

RENEWABLE ENERGY RESOURCES

Resource	TRL	Development lead time	Capital cost, \$/kW (\$2022)	Other considerations
Solar	9	<2 years	\$1,269 ¹	PTC more beneficial than ITC
Wind	9	<2 years	\$1,713 ¹	Eligible for PTC

THERMAL ENERGY RESOURCES

Resource	TRL	Development lead time	Capital cost, \$/kW (\$2022)	Other considerations
Aeroderivative gas CT	9	Up to ~5 years	\$1,280 ¹	Conversion to CO2-free fuel
Linear generator units	8	<2 years	\$2,068 ²	Conversion to CO2-free fuel

1. Cost for 2025 delivery (reflects 2023 cost estimate); utilizes Siemens forecast reported in \$2021, converted to \$2022 assuming 8.0% inflation in 2022

2. Siemens forecast for 2025, initially reported in \$2021 and converted to \$2022 assuming 8.0% inflation in 2022

ENERGY STORAGE RESOURCES

Resource	TRL	Development lead time	Capital cost, \$/kW (\$2022)	Other considerations
Lithium-ion battery	9	<3 years	\$1,491 ¹	Best suited for shorter-duration solutions (30 minutes to 4 hours); storage ITC
Redox-flow battery	8	<5 years	\$4,254 ²	Best suited for longer-duration solutions (8-12 hours); storage ITC
Iron-air storage	8	<5 years	\$2,228 ²	Very-long duration/seasonal storage (100 hours); storage ITC
Pumped-hydro storage (10-hr)	9	5+ years	\$3,577 ²	Specific siting requirements, long duration (8-70 hours); storage ITC
Compressed air energy storage (Adiabatic, 24-hrs)	9	5+ years	~\$2,300 ³	Specific siting requirements, long duration; storage ITC
Liquified air energy storage	7-8	5+ years	\$3,147 ²	Long duration (~6-20 hours); storage ITC
Thermal energy storage	5	5+ years	~\$800 for thermal storage component ²	Utilized with existing infrastructure; long duration (4-168 hours); significant assumptions for modeling; storage ITC
Green hydrogen	5-6	5+ years	\$1,100 for electrolyzers, \$337/kW for CT conversion ²	Significant uncertainties around necessary CT upgrades to allow for 100% hydrogen combustion; uncertainties exist regarding storage/transport; PTC/ITC

1. Cost for 2025 delivery (reflects 2023 cost estimate); utilizes Siemens forecast reported in \$2021, converted to \$2022 assuming 8.0% inflation in 2022
2. Siemens forecast for 2025, initially reported in \$2021 and converted to \$2022 assuming 8.0% inflation in 2022
3. E3 estimate for 24-hr A-CAES 2030 capital cost (E3 *CPUC IRP Zero-Carbon Technology Assessment*)

CARBON CAPTURE RESOURCES

Resource	TRL	Development lead time	Capital cost, \$/kW (\$2022)	Other considerations
Post combustion carbon-capture	8	Up to 5 years	\$2,500-3,200 ¹	Utilized with existing infrastructure; ~99% carbon capture, uncertainties around CO2 storage/transport
NET power plant	7	5+ years	\$2,649 ²	Uncertainty around treatment of post-production carbon stream – likely need to sequester

1. E3 estimate for 2030 capital cost for ~99% carbon capture; ~90% carbon capture estimated to cost \$2,500-3,000/kW in 2030 (E3 *CPUC IRP Zero-Carbon Technology Assessment*)
2. Siemens forecast for 2025, initially reported in \$2021 and converted to \$2022 assuming 8.0% inflation in 2022

DISTRIBUTED ENERGY RESOURCES, ENERGY EFFICIENCY, AND DEMAND RESPONSE

Resource	TRL	Development lead time	2025 capital cost, \$/kW (\$2022)	Other considerations
BTM solar and/or storage	9	<2 years	NA	Currently a load modifier, could act like system resource with DERMS/AMI
Energy efficiency	9	<2 years	Multiple bundles ranging in price	Finite potential; treated as load modifier
Demand response	9	<2 years	~\$115-kW-year*	Modeled as system resource

* PNM is currently reviewing additional information regarding DR costs

OTHER RESOURCES NOT MODELED IN 2023 IRP

Resource	TRL	Development lead time	2025 capital cost, \$/kW (\$2022)	Other considerations
Geothermal	9	5+ years	\$7,800-9,800 (standard) ¹	Dispatchable, high-cost
Concentrated solar with thermal energy storage	8	5+ years	\$6,579 ²	ITC/PTC; ~10 hours of storage; cost-prohibitive
Small modular nuclear reactor	6-7	5-10 years	\$9,944 ²	Nuclear PTC; 80% RPS limits carbon-free energy from other sources
Gravity energy storage	8	5+ years	\$5,535 ²	Specific siting requirements; 2-18 hours of duration; storage ITC; cost-prohibitive

1. E3 estimate for 2030 capital cost; enhanced geothermal plant cost estimated to be ~\$9,000-52,000/kW (E3 *CPUC IRP Zero-Carbon Technology Assessment*)
2. Siemens forecast for 2025, initially reported in \$2021 and converted to \$2022 assuming 8.0% inflation in 2022