

In Pursuit of Excellence

Changing The Culture with Innovations

Todd Teykl, Operations Manager

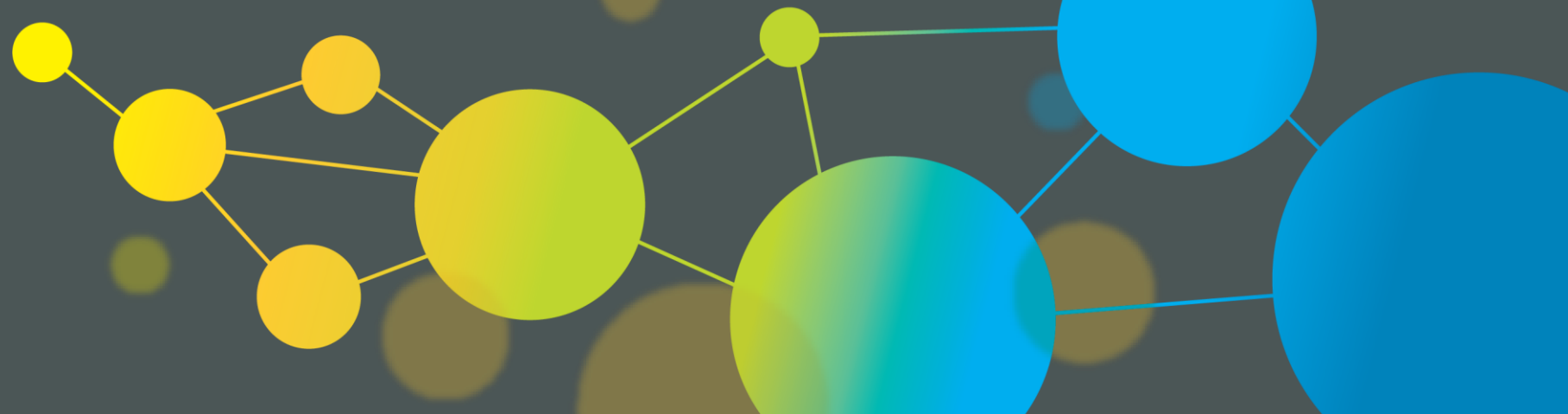
Aaron Minervine, Operations Manager

Major Underground, Houston

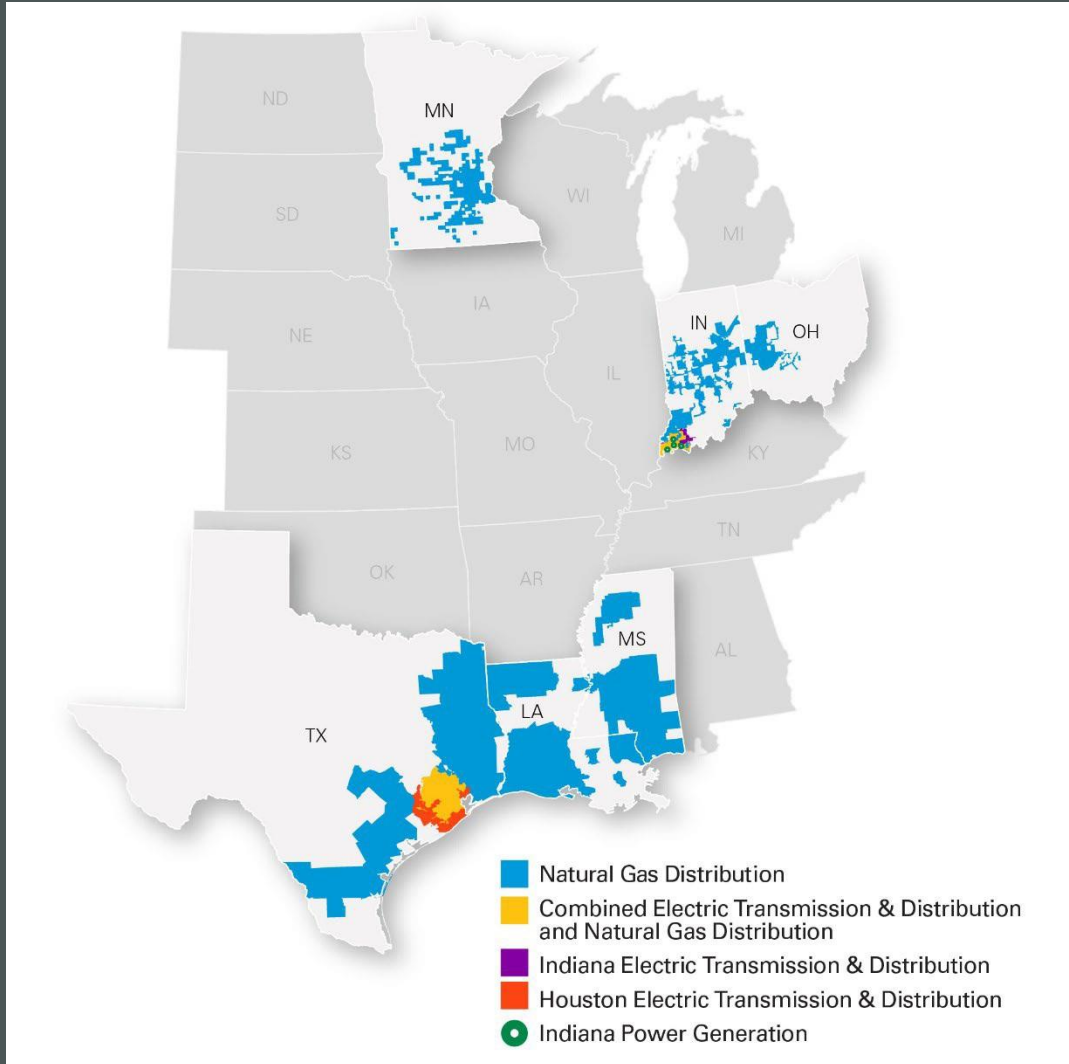
ENSC

Houston, Tx

September 2022



CenterPoint Energy: An Electric and Natural Gas Utility



Electric Transmission & Distribution and Power Generation



more than
2.8 million
METERED CUSTOMERS

2
states

Natural Gas Distribution



more than
4.2 million
METERED CUSTOMERS

6
states

Competitive Energy Businesses



Project activity in more than
20 states

Major Underground Operations Fast Facts

- Infrastructure Stats

- 12kv circuit: 7,661 miles
- 35kv circuit: 22,672 miles
- 69kv circuit: 1.9 miles
- 138kv circuit: 23.9 miles
- Underground Substation Get-Aways : 1,488
- Underground Circuit Dips: 963
- Dedicated Underground circuits: 222
- Underground Transmission circuits: 5
- Underground Secondary network in Downtown Houston: 4 substations, 6 networks
 - Voltages supplied: 120/208 –
- Spot Networks
 - Voltages supplied: 277/480

- Services

Dedicated underground services: 804

Underground customer services outside dedicated service areas: 8,194

- Approximate In-service equipment counts:

Transformers: 10,064

802 vault locations with 1,453 Transformers

8,196 PMT locations with 8,611 Transformers

Padmount Switches: 1,860

Breakers / Interrupters: 892

Network Protectors: 219

Primary Metering cabinets: 60

Manholes: 12,600

Reclosers: 148

In the beginning... Our Culture

- Over 100 years of craftsmanship in UG Operations
- “Tried and True” methods and tools
- Multi-generational history and stability
- Aversion to risk and change (by management?)
 - Change = Risk... don't do it!
 - “If it's not broke, don't fix it” mindset
- Prior innovations had poor track record

What started the Culture Change?

- New management team (2013)
 - In 2021, 100 % turnover of management and 50% of supervision
- Created: A vision for innovation
- Created: A welcome home for new ideas
- Turn words into ACTION
 - Motivated to improve safety, working conditions, and ergonomics
 - Actions also improved reliability and productivity??

A network diagram consisting of several interconnected circles of varying sizes and colors (yellow, lime green, and blue) on a dark grey background. The circles are connected by thin white lines, forming a web-like structure. The largest circle is yellow and contains the text "Let the journey begin...".

**Let the journey
begin...**

In the beginning



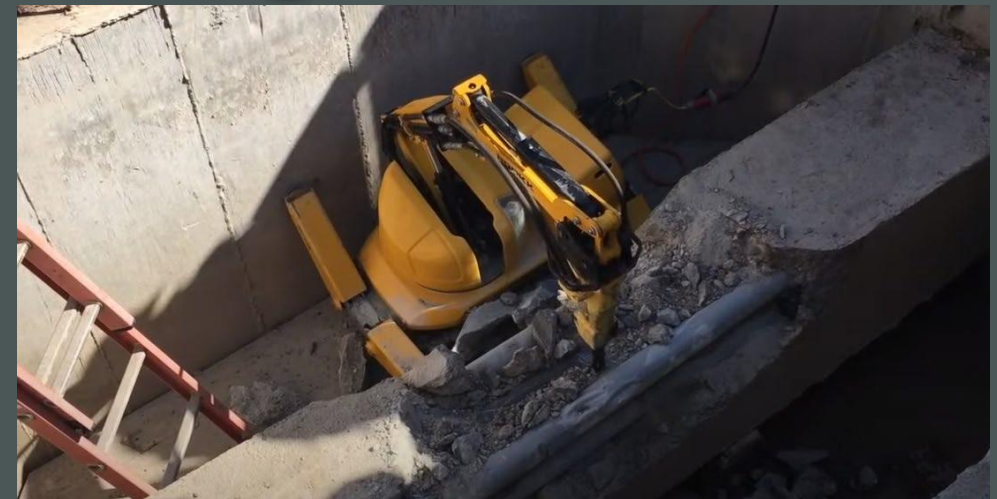
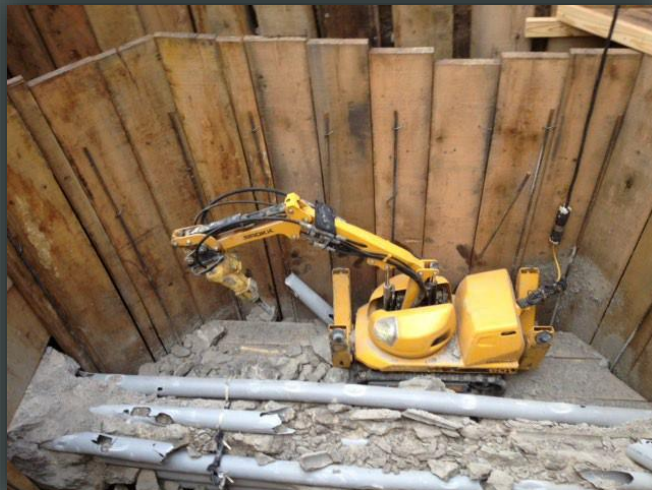
Ø REJECT
○ FIND
⊕ DRIVE

**INNOVATIVE SOLUTIONS FROM
ELECTRIC OPERATIONS MAJOR UNDERGROUND**



Improve concrete removal around energized ducts

- Three skilled workers for one day (one operator, two spotters)
- Workers are out of enclosed space, working above pit with remote control
- Minimal PPE required, no flash hazard
- No silica dust mitigation required



Effects of the Demolition Machine

Employees witnessed:

- An undesirable task be conquered by a joystick
- Improved safety and productivity
- Management enthusiasm and support for new ideas



Created a “hunger” for new tools, equipment, and processes

3 Phase Cable Identification Equipment

- Used to positively identify cable
- Connect machine to cable, ground other end
- Machine places unique signal on each conductor
- Operator identifies each phase conductor using a handheld device and clip-on amp tongs



Hydraulic Cable Cutter

- After positive cable identification, set up in manhole
- Operate cutter from above manhole via remote switch
- No one exposed to hazards



Mechanical Splices – Cold Shrink and EPDM hybrid

- Use of precision tools for consistent cable prep
- Use of shear bolt connector to attach cables
- Eliminates molten metal, gas, and smoke
- Eliminates imperfections, improves reliability
- Reduce risk of injury, improved ergonomics



Update Gas Test Equipment

- Smart Dock “bump” test at end of shift
 - Recharge unit
 - Perform unit health check
 - Upload use and test data to cloud
 - Schedule maintenance/send replacements autonomously



Update Thermal Imaging Equipment

- Replaced “red dot” thermal guns
- Comprehensive view of workspace
- Better communication of trouble locations
- Enabled thermology response procedures



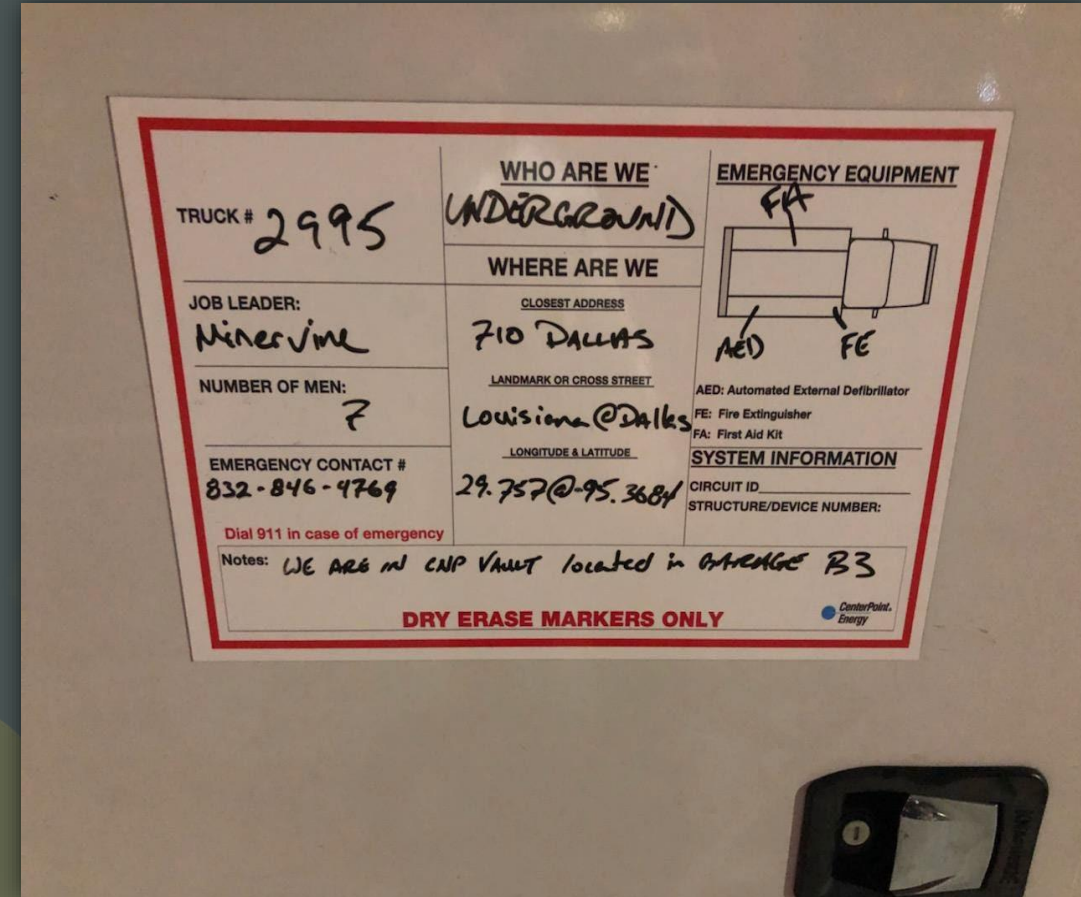
Non-Entry Manhole Rescue System

- Former system required entry
- Quick set up on guard rail, and quick retrieval
- Workers now required to wear body harness & tether
- Tether is removed only when tether becomes a hazard
- Break-away tether connection up top



Magnetic Tailboard Sign

- Idea from Southern Cal Edison (peer review)
- Easy for emergency response to find on jobsite
- Critical information during emergency
- Company-wide implementation



Replace Single Phase Power Transformers in Vaults

- Single phase units not designed for network fault current
 - Lacked Hardened outer case and seals
 - Catastrophic failures endangered public
 - Environmental impact
- Replace with transformers designed for network fault current



Upgrade Vault Lighting

- Most vaults dimly lit by any standard; safety issue
- LED lighting offers substantial improvement
- Retrofitting existing vaults



Lighting Facts Per Bulb	
Brightness	5479 lumens
Estimated Yearly Energy Cost	\$4.82
Based on 3 hrs/day, 11¢/kWh Cost depends on rates and use	
Life	23.1 years
Based on 3 hrs/day	
Light Appearance	
Warm WarmCool5000K	
Energy Used	40 watts

Upgrade Network Protection / Arc Flash reduction

- Gasket for submersion
- Visoblock for isolation
- Stack Light for system status
- ARMS system - instant arc flash reduction allows to trip at reduced value in either direction



Phase Tracker

- EDM Phase Tracker Jr+
- Allows for phase identification on medium and low voltage via GPS





**Navigating
Today's
Challenges...**

Material Shortages

Distribution Transformers

- 3ph units are in excess of 52 weeks
- 1ph high fault rated in excess of 36 weeks

Medium Voltage cables

- EPR cable is in excess of 44 weeks
- XLPE cable is in excess of 30 weeks

Medium Voltage Splices/accessories

- Cold shrink bodies – excess of 30 weeks
- EPDM bodies – 12 weeks

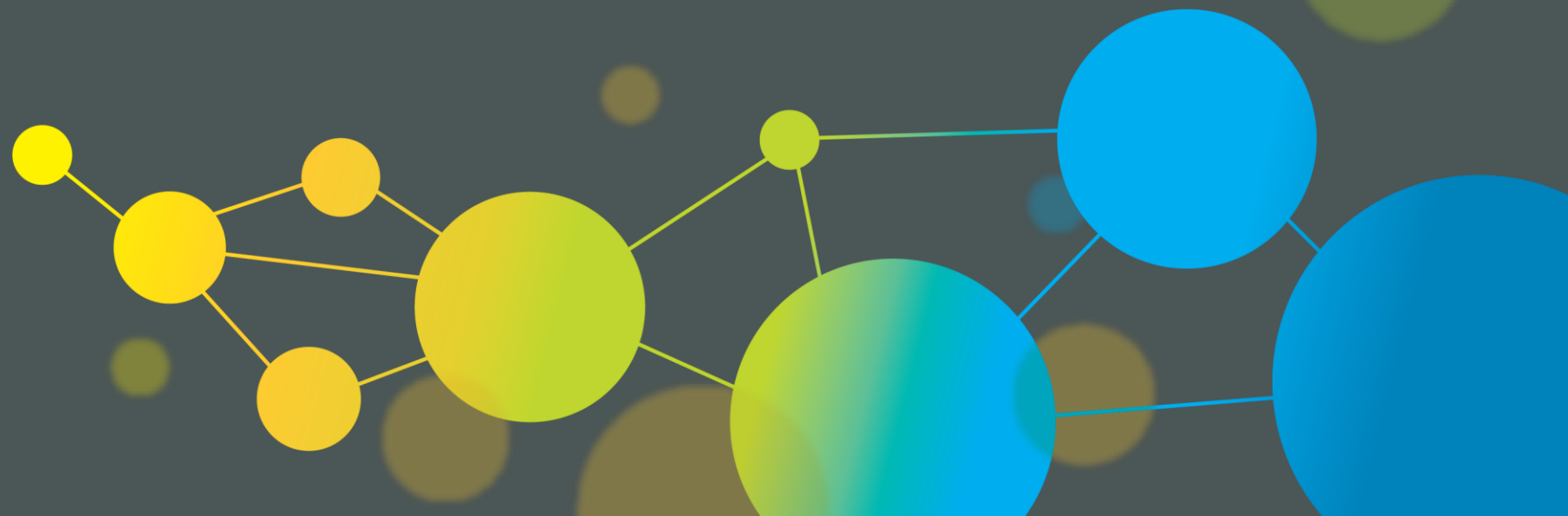
Switch Gear

- 32 + weeks on average

MOV Lightning Arrestor

- 40 + weeks on average

Questions?



Videos



- Brokk 60 demonstration <https://www.youtube.com/watch?v=6ZuGF8WKuBM>
- Robotic Jack Hammer <https://youtu.be/yYPIfcV5Aeg>
- FLIR Thermal Imaging <https://www.youtube.com/watch?v=ChqVYe2hbF4>