

Statement of Need

17.7.3.10 STATEMENT OF NEED:

- A. 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.
- **B.** 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.

Electric System Requirements - Tenets



SPS is committed to providing clean and reliable energy, while keeping bills affordable for customers

Resiliency is an equally important metric that, at times, can be challenging to quantify.

SPS takes a qualitative approach when evaluating the results of resource planning analyses to determine resiliency benefits and other factors outside the scope of economic modeling

Reliability versus Resilience

Reliability is the ability to maintain power delivery to customers in the face of routine uncertainty in operating conditions, as in cases of fluctuating load and generation, fuel availability, and outage of assets under normal operating conditions. Reliability events typically result in shorter outage durations (seconds to hours) and smaller areas of impact (facilities, campuses, or neighborhoods).

Resilience focuses on preparing for, absorbing, adapting to, and recovering from lowprobability, high-consequence disruptive events. Resilience events typically result in longer outage durations (days to months) and larger geographic areas of impact (states, regions, or islands). As a result, they could lead to cascading impacts in other critical infrastructures and parts of the economy.

Source: NREL

Determining the cost of resource portfolios

- SPS uses the EnCompass production cost model to determine the most costeffective portfolio(s) of resources to meet projected future energy demand
- Resource Portfolios must meet predetermined reliability and clean energy requirements (e.g., planning reserve margin requirements)
- System costs are calculated on a present value revenue requirement basis ("PVRR")
- Results are only as accurate as the modeling inputs critical inputs are often subject to sensitivity analysis (e.g., load forecasts, gas prices)

4

- Qualitative factors, often outside the scope of the model, should also be considered
- The lowest cost portfolio of resources *may not* be the optimal portfolio

Modeling System Reliability

Demand:

Resource portfolios must meet the 15% planning reserve margin requirement in *all* months.

Energy:

EnCompass will typically add either additional resources and/or purchase energy from the market to ensure energy adequacy in all hours. This is achieved by setting a high emergency energy cost.



Modeling Demand: Resource Capacity Accreditation

The Southwest Power Pool is responsible for determining the capacity accreditation for each resource type. The following capacity accreditation methodology is expected to be implemented before the action period:

Performance Based Accreditation

Tested capacity less 5-year average forced outage rate

- Thermal Generation
 - Combustion Turbine Generators
 - Combined Cycle Generation

Effective Load Carrying Capability Annual reliability studies performed by the Southwest Power Pool to determine resources contribution to system reliability

- Solar
- Wind
- Battery Energy Storage

The Southwest Power Pool incorporate a sum of the parts approach to hybrid resources. For example, a solar + wind hybrid project would receive the accredited capacity of the solar plus the wind generation (subject to point of injection capability)

6

ELCC Example

At 1,000 MW of Solar across the entire SPP footprint accreditation for Summer is 72% (e.g., 100 MW Solar facility would count 72 MW towards SPS capacity need

Declines as the penetration of solar generation increases



Modeling Energy: Dispatchable vs Intermittent

Resources can be defined as either dispatchable or intermittent. Dispatchable resources, including thermal generation and battery energy storage, can be called upon when needed (subject to start times, state of charge etc.). Intermittent resources, including solar and wind resources, have output controlled by the natural variability of the energy resource.

Intermittent

- No production cost First resources 'dispatched' to meet load
- SPS relies upon hourly production profiles for intermittent resources
- Capacity Factors
 - ~50% for wind resources
 - ~30% for solar resources

Dispatchable

- EnCompass then selects dispatchable resources (or market purchases) to meet the load not served by intermittent resources (and potentially sell into the market) that results in the lowest total cost
- Incorporates factors such as heat rate, round trip efficiency, cost of fuel, start times, min run times etc.

New Mexico - Renewable Portfolio Standards

- New Mexico Renewable Portfolio Standards require the following:
 - No later than January 1, 2015, renewable energy shall comprise no less than 15% percent of each public utility's total retail sales to New Mexico customers;
 - Increases to 20% no later than January 1, 2020;
 - Increases to 40% no later than January 1, 2025;
 - Increases to 50% no later than January 1, 2030;
 - Increases to 80% no later than January 1, 2040;
 - No later than January 1, 2045, zero carbon resources shall supply one hundred percent of all retail sales of electricity in New Mexico

SPS energy mix currently comprised of approximately 40% renewable resources



9

Modeling Clean Energy Requirements

- Resource Planning is conducted at the SPS system level (not individual jurisdictions)
- Can create challenges when modeling state specific requirements such as New Mexico's Renewable Portfolio Standards
- SPS typically does not constrain EnCompass for RPS compliance during the initial EnCompass analysis – instead, the results of the analysis are evaluated, and a second pass analysis conducted when necessary

Post Analysis Review

- EnCompass selects the most cost-effective portfolio of resources that meet predetermined reliability and clean energy requirements
- However, economic analyses do not fully capture all the complexities of integrated resource planning, for example (not exhaustive):
 - The benefits of locating generation in certain geographical areas
 - Resiliency benefits of alternative portfolios
 - Project risks (supply chain issues, generator interconnection risks)
- Factors such as these are evaluated on a qualitative basis and may result in additional modeling, or a different recommended portfolio

QUESTIONS ?



SYSTEM RESOURCES

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System Resources – Important Considerations

- Different resources play different roles in meeting demand and energy requirements
 - Time of generation vs peak load, system transients, weather, etc.
- Supply-side resources provide generation capacity to serve load
- Traditional supply-side resources are typically fossil fuel-based generation (thermal) that can be dispatched as needed to meet load
- Renewable resources are intermittent "as available" resources
- Energy storage resources are typically achieved through Battery Energy Storage Systems ("BESS")
- Demand-side resources typically act to reduce load
- Resource options must be economically viable
- Engineering, Procurement, Construction and Commissioning Timelines



Source: Google stock images

System Resources – Important Considerations

- System resources must connect to the Grid
 - Generator Interconnection Procedures: Attachment V of the Southwest Power Pool Open Access Transmission Tariff ("OATT").
 - New interconnection Section 3
 - Reuse existing interconnection Section 3.9
 - Surplus interconnection Section 3.3
 - Refer to <u>Generator Interconnection Southwest</u> <u>Power Pool (spp.org)</u>
 - High Level Fact Sheet may be useful: <u>generation</u> interconnection 4-pager 2022 03 01.pdf (spp.org)
- Replace/Repower Existing Interconnections
- New Interconnections
- DISIS



Source Image: Xcel Energy, CPR News

System Resources – Established Technologies

- Renewable Energy Resources:
 - Wind
 - Solar Photovoltaic ("PV")
- Thermal Energy Resources:
 - Combustion Turbine Generators ("CTG")
 - Combined Cycle ("CC")
- Energy Storage Resources:
 - Battery Energy Storage Systems ("BESS")
- Commercially competitive resources
- Modeling establishes portfolio, but all generation resources will be eligible to participate in the RFP process

System Resources – Renewable – Wind

- Converts the wind energy into electricity
- Large, three-bladed Wind Turbine Generators ("WTGs") aggregated to produce hundreds of MWs
- Intermittent resource
- Capacity factors range from 45%-55% in eastern New Mexico.

Wind turbine

- Moderate capacity accreditation due to noncoincidental peak generation profiles.
- Land use:125 acre/MW
- PTC/ITC Eligible





Xcel Energy's Sagamore Wind Farm, NM.

System Resources – Renewable – Solar (PV)

- Converts the sun's energy (photons of light) into electricity
- Several forms: Photovoltaic ("PV"), concentrating PV, or concentrating solar power
- Intermittent resource
- Capacity factors range from 30%-35% in eastern New Mexico
- Max output occurs prior to load peak, therefore, less capacity accreditation than nameplate
- Available during the daytime. Generation rises and falls with the sun barring any sky cover such as clouds or fog
- Land use: 8 acre/MW
- PTC/ITC Eligible



Xcel Energy's Sandhill Solar Farm, CO.

System Resources – Thermal – CTG

- Typically referred to a simple-cycles because they operate on a single thermal cycle known as the Brayton Cycle
- Operate on several fuel sources but are traditionally fired with natural gas with a backup fuel such as fuel oil
- Technological advancements have allowed utilization of carbon-free H2, currently blended
- Available in a wide capacity range from 4 MW to over 400 MW
- Provide extremely fast start capabilities and ramp rates, excellent load following
- Firm and dispatchable



Xcel Energy's Jones Station, TX.

System Resources – Thermal – CC

- Utilize CTGs in conjunction with Heat Recovery Steam Generators ("HRSGs") and a Steam Turbine Generator ("STG")
- Referred to as CCs because they combine the thermodynamic Brayton and Rankine Cycles
- Exhaust heat from the CTG(s) are ducted through the HRSG(s) to generator steam used by the STG
- Operate in multiple configurations, i.e., 1-on-1, 2-on-1, 3-on-1, etc.
- Operate on various fuel sources as well, including H2
- Come in a variety of sizes that can range from 100 MW to 1,600 MW
- Efficient due to the "waste" heat is used to generate electricity
- Excellent at load following
- Firm and dispatchable



Hobbs Generation Station, NM.

System Resources – Storage – BESS

- Power from Electrochemical Process, or other Potential Energy Sources (springs, gravity, etc.)
- Various battery chemistries available, Lithium-ion currently most prevalent
- Storage typically ranges in size from 10 MW to over 250 MW for durations from 2 to 8 hours
- Intermittent
- Dispatchable



Source Image: CESI

System Resources – Attributes

Attribute	CTG	CC	Wind	Solar	BESS ³
Firm and Dispatchable	Yes	Yes	No	N0	Yes
Limited Duration	No	No	N/A	N/A	Yes
Proposed Accreditation Method	PBA ¹	PBA ¹	ELCC ²	ELCC ²	ELCC ²
Summer Capacity Accreditation	>95%	>95%	~20%	~75%	>95%
Winter Capacity Accreditation	>95%	>95%	~20%	<5%	~80%
Construction Cost (\$/kW)	500-750	~1000	1,200-2,400	1,200-2,400	1,500-2,100
Heat Rate (MMBtu/kWh)	10	6	N/A	N/A	N/A
Expected Capacity Factor (%)	0-25	25-80	45-55	28-35	N/A
CO ₂ Free	No	No	Yes	Yes	N/A

1) PBA – Performance Based Accreditation

2) ELCC – Effective Load Carrying Capability

3) BESS – Battery Energy Storage System

System Resources – Emerging Technologies

- Battery Chemistries:
 - Iron-air
 - Redox-flow
- Nuclear:
 - Small Modular Nuclear Reactors
- New technology/retrofitting existing to utilize hydrogen combustion
- Carbon capture technologies
- Linear Generators
- Again, all generation resources will be eligible to participate in the RFP process

System Resources – Alternatives

- Behind the meter resources
 - Similar to supply side resources above, but behind the customer meter
 - Rooftop solar, etc.
- Demand Side Management or Demand Response
 - Participation in programs that incentivize reduced consumption during periods of high electricity demand
 - Smart thermostats
 - Smart meters can help inform and shape load profiles
- Energy efficiency
 - Use of more efficient equipment, appliances, lighting, etc.
 - Insulation and weatherization of homes

QUESTIONS ?

