2021 10-Year Assessment Preliminary Needs

Stakeholder and Customer Webcast

PRESENTED BY

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AMERICAN TRANSMISSION COMPANY®

Purpose

- Solicit Input on Needs
  - Network/System Planning
  - Generation Interconnection/Generation to Transmission (G-T) and Distribution to Transmission (D-T)
  - Asset Renewal
  - Communications
- Solicit Input on Public Policy Driven Needs
- Summarize Next Steps

Meeting Protocol

- Please submit questions via the chat function.
- When responding to questions, moderators will repeat them and identify the person asking them.
  - May postpone responding if questions are addressed later in the presentation or not respond if out of scope.
- Do not need to “raise your hand”.
- Because of the number of people participating, Roll Call will not be taken but “Participants” can be seen in Teams.
- All lines are muted.

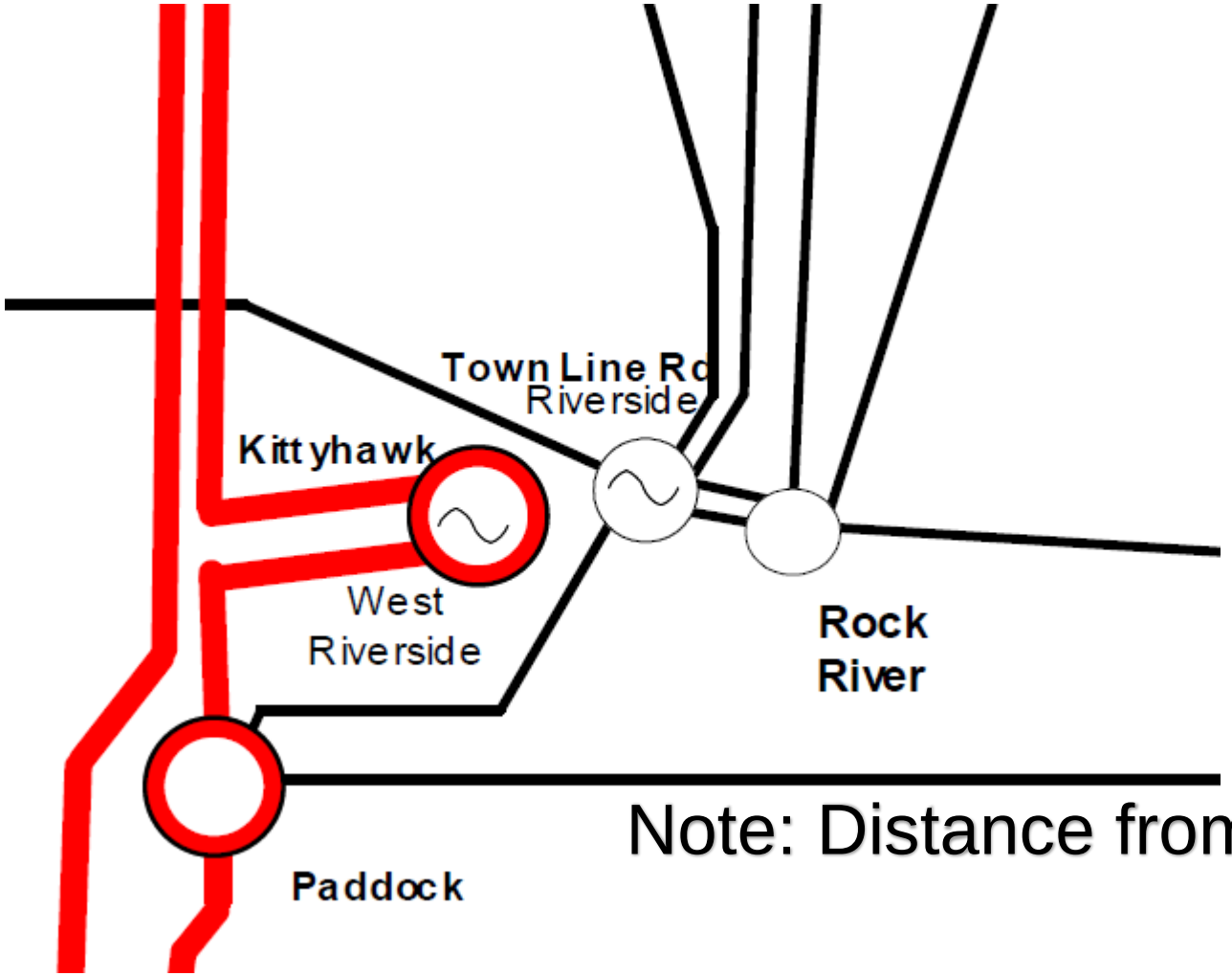
Changing Landscape

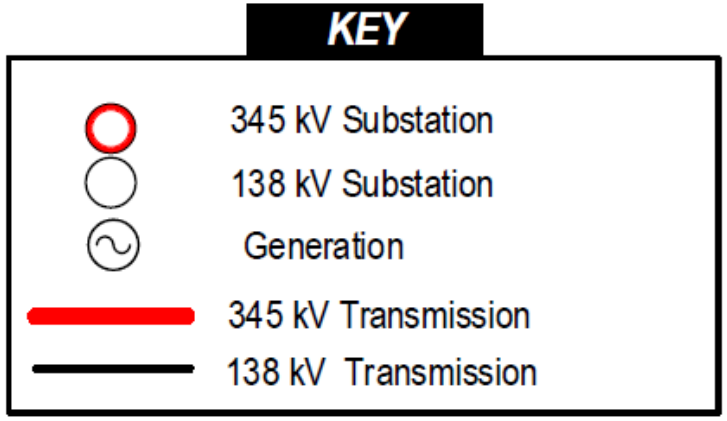
- Project needs are shifting.
  - Reduced need for new load-growth driven projects.
  - Both the G-T and D-T queues are large.
  - Deteriorating infrastructure can jeopardize reliability.
    - Asset Renewal addresses these risks.
  - Telecommunications risks:
    - Maintenance of older telephones lines not a priority.
    - Older 3rd party communication pathways may be less secure.
      - ✓ ATC's Optical Ground Wire (OPGW) network addresses these issues.
      - ✓ Our distribution customers can also use ATC's OPGW network.

Rock County Project

- High West to East bias
- Very few 345/138 kV transformers
- Key Generation Changes
  - Kittyhawk West Riverside Addition 732 MW
  - Edgewater 5 Retirement (formal request) 400 MW
  - Rock River Retirement 170 MW
  - Sheepskin Retirement 40 MW
  - Uncertain Generation changes
    - DPP Renewable Additions
    - Oak Creek Retirements (announced) 995 MW
    - Columbia 1 and 2 Retirements (announced) 1,145 MW

Project Area





Note: Not to scale

Note: Distance from Kittyhawk Substation to Rock River Substation is 1 mile

Next Steps

- Finish Alternative Development (Early March)
- Develop scopes and obtain cost estimates (March)
- Cross-functional team recommendation (Mid-March)
- Submit Project to MTEP21 App A (Early May)
- West Riverside as-built stability analysis (TBD)
  - Confirm Final design

Changing Landscape

- Network/System Planning Needs
  - New potential needs under intact conditions and single contingencies
    - Sunset Point-Bowen Street (Oshkosh Area--P2.1 contingency)
    - High intact system (P0) voltages and single contingency (P1) low voltage limitations at the Presque Isle, National, Tilden, Munising and other buses in the north central U.P.
  - However, if much of the G-T queue is developed, more reliability projects may be needed in the future.

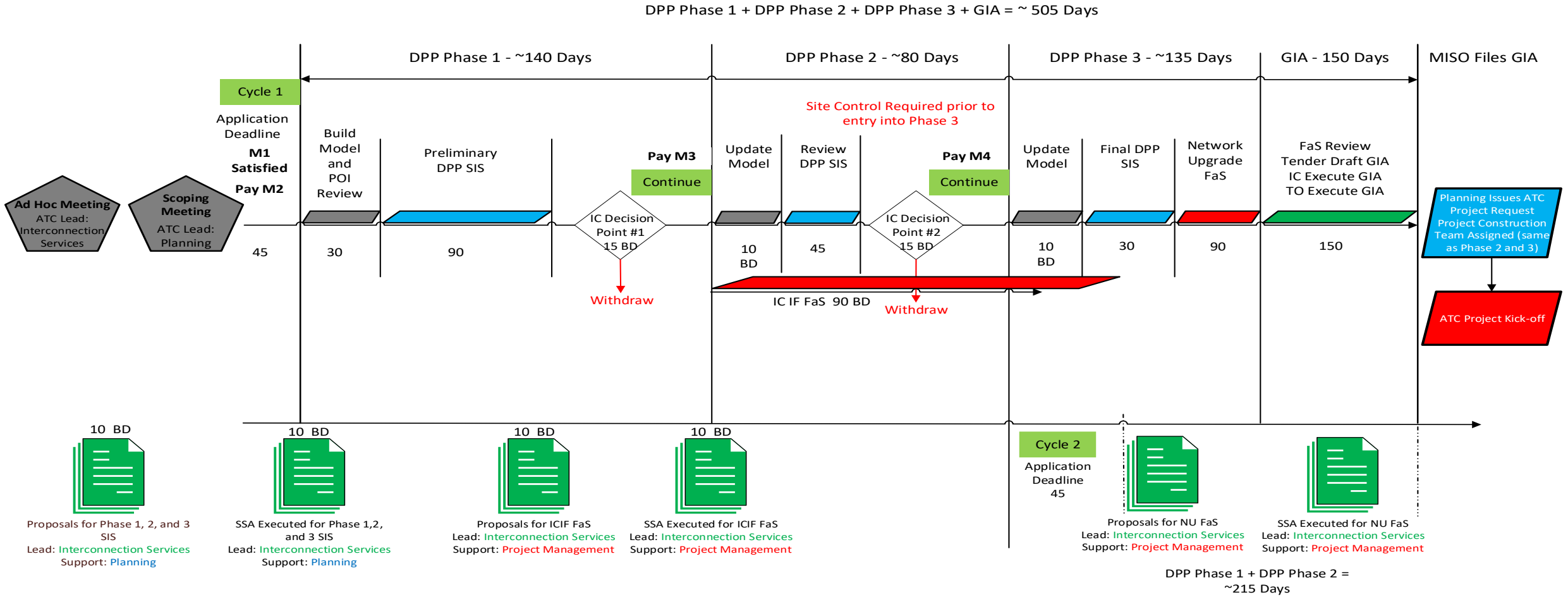
- Presentation concentrates on the current areas of largest need, i.e. on G-T, D-T, Asset Renewal, and Communications.

Generation Interconnections MISO Process

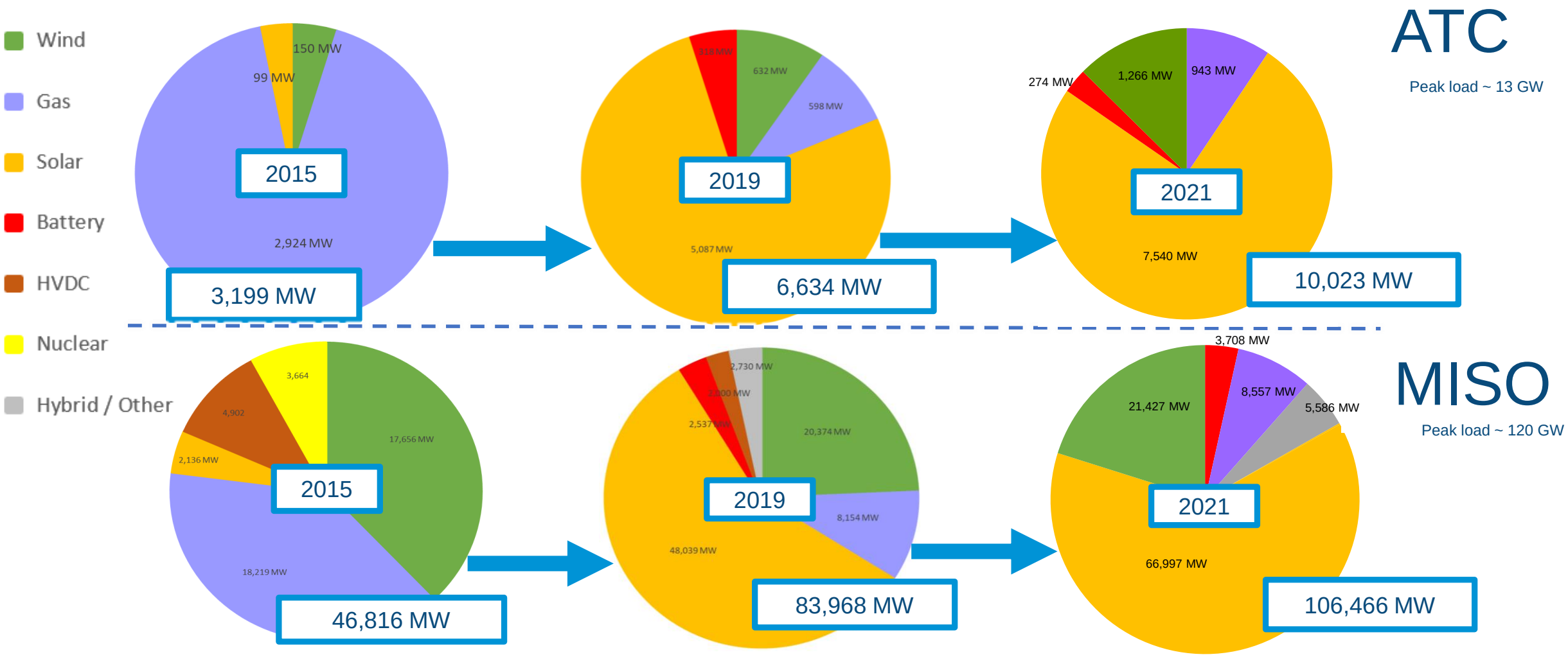
Link to interconnection queue (CTRL + click to follow)

Link to Process Guide (CTRL + click to follow)

Generator Interconnection Process

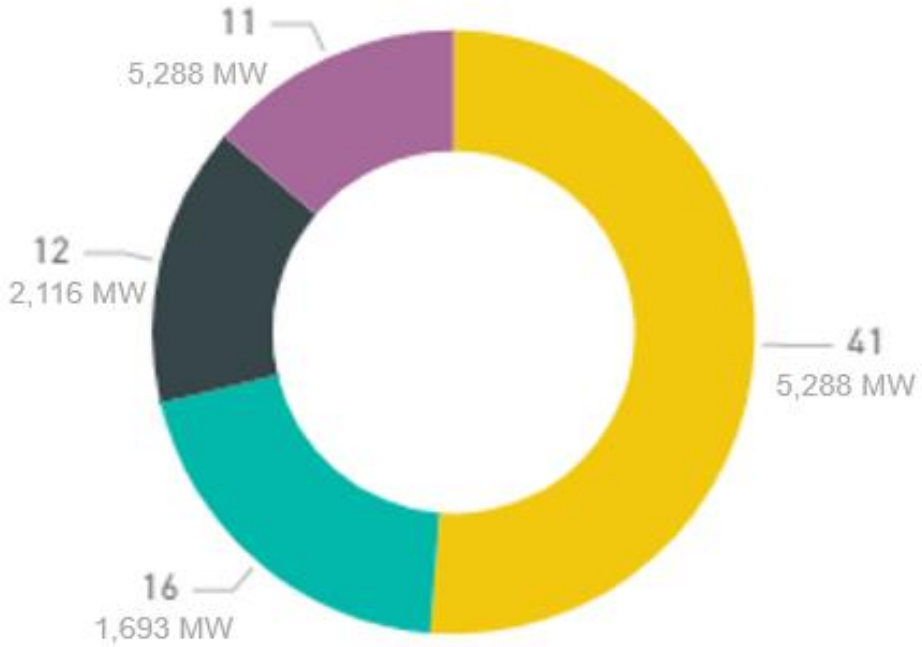


G-T Queue Snapshot: 2015, 2019, 2021

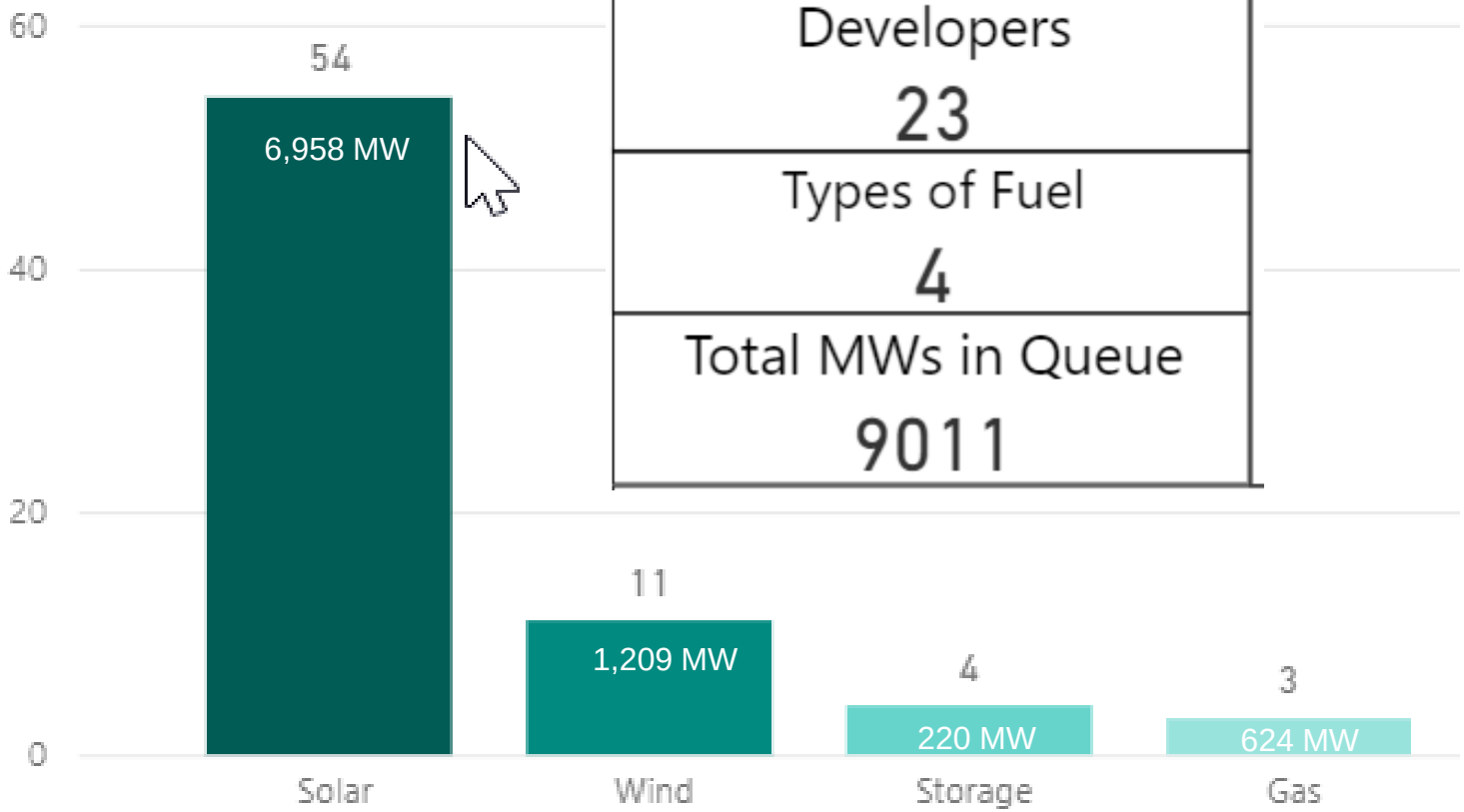


Note: Coal, diesel, and biofuel total less than 100 MW each for each chart.

G-T Dashboard



Active MISO GT Projects
72
Developers
23
Types of Fuel
4
Total MWs in Queue
9011



Phase Queued DPP Phase 2 Construction DPP Phase 3

Affected System Studies

- PJM is an adjacent Regional Transmission Organization (RTO) that studies MISO generator interconnection projects and the study is included in the System Impact Study
  - ATC is not a member of PJM
  - Often the PJM Affected System study causes delays in the MISO process
  - The PJM analysis identifies upgrades within their own footprint that need to be paid for by the contributing generator to the constraint
  - PJM process to complete the Affected System Study differs significantly from the MISO study process
- Load Distribution Companies (LDCs) and existing Generation Operators (GOs) could also be an Affected System

Other Generator Updates

- ATC filed at FERC to change reimbursement policy for the 2020 queue cycle
- Replacement generators
- Surplus generation

Distribution to Transmission (D-T) Interconnections

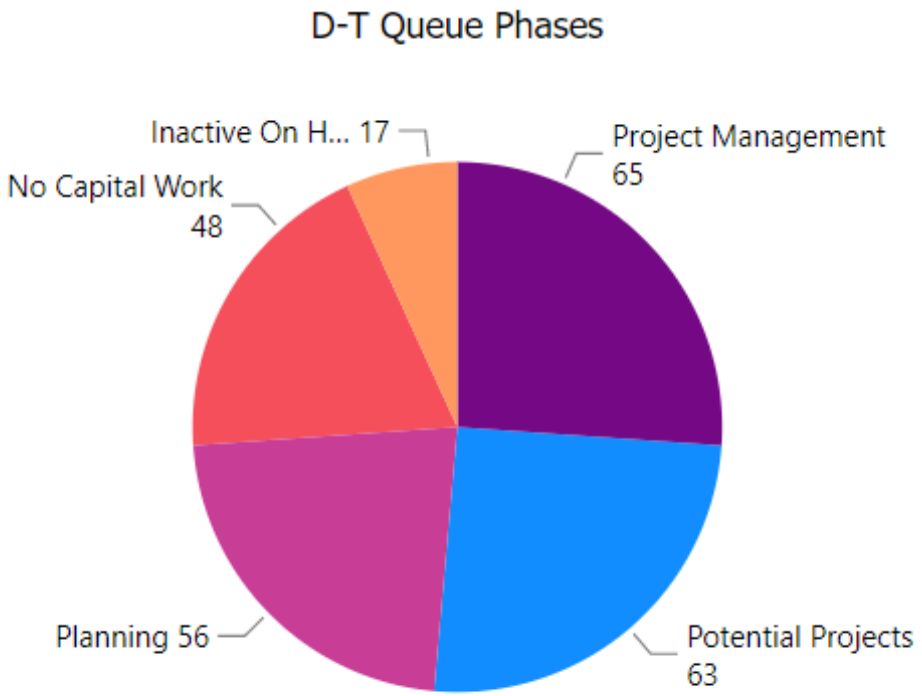
70+ requests in 2020

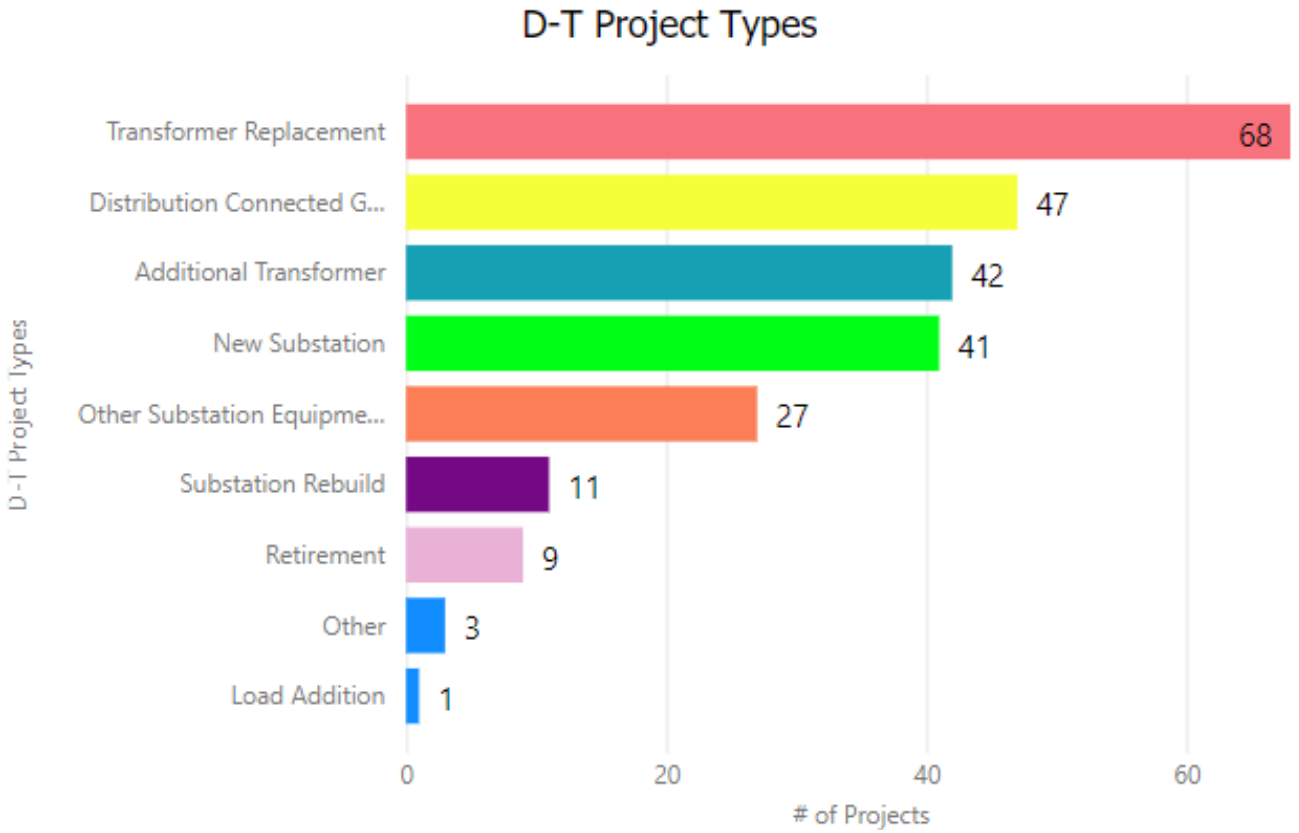
- Governing documents:
  - FERC Tariff Attachment FF-ATCLLC
  - NERC Standards
  - FERC Filed D-T Interconnection Agreement (IA)
  - ATC's Load Interconnection Guide
  - ATC's Business Practices

Distribution to Transmission Interconnections

- Best Value Planning (BVP)
  - Collaborative planning assessment to determine the best value solution for all parties
  - Types of requests
    - New distribution substation
    - Distribution substation equipment change
    - Distributed energy resources (DERs)
    - Unforecasted load or change in load characteristics
    - Power quality issues
  - Individual Project Timelines Vary Widely

D-T Dashboard





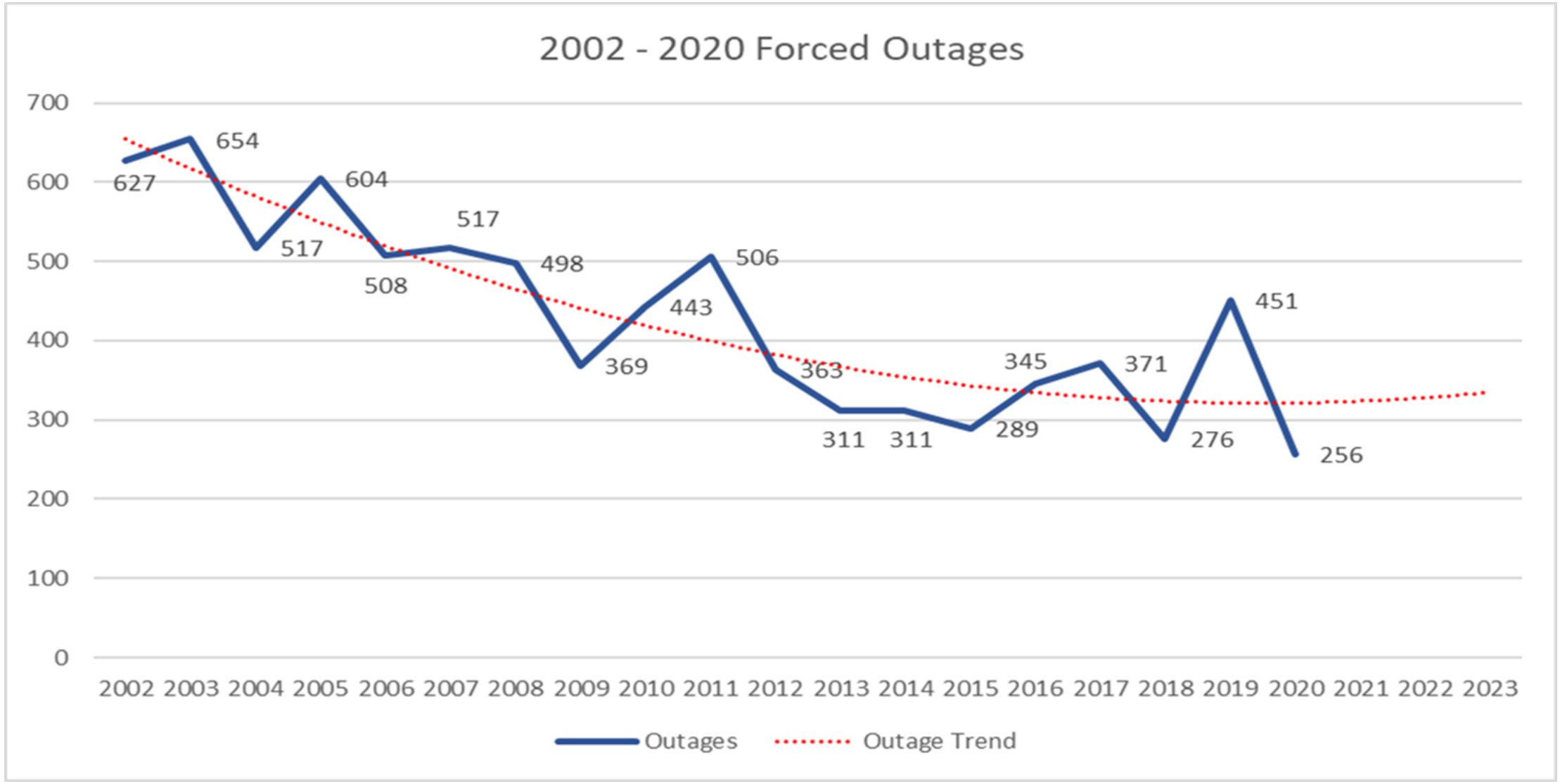
Asset Renewal Program Objectives

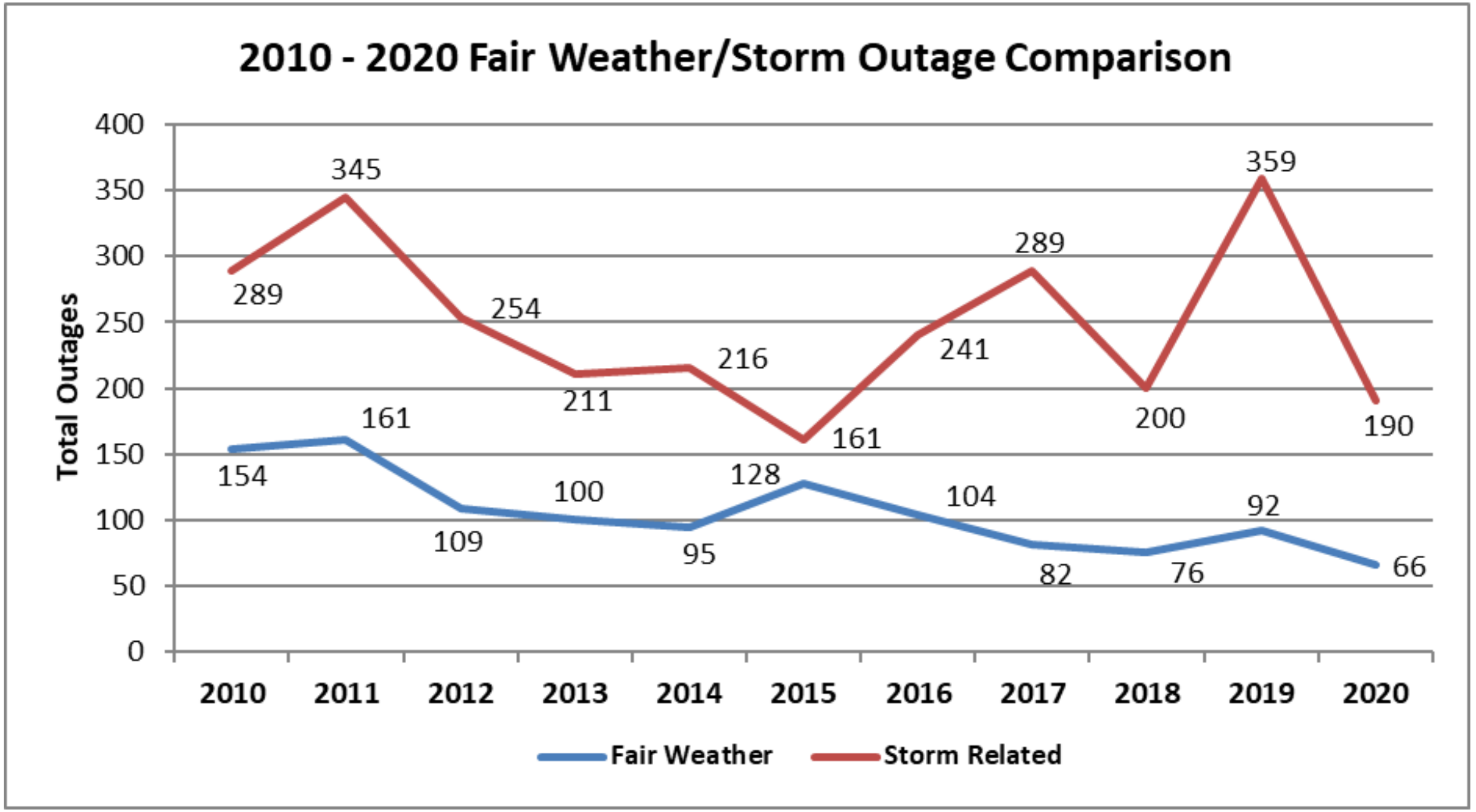
- Safety – public and worker
- Minimize total life cycle cost [Net Present Value of Revenue Requirements (NPV RR) from customer cost/rate perspective]
- Compliance
- Manage risk
- Reliable performance – maintain or improvement
- Environmental performance improvements
- Coordination with Stakeholders

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
Total Outages
400
350
300
250
200
150
100
50
0
345
359
289
289
254
216
241
211
200
190
161
154
161
128
100
104
109
92
95
82
76
66
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Fair Weather
Storm Related

Reliability Performance: January - December 2020

Customer Impact

TSAIDI

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

TSAIFI

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.

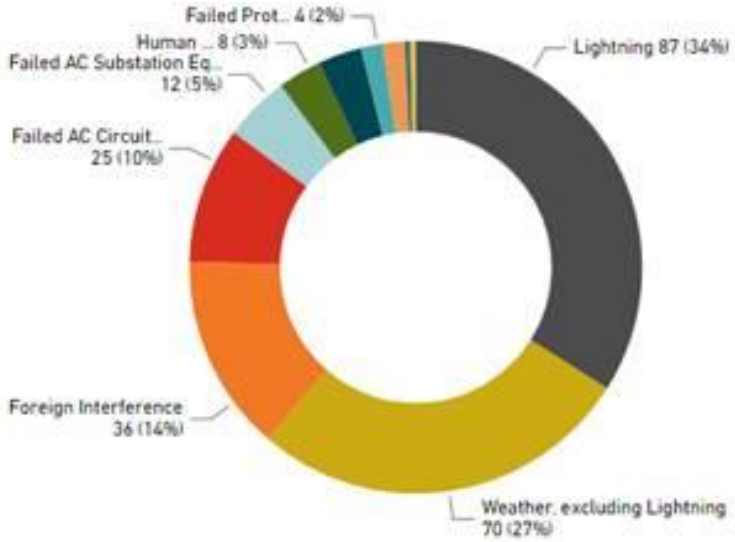
2020 Top impacting outages:

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 sectionalizd 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

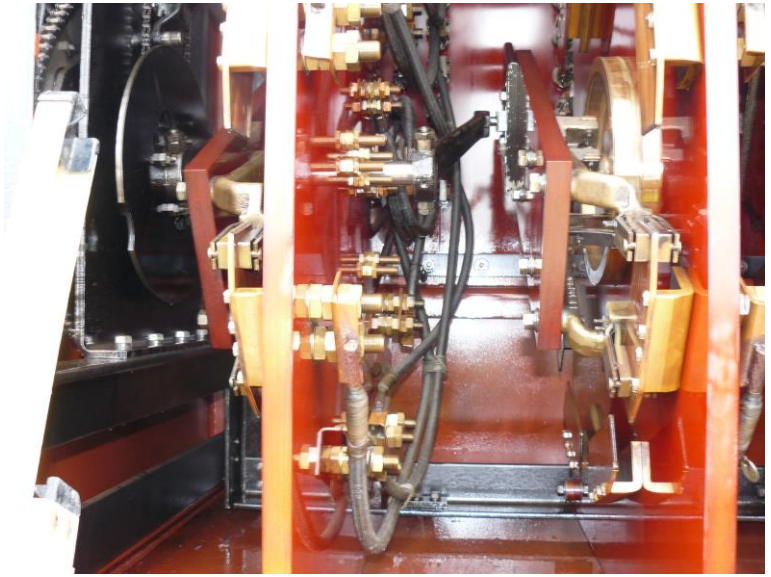


Asset Renewal – Draft 10 Year Forecast Substation Equipment Quantity

Row Labels	2025	2026	2027	2028	2029	2030	Grand Total	In Service Qty	Plan % Replaced Per Year	Avg Nominal Life	Anticipated Replacement %	Avg - Anticipated %
Arresters	12	19	46	25	33	44	179	7,301	0.4%	40.0	2.50%	-2.09%
Batteries and Chargers	17	25	13	29	21	21	126	333	6.3%	20.0	5.00%	1.31%
Breakers and Switchers	41	31	37	28	35	11	183	2,591	1.2%	50.0	2.00%	-0.82%
Capacitor Banks	2	1	3	2	6	2	16	265	1.0%	50.0	2.00%	-0.99%
Control Houses	6	5	1	4	4	4	24	267	1.5%	50.0	2.00%	-0.50%
Instrument Transformers	17	17	57	42	130	50	313	5,713	0.9%	40.0	2.50%	-1.59%
Physical Security - Asset Renewal	309	448	377	8	87	5	1234	1,981	10.4%	7.0	14.29%	-3.90%
Power Transformers	4	4	3	5	4	3	23	198	1.9%	60.0	1.67%	0.27%
Relays	233	369	241	315	567	370	2095	6,763	5.2%	25.0	4.00%	1.16%
SCADA	20	22	18	17	36	27	140	631	3.7%	20.0	5.00%	-1.30%
SCADA (not a trigger)	7	14	16	31	21	28	117	2,664	0.7%	25.0	4.00%	-3.27%
Station Power Transformers		1	5	5	3		14	288	0.8%	40.0	2.50%	-1.69%
Switches	57	85	66	45	97	45	395	5,792	1.1%	60.0	1.67%	-0.53%
Grand Total	**725**	**1041**	**883**	**556**	**1044**	**610**	**4859**					

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



Granville Substation – 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

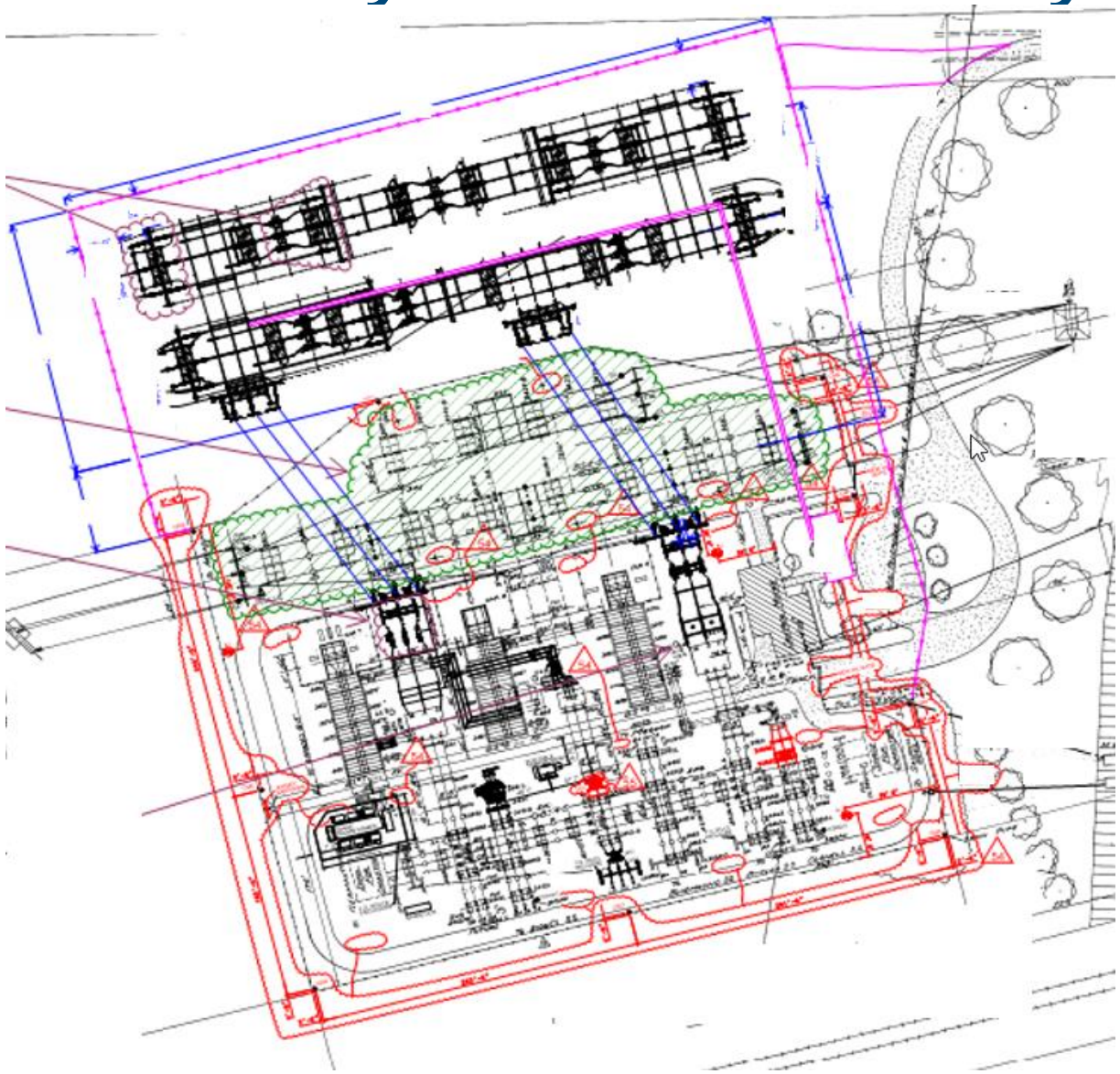
- 345kV
  - 4 – 1970 vintage Westinghouse 3450-GW-25000 oil breakers
    - No manufacturer support for engineering or parts
    - Bushings are prone to oil leaks and performance issues
    - Environmental concerns with large volumes (10,000 gallons) of oil per breaker with no oil spill containment.
    - 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

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!)

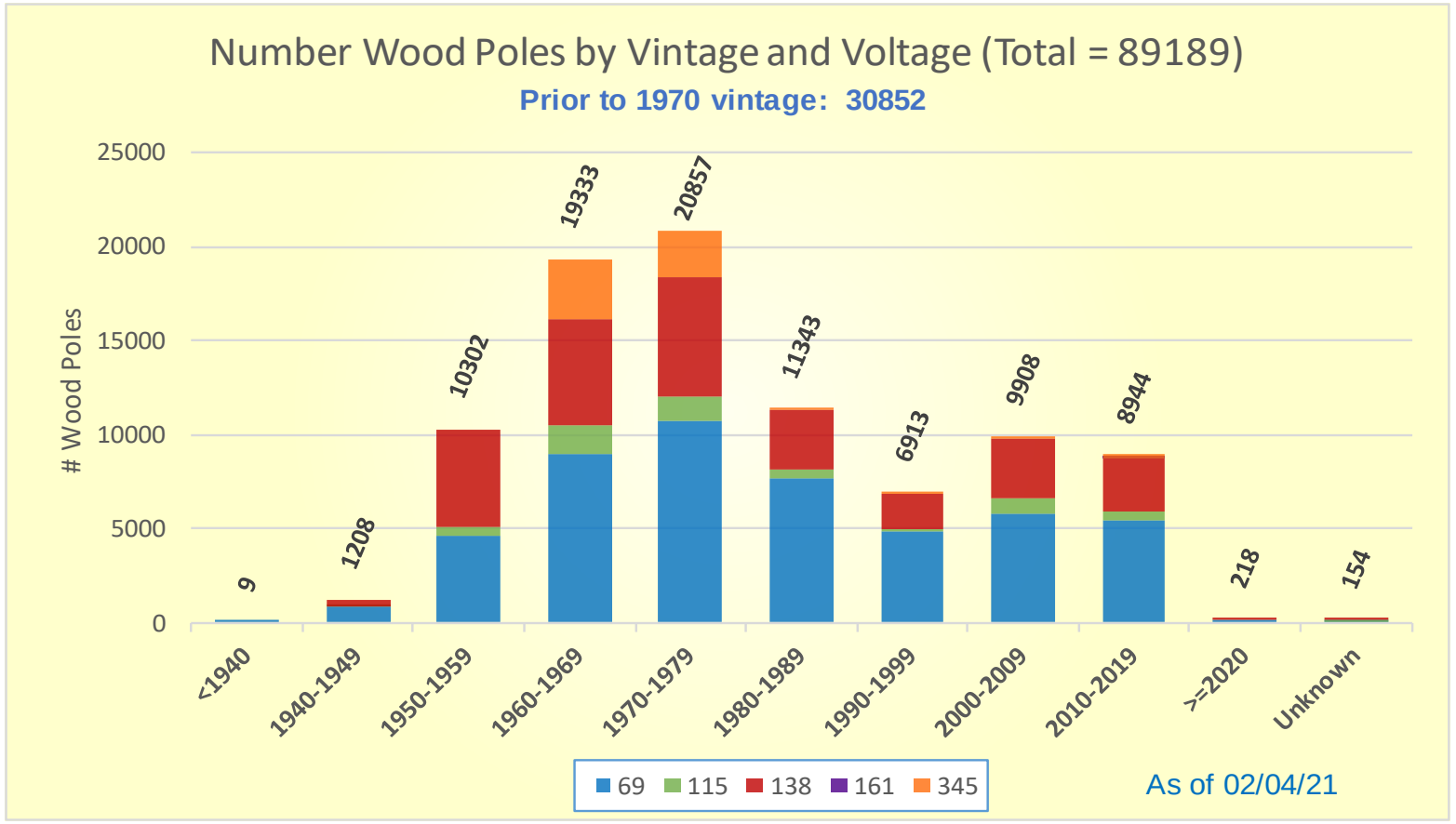


Granville Substation Strategic Outlook

- 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

- 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 to 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.

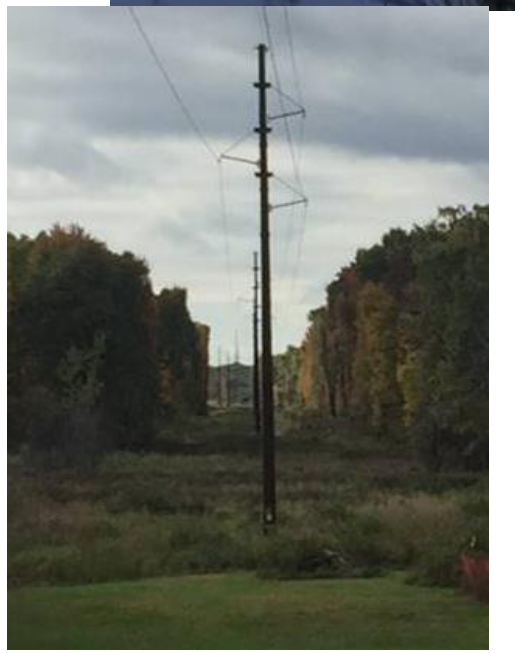
20 Year Outlook - Estimated Wood Poles Installed on ATC System Prior 1970

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**

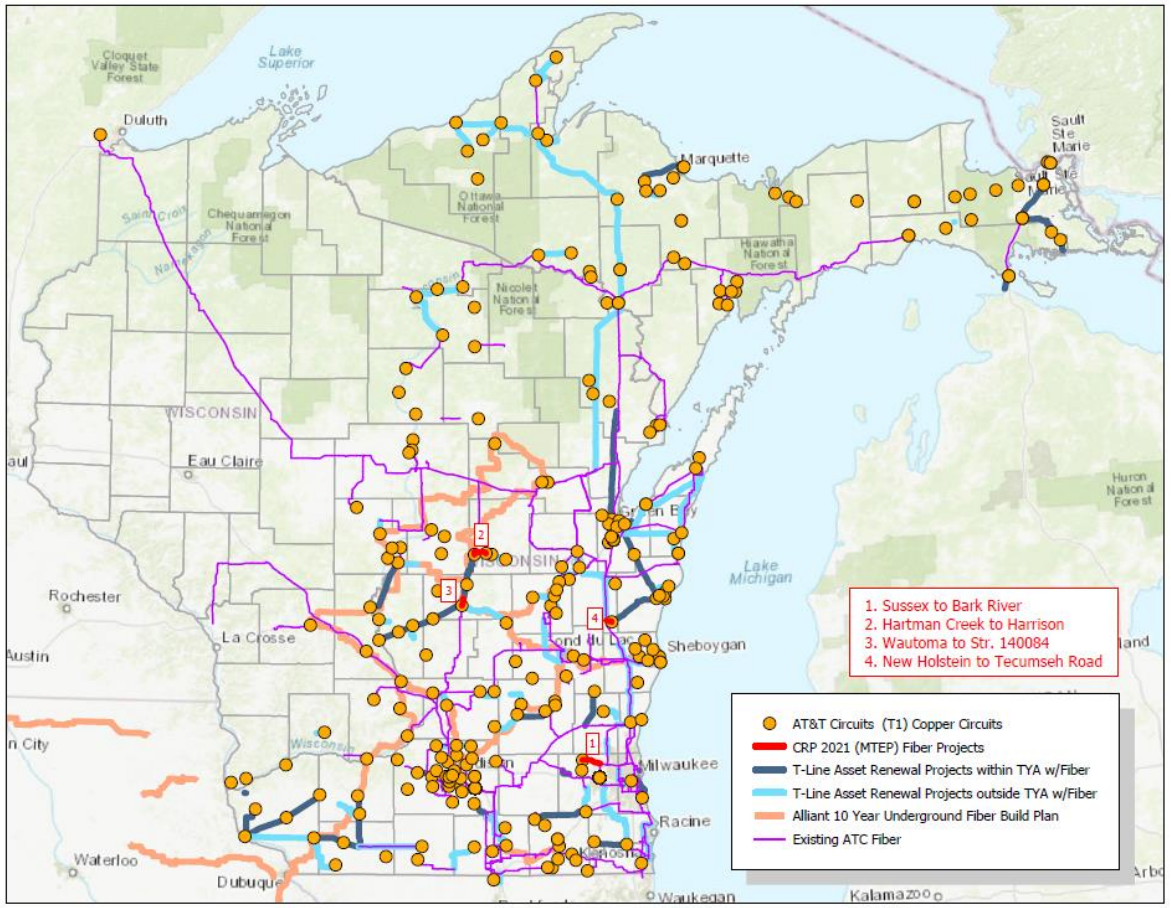
* Multi - Wood Pole Structure is comprised of two (H-Frame) or more wood pole structures. As of 2/04/2021.

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



Communications Projects
-In Service and Active Projects



Communications Projects - 2021 & Beyond

- Challenges, Trends & Opportunities
  - AT&T Performance & Customer Service Challenges
  - Substation Communication Demands
  - T-Line Asset Management Alignment
  - LDC Partnership – (Shared Communications)

Non-Transmission Alternatives (NTAs)

- Stakeholders can offer NTAs through MISO's review process.
- MISO posted a list of NTA eligible projects with its January 27, 2021 Subregional Planning Meeting (SPM) #1 meeting materials.
  - MISO has not specified a deadline yet, but NTA feedback is normally due in late May before SPM#2.
- NTA review process is described in MISO's Business Practice Manual No. 20 (page 82+).

Non-Transmission Alternatives (NTAs)

- MISO is refining its NTA review process this year as part of its "Integrated Roadmap" (IR092) and plans to:
  - Develop mechanism to enable more opportunity for NTAs to be considered beyond the existing use of generation/energy storage which requires interconnection agreements.
  - Alternatives might include converting generators to synchronous condensers or use of load response.
- NTA Attributes:
  - Must be timely in mitigating reliability needs.
  - Must address the full range of needs/benefits.
  - Must provide a "Best Value Plan" for customers.
  - Address the reliability needs for every hour throughout the year.

Planning Criteria Changes - Published

- 2021 Assessment - Criteria Changes
  - Voltage Stability Margin: revised to 5% on a post-contingent basis - sections 1.1.5 and 1.1.6
  - Clarified the application of expected clearing time margins - section 1.2.1
  - Posted as v20.2 on atc10yearplan.com website
- 2021 Assessment - Practices Changes
  - Voltage Stability Margin definition: revised text describing how to apply the new definition - section 12.9
  - Posted as v20.1 on atc10yearplan.com website

Planning Criteria Changes - Anticipated

- Only allow normal and emergency ratings in planning studies
- Address Non-BES Generator Tripping
- Post final Criteria and Practices as versions 21 in Spring 2021

Assessment Status

- Next Steps
  - Needs comments – due March 26
  - Finalize needs – Early April
  - Preliminary solutions meeting/presentation – May 11
  - Finish sensitivity studies – May
  - Develop new or revised scope and cost estimates – June
  - ATC internal review/approval – August
  - 2021 Assessment publication – October

Public Policy Requirements – Comments?

- Any public policy driven needs that may not be covered by the Assessment process?

Questions?

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