



MSCN Business Plan

Energy Efficiency, Renewables, and Microgrid
Opportunities

November 29, 2022

Agenda

- Project Background
- Phase I – Feasibility Study
- Phase II – MSCN Business Plan
- Questions



Project Background

Project Background



Resiliency and sustainability objectives of the City of Santa Rosa

- City and State mandates
- Increased cost of energy
- Increased frequency of natural disasters and catastrophic climate events

Phase I - City-Wide Energy Efficiency, Renewables, and Microgrid Feasibility Study

- Studied feasibility of deploying microgrids at two City building clusters
- identified opportunities for installation of solar photovoltaics and energy efficiency measures at all City facilities and parks

Phase II – MSCN business plan and additional solar PV opportunities

- investigates different financing mechanisms for project implementation at MSCN
 - Phase 1 measures (energy efficiency, solar and battery storage)
 - Bus Electrification and electrical infrastructure upgrades
- Feasibility study for carport and floating solar PVs for the Santa Rosa Water



Phase I – Feasibility Study

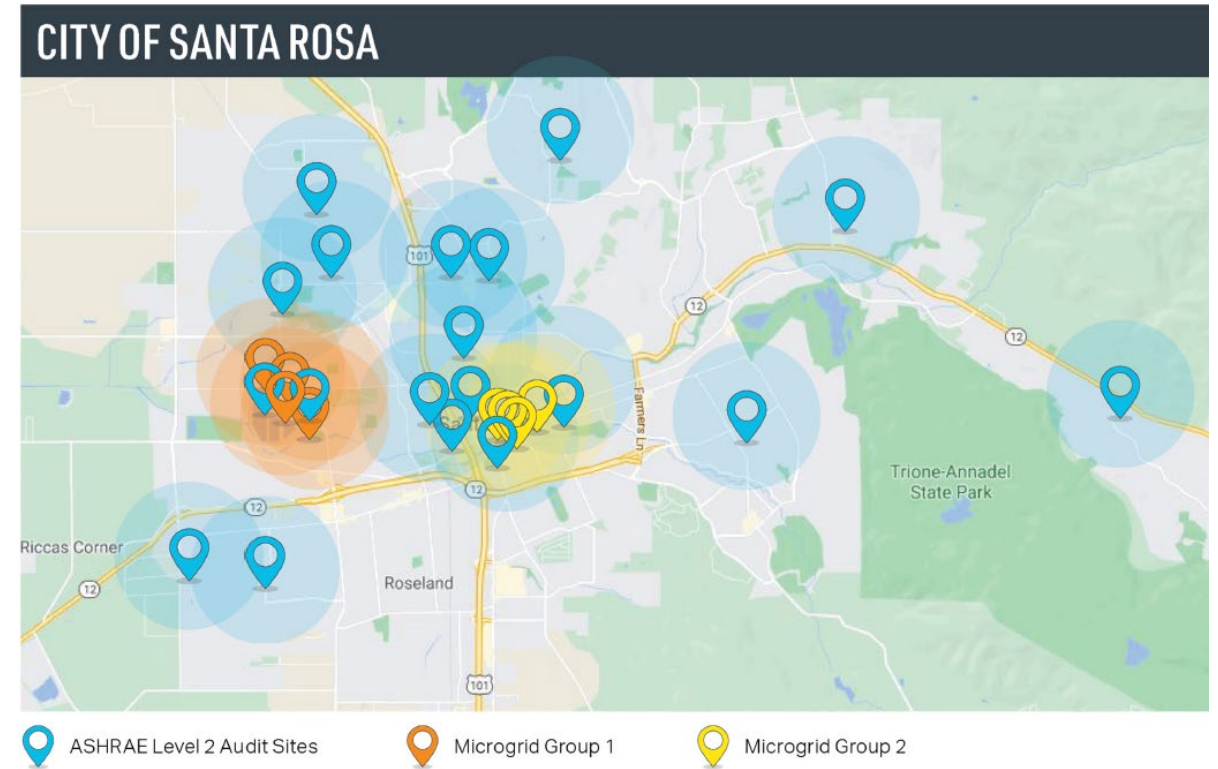
City-Wide Energy Efficiency, Renewables, and Microgrid Feasibility Study

Energy Efficiency



Scope Overview

- Performed Site Investigations for 47 Facilities
- Provided the City:
 - Energy Efficiency Measures
 - Reducing Energy Consumption
 - Addressing Deferred Maintenance
 - Supporting City Electrification Goals



Energy Efficiency



Results

Mix of Energy Efficiency Measures (EEMs) that address different City needs, goals and level of capital investment

Lighting and Lighting Controls Upgrades

Upgrades at 44 Facilities

- \$155,000 Annual Cost Savings
- Simple Payback 5.5 Years

HVAC Upgrades

Upgrades at 8 Main Facilities

- City Hall
- City Hall Annex
- Chamber Building
- Finley Park Community Center
- MSCN
- MSCS
- PSB
- Steele Lane Community Center

Energy Management and Control System

Remote Monitoring and Control System for 10 Buildings

- | | |
|--------------------------------|------------------------|
| • City Hall | Swim Center |
| • City Hall Annex | • Finley Senior Center |
| • Chamber Building | • MSCN |
| • Finley Park Community Center | • MSCS |
| • Finley Park | • PSB |
| | • Sam Jones Hall |

Renewables

Scope Overview

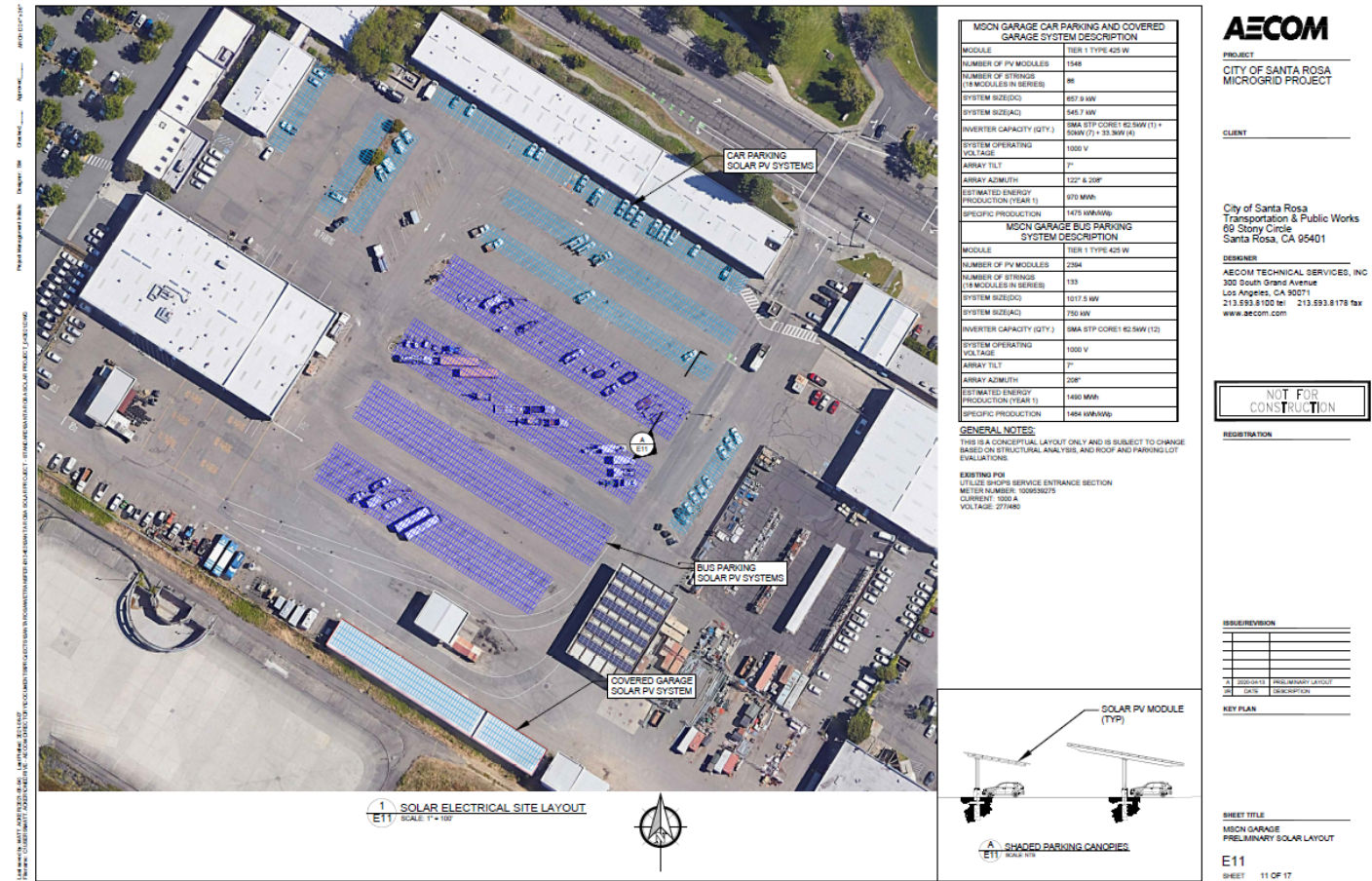
- Total of 107 Sites
- Evaluated for Solar Application Based on:
 - Space Availability
 - Shading
 - Electrical Infrastructure



Renewables

Results

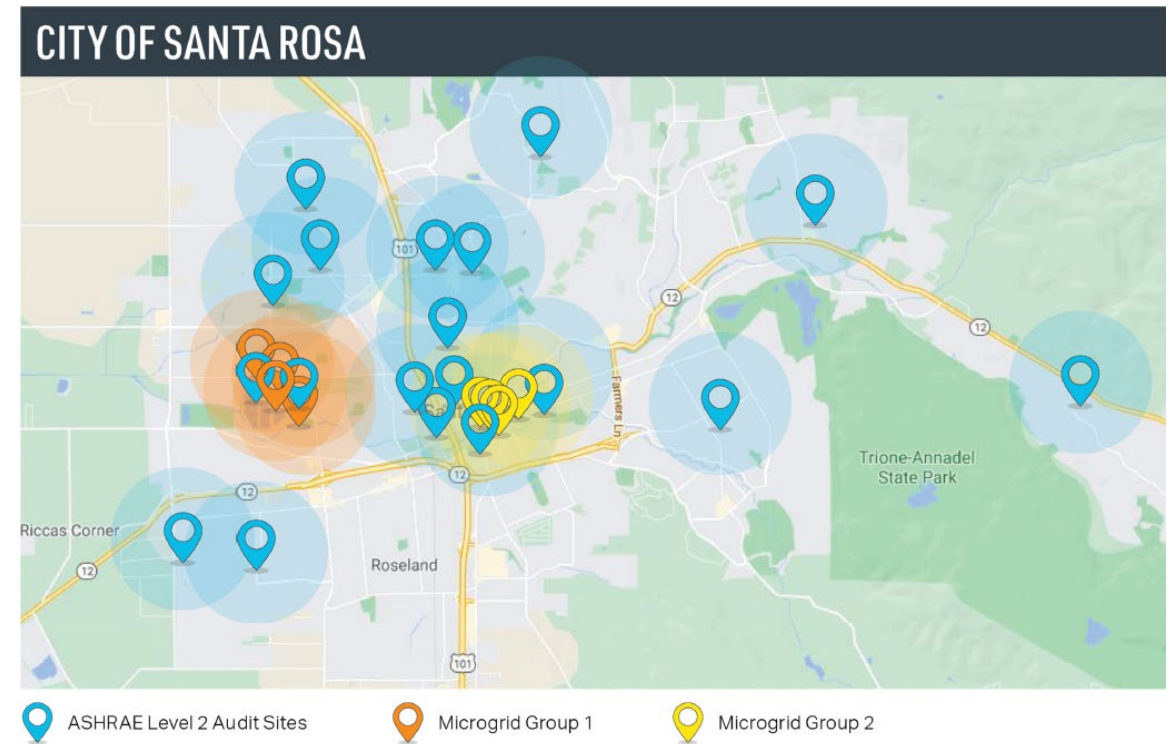
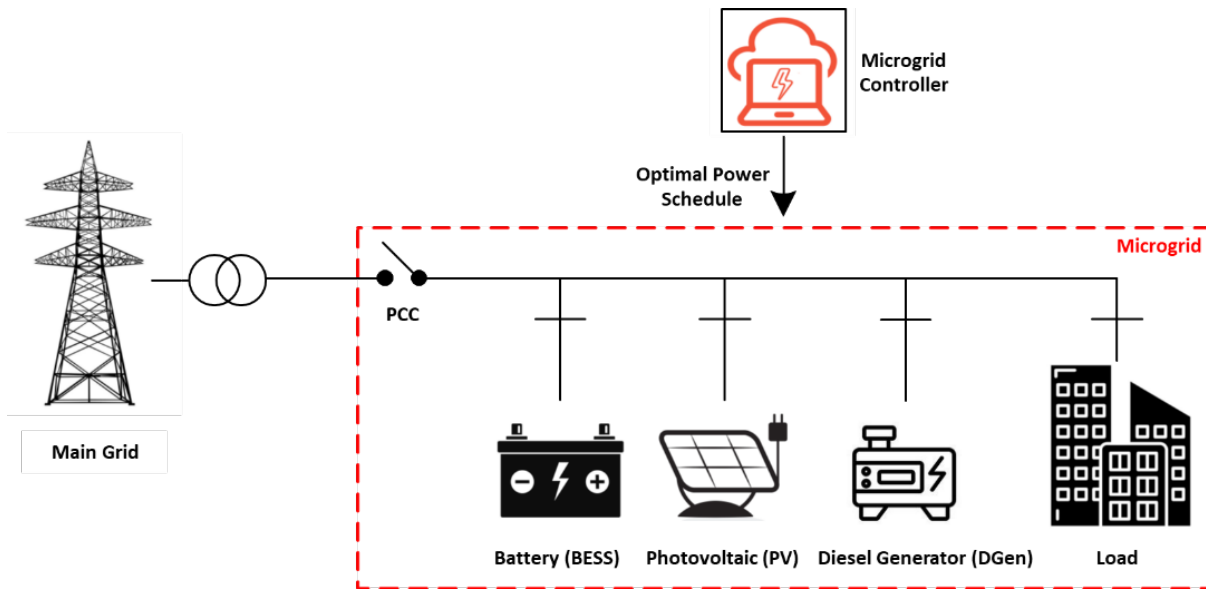
- Maximum Solar Potential of 7.2 MWdc at 17 Sites
 - Tire 1 - Maximum Solar Potential of 3.2 MWdc at 11 Sites
 - Tire 2 - Maximum Solar Potential of 4.0 MWdc at 6 Sites
- Preliminary Site Layouts for each of the 17 Sites



Microgrid

Scope Overview

- Investigate Microgrid Viability for Two Groups of Facilities
 - Group 1 - 18 Buildings and 4 Unique Address
 - Group 2 - 7 Buildings and 4 Unique Address



Microgrid



Results

- Seven (7) Individual Microgrids

Microgrid Implementation Cost Summary					
Facility	Battery Energy Storage System	Solar PV (kWac)	Stand By Generator (kW)	Implementation Cost (\$)	O&M Costs (\$)
MSCN	840 kWh / 200 kW	400	365	\$1,991,000	\$35,000
MSCS	106 kWh / 46 kW	150	100	\$877,542	\$10,000
City Hall	210 kWh / 50 kW	0	450	\$923,500	\$25,000
City Hall Annex	210 kWh / 50 kW	0	450	\$923,500	\$25,000
PSB	840 kWh / 200 kW	0	365	\$1,635,000	\$25,000
Finley Park Senior Center	210 kWh / 50 kW	310	100	\$1,030,612	\$25,000
Finley Park Community Center	132 kWh / 58 kW	63	100	\$904,611	\$17,500
TOTAL		613	1,930	\$8,285,653	\$162,500



Phase 2 – MSCN Business Plan

Business Plan Scope



A subset of Phase I recommendations + Bus electrification at MSCN

Energy Efficiency

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

Solar PV Systems

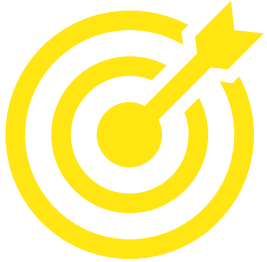
kW-DC	kW-AC	DC/AC	Produced Energy (kWh/first year)
519	402	1.29	762,584

Battery Energy Storage Systems

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

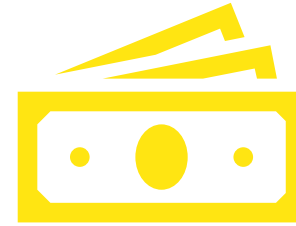
Battery Electric Buses and Charging Systems

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



Objective:

Identify the best financial mechanism for installation of the scope



Methodology:

Identified four financial options suitable for the scope of work

Created a cash flow analysis for each option to identify the net present value of the investment

Studied complexities, risks, and advantages of each of the financial options

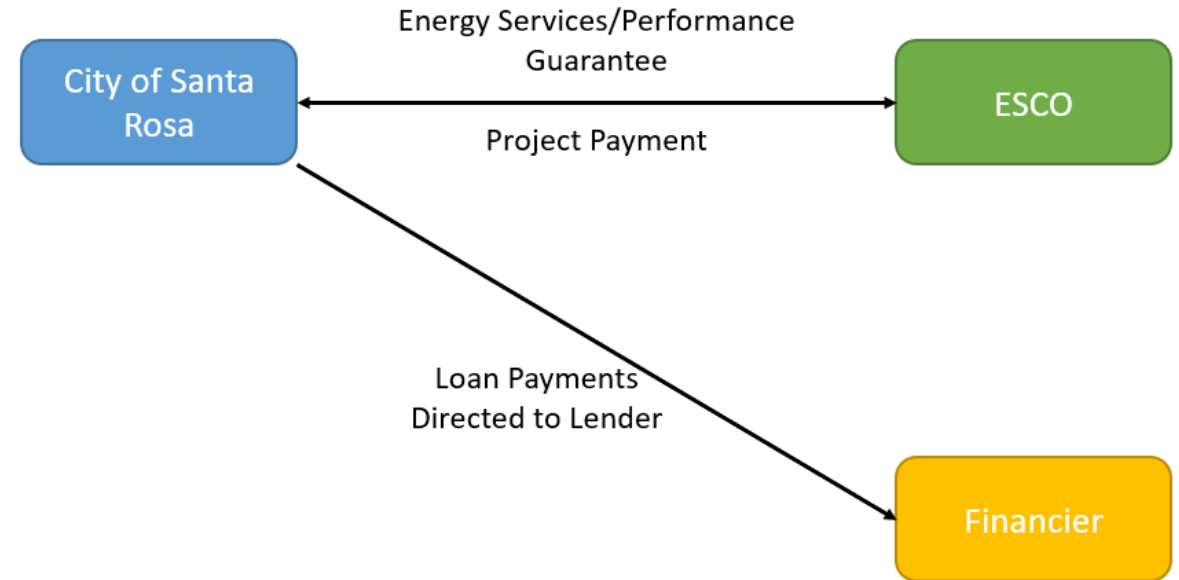
Business Plan – Types of Financial Mechanisms



Energy Savings performance Contract

City and the ESCO

- Energy Services Company (ESCO) conducts Investment grade audit (IGA)
- ESCO provides a comprehensive energy efficiency and renewable energy packages of measures
- City signs a design-build performance contract with the ESCO firm
- Contract includes performance guarantee and the payback schedule
- City pays the project fees to the ESCO per the contract



City and the Financier

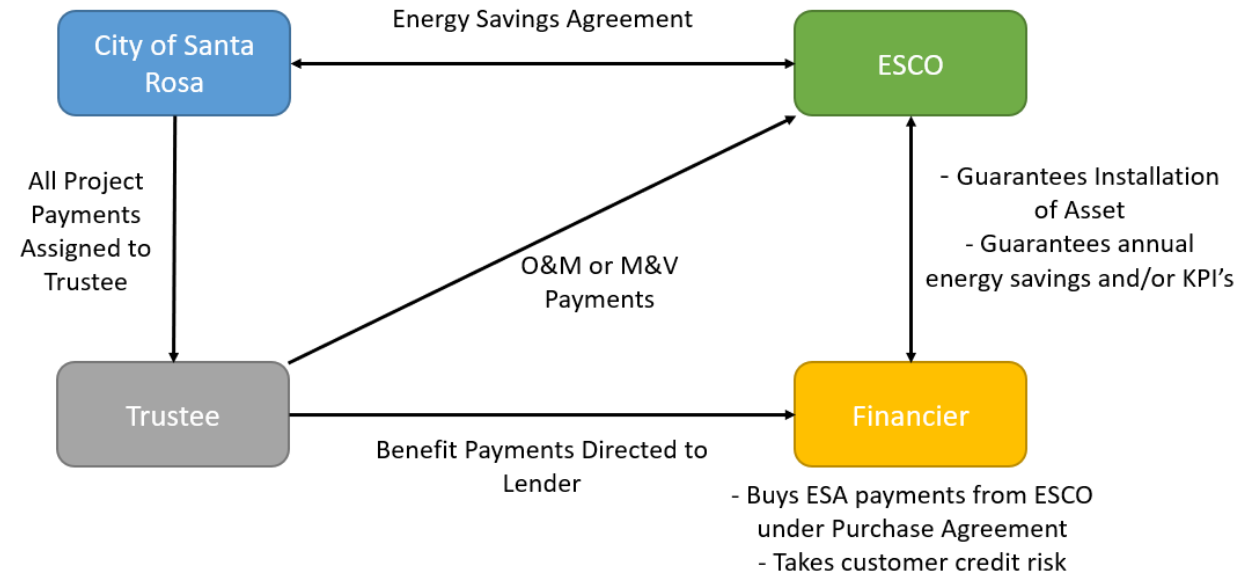
- City works with a financier to secure a tax-exempt lease financing
- City pays the loan payments

Business Plan – Types of Financial Mechanisms



Energy as a Service (EaaS) or Energy Savings Agreement (ESA)

- Energy savings agreement similar to previous option
 - Payment obligations tied to the project performance
- Project fees are paid to the Trustee, ESCO works directly with the Financier
- In general, a more complex contract structure and
- Contract fees are usually higher reflecting the higher risk for the financier



Business Plan – Types of Financial Mechanisms



Power Purchase Agreement (PPA)

- Developer will perform the design, permitting, financing and installation of the solar PV and the battery storage system with little to no upfront cost
- Developer will sell the generated power to the City at an agreed upon fixed rate
 - This rate will be lower than the City's utility rate and therefore offsets the city's utility costs while the developer earns income on the difference
- Developer can take advantage of the tax credits that otherwise the City would not be eligible for.
 - Developer can incorporate these tax credits to the agreed upon rate to share the benefits with the City
- 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.

Business Plan – Studied Options



Four combinations of the discussed financial mechanism studied

Scope	Loan	Self/Grant Fund	Service Contract Payment
<i>Option 1 - ESPC + funded BEB EVSE</i>			
Solar PV and Battery Storage	X		
Energy Efficiency	X		
Bus Electrification		X	
<i>Option 2 - ESPC + PPA + funded BEB EVSE</i>			
Solar PV and Battery Storage			X
Energy Efficiency	X		
Bus Electrification		X	
<i>Option 3 – EaaS/ESA + funded BEB EVSE</i>			
Solar PV and Battery Storage			X
Energy Efficiency			X
Bus Electrification		X	
<i>Option 4 – PPA + funded EE and BEB EVSE</i>			
Solar PV and Battery Storage			X
Energy Efficiency		NA	
Bus Electrification		X	

- BEB – Battery Electric Buses
- EVSE - Electric Vehicle Supply Equipment
- ESPC - Energy Savings performance Contract
- EE – Energy Efficiency
- PPA – Power Purchase Agreement
- EaaS – Energy as a Service
- ESA – Energy Service Agreement

Business Plan – Cash Flow Analysis



- ❑ Cash flow analysis provides the net present value (NPV) of the investment
- ❑ Considers capital costs, operating cost savings and expenses, contract fees, and escalation rates
- ❑ Provides a comparison point for deciding between the different financial options

Capital Costs

Lighting and Lighting Controls Upgrades
Packaged Unit Replacement
New Chillers
New Boilers
Energy Efficiency Rebates and Incentives
Solar PV Install Cost
BESS Install Cost
BEB and EVSE implementation cost

Operating Expenses

Packaged Unit savings
Chiller Replacement savings
Boiler Replacement Savings
Lighting Retrofit Savings
Renewables Energy and Demand Cost Avoidance
NEM 2.0 Excess solar payment
BEB Charging Energy and Demand Cost
Fuel (Diesel) Cost Avoidance
Low Carbon Fuel Standard Credits

Maintenance and replacement

Energy Efficiency O&M savings
PV O&M Rate
BESS O&M Rate
BEB Replacement Cost (net)
EV O&M Avoided Cost
PV Panel Replacement Cost
PV Inverter Replacement Cost
BESS Replacement Cost
BEB Replacement Cost
EVSE Replacement Cost

Business Plan – Results and Recommendations



Comparison of the NPV between the different Options and a summary of the contract assumptions

EaaS/ESA has lowest net present value

Remaining options have similar NPVs

Contract fees and rates are based on market values and similar projects

- Exact rates should be collected from service providers before making a final decision

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	-

Business Plan – Results and Recommendations



Risk level comparison of the different Options

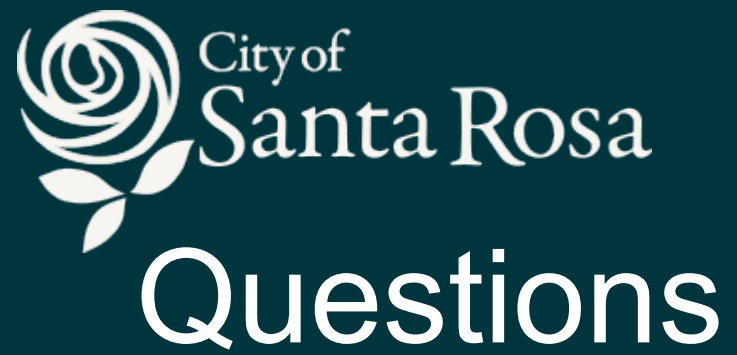
Risk Type	Option 1 - ESPC	Option 2 - ESPC+PPA	Option 3 - EaaS/ESA	Option 4 - PPA
Contract complexity	Medium	Medium	High	Low
Accounting implications	High	Medium	Low	Low
Development/Implementation period	High	High	Medium	Low
Equipment ownership	High	High	Low	Low
Maintenance and operation	Medium	Medium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

Recommendations (MSCN Specific)

- PPA including both solar and BESS is the best option
- Energy Efficiency measures can be self funded
- Bus Electrification and infrastructure upgrades can be implemented with available grants and incentives

City-wide Recommendation

- To obtain maximum benefit from the phase 1 study, AECOM recommends that Santa Rosa considers city-wide solutions
 - Microgrids at MSCN/MSCS and Finley Community Center combined one contracting vehicle through third party financing
 - Whole city energy efficiency upgrades and solar PV/battery deployment using ESPC mechanisms



Thank you.