



John W. Hickenlooper
Governor

Colorado Department of Corrections

October 201H
Update



Rick Raemisch
Executive Director

Energy Management Plan

Intentionally Blank

COLORADO DEPARTMENT OF CORRECTIONS

Energy Management Plan

Mission	1
Management Support	1
Background	1
Facility Description	1
Figure 1 – Colorado Correctional Facility Locations	2
Table 1 – Colorado Correctional Facilities	3
Table 2 – Other CDOC Facilities	5
Table 3 – Colorado APCCY Offices	5
Measurable Goals	6
Plan Objectives	6
Organization – Corrections Energy Management Program	7
Authority and Enabling Legislation	9
Objective and Scope	13
Key Performance Indicators (KPIs)	13
Energy Management	14
Materials and Resource Management	14
Vehicle Petroleum Consumption	14
Strategy	14
Operations Performance Sectors	15
Energy Management	15
Energy and Water Conservation Measures	16
Energy Performance Contracting	17
EPC Strategy	17
EPC Energy and Water Conservation Measures	18
Energy-and-Water Management Plan Implementation	22
Roadmap to Achieve Plan Goals	23
Demand-Side Reductions	23
High Performance Buildings	23
Operations and Maintenance (O&M)	24
Commissioning (Cx)	24
Energy Service Provider Demand Side Management (DSM) Programs	25
Small Energy Efficiency and Water Conservation Projects	25
Supply-Side Alternatives	27
Change the Culture: Energy Awareness and Water Conservation	29
Philosophy	30
Benefits	31
Appendix A	32
CDOC Utility Baseline Data – FY 2005-2006	32
Appendix B	33
Table B-1 – Implemented & Anticipated Energy Conservation Measures (ECCPC)	33
Table B-2 – Implemented and Anticipated Energy Conservation Measures	34

COLORADO DEPARTMENT OF CORRECTIONS

Energy Management Plan

Appendix C.....	35
CDOC Water Conservation Plan – Executive Brief	35
I. Plan Inclusions	37
II. Water Reduction Elements	38
III. Cost of Implementation.....	40
IV. Schedule and Metered Potable Water Reductions.....	42
CDOC Water Conservation Plan - <i>SUPERCEDED</i>	43
Water Conservation Plan (planning process)	43
Level One Measures.....	44
Universal Metering and Sub-Metering	44
Costing, Pricing, Water Allocations, and Incentives	46
Information and Education	46
Second Level Measures	47
Water-Use Audits	47
Retrofits.....	48
Standards.....	48
Landscape Efficiency	48
Level 3 Measures	49
Replacements and Incentives	49
Reuse and Recycling	50
Water-use Regulations and Standards	50
Integrated Resource Management.....	50
In-progress and Completed Water Conservation Measures	51
Future Water Conservation Measures	52
Appendix D.....	53
Table D-1 – Anticipated Future Water Conservation Measures (ECCPC)	53
Table D-2 – Anticipated Future Water Conservation Measures CDOC Facilities....	54

COLORADO DEPARTMENT OF CORRECTIONS

Energy Management Plan

Mission

The mission of the Colorado Department of Corrections (CDOC) is to protect the citizens of Colorado by holding offenders accountable and engaging them in opportunities to make positive behavioral changes and become law-abiding, productive citizens. Within the CDOC, Facility Management Services, which administers the Energy Management Program, is a high performance team that provides timely and cost effective solutions, supporting the operations, maintenance, and construction of Colorado correctional facilities.

Management Support

The Executive Director for the CDOC is ultimately responsible for the administration of and the success of the Energy Management and Water Conservation Plan (the Plan). The Utilities Subprogram, referred to as the Energy Management Program (EMP), is implemented and monitored through a team approach by the agency's Energy Manager.

Background

The CDOC, an executive agency of Colorado state government, operates and manages twenty (20) correctional facilities and two (2) repurposed or decommissioned correctional facilities, on complexes across the State of Colorado, comprising approximately 11,000 acres. CDOC maintains and uses 1166 fleet vehicles to support its state-wide activities. The agency operating budget is \$752.6 million for Fiscal Year July 1, 2013 – June 30, 2014 (FY 2013-2014). For FY 2013-2014, the Utilities budget is appropriated \$18,582,804 from the general fund and \$1,050,834 from cash funds received from sales revenues earned by Correctional Industries.

Over the last 100+ years, the Colorado Department of Corrections has experienced substantial advances in its building and energy technologies. However, many of its buildings are more than 50 years old and were designed and constructed prior to the more modern, energy efficient buildings of today. It is imperative that the CDOC examine its energy consuming portfolio of structures, systems, and vehicles, including new or planned construction, to identify and employ the most efficient and cost-effective solutions in design and operation. This function will be carried out by the Agency Energy Management Program and its Energy Manager.

Facility Description

The CDOC organizational structure includes state owned-and-operated facilities and leased Adult Parole, Community Corrections, and Youthful Offender System (APCCY) offices. CDOC owned facilities are located throughout the state and include 678 buildings totaling more than 7.15 million square feet. Figure 1 shows the location of CDOC correctional facilities, APCCY offices, and private prisons. Tables 1 through 3 on the following pages include facility size and locations for state-owned or operated locations. The current Plan focuses on correctional facilities owned by the State of Colorado. All of the APCCY offices are located in leased space. For leased space, the CDOC focus is on energy awareness, reduced waste (recycling), water conservation, and energy efficient equipment and appliances. Colorado contracted private prisons operations are monitored by the CDOC; however, the CDOC Plan does not currently include energy conservation management measures for private prisons.

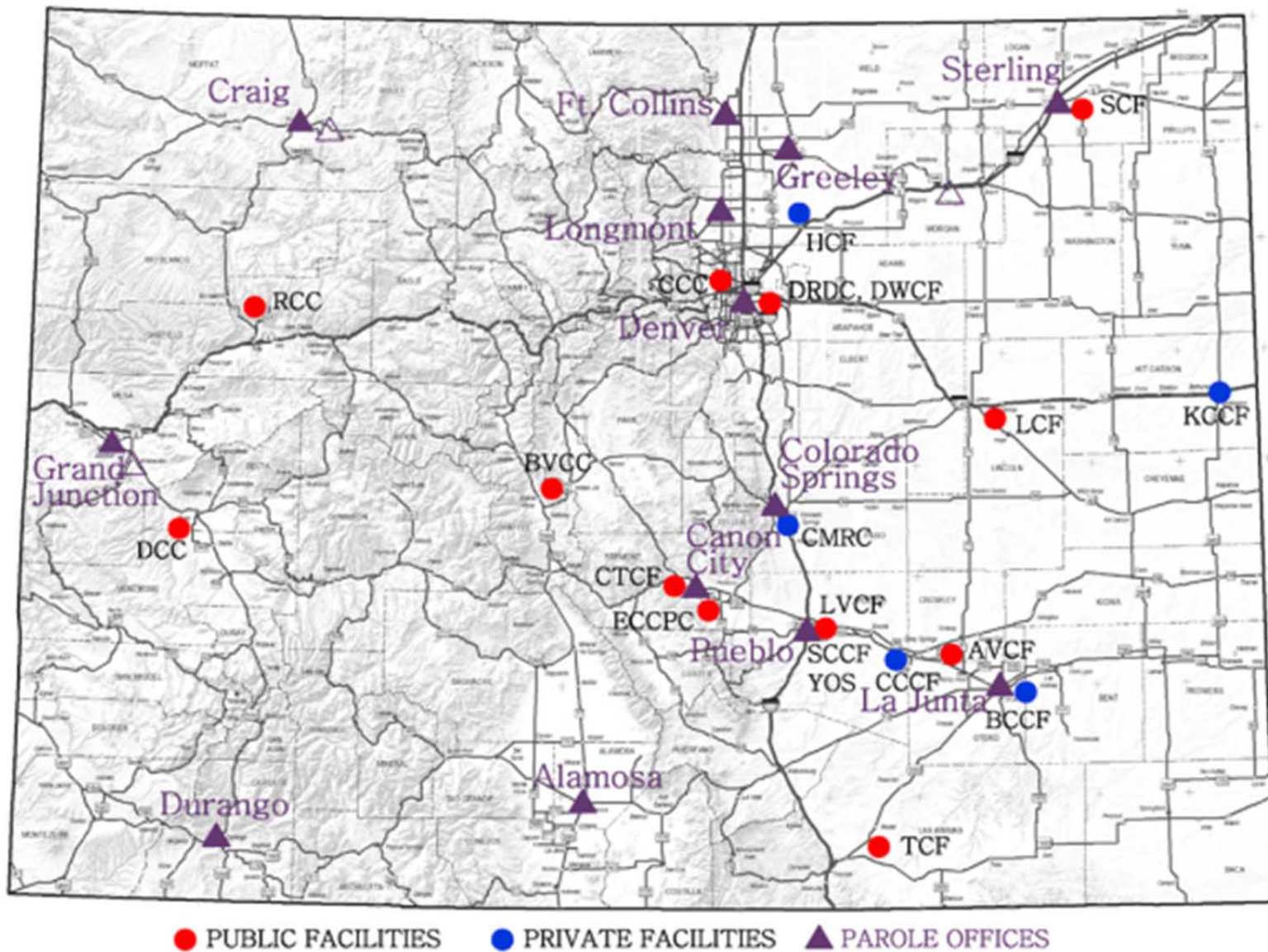


Figure 1 – Colorado Correctional Facility Locations

Table 1 – Colorado Correctional Facilities*

#	Acronym Year Built	Facility Name Square Footage	Bed Capacity	Location Comments
1	ACC 1989	Arrowhead Correctional Center 200,553 SF	520 Beds	Cañon City
2	AVCF 1987	Arkansas Valley Correctional Facility 374,705 SF	1,050 Beds	Crowley
3	BVCC 1889 & 1999	Buena Vista Correctional Complex (BVCF & BVMC) 534,699 SF	1,044 Beds	Buena Vista
4	CCAP 1991	Colorado Corrections Alternative Program Part of BVCC (deactivated as housing)		Buena Vista currently unutilized
5	CCC 1939	Colorado Correctional Center (<i>Camp George West</i>) 45,543 SF	150 Beds	Golden
6	CCF 1980	Centennial Correctional Facility 615,975 SF (Total) 167,753 SF 1980 448,222 SF 2010	320 Beds (Total) 320 Beds (North) 0 Beds (South) Closed	Cañon City
7	CSP 1993	Colorado State Penitentiary 458,906 SF	756 Beds	Cañon City
8	CTCF 1890	Colorado Territorial Correctional Facility 520,126 SF	929 Beds	Cañon City
9	CWCF 1966	Colorado Women's Correctional Facility International Correctional Management Training Center (ICMTC) 67,171 SF (deactivated as housing) converted to training facility		Cañon City
10	DCC 1952	Delta Correctional Center 148,654 SF	480 Beds	Delta
11	DRDC 1990	Denver Reception & Diagnostic Center 305,501 SF	572 Beds	Denver
12	DWCF 1998	Denver Women's Correctional Facility 436,393 SF	900 Beds	Denver

CDOC Energy Management Plan

#	Acronym Year Built	Facility Name Square Footage	Bed Capacity	Location
13	FCF 1939	Fremont Correctional Facility 558,005 SF	1,620 Beds	Cañon City
14	FMCC 1983	Four Mile Correctional Center 117,186 SF	521 Beds	Cañon City
15	LVCF 1935	La Vista Correctional Facility (PMC) 212,773 SF	544 Beds	Pueblo
16	LCF 1991	Limon Correctional Facility 389,358 SF	930 Beds	Limon
17	RCC 1978	Rifle Correctional Center 66,480 SF	192 Beds	Rifle
18	SCC 1957	Skyline Correctional Center 43,682 SF	252 Beds	Cañon City
19	SCCF 1995	San Carlos Correctional Facility 143,441 SF	234 Beds	Pueblo
20	SCF 1998	Sterling Correctional Facility 847,672 SF	2,412 Beds	Sterling
21	TCF 1999	Trinidad Correctional Facility 142,275 SF	400 Beds	Trinidad
22	YOS 1932	Youthful Offender System 85,278 SF	256 Beds	Pueblo

* Table updated October 16, 2013

Table 2 – Other CDOC Facilities**

	Acronym	Facility Name	Location
	Year Built	Square Footage	
Enterprise Operation	CCi	Colorado Correctional Industries	Denver
	1934	50,050 SF	
Leased	HQ	Central Office – Headquarters	Colorado Springs
	1971	60,143 SF	
Leased	TA	Training Academy	Cañon City
	2002	15,688 SF	
Leased	CMHIP	Colorado Mental Health Institute - Pueblo	Pueblo
		Building 16 – Pharmacy	
		4,987 SF	
		Building 54 – Parole Board Offices	
		4,278 SF	
		Building 54 – IG (Inspector General) Offices	
		2,700 SF	
		Colorado Correctional Industries @ YOS	
		1,471 SF	

** Table updated October 16, 2013

Table 3 – Colorado APCCY Offices*****APCCY – Adult Parole, Community Corrections, and Youthful Offender Service**

	Location	Square Footage
Leased	Alamosa Parole Office	1,792 SF
Leased	Cañon City Parole Office	2,142 SF
Leased	Colorado Springs Parole Office	15,277 SF
Leased	Craig Parole Office	1,354 SF
Leased	Denver Parole Office (Broadway)	28,600 SF
Leased	Denver Parole Office (Lincoln)	20,833 SF
Leased	Denver Parole Office (Sherman)	8,260 SF
Leased	Durango Parole Office	2,515 SF
Leased	Englewood Parole Office	9,512 SF
Leased	Fort Collins Parole Office	6,104 SF
Leased	Grand Junction Parole Office	9,431 SF
Leased	Greeley Parole Office	3,860 SF
Leased	La Junta Parole Office	697 SF
Leased	Longmont Parole Office	2,450 SF
Leased	Pueblo Parole Office	6,082 SF
Leased	Sterling Parole Office	1,288 SF
Leased	Westminster Parole Office	23,674 SF
Total APPCCY Offices Square Footage***		143,871 SF

*** Table updated October 16, 2013

Measurable Goals

The initial set of *Greening of State Government* goals Colorado state government sought to achieve by June 30, 2012 were as follows:

Reduction in use below the FY 2005-2006 baseline

- 20% reduction in energy use
- 10% reduction in energy use (*if energy performance contracting is not feasible*)
- 20% reduction in paper use
- 10% reduction in water consumption
- 25% volumetric reduction in state vehicle petroleum consumption**

***Excludes vehicles used for law enforcement, emergency response, road maintenance, and highway construction*

Additional *Greening of State Government* goals with future attainment dates are as follows.

Greenhouse Gas Emissions:

- **20% reduction** from 2005 baseline levels by FY 2020
- **80% reduction** from 2005 baseline levels by FY 2080
- 75% landfill diversion (by FY 2020)

The Governor, in cooperation with the Colorado Energy Office, is currently developing an updated Executive Order which will provide measurable goals for the future.

Plan Objectives

The objective of the Energy Management and Water Conservation Plan (the Plan) is to promote energy efficiency throughout the department through cost effective programs and initiatives. Through the Plan, CDOC will implement and meet energy usage reduction targets established under the Greening of State Government goals. Further, through performance of the plan CDOC will promote and encourage energy awareness and energy-related training of all employees.

To implement the Plan, CDOC will monitor, trend, and review facility energy usage and develop corrective actions if energy use falls outside the bounds of preset limits. Further, CDOC has developed KPIs (Key Performance Indicators) and assigned accountabilities. Throughout our work, CDOC will maintain a close working relationship with the local utility companies.

Utilities Included in the Plan:

- Electricity
- Fuel Oil
- Propane
- Natural Gas
- Steam
- Water
- Waste Water

Organization – Corrections Energy Management Program

The Colorado Energy Office requires that each state agency designate an Energy Manager who is responsible to implement and monitor the agency's Energy Management and Water Conservation Plan. CDOC has developed a team approach for energy management. The Energy Management Program (EMP) works with Offices of Primary Responsibility to reduce energy consumption, increase the use of renewable energy sources, increase the energy efficiency and decrease the environmental impact of the state vehicle fleet, implement "smart water" use and conservation, implement environmental purchasing standards, reduce waste, and increase recycling. The Energy Management Program is funded for 2.6 staff positions and currently includes two, full-time staff with periodic assistance from other staff members, as required.

Richard Weems, Architect, is the Interim Deputy Director of Facility Management Services (FMS). Weems is responsible for the Energy Management Program and serves as the acting Energy Manager.

Diana Dean, P.E.¹, CEM², LEED AP³, GBE⁴, is the Energy Management Engineer. Dean is responsible for identifying energy and water efficiency opportunities and administering the CDOC Energy Performance Contracting process. In addition, Dean works with the Colorado Energy Office and utility providers to take advantage of demand side management opportunities for cost savings. Dean's key subject areas include:

- Utility Program Budget – Team Lead
- Energy Performance Contracting
- Energy Efficiency (Electric, Natural Gas, Propane)
- Building Envelope (Insulation, Walls, Windows)
- Energy Management Control Systems
- HVAC (Heating Ventilating Air-Conditioning)
- Lighting & Daylighting
- Renewable Energy (Solar Photovoltaic, Solar Thermal, Biomass, Wind, Geothermal)
- Metering & Submetering
- Utility Rate Analysis - Unit Costs
- Composting
- Leadership in Energy and Environmental Design (LEED)
- High Performance Buildings
- ENERGY STAR®
- EnergyCAP Utility Management Database – Secondary Administrator
- Education & Awareness – Energy Efficiency and Water Conservation

¹ P.E. – Professional Engineer

² CEM – Certified Energy Manager

³ LEED AP – Leadership in Energy and Environmental Design Accredited Professional

⁴ GBE – Green Building Engineer

Patty Pettus is the EMP Energy Analyst and is responsible for receiving, monitoring, and tracking electric, natural gas, propane, fuel oil, water, wastewater, and other EMP related billings paid from the utility line. Pettus is responsible for compiling utility use baseline data and reporting on CDOC's progress in achieving energy and water reduction goals. Pettus audits utility invoices to ensure accurate billing and is the CDOC primary contact for utility vendors. Pettus coordinates with the agency's accounting office and provides utility information to the CDOC facilities. Pettus is responsible for entering utility usage data into the EnergyCAP utility management database. Pettus is also responsible for the Agency Recycle Program. She oversees this effort at all correctional facilities, compiles the data, and reports to the Colorado Energy Office on the results. Pettus's key subject areas include:

- Utility Invoice Entry, Tracking, Verification, and Reporting
- Natural Gas Usage Tracking and Monthly Nominations
- Monthly and Year-End Accruals Reports
- EnergyCAP Utility Management Database - Primary Administrator
- Electronic Equipment Recycling (Personal Equipment Recycling Employee Fairs)
- Recycling (Paper, Plastics, Metal, Cardboard, Styrofoam, Writing Instruments)
- Education & Awareness – Recycling

John Gillogley, FMS Special Projects Manager, provides assistance to the Energy Management Program. Gillogley manages the agency's land and water rights, water acquisition/trade/exchanges, augmentation plans, water resources, and water and wastewater management issues. Gillogley will assist the EMP with issues related to potable and non-potable water service and use, water reuse and recycling, water conservation practices, and energy and water conservation measures relating to water and wastewater systems. Dean and Gillogley work together to determine feasibility and promote renewable energy projects throughout the CDOC. Gillogley's key subject areas in support of the EMP include:

- Specialty utility contracts
- Renewable project promotion
- Water Use/Reduction/Reuse/Conservation
- Wastewater
- Potable and Non-potable Water
- Irrigation
- Water Rights – including wells and storage
- Substitute Water Supply Plans (temporary and undecreed water needs)
- Land Acquisition, Exchange, Sale, Lease, Encumbrance, and "disposal"
- Water Quality Control Division liaison
- Legislation monitoring (land, water rights and use, wastewater, and related areas)
- Rule change monitoring (all areas)

James “Jim” Ramsey, AIA, LEED AP, serves as the State Buildings Delegate. In this capacity, Ramsey assists the EMP in coordinating with the Office of the State Architect and in implementing applicable High Performance Certification Program building standard for design and construction of correctional facilities. Ramsey’s areas of support for the Energy Management Program include:

- Performance Contracting – Contract Negotiation
- High Performance Buildings

The Energy Management program works with other areas of the department including Fleet, Purchasing, and the Warehouse, on the following measures:

- State Vehicle Petroleum Reduction
- Alternative Fuels Vehicles
- Environmentally Preferable Product Purchasing
- Paper Use Reduction

The core EMP members are assisted by CDOC correctional facilities Physical Plant Managers, Facility Management Services (FMS) Project Representatives, and FMS Planners. In cooperation with FMS and facility staff, the EMP works to verify and ensure that fundamental building elements and systems are installed, calibrated, and operating as efficiently as possible. The EMP also works with the Energy Service Companies (ESCOs) selected to perform Energy Performance Contracting to ensure that government efficiency goals are achieved.

Authority and Enabling Legislation

The Colorado Department of Corrections Utilities Subprogram – Energy Management Program was created in 1998. HB 01-1381 provided the CDOC further authority whereby long term energy savings contracts, funded by utility savings and avoided costs, make projects possible which require multiple year pay-back periods. CDOC has consistently managed this program under this legislation saving millions of dollars over the last fifteen years. With the Governor’s Executive Order D0010 07, this office continues to operate to “...Lead Colorado to a New Energy Economy by advancing energy efficiency, renewable and clean energy resources.”

Executive Orders:

Executive Order D 2010–006 Greening of State Government: Earth Day 2010, (April 22, 2010), to reduce the negative environmental impact of state government. This executive Order provides some modification but does not replace Executive Orders ***D0012 07, D0011 07, and D005 05***. Key directives within the E.O. include:

- Recycling
- Paper Reduction
- Environmentally Preferable Purchasing
- Climate Action Plan
- Renewable Energy
- Petroleum Reduction
- Smart Use of Energy and Water
- Greening Government Coordinating Council
- EnergyCAP Software Use – Track utility bill information for state-owned facilities

Executive Order D 004–08 Reducing Greenhouse Gas Emissions in Colorado, (April 22, 2008), to establish the state's greenhouse gas reduction goals and direct the Colorado Department of Public Health and Environment (CDPHE) to develop reporting regulations. State agencies are directed to join in a statewide effort, coordinated by CDPHE, the Department of Natural Resources, the Department of Agriculture, CEO, and the Governor's Office of Policy and Initiatives, to achieve these goals.

Greenhouse Gas Emissions:

- **20% reduction** from 2005 baseline levels by FY 2020
- **80% reduction** from 2005 baseline levels by FY 2080

Executive Order D0012 07 Greening of State Government: Detailed Implementation, (April 16, 2007), State agencies shall establish policies and procedures to achieve the goals and objectives articulated in Executive Order D0011 07. Sections within the E.O. include:

- Reduction of State Energy Consumption
- Materials Management and Environmental Preferable Purchasing
- Greening the State Fleet
- Renewable Energy Sources for State Energy Consumption

Executive Order D0011 07 Greening of State Government: Goals and Objectives, (April 16, 2007), establishes the goals and objectives for "Greening State Government" activities and initiatives. The Executive Order charges State departments to: "take a position of leadership in the new energy economy". State agencies shall reduce state energy consumption, increase state use of renewable energy sources, increase the energy efficiency and decrease the environmental impact on the state vehicle fleet, and implement an environmental purchasing standard requiring attention to energy and environmental impacts of purchasing and materials decisions.

Executive Order D0010 07 the Governor's Energy Office, (April 16, 2007), changes the name of the Governor's Office of Energy Management and Conservation to the "Governor's Energy Office". The mission of the energy office shall be to lead Colorado to a New Energy Economy by advancing energy efficiency, renewable and clean energy resources.

Executive Order D005 05 Greening of State Government, (July 15, 2005) establishes the Greening of State Government. This order was modified under Executive Order D0012 07. The E.O. directs the Executive Directors of all state agencies to evaluate their current business operations and develop and implement policies and procedures to promote environmentally sustainable and economically efficient practices.

Executive Order D014 03 Energy Performance Contracting to Improve State Facilities (July 16, 2003) directs state agencies to initiate energy performance contracting where the opportunity exists to better utilize utility and operating budgets and to make capital improvements in facilities. Each state agency responsible for state-owned facilities shall investigate the feasibility for an energy performance contract. Legislation to govern energy performance contracts was adopted in House Bill 1381 in 2001, C.R.S. §§ 24-30-2001 through 24-30-2004 and C.R.S. §§ 24-75-108 and 29-4-729.

Colorado Climate Action Plan

The Colorado Climate Action Plan was issued in November 2007. The goal of the plan is to mobilize Colorado's businesses, governments and citizens in an effort to first slow and halt the increase and then reduce emissions to 20 percent below 2005 levels by 2020. By 2050, the goal is to reduce greenhouse gas emissions by 80 percent below 2005 levels. Colorado state government has three important roles to play in facing the climate change challenge:

- Enact "bridge strategies" that immediately reduce greenhouse gas emissions while we pursue technologies to generate cleaner energy
- Provide leadership to ensure that long-term solutions, such as renewable energy and clean coal technologies, are fully developed and broadly implemented
- Prepare the state to adapt to those climate changes that cannot be avoided

Colorado Revised Statutes (CRS)

- 24-30-1301, *et seq* State Buildings, Department of Personnel
- 24-30-1305 Life-cycle cost – high performance standards
- 24-30-1104, *et seq* Alternative Fuel Use Requirement
- 24-30-2001, *et seq* Utility Cost Savings Measures
- 24-38.5-101, Colorado Energy Office – name and mission
- 24-82-60, *et seq* State-Owned Facilities – Energy Conservation
- 24-82-901, *et seq* Outdoor Lighting Fixtures (CDOC prisons, exempt)
- 24-103-207, *et seq* Recycled Paper Content Minimums
- 24-103-207.5, *et seq* Environmentally Preferable Purchasing Preference
- 40-2-124 Renewable Energy Standard

Legislation/Legislative:

- **Senate Bill 13-252** concerns measures to increase colorado's renewable energy standard so as to encourage the deployment of methane capture technologies the bill, which took effect July 1, 2013, amends CRS 40-2-124.
- **Senate Bill 13-028** concerns tracking the utility data of a state building that has achieved the highest performance certification attainable as part of its capital construction project. The bill, approved March 22, 2013, amends and updates amends CRS 24-30-1305.
- **House Bill 12-1315** Effective date July 1, 2012. Reorganization of the Governor's Energy Office, renamed the Colorado Energy Office (CEO), amends CRS 24-38.5-101, and updates and changes the CEO mission to focus on the following.
 - a. Sustain the Colorado energy economy and promote all Colorado energy;
 - b. Promote economic development in Colorado through energy-market advances that create jobs;
 - c. Encourage Colorado-based clean and innovative energy solutions that include traditional, clean, and renewable energy sources in order to encourage a cleaner and balanced energy portfolio;
 - d. Promote energy efficiency;
 - e. Increase energy security;
 - f. Lower long-term consumer costs
 - g. Protect the environment

- **Senate Bill 07-051** requires the state to adopt a "high performance standard certification program" for state building projects
- **Senate Joint Resolution 06-032** Greening of State Government Buildings
- **HB 07-1281** Increased Renewable Energy Standards; The Bill increases the renewable energy requirements to include all utilities, except municipally-owned utilities serving fewer than 40,000 customers
- **HB 07-1220** Environmentally Preferred Purchasing – State Government
- **HB 07-1169** Net Metering for Customer-Generators of Cooperative Electric Associations
- **HB 07-1150** Colorado Clean Energy Development Authority

Colorado Constitution:

- **Amendment 37**, dated 2004 Renewable Energy Portfolio Standard
Renewable energy standard for qualifying retail utilities in Colorado, pursuant to § 40-2-124, C.R.S. Section 40-2-124, C.R.S., was enacted by the voters of the State of Colorado as 2004 Ballot Amendment 37 and was amended by the 2005 Colorado General Assembly by Senate Bill 05-143. Section 40-2-124 was further amended by the 2007 Colorado General Assembly by House Bill 07-1281. The 2008 Colorado General Assembly amended, by House Bill 08-1160, provisions of § 40-2-124, C.R.S., and added § 40-9.5-118, C.R.S., to cause cooperative electric associations to come under the Commission's interconnection rules. The 2009 Colorado General Assembly further amended § 40-2-124, C.R.S., by Senate Bill 09-051, and the 2010 Colorado General Assembly again amended § 40-2-124, C.R.S., by House Bill 10-1001.

American Correctional Association (ACA):

- **ACA Standard on Recycling, Energy and Water Conservation, Pollution Reduction, and Renewable Energy**
4-4003-1 Added August 2010. The facility/agency shall demonstrate it has examined, and where appropriate and feasible, implemented strategies that promote recycling, energy and water conservation, pollution reduction, and utilization of renewable energy alternatives. Comment: Correctional facilities and programs have the responsibility to implement strategies that allow correctional facilities to be managed in ways that are most cost-effective and deliver superior performance, while improving environmental responsibility and sustainability. This includes recycling (including paper, metal, and plastic products), energy conservation (including building insulation, heating and ventilation, temperature controls, vehicle fuel efficiency, water economies, physical plant engineering, and energy measures), pollution reduction (including composting sewer treatment, litter abatement, and carbon emissions), and utilization of renewable energy alternatives (biofuels, solar collection, turbine energy production, and methane collection).

Objective and Scope

The scope of the Colorado Department of Corrections Plan was originally defined by the gubernatorial executive orders and enabling legislation discussed and referenced above. The Plan objective is to effectively accomplish the Governor's and the Colorado Energy Office (CEO) mission in the context of Corrections operations. This agency will work in close cooperation with CEO to implement *Greening of State Government* initiatives, develop sound programs which will enhance efficiencies, and in turn make efficient use of the tax payer dollar. As the Plan evolves over time, the EMP will continue to incorporate the CDOC strategic planning measures and utility reduction targets for energy efficiency and water conservation.

Key Performance Indicators (KPIs)

The Energy Management Program continues the essential function of recording and tracking utility cost and use, and scanning and storing CDOC utility invoices. The EMP makes these records available to CDOC facilities, and uses the information to trend historical use, audit billings, project use, and develop budgets. Utility measurement and data analysis and recording are critical to the effective implementation of the energy program. Use and cost data is used to target facilities where utility use indicates improvements may be warranted and determine payback and cost-effectiveness of projects. The effort also creates baseline performance measures and characteristics by meter for buildings within the department. CDOC's Key Performance Indicators include:

- Utility Consumption Measurement
- Energy Budget Allocations and Performance
- Alignment with the Agency Strategic Plan
- Contributions to the accomplishment of Governor's "effective, efficient, and elegant" vision and objectives
- Compliance with Executive Orders and Directives

Noted previously in the Authority and Enabling Legislation section, ***Executive Order D 2010-006*** requires that state agencies use EnergyCAP software to track utility bill information for state-owned facilities. In compliance with the E.O. and as a KPI, the CDOC has entered historical vendor bill data back to fiscal year 2006, or earlier. CDOC enters and tracks current vendor bills on an ongoing basis. With the implementation of this utility tracking tool, the CDOC is able to report progress toward reaching efficiency goals related to purchased utilities.

Specific performance targets specified in the Governor's Executive Orders and legislation include:

- Energy Management
- Materials and Resource Management
- Vehicle Petroleum Consumption Reduction

Specific performance goals specified in the Colorado Department of Corrections *Performance Plan* include:

- Reduce energy use and water consumption
 - Reduce electricity use
 - Reduce natural gas use
 - Reduce potable water consumption

Energy Management

The department intends to achieve at least a 20% reduction in energy consumption of state facilities below fiscal year 2005-2006 levels where energy savings reduction projects have been funded through the vehicle of Energy Performance Contracts (EPCs). On an ongoing basis, CDOC will assess and implement, where effective, the development of state renewable energy projects with the support of CEO. Correctional facilities pose certain unique design, construction, and operations requirements, some which are not compatible with specific LEED™ criteria. However, CDOC will strive to design and construct new facilities to achieve LEED™-NC Gold certification to the extent it is cost-effective and possible. CDOC will also initiate energy performance contracts where opportunity exists to better utilize utility and operating budgets and to make capital improvements in facilities. In the contracting for services where energy consumption is involved, energy conservation and efficiency are encouraged. In January of 2011, CDOC began construction of energy/water conservation measures for two, state-owned facilities under EPCs. In FY 2011-2012, CDOC entered into one additional EPC. Construction and implementation of measures at all three EPC Phase I facilities is complete. An overview of the measures completed in Phase I is listed in the Energy Performance Contracting section of this Plan. In FY 2012-2013 CDOC's ESCOs completed Technical Energy Audits (TEAs) at three additional correctional facilities. CDOC intends to negotiate and enter into contracts and project financing of EPCs for the next three correctional facilities in FY 2013-2014. An overview of proposed measures for Phase II of the CDOC's EPC efforts are listed in the Energy Performance Contracting section of this Plan

Materials and Resource Management

In the area of resource management, the CDOC is committed to adhering to the purchasing policies developed to reduce the state's environmental impact as a consumer of products and services: 1) Adopt a goal of reduced waste from construction of new buildings and operation and renovation of existing facilities; 2) Achieve a paper use reduction goal of 20% using fiscal year 2005-2006 as a baseline; 3) Achieve a reduction of water consumption goal of 10%, using fiscal year 2005-2006 as a baseline. In the area of Environmentally Preferable Purchasing (EPP), establish requirements to purchase "green" products to the extent possible and feasible and implement EPP as a matter of policy.

Vehicle Petroleum Consumption

In the area of petroleum consumption, achieve a 25% volumetric reduction in petroleum consumption by state vehicles measured against a fiscal year 2005-2006 baseline, while increasing energy efficiency of the fleet (excluded vehicles include those used for law enforcement, emergency response, road maintenance, and highway construction).

Strategy

CDOC energy and water use can be reduced through demand-side reductions, cost-effective supply-side alternatives including renewables, and a commitment throughout the agency to change the culture. The EMP developed the agency's energy and water conservation plan so that implementation of the plan will reduce energy and water consumption in an effort to achieve the State's *Greening of State Government* goals. CDOC is implementing the Environmentally Preferable Purchasing (EPP) practices

under the State of Colorado Environmentally Preferable Purchasing Policy (*current version* – July 1, 2010).

Operations Performance Sectors

CDOC has identified the following core Operations Performance Sectors:

- Existing Buildings/Systems
- Energy Equipment/Fixtures/Systems – Upgrades/Replacements
- Energy Performance Contracting (EPC)
- Commissioning
- Re-commissioning and Retro-Commissioning
- Operation & Maintenance
- Water Conservation
- New Buildings/Systems
- New Construction Design/Engineering – LEED-NC
- Renewable Energy Technology – Geothermal, Solar, Wind, Biomass
- Water Conservation – Fixtures/Use/Xeriscaping/Watering-time/Native Species
- Operation & Maintenance
- Fleet Vehicles
- Transportation and Fuel Management Plan
- Transportation efficiency study
- Fuel type purchase and consumption tracking and reporting
- Petroleum volumetric consumption reduction plan
- Travel policies and directives
- Administration and Environmentally Preferable Purchasing (EPP)
- Purchasing Policies and Directives
- Recycling/Reuse
- Waste Management – Composting and Reduction

Energy Management

CDOC draws on available expertise, experience, and resources both from within the agency and from outside sources to develop and implement an effective energy management program. CDOC is fortunate to have the availability of our innovative Colorado Correctional Industries division which is enthusiastic in participating in energy efficiency, water conservation, and resource management efforts. CDOC explores opportunities and funding mechanisms which minimize the up-front development costs associated with the assessment and implementation of innovative energy solutions. We are working closely with the Colorado Energy Office (CEO), the CDOC Controller, the State Controllers' Office, and the Director of Personnel and Administration to implement cost-effective, efficiency measures. CDOC will incorporate the following components within the Energy Management program:

- Energy Audits/Assessments
- Demand Side Management (DSM)
- Measurement & Verification/Reporting
- Interagency Cooperation/Collaboration
- Public Outreach/Information

Energy and Water Conservation Measures

Energy and water conservation measures (ECMs and WCMs) serve to eliminate energy waste while increasing equipment/building efficiencies. Additional demand-side reductions include increased energy efficiency through effective building operations and management. Potential energy and water conservation measures involve the following systems or equipment:

- Lighting
- Heating, ventilation, air conditioning (HVAC)
- Building envelope (roof, curtain walls, windows, doors)
- Plug Loads (Computers, Monitors, Speakers, Chargers/Transformers)
- Fax machines
- Printers
- Copiers
- Scanners and multi-function devices
- Small power supplies
- Vending machines
- Task lighting
- Refrigeration
- Space heaters – reduce/eliminate use
- Water distribution systems
- Type of water use
- Point of use plumbing fixtures and controls

Equipment Replacement

The Energy Management Program (EMP) will work to develop and encourage purchasing/leasing standards that specify ENERGY STAR® products and premium efficient energy and water use equipment to reduce overall energy and water use. The CDOC Purchasing Office is responsible for processing and/or oversight of virtually all of the Department's purchases of goods and services costing more than \$5,000, and most small construction and maintenance project purchases costing between \$5,000 and \$100,000. The EMP works with the Purchasing Office and facility staff to assist in the selection of products and equipment which meet the current State of Colorado Environmentally Preferable Purchasing (EPP) Policy.

Plug Load Reduction

CDOC in collaboration with an Office of Information Technologies (OIT) policy and a staff education program, we can make an impact on plug loads through behavior modification, new equipment purchases, and the use of power-saving technology. Energy savings options should be enabled on all applicable equipment. CDOC is cooperating with the CEO to deploy the BigFix computer software aimed at reducing desk-top computer energy consumption. Office equipment should include power management and power off features.

- **Power manage:** ensure that all ENERGY STAR® office equipment (computers, printers, copiers) are enabled to go into “low power” or “sleep mode” when not in use.

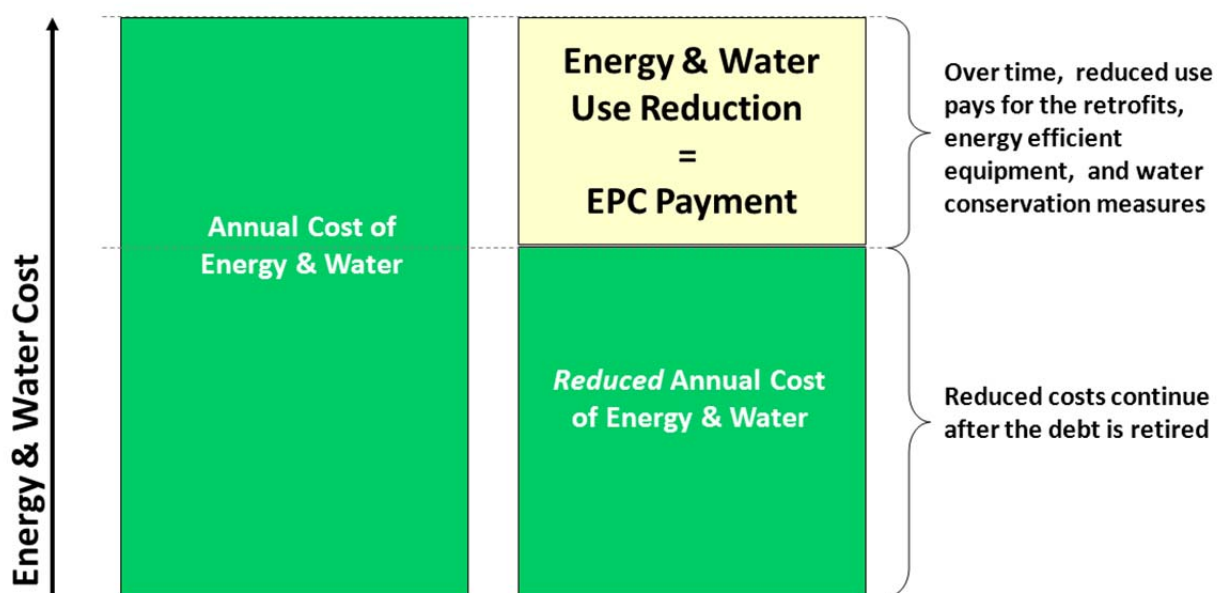
- **Power off:** encourage staff to turn off computers, printers, and other plug-load equipment when not being used.

Energy Performance Contracting

An Energy Performance Contract (EPC) is an agreement between an agency and an energy service company (ESCO). The ESCO conducts a comprehensive energy audit (Technical Energy Audit – TEA) of state facilities and identifies measures to reduce energy and water consumption. If the measures are accepted as feasible, the agency, with state-level review and authorization, arranges the necessary funding of an EPC, typically through third-party financing. In consultation with the agency and the Colorado Energy Office, the ESCO designs and constructs a project that meets the agency's needs. The ESCO guarantees that the improvements will generate energy and water use reductions and associated avoided costs (at then-current or anticipated rates) sufficient to pay for the project over the term of the contract.

EPC Financing

Reductions in energy and water use pay for the improvement measures, over time.



EPC Strategy

The CDOC entered into its first two Energy Performance Contracts – one at CTCF (Colorado Territorial Correctional Facility) and the other at BVCC (Buena Vista Correctional Complex). The on-site audit phase, Technical Energy Audits (TEAs), for the two facilities were completed in 2010. During the EPC construction and implementation phase, which began in January 2011, approximately ten million dollars' worth of equipment and operational upgrades have been installed and implemented at these two facilities at no up-front capital cost to the State of Colorado. The energy and water conservation measures are projected to result in long-term energy savings of up to 30% and municipal water savings of over 10% during the useful life of the work done under these contracts. In Fiscal Year 2011-2012, CDOC embarked on an EPC at Sterling Correctional Facility (SCF). This project combined energy and water

conservation measures throughout the facility with a chiller replacement project. The existing chillers had failed and a temporary chiller plant operated through the summer of 2011. The replacement chillers were brought on-line in time for the summer 2012 cooling season through the use of the EPC vehicle.

EPC Energy and Water Conservation Measures

Through the use of utility, operations, and management savings to fund improvements, where feasible and cost effective, the following measures are being implemented at CDOC facilities:

- Boiler and chiller plant replacement or improvements
- Building automation and energy management control systems
- Heating, ventilation, and air conditioning (HVAC) equipment
- Lighting improvements
- Building envelope modifications
- Chilled water, hot water, and steam distribution systems
- Electric motors and drives
- Refrigeration upgrades
- Distributed power generation systems
- Renewable energy systems
- Energy and utility distribution systems
- Water and sewer systems
- Electricity peak shaving or load shifting
- Energy cost reductions through rate adjustments
- Energy-related process improvements

Phase I - Energy Performance Contracts

CTCF – Energy Performance Contract Cañon City, Fremont County, CO

Contract Value:	\$6.65 million
Projected 1st year Savings:	\$382k
Simple Payback:	17.4 years
Payment Term:	20 years
Construction complete:	100%
Energy Services Company (ESCO):	Johnson Controls

EPC ACCOMPLISHMENTS CTCF

- Boilers replaced
- Variable Frequency Drives - boiler water pumps
- Summer Load Decouple
 - Facilities now independent from heat plant in summer months
- Cooling Towers replaced
- Heat Exchanger expanded
- Chiller Electrical Feeder (reduces demand charges)
- Building Automation System upgrade (DDC controls)
- Control Upgrade – heat pump
- Controls Addition – unit heater fan thermostats

- Air handling units
 - Controls upgrade, VFD retrofit, mix air conversion
- Heat pumps replaced
- Lighting retrofits
- Steam lines consolidated, steam traps replaced, steam pump replaced
- Steam piping insulated, steam pipe modified
- Ice machine replaced
- Water closet and fixture retrofit/replacements
- Laundry ozone system
- Vending miser – reduces vending machine energy use

BVCC – Energy Performance Contract

Buena Vista, Chafee County, CO

Contract Value:	\$6.55 million
Projected 1st year Savings:	\$548k
Simple Payback:	12 years
Payment Term:	15 years
Construction complete:	100%
Energy Services Company (ESCO):	Long Energy Solutions

EPC Accomplishments BVCC

- Combined heat and power
- Stack economizer
- Digital controls
- Ventilation matched to occupancy
- Boiler steam controls optimized
- District heating & plant efficiency
- Boiler and water controls
- Dryer heat recovery in laundry
- Ozone generation system in laundry
- Steam line pipe insulation
- Air handling unit heat recovery
- Kitchen ventilation controls (exhaust fans turned off)
- Evaporator fan controls
- Variable frequency drives (VFDs)
- Interior lighting retro-fit
- Exterior lighting retro-fit

SCF– Energy Performance Contract

Sterling, Logan County, CO

Contract Value:	\$5.55 million
Projected 1st year Savings:	\$419k
Simple Payback:	13.25 years
Payment Term:	14 years
Construction complete:	100%
Energy Services Company (ESCO):	Johnson Controls
TEA Fast Tracked - completed:	12/12/2011

EPC Accomplishments SCF

- Chiller Replacement (emergency project)
- Cooling tower replacement
- Controls optimization
- Steam pressure reduction
- Pipe & valve insulation
- Steam traps replaced
- Water conservation measures
- Ozone laundry
- Retro commissioning
- “Best Value” Chiller Procurement SCF
 - First “Best Value” Chiller selection in State
 - Energy efficiency and performance verified
 - Modified Life Cycle Cost determined
 - Equipment cost + 20-year energy cost
 - Factory testing verified performance
 - 100%, 75%, 50%, and 25% load values verified
 - Engineer verified performance in factory

EPC PHASE I RESULTS**Projected Utility Reduction & Funds for Finance Payment**

EPC Item	CTCF	BVCC	SCF	Total
Electricity Reduction	1,951,852 kWh	1,193,524 kWh	1,213,405 kWh	4,358,781 kWh
Gas Reduction	34,498 DkThrms	49,745 DkThrms	51,614 DkThrms	135,857 DkThrms
Water Reduction	9,793 k-Gal	508 k-Gal	30,558 k-Gal	40,859 k-Gal
Utility Cost Savings	\$381,684 First Year	\$547,828 First Year	\$418,867 First Year	\$1,348,379 First Year
Total Capital Improvements	\$6,652,380	\$6,546,186	\$5,550,988	\$18,749,554

Phase II - Energy Performance Contracts

**ARKANSAS VALLEY CORRECTIONAL FACILITY and
LIMON CORRECTIONAL FACILITY – Energy Performance Contract
Phase II – Energy Performance Contract FY 2011/12 – FY 2014/15**

Contract Value:	\$10.8 million
Projected 1st year Savings:	\$791 k
Simple Payback:	13.6 years
Payment Term:	15 years
Technical Energy Audit:	100% complete
Construction complete:	0%
Energy Services Company (ESCO):	Long Energy Solutions

Proposed Measures – AVCF

- Direct Digital Control Upgrade/Expansion
- New High Efficiency Chillers

- Interior Lighting Retrofit
- Parking Lot & Wallpacks Lighting Retrofit
- Variable Volume Pumping
- Variable Air Volume Conversion
- Demand Controlled Ventilation
- Ozone Laundry System
- Plumbing Fixture Retrofit

Proposed Measures – LCF

- Direct Digital Control Upgrade/Expansion
- New High Efficiency Chillers
- Variable Volume Pumping Conversion
- Variable Air Volume Conversion
- Demand Controlled Ventilation
- Interior Lighting Retrofit
- Parking Lot and Wallpack Lighting Retrofit
- EC Motors/Evaporator Fan Controls
- Plumbing System Retrofit
- Domestic Hot Water Generator Retrofit
- Domestic Water Booster System

FREMONT CORRECTIONAL FACILITY

Phase II – Energy Performance Contract FY 2011/12 – FY 2014/15

Contract Value:	\$4.25 million
Projected 1st year Savings:	\$349 k
Simple Payback:	12.2 years
Payment Term:	15 years
Technical Energy Audit:	100% complete
Construction complete:	0%
Energy Services Company (ESCO):	Siemens Industry, Inc.

Proposed Measures – FCF

- Boiler - Burner controls
- HVAC and controls retro-commissioning
- Building automation system replacement
- HVAC economizer/controls
- Multi-zone HVAC to variable air volume
- Interior lighting
- Kitchen HVAC system
- Heat recovery
- Water conservation
- Ice machines
- Building weatherization
- Pipe insulation

TECHNOLOGY SPECIFIC EPC

Energy Efficient Light Emitting Diode (LED) Exterior Lighting Opportunities

Locations

- Buena Vista Correctional Complex
- Fremont Correctional Facility

Benefits

- Reduces energy use
- Improves visibility
- Replaces legacy lighting systems (that have outdated components, no longer available)
- Color rendition greatly improved
- Visual acuity improved
- Uniform illumination
- Lower illumination levels required
- Reduced operating cost
- Instant strike & re-strike
- Optical control improved (dimming)

Future Phases - Energy Performance Contracts

Facilities

- East Cañon City Prison Complex
 - CSP, ACC, FMCC, SCC
 - Maintenance Support Center
 - Central Warehouse – Visiting Center
 - Armory, Check Point, OIT Center
 - CCI Facilities
- Denver Complex
 - Denver Reception & Diagnostic Center (DRDC)
 - Denver Women's Correctional Facility (DWCF)
 - Denver Complex Alternate Water
- Pueblo Complex (Electric Only)
 - La Vista Correctional Facility (LVCF)
 - San Carlos Correctional Facility (SCCF)
- Trinidad Correctional Facility (TCF)
- Delta Correctional Center (DCC)
- Rifle Correctional Center (RCC)

Energy-and-Water Management Plan Implementation

The CDOC has been greeted with refreshing new ideas and attitudes from their staff and management with regard to energy and water management planning. While change is not always something people are comfortable with, it has been embraced and we are moving forward to create permanent realignment of procedures and behavior patterns. These changes will create a positive impact for the citizens of our state.

The following implementation steps were outlined in a September 2011 presentation to CDOC Executive Staff:

- Buy in from all stakeholders
- Baseline of existing energy use
- Targeted goals for the energy efficiency plan
- Energy Efficiency (& Water Conservation) Plan (refined and developed)
- Energy Performance Contracting statewide
- Enterprise Management Control System
- Demand Side Management
- Market Commodity Purchasing
- Education & Awareness
- Celebrate & share the success of the program

Roadmap to Achieve Plan Goals

We strive to deliver correctional services with optimal efficiency.

- Demand-side Reductions:
 - Reduce utility use and operating costs while sustaining the Mission
 - Ensure sustainability in facility design, renovation, and construction
 - Focus on operations and maintenance
- Supply-side Alternatives:
 - Install renewable systems and procure renewable source energy
 - Reduce waste stream costs by recycling and reusing materials
 - Establish Environmentally Preferable Purchasing (EPP) practices
- Change the Culture:
 - Provide occupant awareness and education
 - Create an informal conservation team – or “Green Team”

Demand-Side Reductions

CDOC employs demand-side reduction measures which involve facility and building system alternatives that will reduce the agency’s energy intensity. Building energy audits, commissioning, and Energy Performance Contracting will develop and implement measures to further reduce utility costs. Employing operations and maintenance best practices should enhance energy efficiency and lower maintenance costs.

High Performance Buildings

CDOC strives to incorporate requirements of the Office of the State Architect High Performance Certification Program in new construction and substantial renovations. High Performance Buildings involve the full spectrum of the project from initial facility master planning to final long-term operation and maintenance of buildings. Life Cycle Cost Analysis will be used in the following situations, when applicable:

- Energy Audits and Assessments
- Project Funding and Financing
- Energy-Efficient and Sustainable Procurement
- Sustainable Building Design and Construction
- Building and System Commissioning

- Operations and Maintenance

New construction, major renovation, and replacement of major building systems in correctional facilities will include the following, as appropriate:

- Highly Efficient Systems
- Petroleum Use Reduction and Energy Security
- Source Energy (pollution reduction)
- Renewable Energy
- Water Conservation
- Use of life cycle costing in procurement
- Use of ENERGY STAR® and energy-saving equipment and products

Through the use of sustainable design and construction for new facilities and major renovation, CDOC plans to achieve an optimum balance of costs, environmental, and human benefit.

- Goal of LEED™ Gold for new construction (*if cost effective and Mission-compatible*)
- Optimize energy efficiency
- Protect water resources
- Optimize site potential
- Assure good indoor air quality
- Use environmentally friendly products
- Minimize waste

Capital and minor repair and alteration projects will employ sustainable design and construction principals where applicable. Key approaches for repairs and alterations include:

- Invest in new, more efficient equipment
- Base decisions on life-cycle costing
- Opportunities with utility programs
- Focus on ENERGY STAR® and environmentally preferable products

Operations and Maintenance (O&M)

Operations and Maintenance practices and procedures have a direct impact on building energy use. The CCOE and the Energy Management Engineer will work with Correctional Facilities Physical Plant Managers and staff in the following areas:

- Perform routine walk-through energy audits
- Monitor equipment run/cycle time
- Energy efficient and ENERGY STAR® equipment replacement
- Integrate building automation systems & maintenance management systems
- Continual operation and maintenance training

Commissioning (Cx)

CDOC will perform commissioning, re-commissioning, and retro-commissioning in applicable situations, if feasible. Commissioning services may be considered in the following applications:

- Quality assurance for new buildings

- Improve performance of existing assets
- Full building/system Cx for capital projects
- Full retro-commissioning for major assets
- Continuous re-commissioning of major equipment
- Training and on-the-job experience

Energy Service Provider Demand Side Management (DSM) Programs

In FY 2009-2010, CDOC implemented a demand response program at the Denver and Sterling correctional facilities through the Xcel Energy – EnerNOC Peak Savings Program. Participants voluntarily reduce electricity consumption during periods of peak electricity demand or high wholesale electricity prices. CDOC will continue to explore and implement additional opportunities to reduce electric power demand as they are made available.

Small Energy Efficiency and Water Conservation Projects

CDOC performs small-scale energy efficiency projects on a periodic basis through utility line cost avoidance. These small projects are identified by facility staff or by Facility Management Services as measures that may avoid utility line costs. A cost estimate and energy or water use reduction is developed to determine probable payback. If the measure is feasible based on cost and simple payback, the measure is approved. The following list is an example of small projects that have been implemented or considered by CDOC over the past few years. Measures that show use and cost avoidance at one facility are shared with the Physical Plant Managers and are implemented at other facilities as opportunities and funds are available.

- **ACC – Arrowhead Correctional Center**
 - Controls Upgrade - Building heating & cooling
- **CCC – Colorado Correctional Center**
 - Furnace Upgrade
 - Hot Water Heater Upgrade
- **CCF – Centennial Correctional Facility**
 - Variable Frequency Drive (VFD)
 - Shower and Wall-Pack Lighting Upgrade
- **DCC – Delta Correctional Center**
 - LED Lighting Efficiency Upgrade
 - Replaced 417 light fixtures in the 5 living units with LED fixtures
 - Replaced 14 pole mounted light fixtures with LED light fixtures
 - Replaced a heating and cooling unit on the food service building DE31
 - Added Insulation
 - Installed a lower ceiling and insulation on general maintenance building DE23
 - Installed new foam roofs, increased insulation and reflectivity - vehicle maintenance DE20 and the Quonset hut DE28
 - Best Management Practice
 - All landscaping, greenhouse, and gardens watered with irrigation water

- Variable Frequency Drives
 - Installed two VFD motor controllers on the two 7 1/2 Horsepower domestic water pumps.
- Upgraded Control System
 - Upgraded the Robert Shaw DDC (direct digital control) environmental controls system
- Compost and recycle program
- **DRDC & DWCF – Denver Complex**
 - Water Conservation
 - Reduced irrigation usage by ~15% through reduce zone watering time
 - Low Flow Water Fixture Project
 - 113 low flow toilets
 - 7 low flow urinals
 - Studying the viability of LED lighting for low mast lights at DWCF
- **ECCPC – East Cañon City Prison Complex**
 - Wastewater Pretreatment Wash Water Reduction
 - Alternate Water – Piping
 - LED Lighting Upgrade – Armory & Maintenance
- **FCF – Fremont Correctional Facility**
 - Variable Frequency Drives
 - LED Exterior Lighting Upgrade
- **FMCC – Four Mile Correctional Center**
 - LED Lighting Upgrade
- **LVCF – La Vista Correctional Facility**
 - LED Wall Pack Lighting Upgrade
- **RCC – Rifle Correctional Center**
 - Compost and recycle program
 - Dining Room Window Replacement
 - Replaced the single pane windows with thermo-pane windows
 - Reduced glass area (reducing heat loss) RI07
 - LED Lighting Efficiency Upgrade
 - Replaced 170 light fixtures in the 2 living units with LED light fixtures
 - Roof Replacement – Installed new foam type roofs; increase insulation and reflectivity
 - Food service building RI07
 - Utility building RI05
 - General maintenance building RI06
 - Best Management Practice
 - All landscaping, greenhouse, and gardens watered with irrigation water
 - Water Conservation Project
 - Replaced 24 shower heads with low flow 1.25 gpm shower heads
 - Replaced the 24 lavatory faucet fixtures in the 2 living units with timed push button faucets

- **SCCF – San Carlos Correctional Facility**
 - Cooling Tower Efficiency Upgrade
 - Plate and Frame Heat Exchanger (Under consideration)
- **TCF – Trinidad Correctional Facility**
 - LED Exit Lights
 - ~ 10,750 kWh annual reduction in energy
 - 2.5 year simple payback

Supply-Side Alternatives

CDOC is considering supply side alternatives which will diversify the agency's utility portfolio, enhance reliability, provide emergency supply, and incorporate cost-effective renewable energy. Potential supply-site alternatives include:

- Solar Photovoltaic
- Ground source heat pumps
- Biomass and alternative methane fuels
- Solar thermal
- Wind generation
- On-site generation
- Combined heat and power
- Heat recovery

A completed and operational renewable energy, supply-side alternative project is the solar photovoltaic (PV) system installation at four (4) correctional facilities in the Black Hills Energy service territory. The systems (combined total just under 400kW) generate renewable electric energy. The project was implemented through Power Purchase Agreements (PPAs). Community Solar Garden participation efforts are ongoing and could result in up to an additional 2MW of panels installed at CDOC facilities.

Purchase Power Agreement @ AVCF Arkansas Valley Correctional Facility

Status: Operational

- ~100 kW-DC photovoltaic (PV) solar system
- Delivers electrical energy produced by a renewable energy source directly to the electrical distribution system at AVCF
- No “up-front”, operating or maintenance costs for the term of the contract
- Reduced greenhouse gas emissions, as CO₂, associated with electrical energy use by over 1,800 metric tons over the full 20-yr contract term
- Option to purchase after contract year six
- Utility Provider Conventional Fuel Use Reductions
- For ONLY the electrical energy produced by the PV system, estimated at sixty-percent (60%) cost avoidance over the 20-yr term of the contract
- Reduced fossil fuel utility usage by 3.1 million kWh (equivalent to 13.3 homes each year) over 20 year term of contract

Purchase Power Agreement @ CTCF Colorado Territorial Correctional Facility

Status: Operational

- ~90 kW-DC photovoltaic (PV) solar system
- Reduced CO₂ greenhouse gas emissions by over 1,700 metric tons over the

full 20-yr contract term

- Reduced fossil fuel utility usage by 2.9 million kWh (equivalent to 12.4 homes each year) over 20 year contract term

Purchase Power Agreement @ SCCF San Carlos Correctional Facility

Status: Operational

- ~100 kW-DC photovoltaic (PV) solar system
- Reduced CO2 greenhouse gas emissions by over 1,800 metric tons over the full 20-yr contract term
- Reduced fossil fuel utility usage by 3.1 million kWh (equivalent to 13.3 homes each year) over 20 year contract term

Purchase Power Agreement @ ECCPC East Cañon City Prison Complex

Status: Operational

- ~100 kW-DC photovoltaic (PV) solar system
- Reduced CO2 greenhouse gas emissions by over 1,800 metric tons over the full 20-yr contract term
- Option to purchase after contract year five
- Reduced fossil fuel utility usage by 3.1 million kWh (equivalent to 13.3 homes each year) over 20 year contract term

Purchase Power Agreement @ SCF In-Process Renewable Energy

Status: Pending agreement completion, execution by the parties, and Controller approval

- ~500 kW-DC photovoltaic (PV) solar system
- Deliver energy produced by a renewable source directly to the electrical distribution system at SCF
- No “up-front”, operating or maintenance costs for the term of the contract
- Option to purchase after contract year six
- Reduce CO2 greenhouse gas emissions by over 13,400 metric tons over the full 20-yr term of the contract

Projected Utility Use Reductions

- Avoided energy cost, relating ONLY to the electrical energy produced by the PV system, is estimated at thirty-five-percent (35%) over the 20-yr term of the contract
- Reduced fossil fuel utility usage by 19.1 million kWh (equivalent to 82.6 homes each year) over 20 year term of contract

Subscription Agreement in Community Solar Garden @SCF

Status: Pending agreement completion, execution by the parties, and Controller approval

- Approximately a thirty-percent (30%) of the output of a 1.97MW-DC photovoltaic (PV) solar system delivering electrical energy produced by a renewable energy source directly to the electrical distribution system of the utility company serving SCF – Xcel Energy
- No “up-front”, operating or maintenance costs for the term of the contract
- Reduced CO2 greenhouse gas emissions by over 53,000 metric tons over the

full 20-yr contract term

Projected Utility Use Reductions:

- Avoided energy cost, relating ONLY to the electrical energy produced by the PV system, is estimated at four and one-half-percent (4.5%) over the 20-yr term of the contract
- Reduced fossil fuel utility usage by 75.2 million kWh (equivalent to 320 homes each year) over 20 year contract term

Change the Culture: Energy Awareness and Water Conservation

The agency's Energy-and-Water Management Plan includes development of an ongoing energy awareness campaign to change the culture of CDOC. The approach to Energy Education includes a multi-stepped plan.

- Step 1 – Assemble the Teams
- Step 2 – Identify opportunities and objectives
- Step 3 – Communications plan
- Step 4 – Implement Education program
- Step 5 – Evaluate program
- Step 6 – Track and report data and results
- Step 7 – Follow through

Training and multi-media communications will engage and educate staff and building occupants. Campaign materials may include:

- Awareness posters
- Events (potentially for Energy Awareness Month and Earth Day)
- O&M checklists and equipment signs
- Stickers with reminder messages
- Electronic messaging
- Staff meeting energy awareness materials
- Training material included during annual, training sessions
 - The 2013 Corrections Training Academy on-line training offerings include an energy efficiency and water conservation module

CDOC will build a greater understanding of the importance of energy efficiency and create individual and team ownership of the energy and water management plan. Through a focus on the benefits and results of supply side alternatives and reduced demand, the awareness campaign will demonstrate how individuals can help to achieve organizational goals.

Individual conservation practices:

- Create a culture of conservation in everyday decisions by staff and tenants
- Conscious choices minimize energy use
- Turn off lights and electronic equipment
- Unplug electronics to avoid standby loads
- Limit or eliminate personal appliances
- Turn off faucets and report leaky fixtures
- Energy efficiency focused O&M

As *Greening of State Government* Awareness increases, staff members will buy-in to green policies, procedures, and practices. Since we have staffing of over 6,000 full time equivalents, it is our plan to incorporate input from individuals who have knowledge of their operations and equipment. Staff “ideas” will be prioritized based on life-cycle costs, implementation costs, and projected savings. Projects with reasonable return on investment will be implemented when possible.

The State Employee Cost Savings Incentive Plan [Administrative Regulation 1450-46 - implemented October 1, 2010], provides rewards for innovative ideas that result in specific, identifiable cost savings to state government. It is the policy of the Department of Corrections to encourage innovative thinking and the involvement of CDOC employees in the development of ideas that will increase the productivity and service level of the Department, while decreasing costs. The CDOC recognizes that employee incentive programs will help encourage employee involvement in making state government more efficient and effective. The Energy Management Program and CCEO will work with the CDOC Business Operations and the FMS Planning Group to evaluate the cost savings potential of innovative ideas submitted that are related to utility use.

Philosophy

The Energy Management mission continues to be to improve plant and program operational energy and/or utility efficiency through life cost analysis, cost-effective energy and/or utility procurement, improved maintenance, system optimization, and user education and incentive systems.

As a state agency that serves the public, CDOC continues to strive to meet both its overall Mission and that of the Energy Management Program. As managers of public funds and assets, we are required to operate in the most cost effective manner practical. We continue to strive to reduce the use of limited resources, improve Colorado’s environment and the health of future generations through the management of our utilities and fossil fuel consumption. Building on the fundamental drivers of sustainability and fiscal responsibility, the Department of Corrections philosophy centers on the following goals and objectives:

- Develop custody specific design standards for utility services for new and existing facilities to permit adequate redundancy to allow for simultaneous scheduled maintenance and periodic replacement
- Identify standard, emergency and standby electrical capacities, including existing contracts for current needs and potential expansions
- Initiate a departmental energy conservation program which results in reduced energy usage
- Establish guidelines and standards for purchase of energy consuming devices based on life cost effectiveness and availability in the industry
- Achieve the goals and objectives of the *Greening of State Government* Executive Order D0012-07

The CDOC’s Energy Management Program has implemented numerous Cost Avoidance projects over the course of nearly two decades. CDOC has completed the construction phase of the first three Energy Performance Contracts, two of which were at our oldest correctional facilities. CDOC is in the contracting phase for EPCs at three

additional facilities. We continually seek funding mechanisms to reduce the initial capital investments and provide the lowest life-cycle-cost equipment and measures.

Benefits

The benefits of energy efficiency, water conservation, and natural resource reduction initiatives to the State of Colorado, its citizens, and State of Colorado Offenders include:

- Reduce dependence on fossil fuels
- Conserve natural resources
- Reduce environmental impact
- Optimize use of operating funds
- Improve the comfort of building occupants
- Increase learning opportunities and meaningful work assignments for offenders
- Improve employee productivity

Appendix A

CDOC Utility Baseline Data – FY 2005/2006

FACILITY	ELECTRIC CONSUMPTION	ELECTRIC CONSUMPTION	ELECTRIC COST	NATURAL GAS CONSUMPTION	NATURAL GAS COST	WASTEWATER VOLUME	WASTEWATER COST	WATER CONSUMPTION	WATER COST	PROPANE CONSUMPTION (PGal)	PROPANE COST	DIESEL CONSUMPTION	DIESEL COST
ACC	See ECCPC	See ECCPC		13,045 MMBtu	\$ 121,154	See ECCPC		See ECCPC					
AD*	1,537 MMBtu	450,000 kWh	\$ 25,948	5,921 MMBtu	\$ 58,413	200 kGal	\$ 701	201 kGal	\$ 1,558				
AVCF	30,835 MMBtu	9,037,000 kWh	\$ 604,282	38,085 MMBtu	\$ 450,595	57,382 kGal	\$ 105,583	71,891 kGal	\$ 193,286				
BVCC	25,103 MMBtu	7,357,000 kWh	\$ 555,621	106,868 MMBtu	\$ 1,254,230	63,652 kGal	\$ 120,000	57,636 kGal	\$ 312			307 MMBtu	\$ 5,200
CCF	See ECCPC	See ECCPC		11,609 MMBtu	\$ 106,645	See ECCPC		See ECCPC					
CI	See ECCPC	See ECCPC		27,324 MMBtu	\$ 256,113	See ECCPC		See ECCPC					
CIBV	477 MMBtu	140,000 kWh	\$ 13,836										
CIDV	546 MMBtu	160,000 kWh	\$ 15,168	3,279 MMBtu	\$ 34,067	344 kGal	\$ 671	344 kGal	\$ 659				
CS**	283 MMBtu	83,000 kWh	\$ 6,130	307 MMBtu	\$ 4,028	18 kGal	\$ 176	18 kGal	\$ 71				
CSP	See ECCPC	See ECCPC		29,453 MMBtu	\$ 267,212	See ECCPC		See ECCPC				1,391 MMBtu	\$ 20,763
CTCF	23,134 MMBtu	6,780,000 kWh	\$ 479,117	72,794 MMBtu	\$ 645,295	55,422 kGal	\$ 132,482	60,771 kGal	\$ 110,728				
CWCF	See ECCPC	See ECCPC		8,720 MMBtu	\$ 80,311	See ECCPC		See ECCPC					
DCC	7,816 MMBtu	2,291,000 kWh	\$ 144,753	19,577 MMBtu	\$ 229,782			15,631 kGal	\$ 29,465			183 MMBtu	\$ 4,011
DRDC	16,074 MMBtu	4,711,000 kWh	\$ 292,456	28,077 MMBtu	\$ 292,623	17,329 kGal	\$ 37,620	19,329 kGal	\$ 33,423				
DWCF	29,956 MMBtu	8,780,000 kWh	\$ 532,227	47,122 MMBtu	\$ 462,812	29,808 kGal	\$ 58,126	36,473 kGal	\$ 65,749				
ECCPC***	95,209 MMBtu	27,904,000 kWh	\$ 1,744,532	10,087 MMBtu	\$ 93,025	179,595 kGal	\$ 488,617	271,236 kGal	\$ 624,638				
FCF	See ECCPC	See ECCPC		82,089 MMBtu	\$ 738,118	See ECCPC		See ECCPC					
FLCF	24,483 MMBtu	7,176,000 kWh	\$ 619,837	84,408 MMBtu	\$ 1,021,239			52,557 kGal				444 MMBtu	\$ 7,973
FMCC	See ECCPC	See ECCPC		17,471 MMBtu	\$ 156,724	See ECCPC		See ECCPC					
LCF	30,675 MMBtu	8,990,000 kWh	\$ 529,859	36,051 MMBtu	\$ 407,194	43,990 kGal	\$ 31,511	61,974 kGal	\$ 187,778			420 MMBtu	\$ 6,424
LVCf	14,039 MMBtu	4,115,000 kWh	\$ 274,394										
RCC	3,876 MMBtu	1,136,000 kWh	\$ 73,176					6,168 kGal		11,048 MMBtu	\$ 138,768		
SCC	See ECCPC	See ECCPC		See ECCPC		See ECCPC		See ECCPC					
SCCF	9,481 MMBtu	2,779,000 kWh	\$ 199,388							489 MMBtu	\$ 8,049		
SCF	51,160 MMBtu	14,994,000 kWh	\$ 885,363	143,421 MMBtu	\$ 1,364,184	130,578 kGal	\$ 317,050	167,083 kGal	\$ 196,667				
TCF	12,160 MMBtu	3,564,000 kWh	\$ 207,213	22,707 MMBtu	\$ 226,989			40,069 kGal	\$ 160,706	1,233 MMBtu	\$ 19,219		
YOS				409 MMBtu	\$ 4,348								
TOTALS	376,844 MMBtu	110,447,000 kWh	\$ 7,203,300	808,824 MMBtu	\$ 8,275,101	578,318 kGal	\$ 1,292,537	861,381 kGal	\$ 1,605,040	12,770	\$ 166,036		\$ 44,371

*Includes 8th Street Warehouse; Canteen; Misc. Buildings; Training Academy

**Includes Parole Offices In Longmont And Grand Junction

***Includes All Electric, Water, & Wastewater for East Complex; Gas For Skyline

CWCF Prison Decommissioned in 2009

Appendix B

Table B-1 – Implemented and Anticipated Energy Conservation Measures (ECCPC)

Location ¹ ● Potential ECMs ✓ In-Place ECMs	General ECM's		Procurement efficiencies				Building systems					Renewables					
	Education & Awareness	Metering	Electric service ²	Demand management	Gas ³	Waste heat (e.g., CHP)	Shell	System	Equipment	Controls	Operations	Solar	Wind	Geothermal	Biomass	Hydro-electric power ⁴	other
ECCPC Campus	●	●			✓							✓	●	●	●		
Arrowhead Correctional Center	●	●	●		✓	●			●	●	●	●		●	●		
Centennial Correctional Facility	●	●	●		✓	●			●	●	●	●		●	●		
Colorado State Penitentiary	●	●	●		✓	●			●	●	●	●		●	●		
Colorado Women's Correctional Facility (Decommissioned & Repurposed)	●	●	●		✓	●			●	●	●	●					
Four Mile Correctional Center	●	●	●		✓	●			●	●	●	●		●	●		
Fremont Correctional Facility	●	●	●		✓	●			●	●	●	●		●	●		
Skyline Correctional Center	●	●	●		n/a	●			●	●	●	●		●	●		
Correctional Industries operations	●	●	●		✓	●											

¹ All of the facilities and centers listed in this table are located on the East Cañon City Prison Complex (ECCPC).

² This would include rate changes, capacity and energy sales, and similar changes to the cost of service.

³ The ECCPC is already served by contract gas purchase; an interruptible rate is not possible.

⁴ A low-head dam exists on the Arkansas, adjacent to the facility, but the elevation difference may prove uneconomical for practical hydroelectric application.

Table B-2 – Implemented and Anticipated Energy Conservation Measures

<div> <div> <div>● Potential ECMs</div> <div>✓ In-Place ECMs</div> </div> <div>Location¹</div> </div>	General ECM's		Procurement efficiencies				Buildings and Systems					Renewables					
	Education	Metering	Electric service	Demand management	Gas	Waste heat (e.g., CHP)	Shell	System	Equipment	Controls	Operations	Solar	Wind	Geothermal	Biomass/biogass	Hydro-electric power	other
Arkansas Valley Correctional Facility	●	●	●		●	●		●	●	●	●	✓					
Buena Vista Correctional Complex ¹	●	●	●		●	✓	●	✓	✓	✓	●	●		●	●	●	
Colorado Correctional Center (Camp George West)	●	●						●	●	●	●						
Colorado Territorial Correctional Facility	●	●	●		✓	●	●	✓	✓	✓	●	✓				●	
Delta Correctional Center	●	●	●		●	●		●	●	●	●	●		●	●		
Denver Complex ²	●	●	●	✓	●			●	●	●	●	●					
Fort Lyon Correctional Facility (Decommissioned)																	
Limon Correctional Facility	●	●	●		●			●	●	●	●	●					
La Vista Correctional Facility	●	✓	●					●	●	●	●						
Rifle Correctional Center	●	●	●			●		●	●	●	●	●			●	●	
San Carlos Correctional Facility	●	✓						●	●	●	●	✓					
Sterling Correctional Facility	●	●	●	✓	●	●		✓	✓	✓	●	●	●				
Trinidad Correctional Facility	●	●	●		●	●		●	●	●	●	●			●	●	
Youthful Offender System	●	✓															

¹ Includes the Buena Vista Correctional Facility (BVCF), the Buena Vista Minimum Center (BVMC), and the Colorado Correctional Alternative Program (CCAP)² Includes the Denver Reception & Diagnostic Center (DRDC) and the Denver Women's Correctional Facility (DWCF)

Appendix C

CDOC Water Conservation Plan – Executive Brief

INTRODUCTION:

During the first few months of Fiscal Year 2011 – 2012, the Colorado Department of Corrections (CDOC) developed a Water Conservation Plan in response to the Governor's water conservation directive. The directive, as relayed by then CDOC Executive Director Tom Clements, charges each department to reduce water usage by 10% over the next 5 years, using Fiscal Year 2010 – 2011 as a baseline year. The CDOC Plan is consistent with best management practices developed by the Federal Energy Management Program.

The primary component of the CDOC Water Conservation Plan is reducing potable water use. CDOC annually uses approximately 907,746 thousand gallons (k-Gal) of potable water (based on metered use in FY 2010 – 2011 and the plan measurement baseline). Reducing potable water use benefits the state by: conserving this limited natural resource; reducing the environmental impacts of developing, producing, treating, and delivering potable water; and, reducing related utility costs associated with potable water use. The current CDOC Water Conservation Plan has the potential to save 135,373 k-Gals of potable water use per year when fully implemented.

The secondary component of the CDOC Water Conservation Plan is developing and maintaining full use of all water assets, including alternative water sources such as owned or leased water rights. The Plan intends to preserve the owned water rights of CDOC – thereby preserving the full market value of these assets.

THE PLAN:

The primary goal of the Plan is to reduce potable water usage by an average of 28,900 k-Gal per year; however, the annual usage reduction, by the end of FY15/16, will be no less than 90,775 k-Gal, or 10% of the FY10/11 baseline amount of 907,746 k-Gal. Plan components include the following. 48,000 k-Gal of this goal was realized by the repurposing of the Fort Lyon Correctional Facility. An estimated additional reduction of no less than 596 k-Gal should be realized by the implementation of a low-flow fixture and valve project at the Denver Complex.

- Save 3,090 k-Gal by replacing outdated equipment with water-conserving, energy efficient equipment.
- Save 11,527 k-Gal through water conservation elements of the Energy Performance Contracts (EPCs) Colorado Territorial Correctional Facility (CTCF), Sterling Correctional Facility (SCF), and Fremont Correctional Facility (FCF). Water conservation measures were included in EPCs at SCF and CTCF; the EPC at FCF is on hold. Monitoring of water use continues at these facilities. Initial measurements indicate that the reduction in metered use at SCF and CTCF is roughly 60,000 kGal, based on a FY 2010-2011 baseline, which far exceeds the 11,527 k-Gal goal.

- Save 59,380 k-Gal by developing alternate water systems through additional Energy Performance Contracts at Sterling Correctional Facility (SCF), the Denver Complex, and East Cañon City Prison Complex (ECCPC). Potable water use will be replaced with non-potable water sources. A portion of the ECCPC alternate water system, identified as Phase 1, is nearly fully designed and scheduled for partial implementation in FY2013-2014, subject to identifying funding. When this phase is completed, potable water use on the ECCPC will be reduced by an estimated 32,990 k-Gal. Development of the other alternate water systems have not progressed beyond the conceptual stage.
- Save 12,244 k-Gal through implementing additional water conservation best management practices statewide.

ACTIONS:

Funding:

- The Plan is self-funded by CDOC, through energy/utility cost avoidance or cash contributions from Colorado Correctional Industries (CCi), and requires no additional appropriation; however, the Plan does require full funding of the current utility line and annual rate adjustments necessary to keep up with utility increases until Energy Performance Contracts are retired.

Contracting:

70,907 k-Gal of savings (52.4% of the entire potential Plan water use reduction) are dependent upon the use of Energy Performance Contracts (EPCs). CDOC originally intended to amend the existing EPCs, where possible; however, this has proven to be contractually difficult. CDOC may create new EPC contracts where required; but, may be limited to effecting conservation efforts solely through its cost savings measures on an annual basis.

Verification and Measurement:

The technical audit, water savings calculations, and measurement and verification components of the performance contracts will verify and confirm implementation of the planned reductions.

CDOC Water Conservation Plan

I. Plan Inclusions

The CDOC team determined that a comprehensive water management and conservation plan should contain all the elements that have been identified by the federal Department of Energy (DOE) through their Federal Energy Management (FEMP) program water conservation document. The CDOC Plan incorporates those Best Management Practices (BMPs) and organizes them into a series of practices which result in efficient and sustainable use of water. The table of contents developed for the BMP plan indicates the breadth of its considerations:

- BMP #1 – Water Management Planning
- BMP #2 – Information and Education Programs
- BMP #3 – Distribution System Audits, Leak Detection, and Repair
- BMP #4 – Water-Efficient Landscaping
- BMP #5 – Water-Efficient Irrigation
- BMP #6 – Toilets and Urinals
- BMP #7 – Faucets and Showerheads
- BMP #8 – Boiler/Steam Systems
- BMP #9 – Single-Pass Cooling Equipment
- BMP #10 – Cooling Tower Management
- BMP #11 – Commercial Kitchen Equipment
- BMP #12 – Laboratory/Medical Equipment
- BMP #13 – Other Water Intensive Processes (includes laundry, evaporative cooling, & vehicle washing)
- BMP #14 – Alternate Water Sources

The EERE/DOE document is attached to the CDOC Water Conservation Plan (the Plan) in its entirety for reference and consideration as the Plan is further developed and implemented over the next five (5) years, and beyond.

The unique nature of the Colorado Department of Corrections requires that additional BMPs be developed. To date, these include the following issues.

- Industrial Process Water
- Agricultural water use (specific to the arid West and its associated water law)
- Housekeeping and cleaning
- Operational consolidation

Industrial process water and agricultural water use relate to CCI enterprise operations. Increased efficient use is a positive trend since it equates to increased offender employment, training, and potential revenue.

Water rights owned for agricultural use in Colorado must be fully utilized or be subject to the possibility of abandonment. Hence, the BMP developed for agricultural water use includes planning for 100% utilization. Simply preserving a water right through full use does not mean that right should be preserved through inefficient use. Efficient use is

actually a mandate of Colorado water law. The CDOC Plan acts to utilize water in the most efficient ways possible.

Most CDOC facilities have already converted landscape irrigation over to non-potable irrigation sources however, and most of those locations are directly supported by owned water rights. As noted above, fully and efficiently utilizing such resources is critical to maintaining those water rights.

The following is a summary of the status of irrigation water sources by location.

Location	Landscape irrigation source	Comments
Administration	potable	
AVCF	potable	
BVCC	non-potable	owned water rights
CCi	varies	Plan will convert to non-potable source
Community Services	potable	
CTCF	non-potable	owned water rights
DCC	non-potable	owned water rights
DRDC	potable	Plan will convert to non-potable source
DWCF	potable	Plan will convert to non-potable source
ECCPC	varies	Plan will convert to non-potable source
LCF	potable	
RCC	non-potable	owned water rights
SCF	potable	Plan will convert to non-potable source
TCF	potable	

The Plan may appear to have a lack of focus on landscaping changes (adoption of xeriscape techniques and evapotranspiration/water balance irrigation systems). This is not the case, though, since such measures will be considered in all locations and implemented where possible within the limitations of available resources and appropriate given site specific circumstances.

II. Water Reduction Elements

CDOC Water Conservation Plan Metered Potable Water Reduction Elements – The major elements of the metered potable water reduction for the CDOC come from the following plan elements.

- Facility repurposing (limited to FLCF in the next five years)
- Scheduled upgrades in food service equipment resulting from the purchase of water-conserving equipment when replacing old equipment
- Current Energy Performance Contracts (EPCs) at BVCC and CTCF
- Pending EPCs at SCF and FCF
- Anticipated EPCs at SCF, the Denver Complex, and ECCPC, involving alternate water systems (replacing potable water usage with non-potable water sources where water meeting potable standards are not required)

These reductions should be measurable and significant enough to meet and provide verification of the Plan reduction goals (2% per year for 5 years for a total of 10% reduction in metered potable water usage as measured against the FY10/11 baseline of 904,500,000 gallons or 2,776 acre feet). The following table is a summary of the CDOC metered potable water usage by location or function.

Location	FY11 USAGE (k-Gal)	
	CDOC PWS ¹	water service
Administration		23
Arkansas Valley Correctional Facility		66,821
Buena Vista Correctional Complex (city)		1,282
Buena Vista Correctional Complex (well)	70,224	
Division of Correctional Industries		370
Community Services		302
Colorado Territorial Correctional Facility		56,271
Delta Correctional Center		17,580
Denver Reception & Diagnostic Center		28,706
Denver Women's Correctional Facility		24,448
East Cañon City Prison Complex		309,963
Fort Lyon Correctional Facility	48,047	
Limon Correctional Facility		60,413
Rifle Correctional Center	8,257	
Sterling Correctional Facility		166,515
Trinidad Correctional Facility		45,348
Subtotals (rounded)	126,500	778,000
Total	904,500	

¹ PWS indicates a public water system which has its own source of raw water, versus being provided water from another water service provider (city, district, etc.)

² The indicated volume is the actual pumped water and includes water that is lost in treatment

Other plan elements are not readily measurable because they lack adequate metering; they result in such a small reduction in water that they cannot be measured; or, they cannot be guaranteed because of conditions that are beyond reasonable control. These include the following.

- Use of low-flow plumbing devices (faucets, toilets, and showers)
- Use of controls to reduce unnecessary uses of potable water (e.g., controls that limit total volume, duration of flow, and/or frequency of use)
- Dental equipment changes (namely, going to waterless dental vacuum units)
- Operational changes in kitchen and snack bar practices (e.g., not using water to cool foods)
- Changes to mechanical processes (heating, cooling, boiler cycling, etc.)
- Awareness and education programs

III. Cost of Implementation

An investment is required to implement a water conservation plan – either a direct cost or an indirect cost. Due to lack of appropriations to fund energy conservation measures, this Plan utilizes a means of self-funding, including the use of EPCs. The funding picture is further complicated by the fact that a significant portion of this Plan does not result in savings that would allow for near-term paybacks. At current water rates which average approximately \$2.60/k-Gal for water and less than a dollar per k-Gal for the flow component of wastewater billings, it is very difficult, if not impossible, to fund the Plan, or even projects, from savings solely related to reduced water and sewer charges. The Plan will be selectively implemented and may require significant modification along the way.

This Plan, as proposed, would be funded in the following manner. Changes in these assumptions would also require Plan changes.

- Procurement of water efficient devices and equipment during their normal replacement cycle (no additional cost but equipment replacement may be delayed when there is significant additional cost associated with such equipment)
- Funding through Energy Services Companies (ESCOs) using Energy Performance Contracting (EPC) which allows the state to pay for improvements over time from continuing funding and appropriation of related normal rate increases
- It is critical to understand that the ability to retire the described EPC's, within the limits of projected project specific negative cashflow (i.e., identified additional funding needs), is contingent upon getting appropriations for what would have been the related rate increases, as well as continuing base appropriations. If such will not be possible, cashflow and payback analyses need to be revisited before the alternate water system portion of the Plan is implemented
- Allocation of other available utility cost avoidances to Plan implementation, when and if available

Please note, as described in the detailed descriptions and supporting information in the Plan, when using EPCs there is substantial premium associated with overhead and financing costs, that must be paid over time, which results in significantly higher overall project costs and extended payback periods. The alternate water systems may require the department to identify funding sources beyond the projected rate increases to retire the full project cost. The identified funding comes from cost avoidance realized from other ECMs, EPCs, and/or SLB land improvements funds.

This Plan requires that the utility line be fully funded each fiscal year, including all related rate increases over the baseline usage in FY10/11. The CDOC will not have sufficient funds to retire the loan(s) financed through the EPCs without full funding.

Plan Funding Sources Table

General note: the following indicates by major plan component the source of identified funding.

Component		Utility line			CCi small projects	continuing operations	grants/rebates
		FY11/12 base ¹	annual rate increases ¹	other utility cost avoidance			
FLCF Repurposing		N/A	N/A	N/A	N/A	N/A	N/A
EPC's (general)							
	BVCC (Long)	✓	✓				
	CTCF (JCI)	✓	✓				
	FCF (Siemens)	✓	✓				
	SCF (JCI)	✓					
EPC's (alternate water)							
	Denver Complex	✓	✓	✓		✓	
	SCF	✓	✓	✓		✓	
	ECCPC	✓	✓	✓	✓	✓	
Food Service/Laundry				✓		✓	✓
Low-flow fixtures				✓		✓	✓
Water Management				✓	✓	✓	✓
Education/Awareness				✓		✓	✓
Audits/Detection				✓	✓	✓	✓

¹ Base continuation and rate increases must be appropriated based upon the original (FY10/11) usage and the water rates current at the time of implementation.

IV. Schedule and Metered Potable Water Reductions

The following is a general outline of the timing of the Plan implementation by fiscal year or other period of time.

Fiscal Year	Component	Source of funding (primary ¹)	Estimated/Actual Consumption Savings (percentage of baseline)	Reduction Attainment Date & Plan totals
FY 2011-2012 Completed	<ul style="list-style-type: none"> • FLCF repurposing • Energy Performance Contract (EPC) @ CTCF • SCF Dishwashers • EPC @ SCF • TCF dishwash machine 	<ul style="list-style-type: none"> • Included in closure • Utility cost avoidance • Operating Expense • Utility cost avoidance • Operating Expense 	1.81% / 2.9% 0.26% / 1.0% 0.19% / (combined) 0.01% / 0.15% 0.06% / 0.0%** Period total: 2.35% Period Achieved: 7.71%	June 30, 2012 Plan total: 2.35% Achieved: 1.77% ¹
FY 2012-2013	<ul style="list-style-type: none"> • FLCF repurposing (cont.) • BVCC laundry ozone • EPCs @ BVCC, CTCF, & SCF (cont.) • SCF Alternate Water System (<i>delayed</i>) • Denver Alternate Water System (<i>delayed</i>) • EPC @ FCF (<i>on hold</i>) • DCC dishwash machine 	<ul style="list-style-type: none"> • Included in closure • Operating Expense • Utility cost avoidance • Utility cost avoidance • Utility cost avoidance • Utility cost avoidance • Operating Expense 	3.59% / 2.9% 0.05% / 0.0%** 0.77% / 4.1% 0.60% / 0.00% 0.34% / 0.00% 0.08% / 0.00% 0.07% / 0.00% Period total: 5.5% Period Achieved: 7.0%	June 30, 2013 1.09% Reductions <i>delayed</i> Plan total: 7.86% Achieved: 7.00%
FY 2013-2014	<ul style="list-style-type: none"> • EPC @ FCF (<i>on hold</i>) • ECCPC Alternate Water System • SCF Alternate Water System (<i>delayed</i>) • Denver Alternate Water System (<i>delayed</i>) 	<ul style="list-style-type: none"> • Utility cost avoidance • Utility cost avoidance • Utility cost avoidance • Utility cost avoidance 	0.08% of CDOC 1.44% of CDOC 0.90% of CDOC 0.70% of CDOC Period total: 3.12%	June 30, 2014 Plan total: 10.98%
FY 2014-2015	<ul style="list-style-type: none"> • ECCPC Alternate Water System (cont.) • AVCF reuse 	<ul style="list-style-type: none"> • Utility cost avoidance • Utility cost avoidance 	2.15% of CDOC 0.28% of CDOC Period total: 2.51%	June 30, 2015 Plan total: 13.41%
FY 2012-2016	<ul style="list-style-type: none"> • Fixtures – Controls – Rules • Education/Behavior • Water Management • Auditing/leak reduction • Laundry equipment replacements system-wide • TCF reuse • Dental vacuums 	<ul style="list-style-type: none"> • Utility cost avoidance • Operating Expense • Operating Expense • Operating Expense • Operating Expense • Operating Expense • Utility cost avoidance • Operating Expense 	0.84% of CDOC 0.50% of CDOC 0.001% of CDOC 0.01% of CDOC 0.02% of CDOC 0.12% of CDOC 0.001% of CDOC Period total: 1.49%	June 30, 2016 Plan total: 14.90%

* See Section III for other sources of funding for each component.

** Facility is master-metered. Savings were not able to be accurately measured.

¹ Metered potable water use actually increased in FY 11/12 despite the success of the ECM's due to new water uses, notably expanded CCI operations on the ECCPC (estimated at 17,000 kgal/yr); the addition of Wastewater Pretreatment Facilities at the Brewster and Adams outfalls (no less than 5,000 kgal/yr); and, the addition of turf at TCF to reduce the impacts of wind-driven fines on building maintenance and HVAC equipment (estimated at 9,000 kgal/yr).

CDOC Water Conservation Plan - *SUPERCEDED*

SUPERCEDED BY THE DETAILED CDOC WATER CONSERVATION PLAN, DATED NOVEMBER 1, 2011, but retained for historical context/reference

The CDOC water “conservation” goals are defined by Executive Order (EO) D 0011 07: state agencies are to reduce water use by ten-percent (10%) compared to the FY 2005-2006 baseline no later than June 30, 2012. While the CDOC has been undertaking water conservation measures since the early 1990’s, this EO has made it necessary to deal with water conservation in a more focused and formalized manner than in the past; moving CDOC efforts from being simply the “right-thing-to-do” to a state mandate. For this reason, the water resources management sub-program has been organizationally incorporated into the utility/energy management program functional unit.

The CDOC has made the following interpretations of the stated EO goal. The physical goal of a ten-percent (10%) reduction in water use will be applied to potable water at all our facilities and centers, as measured at the finished water meter (the potable water service revenue meter, if water is not treated on-site, and after treatment, in cases where the water is treated on-site), if and when such metering is available. This puts all the CDOC’s operational units on an even footing for determining goal accomplishment, whether they are served by a public utility, special district, or they are an independent Public Water System (PWS).

A water conservation plan does not simply include reduction in metered water use; it also includes measures that result in increases in overall utility or system efficiencies, the delaying of capital replacements, and other measures which reduce the cost of service without compromising reliability or quality. Further, efforts to use non-potable water and water re-use in operations, where possible, are also conservation measures, as they result in reduced use of potable supplies, which are energy intensive due to pretreatment and supply requirements.

As an unfunded mandate for existing and new facilities under construction at the time of the E.O., all water conservation measures must have either a return on investment, result in avoided costs, or be the recipient of funds from other Energy Management and Water Conservation Plan (the Plan) cost avoidance. New Controlled Maintenance (CM) and Capital Construction (CC) requests should be programmed to include the costs associated with water conservation measures, if cost-effective and mission-compatible. This is also consistent with the directive that new state buildings achieve [note: include whatever the LEED-level is and the points associated with water conservation].

This agency also has significant agricultural programs. Water rights must be fully exercised or there is the potential that they may be of compromised value or even claimed to have been abandoned. In response, water “conservation” measures for such rights will be to make all reasonable efforts to fully utilize – but not waste – their decreed amounts, consistent with the terms of their decrees and associated agreements.

Water Conservation Plan (planning process)

In order to achieve our water conservation goals, the CDOC undertook and continues to consider and apply, the following steps, consistent with the needs of an agency that must maintain the safety of the public, staff, and inmates above all other considerations.

1. Identified water conservation measures (WCM) [see below]
2. Developed the FY 2005-2006 baseline
3. Establish facility specific use recommendations
4. Undertake to identify potential water conservation measures on a facility by-facility basis

This water conservation plan has assumed that the broad water conservation measures that will be identified will not be all that different than other state agencies or even municipal water service providers and special districts. For that reason, the plan organizes such measures around the categories provided by the Environmental Protection Agency (EPA) for Public Water Systems. The EPA has broken conservation measures into three categories, similar to that found herein below.

First Level Measures

Universal metering and sub-metering
Water accounting and loss control (exfiltration studies)
Information and education

Second Level Conservation Measures

Water-use audits
Retrofits
Adopt standards for new projects
Landscape efficiency (system and transition to non-potable sources)

Third Level Measures

Replacements and incentives
Reuse and recycling
Water-use regulation
Integrated resource management

Level One Measures

Universal Metering and Sub-Metering

Metering is a very fundamental tool of water system management and conservation, as it is with any utility. The absence of measurement data eliminates the metrics needed to establish, administer, track, and audit water conservation measures.

Source-water (raw water) metering. Where the CDOC has its own PWS', source metering is essential for water accounting purposes. It tracks well production and allows for monitoring of losses between the well field and treatment. Such is also required to assure compliance with decrees or bulk water contracts.

Treatment metering. Again, in the case of CDOC PWS' but also where the department does treatment for other issues (e.g., hardness), metering before and after treatment is essential to determining the loss associated with treatment, the system efficiency, and malfunctions.

Master metering (both post-treatment or at a facility's revenue meter when served by others and no treatment is required, for campus settings). Master metering, after

treatment or at the service connection if there is no treatment provided, is needed to identify how much water is being supplied to different operational areas; this metering data helps to identify treatment and system losses. This is the metering point that will be used by Corrections to determine its success in meeting the goal of ten-percent (10%) reduction in water use as compared to FY 2005-2006.

Sub-metering. The water use of each significant operational unit needs to be submitted at the point of water entry. Lack of metering undermines loss control, costing and pricing, and other conservation measures and prevents the auditing and accountability so critical to WCM success. Due to the cost of meter first cost, installation, maintenance, and calibration, submetering may only be justified where usage is significant and monitoring with assist in assuming conservation is being achieved. However, when end-use is not metered, it is very difficult to account for and locate all water use and system losses (due to leaks or undetected flows). Such losses may go undetected for years when comprehensive metered is not in place and, in distribution systems, similar to what the CDOC has most significant complexes, facilities, and centers; this could represent a significant portion of metered water flows. So, within available resources, water metering should be as close to comprehensive as practical.

Non-potable water metering. While not necessarily critical to meeting the goal of a ten-percent (10%) reduction, metering of non-potable water, both untreated and reused, is critical for all of the reasons given above. In many cases, it is also required by decree, rule or contract, so it must be in place regardless of the EO driving the formal water conservation plan.

Meter accuracy. Water meters can be damaged and will gradually deteriorate with age, thus producing inaccurate readings. Inaccurate readings will give misleading information regarding water use critical to WCMs. Scheduled calibration and periodic rebuilding or replacements are an essential element of the program.

System and distribution audits. Continuous system and distribution auditing will provide the information needed to make a more accurate analysis of water use and system deficiencies – spotlighting required emergency repairs and triggering a point where replacement is required (losses exceed economic acceptability).

Leak detection and repair strategy. Institution of a comprehensive leak detection and repair strategy starts with good metering. This strategy may include regular on-site testing using computer-assisted leak detection equipment, a sonic leak-detection survey, or other acceptable method for detecting leaks along water distribution mains, valves, services, and meters.

Loss-prevention program. This may include pipe inspection, cleaning, lining, and other maintenance efforts to improve the distribution system and prevent leaks and ruptures from occurring. Each operational unit might also consider methods for minimizing water used in routine operation. Also, water system maintenance procedures, while still being in accordance with applicable standards, may incorporate changes to reduce consumption without compromising life-cycle cost effectiveness.

Costing, Pricing, Water Allocations, and Incentives

Costing and pricing. Most PWS' conservation strategies that "inspire" conservation do so by exacting a monetary toll, that is, increased usage results in incremental rate increases. Water utility pricing strategies typically involve causing the customer to understand the value of water by conveying information about that value, through increasing the cost of service. The CDOC has a very limited customer base, which is growing smaller. In fact, only one customer is now supplied treated water and they are a sister state agency. The CDOC does not charge this sister agency for water use.

Allocations and Incentives. Where cost is not a consideration, other means of getting operational units, programs, and individual users must be found to stimulate conservation. Education is discussed next and can promote a conservation culture, significantly reducing use. Being able to assign realistic water use allocations allows operational units to manage, especially with sub-metering in place. Incentive programs for living within allocations, and/or coming in under allocation, can sustain "interest" in conservation, as it establishes rewards for attainment as opposed to penalties (and excuses) for lack of success.

Information and Education

Informational and educational programs are critical to the success of any water conservation plan. Such measures can directly produce water savings when users change their water-use habits and a conservation culture replaces thoughtless, unnecessary water use. The impact of such behavioral changes on actual savings can be difficult to estimate but they can be significant. However, informing and educating alone may not produce the same amount of sustained water savings as other, more concrete physical improvements (such as leak repairs and retrofits). In fact, in capacity planning it should not be assumed that behavioral changes or even changes in operational practices are permanent. At best, these can be counted on to reduce current water use but such use reduction will be sustained only so long as these programs are retained and reinforced.

Educational measures can also enhance the effectiveness of other conservation measures. For example, it is widely believed that the informed user is more likely to respond positively to changes in availability to water, time of use, or conservation routines. While certain of our population will work to thwart a conservation program; by-and-large, if staff, and even offenders, are made to feel a part of a program that benefits them as well as the state, they are more likely to participate in furthering or, at least, accepting the changes. More generally, users that are informed and involved are more likely to support the water system's conservation planning goals.

Quarterly updates, Web-enabled Posting, and Annual Summaries. The water conservation plan can include e-mail notices to responsible parties at the various departmental locations that can provide information on water use and their status as to meeting goals. Web-based postings can status all operational units on how any particular unit is doing in achieving use reductions, perhaps even posting the incentives earned. Annual summaries would allow for necessary allocation adjustments, but point to "the winners", how it was accomplished, and how they were rewarded.

Educational program. The water conservation program can use a variety of methods to disseminate information and educate the staff, offenders, and visitors on water conservation. Outreach methods include sending out web-based educational materials, periodic training, printed and video materials, and coordination with like-minded organizations.

Physical Plant Managers (PPM) meetings. The CDOC holds quarterly PPM meetings during which the goals of the water conservation program can be discussed, input sought, and administrative regulations discussed, as well as specific implementation plans considered and refined before formal implementation.

Workshops and Seminars. The water conservation program can hold workshops for operational units that might be able to contribute to water conservation efforts. These might include, for example, workshops for those in the plumbing trades and those responsible for procurement of plumbing fixture and fittings or for landscaping and irrigation systems.

Second Level Measures

Water-Use Audits

Water-use or end-use audits can provide the water conservation program and water users with invaluable information about how water is used and how usage might be reduced through specific conservation strategies.

Large-volume user water audits. Water conservation programs can facilitate water audits for large-volume users, to assist in identifying WCMs. Water audits should begin by identifying the categories of water use for the large-volume user. These may include process, sanitary, domestic, heating, cooling, outdoor, and other water uses. Second, a water audit should identify areas in which overall water use efficiency can be improved through alternative technologies or practices. In the case of Corrections, these might be facility, program, or industry specific.

Large-landscape audits. Water audits can be used for outdoor usage, as well as for indoor processes. Audits of irrigation practices can provide users with information about usage and usage-reduction techniques. These audits can be used in conjunction with irrigation submetering and other landscaping efficiency practices.

Selective end-use audits. Water audits can be widened to include selective end-use audits by area or sub-area, focusing on typical water-use practices within similar use classes (e.g., housing, programs, laundry, and food services). An audit program can be selective in terms of targeting use classes that have particular needs or for which water conservation could be particularly benefited. Audits targeted to older housing, for example, can be particularly beneficial in terms of identifying and fixing plumbing leaks. End-use audits also can be tailored to the usage practices within similar user groups. For example, housing water audits may focus on plumbing fixtures and offender behavior and access to fixtures. Such water audits can be used to make immediate repairs and retrofits. All water audits should include a written report to the responsible party that includes specific ideas for conservation. Water audits can be planned and implemented in conjunction with electric power companies or others interested in promoting conservation practices.

Retrofits

Water conservation programs can promote conservation through a retrofit program. Retrofitting involves making an improvement to an existing fixture, appliance (versus replacement) or piece of equipment in order to increase water-use efficiency. Retrofit programs usually target plumbing fixtures, but water treatment systems can offer significant conservation as well.

Retrofit kits. A basic retrofit kit may include low-flow faucet aerators, low-flow showerheads, and replacement flapper valves. Retrofit kits may be made available free or at low cost.

Calculating savings from a retrofit program requires planners to make a number of assumptions about water use and savings. Some of the assumptions used in residential are as follows and may apply to staff and visitor locations with our facilities; generalized savings for inmate-occupied areas are not yet available.

- Toilets (4-6 flushes per person per day)
- Showerheads (5-15 shower-use minutes per person per day)
- Bathroom Faucets (0.5-3 faucet-use minutes per person per day)
- Kitchen Faucets (0.5-5 faucet-use minutes per person per day)

Targeted programs. An agency, such as Corrections, can target specific operational programs known to be high water consumers. In our case, we know that our central laundries, larger food service operations, and therapeutic and commercial greenhouses are as significant a year-round user as our housing areas. An active retrofit program might be part of the water-use audit program. It is important to ensure that retrofit programs conform to applicable plumbing codes and departmental standards and administrative regulations.

Standards

Pressure reduction. Reducing excessive pressures in the distribution system can save a significant quantity of water. Reducing water pressure can decrease leakage, the amount of flow through open faucets, and stresses on pipes and joints which may result in leaks. Lower water pressure may also decrease system deterioration, reducing the need for repairs and extending the life of existing facilities. Furthermore, lower pressures can help reduce wear on end-use fixtures and appliances.

System-wide pressure management. Pressures exceeding 80 psi should be assessed for reduction. Pressure management and reduction strategies must be consistent with state and departmental regulations and standards, as well as take into account system conditions and needs. Obviously, reductions in pressure should not compromise the integrity of the water system or service quality for customers.

Landscape Efficiency

Outdoor water usage drives maximum-day demand, which in turn drives requirements for transmission and treatment facilities, if potable water is used. It is also, generally, one of the largest single uses of water (albeit, seasonal) at any operational unit. Reducing outdoor usage can be a very effective conservation strategy. Outdoor water use can be reduced through efficiency-oriented landscaping principles, xeriscaping,

time-of-day watering or crop-need-based irrigation, and the use of drought-tolerant native grasses. Taking out unnecessary planted areas may also be practical for security or use reasons.

Promotion of Landscape Efficiency. CDOC can promote the development of water conserving principles into the planning, development and management of new projects, so as to promote landscaping that may reduce cooling loads, while still limiting planting and, when an irrigated crop is necessary (e.g., turf for recreation), assuring it has a low water demand and is maintained to optimize those characteristics (e.g., longer leaf growth).

Water systems may promote xeriscaping, an efficiency-oriented approach to landscaping that encompasses seven essential principles:

- Planning and design
- Limited turf areas
- Efficient irrigation
- Soil improvement
- Mulching
- Use of lower water demand plants
- Appropriate maintenance

Selective irrigation submetering. Selective submetering for irrigation water can be used to improve irrigation management, audit use and provide feedback for optimization.

Landscape planning and replanting. Existing landscapes can be reworked to incorporate water-conserving practices. Utilities can work with commercial and industrial customers to plan and renovate landscaping in accordance with water conserving practices.

Irrigation management. Irrigation management systems, using metering, timing, and water-sensing devices, also can be promoted by the water utility for large-volume customers.

Level 3 Measures

Replacements and Incentives

Incentives. In order to accelerate the replacements of older fixtures, the water conservation program can offer funding, partial funding, and other incentives. These might include the installation of water-efficient fixtures by providing fixtures at no cost or arranging suppliers to provide fixtures at a reduced price. The feasibility and effectiveness of replacements may depend on state plumbing codes and departmental policy. A program to accelerate replacements, coupled with high-efficiency standards, can yield substantial water savings.

Promotion of new technologies. Promoting new technologies for fixtures, appliances, and equipment by inviting vendor input to do test installations can convince operations that the new technology is acceptable for our specific operational needs (heavy on security).

Reuse and Recycling

Industrial and Special Program use applications. An alternative water source for some systems is “grey water” (minimally treated or filtered wastewater) and reclaimed water (partially or fully treated wastewater). Water reuse and recycling practices reduce production demands on the water system and, generally, hydraulic loading on wastewater treatment facilities. The CDOC should work with their users to identify potential areas for reuse or recycling. Some industries can substantially reduce water demand through water reuse (or multiple use) in manufacturing and growing processes. Recycled wastewater can be used for some industrial purposes, agricultural purposes, groundwater recharge, and direct reuse where water quality levels are non-critical.

Large-volume irrigation applications. Reuse and recycling can be encouraged for large-volume irrigation, when such is a use-by-right held by this agency or other form of wholly consumable water (inherent in the source/right or contract use).

Water-use Regulations and Standards

Water-use regulations and standards. Administrative regulations should be in place to manage water use at all times, including during droughts or other water-supply emergencies. In some cases, it may be desirable to extend water-use regulations to promote conservation during non-emergency situations. Examples of water-use regulations:

- Restrictions on nonessential uses, such as lawn watering, car washing, water features, and dust control, etc.
- Restrictions on nurseries, laundries, and food service operations
- Standards for water-using fixtures and appliances (in addition to the federal efficiency standards)
- Bans or restrictions on once-through cooling
- Bans on certain types of water use or practice (such as using running water to cool prepared foods)

Requirements for new projects. Another type of regulation is to impose standards on new projects with regard to landscaping, drainage, and irrigation practices. Many water systems, including publicly owned systems, lack authority to implement such measures; such is not the case for this department. Systems that have such authority must exercise it carefully. In general, restrictions on water use should be justified by the system’s circumstances and should not unduly compromise the end-users needs or quality of service.

Integrated Resource Management

Supply-side technologies. The idea of integrated resource management is that water often is used jointly with other resources. Systems might have opportunities to consider and implement measures that can accomplish integrated resource management, where water conservation is jointly accomplished with the conservation of other resources (or subordinated to energy conservation, if necessary). On the supply-side, the water conservation program can institute operating practices (including various automation methods, strategic use of storage, and other practices) that achieve energy, chemical, and water savings. Source-water protection strategies, including land-use management methods, can be used to conserve water resources and avoid costly new supplies.

Water and wastewater utilities can jointly plan and implement conservation programs to realize savings and share in the benefits.

Demand-side technologies. Integrative practices also can be accomplished on the demand side. Water and energy utilities can conduct comprehensive end-use audits and jointly promote conservation practices by end-users. At times, this may mean that water use may have to be increased, to obtain lower energy use and costs – offering up water conservation for the greater benefit of energy conservation. Large-volume operations can make adjustments to processes, operations and equipment that reduce water and energy usage and wastewater flows, while saving other resources as well.

All of these levels of implementation and specific stratagems associated with such, remain an ideal approach to a water conservation program; however, a dearth of resources have resulted in this agency focusing on a number of significant projects aimed strictly at meeting the current EO of 10% reduction. Fine-tuning and continuing to fully implement this plan, are strictly tied to identifying and allocating addition resources to this sub-program, something not likely to occur in this current economic environment.

In-progress and Completed Water Conservation Measures

Prior to issuance of EO D 0011 07, the CDOC Energy Management Program was working on several WCMs – some of which are completed and others that remain to be completed. These demonstrate the commitment this department has been making to water conservation as well as its good stewardship of this state's assets and financial resources. Among these, the most significant WCMs are the following.

- CDOC-wide WCMs – water master metering and sub-metering; low-flow fixtures; time-of-day use limits – early morning and evening, to reduce evaporation and transpiration losses; laundry system WCMs; replacing conventional shower heads with low-flow devices
- Arkansas River Basin facilities (AVCF and FLCF) – attempting to gain participation in AVC and PSOP and gain Project water allocations
- AVCF – converting turf to native, drought tolerant grasses
- BVCC – exfiltration study to identify and correct exfiltration
- DCC – converted landscape irrigation over to a non-potable water source
- DRCD/DWCF – identification of a water source to take landscape irrigation off potable water supply
- ECCPC – procuring water rights to put landscape irrigation under non-potable water source and initiate project
- FLCF – investigating exfiltration and metering problems/exploring SWSP efficiencies
- RCC – repaired and relining our augmentation reservoir/master-planning landscape irrigation system to increase efficiency (water source has already been converted to non-potable source)
- SCF – eliminated evaporative cooling to reduce water use in minimum and restricted-minimum housing
- TCF – replacing the water service line to eliminate leakage

Future Water Conservation Measures

New WCMs will be developed, over time, and implemented subject to the identification of a funding source (most probably, savings and cost avoidances from ECMs and WCMs).

The targeted water conservation effort for FY 2010-2011 was low-flow shower heads, which, in a correctional environment, should lead to water savings. This effort will continue in FY 2011-2012, if the Plan can continue to generate savings and cost avoidance within the limitation of its appropriation.

The CDOC is also exploring the possibility of leveraging Denver Water Board rebates that might assist it in installing digital controls that would both reduce in-cell water use and provide additional security and control of uncooperative offenders – not to mention reducing vandalism involving the uncontrolled use of water. Equipment has been submitted to Denver Water for their consideration; CDOC awaits a response.

Converting irrigation from potable to non-potable irrigation remains an on-going effort; however, system conversion involves substantial water resource engineering; acquisition of, leasing, or reallocation of water rights; sophisticated contracting; and, legal steps that make the efforts hard to achieve in less than a multi-year timeframe. In addition, due to the up-front costs, other savings for ECM efforts must become available to pursue these efforts or the CDOC will need to pursue such through performance contracting. In 2011-2012, we are looking into implementation of such a system at SCF, with the cooperation of the City of Sterling.

The Tables D-1 and D-2 found in Attachment D provide a general picture of the potential for water conservation believed available within the Colorado Department of Corrections. The list is not an all-inclusive list, but it does provide a general sense of our opportunities and challenges in the area of water conservation.

Appendix D

Table D-1 – Anticipated Future Water Conservation Measures (ECCPC)

Initial Draft Date: January 2008 Updated: October 2011

<div>Potential WCMs</div> <div>Location¹</div>	General WCM					Irrigation					Building systems				Plumbing				Special programs				Other	
	Education	Metering	Service changes	Treatment changes	other	Non-potable source	Time-of-day /ETo controlled	Xeriscape/native turf	Elimination/reduction	other	Service/system piping	HVAC	Non-potable h ₂ O source	other	Low-flow	Waterless	Timed use	other	Laundry	Food Services	Greenhouses	other	Standards adoption	TBD
Arrowhead Correctional Center	●	●				●	●	●	●		●		●		●	●	●		●	●			●	
Centennial Correctional Facility	●	●				●	●	●	●		●		●		●	●	●			●			●	
Colorado State Penitentiary	●	●				●	●	●	●		●	●	●				●		●				●	
Colorado Women's Correctional Facility (Decommissioned & Repurposed)	●	●				●	●	●	●		●		●		●	●	●		●	●			●	
Four Mile Correctional Center	●	●				●	●	●	●		●		●		●	●	●		●	●			●	
Fremont Correctional Facility	●	●				●	●	●	●		●	●	●		●	●	●		●	●			●	
Skyline Correctional Center	●	●				●	●	●	●		●		●		●	●	●		●	●			●	
Correctional Industries operations	●	●																			●	●	●	

¹ All of the facilities and centers listed in this table are located on the East Cañon City Prison Complex (ECCPC).

Table D-2 – Anticipated Future Water Conservation Measures CDOC Facilities

<div>Potential WCMs</div> <div>Location</div>	General WCMs					Irrigation					Building systems				Plumbing				Special programs				Other	
	Education	Metering	Service changes	Treatment changes	other	Non-potable source	Time-of-day /ETo controlled	Xeriscape/native turf	Elimination/reduction	other	Service/system piping	HVAC	Non-potable h2o source	other	Low-flow	Waterless	Timed use	other	Laundry	Food Services	Greenhouses	other	Standards adoption	TBD
Arkansas Valley Correctional Facility	•	•	•	•		•	•	•	•		•		•		•	•	•	•	•	•	•		•	
Buena Vista Correctional Complex ¹	•	•					•	•	•		•				•	•	•		•	•			•	
Colorado Correctional Center (Camp George)	•	•					•	•	•			•			•		•		•	•			•	
Colorado Territorial Correctional Facility	•	•				•	•	•	•		•		•		•	•	•		•	•			•	
Delta Correctional Center	•	•					•		•		•		•		•	•	•		•	•			•	
Denver Complex ²	•	•	•			•	•	•	•		•	•	•		•	•	•	•	•	•			•	
Fort Lyon Correctional Facility (Scheduled to be Decommissioned)																								
Limon Correctional Facility	•	•				•	•	•	•				•		•	•	•		•	•			•	
Pueblo Minimum Center	•	•				•	•								•	•	•		•	•			•	
Rifle Correctional Center	•	•		•	•		•		•				•		•	•	•		•	•	•		•	
San Carlos Correctional Facility	•	•					•		•						•	•	•		•	•			•	
Sterling Correctional Facility	•	•				•	•	•	•		•		•		•	•	•		•	•			•	
Trinidad Correctional Facility	•	•				•							•		•	•	•		•	•			•	
Youthful Offender System	•	•				•									•	•	•		•	•			•	

¹ Includes the Buena Vista Correctional Facility (BVCF), the Buena Vista Minimum Center (BVMC), and the Colorado Correctional Alternative Program (CCAP)² Includes the Denver Reception & Diagnostic Center (DRDC) and the Denver Women's Correctional Facility (DWCF)