



Western Systems

Innovative Transportation Solutions

Cabinet-Integrated Resiliency Strategies for Weather Driven Outages in Seattle

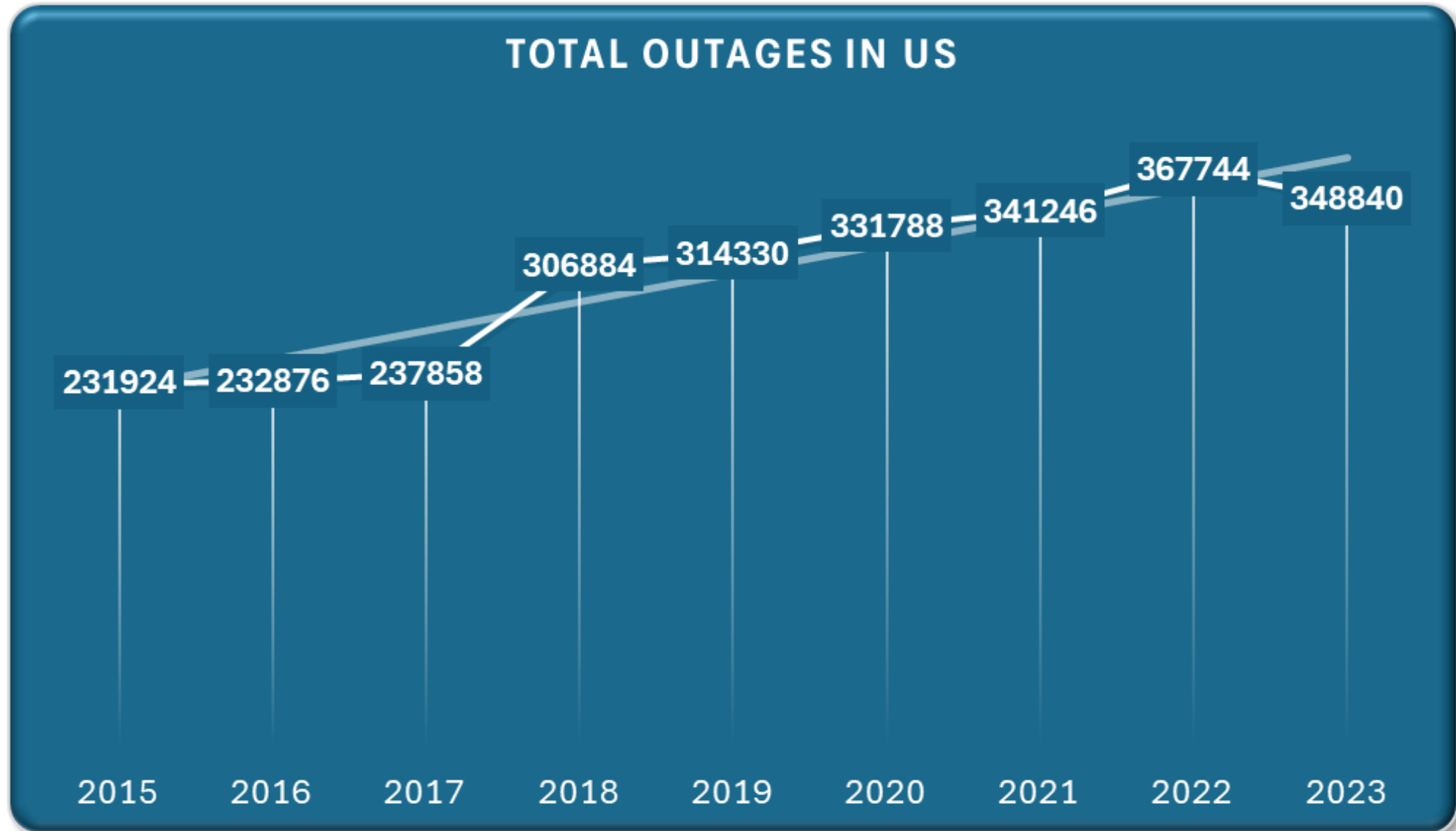


Outages



Outages - US

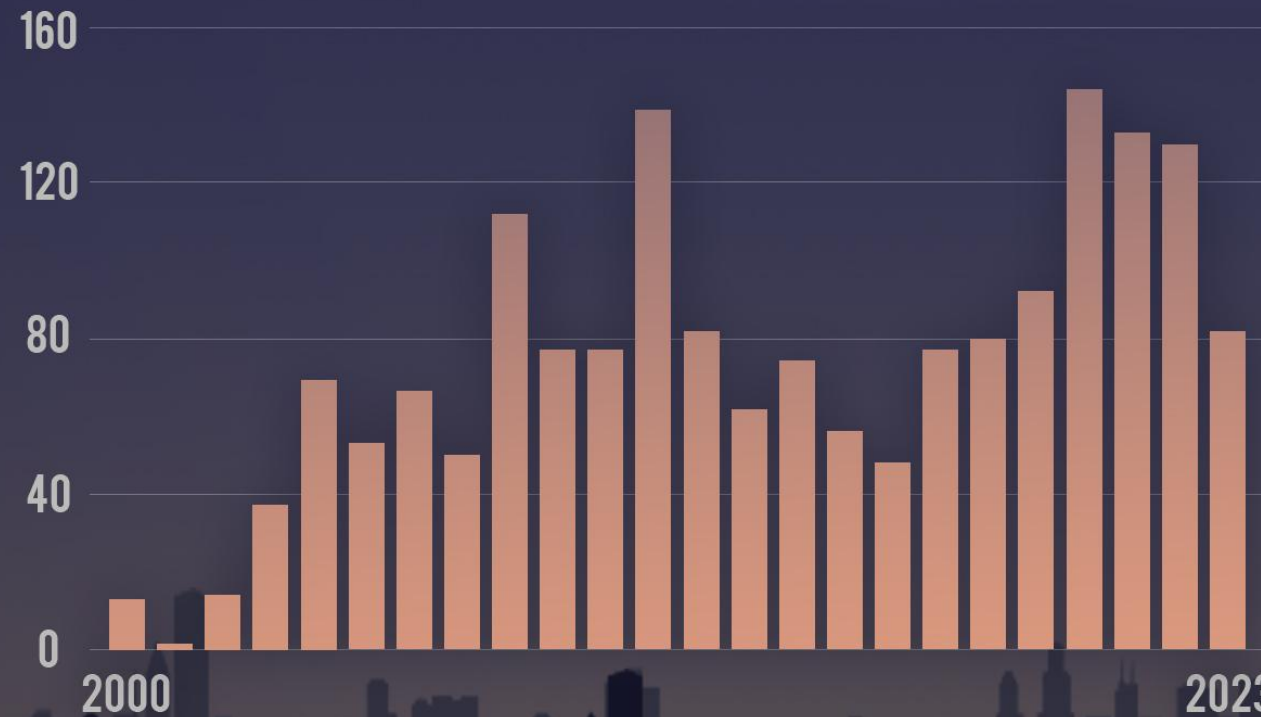
Source: eaglei



Weather Related Outages

Source: Climate Central

WEATHER-RELATED MAJOR U.S. POWER OUTAGES



Annual number of weather-related major power outages.
Number of outages affecting more than 50k customers or service of 300 megawatts
Source: US Department of Energy Form OE-417

CLIMATE  CENTRAL

Weather Related Outages

Source: Climate Central

MAJOR U.S. POWER OUTAGES WEATHER-RELATED, 2000-2023

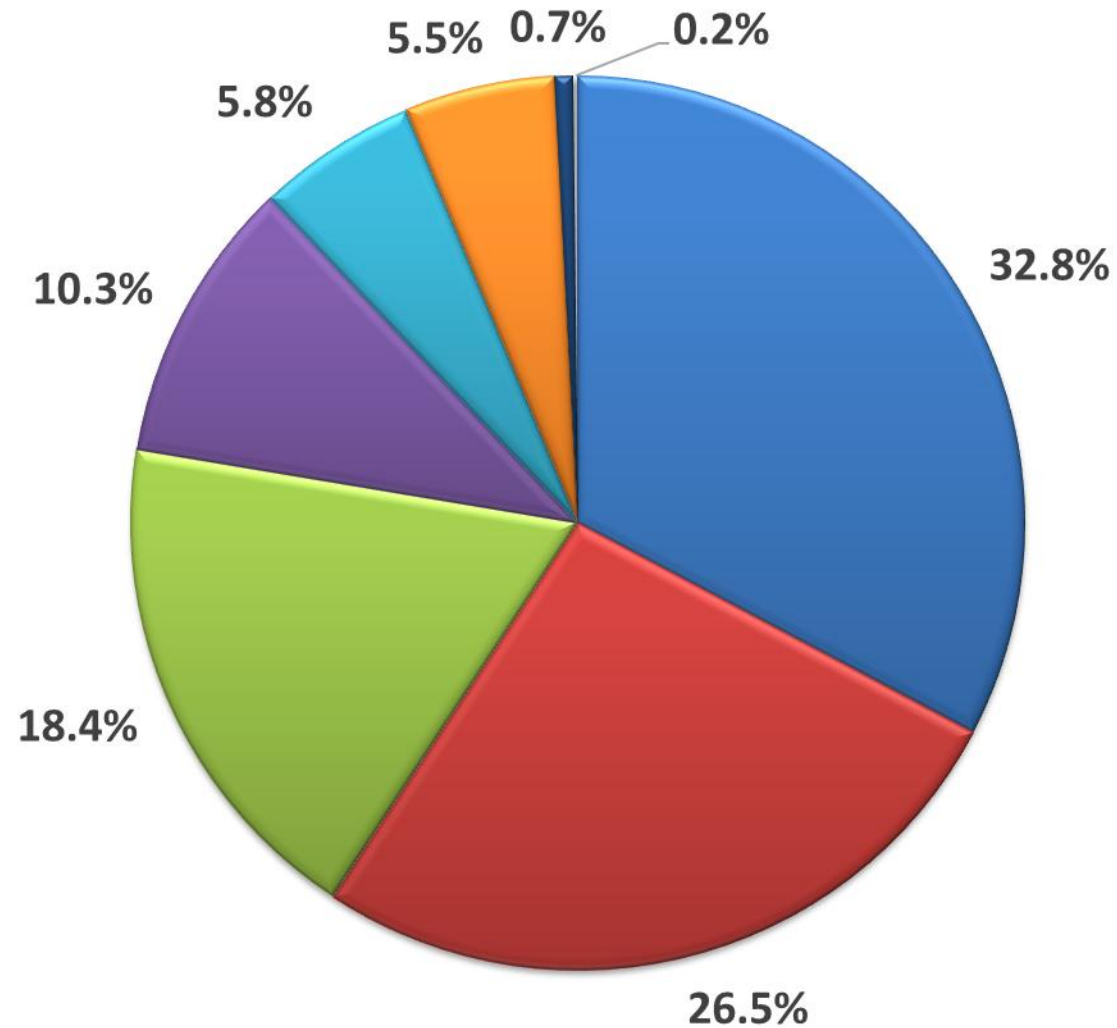


Weather-related major U.S. power outages (2000-2023) by weather type.
Number of outages affecting more than 50k customers or service of 300 megawatts
Source: US Department of Energy Form OE-417

CLIMATE  CENTRAL

Causes

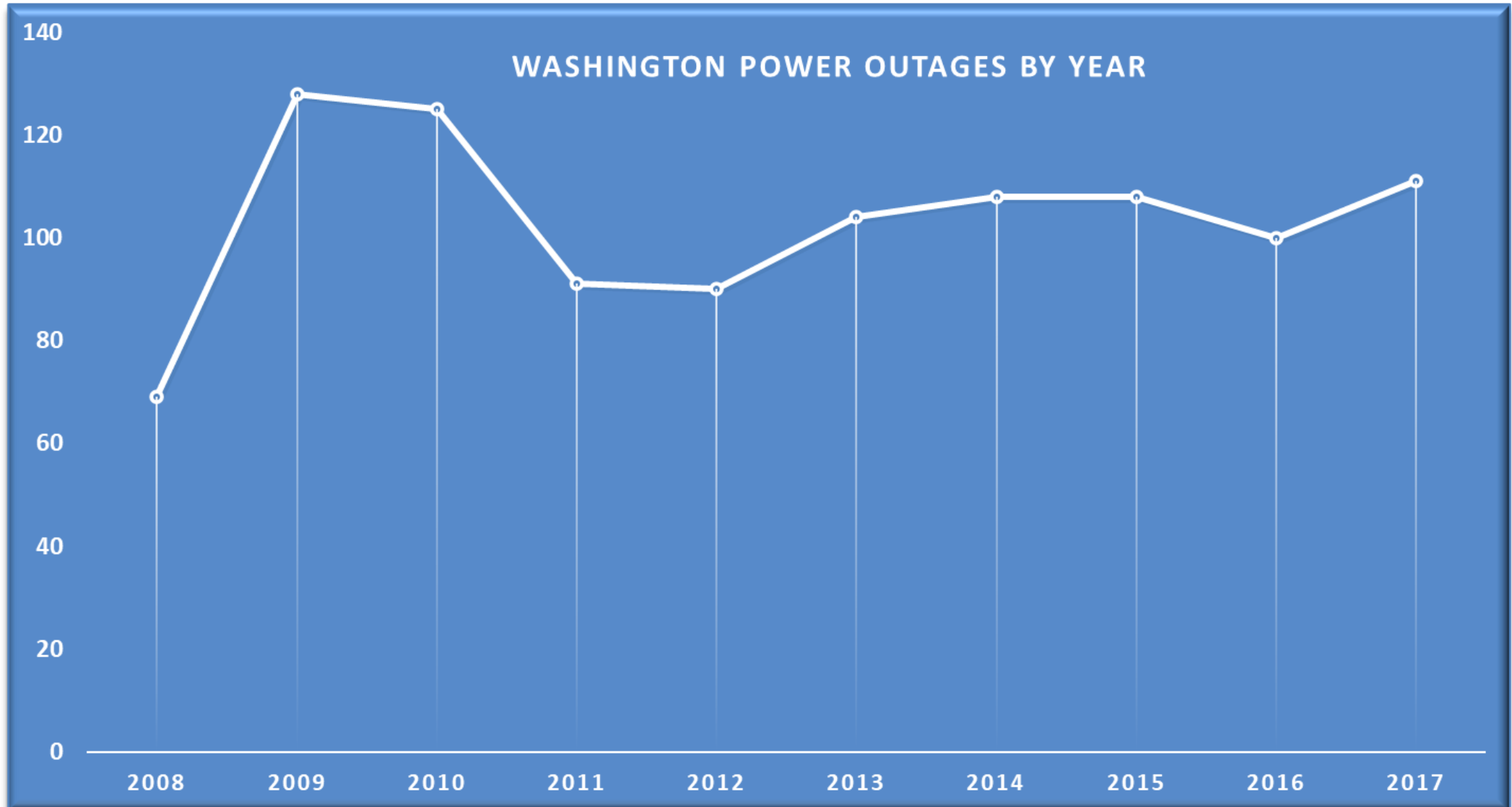
Source: Eaton Blackout Tracker
2008-2017



- Weather / Falling Trees
- Faulty Equipment / Human Error
- Unknown
- Vehicle Accident
- Animal
- Planned
- Theft / Vandalism
- Overdemand

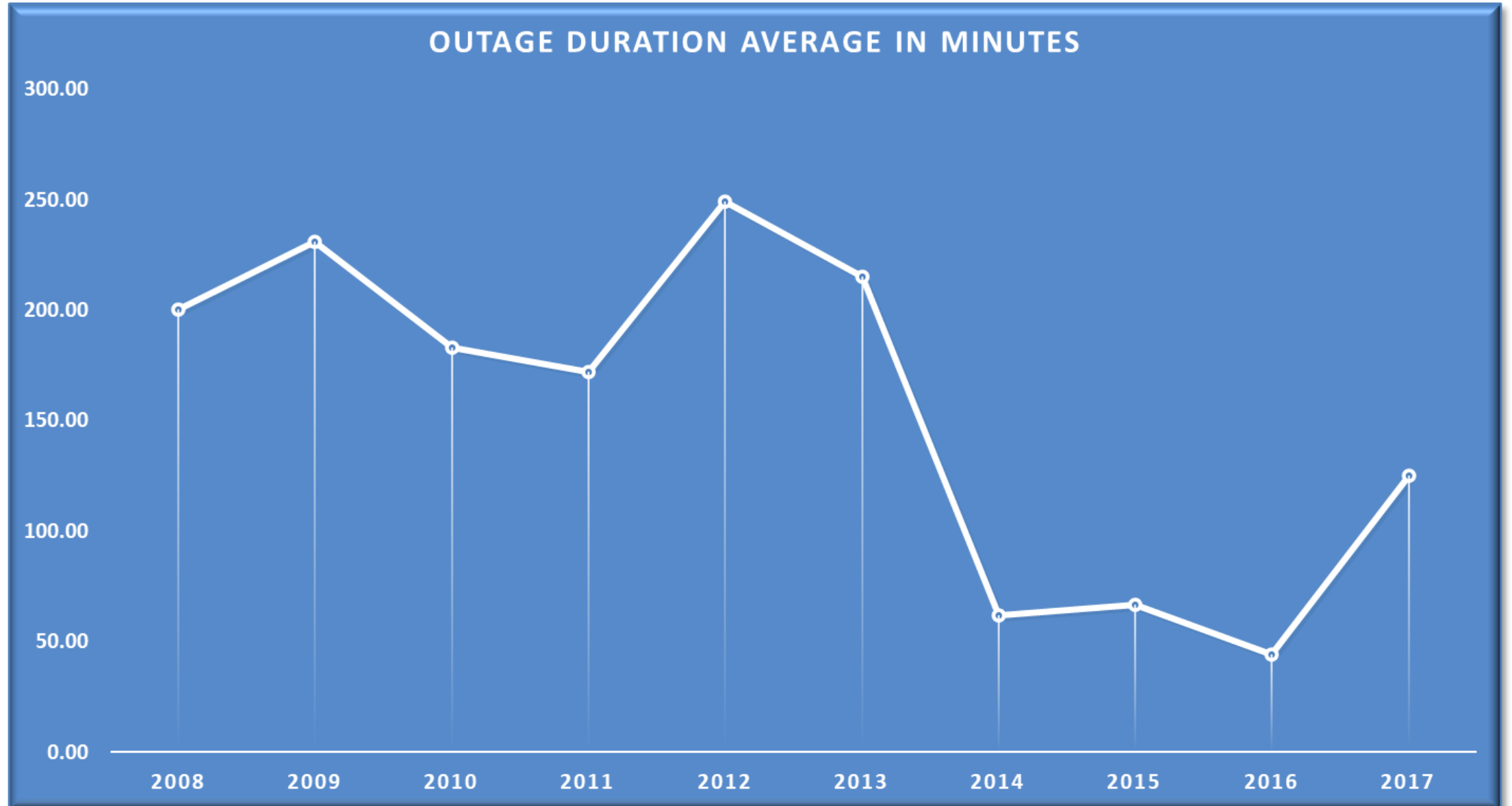
Outages - Washington

Source: Eaton Blackout Tracker



Duration - Washington

Source: Eaton Blackout Tracker 2008-2017



NYS DOT

2009



NYSDOT Report 2009

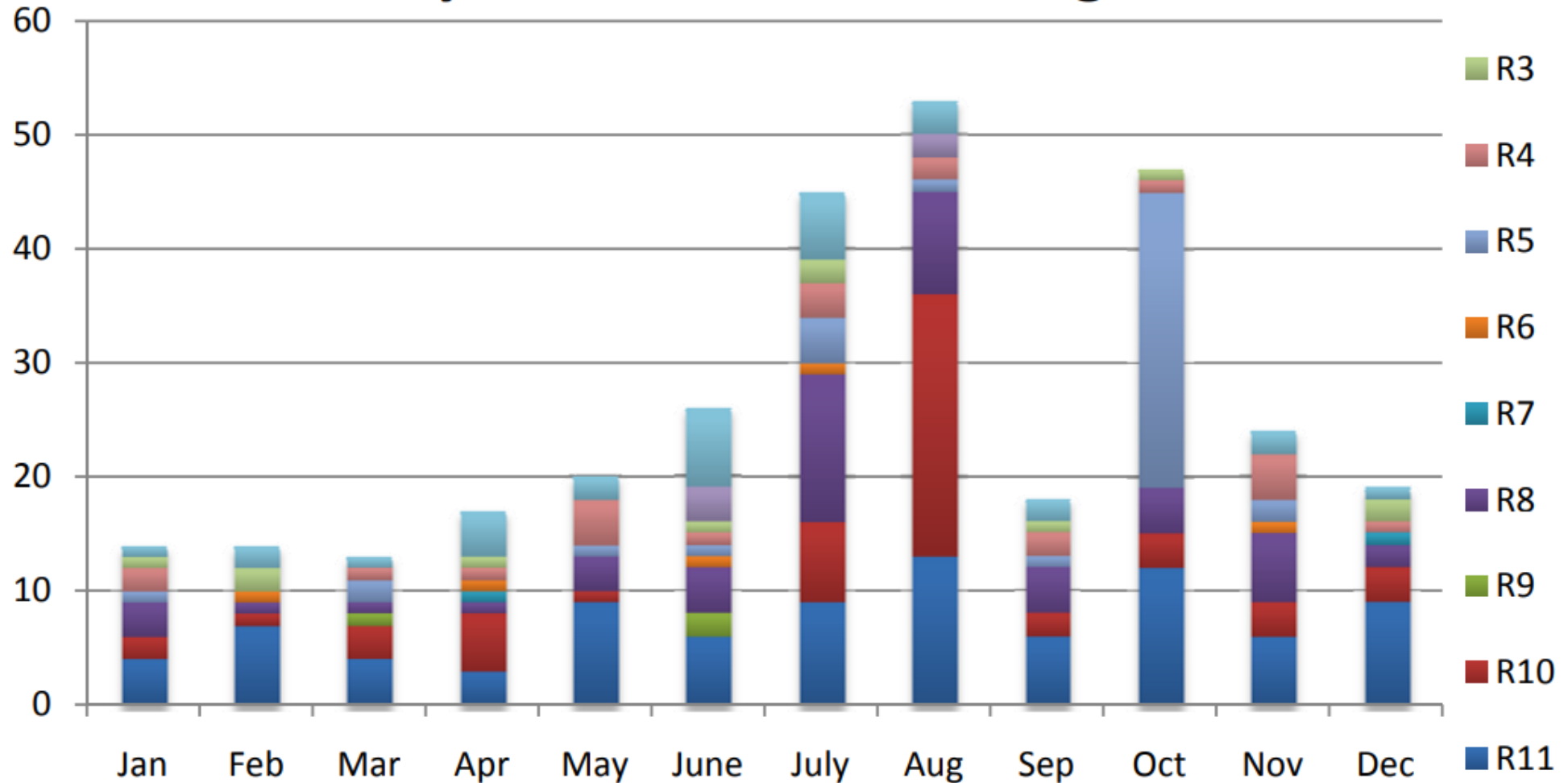
Guidelines for Traffic Signal Energy Back-Up Systems
SPR RESEARCH PROJECT No. C-06-08

Year	Type of Accident								Total
	Fixed Obj	Head on	Left Turn	Rear-End	Right Angle	Right Turn	Sideswipe	Unknown	
2003	2		1	2	56	1			62
2004			1	3	34	2			40
2005		1	4	8	40		1	1	55
2006		1	6	19	76	1		6	109
2007			4	3	35	1		1	44
Total	2	2	16	35	241	5	1	8	310

- Injuries 2x more likely than non-injury accidents
- 77.7% were right angle
- Intersections with turn bays are more dangerous when power is out
47% vs 29%

A stacked bar chart illustrating the distribution of 11 risk categories (R1 through R11) across the twelve months of the year. The vertical axis (Y-axis) represents the count, ranging from 0 to 60 in increments of 10. The horizontal axis (X-axis) lists the months from January to December. Each bar is composed of segments representing the different risk categories, with R11 at the bottom and R3 at the top. The total count for each month is as follows:

Month	R11	R10	R9	R8	R7	R6	R5	R4	R3	Total
Jan	4	2	1	2	1	1	1	1	1	14
Feb	7	2	1	1	1	1	1	1	1	15
Mar	4	3	1	1	1	1	1	1	1	13
Apr	3	6	1	1	1	1	1	1	1	17
May	9	1	1	2	1	1	1	2	1	20
June	6	1	1	3	1	1	1	1	1	26
July	9	7	1	10	1	1	2	2	2	45
Aug	13	23	1	9	1	1	1	1	1	53
Sep	6	2	1	3	1	1	1	1	1	18
Oct	12	3	1	4	1	1	1	1	1	47
Nov	6	3	1	4	1	1	1	2	1	24
Dec	9	3	1	2	1	1	1	1	1	19



Space & Thermal Constraints



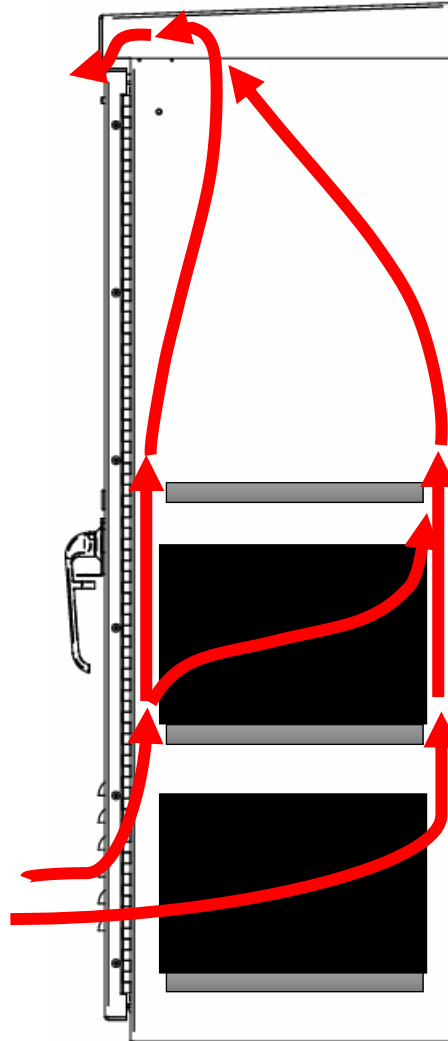
Space



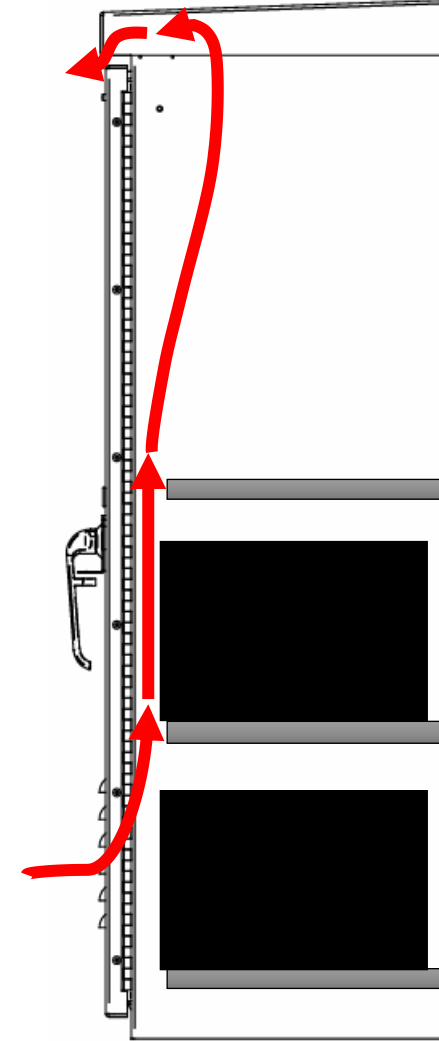
Enclosure Airflow



Alpha
SE48-1616



Off Brand



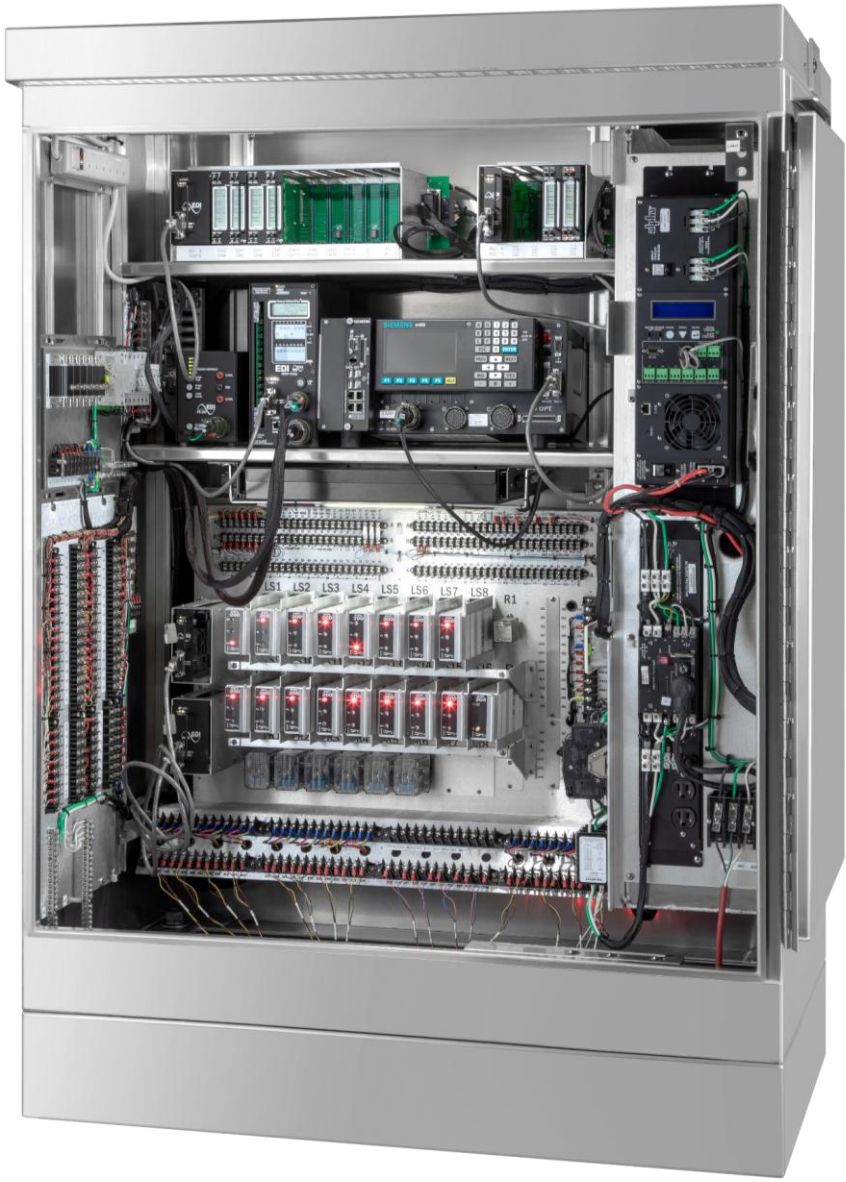
No Airflow Through
or
Up Back

ONLY Across Front

Adding Resiliency



Western P Plus Cabinet



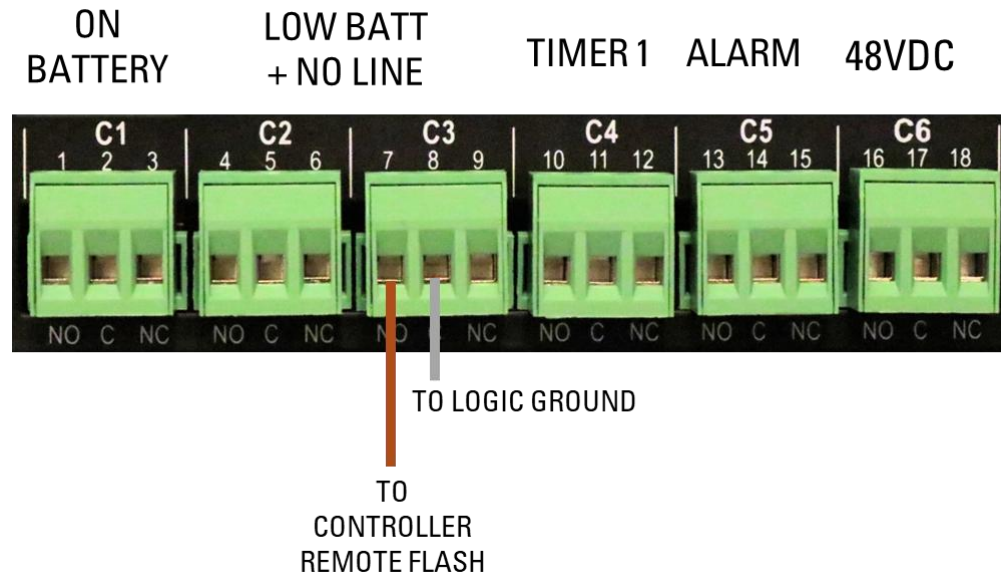
Western ATC Plus Cabinet



UPS System 5 Main Components

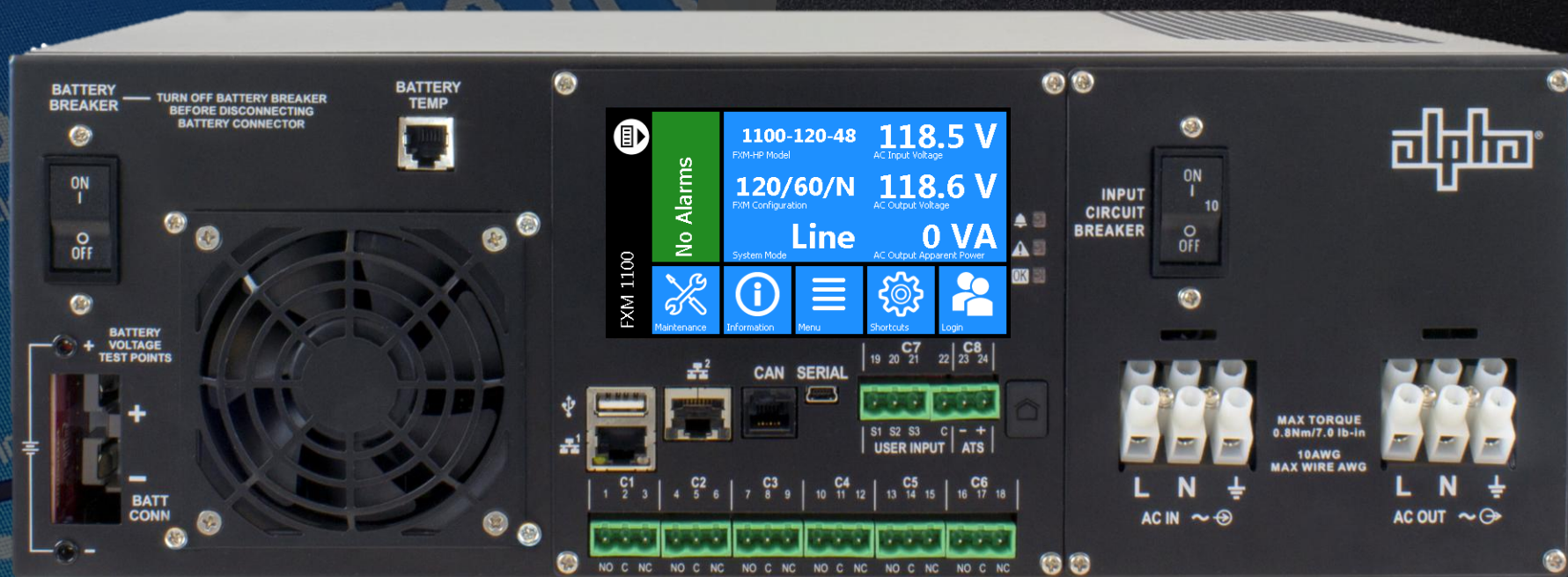


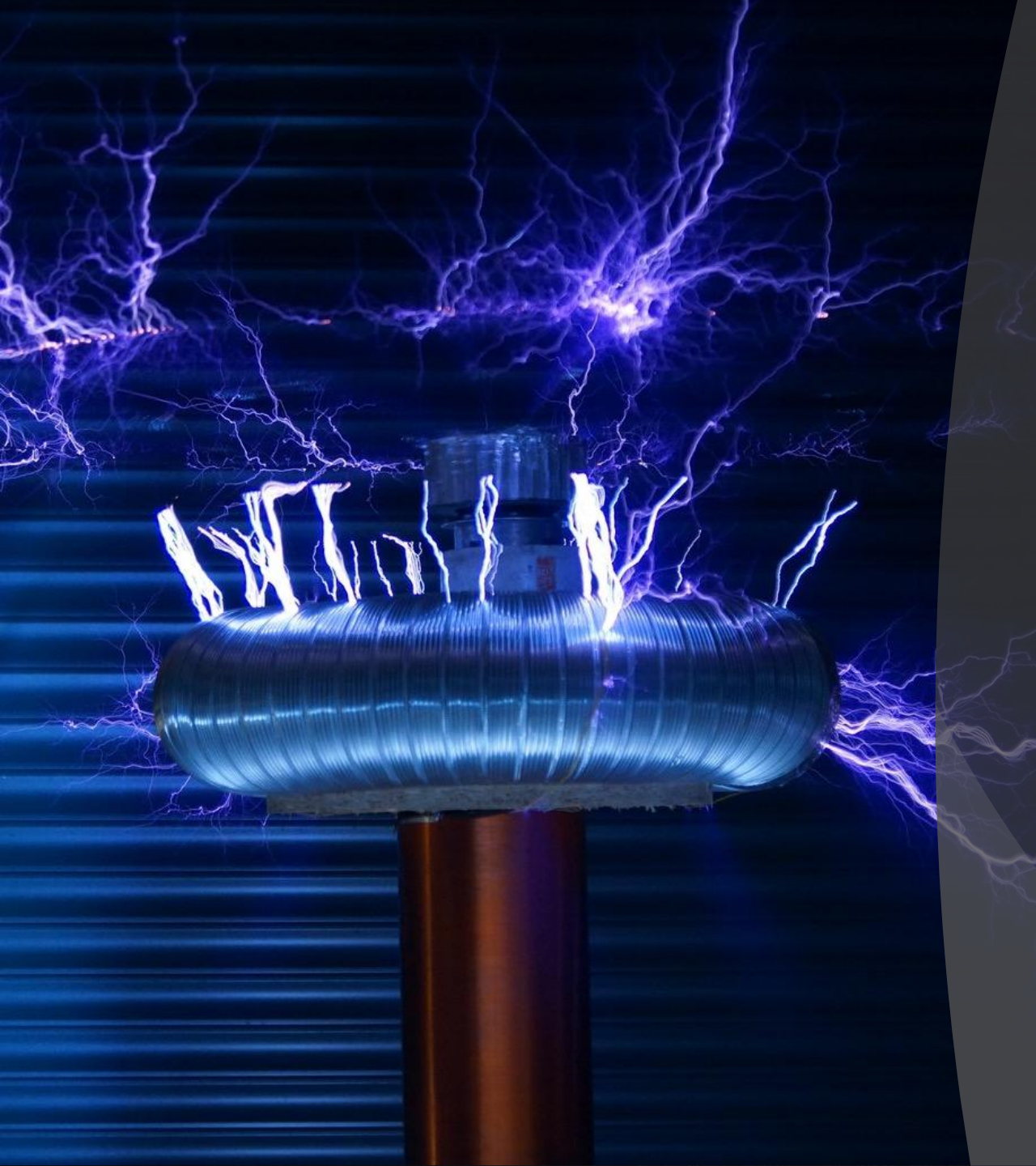
Runtimes – FXM HP 1100



	100XTV	150XTV	195XTV	240XTV
Watts	56Ah	80Ah	100Ah	112Ah
100	16.17	27.23	34.60	37.72
150	12.56	18.68	23.76	26.32
200	10.01	14.81	18.85	21.09
250	8.00	11.77	14.99	16.94
300	6.78	9.94	12.67	14.42
350	5.69	8.31	10.59	12.15
400	5.03	7.32	9.33	10.76
450	4.40	6.38	8.14	9.44
500	4.01	5.80	7.40	8.62
550	3.59	5.19	6.63	7.76
600	3.26	4.69	5.99	7.04
650	2.97	4.28	5.46	6.45
700	2.73	3.92	5.01	5.94
750	2.53	3.62	4.63	5.50
800	2.35	3.36	4.29	5.12

1100-120-48
FXM-HP Model
120/60
FXM Configuration
System Mode
Maintenance
CAN SERIAL

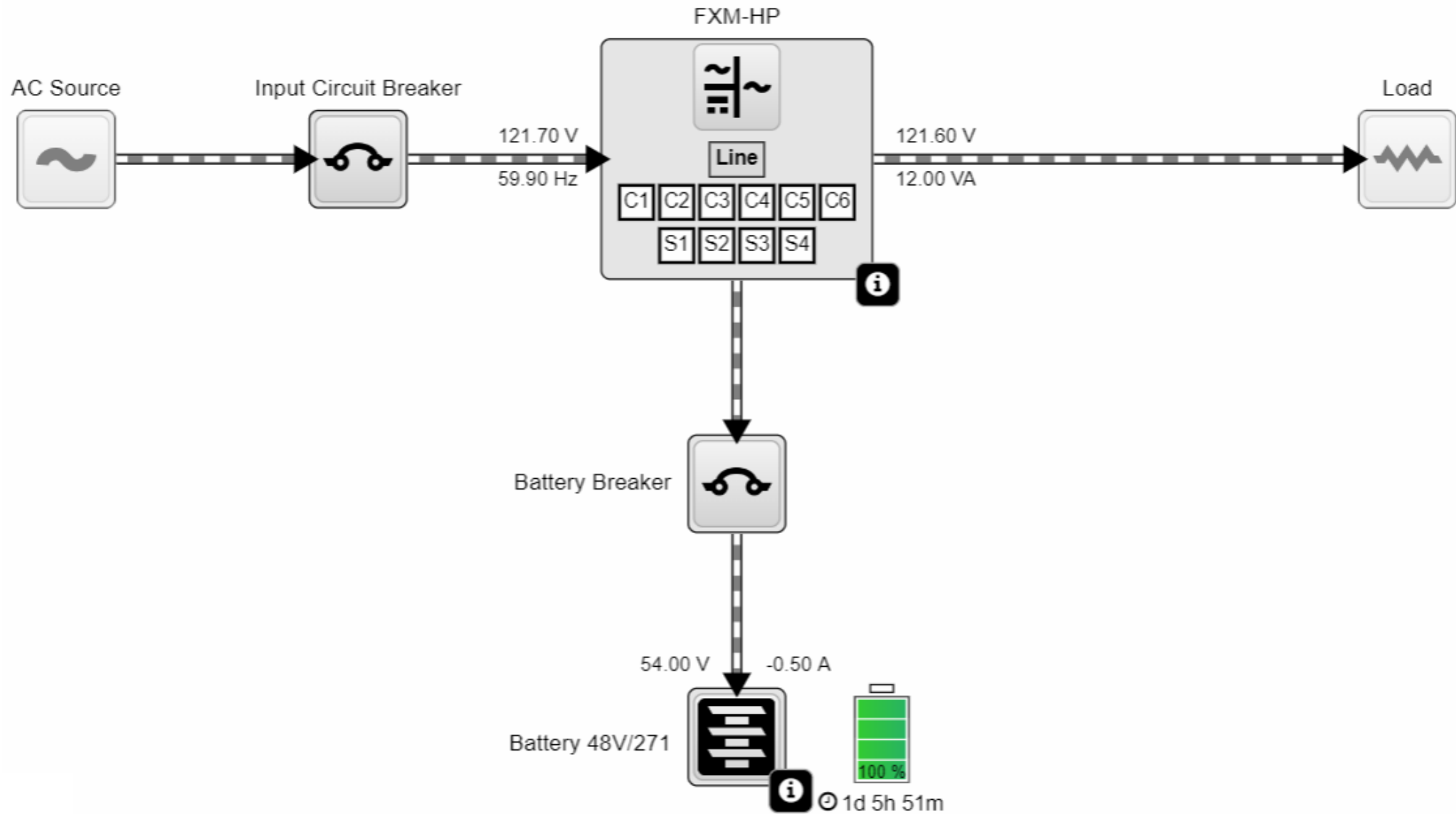




Powerflow

The ability to be able to see visually what is going on with power in your system

FXM-HP 120V-48V/854 Power Flow





LONG-LASTING

5+ days to weeks of continuous runtime to power your intersections, interchanges, and ITS applications during an extended power outage. Contactless, simple refueling.



GREEN & CLEAN

Fuels cells are certified by the California Air Resource Board as zero-emissions power generators.



MINIMAL MAINTENANCE

The HyMax is air-cooled with no moving parts in the fuel cell stack. Just clean or replace inlet air filters once per year.



Questions



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Thank you.