

MAINE POWER RELIABILITY PROGRAM

A CENTRAL MAINE POWER COMPANY PROGRAM

Non-Transmission Alternatives Forum

April 7th, 2008



Program Team



Central Maine Power

Your Electricity Delivery Company



An Energy East Company
Project Owner



ENGINEERING
Transmission System Studies



POWERENGINEERS
Transmission/Substation Design

NTA Energy
Efficiency Modeling



GDS Associates, Inc.
Engineers and Consultants

Environmental Assessment



NTA and Economic Modeling



Public Communication and
Community Relations

BERNSTEIN SHUR

Government Solutions

CIANBRO
Project Management

Legal

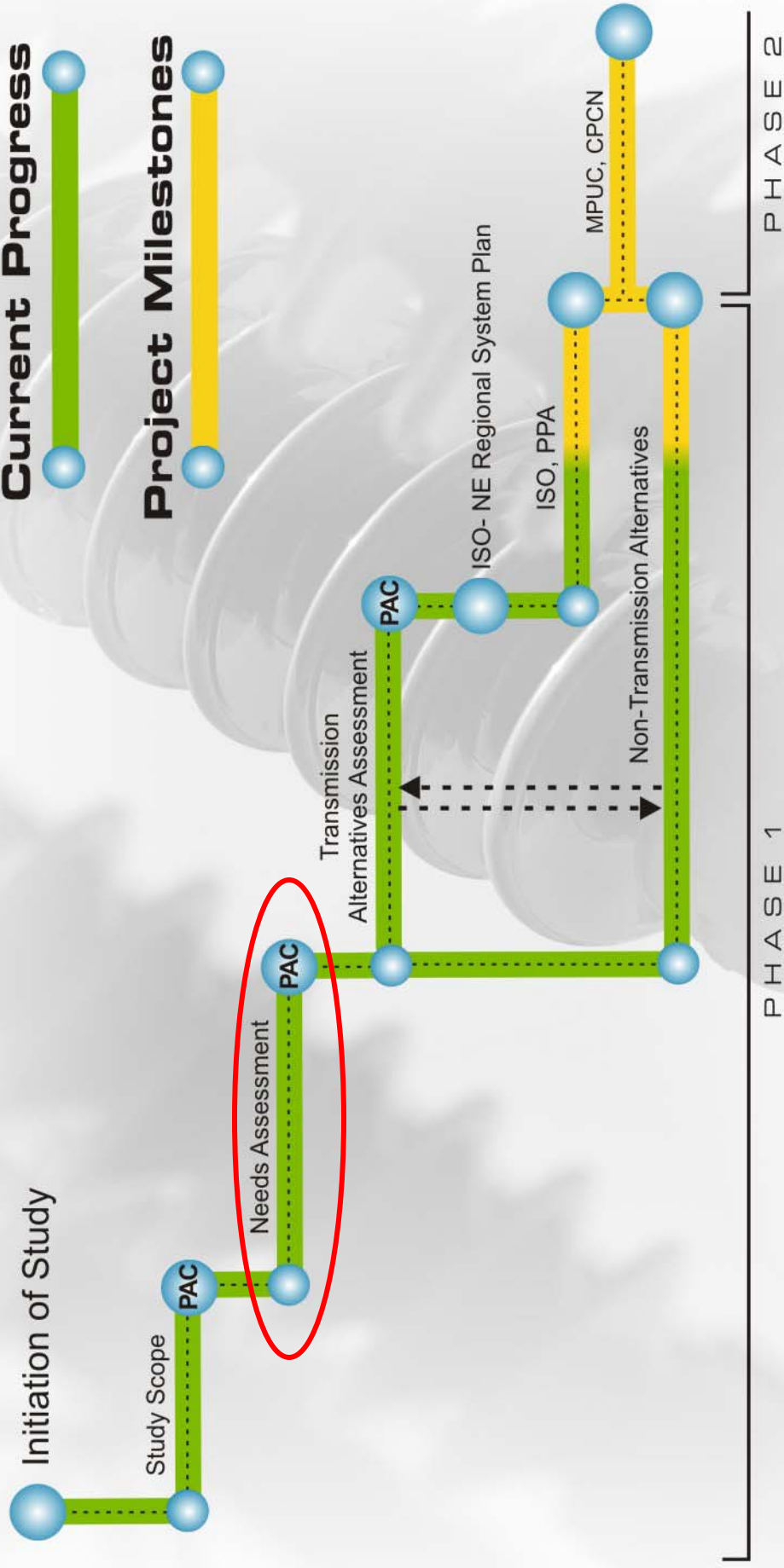


ATTORNEYS AT LAW



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MPPRP - System Planning Study



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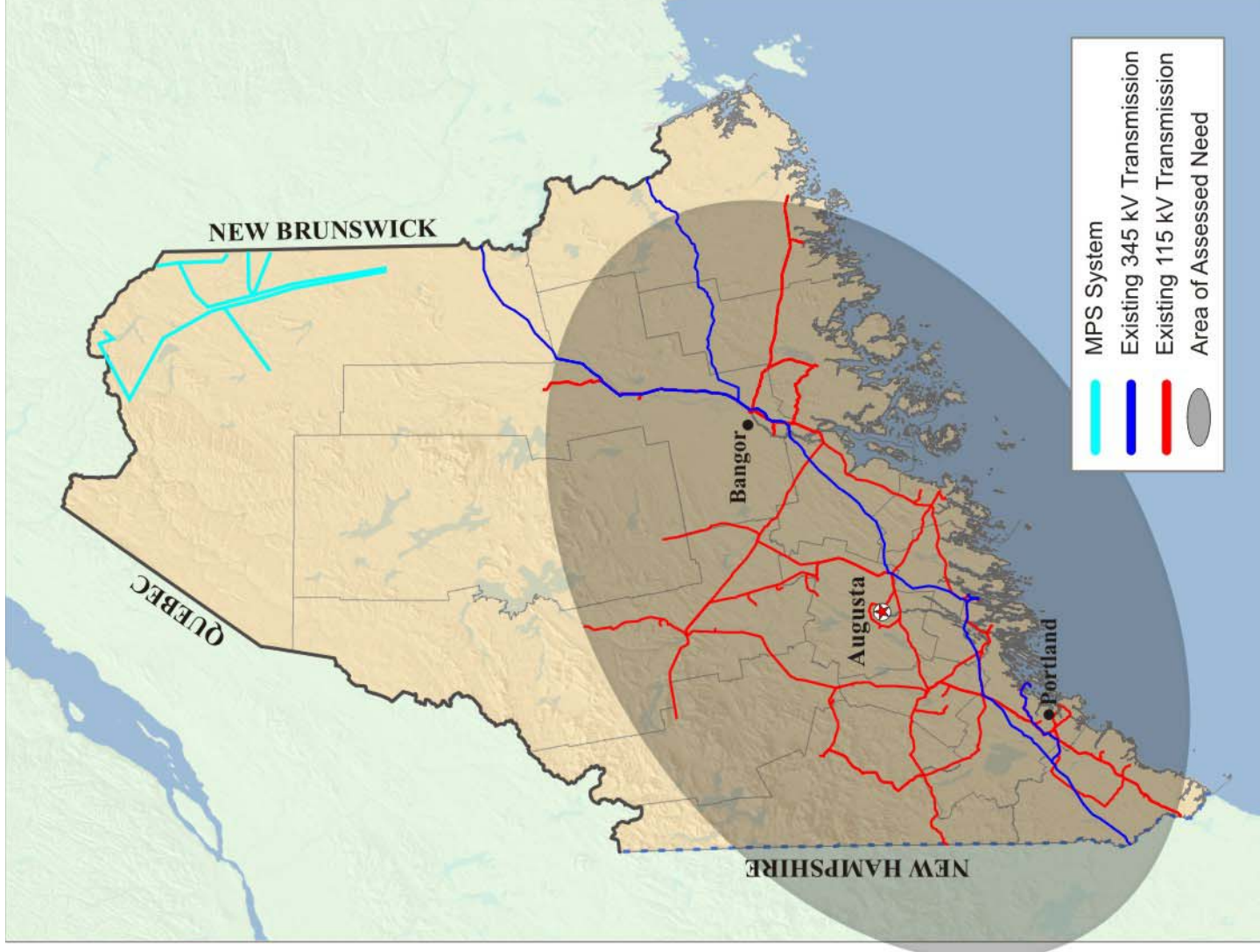
Needs Assessment Study Scope

Maine Reliability

- Identify where the system fails to meet applicable standards



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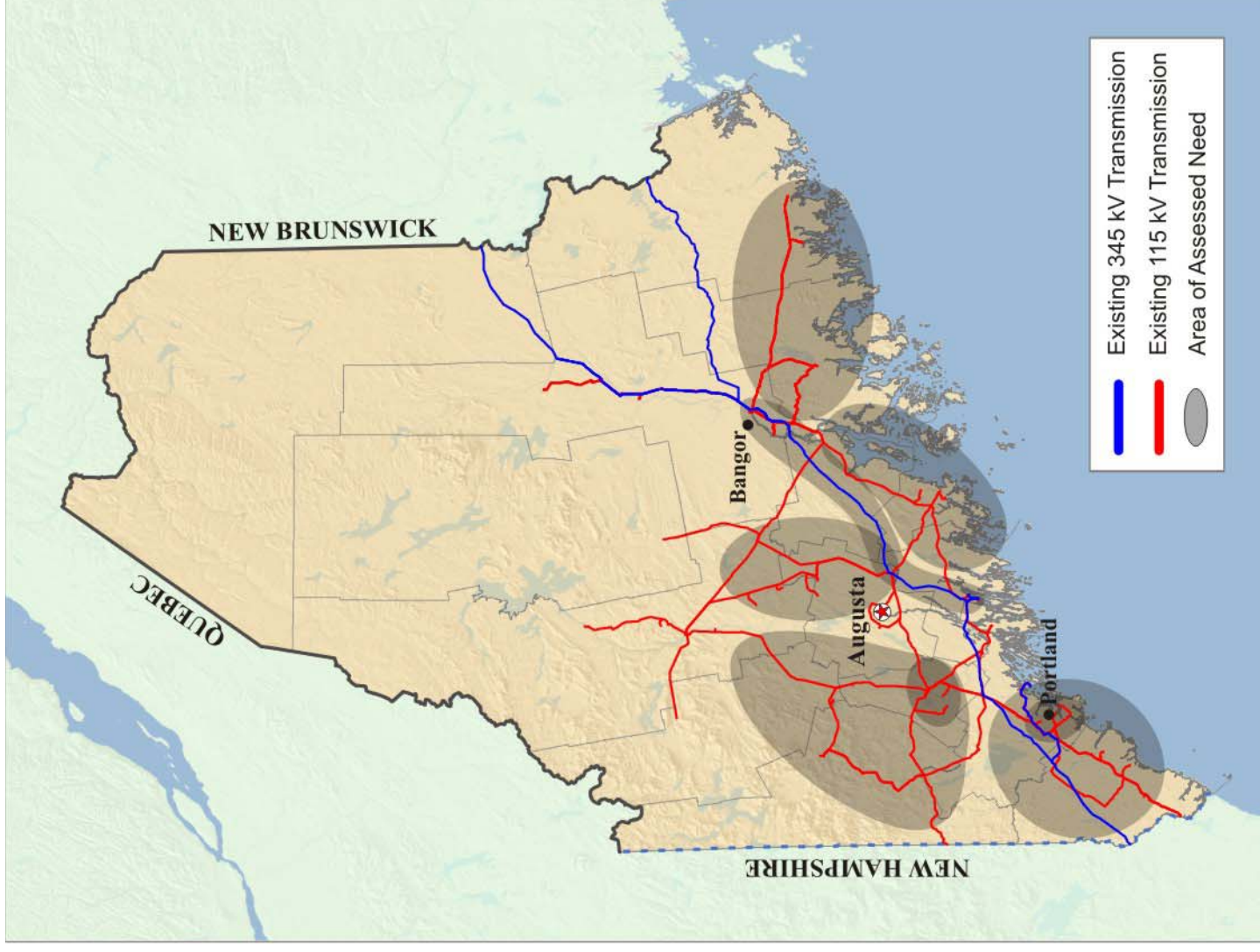


Needs Assessment










- 2017 Peak Load Forecast
- Multiple Maine Generator Dispatch Scenarios
- Various Interface Tie Flow with NB and NH
- Hundreds of Outage Events
- Nearly 5000 Cases Simulated
- Published June 19, 2007



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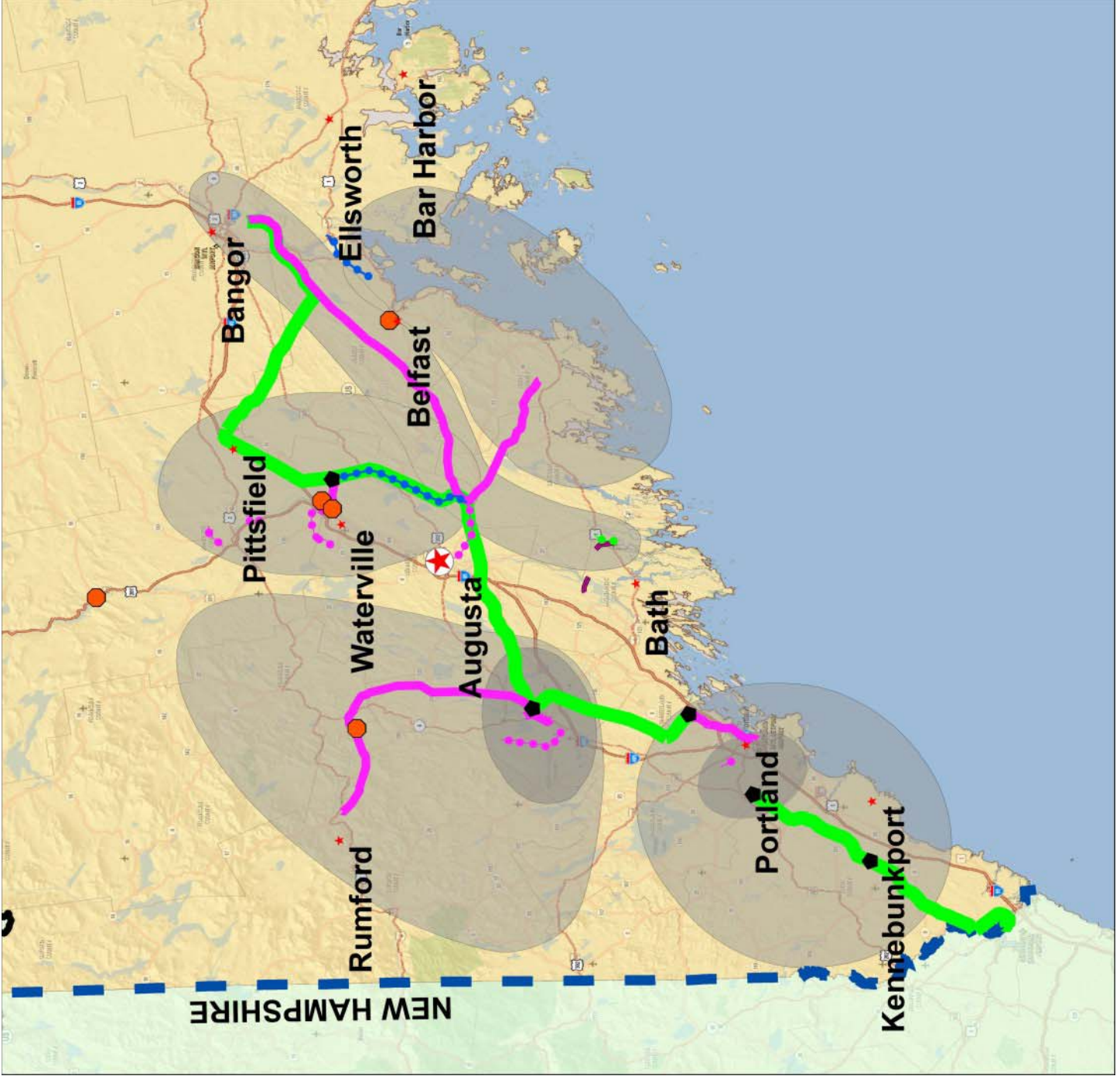


Proposed Solution

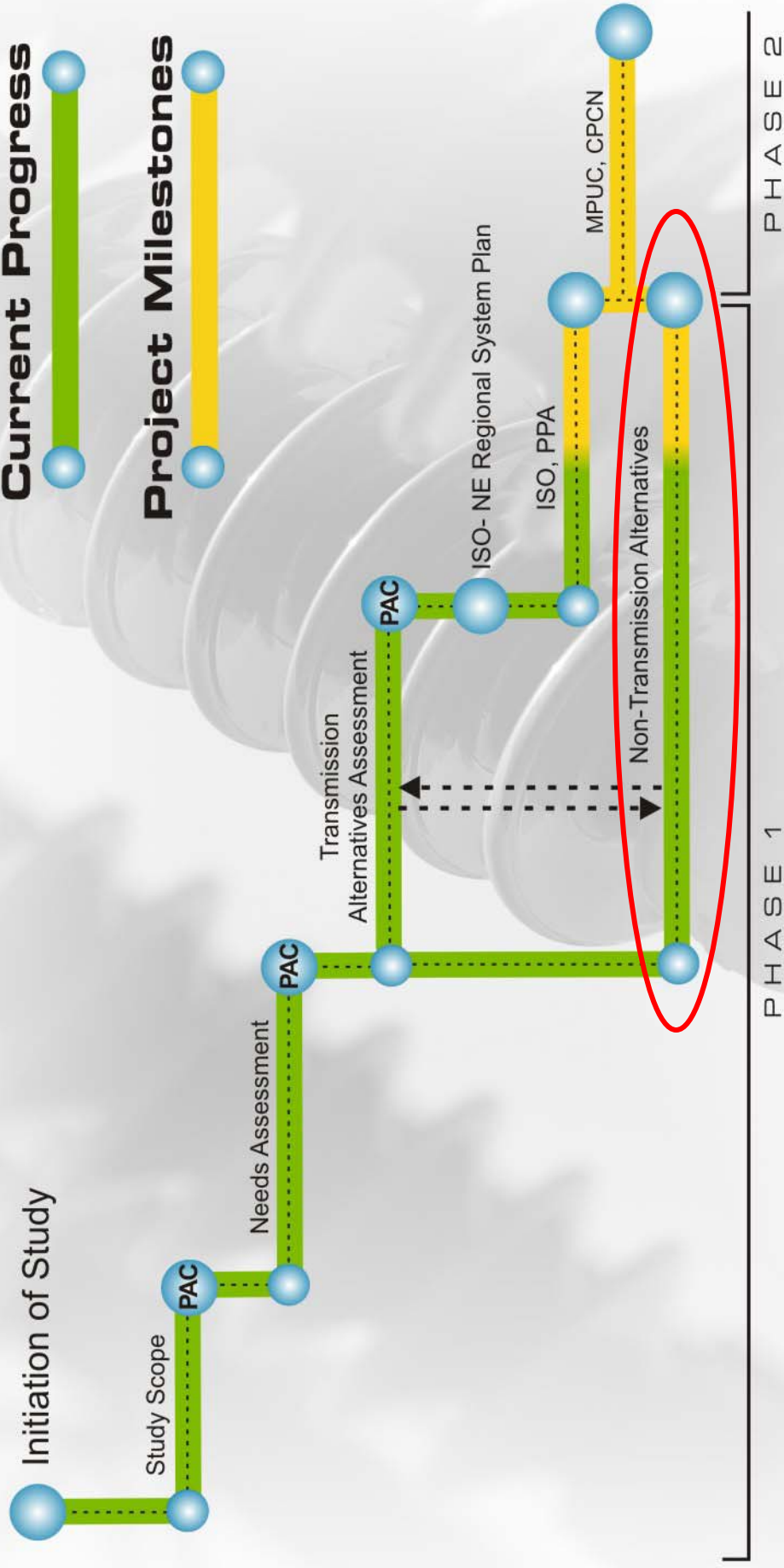
-  Proposed 345 kV Transmission
-  Proposed 115 kV Transmission
-  Proposed Autotransformer
-  Proposed Capacitor Banks
-  Rebuild 115 kV
-  345 kV Re-Rate
-  115 kV Re-Rate
-  DCT Separation
-  Area of Assessed Need



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MPPRP - System Planning Study



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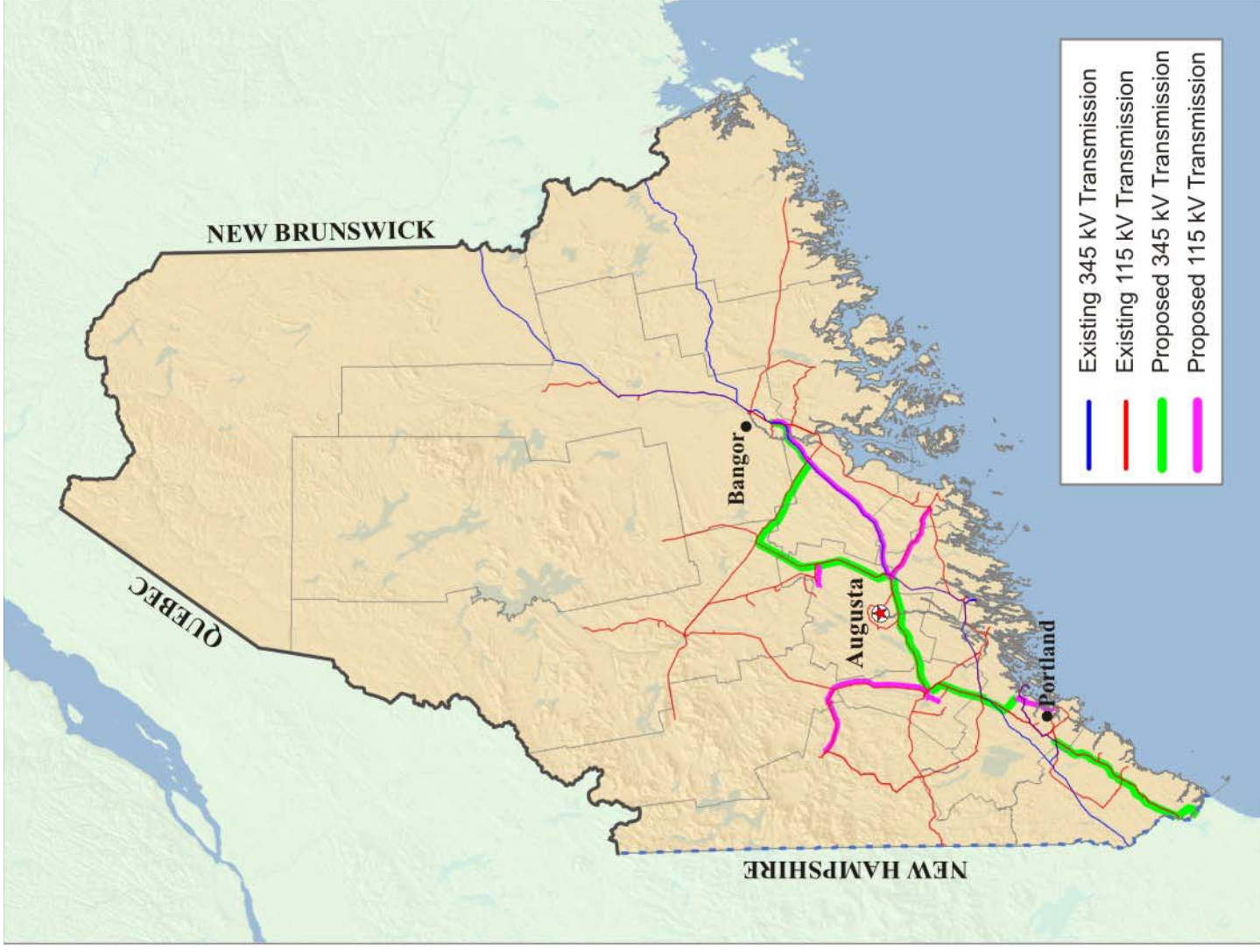
Looking Ahead

- **ISO-NE Approval - 2008**
- **MPUC Filing – 2008**
 - Transmission & Non-Transmission Combination
- **MDEP Filing – 2008**
- **Continued Community Outreach & Stakeholder Briefings**

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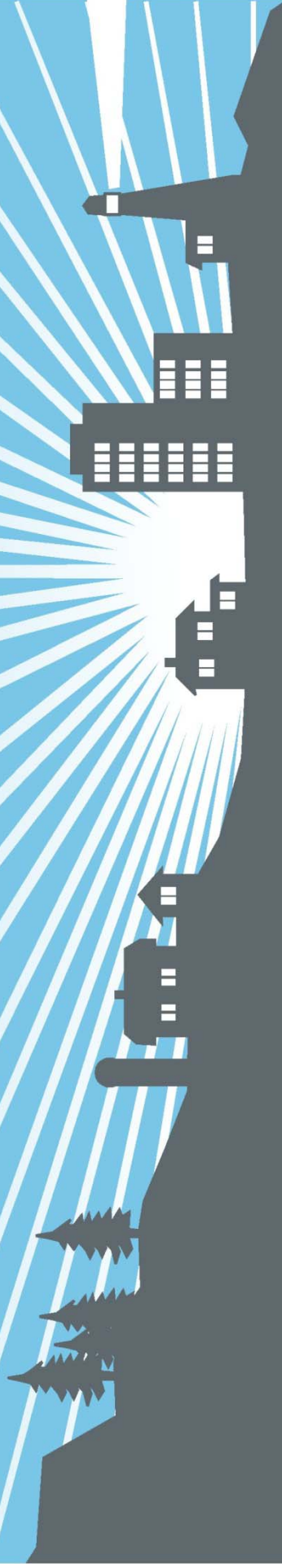


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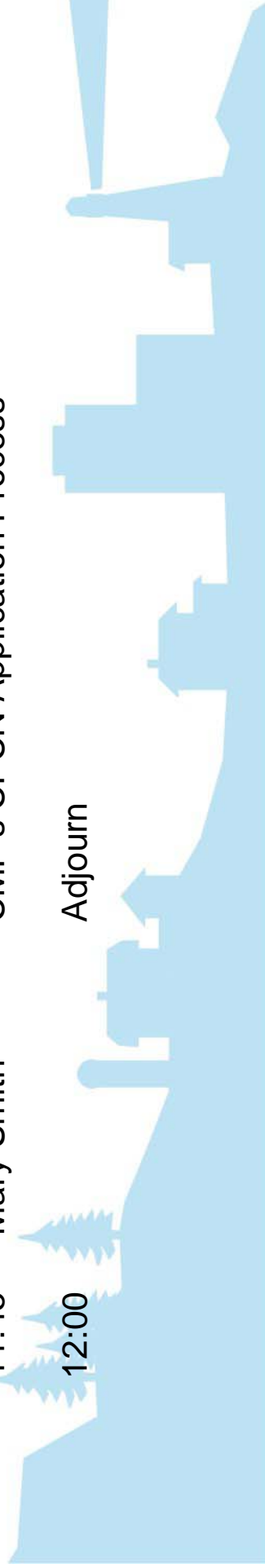
Non-Transmission Alternatives Study Preliminary Results

April 7, 2008



Agenda

8:30	Kay Rand	Welcome and Introductions
8:40	Geoff Thomas	Update on MPRP Activities
8:55	Dan Peaco	Overview of the Non-Transmission Alternatives Assessment Study and Results
9:30	Dick Hahn	Overview of the NTA Assessment Methodology
10:15		BREAK
10:30	Dick Hahn	NTA Assessments For Each MPRP Area
11:15	Dan Peaco	Market Issues, Emissions, and other Benefits
11:30	Dan Peaco	Recap and Discussion
11:45	Mary Smith	CMP's CPCN Application Process
12:00		Adjourn

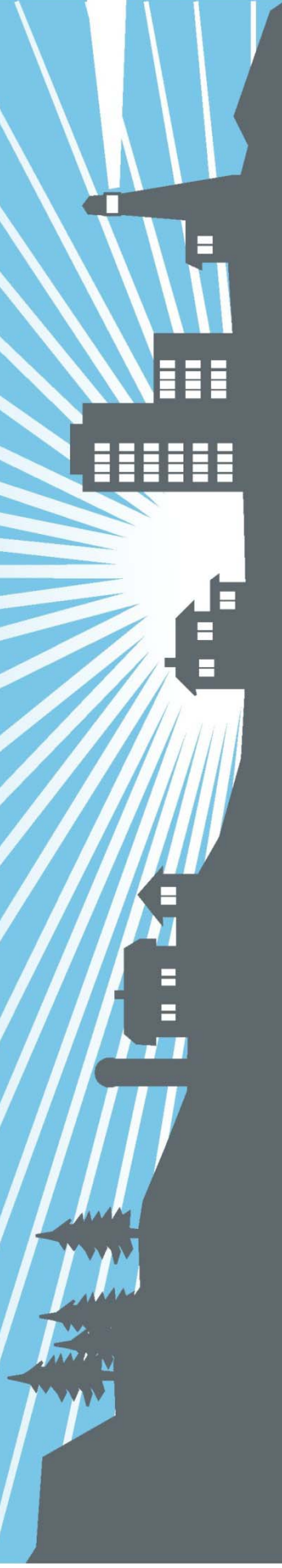


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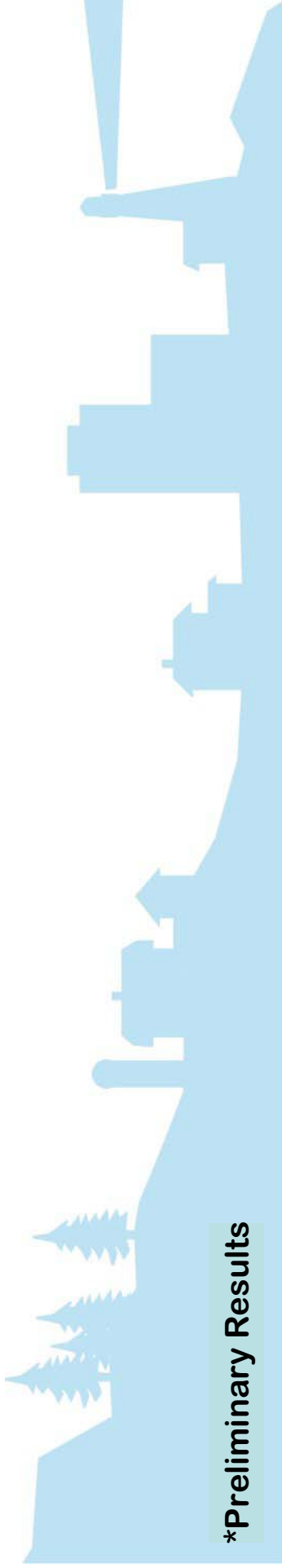
Non-Transmission Alternatives Assessment Study

Overview and Preliminary Results



NTA Study Goals

- **A Planning Study to Assess the Potential for:**
 - Comparable NTA Solutions to the Reliability Needs
 - NTA Options to affect the Timing of Transmission Solutions
 - Composite Transmission/NTA Solutions
- **Assess the Costs and Benefits to CMP Customers**
 - Reliability, Cost Allocation, Market Affects
- **Assess the Potential for Market Options**



*Preliminary Results

NTA Study Status

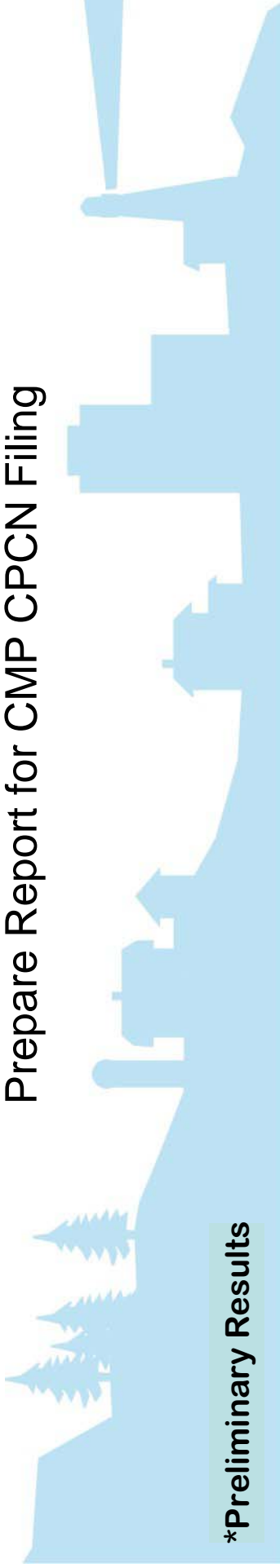
To Date:

- June 2007 NTA Forum Previewed the Study Plans
- Dec 2007 Completion of DSM/DR Potential Study
- Jan 2008 Preferred Transmission Alternative Announced
- Apr 2008 NTA Preliminary Results Forum

Next:

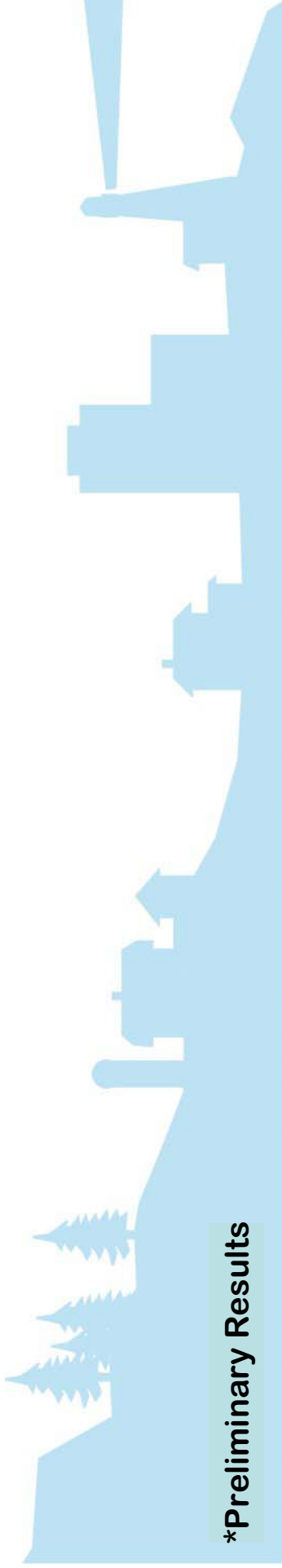
- Finalize Results
- Prepare Report for CMP CPCN Filing

*Preliminary Results



Goals for Today's Presentation

- NTA Study - Preliminary Results Briefing
- Discussion of Results with Interested Stakeholders




*Preliminary Results

Key Steps of the NTA Study

- **2012 – 2027 Needs Assessment**
- **Energy Efficiency/Demand Response Potential Study**
- **Generation Options Assessment**
- **Assess the Potential for:**
 - EE/DR to Alter the Need
 - Combinations of EE/DR and Generation to Address Need
- **Comparative Economics of Alternatives**
- **Assessment of Market Price Implications**


*Preliminary Results



Findings on DSM

- **Energy Efficiency/Demand Response Resources are Economically Attractive in their own right.**
 - Regardless of Need
 - Both Transmission and Generation Solution Alternatives
- **The Max Cost-effective Potential for EE/DR:**
 - Cannot Provide the MW Needed to Displace Most Transmission
 - Cannot Materially Defer the Need for Most of the Segments
- **Projected Efficiency Maine kWh Savings Estimates**
 - Will Achieve About 70% Of Maximum Achievable C/E Potential

*Preliminary Results



Findings on Generation

- **Generation Can Provide Solutions in Several Segments**
 - Not Cost Effective To Maine Customers in Most Cases
- **Solutions Require Smaller, Localized Generation**
 - 100 MW or less: Peaking, CHP, Biomass
- **Wind Resources Are Not a Reliability Solutions**
- **Alternatives to the Northern Backbone Pose Special Challenges**
 - Special Protection Systems and Must Run Operations
- **Amounts Would Significantly Exceed FCM Requirements**



*Preliminary Results

NTA Solutions Findings

- **South Portland Loop NTA Options Are Most Promising**
 - Local Sub-transmission Study May Alter Requirements
- **All Other Areas Show Needs In 2012**
 - NTAs Can Help Mitigate Near-term Needs
- **Peaking Generation Is Generally Best Generation Option**
 - Well Located Biomass Or Combined Heat & Power Also Can Help
- **Energy Efficiency Improves Economics Of All Solutions**



*Preliminary Results

Other Findings

- **Transfer Capability**
 - MPRP Reduces Locational Marginal Prices, The Effect is Limited
 - MPRP Adds Options for Northern Renewables Development
- **Impact on Maine Generators**
 - Net Revenues to Maine Generators Similar for All Cases Studied
- **Regional Benefits**
 - Market Price Benefits Across the Region in Excess of \$1B
- **Emissions**
 - EE and Biomass Reduce CO₂ Emissions When Included in NTAs



*Preliminary Results

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Methodology Overview



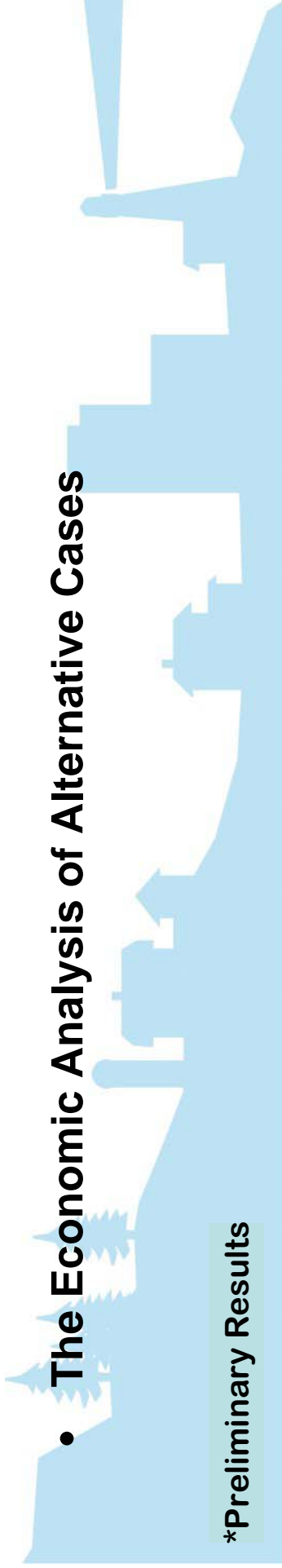
Goals for Methodology Overview

We Will Provide an Overview of:

- **The Reliability Needs Assessment**
 - Translating the Transmission Assessment to Supply and DSM
- **The Generation and DSM Alternatives Selection**
 - Cost, Reliability, Performance, Size, and Resource Potential
- **The Development of Comparable NTA Scenarios**
 - Combining Elements into Reliability Portfolios

- **The Economic Analysis of Alternative Cases**

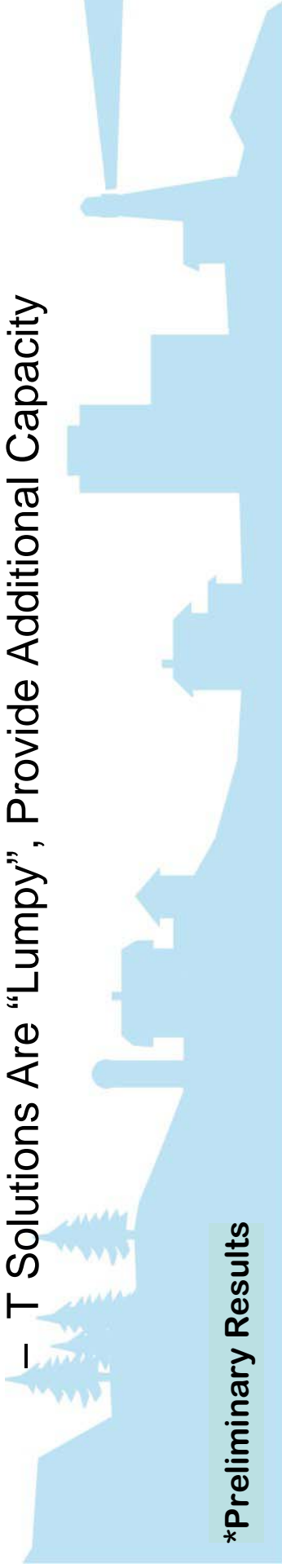
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Needs Assessment

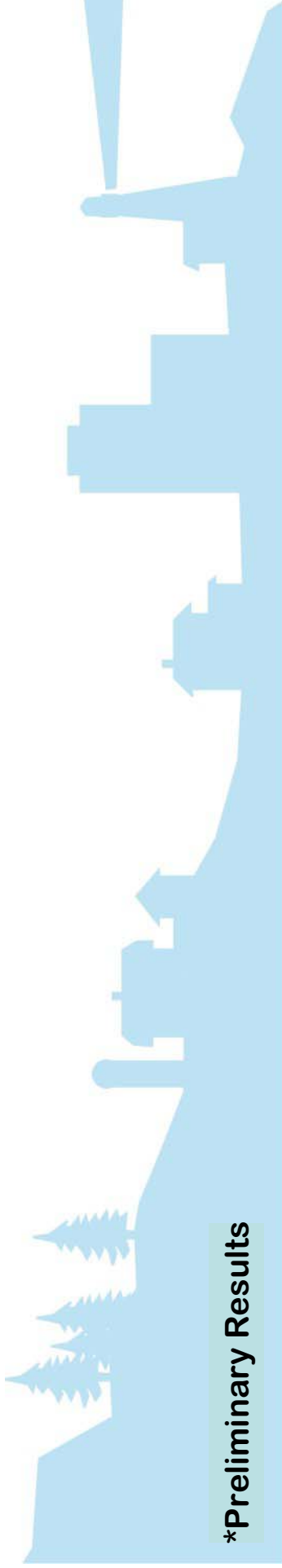
- **Transmission Needs Assessment**
 - Published June 2007
 - 2017 Summer Peak Assessment
 - Stressed the System Under Extreme Loads and Outages
- **Preferred Transmission Solutions**
 - Announced January 2008
 - Sized to Solve the 2017 Stress Conditions
 - T Solutions Are “Lumpy”, Provide Additional Capacity

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Needs Assessment

- **Translating the Transmission Solution to NTAs**
 - NTA Solutions Can Be More Modular
 - Comparability Requires Full Definition of Transmission Solution
- **Added Information Needed for this Assessment**
 - Load Level Where Existing System Remains Reliable
 - Max Load Level that the Transmission Solution Can Support

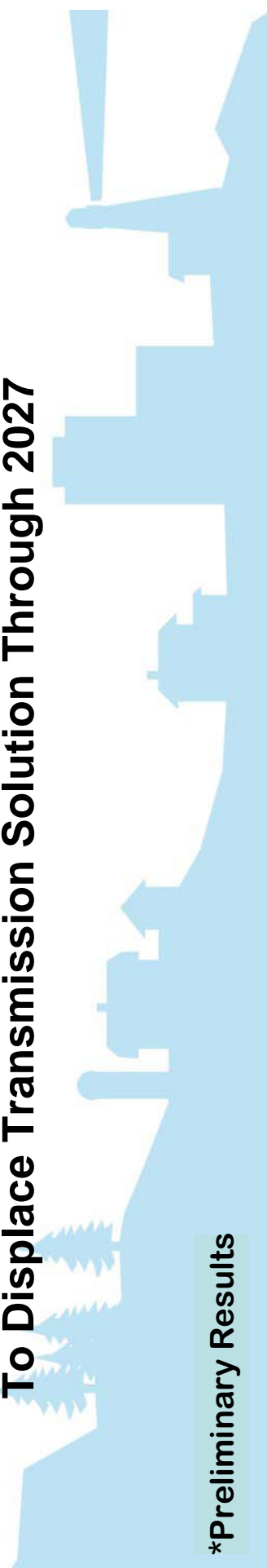


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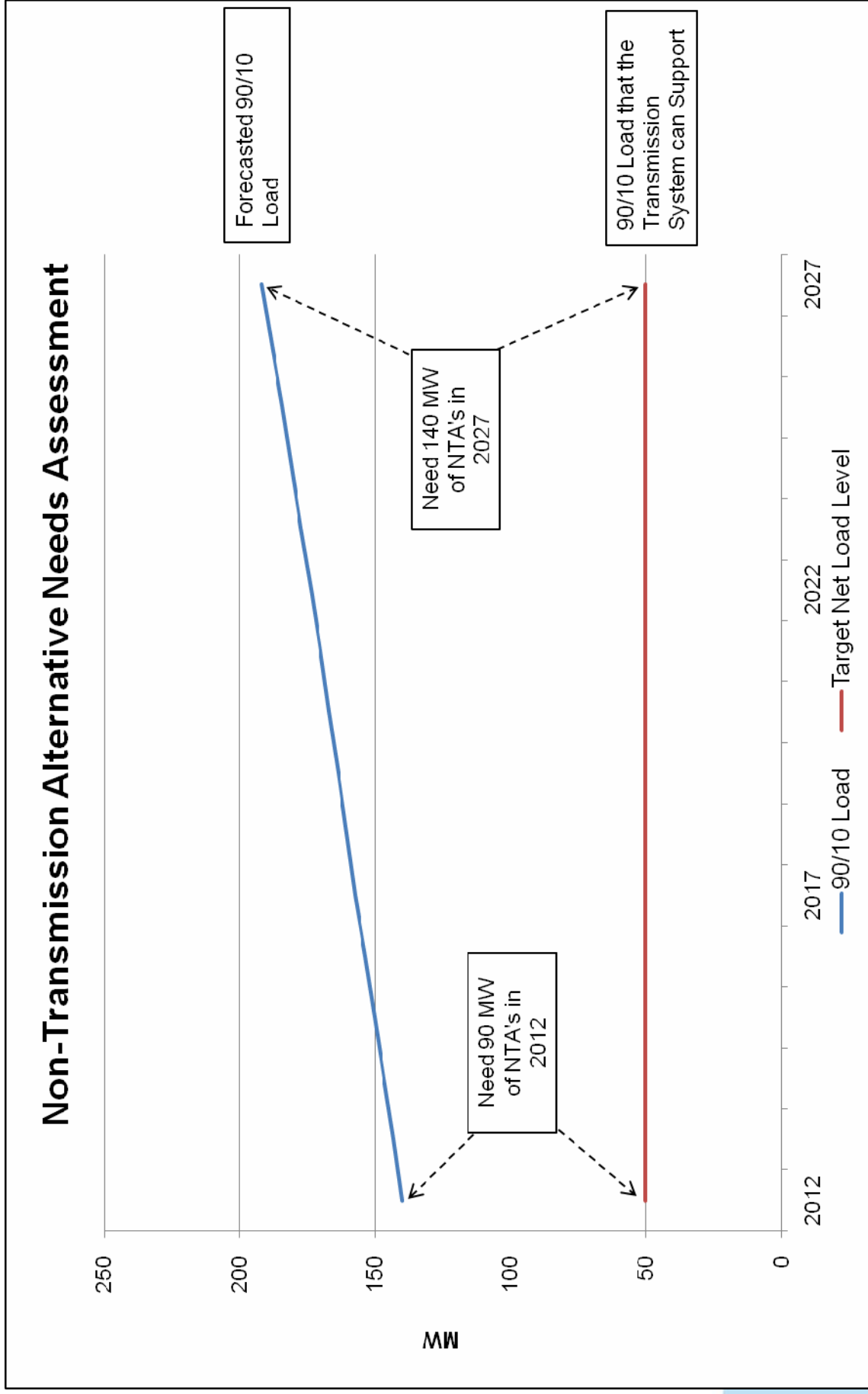
Overview of Methodology

- **Determine The Year Of Need For Each Region Being Studied**
 - 2012 was earliest year due to lead time considerations
- **Identify the preferred transmission solution**
- **Estimate the “Longevity” of the Transmission Solution**
 - Considered Dates Through 2027
 - Matches Minimum Longevity Of Transmission Solutions
- **Estimate Load Reductions And / Or New Local Supplies Needed To Displace Transmission Solution Through 2027**

*Preliminary Results

A light blue silhouette of an industrial facility, possibly a power plant, with several tall chimneys and a complex structure of pipes and buildings. The silhouette is positioned in the background of the bottom right corner of the slide.

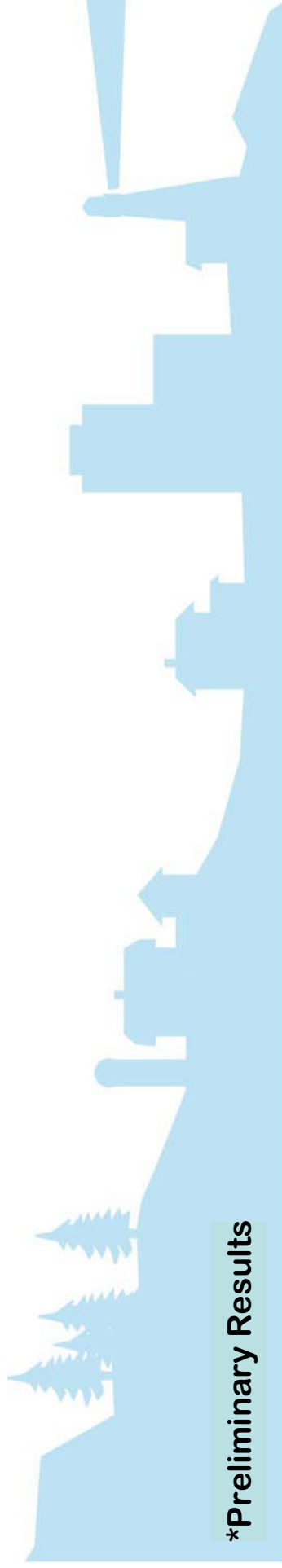
Winslow-Skowhegan Example



*Preliminary Results

DSM Options

- **Include 100% of MACE from GDS Study**
 - Over And Above What Is Already Implicit In CMP Load Forecast In Base Case
- **Adjust GDS Results For System Losses And Extreme Weather**
- **Also consider scenario where no additional DSM is achieved beyond amounts assumed in CMP load forecast**



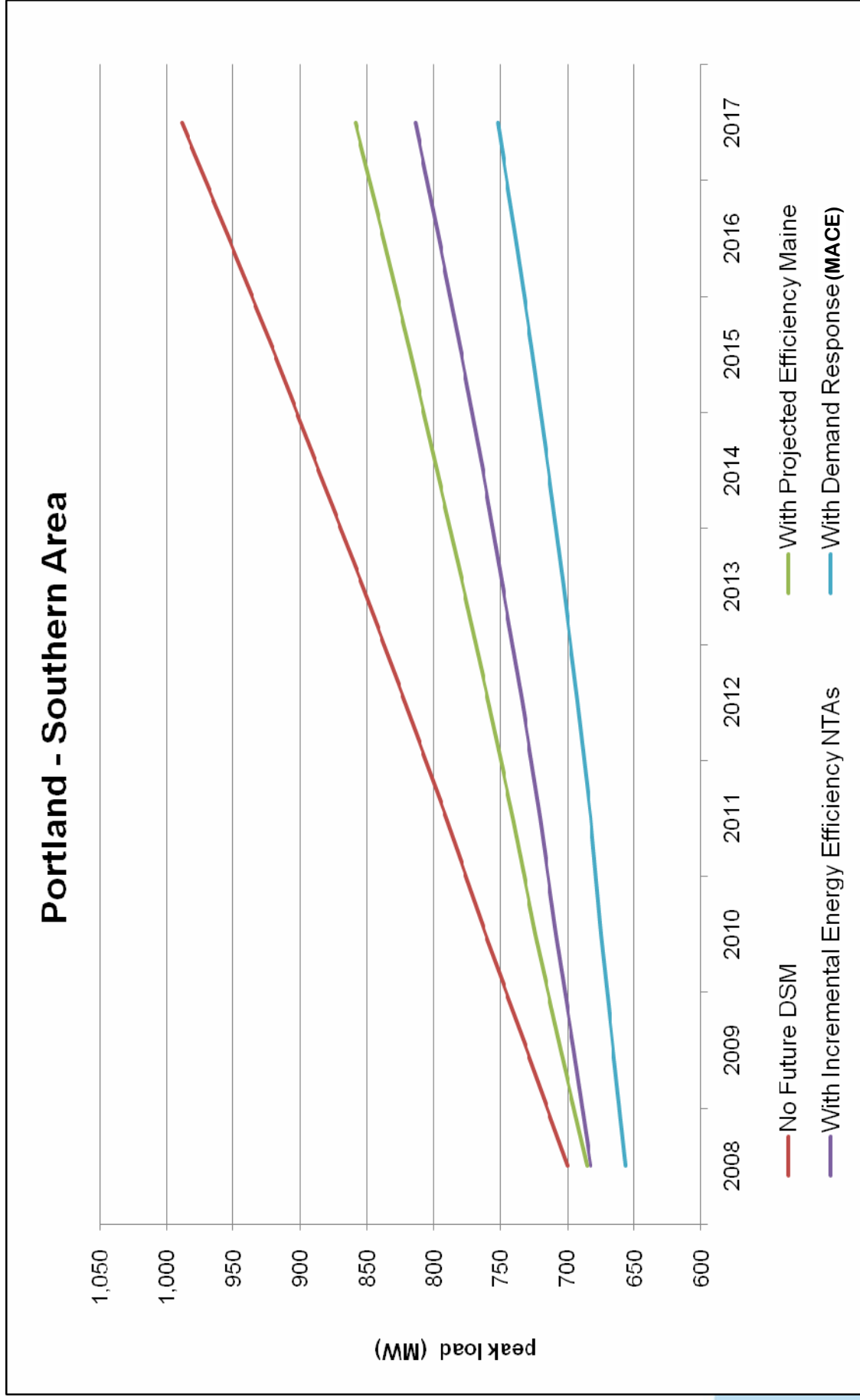
*Preliminary Results

MACE EE and DR Potential By 2017

	<u>Northern Maine 345KV</u>	<u>Winslow- Skowhegan</u>	<u>Midcoast</u>	<u>Western Maine</u>	<u>Lewiston Loop</u>	<u>Southern - Portland</u>	<u>South Portland Loop</u>
MACE Energy Efficiency							
2017 cumulative energy savings (GWH)	926	159	76	269	80	687	167
% of sales	15%	16%	15%	15%	13%	15%	16%
2017 cumulative peak savings (MW)	235	40	18	69	21	175	43
% of peak	17%	17%	16%	17%	14%	17%	18%
Demand Response							
2017 cumulative peak savings (MW)	117	11	10	19	7	62	12
% of peak	9%	5%	9%	5%	5%	6%	5%
(1) MACE values include all DSM potential, including amounts assumed to be implemented by Efficiency Maine							
(2) Percents of the projected sales and peak demand not adjusted for assumed Efficiency Maine impacts							

*Preliminary Results

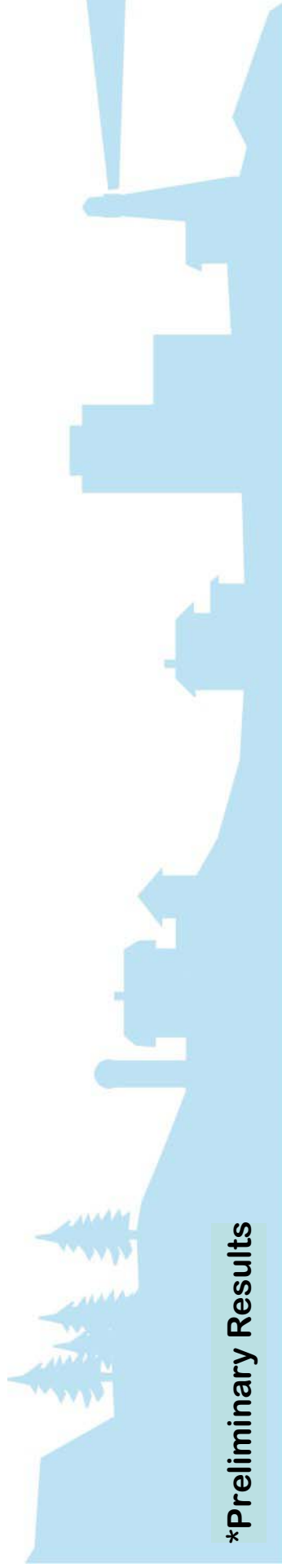
DSM Example



***Preliminary Results**

Generation Options Considered

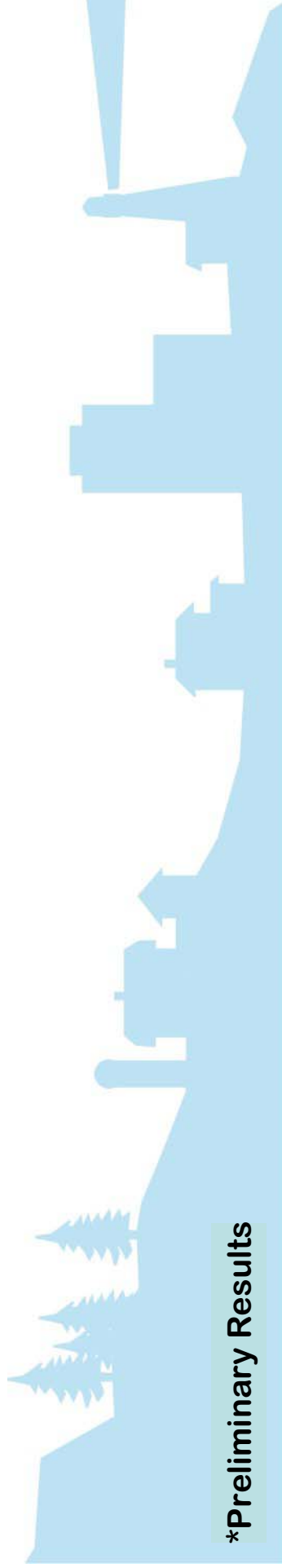
- Wood-fired biomass
- Fuel cells
- Micro-turbines
- Wind
- PV Solar
- CHP
- Gas turbines
- Combined cycle units
- Diesel / ICUs
- IGCC Coal
- Battery Storage



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Preliminary Screening

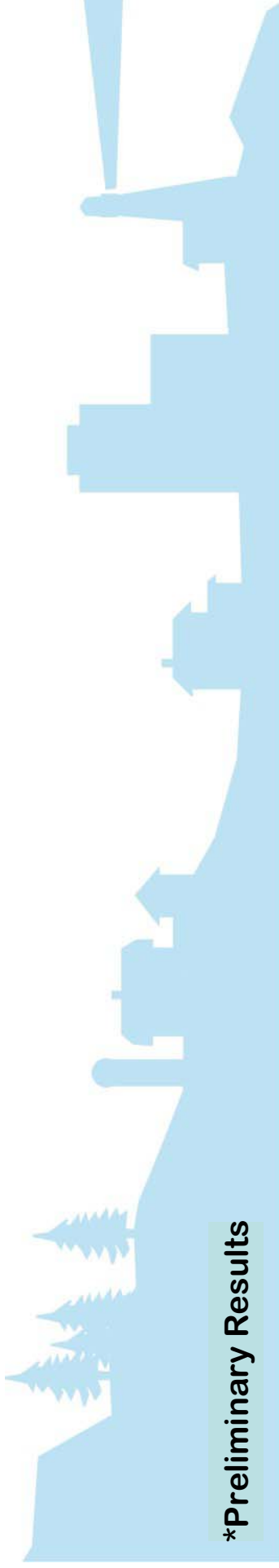
- Wind – Non-dispatchable
- IGCC – Too Large, High Cost
- Microturbines – Too Small For Need, High Cost
- Fuel Cells – Too Small For Need, High Cost
- PV Solar – High Cost
- Battery Storage – High Cost, Immature Technology



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Proposed Generation Options

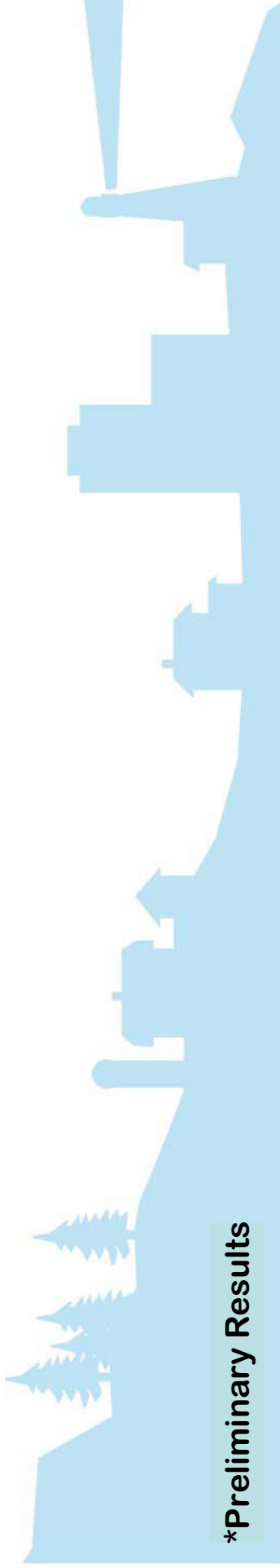
- **Wood-fired Biomass**
- **Combined Heat and Power (CHP or cogeneration)**
 - For Smaller Needs Assessments
- **Combined Cycle Units**
 - For Larger Needs Assessments Where Natural Gas Available
- **Gas Turbines**
 - Peaking Only Capacity



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Firm Generating Capacity

- **Generation Alternatives to Provide Comparable Reliability**
 - Transmission Lines Have Lower Outage Rates
 - Transmission Reliability Assessed Deterministically
 - Generation Reliability Is Traditionally Probabilistic
- **Firm Generation Capacity**
 - Load Carrying Capability At A Target Reliability Level
 - Utilized One-Day In Ten Year Standard



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Firm Generating Capacity

FIRM CAPACITY EXAMPLE SOUTHERN - PORTLAND REGION

	<u>Existing Units</u> <u>Only</u>	<u>Existing units</u> <u>Plus Eight 100</u> <u>MW GTs</u>	<u>Increment</u>
# units	20	28	8
INSTALLED CAP	1,569	2,369	800
SUM CAP	1,492	2,212	720
UCAP	1,355	2,026	671
FIRM CAP	1,284	1,952	668
ratio of Firm to Installed	81.8%	82.4%	83.6%

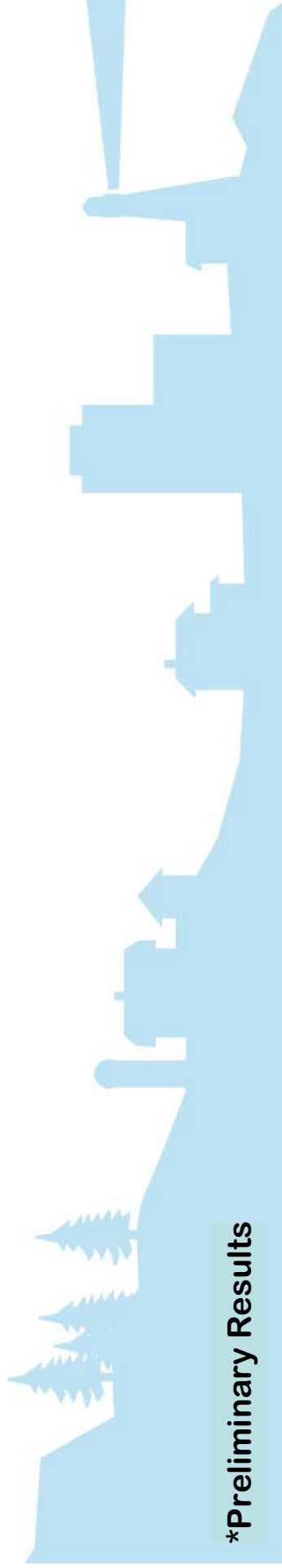
Adding eight 100 MW units increases installed capacity by 800 MW,
but increases firm capacity by 668 MW (83.6%)

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NTA Scenario Design

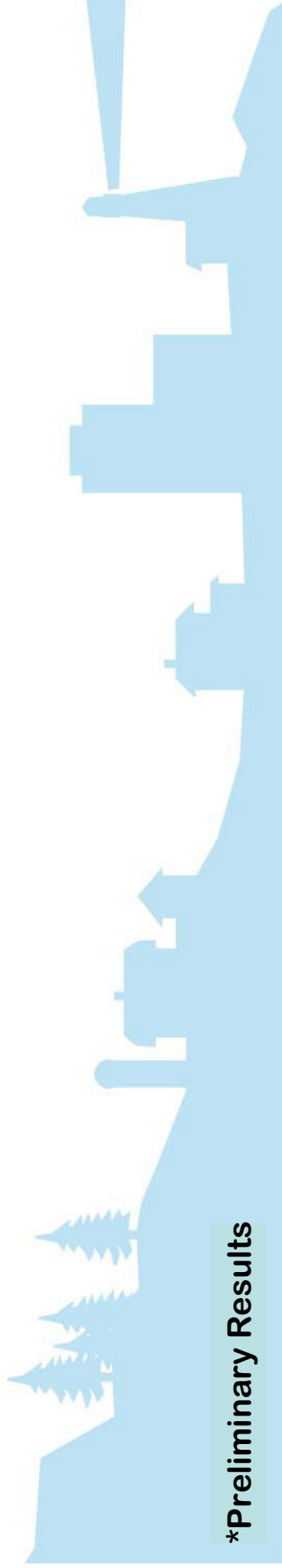
- **Portfolios of NTA Options Tested in Scenarios**
 - Additions Timed to Meet the Year-to-Year Reliability Need
 - Idealized Sizes and Timing
 - Comparable-Scale Long Term Solution to Transmission
- **Tested Separable Components of the Transmission Solution**

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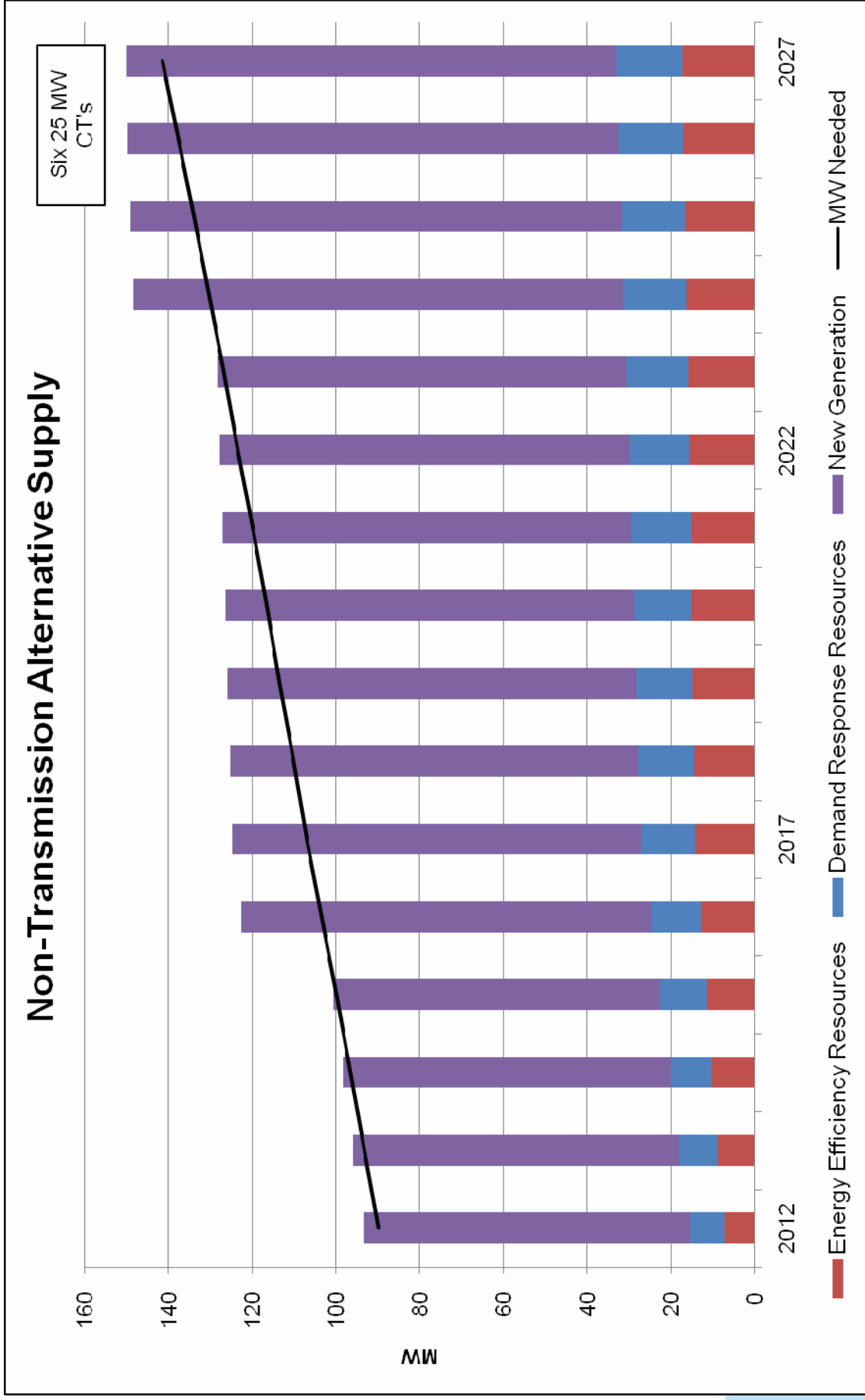
MPRP Components Analyzed

- Southern Backbone – S1
- Northern Backbone – N5
- Combined S1 & N5
- Midcoast
- Winslow-Skowhegan
- Western Maine
- Lewiston Loop
- South Portland Loop



*Preliminary Results

Winslow-Skowhegan Example



***Preliminary Results**

Economic Analysis of Scenarios

- **Analyzed Cost to CMP Customers**
 - Energy, Capacity, and Ancillary Services Costs
 - Renewable Energy Certificate and Emission Allowance Costs
 - Transmission and Distribution Costs
 - MPUC Modified Societal Costs for DSM
 - Generation as Cost of Service to Maine LSE
 - Transmission Costs Assumed Regional PTF Treatment
- **NPV of 2008 to 2027 Costs for Each Case**

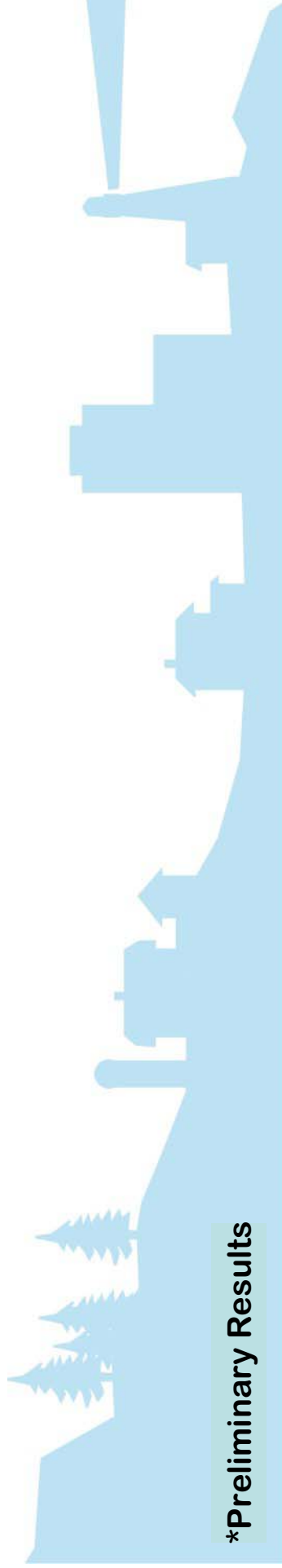
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A light blue silhouette graphic at the bottom of the slide depicts a landscape. On the left, there are several evergreen trees. In the center, a house with a chimney is visible. On the right, a factory with two tall smokestacks is shown. The entire graphic is rendered in a solid light blue color.

NTA Scenarios Analyzed

Alternative Resource Configurations (ARC)

- Base: Transmission Solution
- ARC 1: Max DSM Plus Peaking Generation
- ARC 2: Peaking Generation Only
- ARC 3: Max DSM Plus Combined Cycle/CHP
- ARC 4: Max DSM Plus Biomass & Peaking Generation
- ARC 5: Max Energy Efficiency & Transmission Solution



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SCHEDULED BREAK



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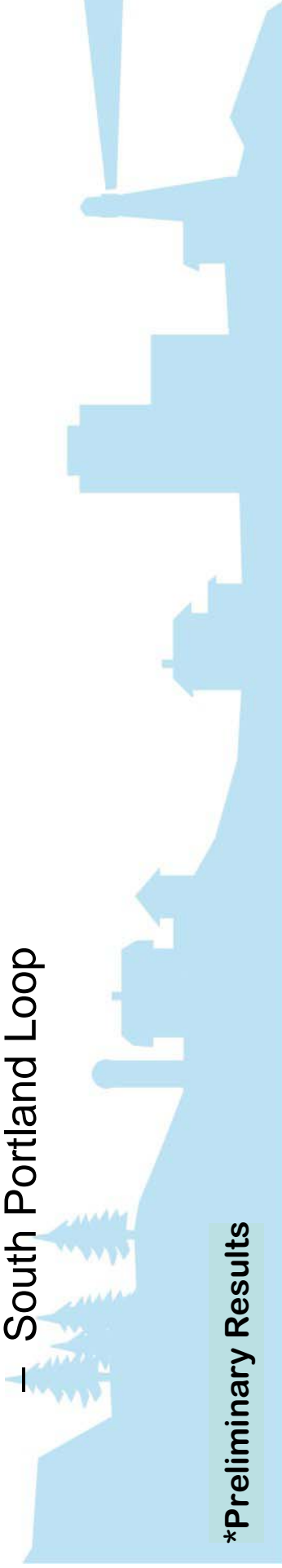
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NTA Assessment by Section



MPPRP Transmission Solution Elements

- **Backbone Components**
 - Northern Section (“N5”) – Pownal to Orrington
 - Southern Section (“S1”) – NH to Pownal
- **Sub-regional Components**
 - Midcoast
 - Winslow-Skowhegan
 - Western Maine
 - Lewiston Loop
 - South Portland Loop



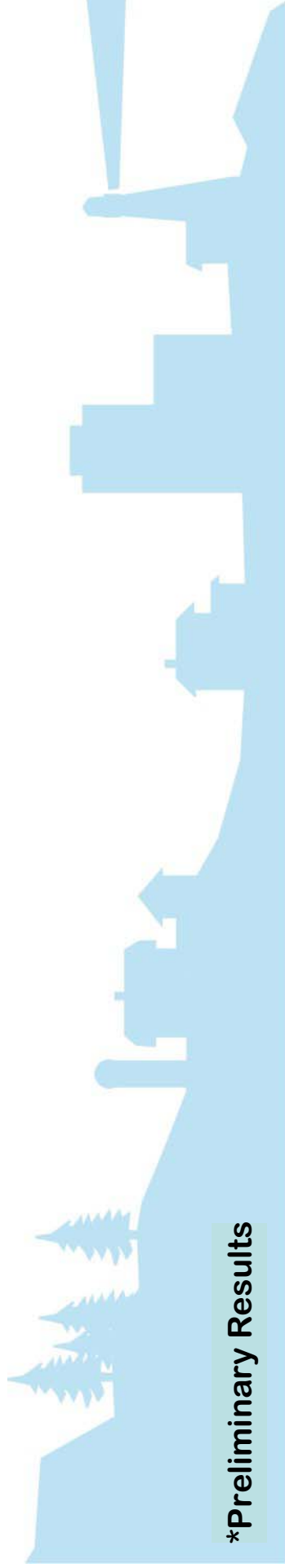
*Preliminary Results

MPPRP Cost Breakdown

Preliminary Cost Estimates

N5 TOTAL	\$1,001
Midcoast	\$63
Winslow-Skowhegan	\$47
Western Maine w/o	
Lewiston Loop	\$85
Lewiston Loop	\$22
Northern 345KV corridor w/o subareas	\$785

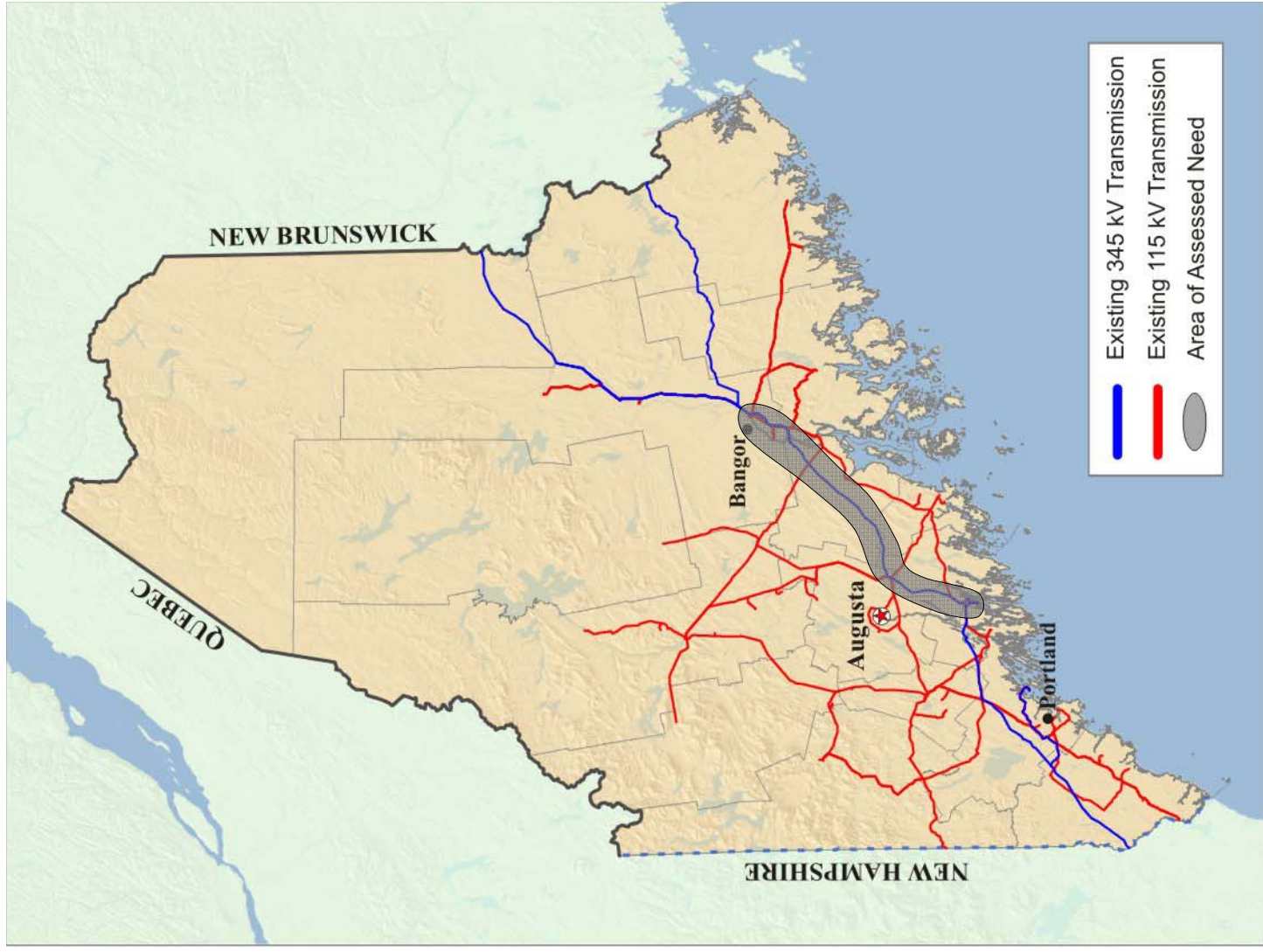
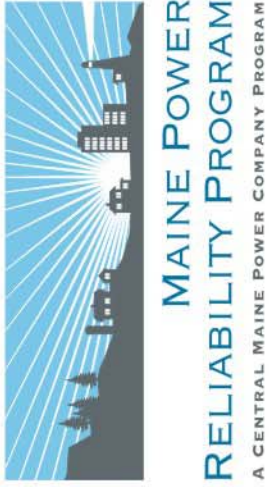
TOTAL S1 ELM	\$353
South Portland Loop	\$30
SoMaine w/o	
SoPoLoop	\$323



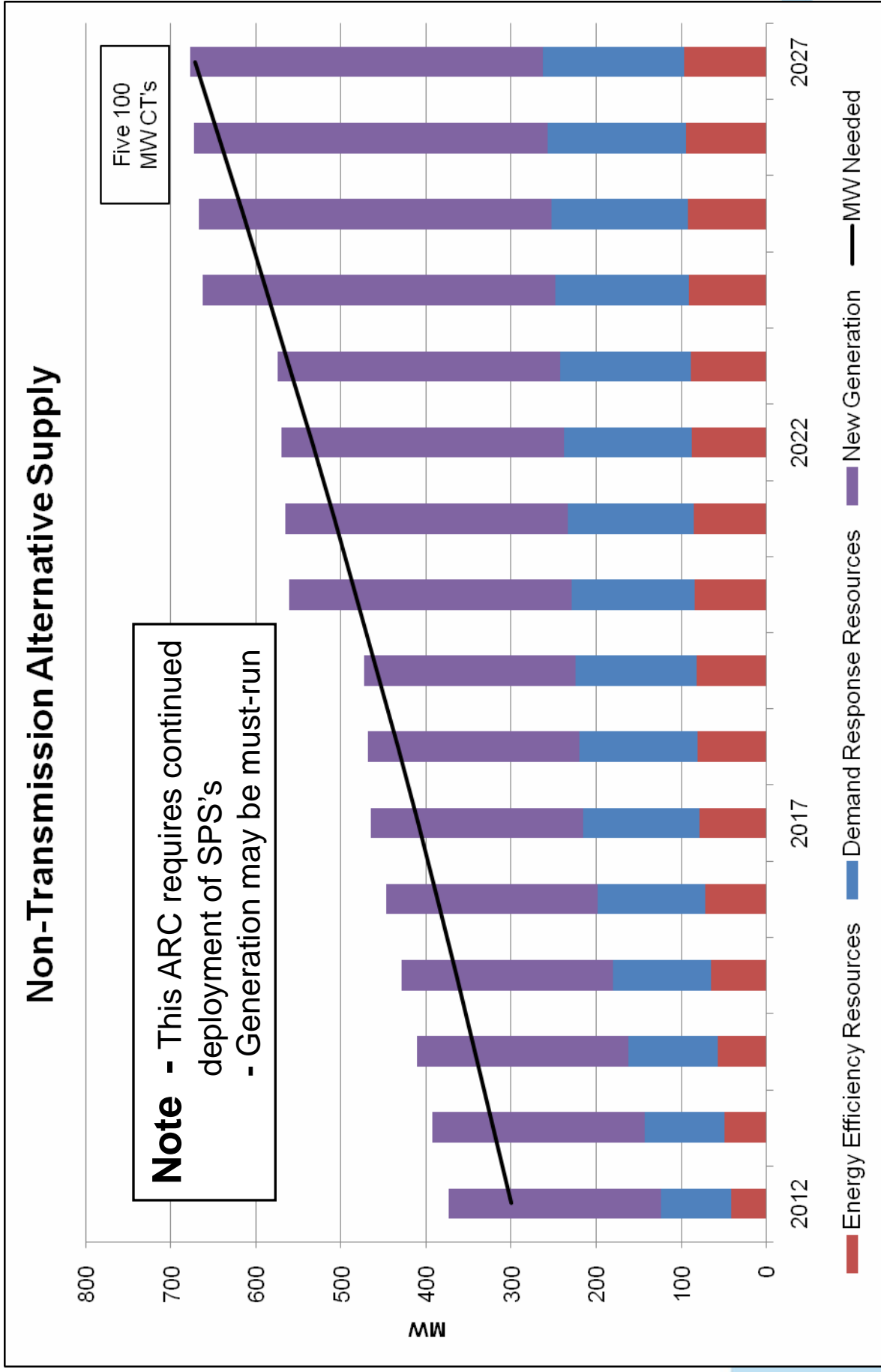
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Northern 345 kV

- **New 345KV Lines**
 - Orrington to Detroit to New Albion / Benton to Maxcys to Surowiec
- **New 115KV Lines**
 - Orrington to Maxcys
- **New autotransformers part of local solutions**
- **Other elements**



ARC-1: Northern 345KV



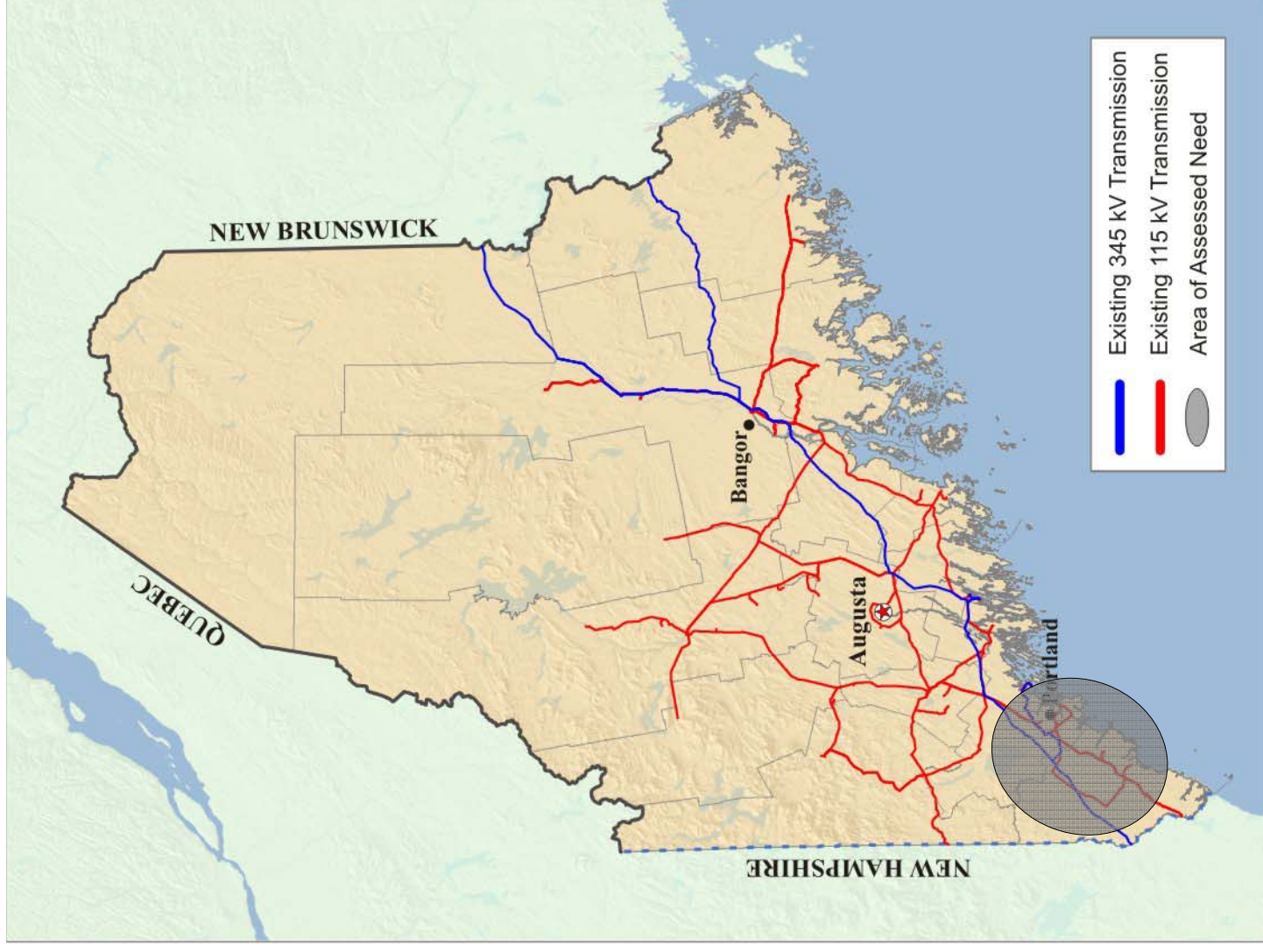
***Preliminary Results**

Southern Backbone

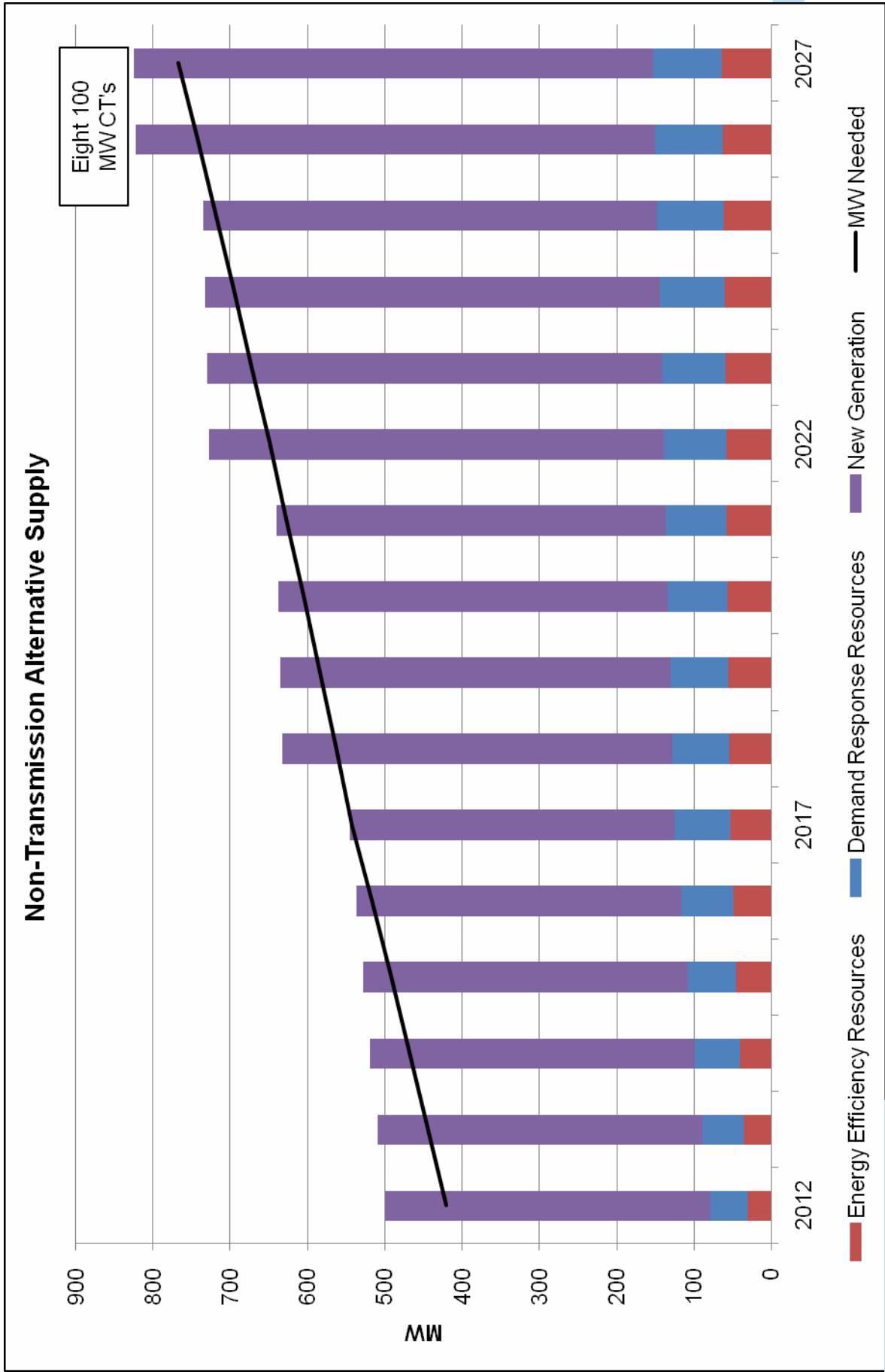
- **New 345 KV Lines**
 - Surowiec SS (Pownal) to Elm St (Yarmouth)
 - Newington NH to Three Rivers to Maguire Rd to South Gorham
- **New Autotransformers**
 - Elm
 - South Gorham
 - Maguire Rd



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ARC-1: Southern-Portland



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NET BENEFITS (COSTS) TO MAINE LOAD

Summary of Net Benefits to Maine Load

Modified Societal Cost Test assuming Full PTF for Transmission Option
 (\$Millions - 2008 NPV)

Backbone Transmission Configuration	Change in NPV
Transmission Solutions N5 & S1	reference
Transmission Solutions with Energy Efficiency	240
Transmission S1 with ARC-1 North (1,2)	79
Transmission N5 with ARC-1 South (1)	(135)
ARC-1 North and South (1)	(32)

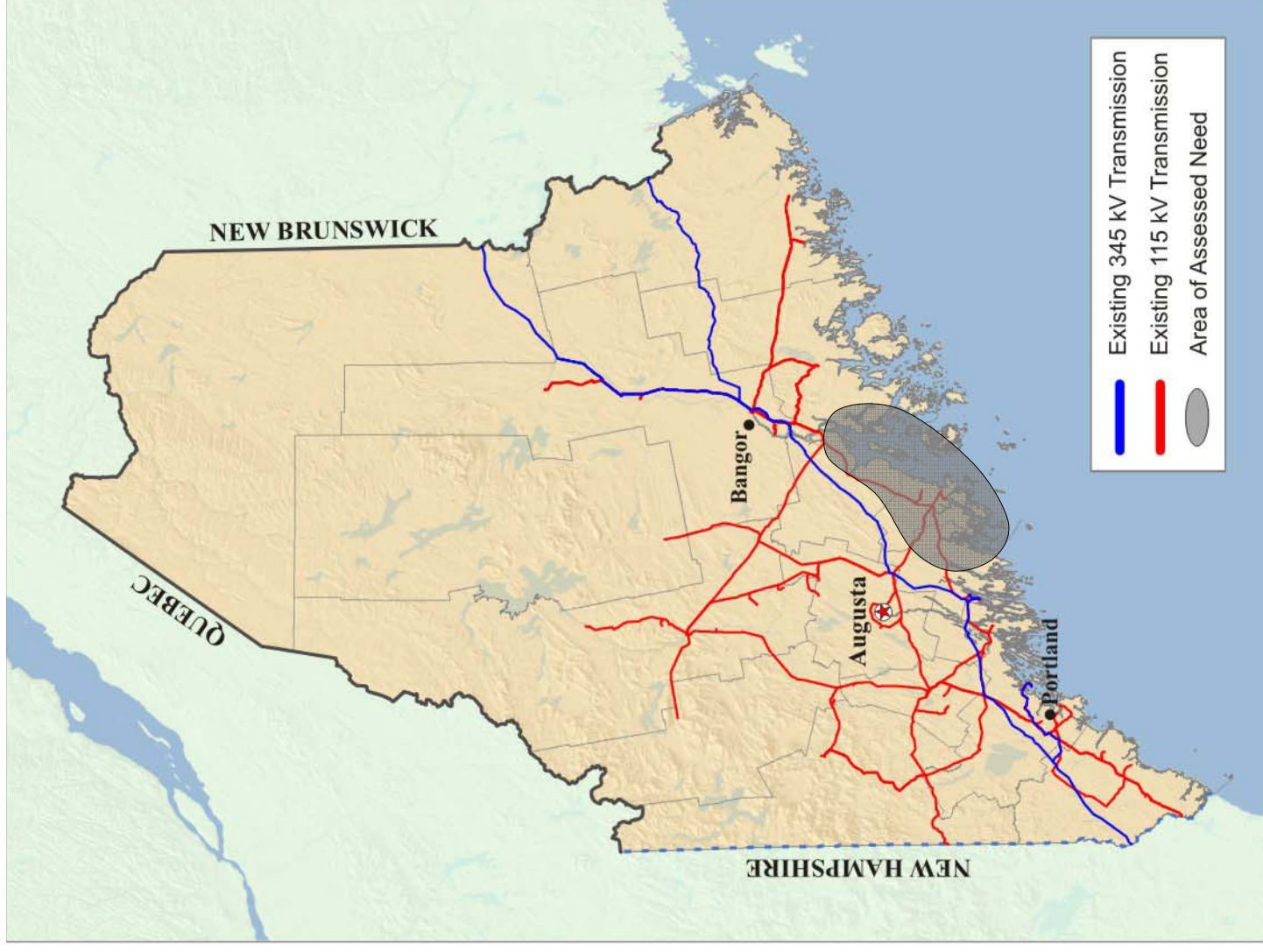
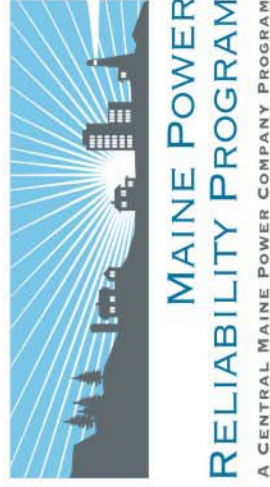
Notes:

- ARC 1 includes maximum DSM (EE and DR) and Peaking Generation
- ARC-1 in the Northern Section requires SPS and must-run generation (not estimated)

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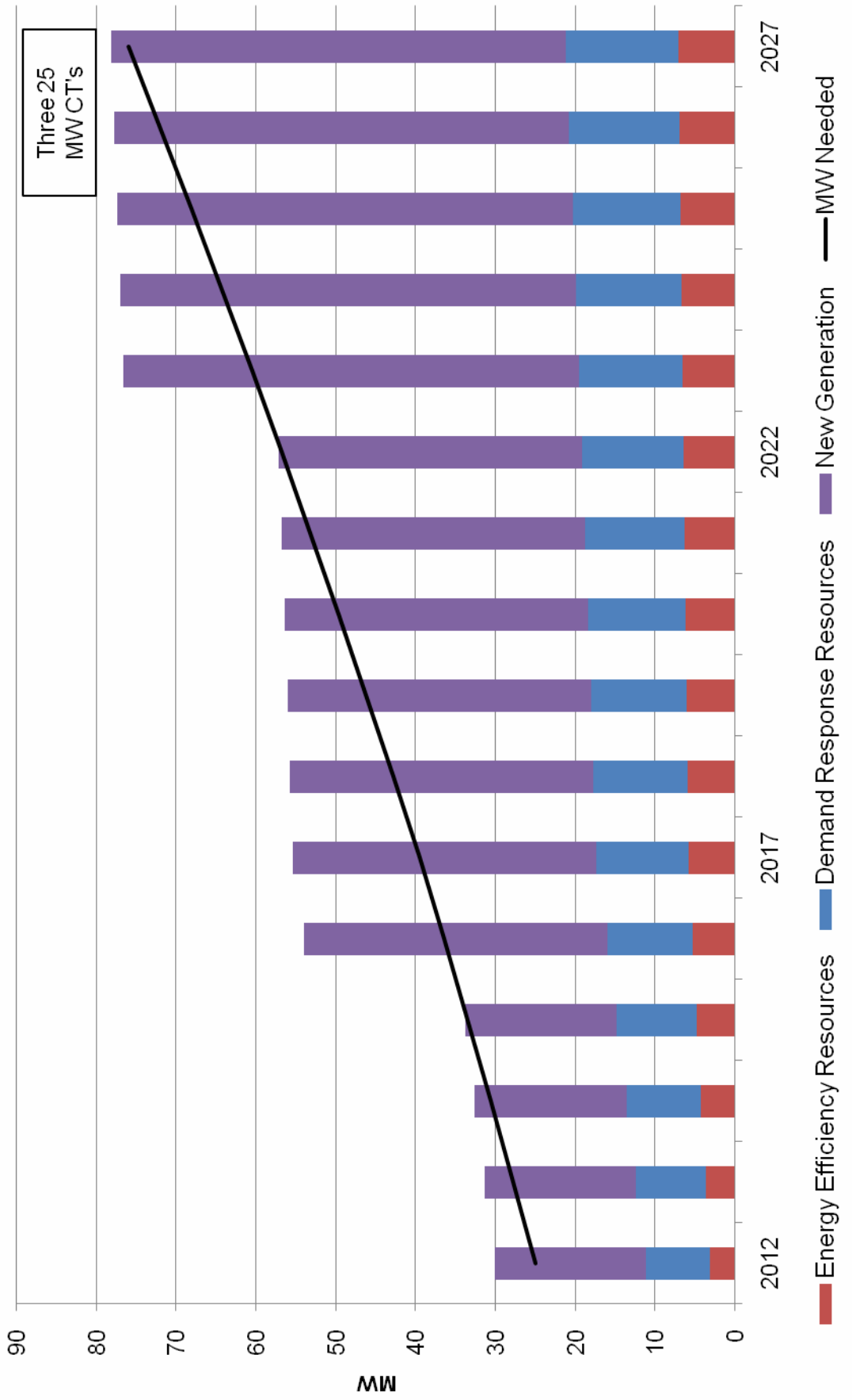
Midcoast Region

- **New 115KV line**
 - Maxcys SS to Highland
- **New capacitor bank at Belfast**



ARC-1: Midcoast

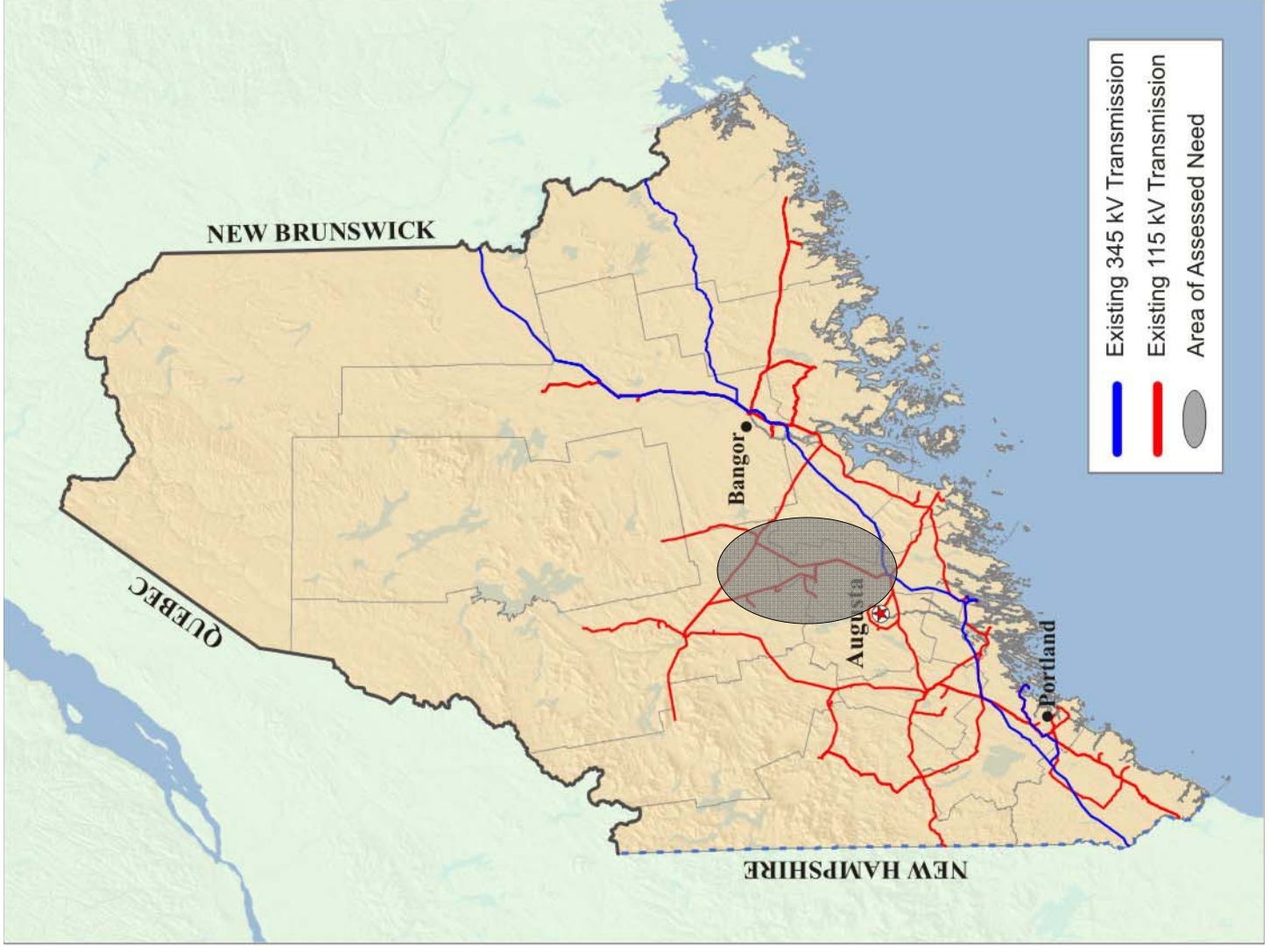
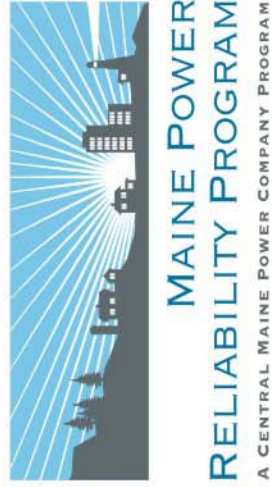
Non-Transmission Alternative Supply



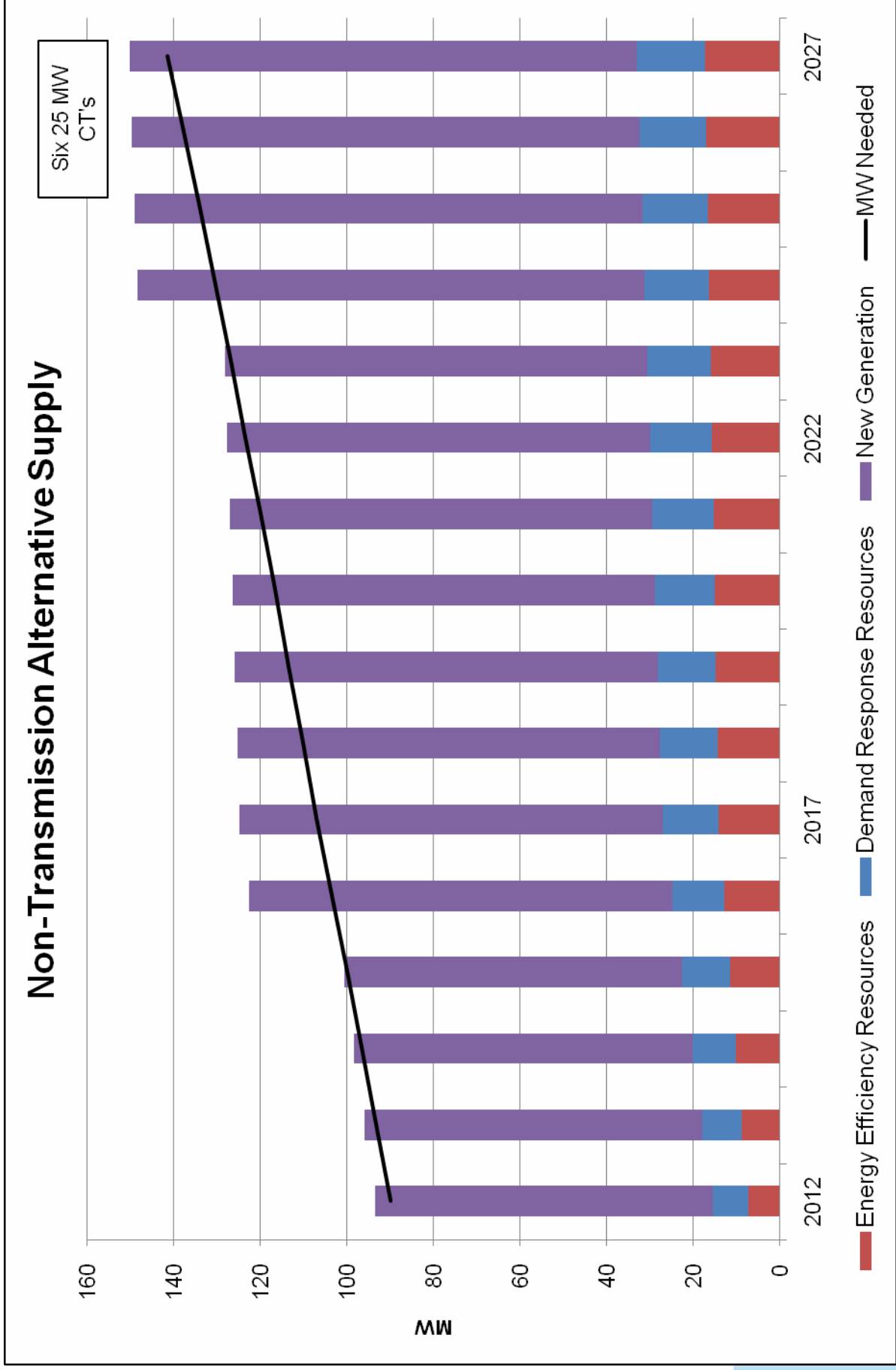
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Winslow – Showhegan

- **New 115KV Line**
 - Benton To Winslow
- **New Autotransformer**
 - New Albion / Benton
- **New Capacitor Banks**
 - Winslow
 - Heywood Rd



ARC-1: Winslow-Skowhegan



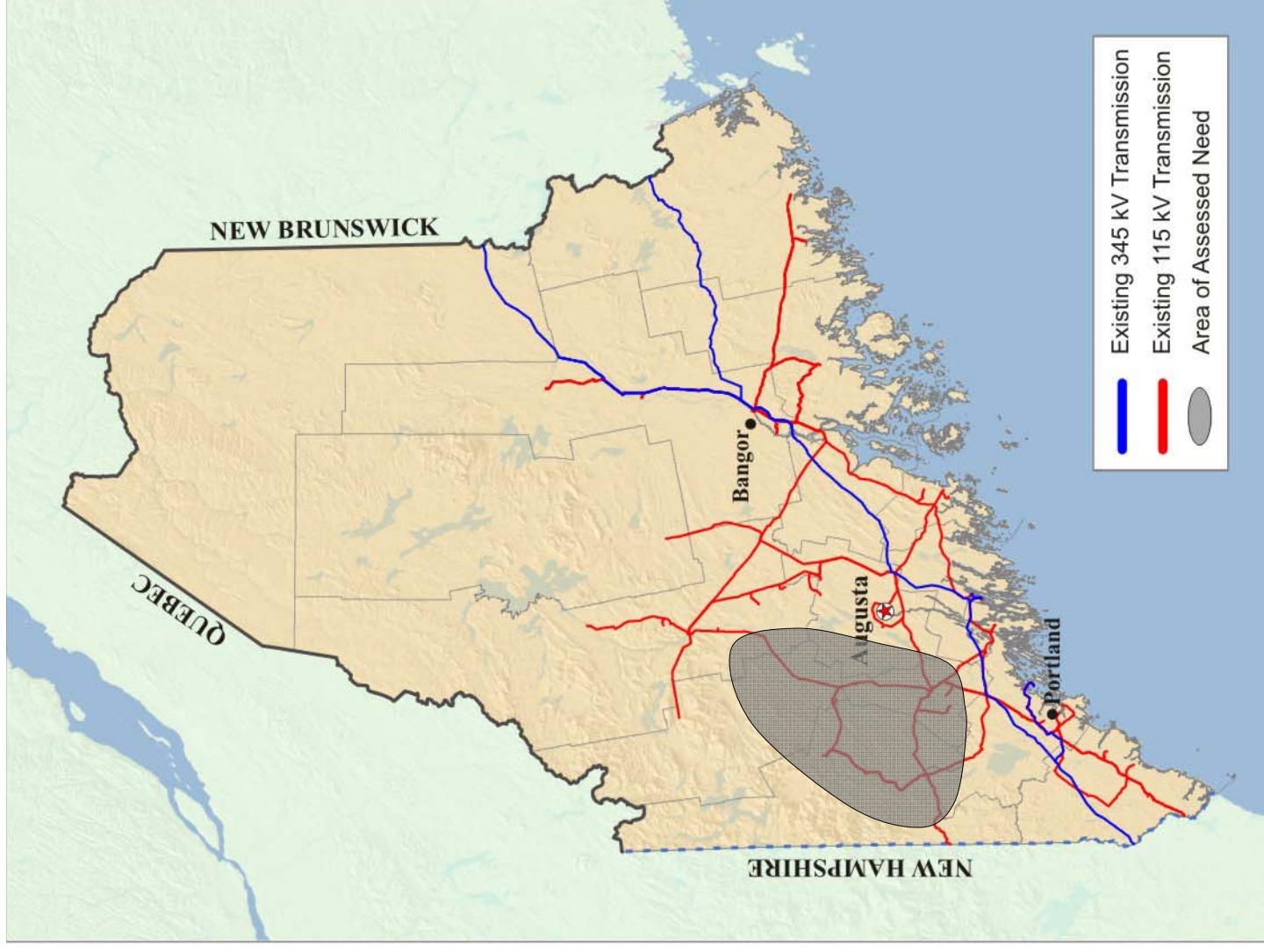
*Preliminary Results

Western Region

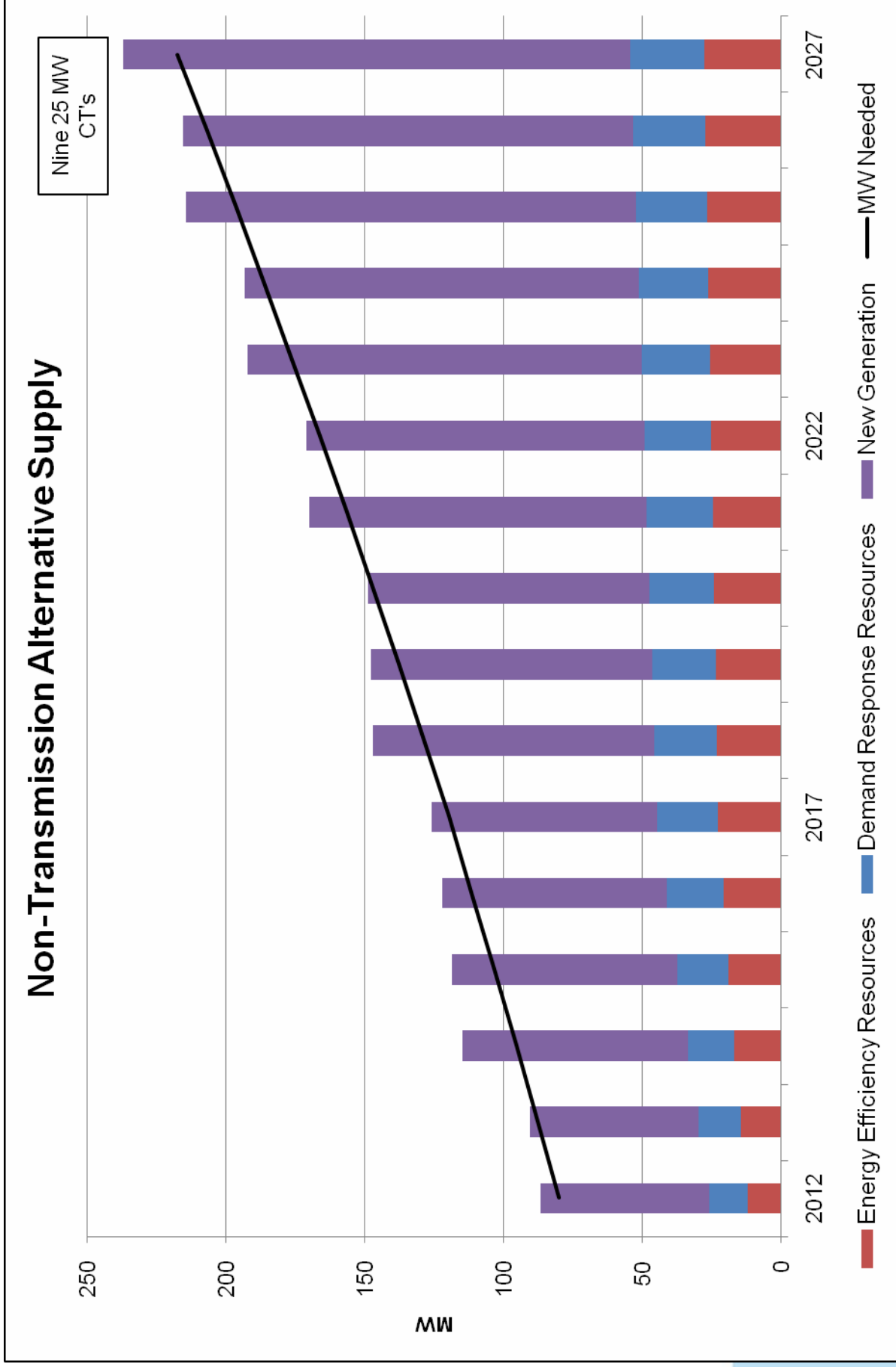
- **New 115KV Lines**
 - Gulf Island To Livermore Falls To Riley
- **New Autotransformer At Gulf Island**
- **New Capacitor Banks At Riley**



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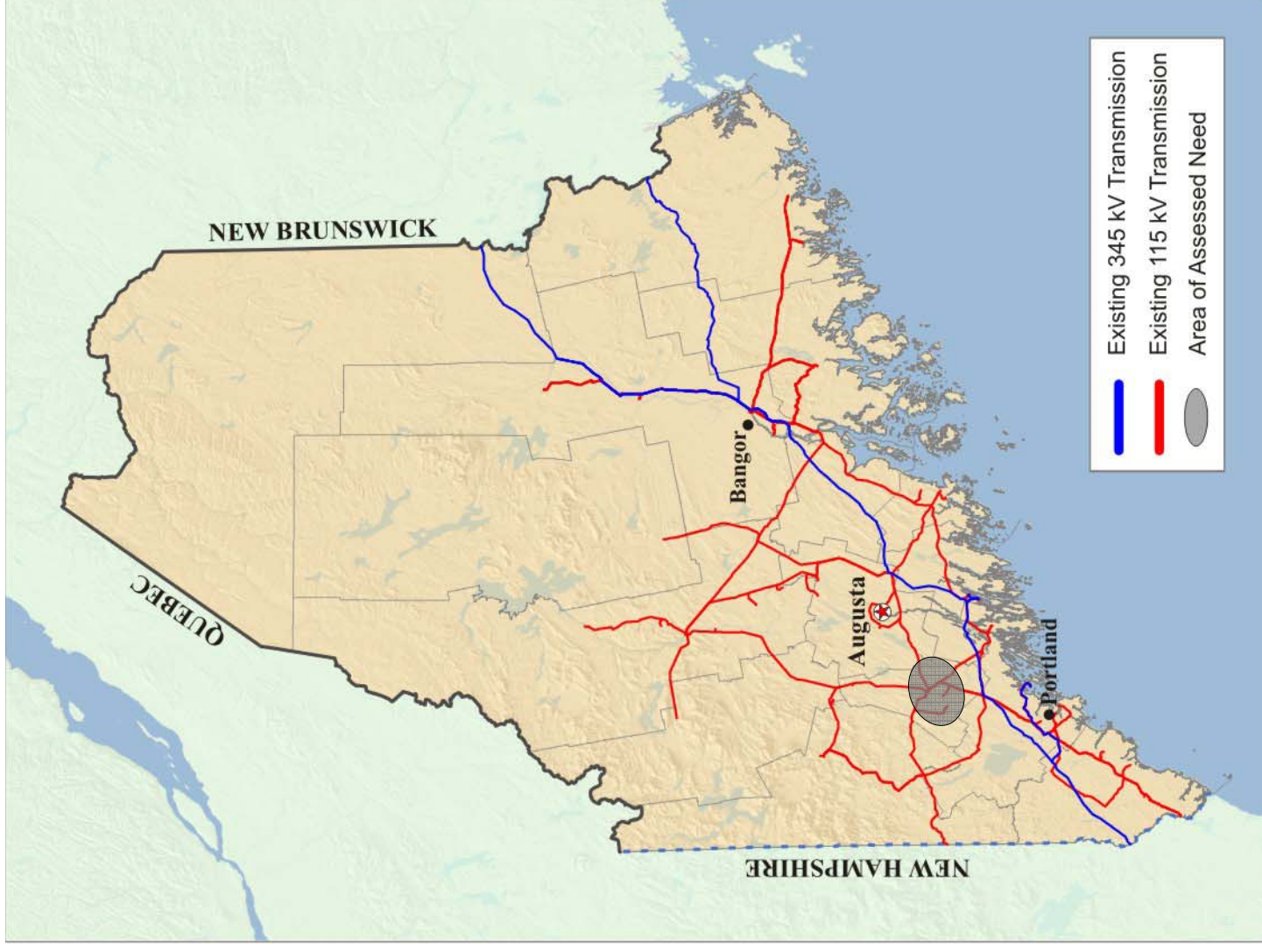
ARC-1: Western Maine



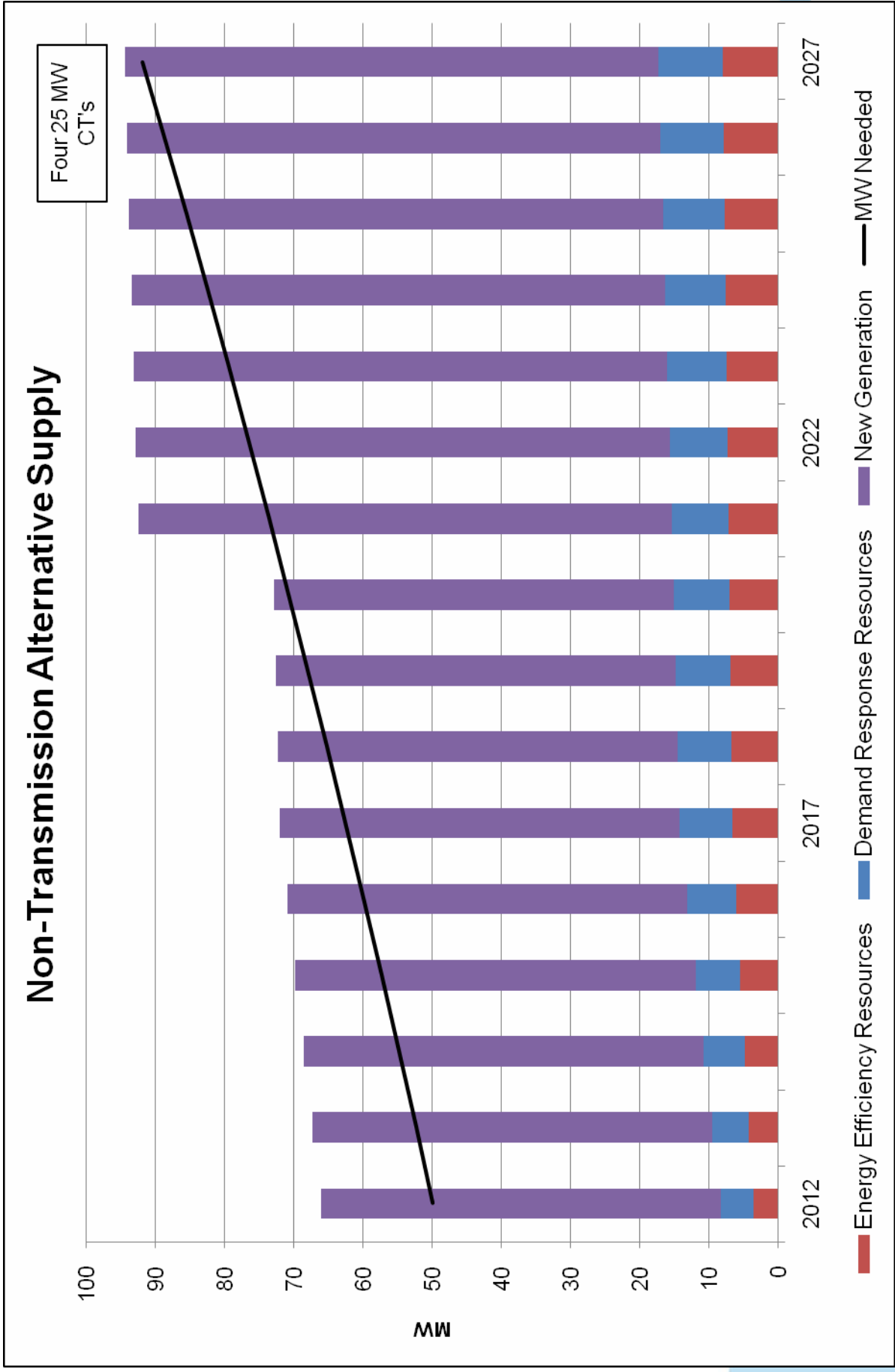
*Preliminary Results

Lewiston Loop

- Sub-region of Western Maine
- New 115 KV line from Gulf Island to Lewiston Lower
- Sub-Transmission Projects Also in This Area



ARC-1: Lewiston Loop



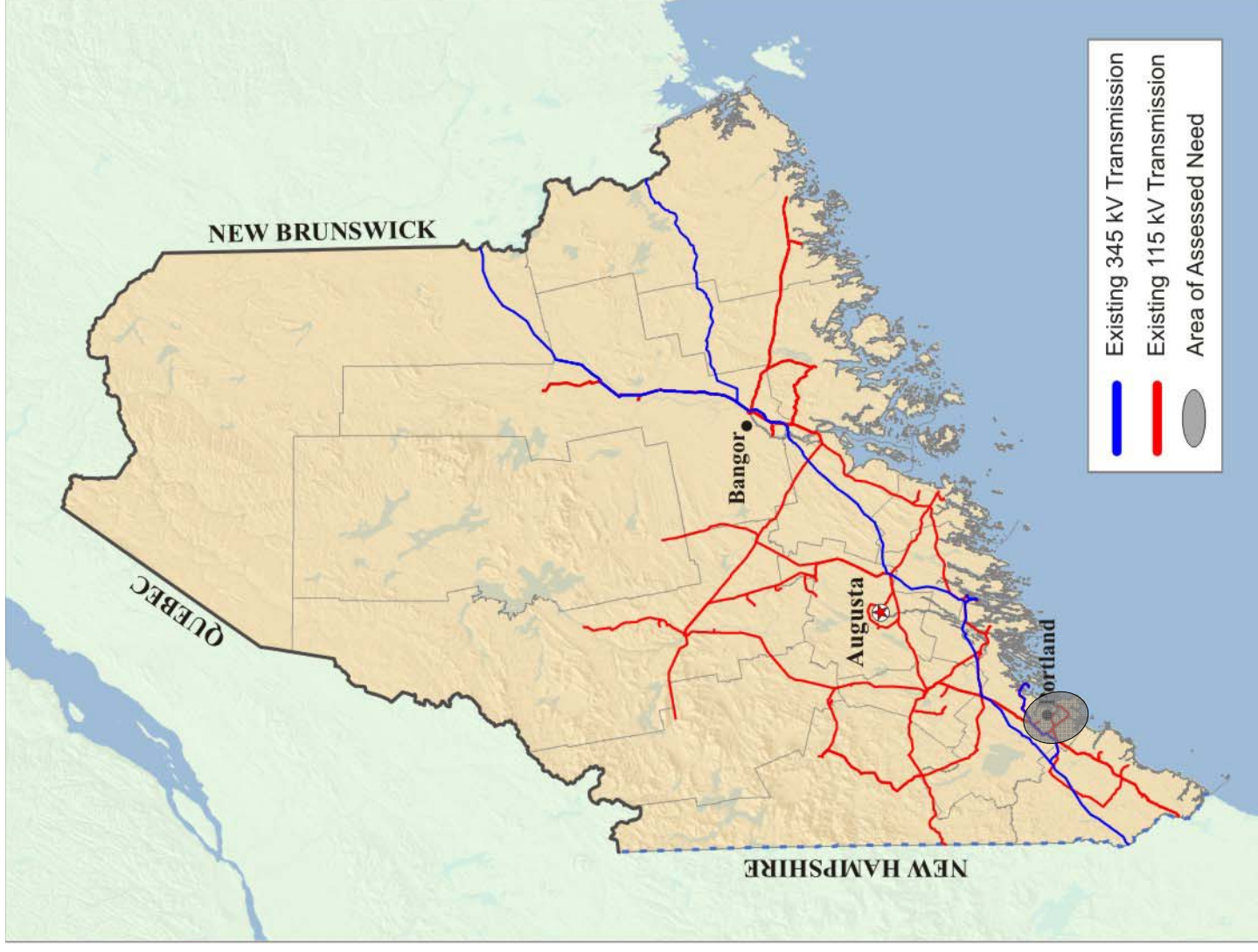
*Preliminary Results

South Portland Loop

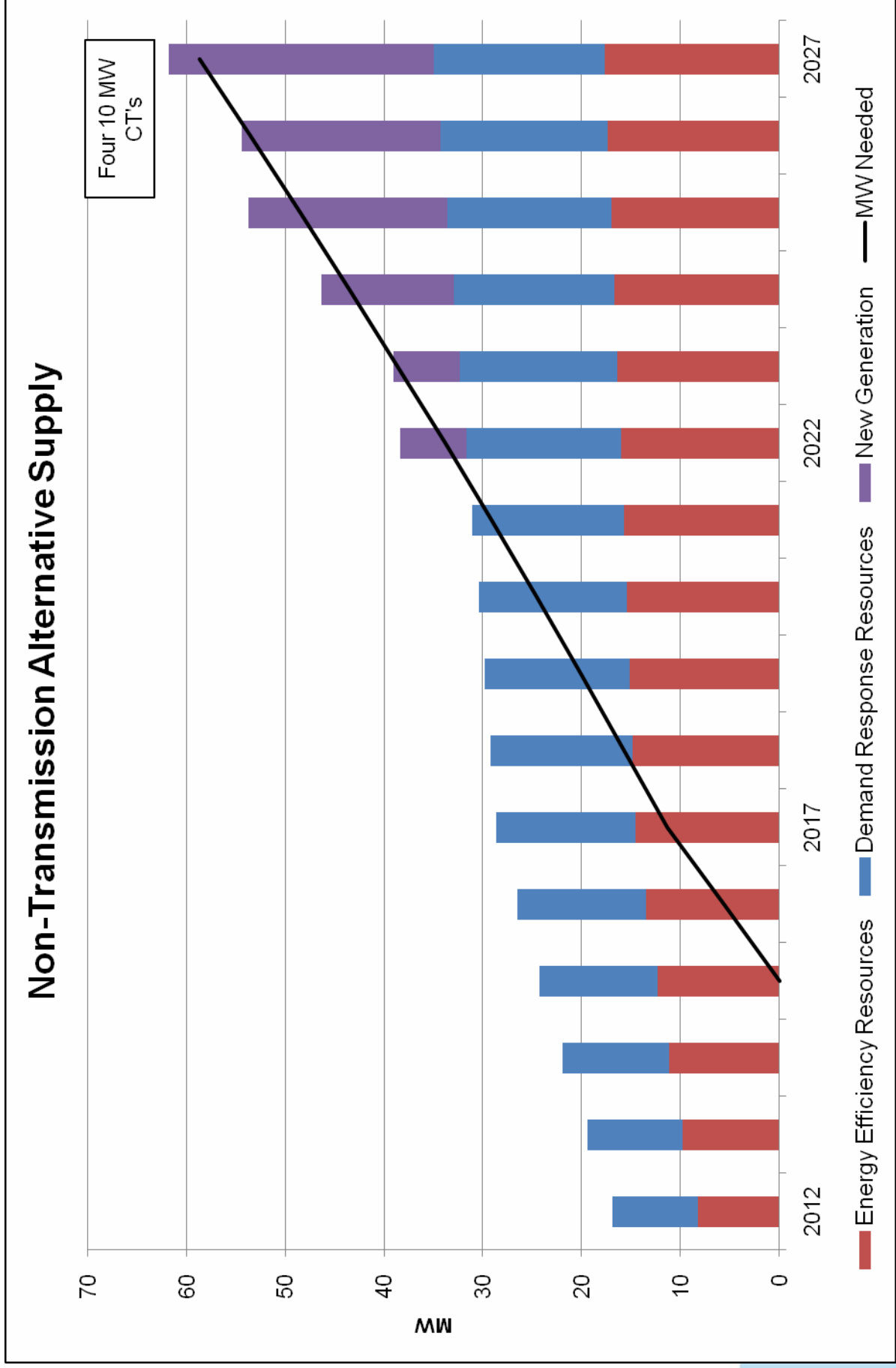
- **New 115KV Line**
 - Elm Street to Cape
- **Sub-Transmission Study**
 - may show add requirements



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ARC-1: South Portland Loop



*Preliminary Results

NET BENEFITS (COSTS) TO MAINE LOAD

NTA ARCs Comparison Non-Backbone Transmission Options

Modified Societal Cost Test assuming Full PTF for Transmission Option
(\$Millions - 2008 NPV)

	Transmission	ARC1	ARC2	ARC3	ARC 4
Western Maine	reference	(61)	(144)	(155)	(39)
Winslow-Skowhegan	reference	(86)	(132)	(196)	(74)
Lewiston Loop	reference	(77)	(97)	(138)	N/A
South Portland Loop	reference	22	(47)	32	N/A
MidCoast	reference	(30)	(70)	(76)	(9)

Note: Positive values indicate the ARC is lower cost; Negative () values indicate that the Transmission is lower cost.



*Preliminary Results

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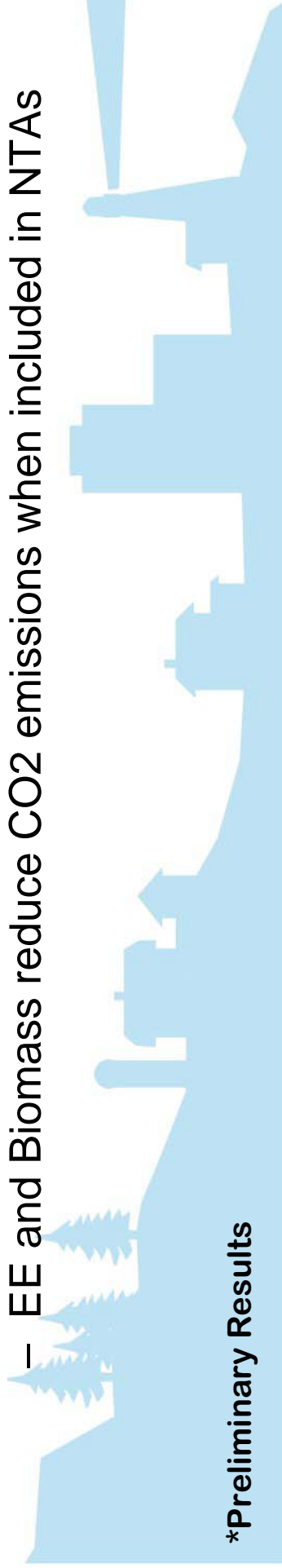
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Market Issues, Emissions, and Other Benefits



Additional Areas Of Analysis

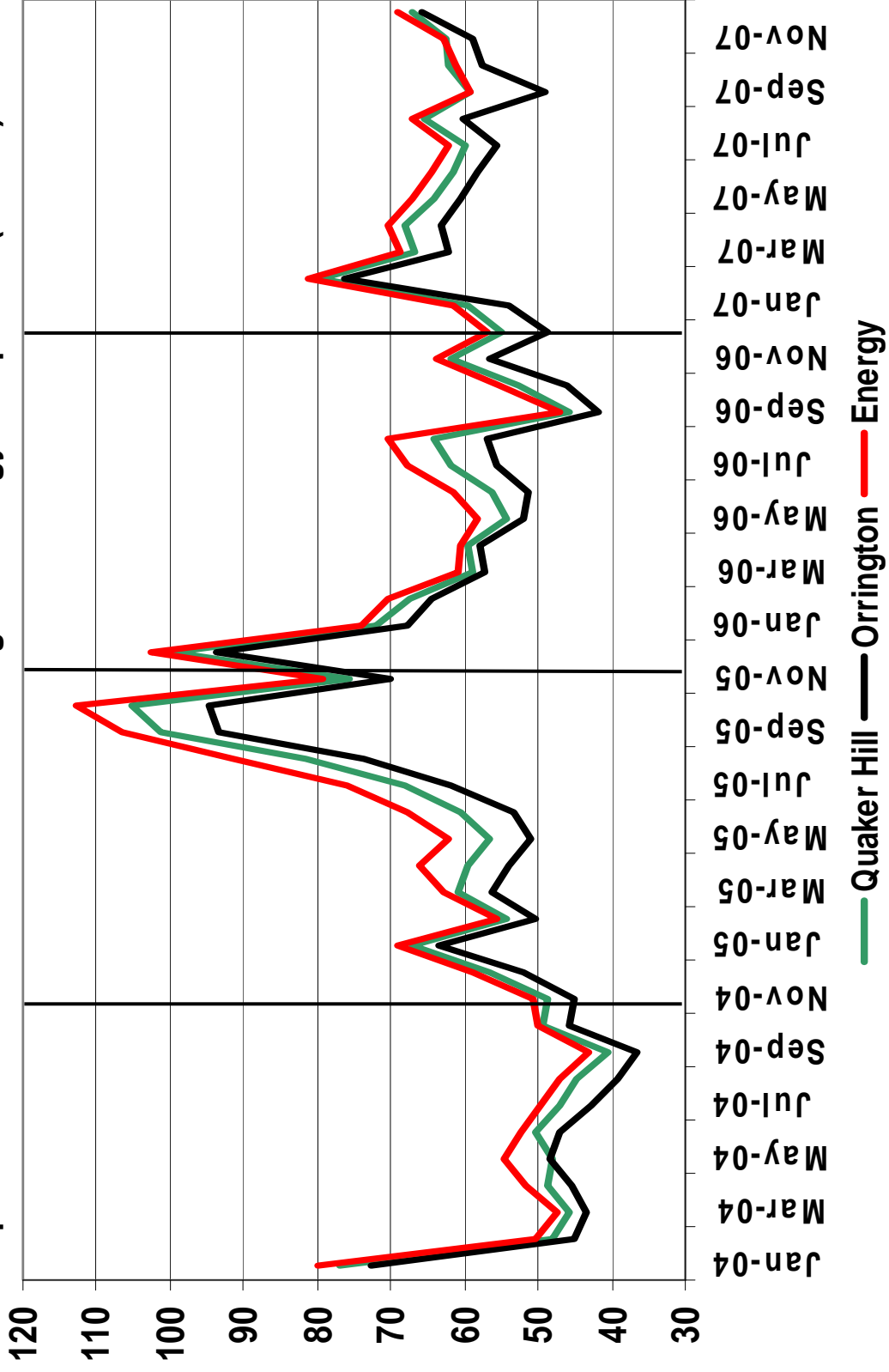
- **MPRP Transfer Capability Increases – Effects on LMPs**
 - MPRP Has Limited Affect on Locational Marginal Prices
- **Impact on Maine Generators**
 - Net Revenues to Maine Generators Similar for All Cases Studied
- **Regional Benefits**
 - Market Price Benefits Across the Region in excess of \$1B
- **Emissions**
 - EE and Biomass reduce CO2 emissions when included in NTAs



*Preliminary Results

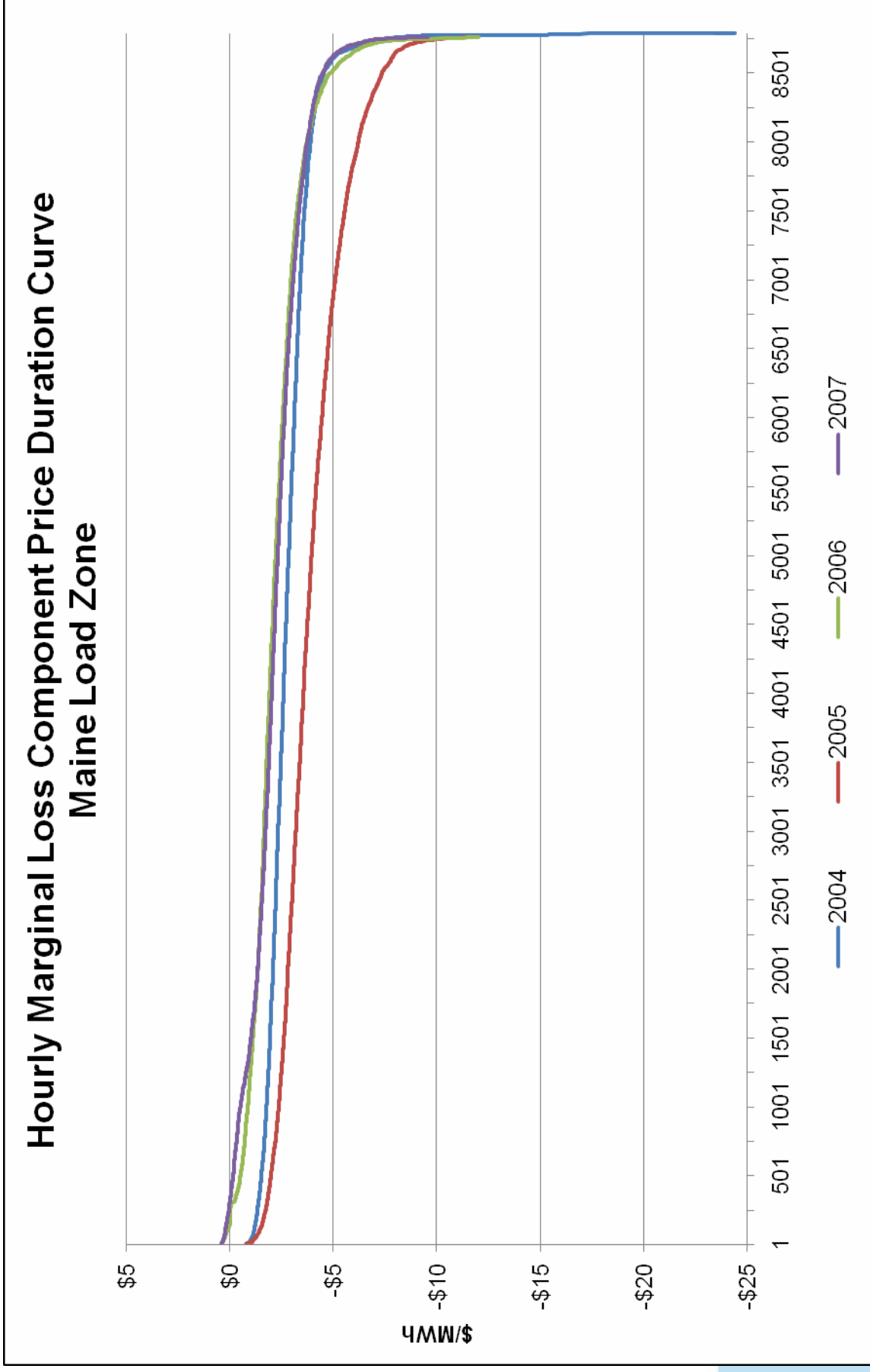
Day Ahead All-Hours Average LMPs

Representative Maine Nodes vs New England Energy Component (\$/MWh)



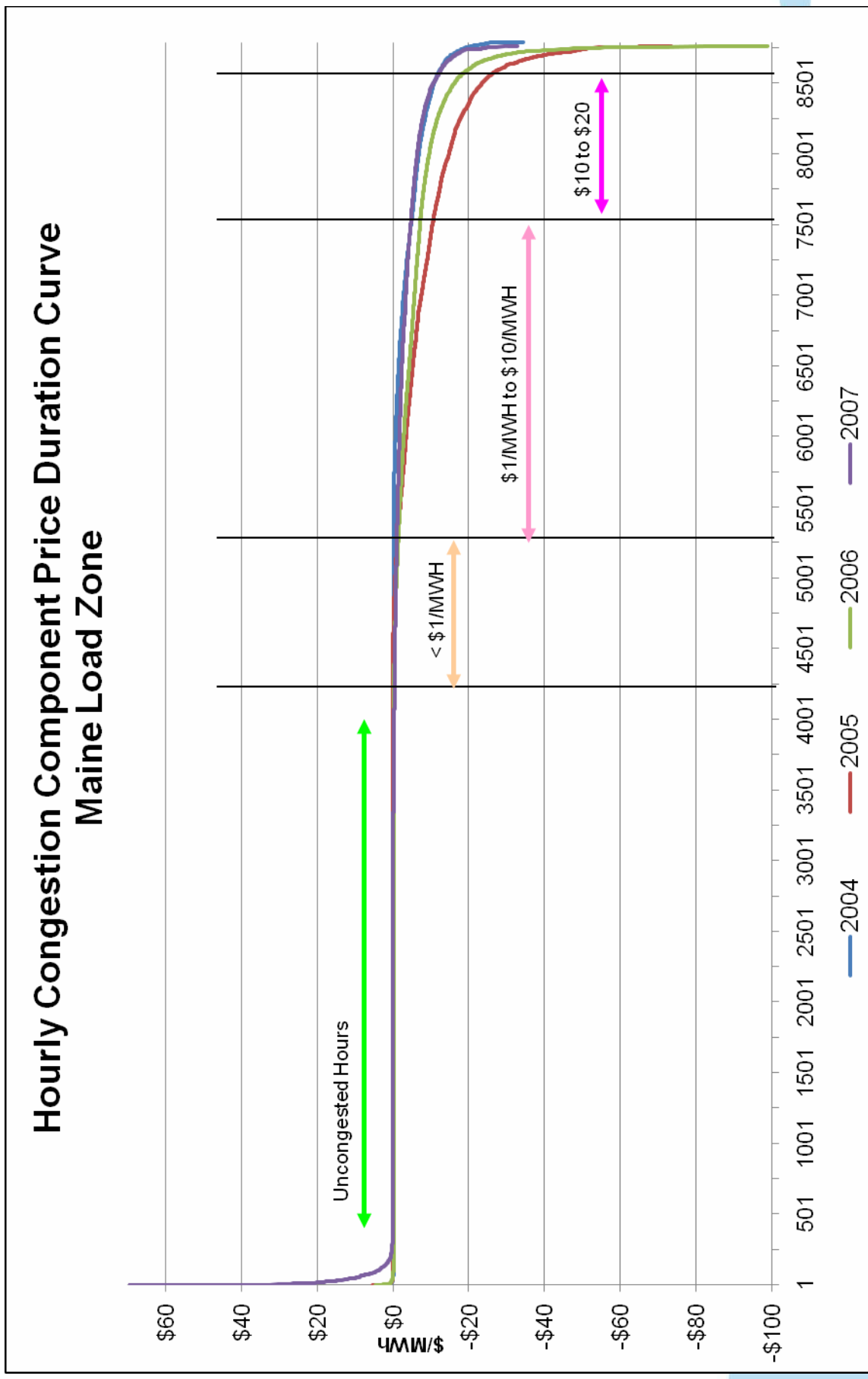
*Preliminary Results

Loss Components Of LMP - Maine



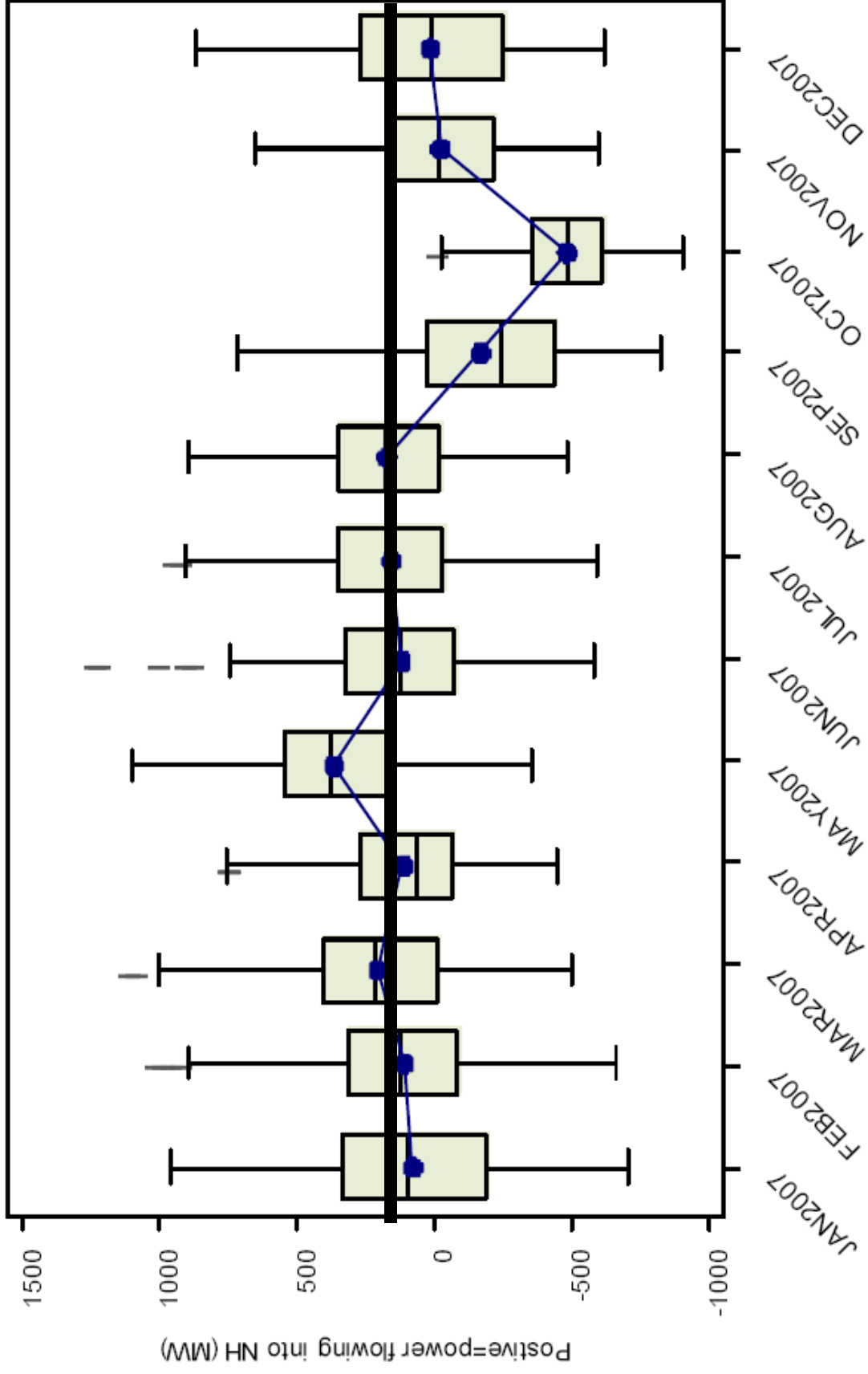
*Preliminary Results

Congestion Components Of LMP - Maine



*Preliminary Results

Maine-New Hampshire Interface Net Flows by Month

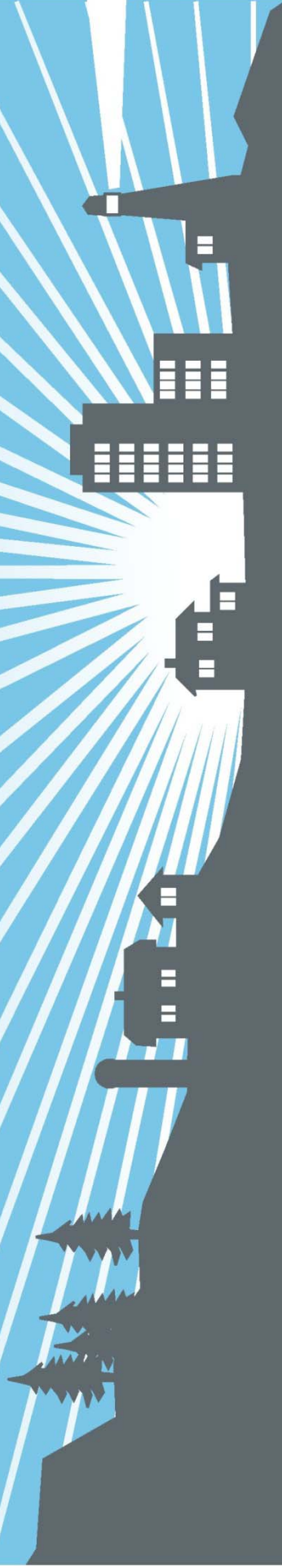


*Preliminary Results

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Recap and Discussion

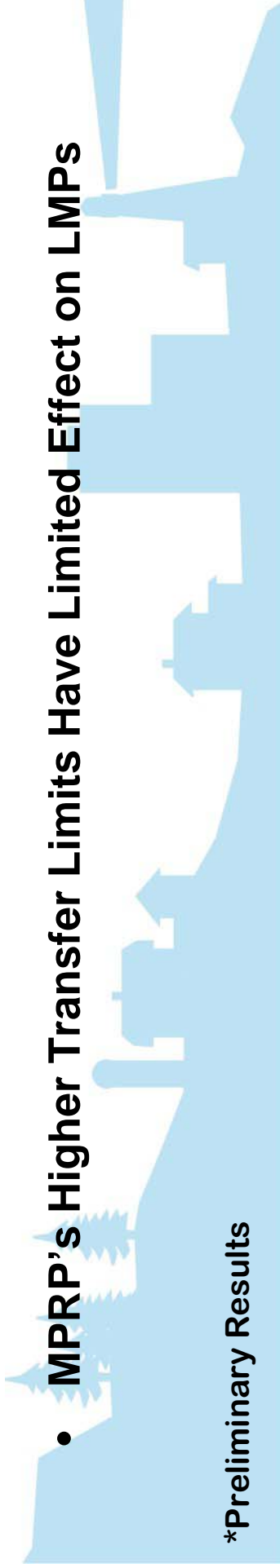


Recap of Findings

- **EE/DR Less Than Needed To Defer Or Replace Transmission**
 - South Portland Loop May be Exception
 - Energy Efficiency is beneficial in all T and NTA Solutions
- **Generation Can Provide Alternatives, But Not Cost-Effective**
 - Small, location-targeted units would be needed
 - Amounts needed would exceed Forward Capacity Market levels

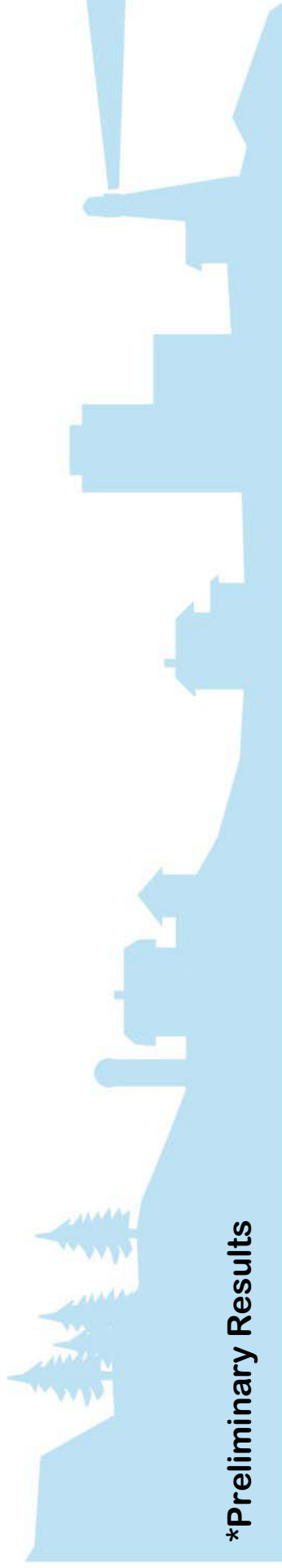
- **MPRP's Higher Transfer Limits Have Limited Effect on LMPs**

*Preliminary Results



Next Steps in the Study

- Wrapping up Analysis Phase of the Study
- Study Report being Prepared for MPRP Filing at MPUC



*Preliminary Results

Discussion and Comments

QUESTIONS?

Ways to Provide Comments, General Information and FAQ

www.mainepower.com

For Questions, Comments and Suggestions

info@mainepower.com

