Jennifer Brooks Hutchinson
Senior Counsel
PPL Services Corporation
JHutchinson@pplweb.com

280 Melrose Street
Providence, RI 02907
Phone 401-784-7288

Rhode Island Energy™
a PPL company

August 11, 2023

VIA ELECTRONIC MAIL

Luly E. Massaro, Commission Clerk
Rhode Island Public Utilities Commission
89 Jefferson Boulevard
Warwick, RI 02888

RE: Docket No. 22-56-EL – The Narragansett Electric Company d/b/a Rhode Island Energy Grid Modernization Plan (GMP)

Dear Ms. Massaro:

On behalf of The Narragansett Electric Company d/b/a Rhode Island Energy ("Rhode Island Energy" or the "Company"), attached is its Supplemental Testimony of Kathy Castro, Ryan Constable, and Carrie Gill.[1]

The purpose of this Supplemental Testimony is to address certain questions and issues regarding the Company's Grid Modernization Plan ("GMP") that it filed on December 30, 2022 in the above-reference proceeding, as discussed at the prehearing conference held in May 2023. Specifically, the Supplemental Testimony provides incremental information, and in some instances reframes prior information, to address the following topics:

- Purpose of the GMP;
- Scope of the GMP docket;
- GMP Analysis;
- Timing of when to begin investments;
- Pace of investments;
- Alternatives to the term "foundational investments";
- Cost recovery;
- Intersection of GMP and the Infrastructure, Safety, and Reliability ("ISR") Plan; and
- Relationship to Advanced Metering Functionality ("AMF").

As explained in detail in the Supplemental Testimony, the Company views the GMP as the validation for evolving its investment strategy, which will result in different investment proposals, such as in future ISR Plans. The Supplemental Testimony further explains the analysis the Company performed to understand which investment strategy alternative is best-fit, least-cost for a

[1] Per communication from Commission counsel on October 4, 2021, the Company is submitting electronic versions of these filings followed by hard copies filed with the Clerk within 24 hours of the electronic filing.

portfolio of electric distribution system issues in light of increasing penetration of distributed energy resources ("DER"). Based on that analysis, the Company concluded that an investment strategy of traditional investments integrated with grid modernization investments – i.e., referred to as a grid modernization investment strategy – is best-fit, least-cost, as explained in more detail in the Supplemental Testimony. The GMP is not intended to be an investment plan. Rather, the Company intends the GMP to validate an investment strategy that will guide future investment proposals the Company will make to the PUC through the appropriate regulatory proceedings.

Accordingly, the Company is not seeking approval of the GMP or preauthorization of its investment strategy as part of this docket. Rather, the Company restates its request that the PUC issue an order affirming that the Company has complied with its obligation to file a GMP that meets the requirements of the Amended Settlement Agreement approved in Docket Nos. 4770/4780, and in doing so, to make a finding that the GMP complies with the PUC's Order No. 23823 in Docket Nos. 4770/4780, thereby satisfying the Company's obligation thereunder. In this docket, the Company welcomes the PUC's and Division's review and discussion of the GMP to gain additional insight into the increasing complexities of the electric system because of the penetration of DERs, and the Company's validation for potential solution alternatives to address a portfolio of electric distribution system issues.

This filing also includes a GMP Analysis Supplement as Attachment 1 to the Supplemental Testimony.

Thank you for your time and attention to this matter. If you have any questions, please contact Jennifer Brooks Hutchinson at 401-316-7429.

Very truly yours,

Jennifer Brooks Hutchinson

Enclosures

cc: Docket No. 22-56-EL Service List
John Bell, Division
Leo Wold, Esq.

CERTIFICATE OF SERVICE

I certify that a copy of the within documents was forwarded by e-mail to the Service List in the above docket on the 11th day of August, 2023.

Adam M. Ramos, Esq.

The Narragansett Electric Company d/b/a Rhode Island Energy
Docket No. 22-56-EL Grid Modernization Plan (GMP)
Service list updated 2/6/2023

Name/Address	E-mail Distribution List	Phone
The Narragansett Electric Company d/b/a Rhode Island Energy Jennifer Hutchinson, Esq. 280 Melrose Street Providence, RI 02907	JHutchinson@pplweb.com; JScanlon@pplweb.com; COBrien@pplweb.com; CAGill@RIEnergy.com; JOliveira@pplweb.com; BLJohnson@pplweb.com; SBriggs@pplweb.com; KGrant@RIEnergy.com; wanda.reder@gridxpartners.com; KRCastro@rienergy.com; PJWalnock@pplweb.com;	401-784-7288
Hinckley Allen Adam Ramos, Esq. 100 Westminster Street, Suite 1500 Providence, RI 02903-2319	aramos@hinckleyallen.com; cdieter@hinckleyallen.com; cwhaley@hinckleyallen.com;	401-457-5164
Division of Public Utilities (Division) Leo Wold, Esq. Christy Hetherington, Esq. Division of Public Utilities and Carriers 89 Jefferson Blvd. Warwick, RI 02888	Leo.Wold@dpuc.ri.gov; Christy.Hetherington@dpuc.ri.gov; Margaret.L.Hogan@dpuc.ri.gov; John.bell@dpuc.ri.gov; Al.contente@dpuc.ri.gov; Joel.munoz@dpuc.ri.gov; Linda.George@dpuc.ri.gov; Machaela.Seaton@dpuc.ri.gov; Al.mancini@dpuc.ri.gov; Paul.Roberti@dpuc.ri.gov; Thomas.kogut@dpuc.ri.gov;	401-780-2177

	Ellen.Golde@dpuc.ri.gov; John.spirito@dpuc.ri.gov;	
Robin Blanton	rblanton@utilityengineering.com;	
William Watson	wfwatson924@gmail.com;	
David Littell	dlittell@bernsteinshur.com;	
Gregory L. Booth, PLLC 14460 Falls of Neuse Rd. Suite 149-110 Raleigh, NC 27614 Linda Kushner L. Kushner Consulting, LLC 514 Daniels St. #254 Raleigh, NC 27605	gboothpe@gmail.com; lkushner33@gmail.com;	
Office of Attorney General Nick Vaz Sarah Rice	srice@riag.ri.gov; nvaz@riag.ri.gov;	
Office of Energy Resources (OER) Albert Vitali, Esq. Dept. of Administration Division of Legal Services One Capitol Hill, 4th Floor Providence, RI 02908 Chris Kearns, OER	Albert.Vitali@doa.ri.gov; nancy.russolino@doa.ri.gov; Christopher.Kearns@energy.ri.gov; Shauna.Beland@energy.ri.gov; Matthew.Moretta.CTR@energy.ri.gov; Anika.Kreckel@energy.ri.gov; Steven.Chybowski@energy.ri.gov; Nathan.Cleveland@energy.ri.gov; William.Owen@energy.ri.gov;	
Original & 9 copies file w/: Luly E. Massaro, Commission Clerk Public Utilities Commission 89 Jefferson Blvd. Warwick, RI 02888	Luly.massaro@puc.ri.gov; Cynthia.WilsonFrias@puc.ri.gov; Alan.nault@puc.ri.gov; Todd.bianco@puc.ri.gov; Emma.Rodvien@puc.ri.gov; Christopher.Caramello@puc.ri.gov;	401-780-2107
Victoria Scott (GOV)	Victoria.Scott@governor.ri.gov;	
Matt Sullivan	ms@green-ri.com;	
Hannah Morini	hm@green-ri.com;	
Jacqueline Petrocchi	jmp@green-ri.com;	

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a Rhode Island Energy
RIPUC Docket No. 22-56-EL
Grid Modernization Plan
Supplemental Testimony
Witnesses: Castro, Constable, and Gill

JOINT PRE-FILED SUPPLEMENTAL DIRECT TESTIMONY

OF

KATHY CASTRO,

RYAN CONSTABLE,

AND

CARRIE GILL

August 11, 2023

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I. Introduction

Kathy Castro

Q. Ms. Castro, please state your name and business address.

A. My name is Kathy Castro. My business address is 280 Melrose Street, Providence, Rhode Island, 02907.

Q. By whom are you employed and in what position?

A. I am employed by Rhode Island Energy as the Director of Asset Management and Engineering. In my position, I am responsible for planning and oversight of projects and programs that ensure a safe and reliable electric distribution system.

Q. Have you previously submitted testimony in this proceeding?

A. Yes, I submitted joint pre-filed direct testimony in this proceeding on December 30, 2022.

Ryan Constable

Q. Mr. Constable, please state your name and business address.

A. My name is Ryan Constable. My business address is 280 Melrose Street, Providence, Rhode Island, 02907.

Q. By whom are you employed and in what position?

A. I am employed by Rhode Island Energy as an Engineering Manager in the Distribution Planning and Asset Management Department. In my position, I am responsible for planning and oversight of projects and programs that ensure a safe and reliable electric distribution system.

Q. Have you previously submitted testimony in this proceeding?

A. Yes, I submitted joint pre-filed direct testimony in this proceeding on December 30, 2022.

Carrie Gill

Q. Dr. Gill, please state your name and business address.

A. My name is Carrie Gill. My business address is 280 Melrose Street, Providence, Rhode Island, 02907.

Q. By whom are you employed and in what position?

A. I am employed by Rhode Island Energy as Senior Manager of Electric Regulatory Strategy within the External Affairs team. In this role, I am responsible for general regulatory matters, policy development, and filings, including providing strategic support to inform business decisions that advance safe, reliable, affordable electricity distribution.

Q. Please describe your educational background and professional experience.

A. I received a doctorate in environmental and natural resource economics from the University of Rhode Island in 2017, master's degrees in business administration and oceanography from the University of Rhode Island in 2010, and a bachelor's of science in physics and mathematics from Loyola University, Maryland, in 2007.

Prior to my role with Rhode Island Energy, I served multiple positions with the Rhode Island Office of Energy Resources from 2017 to 2022, culminating my tenure as chief economic and policy analyst. In that role, I provided strategic oversight of clean energy and climate policies and programs for the State of Rhode Island. Prior to 2017, I held various research and teaching assistantships within University of Rhode Island (2012-2017); provided independent consulting to a solar thermal developer in Washington, DC (2012); served as a Knauss Fellow within the U.S. Department of Energy's Wind and Water Power Program (2011-2012); and supported the Coastal Resources Center with research on coastal community climate adaption (2010).

Q. Have you previously submitted testimony in this proceeding?

A. No, I have not previously submitted testimony in this proceeding. However, I have submitted testimony for Rhode Island Energy in Docket 22-39-REG. I have also testified on several occasions during my tenure with the Rhode Island Office of Energy Resources.

Q. Are you sponsoring any attachments within this supplemental testimony?

A. Yes, we are sponsoring Attachment 1, which is a Grid Modernization Plan ("GMP") Analysis Supplement and introduced in further detail within our supplemental testimony.

Q. Why is Rhode Island Energy filing this supplemental testimony?

A. Rhode Island Energy ("the Company") is filing this supplemental testimony to address potential concerns and questions that may still be outstanding since it filed the GMP in December 2022 and the Prehearing Conference that was held in May 2023.

Q. What are the concerns and questions the Company intends to address via this supplemental testimony?

A. The Company addresses the following topics in this testimony:

- Purpose of the GMP
- Scope of the GMP docket
- GMP Analysis
- Timing of when to begin investments
- Pace of investments
- Alternatives to the term "foundational investments"
- Cost recovery
- Intersection of GMP and the Infrastructure, Safety, and Reliability ("ISR") Plan

- Relationship to Advanced Metering Functionality ("AMF")

Q. How is this supplemental testimony organized?

A. This supplemental testimony is organized into sections corresponding to the list of topics in the question above. Section I is the introduction. Section II discusses the purpose of the GMP. Section III discusses the scope of the GMP docket. Section IV discusses the GMP Analysis.[1] Section V discusses the timing of when investments may begin. Section VI discusses the pace of investments. Section VII discusses the term "foundational investments." Section VIII discusses cost recovery. Section IX discusses the intersection of the GMP and the ISR. Section X discusses the GMP's relationship to AMF. Section XI concludes this supplemental testimony.

In each section, the Company describes its intent in addressing each topic, attempts to address potential outstanding questions and concerns via incremental information or reframing of prior information, and cross-references readers to specific sections of the GMP that provide more detail. At times, the Company may provide responses that reframe information presented previously – this reframing is not intended to be a contradiction, but rather an alternative way of describing consistent sentiments in hopes that the reframing will be more easily understandable and provide further clarity.

[1] The Company uses the term "GMP Analysis" to refer to the distribution study and the benefit-cost assessment.

II. Purpose of the GMP

Q. Please describe the Company's intent in addressing this topic.

A. In this section of testimony, the Company attempts to clarify its perspective on the purpose of the GMP and the value the Company gained by developing the GMP.

Q. How does the Company view the purpose of the GMP?

A. The Company views the GMP as the validation for evolving its *investment strategy*, which will result in different *investment proposals*, such as in future ISR Plans.[2]

In the GMP, the Company evaluates the effectiveness of two investment strategy alternatives for addressing electric distribution system issues today and under increasing penetration of distributed energy resources ("DER").[3] These two investment strategy alternatives are: (i) the Company's status quo investment strategy of traditional investments only (e.g. reconductoring, upgrading transformers, non-wires solutions, etc.;

[2] The Company is intentionally using the term "investment strategy" here to refer to the overarching strategy for how to address electric distribution system issues. In contrast to an "investment strategy," the specific justifications for the individual investment proposals – solutions to specific electric distribution system issues – will be included when the Company proposes each specific investment and will include the electric distribution system issue and the proposed solution.

[3] With increasing penetration of DER and policy signals that seem to encourage further penetration, the Company considered the present (beginning as early as 2017 when developing its rate case in Docket 4770/4780) to be a timely opportunity to revisit its investment strategy to ensure the strategy results in reasonable and prudent investment proposals to resolve electric distribution system issues.

referred to herein as the "traditional investment strategy"); and (ii) the Company's alternative strategy of a smaller extent of traditional investments integrated with grid modernization investments (e.g. adding information technology solutions and communicating sensors in the field, etc.; referred to herein as the "grid modernization investment strategy").[4]

For any *single, isolated* electric distribution system issue, traditional investments often represent the best-fit, least-cost alternative. This is because integrating any level of grid modernization investment necessitates large up-front costs, for example, for the information technology required to ingest, analyze, and communicate with field equipment.

However, it was not certain before now whether a strategy of traditional investments only remains best-fit, least-cost for a *portfolio*[5] of electric distribution system issues. Further, increasing penetration of DER presented a complicating factor that warranted appropriate modeling and analysis. The Company conducted such an analysis when developing the GMP.

[4] This "traditional investment strategy" is described in Book 2 Section 5.2 as the "No Grid Mod Modernization Alternative." This "grid modernization investment strategy" is described in Book 2 Section 5.2 as the "Grid Modernization Alternative."

[5] The Company uses the term "portfolio" to mean a set or multiple (in contrast to one).

In the GMP, the Company describes the analysis it performed to understand which investment strategy alternative is best-fit, least-cost for a portfolio of electric distribution system issues in light of increasing penetration of DER. The Company finds that a strategy of traditional investments integrated with grid modernization investments – the grid modernization investment strategy – is actually best-fit, least-cost for a portfolio of electric distribution system issues with the current penetration of DER seen in localized areas of Rhode Island.[6]

Q. What is the main takeaway of the GMP?

A. The GMP shows that an investment strategy of traditional investments integrated with grid modernization investments – a grid modernization investment strategy – is best-fit, least-cost for a portfolio of electric distribution system issues in Rhode Island. These electric distribution system issues include issues the Company is seeing now, such as interconnection and operational flexibility of DER, maintaining reliability, expanding volt/var optimization to save energy, and the continuous effort to improve worker and public safety. Therefore, the insights from the GMP suggest the Company should shift away from a traditional investment strategy to a strategy of traditional investments integrated with grid modernization investments – a grid modernization investment

[6] The Company addresses potential concerns and questions about the analysis itself, the timing to begin investments, and the pace of investments in Sections IV, V, and VI of this supplemental testimony.

strategy – to resolve electric distribution system issues in future investment proposals, such as in the annual ISR.

Solutions derived from a grid modernization investment strategy are further described within the GMP on an illustrative basis. In completing its GMP Analysis, the Company finds that one such solution – enabling demand-side or customer-side control of electricity use – stands out in importance for achieving safe, reliable, affordable electric service.

Q. What value did the Company get from developing the GMP?

A. The Company recognized the high-level difference between the two investment strategies and benefits of each but did not have the necessary analysis completed to evaluate one against the other prior to developing the GMP.

Through the development of the GMP, the Company developed more advanced analysis tools and methods to conduct the review and determine the appropriate alternative. Prior to developing the GMP, the existing data sets, tools, and methods were not adequate to quantitatively analyze tradeoffs between investment strategies to resolve electric distribution system issues in future states of the world (in relation to increasing penetration of DER). Specifically, the Company improved its prior static analysis to be more dynamic and granular (e.g., modeling all circuits using 8,760 hourly models to

identify electric distribution system issues and how specific solution sets alleviate those issues).

In working through the GMP Analysis, the Company was able to better understand the implications of two investment strategy alternatives, including their implications for safety, affordability, and reliability.

Q. How does the Company intend for the GMP to be used?

A. The Company intends for the GMP to be used as a complementary document, akin to how an area study tests alternatives and guides multi-year investments as proposed through formal filings, such as, but not limited to, the ISR.

These documents (e.g., area studies) are not filed for regulatory review of any single element (though there is extensive engagement with the Division of Public Utilities and Carriers, referred to herein as the "Division"). In the same manner, the Company lays out its decision-making framework in the GMP to center the conversation around those objectives. Akin to area studies, the Company will rely on the findings of the GMP (with its analysis driven by the same area study planning criteria) to guide refined and targeted investment proposals through appropriate dockets, such as investment proposals that are reasonably needed to maintain safe and reliable distribution service over the short- and long-term in each annual ISR Plan.

There is not an exact parallel between the GMP and area studies; rather, the Company draws conceptual similarities within this response to aid understanding of the Company's intent for how the GMP should be used. The difference between the GMP and area studies is that the GMP validates an investment strategy whereas the area studies provide specific investment solutions.

Q. From the Company's perspective, what would go beyond the intended use of the GMP?

A. The Company does *not* intend for the GMP to be used as a static forecast of electric distribution system issues. Although the analysis employs an upper bound of DER penetration, the Company does not view this upper bound as representing a forecasted state of the world.[7]

Similarly, the Company does *not* intend for the GMP to be used as a static investment plan. Although the investments described within the GMP are those that result from the specific modeling it conducted, the Company will propose only those investments that are needed, when they are needed, within the appropriate regulatory filing. In this manner, the GMP is not a static investment plan but a breathable, flexible document

[7] The Company addresses potential outstanding questions and concerns about its analysis and its use for this upper bound scenario Section IV of this supplemental testimony.

describing an investment strategy that will be deployed with on- and off-ramps to guide future targeted investment proposals.[8]

Q. What value does the Company get from having the GMP?

A. The Company developed the GMP – including its extensive analysis and stakeholder engagement – for multiple reasons:

1. To understand the tradeoffs of different investment strategies;
2. To provide transparency into the Company's decision-making process;
3. To work through scale, sequencing, and pace of investments, and associated implications; and
4. To develop quantitative analysis methodologies.

The Company views the GMP as providing the validation for an investment strategy that integrates traditional investments with grid modernization investments – a grid modernization investment strategy. Having a GMP documented and in the public record fosters transparency about and builds understanding of benefits and costs of alternative investment strategies and provides insight into the Company's long-term investment strategy to supplement each investment proposal (i.e., the annual ISR Plan).

[8] The Company addresses potential outstanding questions and concerns about future investment proposals in Sections VIII and IX of this supplemental testimony.

Q. Why did the Company file the GMP?

A. The Company filed the GMP to satisfy the Company's obligation under the Amended Settlement Agreement ("ASA") approved by the Rhode Island Public Utilities Commission ("PUC") in Docket Nos. 4770/4780, Order No. 23823.

Q. Does the Company view the GMP as evidence?

A. The Company is not requesting approval of the contents of the GMP or preauthorization of its investment strategy such that the Company can rely on that approval in subsequent proceedings. Approval of proposed investments will go through the appropriate evidentiary hearings in the relevant dockets.

The Company does, however, intend to use the GMP as evidence in those future dockets to demonstrate that deriving solutions to electric distribution system issues from a grid modernization investment strategy results in solutions that are best-fit, least-cost relative to the traditional investment strategy for a portfolio of electric distribution system issues. In this sense, the Company relies on the findings of the GMP as internal evidence to support business functions – the GMP is the Company's due diligence in examining alternative investment strategies – and may refer to the GMP as evidence in future regulatory proceedings to support and justify its proposed investments, which the Commission may weigh as it deems appropriate.

Q. What is the difference between the GMP filed in Docket No. 22-56-EL and the GMP as contemplated in Docket 4770/4780?

A. Although the GMP as filed in Docket 22-56-EL in 2022 meets the requirements of the GMP as defined in Docket No. 4770/4780, Order No. 23823, and the ASA, the Company has evolved how it intends to use the GMP it filed in Docket No. 22-56-EL in 2022.[9] The Company understands its original grid modernization vision in Docket No. 4780 in 2018, and the resulting GMP as contemplated in Order No. 23823 and the ASA, to be more akin to a multi-year investment plan, albeit with clear on- and off-ramps. However, the Company now emphasizes that the Company, its customers, the PUC, and parties to the ASA are best served by a more breathable and flexible document that provides insights into the best investment strategy under whatever penetration of DER materializes.[10]

Q. How does the Company envision the PUC and the Division could use the GMP?

A. The Company intends that the GMP Analysis provides the PUC and other parties, including the Division, with insights into the increasing complexities of the electric system due to dynamic and distributed technologies, associated electric distribution system issues, potential solution alternatives, and linkages between these. With these

[9] The Company acknowledges an iteration of the GMP was filed in Docket No. 5114 on January 21, 2021, and withdrawn on September 12, 2022.

[10] Book 2 Section 1.2 contains additional detail regarding the history of Docket 4770/4780 and the ASA requirements.

insights, the PUC, Division, and other parties could use the GMP to understand the Company's validation for proposing solutions to resolve electric distribution system issues that are derived from a grid modernization investment strategy. The Company describes such solutions in the GMP and discusses how these solutions interact to optimize net value for customers.

III. Scope of the GMP Docket

Q. Please describe the Company's intent in addressing this topic.

A. The Company's intent in addressing this topic is to help inform the scope of the GMP docket by discussing the Company's perspective on a possible approach.

Q. How does the Company think about the relationship between the scope of the docket and the purpose of the GMP?

A. The scope of the docket should stem directly from the purpose of the GMP. In other words, the docket should assess whether the GMP has met its purpose.

Q. What is the Company's recommendation for the scope of this docket?

A. The Company views the purpose of the GMP as the validation for evolving its investment strategy, which will result in different investment proposals, such as in future ISR Plans. The Company's recommended scope of this docket therefore allows for meaningful

discussion about the contents of the GMP but stops short of requesting approval of specific investments or their cost recovery.

The Company requests that the PUC "issue an order affirming that the Company has complied with its obligation to file a GMP that meets the requirements of the ASA".[11] Order No. 23823 in Docket No. 4770/4780 references "twelve minimum requirements for inclusion in the Grid Modernization Plan" (Order No. 23823 Bates Page 23) that were then incorporated into the ASA (see Section 15 of the ASA). The Company considers that a finding that the GMP complies with the ASA is, therefore, also a finding that the GMP complies with Order No. 23823, thereby satisfying the Company's obligation under Docket No. 4770/4780.

Assessing whether the GMP meets the ASA requirements aligns with the Company's objective to foster transparency about how it is evolving its investment strategy. The twelve requirements are:

"The GMP will take into account the time period for any proposed AMF implementation, and it will include, at a minimum:

[11]The Company states its request for ruling affirming that it has complied with its obligation to file a GMP that meets the requirements of the ASA in Book 2, Section 9, Bates Page 209.

1. Objectives for the electric grid to advance the Goals for the Energy System and Rate Design Principles, and potential visibility requirements of the benefit-cost framework in Docket 4600 Guidance Document;
2. Explanation of the role of currently active programs;
3. Investments and technology deployments planned through the end of any proposed AMF implementation;
4. Functionalities to achieve those objectives;
5. Review of options for candidate technologies to deliver those functionalities;
6. Transparent, updated benefit cost analyses that fully incorporate the Docket No. 4600 framework;
7. An implementation plan that provides a detailed explanation of the prioritization, sequencing, and pace of investments;
8. A plan and explanation for the integration and leveraging of customer-side technologies and resources in the near and long-term;
9. Identification of the possible communications solutions that address current and future needs and support a wide array of potential grid modernization programs and activities;
10. Explanation of congruency with grid modernization activities in New York and Massachusetts;
11. A plan and explanation of how the selected investments and implementation plan address risks of redundancy or obsolescence; and

12. A description of how the GMP, in particular the distribution planning components, addresses the relationship between electrification of heating and transportation and energy efficiency to allow for the furtherance of overall reduced peak demand while also encouraging electrification of heating and transportation." [Order No. 23823, Appendix A, Bates Page 51]

The Company acknowledges that the PUC may vet the GMP's compliance with the ASA through data requests, technical sessions, or hearings, and may include a request for parties to the ASA to intervene, provide testimony, or submit public comment. In offering this recommendation for scope, the Company intends to offer a flexible framework from which the PUC can right-size the depth and breadth of the GMP docket.

Q. Why does the Company not request approval of the contents of the GMP or the specific investments it contains?

A. The Company does not request approval of the GMP itself or the specific investments it contains for several reasons.

First, the GMP validates an investment strategy, which is a fundamental business strategy and is within the purview of the Company to make. A request for approval of the GMP itself would imply a request for approval of a business decision, which would not be an appropriate request to the PUC.

Second, an evidentiary hearing inclusive of detailed engineering review of specific investments within the GMP may be duplicative and inappropriate. The investments – scale, timing, pace – arising from the scenario modeling conducted in the GMP are illustrative to support the Company's analysis of tradeoffs between the baseline traditional investment strategy and the alternative grid modernization investment strategy. The Company is not proposing any specific investments or cost recovery within the GMP; the Company will submit refined investment proposals in targeted areas to address specific electric distribution system issues through appropriate regulatory avenues for further review and oversight.[12] These refined investment proposals will be different from those discussed within the GMP because they will be right-sized and right-timed based on actual electric distribution system issues as they arise.

Q. Is the Company amenable to a larger scope than what it recommends?

A. Yes. While the Company recommends the PUC align the scope of the GMP docket to understand the justification for the Company shifting from a traditional investment strategy to a grid modernization investment strategy, the Company will be a cooperative partner in the docket regardless of how the PUC defines the scope.

[12]The Company states that it is not seeking approval of any particular investments or seeking any cost recovery as part of this GMP in Book 2, Section 1.1, Bates Page 6.

IV. GMP Analysis

Q. What is the Company's intent in providing supplemental testimony regarding the GMP Analysis?

A. The Company recognizes that the PUC and parties have outstanding questions about the GMP Analysis. Throughout this testimony, the Company uses the term "GMP Analysis" to refer to both the distribution study and the benefit-cost assessment. Outstanding questions include clarifications on the methodology and the reasoning for the methodology, linkages between the electrical analysis and the benefit-cost analysis, and the relation of findings to the purpose of the GMP. In this section, the Company attempts to directly answer some of these outstanding questions.

Q. Please summarize the key points of clarification the Company would like to address.

A. To evaluate the effectiveness of switching from a traditional investment only strategy to a grid modernization investment strategy, the Company attempted to analyze tradeoffs in the most conservative manner – meaning the benefits were modeled to be lower bounds and the costs were modeled to be upper bounds, rendering the most conservative benefit-cost ratio.

The GMP Analysis employs a scenario under which maximum investments are required under a grid modernization investment strategy. This scenario is not a forecast. The Company employed this scenario as an upper bound on electric distribution system issues

as a proxy for an upper bound on investments – and costs – to address those issues. In conducting the benefit-cost assessment, the Company generally used lower bounds on estimates of each benefit category. Despite the lower bound of benefits and the upper bound of costs, the Company finds a benefit-cost ratio of evolving to a grid modernization investment strategy that is persistently greater than 1.0 across sensitivity analyses.

The GMP Analysis includes three benchmarks (2030, 2040, and 2050) and annual modeling, which implicitly allows the Company to glean insights about the tradeoffs between investment strategies at lower penetrations of DER. Therefore, even though the Company employs an upper bound and long-term 2050 scenario in its GMP Analysis, the GMP Analysis still provides insights for short-term investment.

The GMP Analysis identifies technological solutions to electric distribution system issues that may be derived from a grid modernization investment strategy, but the Company does not consider these solutions to constitute an investment plan.

Q. Regarding benefits, in your prior response, you stated that the Company generally used lower bounds on estimates of each benefit category when conducting the benefit-cost assessment. Can you substantiate this?

A. Yes, the Company provides examples in Table 1, below. The Company intentionally shows a subset of benefits based on the benefit categories associated with the largest valuation. For more information on all benefits within the benefit-cost assessment, please see Section 8 of the GMP, Book 2 in Docket No. 22-56-EL.

Table 1: The GMP Analysis employs a conservative estimate for benefits – examples from a subset of benefits.

Benefit-Cost Category	Estimation Methodology in GMP Analysis	How Estimate in GMP Analysis is Conservative
Avoided Infrastructure Costs	The Company first identified infrastructure costs for solutions to electric distribution system issues arising in 2050 derived from (i) the traditional investment strategy and (ii) the grid modernization investment strategy. The Company used the difference in costs between (i) and (ii) to represent avoided infrastructure.	Although the Company used the full cost of solutions derived from the grid modernization investment strategy for the cost valuation, the Company only used 55% of the avoided infrastructure costs in its valuation (8% assigned to 2027-2030, 47% assigned to 2031-2042, 45% assigned to 2043-2050 but not included in the BCA).
Reduced DER Curtailment	The Company assumed no benefits from reduced curtailment in 2023-2029; a downscaled-but-positive benefit in 2031-2042, and zero benefit in 2043-2050.	The downscaled-but-positive benefit assigned to 2031-2042 reduced the total benefit valuation by 22%. The realization of zero valuation assigned to 2043-2050 is highly unlikely.
CCO/CVR Benefits	The Company estimated benefits using findings from a third-party vendor evaluation of the Company's pilot.	The evaluation found 1.3% - 3.5% energy savings; the Company assumed 2% energy savings in its valuation (0.7% higher than lower bound, 1.5% lower than upper bound).
Reduced Outage Frequency	The Company estimated benefits using five-year historical data.	The Company reduced the number of successful operations by 25%. DOE reports benefits ranging 11% - 49%; the Company is using 26% (15% higher than lower bound, 23% lower than upper bound).
Utility O&M Savings	The Company assumed a 2% growth rate of O&M expenses when calculating savings.	The Company's actual growth rate for O&M expenses is 3%, so 2% is a conservative assumption.

Q. Regarding costs, the Company says that the GMP Analysis employs an upper bound scenario under which maximum investments are required under a grid modernization investment strategy. How did the Company develop this upper bound scenario and why isn't it a forecast?

A. The Company developed this upper bound scenario with the objective of seeing the most dynamic changes from historical conditions on the electric distribution system. These changes arise from adoption of technologies that (i) increase demand, (ii) increase two-way power flow, and (iii) decrease predictability of load curves. These three characteristics would lead to the most difficult-to-plan-for and most difficult-to-operate-through conditions. Technologies that contribute to these three conditions include distributed generation, renewable energy, electric vehicle charging, and electric heating and cooling. These technologies are also those technologies that are likely to increase in adoption as driven by public policies and the market signals they send. One example of a public policy and its signal to markets is the 2022 Renewable Energy Standard, which signals to the renewable energy market that there may be longer-term value streams from development and continuation of state-driven incentives for in-state development. Another example is the State's recent adoption of the Advanced Clean Cars II regulation, which phases out sales of new light-duty vehicles with internal combustion engines in the coming decade and therefore likely sends market signals encouraging electric vehicle markets in the State (and further supports those markets through state-level and federal-level incentives for electric vehicles).

The Company specifically considered the 2021 Act on Climate in developing its upper bound scenario in the GMP Analysis because the 2021 Act on Climate sets greenhouse gas emissions reductions mandates that are likely to provide at least some level of encouragement to adopt the range of technologies that result in the most dynamic changes from historical conditions on the electric distribution system. Specifically, the Company assumed the State meets these climate mandates through near-complete electrification of thermal and transportation sectors and fully in-state development of renewable energy resources. The Company understands that the 2021 Act on Climate does not require in-state renewable energy resources and that electrification is one pathway of several to reduce greenhouse gas emissions. The Company employed this scenario – which is not a forecast – to model a state of the world with the most electric distribution system issues, and therefore the highest cost of investments to resolve those issues.

Q. How does employing this upper bound scenario in the GMP Analysis provide insight into decisions today?

A. The GMP Analysis methodology would provide insight into decisions today if (i) the GMP Analysis methodology includes modeling of a short-term scenario and (ii) the short-term scenario modeled is similar to a short-term forecast. The Company contends that its GMP Analysis methodology meets both of these criteria.

First, although the GMP Analysis considers electric distribution system issues that emerge from an upper bound scenario analysis through 2050, the GMP Analysis also models benefits and costs in benchmark years 2030 and 2040, developed from an underlying annual model. The underlying annual model was not included in the GMP, but the Company has included this data in this supplemental testimony as Attachment 1 with the intent of adding depth of transparency and, therefore, aiding in understanding the analysis and resulting insights. The GMP Analysis methodology does include modeling of a short-term scenario and therefore meets criteria (i).

Second, the short-term scenario modeled is nearly identical to the contemporaneous electric peak forecast and therefore satisfies criteria (ii).[13] Table 2, below, shows the modeled uptake of DER in the GMP Analysis relative to the Company's contemporaneous electric peak forecast for solar PV, electric vehicles, electric heat pumps, and energy efficiency.[14] This table shows that the GMP Analysis used short-term

[13]Electric Peak (MW) Forecast. Published November 2021. https://systemdataportal.nationalgrid.com/RI/documents/RI_PEAK_2022_Report.pdf

[14]Other DER included in the GMP Analysis include land-based wind, offshore wind, demand response, and energy storage. Land-based wind and offshore wind are omitted from the electric peak forecast because of their negligible impact on summer peak load and are, therefore, not included in Figure 2. Omission of land-based wind and offshore wind from this comparison does not have any material bearing on the argument that the model used in the GMP Analysis is similar in the short-term to expected forecast. Although demand response and energy storage are elements of the electric peak forecast, they are not assumed in the same manner in the GMP Analysis. In contrast, the Company considered levels of demand response and energy storage as endogenous to the model used in the GMP forecast; resultant levels of demand response and energy storage from the GMP Analysis are greater than those levels in the electric peak forecast.

(through 2036) assumptions that were identical to the forecast at that time, with the sole exception of installed nameplate capacity of solar PV in years 2030 through 2036. The Company further explains how the PUC and parties may consider this difference in their interpretation of findings throughout this section of the supplemental testimony (see also specifically Figure 2g.i and 2g.ii and the Company's associated discussion in Attachment 1).

Also of note: the contemporaneous electric peak forecast did not account for market signals from the 2022 Renewable Energy Standard, the 2021 Act on Climate, the Inflation Reduction Act, the National Electric Vehicle Infrastructure Act, or other recent policies that are likely to incrementally encourage market growth and penetration of DER. Therefore, one may also argue that the Company's electric peak forecast may represent a somewhat lower bound future scenario.

Notwithstanding, given how closely the model in the GMP Analysis aligns with the Company's electric peak forecast, the model in the GMP Analysis does indeed represent plausible expectations for the short-term.

Satisfaction of these criteria prompt the Company to consider the insights of its GMP Analysis – notably the benefits of evolving to a grid modernization investment strategy – as being applicable to immediate decision-making.

Table 2. GMP Analysis assumptions and Electric Peak Forecast through 2036

	PV (MW)			EV (number vehicles)			EH (number systems)			EE (MW)		
Year	**GMP Analysis**	**Forecast**	**Delta**	**GMP Analysis**	**Forecast**	**Delta**	**GMP Analysis**	**Forecast**	**Delta**	**GMP Analysis**	**Forecast**	**Delta**
2022	498	498	0	7039	7039	0	6052	6052	0	370	370	0
2023	601	601	0	10605	10605	0	8752	8752	0	387	387	0
2024	704	704	0	15288	15288	0	12052	12052	0	404	404	0
2025	808	808	0	21305	21305	0	15952	15952	0	422	422	0
2026	901	901	0	29494	29494	0	20652	20652	0	440	440	0
2027	984	984	0	39962	39962	0	26352	26352	0	458	458	0
2028	1060	1060	0	52855	52855	0	33152	33152	0	475	475	0
2029	1128	1128	0	68623	68623	0	41352	41352	0	491	491	0
2030	1791	1189	602	87321	87321	0	51152	51152	0	507	507	0
2031	1981	1244	737	109241	109241	0	60462	60462	0	522	522	0
2032	2171	1293	878	133813	133813	0	69307	69307	0	536	536	0
2033	2361	1337	1024	161266	161266	0	77709	77709	0	549	549	0
2034	2551	1377	1174	190458	190458	0	85691	85691	0	562	562	0
2035	2741	1414	1327	222046	222046	0	93274	93274	0	574	574	0
2036	2931	1446	1485	254981	254981	0	100478	100478	0	586	586	0

Notes: PV corresponds to cumulative installed nameplate capacity for solar photovoltaic systems (MW). EV corresponds to cumulative number of electric vehicles, inclusive of light-duty and heavier-duty vehicles. EH corresponds to cumulative number of electric heat pumps. EE corresponds to energy savings in MW. All Forecast figures correspond to the base forecast, not the low or high scenario forecasts. Delta is the difference between assumed adoption in the GMP Analysis and the forecasted adoption in the electric peak forecast. A delta of 0 indicates adoption values are identical between the GMP Analysis and electric peak forecast.

Q. How does this scenario modeling provide insight into which investment strategy is most cost-effective?

A. The model that the Company employs in its GMP Analysis is granular by year; the benefit-cost assessment in the GMP Analysis includes inputs and outputs on an annual basis from 2023-2042 (the 20-year term used). The Company uses this annual level analysis to gain insight into which investment strategy is most cost-effective. In Attachment 1, the Company provides supplemental analysis at an annual granularity to support the insights discussed within this supplemental testimony.

Q. Please elaborate on how this annual analysis included in Attachment 1 provides insight.

A. In developing the GMP, the Company sought to understand whether (and the extent to which) a grid modernization investment strategy is more cost-effective than a traditional investment strategy for resolving a portfolio of electric distribution system issues. These electric distribution system issues arise from adoption of DER spurred by a broader policy shift to decarbonization (see pg. 23:2 herein). The Company anticipates substantial and significant change through 2050, corresponding to the State's mandate to reach net-zero greenhouse gas emissions. Although there likely will continue to be changes in technology adoption and use patterns post-2050, the Company anticipates these changes to be less substantial than changes anticipated over the next three decades.

Therefore, the Company can consider an equivalent corollary of its research question: "at what point in time does a grid modernization investment strategy break even with a traditional investment strategy?"[15] If the Company finds that a grid modernization investment strategy is likely to become more cost-effective than a traditional investment strategy in the nearer-term, then the Company can be reasonably certain that transitioning to a grid modernization investment strategy will prove beneficial for its customers. If, however, the Company finds that a grid modernization investment strategy is unlikely to become more cost-effective than a traditional investment strategy prior to 2050, then the Company should continue with a traditional investment strategy as cumulative costs of grid modernization would likely not exceed the benefits.

In Attachment 1, the Company presents its findings regarding benefits and costs from the GMP Analysis on an annual basis.

Q. What is the Company's main finding?

A. The Company finds that cumulative benefits begin to outweigh cumulative costs within 10 years, which is within the portion of modeling that is (nearly) identical to the Company's peak electric forecast.

[15] Equivalently: If the Company were to evolve from a traditional investment strategy to a grid modernization investment strategy today, at what point in time would the cumulative benefits of the grid modernization investment strategy equal (begin to exceed) the cumulative costs?

Using the upper bound scenario model presented in the GMP and assuming a prompt transition in investment strategy, the Company estimates that evolving to a grid modernization investment strategy will be cost-beneficial relative to a traditional investment strategy by 2030 (equivalently: after eight years of employing the grid modernization investment strategy).

This finding has two corollaries. First, examining the relative effectiveness of the grid modernization investment strategy and the traditional investment strategy over a time period less than eight years, all else equal, omits critical costs and benefits and thereby biases the results and masks the cost-beneficial investment strategy.

Second, the cumulative benefits begin to outweigh the cumulative costs in 2030, which is within the near-term period where modeling is nearly identical to the electric peak forecast. This insight is critical because it suggests the grid modernization investment scenario is cost-beneficial relative to the traditional investment scenario given *solely* high-probability short-term adoption of DER.[16] In contrast, if the point of intersection were found to be in later years (e.g. 2040s), then the timing of intersection (and whether intersection occurs prior to 2050) may be contingent on adoption of DER in the upper

[16]The exception is the modeled installed nameplate PV in the year 2030. This exception is discussed herein and addressed within Attachment 1. Findings are relatively insensitive to adjusting the installed nameplate solar PV within the GMP Analysis to match the electric peak forecast, and the Company reaches the same conclusion about the effectiveness of the grid modernization investment strategy.

bound scenario (post-2036 forecast alignment). That the intersection occurs in the near term is stronger evidence of the effectiveness of the grid modernization investment strategy relative to the traditional investment strategy than if the intersection were found to occur closer to 2050.

Q. Does the Company explore whether this finding is robust to different assumptions?

A. Yes. The Company also conducted several sensitivity analyses (presented in detail in Attachment 1) to understand the extent to which the timing of this breakeven point is sensitive to various assumptions about costs and benefits. The Company found that the timing of the breakeven point is relatively insensitive to assumptions about benefits, including the inclusion and monetization of societal benefits, the inclusion and value of direct customer benefits, the inclusion and value of benefits linked to reduced outages and AMF, the inclusion of costs and benefits related to fiber, and the downscaling of benefits to align with solar PV adoption in the Company's electric peak forecast; in all cases the breakeven point falls between 2030 and 2034.[17] In other words, the finding that the grid modernization investment strategy is cost-beneficial relative to a traditional

[17]The Company additionally constructed a conservative-and-unlikely scenario where zero value was assigned to societal and direct customer benefits, AMF-related benefits, reduced outage related benefits, and benefits downscaled to align with solar PV adoption in the Company's electric peak forecast. This scenario is conservative because it assigns zero value to several benefits that the Company expects will have positive value. This scenario is unlikely because it may be interpreted as a scenario in which these benefits do not occur at all, which is contrary to the Company's expectations. In this conservative-and-unlikely scenario, the breakeven point is 2038. Therefore, if investments were to occur as modeled within the GMP Analysis, the Company is confident that the breakeven point would likely occur prior to 2038. The Company provides more detail and discussion regarding the sensitivity analyses in Attachment 1 and regarding actual investment deployment schedule in Section VI.

investment strategy for a portfolio of solutions to electric distribution system issues is robust.

Q. How is this finding sensitive to assumptions about costs, when to begin investing, and how to pace investments?

A. The upper bound scenario used in the GMP assumes the maximum number of electric distribution system issues and therefore the maximum anticipated number of scalable grid modernization technologies (e.g., advanced reclosers). If a smaller amount of DER are adopted than is modeled, cumulative costs would decrease. If cumulative costs are lower, and benefits stay the same, then the breakeven point would occur sooner. If cumulative costs are lower and benefits are lower commensurately, then the breakeven point would not change.

If the timing of when to begin investing in solutions derived from a grid modernization investment strategy were delayed, then the costs and benefits, and the breakeven point would shift into the future. If this delay were to be sufficiently long, then there may be too many lost opportunities for a grid modernization investment strategy to provide cost-beneficial value. This underscores the Company's shift to a grid modernization investment strategy promptly.

If the investments in solutions derived from a grid modernization investment strategy were to be paced out, then costs and benefits would both accrue more slowly, thereby pushing the breakeven point further into the future. Furthermore, slower pacing adds some uncertainty to costs due to inflation, which may put upward pressure on costs and further delay the breakeven point.[18] As with the timing of when to begin investments, if investments were to be paced out sufficiently slowly, then there may be too many lost opportunities for a grid modernization investment strategy to provide cost-beneficial value. This underscores the Company's proposed swift implementation of a grid modernization investment strategy.

V. Timing of When to Begin Investments

Q. This next section of testimony continues the line of questioning of insights gained from the GMP Analysis, specifically insights as related to the timing of when to begin investments. Please describe the Company's intent in addressing this topic.

A. The purpose of the GMP is to evaluate the effectiveness of evolving to a grid modernization investment *strategy*. Through its GMP Analysis, the Company finds that evolving its investment strategy from traditional investments only to a grid modernization investment strategy is cost-beneficial for a portfolio of solutions to resolve electric distribution system issues. The breakeven point will occur within some definite interval

[18] There may be other cost pressures as well that have either similar or opposite impacts (e.g., deferral value of delayed investment).

of time following the beginning of investments. In this section of testimony, the Company aims to clarify how the GMP Analysis provides insight into the tradeoffs associated with when the Company begins to implement a grid modernization investment strategy.

Q. The Company has discussed the immediacy of issues and urgency of grid modernization since filing its rate case in 2018, and then again in its grid modernization plan filings in 2021 and most recently in 2022 in this docket; however, the electric system still seems to be operating reliably. Why should the PUC and parties consider shifting to a grid modernization investment strategy to be urgent?

A. The Company has been addressing electric distribution system issues with solutions derived from a traditional investment strategy and the employment of operational procedures which, in certain cases, limit the Company's flexibility in operating the electric distribution system and addressing ancillary issues. For example, relative to solutions derived from a grid modernization investment strategy, solutions derived from a traditional investment strategy have less ability to allow for reconfiguration of the electric distribution system and limited ability to dynamically leverage DER. The GMP Analysis shows that, although these traditional investment strategy solutions may address each electric distribution system issue that has arisen, solutions derived from a grid modernization investment strategy would have contributed to a more cost-effective and

operationally flexible electric distribution system. Furthermore, solutions derived from a traditional investment strategy will be less technically viable in future years than solutions derived from a grid modernization investment strategy.

Q. Provide an example of work that would have been different if the Company had derived solutions using a grid modernization investment strategy instead of the traditional investment strategy.

A. Solutions derived from a grid modernization investment strategy could have assisted the Nasonville restoration in many ways. The Company's response to Division 1-33 issued on November 4, 2022, in the Fiscal Year 2024 Electric Infrastructure, Safety, and Reliability ("ISR") Plan, Docket No. 22-53-EL, describes the issues and how such solutions could have mitigated the issues. The Nasonville event alone does not justify an evolution from a traditional investment strategy to a grid modernization investment strategy. Rather, the Nasonville event provides a recent case of how the Company's investment strategy manifests itself and the comparative effects of solutions derived from either investment strategy.

Q. If the Company believes the grid modernization investment strategy will be more cost-effective for a portfolio of solutions addressing electric distribution system issues, why doesn't the Company implement those solutions as normal course of business?

A. The Company is implementing certain solutions derived from a grid modernization investment strategy as normal course of business to the extent it is able to do so. For example, the Company will be setting up ADMS Basic as a result of the Acquisition,[19] and the Company is beginning to invest in advanced reclosers that will be able to integrate with the ADMS system.

The Company's implementation of a grid modernization investment strategy, however, is limited by its ability to recover costs for the limited set of upfront, fixed-cost investments required by a grid modernization investment strategy. This question of ability to recover costs underlies the pace of implementing the grid modernization investment strategy, rather than the question of when to begin implementing a grid modernization investment strategy.[20]

[19]The term "Acquisition" refers to PPL Rhode Island Holdings, LLC's, a wholly owned indirect subsidiary of PPL Corporation, acquisition of 100% of the outstanding shares of common stock of The Narragansett Electric Company from National Grid USA. ADMS Basic is further explained in the Executive Summary and Section 1 of the GMP.

[20] *See* Section VIII of this testimony on Cost Recovery for additional discussion.

Q. What insight does the Company glean from the GMP Analysis regarding when to begin implementing a grid modernization investment strategy?

A. The GMP Analysis demonstrates that evolving from a traditional investment strategy to a grid modernization investment strategy is cost-effective. If the timing of when to begin investing in solutions derived from a grid modernization investment strategy were delayed, then the costs and benefits, and the breakeven point, would shift into the future. If this delay were to be sufficiently long, then there may be too many lost opportunities for a grid modernization investment strategy to provide cost-beneficial value. This underscores the Company's shift to a grid modernization investment strategy.

Q. The Company has previously tied the effectiveness of a grid modernization investment strategy to claims regarding reliability, but these claims have been disputed. If the PUC and parties are not convinced that reliability is declining, then are the findings of the GMP Analysis moot?

A. No, the findings are not moot even if reliability trends are disputed. The Company supplemented its narrative in the GMP with discussion of declining reliability and the effect reliability has on customer satisfaction. While the Company stands by its claims, the findings of the GMP Analysis are independent of claims regarding reliability. Reliability appears in the GMP Analysis as a benefit associated with solutions to electric distribution system issues derived from a grid modernization investment strategy. This benefit is not relational; the magnitude of the benefit is independent of current, past, and

future levels of reliability, and reliability trends. Furthermore, the Company's supplemental analysis included in Attachment 1 demonstrates that a grid modernization investment strategy is cost-effective relative to a traditional investment strategy even when omitting benefits of reduced outages (or, equivalently, assigning those benefits zero value). Therefore, the Company arrives at the same conclusion – that it is cost-effective to evolve to a grid modernization investment strategy – regardless of whether reliability has decreased, increased, or stayed the same in recent years.

VI. Pace of Investments

Q. Describe the Company's intent in addressing this topic.

A. In this section of testimony, the Company aims to alleviate any confusion over how it is proposing to pace solutions derived from a grid modernization investment strategy, how those investments will be proposed, when they will be proposed, where they will be proposed, and whether cost recovery could be delayed, by providing clarity about the Company's strategy to right-size, right-time, and right-locate solutions, and tradeoffs with various investment schedules. Importantly, the Company emphasizes that the solutions derived from a grid modernization investment strategy in the upper bound scenario in the GMP Analysis are *not* intended to be an investment plan nor are they intended to be an all-or-nothing investment proposal.

Q. If this GMP is not an investment plan, how will the Company determine the pacing of investing in solutions derived from a grid modernization investment strategy?

A. First, the Company's objective in proposing the quickest pace possible (e.g. immediate and swift switch to a grid modernization investment strategy) is to realize the most cost-savings and most benefits over the coming decades. However, the Company also understands that the benefit-cost assessment is only one of many potential inputs into decision making and that the Company's recommended pace may not be the preferred pace of the PUC and other parties. In this manner, there is not a black-and-white, all-or-nothing solution, but rather a calculus among shades of gray.

Second, the Company will right-size, right-time, and right-locate solutions derived from a grid modernization investment strategy through its annual planning process with appropriate regulatory oversight, such as in each annual ISR Plan. Some solutions derived from a grid modernization investment strategy rely on a limited set of upfront fixed costs for investments like information technology. This limited set of up-front fixed costs is indeed why a traditional investment strategy may appear to be best-fit, least-cost to resolve any single immediate-term electric distribution system issue. However, the GMP Analysis shows that a short-term perspective masks the cost-effectiveness of the grid modernization investment strategy. Some investments illustrated in the GMP will be required in order for other solutions to be technically viable (e.g., ADMS is required to achieve the full functionality of some operational technology solutions). Other

investments, like advanced reclosers, can be scaled. In saying that the Company will right-size, right-time, and right-locate these solutions, the Company intends to convey that there is (1) flexibility in pace, (2) on- and off-ramps for investment, and (3) opportunity for due diligence in regulatory oversight.

Q. Provide a specific example of what the PUC and parties may see as a "right-sized, right-timed, right-located" solution. In this example, describe the flexibility, on- and off-ramps, and opportunity for due diligence.

A. One example of how the PUC and parties will see the Company propose a "right-sized, right-timed, right-located" solution derived from a grid modernization investment strategy is with advanced reclosers. The Company will employ a strategy that considers factors like circuit average interruption frequency and duration, line exposure, and existing sectionalization in prioritizing locations for advanced reclosers, and factors like supply chain lead times and construction bundling opportunities in responding to cost and time constraints. The Company will apply such a strategy on an annual basis to propose a right-sized, right-timed, right-located recloser program in each ISR, with due diligence from collaboration with the Division prior to filing and with appropriate regulatory oversight from the PUC and intervenors within each ISR docket.

In this example, the Company has the flexibility to propose or not propose advanced reclosers as a solution to immediate-term electric distribution system issues. The on-ramp

for deploying advanced reclosers are the electric distribution system issues for which an advanced recloser would be a solution (i.e., without an issue present and defensible, there is no on-ramp for which to propose an advanced recloser). The off-ramp is the scalable nature of advanced reclosers (i.e., installing one hundred advanced reclosers does not bind the Company or regulators to installing ten more). The opportunity for due diligence is the Company's internal annual planning process and the associated annual regulatory oversight process conducted in alignment with ISR statutory and regulatory standards.

Q. Please discuss the Company's intent with including an execution schedule with its GMP?

A. First, the Company would like to clarify what is meant by offering an execution schedule. Because the GMP is not an investment proposal, the Company would like to avoid any inadvertent signal that the Company will propose the entirety of solutions derived from grid modernization investments illustrated in the GMP Analysis, or at the pace illustrated within the GMP.

The purpose of providing an execution schedule is to demonstrate the pacing with which such solutions may be phased in and to aid in internal project planning for multi-year projects. Although the GMP Analysis indicates the effectiveness of an immediate evolution to a grid modernization investment strategy, the pacing of these solutions can

be flexible and should not be pre-determined prior to identifying and assessing each electric distribution system issue as it arises.

Furthermore, the Company recognizes that, while a prompt transition to a grid modernization investment strategy would offer the largest degree of cost-effectiveness soonest, doing so may not be preferable considering cost impacts to customers. Therefore, the Company discerns that a thoughtful approach to pacing that considers the broader economic landscape and competing policy priorities is advantageous. The Company contends that its execution strategy – proposing right-sized, right-timed, right-located solutions through appropriate cost recovery channels – provides for the nuance and flexibility needed to weigh tradeoffs in pacing.

VII. Alternatives to the term "Foundational Investments"

Q. Describe the Company's intent in addressing this topic.

A. The term "foundational investments" has been used since 2018, but its meaning has evolved, thus making the true intent of the term unclear. In this section of testimony, the Company avoids rehashing prior interpretations and instead offers a different distinction for types of investments to facilitate discussion of the issues at hand.

Q. What further distinction may help facilitate conversation about the GMP?

A. The Company proposes to distinguish between investments with fixed costs (e.g., ADMS) and investments that are scalable (e.g., advanced reclosers). By distinguishing between these two types of investments, the PUC and parties can more clearly discuss how the size of the portfolio of electric distribution system issues affects the benefit-cost assessment of alternative investment strategies.

Specifically, for a single electric distribution system issue or a sufficiently small portfolio of electric distribution system issues, the fixed costs of underlying investments required for solutions derived from a grid modernization investment strategy will render an unfavorable benefit-cost assessment relative to a traditional investment strategy. However, the incremental benefits at the relatively low incremental cost of scalable solutions derived from a grid modernization investment strategy led to the insight that a grid modernization strategy is cost-effective relative to a traditional investment strategy.

Another distinction is the difference between an investment that is a pre-requisite and an investment that is not a pre-requisite. For example, ADMS Basic is a pre-requisite for FLISR. This distinction may be helpful in understanding the dynamics within the benefit-cost assessment because a pre-requisite investment may have a relatively high cost with low benefit on its own but enable scalable solutions that have low cost and high benefit when considered together.

VIII. Cost Recovery

Q. Describe the Company's intent in addressing this topic.

A. The Company's intent with this section of testimony is to address possible outstanding questions about how the Company will request cost recovery for solutions derived from a grid modernization investment strategy by describing available pathways for cost recovery and elaborating on its strategy for how it will request cost recovery in the future.

Q. How is the Company thinking about cost recovery considering the GMP's purpose?

A. The purpose of the GMP is to validate an evolution of investment strategy from traditional investments only to a grid modernization investment strategy. This investment strategy will be used as the underlying framework from which the Company derives solutions to electric distribution system issues. In other words, the grid modernization investment strategy will become, over time, the Company's new business-as-usual strategy.

As such, the Company will apply this investment strategy across all its business functions, and solutions stemming from it will be proposed for cost recovery in the venue in which cost recovery is most appropriate in alignment with statutory and regulatory standards. Any proposal for cost recovery will be subject to appropriate regulatory oversight and review.

For example, the Company will apply the grid modernization investment strategy to electric distribution system issues identified in area studies. These solutions may be proposed for cost recovery through the annual ISR to the extent such investments and spending are reasonably needed to maintain safe and reliable distribution service over the short and long term pursuant to R.I. Gen. Laws § 39-1-27.7.1(d). Another possible cost recovery mechanism is through base distribution rates in accordance with Order No. 23823 and the ASA. All cost recovery proposals will be subject to appropriate regulatory oversight and review.

Q. Why is proceeding with all investments and recovering costs through base rates during the next rate case not appropriate?

A. First, the shift from a traditional investment strategy, known today as "business-as-usual" to a grid modernization investment strategy requires significant upfront costs, which would be impractical for the Company to undertake absent assurances for cost recovery.

Second, the appropriateness of any cost recovery mechanism depends on the investment for which costs are recovered, understanding of which customers cause the costs and which customers benefit from the investment, and all applicable statutory and regulatory standards.

There may be some investments that are appropriate for the Company to make and then request cost recovery through a subsequent base distribution rate case. The Company should not, however, be required to defer recovery to a subsequent base distribution rate case in circumstances where there is an alternate regulatory or statutory mechanism that would allow for cost recovery.

For example, for investments and spending that are reasonably needed to maintain safe and reliable distribution service over the short and long term, per R.I. Gen. Laws §39-1-27.7.1(d), the Company should be able to obtain cost recovery through its ISR Plan.

Q. How is the Company considering cost causation when determining the most appropriate cost recovery mechanism?

A. The Company understands that cost causation is an important driver in fair cost recovery. From the Company's perspective, it is getting increasingly difficult to pinpoint cost causers, and the solutions – especially solutions derived from a grid modernization investment strategy – increasingly provide benefits to customers beyond the cost causers. For example, while distributed generation interconnection may necessitate a mainline recloser (e.g., to protect the electric distribution system via adjustments to impedance), that mainline recloser also provides the additional value of enhancing reliability through sectionalization, which benefits all customers.

Another example: 3VO is often required for distributed generation interconnection, but the proliferation of distributed generation precludes the Company from pinpointing a single cost causer. 3VO is an approved program through the ISR that recovers cost from all customers in accordance with the Allocated Cost of Service Study underlying the ISR Tariff, rather than cost recovery from distributed generation customers solely.

The Company will continue to consider cost causation as a driver of whatever cost recovery mechanism(s) it proposes but does not see a determination of cost causation as a threshold question of the GMP docket.

IX. Intersection of the GMP and the ISR Plan

Q. What is the Company's intent in addressing this topic?

A. The Company's intent is to address possible concerns about duplicating administratively burdensome reviews between the GMP docket and future ISR dockets, and the sequencing of review of the GMP relative to the ISR for maximum insight.

Q. How does the Company envision the PUC and parties review the GMP and ISR to avoid duplicative review?

A. The Company envisions the review of the GMP to be distinct and different from the review of the ISR. The Company describes its vision for the review of the GMP in detail in Section III.

Q. Does the Company see the need for the GMP docket to be complete prior to evaluation of any grid modernization solutions proposed for cost recovery through the ISR?

A. No. From the Company's perspective, there is no need for the GMP docket to be complete prior to evaluating solutions derived from a grid modernization investment strategy within the ISR (or any other docket). In each ISR Plan, the Company will identify electric distribution system issues with the appropriate justification (identified using accepted planning criteria, polices, and other considerations to prioritize issues to be addressed). The Company will right-size, right-time, and right-locate its solutions to those electric distribution system issues, with due diligence and collaboration with the Division prior to submission to the PUC. This right-sizing, right-timing, and right-locating will depend in part on factors related to the electric distribution system issues at hand (e.g., only proposing solutions to electric distribution system issues that are immediate) and in part on factors related to pacing of investments (see Section VI of this testimony for more information). The Company will describe how the solutions meet the standard of review for the ISR (i.e., that the investments and spending are reasonably needed to maintain safe and reliable distribution service over the short- and long-term). In other words, the Company intends to include the justification necessary for any solutions proposed through the ISR Plan within the ISR Plan itself, and this justification should stand on its own outside of the GMP.

X. Relationship to AMF

Q. Please describe the Company's intent in addressing this topic.

A. In this section of supplemental testimony, the Company aims to clarify how it considers the relationship between evolving to a grid modernization investment strategy and deploying advanced metering.

Q. Where has the Company previously described this relationship?

A. The Company previously described this relationship in its responses to PUC 1-1, PUC 1-2, Division 5-7 and Division 5-4 in Docket No. 22-53-EL.

Q. Is AMF a prerequisite to transitioning to a grid modernization investment strategy? Is transitioning to a grid modernization investment strategy a prerequisite to AMF?

A. AMF is not a prerequisite to the Company evolving to a grid modernization investment strategy.[21] AMF is a complementary investment proposal aligned with, but not required by or enabled by, an underlying grid modernization investment strategy.

[21] Additionally, the Company's sensitivity analyses discussed in Section IV and presented in Attachment 1 demonstrate the effectiveness of the grid modernization investment strategy is robust to removal of benefits linked with deployment of AMF.

Evolving to a grid modernization investment strategy is not a prerequisite to deploying AMF. The business case for AMF stands on its own, as demonstrated in Docket No. 22-49-EL.

Although AMF and investments stemming from a grid modernization investment strategy are independent of one another, they are related in the sense that they enhance each other. For example, many, but not all, grid modernization investments are capable of leveraging the increased quantity, quality, and frequency of data made available by AMF meters to deliver increased functionalities and benefits. Similarly, AMF meters are capable of interacting with some of the grid modernization investments to better reduce outage response through automated sectionalization.

Nevertheless, they are not prerequisites for one another because both AMF and grid modernization investments deliver functionalities and benefits on their own, without the need to leverage or interact with one another.

XI. Conclusion

Q. Does this conclude your testimony?

A. Yes, thank you.

ATTACHMENT 1

GMP ANALYSIS SUPPLEMENT

The Company presents its findings regarding benefits and costs from its supplemental GMP analysis herein. This supplemental analysis uses the same underlying data of the GMP analysis but represents additional granularity not included in Book 2 of the GMP filing.

The key insights of this supplemental analysis are (1) the trajectory of cumulative costs and benefits of solutions derived from a grid modernization investment strategy demonstrate that the grid modernization strategy is cost-beneficial for a portfolio of solutions resolving electric distribution system issues, and (2) the breakeven point when cumulative benefits begin to exceed cumulative costs is likely to occur in the short-term.

This Attachment is structured as follows: In Section I, the Company re-frames its research question. In Section II, the Company presents and describes the key figure in this supplemental analysis. In Section III, the Company details key insights from this figure. In Section IV, the Company presents and discusses its sensitivity analyses. In Section V, the Company discusses implications for pacing of investments that it gleans from this supplemental analysis.

I. Re-framing the research question

In developing the GMP, the Company sought to understand whether (and the extent to which) a grid modernization investment strategy is more cost-effective than a traditional investment strategy for a portfolio of electric distribution system issues.[1] These electric distribution system issues arise from adoption of distributed energy resources ("DER") spurred by a broader policy shift to decarbonization.[2] The Company anticipates substantial and significant change through 2050, corresponding to the state's mandate to reach net-zero greenhouse gas emissions. Although there will likely continue to be changes in technology adoption and use patterns post-2050, the Company anticipates these changes to be less substantial than changes anticipated over the next three decades.

Therefore, the Company can consider an equivalent corollary of its research question: "at what point in time does a grid modernization investment strategy become more cost-effective than a traditional investment strategy?" If the Company finds that a grid modernization investment strategy is likely to become more cost-effective than a traditional investment strategy in the nearer-term, then the Company can be reasonably certain that transitioning to a grid modernization investment strategy will prove beneficial for its customers. If, however, the Company finds that a grid modernization investment strategy is unlikely to become more cost-effective than a traditional investment strategy prior to 2050, then the Company should continue

[1] For more detail, the Company refers readers to Section II of its supplemental testimony.

[2] See pg. 23:2 of the Company's supplemental testimony for an explanation of why DER are of interest.

with a traditional investment strategy as cumulative costs of grid modernization would likely not exceed the benefits.

II. Description of Figure 1

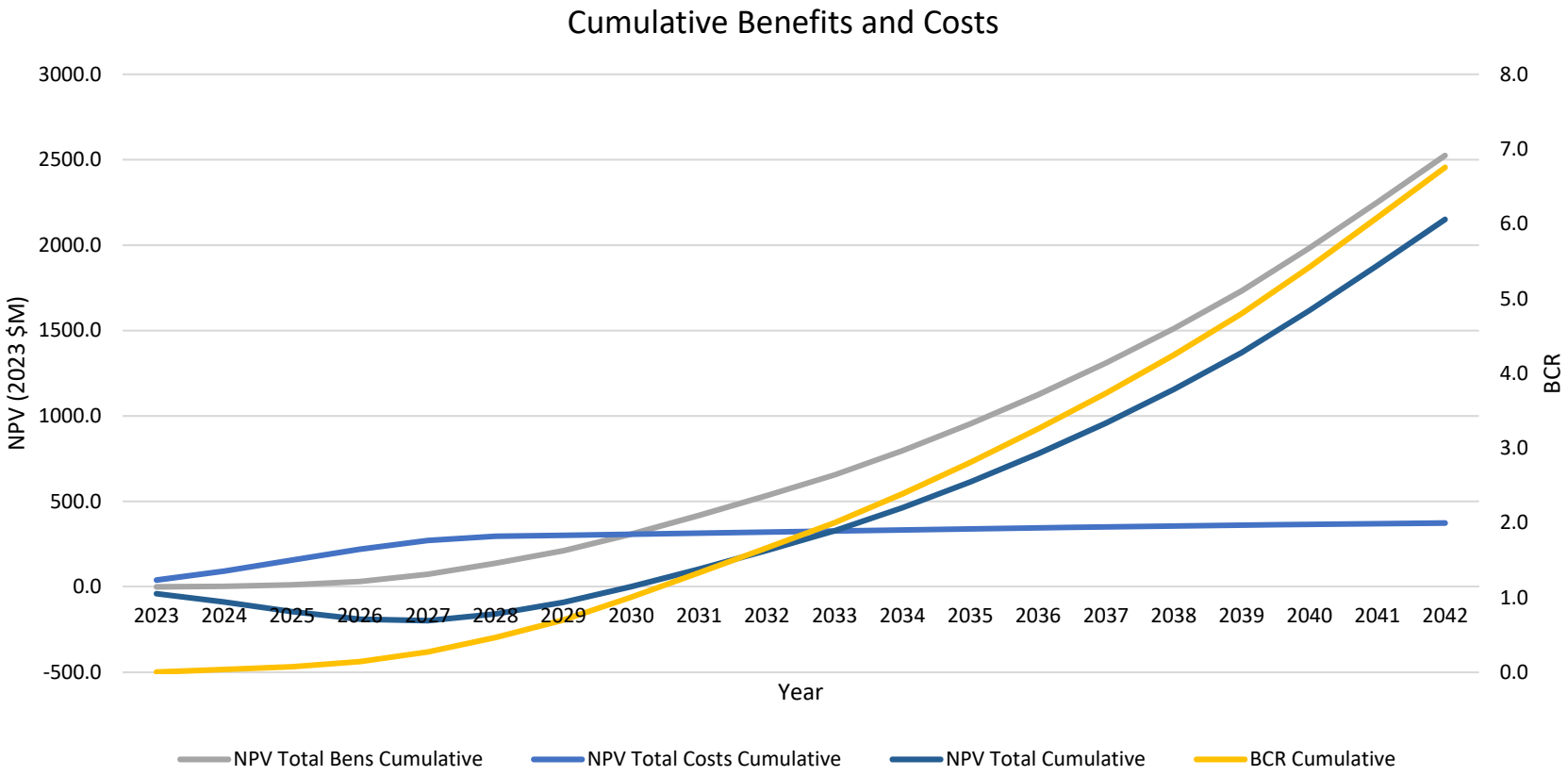
One way to gain insight regarding the research question is to examine the trajectories of cumulative costs and cumulative benefits. Such examination can provide insight into the likelihood that the cumulative cost curve and the cumulative benefits curve will intersect, with this intersection representing the date at which the cumulative benefits will equal the cumulative costs (i.e. the breakeven point, the point at which total cumulative net present value equals zero, the point at which the benefit-cost ratio equals one). This intersection – specifically, the date at which the intersection occurs and the sensitivity of the date at which the intersection occurs to various plausible amendments to assumptions – provides insight into if and when transitioning to a grid modernization investment strategy will be cost-beneficial relative to the traditional investment strategy.

Figure 1, below, plots cumulative benefits and costs, cumulative NPV, and cumulative benefit-cost ratio for each year through 2042 (the 20-year NPV term used in the GMP analysis). All cost/savings figures are net present value in 2023 dollars, plotted on the left-hand axis. The benefit-cost ratio (yellow line) is plotted on the right-hand axis. Year (2023 through 2042) is plotted on the horizontal axis.

An example of how to read this graph: find the year 2025. The top line is the blue line, which represents cumulative costs from 2023 through 2025 in 2023 dollars. The next line down is the gray line, which represents total cumulative benefits from 2023 through 2025 monetized in 2023 dollars. The next line down is the navy-blue line, which represents total cumulative net present value. The navy-blue line illustrates total cumulative costs minus total cumulative benefits. At 2025, the navy blue line is below zero, which means that the total costs were higher than the total benefits (which makes sense because the blue cumulative cost line is larger than the gray cumulative benefits line). The yellow line represents the corresponding benefit-cost ratio. In 2025, the yellow line indicates a benefit-cost ratio that is less than 1, meaning the cumulative benefits achieved from 2023 through 2025 are smaller in magnitude than the cumulative costs incurred from 2023 through 2025 (which makes sense because the gray cumulative benefits line is closer to zero than the blue cumulative costs line).

For reference: Figure 1 here is the same as Figure 8.6 of Book 2 (Bates Page 176) except (i) values are presented with a line rather than a bar and (ii) total cumulative net present value and the cumulative benefit-cost ratio are added to the figure. The values corresponding to year 2030 correspond to the figures presented (NPV) in Figure 8.29 of Book 2 (Bates Page 202).

Figure 1: Cumulative Benefits and Costs 2023-2042



Notes: Figures are cumulative (i.e., from 2023 through year). The years shown are those included in the 20-year net present value (2023-2042). Cumulative costs (blue), cumulative benefits (gray), and cumulative NPV (navy-blue) are presented on the left-hand axis. The benefit-cost ratio (yellow) is presented on the right-hand axis.

III. Key insights from Figure 1

Key observation #1: The cumulative cost curve is concave down and the cumulative benefit curve is concave up; both curves are monotonically increasing.

Cumulative costs accrue at a faster rate in the first few years and then at a relatively level rate beginning in 2026. These rates are driven in part by design (the Company's preferred approach of wholly and immediately evolving to a grid modernization investment strategy) and in part by the nature of costs (there is a limited set of upfront fixed costs). The faster rate of cost accrual followed by a slower rate of cost accrual results in a curve that is concave down (the curve looks more like a rainbow than a smile). The cost curve could never be concave up because (i) the limited set of upfront fixed costs and their longer-than-20-year lifespan prevents total costs from continuing to accumulate indefinitely, (ii) the limited timeframe of change on the electric distribution system prevents unmitigated investment in solutions, and (iii) the upper bound scenario modeling employed in the GMP analysis captures the maximum set of electric distribution system issues and associated solutions to be included within the cumulative cost curve. Therefore, the finding that the cumulative cost curve is concave down is certain, and sensitivity analyses should examine how, not whether the concavity of the cumulative cost curve changes.

Cumulative benefits accrue slowly and then more rapidly beginning in 2026. These rates are driven in part by avoided infrastructure once the limited set of upfront fixed cost investments are in place (e.g., ADMS) as well as in part by assumptions about the penetration of DER over time. The slower rate of accrual followed by a faster rate of accrual results in a curve that is concave up (the curve is more like a smile than a rainbow). The benefits curve could never be concave down because (i) benefits will always begin to accrue faster after the limited set of upfront fixed cost investments are complete and (ii) the penetration of DER is almost certain to increase rather than decrease.[3] Therefore, the finding that the cumulative benefits curve is concave up is certain, and sensitivity analyses should examine how, not whether the concavity of the cumulative benefits curve changes.

Both the cumulative cost curve and cumulative benefits curve are monotonically increasing. A monotonic curve is a function that preserves the relative ranking of one variable as it maps to another variable, and a monotonically increasing curve depicts a function that preserves the exact ranking rather than reverses it (e.g., imagine a plot with a line that only increases). By definition, cumulative costs and cumulative benefits can never decrease. By assumption, there will always be some level of costs each year that corresponds to some level of benefits each year. Therefore,

[3] This only considers through 2050, at which time it is plausible that the penetration of DER levels off (i.e., the slope of the cumulative benefits curve approaches zero).

the cumulative cost curve and the cumulative benefits curve are both monotonically increasing, which has implications for whether the curves intersect.

Key observation #2: The cumulative cost curve will intersect the cumulative benefits curve.

A concave up function and a concave down function can have either zero, one, or two points of intersection over a given interval.[4] The functions have zero points of intersection if the curves do not intersect. The functions have one point of intersection if the curves touch. The functions have two points of intersection if the concave down curve is on top of the concave up curve.

In this case, the concave down cumulative costs curve is on top of the concave up cumulative benefits curve, so there are two points of intersection. These points of intersection occur at day 0 (when no costs have been incurred and no benefits have accrued) and sometime greater than day 0. Therefore, at some day greater than day 0, the cumulative benefits will begin to outweigh the cumulative costs, and determining whether that day is in the near-term or long-term is of direct interest for the research question at hand.

Key observation #3: Cumulative benefits begin to outweigh cumulative costs within a finite number of years, which is within the portion of modeling that is (nearly) identical to the Company's peak electric forecast.

Using the upper bound scenario model presented in the GMP and assuming a prompt transition in investment strategy, the Company estimates that evolving to a grid modernization investment strategy will be cost-beneficial relative to a traditional investment strategy by 2030 (equivalently: after eight years of employing the grid modernization investment strategy).

This finding has two corollaries. First, examining the relative effectiveness of the grid modernization investment strategy and the traditional investment strategy over a time period less than eight years, all else equal, omits critical costs and benefits and thereby biases the results and masks the cost-beneficial investment strategy.

Second, the cumulative benefits begin to outweigh the cumulative costs in 2030, which is within the near-term period where modeling is nearly identical to the electric peak forecast. This insight is critical because it suggests the grid modernization investment scenario is cost-beneficial

[4] Assumes the curves are monotonic and are not linear. In this case, key observation #1 that the curves are both monotonically increasing allows the Company to rule out potential edge cases that would preclude the curves from intersecting at all. If the cumulative costs and cumulative benefits curves were linear, then there would be an additional possibility that the curves share an infinite number of points of intersection (i.e., the lines are directly overlapping and have the same slopes).

relative to the traditional investment scenario given *solely* short-term adoption of DER.[5] In contrast, if the point of intersection were found to be in later years (e.g. 2040s), then the timing of intersection (and whether intersection occurs prior to 2050) may be contingent on adoption of DER in the upper bound scenario (post-2036 forecast alignment). That the intersection occurs in the near term is stronger evidence of the effectiveness of the grid modernization investment strategy relative to the traditional investment strategy than if the intersection were to be found to occur closer to 2050.

IV. Sensitivity analyses

The Company uses Figure 1 to illustrate a number of sensitivity analyses. These sensitivity analyses focus on how sensitive the breakeven point is to different assumptions regarding costs and benefits.

Sensitivities with costs

The upper bound scenario used in the GMP assumed the maximum number of electric distribution system issues and therefore the maximum anticipated number of scalable grid modernization technologies (e.g., advanced reclosers). As the Company right-sizes and right-times use of these technologies in solutions to electric distribution system issues, the actual cumulative cost curve may be lower than the cumulative cost curve presented in Figure 1, meaning the rate of cumulative cost accrual may be lower, all else equal. If costs are lower, then the cumulative cost curve would breakeven with the cumulative benefits curve earlier, all else equal.

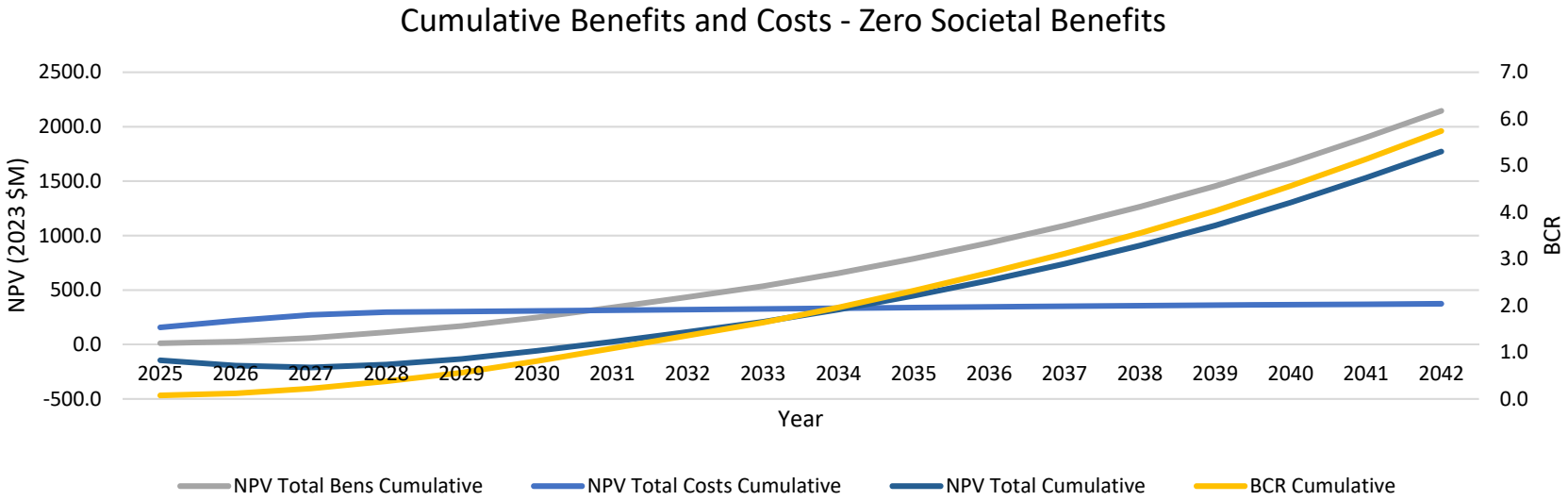
Sensitivities with benefits

The Company presents the entire gamut of benefits – utility, direct customer, and societal benefits – in the GMP and in Figure 1. While there is merit in considering all possible benefits in the value stack, there are also insights to be gleaned by strategically omitting certain benefits (or, equivalently, assigning those benefits zero value). If the timing of when the grid modernization investment strategy becomes more cost-effective than the traditional investment strategy is relatively insensitive to the omission of certain benefits, then the finding that the grid modernization investment strategy is cost-effective will be more robust (equivalently, there would be less risk to evolving to the grid modernization investment strategy).

The Company presents the following sensitivity analyses.

[5] The sole difference between the GMP analysis and the electric peak forecast through 2030 is the modeled installed nameplate PV in the year 2030.

Figure 2a: The effectiveness of the grid modernization investment strategy is relatively insensitive to the consideration of societal benefits.



Omission of societal benefit categories results in cumulative benefits exceeding cumulative costs beginning in 2031.[6] Note that omitting all societal benefit categories results in the bookend sensitivity analysis that provides insights in revising any of the societal benefits downward (this includes sensitivity to which discount factor is used in summing the net present value of societal benefits). In other words, accounting for societal benefits – or not – makes only a difference of one year in the grid modernization investment

[6] A note on terminology: "beginning in [year]" is not meant to imply the Company should wait until that year to begin employing a grid modernization investment strategy. Rather, the terminology is meant to describe that the portfolio of solutions derived from a grid modernization investment strategy that resolve electric distribution system issues from 2023 through [year] is cost-beneficial relative to the equivalent portfolio of solutions derived from a traditional investment strategy.

strategy becoming cost-beneficial. Therefore, the effectiveness of the grid modernization investment strategy is relatively insensitive to the monetary value assigned to societal benefits.

Figure 2b: The effectiveness of the grid modernization investment strategy is relatively insensitive to the consideration of direct customer benefits.

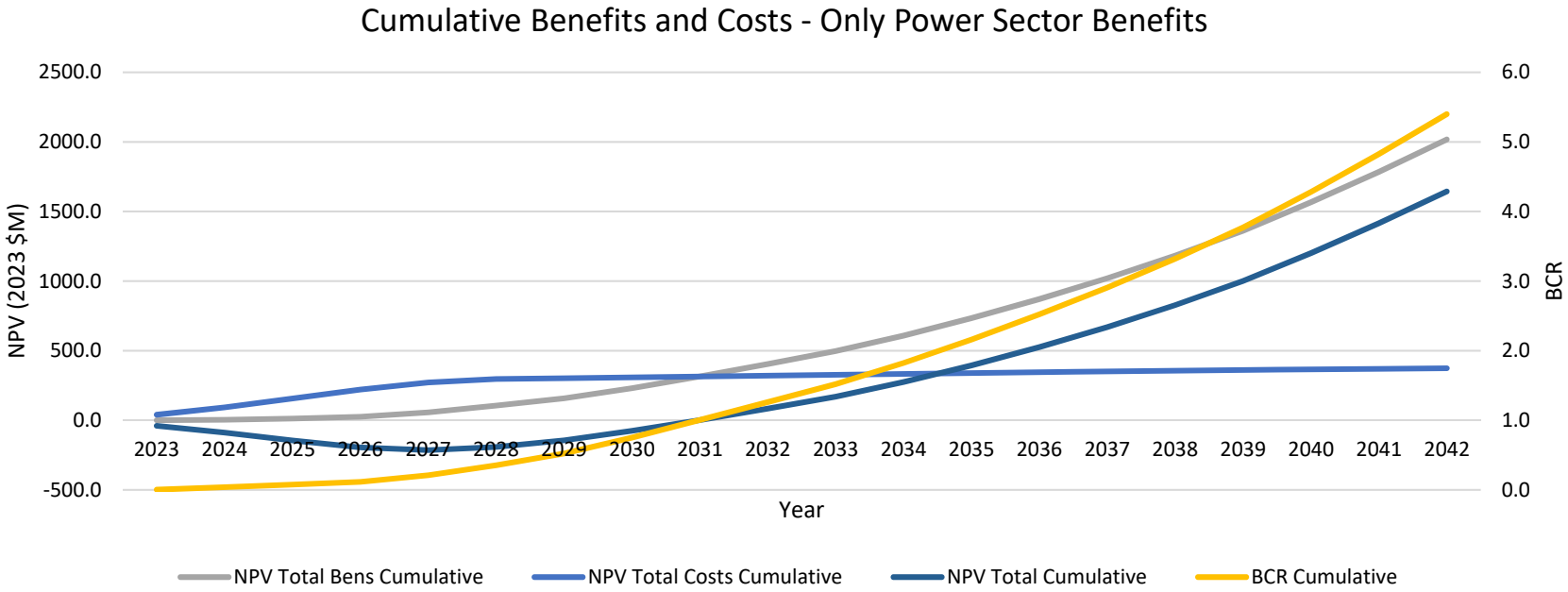


Figure 2b further amends Figure 2a by omitting direct customer benefits (in addition to omission of societal benefits). This omission does not change the date by which the grid modernization investment strategy becomes cost beneficial. In other words, the grid modernization investment strategy becomes cost-beneficial in 2031 when solely considering utility (power sector) benefits. Therefore, the effectiveness of the grid modernization investment strategy is relatively insensitive to consideration of direct customer benefits, including assumptions about the monetary value gained by customers.

Figure 2c: The effectiveness of the grid modernization investment strategy is relatively insensitive to whether AMF is deployed.

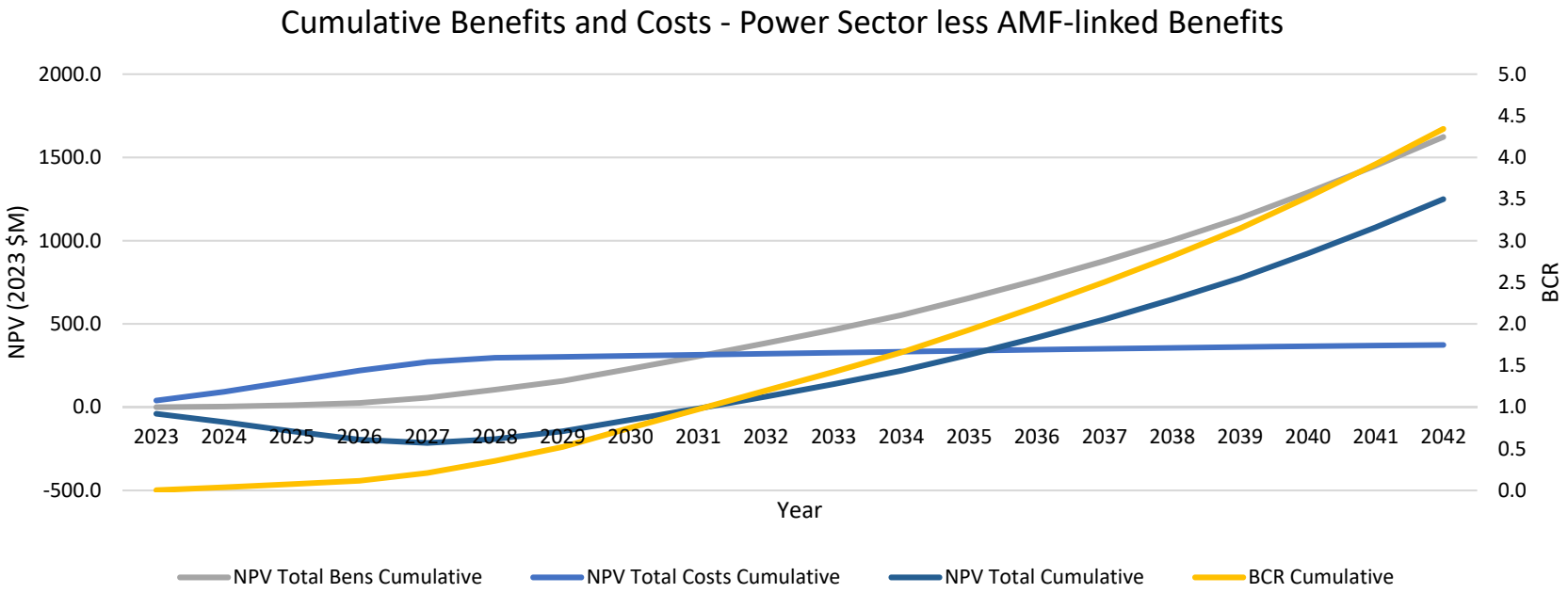


Figure 2c further reduces the benefit stack by omitting all benefits associated with time-varying rates, in addition to omitting societal benefits and direct customer benefits (or equivalently, assigns these benefit categories zero value). The timing in which the grid modernization investment strategy becomes cost-beneficial relative to a traditional investment strategy changes by one year, to 2032. Therefore, the effectiveness of the grid modernization investment strategy is relatively insensitive to the determination of whether to deploy AMF, including assumptions about the monetary value that may arise from differing perspectives of time-varying rates.

Figure 2d: The effectiveness of the grid modernization investment strategy is relatively insensitive to whether fiber is deployed.

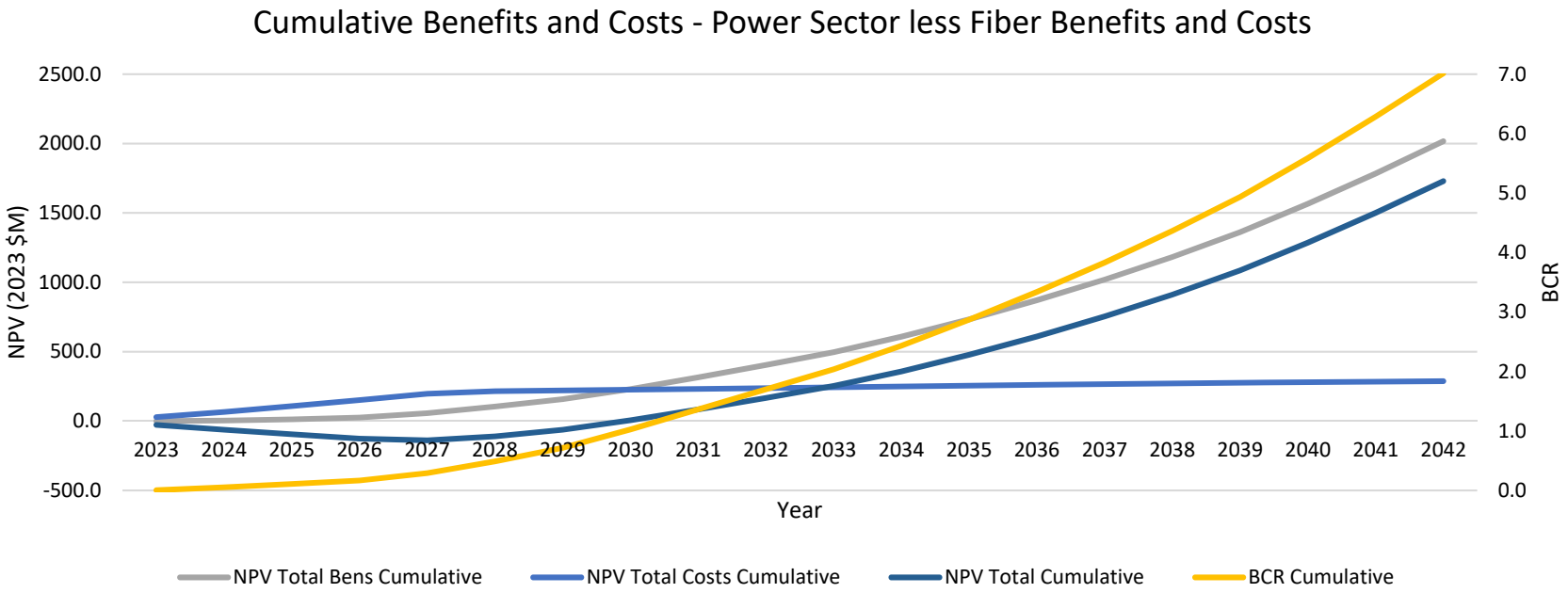


Figure 2d amends Figure 2b by removing all costs and benefits associated with deployment of fiber (in addition to assigning zero value to societal and direct customer benefits). The grid modernization investment strategy becomes cost-beneficial relative to a traditional investment strategy in 2030. Therefore, the effectiveness of the grid modernization investment strategy is relatively insensitive to the inclusion of fiber, including assumptions about the monetary value that may arise from differing perspectives about fiber.

Figure 2e: The effectiveness of the grid modernization investment strategy is relatively insensitive to assumptions about value of reduced outages.

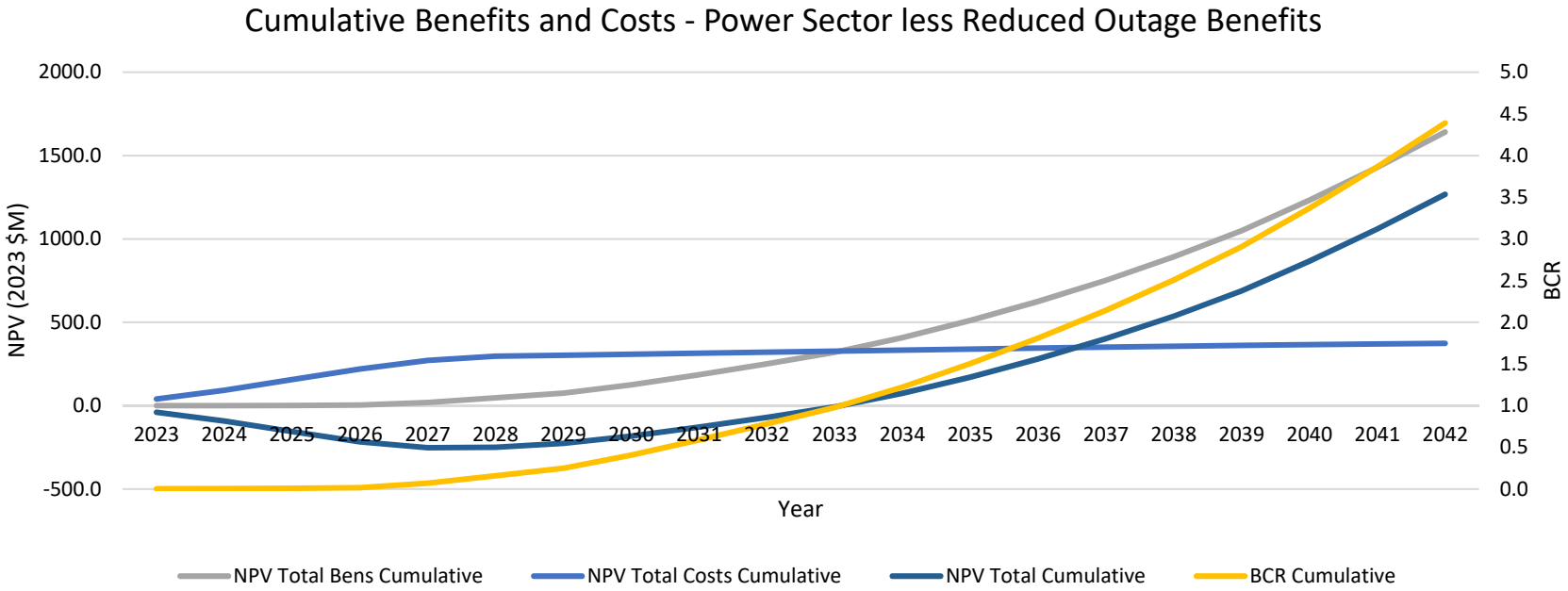


Figure 2e amends Figure 2b by removing all benefits associated with reduced outages due to FLISR (in addition to assigning zero value to societal and direct customer benefits). The grid modernization investment strategy becomes cost-beneficial relative to a traditional investment strategy in 2034. Therefore, the effectiveness of the grid modernization investment strategy is relatively insensitive to the inclusion of benefits related to reduced outages, including assumptions about the monetary value that may be associated with reduced outages.

Figure 2f: The effectiveness of the grid modernization investment strategy holds in the most conservative sensitivity analysis conducted.

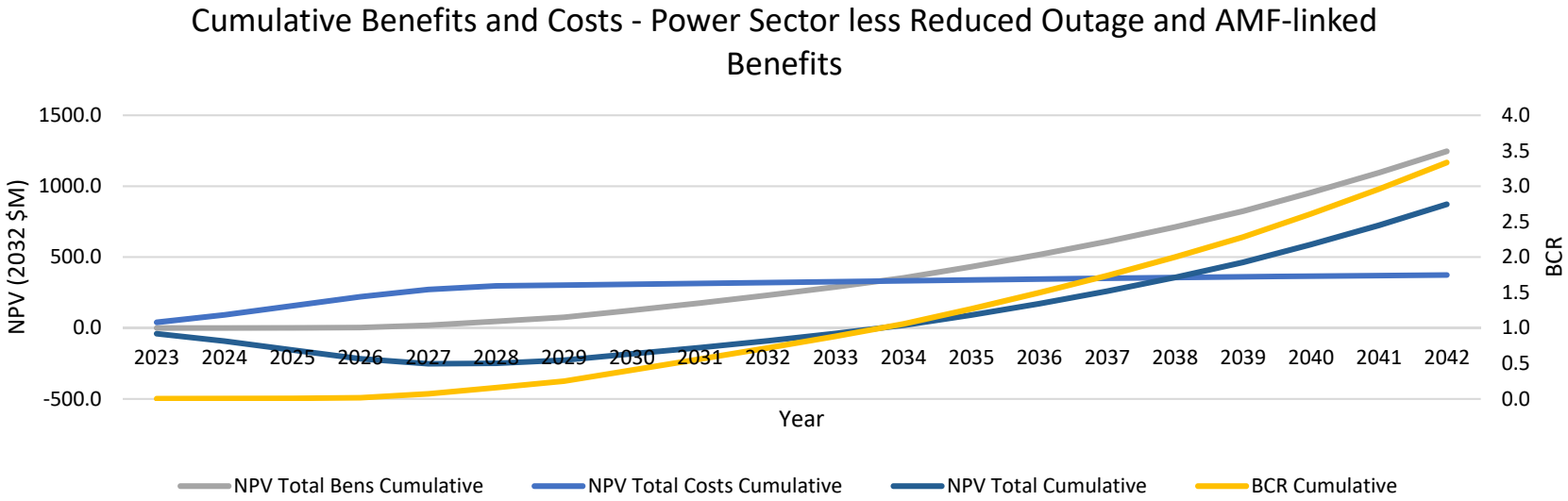


Figure 2f depicts the cumulative costs and benefits of the most conservative scenario conducted: omission of societal and direct customer benefits, omission of benefits contingent on AMF, and omission of benefits related to reduced outages (or, equivalently, assigning these benefits zero value).[7] In this conservative scenario, the grid modernization investment strategy becomes cost-beneficial in 2034. The timing of when the grid modernization investment scenario becomes more cost-effective is within the Company's electric peak forecast, with the only difference being the modeled deployment of solar PV from 2030 to 2034. If less Solar PV were to be installed than is modeled in the GMP analysis, then the cumulative cost curve would shift slightly down and the cumulative benefits curve would shift slightly to the right and flatten slightly. However, the Company would expect the magnitude of

[7] The Company also conducted a sensitivity analysis that removed costs and benefits associated with fiber from Figure 2f; the grid modernization investment strategy becomes cost-beneficial beginning in 2033.

these shifts to be small and the grid modernization investment strategy to ultimately become cost beneficial; the Company explores this sensitivity in Figure 2g.i and Figure 2g.ii, below.

Figure 2g.i: The effectiveness of the grid modernization investment strategy holds in the most conservative sensitivity analysis assuming forecasted and downscaled growth in PV.

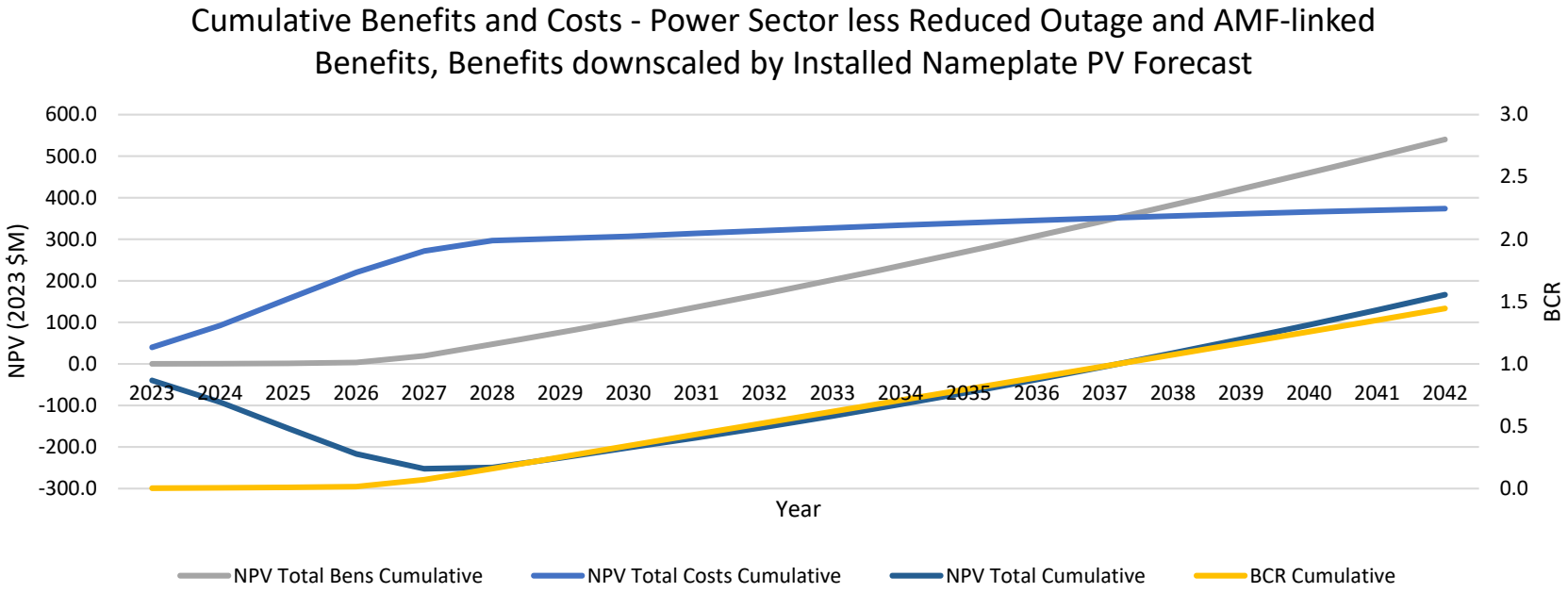


Figure 2g.i amends Figure 2f by scaling the benefits included in Figure 2f (i.e., the most conservative presentation of benefits, which assigns zero value to societal benefits, direct customer benefits, reduced outage benefits, and benefits contingent on AMF deployment) identical to the scaling of PV growth as presented in the 2022 Electric Peak Forecast. Figure 2g.i is identical to Figure 2f for 2023 through 2029 (because assumptions about installed nameplate PV capacity are identical between the GMP analysis and the electric peak forecast; see pg. 28:1 of the Company's supplemental testimony). In producing Figure 2g.i, the Company made two assumptions.

First, annual benefits for 2030 through 2036 were multiplied by the growth rate of PV in the electric peak forecast relative to 2029 (e.g., the electric peak forecast shows a 5% growth in PV from 2029 to 2030, so the Company calculated 2030 benefits to be 105% of 2029 benefits). For years 2037 through 2042 (post-forecast), the Company scaled annual benefits using the most recent forecasted annual growth rate for PV (i.e., a 2% increase, which is the smallest annual PV growth rate in the forecast). This scaling results in total cumulative benefits of $540M, relative to the $1246M shown in Figure 2f. The Company did not scale costs downward at all in Figure 2g.i relative to 2f, which is an unrealistic assumption that is intended to convey an extremely conservative model.

The Company gleans three important insights from Figure 2g.i.

First, costs are overestimated. By reducing the adoption of PV but not adjusting costs, the cumulative costs shown are certain to be higher than actual costs when right-sizing, right-timing, and right-locating solutions derived from grid modernization investments.

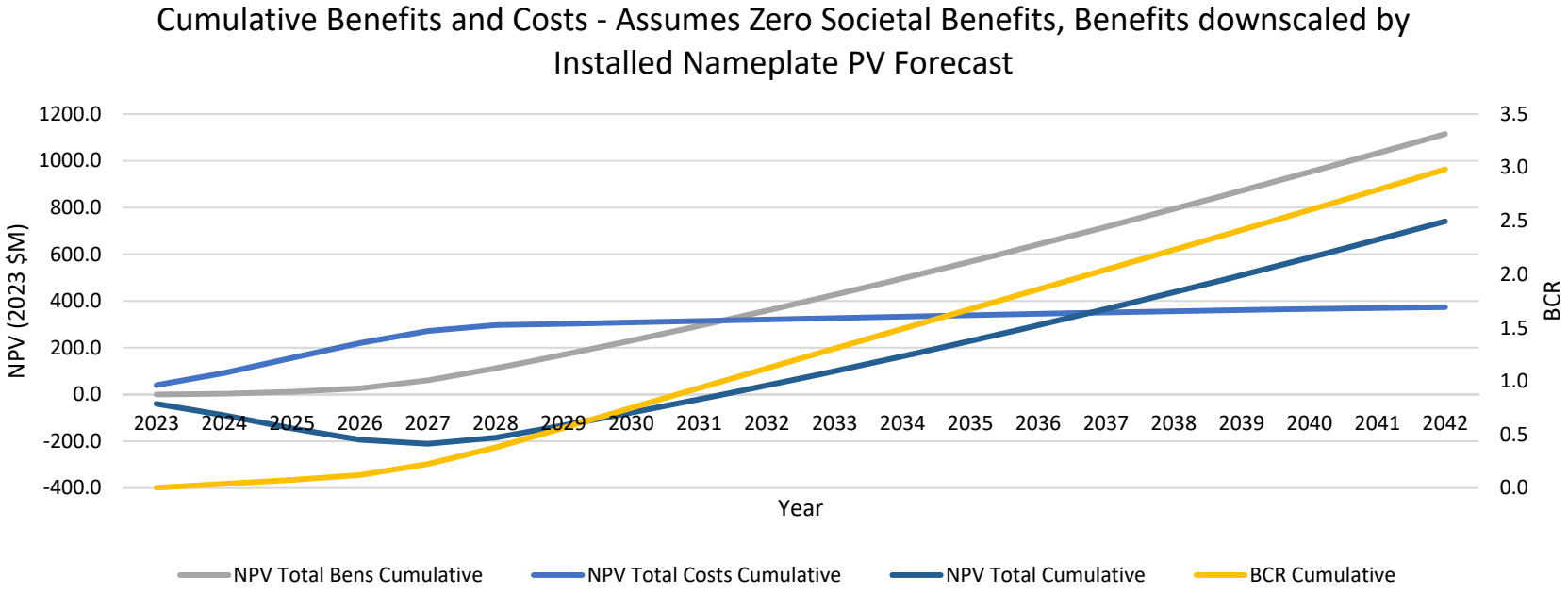
Second, benefits are underestimated. While PV adoption does impact benefits like avoided distribution infrastructure cost savings (meaning reducing assumptions about PV adoption should reduce avoided distribution infrastructure cost savings), PV is not the *only* driver. Adoption of electric transportation and electric heat, for example, are also key drivers of benefits. Therefore, adjusting benefits to solely reflect assumptions about PV adoption likely over-adjusts, and therefore underestimates, benefits. Furthermore, this cumulative benefits curve assigns zero value to societal and direct customer benefits, zero value to reduced outages, and zero value to any future benefit linked with any level of advanced metering, all of which are unrealistic assumptions.

Third, despite the overestimation of costs and the underestimation of benefits, the grid modernization investment strategy becomes cost-beneficial in 2038 relative to the traditional grid modernization strategy. This scenario analysis, which represents an unrealistically conservative portrayal of costs and benefits, gives the Company confidence that the grid modernization investment strategy is more cost-beneficial than a traditional investment strategy over the coming decades, and almost certainly before 2038.

The Company contends that a more realistic portrayal of costs and benefits may arise from amending Figure 2b by scaling benefits with PV adoption. Figure 2b omits societal benefits (or, equivalently, assigns zero value to societal benefits) but includes all power sector and direct customer benefits. Figure 2g.ii, below, downscales benefits in the same manner as Figure 2g.i. As in Figure 2g.i, benefits are likely underestimated because of this scaling, and costs are likely overestimated because of not applying the scaling. In

this scenario, the grid modernization investment strategy becomes cost-beneficial beginning in 2032. In other words, the difference in assumption about PV adoption results in a one-year difference in portfolio size necessary for the grid modernization investment strategy to be more cost-effective than the traditional investment strategy, even when considering the underestimation of benefits and overestimation of costs. Therefore, the effectiveness of the grid modernization investment strategy is relatively insensitive to differential assumptions about PV adoption.

Figre 2g.ii. The grid modernization investment strategy likely becomes cost-beneficial in the nearer term than represented in Figure 2g.i.



V. Implications for pacing

If the evolution of investment strategy is paced out, then (i) the cost curve in Figure 1 would increase at a lower rate over more years and the cost of traditional investments would continue to be incurred, (ii) the benefits curve in Figure 1 would be reduced because of lost opportunity for avoided infrastructure, and (iii) the costs would continue to level out past some year that is further into the future than 2026. The shapes of the cumulative cost curve and cumulative benefits curve would hold.

The timing of intersection (when the grid modernization investment strategy becomes cost-beneficial relative to the traditional investment strategy) would be delayed, and the length of delay would be determined by the pacing.

This insight underscores the Company's motivation to immediately and swiftly evolve from a traditional investment strategy to a grid modernization investment strategy because the relative value attenuates as this evolution is delayed and/or paced out.