



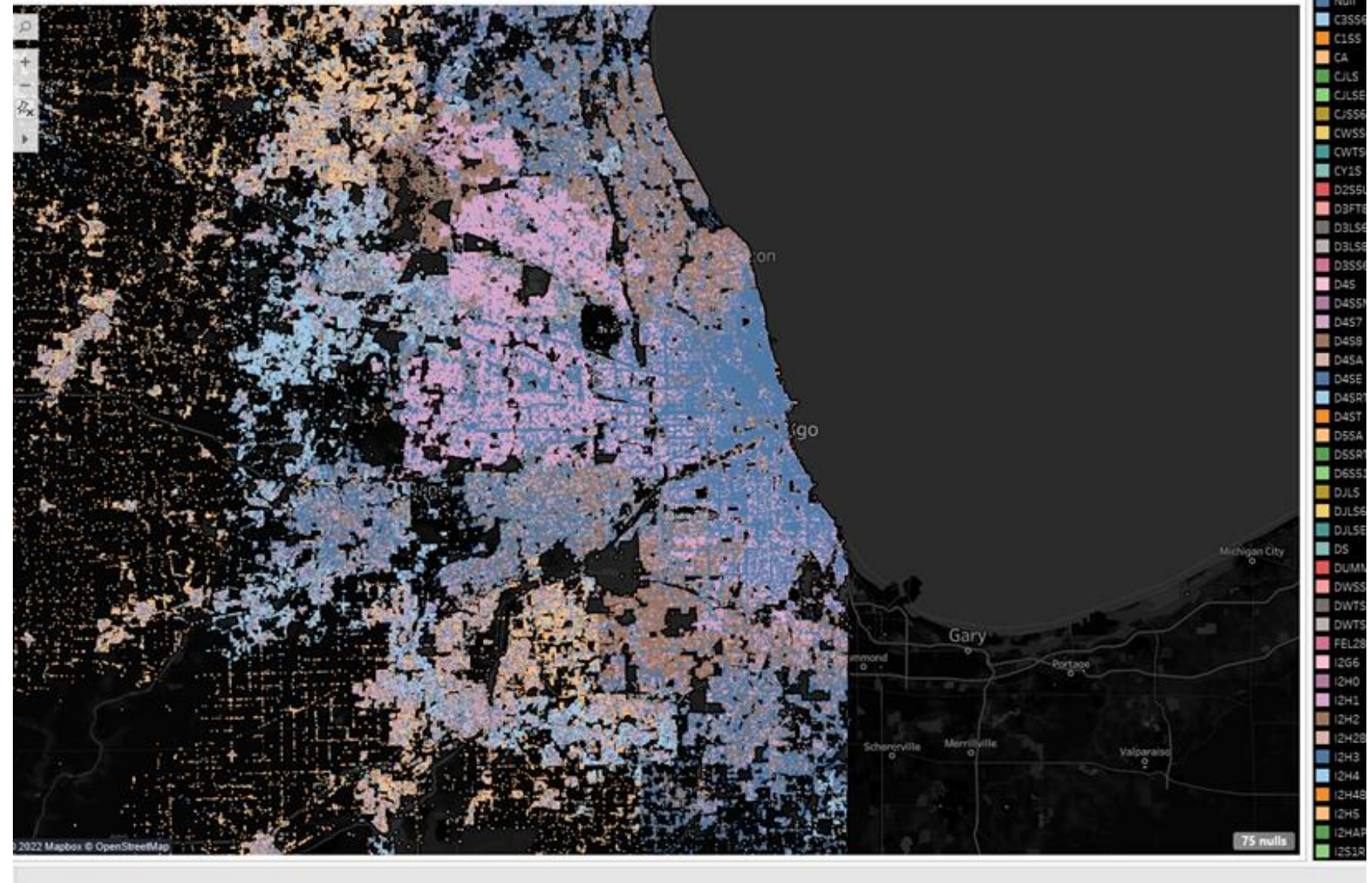
October 2022

# Realizing Unexpected Benefits & Expanding Analytic Use Cases

Natalie Hammer, Sr. Manager AMI Strategy & Data Analytics

# Introduction to ComEd

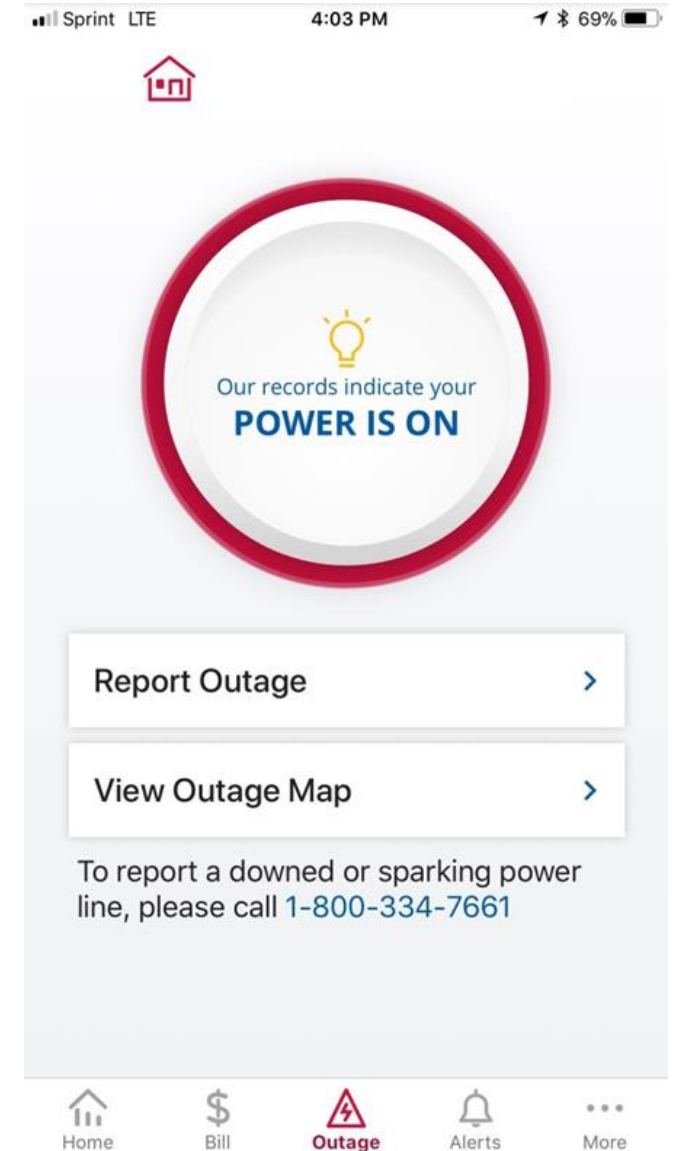
- ComEd is a unit of Chicago-based Exelon Corporation (NYSE: EXC), one of the nation's largest electric utilities
- ComEd and its nearly 6,000 employees serve over 3.8 million customers in northern Illinois



# ComEd Smart Meter Program

4.2M meters read every 4 hours with a 99.92% read rate

- ComEd Smart Meter Program includes:
  - \$960M capital investment as part of \$2.6B infrastructure build-out
  - Leverages Itron's 900 MHz mesh network technology for superior performance and security
  - Functionality integration includes:
    - Billing, Move In/Out, Collections and Theft
    - Outage Management
    - Enhanced web presentation of detailed usage information to improve the customer experience including high usage emails and alerts
    - Peak Time Savings (rebate/opt-in)
  - Supports Smart Cities applications, e.g., Smart Streetlights
  - Municipal Water Meter offerings



# Smart Meter Data Analytics

- **AMI (Advanced Metering Infrastructure)** - Integrated system of smart meters, communication networks, and data management systems that enable two-way communication between utility and customers

## Smart Meter Data Analytics Drives:

Actionable Intelligence



Innovation



Operational Efficiencies



New Insights



## Benefits:

Reduced Cost of Electricity



Enhanced Bill Quality



Improved Safety



Power Quality Visibility





# Operations Optimizer

OPERATIONS OPTIMIZER

User Account: daniel.walrath Daniel Walrath Client: ComEd  
 User Settings | Logout | Email Support

Program: Revenue Assurance - AMI Search: Service Point  
 Analyze KPI Main Page Layer Ma

Analyze :: Revenue Assurance - AMI > Detect > Events after Disconnect Non-Pay - Still Off

VIEWS		ACTIONS				FILTER				QUERY				LOCATE						
Meter	AccountNum	Name	Address	Unit	Town	AcctStatus	DNPScore	DisconnectTime	Num1Hour	Num1Day	Num3Day	NumTotal	PrevKwhPerDay	PostKwhPerDay	AMIModel	OpStatus	Service Point	BG	CIMSMtrStat	SOCreated
						02-ACTIVE	789	04/11/19	0.0	1.0	1.0	1.0	36.81	0.00	I210+C	Disconnected	827528402_82752841_1	16	Cut Out Non-Pay	4/11/2019
						02-ACTIVE	788	04/09/19	0.0	4.0	13.0	15.0	33.17	0.00	I210+C	Disconnected	698430902_69843091_1	3	Cut Out Non-Pay	4/9/2019
						02-ACTIVE	788	04/08/19	2.0	2.0	3.0	3.0	33.06	0.00	I210+C	Disconnected	027212500_80713540_1	1	Cut Out Non-Pay	4/8/2019
						02-ACTIVE	788	04/08/19	0.0	2.0	2.0	2.0	33.24	0.00	I210+C	Disconnected	776157702_83655041_1	12	Cut Out Non-Pay	4/3/2019
						02-ACTIVE	788	04/08/19	0.0	1.0	1.0	1.0	34.09	0.00	I210+C	Disconnected	776110302_77611041_2	12	Cut Out Non-Pay	4/8/2019
						02-ACTIVE	787	04/11/19	0.0	2.0	2.0	2.0	31.03	0.00	I210+C	Disconnected	769747102_76974711_1	20	Cut Out Non-Pay	4/11/2019

Table to Meters

- Meters (Service Point Index Number) X + F S
- Meters (Meter/Account Index Number) X + F S
- Meters (Meter Number) X + F S
- Meters (Set Date) X + F S
- Meters (Billing Group or Cycle) X + F S
- Meters (Meter Status Flag) X - F S
- Meters (Most Recent At Service Point) X - F S
- Meters (Service Point Status Flag) X - F S
- Meter Details (UIQ Administrative State) X + F S
- Meter Details (UIQ Operational Status) X + F S
- Meter Details (AMI Meter Model) X + F S
- Meter Details (Service Voltage) X + F S
- Meter Details (Service Phases) X + F S
- Accounts (Customer Index Number) X + F S
- Accounts (GWA and Route) X + F S
- Accounts (Account Number (SSN)) X + F S
- Accounts (Customer Name) X + F S
- Accounts (Service Address) X + F S
- Accounts (Part Supplied (Unit)) X + F S
- Accounts (Service Town) X + F S
- AMI Interval Data (Interval Date and Time) X + F S
- AMI Interval Data (Channel Description) X + F S
- AMI Interval Data (Interval Value) X + F S
- Service Point Statistics (Last Service Order Index Number) X + F S
- Service Point Statistics (SpAM) X - F S
- Meters (Service Point) X + F S
- Distribution Map (Transformer) X + F S
- Distribution Map (Feeder (Circuit)) X + F S

Make New Query  
 Execute Save Save As Interval Data By Service Point Office Review

Events

Event Category: All

Meter	Time	Type	Source	Value	Valid	Description
	4/13/2019 9:56:34 PM	Disconnected	UIQ Device_Operational_Status	0		Op Status - Disconnected
	4/13/2019 12:00:32 AM	Disconnected	UIQ Device_Operational_Status	0		Op Status - Disconnected
	4/11/2019 3:54:11 PM	15036	UIQ	0		C1219 Primary Power Up
	4/11/2019 3:54:11 PM	15039	UIQ	0		C1219 End device programmed
	4/11/2019 3:54:06 PM	100007	UIQ	0		Power Restore
	4/11/2019 3:49:29 PM	12007	UIQ	0		Last Gasp - power lost to NIC
	4/11/2019 3:49:28 PM	12024	UIQ	0		NIC power down
	4/11/2019 3:49:21 PM	15035	UIQ	0		C1219 Primary Power Down
	4/11/2019 1:05:01 PM	30206	UIQ	0		Trap: Switch state changed for device
	4/11/2019 1:02:39 PM	300043	UIQ	0		This event is generated when a remote provisioning operation succeeds.
	4/11/2019 1:02:29 PM	15122	UIQ	0		RCDC Switch Open

Tampering  
3:49pm

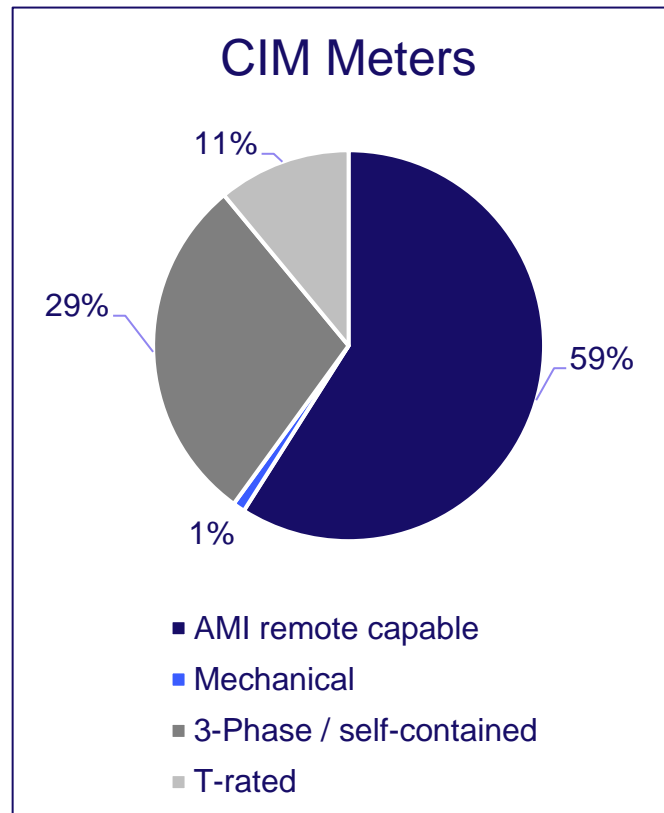
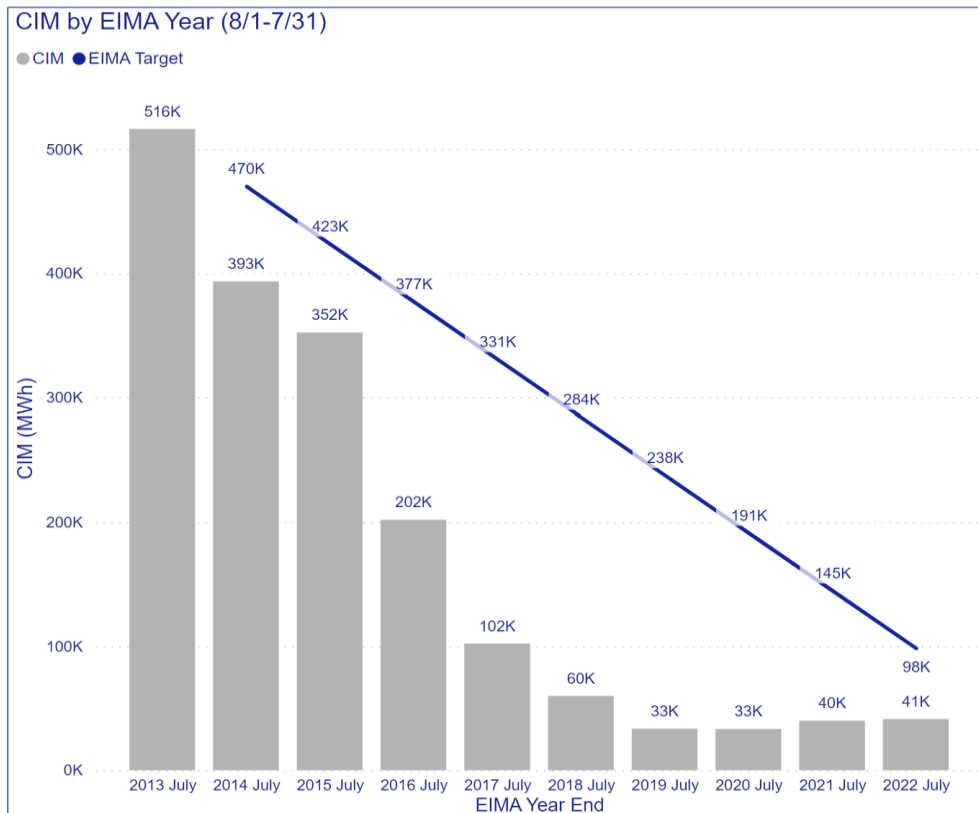
Remote  
Disconnect  
1:02pm

# Consumption on Inactive Meters

- EIMA Metrics: **Consumption on Inactive Meters (CIM)** – Metered electricity with no customer on record to bill

Analyze:: Revenue Assurance - AMI > Detect > Disconnect Unreachable - ALL FAST DW V4

VIEWS		ACTIONS			FILTER			QUERY		LOCATE		
Meter	LastDelkWh	AdminStatus	OpStatus	Address1	Town	Unit	AccountNum	Customer Name	AcctStatus	CIMSMTStat	CountActiveAtAddress	CountPendingActiveAt
<input type="checkbox"/>	09/18/21	Disconnected	Unreachable						TRANSFERRED	Inactive Off	0	0
<input type="checkbox"/>	09/18/21	Disconnected	Unreachable						FINALLED	Inactive Off	0	0
<input type="checkbox"/>	09/18/21	Disconnected	Unreachable						FINALLED	Cut Out Non-Pay	0	0
<input type="checkbox"/>	09/18/21	Disconnected	Unreachable						TRANSFERRED	Inactive Off	0	0
<input type="checkbox"/>	09/18/21	Disconnected	Unreachable						TRANSFERRED	Inactive Off	0	0
<input type="checkbox"/>	09/18/21	Disconnected	Unreachable						FINALLED	Inactive Off	0	0
<input type="checkbox"/>	09/18/21	Disconnected	Unreachable						FINALLED	Cut Out Non-Pay	0	0

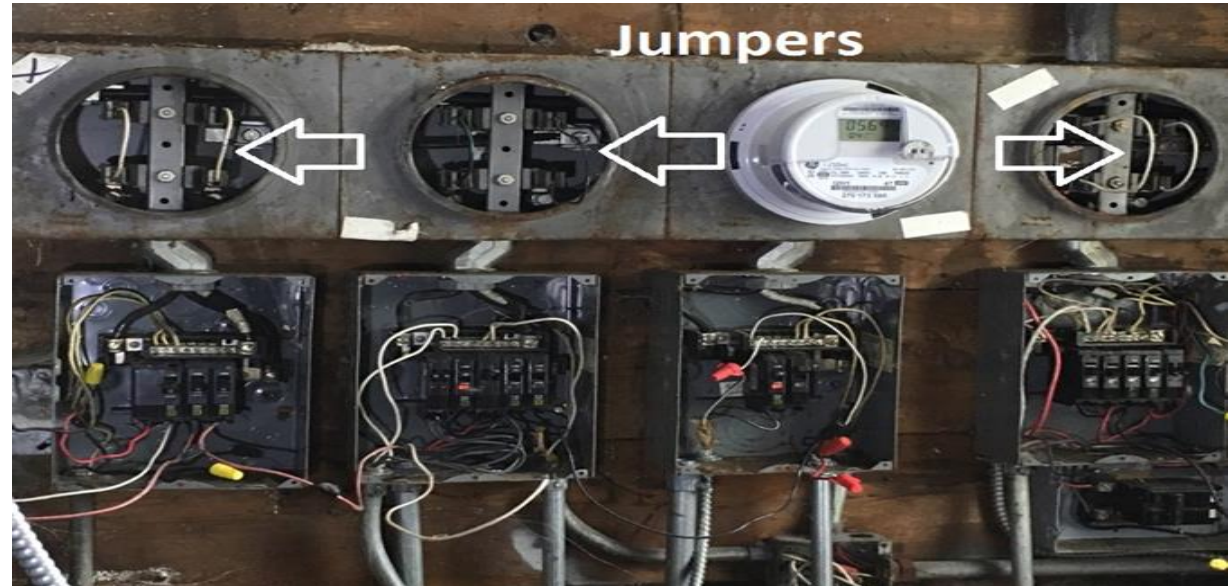
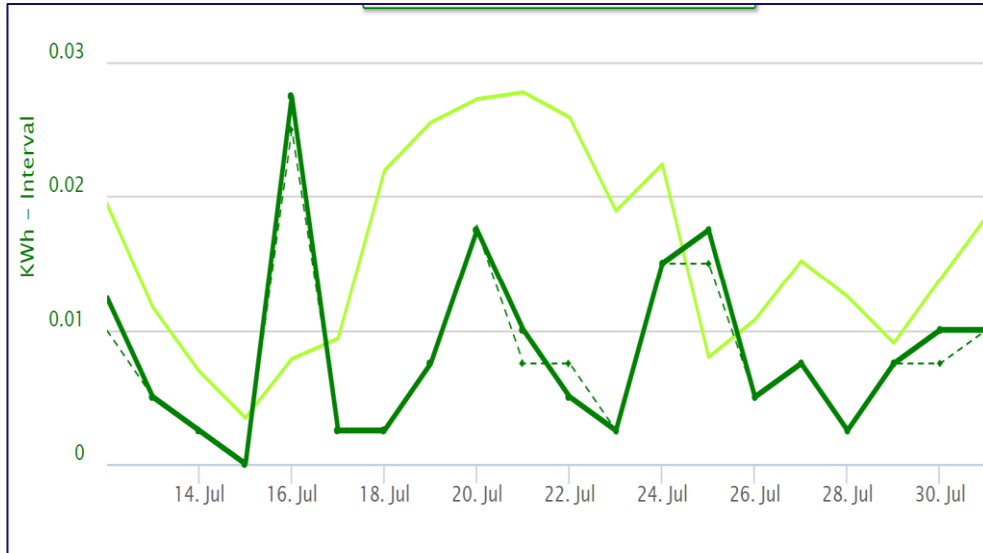


# Reduced Cost of Electricity

- EIMA Metrics: **Unaccounted for Energy (UFE)**– Unmetered electricity that is not billed (e.g., theft of service)

Analyze:: Revenue Assurance - AMI > Detect > Disconnect Unreachable - ALL FAST DW V4

VIEWS		ACTIONS			FILTER			QUERY		LOCATE		
Meter	LastDelKWh	AdminStatus	OpStatus	Address1	Town	Unit	AccountNum	Customer Name	AcctStatus	CIMSMTStat	CountActiveAtAddress	CountPendingActiveAt/
<input type="checkbox"/>	09/18/21	Disconnected	Unreachable						TRANSFERRED	Inactive Off	0	0
<input type="checkbox"/>	09/18/21	Disconnected	Unreachable						FINALLED	Inactive Off	0	0
<input type="checkbox"/>	09/18/21	Disconnected	Unreachable						FINALLED	Cut Out Non-Pay	0	0
<input type="checkbox"/>	09/18/21	Disconnected	Unreachable						TRANSFERRED	Inactive Off	0	0
<input type="checkbox"/>	09/18/21	Disconnected	Unreachable						TRANSFERRED	Inactive Off	0	0
<input type="checkbox"/>	09/18/21	Disconnected	Unreachable						FINALLED	Inactive Off	0	0
<input type="checkbox"/>	09/18/21	Disconnected	Unreachable						FINALLED	Cut Out Non-Pay	0	0



# Theft Algorithms

	Status of Service Orders Created in 2022				792 Orders Completed In July						2022 YTD			
	July 2022 Created	July 2022 Completed	2022 YTD Created	2022 YTD Completed	No Field Find	Jumpers / Tampering	Foreign Meter	New Business Revisions	Wiring / Equipment Issue	# Success / # Completed	July Success Rate	# Tampered / # Completed	Success Rate	# Tampered / # Completed
<b>Algorithms - Field Visit</b>														
Disconnected Unreachable	194	288	1,928	1,647	17	106	0	63	102	271 / 288	94%	37%	95%	39%
Bypassed / Load Side Voltage	126	208	1,150	1,326	35	128	0	6	39	173 / 208	83%	62%	87%	66%
Events After Non-Payment Disconnect	52	87	289	312	12	66	0	1	8	75 / 87	86%	76%	79%	70%
Events After CIM Disconnect	15	19	116	125	10	3	0	1	5	9 / 19	47%	16%	60%	36%
Channel Reverse Energy	14	24	129	164	1	20	0	1	2	23 / 24	96%	83%	96%	61%
AMI Drop on Event	6	11	147	167	2	5	0	1	3	9 / 11	82%	45%	83%	42%
Disconnected with Usage (auto)	9	14	79	83	2	5	0	0	7	12 / 14	86%	36%	92%	49%
AMI Phase Angle/Power Quality	0	0	7	7	0	0	0	0	0	0 / 0	0%	0%	100%	0%
<b>Field Visit Totals</b>	<b>416</b>	<b>651</b>	<b>3,845</b>	<b>3,831</b>	<b>79</b>	<b>333</b>	<b>0</b>	<b>73</b>	<b>166</b>	<b>572 / 651</b>	<b>88%</b>	<b>51%</b>	<b>89%</b>	<b>52%</b>
<b>Algorithms - Pole Cuts</b>														
Pole Cut - Unreachable Meter	103	85	695	653	0	85	0	0	0	85 / 85	100%	100%	100%	100%
Pole Cut - Non-Pay	46	44	333	283	0	37	0	0	7	44 / 44	100%	84%	100%	95%
Pole Cut - Tampering/Bypassed	12	12	153	133	0	12	0	0	0	12 / 12	100%	100%	100%	100%
<b>Pole Cut Totals</b>	<b>161</b>	<b>141</b>	<b>1,181</b>	<b>1,069</b>	<b>0</b>	<b>134</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>141 / 141</b>	<b>100%</b>	<b>95%</b>	<b>100%</b>	<b>99%</b>
<b>Grand Total</b>	<b>577</b>	<b>792</b>	<b>5,026</b>	<b>4,900</b>	<b>79</b>	<b>467</b>	<b>0</b>	<b>73</b>	<b>173</b>	<b>713 / 792</b>	<b>90%</b>	<b>59%</b>	<b>92%</b>	<b>62%</b>



# Repeat Tampering Offender



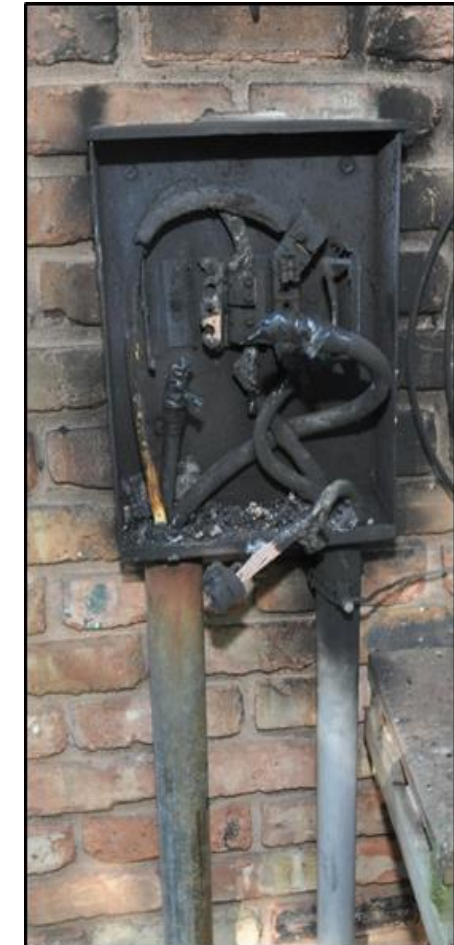
# Improved Safety- Meter High Temp Alarms

- AMI analytics enables early identification of customer equipment degradation and needed repairs, thus helping to prevent unsafe incidents



Analyze - AMI Ops - Temperatures > Detect > High Meter Temperature

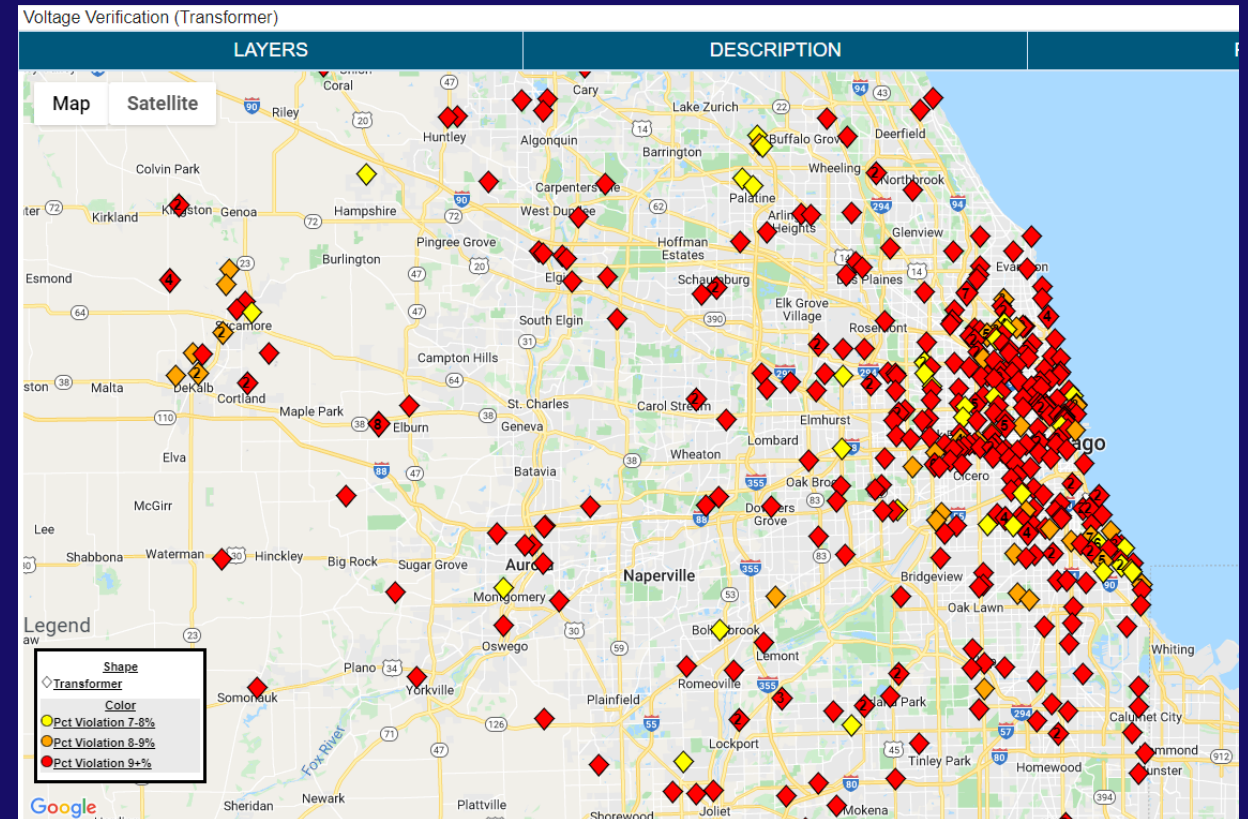
VIEWS		ACTIONS		FILTER		QUERY		LOCAT															
Meter	Loc	CMS/Stat	SPisAct	AMModel	AdminStatus	OpStatus	AccountNum	Address	Unit	Town	OpCl	MRAP	OpRESO	ESO	HighDate	HT_Time	LastHT	2AMT	6AMT2	10AMT3	2PMT4	6PMT5	10PMT6
										MORRIS	CHA	True			10/15/17	22:00	280.6					280.6	280.6
										LIBERTYVILLE	LUB	True			10/15/17	22:13	154.4	150.8	158.0	78.8	77.0	75.2	154.4
										CHICAGO	CN	True			10/15/17	14:05	152.6	105.8	107.6	107.6	152.6	105.8	105.8
										MOLOTHAN	CRE	True			10/15/17	2:10	147.2	147.2	131.0	111.2	107.6	73.4	68.0
										CHICAGO	CN	True			10/15/17	22:15	147.2	96.8	96.8	93.2	132.8	143.6	147.2
										CHICAGO	CN	True			10/15/17	10:02	145.4	105.8	107.6	145.4	107.6	109.4	109.4
										CHICAGO	CN	True			10/15/17	18:02	145.4	102.2	102.2	102.2	102.2	145.4	100.4
										WHEELING	NOR	True			10/15/17	22:29	143.6	143.6	143.6	143.6	143.6	143.6	143.6
										WESTMONT	BOL	True			10/15/17	2:15	143.6	143.6	138.2	123.8	127.4	127.4	131.0
										CHICAGO RIDGE	CRE	True			10/15/17	22:11	143.6	143.6	143.6	145.4	143.6	145.4	143.6
										CHICAGO RIDGE	CRE	True			10/15/17	22:11	143.6	143.6	143.6	143.6	143.6	143.6	143.6





# Voltage Violations Investigation

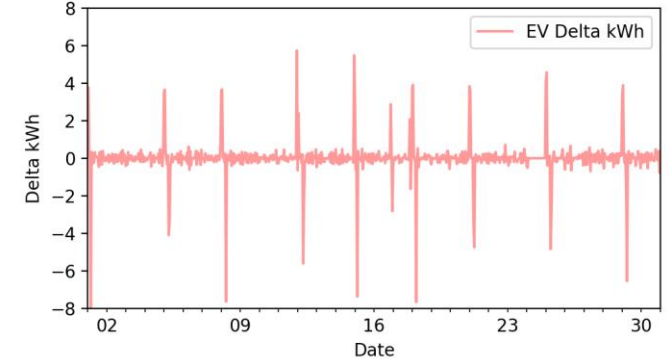
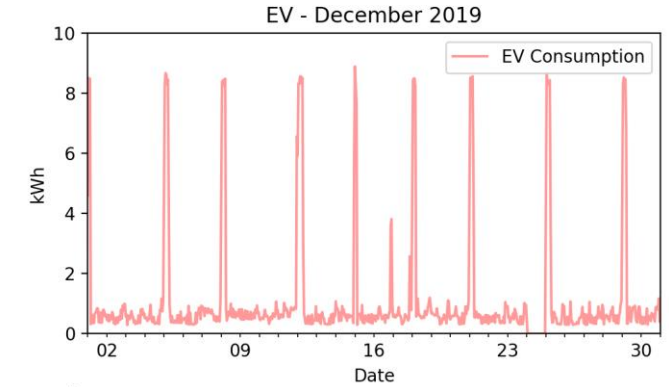
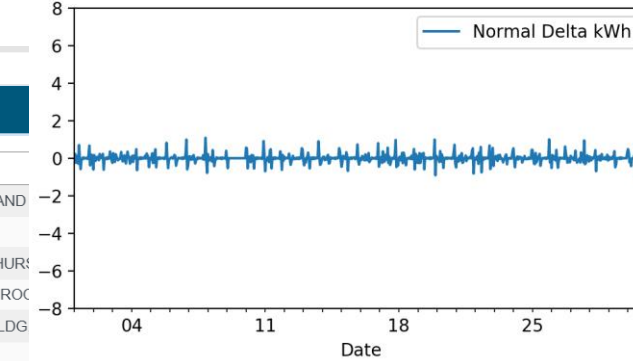
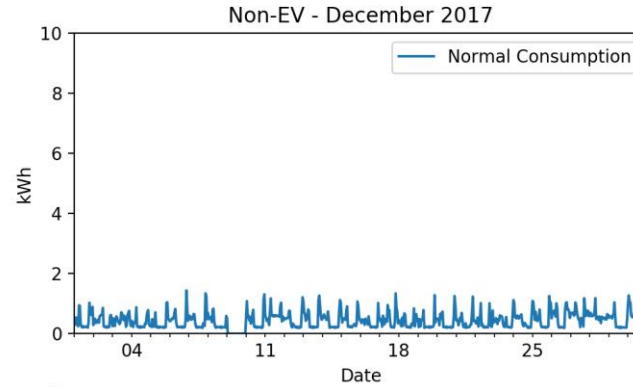
- Proactive investigation of power quality vs. the traditional response
  - Prevent failures by addressing precursor conditions
  - Reduce quantity of high/low voltage complaints
  - Minimize truck rolls using AMI technology
  - Investigations start with largest amount of impacted customers
  - +/- 7% voltage violation for 4x per day for 4 consecutive days



# EV Predictor

Analyze:: Revenue Assurance - AMI > Detect > EV Leads (Transformer) - ComEd

VIEWS		ACTIONS		FILTER	
Transformer	Customer/Feeder	SUM of EVScore	Capacity	Address	
<input type="checkbox"/>	486323U6	J5123	5.248	75	18042 BUCKINGHAM DR, ORLAND
<input type="checkbox"/>	456182K7	D4907	4.911	25	253 N HILLSIDE AVE, HILLSIDE
<input type="checkbox"/>	384354D2	A9421	3.9988	150	387 NORTHGATE RD, LINDENHUR
<input type="checkbox"/>	426093D8	C138Y	3.913	75	2419 PARTRIDGE LN, NORTHBRO
<input type="checkbox"/>	03843803	Y3649	3.9091	999	1045 W WASHINGTON BLVD BLDG
<input type="checkbox"/>	465153A1	W3625	2.8975	75	812 MEGAN CT, WESTMONT
<input type="checkbox"/>	427273C6	C496	2.53	75	1219 ELMWOOD AVE, WILMETTE
<input type="checkbox"/>	444094E4	W6206	2.4332	25	747 SUNRISE LN, ROSELLE
<input type="checkbox"/>	04472204	Y12651	2.3119	100	1479 S INDIANA AVE UNIT BD, CHIK
<input type="checkbox"/>	464222G5	W599	2.2168	1500	6530 DOUBLE-EAGLE DR BLDG, W
<input type="checkbox"/>	05452801	Z74134	2.1745	100	449 W 38TH ST, CHICAGO
<input type="checkbox"/>	456333J2	D3415	2.1397	150	30 RICHMOND AVE, LA GRANGE P
<input type="checkbox"/>	483084B2	J5471	2.0855	25	14858 INDEPENDENCE CT, PLAINF
<input type="checkbox"/>	02672707	X4034	2.0322	100	1529 W WALTGELD ST UNIT CNTL, C
<input type="checkbox"/>	441241E2	W391	2.031	75	39W907 W ROBERTFROST, CAMPT
<input type="checkbox"/>	426021C4	C127	1.9995	50	1054 WILLIAMSBURG DR, NORTHE
<input type="checkbox"/>	03021201	Y3878	1.9884	100	2536 W MOFFAT ST UNIT 1, CHICA
<input type="checkbox"/>	433044E3	E3509	1.9808	37.5	5230 SHOTKOSKI DR, HANOVER T
<input type="checkbox"/>	454031K5	W2025	1.9757	37.5	246 CONCORD LN, CAROL STREA

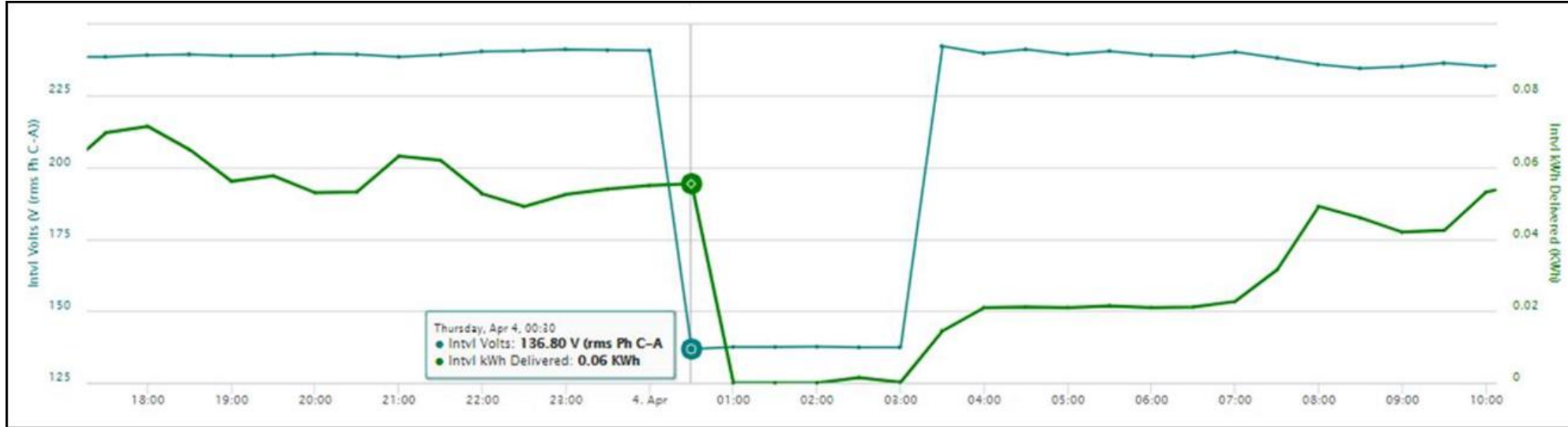


- Scores premises on likelihood of EV
- Rolls up EV's to transformer/feeder/substation



# Power Quality Visibility

- AMI analytics enables us to address customer concerns surrounding power quality and engineering concerns regarding equipment performance



Meter	Time	Type	Source	Value	Valid	Description	Text
	4/4/2019 3:01:51 AM	100007	UIQ	0		Power Restore	NIC Power Restore Trap Received from device: 00:13:50:05:00:1c:3b:2b, Reboot
	4/4/2019 3:01:33 AM	15036	UIQ	0		C1219 Primary Power Up	Primary Power Up occurred for meter 00:13:50:05:00:1c:3b:2b.
	4/4/2019 3:01:30 AM	12024	UIQ	0		NIC power down	NIC power failure. Power loss detection=POWER_FAIL Number of reboots=123 N
	4/4/2019 3:01:27 AM	15035	UIQ	0		C1219 Primary Power Down	Primary Power Down occurred for meter 00:13:50:05:00:1c:3b:2b.



Thank you