DEQ
MONTANA
ENERGY OFFICE

To: Joe Kolman, Research Director & Legislative Environmental Analyst, Legislative Services Division
From: Robyn Boyle, Energy Resource Professional, Air, Energy & Mining Division, Energy Bureau
Date: June 28, 2022
Re: SBECP work with Department of Corrections

The State Buildings Energy Conservation Program (SBECP) provides funding and expertise to develop and implement energy and water saving improvements at state-owned facilities, in accordance with Title 90, chapter 4, part 6, MCA. Energy efficiency improvements include upgrading inefficient lighting, replacing inefficient heating ventilation and cooling systems, and providing more effective temperature controls. Investments are made in energy and water efficiency resulting in reduced utility and operating costs. After completion of a project, the participating state agency uses utility savings to repay the program's investment. The repayment is equal to or less than utility savings resulting from the project.

The Legislature established SBECP in 1989. Since 2009, the State Energy office, housed in DEQ, has also used available federal funding to capitalize the existing state funded program, allowing for a revolving loan program. Since 2009, 133 energy efficiency projects have been funded through the State Building Energy Conservation Program with a program investment of $32,118,817. Utility savings realized are 229,267 MMBTUs (67,243.37 MWh) resulting in financial savings to the state and its taxpayers of $2,684,177 per year. The Department of Corrections has utilized SBECP and continues to explore innovate opportunities to save money and increase efficiency.

SBECP has decided not to move forward with agrivoltaic/solar piece of the pheasant project. After touring the pheasant facility SBECP engineers discovered some substantial limitations when in came to designing the PV system that could be compatible with the flight pens. However, during a potential tour of the men's prison, EQC members can see previous lighting projects completed within the prison campus and learn more about upcoming projects currently in the planning phase. DEQ and DOC are currently analyzing the potential for a solar photovoltaic (PV) array and the feasibility of a combined heat and power (CHP) system paired with an anerobic digester wastewater processing system. DEQ is also providing technical assistance by logging electrical data while DOC upgrades their irrigation pumping systems to variable frequency drives.

Below is a summary of work activities between the SBECP and the Department of Corrections (DOC).

1) Sustainable Corrections Infrastructure Project:

   Staff from DOC, SBECP, and Department of Energy partnered on an Energy Efficiency Accelerator titled the Sustainable Corrections Infrastructure Project (SCIP). The accelerator strives to develop and implement portfolio-wide utility savings with a focus on energy and water conservation, renewable energy, and storage technologies, as well as facility security and resilience. Montana is one of 30 states participating in this accelerator. For more information on SCIP you can visit the Better Buildings Solution Center website here: https://betterbuildingssolutioncenter.energy.gov/accelerators/corrections-infrastructure

2) State Buildings Energy Conservation Program Projects:

   Projects in planning stage:

   Solar PV Array- A solar electric feasibility study was conducted in 2018 and has been updated to reflect current electrical usage at the men's prison. A system would require 740 kW-DC generating capacity to meet the minimum electrical demand of the prison. This would produce a net energy bill savings of $824,000 over a 25-year life of the

system. SBECP is currently researching various financing mechanisms to best capitalize on payback, ownership, and operation and maintenance cost. It is estimated that a system would have a simple payback of 16-years, netting nine additional years of essentially free energy production when considering the 25-year lifespan of the equipment. Notably, infrastructure is then in place to substantially lower the cost of replacement equipment after the lifespan is exceeded for the original array saving additional energy costs for the State.

CHP/Wastewater Treatment- A major limitation for expansion at the men's prison is an outdated sanitary waste system that is at its maximum operating capacity and has no emergency back-up power. The current system treats wastewater through a series of settling ponds, baffles, and grinders. The treated water is then land-applied to nearby agricultural fields using handlines and prison labor. An anaerobic digester system has the potential to process sanitary waste from the prison, food waste from cafeterias, and agricultural waste. These waste streams are reduced or eliminated as the digester outputs methane biogas and digestate which can be used for fertilizer and animal bedding within the prison's agricultural programs. The methane biogas would be combusted on-site using a CHP system consisting of an internal combustion engine or turbine. The CHP system produces electricity for the prison by combusting methane biogas and then repurposes the waste heat from combustion by utilizing it in laundry or municipal water heating applications. Traditional heat and power systems at facilities are separated, which utilize on-site boilers to generate heat and off-site power plants to generate electricity through the grid. These systems are generally 50 – 55 percent fuel-efficient. Conversely, CHP-systems that produce electricity on-site and recover heat for additional applications can achieve total system efficiencies of 65 – 90 precent. [1] The potential CHP and digester projects are in coordination with technical advisors and partners introduced through SCIP.

Women's Prison Lighting Upgrade- SBECP is currently working on a campus-wide lighting upgrade project at the women's prison in Billings that is progressing towards the design phase. Lighting upgrades to LEDs can increase energy efficiency by 75 percent or more compared to incandescent or fluorescent lighting, and the lifespan of LEDs can also last up to 25 times longer than other lighting types.[2] Efficiency and lifespan metrics can be further improved through the use of lighting controls. Numerous non-energy and money related benefits can also be realized through lighting upgrades, including improved site safety, security, and work environment.

[1] EPA Combined Heat and Power (CHP) Partnership: https://www.epa.gov/chp/chp-benefits#:~:text=Overall%2C%20separate%20heat%20and%20grid,achieve%20efficiencies%20approaching%2090%20percent.
[2] DOE LED Lighting Energy Saver: https://www.energy.gov/energysaver/led-lighting#:~:text=LED%20is%20a%20highly%20energy,times%20longer%2C%20than%20incandescent%20lighting.

The table below summarizes projects completed with DOC dating back to the beginning of the SBECP revolving loan program. Following the table is a short description of completed projects.

Project Summary
State Buildings Energy Conservation Program (SBECP)/Department of Corrections
FY 2010-FY2022

Facility	Project Type	Savings/Year (MMBTU)	SBECP Investment ($)	Cost Savings/Year ($)	Invstment Simple Payback (Years)
Men's Prison	Lighting	2,869	$326,155	$67,277	5
Men's Prison	Lighting	349	$263,582	$75,218	3.5
Men's Prison	Mechanical	5,014	$645,119	$63,011	10.5
Men's Prison	Mechanical	10,361	$1,310,880	$89,010	15
Men's Prison	Mechanical/Lighting	2,629	$334,797	$22,504	15
Men's Prison	Mechanical/Lighting	3,667	$527,974	$39,373	13.5
Men's Prison	Mechanical/Lighting	2,961	$339,230	$26,670	13
	Men's Prison Totals	**28,669 MMBTU**	**$3,747,737**	**$383,063**	**11 Avg**
Pine Hills	Lighting	239	$19,342	$5,000	4
Pine Hills	Mechanical /Lighting	833	$250,000	$25,854	10
Pine Hills	Mechanical	5,265	$500,000	$54,878	9.5
Pine Hills	Mechanical	280	$17,000	$1,499	15
Riverside	Lighting	218	$55,959	$7,744	7.5
Riverside	Mechanical /Lighting	2,074	$274,869	$23,027	12
Treasure State	Mechanical	1,558	$265,601	$24,873	11
WATCH East	Mechanical/Lighting	1,385	$290,000	$21,470	13.5
Women's Prison	Mechanical/Lighting	2,137	$602,645	$45,011	13.5
Women's Prison	Mechanical /Lighting	133	$7,000	$609	15
	DOC Totals	**42,821 MMBTU**	**$6,030,153**	**$593,028**	**11 Avg**

*** Gas and Electric savings converted to MMBTU/year for reporting purposes**

Men's Prison – Deer Lodge

- Men's Prison, Campus Lighting Phase I and II- focused on replacing inefficient security and exterior lighting with new LED fixtures. Some of the interior lighting at the Treasure State Correctional Training Center was replaced with new LED fixtures as well. Upgraded all campus interior lighting from fluorescent to LED technology.
- Men's Prison, Laundry - upgraded mechanical and domestic hot water boilers; replaced inefficient laundry equipment and added new ozone technology to achieve health safety standards for this process.
- Men's Prison, Montana Industries – upgraded lighting upgrade that will save money while providing proper lighting levels for safe working conditions.
- Men's Prison, Maximum Security and Close Unit 3 - converted constant volume ventilation to variable air volume and direct expansion cooling, improving the ventilation system for prisoners and employees on the sides of the prison.

- Men's Prison, Rothe and Low E Support Buildings - received new boilers, direct digital controls, domestic hot water heaters, heat recovery on the kitchen ventilation, and insulation in the walls and roof.
- Men's Prison, Close Units 1 and 2 - received new boilers, and variable air volume controls as well as roof insulation.
- Men's Prison, High Side Gym - received new boilers, air handling units, domestic hot water, and insulation. A second phase installed new boilers, lighting, and controls in the Low Side Gym while D Unit also received new boilers, domestic hot water, and variable frequency drives added to the ventilation system. Tag plant replaced the boiler-powered unit heaters with infra-red units and installed occupancy sensors to lighting and the Motor Vehicle Maintenance shop received new lighting.

Pine Hills Youth Correctional Facility – Miles City

- Pine Hills, Campus – upgrades to chiller and lighting systems. Replacement of all the existing fluorescent lighting with new LED lamps campus wide. The metal halide fixtures in the gym are being replaced with new LED fixtures. This project will also replace the existing air-cooled chiller with a higher efficiency chiller.
- Pine Hills, Campus - installed 2 new condensing boilers to handle spring and fall heating demands. The boilers are set up to run until the outside air temperature consistently drops below 20°F. The constant volume air handlers serving throughout the facility were installed with variable speed drives which reduce airflow to match cooling and heating demands. The hot water system was also upgraded with variable speed pumping. The building temperature control system was also upgraded to incorporate energy saving strategies such as discharge air reset and ventilation control.
- Pine Hills, Campus - upgrade of exterior lighting and replacement of inefficient mechanical equipment and installed digital controls that will improve building performance and maintenance.

Riverside Youth Correction Facility – Boulder

- Riverside, Campus – upgrade to lighting. This project replaces all the existing fluorescent lighting with new LED lamps. The metal halide fixtures in the gym are being replaced with new LED fixtures.
- Riverside, Campus - replaced all boilers on campus and installed a high efficiency furnace in the Multi-Purpose building along with upgraded lighting.

Watch East Treatment Center – Glendive

- Watch East Campus – upgraded lighting and installed new lighting with controls, resident wing windows, a new boiler, chiller, and heat pump system that replaced window a/c units.

Treasure State Correctional Training Center – Deer Lodge

- Treasure State Campus - installed a biomass boiler to provide hot water heat, eliminating the existing propane boilers.

Women' Prison – Billings

- Women's Prison, Secure Housing Controls – installation of a small high-efficiency hot water boiler that will serve the Women's Prison during the shoulder months. The roof-top multi-zone units were converted from constant volume units to variable volume units. The heating system pumping was converted from constant volume to variable volume. The existing radiant floor heating system was modified to provide more heat during the winter months. Women's Prison, Campus – replaced old non-operating air handlers with new variable volume system air handlers. Another part of this project replaced the constant volume operation of a couple air handlers to variable volume. Variable air volume terminal units were installed to better control space temperatures throughout the building. The temperature control system was upgraded to digital controls, and the ability to

monitor system operations via an operator workstation was implemented. The final part of this project was to upgrade the exterior lighting and some of the interior lighting to LED technology.

- Women's Prison, Green House/Grounds - irrigation service upgrades to increase water savings; mechanical and control upgrades to optimize building performance and improve operations.