FY13 EXECUTIVE SUMMARY

OSU PHYSICAL PLANT SERVICES
UTILITIES AND ENERGY MANAGEMENT

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Utilities and Energy Management FY13 EXECUTIVE SUMMARY

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 FY13 OVERVIEW

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. In FY12 we completed a partial system valuation and RFI to determine the feasibility of strategic sourcing of utility systems. Based on the results of the RFI an RFP was developed and released during FY13. Strategic sourcing proved unfavorable and we began moving ahead with restructuring and reorganizing in the ***Next Level*** initiative for the entire Physical Plant Services Division.

The Utilities and Energy Management Department purchases, manages, and distributes 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.

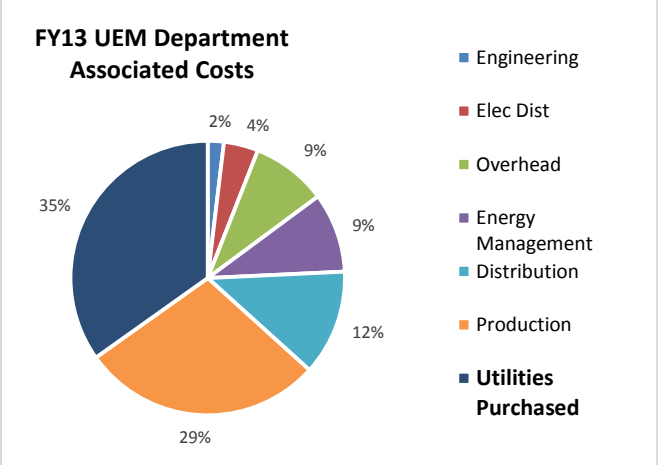
Figure 1 – Utility Rates over 6 years

	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, but 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 (Plant) generates steam to meet most of the heating demands of the Stillwater Campus. OSU purchases electric power from Oklahoma Gas & Electric Company (OG+E). As of January 2013 the Central Plant no longer generates electricity on a continuous basis.

Figure 3 - FY13 Steam and Power 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
Plant Water Misc	24,961,000
Plant Water Use - Total	24,962,300

3.2 Boilers

All the Boilers use natural gas as the primary fuel and fuel oil as the secondary fuel. In FY13 the Campus Peak Heating Steam Usage was 105,000 lbm/hr on Feb 22, 2013 at 7:40 AM, and Peak Steam Produced by Boilers 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. The boilers are the largest user of natural gas on the campus.

Figure 5 - Boiler Run Hours

FY13 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
FY13 TTL	2160	1512	0	1488	6696	11856

Figure 4 - 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
FY13 TTL	44392	41892	0	96230	263068	445582

3.3 Steam Turbine Generators

The Central Plant no longer generates electricity on a continuous basis; electricity is generated during periods of weather that may potentially interrupt power to vital loads on Campus. This capability is tested on a monthly basis. The University will 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.

3.4 Steam Distribution System

OSU's steam distribution system is old but in fair condition and operational. Tunnel structural analysis is in process to determine needed repairs with 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, planned to be conducted in FY14, will be used to develop a renewal and replacement plan as well as providing siting recommendations for a new plant.

4 CHILLED WATER

The Central Chilled Water Plant (CCWP), located in the Central Plant, and the West Chilled Water Plant (WCWP), located at the intersection of McElroy Road and Willis Street, supply most of the cooling demands of the main Campus and are both connected to the common chilled water distribution piping system. Peak Tonnage in FY13 was 12,895 tons on Sep 04, 2012.

Figure 6 – FY13 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	12,067
Date	6/14/2013
Time	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

During FY13, two additional 4,000-ton chillers and a 4,000 ton plate and frame free cooling heat exchanger were added to the WCWP, 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. Utilizing the newly installed free cooling heat exchanger, both plants were able to produce 1,992,020 tons of free cooling. This exceeded the previous peak free cooling production from FY09 of 1,448,952 tons and resulted in over $59,761.00 in calculated annual savings (.4 kw/ton and $0.075/kw).

5 ELECTRICAL

On January 1, 2013 the Cowboy Wind Farm in Blackwell, OK came online and now provides the Campus with approximately 70% of our electrical needs. We 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.

Figure 7 – 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%

Electrical projects in FY13 expanded the distribution system to include areas in the Athletic Village, the tennis project and the track project. Projects being looked at for FY14 include the IT Office Facility, Library Long Term Storage, Res Life Commons, VMTH Academic Wing, Legacy Walk Lighting, Lot 99 Lighting, Metering Projects, Structures Laboratory, and possibly direct bury replacement lines with concrete encased duct banks north of Fractionation Research and east of the Electronics Lab.

6 POTABLE WATER

The OSU potable water system source is Lake Carl Blackwell. Lake level measures are provided by USDA and monitored by the UEM Department.

Figure 8 - Lake Levels in FY13

Date	Lake Level Elevation (ft)	Previous Month Rainfall (in)	Feet below Spillway	Feet above min op level
070212	938.36	2.59	5.78	11.36
080112	937.31	0.36	6.83	10.31
090412	936.66	2.52	7.48	9.66
100112	936.1	0.85	8.04	9.1
110112	935.61	0.48	8.53	8.61
120312	935.37	0.67	8.77	8.37
010213		0.4		
020113	935.01	1.4	9.13	8.01
030413		2.74		
040113	934.81	1.31	9.33	7.81
050113	935.06	5.58	9.08	8.06
060313	938.03	7.73	6.11	11.03
Spillway Elevation - 944.14				
Minimum design lake elevation for WTP operation is 927.0 feet				

Figure 9 - FY13 Potable Water Production

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

6.1 TTHM Issue

The severe drought conditions of 2010-2011 promoted increased algae growth in the surface water of Lake Carl Blackwell, resulting in higher than normal total trihalomethane levels in our treated water. Trihalomethanes are a chemical compound formed when chlorine, used to kill disease-producing organisms, reacts with certain organic materials dissolved in water. The total trihalomethanes (TTHM) level of treated water is monitored by the plant operators to meet the Oklahoma Department of Environmental Quality (ODEQ) guidelines. Due to higher than normal TTHM levels during 2012, OSU submitted a request to ODEQ in January 2013 to construct a sodium permanganate feed system, a precursor treatment, to bring down the TTHM levels. This system increases algae destruction and limits the water's interaction with chlorine thereby reducing TTHM levels. Construction of the sodium permanganate feed system was anticipated to be completed by the end of March but approval was delayed by an ODEQ administrative oversight until April 12th, and the system was not completed until the end of May 2013. We began feeding sodium permanganate on June 3rd.

Earlier in April, as a pro-active step in treating the TTHM levels, we started pre-chlorination of raw water in order to reduce the algae problem. On April 30th we received an ODEQ Notice of Violation (NOV) for high levels of TTHM during 2012 (0.088 mg/L). Testing mid-June indicated inadequate removal of TTHM through the recent use of the sodium permanganate precursor treatment and we submitted a request to ODEA for construction of a chlorine feed point and a switch in treatment to chloramines.

7 NATURAL GAS

Boilers are the largest user of natural gas on the Campus, in the CCWP and the WCWP.

Figure 10 - Natural Gas consumption for OSU Stillwater FY13

Natural Gas CenterPoint (OES) FY13		
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 of Stillwater's wastewater collection system for treatment and final disposal. The wastewater system has adequate capacity to meet current and near future Campus wastewater demands.

9 STORMWATER

The OSU stormwater system is located on the main Campus area and 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 of Stillwater's stormwater system, eventually ending in the Cimarron River. The overall stormwater system has capacity to meet current and near future stormwater demands. 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

The OSU Energy Management Program has exceeded its initial goals to date 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.

Figure 11- System Wide 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%

10.2 Program Status

Total Program savings to date is $28M. This is $9.7M above the project savings for the program of $18M.

Figure 12- System Wide Savings to Date (FY08-13)

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	$5,483,888	17.4%

10.3 Energy Management Program Projects

10.3.1 Task Order 1 – Energy Savings Program

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

10.3.2 Task Order 2 – Steam Traps and Insulation Blankets

Project started March 30, 2011, and is not complete at this time.

10.3.3 Task Order 3 and 4 – Chilled Water Plant Expansion

Construction and installation of Chillers 7 & 8 at the WCWP was completed.

10.3.4 Task Order 5 – New Central Plant

The technical energy audit is complete but the project development plan is on hold.

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

Aircuity™ System/Ventilation project to begin August 2013. Total project benefit over twenty (20) years is ~$4,922,634.

11 FACILITIES INFORMATION

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

Figure 13 - 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+

11.1 Records Section

11.1.1 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 present staffing, 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.

11.1.2 Construction Plan Reviews

FacInfo logs and distributes construction plans submitted for review and receives, records, and relays review comments to the respective project's manager. The number of project plan reviews managed in FY13 was ~95.

11.1.3 ArchibusFM

FacInfo maintains records within Archibus, (a commercial software that links electronic drawings to database records and enables the association of graphical and textual data for tracking, viewing, managing, and reporting purposes) for buildings, floors, and rooms within structures contained in the University's facilities inventory.

11.1.4 Floor Plans

FacInfo monitors new construction and renovations to buildings for the purpose of developing and maintaining floor plans for buildings in the facilities inventory. The square footage of these plans is linked to the Archibus database. 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 14 - CAD Linkage Statistics

Current CAD Floor Plans and Archibus 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.	

To date 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.

11.2 GIS/Mapping Services

Since 2007 FacInfo has been developing an official interactive campus map using GIS technology. The initial 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 15 - 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