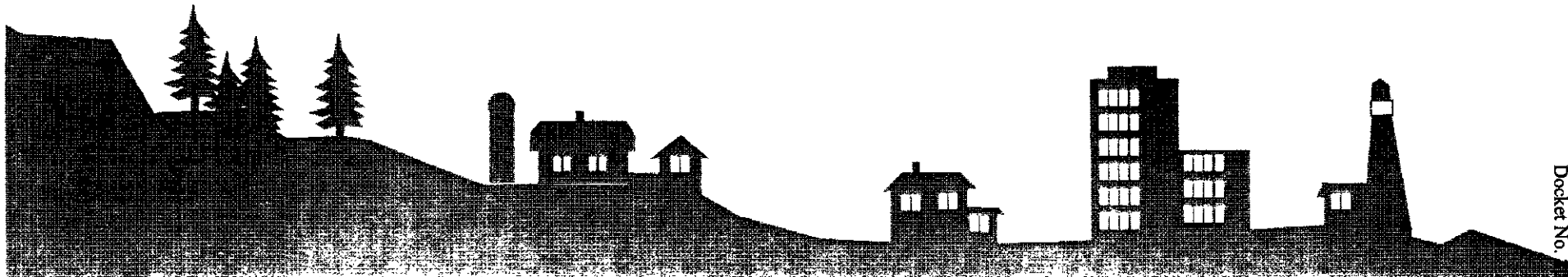


A CENTRAL MAINE POWER COMPANY PROGRAM

**NH Interconnection Options
Three Rivers vs Newington
Status Meeting - Update for ISO-NE
September 19, 2008**



MPRP Interconnection with PSNH

Progress Update

- History of MPRP interconnection with NH, Three Rivers versus Newington option
- Review of system studies
- Drivers for Newington interconnection for MPRP and PSNH
- Cost comparison
- Real estate & environmental issues
- Path forward

History of MPRP Interconnection with NH Three Rivers versus Newington Option

9/19/08

MPRP NH Interconnection System Study

Work Completed to Date

MPRP Alternatives Assessment

S1 vs. S2 Analysis

Completed 3rd quarter 2007

2017 Summer Peak

Three Rivers vs. Newington Analysis

Alternative S1 with Gosling Rd Project

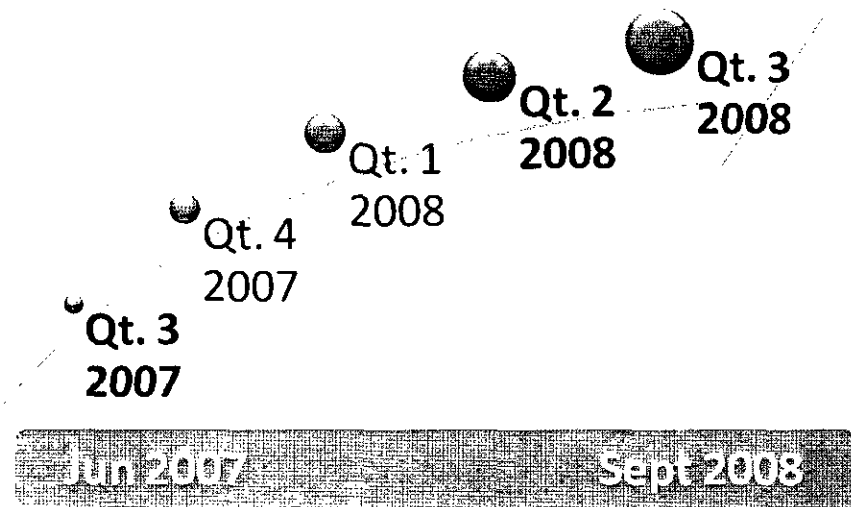
Completed 2nd quarter 2008

2012 Summer Peak

Three Rivers vs. Newington Analysis

Alternative S1 without Gosling Rd Project

Completed 3rd quarter 2008



9/19/08

MPRP Alternatives Assessment Southern Alternative S1 vs. S2

9/19/08

MPRP Interconnection with PSNH

Scope of MPRP Alternatives Assessment, S1 vs. S2 Analysis

- Assessment of Southern Alternatives S1* and S2* examined system requirements to meet N-1 and N-1-1 criteria for two 345kV PSNH interconnection options
 - New 345 kV Three Rivers Substation
 - Interconnect with 345 kV Section 307
 - Build new 345 kV substation
 - Existing 345 kV Newington Substation
 - Extend the new line 6.33 miles from Three Rivers
 - Includes 0.75 mi Piscataqua River Crossing

* Designed to meet N-1-1 criteria

MPRP Interconnection with PSNH

Scope of MPRP Alternatives Assessment, S1 vs. S2 Analysis

- Assessment of Southern Alternatives S1 and S2 cont.
 - Assumptions included
 - 2017 Summer Peak (NE load 34,970MW)
 - Gosling Road Project in-service
 - New 345/115 kV transformers, 2 at Gosling Road and 1 at Deerfield
 - 391 Line Looped in and out at Deerfield
 - Rebuild portion of 115 kV N133 Line (Schiller – Bolt Hill)
 - Other 115 kV upgrades in Seacoast NH area
 - N-1 Analysis Examined
 - D4 I1, I2 & I3
 - D5 I2 & I3
 - N-1-1 Analysis examined only Dispatch D4 I2 (heavy Maine-New Hampshire import) with a major 345 kV system element out of service:
 - Section 307
 - Section 374
 - Section 385
 - Section 386

MPRP Interconnection with PSNH

S1 vs. S2 Analysis

Alternative S1

- Three Rivers Interconnection Requirements
 - To meet N-1 and N-1-1 criteria
 - Rebuild N133 Line from Bolt Hill to Three Rivers
 - Addition of 345 kV series breakers at Three Rivers
 - Newington Interconnection Requirements
 - To meet N-1 and N-1-1 criteria
 - Addition of 345 kV series breakers at Maguire Road
 - To meet N-1-1 criteria
 - Shed approx. 325MW of Maine load
- OR
- Rebuild N133 Line from Bolt Hill to Three Rivers

MPRP Interconnection with PSNH

S1 vs. S2 Analysis

Alternative S2

- Three Rivers Interconnection Requirements
 - To meet N-1 and N-1-1 criteria
 - Rebuild N133 Line from Bolt Hill to Three Rivers
 - Addition of 345 kV series breakers at Three Rivers
 - Shed approx. 125MW of Maine load to mitigate overload on N133 Line from Schiller – Bolt Hill (for N-1-1)
- Newington Interconnection Requirements
 - To meet N-1 and N-1-1 criteria
 - Rebuild N133 Line from Bolt Hill to Three Rivers
 - Shed approx. 125MW of Maine load to mitigate overload on N133 Line from Schiller – Bolt Hill (for N-1-1)

MPRP Interconnection with PSNH

Southern Alternatives Assessment

S1 vs. S2 Analysis

- Conclusions
 - Interconnection along Section 307 requires new 345 kV substation with 6 breaker configuration to mitigate concurrent loss of Section 307 and new line to Maguire Road
 - Newington interconnection provided more benefit to system reliability performance. Addition of third 345 kV line termination at Newington Substation increases access to generation resources.
 - System voltage and reactive performance superior in Newington interconnection option. N-1 analysis of Section 307 outage showed reduced reactive output on Seabrook generator.

MPRP Interconnection with PSNH

Southern Alternatives Assessment

S1 vs. S2 Analysis

- Conclusions continued
 - Lower loading on N133 Line for Newington option
 - Alternative S1 with Newington interconnection, only alternative that did not require rebuild of N133 Line (Bolt Hill – Three Rivers) for N-1 thermal reliability criteria
 - CMP selected rebuild of N133 Line as preferred option to mitigate thermal overload for N-1-1
 - Option to shed ~325 MW of load in Maine was considered undesirable
 - Southern Alternatives S1 and S2 required mitigation of N133 Line overloads for N-1 and N-1-1 regardless of interconnection option.
 - Recommend Newington Interconnection

**Comparative Analysis of
Three Rivers vs. Newington Interconnection
2017 Summer Peak, Southern Alternative S1
Gosling Road Project In Service**

9/19/08

MPRP Interconnection with PSNH

2017 Summer Peak Three Rivers vs. Newington Alternative S1 w/ Gosling Road Project

Scope of Analysis

- Continuation of S1 Alternative Assessment from previous analysis
- Provide comparative analysis of two options for interconnection with PSNH based upon:
 - Electrical performance in the Maine and New Hampshire systems
 - Reliability needs in Maine
 - 345 kV system operability
 - Loss analysis
 - Thermal transfer capability on the ME-NH and NH-ME interface

MPRP Interconnection with PSNH

2017 Summer Peak Three Rivers vs. Newington Alternative S1 w/ Gosling Road Project

Scope of Analysis, cont.

- Analysis of two 345 kV PSNH interconnection options
 - 2017 Summer Peak (NE load 34,970MW)
 - Gosling Road Project In Service
 - Assumed the following based on previous analysis
 - 6 breaker configuration at 345 kV Three Rivers Substation
 - 6 breaker configuration at 345 kV Maguire Road Substation
 - Rebuild of N133 Line (Bolt Hill to Three Rivers)
 - N-1 Analysis examined eight dispatches
 - NH to ME transfer conditions
 - D4 I1 & I3
 - D5 I2 & I3
 - D6 I1 & I3
 - ME to NH transfer conditions
 - D7 I1 & I3

MPRP Interconnection with PSNH

2017 Summer Peak Three Rivers vs. Newington Alternative S1 w/ Gosling Road Project

– Scope of N-1-1 Analysis

- Examined Dispatches D4 I2 & I4 and D7 I2 & I4
- Major 345 kV system element out of service:
 - Section 385 Outage
 - Section 391 Outage
 - Section 386 (Buxton – South Gorham) Outage
 - Section 3021 South Gorham – Maguire Road Outage
 - Section 3022 Maguire Road – NH Outage
 - Section 307 Outage (2 segments for Three Rivers Int.)
 - Section 3135 Newington – Timber Swamp Outage
 - Maguire Road 345/115 kV Autotransformer

MPRP Interconnection with PSNH

2017 Summer Peak Three Rivers vs. Newington Alternative S1 w/ Gosling Road Project

Observations of N-1 Analysis

- Voltage performance
 - No voltage violations reported for either option
 - Observed less dependence on Seabrook reactive output for voltage support with Newington option
- Thermal performance
 - Newington option - No thermal overloads
 - Three Rivers option – Proposed Gosling autotransformer overload for Newington stuck breaker (307E and autotransformer)
 - 102% of 522MVA LTE rating for Dispatch D5 with NB-NE = 0MW
 - Generation restriction required at Newington to reduce loading

MPRP Interconnection with PSNH

2017 Summer Peak Three Rivers vs. Newington Alternative S1 w/ Gosling Road Project

Observations of N-1-1 Analysis

- **Newington option**
 - Addition of a third 345 kV line termination at Newington Substation increases exit capacity by 1500 MVA at Newington
 - Loss of 2 – 345 kV lines (N-1-1) at Newington does not cause thermal concerns.
 - Improves 345 kV system operability (N-1-1)
 - Addition of a third 345 kV line termination at Newington Substation increases access to generation under N-1-1 conditions
 - NU Newington (420MW)
 - Con Ed Newington Energy Center (545MW)
 - Higher transfer capability under line outage conditions

MPRP Interconnection with PSNH

2017 Summer Peak Three Rivers vs. Newington Alternative S1 w/ Gosling Road Project

Observations of N-1-1 Analysis

- Three Rivers Option
 - Two 345 kV line terminations at Newington
 - Outage of both 345 kV lines forces Newington generation onto 115 kV system resulting in severe thermal overloads.
 - Outage of 3135 with DCT 307/N133 *failed to solve due to local area voltage collapse and severe thermal overloads.*
 - Generation restrictions required to mitigate overloads for both single and multiple element contingencies

MPRP Interconnection with PSNH

2017 Summer Peak Three Rivers vs. Newington Alternative S1 w/ Gosling Road Project

- 115 kV System Performance
 - Lower 115 kV Line Loadings for Newington Option
 - N133 Line (Three Rivers – Bolt Hill – Schiller)
 - H137 Line (Merrimack – Garvins)
 - Better contingency performance and less 115 kV overloads

- Loss Analysis
 - Negligible difference in Maine and NH 345 kV and 115 kV system losses between NH Interconnection options
 - Similar electrical point of interconnection

MPRP Interconnection with PSNH

2017 Summer Peak Three Rivers vs. Newington Alternative S1 w/ Gosling Road Project

- Thermal Transfer Capability Analysis
 - ME to NH thermal transfer capability = 2450MW regardless of PSNH interconnection location
 - Limiting contingency Deerfield 785 SB results in same post fault configuration
 - Limit based on Section 391 summer thermal STE rating
 - NH to ME thermal transfer capability
 - Three Rivers option = 1875MW based on Loss of 307E onto H137 Line
 - Newington option = 2175MW based on Loss of 3021 onto Maguire Rd T1
 - Limit based on summer thermal LTE rating

MPRP Interconnection with PSNH

2017 Summer Peak Three Rivers vs. Newington Alternative S1 w/ Gosling Road Project

- Recommend Newington Interconnection
 - Addition of a third 345 kV line termination at Newington Substation
 - Increases exit capacity at Newington
 - Increases 345 kV system operability
 - Increases access to Newington/Seabrook generation resources
 - Lower 115 kV line loading in Seacoast area
 - Less dependence on Seabrook reactive output for voltage support
 - Negligible difference in losses between Three Rivers and Newington interconnections
 - Higher NH-ME thermal transfer capability

**Comparative Analysis of
Three Rivers vs. Newington Interconnection
2012 Summer Peak, Southern Alternative S1
Gosling Road Project Not Included**

9/19/08

MPRP Interconnection with PSNH

2012 Summer Peak Three Rivers vs. Newington Alternative S1 w/o Gosling Road Project

Scope of Comparative Analysis WITHOUT Gosling Road Project

- Base case originated from Proposed Plan Application Analyses
- 2012 summer peak load (NE load 32,290MW)
- 2012 summer intermediate load (NE load 16,970MW)
- Gosling Road Project not included
- Assumed the following based on previous analysis
 - 6 breaker configuration at 345 kV Three Rivers Substation
 - 6 breaker configuration at 345 kV Maguire Road Substation

MPRP Interconnection with PSNH

2012 Summer Peak Three Rivers vs. Newington Alternative S1 w/o Gosling Road Project

Scope of Analysis cont.

- N-1 Analysis examined
 - NH to ME transfers
 - Peak Load for Dispatches D4, D5 & D6 I1
 - ME to NH transfers
 - Peak Load for Dispatches D7 I3 and D7a I3 (Schiller and Con Ed offline)
 - Intermediate Load for Dispatch D9a (Heavy generation supply internal to Maine with Schiller and Con Ed offline)

MPRP Interconnection with PSNH

2012 Summer Peak Three Rivers vs. Newington Alternative S1 w/o Gosling Road Project

Scope of Analysis cont.

- N-1-1 Analysis examined
 - NH to ME transfer, D4 I2 (NB-NE = 0MW)
 - ME to NH transfer, D7 I4 (NB-NE = 500MW)
- Additional limited N-1-1 analysis examined Dispatch D10
 - D7 I4 with reduced transfer on NNE-Scobie + 394 interface
 - Respected generation restrictions per 394 Line out stability guide
 - NU Newington = 300MW
 - ConEd = 200MW (Total Newington station generation \leq 500MW)

MPRP Interconnection with PSNH

2012 Summer Peak Three Rivers vs. Newington Alternative S1 w/o Gosling Road Project

Scope of Analysis cont.

- N-1-1 Analysis for major 345 kV system element out of service:
 - Section 307 Outage (2 segments for Three Rivers Int.)
 - Section 326 Outage
 - Section 363 Outage
 - Section 373 Outage
 - Section 385 Outage
 - Section 386 (Buxton – South Gorham) Outage
 - Section 391 Outage
 - Section 394 Outage
 - Section 3020 Surowiec – Elm Street Outage
 - Section 3021 South Gorham – Maguire Road Outage
 - Section 3022 Maguire Road – NH Outage

MPRP Interconnection with PSNH

2012 Summer Peak Three Rivers vs. Newington Alternative S1 w/o Gosling Road Project

Observations of N-1 Analysis without Gosling Rd Project

- Reliability violations were observed due to absence of Seacoast area (i.e. Gosling Road Project) system upgrades.
- Voltage performance
 - No significant deviation (<1%) between options
- Thermal performance
 - Loss of 307E (Newington – Three Rivers) – Three Rivers Option
 - H137 Line (Merrimack – Garvins) overloads at 100 – 107% of 240MVA LTE rating for D4 I1, D5 I1 and D6 I1 cases (NH to ME transfer)
 - Newington 345 kV SB 3135/3022 (unique to Newington option)
 - N133 Line (Bolt Hill – Three Rivers) loading at 101% of 240MVA LTE rating
 - Single element loss of 3022 Line (Maguire to NH)
 - N133 Line (Bolt Hill – Three Rivers) loading at 99% for both options
 - No other significant deviation in loading (<3%) between options

MPRP Interconnection with PSNH

2012 Summer Peak Three Rivers vs. Newington Alternative S1 w/o Gosling Road Project

N-1-1 Analysis of NH to ME dispatch condition

- Three Rivers Option
 - Introduces additional contingency that could cause low voltage at Seabrook 345 kV, combined outage of 307E and 394 Lines
 - Line overloads for combination of any two outages on these lines:
 - 307E Newington – Three Rivers
 - 363 Seabrook – Scobie
 - 394 Seabrook – West Amesbury
 - Generation restriction required to maintain post-contingent 345kV loading below LTE for loss of two lines. NU Newington reductions as follows:
 - 307E Outage, 175MW reduction
 - 363 Outage, 200MW reduction
 - 394 Outage, 200MW reduction

MPRP Interconnection with PSNH

2012 Summer Peak Three Rivers vs. Newington Alternative S1 w/o Gosling Road Project

N-1-1 Analysis of ME to NH dispatch condition

- Three Rivers Option
 - Introduces additional contingency that could cause low voltage at Seabrook 345 kV, combined outage of 307E and 394 Lines
 - 307E Outage (Unique to Three Rivers Option)
 - Loss of 363 overloads 394 at 106% of LTE
 - Deerfield 7310 SB overloads 115 kV R169 and M183 Lines (<STE)
 - 385 Outage shows significantly lower 115 kV line loadings for DCT 307/N133
 - Did not solve for combined Outage of 363 and 394 Lines
- Newington Option
 - Provides increased exit capacity in Newington/Seabrook area and improves system performance.

MPRP Interconnection with PSNH

2012 Summer Peak Three Rivers vs. Newington Alternative S1 w/o Gosling Road Project

Conclusions of Comparative Analysis

- **Regardless of interconnection option, reliability violations were observed due to absence of Seacoast area system upgrades**
- **N-1 Analysis**
 - **No significant difference in thermal or voltage performance**
- **N-1-1 Analysis**
 - **Newington Option adds more transmission capacity to access NH area 345 kV generation**

MPRP Interconnection with PSNH

Three Rivers vs. Newington

Summary Comparison based on System Studies

	ALTERNATIVES	
	Three Rivers	Newington
Electrical Performance	2	1
Maine Reliability	2	1
345 kV Operability	2	1
Loss Performance	1	1
115 kV System Loading	2	1
ME to NH thermal transfer capability	2450MW	2450MW
NH to ME thermal transfer capability	1875MW	2175MW

MPRP Interconnection with PSNH

Conclusions Based on System Studies

- Recommend Newington Interconnection
 - Addition of a third 345 kV line termination at Newington Substation
 - Increases exit capacity at Newington
 - Increases 345 kV system operability
 - Increases access to Newington/Seabrook generation resources
 - Lower 115 kV line loading in Seacoast area
 - Improvement to system voltage and reactive performance
 - Negligible difference in losses between Three Rivers and Newington interconnections
 - Higher NH-ME thermal transfer capability
 - Three Rivers interconnection showed lower loading on 115 kV R169 Line for one outage and contingency combination

Drivers for Newington Interconnection for MPRP and PSNH

9/19/08

33

ODR-01-46
Attachment 3, Page 33 of 42
Docket No. 2008-255

NU

Cost Comparison

9/19/08

Three Rivers vs. Newington Estimate Comparison (With Gosling Road) (Sept 08)

Option 1 - Tie in 345 kV at Three Rivers SS*	
Three Rivers SS estimated cost**	\$32.10
Rebuild N133 from Bolt Hill to Three Rivers (App. 6.25 miles)	\$9.46
Total	\$ 41.16
Additional scope for this option needs to be identified and estimated.	
Option 2 - Tie in 345 kV at Newington SS	
Newington SS modifications (2 CB's, New Line Position, Control house expansion)	\$7.35
7 miles of 345 kV line from Three Rivers to Newington, including a river crossing and real estate requirements	\$33.15
Rebuild 3.5 miles of N133 and 307 lines	\$22.60
Total	\$63.10

9/19/08

Three Rivers vs. Newington Estimate Comparison (Sept 08)

* All the scope for modifications for interconnection at Three Rivers needs to be identified in detail. All the thermal and voltage modifications would need to be identified before final estimates can be completed.

** This estimate does not include any modifications at remote stations and modifications in the 345-kV line corridor required for interconnection to 307 line at Three-Rivers Substation

Additional Notes:

Note 1: This is a conceptual estimate comparison.

Note 2: All estimates contain 6% annual escalation and 40% contingency.

Note 3: All dollar figures are in millions.

Cianbro Cost Comparison Real Estate & Environmental Issues

9/19/08

Three Rivers vs. Newington Estimate Comparison

BACK-UP ORIGINAL DATA FROM April 08

Base Case S1 Elm <i>(Only modify estimate from Three Rivers SS on)</i>		\$352.9 M
Option 1 - Tie in 345 kV at Three Rivers SS		
Base		352.90
Deduct original Newington SS estimate		(11.10)
Deduct original 6.3 miles of 345 kV line from near Three Rivers to NH side of river		(16.35)
Add revised SS cost of Three Rivers		14.60
	Revised Total	\$340.05
Option 2 - Tie in 345 kV at Newington SS		
Base		352.90
Deduct original Newington SS estimate		(11.10)
Add revised cost for new SS at Newington		0.50
Deduct original 6.3 miles of 345 kV line from near Three Rivers to NH side of river		(16.35)
Add revised cost for 7.8 miles of 345 kV line from Three Rivers to Newington, including a river crossing and real estate requirements		36.10
	Revised Total	\$362.05

Note 1: All estimates contain 20% escalation and 30% contingency.

Note 2: Estimates used the same criteria as on the comparative estimate for N-1-1.

Three Rivers vs. Newington Estimate Comparison

Cost Factors

- Comparative estimate six option study completed by MPRP Team. Delta remains at \$22-27MM range in favor of Three Rivers.
- This cost difference has a minimal scope of \$0.5MM for substation work at Newington. Could be much greater once scope defined by PSNH.
- The delta cost reflects an aerial crossing. Underwater would add at least \$50MM based on PSNH input.

Three Rivers vs. Newington Estimate Comparison

Risk Factors

- Aerial river crossing in the lowest estimate case is at least 4000 ft.
- Tower height may cause issues with FAA. Pease International Airport is nearby.
- Real estate acquisition efforts do not support MDEP permit. (details on next slide)

Three Rivers vs. Newington Estimate Comparison

Risk Factors

- **Real Estate and Permitting.**
 - 21 parcels have been identified for least cost option (Option D).
 - Five homes would need to be taken.
 - Four other parcels are not condemnable.
 - Two other parcels are partially condemnable.
 - All parcels in this option were in Elliot.
 - Real Estate needs in NH appear to be all in commercial and industrial areas.

MPRP Interconnection with PSNH Path Forward

- PUC CPCN
- DEP Permit
- Proposed Plan Applications
- TCA Application