Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: May 16, 2022 **Date of Response: May 27, 2022**
Data Request No. DOE 6-001 **Page 1 of 1**

Request from: Department of Energy

Witness: Johnson, Russel D

Request:

For 2020 (or nearest year available) for the NH system, please provide the total number of customers segregated by residential, industrial, commercial, and other.

Response:

In 2020, Eversource served customers in the following customer classes:

Residential	446,612
Commercial	75,849
Manufacturing	2,719
Public Streetlighting	753
Total Retail	525,933
Other Utilities	12
Grand Total	525,945

Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: May 16, 2022 **Date of Response: May 27, 2022**
Data Request No. DOE 6-002 **Page 1 of 1**

Request from: Department of Energy

Witness: Johnson, Russel D

Request:

For 2020 (or nearest year available) for the NH system for each of the following system-wide annualized totals, please provide in tabular format the % residential, % industrial, % commercial, and % other: a) coincident peak MW load; b) average MW load; d) minimum MW load. Please define "peak," "average," and "minimum" as they apply to this response.

Response:

Rate Class	2020 Coincident Peak		Average		Minimum	
	MW load	%	MW load	%	MW load	%
R	864.068	50%	369.867	44%	180.989	38%
G	321.512	19%	180.056	21%	103.552	22%
GV	340.27	20%	175.179	21%	115.694	24%
LG	207.947	12%	122.62	14%	73.478	16%
Total	1733.797		847.722		473.71	

2020 Coincident Peak - The rate class loads in kW on 07/27/20 at hour ending 18 DST
Average – The mathematical average of all hourly loads for that rate class over the 2020 calendar year.
Minimum – The smallest load noted in a single hour out of all the hours for that rate class in the 2020 calendar year.

Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: May 16, 2022 **Date of Response: May 27, 2022**
Data Request No. DOE 6-003 **Page 1 of 2**

Request from: Department of Energy

Witness: Hebsch, Jennifer J

Request:

Reference data response DOE 4-2. Please supply the following information for the T&D Engineering Standards Bookshelf:
a. "Screen Shot of Books" in pdf format of what the user sees when the Bookshelf is initially accessed.
b. Table of contents for each book/standard in the Bookshelf.
c. Process for adding-to and/or updating Bookshelf contents.

Response:

a. Attachment DOE 06-003(a) is a pdf screen shot of the Standards Bookshelf.

b. Attachment DOE 6-003(b) includes the table of contents, as applicable, for each book in the Standards Bookshelf.

Distribution System Engineering Manual – Only the front page/contents of this book is attached.
Emergency Procedures – Only the front page/contents of this book is attached.
Maintenance Program - EMP – Only the front page and index for this book is attached.
Material – Only the front page/contents of this book is attached.
New Services – The front page of the book is attached with the NH Requirements for Electric Service Connections table of contents.
Overhead – Only the front page/contents of this book is attached.
Specifications – Only the front page/contents of this book is attached.
System Planning – All table of contents attached.
Tool & Equipment – Only the front page/contents of this book is attached.
Transmission & Substation – All table of contents attached.
Underground - Only the front page/contents of this book is attached.
Work Methods – Two levels into the table of contents of this book is attached.

Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: May 16, 2022 **Date of Response: May 27, 2022**
Data Request No. DOE 6-003 **Page 2 of 2**

The Company's **Environmental and Facility Procedures** is no longer populated and therefore is not included in Attachment DOE 6-003(b).

c. Attachment DOE 6-003(c) is TD Procedure - TD003 Document Control Process which describes the process for adding-to and/or updating Bookshelf contents.

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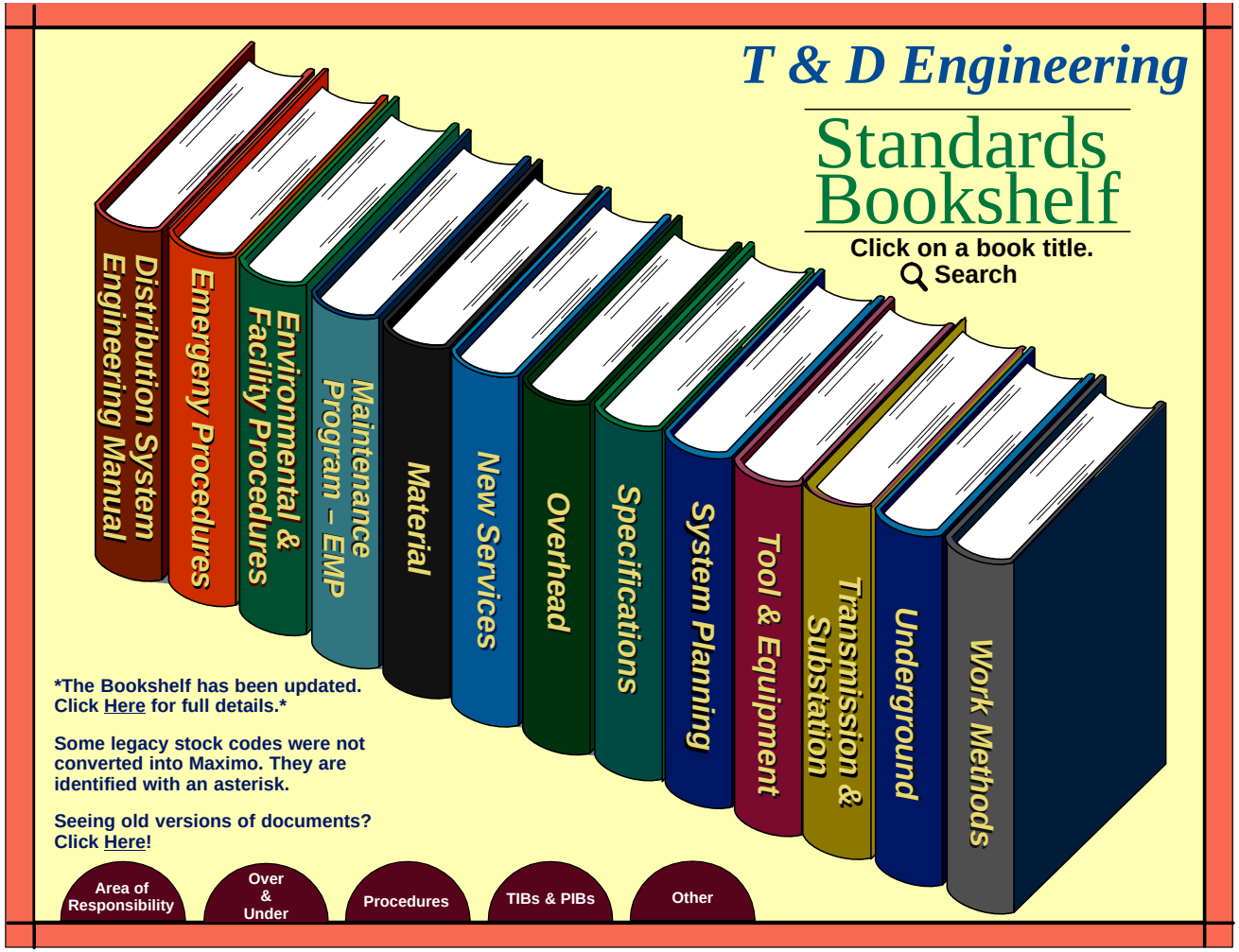

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Distribution System Engineering Manual

01 – General
02 – Reliability
03 – Economics
04 – Calculations
05 – Design General
06 – Overhead Design
07 – Underground Design
08 – Conductors
09 – Arresters
10 – Protection
11 – Switches & Switchgear
12 – Capacitors
13 – Regulators
14 – Transformers
15 – Overhead Services & Secondaries
16 – Underground/DB Service & Secondaries
17 – Power Quality
18 – Substation
19 – Distributed Generation

Common Abbreviations:
By Name
By Abbreviation

Index of Distribution Engineering Reports (DERs)

Eversource Standard Consolidation

Technical Information

EVERSOURCE
Changes / Additions

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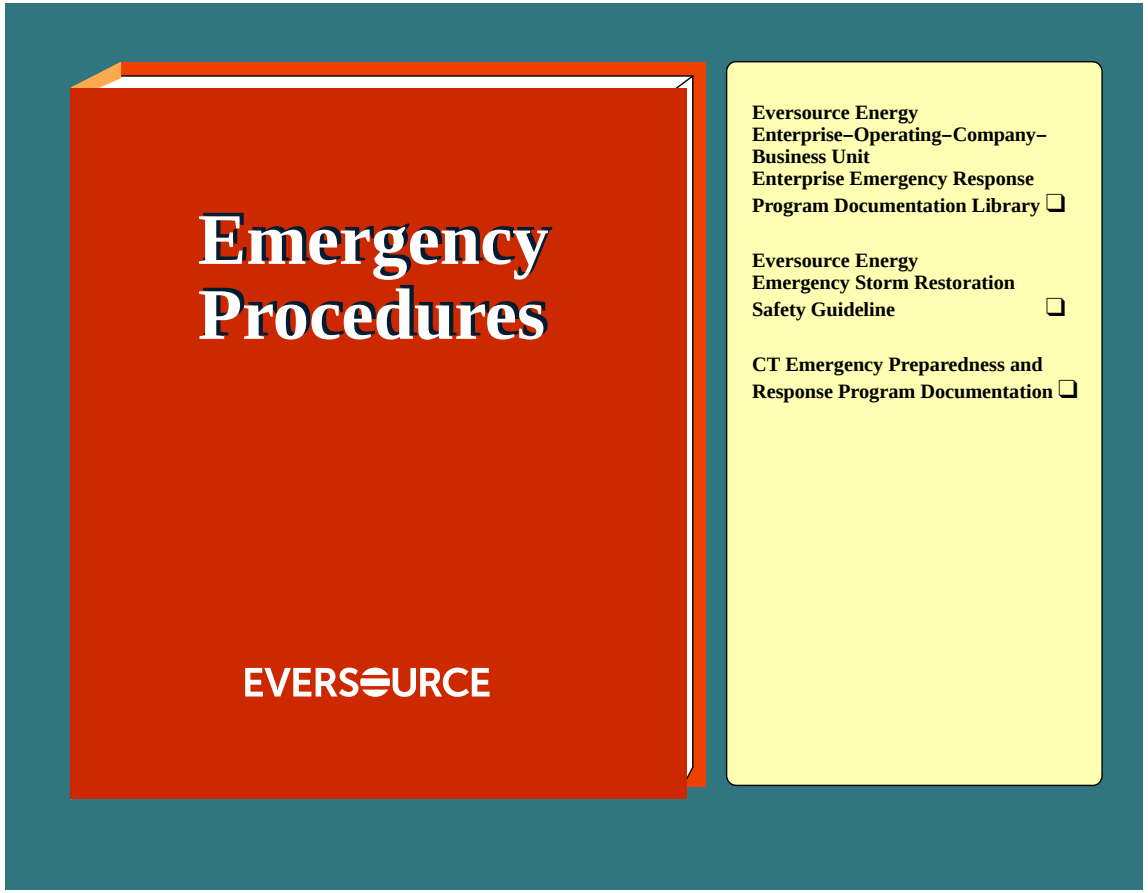

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Eversource Maintenance Program

Maintenance Books

- Transmission & Distribution System
- Gas System

User Feedback System

- Submit New Feedback
- Feedback History
- Print User Feedback Form

EVERSOURCE

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INDEX OF EVERSOURCE MAINTENANCE PROGRAM

Subject	Document Number	Revision Number	Effective Date MM/DD/YYYY
Maintenance Policy	n/a	2	8/6/2014
Introduction - Distribution Maintenance	5.00	5	10/1/2013
Spare			
Aircraft Warning Lights	5.74	1	7/1/2015
Arresters, Lighting	5.25	7	1/1/2017
Spare			
Batteries and Chargers	5.03	6	8/31/2016
Spare			
Cable Pump Houses & Controls	5.68	0	6/1/2015
Capacitors	5.05	5	7/1/2015
Circuit Breakers			
SF6	5.38	5	6/21/2021
Oil	5.39	6	6/21/2021
Vacuum, outdoor	5.40	6	6/21/2021
Air	5.41	6	6/21/2021
Circuit Breakers - Vacuum, Switchgear	5.42	5	7/1/2015
Circuit Switchers	5.07	3	6/1/2015
Spare			
Compressors - Air	5.08	4	6/1/2021
Customer Above Ground Installations	5.10	3	7/1/2015
Direct Buried Systems	5.11	4	6/1/2015
Spare			
Fault Indicator, Overhead	5.32	3	1/1/2017
Spare			
Generator, Emergency	5.18	3	7/1/2015
Infrared Survey	5.22	5	7/1/2015
Load Tap Changers - Superseded by EMP 5.58	5.27	4	11/23/2021
Meters - Transducers	5.75	0	6/1/2015
Spare			
Network Protectors	5.29	3	7/1/2015
Neutral Isolations	5.66	3	7/1/2015
Spare			
Overhead Plant	5.33	5	1/1/2017
Poles, Metal Streetlight	5.52	3	7/1/2015
Poles, Wood	5.61	3	7/1/2015
Power Line Carrier	5.02	0	1/7/2021

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INDEX OF EVERSOURCE MAINTENANCE PROGRAM

Subject	Document Number	Revision Number	Effective Date MM/DD/YYYY
Reactor, Air Core	5.70	0	6/1/2015
Reclosers and Sectionalizers	5.44	4	7/1/2015
Regulators, Voltage	5.01	4	7/1/2015
Relay, Distribution Protective	5.17	3	7/1/2015
Spare			
Resistive Potential Devices - RPD	5.72	0	6/1/2015
Right of Way Inspection	5.45	4	1/31/2017
SCADA RTU	5.76	0	6/1/2015
Spare			
Static Compensator	5.69	0	6/1/2015
Streetlights and Floodlights	5.48	1	8/19/2011
Substation Property Inspection	5.56	3	8/31/2016
Spare			
Spare			
Switches, Disconnect	5.15	4	7/1/2015
Switches, Substation Vacuum	5.31	3	7/1/2015
Switches, Transfer	5.47	2	6/1/2015
Switches, Underground	5.51	2	7/1/2015
Switchgear, Metal-Clad	5.65	2	7/1/2015
Switchgear, Pad-Mounted	5.34	3	7/1/2015
Spare			
Touch Potential	5.62	2	7/1/2015
Transformer, Coupling Capacitor Voltage (CCVT)	5.71	0	6/1/2015
Transformers, Network	5.30	3	6/1/2015
Transformers, Potential	5.43	5	6/2/2021
Transformers, Station Service	5.67	0	6/1/2015
Transformers, Substation	5.58	5	7/1/2015
Transformers, Underground	5.55	3	7/1/2015
Transmission Cables	5.77	0	2/10/2016
Transmission Overhead	5.78	0	2/10/2016
Spare			
Spare			
Vault, Underground	5.59	4	10/12/2015
Vegetation Management	5.60	2	7/1/2015

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Material Book

By Name

A	I	R
B	J	S
C	K	T
D	L	V
E	M	W
F	N	Y
G	O	
H	P	

Catalogs

Common Abbreviations:
- By Name
- By Abbreviation

Legend
MSL

EVERSOURCE

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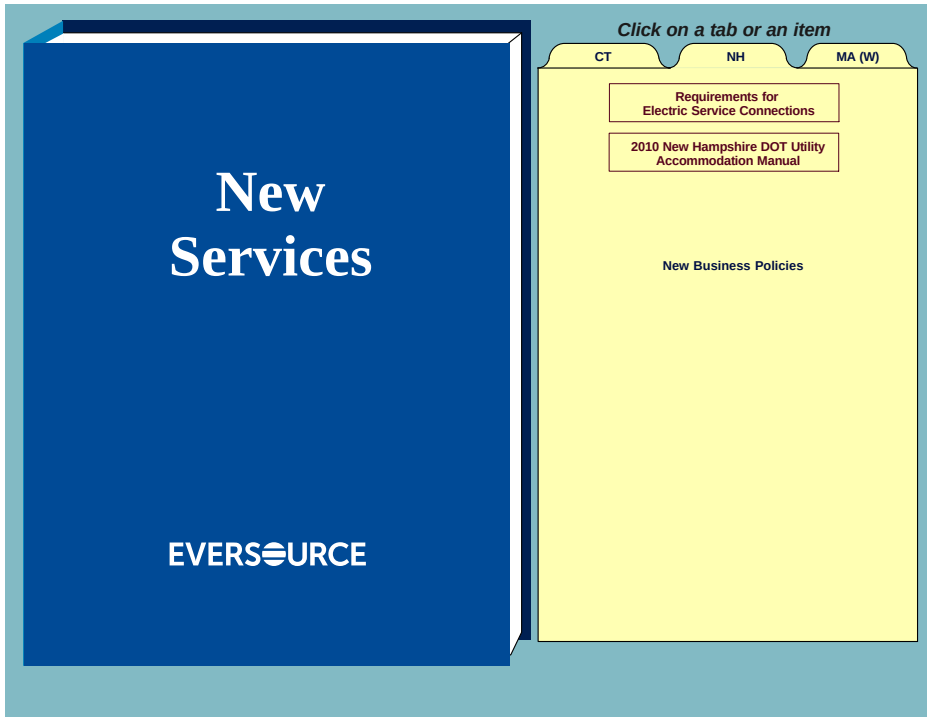

REQUIREMENTS FOR

Electric Service Connections

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TABLE OF CONTENTS (Cont.)

Overhead Distribution

Construction Standards

00 – General
03 – Construction Guidelines/ Line Sensors

04 – Clearances
05 – Poles
06 – Anchors, Guys & Pole Class
07 – General Information/ Antennas
08 – 4.8kV Pre-Build
09 – Conversions Minimum Reconstruction
10 – Distribution Pole Tops
11 – 27.6 kV & Multiple Circuits
12 – Risers
13 – Secondaries
14 – Services
15 – ADSS Fiber Optic Cables

OH DTR Locater

Search

Construction Standards

16 – Arresters & Grounds
17 – Transformers
18 – Cutouts and Solid Blade Disconnects
Switches & Sectionalizers
Reclosers
19 – Capacitors
20 – Regulators
21 – Lighting
32 – Conductors – General
33 – Connectors & Splices
35 – Metering
36 – Distributed Generation

Common Abbreviations:
By Name
By Abbreviation

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Changes / Additions

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System Planning

System Planning Manual

- Transmission
- Distribution
- DER

System Planning

- Distributed Generation Policies
- SysPlan Index

Technical Information

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System Planning

System Planning Index

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RETIRED DOCUMENTS

Section		Applicability	Doc #	Revision Number	Effective Date
1.0	Creation, Review and Approval of System Planning Group Procedures	All	SYSPLAN 000	1	5/15/2014
2.0	Transmission Reliability Standards	All	SYSPLAN 001	0	4/20/2018
3.0	Transmission Planning Procedure - Transmission System Modeling	All	SYSPLAN 002	1	1/20/2019
4.0	Transmission Planning Procedure - Bulk Power System Assessment Methodology	All	SYSPLAN 003	2	11/10/2011
5.0	System Planning Procedure - Major Project Planning and Development Process	All	SYSPLAN 004	1	7/14/2008
6.0	Planning Assessments of Pilgrim Nuclear Power Station Transmission and Back-up Supply	All	SYSPLAN 005	1	3/29/2010
7.0	Determining Transmission System Facility Ratings on the EMA Transmission System	EMA	SYSPLAN 006	2	6/10/2016
8.0	Calculation and Documentation of Auto Transformer Ratings	EMA	SYSPLAN 007	0	5/15/2014
9.0	Calculation and Documentation of Bulk Distribution Transformer Ratings	All	SYSPLAN 008	1	6/11/2008
10.0	Bulk Distribution Substation Assessment Procedure	All	SYSPLAN 010	1	8/1/2018
11.0	Evaluation of Distributed Generation Interconnection Applications	All	SYSPLAN 011	0	3/15/2013
12.0	Transmission Interconnection Process Roadmap	All	SYSPLAN 012	0	8/21/2012
13.0	Eversource EMA Load Shedding Program	EMA	SYSPLAN 014	1	12/30/2014
14.0	Consequential Load Loss Guideline	All	SYSPLAN 015	0	4/20/2018

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System Planning

RETIRED System Planning Index

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Section		Applicability	Doc #	Revision Number	Effective Date

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Distribution System Engineering Manual

Distributed Generation Policies

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Distributed Generation Policies

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Distributed Generation Policies

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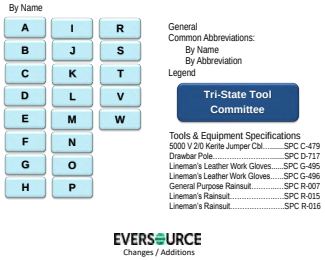
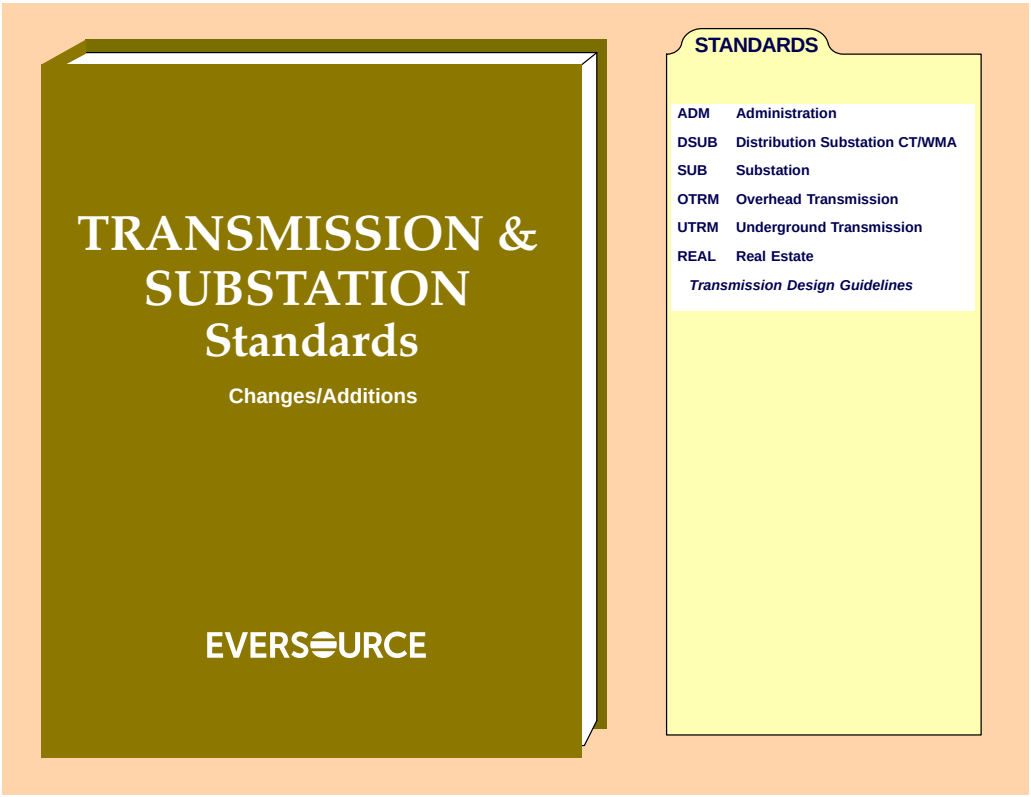
Tool & Equipment Book



EVERSOURCE
Changes / Additions


TRANSMISSION &
SUBSTATION
Standards
Changes/Additions
EVERSOURCE
STANDARDS
ADM Administration
DSUB Distribution Substation CT/WMA
SUB Substation
OTRM Overhead Transmission
UTRM Underground Transmission
REAL Real Estate
Transmission Design Guidelines

Northeast Utilities
Administrative Transmission Line Standards

Key:
00 Completed Standard
00 Incomplete Standard

Revision History

Rev 0 – Original Index Posted 07/28/08

Northeast Utilities
Administrative Transmission Line Standards

Key:
00 Completed Standard
00 Incomplete Standard

Revision History

Rev 0 – Original Index Posted 07/28/08

Index			
Northeast Utilities **Approved by: KMS**	**Administrative** **NU Confidential Information**	**ADM 00** **Page 1 of 1**	**Rev 0** **8/13/2008**

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Key:
SUB 000 Posted
SUB 000 Unposted

SUB 001	Index
SUB 002	Substation Primary One Line Diagrams
SUB 003	Basic Electrical Symbols – CL&P, WMECO
SUB 004	Drawing System
SUB 005	Nomenclature
SUB 006	SUB 006 345kV/115kV Substation Standards Design Criteria
SUB 007	Standard Voltages and Phasing
SUB 008	Substation Safety and Nomenclature Signs (Refer to TD 189)
SUB 009	Thermal Ratings
SUB 010	Substation Site Development
SUB 011	General Arrangements and Typical Designs
SUB 012	Substation Foundation Design
SUB 013	System 1 and System 2 Wiring Separation
SUB 014	Substation Ground
SUB 015	Substation Perimeter Fencing
SUB 016	Design of Substation Steel Structures
SUB 017	Bus Structural Design and Analysis
SUB 018	Disconnect Switch Application Guide
SUB 019	Outdoor Lighting
SUB 020	Cables
SUB 021	Capacitor Banks
SUB 022	Control Enclosure Components
SUB 023	Substation Electrical Clearances
SUB 024	Power Transformers, Reactors, Line Traps
SUB 025	Circuit Breakers, Circuit Switchers
SUB 026	Communications
SUB 027	Key Interlocking
SUB 028	Metering and Telemetering Testing
SUB 029	Protection & Control
SUB 030	Single & Three Line Diagrams, Panel Layouts, Phasing Diagrams
SUB 031	Relay and Control Circuit Fuse Wiring & Connections
SUB 032	Spare
SUB 033	Standard Installation Detail Drawings
SUB 034	Conduit and Trench Systems
SUB 035	SCADA Systems
SUB 036	Substation Sound Level Criteria
SUB 037	Backup Generator & Accessories

SUB 038	Substation Batteries & Chargers
SUB 039	Surge Protection
SUB 040	Direct Stroke Lightning Protection
SUB 041	Substation Security (Retired – replaced by SUB 022.9)
SUB 042	Equipment Structural Loading
SUB 043	Coupling Capacitor Voltage Transformer (CCVT) Standard Drawings
SUB 044	Spare
SUB 045	Spare
SUB 046	Animal Proofing Application Guide
SUB 047	Secondary Oil Containment for Electrical Equipment
SUB 048 -	089 Spare
SUB 049	Protection and Control using IEC 61850 Protocol
SUB 090	Telecommunication Structure Design & Analysis
SUB 091	Substation Physical Hardening Protection
SUB 092 -	098 Spare
SUB 099	Design Basis Manual

Revision History

Rev 0 – Original Index Posted 11/10/05
Rev 1 – Changes to section 3,6,13,27,35,42,44,45
Rev 2 – Added section 8
Rev 3 – Relabeled section 30, 31, 32, 33 and 34
Rev 4 – Added section 90
Rev 5 – Added section 42 posted 12/1/06
Rev 6 – Included PSNH drawing number in 004
Rev 7 – Added Section 47 posted on 04/27/07
Rev 8 – Added SUB 006 Ground Survey, Removed Conduit and Trench Systems from SUB 013 11/23/2007
Rev 9 – Added compately rewritten SUB 13 Wiring Separation (to conform to NPCC criteria) 2/28/2007
Rev 10 – Changed SUB 017 title from Bus, Insulators and Fittings to Bus Structural Design & Analysis 5/09/2008
Rev 11 – Added in SUB 046 Animal Proofing
Rev 12 – Changed Font to Gray on unposted Standards. Updated Header & Footer.
Rev 13- Removed Sub 32 Contents to Sub 29 and Changed Sub 29 title to Protection and Controls
Rev 14 – Added SUB 091, Substation Physical Hardening Protection; changed title from Northeast Utilities to Eversource.
Rev 15 – Added SUB 043 link; changed SUB 031 Wiring Diagrams to SUB 031 Relay and Control Circuit Fuse Wiring & Connections as a result of the removal of the Wiring Diagrams Index 12/15/2015
Rev 16 – Removed SUB 041 and indicated replacement standard 11/1/2017
Rev 17 – Added Section 030 for new standard SUB 030.1 09/06/2019

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Key:
SUB 000 Posted
SUB 000 Unposted

SUB 101 Index
SUB 102 Substation Equipment Procurement Summary
SUB 103 Unused
SUB 104 Unused
SUB 105 Unused
SUB 106 Ground Survey (refer to OTRM 106)
SUB 107 Unused
SUB 108 Unused
SUB 109 Unused
SUB 110 Unused
SUB 111 Unused
SUB 112 Foundations
SUB 113 Unused
SUB 114 Grounding
SUB 115 Chain Link Perimeter Fence
SUB 116 Structures
SUB 117 Substation Insulators
SUB 118 Disconnect Switches
SUB 119 Lighting
SUB 120 Cables
SUB 121 Capacitor Banks
SUB 122 Control Enclosure
SUB 123 Storage Enclosure
SUB 124 Transformers, Reactors, Line Traps
SUB 125 Circuit Breakers, Circuit Switchers
SUB 126 Communication Systems
SUB 127 Unused
SUB 128 Metering
SUB 129 Protective Relaying
SUB 130 Switchboard Devices & Event Recording
SUB 131 Unused
SUB 132 Unused
SUB 133 Unused
SUB 134 Conduit & Trench Systems
SUB 135 SCADA Systems
SUB 136 Substation Sound Levels
SUB 137 Backup Generator & Accessories
SUB 138 Station Batteries & Chargers

SUB 139	Surge Protection
SUB 140	Direct Stroke Lightning Protection
SUB 141	Substation Security
SUB 142	Fabrication of Structural Steel for Northeast Utilities Substations
SUB 143	Capacitor Voltage Transformers
SUB 144	Oil Filled Voltage Transformers
SUB 145	Current Transformers
SUB 146	Unused
SUB 147	Unused
SUB 148	Switchgear
SUB 149 –	189 Spare
SUB 190	Telecommunication Structure Design & Analysis
SUB 191	Substation Physical Hardening Protection
SUB 192	Dynamic VAR Compensation
SUB 193 –	198 Spare
SUB 199	Unused

Revision History

Rev 0 – Original Index Posted 11/14/05
Rev 1 – Changes to Section 113,126,128,130,135,137,138,139,140,141,144,145
Rev 2 – Added section 108 9/15/2006
Rev 3 – Added SUB 106 and Moved Conduit and Trench Systems to 134 10/29/2007
Rev 4 – Changed title of SUB 115 from "Fencing" to "Chain Link Perimeter Fence".
Rev 5 – Changed title of SUB 137 from "Emergency" to "Backup"
Rev 6 – Changed Font to Gray on unposted Standards. Updated Header & Footer.
Rev 7 – Added (activated) SUB 117 11/24/2015
Rev 8 – Added (activated) SUB 192 01/09/2018

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Key:
SUB 000 Approved
SUB 000 Under Development

SUB 201	Index
SUB 202	Eversource Substation Equipment Acceptance Testing Guidelines
SUB 203	Unused
SUB 204	Unused
SUB 205	Unused
SUB 206	Unused
SUB 207	Unused
SUB 208	Substation Safety and Nomenclature Signs (Refer to TD 189)
SUB 209	Unused
SUB 210	Site Development
SUB 211	Unused
SUB 212	Concrete Foundations
SUB 213	Wiring Separation
SUB 214	Grounding
SUB 215	Chain Link Perimeter Fence
SUB 216	Structures
SUB 217	Bus, Insulators and Fittings
SUB 218	Disconnect Switches
SUB 219	Outdoor Lighting
SUB 220	Cables
SUB 221	Capacitor Banks
SUB 222	Control Enclosure
SUB 223	Unused
SUB 224	Power Transformers, Reactors, Line Traps
SUB 225	Circuit Breakers, Circuit Switchers
SUB 226	Communication Systems
SUB 227	Unused
SUB 228	Metering
SUB 229	Protective Relaying
SUB 230	Switchboard Devices & Event Recording
SUB 231	Unused
SUB 232	Unused
SUB 233	Unused
SUB 234	Duct Banks
SUB 235	SCADA Systems
SUB 236	Unused
SUB 237	Backup Generator & Accessories
SUB 238	DC Battery & Charging System Installation and Testing

SUB 239	Surge Protection
SUB 240	Direct Stroke Lightning Protection
SUB 241	Substation Security
SUB 242	Unused
SUB 243	345-kV Capacitor Voltage Transformers
SUB 244	Potential Transformers
SUB 245	Current Transformers
SUB 246	Unused
SUB 247	Unused
SUB 248 –	289 Spare
SUB 290	Telecommunication Structure Design & Analysis
SUB 291 –	298 Spare
SUB 299	Unused

Revision History

Rev 0 - Original Index Posted 11/18/05
Rev 1 - Changes to Section 210,212,213,214,228,229,230,237,238,
Rev 2 – Added section 208 9/15/06
Rev 3 – Added SUB 206 and Moved Conduit and Trench Systems to 234
Rev 4 – Changed Font to Gray on unposted Standards. Updated Header & Footer
Rev 5 – Changed Northeast Utilities to Eversource; updated title of SUB 202.

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Key:
OTRM 000 Posted
OTRM 000 Unposted

OTRM 000 OTRM Design Standards Index
OTRM 001 Spare
OTRM 002 Transmission Line Design Process
OTRM 003 Drawing Numbering System
OTRM 004 Plan and Profile CAD Requirements
OTRM 005 Design Considerations for Air Navigation Safety
OTRM 006 PLS-CADD Design Standards
OTRM 007 HOLD
OTRM 008 HOLD
OTRM 009 Spare
OTRM 010 NU Standard Structure Types
OTRM 011 Spacing of Transmission Lines in Rights-of-Way
OTRM 012 EMF Calculation Protocol
OTRM 013 Life Cycle Cost Evaluations for CL&P & WMECO
OTRM 014 – 019 Spare
OTRM 020 Project Specifications
OTRM 021 HOLD
OTRM 022 HOLD
OTRM 023 Right of Way Encroachments and Uses (Superseded by M7-EN-3003)
OTRM 024 – 029 Spare
OTRM 030 Right-of-Way Vegetation Initial Clearance for 115kV, 230-kV, and 345kV Transmission Lines
OTRM 031 Structure Worksite and Access Areas
OTRM 032 HOLD
OTRM 033 Spare
OTRM 034 – 049 Spare
OTRM 050 Guidelines for Blasting near Utilities
OTRM 051 Transmission Line and Substation Terminal Structure & Lightning Mast Foundations
OTRM 052 HOLD
OTRM 053 – 058 Spare
OTRM 059 Communication Antennas on Transmission Structures
OTRM 060 Extreme Wind & Ice Loading on Transmission Line Structures
OTRM 061 HOLD
OTRM 062 HOLD
OTRM 063 Natural Wood Pole Structures
OTRM 064 Structure Grounding and Counterpoise
OTRM 065 Lightning Arresters
OTRM 066 Transmission Line Terminal Structures

OTRM 067	Overhead to Underground Transition Structures (69/115kV only)
OTRM 068	HOLD
OTRM 069	HOLD
OTRM 070	Wire Sizes, Design Tensions and Deadends, Modeling of Wires & Cables
OTRM 071	Fiber Optic OPGW, ADSS, & Shield Wire
OTRM 072	Mitigation of Wind Induced Conductor Motion
OTRM 073	Insulators and Devices
OTRM 074	Transmission Phase Designaton
OTRM 075	Overhead Transmission Line Ampacity and Thermal Ratings
OTRM 076	Conductor Shielding
OTRM 077	Clearance of 69kV, 115kV, 345kV Conductor to Ground & Other Facilities
OTRM 078	Conductor Clearances within the Supporting Structure (115kV & 345kV)
OTRM 079	AM Radio Noise Consideration – 345-kV Conductor Corona
OTRM 080	Audible Noise Guide
OTRM 081	Evaluation of Stationary Conducting Objects in ROW
OTRM 082	AC Interference Studies

Revision History

Rev 0 -- Original Index Posted 11/22/05
Rev 1 -- Several Additions to Index 8/4/06.
Rev 2 -- Changes to Sections 10 thru 13 11/17/06
Rev 3 -- Upgraded and Changed Index Layout 3/01/2007
Rev 4 -- Changed OTRM 006 from Aerial Laser Survey Criteria to PLS-CADD Design Standards. Also changed approved from RLO to KMS 1/22/2008
Rev 5 -- Revised title of OTRM 070 to include "Deadends" 1/28/2008
Rev 6 -- Revised title of OTRM 064 slightly 1/29/2008
Rev 7 -- Added 070.1
Rev 8 -- Changed Font to Gray on unused Standards. Updated Header & Footer
Rev 9 -- Changed Northeast Utilities to Eversource; changed series numbers in use from Spare to HOLD 07/13/2016
Rev 10 -- Updated title of OTRM 011 03/13/2018

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Key:
OTRM 000 Posted
OTRM 000 Unposted

OTRM 100 OTRM Procurement Standards Index
OTRM 101 Spare
OTRM 102 HOLD
OTRM 103 HOLD
OTRM 104 HOLD
OTRM 105 Unused
OTRM 106 LiDAR Acquisition Requirements and Feature Codes
OTRM 107 Property Survey
OTRM 108 Engineering/Design Survey
OTRM 109 Spare
OTRM 110 Wood and Steel Structures Material Matrix
OTRM 111 HOLD
OTRM 112 HOLD
OTRM 113 HOLD
OTRM 114 – 119 Spare
OTRM 120 HOLD
OTRM 121 HOLD
OTRM 122 HOLD
OTRM 123 Unused
OTRM 124 – 129 Spare
OTRM 130 HOLD
OTRM 131 HOLD
OTRM 132 HOLD
OTRM 133 Spare
OTRM 134 – 149 Spare
OTRM 150 HOLD
OTRM 151 HOLD
OTRM 152 Soil Boring and Testing Requirements OH Transmission Facilities
OTRM 153 – 158 Spare
OTRM 159 HOLD
OTRM 160 Technical Requirements for Steel Pole Structures
OTRM 161 Technical Requirements for Lattice Steel Structures
OTRM 162 Glue-Laminated Wood Transmission Structures
OTRM 163 Natural Wood Pole Transmission Structures
OTRM 164 Resistance and Resistivity Measurements
OTRM 165 HOLD
OTRM 166 HOLD
OTRM 167 HOLD
OTRM 168 HOLD

OTRM 169 HOLD
OTRM 170 HOLD
OTRM 171 Technical Requirements for Composite Optical Ground Wire
OTRM 172 HOLD
~~OTRM 173 Specification for 115-kV Polymer (NCI) Insulators~~ (Cancelled- NCI use banned)
OTRM 174 HOLD
OTRM 175 HOLD
OTRM 176 HOLD
OTRM 177 HOLD
OTRM 178 HOLD
OTRM 179 AM Radio Broadcast Frequency Signal Strength Measurements along Proposed EHV Rights-Of-Way
OTRM 180 HOLD
OTRM 181 HOLD
OTRM 182 HOLD
OTRM 183 - 189 Spare
OTRM 190 UAS, Survey Inspection, and Photography of Transmission Lines
OTRM 191 - 197 Spare
OTRM 198 Inspection and Supplemental Treatment of Transmission Wood Poles (formerly OTRM 268)
OTRM 199 Inspection and Supplemental Treatment of Transmission Steel Structures

Revision History

Rev. 0 – Original Index Posted 11/22/05.
Rev. 1 – Several Additions to Index 8/24/06.
Rev. 2 – Revised Index Layout and Added 152 8/1/07.
Rev. 3 – Added 107 & 108
Rev. 4 – Changed Font to Gray on unposted Standards. Updated Header & Footer. 7/23/08
Rev. 5 – Unknown changes
Rev. 6 – Changed Northeast Utilities to Eversource; changed series numbers in use from Spare to HOLD 07/13/2016
Rev. 7 – Updated title of OTRM 152 05/14/2018
Rev. 8 – Added OTRM 190 and OTRM 199 5/31/18
Rev. 9 – Added OTRM 198 6/14/18

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Key:

OTRM 000 Posted
OTRM 000 Unposted

OTRM 200 Index
OTRM 201 Spare
OTRM 202 HOLD
OTRM 203 HOLD
OTRM 204 HOLD
OTRM 205 Unused
OTRM 206 Construction Staking and As-Built Surveying Requirements
OTRM 207 HOLD
OTRM 208 HOLD
OTRM 209 Spare
OTRM 210 HOLD
OTRM 211 HOLD
OTRM 212 HOLD
OTRM 213 HOLD
OTRM 214 – 219 Spare
OTRM 220 HOLD
OTRM 221 Transmission Line Construction - General
OTRM 222 Operation of Equipment on Eversource Rights-of-Way
OTRM 223 Unused
OTRM 224 – 229 Spare
OTRM 230 Vegetation Clearing Procedures and Practices for Transmission Line Sections
OTRM 231 Access Roads and Structure Work Site
OTRM 232 Identification and Warning Signs
OTRM 233 Spare
OTRM 234 – 249 Spare
OTRM 250 Drilling and Blasting
OTRM 251 Transmission Line, Substation Terminal Structure, and Lightning Mast Foundations
OTRM 252 HOLD
OTRM 253 – 258 Spare
OTRM 259 HOLD
OTRM 260 Steel Pole Installation
OTRM 261 Transmission Line Steel Lattice Towers
OTRM 262 Laminated Wood Pole Structure Construction
OTRM 263 Wood Pole Structures
OTRM 264 Counterpoise Installation General Specification
OTRM 265 HOLD
OTRM 266 HOLD

OTRM 267 HOLD
~~OTRM 268 Inspection and Supplemental Treatment of Transmission Wood Poles~~
(RENUMBERED OTRM 198)
~~OTRM 269 Inspection and Supplemental Treatment of Transmission Steel Structures~~
(RENUMBERED OTRM 199)
OTRM 270 Overhead Conductor Wire Sizes & Design Tension
OTRM 271 HOLD
OTRM 272 HOLD
OTRM 273 HOLD
OTRM 274 HOLD
OTRM 275 HOLD
OTRM 276 HOLD
OTRM 277 HOLD
OTRM 278 HOLD
OTRM 279 HOLD
OTRM 280 HOLD
OTRM 281 HOLD
OTRM 282 HOLD
OTRM 283 - 299 Spare

Revision History
Rev. 0 – Original Index Posted 11/22/05.
Rev. 1 – Several Additions to Index 8/24/06.
Rev. 2 – Deleted OTRM 229 (Best Management Practices) 8/24/06.
Rev. 3 – Updated and changed Index Layout 3/01/2007
Rev. 4 – Changed Font to Gray on unposted Standards. Updated Header & Footer. 7/23/08.
Rev. 5 – Changed number from OTRM 201 to 200. Verified Standard Titles. Removed OTRM 281. 4/3/2009
Rev. 6 – Updated title of OTRM 251
Rev. 7 – Changed series numbers in use from Spare to HOLD 07/13/2016
Rev. 8 – Added OTRM 268 and OTRM 269
Rev. 9 – Updated title of OTRM 222
Rev. 10 – Removed OTRM 269, which was renumbered OTRM 199
Rev. 11 - Removed OTRM 268, which was renumbered OTRM 198

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Key:
UTRM 000 Posted
UTRM 000 Unposted

UTRM 000	UTRM Design Standards Index
UTRM 001	Cross Reference to OTRM Standards
UTRM 002	Transmission Safety and Environmental Design Considerations
UTRM 003	Spare
UTRM 004	Spare
UTRM 005	Spare
UTRM 006	Spare
UTRM 007	Spare
UTRM 008	Spare
UTRM 009	Cable Thermal Ratings
UTRM 010	Spare
UTRM 011	Spare
UTRM 012	Spare
UTRM 013	Unused
UTRM 014	Spare
UTRM 015	Spare
UTRM 016	Power Cable Structures and Bridge Attachments
UTRM 017	Spare
UTRM 018	Spare
UTRM 019	Spare
UTRM 020	Unused
UTRM 021	Spare
UTRM 022	Unused
UTRM 023	Spare
UTRM 024	Spare
UTRM 025	Spare
UTRM 026	Spare
UTRM 027	Spare
UTRM 028	Spare
UTRM 029	Spare
UTRM 030	Spare
UTRM 031	Spare
UTRM 032	Spare
UTRM 033	Spare
UTRM 034	Unused
UTRM 035	Unused
UTRM 036	Unused
UTRM 037	Unused
UTRM 038	Spare

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UTRM 039 Spare
UTRM 040 Spare
UTRM 041 Spare
UTRM 042 Spare
UTRM 043 Spare
UTRM 044 Spare
UTRM 045 Spare
UTRM 046 Spare
UTRM 047 Spare
UTRM 048 Spare
UTRM 049 Spare
UTRM 050 Drilling and Blasting (Refer to OTRM 050)
UTRM 051 Unused
UTRM 052 Unused
UTRM 053 Spare
UTRM 054 Spare
UTRM 055 Spare
UTRM 056 Spare
UTRM 057 Spare
UTRM 058 Spare
UTRM 059 Spare
UTRM 060 Spare
UTRM 061 Spare
UTRM 062 Spare
UTRM 063 Spare
UTRM 064 Sheath Bonding and Grounding
UTRM 065 Spare
UTRM 066 Termination Structures
UTRM 067 Spare
UTRM 068 Spare
UTRM 069 Spare
UTRM 070 Unused
UTRM 071 Cable – Fiber Optic
UTRM 072 Unused
UTRM 073 Spare
UTRM 074 Phasing (Refer to OTRM 074)
UTRM 075 Cable Thermal Ratings
UTRM 076 Spare
UTRM 077 Clearance Requirements
UTRM 078 Spare
UTRM 079 Unused
UTRM 080 - 091 Spare
UTRM 092 Pre-cast Concrete Splice Vaults (refer to UTRM 192)
UTRM 093 – 099 Spare

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Revision History
Rev. 0 - Original Index Posted
Rev. 1 – Changed Font to Gray on unposted Standards. Updated Header and Footer.
Rev. 2 – Changed to UTRM 000, Updated standard titles.

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Key:
UTRM 000 Posted
UTRM 000 Unposted

UTRM 100	UTRM Procurement Standards Index
UTRM 101	Cross Reference to other Applicable Standards
UTRM 102	Unused
UTRM 103 – 008	Spare
UTRM 109	Thermal Sand
UTRM 110	Fluidized Thermal Backfill (FTB™)
UTRM 111	Spare
UTRM 112	Spare
UTRM 113	HPFF Pipe and Accessories
UTRM 114 – 119	Spare
UTRM 120	Cathodic Protection
UTRM 121	Spare
UTRM 122	Factory Fabricated Pressurization Plant for HPFF Cable
UTRM 123	Spare
UTRM 124	Spare
UTRM 125	Spare
UTRM 126	Spare
UTRM 127	Spare
UTRM 128	Spare
UTRM 129	Spare
UTRM 130	Spare
UTRM 131	Spare
UTRM 132	Spare
UTRM 133	Spare
UTRM 134	Unused
UTRM 135	Unused
UTRM 136	Unused
UTRM 137	Unused
UTRM 138	Spare
UTRM 139	Spare
UTRM 140	Spare
UTRM 141	Spare
UTRM 142	Spare
UTRM 143	Spare
UTRM 144	Spare
UTRM 145	Spare
UTRM 146	Spare
UTRM 147	Spare
UTRM 148	Spare

UTRM 149 Spare
UTRM 150 Unused
UTRM 151 Unused
UTRM 152 Soil Boring and Testing Requirements UG Transmission Lines
UTRM 153 Spare
UTRM 154 Spare
UTRM 155 Spare
UTRM 156 Spare
UTRM 157 Spare
UTRM 158 Spare
UTRM 159 Spare
UTRM 160 Spare
UTRM 161 Spare
UTRM 162 Spare
UTRM 163 Spare
UTRM 164 Unused
UTRM 165 Spare
UTRM 166 Unused
UTRM 167 Spare
UTRM 168 Spare
UTRM 169 Spare
UTRM 170 Cable – XLPE, EPR, HPFF
UTRM 171 Unused
UTRM 172 Thermocouple Temperature Monitoring System
UTRM 173 XLPE Cable Support and Restraint System
UTRM 174 Unused
UTRM 175 Terminations – XLPE, EPR, HPFF
UTRM 176 Spare
UTRM 177 Unused
UTRM 178 Spare
UTRM 179 Underground Cable Splices
UTRM 180 – 191 Spare
UTRM 192 Pre-cast Concrete Splice Vaults
UTRM 193 – 199 Spare

Revision History:
Rev. 0 – Original Index Posted
Rev. 1 – Changed Font to Gray on unposted Standards. Updated Header & Footer.
Rev. 2 – Changed from UTRM 101 ot UTRM 100. Updated Standards Titles

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Key:

UTRM 000	Posted
UTRM 000	Unposted

UTRM 200	UTRM Construction Standards Index
UTRM 201	Cross Reference to other Applicable Standards
UTRM 202	Transmission Safety and Environmental Construction Considerations
UTRM 203	Spare
UTRM 204	Spare
UTRM 205	Spare
UTRM 206	Spare
UTRM 207	Spare
UTRM 208	Spare
UTRM 209	Unused
UTRM 210	Spare
UTRM 211	Spare
UTRM 212	Spare
UTRM 213	HPFF Pipe and Accessories Installation
UTRM 214	Spare
UTRM 215	Spare
UTRM 216	Spare
UTRM 217	Spare
UTRM 218	Spare
UTRM 219	Spare
UTRM 220	Unused
UTRM 221	Spare
UTRM 222	Pressurization Plant Installation
UTRM 223	Spare
UTRM 224	Spare
UTRM 225	Spare
UTRM 226	Spare
UTRM 227	Spare
UTRM 228	Spare
UTRM 229	Spare
UTRM 230	Spare
UTRM 231	Spare
UTRM 232	Spare
UTRM 233	Spare
UTRM 234	Duct Bank Construction
UTRM 235	Conduit Material and Installation
UTRM 236	Marking of Underground Cable Systems in Rights-of-Way
UTRM 237	Post Construction Duct and Pipe Cleaning and Inspection
UTRM 238	Spare

UTRM 239 Spare
UTRM 240 Spare
UTRM 241 Spare
UTRM 242 Spare
UTRM 243 Spare
UTRM 244 Spare
UTRM 245 Spare
UTRM 246 Spare
UTRM 247 Spare
UTRM 248 Spare
UTRM 249 Spare
UTRM 250 Drilling and Blasting (Refer to OTRM 250)
UTRM 251 Horizontal Directional Drilling
UTRM 252 Pipe Jacking and Boring
UTRM 253 Spare
UTRM 254 Spare
UTRM 255 Spare
UTRM 256 Spare
UTRM 257 Spare
UTRM 258 Spare
UTRM 259 Spare
UTRM 260 Spare
UTRM 261 Spare
UTRM 262 Spare
UTRM 263 Spare
UTRM 264 Unused
UTRM 265 Spare
UTRM 266 Unused
UTRM 267 Spare
UTRM 268 Spare
UTRM 269 Spare
UTRM 270 Cable – XLPE, EPR, HPFF
UTRM 271 Temperature Monitoring and Communication Cable Installation
UTRM 272 Temperature Monitoring Thermocouple Installation
UTRM 273 Spare
UTRM 274 Unused
UTRM 275 Unused
UTRM 276 Spare
UTRM 277 Unused
UTRM 278 Spare
UTRM 279 Unused
UTRM 280 291 Spare
UTRM 292 Precast Concrete Vault Installation
UTRM 292.1 Retrofit of Concrete Splice Vault with Round Frame and Cover

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UTRM 293 – 299 Spare

Revision History
Rev 0 – Original Index Posted 12/19/05
Rev 1 – Additions to Index Section Descriptions 11/03/2006
Rev 2 – Added UTRM 234 & 235
Rev 3 – Changed Font to Gray on unposted Standards. Updated Header and Footer
Rev 4 – Changed from UTRM 201 to 200. Updated Standards Titles.
Rev 5 – Added UTRM 292.1

Northeast Utilities
Real Estate Standards

Key:
REAL 000 Posted
REAL 000 Unposted

Revision History

Index			
Northeast Utilities **Approved by: KMS**	**Real Estate**	**REAL 001** **Page 1 of 2**	**Rev 0** **11/14/2008**

Underground & URD Distribution

Construction Standards

00 – General

32 – Cables
33 – Connectors
35 – Metering
36 – Distributed Generation
42 – Clearances
43 – Tagging / Identification / Labeling
54 – Secondary / Service
56 – Grounds / Bonds
58 – Transformers
60 – Switchgear / Switches

UG DTR Locater

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Construction Standards

61 – Controls / Sensing / Communication
62 – Fault Indicators / Fuses
63 – Foundations / Box Pads / Handholes
64 – Joints / Splices / Tubing
65 – Miscellaneous Equipment / Tools
66 – Special Projects
67 – Terminations
Risers
76 – Manholes / Vaults / Conduits / Ducts
84 – Network / Conventional

Common Abbreviations:
By Name
By Abbreviation

EVERSOURCE

Changes / Additions

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Work Method Categories

Operation & Maintenance of Equipment & Material	Procedures and Tools
• Overhead (01 – 25) • Substation & Transmission (51 – 75) • Underground (26 – 50)	• Material Handling, Tool Operation, Phasing, Safety, Shared Practices, Voltage Testing, Work Site Setup, etc. (76 – 100)
Description: These categories cover control box functionality, switch/ reclosure operation, breaker maintenance and testing, pad-mount equipment operation,	Description: "Procedures and Tools" cover procedures and processes that can be used system wide (OH, UG, Stations, etc.) as well as how to use and operate specific tools.

WMS Locater
Search

EVERSOURCE
Changes / Additions

Overhead Work Methods

Overhead Equipment & Material
01 – Other, OH
02 – Anchoring & Guying
03 – Capacitors
04 – Connectors
05 – Cutouts, Fuses, Switches, & Sectionalizers
06 – Insulators, Arrestors & Fault Indicators

Overhead Equipment & Material
07 – Lighting
08 – Pole, Hardware & Inspections
09 – Reclosers, Pole-Top
10 – Regulators
11 – Transformers, Pole-Top

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Common Abbreviations:
By Name
By Abbreviation

EVERSOURCE
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Underground Work Methods

Underground Equipment & Material
26 – Other, Pad-mounted & UG
27 – Joints, Splices & Terminations
28 – Transformers, Pad-mounted & UG
29 – Switches & Switchgear
30 – Reclosers, Pad-mounted

Underground Equipment & Material
56 – Network Protectors
58 – Secondary & Tertiary Network Operations
59 – Sectionalizers & Switches
60 – Transformers (Power)

Note: The above categories are from the "Substation & Transmission" index page. All "Back to Index" buttons will link to the Substation index.

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Common Abbreviations:
By Name
By Abbreviation

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Substation Work Methods

Substation & Transmission Equipment & Material	Substation & Transmission Equipment & Material
51 – Other, Substation	57 – Relays, CT's & PT's
52 – Other, Transmission	58 – Secondary & Tertiary Network Operations
53 – Cables & Conductors	59 – Sectionalizers & Switches
54 – Circuit Breakers	60 – Transformers (Power)
55 – Individual & Mobile Substation	61 – Batteries and Battery Banks
56 – Network Protectors	

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Common Abbreviations:
By Name
By Abbreviation

EVERSOURCE
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Procedures & Tools
76 – General / Other
77 – Other, Overhead
78 – Other, Substation & Transmission
79 – Other, Underground
80 – Battery Operated Tools
81 – Cable
82 – Conduit & Underground Chambers
83 – Fault Locating
84 – Hand, Hydraulic & Pneumatic Tools
85 – Personal Protective Equipment

Procedures & Tools
86 – Preventive Maintenance / Inspections, Other (Non-Equipment)
87 – Rigging, Lifting & Handling
88 – Safety & OSHA
89 – Grounding
90 – Testing & Troubleshooting
91 – Voltage Testing & Phasing
92 – Wire – (All Voltages & Types)

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Common Abbreviations:
By Name
By Abbreviation

EVERSOURCE
Changes / Additions

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EVERSOURCE	TD003	Revision 0	
TD PROCEDURE	Document Control Process		
Issue Date: 4/4/2022	**Effective Date:** **4/4/2022**	**Owner Department**: T&D Standards Engineering **Subject Matter Expert:** Amanda L. Wang	**Applicability:** CT-MA-NH

All changes to TD procedures are controlled by TD 001
"Writing, Revising, and Publishing Transmission and Distribution Procedures."

This procedure replaces and supersedes the following procedures (in whole or in part), as described in Section 3 "Summary of Changes":

Approvals:

Approval Signature: *Jennifer J. Hebsch*

Jennifer J. Hebsch
Director, Distribution Technical Engineering

Procedure applicable only to states for which an approval signature appears above.

TABLE OF CONTENTS

ATTACHMENTS

1. INTRODUCTION

1.1 Objective

This procedure defines the process for prioritizing, creating, revising, approving and publishing all documents controlled by Transmission and Distribution Standards Engineering (T&D Standards) including, but not limited to, Material Specifications, DTRs, Work Methods, DSEM and Product/Technical Bulletins. It will serve as a guide for document categories and the organization of those documents.

1.2 Applicability

This guideline pertains to all Eversource Energy Electric organizations.

1.3 References

Unless otherwise specified:

- Forms are available through Forms Management and Print Jobs requests on the intranet.

Procedures are available in the:

- Field Documentation Database
- Regulated Businesses Policies & Procedures database
- T&D Engineering Standards Bookshelf

Development References
Documents used to develop this procedure and the process it controls:

- TD 001 “Writing, Revising, and Publishing Transmission & Distribution Procedures”
- ADM 011 “Preparation, Review and Approval of Transmission/Substation Standards” – For Substation/Transmission Construction and Specification Standards

Supporting References
Documents that support performance of activities directed by this procedure:

- Eversource Standards Bookshelf

Supporting Programs and Databases
Programs and databases that support performance of activities directed by this procedure:

- Eversource Standards Bookshelf

Copies of TDs are currently available in the Standards Bookshelf maintained by Operations Services.

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1.4 Discussion

For the remainder of this document when the term “document” is referenced, it shall include, but not be limited to, all Standards (DTRs, Work Methods, Material Specs/Catalogs, etc.) inspection and maintenance forms/documents, design document forms, technical bulletins, etc. that are controlled by T&D Standards.

The documents created by T&D Standards provide written and/or visual instructions that establish requirements for a variety of work being performed on the Eversource system. The type of document created, and the level of detail included in each document, is dependent of the type and complexity of the work and the risks to safety, health, the environment, and the equipment.

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2. INSTRUCTIONS

2.1 General

2.1.1 Documents are written and revised as needed. The driving factors for creating, revising or consolidating documents include the following:

a. Management direction for new procedures, or changes to existing Standards to support new concepts or system performance improvement.

b. Safety Department and/or Safety Committee generated needs and initiatives.

c. T&D Standards and/or system improvement initiative(s).

d. Field proposed requests or needs.

e. Standard meeting or SRM feedback.

f. New technology.

g. Equipment changes.

h. Material and procedural consolidation including gap analysis.

i. Changes to meet the latest industry practice and codes, and/or compliance requirements.

j. Scheduled periodic reviews, refer to Section 2.8.

2.1.2 All approved documents controlled by T&D Standards must be published on the Eversource HUB on the T&D Standards Bookshelf.

NOTE

Legacy documents that are not currently on the Bookshelf are being migrated over. Until migration is complete, said documents shall be maintained on their legacy system(s).

2.1.3 The documents on the Bookshelf shall be organized by the type of document and then categorized in such a manner to keep related documents together.

2.2 Sections Within a Standard

2.2.1 Unless otherwise noted, the following information shall be contained in the document.

a. Applicability: Details the work areas that the document applies to.

b. Scope: Outlines the purpose of the document.

c. Approvals: Documents must be approved by the required Director(s), Director's Designee and/or Manager(s), for which the document applies. When a document is approved, it will contain the date approved and either the approver's signature or "Signature on File" typed on the signature line.

d. Revision Table: This table lists the date, revision number and a general description of the actions taken. See Note 1 Below

NOTE

1) Only the three latest revisions shall be listed on the table. If/when subsequent revisions are required, and it exceeds three revisions, the oldest revision shall be removed from the table.

e. Table of Contents: A list of the sections of the document organized in the order in which they appear.

2.2.2 The following sections should be considered for inclusion in the document.

a. Safety: Directs the craft worker(s) to adhere to all Company, Employee Safety Manual, and PPE requirements.

1) In some cases, additional Safety content may be added to highlight important hazards associated with the type of work to be performed.

b. Introduction: Provides additional background information regarding why the actions in the document is required for the safe, reliable and economical operation of the Eversource Electric System.

c. Reference Documents: Lists industry and internal documents that are applicable to the standard. Typical references may include but not limited to ANSI, IEEE or OSHA standards and/or Company documents.

d. Definitions: Important and unique terms used within the document.

e. Bill of Material: Lists and describes all major equipment, tools, and material item numbers as they pertain to the document.

f. General: Provides general information to the contents of the document.

g. Attachment/Appendix: Provides additional information that is referenced in the body of the document.

2.2.3 Supplemental documents provide additional information that complete or enhance the information provided in the primary document. Supplemental documents shall be numbered like the primary document and listed under "Reference Documents" in the primary document. To allow revising the document and its supplement independently they are published separately.

2.3 Document Control

2.3.1 T&D Standards has overall responsibility for the creation and revision of all Electric Operation Standards as stated in the Objective.

2.3.2 All documents shall be created using the latest document template(s). Refer to folder "Working Files> Templates" for the latest templates.

2.3.3 When drafting a document, notify the necessary Administrator that changes are in progress, or if a new document is being created.

2.3.4 All draft documents shall be saved on the "T&D_Standards_Eng" Folder to ensure accessibility and document revisions are controlled.

2.3.5 Contact the necessary Administrator to save any approved documents in the appropriate controlled source files folder.

2.3.6 The source files for all approved documents shall be saved in the appropriate folder on the shared drive folder labeled “T&D_Standards_Eng.”

2.3.7 T&D Standards stores electronic copies of all documents published.

2.3.8 T&D Standards shall update the Bookshelf after documents are approved.

2.4 Preparation

2.4.1 When a new document or the revision of an existing is required, an Author(s) within T&D Standards will be assigned to the project. The document is then considered in “Draft”.

a. A watermark stating “DRAFT” shall be placed in the background of the document.

2.4.2 The Author(s) assigned to draft the document shall coordinate with the relevant organizations to produce the document.

a. When required, a working group/review team (SMEs, applicable managers, supervisors, trainers, safety, end users, etc.) shall be created.

2.4.3 The “Summary of Revisions” shall be:

a. Generated to record the creation of a new document.

b. Updated when a document is revised. A new section shall be added to the Summary of Revisions detailing the changes made within the document.

2.4.4 The Author(s) will determine if the document will apply to, or supersede, an existing Eversource or Legacy Company document and make the necessary notation.

a. If the document replaces another document:

1) The document shall have the following placed under the heading:

“***This Document Supersedes ‘[insert document number(s)]’***”

2) The document’s Summary of Revisions shall state the reasons why the document was created and why it replaces the other document(s).

3) The existing/original document shall be “Retired” and the Summary of Revisions shall be updated stating the reasons why.

2.5 Review

2.5.1 The Author(s) shall assemble the original and mark-up or draft document, along with the Summary of Revisions to create the “Document Package.”

a. The Document Package shall include the following:

1) Summary of Revisions

2) Draft Document or original and mark-up

3) Engineering Review Form (ERF), as required

NOTE

When revising a document, all changes made shall be marked with a change bar. All change bars from previous revisions shall be deleted.

2.5.2 When the Author is finished with the draft document, the Document Package shall be sent to the Lead Engineer for the Initial Lead Review (ILR).

2.5.3 In addition to the ILR, Training shall be notified by sending the draft document prior to comment period.

2.5.4 The Lead Engineer shall review the document and determine if a Comment Period is required. If corrections are required, the Document Package shall be sent back to the Author to make those corrections.

2.5.5 The Administrator or Engineer will add "Comment," and the date the document is sent for Comment in the Revision table.

2.5.6 The Administrator will send the Document Package for its Comment Period.

a. The initial Comment Period should last two weeks.

1) All additional Comment Periods should be one week.

2) When required, the Lead Engineer can adjust the length of the Comment Period.

2.5.7 During the Comment Period, the Authors(s) shall collect and track all comments and edits.

a. The Author(s) will address any/all comments, resolve, and document the resolutions accordingly.

1) If critical changes are required, they shall be made, and the document resent for an additional Comment Period.

NOTE

In conjunction with the review process, training representatives should assess and prepare to implement any training requirements that would be imposed by approval of the document.

2.5.8 If corrections and/or changes are made to the document by the Administrator, the Author(s) shall review the document and sign the ERF. Add the ERF to the Document Package and forward it to the Lead Engineer for the Final Lead Review (FLR).

2.5.9 The Lead Engineer shall perform the FLR and review the document and confirm that it is complete.

a. If critical changes are required, they shall be made by the Author and sent back for an additional FLR.

b. When completed, that Lead Engineer shall review the document prior to approval.

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2.5.10 The Lead Engineer will determine if the document should be submitted to the Standards Review Meeting (SRM).

a. SRM Required: The Document Package shall be submitted for the SRM.

1) The SRM team shall review the documents prior to the meeting date and bring all questions and comments to the meeting.

2) All questions and comments shall be reviewed at the SRM.

b. SRM Not Required or completed: The Document Package will be sent for Approval and Publishing.

2.6 Approval and Publishing

2.6.1 The Document Package shall be sent for review to the required Director(s), Director's Designee and/or Manager(s) for approval.

a. The document will be given its approved document number (DTR, WMS, etc.) by the Program Admin/Office Admin.

b. The final draft shall be saved electronically in the documents working folder, on the T&D Standards shared drive.

c. If a physical signature is provided, the document shall be scanned and saved electronically in the document's working folder, on the T&D Standards shared drive.

d. If an email approval is provided, the email shall be saved as a pdf in the document's working folder, on the T&D Standards shared drive.

NOTE

When minor format changes and grammatical errors are corrected, a formal review and approval may not be required. If significant changes and or critical steps are changed, an additional comment period may be required. This shall be determined by T&D Standards Lead and the circumstances that apply.

2.6.2 When the document has been approved by all required parties:

a. The document and Summary of Revisions shall be issued, and copies published, available via the Standards Bookshelf.

b. SBS shall be written and sent out via email for acknowledgement per DNAT System.

c. Documents SHALL be stored in a secure location in accordance with Company Policy.

2.6.3 The completed document and its Summary of Revisions shall be maintained in the appropriate T&D Standards source document folder.

2.7 Retired Documents

2.7.1 If, for any reason, it is determined that a document is required to be retired:

a. A watermark stating "RETIRED", in red, shall be placed in the background of the document.

b. In the header, replace “Revised” with “Retired” and the date retired/obsoleted shall be inserted.

c. The Summary of Revisions shall be updated stating the reasons why the document was retired and any/all documents that supersede it.

d. The document source file and its Summary of Revisions shall be stored electronically in the source folder within “T&D_Standards_Eng”.

e. The retired document SHALL be removed from the intranet and the corresponding index shall be updated stating that the document was retired.

f. Documents SHALL be stored in a secure location in in accordance with Company Policy.

2.8 Periodic Review Requirements

2.8.1 All documents under the administrative control of T&D Standards shall be beholden to the Period Review Process.

2.8.2 The T&D Standards Log shall list the Periodic Review frequency (years until next review) for each document.

2.8.3 Unless otherwise defined by NERC, FERC, OSHA, company mandate, or other federal/state agencies (NESC), the timeframe for the Periodic Review frequency is based on the classification of the document and are as follows:

NOTE

When a shorter Periodic Review timeframe is required, it SHALL be detailed in the document and recorded in the T&D Standards Log.

a. Construction Standards and Guidelines (DTR): 7 Years

b. Distribution System Engineering Manual (DSEM): 7 Years

c. Eversource Maintenance Program (EMP): 10 Years

d. Material Catalogs (CAT): 3 Years

e. Material Specifications (SPC): 7 Years

f. Technical and Product information Bulletins (TIB & PIB): 3 Years

g. Work Method Standards (WMS): 7 Years

2.8.4 With the new NESC publication every five (5) years, standards shall be updated and republished, if necessary, within 18 months of the latest NESC publication. Any required changes will be communicated immediately via a Technical Bulletin to Engineering and Field Operations to ensure the updated code requirements are identified, overall impact is understood and trained to while the standards are updated and republished.

2.8.5 All documents subject to the Periodic Review Process shall be reviewed, approved & published before December 31st of the calendar year in which the Period Review is required, as defined in Section 2.8.3.

2.8.6 Periodic Reviews are based on the most recent publication date.

2.9 Periodic Review Process

2.9.1 In Quarter 4 of each calendar year, a list of documents requiring review in the coming year shall be produced.

2.9.2 T&D Standards shall review the documents to see if changes are required. The following shall be reviewed:

a. Formatting: Verify the latest document format is being used.

b. Document Title: Verify the title is relevant and accurately represents the content of the document.

c. Revision Table: Update the revision number and revision table.

d. Applicability: Verify it covers all required areas of the Company impacted by this document

e. Scope: Confirm that the scope covers the intent of the document.

f. Safety: Verify that the most up to date safety statement is used and that it does not contain language that is irrelevant or belongs in a different section.

g. Reference Documents: Verify that all referenced Company documents, policies, federal, state, and local laws, regulations, external documents, or requirements are listed, active and applicable. If any of these documents have changed, update the document to align with the changes.

h. Bill of Materials/Page backs: Confirm the accuracy of the item numbers and descriptions.

i. Approvals and Signatures: Verify that there is an approver listed for each area of the Company affected by the document.

j. Hyperlinks: Verify all hyperlinks within the document are still working and accurate.

k. Procedure / Content: Review for relevancy and accuracy. Verify the document is still applicable and accurate.

l. Similar/duplicate documents: Search for and consolidate when possible. Retire documents as necessary.

m. Attachment / Appendix: Review for relevancy and accuracy.

2.9.3 Upon completion of the periodic review:

a. The document shall be updated accordingly.

b. The Summary of Revisions updated to describe the changes made to the document.

c. The document sent for review and approval, as described within.

2.9.4 If it is determined that a document is not relevant, it shall be Retired.

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3. SUMMARY OF CHANGES

Changes to TD Procedures are controlled by TD 001 “Writing, Revising, and Publishing Transmission & Distribution Procedures.”

Revision 0 – Effective Date – 04/04/2022

- Original Issue
- Supersedes the following Eversource-EMA documents:
  - D1000 – Guideline for Prioritizing, Creating, Revising and Publishing Distribution Standards
  - D10000 – Guidelines for Prioritizing, Creating, Revising and Publishing Substation Standard
  - D10001 – Guideline for Reviewing and Updating Substation Maintenance Standards

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Exhibit 14

Attachment 1
Definitions
(Sheet 1 of 1)

Distribution Construction Standards (DTR) – A detailed written and visual instructions for the installation of equipment/material. They may consist of a Detailed Guide, notes, drawings and/or bill of materials/page backs.

- Written instructions that specify how to install a device.
- Highly detailed images that depict how the device is constructed, installed and/or interconnected. This includes accompanying notes and a complete bill of materials/page backs.

Design Standard – Detailed application and necessary requirements.

Distribution System Engineering Manual (DSEM) – The basis of the Eversource CT/WMA/NH distribution system design.

Engineering Review Form (ERF) – The form used by the Administrator to record the changes made to a document before it is sent for approval. The Author is required to sign off and approve the changes made.

Eversource Maintenance Program (EMP) – A document containing the maintenance requirements and tasks and the time constraints that need to be carried out to ensure the continued operation of equipment.

Material Specification (SPC) – A detailed description of the design, testing and procurement requirements, the necessary materials or components used to make the device/equipment/tool, and the essential accessories required for application.

Summary of Revisions – The document used to identify the Author(s) and parties involved in document, title of the document, the dates and statuses of the document, review signatures, etc. The document contains an overview of the changes made to each document revision.

Supervisor Briefing Sheet (SBS) – The document that highlights the major changes within the document. SBS are to be created for each new standard or revised standard that has an impact on field.

Technical/Product Information Bulletin (TIB, PIB) – Informational pamphlets that inform personnel of new products or procedural changes, highlights the proper use of tools/equipment, or summarizes field incident lessons learned and other critical information that may require heightened awareness and communication.

Work Method Standard (WMS) – Detailed document of operational and preventative maintenance work requirements, practices and instructions.

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Attachment 2
Document Statuses

(Sheet 1 of 1)

Draft – A new document or document revision that has not been approved. When applicable, this may consist of a marked up and clean copy.

- Draft new documents will be given an "ES" number for tracking and record keeping purposes. After the document is approved, the ES number will be removed and the document will be assigned the number it will be published with on the Bookshelf.

Initial Lead Review (ILR) – The first step in the review and approval process. The Lead Engineer reviews the document and any changes made, and returns to the Author.

Comment – A draft document that is near completion and requires the review by the applicable parties.

Final Lead Review (FLR) – All comments have been addressed and changes have been made. The Lead Engineer confirms the document is ready to be submitted to the SRM.

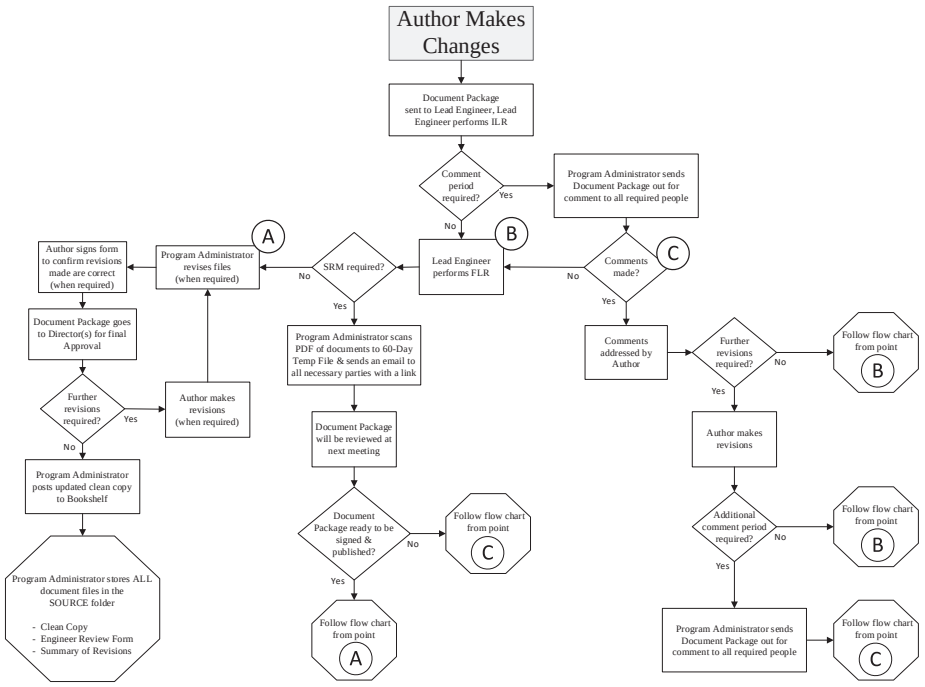
Standards Review Meeting (SRM) – The final review stage of a draft document before approval, involving an SRM Working Group review.

Approval – A document that has gone through the SRM and is with the Approvers for review and approval signatures.

Approved – Accepted by all required parties, ready to be issued.

Retired – The document is no longer relevant, the material and/or practice are no longer in use, the document has been superseded or the document can no longer be applied to the system.

Attachment 3
Approval Process Flow Chart
(Sheet 1 of 1)



Dkt. 20-161
Exh. 14

Attachment 4
Administrator/Engineer Internal Process

(Sheet 1 of 3)

Templates

- The latest templates shall be obtained upon each new or edited document from the following location:

  N:\T&D_Standards_Eng\Standards Working Files_Templates

Obtaining Document Numbers

- All documents are logged on a common tracking sheet. The Program Admin/Office Admin is responsible for logging and administering document numbers to the Engineer.
- All documents will have a numbering scheme based on the categories in the Bookshelf.
- Each document will have ONE number assigned to the standard.
- All new documents should be processed using the Word/Excel templates found on the T&D Standards Drive in the Templates folder.
- Document Naming Prior to approval or SRM (when applicable):
  - When a document is sent for comment, use the DTR/WMS document number section for a place holder (i.e DTR 10.XXX or WMS 04.3XX-234).
  - When the document is ready for Director Review or the SRM, send an email to the Administrator and request a number (for DTR, SPC, WMS, etc.).
- Once the document is ready for Approval, a number shall be obtained from the Administrator.

Obtaining SOURCE Documents

- All published documents requiring any edits shall be requested by the Program Admin/Office Admin via the SOURCE folder found on the T&D_Standards_Eng folder.

DSEMs

- Design guide for CT/WMA/NH only.

DTRs

- Depending on the context written, one or both of the templates can be used when writing a standard (See *Attachment 1 – Distribution Construction Standards (DTR)* for definition).
- Page Backs
  - Each DTR that has a Bill of Material will require a Page Back. Page Back's house the material and the Compatible Units (CU) for Maximo.
  - Each Page Back CU will follow the DTR number followed by 0.A-Z (ex. 10.123.0A).
  - If A-Z is used up and more letters are needed, next letter scheme will be AA, BB ….ZZ.
  - Once approved, The Page backs MUST be emailed to the CU team to be implemented into Maximo.

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Data Request DOE 6-003
Exhibit 14

Attachment 4
Administrator/Engineer Internal Process
(Sheet 2 of 3)

EMP

- Distribution Maintenance Procedures will be maintained by T&D Standards. All other EMP documents shall adhere to ADM 001 and revised by the affiliated groups.
- EMP documents will require a working group. The working group will require representation from all three states.

TIB/PIBs

- TIB – Document abbreviation denotes EMA
- PIB – Document abbreviation denotes CT/WMA/NH
- All TIB/PIBs that have the same subject content will have the following the naming scheme:
    - TIB-21-001 and PIB-21-001 – denotes same subject
- All TIB/PIBs may be signed off by the Manager of T&D Standards.

SPCs

- All consolidated SPC shall include appendices, as necessary.

WMS

- EMA, CT, WMA & NH will have a number associated with it. This will allow each work practice to have a parent name and suffix the clearly defines the operating area it pertains to.
    - EMA = 1, CT = 2, WMA = 3, NH = 4
    - Example:
        - An EMA document will be numbered WMS 90.14-1
        - A CT/WMA will be numbered WMS 90.14-23
        - A CT/WMA/NH will be numbered WMS 90.14-234
- This method will give long term flexibility with future consolidation where in the case when a document pertains to everyone, the document name can drop the suffix and the applicability will be changed to ALL. In other cases where the document is unable to be consolidated the document can continue to carry its suffix.

Saving Documents

- All word and excel documents are to be saved on the T&D Standards Drive in the following folder:

  N:\T&D_Standards_Eng\Standards Working Files

- The following folders mimic the Bookshelf structure. Any new document will be saved within the appropriate folder and follow the structure of the saved documents.

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Exhibit 14

Attachment 4
Administrator/Engineer Internal Process
(Sheet 3 of 3)

For Approval Documents

- All documents shall be sent to the Administrator via Email to be placed within the Director/Manager Approval Folder that is controlled by the Administrator.
- All word documents shall have the watermark "FOR APPROVAL" and shall not have any track changes within the document.

Signatures

- Administrator shall coordinate the signature process between Director/Manager and Engineer.
- Work Method Documents (WMS)
    - Additional signature may be required
    - Program Admin/Office Admin will be responsible for sending email to all parties for approval.

Approved Documents

- All approved documents shall be sent to Engineer for final review by the Administrator.
- Engineer shall provide the approved document ready for upload to the Administrator in PDF form with all approval signatures within the document.
- Engineer provides the placement within the Bookshelf for the Administrator to update the Table of Contents Page(s).
    - Provide the path of which index needs to be updated.
- Administrator will save all documents in the appropriate SOURCE folder found on the T&D _Standards_Eng folder.
- Administrator will email the SBS to the owner(s) of the DNAT system, Training Programs and Compliance, for distribution.

Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: May 16, 2022 **Date of Response: May 27, 2022**
Data Request No. DOE 6-004 **Page 1 of 1**

Request from: Department of Energy

Witness: Hebsch, Jennifer J

Request:

Reference the Company's response to data request (DR) DOE 4-2. Please provide switchgear application standards, including voltage ratings, for when dead-front versus live-front connections are to be used.

Response:

- Please refer to Attachments DOE 06-004(a) through (c) for switchgear application standards. The following Distribution System Engineering Manual (DSEM) standards are provided:

a- DSEM Section 11.50 "Switchgear Design Philosophy", or Attachment DOE 6-004(a).
b- DSEM Section 11.51 "Standard Switchgear Units and Combinations", or Attachment DOE 6-004(b).
c- DSEM Section 11.57 "Automatic Retrofit Switchgear", or Attachment DOE 6-004(c).

- Please refer to DSEM Section 11.50 or Attachment DOE 6-004(a) for switchgear voltage ratings at pages 1 and 2.

- In general, the differences between dead-front and live-front are that dead-front switchgear has no exposed high voltage parts on the front, or high voltage parts installed inside a metal enclosure requires a deliberate opening of an access panel or a shield to access live parts. Conversely, in live-front switchgear, energized parts are readily accessible once the switchgear enclosure is open. The Company is in the process of phasing out switchgear equipment with live-front connections for safety purposes.

Switchgear Design Philosophy

SCOPE – This Standard describes the underlying philosophy in the design and selection of primary voltage switchgear for Eversource Energy. It is intended to help designers of underground and direct–buried systems understand why Standards recommend only a limited number of designs, and what must be considered in the selection among options.

GENERAL – This Standard discusses switchgear for use primarily on the distribution system, outside of substations. It is not a Standard for substation design although some substations, especially smaller ones, can use this switchgear in place of more traditional substation equipment.

SITE SPECIFICS

1. Switchgear installed outdoors consists of an enclosure containing primary voltage switches, fuses, circuit breakers, metering equipment, and access points for testing and grounding of underground electric systems.
2. Switchgear installed indoors in places accessible to the utility and qualified persons only consists of the primary voltage switches, fuses, circuit breakers, metering equipment, and access points for testing and grounding, but not necessarily an overall enclosure. However, all indoor equipment is either dead front (no exposed high voltage parts) or is installed inside a metal enclosure that requires a deliberate opening of a door or access panel to access live parts.
3. Outdoor enclosures are designed to allow them to be placed in the public domain. They must conform to Industry Standards that address their security including strength, door locks, resistance to penetration by thin wires, ventilation, resistance to weather, etc. to make them safe to install where the public can touch them. Standards require stainless steel for the enclosure material.

SWITCHGEAR TYPES – The Industry offers several types of switchgear.

1. Eversource uses what is generally referred to as “pad–mounted” switchgear of a relatively low profile design, on the order of 4–6 feet high, designed to be installed on a concrete pad or manhole made for switchgear. Pad–mounted switchgear is offered in a limited number of configurations by the manufacturers.
2. Pad–mounted switchgear is available in different styles; air–insulated switchgear with gang–operated three–phase switches and fuses for protection, SF_6 insulated, or solid dielectric switchgear with vacuum circuit breakers. **DSEM 11.55** provides criteria to select the proper switchgear design.
3. A popular option often specified by consultants for customer applications is Custom Metal Enclosed Switchgear, sometimes called “High Bay” switchgear. It is used indoors and outdoors, and is 10–12 feet high. This equipment is modular in design and can be custom built for almost any imaginable realistic configuration. Eversource in general does not buy this switchgear due to its size and high cost. None of it is standard. Its primary advantage is that it provides an individual switch for every set of fuses, something required by the National Electrical Code (NEC), which customer–owned systems must follow. Utilities are exempt from the NEC and rely on specialized equipment and training, and they follow the rules in the National Electrical Safety Code (NESC), which effectively allow use of pad–mounted equipment.
4. There are other variations of Metal Enclosed Switchgear, including lower profile modular designs, hybrid designs with SF_6 and modular designs combined, and Unitized Metal Enclosed Switchgear. Unitized switchgear has been purchased in the past for its high fault duty, but now this rating is available in pad–mounted equipment, so unitized switchgear is no longer purchased.

RATINGS – Regardless of the basic switchgear design it is imperative that the switchgear have the ratings necessary for its installation. These ratings are as follows:

1. **Operating Voltage** – The design voltage of the switchgear must meet or exceed the operating voltage, including its high extreme.

a. For 5 kV (i.e., 4.16 kV and 4.8 kV), 8.32 kV and 11 kV applications, use switchgear recommended for 15 kV applications. If automatic switchgear is required, use a 15 kV design with potential transformers designed for the actual operating voltage.

b. For 15 kV applications (i.e., 12.47 kV, 13.2 kV, and 13.8 kV), manual switchgear, rated for 25 kV (or 29 kV) is used for 15 kV and 25 kV applications to reduce spares requirements, standardize design details, and reduce the number of active stock codes. Automatic switchgear is designed for 15 kV, however, because it contains potential transformers which must be voltage specific.

c. For 27.6 kV applications, use 35 kV (or 38 kV) switchgear. The industry offers 25 kV switchgear which is rated for up to 29 kV, but 27.6 kV systems sometimes operate at voltages greater than 29 kV.

d. For 33 kV or 34.5 kV applications, use 35 kV (or 38 kV) switchgear.

2. **Fault Current Withstand** – The switchgear must be rated for the maximum fault current available at the location where the switchgear is installed.

   a. Note that higher fault current that may be available briefly (on the order of a few minutes) during switching at substations are not considered. However, if substation switching that raises fault current is a prerequisite for operating the switchgear, the switchgear **MUST** be designed for the higher fault current. An example of this is switchgear that is fed from two different and normally un–tied buses of a substation, and the buses are tied to minimize current flow through the switchgear when it is operated. If a bulk power transformer is not taken off line to reduce the fault current at the substation to the level that exists when the bus ties are open, the higher fault current existing when the bus tie results in the paralleling of bulk transformers becomes the design criteria for switchgear used on feeders from the substation.

   b. Where alternative supplies to the switchgear are available and would be used for extended periods of time (more than a few minutes) to supply the switchgear, the highest fault current of all such possible sources must be accommodated.

   c. Where switchgear is applied to select alternative (but normally non–paralleled) supplies from two different sources, the fault current withstand design of the switchgear must meet the conditions of the stronger source, but not for both sources combined.

   d. Where switchgear is applied to parallel the supplies from two different sources, the fault current withstand design of the switchgear must meet the fault conditions for both sources combined.

      Note: This mode of operation will also increase the fault current on other parts of the feeders paralleled by the switchgear, and thus is a design rarely encountered on a distribution system.

   e. Be aware of an increase in fault current that will result for parallel installations of reactor–limited feeders *from the same substation source*. If two reactor–limited feeders are paralleled, the fault current available will approximately double. Designers must perform an exact calculation to determine the actual fault current value from such installations.

   f. Feeders supplied by substations where one transformer alone or two transformers paralleled could be supplying the feeder must be designed for the higher fault current from two transformers paralleled. This situation arises in three–transformer substations operated with two transformers paralleled and one operating alone. For the loss of any one of the three transformers, the remaining two are paralleled, subjecting <u>all</u> feeders to the combined fault current of two transformers. This condition could persist for several days or weeks and must be accommodated for all switchgear supplied by feeders from the substation.

g. For new switchgear, the fault current available at the substation source (on the load side of feeder reactors where they exist) is the value to use for all switchgear connected to the feeder, regardless of location. This allows feeder improvements to take place without concern for causing increases in fault currents as could result from replacement with larger conductors, paralleled conductors, or shortened feeder routes.

h. For switchgear that already exists, the actual fault at the location, considering line impedances from the source to the site, can be considered, with the resulting decrease in fault current that results.

i. On most of the distribution system, fault currents are limited to 12500 amps RMS or less by substation design. This is achieved by non−parallel operation of bulk power transformers, assuring sufficiently high transformer impedance when they are specified, neutral reactors, and feeder reactors. This is the standard duty for most switchgear.

j. Higher duty switchgear is required where fault currents exceed 12500 amps RMS. Standards specify air insulated switchgear with extra bus bracing where required to allow it to be applied where fault currents are 17000 amps RMS or less. Newer design SF_6 switchgear is available with a 25000 amp RMS fault withstand design. Standards will often specify these higher fault duties for all switchgear to make it more versatile on the system, reduce spares requirements, and reduce the number of active stock codes.

k. All switches, including fuse holders intended for live switching, shall be rated for fault closure at the fault withstand rating of the switchgear. This includes the grounding switch on SF_6 switchgear with built−in grounding switches. These fully−rated switches have been accepted as grounding devices. Fault closure ratings are inherent in the switch design and are not dependent on the speed of the operator's hand.

3. **Fault Current Limitation**

a. Fault current limitation can be provided by the switchgear itself by the use of current−limiting fuses in the switchgear.

b. Fault current limitation is required if the available short circuit current exceeds 10000 amps and the switchgear supplies systems with load break elbow equipment. Since virtually all pad−mounted transformers employ load break elbows for their primary connections, almost all systems fed by switchgear contain load break elbows. Exceptions include 27.6 kV transformers, which may have live−front spade terminals, and customer switchgear.

c. The rating of a switchgear fuse holder may consider the current−limiting fuse as a limitation on the fault duty requirement of the fuse holder itself. All switches in the switchgear and its bus work must be rated for the full fault current at the supply terminals.

d. Because of their high cost, current−limiting fuses are applied only where required.

e. Eversource has not found a need for pyrotechnic current−limiting fuses. No fuse should be applied if its application requires an in−situ study of the circuit including elements such as capacitors and other connections since circuit characteristics may change and we will not revisit the fuse installation when they do.

4. **Load Current Rating**

a. Switches are rated for 600 amps continuous. The switch load dropping rating may be less and varies by manufacturer.

b. Fuse holders are rated for 200 amps continuous maximum. The rating of the fuse holder is limited by the fuse installed.

c. Circuit breaker ways are generally rated for 600 amps although the breakers may be set for less unless the utility−owned switchgear is feeding a primary service to customer−owned switchgear.

DESIGN DETAILS

1. **Fusing for Air–insulated Switchgear**

   a. Because Connecticut and Western Massachusetts have large developments of 13.2 kV, 13.8 kV, and 23 kV systems, 25 kV air–insulated switchgear has been standardized for all.

   b. The need for current–limiting fuses on high fault current 13.2 kV and 13.8 kV systems has been accommodated by the use of 25 kV switchgear. Current–limiting fuses are physically large and will not fit in the space provided for regular 15 kV expulsion fuses. Thus the larger space provided for the higher voltage clearances in 25 kV switchgear also facilitates the larger current–limiting fuses needed for 13.2 kV and 13.8 kV applications.

   c. Three different fuse holders are available for the universal 25 kV switchgear. The fuse holders can be changed in the field. Order the fuse holder required for the application in new installations. The fuse holders are specific for the switchgear manufacturer and are not interchangeable between switchgear from different manufacturers. The choices are as follows:

      - For 23 kV, 25 kV expulsion fuses*
      - For 13.2 kV and 13.8 kV, 15 kV expulsion fuses*

        * The same fuse holder is used for 15 kV and 25 kV power fuses in standard switchgear but must be adjusted to suit the fuse voltage class.

      - For 13.2 kV and 13.8 kV, 15 kV current–limiting fuses

        Note: There are two different fuse holder arrangements for the 150 amp current–limiting Fuses: S&C and Federal Pacific

2. **Connections**

   a. Cables connected to air–insulated switchgear are connected with live front terminals. These terminals are shielded with double barriers consisting of an inner barrier that requires a penta–head wrench to remove, and an outer lockable stainless steel door with latch.

   b. Kits are available to connect two cables to one terminal. These are nonstandard and should be done only where needed to accommodate a parallel cable run. For other applications, such as to branch off a feeder mainline, the branch connection should be made external to the switchgear with just one cable run to the switchgear terminal. Two cable connections on one terminal, while possible, are difficult to construct and pose space problems.

   c. Cables to all ways of solid dielectric and SF_6 switchgear are connected with 600 amp or 900 amp deadbreak tee connectors. The 600 amp size is Standard; the 900 amp size is for special applications only.

   d. For 35 kV class switchgear 200 amp loadbreak reducing plugs should be included with the deadbreak tee connector to enable the connection of test equipment and grounding elbows without removing the tee connector from the switchgear. At 15 kV and 25 kV use a terminal plug, bushing well stud, and loadbreak connector bushing. The 200 amp loadbreak reducing plug is also used for potential transformer (PT) connections on some automatic switchgear. This connector allows taking the PT off line for cable testing.

3. **Application of Test Voltages to Energized Switchgear**

   a. Air–insulated switchgear is designed to allow application of test voltages to cables connected to air insulated switchgear with other ways energized at line potential if the way under test is open and its barrier board is inserted to prevent its closure.

b. SF_6 insulated switchgear is designed to allow application of test voltages to cables connected to SF_6 insulated switchgear employing dead–front connectors (including deadbreak tee connections) with other ways energized at line potential if the isolating switch for the way under test is open, up to the test value approved and on file from the manufacturer of the switchgear.

c. Exact test voltage limits, including the differences for DC, Thumper, and Very Low Frequency (VLF) testing are prescribed by the Test Department. However, the intent of the switchgear design is to not require the removal of cables from their switchgear terminals for fault locating or proof testing. Nevertheless, in some extreme cases, where a very high test voltage is required, removal may be required.

APPLICABLE RULES AND CONSIDERATIONS

1. Switchgear is available from manufacturers in a number of standardized configurations. Eversource has standardized on the use of only a few of these. This promotes consistency of design to minimize operational differences between installations, and it minimizes spares requirements and the number of active stock codes. **DSEM Sections 07.20, 07.22, 07.32, 07.35, 07.36, 11.55,** and **11.56** prescribe and illustrate standardized applications of switchgear.

2. Nonstandard switchgear applications may be required for unusual situations, although every effort should be made to use a standard configuration. Some nonstandard applications include paralleled feeder service and supplies to primary customers. These could be standardized in the future as they become more common. Where an applicable standard has not yet been published, one should look for precedents set by previous designs for similar situations to avoid unnecessary variation and to support the formulation of a standard approach.

3. Two feeders should not terminate in the same unit of switchgear. This rule guides all Standard switchgear application designs. This rule exists since the single contingency of a switchgear failure, or the need to de–energize switchgear for preventative maintenance should not cause the interruption of two feeders. This is especially important where the two feeders also supply network transformer/protector units feeding a secondary network. The simultaneous interruption of two such feeders would put the network into a double contingency.

   Exception: Two feeders may, in effect, enter the same unit of switchgear if one of the two feeders first passes through switches in another unit of switchgear at the same location. In this case, the feeder that passes through the other unit of switchgear can be isolated from the unit where both appear to either avoid its outage or to recover quickly if a failure interrupts it. This exception is NOT allowed if the two feeders are also secondary network feeders. In that case, the second feeder must also pass through a fault interrupting device before it enters the switchgear where another feeder is present.

   Note: Where the two feeders supplying a switchgear installation originate at different substations, it must be possible to tie them without fuses in the tie to avoid unwanted fuse operation due to load currents flowing between the substations when they are tied. For this reasons, a protection point may not be desirable between the feeders. Circuit breakers can be set to accommodate inter–substation load flows since the phase settings can be set high, with sensitivity provided by the ground trip relay. With fuses, this is not possible as they must provide the required sensitivity and speed as phase devices. If switchgear with fuses in the tie (as a Type 12 unit) must be used in a design involving feeders from two substations, the fuses can be replaced with solid links. Preferably, switchgear without fuses in the tie (e.g. a Type 9) will be specified for such applications.

4. One unit of switchgear should not be the sole source to a load since it must be possible to take this unit of switchgear out of service for repairs, replacement, or other work without interrupting load. This rule guides all Standard switchgear application designs.

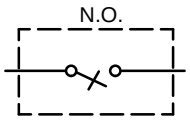
Exception: Small loads in areas where only one underground feeder exists.
See **DSEM Section 07.32.**

5. Loop circuits fed from switchgear must always be run between two different units of switchgear, never from different outputs of the same unit of switchgear. This allows for switchgear repair, replacement, or maintenance without dropping load.
    - *Contained* loops run between different units of switchgear at the same physical location.
    - *Remote end* loops originate at a unit of switchgear, but end at another unit of switchgear in a different location, at a riser pole, or at a tie point with another loop segment fed from a remote switchgear installation.
6. Switchgear is required at normally–open switching points within loops on underground systems wherever the switching point must be operated to take an underground feeder out of service. This is because load break elbows have a life limited to 10 full load make/break operations, and feeders are switched out frequently. Loadbreak elbow switching points are sufficient for accommodating work within a loop circuit itself since the loop circuit should be relatively small compared to a feeder mainline.
    a. Where a loop circuit is fed from two Type 5 (or 211) switchgear units, the open point in the loop must be at one of the Type 5s, unless a Type 3 normally open switchgear unit is located within the loop to serve as the open point. This assures that a switch, and not an elbow, will be operated to take either supply feeder out of service.
    b. Where a loop circuit is fed by load terminals of two Type 9 (or 422) switchgear units at the same location, or by outputs from separate units of a 9/12 (or 413/422) pair, the loop open point may be a set of loadbreak elbows. This is because the switchgear pair provides a tie between them, and switching in the loop is not required to take either supply feeder out of service.
7. As a rule, per **NB–150**, **"Installation, Testing, and Maintenance of Customer–Owned Equipment**," Utility feeders should not terminate directly in customer–owned switchgear. Utility–owned switchgear should exist between the utility feeder and the customer–owned primary switchgear. The utility–owned switchgear provides a place to isolate, tag, and ground the utility feeder for work using utility–owned and maintained switching equipment. Per **NB–150**, Utility employees are not to operate customer equipment.
8. In general, it is not desirable for a cable below an open pole–top cutout to be live when the cutout is open. While this is not forbidden, it is acknowledged that a general belief exists that an open cutout that is not set up for being back fed (as where an overhead line is fed from the underground) indicates a de–energized cable below it. Such restrictions do not apply to switchgear, and it is known that anything inside the switchgear can be alive regardless of the status of any switch and fuse. This is due, in part, to the wide use of switchgear to feed loop circuits. The switch in a unit of switchgear serving as the loop open point provides a suitable device to operate as part of a feeder switching process. While the open point in DB loops fed from risers should be at transformers or other elbow switching points within the loop and not at the riser end, the open point in switchgear–fed loop circuits can, and often must be, at a switchgear end point. Standard switchgear application designs consider this need.
See **DSEM Section 11.51** for illustrations of Standard switchgear units and combinations.
9. It is realized that some compromise must be made to work on the cable between the utility switchgear and the customer switchgear, or on the company switchgear itself. For the majority of the situations the utility–owned switchgear will eliminate the need to operate customer switchgear. The utility–owned switchgear can facilitate transfer of a primary customer supply from one feeder to another. It can also provide protection against back–feed where customer equipment ties two Utility supplies together at primary or secondary level.

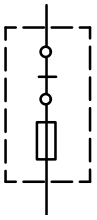
    Note: Customer–paralleled schemes require Utility approval.

Standard Switchgear Units and Combinations

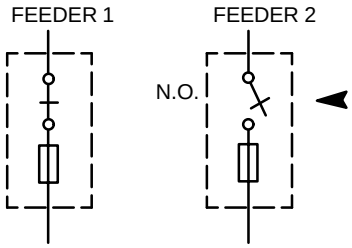
Standard switchgear units and combinations are illustrated below. Details for their application are covered in **DSEM Sections 07.20, 07.22, 07.32, 07.35, 07.36, 11.55, and 11.56.**



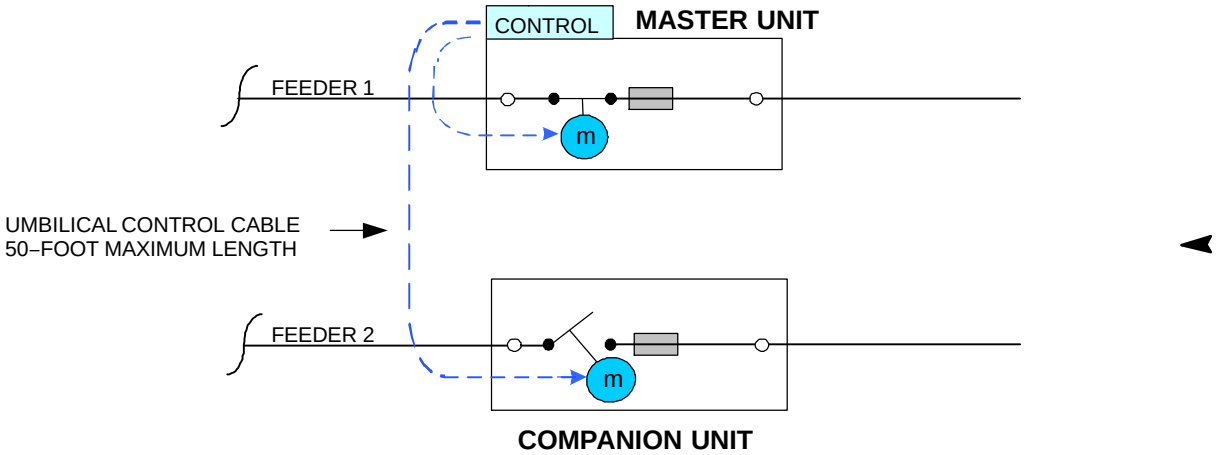
Type 3 – Air Insulated Switch for feeder sectionalizing or for open points in loops



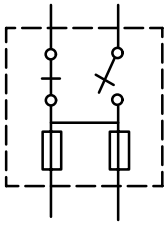
Type 5 – Air Insulated Switch / Fuse for loop end points or dual–primary services.



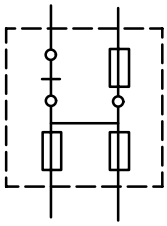
Type 5 Pair – Air Insulated Switchgear. For loop end points at the same location or for a complete dual primary service. May be automated to transfer automatically for loss of the normal source (see below).



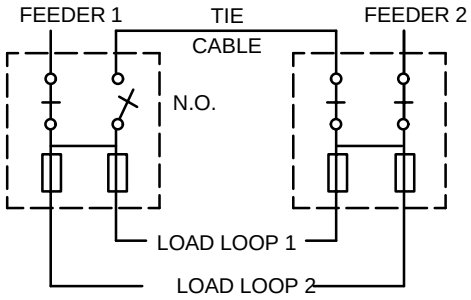
Type 5 Automatic Pair – Air Insulated Switchgear. For loop end points at same location or for a complete dual primary service.



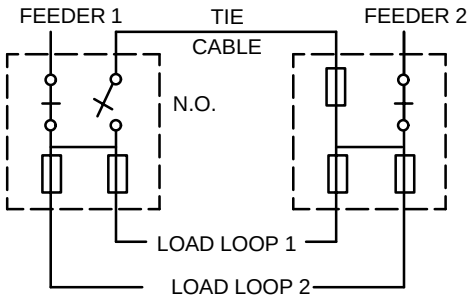
Type 9 – Air Insulated Switchgear. Two switches and two fuses for loads. Used for loop end points with a companion Type 9 or Type 12 unit, or alone to feed very small loads where only one underground feeder exists.



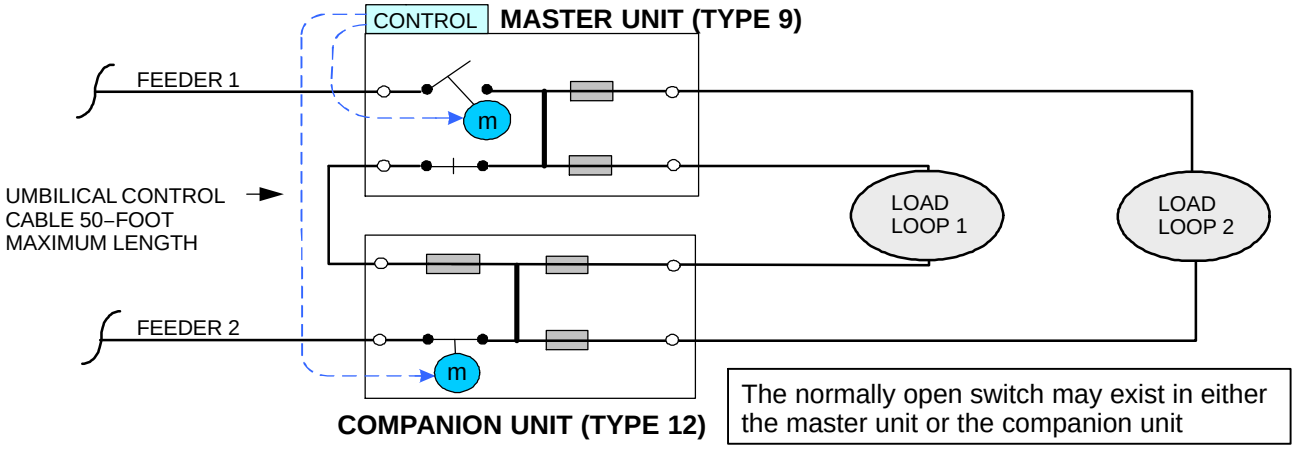
Type 12 – Air Insulated Switchgear. One switch and three fuses. Used as a companion unit with a Type 9 where a protection point is needed in the tie between the two supply feeders to the switchgear installation. Never used alone.



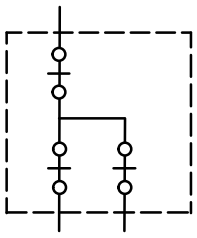
Type 9 Pair – Air Insulated Switchgear. Used to feed two loops or a large service. May be automated as a preferred/alternate scheme with the tie closed and an automatic transfer between the two feeders. Open points in the loops may exist at loadbreak elbows. The lack of a fuse in the tie allows the switchgear to make a live tie between two substations as it transfers load from one source to another.



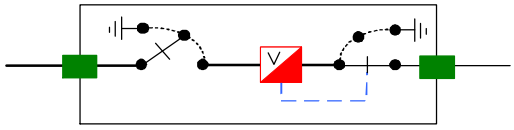
Type 9/12 Pair – Air Insulated Switchgear. Used to feed two loops or a large service. May be automated (see below) as a preferred/alternate scheme with the tie closed and an automatic transfer between the two feeders. Open points in the loops may exist at loadbreak elbows. The fuse in the tie prevents a unit fault from interrupting two feeders.



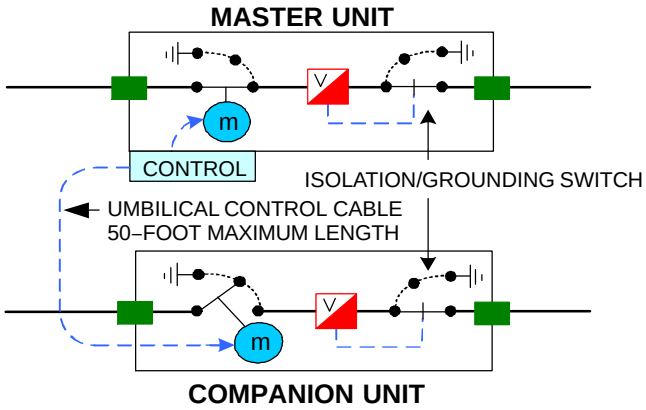
Type 9/12 Automatic Pair – Air Insulated Switchgear. Used to feed two loops (as shown above) or a large service. Automated as a preferred / alternates scheme with the tie closed and an automatic transfer between the two feeders. Open points in the loops may exist at loadbreak elbows. The fuse in the tie prevents a unit fault from interrupting two feeders.



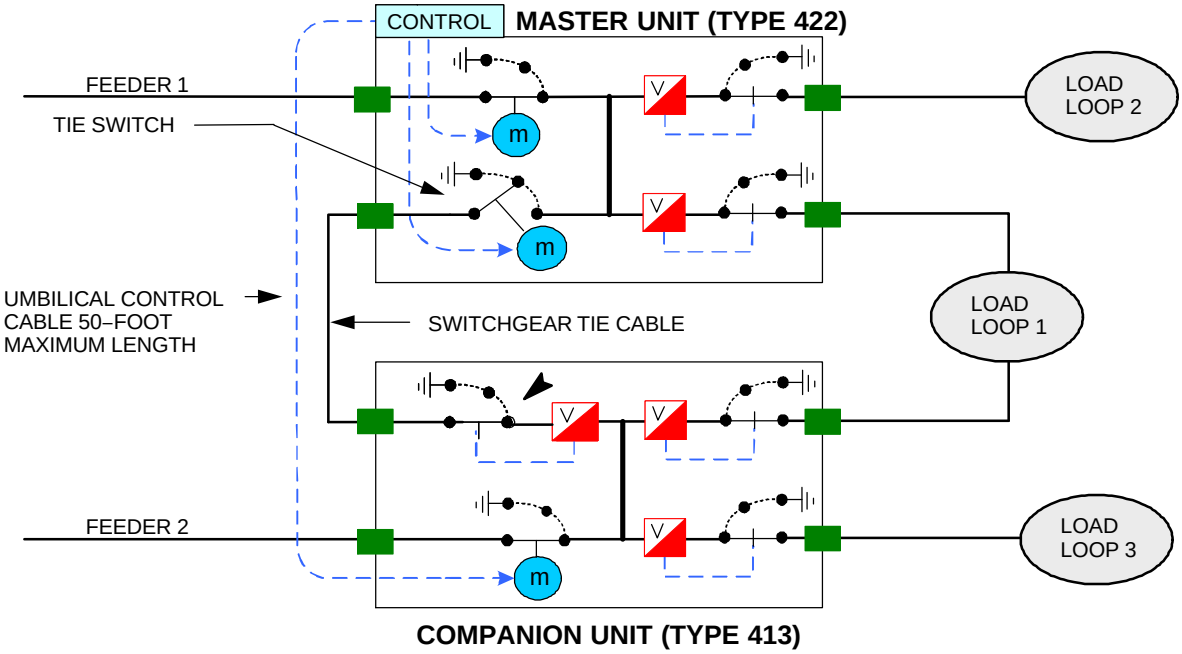
Type 13 – Air Insulated Switchgear. Used to split very large loops into segments or to provide feeder sectionalizing.



Type 211 – SF6 Insulated Switchgear. Used for loop end points, for dual primary services, or for feeder sectionalizing. May be pad–mounted with a shell enclosure, or may be mounted in a vault as is.



Type 211 Automatic Pair – SF6 Insulated Switchgear. Used for loop end points at the same location or a complete dual primary service. Automated (as shown above) to transfer for loss of the normal source.



Type 413/422 Automatic Pair – SF6 Insulated Switchgear. Used for supply to two to four loops (more then two requires remote ends for the loops) or very large services. The automatic transfer mode may be preferred / alternate or main – tie – main depending on how the control is programmed. Only these automated versions are Standard.

Automatic Retrofit Switchgear

SCOPE – This DSEM section describes in particular the upgrading of the manual dual–primary (two Type 3 and two Type 4 wall units) scheme shown on **DSEM 07.206** to automatic operation.

GENERAL – A manually–switched dual–primary conventional underground switchgear scheme, such as the ones described in **DSEM Section 07.20 UG Design Selection**, can be upgraded to automatic operation by the addition of compact EPDM rubber–insulated vacuum switches.

DESIGN FEATURES

1. Air break switches from the manual scheme are retained to provide feeder isolation to facilitate feeder work, including testing and fault locating. In the automatic scheme, both will operate normally closed.
2. Fuses from the manual scheme are retained for protection. The automatic switchgear added does not provide protection. Current–limiting fuses are required (and should exist) where available short circuit current exceeds 10 kA symmetrical. In some older installations, expulsion fuses were applied. If fault currents exceed 10 kA, these should be replaced with current–limiting fuses. This may require the replacement of the fuse enclosures as well. As with all dual primary schemes, fuse sizing is determined by currents flowing between feeders during a live transfer, and not the size of the load itself. Use two paralleled 80NX fuses or one 150 amp CL fuse per phase in all fuse locations.
3. If the dual primary scheme is supplied by common–sourced feeders, which is always the case if the feeders also both supply the same secondary network, and the design is a two Type 3 wall units and one Type 4 wall unit scheme, as shown in **DSEM 07.206**, add a fuse cabinet to change it to a two Type 3 and two Type 4 wall units design as shown in **DSEM 07.206**. The two Type 3 wall units and Type 4 wall unit design is not correct for common–sourced feeders, especially if the feeders also supply transformers that feed a common secondary network. However, before Standards were developed, several of these services were installed. They must be corrected when the service is automated.
4. To automate the service add the new compact EPDM rubber–insulated switchgear in between the fuses and the transformer(s). The automatic package consists of the two three–phase vacuum switches and a control cabinet that connects to each switch unit with 20, 40, 60, or 75 foot control cables. Locate the control cabinet in a separate room from the switchgear. The vacuum switches will operate with one normally open and one normally closed. For loss of the normal supply, the normally closed switch will open and the normally open switch will close to restore service within a few seconds. The switches are rated for only 12,500 amps symmetrical fault current but may be applied in installations with higher fault current if current–limiting fuses are installed in the fuse enclosures.
5. The automatic switchgear includes a fault current blocking scheme to prevent it from closing into a fault.
6. Each automatic switchgear unit can be installed on uni–strut fastened to a wall or on an optional stand which is bolted to the floor and wall.
7. All connections to all units of switchgear are made with 600 amp bolted connectors. The connection to the transformer is made with 200 amp loadbreak connectors. Loadbreak connectors must be located to allow operation with a 10 foot switching stick. Use 4/0 Al cable between all connectors.
8. The two automatic vacuum switches are separate units. The common point for joining the two alternative supplies to the transformer is the six bushing transformer itself.
9. In some cases, a live–front transformer or a three bushing transformer may exist. In that case, install a set of four–way load break junctions on a vault wall to join leads from the two vacuum switches and the transformer.

10. Figure 1 below is a schematic of the automatic retrofit switchgear scheme.

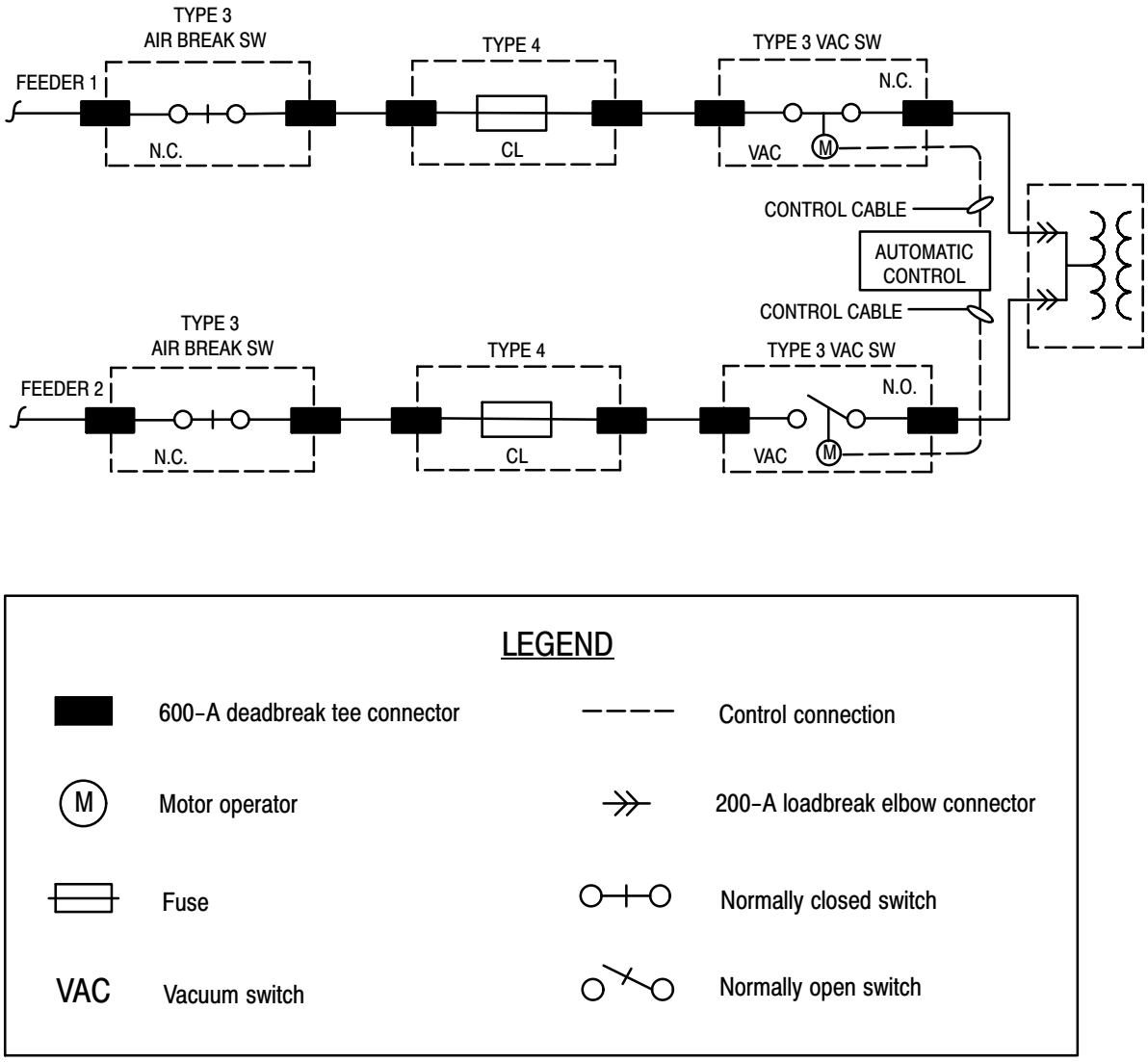


Figure 1 – Automatic Retrofit Switchgear Schematic

Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: May 16, 2022 **Date of Response: May 27, 2022**
Data Request No. DOE 6-005 **Page 1 of 1**

Request from: Department of Energy

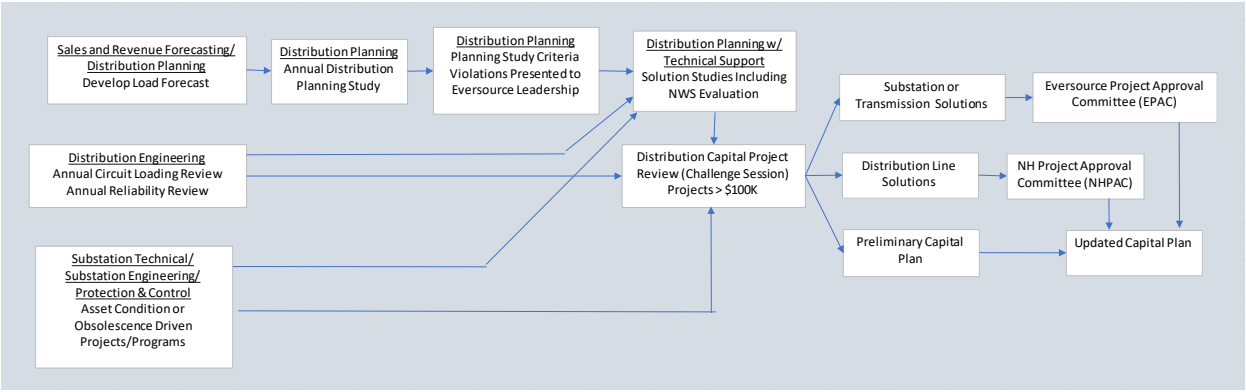
Witness: Walker, Gerhard, Freeman, Lavelle A

Request:

Reference LCIRP, March 31 2021 Supplement, Appendix A, NWA Framework. Please provide a single, high-level flow chart illustrating the project evaluation and selection process for both traditional and NWA solution alternatives, starting with need identification and ending with best overall solution recommendation, including the evaluation criteria (e.g., asset condition) considered for each (i.e., traditional and NWA). This should not be a repeat of the capital approval process.

Response:

The requested flow chart was provided in the October 1, 2020 LCIRP filing, Appendix D, page 24 (Bates page 92). The flow chart is also reproduced below.



Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: May 16, 2022 **Date of Response: May 27, 2022**
Data Request No. DOE 6-006 **Page 1 of 2**

Request from: Department of Energy

Witness: Hebsch, Jennifer J

Request:

Reference the Company's response to DR DOE 5-015 b and c. Regarding the replacement of wood poles with steel poles please provide an estimate of how much is saved in O&M expenses over the useful life of a steel pole as compared with a wood pole. Provide the life-cycle costs. Please provide an estimate of dollars saved on average due to anticipated/estimated lower outages, interruptions.

Response:

The Company indicated in its response to Data Request DOE 5-015 (b), that steel poles when properly maintained have an average useful life ranging from 60 to 80 years, compared to wood poles' useful life of 30 to 40 years. Both steel and wood poles require O&M expenses over the useful life of the pole including: (i) pole inspection cycles consisting of a visual and a ground line inspection, (ii) post storm patrols, (iii) drone or helicopter infrared inspections, and (iv) trimming activities. However, wood poles require additional inspections activities including a visual, sound and bore, and ground line treatment.

The cost benefit for using steel poles becomes more apparent after a steel pole has been in service for 40 or more years as compared to a wooden one. That is because a wooden pole with 40 years in service would be at the end of its service life and it will need to be replaced. In several instances, poles in rights-of-way ("ROW") are set in inaccessible areas due to terrain conditions such as wetlands requiring environmental matting, which increases the cost for replacements. Installing steel poles decreases the frequency of replacement by one half and defer the cost for replacement to one steel pole every 80 years.

The Company is in the process of evaluating the life-cycle cost of steel poles. In general, the life-cycle cost of a pole is calculated based on the initial cost, the cost of replacement, projected lifespan and operations and maintenance cost per year. The higher initial cost of steel poles is offset by the reliability and extended service life of these stronger poles. The lifespan of a pole is a function of a variety of factors including geographical location, terrain, and the probability of failure including during severe and catastrophic weather conditions such as hurricanes, tornados, and tropical storms.

The Company is not currently able to provide an estimate for dollars saved by installation of steel poles. The Company anticipates increased reliability and resiliency in its ROWs across its service territory and a corresponding reduction in pole replacement costs, but an estimate of dollars saved on average in terms of anticipated/estimated lower outages and interruption requires modeling of future storms and the possible

Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: May 16, 2022 **Date of Response: May 27, 2022**
Data Request No. DOE 6-006 **Page 2 of 2**

impacts to the distribution system. The Company is evaluating and developing simulation models to assess the benefits of hardening the distribution system and quantify the anticipated/estimated reduction in outages and interruptions during blue-sky and black-sky days, including benefit-cost analysis.

Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: May 16, 2022 **Date of Response: May 27, 2022**
Data Request No. DOE 6-007 **Page 1 of 1**

Request from: Department of Energy

Witness: Johnson, Russel D

Request:

Reference the Company's response to DR DOE 5-011, Attachment DOE 5 c. Please provide an explanation of why step transformer failures cause lengthy outages.

Response:

Step transformer failures can cause lengthy outages for several reasons:

- the failed equipment cannot be bypassed to restore power to customers while a replacement unit is installed;
- spare step transformers are not carried on responding line trucks for immediate installation;
- replacement step transformers are required to be transported from an area work center or, often, from the Bow Central Warehouse;
- larger size step transformers require additional equipment for removal, transportation, and installation;
- the replacement unit cannot be safely installed by a one-person crew; and
- the failure of a step transformer is not always obvious and often misleading, requiring further troubleshooting and testing before confirmation that a replacement is needed, adding to the overall duration of the outage.

Public Service Company of New Hampshire d/b/a Eversource Energy
Docket No. DE 20-161

Date Request Received: May 16, 2022 **Date of Response: May 27, 2022**
Data Request No. DOE 6-008 **Page 1 of 1**

Request from: Department of Energy

Witness: Freeman, Lavelle A, Labrecque, Richard C

Request:

Reference the Company's response to DR DOE 5-004. Please provide an enhanced explanation regarding the difference(s) between a Feasible Alternative Solution vs. a Technically Feasible Solution. Are they essentially the same?

Response:

The definitions from DR DOE 5-004 are copied below, with additional explanation in underlined text to illustrate the differences between the terms Feasible Alternative Solution and Technically Feasible Solution.

Feasible Alternative Solution – a project is considered feasible if no technical or non-technical constraints have been identified that would preclude construction or implementation. Technical constraints include standard equipment design and availability of materials. Non-Technical constraints include availability of real estate, zoning and permitting concerns, community and stakeholder concerns, and environmental restrictions.

Technically Feasible Alternative Solution - a project is considered technically feasible if no technical constraints have been identified that would preclude construction or implementation. Technical constraints include standard equipment design and availability of materials.