Boulder Valley School District

Department of Operational Services

25 July 2013

Background

The Boulder Valley School District (BVSD) proudly unveiled the Sustainability Management System (SMS) report in 2009. This document is a major step in achieving the school district's commitment to sustainable practices and provides a guide for making meaningful and measurable gains in BVSD sustainability. The SMS is a comprehensive approach for identifying and coordinating existing efforts, establishing baselines, defining sustainability for BVSD, and creating plans to integrate sustainability into our operations and curriculum. The SMS covers four main areas, all with a cross-cutting theme of climate: Buildings (new construction and operations), Materials, Transportation and Education. In each area, the District has identified long term visions, five year goals, and specific strategies for achieving those goals. The SMS has been, and will continue to be used as a roadmap for future years and is supported by Board of Education Policy ECF.

In 2012, the District completed a Sustainability Progress Report which shares the district's most significant accomplishments in sustainability practices since implementing the SMS in 2009. This report also provides some measurement of the district's progress toward meeting the five-year goals defined in the SMS and thus acts as a midway checkpoint of the district's progress. Finally, the plan offers next steps for all of the goals identified in the SMS.

Purpose of the Sustainable Energy Plan (SEP)

Addressing district energy consumption is a key component of the District's sustainability planning. Energy used for electricity and heating and cooling needs has significant impact on the district's environmental footprint and budget.[1] Specific goals around energy fall under the Buildings, and to some extent, Climate categories. The long term vision in the Buildings category is "BVSD is striving toward net zero energy buildings" and the long term vision in the Climate category is to see an 80% reduction in greenhouse gasses (GHGs), or be climate neutral by 2050. Specific 5 year goals relating to energy include the following: five percent improvement in energy operating efficiency per square foot (specific target 65.5 kBTUs per square foot) , a 10% reduction in GHGs below the baseline (FY2008), a minimum increase of 100 kW increase in renewables, and various goals and guiding principles for new building and construction projects relating to energy. There has been a great deal accomplished to in the past few years to reduce energy consumption. This is evidenced by declining energy use since FY2010. Our baseline for energy use was set when we developed the SMS for FY2008. However, because we were in the middle of the bond, and adding increased air conditioning and IT needs, the District saw an increase in energy use per square foot for two years, which then started to decline.

Energy Use Intensity (EUI, which is defined as kBTU/sf/year) has dropped by 4 kBTU/sf district-wide from the baseline year (69 kBTU/sf in FY2008 to 65 kBTU/sf in FY2013) and the 5-year SMS 5% reduction target has been exceeded! The reduction was due to behavioral change, efficient design of Bond and Capital Reserve projects, and energy efficient Maintenance efforts. If the energy use intensity had not been reduced, the district would have spent an additional $303,000[2] on energy in FY2013. Some of the successful strategies that have been employed are listed below.

1. Created two new positions with an energy focus (Project Manager of Energy Systems and Systems Analyst). These positions are actively monitoring energy use and adjusting our systems so they perform more efficiently.
2. Purchased and using Utility Manager, which gives the district easy access to energy and water data

[1] In the 2013 the District spent $4,683,370 on electricity and natural gas. Source: Utility Manager Software

[2] 2013: $4,683,370 spent ÷ 289,112,900 kBTU used = $0.0.01620/kBTU
4,679,717 sf x 4 kBTU/sf reduction = 23,398,585 kBTU reduction
23,398,585 kBTU x $0.01620/kBTU = $303,245

by school, and the ability to easily provide and analyze the data and respond to issues.
3. Completion of select re-commissioning projects.
4. Upgrading lighting.
5. IT implemented computer management software, virtualized most of BVSD servers and is following an end-of-life policy to shut off unused servers..
6. Working with school green teams on competitions to reduce energy (last year, half of BVSD schools participated).
7. Significantly increased renewable energy. Consequently, twenty-two sites were changed to solar time-of-use electric rates. These new rates reduced costs by about 20% for those sites.
8. Installed energy efficient technologies as part of the 2006 Bond.
9. Audited many buildings throughout the district. (Audits through Xcel, GEO and internal)
10. Implemented vacation shut down policies for all major breaks (with a focus on HVAC, IT and occupant behavior).
11. Increased preventative maintenance work as part of heat mitigation efforts. For example, coils in HVAC systems were cleaned to provide better comfort and efficiency.
12. Increased district-wide and community wide communications around best practices for saving energy.

There is still opportunity for more savings through energy and resource conservation. Therefore, the purpose of the SEP is to

- set a new short term goal for district energy reduction
- detail specific tasks for achieving this new goal that include anticipated savings
- detail the staff responsible for tasks
- identify the requirements and barriers to achieve goals
- set a timeframe for achieving milestones
- set goals beyond those outlined in the SMS

The SEP is an evolving document and will be updated regularly.

SEP Goals

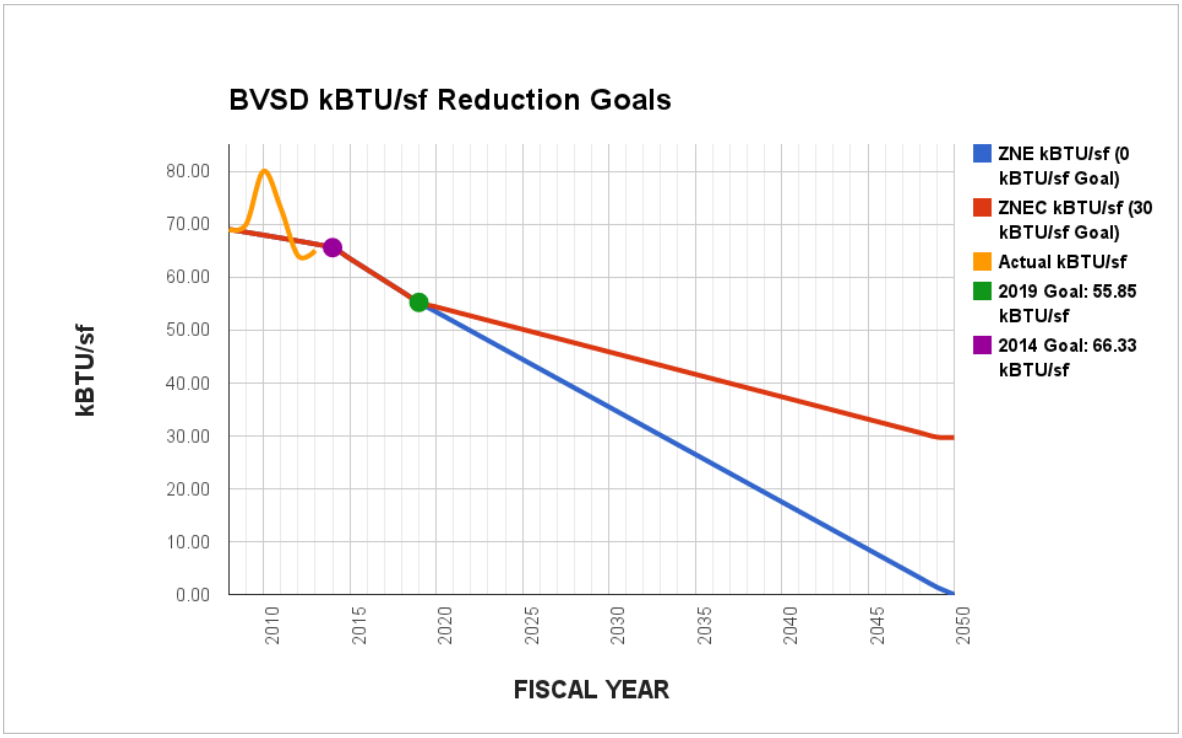
Reduce FY2008 baseline average EUI 20% by FY2019.[3]

This short-term goal aligns with the State of Colorado's reduction quantity goal of 20% for GHG emissions below 2005 levels by 2020. This goal will synchronize with the SMS five-year goal timelines.[4] The previous SMS goal aimed for a five percent improvement in energy operating efficiency per square foot in five years, with a baseline of FY2008 and work beginning FY2010.

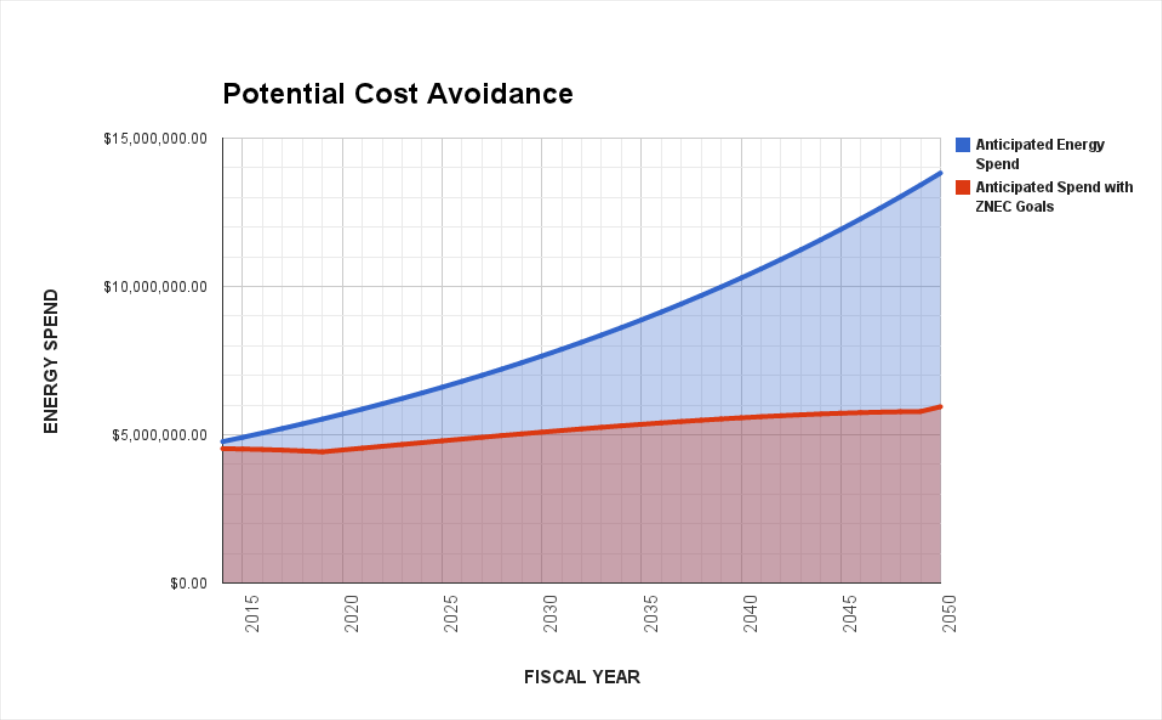
Reduce the average EUI to ≤30 by FY2050[5]

This long-term goal aligns with the SMS stretch goal of Zero Net Energy Buildings (ZNEB).

[3] A 20% reduction is an EUI of 55.2. This is a reduction of 9.8 kBTU/sf from 2013's EUI of 65.
[4] The remaining five year goals in the SMS have a target date of FY2014. Therefore, the next set of five year goals will have a target date of FY2019.
[5] A building that is Zero Net Energy-Capable (ZNEC) is defined as one with an EUI ≤ 30.



An EUI reduction of 20% represents approximately $740,000 in 2013 energy dollars.[6]



Anticipated cumulative cost avoidance of this goal by FY2019 is over two million dollars.[7]

[6] $4,630,256 2012 energy cost / 289,112,000 kBTU = $0.01602/kBTU
65 kBTU/sf - 55.2 kBTU/sf * $0.0162/kBTU = $0.15876/sf * 4,679,717 sf = $742,951.87 saved

[7] Assuming an annual rate increase of 3% through 2050.

Not all existing BVSD buildings have the ability to be ZNEC due to construction type, building orientation, or the severe return on investment or rate of return of the capital improvements required. Since capital projects have the greatest impact on the District's energy use for a building's life, it is imperative to pursue aggressive and measurable goals for design consultants undertaking Capital Construction Projects.

New buildings or additions shall be designed as ZNEB or ZNEC [8] [9]

Capital Construction Projects for existing buildings that are not ZNE-Capable shall employ Deep Energy Retrofits[10] to reduce existing average EUI's to the following levels, which represent an average EUI reduction of approximately 50%[11]

- **High Schools: 40 EUI**
- **Middle Schools: 35 EUI**
- **Elementary: 35 EUI**

SEP Details

The details of this plan are specified in **Appendix A** of this document. The Energy Team found three categories of action to address the new goals and targets:

- Capital Projects
- Operations/Maintenance
- Education/Policy.

As previously stated the SEP is a living document; Appendix A suggets the types of things the district can do to continue to address energy use. Where possible, staff has identified potential costs, a person responsible for completing the work, the number of staff hours needed to complete the task, energy savings and anticipated annual MBTU savings.

Policy or regulation supporting these efforts, particularly as intensity and focus increases, is critical. Policy should be approved by the Board of Education and supported by Cabinet and District Leadership Team. Policy adoption should take place in the next three years, after a few more years of documenting savings in schools participating voluntarily in energy challenges, particularly once a monetary incentive from reduction in utilities is included (in addition to prize money). The district should also wait until buildings are operating at a more consistent level and as expected in regards to heating and cooling, before clamping down heavily on space heating and cooling devices. Draft policy language that was previously proposed is included in Appendix B.

SEP Timeline

Implementation of this plan can and should begin immediately. This gives staff six years to reach the FY2019 Target, and reduce energy by roughly 1.6 kBTU/sf/yr district-wide.

FY 2014 Begin Implementation of Sustainable Energy Plan (Last year of SMS 5-year goals for other categories) See items in Appendix A Highlighted in green. Coordinate with Bond planning to incorporate SEP strategies.

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[8] Further information on ZNE: http://newbuildings.org/sites/default/files/GettingtoZeroReport_0.pdf

[9] Increase project budget by 6% for cost premium. Initial construction costs are slightly higher but are offset by long-term decreased operating costs.

[10] Further information on Deep Energy Retrofits: http://www.rmi.org/retrofit_depot

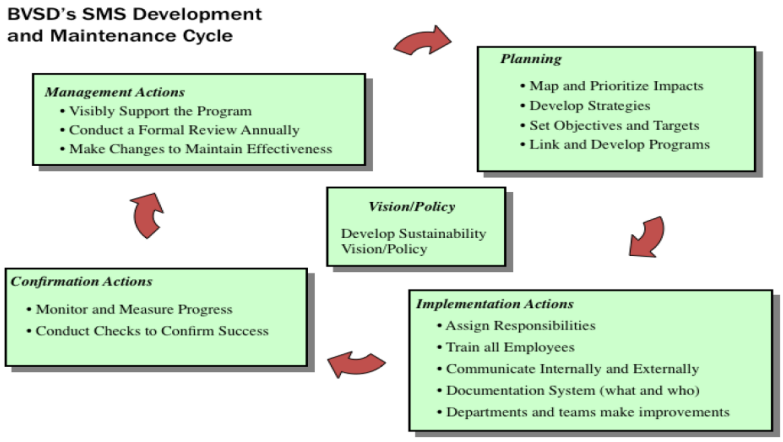
[11] Increase project budget by 7% for cost premium. Initial construction costs are slightly higher but are offset by long-term decreased operating costs.

FY 2015 Potential Bond Election. Continue low to no cost strategies of Appendix A.
FY 2016 Potential Bond Implementation begins. Continue items highlighted in green, begin to phase in capital projects.
FY 2017 Savings from Potential Bond work begins
FY 2018 Continue all strategies.
FY 2019 Target year 20% below Baseline.
FY 2050 Long-term Target: ZNEB/ZNEC

Strategies recommended for implementation in the first three years are highlighted in green in Appendix A. We are starting with items that take little to no upfront cost, and that can be covered with existing staff. Strategies requiring capital investments will be addressed in the latter three years if a Bond measure (or other funding mechanism) is passed and secured.

SEP Questions and Responses

1. What implementation methodology will the team follow to ensure an effective program is implemented?
   Response: Staff will follow a plan-do-check-act model, similar to the model established in the SMS (see diagram below). This document will serve as the plan. Energy staff responsible for meeting the tasks will continue to meet bi-weekly to track progress. The Energy Team (or specified member of the team) will provide monthly updates to the Assistant Superintendent of Operations and the Executive Director of Budget on progress toward meeting the goals and tasks outlined in this plan, and budget implications. The Energy Team (or specified member of the team) will provide quarterly updates to the Board of Education on the Sustainable Energy Plan and programs, including budget implications. The Energy Team will also communicate with Principals and energy champions identified at the schools to provide regular updates regarding billing and school specific progress toward meeting energy goals. This may include an annual Summit/Training for all Energy Champions. The Energy Team will be responsible for re-evaluating the plan and making changes on an as-needed basis, and as significant deadlines are met and goals accomplished.



2. How many evaluation areas have/will be identified that will be used to guide the assessment process?
   Response: We will evaluate progress on a kBTU/square foot basis[12]. This allows for a comparison of all energy use (electrical and heating and cooling) and does not penalize the district for increasing square footage, and offers a way to compare schools of different sizes (without penalizing larger

[12] Data will be weather normalized.

schools). The Energy Team will provide monthly updates showing energy performance by school, school type (e.g. elementary) and district wide. The Energy Team will also show associated dollars with energy consumption and comparisons.

3. What project management tool(s) will be used to track recommendations, responsible parties, due dates and other action elements?
   Response: Microsoft Excel or Microsoft Project for a complex project
4. What software tool will the implementation team use to accurately track and report on energy consumption, savings, and environmental impact?
   Response: Utility Manager, data from Solar Guard (real time data for fourteen schools part of the Power Purchase Agreement), smart meter data from the City of Boulder schools, Casey Middle Schools Green Touch Screen. Future energy dashboards with real time data for all schools is also being considered.
5. How many hours of effort is the implementation team willing to commit to the conservation program? Will new staff be needed?
   Response: Currently, staff is investing roughly 3,430 hours/year on this work, which is just short of two full time positions. This number includes time from interns, and excludes time invested by supporting organizations and partnerships, which is substantial. We believe we can achieve the goal of a 20% reduction of Energy Intensity for FY 18/19 with existing staff. Some of this will be met by training custodians, security staff and school green teams to be extra "eyes" in the schools. While this may require a small adjustment to existing staff responsibilities, it should not necessitate hiring additional staff. In order to achieve further reductions, and all of the strategies outlined in Appendix A in six years, we would need the equivalent of an additional 6 full time staff positions[13] (plus significant capital). If the District finds resources to invest in new staff, we recommend hiring staff that can perform preventative maintenance and recommissioning work first, which in addition to energy savings significantly extends equipment life (thus lowering costs).
6. What outside training will we provide our energy conservation implementation team?
   Response:
   - Bi-monthly CASDEM meetings for relevant Energy Team members and other staff. (no cost) http://www.casdem.org/
   - Real-Time Online Behavioral Training: Association of Energy Engineers (AEE) "Energy Cost Reduction using Six Sigma, Kaizen, 5S, Lean Manufacturing and Behavioral Energy Change"; http://www.aeeprograms.com/Realtime/EnergyCostReduction/
   - Real-Time Online Audit Training: Association of Energy Engineers (AEE) "Energy Auditing Fundamentals" http://www.aeeprograms.com/Realtime/EnergyAuditing/
   - Certified Energy Auditor (CEA) Certification: A three day in-depth preparatory course and examination http://www.aeecenter.org/i4a/pages/index.cfm?pageid=3365
   - LEED Green Associate Certification: $382.00--study guide, application and examination fee. http://www.usgbc.org/credentials/leed-ga/overview
   - Certified Energy Manager (CEM) Certification: A five day comprehensive training seminar and examination $1,795 + $967 (estimated) airfare/hotel per participant http://www.aeecenter.org/i4a/pages/index.cfm?pageid=3351
   - Colorado Energy Office can provide a high level Energy Education Training for non-energy literate staff.
   - Other low-no cost options available through Colorado Energy Office, United States Green

[13] Assuming 1840 hours/year is full time employee. (40 hours*46 weeks) Assuming 65,990 hours of additional time needed beyond annual required hours.

Building Council-Colorado Chapter and local resources (County, nonprofits and City). Topics should include preventative maintenance, Energy 101, high performing schools, green design, greening IT and more.

7. How will the implementation team remain accountable for results?
   Response: The utility budget, starting with the energy components should have direct oversight by a member of the Energy Team, who will be held accountable for reporting on, projecting and managing the account. The Energy Team (or member identified by the Team) will be able to adequately explain the status of the budget and changes as they occur.
8. Recognizing that one person can't accomplish this,how does the implementation team plan to engage everyone in the district to ensure their cooperation and creation of a conservation culture?
   Response: Creating a culture of sustainability takes the support and help of everyone. As stated in BOE Policy ECF "The Board of Education strongly encourages each District employee and student to work toward environmental sustainability and resource conservation through the implementation of the SMS." The district has invested resources, offered policy support and created staff positions with the intent of furthering this work. Because of this commitment, BVSD has made great strides and accomplishments in the past few years. If the district continues to invest in the SMS, and saving energy by dedicating the resources specified in this plan, more savings are possible. Specifically, in order to engage everyone and ensure cooperation of this plan, the plan will need full support of district leadership, including cabinet, BOE and DLT. The Energy Team will identify energy champions at all of the schools and help train these champions, and staff already in the schools on a daily basis, on plan implementation. Energy champions may be students, staff, parents or volunteers. Other key staff involved in implementation will be security agents, custodians, green teams and maintenance staff, all who can act as an extra set of eyes on daily activities at the school. Training will occur once a semester, and the Energy Team will conduct a full audit of the school once a year and a seasonal audit review. These will be reviewed with school teams at the semesterly trainings. Communication with key energy staff at the schools will be monthly at a minimum, and as needed.
9. Why have we not implemented a complete program to date? How do we plan to realistically address those limitations?
   Response: As outlined above, significant work has been achieved to date to address energy consumption with positive results, and we have met the 5-year energy goals outlined in the SMS ahead of target. Staff believes with further support of the leadership (cabinet, DLT, BOE), and more communication and accountability from staff focused on energy, further savings are possible.

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Presented to and Supported by the Board of Education 9/24/2013

Appendices

APPENDIX A: Sustainable Energy Plan Strategies

CAPITAL PROJECTS

	Strategy	GC Labor and Materials	Material Costs for BVSD Labor	Who	Estimated Annual BVSD Hours Required	Estimated Additional BVSD Hours to Reach Estimated Annual MBTU Savings	Estimated Savings for Project-Specific Energy Category (ies)	Estimated Annual MBTU Savings	Estimated Annual Reduction of Total MBTU's	Notes
1	Piping Insulation			Contractor			0.20%	375	0.13%	
2	Replace Failing Motors with NEMA type motors	$240,000		HVAC Tech		600	3.00%	2,400	0.84%	$300 savings per motor/25 mbtu per $ * 200 motors
3	CO2 Sensors Demand Control Ventilation	$1500 each	$250 each	HVAC Tech		1,800	7.00%	11,638	4.06%	$0.05 to $1 /sf, per year(2 million sf * $0.05)
4	Outside Air Temp Sensors	$85,000	$10,000	HVAC Tech		1,000	1.00%	1,641	0.57%	
5	Occupancy Sensors for HVAC and Lighting			Bond		8,000	9.00%	5,013	1.75%	
6	Destratification fans >15' Ceilings	$419,400		Bond			15.00%	386	0.13%	60 rooms assumed * ($4,500 installation per space + $2,490 fans)
7	Replace Pneumantic with DDC			Bond			15.00%	1,350	0.47%	Assuming 35% of district needing pneumatic replacement
8	Add DX in Admin areas in Chiller Buildings			Bond			4.00%	43	0.01%	This Savings is negated by summer programs that require chillller operation
9	Replace inefficient equipment with high-efficiency equipment (boilers, roof top units, etc)	$70,000,000		Bond			10.00%	2,571	0.90%	Cost is shown is an assumption to provide a magnitude of cost. Detailed estimates would have to be undertaken.
10	Convert Constant Volume to VAV	$250,000		Bond			7.00%	13,138	4.58%	savings = 250,000 sf * $1/sf
11	Install VFDs on the appropriate equipment	$75,000		HVAC Tech or Bond		1,600	15.00%	2,056	0.72%	assume 100 VFDs @15HP 11.2 kW*12hrs=134 kWh/day*300 days*100 vfd's=4020000kWh=13706 MBTU
12	Link Community Schools Schedule with Andover	$90,000		Contractor		2,500	3.00%	771	0.27%	http://www.schooldude.com/solutions/products/fsautomation
13	Install eCubes at all walk-in coolers/freezers	$60,000		HVAC Tech	50		20.00%	857	0.30%	
14	Building Envelope Commissioning (Cx)	$2,983,928		Bond			15.00%	3,856	1.34%	Consultant fees ES: $0.35, MS: $0.25, HS: $0.15 Although budgeting for envelope deficiencies is nearly impossible due to the wide array of deficiencies, allow the following per s. f. costs to correct deficiencies; ES: $0.50, MS: $0.40, HS: $0.30
15	Building Systems Cx	$2,352,704		Bond			12.00%	5,913	2.06%	Budget $1.00/sf for new construction, $.50/sf for existing construction based on PSD's experience. (100,000sf new construction assumed for cost estimating)
16	Replace Fluorescent troffers with LED	$7,500,000		Bond			30.00%	7,713	2.69%	Assume 80% of lighting use is fluorescent troffers
17	Replace HID lighting with LED in Gymnasia	$400,000		Bond			4.59%	1,023	0.36%	Save 300,000 kWh annually
18	Replace HID wall packs with LED	$110,000		Bond			1.98%	638	0.22%	assume 10 per building @ 175w * 53 buildings * 8 hrs* 360 days = 267120 kWh *70% energy savings = 186,984 kWh saved
19	Replace HID parking lot lighting with LED	$279,000		Bond			60.00%	428	0.15%	assume 9 at 11 sites; 4 at 45 sites. 279 lights @ 250w*10 hrs*300days=209250kWh annually
20	Install controls to allow for site (exterior and interior) blackouts at night.			Bond			5.00%	1,607	0.56%	http://cvh.sweetwaterschools.org/2013/06/07/lights-out-policy/
21	Replace Type I kitchen hoods with Type II at non-production sites.			Bond						http://www.cloudynights.com/ubbthreads/showflat.php/Cat/0/Number/5022014/page/12/v
22	Replace single pane windows.			Bond						
23	When replacing a roof, exceed ASHRAE 90.1-2010 continuous insulation requirements by 50%.			Bond						
24	Replace Resistance heaters			Bond						
25	Employ Integrated Design Process to all Bond Projects			Bond			50.00%	143,474	50.01%	Meet 50% reduction EUI goal with Integrated Design--**MBTU savings is not included in the total anticipated saved MBTU.** NOTE: Increase project budget by 2% based on Poudre School District's (PSD) experience.
	CAPITAL PROJECTS TOTALS	$84,845,032	$10,000		50	15,500		63,416	22.11%	

Strategies that require little to no capital

Quantities are required for potential Bond pricing estimates

Costs are estimates only. Return on investment analysis should be performed as appropriate.

OPERATIONS and MAINTENANCE

	Strategy	GC Labor and Materials	Material Costs for BVSD Labor	Who	Estimated Annual BVSD Hours Required	Estimated Additional BVSD Hours to Reach Estimated Annual MBTU Savings	Estimated Savings for Project-Specific Energy Category (ies)	Estimated Annual MBTU Savings	Estimated Annual Reduction of Total MBTU's	Notes
1	Change Set Points /Universal Setpoints/Night Setback	$0	$0	Mikulewicz		3,000	2.50%	4,156	1.45%	See Set Points Tab
2	Analyze Operation		$0	Mikulewicz		8,800	5.00%	1,178	0.41%	
3	Discharge air set point		$0	Mikulewicz		1,360	1.00%	1,705	0.59%	
4	Add 12 HVAC Techs to Staff		$840,000	Cuskelly		24,720	1.67%	2,741	0.96%	1.67% savings per technician
5	Add 6 Commissioning Agents to Staff (2 per zone)		$420,000	Cuskelly		12,360				No extra savings assumed, rather this would ensure savings realized from Bond commissioning continues
6	Boiler Optimization		$0	HVAC Tech		250	3.00%	4,152	1.45%	
7	Dom Heaters shut off during breaks		$4,400	Mikulewicz	40		8.20%	2,064	0.72%	
8	Dom Heater Circ Pumps Shut Off 8 Hrs a day		$4,400	Mikulewicz	40		33.00%	1,060	0.37%	
9	Minimum Damper Postions for Outside Air		$33,000	Mikulewicz	300		5.00%	6,920	2.41%	Assume $12,284.80 savings per year per 100,000 ft2 = $61,420
10	Runaway equipment		$39,600	Mikulewicz	360		5.00%	9,384	3.27%	
11	Locked Thermostats in all Portables			HVAC Tech	80					
12	Provide and display real-time energy data in ways that are accessible to staff and students.			Medwetz	96					
13	Benchmark energy performance and water use at least annually.			Medwetz	36					
14	Certify all eligible sites as Energy Star.		$9,000	Medwetz	12					
15	Provide ongoing utility tracking			Medwetz	240					
16	Manage energy budget			Medwetz	96					
17	Review data relating to projects and process changes			Medwetz	192					
18	Inspect facilities for operating efficiency, comfort level, and utilization			Medwetz	720					
19	Initiate new energy programs and goals			Energy Team	48					
20	Review and recommend energy management-related projects and proposals.			Medwetz	48					
21	Develop specifications and designs for new energy projects and systems			Energy Team	72					
22	Support development of new construction specifications related to energy management.			Energy Team	48					
23	Act as liaisons for partnerships with utilities and local, state, and federal agencies.			Energy Team	6					
24	Identify rebates, grants, and other funding options for energy projects. (This should include a revolving fund where savings and rebates from projects continually replenish the budget.)			Energy Team	12					
25	Measure & verify that Community schools is collecting correct energy fees			Energy Team	24					
26	Continue to monitor rates from Xcel, including time of use rates for sites with PV.			Medwetz	12					
27	Publish O&M standards			Cuskelly	80					
28	Publish Cooling & Heating Standards			Mikulewicz	80					
29	Establish protocol at all BVSD schools for the creation of xeric landscaping and athletic fields			Cuskelly						
	OPERATIONS AND MAINTENANCE TOTALS	$0	$1,350,400		2,642	50,490		33,362	11.63%	

Strategies that require little to no capital

Costs are estimates only. Return on investment analysis should be performed as appropriate.

APPENDIX A: Sustainable Energy Plan Strategies

EDUCATION / POLICY

	Strategy	GC Labor and Materials	Material Costs for BVSD Labor	Who	Estimated Annual BVSD Hours Required	Estimated Additional BVSD Hours to Reach Estimated Annual MBTU Savings	Estimated Savings for Project-Specific Energy Category (ies)	Estimated Annual MBTU Savings	Estimated Annual Reduction of Total MBTU's	Notes
1	Policy adoption should take place in the next three years, after a few more years of documenting savings in schools participating voluntarily in energy challenges			Carroll			22.00%	2,357	0.82%	22% of overall "Office Equipment" use is personal appliance consumption. For a conservative approach, this is approximately half the estimated percentage for Centennial and Angevine Middle Schools during a 2011 Energy Audit conducted by our energy intern.
2	Create a School Incentive Program that might include sharing in utility budget savings			Energy Team	40					
3	Manage school energy challenges and incentive programs.		$5,000	Carroll	200		12.00%	3,856	1.34%	
4	Publish monthly energy and water use reports.			Medwetz	48					
5	Educate staff, faculty, and students about energy savings			Carroll	90		3.00%	3,214	1.12%	
6	Train Custodians in Energy Efficient Practices			Carroll	120		3.00%	3,214	1.12%	See Appendix C
7	Train Security Staff in Energy Efficient Practices			Carroll	40		0.50%	536	0.19%	
8	Publish Employee Energy Efficiency Expectations			Carroll	5					See Appendix D for Sample Employee Expectations
9	Coordinate with school-specific champions.			Energy Team	96					
10	Review individual school energy management ideas, plans, and programs			Energy Team	40					
11	Provide regular updates on Plan Implementation (as relates to Energy Budget) to BOE, Budget Director and Assistant Superintendent of Operations			Energy Team	20					
	EDUCATION/POLICY TOTALS	$0	$5,000		699	0		13,176	4.59%	

Strategies that require little to no capital

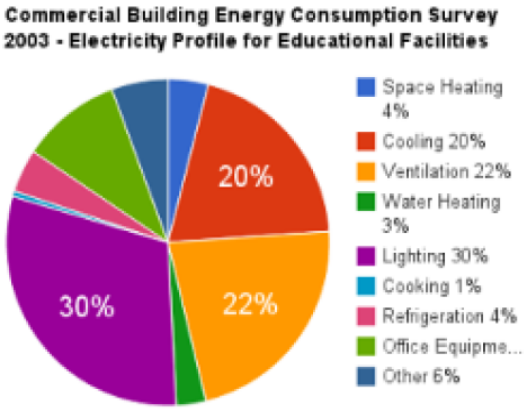
GRAND TOTALS

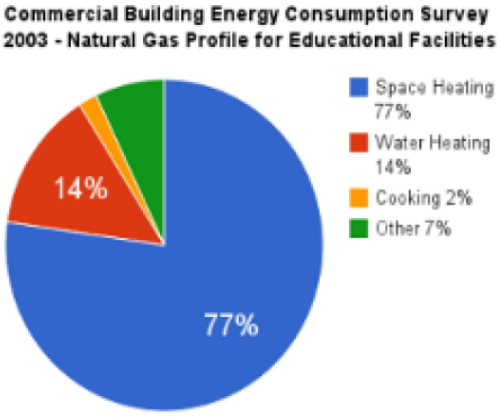
Strategy	GC Labor and Materials	Material Costs for BVSD Labor	Who	Estimated Annual BVSD Hours Required	Estimated Additional BVSD Hours to Reach Estimated Annual MBTU Savings	Estimated Savings for Project-Specific Energy Category (ies)	Estimated Annual MBTU Savings	Estimated Annual Reduction of Total MBTU's	Notes
CAPITAL PROJECTS, OPERATIONS & MAINTENANCE, AND EDUCATION/POLICY STRATEGIES	$84,845,032	$1,365,400		3,391	65,990		109,953	38.33%	

Costs are estimates only. Return on investment analysis should be performed as appropriate.

APPENDIX A: Sustainable Energy Plan Strategies

BVSD FY 2007-08 Energy Consumption based on CBECS Data						
CATEGORY	**ELECTRICITY**			**NATURAL GAS**		
2007-08 Cost:			$2,605,201			$1,451,718
2007-08 use:	31,417,937	kWh				
Conversion:	107,119.79	MBTU		179,750.10	MBTU	
Space Heating	12,854.37	MBTU	$130,260	138,407.58	MBTU	$1,190,409
Water Heating	3,213.59	MBTU	$26,052	25,165.01	MBTU	$116,137
Cooking	1,071.20	MBTU	$26,052	3,595.00	MBTU	$58,069
Other	6,427.19	MBTU	$260,520	12,582.51	MBTU	$87,103
Cooling	21,423.96	MBTU	$677,352			
Lighting	32,135.94	MBTU	$677,352			
Refrigeration	4,284.79	MBTU	$104,208			
Ventilation	14,996.77	MBTU	$182,364			
Office Equipment	10,711.98	MBTU	$521,040			
District Square Footage	4,568,432					
2007-08 Cost:	$2,605,201.00			$1,451,718.00		
cost per MBTU	$0.04			$0.12		
$1.00 =	24.32	MBTU		8.08	MBTU	





APPENDIX B.

DRAFT Recommendation for personal appliances in BVSD schools

Introduction to the Topic

In accordance with Board of Education (BOE) Policy ECF and Resolution 12-30 and the Boulder Valley School District's commitment to sustainability, energy management and heat mitigation efforts, the following proposal is a recommendation for regaining control around the growing number of electrically powered personal appliances in BVSD schools. These appliances (as defined in the language below) use a significant portion of energy. Staff are making this recommendation based on prior district practice and after researching what other districts in Colorado and specifically along the front range are doing to address this issue. Approaches range from strictly forbidding personal space heating equipment and personal refrigerators, to guidelines and recommendations for limiting use and unplugging over breaks, to energy management practices with no specific mention of personal appliances.

Creating a comfortable working and learning environment is a critical component of this work, and in cases where there is conflict, there should be a process in place for addressing concerns.

Our current practice is more voluntary in nature and is based on recommendations, rather than requirements and restrictions.

Draft Policy Recommendation

Staff recommend implementing stricter standards around the use of personal appliances, including personal microwaves and refrigerators, toasters, year round decorative lighting and heating and cooling equipment other than fans. Excluded from this recommendation are personal lamps, fans and stereos, all of which use energy but have benefits for classroom and office comfort and potential instructional value. **Rather than creating a new policy to address this specific issue, we recommend creating a regulation as part of existing policy ECF.** A regulation would give the additional support needed from the administration to help influence change. The regulation should also include district practice for heating and cooling the building, including standard set points for heating and cooling during operational and non operational times (e.g. extended breaks, nights and weekends) and procedures for computer management during off school hours.

DRAFT of ECF-R

District Heating and Cooling

In order to maximize energy saving potential and create comfortable working and learning environments, the District uses the following set points for heating and cooling the schools and buildings. Buildings are brought to temperature ½ hour before bell time and remain at that temperature until 1 hour after bell time in the afternoon.

Ventilation and temperature control are provided for all official activities in the school such as the before and after school activities, the YMCA, SAC and sporting activities. To schedule heating and cooling for these event use the Event Management System software (EMS) through Virtual EMS. Every school has a contact person with access to this system. Schedule your heating and cooling needs event at least 2 weeks prior to the event. If your event is less than two weeks away, contact the District Building Automation Controls Analyst at extension 5044.

Cooling
Occupied Set Point 76 Degrees F

Heating
Occupied Set Point 70 Degrees F

Unoccupied Set Points 55-65 Degrees F
(Includes nights, weekends and extended holidays. May be overridden in extreme weather conditions)

Building temperatures will vary throughout the day and by season, and building occupants should dress accordingly. Staff should keep vents clear from obstruction, and keep windows and doors to the outside closed when the air conditioner and heating units are on. The district will also create and implement an ongoing program for Re/retro-commissioning buildings to ensure that they are operating as intended, and the Maintenance team will follow best preventative maintenance practices, such as cleaning filters and coils regularly and as per manufacturer's guidelines.

Electrical Equipment

- All electricity consuming equipment should be replaced (at time of replacement) with Energy Star™ equipment where these options exists. Submit a request to the Energy Hotline for a list of energy saving equipment.
- Eliminate personal appliances, including individual microwaves, refrigerators, toasters, hot plates (for cooking) and coffee pots For exceptions, submit a request to the Energy Hotline. These items are allowed in staff lounges and kitchens and, in some cases, shared work spaces.
- Eliminate personal printers. The district has transitioned to multi-function devices (MFDs) to meet printing, copying, scanning and faxing needs. IT will no longer support personal printers and schools should not buy toners for personal printers. The MFDs will save the district money and energy and will reduce paper use.
- Minimize the use of personal lamps, and replace incandescent lamps with compact fluorescent lamps. Decorative lighting is not recommended, and should not be used year round. Turn off any personal lamps when not in use and before leaving the room. Please contact your custodian or submit a maintenance work order if the motion sensors are not working properly or if you area is too bright.
- Eliminate the use of personal heaters. If your work space or classroom is uncomfortable please submit a maintenance work order. Exceptions may be warranted if room conditions do not meet district standards and parameters as outlined above for heating and cooling set points. Portable air conditioners are not allowed. Fans are allowed in order to increase air movement and circulation, particularly on hot days.
- Turn off any equipment and lighting that is not being used and in unoccupied areas. The easiest way to save energy is with careful attention to operate equipment only when required. All district computers are set to power down during periods of inactivity.
- Use power strips when possible and unplug equipment that is not used regularly. Equipment that is plugged into the wall and off still uses a small amount of electricity.

APPENDIX C.
Training Guidelines for Custodians

1. General
    a. Be a leader in energy conservation. Lead by example.
    b. Instruct others on common misconceptions about energy use.
    c. Be alert for energy waste at all times (lights, computers, heating and cooling systems left on when not needed are biggest energy wasters).
    d. Perform a shutdown checklist at the end of each day to make certain that the building systems are shut down in an energy conservative manner.
    e. Light only the room being cleaned. Turn lights off when leaving the room.
    f. Work with fewer lights turned on when possible (areas with ample daylight such as corridors, entryways, commons).
    g. Recycle paper, cardboard, plastic, glass, and metal where possible.
    h. Use recycled products such as paper and other environment-friendly products such as water-based paints, and non-toxic floor and desk cleaners.
    i. Use dry cleanup before using water/spray washing. Minimize water washing
2. HVAC
    a. Advise maintenance if you think a time or temperature schedule change is needed.
    b. Keep the heat inside. Close blinds at night to keep in the heat. Open during the day to let sun shine through and warm the inside of the building. Do the reverse during the cooling season.
    c. Keep exterior doors and windows closed while heating or cooling systems are operating.
3. Maintenance
    a. Report all leaking faucets and pipes as well as running toilets.
    b. Report heating and air conditioning problems to maintenance.
    c. Report damaged doors and windows to reduce the need for heating and cooling in the building.
    d. Make suggestions to maintenance staff and administration to improve energy and operational efficiency.
4. Lighting
    a. Before the School Day
        i. From the time the custodian arrives until 15 minutes before the students arrive – lighting in the corridors, restrooms and commons should be kept to a minimum, enough for people to safely move around. All other lights in unoccupied areas should be turned OFF.
        ii. Custodian should not turn classroom, auditorium, gym or office lights on. Teachers and staff can do this when they arrive.
        iii. 15 minutes before students arrive – all necessary lighting should be turned ON.
        iv. Teachers can use partial lighting when students are not present in the classrooms. (Maximize available daylight.)
    b. During the School Day
        i. On sunny days, areas (entryways, commons, corridors, etc.) with ample daylight should have interior lights turned OFF.
        ii. Teachers (or assigned students) and office staff should turn lights when leaving classrooms and offices.
        iii. Be sure all outside lights are OFF. Portable classrooms have a manual switch. If outside building security lights are on, please notify maintenance.
        iv. PE teachers can use less than the full bank of gym lights when holding classes

outside.

v. Teachers using the stage for classes should not use auditorium house lighting unless needed.
vi. Make sure outside lights are off during the day.

c. After the School Day
    i. Each staff member should turn lights OFF when leaving their classrooms or offices to attend meetings or before leaving for the day.
    ii. Daytime custodian should brief substitute custodians of lighting control procedures.
    iii. Custodial staff should do classroom trash and check for lights OFF.
    iv. Custodial staff should vacuum corridors with lights ON while staff and students are still present.
    v. Soon after staff and students are noticeably gone, corridor lights should be turned OFF.

d. Nighttime
    i. Lights should be OFF except in the immediate area where custodial staff is working, or where school or community events are being held.
    ii. Staff or community members hosting events should be held responsible for lighting control in that area of the school.
    iii. Campus blackouts should be in effect within 15 minutes after the custodian is scheduled to leave.

APPENDIX D.

Sample Employee Expectations

1. Teach energy efficiency to students. Lead by example and get students involved.
2. Turn lights off when leaving the room for any period of time.
3. Work with fewer lights turned on when possible (i.e. when students not in room).
4. Turn computers on to start each day and off at end of each day.
5. Turn off electrical equipment and appliances when not in use and at end of each day.
6. Portable electric heaters, compact refrigerators, microwave and toaster ovens, coffee brewers and hot plates shall not be used.
7. Report all leaking faucets and pipes as well as running toilets.
8. Report damaged doors and windows to reduce the need for heating and cooling in the building.
9. Advise maintenance if you think a time or temperature schedule change is needed.
10. Keep the heat inside. Close blinds at night to keep in the heat. Open during the day to let sun shine through and warm the inside of the building. Do the reverse during the cooling season.
11. Keep exterior doors and windows closed while heating and cooling systems are operating.
12. Keep books, etc. off of heating and cooling equipment, especially where it blocks airflow.
13. Recycle paper, cardboard, plastic, glass, and metal where possible.
14. Make suggestions to maintenance staff and administration to improve energy and operational efficiency.
15. Only use kilns when needed. When kilns are in use, try to reduce other loads to offset peak.