Attachment 2

City of Santa Rosa

MSCN Business Plan Analysis

October 11, 2022

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Executive Summary

As California moves towards complete grid decarbonization and elimination of fossils fuels for both stationary and non-stationary sources, state agencies and cities are developing, finalizing and deploying strategic implementation plans to meet the state mandated goals. In addition to focusing on deferred maintenance opportunities and renewable energy sources, these entities are also focused on improving the resiliency of their operations in light of the increasing frequency of natural disasters and catastrophic climate events. City of Santa Rosa (Santa Rosa or City), in the past 10 years, has endured a continuously lengthening wildfire season and has suffered significant losses in multiple wildfires (i.e., Tubbs, Kincade, and Glass). These fires along with the Covid-19 pandemic, have impacted Santa Rosa's short- and long-term goals as documented in the Municipal Operations Climate Action Plan.

In 2021 AECOM completed a detailed feasibility study for Santa Rosa to help the city identify cost-effective opportunities for reducing Greenhouse Gas (GHG) emissions and improving the resiliency of the City's operations. Under this scope, AECOM performed a detailed investigation to analyze the feasibility of deploying microgrids at two City building clusters as well as identify opportunities for installation of solar photovoltaics and energy efficiency measures at all City facilities and parks.

A total of 47 city facilities and 63 parks were included in the scope, of which 9 buildings were investigated for microgrid deployment. Utilizing the data obtained during our detailed site visits and the information provided by Santa Rosa, AECOM developed a comprehensive suite of solutions across the three main aspects of the scope. Based on the completed feasibility study, the City has decided to develop a business plan analysis for the Maintenance Service Center North (MSCN) to consider a selection of solutions from the AECOM feasibility study and a bus electrification plan (jointly referred to as decarbonization plan hereafter)

This Business Plan investigates different financing mechanisms for implementation of the decarbonization plan including Energy Savings Performance Contract (ESPC), Power Purchase Agreement (PPA) and Energy Service Agreement (ESA). For each of these mechanisms, the business plan studies life cycle cost analysis, return on investment, O&M forecasting, and risk analysis.

Decarbonization Plan

The decarbonization plan for MSCN is based on the study completed in Phase 1 which includes the following

Energy Efficiency

1. Upgrading the interior and exterior lighting systems with new, high efficiency light-emitting diode (LED) lighting and control technology:

    - Fixture Retrofits: The linear fluorescent T8 fixtures will be upgraded using retrofit kits. A retrofit or conversion kit replaces the lamp and ballast with new electronics and LED modules and re-uses the existing housing.
    - Fixture Replacements: The various Induction, HID, and T5 fixtures used in high bay and exterior applications and will be replaced with new LED fixtures.
    - Fixture Re-Lamps: Screw-in lamps such as A15, A19, and A21 bulbs will be re-lamped with equivalent LEDs.

- Controls: The proposed control solution utilizes local, integrated occupancy, and daylight and dimming controls.

2. Replacing the four packaged AC (Air Conditioning) systems at the Garage and Transit Operation Building
    - Replacing the two 4-ton AC units with high efficiency equivalent units at the Garage
    - Replacing the two 20-ton AC units at the Transit Operation will be replaced with a high efficiency packaged VAV units
3. Replacing the two chillers at MSCN with new high efficiency chillers of similar capacity
4. Replacing the boilers located at the Shop building with two new 1,000-MBH high efficiency condensing boilers

ECM Description	Electrical Savings (kWh)	Electrical Demand Savings (kW)	Natural Gas Savings (Therms)
Lighting and Lighting Controls Upgrades	214,820	52	0
MSCN Packaged Unit Replacement	34,077	6	30
MSCN New Chillers	4,754	1	0
MSCN New Boilers	-1,283	0	2,651

Renewable Energy

1. **Solar PV Systems:** The MSCN consists of 8 facilities. AECOM conducted a feasibility assessment of the sites based on four criteria: system space, excessive shading, electrical infrastructure, and ease of construction. AECOM study identified the MSCN garage as the most feasible location for the implementation of solar PV Systems. AECOM identified two options for this site: either a Canopy design for the car parking spaces or a system for the bus parking. Both these systems were designed for maximum capacity with an approximate size of 1.7 MW-DC. The maximum available capacity significantly exceeds the current load at the MSCN. Considering the existing utility renewable rate structures, installing excess renewable capacity is not financially viable. Also, in phase I analysis, we identified that available PG&E electrical transformer would have to be upgraded if we are to install more than 400 kW-AC of solar PV. Considering this constraint, there is still enough site potential from a combination of solar PV, batteries and diesel backup generator that 100% of the load can addressed during a power outage. Therefore, in our cash flow analysis, we scaled the solar PV capacity back to the identified 400 kW-AC threshold. Important to note that MSCN will be housing 10 EVSE for the battery electric buses. City may choose to complete another load analysis to estimate the forecasted load of MSCN, and to identify the optimum PV and battery capacity.

kW-DC	kW-AC	DC/AC	Produced Energy (kWh/first year)

519	402	1.29	762,584

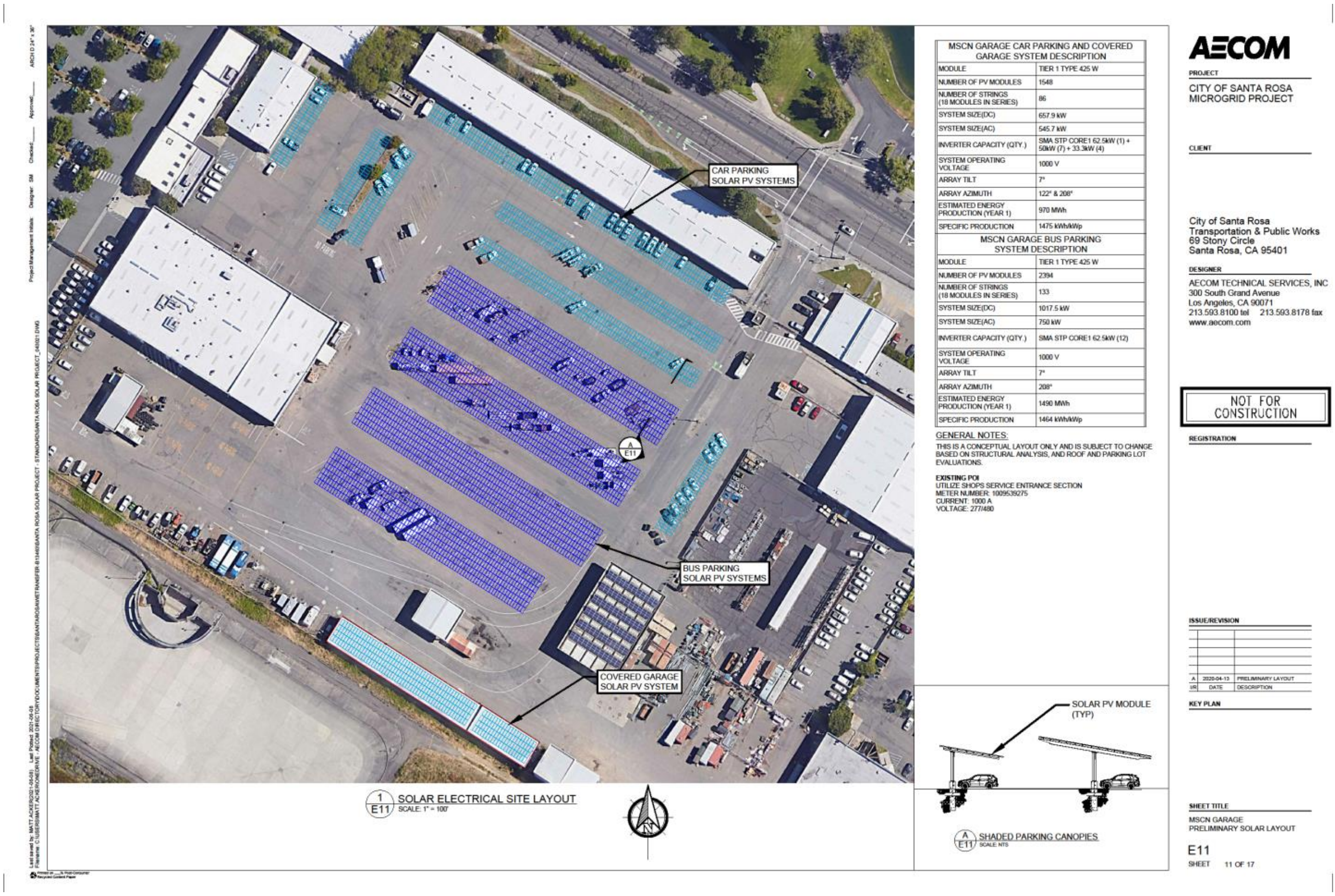


Figure 1 – Maximum solar PV capacity available at MSCN garage.

2. **Battery Storage Systems:** Santa Rosa is interested in developing MSCN as a resilient operations hub during an outage or a climate event and the goal is that all critical loads in this complex are supported by backup power. AECOM conducted a feasibility study for the battery storage system as part of the complete microgrid system feasibility study. MSCN have significant potential for the installation of Solar PV however the available PG&E electrical transformer would have to be upgraded if we are to install more than 400 kW of solar PV. Considering this constraint, the size of the battery is calculated as 840kWh/200kW and this size is based on the solar PV array of 400 kW-AC.

Battery Size kW	Battery Capacity kWh	Solar PV (kW-AC)
200	840	400

Transportation Electrification

City of Santa Rosa is planning to adapt battery electric buses (BEB) housed at MSCN. Based on the information provided by the City, the project is planned in two phases, each phase includes installation of 5 chargers and the corresponding infrastructure. The plan includes a one-to-one ratio of BEB to EVSE. The City has secured multiple grants to fund the installation of phase one and two of the bus electrification plan. In a study completed by The Cadmus Group, multiple charging solutions were identified. The study notes that City is interested in ABB 150 chargers. The business plan analysis assumes 8-hour charge window scenario, with 466 kWh batteries, and 44 kW minimum charger rate.

Charger Type	Charger Quantity	Charge Window (hour)	Minimum Charger Rating (kW)	Battery Capacity (kWh)
ABB 150	10 (2 phases)	8	44	466

Business Plan

Analysis - Inputs

We used financial outputs of the decarbonization plan to study the cash flow of the different business solutions considered. Basic assumptions to initiate the cashflow analysis are presented in the table below:

Parameters	Values
Construction Period	1 year
Contract Length	25 years
Discount Rate	3.8%

The following assumptions and inputs were used to model the cash flow of the decarbonization plan.

Energy Efficiency

Capital cost inputs include replacement costs of chillers, boilers, rooftop units and lighting systems. Installation costs estimated in Phase-1 has been adjusted to account for the inflation. Rebates and incentives are estimated based on available PG&E performance-based Energy Efficiency programs.

Operation costs include the energy cost savings from installation of the EE projects. Year over year energy and demand cost escalation are accounted for in the analysis. In phase 1 analysis, we estimated the O&M avoided cost by installing the new HVAC and lighting equipment. In the analysis we assumed a year over year increase in the O&M avoided cost. Following table provides a summary of the energy efficiency projects financial specifications used in the cash flow analysis.

Input	Unit	Value	Type
Lighting and Lighting Controls Upgrades	$	$(168,876)	Capex
Packaged Unit Replacement	$	$(252,745)	Capex
New Chillers	$	$(161,442)	Capex

New Boilers	$	$(330,366)	Capex
Energy Efficiency Rebates and Incentives	$	$2,038	Capex
Packaged Unit savings	$/year	$6,793	Opex
Chiller Replacement savings	$/year	$1,744	Opex
Boiler Replacement Savings	$/year	$2,643	Opex
Lighting Retrofit Savings	$/year	$29,122	Opex
O&M Escalation Rate	%	2%	O&M
Energy Efficiency O&M savings	$/year	$10,888	O&M

Solar PV and Battery Storage

Capital cost inputs include the installation cost of solar PV and the BESS. To estimate the cost, we scaled back the capacity and the cost with the same ratio to achieve 400 kW-AC. Inflation rate in the solar PV market has been particularly high. We assumed a 20% cost increase to account for this inflation. BESS installation cost has been adjusted based on US Bureau of labor statistics reported inflation rate. These inputs are rough order of magnitude (ROM) estimates. The exact cost should be verified through solar PV and BESS vendors.

Operation costs include the energy and demand cost avoidance as estimated in Phase 1. Year over year energy and demand cost escalation are accounted for in the analysis. In the 25-year cash flow analysis we accounted for year over year solar PV and BESS capacity degeneration as well as $/kW O&M costs. Depending on the type of contract, these values are included or excluded in the operations cash flow.

Input	Unit	Value	Type
Solar PV Install Cost	$	$(1,394,415)	Capex
BESS Install Cost	$	$(1,148,846)	Capex
Renewables Energy and Demand Cost Avoidance	$	$137,018	Opex
Annual Solar PV Degradation	%	-0.005	-
Annual BESS Degradation	%	0.03	-
NEM 2.0 Excess solar payment	$/kW	$0.05	Opex
PV O&M Rate	$/kW	$(60)	O&M
BESS O&M Rate	$/kW	$(15)	O&M

Transportation Electrification

The city has secured $2,494,000 of funding that will cover phase I (5 chargers) and phase II (additional 5 chargers) of the bus electrification plan. Therefore, the bus electrification infrastructure is incorporated in the financial analysis as fully funded, or net zero Capex.

Procurement of the BEBs are accounted for in the two years following the construction year, 5 BEBs purchased each year. According to National Renewable Energy Laboratory, U.S. Department of Energy, average cost of BEB is about $880,000 and for similar diesel model is $480,000. There are multiple rebates and grants available to cover the BEB cost, such as Federal Transit Administration grant, Carl Moyer Memorial Air Quality Standards Attainment Program, and the PG&E EV rebate program. In our analysis, we assumed that net cost difference between the BEB and diesel model will be covered from these resources.

Operation cost impacts included in our analysis includes fuel (diesel) cost savings, energy cost of BEB charging, and the avoided O&M cost of diesel buses. Corresponding year over year escalations have been used for fuel and energy rates.

Input	Unit	Value	Type
BEB and EVSE implementation cost	$	$(2.494,000)	Capex
BEB and EVSE implementation funds	$	$2,494,000	Capex
BEB Charging Energy and Demand Cost	$/Bus	$(22,925)	Opex
Fuel (Diesel) Cost Avoidance	$/Bus	$46,493	Opex
Low Carbon Fuel Standard Credits	$	$33,360	Opex
BEB Replacement Cost (net)	$/Bus	$(407,308)	O&M
EV O&M Avoided Cost	$/year	$11,388	O&M

Equipment Replacements and Operation Cost Reserves

The equipment planned to be installed have specific useful life that can be shorter than the 25-year cash flow period. These replacement periods and the corresponding cost have been accounted for in the analysis. Table below summarized the replacement period and cost assumptions for each equipment. Important to note that many of these replacements are 10 or more years int the future, and the cost estimate or rough order of magnitude.

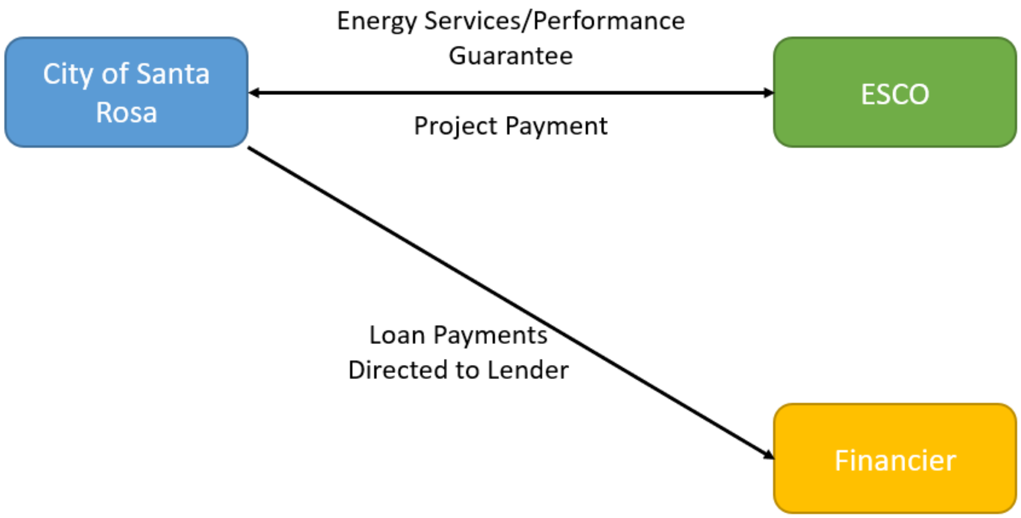
O&M/Opex Reserve		
PV Panel Replacement Period	years	25
PV Panel Replacement Cost rate	$/kW	$(30)
PV Inverter Replacement Period	years	10
PV Inverter Replacement Cost rate	$/kW	$(20)
BESS Replacement Period	years	13
BESS % of initial install Cost of replacement	%	60%
EV Replacement Period	Years	13
EV BEB Replacement Cost Rate	$/Bus	$(407,308)
EVSE Replacement Period	Years	13
EVSE % of initial install Cost of replacement		60%

Business Plan Financial Options

We considered multiple combinations of project financing options, and three of which resulted in viable scenarios.

Option 1 - ESPC + funded BEB EVSE

Under this option, an Energy Services Company (ESCO) is selected by the City in accordance with CA Government Code 4217 through a qualification base procurement. The selected ESCO will conduct a detailed investment grade audit (IGA) which will result in comprehensive energy efficiency and renewable energy packages of measures. Per CA 4217, it is necessary that the simple payback period is less than or equal to the life of the measures. This is usually 25 years or less. This package of measures created by the ESCO includes a 30% design package which is utilized to lock in the final price of the project. Based on the final IGA report and a 30% design package, the City can proceed with the ESCO firm to finalize design-build performance contract. In addition to the final price, this contract has the performance guarantee and payback schedule based on the guaranteed savings over the life of the contract. Typically, municipal ESPC projects are financed through tax-exempt lease financing which has multiple benefits for municipal governments including but not limited to 100% equipment financing, attractive rates comparable to municipal bonds but without the required bond approvals, simplified documentation, and flexible terms. This approach is ideal for deferred maintenance projects and can be utilized in combination with financing renewable generation assets such as solar PV and batteries.

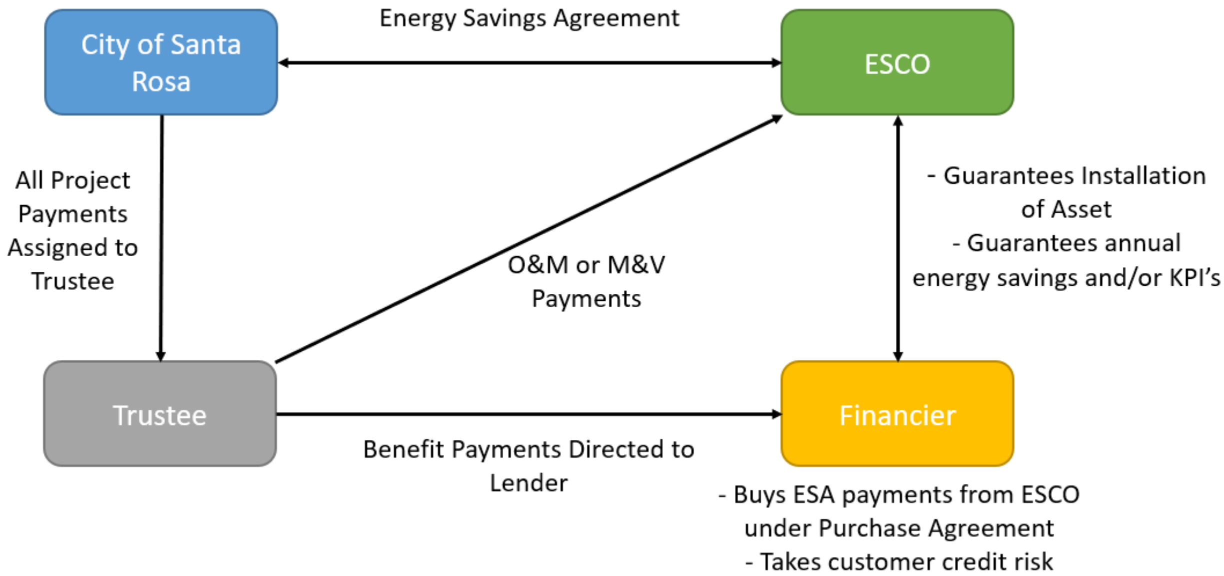


Option 2 - ESPC + PPA + funded BEB EVSE

This option considers an ESPC contract for the energy efficiency portion of the decarbonization plan, while assuming a PPA for the solar PV and the battery storage implementations. Under the PPA agreement, a developer will perform the design, permitting, financing and installation of the solar PV and the battery storage system with little to no upfront cost. The developer will sell the generated power to the City at an agreed upon fixed rate. This rate will be lower that the City's utility rate and therefore offsets the cities utility costs while the developer earns income on the difference. Under the PPA option, the developer can take advantage of the tax credits that otherwise the City would not be eligible for. The developer can incorporate these tax credits to the agreed upon rate to share the benefits with the City. In our analysis we assumed a 25-year contract, during which, the developer will be responsible for the operation and maintenance of the systems. At the end of the PPA term, City may choose to extend the PPA, have the developer remove the equipment, or purchase the equipment from the developer at a fair market value.

Option 3 – EaaS/ESA + funded BEB EVSE

Energy as a Service (EaaS) or Energy Savings Agreement (ESA) are more complex vehicles to fund both deferred maintenance as well as renewable energy projects. The financial vehicles are basically off-balance sheet financing where the assets can be either owned by the municipality (ESA) or by a Special Purpose Entity (SPE). For both these options, the payment obligation is tied with the project performance as in ESPC. The operations and maintenance pieces of the project are embedded in these contracts however there is the flexibility of utilizing the owner's staff for maintenance through a negotiated contract with clear documentation of performance requirements.



Option 4 – PPA + funded EE and BEB EVSE

This option is a subset of option 2 discussed above. Overall, the capital cost of installing the energy efficiency projects at the MSCN is a small portion of the overall decarbonization plan, about 10%. The energy efficiency measures also have a relatively long payback. Therefore, one option for the City is to separate EE from the decarbonization plan energy contracts and self-fund the project upfront. This option reduces the overall complexity of the energy contract. With EE separated, a power purchase agreement can be made to install the solar PV and the battery storage. In our analysis, we included an upfront fund to install EE, and included the operational costs and savings of the EE for the remainder of the cash flow period.

Methodology

The four options discussed above are studied through a cash flow analysis. The objective of the cash flow analysis is to identify the net present value (NPV) for each option, as a KPI to be included in the decision-making matrix.

The cash flow is structured based on the financial specifications of the decarbonization plan. The inputs to the analysis are four categories, Capex, Opex, O&M and Opex reserve, and loan specifications. Capex includes the required upfront cost for installation of EE, solar PV, battery storage, and EVSE. The total upfront cost is incorporated in each option as following

Capital Cost	Loan	Self/Grant Fund	Service Contract Payment
Option 1 - ESPC + funded BEB EVSE			
Solar PV and Battery Storage	X		
Energy Efficiency	X		
Bus Electrification		X	
Option 2 - ESPC + PPA + funded BEB EVSE			

Solar PV and Battery Storage			X
Energy Efficiency	X		
Bus Electrification		X	
Option 3 – EaaS/ESA + funded BEB EVSE			
Solar PV and Battery Storage			X
Energy Efficiency			X
Bus Electrification		X	
Option 4 – PPA + funded EE and BEB EVSE			
Solar PV and Battery Storage			X
Energy Efficiency		NA	
Bus Electrification		X	

Different aspects of the decarbonization plan are used to calculate the savings and cost Opex for EE, solar PV, battery storage and EVSE. Table below summarizes how the Opex is incorporated in the cashflow analysis for each Option. Marked cells in the table, note that the associated cost is directly incorporated in the Santa Rosa cash flow and is not integrated in the contract payments.

Opex	Option 1 - ESPC + funded BEB EVSE	Option 2 - ESPC + PPA + funded BEB EVSE	Option 3 – EaaS/ESA + funded BEB EVSE	Option 4 – PPA + funded EE and BEB EVSE
Energy cost savings (EE)	X	X	X	NA
Demand cost savings (EE)	X	X	X	NA
Solar PV demand and energy **cost** avoidance	X	X	X	X
NEM 2.0 excess solar payment	X			
BESS demand and energy cost avoidance	X	X	X	X
EV electrical cost	X	X	X	X
EV demand cost	X	X	X	X
Fuel cost avoidance	X	X	X	X
Low Carbon Fuel Standard Credits	X	X	X	X

The cash flow analysis assumes 25 years contract term for all options, with one year of construction (year 0). Annual costs and savings are estimated for each year of the period, while accounting for year over year escalation rates such as increased cost of energy or O&M cost. The replacement costs discussed earlier are accounted for as one-time payments at the end of replacement periods. Net value for each year is calculated and a discount rate is assumed to calculate the overall NPV for each option.

Forecasting and Rates

To estimate the cash flow for the term of the contracts, multiple forecasting factors are assumed:

- Discount rate: the US. Department of the Treasury reports are used to estimate the year over year discount rate. The daily treasury par yield curve rates averaged for the last 30 days is 3.811%. However, it is important to note that rates are changing rapidly and during the same period in 2021, the average rate was 1.894%.

- Loan interest rate: At the time of the report, US. Department of the Treasury, 7-day average index rate is 4.041% for 20-year term and 3.768% for 30-year term. The estimated 25-year index rate is 3.905%. Assuming a 1.5% spread added by the lender, the interest rate is estimated as 5.405%.
- Cost of energy and demand escalation rate: MSCN is served by PG&E B19 rates. We reviewed PG&E's B19 rates from 2019 to present and calculated year over year increases. From 2019 to 2020 on average rates increased by 3%, from 2020 to 2021 decreased by 5%, and from 2021 to present rates, increased by 22%. The average year over year increase has been 7% for the past 4 year.
- Fuel (diesel) cost escalation rate: US. Energy Information Administration, report on California diesel fuel prices is used to estimate the cost escalation rate. Due to the recent rapid fluctuations in the fuel prices, we expanded our sample range and reviewed fuel prices form 2010 and averaged increases since. The year over year fuel cost escalation is calculated as 7%.

Financial Options Costs and Assumptions

- NEM 2.0 excess generation payment: excess solar payment is calculated based on average raw utility rates. Under PPA and ESA contracts, the excess generation payments are deposited to the service provider party. The excess payment is used to reduce the overall PPA or ESA cost. In our analysis, we assumed excess payment to be paid to the City only in the first Option, where renewable generations are packaged under full ESPC.
- O&M and replacement costs: Replacement periods of PV panels, BESS, inverters, BEB, and EVSE is incorporated in the cash flow. BEB and EVSE replacements are assumed self-funded. All other replacement costs are included in the full ESPC only (Option 1). In all other options, replacement costs are assumed as part of the PPA or ESA costs.
- PPA Rates: We compared multiple resources including recent projects and CAISO rates to estimate current PPA $/kWh rate. For combination of rooftop and canopy solar, we identified the average 0.1566 $/kWh, adding BESS to the PPA scope increases the rate to $0.25/kWh. These rates are estimates based on current project examples and market values.
- ESPC costs and markups: ESPC typically includes two fees. One is the ESPC development cost. Typically, this cost is about 5% of the capital expenses. Second fee is the ESPC markup, which differs between technologies and scopes. Typically, the markup is about 15% for lighting EE, 15% for PV and BESS and 20% for HVAC EE.
- ESA Rates: We assumed the ESA $/kWh rate to be 10% higher than the estimated PPA rate. This is to account for the higher complexity of the ESA contracts.

It is important to note that the PPA, ESPC, and ESA rates and fees are estimates based on current project examples and market values. However, City should collect accurate quotes form service providers before choosing between these options. AECOM has created the cash flow analysis as an overall structure, once more detailed scope and proposal specifications are available, the analysis can be updated accordingly.

Results

The following table compares the NPV between the different Options and summarizes the contract assumptions.

Results/Specifications	Unit	Option 1 – ESPC	Option 2 - ESPC + PPA	Option 3 - EaaS/ESA	Option 4 - PPA
NPV	$	$3,047,971	$2,997,932	$853,147	$2,794,438
Contract term	years	25	25	25	25
ESPC Scope	-	EE, PV, BESS	EE	-	-
PPA Scope	-	-	PV, BESS	-	PV, BESS
Self/Grant funded	-	BEB EVSE	BEB EVSE	BEB EVSE	BEB EVSE
Loan amount	$	$(3,751,062)	$(1,207,801)	-	-
Loan interest rate	%	5%	5%	-	-
Grant/Self fund	$	$2.4M	$2.4M	$2.4M	$2.4M
PPA Rate	$/kWh	-	$0.25	-	$0.25
Energy Service Agreement Fee	$/kWh	-	-	$0.28	-

Risk Assessment and Recommendations

Risk Type	Option 1 - ESPC	Option 2 - ESPC+PPA	Option 3 - EaaS/ESA	Option 4 - PPA
Contract complexity	Medium	Medium	High	Low
Accounting implications	High	Medium	Low	Low
Development/Implementation period	High	High	Medium	Low
Equipment ownership	High	High	Low	Low
Maintenance and operation	Medium	Medium	High	High
Performance Period	Low	Low	Low	Medium

The above table provides a high-level picture of the risk levels associated with the different aspects of each of the financing options. This provides another data point in addition to the ROI for the City to decide on the type of financing mechanism most suitable for the scope.

If we analyze the different options for MSCN purely on NPV, we can come to a conclusion that the ESPC model would be the most viable for the City to undertake. However, looking at the savings potential available at MSCN and complexity as well as time risk associated with developing and implementing an ESPC make other options viable as well.

Keeping in mind the current condition of the City infrastructure and the growing risk of climate events, it is our recommendation that the scope of this project be expanded to include additional facilities which are going to be occupied in the long run. This would help in making the case for an ESPC which can encompass multiple facilities and measures resulting in the overall reduction of the City utility spend. This can justify the added complexity of an ESPC type contract vehicle and also result in a better financial outcome. One additional aspect to consider is that for an ESPC the City is going to take on additional in the form a municipal lease and this set up would benefit if the amount is higher and is tied to additional guaranteed savings.

While this business plan did not explicitly include the recommended microgrids, AECOM recommends the City in exploring that option as well. The EaaS approach which can combine energy efficiency upgrades with renewable generation assets along with microgrid islanding capabilities would be the option to consider where all the assets under the EaaS contract will be owned by a special purpose entity also responsible for the performance of the assets. As mentioned earlier, there are carve outs in these types of agreements which can allow the City to still provide O&M services under this contract.

Finally, if the City priority is to deploy this project expeditiously and keep the current scope then the most cost effective and streamlined method is to install solar PV and batteries through a PPA and install the energy efficiency measures through annual budget allotment for deferred maintenance. This will help the City install critical infrastructure at MSCN in the least amount of time to provide much needed resilience to the critical operations of this facility.

Abbreviations

Abbreviations	Definitions
AC	Air Conditioner
AC	Alternating Current
BEB	Battery Electric Buses
BESS	Battery Energy Storage System
CA	California
CAISO	California Independent System Operator
Capex	Capital Expenditures
DC	Direct Current
EaaS	Energy As a Service
EE	Energy Efficiency
ESA	Energy Service Agreement
ESCO	Energy Service Company
ESPC	Energy Savings performance Contract
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
GHG	Greenhouse Gas
HID	High Intensity Discharge
HVAC	Heating, Ventilation, and Air Conditioning
IGA	Investment Grade Audit
KPI	Key Performance Indicator
LED	Light Emitting Diode
MBH	1,000 British Thermal Units
MW	Mega Watt
NEM	Net Energy Metering
NPV	Net Present Value
O&M	Operation and Maintenance
Opex	Operating Expenses
PPA	Power Purchase Agreement
PV	Photovoltaic
ROI	Return on Investment
ROM	Rough Order of Magnitude
SPE	Special Purpose Entity
VAV	Variable Air Volume