York District Schools
PV System
Performance Analysis Rev 1.0

Prepared

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Contact information

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Executive Summary

As part of Boxbrite's services we offer analysis of historical performance and then offer recommendations based on our experience. Also since we exclusively provide a monitoring service we are then well positioned to provide independent and objective advice to customers. Our goal is to provide advice that maximizes the customer's ROI over the long term.

We often use public portals to systems and ingest our data into our custom analytics platform to identify historical and current problems. For this report we've located the public portals listed in the YCDSB 2024-2029 Energy Conservation and Demand Management Plan. The links to those portals are included as hyperlinks below. We've also used our analytic platform and experience to estimate the losses for each of the systems. Given the age of the systems and our experience these problems are common without dedicated monitoring and regular maintenance.

A brief summary of each system is listed below with the remainder of the document outline systems and issues.

- Cardinal Carter C.H.S. - Although the data logger continues to report the inverter hasn't since Feb 2021 which if correct represent approximately $27,200 in lost revenue.
- Father Michael McGivney - This 10kW single inverter system appears to have stopped producing in July 2022 with potential losses of $15,000.
- Jersey Public School - Keswick - This 10kW single inverter system appears to have failed in August 2022 and a number of years of underperformance with potential losses of $45,000.
- Our Lady of the Lake C.H.S. - This 24kW two inverter system has problems dating back to 2017. The systems hasn't been reporting since May 2024th and potential losses are $20,000 to $30,000
- Our Lady Queen of the World Catholic Academy MicroFIT - This 6.75kW appears to have lost 50% of production on April 8th 2023 with losses of approximately $5,000.
- Our Lady Queen of the World Catholic Academy FIT System. This 216kW 6 inverter system was installed in 2017 and likely isn't owned by YDCSB.

Communications with inverters were lost in March 24th but Paycheck data is indicating that one inverter is likely down with a second one not producing some days. Losses are potentially $15,600.

- St . Maximilian Kolbe C.H.S. - This is a 5kW single inverter system that was working well until the spring of 2024. Repeated startup problems since then with estimated losses of $3,500 since then.

- St. Monica - C.E.S. - This single 35kW system has been performing consistently since 2012 with some reporting errors in 2019 and 2020. However, the overall performance appears to be 25% to 30% below what a system of that size should be producing.

- St Gregory the Great CA - This system is listed as 24kW and has two 12 kW inverters. However, the one inverter potentially hasn't produced since May 4th 2016th. The last values from the inverter on the portal are showing the inverter in error with a lifetime production of only 3,900kW. If the inverter has been down the losses would likely be $80,000 to $100,000. The second inverter stopped reporting in March 2024.

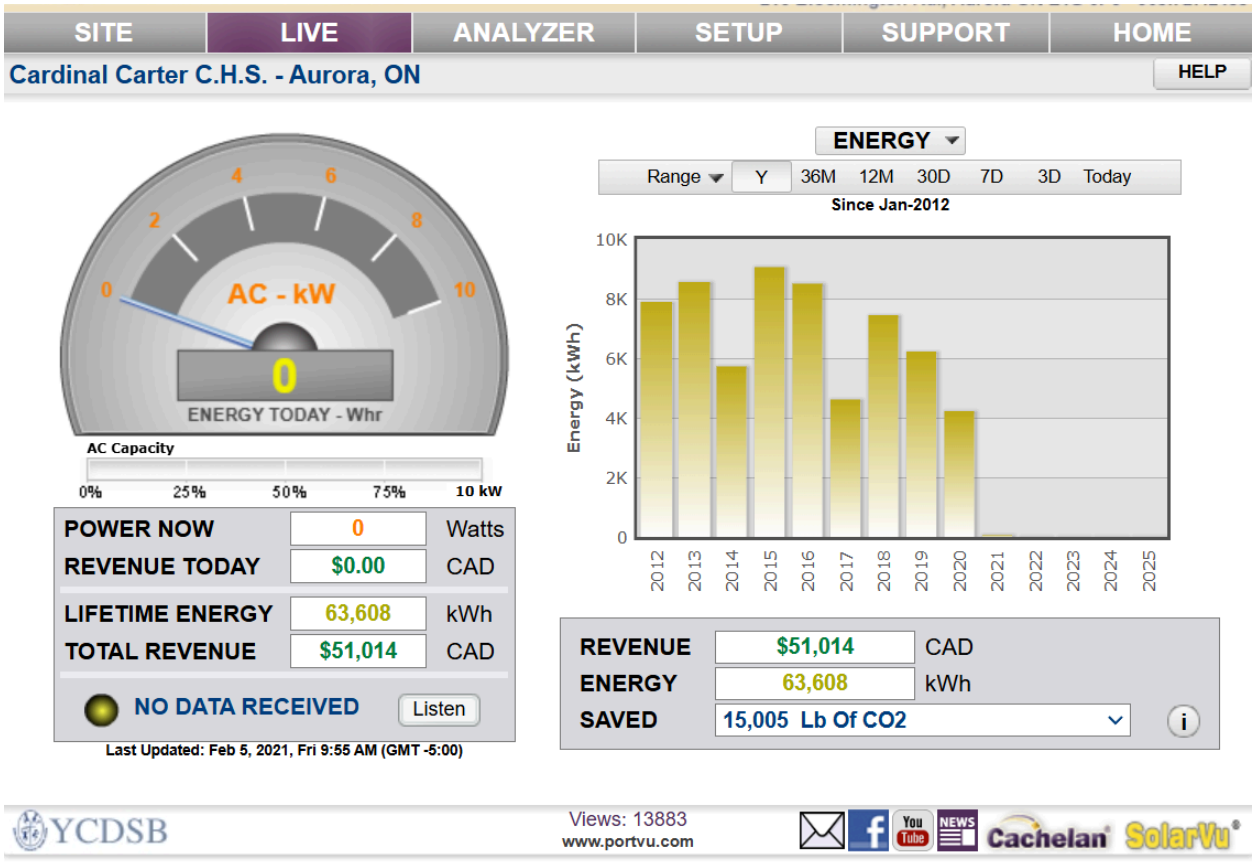
- Sutton Public School - This 3.15kW system is currently producing well but has experienced long periods without producing such as Oct 6, 2023 to April 10th 2024.

In addition to this report a sample monthly report for May 2024 can be found here. We prepare these reports monthly for our customers, in addition to providing daily monitoring to catch new problems as they develop.

Cardinal Carter C.H.S.

The inverter on this 10kW system stopped reporting on Feb 5, 2021 at which point it was reporting a ground fault. The gateway though is continuing to communicate. There are indications that it was failing prior to this point. Lifetime production shows the inverter was down between Feb 12, 2020 and July 2nd 2020.

Assuming the inverter remains down, losses would be approximately $6,800/year potentially now $27,200 over the last four years.



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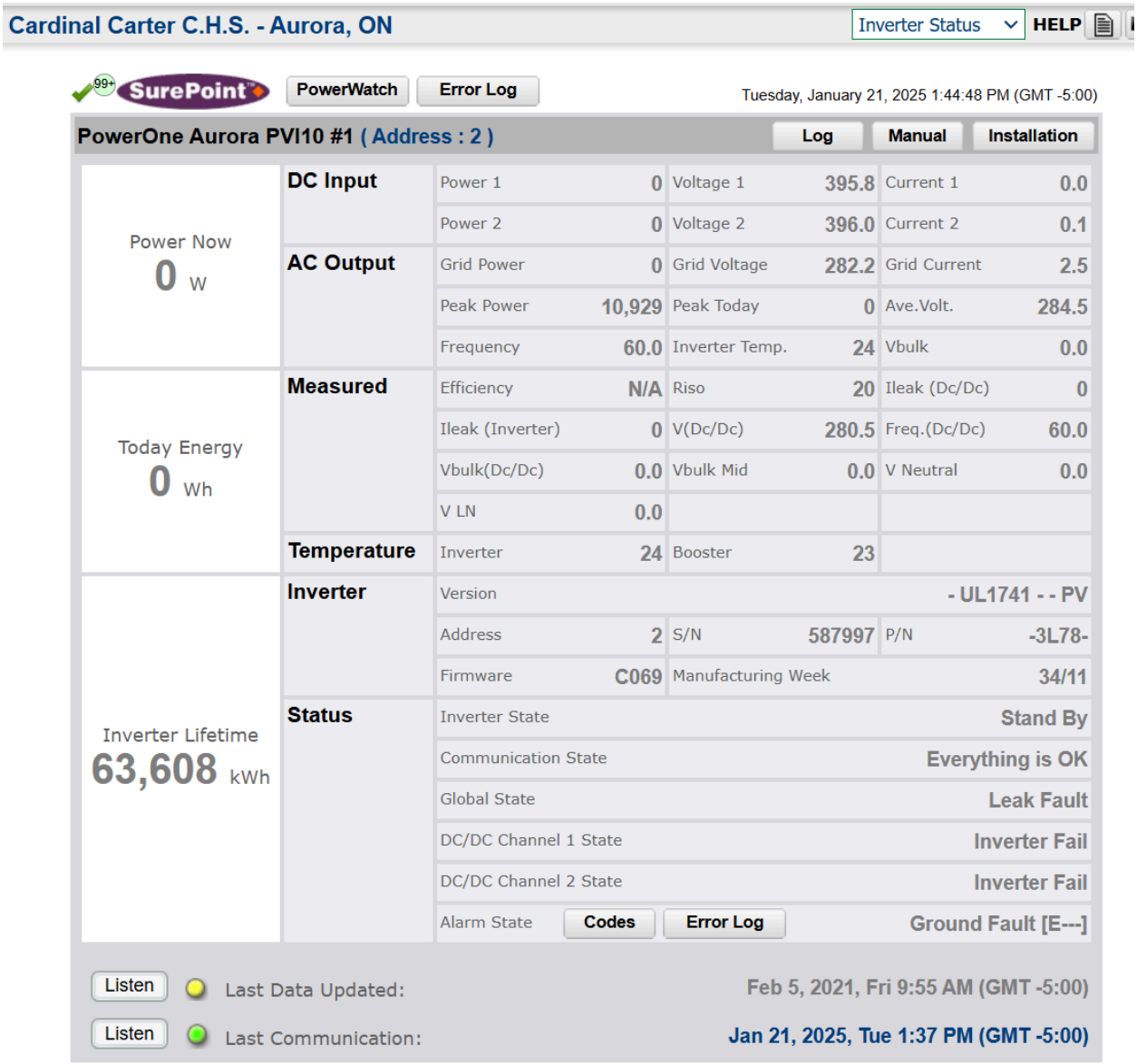
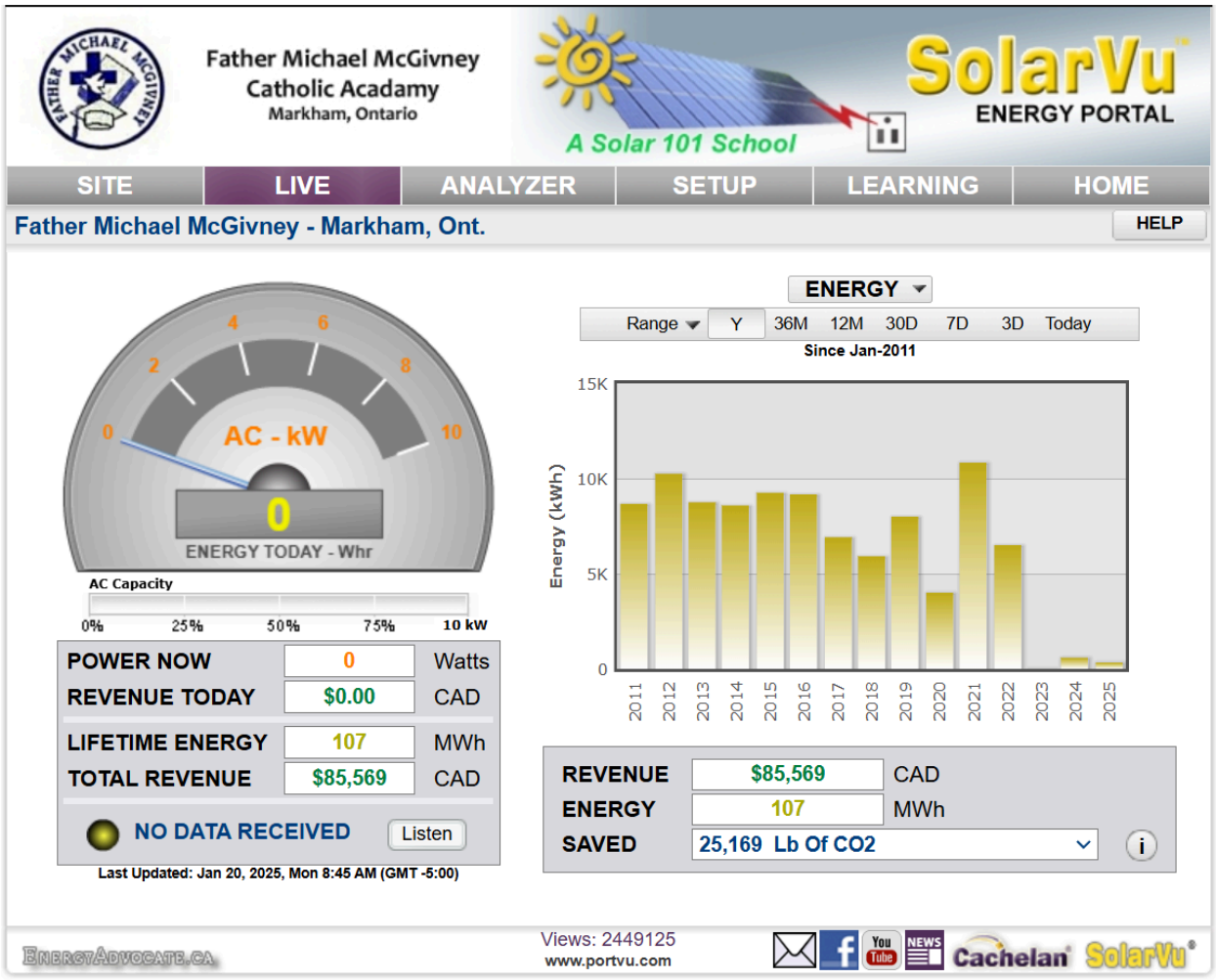


Father Michael McGivney

This 10kW system appears to have stopped producing on July 25th 2022 based on the lifetime inverter readings reported late in 2024 and early 2025. In late 2024 there are small amounts of production. There were previous large gaps in

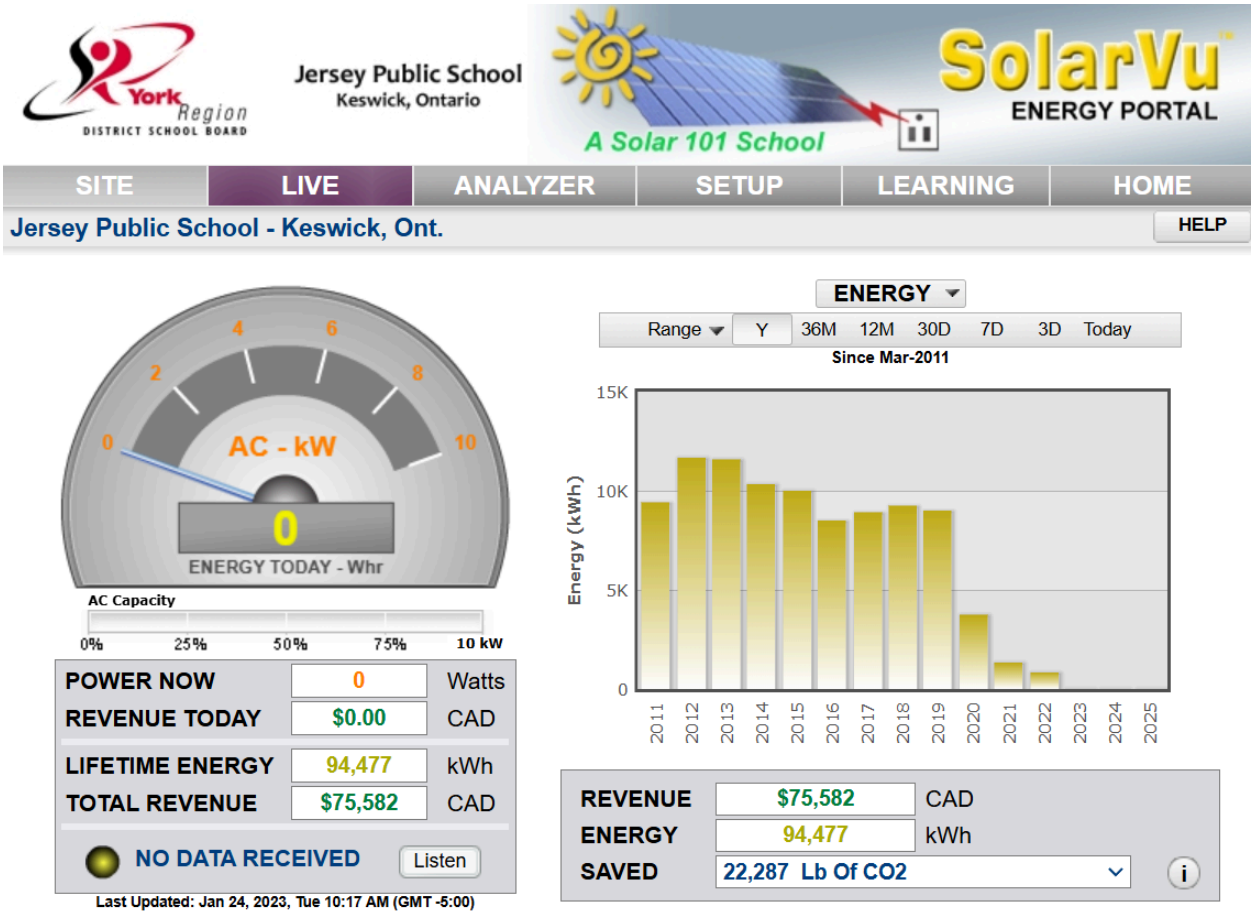
communications but the system was producing during those periods. Losses since that period would be approximately $15,000.



Drop in production may be due to apparent ground faults starting as early as 2011

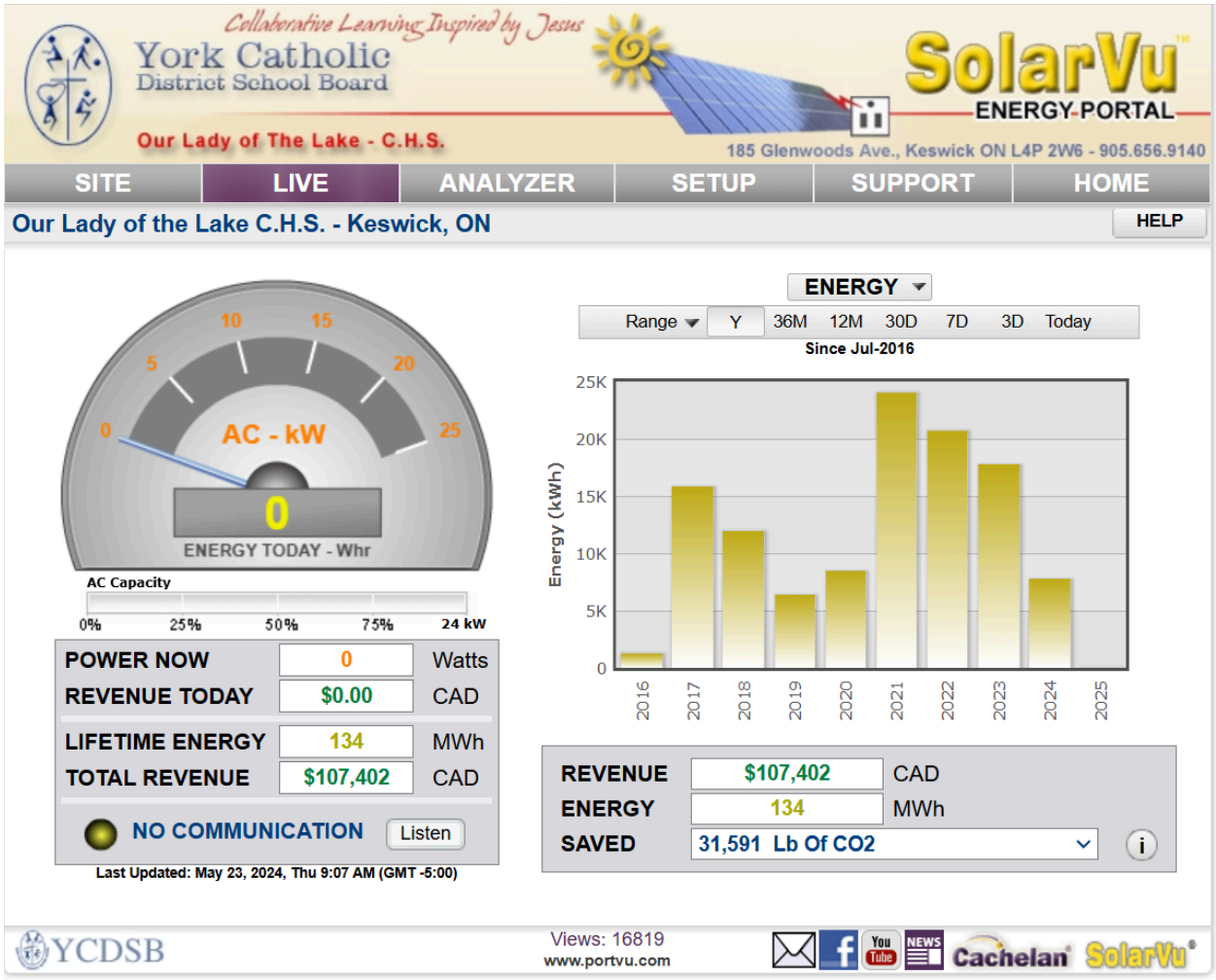
Jersey Public School - Keswick

This is a 10kW single inverter system that starts to develop underperformance problems as early as 2016. The production profile shows drops in production in the afternoon particularly in warmer weather. This program becomes quite significant in 2019 and 2020 with production dropping substantially. The problem could be as simple as a failed fan and the inverter appears to have failed completely in August 2022. Assuming the system is still down at this point. Losses are likely in excess of $45,000 at this point.



Our Lady of the Lake C.H.S.

This 24kW two inverter system has problems going back to 2017. The system stops reporting May 2024. Difficult to determine total losses due to replacement inverter and not knowing current status but historical losses of $20,000 to $30,000 are likely.



Inverter #1 has startup problems beginning in the spring 2017. Then stops producing on July 9th 2017. Restarts on July 30th, 2020 but at that point won't go past 6.4kW. Based on inverter stats appears to be a replacement inverter so may have been producing for a period of time prior to that.

Last readings from May 2024 would appear to indicate that all strings perhaps feeding into MPPT1 which would explain why it would clip at 6,400. Inverter 1 matches Inverter #2 until it reaches that power level. Possible this has led to inverter failing.

SurePoint | PowerWatch | Error Log | Tuesday, January 21, 2025 3:04:14 PM (GMT -5:00)

PowerOne Aurora PVI12 #1 (Address : 2) | Log | Manual | Installation

Power Now: 6,153 W

Today Energy: 8,029 Wh

Inverter Lifetime: 52,583 kWh

DC Input	Power 1	6,331	Voltage 1	250.4	Current 1	25.1
	Power 2	0	Voltage 2	19.9	Current 2	0.0
AC Output	Grid Power	6,153	Grid Voltage	279.5	Grid Current	7.4
	Peak Power	6,805	Peak Today	6,130	Ave.Volt.	279.6
	Frequency	60.0	Inverter Temp.	55	Vbulk	748.4
Measured	Efficiency	97%	Riso	20	Ileak (Dc/Dc)	0
	Ileak (Inverter)	0	V(Dc/Dc)	278.6	Freq.(Dc/Dc)	60.0
	Vbulk(Dc/Dc)	751.8	Vbulk Mid	379.4	V Neutral	0.0
	V LN	0.0				
Temperature	Inverter	55	Booster	46		
Inverter	Version					- UL1741 - - PV
	Address	2	S/N	500148	P/N	-3L78-
	Firmware	C21E	Manufacturing Week			43/19
Status	Inverter State					Run
	Communication State					Everything is OK
	Global State					Run
	DC/DC Channel 1 State					MPPT
	DC/DC Channel 2 State					Input Low
	Alarm State	Codes	Error Log			No Alarm

Listen | Last Data Updated: May 23, 2024, Thu 9:07 AM (GMT -5:00)

Listen | No Communication Since: May 23, 2024, Thu 9:07 AM (GMT -5:00)

Only MPPT1 appears to have any strings connected. Unlikely at 9:00AM in May that the panels don't have enough indirect sunlight to be showing voltage

PowerOne Aurora PVI12 #2 (Address : 3) | Log | Manual | Installation

Power Now: 6,237 W

Today Energy: 6,363 Wh

Inverter Lifetime: 79,040 kWh

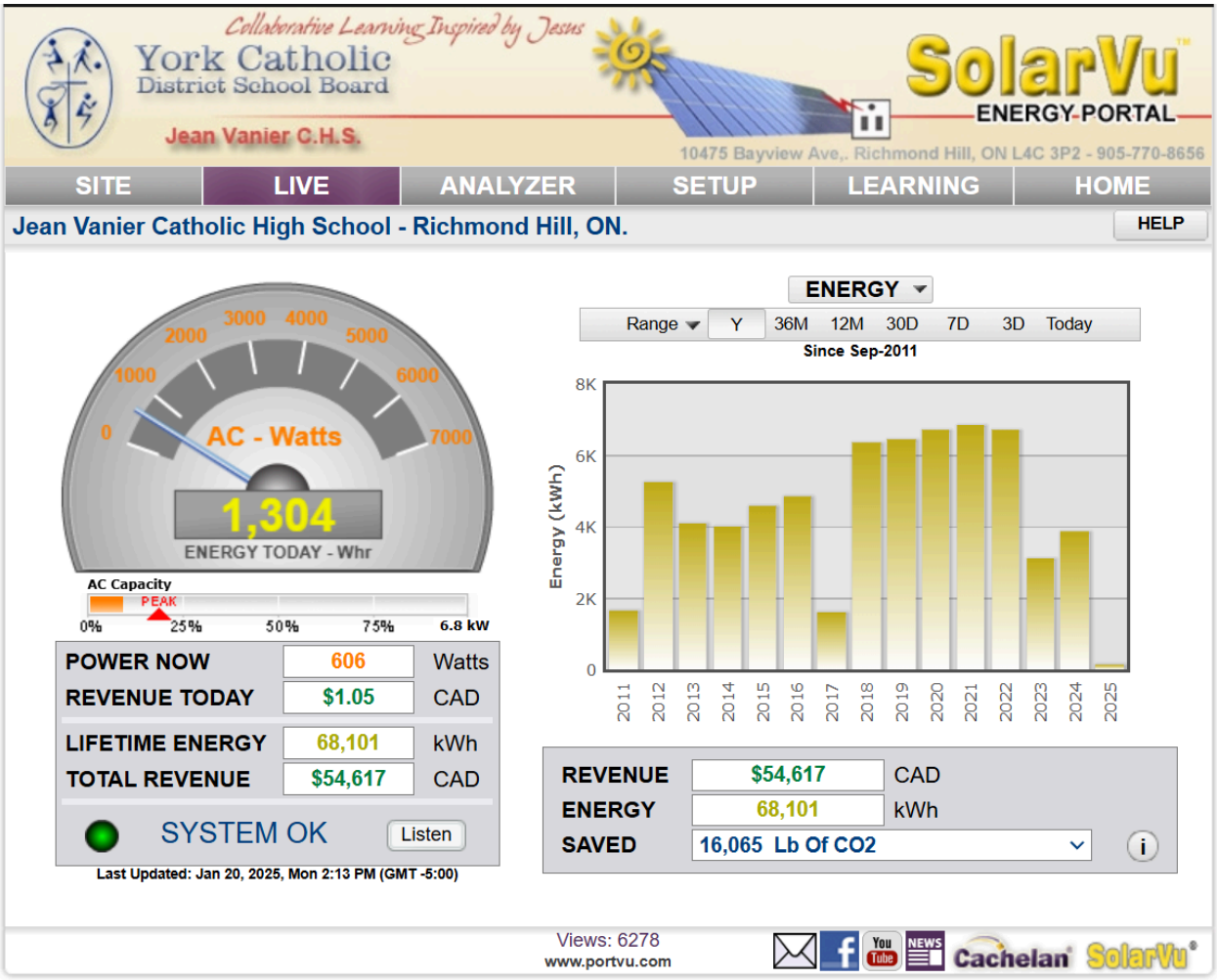
DC Input	Power 1	6,408	Voltage 1	256.7	Current 1	25.4
	Power 2	1	Voltage 2	256.0	Current 2	0.0
AC Output	Grid Power	6,237	Grid Voltage	278.3	Grid Current	7.3
	Peak Power	12,430	Peak Today	6,237	Ave.Volt.	278.8
	Frequency	60.0	Inverter Temp.	54	Vbulk	739.1
Measured	Efficiency	97%	Riso	20	Ileak (Dc/Dc)	0
	Ileak (Inverter)	0	V(Dc/Dc)	280.5	Freq.(Dc/Dc)	60.0
	Vbulk(Dc/Dc)	738.0	Vbulk Mid	362.1	V Neutral	0.0
	V LN	0.0				
Temperature	Inverter	54	Booster	50		
Inverter	Version					- UL1741 - - PV
	Address	3	S/N	588002	P/N	-3L78-
	Firmware	C069	Manufacturing Week			34/11
Status	Inverter State					Run
	Communication State					Everything is OK
	Global State					Run
	DC/DC Channel 1 State					MPPT
	DC/DC Channel 2 State					MPPT
	Alarm State	Codes	Error Log			No Alarm

Both MPPTs showing normal voltage and MPPT mode. Only slight power early in morning though on MPPT2

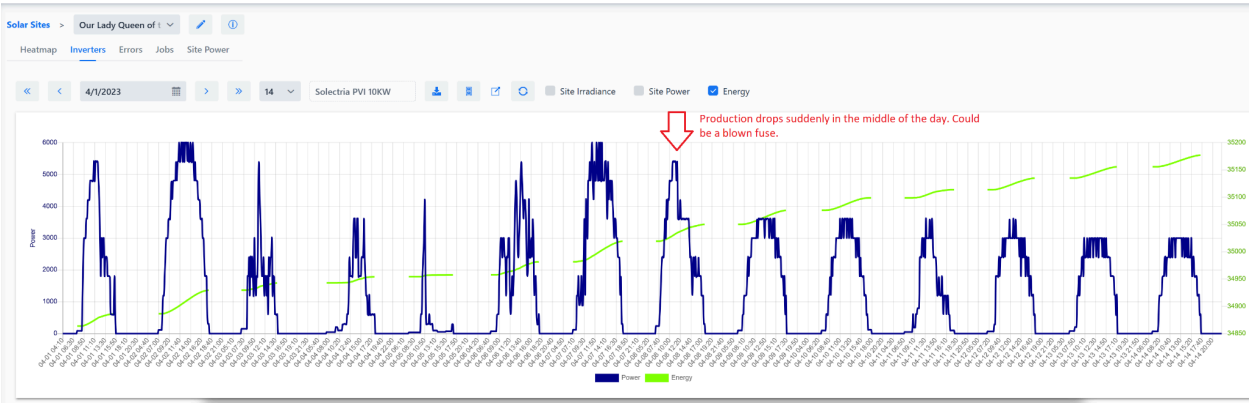
Inverter #2 appears to have startup problems for a number of years.

Our Lady Queen of the World Catholic Academy MicroFIT

This appears to be a smaller 6.75kW DC system originally installed in 2011. There may have been a problem initially because the power jumps in 2017 when a 10kW inverter was installed based on the lifetime energy values.

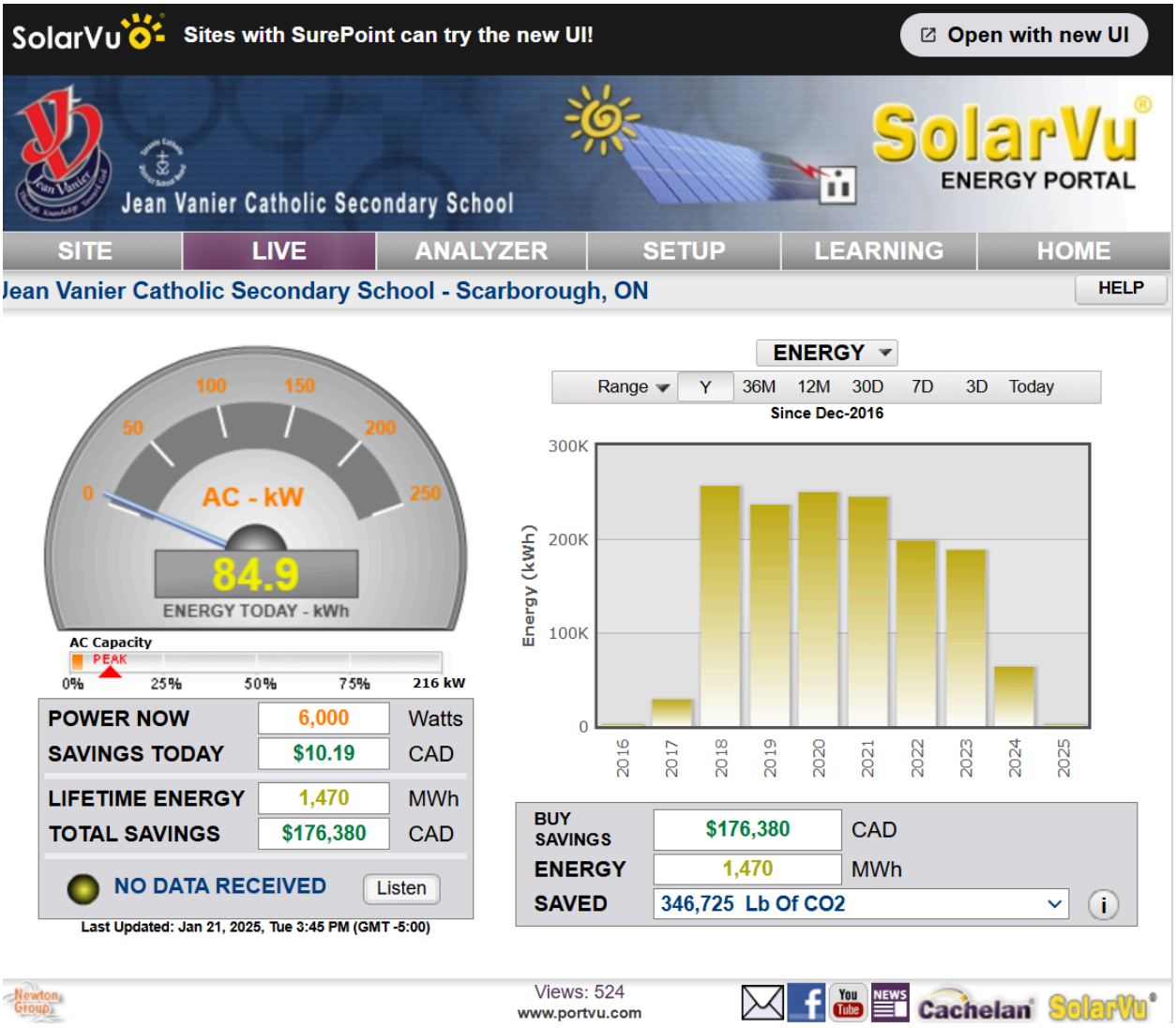


On April 8th 2023 this system appears to have lost production from one of two strings and has been producing at 50% since then. Potentially due to a blown fuse. Loses due to that loss of a string would be approximately $5,000 since then.



Our Lady Queen of the World Catholic Academy FIT System

This six inverter FIT system was installed in 2017 along with the existing MicroFIT system. Communications with the inverters was lost in March 2024 but Paycheck data is available which indicates one inverter is currently down and a second is sometimes not producing.



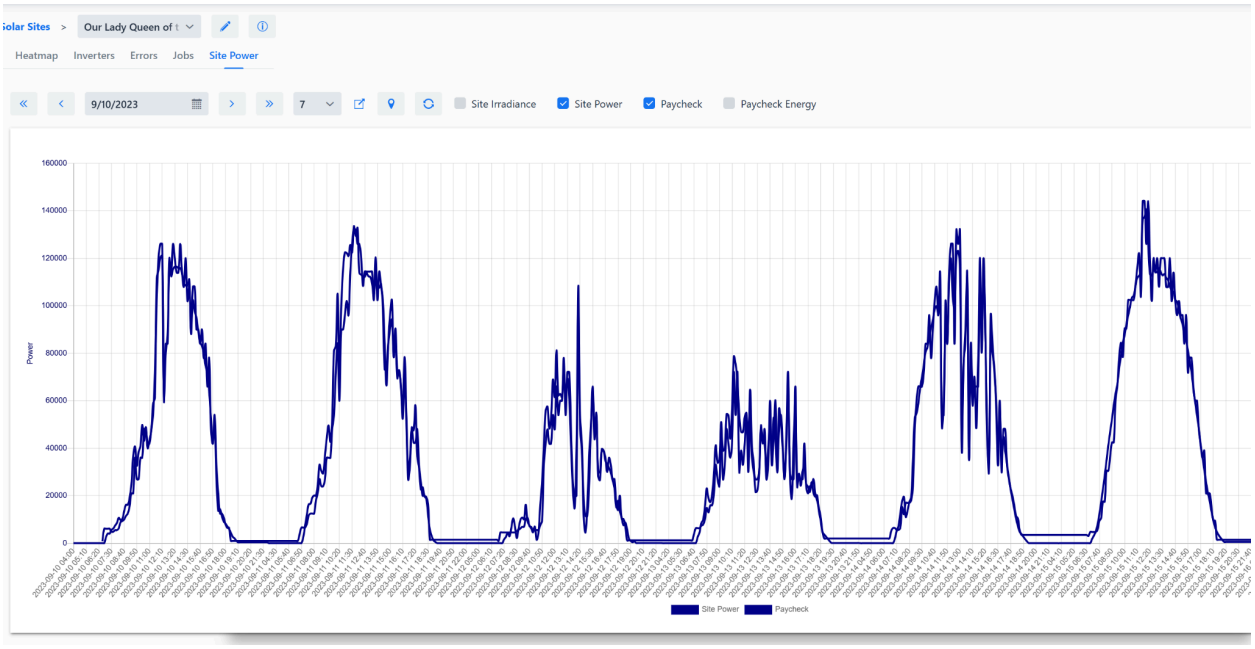
- Inverter #1 starts to develop problems in the fall of 2021 but also has communication problems so difficult to determine losses.
- Inverter #2 develops startup problems May 2020 which get worse throughout the year and lead to multiday shutdowns. Likely are some type of ground fault condition.

- Inverter #3 produces approximately 50% of the other inverters. This could be by design and appears to have half of the strings of other 36kW inverters but is unusual and should be verified. The DC/AC ratio is 118% so having that low of DC of approximately 24kW is unusual.
- Inverter #5 appears to have startup problems beginning spring 2023
- Inverter #6 appears to lose a string June 25, 2022.

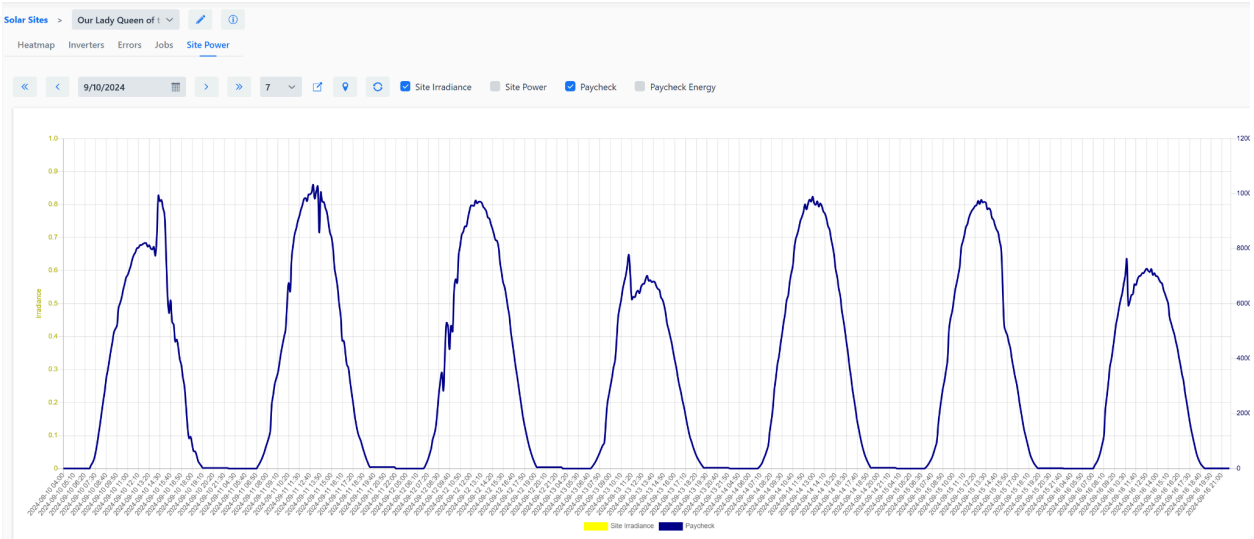
Paycheck Analysis and Comparison with MicroFIT

Communications were lost with the inverters in March 2024 however data is still

Production in 2023



Production in 2024 reported by Paycheck Only



Production reported by MicroFIT system during the same time period. The Paycheck data would indicate that one inverter likely #2 is down completely and Inverter #1 is down on some days because the skies were clear for those seven days.

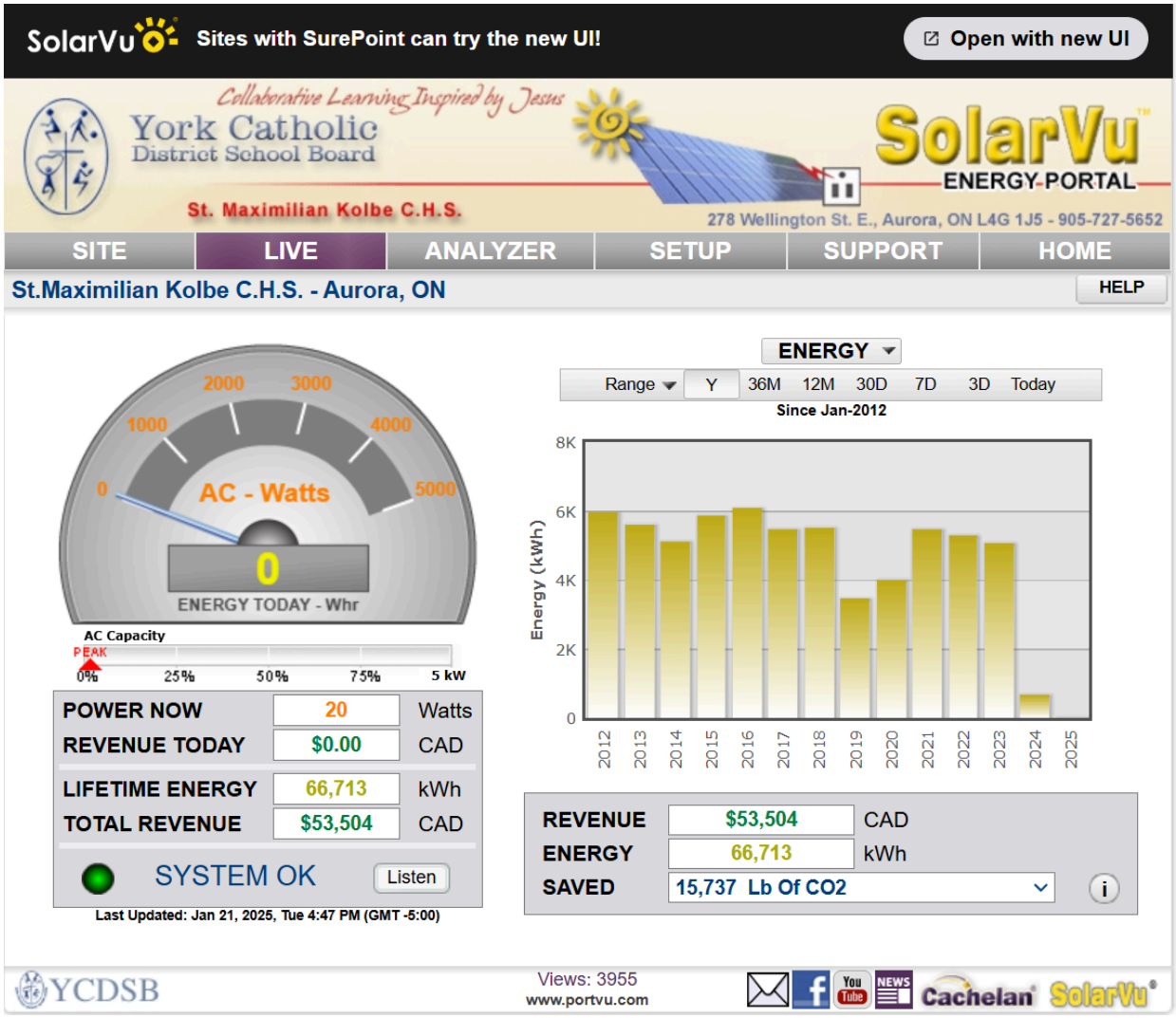
Total Losses

These losses are calculated based on Inverter #3 having 60% the capacity of most inverters and Inverter #6 having 85% the panels of #1,2,4,5.

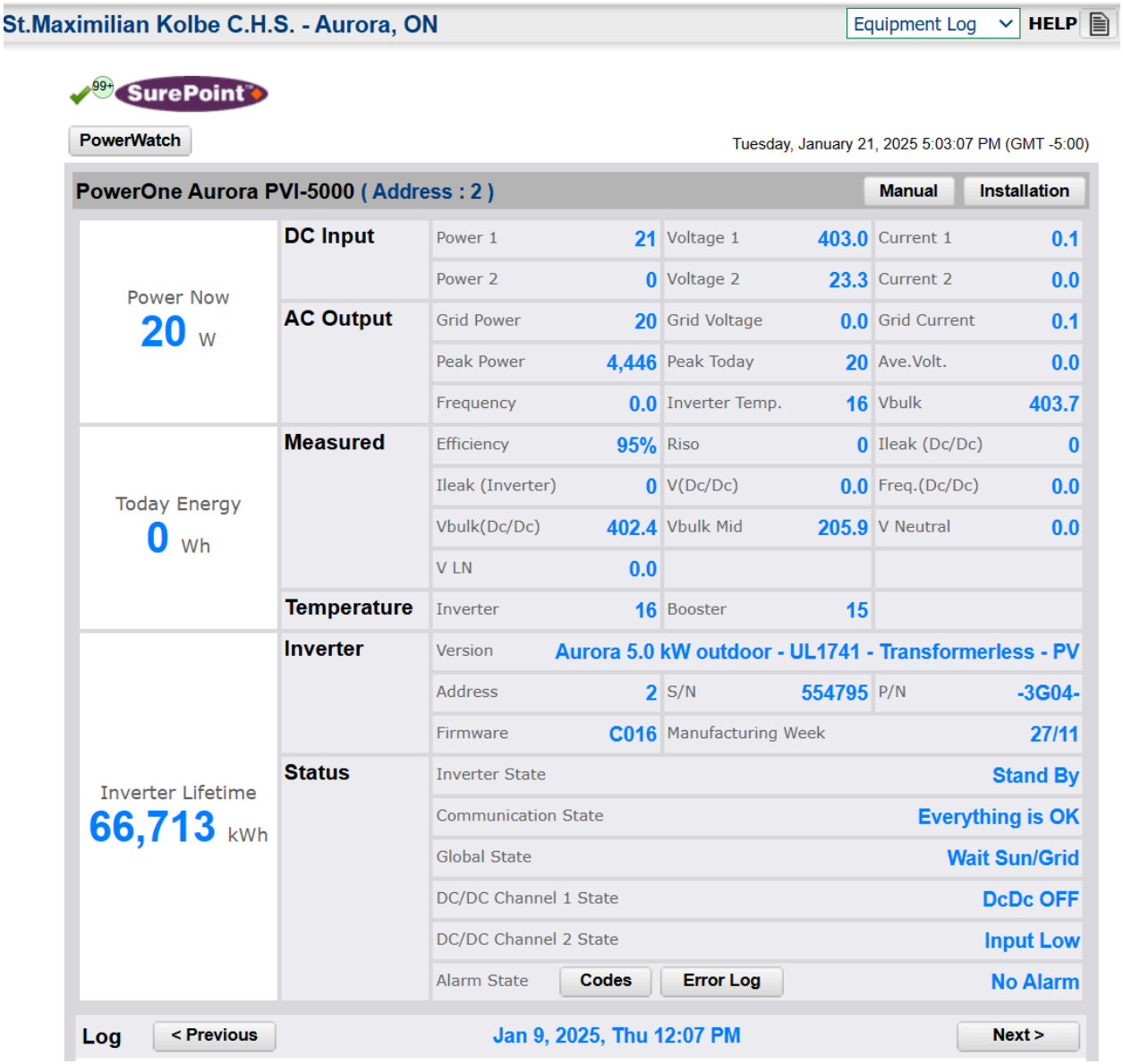
Inverter	Lifetime kWh March 2024	Losses kWh	Reason
1	236,091	40,734	Startup issues
2	273,199	3,626	Believe fails on March 1, 2024 and startup
3	164,808		Assuming 60% of Inverter #5
4	276,825		Expected production
5	273,543	3,282	Startup issues
6	237,926		Assuming 85% of Inverter #5
Total		**47,642**	**$15,674.22**

St . Maximilian Kolbe C.H.S.

This is a 5kW system built in 2011. The system had problems in earlier years but was working well until the spring of 2024. At that point it had repeated startup problems. Losses would be approximately $3,500 since that date.



Examining the inverter status at Jan9 2025 at 12:07PM shows the inverter should be able to power up but either has an internal fault or isn't connected to the grid because it won't produce power.



St.Maximilian Kolbe C.H.S. - Aurora, ON

Equipment Log | HELP

SurePoint

PowerWatch

Tuesday, January 21, 2025 5:03:07 PM (GMT -5:00)

PowerOne Aurora PVI-5000 (Address : 2) Manual | Installation

Power Now: 20 W

Today Energy: 0 Wh

Inverter Lifetime: 66,713 kWh

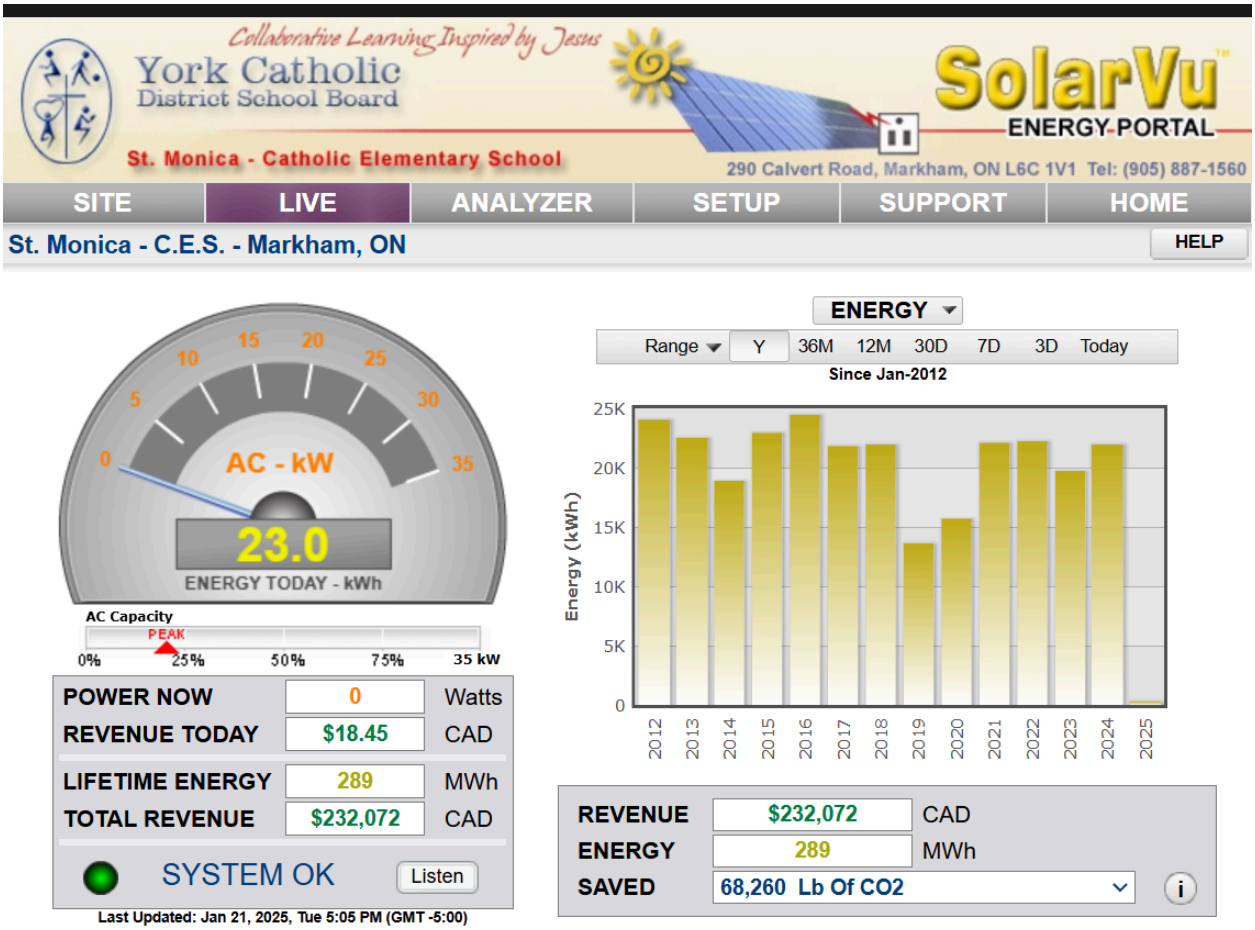
DC Input	Power 1	21	Voltage 1	403.0	Current 1	0.1
	Power 2	0	Voltage 2	23.3	Current 2	0.0
AC Output	Grid Power	20	Grid Voltage	0.0	Grid Current	0.1
	Peak Power	4,446	Peak Today	20	Ave.Volt.	0.0
	Frequency	0.0	Inverter Temp.	16	Vbulk	403.7
Measured	Efficiency	95%	Riso	0	Ileak (Dc/Dc)	0
	Ileak (Inverter)	0	V(Dc/Dc)	0.0	Freq.(Dc/Dc)	0.0
	Vbulk(Dc/Dc)	402.4	Vbulk Mid	205.9	V Neutral	0.0
	V LN	0.0				
Temperature	Inverter	16	Booster	15		
Inverter	Version	Aurora 5.0 kW outdoor - UL1741 - Transformerless - PV				
	Address	2	S/N	554795	P/N	-3G04-
	Firmware	C016	Manufacturing Week			27/11
Status	Inverter State	Stand By				
	Communication State	Everything is OK				
	Global State	Wait Sun/Grid				
	DC/DC Channel 1 State	DcDc OFF				
	DC/DC Channel 2 State	Input Low				
	Alarm State	Codes | Error Log				No Alarm

Log | < Previous | Jan 9, 2025, Thu 12:07 PM | Next >

St. Monica - C.E.S. - Markham, ON

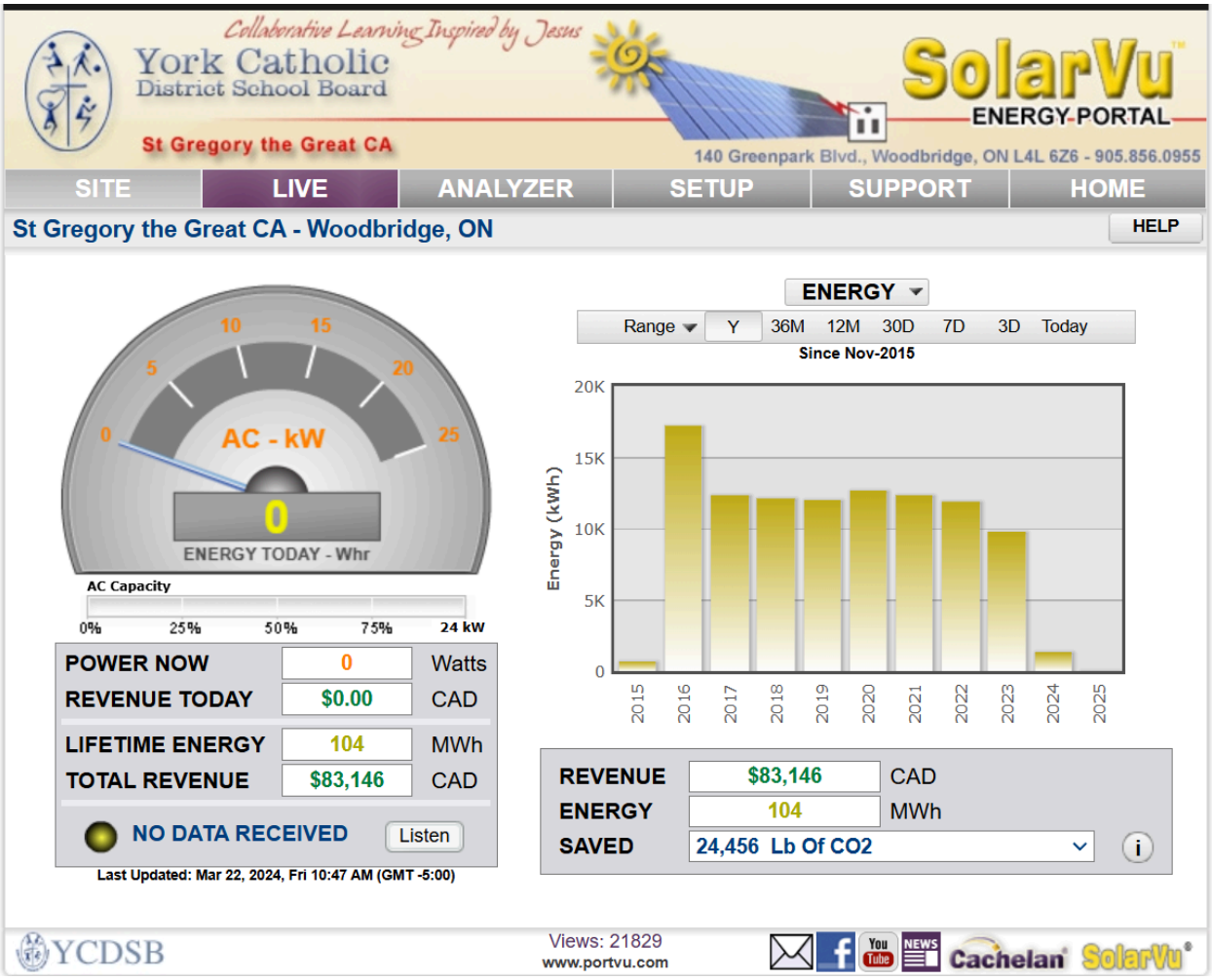
This system appears to have been performing without hardware problems since installation. The drop in production reported in 2019 and 2020 is due to lack of communication between August 1, 2019 and May 27th 2020.

The only unusual aspect is the overall production is quite low for a 35kW inverter. The system never exceeds 18kW even in ideal spring time conditions. The number of panels aren't listed so it isn't possible to determine whether this amount of production is expected relative to other systems. Google Maps seems to indicate the panels mounted flush with the roof which would lower the expected production for 35kW DC according to PVWatts from 45,000kWh in a year to 39,000kWh which is still significantly higher than the peak of 24,600kWh reported in 2012.



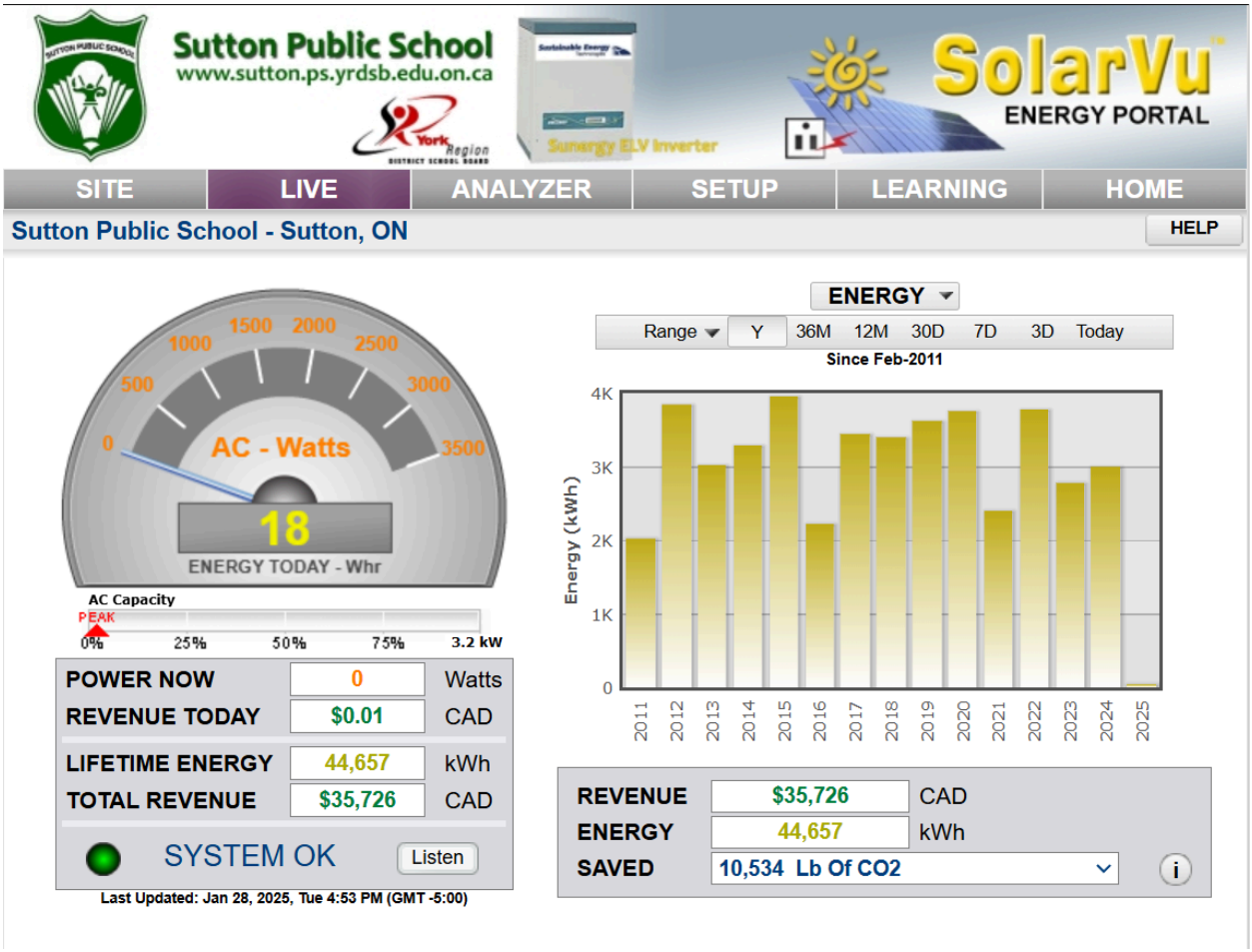
St Gregory the Great CA

This system is listed as a 24kW system with two 12kW which match what Google Map shows with 120+ panels and two inverters. However, data from Inverter #1 appears to have stopped May 4th 2016. The data logger indicates it was still communicating until March 21, 2024. Inverter #2 stopped reporting then as well on March 22, 2024.



Sutton Public School

This 3.15kW system is still producing well but there are often multimonth gaps where the system isn't producing. For example between Oct 6, 2023 to April 10th 2024 the lifetime production shows the system wasn't producing.


Sutton Public School
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York Region
SolarVu
ENERGY PORTAL
Sunergy ELV Inverter
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LIVE
ANALYZER
SETUP
LEARNING
HOME
Sutton Public School - Sutton, ON
HELP
0
500
1000
1500
2000
2500
3000
3500
AC - Watts
18
ENERGY TODAY - Whr
AC Capacity
PEAK
0%
25%
50%
75%
3.2 kW
POWER NOW
0
Watts
REVENUE TODAY
$0.01
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LIFETIME ENERGY
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kWh
TOTAL REVENUE
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CAD
SYSTEM OK
Listen
Last Updated: Jan 28, 2025, Tue 4:53 PM (GMT -5:00)
ENERGY
Range
Y
36M
12M
30D
7D
3D
Today
Since Feb-2011
Energy (kWh)
4K
3K
2K
1K
0
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
REVENUE
$35,726
CAD
ENERGY
44,657
kWh
SAVED
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