

# ArcSense<sup>®</sup> Study

PSEG Long Island, TESCO, L+G

# Project Background

- **PSEG LI**

- 1.2 million connected customers (electric)
- Fully AMI deployed, L+G Gridstream
  - Deployment commenced: 2018
  - Deployment completed: Spring 2022

- **TESCO**

- Developed ArcSense® technology in-house
- Worked with L+G to provide as a formal offering
- PSEG LI offered to run a pilot program of ~4,500 meters
- Pilot launched in Fall 2021

- **L+G**

- Provided platform and access to load profile data for arc reads
- Incorporating the technology into their next gen, Revelo® meter

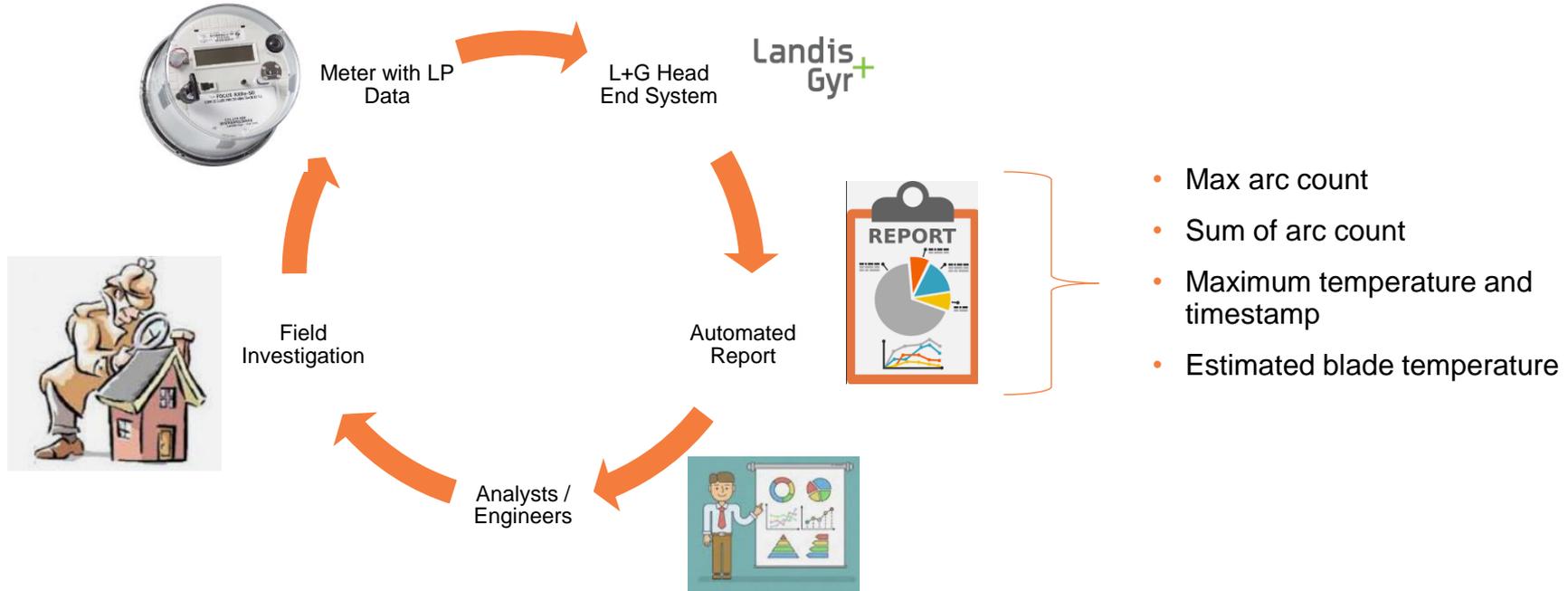


# ArcSense® Pilot

- Collaboration between PSEG Long Island, TESCO, and Landis + Gyr
- Pilot project included a total of ~4,500 meters in the field at various locations
- New technology developed by TESCO is integrated into an L+G Focus Meter
- The board detects the RF signature of a micro-arc
- Micro-arc data is captured and relayed within the load-profile data
  - Load-profile reporting was an open channel to provide the additional micro-arc data for reporting analysis



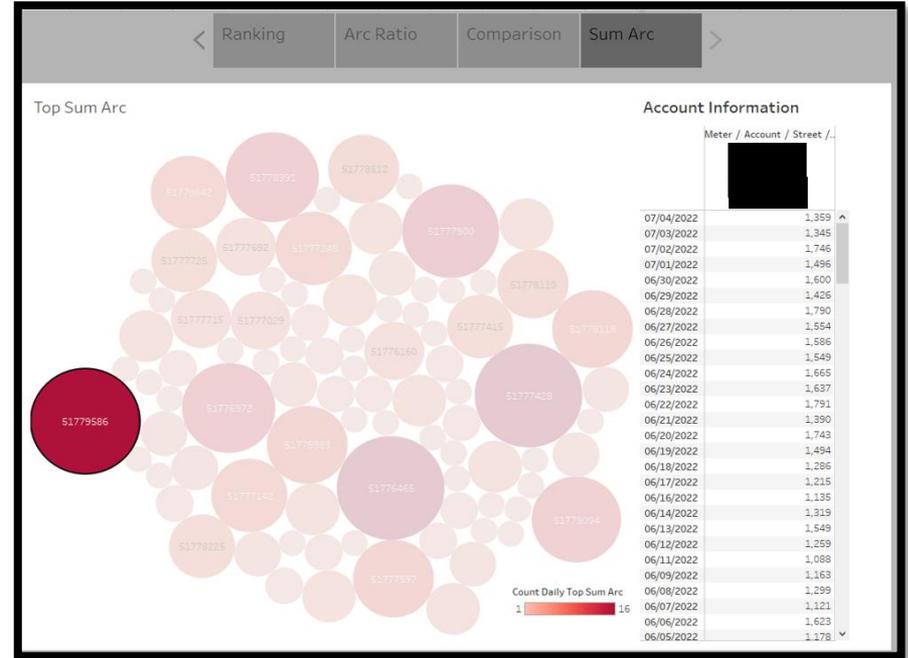
# Additional Load Profile Data in Daily Report



A	B	C	D	E	F	G	H	I	J	K	L	M	N
RUN_DATE	CONFIGURATION_GROUP	METER	MAX_RISE	MAX_RISE_TIME	MAX_ARCCOUNT	KWH_ATMAXARCTM	MAX_ARCCOUNT_TIME	SUM_ARC_COUNT	MAXTEMP	MAXTEMP_TIME	MAX_KWH	MAXKWH_TIME	LATITUDE
7/4/2022	Arc_Sense	51775736	2	7/4/2022 11:45	7	0.3768	7/4/2022 11:45	7	40	7/4/2022 15:15	2.2746	7/4/2022 16:15	40.841446
7/4/2022	Arc_Sense	51775738	2	7/4/2022 19:15	6	1.3734	7/4/2022 19:15	6	40	7/4/2022 12:00	1.7136	7/4/2022 19:00	40.907032
7/4/2022	Arc_Sense	51775739	2	7/4/2022 19:15	6	0.5376	7/4/2022 19:15	6	51	7/4/2022 17:45	0.582	7/4/2022 15:30	40.911827
7/4/2022	Arc_Sense	51775741	2	7/4/2022 23:30	7	0.4872	7/4/2022 23:30	72	56	7/4/2022 8:00	1.119	7/4/2022 22:00	40.85447
7/4/2022	Arc_Sense	51775742	7	7/4/2022 16:30	20	1.0806	7/4/2022 16:30	40	55	7/4/2022 11:30	1.251	7/4/2022 15:15	40.854065



# Tableau Data



# Arc Sense Priority List

- **Meters were selected based on below criteria:**
  - High arc count: >100 arcs
  - Days of high arc: >=14 days
- **Meters prioritized by number of days they appeared on Arc Sense Report**
  - Priority 1 = 40-95 days of high arc
  - Priority 2 = 20-39 days of high arc
  - Priority 3 = 14-19 days of high arc
- **Some meters with anomalous data profiles (high average arc counts or abnormal temp readings) were moved up in priority level**

	Meter Number	Priority	Division	Date of Visit
1				
2				
3		1	Western Suffolk	4/29/2022
4		2	Western Suffolk	5/9/2022
5		3	Western Suffolk	5/9/2022
6		1	Western Suffolk	5/23/2022
7		1	Western Suffolk	5/23/2022
8		1	Central Nassau	5/24/2022
9		1	Central Nassau	5/24/2022
10		1	Central Nassau	5/24/2022
11		3	Western Suffolk	6/2/2022
12		1	Eastern Suffolk	6/22/2022
13		2	Eastern Suffolk	6/22/2022

# Priority Classifications

- **Priority 1 – 15 sites, 13 investigations showed issues at the site, 7 hot-socket compromised**
- **Priority 2 – 23 sites, 18 investigations showed issues at the site, 5 hot-socket compromised**
- **Priority 3 – 19 sites, 8 investigations showed issues at the site, 2 hot-socket compromised**

Meter Numb	Prior	Date of Visit	Note	Meter Pan Brand	Meter Pan Type
	1	5/23/2022	Pan Damaged at Top Conduit Entry, 2 repair points on neutral	Murray	Bypass Lever
	1	4/22/2022	None	Milbank - Ring Type	Ring
	1	4/22/2022	Generator Present at house, dielectric grease found on meter	Milbank - Bypass Lever	Bypass Lever
	1	4/22/2022	found Open neutral at Next House	Murray-Bypass Lever	Bypass Lever
	1	4/22/2022	Damaged Weather head, Repairs to Neutral and Hot legs for feed across the street. Corrosion/oxidation on Phase A line	Anchor- Ring Type	Ring
	1	4/29/2022	none	Murray	Bypass Lever
	1	4/29/2022	part of ceramic broken on inside of pan	Anchor	Ring
	1	5/23/2022	none	Milbank	Ring
	1	5/23/2022	brand new pan and new service wires, some pitting on meter	Milbank	Bypass Lever
	1	5/26/2022	near window AC Unit	Anchor	Ring
	1	5/24/2022	open to elements and had been allowing water to drain into pan; meter pan jaws had dielectric grease. Meter Arced when re installed.	Not legible	Ring
	1	5/24/2022	Linkets at weatherhead instead of fuzzy boxes, discoloration on phase A load side of meter blade	Murray	Bypass
	1	5/24/2022	Burn Marks on Meter Pan Jaws	Milbank	Bypass Lever
	1	6/22/2022	corrosion inside meter pan	milbank	bypass
	1	6/24/2022	repair point on service drop. 1 block away from transmission line	murray	bypass

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Meter Numb	Prior	Date of Visit	Note	Meter Pan Brand	Meter Pan Type
2		4/22/2022	repairs to wires at weathehead	Crouse Hinds - Ring Type	Ring
2		4/23/2022	Meter located in Vicinity of Water Tower with Cell Antennas	murray	ring type
2		4/23/2022	House Behind LIE Barrier, near Road Noise	Anchor	ring type
2		4/23/2022	Meter located in Vicinity of Water Tower with Cell Antennas, RF detector reads 1.0 in vicinity of meter	Milbank	Bypass Lever
2		5/23/2022	2 repair points in neutral wire to weather head, meter is 1 mile from cell tower	Milbank	Bypass Lever
2		5/9/2022	of A Phase. Meter is in direct sunlight. Meter has illegal holes drilled and is being used as a raceway for Romex which is not properly insulated. Weatherhead has flexible insulation to meter pan.	Milbank	Bypass Lever
2		5/26/2022	Rusted conduit, Service wire Deteriorating	Murray	A Base
2		5/26/2022	None	?	Circular Style Socket
2		5/26/2022	meter within 40 feet of transmission lines	Anchor	Ring
2		6/2/2022		Milbank	Ring
2		5/23/2022	none	Murray	Bypass Lever
2		6/2/2022	Improper connection at weatherhead	Milbank	Bypass
2		6/2/2022	None, installed at meter bank	Delta	
2		6/2/2022	Repair Point, weatherhead has signs of wear	?	Socket
2		6/2/2022	conduit at meter pan is separated	Murray	Ring
2		6/22/2022	near several AC Units	anchor	socket
2		D			
2		6/22/2022	neutral wire shows signs of heating up inside pan	milbank	bypass
2		6/24/2022	RF Readings 10-13	murray	bypass
2		6/24/2022	none	milbank	bypass
2		6/24/2022	not pulled, pan installed in siding	unknown	ring socket
2		6/24/2022	corrosion on weather head conduit	anchor	ring socket

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Meter Num	Prior	Date of Visit	Note	Meter Pan Brand	Meter Pan Type
3		4/22/2022	Found Burned/damaged insulation on line side of A Phase	Murray Bypass Lever	Bypass Lever
3		4/22/2022	oxidation on 2nd phase, busy roadway	Crouse Hinds - Ring Type	Ring
3		4/29/2022	Meter located in Vicinity of Water Tower with Cell Antennas	not visible	Ring Type
3		4/29/2022	none	not visible	RING TYPE
3		AA			
3		5/23/2022	none	Murray	Ring
3		5/9/2022	none	Anchor	Ring
3		5/9/2022	Found Pan Jaws recessed due to meter installation, Found signs of Arcing, Found open insulation cover on "fuzzy box" at	Anchor	Ring
3		5/23/2022	RF read 3.3 mw/m2 in area of meter. Meter is at busy roadway. Linkets installed at wire to house instead of fuzzy boxes	Anchor	Ring
3		6/2/2022	None	Murray	Bypass
3		CC			
3		6/2/2022	Pitting on A Blade of meter	Murray	Bypass
3		6/22/2022	No customer not disconnected	nr	nr
3		6/22/2022	None	"POT Type"	
3		F			
3		5/24/2022	none	Not legible	Ring
3		6/24/2022	not pulled		ring socket
3		N			
3		6/24/2022	near AC Units, waterfront property	durham	ring socket

# Field Investigations

- PSEG Long Island Technicians and Engineers performed site visits
- Recorded various site conditions and measurements from each meter:
  - Condition of meter pan, conduit, weather-head, and secondary wires
  - Voltage and amperage
  - IR temperature reading on face of meter and on jaws
  - RF reading in area of meter
- Field Tools:
  - IR temperature laser
  - TESCO jaw tester
  - Multimeter
  - RF meter



## Meter Engineering – Meter Investigation Report

Date:	Field Personnel:	Purpose of Investigation:
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**Equipment Information**

Meter Number:	Meter Form:	Meter Brand:	Meter Pan Type:
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**Site Information**

Repair Points at Wire at Secondary or at House?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Generator Present?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Damage to Meter Pan?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Description/Comment:		

**RF Readings (Before Removing Meter)**

	Top	Bottom
RF Readings Near Meter		
Comments:		

**Measured Electrical Values (If Applicable and Safely Possible)**

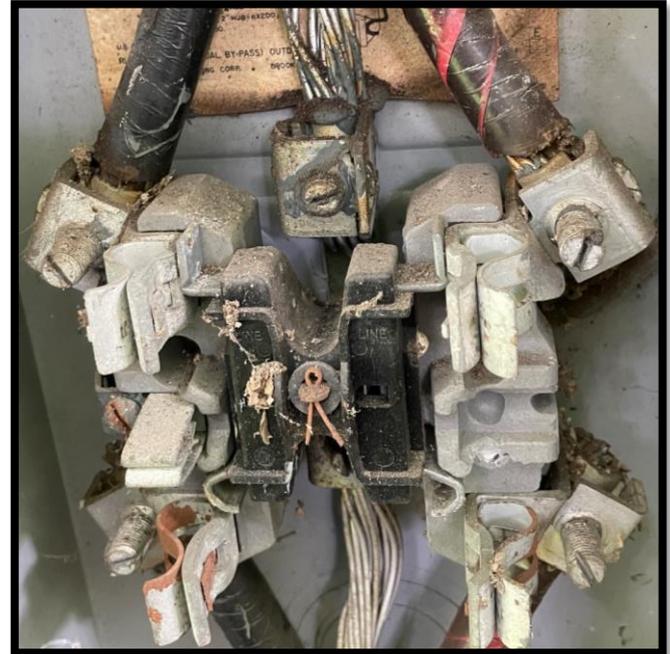
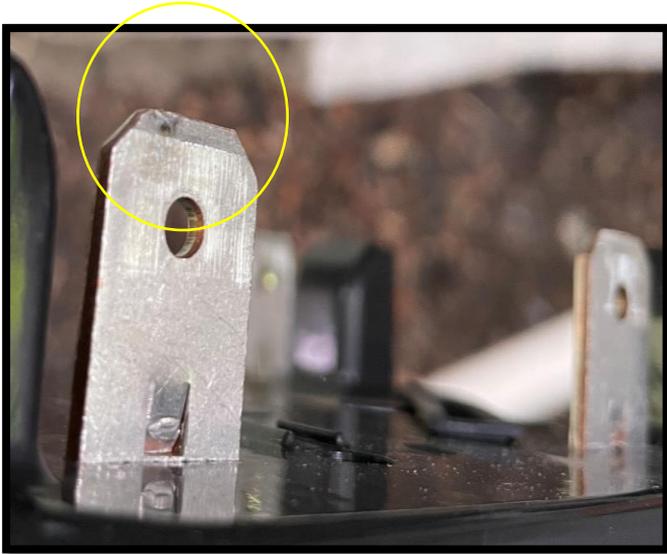
Voltage			Current	
	Line (Volts)	Load (Volts)		Load (Amps)
Voltage (A-B)			A-Phase	
Voltage (A-C)			B-Phase	
Voltage (B-C)			C-Phase	
Voltage (A-Neutral)			Neutral	
Voltage (B-Neutral)				
Voltage (C-Neutral)				

**IR Temperature Readings (After Removal of Meter)**

	Line	Load
IR Temp Gun Reading at Meter Pan Jaw (Phase A)		
IR Temp Gun Reading at Meter Pan Jaw (Phase B)		
IR Temp Gun Reading at Meter Pan Jaw (Phase C)		
IR Temp Gun Top of Meter at Meter Pan Jaw		N/A

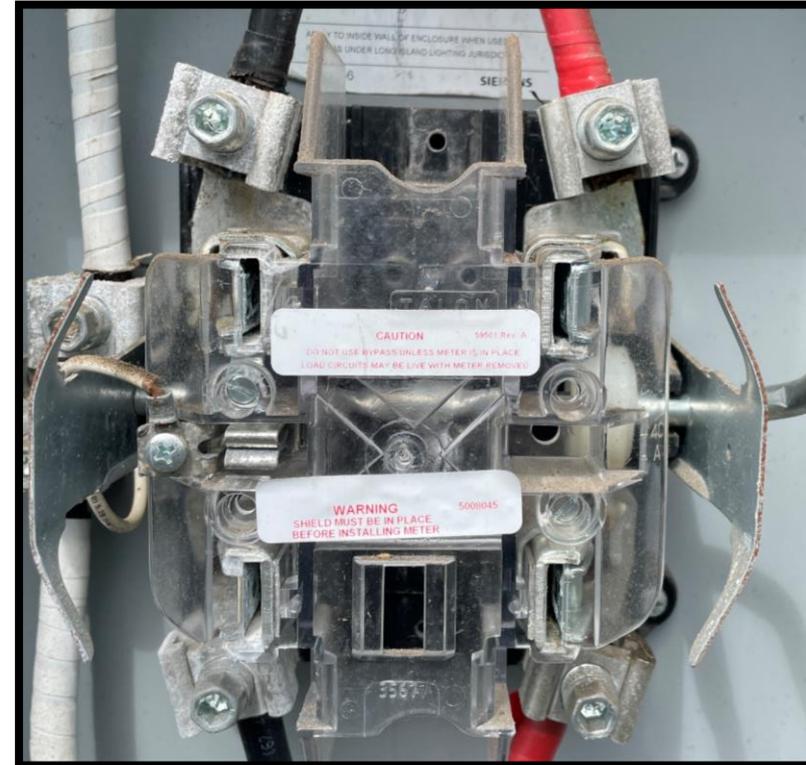
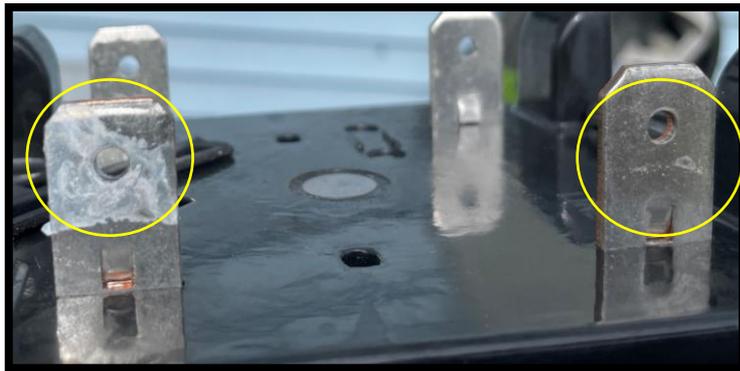
# Meter 51\*\*\*\*48 – Discoloration on Meter Blade

- Days on report with >100 Max Arc Count: 16
- Average arc count: 160
- Max Arc Count: 320
- Arc Sense Priority Level 3
- No previous reports of overheating or rise in temperature
- Pitting on meter blade
- Meter pan did not show any signs of damage or excessive weathering



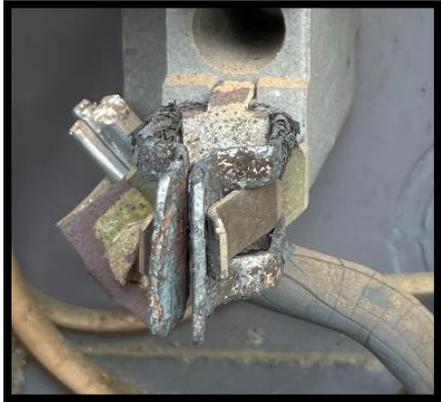
# Meter 51\*\*\*\*35 – Discoloration on Meter Blade

- Days on report with >100  
Max Arc Count: 43
- Average arc count: 305
- Max Arc Count: 534
- Arc Sense Priority Level 1
- No previous reports of overheating or rise in temperature



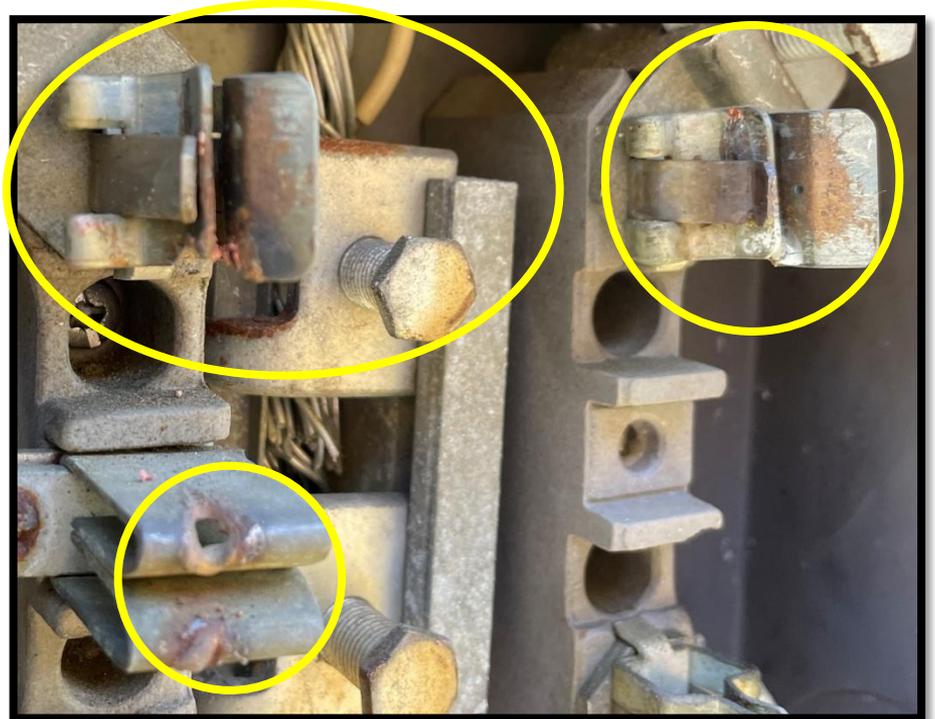
# Meter 51\*\*\*\*18 – High Temperature Alerts

- Originally a non-Arc Sense meter was at property
- Meter was reported by Analyst to indicate high temperature alerts
- Arc Sense meter was installed in Spring 2022 after high temperature alerts
- Arc count and temperature readings were high enough to warrant investigation
- Found brittle jaws inside meter pan; meter pan was replaced as a result



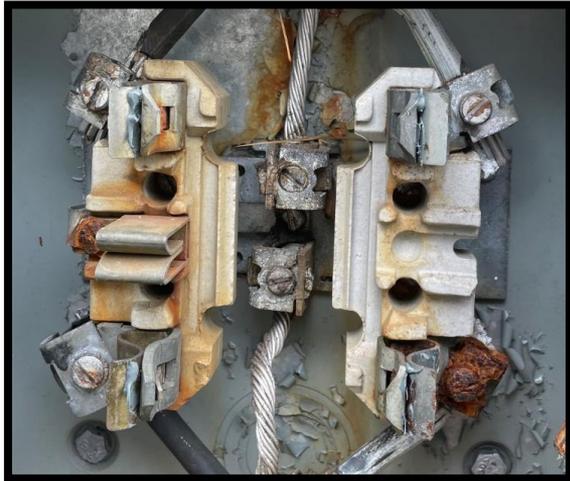
# Meter 51\*\*\*\*26 – Meter Pan with Recessed Jaws

- Days on report with >100 Max Arc Count: 18
- Average arc count: 278
- Max Arc Count: 539
- Arc Sense Priority Level 3
- No previous reports of overheating or rise in temperature
- Recessed springs and discoloration on the jaws
- Damaged neutral (as if someone tried to fix the jaws and an uninsulated screwdriver made contact between phase/neutral)



# Meter 51\*\*\*\*14 – Conduit Allowing Water

- Days on report with >100 Max Arc Count: 43
- Average arc count: 233
- Max Arc Count: 473
- Arc Sense Priority Level 1
- No previous reports of overheating or rise in temperature
- Conduit allowed water to enter into the meter pan
- Screw terminal at C-phase load side was rusted and deteriorating
- Meter produced arcs when reinstalled



# Meter 51\*\*\*\*55 – Weather-head Conduit Damage

- Days on report with >100 Max Arc Count: 35
- Average arc count: 355
- Max Arc Count: 1601
- Investigation Priority Level: 2\*
  - Moved to priority 1 based on recent top arc counts
- No previous reports of overheating or rise in temperature
- Meter not removed because customer was not home and it was a non-bypass pan
- Technician found damage to weather-head conduit



# Meter 51\*\*\*\*25 – Weather-head + Wire Repair Points

- Days on report with >100 Max Arc Count: 56
- Average arc count: 247
- Max Arc Count: 625
- Arc Sense Priority Level 1
- No previous reports of overheating or rise in temperature
- Damage at weather-head conduit
- Found repair points on neutral at triplex to house



# Meter 51\*\*\*\*25 – Broken Ceramic Inside Meter Pan

- Days on report with >100 Max Arc Count: 93
- Average arc count: 236
- Max Arc Count: 349
- Arc Sense Priority Level 1
  
- No previous reports of overheating or rise in temperature
- Technician found broken ceramic on the foundation inside the meter pan



# Key Pilot Insights

- **Value in Arc Detection, Data, and Manpower**
  - Arc Detection: helps to identify meters that may have safety issues
    - Uses load-profile channel to push as **data**
  - Data: allows for analytics to identify trends and identify quality issues
    - Pushed as daily report via L+G head-end to be interpreted by **manpower**
  - Manpower: Analyzes data, informs field force, provides investigation and response to potentially unsafe situations
- **Specific problems that were identified in this study:**
  - Brittle jaws & recessed jaws
  - Water damage
  - Hot socket situations
    - Current & future
- **In the short duration of this project, customers have been notified and pan was replaced, thereby avoiding a dangerous situation in the field**

# Looking Forward

- **Continuing to evolve**
  - Prioritization Process
  - Tableau Dashboard
  - Field Force Checklist
    - Meter Manager Field Client
  - Round table results with additional Arc Sense deployments



# Thank You

- Comments
- Questions