

Thermal Energy Storage, a Sustainable Solution for District Growth and Future Energy Needs



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Objective

- Alamo Colleges District (ACD) completed the installation of three thermal energy storage (TES) tanks.
- Reliability – meet the cooling needs of campuses with increasing student population.
- Replicability – Cost and energy savings.
- TES tanks adding to overall benefits from energy management at ACD.



Alamo Colleges District



Population Summary			
	2010	2017	2022
Total Population	2,146,000	2,456,000	2,691,000
Males	1,053,000	1,208,000	1,324,000
Females	1,093,000	1,248,000	1,367,000
Population by Age			
Total	2,146,000	2,456,000	2,691,000
18 - 64	1,332,700	1,517,800	1,525,200
65 Plus	240,000	332,000	409,000
0 - 4	7.3%	6.9%	6.9%
5 - 9	7.5%	6.9%	6.8%
10 - 14	7.5%	7.0%	6.9%
15 - 24	14.9%	14.1%	13.3%
25 - 34	13.9%	14.6%	14.7%
35 - 44	13.3%	12.9%	13.4%
45 - 54	13.7%	12.4%	11.5%
55 - 64	10.8%	11.7%	11.4%
65 - 74	6.2%	8.1%	9.0%
75 - 84	3.6%	3.8%	4.6%
85 +	1.4%	1.6%	1.6%
Households			
2016 Households	768,000	870,300	952,200
Educational Attainment, 2017			
Total	1,599,100		
Less than 9th Grade			7.4%
9th - 12th Grade, No Diploma			7.7%
High School Graduate			21.5%
GED/Alternative Credential			4.6%
Some College, No Degree			22.6%
Associate Degree			7.9%
Bachelor's Degree			18.2%
Graduate/Professional Degree			9.9%



Colleges and Campus Locations



The Alamo Colleges District is comprised of 5 distinct colleges and several campus locations near the San Antonio metropolitan area.



District Enrollment

Year	Total District Enrollment	Enrollment Percent Change (Year-Over-Year)
2006	50,711	
2007	52,065	2.7%
2008	54,565	4.8%
2009	61,187	12.1%
2010	64,467	5.4%
2011	67,882	5.3%
2012	66,240	-2.4%
2013	66,591	0.5%
2014	65,441	-1.7%
2015	65,394	-0.1%
2016	67,483	3.2%
2017	70,615	4.6%

Source: Facility Programming and Consulting

In 2017, the Alamo Colleges District (ACCD) had nearly 71,000 enrolled students, a 46% increase over 2016. Since 2006, the district enrollment grew by nearly 20,000, a 39.0% increase.



SAC Enrollment

Year	San Antonio (SAC) Total Enrollment	Enrollment Percent Change (Year-Over-Year)	Percent of District Total Enrollment
2006	21,800		43.0%
2007	22,254	2.1%	42.7%
2008	20,821	-6.4%	38.2%
2009	22,844	9.7%	37.3%
2010	23,763	4.0%	36.9%
2011	22,800	-4.1%	33.6%
2012	22,950	0.7%	34.6%
2013	22,393	-2.4%	33.6%
2014	21,846	-2.4%	33.4%
2015	20,586	-5.8%	31.5%
2016	21,850	6.1%	32.4%
2017	21,071	-3.6%	29.8%

Source: Facility Programming and Consulting

As of 2017, San Antonio Campus (SAC) had more than 21,000 enrolled students, a -3.6% decrease over 2016. This campus accounts for 30 percent (29.8%) of the district's total enrollment in 2017.



NVC Enrollment

Year	Northwest Vista (NVC) Total Enrollment	Enrollment Percent Change (Year-Over-Year)	Percent of District Total Enrollment
2006	8,522		16.8%
2007	9,166	7.6%	17.6%
2008	11,737	28.0%	21.5%
2009	13,834	17.9%	22.6%
2010	13,802	-0.2%	21.4%
2011	17,183	24.5%	25.3%
2012	15,968	-7.1%	24.1%
2013	16,762	5.0%	25.2%
2014	16,667	-0.6%	25.5%
2015	16,652	-0.1%	25.5%
2016	17,103	2.7%	25.3%
2017	18,610	8.8%	26.4%

Source: Facility Programming and Consulting

As of 2017, Northwest Vista Campus (NVC) had more than 18,500 enrolled students, a 8.8% increase over 2016. This campus accounts for 26.4 percent of the district's total enrollment in 2017.



SPC Enrollment

Year	St. Philip's (SPC) Total Enrollment	Enrollment Percent Change (Year-Over-Year)	Percent of District Total Enrollment
2006	9,899		19.5%
2007	9,507	-4.0%	18.3%
2008	9,695	2.0%	17.8%
2009	10,737	10.7%	17.5%
2010	11,464	6.8%	17.8%
2011	11,590	1.1%	17.1%
2012	11,621	0.3%	17.5%
2013	11,328	-2.5%	17.0%
2014	11,573	2.2%	17.7%
2015	12,687	9.6%	19.4%
2016	13,277	4.7%	19.7%
2017	14,185	6.8%	20.1%

Source: Facility Programming and Consulting

As of 2017, St. Philip's Campus (SPC) had over 14,000 enrolled students, a 6.8% increase over 2016. This campus accounts for 20 percent (20.1%) of the district's total enrollment in 2017.



PAC Enrollment

Year	Palo Alto (PAC) Total Enrollment	Enrollment Percent Change (Year-Over-Year)	Percent of District Total Enrollment
2006	8,162		16.1%
2007	8,021	-1.7%	15.4%
2008	7,870	-1.9%	14.4%
2009	8,242	4.7%	13.5%
2010	9,695	17.6%	15.0%
2011	9,889	2.0%	14.6%
2012	9,928	0.4%	15.0%
2013	10,038	1.1%	15.1%
2014	9,616	-4.2%	14.7%
2015	9,805	2.0%	15.0%
2016	10,313	5.2%	15.3%
2017	10,816	4.9%	15.3%

Source: Facility Programming and Consulting

As of 2017, Palo Alto Campus (PAC) nearly 11,000 enrolled students, a 4.9% increase over 2016. This campus accounts for 15.3 percent of the district's total enrollment in 2017.



NLC Enrollment

Year	Northeast Lakeview (NLC) Total Enrollment	Enrollment Percent Change (Year-Over-Year)	Percent of District Total Enrollment
2006	2,328		
2007	3,117	33.9%	6.0%
2008	4,442	42.5%	8.1%
2009	5,530	24.5%	9.0%
2010	5,743	3.9%	8.9%
2011	6,420	11.8%	9.5%
2012	5,773	-10.1%	8.7%
2013	6,070	5.1%	9.1%
2014	5,739	-5.5%	8.8%
2015	5,664	-1.3%	8.7%
2016	4,940	-12.8%	7.3%
2017	5,933	20.1%	8.4%

Source: Facility Programming and Consulting

As of 2017, Northeast Lakeview Campus (NLC) had nearly 6,000 enrolled students, a 20.1% increase over 2016. This campus accounts for 8.4 percent of the district's total enrollment in 2017.



Alamo Colleges Physical Plants:

- Five main central/physical plants at each Campus
- Construction dates range between 1961 and 2009
 - Between 57 and 9 years old
 - Renovations/Upgrades between 2007 and 2015
- Facility Condition Index
- Campus Building Summary
- Staffing



Facility Condition Index (FCI):

Defined: FCI is an index of facility condition based on the cost of deferred maintenance requirements relative to the building replacement value.

$$\text{FCI} = \frac{\text{requirement costs}}{\text{building replacement value}}$$

Low FCI and RI = Good

Indicates better condition than others with a higher FCI and RI.



San Antonio College Central Plant:



- Constructed **1961**
- Age **57 Years Old**
- Renovated **2015**
- FCI **33.9%**
- Campus Building Summary
 - Size ~**2 million SF**
 - Count **40+**



Palo Alto College Central Plant:



- Constructed **1987**
- Age **31 Years Old**
- Renovated **2015**
- FCI **68.7%**
- Campus Building Summary
 - Size **~560 thousand SF**
 - Count **20+**



St. Philip's College Central Plant:



- Constructed **1987**
- Age **31 Years Old**
- Renovated **2015**
- FCI **28.8%**
- Campus Building Summary
 - Size **~800 thousand SF**
 - Count **20+**



Northwest Vista College Texas and Mexican Persimmon Physical Plants:



*Pictured:
Mexican PP
(2009) and TES*



*Pictured:
Texas PP
(1998)*

- Constructed **1998 & 2009**
- Age **20 & 9 Years Old**
- Renovated **2007** (Tex PP)
- FCI **2.3% & 0.4%**
- Campus Building Summary
 - Size **~800 thousand SF**
 - Count **20+**



Northeast Lakeview College Physical Plant:

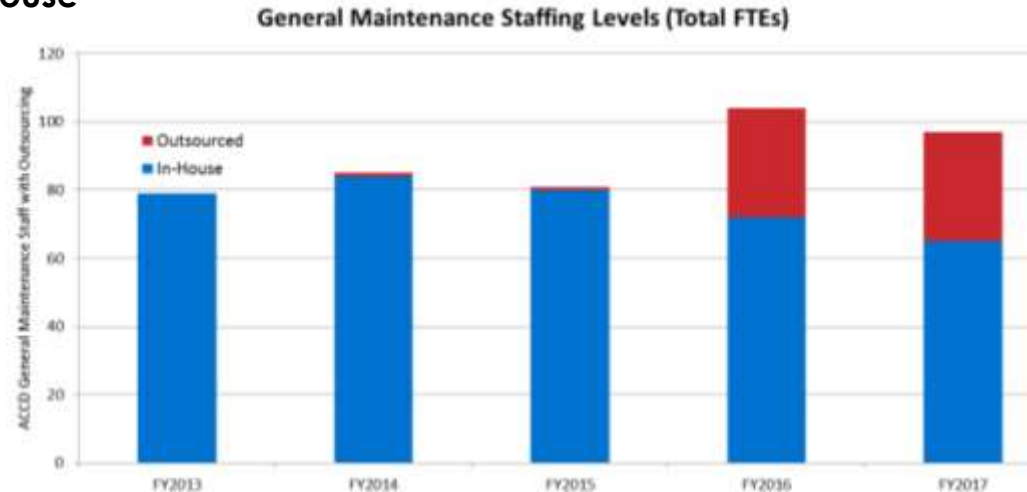


- Constructed **2008**
- Age **10 Years Old**
- Renovated **2012**
- FCI **2.2%**
- Campus Building Summary
 - Size **~390 thousand SF**
 - Count **10+**



Alamo Colleges Building Maintenance Staffing:

- Moving from In-House to Outsourced Staffing
- Transitional period, Full Time Equivalent (FTE) Attrition
- **Physical Plant Staff**
 - Transitioned from almost 100% in-house
 - to almost 100% outsourced



SPC – Boiler Dismantle Project at Physical Plant



Alamo Colleges District: By 2025

- \$450 Million Bond – Approved by Bexar County voters in May 2017.
- Capital Improvement Program:
 - Renovation of existing facilities
 - Adding new facilities
 - Expansion of geographic reach within Bexar County
 - Adding physical plant and technology capacity
- Add over 700,000 square feet
- Total enrollment of 77,000



Chilled Water Thermal Energy Storage (TES) Tanks: Since 2014



Northeast Lakeview
College

1.0 million gallons
70'-0" ID x 34'-9" water depth
4,000 gpm



Palo Alto College

0.53 million gallons
42'-4" ID x 50'-8" water depth
2,500 gpm



Northwest Vista
College

0.9 million gallons
66'-2" ID x 35'-0" water depth
4,000 gpm



Thermal Storage Project in Numbers



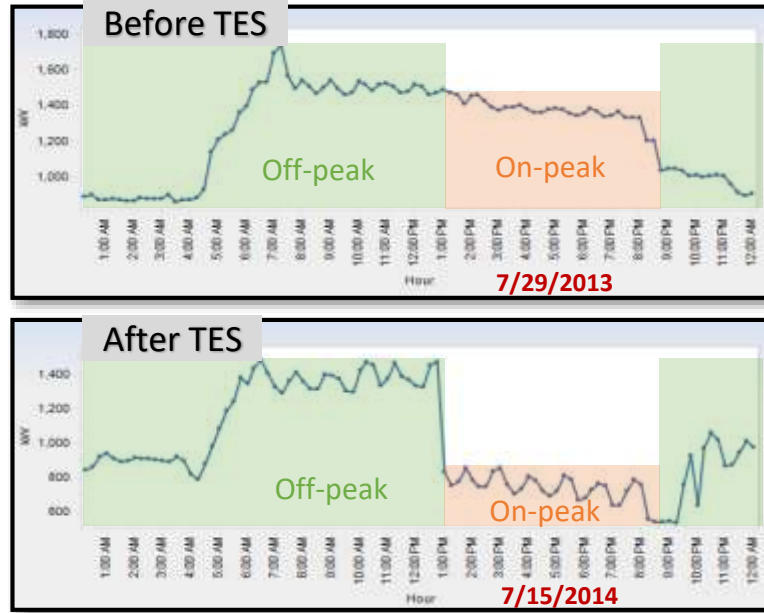
- ~\$7 Million project
- Approx. \$280,000 in expected annual cost savings
- Almost 1.5 GWh/yr in expected energy consumption benefits

TES Tanks: Part of a larger district initiative to optimize energy use



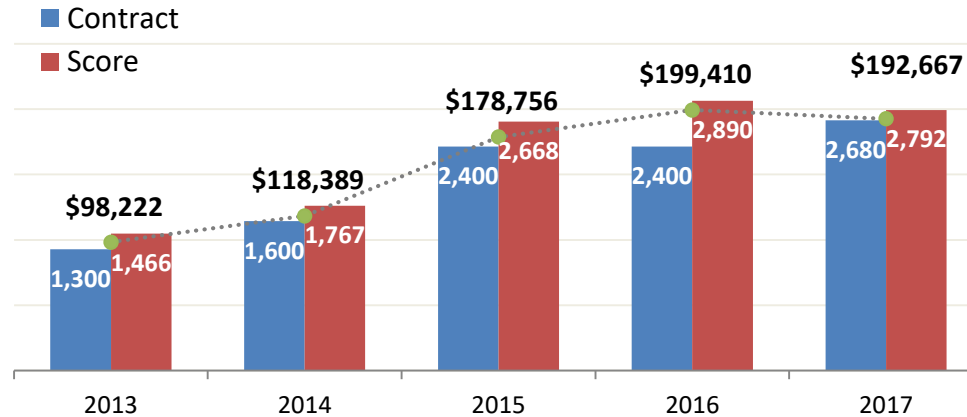
TES Tanks: Manage Daily Peak Loads

Colleges switched from real-time cooling to drawing from the TES tanks.



Demand Response: Contracted curtailment load increased in 2015

Historic Performance and Rebate



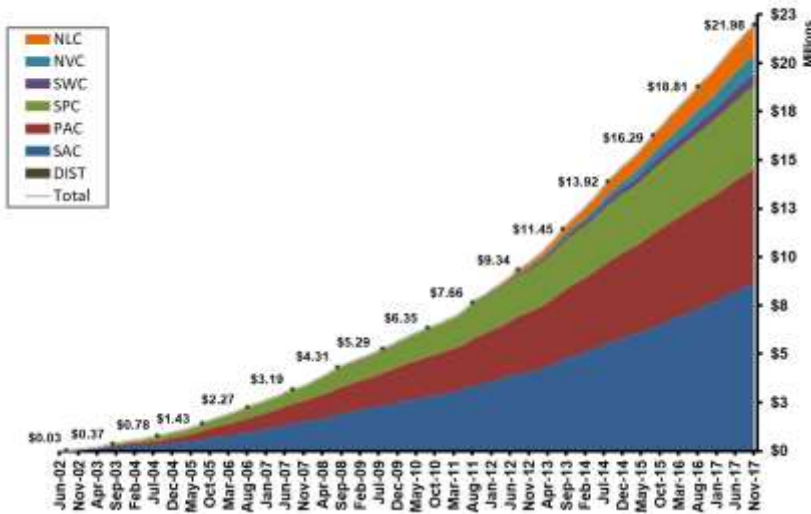
Alamo Colleges kW contracted reduction versus actual reduction, and corresponding rebate from 2013 to 2017

To date, **Alamo Colleges has earned almost \$790,000 in rebates** from participating in this program.

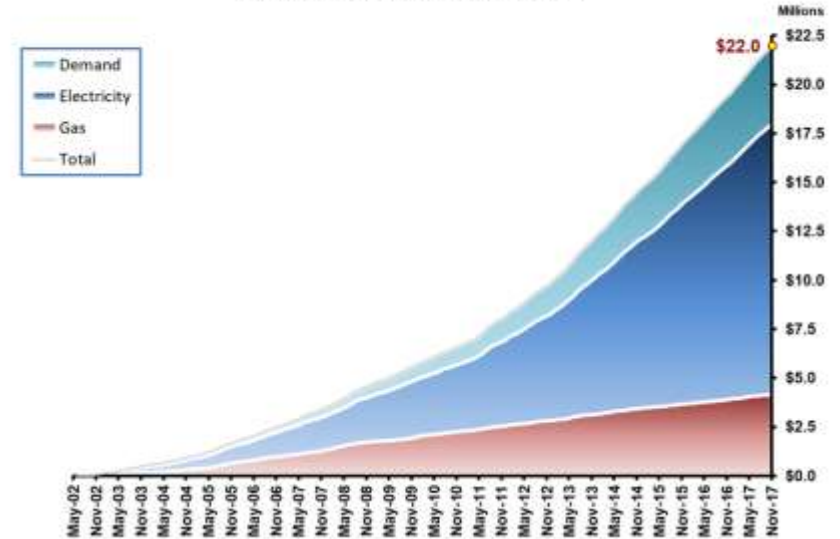


TES Tanks add to Overall Benefits from Energy Management

Alamo Colleges Cumulative Savings



Alamo Colleges Cumulative Savings



Cumulative cost savings ~ \$22 Millions

From May 2002 through December 2017) Includes district wide operation buildings and all campuses.



Conclusion

- Optimize energy use: meet the demands of an increasing square footage and student population
- Additional cost savings and energy benefits:
Increase curtailment load on DR program
- Long-term payback: ~ 25 years
- Promote sustainability



Thanks.

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