



**City of Ann Arbor
RFP No. 21-05 Solar Installations for City Facilities**

Summary for City of Ann Arbor Energy Commission

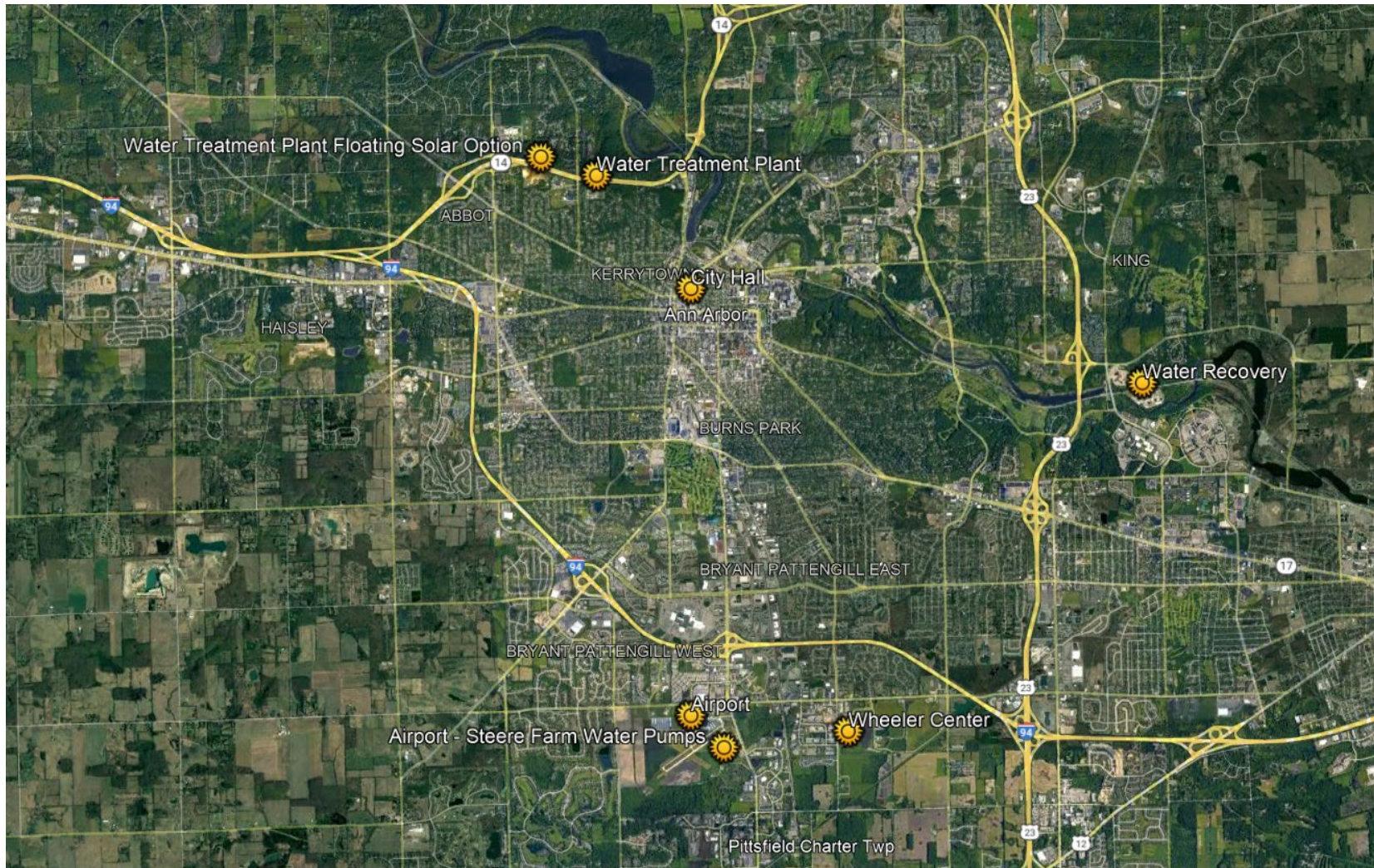
March 2022



Project Recap

- Program team of Enerlogics, Melink, and Madison (the “Team”) selected by the City of Ann Arbor as a result of the RFP issued in March 2021.
- City split the award to two firms (Enerlogics for larger sites, Homeland for smaller sites) with a preliminary engineering phase for H2 2021.
- Our Team has been finalizing designs, including multiple design reviews with City facilities and operations personnel, over the second half of 2021
- Final engineering and design work was used to develop full cost model, which was also used to provide financed options for the project sites.
- This presentation (and accompanying final report) reflect the fully designed systems for City final sign off an approval
- Targeting City approval in early 2022, with interconnection and permit applications to follow; construction start in late Spring 2022 with target completion dates later in 2022.

Enerlogics Sites



- Airport
- Airport Steere Farm WTP Pumps
- City Hall
- Water Recovery Plant
- Water Treatment Plant
- Wheeler Center

Summary of Options

	Base System	System with Floating Solar Option
Solar System Size (kWdc)	3,204	4,314
Initial Year Energy (kWh)	3,817,218	5,149,550
Summary	Ground mount, roof mount, and canopy installation on 6 primary areas	Base system plus floating solar option for Water Treatment Plant
Percentage of Site Consumption	12.6%	17.0%
Total Installed Cost	\$6,682,369	\$10,213,348
30-Year Gross Electricity Bill Savings (1)	\$10,691,199	\$14,214,863
PPA Rate with No Prepayment (2)	\$0.1228/kWh	\$0.1425/kWh
PPA Rate with 50% Prepayment (3)	\$0.0631/kWh	\$0.0688/kWh
Energy Storage System Options	1050 kW 2302 kWh ESS Option Additional \$1,299,000 in installed cost	Same as base system
GHG Equivalencies (3)	Equivalent CO ₂ reductions (2,705 metric tons) as 6,263 barrels of oil or 491 homes electricity use; Equivalent greenhouse gas emissions avoided by 920 tons of waste recycled	Equivalent CO ₂ reductions (3,649 metric tons) as 8,449 barrels of oil or 663 homes electricity use; Equivalent greenhouse gas emissions avoided by 1,241 tons of waste recycled

(1) Gross electricity bill savings with DTE costs increasing at 3.0% per year; (2) 20-year initial term with 1.5% annual escalation; (3) GHG from EPA calculator at <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>



Ann Arbor Municipal Airport



Site	Ann Arbor Municipal Airport - Northeast Hangers	Ann Arbor Municipal Airport - Admin Building	Ann Arbor Municipal Airport - Northwest Hangers
Address	715 Airport Drive	801 Airport Drive	1080 Airport Drive
DTE Account Number	910008460859	910008460743	910008461394
Tariff Rate	Business Electric Service	Demand Pricing	Business Electric Service
Adjusted Annual kWh	42,066	107,040	91,280
Recent Monthly Cost per kWh	\$0.14368	\$0.19252	\$0.14884
System Type	Ground Mount	Ground Mount	Ground Mount
Design kWdc	32	78	71
Design kWac	25	60	60
Initial Year Energy (kWh)	39,340	100,864	87,997
Yield (kWh/kWdc)	1,228	1,288	1,236
Solar % of Usage	93.5%	94.2%	96.4%
Acquisition Cost per W	\$2.182	\$2.182	\$2.182
Acquisition Cost	\$69,911	\$170,894	\$155,358
PPA with No Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.1418	\$0.1285	\$0.1352
PPA with 50% Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.0771	\$0.0666	\$0.0707
50% Prepayment	\$34,956	\$85,447	\$77,679

Ann Arbor Municipal Airport – Steere Farm WTP Pumps

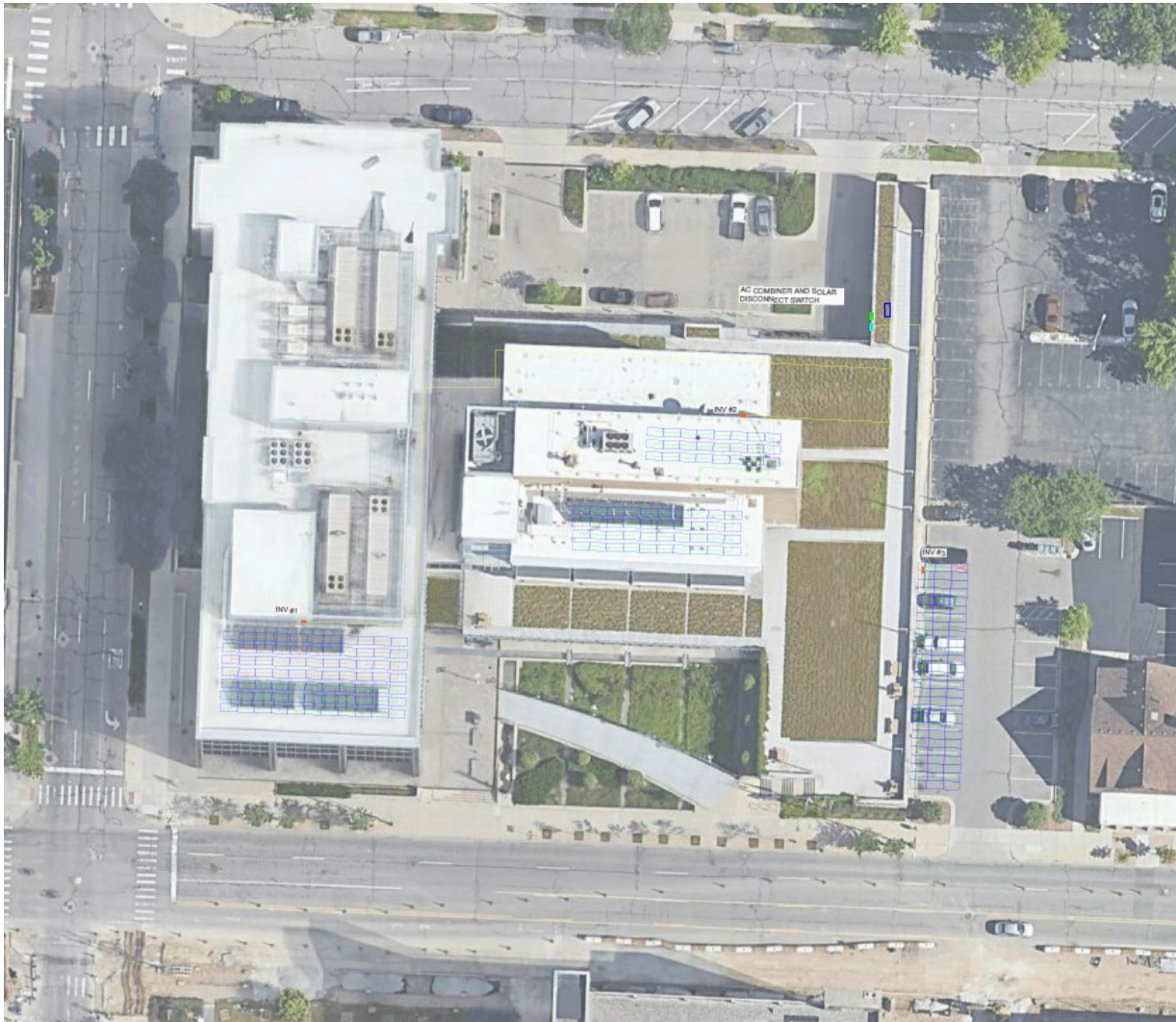


Site	Ann Arbor Municipal Airport - Steere Farm (WTP Pumps)
Address	~4328 S State Street
DTE Account Number	910006810451
Tariff Rate	Business Electric Service
Adjusted Annual kWh	848,612
Recent Monthly Cost per kWh	\$0.04386
System Type	Ground Mount
Design kWdc	605
Design kWac	480
Initial Year Energy (kWh)	776,262
Yield (kWh/kWdc)	1,283
Solar % of Usage	91.5%
Acquisition Cost per W	\$2.182
Acquisition Cost	\$1,320,546
PPA with No Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.1177
PPA with 50% Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.0558
50% Prepayment	\$660,273

Comments and considerations:

- Runway extents for keep out zones plus existing water pipelines limited areas where solar could be installed

Ann Arbor Municipal Center Rooftop + Carport Solar



Site	Ann Arbor Municipal Center - City Hall
Address	100 N 5th Ave
DTE Account Number	910000057307
Tariff Rate	Primary Supply Rate EFI-D11
Adjusted Annual kWh	3,078,146
Recent Monthly Cost per kWh	\$0.07882
System Type	Roof Mount + Canopy
Design kWdc	98
Design kWac	75
Initial Year Energy (kWh)	112,934
Yield (kWh/kWdc)	1,148
Solar % of Usage	3.7%
Acquisition Cost per W	\$4.321
Acquisition Cost	\$424,949
PPA with No Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.2625
PPA with 50% Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.1253
50% Prepayment	\$212,474

Comments and considerations:

- Green roof has existing public access and weight making additional solar on those areas not feasible
- Rooftop solar plus carport solar on areas not shaded by building
- Note that structural analysis was performed on all rooftop areas

Water Recovery Plant

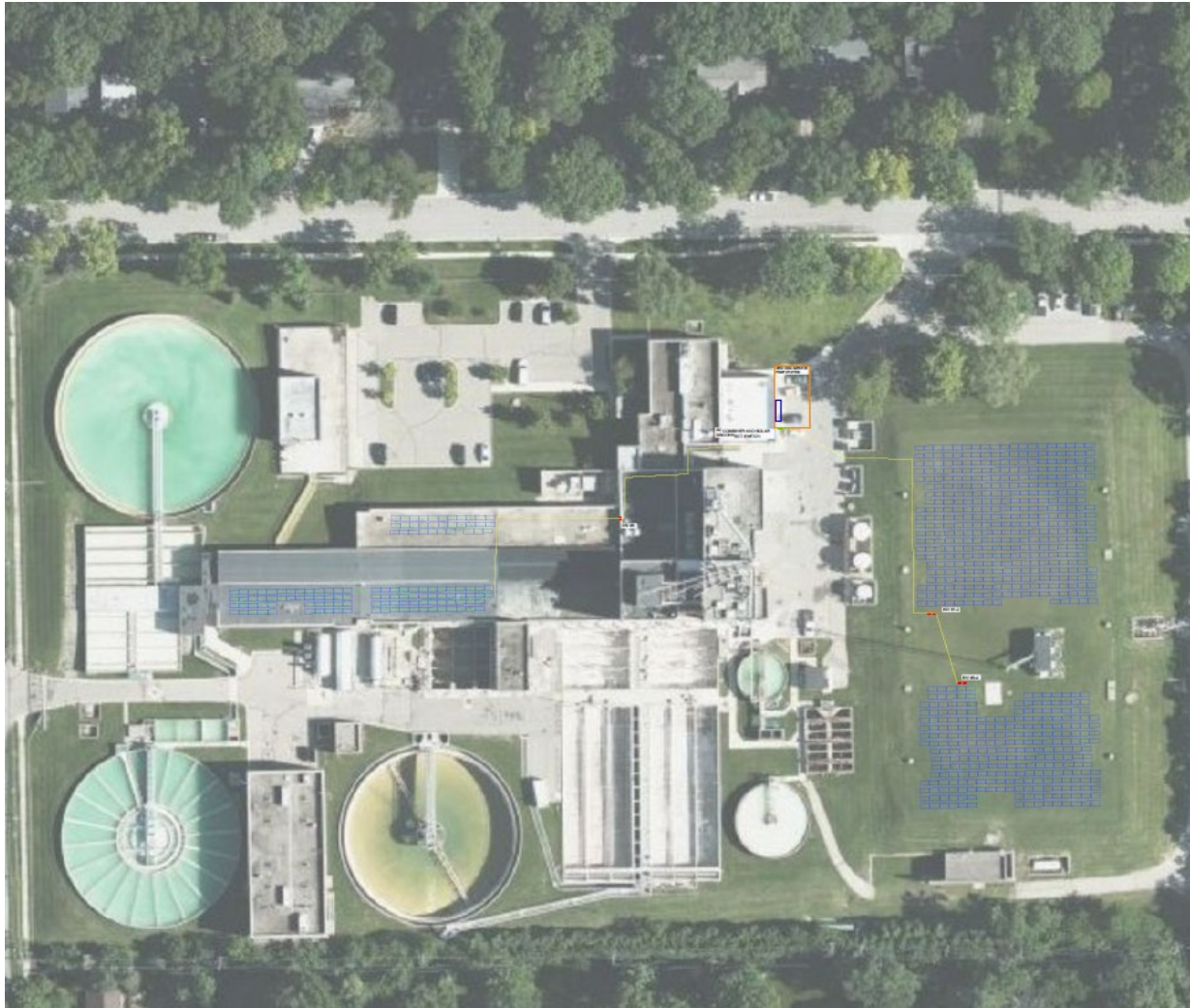


Site	Water Recovery (Wastewater Treatment Plant)
Address	49 S Dixboro
DTE Account Number	91000053793
Tariff Rate	Primary Supply Rate EFI-D11
Adjusted Annual kWh	13,440,737
Recent Monthly Cost per kWh	\$0.07788
System Type	Ballasted Roof Mount
Design kWdc	681
Design kWac	516
Initial Year Energy (kWh)	788,363
Yield (kWh/kWdc)	1,158
Solar % of Usage	5.9%
Acquisition Cost per W	\$2.263
Acquisition Cost	\$1,540,764
PPA with No Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.1359
PPA with 50% Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.0647
50% Prepayment	\$770,382

Comments and considerations:

- Note that structural analysis was performed on all rooftop areas
- Structural limitations of roofs (W building) require mechanical attachments instead of ballasted approach
- Facility staff had concerns on mechanical attachments on some key roof areas, further reducing amount of solar (e.g., filter building roof eliminated)

Water Treatment Plant: Rooftop and Ground Mount Solar

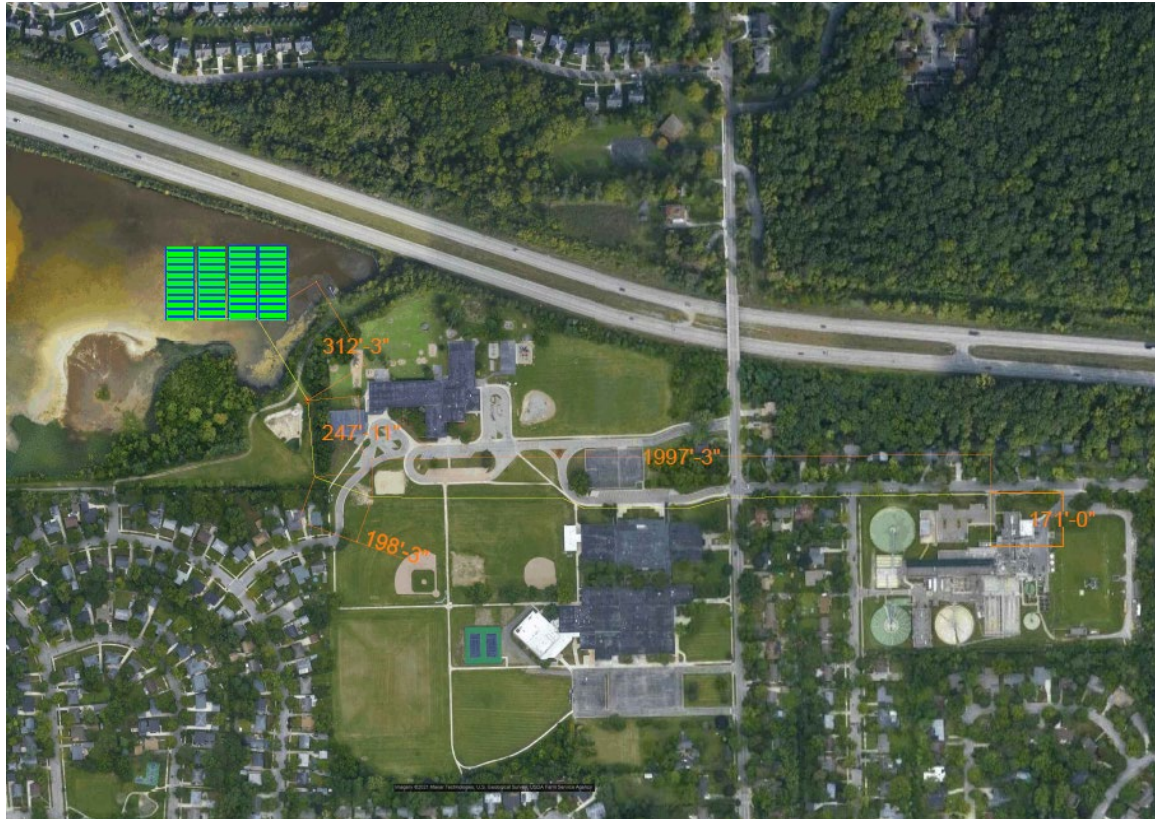


Site	Water Treatment Plant
Address	919 Sunset
DTE Account Number	910000053421
Tariff Rate	Primary Supply Rate EFI-D11
Adjusted Annual kWh	6,694,251
Recent Monthly Cost per kWh	\$0.07257
System Type	Roof Mount + Ballasted Ground Mount
Design kWdc	342
Design kWac	300
Initial Year Energy (kWh)	408,932
Yield (kWh/kWdc)	1,197
Solar % of Usage	6.1%
Acquisition Cost per W	\$2.132
Acquisition Cost	\$728,598
PPA with No Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.1254
PPA with 50% Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.0604
50% Prepayment	\$364,299

Comments and considerations:

- Note that structural analysis was performed on all rooftop areas
- Structural limitations of some limited areas require mechanical attachments instead of ballasted approach
- Facility staff had concerns on mechanical attachments on some key roof areas, further reducing amount of solar (e.g., elimination of W/E row on rooftop)

Water Treatment Plant: Floating Solar Option

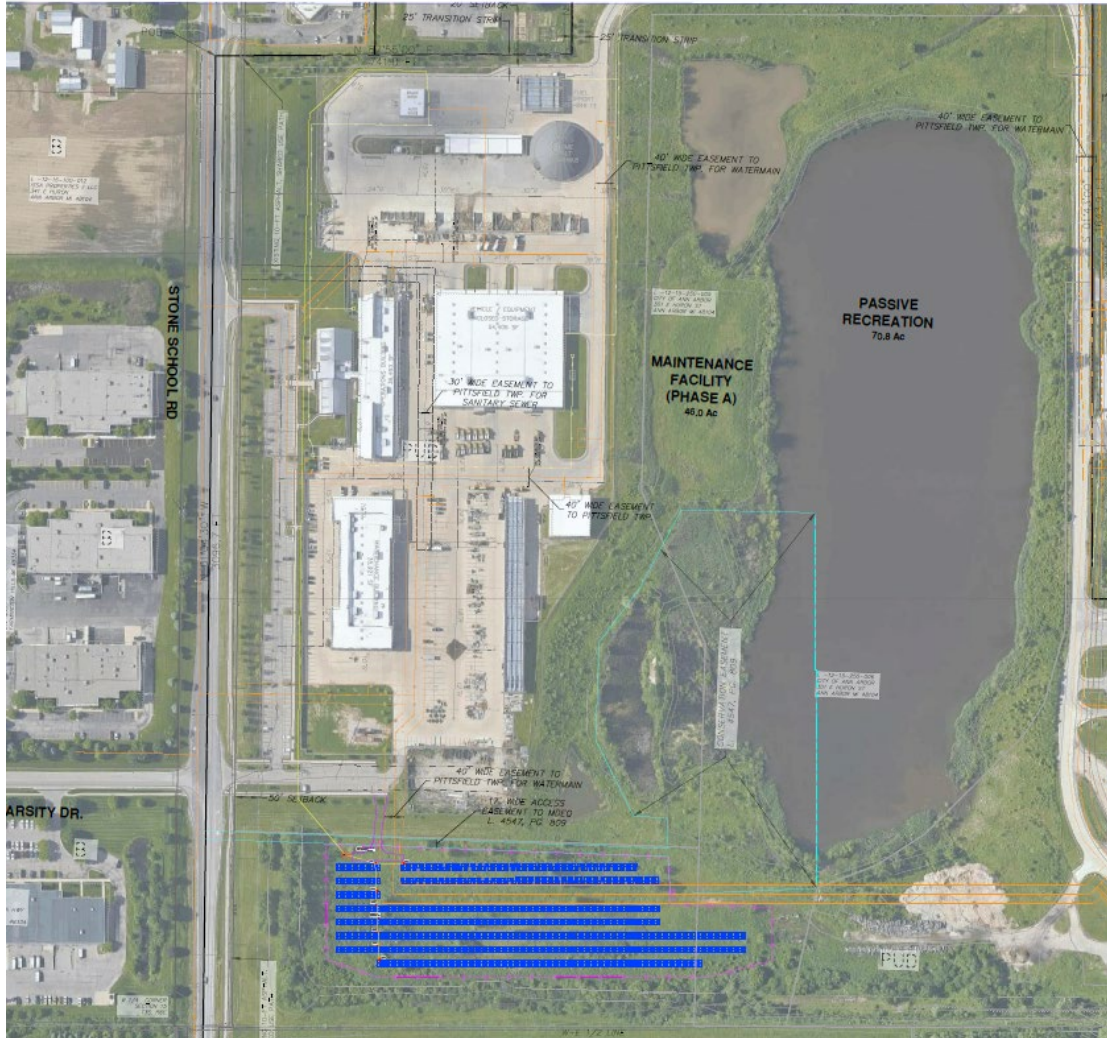


Site	Water Treatment Plant
Address	
DTE Account Number	
Tariff Rate	
Adjusted Annual kWh	
Recent Monthly Cost per kWh	
System Type	Floating Solar
Design kWdc	1,111
Design kWac	875
Initial Year Energy (kWh)	1,332,332
Yield (kWh/kWdc)	1,200
Solar % of Usage	19.9%
Acquisition Cost per W	\$3.179
Acquisition Cost	\$3,530,979
PPA with No Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.1989
PPA with 50% Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.0966
50% Prepayment	\$1,765,489

Comments and considerations:

- Floating solar on pond to W
- Has been through preliminary review with the state; small area deemed feasible

Wheeler Center: Ground Mount Solar



	Wheeler Center
Site	
Address	4251 Stone School
DTE Account Number	910000076323
Tariff Rate	Primary Supply Rate EFI-D11
Adjusted Annual kWh	1,832,013
Recent Monthly Cost per kWh	\$0.08897
System Type	Ground Mount
Design kWdc	1,296
Design kWac	1,000
Initial Year Energy (kWh)	1,502,526
Yield (kWh/kWdc)	1,160
Solar % of Usage	82.0%
Acquisition Cost per W	\$1.753
Acquisition Cost	\$2,271,348
PPA with No Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.1058
PPA with 50% Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.0508
50% Prepayment	\$1,135,674

Comments and considerations:

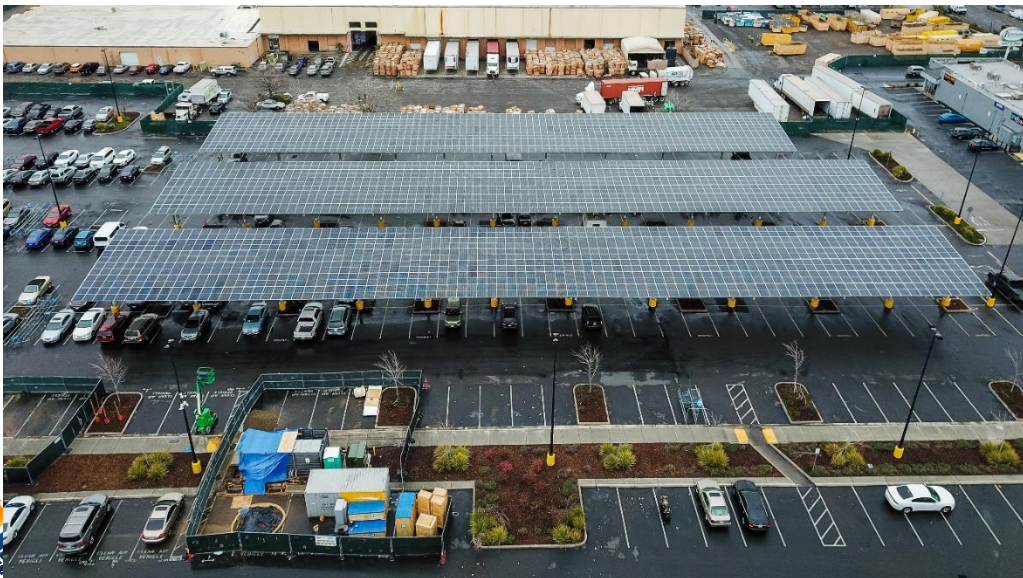
- Maintained 40' easement for Pittsfield Township water right of way

Solar Deployment Examples Photos



Ballasted
Roof Mount

Ground
Mount



Carport
Canopy

Floating
Solar



Energy Storage Systems Proposed


- ESS options included for all sites on the D11 Tariff (\$13.82/kW-month demand charges in the 11am – 7 pm weekdays):
 - Municipal Center: 100 kW / 186 kWh
 - Water Recovery: 250 kW / 558 kWh
 - Water Treatment Plant: 250 kW / 558 kWh
 - Wheeler Center: 100 kW / 186 kWh
- Plus Airport Steere Farm WTP Pump: 100 kW / 256 kWh (not on D11, but included to show economic analysis)
- Example 100 kW / 200 kWh class system indicated to right; multiple suppliers for these systems

GRIDBOX
M100 MICROGRID SYSTEM


M100 MICROGRID SYSTEM

Inverter Battery Combo
2.99 x 2.438 x 2.591 m

- Modular design.
- Support PV, BAT, DG and GRID access and on/off-grid automatic switching.
- Thermal management design.
- External maintenance.
- PI, BMS, EMS Integrated.
- Real time and History Data Accumulation



M100 CONFIGURATION



Product Module	S138-7P9	BESS Controller 4	Power Inverter
M100-128	2	1	1
M100-192	3	1	1

Product Module	S138-7P9	BESS Controller 10	Power Inverter
M100-256	4	1	1
M100-384	6	1	1

POWERED BY **LITHION**

lithionbattery.com | Flexcombo-M100 01

Modeling of Project Economics

- Full analytics being run on all sites and design options
- Analytics will include power purchase agreement (PPA) options:
 - Full turnkey purchase (100% payment by City)
 - Hybrid PPA: 20-year PPA with 1.5% annual escalation; 50% upfront cost to City
 - Ann Arbor pays some of project costs through grants/funding; reduced PPA accordingly)
 - 20-year PPA with 1.5% annual escalation; \$0 upfront cost to City
 - Ann Arbor pays zero costs, higher PPA rates
- Notes:
 - PPA modeling performed under current tax code (26% ITC, etc.)
 - Build Back Better proposed legislation may increase tax credits (30% ITC with potential 10% bonus ITC) for qualified projects

Summary of Economics

Site	Ann Arbor Municipal Airport - Northeast Hangers	Ann Arbor Municipal Airport - Admin Building	Ann Arbor Municipal Airport - Northwest Hangers	Ann Arbor Municipal Airport - Steere Farm (WTP Pumps)	Ann Arbor Municipal Center - City Hall	Water Recovery (Wastewater Treatment Plant)	Water Treatment Plant	Water Treatment Plant	Wheeler Center	Total without Floating Solar	Total with Floating Solar	Ann Arbor Municipal Center - City Hall without Canopy
System Type	Ground Mount	Ground Mount	Ground Mount	Ground Mount	Roof Mount + Canopy	Ballasted Roof Mount	Roof Mount + Ballasted Ground Mount	Floating Solar	Ground Mount	Total Without Floating	Total including Floating	Roof Mount Only
Design kWdc	32	78	71	605	98	681	342	1,111	1,296	3,204	4,314	63
Initial Year Energy (kWh)	39,340	100,864	87,997	776,262	112,934	788,363	408,932	1,332,332	1,502,526	3,817,218	5,149,550	72,205
Solar % of Usage	93.5%	94.2%	96.4%	91.5%	3.7%	5.9%	6.1%	19.9%	82.0%	12.6%	17.0%	2.3%
Acquisition Cost per W	\$2,182	\$2,182	\$2,182	\$2,182	\$4,321	\$2,263	\$2,132	\$3,179	\$1,753	\$2,086	\$2,367	\$3,124
Acquisition Cost	\$69,911	\$170,894	\$155,358	\$1,320,546	\$424,949	\$1,540,764	\$728,598	\$3,530,979	\$2,271,348	\$6,682,369	\$10,213,348	\$195,250
PPA with No Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.1418	\$0.1285	\$0.1352	\$0.1177	\$0.2625	\$0.1359	\$0.1254	\$0.1989	\$0.1058	\$0.1228	\$0.1425	\$0.1973
PPA with 50% Prepayment (20-year initial term, 1.5% annual escalation) (1)	\$0.0771	\$0.0666	\$0.0707	\$0.0558	\$0.1253	\$0.0647	\$0.0604	\$0.0966	\$0.0508	\$0.0631	\$0.0688	\$0.0987
50% Prepayment	\$34,956	\$85,447	\$77,679	\$660,273	\$212,474	\$770,382	\$364,299	\$1,765,489	\$1,135,674	\$3,341,185	\$5,106,674	\$97,625
Notes:	(1) PPA with current 26% ITC; 20-year initial term, 1.5% annual escalation. Assumes any property tax obligations are paid by Ann Arbor											
End of term buyout No Prepayment	\$6,991	\$17,089	\$15,536	\$132,055	\$42,495	\$154,076	\$72,860	\$353,098	\$227,135	\$668,237	\$1,021,335	\$19,525
End of term buyout with Prepayment	\$3,496	\$8,545	\$7,768	\$66,027	\$21,247	\$77,038	\$36,430	\$176,549	\$113,567	\$334,118	\$510,667	\$9,763
Storage Option				100/256	100/186	250/558	250/558	250/558	100/186			100/186
Cost				\$187,000	\$141,000	\$415,000	\$415,000	\$415,000	\$141,000	\$1,299,000	\$1,714,000	\$141,000
PPA 0%				\$0.1344	\$0.3496	\$0.1725	\$0.1968	\$0.2223	\$0.1124			\$0.3398
PPA 50%				\$0.0637	\$0.2085	\$0.0821	\$0.0948	\$0.1080	\$0.0540			\$0.2413
ETB Analysis of Solar Only with Grid at 3.0% Escalation												
Current Electric Bill	\$5,894	\$12,146	\$11,622	\$98,431	\$257,624	\$947,155	\$512,211	\$512,211	\$153,451	\$1,998,534	\$2,510,745	\$257,624
Electric Bill post Solar	\$2,065	\$2,998	\$3,459	\$24,924	\$243,670	\$899,128	\$484,159	\$431,404	\$92,955	\$1,753,358	\$2,184,762	\$247,986
Initial Year Savings	\$3,829	\$9,148	\$8,163	\$73,507	\$13,954	\$48,027	\$28,052	\$80,807	\$60,496	\$245,176	\$325,983	\$9,638
30-Year Bill Savings	\$166,950	\$398,909	\$355,956	\$3,205,356	\$608,479	\$2,094,281	\$1,223,244	\$3,523,664	\$2,638,024	\$10,691,199	\$14,214,863	\$608,479
Cash Purchase												
Payback Period (Years)	15.3	15.5	15.8	15.0	23	23.9	20.3	>30	26.9			16.7
IRR	5.9%	5.7%	5.6%	6.0%	2.2%	1.9%	3.3%	0.0%	0.9%			5.1%
NPV	\$ 8,526	\$ 16,523	\$ 11,878	\$ 185,403	\$ (138,973)	\$ (554,780)	\$ (153,241)	\$ (1,876,592)	\$ (1,028,316)	\$ -1,652,980	\$ -3,529,572	\$ 1,693
PPA with No Prepayment												
NPV	\$ 1,567	\$ 11,097	\$ 3,118	\$ 227,065	\$ (116,010)	\$ (535,378)	\$ (133,667)	\$ (2,109,855)	\$ (984,743)	\$ -1,526,951	\$ -3,636,806	\$ (3,490)
PPA with 50% Prepayment												
NPV	\$ 1,794	\$ 11,868	\$ 3,863	\$ 238,146	\$ (118,777)	\$ (511,089)	\$ (131,266)	\$ (1,940,531)	\$ (965,815)	\$ -1,471,276	\$ -3,411,807	\$ (691)
ETB Analysis of Solar + Storage with Grid at 3.0% Escalation												
	No Storage	No Storage	No Storage	100/256 ESS	100/186 ESS	250/558 ESS	250/558 ESS	250/558 ESS	100/186 ESS			
Current Electric Bill	\$5,894	\$12,146	\$11,622	\$98,431	\$257,624	\$947,155	\$512,211	\$512,211	\$153,451	\$1,998,534	\$2,510,745	\$257,624
Electric Bill post Solar	\$2,065	\$2,998	\$3,459	\$25,064	\$236,537	\$858,915	\$448,988	\$389,433	\$80,194	\$1,658,220	\$2,047,653	\$240,886
Initial Year Savings	\$3,829	\$9,148	\$8,163	\$73,367	\$21,087	\$88,240	\$63,223	\$122,778	\$73,257	\$340,314	\$463,092	\$16,738
30-Year Bill Savings	\$166,950	\$398,909	\$355,956	\$3,199,803	\$904,501	\$3,763,117	\$2,682,832	\$5,265,454	\$3,167,576	\$14,639,644	\$19,905,098	\$714,944
Cash Purchase												
Payback Period (Years)	15.3	15.5	15.8	16.8	21.4	18.6	15.8	24.4	24.6			17.1
IRR	5.9%	5.7%	5.6%	5.0%	2.9%	4.2%	5.7%	1.7%	1.7%			4.9%
NPV	\$8,526	\$16,523	\$11,878	\$ (4,199)	\$ (142,717)	\$ (195,997)	\$ 108,521	\$ (1,483,982)	\$ (923,781)	\$ -1,121,246	\$ -2,605,228	\$ (2,681)
PPA with No Prepayment												
NPV	\$1,567	\$11,097	\$3,118	\$ 36,655	\$ (104,325)	\$ (170,566)	\$ 138,092	\$ (1,746,434)	\$ (877,844)	\$ -962,206	\$ -2,708,640	\$ (11,774)
PPA with 50% Prepayment												
NPV	\$1,794	\$11,868	\$3,863	\$ 42,430	\$ (177,069)	\$ (139,699)	\$ 143,400	\$ (1,556,416)	\$ (858,115)	\$ -971,528	\$ -2,527,944	\$ (77,266)
Notes	Cash Purchase does not include O&M NPV at 5.0% discount factor, reflects net savings after costs / PPA costs.											



Schedule Considerations

- As with other industries, supply chain constraints have significantly impacted project schedules
 - Leadtime on equipment is longer than typical, plus highly variable as we get later into the year
 - Labor capacity also can be impacted as we get later into the calendar year
- Key driver: timing on Ann Arbor contract execution: Example schedule has 2/15 as contract execution date
- Once contracts are executed, final engineering will commence:
 - Environmental studies for ground mount sites
 - Completion of full sets of stamped electrical and mechanical drawings, that will need to be reviewed by the City before being finalized.
 - Submission for permits and interconnection application
- Purchase of long lead time items:
 - Ground mount racking lead time is currently 12 weeks
 - Roof mount racking lead time is currently <4 weeks
 - Module and transformer lead times are fluctuating, including consideration of import bans. Example schedule uses a conservative 25-week lead time
- Construction will be a staggered basis on the sites, with estimate of 4 months

Questions and Open Discussion



Contacts



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Status Update – AA Parks & Rec Solar 3/8/2022

Homeland Solar

Mark Dorogi, M.Eng
Larry Kerber, M.B.A
Chuck Hookham, P.E.



Homeland City Parks & Rec Sites

- Burns Senior Center
- Farmer's Market
- Leslie Science and Nature Center
- Leslie Golf Course – Club House, Pump House, Barn
- Huron Hills Golf Course – Club House, Pump House
- Gallup Canoe Livery
- Mack Pool
- Fuller Park
- Cobblestone Farm
- Buhr Park
- Veterans Park



Portfolio Summary – A Few Options

Site	Min	Mid	Max
Burns Senior	Rooftop	Carport	Carport
Farmer's Market	Rooftop Base	Rooftop Extended	Rooftop Extended
Buhr	Rooftop	Rooftop	Rooftop+Ground
Cobblestone	Barn Rooftop	Barn Rooftop	Ground
Fuller	Carport	Carport	Carport
Gallup Canoe Livery	Pergola	Pergola	Pergola
Leslie Science Center	Carport	Carport	Carport
Leslie Golf Couse - Barn	Rooftop	Rooftop	Rooftop
Leslie Golf Course - Pump House	Ground	Ground	Ground
Leslie Golf Course - Club House	none	Carport	Carport
Mack Pool	Ballasted	Ballasted	Ballasted
Veterans Park	Rooftop	Rooftop	Rooftop+Carport
Huron Hills Pump House	Rooftop	Rooftop	Rooftop
Huron Hills Club House	Rooftop	Carport	Carport

	Min	Mid	Max
Recent Monthly Cost per kWh	1,841,800	1,881,800	1,891,800
Recent Monthly Cost per kWh	\$0.15	\$0.15	\$0.15
Design kW DC	843	932	1,150
Design kW AC	706	783	1,011
Initial Year Energy (kWh)	980,450	1,079,630	1,350,630
Yield	1.16	1.16	1.17
% Offset	53%	57%	71%
Cost (\$)	\$1,757,600	\$2,256,100	\$2,926,100
Cost/W	\$2.09	\$2.42	\$2.55
IRR	3.4%	2.2%	1.8%
NPV	\$340,320	\$64,040	(\$277,360)
Term Bill Savings (\$)	\$2,733,724	\$3,011,500	\$3,441,600

Burns Senior Center- Carport w/EV Charger Preferred, Resilience Hub



	Burns Senior	Burns Senior
Site	1320 Baldwin	1320 Baldwin
Address	1320 Baldwin	1320 Baldwin
System Type	Rooftop	Carport
Rate	D3	D3
kWh	30,000	30,000
Recent Monthly Cost per kWh	\$0.15	\$0.15
Design kW DC	14.06	29.52
Design kW AC	11.4	20
Initial Year Energy (kWh)	11,550	31,230
Yield	0.82	1.06
% Offset	39%	104%
Cost (\$)	\$31,100	\$106,000
Cost/W	\$2.25	\$3.59
IRR	3.5%	-0.7%
NPV	\$6,380	(\$30,500)
Term Bill Savings (\$)	\$48,900	\$89,700

- Resilience Center Storage Options;
 - One 16 kWh battery \$15,250
 - Two 16 kWh batteries \$28,000 (recommended)
- EV charger: Chargepoint Commercial CT4021, dual port
 - Can charge two EV's at level 2 simultaneously or shared
 - Approximately \$15,000 installed

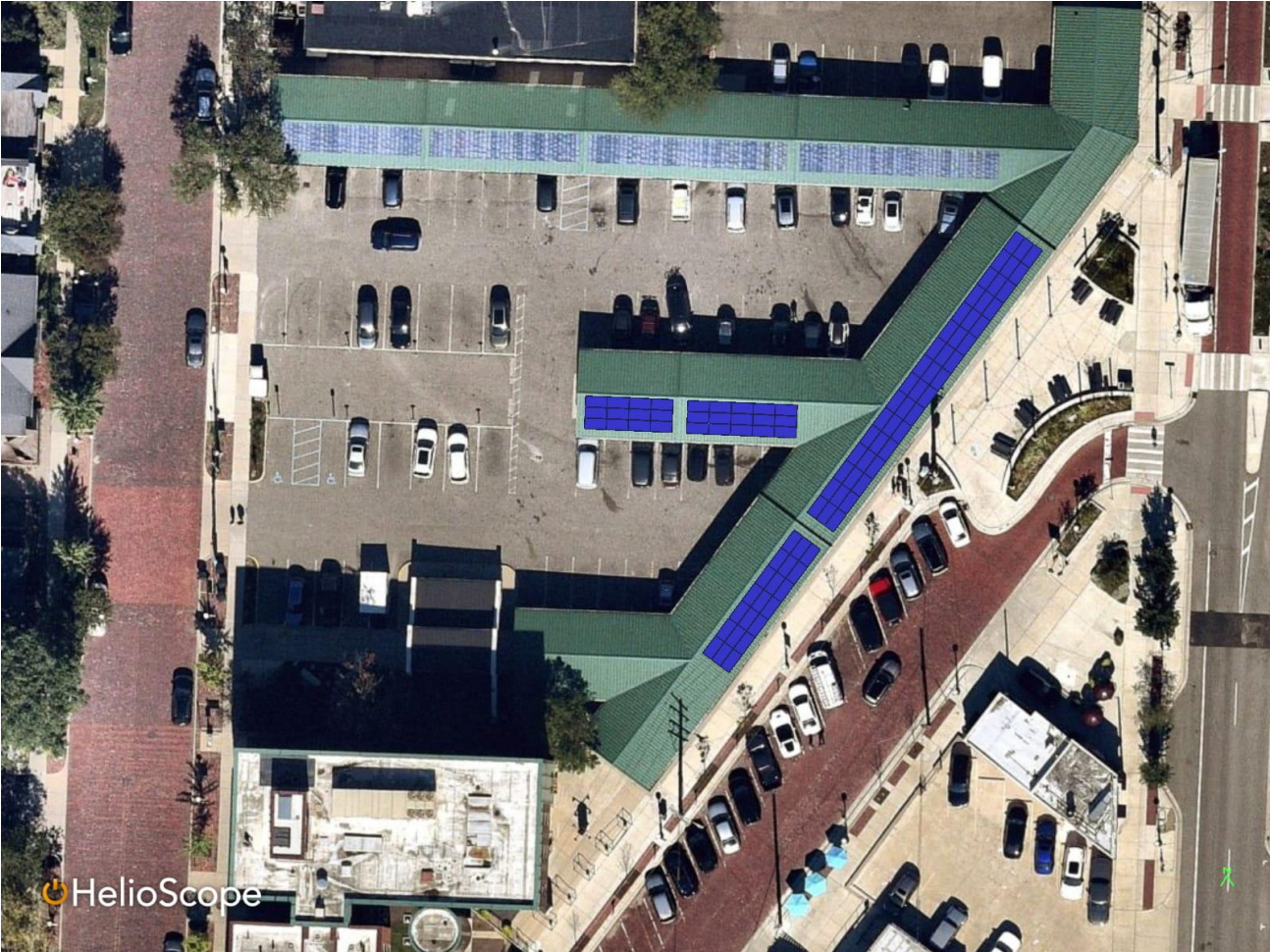
Gallup Canoe Livery – Pergola



	Gallup Canoe Livery
Site	Gallup Canoe Livery
Address	3000 Fuller
System Type	Pergola
Rate	D3
kWh	16,000
Recent Monthly Cost per kWh	\$0.15
Design kW DC	17.92
Design kW AC	15.2
Initial Year Energy (kWh)	23500
Yield	1.31
% Offset	147%
Cost (\$)	\$54,400
Cost/W	\$3.04
IRR	2.20%
NPV	\$1,240
Term Bill Savings (\$)	\$72,600

- Pergola rebuild allowance \$10K
- No EV chargers or storage needed
- System oversized, may need to cut back

Farmers Market – Expanded with EV Charging



Site	Farmers Market
Address	315 Detroit
System Type	Rooftop Expanded
Rate	D3
kWh	28,400
Recent Monthly Cost per kWh	\$0.15
Design kW DC	39.36
Design kW AC	34.2
Initial Year Energy (kWh)	46,000
Yield	1.17
% Offset	160%
Cost (\$)	\$86,700
Cost/W	\$2.34
IRR	4.2%
NPV	\$26,000
Term Bill Savings (\$)	\$147,300

- Existing solar will remain and be combined with new solar
- Expanded system sized for EV charger addition; will cover about 48,000 miles of driving annually
- EV charger installation cost approximately \$15K per charger
- Possible 5-story future building just to SE of array may cause minor shading loss, on the order of 5-7% or so annually.

Leslie Science Center- Carport w/ EV Charger

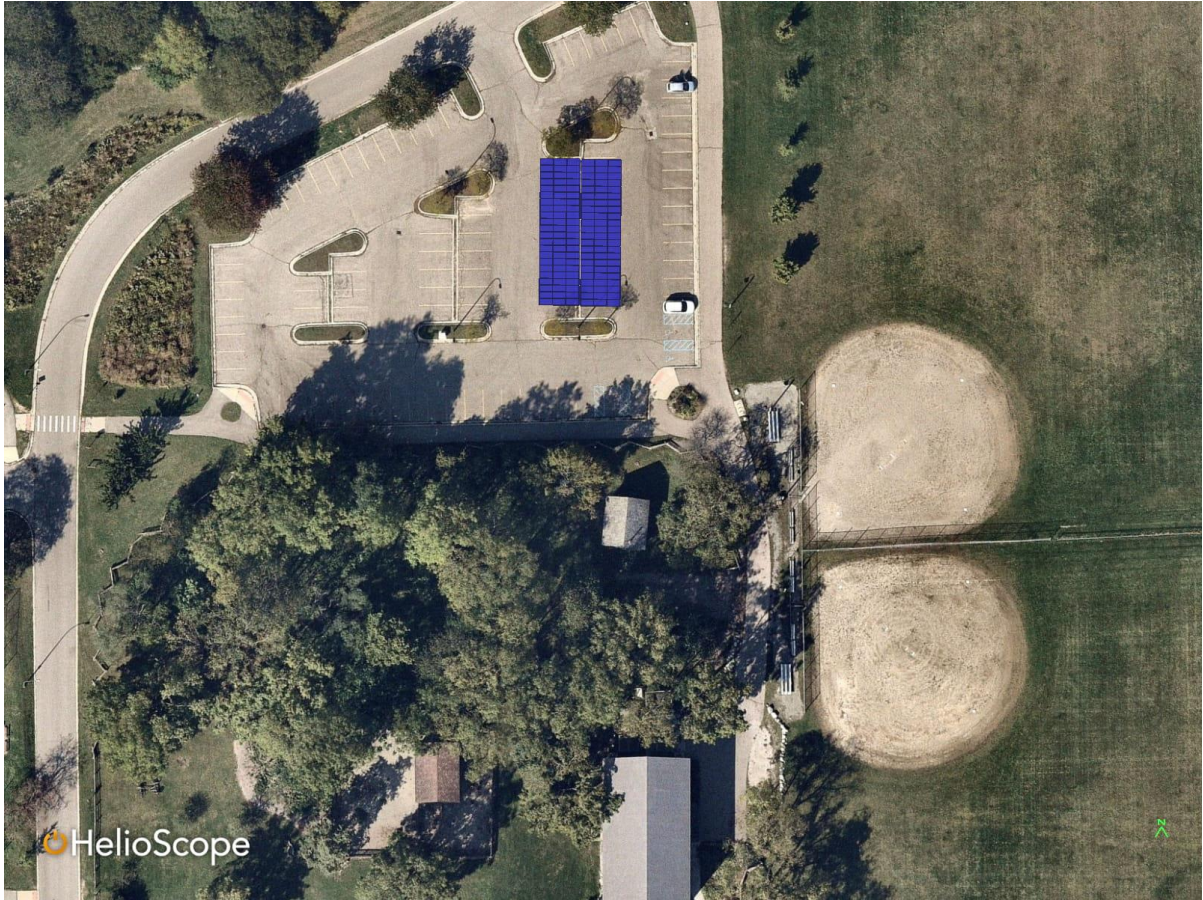


Site	Leslie Science Center
Address	1831 Traver
System Type	Carport
Rate	D3
kWh	50,000
Recent Monthly Cost per kWh	\$0.15
Design kW DC	50.43
Design kW AC	45.6
Initial Year Energy (kWh)	59700
Yield	1.18
% Offset	119%
Cost (\$)	\$195,000
Cost/W	\$3.87
IRR	-1.50%
NPV	(\$74,600)
Term Bill Savings (\$)	\$157,000

- Two highest meters will be combined (Leslie & Critter houses)
- System oversized slightly for EV charger and to cover anticipated critter house expansion
- No storage desired



Cobblestone Farm: Barn and Ground Options



Cobblestone Farm Summary

Site	Cobblestone	Cobblestone
Address	2781 Packard	2781 Packard
System Type	Rooftop	Carport
Rate	D3	D3
kWh	48,000	48,000
Recent Monthly Cost per kWh	0.145	0.145
Design kW DC	44.28	54.12
Design kW AC	34.2	40
Initial Year Energy (kWh)	40,500	63,000
Yield	0.92	1.16
% Offset	84%	130%
Cost (\$)	\$95,000	\$223,000
Cost/W	\$2.15	\$3.94
IRR	2.90%	-1.30%
NPV	\$11,800	(\$77,000)
Term Bill Savings (\$)	\$139,000	\$177,000

- Barn option has some shade from tall trees near building
- Carport flexible in terms of sizing and EV charger addition
- Storage not desired
- EV chargers desired

Fuller Summary- Carport w/EV Charging



Site	Fuller Park
Address	1519 Fuller
System Type	Carport
Rate	D3
kWh	145,000
Recent Monthly Cost per kWh	\$0.13
Design kW DC	140.22
Design kW AC	120
Initial Year Energy (kWh)	166,200
Yield	1.19
% Offset	115%
Cost (\$)	\$445,000
Cost/W	\$3.18
IRR	0.80%
NPV	(\$63,000)
Term Bill Savings (\$)	\$495,000

- Up to four EV chargers could be added (36 parking spaces)

Mack Pool



Site	Mack Pool
Address	715 Brooks
System Type	Ballasted
Rate	D4
kWh	210000
Recent Monthly Cost per kWh	\$0.124
Design kW DC	96.76
Design kW AC	100
Initial Year Energy (kWh)	114000
Yield	1.18
% Offset	54%
Cost (\$)	\$193,000
Cost/W	\$1.99
IRR	1.10%
NPV	(\$22,000)
Term Bill Savings (\$)	\$222,900

- State permitting issue; joint operating agreement with AAPS
- Demand rate makes payback not so favorable

Buhr Park



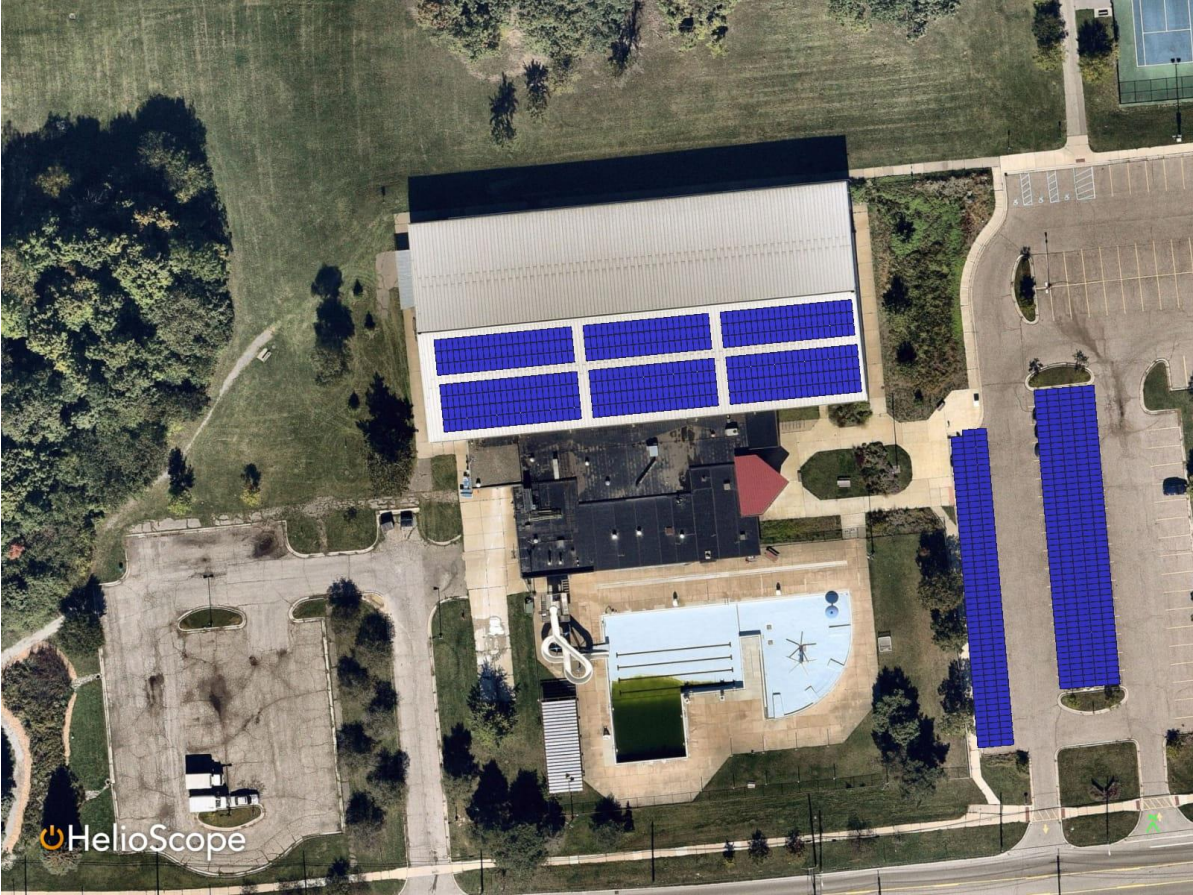
HelioScope

Site	Buhr Park
Address	2751 Packard
System Type	Rooftop
Rate	D3
kWh	360,000
Recent Monthly Cost per kWh	\$0.13
Design kW DC	190.65
Design kW AC	150
Initial Year Energy (kWh)	217,100
Yield	1.14
% Offset	60%
Cost (\$)	\$338,000
Cost/W	\$1.77
IRR	4.90%
NPV	\$138,000
Term Bill Savings (\$)	\$620,000

- Rooftop looks straightforward
 - Structural evaluation to be done, don't expect issues
- Expanded option: Carport in east lot
 - Would be Cat3 DTE, with extra DTE costs tbd
 - Load high in winter, so expanded system does not make much financial sense due to higher summer export



Veterans Park: Rooftop and Rooftop + Carport



Veterans Park

Site	Veterans Park	Veterans Park
Address	2150 Jackson	2150 Jackson
System Type	Rooftop	Roof+Carport
Rate	D4	D4
kWh	850000	850000
Recent Monthly Cost per kWh	\$0.168	\$0.168
Design kW DC	189.4	349
Design kW AC	150	300
Initial Year Energy (kWh)	215000	400000
Yield	1.13	1.14
% Offset	25%	47%
Cost (\$)	\$339,000	\$855,000
Cost/W	\$1.79	\$2.45
IRR	3.00%	0.40%
NPV	\$44,000	(\$166,000)
Term Bill Savings (\$)	\$499,100	\$897,000

- Load is large, but demand rate lowers payback
- Rooftop looks straightforward
 - Structural evaluation to be done, don't expect issues
 - Limited room for equipment; inverters and transformer probably have to be outside
- Expanded option with carport:
 - Would be Cat3 DTE, with extra DTE costs tbd
 - Allow EV chargers to be more easily added
- Potential for Resilience Hub

Leslie Golf Course: Club House



Site	Leslie Golf - Club House
Address	2120 Traver
System Type	Carport
Rate	D3
kWh	40,000
Recent Monthly Cost per kWh	\$0.15
Design kW DC	41
Design kW AC	34.2
Initial Year Energy (kWh)	50800
Yield	1.24
% Offset	125%
Cost (\$)	\$157,000
Cost/W	\$3.83
IRR	0.30%
NPV	(\$31,000)
Term Bill Savings (\$)	\$164,000

- Limited options for rooftop or ground mount
- Carport location flexible
- Oversized for additional load or EV charger addition

Leslie Golf Course: Barn



Site	Leslie Golf - Barn
Address	2120 Traver
System Type	Rooftop
Rate	D3
kWh	13,000
Recent Monthly Cost per kWh	\$0.15
Design kW DC	10.24
Design kW AC	10
Initial Year Energy (kWh)	12600
Yield	1.23
% Offset	97%
Cost (\$)	\$26,000
Cost/W	\$2.54
IRR	3.60%
NPV	\$5,500
Term Bill Savings (\$)	\$41,000

- New shingles needed
- Project appears simple, no obvious issues

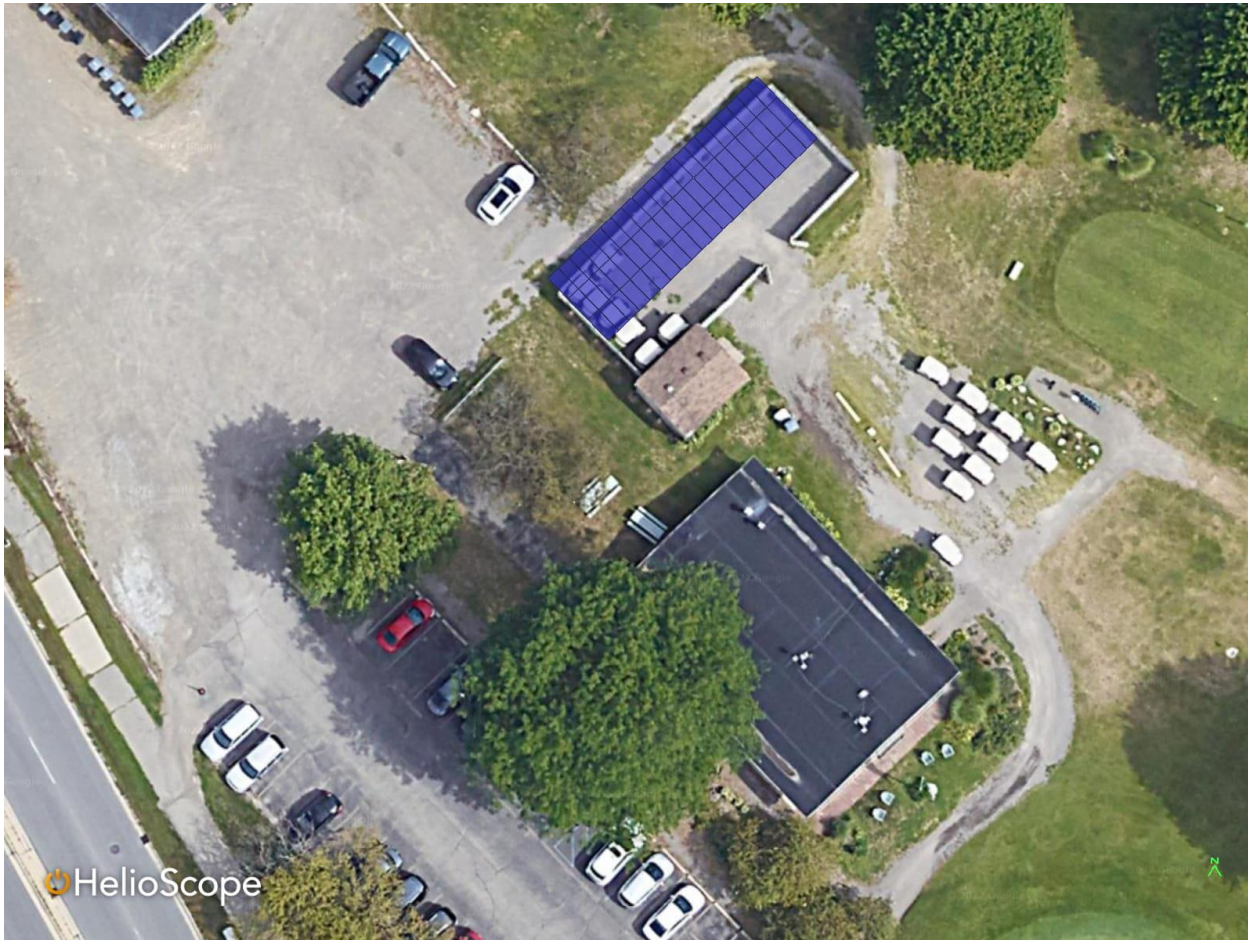
Leslie Golf Course: Pump House



	Leslie Golf - Pump House
Site	2120 Traver
Address	Ground
System Type	D3
Rate	41,400
kWh	\$0.15
Recent Monthly Cost per kWh	32.8
Design kW DC	30
Design kW AC	42000
Initial Year Energy (kWh)	1.28
Yield	101%
% Offset	\$68,000
Cost (\$)	\$2.08
Cost/W	4.70%
IRR	\$25,000
NPV	\$121,500
Term Bill Savings (\$)	

- Efficient design, 480V service
- Load is heavy from 10pm-2am so not ideal, but still looks good
- Perhaps some tree trimming or vegetation management

Huron Hills Golf Course: Club House



	Huron Hills Golf - Club House
Site	3465 E Huron River
Address	River
System Type	Carport
Rate	D3
kWh	22000
Recent Monthly Cost per kWh	\$0.15
Design kW DC	24.6
Design kW AC	20
Initial Year Energy (kWh)	29000
Yield	1.19
% Offset	132%
Cost (\$)	\$100,000
Cost/W	\$4.07
IRR	-0.60%
NPV	(\$30,000)
Term Bill Savings (\$)	\$91,500

- Carport over golf cart pen is preferred; keep post outside pen
- EV chargers possible
- Load rather modest, so can't cover entire pen

Huron Hills Golf Course: Pump House



	Huron Hills Golf - Pump House
Site	3465 E Huron River
Address	
System Type	Ground
Rate	D3
kWh	28000
Recent Monthly Cost per kWh	\$0.15
Design kW DC	24.6
Design kW AC	20
Initial Year Energy (kWh)	32000
Yield	1.32
% Offset	114%
Cost (\$)	\$53,000
Cost/W	\$2.15
IRR	4.80%
NPV	\$20,600
Term Bill Savings (\$)	\$96,000

- Pretty straightforward
- Load profile assumed to be same as Leslie pump house