Unveiling the Unseen: Harnessing UV Fluorescence for Comprehensive Rooftop PV System Assessment and Successful Insurance Claims Process

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Collecting data to support an insurance claim for hail damaged commercial rooftop PV systems can be challenging since the small or non-existent spaces between panels does not allow access to the MC4 connectors to perform electroluminescence (EL) testing. Other obstacles include physical space to place a luminescence camera system close to many of the panels.

Ultraviolet fluorescence (UVF) is an emerging technique for imaging cracked solar cells and other defects that is non-contact in nature, and which is well suited toward imaging these rooftop systems.

While EL is well known to the PV community and to some insurance claim boards, UVF is unfamiliar to most. This is a barrier to its implementation in insurance claims.

This poster shows UVF images captured for a variety of rooftop systems in Minnesota, and shares details on how these images were used in successful insurance claims.

Claims Investigation process

1.Evaluate Damages Using UVF:
Assess damages to PV system utilizing Ultraviolet Fluorescence (UVF) technology.

2.Identify Probable Causation:
Determine likely causes of damages by analyzing available weather data in conjunction with damage assessment.

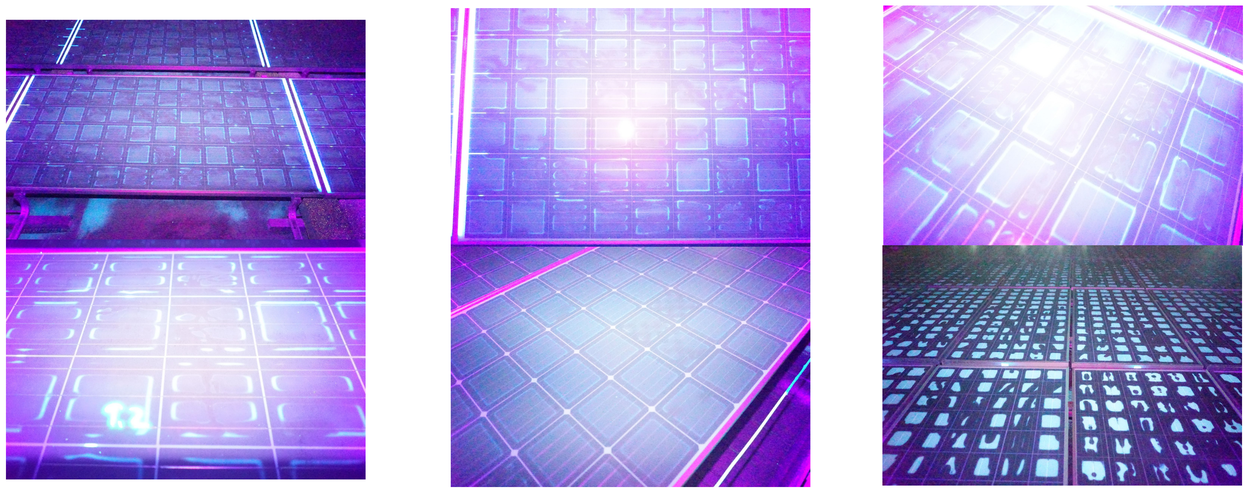
3.Investigate Energy Production Reports:
Analyze energy production reports to pinpoint performance changes associated with specific events.

4.Inspect PV Array Components:
Check components for availability and adherence to industry codes and standards.

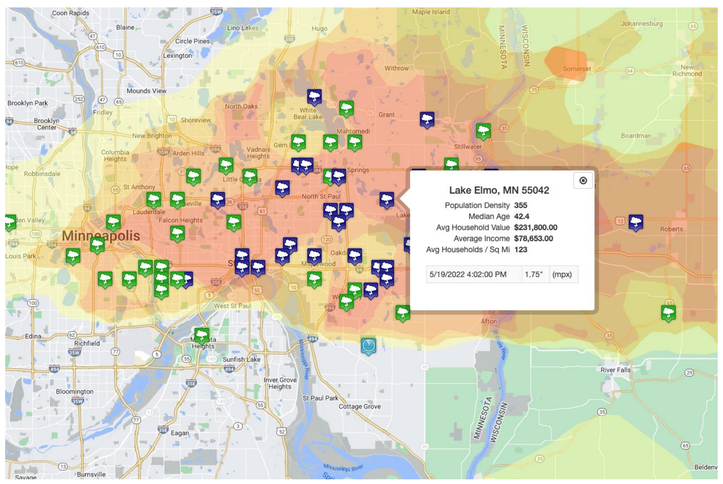
5.Scope and Proposal for Repairs/Replacement:
Develop a detailed scope and proposal for necessary repairs or replacement of the PV Array.

6.Estimate Based on Industry Standards:
Provide cost estimate using industry-standard Xactimate or customized bid compilation, as per client preference.

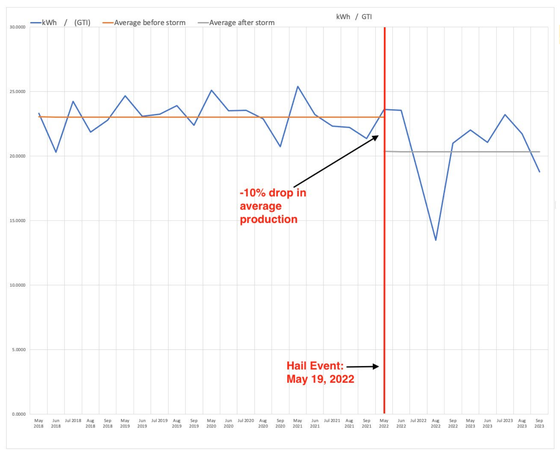
1. Cracking on the panels shows up differently under UVF depending on the age of the array and the materials used in manufacturing



2. Historical weather maps along with recorded storm data is used in determining causation



3. PV output data along with solar radiation information is used to identify production decrease



PV Output Data

Actual

	Jan 2018	Feb 2018	Mar 2018	Apr 2018	May 2018	Jun 2018	Jul 2018	Aug 2018	Sep 2018	Oct 2018	Nov 2018	Dec 2018	2018
kWh Production	647.1000	1,150.9000	3,541.2000	4,363.2000	5,957.5000	4,777.8000	6,288.0000	4,837.2000	3,964.5000	2,644.6000	1,199.2000	541.9000	39,913.1000
(GTI) Global Tilt Irradience	113.0813	163.2204	182.2411	232.1751	255.3200	235.3474	259.2573	221.2534	174.0199	118.7694	93.9240	75.5349	2,124.1442
kWh / (GTI)	5.7224	7.0512	19.4314	18.7927	23.3335	20.3011	24.2539	21.8627	22.7819	22.2667	12.7678	7.1742	205.7394
Weighted snow Depth (FT)	0.4012	0.8258	0.8346	0.5698	0.0000	0.0000	0.0000	0.0000	0.0000	0.0022	0.0540	0.1562	2.8438
													0.0000
	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	Jun 2019	Jul 2019	Aug 2019	Sep 2019	Oct 2019	Nov 2019	Dec 2019	2019
kWh Production	1,677.0000	203.3000	3,237.5000	3,980.4000	5,497.4000	5,950.1000	5,821.5000	5,766.2000	3,753.5000	2,581.9000	1,474.1000	50.4000	39,993.3000
(GTI) Global Tilt Irradience	102.0192	131.0234	204.0984	184.8292	222.7698	257.5972	250.3194	241.0060	167.6064	131.8415	93.8115	86.9806	2,073.9026
kWh / (GTI)	16.4381	1.5516	15.8624	21.5356	24.6775	23.0985	23.2563	23.9255	22.3947	19.5834	15.7134	0.5794	208.6165
Weighted snow Depth (FT)	0.2100	0.8744	0.8187	0.0682	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0681	0.7382	2.7779
	Jan 2020	Feb 2020	Mar 2020	Apr 2020	May 2020	Jun 2020	Jul 2020	Aug 2020	Sep 2020	Oct 2020	Nov 2020	Dec 2020	2020
kWh Production	541.2000	2,272.2000	4,086.2000	5,183.9000	5,860.2000	6,423.6000	6,318.2000	5,683.3000	4,072.8000	2,815.0000	1,758.5000	1,133.9000	46,149.0000
(GTI) Global Tilt Irradience	78.4433	186.8262	168.5370	236.9294	233.3749	273.2928	268.1306	248.2313	196.5461	149.3199	117.8369	91.0325	2,248.5010
kWh / (GTI)	6.8993	12.1621	24.2451	21.8795	25.1107	23.5045	23.5639	22.8952	20.7219	18.8521	14.9232	12.4560	227.2133
Weighted snow Depth (FT)	0.8654	0.9198	0.1452	0.0451	0.0000	0.0000	0.0000	0.0000	0.0000	0.1160	0.0833	0.0000	2.1750
	Jan 2021	Feb 2021	Mar 2021	Apr 2021	May 2021	Jun 2021	Jul 2021	Aug 2021	Sep 2021	Oct 2021	Nov 2021	Dec 2021	2021
kWh Production	691.8000	1,642.4000	4,662.8000	4,575.7000	5,947.0000	6,790.6000	6,012.9000	5,515.6000	4,724.9000	3,220.9000	1,952.9000	709.6000	46,447.1000
(GTI) Global Tilt Irradience	97.3419	160.8393	205.1153	200.7451	234.2065	292.5579	269.3972	248.2749	221.3283	149.0672	109.9365	85.5125	2,274.3227
kWh / (GTI)	7.1069	10.2114	22.7326	22.7936	25.3921	23.2111	22.3198	22.2157	21.3479	21.6070	17.7639	8.2982	225.0003
Weighted snow Depth (FT)	0.5888	0.8189	0.1552	0.0011	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0330	0.1965	1.7935
	Jan 2022	Feb 2022	Mar 2022	Apr 2022	May 2022	Jun 2022	Jul 2022	Aug 2022	Sep 2022	Oct 2022	Nov 2022	Dec 2022	2022
kWh Production	654.2000	2,087.2000	3,219.1000	3,922.4000	5,578.0000	6,488.3000	4,846.1000	3,209.7000	4,800.9000	3,448.1000	1,080.6000	524.5000	39,859.1000
(GTI) Global Tilt Irradience	121.3171	147.4583	175.5054	180.5746	236.3476	275.4371	261.8810	238.2457	228.5081	169.6418	99.8288	86.8480	2,221.5934
kWh / (GTI)	5.3925	14.1545	18.3419	21.7218	23.6008	23.5564	18.5050	13.4722	21.0098	20.3258	10.8245	6.0393	196.9444
Weighted snow Depth (FT)	0.5764	0.6259	0.3194	0.0177	0.0000	0.0000	0.0000	0.0000	0.0000	0.0014	0.0933	0.5832	2.2174
	Jan 2023	Feb 2023	Mar 2023	Apr 2023	May 2023	Jun 2023	Jul 2023	Aug 2023	Sep 2023	Oct 2023	Nov 2023	Dec 2023	2023
kWh Production	3.8000	250.2000	2,517.1000	4,357.8000	6,106.0000	5,983.6000	6,235.9000	5,598.0000	3,765.4000	2,028.8000	2,011.1000	1,041.9000	39,899.6000
(GTI) Global Tilt Irradience	85.2082	159.4412	180.6325	212.2904	277.3602	284.1797	268.7718	257.5254	200.6558	152.1082	117.1972	83.1218	2,278.4925
kWh / (GTI)	0.0446	1.5692	13.9349	20.5275	22.0147	21.0557	23.2015	21.7377	18.7655	13.3379	17.1600	12.5346	185.8837
Weighted snow Depth (FT)	1.1426	1.0547	1.2363	0.3094	0.0000	0.0000	0.0000	0.0000	0.0000	0.0021	0.0110	0.0141	3.7702

4. The availability of replacement components factors into how the claim is processed

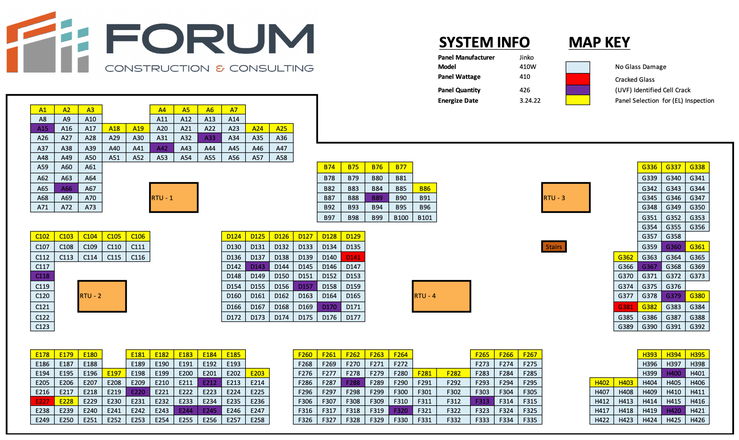
PV Panel Type	Panel (qty)	Availabilty
SilfabSLG310P	64	Obsolete

Heliene 72PHD-320
Call for price Out of stock
DISCONTINUED: Heliene 72PHD-320, a 320 Watt, 72-cell poly-crystalline PV module, MC4 connectors
Add to wishlist

Inverter	(qty)	Availabilty
SolarEdge SE40k 480V3Ph Inverter	1	Yes

solar EDGE
SOLAREDGE
$3,189.99
SKU: SE40K-USR48BNZ4
Condition: New
Weight: 79.20 LBS
Shipping: Calculated at checkout

5. Labeled maps of the array are used to note the type and location of damage that has been detected



6. An itemized Xactimate bid is provided for each repair

FORUM CONSTRUCTION & CONSULTING
16221 Main Ave SE #202
Prior Lake, MN 55372

PV System

Array A

DESCRIPTION	QUANTITY	UNIT PRICE	TAX	O&P	RCV	DEPREC.	ACV
22. R&R Solar electric panel array - over 5000 watt - per watt	24,050.00 EA	5.55	4,148.63	27,525.22	165,151.35	(0.00)	165,151.35
****** Panels are Heliene320P that produce 320W per panel*							
****** (74) Panels x 325 W = 24050 Watts*							
23. R&R Solar battery backup and converter	1.00 EA	1,013.24	43.13	211.26	1,267.63	(0.00)	1,267.63
Totals: Array A			**4,191.76**	**27,736.48**	**166,418.98**	**0.00**	**166,418.98**

General Condtions

DESCRIPTION	QUANTITY	UNIT PRICE	TAX	O&P	RCV	DEPREC.	ACV
24. Hold Permits & Fees (PWI)*	1.00 EA	0.00	0.00	0.00	0.00	(0.00)	0.00
25. ***Hold for Conduit and wiring supplement*	1.00 EA	0.00	0.00	0.00	0.00	(0.00)	0.00
******See Supplement document*							
26. ***Hold for Engineering invoices*	1.00 EA	0.00	0.00	0.00	0.00	(0.00)	0.00
******Three rounds of engineering is generally required for the approval of a PV System. Forum will provide invoices on a PWI basis*							
27. Rental equipment delivery / Flat Bed for panels to be recycled*	1.00 EA	3,000.00	0.00	600.00	3,600.00	(750.00)	2,850.00
28. Landfill fees - (per ton)	6.90 EA	90.00	0.00	124.20	745.20	(0.00)	745.20
******Recycling of old panels*							
- (74) Panels & wracking @ 60 lbs = 4,440 lbs							
- (74) Panels x (296) Ballast blocks = 296 blocks x 25lbs = 7,400							
- Conduit = 2,000 lbs							
Total = 13,800 lbs = 6.9 Ton							
29. Telehandler/forklift and operator	40.00 HR	145.23	0.00	1,161.84	6,971.04	(1,452.30)	5,518.74
30. Telehandler/forklift (per week) - no operator	2.00 WK	1,250.21	0.00	500.08	3,000.50	(625.11)	2,375.39
31. Dumpster load - Approx. 40 yards, 7-8 tons of debris	2.00 EA	722.01	0.00	288.80	1,732.82	(0.00)	1,732.82
Totals: General Condtions			**0.00**	**2,674.92**	**16,049.56**	**2,827.41**	**13,222.15**
Total: PV System			**4,191.76**	**30,411.40**	**182,468.54**	**2,827.41**	**179,641.13**