

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



ALAMO  
COLLEGES  
DISTRICT

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March 2018

# 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.





# 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%

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.

Source: Facility Programming and Consulting



# 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:



- 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+**

*Pictured:*  
Mexican PP  
(2009) and TES



*Pictured:*  
Texas PP  
(1998)



# Northeast Lakeview College Physical Plant:

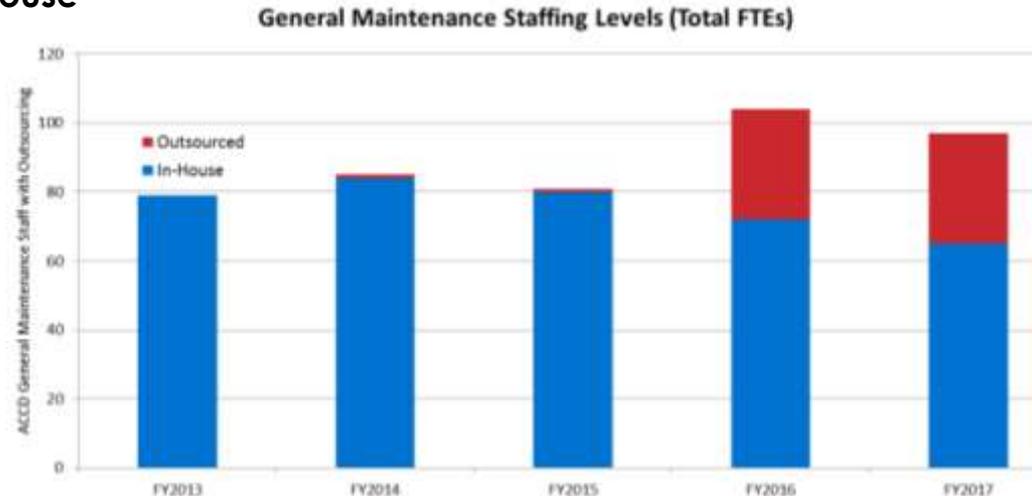


- Constructed **2008**
- Age **10 Years Old**
- Renovated **2012**
- FCI **2.2%**
- Campus Building Summary
  - Size **~390 thousand SF**
  - Count **10+**



# 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

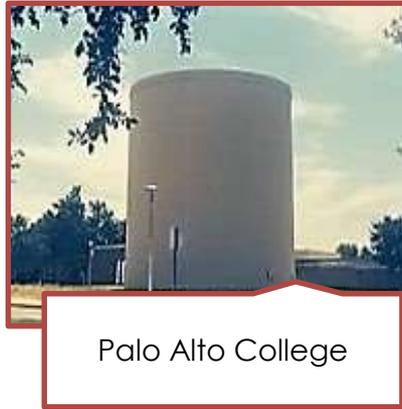
- \$450 Million Bond – Approved by Bexar County voters in May 2017.
- Capital Improvement Program:
  - Renovation of existing facilities
  - Adding new facilities
  - Expansion of geographic reach within Bexar County
  - Adding physical plant and technology capacity
- Add over 700,000 square feet
- Total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



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



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



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



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



# Thermal Storage Project in Numbers



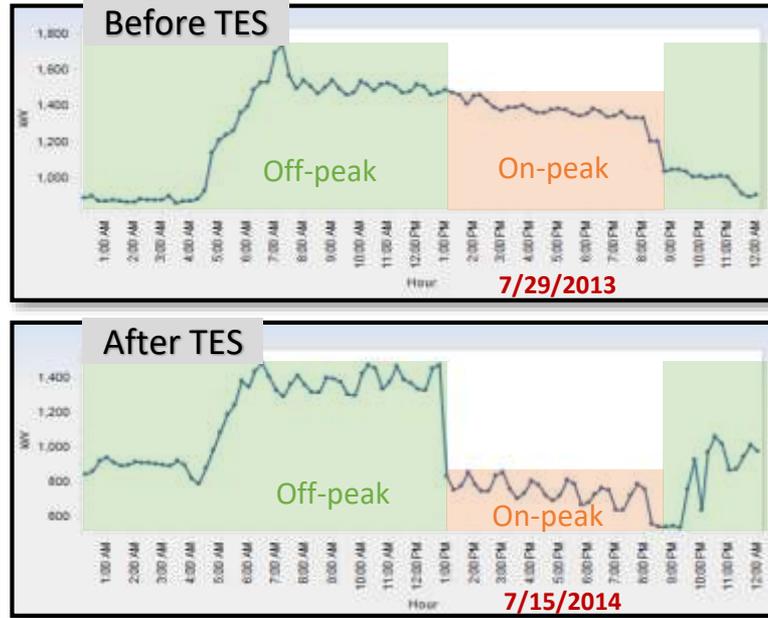
- ~\$7 Million project
- Approx. \$280,000 in expected annual cost savings
- Almost 1.5 GWh/yr in expected energy consumption benefits

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



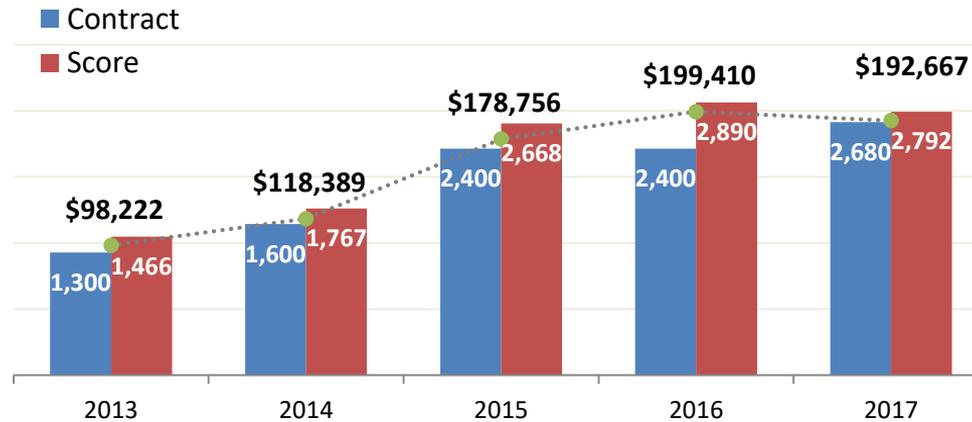
# TES Tanks: Manage Daily Peak Loads

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



# Demand Response: Contracted curtailment load increased in 2015

## Historic Performance and Rebate



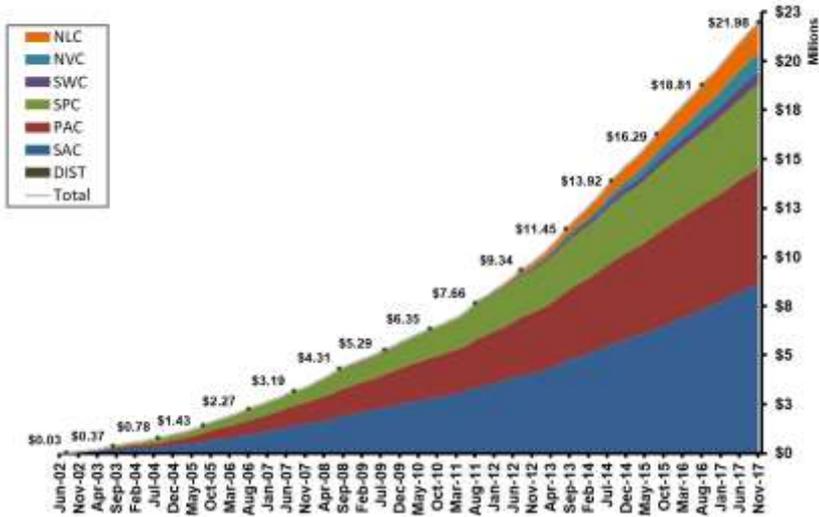
Alamo Colleges kW contracted reduction versus actual reduction, and corresponding rebate from 2013 to 2017

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

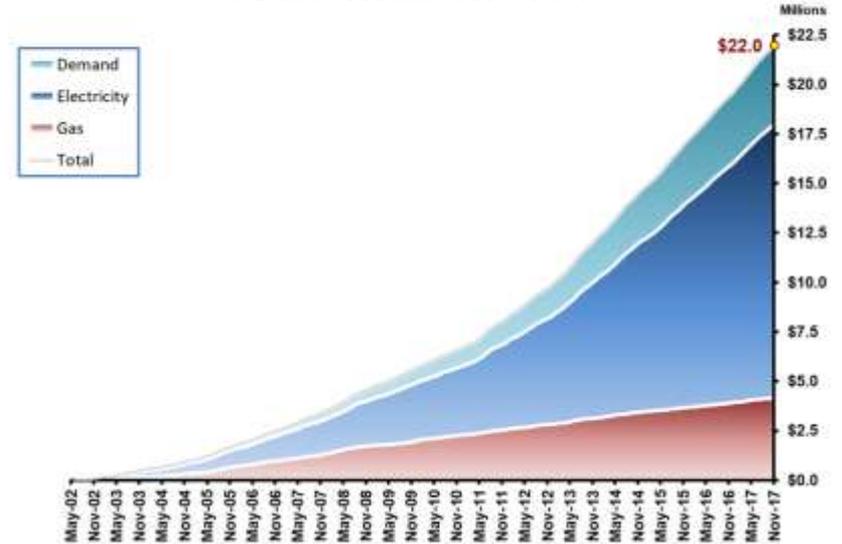


# TES Tanks add to Overall Benefits from Energy Management

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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