Integrated Resource Plan:
Statement of Need Table of Contents
Working group suggestions for Public Service New Mexico - May 31, 2023

Statement of Need 17.7.3.10

- The statement of need is a description and explanation of the amount and the types of new resources, including the technical characteristics of any proposed new resources, to be procured, expressed in terms of energy or capacity, necessary to reliably meet an identified level of electricity demand in the planning horizon and to effect state policies.
- The statement of need shall not solely be based on projections of peak load. The need may be attributed to, but not limited by, incremental load growth, renewable energy customer programs, or replacement of existing resources, and may be defined in terms of meeting net capacity, providing reliability reserves, securing flexible resources, securing demand-side resources, securing renewable energy, expanding or modifying transmission or distribution grids, or securing energy storage as required to comply with resource requirements established by statute or commission decisions.

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1. Introduction

   The PNM Integrated Resource Plan 2023 [IRP-2023] [provides/brings] the [best/furthest] long range path for building out the strongest, most reliable electrical power delivery system for our customers over the next 20 years as we can envision [in 2023/now]. The IRP report begins with the current status of PNM's system, and shows how available resources and technologies can bring improvements. Simultaneously we recognize that changes are occurring in most every sector of the environment in which we operate. These will require ongoing re-evaluation and modifications to the 2023 IRP plan that will be incorporated in future triennial PNM IRPs.

   Meeting our clean energy goals and preserving system reliability while providing for the growing needs of our customers in an affordable manner will require the addition of significant amounts of new generation capacity over the next twenty years. We anticipate that over the seventeen years between today and 2040, the likely amount of new installed generation capacity will total between 4,000 to 5,000 MW or more. This amount of *new* capacity is significantly greater than the amount that exists today, implying that the achievement of our goals will require continuous and significant evolution of our portfolio.

2. Vision and Goals
   a. The identification of a set of resources and a sequencing of those resource deployments that conforms to the regulations and policies of the State of New Mexico, reliably serves all customers at an equitable cost that encourages consumer electrification efforts and that is resilient in the face of physical, cyber and environmental disruptions.
   b. Regulatory Environment and Requirements

        i. Legal requirements and standards in planning horizon
        ii. Known and expected rules
    c. Goals
        i. Reliability and Resiliency: Utility's Obligation to Serve
            1. Minimum Reserve Requirements
            2. Reliability Standards
            3. Swift recovery from climate or cyber disruption
        ii. Public Interest and Equity
            1. Responsibilities to Ratepayers and Shareholders
                a. Affordability
                b. Availability to Underserved Communities
                c. Climate Justice for individuals and communities impacted by plant retirements or local pollution
            2. Social and Environmental Costs
                a. Costs of Energy to Consumers
                b. Climate Change Impacts
                c. End of Life (Recycling/disposal)
            3. Consumer Education
            4. NIMBY
3. Current and Expected System Conditions
    a. Timeline
        i. Urgency (What is driving the urgency?)
    b. Load Forecast
        i. Electrification Impact
    c. Baseline System
        i. Forecasted Retirements
        ii. Transmission Constraints
        iii. Distribution System Constraints
4. Identified Decision Points and Pathways
    a. "Getting to Zero" Carbon
        i. Motivations
            1. Regulations & Policy
                a. ETA (2019)
                b. EPA - evolving
            2. Public Service in response to Mar 2023 IPCC report analysis - https://www.ipcc.ch/report/ar6/syr/ summary for policymakers - pg 23

b. Making "no regrets" decisions
    i. Minimizing investment risk
        1. Stranded assets
        2. Loss of public trust
ii. Maximizing investment opportunity
        1. First to market w/ long term solutions
        2. Public trust and sentiment

iii. Value of money vs future human life opportunities

c. Regional Planning and Coordination

i. Organized Market Opportunities

ii. Future Regional Transmission Operator

5. Resources

a. Candidate Resources

i. Renewable generation

1. Solar incl Community Solar

2. Wind

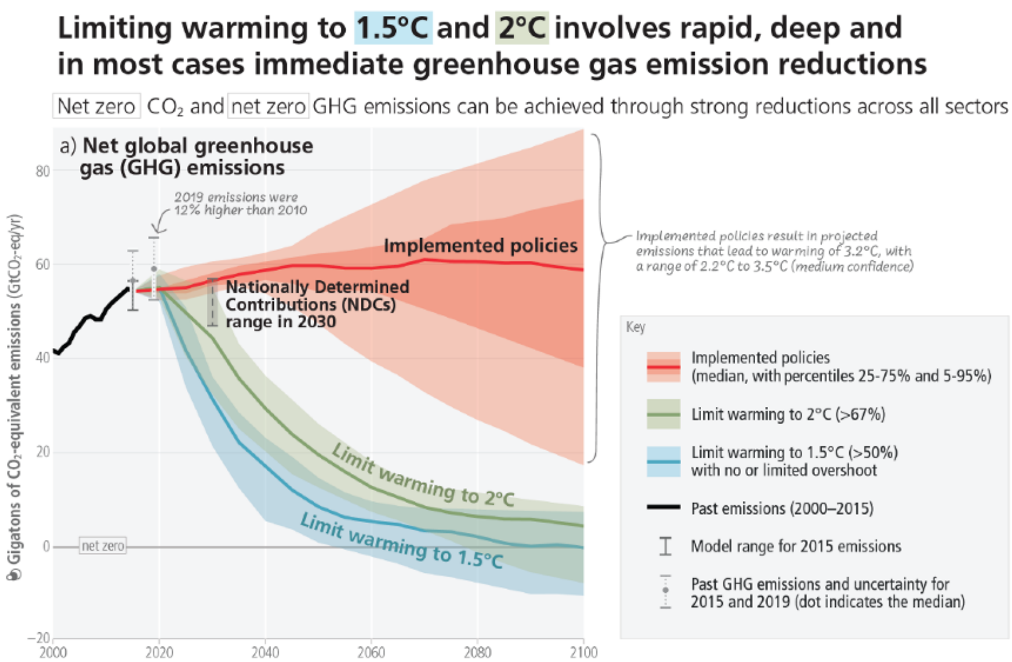
3. Geothermal

ii. No new gas of any type

iii. Energy Storage

1. Short duration (up to 10 hr)

a. Lithium-ion battery etc. see below charts

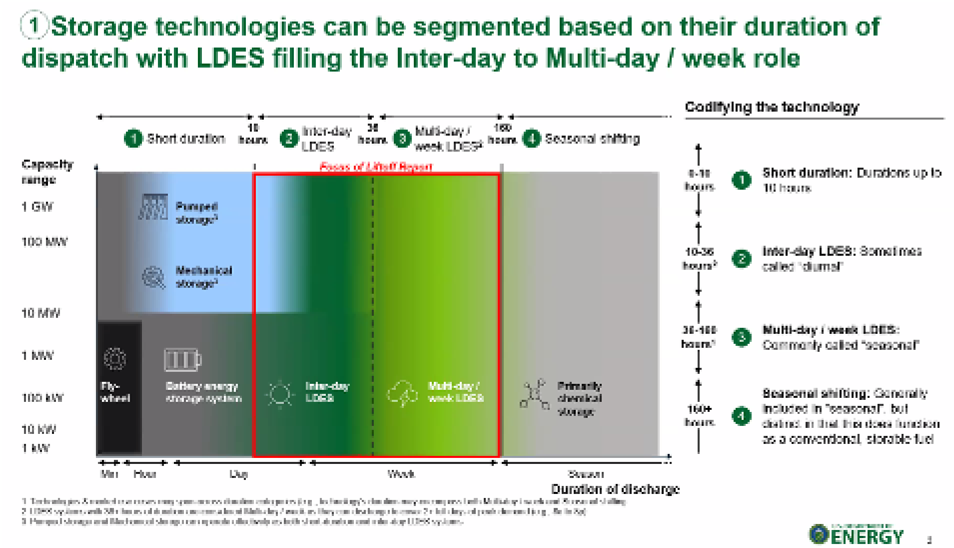


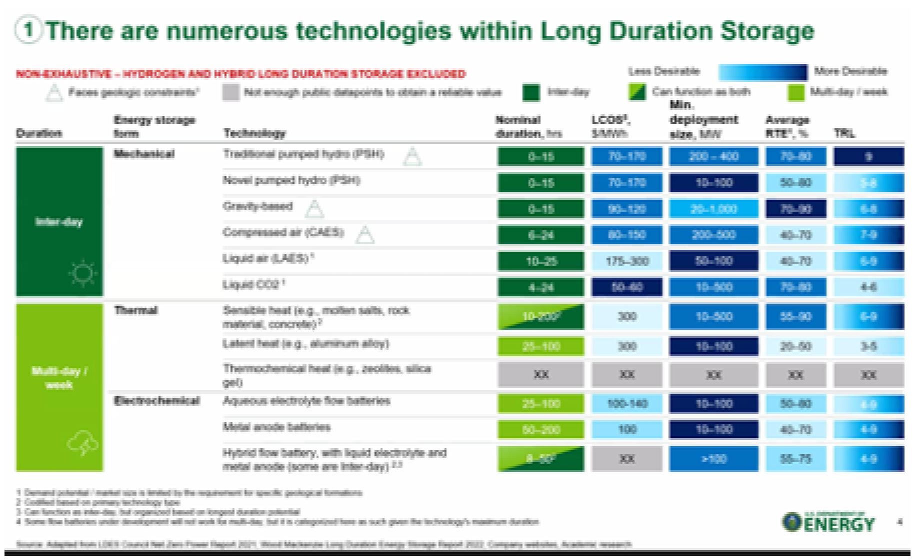
2. Inter-day & Multi-day/week Long Duration Energy Storage (LDES) - see charts below

3. Seasonal Shifting

a. Pumped-hydro storage, thermal energy storage, etc

4. Not for electric





Duration	Energy storage form	Technology	Nominal duration, hrs	LCOS[3], $/MWh	Min. deployment size, MW	Average RTE[4], %	TRL
Inter-day	Mechanical	Traditional pumped hydro (PSH)	0–15	70–170	200 – 400	70–80	9
		Novel pumped hydro (PSH)	0–15	70–170	10–100	50–80	5-8
		Gravity-based	0–15	90–120	20–1,000	70–90	6-8
		Compressed air (CAES)	6–24	80–150	200-500	40–70	7-9
		Liquid air (LAES)[1]	10–25	175–300	50–100	40–70	6-9
		Liquid CO2[1]	4–24	50–60	10–500	70–80	4-6
Multi-day / week	Thermal	Sensible heat (e.g., molten salts, rock material, concrete)[2]	10-200[3]	300	10–500	55–90	6-9
		Latent heat (e.g., aluminum alloy)	25–100	300	10–100	20–50	3-5
		Thermochemical heat (e.g., zeolites, silica gel)	XX	XX	XX	XX	XX
	Electrochemical	Aqueous electrolyte flow batteries	25–100	100–140	10–100	50–80	6-9
		Metal anode batteries	50–200	100	10–100	40–70	4-9
		Hybrid flow battery, with liquid electrolyte and metal anode (some are Inter-day)[2,3]	8–50[3]	XX	>100	55–75	4-9

a. Potential New Resources
    i. Adoption of new technologies
    ii. High Penetration of Distributed/Customer-owned Generation
    iii. Firming Plans
    iv. Energy efficiency and demand-response
    v. Cost-effective repowering or upgrading of existing fossil resources to minimize risk of stranded investment or delayed decarbonization
b. [System Needs]
c. Preferred Portfolio
    i. [results of PNM modeling]
    ii. Potential pilot projects
    iii. [PNM conclusions]

DETERMINATION OF THE RESOURCE PORTFOLIO:

A. To identify the most cost-effective resource portfolio, utilities shall evaluate all supply- side resources, energy storage, and demand-side resource options on a consistent and comparable basis, taking into consideration risk and uncertainty, including but not limited to financial, competitive, operational, fuel supply, price volatility, downstream impacts on transmission and distribution investments, extreme-weather events, and anticipated environmental regulation costs.
B. The utility shall evaluate the cost of each resource through its projected life with a life-cycle or similar analysis.
C. The utility shall consider and describe ways to mitigate ratepayer risk.
D. Each electric utility shall provide a summary of how the following factors were considered in, or affected, the development of resource portfolios:
(1) load management or modification and energy efficiency requirements;
(2) renewable energy portfolio requirements;
(3) existing and anticipated environmental laws and regulations, and, if determined by the commission, the standardized cost of carbon emissions;
(4) fuel diversity;
(5) susceptibility to fuel interdependencies;
(6) transmission or distribution constraints; and
(7) system reliability and planning reserve margin requirements.
E. Alternative portfolios. In addition to the detailed description of what the utility determines to be the most cost-effective resource portfolio, the utility shall develop alternative portfolios by altering risk assumptions and other parameters developed by the utility.