In its June 29, 2016 Comments to LUPC ("ISO Comments"), ISO-New England (ISO-NE) identifies constraints that exist in the Maine transmission system and the need for upgrades to accommodate new generation. Although constraints exist, there are a number of reasons why the existing transmission system should be able to accommodate the Bryant Mountain project.[1] The map included as Exhibit A identifies Maine's major interfaces and the key constraint areas identified by ISO-NE in its comments. This map was included in a December 18, 2014 report that ISO New England presented to the ISO-NE Planning Advisory Committee, *Strategic Transmission Analysis: Wind Integration Study: Maine and Northern Vermont Updates* ("2014 ISO Study"). The key interfaces are the Orrington-South interface in northern Maine, the Surowiec-South interface in southern Maine, and the Maine-New Hampshire interface at the Maine and New Hampshire border. They are depicted by the green-dashed lines on Exhibit A. There are several more localized constraint areas, shown in purple dashed lines on Exhibit A. They include the Keene Road, Wyman Hydro, and Rumford export areas. The most constrained area is north of the Orrington-South interface and, in particular, north of Keene Road. ISO-NE notes in its comments that the major constraint that affects new wind generation is located in northern Maine. (ISO Comments at pp. 2-3.)

The northern Maine constraint identified by ISO-NE does not affect the Bryant Mountain project, which is located south of Rumford and therefore is not affected by the constraints in the system to the north.

The Bryant Mountain project is subject to the Surowiec-South and Maine-New Hampshire interfaces and constraints that might exist in those locations but, as discussed below, ISO-NE has studied those constraints and the impact they might have on wind generation and concluded they are minimal. In the March 28, 2016 report by ISO-NE and presented to the ISO-NE Planning Advisory Committee Meeting, *2015 Economic Study Strategic Transmission Analysis – Onshore Wind Integration Draft Results* ("ISO Economic Study"), it was determined that Maine Interface Upgrades would produce: **"Little to no savings: Infrequent interface constraints and small amounts of bottled-in energy."[2]** Meaning that because wind generation is not constrained for significant amounts of time, there would be minimal economic benefit to

---

[1] As discussed in my initial June 29, 2016 Letter that was Exhibit B to EverPower's pre-filed testimony, the project will undergo a multi-year system impact study at ISO-NE that will identify any specific upgrades required as part of the project interconnecting with the electrical grid. The costs of those upgrades will be paid for by the generator.

[2] A complete copy of the ISO Economic Study is included as Exhibit C. This reference is on slide 14 associated with dispatch scenarios 1,2,3 and 4, which are existing generation plus generation north of Suroweic interface 453, 623, 857, 1149MW.

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implementing upgrades to reduce or eliminate those constraints. Further, upgrades associated with projects as required by ISO-NE studies actually often increase transmission capacity and reduce congestion on the system.

When ISO-NE discusses capacity of the existing transmission system, typically it is evaluating the ability of the system to operate during periods of peak demand. Wind resources typically do not operate at maximum capacity during periods of peak demand. For example, wind projects have a lower output during the summer, when demand in New England peaks. Therefore, the potential constraints identified by ISO-NE, which occur during periods of peak demand, typically do not limit operation of wind power projects. This is evident in Exhibit B, which includes several slides from the ISO Economic Study. Slide 61 depicts flows across the Maine-New Hampshire interface and shows that during 2015 that interface was not constrained for wind or any other resources. Similarly, Slide 53 depicts flows across the Surowiec-South interface and shows that during 2015 that interface was not constrained for wind or other resources. It is possible those interfaces could be constrained during periods of higher demand not experienced in 2015, and ISO-NE specifically evaluated the potential for constraints at those interfaces under several hypothetical scenarios. The ISO Economic Study evaluated several scenarios, including a scenario in which all of the wind that was in the ISO-NE queue as of April 1, 2015 (identified as Scenario 6 on Slide 8 of Exhibit B, and which includes approximately 3,727 MW of wind power in addition to the 453 MW of wind power that was then in service in Maine) was operating. Under this scenario, there would be significant constraints at the Orrington-South interface, but no constraints at the Maine-New Hampshire interface, and minimal constraints at the Surowiec South interface. Exhibit B Slide 15. This study takes into account the variable nature of wind generation and aligns it with load as well as price signals which encourage other generators to operate, and as such it provides a more complete picture of the impact that existing transmission constraints might have on operation of existing and new wind resources.

In short, although there are constraints in the existing system, the Bryant Mountain project is not located in the areas of most significant constraints. Additionally, the constraints do not significantly affect wind resources, which do not operate during periods of time of maximum constraint in the system.

It has also been noted that there is a significant volume of wind generation proposed in the ISO-NE generation interconnection queue. Not all projects in the interconnection queue proceed to the next phase of study or are ever built. For example,[3] since 1996, less than 5,000 MW out of a total of 65,000 MW of proposed interconnections (including Elective Transmission Upgrades, which may only be elimination of congestion bottle necks vs. actual new generation) proceeded to the stage of filing an Interconnection Application. (The information from 1996-

[3] Based on the ISO New England Generator Interconnection Queue as of 7/28/2016

2004 is limited and it is likely the number of proposed interconnections is even higher.) In recent months, there have been a number of market signals (for example, Massachusetts, Rhode Island and Connecticut have issued a joint request for clean energy and transmission to deliver that clean energy) that have promoted competing applications of renewable generation into the ISO-NE queue, much of which will never come to completion. As reflected in the ISO Comments, the majority of proposed wind development in Maine is in northern Maine, Aroostook County. (ISO Comments at 3.) There is only minimal new generation proposed in Oxford County (63 MW, which includes the 40 MW Bryant Mountain project).

Jeffrey H Fenn P.E.
Director Electrical Engineering

SGC

EXHIBIT A

DECEMBER 18, 2014 | WESTBOROUGH, MA

Strategic Transmission Analysis: Wind Integration Study: Maine and Northern Vermont Updates

Planning Advisory Committee

Stan Doe

MANAGER, TRANSMISSION STRATEGY

Maine's Major Interfaces and Relationship to Wind Resources

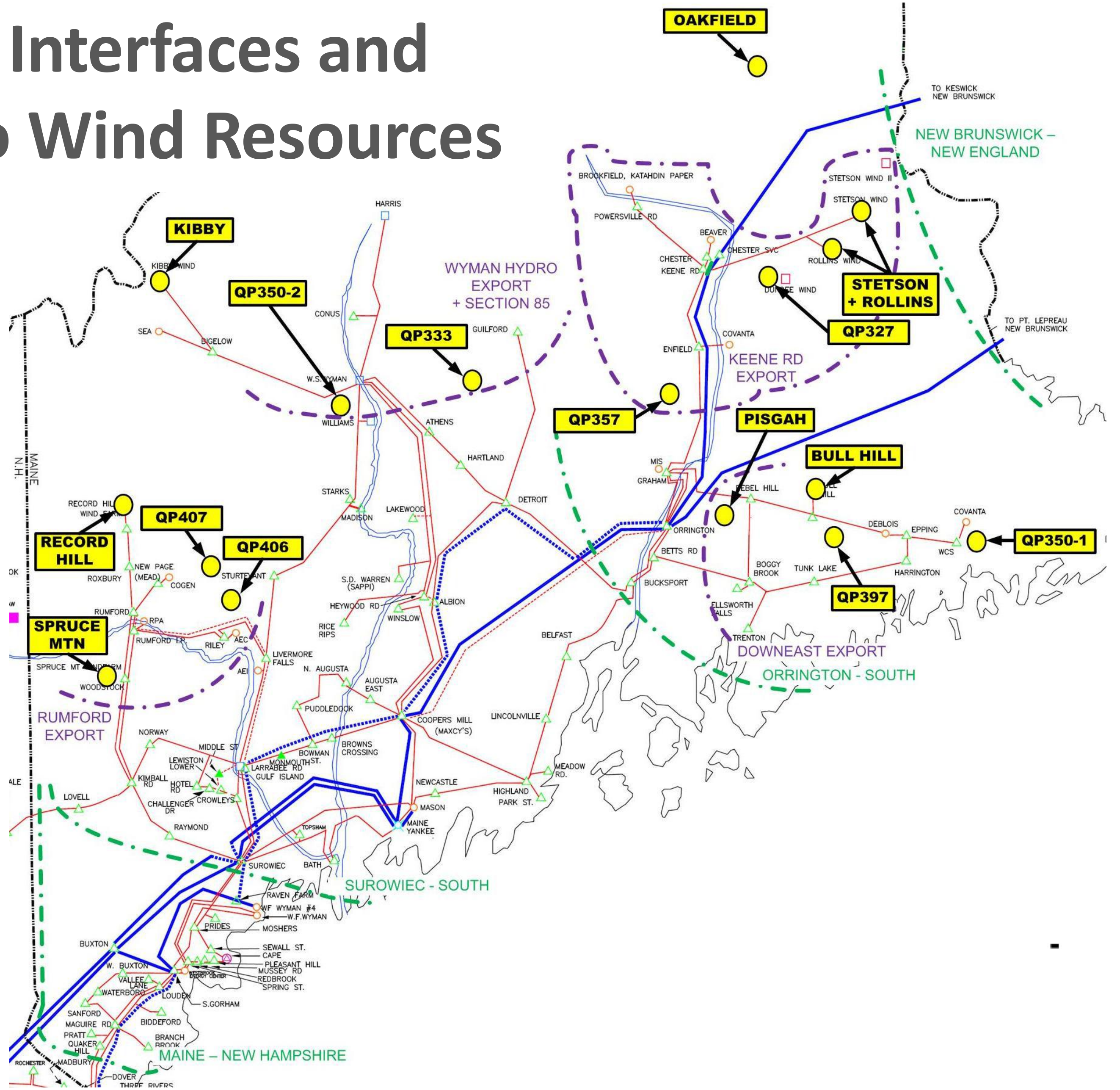


EXHIBIT B

MARCH 28, 2016 | WESTBOROUGH, MA

2015 Economic Study Strategic Transmission Analysis – Onshore Wind Integration Draft Results

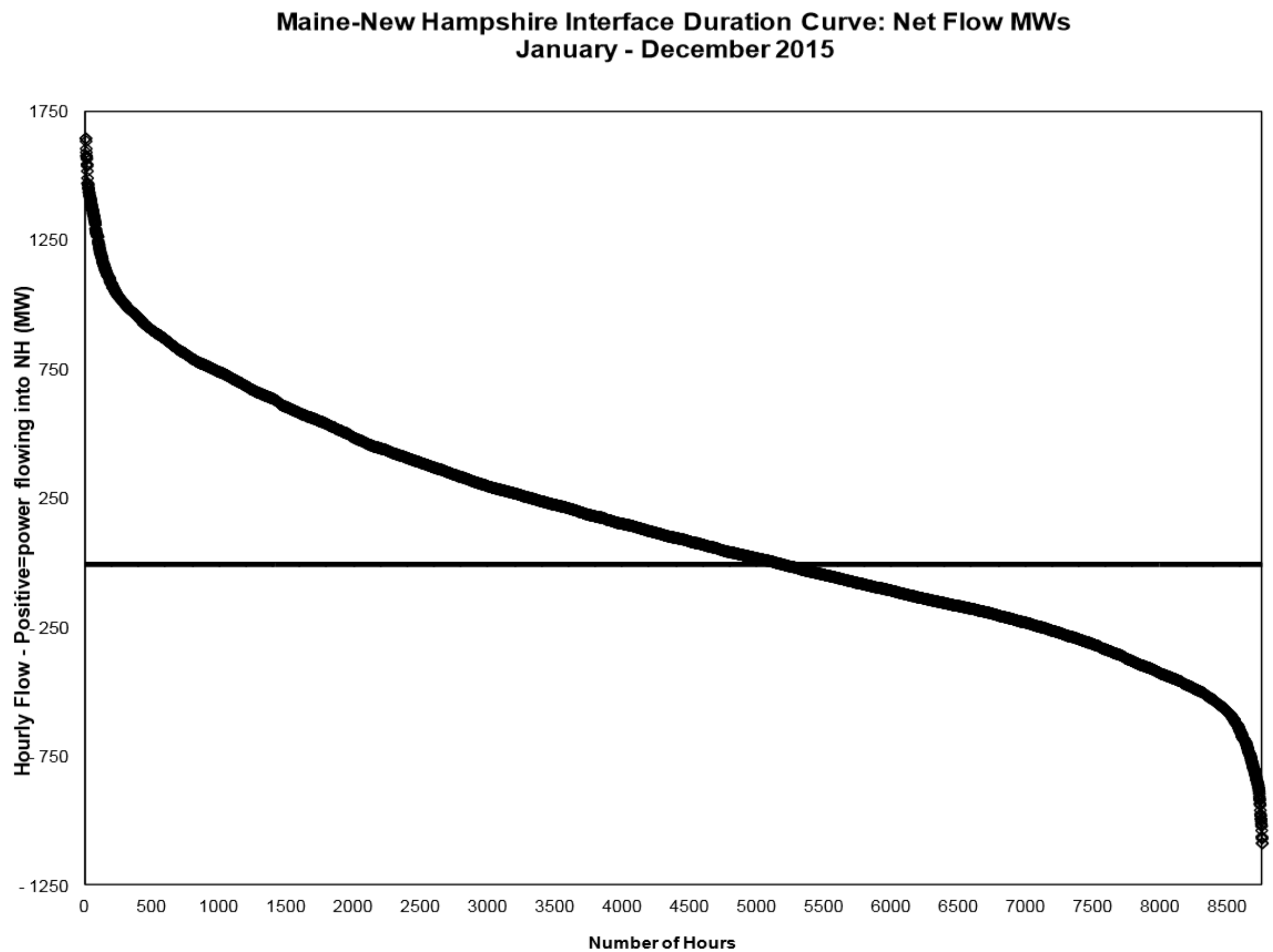
Planning Advisory Committee Meeting

Jessica Lau and Wayne Coste

SYSTEM PLANNING

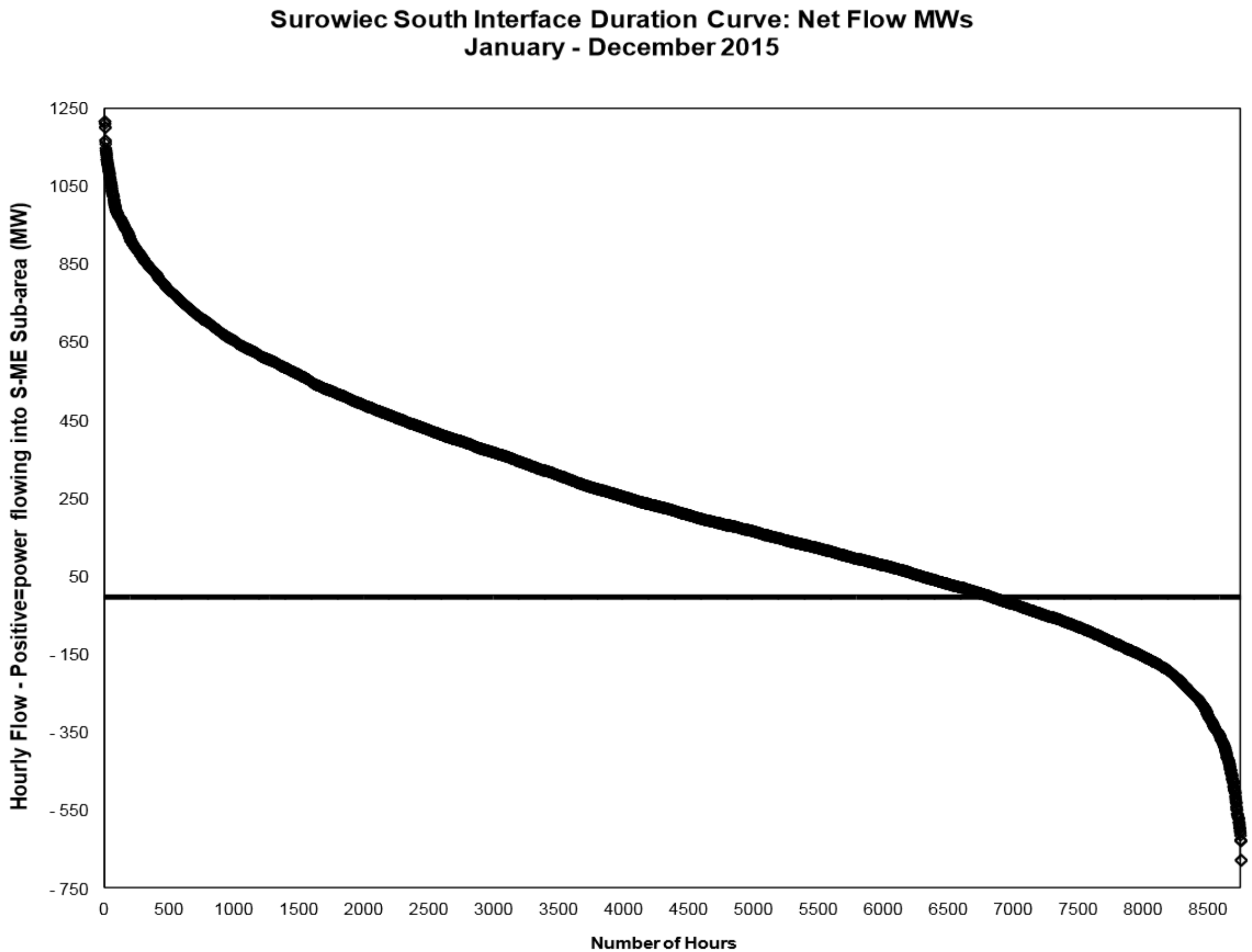
2015 Historical Interface Flow (MW)

Maine – New Hampshire (1,900 MW limit)



2015 Historical Interface Flow (MW)

Surowiec South (1,500 MW limit)



Wind Scenarios

New England Wind Nameplate (MW)

	Scenarios	Wind Nameplate (MW) Maine	Outside of Maine	New England Total
1	Existing Wind in New England (In-Service as of 4/1/15) *	453	426	878
2	RENEW Sensitivity 1 (Less Wind) *	623	426	1,049
3	Proposed Wind in New England with I.3.9 approval (as of 4/1/15)	857	489	1,345
4	RENEW Basecase – STA-WI Studied Wind (as of 10/1/13) *	1,149	426	1,575
5	RENEW Sensitivity 2 (More Wind)*	2,084	426	2,510
5_{NB}	RENEW Sensitivity 2 (More Wind)* and 1,000 MW of NB imports available for dispatch	2,084	426	2,510
6	All Future Queue Wind in New England (as of 4/1/15)	3,727	678	4,405

Note: Values may not sum to total due to rounding

*Outside Maine, assumed only "existing wind" as of 4/1/15

Percent of Time Interface is at Limit (% of Year)

Orrington South is the most limited and leads to minimal congestion at Surowiec South and ME-NH

	Scenarios	Orrington South Export Limit		Surowiec South Export Limit		ME-NH Export Limit	
		Pre-Upgrades (1,325 MW)	Post-Upgrades (1,650 MW)	Pre-Upgrades (1,500 MW)	Post-Upgrades (2,100 MW)	Pre-Upgrades (1,900 MW)	Post-Upgrades (2,300 MW)
1	Existing Wind in New England (In-Service as of 4/1/15) *	1	0	0	0	0	0
2	RENEW Sensitivity 1 (Less Wind) *	6	0	0	0	0	0
3	Proposed Wind in New England with I.3.9 approval (as of 4/1/15)	8	0	1	0	0	0
4	RENEW Basecase – STA-WI Studied Wind (as of 10/1/13) *	13	0	4	0	0	0
5	RENEW Sensitivity 2 (More Wind)*	43	19	11	0	0	0
5_{NB}	RENEW Sensitivity 2 (More Wind)* and 1,000 MW of NB imports available for dispatch	83	57	12	0	0	0
6	All Future Queue Wind in New England (as of 4/1/15)	69	52	11	0	0	0

*Outside Maine, assumed only "existing wind" as of 4/1/15

EXHIBIT C

MARCH 28, 2016 | WESTBOROUGH, MA

2015 Economic Study Strategic Transmission Analysis – Onshore Wind Integration Draft Results

Planning Advisory Committee Meeting

Jessica Lau and Wayne Coste

SYSTEM PLANNING

Outline

- Overview
- Background and Assumptions
- Study Results
- Appendix
  I. Scenarios
  II. Generation by Resource Type Metrics
  III. Air Emissions Metrics
  IV. Bottled-In Energy Metrics
  V. Interface Flow Metrics
  VI. LMP Metrics
  VII. Modeling Assumptions

Overview

- The ISO is performing three 2015 Economic Studies
  - Keene Road area wind development and analysis of local interface constraints (request by SunEdison)
  - Offshore Wind Deployment (request by Massachusetts Clean Energy Center)
  - Maine Upgrades Identified in ISO-NE's Strategic Transmission Analysis for Wind Integration – Onshore Wind (request by RENEW Northeast)
- Today the ISO is seeking PAC input on the draft results of the **Strategic Transmission Analysis – Onshore Wind**
  - Estimate extent that transmission constraints are binding
  - Measure the economic benefits of relieving those transmission system constraints
- This analysis includes future resources in some scenarios, but may not account for all the necessary transmission facilities associated with the interconnection of the resource
  - All future constraints may not be captured in this analysis
- Final study results and report will be completed after consultation with the PAC
  - The results may be used to inform the region on the needs for future transmission upgrades in the Maine area

Background

- The Onshore Wind – Strategic Transmission Analysis scope of work and assumptions were developed with PAC input at the May and June 2015 meetings
  - Scope of Work
  - Study Assumptions
  - Stakeholder Comments on Scope of Work

Background

Strategic Transmission Analysis

2012-2014

- ISO-NE conducted the Strategic Transmission Analysis for Wind Integration (**STA-WI**)
  - Designed to understand transmission constraints in Maine affecting wind resources in northern New England
  - Focused on potential upgrades that would not require major new transmission construction

2016

- ISO-NE will conduct an updated **Strategic Transmission Analysis for Maine** as discussed in 3/28/2016 PAC agenda item 2.0
  - The Maine transmission topology has changed
  - Some upgrades identified in the previous study have been implemented
  - Some upgrades are no longer appropriate for current system

Background

2015 *Economic Study of Strategic Transmission Analysis – Onshore Wind*

Study Objective: Evaluate the impact of increasing transfer capability along the Maine corridor

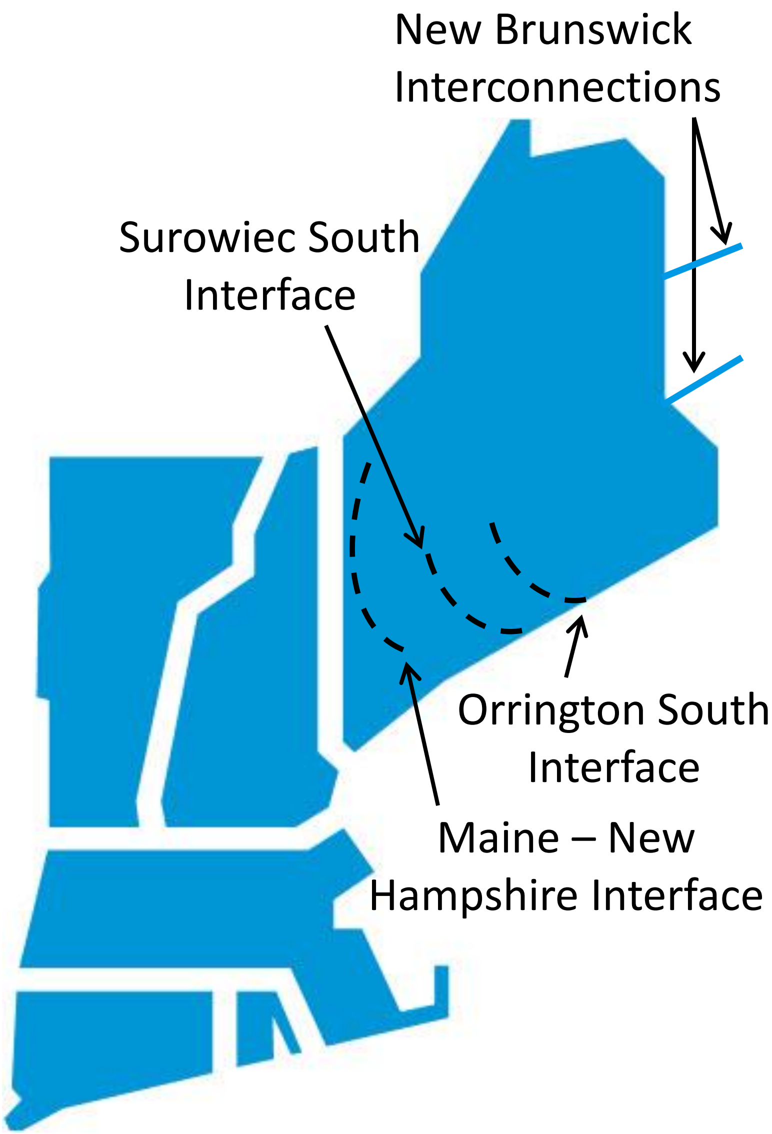
- The effect of increasing transfer limits of major ME interfaces
  - Were identified in the Strategic Transmission Analysis – Wind Integration
  - Higher ME interface limits are not directly attributable to specific transmission upgrades
- Pre-contingency thermal limits are respected in the Gridview software
  - Operation of wind resources can be constrained by local thermal limits
- Other local constraints are not modeled
  - Local, voltage and stability constraints
    - E.g. Keene Road, Wyman and Rumford areas
  - Could constrain the operation of impacted resources

Key Study Assumptions

Study Year 2021

- System Characteristics
  - 2015 CELT loads, EE & PV Forecast
  - FCA #9 resources with a Capacity Supply Obligation (CSO) and 2015 CELT resources without a CSO
  - NREL wind hourly profiles
  - Hourly imports and exports available for dispatch
  - 2015 EIA Annual Energy Outlook Fuel Forecast

ME Interface Export Limit	Pre-Upgrades Cases (MW)	Post-Upgrades Cases (MW)
Keene Road, Wyman, Rumford	Unconstrained	Unconstrained
Orrington South	1,325	1,650
Surowiec South	1,500	2,100
Maine – New Hampshire	1,900	2,300



Wind Scenarios

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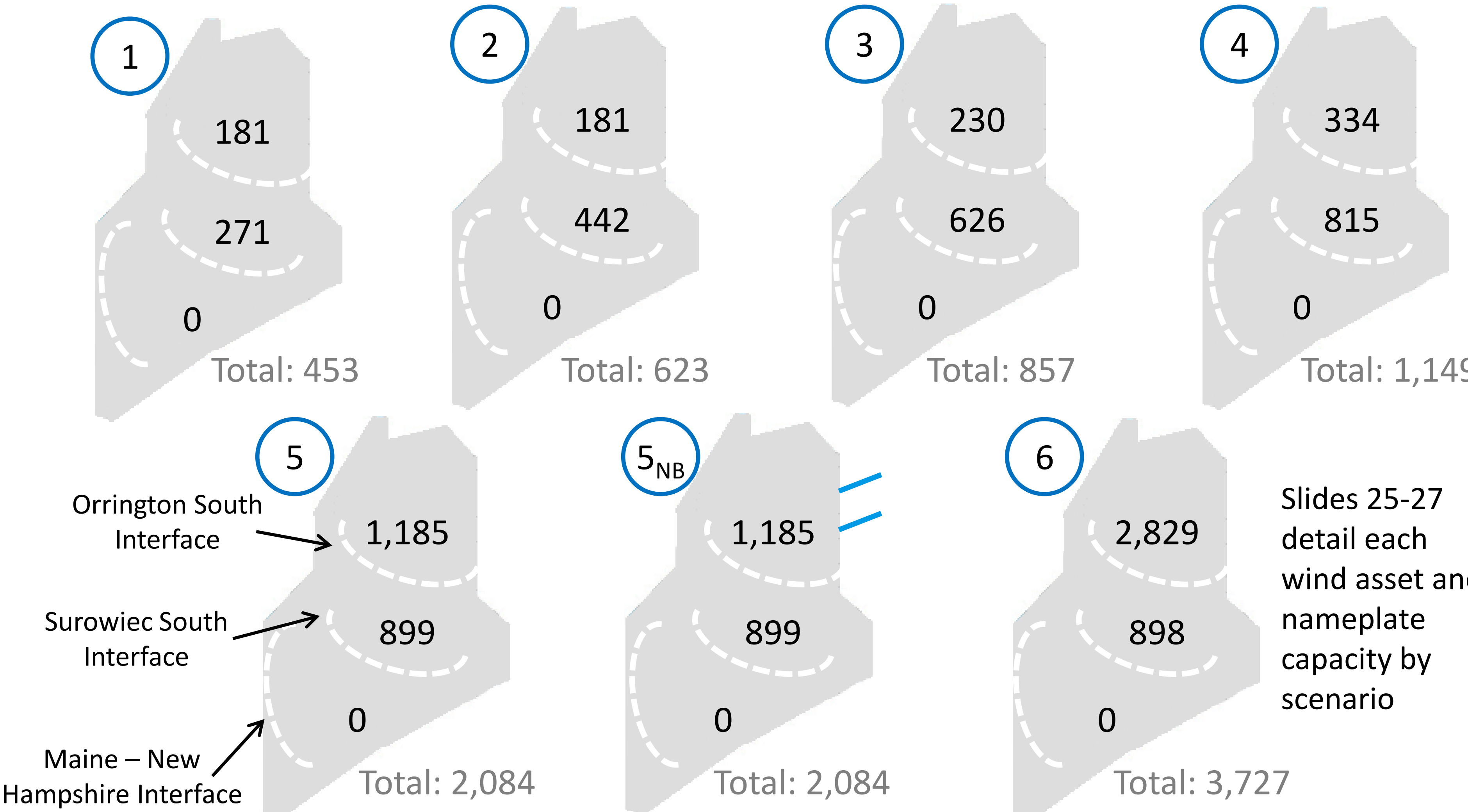
Note: Values may not sum to total due to rounding

*Outside Maine, assumed only "existing wind" as of 4/1/15

Wind Scenarios

Maine Wind Nameplate (MW)



Slides 25-27 detail each wind asset and nameplate capacity by scenario

Note: Values may not sum to total due to rounding

DRAFT STUDY RESULTS

Summary of Draft Results

Study Year 2021

- For 453 MW to 1,149 MW of total wind integration in Maine
  - $0M to $5M production cost savings due to increasing Maine corridor interfaces
  - Orrington South interface becomes more constrained as more wind resources are added
- With 2,084 MW to 3,727 MW of total wind integration in Maine
  - $31M to $75M production cost savings result from increasing the Maine interface transfer limit constraints
  - Orrington South interface is the major constraint
    - Most wind resources are located north of Orrington South
    - Affects the ability to transport economically dispatched resources to South of Orrington (including New Brunswick imports)
  - Relieving the Maine corridor results in the North-South interface becoming increasingly constrained
- Reminder that the above calculations are associated only with the changes in transfer capabilities on the major interfaces
  - Bottled-in energy was observed due to both interface and local thermal constraints
  - Study does not reflect influence of future interconnections on local system constraints

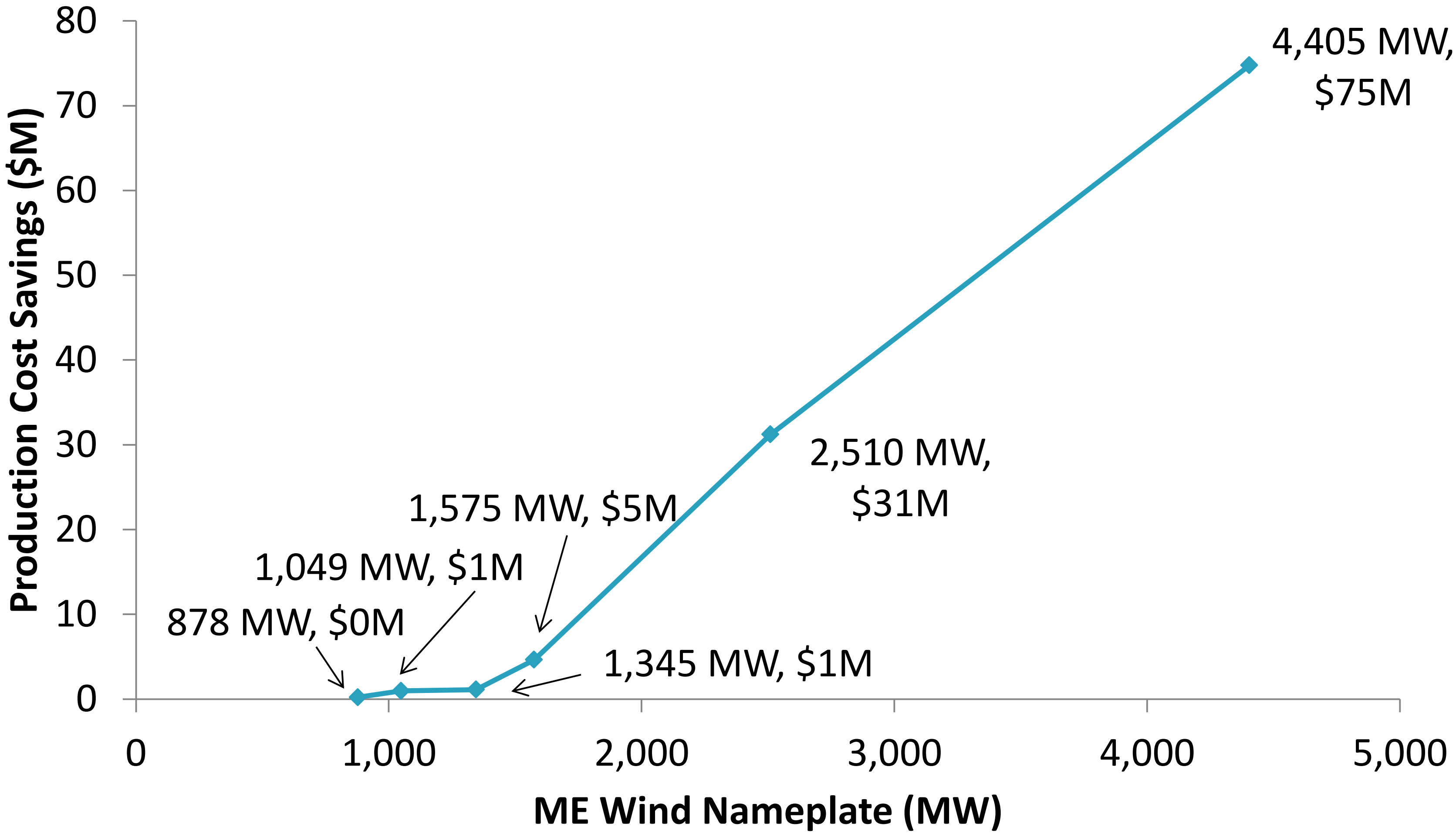
Production Cost Savings due to ME Interface Upgrades ($M/Year)

	Scenarios	Production Cost		Production Cost Savings	Case Shows
		Pre-Upgrades	Post-Upgrades		
1	**Existing Wind in New England (In-Service as of 4/1/15) ***	3,668	3,667	**0**	***Little to no savings**: Infrequent interface constraints and small amounts of bottled-in energy*
2	**RENEW Sensitivity 1 (Less Wind) ***	3,639	3,638	**1**	
3	**Proposed Wind in New England with I.3.9 approval (as of 4/1/15)**	3,593	3,592	**1**	
4	**RENEW Basecase – STA-WI Studied Wind (as of 10/1/13) ***	3,563	3,559	**5**	
5	**RENEW Sensitivity 2 (More Wind)***	3,458	3,427	**31**	***When > 2,084 MW of Maine Wind:** Production cost savings are realized from relaxing interfaces and releasing bottled-in energy*
5_{NB}	**RENEW Sensitivity 2 (More Wind)* and 1,000 MW of NB imports available for dispatch**	3,338	3,261	**78**	
6	**All Future Queue Wind in New England (as of 4/1/15)**	3,351	3,276	**75**	

Note: Values may not sum to total due to rounding

*Outside Maine, assumed only "existing wind" as of 4/1/15

Production Cost Savings ($M/Year) vs. New England Wind Nameplate (MW)



Note: New Brunswick sensitivity (1,000 MW of NB imports available for dispatch) is excluded in this graph

Load Serving Entity (LSE) Expense Savings due to ME Interface Upgrades ($M/Year)

	Scenarios	LSE Expense		LSE Expense Savings	Cases Shows
		Pre-Upgrades	Post-Upgrades		
1	Existing Wind in New England (In-Service as of 4/1/15) *	7,246	7,245	**1**	***Little to no savings**: Infrequent interface constraints and small amounts of bottled-in energy*
2	RENEW Sensitivity 1 (Less Wind) *	7,217	7,215	**1**	
3	Proposed Wind in New England with I.3.9 approval (as of 4/1/15)	7,178	7,177	**1**	
4	RENEW Basecase – STA-WI Studied Wind (as of 10/1/13) *	7,167	7,165	**2**	
5	RENEW Sensitivity 2 (More Wind)*	7,093	7,054	**39**	***When > 2,084 MW of Maine Wind:** LSE expense savings are realized from relaxing interfaces and releasing bottled-in energy*
5_{NB}	RENEW Sensitivity 2 (More Wind)* and 1,000 MW of NB imports available for dispatch	7,002	6,922	**80**	
6	All Future Queue Wind in New England (as of 4/1/15)	6,959	6,883	**76**	

Note: Values may not sum to total due to rounding

*Outside Maine, assumed only "existing wind" as of 4/1/15

Percent of Time Interface is at Limit (% of Year)

Orrington South is the most limited and leads to minimal congestion at Surowiec South and ME-NH

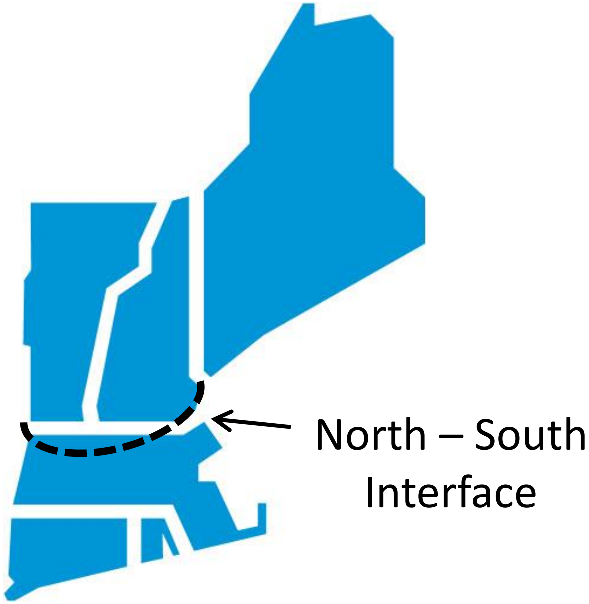
	Scenarios	Orrington South Export Limit		Surowiec South Export Limit		ME-NH Export Limit	
		Pre-Upgrades (1,325 MW)	Post-Upgrades (1,650 MW)	Pre-Upgrades (1,500 MW)	Post-Upgrades (2,100 MW)	Pre-Upgrades (1,900 MW)	Post-Upgrades (2,300 MW)
1	Existing Wind in New England (In-Service as of 4/1/15) *	1	0	0	0	0	0
2	RENEW Sensitivity 1 (Less Wind) *	6	0	0	0	0	0
3	Proposed Wind in New England with I.3.9 approval (as of 4/1/15)	8	0	1	0	0	0
4	RENEW Basecase – STA-WI Studied Wind (as of 10/1/13) *	13	0	4	0	0	0
5	RENEW Sensitivity 2 (More Wind)*	43	19	11	0	0	0
5_{NB}	RENEW Sensitivity 2 (More Wind)* and 1,000 MW of NB imports available for dispatch	83	57	12	0	0	0
6	All Future Queue Wind in New England (as of 4/1/15)	69	52	11	0	0	0

*Outside Maine, assumed only "existing wind" as of 4/1/15

Percent of Time Interface is at Limit (% of Year), Cont.

North – South Interface

Scenarios		North-South Export Limit (2,675 MW)	
		Pre-Upgrade	Post-Upgrade
1	Existing Wind in New England (In-Service as of 4/1/15) *	0	0
2	RENEW Sensitivity 1 (Less Wind) *	1	1
3	Proposed Wind in New England with I.3.9 approval (as of 4/1/15)	2	2
4	RENEW Basecase – STA-WI Studied Wind (as of 10/1/13) *	2	3
5	RENEW Sensitivity 2 (More Wind)*	3	9
5_{NB}	RENEW Sensitivity 2 (More Wind)* and 1,000 MW of NB imports available for dispatch	4	13
6	All Future Queue Wind in New England (as of 4/1/15)	6	17



When there is >2,084 MW of wind nameplate in Maine, the North-South interface begins to experience more congestion

*Outside Maine, assumed only "existing wind" as of 4/1/15

Maine Bottled-In Energy (GWh)

Operation of some wind resources were constrained by local thermal limits. This cannot be relieved by increasing Maine corridor transfer capability.

Scenarios	Wind ($0 Threshold Price)		Hydro ($5 Threshold Price)		NB Import ($10 Threshold Price)	
	Pre-Upgrades	Post-Upgrades	Pre-Upgrades	Post-Upgrades	Pre-Upgrades	Post-Upgrades
1	14	14	0	0	0	0
2	14	14	0	0	9	0
3	15	15	0	0	19	0
4	92	91	0	0	57	0
5	97	92	17	12	702	194
5_{NB}	92	89	13	12	2,435	1,028
6	1,641	941	362	270	2,174	1,560

Note: Values may not sum to total due to rounding
*Outside Maine, assumed only "existing wind" as of 4/1/15

Maine Bottled-In Energy (GWh)

Pre-Upgrades (approximately represented by shape size in subarea)

CO_2 Systemwide Reductions due to ME Interface Upgrades (kton**)

Changes (%) in CO_2 emissions are small relative to systemwide emissions of 32,000 kton/year

	Scenarios	CO_2 Reduction		Cases Show
		kton	(%)	
1	**Existing Wind in New England (In-Service as of 4/1/15) ***	1	**0**	*Overall, as wind penetration increases, there is more CO_2 reduction due to Maine interface upgrades.* *Negative CO_2 reduction occurs in cases 2 and 3 due to change in unit commitment after Maine interface upgrades. The system conducts least-cost dispatch and not least-emission dispatch. ($20 CO_2 cost is taken into account)*
2	**RENEW Sensitivity 1 (Less Wind) ***	-3	**0**	
3	**Proposed Wind in New England with I.3.9 approval (as of 4/1/15)**	-7	**0**	
4	**RENEW Basecase – STA-WI Studied Wind (as of 10/1/13) ***	3	**0**	
5	**RENEW Sensitivity 2 (More Wind)***	216	**1**	
5_{NB}	**RENEW Sensitivity 2 (More Wind)* and 1,000 MW of of NB imports available for dispatch**	618	**2**	
6	**All Future Queue Wind in New England (as of 4/1/15)**	701	**2**	

Note: Values may not sum to total due to rounding

*Outside Maine, assumed only "existing wind" as of 4/1/15

**1 kton = 1,000 short ton = 2,000,000 lb

2015 Economic Study: Next Steps

- Review stakeholder comments and continue stakeholder discussions at future PAC meetings
- Develop report summarizing the Onshore Wind – Strategic Transmission Analysis Study

Questions

APPENDICES

I – Scenarios

II – Generation by Resource Type Metrics

III – Air Emissions Metrics

IV – Bottled-In Energy Metrics

V – Interface Flow Metrics

VI – LMP Metrics

VII – Modeling Assumptions

APPENDIX I

Scenarios

Table of Scenarios

Cases

#	Scenarios	Case Names: Pre-Upgrades	Case Names: Post-Upgrades
1	**Existing Wind in New England (In-Service as of 4/1/15) ***	Pre-E	Post-E
2	**RENEW Sensitivity 1 (Less Wind) ***	Pre-Less	Post-Less
3	**Proposed Wind in New England with I.3.9 approval (as of 4/1/15)**	Pre-P	Post-P
4	**RENEW Basecase – STA-WI Studied Wind (as of 10/1/13) ***	Pre-Base	Post-Base
5	**RENEW Sensitivity 2 (More Wind)***	Pre-More	Post-More
5_{NB}	**RENEW Sensitivity 2 (More Wind)* and 1,000 MW of of NB imports available for dispatch**	Pre-More-NB	Post-More-NB
6	**All Future Queue Wind in New England (as of 4/1/15)**	Pre-F	Post-F

*Outside Maine, assumed only "existing wind" as of 4/1/15

Wind Units by Scenario and Subarea (1/3)

BHE (MW)

Area	Name	1 Existing Wind in New England (In-service 4/1/15)	2 RENEW Sensitivity 1 (Less Wind)	3 Proposed Wind in New England with I.3.9 (as of 4/1/15)	4 RENEW Basecase - STA-WI Studied Wind (as of 10/1/13)	5 RENEW Sensitivity 2 (More Wind)	5_{NB} Sensitivity 2 (More Wind) and 1,000 MW of NB imports available for dispatch	6 All Queue Wind in New England (as of 4/1/15)
BHE	QP357_Passadumkeag Windpark	0.0	0.0	40.0	40.0	40.0	40.0	40.0
BHE	QP476_Wind	0.0	0.0	0.0	52.8	52.8	52.8	52.8
BHE	Rollins Wind Plant	61.8	61.8	61.8	61.8	61.8	61.8	61.8
BHE	Stetson II Wind Farm	26.3	26.3	26.3	26.3	26.3	26.3	26.3
BHE	Stetson Wind Farm	58.7	58.7	58.7	58.7	58.7	58.7	58.7
BHE	Bull Hill Wind	34.5	34.5	34.5	34.5	34.5	34.5	34.5
BHE	QP349_Pisgah Mountain	0.0	0.0	9.1	9.1	9.1	9.1	9.1
BHE	QP397_Hancock Wind Project	0.0	0.0	0.0	51.0	51.0	51.0	51.0
BHE	QP400_Wind	0.0	0.0	0.0	0.0	0.0	0.0	90.0
BHE	QP403_Pisgah Mountain Increase (see QP249)	0.0	0.0	0.0	0.0	0.0	0.0	0.1
BHE	QP417_Wind	0.0	0.0	0.0	0.0	250.0	250.0	250.0
BHE	QP420_Wind	0.0	0.0	0.0	0.0	0.0	0.0	72.6
BHE	QP435_Wind	0.0	0.0	0.0	0.0	0.0	0.0	111.0
BHE	QP458_Wind	0.0	0.0	0.0	0.0	0.0	0.0	104.0
BHE	QP459_Wind	0.0	0.0	0.0	0.0	0.0	0.0	104.0
BHE	QP460_Wind	0.0	0.0	0.0	0.0	0.0	0.0	104.0
BHE	QP461_Wind	0.0	0.0	0.0	0.0	0.0	0.0	104.0
BHE	QP462_Wind	0.0	0.0	0.0	0.0	0.0	0.0	104.0
BHE	QP470_Wind	0.0	0.0	0.0	0.0	600.6	600.6	600.6
BHE	QP471_Wind	0.0	0.0	0.0	0.0	0.0	0.0	600.6
BHE	QP486_Wind	0.0	0.0	0.0	0.0	0.0	0.0	250.0
	BHE Total	**181.3**	**181.3**	**230.3**	**334.1**	**1184.7**	**1184.7**	**2829.0**

Wind Units by Scenario and Subarea (2/3)

ME (MW)

Area	Name	1 Existing Wind in New England (In-service 4/1/15)	2 RENEW Sensitivity 1 (Less Wind)	3 Proposed Wind in New England with I.3.9 (as of 4/1/15)	4 RENEW Basecase - STA-WI Studied Wind (as of 10/1/13)	5 RENEW Sensitivity 2 (More Wind)	5_{NB} Sensitivity 2 (More Wind) and 1,000 MW of NB imports available for dispatch	6 All Queue Wind in New England (as of 4/1/15)
ME	GMCW	10.5	10.5	10.5	10.5	10.5	10.5	10.5
ME	Kibby Wind Power	149.6	149.6	149.6	149.6	149.6	149.6	149.6
ME	QP272_Oakfield II Wind – Keene Road	0.0	147.6	147.6	147.6	147.6	147.6	147.6
ME	Saddleback Ridge Wind	34.2	34.2	34.2	34.2	34.2	34.2	34.2
ME	Spruce Mountain Wind	20.0	20.0	20.0	20.0	20.0	20.0	20.0
ME	QP300_Canton Mountain Winds	0.0	22.8	22.8	22.8	22.8	22.8	22.8
ME	QP333_Bingham Wind	0.0	0.0	184.8	184.8	184.8	184.8	184.8
ME	QP350-1_Wind (Withdrawn as of 4/1/15)	0.0	0.0	0.0	92.0	92.0	92.0	0.0
ME	QP350-2_Wind	0.0	0.0	0.0	96.9	96.9	96.9	96.9
ME	QP393_Wind	0.0	0.0	0.0	0.0	84.0	84.0	84.0
ME	QP406_Canton Increase and CNR (see QP300)	0.0	0.0	0.0	0.0	0.0	0.0	3.6
ME	QP407_Saddleback Increase and CNR (see QP287)	0.0	0.0	0.0	0.0	0.0	0.0	1.2
ME	QP452_Wind	0.0	0.0	0.0	0.0	0.0	0.0	85.8
ME	Record Hill Wind	50.6	50.6	50.6	50.6	50.6	50.6	50.6
ME	WND_MISC_ME	6.3	6.3	6.3	6.3	6.3	6.3	6.3
	ME Total	**271.2**	**441.6**	**626.4**	**815.3**	**899.3**	**899.3**	**897.9**

Wind Units by Scenario and Subarea (3/3)

BST, CMA/NEMA, NH, RI, SEMA, VT, WMA (MW)

Area	Name	1 Existing Wind in New England (In-service 4/1/15)	2 RENEW Sensitivity 1 (Less Wind)	3 Proposed Wind in New England with I.3.9 (as of 4/1/15)	4 RENEW Basecase - STA-WI Studied Wind (as of 10/1/13)	5 RENEW Sensitivity 2 (More Wind)	5_{NB} Sensitivity 2 (More Wind) and 1,000 MW of NB imports available for dispatch	6 All Queue Wind in New England (as of 4/1/15)
BST	WND_MISC_BST	12.2	12.2	12.2	12.2	12.2	12.2	12.2
CMA NEMA	WND_MISC_CMANEMA	4.0	4.0	4.0	4.0	4.0	4.0	4.0
CMA NEMA	Princeton Wind Farm Project	3.0	3.0	3.0	3.0	3.0	3.0	3.0
NH	Lempster Wind	25.3	25.3	25.3	25.3	25.3	25.3	25.3
NH	Granite Reliable Power	120.2	120.2	120.2	120.2	120.2	120.2	120.2
NH	QP415_Jericho Wind	0.0	0.0	12.1	0.0	0.0	0.0	12.1
NH	Groton Wind Project	50.5	50.5	50.5	50.5	50.5	50.5	50.5
NH	QP390_Wind	0.0	0.0	50.8	0.0	0.0	0.0	50.8
NH	QP543_Wind	0.0	0.0	0.0	0.0	0.0	0.0	28.4
RI	WND_MISC_RI	7.2	7.2	7.2	7.2	7.2	7.2	7.2
SEMA	WND_MISC_SEMA	22.9	22.9	22.9	22.9	22.9	22.9	22.9
VT	Sheffield Wind Farm	40.0	40.0	40.0	40.0	40.0	40.0	40.0
VT	Searsburg Wind	1.7	1.7	1.7	1.7	1.7	1.7	1.7
VT	Kingdom Community Wind	81.5	81.5	81.5	81.5	81.5	81.5	81.5
VT	QP532_Wind	0.0	0.0	0.0	0.0	0.0	0.0	19.9
VT	QP536_Wind	0.0	0.0	0.0	0.0	0.0	0.0	5.0
VT	QP488_Wind	0.0	0.0	0.0	0.0	0.0	0.0	96.9
WMA	QP396_Berkshire Wind Increase	0.0	0.0	0.0	0.0	0.0	0.0	4.8
WMA	QP539_CNR Only	31.7	31.7	31.7	31.7	31.7	31.7	31.7
WMA	QP477_Wind	0.0	0.0	0.0	0.0	0.0	0.0	30.0
WMA	QP535_Wind	0.0	0.0	0.0	0.0	0.0	0.0	5.0
WMA	Berkshire East Wind	16.7	16.7	16.7	16.7	16.7	16.7	16.7
WMA	WND_MISC_WMA	8.8	8.8	8.8	8.8	8.8	8.8	8.8
	Outside Maine Total	**425.6**	**425.6**	**488.5**	**425.6**	**425.6**	**425.6**	**678.4**

Maine Interface Upgrades

- Conceptual transmission upgrades
  - Used upgraded interface limits identified in the 2012-2014 Strategic Transmission Analysis – Wind Integration
  - Specific upgrades to accomplish changes are not defined
- Maine stability / voltage interface limit increases
  - Orrington-South
    - 2021 limit is 1,325 MW
    - 2021 plus upgrades limit is 1,650 MW
  - Surowiec-South
    - 2021 limit is 1,500 MW
    - 2021 plus upgrades limit is 2,100 MW
  - ME-NH
    - 2021 limit is 1,900 MW
    - 2021 plus upgrades limit is 2,300 MW

Scenario Specific

New Brunswick Imports

- Cases 1, 2, 3, 4, 5, and 6
  - Daily diurnal curves
  - Historical monthly maximum imports for 2013-2014
- Sensitivity case (5_{NB}) evaluate the impact of additional New Brunswick imports
  - Assumed 1,000 MW of available imports for dispatch ($10/MWh threshold price)

APPENDIX II

Generation by Resource Type Metrics

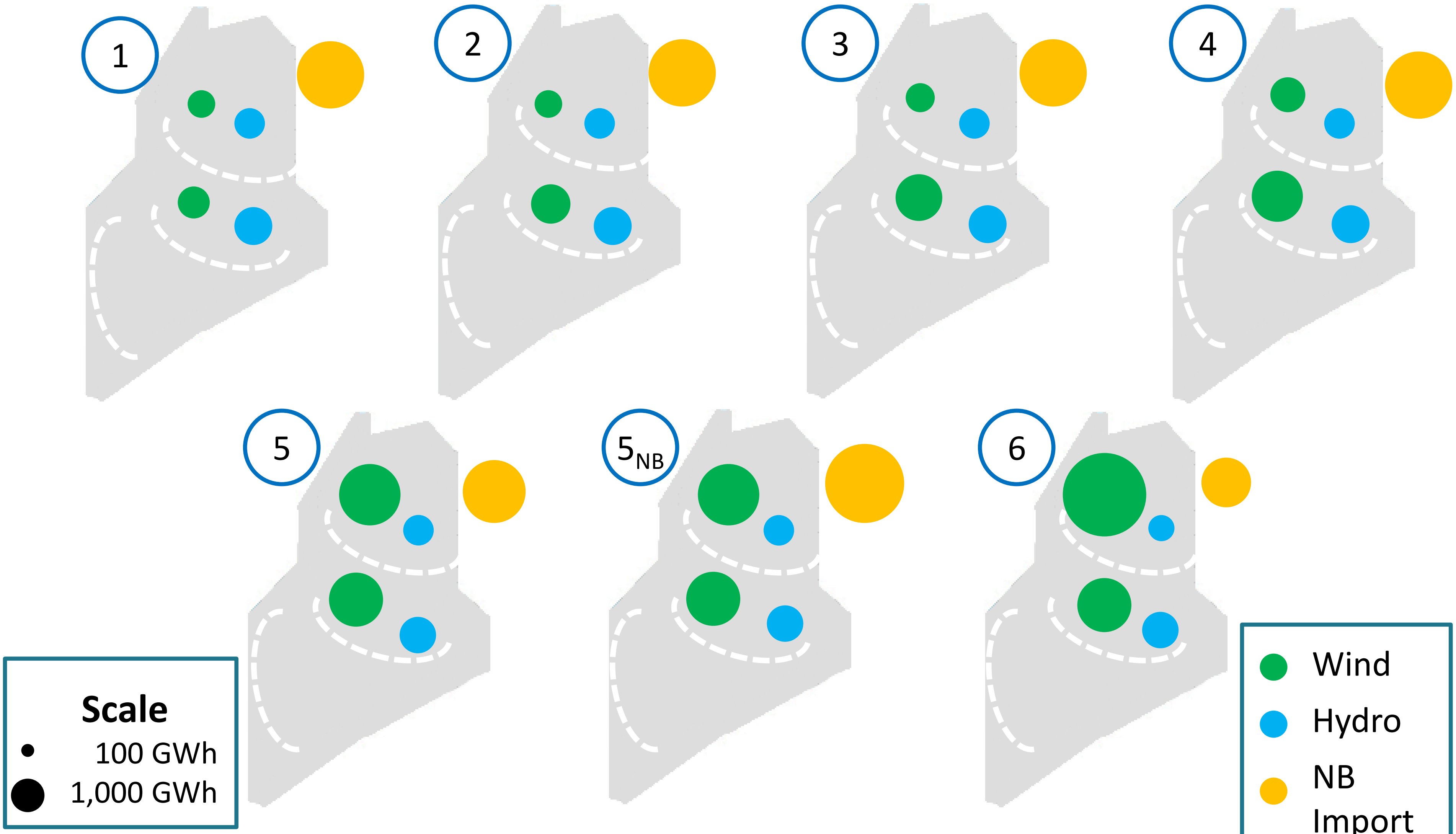
Maine Generation (GWh)

Scenarios	Wind ($0 Threshold Price)		Hydro ($5 Threshold Price)		NB Import ($10 Threshold Price)	
	Pre-Upgrades	Post-Upgrades	Pre-Upgrades	Post-Upgrades	Pre-Upgrades	Post-Upgrades
1	1,454	1,454	2,060	2,060	4,592	4,592
2	2,025	2,025	2,060	2,060	4,582	4,592
3	2,793	2,793	2,060	2,060	4,573	4,592
4	3,634	3,635	2,060	2,060	4,535	4,592
5	6,615	6,620	2,042	2,047	3,889	4,398
5_{NB}	6,620	6,623	2,046	2,047	6,325	7,732
6	10,058	10,758	1,698	1,790	2,418	3,032

Note: Values may not sum to total due to rounding
*Outside Maine, assumed only "existing wind" as of 4/1/15

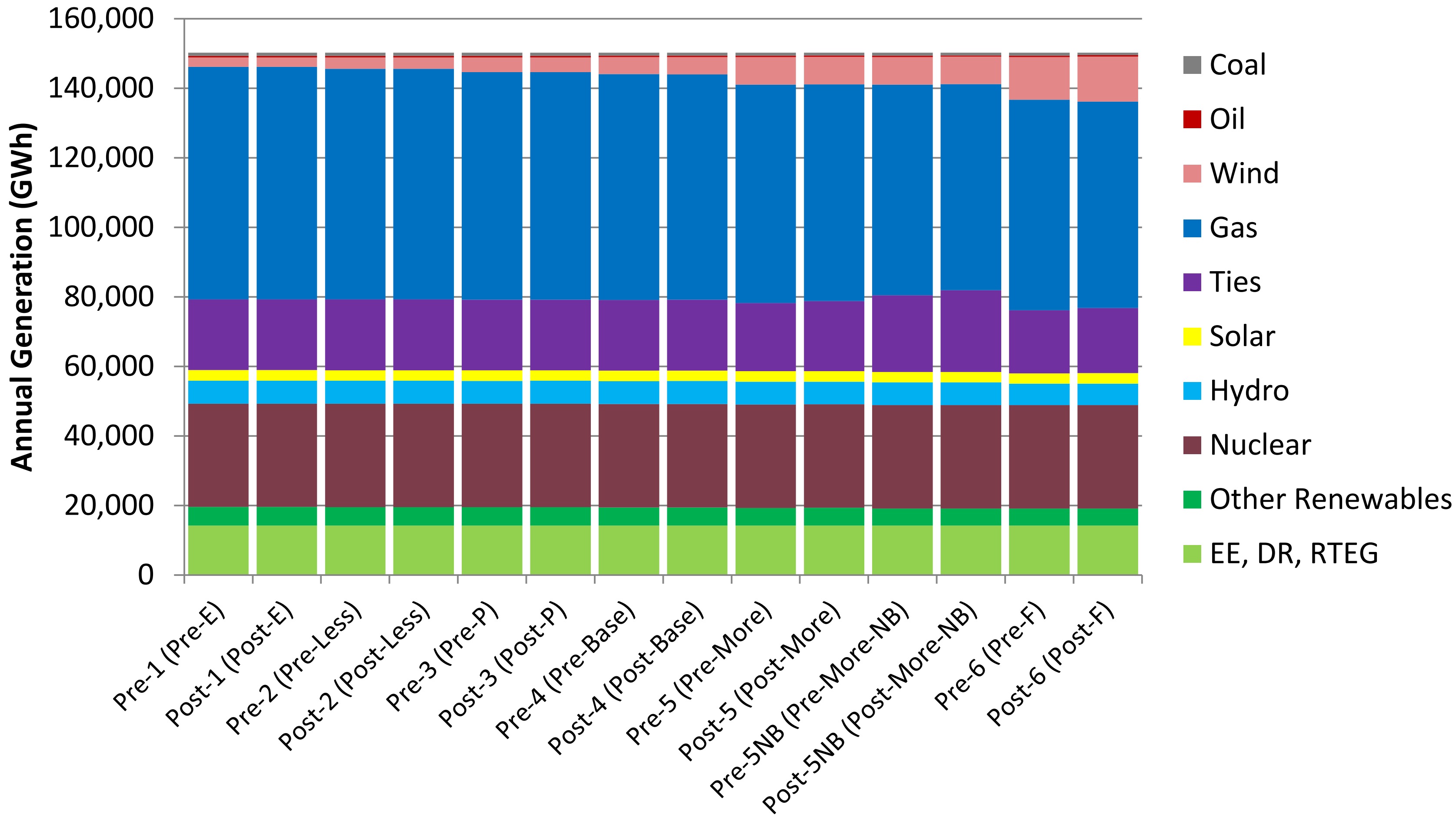
Maine Generation (GWh)

Pre-Upgrades (approximately represented by shape size in subarea)



Annual Generation by Resource Type

Graph



Annual Generation by Resource Type (GWH)

Table

Cases	Resource Type									
	EE, DR, RTEG	Other Renewables	Nuclear	Hydro	Solar	Ties	Gas	Wind	Oil	Coal
Pre-1 (Pre-E)	14,238	5,307	29,754	6,631	2,990	20,371	66,852	2,735	405	938
Post-1 (Post-E)	14,238	5,308	29,754	6,631	2,990	20,371	66,853	2,735	403	938
Pre-2 (Pre-Less)	14,238	5,279	29,754	6,625	2,990	20,362	66,325	3,324	405	919
Post-2 (Post-Less)	14,238	5,289	29,754	6,626	2,990	20,371	66,309	3,324	402	919
Pre-3 (Pre-P)	14,238	5,242	29,754	6,614	2,990	20,344	65,438	4,264	403	936
Post-3 (Post-P)	14,238	5,256	29,754	6,615	2,990	20,363	65,401	4,264	405	935
Pre-4 (Pre-Base)	14,238	5,179	29,754	6,611	2,990	20,308	64,951	4,933	407	850
Post-4 (Post-Base)	14,238	5,199	29,754	6,609	2,990	20,364	64,874	4,934	402	858
Pre-5 (Pre-More)	14,238	5,041	29,754	6,572	2,990	19,664	62,806	7,914	400	840
Post-5 (Post-More)	14,238	5,079	29,754	6,550	2,990	20,167	62,350	7,920	386	786
Pre-5NB (Pre-More-NB)	14,238	4,844	29,754	6,563	2,990	22,100	60,570	7,920	400	842
Post-5NB (Post-More-NB)	14,238	4,889	29,754	6,521	2,990	23,502	59,270	7,922	381	753
Pre-6 (Pre-F)	14,238	4,871	29,754	6,153	2,989	18,179	60,551	12,207	413	843
Post-6 (Post-F)	14,238	4,864	29,754	6,190	2,990	18,784	59,369	12,907	378	724

Annual Generation by Resource Type (GWH)

Table - Effect of Relaxing Maine Interfaces (Post minus Pre)

Scenarios	Resource Type									
	EE, DR, RTEG	Other Renewables	Nuclear	Hydro	Solar	Ties	Gas	Wind	Oil	Coal
1	0.0	1.0	0.0	0.0	0.0	0.0	0.8	0.0	-1.7	-0.1
2	0.0	9.6	0.0	1.0	0.0	9.2	-16.2	0.0	-3.4	-0.4
3	0.0	14.8	0.0	1.5	0.0	19.1	-36.6	0.0	2.0	-0.9
4	0.0	19.7	0.0	-1.9	0.0	56.1	-76.9	0.6	-5.6	8.0
5	0.0	37.9	0.0	-22.0	0.0	502.7	-455.7	5.5	-14.0	-54.3
5_{NB}	0.0	44.2	0.0	-41.4	0.0	1,402.4	-1,299.6	2.3	-19.1	-88.7
6	0.0	-6.5	0.0	36.7	0.3	605.0	-1,182.1	699.9	-34.3	-118.9

APPENDIX III

Air Emissions Metrics

CO_2 Systemwide Emission Reductions due to ME Interface Upgrades (k short ton**)

Changes (%) in emissions are small relative to systemwide emissions

	Scenarios	CO_2 Emissions (kton)		CO_2 Reduction	
		Pre-Upgrades	Post-Upgrades	kton	% of 32,000 kton
1	Existing Wind in New England (In-Service as of 4/1/15) *	31,775	31,775	1	**0**
2	RENEW Sensitivity 1 (Less Wind) *	31,483	31,485	-3	**0**
3	Proposed Wind in New England with I.3.9 approval (as of 4/1/15)	31,047	31,054	-7	**0**
4	RENEW Basecase – STA-WI Studied Wind (as of 10/1/13) *	30,633	30,631	3	**0**
5	RENEW Sensitivity 2 (More Wind)*	29,462	29,246	216	**1**
5_{NB}	RENEW Sensitivity 2 (More Wind)* and 1,000 MW of NB imports available for dispatch	28,190	27,572	618	**2**
6	All Future Queue Wind in New England (as of 4/1/15)	28,250	27,549	701	**2**

Note: Values may not sum to total due to rounding

*Outside Maine, assumed only "existing wind" as of 4/1/15

**1 kton = 1,000 short ton = 2,000,000 lb

SO_2 Systemwide Emission Reductions due to ME Interface Upgrades (short ton**)

Changes (%) in emissions are small relative to systemwide emissions

Scenarios		SO_2 Emissions (ton)		SO_2 Reduction	
		Pre-Upgrades	Post-Upgrades	ton	% of 3,200 ton
1	Existing Wind in New England (In-Service as of 4/1/15) *	3,054	3,050	4	**0**
2	RENEW Sensitivity 1 (Less Wind) *	3,020	3,014	7	**0**
3	Proposed Wind in New England with I.3.9 approval (as of 4/1/15)	3,010	3,016	-6	**0**
4	RENEW Basecase – STA-WI Studied Wind (as of 10/1/13) *	2,923	2,901	22	**1**
5	RENEW Sensitivity 2 (More Wind)*	2,864	2,737	127	**4**
5_{NB}	RENEW Sensitivity 2 (More Wind)* and 1,000 MW of NB imports available for dispatch	2,817	2,614	203	**6**
6	All Future Queue Wind in New England (as of 4/1/15)	2,801	2,536	264	**8**

Note: Values may not sum to total due to rounding

*Outside Maine, assumed only "existing wind" as of 4/1/15

**1 short ton = 2,000 lb

NO_X Systemwide Emission Reductions due to ME Interface Upgrades (short ton**)

Changes (%) in emissions are small relative to systemwide emissions

Scenarios		NO_X Emissions (ton)		NO_X Reduction	
		Pre-Upgrades	Post-Upgrades	ton	% of 9,300 ton
1	Existing Wind in New England (In-Service as of 4/1/15) *	9,284	9,283	1	0
2	RENEW Sensitivity 1 (Less Wind) *	9,199	9,199	-1	0
3	Proposed Wind in New England with I.3.9 approval (as of 4/1/15)	9,121	9,132	-11	0
4	RENEW Basecase – STA-WI Studied Wind (as of 10/1/13) *	8,921	8,935	-14	0
5	RENEW Sensitivity 2 (More Wind)*	8,632	8,535	97	1
5_{NB}	RENEW Sensitivity 2 (More Wind)* and 1,000 MW of NB imports available for dispatch	8,314	8,108	205	2
6	All Future Queue Wind in New England (as of 4/1/15)	8,346	8,037	309	3

Note: Values may not sum to total due to rounding

*Outside Maine, assumed only "existing wind" as of 4/1/15

**1 short ton = 2,000 lb

APPENDIX IV

Bottled-in Energy

Bottled-In Energy (GWh)

BHE - RSP Subarea

Scenarios	Wind ($0 Threshold Price)		Hydro ($5 Threshold Price)		NB Import ($10 Threshold Price)	
	Pre-Upgrades	Post-Upgrades	Pre-Upgrades	Post-Upgrades	Pre-Upgrades	Post-Upgrades
1	0	0	0	0	0	0
2	0	0	0	0	9	0
3	0	0	0	0	19	0
4	0	0	0	0	57	0
5	2	0	5	4	702	194
5_{NB}	0	0	1	0	2,435	1,028
6	1,529	836	250	171	2,174	1,560

*Outside Maine, assumed only "existing wind" as of 4/1/15

Bottled-In Energy (GWh)

ME - RSP Subarea

Scenarios	Wind ($0 Threshold Price)		Hydro ($5 Threshold Price)	
	Pre-Upgrades	Post-Upgrades	Pre-Upgrades	Post-Upgrades
1	14	14	0	0
2	14	14	0	0
3	15	15	0	0
4	92	91	0	0
5	97	92	17	12
5_{NB}	92	89	13	12
6	1,641	941	362	270

*Outside Maine, assumed only "existing wind" as of 4/1/15

Bottled-In Energy (GWh)

SME - RSP Subarea

Scenarios	Wind ($0 Threshold Price)		Hydro ($5 Threshold Price)	
	Pre-Upgrades	Post-Upgrades	Pre-Upgrades	Post-Upgrades
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
5_{NB}	0	0	0	0
6	0	0	0	0

*Outside Maine, assumed only "existing wind" as of 4/1/15

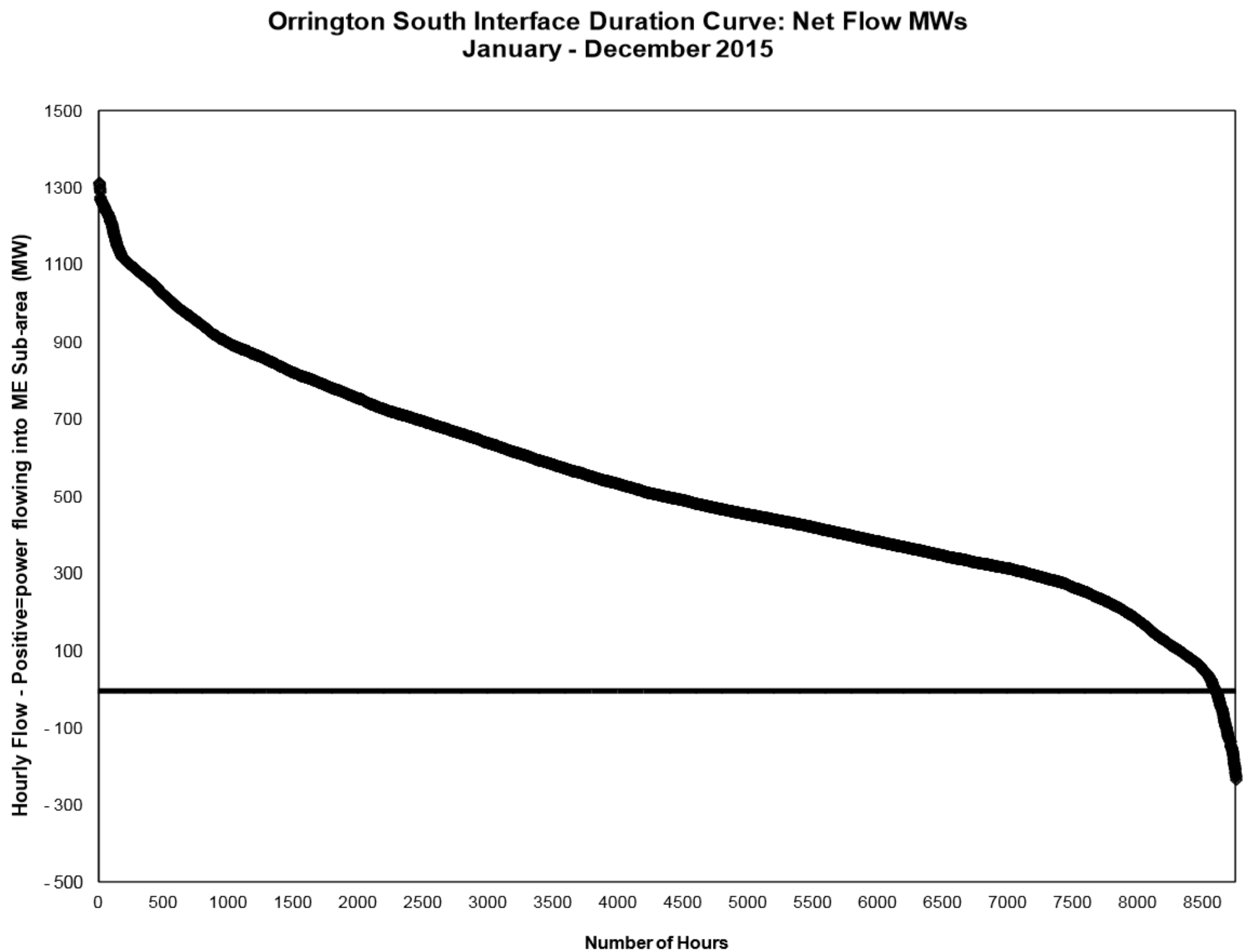
APPENDIX V

Interface Flow Metrics

- *Historical*
- *Draft Study Results*

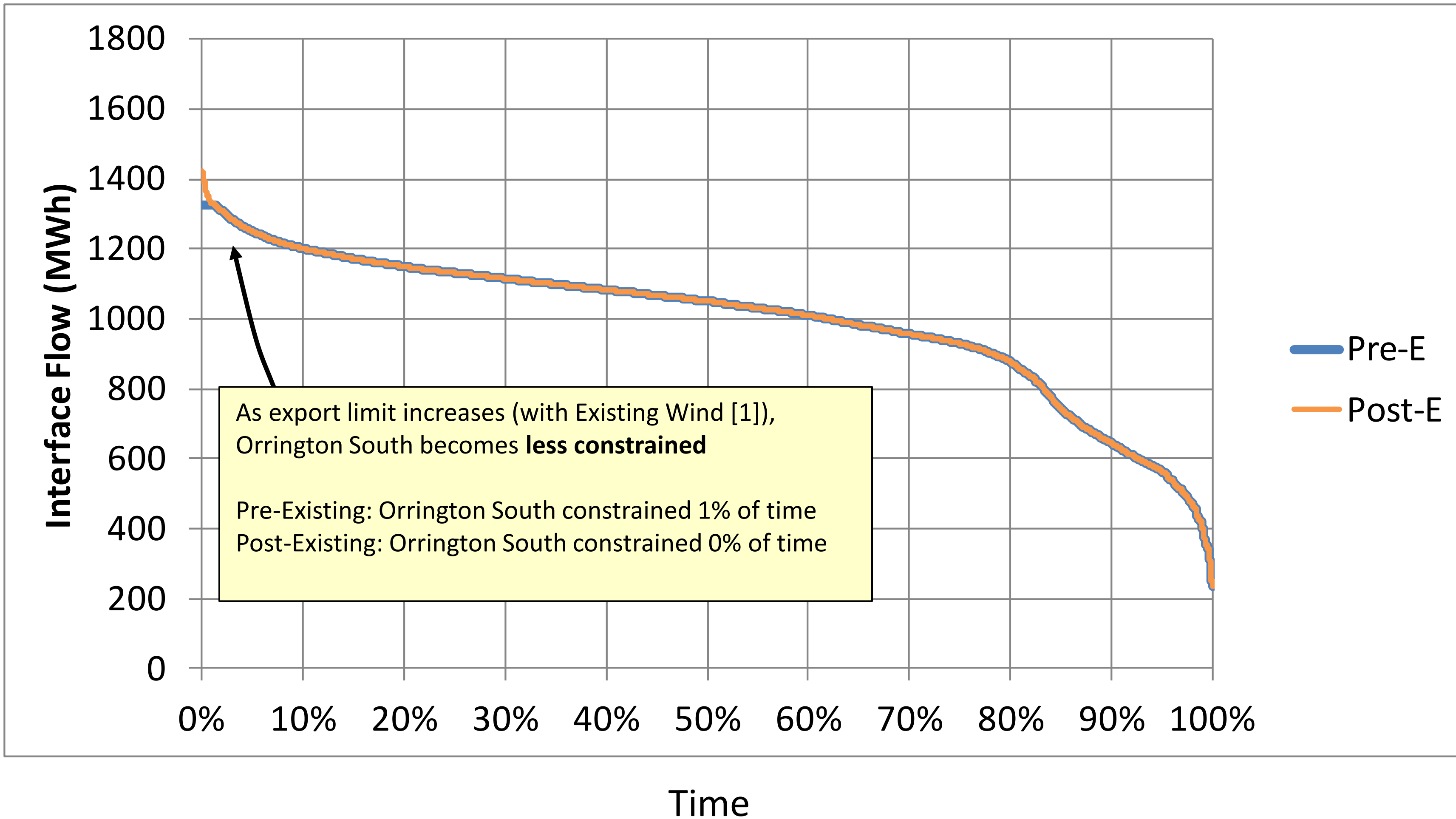
2015 Historical Interface Flow (MW)

Orrington South (1,325 MW limit)



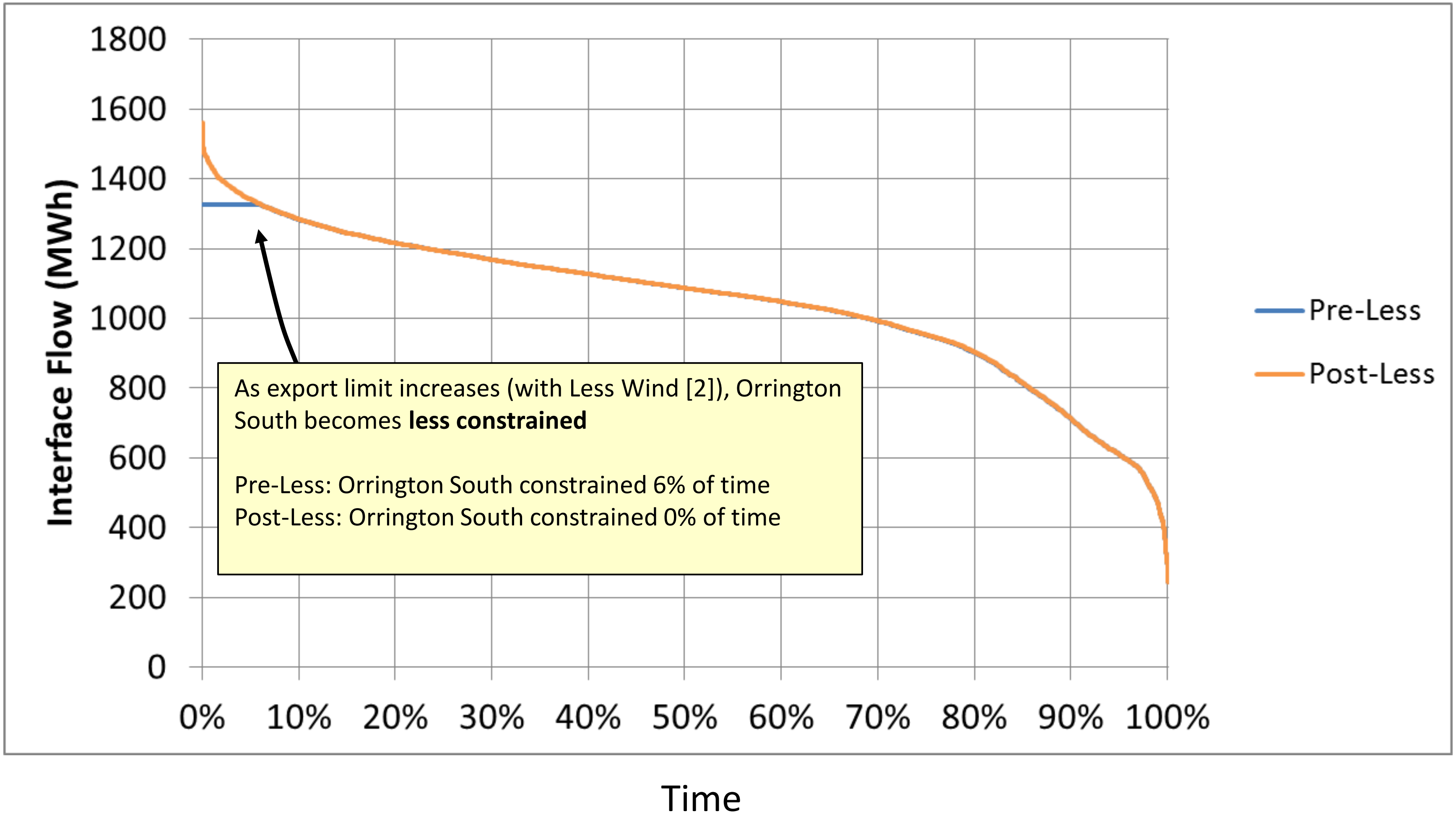
Interface: Orrington South – Existing Wind

Duration Curve



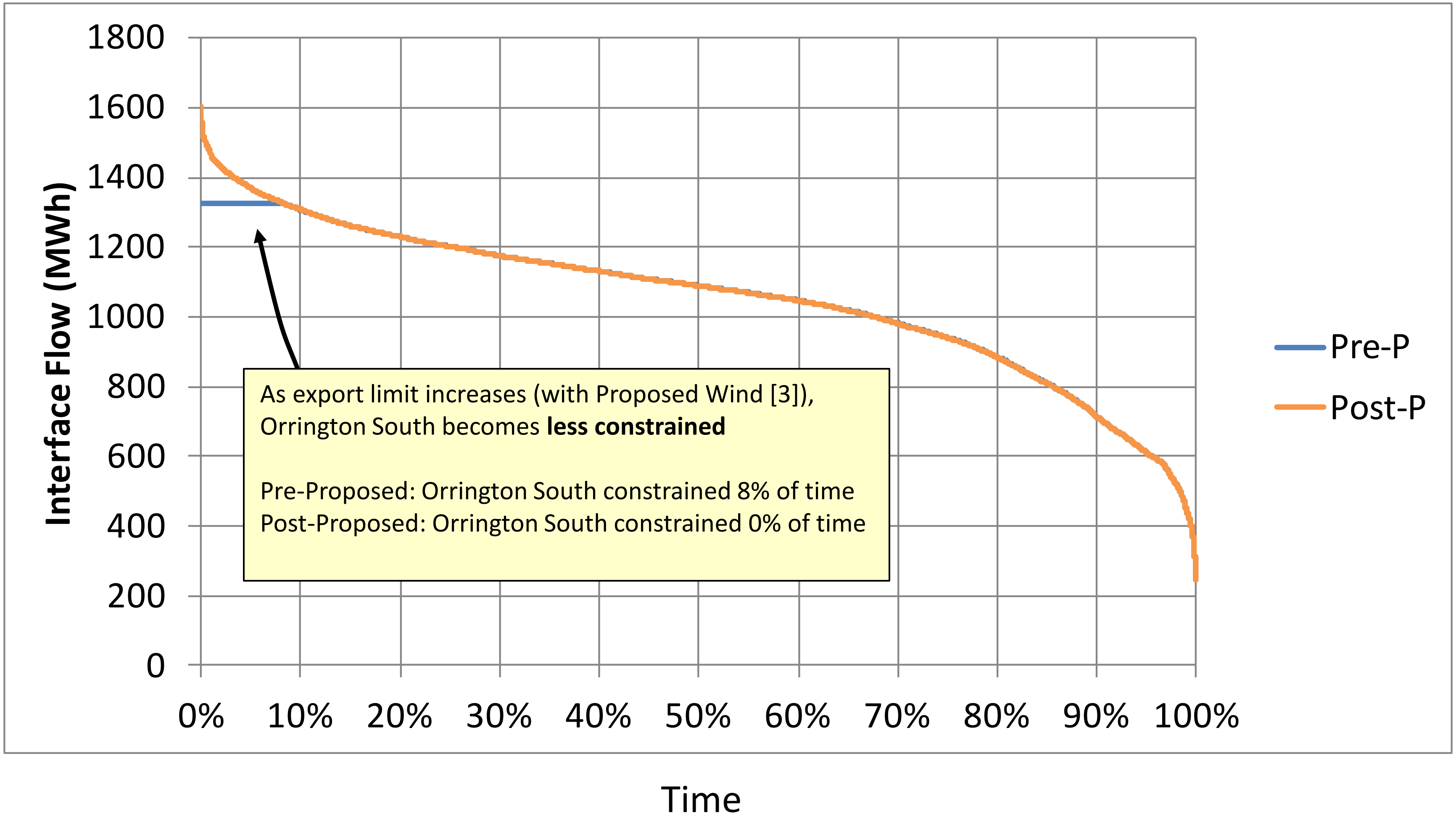
Interface: Orrington South – Less Wind

Duration Curve



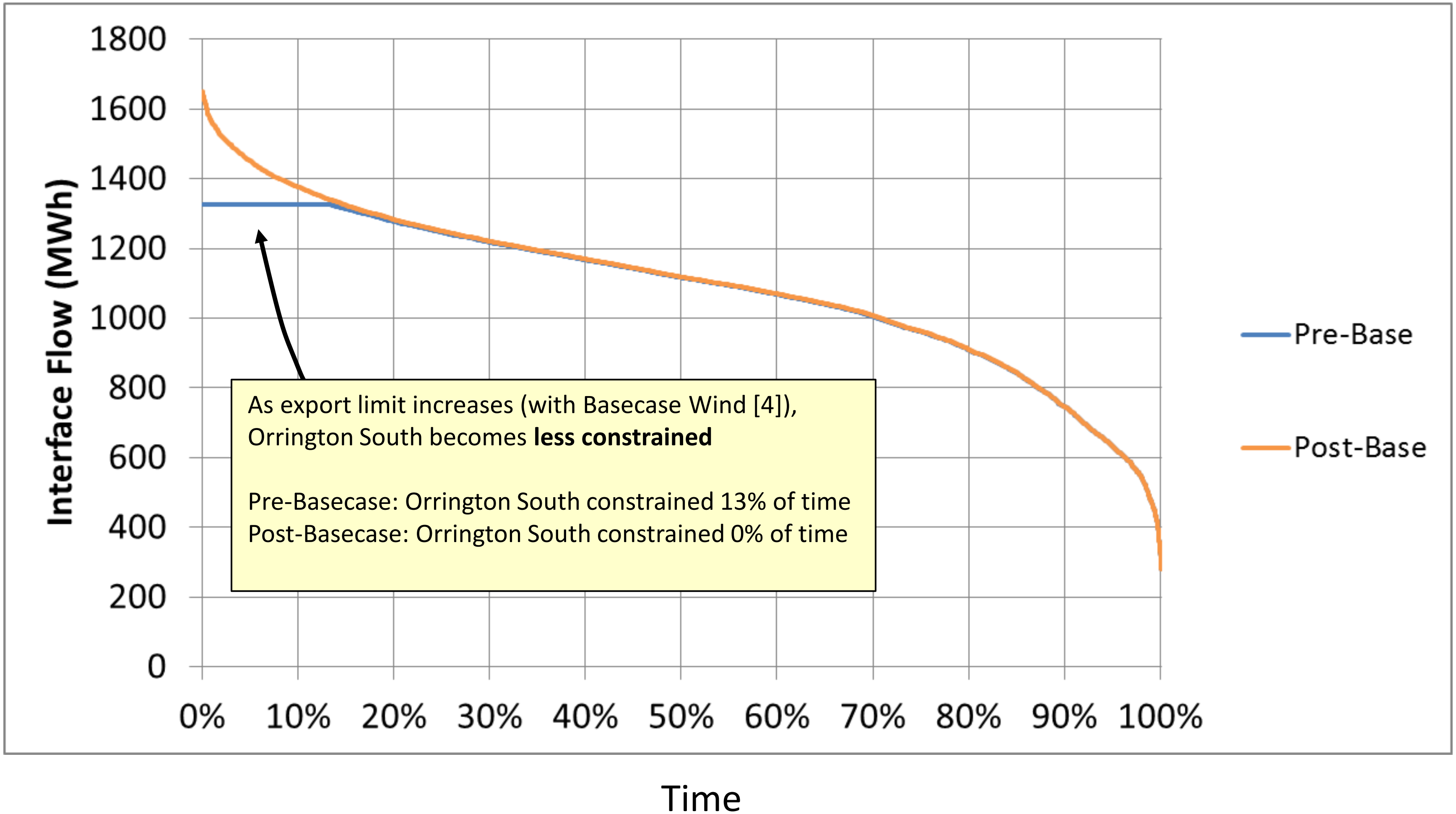
Interface: Orrington South – Proposed Wind

Duration Curve



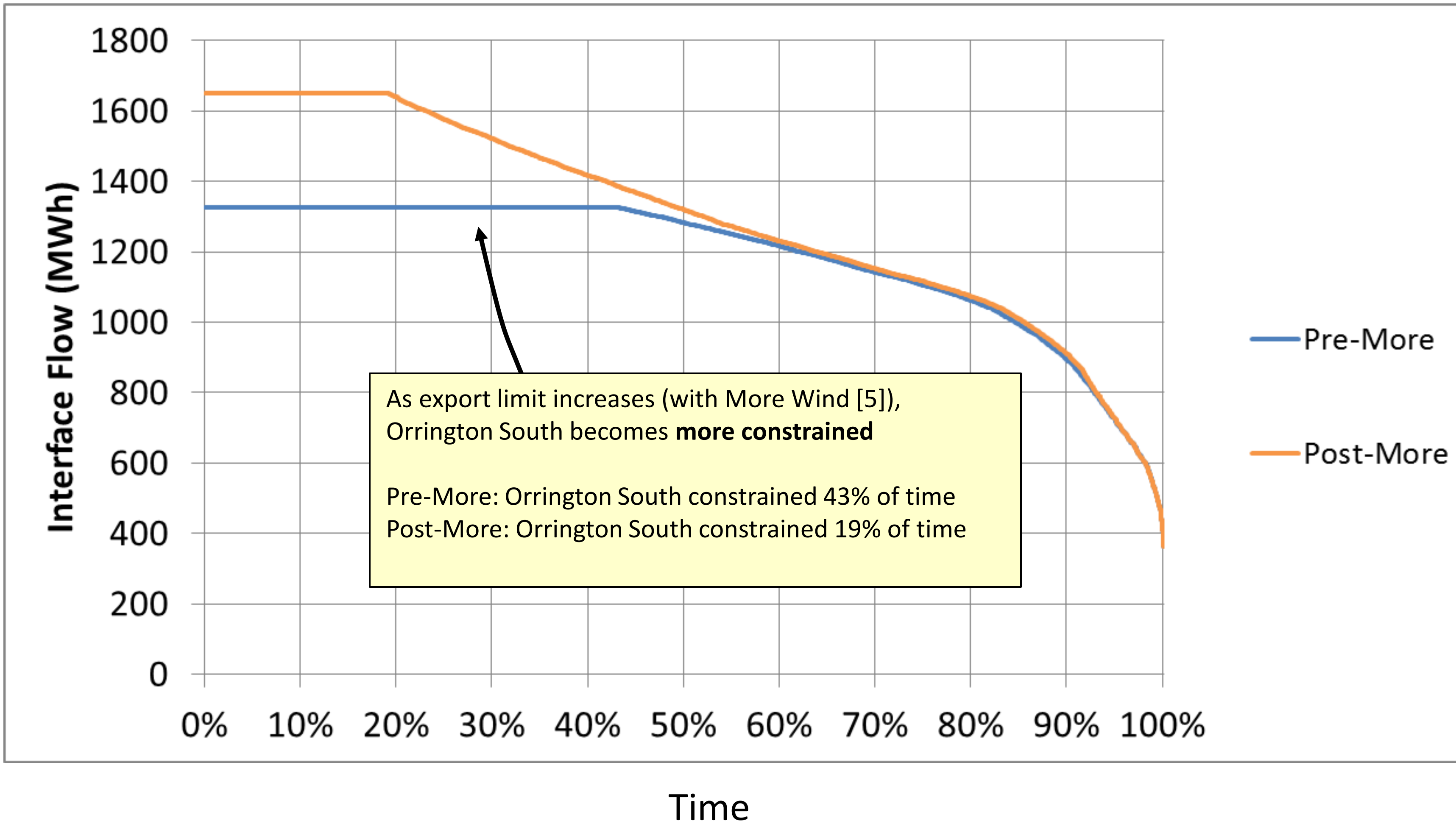
Interface: Orrington South – Basecase Wind

Duration Curve



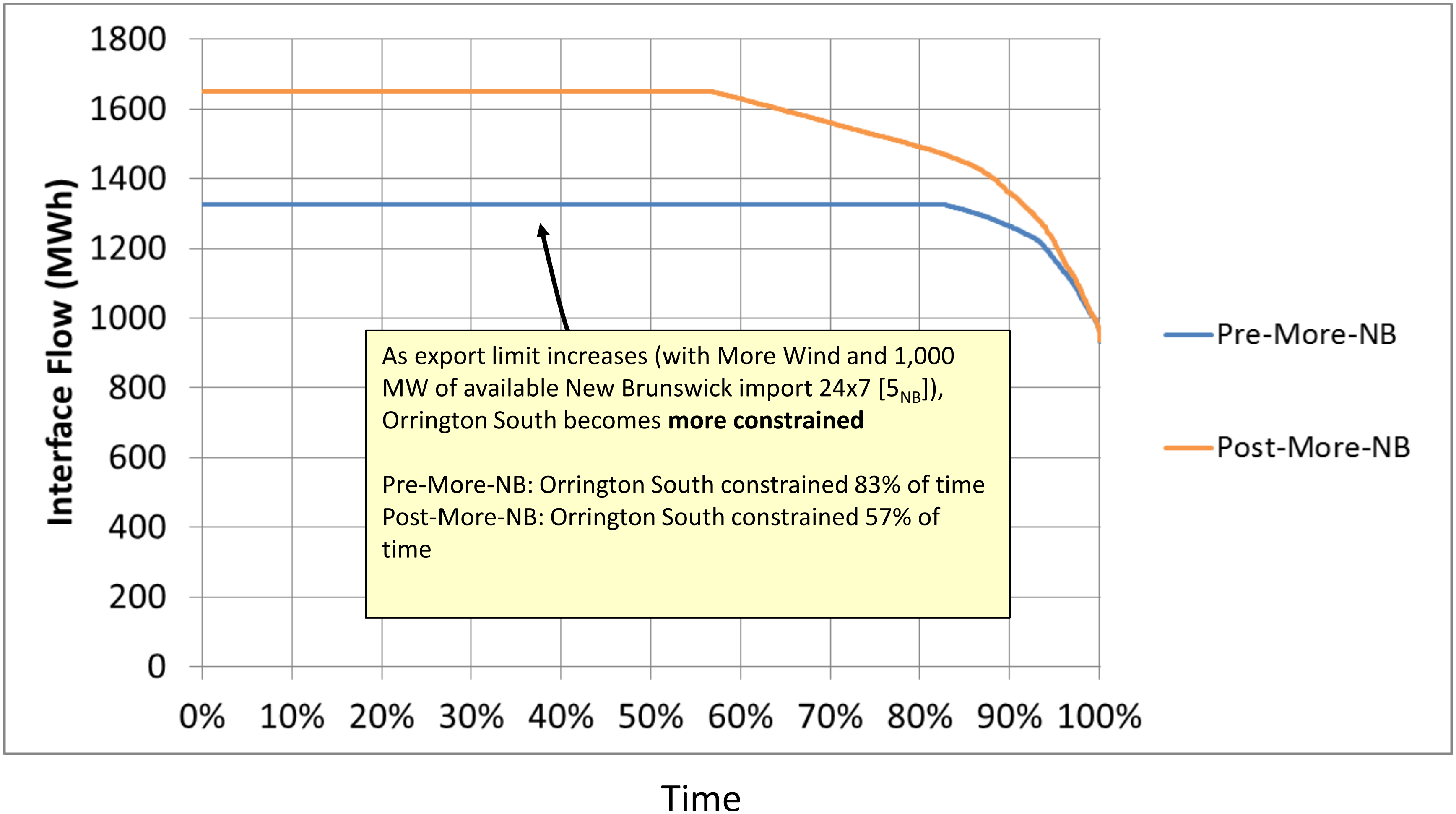
Interface: Orrington South – More Wind

Duration Curve



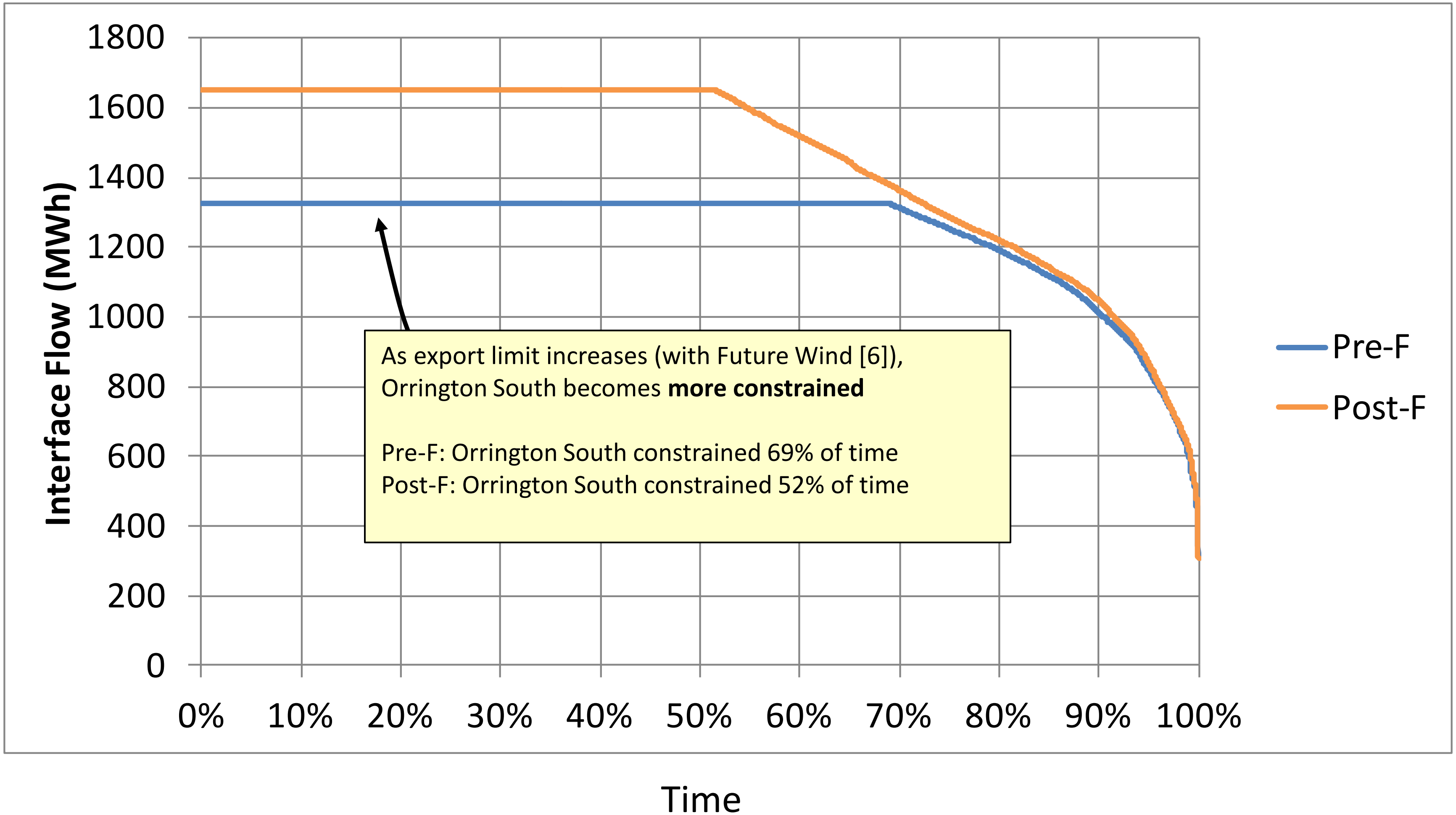
Interface: Orrington South – More Wind with NB at 1000 MW

Duration Curve



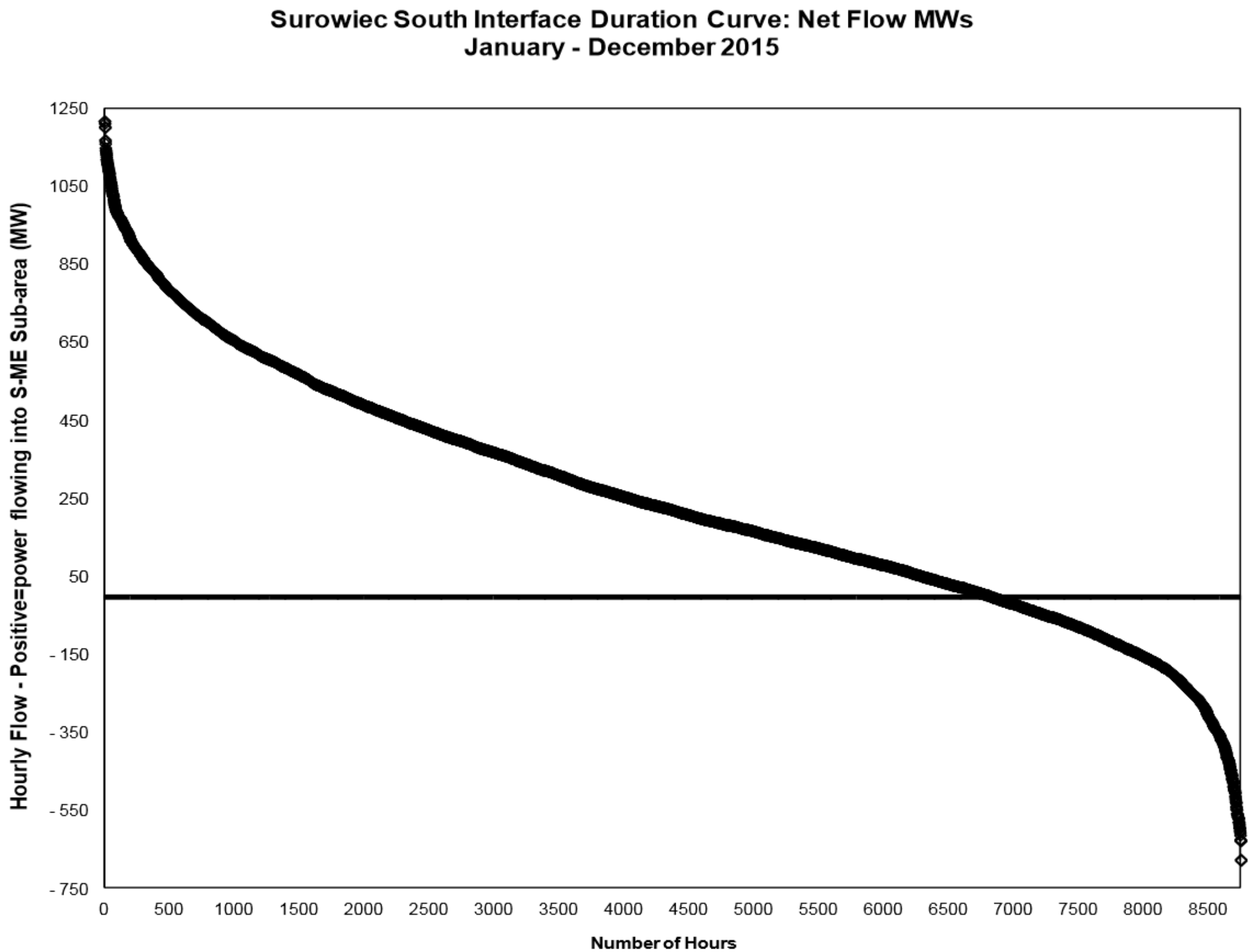
Interface: Orrington South – Future Wind

Duration Curve



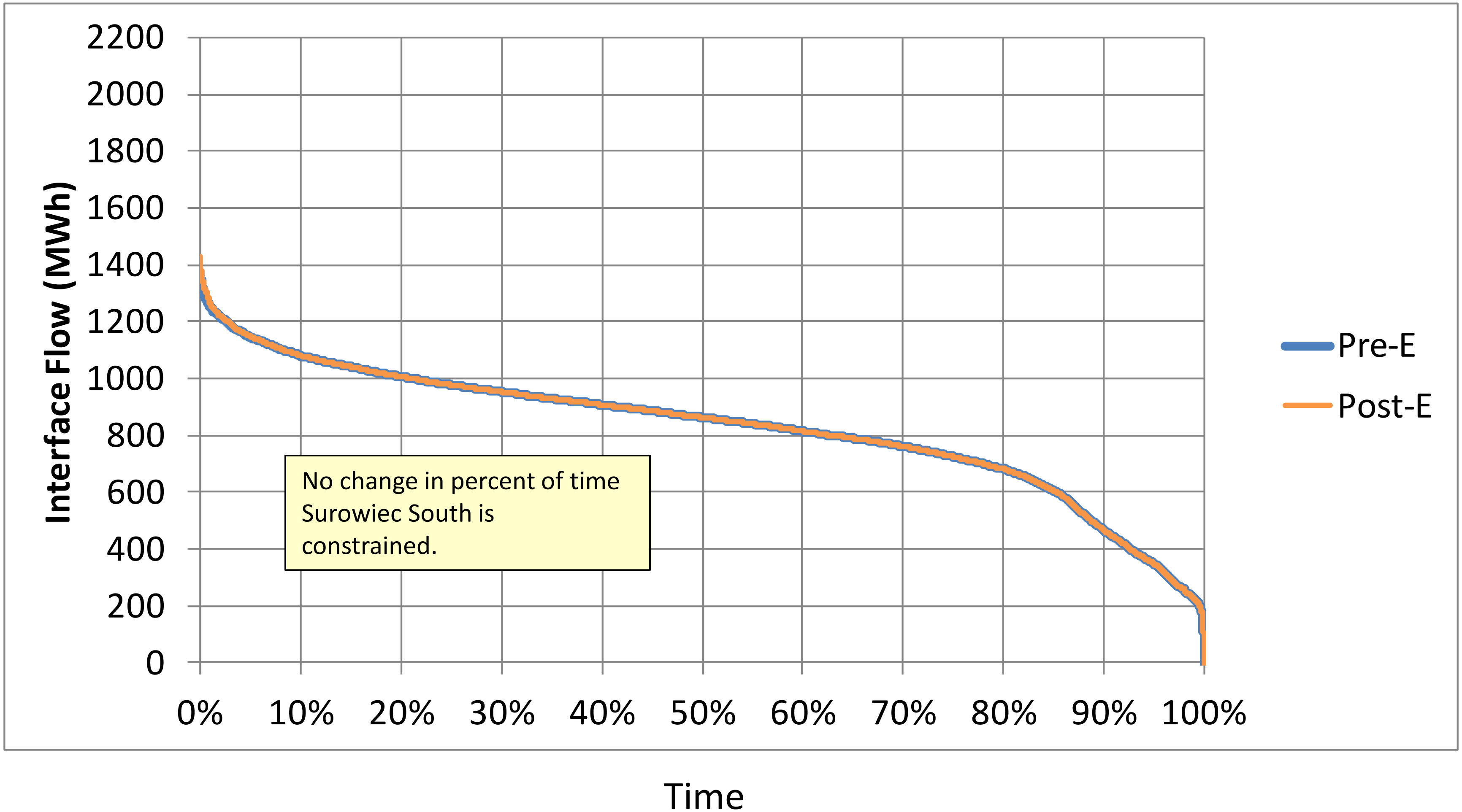
2015 Historical Interface Flow (MW)

Surowiec South (1,500 MW limit)



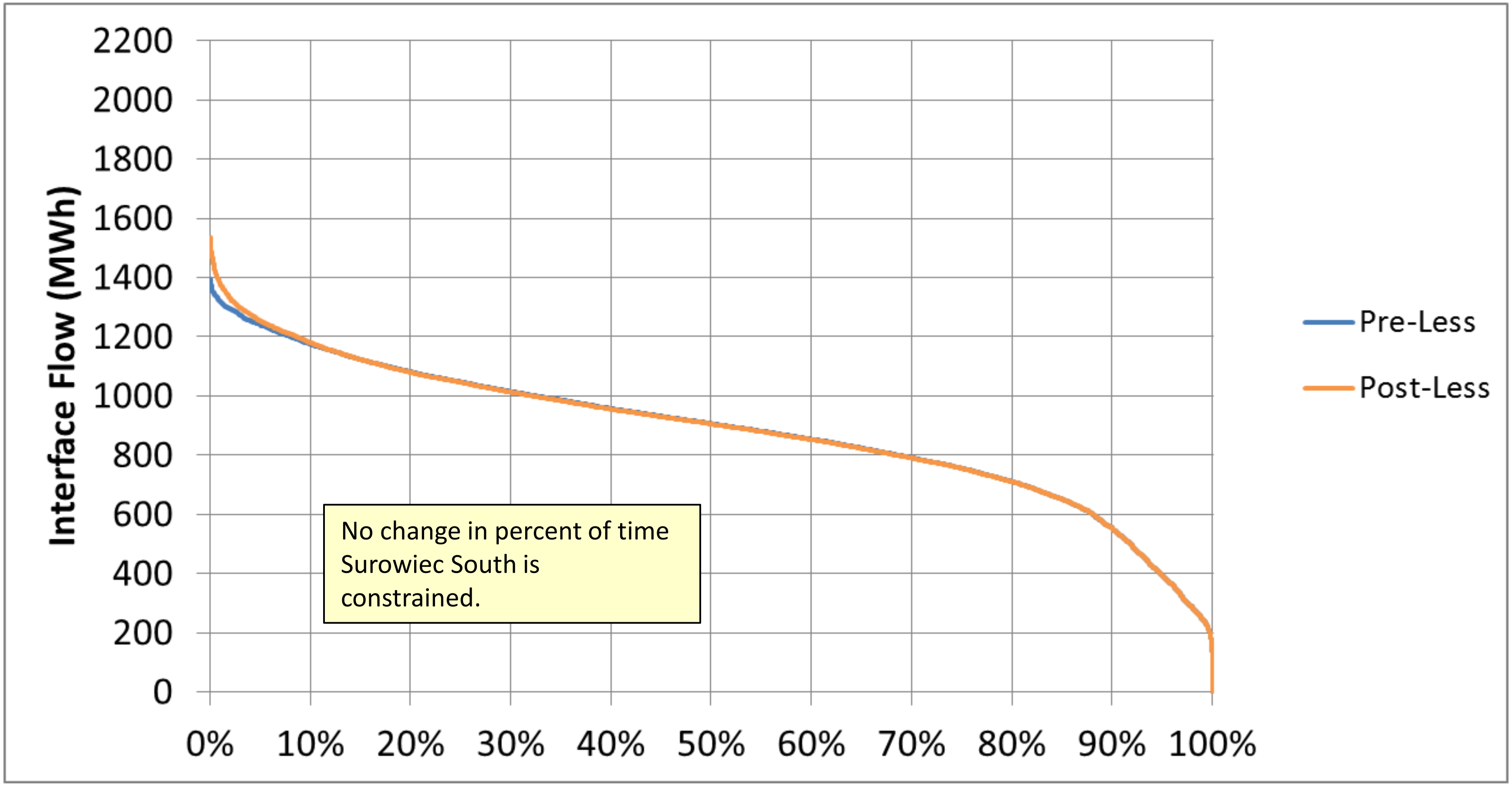
Interface: Surowiec South – Existing Wind

Duration Curve



Interface: Surowiec South – Less Wind

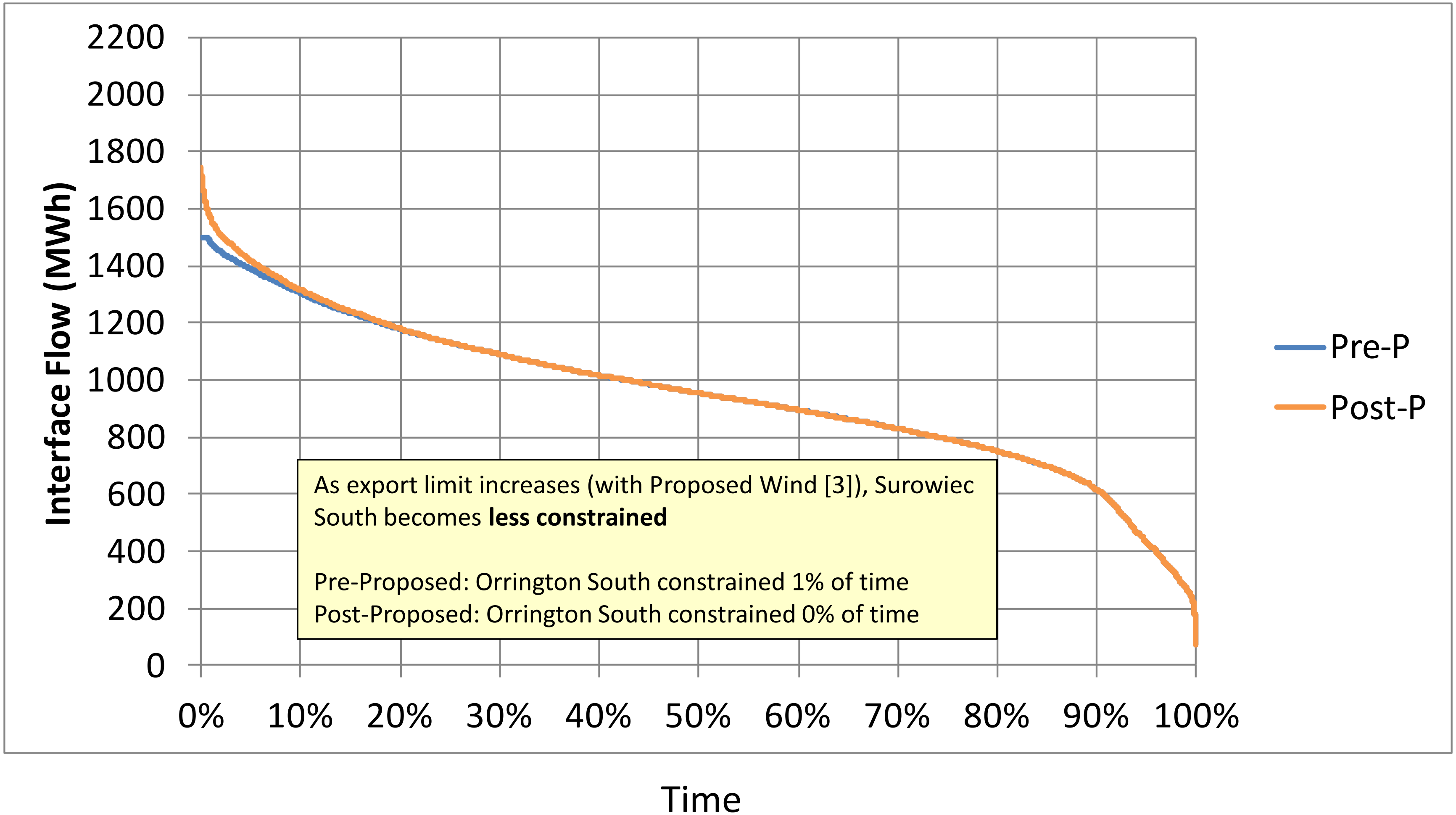
Duration Curve



Time

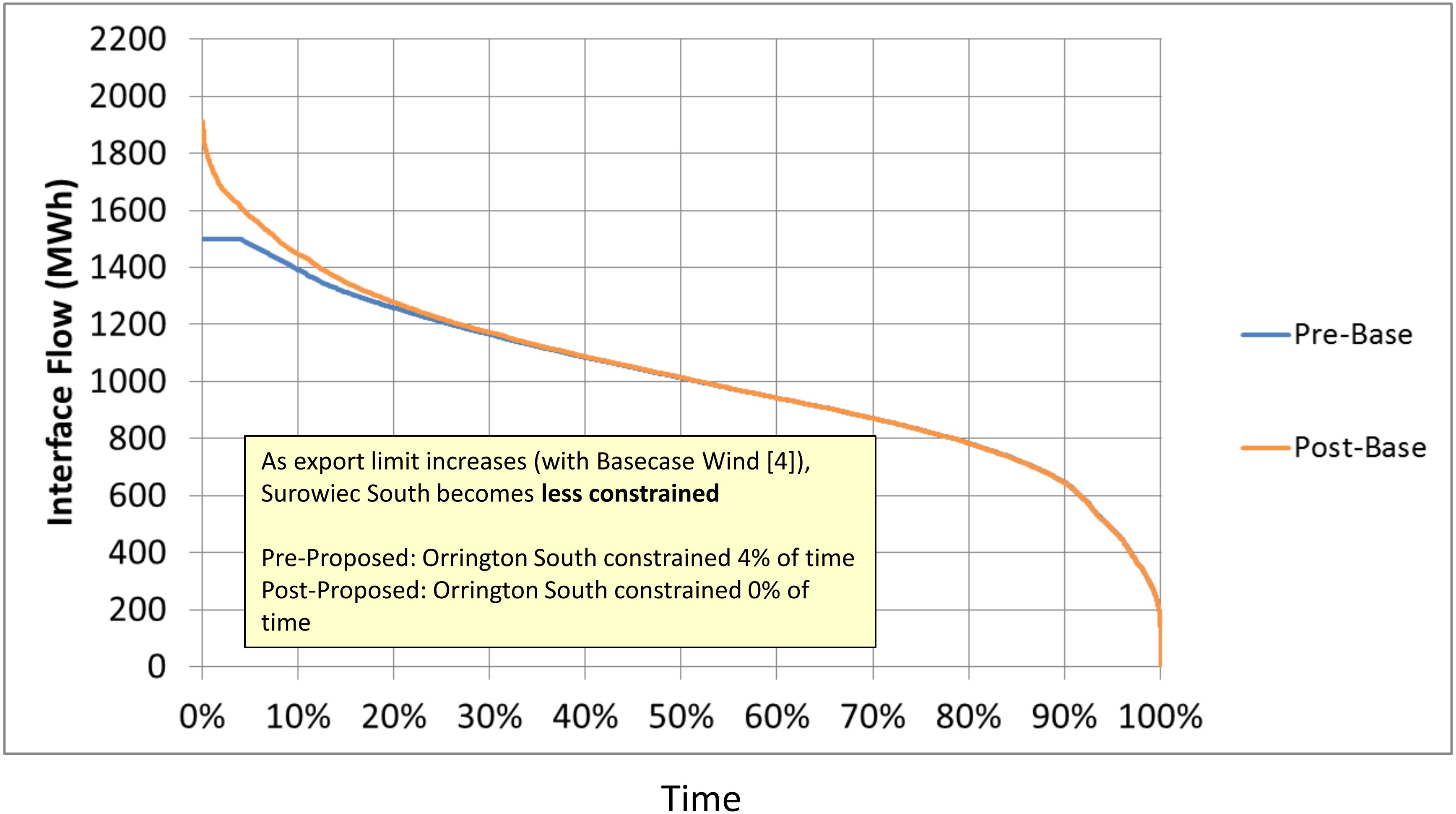
Interface: Surowiec South – Proposed Wind

Duration Curve



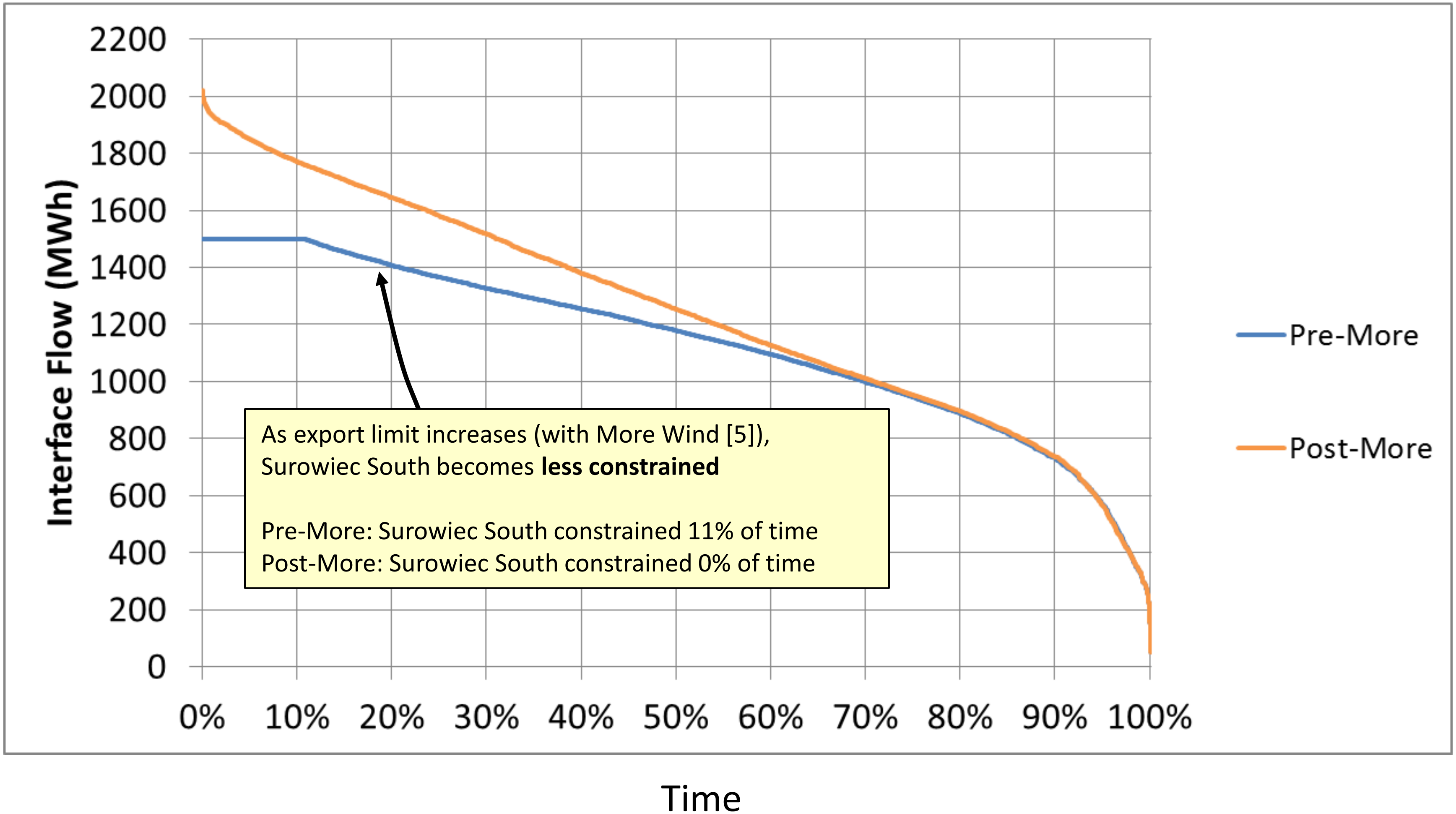
Interface: Surowiec South – Basecase Wind

Duration Curve



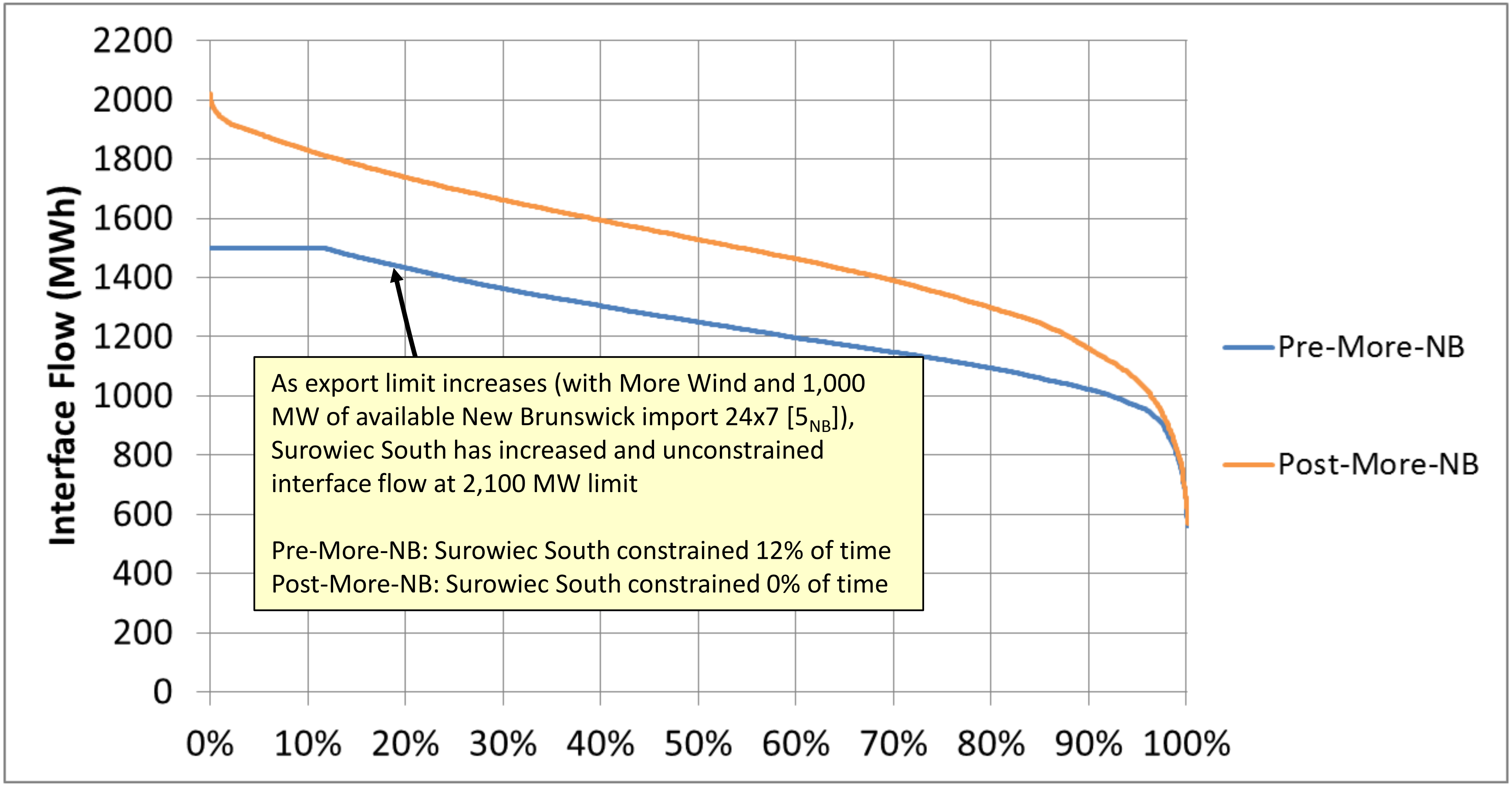
Interface: Surowiec South – More Wind

Duration Curve



Interface: Surowiec South – More Wind with NB at 1000 MW

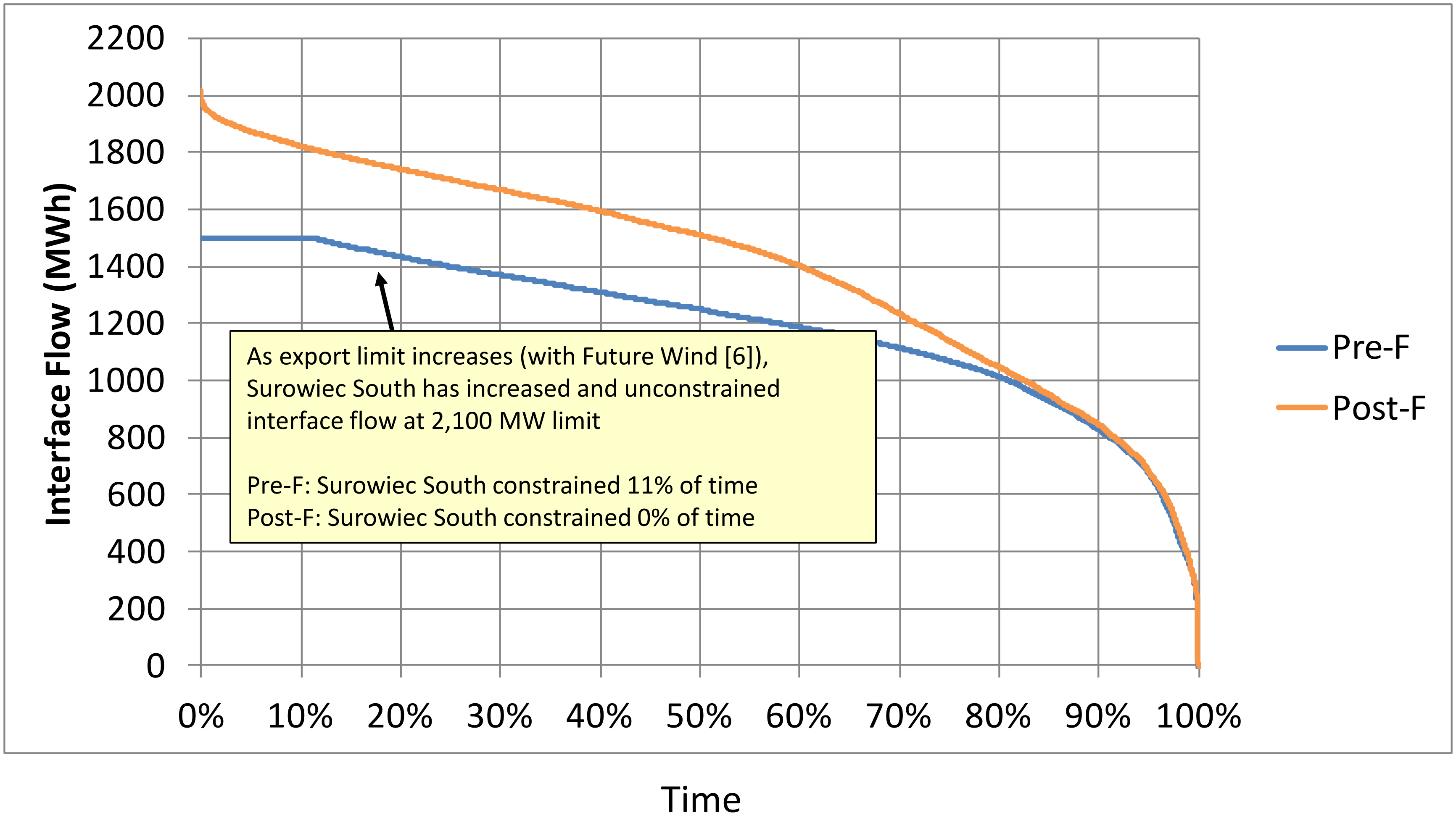
Duration Curve



Time

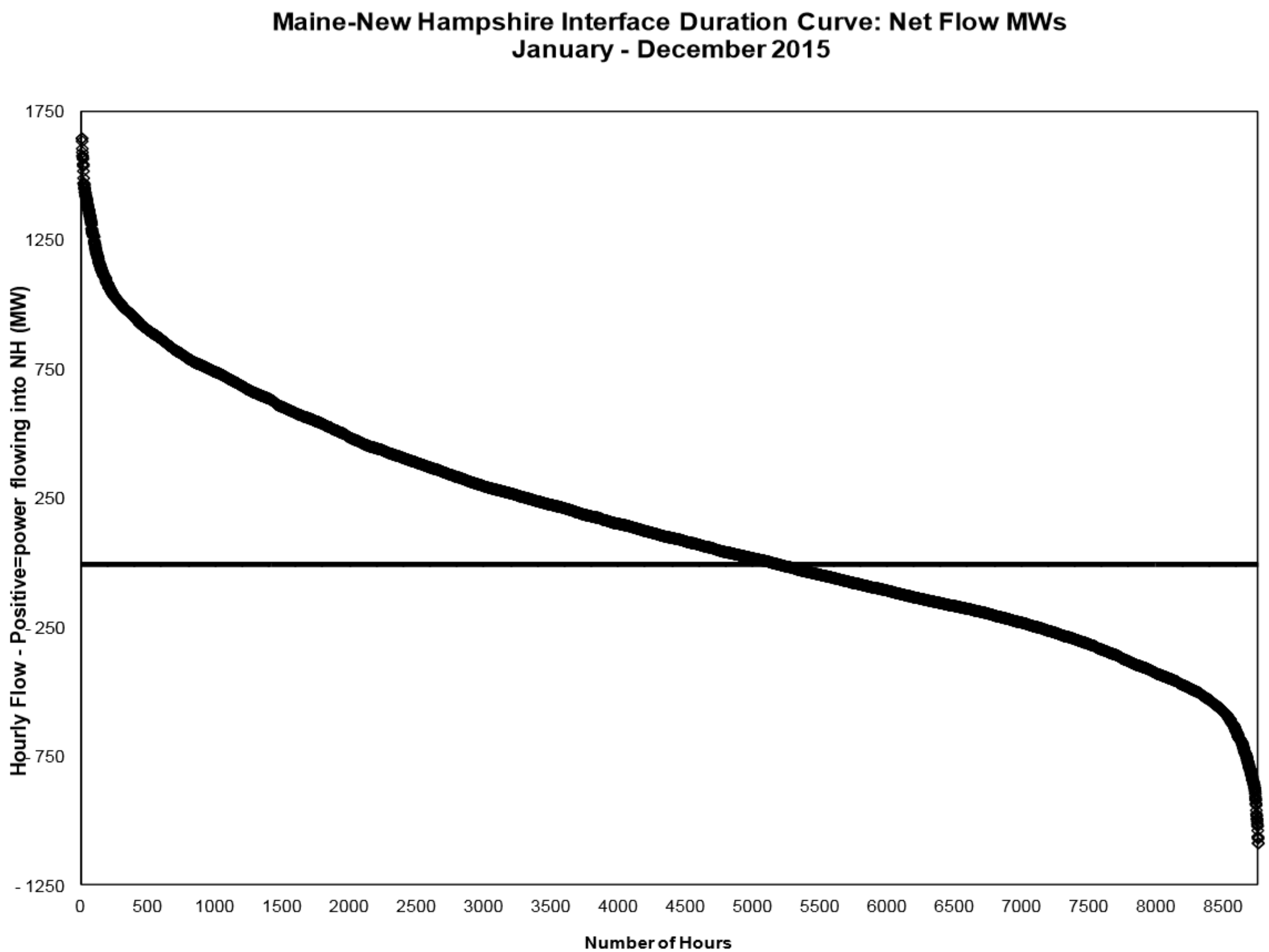
Interface: Surowiec South – Future Wind

Duration Curve



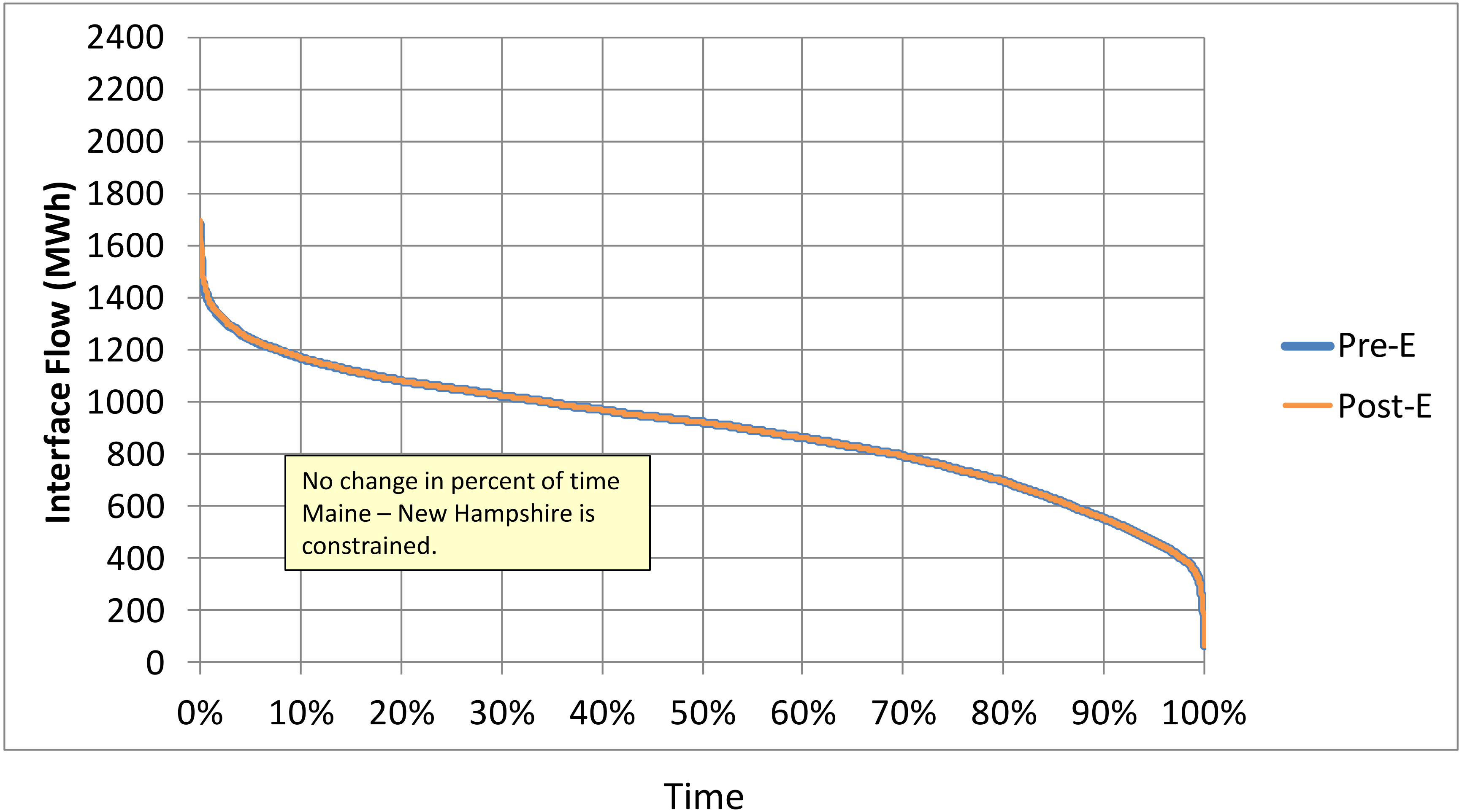
2015 Historical Interface Flow (MW)

Maine – New Hampshire (1,900 MW limit)



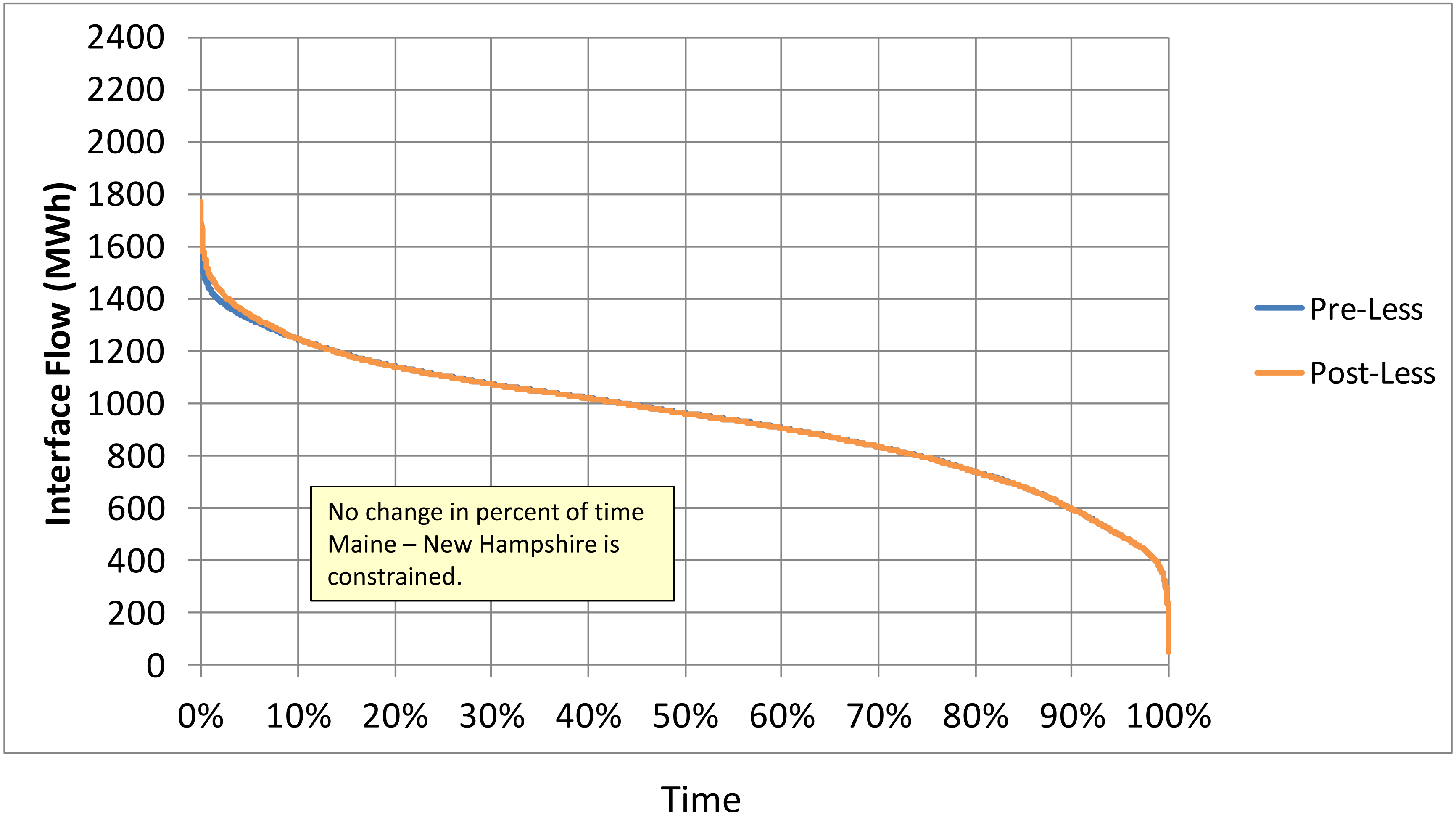
Interface: ME-NH – Existing Wind

Duration Curve



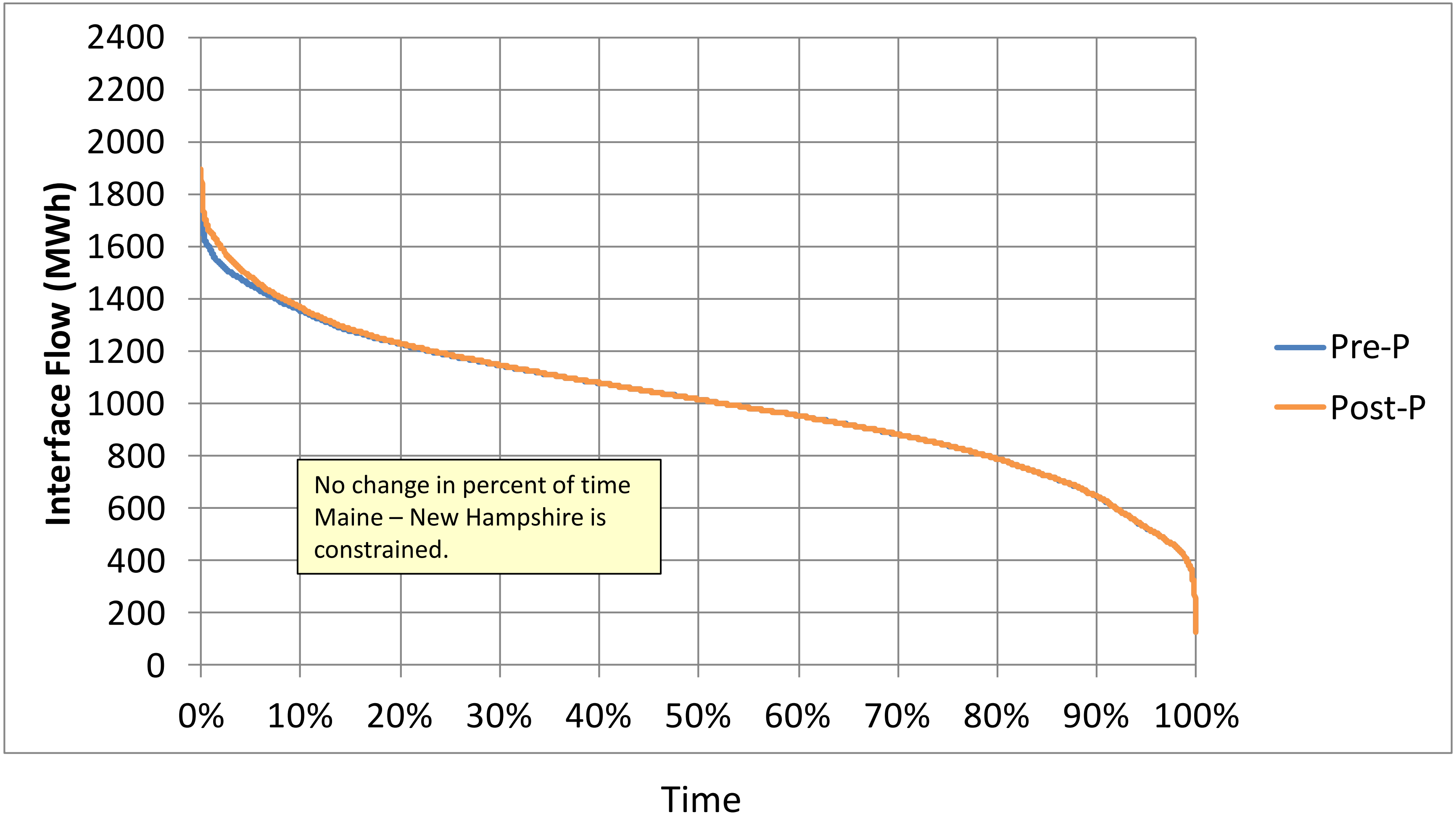
Interface: ME-NH – Less Wind

Duration Curve



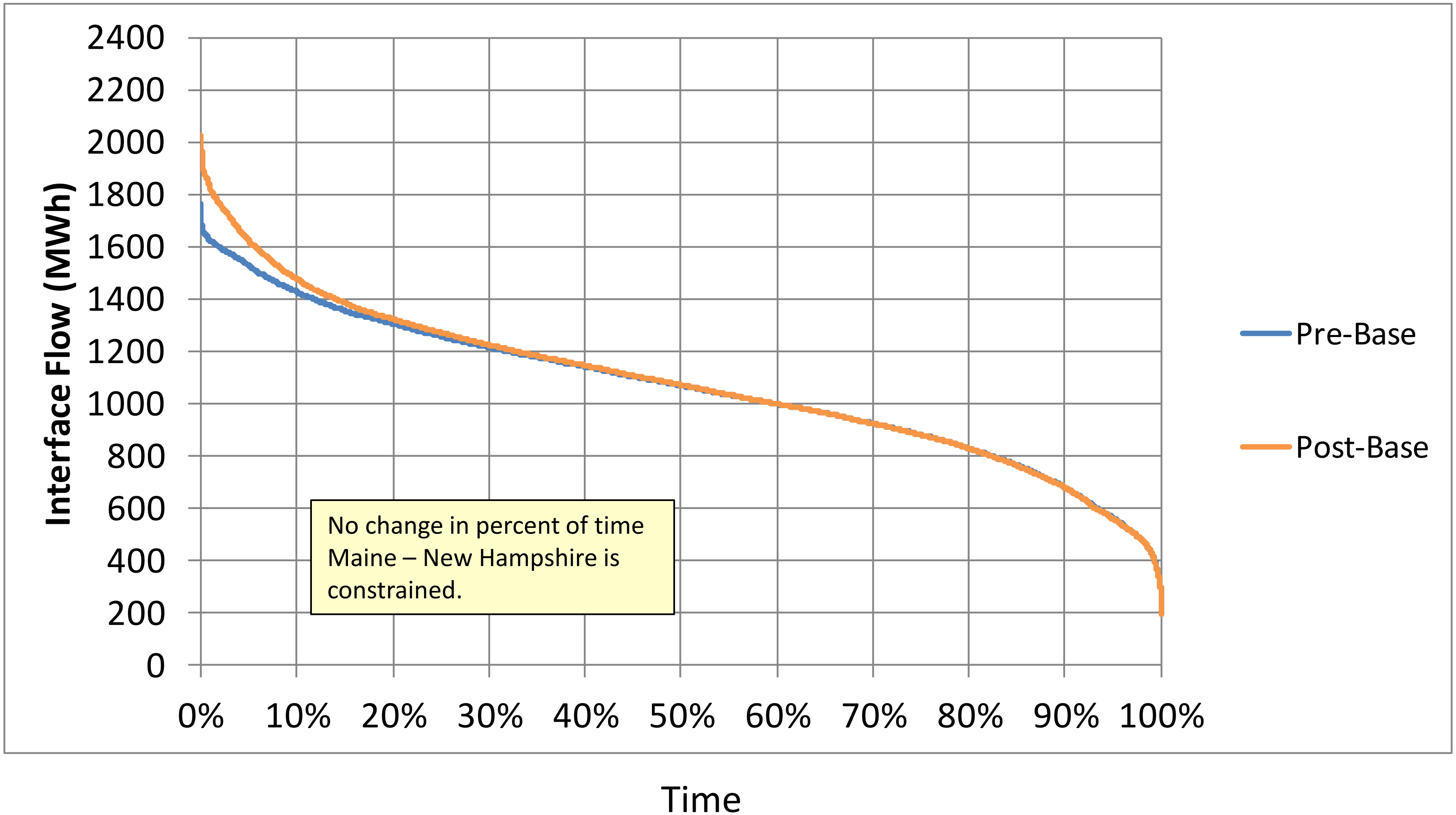
Interface: ME-NH – Proposed Wind

Duration Curve



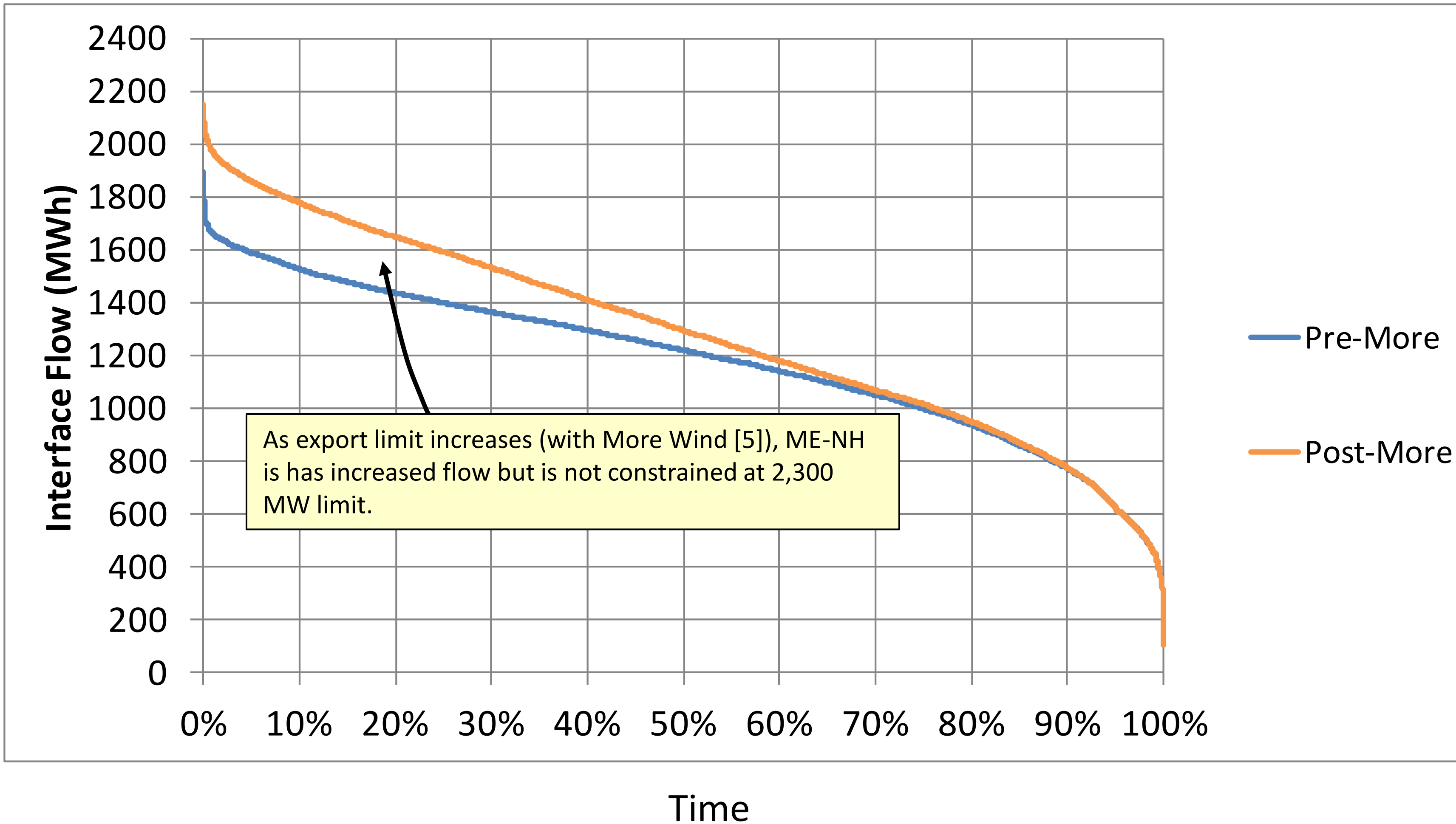
Interface: ME-NH – Basecase Wind

Duration Curve



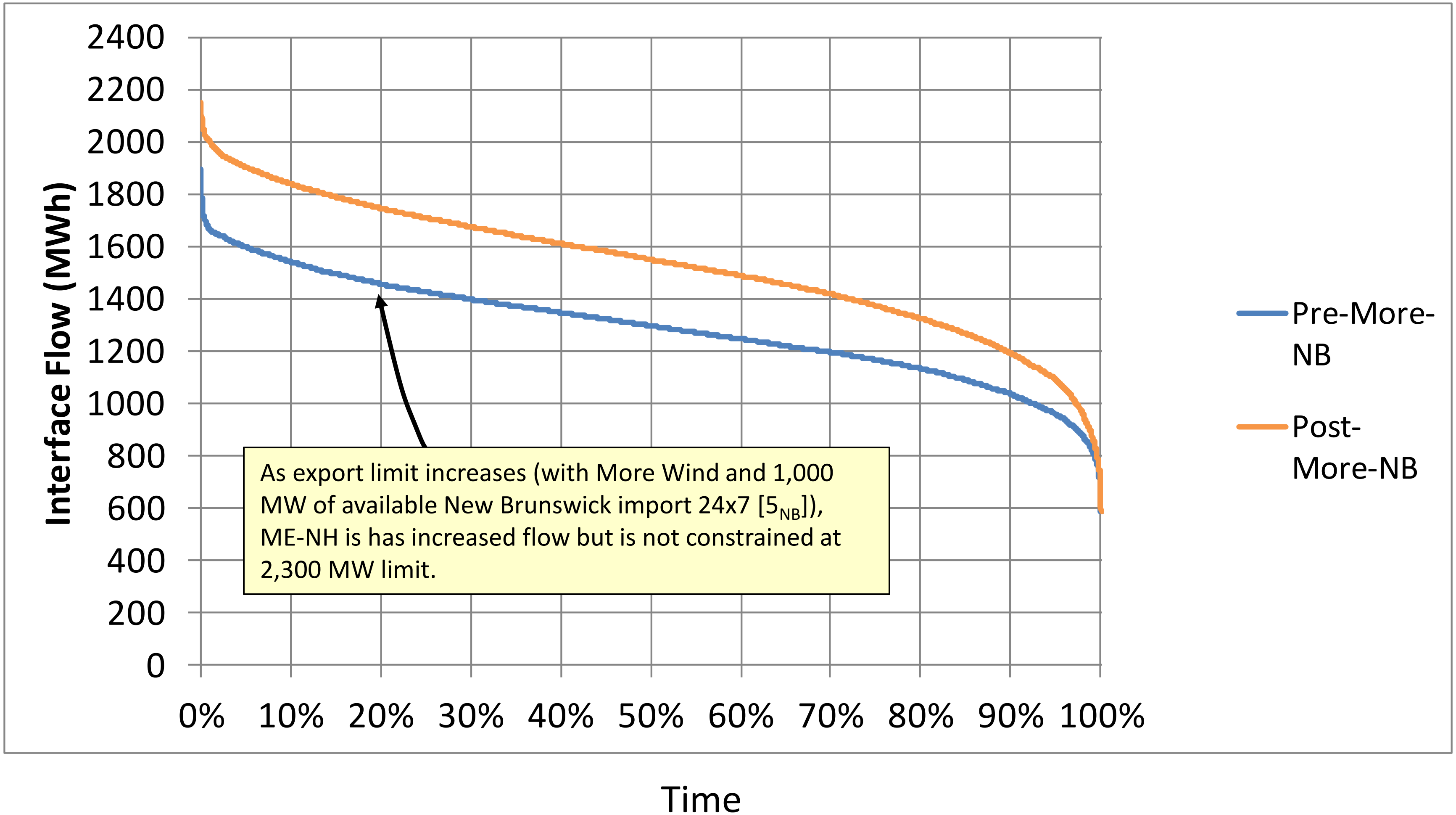
Interface: ME-NH – More Wind

Duration Curve



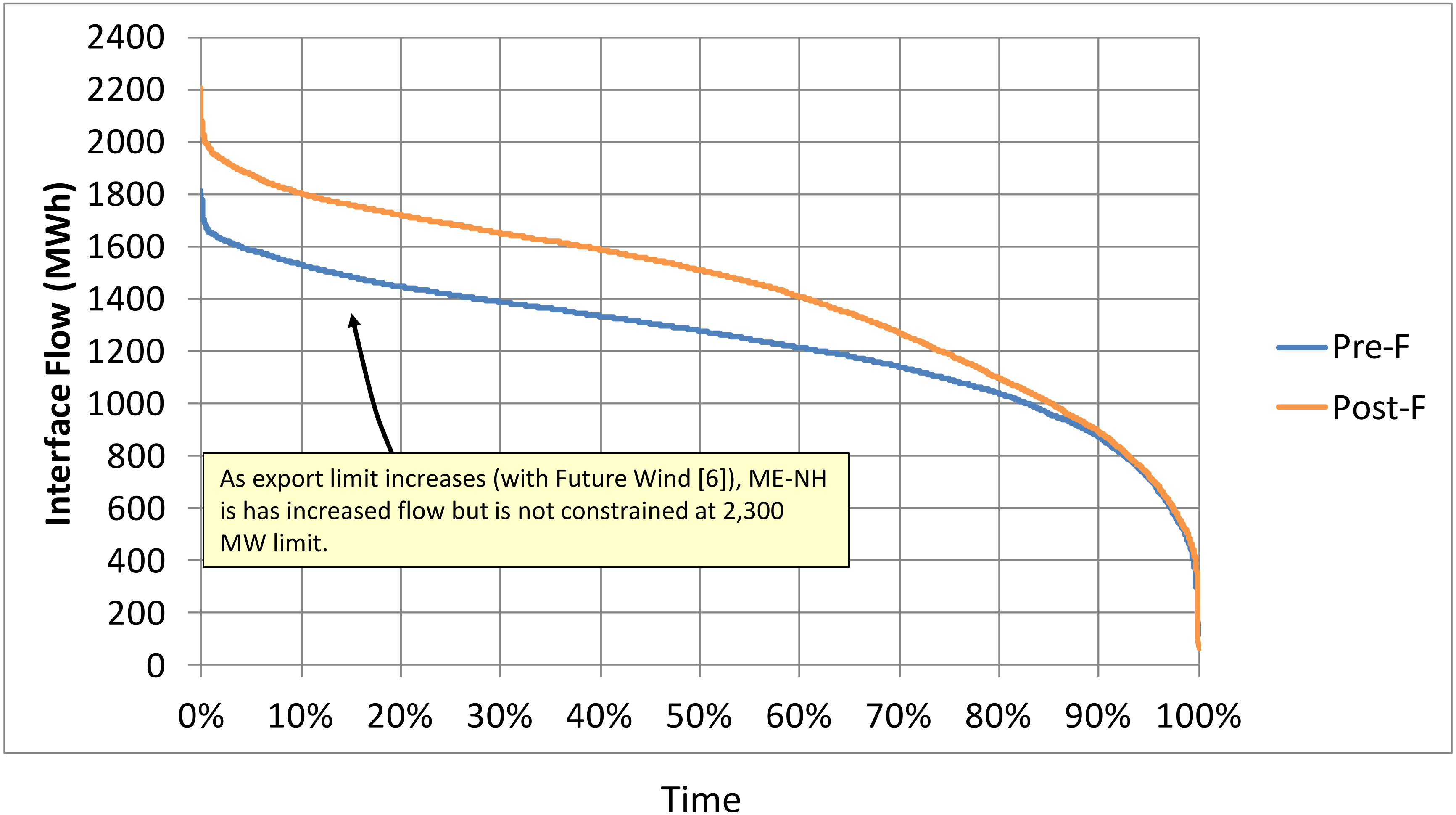
Interface: ME-NH – More Wind with NB at 1000 MW

Duration Curve



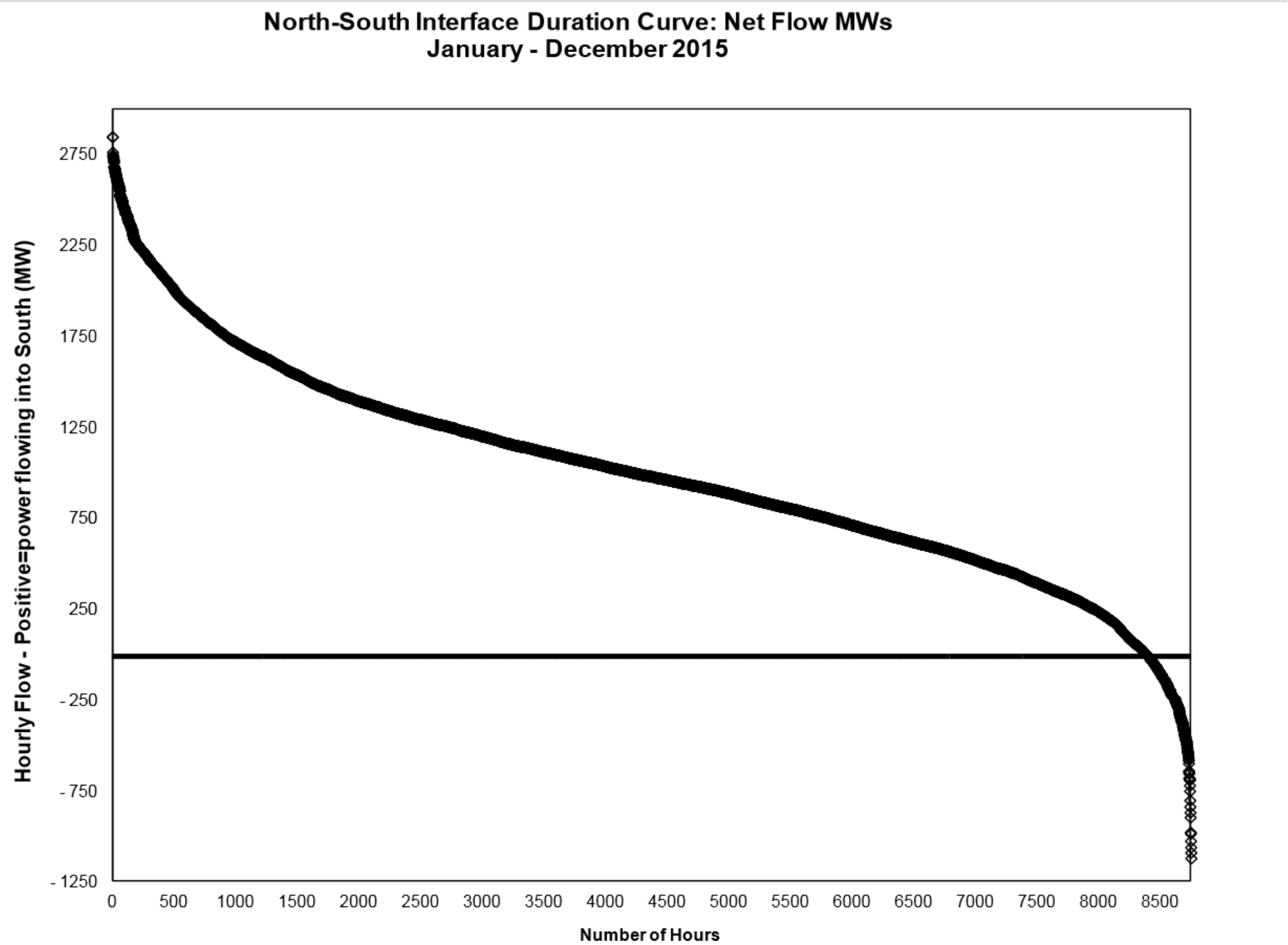
Interface: ME-NH – Future Wind

Duration Curve



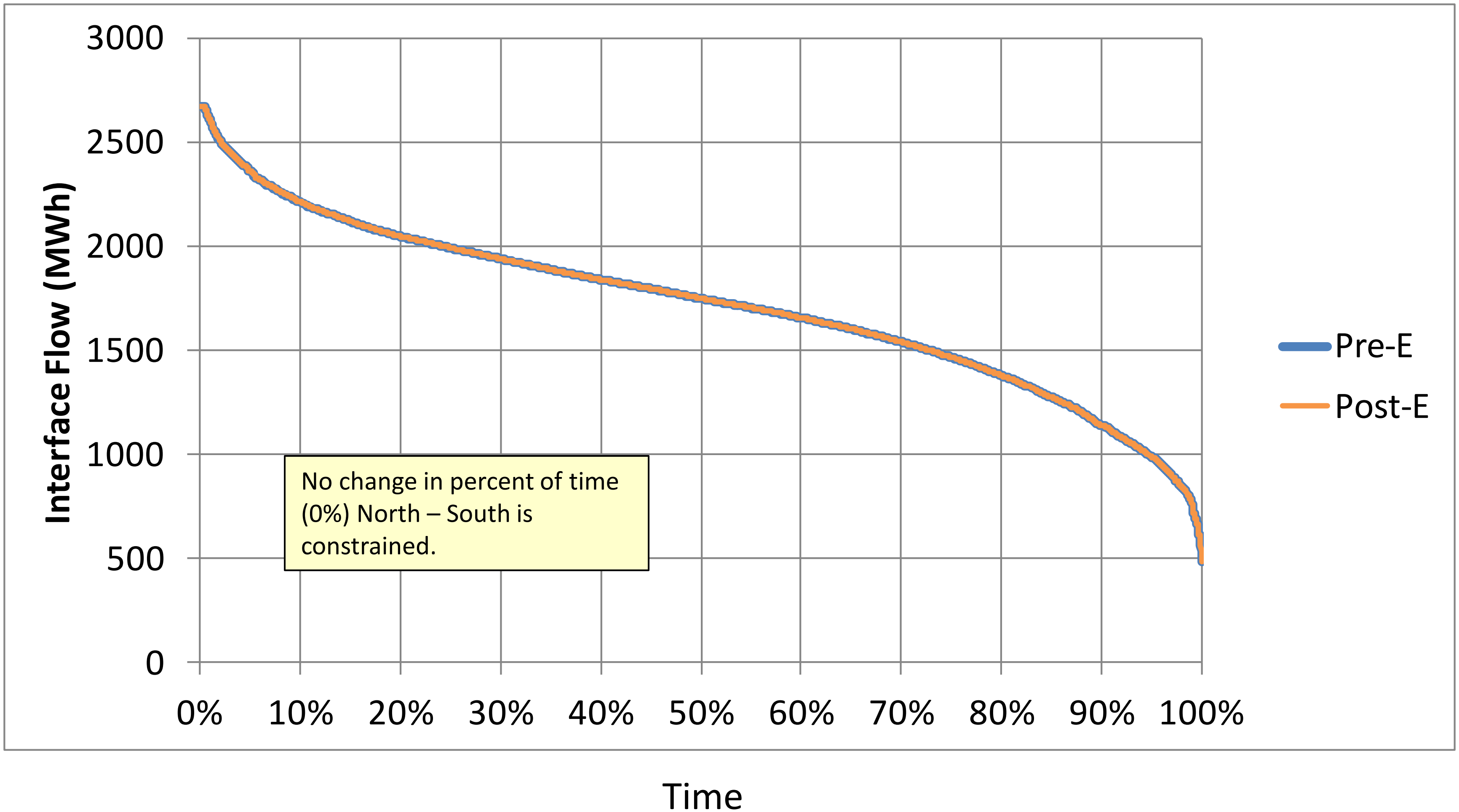
2015 Historical Interface Flow (MW)

North – South (2,675 MW limit)



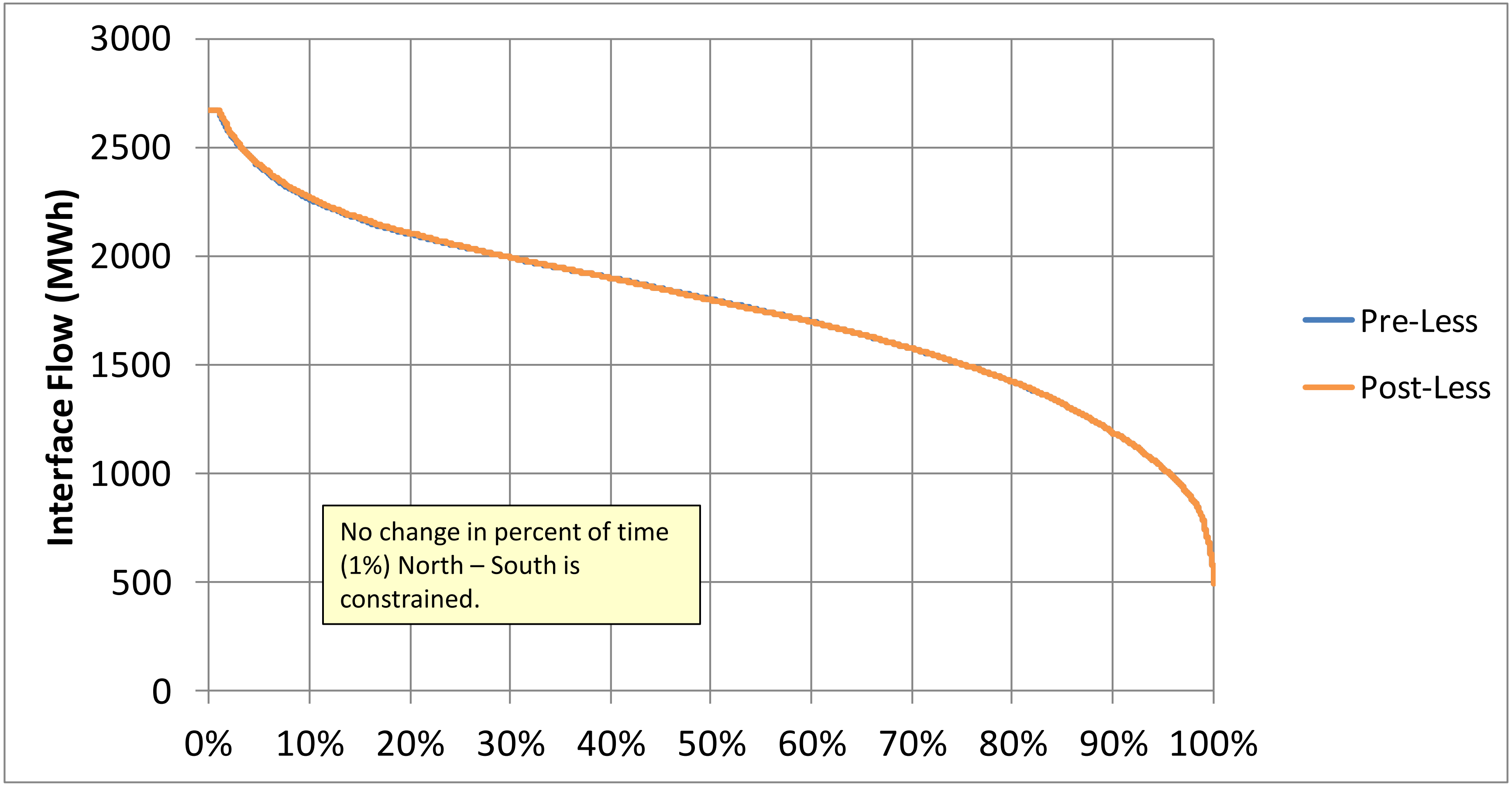
Interface: North-South – Existing Wind

Duration Curve



Interface: North-South – Less Wind

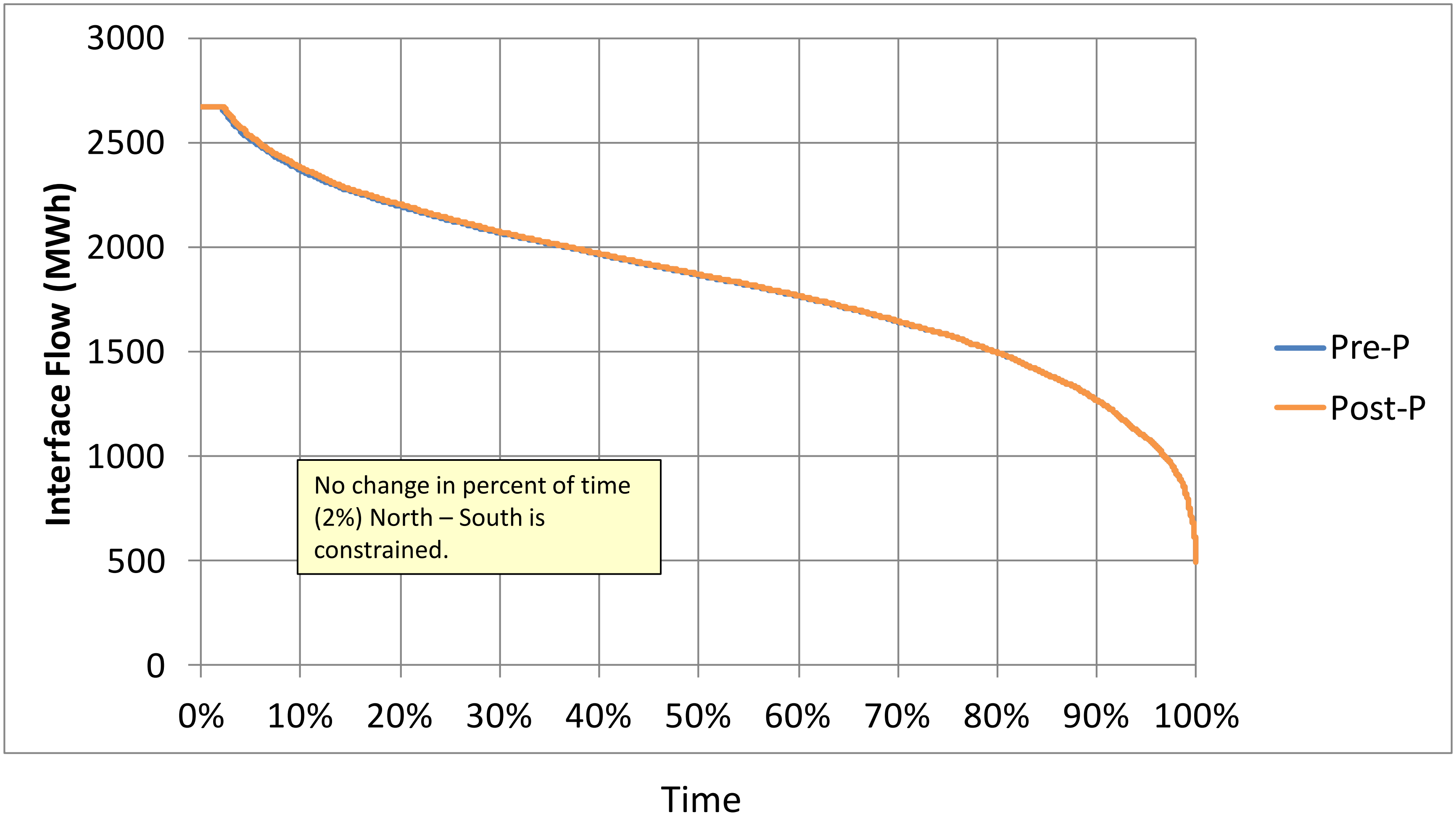
Duration Curve



Time

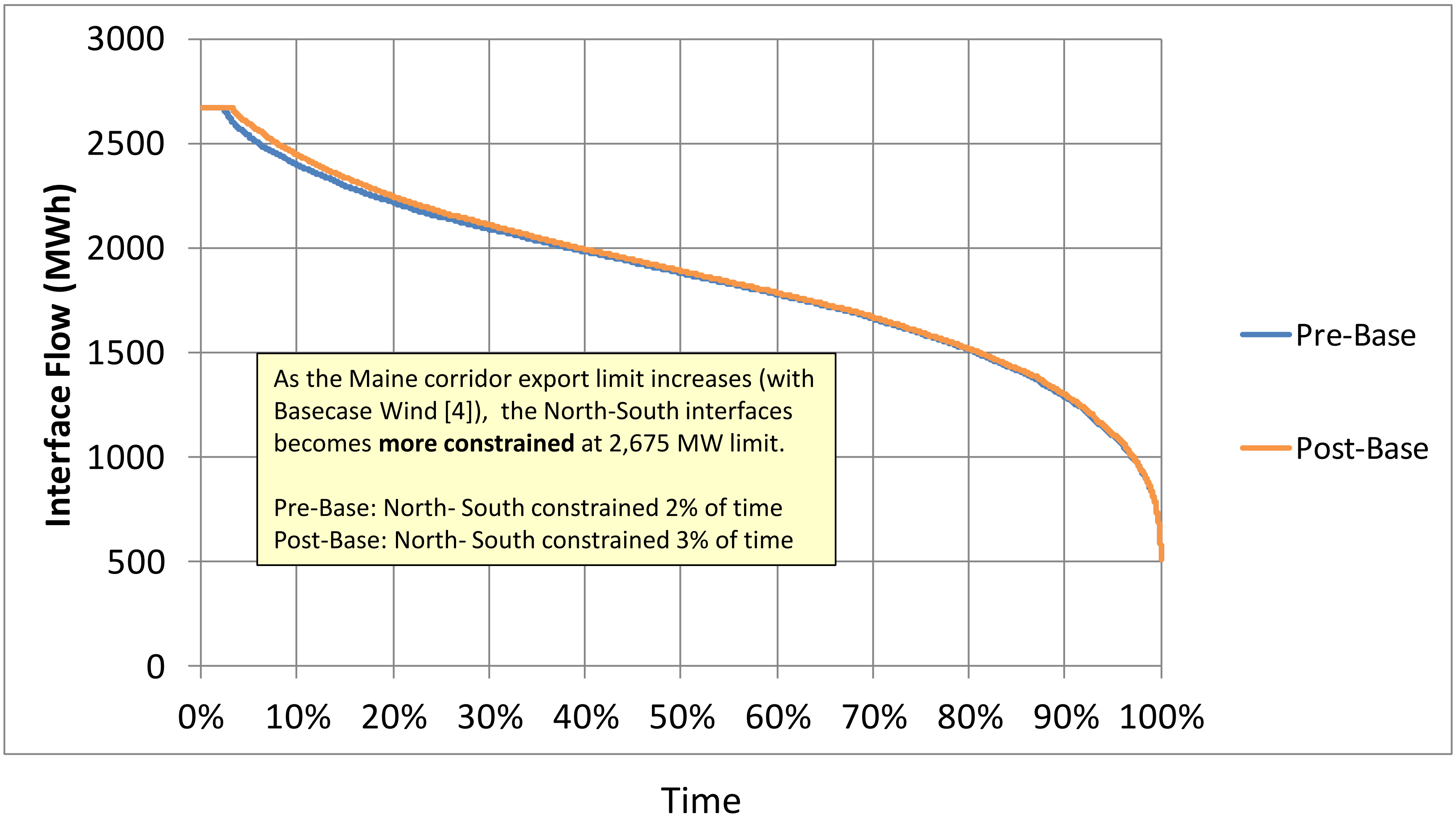
Interface: North-South – Proposed Wind

Duration Curve



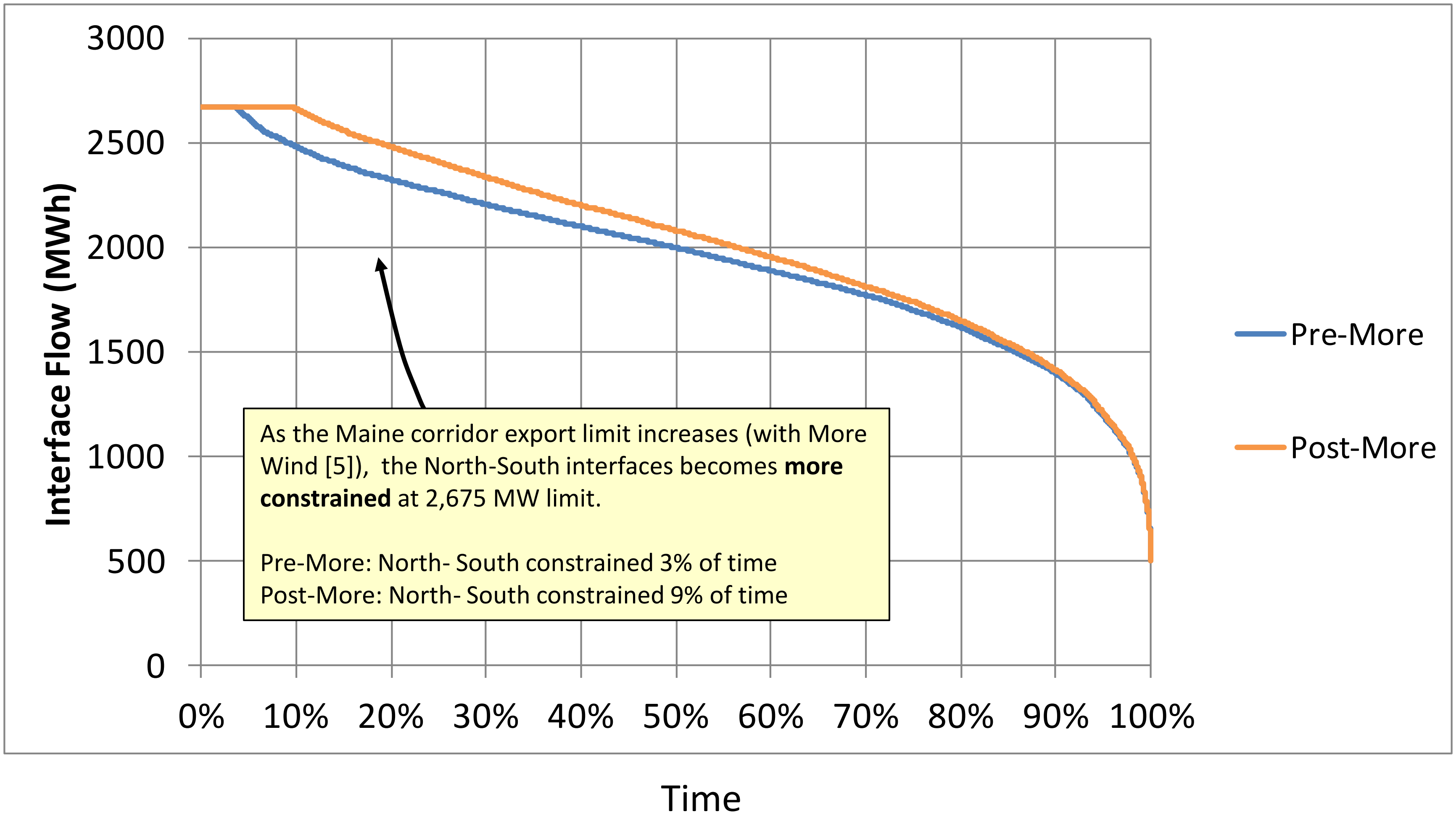
Interface: North-South – Basecase Wind

Duration Curve



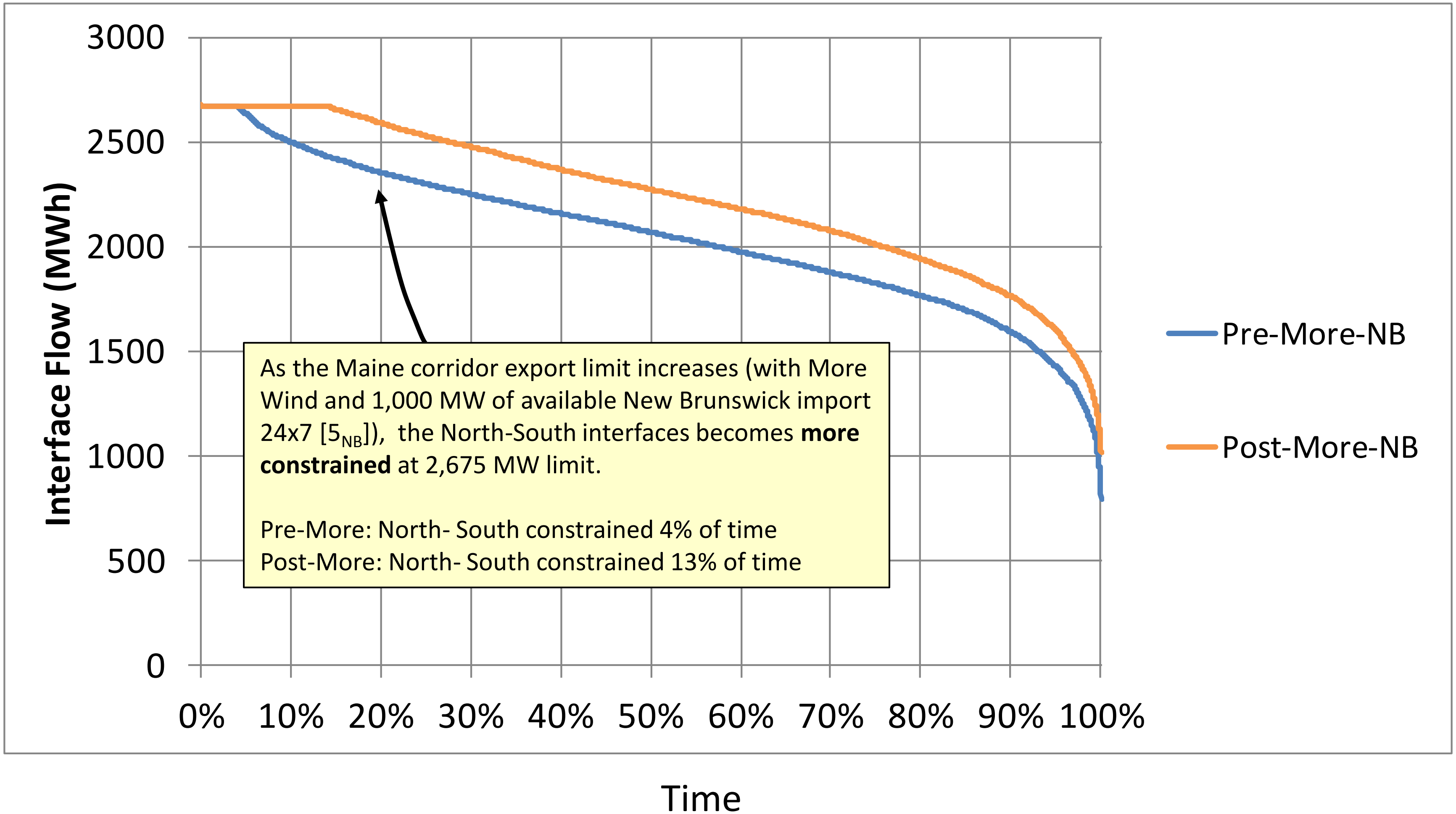
Interface: North-South – More Wind

Duration Curve



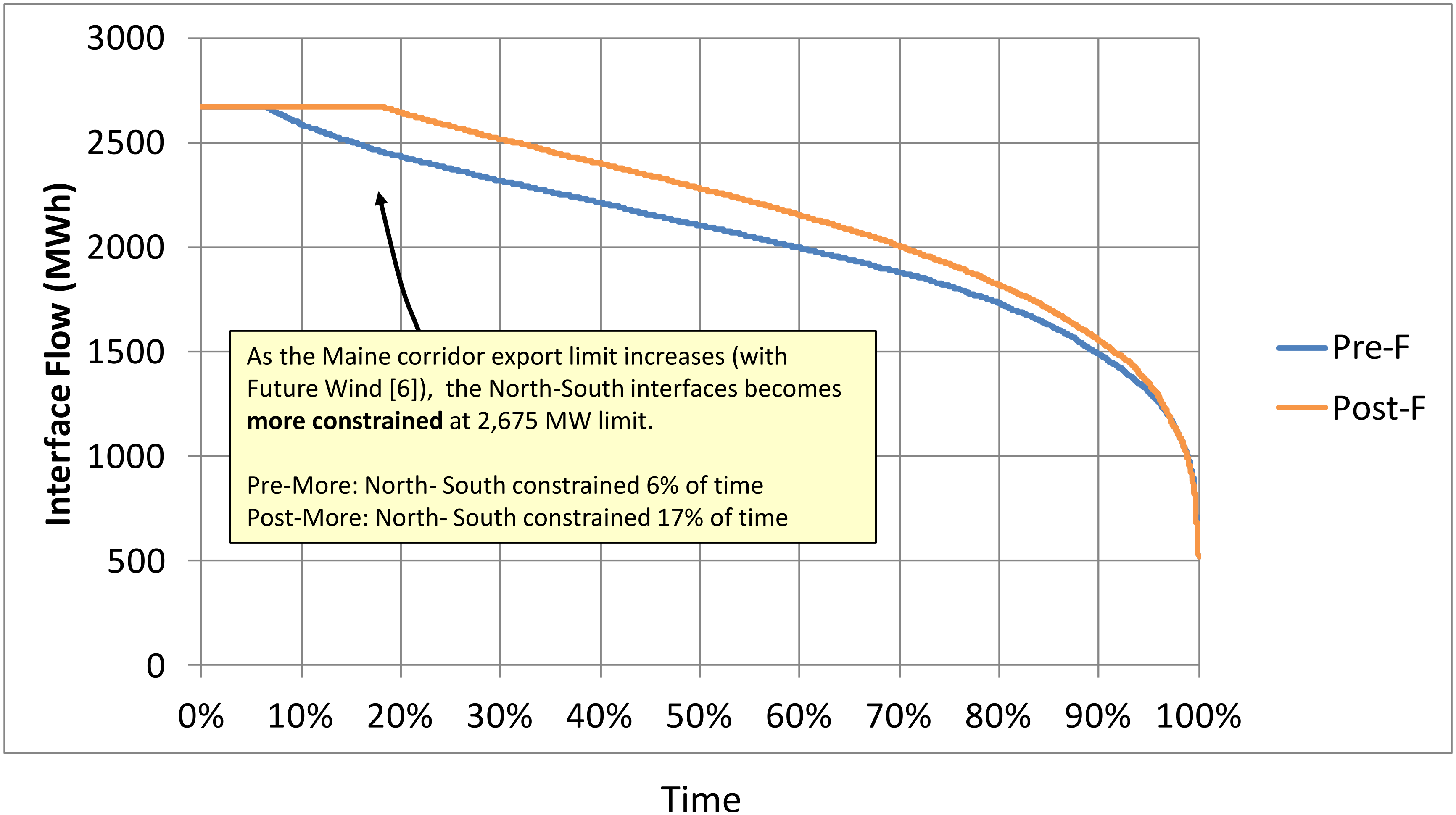
Interface: North-South – More Wind with NB at 1000 MW

Duration Curve



Interface: North-South – Future Wind

Duration Curve



APPENDIX VI

LMP Metrics

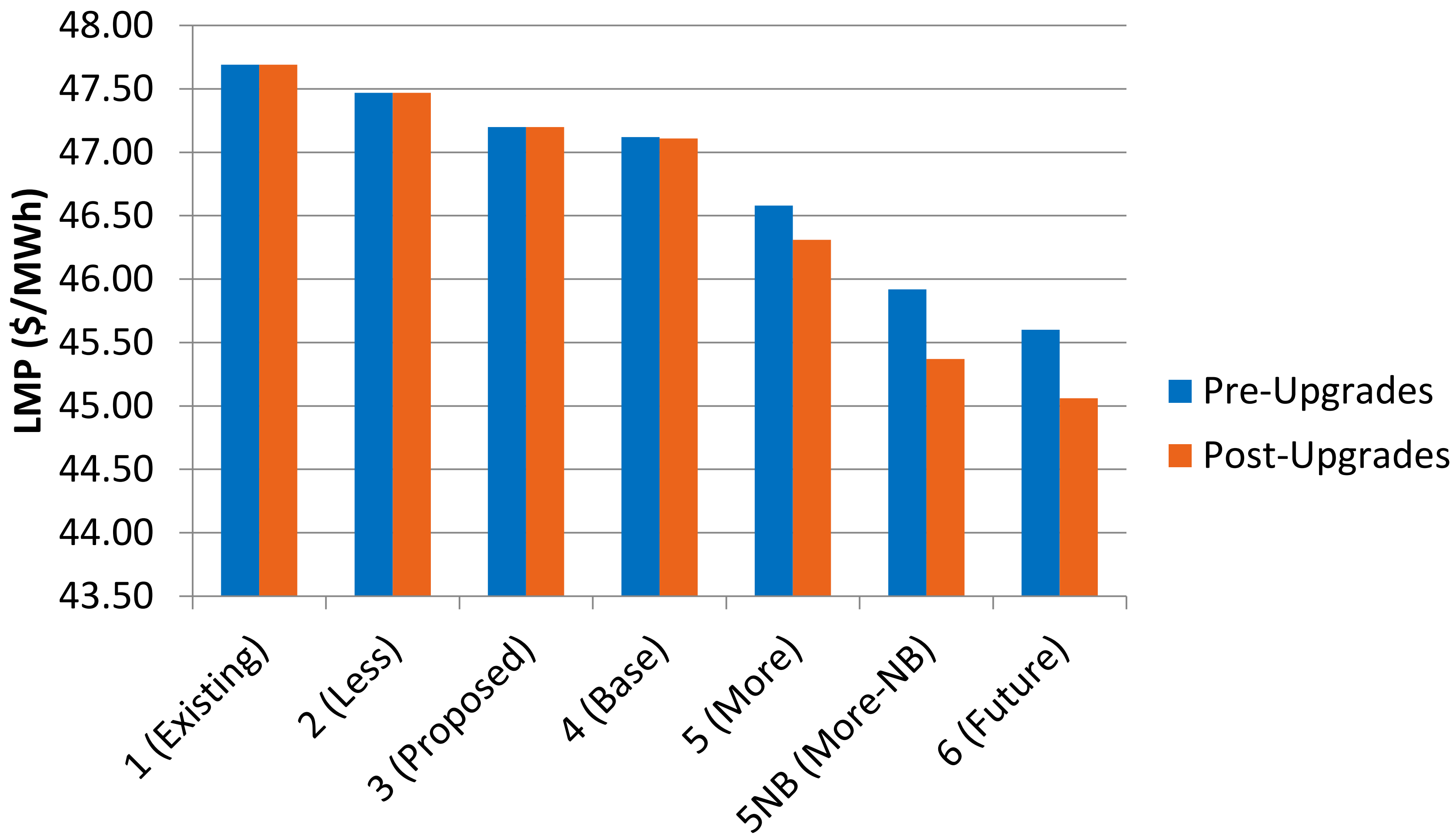
Summary

LMP Metrics

- LMP duration curves allow the effect of the three classes of study resources to be seen
  - At $0/MWh wind-on-wind competition spills wind
  - At $5/MWh hydro is spilled
  - At $10/MWh imports are curtailed

New England LMP – weighted by load ($/MWh)

Graph



New England LMP – weighted by load ($/MWh)

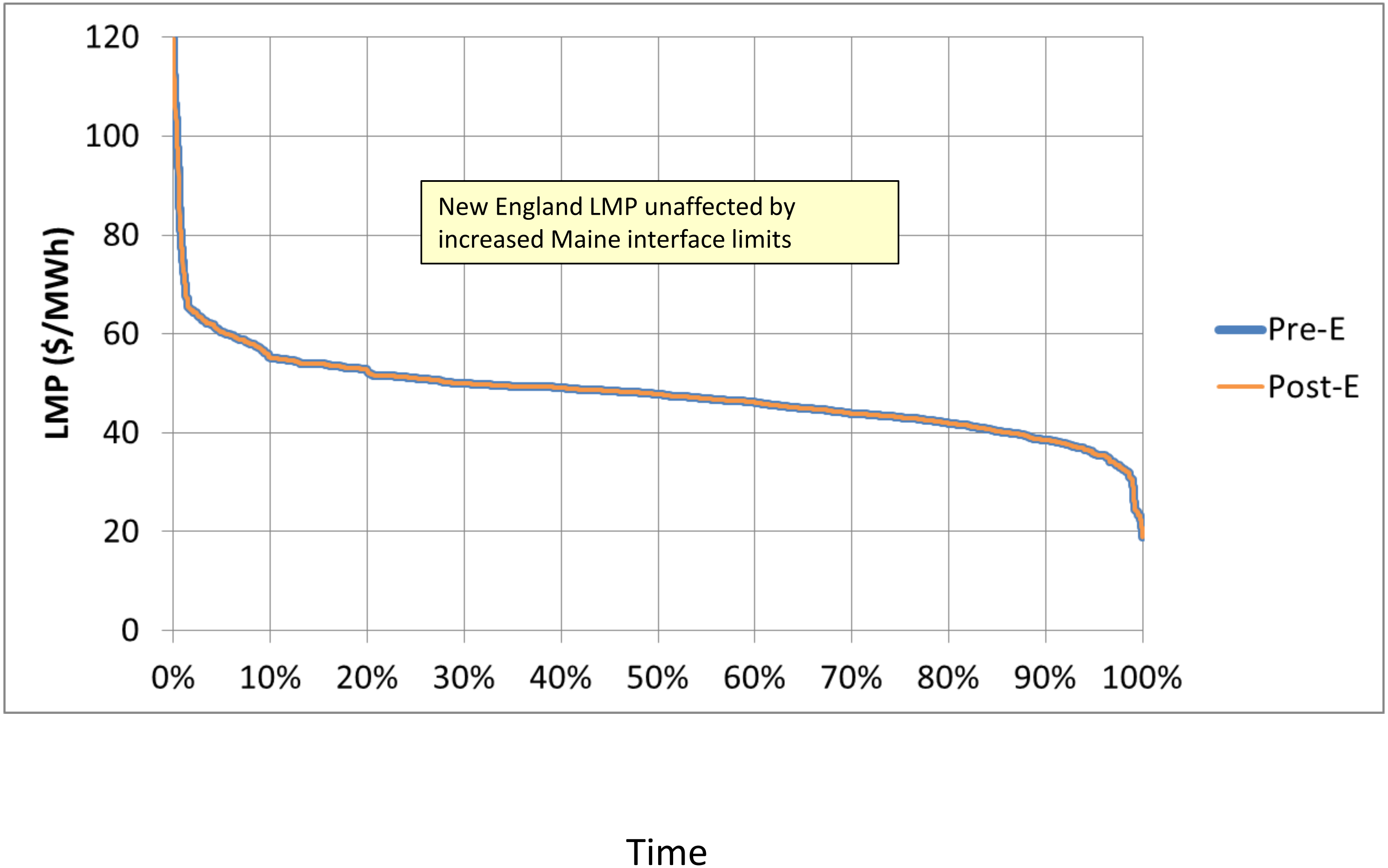
Table

	Scenarios	LMP ($/MWh)	
		Pre-Upgrades	Post-Upgrades
1	Existing Wind in New England (In-Service as of 4/1/15) *	47.69	47.69
2	RENEW Sensitivity 1 (Less Wind) *	47.47	47.47
3	Proposed Wind in New England with I.3.9 approval (as of 4/1/15)	47.20	47.20
4	RENEW Basecase – STA-WI Studied Wind (as of 10/1/13) *	47.12	47.11
5	RENEW Sensitivity 2 (More Wind)*	46.58	46.31
5_{NB}	RENEW Sensitivity 2 (More Wind)* and 1,000 MW of NB imports available for dispatch	45.92	45.37
6	All Future Queue Wind in New England Wind (as of 4/1/15)	45.60	45.06

*Outside Maine, assumed only "existing wind" as of 4/1/15

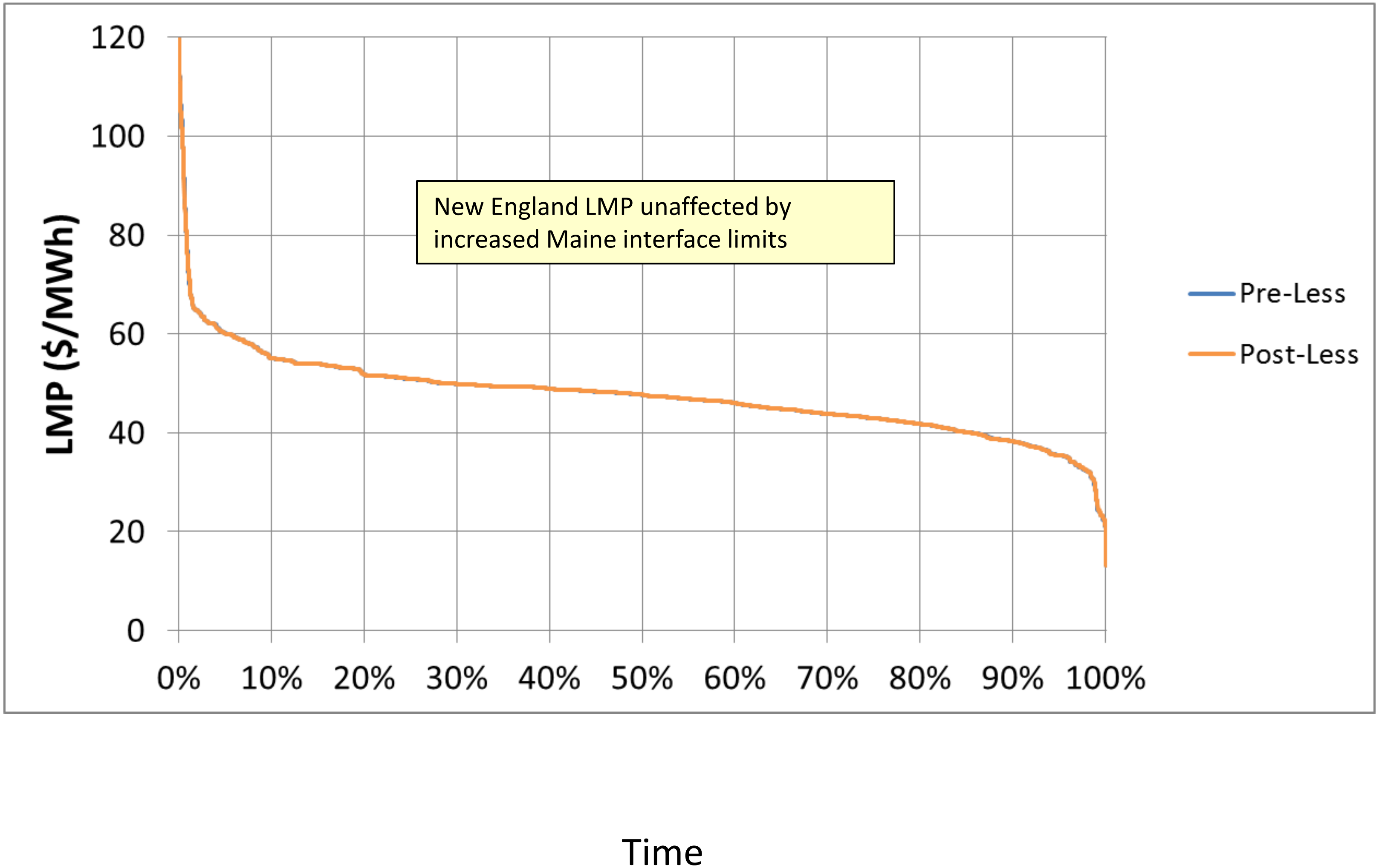
LMP: New England – Existing Wind

Duration Curve



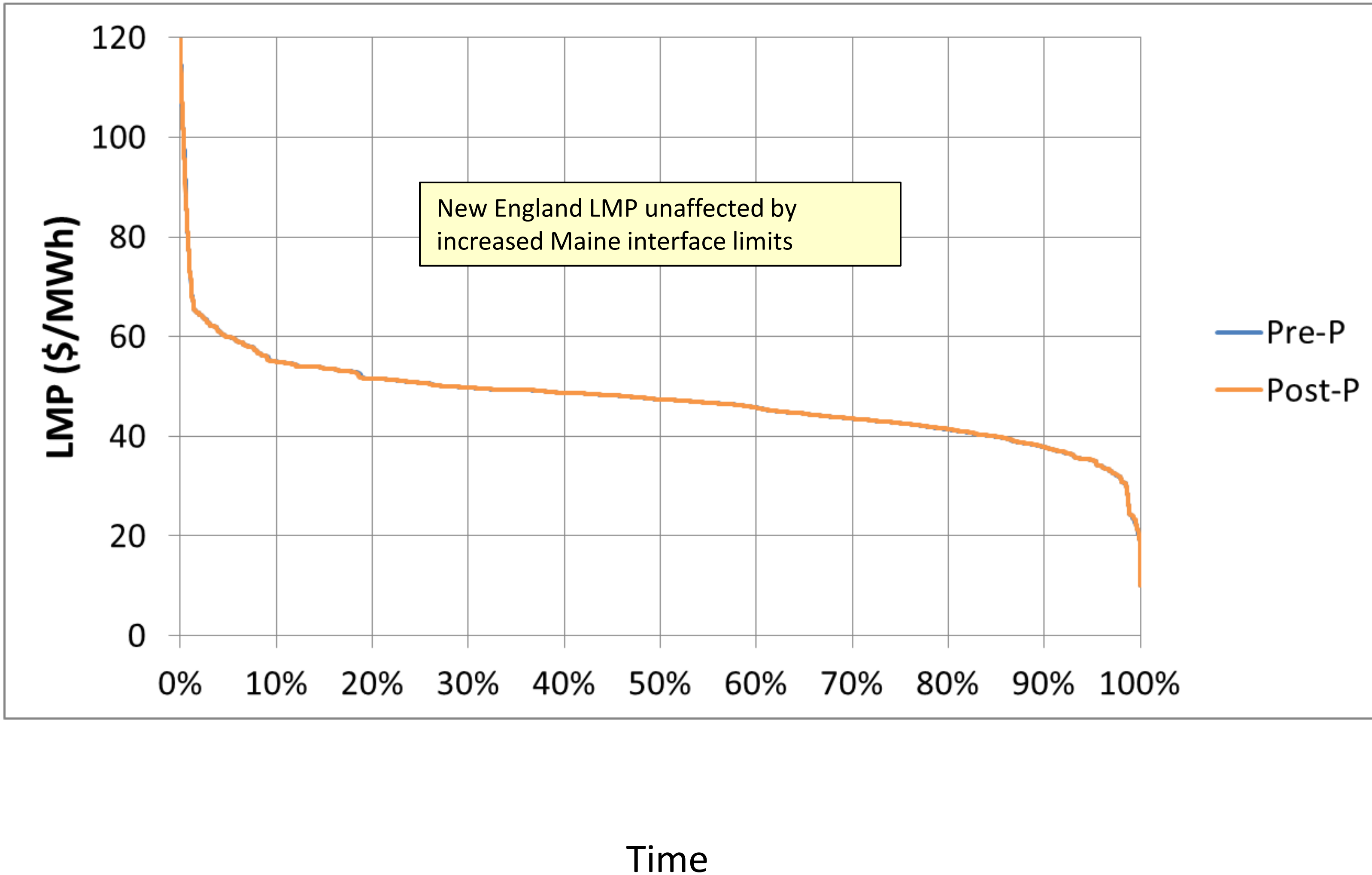
LMP: New England – Less Wind

Duration Curve



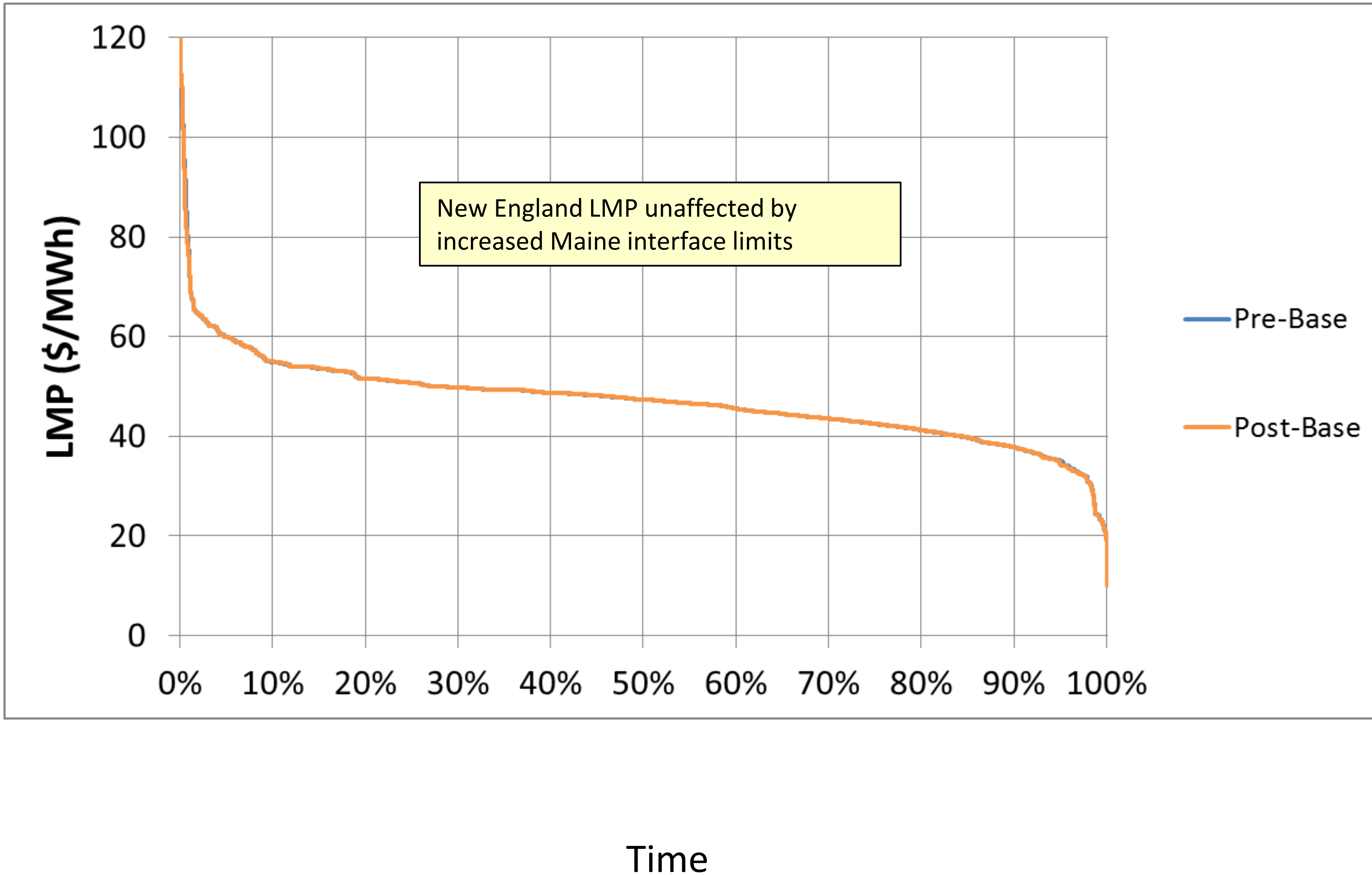
LMP: New England – Proposed Wind

Duration Curve



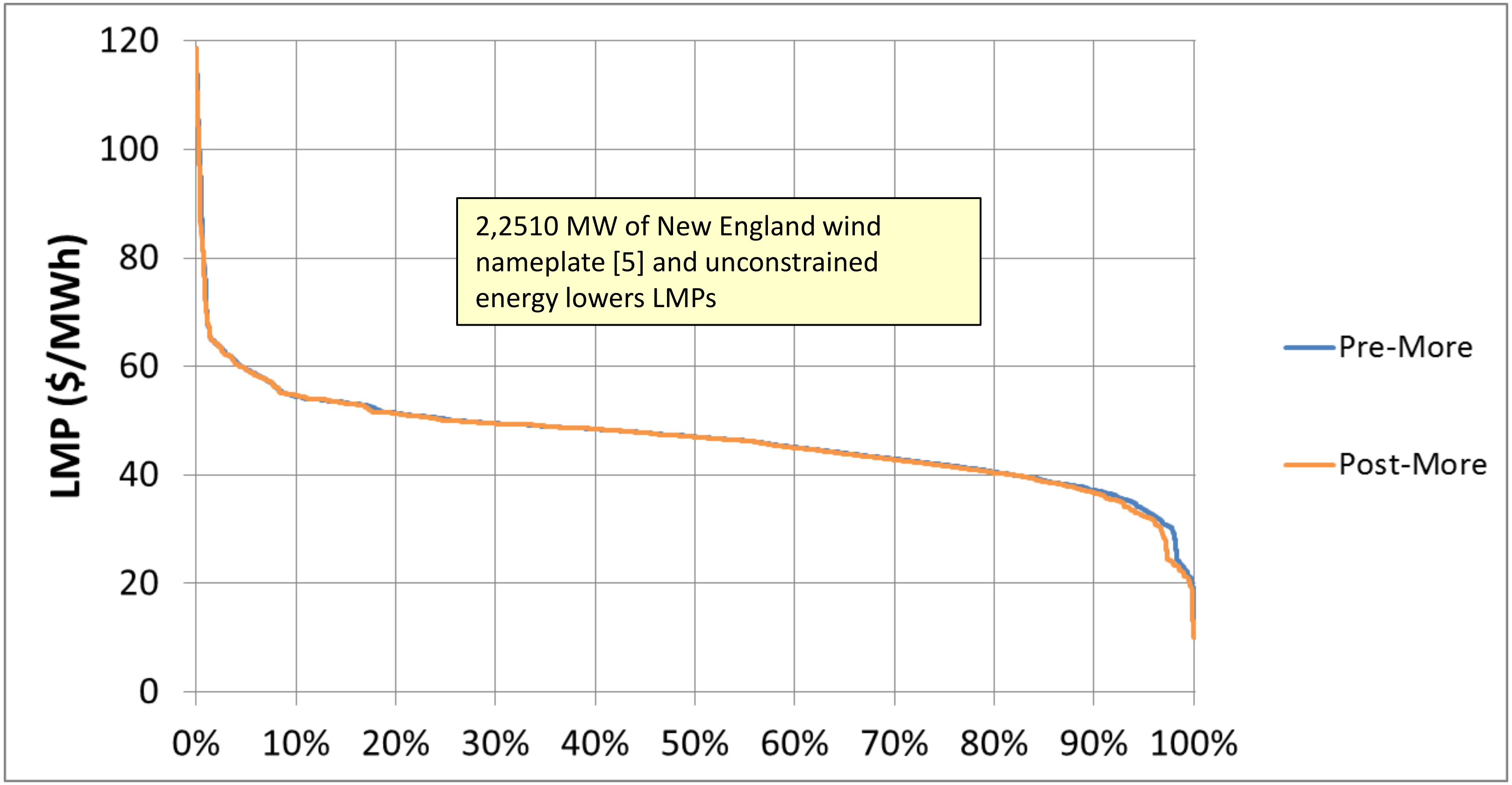
LMP: New England – Basecase Wind

Duration Curve



LMP: New England – More Wind

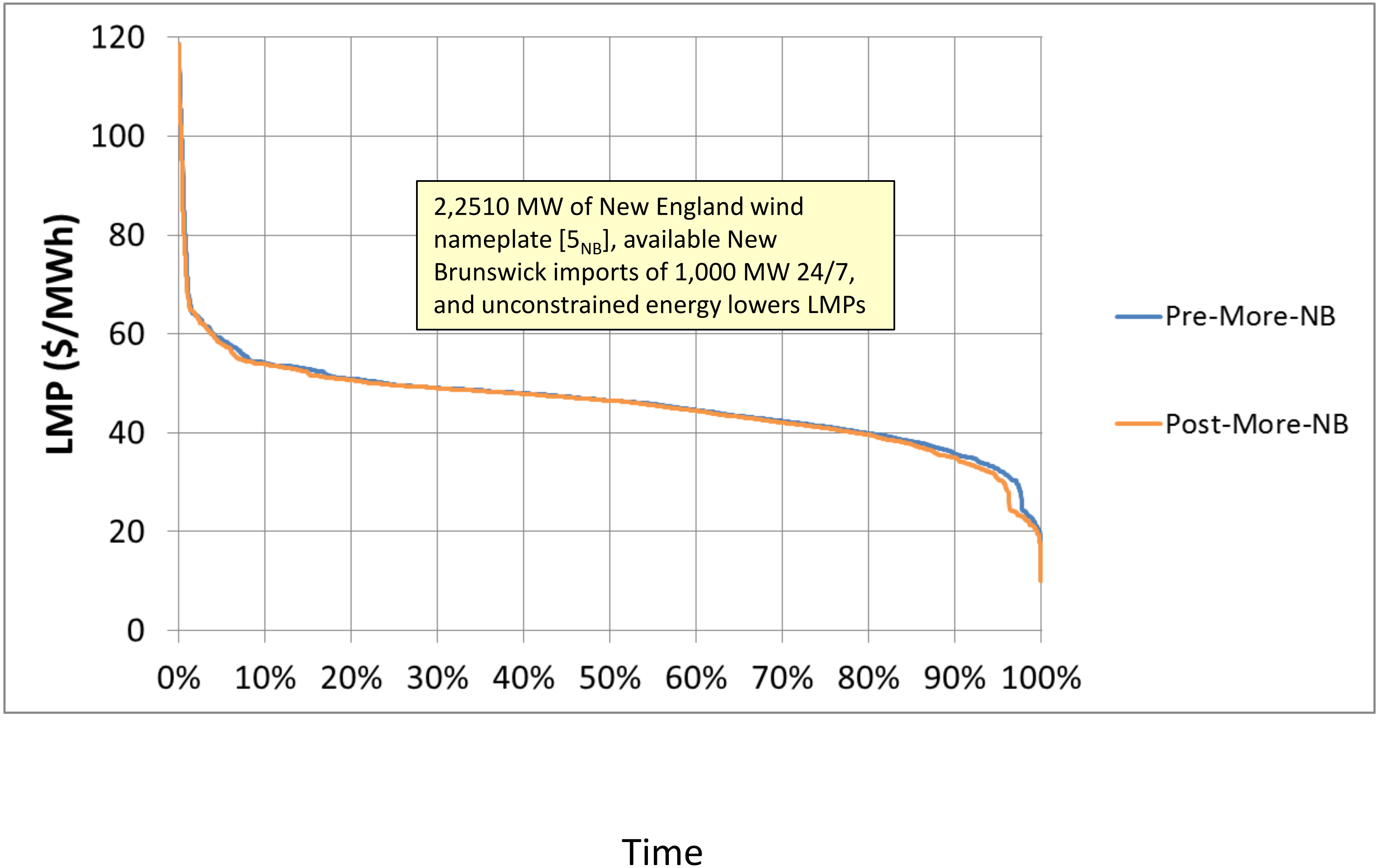
Duration Curve



Time

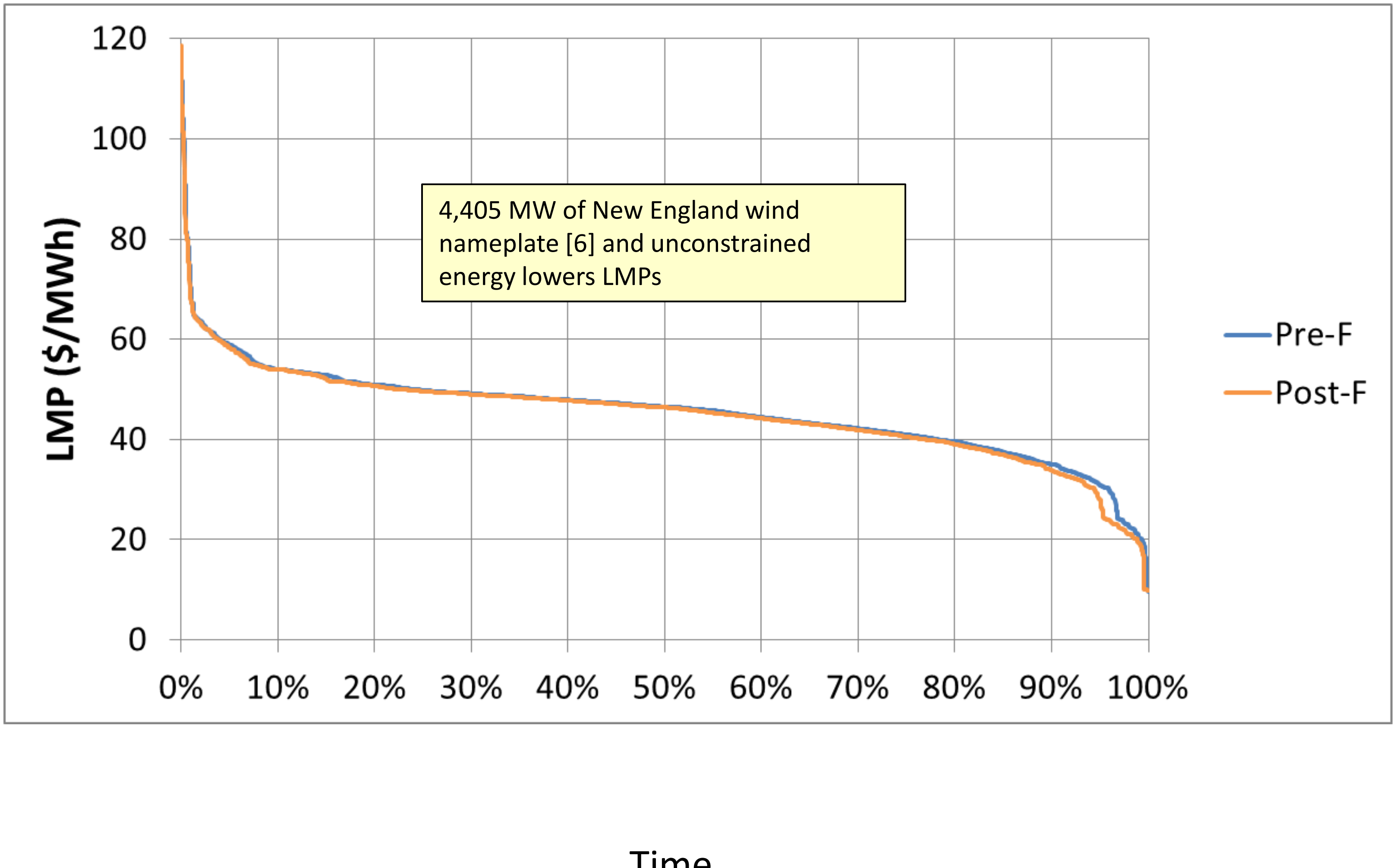
LMP: New England – More Wind with NB at 1000 MW

Duration Curve



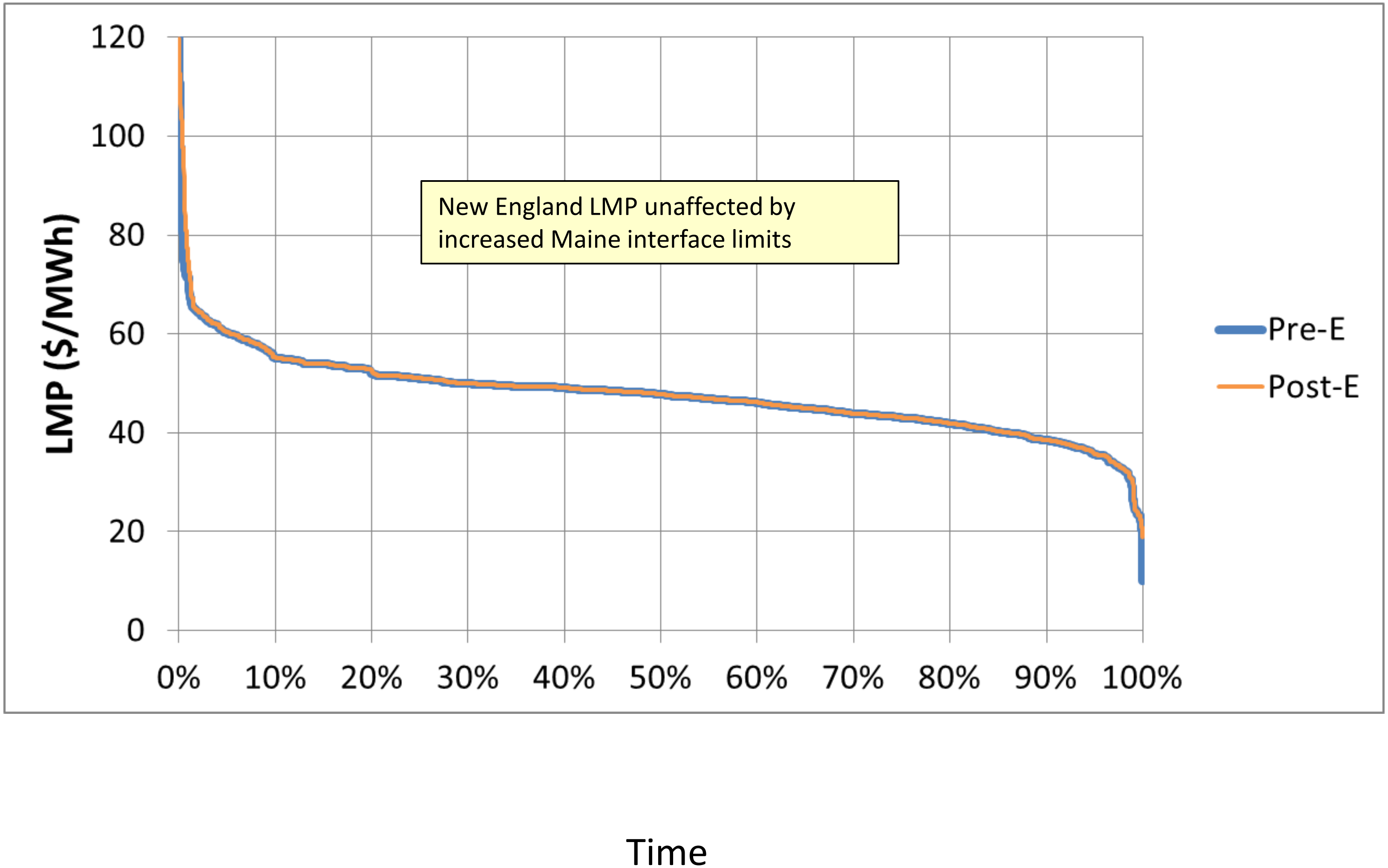
LMP: New England – Future Wind

Duration Curve



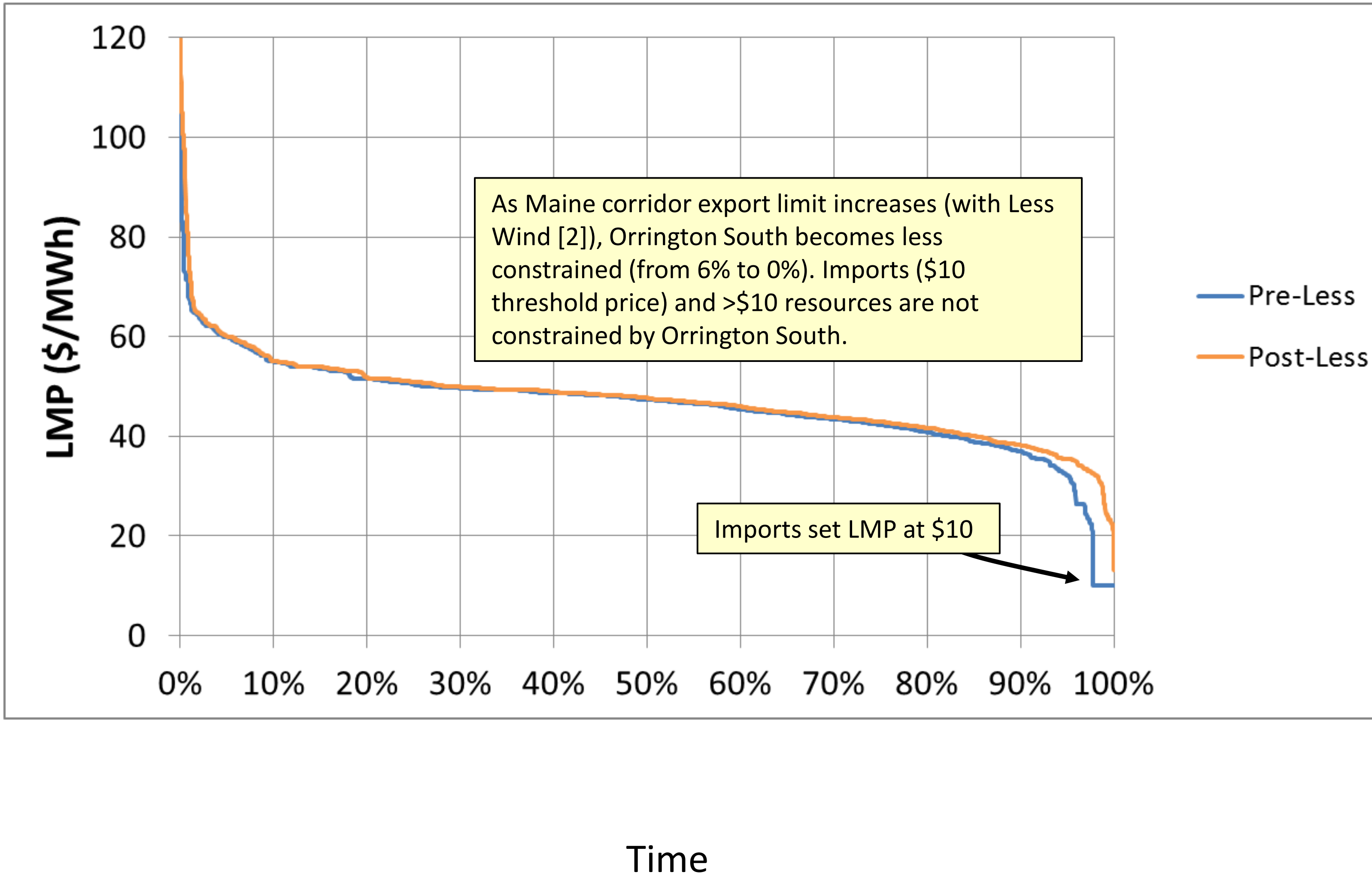
LMP: BHE – Existing Wind

Duration Curve



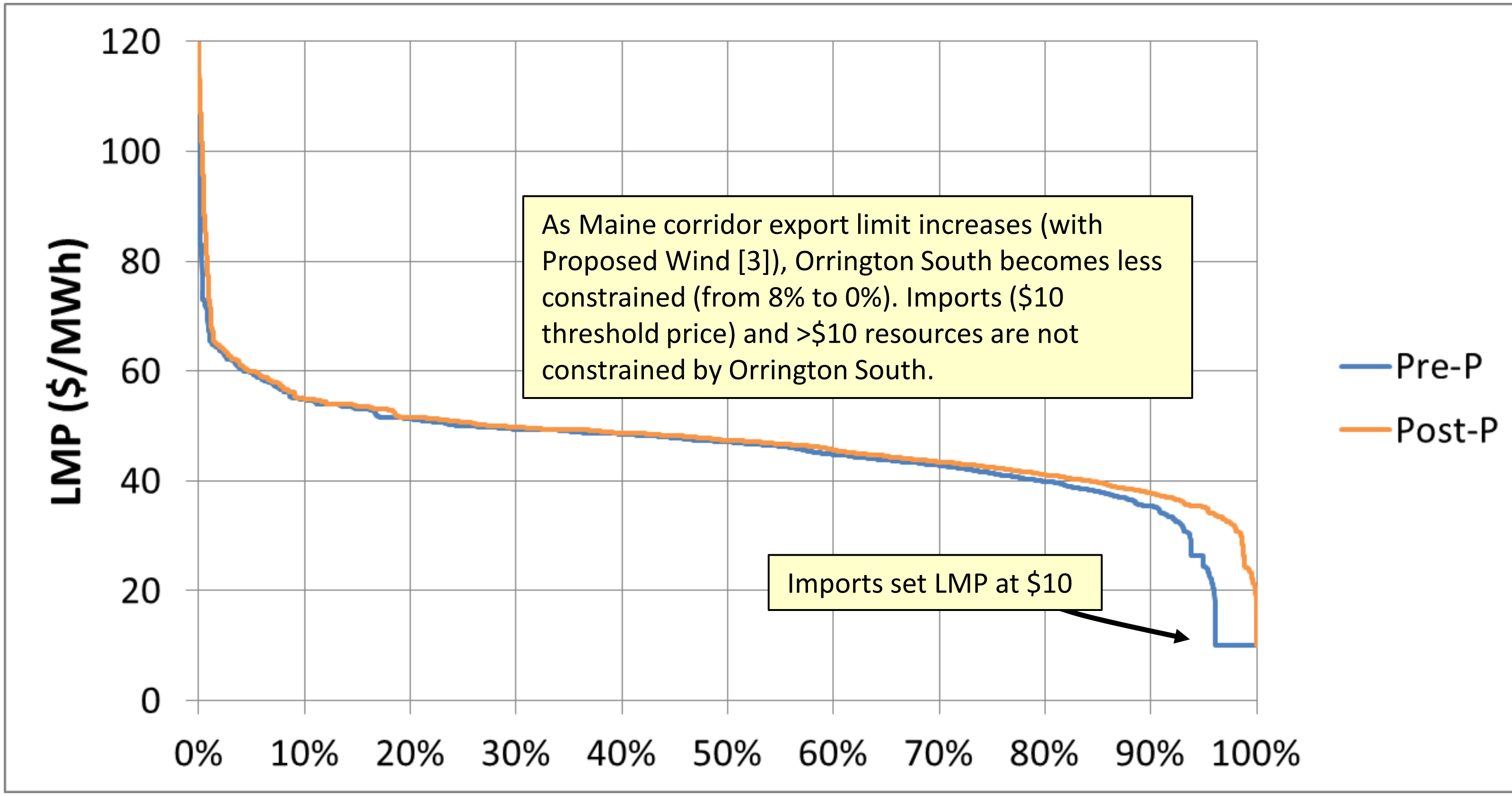
LMP: BHE – Less Wind

Duration Curve



LMP: BHE – Proposed Wind

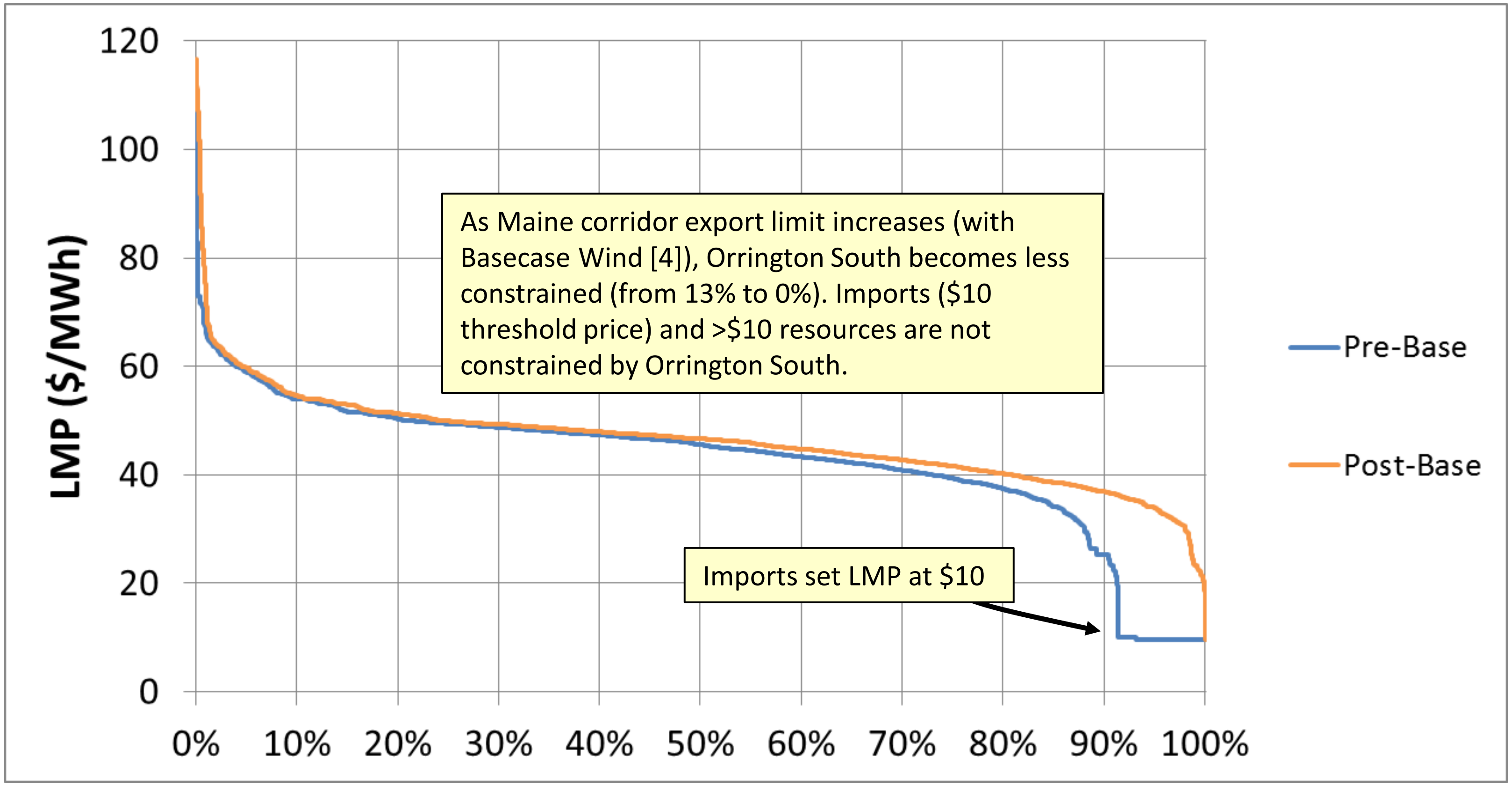
Duration Curve



Time

LMP: BHE – Basecase Wind

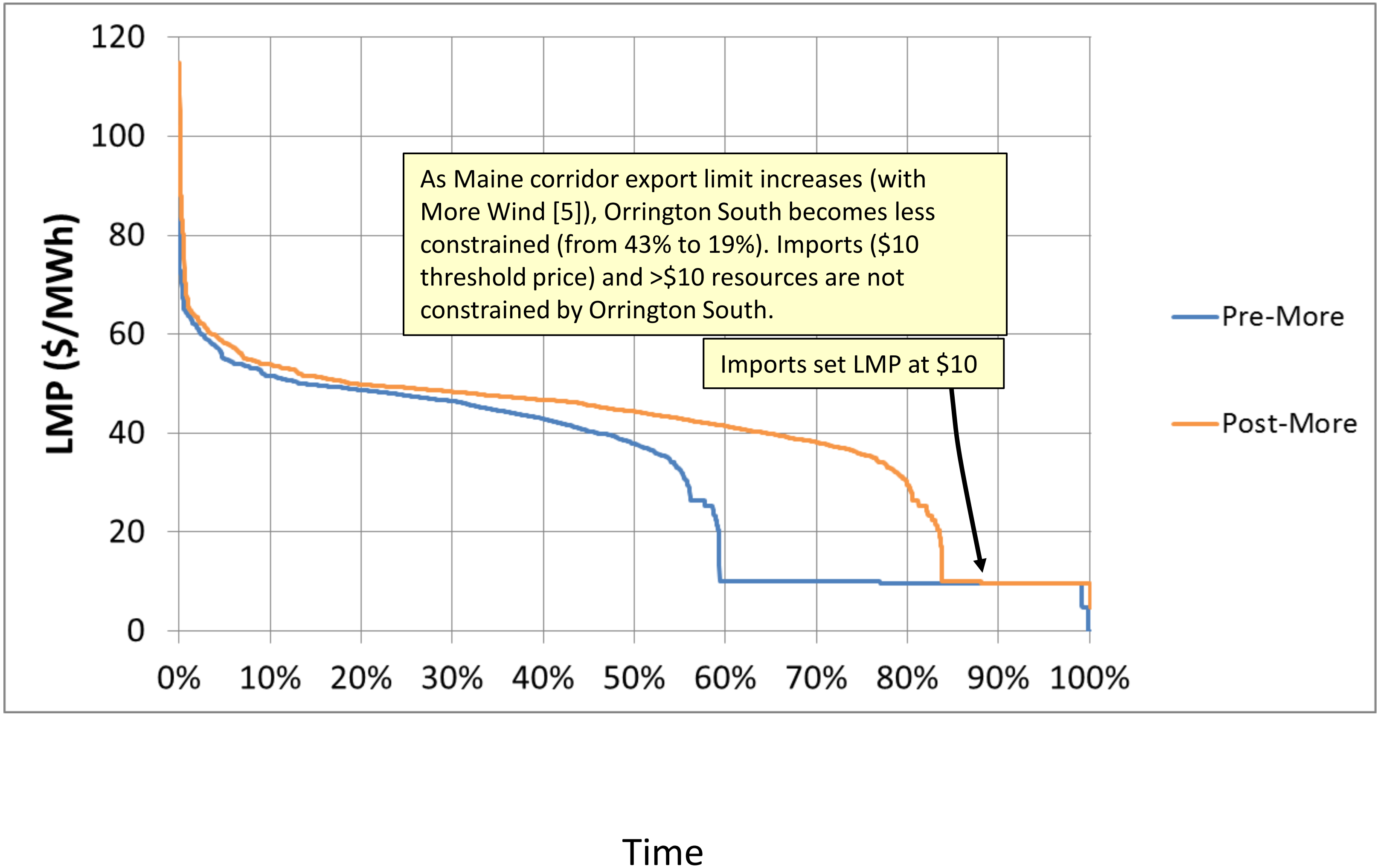
Duration Curve



Time

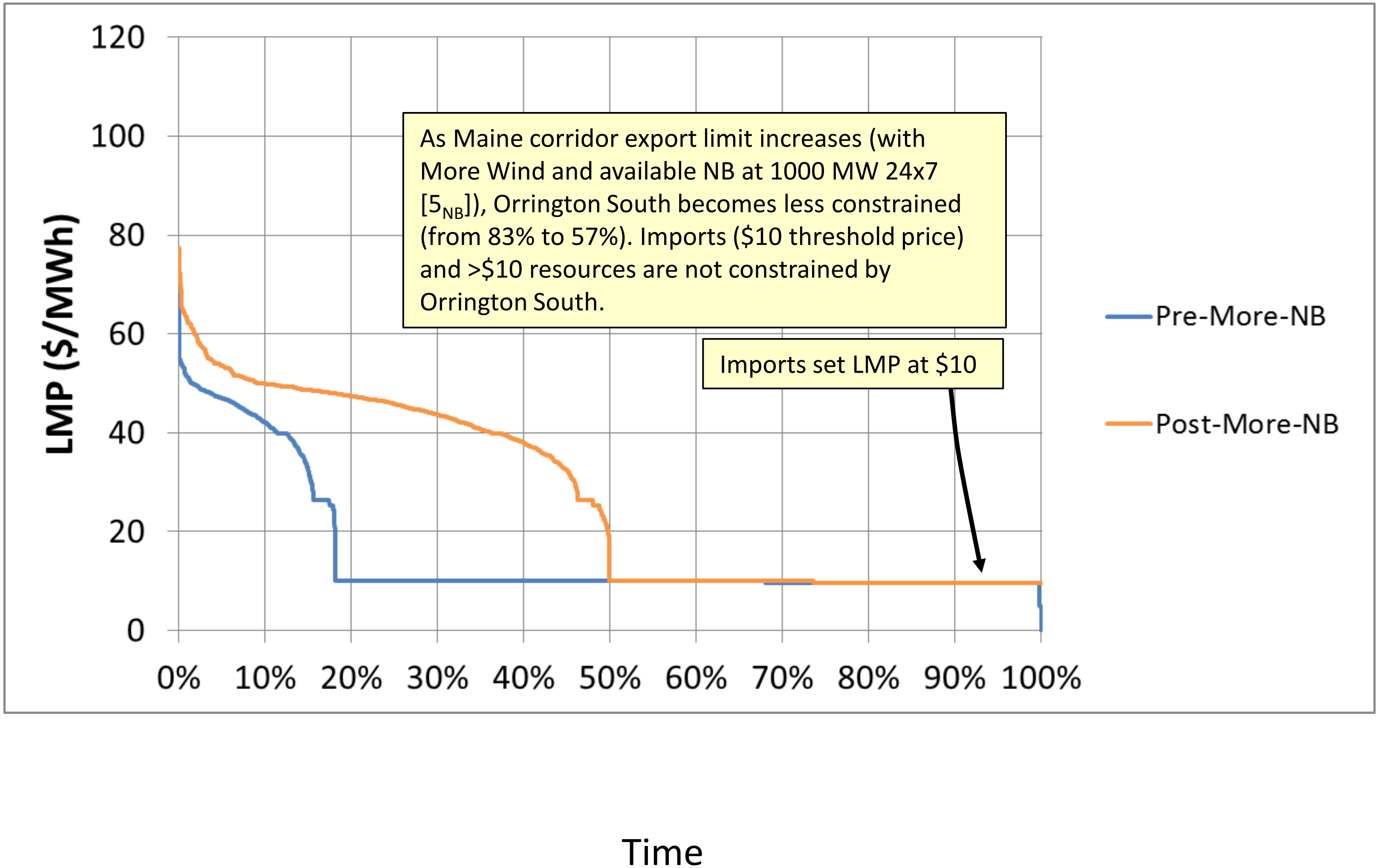
LMP: BHE – More Wind

Duration Curve



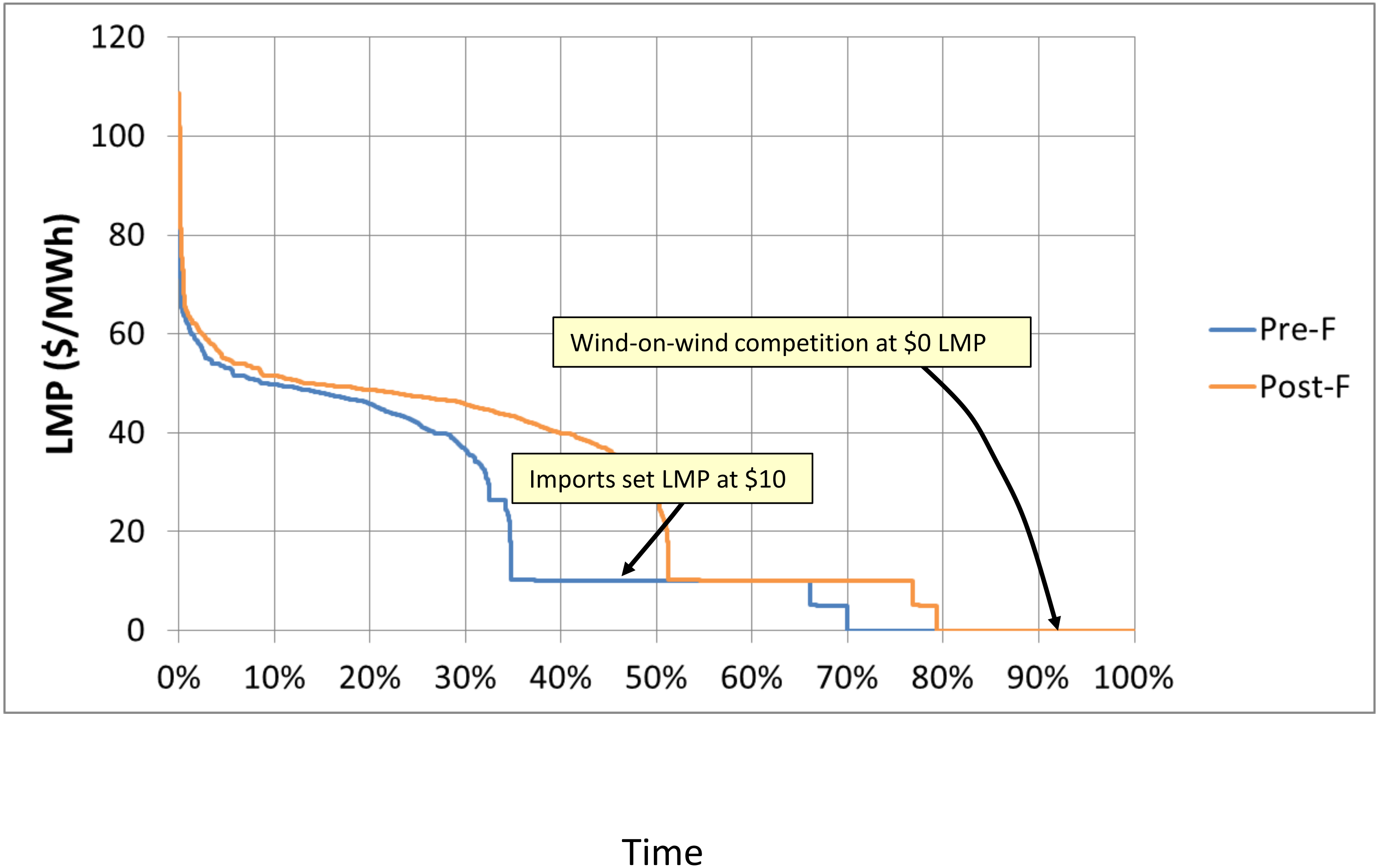
LMP: BHE – More Wind with NB at 1000 MW

Duration Curve



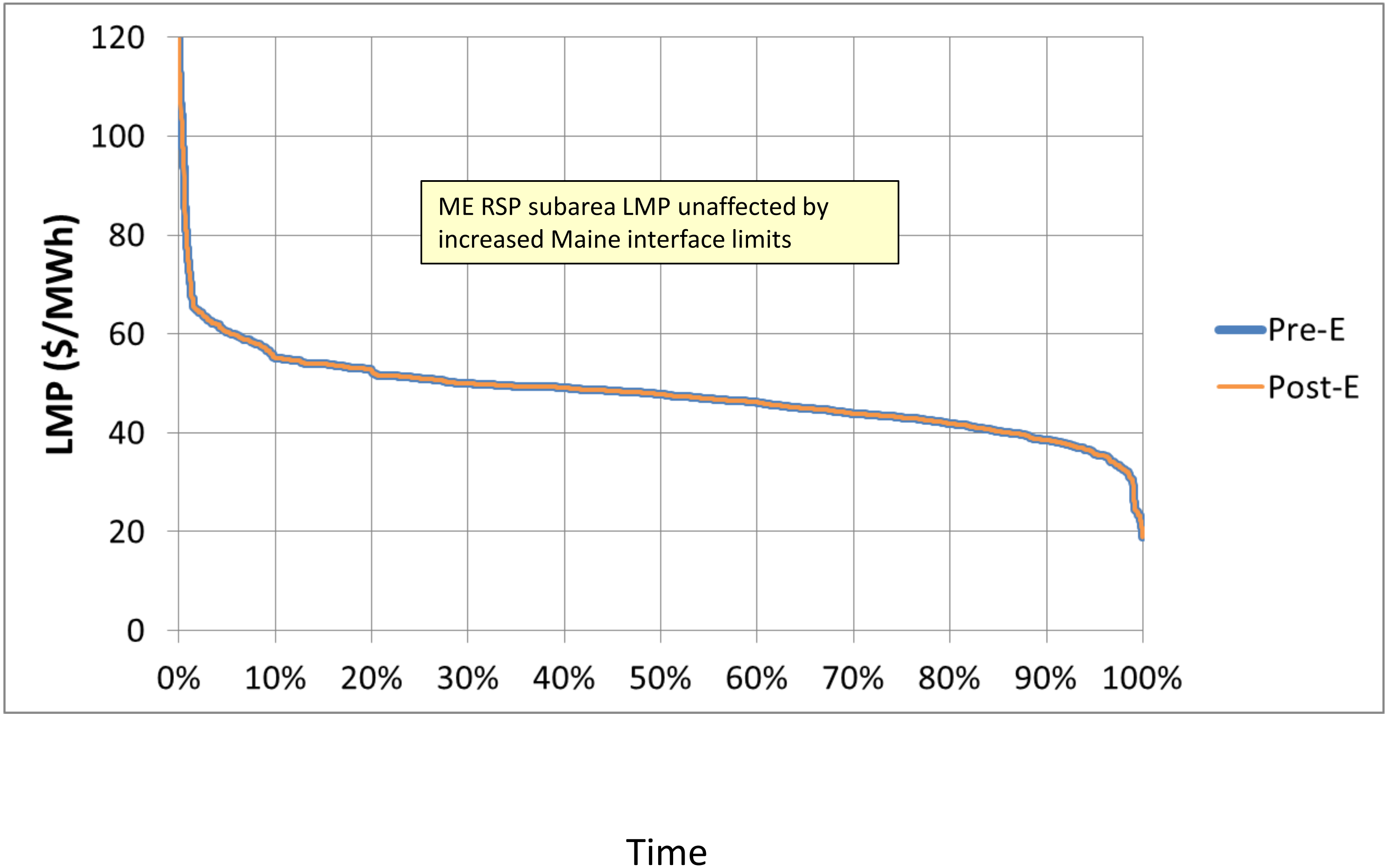
LMP: BHE – Future Wind

Duration Curve



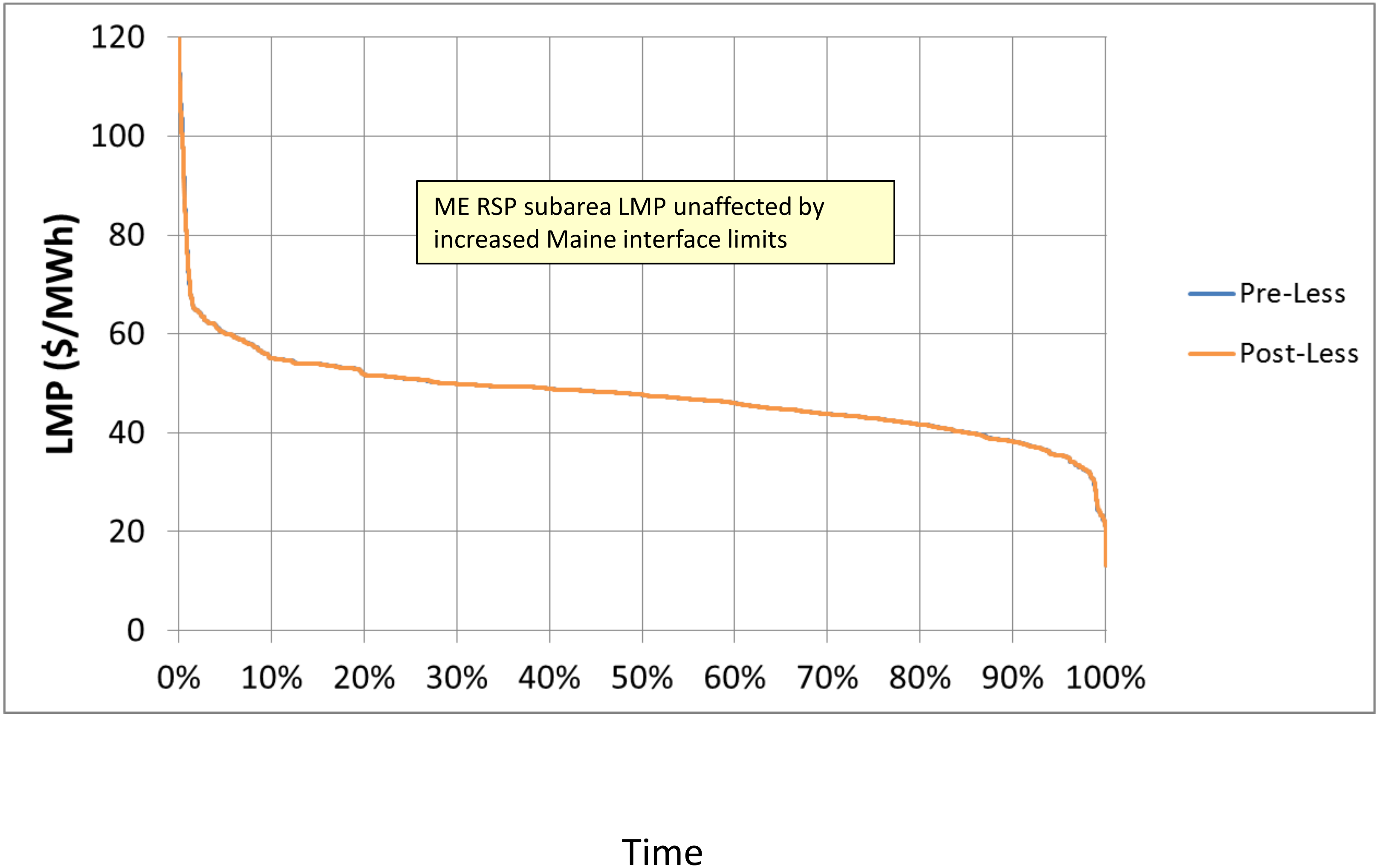
LMP: ME – Existing Wind

Duration Curve



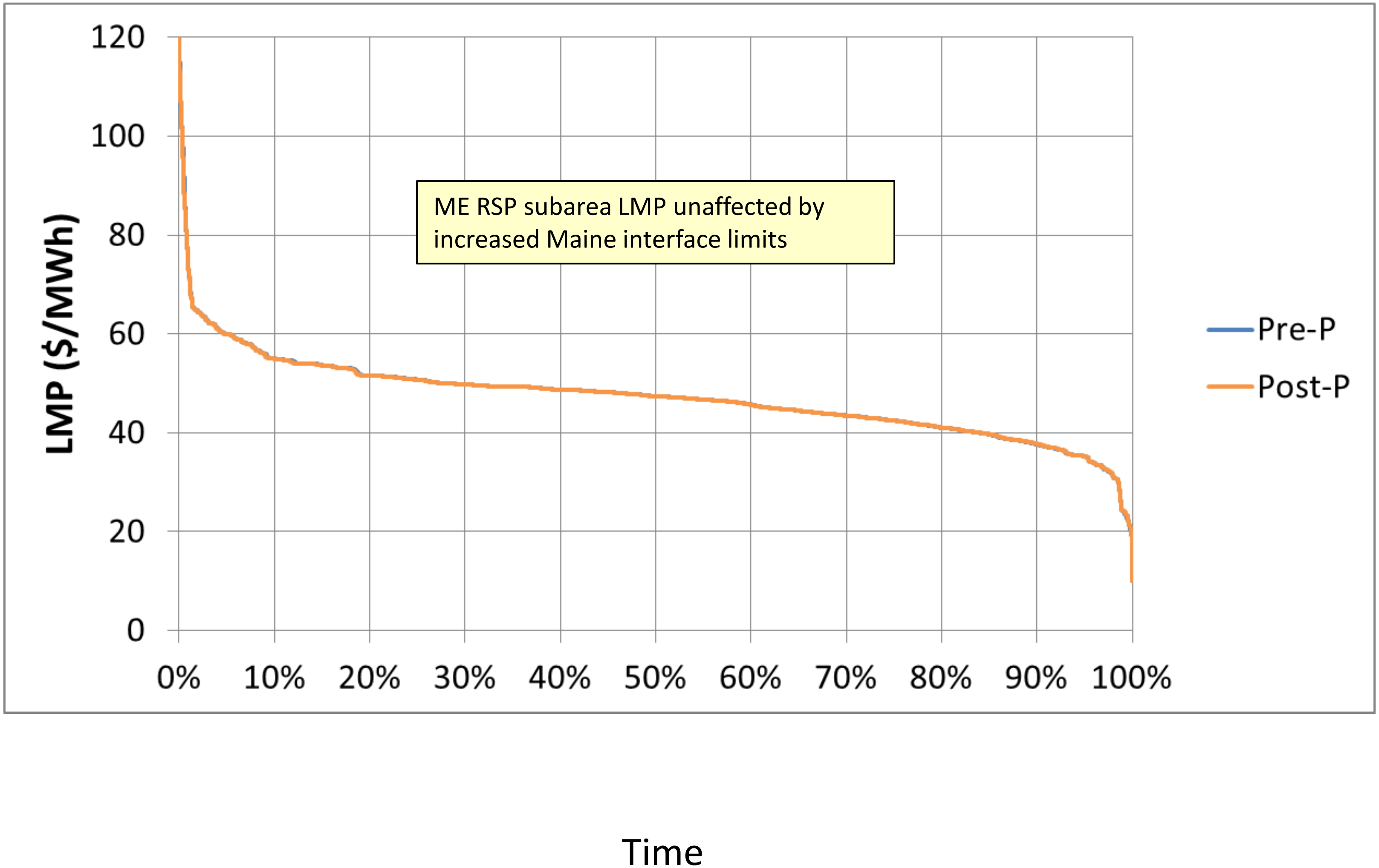
LMP: ME – Less Wind

Duration Curve



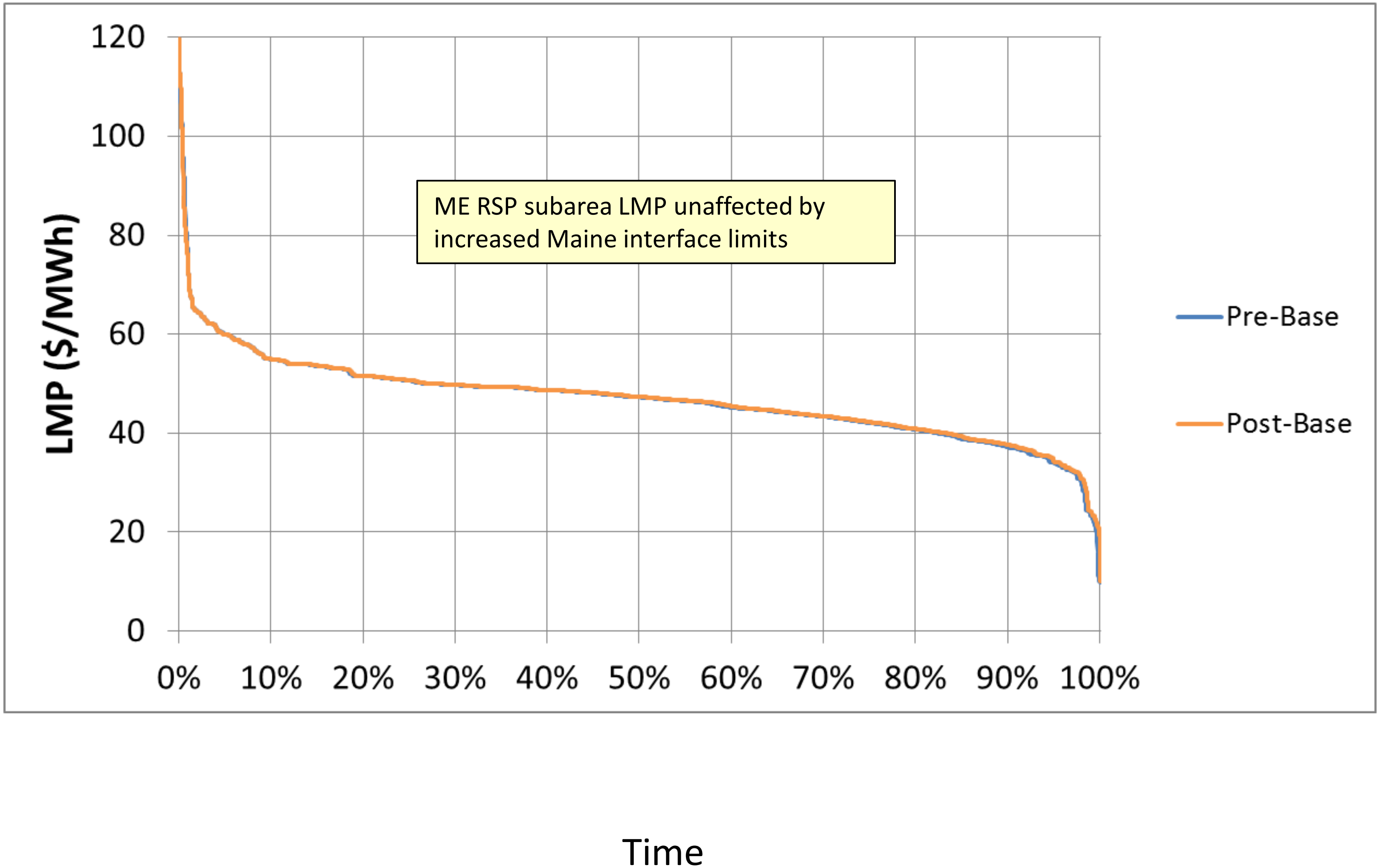
LMP: ME – Proposed Wind

Duration Curve



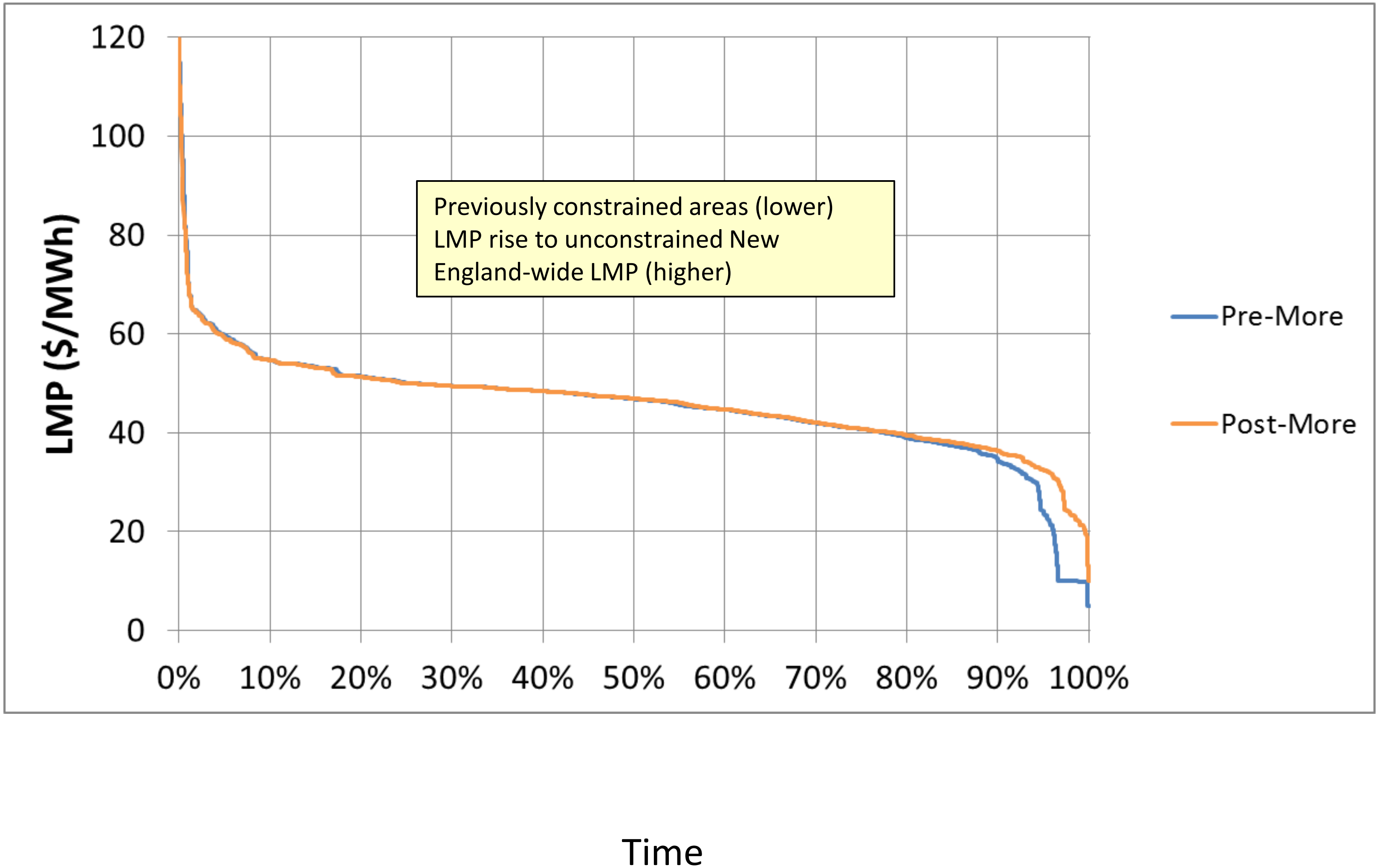
LMP: ME – Basecase Wind

Duration Curve



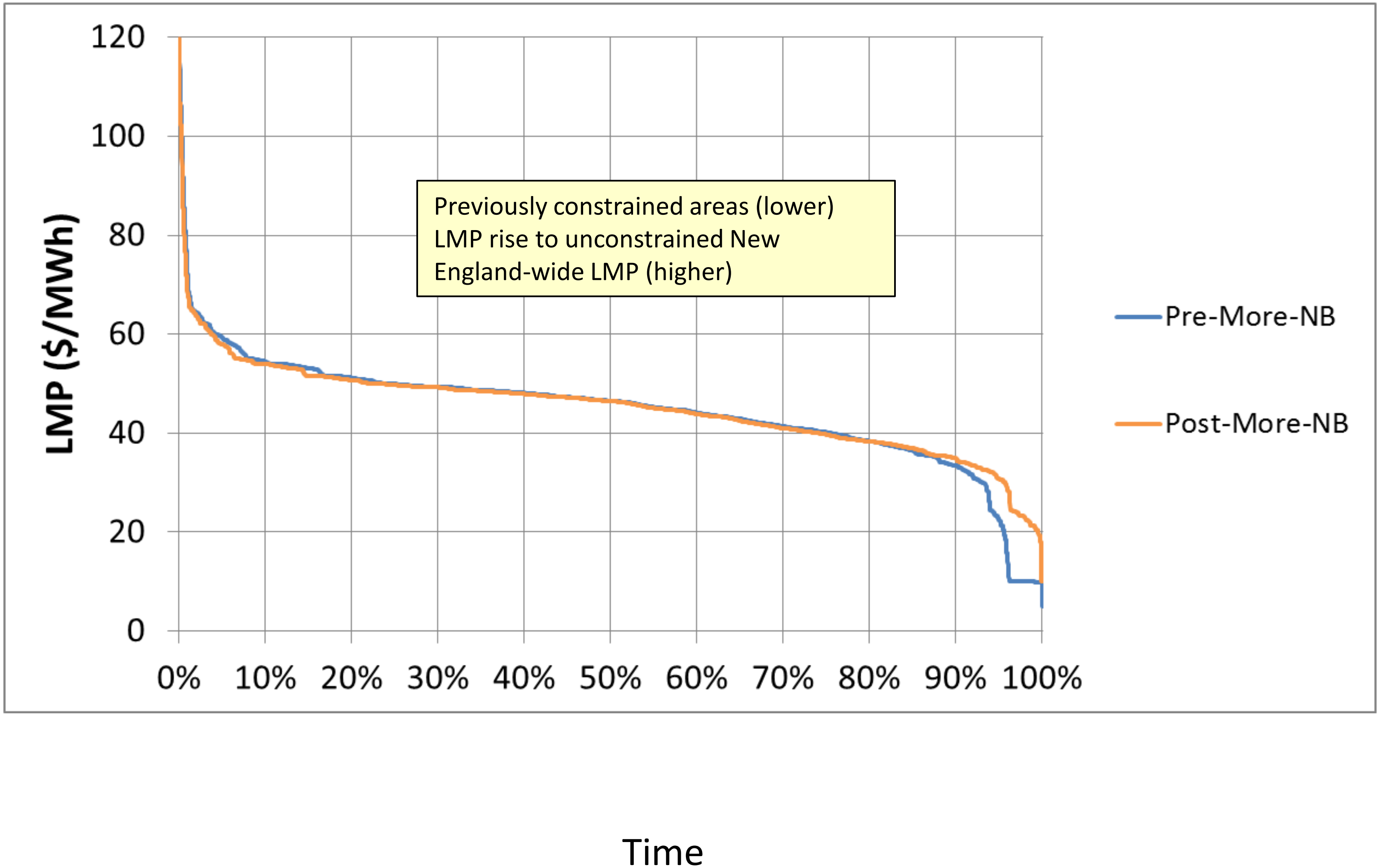
LMP: ME – More Wind

Duration Curve



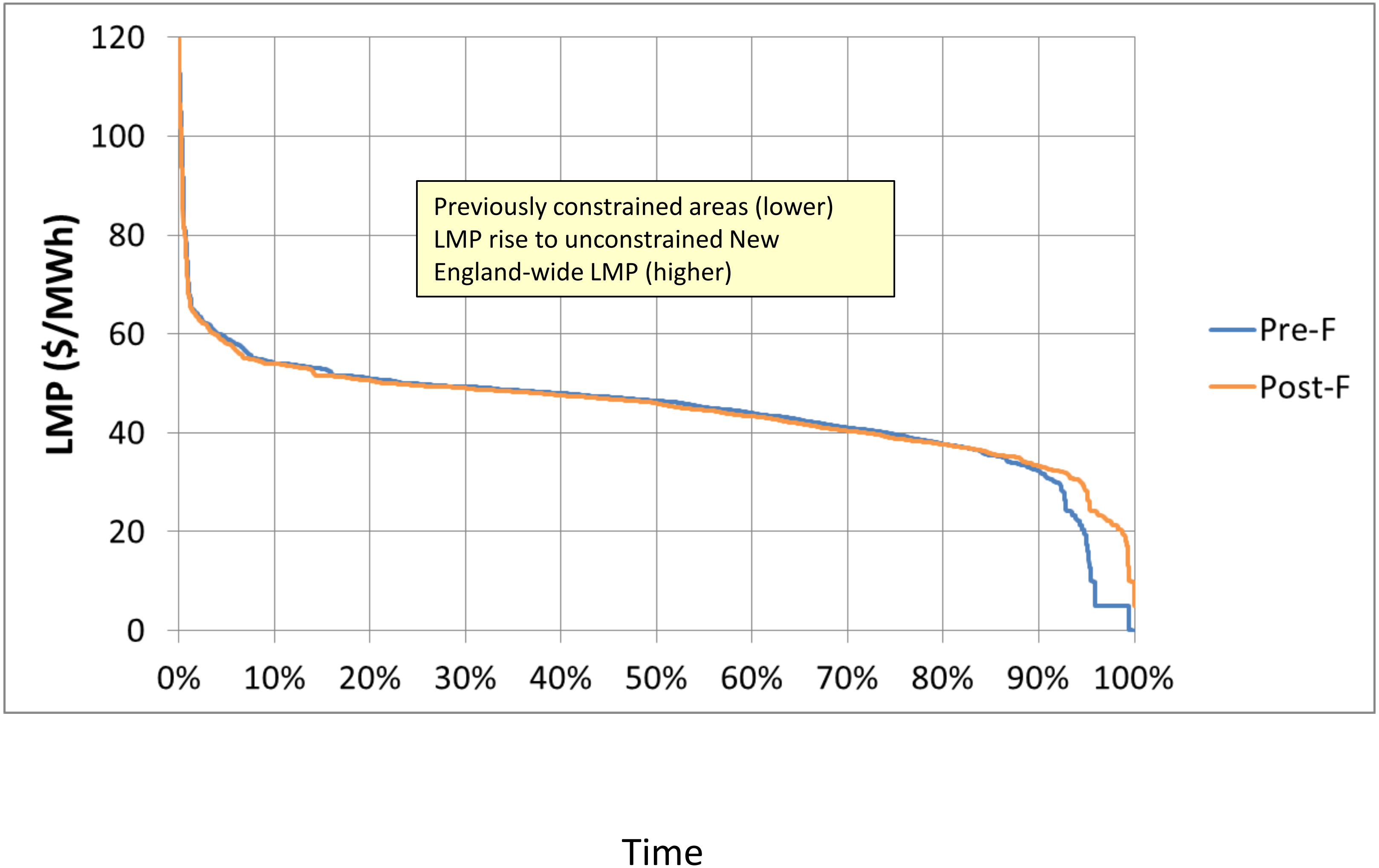
LMP: ME – More Wind with NB at 1000 MW

Duration Curve



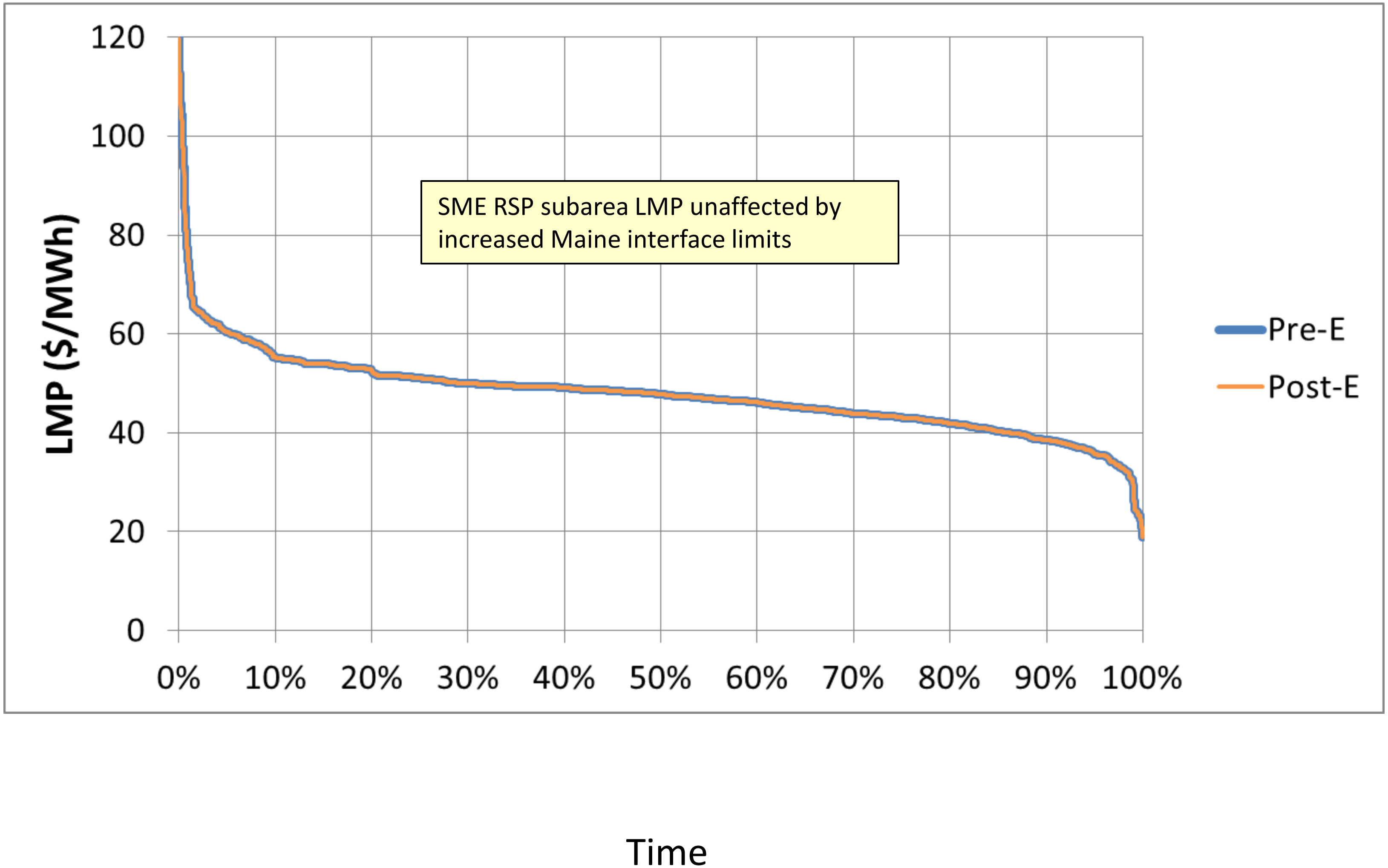
LMP: ME – Future Wind

Duration Curve



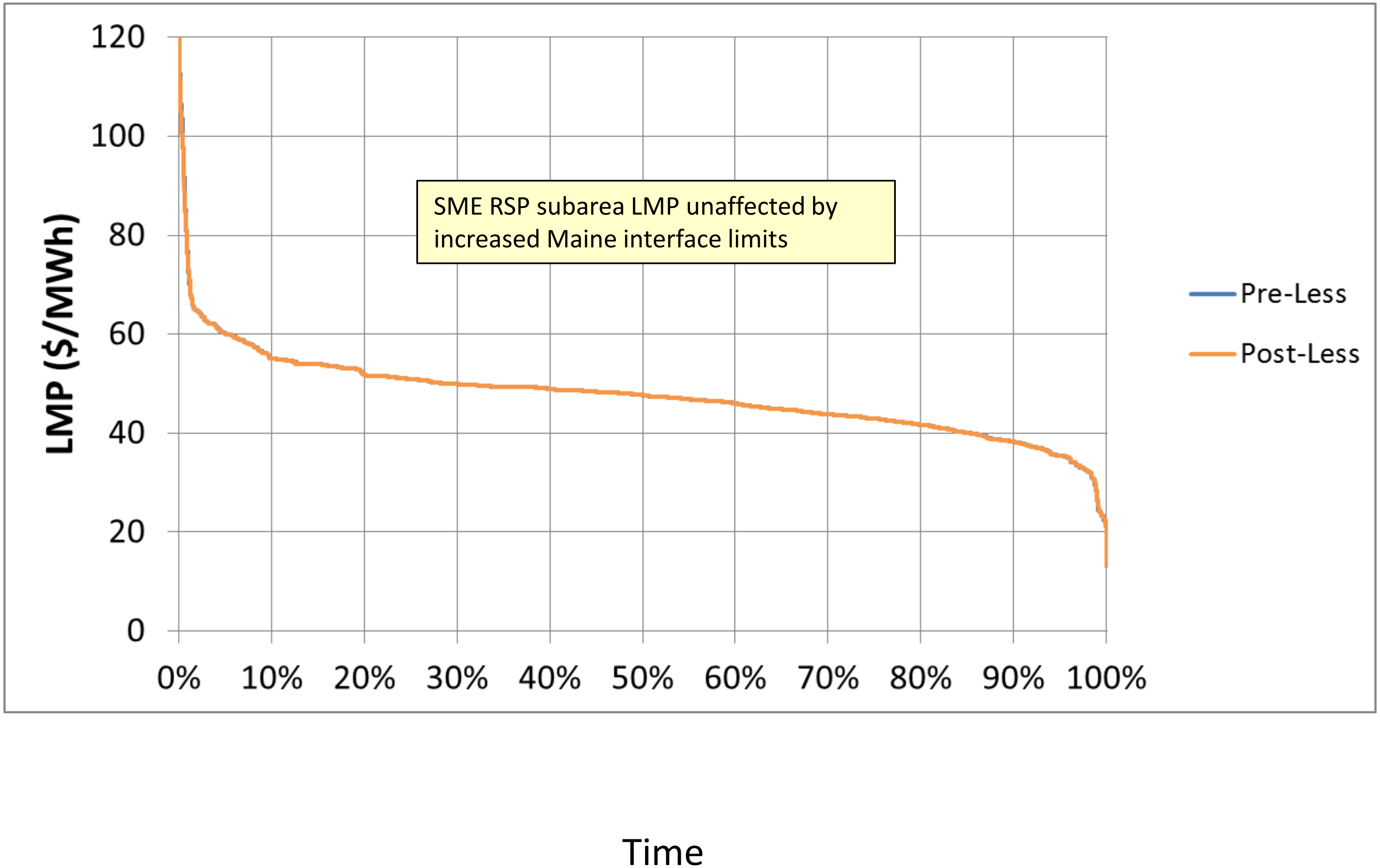
LMP: SME – Existing Wind

Duration Curve



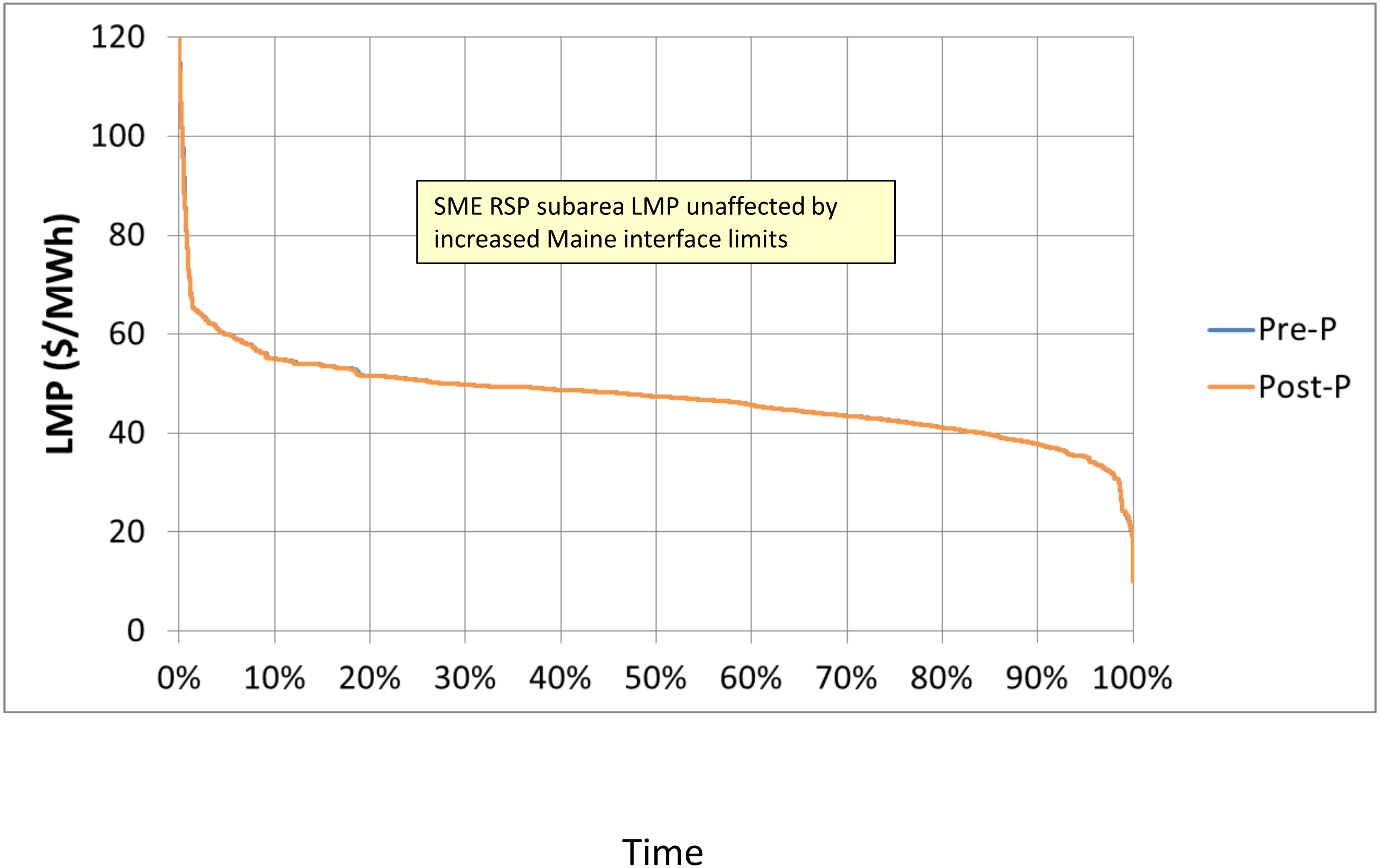
LMP: SME – Less Wind

Duration Curve



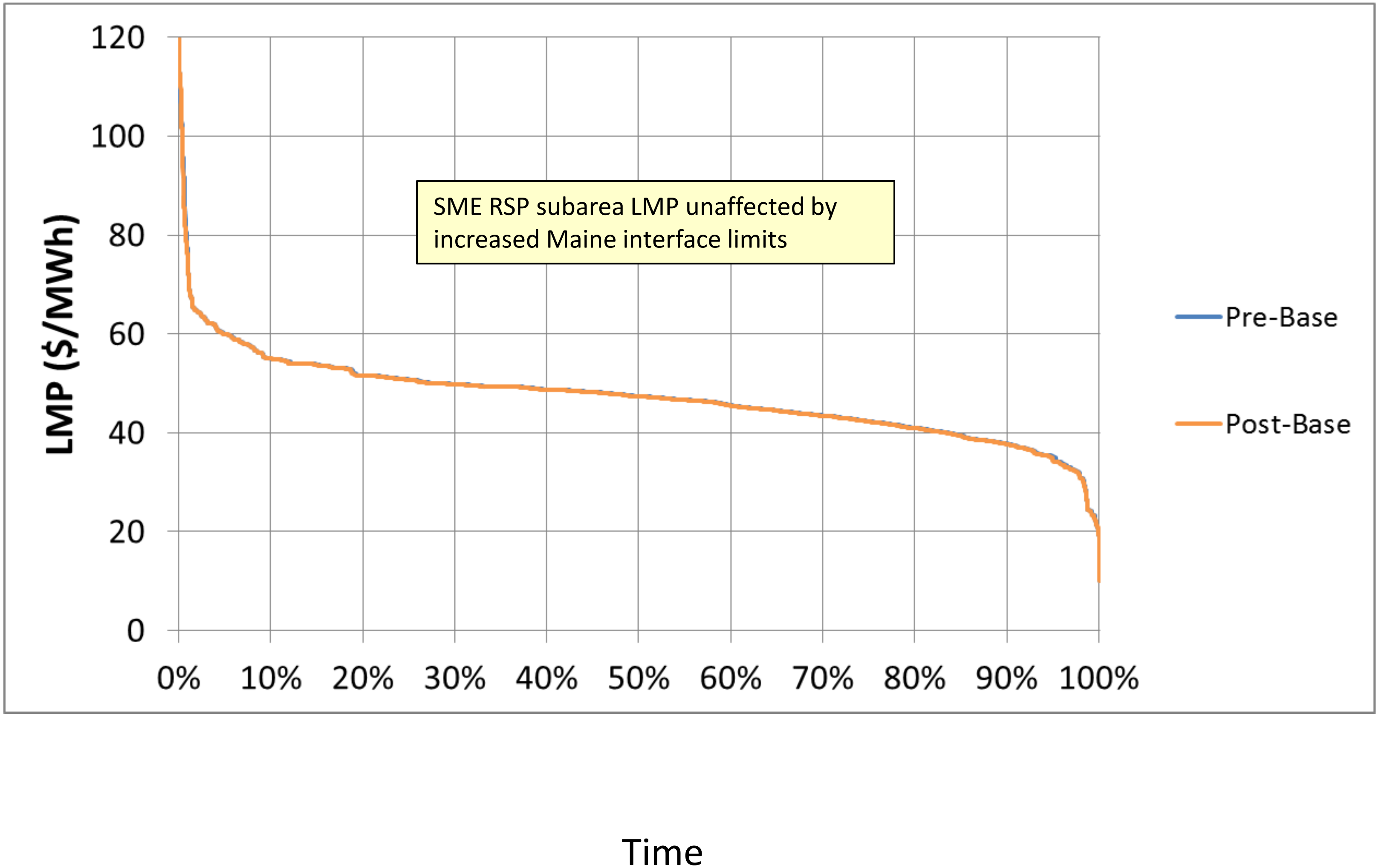
LMP: SME – Proposed Wind

Duration Curve



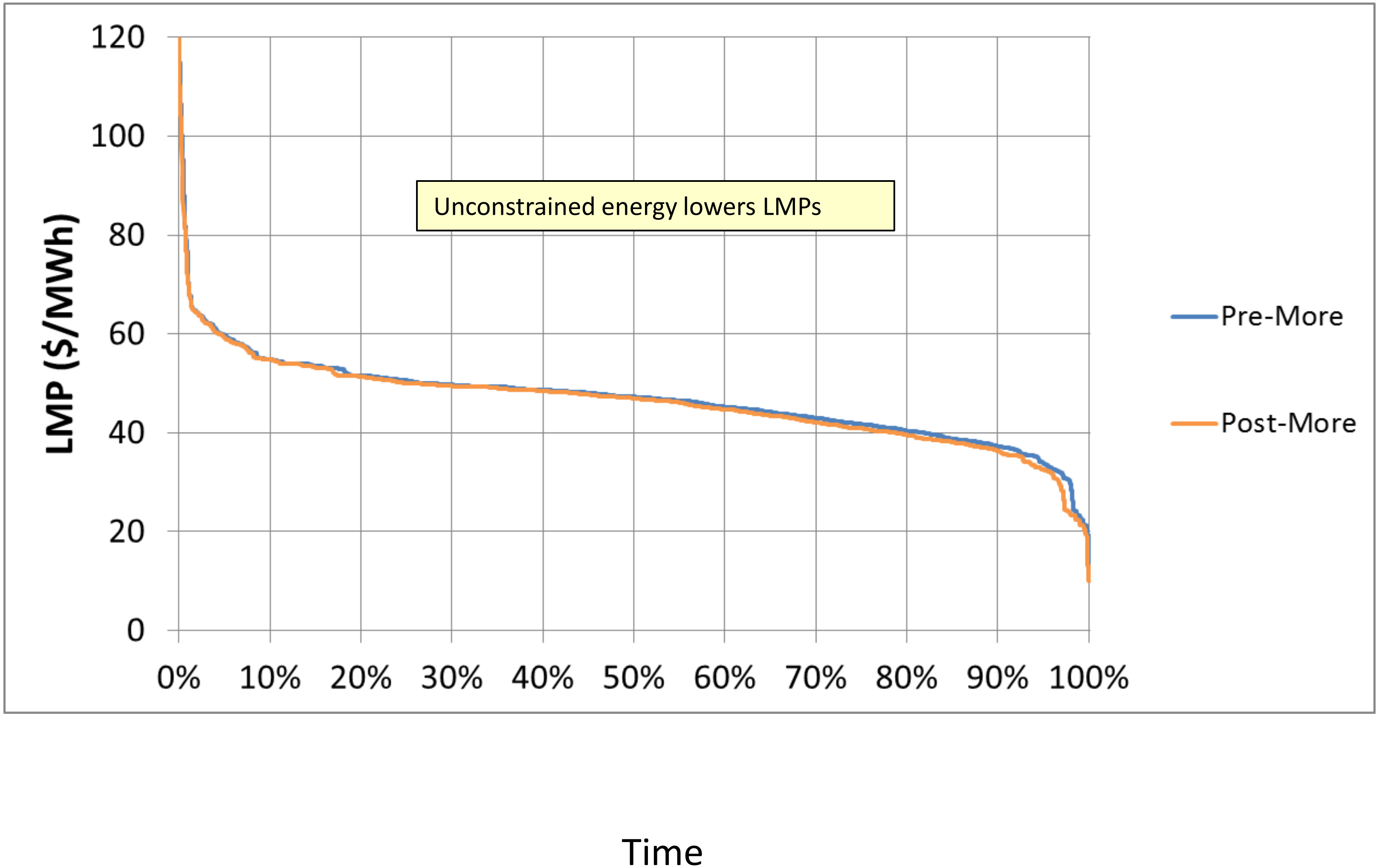
LMP: SME – Basecase Wind

Duration Curve



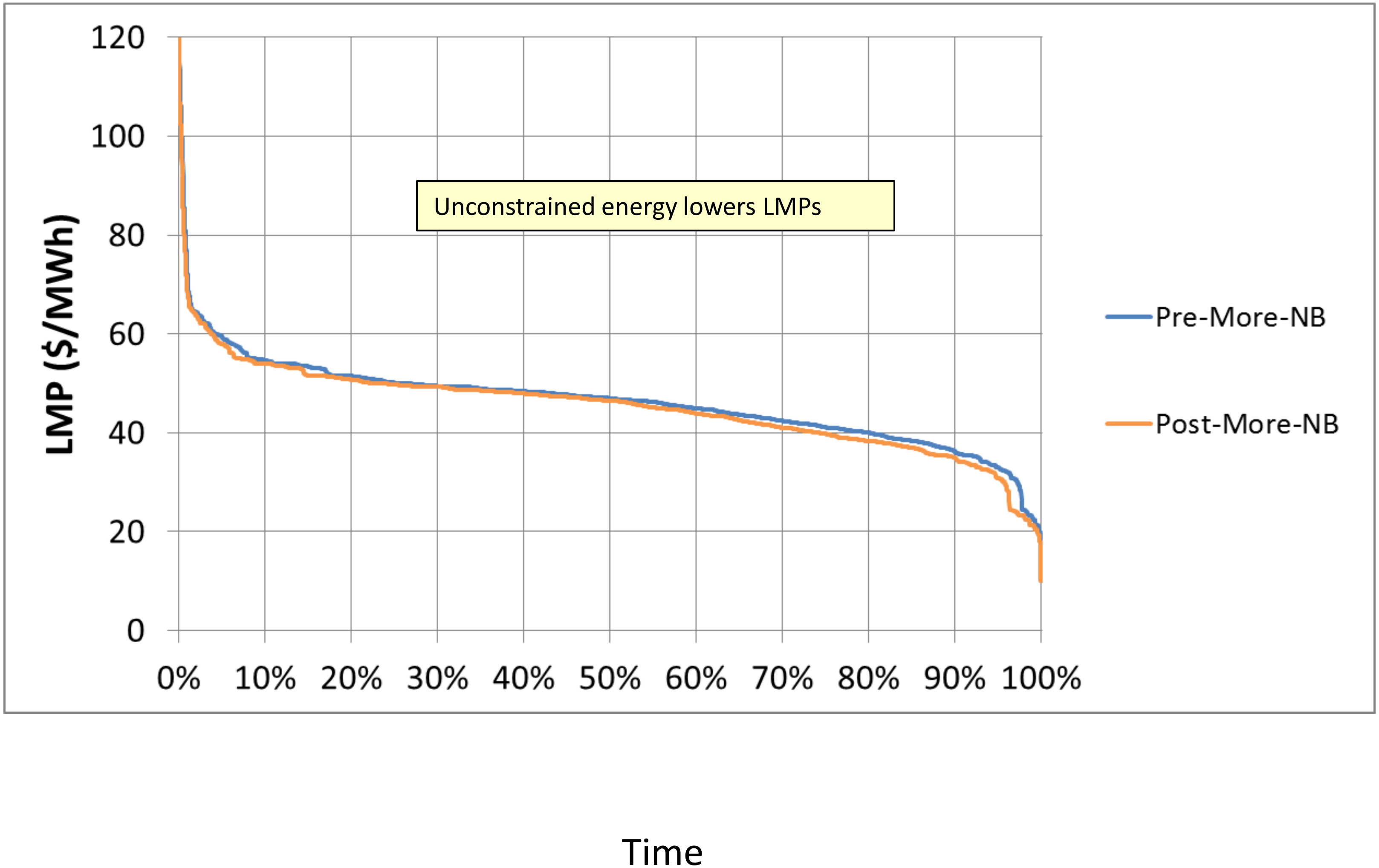
LMP: SME – More Wind

Duration Curve



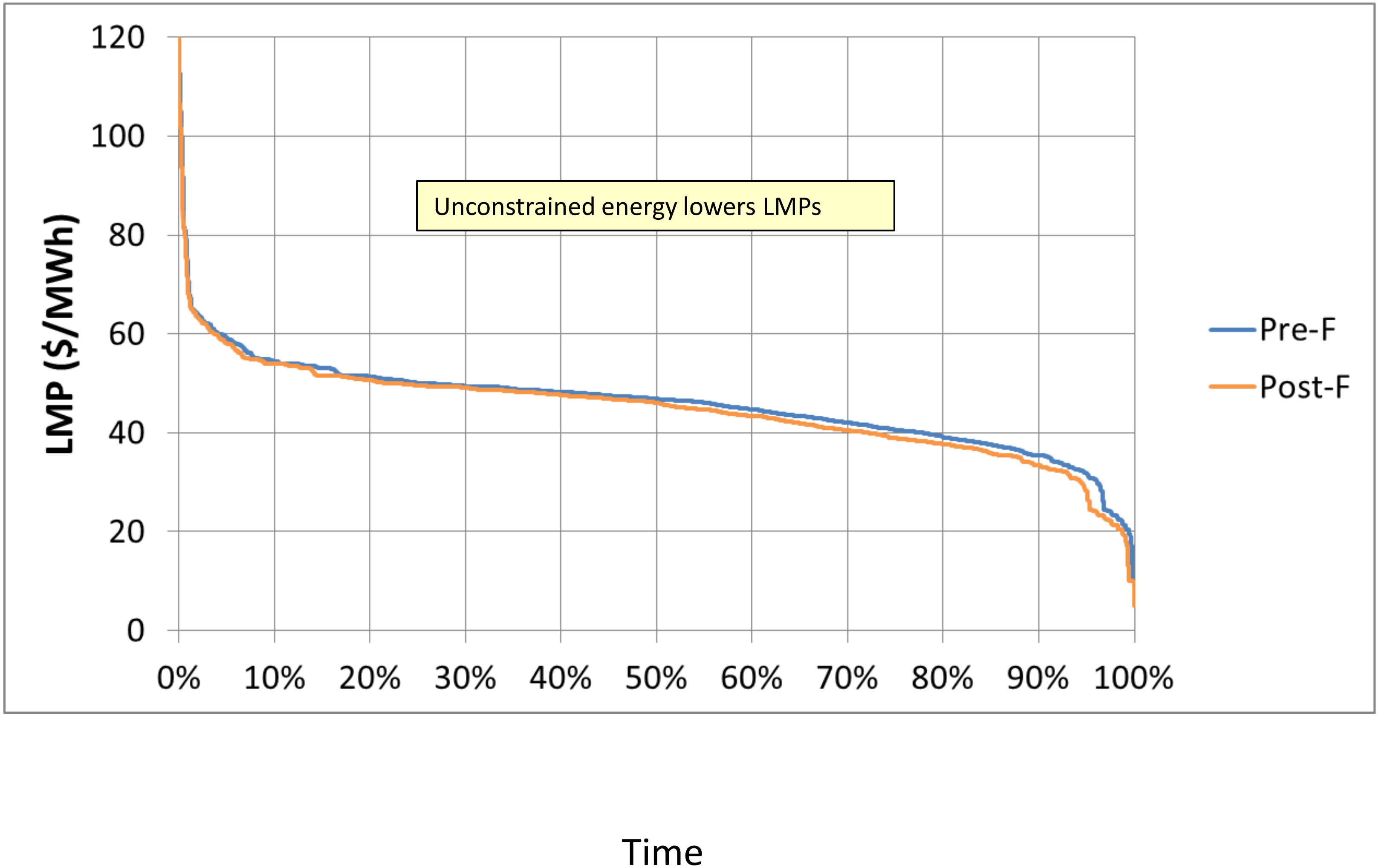
LMP: SME – More Wind with NB at 1000 MW

Duration Curve



LMP: SME – Future Wind

Duration Curve



APPENDIX VII

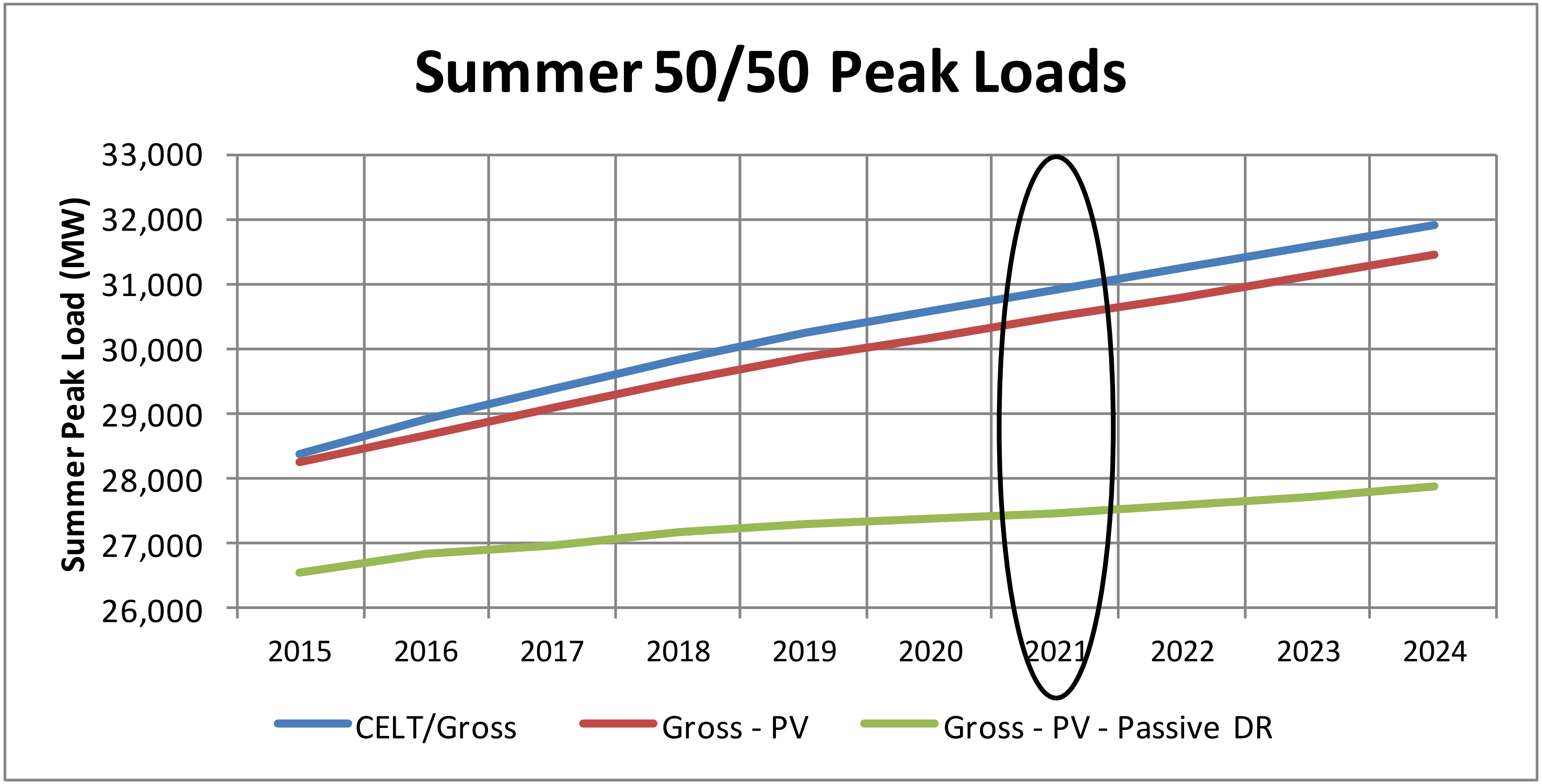
Modeling Assumptions

Base Economic Evaluation Model

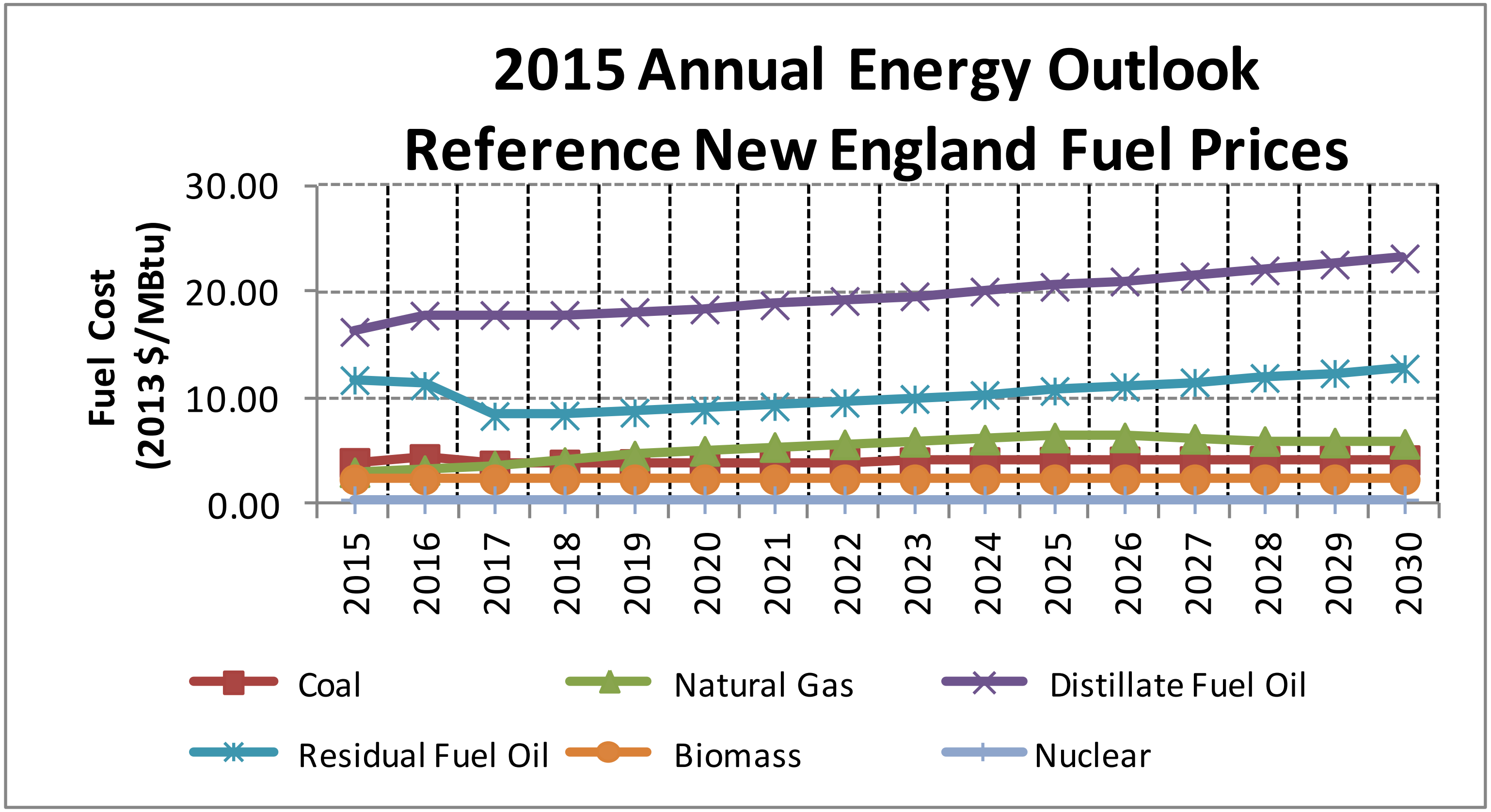
- System conditions consistent with FCA 9 (2018 / 2019) timeframe
  - Resources
  - Transmission capability
  - Demand
- Other economic assumptions
  - Fuel costs
  - Generator availability

Load: New England Peak Load Forecast

Effect of Behind-the-Meter PV and Passive DR



Fuel Price Forecast: EIA's 2015 AEO Base



Resource Assumptions

Overview

- Resources include
  - Cleared in Forward Capacity Auction #9
  - 2015 CELT resources
  - Other energy only resources
  - Wind in each study are specified by the economic study request
    - Wind resource production modeled based on 2012 NREL data
- Demand resources
  - Energy efficiency (EE) and photovoltaic (PV) – including forecasts
  - Active demand resources (DR)
  - Hourly profile based on 2006 weather (consistent with wind and PV data)

Resource Assumptions

Overview (Cont.)

- Dispatch threshold price
  1) Wind ($0/MWh)
  2) Hydro ($5/MWh)
  3) Imports ($10/MWh)

  *Note: Production cost is zero for these resources. An LMP below the threshold price will result in a resource self curtailing.

- Resources modeled as hourly profiles
  - EE, DR, RTEG
  - PV, wind,
  - Hydro
  - Imports
- Wind profiles based on 2012 NREL data
  - Capacity factors range is from 31% to 41%

Resource Assumptions

Thermal Units

- Points of interconnection for resources based on ISO-NE TPL case*
- Existing thermal units
  - Simulation study production cost parameters: Heat rate curve, Start-up cost, No-load cost and etc.
  - Primary and secondary fuel definition are based on 2015 CELT
- Operational limits
  - Minimum up time, Minimum down time and Start up time
  - Ramp rate limits
- Energy limits: assume no energy limits
- Future thermal units
  - Production cost parameters based on: unit type, technology and rating

*Source: NERC TPL Study 2021 Summer Peak Case (https://smd.iso-ne.com/operations-services/ceii/pac/2015/08/final_nerc_tpl_study_2021_summer_peak_case.zip)

Resource Assumptions

Thermal Units (Cont.)

- Combined cycle units
  - Individual machines from a combined cycle plant are modeled as a single generator at one of the machine's buses
- Outages
  - Thermal units derated to reflect the forced outages using Equivalent Forced Outage Rate (EFOR)
  - Planned maintenance schedule will be developed and held constant across cases

Resource Assumptions

Hydro Units

- Hydro units modeled using
  - Hourly energy generation profiles
  - Peak shaving bias
  - Used in previous economic studies
- Hydro units are assumed to have no maintenance outage

Resource Assumptions

Pumped Storage Units

- Modeled in peak shaving mode
  - Pumping during off-peak hours
  - Generating during on-peak hours
- Pumped storage physical parameters
  - Minimum pond size
  - Maximum pond size
  - Plant capacity factor
  - Based on assumptions used in previous studies

Resource Assumptions

Photovoltaic

- 2015 PV Forecast used for simulation year 2021
- Represented by a time stamped, chronological hourly solar PV profile
- National Renewable Energy Laboratory (NREL) has developed a simulated solar PV dataset based on 2006 weather
  - New England specific
  - Profiles by RSP area available
- Consistent with methodology used for wind profile

Resource Assumptions

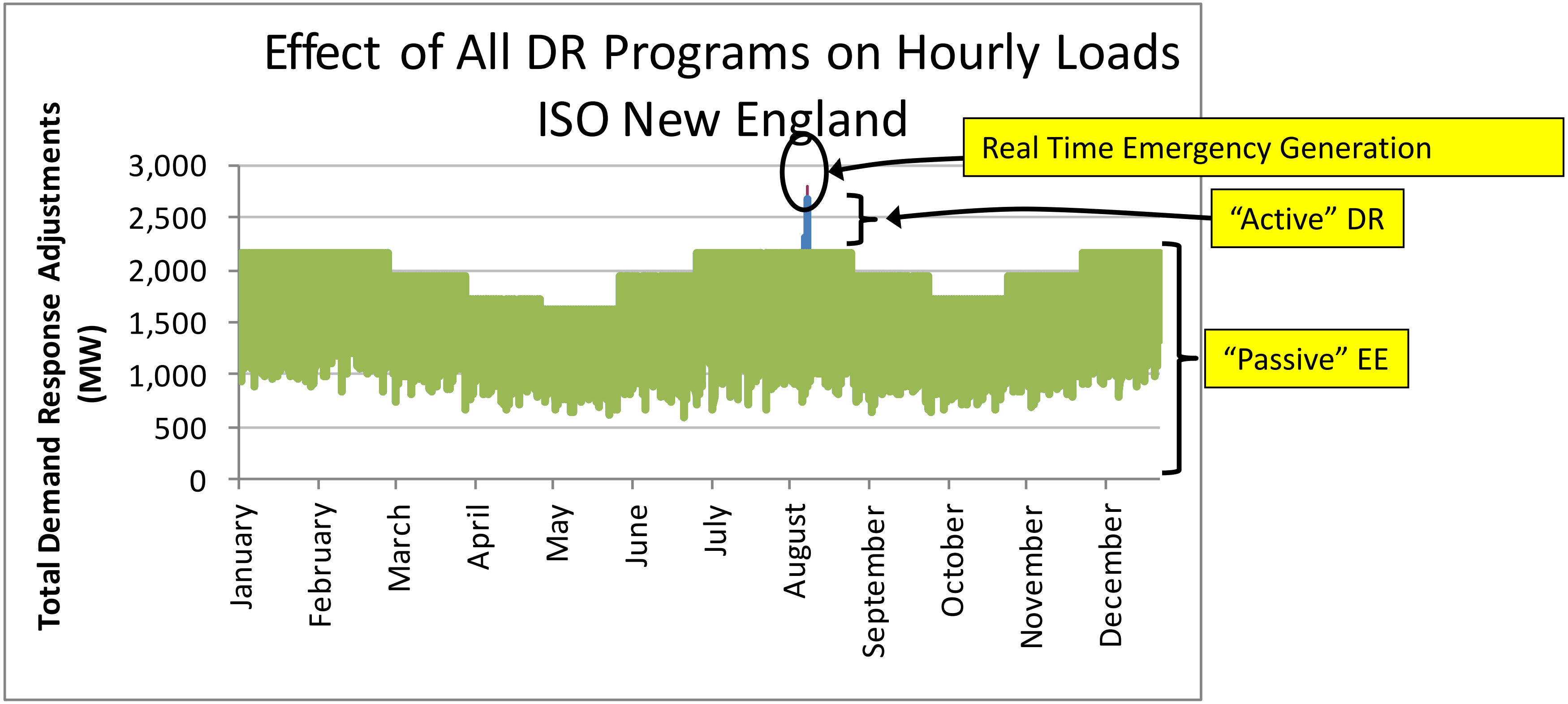
Demand Resources

- Active DR, EE and RTEG are modeled explicitly
  - Hourly profile for each category of demand side resource
  - FCA amounts used through capacity commitment periods
- Forecasts
  - The latest EE forecast through the year 2024 is reflected
  - Active DR and RTEG are held constant for years beyond capacity commitment period (same as other FCM resources)

Resource Assumptions

Demand Resources (Cont.)

- Hourly profiles are used to explicitly reflect energy efficiency (EE), active demand resources (DR) and real-time emergency generation (RTEG)



Operating Reserve Modeling

- Operating reserve requirement is determined in real time
  - Based on the first and second largest system contingencies
  - Resource profiles (hydro / wind / interchange etc) excluded
- Current operating reserve requirements
  - 125% of the first contingency in ten minutes split between
    - Ten-Minute Spinning Reserve (TMSR) = 50%
    - Ten-Minute Non-Spinning Reserve (TMNSR) = 50%
  - Thirty-Minute Operation Reserve (TMOR) not modeled
    - Assumed to be adequate
    - Provided by hydro, pumped storage and quick-start resources
    - Reasonable assumption except, possibly, at times of peak loads

Network Modeling

- Modeling of transmission network
  - ISO-NE TPL case*
  - Detailed modeling in ISO-NE region only
  - Representation for neighboring systems
    - Detailed network modeling not required for NY, NB and HQ
    - Base flows based on historical line flows

*Source: NERC TPL Study 2021 Summer Peak Case (https://smd.iso-ne.com/operations-services/ceii/pac/2015/08/final_nerc_tpl_study_2021_summer_peak_case.zip)

Network Modeling (cont)

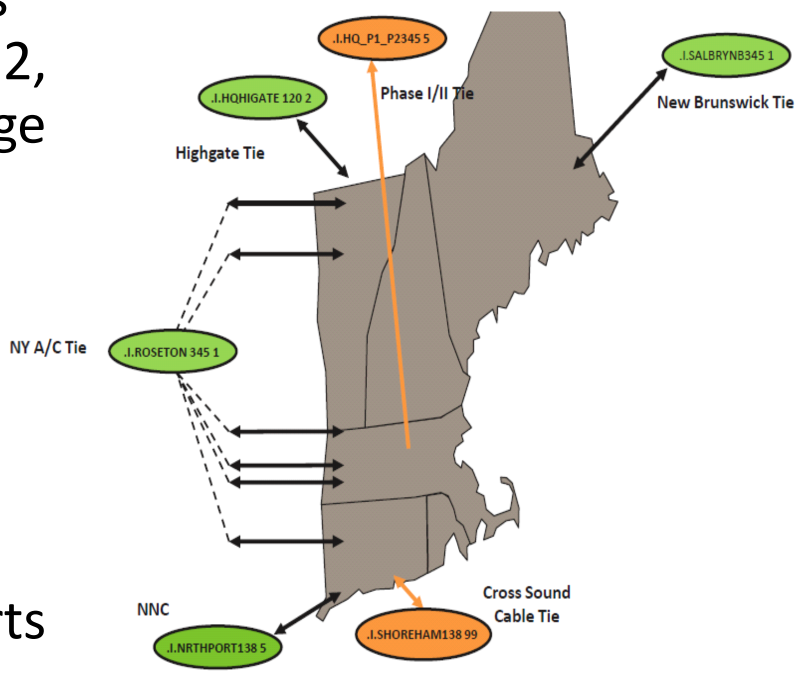
- Modeling of internal interface limits
  - The latest ISO-NE estimated internal interface limit values reflected
- Modeling of transmission line
  - All 230 kV and 345kV circuits ISO-NE region are monitored for thermal overloads
    - Nearly 300 branches monitored for thermal overloads
    - Includes transformers that step up to 230 kV and above
  - Generator step-up (GSU) transformers are excluded
    - Ensure a generating plant output is not limited by GSU modeling
- Monitoring of transmission line
  - 115 kV and above lines in areas of concern as appropriate
    - Maine for
      - Strategic Transmission Analysis – Wind Integration study
      - Keene Road study
    - SEMA / RI for off-shore wind study

Imports and Exports Modeling

- Hourly imports and exports over the following external interconnections are modeled based on average 2012, 2013 and 2014 historical interchange values*
  - New York AC
  - NNC
  - Cross Sound Cable
  - Highgate
  - HQ Phase II
- New Brunswick modeled as historical monthly maximum imports from 2013 and 2014

*The same approach used in previous economic studies for representing import/export assumptions

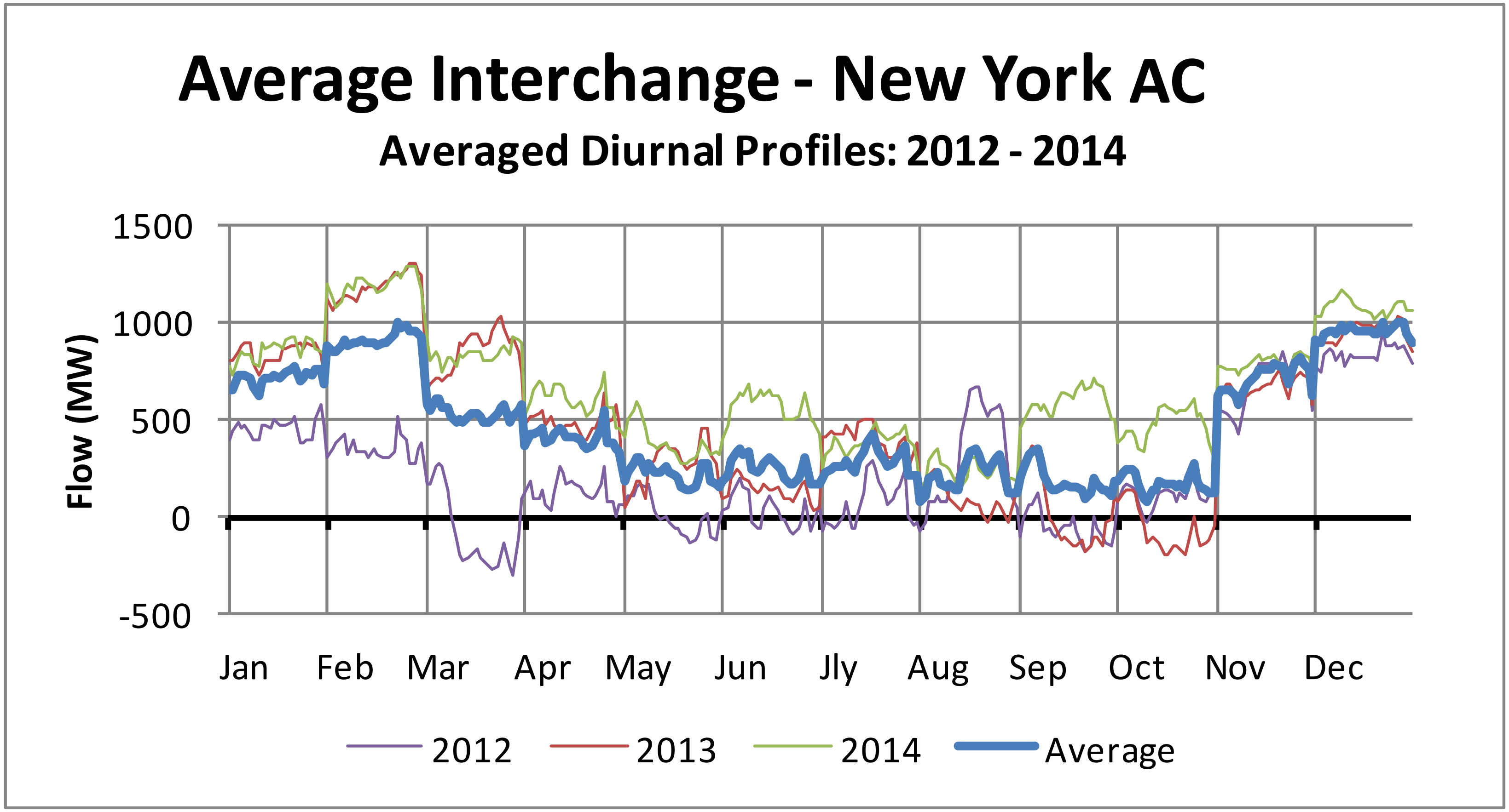
ISO -NE External Interface



Modeling of Imports/Exports

Imports and Exports Modeling

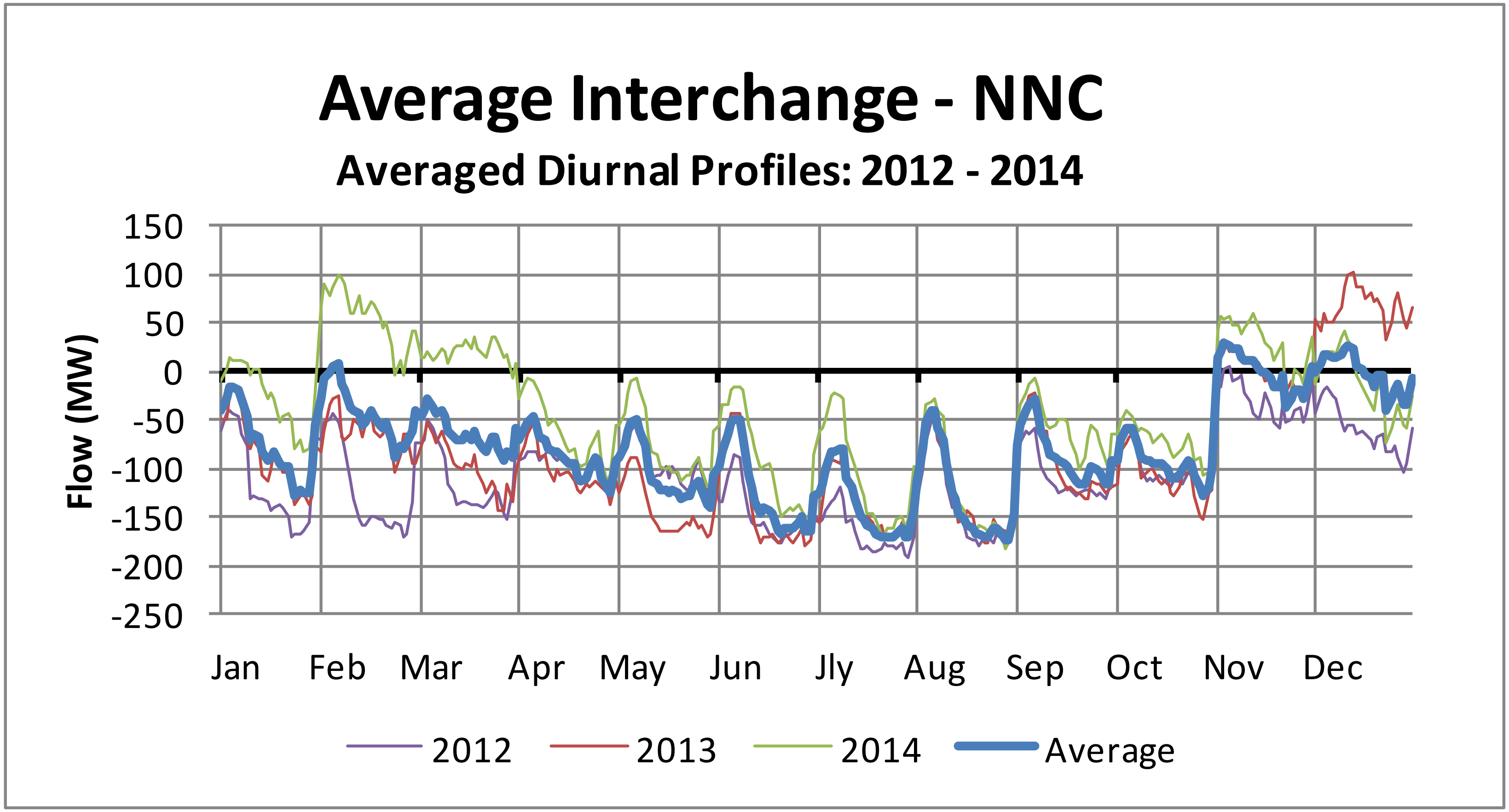
New England to New York - AC Interface



Note: positive values represent imports; negative values represent exports.

Imports and Exports Modeling

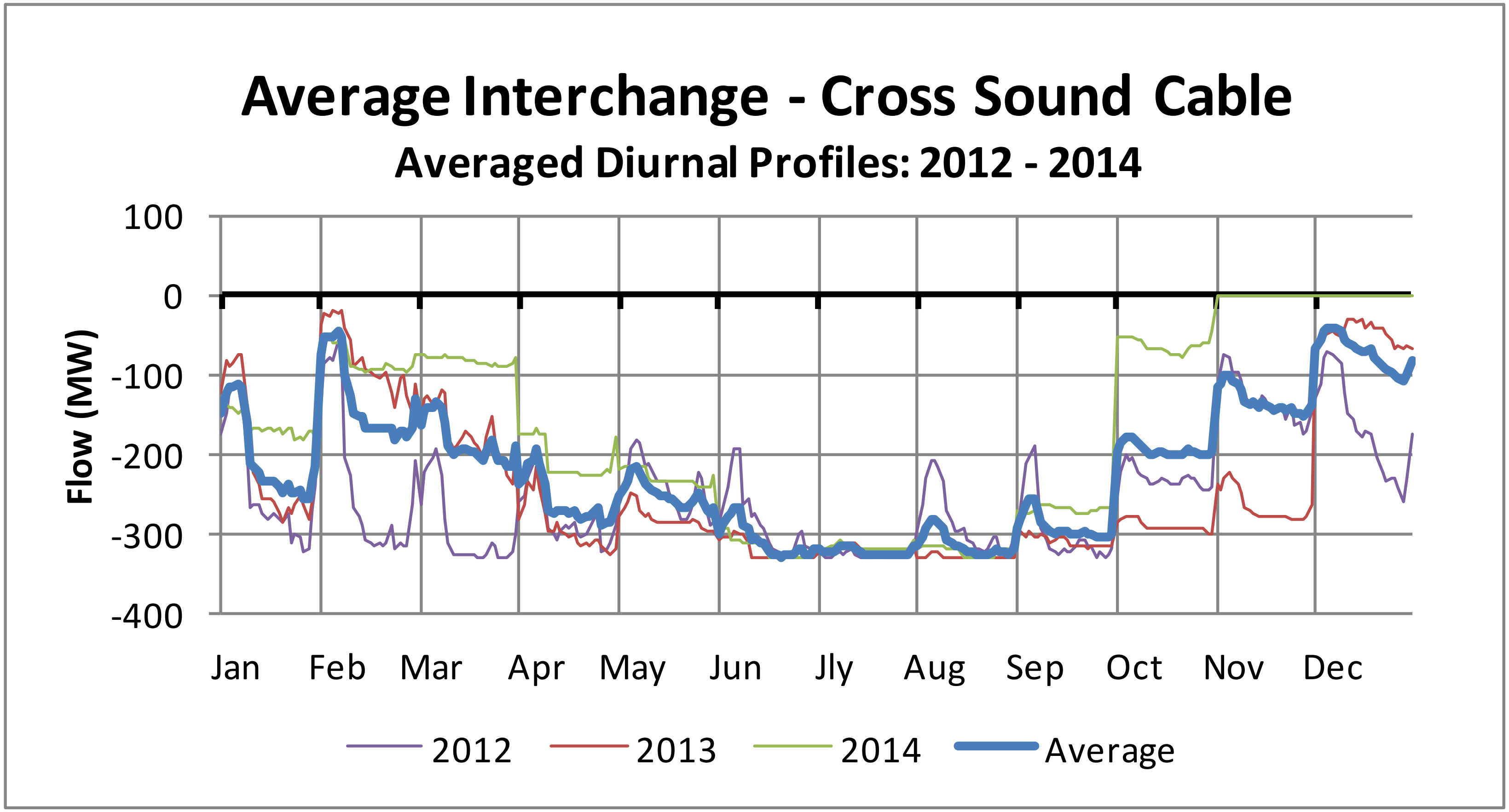
New England to New York - NNC Interface



Note: positive values represent imports; negative values represent exports.

Imports and Exports Modeling

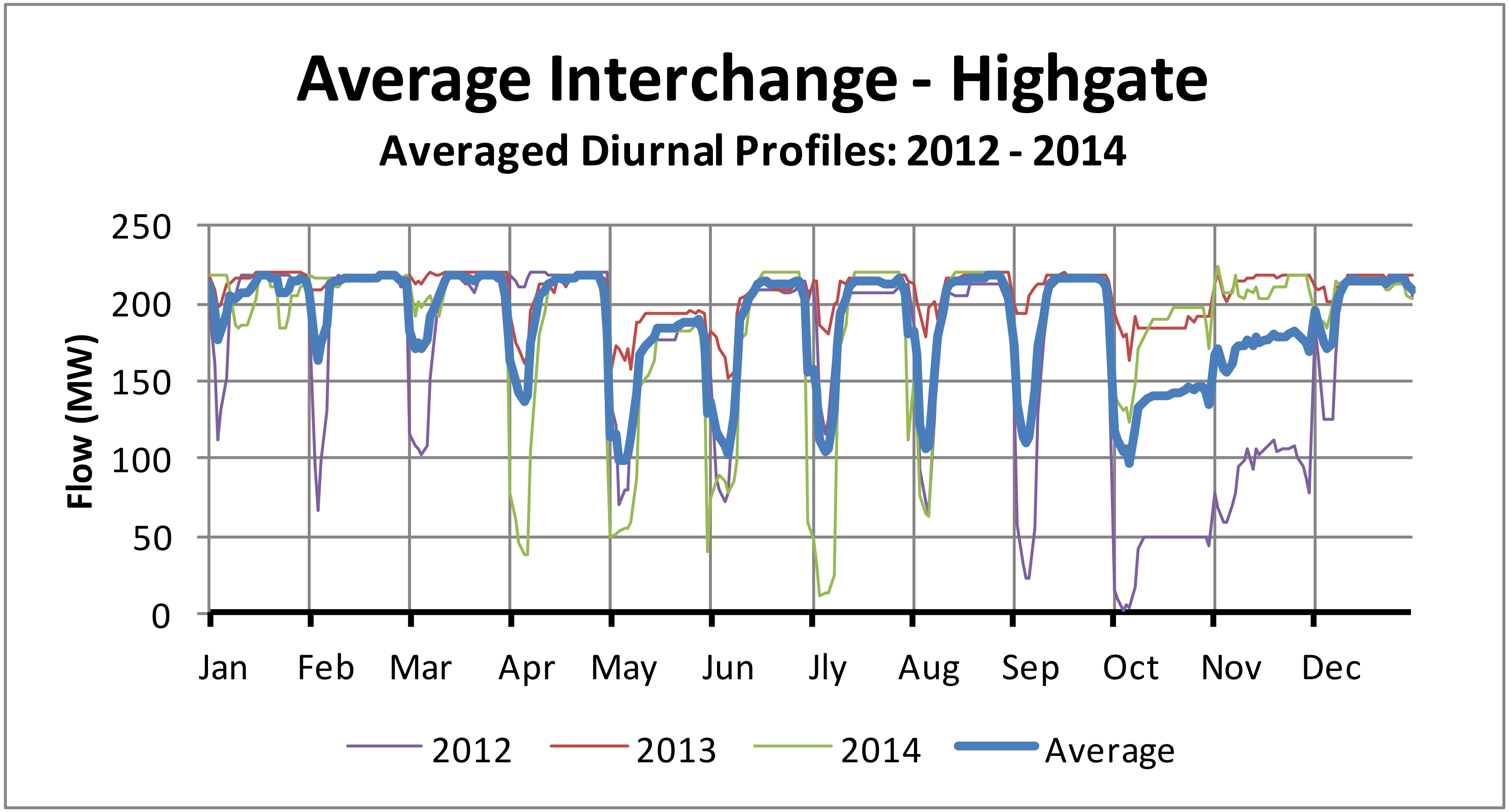
New England to New York – Cross Sound Cable



Note: positive values represent imports; negative values represent exports.

Imports and Exports Modeling

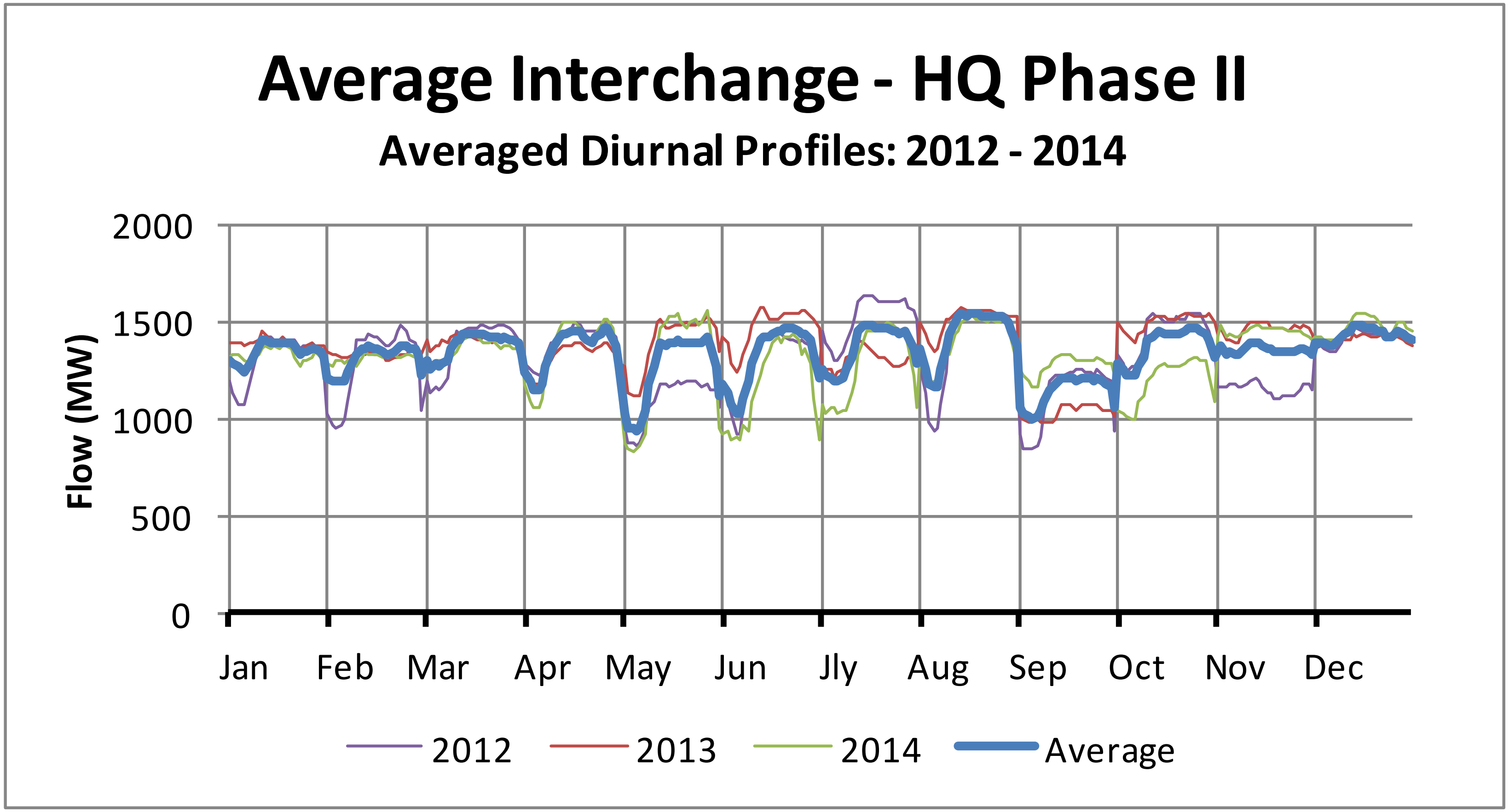
Quebec to New England: Highgate



Note: positive values represent imports; negative values represent exports.

Imports and Exports Modeling

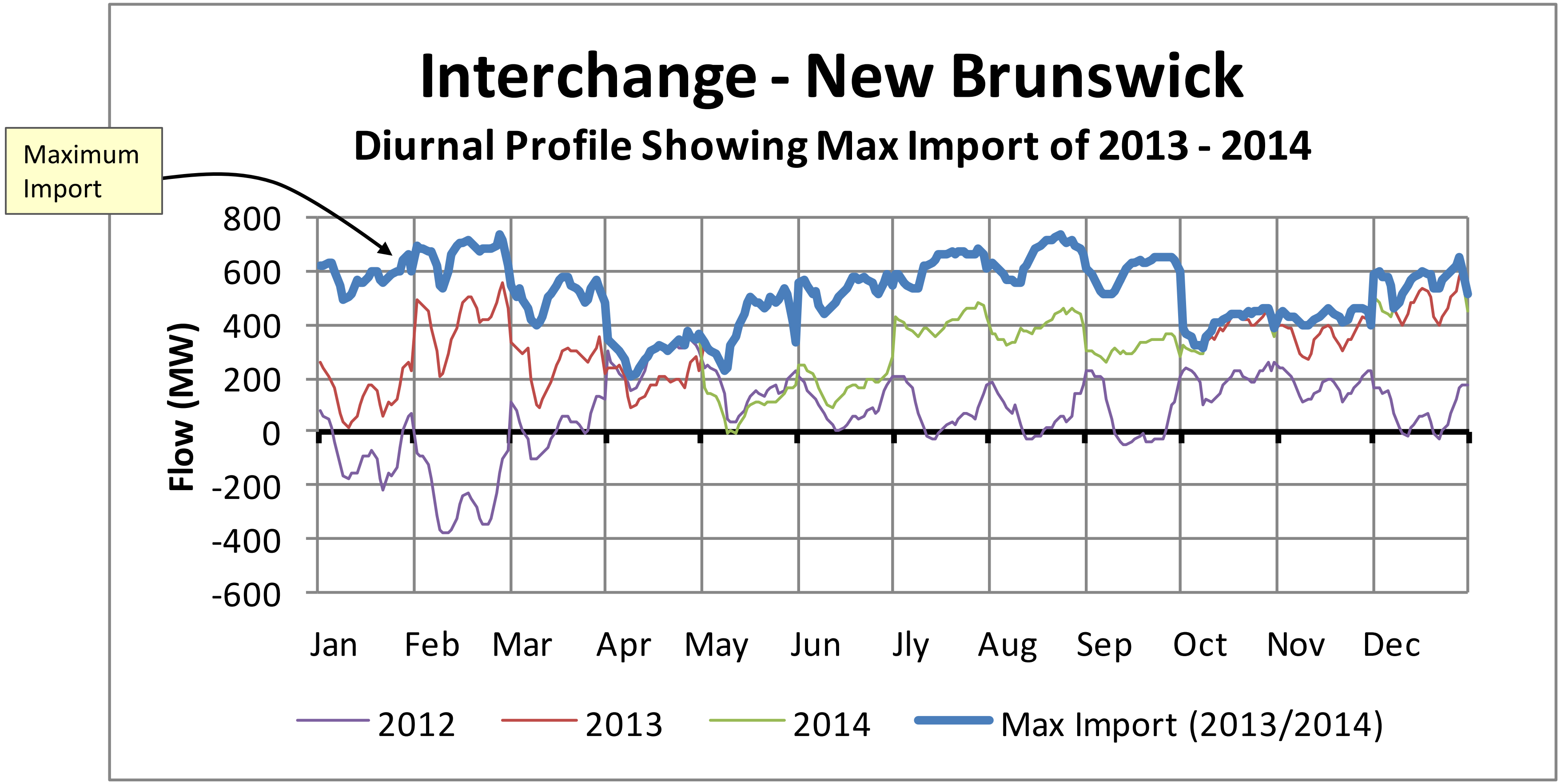
Quebec to New England: HQ Phase II



Note: positive values represent imports; negative values represent exports.

Imports and Exports Modeling

New Brunswick to New England



Note: positive values represent imports; negative values represent exports.

Questions

Wind Turbine Impacts On Residential Property Values

Ben Hoen
Lawrence Berkeley National Laboratory

AWEA Northeast Summit
July 20, 2016

Four Major US Studies Were Released Since 2009

Large Scale US Studies Investigating Property Value Impacts Near Operating Turbines

Study	**Authors**	**Date**
US Wide Study	LBNL	December 2009
US Wide Study	LBNL	August 2013
RI Based Study	U of RI	December 2013
MA Based Study	UConn/LBNL	January 2014

US Based Study #1: LBNL 2009

Wind Energy Facilities and Residential Properties: The Effect of Proximity and View on Sales Prices

Authors Ben Hoen, Ryan Wiser, Peter Cappers, Mark Thayer, and Gautam Sethi

Abstract This paper received a manuscript prize award for the best research paper on Sustainable Real Estate (sponsored by the NAIOP Research Foundation) presented at the 2010 ARES Annual Meeting.

Increasing numbers of communities are considering wind power developments. One concern within these communities is that proximate property values may be adversely affected, yet there has been little research on the subject. The present research investigates roughly 7,500 sales of single-family homes surrounding 24 existing wind facilities in the United States. Across four different hedonic models, and a variety of robustness tests, the results are consistent: neither the view of the wind facilities nor the distance of the home to those facilities is found to have a statistically significant effect on sales prices, yet further research is warranted.

Wind power development has expanded dramatically in recent years (WEC, 2010) and that expansion is expected to continue (Global Wind Energy Council, 2008; Wiser and Hand, 2010). The U.S. Department of Energy, for example, published a report that analyzed the feasibility of meeting 20% of electricity demand in the United States with wind energy by 2030 (U.S. DOE, 2008).

Approximately 3,000 wind facilities would need to be sited, permitted, and constructed to achieve a 20% wind electricity target in the U.S.[1] Although surveys show that public acceptance is high in general for wind energy (e.g., Firestone and Kempton, 2006), a variety of local concerns exist that can impact the length and outcome of the siting and permitting process. One such concern is related to the views of and proximity to wind facilities and how these might impact surrounding property values. Surveys of local communities considering wind facilities have frequently found that adverse impacts on aesthetics and property values are in the top tier of concerns relative to other matters such as impacts on wildlife habitat and mortality, radar and communications systems, ground

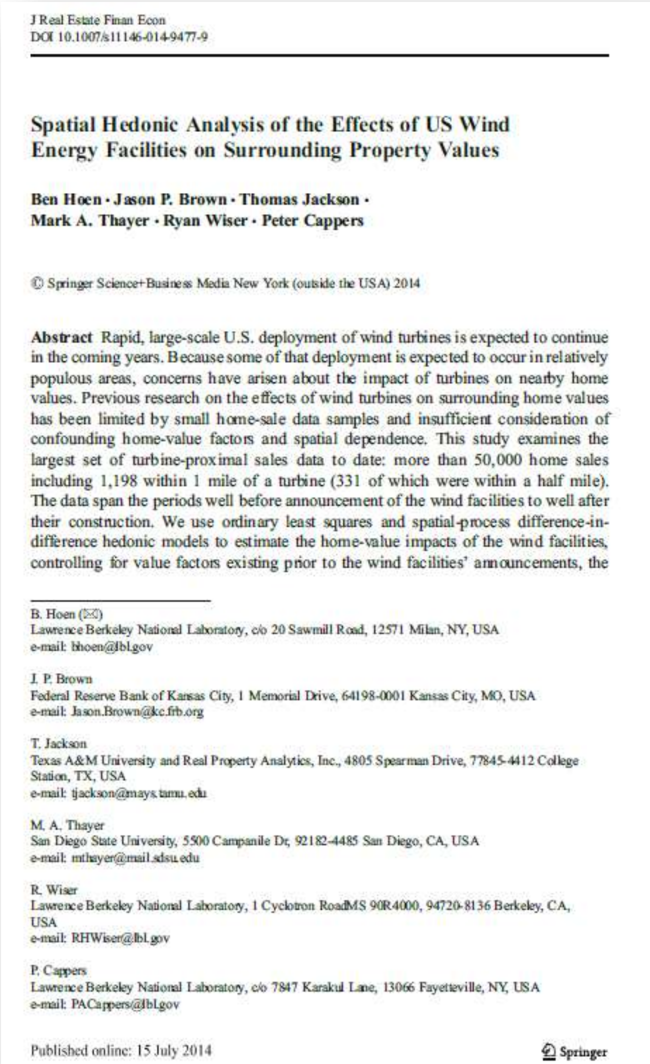
JRER | Vol. 33 | No. 3 – 2011

Summary

- 7,489 sales w/in 10 miles of 11 facilities
- **125 post-construction sales** within 1 mile
- Rural settings with large (50+ turbines) wind facilities

BERKELEY LAB

US Wide Study #2: LBNL 2013



J Real Estate Finan Econ
DOI 10.1007/s11146-014-9477-9

Spatial Hedonic Analysis of the Effects of US Wind Energy Facilities on Surrounding Property Values

Ben Hoen · Jason P. Brown · Thomas Jackson · Mark A. Thayer · Ryan Wiser · Peter Cappers

Abstract Rapid, large-scale U.S. deployment of wind turbines is expected to continue in the coming years. Because some of that deployment is expected to occur in relatively populous areas, concerns have arisen about the impact of turbines on nearby home values. Previous research on the effects of wind turbines on surrounding home values has been limited by small home-sale data samples and insufficient consideration of confounding home-value factors and spatial dependence. This study examines the largest set of turbine-proximal sales data to date: more than 50,000 home sales including 1,198 within 1 mile of a turbine (331 of which were within a half mile). The data span the periods well before announcement of the wind facilities to well after their construction. We use ordinary least squares and spatial-process difference-in-difference hedonic models to estimate the home-value impacts of the wind facilities, controlling for value factors existing prior to the wind facilities' announcements, the

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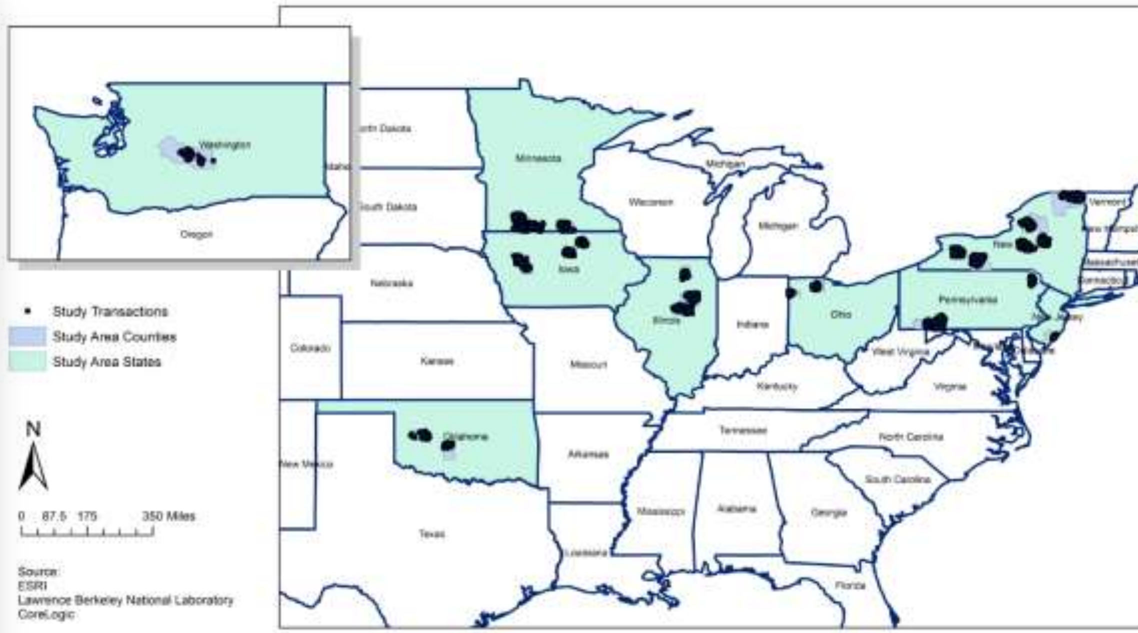
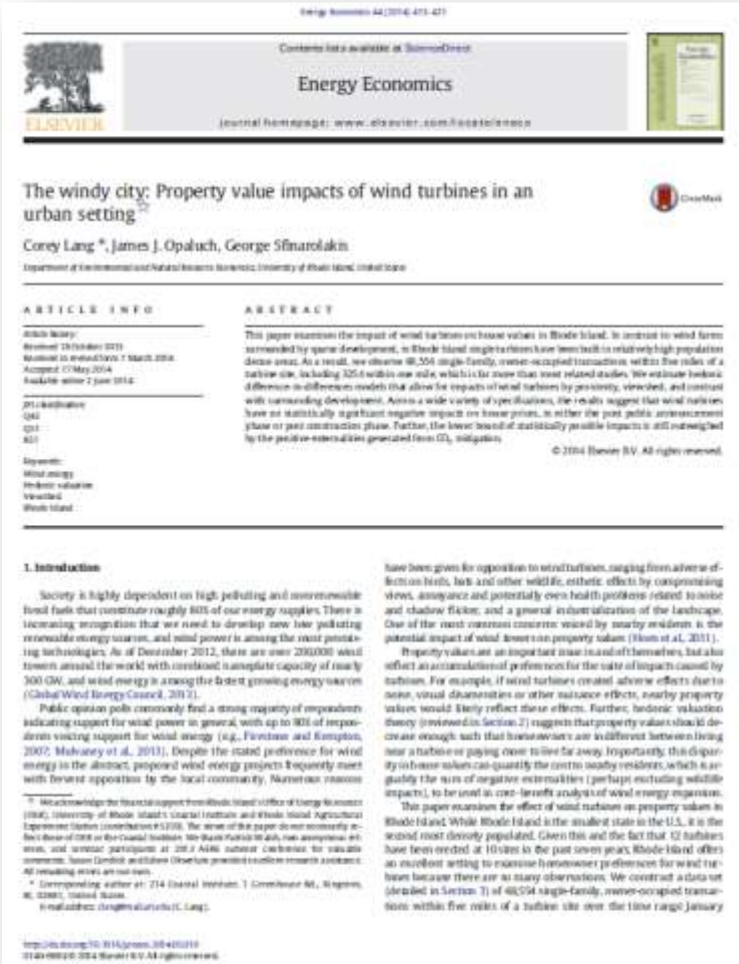
Published online: 15 July 2014 Springer



Summary

- 51,276 total sales, 9 states, 67 facilities
- **376 post-construction sales** within 1 mile
- Rural settings, large (50+ turbines) facilities

RI Based Study: URI 2013



Contents lists available at ScienceDirect

Energy Economics

journal homepage: www.elsevier.com/locate/eneco

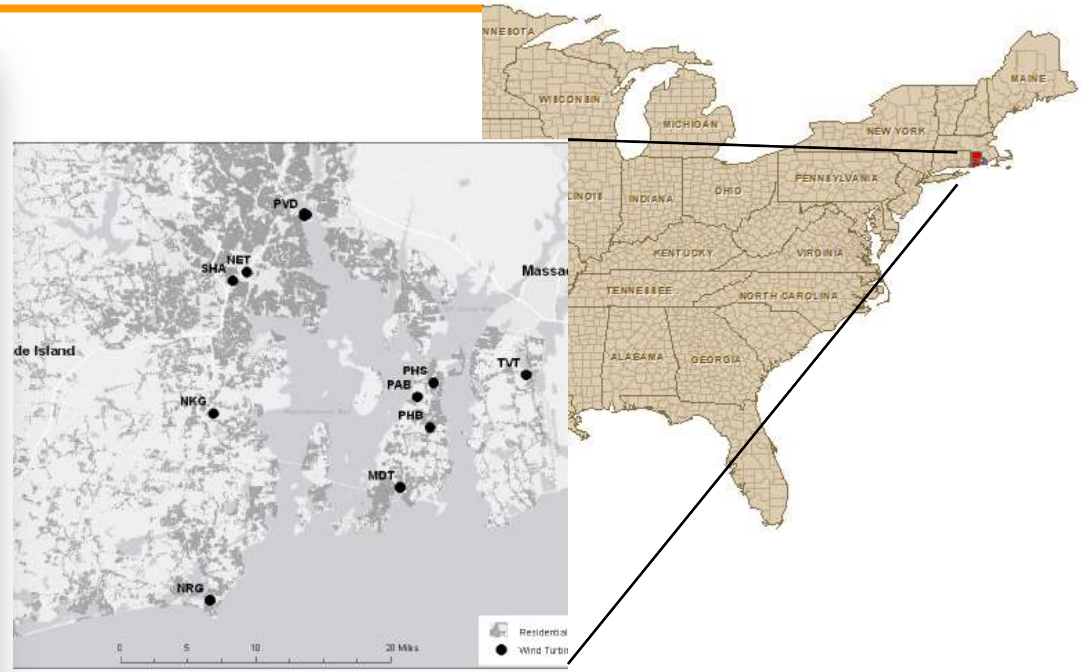
The windy city: Property value impacts of wind turbines in an urban setting

Corey Lang *, James J. Opaluch, George Sfinarolakis

ARTICLE INFO

ABSTRACT

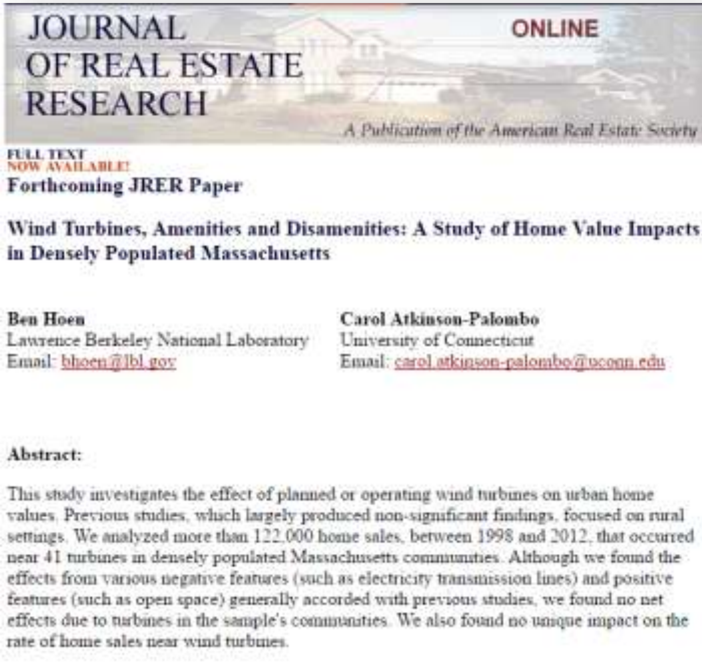
1. Introduction



Summary

- 48,554 total sales, 10 facilities
- **412 post-construction sales** within 1 mile
- Mostly urban settings, small facilities

MA Based Study: UConn/LBNL 2014


JOURNAL OF REAL ESTATE RESEARCH ONLINE

A Publication of the American Real Estate Society

FULL TEXT NOW AVAILABLE!

Forthcoming JRER Paper

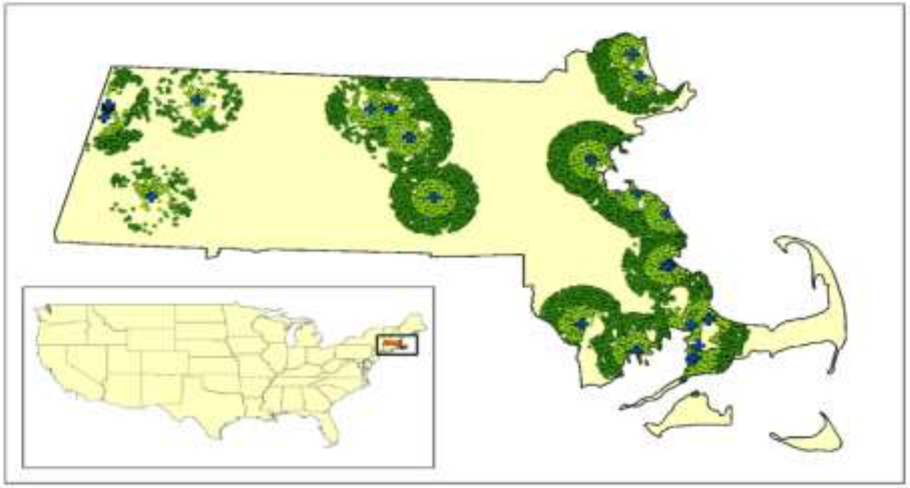
Wind Turbines, Amenities and Disamenities: A Study of Home Value Impacts in Densely Populated Massachusetts

Ben Hoen
Lawrence Berkeley National Laboratory
Email: bhoen@lbl.gov

Carol Atkinson-Palombo
University of Connecticut
Email: carol.atkinson-palombo@uconn.edu

Abstract:

This study investigates the effect of planned or operating wind turbines on urban home values. Previous studies, which largely produced non-significant findings, focused on rural settings. We analyzed more than 122,000 home sales, between 1998 and 2012, that occurred near 41 turbines in densely populated Massachusetts communities. Although we found the effects from various negative features (such as electricity transmission lines) and positive features (such as open space) generally accorded with previous studies, we found no net effects due to turbines in the sample's communities. We also found no unique impact on the rate of home sales near wind turbines.



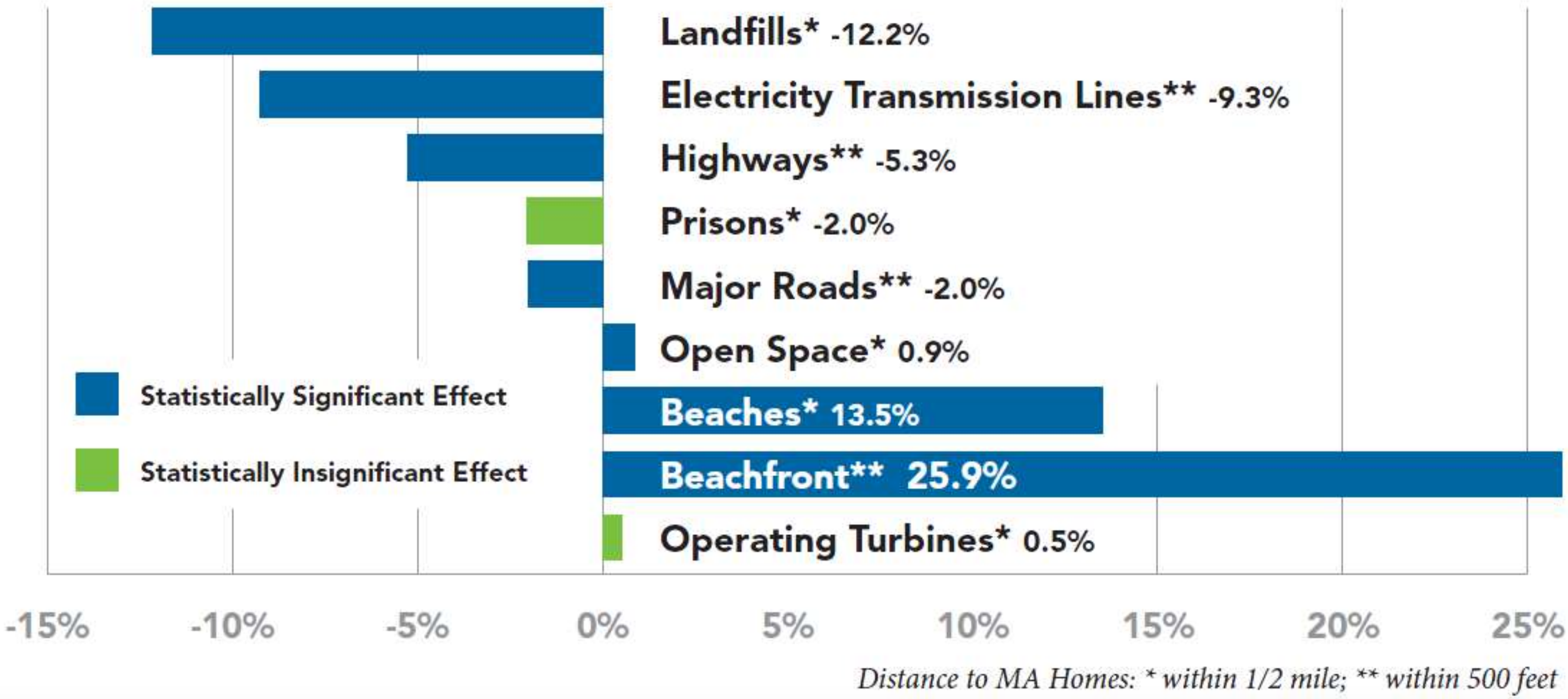
Received the Marc Louargand Award for the Best Research Paper by a Practicing Real Estate Professional presented at the 2014 ARES Annual Meeting

Summary

- 312,677 total sales, 26 facilities
- **1,503 post-construction sales** w/in 1 mile
- Urban settings, mostly small facilities
- First study to test wind turbine **and** other environmental amenities/disamenities together

MA Based Study Results

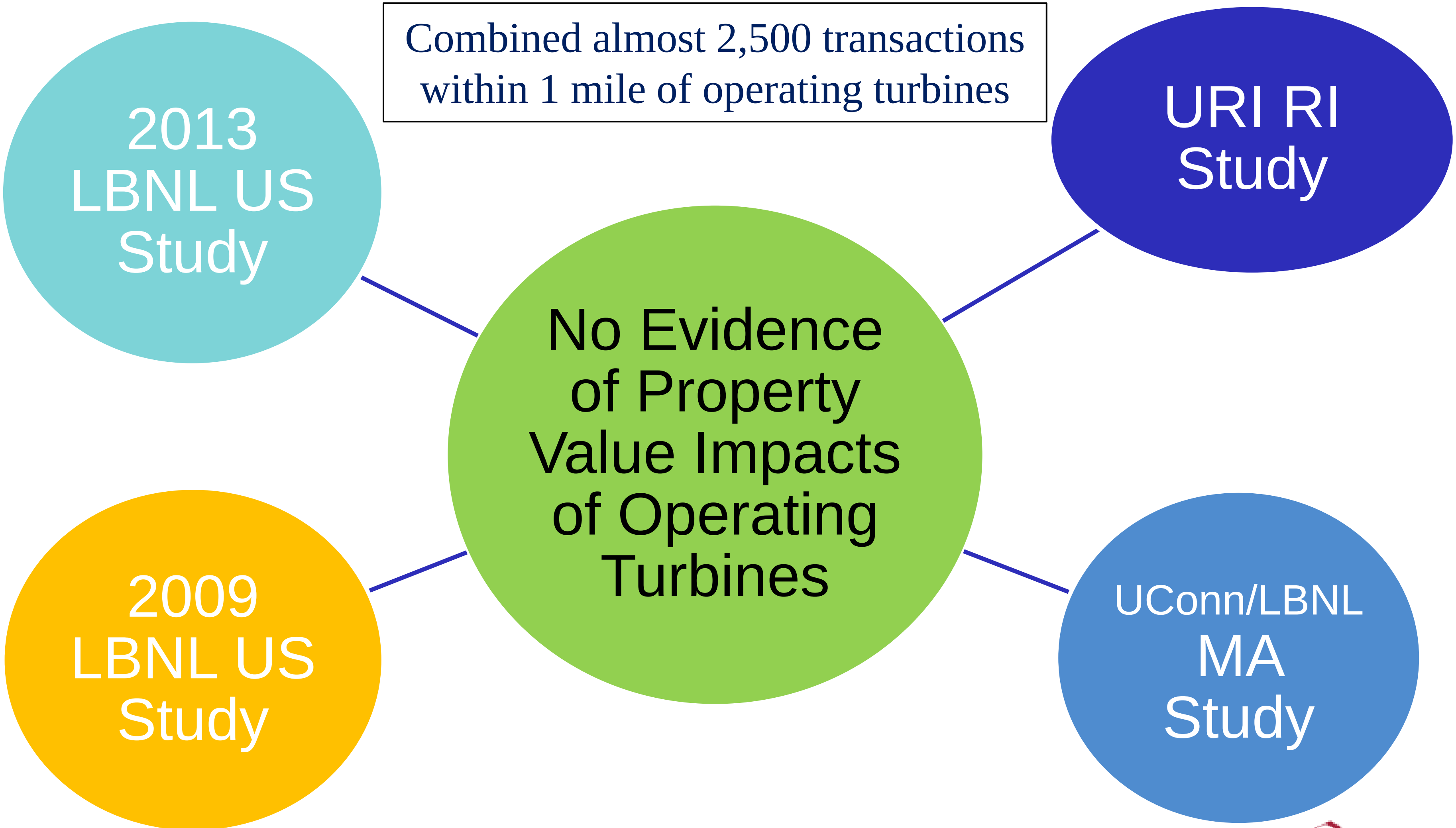
We Compared Impacts Across Amenities and Disamenities



Although the study found the effects from a variety of negative features …and positive features…the study found no net effects due to the arrival of turbines". (p. 1)

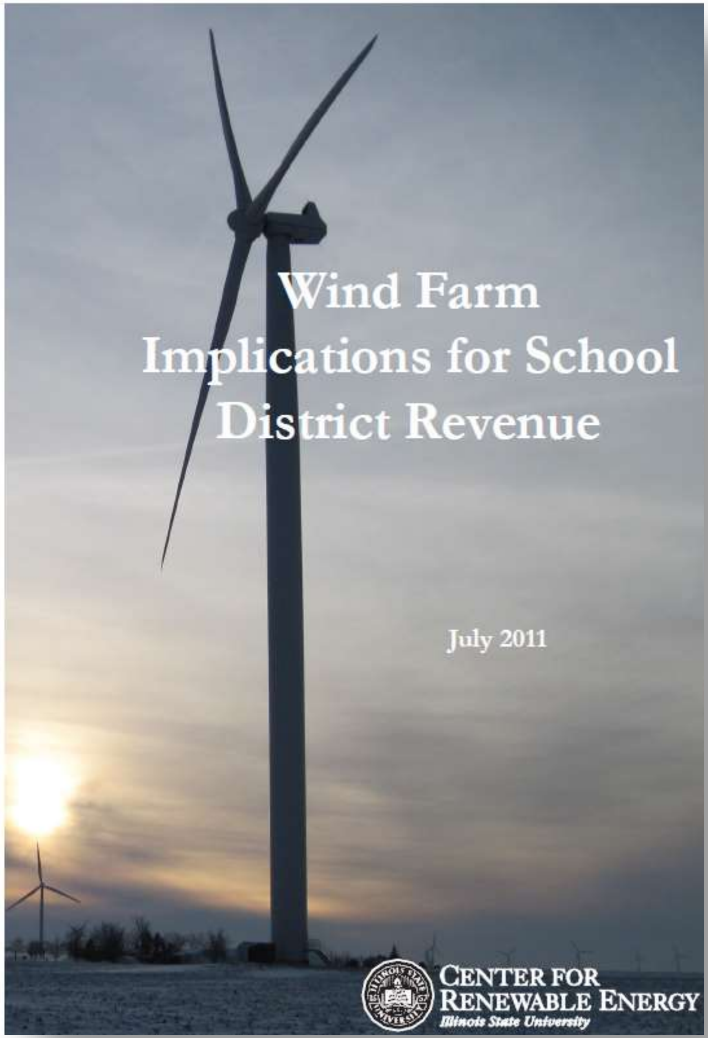
Four Large Scale US Studies = Four Distinct Research Efforts

But The Same Results



Why Has Consistent Evidence Of Impacts Failed To Emerge In US?

School District Revenue Is Significant

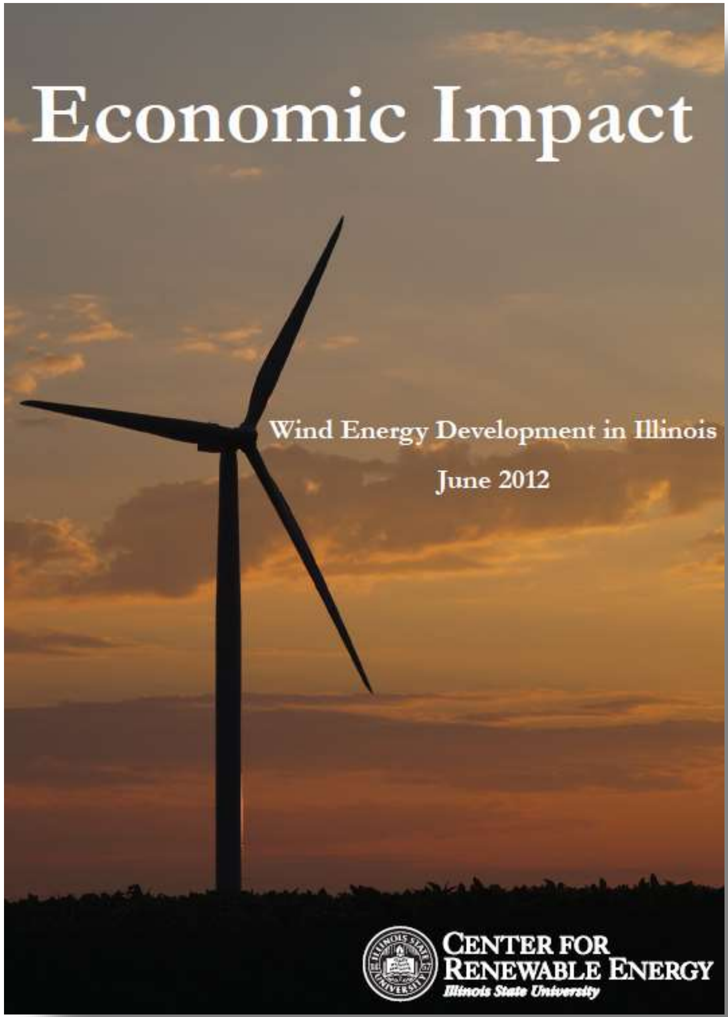


Estimated effect of wind farm on annual school district budget equates to a present value of:

$60-80 Thousand per MW!

$6-8 Million for 100 MW!

Total Economic Effects Can Be Very Large



Estimated the 23 largest wind facilities in Illinois equates to a present value of:

$0.9 Million per MW!

$90 Million for 100 MW!

Wind Counties Can Have Lower Taxes And Higher School Quality


Contents lists available at SciVerse ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Local non-market quality of life dynamics in new wind farms communities

Matthew E. Kahn*

HIGHLIGHTS

• Rural counties with wind farms have lower property tax rates than neighbor counties.
• Wind farm counties have lower student–teacher ratios.
• Ambient air pollution levels are higher near fossil fuel fired power plants.

ARTICLE INFO

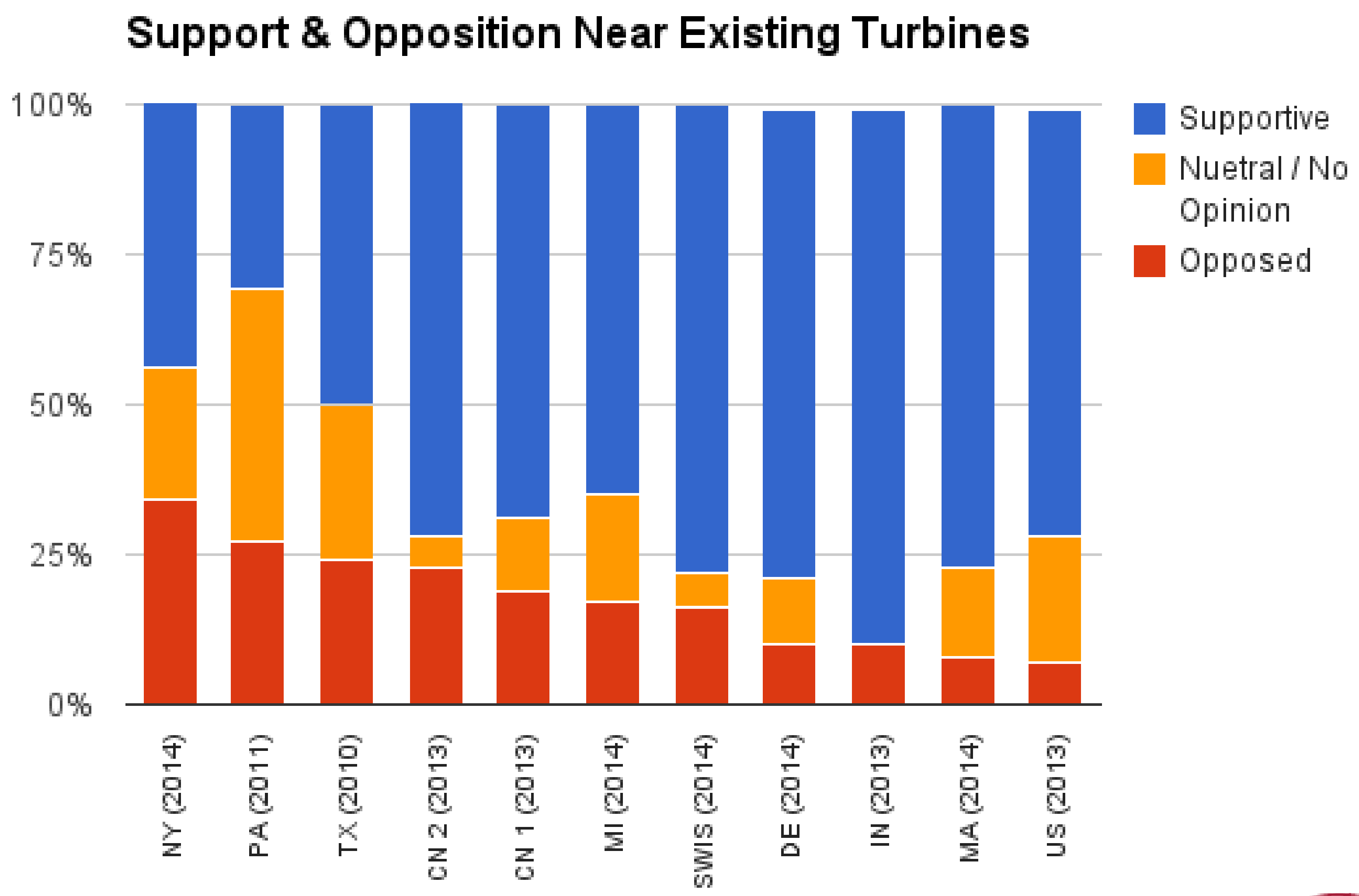
ABSTRACT

1. Introduction

"…property tax rates have fallen and public school quality has improved in those counties where wind farms have been built."
(p. 800)

Kahn (2013): *Statistical analysis of West Texas county tax rates, school expenditures and teacher-student ratios*

Multiple Surveys Have Found High Levels Of Support Near Turbines



Buyers Could Be Sorting Themselves Into Supporters And Objectors

A PURE THEORY OF LOCAL EXPENDITURES[1]

CHARLES M. TIEBOUT
Northwestern University

One of the most important recent developments in the area of "applied economic theory" has been the work of Musgrave and Samuelson in public finance theory.[2] The two writers agree on what is probably the major point under investigation, namely, that no "market type" solution exists to determine the level of expenditures on public goods. Seemingly, we are faced with the problem of having a rather large portion of our national income allocated in a "non-optimal" way when compared with the private sector.

This discussion will show that the Musgrave-Samuelson analysis, which is valid for federal expenditures, need not apply to local expenditures. The plan of the discussion is first to restate the assumptions made by Musgrave and Samuelson and the central problems with which they deal. After looking at a key difference between the federal versus local cases, I shall present a simple model. This model yields a solution for the level of expenditures for local public goods which reflects the preferences of the population more adequately than they can be reflected at the national level. The assumptions of the model will then be relaxed to see what implications are involved. Finally, policy considerations will be discussed.

THE THEORETICAL ISSUE

Samuelson has defined public goods as "*collective consumption goods* ($X_{n+1}, \ldots, X_{n+m}$) which all enjoy in common in the sense that each individual's consumption of such a good leads to no subtraction from any other individual's consumption of that good, so that $X_{n+j} = X^i_{n+j}$ simultaneously for each and every ith individual and each collective good."[3] While definitions are a matter of choice, it is worth noting that "consumption" has a much broader meaning here than in the usual sense of the term. Not only does it imply that the act of consumption by one person does not diminish the opportunities for consumption by another but it also allows this consumption to be in another form. For example, while the residents of a new government housing project are made better off, benefits also accrue to other residents of the community in the form of the external economies of slum clearance.[4] Thus many goods that appear to lack the attributes of public goods may

[1] I am grateful for the comments of my colleagues Karl de Schweinitz, Robert Eisner, and Robert Strotz, and those of Martin Bailey, of the University of Chicago.

[2] Richard A. Musgrave, "The Voluntary Exchange Theory of Public Economy," *Quarterly Journal of Economics*, LII (February, 1939), 213–17; "A Multiple Theory of the Budget," paper read at the Econometric Society annual meeting (December, 1955); and his forthcoming book, *The Theory of Public Economy;* Paul A. Samuelson, "The Pure Theory of Public Expenditures," *Review of Economics and Statistics*, XXXVI, No. 4 (November, 1954), 387–89, and "Diagrammatic Exposition of a Pure Theory of Public Expenditures," *ibid.*, XXXVII, No. 4 (November, 1955), 350–56.

[3] "The Pure Theory . . . ," *op. cit.*, p. 387.

[4] Samuelson allows for this when he states that "one man's circus may be another man's poison," referring, of course, to public goods ("Diagrammatic Exposition . . . ," *op. cit.*, p. 351).

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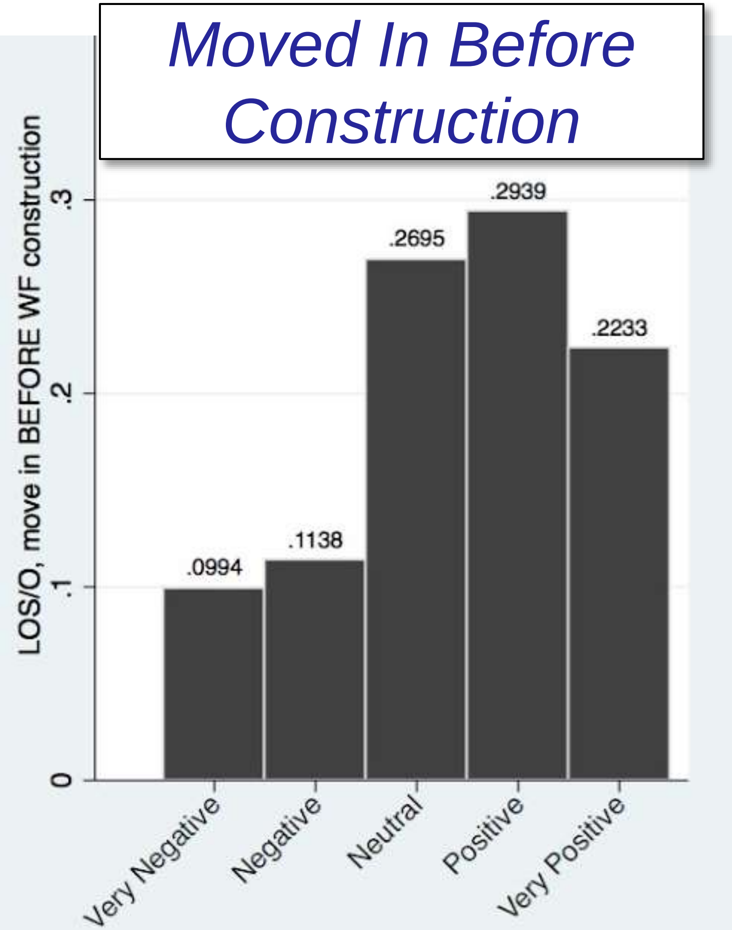
When consumers are mobile, over time they will sort themselves such that those living in a community with become more supportive of that community over time.

Tiebout, 1956

This Theory Is Supported By Results From 2016 Survey Of 1700 Residents Near Turbines

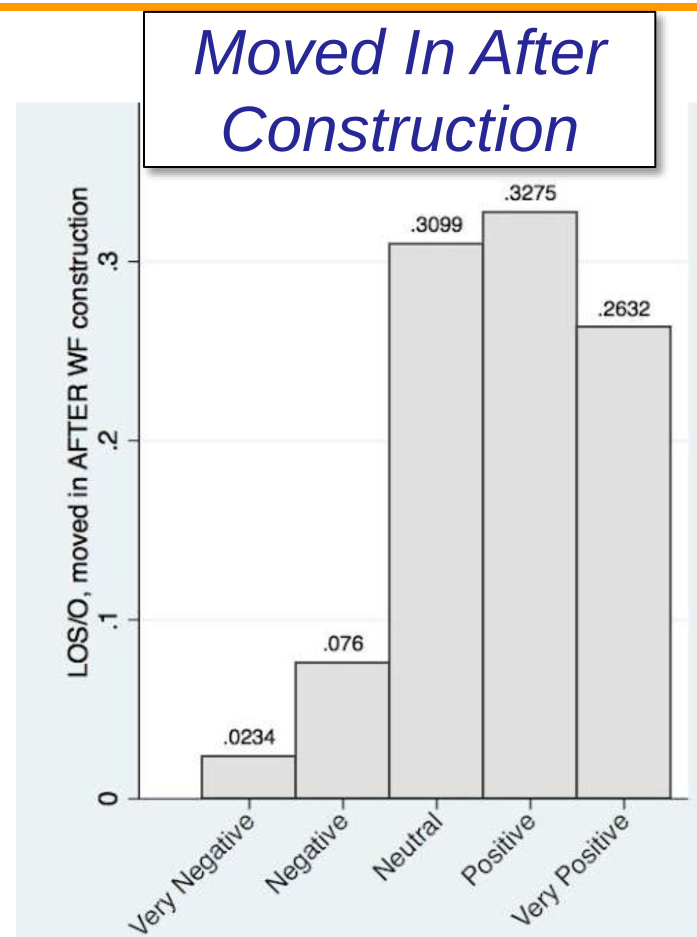


21% 52%

Homes within 1 mile of a turbine

n=500

Preliminary LBNL Results Do Not Cite



10% 59%

Overall Conclusions

- Consistent property value impacts have failed to emerge near turbines in US
- Reasons for this include:
  - Significant compensation for schools and local economies
  - Relatively high levels of support for turbines
  - Sorting over time to more supportive communities
- As turbines get quieter, if compensation schemes are consistently applied, and if the community is regularly involved in the development process adverse effects are likely to continue to be elusive.

LBNL Survey Results Will Shed More Light On Levels Of Support, Opposition & Annoyance Near US Turbines

Thank You & Questions?

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This work was supported by the Office of Energy Efficiency and Renewable Energy (Wind and Water Power Technologies Office) of the U.S. Department of Energy under Contract No. DE-AC02-05CH1123.

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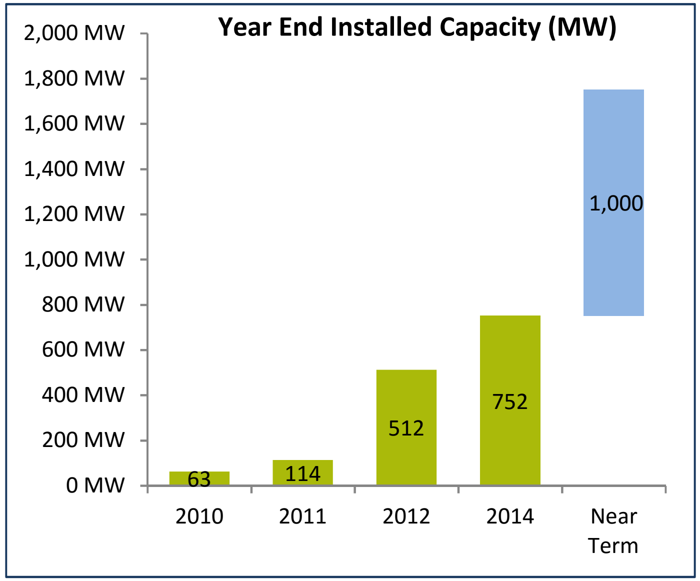
Harry Benson, Senior, Director of Development, EverPower Maine LLC

EverPower Overview

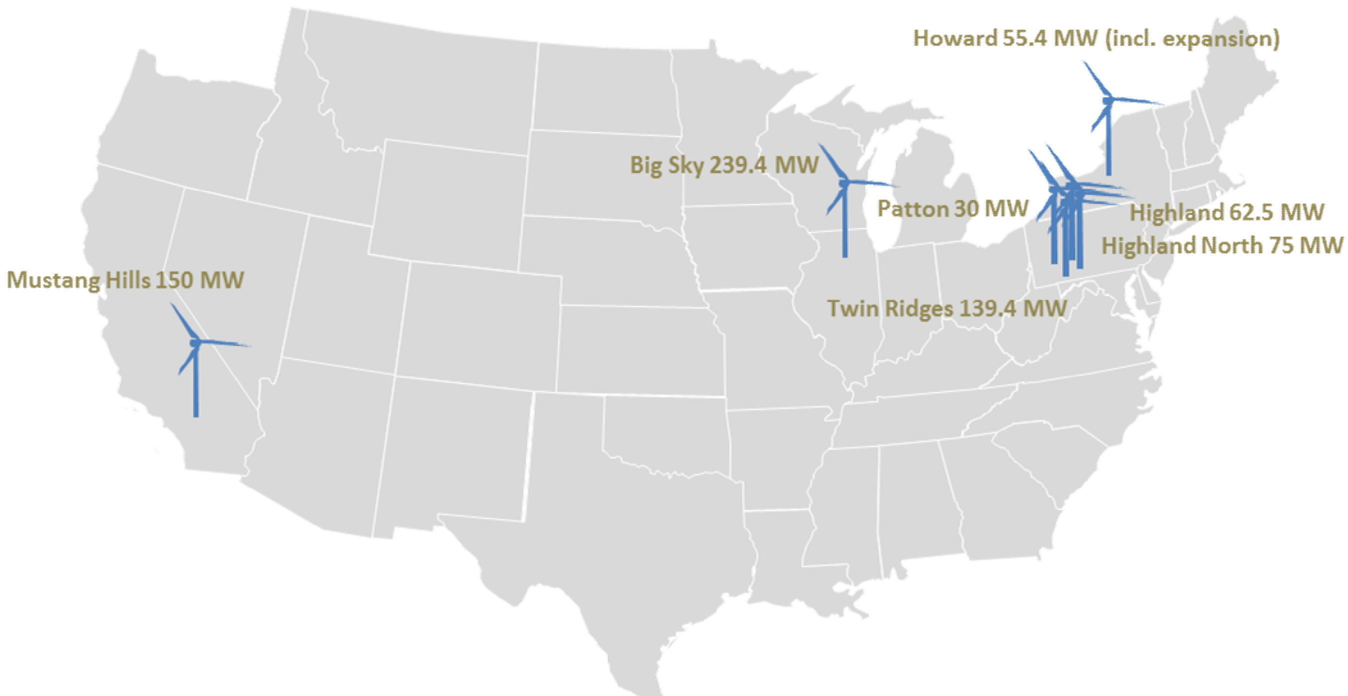
- EverPower was founded in 2002 by CEO, Jim Spencer and acquired by Terra Firma in 2009
- Since acquisition, Terra Firma has committed $660m of equity to its investment and the business has been transformed from a development-only player to an owner-operator of wind generation assets with the ambition of growing the business to be a scale player
- EverPower currently has 750+ MW of operational capacity and has a substantial pipeline of near and mid-term projects
- The organizational capabilities have been built to accommodate such growth and the business now has over 50 employees between its office in New York and its corporate headquarters in Pittsburgh, Pennsylvania
- The company has a real time commercial operations center to manage the power contracts and delivery optimization.
- The company has expertise in development, project finance, wind resource analysis, construction management and operations

Timeline	Key Events	Installed Capacity (MW)
2002	▪ Everpower founded to compete in renewable solar energy and wind development	-
2009	▪ First wind farm (Krayn) goes operational	63
2011	▪ Howard Wind Farm (NY) goes operational	114
2012	▪ Acquisition of Alta VI (Mustang Hills - 150 MW) ▪ Highland North, Twin Ridges and Patton go operational	512
2014+	▪ Acquisition of Big Sky Wind Farm. ▪ EverPower is a premier owner and operator of renewable generating assets, with over 2.3 GW of development assets	752+



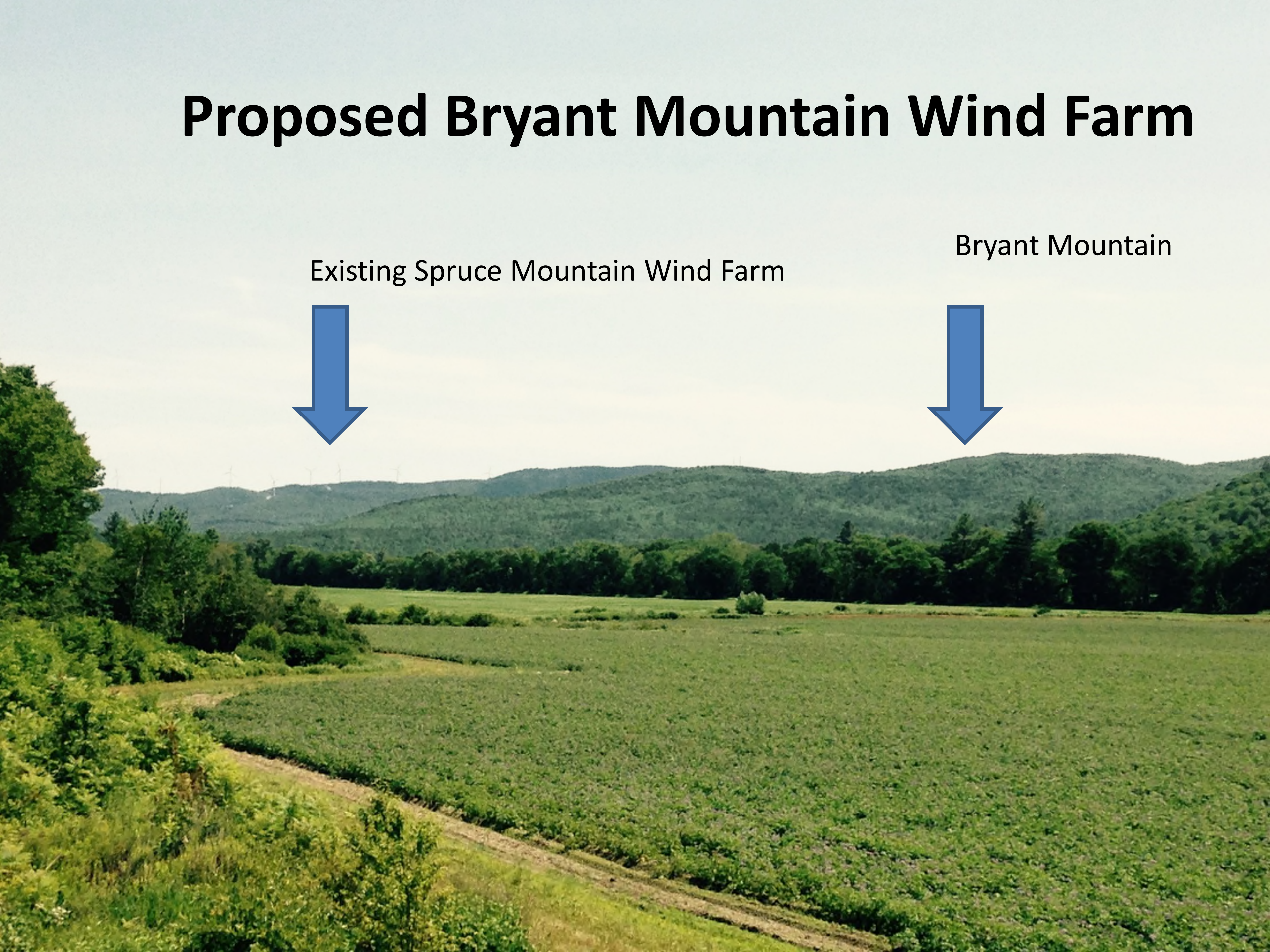
EverPower is a fast-growing, onshore wind developer that focuses on strategic project development and operation in California and the Northeast markets of the United States

OPERATING WIND FARMS



Project	State	Status	COD	Capacity	Ownership	Asset History	Technology
Highland	PA	Operating	2009	62.5 MW	100%	Organic Development	Nordex
Howard	NY	Operating	2011	51.3 MW	100%	Organic Development	RePower
Highland North	PA	Operating	2012	75.0 MW	100%	Organic Development	Nordex
Mustang Hills	CA	Operating	2012	150.0 MW	100%	Acquisition – Operating	Vestas
Patton	PA	Operating	2012	30.0 MW	100%	Acquisition – Development	Gamesa
Twin Ridges	PA	Operating	2012	139.4MW	100%	Organic Development	RePower
Howard Expansion	NY	Operating	2012	4.1 MW	100%	Organic Development	Repower
Big Sky	IL	Operating	2011	239.4 MW	100%	Acquisition – Operating	Suzlon

Source: EverPower management


Proposed Bryant Mountain Wind Farm
Existing Spruce Mountain Wind Farm
Bryant Mountain

BRYANT MOUNTAIN WIND FARM

Project Overview		
Location	Oxford County, Maine	
Power Region	NE ISO	
Targeted Permitting, COD	2019	2020
Nameplate Capacity	40 MW	
Wind Speed	Class III A site	
Location	Bryant and Chamberlain Mtns.	
Interconnection	115kV line to south	
Turbine Viability	Vestas, GE, Gamesa	

Source: EverPower management

Importance of Keeping Milton Expedited

- Zoning sends an important message
- Developer will not go forward under these circumstances
- This would be a clear signal from LUPC

EverPower Maine LLC

We strive to be a **good neighbor in the communities** in which we operate by working together with local stakeholders from early in the development process right on through the operational life of our wind farms. -EverPower

Economic Benefits-Muskie School Report 2006-2014

- More than **$500 million** was spent in Maine on wind power projects
- Construction of 18 projects (does not include Bryant) would result in **$1.28 billion** in spending in Maine over 12 years

Source: Charles S. Colgan, Maine Center for Business and Economic Research, December, 2014 *Economic Impacts of Wind Energy Construction and Operations in Maine, 2006-2018.*

everpower™

Project Benefits

- **Construction and Operation Benefits**
  - $104 million investment
  - Capital expenditure of $80 million
  - Estimated $13.1 million in construction wages (primary workers and secondary workers)
  - Estimated $900,000 in annual wages operation
  - Local spending during construction over $23 million
  - Local spending during operation estimated to be $1.5 million annually

Source: Job and Economic Development Impact (JEDI) Model

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Additional Economic Benefits

- Taxes and Community Benefits
- Estimated annual taxes of more than $320,000
- Work to keep the money local
- Minimum of $48,000 annually in community benefit agreement for local use
- $40-50,000 annually to local fund to be administer by the community
  - ATV or snowmobile club projects
  - Ball club equipment and uniforms or travel
  - Road improvements
  - Many, many, many other possibilities
- Exploring conservation opportunities in the area
- Over $400,000 in annual payments out to over 28 local landowners
  - Turbine payments, neighbor agreements
  - Upfront payments for easements and option payments
  - Spent locally

everpower™

Environmental Benefits

- Contribution towards wind energy goals
  - 2000 MW by 2015
  - 3000 MW by 2020 (300 MW Offshore)
- Project expected to result in annual displacement of:
  - 14 tons of NO_x
  - 29.1 tons of SO_x
  - 67,697.3 tons of CO_2

Source: yourstory.com

Site Selection Process

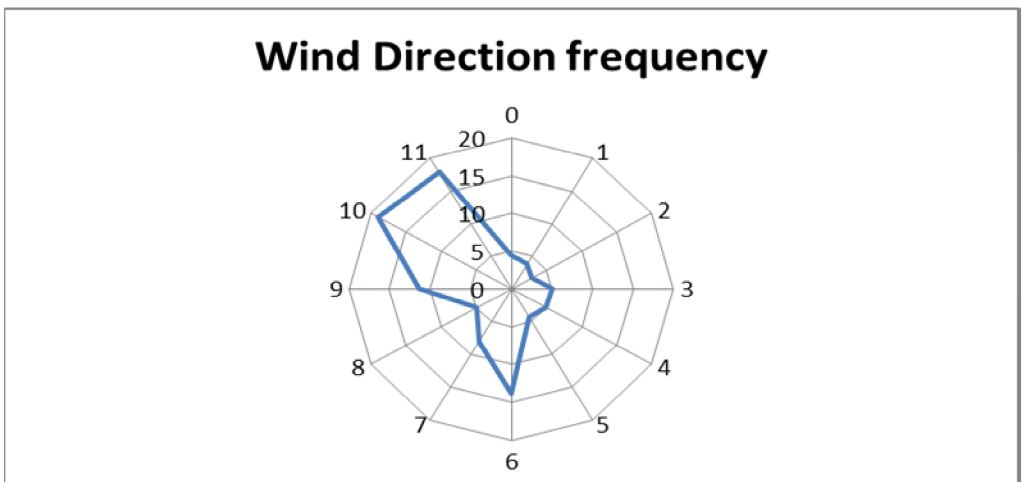
- Economically viable/competitive
- Must be compatible with community values
- Permittable site

Site Selection Process

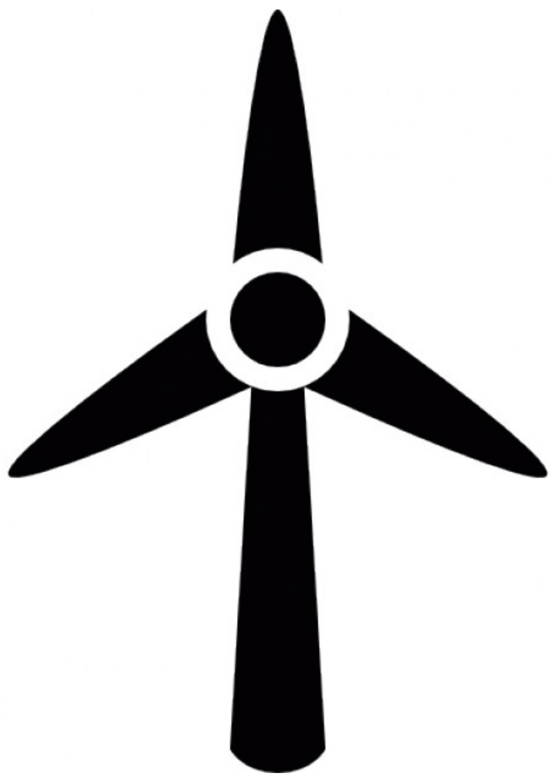
- Overall Economics of the project
  - Competitive Business Environment- New England PPAs
  - Cheap prices for electricity
    - Evolution of Turbine Technology
    - Long generator lead lines
    - Blending with Hydro

Wind Resource

The wind resource of Bryant Mountain is competitive. It is in the range to warrant a Class IEC Class III wind turbine.



Site Turbine Selection Process



Turbine Class
From IEC 61400-1, Edition 2

Table 1 – Basic parameters for WTGS classes

WTGS class		I	II	III	IV	S
V_{ref}	(m/s)	50	42,5	37,5	30	Values to be specified by the designer
V_{ave}	(m/s)	10	8,5	7,5	6	
A	I_{15} (–)	0,18	0,18	0,18	0,18	
	a (–)	2	2	2	2	
B	I_{15} (–)	0,16	0,16	0,16	0,16	
	a (–)	3	3	3	3	

Figure 2: Parameters of Wind turbine classes defined in IEC 61400-1 Ed. 2.

300-400 W/m2 → 6.4-7.0 m/s

m/s = mph

10 m/s = 22.4 mph
8.5 m/s = 19 mph
7.5 m/s = 16.8 mph
6 m/s = 13.4 mph

Site Selection Process

- Available Land
- Construction Cost
- Suitable Transmission
  - Bryant Mountain is NE ISO queue #555 for the 115 line to the south.
  - NE ISO says 2 years to study
  - Jeff Fenn of SGC's feasibility analysis, says yes it is.

everpower™

Proximity to Residents

- Population Density and Setbacks-
  - One residence within 4,000 feet
  - Talking to everyone within one mile of the project
  - We will comply with the 42 dBA Standard for DEP permit (Spruce Mtn was 45dBA)
    - One within 4000 feet, most outside of that.
    - Turbine technology is improving in this area
  - Shadow flicker assessment will be conducted for DEP permit
  - Property values-
    - Neighbor agreements if within a mile
    - Ben Hoen studies

Wind Turbine Impacts On Residential Property Values

Ben Hoen
Lawrence Berkeley National Laboratory

AWEA Northeast Summit
July 20, 2016

Site Selection Process- Permittable

- Outstanding and Significant Scenic Resources
- Habitat and Wildlife
- Location within Expedited

Conclusions

- Bryant Mountain Wind Farm is needed for Maine to meet its wind energy goals. Good sites are very far and few between. When you find a good site, it needs to be realized.
- Bryant Mountain satisfies the siting criteria for successful wind development
- We would like LUPC to maintain the current zoning so that we can:
  - Reach out to all local landowners and towns and determine if project is compatible with the needs of the community
  - Develop appropriate community benefits packages the meet the community's needs
  - Conduct all wildlife and resource value studies to determine whether there are site specific consideration that make development inappropriate

Conclusions

- If in two-three years, the site remains viable, we would submit an application to DEP
- There would be a complete and robust review process with opportunity for:
  - Public input
  - Agency input

That would ensure that the project is permitted only if the site is, in fact, appropriate for wind development.

Thank you!

- Thanks to the Commissioners and Staff, local governments, landowners for their time and effort on this matter

Harry Benson

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Milton Township

Substantive Review of Petition to Remove Milton Township from Expedited Permitting Area

Joy Prescott, Stantec Consulting

August 10, 2016

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1 Project Context and Location

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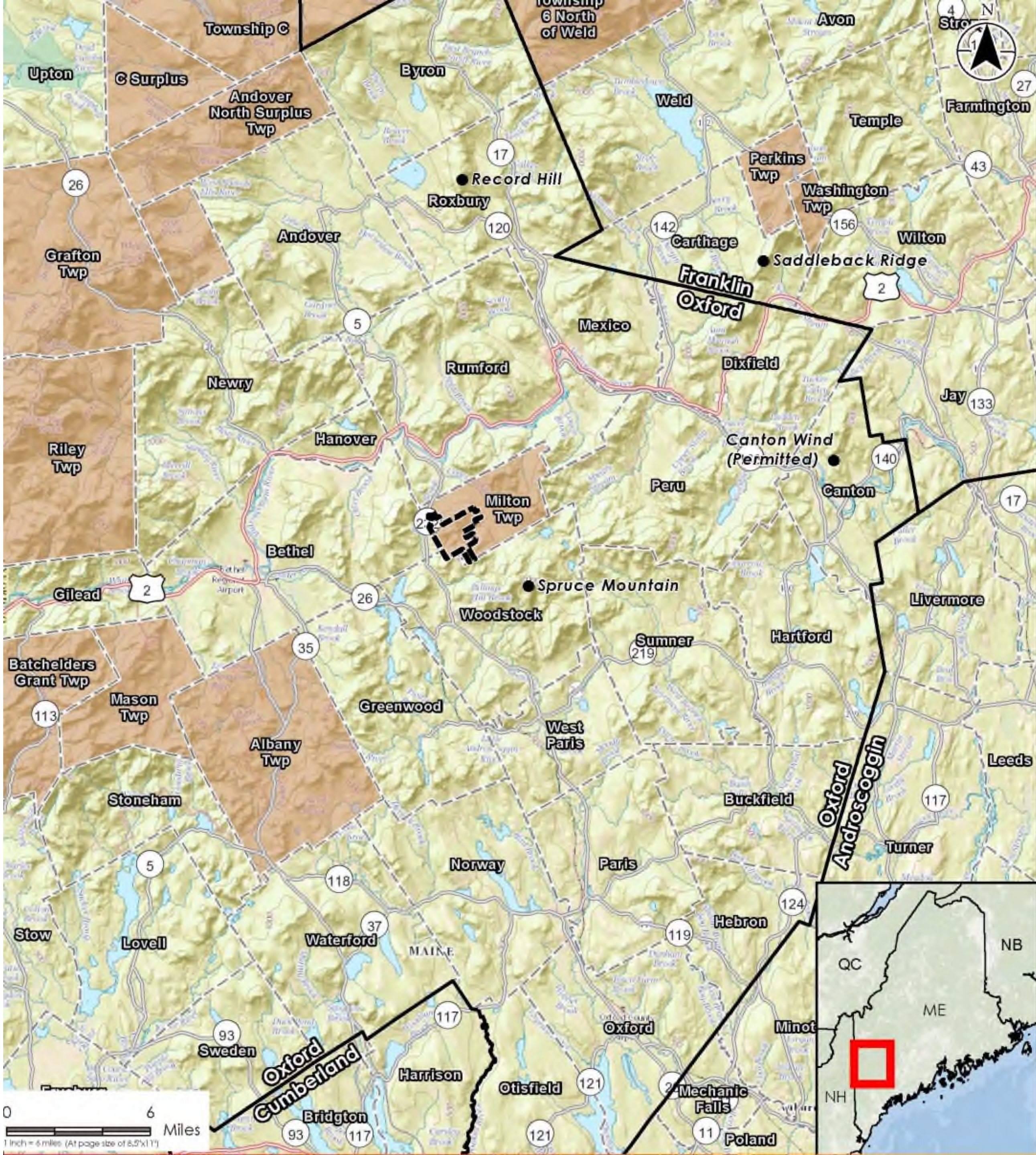
Project Location



2 DEP Permitting Process

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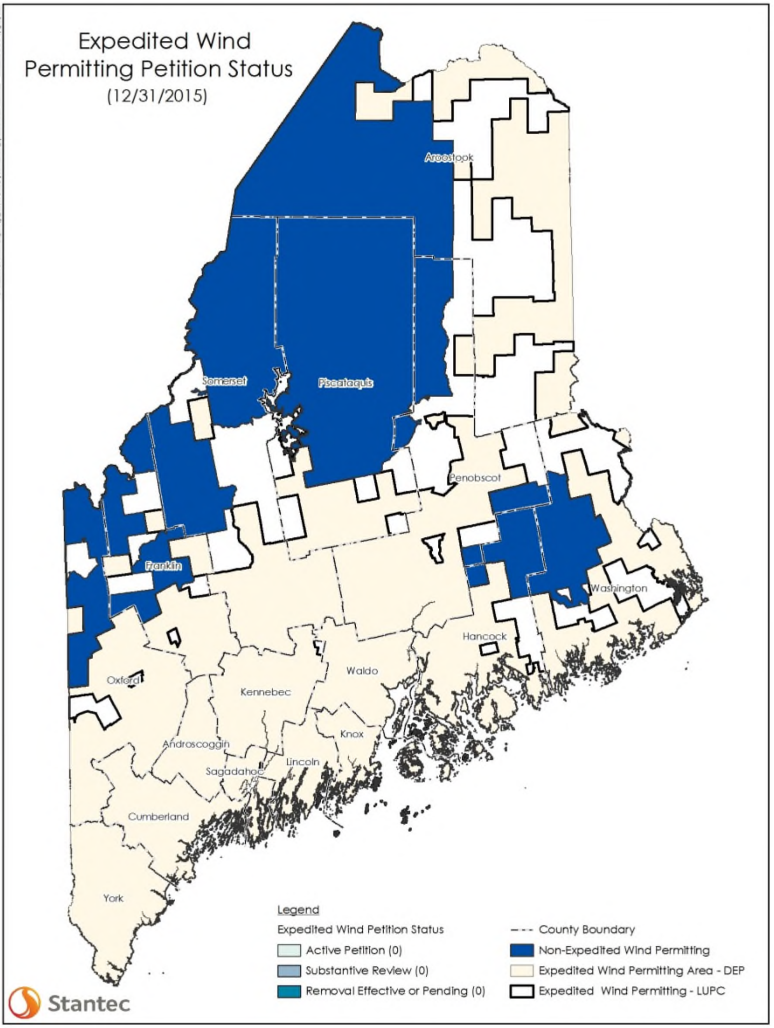
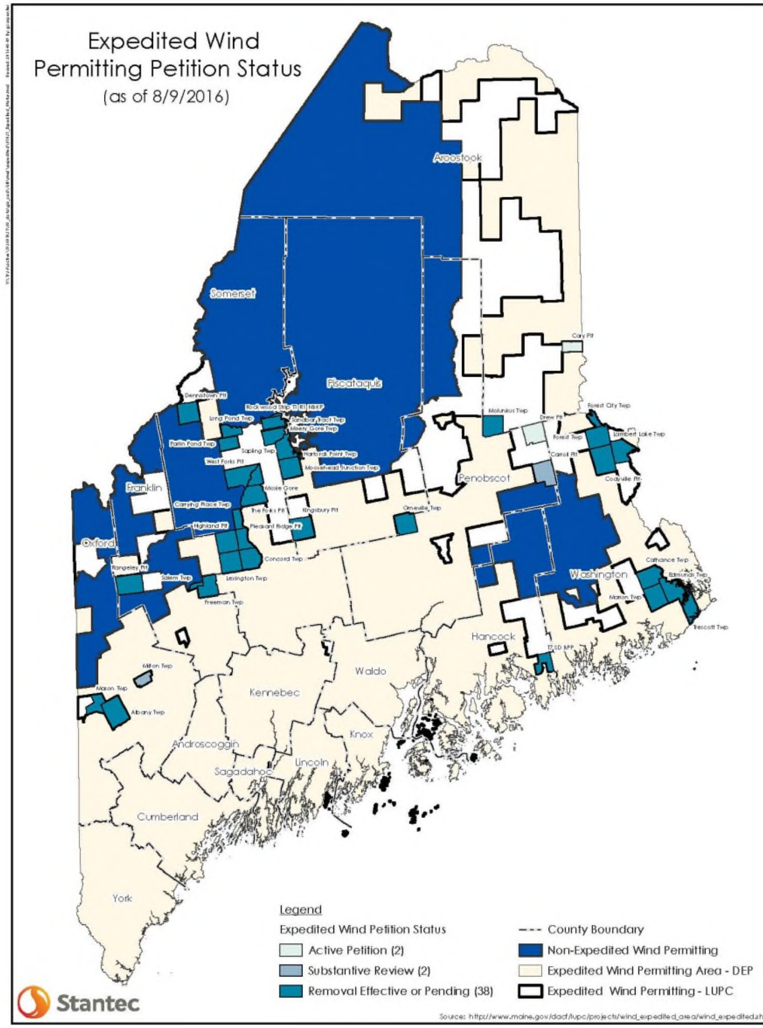
Expedited Permitting Area: Wind Power is an Allowed Use



35% of LUPC allows wind power

Wind Power as Allowed Use, 12/31/15



27% of LUPC allows wind power

Wind Power as Allowed Use, 8/9/16

Review Process

Review by state agencies and third-party reviewers

- Evaluate whether project meets standards
- LUPC must certify project meets standards
- Work with developer to address issues

Multiple points for public input

- Developer holds 1+ public info meeting
- Public can request public hearing
- DEP holds 2 public meetings (if no hearing)
- Written comments can be submitted to DEP

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DEP must evaluate 32 standards before issuing a permit for a wind project

Site Law Standards for all Large Projects

1. Project Description
2. Title, Right, and Interest
3. Financial Capacity
4. Technical Capacity
5. Noise *
6. Visual Quality *
7. Wildlife, Wetlands, and Fisheries
8. Historic Resources
9. Unusual Natural Areas
10. Buffers
11. Soils
12. Stormwater
13. Urban Impaired Streams
14. Basic Standards
15. Groundwater
16. Water Supply
17. Wastewater
18. Solid Waste
19. Flooding
20. Blasting
21. Air Emissions
22. Odors
23. Water Vapor
24. Sunlight
25. Notices

Additional Standards for Wind Projects

26. Shadow Flicker
27. Public Safety
28. Tangible Benefits
29. Decommissioning
30. Visual Impact
31. LUPC Certification
32. Best Practical Mitigation

* Noise and Visual Impact are evaluated under both Site Law and wind-specific standards

3 Consistency with CLUP

Location of Development

GOAL: Guide the **location of new development** in order to protect and conserve forest, recreational, plant or animal habitat and other natural resources, to ensure the compatibility of land uses with one another and to allow for a reasonable range of development opportunities important to the people of Maine, including property owners and residents of the unorganized and deorganized townships.

Milton is located on periphery of LUPC jurisdiction

- Surrounded by 4 organized towns
- Most areas within 10 miles are in organized towns

LUPC Policies

- "guide development to areas near existing towns and communities"
- "energy facilities are best located in areas on the edge of the jurisdiction with good existing road access but low natural-resource values"

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Economic Development

<u>GOAL:</u> Encourage **economic development** that is connected to local economies, utilizes services and infrastructure efficiently, is compatible with natural resources and surrounding uses, particularly natural resource-based uses, and does not diminish the jurisdiction's principal values.

Wind is compatible with forest management

- Provide value to forest landowners
- Provide benefits to Oxford County, including **$320k**+ /year in taxes, **$48k**+/ year for community benefits to the host community, and **$50k**/year to fund local projects.

LUPC Policies

- "encourage forest … and other resource-based industries"
- "encourage economic development in those areas identified as most appropriate for future growth"

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Energy Resources

<u>GOAL:</u> Provide for the environmentally sound and socially beneficial utilization of indigenous **energy resources** where there are not overriding public values that require protection.

Renewable energy provides benefits to Maine

- Existing capacity built thru small-medium projects
- Resource-based economic development consistent with state energy policies

LUPC Policies

- "support indigenous, renewable energy resources"
- "accommodate energy generation installations that are consistent with state energy policies"
- "new renewable energy projects displace … fossil fuels and carry benefits"

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Scenic and Recreation

<u>GOAL:</u> Protect the high-value **scenic resources** of the jurisdiction by fitting proposed land uses harmoniously into the natural environment.

<u>GOAL:</u> Conserve the natural resources that are fundamental to maintaining the **recreational environment** that enhances diverse, abundant recreational opportunities.

Resources located outside Milton

- Limited recreational opportunities within Milton
- No lakes or ponds within Milton
- Nearest scenic resource in LUPC is in Albany
- Detailed survey of resources conducted as part of permit application to DEP

LUPC Policies

- "encourage patterns of grown to minimize impacts on natural values and scenic character"
- "identify and protect areas that possess scenic features and values of state or national significance"

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Wildlife

GOAL: Conserve and protect the aesthetic, ecological, recreational, scientific, cultural and economic values of **wildlife**, plant and fisheries resources.

Few wildlife resources

- No Critical Habitat (eagle, salmon, lynx)
- No rare or exemplary natural community or ecosystem
- No mapped Significant Vernal Pools
- No high elevation areas

- Potential impacts to wildlife habitat will be identified during on-site surveys

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Wildlife

GOAL: Conserve and protect the aesthetic, ecological, recreational, scientific, cultural and economic values of **wildlife**, plant and fisheries resources.

Proximity to bat hibernaculum

- Hibernaculum 2.5 miles from nearest turbine
- Species most at risk from turbine collision do not use hibernaculum

Low risk of fatality to bats from turbines

- Existing bat fatality is very low in Maine
- Curtailment significantly reduces mortality

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3 Ability to Meet State Goals

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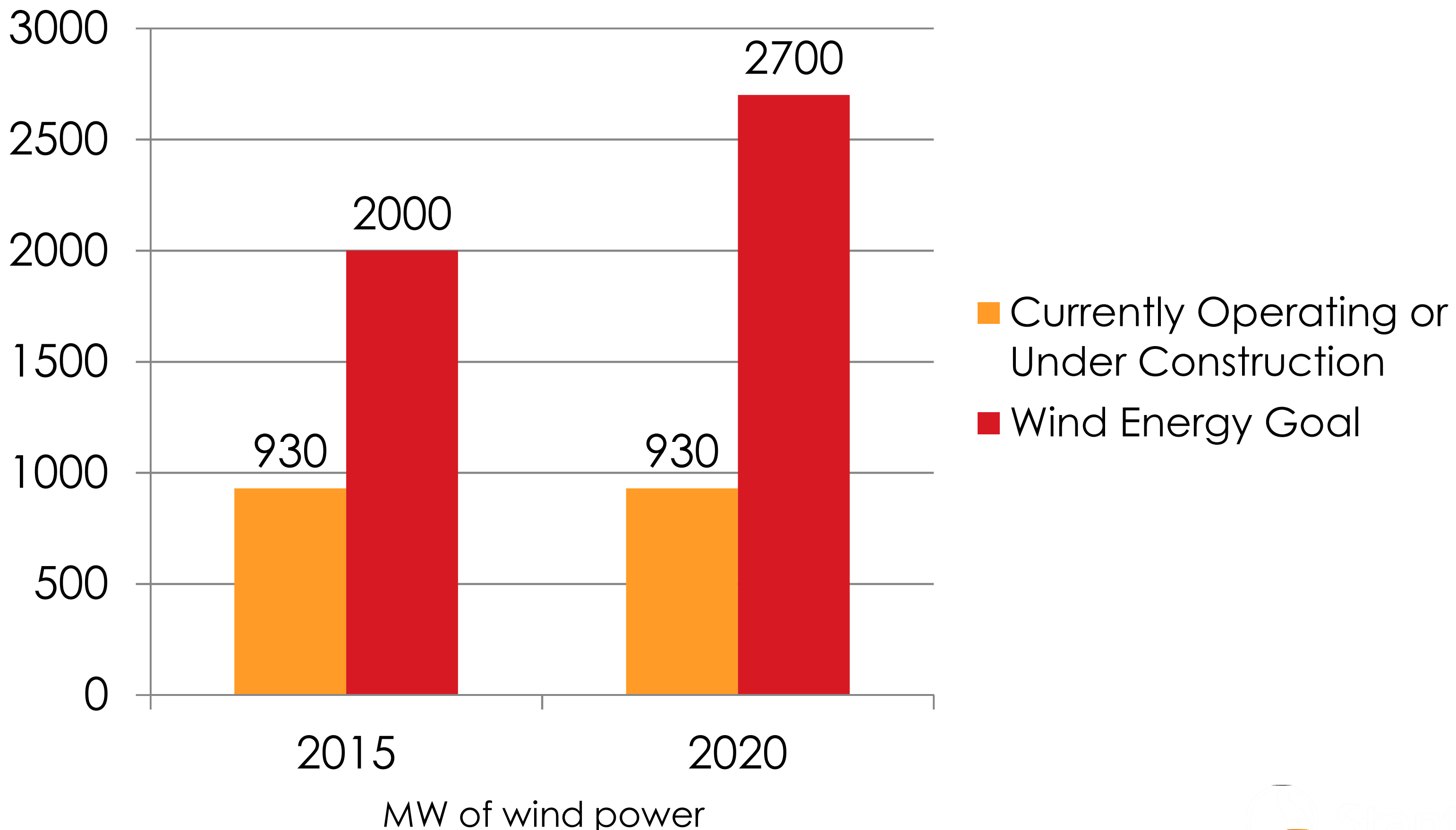
Projects like Milton are key for Maine to meet its wind energy goals



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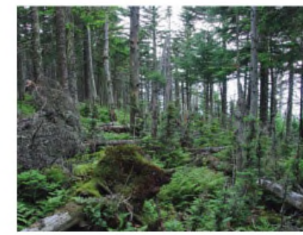
Wildlife and Siting

Wind Power and Wildlife in Maine:

A State-wide Geographic Analysis of High-Value Wildlife Resources and Wind Power Classes

MAINE AUDUBON



Susan Gallo, Wildlife Biologist

Maine Audubon, December 2013

Wildlife and Siting

Project meets recommendations from MAS report

1. The project is located in the expedited wind permitting area away from known and valuable wildlife resources.
2. Everpower is committed to minimizing and avoiding impacts to wildlife resources.
3. Milton does not include any high elevation sites (>2,700'), any modelled Bicknell's Thrush habitat, or areas designated as Critical Summits.
4. Milton is not located within 2 miles of the coast.

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Conclusion

- Milton is appropriate for wind power development
- Project would provide economic development for Milton and Oxford County
- Project must meet 32 standards before DEP can issue permit

Wind development should continue to be identified as an allowed use in Milton Township

Stantec

August 10, 2016

It is very upsetting to hear Woodstock residents talk about the Milton Twp Wind project. I see the Spruce Mountain Wind Farm from my property and I do not receive any benefits from them. All I want is the same opportunity as they have.

Deana Buck

7.4.1.4