Outage Improvement Advisory Team

June 16, 2022

Agenda for today

- Welcome – J. T. Young
- Reminder of OIAT Scope and Objectives – Brian Solsbee
- Review of Previous Sessions…Topics covered; issues identified – Brian
- Overview of Elements of 5-Year Plan Enhancements; Heat Wave Impacts on System Reliability – Alonzo Weaver
- Overview of Proposed Solutions with Tentative Timeframes, Reliability and Cost Impacts – Alonzo & Team
- Break as Needed
- OIAT Discussion Regarding any Additional Considerations - Brian
- Wrap up – Brian
- What to Expect Next and Closing Thoughts – Alonzo/J. T.

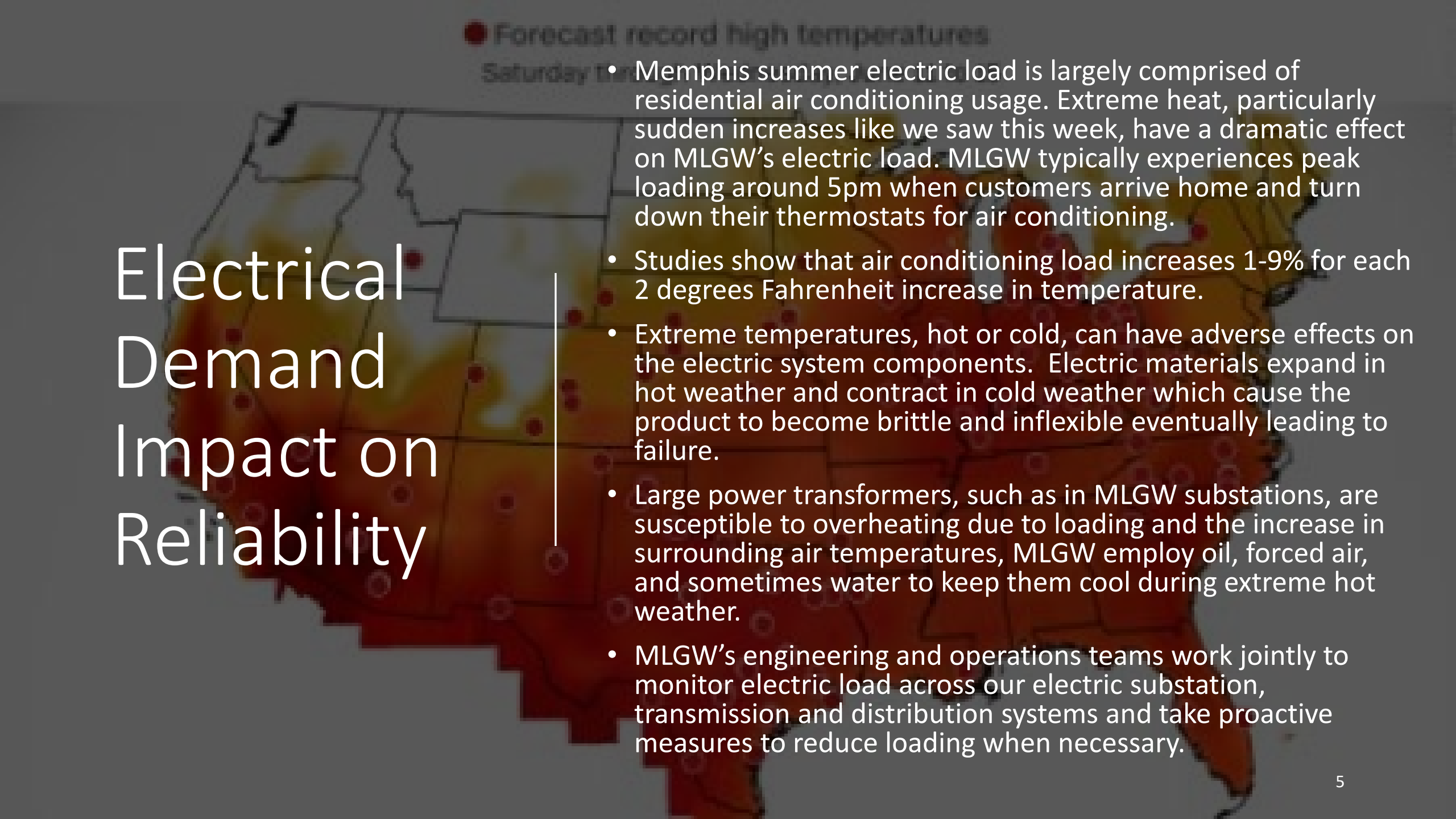
Review of Elements of 5-Year Plan Enhancements; Heat Wave Impacts on System Reliability

Planned Electric Infrastructure Investment

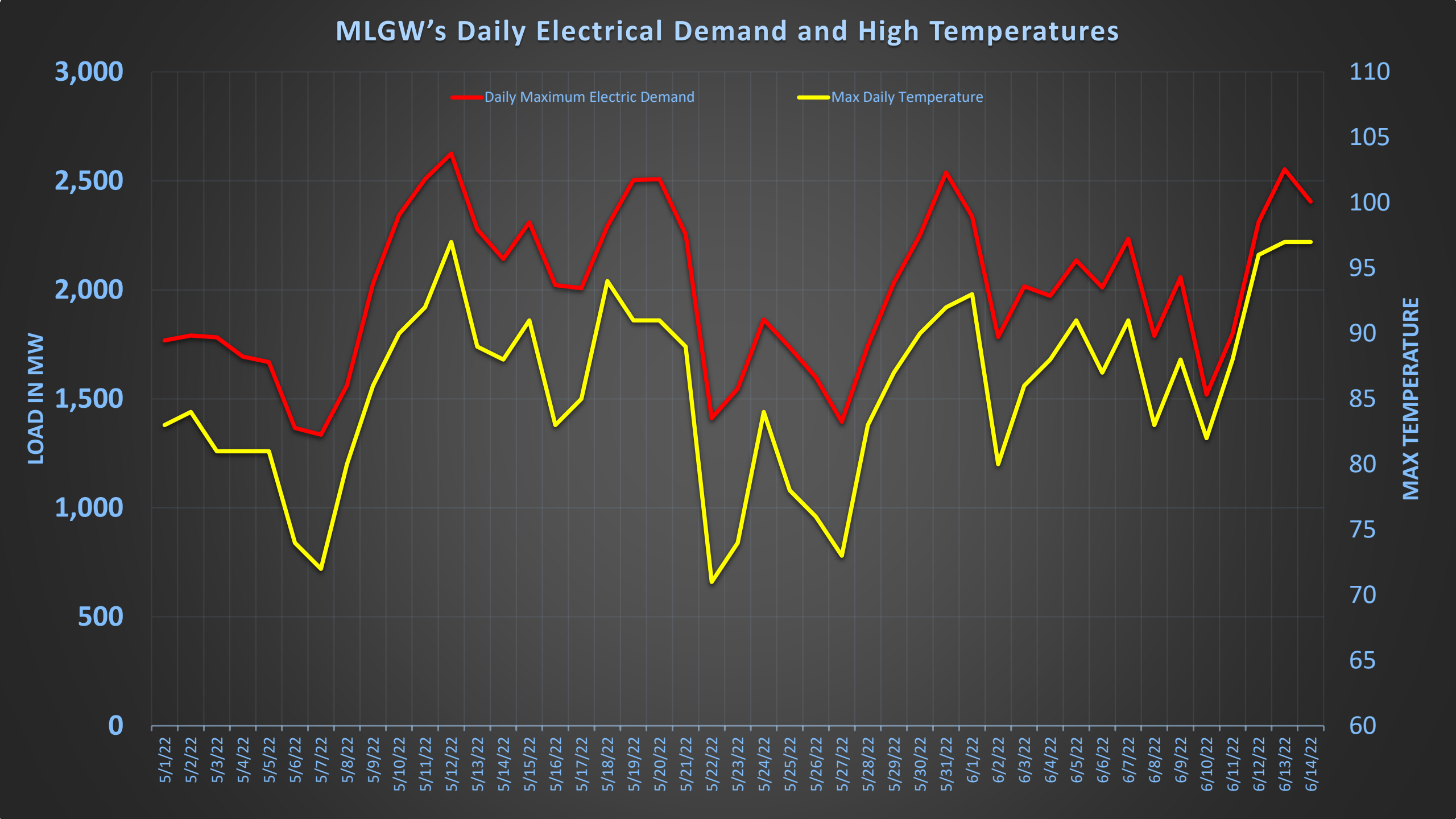
Asset Affiliation	Description	Consequence	5 Year Spending Target	Spending through Dec-21	% Spend to Date	Remaining Expenditure
Asset life	Substation equipment needs to be maintained and components need to be replaced periodically to extend asset life.	Depending on the equipment that fails, a long duration outage could occur.	$54.7 Million	$23.5 Million	43%	$31.2 Million
Vegetation management	Vegetation-caused outages.	Vegetation is the leading cause of MLGW outages. Need to reduce trim cycle.	$98.5 Million	$14.3 Million	14.5%	$84.2 Million
Underground cable	1960-1980 vintage UG cable failures.	Cable segment failures lead to long duration outages.	$54 Million	$6.2 Million	11.5%	$47.8 Million
Grid modernization	Technology needs to be upgraded	Delays in implementing can create an inability to implement upgrades in an optimal manner.	$130 Million	$11.1 Million*	8.5%	$118.9 Million
Wood poles	Wood poles have been inspected and rated. Not all identified poles have been replaced.	To the extent that those identified have not been replaced, additional pole failures are likely to occur.	$15 Million	$6.1 Million	40.7%	$8.9 Million

(Excerpts from HDR Engineering Study's Risk Register)

Electrical Demand Impact on Reliability



- Memphis summer electric load is largely comprised of residential air conditioning usage. Extreme heat, particularly sudden increases like we saw this week, have a dramatic effect on MLGW's electric load. MLGW typically experiences peak loading around 5pm when customers arrive home and turn down their thermostats for air conditioning.
- Studies show that air conditioning load increases 1-9% for each 2 degrees Fahrenheit increase in temperature.
- Extreme temperatures, hot or cold, can have adverse effects on the electric system components. Electric materials expand in hot weather and contract in cold weather which cause the product to become brittle and inflexible eventually leading to failure.
- Large power transformers, such as in MLGW substations, are susceptible to overheating due to loading and the increase in surrounding air temperatures, MLGW employ oil, forced air, and sometimes water to keep them cool during extreme hot weather.
- MLGW's engineering and operations teams work jointly to monitor electric load across our electric substation, transmission and distribution systems and take proactive measures to reduce loading when necessary.


MLGW's Daily Electrical Demand and High Temperatures
Daily Maximum Electric Demand
Max Daily Temperature
LOAD IN MW
MAX TEMPERATURE
3,000
2,500
2,000
1,500
1,000
500
0
110
105
100
95
90
85
80
75
70
65
60
5/1/22
5/2/22
5/3/22
5/4/22
5/5/22
5/6/22
5/7/22
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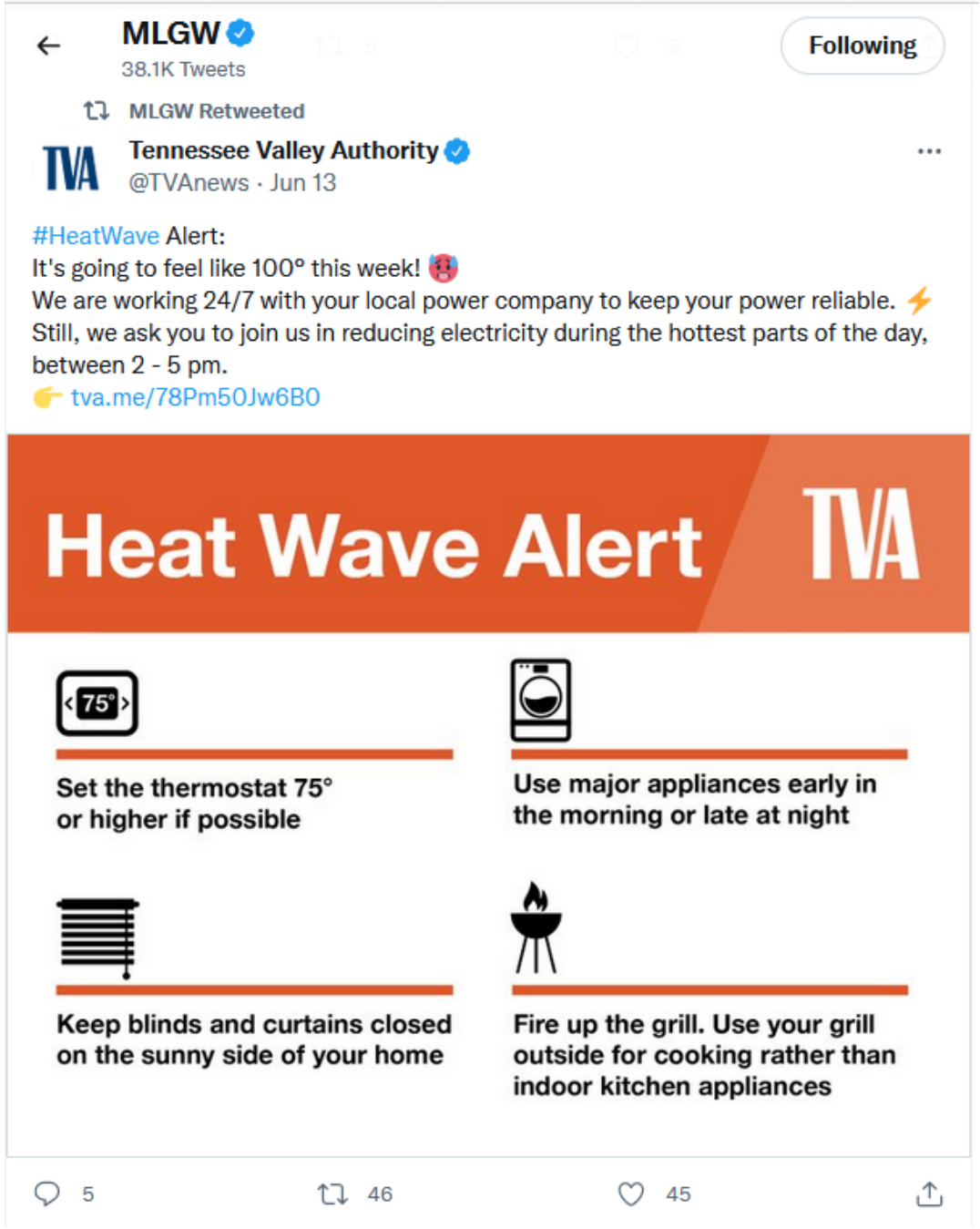
6/4/22
6/5/22
6/6/22
6/7/22
6/8/22
6/9/22
6/10/22
6/11/22
6/12/22
6/13/22
6/14/22

Why does MLGW & TVA request customers adjust thermostats during these peak electrical demand periods?

- TVA is responsible for balancing the electric supply to their customers' load. Regulatory guidelines also require they maintain a reserve component should the TVA system lose generation.
- Although rare, under TVA's Electric Load Curtailment Plan (ELCP), steps to reduce load are issued to protect the integrity of the bulk electric system. The local power companies, like MLGW, are required to follow these steps:



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Steps in TVA's Emergency Curtailment Load Program

1. Step 10 - In-House Load Curtailment: When notified by TVA to implement Step 10, MLGW Facilities Management Dept. will immediately curtail in-house load in offices, service centers and other facilities by eliminating non-essential lighting and by reducing electric demand for heating and air conditioning.
2. Step 20 - Voluntary Load Curtailment By Customers: When notified by TVA to implement Step 20, all distributors will take appropriate measures to supplement TVA's efforts (through the news media and other means) to urge all customers to voluntarily curtail electrical use.
3. Step 30 - Remaining Actions, Including Localized Voltage Reduction, to Avoid Firm Curtailment: Upon notification by TVA to implement Step 30, TVA may lower bus voltage at the electric gate substations. MLGW System Operations must take remaining actions to curtail non-essential loads, Energy Resources and Corporate Communications shall request large customers and public to do the same.
4. Step 40 – Partial Curtailment of Large Industrial Firm Load: Upon notification by TVA to implement Step 40, MLGW Systems Operation and Industrial and Commercial Care personnel shall notify all industrial customers, with contracted demands of 5,000kW and greater, to curtail their demand within 30 minutes to only the essential load necessary for safety and fire protection. After 30 minutes, personnel will then re-contact customers to ensure compliance.
5. Step 50 – Interruption of General Firm Load: When notified by TVA to implement Step 50, MLGW will open substation feeder breakers on a rotational basis. Electric feeder circuit breakers will be opened on a rotational basis for 30-90 minutes to accomplish the necessary load reduction.
6. Step 60 - Emergency Tripping of Firm Load: When notified by TVA to implement Step 60, due to system voltage collapse to 144kV, MLGW will open specified low-side bank breakers dropping firm load until voltage reaches 154kV.

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Memphis Light, Gas & Water

Memphis, Tennessee

Outage Improvement Advisory Team

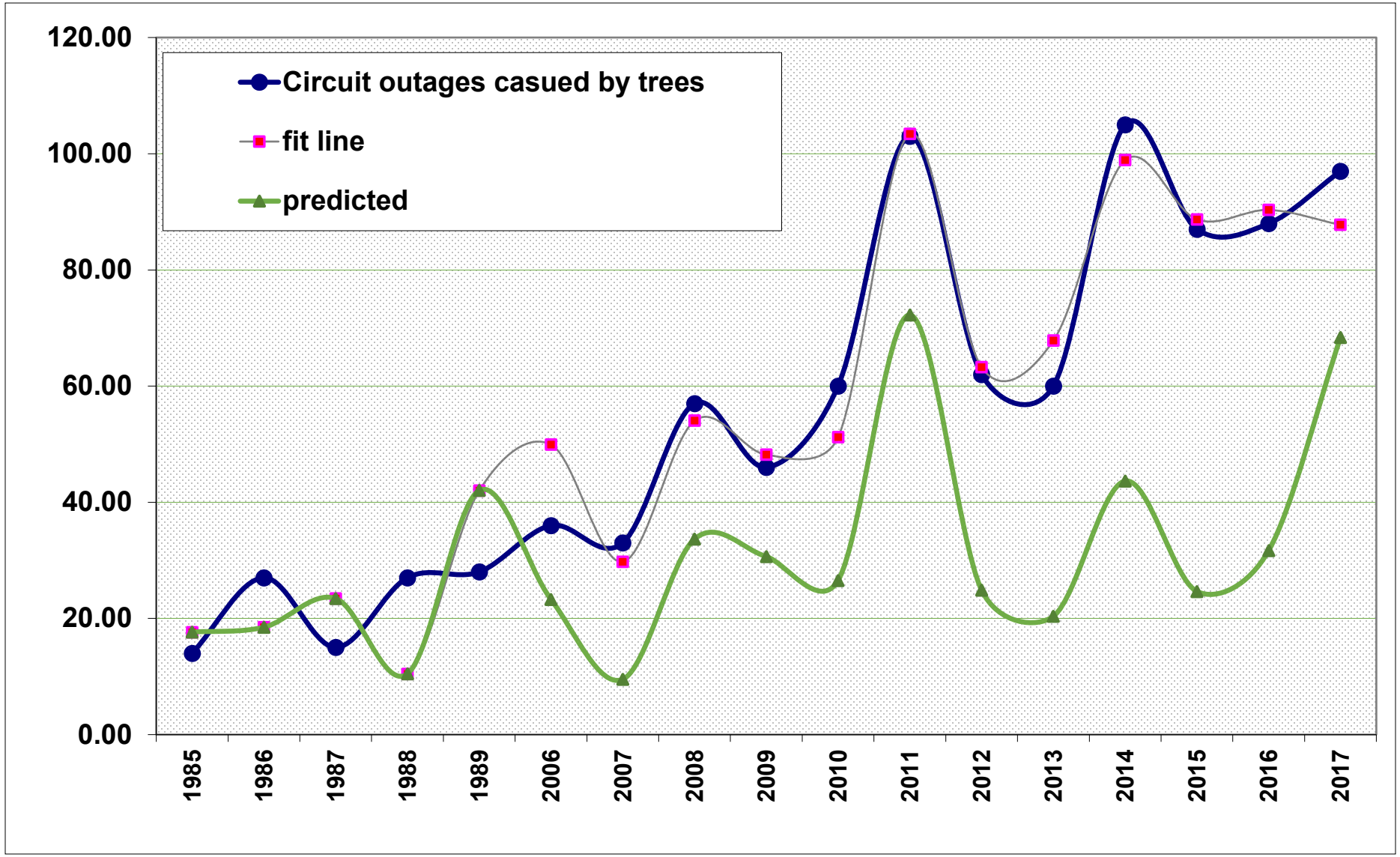
Vegetation Management & Policy

Vegetation Management

REDUCTION GOAL
CUSTOMER MINUTES INTERRUPTED

21.8 M

Predicted Outages With 3 Year Cycle



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Action Plan – Vegetation Management

1. *MLGW is adding contracted resources to accelerate tree trimming and to meet annual goals for cycle trim.*

2. *Using outage data to direct trimming by circuits and neighborhoods.*

3. *Conducting a pilot with a consulting contractor to utilize satellite data to identify 'danger' trees and assess efficacy of line clearance.*

4. *Cooperate with municipalities to develop standards, ordinances and policies to better manage vegetation.*

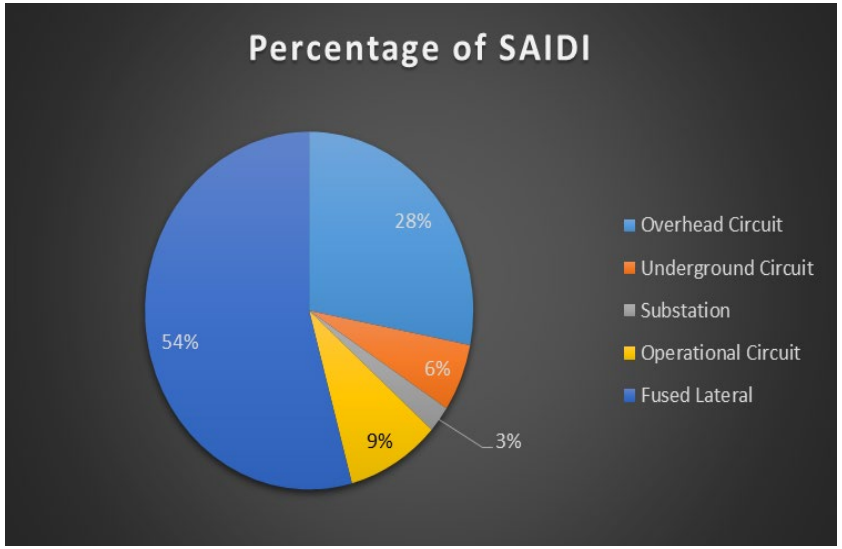
Infrastructure/Resiliancy

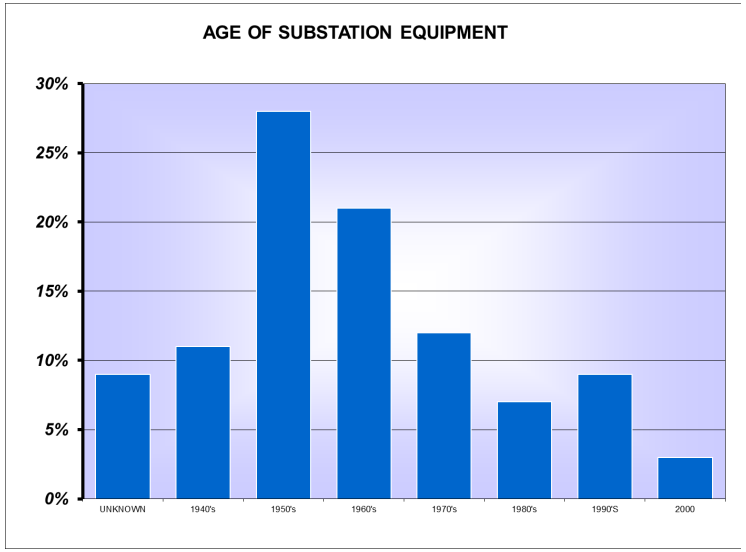
Substation Infrastructure

REDUCTION GOAL
CUSTOMER MINUTES INTERRUPTED

1.3 M

Substation Infrastructure





3 – 5 % of overall customer minutes are caused by Substation events

Many Substation breakers and transformers are past normal life expectancy.

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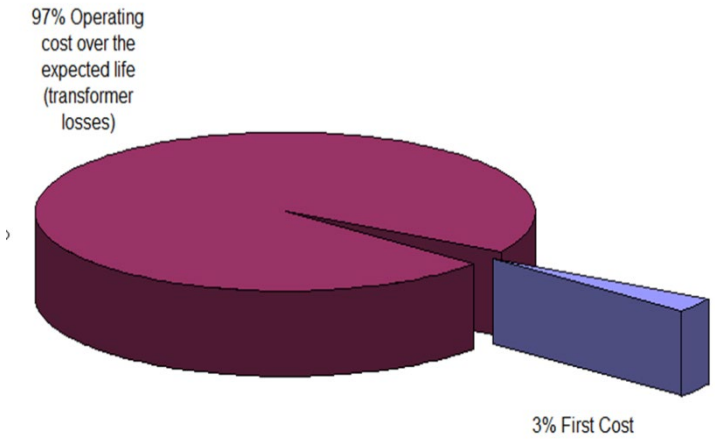
Predicting Transformer Failures

Dissolved Gas Analysis

Transformer TOC



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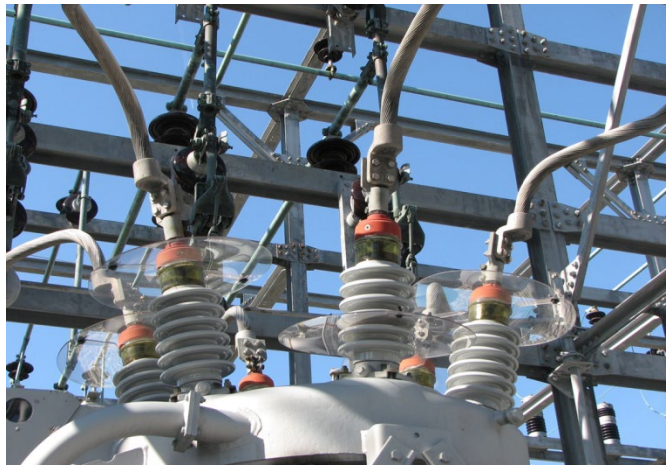
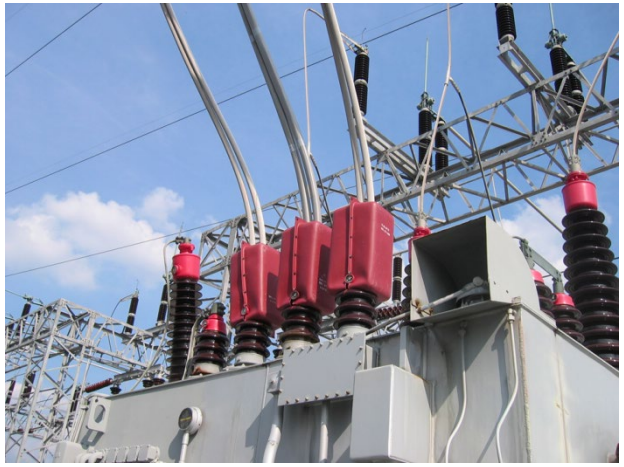
Animal Mitigation at Substations





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Action Plan – Substation

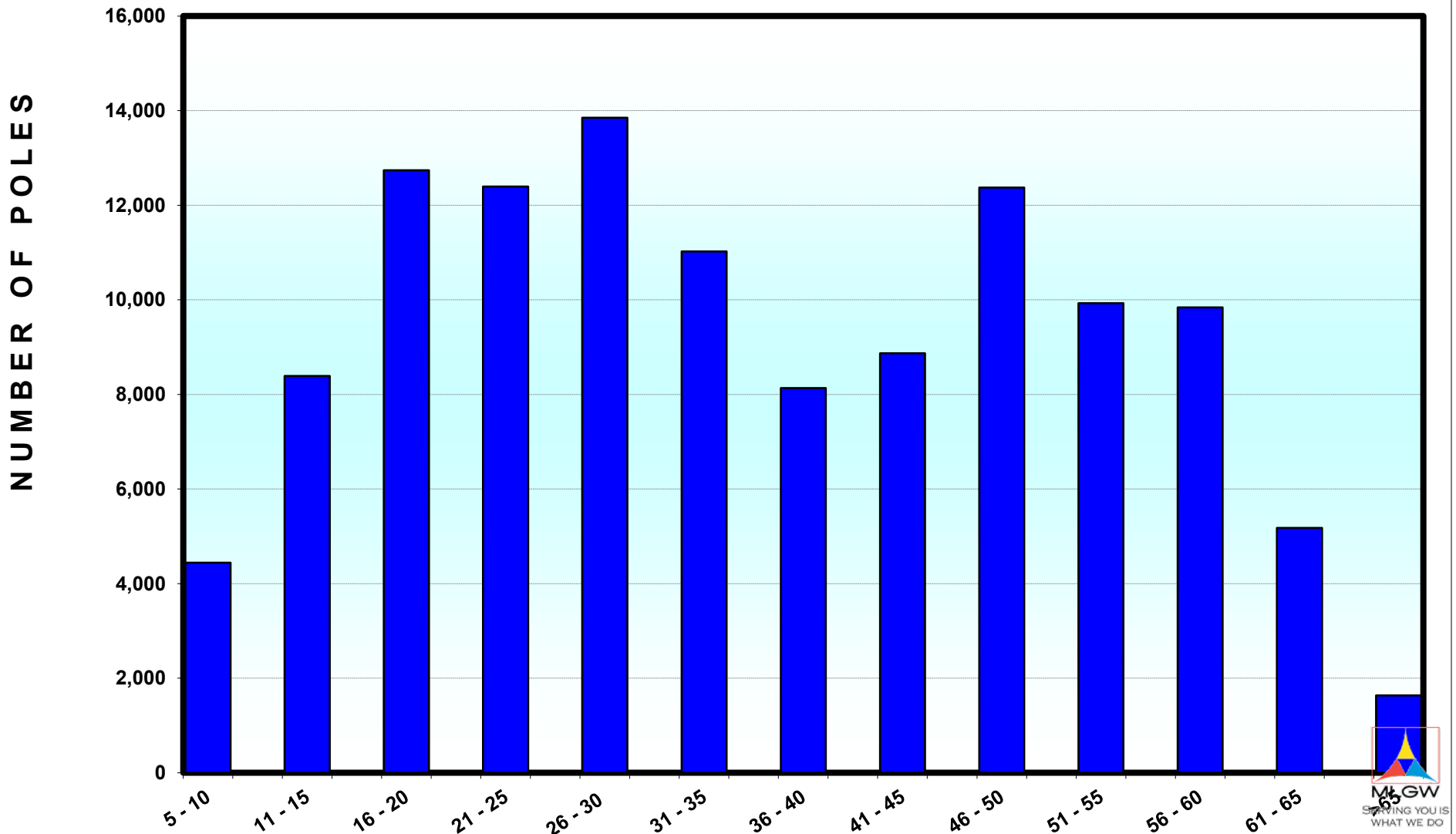
- ✓ *Infrastructure replacement is on schedule and will continue to move forward.*

- ✓ *MLGW will continue installation of animal mitigation at stations. Additional technologies will be explored to try to prevent animal related outages.*

Pole Management

REDUCTION GOAL
CUSTOMER MINUTES INTERRUPTED
2.0 M

Age of Wooden Distribution Poles



WOOD POLE MANAGEMENT

1. Assess the condition of each individual wood pole by complete inspections on a ten-year cycle.

2. Identify, Prioritize, and Quickly Replace Poles that are at end-of-life.

3. Mechanically Re-enforce restorable poles to extend life

4. Treat poles with fumigants & pesticides to extend life.

Pole Management – 2022 Status

1. *Started new Inspection/Treatment cycle in February 2021. Inspected over 39,000 poles.*

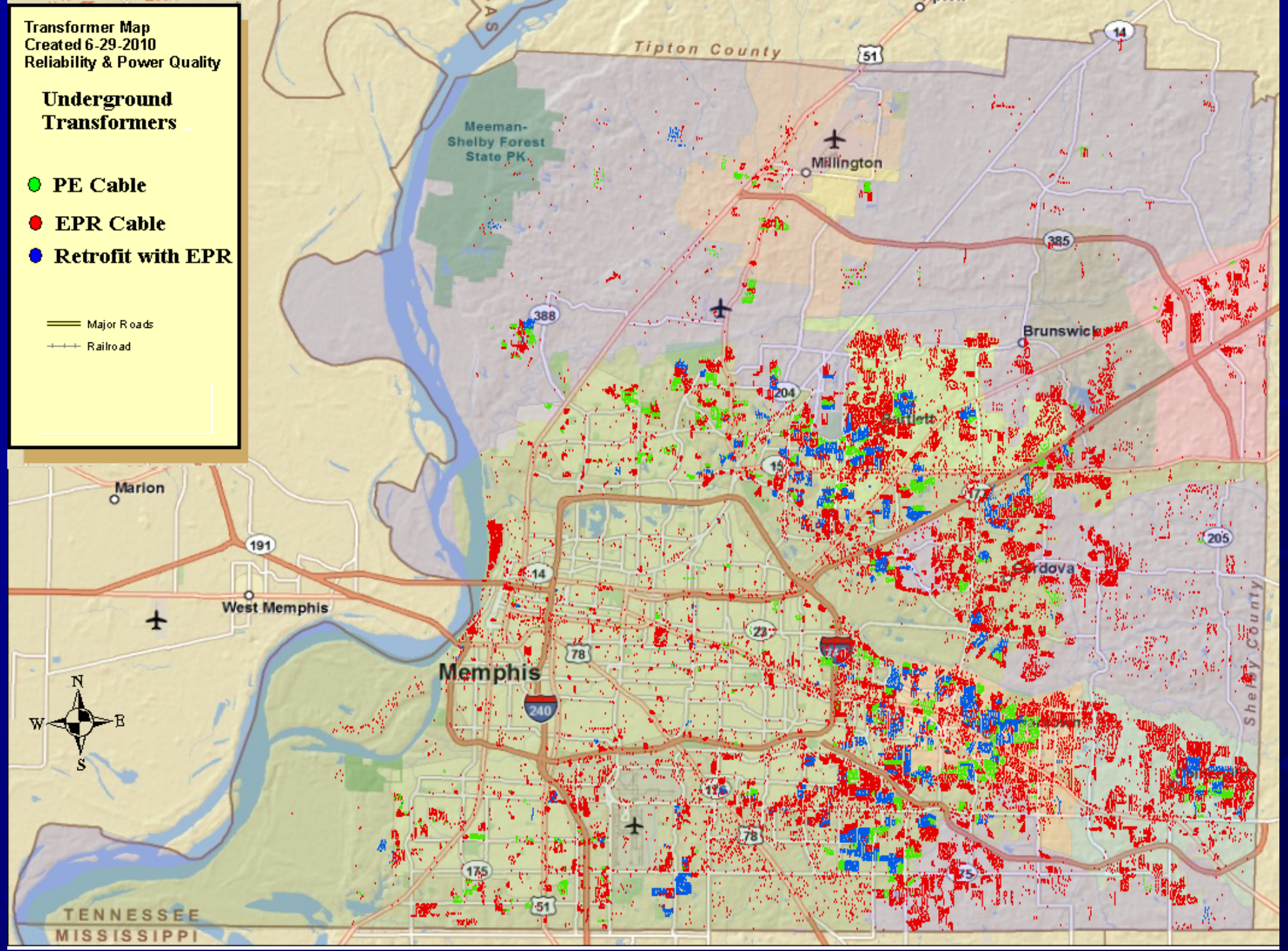
2. *Contracted Pole Replacement started in 2021.*

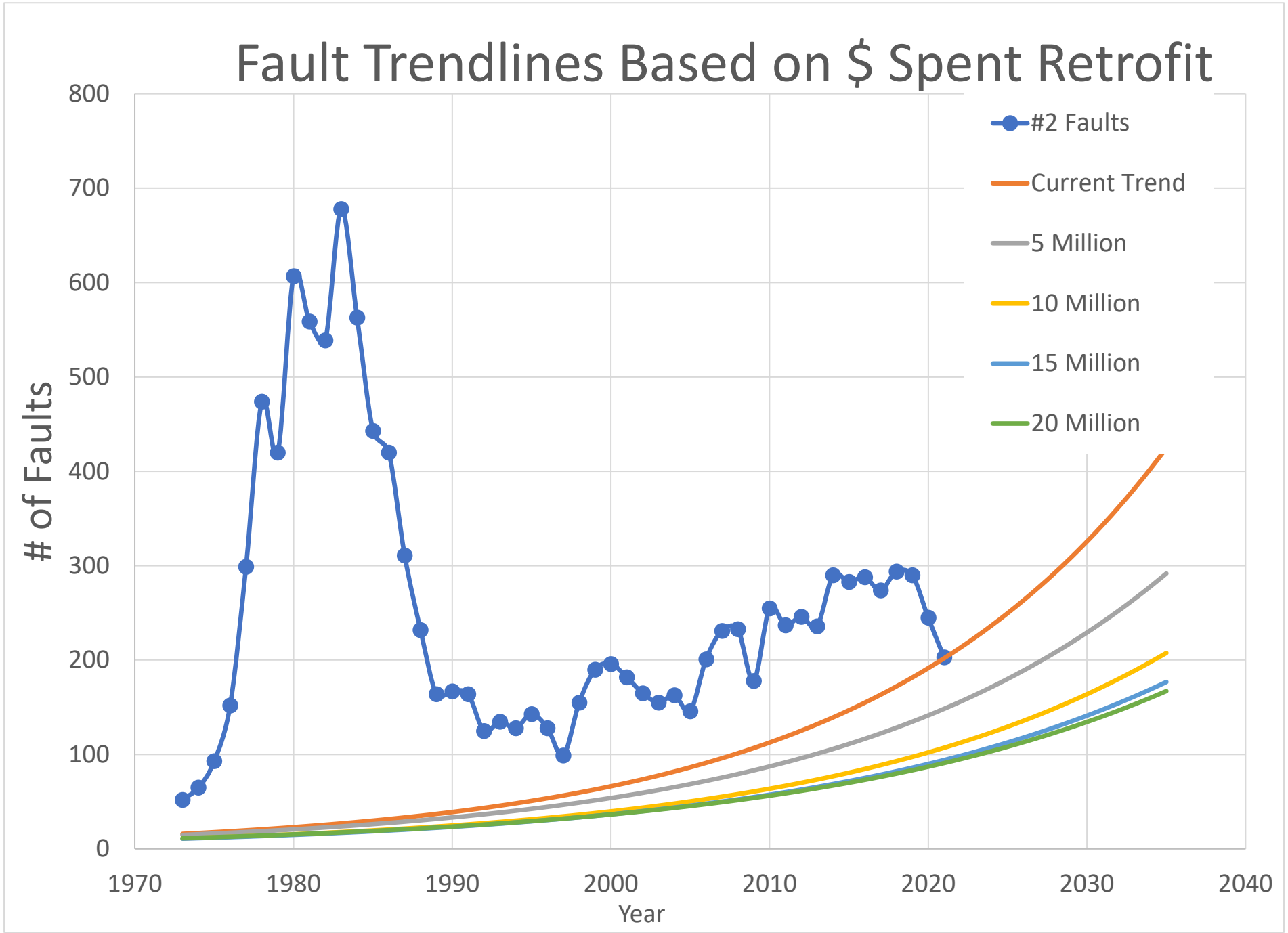
3. *Replaced 880 poles in 2021. 363 Poles have been replaced in 2022.*

4. *Project may be accelerated to take advantage of available resources.*

UG Cable Replacement

REDUCTION GOAL
CUSTOMER MINUTES INTERRUPTED
4.3 M


Transformer Map
Created 6-29-2010
Reliability & Power Quality
Underground Transformers
PE Cable
EPR Cable
Retrofit with EPR
Major Roads
Railroad
Tipton County
Meeman-Shelby Forest State PK.
Millington
Brunswick
Marion
West Memphis
Memphis
Shelby County
TENNESSEE
MISSISSIPPI
N
W
E
S


Fault Trendlines Based on $ Spent Retrofit
800
700
600
500
400
300
200
100
0
# of Faults
1970
1980
1990
2000
2010
2020
2030
2040
Year
#2 Faults
Current Trend
5 Million
10 Million
15 Million
20 Million

Cable Replacement – 2022 Status

1. *Contracted crew resources became available in 2021.*

2. *The number of URD faults per year have declined by 30%.*

3. *There is still a work backlog for 2022.*

4. *MLGW will evaluate options and needs as we go forward.*

System Hardening

REDUCTION GOAL
CUSTOMER MINUTES INTERRUPTED

11.2 M

System Hardening

- Improve Restoration Process
- Design Enhancements to Overhead Electric System
- Strategic Underground…In areas where it's feasible
- Scheduled Preventive Maintenance
- Remedial Maintenance

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Restoration Efficiency

MLGW is utilizing contract crews engaged for pole replacement and other overhead work for storm restoration during large storms.

MLGW improving the interface between the Outage Management System (CARES) and SCADA so that they are data synced for restoration.

MLGW is reviewing restoration processes based upon experience gained for Winter Storm Landon. Areas for improvement include faster damage assessment, better two-way communications with contract crews, and improved abilities to project and report progress.

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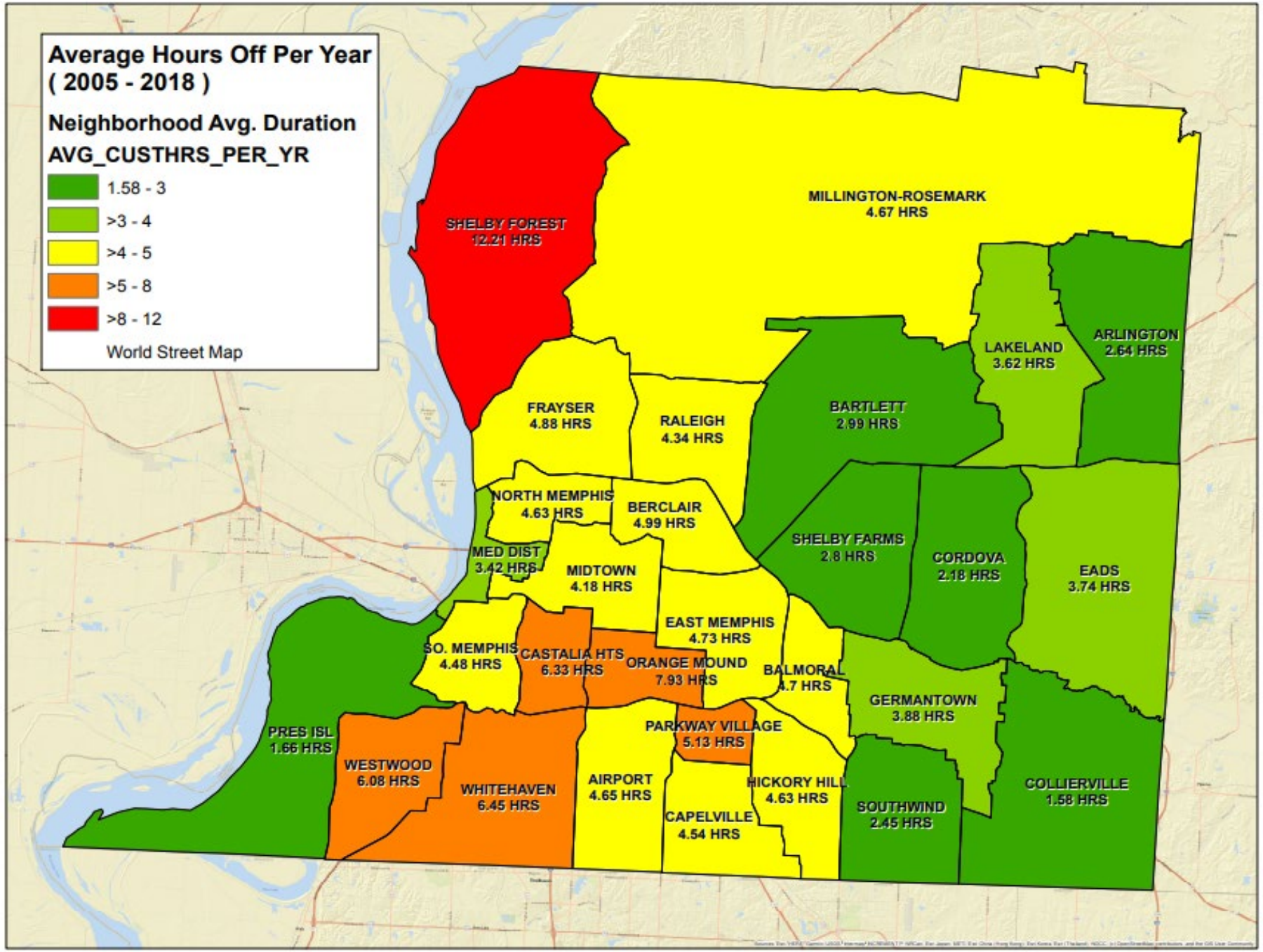
Overhead Electric System Redesign

Neighborhood Initiative



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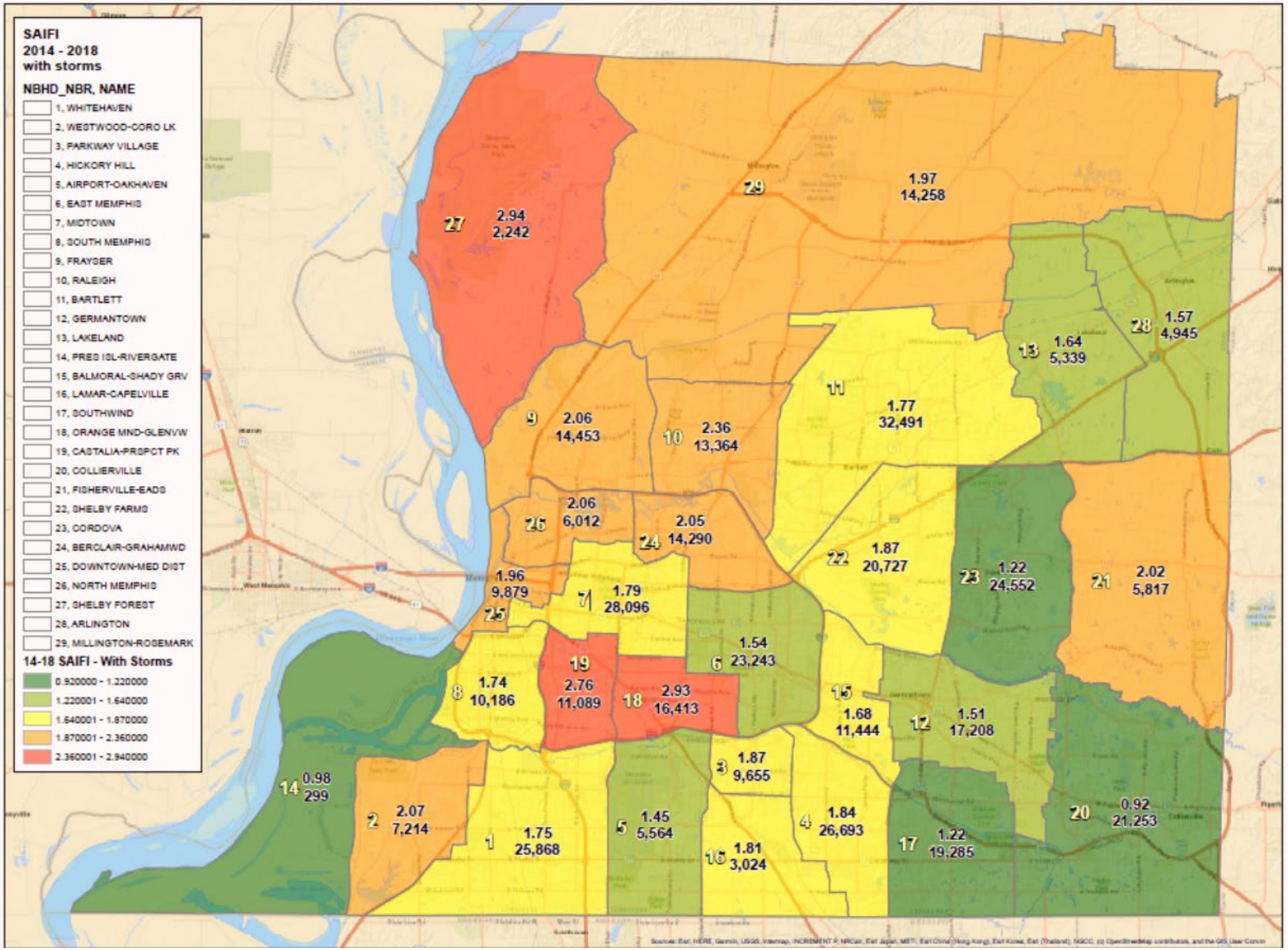

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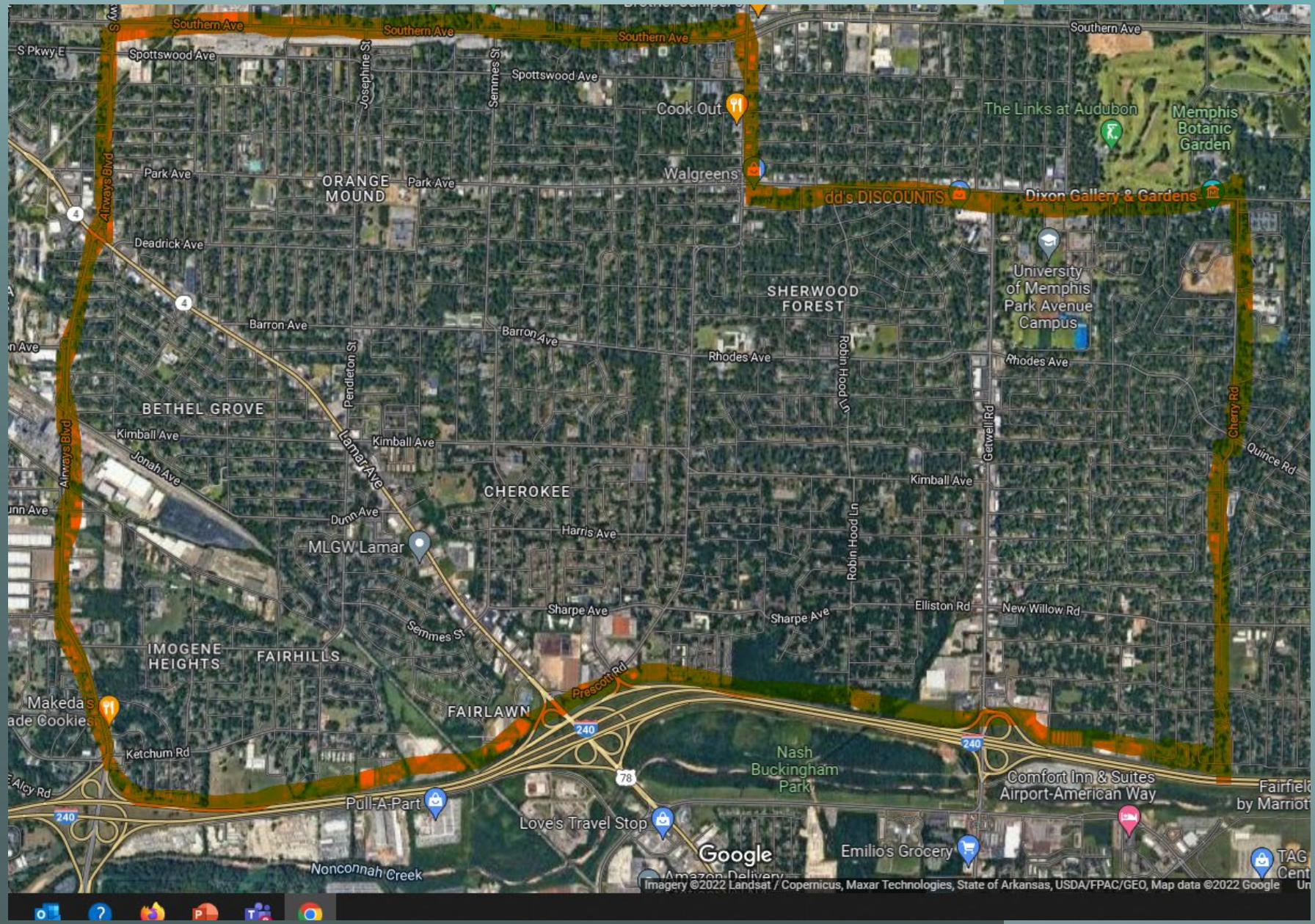
Southern Ave
Spottswood Ave
Josephine St
Semmes St
Cook Out
The Links at Audubon
Memphis Botanic Garden
Park Ave
ORANGE MOUND
Walgreens
dd's DISCOUNTS
Dixon Gallery & Gardens
Deadrick Ave
University of Memphis Park Avenue Campus
SHERWOOD FOREST
Barron Ave
Rhodes Ave
Robin Hood Ln
Gerwell Rd
Cherry Rd
Quince Rd
BETHEL GROVE
Kimball Ave
Jonah Ave
Lamar Ave
Pendleton St
Airways Blvd
CHEROKEE
Dunn Ave
Harris Ave
MLGW Lamar
Sharpe Ave
Elliston Rd
New Willow Rd
IMOGENE HEIGHTS
FAIRHILLS
Prescott Rd
FAIRLAWN
Makeda's Made Cookies
Ketchum Rd
Nash Buckingham Park
Comfort Inn & Suites Airport-American Way
Pull-A-Part
Love's Travel Stop
Google
Emilio's Grocery
Nonconnah Creek
Imagery ©2022 Landsat / Copernicus, Maxar Technologies, State of Arkansas, USDA/FPAC/GEO, Map data ©2022 Google

Substation #1 Substation Improvement Projects (2016 - 2027)			
Project	**WO#**	**Dollars**	**Schedule**
Replace 115 kV Circuit Breaker 1589	WO466021	$ 260,763	Replacement completed 2/2020
Replace 12 kV Circuit Breaker 1203	WO752096	$ 198,735	Replacement completed 7/2021
Replace Remote Terminal Unit (RTU)	C1P77643	$ 897,695	Replacement completed 2/2022
Replace Batteries & Battery Charger	WO481422	$ 97,430	Replacement complete 2020
Replace 12 kV Circuit Breaker 1211	Planned	$ 250,000	Planned Replacement
Replace 115 kV Reactor	C1N77604	$ 371,140	Planned Replacement
Total Substation #1 Improvement Projects		**$ 2,075,763**	
Substation #5 Substation Improvement Projects (2016 - 2027)			
Sectionalize 12 kV Bus & Add Capacitor Bank	C1N31115	$ 1,600,000	Completed 2016
Replace 161/23 kV Transformer 05649	C1Q29236	$ 1,702,684	Completed 2017
Replace 12 kV Circuit Breaker 5207	WO498776	$ 210,271	Completed 10/2019
Replace Remote Terminal Unit (RTU)	C1F15828	$ 847,498	Construction in Progress
Replace 23/12 kV Transformers 5335 & 5337	WO648960	$ 9,501,957	Planned replacement
Replace 12 kV Circuit Breakers 5235 & 5237	WO742215	$ 556,948	Planned replacement
Install SATEC Metering (Distribution Automation)	WO491637	$ 281,596	Planned replacement
Total Substation #5 Improvement Projects		**$ 14,700,954**	
Substation #25 Substation Improvement Projects (2016 - 2027)			
Replace Lead Acid Batteries w/Nickel Cadmium Batteries	WO460693	$ 82,471	Completed 2019
Replace 115 kV Circuit Breaker 5153	WO675036	$ 280,808	Planned replacement
Replace 12 kV Circuit Breakers 5611 & 5639	WO880397	$ 737,906	Construciton in Progress
Replace two (2) 12 kV Capacitor Banks	WO596878	$ 847,324	Planned replacement
Replace 115 kV Transmission Switches 5172, 5186 & 5188	WO518797	$ 456,430	Replacement completed 3/2022
Total Substation #25 Improvement Projects		**$ 2,404,940**	
Substation #42 Substation Improvement Projects (2016 - 2027)			
Replace 12 kV Circuit Breaker 42215	C1P62831	$ 98,551	Completed 2016
Install Spare LTC Transformer & Seismic Foundation	C1P74544	$ 1,875,877	Completed 6/2017
Replace 12 kV Circuit Breaker 42257	WO203224	$ 67,431	Completed 12/2017
Replace 12 kV Circuit Breaker 42205	WO260660	$ 309,251	Completed 12/2018
Replace 12 kV Circuit Breaker 42207	WO608233	$ 141,773	Replacement completed 5/2020
Replace Batteries & Battery Charger	WO607411	$ 141,641	Completed 2/2022
Install CVT on 161 kV Circuit 31675	WO440920	$ 178,508	Planned Replacement
Total Substation #42 Improvement Projects		**$ 2,813,032**	
Substation #55 Substation Improvement Projects (2016 - 2027)			
Remote Power Circuit Breaker Racking Device	WO636120	$ 132,980	Completed 2020
Install Transient Recover Voltage Transformer	WO333092	$ 29,043	Completed 10/2019
Seismic Mitigation of Components Inside Control House	WO389125	$ 267	Completed 9/2021
Total Substation #55 Improvement Projects		**$ 162,289**	
Total Substation 1, 5, 25, 42 & 55 Improvement Projects		**$ 22,156,979**	

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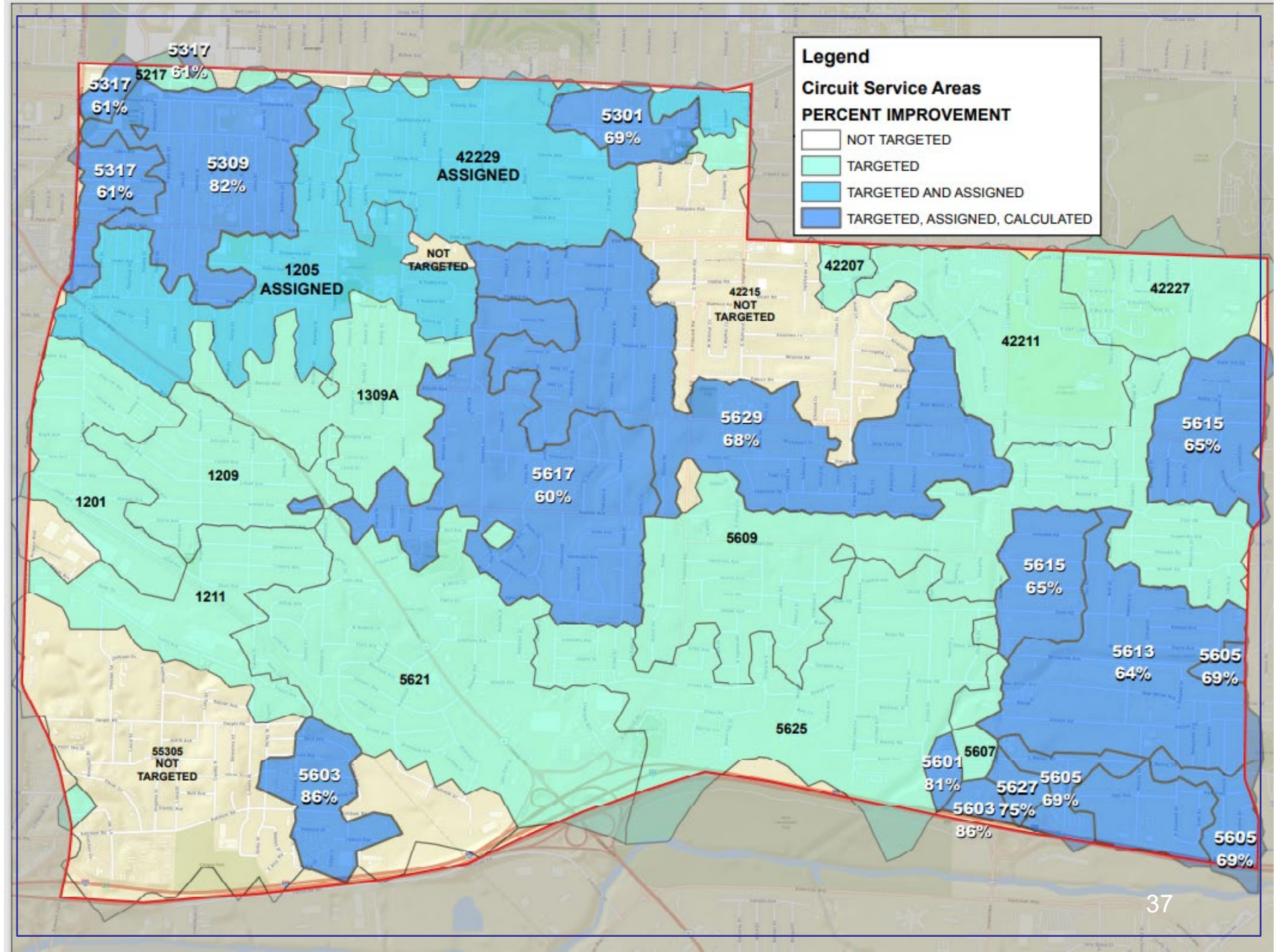

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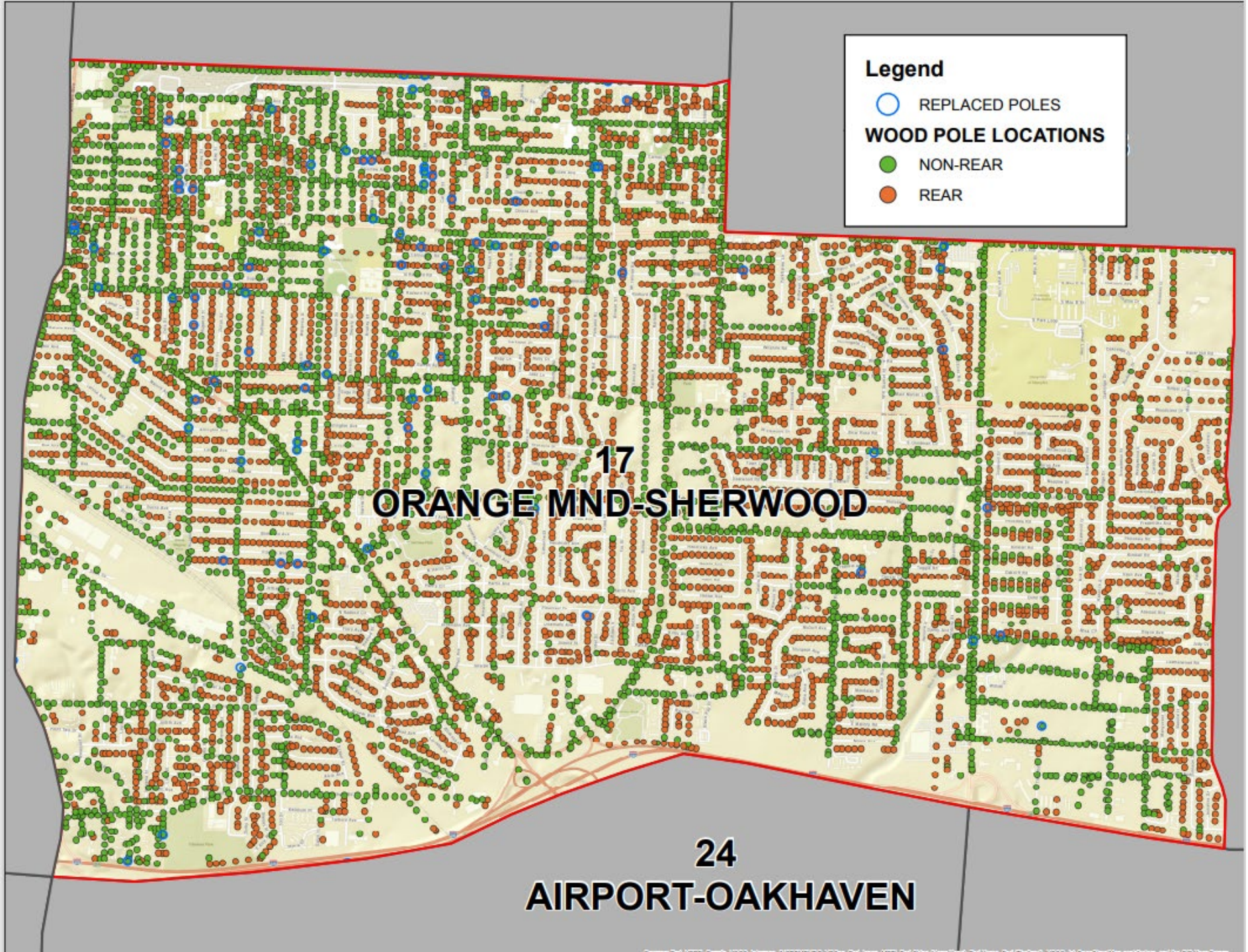

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INFRASTRUCTURE PROBLEMS ON THE DISTRIBUTION LEVEL?

1. Create a neighborhood initiative to address overhead distribution that is aged and built below current standards.
2. Start in the worst performing areas and work in a systematic manner.
3. Conduct in depth survey of area infrastructure and line configurations.
4. Dedicate crews and engineering resources to get work done.
5. Break up long feeds and install additional transformers for reliability and better voltage regulation.
6. Upgrade lightning protection on lines.
7. Replace cable types that are failure prone – consider use of spacer (tree) cable.
8. Add animal protection where needed.

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System Hardening by Neighborhood

- Systematic Upgrade of Overhead Distribution
  - Eliminate DJ framed transformer
  - Reduce customers per transformer
    - Install additional transformers
    - Eliminate open wire secondary
    - Add squirrel proofing
  - Reduce customers per fuse
    - Break long taps into smaller sections
    - Strategic undergrounding in some cases
  - Replace substandard service wires
  - Inspect jumpers and connections
  - Trip Savers

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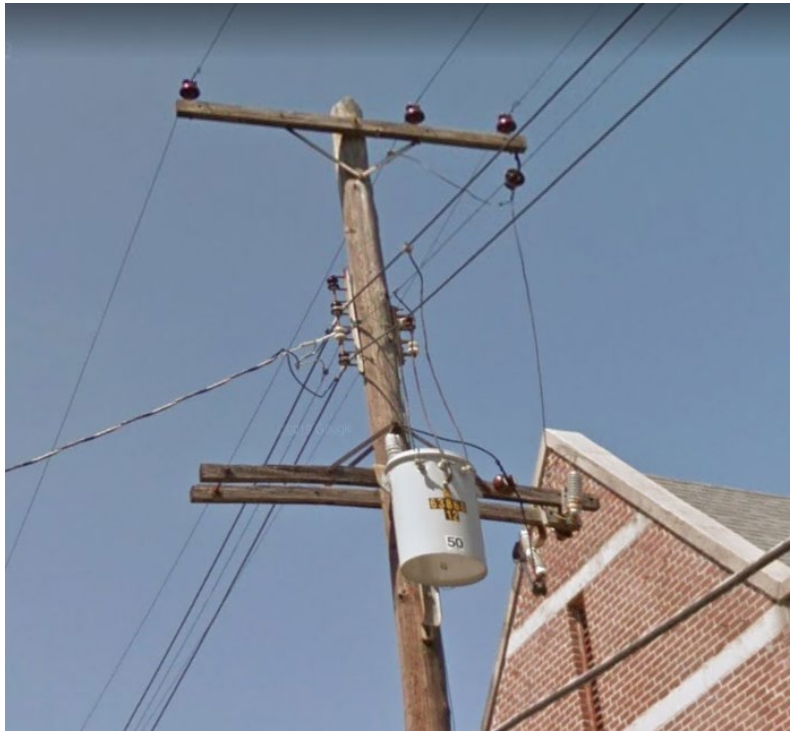
System Hardening by Neighborhood



- DJ framed transformer
  - Obsolete construction
  - Prone to outages from trees and animals
  - Clearance and hot lines are not as safe as current standards.

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Tap Automation

- Reduce Truck Rolls
- Reduce Tap Customer Minutes Interrupted (CMI)
- Improve System Reliability
- Improve Customer Satisfaction

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Infrastructure/Technology

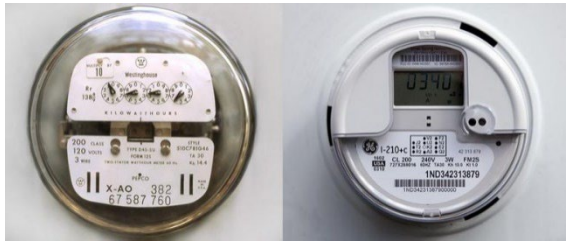
Grid Modernization

REDUCTION GOAL
CUSTOMER MINUTES INTERRUPTED

43.4 M

Grid Modernization

- Smart meters
  - Provides remote usage reporting.
  - Gives customers detailed usage information.
  - Capable of Time of Use and Pre-pay options.
  - Allows remote connect and disconnect.
  - Capable of reporting outages, voltage issues, and tampering.



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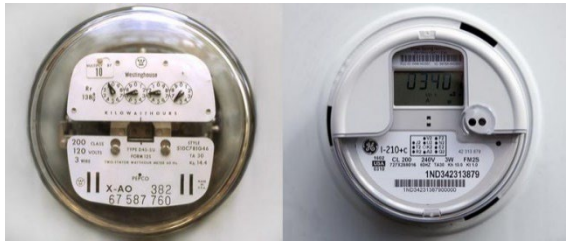
Smart Meters

- The current network communications (Tropos & 900 MHz network) has not proven resilient enough to maintain accurate two-way communication of outage status during large storms.

- Smart meters may benefit from new communication networks adopted for DA.



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Distribution Automation

- Streamline Restoration
  - Isolate Fault
  - Reduce Customer Minutes Out
  - Reduce Customer Affected
  - Improve System Reliability
  - Improve Customer Satisfaction
  - Does not reduce repair costs
  - Increases Operational Costs
- Load Shifting
- Voltage Regulation
- Power Factor Correction

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Distribution Automation – Phase 1

- **Estimated cost $130 M**

  Install 1,200 automated switches on worst performing circuits.

  - **Switches will automatically operate to interrupt faults.**
    - **Shield upstream customers from outage.**
  - **Switches detect fault current to facilitate switching plan.**
    - **Operators can restore services quickly without need for trouble shooter.**

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Distribution Automation – Phase 1

Project Status

- ✓ Completed detailed selection and specifications of switches.
- ✓ Developed estimated costs for Phase 1
- ✓ Created processes for purchase and handling of DA equipment.
- ✓ Developed methodology for prioritizing circuits for automation.
- ✓ Developed methods for choosing sites for switches based upon historical reliability data.
- ✓ Developed design criterion and methods including communications.

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Distribution Automation – Phase 1

Project Status – continued

- ✓ Commenced deployment of devices.
- ✓ Determined how to test and commission devices
- ✓ Integrated with SCADA
- ✓ Engaged Burns and McDonnell as consultant
  - ✓ Evaluated and appraised current work methodology.
  - ✓ Developed detailed project road map
    - ✓ Resource recommendations
    - ✓ Command and Control for full automation.
    - ✓ Assist with Change Management
    - ✓ Lab recommendations for testing switches on grid simulations

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Distribution Automation

- **Phase 2 – estimated cost $30-40M**

  Install a wireless communication system to automate switches

  - Working on feasibility study with Burns and McDonnel
  - Resilient, robust, and reliable system (PLTE)
  - Capable of handling big data
  - Start deployment in 2023
  - Exploring incorporating communications for smart meters

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Distribution Automation

- **Phase 3 - estimated cost $10-15 M**

  Install an Advanced Distribution Management System

  - **Real time communications between SCADA, CARES (OMS) with synched data**
    - **Fault Location with Isolation and Restoration**
    - **Volt/Var Optimization**
    - **Load Allocation**
    - **Switch Order Management**
  - **Separates transmission and distribution operations**
  - **RFP at the end of 2022**

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Distribution Automation

- **Phase 4 -**

Additional Grid Modernization

  - **Upgrade Substation Relays ($15 - $20 M)**
    - **Improves monitoring, coordination, and analytics for grid.**
    - **Begin RFP in 2023**
  - **Complete saturation of electric system with additional DA switches**
  - **Communications to capacitors and regulators.**
  - **Deploy sensors for granular operational**
  - **Investigate other strategies to exploit ADMS.**

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Distribution Automation

By the numbers

- Selected locations for 322 switches
- Completed designs for installation of 242 switches
- 327 Remotely Controlled Devices currently in service
- 190 Installed & Commissioned since commencement of 5-year improvement project
- $13.8 M spent
- Receiving deliverables from consultation contract

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Communications

Email Communications

View this email in your browser

MLGW

- MLGW Crews Prepare for Severe Weather
- Important MLGW Contact Info for Customers
- Get Outage Updates
- Prevent Frozen Pipes
- Winter Weather Tips

MLGW Crews Prepare for Severe Weather

Memphis Light, Gas and Water Division is prepared for severe weather as the National Weather Service forecasts accumulating ice and sleet in the Mid-South beginning Wednesday night.

MLGW crews and additional contract crews are ready to respond to any local damage or outages, however; restoration times may be extended due to COVID-19 safety measures.

Customers should avoid contact with downed power lines—even if their home or area has experienced a loss of power as the lines could still be energized.

To report an emergency such as downed wires or gas leaks, please call (901) 528-4465. This number should be treated like 911 and only used for these types of emergencies.

- Advance notice of storms
- Preparation Tips/Storm Prep Video

www.youtube.com/watch?v=AJrUJo-fTjc

- Emergency Contact Information

mlgw.com/residential/importantnumbers

Outage Text Notifications

- Easy sign up for text alerts via MLGW My Account
- Customers notified anywhere during anytime of an outage
- Quick outage updates without logging into MyAccount or visiting mlgw.com
- Future feature: Customers can report outages

Traditional Media

MLGW crews prepared for severe weather

(May 25, 2022) – Memphis Light, Gas and Water Division is prepared for severe weather with the possibility of heavy rainfall and a few strong to severe thunderstorms.

MLGW crews are ready to respond to any local damage or outages.

Stay away from downed power lines.
Customers should avoid contact with downed power lines—even if their home or area has experienced a loss of power as the lines could still be energized.

To report an emergency such as downed wires or gas leaks, please call (901) 528-4465. This number should be treated like 911 and only used for these types of emergencies.

Important MLGW contact information for customers:
· Outage Reporting: (901) 544-6500
· Emergency: (901) 528-4465
· Customer Care Center: (901) 544-MLGW (6549)

Visit MLGW's storm readiness guide for tips on preparing for weather emergencies: mlgw.com/images/content/files/pdf/StormPrep.pdf. For more outage related information, visit mlgw.com/outagecenter.

–ENDIT–

MLGW is the largest three-service public power utility in the nation, serving more than 439,000 customers in Memphis and Shelby County.

mlgw.com

- MLGW works with print, television, and radio outlets to keep the public informed.
- We also host daily press conferences and send press releases.
- During large-scale events or crisis activation, customer care hours are extended to give people more time to report outages and check on restorations.

Outage Communication Goals

youtu.be/wjldRzLmAUE

- Launch campaign to increase email opt-in (current distribution: 150K)
- Heavy promotion of text alerts to increase enrollment (current enrollment: 89K)
- Campaign tactics: digital and traditional media commercials, IVR phone messages, bill insert, email, web, social media, posters and flyers, news releases, MLGW App etc.
- By utilizing storm/outage predictive software, we will be able to notify customers of expected outages and damages to the electric system, giving our customers better information **before a storm.**

Summary of Planned Initiatives

Tentative OIAT Solutions Matrix

Category	In Current MLGW Plan?	Implementation Timeframe or Target	Reliability Impact	Lead Entity	Estimated Costs
Infrastructure/Resiliency					
• **Overhead rebuild & storm hardening (including rear lot line upgrades; deferred maintenance & warranted redundancy)**	N	36 months	About 1% reduction in CMI but aimed at problem areas.	**MLGW**	$4 M for pilot area in Map 18 (Orange Mound, Sherwood Forest, etc.) This is $250 per customer and does not include previously budgeted ongoing work for DA, pole replacement, and tree trimming. Estimated cost for system wide project ~ $25 M
• **Accelerate Distribution Automation – Phase 1**	Y	24 Months	24% CMI reduction	**MLGW**	Phase 1 budgeted for $130; May be difficult with supply chain
• **Accelerate Distribution Automation – Phase 2**	N	24 months	4% CMI reduction	**MLGW**	Phase 2 includes ADMS and Wireless Communication - $50M
• **Accelerate Pole Replacements**	Y	18 months	2% CMI reduction	**MLGW**	Budgeted $3 M per year or $15 for five-year plan.
• **Accelerate Underground Cable Replacements**	Y	24 months	2.6% CMI reduction	**MLGW**	Budgeted $50 M for five-year plan.
• **Substation equipment retrofits & wildlife mitigation**	Y	36 months	1% CMI reduction	**MLGW**	Budgeted $55 M for five-year capital plan
• **Line Inspection to Identify Remedial Maintenances**	N	24 months	TBD	**MLGW**	$200 K per year.
• **Strategic Underground**	N	60+ months	TBD	**MLGW**	TBD

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Category	In Current MLGW Plan?	Implementation Timeframe or Target	Reliability Impact	Lead Entity	Estimated Costs
Vegetation Management & Policy					
• Accelerate Tree Trimming	Y	1Q 2023	13% CMI Reduction	**MLGW**	Budgeted at $98 M for Five Year Plan
• Standards/Ordinances	N	3Q 2023		**Municipality**	N/A
• Enforcement capacity/efficacy	N	3Q 2023		**Municipality**	N/A
• Set-back	N	3Q 2023		**Municipality**	N/A
• Homeowner assistance	N	3Q 2023		**Municipality**	N/A
Technology/Communications					
• Smart Meter	Y	3Q 2022		**MLGW**	May use DA wireless communications
• MLGW website dashboard enhancements	Y	3Q 2022		**MLGW**	TBD
• Other					
Communications					
• Pre-storm customer alerts	Y	3Q 2022	N/A	**MLGW**	TBD
• Restoration timeframe alerts	Y	3Q 2022	N/A	**MLGW**	TBD
• Text alerts enhancements	Y	3Q 2022	N/A	**MLGW**	TBD
Logistics					
• Early contract crew engagement	Y	3Q 2022	N/A	**MLGW**	N/A
• Pre-storm accommodation arrangements	N	3Q 2022	N/A	**MLGW**	N/A

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Category	In Current MLGW Plan?	Implementation Timeframe or Target	Reliability Impact	Lead Entity	Estimated Costs
Miscellaneous/Other					
• **Premise-level back-up generators**	N	2Q 2023	N/A	**MLGW**	TBD
• **Traffic signalization & back up power**	N	36 Months	Safety	Municipality	TBD

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Summary

- Your input has been vital throughout this process…Thank You!!
- Finalization of cost estimates will be completed over the next several weeks.
- Some initiatives (i.e., policy-related) may require Board and/or Council actions.
- Our goal is to move a quickly as feasible in accelerating our existing 5-Year Service Improvement Plan.
- We must be mindful of supply chain and other potential challenges as we move forward.
- Incremental reliability improvement initiatives will come at a cost. There are likely cost impacts not yet considered and/or budgeted which could mean increased costs for customers at some point.
- MLGW will partner with the municipalities to ensure effective coordination with policy-related and other relevant initiatives.
- We plan to work across our service area and will seek to prioritize efforts in those efforts where outage issues have been most prevalent.
- We will provide all presentations on our website (mlgw.com) and will provide updates on our progress to the community on a routine (likely quarterly) basis.

Questions/Comments

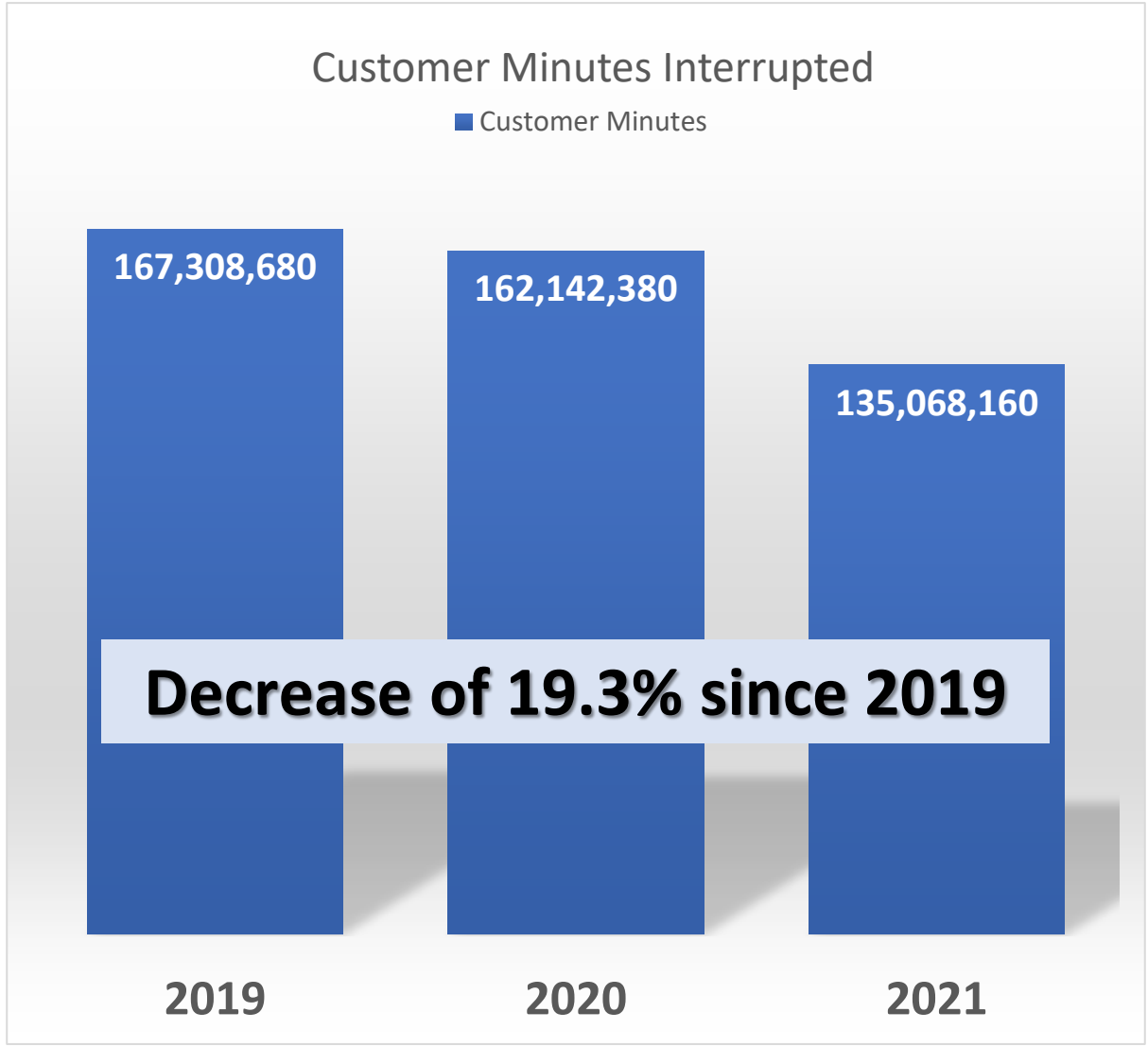
Appendix

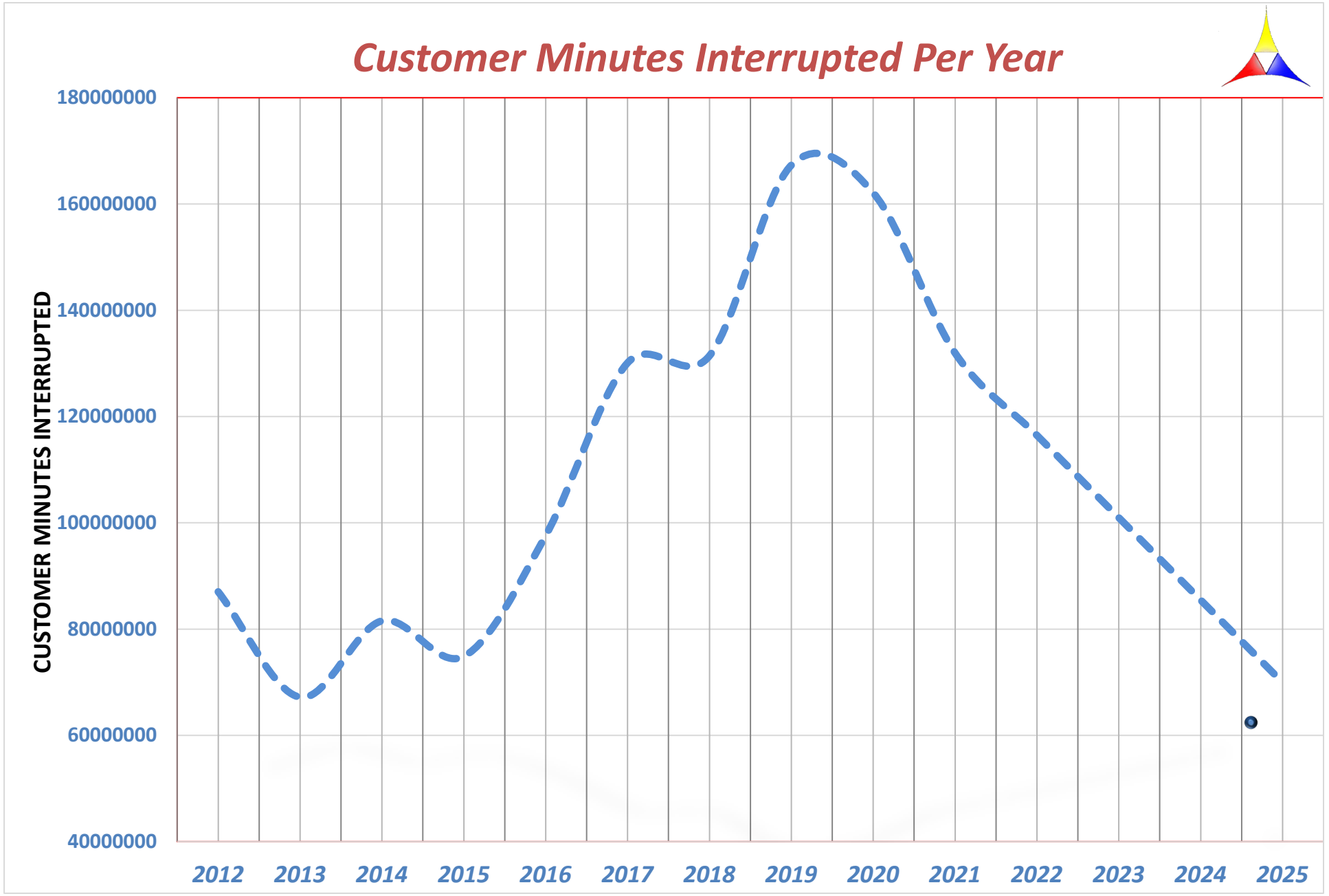
NBR	NEIGHBORHOOD	2005-2008			2009-2013			2014-2018		
		Average Time Off Per Outage (Minutes)	Average Interruptions Per Year	Average Time Off Per Year (Hours)	Average Time Off Per Outage (Minutes)	Average Interruptions Per Year	Average Time Off Per Year (Hours)	Average Time Off Per Outage (Minutes)	Average Interruptions Per Year	Average Time Off Per Year (Hours)
1	SHELBY FOREST	212.8	7.4	2.10	181.6	6.3	2.08	249.1	12.6	3.03
2	MILLINGTON-ROSEMARK	130.8	3.8	1.75	113.7	3.4	1.80	142.2	4.8	2.01
3	FRAYSER	131.3	2.8	1.27	148.1	3.3	1.34	143.2	5.1	2.13
4	RALEIGH	182.8	5.2	1.70	123.1	3.3	1.62	110.7	4.5	2.44
5	BARTLETT	120.4	3.3	1.63	98.9	2.2	1.34	101.9	3.1	1.81
6	LAKELAND	97.7	2.3	1.41	106.5	2.0	1.13	132.9	3.7	1.69
7	ARLINGTON	139.2	4.0	1.71	110.5	2.0	1.07	100.7	2.7	1.63
8	NORTH MEMPHIS	101.6	3.4	2.00	106.1	2.7	1.53	135.6	4.8	2.12
9	BERCLAIR-GRAHAMWOOD	99.7	3.0	1.81	108.8	3.0	1.67	147.0	5.1	2.08
10	SHELBY FARMS	100.4	1.9	1.11	95.9	2.8	1.75	90.3	2.9	1.90
11	CORDOVA	104.4	2.5	1.41	91.4	1.6	1.02	106.6	2.2	1.26
12	FISHERVILLE-EADS	125.3	5.1	2.45	91.5	2.2	1.43	111.0	3.8	2.06
13	DOWNTOWN-MED DIST	139.2	3.0	1.31	97.6	2.5	1.52	105.5	3.6	2.03
14	MIDTOWN	132.4	3.9	1.77	132.6	3.7	1.66	140.7	4.3	1.84
15	EAST MEMPHIS	159.5	4.1	1.56	142.4	3.6	1.51	184.8	4.8	1.57
16	SOUTH MEMPHIS	158.4	4.4	1.65	156.6	4.6	1.77	156.7	4.6	1.77
17	CASTALIA HEIGHTS-PROSPECT PARK	154.0	5.3	2.06	135.1	4.6	2.03	138.3	6.4	2.79
18	ORANGE MOUND-[redacted]	158.4	4.2	1.60	136.3	3.3	1.45	163.5	8.1	2.98
19	BALMORAL-SHADY GROVE	133.2	3.1	1.38	135.1	3.2	1.44	167.5	4.8	1.71
20	GERMANTOWN	146.9	3.0	1.22	109.9	2.9	1.57	153.7	4.0	1.56
21	PRESIDENTS ISLAND-RIVERGATE	158.6	3.3	1.23	88.4	2.2	1.47	101.9	1.6	0.95
22	WESTWOOD-CORO LAKE	226.4	3.8	1.00	166.7	4.3	1.53	176.7	6.2	2.12
23	WHITEHAVEN	168.3	4.7	1.66	154.1	3.6	1.39	222.8	6.7	1.80
24	AIRPORT-OAKHAVEN	162.3	4.6	1.71	135.8	3.6	1.59	192.1	4.8	1.50
25	PARKWAY VILLAGE	165.9	3.8	1.38	148.3	3.9	1.57	165.3	5.3	1.92
26	LAMAR-CAPELVILLE	212.0	5.2	1.47	129.9	2.7	1.24	149.0	4.9	1.98
27	HICKORY HILL	98.2	2.1	1.27	109.6	2.6	1.42	150.7	4.7	1.88
28	SOUTHWIND	115.5	2.2	1.14	87.8	1.9	1.29	119.7	2.5	1.27
29	COLLIERVILLE	113.2	1.8	0.94	80.3	1.5	1.13	102.8	1.6	0.96

Electric Reliability: Five-Year Improvement Plan

Areas of Focus

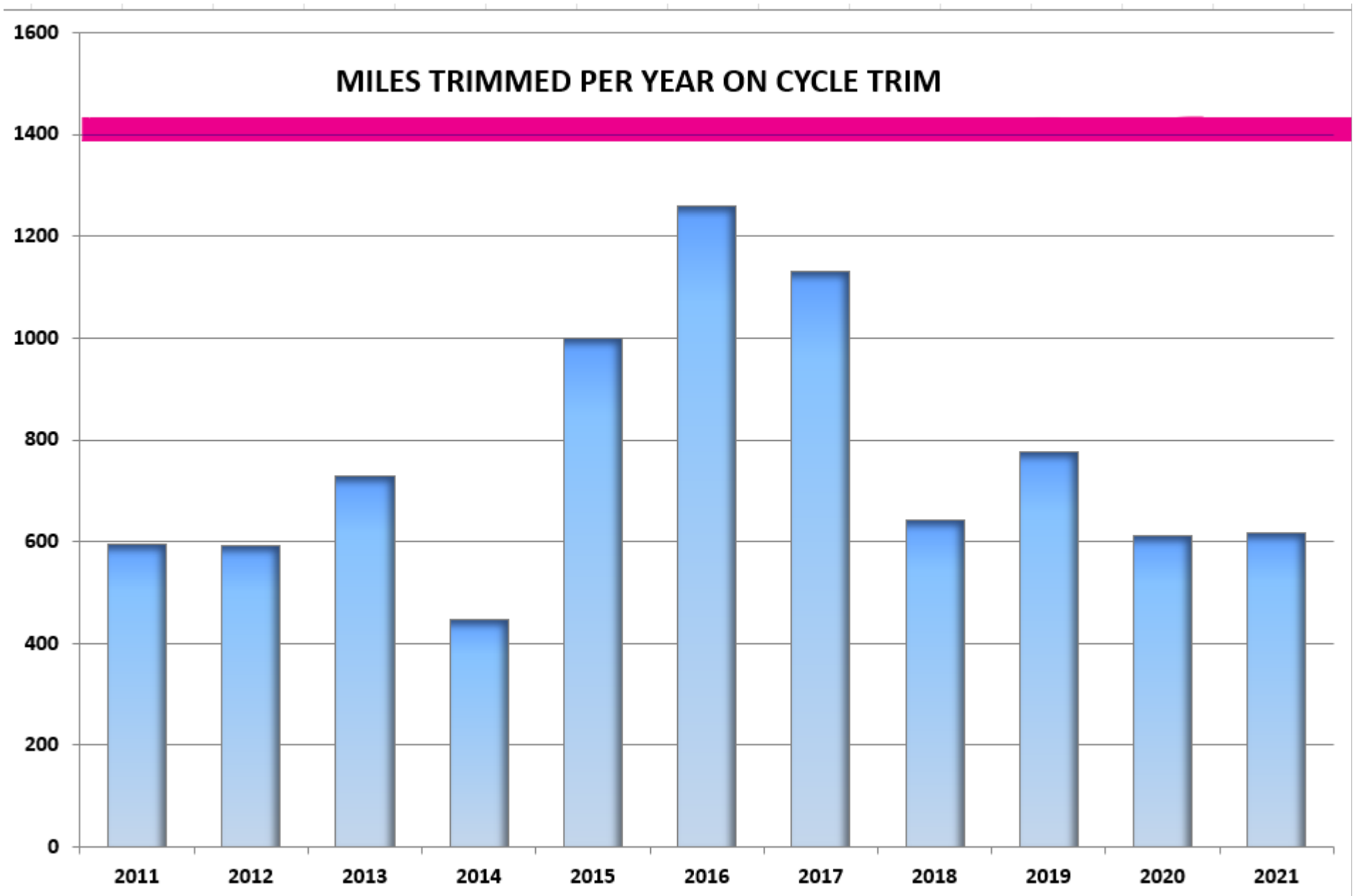
- Replacement of Defective UG Cable
- Wood Pole Management
- Tree Trimming
- Aging Substation Equipment
- Automation of Distribution System
- Hardening of OH Electric System




Customer Minutes Interrupted Per Year
CUSTOMER MINUTES INTERRUPTED
180000000
160000000
140000000
120000000
100000000
80000000
60000000
40000000
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025

Contracts In Place to Assist with Progress

1. **Contract #12163/Davis H. Elliot – Electric C & M/Overhead**
   - Contract Value: $55.3 million
   - Contract Term: 4/12/2021 -4/11/2026
   - Replacement of Defective Wood Poles
   - Automation of Distribution System
   - Hardening of OH Electric System
2. **Contract #12198/Standard Electric Co. – Electric C & M/Underground**
   - Contract Value: $69.7 million
   - Contract Term: 9/2/2021 - 9/1/2026
   - Replacement of Defective UG Cable
3. **Contract #12077/Asplundh Tree Expert – Line Clearance**
   - Contract Value: $97.4 million
   - Contract Term: 10/7/2019 - 10/6/2024
   - Electric Distribution Line Clearance
4. **Contract #12151/ABC Professional Tree Services – Line Clearance**
   - Contract Value: $30.0 million
   - Contract Term: 1/3/2021 - 1/2/2026
   - Electric Distribution Line Clearance
5. **Contract #12238/Electric Substation Construction and Maintenance Services**
   - Contract Value: $2.5 million
   - Contract Term: 2/15/2022 – 2/15/2023 (w/option of 4, 1-year renewals)
   - Substation work, Distribution Automation



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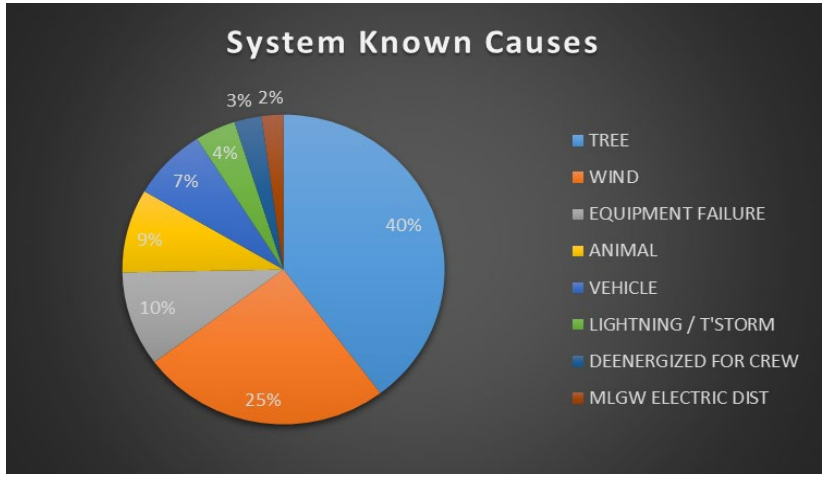
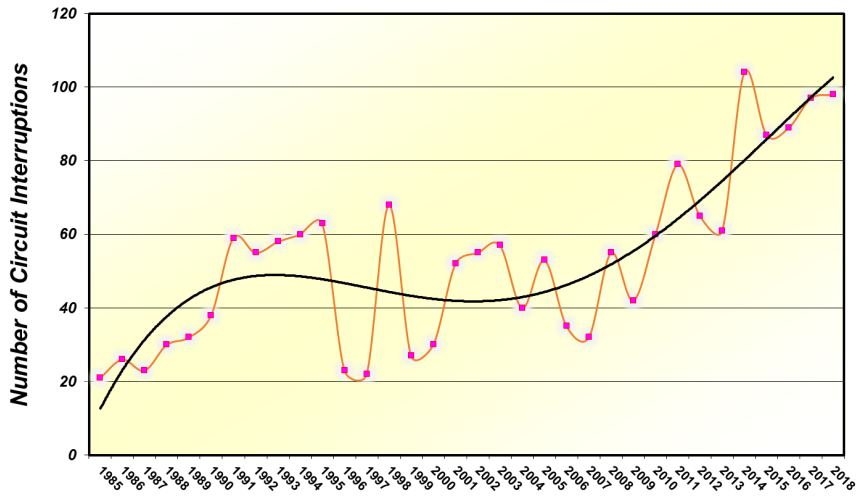
VEGETATION MANAGEMENT





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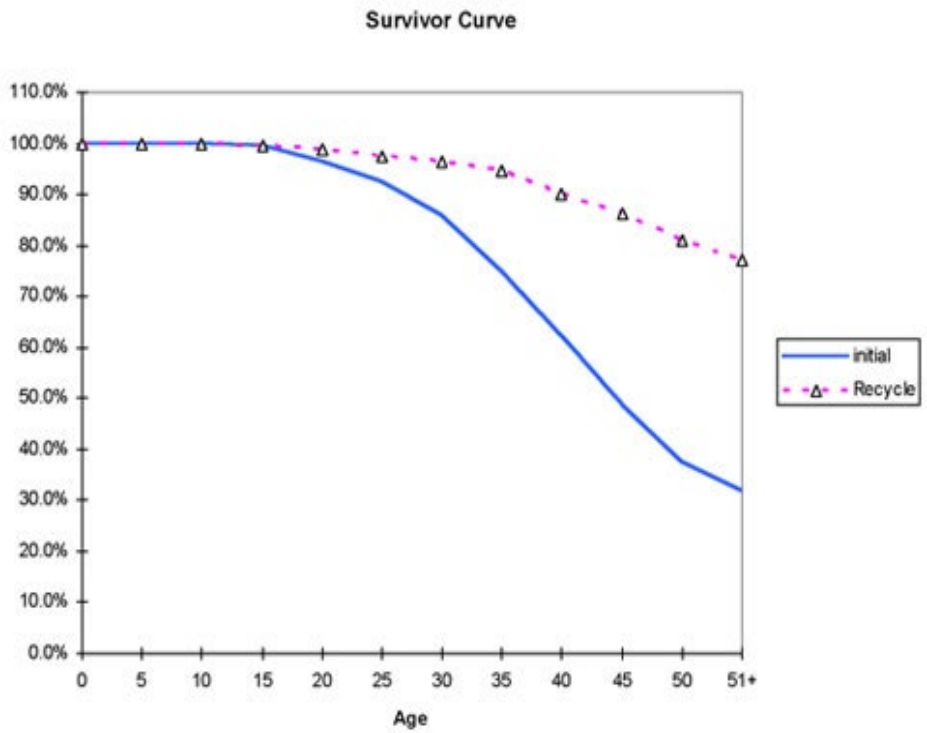
Wood Pole Inspection & Treatment



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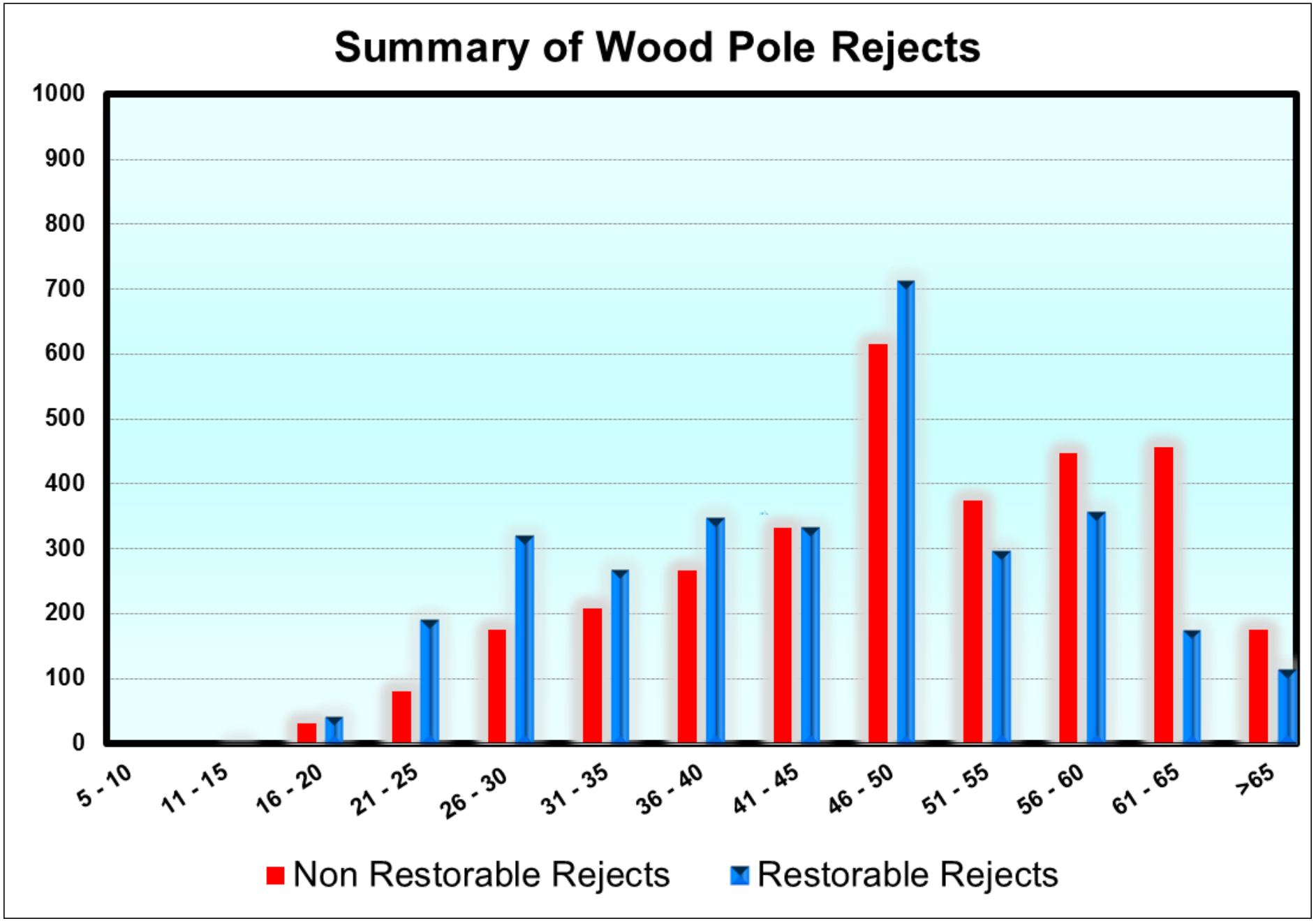
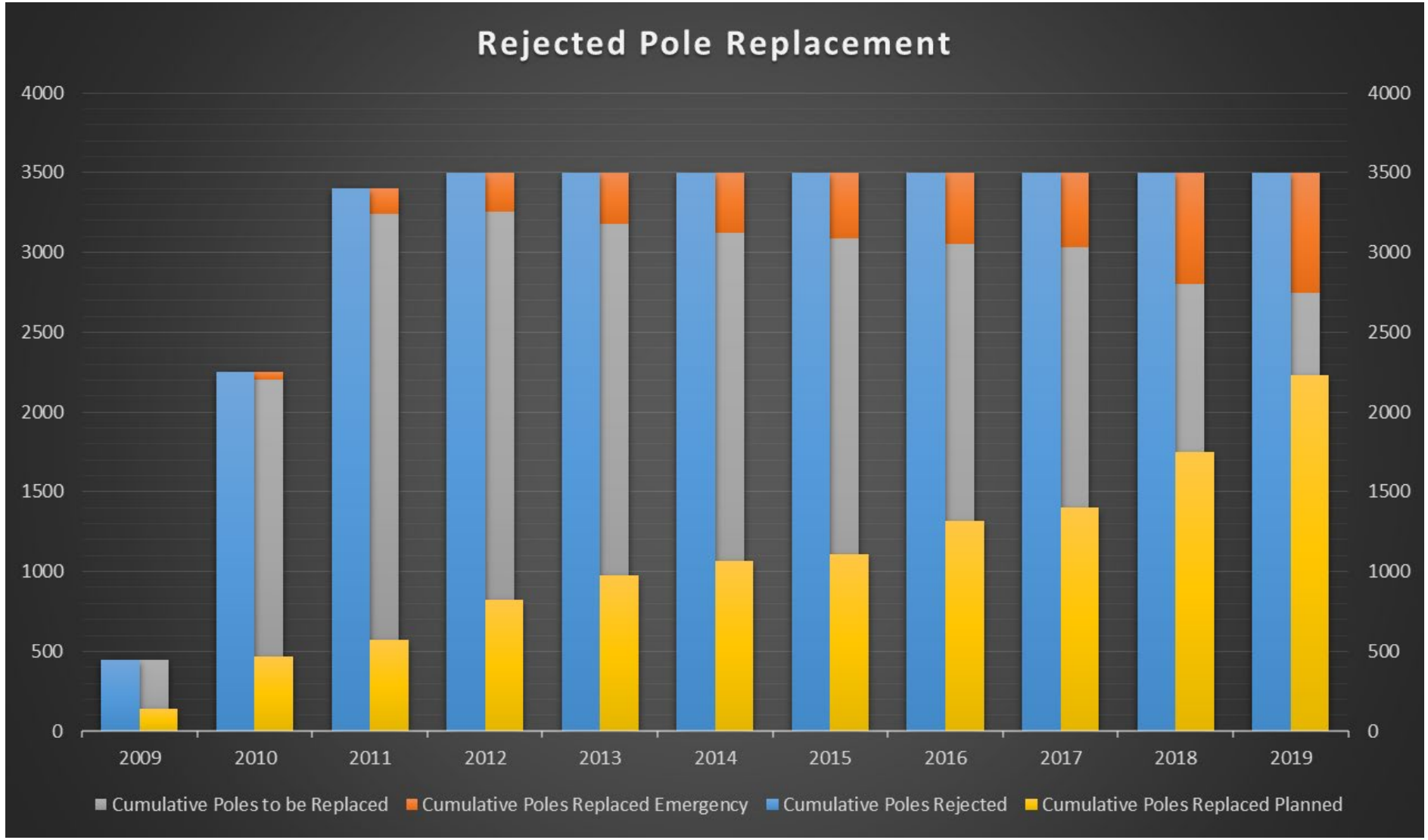

Summary of Wood Pole Rejects
1000
900
800
700
600
500
400
300
200
100
0
5 - 10
11 - 15
16 - 20
21 - 25
26 - 30
31 - 35
36 - 40
41 - 45
46 - 50
51 - 55
56 - 60
61 - 65
>65
Non Restorable Rejects
Restorable Rejects


Rejected Pole Replacement
4000
3500
3000
2500
2000
1500
1000
500
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Cumulative Poles to be Replaced
Cumulative Poles Replaced Emergency
Cumulative Poles Rejected
Cumulative Poles Replaced Planned

Maintenance

Largest preventive maintenance item on the electric system is tree trimming.

MLGW is making preventative maintenance programs more condition and usage driven. (Reliability Centered Maintenance)

MLGW will assess resources for line inspection and system remedial repairs.

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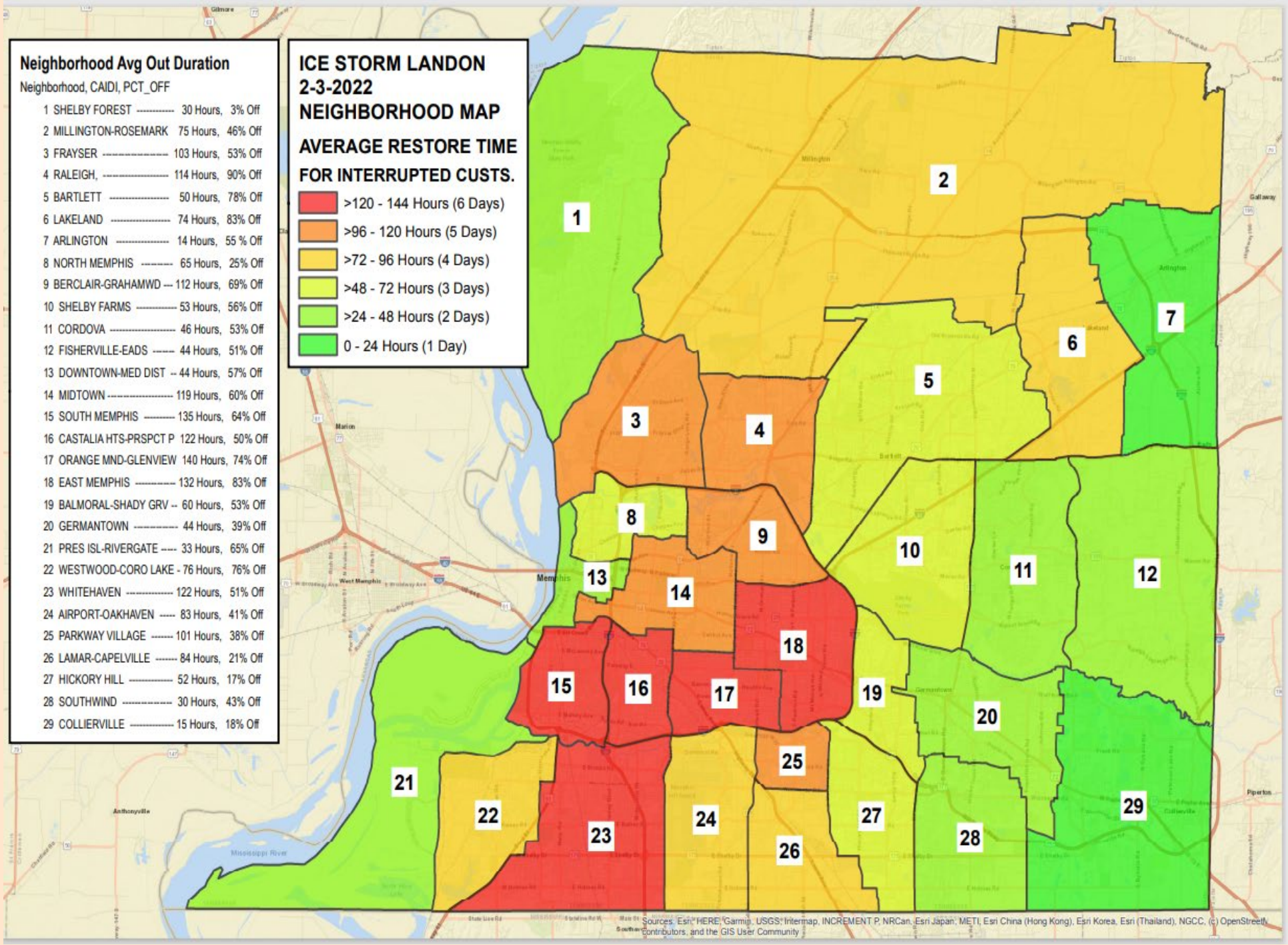

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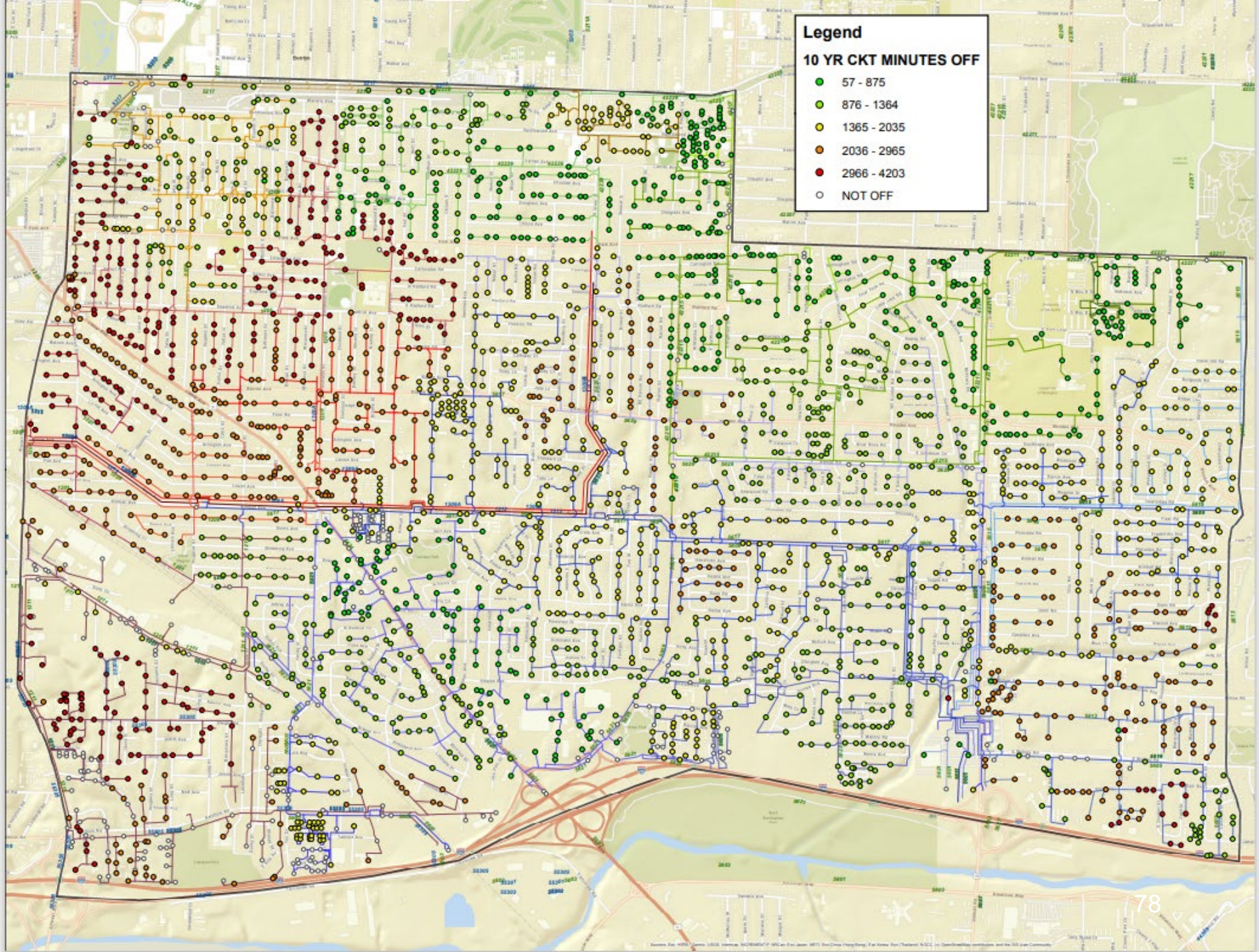
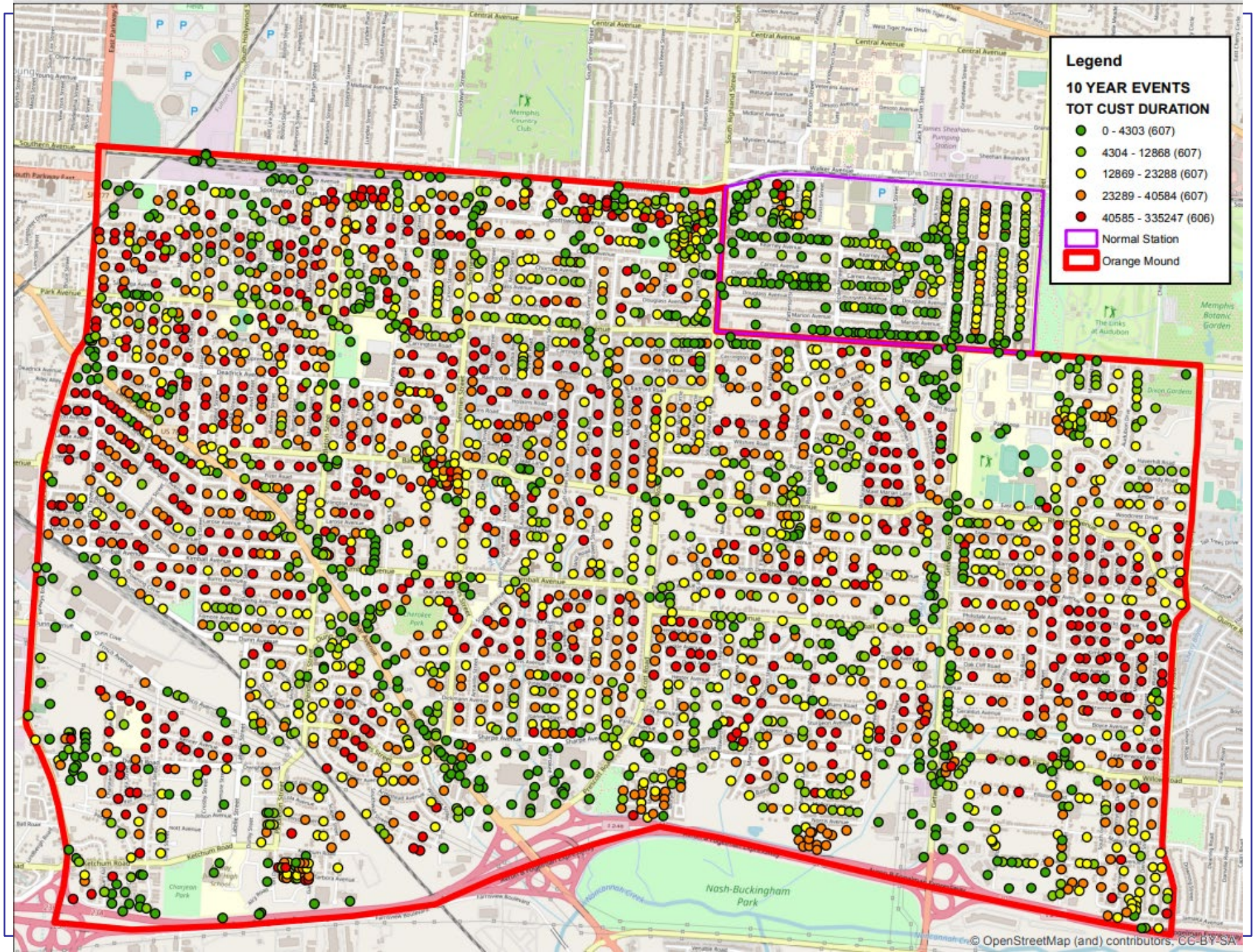

Legend
10 YR CKT MINUTES OFF
57 - 875
876 - 1364
1365 - 2035
2036 - 2965
2966 - 4203
NOT OFF



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