

Electric Vehicles: Cash Cow or Apocalypse?

Tyler Grosshuesch
Wright-Hennepin CEA

Neither, but thanks for
indulging the clickbait title

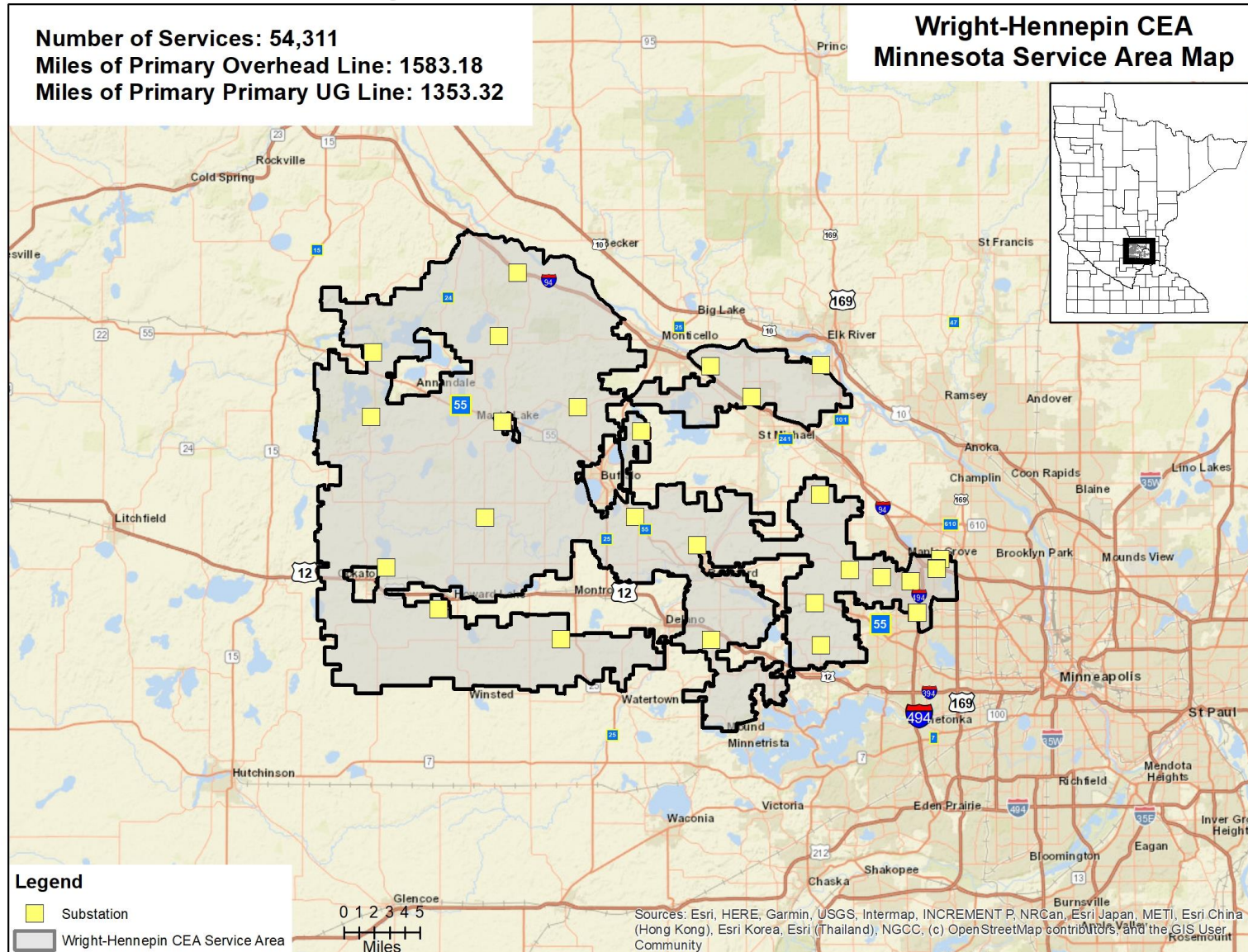
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Intro: About Wright-Hennepin



Intro: Paired Imperatives of EV Charging

- Part 1: Planning for increased residential load
 - New large loads (~30% increase)
 - In areas thought to be fully built-out
 - Appear without our foreknowledge
 - Not considering fleet or public charging – normal new service process
- Part 2: Advancing multiple aspects of beneficial electrification
 - Displacing more polluting energy sources
 - Increased member engagement
 - Controllable load with flexible timing
 - Overnight for traditional base-load
 - Solar peak
 - Wind peak
 - Increased kWh sales

Intro: Why me?... Why you?

Plays to the strengths of GIS & GIS Specialists

- Data
 - Access
 - Integration
 - Analysis
 - Visualization
- Engineering & Operations domain knowledge
- Programming experience or adjacent knowledge

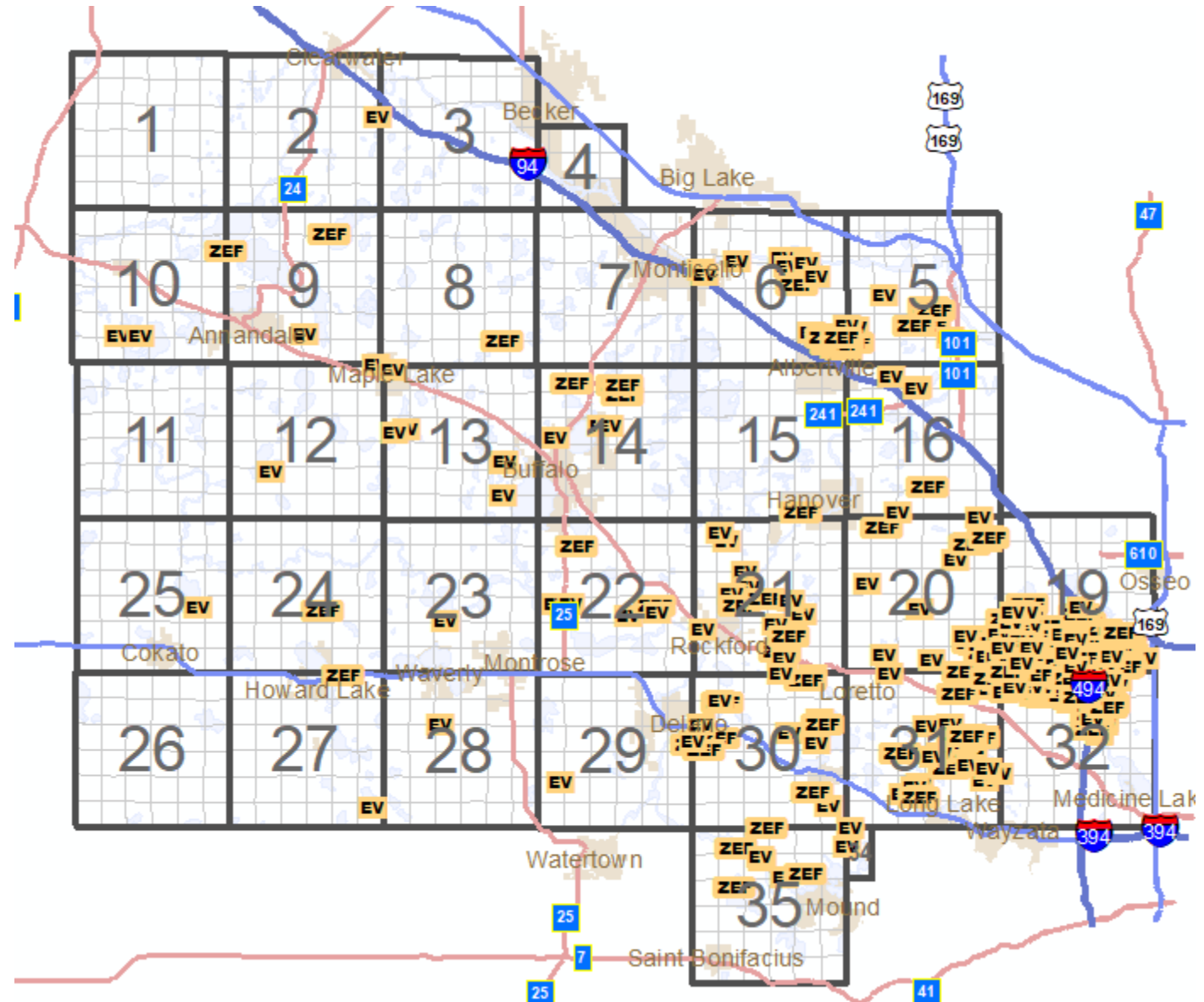
Part 1 - Understanding & Planning for Increased Load

- Understanding existing EV charging load
 - Known
 - Dots on a map
 - Sub, Feeder, and Transformer reports
 - Unknown
 - Surveillance for new loads (WIP)
- Long range plan

Part 1 – Known EV Loads

Dots on a map

Combine billing info
with GIS service
location



Part 1 – Known EV Loads

Substation, Feeder,
and Transformer
reports

Combine billing and
engineering
information

chargers_per_substation	UplineSource	service_count	pct_service_with_ev
96	LAWNDALE	3883	2.5
26	MEDINA	1292	2
66	CORCORAN	3672	1.8
47	PLYMOUTH 2	2654	1.8
43	BASS LAKE	3675	1.2
27	DELANO	2310	1.2
27	PLYMOUTH 1	2987	0.9
11	TRAILHAVEN	1362	0.8
4	WILLOW	540	0.7
13	OAKWOOD	2419	0.5
14	ROCKFORD	2895	0.5
10	ALBERTVILLE	2069	0.5
11	CEDAR ISLAND 2	2383	0.5
6	LAKE CONSTANCE	1325	0.5

Part 1 – Known EV Loads

Substation, Feeder,
and Transformer
reports

Combine billing and
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chargers_per_feeder	UplineSource	UplineFeeder	service_count	pct_service_with_ev
4	BASS LAKE	FDR 43	102	3.9
39	LAWNDALE	FDR 122	1059	3.7
50	CORCORAN	FDR 20	1427	3.5
4	DELANO	FDR 25	116	3.4
16	MEDINA	FDR 46	476	3.4
4	BASS LAKE	FDR 73	134	3
1	TRAILHAVEN	FDR 130	40	2.5
1	WOODLAND	FDR 141	41	2.4
22	PLYMOUTH 2	FDR 162	952	2.3
25	LAWNDALE	FDR 125	1083	2.3
27	LAWNDALE	FDR 123	1230	2.2
12	BASS LAKE	FDR 44	630	1.9
3	MEDINA	FDR 45	161	1.9
22	PLYMOUTH 2	FDR 161	1250	1.8
6	PLYMOUTH 1	FDR 83	341	1.8
9	PLYMOUTH 1	FDR 84	567	1.6

Part 1 – Known EV Loads

Substation, Feeder,
and Transformer
reports

Combine billing and
engineering
information

chargers_per_transformer	UplineSource	UplineFeeder	UplineTransformer	ea_code
3	LAWNDALE	FDR 122	32-6BA-3T2	UG-50 kVA-1Ph
3	LAWNDALE	FDR 123	19-31DA-2T9	UG-50 kVA-1Ph
3	LAWNDALE	FDR 123	19-31DC-4T9	UG-25 kVA-1Ph
3	LAWNDALE	FDR 125	19-30BA-7T2	UG-50 kVA-1Ph
3	LAWNDALE	FDR 125	19-30BA-7T5	UG-50 kVA-1Ph
2	BASS LAKE	FDR 43	19-33DD-1T12	UG-50 kVA-1Ph
2	BASS LAKE	FDR 43	19-34CC-1T3	UG-25 kVA-1Ph
2	BROOKS LAKE	FDR 173	25-23AD-1T4	UG-25 kVA-1Ph
2	CORCORAN	FDR 19	19-31AB-5T4	UG-25 kVA-1Ph
2	CORCORAN	FDR 20	19-31CC-1T15	UG-25 kVA-1Ph
2	CORCORAN	FDR 20	19-31CD-6T2	UG-25 kVA-1Ph
2	CORCORAN	FDR 20	20-36AC-1T12	UG-75 kVA-1Ph
2	CORCORAN	FDR 20	20-36AD-1T11	UG-50 kVA-1Ph
2	CORCORAN	FDR 20	32-6CB-6T9	UG-25 kVA-1Ph
2	LAWNDALE	FDR 122	32-5BB-6T13	UG-50 kVA-1Ph
2	LAWNDALE	FDR 122	32-6AD-3T3	UG-50 kVA-1Ph
2	LAWNDALE	FDR 122	32-6BD-3T2	UG-50 kVA-1Ph
2	LAWNDALE	FDR 122	32-6DB-2T3	UG-50 kVA-1Ph
2	LAWNDALE	FDR 123	19-31DA-2T6	UG-50 kVA-1Ph
2	LAWNDALE	FDR 123	19-31DD-4T1	UG-50 kVA-1Ph

Part 1 – Known EV Loads

Substation, Feeder,
and Transformer
reports

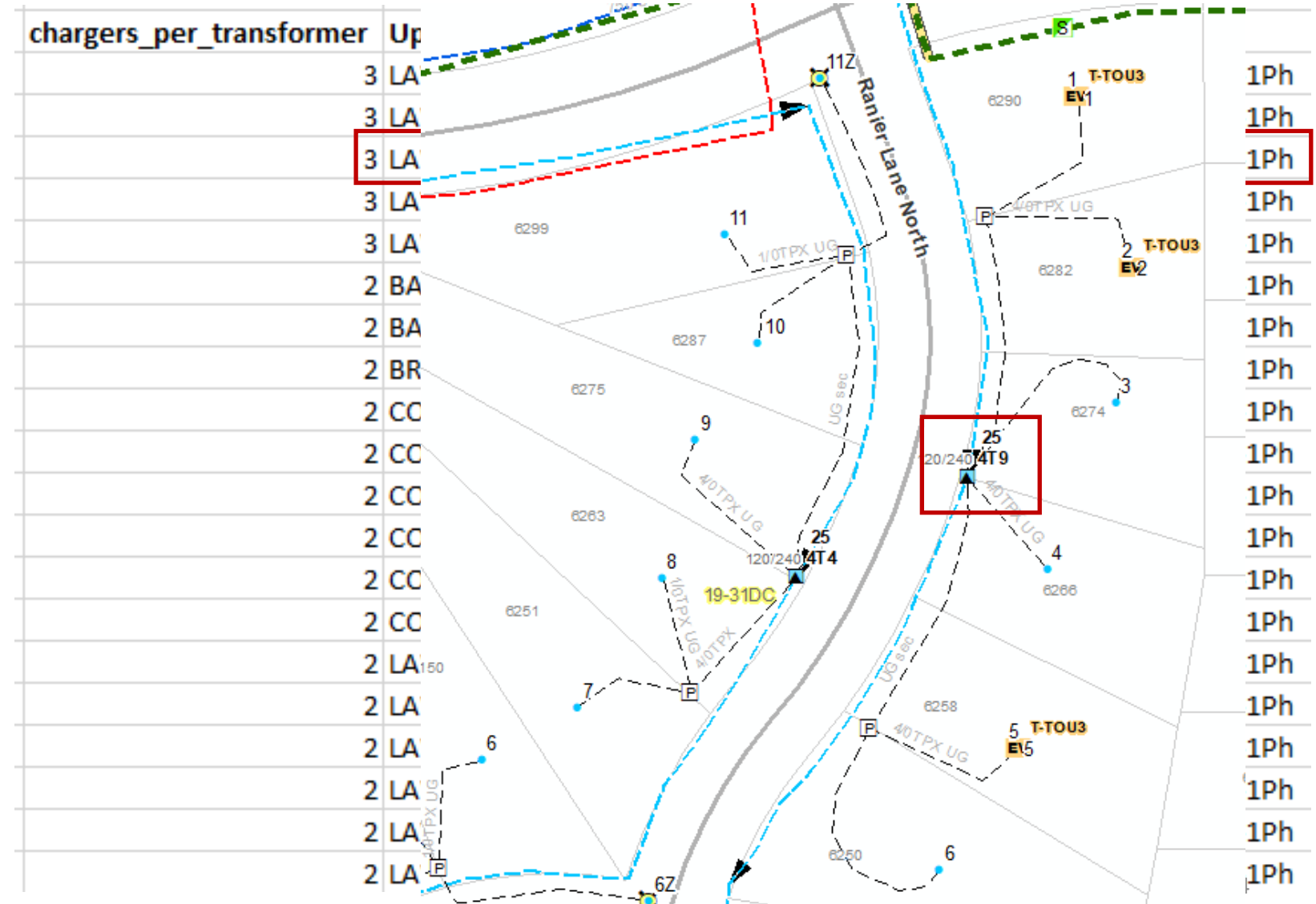
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Part 1 – Known EV Loads

Substation, Feeder,
and Transformer
reports

Combine billing and
engineering
information



Part 1 – Surveillance for Unknown EV Loads

- Non-Intrusive Load Monitoring
- Data Sources
 - Meter data
 - Billing system
- Methods
 1. Understand the load profile of known EV loads
 2. Use that to identify similar loads in the meter data
 1. Use specific known characteristics to find matches
 2. Feed data into a machine learning algorithm (WIP)

Part 1 – Surveillance for Unknown EV Loads

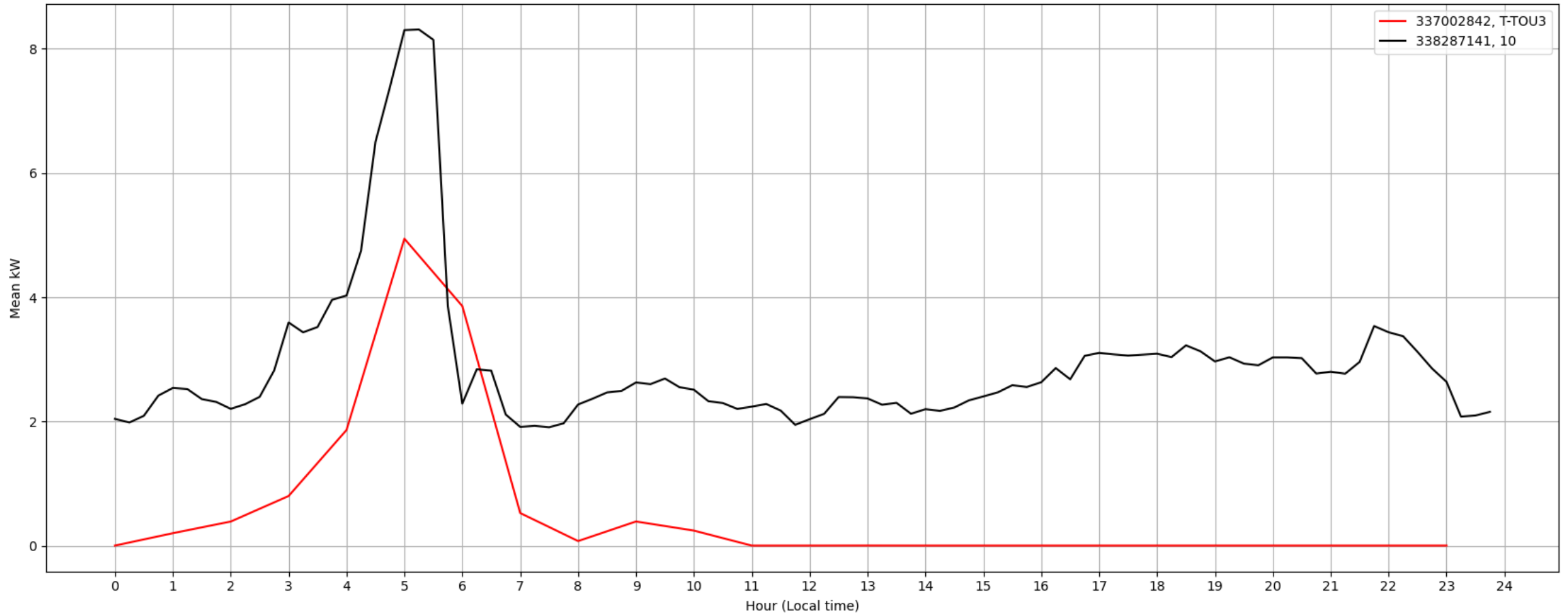
- Load profile example 1: Expected

Black: General Service

Red: EV

Gray: Other

Daily mean demand (kw) at 19 31DD0403004, LAWNDALE 123.0
2022-09-01 - 2022-09-30



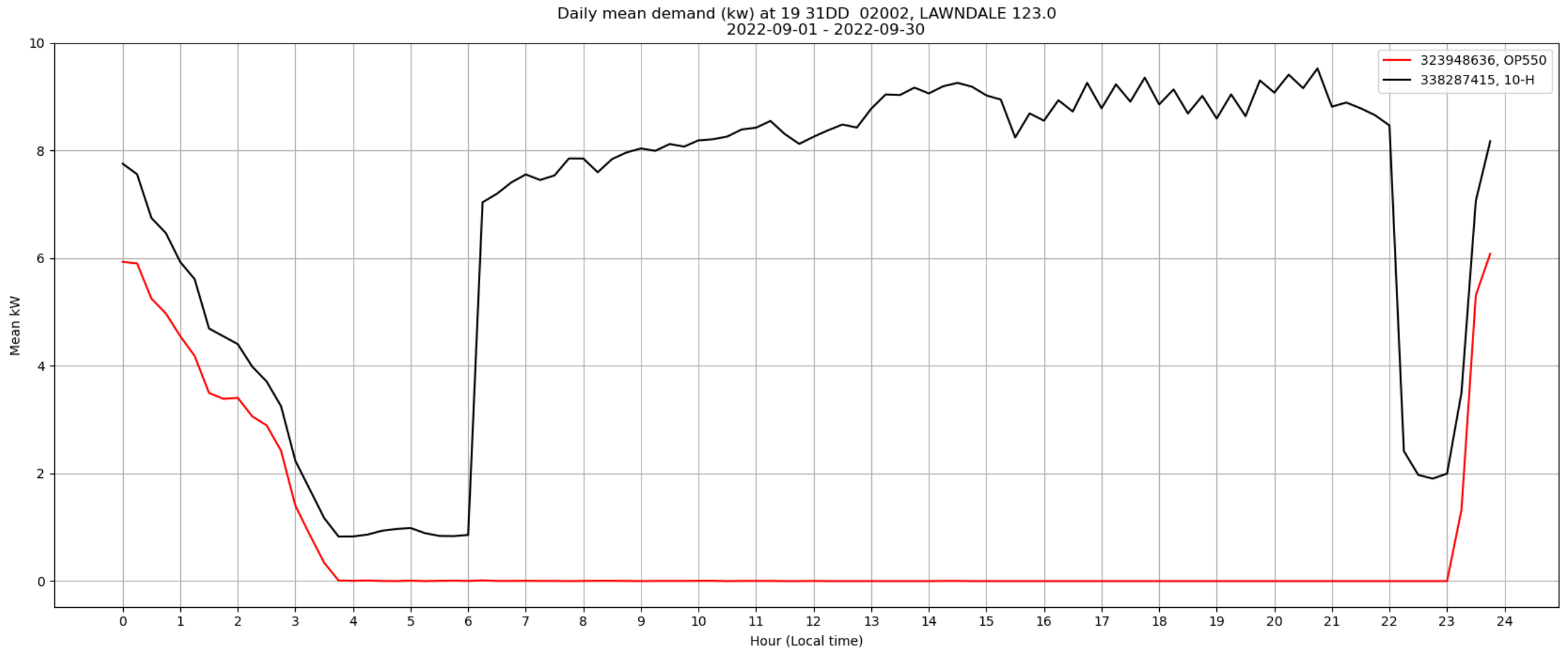
Part 1 – Surveillance for Unknown EV Loads

- Load profile example 2: Unexpected

Black: General Service

Red: EV

Gray: Other



Part 1 – Surveillance for Unknown EV Loads

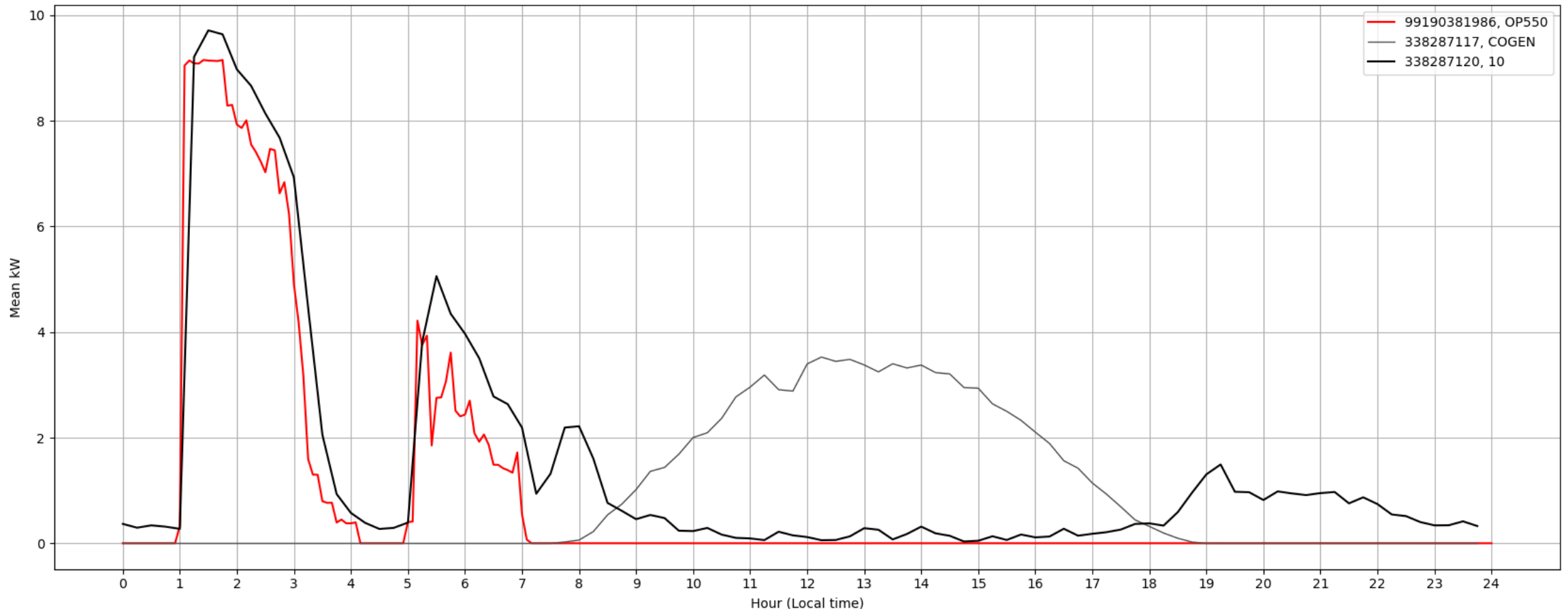
- Load profile example 2: Expected w/ solar

Black: General Service

Red: EV

Gray: Other

Daily mean demand (kW) at 19 32BC 03004, LAWNSDALE 121.0
2022-09-01 - 2022-09-30

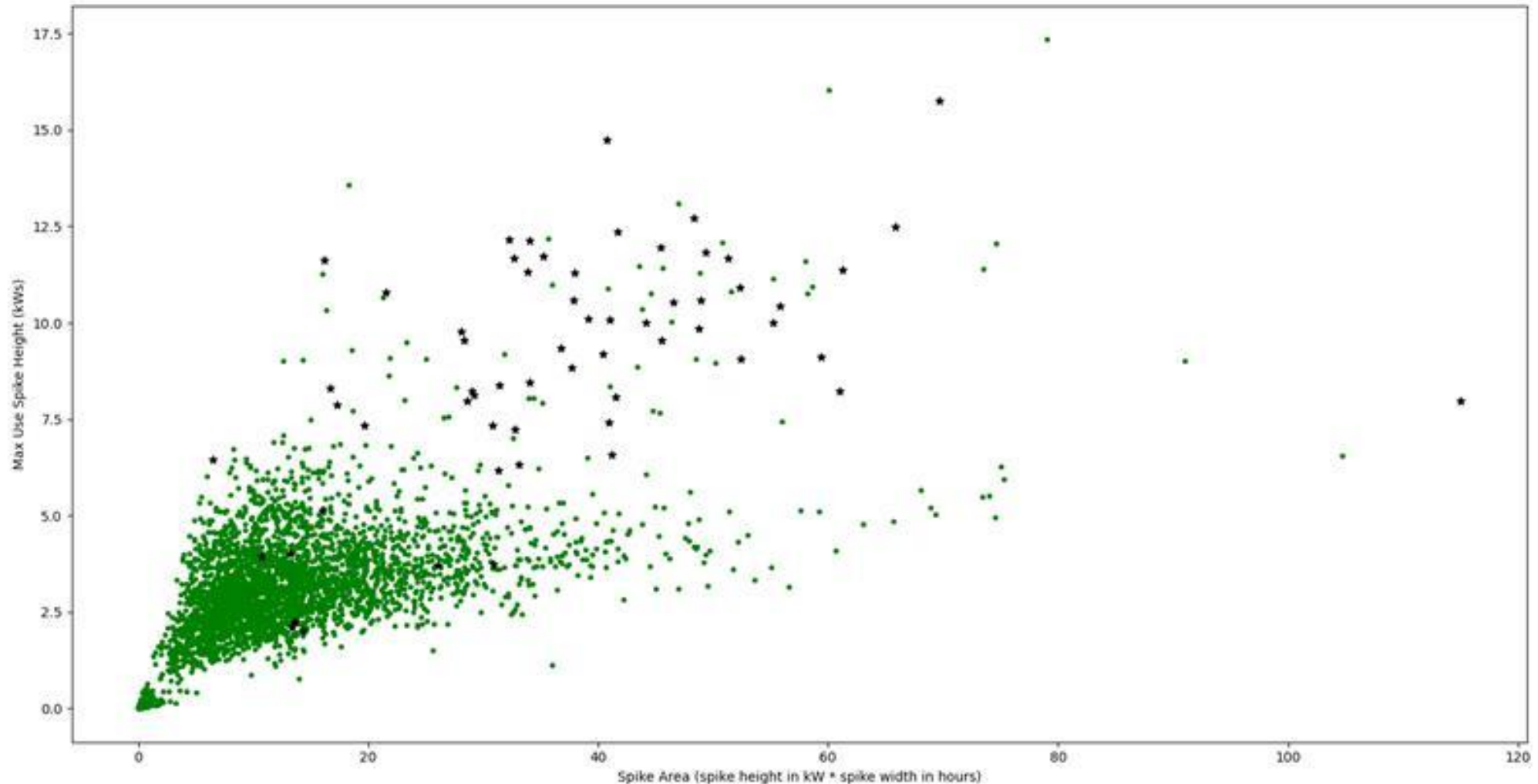


Part 1 – Surveillance for Unknown EV Loads

- Approach – starting simple
 - One substation at a time
 - One month of meter data
 - Shoulder months
- v1 – Spikes above average demand
- v2 – Machine learning - work in progress
 - Requires control group
 - Surveying members to get confirmed no-EV locations

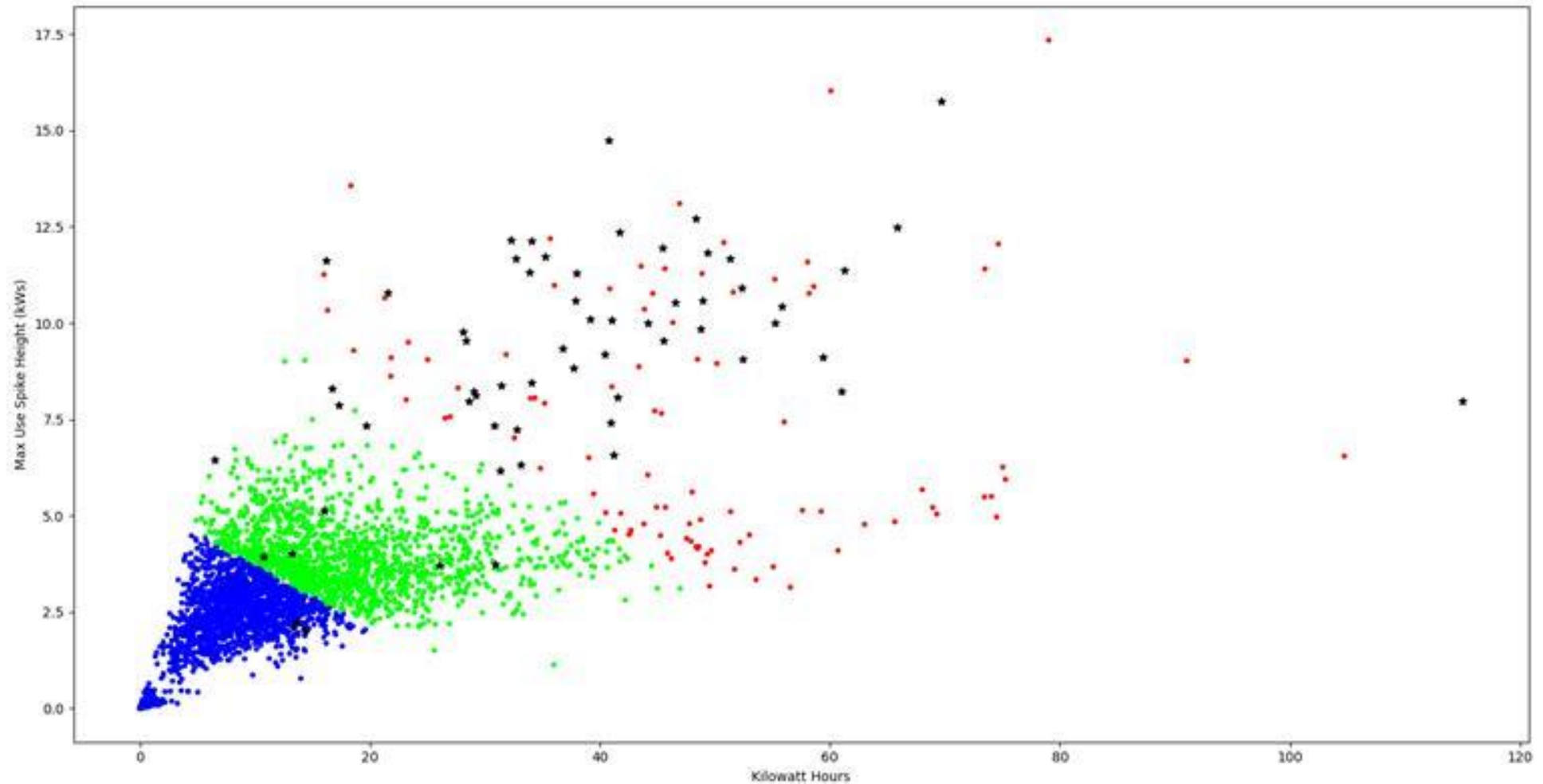
Part 1 – Surveillance for Unknown EV Loads

- v1 – Spikes above average demand



Part 1 – Surveillance for Unknown EV Loads

- v1 – Spikes above average demand



Part 1 – Long Range Plan

- Beginning a new 15 year long range plan
- EV load growth is a fundamental part of this plan
 - Multiple EV adoption rate scenarios
 - Geographic variation
- Repeatable load forecast model
 - Revise inputs based on actuals
 - Reevaluate projects based on revised forecast

Part 1 - Future

- Routine checks for unknown EV loads
- Dashboard to share & integrate
- Targeted communications

Part 2 - Advancing Beneficial Electrification

- Programs & Rates
- Member communications

Business & Technology Report
March 2023

**Electric Vehicle Rate and Program Design
for Electric Cooperatives**



Part 2 - Programs & Rates

- Charger ZEF brand smart chargers – up to \$1,000 rebate
 - Onboard metering
 - Onboard control
 - Off-peak rate only for now (cheap overnight charging only)
- Bring your own charger – up to \$500 rebate
 - Additional meter install
 - Additional control install if off-peak rate
 - Time-of-use rate available (cheap overnight, expensive during peak times)

Part 2 - Programs & Rates

- Subscription
 - \$50 / mo. 1st year, \$25/mo. Thereafter
 - Pilot project: unlimited kWh overnight
 - When offered: capped monthly kWh
 - Time-of-use rates during other times

Part 2 - Programs & Rates: Future Possibilities

- Software-only metering & control
 - No additional meter, smart charger, or control switch
 - Use vehicle's built-in software
 - Like using the car's app with owner's authorization
 - Control charge time and demand
 - Metering quality?
- Vehicle-to-Grid
 - Discharge vehicle battery to reduce overall demand

Part 2 – Member Communications

- Seek to be the EV experts for our members
- Promote EVs throughout co-op communications
- Host EV Ride & Drive event
- Work with car dealers
- Surveys and targeted mailings
- Starting EV member advisory group



Questions

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