PNM 2023-2042 IRP: Initial Modeling Results

FACILITATED STAKEHOLDER MEETING #5

JUNE 15, 2023

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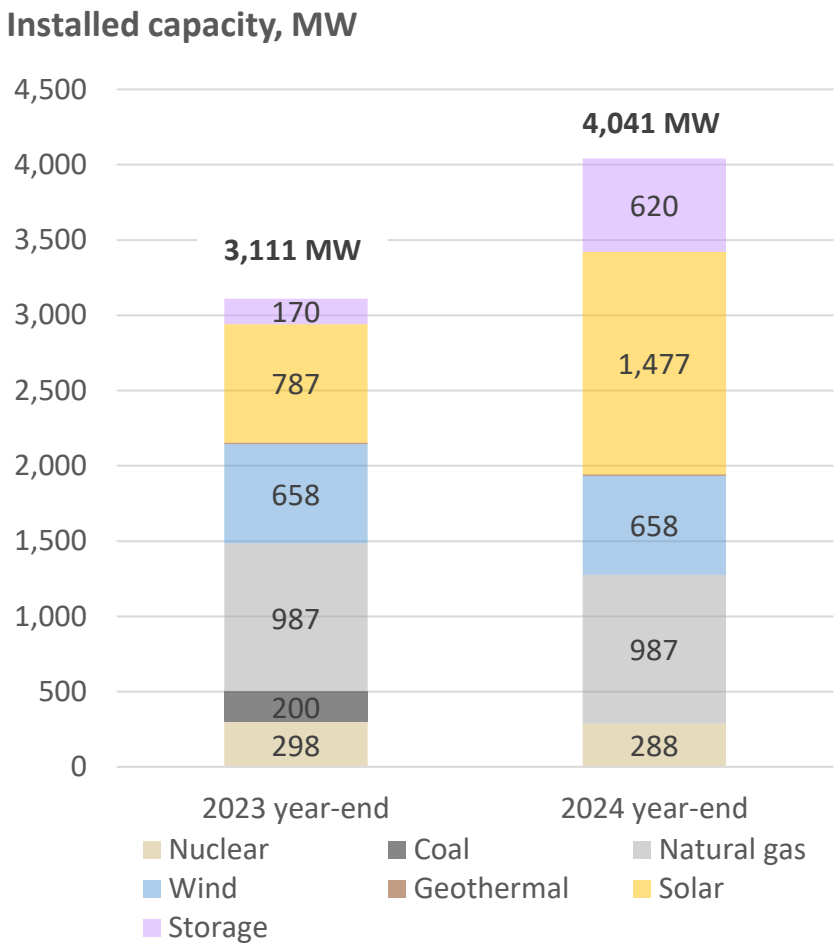
PNM'S EXISTING RESOURCE PORTFOLIO AND NEAR-TERM RESOURCE ADEQUACY



2024 capacity

Storage: 620

Solar: 1,477

Wind: 658

Natural Gas: 987

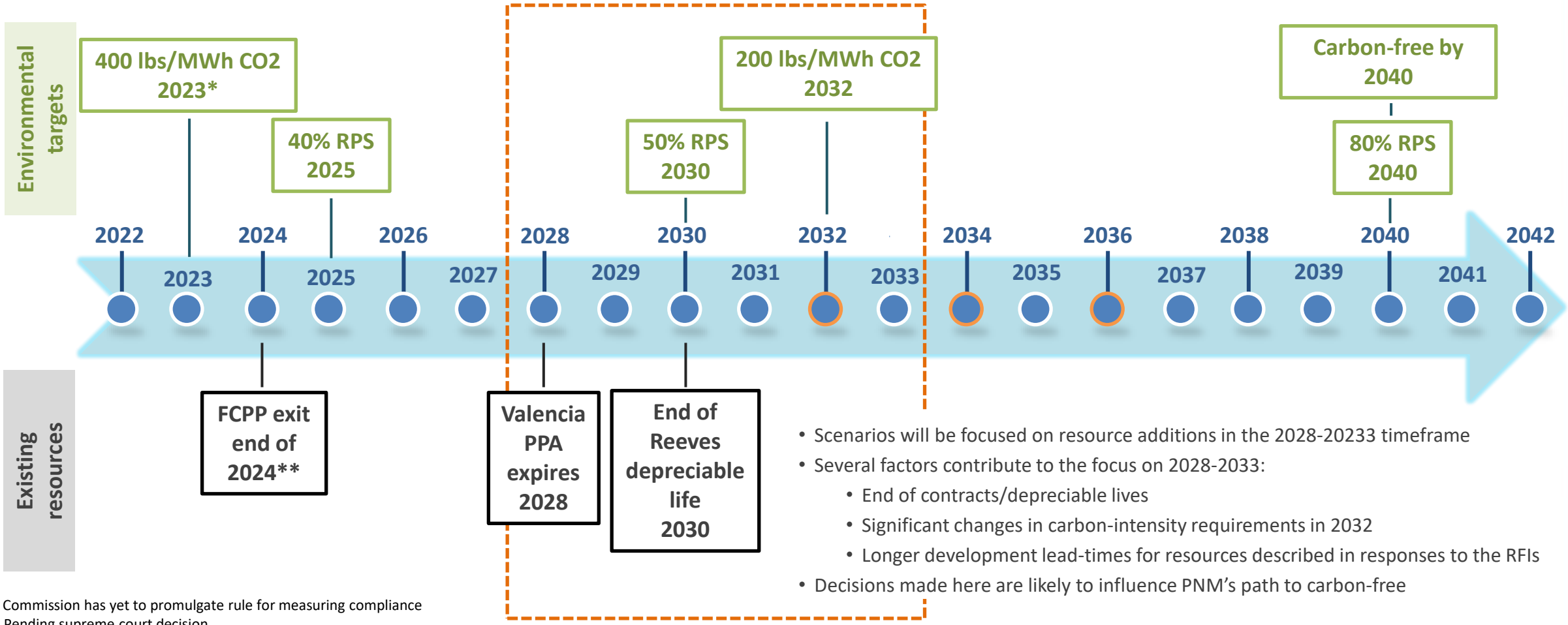
Coal: 0 MW (FCPP abandoned*)

Nuclear: 288 MW share of Palo Verde

*Pending appeal at NM Supreme Court

- Near term additions include 400 MW of solar and 170 MW of storage by the end of 2023
- By year-end 2024, PNM will have added an additional 690 MW of solar and 450 MW of storage
- RFPs for 2026-2028 are currently ongoing

KEY ELEMENTS WITHIN TIMELINE FOR 2023 IRP ANALYSIS POINT TO 2028-2033 AS A CRITICAL PERIOD



- Scenarios will be focused on resource additions in the 2028-20233 timeframe
- Several factors contribute to the focus on 2028-2033:
  - End of contracts/depreciable lives
  - Significant changes in carbon-intensity requirements in 2032
  - Longer development lead-times for resources described in responses to the RFIs
- Decisions made here are likely to influence PNM's path to carbon-free

* Commission has yet to promulgate rule for measuring compliance
** Pending supreme court decision

TECHNOLOGIES FOR PHASE 1 MODELING

Base technologies only

PNM relies on solar, wind, and storage (lithium-ion) to meet future need and carbon emission reduction goals

Base + long-duration Storage

PNM makes a commitment to add long-duration storage in the 2028-2033 timeframe to meet future capacity need and facilitate clean energy transition

Base + natural gas

PNM allows new build of natural gas resources that will be converted to utilize hydrogen in 2040

Base + wind expansion

PNM seeks strategic transmission expansion in the late 2020's/early 2030s to integrate a large quantity of wind resources

Base + carbon capture

PNM relies on carbon capture and sequestration technologies to meet future capacity need and facilitate clean energy transition

Base + H2/early gas conversion

PNM pilots use of hydrogen before 2040 by creating green hydrogen via electrolysis for use in new or existing CTs

Energy efficiency and demand response included in all scenarios

DISCLAIMER - RESULTS ARE PRELIMINARY DRAFT

- PNM has incorporated numerous updates to its modeling in this IRP cycle
- While we have taken every effort to ensure the validity of these techniques, please understand that the results we will discuss are considered preliminary draft results and will likely change as we continue to refine the analysis
- In previous IRP cycles we would not present results before a full draft of the IRP was ready; we have made efforts to get stakeholders involved earlier in this IRP cycle, starting the public advisory process earlier than ever
- In order to maximize stakeholder involvement, presenting preliminary results and inviting feedback earlier is equally important
- At this stage, we will highlight some of the key trends we see so far, and some of the areas that require further study and refinement

Preliminary results

PHASE 1 SCENARIOS EXPLORE ATTRIBUTES OF A VARIETY OF TECHNOLOGIES

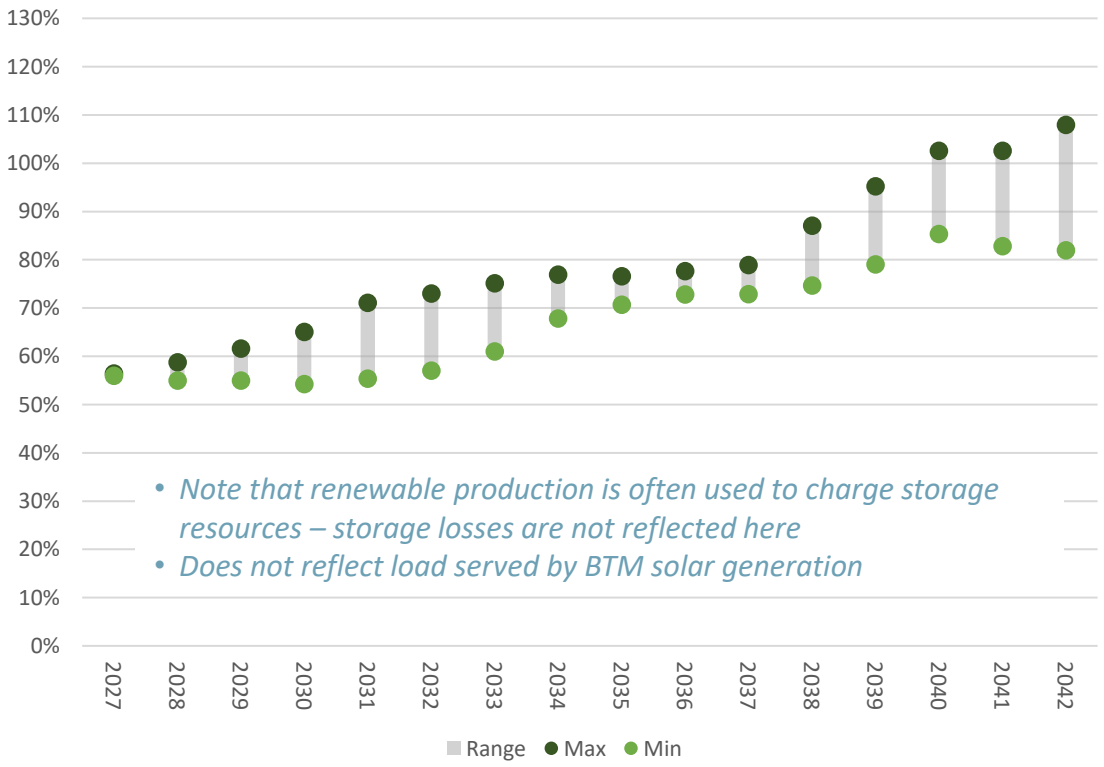
Scenario Name	Scenario-Specific Assumptions
Base technologies	Only solar, storage, and EE, DR allowed through 2032
LD storage - CAES	At least 100 MW of compressed air energy storage by 2032
LD storage - Flow	At least 100 MW of flow batteries by 2032
LD storage - IAS	At least 100 MW of iron air energy storage by 2032
LD storage - PHS 8-hr	300 MW of pumped storage (8hr) by 2032
LD storage - PHS 70-hr	300 MW of pumped storage (70hr) by 2032
LD storage - Thermal	At least 150 MW of thermal energy storage by 2032
Thermal - CT	New hydrogen-ready CTs allowed
Thermal - Linear	New hydrogen-ready linear generators allowed
Wind expansion	New wind & associated transmission allowed beginning in 2028
CCS - CCGT retrofit	Afton CC (235 MW) retrofitted with CCS capability
CCS - Net Power	280 MW NET power plant added by 2032
H2 - 250 MW	~250 MW hydrogen-fueled CT & ~750 MW electrolyzer added in 2031

- In Phase 1, technology-specific scenarios are screened under the Current Trends and Policy future for capacity expansion and production cost runs
- This approach gives PNM the ability to evaluate the overall portfolio costs associated with a range of scenarios
- Results presented today include:
  - Portfolio-level carbon intensity
  - Present value revenue requirement
  - New capacity additions through 2032/2042
- All portfolios required to meet reliability, RPS, and carbon-intensity targets

Preliminary results

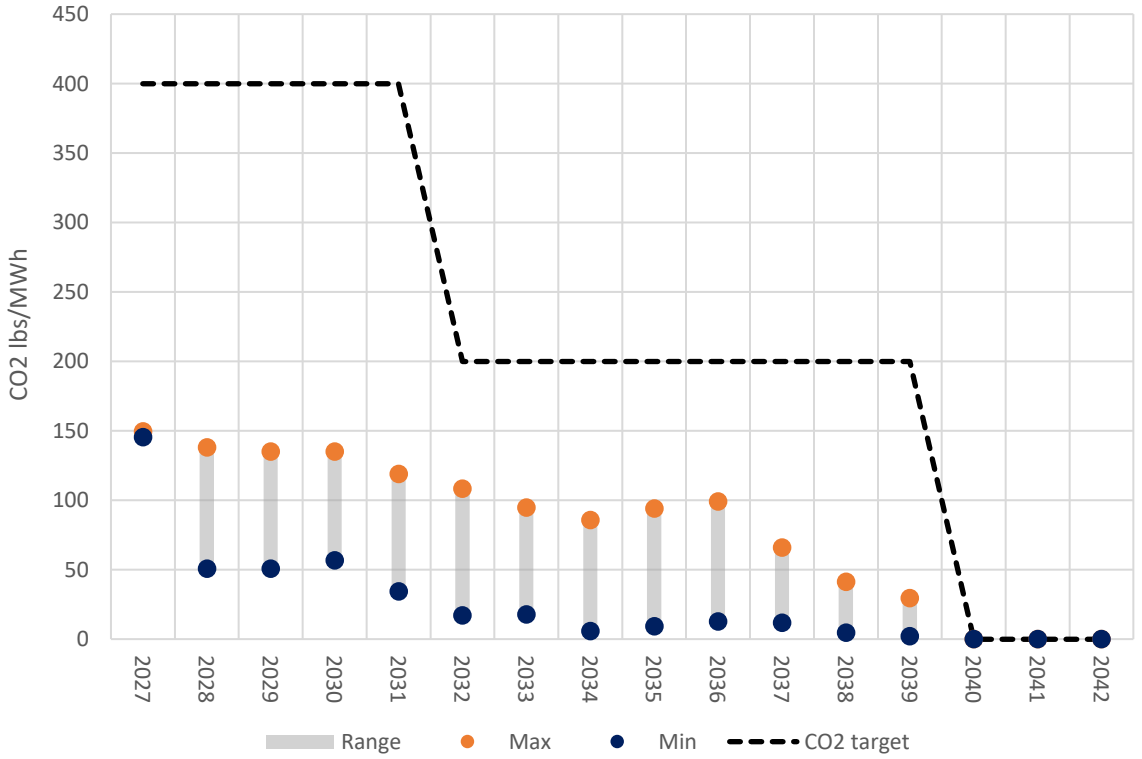
ALL PORTFOLIOS MEET ENVIRONMENTAL REQUIREMENTS

Renewable production as % of retail load across portfolios



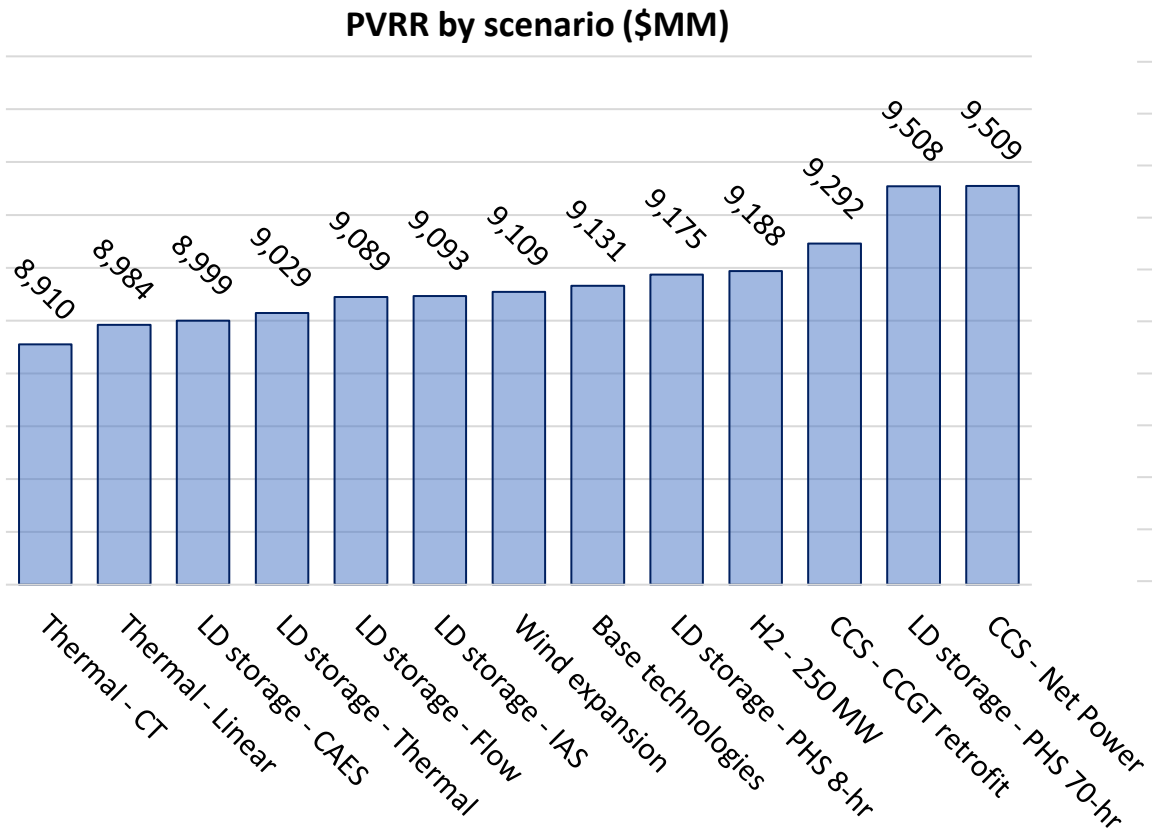
- *Note that renewable production is often used to charge storage resources – storage losses are not reflected here*
- *Does not reflect load served by BTM solar generation*

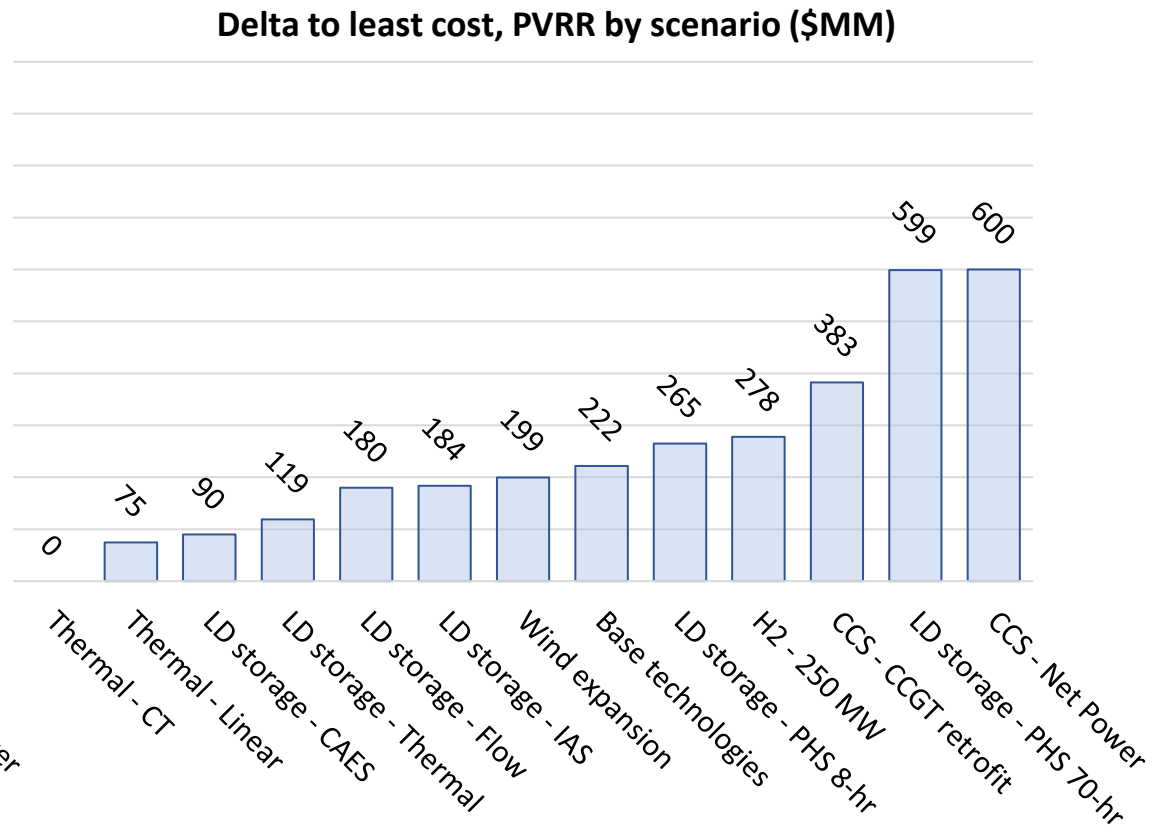
Carbon intensity across portfolios



Preliminary results

COST COMPARISON ACROSS SCENARIOS





Preliminary results

NEW RESOURCE ADDITIONS BY 2032 (GENERIC/RFI ADDITIONS 2025-2032, DOES NOT REFLECT RETIREMENTS)

Scenario	PVRR rank	Solar	Wind	Energy Efficiency	Demand response	Battery Storage	Pumped Storage	Long-Duration Storage	Electrolyzer	CTs	Linear generator	CCS Retrofits	NET power plant
Thermal - CT	1	193	-	152	42	684	-	-	-	164	-	-	-
Thermal - Linear	2	251	-	157	63	801	-	-	-	-	50	-	-
LD storage - CAES	3	318	-	153	42	747	-	200	-	-	-	-	-
LD storage - Thermal	4	221	-	155	63	658	-	150	-	-	-	-	-
LD storage - Flow	5	314	-	160	63	703	-	100	-	-	-	-	-
LD storage - IAS	6	191	-	154	63	753	-	100	-	-	-	-	-
Wind expansion	7	-	800	155	63	771	-	-	-	-	-	-	-
Base technologies	8	294	-	162	63	857	-	-	-	-	-	-	-
LD storage - PHS 8-hr	9	72	-	147	63	662	300	-	-	-	-	-	-
H2 - 250 MW	10	855	-	151	42	688	-	-	768	256	-	-	-
CCS - CCGT retrofit	11	338	-	161	63	945	-	-	-	-	-	196	-
LD storage - PHS 70-hr	12	249	-	149	63	435	300	-	-	-	-	-	-
CCS - Net Power	13	173	-	157	42	686	-	-	-	-	-	-	280

Preliminary results

NEW RESOURCE ADDITIONS BY 2042 (GENERIC/RFI ADDITIONS 2025-2042, DOES NOT REFLECT RETIREMENTS)

Scenario	PVRR rank	Solar	Wind	Energy Efficiency	Demand response	Battery Storage	Pumped Storage	Long-Duration Storage	Electrolyzer	CTs	Linear generator	CCS Retrofits	NET power plant
Thermal - CT	1	1,190	1,000	304	42	1,603	-	-	-	328	-	-	-
Thermal - Linear	2	1,429	1,000	308	63	2,181	-	-	-	-	50	-	-
LD storage - CAES	3	1,465	1,000	304	42	2,170	-	200	-	-	-	-	-
LD storage - Thermal	4	1,460	1,000	307	63	2,231	-	150	-	-	-	-	-
LD storage - Flow	5	2,097	800	314	63	2,284	-	100	-	-	-	-	-
LD storage - IAS	6	1,495	1,000	308	63	2,385	-	100	-	-	-	-	-
Wind expansion	7	1,528	1,000	309	63	2,603	-	-	-	-	-	-	-
Base technologies	8	2,095	800	316	63	2,542	-	-	-	-	-	-	-
LD storage - PHS 8-hr	9	1,473	1,000	298	63	1,836	300	-	-	-	-	-	-
H2 - 250 MW	10	4,516	-	303	42	3,716	-	-	768	256	-	-	-
CCS - CCGT retrofit	11	1,213	1,000	312	63	2,201	-	-	-	-	-	196	-
LD storage - PHS 70-hr	12	1,770	1,000	301	63	1,759	300	-	-	-	-	-	-
CCS - Net Power	13	1,470	1,000	304	42	2,328	-	-	-	-	-	-	280

Preliminary results

AREAS OF FOCUS FOR ADDITIONAL STUDY

- The Inflation Reduction Act (IRA) is a significant and complex piece of legislation that provides significant tax credits for investment in and production from a wide range of clean energy technologies
- Given the complexity of the IRA and lack of detailed guidance on all aspects, we are modeling the impacts given our current understanding – which will evolve as we continue to learn and better understand the IRA
- We continue to assess PTC interactions and implications for our modeling
- We continue to evaluate results and review our modeling approaches regarding RFI technologies and hydrogen
- We will use our initial results and findings to better inform next phase analysis

Preliminary results

PNM'S INITIAL OBSERVATIONS & NEXT STEPS

Initial Observations

- Due to favorable economics enabled by the IRA and diversity with solar, wind appears cost-effective across all portfolios; to the extent we can develop transmission, it may play a role in meeting near-term needs
- Solar and storage will play a key role in meeting our future needs, but meeting near-term needs with solar and storage exclusively is costly – we want to ensure we're taking steps to make other options available
- Multiple longer duration storage technologies can serve as viable solutions to meet reliability needs in the early 2030s and merit further investigation
- Thermal technologies provide cost savings and are a proven option – and we can add capacity without materially impacting any of our environmental objectives
- While natural gas scenarios are some of the lowest-cost, they hinge on the existence of a hydrogen economy by 2040 – further exploration of alternative options for these resources, should we invest in them, is needed
- Large tax credits for hydrogen production infrastructure and renewable production appear to provide some benefits to the hydrogen scenario; however, this is a very complex scenario, and warrants continued evaluation of IRA rules and technology advancements

Next Steps

- Examine how robust initial observations are to key uncertainties
- Explore implications of technology cost uncertainty upon results that rely heavily on emerging technologies
- Determine the cost to add additional wind/solar/battery storage capacity by 2040 should a hydrogen economy fail to materialize
- Construct hybrid scenarios that combine most attractive options identified in initial scenario analysis; Phase 2 modeling will inform us about synergies between technologies
- Conduct additional reliability modeling of most promising portfolio options

Preliminary results

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