FY13 DEPARTMENT FACT SHEETS

OSU PHYSICAL PLANT SERVICES
UTILITIES AND ENERGY MANAGEMENT

James Rosner, P.E.
Director, Utilities and Energy Management
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1 MISSION and VISION

- **MISSION:** Provide reliable, uninterrupted utility services to our customers, and foster University-wide sustainable stewardship of energy resources.
- **VISION:** Strengthen OSU's mission by setting the standard of excellence in utility delivery and energy management.

2 OVERVIEW

Oklahoma State University owns and manages the heating, cooling, and domestic water production for the majority of the Campus. Distribution systems for produced utilities, natural gas, storm and sanitary sewers, raw water, and medium and low voltage electrical are also owned and maintained by the University. On January 1, 2013, the Cowboy Wind Farm began supplying the Campus with approximately 70% of our electrical needs. This historic moment ended many decades of electrical production at our Central Plant and placed us #6 on the EPA's top ten list of colleges and universities using the most renewable energy.

For over a century the University has produced and distributed utilities in support of the University's core mission. Ever vigilant to responsible use of our resources, we elected to investigate if other methods could be used to produce and distribute utilities more cost effectively, without sacrificing our core mission. In FY12 we completed a partial system valuation and RFI to determine the feasibility of strategic sourcing of our utility systems. We looked into whether or not a private firm could finance, operate, and maintain our utility systems more effectively and efficiently than we could by upgrading and continuing to use our existing in-house systems.

Based on the results of the RFI an RFP was developed and released during FY13. Strategic sourcing proved unfavorable and we are moving ahead with a ***Next Level*** initiative in the Physical Plant.

The Utilities and Energy Management Department purchases, manages, and processes all purchased utilities. Customers supplied and metered by an outside utility company and distributed directly are billed without markup. Figure 1 below lists utility rates only for those customers for whom the Department adds value, accrues expenses in production and distribution, or provides operation or maintenance.

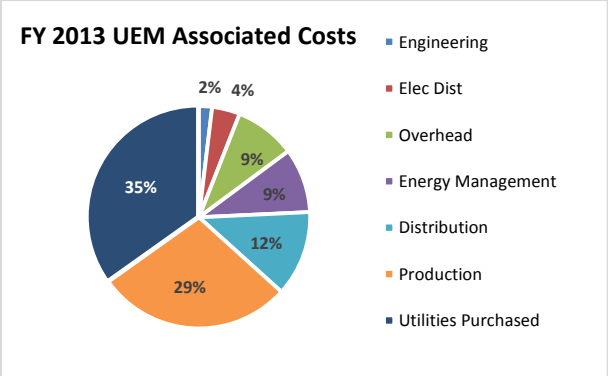
Figure 1 – Utility Rates over 6 years

	FY09		FY10	FY11	FY12	FY13	FY14	Units
	Jul-Dec	Jan-Jun						
Electricity	$0.071		$0.075	$0.078	$0.075	$0.075	$0.075	/KWH
Steam	$15.300		$16.000	$16.600	$16.000	$16.000	$16.000	/Mlbs
CH Water	$11.900		$14.000	$14.400	$14.400	$14.400	$14.400	/MMBTU
Water	$6.750	$6.300	$4.950	$4.950	$4.950	$4.950	$4.950	/Mgal
Sewer	$4.200		$4.950	$4.950	$4.950	$4.950	$4.950	/Mgal

We expect natural gas and electric costs to increase during FY14 due to contractual peak pricing and market conditions. Operating costs continue to climb at 3% to 4.5% annually and will likely continue to do so for the foreseeable future. Overall the rates to utilities customers have remained flat for the past four fiscal years. We expect these rates to increase as cost of goods increase, construction and facility projects begin, and depreciation practices are put into place.

Figure 2 – FY13 UEM Department Costs

The Department's expenses are distributed over the following areas:



3 STEAM and POWER PLANT

3.1 Central Power Plant

The Central Power Plant (Central Plant) generates steam to meet most of the heating demands of the Campus. OSU purchases electric power from Oklahoma Gas & Electric Company (OG+E). The Central Plant is no longer generating electricity on a continuous basis; electricity is generated during periods of weather that may potentially interrupt power to vital loads on Campus and tests this capability on a monthly basis. The University expects to maintain this capacity until a second OG+E substation is built on Campus, which is contractually required to occur by the end of calendar year 2015.

The Central Plant was originally constructed in 1947, with upgrades and expansions through the years since construction. The Central Plant houses five (5) boilers, four (4) steam turbine generators, four (4) cooling towers, and other auxiliary equipment. Additionally, the Central Plant houses four (4) chillers and associated chilled water equipment. The Central Plant is significantly past its design life; replacement of the Central Plant will happen within the next five (5) years.

The Central Plant is old and has some problems, but is operational and in fair condition. The Central Plant building is in need of roof repair. The room that houses Boiler 5 has structural problems. There is ongoing asbestos abatement at the Central Plant. Boiler 3 has many tube leaks and is not operational. Boilers 1 and 2 were re-tubed in 1970–1980 and are in fair condition. All four (4) turbine generators need to be overhauled. Turbine 3 is decommissioned and its parts are used for other operating units. An Arc-Flash Survey is needed. The 2400 V switchgear and buswork need to be upgraded.

The Central Plant cooling tower has exceeded its useful life and should be replaced. The Central Plant is utilizing chilled water cooling towers for turbine condenser use and the roof top tower is dry. The cooling water pipe to the tower is leaking and needs repair. The quench tank and the acid tank need replacement. The main steam header isolation valves need to be replaced with an automated quick acting leak isolation valve. Additionally, Boiler 3's non-return valve, Boiler 5's FD fan VFD drive, and Boiler 4's FD fan turbine drive all need replacement. Number 1 boiler feed pump VFD drive also needs replacement. The three (3) old air compressors have exceeded their useful life and need to be replaced with a single new air compressor. The under deck piping at the Central Plant has exceeded its useful life and also needs to be replaced.

Figure 3 - FY13 Steam and Central Plant Production

ITEM	FY13 Production/Use Figures
KWH Generated	127,000
Station Use	293,000
KWH Net Output	-166,000
Hours Operation	8,856
Total Water Evap, lbs	344,882,000
Makeup Water, lbs	29,583,762
Makeup Water %	8.58%
Steam To Turbines, lbs	1,441,000
Heating Steam 50 lbs	302,221,000
Total Steam Send Out	302,221,000
Steam Equivalent to Electricity	1,539,170
Steam Per KWH, lbs	12.12
Tower Water Makeup	1,300
Central Plant Water Misc	24,961,000
Central Plant Water Use - Total	24,962,300

3.2 Boilers

There are five Boilers at the Central Plant, one of which (Boiler 3) is inactive. All the Boilers use natural gas as the primary fuel and fuel oil as the secondary fuel. The Central Plant has two oil tanks with a total capacity of 48,000 gallons of No. 2 fuel oil. The Boilers seldom burn fuel oil. The Boilers generate steam at 250 pounds per square inch gauge (psig) and 600° Fahrenheit for the steam turbines, steam driven chillers, other small steam turbine drives, and the steam distribution system.

- Total design capacity for all Boilers is 369,000 pounds/hour with proven capacity of 324,000. With Boiler 3 in extended layup these numbers are reduced to 321,000 and 276,000 respectively.

- The historic high Peak Steam Produced is 187,000 lbm on Feb 1, 2011. The historic high Peak Heating Steam Usage (in the last decade) is 136,000 lbm/hr on Feb 1, 2011.
- Campus Peak Heating Steam Usage in FY13 was 105,000 lbm/hr on Feb 22, 2013 at 7:40 AM.
- Peak Steam Produced by Boilers in FY13 was 133,000 lbm/hr on Dec 17 at 7:28 AM. The Central Plant was generating electricity at this time to support poultry substation maintenance.

Figure 4 - Central Plant Boilers Data

Boiler #	Year Installed	Steam Flow lbs/hr		Firm Capacity *
		Name Plate	Proven	
1	1947	48,000	40,000	40,000
2	1947	48,000	40,000	40,000
3	1947	48,000	38,600	
4	1956	125,000	115,000	
5	1962	100,000	90,400	90,400
Capacity		369,000	324,000	170,400

* The Firm Capacity, by definition, is the total with the largest boiler off-line. Boiler 3 has been deemed unreliable and is in extended dry layup, and therefore excluded from the Firm Capacity Calculation.

**Note: The instruction manual for Boilers 1 – 3 states a normal rating of 32,000 lbs/hr, 48,000 lbs/hr maximum (2 hours maximum).

The Boilers are operated in a strategy that ensures that steam supplied to Campus can meet a diverse load throughout the day. Boiler 5 is predominantly used due to its superior turndown ratio.

Figure 5 - Boiler Run Hours

Boiler Run Hours						
	#1	#2	#3	#4	#5	Total
Jul-12					744	744
Aug-12					744	744
Sep-12		24			720	744
Oct-12	48	24			744	816
Nov-12	72	24		72	696	864
Dec-12	408	24		216	600	1248
Jan-13	168	96		648	240	1152
Feb-13	480	288		192	504	1464
Mar-13	120	72		336	432	960
Apr-13	480	288			456	1224
May-13	384	672			96	1152
Jun-13				24	720	744
Year TTL	2160	1512	0	1488	6696	11856

The boilers are the largest user of natural gas on the Campus as the following table illustrates.

Figure 6 - Boilers Natural Gas Consumption

Boiler Natural Gas Consumption (in 1000 CF)						
	#1	#2	#3	#4	#5	Total
Jul-12					19025	19025
Aug-12					19998	19998
Sep-12		4205			22234	26439
Oct-12	256				33251	33507
Nov-12	1186			4169	33592	38947
Dec-12	8289	25		14163	33034	55511
Jan-13	3549	1140		45166	9368	59223
Feb-13	11861	7130		11699	21607	52297
Mar-13	2940	1390		21033	23796	49159
Apr-13	9992	7493			23404	40889
May-13	6319	20509			2651	29479
Jun-13					21108	21108
Year TTL	44392	41892	0	96230	263068	445582

3.3 Steam Turbine Generators

There are four Steam Turbine Generators of which one is inactive. The extraction pressure of Generators 1 and 2 are 50 psig. Generator 3 is reported as decommissioned to the Department of Energy and has been mechanically separated from the steam system.

Generators 1, 2 and 4 operate at 2.4 kV and are connected to the electric distribution system through a metal-clad switchgear lineup located inside the Central Plant on the generator floor. The switchgear contains a total of 14 circuit breakers which provides control and over-current protection for the four generators, seven 2.4 kV distribution feeders, two 2.4 kV tie feeders to the Poultry Substation, and a 2.4 kV auxiliary feeder for station power. This switchgear was originally installed in the late 1940s.

As previously mentioned, the Central Plant is no longer generating electricity on a continuous basis; electricity is generated during periods of weather that may potentially interrupt power to vital loads on Campus and tests of this capability occur on a monthly basis.

3.4 Steam Distribution System

Steam is supplied to the Campus for space and water heating, and processed by the Central Plant from the Generator extractions or the pressure reducing station. At the Central Plant pressure reducing station, the high pressure steam is throttled and de-superheated to 50 psig steam. Steam supplied to the distribution system is 50 psig and 425° Fahrenheit. Both a 5" and an 8" pressure reducing/de-superheating station is used to provide steam to Campus. The installed units are capable of providing a measured output of 125,000 lbm/hr, which is significantly below the historic peak. A third de-superheating station needs to be installed or manpower must be retained to operate Generators for extraction steam.

The steam and condensate pipes are located primarily in tunnels with a very small portion being direct buried. The size and condition of the tunnels vary from 3-feet x 3-feet to 8-feet x 8-feet with some service tunnels smaller than 2-feet x 2-feet. The steam lines range in size from 2-inches to 12-inches in diameter and the condensate lines range in size from 1-inch to 6-inches in diameter. Approximately 50 percent of the pipes are insulated with asbestos, 40 percent with fiberglass, and the remaining 10 percent with cellulite. The steam pipes have expansion joints, 90% of which are primarily slip-type. The other 10% of the pipes are expansion bellows-type, insulated with a fiberglass blanket. The majority of the steam traps are inverted bucket–type; the remainder are thermostatic-type. The steam pipes are Schedule 40 steel. Pipes larger than 3-inches are welded; pipes smaller than 3-inches are threaded. The condensate pipes are Schedule 80 steel pipes and a small amount are stainless steel threaded pipes. There are three Armstrong steam-powered condensate return pumps in the tunnels.

The steam distribution system is old and has some problems, but is operational and in fair condition. Tunnel structural analysis is in process to determine needed repairs. There is existing asbestos in some components of the system. A thermal and hydraulic study of the steam distribution system was last conducted in 1997. A new study is planned to be conducted in FY14. This study will be used to develop a renewal and replacement plan as well as providing siting recommendations for a new plant.

4 CHILLED WATER

OSU has two chilled water plants: (1) the Central Chilled Water Plant (CCWP), located at the intersection of Hall of Fame Avenue and Washington Street, and (2) the West Chilled Water Plant (WCWP), located at the intersection of McElroy Road and Willis Street. The Central Plant and the CCWP are located in the same building and are operationally interconnected. The cooling towers are shared by the Central Plant and CCWP, and the steam driven chiller is supplied with steam from the Central Plant. The WCWP is a standalone facility in the northwest corner of Campus. The combined chiller capacity of the two plants is 29,000 tons circulating approximately two million gallons of water through 20 miles of chilled water piping supplying 82 Campus buildings with chilled water for air conditioning, dehumidification, and process cooling. The CCWP and WCWP supply most of the cooling demands of the main Campus and are both connected to the common chilled water distribution piping system.

Figure 7 - Chilled Water Production Data

ITEM	FY13 DATA
17DA's Ton-Hr Electric	37,613,166
Ton Hrs Free Cooling	1,992,020
Ton-Hr Refrigeration Total	39,605,186
Total Hrs Oper Machines	34,408
Hrs Oper Free Cooling	1,251
Both Plants' Tower Makeup Gallons	88,004,000
Both Plants' Distribution Makeup Gallons	196,930
Both Plants' Water - Total Gallons	88,200,930
KWH Used Plant MCC's	8,724,983
KWH Used Elect Drive	19,713,748
KWH Used Total	28,438,731
Total BTU's Produced	59,486,328,000
Peak Tons Date Time	12,067 6/14/2013 1:00:00 PM
KWH Per Ton-Hr Chiller 1	
KWH Per Ton-Hr Chiller 3	0.79
KWH Per Ton-Hr Chiller 4	0.71
KWH Per Ton-Hr Chiller 5	0.58
KWH Per Ton-Hr Chiller 6	0.64
KWH Per Ton-Hr Chiller 7	0.58
KWH Per Ton-Hr Chiller 8	0.52
Average total KWH/ton for year	0.63
Total both Plants KWH/Ton	0.85

Peak Tonnage in FY13 was 12,895 tons on Sep 04, 2012.

Historic Peak Tonnage is 16,109 tons on Aug 23, 2010. This peak was observed during system recovery following the loss of an operating chiller. During normal operating conditions on Jul 18, 2011 and Jun 18, 2010, 14,903 tons and 15,128 tons respectively were observed.

During FY13, utilizing the newly installed free cooling heat exchanger, the production plants were able to produce 8,488,525 tons of free cooling. This drastically exceeded the previous peak free cooling production from FY09 of 1,448,952 tons and resulted in over $200,000.00 in calculated annual savings (.4 kw/ton and $0.075/kw).

Figure 8 - Chilled Water Generation Data

Chilled Water Generation						
Plant	Energy	Type	Refrigerant	Capacity Tons	Firm Capacity	Firm Capacity West Plant Only *
CCWP - Central Chilled Water Plant						
Chiller 1	Electric	Centrifugal	R134a	3000	3000	
Chiller 2	Steam	Centrifugal	R134a	1500	1500	
Chiller 3	Electric	Centrifugal	R134a	4200	4200	
Chiller 4	Electric	Centrifugal	R134a	4200		
WCWP - West Chilled Water Plant						
Chiller 5	Electric	Centrifugal	R134a	4000	4000	4000
Chiller 6	Electric	Centrifugal	R134a	4000	4000	4000
Chiller 7	Electric	Centrifugal	R134a	4000	4000	4000
Chiller 8	Electric	Centrifugal	R134a	4000	4000	
Free Cool HX	NA	exchanger	NA	4000		
Total				32900	24700	12000

*At point of decommissioning the Central Plant.

Chillers 7&8 were performance tested by Carrier on May 21, 2013.

- Chiller 7 produced 4,155 tons at .636 KW/TON at ARI conditions.
- Chiller 8 produced 4,140 tons at .616 KW/TON at ARI conditions.

4.1 Central Chilled Water Plant

The CCWP is located in the same building as the Central Plant. The Central Plant was constructed in 1947 and the chilled water portion was added in 1976. There are four Chillers at the CCWP. All Chillers are centrifugal and use R134A refrigerant. Chiller 2 is steam driven and all other Chillers are electric driven. Chiller 4 has a slip ring drive and operates at variable speed; the other Chillers have constant speed motor drives. As mentioned in the previous section, the University desires to build a new steam plant as soon as prudently practical and repurpose the real estate occupied by the existing Central Plant. The future plant may include steam driven chillers or a separate chilled water plant may be built in conjunction with the new steam plant.

The CCWP is in fair condition commensurate with its age. Chiller 4's slip-ring electric drive needs repair or a new variable speed drive. The circulating water return header has many patches and is in need of replacement. Overhaul of Chiller 1, Chiller 2 and its steam turbine drive, and the electric drives of Chiller 1 and 3 are needed. Prior to Central Plant demolition, either additional chillers or a thermal storage system will be required to maintain firm capacity.

4.2 West Chilled Water Plant

Phase 1 of the WCWP was constructed in 2000 with room for expansion. The Phase 2 expansion was constructed in 2008. The final expansion, termed "Build Out", is in the final stages of completion and will have final testing when loads permit. During Phase I, the building structure, Chiller 5, and Cooling Tower 4 were constructed. During Phase II, Chiller 6 and Cooling Tower 5 were added. In the Build Out phase completed during FY13, two additional 4,000-ton chillers and a 4,000 ton plate and frame free cooling heat exchanger were added, as well as one cell each to Cooling Towers 4 and 5 and the refurbishment of fill and mechanicals in the existing 3 cells in Cooling Tower 4. Full capacity testing will be conducted when weather conditions permit. It is possible that flow conditions will require the use of the Central Plant until the next phase is complete.

4.3 Chilled Water Distribution

The chilled water system distribution piping contains in excess of 1,800,000 gallons of water and is direct buried with a general depth of burial of 8 feet; the deepest depth of burial is 22 feet. The distribution pipe network is comprised of steel, PVC, and transite material types, and ranges in size from 2- to 36-inches. The large chilled water supply lines are insulated; return lines are not insulated. All supply and return lines less than 10-inches diameter are insulated. Pipes installed recently contain tracer wire. The system has adequate air vents and blow downs. A thermal and hydraulic study of the chilled water system was last conducted in 2002, a new study is planned to be conducted in FY14. This study will be used to develop a renewal and replacement plan as well as providing siting recommendations for a new plant. The distribution system is in fair condition.

5 ELECTRICAL

For the main Campus areas, OSU currently purchases electric power from OG+E at two separate delivery points: (1) the OG+E-owned McElroy Substation, located on McElroy Road just west of McDonald Street and east of Willis Street, which receives power from an OG+E-owned 138 kV (kilovolt) transmission line, and (2) the OG+E-owned Poultry Substation, located on Hall of Fame Avenue just west of Lincoln Street, which is supplied from the McElroy Substation via 12.47 kV feeders.

In 2011 the University entered into a long term agreement with OG+E to purchase Wind Generated Electricity and the construction of a wind farm near Blackwell Oklahoma began. This agreement furthered our goals for stewardship of the environment and conservation of irreplaceable resources. It also stabilized our future electrical costs. On January 1, 2013 the Cowboy Wind Farm began supplying the Campus with approximately 70% of our electrical needs.

According to the U.S. EPA, Oklahoma State University's green power use of 110 million kWh is equivalent to avoiding the carbon dioxide (CO2) emissions of nearly 15,000 passenger vehicles per year, or the CO2 emissions from the electricity use of more than nearly 9,000 average American homes.

Figure 9 - Wind Farm Electrical Data FY13

	Jan	Feb	Mar	Apr	May	Jun
Month wind %	73.70%	83.70%	77.10%	77.10%	70.50%	70.80%
Month non wind %	26.30%	16.30%	22.90%	22.90%	29.50%	29.20%
Calendar YTD wind kw	8,174,836	16,454,720	23,800,508	31,705,273	39,447,227	48,320,844
Calendar YTD non wind kw	2,917,207	4,529,658	6,711,481	9,059,329	12,298,870	15,958,610
Calendar YTD wind %	73.70%	78.41%	78.00%	77.78%	76.23%	75.17%

OSU holds the No. 6 spot on the EPA's Top 20 College & University list of the largest green power purchasers. This purchase also qualifies OSU for EPA's Green Power Leadership Club, a distinction given to organizations that have significantly exceeded EPA's minimum purchase requirements. Green Power Leadership Club members must purchase ten times the partnership's minimum requirement organization-wide.

OSU purchased 140,556,317 kw from OG+E in FY13. This represented a reduction of 8,260,220 kw from the previous fiscal year. Maximum demand was 30,428 kw compared to the previous fiscal year's 31,042 kw.

OSU owns and operates an electric distribution system consisting of:

- One 2.4 kV metal-clad switchgear assembly (located at the Poultry Substation)
- Four 12.47 kV metal-clad switchgear assemblies (Three at the Poultry Substation and one at the Central Plant.)
- One 12.47 kV metal-clad switchgear assembly (located at the WCWP)

The distribution system serving the main Campus area is primarily an underground system consisting of both 2.4 kV and 12.47 kV elements. Feeder 21 from the McElroy Substation is the only 12.47 kV overhead feeder and serves the west Campus Water Treatment Plant (WTP), the WTP 12.47 kV step-down transformer, which steps voltage down to 2.4 kV for the small grains area, and the West Virginia Street rural overhead distribution. The 2.4 kV facilities supply only a portion of the main and west Campus, generally the older portions of the Campus. These facilities are a combination of overhead, direct burial and conduit construction practices.

The 2.4 kV system on the central Campus is comprised of 7 radial distribution feeders originating at the Central Plant. The feeders are supplied directly from the 2.4 kV generators and indirectly from the Poultry Substation through two 2.4 kV tie feeders. The tie feeders are supplied from two OG+E-owned 12.47-2.4 kV step-down transformers located at the Poultry Substation. The 2.4 kV feeders were constructed in the late 1940s and 1960s.

The 12.47 kV system is comprised of 11 feeders; 3 feeders originate at the McElroy Substation and 8 feeders originate at the Poultry Substation. These feeders are supplied from OG+E-owned 138-12.47 kV power transformers at the McElroy Substation and switchgear located at the Poultry Substation. The 12.47 kV feeders are configured in a multi-loop arrangement with pad-mounted sectionalizing switches and elbow sectionalizing terminals. Laterals are protected with fuses. The substations and the majority of the 12.47 kV feeders were constructed in the mid-1960s to present.

The electric utility system is a mixture of components installed between the 1940s and the 1990s. The weighted average age of the system is 1976. The majority of the 2.4 kV cable and ducts serving the older buildings in the main

Campus area were installed in the 1960s and are approaching the end of their useful life. Significant replacements/upgrades may be required over the next decade. The 12.47 kV system and related switchgear, which serve the remainder of the University, are generally in good condition.

The system load varies both seasonally and hourly. The peak system loading generally occurs during the afternoon hours in the late summer. The current peak electrical demand is approximately 31.6 MW (megawatt). The nighttime loading runs as low as approximately 8.0 MW during the winter months.
McElroy Substation supplies 3 nominal >600 amp 12.47 kV distribution feeders into the Campus grid. With allowance for voltage drop and power factor, these feeders have a capacity of approximately 5 MW each.

Poultry Substation supplies 8 nominal >600 amp 12.47 kV distribution feeders with a capacity of approximately 5 MW each. This substation also supplies 4 nominal 600 amp 2.4 kV distribution feeders with a capacity of approximately 1 MW each. In addition, there are 2 nominal 1200 amp rated 2.4 kV power plant tie feeders with a capacity of approximately 2.5 MW each.

The Central Plant supplies 7 nominal 600 amp 2.4 kV distribution feeders with a capacity of approximately 1 MW each. The Central Plant contains 3 operating steam turbine-generators with a total rated capacity of 10 MVA (8 MW). One additional 1.875 MVA unit is damaged and is no longer operational.

The gross total system distribution feeder capacity with the Central Plant in operation is currently 6.6 MW. When the Central Plant is not in operation, the 7 distribution feeders supplied directly from the Central Plant switchgear are instead fed from the 2 Central Plant tie feeders. The total system capability is limited to a total of 6.4 MW under this operating condition.
Many of the 2.4 kV cables and ducts serving buildings on the main portion of the Campus are approaching 50 years of continuous service and have become a reliability and repair concern. The most significant issues are age, materials, and electrical operation. Much of the cable and duct are deteriorated with age, resulting in a rising rate of annual repairs. Significant portions of the existing facilities will require replacement over the near-to-intermediate term. With an anticipated growth rate of 3% per year, the Campus peak electrical demand will increase by > 80% over the next 20 years. This growth will exceed the capacity of some of the existing electrical infrastructure. It is anticipated that many of the necessary system upgrades can be accommodated as new facilities are planned. As a result preliminary design decisions are being made to upgrade the 2.4 kV distribution system to a 12.47 kV system and provide step-down transformers as needed to feed existing buildings.

Fiscal year 2013 projects expanded the distribution system to include areas in the Athletic Village, the tennis project and the track project. Projects being looked at for Fiscal year 2014 include the IT Office Facility, Library Long Term Storage, Res Life Commons, VMTH Academic Wing, Legacy Walk Lighting, Lot 99 Lighting, Metering Project, Structures Laboratory and possibly direct bury replacement with concrete encased DB north of Fractionation Research and east of the Electronics Lab.

6 POTABLE WATER

The OSU potable water system is the primary potable water source for the Campus. There are connections between OSU's and the City of Stillwater's (City) potable water systems to assist each other during critical water demand periods. OSU also maintains 3 potable water systems to the recreational facilities located at Lake Carl Blackwell.

6.1 Lake Carl Blackwell Dam

Lake Carl Blackwell Dam (Dam) is an earthen dam located on Stillwater Creek approximately 6 miles west of the City, approximately 1 mile north of State Highway 51. The Dam was constructed by the United States Government Resettlement Administration in 1935. In 1938, with the Dam partially completed, filling of the reservoir began and the reservoir was full by the fall of 1940. Safety concerns required the Dam to be modified in 1948 by the Soil Conservation Service. The modification consisted of raising the top of the Dam 3.3 feet and lowering the spillway elevation from 946 feet to 944.14 feet. Presently, the reservoir drainage area is 75 square miles with some 57 miles of reservoir shore line.

In addition to serving as the reservoir for domestic water production, Lake Carl Blackwell (LCB) is used extensively for various recreational purposes and as such the apparent lake level is a concern. The largest impact to lake level is natural evaporation. There are other impacts including raw water supply to Karsten Creek Golf Facility, Stillwater Country Club, Meridian Technology Center ponds, right of way water taps, and oil well production uses. Lake level is monitored by the UEM Department and a rationing plan is being developed in the event that lake level becomes an issue.

Figure 10 - Lake Levels FY13

Date	Lake Level Elevation (ft)	Previous Month Rainfall (in)	Feet below Spillway	Feet above min op level
7/2/2012	938.36	2.59	5.78	11.36
8/1/2012	937.31	0.36	6.83	10.31
9/4/2012	936.66	2.52	7.48	9.66
10/1/2012	936.1	0.85	8.04	9.1
11/1/2012	935.61	0.48	8.53	8.61
12/3/2012	935.37	0.67	8.77	8.37
1/2/2013		0.4		
2/1/2013	935.01	1.4	9.13	8.01
3/4/2013		2.74		
4/1/2013	934.81	1.31	9.33	7.81
5/1/2013	935.06	5.58	9.08	8.06
6/3/2013	938.03	7.73	6.11	11.03
Spillway Elevation - 944.14				
Minimum design lake elevation for WTP operation is 927.0 feet				

6.2 Raw Water

In 1948, a 30-inch concrete raw water pipeline was constructed from LCB to the current site of the Water Treatment Plant (WTP). Information from the raw water line plan and profile design drawings indicates the raw water pipeline is 30,015 feet long. The design drawings also indicate the minimum lake design water level elevation is 927.0 feet and the outlet of the pipe is 872.2 feet. The pipe's maximum rated capacity is 12 MGD (million gallons per day). A minor amount of raw water lines are in the main Campus area, primarily in the west Campus farm and research areas. They consist of 4-inch and 6-inch ductile iron pipes. The raw water lines draw water from the 30-inch raw water line from LCB to the WTP.

The raw water system consists of LCB Dam and Reservoir, the 30-inch pipeline from LCB to the WTP, and various raw water lines within the farm and research Campus areas. The reservoir yield and the raw water pipeline capacity of 12 MGD are probably adequate to supply raw water to the WTP for the foreseeable future.

A preliminary design to extend the raw water system into central Campus for irrigation and other needs has been completed. Infrastructure needed to perform this extension is being installed as other projects provide the opportunity. To date, main distribution lines have been installed during repairs to Farm Road and Monroe Street projects.

6.3 Water Lines

There are 6 connection points between the City and OSU, 4 of which are located on Campus. These connections are only to be used to provide water to the Campus in the event of a WTP malfunction or maintenance service that would require taking the WTP off-line. There is 1 connection point into the City located and metered at the WTP. In the event OSU was required to provide water to the City, this is the only point where water would be fed into the City system. These connection points consist of isolation valves and meters to measure the volume of potable water transferred from one system to the other. Normally, the valves are closed and are used only when one of the systems is in need of water.

The potable water lines range in size from less than 4 inches to 18 inches and consist of polyvinyl chloride (PVC), ductile iron, and asbestos cement material types. Additionally, there are raw water lines ranging in size from 4- to 6-inches located in the west Campus area. OSU personnel estimate the asbestos cement pipe was installed in the 1960s, the ductile iron in the 1980s, and the PVC after 1990.

Pressures in the system vary depending on distance from the water storage tank and time of day. A booster pump was previously installed in the Central Plant to ensure that domestic water supply to the reverse osmosis unit was sufficient to ensure continuous operation for boiler makeup during periods of pressure fluctuation. Fire hydrant tests are periodically conducted to ensure adequate flow for fire protection needs.

6.4 Water Storage Tank

One water storage tank is located in the west Campus area about 3,000 feet north of the WTP, south of McElroy Road. The elevated tank has a height of 134 feet and a capacity of 500,000 gallons. This volume represents approximately 12 hours use. The tank was installed in 2009. OSU's potable water distribution system is a mixture of components installed on average between the 1960s and present day. With an average composite age of 22 years, the overall system is in good condition. As the system ages and the older pipes reach their normal life expectancy, periodic maintenance upgrades will be required.

6.5 Water Treatment Plant

Construction of the WTP began in 1948 and was fully completed later in 1950 however the plant came on-line April 1, 1950, prior to being fully completed because the City of Stillwater water treatment plant was failing. Since then numerous modifications to the WTP have been made to bring it to its present condition. Recent modifications include upgrading the electrical system, the chemical feed system, and the SCADA system in 2008. The WTP presently has a rated flow capacity of 4 MGD. It has the ability to be flow rated at up to 8.3 MGD to allow support for the City, upon submittal to ODEQ. Following an extended multiyear shutdown, the WTP was restarted on August 14, 2010 producing 2.747 MGD potable water. The peak daily flow for the period occurred on August 7, 2010 and was 2.494 MGD, 62% of the rated WTP flow.

The average daily potable flow produced by the WTP is 1.27 MGD. The ODEQ monthly Operational Report submitted by OSU lists the population at 13,000. This results in an average daily demand of 97.7 gallons per person per day. ODEQ Standard Chapter 626, Appendix G, lists the daily design flow for an Urban Resident is 100 gallons per day per person.

- The maximum day demand is recognized to be 2.5 times the average daily flow: 1.27 X 2.5 = 3.175 MGD, which is less than the rated WTP flow of 4.0 MGD.
- The recognized maximum hour design flow is 4.0 times the average daily flow: 4.0 x 1.27 = 5.08 MGD.
- The recognized instantaneous peak flow is 5.0 times the average daily flow: 5.0 x 1.27 = 6.35 MGD.

With a production rated capacity of 4.0 MGD, the WTP can satisfy the present maximum day demand of 3.175 MGD, and can probably support a population increase of about 20 percent. With a maximum hour flow rate of 5.08 MGD, the maximum hour flow rate is 212,000 gallons per hour. At a rate capacity of 4.0 MGD, the WTP can produce 166,000 gallons per hour (4,000,000 / 24 = 166,000). To meet this demand will require 46,000 gallons from the 500,000-gallon elevated storage tank which should not be a problem.

The existing potable water system is adequate to meet the existing potable water demands. As OSU's service area grows, the water demand will grow proportionally. Depending on the makeup of OSU's growth (e.g., typical university growth versus high water demand special research facilities, etc.), the system capacity may need to be enlarged to meet the required demand.

A master plan is being developed for the Campus area. New facilities are defined and as their potable water requirements are defined, and as project funding is established, the existing potable water system will be modified as necessary to meet these new water requirements. Final engineering is nearly completed for a new 1.2 million gallon underground clearwell to be added north of the existing WTP. The clearwell expansion is in line with current design practice and will give OSU the ability to react to changing demands without constantly having to vary the flow through the filters. Steady flow through the filters is desirable as it prevents the filter beds from going through sudden flow shifts that disrupt the process.

Figure 11 - Potable Water Production FY13

FY13	Potable Water produced
Jul-12	58338000
Aug-12	60502000
Sep-12	46913000
Oct-12	41175000
Nov-12	35182000
Dec-12	27070000
Jan-13	29862000
Feb-13	28281000
Mar-13	30162000
Apr-13	32327000
May-13	28995000
Jun-13	36819000

7 NATURAL GAS

Natural gas is used in the main and west Campus areas. There are connections between OSU's natural gas system and the Oklahoma Natural Gas Company (ONG) that provides natural gas supply to various points on Campus. ONG has major gas piping within the Campus area. A major east-west pipe runs along the north side of McElroy Road, a north-south pipe runs on the west side of Western Road and a north-south pipe that starts near the intersection of University Avenue and Stout Lane, traverses north through the campus to Hall of Fame Avenue, then east on the south side of Hall of Fame Avenue to a meter at the Central Plant (Building 37). At the intersection of Hall of Fame Avenue and Monroe, ONG proceeds north along the west side of Monroe Street to connect to their pipe along McElroy Road. From this pipe ONG provides natural gas service directly to Cowboy Mall, Building 283.

OSU is classified as a "Master Meter" facility by the Oklahoma Corporation Commission. A portion of the system that supplies non-Campus entities such as lease holders of food court space is considered jurisdictional. The University maintains the entire system to the standards of a jurisdictional system.

Natural gas is received at 4 points in the main Campus area and 1 point in the west Campus area. The 4 main Campus connection points are: 1) south of McElroy Road on Knoblock Street; 2) at the Central Plant, Building 37, along Hall of Fame Road west of Washington Street; 3) south of Hall of Fame Road between Cleveland and Lincoln Streets; and 4) east side of Western Road near Career Tech Printing Plant Warehouse, Building 300. In the west Campus area the connection point is north of State Highway 51 along August Street. ONG has a master meter and pressure/regulator at each of these connection points to reduce pressure to OSU's distribution pressure (30 pounds per square inch).

The vast majority of natural gas piping has been installed since 2001 and is polyethylene (PE) pipe. Tracer wires were installed with the pipe, located above and near the pipe; a warning tape was installed about 12- to 18-inches below the surface above the pipe. Some steel pipe may have been abandoned in-place and may contain small amounts of natural gas. As these pipes are discovered they are purged and re-capped. Annually a natural gas system leak test is conducted and discrepancies, if any, are repaired at the time of discovery.

Sectional isolation valves, mostly located at intersections, are located throughout the system. There are also valves located at each of the service lines near the distribution pipe. Each service connection includes a regulator to reduce system pressure to service pressure, a meter and a shut-off valve.

The current largest monthly usage billed in the last 18 months was January 2011, 120,691 Dth total; 93,080 Dth of that total was for steam generation. At this time it is unknown what the future peak demand may be. The natural gas system meets all current natural gas demands. It is expected that the current natural gas distribution system can meet any future natural gas demands placed on the system. There are no known deficiencies in the natural gas system relative to the existing system capacity. The existing natural gas distribution system is capable of providing natural gas to future facilities without significant modification to the existing system.

Figure 12 - Natural Gas consumption for OSU Stillwater FY13

Natural Gas CenterPoint (OES)		
MMBTU	**Campus**	**Venture 1**
12-Jul	24,239	64
12-Aug	27,324	99
12-Sep	29,887	134
12-Oct	49,043	154
12-Nov	58,293	155
12-Dec	82,828	195
13-Jan	90,450	195
13-Feb	79,788	161
13-Mar	73,635	173
13-Apr	60,287	167
13-May	38,806	159
13-Jun	25,879	103
Total	**640,459**	**1,759**

8 WASTE WATER

The main Campus area wastewater system is the primary wastewater collection system for the Stillwater Campus. OSU does not own or operate its own wastewater treatment facility; all wastewater generated on OSU campus flows into the City's wastewater collection system for treatment and final disposal. Wastewater is transferred to the City's wastewater collection system at 13 separate connection points. There is one point on west Campus where the wastewater is transferred to the City.

The wastewater collection system for Campus is sub-divided into 13 collection basins, titled A through N. Twelve (12) of the basins, B through N, flow directly into the City's wastewater collection system via manholes, east and south of the boundary between OSU and the City. Basin A, on main Campus, flows into west Campus Basin O, with both basins eventually flowing into the City's wastewater system.

There is one small lift station within the collection system. The lift station is located north of McElroy Road in a manhole south of Fire Protection & Safety Technology Laboratory, Building 222. The lift station serves Buildings 222 and Fire Technology Outdoor Laboratory – Fire Tech Area, Building 220, and pumps wastewater through an approximately 130-foot long force main east to a manhole.

Some buildings on Campus contain small lift stations (sump pumps) but are not considered a part of the wastewater collection system. The wastewater collection pipes range in size from 2- to 15-inches and consist of polyvinyl chloride (PVC), ductile iron (DIP), vitrified clay (VCP), and reinforced concrete pipe (RCP) materials.

In 2002, OSU had an engineering study completed on 6 Basins (A, C, M, E, H, and F) of the wastewater collection system. The study measured actual wastewater flows for a non-rainfall period in order to determine average and peak flow without rain. Additional measurement was done during a rain event to determine average and peak flow during a rainy period. Using the flows and rainfalls from the rainy period, the wastewater pipe flows were adjusted to a 5-year 60-minute rainfall event (2.3 inches/hour). During a period of no rainfall (11-18 October 2002), the average and peak daily flows were determined for the 6 basin areas. The only basin studied that did not have adequate capacity was Basin F at 208% capacity. The report recommended that the approximately 1,400-feet of pipe 8" VCP to the outlet (the City manhole) be changed to 12" PVC pipe. The size change would provide adequate capacity for existing conditions and some capacity for future expansion.

OSU's wastewater collection system is a mixture of components installed between the 1960s and present day. With an average composite age of 32 years, the overall system is considered to be in good condition. The system has experienced some problems with inflow/infiltration, mainly in Basins F and M. Most of the maintenance work on the wastewater system has been in modifying the system for building expansion/restoration that has taken place in the past few years. The vitrified clay pipe that has been installed over 50 years ago appears in good shape with very little maintenance necessary. As the system ages and the older pipes reach their normal life expectancy, periodic maintenance upgrades will be required.

For the most part, the existing wastewater collection system is adequate to meet existing wastewater demands. The engineering report mentioned previously recommends that the 8" VCP in Basin F entering the City's manhole be changed to 12" PVC in order to increase capacity. OSU O&M personnel also recommend changes in Basin F: the 8" VCP pipe from Manhole 147-003 to Manhole 147-006 JPI should be replaced with new 12" PVC pipe from Manhole 147-003 Manhole 147-006A JPI, and Manhole 147-006 JPI should be abandoned.

The VCP pipe has not experienced excessive maintenance problems and would be replaced only when specific areas experience excessive maintenance problems. Some other items need to be replaced, but these items generally fall under normal repair and will be replaced as time and material becomes available. When other projects become funded, if repairs or upgrades are necessary, the repairs will be made as part of the proposed construction project.

As OSU's service area grows and new buildings are added within the existing footprint, the wastewater generated will grow proportionally. The wastewater system's growth will be tied to OSU's potable water growth (e.g., typical university growth versus high water demand special research facilities, etc.); the wastewater collection system capacity may need to be enlarged to meet the required demand. The grade from north to south will allow for additional growth in the gravity flow system without lift stations.

The wastewater system has adequate capacity to meet current and near future wastewater demands.

9 STORMWATER

The OSU stormwater system is located on the main Campus area. The stormwater system is the primary stormwater conveyance system for the Campus. There is no stormwater treatment facility on Campus - all stormwater collected in the main Campus flows into the City's stormwater system, eventually ending in the Cimarron River. OSU's stormwater system connects at 7 locations to the City's stormwater system.

The stormwater system for main Campus is sub-divided into 8 basins titled A through H. The basins flow directly into the City's stormwater system via manholes or open channel flow.

The stormwater system ranges in size from 1 inch pipes to 6 foot by 5 foot boxes and consists of polyvinyl chloride(PVC), cast iron (CI), ductile iron (DIP), vitrified clay (VCP), reinforced concrete (RCP), corrugated metal (CMP), and reinforced concrete box (RCB) materials.

OSU's stormwater system is a mixture of components installed between the 1960s and present day. With an average composite age of 22 years, the overall system is considered to be in fair condition. As the system ages and the older pipes reach their normal life expectancy, periodic maintenance upgrades will be required.

As new facilities are developed and as their stormwater requirements are defined, the existing stormwater system will need to be modified as necessary to meet the new stormwater requirements. There is adequate slope in the land from north to south to allow gravity flow, and lift stations are not necessary.

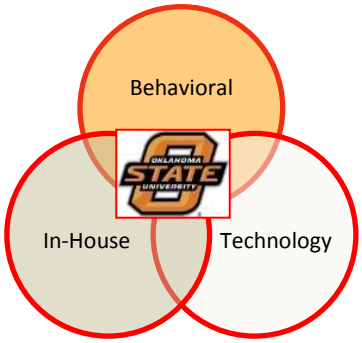
The overall stormwater system has capacity to meet current and near future stormwater demands. As stated previously, as the OSU service area grows, there may be a need to enlarge the stormwater system to meet required demand.

10 ENERGY MANAGEMENT

10.1 Overview

Oklahoma State University has created a comprehensive energy management program with a three-tiered approach. The primary, and most successful, tier has been the use of Behavioral Energy Management. The Behavioral approach consists of changing individual and institutional behaviors and decision making processes. A Technological approach is the second tier of the program. The technical approach uses energy projects and energy savings contracts (ESCO) to improve physical assets and conditions of facilities to increase energy efficiency. The third tier utilizes and influences the operations of the In-House Physical Plant shops. The In-House tier focuses on ways to improve the practices and procedures of work, purchases, and decisions in the day-to-day operations of the OSU Campus.

Figure 13 - The three tiers of the OSU Energy Management program.



To date, the OSU Energy Management Program has exceeded its initial goals and continues to introduce and implement innovative energy saving systems and methods. It has become a premiere program and leader in the field of higher education energy conservation and management. Additionally, the success of the OSU Behavior-based energy program received recognition from the State of Oklahoma.

The State of Oklahoma sought to create a similar program for state-wide energy savings without increasing capital expenditures. On May 8, 2012, Senate Bill 1096 (SB1096) established the Oklahoma State Facilities Energy Conservation Program. The program directs all state agencies and higher education institutions to achieve an energy efficiency and conservation improvement target of at least 20 percent by the year 2020 compared to a 2012 baseline. Upon implementation, all agencies are required to input historical utility cost into approved software on a monthly basis.

OSU has been directly involved in the development of the State program. The Director of Physical Plant, Rick Krysiak was granted a leave of absence from OSU to serve as the Director, State Energy Program at State of Oklahoma. Mr. Krysiak has developed requests for proposals (RFP) for the behavior based program and software for the State. OSU Energy Managers have also assisted in the development by assisting Mr. Krysiak from the successes and lessons learned from the OSU energy program implementation. SB1096 has large implications for future energy initiatives at OSU and the department is committed to rising to the new challenge.

10.2 Program Status

The Oklahoma State University System total program savings since 2007 to the end of FY13 is $28,090,969 resulting in a combined percentage cost avoidance of 17.4%. The total savings is $9.7M above the project savings goal for the program of $18M.

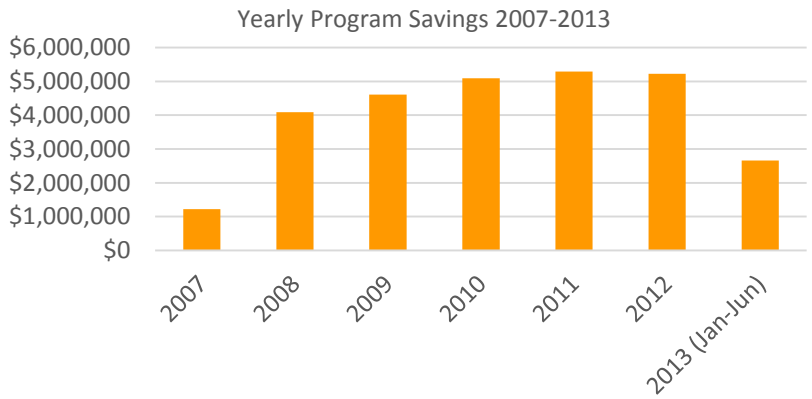
Figure 14 – System Wide Program Savings FY13

Location	Dollar Amount	Savings
OSU STW (main campus)	$4,567,220	18.9%
OSU OKC	227,837	23.7%
OSU Tulsa	259,684	24.3%
OSU Center Health Sciences	271,774	33.3%
OSUIT Okmulgee	157,373	15.1%
Total Savings FY13	$5,483,888	18.7%

Figure 15 - System Wide Savings to Date (FY08-FY13)

Location	Dollar Amount	Savings
OSU STW (main campus)	$23,249,588	16.7%
OSU OKC	1,273,350	23.4%
OSU Tulsa	1,326,528	22.3%
OSU Center Health Sciences	1,344,768	34.3%
OSUIT Okmulgee	896,735	12.9%
Total Savings FY08-FY13	$28,090,969	17.4%

Figure 16 - System Wide Program Savings since July 2007



Notable accomplishments in the program for FY13 include:

- Presented plaques to buildings that have achieved $1M in savings. Wes Watkins Center for International Trade Development, Advanced Technology Research Center and Boone Pickens Stadium have each achieved $1M in energy savings since 2007.
- Created an Energy Management Action Plan performed by Cenergistic for the Stillwater campus.
- Hosted Flip the Switch event Feb 15, 2013 marking the start of the Cowboy Windfarm.
- Upgrading the Energy Management Software from ECAP PRO to ECAP Enterprise.
- Presentation to Tinker AFB and Loves Country Stores on the OSU Energy Management Program.
- Presentation at the 2013 Green Building Summit in Oklahoma City.
- Participated in "Turn It Off Tuesday" lights out at lunch across the Stillwater Campus.

10.3 Behavior:

OSU strives to become a model of thoughtful stewardship through energy management and conservation, not only for the benefit of natural resources and the environment but also for taxpayer and tuition dollars. In an effort to reduce energy consumption on each of its five campuses, Oklahoma State University implemented an Energy Conservation Program in 2007. President Burns Hargis was concerned with increasing energy costs as well as a reduction in State funding of higher education.

The goal of the program was to reduce energy consumption without large capital expenditures or projects; therefore, a behavior-based conservation program was created. OSU selected Cenergistic (then Energy Education Incorporated) to develop the behavior-based program based on their success in K-12 and other agencies. All students, faculty and staff are asked to do their part to conserve and help create a culture of conservation at Oklahoma State University and our campuses in Stillwater, Tulsa, Oklahoma City, and Okmulgee.

OSU established Energy Management and Conservation Policy #1-0520 and OSU Energy Guidelines with web access to formally document the expectations and standards of the program. With this foundation, OSU developed a people-oriented energy management program at each of the OSU campuses. The focus was to promote conservation of electricity, chilled water, steam condensate, gas, and water. Much of the conservation resulted from reducing consumption mechanically by adjusting heating, ventilation, and air-conditioning (HVAC) system run times to match events and occupancy in buildings. Education is a large part of the program and Energy Managers work to increase

energy awareness of faculty, staff, and students through presentations, promotional materials, website and Facebook interaction. This emphasized reductions during unoccupied times and promoting behavior changes of "energy consumers" to "energy savers".

Energy Managers (EM) are the key to the success of the Energy Conservation Program. They gather data and monitor energy consumption for assigned buildings. An EM works with class and event scheduling to determine the occupancy patterns in each of the buildings. They apply this knowledge to the operation of the heating, ventilation, and air-conditioning (HVAC) systems. Energy Managers work to educate the occupants of each building on ways their efforts can contribute to reducing energy costs at OSU. They perform energy audits in assigned buildings to look for energy savings opportunities around the clock, especially during predominantly unoccupied times of the day, including weekends and holidays. Energy reports are generated and provided to building administrators, custodial staff, and others who may then share that information with building occupants to promote behavior changes that contribute to energy savings.

10.4 Technology

As the behavioral approach address consumption in the facilities, the energy program has used technology and Energy Savings Performance Contracts to improve efficiencies of physical assets in facilities and utilities on the Stillwater campus.

Energy Technologies in Use

At OSU, cutting-edge technology assists in the ongoing effort to reduce energy usage and costs, thereby, reducing our carbon footprint. Below is a list of some of the technologies used for energy management at OSU:

Building automation systems (BAS) provide web-based, digital controls for heating, air-conditioning and ventilation (HVAC) systems for the purpose of energy management at OSU. The BAS involves air handlers, the chilled and hot water systems, damper controls, exhaust fan controls, pump controls, and lighting controls in various campus buildings. The BAS enables energy managers to schedule HVAC and lighting to match the occupancy patterns in OSU buildings. Direct digital control allows energy managers to monitor temperatures by zone within each building within the system and make adjustments in scheduling or temperature, as needed.

Automated lighting systems are used in several OSU buildings, which enable energy managers to schedule lighting based on occupancy patterns.

Automation of energy meters allows energy managers to be digitally monitor data at repeated intervals for real-time review of energy use in OSU buildings. Additional “smart meters” are planned to be installed throughout the upcoming years.

Utility meters for natural gas, electric, chilled water, and steam condensate are used and monitored closely at OSU to ensure that energy usage is accurately accounted for each month.

Vending machine controls at OSU utilize a passive infrared occupancy sensor (PIR) that can turn off the compressor and fluorescent lights in the vending machine when the area is unoccupied. A temperature sensor can power up the machine at intervals to keep the products cool enough.

10.5 Energy Savings Performance Contracts

10.5.1 Task Order 1 – Energy Savings Program

Project started July 2007 and completed July 2013. Total project benefits over twenty (20) years ~$20,743,385.

1. FIM RL 1A - Lighting Retrofit
2. FIM RL 3 - Vending Miser Controls installed on (19) Soda and (13) Snack Machines in Residential Life dormitories to reduce energy waste by monitoring occupancy levels and ambient temperature changes.
3. FIM CW 1A - Installed Aircuity™ in (39) labs in ATRC to monitor and perform a comprehensive analysis of the facility's air quality and modulate each room's airflow to ensure safety and minimize energy use.
4. FIM CW 5 - Computerized Maintenance and Management System (Work Order System)
5. FIM CW 4B - Interior Lighting Retrofit for (38) General University Campus buildings
6. FIM CW 4.1 - Exterior Lighting Improvements on OSU Campus/REMOVED from Scope of Work.
7. FIM CW 7A - Air Handling Units improvements – from constant volume to variable volume conversion units.
8. FIM CW 8 - Vending Miser Controls installed on (85) Soda and (54) Snack Machines and (27) glass front juice coolers in OSU's General University buildings.
9. FIM CW 10 - Building Envelope Improvements to seal air leaks around doors, windows, roof/wall joints.

Figure 17 - Total Project Benefits

Year	Utility Cost Avoidance*	Operations and Maintenance Cost Avoidance	Annual Project Benefits
1	$481,939	$131,662	$613,601
2	$497,109	$135,612	$632,721
3	$512,757	$139,680	$652,438
4	$528,898	$143,871	$672,769
5	$545,547	$148,187	$693,734
6	$562,720	$152,632	$715,352
7	$676,812	$157,211	$834,024
8	$716,421	$161,928	$878,348
9	$758,347	$166,785	$925,132
10	$802,726	$171,789	$974,515
15	$1,066,758	$199,151	$1,265,909
20	$1,417,635	$230,870	$1,648,505
Totals**	$17,205,578	$3,537,807	$20,743,385

*Utility Cost Avoidance is a Measured Project Benefit. Utility Cost Avoidance figures in the table above are based on anticipated increases in unit energy costs.
**Total includes figures from all years (1-20).

10.5.2 Task Order 2 – Steam Traps and Insulation Blankets

Project started March 30, 2011. Not complete at this time.

1. FIM RL 2-4 Steam Traps and Insulation Blankets for Residential Life
    a. Audit of steam distribution system.
    b. Replaced steam traps and atmospheric vacuum breakers
    c. Installed insulating blankets and/or materials on valves and fittings.
2. FIM RL 2-5 Building Envelope Improvement for Residential Life
    a. Air leak audit of Iba Hall Residential Life building could not be completed due to discovery of asbestos containing material.
3. FIM TO 2-2 Steam Traps and Insulation Blankets for General University Campus
    a. Audit of steam distribution system.
    b. Replaced steam traps and atmospheric vacuum breakers
    c. Installed insulating blankets and/or materials on valves and fittings.
4. FIM TO 2-4 Building Envelope Improvements for General University Buildings
    a. Air leak audit of GU buildings.
5. FIM TO 2-9A Pilot Water Treatment Plant Lighting Retrofit
    a. Retrofit existing interior T12 lamps and magnetic ballasts with new 25 watt T8 lamps and new instant-start, low ballast-factor electronic ballasts.
6. FIM TO 2-9B Water Treatment Plant Interior Lighting Retrofit
    a. Assess interior lighting needs.
7. FIM TO 2-9C Water Treatment Plant Exterior Lighting Retrofit

   a. Review the condition and functionality of the existing lighting and recommend improvements.
8. FIM TO 2-9D Noble Research Center Lighting Control Upgrade
   a. Remove occupancy sensors and install wall mounted switches for ceiling lights.
9. FIM TO 2-10 Campus-Wide Exterior Lighting Study/Recommendations
   a. Assess existing campus-wide exterior lighting and identify/specify upgrades to meet selected National Standard for each of the various types of areas.
10. FIM TO 2-11 West Chilled Water Plant Preliminary Engineering
   a. Preliminary engineering design for increase of the WCWP capacity from 8k tons to 16k tons.

10.5.3 Task Order 3-4 – Chilled Water Plant Upgrades

Purpose of this project is to describe the minimum equipment necessary to increase the capacity of the West Chilled Water Plant from 8k tons to 16k tons. The project installed 2 x 4,000 Ton Carrier chillers, installed cooling tower cell 4d and 5d and retrofitted existing cells, installed a plate-and frame free cooling heat exchanger.

10.5.4 Task Order 5 – New Central Plant

Produce a comprehensive energy conservation and design study for the existing Central Plant. The technical energy audit is complete and the project development plan is on hold.

10.5.5 Task Order 6 – Henry Bellmon Research Center (HBRC) Ventilation

Aircuity™ System/Ventilation project started August 2013. Total project benefits over twenty (20) years ~$4,922,634.

1. FIM TO 1 Aircuity™ – HBRC
   a. Install Aircuity OptiNet Facility Monitoring System for (59) laboratories to monitor the quality of the air in the space and perform intelligent interface with existing controls system to modulate each room's airflow to ensure safety and minimize energy use.
2. FIM TO 2 Chemical Fume Hood Controls HBRC
   a. Install a zone presence sensor and fume hood alarm for (71) fume hoods to adjust the face velocity when the sensor detects no movement around the fume hood to ensure safety and minimize energy use.
3. FIM #3 Demand Controlled Ventilation HBRC
   a. Install CO_2 sensors that work intelligently with the Outside Air dampers to monitor CO_2 levels, maintain acceptable environmental conditions and reduce operating costs.

10.6 In-House

Energy Managers work closely with OSU Physical Plant Services to identify energy issues with facilities and mechanical equipment. The energy managers create projects to address these issues and are completed using Physical Plant Services Work Orders or through contracts.

Notable In-House Efforts for FY13 included:

1. Changed the AHU sequence of operation to implement a staggered nightly purge of the chilled water system on a building level.
2. Investigated the feasibility of electrochromic glass window treatment technology.
3. Investigated and the feasibility of demand defrost control technology and installed controls.
4. Participated in the Utility Systems Strategic Sourcing RFP (privatization).
5. Participated with REQ architect design selection committees.
6. Investigated the feasibility of kitchen fume hood exhaust technology.
7. Investigated the feasibility of capturing and reuse of AHU condensate water.
8. Worked with res/life to improve plate and frame heat exchanger delta temperature.
9. Managed the Retro Commissioning study of Noble Research Center.
10. Shop coordination for lighting retrofits, mechanical maintenance, and water improvements

Memberships/Associations:

1. Environmental Protection Agency (EPA)
2. Energy Star
3. International District Energy Association (IDEA)

4. Association of Energy Engineers (AEE)
5. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

10.7 Summary

The Energy Management program is engaged in using internal resources to improve operations while avoiding energy use. EM works with an ESCO to execute capital projects with guaranteed savings and partners with Campus to educate energy consumers in energy savings behavior.

11 FACILITIES INFORMATION

Generally stated, the Office of Facilities Information (FacInfo) has the task of gathering, storing, and disseminating information related to the University's infrastructure. FacInfo also is responsible for supporting and developing several computer/software systems related to that work. The work of supporting the development and management of critical campus functions through its stewardship of facilities information and information systems extends to OSU's entire multi-campus system.

Figure 18 - OSU System Facilities Statistics

OSU-System Statistics as of August 2013		
Campus Site	Number of Bldgs./Structures	Gross Square Feet
OSU-Stillwater Campus	595	11,388,921
OSU-Institute of Technology (Okmulgee)	90	1,066,887
OSU-Oklahoma City Campus	23	451,633
OSU-Tulsa Campus	7	523,243
OSU-Center For Health Sciences (Tulsa)	13	194,275
OSU-Ag Experiment Stations	121	263,960
County Extension Offices	82	1,800+
Miscellaneous	22	83,861
Total	953	13,974,580+

A&M Colleges Oklahoma State University departments often are called upon to provide services to the non-OSU campuses under our Board of Regents—the Oklahoma A&M Colleges. The services provided to the A&M colleges can involve space and financial tracking, reporting, administrative consulting, inspection services, and project management for construction projects. Therefore, in addition to maintaining the building inventory for structures belonging to the OSU-System, FacInfo also maintains building-level data on the structures on the A&M campuses. In addition, the FacInfo Records Section also maintains historical construction drawings for construction on the A&M campuses when an OSU department has managed, designed, or engineered that construction.

11.1 Records Section

11.1.1 University Construction Records Archive

The FacInfo Records Section manages the University's archive of historical construction records. The Records Section staff is responsible for (i) receiving construction plans, operations and maintenance manuals, specifications, and other important documents at various points during a project's life; (ii) document storage; (iii) document disposition; and (iv) document preservation. At the present time there are an estimated 75,000 sheets of construction plans in the construction plan archive, and the number is growing each month.

11.1.2 Customer Service

The Records Section staff assists many people who are searching for facilities information. These customers may be students performing searches at the request of their professors in conjunction with assigned class work, campus planners and design firms who need information for campus projects, or trades personnel looking for information from the archive to assist them in maintenance tasks.

11.1.3 Electronic Document Management

In the spring of 2013 the Office of Facilities Information brought on line a new Electronic Document Management System (EDMS). The EDMS was established for use in extending the life and security of the information in the archive and to make the information in the archive more accessible. The Records Section staff is now heavily involved in scanning drawings and placing them into the EDMS along with relevant document data gathered and cataloged into database records to allow for efficient searching of records. Taking into account other staff responsibilities and the number of historical plans already in the physical archive, completion of the initial scanning and data entry for the existing historical plans is projected for approximately 2020 with present staffing.

11.1.4 Construction Plan Reviews

Along with other tasks, the Records Section staff receives, logs, and distributes construction plans submitted for review. FacInfo also receives and records comments by Physical Plant plan reviewers and relays their comments to the respective project's manager. The task of organizing project plan reviews was given to FacInfo in October 2010.

Figure 19 - FI Plan Reviews by Year

Plan Reviews Organized by FacInfo by Year	
YEAR	Number of Reviews
2010	5
2011	52
2012	85
2013 (8mo.)	69

11.2 CAFM Services

11.2.1 Facilities Inventory

The Office of Facilities Information is responsible for maintaining the facilities inventory for all buildings and other structures owned, leased, or rented by Oklahoma State University—or otherwise occupied by University personnel or equipment. As part of the work of managing the facilities inventory, FacInfo has the duties of maintaining official building names, assigning building numbers, and numbering rooms for both new construction and renovation projects. The facilities inventory maintained by FacInfo includes structures on the main Stillwater campus; OSU's branch campuses in Oklahoma City, Tulsa, and Okmulgee; Agriculture Experiment Stations across the state, and other buildings including the building inventories of the state's A&M Colleges. FacInfo employs the ArchibusFM software suite of solutions and maintains a dedicated Archibus database server to maintain these inventories.

11.2.2 ArchibusFM

Archibus is a leading commercial solution marketed by Archibus, Inc., Boston, MA. Among other features, the Archibus system allows electronic drawings to be linked to database records for the purpose of enabling the association of both graphical and textual data for tracking, viewing, managing, and reporting purposes. Archibus was initially deployed at OSU for use in space management activities.

FacInfo maintains records within Archibus for buildings, floors, and rooms within structures contained in the University's facilities inventory. While Archibus initially was deployed for space tracking (in support of the work of the Office of Budget and Asset Management), Facinfo has since licensed other features within its modular system and expanded the use of Archibus over the years for other purposes.

11.2.3 Campus Clients of CAFM Services

Following is a list of the departments that have partnered with FacInfo to use the CAFM Services along with notes concerning their use of Archibus.

Figure 20 - CAFM Services Campus Clients

Department	Year Implemented	Notes
Office of Budget and Asset Management (BAM)	1999	Archibus deployed to integrate BAM's space accounting responsibilities with FacInfo's work of maintaining campus floor plans.
Risk and Property Management	2004	Modified the database to allow for the maintenance of facilities insurance data.
Environmental Health Services	2008	Purchased Archibus consulting services; participated in and managed the development of an asbestos abatement module.
Parking and Transit Services	2008	Deployed a parking lot/parking space management module that also includes a parking lot signage inventory component. This module was in-house development
Environmental Health Services	2010	Deployed the Archibus Building Operations module to allow EHS to manage its fire safety equipment inventory within Archibus. Performed customization services to provide EHS with an inspection management service for their equipment using the Archibus Preventive Maintenance component as its foundation.

11.2.4 Floor Plans

In addition to maintaining plans and other records in the construction records archive, FacInfo monitors new construction and renovations to buildings for the purpose of developing and maintaining floor plans for buildings in the facilities inventory. The production of electronic floor plans for the purpose of linking building floors and rooms to the Archibus database has been an ongoing project since 1996.

Since beginning this project, CAD Technicians employed by FacInfo have been physically measuring buildings and their rooms using high-end, handheld laser distance meters. The technicians then draw accurate floor plans in AutoCAD using those measurements. A "Polyline" is then drawn around each floor's perimeter, and the Polyline of each floor is linked to the Archibus database. The Archibus software extracts the square footage area of the respective

floor from its polyline for inclusion in the database. Similarly, polylines drawn around each of the rooms to define the room areas also are linked to the database in turn.

Presently, electronic (CAD) floor plans for nearly all buildings on the main Stillwater campus east of Western Road have active links to the Archibus database and are used for space management and asset tracking. FacInfo staff is currently actively measuring buildings in the agricultural research areas west of Western Road and producing and linking drawings for those structures.

Figure 21 - CAD Linkage Statistics

CAD Floor Plans and Database Linkage Statistics	
Item	**Statistics as of August 2013**
Number of OSU-Stillwater buildings with electronic floor plans linked to Archibus	308
Number of floors with Polyline links to Archibus	682
Number of Rooms with Polyline links to Archibus	34,792
Number of OSU-Stillwater buildings without electronic floor plans	281
Note: All buildings, floors, and rooms in the OSU inventory are maintained in Archibus even though electronic floor plans with Polyline links to the database may not yet exist for the structures.	

11.2.5 Branch Campuses and AG Experiment Stations

As of FY13 there are 134 buildings on OSU's branch campuses and 121 buildings on OSU's Agriculture Experiment Stations outside of Stillwater that are not reflected in the above statistics. No electronic floor plans have been produced by FacInfo for the branch campuses. Future goals include the generation of those floor plans and their linkage to the Archibus system. However, there is no projection of dates to either start or complete that effort because there has been no movement to authorize, support, or fund that work.

11.3 GIS/Mapping Services

In January of 2007 the FacInfo Manager, with the support of the Director of Physical Plant Services, made a proposal to establish a campus-wide Geographic Information System (GIS) to serve the administrative tasks of multiple departments. An RFP (Request For Proposal) was assembled for purchasing a GIS Study and Needs Analysis. The RFP was approved for distribution in March of that year. Physical Plant Services and the Office of Risk and Property Management provided the funding for the Needs Analysis.

A completed "Preliminary GIS Study and Needs Analysis" was delivered to OSU in September 2007. Seven campus departments were interviewed during the GIS study:

1) Physical Plant Engineering & Utilities
2) Physical Plant Facilities Information
3) Public Safety
4) Parking & Transit Services
5) Risk and Property Management
6) Environmental Health and Safety
7) Long Range Facilities Planning

The study identified 36 separate business processes on campus that could benefit from the use of GIS technology. The study identified 57 types of geographic data that OSU was tracking outside of a GIS and provided OSU with a list of 130 recommended GIS data layers to maintain in the system. The following nine software applications/systems were targeted as having potential to be integrated with a campus-wide GIS:

1) Computer Aided Facilities Management (CAFM)—Archibus
2) AutoCAD Map 3D—Used for Utility Mapping
3) Computer Aided Design (AutoCAD)—Used in project design and planning
4) Computer Aided Management of Emergency Operations
5) Desktop GIS (ESRI's ArcGIS Desktop)
6) Computer Aided Dispatch for Police/Fire/E911—New World System's Aegis CAD
7) Records Management for Police/Fire/E911—New World System's RMS
8) Physical Plant's Facilities Management System—FMS (at the time of the study)
9) Parking Management Software—T2 Systems' Power Pack

In 2010 the FacInfo staff developed and piloted various functionalities within interactive, web-enabled campus maps using available imagery and open source GIS tools. The University's Chief Information Officer (CIO) partnered with FacInfo in promoting the efforts to establish GIS to enable the production of an official interactive campus map using GIS technology. The proposal to budget this work was accepted by the Vice President of Business and Finance in

January 2011. The CIO provided initial seed money to get the GIS effort started, and Physical Plant Utilities and Energy Management then took over the task of providing on-going funding for the enterprise.

Figure 22 - GIS Development History

GIS Development History	
Item	**Date**
Initial "Preliminary GIS Study and Recommendations" completed.	September 2007
Pilot work and promotion of an official interactive web-based campus map for OSU-Stillwater.	During 2010
Authorization to budget the GIS enterprise and develop interactive map services for OSU-Stillwater.	January 2011
Provided GIS server workspace to the Physical Plant Grounds department and shared GIS map services with them.	March 2012
Version One of the Campus Interactive Map is live and links are starting to be provided on OSU's web pages.	April 2012
Version Two is live with new features including a Building Finder, an emergency phone layer, and an enhanced building popup with Pictometry Imagery.	June 2012
Started development work to bring all OSU-Stillwater utility systems into GIS and establish a centralized geo-database for use by campus data stakeholders.	October 2012
Imported the first utility system into the GIS development geo-database and provided version one of a web interface for the Utilities department staff to use to review the data structure and provide feedback on the development efforts.	August 2013
Provided GIS server workspace to the Division of Agricultural Sciences and Natural Resources and shared map services with them.	August 2013

11.3.1 Campus Interactive Map—Future Development

Development of functionality within the Campus Interactive Map continues. However, much of that development has been delayed due to the emphasis that has had to be placed on bringing all campus utility systems into the GIS. Among the functionality planned for future versions of the interactive map are:

1. Wayfinding functionality (path tracing for navigating sidewalks including the accommodation of wheel chair paths)
2. Expanded coverage for the map to include facilities in the Stillwater area outside of the main contiguous campus coverage
3. Inclusion of campus parking lot information
4. Expanded coverage for the map to include the OSU branch campuses in Oklahoma City, Tulsa, and Okmulgee (with a "Campus Picker" function to allow for easy transitions between campuses)
5. Expanded coverage for the map to include all Ag. Experiment Stations in the State of Oklahoma operated by the Division of Agricultural Sciences and Natural Resources (with an "Ag. Experiment Station Picker" function to allow for easy transitions between stations)
6. Inclusion of historical views of campus
7. Inclusion of campus master plan views and details

11.3.2 Preparation of Map Data

FacInfo maintains base maps for OSU-Stillwater in AutoCAD electronic drawing files. FacInfo uses those base maps to generate various maps used by campus departments and the public. The base maps are updated as time allows using the most current information available to FacInfo.

When it comes to mapping work, the preparation of utilities data in AutoCAD drawings for all utility systems that exist on campus is a high priority at this time. Currently, the emphasis on this work revolves around the importance of having good utilities map data to import into the campus GIS.

11.3.3 GIS Data Structure Design

One of the most critical tasks that FacInfo staff members are presently involved in is that of designing and establishing the data structure of the GIS. The proper design of the structure of the geo-database that will be used by FacInfo and other campus departments both now and in the future is foundational in importance. Future successes and the ease in which future development using the GIS can be accomplished depend on a thoughtfully and carefully constructed database design.

FacInfo is constantly researching and defining the requirements for the GIS data structure and reviewing the decisions we make. FacInfo involves the departments it serves in reviewing and establishing the design of both the database and the processes being implemented through GIS.

11.3.4 Distributed Data Maintenance in GIS

While FacInfo will continue to have responsibilities for entering and maintaining campus data in the campus GIS as long as the GIS is supported through the department, the system is being developed to facilitate a *Distributed Data Maintenance* model—or shared data entry/maintenance.

An example of this model: In this model, unless there is a reassignment of tasks, FacInfo staff will be responsible for maintaining the actual existence and geographic accuracy of visible GIS features related to the campus utility systems (features like utility pipes, manholes, valves, etc.). But while FacInfo staff may enter or modify those graphical features, the Utilities department will be responsible for maintaining most of the attribute data attached to those features' database records.

And since the line work and visible site features associated with parking lots are part of the information maintained in the campus base map, those features also likely will be maintained by FacInfo. But the Parking and Transit Services department will be responsible for maintaining relevant attribute data associated with parking lots and parking spaces residing in the GIS.

In the case of the Campus Grounds Department, FacInfo's role may be limited to providing the tools and support required by the Grounds staff to allow them to maintain the campus tree inventory using the GIS. So the Grounds staff may not only be responsible for entering and maintaining the attribute data for those trees but also for the initial input of those tree features into the GIS.

Then there is the Public (which includes students, prospective students, parents, visitors to campus, and staff who need only to view publicly available information). The Public needs to enter or modify no data, but they need to see shared data that is distributed in the Campus Interactive Map.

Below is a graphic showing the Distributed Data Maintenance Model as it relates to these groups. The graphic assumes the existence of only four (4) data sets, only five (5) departments, and the Public.

Some questions being answered in the following graphic:

1. Who is responsible for inputting or editing the geo-referenced Features (visible objects)?
2. Who is responsible for entering or modifying each respective Feature's attribute data?
3. Who can or should be able to share in viewing and using each respective Feature's location information and attribute data.

Figure 23 - Distributed Data Maintenance Model

Distributed Data Maintenance Model			
Features	Dept. Responsible for Inputting or Editing Visible GIS Features	Dept. Responsible for Entering or Modifying Feature Attribute Data	Group with Access to View the Features and their Attribute Data
Streets, Sidewalks, and Buildings	FacInfo	FacInfo	FacInfo, Utilities, Parking & Transit, Grounds, Energy Management, Public
Utility Lines and other Features like manholes, water valves, etc.	FacInfo	Utilities	Facinfo, Utilities, Grounds, Energy Management,
Parking Lots and Parking Spaces	FacInfo	Parking and Transit Services	FacInfo, Utilities, Parking & Transit, Grounds, Energy Management, Public
Trees in the Campus Tree Inventory	Grounds	Grounds	FacInfo, Utilities, Parking & Transit, Grounds, Energy Management, Public

Using the Distributed Data Maintenance model, above, all parties have the benefit of being able to view and use the information they are authorized to see, and if they have editing privileges/duties they are responsible for maintaining only a subset of that data. Various offices will be able to view the data maintained by others and no longer have the need to maintain duplicate sets of that data in order to relate it to the specific data they actually are responsible for maintaining. Over time this data sharing model will increase efficiency, cut down on duplication, and increase data accuracy.

11.4 System Development and Support

In addition to its basic responsibilities for gathering, maintaining, and disseminating information, the Office of Facilities Information also is responsible for maintaining, developing, and supporting multiple computer software systems and applications related to or used in that work. Following is a list of the systems and applications maintained and supported by FacInfo.

Figure 24 - FI Computer Systems

FacInfo Computer Systems, Applications, and their Purposes			
System	Application	Used for these Processes	Dedicated Servers Maintained for this System
Computer Aided Facilities Management System (CAFM)	Archibus and Archibus Web Central	--Facilities Inventory --Space Management --Equipment Inventories --Preventive Maintenance --Risk & Property Mgmt.	--One physical production server --One virtual development server
Electronic Document Management System (EDMS)	BlueCielo Meridian	--Electronic archive for construction plans and other project-related historical documents.	--One physical production server
FacInfo Web Services	Floor Plan Viewer (custom web application integrated into the FacInfo web site)	--Provides viewable and printable campus floor plans to authorized campus staff via login validation.	--This depends on a live data feed from the Archibus server to populate its building pick list.
FacInfo Windows Applications	FacInfo Floor Plan Tools (custom Windows application)	--Provides electronic floor plans to authorized Physical Plant users to allow them to annotate, save, and print floor plans for use in estimating and managing small renovation projects.	--This depends on a live data feed from the Archibus server to populate pick lists for both the buildings and floors within buildings.
Pictometry	Pictometry Analytics (Self Hosted Pictometry On Line)	--Provides high resolution imagery for viewing ortho and oblique aerial photography; and provides proprietary measuring tools for use by authorized campus staff. --Provides orthographic background imagery for the Campus Interactive Map and oblique imagery in building information popups within the interactive map.	--One physical production server
Geographic Information System (GIS)	ESRI ArcGIS (ArcMap and other ESRI tools)	--Provides a repository for OSU site information. --Provides a repository for OSU infrastructure data. --Provides means for managing and distributing facilities information. --Provides means for geo-locating and analyzing all data contained in the GIS.	--One physical production server --One Physical development server
FacInfo Web Services	Campus Interactive Map (custom web application)	--Provides the University with an official on-line map. --Provides a means for distributing campus wayfinding information to the public, students, and staff.	This application is supported through the integration of GIS, Archibus, and Pictometry; and it depends on the functionality of all three of those systems' servers.
FacInfo Web Services	WebGIS (custom web application presently dedicated to the maintenance and dissemination of utility system information.)	--Provides Utilities Staff with a secure, on-line interface to visualize geographic location data and to edit the attribute data of utility system features.	This application was developed using services configured by FacInfo and provided by the GIS; and it depends on the functionality of the GIS server.
FacInfo Web Services	Sortable Building Lists (custom building lists available on the FacInfo web site)	--Provides the public, students, and staff with direct access to OSU's official building inventory.	This application provides a live feed of building information in real time as the data is retrieved on demand from the Archibus database; and it depends on the functionality of the Archibus server.

The integration of data and tools provided by the major systems and their servers that are managed by FacInfo is now and will continue to be a high priority of FacInfo's development work as staff members look for better ways to facilitate the work of other departments at the University and find ways to provide others with efficient and robust services.

11.5 Staffing

Figure 25 - FI Staff

Staffing—Office of Facilities Information			
Workgroup/Section	FTE Staff	Student Staff	Staff Description
Management	1		Manager, Office of Facilities Information
Records Section	1 1	 2	Records Section Supervisor Facilities Records Archivist Student Technicians
CAFM Services	1		CAFM Technician
GIS/Mapping Services	1		CAD Technician
System Development and Support	2		Application Developers
	7	2	Totals