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## Executive Summary:

### Overview

CMS Viron Energy Services is pleased to provide the San Mateo County Community College District with a Comprehensive Energy Analysis report that recommends an Energy Infrastructure and Efficiency Program that is economically sound, integrated with the Facilities Master Plan, and supports the District's overall educational mission. Through this program, the San Mateo County Community College District will demonstrate and provide the campus community the following:

#### ◆ ECONOMIC LEADERSHIP

- Generating approximately **\$900,000 in net annual operating cost avoidance** and more than **\$20,000,000 in cost avoidance** over the project's life.

#### ◆ INTEGRATION WITH FACILITIES MASTER PLAN

- Through the Energy Infrastructure and Efficiency Program, the District will be implementing key facility renovation activities that are integrated with the **Capital Improvement Program's** project schedule.

#### ◆ IMPROVED LEARNING AND WORKPLACE ENVIRONMENT

- Installing more **Effective Lighting Systems and Controls** in classrooms, lecture halls, labs, physical education and sports facilities, and offices.
- Providing **Improved Environmental Controls and Indoor Air Quality** by repairing, replacing, and/or installing modern heating, cooling, ventilation, and energy management equipment.

#### ◆ STATE-OF-THE-ART ENERGY INFRASTRUCTURE UPGRADES

- Providing needed repairs to the **Heating Plants and Loops, HVAC Systems and EMS Controls**.
- Adding a new, high efficiency **Central Chilled Water plant and loop** at Cañada College.
- Installing an **Internet-based Energy Information System – Utility Vision** that enables the District maintenance and operations staff to track energy efficiency performance and electricity production.

#### ◆ STATE GRANTS AND INCENTIVES

- The Energy Infrastructure and Efficiency Program total cost will be reduced through grants and incentives totaling over **\$800,000**.

## ◆ ENVIRONMENTAL STEWARDSHIP

- Through **Energy Conservation, Energy Efficiency and Clean Distributed Generation** reducing annual electric grid consumption by over 6,700,000 kilowatt-hours (this is the equivalent of approximately 1,800 residences).

## Work Performed

CMS Viron has completed the following work under contract to the District according to the May 2001 agreement to conduct a Comprehensive Energy Analysis (CEA) of district facilities. Over the past year, CMS Viron staff met with the Facilities, Operations, and Planning staff, attended regular CEA progress meetings, and presented reports to the Chancellor and Board of Trustees on the interim results. For this report, CMS Viron performed the following tasks:

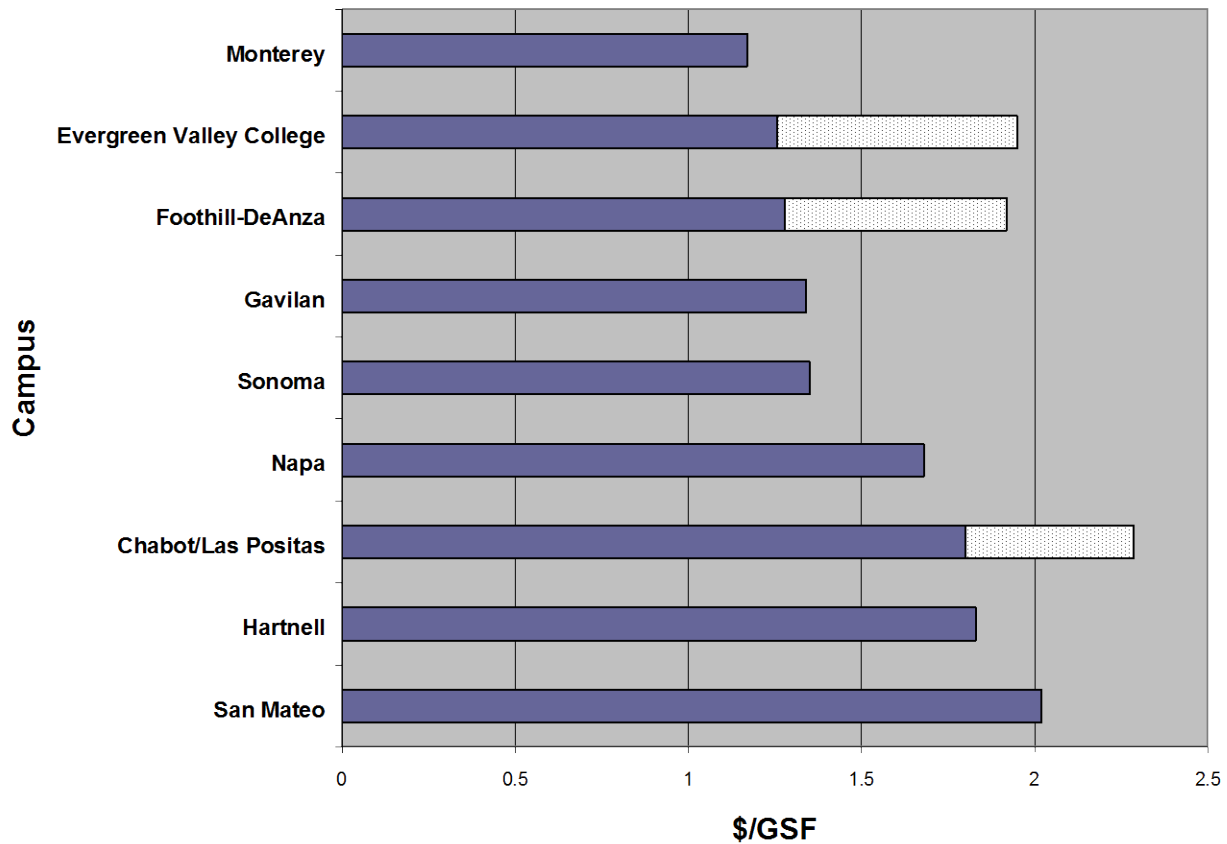
- Reviewed and copied (where appropriate) existing documentation, including drawings, utility bills, operating logs, utility company invoices, and metering logs.
- Conducted several months of on-site data gathering as part of a thorough field survey of the facility. Installed data loggers and interviewed school and plant operations personnel about facility operations.
- Identified contractor personnel to assist in identifying potential energy conservation measures (ECM's), potential distributed generation measures (DGM's), and to provide budgetary and bid-level quotes for implementing the ECM's, DGM's, energy system repairs, and facility improvements.
- Analyzed data gathered on-site and elsewhere, and identified potential ECM's and DGM's.
- Computed energy and demand savings of potential ECM's and DGM's.
- Developed measure selection criteria in conjunction with District staff.
- Conducted financial analyses for potential energy system repairs, ECM's, DGM's, and facility improvements, e.g., added cooling and a chilled water system in selected buildings at Cañada College.
- Prepared this CEA report and submitted it to the San Mateo County Community College District staff.

Per the guidance provided by District staff, this report presents an analysis of energy infrastructure repairs and improvements, energy conservation measures, and distributed generation technologies that appear to be both technically and economically feasible based on our experience. Other measures were considered but were not included in this report due to time limitations and to provide for easier reading. For the selected ECM's, DGM's, and Energy Infrastructure repairs and upgrades, detailed analyses with assumptions and costing are provided.

## Key Findings

### High Utility Expenses:

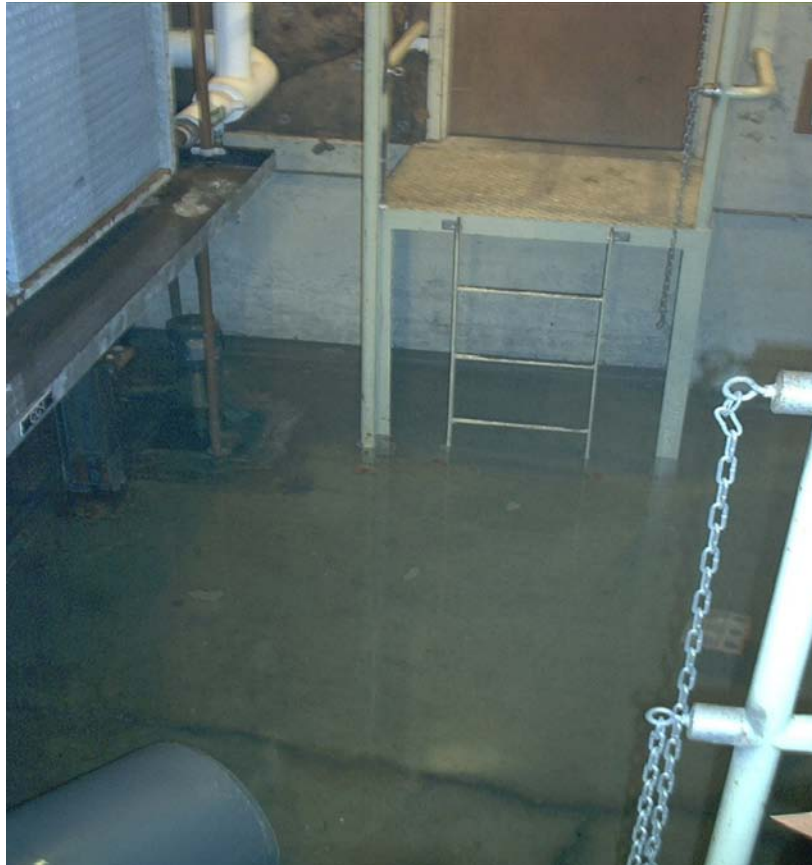
The District has a total annual electricity and natural gas expenditure of over \$2 per gross square foot of facility area. This is one of the highest expenditures when compared with other San Francisco Bay Area community college districts. In addition, the pending termination of the electricity procurement agreement with Enron Energy Services will add up to \$600,000 per year in additional expense.



**Figure 1-1: Comparison of Community College Annual Energy Expenditures**

**Substantial Maintenance Backlog, Aging Equipment, and Inadequate EMS Controls:**

Based on our detailed, building-by-building energy survey, and based on actual maintenance records supplied by District staff, we have documented a broad range of maintenance needs, inoperable, aging or inefficient equipment, and equipment repairs that are necessary to sustain facility operations and control operating expenses. The campus EMS system is outdated and in many cases inoperable or set to manual control. A related finding is the lack of adequate maintenance funding over the past ten or more years that has resulted in a large maintenance backlog. The following photos illustrate our findings:



**Fig. 1-2: Plugged Condensate Drain**



**Fig. 1-3: Manual Override on Older EMS Controls**



**Fig. 1-4: Leaky Pumps and Valves**

## Results

Based upon the results of the inspection survey and preliminary analyses of selected potential measures identified in the survey, CMS Viron believes there are significant opportunities for energy and maintenance cost savings and for improved comfort at the San Mateo County Community College District -- **Tables 1-1 through 1-3** present the results of our analyses.

**Table 1-1** presents those ECM's/DGM's that were investigated by CMS Viron for the San Mateo County Community College District.

**Table 1-1  
Energy Infrastructure Measures Investigated**

<b>Category</b>	<b>Energy Infrastructure Measure</b>
<b>Repairs</b>	M1-M8: Mechanical HVAC/Piping Repairs
<b>ECM</b>	L0: Fall 2001 Lighting Efficiency Project
<b>ECM</b>	L1-7: Energy Efficient Lighting
<b>ECM</b>	M9-M10: HiEff Motors & HHW VFDs
<b>ECM</b>	C1: EMS Controls/ Backbone
<b>ECM</b>	M11-M13: HQ Boiler/CT/Chiller/VAV
<b>DGM</b>	DG1: Combined Heat & Power (900 kW)
<b>DGM</b>	DG2: Solar PV System (218 kW)
<b>Facility Improvement</b>	C2: EMS Controls/ Zones
	M14: UtilityVision
	M15: Chilled Water Plant/Loop (CSM & Canada)
	M16: VTCV to VAV conversion

**Table 1-2** provides a package of energy infrastructure measures we are calling the “Preferred Option”, including L-1 – L7 (Lighting), M1-M8, M10 (HVAC), C-1 (EMS), DG-1 (Combined Heat and Power Measure), M14 (UtilityVision energy information system), and M15A (Chilled Water plant and loop at Cañada College). The preferred option includes all energy infrastructure measures identified during the CEA project that met the District’s selection criteria. For this option, the first year operating cost savings including utility cost savings, maintenance costs, and operational savings are estimated at \$908,233.

**Table 1-2  
Preferred Option**

Category	Energy Infrastructure Measure	Total First Year Dollar Savings	Total Project Costs (Low)	Total Project Costs (High)	PG&E /CPUC Rebates	Net Project Costs (Low)	Net Project Costs (High)	Estimated System Life
Repairs	M1-M8: Mechanical HVAC/Piping Repairs	\$166,903	\$7,350,000	\$7,500,000	\$0	\$7,350,000	\$7,500,000	25.0
Repairs	C1: EMS Controls/ Backbone	\$129,000	\$2,250,000	\$2,420,000	\$0	\$2,250,000	\$2,420,000	20.0
ECM	L1-8: Energy Efficient Lighting*	\$126,500	\$850,000	\$870,000	\$0	\$850,000	\$870,000	15.0
ECM	M10: Heating Hot Water VFDs	\$56,900	\$695,000	\$735,000	\$0	\$695,000	\$735,000	25.0
ECM	DG1: Combined Heat & Power	\$478,072	\$2,400,000	\$2,660,000	\$803,000	\$1,597,000	\$1,857,000	25.0
ECM	M14: UtilityVision	\$0	\$65,000	\$70,000	\$0	\$65,000	\$70,000	15.0
Central A/C	M15A: Chilled Water Plant/Loop (Cañada)	(\$49,142)	\$1,850,000	\$1,920,000	\$0	\$1,850,000	\$1,920,000	30.0
	<b>TOTALS</b>	<b>\$908,233</b>	<b>\$15,460,000</b>	<b>\$16,175,000</b>	<b>\$803,000</b>	<b>\$14,657,000</b>	<b>\$15,372,000</b>	<b>24.5</b>

\* L1-L8 Savings includes Fall 2001 Lighting Efficiency Project



**Table 1-3** provides a financial proforma of the Preferred Option. After a California Public Utilities Commission incentive of \$803,134 for the cogeneration systems at Skyline College and the College of San Mateo, the net project cost is \$15,135,043. The projected savings surpass the net project investment within fifteen (15) years.

**Table 1-3  
Preferred Option - Proforma**

**San Mateo County Community College District  
CMS Viron Project #1323**

Cost of Improvements (Total Project Fee paid to Viron) .. (ECMs M1, M2, M3, M4, M7, M8, M10, M14, M15A, L1-L8, C1, DG1)	\$15,938,177	* Includes CEA Fee
<u>Estimated CPUC Self-Generation Incentive .....</u>	<u>(\$803,134)</u>	
<b>NET PROJECT COST =</b>	<b>\$15,135,043</b>	

(1) Year	(2) Guaranteed Annual Energy Savings <small>(ECMs M1-4, M7, M8, M10, M14, L1-L8, C1, FLP)</small>	(3) Stipulated Cogen Annual Energy Savings <small>(ECM DG-1)</small>	(4) Estimated CHW Plant Energy Usage <small>(ECM M-15A)</small>	(5) O&M Savings	(6) Cogen Maintenance Costs	(7) Monitoring Fee	(8) Total Annual Saving	(9) Cumulative Savings
1	\$410,367	\$502,072	(\$49,142)	\$68,936	\$24,000	Included	\$908,233	\$908,233
2	\$426,782	\$522,155	(\$51,108)	\$58,595	\$82,000	Included	\$874,424	\$1,782,657
3	\$443,853	\$543,041	(\$53,152)	\$49,806	\$84,460	Included	\$899,088	\$2,681,744
4	\$461,607	\$564,763	(\$55,278)	\$42,335	\$136,994	Included	\$876,433	\$3,558,177
5	\$480,071	\$587,353	(\$57,489)	\$25,401	\$89,604	Optional	\$945,733	\$4,503,910
6	\$499,274	\$610,847	(\$59,789)	\$15,241	\$92,292	Optional	\$973,282	\$5,477,192
7	\$519,245	\$635,281	(\$62,180)	\$9,144	\$95,060	Optional	\$1,006,430	\$6,483,622
8	\$540,015	\$660,693	(\$64,668)	\$5,487	\$154,187	Optional	\$987,339	\$7,470,961
9	\$561,616	\$687,120	(\$67,254)	\$3,292	\$100,850	Optional	\$1,083,924	\$8,554,885
10	\$584,080	\$714,605	(\$69,944)	\$1,975	\$103,875	Optional	\$1,126,841	\$9,681,726
11	\$607,443	\$743,189	(\$72,742)	\$0	\$106,991	Optional	\$1,170,899	\$10,852,625
12	\$631,741	\$772,917	(\$75,652)	\$0	\$173,539	Optional	\$1,155,467	\$12,008,092
13	\$657,011	\$803,833	(\$78,678)	\$0	\$113,507	Optional	\$1,268,659	\$13,276,751
14	\$683,291	\$835,987	(\$81,825)	\$0	\$116,912	Optional	\$1,320,541	\$14,597,292
15	\$710,623	\$869,426	(\$85,098)	\$0	\$120,420	Optional	\$1,374,531	\$15,971,823

**Notes by Column:**

- Years after substantial completion of all measures.
- Energy Prices escalation = 4% per year.
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- Energy Prices escalation = 4% per year.
- Annual O&M savings are attributable to the new lamps and ballasts installed under ECMs L1-L8. Annual savings for years 2-4 is reduced by 15% to account for premature failure of new lamps and/or ballasts. The annual savings for years 5-10 is reduced by 40% to account for lamp failures after the expected usefull life of five years. The O&M savings terminate entirely in year 11 when the 10-year usefull life of the ballast expires.
- Cogen maintenance costs escalate 3% annually and include \$50,000 in years 4, 8 & 12 for a complete engine overhaul. Cogen maintenance costs are not included in Total Project Fee.
- Monitoring fees for years 1-4 are capitalized in the Total Project Fee. Viron's Monitoring contract must be renewed at the beginning of year 5 for the energy savings guarantee to remain in effect.
- Column (2) plus Column (3) plus Column (4) plus Column (5) minus Column (6) minus Column (7)



## **Conclusions and Recommendations**

Based on the overall return on investment, improved service and reliability, and enhanced learning and working environment, **CMS Viron recommends the implementation of energy infrastructure measures in the “Preferred Option”**. CMS Viron believes these measures offer significant benefits to the SMCCCD. These benefits will have the effect of reducing future energy costs and mitigating the impact of future energy price increases while reducing maintenance and operating costs.

CMS Viron will provide overall engineering, project and construction management, commissioning, and on-going performance monitoring for the system repairs, energy efficiency, and distributed generation projects. CMS Viron will provide the SMCCCD, in essence, a single point of contact and responsibility for complete project implementation.

## **Report Organization**

This report is presented in the five Sections and an Appendix. Sections 2 through 5 contain the complete analyses, including operating cost impacts of the energy system repairs, ECM's, DGM's, and facility improvements:

- Section 1: Executive Summary
- Section 2: Utility Baseline Analysis/Rates
- Section 3: Data on Present
- Section 4: Energy Conservation Measures
- Section 5: Monitoring
- Appendix

## **CMS Viron Energy Services Contact Person**

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Or

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