Helping to keep the lights on,
businesses running
and communities strong®

2018 10-Year Assessment
Preliminary Study Design

October 24, 2017
Stakeholder and Customer Webcast
Jeremy Voigt, System Planning

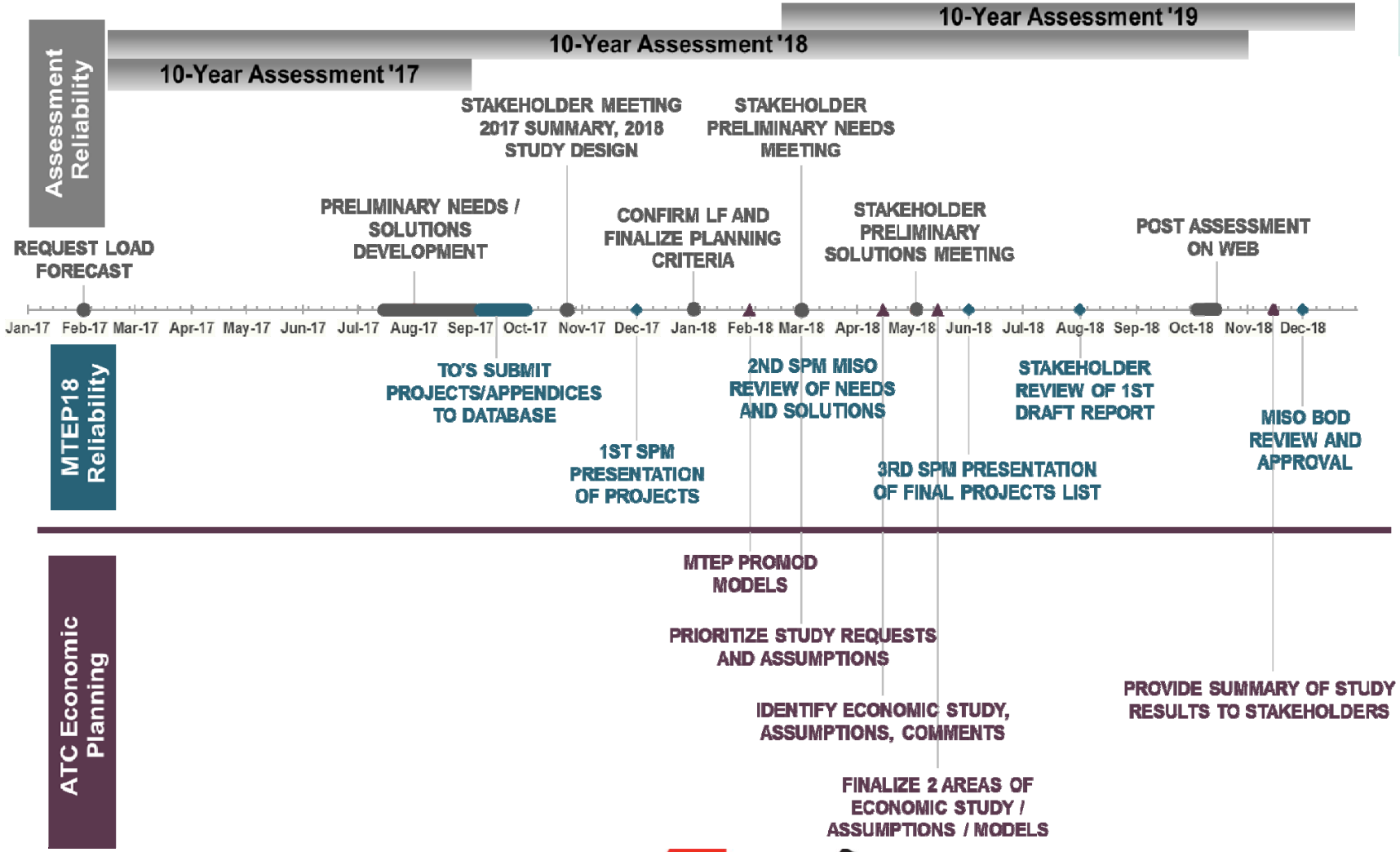
Purpose

- Summarize ATC's project development processes
- Solicit input for the 2018 Assessment Study Design
- Solicit input on Public Policy Requirements

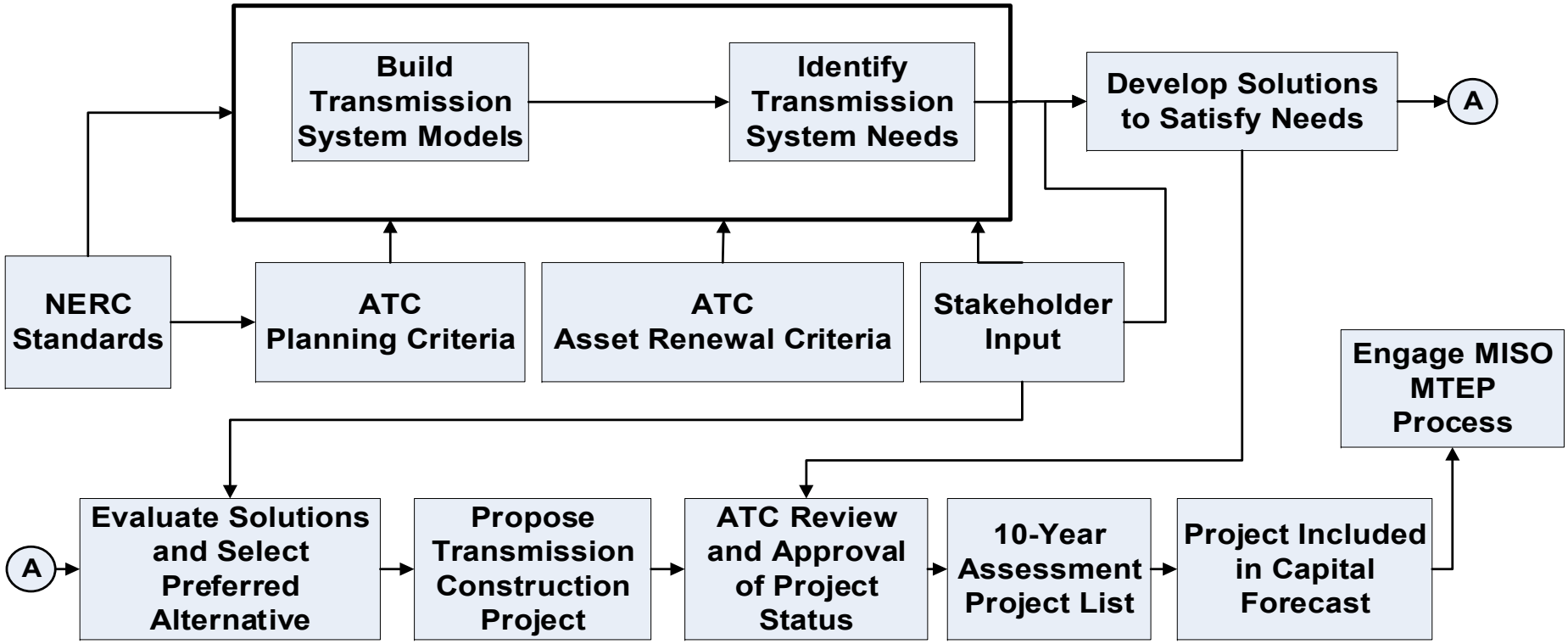
ATC's Project Development Processes

- Local Transmission Planning
  - Asset Renewal
  - Interconnections
  - Network
    - Planning Reliability Criteria
    - Sectionalizing Guidelines
    - Economic Benefits Considerations
- Other Solution Considerations, including Distributed Energy Resources (DER)
- Regional Planning
- Public Policy Requirements

Timeline


Assessment Reliability
10-Year Assessment '19
10-Year Assessment '18
10-Year Assessment '17
STAKEHOLDER MEETING 2017 SUMMARY, 2018 STUDY DESIGN
STAKEHOLDER PRELIMINARY NEEDS MEETING
PRELIMINARY NEEDS / SOLUTIONS DEVELOPMENT
CONFIRM LF AND FINALIZE PLANNING CRITERIA
STAKEHOLDER PRELIMINARY SOLUTIONS MEETING
POST ASSESSMENT ON WEB
REQUEST LOAD FORECAST
Jan-17 Feb-17 Mar-17 Apr-17 May-17 Jun-17 Jul-17 Aug-17 Sep-17 Oct-17 Nov-17 Dec-17 Jan-18 Feb-18 Mar-18 Apr-18 May-18 Jun-18 Jul-18 Aug-18 Sep-18 Oct-18 Nov-18 Dec-18
MTEP18 Reliability
TO'S SUBMIT PROJECTS/APPENDICES TO DATABASE
2ND SPM MISO REVIEW OF NEEDS AND SOLUTIONS
STAKEHOLDER REVIEW OF 1ST DRAFT REPORT
MISO BOD REVIEW AND APPROVAL
1ST SPM PRESENTATION OF PROJECTS
3RD SPM PRESENTATION OF FINAL PROJECTS LIST
ATC Economic Planning
MTEP PROMOD MODELS
PRIORITIZE STUDY REQUESTS AND ASSUMPTIONS
PROVIDE SUMMARY OF STUDY RESULTS TO STAKEHOLDERS
IDENTIFY ECONOMIC STUDY, ASSUMPTIONS, COMMENTS
FINALIZE 2 AREAS OF ECONOMIC STUDY / ASSUMPTIONS / MODELS

Local Transmission Planning Process



Project Status

Strategic

Provisional

Proposed

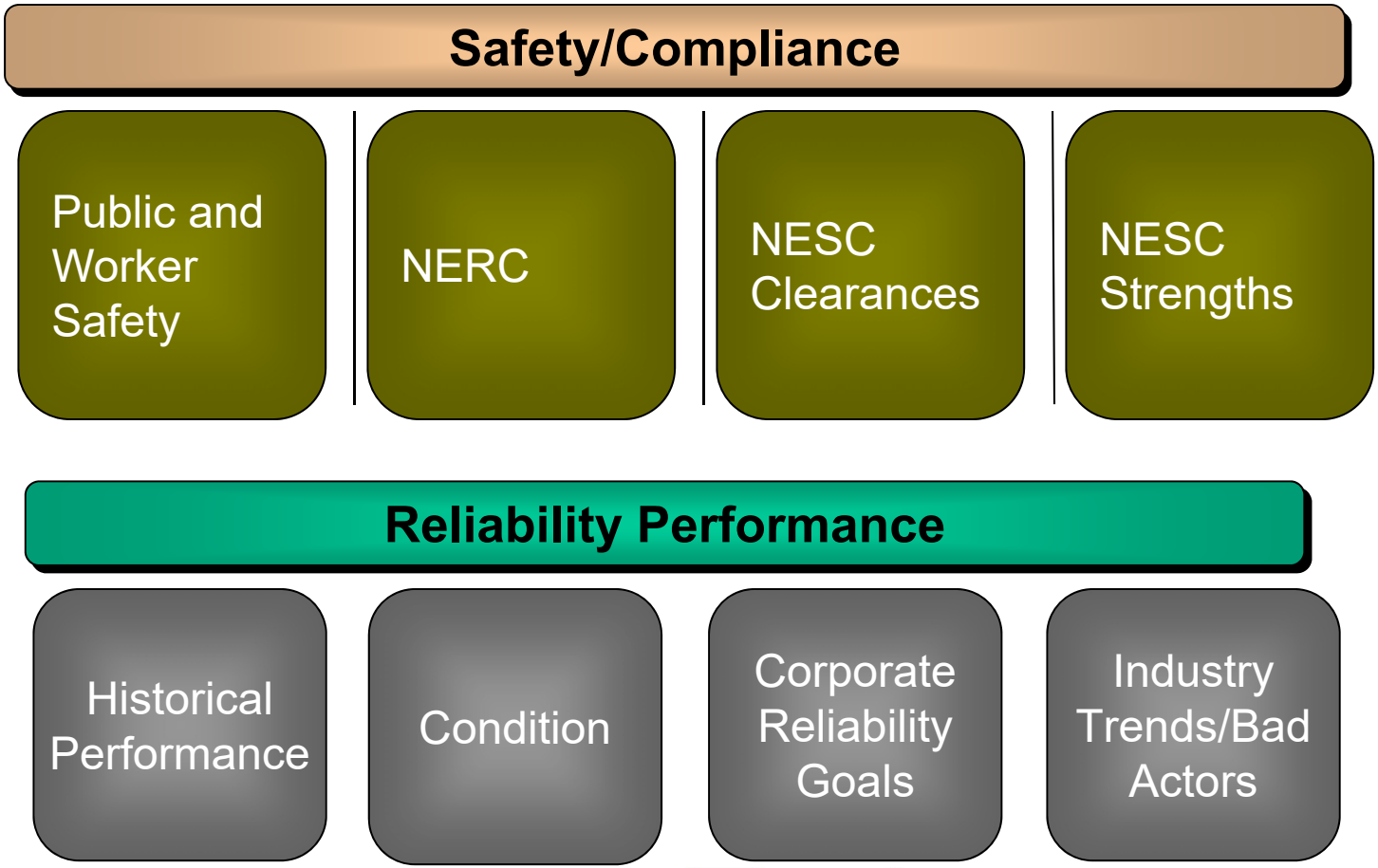
Planned

In-Service

Asset Renewal Program Objectives

- Safety – Public and worker
- Minimize total life cycle cost
- Compliance
- Manage risk of aging infrastructure
- Reliability performance improvements
- Environmental performance improvements

Asset Renewal Criteria



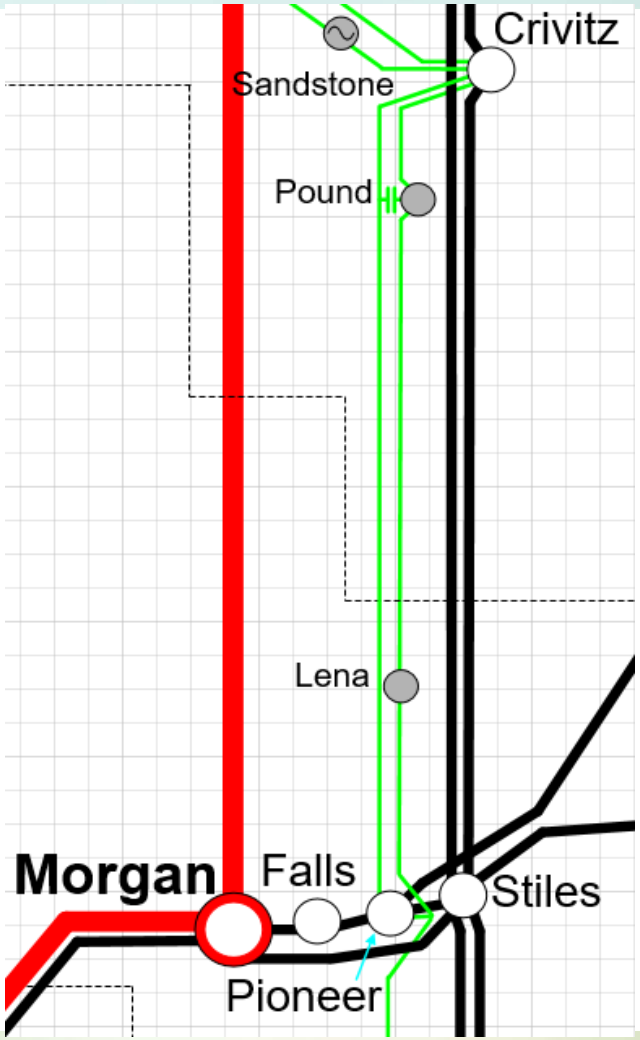
Asset Renewal Considerations

- Is the asset still needed?
  - Assess area needs
  - Obtain cross-functional and distribution provider input
  - Consider removal of lines (full/partial retirement)
- What ratings are needed?
- Investing prudently using defensible criteria

Asset Renewal Considerations – E-83/B-2

- ATC team and affected distribution provider assessed area needs

- Found potential for full or partial retirement
  - Option being considered: move substations nearby existing 138 kV lines
  - Evaluation in progress
    - Determining costs and distribution impacts
    - Preferred solution expected by 2018



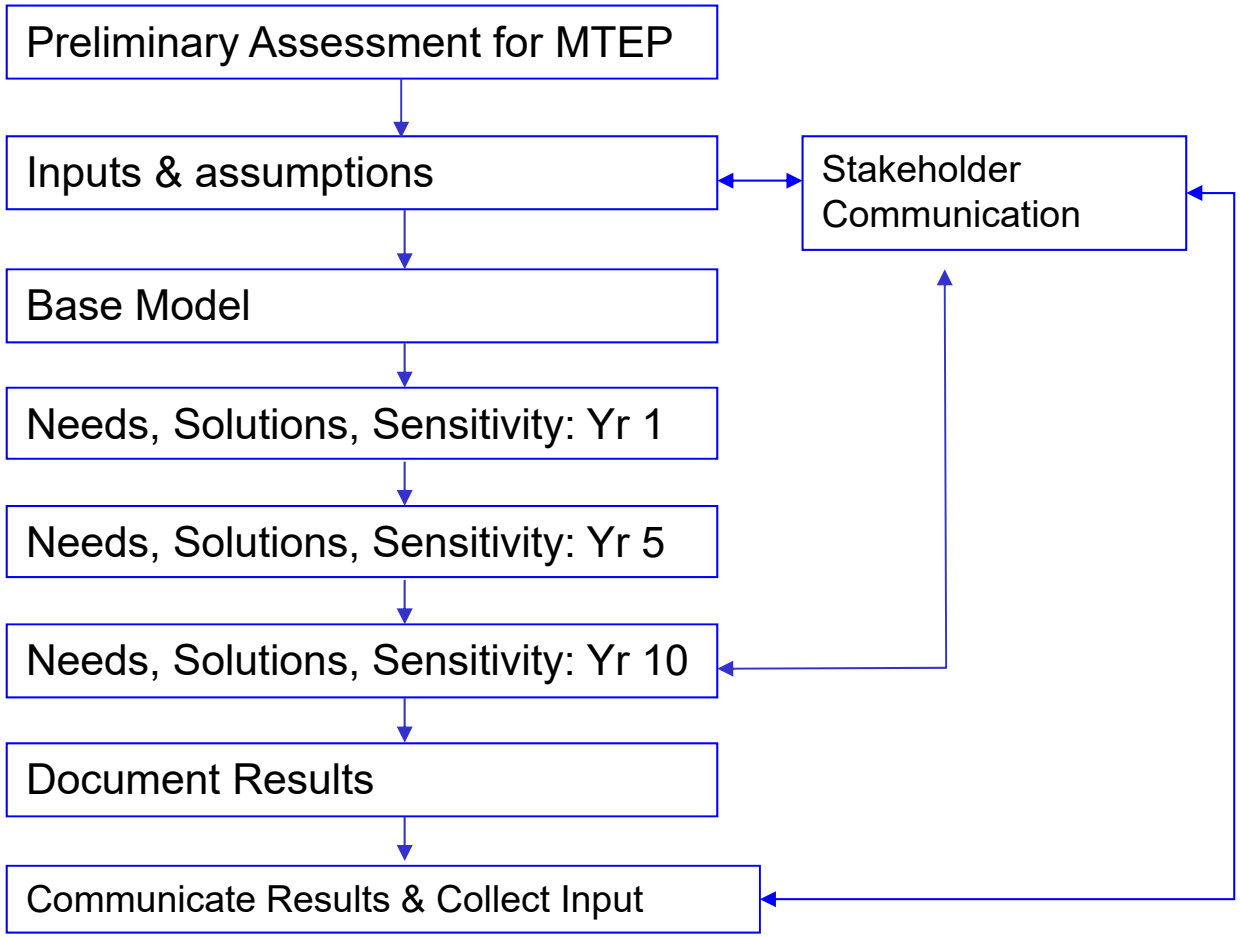
Interconnections

- G-T
  - Support MISO Attachment X and Y Processes
- D-T
  - Collaboration with distribution providers through Load Interconnection Request Form (LIRF) and BVP process
- T-T
  - Collaboration with other Transmission Owners

Network Planning Objectives

- Compliance with NERC regional and local criteria
- Best Value Plan (BVP)
- Customer involvement
- Address Public Policy requirements
- Maintain or improve the adequacy and reliability of the electric transmission system

Network Planning Assessment Process



Planning Criteria & Assessment Practices

- NERC Standards, particularly TPL-001, version 4

- ATC Planning Criteria/Assessment Practices
  - http://www.atc10yearplan.com (About tab)
  - Updated to Planning Criteria v19 & Planning Assessment Practices v6

- Sectionalizing Guidelines
  - Developed with distribution providers early in ATC's history
  - http://www.atcllc.com/wp-content/uploads/2016/12/Final-Load-Interconnection-Guide-Rev-6-122116.pdf (Sections 3.6.1-3.6.2)

Planning Criteria & Assessment Practices Updates

- Planning Criteria v19
  - Added non-BES facilities in some parts of section 1.1.6 General Steady State Performance Criteria
  - Added section 1.6 Generating Facility Power Factor and Voltage Regulation

- Planning Assessment Practices v6
  - Added section 6 Facility Condition Methodology
  - Added section 13.7 Other ATC Interconnection Studies and Considerations
  - Added text to section 13.6.1 Generator Interconnection Studies regarding dispatch modeling assumptions, power factor and voltage schedule

2018 Studies and Assumptions

- Preliminary 2017 Load Forecast Confirmation and MTEP18 Support Studies
- Modeling Assumptions
  - Model Years
  - Load
  - Generation
  - No Load Loss Allowed Contingency Analysis
- Additional Studies

Preliminary Load Forecast and MTEP18 Support Studies

- Initial screening (reduced generator reactive capability)
  - Summer peak (5 and 10 year models)
  - 2017 load forecast
  - 2017 TYA outside world (2016 MMWG cases)

- To confirm 2017 Load Forecast and support MTEP18 database development
  - No load loss allowed contingencies
  - Completed July 2017

Projects Submitted to MTEP18

- MTEP18 Active Project List

2018 TYA Model Years

- 2018 (As-planned)
- 2019
- 2023
- 2028

- All models will likely be completed by the Spring of 2018

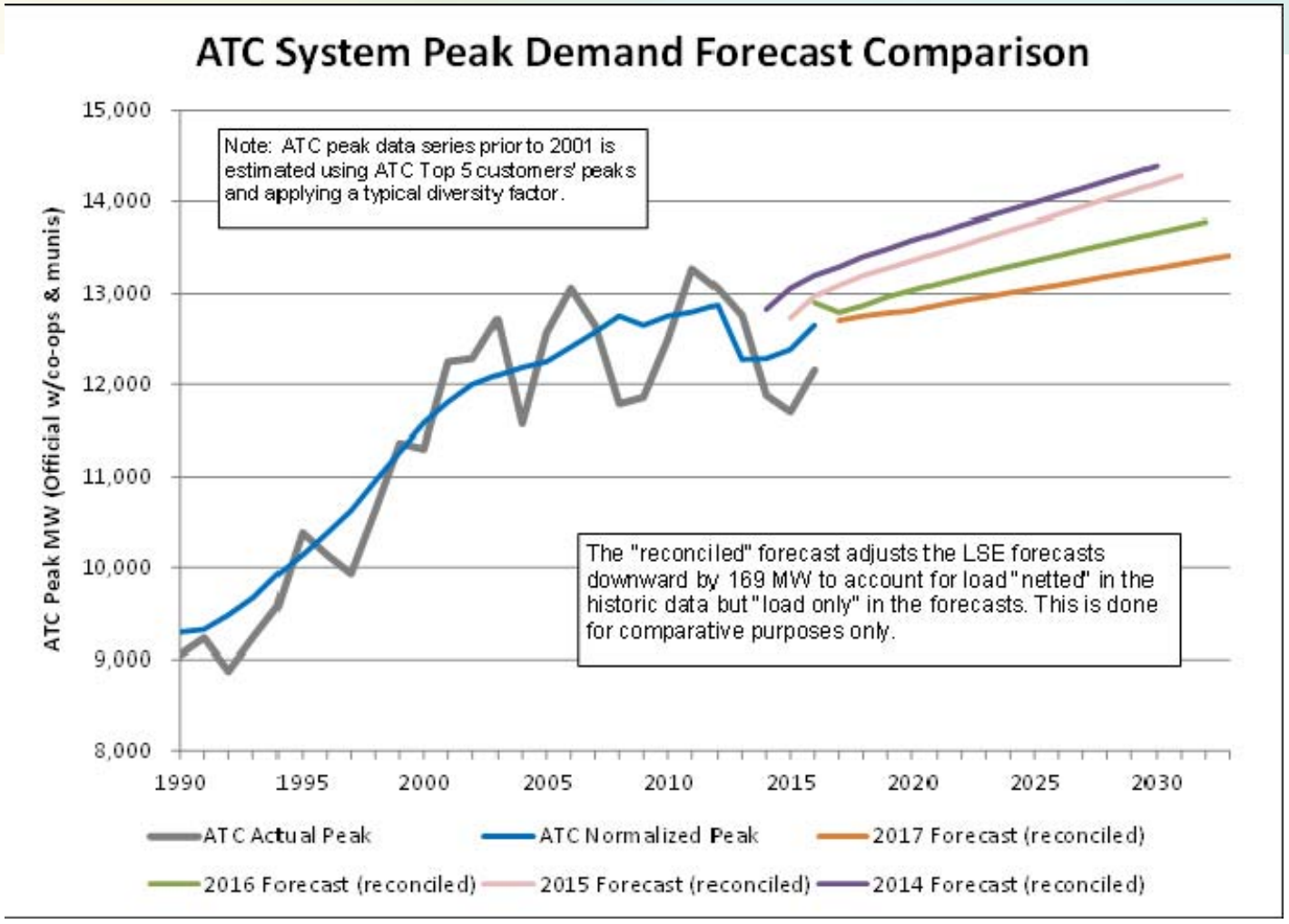
Load - Historical

- Requested September 27, 2017
  - Summer peak
  - Winter peak
  - Light load
  - Shoulder load
- Receive November 1, 2017
- Add to databases

Load – Expected Forecast

- Requested LDC forecasts February 2017
  - 11 years
  - Consistent with resource planning forecast
  - Considered expected (50/50 probability)
- Received in April 2017
- ATC compiles
  - Comparisons to previous forecasts
  - Differences confirmed with LDCs
  - Finalized copy to LDCs – August 2017
  - Forecasted load is what the system is planned for

Load Forecast Trends



Load Forecast Trends, Continued

Model	ATC Load (MW)		
	2016 Assessment	2017 Assessment	2018 Assessment
Year 1 Summer Peak	13,400	13,000	13,000
Year 5 Summer Peak	+300	+300	+200
Year 10 Summer Peak	+700	+600	+400
Year 5 Shoulder	9,800	9,400	9,400
Year 10 Shoulder	+300	+200	+100

Generation Modeling

- Existing generator data
  - Annual updates requested from GOs in Q3 of each year
- Generation additions
  - Only add generators with signed interconnection agreements
  - Additions modeled at MISO Facility study location
- Generation retirements
  - Generators with a completed MISO Attachment Y are modeled as retired, unless there is an SSR agreement
- Intact system and outage conditions
  - Maintain voltage criteria for
    - 90% maximum generator reactive power output
    - 90% minimum generator reactive power consumption

Generation Dispatch

- Local Balancing Area merit order dispatch:
  - Used for Assessment summer peak and shoulder models. Local Balancing Area dispatch from merit order provided by LBA
- ATC-wide merit order dispatch:
  - Minimum load models
  - ATC-wide merit order dispatch determined with PROMOD
- Generators without scheduled transactions:
  - If signed IA, generation included in the host Local Balancing Area.

No Load Loss Allowed Contingency Analysis

- Peak
  - 1, 5, and 10 year out models
- Shoulder (firm)
  - 5 and 10 year out models
  - 70% load except for Zone 2 (90% load) and northern Zone 4 (80% load)
  - Shoulder rating methodology
- Minimum load
  - 1 and 5 year out model
  - 40% load

Additional Network Planning Studies

- Load Loss Allowed
- Existing Generator Stability Reviews
- Annual Fault Study
- High Bias Study
  - Identify next few limiters
  - Just informational

Other Solution Considerations

- Preliminary process developing with our stakeholders
- Two ways process can be initiated
  - Need initiated by local distribution provider
    - Identify T or D related reliability/service concerns
    - Develop needs and solutions
    - Communicate with ATC to promote collaboration
      - Use existing D-T or G-T processes
  - Need initiated by ATC
    - 10-Year Assessment screening – develop Needs/Limitations lists
    - Customers/stakeholders engage ATC with ideas
    - Collaborate to identify possible DER options from customers
    - Open project development discussions
    - Use modified BVP practices to balance comparison of appropriate alternatives

Needs Table Example (Sample)

Model	Planning Zone	Monitored Facility	Category	% of Facility Rating	% of Nominal Bus Voltage	Mitigation
2023 Peak	5	Port Washington - Saukville 138-kV line 742	P12	101.3%	--	2021 Port Washington - Saukville: Rebuild Line 762 to a double circuit
2023 Peak	3	Portage - Columbia 138-kV line X-13	P12	103.3%	--	Transitional Rating until 2023 Cardinal - Hickory Creek 345-kV line construction
2023 Peak	4	Plymouth 4 138-kV Bus	P21	--	78%	Holland Substation, UVLS Relaying Addition
2023 Peak	4	Howards Grove 138-kV Bus	P21	--	81%	Holland Substation, UVLS Relaying Addition
2028 Peak	5	Port Washington - Saukville 138-kV line 752	P12	100.8%	--	2021 Port Washington - Saukville: Rebuild Line 762 to a double circuit
2028 Peak	5	Charter Industrial 138-kV Bus	P21	--	68%	Holland Substation, UVLS Relaying Addition
2028 Peak	4	Holland 138-kV Bus	P21	--	73%	Holland Substation, UVLS Relaying Addition

Regional Planning

- MTEP
  - Preliminary screening helps ATC to better prepare for upcoming MTEP cycle
- MISO Coordinated Seasonal Assessments
- ERAG/MMWG Seasonal Assessments
- RF Seasonal Assessments

Public Policy Requirements

- Following MISO Tariff (Attachment FF) Processes

- Previously identified requirements
  - State Renewable Portfolio Standard (RPS) mandates
  - EPA regulations
  - State mandates and goals for energy efficiency (EE) and demand side management (DSM) programs

- Any public policy requirements not identified in ATC or MISO processes?

Schedule

- Expected Load Forecast – Done
- Criteria and Methodology Update – Done
- Preliminary MTEP18 Support Study – Done
- Post 2018 TYA Preliminary Study Design – Done
- Stakeholder Study Design Meeting – October 24, 2017
- Stakeholder Design Comments Due – December 1, 2017
- Study Design Completion – December 2017
- Model Development Completion – March 2018
- Preliminary Needs Meeting – March 1, 2018
- Preliminary Solutions Meeting – May 3, 2018
- Document and Publish – September 2018

Thank you for Participating

To provide solicited comments or for more information, please contact

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By December 1, 2017