Financial Evaluation of Proposed Solar Power Purchase Agreements

Wave 4 Portfolio: 10 Fairfax County Public Schools

Prepared for

Mr. Cliff Pahlavani
Senior Manager, Sustainability
Fairfax County Public Schools

September 28, 2026

Prepared By

Arcadis U.S., Inc.
320 Commerce, Suite 200
Irvine, California
Phone: 714 730 9052
www.arcadis.com

Arcadis Ref# 30346442



Harish Kanneganti, PE, CEM
Senior Consultant



Nariman Mostafavi, PhD
Energy Efficiency & Life Cycle Carbon Lead

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Abbreviations and Definitions

The following terms are used throughout this report.

Term or Abbreviation	Definition
Breakeven NPV	The point at which NPV savings or cost relative to continued grid procurement equals $0.
Breakeven PPA Price	The maximum initial PPA price that results in $0 of NPV savings or cost relative to continued grid procurement under the modeled assumptions.
Discount Factor	The factor used to convert a future cost or saving to its present value.
Discount Rate	The annual rate used to convert future cash flows to present value. This analysis uses 7%.
Energy Use Intensity (EUI)	Annual site energy use divided by building floor area, expressed in kBtu/sf.
Export Credit	The value assigned to solar electricity exported to the utility grid. This analysis assumes $0/kWh.
Grid Procurement	The modeled cost of purchasing all electricity from the serving utility without the proposed solar project.
Heating, Ventilation, and Air Conditioning (HVAC)	Building systems that provide space heating, cooling, and ventilation.
Kilowatt Direct Current (kWdc)	A measure of the rated direct-current capacity of a solar photovoltaic system.
Kilowatt-hour (kWh)	A unit of electrical energy equal to one kilowatt of power used or generated for one hour.
Light-Emitting Diode (LED)	A high-efficiency lighting technology.
Measurement and Verification (M&V)	The process used to quantify and confirm project performance or energy savings.
Net Present Value (NPV)	The present value of future costs or savings over the analysis term after applying the selected discount rate.
Normalized Site Energy Use	Weather-adjusted annual electricity consumption used in the financial analysis.
Operations and Maintenance (O&M)	Recurring activities and costs required to operate and maintain the solar system.
Power Purchase Agreement (PPA)	An agreement under which a third party owns and operates the solar system and FCPS purchases the electricity generated at an agreed price per kWh.
PPA Escalation	The annual percentage increase in the PPA price. The offered PPA is modeled with 0% annual escalation.
PPA NPV	The present value of total electricity procurement costs under the PPA, including post-solar grid purchases and PPA payments, less any export credit.
PPA Payment	The cost of all solar generation multiplied by the applicable PPA price.
PPA Savings / (Cost)	Grid procurement cost minus total PPA procurement cost. A positive value represents savings; a value in parentheses represents added cost.
Renewable Energy Credit (REC)	An instrument representing the environmental attributes associated with one megawatt-hour of renewable electricity generation.
Self-Consumed Solar	Solar electricity used at the school rather than exported to the utility grid.
Solar Degradation	The modeled annual reduction in solar production as the PV system ages. This analysis uses 0.5% per year.
Typical Meteorological Year 3 (TMY3)	Representative weather data used with 2025 electricity consumption to develop weather-normalized site energy use.
Utility Rate Escalation	The modeled annual increase in marginal utility energy rates. This analysis uses 3% per year.
Variable-Frequency Drive (VFD)	A device that varies motor speed to match system demand and reduce energy use.
Year 1 Production	The modeled amount of electricity generated by the proposed solar system during the first operating year.

Executive Summary

Arcadis evaluated the Sun Tribe Wave 4 solar proposal using school-specific monthly electricity consumption, proposed solar generation, marginal utility energy rates, and the offered 25-year PPA prices.

At FCPS's request, the primary results are presented using cumulative 25-year nominal cash flows. The table below compares the cumulative 25-year nominal electricity procurement cost under continued utility service with the cumulative 25-year nominal electricity procurement cost under the proposed solar PPA.

Table 1. Executive Summary – Nominal Cash Flow Basis

School	25-Yr Grid Cost, $	25-Yr Solar PPA Cost, $	Cumulative Savings / (Cost)	Nominal Cash Flow Analysis Outcome
Bonnie Brae ES	$5,533,728	$5,477,019	$56,709	Positive cumulative savings
Brookfield ES	$3,754,913	$3,312,778	$442,135	Positive cumulative savings
Dranesville ES	$5,024,244	$4,640,610	$383,633	Positive cumulative savings
Belle View ES	$4,078,377	$4,039,799	$38,578	Positive cumulative savings
Kent Gardens ES	$3,800,363	$3,728,620	$71,744	Positive cumulative savings
McNair Upper ES	$3,559,738	$3,488,071	$71,666	Positive cumulative savings
Stone MS	$3,693,175	$3,587,245	$105,930	Positive cumulative savings
Falls Church HS	$17,798,671	$15,683,678	$2,114,994	Positive cumulative savings
West Springfield HS	$14,306,748	$13,070,714	$1,236,033	Positive cumulative savings
Woodson HS	$23,846,830	$23,096,222	$750,608	Positive cumulative savings
Total	**$85,396,786**	**$80,124,757**	**$5,272,030**	**Positive cumulative savings**

The nominal cash flow analysis indicates that all ten proposed PPAs result in positive cumulative savings over the 25-year analysis period.

Key observations from the nominal cash flow analysis include:

- All ten schools are projected to achieve positive cumulative savings over the 25-year contract term under the proposed PPA structure.
- Portfolio-wide cumulative **savings are estimated at approximately $5.27 million**, reducing total nominal electricity procurement costs from approximately $85.4 million to $80.1 million.
- Falls Church High School, West Springfield High School, and Woodson High School produce the largest absolute savings, primarily due to their larger solar system capacities and higher electricity consumption.
- While savings vary by school, every proposed PPA remains cash-flow positive on a cumulative nominal basis, indicating a lower total nominal cost of electricity procurement compared to continued utility purchases.

The table below compares the 25-year present value of continued grid procurement with the 25-year present value of total electricity procurement under the solar PPA. A lower PPA procurement NPV than grid procurement indicates a financially favorable PPA under the modeled assumptions.

Table 2. Executive Summary – NPV Basis

School	25-Yr Grid NPV	25-Yr Solar PPA NPV	NPV Savings/(Cost)	Proposed PPA ($/kWh)	Breakeven PPA Price ($/kWh)	NPV Analysis Outcome
Bonnie Brae ES	$2,330,645	$2,378,137	($47,493)	$0.1790	$0.1676	Financially not favorable
Brookfield ES	$1,581,460	$1,496,892	$84,568	$0.1553	$0.1673	Financially favorable
Dranesville ES	$2,116,065	$2,041,547	$74,518	$0.1553	$0.1676	Financially favorable
Belle View ES	$1,717,693	$1,750,002	($32,308)	$0.1790	$0.1676	Financially not favorable
Kent Gardens ES	$1,600,602	$1,615,496	($14,894)	$0.1790	$0.1734	Financially not favorable

McNair Upper ES	$1,499,258	$1,514,135	($14,878)	$0.1790	$0.1734	Financially not favorable
Stone MS	$1,555,457	$1,642,721	($87,263)	$0.1453	$0.1361	Financially not favorable
Falls Church HS	$7,496,281	$6,842,411	$653,871	$0.1343	$0.1676	Financially favorable
West Springfield HS	$6,025,585	$5,719,323	$306,262	$0.1343	$0.1520	Financially favorable
Woodson HS	$10,043,589	$9,845,454	$198,135	$0.1453	$0.1676	Financially favorable
Total	**$35,966,635**	**$34,846,118**	**$1,120,517**			**Financially favorable at portfolio level**

Key observations from the NPV analysis include:

- NPV is the primary **financial metric recommended by Arcadis** to evaluate solar PPAs and other long-term energy investments, as it accounts for the time value of money and provides a more accurate measure of lifecycle financial performance than nominal cash flow.
- At the portfolio level, the proposed PPAs are financially favorable, with total estimated NPV **savings** of approximately **$1.12 million** relative to continued utility procurement.
- The breakeven PPA price shown in the table represents the maximum initial PPA rate that results in zero NPV savings relative to continued utility procurement. PPA prices below the breakeven value are financially favorable, while PPA prices above the breakeven value are financially unfavorable under the modeled assumptions.
- While savings vary by school, every proposed PPA remains cash-flow positive on a cumulative nominal basis, indicating a lower total nominal cost of electricity procurement compared to continued utility purchases.
- The following five schools are not financially favorable at the proposed PPA rates
    - Bonnie Brae Elementary School
    - Belle View Elementary School
    - Kent Gardens Elementary School
    - McNair Upper Elementary School
    - Stone Middle School

Key observations for ownership option:

- At FCPS's request, Arcadis also evaluated ownership alternatives for Kent Gardens Elementary School and Stone Middle School.
- Under the modeled assumptions, **neither ownership option is financially favorable** relative to continued utility procurement.
- The ownership analyses indicate that installed costs would need to be substantially lower to achieve NPV breakeven.
- Based on the NPV results, **Arcadis does not recommend** advancing the ownership alternatives at the currently assumed installed costs.
- The ownership evaluations are intended as directional screening analyses and do not include financing, incentives, tax impacts, insurance, major equipment replacement, or residual value considerations.

1. Purpose, Scope, and Method

This report assesses the Sun Tribe Solar Wave 4 proposal for six elementary schools, one middle school, and three high schools. It addresses the proposed system size, Year 1 production, initial PPA price, 25-year term, 0% annual PPA escalation, zero upfront FCPS capital cost under the PPA, included PPA operations and maintenance, and FCPS retention of renewable energy credits. For Kent Gardens and Stone Middle, it also evaluates outright ownership.

Calculation framework

- Self-consumed solar equals the lower of the monthly school load and monthly solar production.
- Avoided utility cost equals self-consumed solar multiplied by the applicable monthly marginal utility rate.
- Monthly marginal utility rates were developed for each utility tariff using applicable energy, fuel, and other volumetric ($/kWh) charges identified in the utility rate schedules and the 2026 VEPGA contract. Fixed customer charges and demand charges were excluded from the marginal rate calculation
- Electricity emission factors were derived from NREL Cambium marginal emissions data for the applicable utility region
- PPA payment equals all solar generation multiplied by the PPA rate offered.
- Total PPA procurement cost equals post-solar grid cost plus PPA payment less export credit.
- Solar production declines 0.5% annually, marginal utility rates escalate 3% annually, PPA rates escalate 0% annually, and cash flows are discounted at 7%.
- Annual emission savings decrease over time due to both solar module degradation (0.5% per year) and projected reductions in grid emissions intensity based on NREL Cambium data.
- The analysis is energy-only and does not include demand-charge savings.

Table 3. Analysis Assumptions

Assumption	Value
Analysis term	25 years
Utility rate escalation	3.0% per year
Discount rate	7.0%
Solar degradation	0.5% per year
PPA escalation	0.0%
Export credit	$0/kWh

Ownership Analysis Assumptions and Limitations

Ownership scenarios were evaluated as high-level screening analyses intended to provide directional insight into the relative economics of ownership compared to continued utility procurement and the proposed PPA structure. Installed cost assumptions for Kent Gardens Elementary School and Stone Middle School were based on cost information provided by FCPS. The ownership analyses include upfront capital cost, fixed operations and maintenance costs, post-solar electricity purchases, and export treatment assumptions consistent with the PPA analysis.

The ownership analyses do not include financing costs, grants or incentives, tax impacts, insurance, inverter replacement, major equipment replacement, residual value, or other lifecycle ownership considerations that may materially affect project economics. Accordingly, the ownership scenarios should not be considered full lifecycle ownership pro formas and are intended only as directional economic screening analyses.

2. Summary of PPA Offers and School Energy Profile

The following table summarizes the offered PPA terms and the annual energy information used to inform the school-level financial analysis.

Table 4. Utility Summary

School	Utility	Rate Schedule	Offered PPA ($/kWh)	Year 1 PV Energy Output (kWh)	2025 Electricity Use (kWh)	Normalized Site Energy Use (kWh)	EUI (kBtu/sf)
Bonnie Brae ES	Dominion Energy Virginia	Schedule 110	$0.1790	374,585	956,801	1,187,704	51.2
Brookfield ES	Dominion Energy Virginia	Schedule 110	$0.1553	630,918	855,528	805,139	24.6
Dranesville ES	Dominion Energy Virginia	Schedule 110	$0.1553	540,582	1,132,473	1,078,225	49.5
Belle View ES	Dominion Energy Virginia	Schedule 110	$0.1790	254,823	848,493	873,444	38.6
Kent Gardens ES	Dominion Energy Virginia	Schedule 100	$0.1790	238,123	765,656	786,567	77.2
McNair Upper ES	Dominion Energy Virginia	Schedule 100	$0.1790	237,867	738,674	736,764	32.8
Stone MS	NOVEC	Schedule 3GP	$0.1453	852,669	934,272	963,805	30.4
Falls Church HS	Dominion Energy Virginia	Schedule 110	$0.1343	1,756,140	3,872,513	3,813,607	50.9
West Springfield HS	Dominion Energy Virginia	Schedule 132	$0.1343	1,553,901	3,537,813	3,339,583	45.7
Woodson HS	Dominion Energy Virginia	Schedule 100	$0.1453	794,104	4,886,328	5,104,661	72.1

Note:

- The 2025 electricity consumption data and EUI were obtained from the FCPS EnergyCAP platform.
- Normalized site energy use represents the weather-adjusted annual electricity consumption used in the financial analysis.
- Arcadis developed the weather-normalized energy consumption values using Typical Meteorological Year (TMY3) weather data in conjunction with 2025 electricity consumption data.

Bonnie Brae Elementary School

System Size	Year 1 PV Output, kWh	Offered PPA Rate, $/kWh	25-yr Grid Cost, $	25-yr PPA Cost, $	25-yr Savings, $
281 kWdc	374,585 kWh	$0.1790	$5,533,728	$5,477,019	$56,709

The table below presents the annual nominal cash flow analysis for the proposed PPA. The PPA column includes the remaining grid purchases after solar generation, plus PPA payments, less any export credit. All costs and savings are shown in nominal dollars and do not reflect discounting.

Year	Grid Procurement Cost, $	Solar PPA Procurement, $	Annual PPA Savings / (Cost), $	Emission Savings, MT CO_2
1	$151,778	$170,836	($19,058)	138
2	$156,332	$173,862	($17,530)	131
3	$161,022	$176,996	($15,974)	125
4	$165,852	$180,242	($14,389)	118
5	$170,828	$183,603	($12,775)	113
6	$175,953	$187,084	($11,131)	108
7	$181,231	$190,687	($9,456)	103
8	$186,668	$194,417	($7,749)	98
9	$192,268	$198,277	($6,009)	92
10	$198,036	$202,272	($4,235)	91
11	$203,977	$206,405	($2,427)	90
12	$210,097	$210,681	($584)	89
13	$216,400	$215,104	$1,296	88
14	$222,892	$219,679	$3,212	87
15	$229,578	$224,411	$5,167	83
16	$236,466	$229,304	$7,162	80
17	$243,560	$234,364	$9,196	76
18	$250,867	$239,595	$11,272	73
19	$258,393	$245,003	$13,390	70
20	$266,144	$250,593	$15,551	68
21	$274,129	$256,371	$17,757	67
22	$282,352	$262,343	$20,009	66
23	$290,823	$268,515	$22,308	64
24	$299,548	$274,893	$24,655	63
25	$308,534	$281,483	$27,051	62

The proposed solar PPA is projected to reduce cumulative nominal electricity procurement costs by approximately **$56,709** over the 25-year analysis period. However, the NPV analysis indicates an estimated **$47,493 increase** in lifecycle cost relative to continued grid procurement. The difference between the nominal and NPV results reflects the timing of projected cash flows, with higher PPA costs occurring in the earlier years and savings occurring later in the contract term.

Brookfield Elementary School

System Size	Year 1 PV Output, kWh	Offered PPA Rate, $/kWh	25-yr Grid Cost, $	25-yr PPA Cost, $	25-yr Savings, $
478 kWdc	630,918 kWh	$0.1553	$3,754,913	$3,312,778	$442,135

The table below presents the annual nominal cash flow analysis for the proposed PPA. The PPA column includes the remaining grid purchases after solar generation, plus PPA payments, less any export credit. All costs and savings are shown in nominal dollars and do not reflect discounting.

Year	Grid Procurement Cost, $	Solar PPA Procurement, $	Annual PPA Savings / (Cost), $	Emission Savings, MT CO_2
1	$102,989	$120,300	($17,311)	232
2	$106,079	$120,895	($14,816)	221
3	$109,261	$121,536	($12,274)	210
4	$112,539	$122,223	($9,684)	199
5	$115,915	$122,959	($7,043)	191
6	$119,393	$123,744	($4,352)	182
7	$122,975	$124,582	($1,607)	173
8	$126,664	$125,473	$1,191	164
9	$130,464	$126,420	$4,044	156
10	$134,378	$127,423	$6,954	154
11	$138,409	$128,486	$9,923	152
12	$142,561	$129,610	$12,951	150
13	$146,838	$130,797	$16,041	148
14	$151,243	$132,050	$19,194	146
15	$155,781	$133,370	$22,411	140
16	$160,454	$134,760	$25,694	134
17	$165,268	$136,222	$29,046	129
18	$170,226	$137,759	$32,467	123
19	$175,332	$139,373	$35,960	117
20	$180,592	$141,067	$39,526	115
21	$186,010	$142,843	$43,167	113
22	$191,590	$144,705	$46,885	111
23	$197,338	$146,655	$50,683	109
24	$203,258	$148,696	$54,562	107
25	$209,356	$150,832	$58,524	104

The proposed solar PPA is projected to reduce cumulative nominal electricity procurement costs by approximately **$442,135** over the 25-year analysis period. The NPV analysis indicates an estimated **$84,568 reduction** in lifecycle cost relative to continued grid procurement.

Dranesville Elementary School

System Size	Year 1 PV Output, kWh	Offered PPA Rate, $/kWh	25-yr Grid Cost, $	25-yr PPA Cost, $	25-yr Savings, $
400 kWdc	540,582 kWh	$0.1553	$5,024,244	$4,640,610	$383,633

The table below presents the annual nominal cash flow analysis for the proposed PPA. The PPA column includes the remaining grid purchases after solar generation, plus PPA payments, less any export credit. All costs and savings are shown in nominal dollars and do not reflect discounting.

Year	Grid Procurement Cost, $	Solar PPA Procurement, $	Annual PPA Savings / (Cost), $	Emission Savings, MT CO_2
1	$137,804	$152,496	($14,691)	199
2	$141,938	$154,489	($12,550)	190
3	$146,197	$156,565	($10,369)	180
4	$150,582	$158,728	($8,146)	171
5	$155,100	$160,979	($5,879)	163
6	$159,753	$163,322	($3,569)	156
7	$164,546	$165,760	($1,214)	148
8	$169,482	$168,294	$1,188	141
9	$174,566	$170,930	$3,637	133
10	$179,803	$173,669	$6,134	132
11	$185,197	$176,515	$8,682	130
12	$190,753	$179,472	$11,282	128
13	$196,476	$182,543	$13,933	127
14	$202,370	$185,731	$16,639	125
15	$208,441	$189,041	$19,401	120
16	$214,695	$192,476	$22,219	115
17	$221,135	$196,040	$25,096	110
18	$227,770	$199,737	$28,032	105
19	$234,603	$203,573	$31,030	100
20	$241,641	$207,550	$34,091	99
21	$248,890	$211,674	$37,216	97
22	$256,357	$215,948	$40,408	95
23	$264,047	$220,379	$43,668	93
24	$271,969	$224,971	$46,997	91
25	$280,128	$229,729	$50,398	90

The proposed solar PPA is projected to reduce cumulative nominal electricity procurement costs by approximately **$383,633** over the 25-year analysis period. The NPV analysis indicates an estimated **$74,518 reduction** in lifecycle cost relative to continued grid procurement.

Belle View Elementary School

System Size	Year 1 PV Output, kWh	Offered PPA Rate, $/kWh	25-yr Grid Cost, $	25-yr PPA Cost, $	25-yr Savings, $
198 kWdc	254,823 kWh	$0.1790	$4,078,377	$4,039,799	$38,578

The table below presents the annual nominal cash flow analysis for the proposed PPA. The PPA column includes the remaining grid purchases after solar generation, plus PPA payments, less any export credit. All costs and savings are shown in nominal dollars and do not reflect discounting.

Year	Grid Procurement Cost, $	Solar PPA Procurement, $	Annual PPA Savings / (Cost), $	Emission Savings, MT CO_2
1	$111,861	$124,826	($12,965)	94
2	$115,217	$127,142	($11,925)	89
3	$118,674	$129,540	($10,867)	85
4	$122,234	$132,023	($9,789)	81
5	$125,901	$134,592	($8,691)	77
6	$129,678	$137,250	($7,572)	73
7	$133,568	$140,001	($6,433)	70
8	$137,575	$142,846	($5,271)	66
9	$141,702	$145,790	($4,088)	63
10	$145,953	$148,835	($2,881)	62
11	$150,332	$151,983	($1,651)	61
12	$154,842	$155,239	($397)	61
13	$159,487	$158,606	$881	60
14	$164,272	$162,087	$2,185	59
15	$169,200	$165,685	$3,515	57
16	$174,276	$169,404	$4,872	54
17	$179,504	$173,248	$6,256	52
18	$184,890	$177,222	$7,668	50
19	$190,436	$181,327	$9,109	47
20	$196,149	$185,570	$10,579	46
21	$202,034	$189,954	$12,080	46
22	$208,095	$194,483	$13,612	45
23	$214,338	$199,162	$15,176	44
24	$220,768	$203,996	$16,772	43

Year	Grid Procurement Cost, $	Solar PPA Procurement, $	Annual PPA Savings / (Cost), $	Emission Savings, MT CO_2
25	$227,391	$208,988	$18,402	42

The proposed solar PPA is projected to reduce cumulative nominal electricity procurement costs by approximately **$38,578** over the 25-year analysis period. However, the NPV analysis indicates an estimated **$32,308 increase** in lifecycle cost relative to continued grid procurement. The difference between the nominal and NPV results reflects the timing of projected cash flows, with higher PPA costs occurring in the earlier years and savings occurring later in the contract term.

Kent Gardens Elementary School

System Size	Year 1 PV Output, kWh	Offered PPA Rate, $/kWh	25-yr Grid Cost, $	25-yr PPA Cost, $	25-yr Savings, $
178 kWdc	238,123 kWh	$0.1790	$3,800,363	$3,728,620	$71,744

The annual cash-flow table includes grid procurement, solar PPA procurement, and outright ownership. Year 0 captures the ownership capital cost. Annual ownership cost includes post-solar grid purchases and fixed O&M, less export value. The current ownership input is $800,494 in capital cost and $25/kW-year in O&M.

Year	Grid Procurement Cost, $	Solar PPA Procurement, $	Ownership, $	PPA vs Grid, $	Emission Savings, MT CO_2
0	$0	$0	$800,494	$0	0
1	$104,236	$115,304	$77,130	($11,068)	88
2	$107,363	$117,434	$79,473	($10,071)	84
3	$110,584	$119,639	$81,890	($9,055)	79
4	$113,901	$121,922	$84,384	($8,020)	75
5	$117,318	$124,285	$86,957	($6,966)	72
6	$120,838	$126,730	$89,611	($5,892)	69
7	$124,463	$129,261	$92,350	($4,798)	65
8	$128,197	$131,880	$95,175	($3,683)	62
9	$132,043	$134,588	$98,090	($2,546)	59
10	$136,004	$137,391	$101,097	($1,387)	58
11	$140,084	$140,289	$104,199	($205)	57
12	$144,287	$143,287	$107,399	$1,000	57
13	$148,615	$146,386	$110,701	$2,229	56
14	$153,074	$149,591	$114,106	$3,483	55
15	$157,666	$152,905	$117,619	$4,761	53
16	$162,396	$156,330	$121,244	$6,066	51
17	$167,268	$159,871	$124,982	$7,397	49
18	$172,286	$163,531	$128,839	$8,755	46
19	$177,455	$167,314	$132,817	$10,141	44
20	$182,778	$171,223	$136,921	$11,555	43
21	$188,262	$175,263	$141,154	$12,999	43
22	$193,909	$179,436	$145,521	$14,473	42
23	$199,727	$183,749	$150,025	$15,978	41
24	$205,719	$188,204	$154,671	$17,514	40

Year	Grid Procurement Cost, $	Solar PPA Procurement, $	Ownership, $	PPA vs Grid, $	Emission Savings, MT CO_2
25	$211,890	$192,807	$159,464	$19,083	39

The proposed solar PPA is projected to reduce cumulative nominal electricity procurement costs by approximately **$71,744** over the 25-year analysis period. However, the NPV analysis indicates an estimated **$14,894 increase** in lifecycle cost relative to continued grid procurement. The difference between the nominal and NPV results reflects the timing of projected cash flows, with higher PPA costs occurring in the earlier years and savings occurring later in the contract term.

The ownership alternative is projected to result in an estimated $391,306 increase in lifecycle cost relative to continued grid procurement under the modeled assumptions. Ownership reaches NPV breakeven at an estimated capital cost of approximately $409,188, or $2.30/W, compared to the assumed installed cost of $800,494 ($4.50/W).

McNair Upper Elementary School

System Size	Year 1 PV Output, kWh	Offered PPA Rate, $/kWh	25-yr Grid Cost, $	25-yr PPA Cost, $	25-yr Savings, $
179 kWdc	237,867 kWh	$0.1790	$3,559,738	$3,488,071	$71,666

The table below presents the annual nominal cash flow analysis for the proposed PPA. The PPA column includes the remaining grid purchases after solar generation, plus PPA payments, less any export credit. All costs and savings are shown in nominal dollars and do not reflect discounting.

Year	Grid Procurement Cost, $	Solar PPA Procurement, $	Annual PPA Savings / (Cost), $	Emission Savings, MT CO_2
1	$97,636	$108,692	($11,056)	88
2	$100,565	$110,625	($10,060)	83
3	$103,582	$112,627	($9,045)	79
4	$106,690	$114,701	($8,012)	75
5	$109,890	$116,849	($6,959)	72
6	$113,187	$119,073	($5,886)	69
7	$116,583	$121,375	($4,793)	65
8	$120,080	$123,759	($3,679)	62
9	$123,682	$126,225	($2,543)	59
10	$127,393	$128,778	($1,385)	58
11	$131,215	$131,419	($205)	57
12	$135,151	$134,152	$999	56
13	$139,206	$136,979	$2,227	56
14	$143,382	$139,903	$3,479	55
15	$147,683	$142,927	$4,756	53
16	$152,114	$146,055	$6,059	51
17	$156,677	$149,289	$7,389	48
18	$161,377	$152,632	$8,745	46
19	$166,219	$156,089	$10,130	44
20	$171,205	$159,663	$11,543	43
21	$176,342	$163,356	$12,985	43
22	$181,632	$167,174	$14,457	42
23	$187,081	$171,120	$15,961	41
24	$192,693	$175,198	$17,496	40
25	$198,474	$179,411	$19,063	39

The proposed solar PPA is projected to reduce cumulative nominal electricity procurement costs by approximately **$71,666** over the 25-year analysis period. However, the NPV analysis indicates an estimated **$14,878 increase** in lifecycle cost relative to continued grid procurement. The difference between the nominal and NPV results reflects the timing of projected cash flows, with higher PPA costs occurring in the earlier years and savings occurring later in the contract term.

Stone Middle School

System Size	Year 1 PV Output, kWh	Offered PPA Rate, $/kWh	25-yr Grid Cost, $	25-yr PPA Cost, $	25-yr Savings, $
667 kWdc	852,669 kWh	$0.1453	$3,693,175	$3,587,245	$105,930

The annual cash-flow table includes grid procurement, solar PPA procurement, and outright ownership. Year 0 captures the ownership capital cost. Annual ownership cost includes post-solar grid purchases and fixed O&M, less export value. The current ownership input is $1,431,895 in capital cost and $25/kW-year in O&M.

Year	Grid Procurement Cost, $	Solar PPA Procurement, $	Ownership Procurement, $	PPA vs Grid, $	Emission Savings, MT CO_2
0	$0	$0	$1,431,895	$0	0
1	$101,296	$136,476	$29,258	($35,180)	314
2	$104,335	$136,691	$30,093	($32,356)	299
3	$107,465	$136,945	$30,963	($29,481)	284
4	$110,689	$137,241	$31,872	($26,552)	270
5	$114,009	$137,578	$32,820	($23,569)	257
6	$117,430	$137,959	$33,808	($20,530)	246
7	$120,953	$138,386	$34,839	($17,433)	234
8	$124,581	$138,859	$35,913	($14,278)	222
9	$128,319	$139,380	$37,032	($11,062)	210
10	$132,168	$139,952	$38,199	($7,784)	208
11	$136,133	$140,575	$39,415	($4,442)	205
12	$140,217	$141,252	$40,681	($1,035)	202
13	$144,424	$141,985	$42,000	$2,439	200
14	$148,756	$142,775	$43,373	$5,982	197
15	$153,219	$143,624	$44,802	$9,595	189
16	$157,816	$144,534	$46,290	$13,281	181
17	$162,550	$145,508	$47,839	$17,042	174
18	$167,427	$146,548	$49,450	$20,878	166
19	$172,450	$147,656	$51,127	$24,793	158
20	$177,623	$148,834	$52,871	$28,789	155
21	$182,952	$150,085	$54,686	$32,866	153
22	$188,440	$151,412	$56,572	$37,028	150
23	$194,093	$152,816	$58,534	$41,277	147
24	$199,916	$154,301	$60,574	$45,615	144

Year	Grid Procurement Cost, $	Solar PPA Procurement, $	Ownership Procurement, $	PPA vs Grid, $	Emission Savings, MT CO_2
25	$205,914	$155,870	$62,695	$50,044	141

The proposed solar PPA is projected to reduce cumulative nominal electricity procurement costs by approximately **$105,930** over the 25-year analysis period. However, the NPV analysis indicates an estimated **$87,263 increase** in lifecycle cost relative to continued grid procurement. The difference between the nominal and NPV results reflects the timing of projected cash flows, with higher PPA costs occurring in the earlier years and savings occurring later in the contract term.

The ownership alternative is projected to result in an estimated $330,092 increase in lifecycle cost relative to continued grid procurement under the modeled assumptions. Ownership reaches NPV breakeven at an estimated capital cost of approximately $1,101,803, or $1.65/W, compared to the assumed installed cost of $1,431,895 ($2.15/W).

Falls Church High School

System Size	Year 1 PV Output, kWh	Offered PPA Rate, $/kWh	25-yr Grid Cost, $	25-yr PPA Cost, $	25-yr Savings, $
1,310 kWdc	1,756,140 kWh	$0.1343	$17,798,671	$15,683,678	$2,114,994

The table below presents the annual nominal cash flow analysis for the proposed PPA. The PPA column includes the remaining grid purchases after solar generation, plus PPA payments, less any export credit. All costs and savings are shown in nominal dollars and do not reflect discounting.

Year	Grid Procurement Cost, $	Solar PPA Procurement, $	Annual PPA Savings / (Cost), $	Emission Savings, MT CO_2
1	$488,180	$499,027	($10,847)	647
2	$502,825	$506,902	($4,077)	616
3	$517,910	$515,083	$2,827	585
4	$533,447	$523,580	$9,867	555
5	$549,451	$532,403	$17,047	530
6	$565,934	$541,563	$24,371	506
7	$582,912	$551,070	$31,842	481
8	$600,399	$560,934	$39,465	457
9	$618,411	$571,168	$47,243	433
10	$636,964	$581,783	$55,181	428
11	$656,073	$592,791	$63,282	422
12	$675,755	$604,205	$71,550	417
13	$696,027	$616,037	$79,991	412
14	$716,908	$628,301	$88,607	406
15	$738,416	$641,010	$97,405	390
16	$760,568	$654,179	$106,389	374
17	$783,385	$667,822	$115,563	358
18	$806,887	$681,955	$124,932	342
19	$831,093	$696,592	$134,502	326
20	$856,026	$711,749	$144,277	320
21	$881,707	$727,444	$154,263	314
22	$908,158	$743,693	$164,465	308
23	$935,403	$760,515	$174,888	302
24	$963,465	$777,926	$185,539	297

Year	Grid Procurement Cost, $	Solar PPA Procurement, $	Annual PPA Savings / (Cost), $	Emission Savings, MT CO_2
25	$992,369	$795,945	$196,423	291

The proposed solar PPA is projected to reduce cumulative nominal electricity procurement costs by approximately **$2,114,994** over the 25-year analysis period. The NPV analysis indicates an estimated **$653,871 reduction** in lifecycle cost relative to continued grid procurement.

West Springfield High School

System Size	Year 1 PV Output, kWh	Offered PPA Rate, $/kWh	25-yr Grid Cost, $	25-yr PPA Cost, $	25-yr Savings, $
1,150 kWdc	1,553,901 kWh	$0.1343	$14,306,748	$13,070,714	$1,236,033

The table below presents the annual nominal cash flow analysis for the proposed PPA. The PPA column includes the remaining grid purchases after solar generation, plus PPA payments, less any export credit. All costs and savings are shown in nominal dollars and do not reflect discounting.

Year	Grid Procurement Cost, $	Solar PPA Procurement, $	Annual PPA Savings / (Cost), $	Emission Savings, MT CO_2
1	$392,404	$420,640	($28,236)	572
2	$404,176	$426,884	($22,709)	545
3	$416,301	$433,376	($17,075)	518
4	$428,790	$440,122	($11,332)	491
5	$441,654	$447,131	($5,477)	469
6	$454,903	$454,411	$493	447
7	$468,550	$461,970	$6,580	426
8	$482,607	$469,819	$12,788	405
9	$497,085	$477,964	$19,121	384
10	$511,998	$486,417	$25,580	379
11	$527,358	$495,187	$32,171	374
12	$543,178	$504,283	$38,895	369
13	$559,474	$513,717	$45,757	364
14	$576,258	$523,498	$52,759	359
15	$593,546	$533,639	$59,907	345
16	$611,352	$544,149	$67,203	331
17	$629,693	$555,042	$74,651	317
18	$648,583	$566,328	$82,255	303
19	$668,041	$578,021	$90,020	289
20	$688,082	$590,133	$97,949	283
21	$708,725	$602,678	$106,046	278
22	$729,986	$615,670	$114,317	273
23	$751,886	$629,121	$122,764	268
24	$774,443	$643,048	$131,394	262
25	$797,676	$657,466	$140,210	257

The proposed solar PPA is projected to reduce cumulative nominal electricity procurement costs by approximately **$1,236,033** over the 25-year analysis period. The NPV analysis indicates an estimated **$306,262 reduction** in lifecycle cost relative to continued grid procurement.

Woodson High School

System Size	Year 1 PV Output, kWh	Offered PPA Rate, $/kWh	25-yr Grid Cost, $	25-yr PPA Cost, $	25-yr Savings, $
582 kWdc	794,104 kWh	$0.1453	$23,846,830	$23,096,222	$750,608

The table below presents the annual nominal cash flow analysis for the proposed PPA. The PPA column includes the remaining grid purchases after solar generation, plus PPA payments, less any export credit. All costs and savings are shown in nominal dollars and do not reflect discounting.

Year	Grid Procurement Cost, $	Solar PPA Procurement, $	Annual PPA Savings / (Cost), $	Emission Savings, MT CO_2
1	$654,068	$667,708	($13,640)	292
2	$673,690	$684,225	($10,535)	279
3	$693,901	$701,270	($7,370)	265
4	$714,718	$718,861	($4,143)	251
5	$736,159	$737,012	($853)	240
6	$758,244	$755,742	$2,501	229
7	$780,991	$775,069	$5,922	218
8	$804,421	$795,009	$9,412	207
9	$828,553	$815,582	$12,971	196
10	$853,410	$836,808	$16,602	194
11	$879,012	$858,705	$20,307	191
12	$905,383	$881,295	$24,087	189
13	$932,544	$904,599	$27,945	186
14	$960,521	$928,638	$31,883	184
15	$989,336	$953,434	$35,902	176
16	$1,019,016	$979,011	$40,005	169
17	$1,049,587	$1,005,393	$44,194	162
18	$1,081,074	$1,032,603	$48,471	155
19	$1,113,507	$1,060,668	$52,838	147
20	$1,146,912	$1,089,613	$57,298	145
21	$1,181,319	$1,119,466	$61,854	142
22	$1,216,759	$1,150,252	$66,506	139
23	$1,253,261	$1,182,002	$71,259	137
24	$1,290,859	$1,214,745	$76,114	134
25	$1,329,585	$1,248,510	$81,075	132

The proposed solar PPA is projected to reduce cumulative nominal electricity procurement costs by approximately **$750,608** over the 25-year analysis period. The NPV analysis indicates an estimated **$198,135 reduction** in lifecycle cost relative to continued grid procurement.

3. Sun Tribe Proposal Review and Decision Conditions

The proposal states that FCPS has zero upfront capital cost under the PPA, the rooftop lease is $1 per year, operations and maintenance are included for the PPA term, utility grid-upgrade costs are excluded except for a power-quality meter, DynaTred Max is assumed under racking on gravel roofs, and FCPS retains renewable energy credits.

Retention of RECs allows FCPS to claim the environmental attributes of the solar generation for sustainability reporting, renewable energy tracking, and progress toward organizational emissions-reduction goals.

Items to confirm before due diligence

- Final PPA price and 0% annual escalation for each site.
- Production guarantee, degradation convention, underperformance remedies, and measurement and verification.
- Responsibility for interconnection studies, utility upgrades, power-quality metering, and schedule impacts.
- Roof condition, structural capacity, roof warranty coordination, roof replacement coordination, access restrictions during school operations, temporary panel removal and reinstallation obligations, insurance, indemnity, termination, buyout, assignment rights, and end-of-term obligations.
- For ownership, incentive eligibility, financing, lifecycle O&M, inverter replacement, insurance, taxes, and residual value.

Limitations

- Monthly data cannot capture hourly solar coincidence and may overstate onsite use during some hours.
- The analysis includes marginal energy value only and does not claim demand-charge savings.
- Marginal rates are based on modeled rate-schedule treatment and may change with future tariffs or usage patterns.
- Export credit is modeled at $0/kWh.
- As per the information provided by FCPS, exported solar generation was not assigned any financial value; only self-consumed solar generation was included in the cost savings analysis.
- Ownership excludes financing, incentives, taxes, insurance, major equipment replacement, and residual value.

4. Sensitivity Analysis (NPV Metric)

The sensitivity analysis tests whether each proposed PPA is financially favorable under utility-rate escalation assumptions ranging from 0% to 6% per year. All other assumptions, including the offered PPA prices, 0% PPA escalation, 0.5% annual solar degradation, 7% discount rate, and $0/kWh export credit, remain unchanged.

School-Level PPA Favorability by Utility-Rate Escalation

School	0%	1%	2%	3%	4%	5%	6%
Bonnie Brae Elementary School	Not favorable	Not favorable	Not favorable	Not favorable	Favorable	Favorable	Favorable
Brookfield Elementary School	Not favorable	Not favorable	Not favorable	Favorable	Favorable	Favorable	Favorable
Dranesville Elementary School	Not favorable	Not favorable	Not favorable	Favorable	Favorable	Favorable	Favorable
Belle View Elementary School	Not favorable	Not favorable	Not favorable	Not favorable	Favorable	Favorable	Favorable
Kent Gardens Elementary School	Not favorable	Not favorable	Not favorable	Not favorable	Favorable	Favorable	Favorable
McNair Upper Elementary School	Not favorable	Not favorable	Not favorable	Not favorable	Favorable	Favorable	Favorable
Stone Middle School	Not favorable	Not favorable	Not favorable	Not favorable	Favorable	Favorable	Favorable
Falls Church High School	Not favorable	Favorable	Favorable	Favorable	Favorable	Favorable	Favorable
West Springfield High School	Not favorable	Not favorable	Favorable	Favorable	Favorable	Favorable	Favorable
Woodson High School	Not favorable	Not favorable	Favorable	Favorable	Favorable	Favorable	Favorable

Sensitivity conclusions. At the base-case utility-rate escalation of 3%, five PPAs produce positive NPV savings and five result in negative NPV savings, consistent with the school-level recommendations presented in the report. At 4% escalation or higher, all ten PPAs are favorable under the modeled assumptions.

Falls Church High School remains favorable at 1% escalation, while West Springfield High School and Woodson High School become favorable at 2%. Brookfield Elementary School and Dranesville Elementary School become favorable at 3%. Bonnie Brae Elementary School, Belle View Elementary School, Kent Gardens Elementary School, McNair Upper Elementary School, and Stone Middle School require at least 4% escalation to become favorable. These results show that the PPA conclusions are sensitive to future utility-rate growth, particularly for schools near the breakeven point.

5. Energy Benchmarking and Efficiency Opportunities

Benchmark comparison. The ENERGY STAR reference provided for K-12 schools shows a median site EUI of 48.5 kBtu/sf (EnergyStar Portfolio Manager – 2024 published value for K-12 school). The comparison below uses that benchmark as a screening reference. EUI alone does not identify the specific cause of higher energy use, so the recommended measures should be confirmed through a targeted site assessment.

School	Site EUI	Variance	LED Status	Screening Recommendation
Bonnie Brae Elementary School	51.2	6% above	No	Evaluate LED retrofit and controls upgrade opportunities.
Brookfield Elementary School	24.6	49% below	No	Evaluate LED retrofit when fixtures are due for replacement; current EUI is well below the benchmark.
Dranesville Elementary School	49.5	2% above	No	Evaluate LED retrofit and controls upgrade opportunities.
Belle View Elementary School	38.6	20% below	No	Evaluate LED retrofit and controls; confirm economics through a lighting survey.
Kent Gardens Elementary School	77.2	59% above	No	Prioritize LED retrofit and broader efficiency assessment in parallel with PPA due diligence.
McNair Upper Elementary School	32.8	32% below	Verify	Verify the extent of prior LED work and focus on remaining lighting, controls, and HVAC opportunities.
Stone Middle School	30.4	37% below	No	Evaluate energy efficiency opportunities; current PPA economics are not favorable.
Falls Church High School	50.9	5% above	Partial LED	Confirm remaining non-LED areas and complete cost-effective lighting and controls upgrades.
West Springfield High School	45.7	6% below	Partial LED	Confirm remaining non-LED areas and complete cost-effective lighting and controls upgrades.
Woodson High School	72.1	49% above	Partial LED	Complete the LED assessment and evaluate HVAC and controls through a targeted site assessment.

Interpretation. Kent Gardens Elementary School and Woodson High School have the highest reported EUIs in the group and are materially above the ENERGY STAR K-12 benchmark. Bonnie Brae Elementary School, Dranesville Elementary School, and Falls Church High School are modestly above the benchmark. The remaining schools are at or below the benchmark. While higher EUI values may indicate opportunities for improved efficiency, benchmarking alone does not determine whether energy efficiency investments should be prioritized over solar or other capital projects. Additional site-level assessment would be required to identify specific measures and evaluate their costs and benefits.

Recommended approach. The benchmarking results can be used to identify schools that may benefit from additional energy efficiency evaluation. Potential opportunities may include lighting upgrades, controls optimization, HVAC scheduling improvements, building automation system enhancements, ventilation optimization, variable-frequency drives, equipment replacement, and selected building envelope improvements. Any identified measures should be evaluated based on site conditions, expected energy savings, implementation costs, available incentives, operational requirements, and lifecycle economics. Energy efficiency assessments may be conducted independently or in parallel with solar PPA evaluation and due diligence activities, as the benchmarking analysis does not establish a direct economic comparison between energy efficiency measures and the proposed solar projects.

Other measures. In addition to lighting, a targeted assessment should consider HVAC scheduling, building automation controls, economizer operation, setpoints, ventilation, variable-frequency drives, equipment replacement, and selected building-envelope improvements. The assessment should compare installed cost, annual savings, available incentives, simple payback, and lifecycle savings before projects are prioritized.

Conclusion. Energy efficiency and solar can be complementary strategies for reducing energy costs, managing future utility expenditures, and supporting decarbonization goals. The benchmarking results presented in this section identify potential opportunities for further energy efficiency assessment but do not establish the technical or financial viability of any specific measure. Additional site-level analysis would be required to determine the costs, savings, implementation requirements, and financial performance of potential energy efficiency projects. Therefore, the benchmarking results should be considered a high-level screening tool to help prioritize future investigations and capital planning efforts rather than a basis for determining whether a proposed solar PPA should be advanced.

6. Portfolio Conclusion

Under the modeled assumptions, the proposed Sun Tribe Wave 4 portfolio is financially favorable at the portfolio level under both evaluation methods. The nominal cash flow analysis indicates positive cumulative savings at all ten schools and approximately $5.27 million in portfolio-wide savings over the 25-year contract term. Similarly, the portfolio-level NPV analysis indicates approximately $1.12 million in lifecycle savings relative to continued utility procurement. These results suggest that the proposed PPAs can reduce FCPS electricity procurement costs at the portfolio level without requiring upfront capital investment.

While the portfolio-level results are favorable, NPV outcomes vary by school. Five schools, Brookfield Elementary School, Dranesville Elementary School, Falls Church High School, West Springfield High School, and Woodson High School, are financially favorable at the offered PPA rates. The remaining five schools, Bonnie Brae Elementary School, Belle View Elementary School, Kent Gardens Elementary School, McNair Upper Elementary School, and Stone Middle School, generate positive cumulative nominal savings but are not financially favorable on an NPV basis at the offered pricing. Ownership alternatives evaluated for Kent Gardens Elementary School and Stone Middle School are also not financially favorable under the modeled assumptions. FCPS should consider both the nominal cash flow and NPV results when making procurement decisions, while using the school-level NPV analysis to support PPA negotiations and evaluation of alternative pricing structures