

Memo

Date: Monday, June 30, 2025

To: Scientists' Cliffs Association Board of Directors

From: Nathan Macek

Subject: Community House HVAC Operating Cost Estimate

This memorandum transmits the Community House Heating, Ventilation, and Air Conditioning (HVAC) operating cost estimate presented to the Board of Directors at its June 14, 2025 meeting.

This estimate builds on the estimate prepared in February 2024 by community member Peter Cochrane to refine the assumptions and methodology. Key refinements of this estimate include:

- Considers seasonality of HVAC and Comm House usage
 - Greater use of Comm House in summer, less in shoulder months, light usage during winter
 - Greater need to operate HVAC during summer heat and winter cold than during moderate spring and fall weather
 - Greatest HVAC cost in winter, moderate cost in summer, lowest cost in fall, spring
- Accounts for cost of proposed Ruud Heat Pump System
 - 5-ton air handler, 18 SEER heat pump serving 2,400 square foot Community House
 - Minimal use of electric resistance coil auxiliary heat during winter
 - Assumes 10% contingency
- Applies updated energy cost estimate
 - \$0.184 per kWh, based on recent SMECO bills
- Considers potential improvements in building insulation
 - Based on EPA Energy Star estimates, better insulation could result in a 17% cost savings

The analysis finds that without improvements in building roof insulation, the average monthly cost to operate the system during the months of May through October is \$170, and during November through April is \$500, resulting in an estimated average monthly cost of

\$333, or \$4,000 annually. **Without roof insulation improvements, the analysis estimates an annual cost range between \$3,000 and \$5,000 annually (+/- 25% of the base cost estimate).**

EPA Energy Star program estimated savings from improved roof insulation is 17%, resulting in an estimated average monthly cost of \$280, or \$3,330 annually, with a potential range between \$2,500 and \$4,200 annually (+/- 25% of the base cost estimate). **The insulation-related energy cost savings are estimated to range between \$500 and \$800 annually.**

This should be considered a conservative cost estimate because further measures may be undertaken to reduce energy demand during winter months, when operating costs are highest due to cold weather. For example, the building could be closed to activities, maintaining a building temperature of 55 degrees and limiting the need for additional heating. Or, the building could be winterized and closed completely during the coldest months, resulting in minimal energy usage.

In addition, the cost of HVAC operating costs may be offset by including an HVAC surcharge or increasing the base cost of Community House rentals. This would help to cover the cost of HVAC and reflect the value provided to building users. An additional rental cost of, for example, \$50 during the winter and \$25 during the summer would be a modest additional cost relative to existing Community House rental rates, particularly relative to the cost of competing rental facilities in the surrounding area.

Attachments:

- Community House HVAC Cost Estimate
- Presentation to SCA Board of Directors

Scientists' Cliffs HVAC--Community House

Summary--Operating Cost Estimate--Annual

June 30, 2025

(\$ X 1)

		<u>Average Monthly Cost</u>
Cooling: (May - September)	Total	
Heat Pump	441	
Air Handler	363	
Total Cooling	804	161
Heating: (October - April)		
Heat Pump	1,215	
Resistance Coils	994	
Air Handler	599	
Total Heating	2,808	401
Contingency @ 10%	361	
Round to Nearest Hundred \$	27	
Grand Total	4,000	333

Note: 1.

Cost/KWH is based on 2024 SMECO bill for the Community House, and is calculated by dividing the total billed dollars *less \$9.50 fixed monthly facilities charge* by the total billed KWH.

2. This is an Order of Magnitude Estimate, and could fluctuate 25% in either direction (\$3,000 to \$5,000).
3. This estimate is based on Option #3 (two identical units).
4. See Page 4 of 4 for Updated Estimate Details.

Scientists' Cliffs HVAC--Community House
Updated Detail--Operating Cost Estimate--Annual
June 30, 2025
(\$ x 1)

Heat Pump Operation													Air Handler Operation						
Cooling:	Days of Activities		Additional Days Off-Hours	Avg. Hr/Day	Run Time %	Cooling Degree Days	Average Monthly Temperature	Energy Demand as % of Degree	BTU's	Factored BTUs	Total BTU/Mo	Run Time	KW/HR	KWH	Grand Total	Monthly			
	per Month	Operation	(Note 0)													(Note 1)	(Note 1.1)	(Note 1.2)	(Note 2)
Months:	31	12	N/A	8.3	80%	89	68	10%	60,000	5,973	1,232,859	206				\$ 47.87			
May	30	24	N/A	10.8	80%	271	74	30%	60,000	18,188	4,714,309	259				\$ 183.04			
June	31	30	N/A	11.8	80%	408	79	46%	60,000	27,383	8,017,611	293				\$ 311.29			
July	31	24	N/A	10.6	80%	360	77	40%	60,000	24,161	6,378,523	264				\$ 247.65			
August	30	12	N/A	8.4	80%	180	71	20%	60,000	12,081	2,435,436	202				\$ 94.56			
September	Total Cooling BTU/Hr											22,778,738	1,224	0.805	985				
SEER (BTU/Watt)											19								
Cooling Watt Hours											1,198,881								
Total Cooling KWH											1,199								
\$/KWH (Note #12)											\$0.18						\$0.18		
Number of Operating Units											2						2		
Annual Cooling Operating Cost											\$441						\$363	\$ 804	\$ 176.88

Heat Pump Operation													Coil Operation			Air Handler Operation						
Heating:	Days of Activities		Additional Days Off-Hours	Avg. Hr/Day	Run Time %	Heating Degree Days	Average Monthly Temperature	Energy Demand as % of Degree	BTU's	Factored BTUs	Total BTU/Mo	# Days Below 20 Degrees	Hours per Month Below 20	KW/Hr	Total KWH	Run Time	KW/HR	KWH	Grand Total	Monthly		
	per Month	Operation	(Note 5.1)																	(Note 5.2)	(Note 6)	(Note 6.1)
Months:	31	12	3.3	9.0	80%	214	58	24%	60,000	14,362	3,191,373	-	-	15	-	278				\$ 92.29		
October	30	8	7.1	9.0	80%	462	50	52%	60,000	31,007	6,713,478	1	12	15	180	271				\$ 267.04		
November	31	8	11.4	9.8	80%	744	41	83%	60,000	49,933	12,090,826	4	48	15	720	303				\$ 641.23		
December	31	8	13.8	10.2	80%	894	36	100%	60,000	60,000	15,193,108	5	60	15	900	317				\$ 803.83		
January	28	8	11.5	10.2	80%	750	38	84%	60,000	50,336	11,485,803	4	48	15	720	285				\$ 623.73		
February	31	8	9.3	9.3	80%	605	45	68%	60,000	40,604	9,415,137	1	12	15	180	290				\$ 345.17		
March	30	12	4.7	9.3	80%	308	55	34%	60,000	20,671	4,637,459	-	-	15	-	280				\$ 134.11		
April	Total Heating BTU/Hr											62,727,184			2,700	2,024	0.805	1629				
SEER (BTU/Watt)											19											
Heat Pump Watt Hours											3,301,431											
Total Heat Pump KWH											3,301											
\$/KWH (Note #12)											\$0.18						\$0.18	\$0.18				
Number of Operating Units											2						2	2				
Annual Heating Operating Cost											\$1,215						\$994	\$599	\$ 2,808	\$ 441.26		
Subtotal Annual Operating Cost																					\$ 3,612	\$ 331.10
Contingency @ 10%																					\$ 361	10%
Round to Nearest Hundred \$																					\$ 27	
Total Annual Operating Cost																					\$ 4,000	\$ 333.33

Notes:

0. Average Cooling Hours per Day is a monthly average based on 12 hour run time on days when Comm House has activities and 6 hours on days when Comm House is closed (thermostat set to higher temperature)
 1. Run Time % for Cooling assumes % of each hour of operation the heat pump is running
- 1.1 Average Cooling Degree Days by Month for Patuxent River NAS (Source: <https://www.climate-charts.com/USA-Stations/MD/USW00013721.html>)
- 1.2 Factored BTUs are BTUs demanded per hour for each month are prorated based on (degree days) / (maximum degree days)
 2. Total BTU/Mo = (Days * Average Hr/Day * Run Time % * Factored BTU's)
 3. Run Time = (Days * Hr/Day * Run Time %)
 4. KW/HR = (3.5 Amps * 230 Volts)/1,000 (amps and volts provided by the Product Data Manual found in the internet for air handler #TAM9A0C60V51DB).
 5. KWH = Run Time * KW/HR
- 5.1 Prorated number of days per month HVAC must run during off-peak hours as an inverse function of Average Monthly Temperature
- 5.2 Average Heating Hours per Day is a monthly average based on 12 hour run time on days when Comm House has activities and 6 hours on days when Comm House is closed (thermostat set to lower temperature)
\\==> PLUS 6 hour average run time on days requiring additional hours operation due to cold weather
 6. Run Time % for Heating assumes % of each hour of operation the heat pump is running
- 6.1 Average Heating Degree Days by Month for Patuxent River NAS (Source: <https://www.climate-charts.com/USA-Stations/MD/USW00013721.html>)
- 6.2 Factored BTUs are BTUs demanded per hour for each month are prorated based on (degree days) / (maximum degree days)
 7. Total BTU/Mo = (Days * Average Hr/Day * Run Time % * Factored BTU's)
- 7.1 Washington, DC Metropolitan Area averages 15 days below 20 degrees F per year, which are assumed to be distributed over winter months
- 7.2 Total hours in month that coil is operating, assuming coil operates 12 hours per day for any day with temperature below 20 degrees F
 8. Total KWH = (Hours/Month Below 20 Degrees * KW/Hr)
 9. Run Time = (Days * Hr/Day)
10. All Days, Hr/Day, Run Time %, Heat Pump % vs. Coil % are OOM (Order Of Magnitude) estimates. This estimate could fluctuate by 25% in either direction.
11. Heat Pump BTUs are calculated at 12,000 BTU/TON.
12. Cost/KWH is based on 2024 SMECO bill for the Community House, which was for 204 KWH at a cost of \$47.37, less \$9.50 fixed facilities charge. It is calculated by dividing the variable amount billed by the total billed KWH.
13. This estimate (including BTU's, KW/Hr, SEER) is based on Option #3 dated 8/21/2023 (Assured Comfort Services Estimate #780, which is for two identical 5 ton Heat Pumps with Resistance Coil Backup heat).
14. There is no date shown for the estimate to expire. Before asking the Board of Directors for funding, it needs to be confirmed as valid with Assured Comfort Svs.
15. Numbers shown in reverse video may be revised by the user .

Community House HVAC Operating Cost Estimate

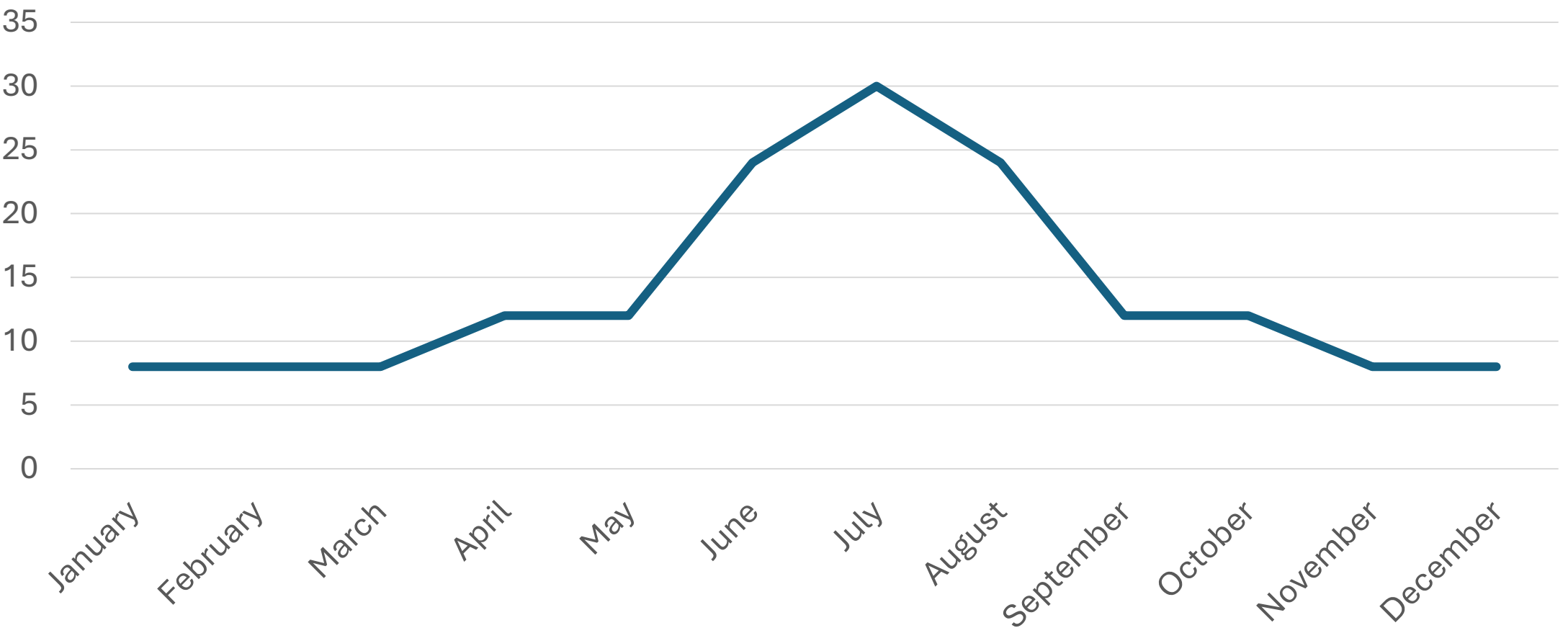
Presentation to Scientists' Cliffs Association Board of Directors

June 14, 2025

Updated HVAC Operating Cost Estimate

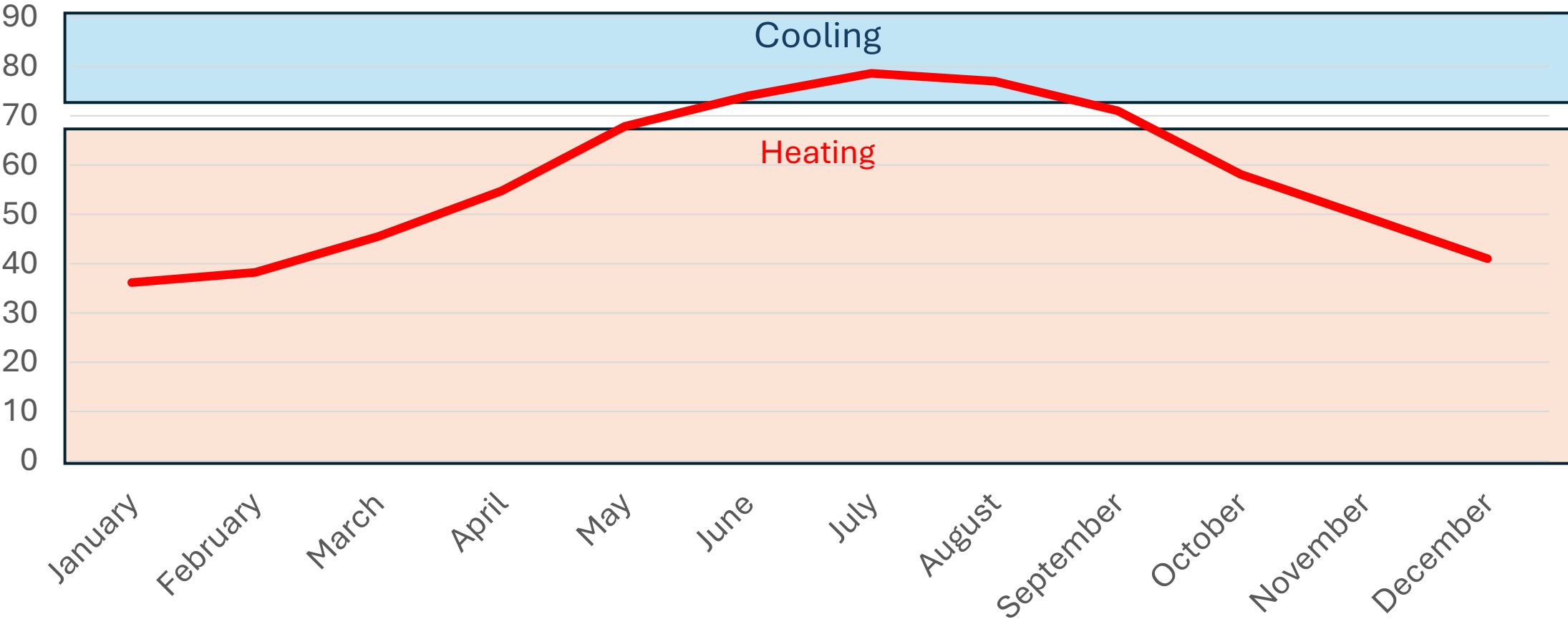
- Considers seasonality of HVAC and Comm House usage
 - Greater use of Comm House in summer, shoulder months
 - Greater HVAC usage during height of summer and depth of winter
 - Greatest HVAC cost in winter, moderate cost in summer, lowest cost in fall, spring
- Accounts for cost of proposed Ruud Heat Pump System
 - 5-ton air handler, 18 SEER heat pump
 - Minimal use of electric resistance coil auxiliary heat during winter
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 - Based on EPA Energy Star estimates, better insulation could result in a 17% cost savings

Assumed Comm House Activity Days



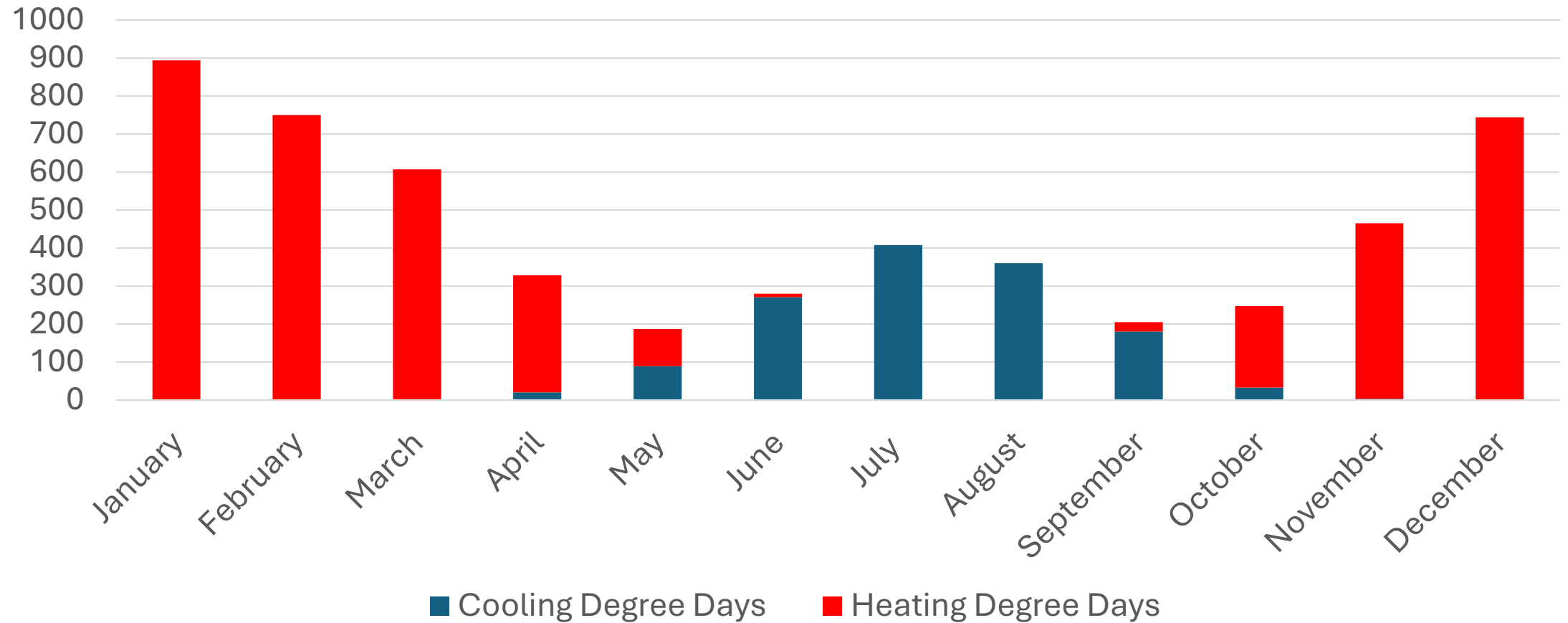
Average Monthly Temperature

Patuxent River NAS Weather Station

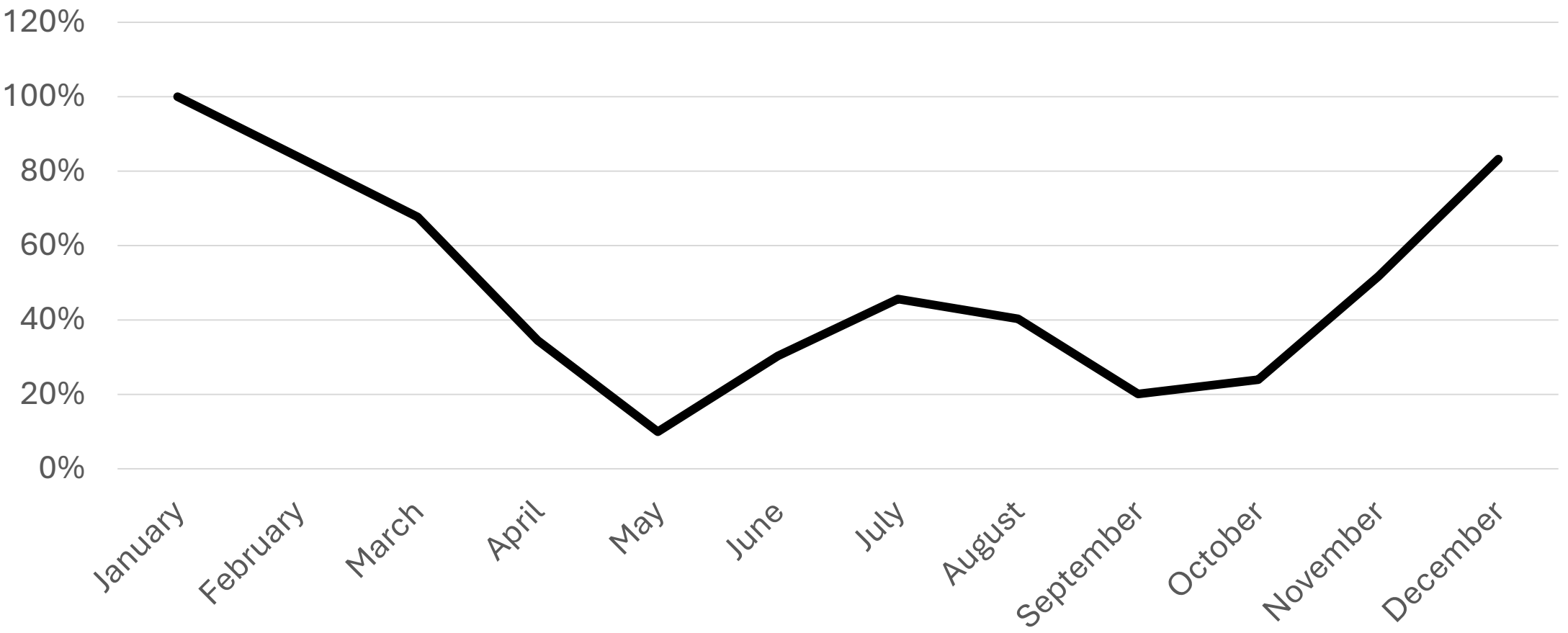


Average Monthly Heating & Cooling Degree Days

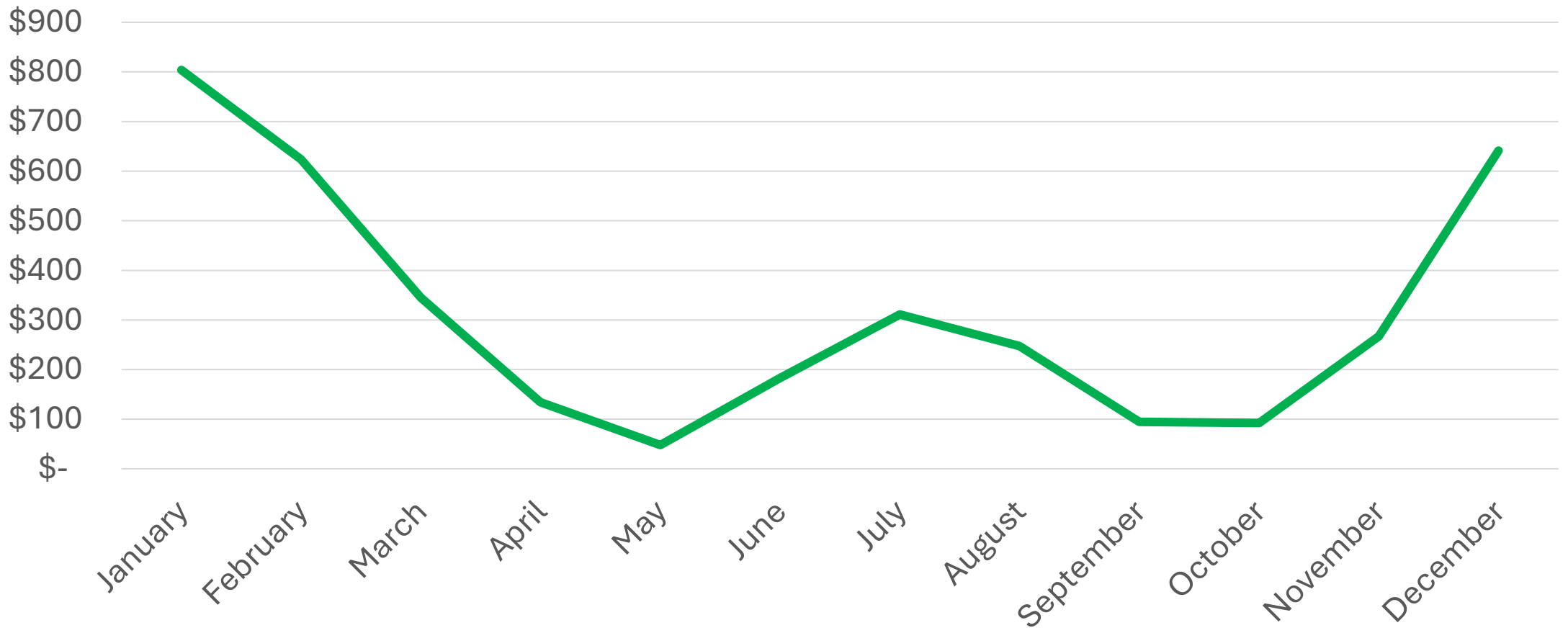
Patuxent River NAS Weather Station



Average Monthly Energy Demand



Average Monthly Energy Cost



Estimated Operating Cost – No Insulation

Timeframe	Cost	Average Monthly Cost
May-October	\$1,000	\$167
November-April	\$3,000	\$500
Annual	\$4,000	\$333

Cost may range between \$3,000 and \$5,000 annually (+/- 25%)

- Potential range in average monthly cost of \$250 to \$420

Estimated Operating Cost – With Roof Insulation

Timeframe	Cost	Average Monthly Cost
May-October	\$840	\$140
November-April	\$2,490	\$415
Annual	\$3,330	\$280

EPA Energy Star estimated energy savings from roof insulation is 17%

Cost may range between \$2,500 and \$4,200 annually (+/- 25%)

- Potential range in average monthly cost of \$210 to \$350

Represents annual savings of \$500 to \$800 compared to no insulation

Other Considerations

- HVAC O&M Cost Range
 - \$3,000 to \$5,000 annually without roof insulation
 - \$2,500 to \$4,200 annually with roof insulation
 - Insulation-related savings of \$500 to \$800 annually
- Comm House Rental HVAC Surcharge
 - Comm house rental surcharge of \$25 in summer and \$50 in winter could recover a large portion of HVAC O&M costs
 - Surcharge reflects the value that HVAC provides users
 - Modest additional cost relative to existing Comm House rental rates and cost of competing rental facilities