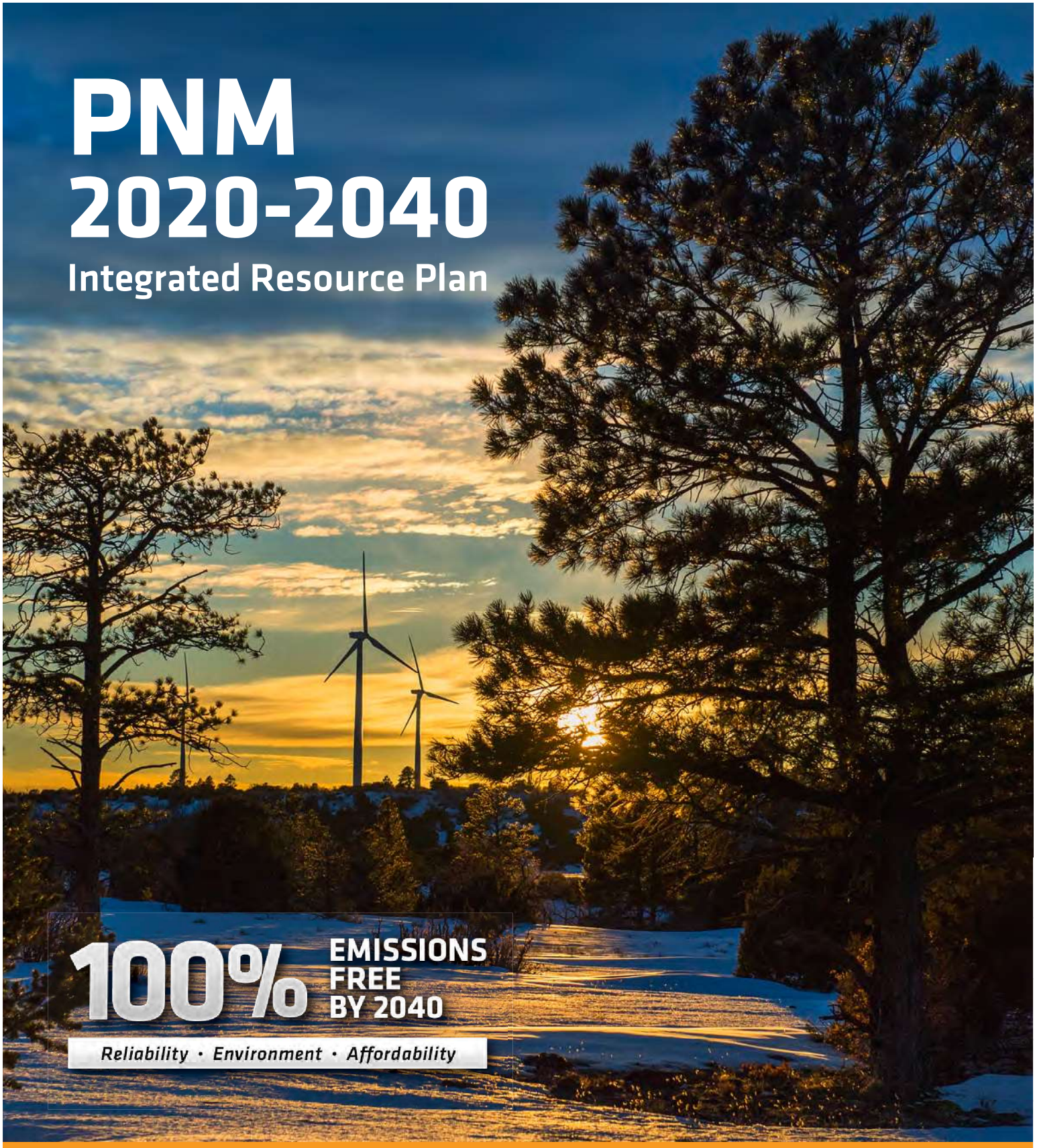
PNM 2020-2040

Integrated Resource Plan



Moving to the next decade of emissions-free electricity

January 29, 2021

PNM®

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Executive Summary

This is PNM's fifth Integrated Resource Plan (IRP) filed with the New Mexico Public Regulation Commission ("Commission"), but it is our first plan since announcing our commitment to achieve a carbon emissions-free portfolio by 2040. Like our prior plans, this IRP identifies the most cost-effective portfolio of resources to meet projected electricity demands over the next twenty years. This year, it does so in the context of our new long-term goal, providing a vision for our transition to a carbon emissions-free portfolio and taking our previous environmental stewardship to a new level.

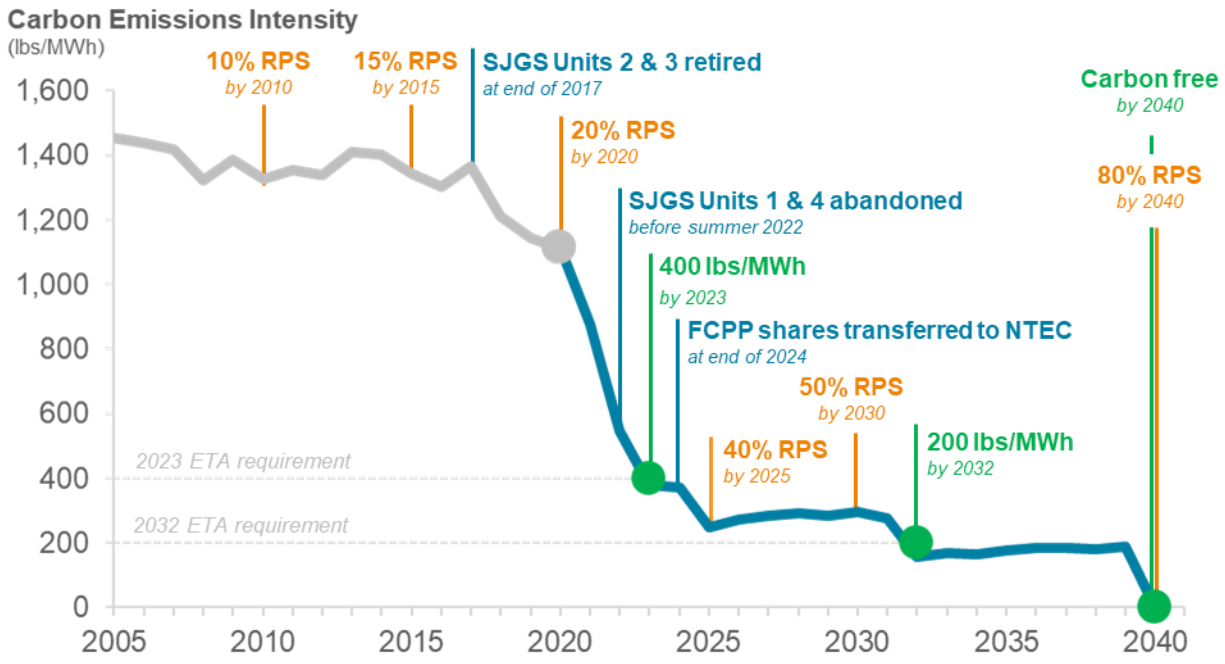
PNM's commitment to decarbonize aligns with the state of New Mexico's strong policy position to achieve deep reductions to its carbon footprint. In 2019, the governor signed into law the Energy Transition Act (ETA), which established significant long-term targets for utilities within the state:

- By 2040, all retail sales must be supplied by 80% renewable generation; and
- By 2045, all retail sales must be supplied by 100% carbon emissions-free generation.

Our governor also enacted Executive Order 2019-003, joining the US Climate Alliance in support of the 2015 Paris Agreement and establishing a goal to reduce economy-wide carbon emissions by 45% by 2030 (relative to 2005 levels). As the largest public utility in New Mexico, we recognize that we have a significant role to play in the effort to meet this goal and any others that may follow, and so this IRP takes on a scope and challenge beyond our previous IRPs by demonstrating our plans to eliminate a significant portion of the state's carbon emissions.

For this IRP, we have developed a twenty-year plan to transition our portfolio to meet our carbon-free goal and the requirements of the ETA. Figure 1 illustrates how our actions over this period will drive our emissions intensity to zero over the analysis horizon.

Figure 1. Historical and projected emissions intensity under our MCEP plans



Our plan to meet our customers' needs while facilitating a transition to a carbon-free portfolio comprises three main elements:

Transition away from aging baseload infrastructure: Since our 2017 IRP, we have developed plans to exit our shares of several of our largest legacy generation ownership resources. In 2019, under the terms of the ETA, we received approval from the Commission to abandon our 497 MW share of the San Juan Generating Station (SJGS) by June 2022. In 2020, we announced plans to return leased shares of the Palo Verde Nuclear Generating Station (PVNGS) in 2023 and 2024 and to exit our 200 MW share of the Four Corners Power Plant (FCPP) at the end of 2024, subject to Commission approvals. By 2025, PNM can be fully divested of coal generation, allowing us to reduce our emissions intensity below levels set by the ETA and paving the way for the long-term changes needed to meet our ultimate goal.

Invest in renewables, efficiency, and storage to decarbonize our energy supply: The investments that we make to replace our retiring resources will provide us with low carbon electricity far into the future, supporting our efforts to transition to a carbon emissions-free system by 2040. In 2019, our energy mix was roughly 44% carbon emissions free. With the replacement of SJGS with carbon-free resources this figure will increase to approximately 65% by the end of 2023 Meeting our goal of 100% by 2040 will require additional investments in a diverse set of resources, including renewables to supply carbon-free power, energy storage to balance supply and demand, and efficiency and other demand-side resources to mitigate load growth.

Retain and invest in firm capacity to maintain reliability: even as our portfolio transitions towards increased reliance on wind, solar, storage, and other emerging technologies, we envision a continued crucial role for traditional capacity resources. These resources, which include existing nuclear and natural gas plants that we may retrofit to operate on carbon-free fuels, are essential to maintaining resource adequacy due to their ability to serve as backstop resources when variable and energy-limited resources are not able to generate.

An Industry in Transition

This Integrated Resource Plan is set against a backdrop of an industry that is rapidly changing, creating a challenging and uncertain environment for resource planning. Our planning approach recognizes the unprecedented level of uncertainty we must consider while meeting short- and long-term needs. The most significant uncertainties that pose risks in our planning process are:

Changing customer needs & preferences: the nature of our service to customers is evolving in multiple ways: in our customers' preferences for clean energy and in the types of end uses we supply. Customers' demand for electricity will change with shifts and uncertainty in the economy.

Changing wholesale market dynamics: increasing retirements of firm generation throughout the West, coupled with significant investments in renewable generation across the region, are reshaping our opportunities to transact in wholesale markets.

Changing technology options: innovation and competition are continuing to drive cost reductions for existing technology and to bring new technologies into the market, including new options for energy storage, carbon-free fuels, and innovative demand-side resources.

Our planning process considers how these uncertain factors will affect our supply portfolio as we optimize our future energy mix.

Developing our Plan

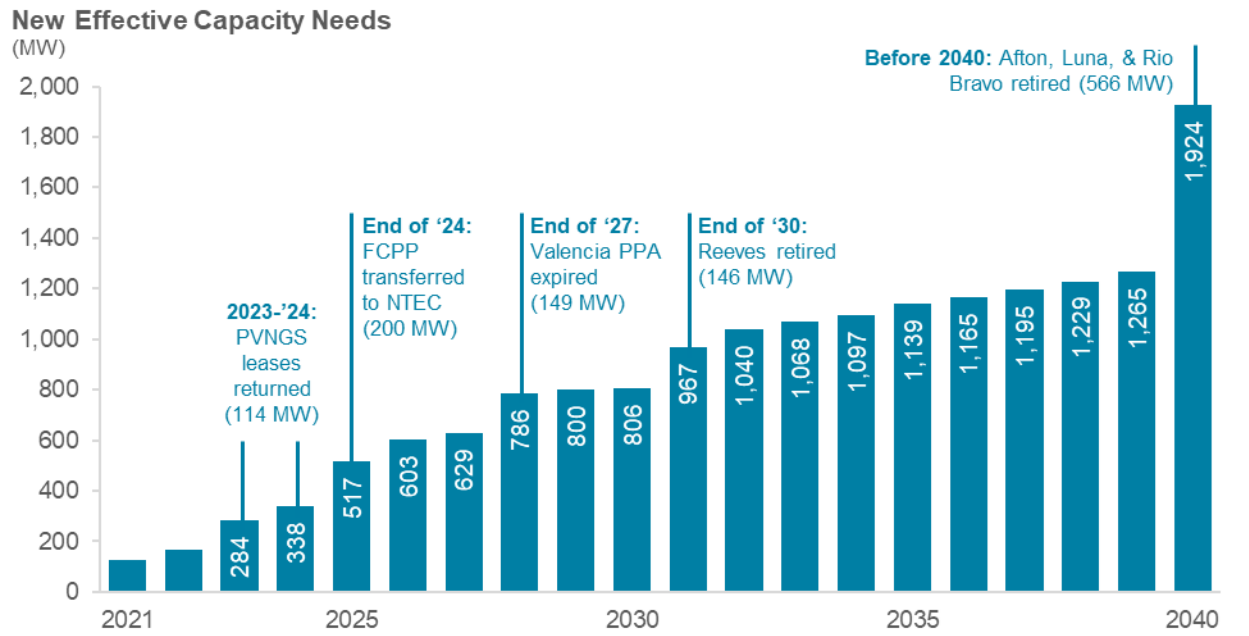
The goal of our IRP is to produce a "Most Cost-Effective Portfolio" (MCEP) that minimizes cost to our customers while meeting or exceeding reliability and environmental objectives; Figure 2 illustrates the primary objectives of the IRP process. We evaluated a wide range of different scenarios and sensitivities to identify the MCEP that meets the needs of our customers at lowest costs. From this MCEP, we identify a four-year "Action Plan" that reflects the near-term outcomes.

Figure 2. Pillars of our integrated resource planning process

Among these goals, we view the preservation of reliability for our customers as a fundamental requirement; achieving this as we increase reliance on renewable generation will require paradigmatic shifts in how we plan the system. In the past, our resource adequacy planning has focused on ensuring that we have sufficient capacity to meet peak demand; in the future, changes to our resource mix will lead to reliability challenges outside of this traditional peak period. By 2023, our new solar resources will shift our greatest reliability challenge into the summer "net peak" period after sundown. To prepare for these changes, we must rethink our framework for resource adequacy. Doing so means revisions and updates to our approach to resource adequacy to better account for our needs across all hours of the year, not just during the periods of peak demand.

Maintaining reliability while our demand grows and fossil resources are transitioned will require increasing investments in new resources that contribute capacity to our resource adequacy needs. Figure 3 shows our cumulative capacity needs over the 20-year IRP analysis horizon.

Figure 3. Summary of PNM's cumulative new capacity needs over time.



To identify a portfolio of resources that meets these needs and our other objectives, we rely on sophisticated commercial software tools designed to address the industry's most pressing questions. The complexity of the questions that our plan must address has increased as the diversity of new technology options has expanded. To develop and evaluate portfolios, our planning process relies primarily on two modeling tools:

1. **EnCompass**, a capacity expansion and production simulation model that we use to optimize and simulate portfolios least-cost resources to meet our future needs; and
2. **SERVM**, a loss-of-load probability model that we rely on for detailed reliability analysis of our portfolios.

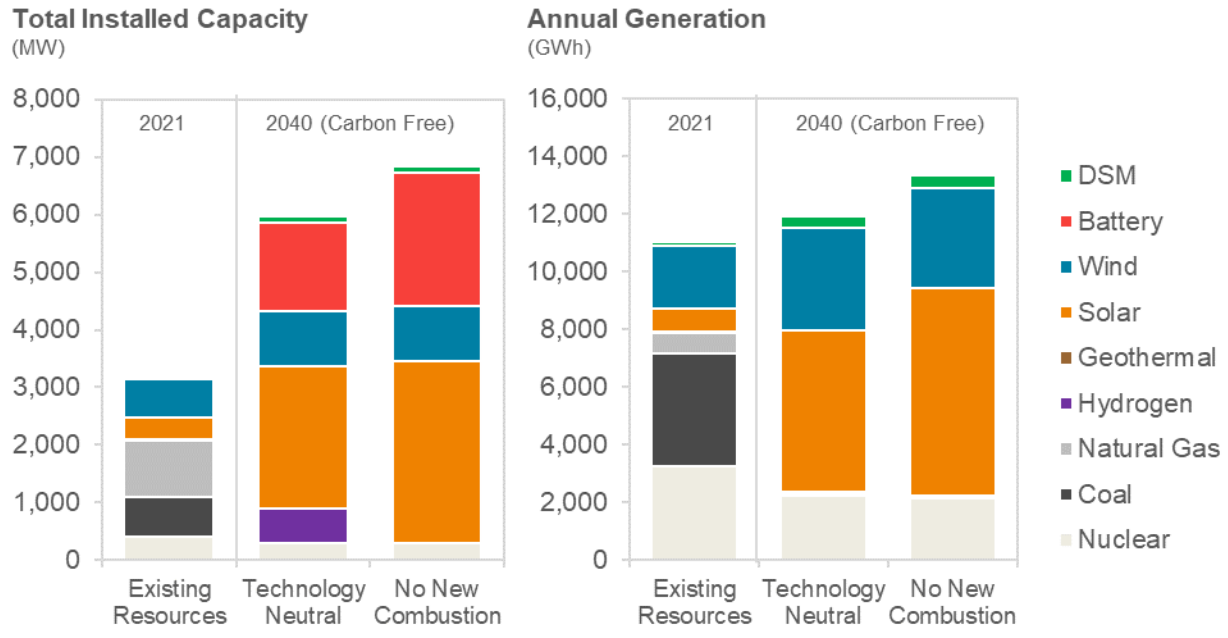
These two models provide complementary perspectives and together allow us to develop a plan that minimizes costs while meeting our reliability, regulatory, and environmental objectives.

Throughout this process, we have relied heavily on our stakeholders to provide valuable input, helping us establish the key questions within the scope of the IRP and develop reasonable inputs and assumptions. Since July 2019, PNM has hosted eleven public meetings to engage key stakeholders and solicit feedback to help inform our IRP. Through each of these meetings, our stakeholders have provided us with a diverse range of views and perspectives that have helped us refine the scope of our work and craft our plan to meet our key objectives.

Our Most Cost-Effective Portfolios

Our analysis in this IRP focused on a comparison of two primary paths to a carbon-free portfolio: (1) a **"Technology Neutral"** investment scenario that considers all possible technologies that could help meet our 2040 goals; and (2) a **"No New Combustion"** investment scenario that focuses on investments in renewables and storage. Figure 4 summarizes the portfolios of resources that achieve our 2040 carbon-free goals in each of these scenarios.

Figure 4. Summary of 2040 portfolios under Technology Neutral and No New Combustion portfolios



Higher annual generation in No New Combustion scenario offset by higher storage losses and off-system sales

In many respects, these two portfolios are very similar:

- Both portfolios require significant investments in new resources, roughly doubling the amount of installed capacity in our portfolio over the next 20 years;
- Both portfolios meet our 2040 energy needs with a carbon-free mix that is almost entirely supplied by nuclear, wind, solar, and DSM resources; and
- Both portfolios require significant investments in energy storage to meet balancing needs and to ensure resource adequacy.

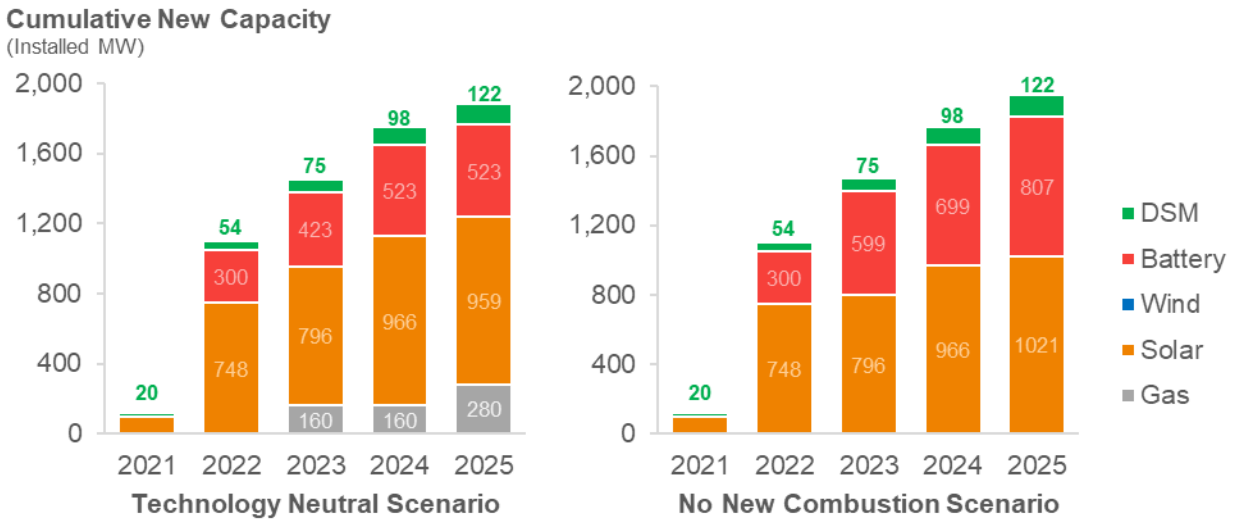
Where the two portfolios differ most significantly is in how we meet our resource adequacy needs:

- The Technology Neutral scenario relies on hydrogen-ready combustion turbines (CTs) to meet a portion of resource adequacy needs; these resources, which operate at low capacity factors throughout their lifetimes, are fueled by natural gas when brought online in the 2020s but are eventually converted to burn hydrogen by 2040.
- The No New Combustion scenario fills this same capacity need with incremental energy storage, requiring resources with increasing duration to offset storage's declining capacity value.

Based on the analysis conducted in this plan, both strategies can support our transition to carbon free while maintaining resource adequacy; however, there are a number of risks specific to a No New Combustion pathway that could lead to degradation of reliability below acceptable levels. While we recognize the appeal of storage as a non-fossil investment as well as the apparent risk of investing in new fossil asset before the viability of conversion to carbon-free fuels is certain, we will continue to prioritize reliability in our planning and procurement decisions.

Regardless of the pathway chosen, the next five years will require significant activity to enable progress towards our transition. Figure 5 shows the cumulative investments in each of these scenarios. Both will put us on a path to achieve a carbon emissions-free system by 2040.

Figure 5. Near-term investments in our Most Cost Effective Portfolios



Includes SJGS replacement resources (650 MW solar, 300 MW storage, and 15 MW DSM)

Our Four-Year Action Plan

As a first step towards this end point, our Action Plan comprises the following steps over the next four years:

Pursue abandonment and replacement of outstanding PVNGS lease interest and FCPP

- File for abandonment of the 114 MW of PVNGS leases and approval of replacement resources consistent with the identified MCEP paths.
- Issue an RFP for new capacity deliverable in 2025 to replace the FCPP capacity and file for approval of replacement resources by January 2022.

Complete annual filings for renewables and demand-side resources as required by the Commission

- Continue to develop and implement cost effective energy efficiency and demand management programs and file plans with the Commission.
- File Annual Renewable Energy Procurement Plans to demonstrate compliance with the RPS and request approval of new resources if needed.

Explore cost-effective options to maintain system supply and reliability

- Develop energy storage as a capacity resource and monitor its real-world performance in a resource adequacy context to better understand risks.
- Limit consideration of combustion-based resources to those that can be easily repurposed or retrofit to operate using carbon-free fuels, including hydrogen and renewable fuels.
- Continue to assess regional market depth and liquidity impact on resource planning decisions.
- Transition to the industry standard loss of load expectation of 0.1 days per year ("one day in ten years") to maintain best practices in reliability planning for our system.
- Explore rate design approaches that reflect customer use and load needs and evaluate energy efficiency and DSM program opportunities under the Efficient Use of Energy Act.

Continue to monitor and explore opportunities to advance transition to a carbon-free portfolio

- Monitor landscape of emerging technologies that could contribute to carbon-free goals, including generation resources, storage, and clean fuels.
- Utilize PNM's Wired for the Future program to pursue opportunities to modernize the grid and invest in transmission that supports the transition towards a carbon free system.
- Implement PNM's Transportation Electrification Program upon approval by the Commission.
- Assess potential load increases from economic development activities in PNM's service areas, in cooperation with state and local entities.

Conduct the 2023-2042 Integrated Resource Plan

- Address the implications of the expiration of supply contracts and any retiring resources.
- Consider the impacts of participation in the CAISO Energy Imbalance Market on our resource planning process and decisions.
- Apply co-optimization to generation, storage, and transmission as identified in this report to enhance coordinated planning efforts.
- Work with stakeholders in an ongoing collaborative public advisory process.