provides ancillary services including Voice Mail, Automatic Call Distributor, and interfaces with the PSAP (Public Safety Answering Point) located in the FSU Police Department.

Campus Access and Security

FSU maintains a robust system for security alarms, cameras and electronic door locks. Over 500 surveillance cameras and 2,300 electronic door locks are deployed on main campus. Similar security infrastructure is in place at the remote campuses. ITS and FSUPD operate the systems in partnership, ensuring a safe environment for the FSU community

Telecommunications Cabling Infrastructure

ITS is responsible for the installation and maintenance of all telecommunications cabling infrastructure at the University. This includes inter- and intra-building fiber optic, coaxial, telephone, and Ethernet wiring for new construction and renovations. ITS manages approximately 700 Telecommunications Rooms and wiring termination facilities in campus buildings. The ITS Infrastructure Group also coordinates with cellular and telecommunications providers who interface with the campus.

Future Needs and Requirements

ITS has funding and scheduling mechanisms for the life-cycle replacement of centrally-provided network and telecommunications infrastructure. This is accomplished through the recharge of auxiliary services and annual E&G allocations. Departmentally-managed infrastructure is dependent on departmental funding.

The University is dependent on commercial service providers for cellular communications. FSU has historically leased space to cellular carriers to install communications facilities on campus, which have typically involved rooftop transmitters and antennas. With the construction of buildings which are LEED certified, indoor penetration of cellular signal is greatly reduced. There also exists inequity among the three carriers in the Tallahassee market regarding campus coverage.

FSU would benefit from the installation of a neutral-host campus-wide cellular DAS (distributed antenna system). This would eliminate problems with indoor coverage and provide equal coverage for members of the campus community who use different carriers. ITS is currently in negotiation with vendors that provide this service.