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April 2, 2018

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), and data sheets for all projects (Attachment C).

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 five 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. A brief description of each project listed on chronological order of targeted in-service year follows:

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."

1. Line 6903 Rebuild (Otter Creek to Limestone Switching Station)

Description: Line 6903 is a 69kV transmission line that connects MPD's Limestone Switching to Caribou Stations. This line is part of a key transmission loop for reliability within the MPD system transmission core and because there are power exports during periods of light load and maximum generation, it can be more heavily loaded than 6904. Line 6903 is also reaching an age where inspections are finding more 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 some degree of internal decay and several were recently rejected due to insufficient pole strength. Besides asset condition and strength concerns, Line 6903 is also thermally sag limited due to tight clearances with the 12 kV distribution underbuild. A rebuilt Line 6903 (new poles, crossarms, insulators and conductor) will allow for continued delivery of safe and reliable electric service while helping to improve voltage regulation in the Ashland area.

2. Line 6930 Rebuild (Maysville Siding Road to Washburn)

Description: Line 6930 is a 69kV 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 issues can occur at light load, peak generation; and peak load, no local generation periods. Observations by System Operations personnel confirm that maintaining Ashland area voltages below 102.5%, a regional transmission operational criterion, is challenging. 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 8.4 mile line segment from Maysville Siding Road to Washburn by removing from service the 1950s era wood poles with high rates of internal decay and wood pole crossarms while placing in service a larger capacity electricity conductor to improve voltage regulation at all load periods in the greater Ashland Region.

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

Description: Line 1176 is 138kV and is MPD's only NERC transmission asset elevating its importance within the MPD system. Many of the wood poles comprising Line 1176 H-frame structures were placed in-service in 1957 and are approaching end-of life. 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 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. A complete rebuild of Line 1176 will remove from service wood poles in poor condition and wood pole crossarms that have an above average failure rate. This project will also address NESC clearance concerns (marginal/insufficient blow-out clearances) while slimming the profile of the rebuilt line within its 100 foot ROW making it less likely that a tree falling from the outside of the ROW could contact the line and result in an outage to thousands of customers.

4. Line 6930 Rebuild (Washburn to Ashland)

Description: Line 6930 is a 69kV 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 issues can occur at light load peak generation, and peak load, no local generation periods. Observations by System Operations personnel confirm that maintaining Ashland area voltages below 102.5%, a regional transmission operational criterion, is challenging. MPD began addressing this transmission planning shortcoming in 2013 by rebuilding with higher ampacity conductor the first 2.5 mile section of Line 6930 from Caribou Substation to the Dow Siding Road. This specific project rebuilds the 16.9 mile roadside section of Line 6930 from Washburn to Ashland substations, and when coupled with other Line 6930 projects (Dow Siding Road to Maysville Siding Road and Maysville Siding Road to Washburn), the result is the complete rebuild of this transmission line asset and the establishment of a strong, reliable and stable transmission link from east to west across the MPD 69kV electrical network and greatly improved voltage regulation capability in the greater Ashland Region.

5. Line 6950 Rebuild (Westfield to Mars Hill Switching Station)

Description: This project involves the rebuild of the Line 6950 segment from the Company's Westfield Substation to its Mars Hill Switching Station. This line segment is 3.4 miles long and comprised of 30 H-frame wood pole structures with wood pole crossarms and 336.4 ACSR wire. This line segment was originally constructed in 1964. Slightly less than 60% of the wood poles comprising this line segment have internal decay and 26% of these have reduced shell thickness/strength because of rot discovered in 2011. This level and severity of internal and external decay is expected to increase as these wood poles age and will be reassessed on 2021. Line 6950 runs alongside and operates in tandem with Line 6940. Together, these lines provide a strong and reliable 69kV backbone transmission power flow source for more than 5,000 MPD customers and the thousands more served indirectly by Eastern Maine Electric Cooperative (EMEC) and Houlton Water Company (HWC).

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 five projects it intends to carry out under this category in the next five years. A brief description of each project listed on chronological order of targeted in-service year follows:

1. Line 6913 Mapleton Construction

Description: This project involves the rebuild of a short line segment (less than 1 mile) due to insufficient clearance between the 12kV distribution conductors beneath and nearby structures caused primarily by older shorter class wood poles, the overwhelming majority of which have some level of internal decay. Work associated with this project is underway and expected to be completed in 2018.

2. Line 6913 Construction (Presque Isle Switching Station to Pole 160)

Description: This project would rebuild the relatively short 1.2 mile ROW segment of this line from the Company's Presque Isle Switching Station to pole 144 because of wood poles in deteriorated condition while also replacing 1.8 miles of smaller capacity 3/0 ACSR conductor with 795 ACSR wire from Presque Isle Switching Station to roadside pole 160 for the purpose of lowering overall line impedance that will help improve voltage regulation in the Ashland Region.

3. Line 6901 Construction Fort Fairfield Tap

Description: The transmission tap from Line 6901 to the MPD Fort Fairfield distribution substation is 1.2 miles long and comprised of wood poles placed in-service in early 1960s. According to the most recent comprehensive ground line wood pole strength and condition assessment, half of all original wood poles have internal decay and one pole was rejected due to insufficient shell strength. This project is planned for construction in 2019 and will remove from service wood poles in deteriorated condition while also addressing five wood poles currently in a beaver swamp by replacing them with a composite pole alternative. The existing 3/0 ACSR conductor will be retained.

4. Line 6930 Rebuild (Dow Siding Road to Maysville Siding Road)

Description: Line 6930 is a 69kV transmission line that connects the MPD Caribou Stations to its Ashland Substation. Observations by System Operations personnel confirm that maintaining Ashland area voltages below 102.5%, a regional transmission operational criterion, is challenging. MPD began addressing this transmission planning shortcoming in 2013 by rebuilding with higher ampacity conductor the first 2.5 mile section of Line 6930 from Caribou Substation to the Dow Siding Road. This project continues that effort by

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 2017, 25% of Emera Maine's annual transmission property depreciation charge is \$3,379,096.

rebuilding the next three mile line segment from Dow Siding Road to Maysville Siding Road by removing from service the 1950s era wood poles with high rates of internal decay and wood pole crossarms.

5. Line 6915 Construction (Flo's Inn to North Presque Isle Substation)

Description: This project would rebuild the segment of Line 6915 from Flo's Inn to the Company's North Presque Isle Substation, a distance of 3.0 miles, removing from service wood poles and wood pole crossarms in deteriorated condition and substituting 795 ACSR wire for the 336.4 ACSR in use on today. Because the design temperature of the 336.4 ACSR wire is 120 degrees F this transmission line is severely sag limited during the summer months. This project would address this short coming while also improving the overall reliability of the line by removing from service deteriorated plant that could fail and result in an outage for customers.

Notable 2018 Chapter Report Inclusions & Removals

Notable inclusions in this year's report Chapter 330 Report and removals from the Company's 2017 Report include: (1) new inspection data obtained by Asset Managers allowed for the removal of the Line 6903 Loring Tap Construction Project (a minor transmission project) from this year's report because the condition of in-service assets was acceptable and did not warrant action within the next five years and (2) the verification that the 1.8 mile section of Line 6913 at Presque Isle Switching Station was not the larger ampacity 336 ACSR conductor but actually a smaller gauge (3/0 ACSR wire), coupled with a walk-through visual inspection of this line segment in February 2018 that identified many wood poles in a deteriorated condition, warranted the immediate rebuild of this short section of Line 6913. This project will sustain this segment of Line 6913's operational viability and will also help improve Ashland voltage regulation.

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) 973-2652 if you have any questions about this filing.

Sincerely,



Sarah Spruce
Regulatory Counsel

SS:sm
Enclosures

Project Progress Update from 2017 Filing

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

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

Line 6903 Rebuild (Otter Creek to Limestone Switching Station)

Line 6930 Rebuild (Maysville Siding Road to Washburn)

Line 6930 Rebuild (Washburn to Ashland)

Line 6950 Rebuild (Westfield to Mars Hill Switching Station)

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

Minor Transmission Line Construction Projects (69kV and above)

Line 6901 Construction – Fort Fairfield Tap

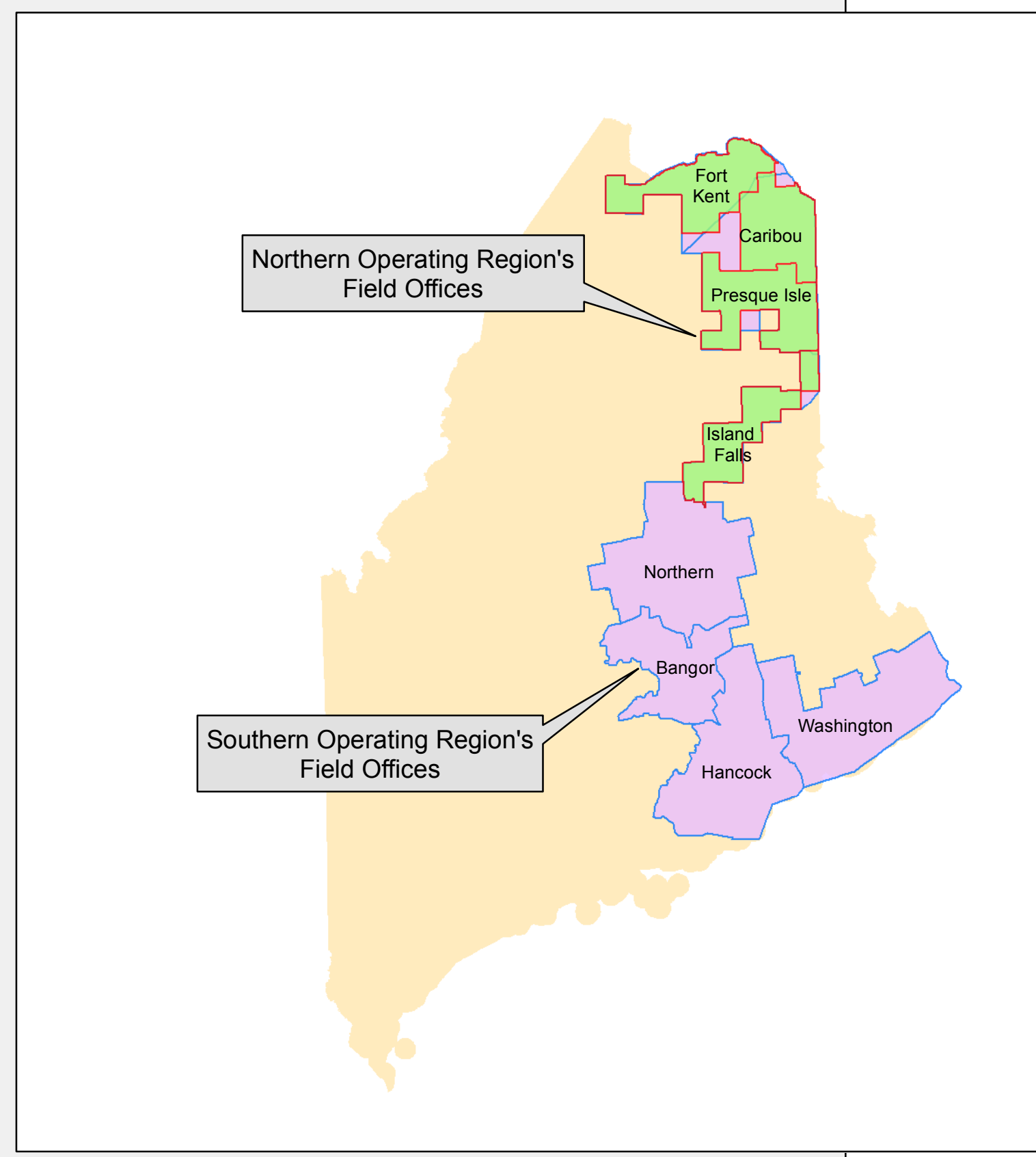
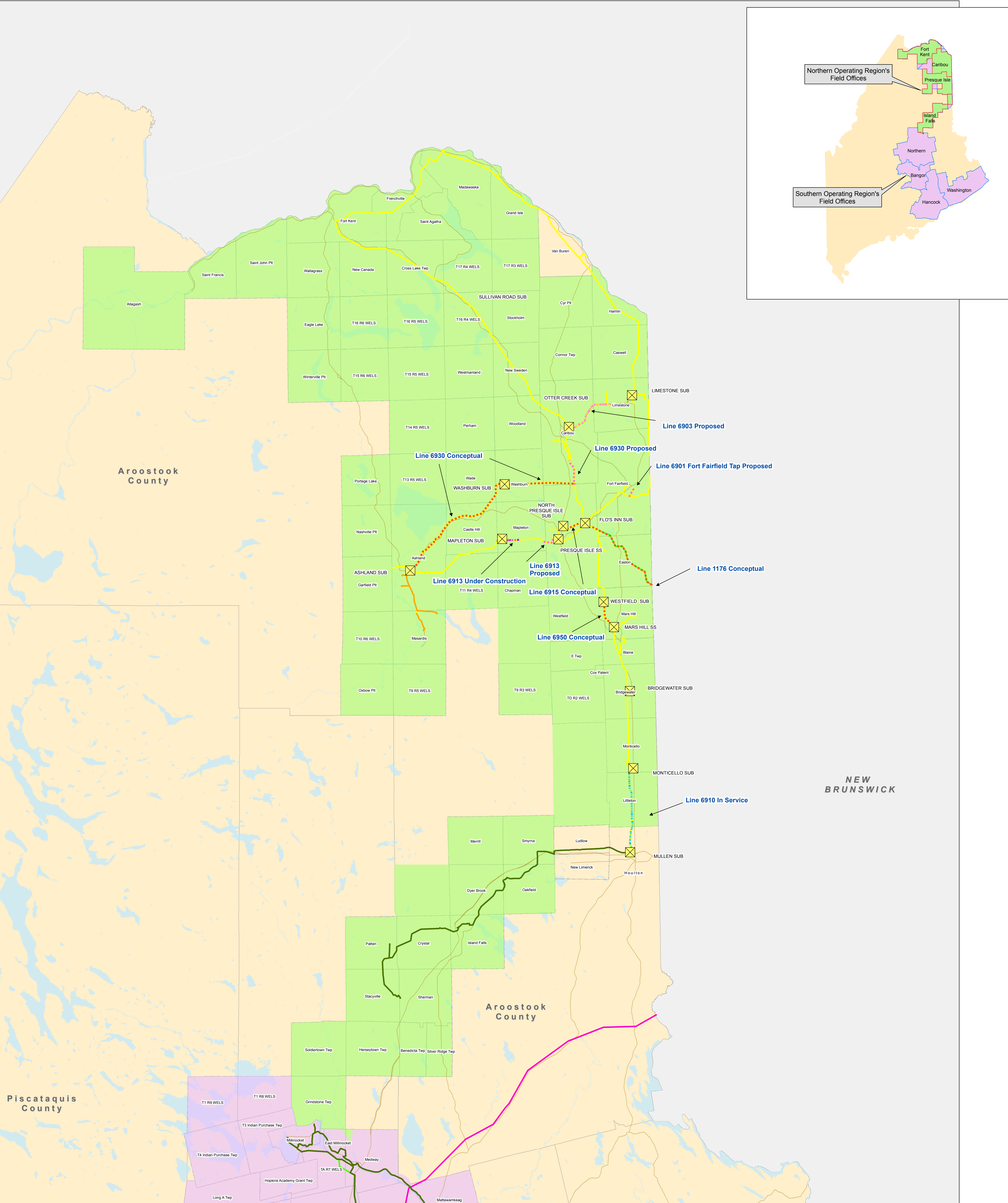
Line 6913 Construction – Main Street Mapleton to Mapleton Substation (***)Under Construction)

Line 6913 Construction – Presque Isle Switching Station to Pole 160

Line 6915 Construction – Flo's Inn to North Presque Isle Substation

Line 6930 Construction – Dow Siding Road to Maysville Siding Road

Attachment B



Chapter 330 Project Area Status

- In Service
- Under Construction
- Planned
- Proposed
- Conceptual

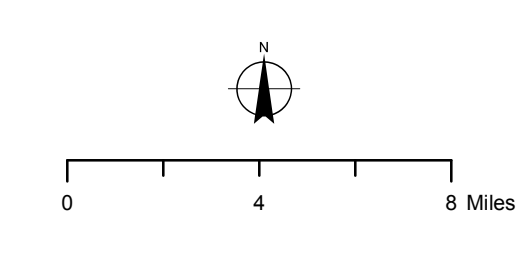
Substations

- Substations
- Existing Transmission Lines**
- 19.9 KV
- 34.5 KV
- 44/46 KV

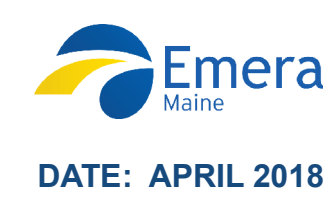
- 69 KV
- 115/138 KV
- 345 KV

- Northern Operating Region
- Southern Operating Region

DATA SOURCES: MAINE OFFICE OF GIS, ESRI, AND EMERA MAINE
PROJECTION: NAD 1983 UTM ZONE 19N



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



DATE: APRIL 2018

3/28/2018

Chapter 330 - Line 6903 Rebuild (Otter Creek Substation...



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



I Like It

Tags &
Notes

Year Budgeted	2019
Region	NOR
Ch330 Project Title	Line 6903 Rebuild (Otter Creek Substation to Limestone Switching Station)
Related Projects	851B
Proj Type	Rebuild/Rerate
PTF	No
Proj Status	Proposed
Cost Range	\$4.9M to \$6.9M
Cost Estimate	
Reason for Need	<p>Line 6903 is a 12-mile long 69kV transmission line constructed in 1961 that connects the Emera Maine Northern Operating Region's Limestone Switching Station to its Caribou Substation. 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. This line is part of the key transmission loop for reliability within the EM-MPD system transmission core. There are system conditions where Line 6903 can be more heavily loaded than 6904 since load is dropped off to distribution substations along this path to the US/Canada Border and onto Tinker Substation. Transmission planning studies indicate overloads on line 6903 exist that need to be addressed. This line has reached a condition where inspection assessments indicate widespread pole decay. The most recent ground line assessment of internal wood pole strength of Line 6903 was conducted in 2012. This activity determined that roughly 70% of the original 1960s era wood poles had 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 Line 6903 wood poles were replaced between Otter Creek and Limestone Switching Station because of rot/decay or other condition and another four poles were rejected as a result of the more recent wood pole sounding and boring assessments. In order to meet MDOT requirements for lines requiring multiple pole replacement where the electrical and other (telephone, cable) infrastructure are on opposite sides of the road, and to safely rebuild this line at a lower cost, it must be relocated across to the other side of the Route 89 bypass highway and be combined with existing telephone/cable lines. Due to the contingency loading and voltage regulation required during 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 solve the lines current thermal limit and help the wider transmission system avoid voltage collapse. It is also the first step in solving normal and contingency voltage regulation problems in the Ashland area. These voltage concerns exist whether ReEnergy Ashland is running at maximum (high voltage) or down (low voltage due to area load).</p>
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

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Chapter 330 - Line 6903 Rebuild (Otter Creek Substation...

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	2019

Content Type: Ch 330 Project
Created at 7/25/2016 9:23 AM by WRIGHT, AMY
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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	Proposed
Cost Range	\$4.5M to \$6.0M
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 using southern pine wood poles treated with creosote preservative, a combination that was commonly used during the 1950s and 1960s. According to a ground line wood pole strength and condition assessment performed in 2010, slightly more than one-half of all original wood poles set in 1969 and that remained in-service had level of internal decay and 23% of the group with decay had reduced level of 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 future wood pole assessments will yield higher levels of decay, reduced shell thickness and quantity of rejected poles. 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 MPD 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 lightning strikes. As these wood pole crossarms continue to age water (from rain and snow storms) entering through upward facing surface cracks and becoming trapped inside will continue to feed the internal decay process that will eventually result in their failure if not removed from service before this occurrence. 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. Specifically, observations by System Operations personnel confirm that maintaining Ashland area voltages below 102.5%, a regional transmission operational criterion, is challenging. Operational adjustments to help control this issue without impacting customers have become increasingly less effective over time, so alternative solutions such as more extensive rebuilding/reconducting 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	6930
Project Location	Maysville Siding Road to Washburn Substation
Line Length	8.4 Miles
Peak Load	28 MVA
Voltage Level	69kV
Year Constructed	1969
Existing Design	Wood pole H-frame structures with wood pole crossarms
Existing Conductor	336.4 ACSR
New Conductor	477 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.

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Chapter 330 - Line 6930 Rebuild Phase II (Maysville to...

New Design	Single wood pole horizontal polmer line post insulators
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Comment

Projects Lookup:Title (linked to item)	Line 6930 Rebuild Phase II (Maysville to Washburn)
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Budget Year	2020
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Content Type: Ch 330 Project
Created at 3/24/2017 1:35 PM by PARADIS, MARK
Last modified at 3/28/2018 2:52 PM by PARADIS, MARK



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



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Tags &
Notes

Year Budgeted	2021
Region	NOR
Ch330 Project Title	L1176 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

Line 1176 is a 138kV transmission line asset that connects the Maine Public District (MPD) with New Brunswick Power Company (NBPCO). The primary drivers of this proposed rebuild project are: (1) remove from service wood poles and wood crossarms in poor condition; (2) 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; (3) significantly reduce the potential for outage caused by 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 wood pole/horizontal line post insulator construction and (4) 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 within 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 all of which could reduce (on average) annual service interruptions and hours of service interruptions by 6,513 customers and 3,504 hours, respectively. 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 electrical network, which elevates its' importance as a 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 objective of this proposed rebuild project is to establish 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 (quantity 225) 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. 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 original wood poles were replaced in the late 1970s when this line (which at that time had been a 69kV transmission line) was reconfigured to operate as a 138kV line asset through the addition of longer insulator strings and a few longer crossarms. Of the 146 original wood poles remaining in-service today (which are now rapidly approaching 60 years of age) 70% have 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 is lower than it could have been, which increases the risk of 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 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 assessments of 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

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Chapter 330 - L1176 Rebuild (Flo's Inn Substation to U.S./Canadian...

have been a total of three wood pole crossarm failures in the past three 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 69kV 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 from 69kV to a 138kV transmission asset in 1978 longer insulator strings and a quantity of 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 periods of extreme high winds the conductor may "blow-out" or side-swing and (in some instances) contact with the adjacent wood poles 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 yields a thermal rating of 116 MVA. With a larger ampacity wire (795 ACSR) positioned higher above the ground this 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 corridor, for which such an event occurred in July 2016 and during the October Windstorm of 2017. 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 further away from the sides of the ROW reducing the potential of contact by a danger tree falling into the ROW. (Note: Line 1176 was outaged for a brief time during the October 2017 windstorm event due to a tree falling onto the line from outside of ROW. The Company has maintained the width of the ROW to the maximum distance allowed by its easements. However, this type of outage is expected to continue going forward given the width of the easement and height of trees along the ROW corridor until such time that the ROW is widen or the line profile is narrowed through redesign/rebuild).

Regulatory Activity	MPUC Docket 2014-00048
Line Identification	1176
Project Location	Flo's Inn Substation in Presque Isle to Maine/New Brunswick Border
Line Length	11.9 miles
Peak Load	69 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 polymer horizontal line post insulators
Comment	
Projects Lookup:Title (linked to item)	Line 1176/3855 Rebuild (Flo's Inn Sub to Border)
Budget Year	2021

Content Type: Ch 330 Project
 Created at 7/25/2016 9:23 AM by WRIGHT, AMY
 Last modified at 3/28/2018 2:45 PM by PARADIS, MARK

Close



Capital Financial Planning ▶ Chapter 330
: Line 6930 Rebuild Phase III
(Washburn to Ashland)



I Like It

Tags &
Notes

Year Budgeted	2022
Region	NOR
Ch330 Project Title	Line 6930 Rebuild Phase III (Washburn to Ashland)
Related Projects	L6930RBD3
Proj Type	Rebuild/Rerate
PTF	No
Proj Status	Conceptual
Cost Range	\$12M to \$14M
Cost Estimate	
Reason for Need	<p>Line 6930 is 30.7 mile long 69kV transmission line asset that runs from the Emera Maine Northern Operating Region's Caribou Substation to Ashland Substation. This line was originally constructed in three sections; one part during the mid-1950s and the other in the late 1960s and the third in mid-1970s. The Line 6930 section between Washburn and Ashland is 16.9 miles long and was placed in service in 1974. It is comprised of H-frame wood pole structures, 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. 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. Specifically, observations by System Operations personnel confirm that maintaining Ashland area voltages below 102.5%, a regional transmission operational criterion, is challenging. Operational adjustments to help control this issue without impacting customers have become increasingly less effective over time, so alternative solutions such as more extensive rebuilding/reconducting 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). This project would rebuild the final 16.9 mile long section of Line 6930 from Washburn to Ashland with tall heavier class wood poles, fiberglass crossarms and larger conductor wire (477 ACSR at a minimum) for the purpose of improving voltage regulation at Ashland Substation. This final project would complete the rebuild of this transmission asset and provide a strong, reliable and stable 69kV transmission power flow path east to west across the MPD electrical network.</p>
Regulatory Activity	None
Line Identification	6930
Project Location	Washburn to Ashland
Line Length	16.9 Miles
Peak Load	28 MVA
Voltage Level	69kV
Year Constructed	1974
Existing Design	Wood pole H-Frame structures with wood pole crossarms and suspension insulators
Existing Conductor	336.4 ACSR
New Conductor	477 ACSR
Impact on Generators	Improved voltage regulation in the Ashland region would require the local generator in that area to produce fewer VARS at various times to help stabilize the power system.
Potential Alternatives	Install an SVC at Ashland Substation if economically and technically feasible.
New Design	
Comment	None
Projects Lookup:Title (linked to item)	Line 6930 Rebuild Phase III (Washburn to Ashland)

3/28/2018

Chapter 330 - Line 6930 Rebuild Phase III (Washburn to...

Budget Year

2022

Content Type: Ch 330 Project

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Capital Financial Planning ▶ Chapter 330
: Line 6950 Rebuild (Westfield to Mars
Hill Switching Station)



I Like It

Tags &
Notes

Year Budgeted	2022
Region	NOR
Ch330 Project Title	Line 6950 Rebuild (Westfield to Mars Hill Switching Station)
Related Projects	
Proj Type	Rebuild/Rerate
PTF	No
Proj Status	Conceptual
Cost Range	\$3.0M to \$3.5M
Cost Estimate	
Reason for Need	<p>The Line 6950 segment from Westfield Substation to the Company's Mars Hill Switching Station is 3.44 miles long, located entirely in ROW and is comprised of 30 H-frame wood pole structures, wood pole crossarms and 336.4 ACSR wire. This line was originally constructed in 1964 using southern pine wood poles treated with creosote preservative, a combination that was commonly used during the 1950s and 1960s. According to the most recent comprehensive ground line wood pole strength and condition assessment performed in 2011, roughly 60% of all original wood poles had internal decay, 26% had reduced shell strength due to internal rot and 14% had external mechanical damage. This level and severity of decay is expected to increase as these wood poles age and the progression of decay will be reassessed in 2021 during the next full internal condition assessment for this line scheduled for year 2021. In addition to deteriorating wood poles, this line segment contains wood pole crossarms that have a history of failure throughout the MPD 69kV ROW system due to decay and lightning strikes. As these wood pole crossarms continue to age water (from rain and snow storms) will enter through upward facing surface cracks and become trapped inside, contributing to the internal decay process that will eventually result in their failure if not removed from service before this occurrence. Line 6950 runs from the Company's Flo's Inn Substation to Mars Hill Switching Station; a total distance of 14.42 miles. This transmission asset operates in parallel with Line 6940, the two of which are relied upon to provide a strong transmission link to its Mars Hill Switching Station downstream from which more than 5,000 MPD customers and the service territories of Eastern Maine Electric Cooperative (EMEC) and Houlton Water Company (HWC) are served. This project begins the work of rehabilitating Line 6950 by removing from service aging assets in deteriorating condition and putting in place current day lightning protection measures for the purpose improving the quality of service to thousands of MPD, EMEC and HWC customers.</p>
Regulatory Activity	None
Line Identification	6950
Project Location	Westfield to Mars Hill Switching Station
Line Length	3.44 miles
Peak Load	50 MVA
Voltage Level	69kV
Year Constructed	1964
Existing Design	Wood pole H-Frame structures with wood pole crossarms and suspension insulators
Existing Conductor	336.4 ACSR
New Conductor	447 ACSR
Impact on Generators	None
Potential Alternatives	None
New Design	Single wood pole with polymer horizontal line post insulators
Comment	
Projects Lookup:Title (linked to item)	

3/28/2018

Chapter 330 - Line 6950 Rebuild (Westfield to Mars Hill...

Budget Year

-; 2022

Content Type: Ch 330 Project

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



I Like It

Tags &
Notes

Year Budgeted	2018
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	Under Construction
Cost Range	\$600K - \$900K
Cost Estimate	
Reason for Need	This line segment has been flagged by engineering as having insufficient clearance between the 12kV distribution conductors located beneath Line 6913 and nearby structures/buildings; caused primarily by the existing shorter class poles (40 & 45 foot) located in this 0.8 mile line segment. It does not meet current NESC code clearance requirement. Also, per the most recent ground line wood pole strength and condition assessment performed in 2012, 15 (or 83%) of the early 1950 era wood poles contained in this 0.8 mi line section were determined to have internal decay and one was rejected for insufficient shell thickness. Reconductoring of both the transmission and distribution ACSR wire is necessary. The existing conductor is approximately 54 years old. The reinforcing steel core of this wire has been found to corrode as it ages making it brittle and prone to failure. The transmission conductors have 20 splices in this section short line segment and the distribution conductors have 39 splices. This is an unusually high number of splices for such a short section of line and further evidence that the aged steel core is in poor condition. The transmission conductor will be replaced with 336 ACSR. The distribution conductor was sized as 336.4 AAC as the main line section (leading from the substation) in support of this 35 mile circuit.
Regulatory Activity	None
Line Identification	6913
Project Location	Mapleton
Line Length	0.81 miles
Peak Load	26 MVA
Voltage Level	69kV
Year Constructed	1963
Existing Design	Single wood pole, crossarm, post insulators, dist U/B
Existing Conductor	3/0 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 - Phase I
Budget Year	2018

Content Type: Ch 330 Project
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4/2/2018

Chapter 330 - Line 6913 Rebuild (Presque Isle Switching...



Capital Financial Planning ▶ Chapter 330
: Line 6913 Rebuild (Presque Isle
Switching Station to Pole 160)



I Like It

Tags &
Nntec

Year Budgeted	2018
Region	NOR
Ch330 Project Title	Line 6913 Rebuild (Presque Isle Switching Station to Pole 160)
Related Projects	
Proj Type	Rebuild/Rerate
PTF	No
Proj Status	Proposed
Cost Range	\$1.0M to \$1.5M
Cost Estimate	
Reason for Need	<p>There are two reasons to rebuild the 1.8 mile section of Line 6913 from Presque Isle Switching Station (P.I.S.S.) to State Route 163. These reasons are (1) deteriorated plant and (2) to improve Ashland voltage regulation. A discussion of each follows: Replace Deteriorated Plant: Line 6913 is comprised of 470+ wood poles most with wood sawn crossarms that support conductors of various sizes, but generally 3/0 ACSR wire. During a recent visual assessment of Line 6913 wood pole assemblies in the ROW near P.I.S.S., asset managers discovered that many of these poles were in poor condition and warranted removal from service. Specifically, 83% of the 24 wood poles in this short 1.2 mile long ROW segment were at least 50 years old and the majority of these older poles were determined to be at end-of-life condition. The deteriorated plant includes: internal decay, deep longitudinal cracks, numerous large woodpecker holes and excessive lean suggesting decay well below the ground line level. In fact, nearly half (quantity 11) of these poles are currently classified as rejected poles by asset managers. Because many of these wood pole assemblies are located in a wetland area for which matting of the terrain to minimize environmental impact during access will be extensive and expensive, it is most economical to replace the smaller gauge wire at the same time as the wood poles (see Voltage Regulation discussion below). Improve Ashland Voltage Regulation: Line 6913 is a 19.0 mile long 69kV transmission line that connects the Company's Maine Public District P.I.S.S. with its Ashland Substation. Segments of this line were rebuilt in the past with 336 ACSR wire but much of it continues to use the smaller gauge 3/0 ACSR wire to transmit power from substation to substation to substation. Due to its overall long length and generally small conductor size, transmission planning studies show that voltage regulation issues occur at both light load/peak generation, and peak load/no local generation periods. Specifically, observations by System Operations personnel confirm that maintaining Ashland area voltages below 102.5%, a regional transmission operational criterion, is challenging. The primary reason for this is the predominant use of 3/0 conductor on this line. Operational adjustments to help control this issue without impacting customers have become increasingly less effective over time, so alternative solutions such as more extensive rebuilding/reconducting or an SVC at Ashland are all under consideration. It should be noted that transmission planning studies have shown that the optimal conductor for this specific line, should it be entirely rebuilt, would not be 795 ACSR conductor. However, because most of the 300+ poles comprising the Line 6913 segment between Mapleton and Ashland (12.5 miles) were installed in the mid-1980s and, while adequate to support 3/0 ACSR wire, they are undersized to carry larger wire (477 ACSR or larger). During a recent visual inspection of Line 6913 it was discovered that the line segment in ROW near Presque Isle was comprised of 3/0 ACSR wire and not 336 ACSR as indicated in Maine Public District records. Therefore, rebuilding this short length of Line 6913 with larger capacity wire (795 ACSR) will lower overall impedance of the line and improve voltage regulation in the Ashland area. (Please also see Emera's response in Docket 2015-00161 dated April 14, 2017 where 559 AAC Conductor is modeled for this line. That analysis found it is more cost effective to rebuild sections of Line 6913 with 795 ACSR conductor than the entire line with 559 AAC.) In summary, the wood pole assemblies in the Line 6913 ROW segment near P.I.S.S. must be rebuilt due to end-of-life plant condition. Because the replacement of 1.8 miles of 3/0 ACSR wire located in this general area will improve Ashland area voltage; it is prudent to rebuild this entire segment with 795 ACSR conductor at the same time.</p>
Regulatory Activity	
Line Identification	Line 6913
Project Location	Presque Isle
Line Length	1.8 miles

4/2/2018	Chapter 330 - Line 6913 Rebuild (Presque Isle Switching...
Peak Load	26 MVA
Voltage Level	69kV
Year Constructed	1965
Existing Design	Single wood poles with horizontal wood crossarms and cermain insulators
Existing Conductor	3/0 ACSR
New Conductor	795 ACSR
Impact on Generators	Lower line impedance will improve voltage regulation in the Ashland Region and thereby reduce the need for Reenergy to produce VARs to help stabilize the power system in that region.
Potential Alternatives	SVC
New Design	Single wood pole with horizontal fiberglass crossarms with polymer clamp type insulators and 795 ACSR wire
Comment	
Projects Lookup:Title (linked to item)	
Budget Year	2018

Content Type: Ch 330 Project
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3/28/2018

Chapter 330 - Line 6901 Rebuild Fort Fairfield Tap


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


I Like It

Tags &
Notes

Year Budgeted	2019
Region	NOR
Ch330 Project Title	Line 6901 Rebuild Fort Fairfield Tap
Related Projects	869B
Proj Type	Rebuild/Rerate
PTF	No
Proj Status	Proposed
Cost Range	\$500K to \$700K
Cost Estimate	
Reason for Need	The Line 6901 tap to the Emera Maine 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 comprehensive ground line wood pole strength and condition assessment of this entire line segment performed in 2013, seven of these poles were identified to have internal decay that can reduce the pole's internal shell thickness/strength and one of these poles was actually rejected due to insufficient effective remaining shell strength. This level of internal decay and quantity of rejected poles is expected to increase as this line continues to age. This project will target for replacement aging wood poles in deteriorated condition and will address five wood poles located in beaver swamps found in this ROW, replacing them with an equivalent composite pole alternative.
Regulatory Activity	None
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	3/0 ACSR
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)	Line 6901 Fort Fairfield Tap Rebuild
Budget Year	2019

Content Type: Ch 330 Project
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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	\$1.5M to \$2.0M
Cost Estimate	
Reason for Need	<p>Line 6930 is 30.7 mile long 69kV transmission line asset that runs from the Emera Maine Northern Operating Region's Caribou Substation to Ashland Substation. This line was originally constructed in three sections; one part during the mid-1950s and the other in the late 1960s and the third in mid-1970s. 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 in 2013 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. Specifically, observations by System Operations personnel confirm that maintaining Ashland area voltages below 102.5%, a regional transmission operational criterion, is challenging. Operational adjustments to help control this issue without impacting customers have become increasingly less effective over time, so alternative solutions such as more extensive rebuilding/reconductoring 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). Currently, the 3.0 mile line segment of Line 6930 located between the Dow Siding Road and Maysville Siding Road is the oldest section of Line 6930. And, according to a ground line wood pole strength and condition assessment performed in 2010, 81% of all original 1950s wood poles had internal decay and this level of decay and resulting quantity of rejected poles is expected to increase as this group of wood poles continues to remain in-service.</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 crossarm
Existing Conductor	336.4 ACSR
New Conductor	477 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

3/28/2018

Attachment C

Chapter 330 - Line 6930 Rebuild Phase I (Dow Siding Road...

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
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Capital Financial Planning ▶ Chapter 330
: Line 6915 Rebuild Phase I (Flos Inn to
North Presque Isle)



I Like It

Tags &
Notes

Year Budgeted	2022
Region	NOR
Ch330 Project Title	Line 6915 Rebuild Phase I (Flos Inn to North Presque Isle)
Related Projects	L6915RBD1
Proj Type	Rebuild/Rerate
PTF	No
Proj Status	Conceptual
Cost Range	\$1.5 to 2.0M
Cost Estimate	
Reason for Need	<p>Line 6915 is a short 5.6 mile long 69kV transmission asset that connects the Emera Maine Flo's In Substation to its Presque Isle Switching Station. This line was originally constructed in 1960 and 1963 in two sections and is comprised of 134 wood poles of which slightly more than one-half are 50 years of age or older. Line 6915 uses 336.4 ACSR conductor to transmit power downstream to distribution substation which seems adequate but because the design conductor temperature is only 120 °F this transmission line is severely sag limited during the summer months. The line near Flo's Inn is H-frame construction (two-pole structures with wood pole crossarms) in ROW. Near the Aroostook Centre Mall it becomes single pole and then a mix of H-frame and single pole structures to Presque Isle Switching Station. The normal operational configuration of this Line 6915 is radial to Presque Isle Switching Station, however for Line 6914 maintenance Line 6915 is closed in to feed 6913 to Ashland. It also has the capability to feed 6901 line to Tinker. The condition of wood poles is typical of a line of this age. According to the most recent comprehensive ground line wood pole strength and condition assessment performed in 2010, 44% of all wood poles assessed, regardless of age had internal decay, however when we consider only poles 50 years of age or older (those set before 1967) the percentage of poles with internal decay jumps to 52% with two of the poles flagged for replacement due to insufficient shell thickness (a 3% reject rate). Besides older wood poles with internal and/or external decay (i.e., shell rot) the H-frame structures located in the ROW outside of the Company's Flo's Inn Substation have wood pole crossarms that have a history of failure in the Maine Public District.</p>
Regulatory Activity	None
Line Identification	6915
Project Location	Presque Isle
Line Length	3.0 Miles
Peak Load	19 MVA
Voltage Level	69kV
Year Constructed	1963
Existing Design	H-Frame wood pole structures with wood pole crossarms and suspension insulators
Existing Conductor	336.4 ACSR
New Conductor	795 ACSR
Impact on Generators	None
Potential Alternatives	None
New Design	Single wood pole with horizontal polymer insulators
Comment	None
Projects Lookup:Title (linked to item)	Line 6915 Rebuild Phase I (Flos Inn to North PI)
Budget Year	2022

3/28/2018

Chapter 330 - Line 6915 Rebuild Phase I (Flos Inn to North...

Attachment C

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