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USERS CONFERENCE 2016

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TRANSFORM YOUR WORLD

Using the PI System to Create a Smart Campus that Optimizes Energy and Water Operations

Presented by

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UC DAVIS
UNIVERSITY OF CALIFORNIA

Presentation Contents

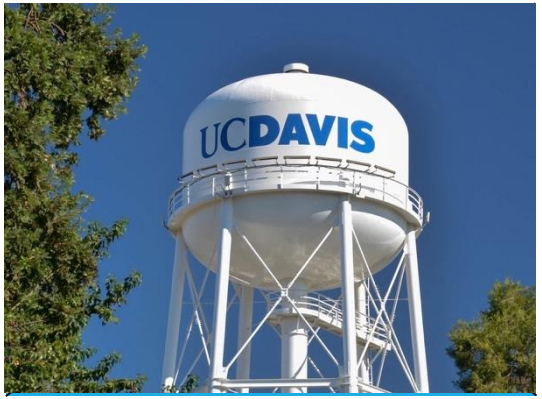
- About UC Davis: a Utility and Customer Model
- Multiple Challenges, Multiple Solutions, Multiple Results, One PI System
- Campus Water
- Campus Energy
- Campus Buildings
- Future Steps

ONE WORLD One UC DAVIS

UC Davis (Main Campus)

- 35k Students, 23k Faculty & Staff
- 1,000+ Buildings, 180 over 10,000 SF
- 11.3M SF total; 5,300 acres Land
- Founded 1905, Average Building Age: 41 years

Using the PI System for Analyzing, Reporting and Visualizing Water Data



COMPANY and GOAL

Optimize water operations and transparency with better automation and improved reporting.

CHALLENGE

No comprehensive view of water systems and data was stored separately in a variety of ways

- Some information was in SCADA and some was collected on paper by manual meter reads

SOLUTION

Able to bring all water use data into PI System, where we could then analyze, report and visualize all from one place

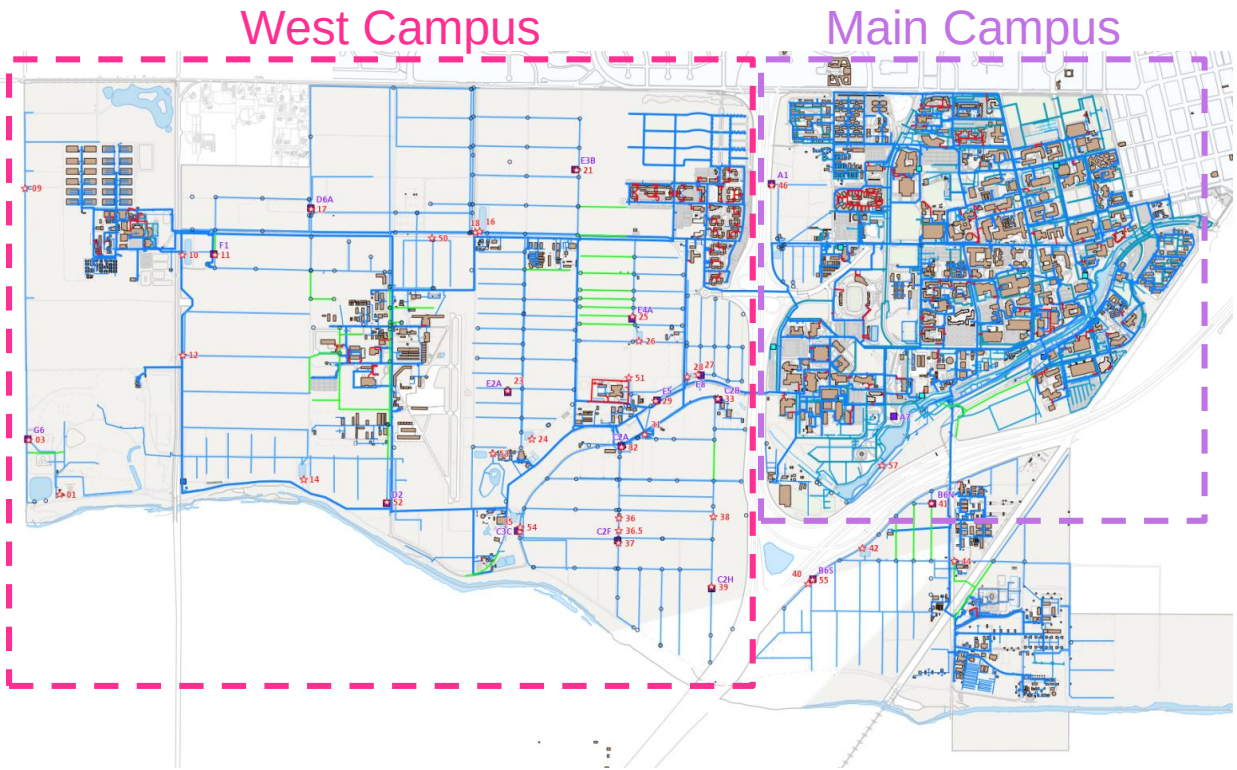
- Brought data from SCADA into PI System
- PI Manual Logger was used to bring in the manually read data
- PI DataLink brought everything together in one spreadsheet

RESULTS

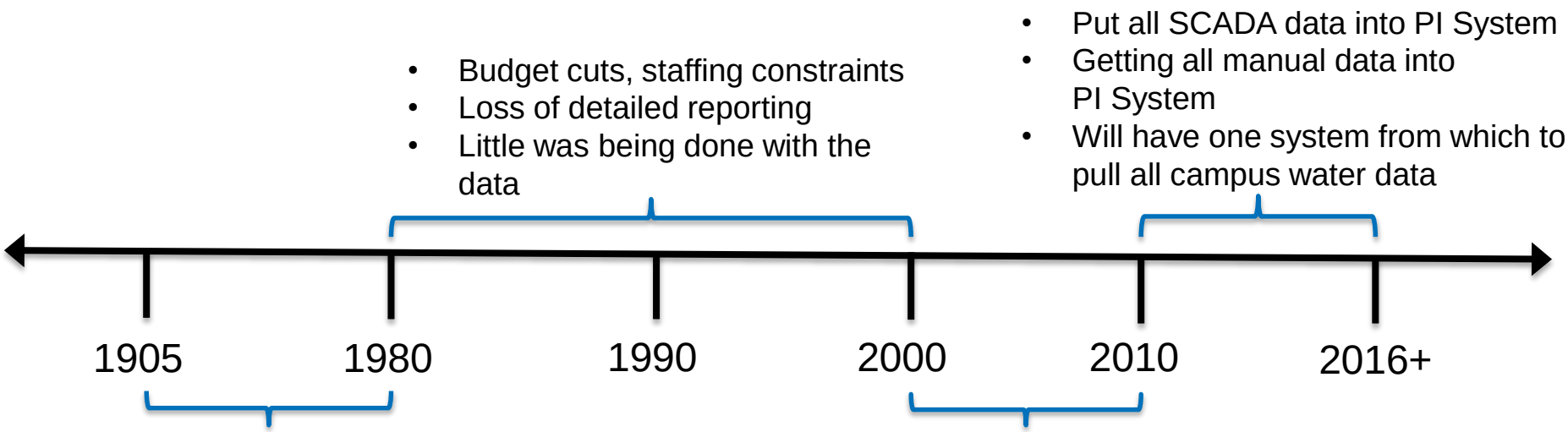
More knowledge and transparency, better reporting, automation of processes

- 351 Mgal of water saved in the last 12 months
- 25% reduction of drinking water and irrigation water between June 2015 and Feb 2016
- http://water.ucdavis.edu/#!/

UC Davis Water Systems



Historical Context



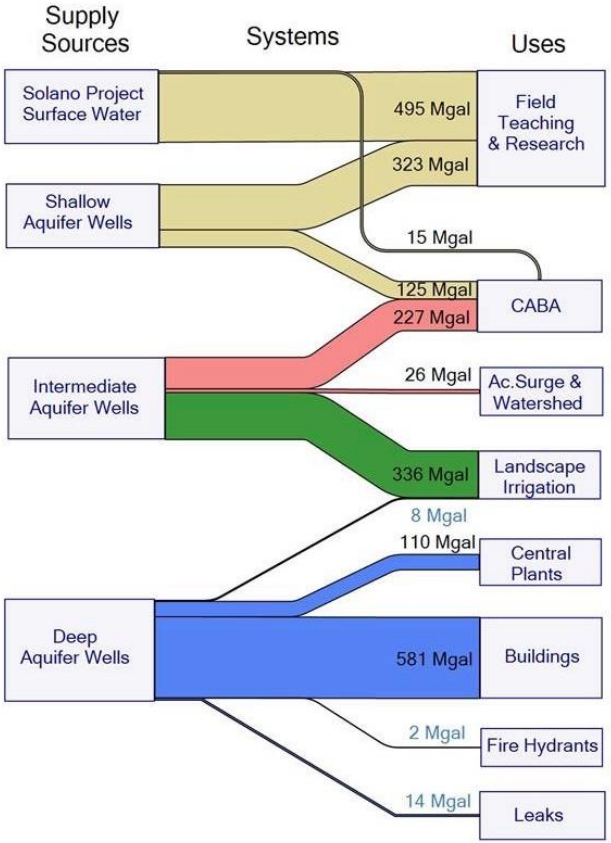
- All meters manually read
- Thorough understanding of water use
- Carefully tracked in paper systems

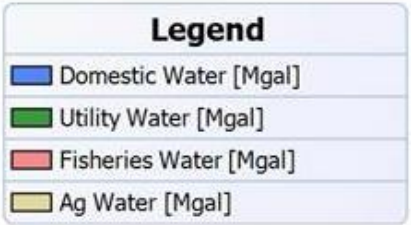
- Budget cuts, staffing constraints
- Loss of detailed reporting
- Little was being done with the data

- Began using SCADA for some water systems
- More detailed tracking began, but in multiple spreadsheets

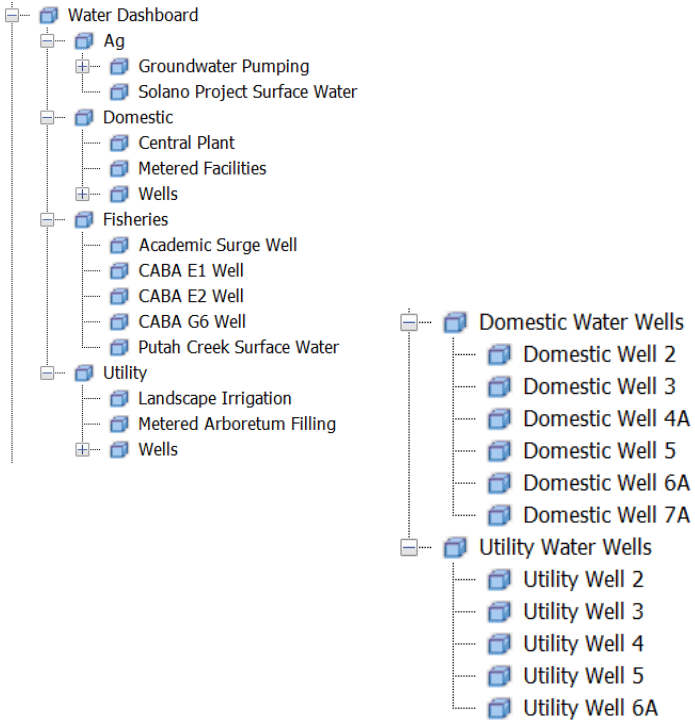
- Put all SCADA data into PI System
- Getting all manual data into PI System
- Will have one system from which to pull all campus water data

Understanding UC Davis Water Process Flow



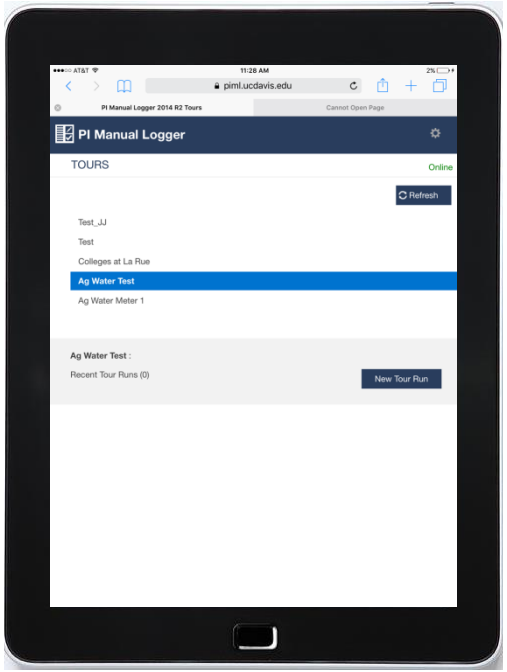


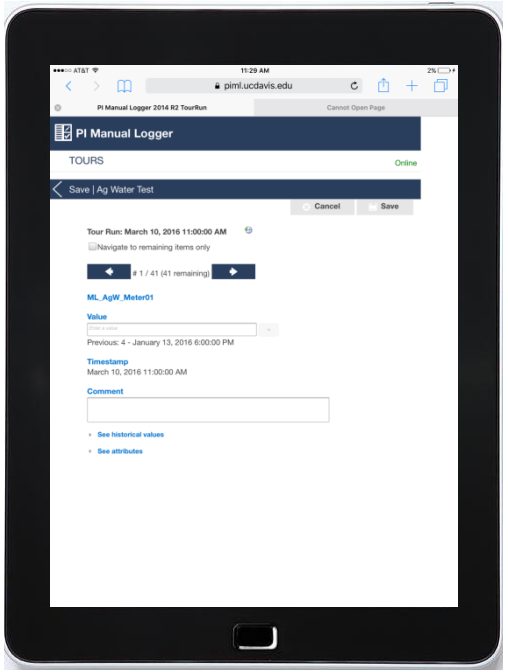
SCADA to PI System



Name	Value
Discharge Pressure	4.0062499046325684
Elevation of Top of Well Casin...	I/O Timeout
Energy Total Since Reset	166605.125
Flow Rate	353.15625
Flow Total Since Reset	213.74000549316406
Generator Running	0
Power	24
Tag Prefix	DWtr_W02##
Well Level	-191.39375305175781
Well Level Depth to Sensing Po...	I/O Timeout
Well Level Referenced to Sea L...	-93.393753051757812
Wire to Water Efficiency	55.660720825195312

Used PI Manual Logger to bring manual reads into automated system



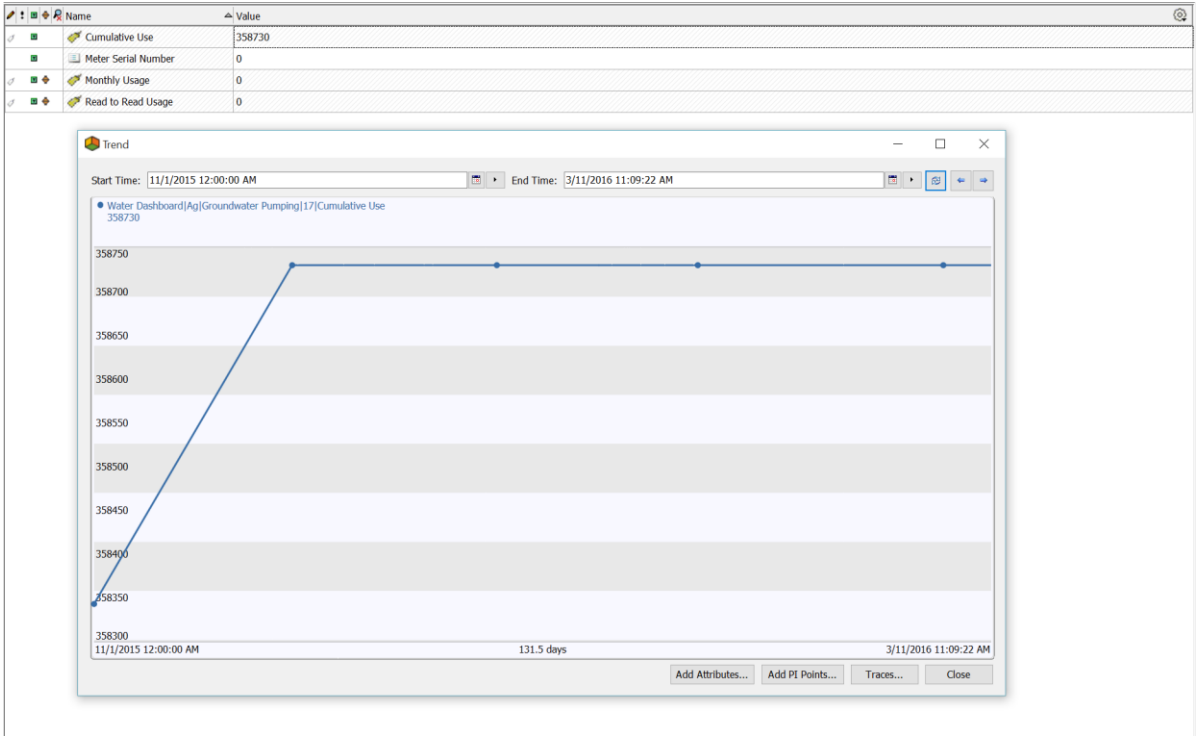


PI Asset Analytics

Example Element: Water Dashboard\Ag\Groundwater Pumping\17

Name	Expression
UsageNow	`TagVal('Cumulative Use', BOM('*'))`
UsageBOM	`TagVal('Cumulative Use', BOM(BOM('*')-1))`
MonthlyUsage	`UsageNow-UsageBOM`

Name	Expression
Variable1	`DeltaValue('Cumulative Use')`



PI DataLink Reporting

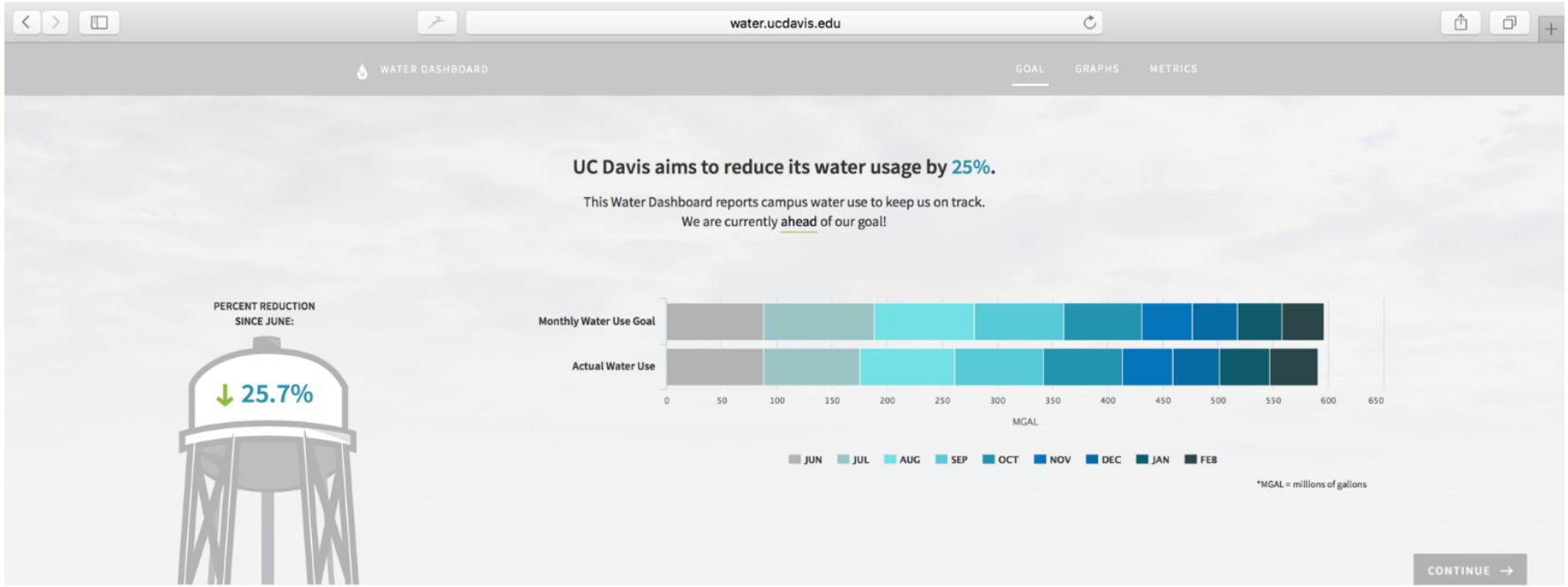
NOV	Fisheries	Academic Surge Well	2.46100	2.46100	Mgal	12/3/2012
DEC	Fisheries	Academic Surge Well	62.04600	62.04600	Mgal	1/2/2013
JAN	Fisheries	Academic Surge Well	2.38600	2.38600	Mgal	2/1/2013
FEB	Fisheries	Academic Surge Well	2.20600	2.20600	Mgal	3/1/2013
MAR	Fisheries	Academic Surge Well	2.40200	2.40200	Mgal	4/1/2013
APR	Fisheries	Academic Surge Well	2.27500	2.27500	Mgal	5/1/2013
MAY	Fisheries	Academic Surge Well	2.32400	2.32400	Mgal	6/3/2013
JUN	Fisheries	Academic Surge Well	1.84300	1.84300	Mgal	7/1/2013
JUL	Fisheries	Academic Surge Well	2.04200	2.04200	Mgal	8/1/2013
AUG	Fisheries	Academic Surge Well	2.24000	2.24000	Mgal	9/3/2013
SEP	Fisheries	Academic Surge Well	1.98100	1.98100	Mgal	10/1/2013
OCT	Fisheries	Academic Surge Well	2.26300	2.26300	Mgal	11/4/2013
NOV	Fisheries	Academic Surge Well	2.32100	2.32100	Mgal	12/2/2013
DEC	Fisheries	Academic Surge Well	2.38000	2.38000	Mgal	1/2/2014
JAN	Fisheries	Academic Surge Well	2.37900	2.37900	Mgal	2/3/2014
FEB	Fisheries	Academic Surge Well	2.09100	2.09100	Mgal	3/3/2014
MAR	Fisheries	Academic Surge Well	2.21500	2.21500	Mgal	4/1/2014
APR	Fisheries	Academic Surge Well	2.28400	2.28400	Mgal	5/1/2014
MAY	Fisheries	Academic Surge Well	2.22500	2.22500	Mgal	6/2/2014
JUN	Fisheries	Academic Surge Well	1.82100	1.82100	Mgal	6/30/2014
JUL	Fisheries	Academic Surge Well	2.04000	2.04000	Mgal	8/1/2014
AUG	Fisheries	Academic Surge Well	2.12500	2.12500	Mgal	9/2/2014
SEP	Fisheries	Academic Surge Well	2.00900	2.00900	Mgal	10/1/2014
OCT	Fisheries	Academic Surge Well	1.86100	1.86100	Mgal	11/3/2014
NOV	Fisheries	Academic Surge Well	2.05700	2.05700	Mgal	12/1/2014
DEC	Fisheries	Academic Surge Well	2.39000	2.39000	Mgal	1/2/2015
JAN	Fisheries	Academic Surge Well	2.34300	2.34300	Mgal	2/2/2015
FEB	Fisheries	Academic Surge Well	2.13700	2.13700	Mgal	3/2/2015
MAR	Fisheries	Academic Surge Well	2.25200	2.25200	Mgal	4/1/2015
APR	Fisheries	Academic Surge Well	1.54400	1.54400	Mgal	5/1/2015
MAY	Fisheries	Academic Surge Well	1.98200	1.98200	Mgal	6/1/2015
JUN	Fisheries	Academic Surge Well	2.03700	2.03700	Mgal	7/1/2015
JUL	Fisheries	Academic Surge Well	2.21400	2.21400	Mgal	8/3/2015
AUG	Fisheries	Academic Surge Well	2.00500	2.00500	Mgal	9/1/2015
SEP	Fisheries	Academic Surge Well	2.14326	2.14326	Mgal	10/1/2015
OCT	Fisheries	Academic Surge Well	2.37100	2.37100	Mgal	11/2/2015
NOV	Fisheries	Academic Surge Well	2.19000	2.19000	Mgal	12/1/2015
DEC	Fisheries	Academic Surge Well	2.61600	2.61600	Mgal	1/4/2016
JAN	Fisheries	Academic Surge Well	2.17800	2.17800	Mgal	2/1/2016
FEB	Fisheries	Academic Surge Well	2.25200	2.25200	Mgal	3/1/2016
MAR	Fisheries	Academic Surge Well		0.00000	Mgal	
APR	Fisheries	Academic Surge Well		0.00000	Mgal	

Converted
Calendarized

Drought Response Monthly Tracking Sheet

	Date		Domestic Water				Grounds Use			Fisheries						Field Teaching and Research				
	Month	Year	Central Plants	Metered Facilities	Unmetered Use	Total	Landscape Irrigation and Unmetered Arboretum Filling	Metered Arboretum Waterway Filling	Total	Academic Surge Well	CABA G6 Well	Putah Creek Surface Water	CABA E1 Well	CABA E2 Well	Total	Solano Project Surface Water	Ground water Pumping	Total	and Total
1/1/2013	JAN	2013	3.87	16.29	27.71	**47.87**	5.90		**5.90**	4.45	10.46	4.83	21.56		**41.30**	-	0.36	**0.36**	***95.42***
2/1/2013	FEB	2013	3.95	15.73	24.69	**44.38**	6.36		**6.36**	2.21	10.07	0.29	19.41		**31.98**	0.21	2.70	**2.91**	***85.63***
3/1/2013	MAR	2013	6.27	15.91	29.98	**52.16**	16.67		**16.67**	2.40	10.81	0.62	20.96		**34.80**	6.54	7.07	**13.61**	***117.24***
4/1/2013	APR	2013	9.02	20.46	30.90	**60.39**	23.76		**23.76**	2.28	10.89	-	19.95		**33.12**	35.47	18.12	**53.59**	***170.86***
5/1/2013	MAY	2013	11.36	23.70	33.27	**68.34**	44.43		**44.43**	2.18	10.11	-	19.38		**31.67**	102.28	34.55	**136.83**	***281.26***
6/1/2013	JUN	2013	14.38	19.79	35.32	**69.49**	48.76		**48.76**	1.98	11.47	-	18.11		**31.57**	147.24	46.25	**193.49**	***343.30***
7/1/2013	JUL	2013	15.20	21.02	38.19	**74.40**	58.87		**58.87**	2.04	10.69	-	17.94		**30.67**	104.98	35.57	**140.55**	***304.49***
8/1/2013	AUG	2013	13.03	18.21	37.22	**68.47**	53.43		**53.43**	2.10	9.83	-	17.86		**29.79**	63.07	28.06	**91.14**	***242.83***
9/1/2013	SEP	2013	9.16	20.01	34.53	**63.70**	44.99		**44.99**	2.12	10.75	-	17.71		**30.58**	31.14	21.21	**52.34**	***191.61***
10/1/2013	OCT	2013	6.51	23.37	38.10	**67.98**	26.05		**26.05**	2.06	9.32	1.00	18.63		**31.01**	3.71	7.98	**11.68**	***136.73***
11/1/2013	NOV	2013	3.39	17.35	28.51	**49.25**	11.68		**11.68**	2.44	10.44	3.07	18.03		**33.97**	-	8.63	**8.63**	***103.53***
12/1/2013	DEC	2013	4.04	17.16	26.84	**48.04**	6.88		**6.88**	2.39	9.74	4.99	18.03		**35.15**	-	10.12	**10.12**	***100.19***
1/1/2014	JAN	2014	3.83	16.74	32.19	**52.76**	6.66		**6.66**	2.31	10.07	4.83	17.47		**34.67**	3.26	11.94	**15.20**	***109.29***
2/1/2014	FEB	2014	3.80	15.11	28.41	**47.31**	4.47		**4.47**	2.09	10.31	0.29	17.85		**30.55**	16.68	8.17	**24.84**	***107.17***
3/1/2014	MAR	2014	5.00	16.38	32.89	**54.27**	5.93		**5.93**	2.36	11.15	0.62	19.30		**33.43**	5.28	4.78	**10.06**	***103.69***
4/1/2014	APR	2014	7.22	21.18	33.56	**61.97**	12.21		**12.21**	2.28	10.41	-	17.94		**30.63**	20.60	5.33	**25.94**	***130.74***
5/1/2014	MAY	2014	10.85	22.85	41.46	**75.16**	34.45		**34.45**	2.16	10.08	-	17.42		**29.66**	104.57	26.93	**131.50**	***270.77***
6/1/2014	JUN	2014	11.53	19.72	40.95	**72.20**	42.62	0.06	**42.68**	1.95	11.06	-	14.52		**27.53**	174.00	34.89	**208.89**	***351.30***
7/1/2014	JUL	2014	12.81	20.51	41.57	**74.89**	44.49	5.27	**49.76**	1.98	10.08	-	13.59		**25.65**	161.43	34.80	**196.23**	***346.53***
8/1/2014	AUG	2014	10.96	15.83	43.02	**69.81**	40.06	1.96	**42.02**	2.06	10.08	-	13.58		**25.72**	78.71	38.17	**116.89**	***254.45***
9/1/2014	SEP	2014	9.73	17.13	38.17	**65.04**	29.99	11.60	**41.59**	2.08	10.73	-	12.97		**25.78**	45.56	25.92	**71.48**	***203.89***
10/1/2014	OCT	2014	7.25	20.22	38.11	**65.58**	19.73	0.02	**19.75**	1.75	9.78	1.00	13.67		**26.20**	3.48	9.75	**13.23**	***124.76***
11/1/2014	NOV	2014	2.11	13.88	32.87	**48.85**	4.98		**4.98**	2.17	11.04	3.07	13.31		**29.59**	-	9.37	**9.37**	***92.80***
12/1/2014	DEC	2014	3.53	14.07	22.57	**40.17**	2.63		**2.63**	2.32	10.08	4.99	14.11		**31.50**	-	0.69	**0.69**	***74.99***
1/1/2015	JAN	2015	2.86	14.58	26.00	**43.44**	3.32		**3.32**	2.34	10.40	4.83	14.31		**31.88**	-	2.25	**2.25**	***80.90***
2/1/2015	FEB	2015	3.13	14.57	22.59	**40.28**	3.69		**3.69**	2.14	10.37	0.29	12.89		**25.68**	0.74	3.69	**4.44**	***74.09***
3/1/2015	MAR	2015	4.92	15.72	29.15	**49.79**	13.65		**13.65**	2.33	15.35	0.62	14.10		**32.39**	13.80	13.48	**27.28**	***123.11***
4/1/2015	APR	2015	7.79	19.25	25.93	**52.98**	18.52		**18.52**	1.54	12.78	-	13.17		**27.50**	49.73	23.22	**72.95**	***171.94***
5/1/2015	MAY	2015	6.32	19.33	29.11	**54.76**	26.12		**26.12**	1.98	12.68	-	11.02		**25.68**	116.50	28.02	**144.52**	***251.08***
6/1/2015	JUN	2015	7.85	25.06	27.16	**60.07**	28.10		**28.10**	2.04	11.76	-	10.40		**24.19**	108.65	24.76	**133.40**	***245.76***
7/1/2015	JUL	2015	4.17	22.66	29.82	**56.65**	30.50		**30.50**	2.08	13.61	-	7.28		**22.96**	89.49	36.71	**126.20**	***236.32***
8/1/2015	AUG	2015	5.14	14.56	35.40	**55.10**	31.35		**31.35**	2.14	13.07	-	0.47	17.59	**33.27**	51.21	38.04	**89.26**	***208.98***
9/1/2015	SEP	2015	6.13	17.27	28.89	**52.29**	28.25		**28.25**	2.14	12.13	-	-	18.55	**32.82**	25.09	11.22	**36.31**	***149.67***
10/1/2015	OCT	2015	5.51	15.66	32.03	**53.20**	18.05		**18.05**	2.30	12.80	1.00	-	17.38	**33.48**	-	6.34	**6.34**	***111.07***
11/1/2015	NOV	2015	2.68	14.75	23.48	**40.92**	4.90		**4.90**	2.26	13.56	3.07	0.03	15.71	**34.63**	-	1.55	**1.55**	***82.00***
12/1/2015	DEC	2015	3.43	13.93	20.89	**38.25**	3.98		**3.98**	2.39	15.11	4.99	-	18.22	**40.71**	-	0.01	**0.01**	***82.95***
1/1/2016	JAN	2016	-	-	43.04	**43.04**	3.29	-	**3.29**	2.41	10.61	4.83	0.05	19.18	**37.08**	-	0.09	**0.09**	***83.50***
2/1/2016	FEB	2016	-	-	40.17	**40.17**	3.52	-	**3.52**	2.25	13.34	0.29	-	16.13	**32.01**	-	-	-	***75.70***
3/1/2016	MAR	2016	-	-	-	**0**	0	-	-	0	0	0	0	0	-	0	-	-	-
4/1/2016	APR	2016	-	-	-	**0**	0	-	-	0	0	0	0	0	-	0	-	-	-
5/1/2016	MAY	2016	-	-	-	**0**	0	-	-	0	0	0	0	0	-	0	-	-	-
6/1/2016	JUN	2016	-	-	-	**0**	0	-	-	0	0	0	0	0	-	0	-	-	-
7/1/2016	JUL	2016	-	-	-	**0**	0	-	-	0	0	0	0	0	-	0	-	-	-
8/1/2016	AUG	2016	-	-	-	**0**	0	-	-	0	0	0	0	0	-	0	-	-	-
9/1/2016	SEP	2016	-	-	-	**0**	0	-	-	0	0	0	0	0	-	0	-	-	-
10/1/2016	OCT	2016	-	-	-	**0**	0	-	-	0	0	0	0	0	-	0	-	-	-
11/1/2016	NOV	2016	-	-	-	**0**	0	-	-	0	0	0	0	0	-	0	-	-	-
12/1/2016	DEC	2016	-	-	-	**0**	0	-	-	0	0	0	0	0	-	0	-	-	-

UC Davis Water Dashboard



UCDAVIS
OFFICE OF THE VICE CHANCELLOR AND CHIEF FINANCIAL OFFICER
Finance, Operations and Administration

Due to the drought, UC Davis has set the goal to reduce potable and landscape irrigation water use by 25% (relative to 2013 use). The chart above tracks our progress towards this goal for the state-specified compliance period of June 2015 through February 2016.

Do you know how much energy your campus building is using? Find out on **ceed.ucdavis.edu**.

UC Davis Water Dashboard

UCDAVIS
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Domestic Water
Water used for campus buildings and central plant heating and cooling systems

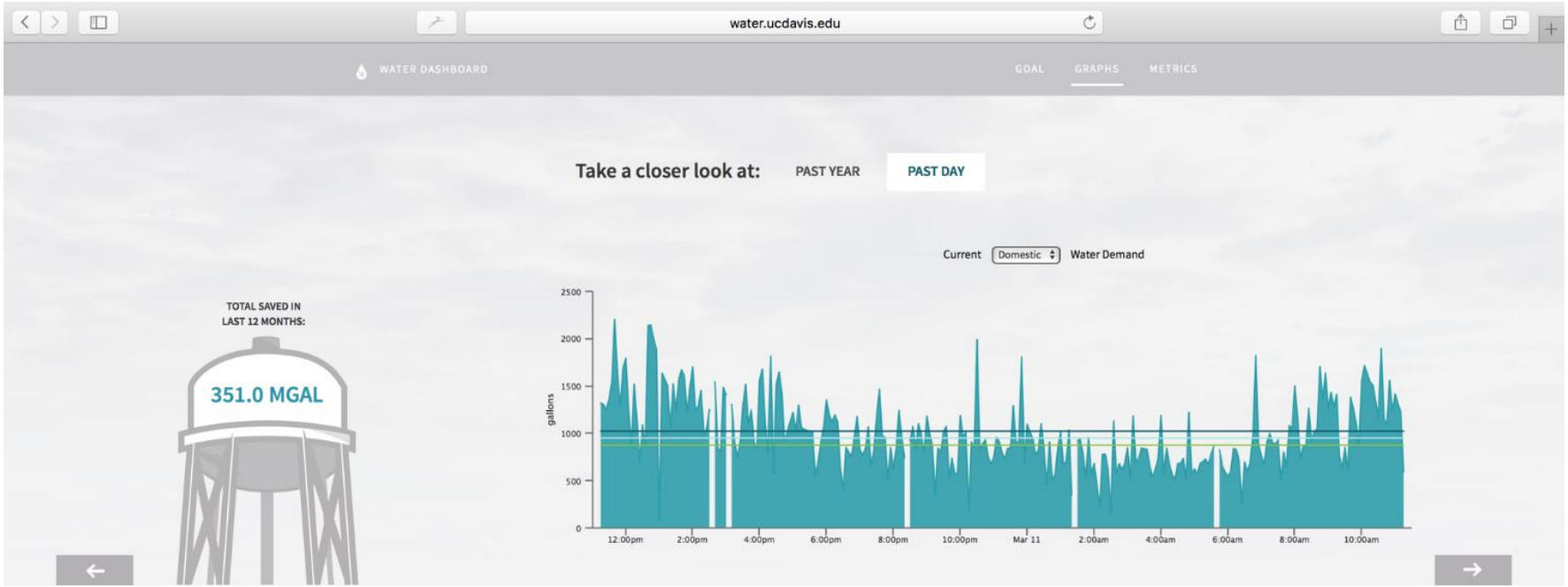
Agriculture Water
Water used primarily for agricultural research

Utility Water
Water used primarily for landscape irrigation

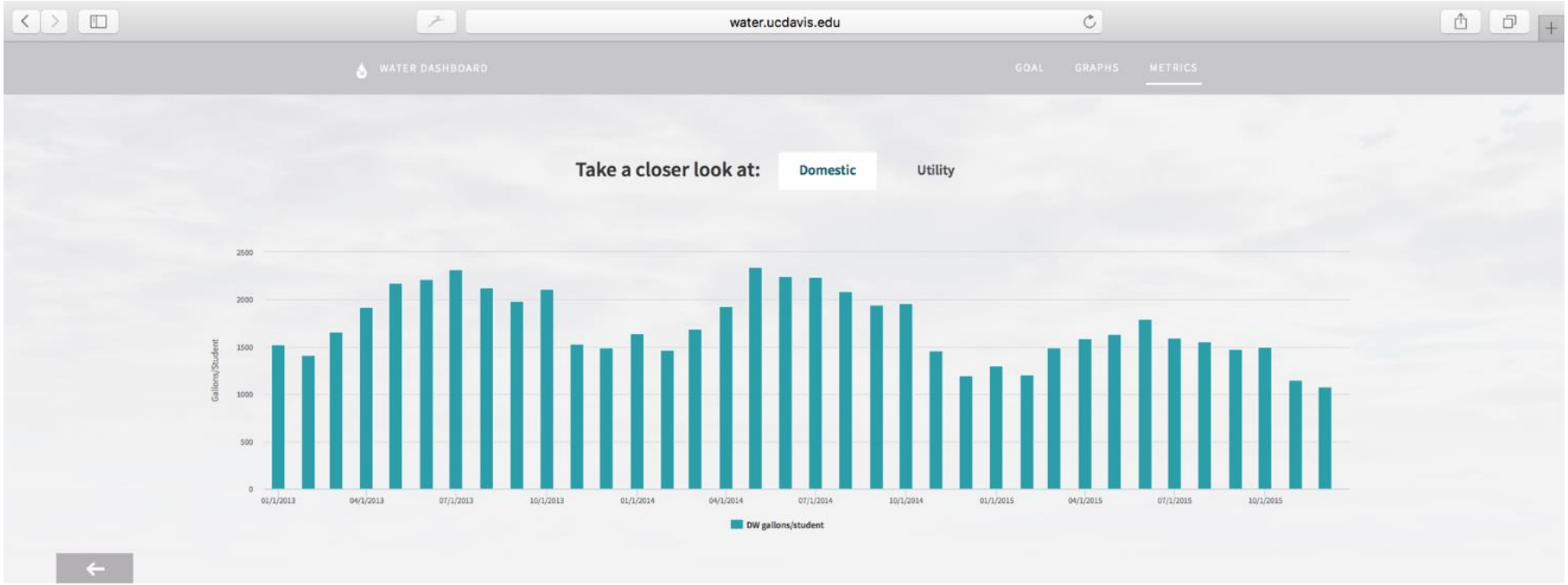
Fisheries Water
Water used for fisheries research

Goal
Our 25% reduction goal

UC Davis Water Dashboard



UC Davis Water Dashboard



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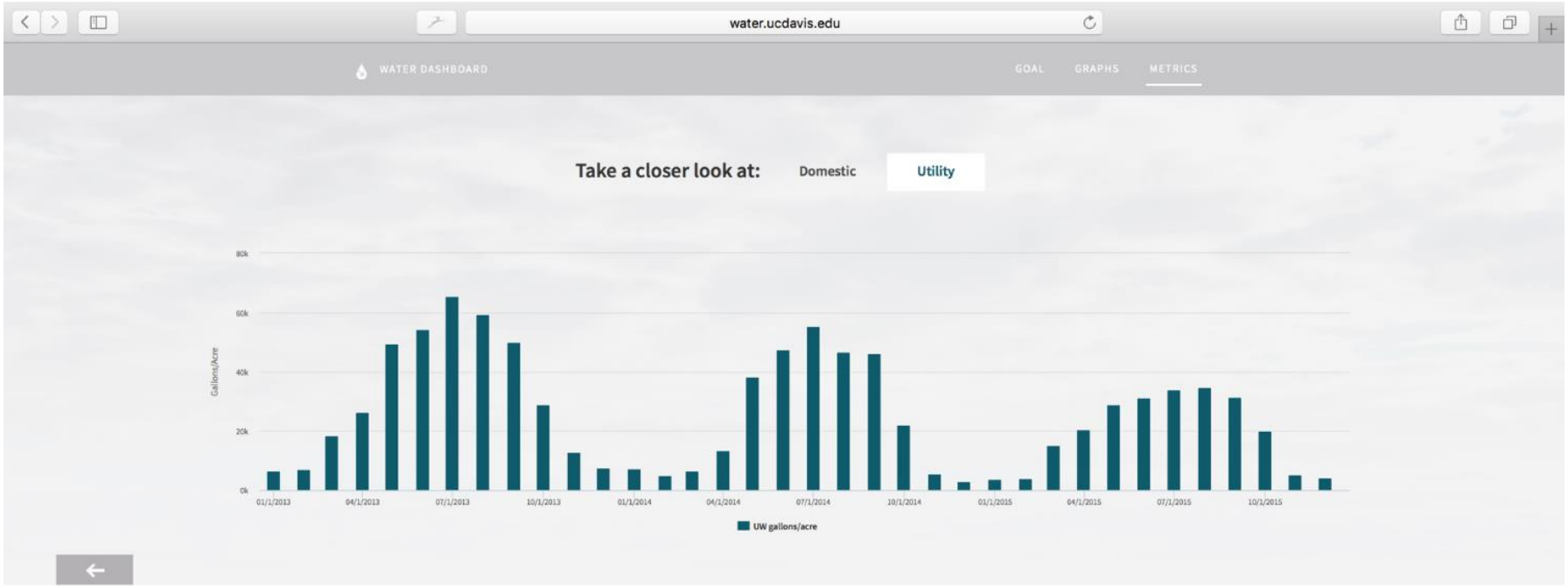
Finance, Operations and Administration

Domestic Water
Water used for campus buildings and central plant heating and cooling systems

Utility Water
Water used primarily for landscape irrigation

UC Davis Water Dashboard



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Finance, Operations and Administration

Domestic Water
Water used for campus buildings and central plant heating and cooling systems

Utility Water
Water used primarily for landscape irrigation

Savings results

Water Use Data for Emergency Drought Regulation Compliance Period (Mgal)

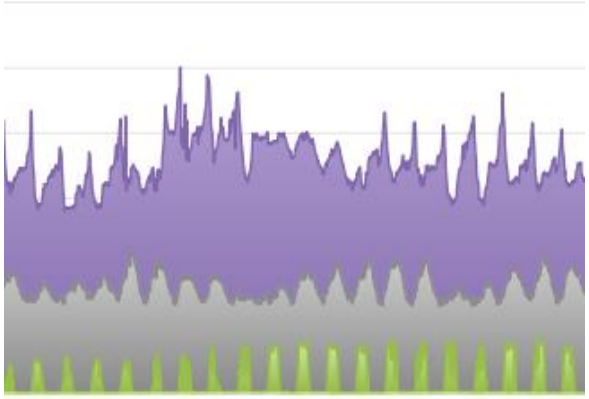
Month	Domestic		Utility		Domestic + Utility		Savings	
	2013	2015-16	2013	2015-16	2013	2015-16	Amount	%
JUN	69.49	60.07	48.76	28.10	118.25	88.17	30.08	25.44%
JUL	74.40	56.65	58.87	30.50	133.27	87.16	46.11	34.60%
AUG	68.47	55.10	53.43	31.35	121.89	86.46	35.44	29.07%
SEP	63.70	52.29	44.99	28.25	108.69	80.54	28.15	25.90%
OCT	67.98	53.20	26.05	18.05	94.03	71.25	22.78	24.23%
NOV	49.25	40.92	11.68	4.90	60.94	45.82	15.12	24.81%
DEC	48.04	38.25	6.88	3.98	54.92	42.23	12.68	23.10%
JAN	47.87	43.04	5.90	3.29	53.76	46.33	7.43	13.83%
FEB	44.38	40.17	6.36	3.52	50.74	43.69	7.05	13.89%
				Total:	**796.48**	**591.62**	**204.86**	**25.72%**

Key savings enabled by having the data

- Landscape irrigation (turf replacement, etc):
  - **84 Mgal Savings** in 2014 compared to 2013
- Recycled water into arboretum (permit modification):
  - **19 Mgal Savings** per year compared to 2014
- Recycled water into cooling towers:
  - **61 Mgal Savings** per year compared to 2014
- Higher cooling tower cycles:
  - Modified air permit and implemented chemical feed
- Fisheries well controls repair (most of their savings)

Whole-Campus Energy: Our Energy Story

Creating an Energy Dashboard using PI System Data



COMPANY and GOAL

Optimize Water and Energy Operations with Data Visualization and Reporting

CHALLENGE

Whole-campus energy data was not available to members of the campus or the public.

- Where does our energy come from?
- New solar farm, energy production should be visible.

SOLUTION

Develop in-house an energy dashboard using data centralized in the PI System.

- Team consisting of Engineers, Data Analyst, UX Designer, and Computer Scientists

RESULTS

Our web dashboard has been shared throughout campus as well as by the Chancellor and Vice Chancellor at UC Davis

- ceed.ucdavis.edu/#!/energystory
- Also integrated with Campus Energy Education Dashboard

Challenge - Energy data unshared and static

One large Excel spreadsheet

- Static, historical data

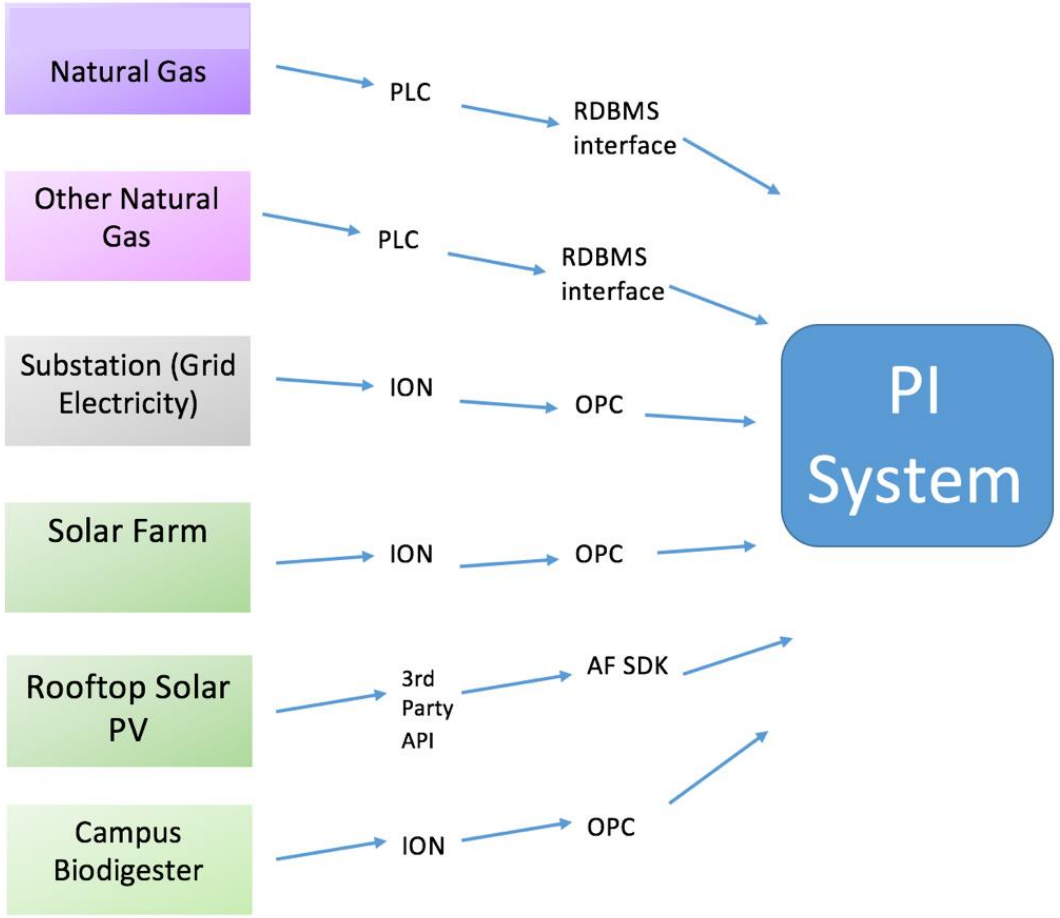
Used by small group of people

- Energy Planning, Billing

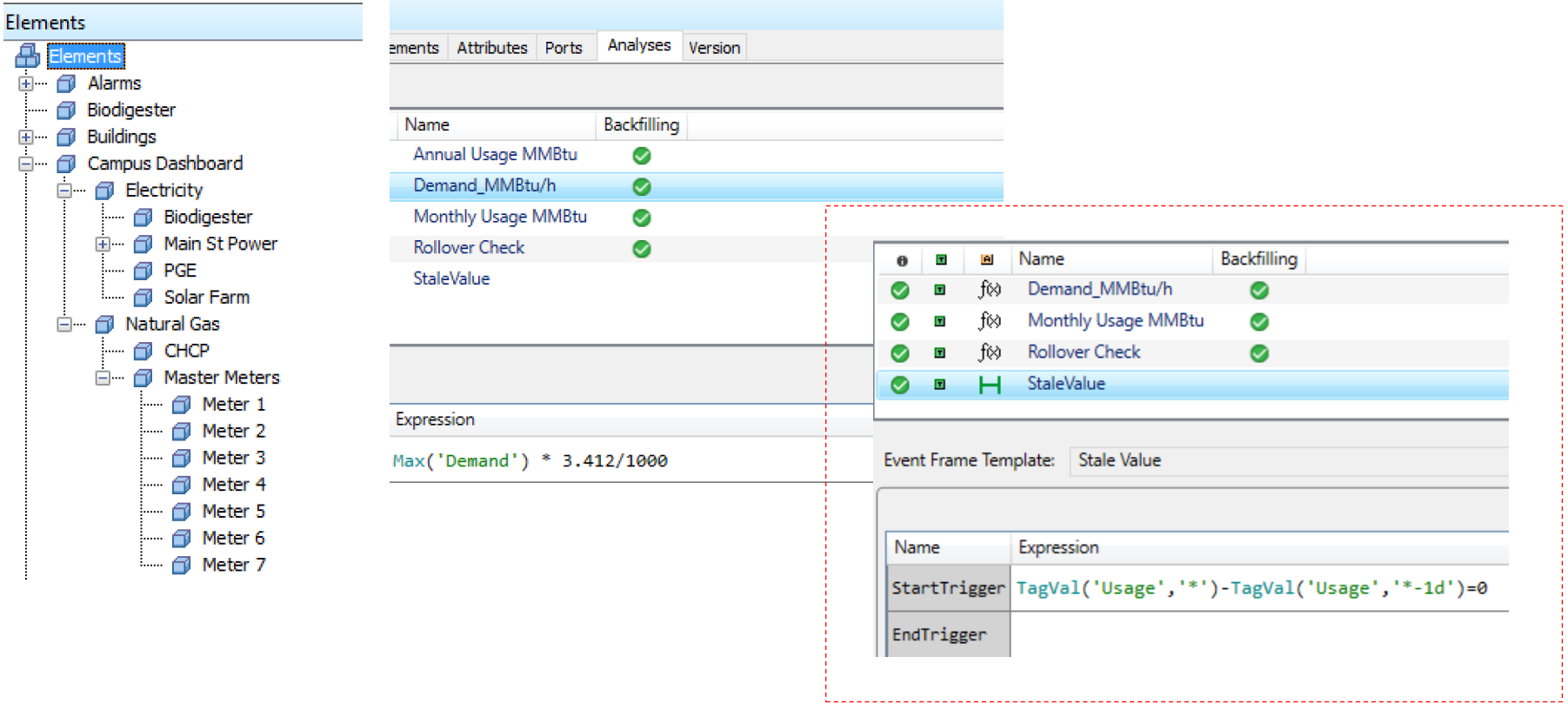
Outside of this group, few people knew where to find data

- Not available to public

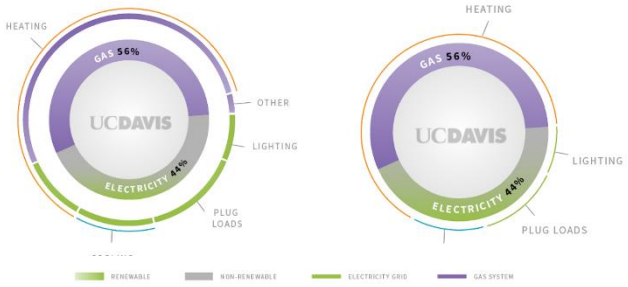
Data Integration

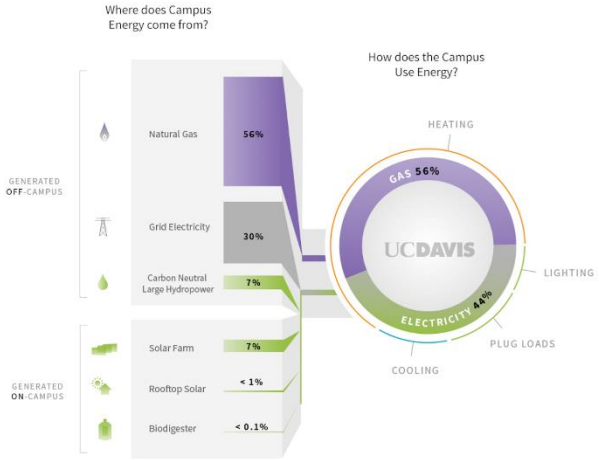


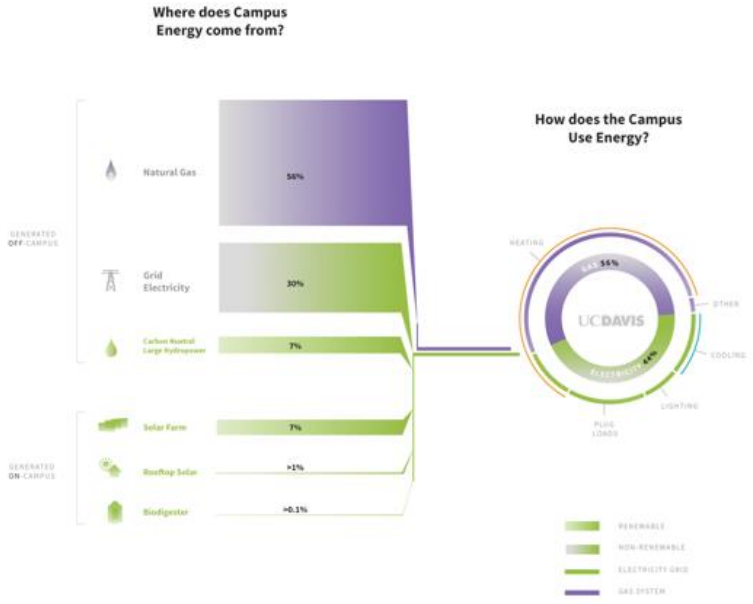
Used Asset Framework and Asset Analytics



Collaborated with designer and computer scientists to create dashboard







Demo:

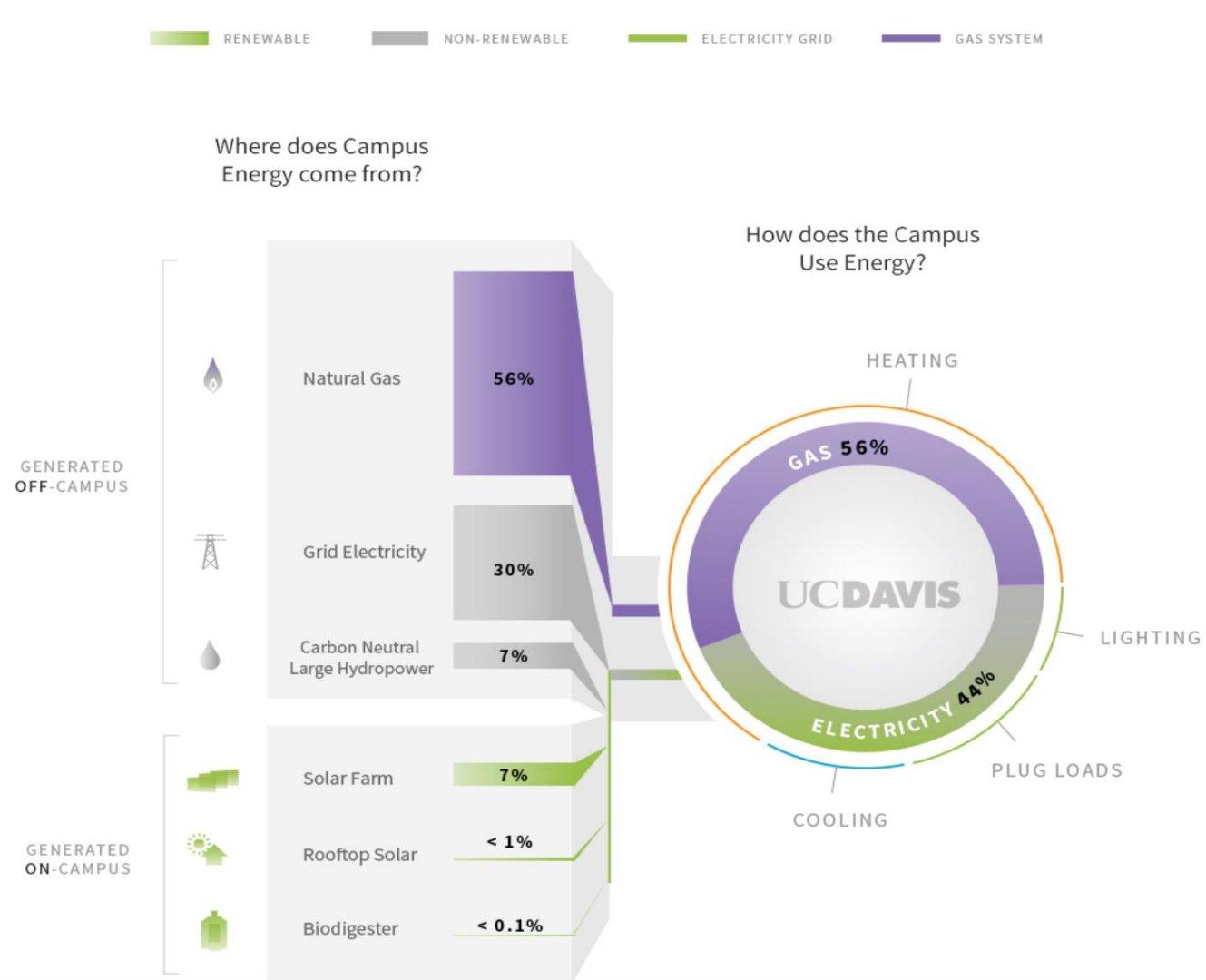
ceed.ucdavis.edu/#!/energystory

Our Energy Story

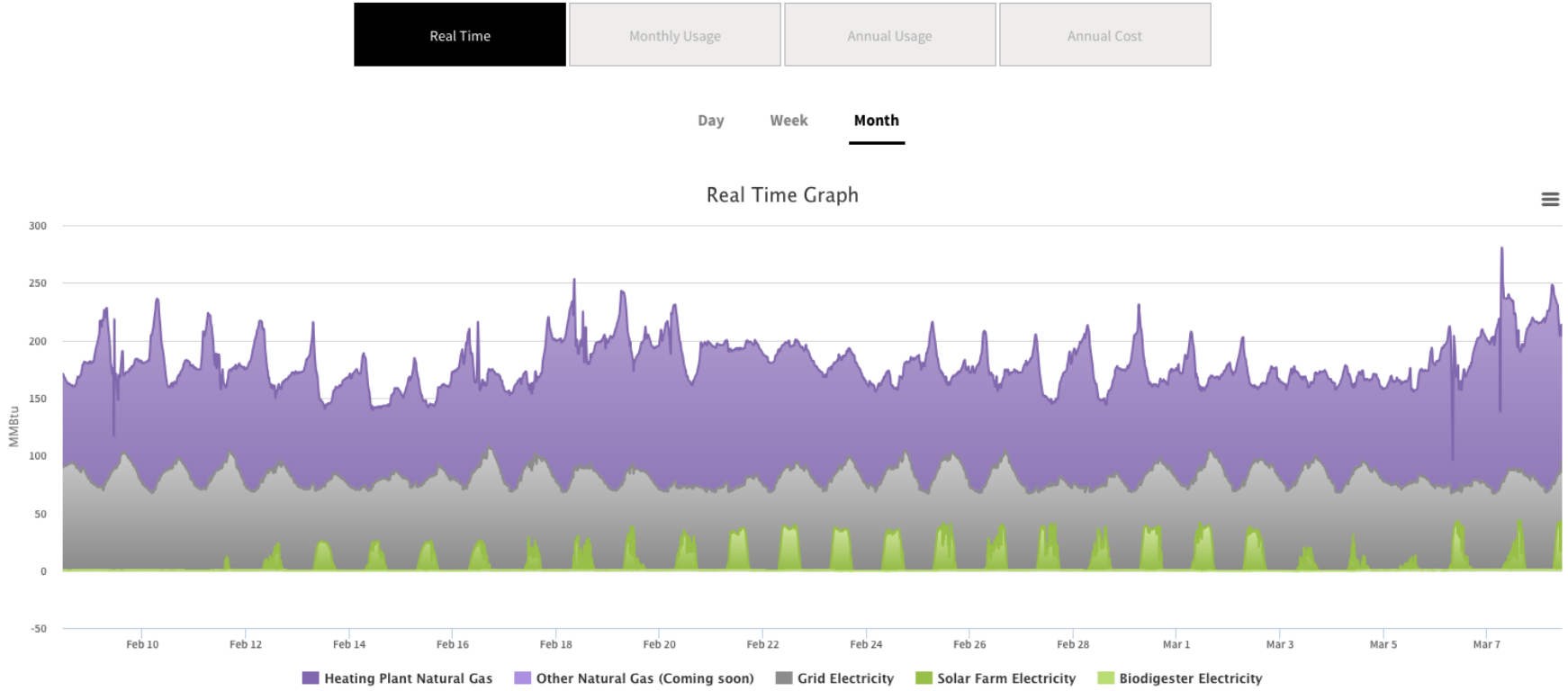
A Subtitle

- Overview
- Metrics
- Graphs

- Campus Energy Map
- Water Dashboard

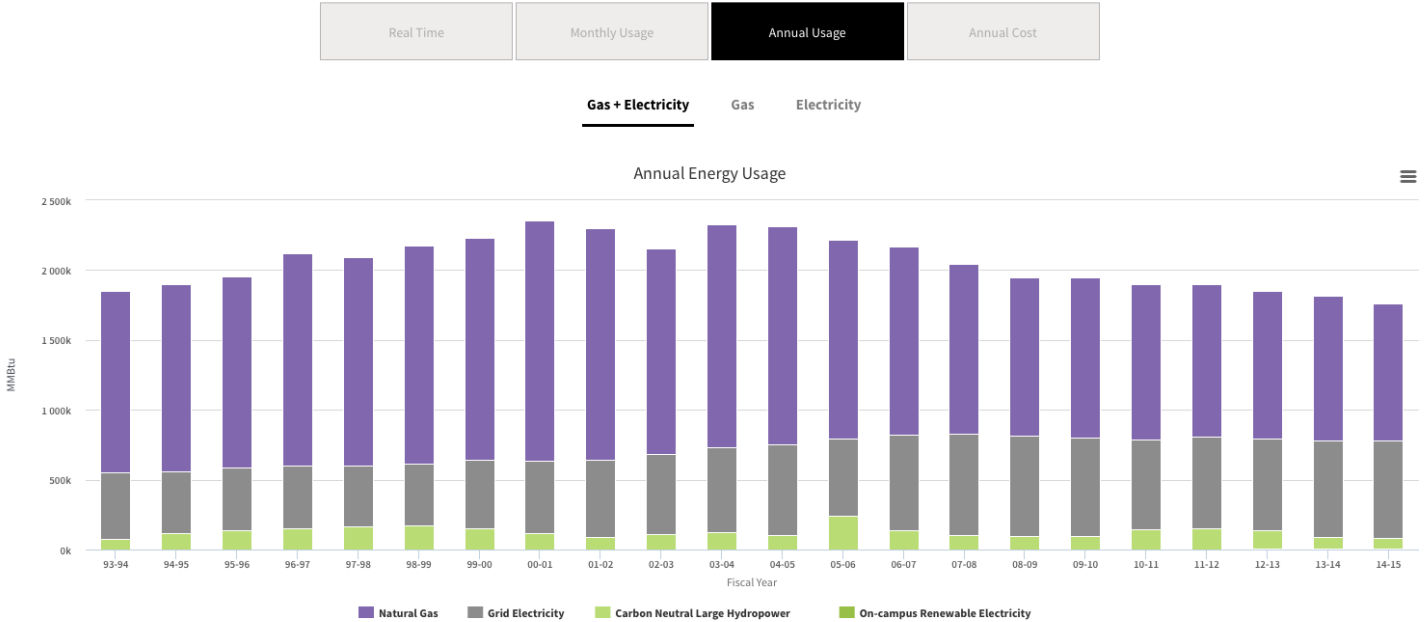


Real-time demand graph



Monthly Usage

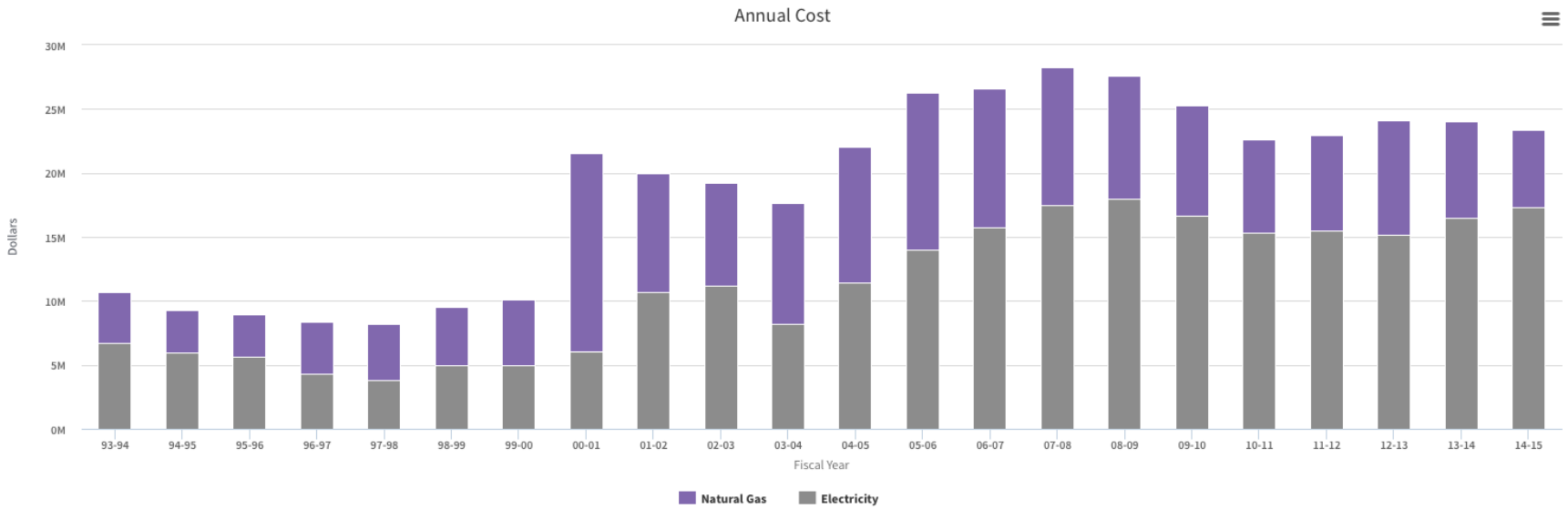
Annual Usage



UC Davis is using less energy today than twenty years ago. This reduction occurred concurrent with a period of large campus growth (over 2.6M square feet of new building space and 6,300 additional students). Campus energy use steadily increased from fiscal year 1993-94 until fiscal year 00-01, when the California energy crisis occurred, causing campus annual energy costs to more than double. The increased financial pressure plus a new focus on reducing greenhouse gas emissions prompted the University to make significant investments in infrastructure, implement extensive energy conservation measures in existing buildings, and further commit to the construction of highly-efficient new buildings. Total campus energy use has been steadily dropping since 2001. Savings can largely be attributed to building energy projects, connecting buildings to the Central Plant, and Central Plant efficiency improvements.

Annual Cost

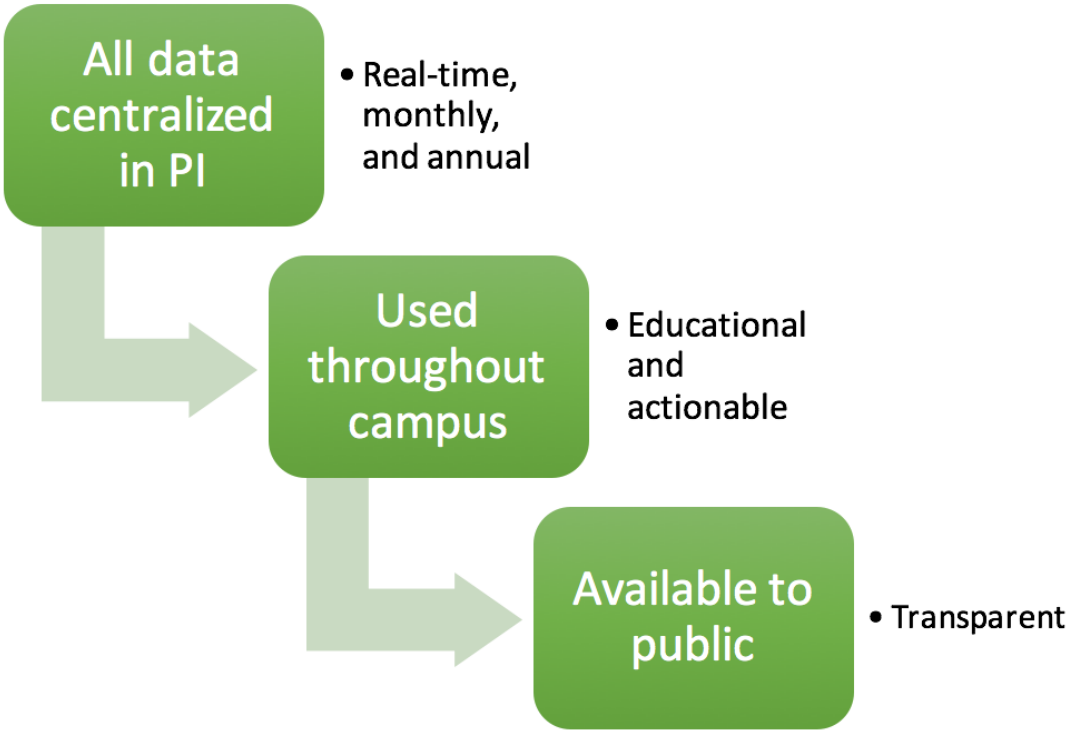
Real Time | Monthly Usage | Annual Usage | **Annual Cost**



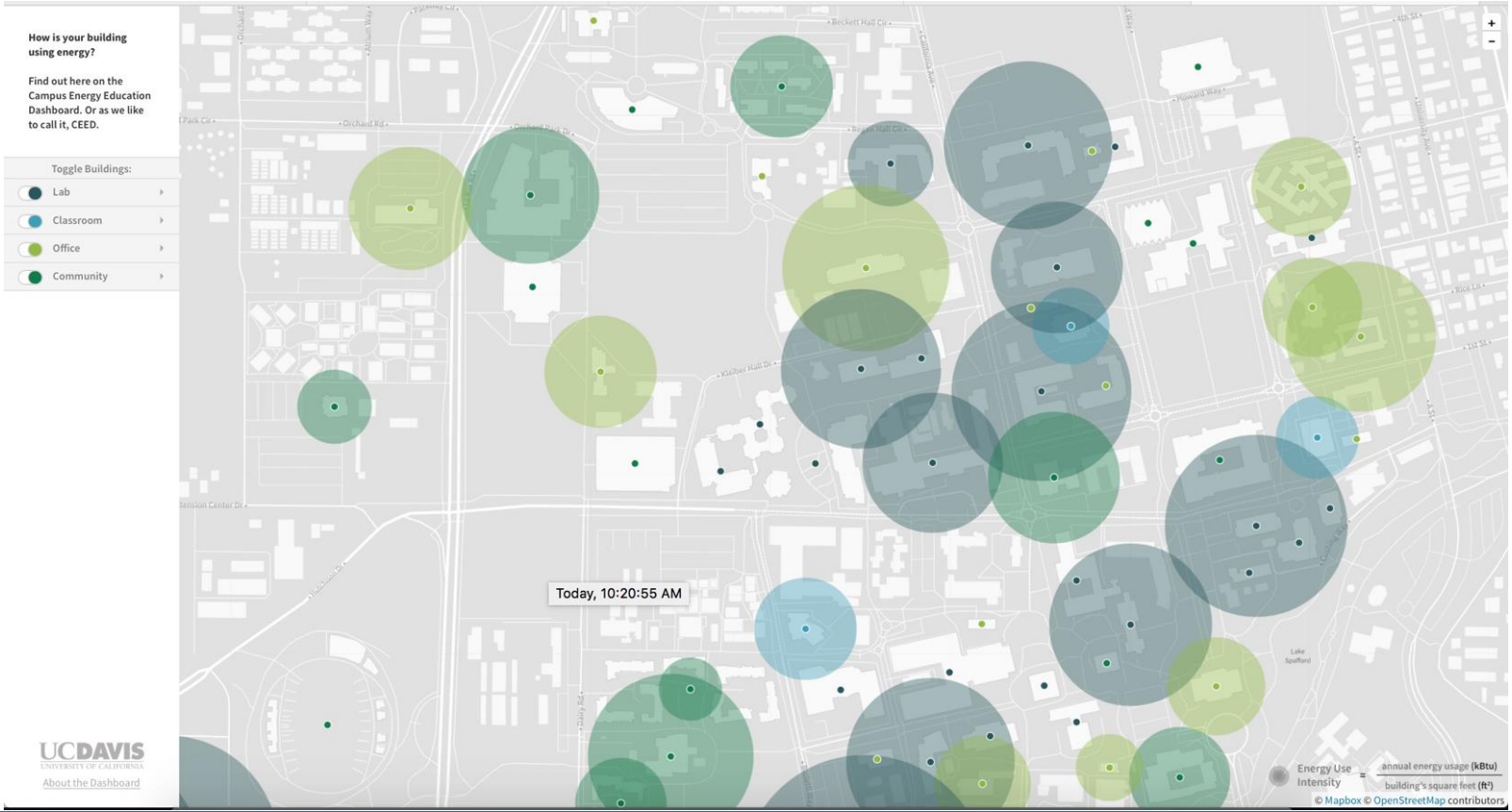
The costs for electricity and gas have varied considerably over the years given market conditions and campus-specific contractual issues. Campus energy costs peaked in FY07-08 at $28.2M. Energy costs for fiscal year 11-12 through the present include financing fees to pay for past energy projects and allowances that were purchased for greenhouse gas emissions under California's Cap and Trade Program.

Energy Metrics

Value Added



Campus Energy Education Dashboard (CEED)



CEED Live Building Data

Ongoing commissioning through Automated Fault Detection and Diagnostics

COMPANY and GOAL

Optimize Water and Energy Operations with Data Visualization and Reporting

UCDAVIS FACILITIES MANAGEMENT

eco energy conservation office

CHALLENGE

Actively engage with data to monitor building performance

- How to go above and beyond spreadsheets?
- How to create insightful trends and reports?

SOLUTION

Import Data from BMS to PI System

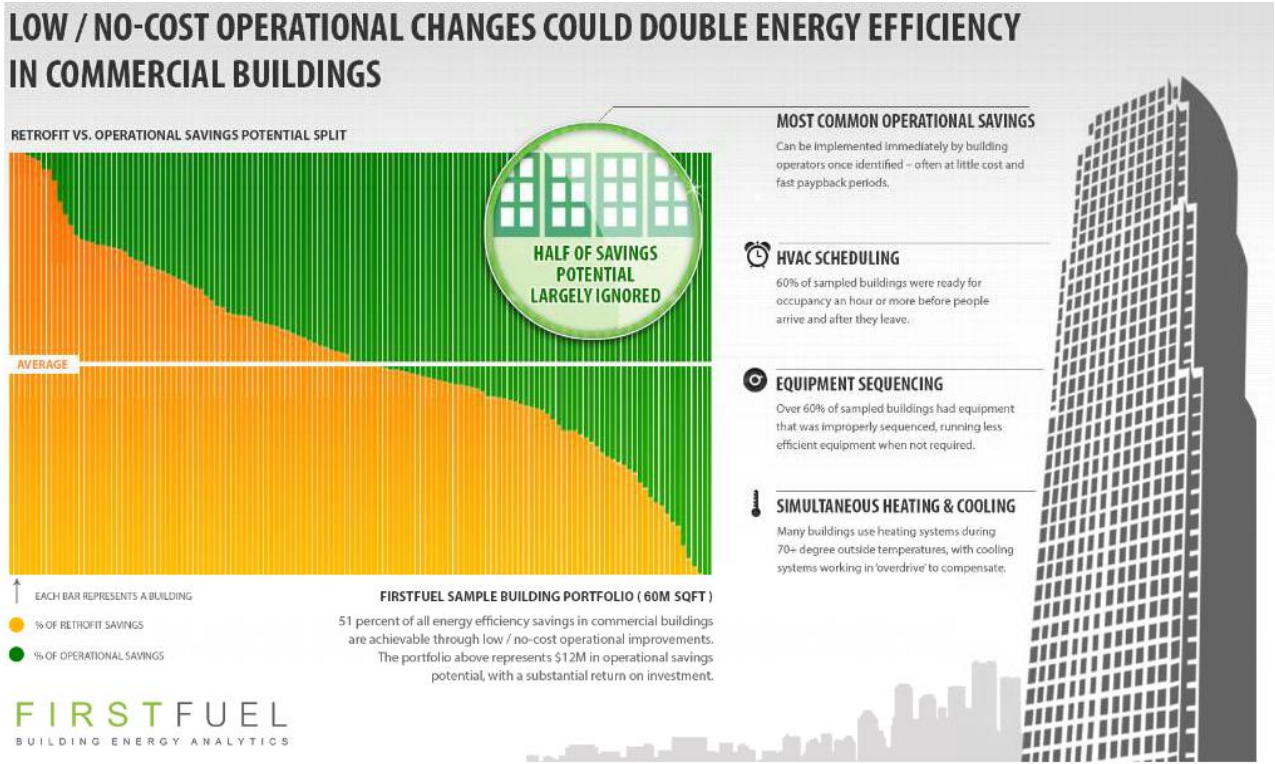
- Pilot on two buildings
- Build Asset Analytics, Event Frames and PI Coresight Displays

RESULTS

Data Driven System for Monitoring HVAC Operations

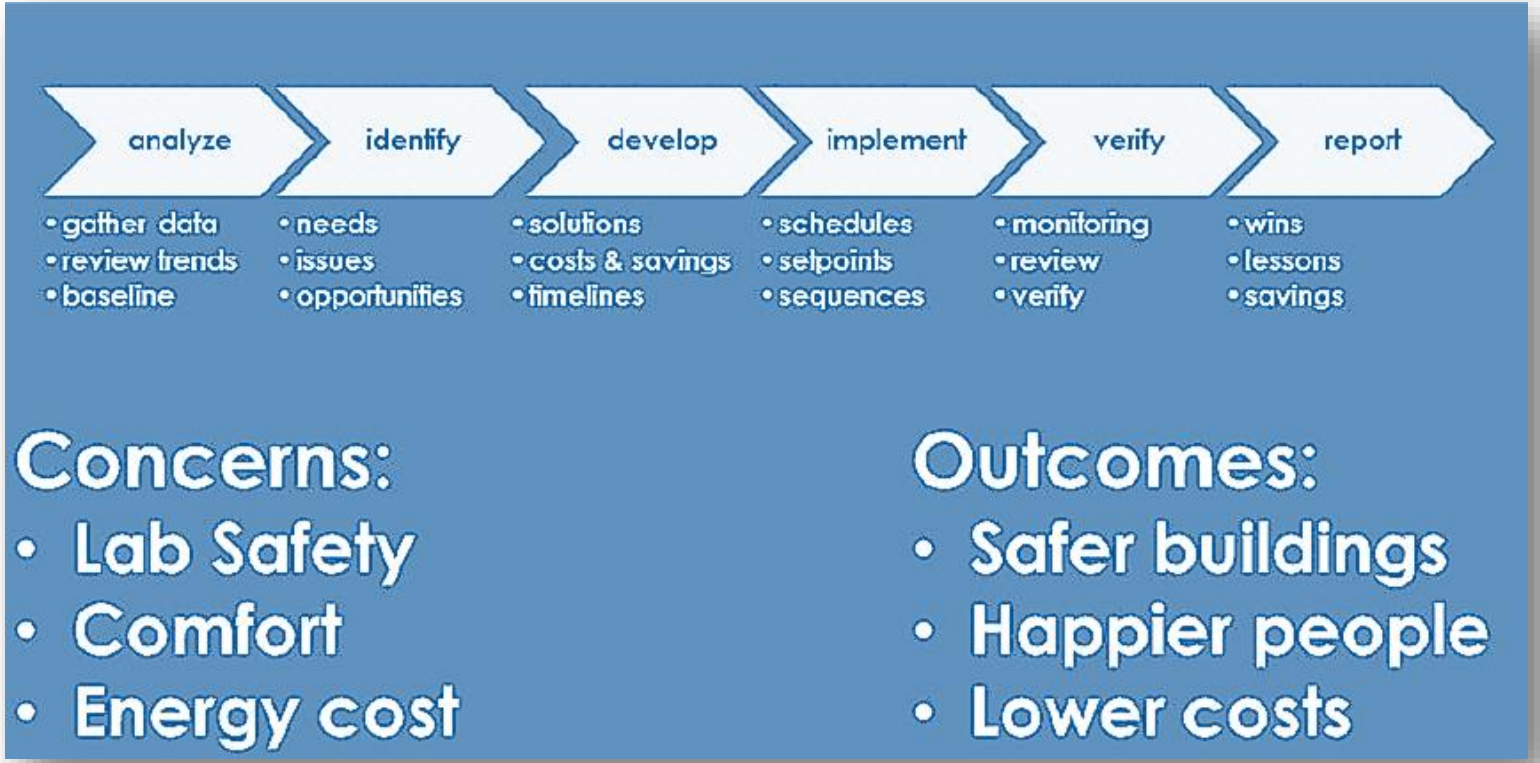
- A scalable process of baselining, commissioning and measuring

Why Ongoing Commissioning Matters?

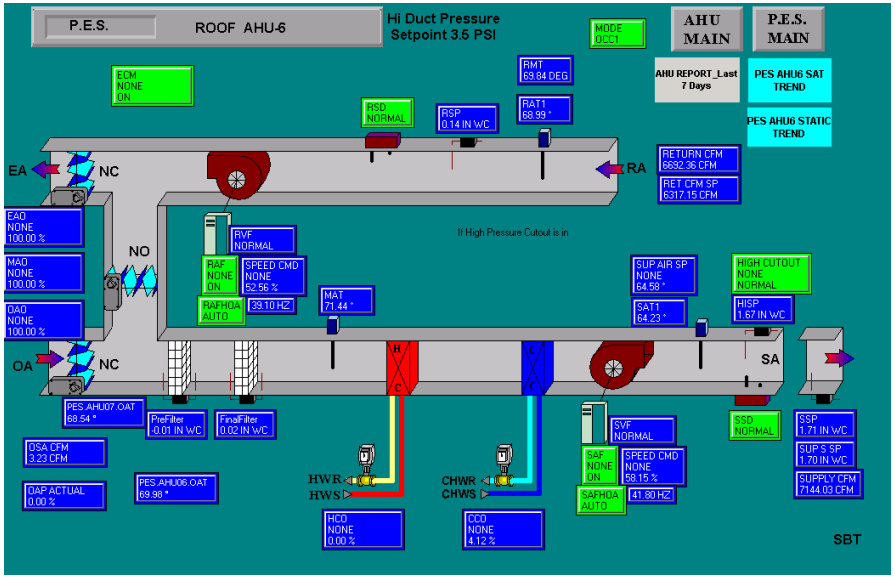


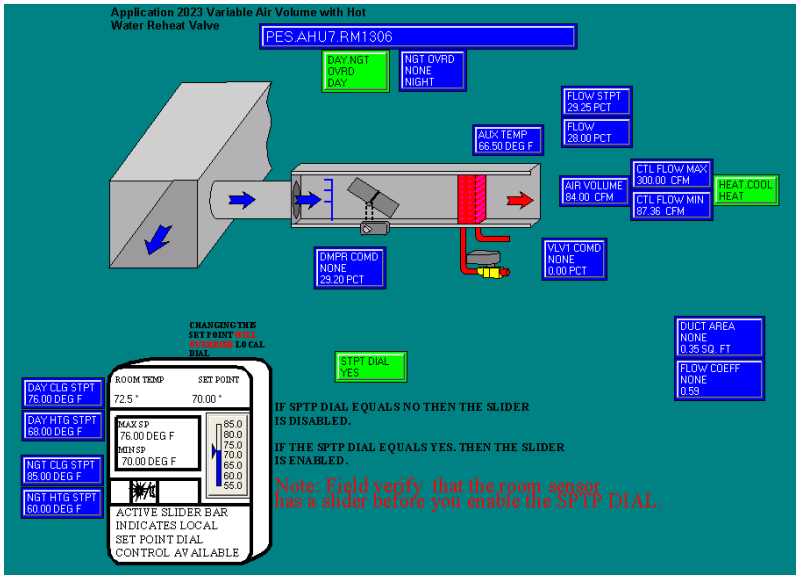
Source: http://www.firstfuel.com/blog/the-hidden-opportunity-in-commercial-energy-efficiency/

What is Active Commissioning Enterprise?



What is including in Building Management System?

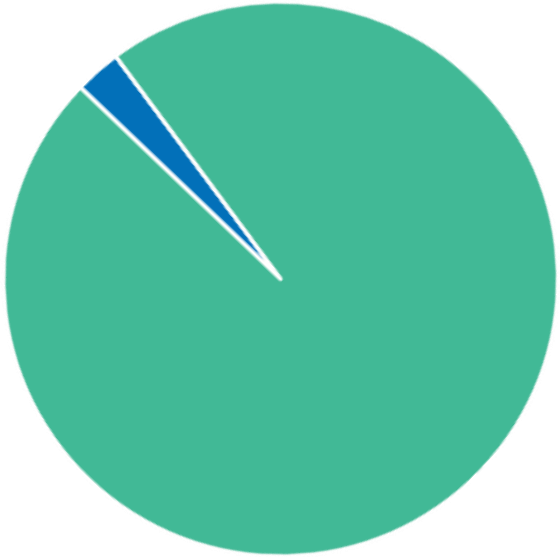




How BIG is our Building DATA?

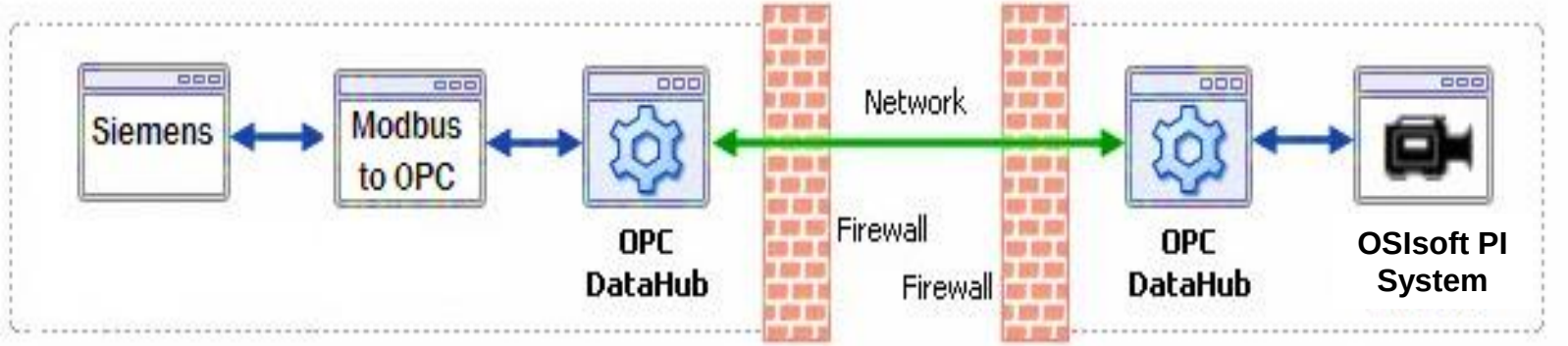
Target Data Integration Work

Integrated: 3%
Tags: 11,000
Buildings: 2
AHUs: 12
Zones: 252
Sq. Footage: 140,000

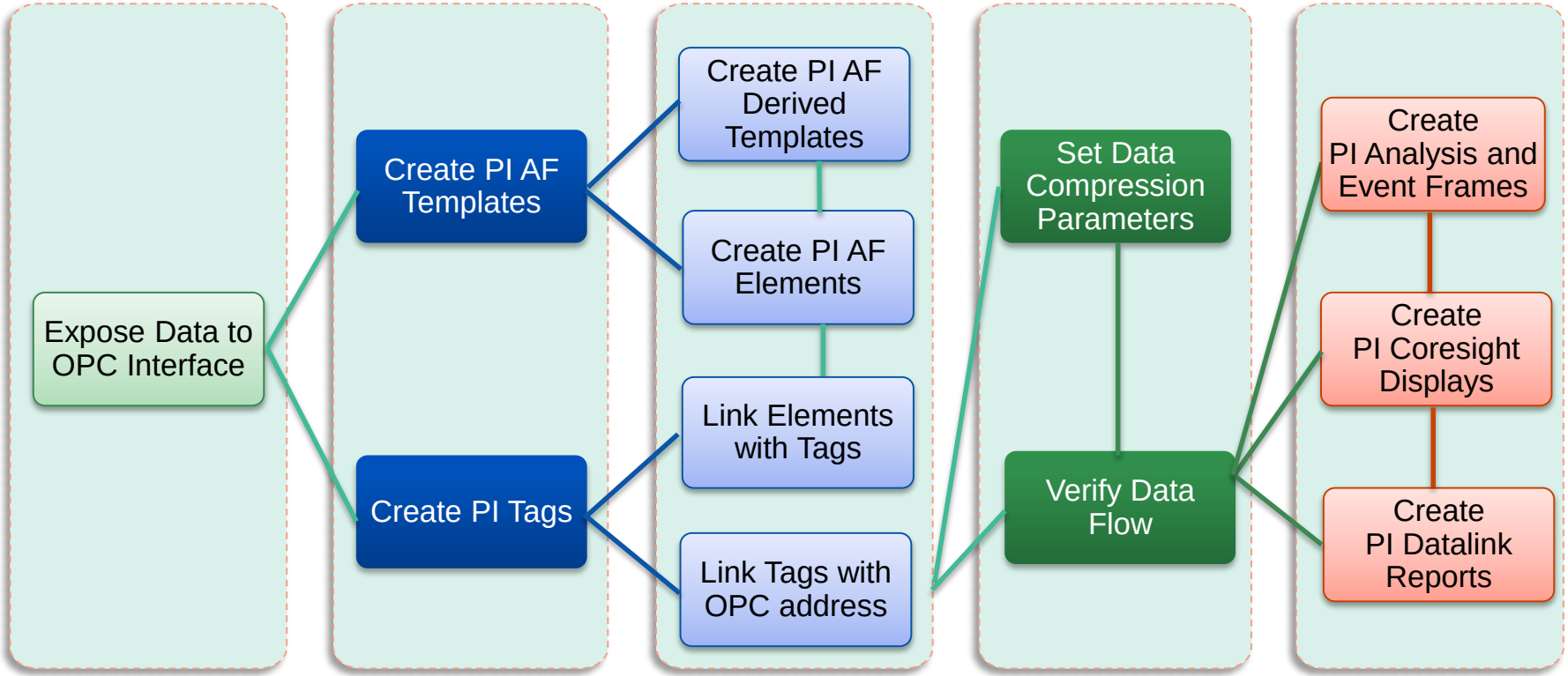


Target: 97%
Tags: 300,000
Buildings: 70
AHUs: 300
Zones: 3500
Sq. Footage: 4.5M

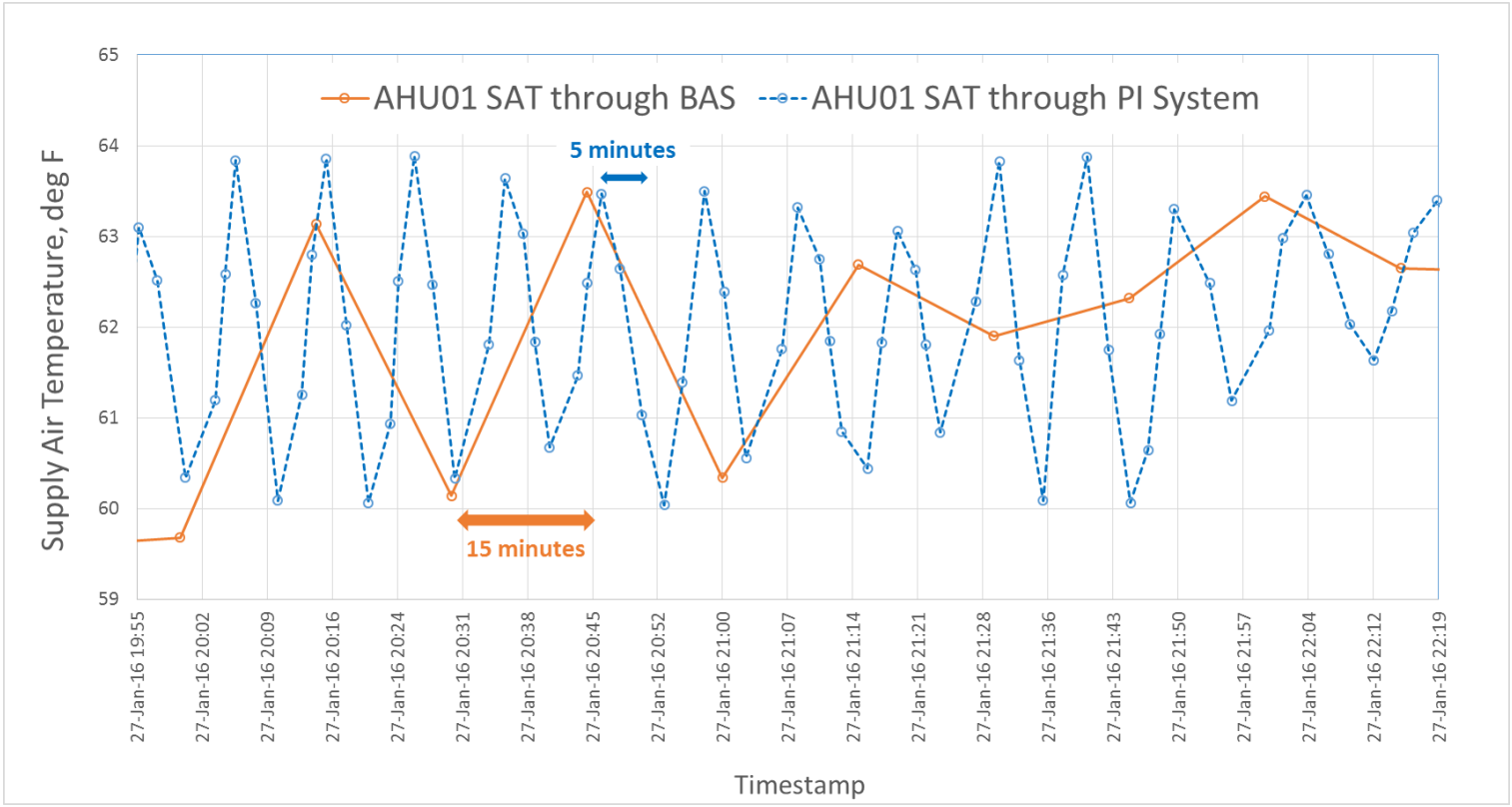
How we cleared Network Security Check?



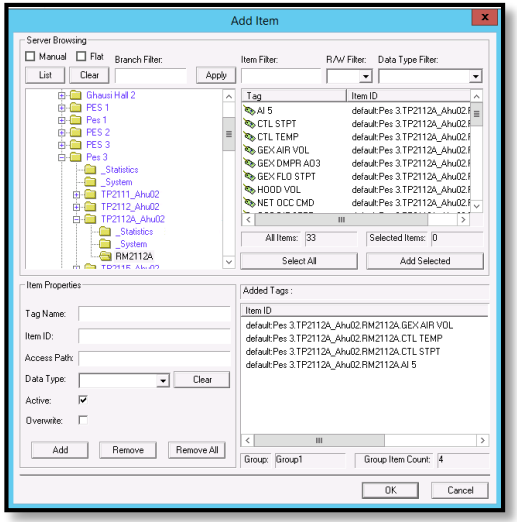
What are the implementation steps?

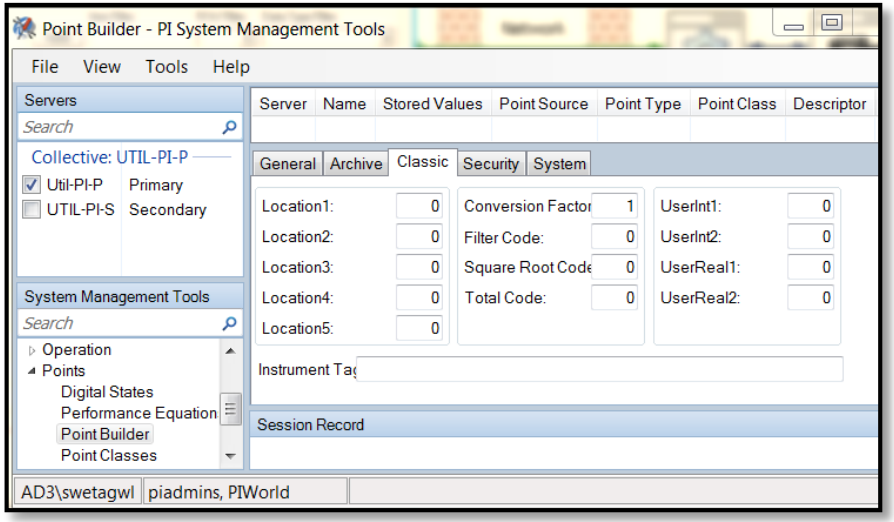


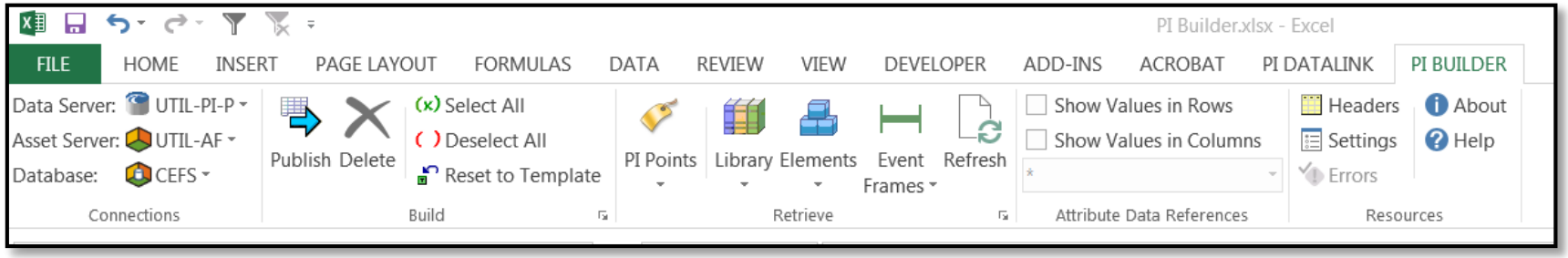
What is the value of Real-Time Data?



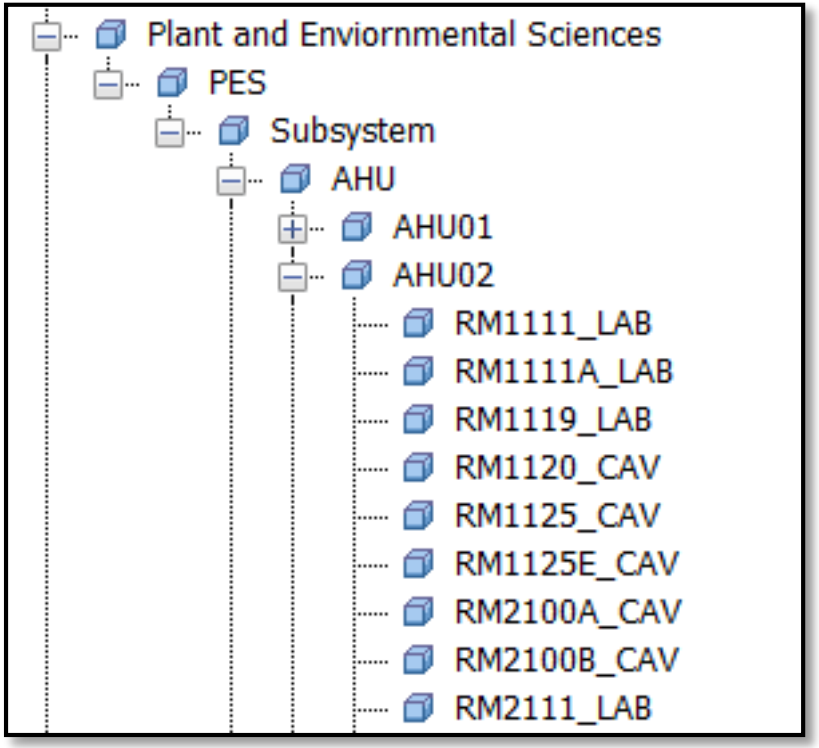
Creating and Editing Tags in bulk: PI Builder





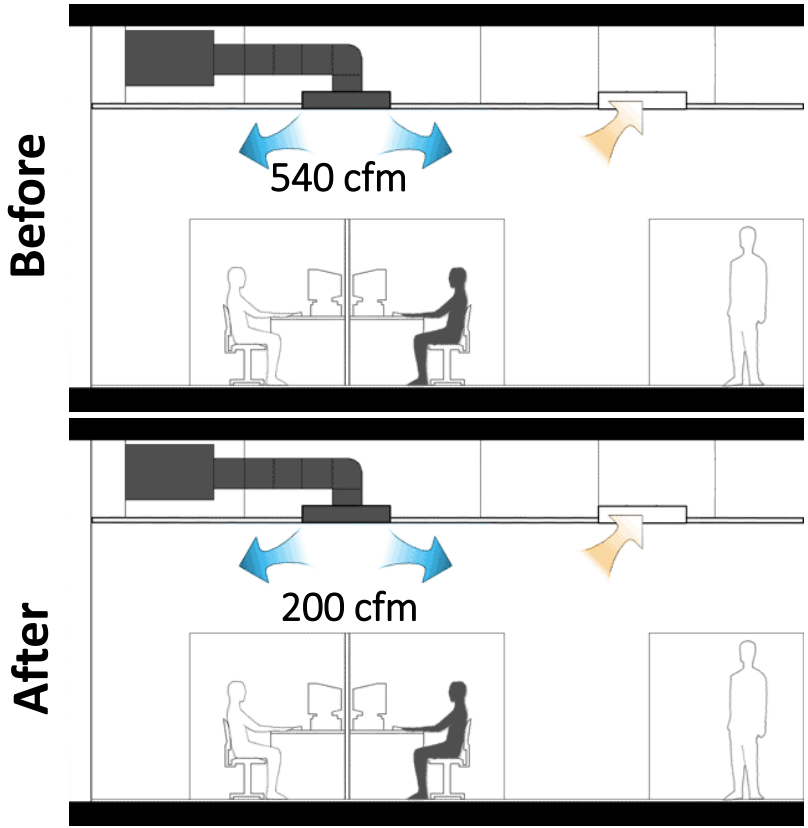


Scalability through PI AF Elements and AF Templates



Dynamic Office Air Minimum Reset using PI Analytics

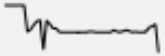
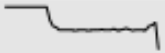
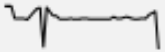
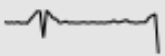
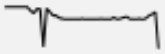
- Fan Savings, Reheat Savings, Steam & Chilled Water Savings
- Better ventilation for 85 zones.
- Sequence saves energy during 88% of operation time.

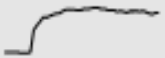


Dynamic Office Air Minimum Reset using PI Analytics

Clgminstpt	TagVal('Air Flow Cooling Minimum Setpoint')	540 ft3/min	Map
Ctlstpt	TagVal('Air Flow Control Setpoint')	538.65 ft3/min	Map
AvgOAP	TagAvg('Outside Air Percent','*-15m','*')	37.004 %	Map
OAPlowlimit	if(AvgOAP<='MAM') then 'MAM' else AvgOAP	37.004 %	Map
flowmincalc	(0.06*'Square Footage'+5*'Number of Occupants')/(OAPlowlimit/10(	205.28	Map
flowmincalc2	If(flowmincalc >=MaxLimit) then MaxLimit else flowmincalc	205.28	Map
NewAirflowMin	if(flowmincalc2 <=MinLimit) then MinLimit else flowmincalc2	205.28	Dynamic Air Flow Minimum
IsNewLow	if(NewAirflowMin<Clgminstpt) then 1 else -1	1	Map
IsFlowMin	If(Ctlstpt<Avg(clgminstpt,clgmaxstpt)) then 1 else 0	1	Map
IsSFon	If('Supply Fan Speed'>0) then 1 else 0	1	Map
CFMsaved	abs(TagVal('Air Flow') - NewAirflowMin) * IsNewLow*IsFlowMin*Is(	344.91	Air Flow Saved

Visualizing through PI Coresight

Name	Trend	Value	Average ▲	Minimum	Maximum
Ghausi.AHU03.RM2000.Air Flow Saved		-777.76	-361.02	-777.76	0
Ghausi.AHU03.RM3007.Air Flow Saved		-528.69	-199.18	-528.69	0
Ghausi.AHU03.RM3000.Air Flow Saved		-705.46	-184.54	-705.46	0
Ghausi.AHU03.RM3029.Air Flow Saved		-481.41	-151.78	-481.41	-39.853
Ghausi.AHU03.RM3017.Air Flow Saved		-256.62	-57.395	-256.62	0
Ghausi.AHU03.RM2005.Air Flow Saved		0	-10.795	-49.6	0

Name	Trend	Value	Average ▼	Minimum	Maximum
Ghausi.AHU05.RM1007.Air Flow Saved		330.14	256.83	0	411.64
Ghausi.AHU05.RM1011.Air Flow Saved		346.63	247.25	-227.6	418.84

More Analysis, More Event Frames, More Savings

- Sensor Value not matching Setpoint
- Setpoint out of Range
- Static Sensor
- Damper Stuck Close/Open
- Reheat Valve/Chilled Water Coil Leaking
- Test New Sequences

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Questions

Please wait for the **microphone** before asking your questions

State your **name & company**

Please remember to…

Complete the Online Survey for this session

http://ddut.ch/osisoft

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谢谢

Danke

Gracias

Merci

Thank You

ありがとう

Спасибо

Obrigado


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