Together We Shine

The Enduring Strength of Municipal Power Systems

ELECTRICITIES of NORTH CAROLINA, INC. | *The energy behind public power*

Introductions

Craig Bachelor

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Manager, Grid Innovation

PUBLIC POWER'S

STRATEGIC PRIORITIES

FUTURE–FOCUSED

Develop a future-focused mindset

PROVIDE SUPERIOR POWER

Deliver reliable, affordable, and sustainable electric power

PEOPLE

Leverage our people as our greatest asset

STRENGTHEN PUBLIC POWER

Build public and political support for public power

CUSTOMER-CENTERED INNOVATION

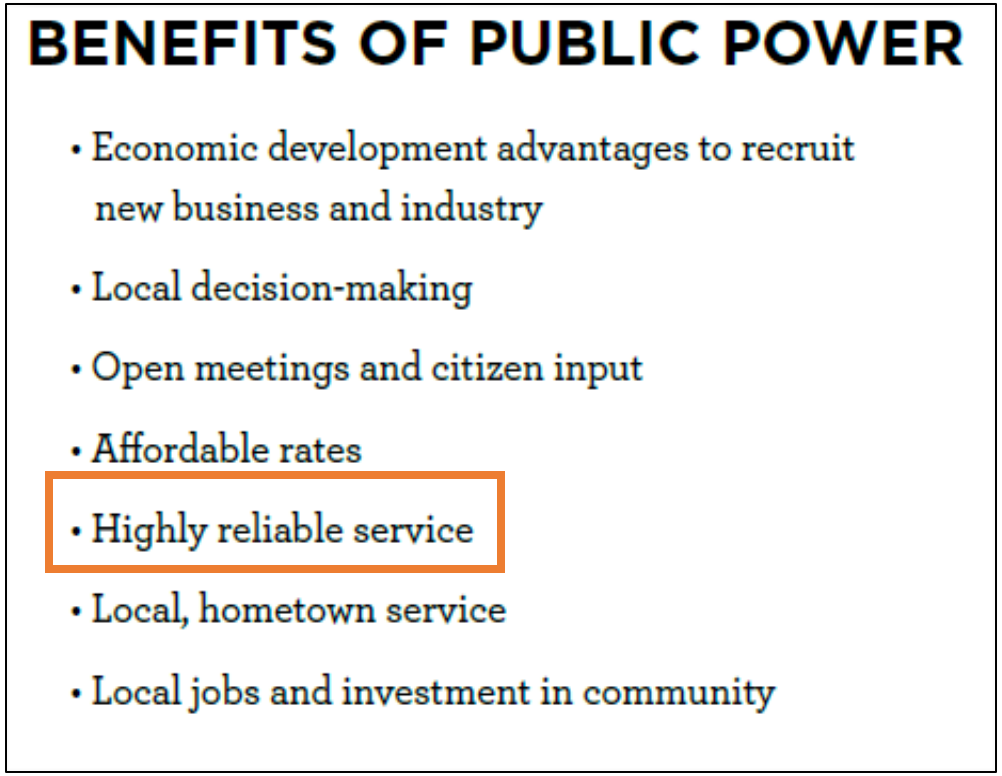
Innovate and invest to better serve our customers and communities

PROVIDE SUPERIOR POWER

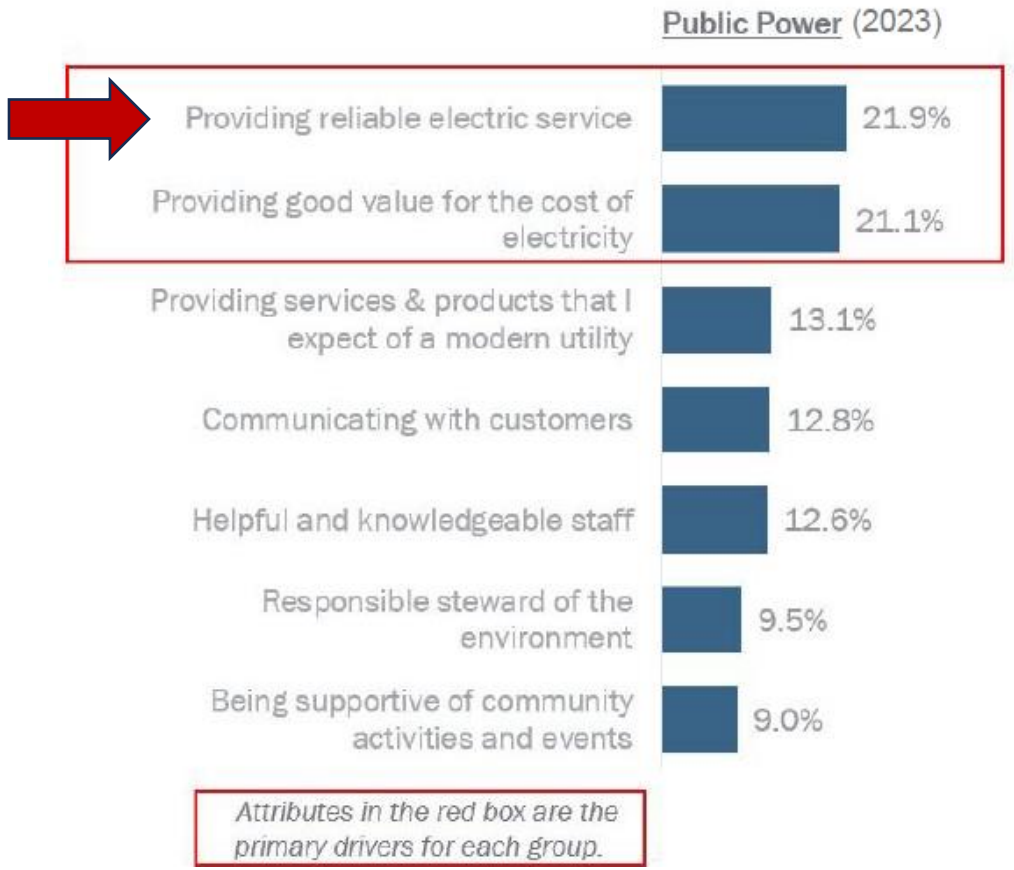
Deliver reliable, affordable, and sustainable electric power.

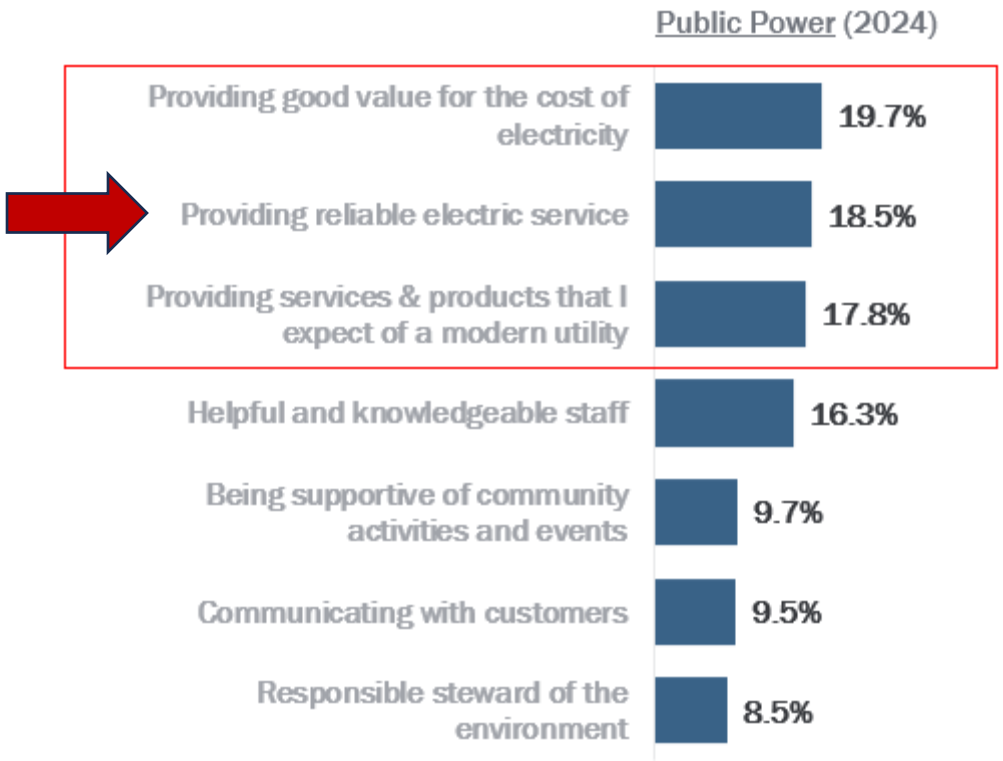
Reliability Overview

- One of the top benefits of Public Power is our highly reliable service compared to competitors.
- Public Power crews are typically local, readily available, flexible, and highly motivated to restore power to their own communities.
- Public Power communities have partnered together to provide robust emergency assistance programs.



Customer Perception of Reliability





NC Public Power Retail Customer Surveys consistently report reliability as a primary factor driving customer satisfaction.

Tracking and Reporting Reliability

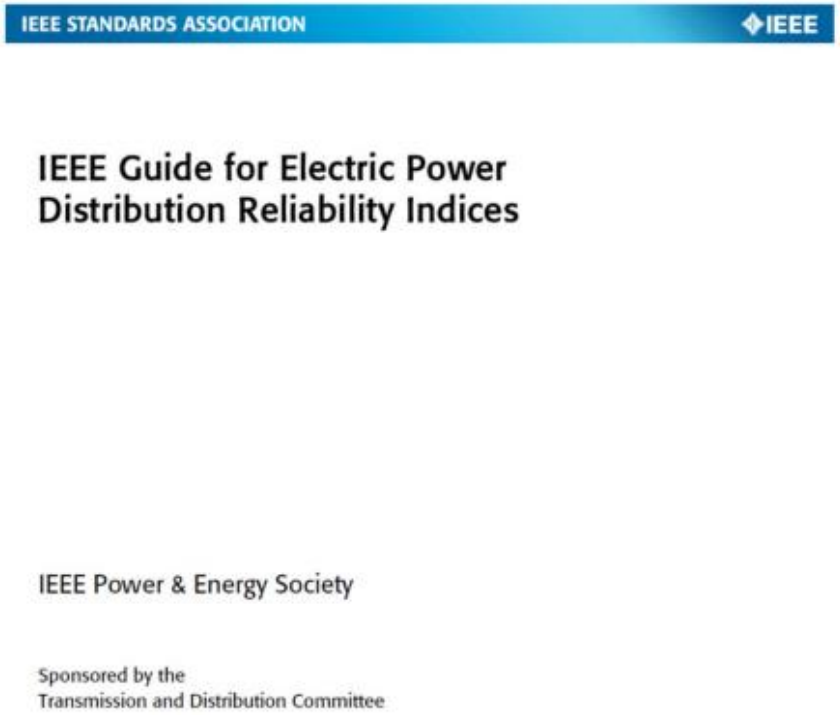
- Tracking Tools:
  - eReliability Tracker (APPA Program)
  - SCADA Systems
  - Outage Management Systems
  - AMI meters
- To maintain credibility and compare accurately, outage tracking and reporting must be taken seriously and tracked consistently.
- IOUs must report quarterly reliability indices to NCUC (Docket E-100 Sub 138A).
- EIA-861 now includes reliability indices in the annual report.

Reliability Indices

Institute of Electrical & Electronics Engineers (IEEE)

IEEE-1366 Reliability Indices

- **System Average Interruption Duration Index (SAIDI)**
- **System Average Interruption Frequency Index (SAIFI)**
- **Customer Average Interruption Duration Index (CAIDI)**
- Average Service Availability Index (ASAI)



PROVIDE SUPERIOR POWER

Deliver reliable, affordable, and sustainable electric power.

Supporting Measure #1:
Reliability: SAIDI & SAIFI

Reliability Indices – What Do They Mean?

SAIDI = System Average Interruption Duration Index

- ***Average outage duration per customer (minutes per year)***
- Example: A utility serving 1000 customers with 60,000 minutes of outage time in a year would have a SAIDI = 60,000/1000 = 60 minutes.

$$\text{SAIDI} = \frac{\text{Total Number of Minutes Customers are Interrupted}}{\text{Total Number of Customers Served}}$$

Reliability Indices – What Do They Mean?

SAIFI = System Average Interruption Frequency Index

- ***Average number of outages a customer experiences (typically in a year)***
- Example: A utility serving 1000 customers with 500 customers experiencing an outage disruption in a year would have a SAIFI =500/1000 = 0.5.

$$\text{SAIFI} = \frac{\text{Total Number of Customers Interrupted}}{\text{Total Number of Customers Served}}$$

Reliability Indices – What Do They Mean?

CAIDI = Customer Average Interruption Duration Index

- ***Average time (minutes) it takes to restore power for an outage***
- Example: A utility with 5000 minutes of power interruption affecting 100 customers would have a CAIDI = 5000/100 = 50.

$$\text{CAIDI} = \frac{\text{Total Number of Minutes Customers are Interrupted}}{\text{Total Number of Customer Interruptions}}$$

Reliability Indices – What Do They Mean?

ASAI = Average Service Availability Index

- ***Percentage availability of electric service to customers during a specific time frame***
- An ASAI of 99.99% means the electric service was available for 99.99% of the time during the given period.

$$\text{ASAI} = \frac{\text{Total Hours of Service Availability to Customers}}{\text{Total Hours Service is Demanded by Customers}}$$

Major Event Days (MEDs)

- Major events require a crisis mode of operation to respond adequately.
- A Major Event Day (MED) is an event that has a daily system SAIDI that exceeds a threshold based on historical data. $T_{MED} = e^{(\alpha + 2.5\beta)}$
- Reliability indices excluding MEDs will always be less than are equal to reliability indices with MEDs.
- Factoring out outages associated with MEDs provides a better measure of day-to-day operations, system planning, and asset management, whereas reliability indices with MEDs measure system resiliency.
- When benchmarking across different regions, compare indices without MEDs.

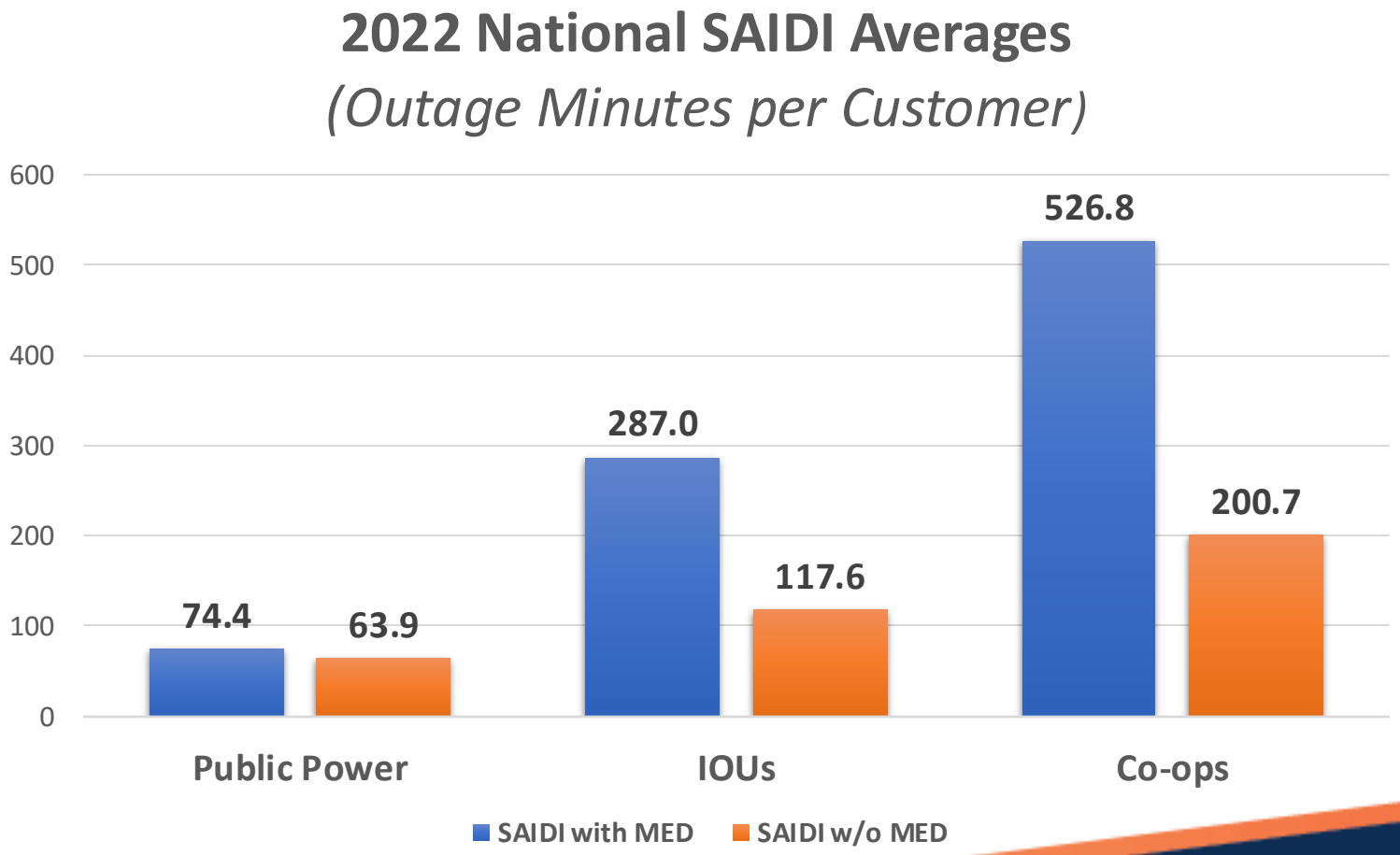
What is “Good” Reliability*?

- SAIDI ≤ 60 minutes
- SAIFI ≤ 1 outage
- CAIDI ≤ 90 minutes

Year 2022 National Average Reliability Indices *(Without Major Event Days)*			
Source: Form EIA-861	**Top 25%**	**Average**	**Median**
SAIDI (minutes per customer)	54.60	145.93	104.81
SAIFI (outages per customer)	0.64	1.28	1.07
CAIDI (minutes per outage)	73.53	105.64	96.31

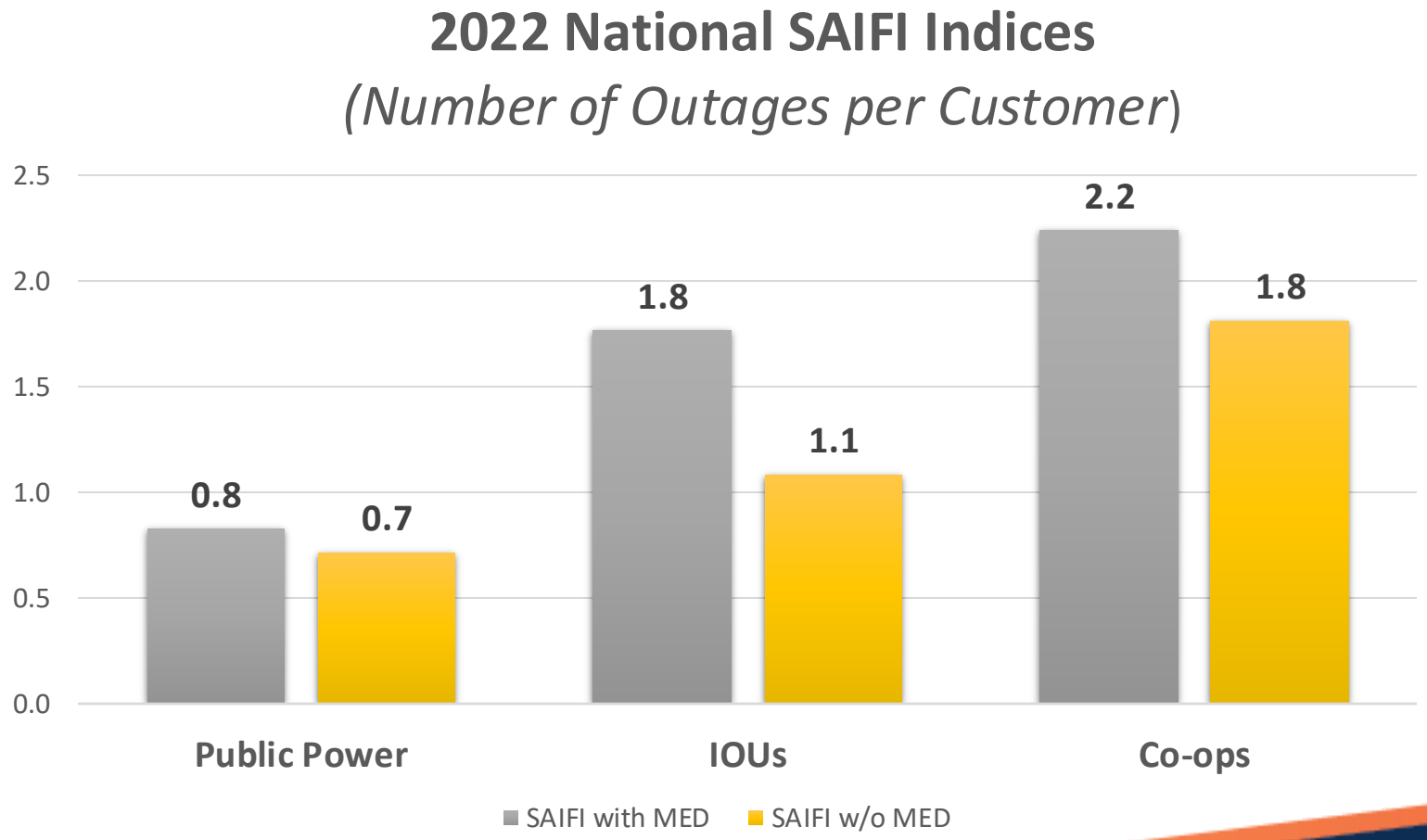
**Excludes Major Event Days (MEDs)*

National Reliability Comparisons



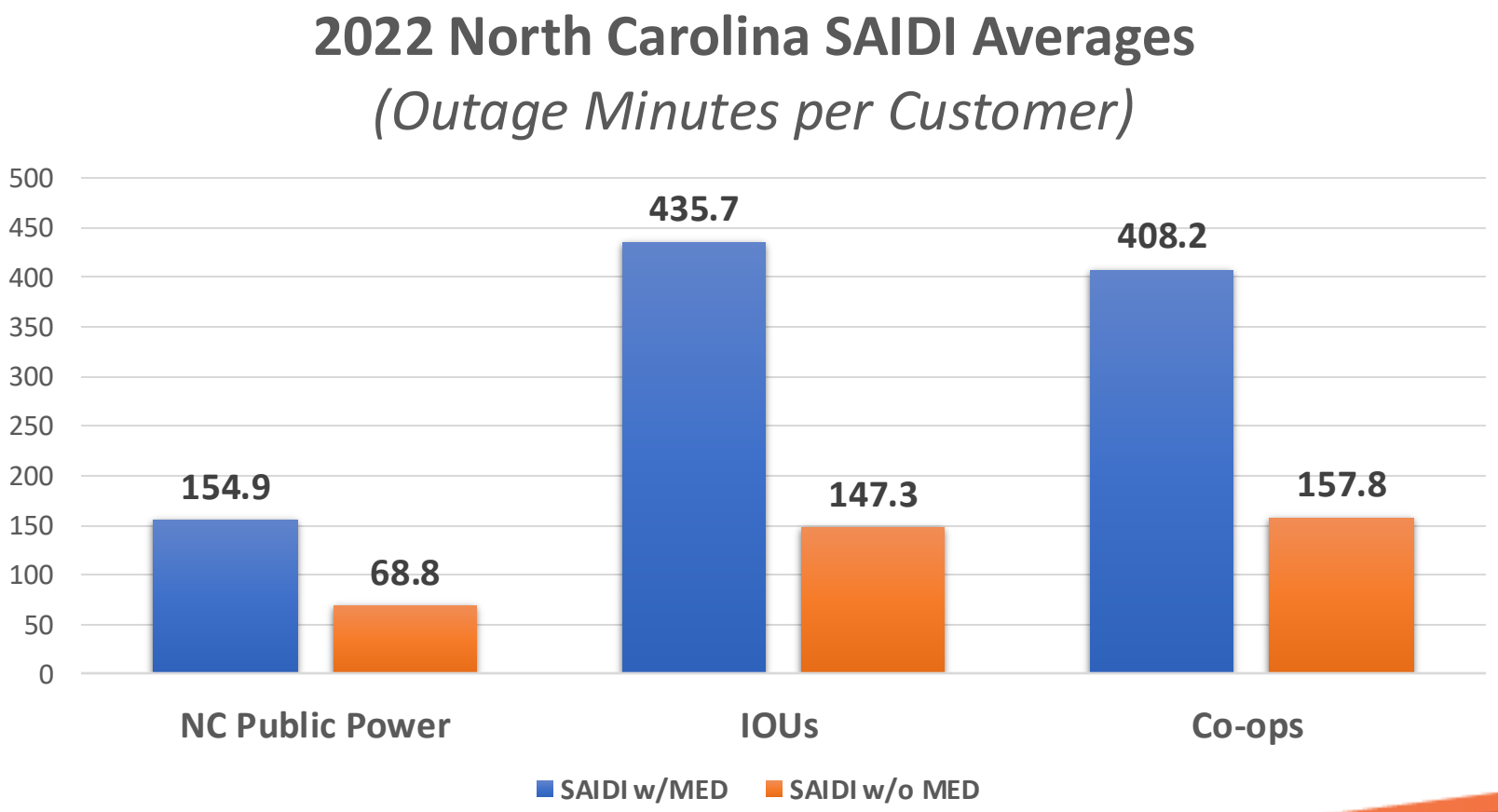
Across the nation, Public Power utilities are consistently more reliable.

National Reliability Comparisons



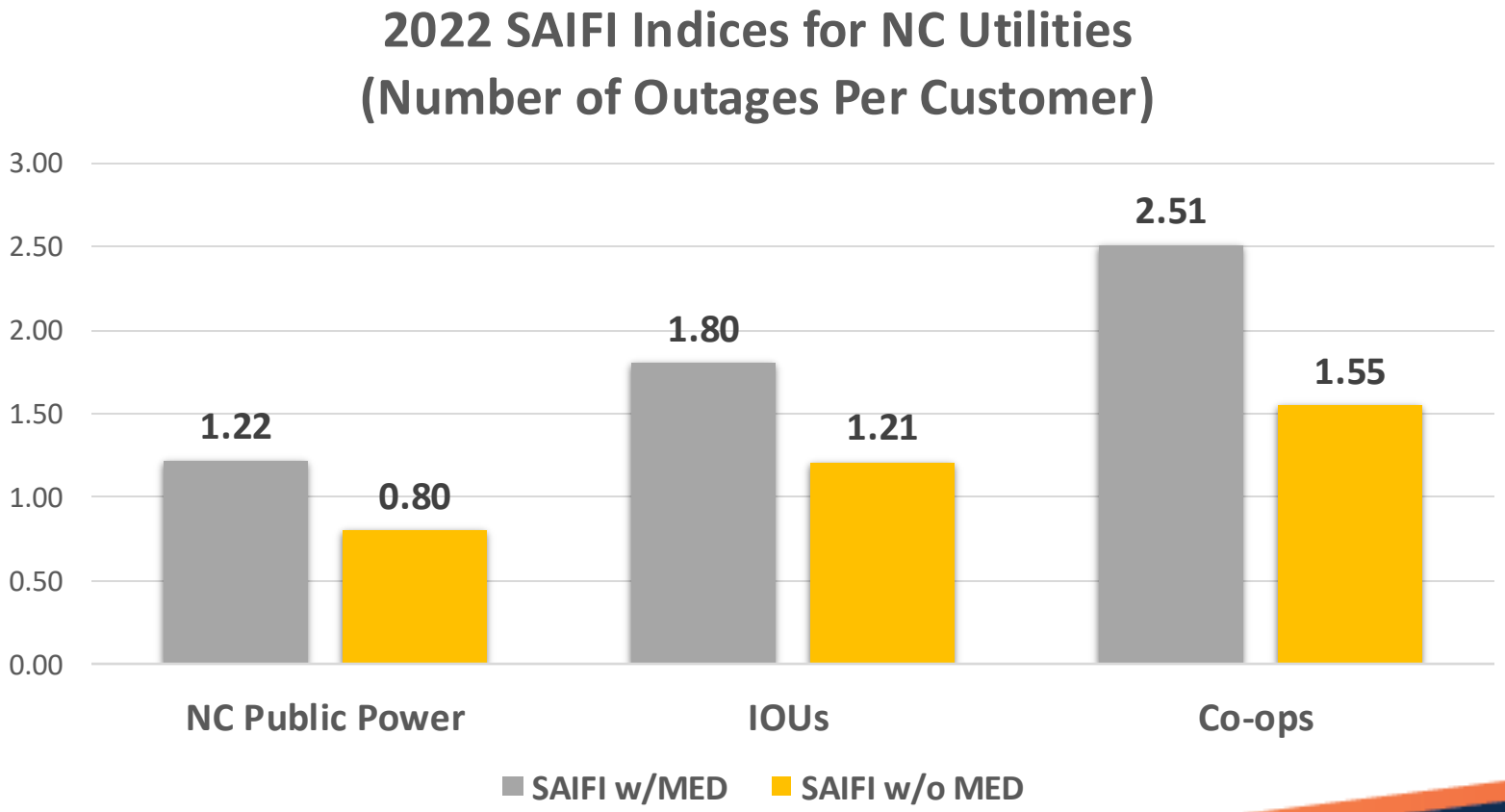
Across the nation, Public Power utilities are consistently more reliable.

North Carolina Reliability Comparisons



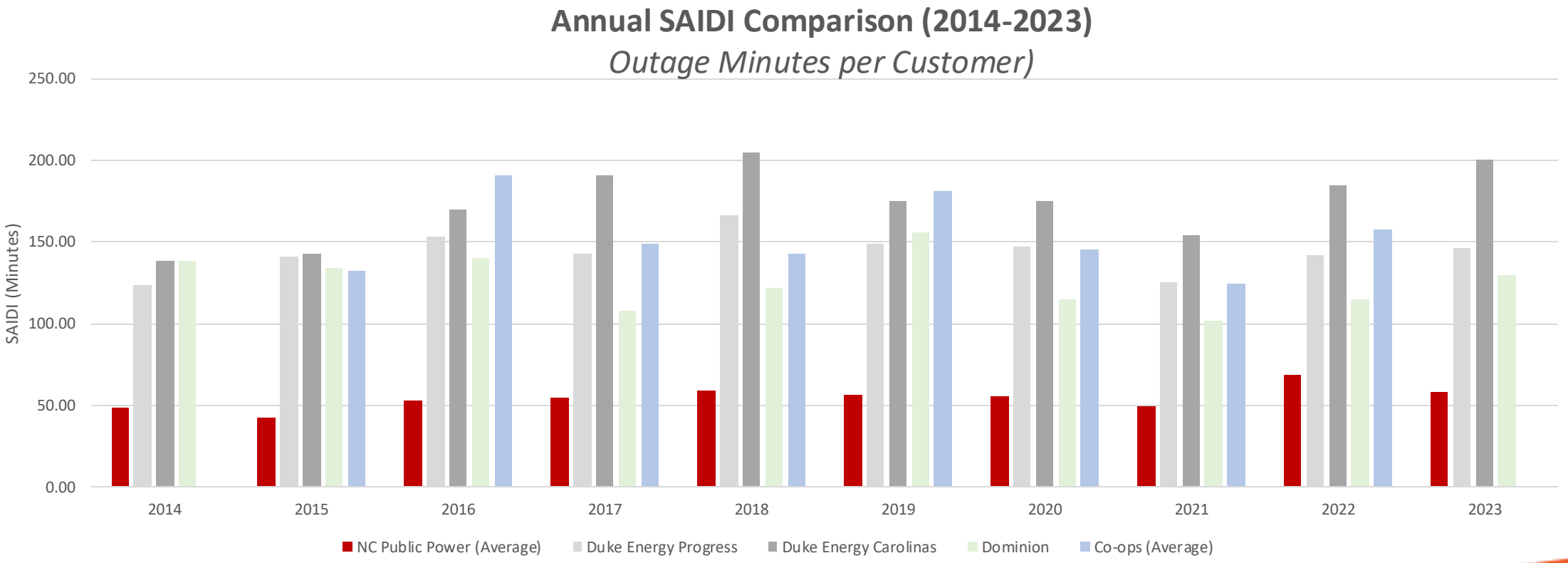
Utilities	2023 SAIDI w/o MEDs
NC Public Power (Average)	58
Co-ops (Average)	TBD
Duke Energy Progress	146
Duke Energy Carolinas	200
Dominion	130

North Carolina Reliability Comparisons

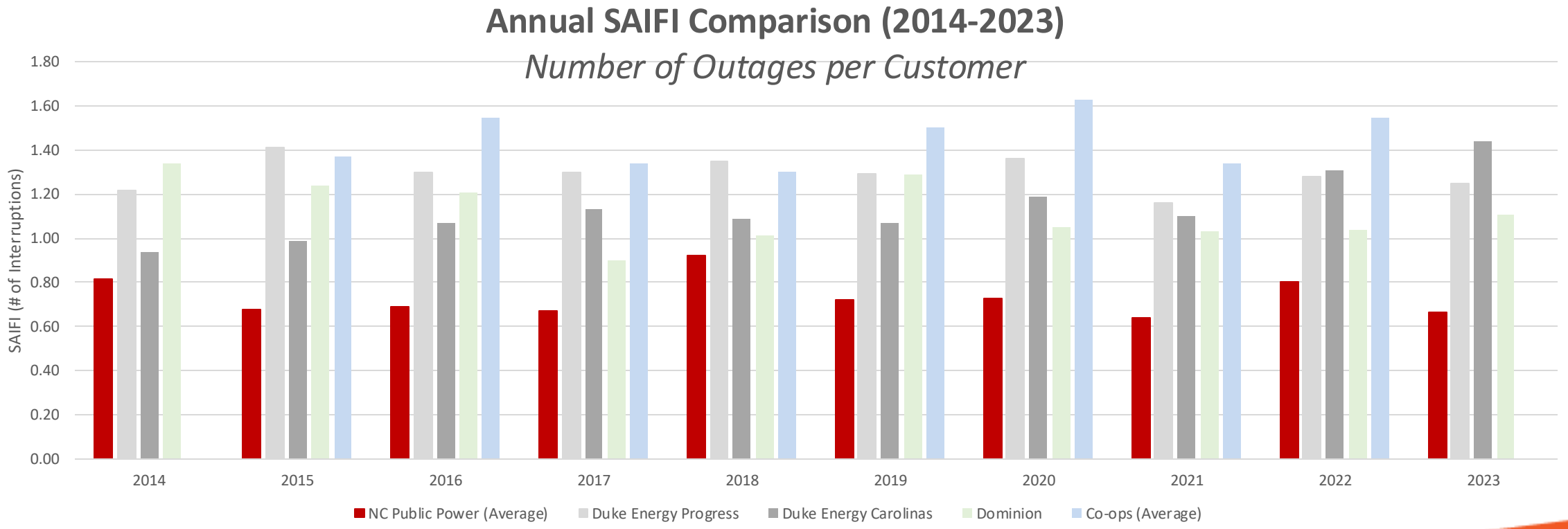


Utilities	2023 SAIFI w/o MEDs
NC Public Power (Average)	0.66
Co-ops (Average)	TBD
Duke Energy Progress	1.25
Duke Energy Carolinas	1.44
Dominion	1.11

NC Reliability Data - SAIDI without MEDs



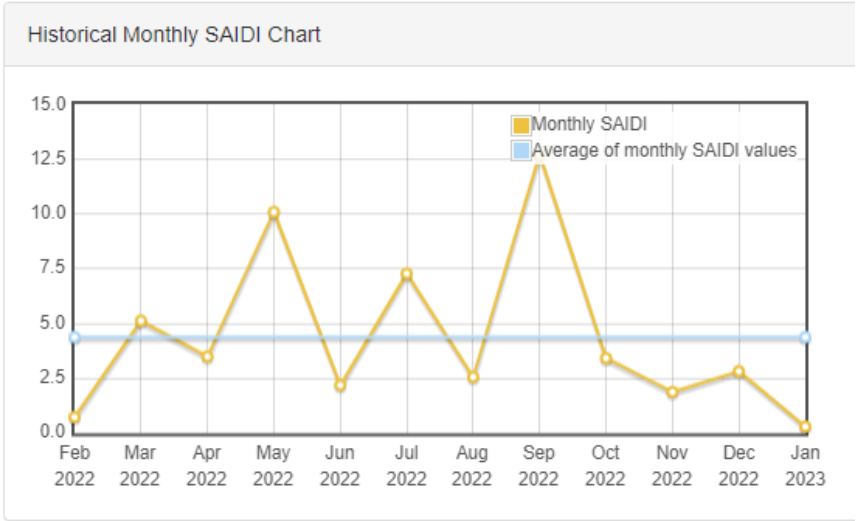
NC Reliability Data (SAIFI without MEDs)

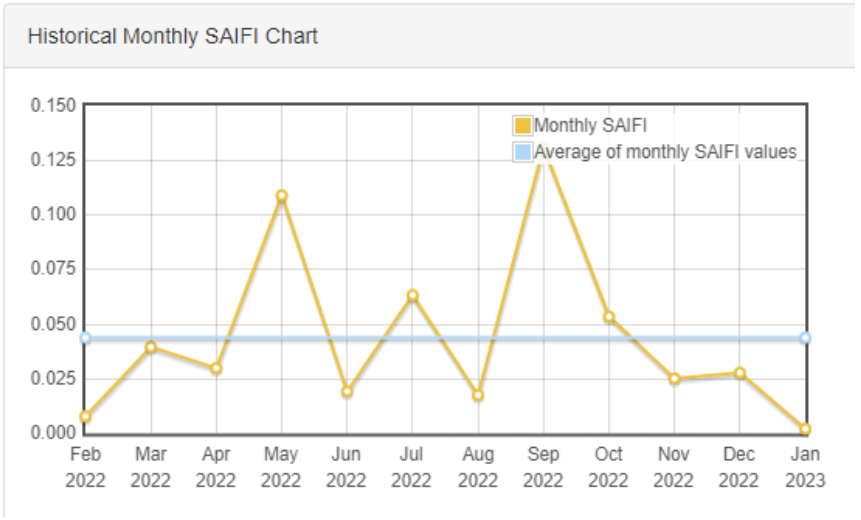


Reliability Tracking

APPA e-Reliability Tracker

- Tracks every outage by date, cause, date/time, duration, circuit, substation, and more.
- Integrates with Outage Management Systems or can be updated manually.
- ElectriCities sponsorships are available for Power Agency and Independent members.

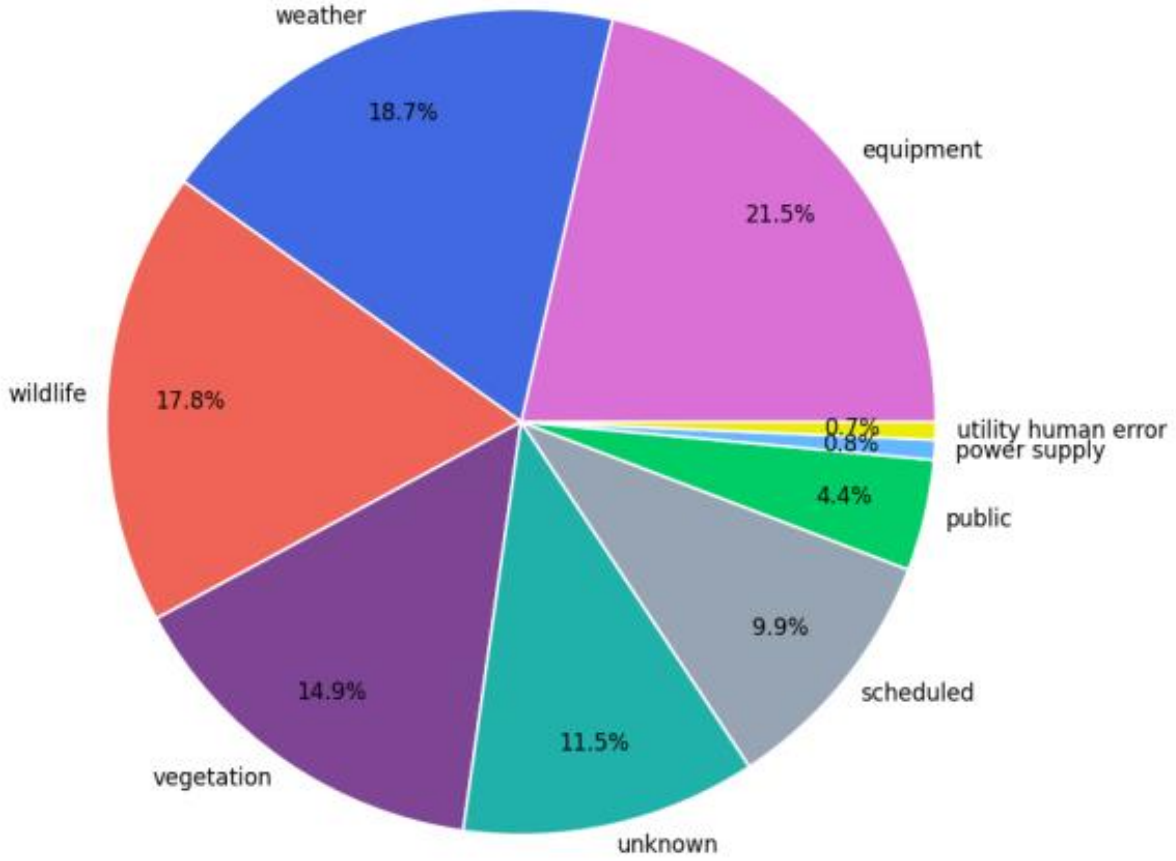




Reliability Benchmarking

- **ElectriCities Annual Reliability Indicators**
  - Track and compare reliability indices for North Carolina IOUs, Co-ops, and participating ElectriCities members
  - SAIDI, SAIFI, CAIDI - with and without MEDs
  - Initial draft without Co-op data distributed in April for member review
  - Yearly updates finalized and distributed in September/October
  - Includes graphs illustrating Public Power excellence in reliability
- **APPA Annual Utility Specific & Joint Action Agency Benchmarking Reports**

What are Primary Causes of Electric Outages?



Primary Causes of Public Power Outages in 2023

Source: 2023 APPA eReliability Tracker Annual Report

OE-417 Electric Emergency & Disturbance Events

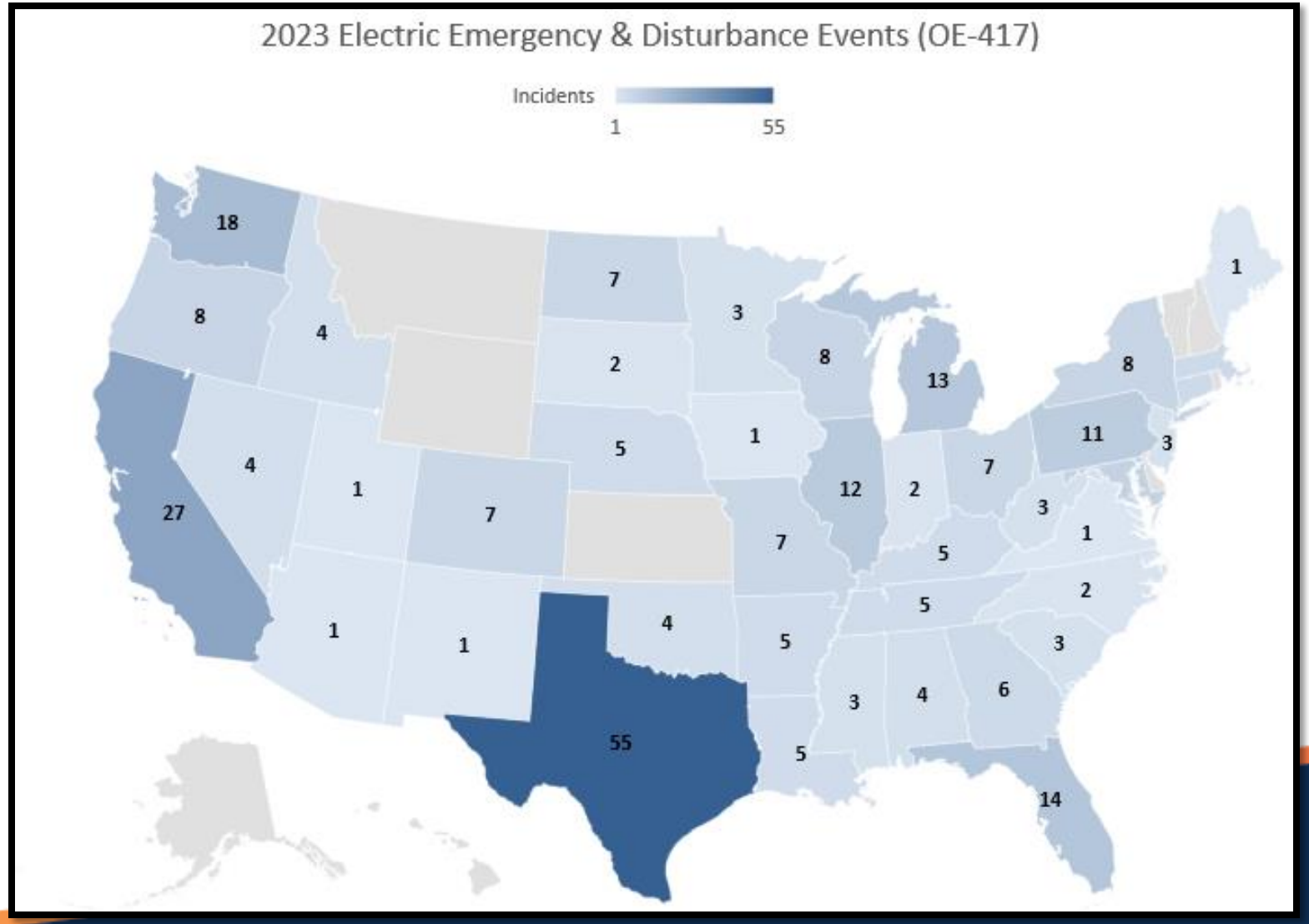
- **Emergency Alerts**
  - Major physical attacks
  - Disruptive cyber events
  - Complete operational failure
  - Partial failure or islanding
  - Emergency weather event
  - 300 MW loss for ≥15 minutes per incident
  - System voltage reduction ≥ 3%
  - Intentional reduction to maintain continuity of Bulk Electric System
- **Normal Reports**
  - Physical or cyber attacks with potential reliability or system adequacy impacts
  - Outages impacting 50,000+ customers for ≥ 1 hour
  - Fuel supply emergencies which could impact system adequacy or reliability

oe.netl.doe.gov/OE417_annual_summary.aspx

Year 2023 OE-417 Electric Emergency and Disturbance Events

Event Type	Number of Events	Number of Customers Affected
Physical Attack / Vandalism	106	7,140
Weather or Natural Disaster	79	4,361,308
Suspicious Activity	61	378
Other	28	65,568
System Operations	18	-
Transmission Interruption	11	-
Generator Loss or Failure	9	778,582
Unknown	9	1
Substation Failure	8	-
Equipment Failure	6	29,648
Theft	5	-
Cyber Event	4	-
Threat of Physical Attack	2	-
Fuel Supply Emergency	1	-
Vandalism	1	-
Grand Total	348	5,242,625

Major Events & Disturbance Variability



Two Events Impacting North Carolina

1. Vandalism (NC only)
    a) Outage duration = 1:05
    b) Date: 2/26/23
2. Suspicious Activity (NC/SC)
    a) Outage duration = 2:50
    b) Date: 10/3/23

Texas had some vandalism and suspicious activity, but they were mostly impacted by severe weather.

What is Mutual Aid?

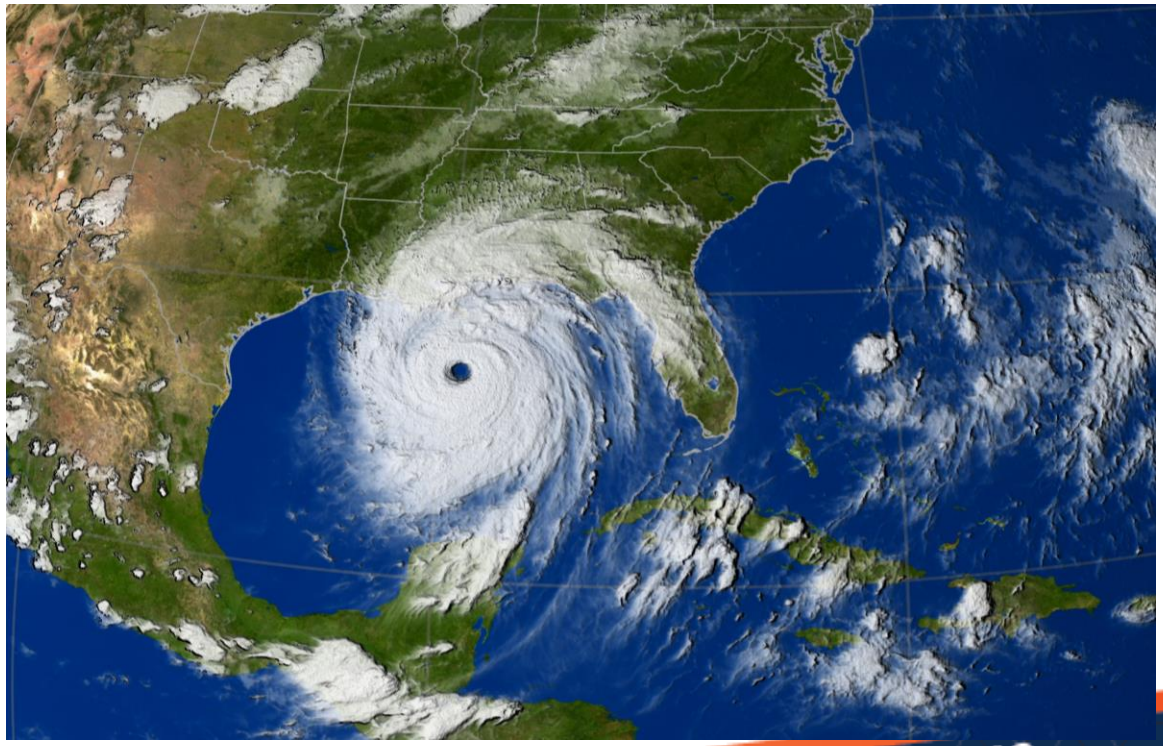
Mutual Aid: Support or aid provided as a collective effort within a community, especially in an emergency or to help those in need.

Examples:

- Hurricanes
- Thunderstorms
- Tornadoes
- Flooding
- Material requests
- Staff shortages
- Assessors
- Safety and training assistance
- Logistical support
- Ice Storms

Mutual Aid is Designed For Members

First and foremost, Mutual Aid is designed for ElectriCities of N.C. members in need of assistance ranging from day-to-day operations to natural disasters.



The Reason for Mutual Aid

The Mutual Aid process is in place to ensure the members of ElectriCities of N.C. they can call our mutual aid coordinator for assistance and have the help they need in a timely fashion

The First Call to Make For Assistance

If mutual aid is needed, the first call members make is Nick Whitley.
Nick is ElectriCities of NC Mutual Aid Coordinator.

Nick Whitley
Supervisor, Safety and Training
Mutual Aid Coordinator
(252) 966-8015
nwhitley@electricities.org

Jeff Freeman
Safety and Training Specialist
Assistant, Mutual Aid Coordinator
(704) 308-8263
jfreeman@electricities.org

Once the Call is Made

Internally, the mutual aid coordinator determines the impact of the event:

- Low impact; One or two members are impacted. Examples include straight line winds, thunderstorms, staff shortages, etc.

- Significant impact; A few members are impacted. Thunderstorms, tornadoes, tropical storms, etc.

- Catastrophic impact; a significant number of members are impacted. Hurricanes, ice storms, etc.

Low Impact

The requesting member reaches out to Nick to ask for assistance.

Nick will pose the following question to the requesting member.

- How many crews do you need?
- Will you be needing any specialized equipment?

Nick will then reach out to neighboring members for assistance. Once there is a verbal agreement for assistance, emails are sent to the receiving and assisting members to ensure the needs will be met.

Low Impact

Internally at ElectriCities, Nick sends communications to Deb Clark; Supervisor; External Communications and APPA.

- EAP email still happens (via Safety & Training)
- Operational email still happens.
  - 10 am email from Safety & Training to Communications rep for review – a single representative from Operations to give the final approval before Communications sends.
  - 12 pm (or earlier) email from Communications to AMS list

Significant Impact

Requesting members reach out to Nick requesting assistance.

Nick will ask the following questions to the requesting member.

- How many crews do you need?
- Will you be needing any specialized equipment?

- During a Mutual Aid event involving multiple members, the Mutual Aid coordinator will send an email to ElectriCities members with the assistance request, location, and needs.

Significant Impact

Internally at ElectriCities, Nick sends communications to Deb Clark; Supervisor; External Communications and APPA.

- EAP emails
  - Operational email
    10 am email from Safety & Training to Communications rep for review – a single representative from Operations to give the final approval before Communications sends.
  - 12 pm (or earlier) email from Communications to AMS list
  - Public Consumption email (based off operational email, but to wider audience with streamlined information

Catastrophic Impact

A catastrophic weather event affects numerous members and impacts what ElectriCities does to prepare. For example, a hurricane forecasted to make landfall on the east coast will require additional preparation.

Pre landfall

- Mutual Aid coordinator monitors the forecasted path.
- APPA holds conference calls with regional mutual aid coordinators to update resources available
- ElectriCities Communications, Data Capable, Operations, and Safety and Training prepare internally to assist members potentially impacted.
- Mutual aid coordinator sets up daily conference calls with ElectriCities members to prepare with prestaging and outgoing communications.

Catastrophic Impact (During the Storm)

When the Hurricane makes landfall

Mutual aid coordinators, Communications, Data Capable, and Operations are in contact with members collecting data for real time assessments.

- Safety and Training reach out to affected members to gain scope of the damage.
- Communications
  - Likely increased EAP calls/emails to multiple per day
  - Public Consumption email sent
  - Likely presence needed at downtown State of North Carolina Operations Center (Rhian Ray, Government Affairs Manager)
- Operations is in contact with Duke Energy and/or Dominion Energy with updates on delivery points.
- Data Capable begins requesting outage numbers from members.

Catastrophic Event (Post Storm)

Once the hurricane has moved out of the region the mutual aid coordinators begin filling requests for members needing assistance.

Starting with members helping members. The mutual aid coordinator sends an email to N.C. members asking for assistance.

- If more assistance is needed the mutual aid coordinator reaches out to neighboring coordinators, such as S.C. and V.A.
- In a large-scale event that effects the southeast U.S., the National Mutual Aid Working Group will ask for assistance from the entire U.S.
- Mutual Aid Coordinator and ElectriCities will hold daily conference calls with members for updates on restoration.

Catastrophic Impact (Post Storm-Cont.)

- Communications sends an updated post storm if needed
- Data capable will update outage numbers across the state daily
- Operations will work as a liaison between members and Investor Owned Utilities (IOU's) to get updates on delivery points and restoration times. (transmission circuits)

Examples of Success!

Over the past few years N.C. Public Power has been a part of 19 Mutual Aid events. ElectriCities members have assisted in five states and the Navajo Nation

- Virginia
- South Carolina
- Tennessee
- Florida
- Louisiana
- Navajo Nation

Questions, feedback, and discussion

Thank you