

2021 10-Year Assessment Preliminary Solutions

Stakeholder and Customer Webcast

PRESENTED BY

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Stakeholder & Customer Presentation

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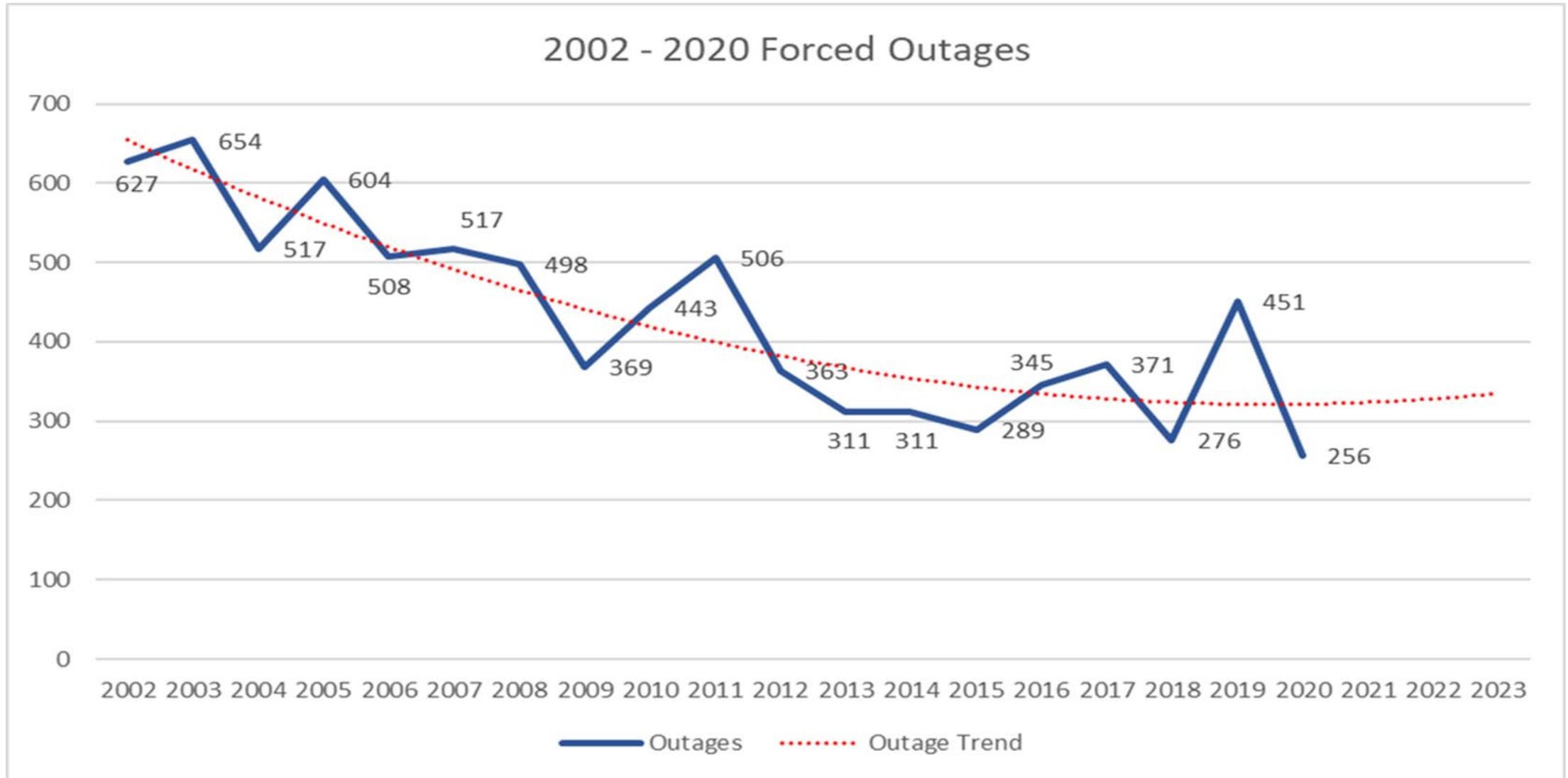
Asset Renewal Program Objectives

- Safety – public and worker
- Minimize total life cycle cost [Net Present Value of Revenue Requirements (NPV RR) from customer cost/rate perspective]
- Compliance
- Manage risk
- Reliable performance – maintain or improvement
- Environmental performance improvements
- Coordination with Stakeholders

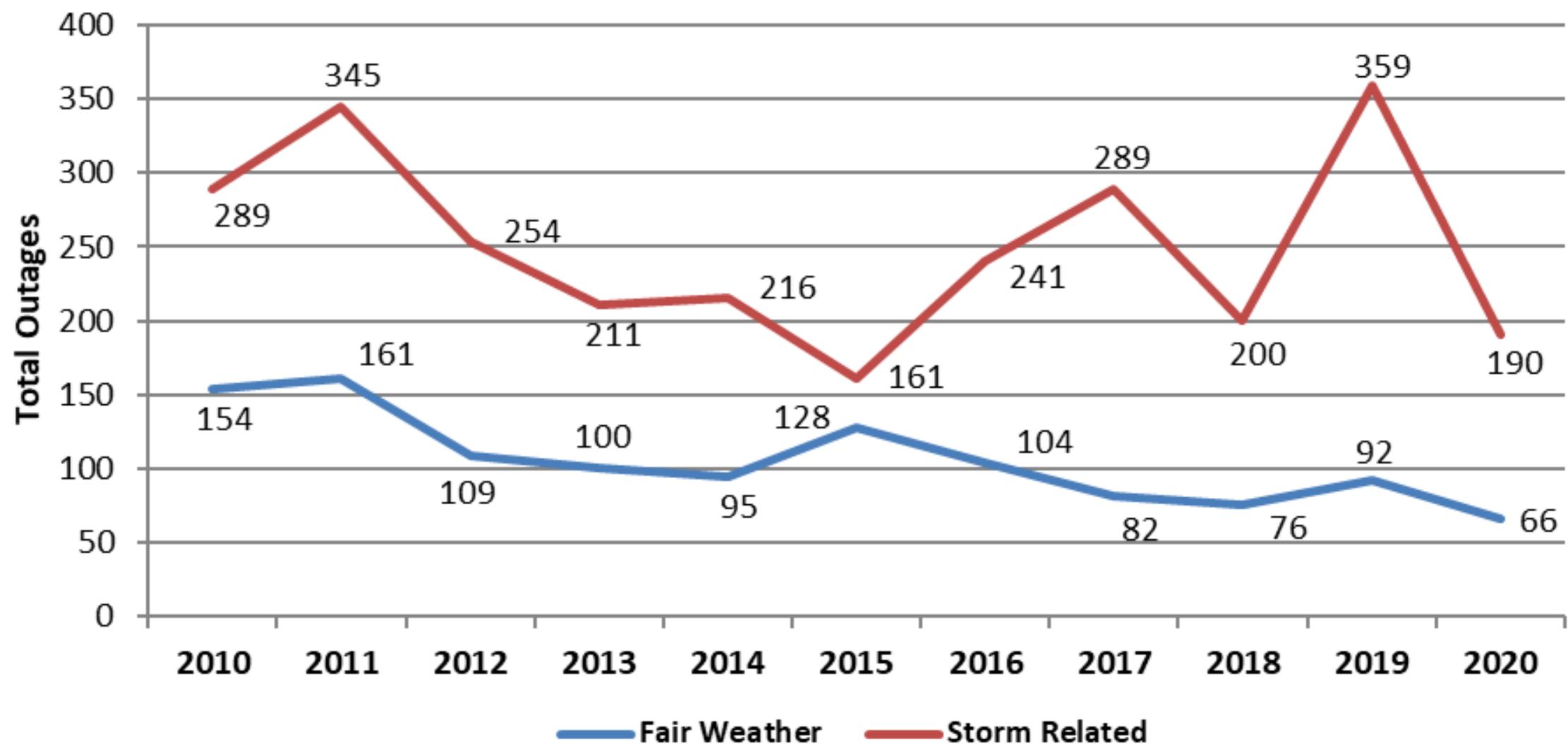
Replacement is based on...

- **Safety** – public and worker
- **Condition** – tests, maintenance costs/risks
- **Obsolescence** – part availability, factory support, craft labor expertise with this specific equipment, available spares
- **Utilization** – application, system changes
- **Criticality** – consequence of failure, outage impacts
- **Costs** – maintenance and replacement
- **Environmental** – PCB contamination, oil volumes and containment, proximity to waterways, SF6 gas leaks, lead, mercury, environmental compliance/risks
- **Compliance** – NERC, CIP, EPA, State DNR
- **Other Considerations** – test frequency, on-line monitoring, test information available, fleet size, common fleet issues, maintenance history, failure mode, industry experience

ATC System Performance – Forced Outages



2010 - 2020 Fair Weather/Storm Outage Comparison



Reliability Performance: January - December 2020

Customer Impact



The 5.88 minute T-SAIDI YTD is 1.27 minutes less than our 5 year average of 7.15.



The 0.059 T-SAIFI YTD is .004 less than our five year average of .063.

Total Forced Outages



The 256 total Forced Outages are 90 less than our five year average of 346.

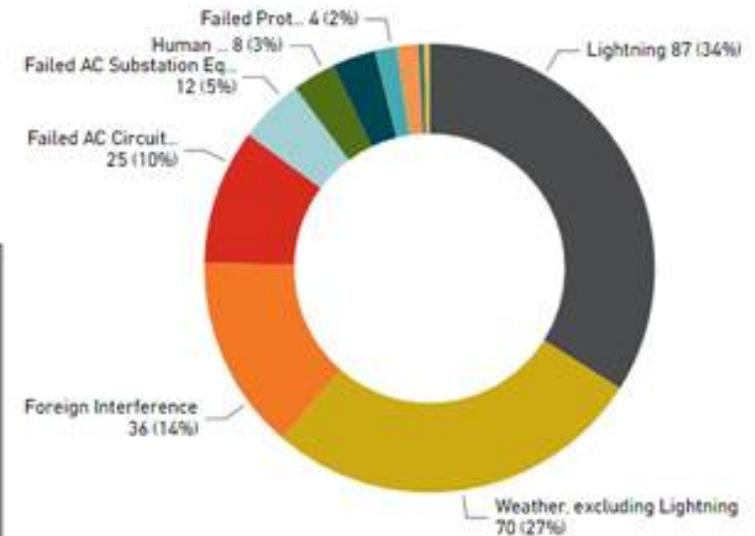
2020 Top impacting outages:

A failed jumper on circuit X-154 accounting for 1.16 minute (20%) T-SAIDI YTD. A planned outage at Tower Drive substation did not allow the circuit to be sectionalized and customers picked up.

A failed control house fuse and missing relay logic prevented system operations from sectionalizing circuit and restoring customers after a live off ROW tree fell onto TWFY81. 7,618 customers were impacted for 2.3 hours accounting for 0.40 minute (7%) T-SAIDI YTD.

Live off ROW tree fall in on circuit 6530 in a remote location making it difficult to locate and remove. 7,257 customers were impacted for an average of 4 hours accounting for 0.36 minute (6%) T-SAIDI.

Total Circuit Outages by Cause Code



Asset Renewal Forecast Substation Equipment Quantity

Equipment		2025	2026	2027	2028	2029	2030	Grand Total	In Service Qty	Plan % Replaced Per Year	Avg Nominal Life	Anticipated Replacement %
Arresters		12	19	46	25	33	44	179	7,301	0.4%	40.0	2.50%
Batteries and Chargers		17	25	13	29	21	21	126	333	6.3%	20.0	5.00%
Breakers and Switchers		41	31	37	28	35	11	183	2,591	1.2%	50.0	2.00%
Capacitor Banks		2	1	3	2	6	2	16	265	1.0%	50.0	2.00%
Control Houses		6	5	1	4	4	4	24	267	1.5%	50.0	2.00%
Instrument Transformers		17	17	57	42	130	50	313	5,713	0.9%	40.0	2.50%
Power Transformers		4	4	3	5	4	3	23	198	1.9%	60.0	1.67%
Relays		233	369	241	315	567	370	2095	6,763	5.2%	25.0	4.00%
SCADA		20	22	18	17	36	27	140	631	3.7%	25.0	4.00%
SCADA (not a trigger)		7	14	16	31	21	28	117	2,664	0.7%	25.0	4.00%
Station Power Transformers			1	5	5	3		14	288	0.8%	40.0	2.50%
Switches		57	85	66	45	97	45	395	5,792	1.1%	60.0	1.67%
Grand Total		416	593	506	548	957	605	3625	32,806			

Asset Renewal Program Forecast

		Dollars (000s')						
Sum of Escalated Cost		Replace Year (Am Target then Calc)						
Present Sort	Equip Classification	2025	2026	2027	2028	2029	2030	Grand Total
SUBSTATION	Arresters	\$234	\$378	\$932	\$517	\$696	\$947	\$3,703
	Batteries and Chargers	\$1,663	\$2,332	\$1,405	\$2,647	\$2,137	\$1,721	\$11,904
	Breakers and Switchers	\$11,057	\$8,479	\$10,749	\$8,001	\$10,422	\$3,537	\$52,246
	Capacitor Banks	\$866	\$442	\$1,239	\$689	\$2,226	\$717	\$6,179
	Control Houses	\$12,989	\$11,041	\$2,252	\$9,189	\$9,373	\$9,561	\$54,406
	GIS Station Asset Renewal	\$15,000				\$40,000		\$55,000
	Instrument Transformers	\$595	\$574	\$2,056	\$1,483	\$4,849	\$1,847	\$11,405
	Power Transformers	\$12,177	\$12,145	\$12,388	\$12,923	\$12,888	\$13,146	\$75,667
	Relays	\$18,990	\$28,576	\$22,730	\$27,784	\$52,914	\$38,176	\$189,171
	SCADA	\$3,117	\$3,498	\$2,919	\$2,812	\$6,074	\$4,647	\$23,067
	SCADA (not a trigger)	\$310	\$632	\$737	\$1,456	\$1,006	\$1,369	\$5,510
	SS Router Asset Renewal	\$900	\$	\$	\$	\$	\$	\$900
	Station Power Transformers		\$60	\$304	\$310	\$190		\$864
	Switches	\$3,702	\$5,631	\$4,460	\$3,101	\$6,819	\$3,227	\$26,940
XFRM Online Monitoring	\$4,142	\$3,009	\$3,761				\$10,912	
SUBSTATION Total		\$85,743	\$76,795	\$65,934	\$70,913	\$149,595	\$78,894	\$527,874
IT/OT/FIBER	IT/OT Equipment	\$4,637	\$4,776	\$3,690	\$3,800	\$3,914	\$4,032	\$24,849
	OPGW Asset Renewal	\$	\$	\$3,690	\$	\$	\$2,688	\$6,377
IT/OT/FIBER Total		\$4,637	\$4,776	\$7,379	\$3,800	\$3,914	\$6,720	\$31,227
Transmission Line	Tline - OH	\$79,270	\$76,320	\$109,500	\$126,355	\$128,883	\$131,460	\$651,788
	Tline - Reinsulate Projects	\$1,082	\$1,104	\$1,126	\$1,149	\$1,172	\$	\$5,633
	Tline - UG	\$27,700	\$62,700	\$4,300	\$1,200	\$10,900	\$1,000	\$107,800
Transmission Line Total		\$108,052	\$140,124	\$114,926	\$128,704	\$140,954	\$132,460	\$765,221
Grand Total		\$198,432	\$221,695	\$188,239	\$203,418	\$294,463	\$218,074	\$1,324,322

Dollars (000s')

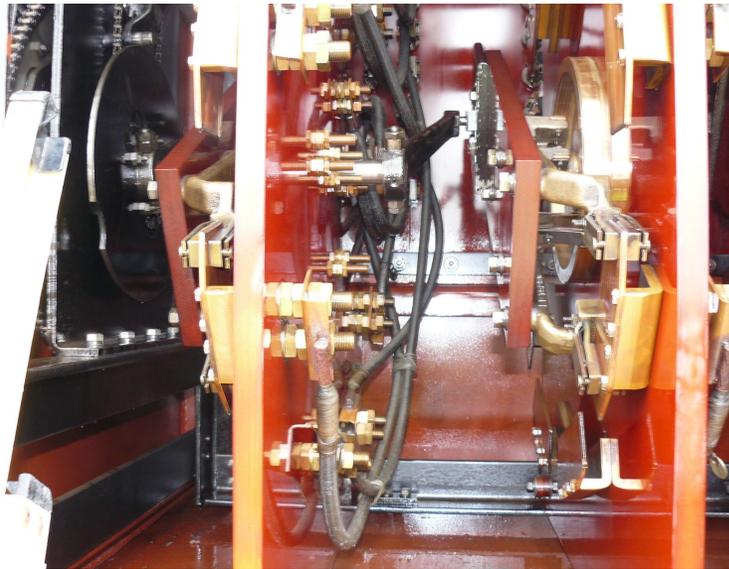
Projects by Station – 2025 In Service Date

Location	Total (000's)	Location	Total (000's)	Location	Total (000's)
Bark River	\$541	Golden Sands	\$65	Plover	\$974
Bluemound	\$1,104	Hartford	\$271	Port Edwards	\$104
Branch	\$825	Hilltop (ALTE)	\$104	Poynette	\$54
Burlington	\$	Holmes	\$104	Racine	\$6,919
Butte Des Morts	\$801	Howards Grove	\$104	Rock Branch	\$1,368
Castle Rock	\$156	Hume	\$830	Rockdale	\$5,616
Christiana	\$221	Kansas	\$1,968	Saratoga	\$6,022
City Limits	\$221	Kewaunee	\$117	Sheboygan Energy Center	\$208
Clear Lake	\$866	Lake Park	\$377	South Fond du Lac	\$271
Cross Country	\$331	Lincoln	\$933	St Germain	\$541
Cypress	\$331	Lodestar	\$541	Sugar Creek	\$628
DeForest	\$1,325	Lone Rock	\$595	Summit	\$390
Dewey (WE)	\$862	Munising	\$104	Watersmeet	\$54
Eden	\$1,197	North Lake	\$3,247	Waukesha	\$
Elm Road	\$208	North Madison 345/138 kV	\$208	Wautoma	\$104
Fitzgerald	\$5,412	Norwich	\$1,481	West Marinette	\$3,247
Forest Junction	\$662	Oak Creek	\$8,754	Yahara River	\$156
Fox River SW YD	\$331	Oakview	\$221	Everett GIS, Tran Monitoring	\$20,042
Freeman	\$1,022	Park Hill	\$2,165	Grand Total	\$85,743
Gardner Park	\$208	Pflaum	\$233		

Projects over \$3M will have separate MTEP IDs

Lancaster Power Transformer – Life Extension

- Allis Chalmers Power Transformer
- Built in Milwaukee in 1954
- Life Extension – 2015
 - High Voltage Bushings
 - Low Tap Changer bypass
 - Oil Seal Gaskets
- Planned Retirement 2024



Asset Renewal - Granville Substation Project - Station Overview

- 345kV to 138kV transformation and distribution
- Located in Milwaukee
- Constructed circa 1968
- Important station functions
 - Network hub serving Milwaukee Metro area
 - Key network switching station connecting north with south
- 3x 345kV Lines
- 7x 138kV Lines
- Project Cost \$29M, 2024 In Service Date

345kV System



Asset Renewals – Granville Substation Performance and Reliability Drivers

- 345kV
 - 4 Oil Breakers
 - 7 Disconnect Switches
 - 3 Arresters
- 138kV
 - 7 Oil Breakers
 - 12 Arresters
- Building and Equipment
 - Control House
 - 21 Relay Panels
 - 2 Remote Terminal Units (RTUs)
 - 3 Batteries, 5 Chargers



Granville Oil Breakers

- 345kV
 - 4 – 1970 vintage Westinghouse 3450-GW-25000 oil breakers
 - ◆ No manufacturer support for engineering or parts
 - ◆ Bushings are prone to oil leaks and performance issues
 - ◆ Environmental concerns with large volumes (10,000 gallons) of oil per breaker with no oil spill containment.
 - ◆ Skill of the craft labor on this equipment is diminishing.
- 138kV
 - 7 - 1969 vintage Westinghouse 1380-GM-15000 oil breakers
 - ◆ Minimal manufacturer support for engineering or parts
 - ◆ Bushings are prone to leaks and performance issues
 - ◆ Operating Mechanism design requires significant maintenance
 - ◆ No oil spill containment



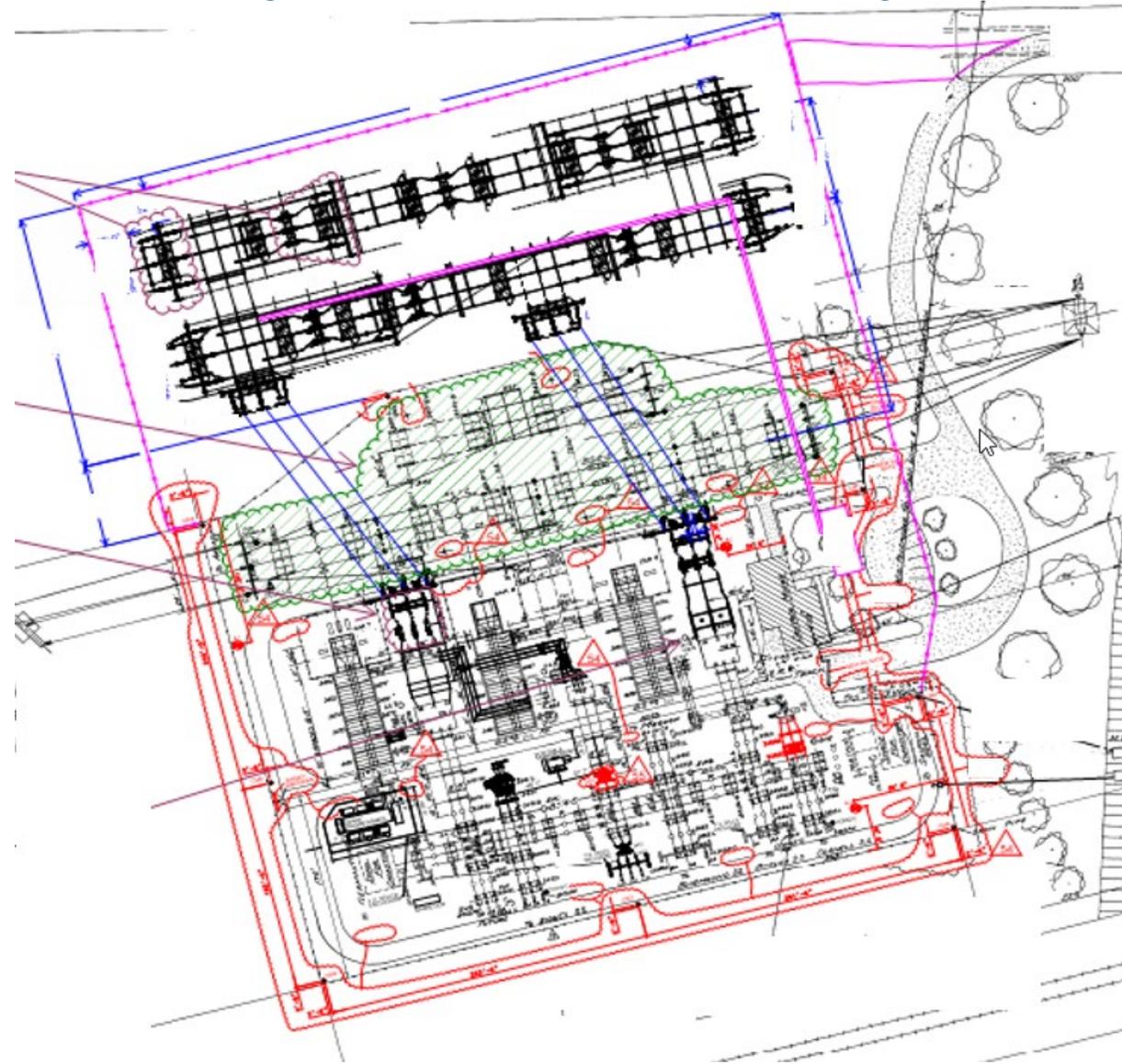
Granville Relay Panels

- 21 relay panels
 - modern standardized schemes deliver
 - ◆ Superior protection and performance
 - ◆ Redundancy for secure operations and testing
 - ◆ Alarming to System Control Center
 - ◆ Remote interrogation for fault investigation, root cause analysis and improved restoration



Bus Design Upgrade for System Resiliency

- 345kV asset renewal work makes this an opportune time to revisit bus configuration needed now and for the next 50 years
- Reliable constructability plan is key! (hint - Keep the Lights On!)

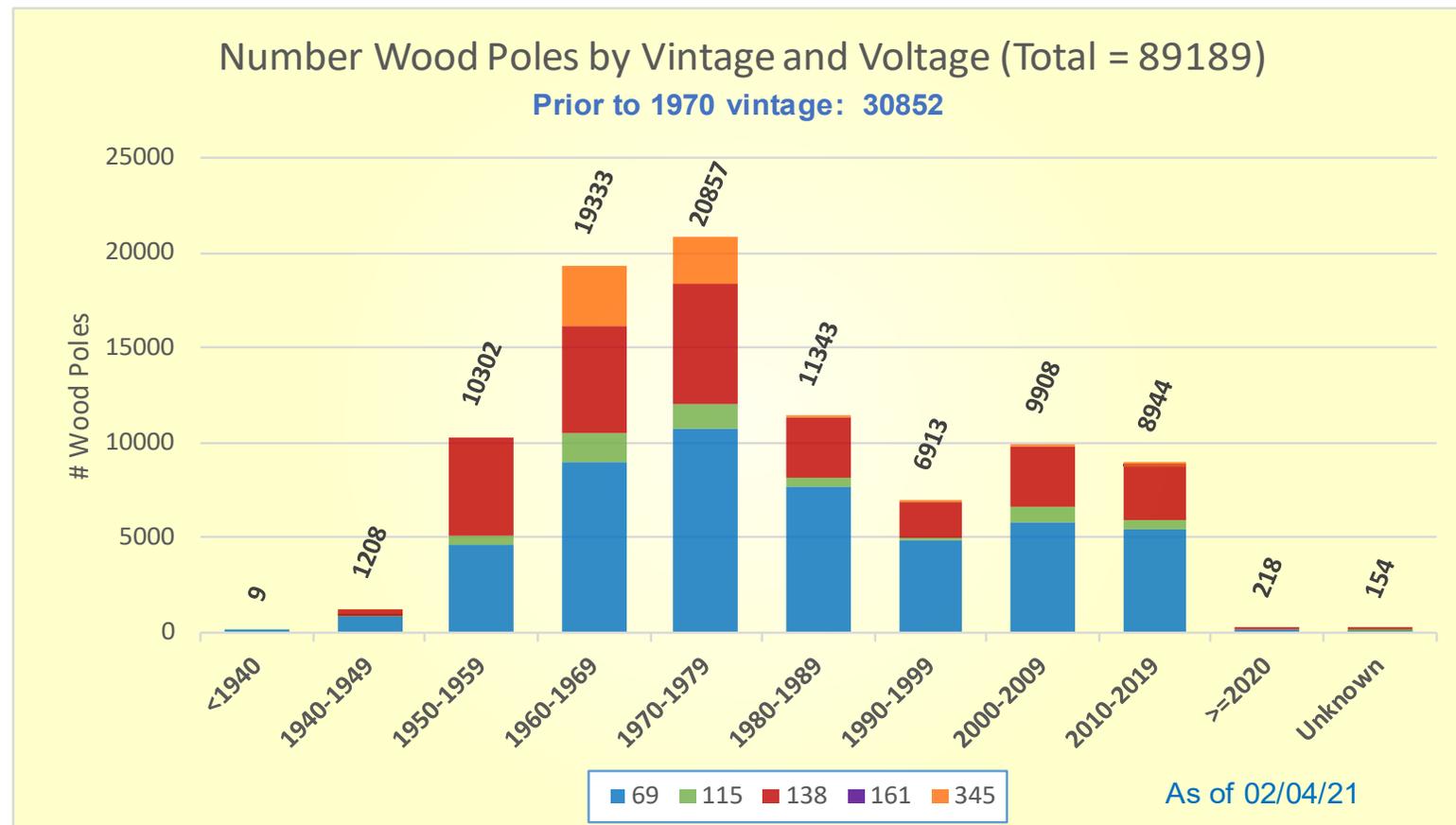


Granville Substation Strategic Outlook

- Long Range (2024 and beyond) Strategic Outlook
 - High-priority local delivery role will continue
 - High-priority regional 345kV network facility for power transfer
 - Need for a robust, reliable bus configuration
 - Need to ensure station and equipment reliability

Overhead Transmission Lines – 20 year Outlook

- Objective is to manage condition, preserve reliability and safety as these assets reach end of life.
- Pre-1970 vintage wood poles are likely to be replaced in the next 20 - 25 years.



Overhead Transmission Lines – 20 year Outlook

20 Year Outlook - Estimated Wood Poles Installed on ATC System Prior 1970

- Identified needs:
 - For the next twenty years initial outlook is ATC will need to rebuild approximately 100 miles per year considering all voltages.
- Future needs still include:
 - Rebuild of steel poles and lattice structures with some of the oldest vintages from early 1900's.
 - Asset renewal of line insulators and more minor hardware to ensure adequate performance.

Voltage Class	Mono Wood Poles	Multi - Wood Pole Structures *	Number of Wood Poles on Multi-Wood Pole Structures	Grand Total Number of Wood Poles	Grand Total Number of Wood Structures	Average Span Length (ft.)	Number of Miles per Year Next 20 Year
69	13049	652	1430	14479	13701	300	39
115	7	1030	2123	2130	1037	650	6
138	962	4851	10142	11104	5813	650	36
345	0	1528	3146	3146	1528	950	14
Grand Total	15046	8143	16989	32035	23189		95
round							100

* Multi - Wood Pole Structure is comprised of two (H-Frame) or more wood pole structures. As of 2/04/2021.

Transmission Line Asset Renewal Projects

Project (PR) Name	ISD
National - Presque Isle SW YD 138 kV (446), Re-insulate	2024
Lincoln - 43rd Street Terminal 138 kV (5053), Rebuild	2024
Blaney Park - Mich Limestone Quarry Tap 69 kV (6914), Partial Rebuild	2025
Huiskamp - Ruskin 69 kV (6937), Partial Rebuild	2025
Str 1102 - Str 4511 138 kV (872K61), Replace Select Poles	2024
Harbor - Russel Terminal 138 kV (893K11), Replace Underground Cable	2025
Pine River - Mich Limestone Quarry 69 kV (ESE_6906), Rebuild	2026
Glendale SS - 138 kV (), Pumping Plant Upgrade	2024
Munising - Shingleton 69 kV (Inland), Install Phase Spacers and Replace Select Poles	2021
Ontonagon - Victoria Hy 69 kV (Ontonagon69), Re-insulate	2024
Tower Dr - Pulliam 69 kV (P-16), Partial Rebuild	2024
Valley SS - 138 kV (), Pumping Plant Upgrade	2024
Falcon - Darlington 138 kV (X-101), Rebuild	2027
Hillman - Falcon 138 kV (X-14), Rebuild	2028
Lodestar - Erdman 138 kV (X-48), Replace underground cable	2023
South Beaver Dam - Horicon 69 kV (Y-134), Rebuild	2026
Browntown - South Monroe 69 kV (Y-155), Rebuild	2026
Nelson Dewey - Bloomington 69 kV (Y-184), Rebuild	2025
Edgewater - Erdman 69 kV (Y-31), Replace underground cable	2023

Asset Renewal T-line Needs Example

- Portage – Dam Heights 69kV Rebuild (Line Y-16)
 - Project Background
 - ◆ Approximately 25 of miles of rebuild
 - Past Needs
 - ◆ Condition and Performance Issues
 - ◆ Replace 1910's vintage lattice structures
 - ◆ Outages: One of the most frequently outage ATC lines
 - ✓ On average about 4 outages per year
 - ✓ Need to update to avian friendly design
 - ✓ Improved lightning performance
 - Current status
 - ◆ Project went in-service Fall of 2017
 - ◆ No outages since the new design went into service





Questions and comments may be directed to
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