2024 Interruption/Outage Report

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AI Image generated using Microsoft CoPilot

Lincoln Electric System

Reliability Statistics Indices

- SAIDI – System Average Interruption Duration Index
    - LES Goal: < 30 minutes (normal day)

- CAIDI – Customer Average Interruption Duration Index
    - LES Goal: < 60 minutes (normal day)

- ASAI − Average Service Availability Index

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Outage Statistics

		2020	2021	2022	2023	2024	5 Year Average
Number of Major Event Days		4	2	1	0	5	2.4
ASAI (%)	ND	99.9959	99.9967	99.9974	99.9964	99.9963	99.9965
SAIDI (Minutes) (LES ND Goal <30)	AD	58.1	41.2	16.5	19.1	187.1	64.4
	ND	21.6	17.1	13.8	19.1	19.3	18.2
CAIDI (Minutes) (LES ND Goal <60)	AD	96.7	68.9	76.1	63.9	269.1	114.9
	ND	60.0	65.8	74.5	63.9	64.0	65.6

AD – All Days (including Major Event Days)   ND – Normal Days (excluding Major Event Days)

Major Event Day (MED) definition (IEEE 1366)

- "a catastrophic event which exceeds reasonable design or operational limits of the electric power system and during which at least 10% of the customers within an operating area experience a sustained interruption during a 24-hour period"

2024 Summary

Total number of customers: 151,839

Distribution Outages

Category	Total Inter	Sustain Inter	Inst Inter	Cust-Min
Y-T-D (ND)	614	565	76	2,935,319
Y-T-D	974	909	128	28,410,149

System Indexes

Category	ASAI (%)	SAIDI (min)	CAIDI (min)	SAIFI (total)	MAIFI (total)	# of Major Event Days
Y-T-D (ND)	99.99633	19.3	64.0	0.30	0.52	0
Y-T-D	99.96450	187.1	269.1	0.70	0.83	5

	SAIDI	SAIDI (ND)	CAIDI	CAIDI (ND)
2020	58.1	21.6	96.7	60.0
2021	41.2	17.1	68.9	65.8
2022	16.5	13.8	76.1	74.5
2023	19.1	19.1	63.9	63.9
2024	187.1	19.3	269.1	64.0
5-Year Average	64.4	18.2	114.9	65.6

MOMENTARY OUTAGE IDENTIFICATION:

The delineation between a momentary and a sustained outage is defined at LES by the 5 minute mark. Those incidents less than 5 minutes in duration are momentary, and those greater than or equal to 5 minutes are sustained.

OTHER CRITERIA

Reporting is done on all incidents, including single customer outages. Customer related problems, including credit cuts, are not. Also to note, planned outages that take place during switching are excluded, but unplanned outages during switching are not.

MAJOR EVENT DAY (MED) EXCLUSION:

The threshold for any single day to be classified as a MED for the current calendar year is **1.810 SAIDI minutes**. The details on subsequent sheets exclude MEDs; those reports would be appended to the monthly report in which they occurred.

MEDs FOR LAST 12 MONTHS:

Date	SAIDI	CAIDI	Description
4/6/2024	4.60	93.8	Strong Winds/Lightning
5/24/2024	4.40	131.2	Strong Winds/Thunderstorm
7/2/2024	7.10	178.9	Thunderstorm/Lightning
7/31/2024	146.8	573.6	Extreme Winds/Thunderstorm
8/1/2024	6.12	332.8	Extreme Winds/Thunderstorm

Definitions:

ND   = Normal Day (No Major Events)

ASAI   = The efficiency of The distribution system in percent

SAIDI = The outage time in minutes if all customers were off at the same time, based on number of customers

CAIDI = The weighted average outage time that a customer will have if the customer experiences an outage, based on number of customers

SAIFI = The average number of sustained outages a customer will experience, based on number of customers

MAIFI = The average number of blinks a customer will experience, based on number of customers

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SAIDI and Major Event Day History

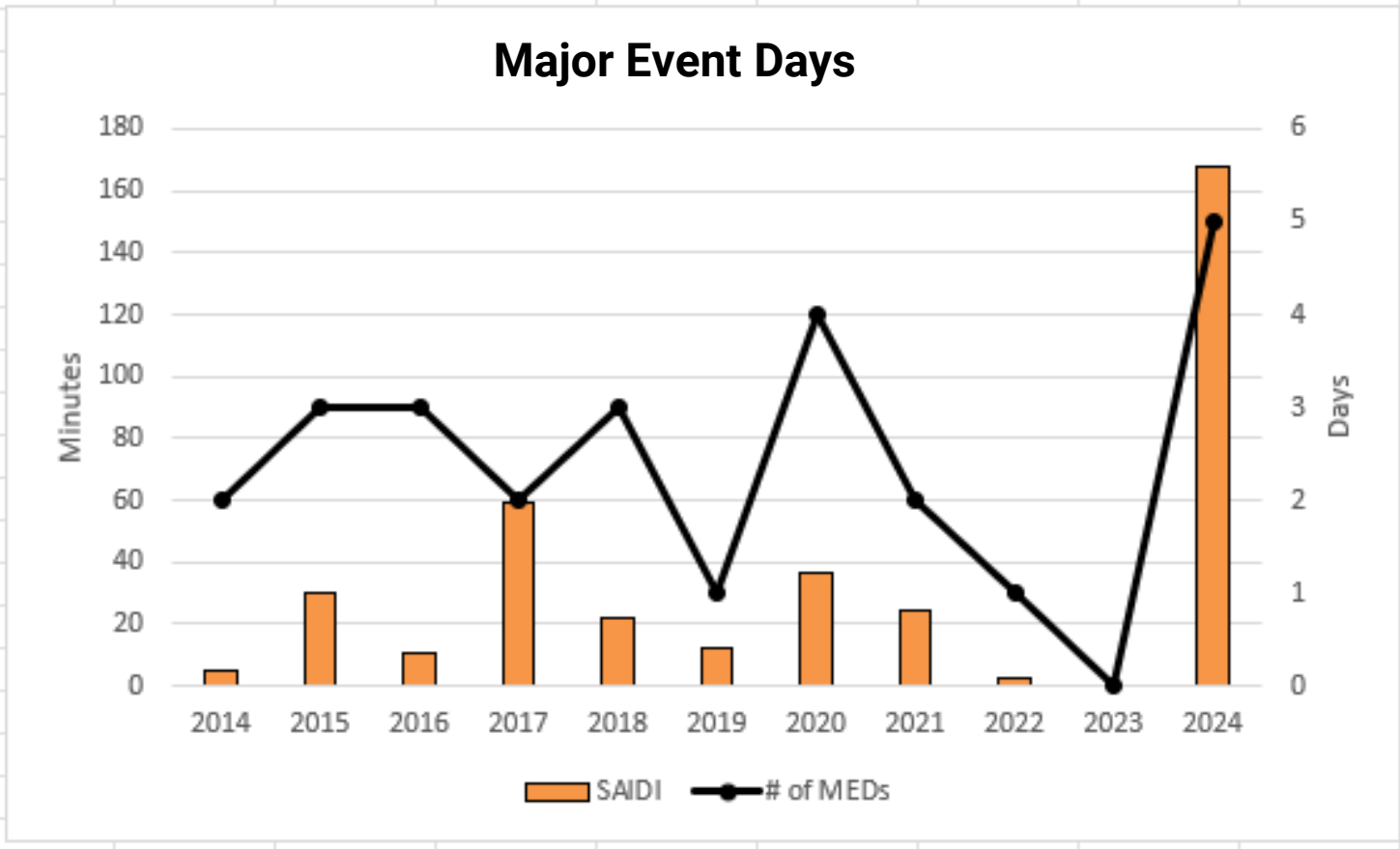| MAJOR EVENT DAY (MED) EXCLUSION: |
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*Major Event Threshold TMED = e ^(α +2.5 * β)*
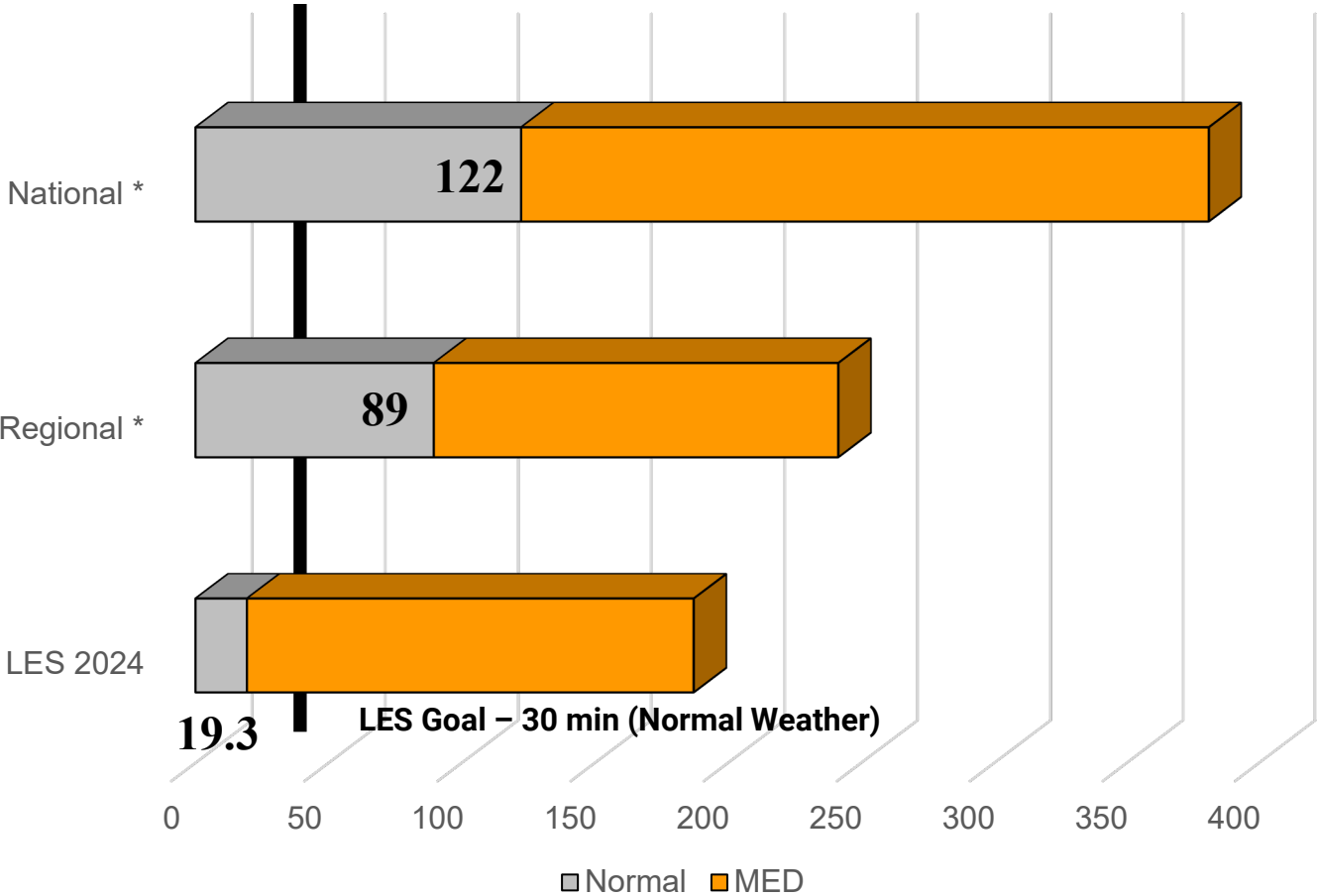*α = [ln(SAIDI/day)] # days] = average of natural logs of daily SAIDI*
β = SD[ln(SAIDI/day)] = standard deviation of the natural logs of daily SAIDI.

SAIDI and Major Event Day History

SAIDI
(average outage time per customer)
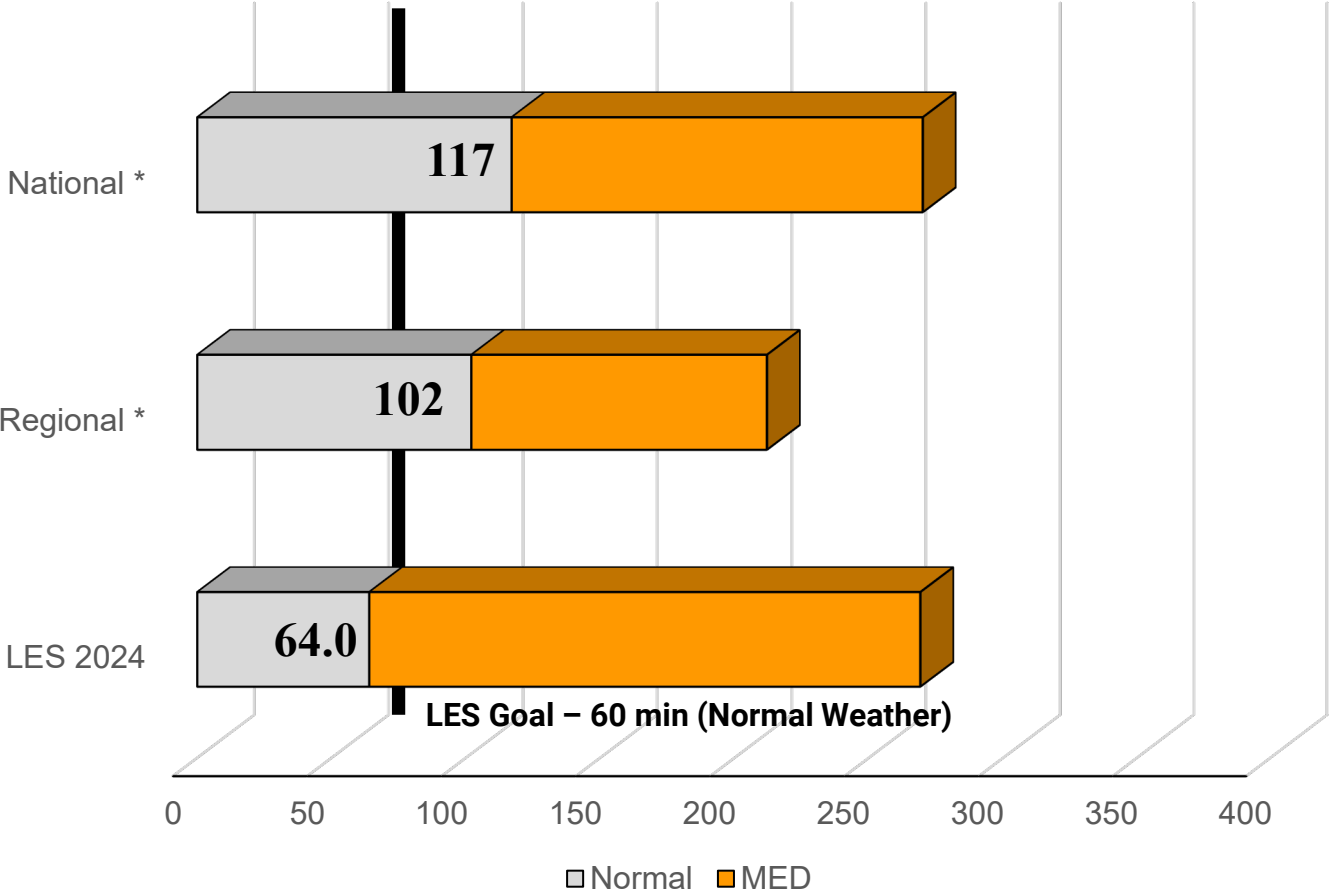
National *: 122 (Normal), MED
Regional *: 89 (Normal), MED
LES 2024: 19.3 (Normal), MED

LES Goal – 30 min (Normal Weather)

Scale: 0, 50, 100, 150, 200, 250, 300, 350, 400

Legend: ☐ Normal ☐ MED

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CAIDI

(average restoration time)

Chart showing CAIDI values:
- National *: 117 (Normal), plus MED extending to ~295
- Regional *: 102 (Normal), plus MED extending to ~230
- LES 2024: 64.0 (Normal), plus MED extending to ~290

LES Goal − 60 min (Normal Weather)

X-axis: 0, 50, 100, 150, 200, 250, 300, 350, 400

Legend: ☐ Normal ☐ MED

Source: U.S. Energy Information Administration, Electric power sales, revenue, and energy efficiency Form EIA-861 detailed data files
* Rolling 5-year average of available data (2019-2023)

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Outage Prevention Alignment

Cause Category	Total Outages	Customer Minutes	Annual SAIDI Contribution (min)	Prevention Program / Strategy
Trees	121	513,817	3.38	🔺 ✚ ⬠
Wind *32x 2023 minutes*	14	384,504	2.53	🔺 ✚ ⬤ ⬠
12kV UG Primary Cable/Splice Failure	36	355,678	2.34	🟧 ⬠ 🔷
Sub Problem	5	350,884	2.31	
Squirrels *Out of top 3 ☺*	66	329,864	2.17	🔺 ✚ ⬤ ⬠ 🔷
Overhead Problem	107	238,831	1.57	🔺 ✚ ⬤ ⬠
Vehicle Accident	15	202,468	1.33	
12kV UG Primary Cable Cut	12	179,495	1.18	🔷
Birds & Other Creatures	25	147,300	0.97	🔺 ✚ ⬤ ⬠ 🔷
Lightning	36	104,435	0.69	🔺 🟧 ✚ ⬤ ⬠ 🔷
Miscellaneous Errors	74	86,984	0.57	
Underground Problems	103	41,060	0.27	🟧 ⬠ 🔷

🔺 Vegetation Management   🟧 CRP   ✚ Feeder Hardening   ⬤ ODAM   ⬠ PUP   🔷 UDAM

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Proactive Efforts to Improve Our System

Distribution Outage Analysis Team (DOAT)

- Cross Functional Team of LES' SME's
- Investigates common cause of component failures or outages
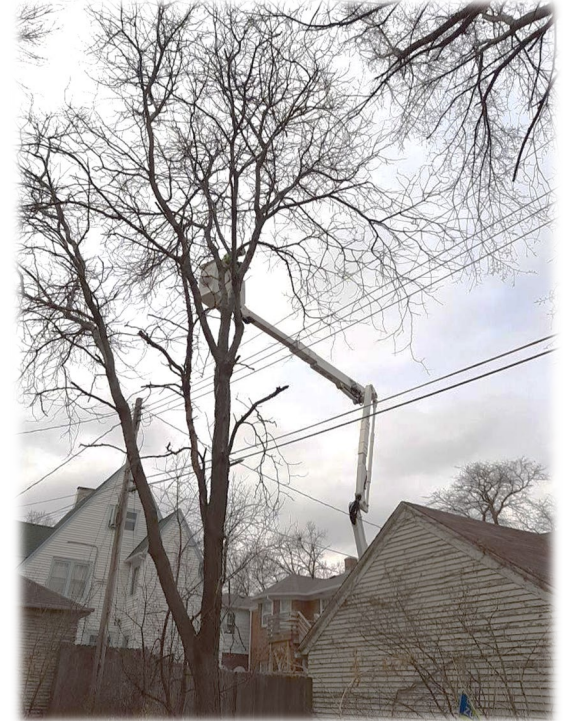
Vegetation Management

- Strive for a four-year cycle
- $4.1M in 2024, $5.2M in 2025

Cable Replacement Program (CRP)

- Replaces aged 12kV underground primary cable
- $2.3M in 2024, $3.5M in 2025

Arterial Feeder Hardening

- Converts existing overhead feeder to underground
- $2.0M in 2024, $2.2M in 2025

Proactive Efforts to Improve Our System

**Overhead Distribution Asset Management Program (ODAM)**

- Inspects wood poles and attachments, treats, fixes, replaces
- $2.5M in 2024, $4.9M in 2025

Precision Undergrounding Program (PUP)

- Identifies overhead line segments that have accumulated the most incident duration minutes and converts attached LES facilities to underground
- $235K in 2024, total $600K in 2025-2026

Underground Distribution Asset Management Program (UDAM)

- Exterior & Interior inspection of 12kV pad-mounted equipment
- Combination of LES Teammates and External Staff
- $300K in 2025 (first contracted year)

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Questions?

Project Favorability
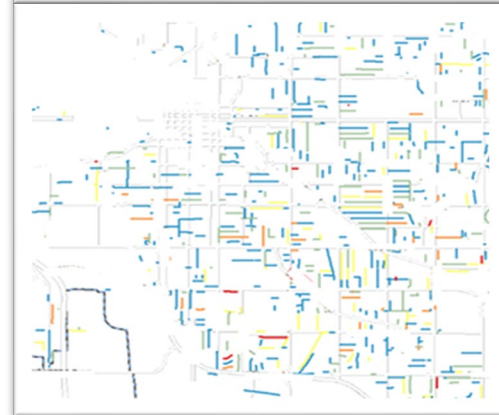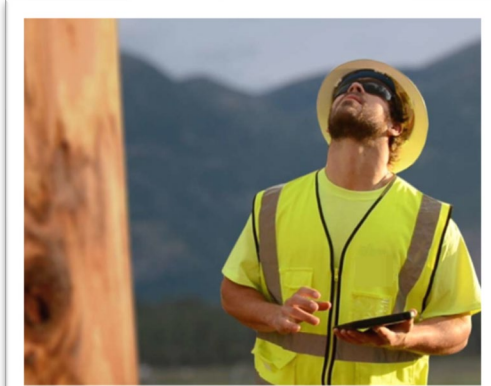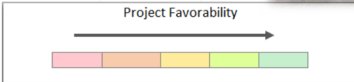
Weighted Total	Project Cost Value Ranking (0-5) (5 high, 0 low)	Average Annual Impact of Sustained Incidents Ranking (0-5) (5 high, 0 low)	Target Line High Risk Ranking (-5 to 5) (5 high, -5 low)	Target Line Vegetation Density (1-5) (5 high, 1 low)	Quantity of Service Conversions (1-5) (5 low, 1 high)	Quantity of Above Grade Equipment Easements (1-5) (5 low, 1 high)	Quantity Easement Needed (1-5) (5 low, 1 high)	Loop Complexity (1-5) (5 none, 1 extreme)	Design Difficulty (1-5) (5 low, 1 high)	Equity Consideration (% below poverty in area, % minority) (0-5) (5 high, 0 low)
69	LOW	LOW	TOP	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM-HIGH	MEDIUM-LOW	MEDIUM-LOW	MEDIUM	NONE
52	LOW	MEDIUM-LOW	MIDDLE	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM-HIGH	HIGH	MEDIUM-LOW
72	LOW	LOW	BOTTOM	HIGH	MEDIUM-LOW	MEDIUM	MEDIUM-LOW	MEDIUM-LOW	LOW	NONE
82	MEDIUM	MEDIUM-LOW	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	MEDIUM-LOW	MEDIUM	NONE
21	VERY-LOW	LOW	BOTTOM	MEDIUM-LOW	HIGH	HIGH	MEDIUM-HIGH	MEDIUM	HIGH	LOW

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