Public Advisory Group Special Session on Resource Analysis for 2018 IRP

October 20, 2017

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Agenda

1) Summary of PRC requirements for Resource Analysis
2) Discussion of Supply Side Resources
3) Discussion of Demand Side Resources, Energy Storage, Rate Design
4) Conclusion

Summary of PRC requirements for Resource Analysis

From the Rule 17.7.3 on Integrated Resource Plans for Electric Utilities (cont.)

1) The purpose of the IRP process is **"…to identify the most cost effective portfolio of resources to supply the energy needs of customers."** (17.7.3.7)
2) "most cost effective resource portfolio means **those supply-side resources and demand-side resources that minimize the net present value of revenue requirements** proposed by the utility to meet electric system demand during the planning period consistent with reliability and risk considerations" (17.7.3.7)
3) "To identify the most cost-effective resource portfolio, **utilities shall evaluate all feasible supply, energy storage, and demand-side resource options on a consistent and comparable basis**, and take into consideration risk and uncertainty (including but not limited to financial, competitive, reliability, operational, fuel supply, price volatility and anticipated environmental regulation). The utility shall evaluate the cost of each resource through its projected life with a life-cycle or similar analysis."
4) "The utility shall also describe how **changes in rate design might assist in meeting, delaying or avoiding the need for new capacity**."

Resource Evaluation on a Comparable Basis

Supply Side Resources

1) Solar
2) Wind
3) Biomass
4) Geothermal
5) Gas Fired CC
6) Gas Fired CT
7) Gas Reciprocating Engine

8) Solar w/declining costs

9) Wind w/declining costs

10) Solar w/storage

11) Solar w/storage and declining costs

12) Purchased power spot buy

Solar with Declining Costs
(Merrie Lee Soules)

A. Utility scale solar costs have decreased by 85% over the last seven years (*Lazard's Levelized Cost of Energy – 10.0*)
B. Utility scale solar costs will continue to decrease but at a more modest rate

- Use capital cost = $1450/kW (2019), $1400/kW (2020), $1350/kW (2021), $1300/kW (2021), $1250/kW (2022), $1200/kW (2023), $1150/kW (2024), $1100/kW (2025), $1050/kW (2026), $1000/kW (2027), $950/kW (2028), $900/kW (2029)
- Fixed O&M = $12.00/kW-yr

Wind with Declining Costs
(Merrie Lee Soules)

A. Utility scale wind costs have decreased by 66% over the last seven years (*Lazard's Levelized Cost of Energy – 10.0*)
B. Utility scale wind costs will continue to decrease but at a more modest rate

- Use capital cost = $1700/kW (2019), $1675/kW (2020), $1650/kW (2021), $1625/kW (2021), $1600/kW (2022), $1575/kW (2023), $1550/kW (2024), $1525/kW (2025), $1500/kW (2026), $1475/kW (2027), $1450/kW (2028), $1425/kW (2029)
- Fixed O&M = $40.00/kW-yr

Solar with Storage PPA
(Merrie Lee Soules)

A. Tucson Electric Power (TEP) announced a Purchased Power Agreement (PPA) with NextEra Energy for solar with energy storage at $0.045/kWh (*Utility Dive, May 30, 2017*)
B. Subsidies for solar combined with storage continue to be available

- Assume 100MW solar array, 30MW 120MWh storage capacity
- Assume PPA at $0.045/kWh for 20 years

Solar with Storage PPA Declining Costs
(Merrie Lee Soules)

A. The cost of Solar continues to decline
B. Subsidies for solar combined with storage continue to be available
C. The cost of energy storage is expected to decrease dramatically

- Assume 100MW solar array, 30MW 120MWh storage capacity
- Assume 20 year PPAs will decline in cost over time
- Use $0.045/kWh (2020), $0.043/kWh (2021), $0.041/kWh (2022), $0.039/kWh (2023), $0.037/kWh (2024), $0.035/kWh (2025), $0.032/kWh (2026)

Purchased Power Spot Buy
(Merrie Lee Soules)

A. The Native System Peak Demand in 2016 of 1892MW occurred on July 14, hour 1500-1600.
B. EPE made spot buy purchases of power amounting to 325MW at this peak
C. EPE paid prices ranging from $53.95/MWh to $60.00/MWh *(EPE's Objections and Responses to CLC's First Set of Discovery, Case No. 17-00090-UT, June 29, 2017)*
D. Due to substantial amounts of renewables in other markets in the western grid and available transmission capacity, purchased power spot buys are not limited going forward

- Use $75.00/MWh for Purchased Power Spot Buys up to 325 MW

Demand Side Resources, Energy Storage, and Rate Design

1) Demand Management
2) Distributed Generation
3) Generators at Customer Location
4) Energy Storage
5) Energy Efficiency
6) Rate Design

Demand Response
(Phil Simpson)

1. The following 2 slides address limited aspects of Demand Response (DR)
2. Only “Firm” resources are included, meaning “directly controlled by the utility or scheduled ahead of time.” This reduces risk and increases reliability
3. “Non-Firm” resources outside of the utility’s direct control, driven by modified customer usage based on pricing mechanisms, are not included here
4. DR is an alternative to generation at or near peak load. Other uses are contingency reserves, regulation, and load following, and add significant value not accounted for here *(See EPE “Resource Intermittency” slide 33 from October 5, 2017 PAG presentation)*

Demand Response (Firm)

(Phil Simpson)

1) The Northwest Power Conservation Commission (NWPCC) specifies 600 MW of demand response load shifting off of peak as part of its least cost portfolio.
2) Measures include Direct Load Control (DLC) or Programmable Communicating Thermostats (PCT) to firmly control air conditioning, irrigation pumping, space heating, water heating, and lighting, as well as curtailable/interruptible agricultural/industrial loads *(Chapter 14, Demand Response, Seventh Northwest Conservation and Electric Power Plan)*
3) Total resource costs range from $25/kW-yr to $144/kW-yr, with most potential capacity below $57/kW-yr (Capital + Fixed O&M)*(Chapter 14 and Appendix J: Demand Response Resources, Seventh Northwest Conservation and Electric Power Plan)*
4) The NWPCC also identifies a dispatch cost of $110/MWh (Dispatch costs are incentives and variable costs; equivalent to EPE's variable O&M costs)

- **Assume 40 MW of demand response is cost effective for EPE (proportional to 600MW for Northwest Power region, based on ratio of peak loads)**
- **Use $60/kW-yr for the total resource cost and a dispatch cost of $110/MWh**

Demand Response Enhanced eSmart Program
(Phil Simpson)

1) Enhancement of current EPE eSmart thermostat program
   A. Increase rebate from $125 to $250 customers that connect an eSmart qualified thermostat to EPE's system
   B. Increase the seasonal payment from $25 to $100
   C. Remove the limit of 3,000 customers
2) PNM reports that each connection averages 1.02kw/connection of potential demand reduction (*2016 PNM Report issued May, 2017)*
3) Assume 20% of EPE's residential customers would enroll = 16,600 customers

- Assume 16MW capacity for $4.15M for initial connections and $1.67M per year for seasonal payments

Distributed Generation
(Merrie Lee Soules)

1) In 2017, incentives in the form of New Mexico Tax credits and Renewable Energy Certificate payments were eliminated
2) This resulted in slowing the rate of growth in Distributed Generation (DG) installations from an average of 46% annual increase in installed capacity to 23% increase in installed capacity from 2016 to 2017 (pg 35, EPE material dated August 8, 2017)
3) Reintroducing REC payments would increase the installation rate of DG capacity

- Assume REC payments of $20/MWh would increase the installation rate by 5 percentage points per year
- Assume REC payments of $40/MWh would increase the installation rate by 10 percentage points per year
- Assume REC payments of $80/MWh would increase the installation rate to 100%

Generators at Customer Locations
(Allen Downs)

1. Many larger customers have emergency backup generators
   A. Many are 100MW and up
   B. All are unused most of the time
   C. Could be a resource for EPE to handle peak loads
2. Supply side – power to the grid
   A. Full output of generator available to EPE to meet peak
   B. Generator must be synchronized with the grid to connect
   C. No interruptions to customer load
3. Demand side – handle all or part of customer load
   A. All or part of customer load removed from grid
   B. Will always be less than full output of generator
   C. Customer load interrupted during switchover
4. EPE would
   A. Provide necessary equipment & labor for initial setup
   B. Be responsible for routine maintenance and testing
   C. Pay for or supply fuel
   D. Have access to generator to meet peak demand or system emergencies
5. Customer would
   A. Be relieved of costs of maintaining and running generator
   B. Make any changes needed (RPS?) to handle switchover glitches
   C. Negotiate with EPE concerning payment of any repair costs

Generators at Customer Location (cont.)

- Assume 30MW of capacity available
- Assume capital cost for transfer switch of $26,000/MW
- Assume maintenance and repair costs at $8500/MW-yr

Energy Efficiency – High Efficiency Swamp Cooler Blower Motors

(Allen Downs)

1. High Efficiency ECM motors
   A. ECM – Electronically Commutated, or Electronically Controlled, Motor
   B. DC motor with attached controller directly replaces AC motor
   C. Approximately 80% efficient
2. Comparison of ECM motors to conventional split phase AC motors
   A. Typical swamp cooler blower motors are 2 speed (1725 & 1140 RPM)
      1) Efficiency about 65% at high speed, as low as 40% at low speed
   B. ECM motors are variable speed (preprogrammed for expected use)
      1) Efficiency about 80%
      2) Cost is approximately double that of split-phase AC motors

Energy Efficiency – High Efficiency Swamp Cooler Blower Motors (cont.)

1. Current EPE program rebates higher efficiency evaporative coolers
   A. Utility Cost Test (UCT) based on comparison to refrigerated AC
   B. More efficient evaporation due to improved pads
   C. Blower motors are not more efficient
   D. Higher power usage due to increased air resistance of pads
   E. Probably uses more power than the cooler it replaced
   F. Not effective for reducing peak load
2. ECM cooler blower motors will be more effective at reducing peak than high efficiency swamp coolers

- Assume 1.2MW in the first program year growing to 75MW in the eighth year
- Assume an expenditure of $480,000 in the first year growing to $10M in the eighth year and $10M ongoing

Energy Efficiency – Do what Texas does
(Merrie Lee Soules)

- EPE estimates that the demand savings during EPE's system peak from energy efficiency will be approximately
  - 1470 kW/yr attributed to New Mexico
  - 3350 kW/yr attributed to Texas
- EPE budgets
  - $5,191,262 per year in New Mexico
  - $4,394,650 per year in Texas
- Resulting in cost per kW savings of
  - $3531/kW/yr in New Mexico
  - $1312/kW/yr in Texas
- Assume 10MW of capacity available in New Mexico at a cost of $1312/kW/yr by applying the Texas programs in New Mexico

Energy Storage
(Steve Fischmann)

1. Energy Storage can serve peak demand and reduce the need for distribution investment
2. Assume a lithium ion battery storage technology in place of substation

- Cost is **savings** of $1400/kWh
  - Use $600/kWh capital cost
  - Assume $2000/kWh savings in distribution investment
- Use $36/MWh for battery charging costs
- Assume $200/kWh battery replacement cost after 10 years
- Use $12/kWh Fixed Operations & Maintenance Cost
- Capacity potential is 100 MW or equal to the capacity of planned distribution projects within the next 20 years

Conclusions

1. Supply side resources, demand side resources, energy storage and rate design are required to be analyzed on a consistent and comparable basis
   A. Rate design proposals to be modeled will be forthcoming
   B. Additional proposal regarding energy efficiency, energy storage, and others may be forthcoming
2. Assumptions beyond what has been presented, either by EPE or the PAG participants, need to be transparent
3. EPE is hereby formally requested to provide written acceptance of these proposals