CENTRAL MAINE POWER

CMP & NTAs

MPRP & Post-MPRP Follow-Up

Vermont System Planning Committee
NTA Workshop October 11, 2013

Dave Conroy

IBERDROLA USA

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Presentation Overview

- Planning for MPRP: Needs Assessment, Transmission Alternatives Analysis and Non-Transmission Alternatives Analysis and stakeholder process through 2008, slides 3-35
- MPRP Stipulation Requirements, June 2010 – slide 36
- MPRP Follow-Up Analyses : Mid-Coast Spur and Portland Loop NTA Analysis, 2011 – present – slides 37-42
- Boothbay Hybrid Transmission and NTA/Smart Grid Pilot - Jason

Planning for MPRP

The following section is taken from the MPRP NTA Forum held in April 2008 to discuss ongoing NTA analyses with stakeholders before CMP's Petition for a certificate of Public Convenience and Necessity in July 2008

Maine Power Reliability Program

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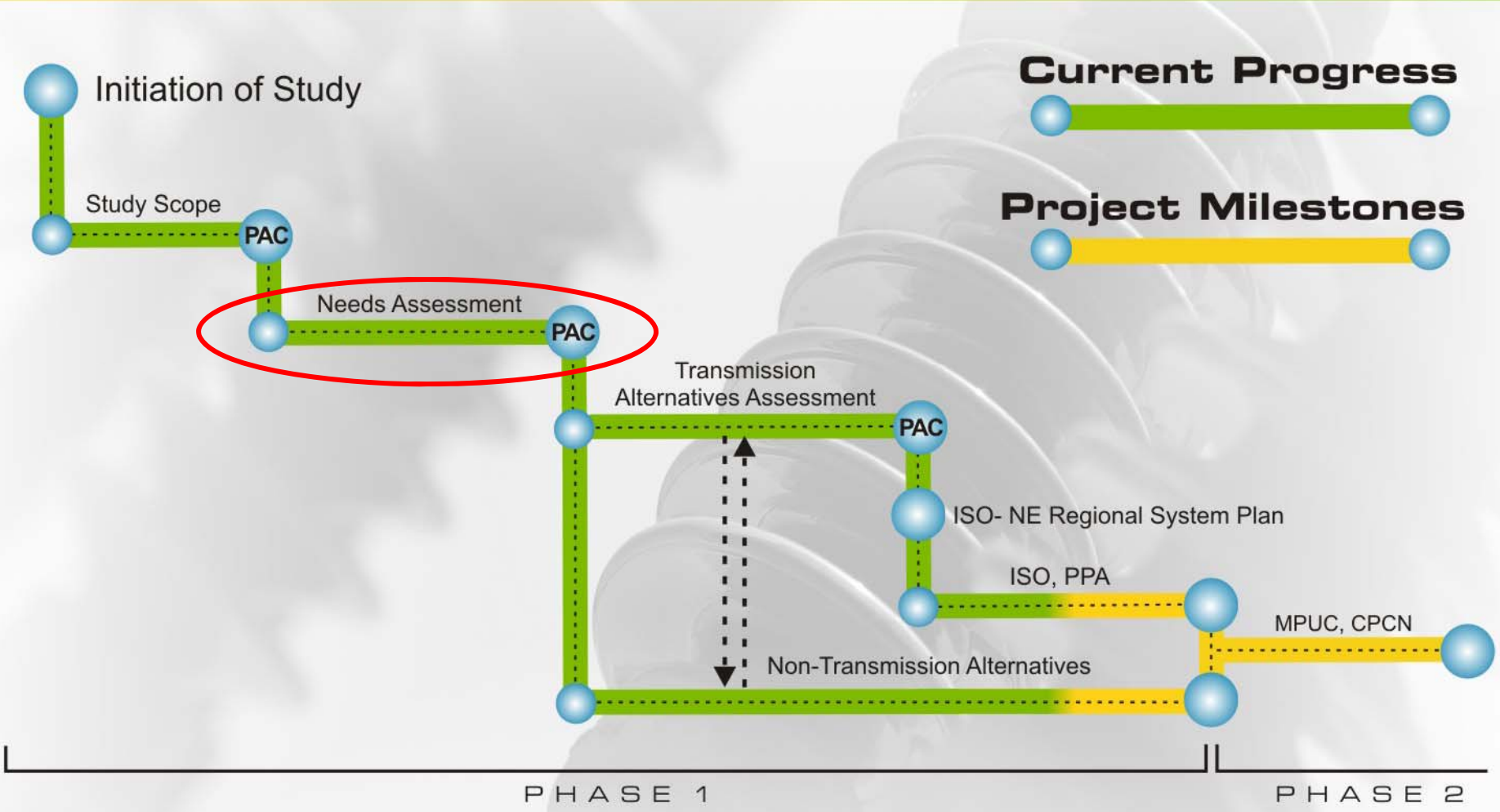
Non-Transmission Alternatives Forum

April 7th, 2008

MPRP - System Planning Study



MAINE POWER
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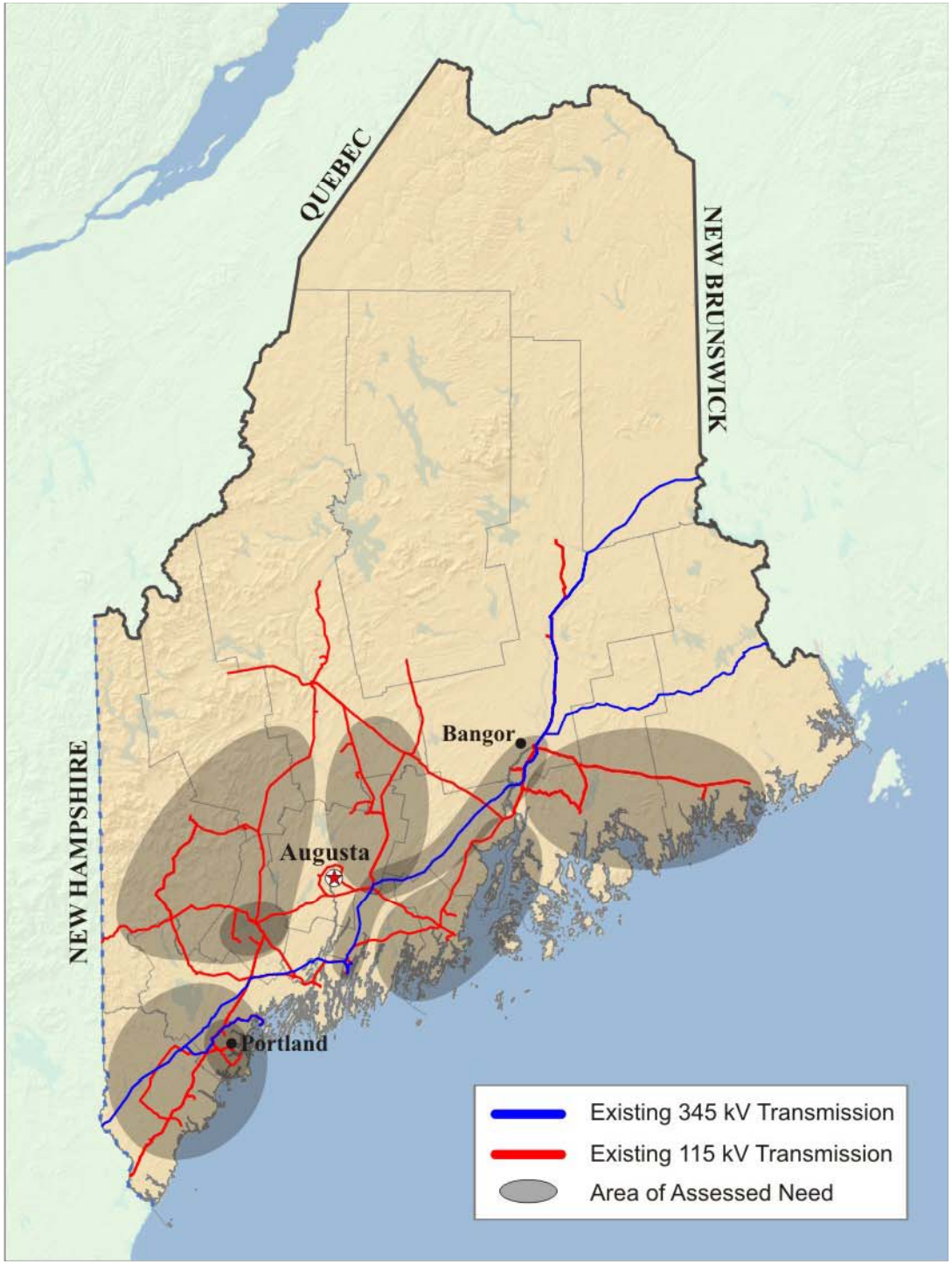
Needs Assessment

- 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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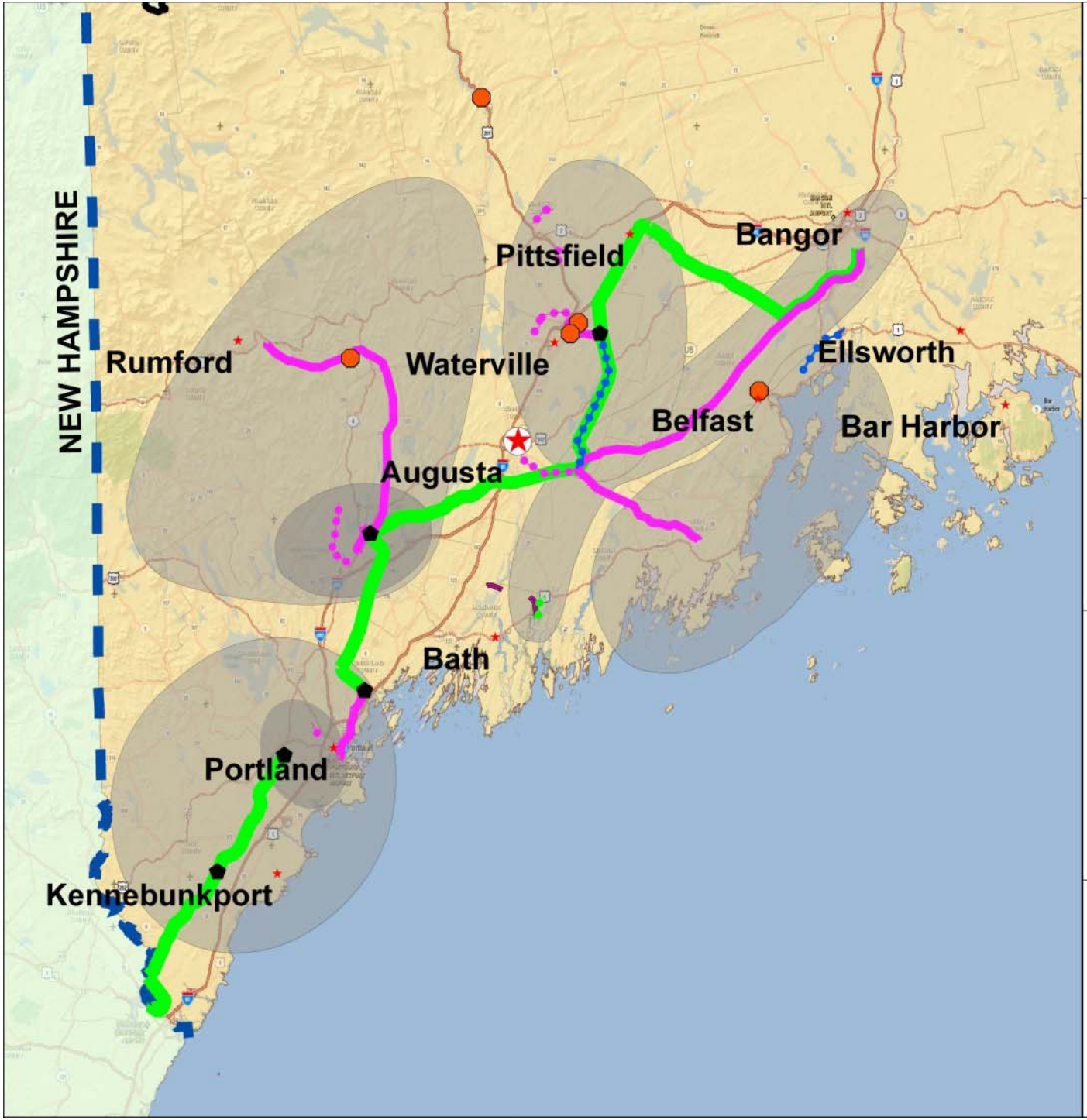

Proposed Solution

- 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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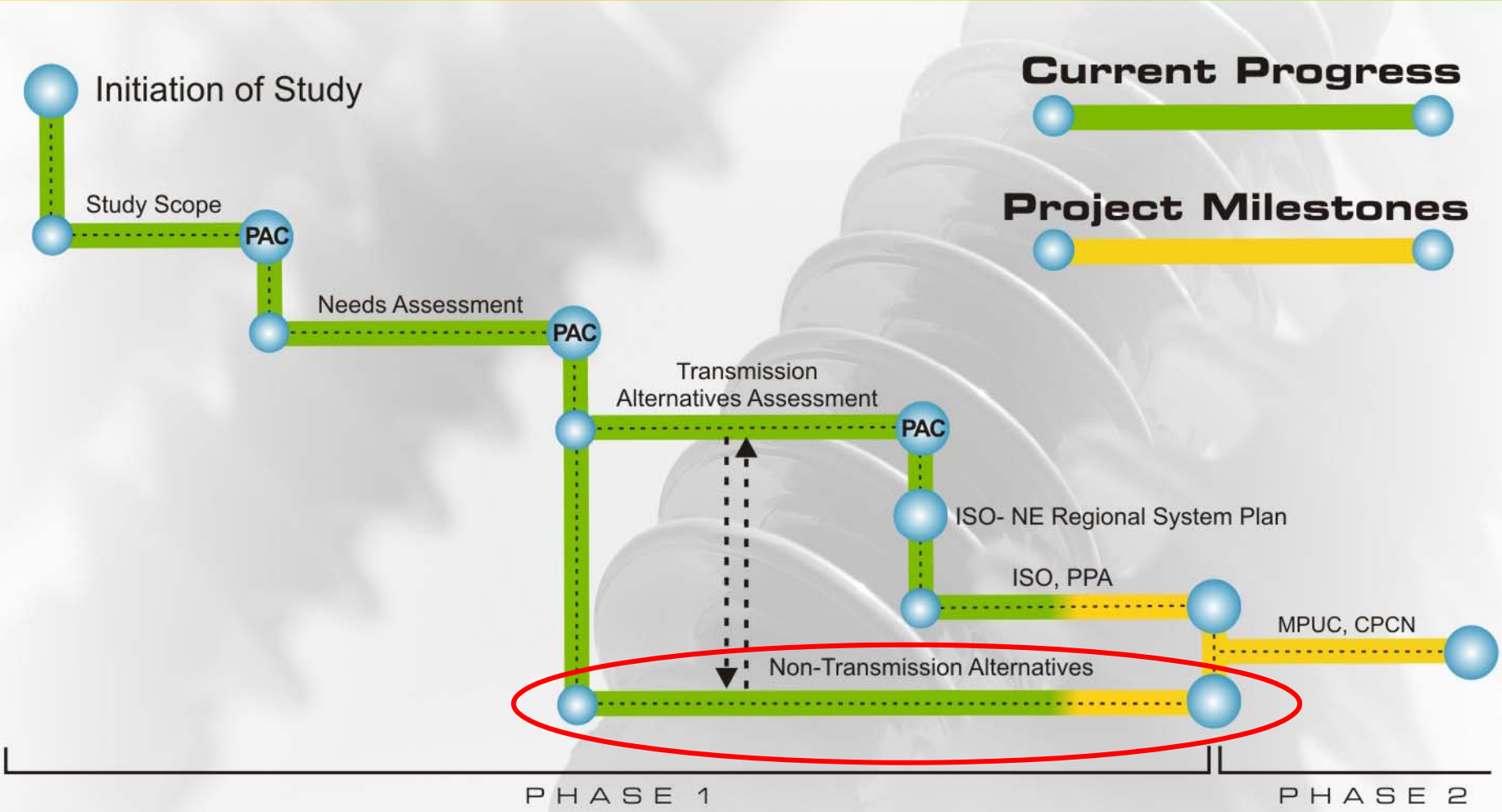
MPRP - System Planning Study



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Non-Transmission Alternatives Assessment Study

Overview and Preliminary Results

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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

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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

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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

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

***Preliminary Results**

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

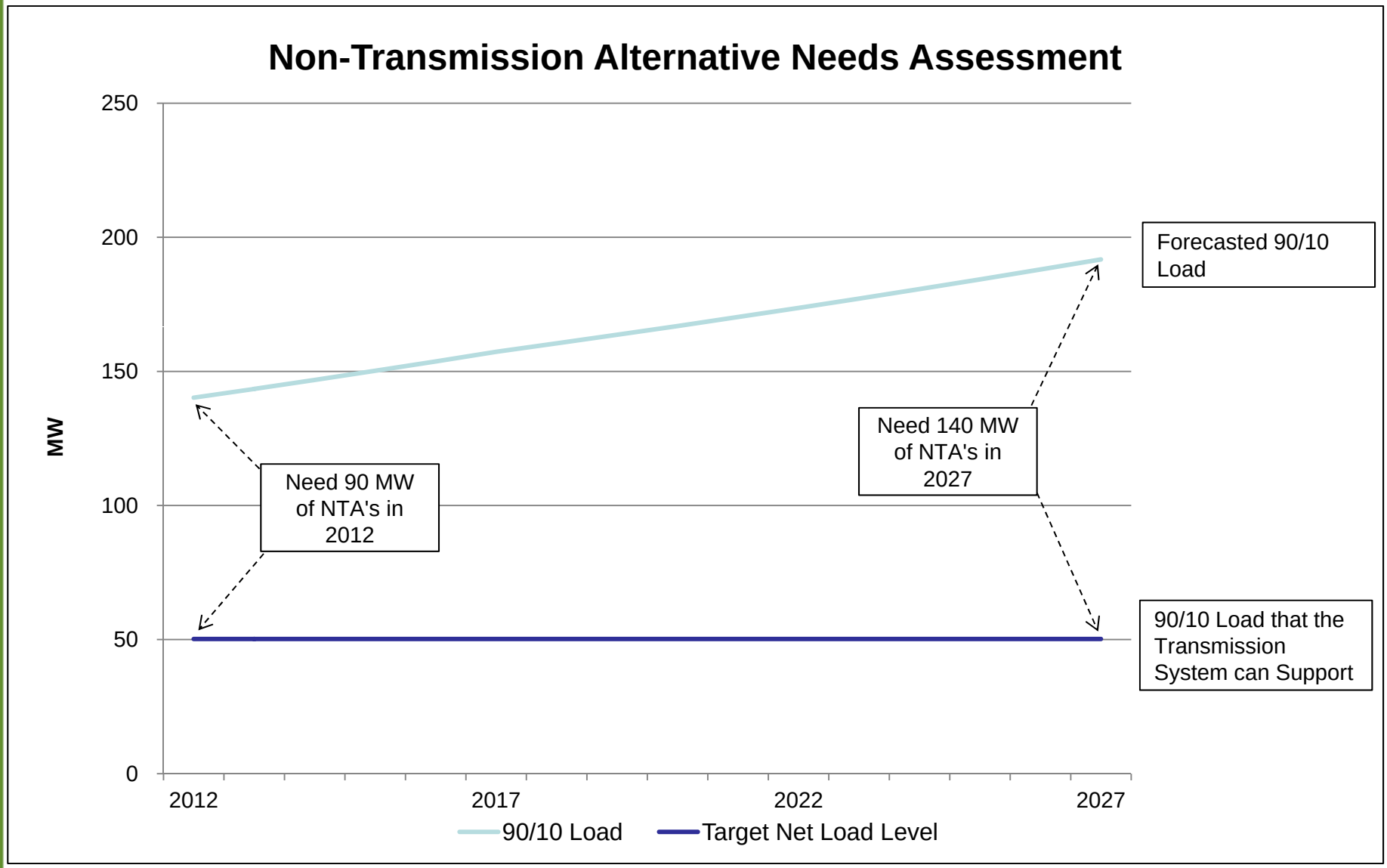
Estimate the “Longevity” of the Transmission Solution

- 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**

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**

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

*Preliminary Results

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

***Preliminary Results**

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

***Preliminary Results**

Firm Generating Capacity

FIRM CAPACITY EXAMPLE
SOUTHERN - PORTLAND REGION

	Existing Units Only	Existing units Plus Eight 100 MW GTs	Increment
# 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%)

*Preliminary Results

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

***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

***Preliminary Results**

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

***Preliminary Results**

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NTA Assessment by Section

MPRP Transmission Solution Elements

Backbone Components

- Northern Section (“N5”) – Pownal to Orrington
- Southern Section (“S1”) – NH to Pownal

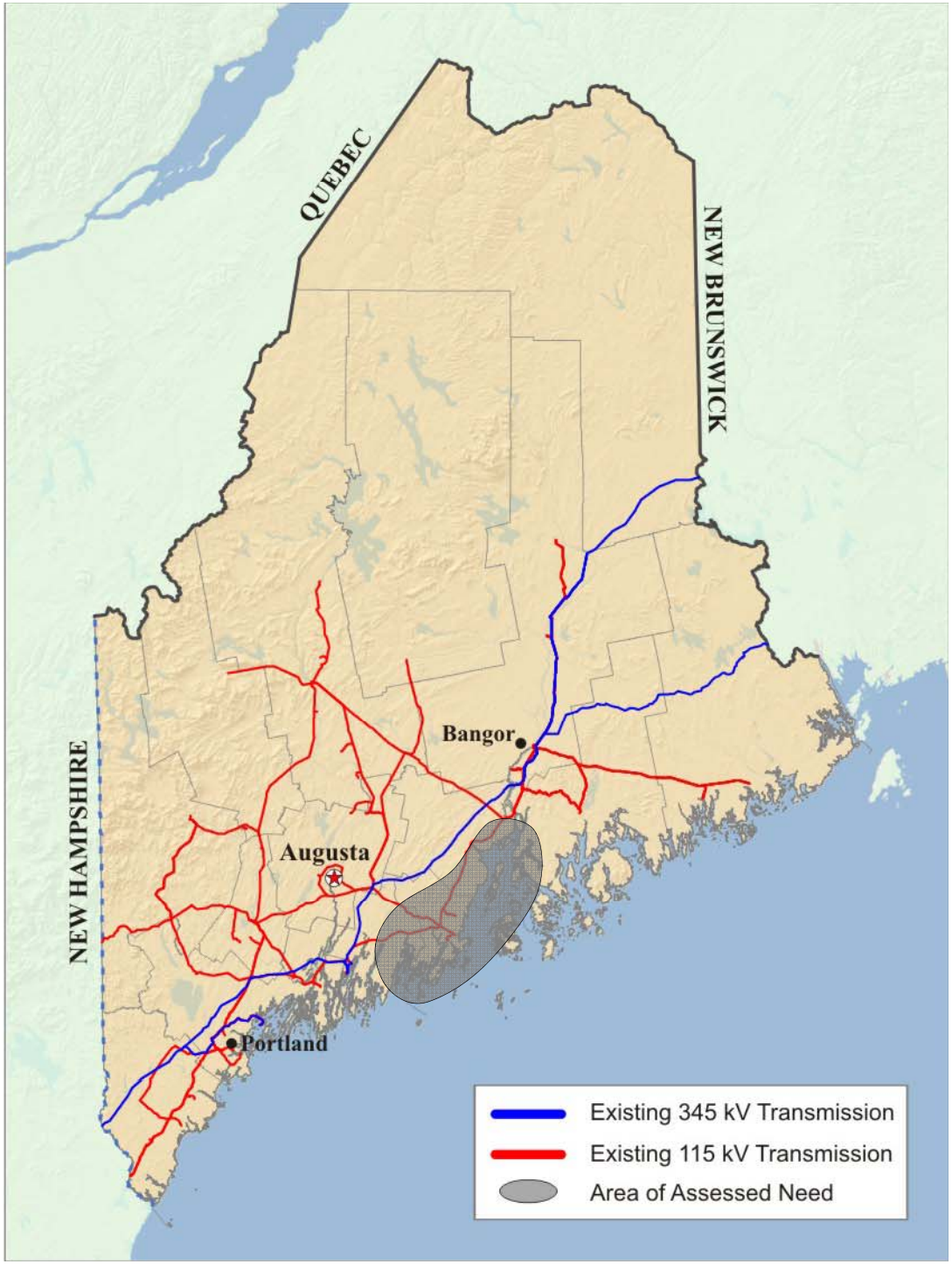
Sub-regional Components

- Midcoast
- Winslow-Skowhegan
- Western Maine
- Lewiston Loop
- South Portland Loop

***Preliminary Results**

Midcoast Region

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



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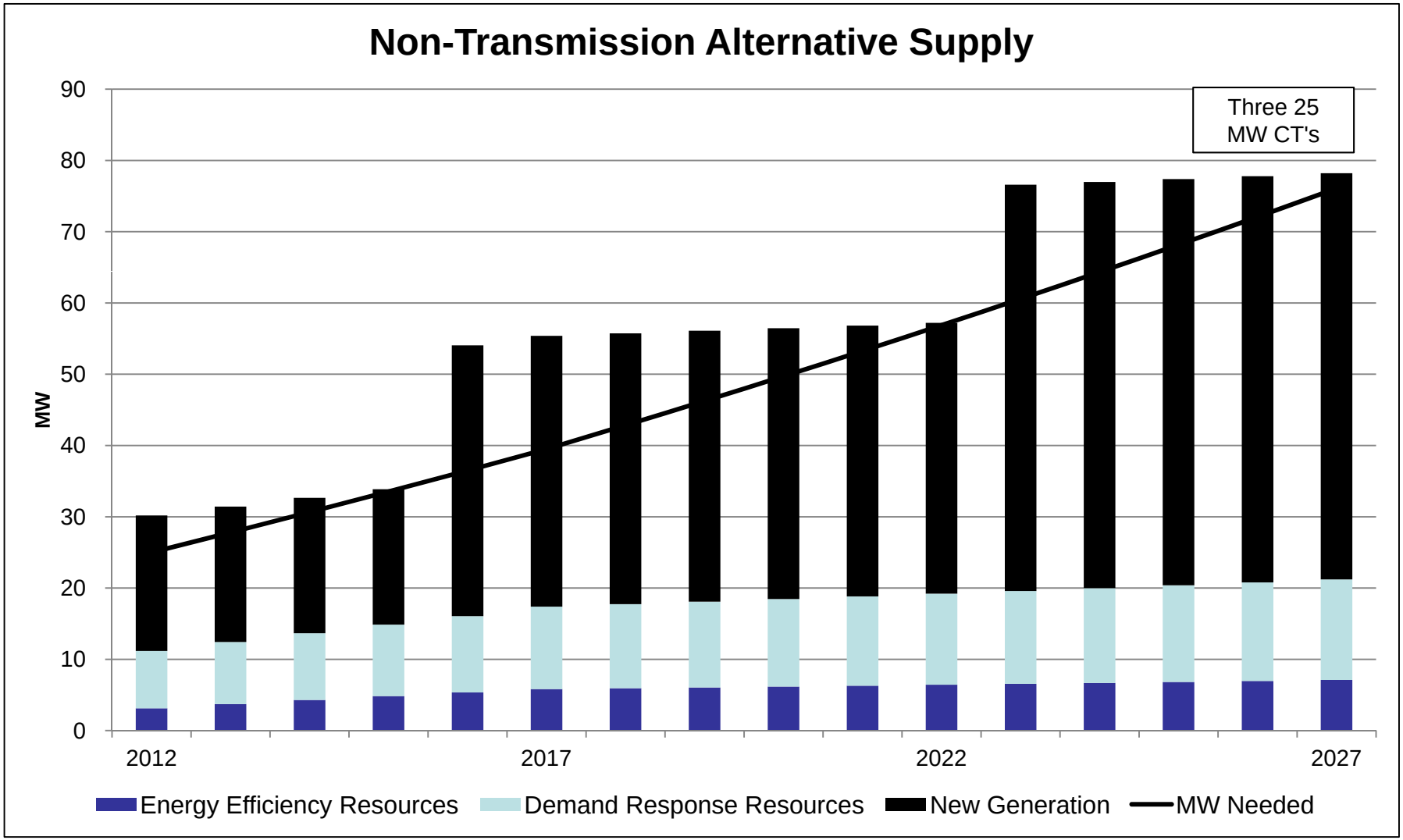
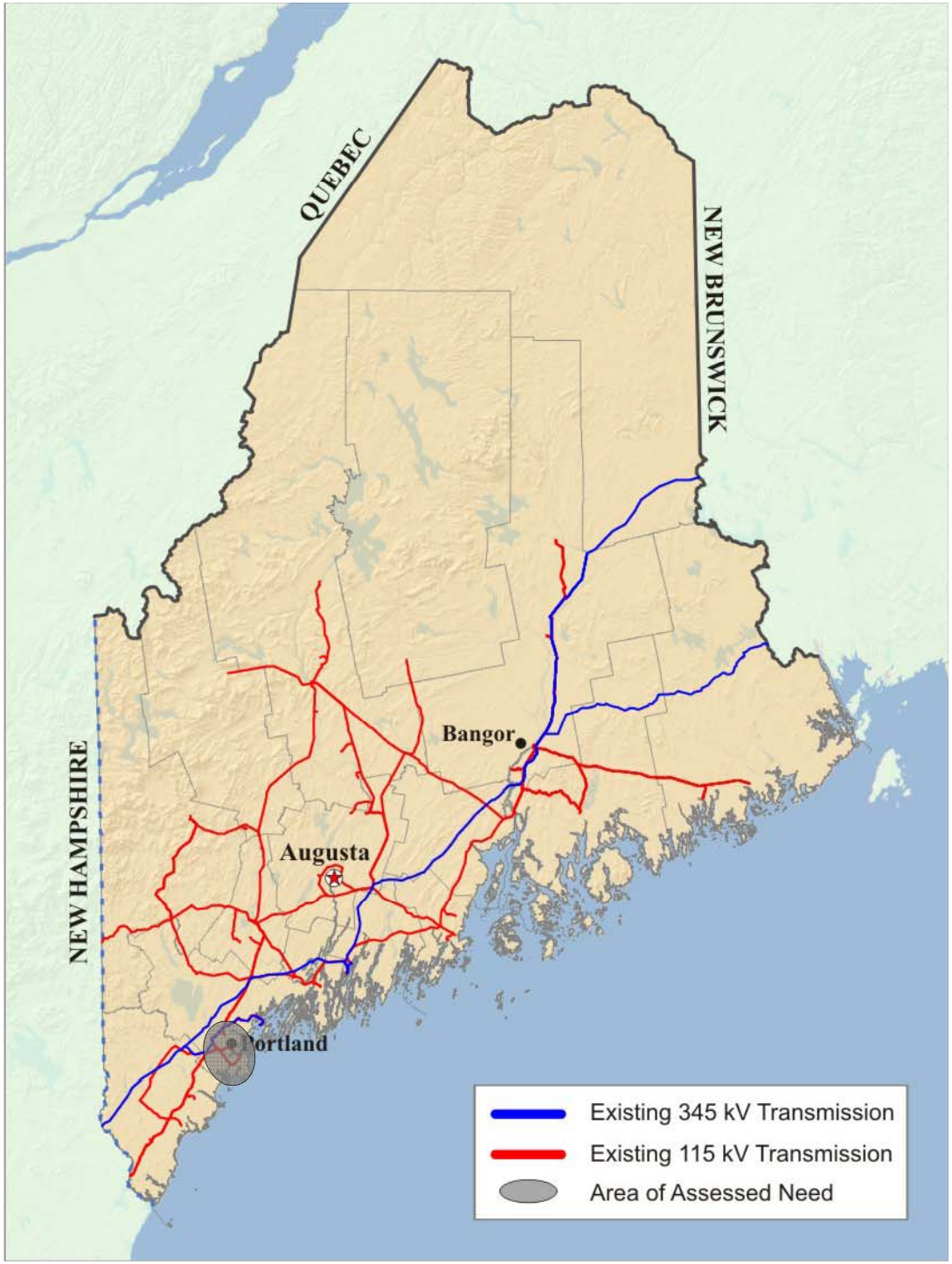
ARC-1: Midcoast



*Preliminary Results

South Portland Loop

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



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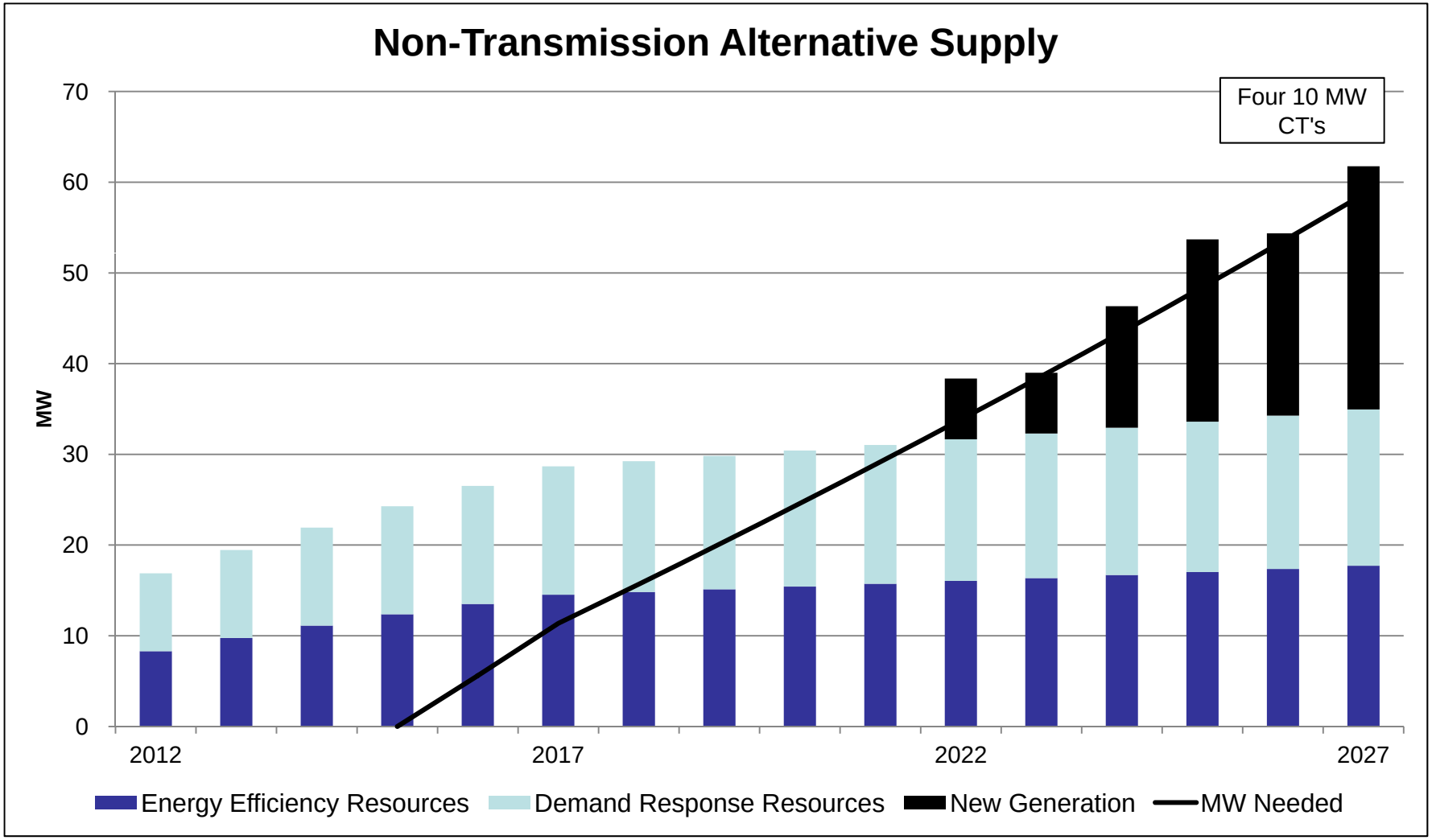
ARC-1: South Portland Loop



*Preliminary Results

NET BENEFITS (COSTS) TO MAINE LOAD

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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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**

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MPRP Stipulation

The needs in the Mid-Coast area will be further evaluated as part of a non-transmission alternative (NTA) pilot project which will be filed by GridSolar and CMP within six months of the date of this Order as a component of a Pilot Plan to be developed by the two companies.

The Pilot Plan will also include a Portland Pilot Project which will be developed to address reliability needs in the Portland area with a non-transmission alternative.

In addition to these two NTA pilot projects, the Pilot Plan will also include a Smart Grid Platform (SGP) proposal which will address:

(1) the design, installation, ownership, cost, cost recovery and operation of one SGP;
(2) the procurement process, ownership, quantities, schedule, control, costs, and cost recovery of the generation and demand resources for the Pilot Plan;
(3) access to the SGP by others; and
(4) education of ratepayers on the opportunities presented by the Smart Grid.

The Pilot Plan will recommend that GridSolar be designated to serve as the Smart Grid Energy Services Operator (SGESO) within CMP's service territory.

Link: https://mpuc-cms.maine.gov/CQM.Public.WebUI/Common/CaseMaster.aspx?CaseNumber=2008-00255. Select item 981 which contains the Order approving Stipulation and the Stipulation.

MPRP Follow-Up Analyses

Lewiston Loop

Mid-Coast Transmission & NTA Assessment

- Original
- New BES Definition impact
- Maine PUC Transmission Planning Standards Investigation and “Safe Harbor” provisions

Portland Transmission & NTA Assessment

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Differences in Current Study Approach Compared to Original MPRP Study

- The MPRP study was a bulk system study. The 34.5 kV system was modeled as an equivalent 115 kV load.
- Current studies include a detailed model of the 34.5 kV system and actual loads at all substations.

- For determining critical load levels, the MPRP study scaled loads in aggregate across the system.
- Current studies may determine critical load levels for sub-areas or buses, if more effective.

- The MPRP study was designed to ISO-NE PP3 and NPCC Directory 1 standards for PTF and BPS.
- In addition, Current studies use MPUC-ordered “Safe Harbor” standards for the local 34.5 kV transmission system.

- The MPRP study did not consider the impact on the bulk system of the 34.5 kV system, and vice versa; whether helpful or harmful.
- Current studies consider impacts at all voltage levels for all contingencies, and evaluates those in the context of the MPUC “Safe Harbor” provisions.

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Steps of an NTA Analysis

- Determine needs of the existing system at a projected future load level – identify N-1, N-1-1, and maintenance outage reliability violations by applying applicable criteria to applicable part of the system
  - NERC TPL-001-4 to BES
  - NPCC Directory 1 to BPS
  - ISO-NE Planning Procedure 3 to PTF
  - Iberdrola USA System Planning Criteria to Local System, with Maine PUC “Safe Harbor” conditions
- Find transmission solutions that would solve the identified reliability violations
- Determine the critical load level at which these violations would go away (the difference between the projected load and the critical load is the amount of NTA effective capacity that would be required to avoid all transmission improvements)
- Develop hybrid solutions that would avoid some transmission improvements and also reduce the amount of NTA required

Process for Evaluating Midcoast NTA Possibilities

- RLC Engineering completed an NTA Analysis for the Midcoast area in February 2011
  - NTA only solutions did not appear feasible
  - Two transmission/NTA hybrid solutions were analyzed
- CMP presented this study in the continuing case before the Maine PUC
  - Commission staff requested analysis of an additional hybrid solution

Process for Evaluating Midcoast NTA Possibilities

- RLC Engineering completed the supplemental NTA Analysis for the Midcoast area in November 2011
  - Follow up analysis showed that a 2 MW NTA in the Boothbay sub-region of the Midcoast, along with certain transmission improvements, could avoid construction of $18 million of transmission improvements
  - In April 2012 the Commission issued an order to implement components of this hybrid solution including the 2 MW pilot NTA
    Link: https://mpuc-cms.maine.gov/CQM.Public.WebUI/Common/CaseMaster.aspx?CaseNumber=2011-00138. Select item 83 which contains the Stipulation filed by GridSolar et al.
  - Solutions to remaining reliability issues were deferred pending completion of the Maine PUC Planning Standards Investigation

What is Next

- Present results from RLC's current Midcoast area study to the Maine PUC later this year.
- Begin a new Needs Assessment, Transmission Alternative, and NTA analysis for the Portland area later this year.
- Receive an order for the remainder of the Midcoast area and the Portland area from the Maine PUC next year.