Moscow City Council

Sustainability Workshop
~Agenda~

Laurie M. Hopkins
City Clerk

www.ci.moscow.id.us

208.883.7015

Monday, April 26, 2021 **5:30 PM** **Council Chambers**
206 E. Third St.

The Moscow Mayor, City Council and Staff welcome you to tonight's meeting, Due to the rise in COVID-19 cases in the area, the meeting is open to the public, but is subject to social distancing protocols and masks will be required of attendees. If you do not have a mask, a disposable mask will be provided. The number of attendees at any one time is limited to no more than 14 due to social distancing requirements in Stage 3 of the Idaho Rebounds Plan and the City of Moscow Public Health Emergency Order Please note that Moscow City Council workshop meetings may be televised, videotaped and/or recorded. Links to view the City Council workshop live can be found on the City website, YouTube, Facebook and Spectrum Cable 1301. Thank you for your interest in City government.

WORKSHOP AGENDA

1. **Welcome - Bill Lambert**

2. **Introduction - Tyler Palmer, Deputy City Supervisor Public Works & Services**

3. **2020 Greenhouse Gas Council Workshop--Tyler Palmer/Kyle Steele/Kelli Cooper**

   The City of Moscow achieved the Council goal established in 2010 for a 20% reduction of City-operations-generated greenhouse gasses by 2020. The Council will receive a report on how the goal was accomplished, and consider a framework for continued action by the City toward carbon neutrality. Staff has conducted a comprehensive review of the 10-year Capital Improvement Plan, and its projected impact on City emissions. A list of categorized projects with cost and impact estimations was generated, and projections accounted for growth. The Sustainable Environment Commission has been involved in the review of the framework, and has provided a letter of support for the approach. Staff will solicit guidance from Council on next steps.

   DIRECTION: Receive the report and direct staff to analyze and bring forward feasible projects that advance the City toward carbon neutrality. Further, direct staff to conduct analysis on current and future sequestration activities and infrastructure in order to identify a realistic path to carbon neutrality or provide staff further direction.

ADJOURN

NOTICE: Moscow City Council and committee meetings are televised, videotaped and/or recorded. Individuals attending the meeting who require special assistance to accommodate physical, hearing, or other impairments, please contact the City Clerk, at (208) 883-7015 or TDD 883-7019, as soon as possible so that arrangements may be made.

CITY COUNCIL STAFF REPORT

DATE: Monday, April 26, 2021

AGENDA ITEM TITLE

2020 Greenhouse Gas Council Workshop--Tyler Palmer/Kyle Steele/Kelli Cooper

RESPONSIBLE STAFF

Tyler Palmer, Deputy Director - Operations

REVIEWED BY

ADDITIONAL PRESENTER(S)

Kelli Cooper, Kyle Steele, Environmental Services Supervisor

OTHER RESOURCES

DESCRIPTION

The City of Moscow achieved the Council goal established in 2010 for a 20% reduction of City-operations-generated greenhouse gasses by 2020. The Council will receive a report on how the goal was accomplished, and consider a framework for continued action by the City toward carbon neutrality. Staff has conducted a comprehensive review of the 10-year Capital Improvement Plan, and its projected impact on City emissions. A list of categorized projects with cost and impact estimations was generated, and projections accounted for growth. The Sustainable Environment Commission has been involved in the review of the framework, and has provided a letter of support for the approach. Staff will solicit guidance from Council on next steps.

STAFF RECOMMENDATION

Receive report and direct staff to analyze and bring forward feasible projects that advance the City toward carbon neutrality. Further, direct staff to conduct analysis on current and future sequestration activities and infrastructure in order to identify a realistic path to carbon neutrality.

PROPOSED ACTIONS

Direction: Receive the report and direct staff to analyze and bring forward feasible projects that advance the City toward carbon neutrality. Further, direct staff to conduct analysis on current and future sequestration activities and infrastructure in order to identify a realistic path to carbon neutrality or provide staff further direction.

FISCAL IMPACT

PERSONNEL IMPACT

ATTACHMENTS

1. pktCC_2021-04-26 sustainability workshop

Greenhouse Gas Inventory

Council Workshop Packet

April 26, 2021

Heart of the Arts

Sustainable Environment Commission

A Volunteer Commission of the City of Moscow

Kyle Steele
Environmental Services Supervisor

Gary J. Riedner
City Supervisor

Regular Meeting Time:
Third Tuesday
of the month
6:00 p.m.

Mayor's Conference Room
of City Hall

Please check with City Hall to confirm meeting times or to volunteer for this or other City Commissions

Sustainable Environment Commission
c/o Kyle Steele
P.O. Box 9203
Moscow, ID 83843-1703
Website: www.ci.moscow.id.us

City Hall
206 East 3rd Street
Phone (208) 883-7000
Fax (208) 883-7018
Hearing Impaired (208) 883-7019

April 23, 2021

Dear Mayor Lambert and City Council Members:

The Sustainable Environment Commission is pleased to support the Greenhouse Gas Goal framework presented by Kelli Cooper at our March and April meetings. This framework continues the significant accomplishments already achieved by the city – most notably reaching the goal of reducing greenhouse gas emissions 20% by 2020.

The SEC encourages the city to consider projects to further curb greenhouse gas emissions. Some examples could be reduced energy consumption associated with city building/facilities, streetlights/traffic signals, employee commute, solid waste, water and wastewater. Of particular importance would be the potential for use of renewable energy sources at the Water Reclamation and Reuse Facility given this facility has one of the highest carbon footprints.

On behalf of the SEC, I thank you and the city staff for your outstanding efforts to make Moscow a great place to live and work.

Sincerely,

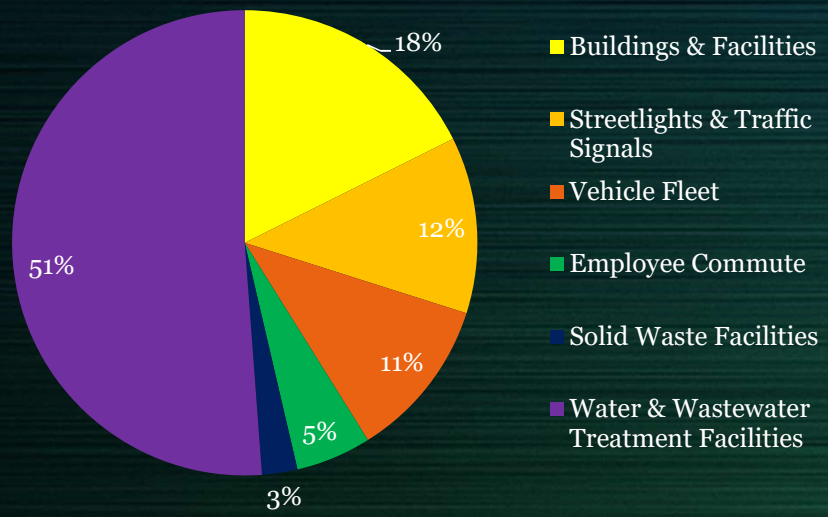
Steve McGeehan, Chair
Moscow Sustainable Environment Commission

City Commissions are advisory to the Mayor and City Council and this communication does not represent the official position of the City of Moscow.

2020 Greenhouse Gas Inventory Report

City Council Workshop April 26, 2021

2008 Inventory



Total Emissions

4,722 MT CO_{2e}

Baseline Emissions

Buildings & Facilities:

- LED lighting
- HVAC
- Water conservation
- HLAC boiler
- Combining IS equipment

2008 Sector Total

833 MT CO_{2e}

660 MT CO_{2e}

2020 Sector Total
20.8% reduction

3.5% overall reduction

Streetlights & Traffic Signals:

- LED Traffic signals
- LED Streetlights

2008 Sector Total

579 MT CO_{2e}

358 MT CO_{2e}

2020 Sector Total
38.2% reduction

9.1% overall reduction

Vehicle Fleet:

- EcoDriver program
- Vehicle fleet replacement

2008 Sector Total

530 MT CO_{2e}

473 MT CO_{2e}

2020 Sector Total
10.8% reduction

1.2% overall reduction

Employee Commute:

- Increased fuel efficiency of employee vehicles
- Telecommuting

2008 Sector Total

247 MT CO_{2e}

187 MT CO_{2e}

2020 Sector Total
24.3% reduction

1.3% overall reduction

Solid Waste:

- Only sector that showed an increase over 2008 Levels
- Tied Exclusively to Growth in the City

2008 Sector Total

116 MT CO_{2e}

153 MT CO_{2e}

2020 Sector Total

31.9% increase

0.8% overall increase

Water & Wastewater Facilities:

- Variable Frequency Drive on Well 6
- LED lighting upgrades at the WRRF
- Water Conservation Program
- Operational updates

2008 Sector Total

2,417 MT CO_{2e}

1,958 MT CO_{2e}

2020 Sector Total

19% reduction

9.7% overall reduction


Success!
CITY OF MOSCOW 1887 IDAHO
Baseline
4,722MT CO2e
2008 Total Emissions
20% Reduction
3,789MT CO2e
2020 Total Emissions

Evaluated Capital Improvement Projects

These projects were identified from to have a greenhouse gas impact to operations. A '+' effect indicates a reduction in emissions while a '-' indicates an increase in emissions. Costs were identified at the time the project was added to the capital improvment program portfolio. For the purposes of this workshop, impacts were calculated using today's emissions factors.

Buildings & Facilities

Project	Description	Outcome	Effect	Expected impact MT CO2e	Cost	Planned for	Payback time	Cost/MT CO2e	Notes
Indian Hills Park Restroom	Installation of a single user precast restroom facility at Indian Hills Park and association utility and pathway connections	Addition of restroom facilities at park in accordance with the park masterplan development; increased energy consumption	-	3	$132,220.00	2022/2023		$44,073.33	assumes similar consumption of friendship square bathroom
Lola Clye Park Restroom Construction	Installation of single user precast restroom facilitiy at Lola clyde Park and associated utility and pathway connections	Addition of restroom facilities at park in accordance with the park masterplan development; increased energy consumption	-	3	$155,579.00	2026/2027		$51,859.67	assumes similar consumption of friendship square bathroom
Itani Park Restroom	Installation of single user precast restroom facility at Itani Park and associated utility and pathway connections	Addition of restroom facilities at park in accordance with the park masterplan development; increased energy consumption	-	3	$155,579.00	2026/2027		$51,859.67	assumes similar consumption of friendship square bathroom
HLAC Pool Heater Replacement	Replacement of the pool heaters at the Hamilton Lowe Aquatics Center	Maintenance of facilities amenities to maintain user recreation opportunities and experience; increased energy efficiency of heaters leads to reduced energy consumption	+	8	$109,922.00	2032		$13,740.25	increase heater efficiency by 5 percent- opt for the higher effiency model during next replacement
Police Services Facility Project	Construction of a new 15,300 sq ft Police Services Facility including a 3,000 square foot outbuilding, secured parking area and associated site improvements	Improved and more efficient police services delivery to the community	-	50	$8,148,787.00	ongoing		$162,975.74	Will depend on elimination of old facility and how much more efficient the new building is compare to the old one; at least a slight increase in emissions is expected due to doubling the floor space.
Haddock Building Remodel Project	Remodel of the 7500 sq ft Haddock Building to house the Community Planning and Design staff that are currently located in the Mann Building and The Annex buildings	Project will provide necessary office, conference, reception and storage space for the operations of the Community Planning and Design staff;	-	5	$475,700.00	2021		$95,140.00	Will depend on elimination of old facility and how much more efficient the new building is compare to the old one; at least a slight increase in emissions is expected due to doubling the floor space.
Mann Building Remodel Project	Remodel of the Mann Building to stabilize exterior masonry cracking, install a new roof and other minor renovations to accommodate the Information Systems Department Staff that are currently housed in the Eggan Youth Center	Building Stabilization and extension of serviceable life	+	12	$79,303.00	2021		$6,608.58	Most efficient building in the city as it is; after remodel it will be occupied by fewer staff as well.
City Hall- Roof Replacement Project	Replacement of the existing metal roof on City Hall	Maintenance/Extension of building life	+	12	$140,000.00	2026/2027		$11,666.67	opportunity for increasing energy effiency; opportunity for solar-ready roof or solar install.
HIRC Parking lot Replacement Project	Replacement of deteriorating parking lot paving at the HIRC	Maintenance/Extension of building life; potential solar project	+	**	$233,398.00	2021/2022			opportunty for groundmount solar that provides electricity to HIRC/HLAC, can also provide added value to rec center patrons by shading their vehicles.
HIRC HVAC Replacement Project	Replacement of HVAC system reaching end of serviceable life at the Hamilton Indoor Recreation Center	Maintenance/Extension of building life; upgraded HVAC efficiency reduces energy consumption	+	3	$123,806.00	2023/2024		$41,268.67	opt for more efficient models to maximize benefit to ghg inventory
HIRC Roof Replacement Project	Replacement of roofing shingles reaching end of serviceable life at Hamilton Indoor Recreat Center	Maintenance/Extension of building life; potential increase in energy efficiency; potential solar project;	+	**	$415,962.00	2033/2034		#VALUE!	opportunity for increasing energy efficiency; making the roof solar ready and/or installing rooftop solar; Also look into cool roofs

Streetlights & Traffic Signals

Project	Description	Outcome	Effect	Expected impact MTCO2e	Project Cost	Planned For	Payback Time	Cost/ MTCO2e	Notes
Paradise Path Lighting Project Phase I	Installation of energy efficient LED pathway lighting on Paradise Path from South Main to Berman Creekside Park	Enhanced pathway lighting to improve safety and expand use of the pathway system use during periods of limited daylight hours	-	0.25	$96,305.00	2021		$385,220.00	Adding any new lighting, even LED, will increase elctrical consumption. Goal should be to minimize impact by using most energy efficient options and designs; may have community emission implications
Pardise Path Lighting Project Phase II	Installation of energy efficient LED pathway lighting on Paradise Path from Berman Creekside Park to pedestrian underpass at Styner Street and the Troy Highway	Enhanced pathway lighting ti improve safety and expand use of the pathway system use during periods of limited daylight hours	-	0.25	$96,305.00	2029/2030		$385,220.00	Adding any new lighting, even LED, will increase elctrical consumption. Goal should be to minimize impact by using most energy efficient options and designs; may have community emission implications.
LED Conversion Project	Replacement of City-owned streetlights with new high-efficiency LED light fixtures	Reduction of energy use and associated greenhouse gas emissions and associated financial savings	+	109	$154,500.00	2019/2022		$1,417.43	Convertying remaining City owned streetlights to LED would reduce electrical consumption, and reduce operating cost

Ghormley Pickleball Courts	Removal of existing serverely deteriorated tennis courts and construction of four new lighted pickleball courts and associated amenities	adding lighting increases energy consumption	-	0.25	$247,200.00	2021		$988,800.00	Adding any new lighting, even LED, will increase elctrical consumption. Goal should be to minimize impact by using most energy efficient options and designs
Third & Sixth Street Safety improvement Project	Reconstruction of ADA non-compliant sidewalks and pedestrian ramps, curb extensions and corridor lighting improvements	Increased pedestrian safety and ADA compliance and accident reduction within the corridor;	+	1	$856,500.00	2021		$856,500.00	opportunity to convert lighting to LED if it isn't already; for every 3100 kwh saved
South Couplet Beautification Project	Installation of street trees, landscaping, lighting and other streetscape improvements at the South Couplet intersection	Enahnced Pedestrian facilities, traffic calming and City beautification; added lighting will increase electrical consumption	-	1	$340,466.00	2022/2023		$340,466.00	Wisescaping opportunity to reduce water needs; opportunity for wildlife benefits; additional lighting leads to increased energy consumption; for every 3100 kwh added
Lieuallen Beautification Project	Installation of street trees, landscaping, lighting and other streetscape improvements at the Lieuallen intersection	Enhanced Pedestrian facilities, traffic calming and City beautification; added lighting will increase electrical consumption	-	1	$169,107.00	2025/2026		$169,107.00	Wisescaping opportunity to reduce water needs; opportunity for wildlife benefits; additional lighting leads to increased energy consumption; for every 3100 kwh added
South Main Beautification Project	Installation of street trees, landscaping, lighting and other streetscape improvements at the South Main and Palouse River Drive intersection	Enhanced Pedestrian facilities, traffic calming and City beautification; added lighting will increase electrical consumption	-	1	$175,597.00	2027/2028		$175,597.00	Wisescaping opportunity to reduce water needs; opportunity for wildlife benefits; additional lighting leads to increased energy consumption; for every 3100 kwh added
Mountain View Beautification Project	Installation of street trees, landscaping, lighting and other streetscape improvements at the Troy Highway and Mountain View intersection	Enhanced Pedestrian facilities, traffic calming and City beautification; added lighting will increase electrical consumption	-	1	$129,426.00	2029/2030		$129,426.00	Wisescaping opportunity to reduce water needs; opportunity for wildlife benefits; additional lighting leads to increased energy consumption; for every 3100 kwh added
Avista Streetlight Changeout	Convert remaining Avista-owned streetlights to LED; 278 lamps remaining	Reduced energy consumption	+	11.6	< $	2021	instant	#VALUE!	Costs the city nothing- pure savings through reduced consumption

Vehicle Fleet

Project	Description	Outcome	Effect	Expected impact MTCO2e	Cost	Planned For	Payback Time	Cost/ MTCO2e	Notes
402	2013 Ford Interceptor Sedan (avg MPG 22) transition to Hybrid SUV (34 mpg)	reduce fuel consumption	+	2	$27,810.00	2020/2021		$13,905.00	
403	2014 Ford Interceptor Sedan-(19 MPG) transtion to Hybrid model	reduce fuel consumption	+	2	$27,810.00	2020/2021		$13,905.00	
404	2014 Ford Interceptor SUV- (22 MPG) transition to Hybrid SUV (34 mpg)	reduce fuel consumption	+	2	$27,810.00	2020/2021		$13,905.00	
101	2013 Chevrolet Silverado 1500 (18.5 MPG) transition to Hybrid	reduce fuel consumption	+	2	$30,240.00	2025		$15,120.00	
109	2012 Chevrolet 1/2 Ton Pickup -(21.5 MPG) transition to Hybrid	reduce fuel consumption	+	2	$29,430.00	2024		$14,715.00	
110	2012 Chevrolet 1/2 Ton Pickup- (21.5 MPG) transition to Hybrid	reduce fuel consumption	+	2	$29,430.00	2024		$14,715.00	
111	2011 Chevrolet 1500-(21.5)MPG transition to Hybrid	reduce fuel consumption	+	2	$28,620.00	2023		$14,310.00	
112	2015 Chevrolet Equinox-(27 MPG) transition to EV	reduce fuel consumption	+	2	$40,120.00	2027		$20,060.00	
114	2011 Ford E-450 (7.2 mpg) transition to EV	reduce fuel consumption	+	2	$39,100.00	2026		$19,550.00	
128	2012 Ford Escape-(25.5 MPG) transition to EV	reduce fuel consumption	+	2	$37,060.00	2024		$18,530.00	
130	2014 Chevrolet Silverado 1500-(21 MPG) transition to Hybrid	reduce fuel consumption	+	2	$31,050.00	2026		$15,525.00	
137	2009 Bobcat transition to EV	reduce fuel consumption	+	2	$37,060.00	2024		$18,530.00	
204	2012 Chevrolet Silverado 1500-(18.5 MPG) transition to Hybrid	reduce fuel consumption	+	2	$29,430.00	2024		$14,715.00	
205	2010 Chevrolet Silverado 1500-(18.5MPG) transition to Hybrid	reduce fuel consumption	+	2	$27,810.00	2022		$13,905.00	
207	2014 Chevrolet Silverado 1500-(21 MPG) transition to Hybrid	reduce fuel consumption	+	2	$31,050.00	2026		$15,525.00	
208	2012 Chevrolet Silverado 1500- (18.5 MPG) transition to Hybrid	reduce fuel consumption	+	2	$29,430.00	2024		$14,715.00	
310	2016 Chevrolet Equinox- (27 MPG) transition to EV	reduce fuel consumption	+	2	$41,140.00	2028		$20,570.00	
311	2009 Ford Ranger- (23.5 MPG) transition to EV	reduce fuel consumption	+	2	$35,020.00	2021		$17,510.00	
312	2014 Chervrolet Van- (16.5 MPG) transition to EV	reduce fuel consumption	+	2	$39,100.00	2026		$19,550.00	
313	2009 Ford Ranger-(23.5 MPG) transition to EV	reduce fuel consumption	+	2	$35,020.00	2021		$17,510.00	
314	2009 Cheverolet Colorado- (21 MPG) transition to EV	reduce fuel consumption	+	2	$35,020.00	2021		$17,510.00	
401	2017 Ford Interceptor SUV- (22 MPG) transition to Hybrid	reduce fuel consumption	+	2	$29,430.00	2024		$14,715.00	
406	2017 Ford Interceptor SUV- (22 MPG) transition to Hybrid	reduce fuel consumption	+	2	$29,430.00	2024		$14,715.00	
408	2016 Ford Interceptor SUV- (22 MPG) transition to Hybrid	reduce fuel consumption	+	2	$28,620.00	2023		$14,310.00	
410	2015 Ford Interceptor SUV-(22 MPG) transition to Hybrid	reduce fuel consumption	+	2	$27,810.00	2022		$13,905.00	

411	2014 Ford Interceptor - (22 MPG) transition to Hybrid	reduce fuel consumption	+	2	$31,050.00	2026	$15,525.00	
413	2015 Ford Interceptor SUV- (22 MPG) transition to Hybrid	reduce fuel consumption	+	2	$27,810.00	2022	$13,905.00	
414	2015 Ford Fusion-(30 MPG) transition to Hybrid/PHEV	reduce fuel consumption	+	2	$31,860.00	2027	$15,930.00	
421	2019 Harley FLHTP (44.2 mpg) transition to EV	reduce fuel consumption	+	2	$36,040.00	2023	$18,020.00	
482	2010 Chevrolet Malibu-(27.5 MPG) transition to Hybrid/PHEV	reduce fuel consumption	+	2	$27,810.00	2022	$13,905.00	
483	2014 Ford Fusion- (31 MPG) transition to Hybrid/PHEV	reduce fuel consumption	+	2	$31,050.00	2026	$15,525.00	
484	2013 Ford Fusion- (31 MPG) transition to Hybrid/PHEV	reduce fuel consumption	+	2	$30,240.00	2025	$15,120.00	
485	2012 Chevrolet Malibu- (27.5 MPG) transition to Hybrid/PHEV	reduce fuel consumption	+	2	$29,430.00	2024	$14,715.00	
486	2018 Ford Fusion- (28.5 MPG) transition to Hybrid/PHEV	reduce fuel consumption	+	2	$34,290.00	2030	$17,145.00	
504	2009 Ford 1/2 Ton Pickup- (17.5 MPG) transition to Hybrid	reduce fuel consumption	+	2	$27,810.00	2021	$13,905.00	
505	2013 Chevrolet Equinox- (27 MPG) transition to Hybrid	reduce fuel consumption	+	2	$30,240.00	2025	$15,120.00	
702	2015 Chevrolet Silverado 1500- (21 MPG) transition to Hybrid	reduce fuel consumption	+	2	$31,860.00	2027	$15,930.00	
703	2015 Chevrolet Silverado 1500-(21 MPG) transition to Hybrid	reduce fuel consumption	+	2	$34,290.00	2030	$17,145.00	
705	2009 Ford Ranger- (23.5 MPG) transition to Hybrid	reduce fuel consumption	+	2	$27,810.00	2021	$13,905.00	
719	2015 Chevrolet Silverado 1500-(21 MPG) transition to Hybrid	reduce fuel consumption	+	2	$32,670.00	2028	$16,335.00	
901	2012 Ford Escape-(25.5 MPG) transition to EV	reduce fuel consumption	+	2	$40,120.00	2027	$20,060.00	
902	2015 Chevrolet Equinox-(27 MPG) transition to EV	reduce fuel consumption	+	2	$43,180.00	2030	$21,590.00	
907	2012 Ford Escape-(25.5 MPG) transition to EV	reduce fuel consumption	+	2	$40,120.00	2027	$20,060.00	

Employee Commute

Project	Description	Outcome	Effect	Expected impact	Cost	Planned For	Payback Time	Notes
No projects evaluated								

Solid Waste Facilities

Project	Description	Outcome	Effect	Expected impact	Cost	Planned For	Payback Time	Notes
No projects evaluated								

Water & Wastewater Treatment Facilities

Project	Description	Outcome	Effect	Expected impact	Cost	Planned for	Payback Time	Notes
SE Booster ATS and MCC Project	Replacement, repair and modernization of water production, distribution and storage facilities. Includes the Well #6 backup power generator and automatic transfer switch installation.	Enahnce reliability, reduced maintenance/operational costs and reduced energy use/consumption	+	1	$225,000.00	2021	$225,000.00	For every 3100 kW-hr saved
Moser & Vista Pressure Zone Intertie	Moser and Vista pressure zone interconnection- Installation of 550' of 8" water main from Third Street to Jansen	Installation of new pressur main to interconnect the Moser and Vista high pressure zones to allow the decommission of the Moser water booster station that is reaching end of life; Decommissioning should lead to decreased electrical consumption	+	8.7	$102,318.00	2023	$11,760.69	Decommission of moser booster reduces the electrical consumption
Booster Stations Phase II	Replacing two below-grade booster stations located on Indian Hills Drive and Ponderosa Drive	Replacement of water boosters stations reaching end of life and unable to provide required fire flow for the fire suppression; increased pump efficiency could result in reduced energy consumption	+	1	$1,740,700.00	2021	$1,740,700.00	for every 3100 kW-hr saved
Well #6 Generator/ATS Installation Project	Replacement, repair and modernization of water production, distribution and storage facilities. Includes the Well #6 backup power generator and automatic transfer switch installation.	Enhance reliability, reduced maintenance/operational costs and reduced energy use/consumption	+	1	$175,000.00	2021	$175,000.00	For every 3100 kW-hr saved
Well #6 Building Replacement	Project includes the reconstruction of the Well 6 building which is structural deficient due to wood rot and deterioration within the building walls	Replacement of deteriorated well house building to maintain safe and sanitary operating conditions; reduced energy consumption for heating but increased energy consumption for cooling	+/-	*	$225,000.00	2021	#VALUE!	Too many variables to determine exact impact.
Well #10 Phase II	Development of Well #10 includeing the installation of pump, controls, backup power generation and all supporting systems and structures	Development of additional water source supply to meet State of Idaho production water source redundancy requirements	-	5.5	$1,411,630.00	2021	$256,660.00	Because Well 10 is a redundancy of Well 9, its impact is expected to be minor due to the relatively small amount of energy required to maintain readiness and to heat/cool the building.
Well 2 & 3 Filter Plant Rehabilitiation	Project includes the rehabilitation of the sand filter system located within the Well 2&3 pump house. Project will include assessment of backwash water reclamation improvements to reduce water waste during backwash operations	Rehabilitation of existing sand filter system for wells 2 and 3 to maintain/improve water quality, allow continued use of recharging shallow aquifer source and reduce backwash water waste; reduced energy consumption due to reduced water consumption for backwash needs	+	1	$782,864.00	2026	$782,864.00	For every 3100 kW-hr saved

South Lift Station Force Main Upgrade	Upgrade of south main force main new pressure main to allow for decreased velocities in the pipeline, lower pump hoursepower requirements, and pipeline redundancy which would allow continued lift station operation during pressure main maintenance or repair.	Reduced Horsepower requirements may reduce energy consumption	+	1	$600,000.00	2020	$600,000.00	For every 3100 kW-hr saved
WRRF Phase V Project	Phase V improvements include treatment facility improvements to meet effluent discharge temperature standards to address current permit violations during warmer summer months. Options may include full land application or installation of chillers.	Chiller will increase energy consumption.	-	97	$$$$	2022/2024	#VALUE!	For every 300,000 kW-hrs added
WRRF UV Treatment System Project	This project includes transition from chlorine disinfection to UV treatment to improve effluent to Class A to allow expanded effluent reuse and reduce residual chlorine levels	UV system will increase energy consumption, however eventual expanded reuse may reduce water pumping which decreases energy consumption	-/+	1	$5,375,666.00	2026/2028	$5,375,666.00	For every 3100 kW-hr added
WRRF Energy Control and Supply Improvement Projects	This item includes various energy and controls repair, replacement and enhancements to increase energy conservation, redundancy and system controls; two parts	Reduced energy consumption	+	1	$220,000.00	2025/2027	$220,000.00	For every 3100 kW-hr saved
Water Conservation Program	continued promotion and implementation of water conservation program to reduce water consumption	reduced energy consumption to pump water	+	1	$97,500.00	ongoing	$97,500.00	for every 3100 kW-hr saved;

Evaluated Potential Projects

These projects were identified as potential greenhouse gas reduction measures within city operations. This list is not exhaustive and includes stand-alone as well as supplementary projects that could be included as part of existing capital improvement projects. For the purposes of this workshop, projects were evaluated using today's emission factors and today's dollars.

Buildings & Facilities

Project	Description	Outcome	Effect	Expected impact MT CO2e	Cost	Planned for	Payback time	Cost/MT CO2e	Notes
Solar Project: HIRC/HLAC parking lot	Install solar on/at the HIRC/HLAC. Ground mounted system that creates shade structures in the parking lot.	Supplements Grid electricity, reducing emissions associated with grid energy consumption	+	80	$445,000.00	No current plans	12.5 years	$5,562.50	solar project here would be highly visible to the public; any amount of energy produced would benefit ghg inventory; this project would be a full offset of HLAC electrical use
Solar Project: HIRC Roof	Roof mount on HIRC	Supplements Grid electricity, reducing emissions associated with grid energy consumption	+	36	$201,500.00	No current plans	12.5 years	$5,597.22	solar project here would be highly visible to the public; any amount of energy produced would benefit ghg inventory
Solar Project: HLAC Roof	roof mount on HLAC	Supplements Grid electricity, reducing emissions associated with grid energy consumption	+	13	$84,300.00	No current plans	14.5 years	$6,484.62	solar project here would be highly visible to the public; any amount of energy produced would benefit ghg inventory
Solar Project: Police Station	Install 25kW solar system on the Police Station	Supplements Grid electricity, reducing emissions associated with grid energy consumption	+	9	$88,000.00	No current plans		$9,777.78	solar project here would be highly visible to the public; any amount of energy produced would benefit ghg inventory
Window Replacement: City Hall	upgrade windows at city hall to improve energy efficiency, while maintaining historic aspect of the windows	reduced consumption of natural gas for heating and electricity for cooling	+	51	$$$	No current plans		#VALUE!	increase building efficiency will decrease consumption; calculation assumes 20% savings of electricity and natural gas due to increased efficiency
Solar Project: Eggan	Install solar on Eggan up to 7kW system/24 panels	Supplements Grid electricity, reducing emissions associated with grid energy consumption	+	2.5	$25,200.00	No current plans	20+	$10,080.00	solar project here would be highly visible to the public; any amount of energy produced would benefit ghg inventory
Main Fire Station LED retrofit	upgrade lighting at Main fire station to LED	reduced electrical consumption	+	8	$6,316.86	No current plans	1 year	$789.61	While this is not a City owned building, we are responsible for its energy consumption. Working with the Volunteer Fire Department to make this change happen would benefit both parties.
Solar Project: East City Park Restroom	Install a 5kW solar system on the bathroom structure	reduce grid electrical consumption	+	2	$9,764.00	no current plans	10 years	$4,882.00	This project could be repeated at all City Parks as funds are available. A system this size would essentially run the bathrooms for free during summer months.
Building Envelope Assessments	Assess and repair building envelope issues that lead to increased energy consumption. I.E. drafty windows, drafty doors, drafty walls/spaces	increased energy efficiency which reduces energy consumption	+		Staff labor costs	no current plans		#VALUE!	If done internally this could be a very low cost option to pursue; time could provide constraints but we could limit to 1 facility a year to reduce.
Solar Project: City Shop	install 100 kW/335 panel system on the roof of the shop.	reduce grid electrical consumption by 8%	+	3.2	$352,050.00	no current plans	14 years	$110,015.63	estimates completed using Avista Watt Plan calculator
Smart Thermostats	installing smart thermostats could save up to 10% on heating and cooling costs	reduced electrical and natural gas consumption	+		$300.00	No current plans	1 year	#DIV/0!	cost is per each thermostat that would need to be replaced
Window Replacement: Public Works and Services Building	upgrade windows at PW&S to improve energy efficiency	reduced consumption of natural gas for heating and electricity for cooling	+	++				#VALUE!	

Streetlights & Traffic Signals

Project	Description	Outcome	Effect	Expected impact MTCO2e	Project Cost	Planned For	Payback Time	Cost/ MTCO2e	Notes
Ghormley Ballfields Lights change out	transitional all ballfield lighting to led	reduced energy consumption	+	2	$40,000.00	not currently planned		$20,000.00	Based on an estimate for Ghormley field lights as they were used in 2018
Community Ballfields	transitional all ballfield lighting to led	reduced energy consumption	+	2	$40,000.00	not currently planned		$20,000.00	Based on an estimate for Ghormley field lights as they were used in 2018
Solar Streetlights	transitional all city-owned streetlights to solar powered streetlights	reduced energy consumption	+		$547,400.00				

Vehicle Fleet

Project	Description	Outcome	Effect	Expected impact MTCO2e	Cost	Planned For	Payback Time	Cost/ MTCO2e	Notes

734	2019 Cub Cadet mower transition to electric	reduced fuel consumption	+	5	23900	not currently planned	1 year	$4,780.00	Assumed replacement by equivalent electric model (Mean Green Mowers)
735	2019 Cub Cadet mower transition to electric	reduced fuel consumption	+	4	23900	not currently planned	1 year	$5,975.00	Assumed replacement by equivalent electric model (Mean Green Mowers)
727	2017 John Deere 1585 Terraincut mower transition to electric	reduced fuel consumption	+	4	23900	not currently planned	1 year	$5,975.00	Assumed replacement by equivalent electric model (Mean Green Mowers)
728	2019 John Deere 1585 Terraincut mower transition to electric	reduced fuel consumption	+	6	23900	not currently planned	1 year	$3,983.33	Assumed replacement by equivalent electric model (Mean Green Mowers)
730	2014 Hustler Super Duty Fastrak mower transition to electric	reduced fuel consumption	+	0.5	23900	not currently planned	1 year	$47,800.00	Assumed replacement by equivalent electric model (Mean Green Mowers)

Employee Commute

Project	Description	Outcome	Effect	Expected impact	Cost	Planned For	Payback Time		Notes
Alternative Transportation incentive	Rewarding employees who use alternative transportation to get to work: carpool, bus, walking, biking, etc.	Reduced fuel use	+	*/**		not currently planned			Cost will depend on what type of program is implemented. examples: https://www.bestworkplaces.org/pdf/carpool_June07.pdf
Telecommuting	Expand/make permanent some telecommuting where possible and practical; Could also consider split time positions such as 3 days in office/2 days telecommute	Reduced fuel use	+	*/**	$0-$250	not currently planned			Potential for supplementation of internet costs of permanent telecommute employees. For partial telecommuting, costs would be associated with a secondary work station.
Electric Vehicle Charging Stations	Add electric vehicle charging stations to all city facilities	reduced fuel consumption for commute; encourage the purchase of electric vehicles by employees				not currently planned			

Solid Waste Facilities

Project	Description	Outcome	Effect	Expected impact	Cost	Planned For	Payback Time		Notes
Sustainable Purchasing Guideline update	Update sustainable purchasing guidelines	Reduced landfill waste	+	*	staff time	not currently planned			This was intended to be updated every 2 years when it was adopted.
Improved Waste Tracking	track percent full of all trash containers at city facilities; Pair with occasional waste audits	Improved data set for determining actual waste generated; data can be used to adjust volume of container	+/-	*/**	$	not currently planned	immediate savings if reductions are determined		This would improve accuraccy of our greenhouse gas inventories as well as give us insight into how well our recycling program is working. Add to Energy Star Portfolio Manager.

Water & Wastewater Treatment Facilities

Project	Description	Outcome	Effect	Expected impact	Cost	Planned for	Payback Time		Notes
DOE SWIFT	Participation in SWIFT program through the Department of Energy which provides technical assistance to find energy efficiency improvements	reduced energy consumption; impacts tbd- dependent on energy savings elements identified	+		< $	2021-2022			Free program that could help staff identify energy conservation projects to be added to the CIP.
Solar Project: WRRF	install a solar array at the WRRF to help offset energy consumption; Options might include ground mounted system on site, ground mounted system	energy generation with reduced consumption from the grid	+	9	$88,000.00	not currently planned		$9,777.78	Based on 25KW system
Wind Project: WRRF	install wind turbine(s) to generate electricity to reduced consumption from the grid	energy generation to reduced consumption from the grid	+	3.2	$100,000.00	not currently planned	90 years at current prices	$31,250.00	Based on a 10KW system which could produce up to 10,000 kWh per year; 2028

Solar Estimates for City Facilities

Figures obtained from Avista Watt Estimator solar calculator using the 15%-20% offset defaults and actual facility energy consumption data.

Location	Facility	% Energy Solar	cost	AVERAGE Monthly savings	break even point in 20 years?	kwh production	GHG	$/ MTCO2e
2019 White Ave	Animal Shelter	19%	$15,750.00	$45.00	not expected	5829	1.6	$9,843.75
603 S. Main St.	Main Fire Station	20%	$45,150.00	$84.00	not expected	14683	4.1	$11,012.20
1300 White Ave/1201 S Mountainview	Mt. View Fire Station	19%	$28,350.00	$66.00	not expected	9141	2.5	$11,340.00
229 Pintail Ln	Fire Station 3	20%	$38,850.00	$80.00	not expected	13869	3.9	$9,961.54
206 E. 3rd St	City Hall	20%	$92,400.00	$162.00	not expected	28769	9.33	$9,903.54
122 E. 4th St	Police Station	NA- will be selling this building after new police station is complete						
155 Southview Ave	New Police Station	estimate already completed						
221 E. 2nd St	Mann Building	19%	$12,600.00	$32.00	not expected	4063	1.1	$11,454.55
830 N. Mountain View	Pool- HLAC (Hamilton Lowe Aquatic Center)	estimate already completed						
201 N. Main St.	Water building	20%	$3,150.00	$9.00	not expected	1140	0.32	$9,843.75
670 N. Van Buren	MPD storage shed							
1724 E. F St.	Rec Center- HIRC (Hamilton Indoor Rec Center)	estimate already completed						
1515 E. D St.	Eggan Youth Center	20%	$28,350.00	$67.00	non expected	9141	2.5	$11,340.00
650 N. Van Buren St.	City Shop	20%	$70,350.00	$140.00	not expected	24943	6.9	$10,195.65
900 E. 3rd St Rest	East City Park Restroom	18%	$8,400.00	$23.00	not expected			
660 N. Van Buren	Shop H2O	18%	$4,200.00	$12.00	not expected (by year 21)	1555	0.43	$9,767.44
851 N Van Buren St. Shed	Shed							
1026 E. F St.	Restroom Rotary Park	too shaded- unable to estimate- solar not recommended						
310 Home St.	Ghormley Park Restroom	too shaded- unable to estimate- solar not recommended						
111 4th St. Restroom	Friendship Square Restroom	too shaded- unable to estimate- solar not recommended						
205 E 5th St.	Haddock building (NEW)*	20%	$14,700.00	$37.00	not expected	4740	1.3	$11,307.69
Lena Whitmore Park	Park Restroom/shelter	19%	$4,200.00	$12.00	not expected	1555	0.43	$9,767.44
Hordemann's Pond	Park Restroom/shelter	16%	$3,150.00	$9.00	not expected	1117	0.31	$10,161.29
Mountainview Rd	Mountainview Park Restroom/shelter?	20%	$14,700.00	$42.00	not expected	5442	1.5	$9,800.00
1501 Lanny Ln	Picabu Park	aerial photo for estimate not available						
1040 n polk	Lola Clyde Park	aerial photo for estimate not available						
							36.22	$0.00

Components

Component	Name	Count
Inverters	M250 (240V) (Enphase)	278 (66.7 kW)
AC Panels	4 input AC Panel	1
AC Panels	5 input AC Panel	2
AC Home Runs	1/0 AWG (Aluminum)	3 (2,066.5 ft)
AC Branches	10 AWG (Copper)	14 (1,587.6 ft)
Modules	REC, Twinpeak 2 290WP (290W)	278 (80.6 kW)

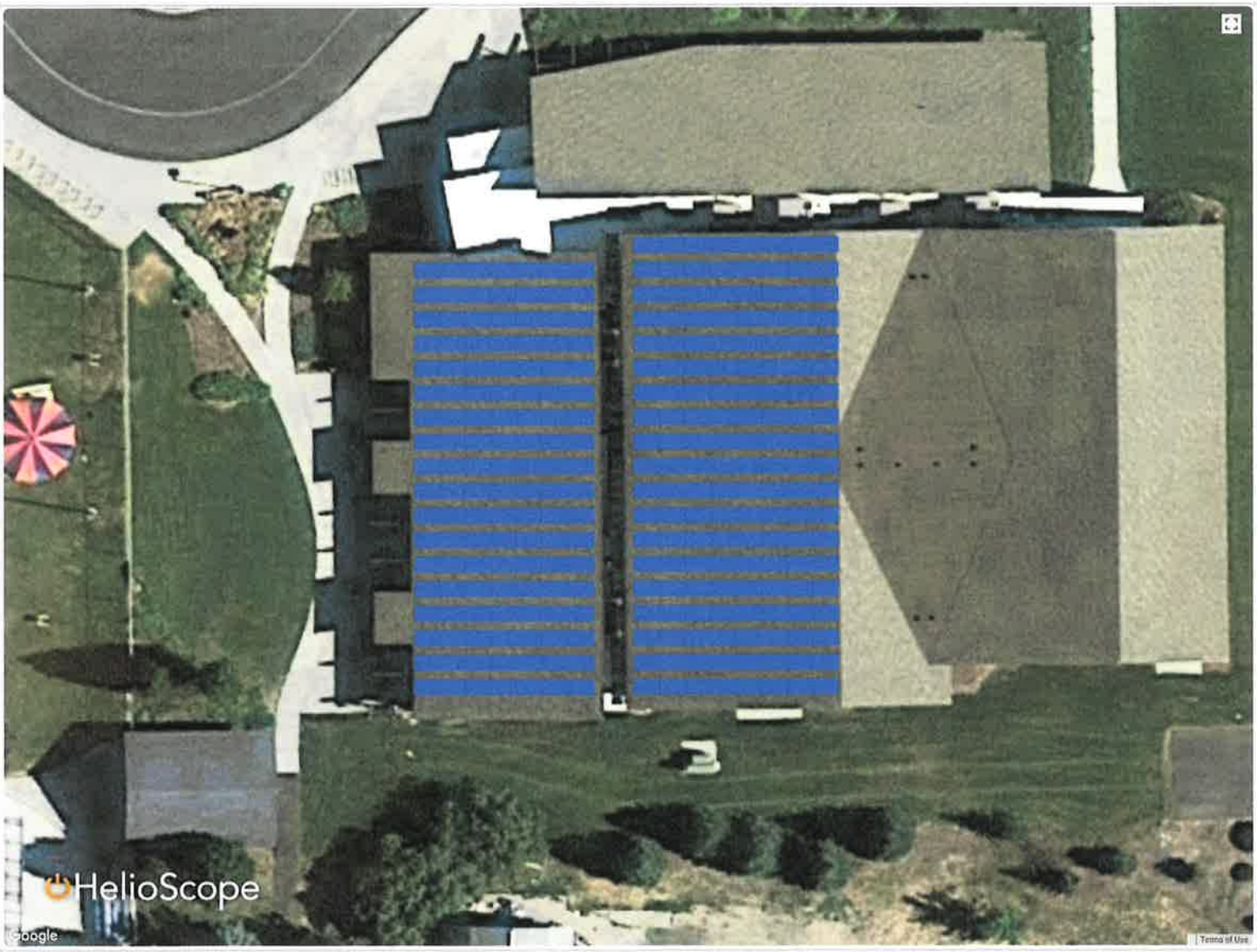
Wiring Zones

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	12	1-1	Along Racking

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Flush Mount	Horizontal (Landscape)	0°	180°	2.0 ft	1x1	152	152	44.1 kW
Field Segment 2	Flush Mount	Horizontal (Landscape)	0°	180°	2.0 ft	1x1	126	126	36.5 kW

Detailed Layout



Design Criteria

System Size in kW	80.60
System Size in Watts	80,600

Utility & Rebate Criteria

Utilities Saved/kWh	$ 0.10
Utility Rate Annual Increase	7.0%
Efficiency Factor	99.17%

System Cost Components

Total System Cost	$ 201,500
Federal Tax Credit	
State Tax Credit	$ -
Depreciation Benefit	

25 Year System Life Summary

Total Accumulated kWh	2,704,027
Total Utility Savings	$ 598,891
Up Front Cost	$ 201,500
Total Gov. Credits/Benefits/Rebates	
Total Net Cost/At Risk Capital:	**$ 201,500**
25 Yr Total Net Savings	**$ 397,391**
Net Savings w/ Traditional Power	0

Year	1	2	3	4	5	6	7	8
Annual kW	123,795	122,768	121,749	120,738	119,736	118,742	117,757	116,779
Utility Rate	$ 0.10	$ 0.10	$ 0.11	$ 0.12	$ 0.13	$ 0.14	$ 0.15	$ 0.16
Accumulated kW	123,795	246,563	368,311	489,050	608,786	727,528	845,285	962,064
Yearly Utility Savings	$ 10,379	$ 11,013	$ 11,784	$ 12,609	$ 13,492	$ 14,436	$ 15,447	$ 16,528
MACRS Dep. Benefits						$ -	$ -	$ -
Federal Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
State Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Cash flow:	$ 10,379	$ 11,013	$ 11,784	$ 12,609	$ 13,492	$ 14,436	$ 15,447	$ 16,528
Total Acumulated:	$ 10,379	$ 21,392	$ 33,177	$ 45,786	$ 59,278	$ 73,714	$ 89,161	$ 105,689

Year	9	10	11	12	13	14	15	16
Annual kW	115,810	114,849	113,896	112,950	112,013	111,083	110,161	109,247
Utility Rate	$ 0.17	$ 0.18	$ 0.19	$ 0.21	$ 0.22	$ 0.24	$ 0.25	$ 0.27
Accumulated kW	1,077,874	1,192,723	1,306,618	1,419,568	1,531,581	1,642,664	1,752,825	1,862,072
Utility Savings	$ 17,685	$ 18,923	$ 20,248	$ 21,665	$ 23,182	$ 24,804	$ 26,541	$ 28,398
MACRS Dep. Benefits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Federal Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
State Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Cash flow:	$ 17,685	$ 18,923	$ 20,248	$ 21,665	$ 23,182	$ 24,804	$ 26,541	$ 28,398
Total Acumulated:	$ 123,374	$ 142,297	$ 162,545	$ 184,210	$ 207,391	$ 232,196	$ 258,736	$ 287,134

Year	17	18	19	20	21	22	23	24
Annual kW	108,340	107,441	106,549	105,665	104,788	103,918	103,055	102,200
Utility Rate	$ 0.29	$ 0.31	$ 0.33	$ 0.35	$ 0.38	$ 0.41	$ 0.43	$ 0.48
Accumulated kW	1,970,412	2,077,853	2,184,402	2,290,066	2,394,854	2,498,772	2,601,827	2,704,027
Utility Savings	$ 30,366	$ 32,513	$ 34,789	$ 37,224	$ 39,830	$ 42,618	$ 45,602	$ 48,794
MACRS Dep. Benefits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Federal Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
State Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Cash flow:	$ 30,366	$ 32,513	$ 34,789	$ 37,224	$ 39,830	$ 42,618	$ 45,602	$ 48,794
Total Acumulated:	$ 317,521	$ 350,034	$ 384,823	$ 422,048	$ 461,878	$ 504,496	$ 550,098	$ 598,891

The values shown above for the Annual kW generation have been adjusted each year
for a decline in efficiency/production to match Module Power Output Guarantees.
Numbers represented are conservative estimates and may vary due to weather and sunlight conditions

Components

Component	Name	Count
Inverters	SE33.3KUS (SolarEdge Technologies)	5 (167.0 kW)
AC Panels	5 input AC Panel	1
AC Home Runs	10 AWG (Copper)	5 (3,252.5 ft)
AC Home Runs	1 AWG (Copper)	1 (523.1 ft)
Combiners	1 input Combiner	5
Combiners	3 input Combiner	5
Strings	10 AWG (Copper)	15 (2,154.8 ft)
Optimizers	P700 (SolarEdge)	315 (220.5 kW)
Modules	REC, Twinpeak 2 290WP (290W)	616 (178.6 kW)

Wiring Zones

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	12	13-43	Along Racking

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Flush Mount	Vertical (Portrait)	10°	178.933°	0.0 ft	1x1	328	328	95.1 kW
Field Segment 2	Flush Mount	Vertical (Portrait)	10°	178.933°	0.0 ft	1x1	288	288	83.5 kW

Detailed Layout

Design Criteria

System Size in kW	178.00
System Size in Watts	178,000

Utility & Rebate Criteria

Utilities Saved/kWh	$ 0.10
Utility Rate Annual Increase	7.0%
Efficiency Factor	99.17%

System Cost Components

Total System Cost	$ 445,000
Federal Tax Credit	
State Tax Credit	$ -
Depreciation Benefit	

25 Year System Life Summary

Total Accumulated kWh	5,971,673
Total Utility Savings	$ 1,322,614
Up Front Cost	$ 445,000
Total Gov. Credits/Benefits/Rebates	$ 228,063
Total Net Cost/At Risk Capital:	**$ 216,938**
25 Yr Total Net Savings	**$ 1,105,676**
Net Savings w/ Traditional Power	0

Year	1	2	3	4	5	6	7	8
Annual kW	279,394	271,125	268,874	266,643	264,429	262,235	260,058	257,900
Utility Rate	$ 0.10	$ 0.10	$ 0.11	$ 0.12	$ 0.13	$ 0.14	$ 0.15	$ 0.16
Accumulated kW	279,394	544,518	813,393	1,080,035	1,344,465	1,606,699	1,866,756	2,124,657
Yearly Utility Savings	$ 22,921	$ 24,322	$ 26,025	$ 27,847	$ 29,796	$ 31,882	$ 34,113	$ 36,501
MACRS Dep. Benefits							$ -	$ -
Federal Credits		$ -	$ -	$ -	$ -	$ -	$ -	$ -
State Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Cash flow:	$ 22,921	$ 24,322	$ 26,025	$ 27,847	$ 29,796	$ 31,882	$ 34,113	$ 36,501
Total Acumulated:	$ 22,921	$ 47,244	$ 73,269	$ 101,115	$ 130,911	$ 162,793	$ 196,906	$ 233,408

Year	9	10	11	12	13	14	15	16
Annual kW	255,759	253,636	251,531	249,443	247,373	245,320	243,284	241,264
Utility Rate	$ 0.17	$ 0.18	$ 0.19	$ 0.21	$ 0.22	$ 0.24	$ 0.25	$ 0.27
Accumulated kW	2,380,416	2,634,053	2,885,584	3,135,027	3,382,400	3,627,720	3,871,004	4,112,268
Utility Savings	$ 39,056	$ 41,790	$ 44,716	$ 47,846	$ 51,195	$ 54,779	$ 58,613	$ 62,716
MACRS Dep. Benefits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Federal Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
State Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Cash flow:	$ 39,056	$ 41,790	$ 44,716	$ 47,846	$ 51,195	$ 54,779	$ 58,613	$ 62,716
Total Acumulated:	$ 272,464	$ 314,254	$ 358,970	$ 406,816	$ 458,011	$ 512,789	$ 571,402	$ 634,118

Year	17	18	19	20	21	22	23	24
Annual kW	239,262	237,276	235,307	233,354	231,417	229,496	227,591	225,702
Utility Rate	$ 0.29	$ 0.31	$ 0.33	$ 0.35	$ 0.38	$ 0.41	$ 0.43	$ 0.46
Accumulated kW	4,351,530	4,588,806	4,824,113	5,057,466	5,288,883	5,518,379	5,745,970	5,971,673
Utility Savings	$ 67,106	$ 71,804	$ 76,830	$ 82,208	$ 87,962	$ 94,120	$ 100,708	$ 107,758
MACRS Dep. Benefits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Federal Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
State Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Cash flow:	$ 67,106	$ 71,804	$ 76,830	$ 82,208	$ 87,962	$ 94,120	$ 100,708	$ 107,758
Total Acumulated:	$ 701,224	$ 773,028	$ 849,858	$ 932,066	$ 1,020,028	$ 1,114,148	$ 1,214,856	$ 1,322,614

The values shown above for the Annual kW generation have been adjusted each year
for a decline in efficiency/production to match Module Power Output Guarentees.
Numbers represented are conservative estimates and may vary due to weather and sunlight conditions

Components

Component	Name	Count
Inverters	M250 (240V) (Enphase)	97 (23.3 kW)
AC Panels	5 input AC Panel	1
AC Home Runs	1/0 AWG (Aluminum)	1 (386.1 ft)
AC Branches	10 AWG (Copper)	5 (1,013.3 ft)
Modules	REC, Twinpeak 2 290WP (290W)	97 (28.1 kW)

Wiring Zones

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	12	1-1	Along Racking

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Flush Mount	Vertical (Portrait)	0°	180°	0.0 ft	1x1	36	36	10.4 kW
Field Segment 2	Flush Mount	Vertical (Portrait)	0°	180°	0.0 ft	1x1	61	61	17.7 kW

Detailed Layout

Design Criteria

System Size In kW	29.10
System Size In Watts	29,100

Utility & Rebate Criteria

Utilities Saved/kWh	$ 0.10
Utility Rate Annual Increase	7.0%
Effeiency Factor	99.17%

System Cost Components

Total System Cost	$ 84,300
Federal Tax Credit	
State Tax Credit	$ -
Depreciation Benefit	

25 Year System Life Summary

Total Accumulated kWh	942,719
Total Utility Savings	$ 208,795
Up Front Cost	$ 84,300
Total Gov. Credits/Benefits/Rebates	
Total Net Cost/At Risk Capital:	**$ 84,300**
25 Yr Total Net Savings	**$ 124,495**
Net Savings w/ Traditional Power	0

Year	1	2	3	4	5	6	7	8
Annual kW	43,159	42,801	42,446	42,094	41,744	41,398	41,054	40,713
Utility Rate	$ 0.10	$ 0.10	$ 0.11	$ 0.12	$ 0.13	$ 0.14	$ 0.15	$ 0.16
Accumulated kW	43,159	85,960	128,406	170,500	212,244	253,642	294,696	335,409
Yearly Utility Savings	$ 3,618	$ 3,840	$ 4,108	$ 4,396	$ 4,704	$ 5,033	$ 5,385	$ 5,762
							$ -	$ -
Federal Credits		$ -	$ -	$ -	$ -	$ -	$ -	$ -
State Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Cash flow:	$ 3,618	$ 3,840	$ 4,108	$ 4,396	$ 4,704	$ 5,033	$ 5,385	$ 5,762
Total Acumulated:	$ 3,618	$ 7,458	$ 11,567	$ 15,963	$ 20,666	$ 25,699	$ 31,085	$ 36,847

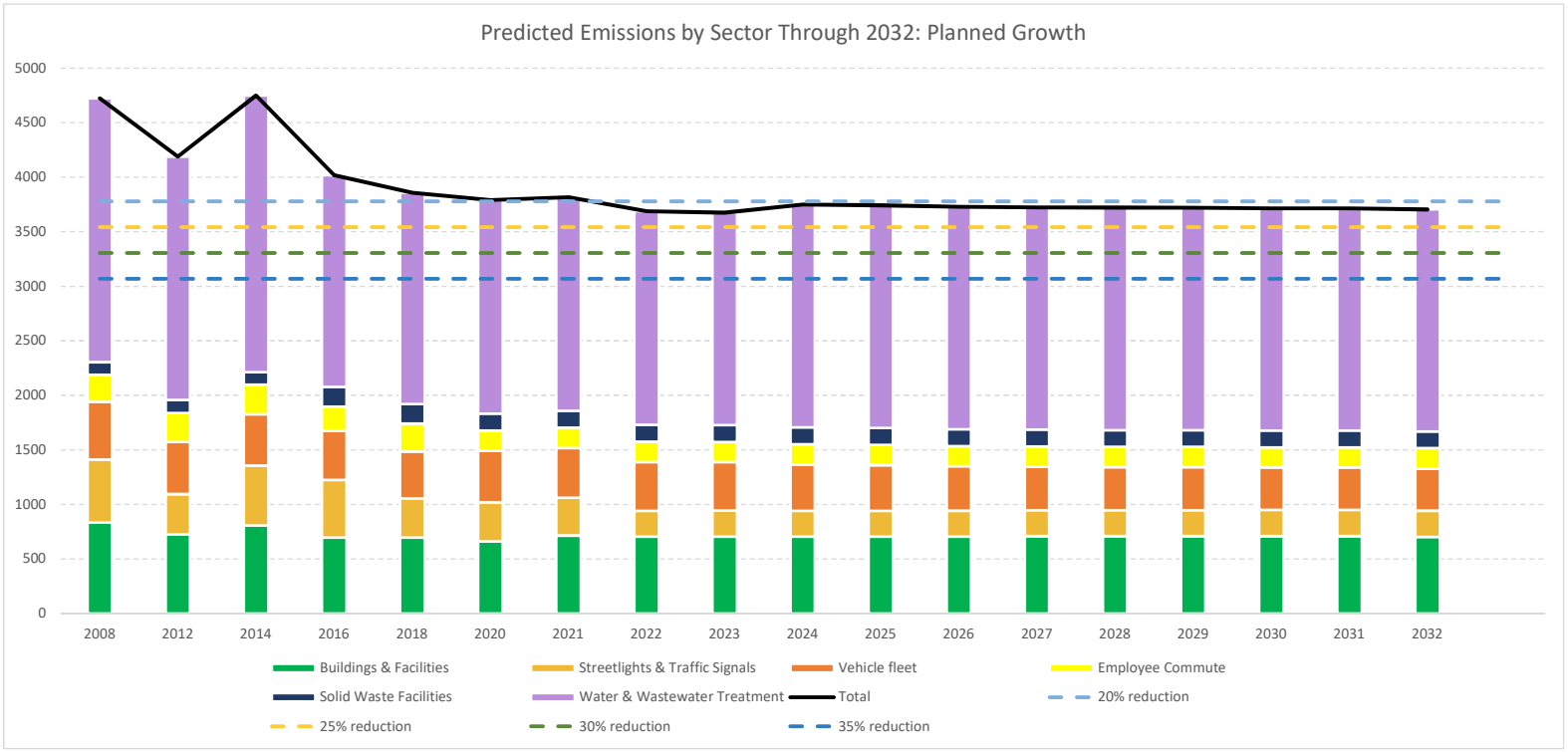
Year	9	10	11	12	13	14	15	16
Annual kW	40,375	40,040	39,708	39,378	39,052	38,727	38,406	38,087
Utility Rate	$ 0.17	$ 0.18	$ 0.19	$ 0.21	$ 0.22	$ 0.24	$ 0.25	$ 0.27
Accumulated kW	375,785	415,825	455,533	494,912	533,963	572,691	611,097	649,184
Utility Savings	$ 6,166	$ 6,597	$ 7,059	$ 7,553	$ 8,082	$ 8,646	$ 9,253	$ 9,901
MACRS Dep. Benefits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Federal Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
State Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Cash flow:	$ 6,166	$ 6,597	$ 7,059	$ 7,553	$ 8,082	$ 8,646	$ 9,253	$ 9,901
Total Acumulated:	$ 43,013	$ 49,610	$ 56,669	$ 64,222	$ 72,304	$ 80,952	$ 90,205	$ 100,105

Year	17	18	19	20	21	22	23	24
Annual kW	37,771	37,458	37,147	36,838	36,533	36,229	35,929	35,631
Utility Rate	$ 0.29	$ 0.31	$ 0.33	$ 0.35	$ 0.38	$ 0.41	$ 0.43	$ 0.46
Accumulated kW	686,955	724,413	761,559	798,398	834,930	871,160	907,088	942,719
Utility Savings	$ 10,594	$ 11,335	$ 12,129	$ 12,978	$ 13,886	$ 14,858	$ 15,898	$ 17,011
MACRS Dep. Benefits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Federal Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
State Credits	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Cash flow:	$ 10,594	$ 11,335	$ 12,129	$ 12,978	$ 13,886	$ 14,858	$ 15,898	$ 17,011
Total Acumulated:	$ 110,699	$ 122,034	$ 134,163	$ 147,141	$ 161,027	$ 175,885	$ 191,783	$ 208,795

The values shown above for the Annual kW generation have been adjusted each year
for a decline in efficiency/production to match Module Power Output Guarantees.
Numbers represented are conservative estimates and may vary due to weather and sunlight conditions

Planned Growth Forecast

	Historical Inventories																		
Sector	**2008**	**2012**	**2014**	**2016**	**2018**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	
Buildings & Facilities	833	725	807	695	696	660	715	703	706	703	703	703	709	709	709	709	709	701	
Streetlights & Traffic Signals	579	369	550	530	359	358	345.9	236.9	237.9	237.9	237.9	238.9	238.9	239.9	239.9	241.15	241.15	241.15	
Vehicle fleet	530	479	470	449	429	473	457	449	443	425	419	407	397	393	393	387	387	387	
Employee Commute	247	267	271	224	256	187	187	187	187	187	187	187	187	187	187	187	187	187	
Solid Waste Facilities	116	116	116	181	181	153	153	153	153	153	153	153	153	153	153	153	153	153	
Water & Wastewater Treatment	2417	2233	2534	1939	1935	1958	1958.5	1957.5	1947.8	2043.8	2042.8	2040.8	2038.8	2038.8	2037.8	2036.8	2035.8	2034.8	
Total	**4722**	**4189**	**4748**	**4018**	**3856**	**3789**	**3816.4**	**3686.4**	**3674.7**	**3749.7**	**3742.7**	**3729.7**	**3723.7**	**3720.7**	**3719.7**	**3713.95**	**3712.95**	**3703.95**	
20% reduction	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6
25% reduction	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5
30% reduction	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4
35% reduction	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3



Potential Projects Forecast

	Historical Inventories																		
Sector	**2008**	**2012**	**2014**	**2016**	**2018**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	
Buildings & Facilities	833	725	807	695	696	660	715	691.15	689.55	686.55	606.55	602.65	606.15	595.15	592.65	531.15	521.82	513.82	
Streetlights & Traffic Signals	579	369	550	530	359	358	345.9	236.9	237.16	237.16	233.66	234.66	234.66	235.66	235.66	234.91	234.91	234.91	
Vehicle fleet	530	479	470	449	429	473	457	444	432	410	404	391.5	381.5	377.5	377.5	371.5	371.5	371.5	
Employee Commute	247	267	271	224	256	187	187	187	187	187	183	183	183	183	183	183	183	183	
Solid Waste Facilities	116	116	116	181	181	153	153	153	153	153	153	153	153	153	153	153	153	153	
Water & Wastewater Treatment	2417	2233	2534	1939	1935	1958	1958.5	1957.5	1947.8	2034.8	2033.8	2031.8	2029.8	2029.8	2025.6	2024.6	2023.6	2022.6	
Total	**4722**	**4189**	**4748**	**4018**	**3856**	**3789**	**3816.4**	**3669.55**	**3646.51**	**3708.51**	**3614.01**	**3596.61**	**3588.11**	**3574.11**	**3567.41**	**3498.16**	**3487.83**	**3478.83**	
20% reduction	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6	3777.6
25% reduction	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5	3541.5
30% reduction	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4	3305.4
35% reduction	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3	3069.3