



April 3, 2017

Faith Huntington
Director of Electricity and Gas Utilities
Maine Public Utilities Commission
State House Station #18
Augusta, ME 04333-0018

RE: Emera Maine Transmission Line Rebuild or Relocation Projects, 35-A M.R.S.A. §3132(3) and Minor Transmission Line Construction Projects, 35-A M.R.S.A. §3132 (3-A).

Dear Ms. Huntington:

Pursuant to 35-A M.R.S.A. § 3132(3) and (3-A) and Chapter 330(§8) of the Maine Public Utilities Commission Rules, enclosed is Emera Maine's annual filing of its Transmission Line Rebuild or Relocation Projects (69 kV and above), and its Minor Transmission Line Construction Projects (69 kV and above) ("Chapter 330 Report").

Attached to this letter is a summary list of the projects by category (Attachment A), a map of the service territory depicting the location of all projects (Attachment B), data sheets for all projects (Attachment C), and the Transmission Line Loading report based on projected growth from the 2015 Transmission Needs Assessment Analysis (Attachment D).

Due to conditions imposed in Docket No. 2011-00170, past Chapter 330 filings included projects between 34.5 kV and 69 kV. However, those conditions were vacated by Order in that docket dated December 12, 2016. Therefore, this report includes transmission projects that are or will operate at voltages of 69 kV and above.

Bangor Hydro District

Emera Maine does not intend to carry out any major or minor transmission line rebuild, relocation, or construction projects in the Bangor Hydro District (BHD) in the next five years.

Maine Public District

Emera Maine intends to carry out seven major or minor transmission line rebuild, relocation or construction projects in the Maine Public District (MPD) in the next five years.

Transmission Line Rebuild or Relocation Projects (69 kV and above)

See Title 35-A M.R.S.A. § 3132(3) ¹

In the MPD, Emera Maine currently has four projects it intends to carry out under this category in the next five years.

1. Line 6903 - Rebuild 9.8 miles from Otter Creek to Limestone Switching Station

Description: Line 6903 is a 69 kV transmission line that connects MPD's Limestone Switching to Caribou Stations. This line segment is part of a key transmission loop for reliability within the MPD system transmission core. Line 6903 is experiencing widespread pole decay. The most recent ground line assessment of internal wood pole strength determined that roughly 70% of the original 1960s era poles exhibited internal decay. Besides condition strength concerns, Line 6903 is thermally sag limited due to tight clearances with the 12 kV distribution underbuild. A rebuilt 6903 (new poles, crossarms, insulators and conductor), will allow for continued delivery of safe and reliable service, and maintenance of required voltage levels on the MPD system.

2. Line 6930 - Rebuild Phase I, 3.0 miles from Dow Siding Road to Maysville Siding Road

Description: Line 6930, in total, is a 30.7 mile long 69 kV transmission line that connects the MPD's Caribou Stations to Ashland Substation. Due to the overall long length of Line 6930, transmission planning studies have shown that voltage regulation is a major concern. MPD began addressing this transmission planning shortcoming in 2013 by rebuilding the first 2.5 mile section of Line 6930 from Caribou Substation to the Dow Siding Road with higher ampacity conductor. This project continues that effort by rebuilding the next 3 mile line segment from Dow Siding Road to Maysville Siding Road – a segment with 1950's era wood poles. The most recent assessment found internal decay in 81% of these poles. This rebuild is necessary to ensure continued delivery of safe and reliable service as well as to maintain required voltage levels on the MPD system.

3. Line 6930 - Rebuild Phase II, 8.4 miles from Maysville Siding Road to Washburn

The Line 6930 segment from Maysville Siding Road to MPD's Washburn Substation is comprised primarily of H-frame wood pole structures constructed in the late 1960s with wood pole crossarms and 336.4 ACSR wire. Recent inspections have determined more than 50% of all original wood poles have some level of internal decay. Also, a number of the crossarms were damaged by

¹ Title 35-A M.R.S.A. § 3132(3) requires each transmission and distribution utility to file an annual report of the "transmission line rebuilding or relocation projects that it intends to carry out during the next five years...that will become, or remain at, 69 kilovolts or more."

lightning strikes. The condition and previously discussed voltage requirements indicate a continuing rebuild of this transmission line asset, started in 2013, is needed.

4. Line 1176 - Rebuild 11.9 miles Flo's Inn to US/Canada Border

Line 1176 is a 138 kV line: MPD's only NERC Bulk Electric System or BES transmission line. It is a key line linking MPD to the New Brunswick system. Sixty-five percent of wood poles comprising Line 1176 H-frame structures were placed in-service in 1957 and are approaching end-of-life condition. These poles are experiencing widespread decay. The most recent ground line assessment of internal wood pole strength determined that approximately 70% of the original poles exhibited internal decay. To date, this decay has required targeted replacement of 12% of its structures.

A complete rebuild of Line 1176 (new single wood poles, horizontal line pole insulators and conductor), will be necessary to ensure continued provision of safe and reliable service. The rebuild will also allow for increasing line to ground clearances, improving safety margins. Additionally, the design of the new line will improve blow out clearances (risk of phase conductors contacting another phase or a pole during horizontal winds) and also by narrowing the profile to reduce exposure to outages caused by trees falling from outside the right of way.

The rebuild planning for this line has been shifted from early to late in the five-year period due to the completion of the upgrade of Line 6901 and because the biomass generators are continuing to run. This additional time also allows better coordination with NB Power for the rebuild of their side of the line in Canada.

Minor Transmission Line Construction Projects (69 kV and above)

See Title 35-A M.R.S.A. § 3132(3-A)²

In the MPD, Emera Maine currently has three projects it intends to carry out under this category in the next five years.

1. Line 6913 - 0.8 miles, from Main Street Mapleton to Mapleton Substation

Description: This project involves the rebuild of a short line segment due to

² Title 35-A M.R.S.A. § 3132(3-A), requires transmission and distribution utilities to separately report minor transmission line construction projects. A minor transmission line construction project is defined as "...a transmission line construction project, the cost of which does not exceed 25% of the utility's current annual transmission property depreciation charge." For 2016, 25% of Emera Maine's annual transmission property depreciation charge is \$3,188,745.

insufficient clearance between the 12 kV distribution conductors beneath and nearby structures caused primarily by older, shorter, wood poles; 83% of which have internal decay. This work, consisting of new single poles, crossarms, insulators and conductor, is scheduled to occur during 2017.

2. Line 6901 – 1.2 miles, Construction Fort Fairfield Tap

Description: The transmission tap from Line 6901 tap to the MPD Fort Fairfield distribution substation is comprised of wood poles placed in-service in early 1960s. A recent assessment of wood pole strength and condition determined that half of the wood poles have internal decay. This project is planned for 2019 and would replace these deteriorating wood poles and insulators while retaining the existing 3/0 ACSR conductor.

3. Line 6903 – 1.6 miles, Construction Loring Tap

Description: The 69 kV transmission tap off Line 6903 to the MPD Loring Substation is 1.6 miles long and comprised of wood poles of mixed age with a majority placed in-service around 1961. A recent assessment of wood pole strength and condition determined that 64% of the original wood poles have internal decay. This project is planned for 2019 and would replace these deteriorating wood poles with new single wood poles and polymer horizontal line post insulators while retaining the existing 3/0 ACSR conductor.

We look forward to meeting with you in April to review the projects in greater detail. In the meantime, please contact Dave Norman at (207) 973-2708, Steve Sloan at (207) 973-2568 or me at (207) 973-2847 if you have any questions about this filing.

Very truly yours,



Tim Pease

Director, Legal and Regulatory Affairs

TP:sm

Enclosures:

Attachment A – Project List by Category

Attachment B – Service Territory Map

Attachment C – Project Data Sheet

Attachment D - Transmission Line Loading Report

Attachment A

Progress Update from 2016 Filing – Major and Generator Projects

Line 6901 Rebuild – Complete

Line 6910 Rebuild, Phase II (Bridgewater to Monticello) – Complete

Line 6910 Rebuild, Phase III (Monticello to Mullen) – Under Construction

Orrington Series Capacitor – Bingham Wind Generator Interconnect – Complete

Passadumkeag Wind Generator Interconnect – Complete

Pisgah Mountain Wind Farm Interconnect – Complete

Hancock Wind Interconnect – Complete

Line 6905 Rebuild – Limestone Switching Station to Madawaska Substation (No longer in 5-year plan)

Line 6909 Rebuild – Madawaska Substation to Fish River Substation (No longer in 5-year plan)

Line 59 Rebuild – Columbia to Epping (No longer in 5-year plan)

Transmission Line Rebuild or Relocation Projects (69 kV and above)

Line 6903 Rebuild (Otter Creek to Limestone Switching Station)

Line 6930 Rebuild Phase I (Dow Siding Road to Maysville Siding Road)

Line 6930 Rebuild Phase II (Maysville Siding Road to Washburn)

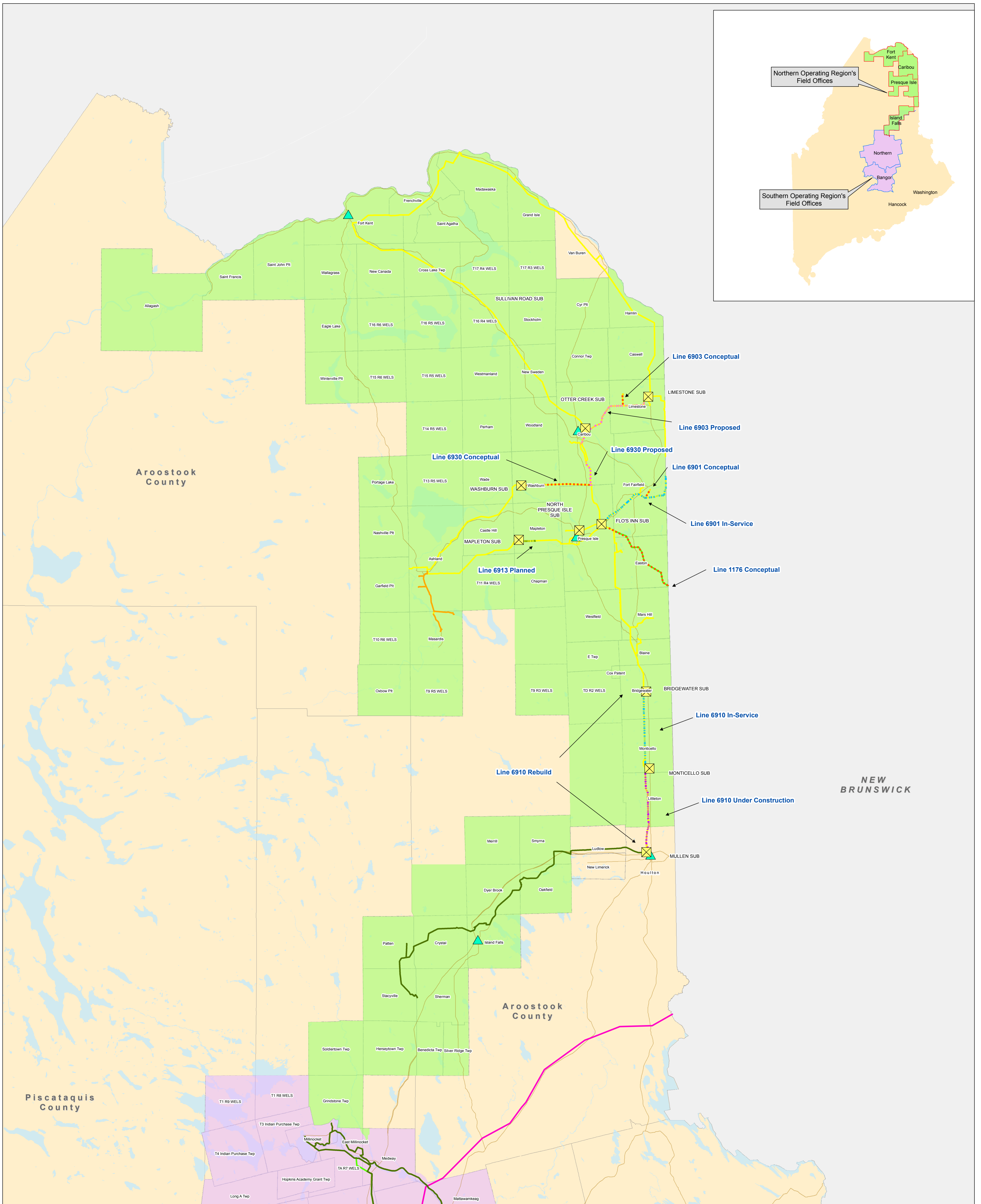
Line 1176 Rebuild (Flo's Inn to US/Canada Border)

Minor Transmission Line Construction Projects (69 kV and above)

Line 6901 Construction Fort Fairfield Tap

Line 6903 Construction Loring Tap

Line 6913 Construction – Main Street Mapleton to Mapleton Substation



<p>Chapter 330 Project Area Status</p> <ul style="list-style-type: none"> In Service Under Construction Planned Proposed Conceptual 	<p>Substations</p> <p>Existing Transmission Lines</p> <ul style="list-style-type: none"> — 19.9 KV — 34.5 KV — 44/46 KV 	<ul style="list-style-type: none"> — 69 KV — 115/138 KV — 345 KV 	<ul style="list-style-type: none"> Northern Operating Region Southern Operating Region 	<p>DATA SOURCES: MAINE OFFICE OF GIS, ESRI, AND EMERA MAINE</p> <p>PROJECTION: NAD 1983 UTM ZONE 19N</p> <div style="text-align: center;"> </div>
--	--	--	--	---

**EMERA MAINE
NORTHERN OPERATING REGION
AND TRANSMISSION SYSTEMS
PROJECTS IN CHAPTER 330 FILING**

DATE: APRIL 2017



Capital Financial Planning > Chapter 330:
Line 6913 Rebuild (Main St Mapleton to
Mapleton Substation)



I Like It

Tags &
Notes

Year Budgeted	2017
Region	NOR
Ch330 Project Title	Line 6913 Rebuild (Main St Mapleton to Mapleton Substation)
Related Projects	2349
Proj Type	Rebuild/Rerate
PTF	No
Proj Status	Planned
Cost Range	\$600K - \$900K
Cost Estimate	
Reason for Need	<p>Line 6913 is a 19.0 mile 69kV transmission line that runs from the Company's Maine Public District Presque Isle Switching Station to Ashland substation. This line is comprised of 461 wood poles with wood sawn crossarms located primarily located alongside rural roads. A majority of the wood poles comprising this transmission line range in age from 40 years of age and younger suggesting that much of this line's wood pole plant has many years of useful life remaining. However, Line 6913 does have 68 wood poles that are 50 years of age or older and 17 of these that were placed in-service in 1954 are located in the town of Mapleton along a 0.8 mile 25 pole line segment located just to the east of Mapleton Substation. According to the most recent ground line wood pole strength and condition assessment performed in 2012, 15 (or 83%) of the early 1950s era wood poles examined were determined to have some degree of internal decay and one was rejected for insufficient shell thickness. Besides the condition of wood poles this line segment has been flagged by engineering as having insufficient clearance between the 12kV distribution conductors located beneath Line 6913 and nearby structure/buildings caused primarily by these shorter class poles (40 & 45 footers versus 55 footers) located in this 0.8 mile line segment.</p>
Regulatory Activity	None
Line Identification	6913
Project Location	Mapleton
Line Length	0.81 miles
Peak Load	17 MVA
Voltage Level	69kV
Year Constructed	1963
Existing Design	Wood, Single Pole and Crossarm, Post Insulators, Dist. U/B
Existing Conductor	336.4 ACSR Transmission, #2 ACSR Distrib
New Conductor	336.4 ACSR Linnet Trans., and 336.4 AAC
Impact on Generators	None without a complete line rebuild
Potential Alternatives	138 kV Line
New Design	Wood, Single Pole and horizontal Post Insulators, Dist. U/B
Comment	
Projects Lookup:Title (linked to item)	Line 6913 & 12-22 Rebuild
Budget Year	2017

Content Type: Ch 330 Project
Created at 7/25/2016 9:23 AM by WRIGHT, AMY

Close

Last modified at 3/31/2017 11:07 AM by PARADIS, MARK



Capital Financial Planning > Chapter 330:
Line 6903 Rebuild (Otter Creek
Substation to Limestone Switching
Station)



I Like It

Tags &
Notes

Year Budgeted	2018
Region	NOR
Ch330 Project Title	Line 6903 Rebuild (Otter Creek Substation to Limestone Switching Station)
Related Projects	L6903RBD
Proj Type	Rebuild/Rerate
PTF	No
Proj Status	Proposed
Cost Range	\$4.9M to \$6.9M
Cost Estimate	

Reason for Need

Line 6903 is a 12-mile long 69kV transmission line constructed in 1961 that connects Emera Maine's Northern Operating Region's Limestone Switching to Caribou Stations. Line 6903 also serves Loring, Otter Creek and Pond substations in some system configurations. Line 6903 is comprised of 336.4 ACSR Linnet gauge wire supported by a mix of single wood poles, sawn wood crossarms and horizontal ceramic post insulators. Line 6903 is part of the key transmission loop for reliability within the EM-MPD system transmission core of which slightly more than 2 miles of was rebuilt from Caribou Substation to Otter Creek Tap in 2010 leaving 9.8 miles of the original line in-service and the focus of this project.

Because there are power exports during periods of light load and maximum generation, Line 6903 can be more heavily loaded than 6904 since load is dropped off to distribution subs along this path to the US/Canada Border and onto Tinker Substation. Many transmission planning studies indicate overloads on line 6903 that need to be addressed. This line is also reaching an age where inspections are finding more widespread pole decay. The most recent ground line assessment of internal pole strength conducted of Line 6903 wood poles was completed in calendar year 2012. This activity determined that roughly 70% of the original 1960s era wood poles exhibited some degree of internal decay and that seven of these older wood poles had insufficient shell strength and required removal/replacement. To-date, slightly more than 15% of all original wood poles have been replaced on Line 6903 between Otter Creek and Limestone Switching Station because of rot/decay or other purpose and another four poles have been rejected as a result of recent wood pole sounding and boring assessments.

Besides condition strength concerns, Line 6903 is also thermally sag limited due to tight clearances with 12 kV distribution underbuild beneath the 69 kV lines. It has a nominal summer rating of 39 MVA for its 336.4 ACSR conductor due to sag and clearance limits. In order to safely rebuild this line, it will have to be relocated across to the other side of the Route 89 bypass highway and be combined with existing telephone lines per MDOT rules. Due to the contingency loading and voltage regulation required during those system contingencies, larger conductor is recommended for this rebuild. The RLC studies indicate 70 MVA is the peak circuit loading for this line, but there are still many cases where this line, if upgraded to larger conductor, would remove the lines current thermal limits and help the wider transmission system avoid voltage collapse. It would also improve normal voltage regulation in the Ashland area.

Regulatory Activity	None
Line Identification	6903
Project Location	Otter Creek Substation Tap to Limestone Switching Station
Line Length	9.8 miles
Peak Load	30 MVA
Voltage Level	69kV
Year Constructed	1961
Existing Design	Single pole wood with horizontal wood crossarms
Existing Conductor	336.4 Linnet ACSR

New Conductor	795 ACSR Drake
Impact on Generators	May increase system ATC/TTC limits when combined with other system upgrades
Potential Alternatives	None
New Design	Single wood pole with horizontal fiberglass crossarms
Comment	Existing line has no lightning protection and substandard clearances to distribution underbuild.
Projects Lookup:Title (linked to item)	Line 6903 Upgrade (Otter Creek Sub to Limestone SW Sta)
Budget Year	2018

Content Type: Ch 330 Project
Created at 7/25/2016 9:23 AM by WRIGHT, AMY
Last modified at 4/3/2017 3:56 PM by PARADIS, MARK

Close



Capital Financial Planning ▶ Chapter 330:
Line 6901 Rebuild Fort Fairfield Tap



I Like It

Tags &
Notes

Year Budgeted	2018 - 2019
Region	NOR
Ch330 Project Title	Line 6901 Rebuild Fort Fairfield Tap
Related Projects	
Proj Type	Rebuild/Rerate
PTF	No
Proj Status	Conceptual
Cost Range	\$500K to \$700K
Cost Estimate	
Reason for Need	The Line 6901 tap to the Company's Fort Fairfield distribution substation is 1.2 miles long and comprised of 15 wood poles placed in-service in 1964. According to the most recent ground line wood pole strength and condition assessment performed in 2013, seven of these poles were identified as having internal decay that reduce the pole's internal shell thickness/strength and one of these poles was actually rejected due to insufficient effective remaining shell strength. In an effort to sustain the reliable transmission power flow to the 1,600 customers served by the Fort Fairfield Substation it is recommended that the existing Line 6901 tap to Fort Fairfield distribution substation be rebuilt using single wood poles and horizontal polymer line post insulators while retaining the existing conductor.
Regulatory Activity	
Line Identification	6901 Tap
Project Location	Fort Fairfield
Line Length	1.2 Miles
Peak Load	3 MVA
Voltage Level	69kV
Year Constructed	1964
Existing Design	Single wood pole with horizontal crossarm and porcelain insulators
Existing Conductor	3/0 ACSR
New Conductor	
Impact on Generators	None
Potential Alternatives	None
New Design	Single wood poles with polymer horizontal line post insulators and lightning protection
Comment	
Projects Lookup:Title (linked to item)	
Budget Year	2018; 2019

Content Type: Ch 330 Project
Created at 3/30/2017 9:54 AM by PARADIS, MARK
Last modified at 3/31/2017 2:02 PM by PARADIS, MARK



Capital Financial Planning > Chapter 330:
Line 6903 Rebuild Loring Tap



I Like It

Tags &
Notes

Year Budgeted	2018 - 2019
Region	NOR
Ch330 Project Title	Line 6903 Rebuild Loring Tap
Related Projects	
Proj Type	Rebuild/Rerate
PTF	No
Proj Status	Conceptual
Cost Range	\$600K to \$900K
Cost Estimate	
Reason for Need	The Line 6903 tap to the Company's Loring Substation is 1.6 miles long and comprised of 37 wood poles placed most of which were placed in-service in 1961 or earlier. According to the most recent ground line wood pole strength and condition assessment performed in 2012, 64% of these original wood poles have some level of internal decay and 2 were flagged for replacement due to insufficient shell thickness. In an effort to sustain the reliable transmission power flow to Loring Substation and the Loring Commerce Centre (a potential industrial expansion site) it is recommended that this Line 6903 tap line be rebuilt using taller and heavier class poles and horizontal polymer line post insulators. The existing conductor should be retained for now but the placement of taller heavier class poles would enable a larger wire to be installed should load growth materialize at this industrial site in the future.
Regulatory Activity	
Line Identification	6903 Tap
Project Location	Loring
Line Length	1.6 Miles
Peak Load	2 MVA
Voltage Level	69kV
Year Constructed	1961
Existing Design	Single wood pole with horizontal crossarm and porcelain insulators
Existing Conductor	3/0 ACSR
New Conductor	
Impact on Generators	None
Potential Alternatives	
New Design	Single wood poles with polymer horizontal line post insulators and lightning protection
Comment	
Projects Lookup:Title (linked to item)	
Budget Year	2018; 2019

Content Type: Ch 330 Project
Created at 3/30/2017 10:09 AM by PARADIS, MARK
Last modified at 3/31/2017 2:03 PM by PARADIS, MARK



Capital Financial Planning ▶ Chapter 330:
Line 6930 Rebuild Phase I (Dow Siding
Road to Maysville Siding Road)



I Like It

Tags &
Notes

Year Budgeted	2019
Region	NOR
Ch330 Project Title	Line 6930 Rebuild Phase I (Dow Siding Road to Maysville Siding Road)
Related Projects	L6930RBD1
Proj Type	Rebuild/Rerate
PTF	No
Proj Status	Proposed
Cost Range	\$1.4M to \$1.8M
Cost Estimate	
Reason for Need	<p>Line 6930 is 30.7 mile long 69kV transmission line asset that runs from the Company Northern Operating Region's Caribou Stations to Ashland Substation. This line was originally constructed in three sections; one part during the mid-50s and the other in the late 60s and the third in mid-70s. The Line 6930 section between Ashland and Maysville is 25.3 miles long and uses H-frame structures (placed in service in 1969 and 1974) and wood pole arms to support 336.4 ACSR wire in space, which would seem to be adequate however, the designed conductor temperature for this wire is only 120 °F and as a result this line segment is severely sag limited in the summer months. The first 2.5 mile segment of Line 6930 beginning at Caribou Substations and extending to the Presque Isle Stream crossing was rebuilt in its entirety at which time 1950s wood poles were removed from service and H-frame and single pole wood arm structures were installed with larger 477 ACSR Hawk conductor that was designed with 167°F conductor temperatures and so is somewhat sag limited versus a full 212°F rating. Due to the overall long length of Line 6930, transmission planning studies have shown that voltage regulation issues can occur at light load peak generation, and peak load no local generation periods. Observations in system operation confirm that ReEnergy Ashland is forced to consume large amounts of VARs to maintain area voltages below 1.025%, which is a regional transmission planning criteria. Operational adjustments to help control this issue have become increasingly less effective over time, so alternative solutions such as reconductoring, rebuilding, or an SVC at Ashland are all under consideration. However, the typical solution to the 6913/6930 voltage regulation issue is to rebuild these lines with larger conductor that would lower its overall resistance and result in lower voltage drop and therefore high voltage levels at the end of the line (i.e., Ashland).</p> <p>Currently, the 3.0 mile line segment of Line 6930 located between the Dow Siding Road and Maysville Siding Road is the oldest section remaining on this transmission asset. According to the most recent ground line wood pole strength and condition assessment performed in 2010, 81% of all original 1950s wood poles have some level of internal decay and it is expected that the repeat condition assessment of this group of poles scheduled to occur later in calendar year 2017 will result in higher levels of internal pole decay and multiple pole rejects due to the continue decay and diminishment of effective shell thickness/strength.</p>
Regulatory Activity	None
Line Identification	6930
Project Location	Dow Siding Road to Maysville Siding Road
Line Length	3.0 miles
Peak Load	28 MVA
Voltage Level	69kV
Year Constructed	1955
Existing Design	Single pole with wood arm
Existing Conductor	477 ACSR
New Conductor	795 ACSR
Impact on Generators	This project may affect VAR flow or reduce the number of hours of generator curtailment for maintenance outages. The impact is minimal until the entire path is rebuilt.

Potential Alternatives	EM is investigating an SVC installation at Ashland to minimize VAR flow, improve voltage regulation and extend the life of certain segments 6930 and 6913 lines until they require a rebuild due to pole age and condition.
New Design	Single wood pole with polymer horizontal line post (HLP) insulators
Comment	None
Projects Lookup:Title (linked to item)	Line 6930 Rebuild Phase I (Dow Siding to Maysville)
Budget Year	2019

Content Type: Ch 330 Project
Created at 7/25/2016 9:23 AM by WRIGHT, AMY
Last modified at 3/31/2017 11:26 AM by PARADIS, MARK

Close



Capital Financial Planning ▶ Chapter 330:
Line 6930 Rebuild Phase II (Maysville to
Washburn)



I Like It

Tags &
Notes

Year Budgeted	2020
Region	NOR
Ch330 Project Title	Line 6930 Rebuild Phase II (Maysville to Washburn)
Related Projects	L6930RBD2
Proj Type	Rebuild/Rerate
PTF	No
Proj Status	Conceptual
Cost Range	\$4.0M to \$5.1M
Cost Estimate	
Reason for Need	<p>Line 6930 segment from Maysville Siding Road to the Company's Washburn Substation is 8.4 miles long and comprised primarily of 56 H-frame wood pole structures with wood pole crossarms and 336.4 ACSR wire. This line was originally constructed in 1969 and using southern pine wood poles treated with creosote preservative, a combination that was commonly used during the 1950s and 1960s.</p> <p>According to the most recent ground line wood pole strength and condition assessment performed in 2010, slightly more than one-half of all original wood poles set in 1969 that remain in-service today have some level of internal decay and that 23% of this pole group with decay had some level of reduced shell thickness with two being rejected and flagged for replacement because their useful remaining shell strength had fallen below two-thirds (66%) of their original level. It is expected that the scheduled repeat of wood pole condition assessment of this group of wood poles planned to occur later in calendar year 2017 will result in higher levels of internal pole decay and multiple pole rejects due to continued reduction of effective shell thickness/strength of these aging wood poles caused by internal/external decay. In addition to decaying wood poles, this line segment contains wood pole crossarms that have a history of failure due to decay and lightning strikes throughout the entire system. In fact, the most recent visual inspection of this line segment completed in 2016 identified five wood pole crossarms that exhibited excessive rot or were broken or damaged by a lightning strike. As these wood pole crossarms continue to age water from rain and snow storms that enter through upward facing surface cracks and become trapped inside will only continue to feed the internal decay process that will eventually result in their failure if not removed from service before this occurrence.</p> <p>Due to overall long length of Line 6930, transmission planning studies have shown that voltage regulation issues can occur at light load peak generation, and peak load no local generation periods. Observations in system operation confirm that ReEnergy Ashland is forced to consume large amounts of VARs to maintain area voltages below 1.025%, which is a regional transmission planning criteria. Operational adjustments to help control this issue have become increasingly less effective over time, so alternative solutions such as reconductoring, rebuilding, or an SVC at Ashland are all under consideration. However, the typical solution to the 6913/6930 voltage regulation issue is to rebuild these lines with larger conductor that would lower its overall resistance and result in lower voltage drop and therefore high voltage levels at the end of the line (i.e., Ashland).</p>
Regulatory Activity	None
Line Identification	Line 6930
Project Location	Maysville Siding Road to Washburn Substation
Line Length	8.4 Miles
Peak Load	24 MVA
Voltage Level	69kV
Year Constructed	1969
Existing Design	Wood pole H-frame structures with wood pole arms
Existing Conductor	336.4 ACSR
New Conductor	795 ACSR

Impact on Generators

This project may affect VAR flow or reduce the number of hours of generator curtailment for maintenance outages. The impact is minimal until the entire path is rebuilt.

Potential Alternatives

EM is investigating an SVC installation at Ashland to minimize VAR flow, improve voltage regulation and extend the life of certain segments 6930 and 6913 lines until they require a rebuild due to pole age and condition.

New Design

Single wood pole horizontal polymer line post insulators

Comment

Projects Lookup:Title (linked to item)

Line 6930 Rebuild Phase II (Maysville to Washburn)

Budget Year

2020

Content Type: Ch 330 Project

Created at 3/24/2017 1:35 PM by PARADIS, MARK

Last modified at 3/31/2017 11:27 AM by PARADIS, MARK





Capital Financial Planning ▶ Chapter 330: L1176/3855 Rebuild (Flo's Inn Substation to U.S./Canadian Border)



I Like It

Tags &
Notes

Year Budgeted	2021
Region	NOR
Ch330 Project Title	L1176/3855 Rebuild (Flo's Inn Substation to U.S./Canadian Border)
Related Projects	910A
Proj Type	Rebuild/Rerate
PTF	No
Proj Status	Conceptual
Cost Range	\$6.0M - \$8.5M
Cost Estimate	
Reason for Need	

The primary drivers of the proposed rebuild of the Line 1176 from Flo's Inn to the US/Canada Border are:

- Remove from service wood poles and wood pole crossarms placed in service in 1957 that are in poor condition,
- Replace the existing conductor with a higher ampacity alternative and place this wire higher off the ground to achieve a maximum operating design conductor temperature of 212 degrees F at 100 degrees ambient air, which will eliminate NESC clearance concerns and eliminate the potential for a conductor blow-out fault condition and outage,
- Significantly reduce the potential for outage caused falling vegetation (trees from outside the utility maintained ROW by increasing the distance from energized conductor to ROW edge through the use of vertical single pole/horizontal line post insulator construction,
- Improve the overall reliability and protection of this new line section through the installation of adequate lightning protection (overhead static wire and arrestors) and communications (fiber) which does not exist with Line 1176 in its present condition.

Upon the completion of this proposed project the Company will have in-place a more reliable 138kV transmission line asset that is less likely to be impacted by equipment failure, weather and vegetation contact that could reduce (on average) annual service interruptions and hours of service interruptions by 6513 customers and 3504 hours, respectively. Line 1176 is a 138kV transmission line asset that connects the Maine Public District (MPD) with New Brunswick Power Company (NBPCO).

General: Line 1176 is an inter-border transmission line and the only Bulk Electric System (BES) transmission asset (as defined by the NERC Brightline Definition Criteria) in the MPD, which elevates its' importance as critical power flow path between these two operating regions. Line 1176 begins at the Company's Flo's Inn Substation and travels east from there to the United States/New Brunswick border, a distance of 11.89 miles. An outage to Line 1176 can impact more than 20,000 customers (more than half) of the MPD customer base when the MPD transmission network is operated in two-part radial and when it is configured in three-part radial that level drops slightly more than 13,000 customers. Line 1176 was originally constructed in the mid-1950s and is comprised primarily of wood pole H-frame construction, wood pole crossarms, glass bell suspension insulators and 266 ACSR wire. This proposed project rebuild Line 1176 from Flo's Inn to the US/Canada border, a distance of 11.89 miles for the purpose of establishing a long-term and more reliable transmission power flow source for a major of the customers living in the central and southern regions of the MPD.

Pole Condition: Standing wood poles comprising Line 1176 are primarily southern pine species with obsolete "creosote" preservative treatment and are generally class 3 poles with a set height of 45 - 60 feet. There are 225 standing wood poles comprising Line 1176. Twenty-seven (or 12%) of these wood poles were replaced in the past 15 years because of failure or internal decay concerns while another 21% of the original wood poles were replaced in the late 1970s when this line (which had been a 69kV transmission line) was reconfigured to operate as a 138kV line through the addition of longer insulator strings and a few longer crossarms. Of the 146 original wood poles remaining in-service (which are now rapidly approaching 60 years of age) 70% have some level of internal decay (such as hollow-heart or enclosed pockets due to insect or fungus activity). And, because Line 1176 was originally constructed without "X" bracing between its standing wood poles the overall vertical stability of its original H-frame structures lower than it could have been, which increases the risk total structure failure because of a single weakened pole.

Crossarm Condition: Line 1176 has 69 of its original wood pole crossarms remaining in-service today and a total of 104 when you factor in the newer arms put into service in 1978. It is common knowledge that this type of wood crossarm is susceptible to the development of deep cracks and checking that can provide a pathway for water to reach and settle inside the crossarm leading to higher levels of decay and failure over time. While the Company does not have recent crossarm inspection data for this specific line, it does have inspection data from 843 wood pole crossarms of similar age (pre-1970s) obtained from lines 6901, 6905, 6909, 6910 and 6920. This inspection activity discovered that 94 (or 11%) of these wood pole crossarms are in poor condition and require replacement while another 218 crossarms (or 26%) were determined to be in fair condition. However, given the fact that a Line 6901 wood pole crossarm judged to be in "fair" condition failed in 2015 and that there have been a total of three wood pole crossarm failures in the past two years (one of them on Line 1176) the Company's Asset Managers believe that the prudent course of action here is to replace all wood pole crossarms of this type over time to ensure the long-term reliability of the MPD transmission system.

NESC & Conductor Blow out Concerns: The proposed rebuild of Line 1176 would address NESC clearance concerns and marginal/insufficient blow-out clearances. When this line was upgraded to a 138kV transmission asset in 1978 longer insulator strings and a selected longer wood pole crossarms were added to establish the necessary air gap clearances to prevent flashover from the conductor to the crossarm. However, according to MPD engineering during period of extreme high winds the conductor may "blow-out" or side-swing and (in some instances) contact with the adjacent wood pole causing a fault condition and outages for customers. The rebuild of this transmission line would address this concern along with increasing the conductor to ground clearance distances thereby resulting in a higher thermal rating. Note: Line 1176 is currently designed to have a maximum conductor temperature of 167 degrees F at 86 degrees F ambient air temperature that yield a thermal rating of 116 MVA. With the larger wire (795 ACSR) positioned higher above the ground the line will now be able to operate at a maximum conductor temperature of 212 degrees F at 100 degrees F air temperature resulting in a thermal rating of 275 MVA, an increase of 137%.

Vegetation Contact: Line 1176 is generally located in a 100 foot wide utility maintained ROW with its outside conductors located 40 feet from the ROW edge. The closeness of energized conductor to ROW edge increases its susceptibility to contact by a tree falling from outside of the ROW, for which such an event occurred in July of this calendar year. The proposed rebuild of the Line 1176 would eliminate H-frame and 3-pole tangent structures and replace them with single poles with horizontal line pole insulators, something that would raise conductors higher off the ground and move them into the middle of the ROW and further away from the side of the ROW reducing the potential of contact by a danger tree falling into the ROW.

Regulatory Activity	MPUC Docket 2014-00048
Line Identification	1176 (formerly 3855)
Project Location	Flo's Inn Substation in Presque Isle to MAine/New Brunswick Border
Line Length	11.9 miles
Peak Load	57 MVA
Voltage Level	138kV
Year Constructed	1957
Existing Design	Wood Pole H-frame structures with wood pole crossarms
Existing Conductor	266.8 ACSR Partridge
New Conductor	795 ACSR Drake
Impact on Generators	May increase ATC and TTC ratings to New Brunswick Power. May impact all generators with export. May provide additional capacity for Northern Maine generators.
Potential Alternatives	An additional 138 or 345 kV Line to New Brunswick Power or ISO-NE.
New Design	Single wood poles with HLP insulators
Comment	
Projects Lookup:Title (linked to item)	Line 1176/3855 Rebuild (Flo's Inn Sub to Border)
Budget Year	2021

Created at 7/25/2016 9:23 AM by WRIGHT, AMY

Last modified at 3/31/2017 11:05 AM by PARADIS, MARK

Close

Transmission Line Loading (based on 2015 Transmission Needs Assessment Analysis)

Line No.	From	To	Nom. Voltage	Conductor	Length (mi.)	Sum. Norm. Rating (MVA)	Summer Peak Hour Loading (N-1)	Contingency	Notes
390	Orrington	Baileyville	345kv	1192 ACSR	84.4	1773	1000 max	S396	Loading managed by ISO
246	Orrington	Veazie	115kv	2-795 ACSR	7.25	457	186	L248	Gen loading higher (295)
248	Orrington	Veazie	115kv	795 ACSR	7.25	229	153	L246	Gen loading higher (241)
249	Orrington	Veazie	115kv	795 ACSR	7.25	229	153	L246	Gen loading higher (241)
65	Orrington	Bucksport	115kv	795 ACSR	5.36	229	163	S205	
205	Orrington	Bucksport	115kv	795 ACSR	5.36	229	163	S65	
247	Orrington	Orrington	115kv	266 ACSR	4.07	39	25	none	
60	Orrington	Ellsworth Falls	115kv	795 ACSR	20.67	229	85.5	L66	
66	Veazie	Clifton	115kv	795 ACSR	13.41	173	84.8	L60	
51	Clifton	Township 16	115kv	795 ACSR	14.9	233	25.8	L58	Gen loading higher (86.6)
93	Township 16	Deblois	115kv	795 ACSR	10.71	233	34.1	L58	Gen loading higher (85.7)
52	Deblois	Columbia	115kv	795 ACSR	9.15	229	30.1	L58	Gen loading higher (83.5)
61	Columbia	Jonesboro	115kv	4/0 ACSR	12	32	25.1	L59	
67	Clifton	Ellsworth Falls	115kv	795 ACSR	13.07	173	63.6	L60	
68	Ellsworth Falls	Ellsworth Falls	115kv	266 & 795 ACSR	0.59	115	59	L57	
57	Ellsworth Falls	Trenton	115kv	795 ACSR	14.3	229	58.3	L93	
58	Ellsworth	Sullivan	115kv	795 ACSR	22.45	229	34.4	L93	Gen loading higher (85.6)
59	Sullivan	Columbia	115kv	795 ACSR	21.7	229	27.4	L93	Gen loading higher (89.3)
59	Columbia	Columbia	115kv	266 ACSR	3.63	89	19.3	L93	Gen loading higher (93.8)
69	Columbia	Harrington	115kv	266 ACSR	0.66	89	25.4	L61	
64	Greenbush	Chester	115kv	2-795 ACSR	43.48	285	202	Keene T1	Light load, high gen
97	Veazie	Greenbush	115kv	2-795 ACSR	43.48	437	245	Keene T1	Light load, high gen
63	Chester	Chester	115kv	795 ACSR	0.37	68	17.5	Keene T4	Lost LP&T load
62	Chester	TA R7 Wels	115kv	795 ACSR	17.26	229	126	none	

- Loading on the EM Bangor Hydro Region 115kv and above circuits were based on local transmission criteria. The majority of these lines will also fall under NERC reliability criteria and subject to N-1-1 and stuck breaker evaluations

BANGOR DIVISION - Projected growth rate 0.4% per year

1	Veazie	Ellsworth Falls	46kv	4/0, 266,312,336,795	23.4	28	13.9	Boggy T1	
5	Veazie	Old Town	46kv	336 H, 336, 556H, 559	10.75	35	17.4	L7 S	
7	Veazie	Milford	46kv	266, 336, 556H	10.56	34	28.3	L87	
8	Veazie	Hampden	46kv	266, 556H, 795, 750UG	7.69	34	40.4	L9	Final section in 2017 plans
9	Veazie	Brewer	46kv	795 ACSR	6.68	72	51.8	L8	
70	Veazie	Bangor	46kv	559AAAC, 795ACSR	8.48	53	22.2	L71	
71	Veazie	Bangor	46kv	556H, 559, 795	4.89	52	44	L72	
72	Veazie	Bangor	46kv	556H, 559, 795	4.89	52	44	L71	
50	Bangor	Corinth	46kv	3/0 ACSR, 795	15.4	25	15.5	L81	
74	Corinth	Milo	46kv	266 ACSR	17.7	34	9.6	L50	
73	Bangor	Bangor	46kv	3/0, 266 ACSR	3.9	25	21.8	L70	reconductor when rebuilt
75	Bangor	Bangor	46kv	3/0 ACSR, 336H	3.2	25	10.4	L78	
76	Brewer	Bangor	46kv	336, 556H, 795	0.83	46	29	L8	
77	Hampden	Hermon	46kv	556H, 795, 600UG	4.68	46	15.7	L70	
78	Bangor	Hermon	46kv	795 ACSR	6.41	72	22.8	L77	
79	Bangor	Bangor	46kv	795 ACSR	1.34	72	10.4	none	

Line No.	From	To	Nom. Voltage	Conductor	Length (mi.)	Sum. Norm. Rating (MVA)	Summer Peak Hour Loading (N-1)	Contingency	Notes
HANCOCK DIVISION - Projected growth rate 0.59% per year									
2	Ellsworth	Trenton	34.5kv	266, 312, 336, 336H, 559	8.7	27	19.6	Trenton T1	
10	Ellsworth Falls	Sedgewick	46kv	1/0 ACSR, 4/0, 336, 336H, 559, 795	23.73	19	12	none	
11	Ellsworth Falls	Hancock	34.5kv	795 ACSR	6.48	37	24.4	Trenton T1	
12	Ellsworth Falls	Ellsworth	34.5kv	477 ACSR	2.55	30	24.6	Trenton T1	will monitor
13	Hancock	Sullivan	34.5kv	3/0, 556H, 795	16.4	18	10.8	Tunk T1	
17	Sullivan	Cherryfield	34.5kv	266, 336H, 559, 795	11.1	27	10.8	Tunk T1	
18	Cherryfield	Harrington	34.5kv	266, 336H	7.11	27	10.8	Tunk T1	
22	Bar Harbor	Bar Harbor	34.5kv	1/0, 336, 336H	6.26	14	13.2	none	one section 1/0 replace w/Sub
24	Sullivan	Gouldsboro	34.5kv	266 ACSR	6.48	27	3.2	L15	
28	Hancock	Trenton	34.5kv	3/0, 266, 312, 336, 336H, 350UG, 556H, 559	8.47	18	10.9	Trenton T1	
29	Mount Desert Island	Southwest Harbor	34.5kv	#2 ACSR, 1/0 AAAC, 336H	5.49	11	6.4	none	
32	Trenton	Bar Harbor	34.5kv	559, 1000MCM, 795	6.28	40	26.8	L48	
32	Trenton	Bar Harbor	34.5kv	559, 1000MCM, 795	6.28	40	26.8	L48	
40	Bar Harbor	Northeast Harbor	34.5kv	#4 ACSR, 1/0 AAAC, 336, 336H, 795	5.95	8.6	2.5	none	
48	Trenton	Mount Desert Island	34.5kv	556H, 559, 795	7.39	36	26.7	L32	

WASHINGTON COUNTY - Projected growth rate 0.27% per year									
3	East Machias	Jonesboro	34.5kv	266, 312, 336, 336H	8.32	27	13.6	L4	
4	East Machias	Jonesboro	34.5kv	336 AAC, 336H	9.65	27	13.9	L3	
14	Jonesboro	Columbia Falls	34.5kv	#4, #6, 1/0, 336, 336H	10.2	3.4	4.6	L16	
15	Harrington	Gouldsboro	34.5kv	336, 336H	18.71	27	5.9	L24	
16	Harrington	Jonesboro	34.5kv	336, 336H, 556H	14.59	36	19	Washington Cty T1	
19	East Machias	Eastport	34.5kv	1/0H, 4/0, 336, 336H, 556H, 559	39.58	13	5.1	L20	
20	East Machias	Dennysville	34.5kv	#2, #4, #6, 336, 336H	24.38	8	5.1	L19	
21	Jonesboro	Machiasport	34.5kv	266 ACSR	9.61	27	0.6	none	
23	East Machias	Cutler	34.5kv	#4 cu, 1/0 ACSR, 336H	6.88	10	0.7	none	
25	Columbia Falls	Jonesport	34.5kv	#4, #6, 1/0, 336, 336H	14.1	8	1.6	none	
26	Whiting	Lubec	34.5kv	333Hendrix AAC	8.91	27	0.8	none	

NORTHERN DIVISION - Projected growth rate 0.05% per year									
80	Milford	Enfield	46kv	4/0, 266, 336, 336H	23.11	28	9.6	L87	
81	Enfield	Milo	46kv	2A Cweld, 266, 336H, 559	18.52	19	11.4	L50	Can only pick up partial load
83	Lincoln	Enfield	46kv	266 ACSR	12.11	36	11.8	W.Enf. Gen	
84	Chester	Medway	46kv	#2, 1/0, 4/0, 266, 336H	25.33	18	5.1	L86	
85	Chester	Lincoln	46kv	336H, 556H, 559	1.87	34	18	W.Enf. Gen	
86	Chester	Medway	46kv	266 ACSR, 336 AAC	15.79	36	7.9	Medway Gen	
87	Chester	Lincoln	46kv	336H, 556H, 559	1.87	34	18	W.Enf. Gen	
88	Medway	Millinocket	46kv	312, 336, 559	9.16	36	8.2	L89	
89	Medway	Millinocket	46kv	#2, 266, 336, 336H, 559	13.39	18	8.2	L88	
90	Chester	Chester	46kv	336 AAC, 336H AAC	0.81	34	0.8	none	

** Thermal loading is just one factor in determining circuit capability. Voltage drop across the line and line condition must also be taken into account.
 - Loadings based on Transmission Study results which are performed every 5 years. Loadings for years in between will be study loads increased by the projected growth rates.