BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF PUBLIC SERVICE COMPANY OF NEW MEXICO'S APPLICATION FOR APPROVAL OF PURCHASED POWER AGREEMENTS, ENERGY STORAGE AGREEMENTS, AND CERTIFICATES OF PUBLIC CONVENIENCE AND NECESSITY FOR SYSTEM RESOURCES IN 2026,	)	**Case No. 23-00xxx-UT**
PUBLIC SERVICE COMPANY OF NEW MEXICO,	)	
Applicant	)	

DIRECT TESTIMONY

OF

NICHOLAS L. PHILLIPS

October 25, 2023

NMPRC CASE NO. 23-_____-UT
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NICHOLAS PHILLIPS

WITNESS FOR
PUBLIC SERVICE COMPANY OF NEW MEXICO

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AFFIDAVIT

DIRECT TESTIMONY
OF NICHOLAS L. PHILLIPS
NMPRC CASE NO. 23-_____-UT

I. INTRODUCTION AND PURPOSE

Q. PLEASE STATE YOUR NAME, POSITION AND BUSINESS ADDRESS.

A. My name is Nicholas L. Phillips and I am a Director at Atrium Economics, LLC ("Atrium"). Atrium is a management consulting and financial advisory firm focused on the North American energy industry. My business address is 10 Hospital Center Commons, Suite 400, Hilton Head Island, South Carolina, 29926.

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL QUALIFICATIONS.

A. My educational background and relevant employment experience are summarized in PNM Exhibit NLP-1 attached to my testimony. Prior to joining Atrium, I held the position of Director, Integrated Resource Planning with Public Service Company of New Mexico ("PNM") and was employed by PNM as the Director, Integrated Resource Planning throughout Request for Proposals ("RFP") evaluation, contract negotiation and preparation of the instant filing.

Q. PLEASE DESCRIBE THE RESPONSIBILITIES OF THE INTEGRATED RESOURCE PLANNING DEPARTMENT.

A. The Integrated Resource Planning department is responsible for developing PNM's resource plans and the regulatory filings to support those resource plans, including the annual renewable energy portfolio procurement plan and the triennial Integrated Resource Plan ("IRP"). The Integrated Resource Planning department is also responsible for

performing resource planning analysis to support resource additions and acquisitions, all of which require New Mexico Public Regulation Commission ("NMPRC" or "Commission") approval such as those being requested in this docket. Additional responsibilities include developing PNM's load forecast, resource adequacy, and supply-side resiliency studies.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testing on behalf of Public Service Company of New Mexico.

Q. HAVE YOU PREVIOUSLY PROVIDED TESTIMONY IN NMPRC PROCEEDINGS?

A. Yes. Cases in which I have testified before the Commission are identified in PNM Exhibit NLP-1.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to discuss the analysis performed by PNM and the resulting portfolio of resources that PNM is asking the Commission to approve. Additionally, I will describe how this procurement fits into PNM's overall strategy for transitioning its electric supply to carbon free consistent with New Mexico's guiding energy policy, the Energy Transition Act, in a safe and reliable way.

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS AND RECOMMENDATIONS.

A. I recommend that the Commission approve PNM Application requesting to enter into three (3) Energy Storage Agreements ("ESA") totaling 250 MW of four-hour energy storage, one (1) Purchased Power Agreement ("PPA") for 100 MW of solar energy, and a Certificate of Public Convenience and Necessity ("CCN") to construct a 60 MW, four-hour Battery Energy Storage System ("BESS"). All together this portfolio will move PNM to the current industry resource adequacy standard one-day-in-ten-year ("1-in-10") Loss of Load Expectation ("LOLE").[1]

PNM Table NLP-1

Resource Name	Structure	Size (MW)	Storage Volume (MWh)
Sky Ranch Storage 2	ESA	100	400
Route 66 Storage	ESA	49.5	198
Quail Ranch Solar	PPA	100	N/A
Quail Ranch Storage	ESA	100	400
Sandia Substation BESS	EPC	60	240
Total ESA	**ESA**	**249.5**	**998**
Total PPA	**PPA**	**100**	**N/A**
Total EPC	**EPC**	**60**	**240**

[1] This is equivalent to 0.1 LOLE per year.

Total Storage	**309.5**	**1238**
Total Generation	**100**	**N/A**

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. First, I will give a general overview of the filing and resources being requested in PNM's Application. Next, I will discuss the concept of resource adequacy and how this is viewed within PNM resource planning. Then I will discuss the portfolio modeling analysis PNM performed to determine the resources for which it is requesting approval. Finally, I will offer my conclusions and recommendations as it relates to this procurement.

Q. ARE YOU SPONSORING ANY EXHIBITS AS PART OF YOUR TESTIMONY?

A. Yes. I am sponsoring the following Exhibits:

- PNM Exhibit NLP-1 Resume and Qualifications
- PNM Exhibit NLP-2 Demand and Energy Forecast
- PNM Exhibit NLP-3 Natural Gas and CO2 Price Forecast
- PNM Exhibit NLP-4 Technology Cost Forecast
- PNM Exhibit NLP-5 Effective Load Carrying Capabilities
- PNM Exhibit NLP-6 Pricing Comparison (Fixed vs Volumetric)

II. RESOURCE PLANNING OVERVIEW

Q. PLEASE BRIEFLY DESCRIBE THIS RESOURCE PROCUREMENT FILING.

A. The resources PNM is presenting for approval in this filing will meet multiple system needs including adding needed capacity to meet increasing PNM customer demand as well as positioning PNM's system in line with the current industry resource adequacy standard. The proposed procurement primarily consists of energy storage resource additions which play an essential role in reliably decarbonizing the grid and integrating renewable resources on PNM's system. The proposed procurement also contemplates a small solar addition to PNM's system co-located with one of the proposed energy storage system additions.

Q. HOW DO THE RESOURCES IN THIS APPLICATION SUPPORT PNM'S EFFORTS TO MEET THE CARBON-FREE GENERATION GOALS IN THE ENERGY TRANSITION ACT?

A. This procurement aligns with the need to move to a fully carbon-free generation fleet by 2045 as required by the Energy Transition Act, and PNM's separate corporate goal to be carbon-free by 2040. While PNM continues to issue All-Source Requests for Proposals ("RFPs") and evaluate offers and identify the most cost-effective solutions for reliably transitioning the system to carbon free by 2040, all the resources presented in this Application are carbon-free.

Q. PLEASE EXPLAIN HOW THE REQUESTED CCN FOR ENERGY STORAGE INCLUDED IN THIS FILING MEETS THE REQUIREMENTS UNDER §62-9-1 OF THE PUBLIC UTILITY ACT?

A. The proposed Sandia Substation BESS reduces costs to ratepayers by avoiding or deferring the need for investment in new generation as the only generation resource included in this filing is the 100 MW of solar. Without the storage, PNM would need to invest in other resources capable of providing firm capacity to the system, such as natural gas turbines, necessary to provide safe and reliable service to PNM's customers. Furthermore, as discussed by PNM witness Duane, the project will also reduce transmission congestion in the load pocket.

When utilized as a peaking resource to cover the high-risk hours (net load periods) the proposed facility will reduce the use of fossil fuels for meeting customer demands and will also be capable of providing ancillary services to support the ability to reliable transmit energy from generation resources to customer loads. This will in turn assist with ensuring grid reliability, including transmission and distribution system stability, while integrating sources of renewable energy into the grid, support diversification of energy resources and enhance grid security, and reduce greenhouse gases and other air pollutants resulting from power generation.

As a utility owned resource, the Sandia Substation BESS will provide the PNM with the discretion, subject to applicable laws and rules, to operate, maintain and

control energy storage systems so as to ensure reliable and efficient service to customers.

Finally, the Sandia Substation BESS is part the most cost-effective portfolio among feasible alternatives. Additional response to the requirements of §62-9-1 is provided by PNM witness Heffington.

III. PNM'S RESOURCE ADEQUACY

Q. PLEASE BRIEFLY EXPLAIN RESOURCE ADEQUACY.

A. Resource adequacy is the ability of a bulk electric power system to serve load across a broad range of weather and system operating conditions, subject to a long-run reliability standard. No electricity system is perfectly reliable; there is always some chance that generator failures and/or extreme weather conditions that impact supply and demand could compound another to result in loss of load. The resource adequacy of a system depends on the characteristics of electricity demand—its magnitude, seasonal and hourly patterns, and weather sensitivity—as well as generation resources—their size, dispatchability, outage rates, and other limitations on availability, such as the variable production of renewable resources. If the availability of resources is adequate to meet load across a wide range of conditions and limit loss of load events to a reasonable level—where "reasonable" is defined by a reliability target—then a system is considered to have an adequate supply of resources.

Q. PLEASE DESCRIBE INDUSTRY BEST PRACTICES FOR RESOURCE ADEQUACY PLANNING.

A. There is no single mandatory or voluntary national standard for resource adequacy. Instead, standards are established by utilities—under regulatory oversight—or by independent system operators. Many utilities in North America rely on a "one-day-in-10-year" standard to determine whether their systems have an adequate supply of resources. Under this standard, a system is considered reliable (and to have an adequate supply of resources) if the expected frequency of loss of load events is limited to at most one day every 10 years ("1-in-10") (or a loss of load expectation, LOLE, of 0.1 days per year ("0.1 LOLE")). In general, "best practices" continue to evolve as resource adequacy planners gain more understanding regarding the challenges for reliably decarbonizing the electric grid; however, the basic foundation of a robust framework for future resource adequacy planning is well-established and relies on the use of a loss of load probability ("LOLP") model. The complexity of the probabilistic simulations needed will increase significantly as an unavoidable consequence of the transition to a portfolio less reliant upon conventional firm resources and more reliant on variable or availability-limited resources. Ensuring future resource adequacy will require continued enhancements to probabilistic methods and data that capture this increasing complexity, including simulation of chronological operations and resource interactions and consideration of weather variability, energy use limitations, and evolving load patterns.

Q. HOW HAS PNM RESOURCE ADEQUACY PLANNING EVOLVED TO MEET CHANGING SYSTEM RESOURCE NEEDS?

A. Up until a few years ago, PNM relied on a static 13% Planning Reserve Margin ("PRM") to plan its system resource needs. As more renewable energy resources were added to the system, coupled with the passage of the Energy Transition Act, PNM re-examined its approach and began employing a more robust LOLP methodology to determine system resource adequacy. This move was discussed in detail in Case Nos. 19-00195-UT, 21-00215-UT, 21-00159-UT, PNM's 2020 IRP and throughout the ongoing 2023 IRP public process.

Both PNM and the Commission recognized the need to move resource adequacy planning to best practices to enable a safe and reliable energy transition. In Case No. 21-00215-UT, the Commission acknowledged that it was appropriate for PNM to transition from PRM planning to LOLP planning. The Commission specifically cited that the resource adequacy paradigm must change as a power-system becomes dominated by intermittent power resources and found that "[r]enewable energy and storage provide some contribution to resource adequacy requirements, but their contribution is limited and declines as more of these resources are added." The Commission also noted that "[a]s renewables are added, [f]irm, dispatchable resources are required to cost-effectively maintain resource adequacy and provide

capacity during prolonged periods of low renewable generation when energy storage has been depleted."[2] This is illustrated through several useful graphics.[3]

Q. ARE PNM'S RESOURCE ADEQUACY METHODS CONSISTENT WITH INDUSTRY BEST PRACTICES?

A. Yes. PNM employs industry best practices for resource adequacy planning and has been procuring the resources necessary to implement its identified system needs. The procurements proposed in this proceeding will move the PNM system to its current desired resource adequacy standard. As it progresses more deeply down the decarbonization path, PNM will continue to assess its planning and will likely incorporate additional considerations to ensure the system maintains all the reliability attributes (for example, not just resource adequate, but also resilient) of the traditional system.

Q. HOW DO THE PROJECTS FOR WHICH PNM SEEKS COMMISSION APPROVAL IN THIS CASE HELP ENSURE THE COMPANY WILL MEET ITS RESOURCE ADEQUACY REQUIREMENTS?

A. Beginning in Case No. 19-00195-UT, PNM began utilizing more robust resource adequacy planning in its resource evaluation process. In that case, PNM utilized a one-day-in-five-year ("1-in-5") resource adequacy criterion (or 0.2 LOLE). Then

[2] Case No. 21-00215-UT, Recommended Decision at 29 (Feb. 14, 2022) (internal citations omitted).
[3] *Id*. at 30-33.

in PNM's 2020 IRP and in Case No. 21-00215-UT, PNM discussed options for moving to the more typical 1-in-10 standard and communicated its intent to implement the 1-in-10 standard in its next procurement proceeding. The resources included in this filing will both fill out the remaining set of resources to get PNM to the now legacy standard 0.2 LOLE as well as move toward the 0.1 LOLE standard.

Q. GIVEN THE PNM'S MOVE TO A LOSS OF LOAD EVENT INDUSTRY PLANNING STANDARD, IS A PLANNING RESERVE MARGIN ANALYSIS STILL RELEVANT?

A. No. PRM is merely an accounting convention and a simple PRM analysis is no longer sufficient as a real measure of resource adequacy.[4] The resource adequacy analysis conducted as part of this proceeding provides a more comprehensive assessment that takes into account the unique capabilities of PNM's resource fleet and its load patterns across all hours of the year. As discussed by PNM witness Wintermantel, PNM did conduct a resource adequacy assessment as part of its 2020 and 2023 IRP processes and performed resource adequacy analysis of the proposed portfolio presented as part of this filing.

IV. RESOURCE PORTFOLIO MODELING AND ANALYSIS

[4] Energy Systems Integration Group, *Ensuring Efficient Reliability: New Design Principles for Capacity Accreditation*, Feb. 2023, https://www.esig.energy/new-design-principles-for-capacity-accreditation/.

A. Modeling Framework

Q. WHY IS PNM PROPOSING THE RESOURCE PORTFOLIO PRESENTED IN THIS FILING?

A. The portfolio of resources included in PNM's Application represent the lowest reasonable cost to meet PNM's customer demand and energy needs in a safe and reliable way. For PNM, this means procuring resources to meet the 0.2 LOLE standard and move toward meeting the 0.1 LOLE industry standard while furthering PNM's transition towards a carbon free electric system.

Q. WHAT ROLES DID THE RESOURCE PLANNING TEAM PLAY IN EVALUATING POSSIBLE RESOURCE PORTFOLIOS IN THIS FILING?

A. PNM's resource planning team's primary focus is to perform detailed portfolio modeling of a shortlist of RFP bids focusing on portfolio economic and reliability analysis. The outcome of this analysis is a recommendation for a preferred set of resources. This is generally referred to as "Phase III" in the RFP evaluation. While this is the primary function of the resource planning team, the team was also involved in reviewing the RFP before it was released, consulted on Phases I and II of the evaluation process, met with the Independent Evaluator to provide information throughout the process, and aided in the negotiation of the final contracts. PNM Witness Roger Nagel discusses the RFP phases and processes in detail in his direct testimony.

Q. PLEASE DESCRIBE THE GENERAL FRAMEWORK PNM USED TO DETERMINE THE RESOURCE PORTFOLIO PRESENTED IN THIS FILING.

A. The first step was to issue a Request for Proposals ("RFP") and obtain offers for resources deliverable to PNM's system by the summer of 2026. PNM issued the RFP in November of 2022 and asked for offers to be submitted for resources that could deliver in 2026, 2027 or 2028 ("2026-2028 RFP"). PNM's RFP administration and evaluation team went through a three-phase process to evaluate the bids for 2026, which was overseen by an Independent Evaluator. The final shortlist of bids resulting from second phase of the RFP evaluation was provided to my team. This shortlist of bids was used to populate a database of candidate resources in PNM's resource planning models. The general framework for the portfolio analysis used to determine the resource portfolio presented in this case started with the modeling process and protocols utilized in PNM's 2020 IRP. Given that PNM has updated its models throughout its 2023 IRP process, which kicked off in April of 2022, the modeling data and framework incorporated some of those updates, as addressed later in my testimony. PNM used its models to compare the economics and reliability characteristics of multiple combinations of resources from the 2026 RFP shortlist of bids to arrive at the portfolio proposed in its Application.

Q. WHAT MODELING TOOLS DID PNM USE TO PERFORM ITS RESOURCE PORTFOLIO ANALYSIS?

A. PNM used the EnCompass software to perform its economic analysis. EnCompass is a power supply optimization software developed and licensed by Anchor Power Solutions[5] that uses Mixed Integer Programming to simultaneously optimize multiple objectives and constraints (financial, physical, operational, reliability, etc.). PNM also relied on the Strategic Energy Evaluation and Risk Model ("SERVM") under a consulting agreement with Astrapé Consulting for the LOLP modeling of portfolios. SERVM and its applications in this proceeding are more fully described by PNM Witness Wintermantel. These models worked together in an iterative manner to produce the resource portfolios presented in this case.

Q. PLEASE BRIEFLY DESCRIBE THE ANALYSIS PERFORMED BY ASTRAPE.

A. Astrape Consulting, LLC ("Astrape") licenses SERVM to PNM and also performs consulting work and analysis on PNM's behalf. Similar to its role in Case No. 21-00215-UT, Astrape reviewed the results of PNM's economic modeling and performed LOLP analysis of the portfolios. Through the 2023 IRP process Astrape also performed an updated resource adequacy assessment of PNM's system including developing updated Effective Load Carrying Capability ("ELCC")

[5] Horizons Energy provides technical consulting services including EnCompass modeling for PNM's Resource Analysis under PNM's direction. Horizons Energy specializes in consulting services using EnCompass and works closely with Anchor Power Solutions which licenses the EnCompass software and develops the Horizons EnCompass National Database.

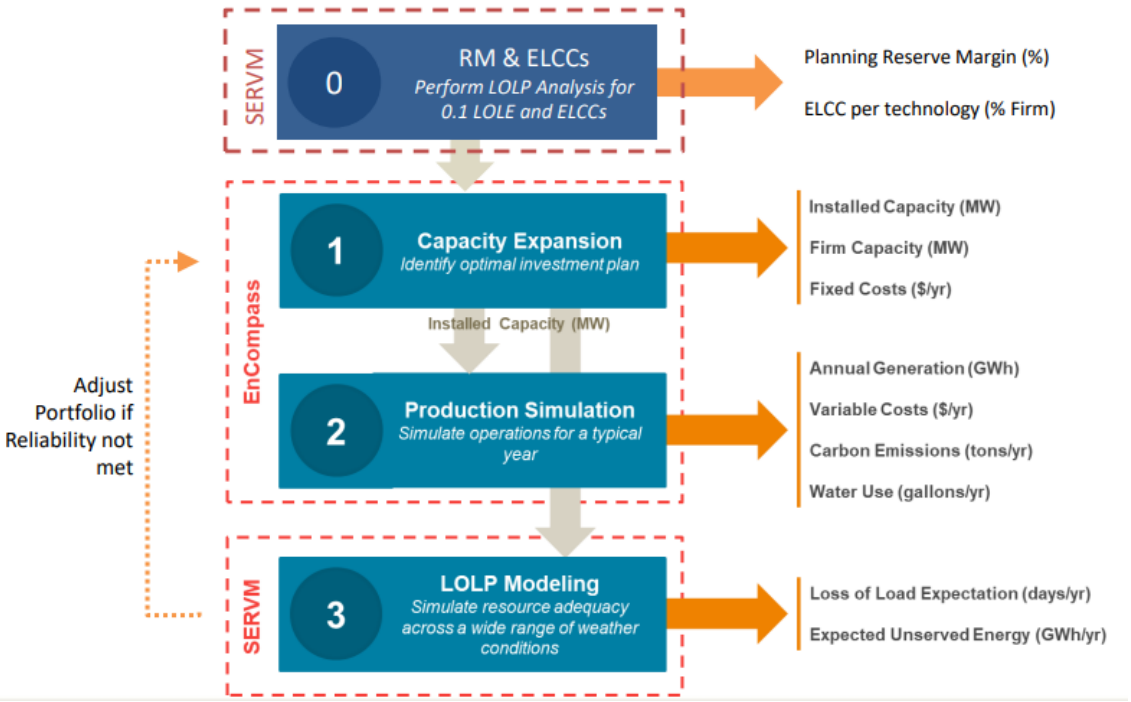
curves for intermittent and energy storage resources. ELCC measures a resource's contribution to the system's needs relative to perfect capacity, accounting for its limitations and constraints. These curves then inform PNM's capacity expansion and economic modeling to optimize resource portfolios.[6]

Q. HOW DO THE ENCOMPASS AND SERVM MODELING WORK TOGETHER TO PRODUCE A RELIABLE AND COST-EFFECTIVE RESOURCE PORTFOLIO?

A. PNM Figure NLP-1 below shows how the SERVM and EnCompass models are used to develop ELCC curves, inform capacity expansion and production simulation, and determine a portfolio's resource adequacy across a wide range of weather conditions.

[6] *See PNM 2023-2042 IRP: Modeling for Reliability, Resource Adequacy and Resiliency*, Technical Session #1 (June 8, 2022), https://www.pnmforwardtogether.com/assets/uploads/2023-IRP-Technical-Session-1-Post2.pdf.

PNM Figure NLP-1



B. PNM's Resource Portfolio Analysis

Q. PLEASE SUMMARIZE KEY IRP ASSUMPTIONS THAT WERE UPDATED FOR PNM'S RESOURCE PORTFOLIO ANALYSIS.

A. PNM used the 2020 IRP model as the starting point for its EnCompass modeling. Key inputs that were updated during the development of PNM's 2023 IRP and utilized in the portfolio analysis include the following:

- The Study Horizon, to examine the period of 2023-2042;
- The load forecast (PNM Exhibit NLP-2);
- Commodities pricing (PNM Exhibit NLP-3);
- Fixed production revenue requirements for the existing PNM system;

- Online dates for new resources approved but not yet online, to align with the most recent schedules available and reflect terminated contracts removed from the portfolio;
- Abandonment of Four Corners Power Plant ("FCPP") at the end of 2031.
- The 0.1 LOLE Resource Adequacy standard.
- ELCC modeling for renewable, energy storage, and demand response resources (PNM Exhibit NLP-5);
- Generic candidate resources, technology cost curves (PNM Exhibit NLP-4), and use of the explicit bids received from the 2026-2028 RFP (2026 bids only);
- Volumetric priced bid modeling and costs of imputed debt. (PNM Exhibit NLP-6)

Q. HOW DOES PNM COMPARE THE RELATIVE ECONOMICS BETWEEN RESOURCE PORTFOLIOS?

A. PNM measures long-term costs by using EnCompass to compare the difference in the net present value ("NPV") of revenue requirements required to meet retail customer loads over a 20-year planning period. This is consistent with the requirement in the Commission's IRP Rule (17.7.3.7(P) NMAC) to consider resource portfolio costs over a 20-year planning period. PNM's calculation of long-term costs and comparative savings includes the following:

- Cost to operate and maintain existing resources over 20 years;

- Cost to build, operate, and maintain any resources added in the 20-year study period; and
- Costs associated with retirement or abandonment of any resources during the 20-year study period.

The resulting portfolios were constructed subject to the following constraints: all portfolios had to meet the demand and energy loads of PNM's customers and meet regulatory requirements such as New Mexico's Renewable Portfolio Standard ("RPS") and emission rate requirements. All the costs of construction or acquisition of resources, fuel/variable production costs, O&M, and other costs (including the costs for known transmission network upgrades) were translated into estimated revenue requirements. Portfolio costs were calculated for the 20-year study period and converted to NPV to reflect differences in timing and to compare costs on an equivalent basis.

Q. PLEASE SUMMARIZE THE RESULTS OF THE RESOURCE PORTFOLIO ANALYSIS.

A. The resource portfolio analysis identified a proposed portfolio of resources comprised of four projects to meet system requirements. One project is a combined PPA and ESA for a solar photovoltaic ("PV") resource and a four-hour BESS. This project includes 100 MW of solar PV resources and 100 MW (400 MWh) of energy storage added to an existing site interconnection that is currently under

construction. The second project is a 100 MW, four-hour (400 MWh) BESS that will be added to a solar site that that is currently under construction and that will be placed into service in early 2024. The third project is a 50 MW, four-hour (200 MWh) BESS that will be added to an existing solar site. The final project is a 60 MW, four-hour (240 MWh) utility owned BESS. PNM Witness Heslop provides additional details about these projects, including the proposed agreements for these resources. The first three projects enable PNM to achieve its legacy 0.2 LOLE planning standard. The final project moves PNM toward the industry standard planning criteria of 0.1 LOLE.

Q. WHAT SCENARIOS WERE EXAMINED IN THE RESOURCE PORTFOLIO ANALYSIS?

A. Consistent with the analytical framework used in the 2020 IRP, when conducting the resource portfolio analysis, PNM analyzed two potential alternatives that will allow PNM to reach a carbon-free portfolio by 2040. The first path reflects a no new combustion ("NNC") scenario, which limits the available options (both RFP shortlisted bids and generic candidate resources) to only renewable and energy storage resources. PNM also examined a potential path that allowed new combustion resources as alternatives (both RFP shortlisted bids and generic candidate resources, referred to as the Technology Neutral ("TN") scenario.

Q. PLEASE DISCUSS THE COMPOSITION OF THE RESOURCE PORTFOLIOS THAT RESULTED FROM THE ANALYSIS.

A. Both the TN and NNC portfolios resulted in the same projects being chosen from the 2026 RFP bids. There is a difference between the NNC and TN scenario costs attributable to adding new gas resources in the TN scenario post-2026, but this does not change the outcome for the 2026 resources presented in this Application. Consequently, PNM's proposed portfolio of solar and energy storage resources is the preferred procurement under either scenario. Going forward, PNM will continue to issue all-resource RFPs and evaluate technologies that can contribute to its ability to maintain reliable electric service at the lowest reasonable cost while continuing to enable it to meet the RPS and carbon emission requirements of the ETA.

Q. WILL PNM'S RESOURCE PORTFOLIO BE RELIABLE WITH A COMBINATION OF ENERGY STORAGE AND RENEWABLE ENERGY RESOURCES AS PROPOSED?

A. Yes. The resource portfolio presented in this Application achieves PNM's legacy planning standard of 0.2 LOLE and moves PNM towards the 0.1 LOLE industry standard planning criteria. PNM Witness Wintermantel's testimony provides additional detail regarding the resource adequacy modeling showing how selected resource portfolio meets the 0.1 LOLE resource adequacy standard.

Q. PLEASE ELABORATE ON THE UPDATES TO PNM'S MODELING RELATED TO IMPUTED DEBT.

A. The concept and implications of debt imputation are more fully explained by PNM witnesses Monroy, Nichols and Feldman. In summary, after issuing its 2026-2028 RFP, PNM's accounting assessment, in coordination with its auditors, concluded that ESAs PNM previously entered into would be classified as leases for accounting purposes and the liabilities of these leases would appear on PNM's balance sheet. S&P, one of the major credit rating agencies that rates PNM's debt, will include lease obligations as adjusted debt for balance sheet treatment.[7] Given the existing ESAs PNM has already entered into, the amount of storage that will be necessary to enable the energy transformation required by the ETA, and requirements under both NMAC 17.9.551.8(D)(7) & (9), PNM incorporated an estimate of the cost of debt imputation into its RFP evaluation and sought alternative ways to mitigate that cost.

Q. PLEASE DESCRIBE HOW PNM ESTIMATED IMPUTED DEBT IMPACTS ASSOCIATED WITH FIXED PRICED ESA OFFERS AND THE INCREMENTAL COST ASSOCIATED WITH THAT DEBT.

A. Before summarizing the methods, I note there are three steps in the overall process necessary to determine the financial impact to PNM associated with fixed price

[7] *See* Direct Testimony of PNM witness Feldman at 4:6-10, 6:18-7:13, 10:18-11:22 (citing S&P Global Ratings, Criteria | Corporates | General: Corporate Methodology: Ratios And Adjustments at 35 (April 1, 2019), https://disclosure.spglobal.com/ratings/en/regulatory/article/-/view/sourceId/10906146); *see also* Direct Testimony of PNM witness Nichols at 4:1-12.

ESAs. The first is determining the accounting treatment for the ESAs—while I will summarize the accounting implications here, PNM witness Monroy presents a more detailed discussion in his direct testimony. The second step is to understand impact of the financial treatment by credit rating agencies—again, I will summarize the financial implications here, but PNM witnesses Nichols and Feldman present a more detailed discussion of credit rating agency financial treatment and its impact on PNM in their testimony. The third step is to utilize these principles to create a cost model for fixed price ESAs to incorporate into the resource planning process.

PNM first estimated the potential lease liability associated with a fixed price ESA. PNM Witness Monroy discusses how PNM developed potential lease liabilities for ESAs presented in this case. PNM ultimately estimated that the lease liability would be equal to approximately 70% of the fixed contract price after removing non-lease components of the contracts.[8]

PNM's next calculated the annual net present value of the lease liability over the term of the contract. As PNM makes payments under the term of the contract over time, the lease liability decreases—similar to paying a car lease over time. An example of this concept is presented by PNM Witness Nichols at PNM Exhibit TN-1.

[8] This will vary from contract to contract.

With this basic accounting structure in place, the next step is to estimate the costs associated with the lease liability based on risk reduction factors and evaluation metrics. There are multiple credit metrics that credit rating agencies consider when assessing the financial integrity of an institution. For purposes of this analysis PNM examined the debt-to-capital ratio and the cashflow-to-debt ratio (also known as Funds from Operation ("FFO") to debt). The debt-to-capital method calculates the incremental cost of equity associated with rebalancing PNM's capital structure to offset the additional leverage (i.e., imputed debt) created by the lease liabilities for each fixed price ESA. I refer to this as the "Cap Structure Method." An example of this concept is also discussed by PNM witness Nichols and included in PNM Exhibit TN-1. The second approach was to calculate the incremental revenue necessary to offset the additional leverage created by the lease liabilities when comparing FFO-to-debt for each fixed price ESA offered into the RFP. I will refer to this as the "Credit Ratio Method." I discuss these methods more later in this Testimony when explaining the results of PNM's analysis and PNM Figure NLP-2.

As PNM Witness Feldman explains, the net present value of the lease liability is adjusted to reflect regulatory or legislative cost recovery mechanisms and/or overall recovery risk by applying a risk factor to the imputed debt amount. Generally, ratings agencies apply a 50% risk reduction factor when the utility recovers fixed costs through base rates and a 75% risk reduction factor when a special adjustment

mechanism is employed. PNM examined the ESA lease liabilities and associated impacts on credit metrics under both the 50% and 75% risk reduction factors. PNM then calculated the incremental cost of mitigating the risk reduced lease liability for both scenarios using both the Cap Structure Method and the Credit Ratio Method. The calculated incremental costs from these analyses could then be added to the project cost of any fixed price ESA offer in the RFP evaluation. PNM Witness Nichols explains in detail how PNM calculated the incremental costs associated with mitigating imputed debt from the ESAs.

Q. WHAT OTHER MITIGATION ALTERNATIVES DID PNM CONSIDER?

A. As discussed in the direct testimony of PNM witness Nagel, PNM requested bidders who submitted an offer for a fixed price ESA to also provide a volumetric based price. A volumetric priced contract bases price dependent upon the amount of energy delivered to PNM's system as opposed to a fixed price tolling contract which would set a fixed price regardless of usage.

Q. PLEASE EXPLAIN THE VOLUMETRIC PRICING STRUCTURE FOR ESAS.

A. Volumetric priced ESAs have no fixed minimum payment component and should lead to no lease liability and thus no debt imputation. In the case of these specific contracts, the volumetric price is tied to the solar output of co-located solar facilities. However, this structure does lead to less certainty in revenue for the

counterparty and thus is accompanied with a premium in the notional value of the contract over the fixed price alternative (before consideration of debt imputation). Not all bidders (especially standalone ESA offers) were willing to provide a volumetric based price without a fixed minimum throughput requirement as stand-alone facilities have no co-located solar facility, and in order to achieve revenue certainty sufficient to finance the projects, would require some form of minimum commitment. PNM witness Feldman discusses the likely rationale explaining why some bidders would be unwilling to provide such a pricing structure.[9]

Q. IS IT MEANINGFUL TO COMPARE TO VOLUMETRICALLY PRICED ESAS USING A PER UNIT VOLUMETRIC PRICE?

A. No. If the volumetric basis for the price is tied to co-located solar (as is the case with the bids in this evaluation), then comparing the per unit prices is not meaningful unless the expected output of the co-located solar facility is the same for both battery projects. Consider as an example two hybrid solar-battery projects with different solar resources. Assume the first includes 100 MW of four-hour BESS co-located with 100 MW of solar and the second includes 100 MW of four-hour BESS co-located with 200 MW of solar. In this example, assuming the only difference in the projects is the size of the solar, then one would expect the volumetric price for the battery of the second project to be 50% of the volumetric price for the battery of the first project. This is because the solar generation of the

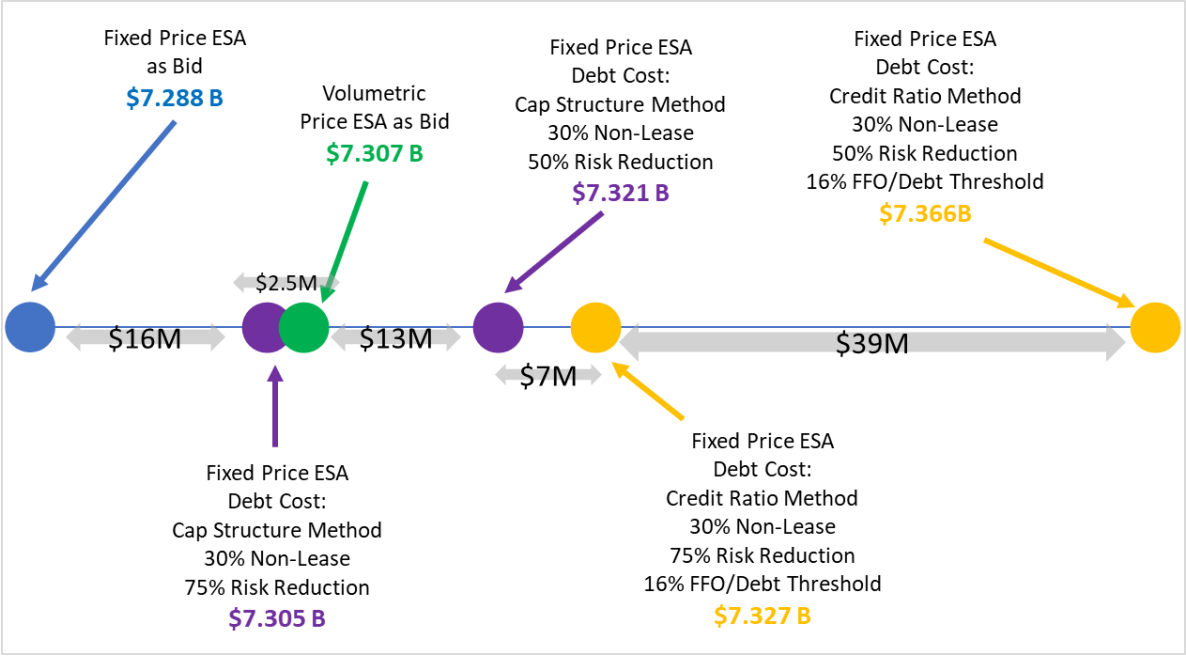
[9] Direct Testimony of PNM Witness Feldman at 16.

second project should double the output of the first project. A comparison of the fixed price ESA offers and the corresponding volumetric price offers for the proposed portfolio is presented in PNM Exhibit NLP-6.

Q. HOW DID PNM COMPARE THE DIFFERENT PRICING STRUCTURES WHEN EVALUATING THE RFP BIDS?

A. PNM compared the relative economics of resource portfolios using the original fixed price proposals—with and without adjustments for the costs associated with debt imputation—to the submittals based on volumetric pricing. PNM found that the underlying resource portfolio, when focusing on lowest reasonable cost, did not change—though the NPV of the portfolios did. The figure below shows the spectrum of the portfolio NPV given the different pricing assumptions. This figure shows clearly that even assuming minimal impact of debt imputation, PNM's customers are essentially indifferent in pricing structure between fixed and volumetric prices for ESAs. However, the credit rating agencies' final determination on imputed debt creates a significant risk PNM's customers could be worse off if PNM pursues fixed price contracts instead of volumetric priced contracts. This is evidenced below in PNM Figure NLP-2 when examining lower risk reduction factors under the Cap Structure Method as well as an examination of the Credit-Ratio Method.

PNM Figure NLP-2



Q. WHY DID PNM DECIDE TO MOVE FORWARD WITH A VOLUMETRIC PRICE STRUCTURE FOR THE ESAS PRESENTED IN THIS PROCEEDING?

A. PNM moved forward with a volumetric price structure for the ESAs as they represented the lowest cost options to customers after taking into consideration the impact of imputed debt.[10] As discussed in PNM witness Nagel's testimony, PNM initially received RFP bids for fixed price ESAs, but subsequently asked bidders to update their bids based on a volumetric pricing structure. PNM estimated the cost of moving to a volumetric price contract for the recommended portfolio to be about $18.9 million on a net present value ("NPV") basis (in 2023 dollars).

[10] PNM Exhibit JWH-9 (Independent Evaluator Phase 3 Report at page 14)

PNM consulted its independent evaluator for guidance on the proposed volumetric price structure to determine whether it was worth paying the cost to avoid the potential cost of imputed debt. The independent evaluator advised that for this to be the case: (1) the risk of debt imputation must be real; (2) the cost of debt imputation must be at or above the premium cost; and (3) the risk profile of the contracts should not change when moving from a variable to a fixed structure.

The independent evaluator agreed with PNM that there is a material risk of debt imputation by S&P, although the exact amount of debt S&P will impute is uncertain. The independent evaluator also determined that the cost of debt imputation would be roughly similar to the cost premium.

Q. PLEASE DISCUSS PNM'S ANALYSIS ASSOCIATED WITH A PROJECT LOCATED IN THE CENTRAL CONSOLIDATED SCHOOL DISTRICT WITHIN ITS PROPOSED PORTFOLIO.

A. As a part of its 2026-2028 RFP, PNM committed to progressing some projects located within the Central Consolidated School District ("CCSD") or sited on Navajo Nation tribal lands into the Phase III portfolio evaluations even if they did not price competitively against other projects of similar technology. As more thoroughly discussed by PNM witness Nagel, there were no projects offered into the RFP for delivery by 2026 that were located on Navajo Nation lands. There were five projects located within the CCSD submitted into the RFP for delivery in

2026; however, after conducting the Phase I and Phase II screenings, only one of these five projects remained viable ("CCSD Project"). Initially, portfolios developed that were required to include the CCSD Project did appear to be within in reasonable proximity of the lowest reasonable cost portfolios. However, when the developer of the CCSD project was asked to provide a volumetric price for the ESA component of the project, the notional value of the ESA increased over 100% from the as-bid fixed price offer. Furthermore, when PNM inquired why the volumetric price offer increased so much relative to the as-bid fixed price offer, the developer indicated that if they were to re-price the fixed price offer based on market conditions as of the request for variable pricing, the fixed price would also increase by approximately 35%-40%. Consequently, PNM is not recommending pursuing the CCSD project based on this additional premium in both the fixed price and the volumetric price bid.

Q. ARE MORE PROJECTS LOCATED ON THE NAVAJO NATION LANDS OR IN THE CCSD AVAILABLE FOR EVALUATION THAT COULD DELIVER IN 2027 OR 2028.

A. Yes. PNM maintains committed to progressing some projects located within the Central Consolidated School District ("CCSD") or sited on Navajo Nation tribal lands into the Phase III portfolio evaluations even if they did not score price competitively against other projects of similar technology. There are 13 projects

located within the CCSD and 4-6 projects sited on Navajo Nation lands available for evaluation that could deliver in 2027 or 2028.

Q. RULE 551.8(D)(8) REQUIRES EVIDENCE THAT THE PPAS/ESAS ARE CONSISTENT WITH PNM'S MOST RECENT COMMISSION-ACCEPTED INTEGRATED RESOURCE PLAN. IS PNM'S APPLICATION IN THIS FILING CONSISTENT WITH THE 2020-2040 INTEGRATED RESOURCE PLAN?

A. Yes, the analysis and conclusions are consistent with PNM's 2020 IRP in the following ways:

- PNM's proposed portfolio of resources consist of a mix of solar and battery storage resources, which also make up PNM's NNC Most Cost -Effective Portfolio; and
- The proposed resources align with PNM's multiple-path 2020 IRP by investing in renewables and non-carbon emitting resources that support PNM's efforts to transition to carbon emissions-free system by 2040.

Q. HAS PNM SHOWN THAT ITS PROPOSED PORTFOLIO OF RESOURCES INCLUDING THE PPAS AND ESAS, IS CONSISTENT WITH THE PROVISION OF SAFE AND RELIABLE ELECTRIC UTILITY SERVICE AT THE LOWEST REASONABLE COST, CONSIDERING

BOTH SHORT AND LONG-TERM COSTS AND ALL OTHER RELEVANT FACTORS, AS REQUIRED BY RULE 551.8(D)(6)?

A. Yes, as indicated in my testimony, PNM's recommended portfolio of resources in this application will allow PNM to meet industry standard LOLE criteria for the provision of safe and reliable electric service. Also as described in my testimony, PNM's analysis of bids received in its all-resource RFP has resulted in the lowest reasonable cost resources to meet this need.

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS AND RECOMMENDATIONS.

A. I recommend that the Commission approve PNM's Application requesting to enter into three (3) ESAs totaling 250 MW of four-hour energy storage, one (1) PPA for 100 MW of solar energy, and a CCN to construct a 60 MW, four-hour BESS. All together PNM's recommended resource portfolio will move PNM to the current industry standard one day in ten year LOLE resource adequacy standard.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, I have nothing further at this time.

GCG#531704

Resume of Nicholas Phillips

PNM Exhibit NLP-1

Is contained in the following 2 pages.

Nicholas L. Phillips
EDUCATIONAL AND PROFESSIONAL SUMMARY

Address: 10 Hospital Center Commons, Suite 400, Hilten Head Island, Couth Carolina, 29926

Position: Director, Atrium Economics, LLC. October 2023 to present

Education: Bachelor of Science in Electrical Engineering, Washington University in St. Louis/University of Missouri - St. Louis Joint EngineeringProgram

Master of Engineering in Electrical Engineering, Electric Power and Energy Systems, Iowa State University of Science and Technology

Master of Science in Computational Finance and Risk Management, University of Washington Seattle

Employment: Director, Atrium Economics LLC

Director, Integrated Resource Planning, Public Service Company of New Mexico. June 2019 – October 2023

Principal with Brubaker & Associates, Inc. ("BAI"), a consulting firm specializing in public utility regulation, energy, and economics. September 2009 – June 2019

Professional Affiliations: Member of the Institute of Electrical and Electronic Engineers ("IEEE") Power Engineering Society

Testimony/Affidavits Presented Before:
Kansas Public Service Commission
Michigan Public Service Commission
Missouri Public Service Commission
Wisconsin Public Service Commission
Wyoming Public Service Commission
California Public Utilities Commission
Nevada Public Utilities Commission
Idaho Public Utilities Commission
Federal Energy Regulatory Commission
New Mexico Public Regulation Commission

NMPRC Testimony:

Case No. 13-00390-UT	PNM's SJGS Units 1 and 4 Abandonment
Case No. 15-00261-UT	PNM's 2015 General Rate Case
Case No. 15-00312-UT	PNM's AMI Application
Case No. 16-00276-UT	PNM's 2016 General Rate Case
Case No. 17-00044-UT	SPS Application for Wind CCN & PPA
Case No. 19-00018-UT	PNM's SJGS Units 2 and 3 Abandonment
Case No. 19-00195-UT	PNM's SJGS Replacement Resources Application
Case No. 20-00087-UT	PNM's Energy Efficiency 2021 Plan Application

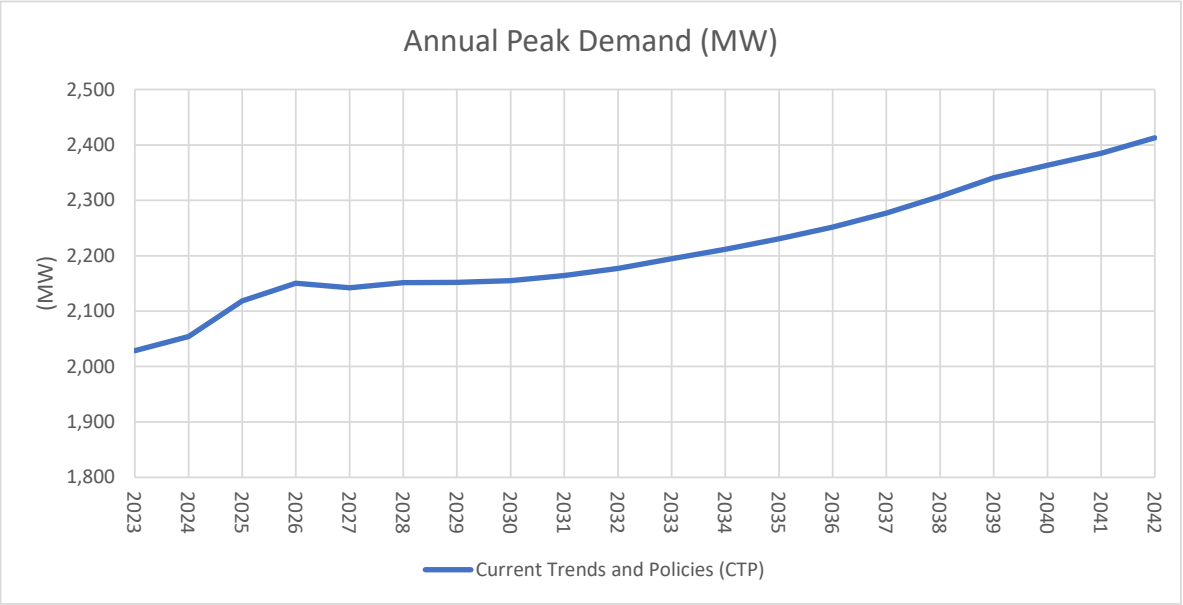
Case No. 20-00124-UT	PNM's 2021 Renewable Energy Plan
Case No. 20-00182-UT	PNM's SJGS Replacement Resources Compliance Application
Case No. 20-00218-UT	PNM's Demand Response Application
Case No. 21-00031-UT	Application for Facebook PPA and ESA 3
Case No. 21-00083-UT	Palo Verde Abandonment and Replacement
Case No. 22-00143-UT	PNM's 2023 RPS Application
Case No. 22-00270-UT	PNM's 2022 General Rate Case
Case No. 23-00138-UT	PNM's Energy Efficiency 2024 Plan Application
Case No. 23-00196-UT	PNM's 2024 RPS Application

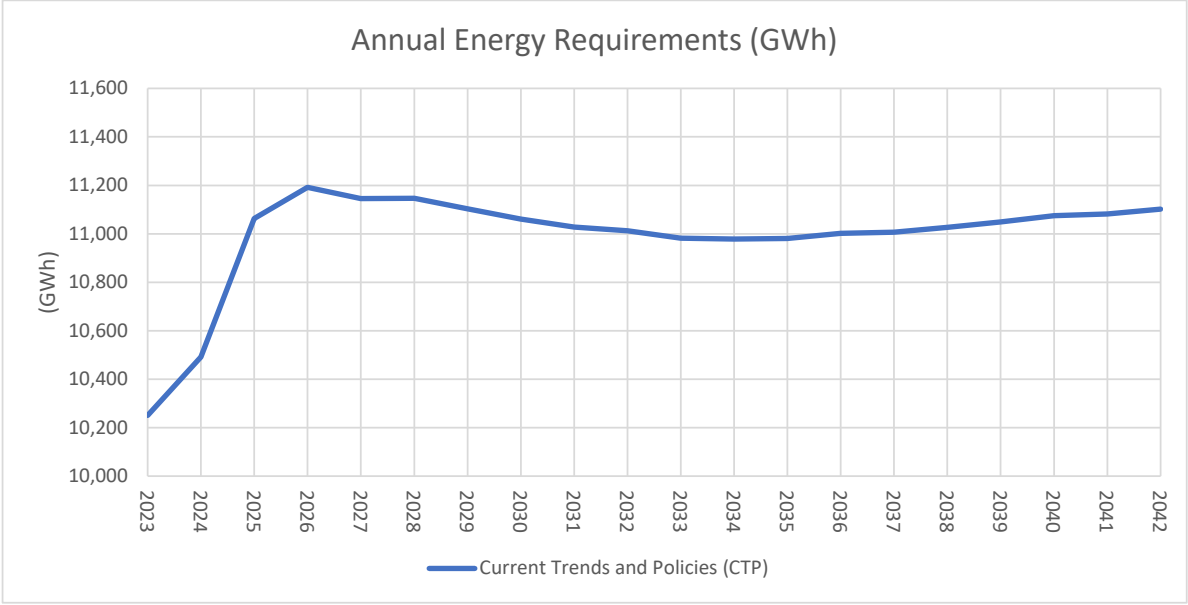
GCG#528279v4

Demand and Energy Forecast

PNM Exhibit NLP-2

Is contained in the following 1 page.

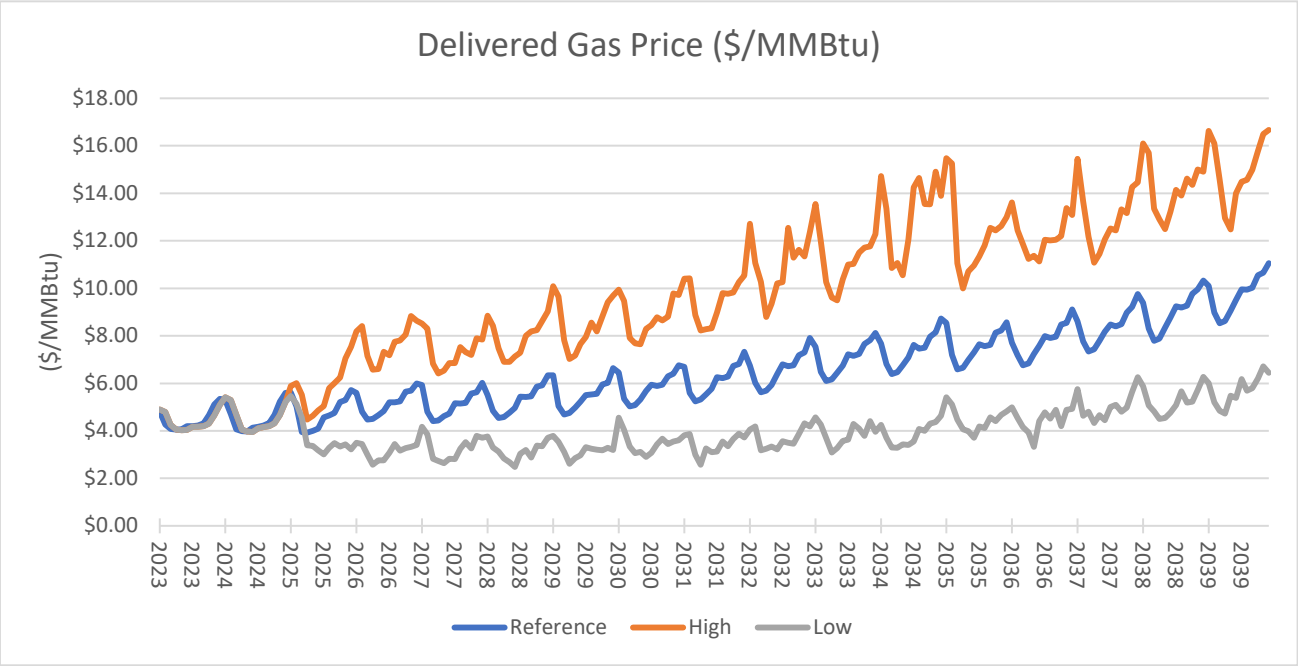

Annual Peak Demand (MW)
(MW)
2,500
2,400
2,300
2,200
2,100
2,000
1,900
1,800
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
Current Trends and Policies (CTP)

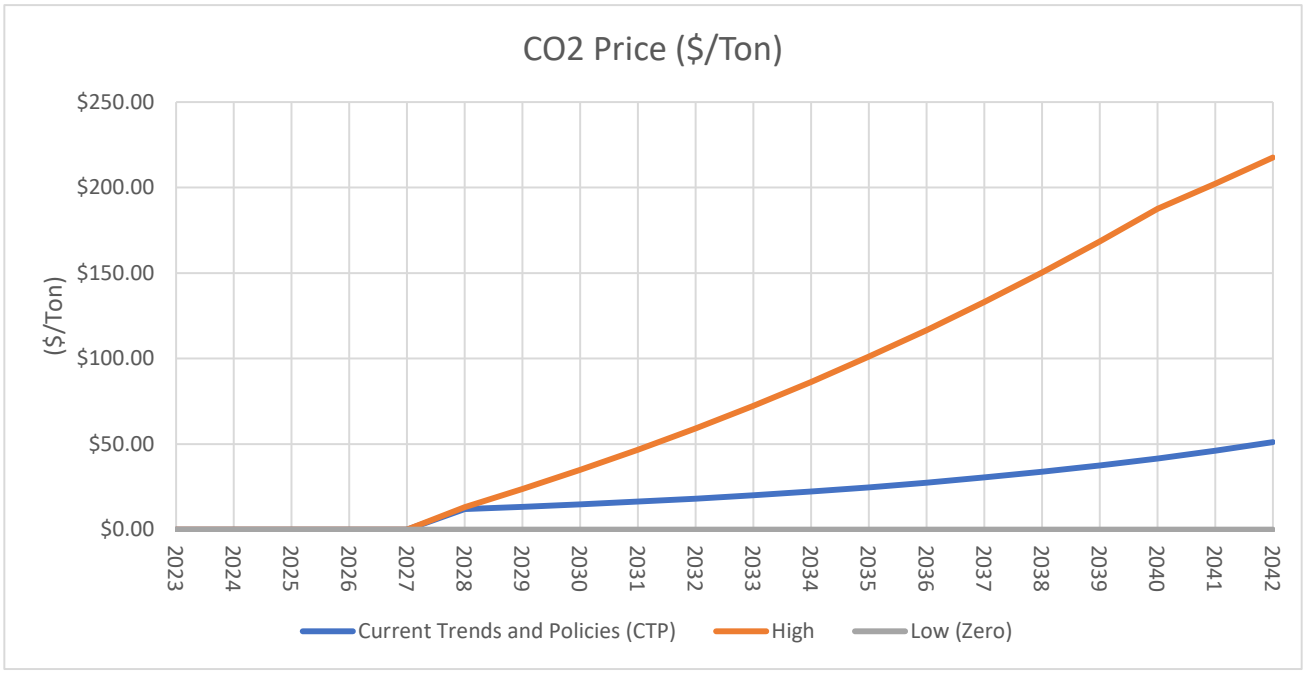

Annual Energy Requirements (GWh)
(GWh)
11,600
11,400
11,200
11,000
10,800
10,600
10,400
10,200
10,000
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
Current Trends and Policies (CTP)

Natural Gas and CO2 Price Forecast

PNM Exhibit NLP-3

Is contained in the following 1 page.

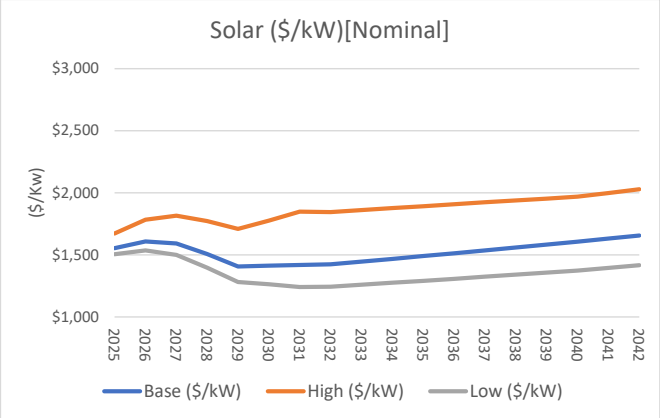

Delivered Gas Price ($/MMBtu)
($/MMBtu)
$18.00
$16.00
$14.00
$12.00
$10.00
$8.00
$6.00
$4.00
$2.00
$0.00
2023 2023 2024 2024 2025 2025 2026 2026 2027 2027 2028 2028 2029 2029 2030 2030 2031 2031 2032 2032 2033 2033 2034 2034 2035 2035 2036 2036 2037 2037 2038 2038 2039 2039
Reference
High
Low

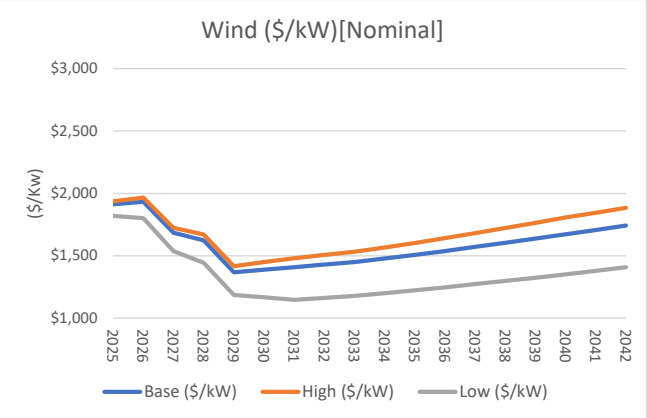

CO2 Price ($/Ton)
($/Ton)
$250.00
$200.00
$150.00
$100.00
$50.00
$0.00
2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042
Current Trends and Policies (CTP)
High
Low (Zero)

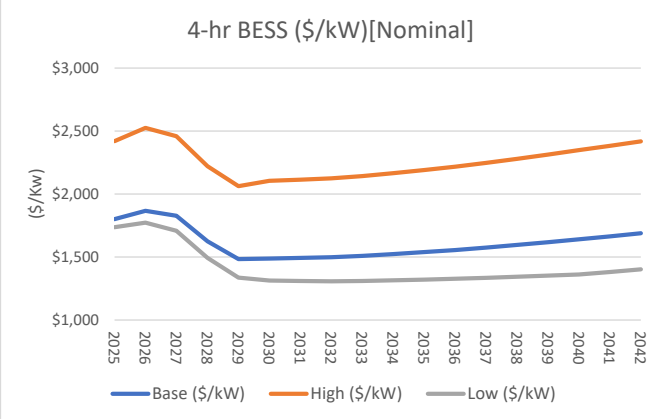
Technology Cost Forecast

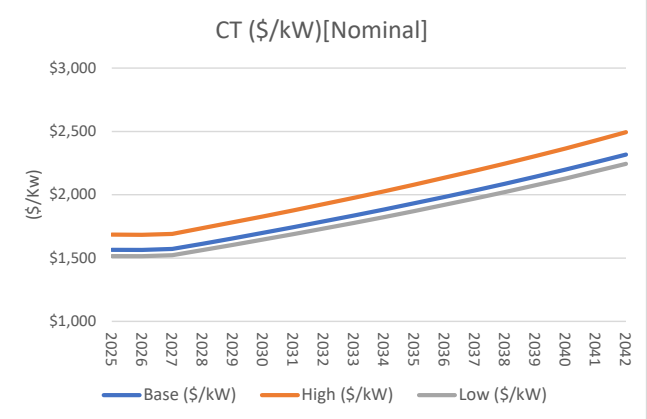
PNM Exhibit NLP-4

Is contained in the following 1 page.


Solar ($/kW)[Nominal]
$3,000
$2,500
$2,000
$1,500
$1,000
($/kW)
2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042
Base ($/kW)
High ($/kW)
Low ($/kW)


Wind ($/kW)[Nominal]
$3,000
$2,500
$2,000
$1,500
$1,000
($/kW)
2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042
Base ($/kW)
High ($/kW)
Low ($/kW)


4-hr BESS ($/kW)[Nominal]
$3,000
$2,500
$2,000
$1,500
$1,000
($/kW)
2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042
Base ($/kW)
High ($/kW)
Low ($/kW)


CT ($/kW)[Nominal]
$3,000
$2,500
$2,000
$1,500
$1,000
($/kW)
2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042
Base ($/kW)
High ($/kW)
Low ($/kW)

Effective Load Carrying Capabilities

PNM Exhibit NLP-5

Is contained in the following 1 page.

BESS 4-hr (% ELCC)																			
Load Level (MW)	Existing	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
0	84.8	88.8	88.8	88.8	88.8	88.8	88.8	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3
450		88.8	88.8	88.8	88.8	88.8	88.8	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3
900		64.3	64.3	64.3	64.3	64.3	64.3	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4
1350		43.1	43.1	43.1	43.1	43.1	43.1	56.2	56.2	56.2	56.2	56.2	56.2	56.2	56.2	56.2	56.2	56.2
1800		23	23	23	23	23	23	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8
2250		20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
2700		20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
9999		20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20

Solar (% ELCC)																		
Load Level (MW)	Existing	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
0	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
300		2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
600		1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
900		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
1200		0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
1500		0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
3000		2.85	2.85	2.85	2.85	2.85	2.85	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	2.44	2.44	2.44
3500		1.25	1.25	1.25	1.25	1.25	1.25	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.27	2.27	2.27
4000		1.25	1.25	1.25	1.25	1.25	1.25	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.27	2.27	2.27

Wind (% ELCC)		
Load Level (MW)	Existing	All-years
0	20.1	20.1
400		12.1
800		6.8
1200		3
1600		1
2000		0.5

Pricing Comparison (Fixed vs. Volumetric)

PNM Exhibit NLP-6

Is contained in the following 1 page.

Bidder No	Project Name	Project Structure	Tech	Storage Capacity	Co-Located Solar Capacity	Co-Located Solar Average Annual Output***	As-Bid Capacity Cost	Notional Contract Value - Capacity Price Basis	Volumetric Pricing Capacity Cost	Notional Contract Value - Volumetric Price Basis	Percent Change in Notional Value of Contract
				(MW)	(MW)	(MWh)	($/kW-mo)	$000	($/MWH)	$000	%
16-1		ESA	Stand Alone BESS	100	190*						7.80%
16-2		ESA	Stand Alone BESS	49.5	49.5*						9.63%
45-1.1		ESA	Stand Alone BESS	100	0						*N/A*
25-1		ESA	Hybrid	100	100						-0.98%
18-3.1		ESA	Hybrid	100	165						9.32%
23-2.1		ESA	Hybrid	100	200						129.01%
23-2.2		ESA	Hybrid	88	175						*N/A*
23-2.3		ESA	Hybrid	75	150						*N/A*
23-2.4		ESA	Hybrid	50	100						113.39%
18-3.2		ESA	Hybrid	50	165						9.58%

***Solar project previously approved by NMPRC**

****Prices include gross up for Gross Receipts Tax**

***** Estimated average solar output over contract term inclusive of degradation**

BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF PUBLIC SERVICE COMPANY OF NEW MEXICO'S APPLICATION FOR APPROVAL OF PURCHASED POWER AGREEMENTS, ENERGY STORAGE AGREEMENTS, AND CERTIFICATES OF PUBLIC CONVENIENCE AND NECESSITY FOR SYSTEM RESOURCES IN 2026,	)	**Case No. 23-00xxx-UT**
PUBLIC SERVICE COMPANY OF NEW MEXICO,	)	
Applicant	)	

SELF AFFIRMATION

NICHOLAS L. PHILLIPS, Director at Atrium Economics, LLC ("Atrium") upon penalty of perjury under the laws of the State of New Mexico, affirm and state: I have read the foregoing **Direct Testimony of Nicholas L. Phillips** and it is true and accurate based on my own personal knowledge and belief.

Dated this 25th day of October, 2023.

/s/Nicholas L. Phillips
NICHOLAS L. PHILLIPS