

Utah Department of Corrections

BUSINESS SERVICES OPERATIONS RESEARCH EVENT



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I. EXECUTIVE SUMMARY

Utah Department of Corrections Disclaimer

This report, titled "Business Services Operations Research Event," was authored and prepared by independent student interns. The views, findings, conclusions, and strategic proposals expressed herein are solely those of the student authors and do not necessarily reflect the official policy, position, or endorsement of the Utah Department of Corrections or the Utah Department of Government Operations.

INTRODUCTION

Overview of Organization

The State of Utah ("the State")

As the overarching authority for Utah's regulatory and environmental operations, the State is actively addressing the region's unique air quality challenges. Utah's geography—characterized by mountain-rimmed valleys—frequently triggers thermal inversions that trap pollutants until cleared by weather fronts. As the host of the 2034 Winter Olympic Games, Utah's air quality will be showcased on screens around the world. The State has implemented a Climate-Positive Olympics initiative, promising to improve air quality and environmental health throughout Utah with the intent that a positive climate impact will improve public health and tourism.

Government Operations ("GovOps")

The State's GovOps department provides central administrative and operational support to all state agencies, managing infrastructure construction, finance, procurement, and fleet services.

The Utah Department of Corrections ("Corrections")

Corrections operates the State's prisons with a dedicated workforce of over 2,000 employees, overseeing operations, custody, health services, education, and vocational training for over 3,000 incarcerated persons.

The Utah State Correctional Facility ("the Prison")

The Prison is Utah's largest correctional facility, housing general population, maximum security, and mental health units. The newly constructed Prison is state-of-the-art and technologically advanced.

Corporate Social Responsibility (CSR) Overview

Corrections' current CSR efforts include **environmental sustainability**, through water conservation, habitat restoration, greenhouse operations; and **reduced recidivism**, by training incarcerated persons to become certified automotive and maintenance technicians. Its new facility is designed to **reduce energy demand** with efficient landscaping, natural lighting, and advanced technology. Corrections is considering transitioning to **solar power** to cut costs and emissions further. Employee electric vehicle (EV) use is at 15%; however, limited charging access inhibits further EV adoption, thereby limiting reductions in commuting-related emissions.

Objective of Plan

The AIR Initiative is designed to eliminate the Prison's reliance on traditional gas and electrical utilities by transitioning to a rooftop **solar** microgrid. This system uses end-of-life **EV batteries** repurposed from the state fleet to **store surplus energy** for off-peak use, lowering both **operational costs** and CO₂/PM_{2.5} **emissions**. The microgrid will also power 4 new **solar-charging stations** to encourage EV adoption among staff. The Prison will serve as a **pilot** for possible statewide adoption, providing a scalable model for government-led energy independence.

RESEARCH METHODS USED IN THE STUDY

Primary Research

State Employee Meetings:

Held **5** in-person and **13** virtual meetings, and exchanged **40+** emails with State, Corrections, and Prison contacts, discussing Prison operations, budgets, CSR efforts, employee satisfaction, and solar feasibility.

Expert Meetings:

Met virtually with experts in CSR and EV battery storage for insights on supply chain sustainability, solar conversion, associated cost savings, and using recycled EV batteries for solar energy storage.

Surveys:

Surveyed **150** Utah taxpayers to gauge public sentiment on recycling waste materials for Prison use and received a **43%** response rate.

Prison Tour:

In-person, guided tour of the Prison to learn about facility planning, staffing, inmate programs, existing power sources, and solar viability.

Secondary Research

Solar: Reviewed government reports on costs, space requirements, and maintenance for converting the Prison to solar with EV battery storage. Researched Utah solar projects for accurate cost and labor data relevant to our initiative.

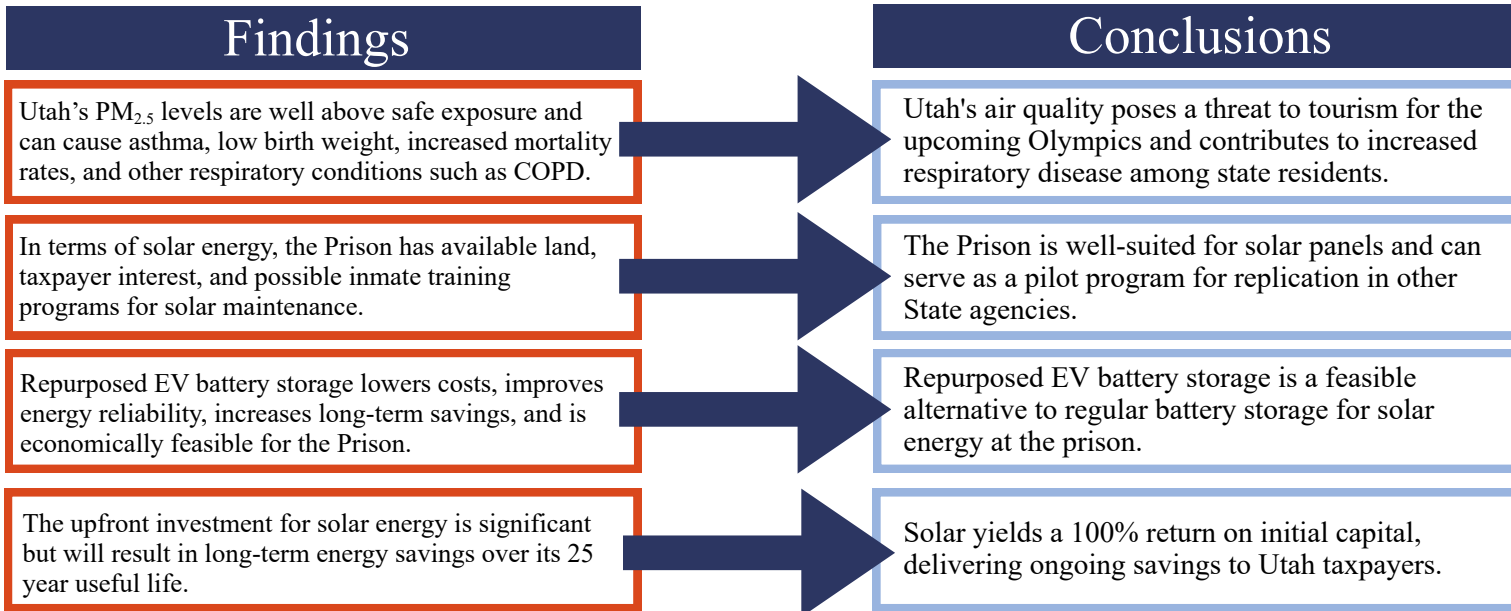
Costs: Analyzed commercial solar costs, Utah electricity rates, savings from repurposed EV batteries, and applicability of federal tax incentives using state reports and online resources.

Energy Storage: Assessed online data for feasibility and land requirements of EV battery storage systems.

Air: Examined similar initiatives, Utah air quality data, research on the upcoming Olympics, and Prison employee EV survey results to evaluate the feasibility of our plan.



FINDINGS AND CONCLUSIONS OF THE STUDY



PROPOSED STRATEGIC PLAN

The AIR Initiative is a three-part plan to address the State's interest in improving air quality, lowering operational costs, and exploring solar power, the taxpayers' interest in reducing government spending, and the Prison employees' interest in additional EV chargers. The AIR Initiative reduces the Prison's natural gas and electricity use by adding solar power and storing excess energy in repurposed end-of-life EV batteries from State fleet vehicles. The AIR Initiative significantly **reduces energy costs while improving the Prison's energy reliability and the State's air quality**. This proposal is a pilot project for review by the State, with the intent of replication in other state agencies. To simplify our plan, we split it into three phases: Assess, Implement, and Reflect.



Assess

In the first phase, we **ASSESS** the feasibility of adding a solar microgrid at the Prison by evaluating site conditions, energy demand, operational constraints, and the use of repurposed EV batteries for energy storage. State policies and comparable projects are reviewed to ensure regulatory alignment, identify cost-saving opportunities, and determine whether the project should advance. The project is then designed and opened to bids in accordance with GovOps procurement policy to ensure regulatory compliance.



Implement

The **IMPLEMENT** phase moves the project from planning to execution through construction and installation while minimizing operational disruption and maintaining safety. The installation, integration, and testing of the solar microgrid, repurposed EV battery storage, and solar-powered EV charging stations will take approximately 6 months. This enables the proper implementation of energy storage and backup power, resulting in reduced operating costs. Incarcerated persons will also be trained and certified on proper solar installation and maintenance and guards trained on related safety precautions.



Reflect

The final phase **REFLECTS** on system performance through ongoing data collection and tracking of energy production, battery efficiency, cost savings, and operational impacts throughout the first year of operation. Results are compiled into performance and cost analyses to support replication at other state facilities and inform future renewable energy initiatives statewide.

Desired Key Metrics

To evaluate the project's overall effectiveness, four key performance indicators were established to measure project success.

40% | **Prison Energy Cost Reduction**
Reduce the Prison's annual energy costs by 40%

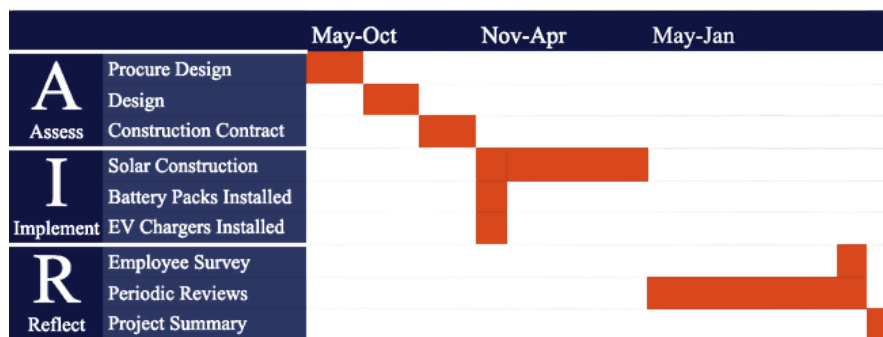
35% | **EV Charger Use**
Increase use of onsite EV chargers by 35%

9,000 | **CO₂ Reduction**
Decrease the Prison's Carbon Dioxide output by 9,000 tons

70% | **Employee Satisfaction**
Boost Corrections employee satisfaction rate to 70%

Timeline

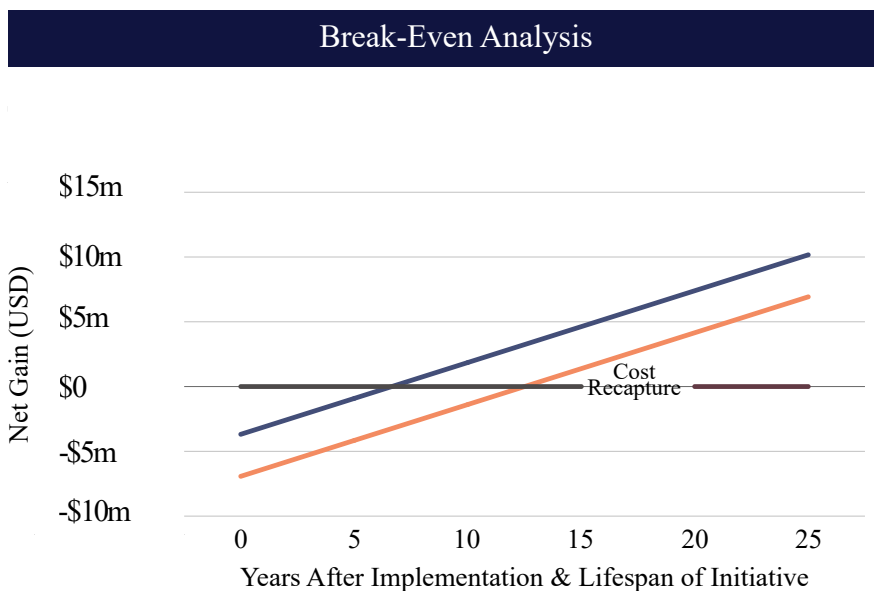
The AIR Initiative follows a phased timeline beginning with assessment, design, and procurement, including construction contracting and system planning. Implementation includes installing solar panels, battery storage, and EV chargers, followed by ongoing evaluation through employee surveys, periodic reviews, and a final project summary.



PROPOSED BUDGET

The AIR Initiative costs \$3.68 million, just **0.7% of Corrections' predicted 2026 budget**. The majority of the funds are used to acquire solar panels, which trained incarcerated persons will maintain. The plan reduces the Prison's total energy costs by 35%, generating approximately **\$550,000 in annual savings**. The initiative has a 7–13 year payback period (dependent on federal tax credits), at which point the cumulative cost savings will fully offset the initial capital outlay. Federal tax credits cover **6%–50%** of costs, depending on construction completion date. The Bipartisan Infrastructure Law could potentially cover additional costs if the project is completed by December 31, 2027.

Activity	Cost
Planning/Design/Scoping	\$610,295
EV Battery Conversion	\$725,000
Solar Panels	\$6,025,500
EV Chargers	\$5,600
Data Collection	\$3,000
Subtotal	\$7,369,395
Federal Tax Credits	(\$400k-3.7million)
Total Cost	\$3.7-6.9 million



Return on Investment

Year	Cumulative Investment	Net Savings	Net Gain	Return on Investment
2027	\$3,684,697.50	\$0	-\$3,684,697.50	-100%
2031	\$3,684,697.50	\$2,216,244	-\$1,468,453.50	-39.8%
2035	\$3,684,697.50	\$4,432,488	+\$747,790.50	+20.3%
2039	\$3,684,697.50	\$6,648,732	+\$2,964,034.50	+80.4%

Return on investment is calculated by comparing net annual energy savings against total project costs, accounting for available incentives and reduced battery storage expenses. Savings will reduce ongoing energy costs after the project is paid off.