

conEdison

Microprocessor Relays in Network Protectors

Distribution Engineering | Equipment Analysis Center (DEEAC)

Distribution Engineering Equipment Group

Presented by:

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Agenda

- Con Edison of NY
- Typical Secondary Network
- Microprocessor Relays
- Relay Programs
- Tools for the Field
- Leveraging Technology
- Questions



Con Edison of NY – Service Area



Customers 3.4 million Population 9.2 million Area 660 mi²

Peak Demand 13,322 MW Con Edison Load Density 22.1 MW/mi² NY State Load Density 0.6 MW/mi²

Network (underground) 85% Non-network (radial, overhead) 15%

Transmission 69, 1 38, 345, 500 kV Primary Distribution 4, 13, 27, 33 kV Secondary Distribution 120, 265 V



Typical Secondary Network





Network Protector Relay Advancement

• Electromechanical and Solid-State Relays





- Microprocessor Relays
 - Direct replacement
 - Programmable





Microprocessor Relays – Early Stages

- Remote Monitor System (RMS)
 - Transformer: Loading, temperature, pressure
 - Network Protector: Switch status, 3 phase secondary voltages

Net RMS

SHERIDAN SQUARE: V 03027 and Its Nearbys

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Target		FDR	Address	STATUS	LC)AD (A	ABC)	(avg)	\ 	OLTAGE	с	TEMPERA	TURE	PRESSURE
V 03027		<u>10M02</u>	HUDSON ST 405	closed	47	45	45	(46)	122	121	121	33		2.8
Noarby	MDE	EDB	Addrocc	Status		Loads(%)			Voltages			Temperature		Draceura
меагру	NDF	FUK	Auuress	Status	A	В	С	(avg)	A	В	С	T/Oil I	H/Spot	Pressure
VS07764	15	10M12	111 LEROY ST	closed	34	34	34	(34)	121	122	121	0		-2.1
V 07062	12	<u>10M01</u>	LEROY ST 126	closed	41	44	44	(43)	121	122	121	27		2.5
V 01289	4	10M03	W HOUSTON ST 284 WLY CTR	closed	45	49	54	(49)	0	121	121	41		1.6
V 01636	4	<u>10M11</u>	W HOUSTON ST 284 ELV	open	0	0	0	(0)	121	121	120	35		3.5
VS01604	4	10M04	130 LEROY ST	open old	0	0	2	(2)	114	120	97	28		18.4
VS07368	4	<u>10M05</u>	130 LEROY ST	closed	20	22	20	(21)	121	122	121	9		1.2



Leveraging Microprocessor Relay Data

- Driving Operational decisions
 - Real time data acquisition
- Supporting Engineering analysis tools
 - Visualization tools and alerts
 - Moving from time-based to condition-based inspections





Microprocessor Relays – Trip Modes

- Sensitive
 - Relay will trip if power flow is greater than 0.15% of the CT's rating
- Time Delay
 - Relay will initiate a "2.5 minute" trip delay during reverse power flow condition
- Insensitive
 - Relay will allow reverse power flow less than the instantaneous trip level.
- Adaptive Trip
 - Allows reverse power flow
 - Distributed Generation (DG) locations
 - Prevents unwarranted network protector (NWP) operations



Evolving Relay Programs

- NWP Auto Exercise (AE)
 - Automatically exercise NWP in the field
 - RMS flags will aid in identifying defective NWP
- Two Stage Closing (2SC)
 - Automatically close NWPs that remained open
 - Close NWP at 5 Volts difference
- SCADA Capabilities & H9 Relays
 - Allowing us to clear an Alive Backfeed (ABF) remotely
 - Utilize the relay as a diagnostic tool for the NWP



NWP with Relay at Con Edison's Astoria Transformer Shop



Question

 How is your company managing Distribution Energy Sources (DERs) in network areas?



Tools – Troubleshooting Guide

- Creating dynamic guides for Field personnel
- Maintaining Relays
 - Firmware
 - Settings
 - Resetting RMS

oubleshooting Steps	RESETTING RMS								
 Click 'RMS Setup' Ensure "Enable RCT PLC Link" box is checked. Verify Close the RMS setup window Click 'Program' common mistake is forgetting to perform steps 3 and 	y ID, CT multiplier, and	d Frequency are	e correct.						
El ETI Fieldho v10005 Conéd Ele Evi Units Help Type: WH SN: 184785 Ver: 09.91 FW Date: 11/23/2020 Relay Volta	age: 125 Cycles: 35	- D X							
UNBLOCKED CLOSE									
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Tools – Relay Checklist (Phase I)

- Field to provide more detailed information
 - Relay serial number
 - Environment / observations
 - Operational performance
- Coordinate analysis
 - Obtains Relays & Data
 - Involving vendor(s)
 - Provide analysis reports
- Provide findings
 - Provide solutions to the Field
 - Work with the vendor

Relay Checklist:

Location (Borough)	
Structure Number	
Feeder	
Voltage	
Employee ID	
Date	
Relay - Serial Number	
Relay - Firmware version	
Relay - Temperature	
24-point or 25-point RMS Board	
Error Code Displayed	
Pulse Trip Reset – Boxed Checked	
Damage Insulation Wiring	
Unresponsive Relay – No Scroll	
General Field Comments	



Tools – Power Apps (Phase II)

• Current tool (Paper Checklist)



- Transition to a digital format (Power App)
 - Replace the paper checklist
 - Photos & Videos

	P PowerApp	S
Recent a	pps	See all
*	NWP FRET Sina, Ambra Consolidated Edison Company of New York, I (default) (Upgrade)	nc.
	NWP Test Sheets and Photos Sitt, Esther S. Consolidated Edison Company of New York, I (default) (Upgrade)	nc.
	NWP Attendance Sina, Ambra Consolidated Edison Company of New York, I (default) (Upgrade)	nc.
	Transformer FRET Sina, Ambra Consolidated Edison Company of New York, I (default) (Upgrade)	nc.
	Inventory - Radial Sina, Ambra Consolidated Edison Company of New York, I (default) (Upgrade)	nc.
Home		••• More



Leveraging Technology to meet Business Needs

- Complex Relays/ SCADA for a complex distribution system
 - Coordination with costumers





Meeting the Future Power Grid

- Distribution
 Generation (DG)
 - Growing volume
 - More reverse power conditions
 - Explore technology to work and coordinate together
 - Grow our understanding of the impact to our system

Smart Grid

Smart grid puts information and communication technology into electricity generation, delivery, and consumption, making systems cleaner, safer, and more reliable and efficient.









