



NETO Asset Management Process

Planning Advisory Committee Meeting

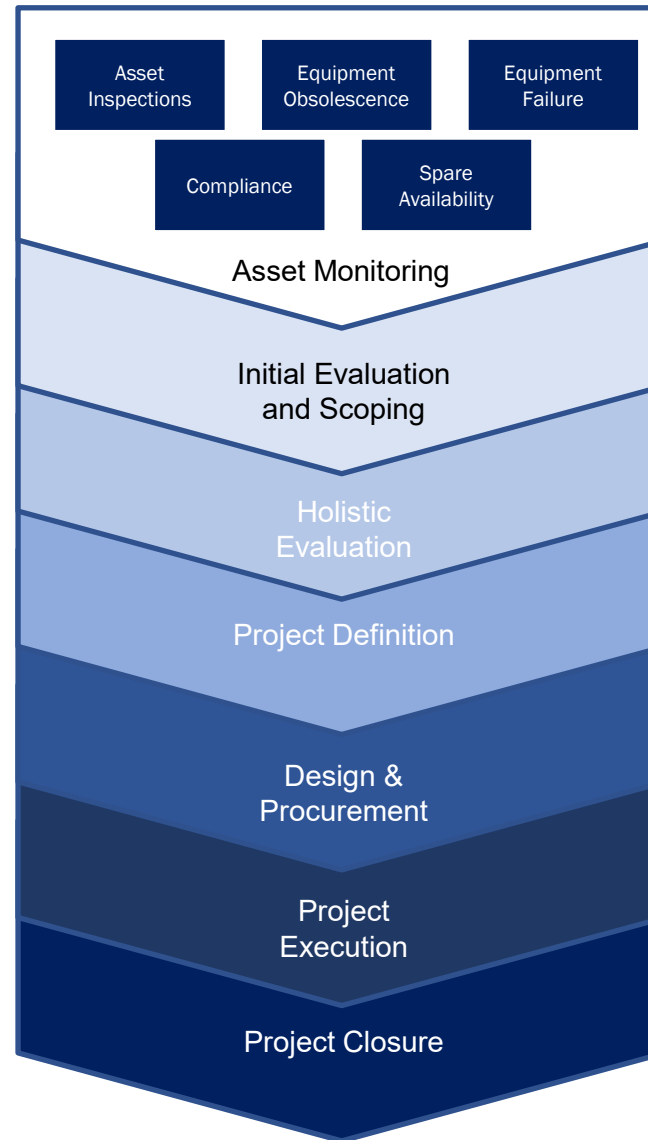
Presented by Rafael Panos, National Grid

October 18th, 2023

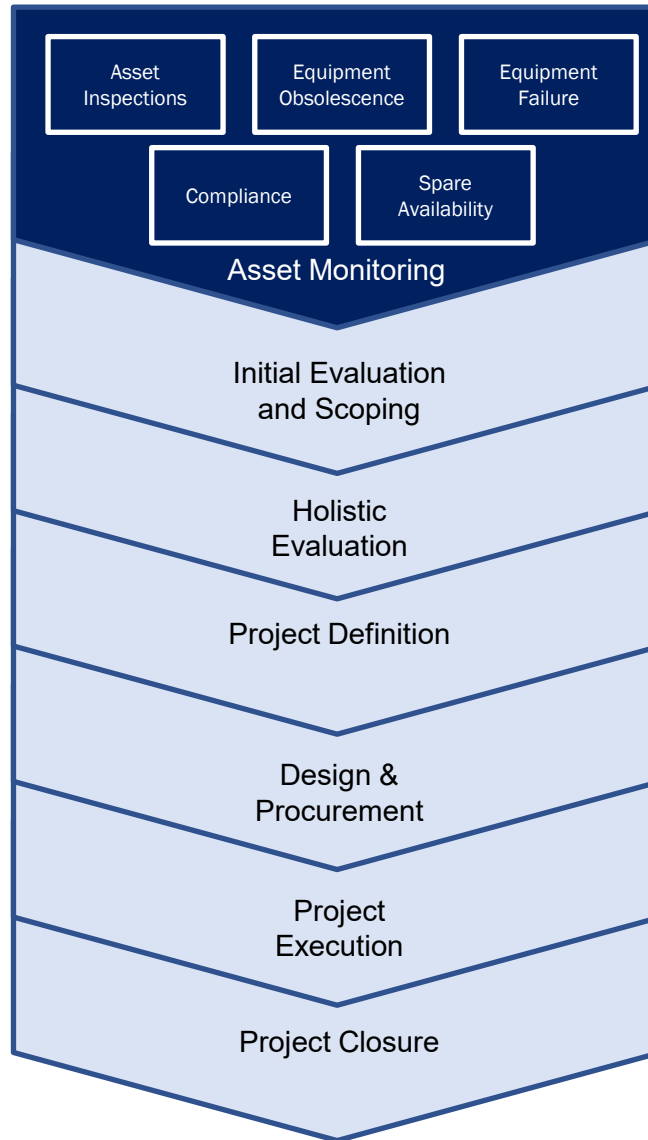
Agenda

- Asset Management Process Overview
- Assets Monitoring & Condition Assessment
- Initial Evaluation and Scoping
- Holistic Evaluation
- Project Definition
- Examples
- Best Practices and Key Takeaways

Asset Management Process Overview



Assets Monitoring



Red Flags Verification and Analysis coming from:

- Asset Condition / Inspections
 - Periodic inspections on all assets in all right-of-ways and within substations
 - Evaluation of equipment test results
- Equipment Obsolescence
 - Based on manufacturers notification of obsolescence
- Equipment Failure
 - Tracking of current and historical equipment failure
- Compliance
 - Compliance with our design standards and regulatory compliance (NPCC Directory 4, CIP, FAC-008, etc.)
- Spare Availability
 - Spare component availability is essential for maintenance and continuity of operations

Identification of initial scope of work
Trigger Project Initiation

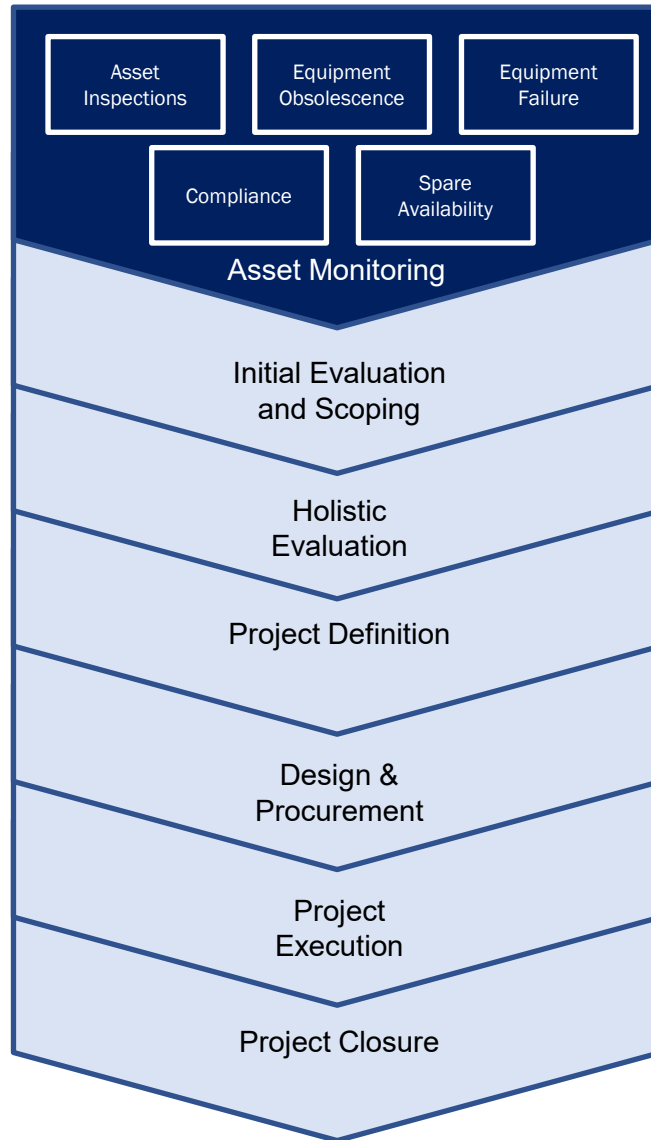
Asset Condition / Inspections – Overhead / Underground Lines

	Eversource	Avangrid	National Grid	VELCO	Versant	Rhode Island Energy
Ground Inspection	8 years wood 16 years steel	10 years (5 years if rated "fair")	5 year (entire system) 10 years (Wood Pole inspect and treat) 20 years (steel structure coating/foundation/ footers)	8 years wood 20 years steel	Wood ROW 10 year Excavate and treat, 5 year retreat Wood Roadside 6 Year Sound and bore. Steel 5 year	3-5 year cycle based on asset risk
Drone Inspection	Every year ≥ 200 kV 2 years < 200 kV	10 years UI 10 years CMP if non-climbable	As needed	8 years	10 year	As needed
Visual Helicopter Inspection	As needed	Twice a year	Twice a year	Twice a year	Twice a year	Annual
Climbing Inspection	N/A	10 years CMP	N/A	As needed	As needed	N/A
Infrared Helicopter Inspection	As needed	Annual	Annual	Annual	As needed	Annual
Underground Vault Inspections	Every 5 years	1 and 2 year cycles	Annual	N/A	Annual	As needed
Cathodic Protection Inspection	Annual for entire system Every other month for equipment	Annual	Every other month	Annual	N/A	N/A

Asset Condition / Inspections – Substation Equipment

	Eversource	Avangrid	National Grid	VELCO	Versant	Rhode Island Energy
Visual Inspection	Monthly	Every other month plus annual comprehensive	Every other month	Monthly	Monthly	Every other month
Infrared Inspection	Twice a year	Twice a year	Annual	Twice a year	Twice a year	Annual
Transformer Dissolved Gas Analysis	Continuous alarms, with annual sampling	≤ 115 kV Annual 345 kV twice a year	69 -115kV Annual 230 - 345kV twice a year	Continuously on some large transformers Manually: Once a year	Annual on < 345kV Twice a year on 345kV	Annual
Transformer Offline inspection	6 or 12 years	LTC transformers are 4-8 years Non-LTC transformers are 12 years	12 years	Every six years	Various periods (LTC vs non-LTC)	12 years
Civil-Focused Inspection/Survey	6 or 12 years	Every 4 years	As needed	N/A	As needed	As needed

Assets Monitoring – Wood Pole Example

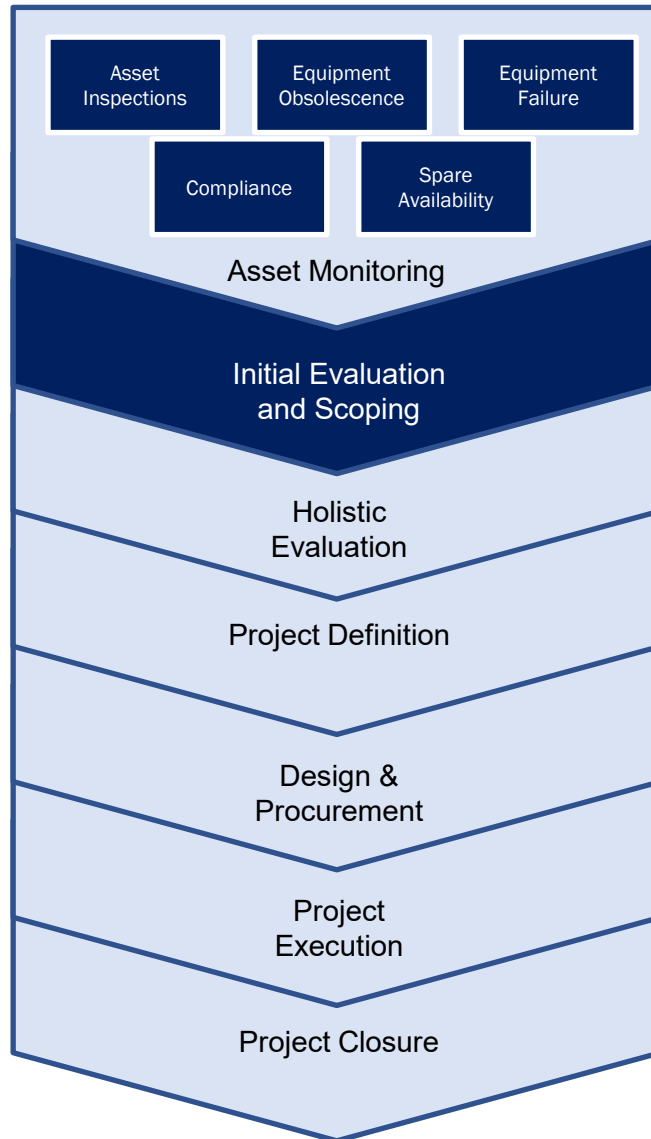


115 kV Line AAA Wood Pole Inspections

- Biennial drone inspections revealed asset condition issues on a subset of wood structures on 115 kV line AAA
 - Of 100 existing wood structures originally installed in 1980, 20 were found to have 1 or more of the following issues:
 - Significant pole top rot
 - Moderate woodpecker damage
 - Significant pole cracking/splitting



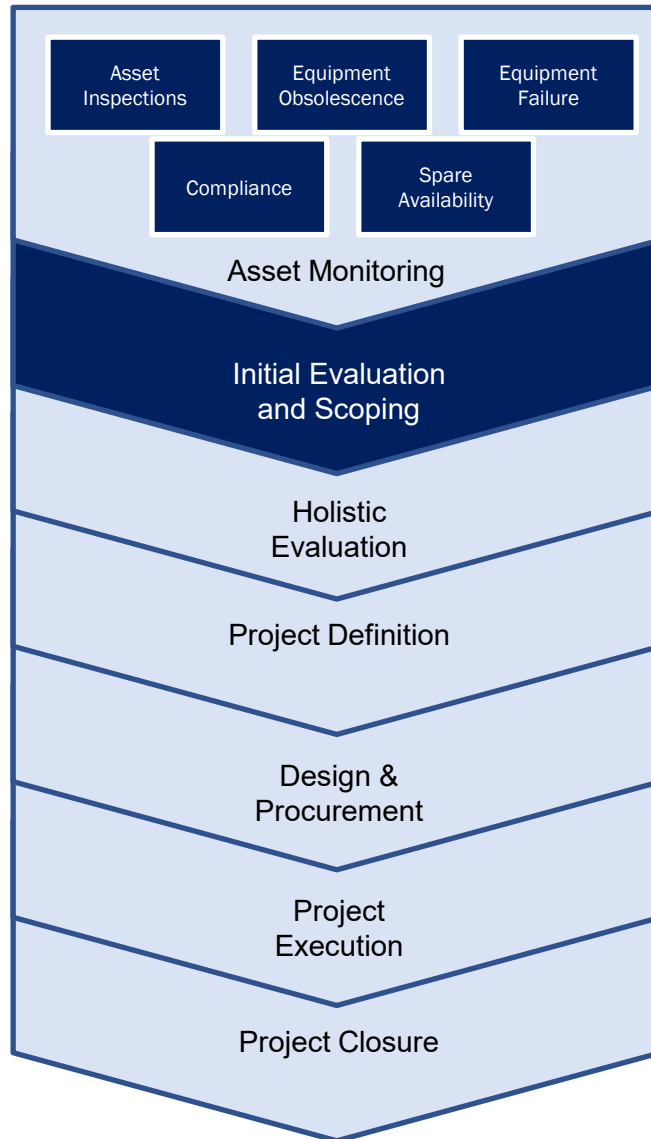
Initial Evaluation and Scoping



- Condition Assessment
- Seed Funding
 - Funds are allocated to further study the initial scope of work and any possible enhancements
- Resources Assignment
 - Project Manager, Engineering, etc.
- Schedule Initiation
 - Tentative Milestone Schedule is used to start a project schedule; refined by the project team as the project evolves

**Project Team Assembled, Funds Available,
Initial Project Schedule**

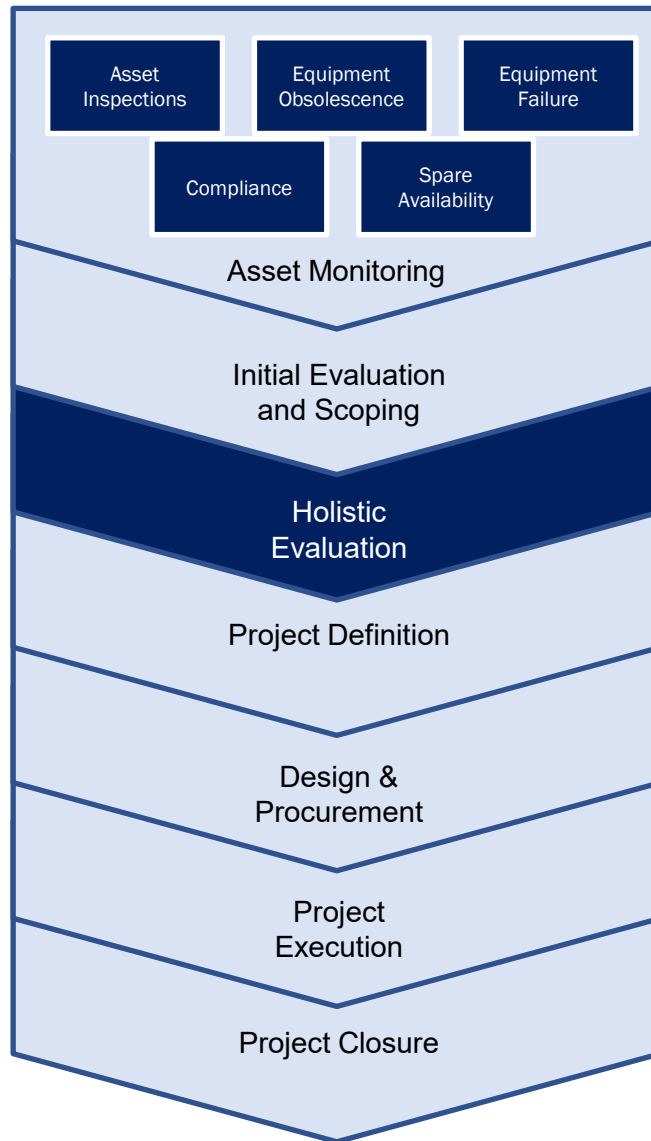
Project Initiation - Wood Pole Example



- With inspections of line AAA complete and asset condition issues identified, a project team is formed
- Initial funds are allocated to the project to further study the identified issues
- The project team develops project scopes and identifies any enhancements to the scope
- A tentative schedule is laid out to get the project through development and on to Execution



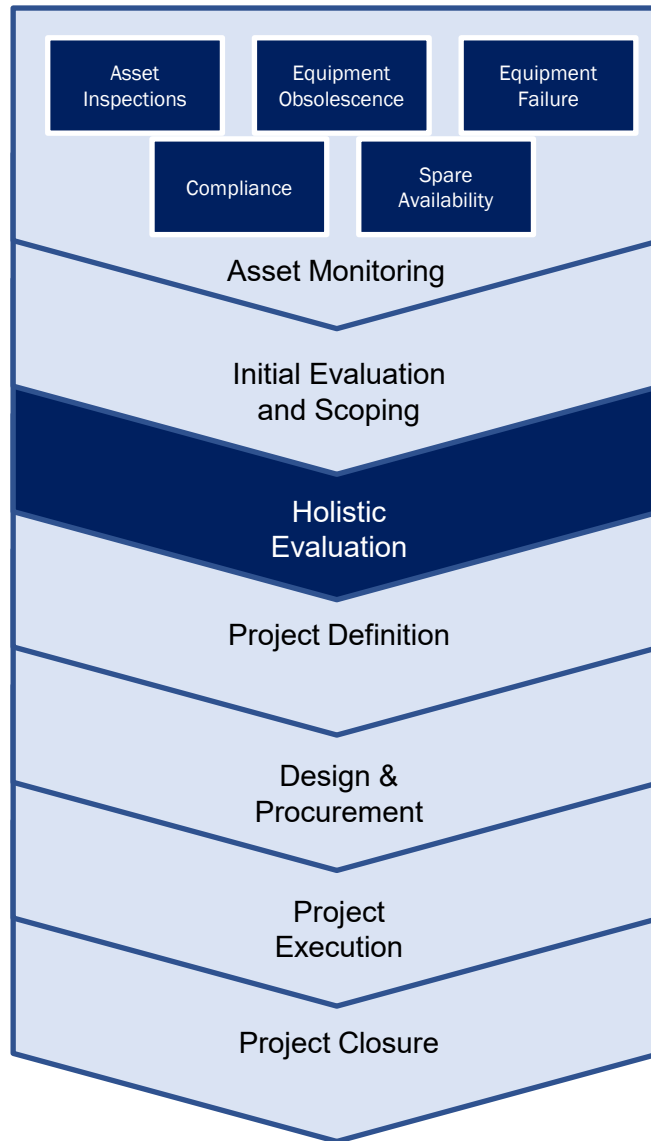
Holistic Evaluation



Based on initial scope of work:

- **Conceptual Engineering**
 - Initial selection of new equipment/materials, location
- **Conceptual Constructability Review**
 - Initial review of access, permitting needs, rights-of-way, compliance, etc.
- **Project Efficiencies Exploration**
 - Coordination with other projects
 - Opportunity to address additional scope/needs
 - Opportunity to address additional scope/needs may trigger alternatives with potential scope enhancement and/or engineering design modifications
 - Examine line resiliency, for example suitability for regional storms

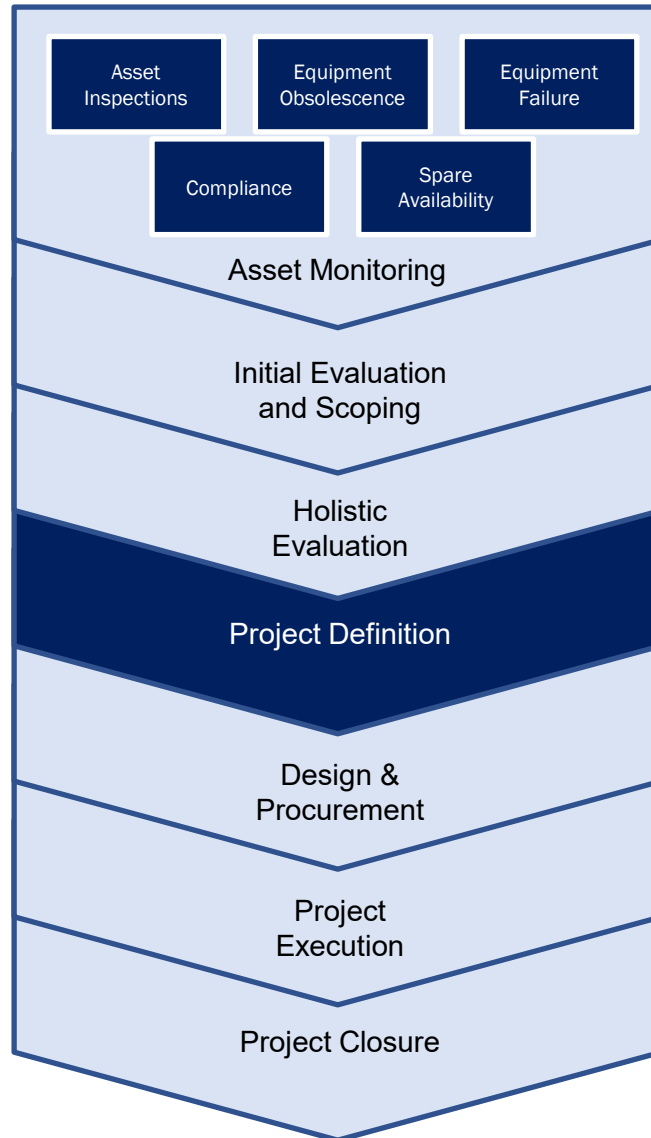
Holistic Evaluation - Wood Pole Example



- After analysis, the project team determined the following:
 - Difficult terrain was identified along the ROW, which will require additional matting to limit environment impact and provide safe working environments
 - 5 additional wood structures that are adjacent to existing identified structures are also considered for replacement due to need to be addressed in near future
 - Takes advantage of access and permitting efficiencies
 - Steel monopoles are selected to replace the wood structures due to increased longevity and reliability



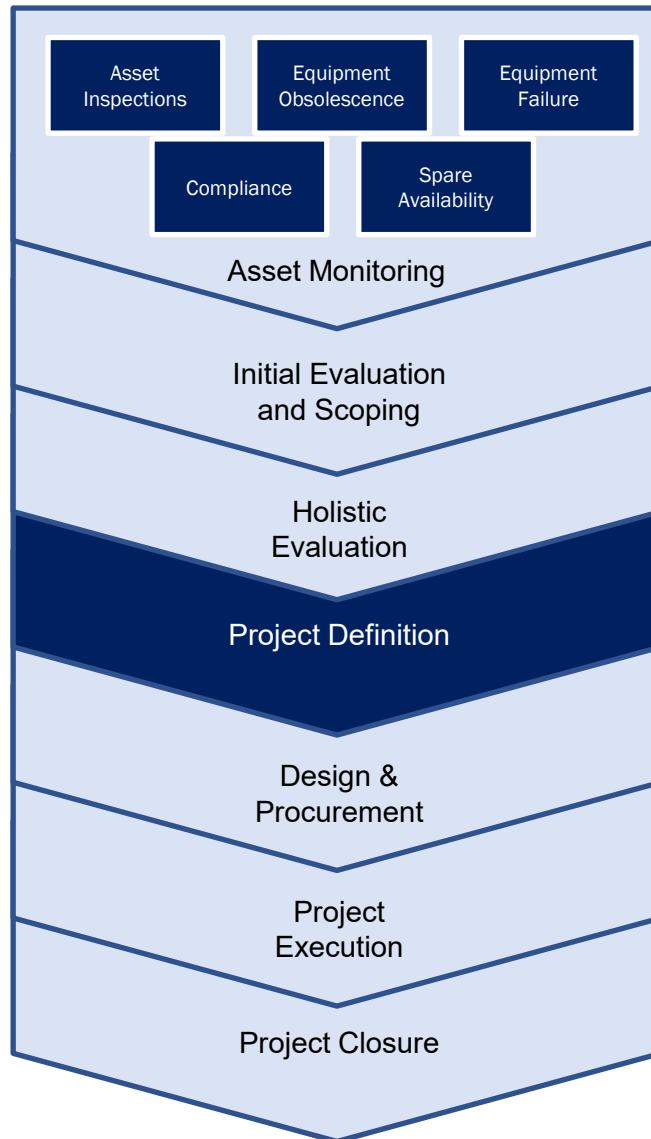
Project Definition



- Alternatives Analysis
 - Initial Pro/Cons analysis along with rough cost estimates
 - Pro/Cons analysis along with conceptual estimate (-25%/+50%), if initial alternative analysis is not conclusive
- Selection of Preferred Alternative
- Preliminary Engineering of Preferred Alternative
- Constructability Review
- Finalized Planning Grade Cost Estimate (+/-25%) of Preferred Alternative
- Project Full Funding

Project Scope has been Finalized, project cost estimated, and funds approved

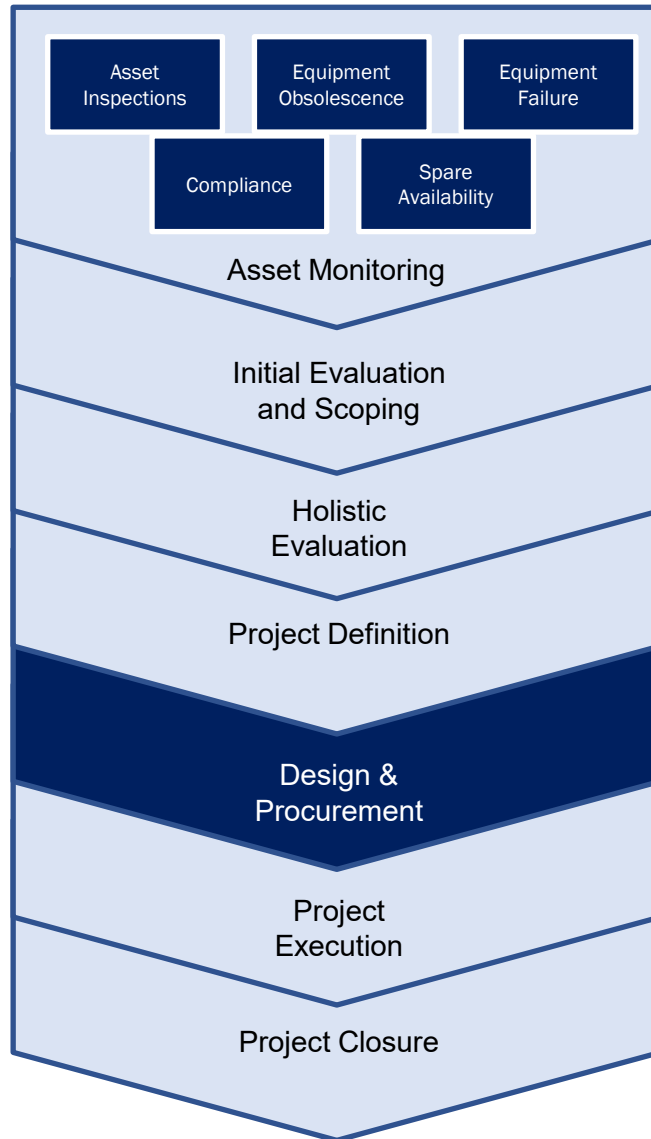
Project Definition - Wood Pole Example



- Two alternatives were developed for consideration:
 - Replace 20 wood structures with asset condition issues with steel monopoles
 - Replace combination of 25 wood structures (20 asset condition and 5 to increase long-term efficiency) with steel monopoles
- Company-internal committee review decided the expanded scope would be more cost-effective and reliable solution
- Preliminary engineering of preferred alternative and a constructability review completed
- Full funding acquired after management review, and final design and materials procurement commenced

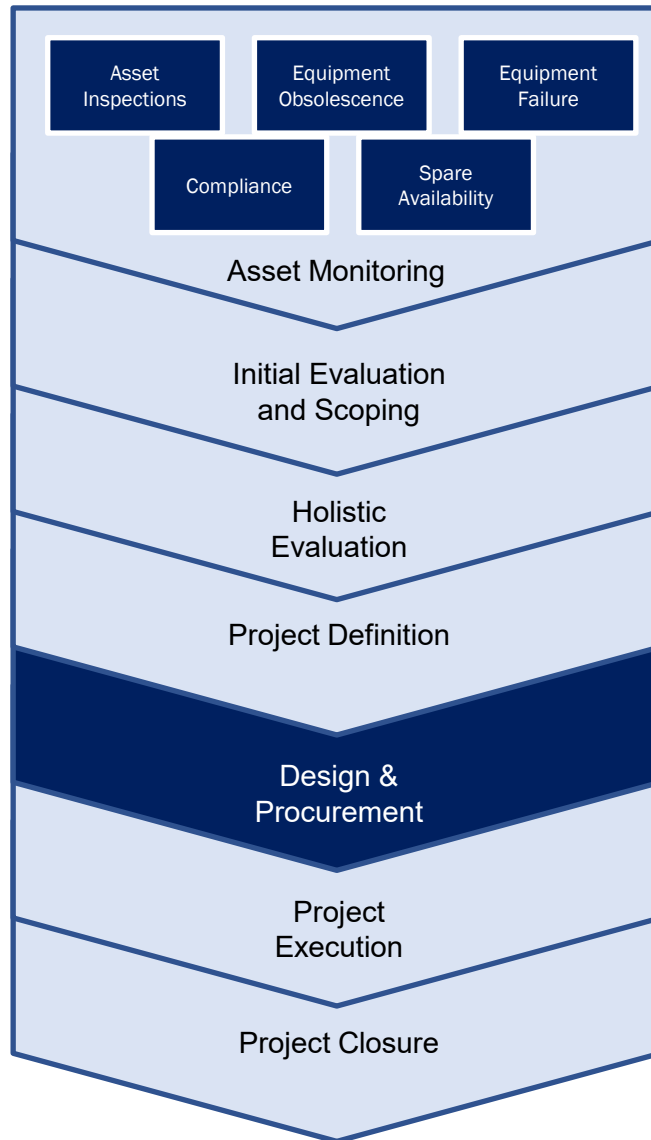


Design & Procurement



- Project Management
 - Schedule
 - Costing/forecasting
 - Risk assessment
- Issue Construction Drawings
- Outages/Planning/Coordination
- Project siting/permitting and outreach activities
 - Siting/permitting/outreach strategy development
 - Document development and submission
- Materials procurement
- Request for Proposal (RFP) / competitive bid for Construction Services

Design & Procurement - Wood Pole Example

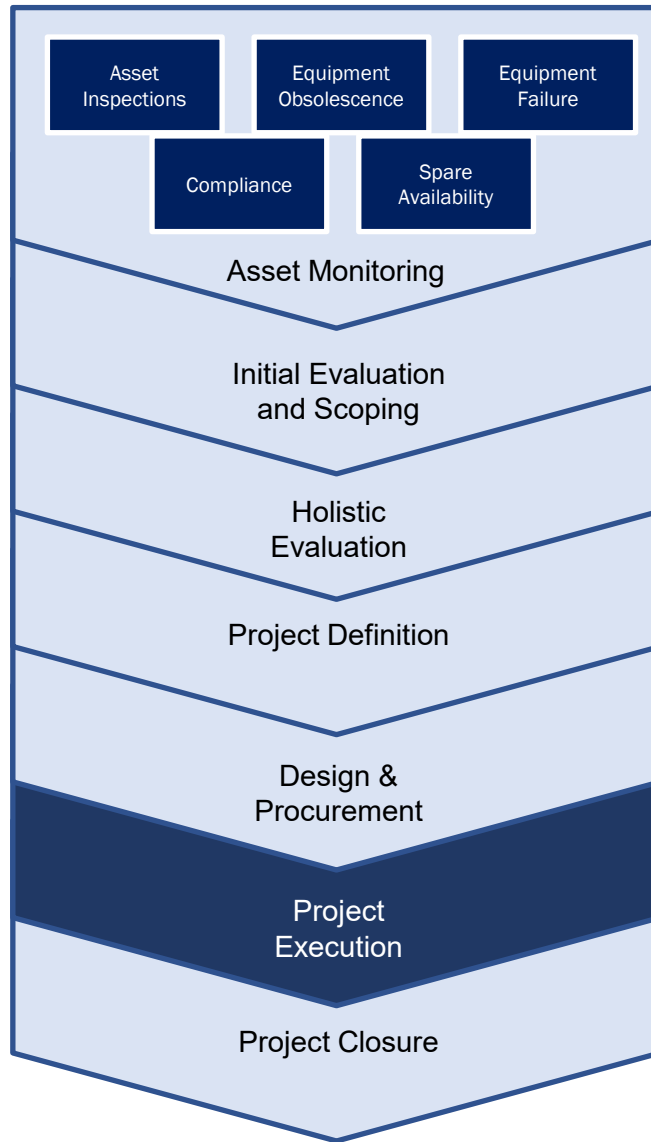


- Project Manager takes over the Line AAA project

- Cost forecasting and schedule management for all teams involved
- IFC design for pole replacements finalized with engineering
- Outage planning and coordination developed with necessary stakeholders to guarantee that Line AAA outage will not cause reliability issues in region
- Siting and Permitting applications acquired with minimal outreach needed due to minor change in ROW design
- Procurement of steel monopoles initiated, including a price guarantee
- Coordinated the development of RFP documentations to support a competitive bid/direct award for Construction Support
- With all necessary construction readiness documentation and construction vendor contracts authorized, Project Execution may begin

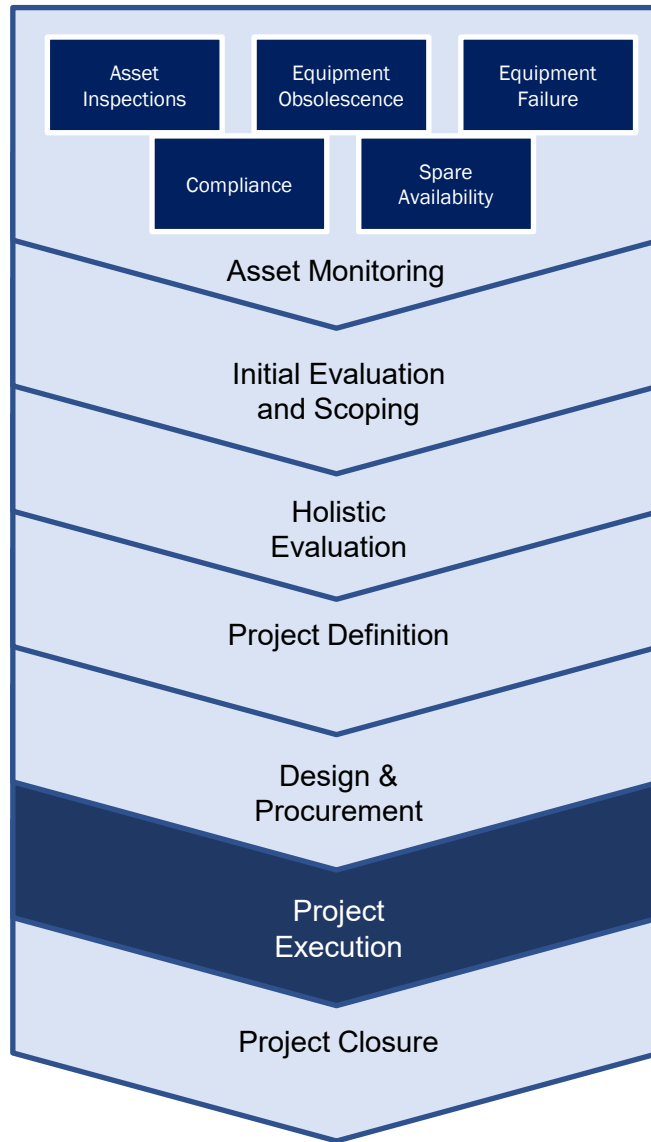


Project Execution



- Construction
 - Materials & Site Mobilization
 - Pre-Construction Authorizations
 - Monitoring variance/construction status
 - Scope
 - Schedule
 - Cost and Forecast against budget
 - Field Request For Information (RFI) resolution
 - Safety and Compliance Audits & Incident Investigation
 - Risk and Change Management

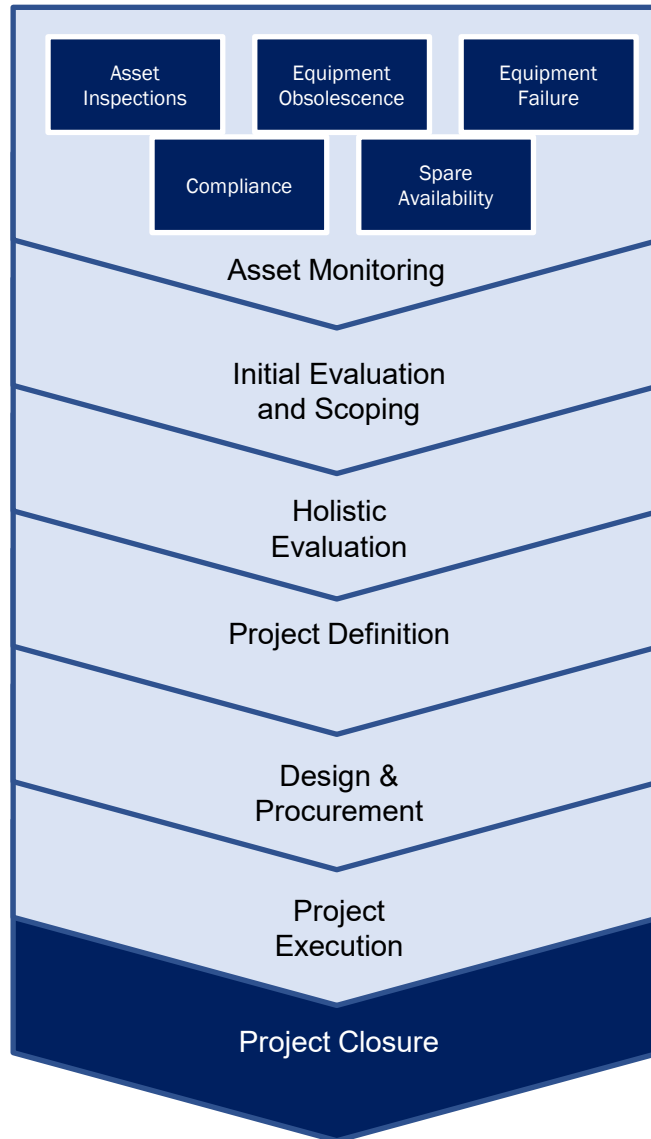
Project Execution - Wood Pole Example



- Project team conducts a construction kick-off meeting
- Construction meetings are set up weekly to review progress, challenges, issues as poles within the scope are being replaced
- Inclement weather delays the construction by several days, extending construction time
 - Additional days drive project cost increases
- With scope completed, the Line AAA outage is canceled, and its assets are placed back into service
 - As-built and relative maintenance and asset tracking date is captured and provided to necessary support teams
- Construction site is broken down and demobilized
- Clean up activities commence, and several customer concerns are addressed due to vehicle wear on ROW access

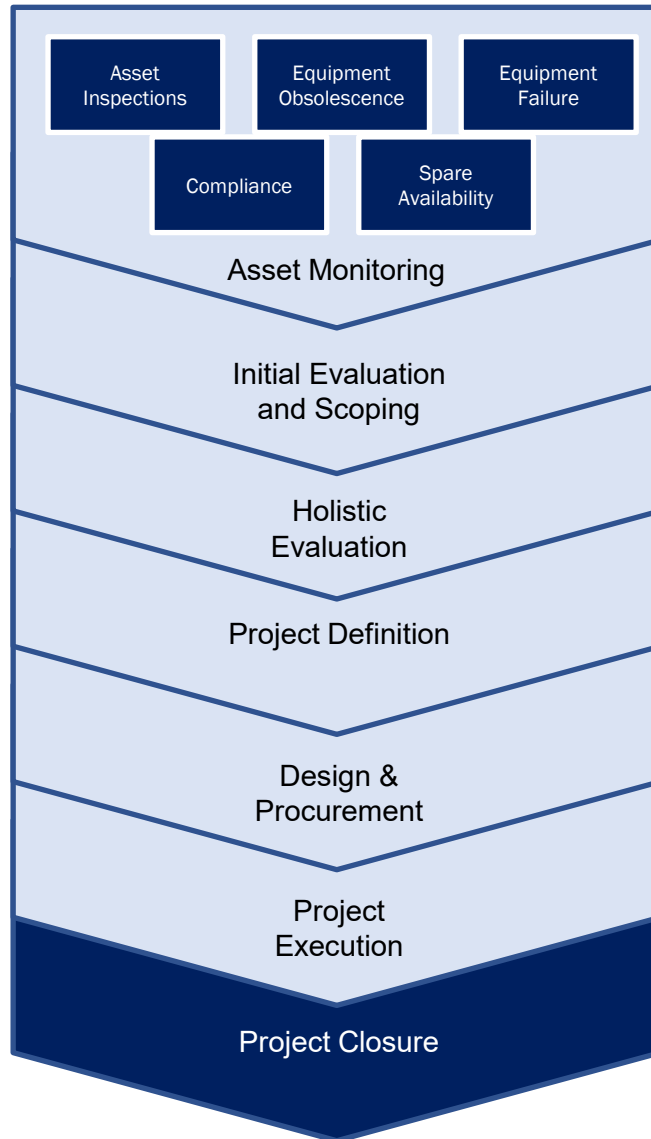


Project Closure



- Occurs after new facilities are placed in-service
 - Project Work Order closeouts
 - PO commitment values reconciled and closed out following final invoicing
 - Invoice processing and payment
 - Material reconciliation/returns/investment recovery coordination
 - Units of property development
 - Project administration closeout
 - Lessons learned documentation
 - Turnovers of applicable documentation/info for Maintenance Organization
 - Asset Tracking Tools updated
- Actual Final Cost determined

Project Closure - Wood Pole Example



- Final budget and schedule recorded
 - Project 2% under budget due to limited need for contingencies
- Record any safety incidents:
 - A contract worker backed truck into a structure with minimal vehicle damage
- Collect and compile all necessary post construction documentation and provide to the appropriate teams
- Final cost communicated to finance departments
- Financial closeout of the project



Transmission Line Example

- MEPCO 345kV Structure Replacements
 - Jointly owned by CMP and Versant
 - Lines constructed in the late 1960's consisting of wood H-frame structures and bundled 850.8 kcmil ACSR conductor
 - Rejected poles and crossarms were identified through the inspections and required replacement
 - Focused on Sections 388, 3023, 396, and 3001
 - Performed targeted structure replacements of 69 structures on Sections 396 and 3001
 - Replaced all original structures leaving existing conductor for Sections 388 and 3023

Transmission Line Example

- Eversource Laminate Wood System (LWS) Structure Replacement Program
 - Previous projects (structure and arm replacements) revealed additional concerns about the overall integrity of LWS poles (rot, woodpecker damage, pole top rot)
 - The integrity of the laminated wood structures cannot be measured by conventional visual inspection methods and the remaining strength cannot be estimated because typically laminated wood is found to be rotting from within or under the mounting brackets
 - This type of damage is not visible during aerial or ground inspections
 - Eversource initiated a proactive system-wide program to replace all LWS

Transmission Line Example

- NEP 69kV A-1 & B-2 Asset Condition Rebuild
 - Originally constructed in 1909 with a total length of 60 miles
 - Mainline structures consisting of lattice towers and taps using H-frame wood structures
 - Condition concerns were identified through aerial and foot patrol inspections identifying need of replacement
 - Proposed entire rebuild on the mainline and taps to 115kV construction using steel poles
 - Install new new conductor and OPGW on the mainline and taps

Substation Examples

- Eversource Relay Replacement Program
 - General Electric issued product advisory letters stating that specific GE Central Processing Units (CPUs), Power Supply Modules, and UR Firmware would no longer be manufactured
 - Product support ended in 2020
 - Eversource has observed a marked increase in the number of GE relay modules that have failed and caused mis-operations
 - Eversource initiated a program to address and replace GE Relays with priority on the relays that would
 - No longer be supported by GE and,
 - protect BES or BPS substations
 - Eversource has standardized on Schweitzer relays as the replacement unit

Best Practices and Key Takeaways

- The asset management process is a continuous cyclical process that requires constant attention from a diverse team of subject matter experts to maintain a cost-effective, safe and reliable system
- A holistic approach to transmission asset management provides the most economical and efficient path to meet regional system reliability needs
- Project scope and complexity varies greatly, meaning projects can take between months and years to execute
- This process differs slightly within each New England Transmission Owner, but all NETOs have the same high-level approach to prudently maintaining their assets and overall system reliability

Tentative PAC Discussion Schedule

Date	Topics
July 25 (completed)	<ul style="list-style-type: none">▪ RNS rate overview and forecast, with additional asset condition forecast information
August 16 (completed)	<ul style="list-style-type: none">▪ Guidelines for asset condition PAC presentations▪ Cost estimating process
September 20 (completed)	<ul style="list-style-type: none">▪ Status update on asset condition database
18-Oct	<ul style="list-style-type: none">▪ Asset management process presentation
15-Nov	<ul style="list-style-type: none">▪ Guidelines for asset condition PAC presentations – Update▪ Five year forecast of Asset Condition projects
20-Dec	<ul style="list-style-type: none">▪ Publication of initial asset condition database▪ Asset Condition Guidance Document – Progress update

Topics and timelines subject to change

- 2024 schedule will be provided later this year
 - Planned presentations include but are not limited to:
 - Q1 2024 - NETO response to stakeholder comments on Q4 2023 presentations
 - Q2 2024 - Asset Condition Guidance Document – Progress update

Questions

