SEVERE WEATHER EVENT OF FEBRUARY, 2011 AND ITS CASCADING IMPACTS ON NM UTILITY SERVICE

21 December 2011

PREPARED BY
THE STAFF OF THE NEW MEXICO PUBLIC REGULATION COMMISSION
INFORMAL TASK FORCE INVESTIGATION
DISCLAIMER

Staff’s Draft Report of the Informal Task Force was prepared by the staff of the New Mexico Public Regulation Commission as part of the review of the cold weather events of early February 2011 and the impact on natural gas and electricity consumers in New Mexico. The Informal Task Force was convened independently by PRC Staff bringing together entities on a voluntary basis from the energy sector to evaluate the effects of the February event, to develop a set of recommendations for coordinated response to emergencies in the future, and for best practices going forward. The Informal Task Force deliberately avoided any interference with NMPRC Case No.11-00039-UT docketed by the Commission to investigate New Mexico Gas Company and the outages to its system during the February 2011 severe weather event. A Commission order on the docketed case has not been issued as of the date of this report.

Staff’s Report summarizing the progress of the Informal Task Force is for information purposes only, and is not intended to be used as evidence in any proceeding and is not any finding of fact or any order of Commission.
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Foreword

This report was prepared through the efforts of an informal task force (the “Task Force”) created in early February 2011 to examine events surrounding the severe cold weather that gripped New Mexico and much of the Southwestern United States in late January and early February, 2011. The Task Force was formed by the staff of the Utility Division of the New Mexico Public Regulation Commission (the “Commission” or “NMPRC”) as an informal task force to complement but not to overlap or otherwise interact, conflict, or otherwise interfere with the Commission’s Docket No. 11-00039-UT. Unlike the docketed case, the Task Force was not to focus on any particular organization’s actions or lack of actions; rather, it was created to focus on lessons learned and to recommend application of those lessons learned. Participation in the Task Force was strictly voluntary. The Task Force did not have subpoena power nor did it rely on any information that was not in the public domain. Specifically, the mission of the Task Force was:

- Develop a concise summary of the severe weather cascading events (also see time line), using publicly available information from all investigative initiatives (including FERC, NERC, PUCT, TXRRC, ERCOT, NMPRC, etc). This report relied heavily on the August 2011 report jointly developed by the Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Corporation (NERC) entitled ‘Outages and Curtailments During the Southwest Cold Weather Event of February 1 – 5, 2011’;

- Identify root causes and contributing factors for the failures and near-failures that occurred in New Mexico’s electric and natural gas retail markets, using publicly available information;

- Identify potential measures to be considered by NMPRC-regulated utilities (PNM, EPE, SPS, NMGC, Zia Natural Gas, and Raton Natural Gas) to mitigate the impact of future severe cold weather occurrences;

- Review NMPRC policies and rules and recommend rule changes to ameliorate future severe cold weather impacts; and

- Review pertinent issues which may be influenced by other New Mexico or federal agencies and suggest mitigating actions for consideration.

Many of the recommendations made in this document, if implemented, will require investment in physical plant or may result in additional contractual obligations. Specific cost/benefit or rate impact analyses were not performed, because the recommendations are general in nature and not amenable to quantitative analyses. The recommendations made were generally limited, however, to those that are believed to be practical and able to be implemented at reasonable cost.
Staff of the Utility Division, Legal Division, Consumer Relations Division and Pipeline Safety Bureau of the Transportation Division ("Staff") of the NMPRC wishes to express its appreciation to all that participated in or observed the process. Without the extensive participation, this report would not have been possible.

The public and private organizations and the individuals that participated or observe were:

- New Mexico Public Regulation Commission (Utility Division)
- New Mexico Public Regulation Commission (Legal Division)
- New Mexico Public Regulation Commission (Consumer Relations Division)
- New Mexico Public Regulation Commission (Pipeline Safety Bureau, Transportation Division)
- Office of the New Mexico Attorney General (AG)
- Federal Energy Regulatory Commission (FERC)
- Southwestern Public Service Company (SPS)
- Public Service Company of New Mexico (PNM)
- El Paso Electric Company (EPE)
- New Mexico Rural Electric Cooperatives Association (NMRECA)
- New Mexico Gas Company (NMGC)
- Raton Natural Gas Company (RNG)
- Zia Natural Gas Company (ZNG)
- City of Taos (Taos)
- Village of Questa (Questa)
- City of Española (Espanola)
- National Nuclear Security Administration (NNSA)
- New Mexico Industrial Energy Consumers Association (NMIEC)

Staff's Report summarizing the progress of the Informal Task Force is for informational purposes only, and is not intended to be used as evidence in any proceeding and is not any finding of fact or any order of Commission.
Executive Summary

This report focuses on the severe weather event that occurred in the southwestern part of the US during the first week of February 2011 and its impact on New Mexico electric and natural gas operations. Temperatures were bitterly cold throughout the region for an extended period of time, and normal cold-weather preparations employed by the operators at many electric generating facilities and at natural gas production and processing facilities proved to be relatively ineffective at protecting against freeze-ups or other equipment malfunctions.

Many reviews of the event were undertaken by various state, regional and federal entities. The reports produced as of the date of this report (and including this report) are all in general agreement that the curtailment of electricity and natural gas service affected large numbers of customers in Texas and New Mexico, and was the result of the confluence of several interrelated occurrences. On a very high level, the following occurred:

- Record high electricity demand and natural gas demand was experienced during the January 31 – February 7 cold weather period. Curtailed natural gas consumers in New Mexico responded by relying on other forms of heating, such as electric space heaters.
- The extended cold weather overwhelmed many of the weatherization steps taken by operators of electricity generating facilities, first in Texas and then in New Mexico.
- The extended cold weather also overwhelmed many of the weatherization steps taken at natural gas production facilities in the San Juan Basin and Permian Basin, as well as other production areas in Texas.
- The loss of electrical generation capacity in Texas required system operators to declare emergency conditions and to institute rolling black-outs. Among the customers affected were natural gas processing plants, which further diminished the amount of natural gas production.
- The loss of generating capacity in southern and southeastern New Mexico was mostly due to freezing conditions at local generating units, rather than fuel supply issues. Rolling black-outs were instituted in the Las Cruces and southeastern New Mexico areas to protect the overall systems.
- Gas pressures in the pipeline systems in northern New Mexico dropped to levels where large areas had to be cut off. The outage lasted for several days.
- Emergency measures taken by New Mexico state and local public and private institutions greatly assisted in reducing natural gas and electricity demand in New Mexico.
- The electric transmission system throughout New Mexico was extremely stressed but generally held.

Analyses of the severe weather event have confirmed that while the cold weather event was unusual, it was not unprecedented. While more steps can be employed, especially more effective or more focused weatherization at critical places at power plants, natural gas facilities,
and other critical facilities, many other factors contributed to the problems encountered. There is greater interdependence today than in the past between the electric markets and the natural gas market. For example, more electrical generation is dependent on gas fuel – sometimes it is the only fuel available – while natural gas processing and pipeline compression facilities are increasingly dependent on electricity to drive rotating equipment. This report attempts to provide an overview of the contributing factors that have been determined by the various investigations that are more “global” in nature, including ways for better communications between utilities, government agencies and officials, emergency response entities, and the public.

Finally, this report also contains discussion of what opportunities are available to the three regulated investor-owned electric utilities and the three regulated investor-owned natural gas utilities in New Mexico for mitigation of future adverse severe weather. Staff also makes six (6) specific recommendations that should be considered by the New Mexico Public Regulation Commission (“NMPRC”) to address future adverse severe weather possibilities, and also identifies eight (8) recommendations that fall beyond the jurisdiction of the NMPRC.
Summary of the Severe Weather Event of Early 2011

Over the four-day period from January 31 through February 3, a strong and complex winter system resulted in several days of extremely adverse weather across northern and central New Mexico and neighboring areas. Upper level high pressure has been in place over the U.S. west coast over much of the winter. During the period from January 30 through February 3, two strong upper level disturbances deepened east of the upper high and crossed New Mexico. These two systems were accompanied by an exceptionally strong surface front resulting in snow, wind and bitter cold temperatures across New Mexico. This system crossed New Mexico on the January 31 resulting in snow that favored the northern high terrain and the northeast plains. The second system deepened over Utah on February 1 and moved slowly south of the state by February 3.¹

In early February, a winter storm hit the US Southwest. From January 31 to February 4, temperatures in Texas, New Mexico, Arizona and Mexico were the coldest experienced within the region since 1971. Ambient air temperatures were below-zero degrees Fahrenheit, and wind chill temperatures were consistently -20 to -30 degrees Fahrenheit. Albuquerque, New Mexico, experienced 88 consecutive hours of below-freezing temperatures and set a new record low temperature of -7 degrees Fahrenheit on February 3.² Temperatures at the El Paso (TX) International Airport were below 18 degrees Fahrenheit during most of February 2 through February 4.³ Taos recorded a low temperature of -26 degrees Fahrenheit on February 3.⁴

The February severe cold weather moved southward from the Midwest across Oklahoma and northern Texas on January 30. It continued south and west into New Mexico. According to NOAA, a second system deepened over Utah on February 1, moved slowly southward and spread until almost all of Arizona, New Mexico, Texas and Oklahoma was engulfed with bitterly cold air. The weather systems finally relented on February 4 and 5 when normal temperatures started reappearing.

New Mexico frequently experiences severe cold. Most of the severe cold tends to be localized and short-lived. The February severe weather was unusual in its breadth, depth and duration. Most of the moisture in the February storm occurred east of New Mexico in Texas and Oklahoma. Conditions in New Mexico could have been much more difficult if the severe weather had included significant ice and snow.

¹ NOAA.
² Ibid.
³ The Old Farmer’s Almanac.
⁴ National Weather Service.
1 Electric and natural gas interdependencies in Texas

Prior to the severe cold moving south from the Midwest into Oklahoma and north Texas on Monday, January 31, power plant and natural gas facility operators started taking cold-weather measures beyond normal winterization programs. By early evening on Tuesday, February 1, temperatures had plummeted through most of Texas and demand for electricity and natural gas grew significantly. Soon after midnight, in the early hours of Wednesday, February 2, the cold temperatures and wind chill in Texas started causing a significant number of outages of electric generating facilities. According to news media reports, outages began in central Texas where several coal-fired power plants began to experience problems related to freezing and eventually were forced to shut down.⁵ Other power plants were dispatched, many of them natural gas fired power plants, but they too experienced problems related to freezing and failed to stabilize and come on-line. As Texas awakened on February 2, already high electricity demand continued to grow, stressing the electric system to the point where the Electric Reliability Operating Council of Texas (ERCOT) had to declare a system emergency. For example, the demand for electricity on February 2 was over 9,200 MW (19.2%) higher than the published winter forecast peak and over 1,400 MW (2.5%) higher than the previous all-time winter peak.⁶ ERCOT instructed system operators to institute rolling blackouts throughout the western part of Texas. More than 50 power plants, representing 7,000 MW of capacity, were unavailable in the ERCOT area. Other than nuclear, all categories of power plants experienced outages or were unable to operate, including most of Texas’ wind resources.⁷

By February 2, some Texas gas producers, not immune to the cold, also began experiencing production shut-downs. With natural gas demand sky-rocketing, it is believed that the rolling blackouts further aggravated the gas supply situation because electricity is critical to run compressors and other equipment used in the production and processing of natural gas in the Permian Basin and throughout Texas.⁸ It is believed that the cold weather chain of events contributed to the low-line pressure and line pack problems in the pipelines serving New Mexico and other western states. The lack of natural gas further adversely impacted power plants that use natural gas fuel.

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⁵ Dallas Morning News
⁶ Texas Reliability Entity
⁷ FERC/NERC
⁸ NMPRC Case 11-0039-UT
Gas Resources in the New Mexico’s San Juan and Permian Basins

The cold temperatures resulted in a high percentage of well-head closures in both the San Juan Basin and the Permian Basin. The level of closure experienced was higher than levels ordinarily experienced during winter storms, particularly in the Permian Basin, where extreme cold normally does not extend that far south. No data is readily available on the amount of natural gas production that was lost due to well-head closure.

Well-head shut-in or closure can occur for several reasons. For example, liquids in the products freeze, or equipment fails due to cold weather problems. Additionally, in the Permian Basin, the lack of gas gathering and processing plant capacity coupled with the inability due to environmental issues or unfavorable economics of flaring causes production closure. Anecdotally, it is believed that gathering and processing curtailments resulted from the electric outages. These outages shut down compressors and plant equipment necessary to process natural gas to pipeline quality. As the production has nowhere to flow, the stream slows down and eventually stops. The fluids in the wellhead and flow line have lower kinetic energy, and the fluids’ freezing temperature rises. Therefore, when the midstream gas gatherers and processors lost their plants and compression, wells froze. After wells freeze up, it is very difficult to get them back on stream when the midstream plants and compression come back online. Anecdotal reports indicate that more than 25% of production was affected by these circumstances and perhaps as much as 50% was down during the peak of the electric outages in the Permian Basin.9

The unusual confluence of events in February resulted in significant reductions in line pack and pressure on interstate gas pipelines serving the entire Southwest Region. As temperatures dropped in New Mexico, natural gas demand grew to unprecedented level. As line pack and pressures dropped, the two interstate pipelines that supply gas, Transwestern Pipeline (“TW”) and El Paso Natural Gas (“EPNG”), implemented notices starting on February 1, and by February 3 had to implement restrictions.10 All local natural gas distribution companies (investor-owned, municipally-owned, and associations) in New Mexico were unable to draw gas off the interstate pipelines to meet customer’s demand.

NMGC’s curtailment of several New Mexico communities and customers is the subject of Commission Docket No. 11-0039-UT. A final order in that case has not been issued as of the date of this report. ZNG’s southern system experienced shortages and ZNG had to oversubscribe its take from the interstate pipeline systems. Some southern NM municipal systems connected to the interstate pipeline system also experienced curtailment and had to shed customers. RNG and ZNG’s northern system and some northern NM municipal systems were stressed, but did not have to curtail service. The northeast part of New Mexico’s natural gas utilities are served by supply from the north through Colorado, which did not experience the same level of temperature anomaly as did New Mexico and Texas natural gas production areas. Supply sources north of New Mexico are more accustomed to cold weather.

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9 Ibid.
10 FERC/NERC
Electric Generation and Transmission in New Mexico

The electric system in New Mexico was stressed, and many electric generating facilities in the state did experience either natural gas shortage or operating problems, including shut-down or failure to start up, due to the freezing conditions. Some black-outs were experienced in the EPE and PNM service territories. EPE experienced freezing conditions causing several of its local natural gas fired power plants to be unable to operate. SPS service territory in New Mexico is part of the Southwest Power Pool, which is physically separate from the rest of New Mexico. SPS was impacted by power plant shut-downs in Texas and Oklahoma. PNM’s electric system held, but it too was stressed. PNM did experience some minor outages cause by unrelated transmission problems. The San Juan Generating Station (SJGS) and the Four Corners Generating Station (FCGS), coal plants located in the Four Corners region, and the Escalante Generating Station (EGS), a coal plant near Gallup, experienced some difficulties but generally managed to operate acceptably. The Palo Verde Nuclear Generating Station (PVNGS), west of Phoenix, operated with little difficulties. SJGS, FCGS, and PVNGS are major sources of electricity for PNM and EPE. Had these stations not operated, or if the storm had been particularly “wet” so that transmission would have been compromised, electric system curtailments could have been much more widespread in New Mexico. EGS is owned and operated by Tri-State Generation and Transmission (Tri-State), which supplies many of the rural electrical cooperatives in New Mexico. Most of Tri-State’s other generation is outside and north of New Mexico and Tri-State’s New Mexico transmission system was not significantly affected by the severe weather. Information on each regulated utility experience is contained in the following section and in the appendix.

As the temperatures rose, facilities started coming back on-line. The emergency measures taken by the utilities as well as emergency actions taken by local and state government (for example, local school and government office closures), helped the crisis to ebb. By February 5, restoration of electric service had occurred and, as line pressure was returning to normal, natural gas customer restoration was starting or was underway.
Summary of Severe Weather Event Cascading Impacts On NM Utilities and Response

Note: Electrical and natural gas physical system design criteria as well as operating requirements are prescribed by national codes and standards (e.g., National Electrical Safety Code, national Pipeline Safety Code CFR 192, etc). All utilities have winter season preparation plans, which include fuel supply strategies as well as physical modifications to plants and systems (mostly weatherization measures). All utilities attempt to anticipate severe conditions through monitoring of long-term (typically seasonal or >1 month projections) weather patterns as well as monitoring short term weather forecasts (next day or <1 week). Each utility follows written emergency plans and procedures. For more information, refer to the August 2011 FERC/NERC joint report.


In August 2011, the FERC and NERC issued a lengthy Report on Outages and Curtailments During the Southwest Cold Weather Event of February 1-5, 2011 (hereinafter “FERC Report”). The report is summarized here for the convenience of the reader. The reader is encouraged to review the total document and not to rely solely on the summary contained in this report.

The reader is also encouraged to read the NERC report: Analysis of Power System Impacts and Frequency Response Performance: February 1 – 4, 2011 Texas and Southwestern U.S. Cold Snap, dated September 2011.

Introduction:

Section I of the FERC Report (pp. 1-7) is an Introduction which details the FERC’s investigation scope and methods.

Executive Summary:

Section II of the FERC Report (pp. 7-13) is an Executive Summary and is included here verbatim so that the reader can receive the full information. The events that occurred and the actions taken by the New Mexico utilities as described in this report largely comport to the information that is contained in the FERC report. Again, the reader is encouraged to read the entire FERC report for more complete information:

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11 This report is 357 pages and is not reproduced here. It is available on the FERC website at: http://www.ferc.gov/legal/staff-reports/08-16-11-report.pdf.

12 This report is 46 pages and is not reproduced here. It is available on the NERC website at: http://www.nerc.com/files/RISA_Cold_Snap_report_9-7-11_v10.pdf.
The arctic cold front that descended on the Southwest during the first week of February 2011 was unusually severe in terms of temperature, wind, and duration of the event. In many cities in the Southwest, temperatures remained below freezing for four days, and winds gusted in places to 30 mph or more. The geographic area hit was also extensive, compounding efforts to obtain power and natural gas from neighboring regions.

The storm, however, was not without precedent. There were prior severe cold weather events in the Southwest in 1983, 1989, 2003, 2006, 2008, and 2010. The worst of these was in 1989, the prior event most comparable to 2011. That year marked the first time ERCOT resorted to system-wide rolling blackouts to prevent more widespread customer outages. In all of those prior years, the natural gas delivery system experienced production declines; however, curtailments to natural gas customers in the region were essentially limited to the years 1989 and 2003.

**Electric**

Going into the February 2011 storm, neither ERCOT nor the other electric entities that initiated rolling blackouts during the event expected to have a problem meeting customer demand. They all had adequate reserve margins, based on anticipated generator availability. But those reserves proved insufficient for the extraordinary amount of capacity that was lost during the event from trips, derates, and failures to start.

In the case of ERCOT, where rolling blackouts affected the largest number of customers (3.2 million), there were 3,100 MW of responsive reserves available on the first day of the event, compared to a minimum requirement of 2,300 MW. But over the course of that day and the next, a total of 193 ERCOT generating units failed or were derated, representing a cumulative loss of 29,729 MW. Combining forced outages with scheduled outages, approximately one-third of the total ERCOT fleet was unavailable at the lowest point of the event. These extensive generator failures overwhelmed ERCOT’s reserves, which eventually dropped below the level of safe operation. Had ERCOT not acted promptly to shed load, it would very likely have suffered widespread, uncontrolled blackouts throughout the entire ERCOT Interconnection.

ERCOT also experienced generator outages in the Rio Grande Valley on February 3, again due to the cold weather. This area is transmission constrained and the loss of local generation led to voltage concerns that necessitated localized load shedding. Spot prices in ERCOT hit the $3000 per MWh cap on February 2, the worst day of the event. Given the high demand and the huge loss of generation, this was not a surprising development. In fact, very high prices are an expected response to scarcity conditions, one that is built into ERCOT’s energy-only market. ERCOT’s IMM [Independent Market Monitor] reviewed market performance during the event and found no evidence of market manipulation.

EPE and Salt River Project (“SRP”) likewise suffered numerous generator outages, necessitating load shed of 1,023 MW in EPE’s case and 300 MW in SRP’s case. As with ERCOT, many of these generators failed because of weather-related reasons.

A number of entities within SPP also experienced outages during the event. In their case, however, load shedding was not required, principally because the utilities were able to purchase emergency energy from other SPP members. One other utility in the
Southwest, PNM, experienced blackouts, but these were localized and the result of transmission outages that were mostly unrelated to the weather.

The actions of the entities in calling for and carrying out the rolling blackouts were largely effective and timely. However, the massive amount of generator failures that were experienced raises the question whether it would have been helpful to increase reserve levels going into the event. This action would have brought more units online earlier, might have prevented some of the freezing problems the generators experienced, and could have exposed operational problems in time to implement corrections before the units were needed to meet customer demand.

The February event underscores the need to have sufficient black start units available, particularly in the face of an anticipated severe weather event. In ERCOT’s case, for instance, nearly half of the black start units were either on scheduled outage at the time of the event or failed during the event itself, jeopardizing the utility’s ability to promptly restore the system had an uncontrolled, ERCOT-wide blackout occurred.

The majority of the problems experienced by the many generators that tripped, suffered derates, or failed to start during the event were attributable, either directly or indirectly, to the cold weather itself. For the Southwest as a whole, 67 percent of the generator failures (by MWh) were due directly to weather-related causes, including frozen sensing lines, frozen equipment, frozen water lines, frozen valves, blade icing, low temperature cutoff limits, and the like. At least another 12 percent were indirectly attributable to the weather (occasioned by natural gas curtailments to gas-fired generators and difficulties in fuel switching).

Low temperatures returned to the region on February 10. In fact, ERCOT set a new winter peak that day. But no load shedding proved necessary, largely because the temperatures were not quite as cold or sustained as those of the previous week, the winds were less severe, and many of the repairs and protective measures taken by the generators on February 2 remained in place.

Natural Gas

Problems on the natural gas side largely resulted from production declines in the five basins serving the Southwest. For the period February 1 through February 5, an estimated 14.8 Bcf of production was lost. These declines propagated downstream through the rest of the gas delivery chain, ultimately resulting in natural gas curtailments to more than 50,000 customers in New Mexico, Arizona and Texas. The production losses stemmed principally from three things: freeze-offs, icy roads, and rolling electric blackouts or customer curtailments. Freeze-offs occurred when the small amount of water produced alongside the natural gas crystallized or froze, completely blocking off the gas flow and shutting down the well. Freeze-offs routinely occur in very cold weather, and affected at least some of these basins in all of the six recent cold weather events in the Southwest with the possible exception of 1983, for which adequate records are not available. During the February event, icy roads prevented maintenance personnel and equipment from reaching the wells and hauling off produced water which, if left in holding tanks at the wellhead, causes the wells to shut down automatically. The ERCOT blackouts or customer curtailments affected primarily the Permian and Fort Worth Basins and caused or contributed to 29 percent (Permian) and 27 percent (Fort Worth) of
the production outages, principally as a result of shutting down electric pumping units or compressors on gathering lines.

Processing plants suffered some mechanical failures, although most of their shortfalls resulted from problems upstream at the wellhead. The production declines, coupled with increased customer demand, reduced gas volume and pressure in the pipelines and in those limited storage facilities serving the Southwest. These entities in turn were unable in some instances to deliver adequate gas supplies to LDCs.

When LDCs suffer declines in gas pressure on their systems, they must reduce the amount of gas being consumed to prevent pressures from falling so low that their entire systems might fail. As a result of the high gas demand and the falling pressures on their systems, four LDCs in New Mexico, Arizona and Texas were forced to curtail retail service or were unable to supply gas to all customers. These curtailments or outages affected more than 50,000 customers in those states, including the cities of El Paso in Texas, Tucson and Sierra Vista in Arizona, and Hobbs, Ruidoso, Alamogordo, Silver City, Tularosa, La Luz, Taos, Red River, Questa, Española, Bernalillo, and Placitas in New Mexico. In contrast to the relative ease of restoring electric service, restoration of gas service was complicated by the necessity to have LDC crews manually shut off gas meters and then relight pilot lights on site.

Winterization

Generators and natural gas producers suffered severe losses of capacity despite having received accurate forecasts of the storm. Entities in both categories report having winterization procedures in place. However, the poor performance of many of these generating units and wells suggests that these procedures were either inadequate or were not adequately followed.

The experiences of 1989 are instructive, particularly on the electric side. In that year, as in 2011, cold weather caused many generators to trip, derate, or fail to start. The PUCT investigated the occurrence and issued a number of recommendations aimed at improving winterization on the part of the generators. These recommendations were not mandatory, and over the course of time implementation lapsed. Many of the generators that experienced outages in 1989 failed again in 2011.

On the gas side, producers experienced production declines in all of the recent prior cold weather events. While these declines rarely led to any significant curtailments, electric generators in 2003 did experience, as a result of gas shortages, widespread derates and in some cases outright unit failure. It is reasonable to assume from this pattern that the level of winterization put in place by producers is not capable of withstanding unusually cold temperatures.

While extreme cold weather events are obviously not as common in the Southwest as elsewhere, they do occur every few years. And when they do, the cost in terms of dollars and human hardship is considerable. The question of what to do about it is not an easy one to answer, as all preventative measures entail some cost. However, in many cases, the needed fixes would not be unduly expensive. Indeed, many utilities have already undertaken improvements in light of their experiences during the February event. This report makes a number of recommendations that the task force believes are both reasonable economically and which could substantially reduce the risk of blackouts and
natural gas curtailments during the next extreme cold weather event that hits the Southwest.

**Electric and Gas Interdependency**

The report also addresses the interdependency of the electric and natural gas industries. Utilities are becoming increasingly reliant on gas-fired generation, in large part because shale production has dramatically reduced the cost of gas. Likewise, compressors used in the gas industry are more likely than in the past to be powered with electricity, rather than gas. As a result, deficiencies in the supply of either electricity or natural gas affect not only consumers of that commodity, but of the other commodity as well.

Gas shortages were not a significant cause of the electric generator outages experienced during the February 2011 event, nor were rolling blackouts a primary cause of the production declines at the wellhead. Both, however, contributed to the problem, and in the case of natural gas shortfalls in the Permian and Fort Worth Basins, approximately a quarter of the decline was attributed to rolling blackouts or customer curtailments affecting producers.

The report explores some of the issues relating to the effects of shortages of one commodity on the other, including the question of whether gas production and processing facilities should be deemed “human needs” customers and thus exempted or given special consideration for purposes of electric load shedding. However, any resolution of the many issues arising from electric and natural gas interdependency must be informed by an examination of more than one cold weather event in one part of the country. For that reason, the report does not offer specific recommendations in this area, but urges regulatory and industry bodies to explore solutions to the many interdependency problems which are likely to remain of concern in the future.\(^\text{13}\)

**The Electric and Natural Gas Industries:**

Section III of the FERC Report (pp. 13-49) is entitled “The Electric and Natural Gas Industries” and provides background detail on the electric and gas industries and their origins and current situation.

**Preparations for the Storm:**

Section IV of the FERC Report (pp. 49-73) is entitled “Preparations for the Storm”, and provides detail on the storm including weather conditions during the event, preparations undertaken by the electric industry for the storm including ERCOT, the Salt River Project, and El Paso Electric. This section also details preparations undertaken by the natural gas industry including producers, processing plants, interstate pipelines, intrastate pipelines, and local distribution companies.

The Event: Load Shed and Curtailments:

Section V of the FERC Report (pp. 73 – 139) is entitled “The Event: Load Shed and Curtailments”, and states that “when the storm hit the Southwest on February 1, both electric and natural gas facilities began experiencing outages and other production difficulties. These difficulties escalated and ultimately led to load shedding by three electric balancing authorities and service curtailments by four gas LDCs beginning on February 2”.

Section V then details the unfolding events that led to these disruptions, and the conduct of the load shedding and curtailments.

Causes of the Outages and Supply Disruptions:

Section VI of the FERC Report (pp. 139 – 169) is entitled “Causes of the Outages and Supply Disruptions”, and states that “The precipitating cause of the rolling blackouts experienced in Texas and Arizona during the February 2011 cold weather event was the large number of electric generator outages. The principal cause of the gas service curtailments experienced in several Southwestern states was the production declines in the supply of natural gas, which led to volume and pressure reductions in the pipelines. The task force has analyzed in detail the causes of these outages and declines and found that the majority of them were directly or indirectly related to the weather, particularly so with respect to production declines in the gas supply.”

Section VI describes in detail those causes, both weather and non-weather related.

Among other things, the FERC Report found:

Regarding generation outages in El Paso Electric:

*The EPE balancing authority shed approximately 623 MW of firm load over the course of the February event, due to the loss of 646 MW of local generation… almost all of EPE’s outages were due to the cold weather.*

Regarding Natural Gas:

*Most of the natural gas supply problems experienced in the Southwest during the cold weather event were caused by freeze-offs, principally at the wellhead or, to a lesser degree, at nearby processing plants. Other*

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14 Id., p.73.
15 Id., p. 139.
16 Id., p. 158.
equipment failures also played a role, as did the rolling blackouts and customer curtailments in the ERCOT region.  

- The task force explored upstream production outages by surveying 15 of the larger producers in the San Juan, Permian, Fort Worth, East Texas, and Gulf Coast Basins. These producers accounted for almost 40 percent of the total production for the five basins, with the highest percentages from the Fort Worth, San Juan, and Permian Basins.

- For February 1 to February 5, an estimated 14.8 Bcf of production was lost from these five basins due to weather-related reasons. Of that amount, the surveyed producers lost 7.1 Bcf, equal to 48 percent of the total.

These production losses occurred for a variety of reasons including freeze-offs, icy roads that hampered logistics such as hauling away water produced by treatment equipment, and rolling blackouts and customer curtailments.

- Rolling blackouts were a problem particularly in the Fort Worth Basin, where they caused outages of compressors on gathering lines. In the Permian Basin, deployment of Load Resources by ERCOT during the event caused disruption to electric pumping units. According to information received from the surveyed producers, 27 percent of the outages in the Fort Worth Basin were due to the rolling blackouts, and 29 percent of the outages in the Permian Basin were due to rolling blackouts or the curtailment of interruptible load.

- The Permian Basin suffered production losses from February 1 through February 5 of 3.98 Bcf, with a maximum daily decline of 1.31 Bcf on February 4. The reasons provided for these declines are based on information received from processors representing 34 percent of the maximum daily outage and producers representing 28 percent out of the cumulative losses.

- The San Juan Basin suffered production losses from February 1 through February 5 of 1.3 Bcf, with a maximum daily decline of 0.43 Bcf on February 3 and February 4. The reasons provided for these declines are based on information received from processors representing 52 percent of the maximum daily outage and producers representing 71 percent of the cumulative losses.

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17 Id., p. 159
18 Id., pp. 160 - 161.
19 Id., pp. 161 - 162.
20 Id., p. 164.
Prior Cold Weather Events:

Section VII of the FERC Report (pp. 169 - 189) is entitled “Prior Cold Weather Events”, and focusing primarily on Texas weather, states that “the arctic cold front that descended on the Southwest during the first week of February 2011 was indisputably severe … but not however, entirely without precedent”\(^{21}\) and goes on to examine pertinent prior weather events to determine if there were lessons that could have been learned that might have prevented or ameliorated the service disruption.

Electric and Natural Gas Interdependencies:

Section VIII of the FERC Report (pp. 189 – 195) is entitled “Electric and Natural Gas Interdependencies” and states that “the February 2011 cold weather event highlights the interdependency of electricity and natural gas, an interdependency that has grown in recent years. Natural gas has become an increasingly popular fuel choice for electric generators. Concurrently, compressors used in the production and transportation of natural gas have come to rely increasingly on electricity for their power source, rather than natural gas.”\(^{22}\)

Key Findings and Recommendations:

Section IX of the FERC Report (pp. 195 - 217) is entitled “Key Findings and Recommendations” and summarizes in one section of the report all the key findings and recommendations that the “task force believes, if implemented, could significantly contribute to preventing a recurrence of the rolling blackouts and natural gas curtailments experienced in the Southwest during the February 2011 cold weather event.”\(^{23}\)

Key Findings: Electric

- During the February event, temperatures were considerably lower (15 degrees plus) than average winter temperatures, and represented the longest sustained cold spell in 25 years. Steady winds also accelerated equipment heat loss. However, such a cold spell was not unprecedented. The Southwest also experienced temperatures considerably below average, accompanied by generation outages, in December 1989. Less extreme cold weather events occurred in 2003 and 2010. Many generators failed to adequately apply and institutionalize knowledge and recommendations

\(^{21}\) Id., p. 169.

\(^{22}\) Id., p. 189

\(^{23}\) Id., p. 195
from previous severe winter weather events, especially as to winterization of generation and plant auxiliary equipment.

- While load forecasts fell short of actual load, the forecasts were not a factor in the loss of load. ERCOT manually increased its February 1 and February 2 forecasts by 4,000 MW to factor in wind chill, and had established sufficient reserves to accommodate both forecasted load and the actual load that transpired. The reason blackouts had to be initiated was that over 29,000 MW of generation that was committed in the day-ahead market or held in reserve either tripped, was derated, or failed to start. This was the largest loss of generation in ERCOT’s history, including during the prior cold weather load shed event in December 1989 and the two hot weather load shed events in 2003 and 2006. While units of all types (except nuclear generating units) tripped, derated, or failed to start in 2011, in ERCOT, gas combined cycle units had the highest percentage of failures, compared to their percentage of the total fuel mix.

- ERCOT and the generators with ERCOT could better coordinate generator scheduled outages, both in terms of the total amount of scheduled outages at a given time and their location. A substantial amount of generation (11,566 MW) was on scheduled outage going into the cold weather event. ERCOT’s current Protocols provide that requests for scheduled outages submitted earlier than eight days before the outage is to begin are automatically approved, unless they would violate a Reliability Standard.

- ERCOT’s fast action in initiating rolling blackouts prevented more widespread and less controlled ERCOT-wide blackouts. Had ERCOT not initiated manual load shedding, its under-frequency load shedding relays would have instantaneously dropped approximately 2,600 MW (five percent of system load), a loss that could have created further system disturbances and resulting generation outages. Load shedding by the transmission and distribution operators in ERCOT’s footprint was generally carried out in a timely and effective manner.

- Transmission operators and distribution providers generally did not identify natural gas facilities such as gathering facilities, processing plants or compressor stations as critical and essential loads.

- Balancing Authorities, Reliability Coordinators and generators often lacked adequate knowledge of plant temperature design limits, and thus did not realize the extent to which generation would be lost when temperatures dropped.

- The lack of any state, regional or Reliability Standards that directly require generators to perform winterization left winter-readiness dependent on plant or corporate choices. While Reliability Standard EOP-001 R.4 and R.5 refer to winterization as a consideration in emergency plans, these requirements apply only to Balancing Authorities, Transmission Owners, and Transmission Operators.
• Generators were generally reactive as opposed to being proactive in their approach to winterization and preparedness. The single largest problem during the cold weather event was the freezing of instrumentation and equipment. Many generators failed to adequately prepare for winter, including the following: failed or inadequate heat traces, missing or inadequate wind breaks, inadequate insulation and lagging (metal covering for insulation), failure to have or to maintain heating elements and heat lamps in instrument cabinets, failure to train operators and maintenance personnel on winter preparations, lack of fuel switching training and drills, and failure to ensure adequate fuel.

• Gas curtailment and gas pressure issues did not contribute significantly to the amount of unavailable generating capacity in ERCOT during the event. The outages, derates, and failures to start from inadequate fuel supply total 1,282 MW from February 1 through February 5, as compared to an overall peak net generating capacity reduction of 14,702 MW.24

Recommendations – Electric

1. Balancing Authorities, Reliability Coordinators, Transmission Operators and Generation Owner/Operators in ERCOT and in the Southwest regions of WECC should consider preparation for the winter season as critical as preparation for the summer peak season.

2. Planning authorities should augment their winter assessments with sensitivity studies incorporating the 2011 event to ensure there are sufficient generation and reserves in the operational time horizon.

3. Balancing Authorities and Reserve Sharing Groups should review the distribution of reserves to ensure that they are useable and deliverable during contingencies.

4. ERCOT should reconsider its protocol that requires it to approve outages if requested more than eight days before the outage, consider giving itself the authority to cancel outages previously scheduled, and expand its outage evaluation criteria.

5. ERCOT should consider modifying its procedures to (i) allow it to significantly raise the 2,300 MW responsive reserve requirement in extreme low temperatures, (ii) allow it to direct generating units to utilize pre-operational warming prior to anticipated severe cold weather, and (iii) allow it to verify with each generating unit is preparedness for severe cold weather, including operating limits, potential fuel needs and fuel switching abilities.

6. Transmission Operators, Balancing Authorities, and Generation Owner/Operators should consider developing mechanisms to verify that

units that have fuel switching capabilities can periodically demonstrate those capabilities.

7. Balancing Authorities, Transmission Operators and Generator Owners/Operators should take the steps necessary to ensure that black start units can be utilized during adverse weather and emergency conditions.

8. Balancing Authorities, Reliability Coordinators and Transmission Operators should require Generator Owner/Operators to provide accurate ambient temperature design specifications. Balancing Authorities, Reliability Coordinators and Transmission Operators should verify that temperature design limit information is kept current and should use this information to determine whether individual generating units will be available during extreme weather events.

9. Transmission Operators and Balancing Authorities should obtain from Generator Owner/Operators their forecasts of real output capability in advance of an anticipated severe weather event; the forecasts should take into account both the temperature beyond which the availability of the generating unit cannot be assumed, and the potential for natural gas curtailments.

10. Balancing Authorities should plan ahead so that emergency enforcement discretion regarding emission limitations can be quickly implemented in the event of severe capacity shortages.

11. States in the Southwest should examine whether Generator/Operators ought to be required to submit winterization plans, and should consider enacting legislation where necessary and appropriate.

12. Consideration should be given to designing all new generating plants and designing modifications to existing plants (unless committed solely for summer peaking purposes) to be able to perform at the lowest recorded ambient temperature for the nearest city for which historical weather data is available, factoring in accelerated heat loss due to wind speed.

13. The temperature design parameters of existing generating units should be assessed.

14. Generator Owner/Operators should ensure that adequate maintenance and inspection of its freeze protection elements be conducted on a timely and repetitive basis.

15. Each Generator Owner/Operator should inspect and maintain its generating units’ heat tracing equipment.

16. Each Generator Owner/Operator should inspect and maintain its units’ thermal insulation.

17. Each Generator Owner/Operator should plan on the erection of adequate wind breaks and enclosures, where needed.
18. Each Generator Owner/Operator should develop and annually conduct winter-specific and plant-specific operator awareness and maintenance training.

19. Each Generator Owner/Operator should take steps to ensure that winterization supplies and equipment are in place before the winter season, that adequate staffing is in place for cold weather events, and that preventative action in anticipation of such events is taken in a timely manner.

20. Transmission Operators should ensure that transmission facilities are capable of performing during cold weather conditions.

21. Balancing Authorities should improve communications during extreme cold weather events with Transmission Owner/Operators, Distribution providers, and other market participants.

22. ERCOT should review and modify its Protocols as needed to give Transmission Service Providers and Distribution Service Providers in Texas access to information about loads on their systems that could be curtailed by ERCOT as Load Resources or as Emergency Interruptible Load Service.

23. WECC should review its Reliability Coordinator procedures for providing notice to Transmission Operators and Balancing Authorities when another Transmission Operator or Balancing Authority within WECC is experiencing a system emergency (or likely will experience a system emergency), and consider whether modification of those procedures is needed to expedite the notice process.

24. All Transmission Operators and Balancing Authorities should examine their emergency communications protocols or procedures to ensure that not too much responsibility is placed on a single system operator or on other key personnel during an emergency, and should consider developing single points of contact (persons who are not otherwise responsible for emergency operations) for communications during an emergency or likely emergency.

25. Transmission Operators and Distribution Providers should conduct critical load review for gas production and transmission facilities, and determine the level of protection such facilities should be accorded in the event of system stress or load shedding.

26. Transmission Operators should train operators in proper load shedding procedures and conduct periodic drills to maintain their load shedding skills.²⁵

²⁵ Id., pp. 197 – 212.
Key Findings - Natural Gas

- Extreme low temperatures and winter storm conditions resulted in widespread wellhead, gathering system, and processing plant freeze-offs and hampered repair and restoration efforts, reducing the flow of gas in production basins in Texas and New Mexico by between 4 Bcf and 5 Bcf per day, or approximately 20 percent, a much greater extent than has occurred in the past.

- The prolonged cold caused production shortfalls in the San Juan and Permian Basins, the main supply areas for the LDCs that eventually curtailed service to customers in New Mexico, Arizona, and Texas.

- Wellhead freeze-offs normally occur several times a winter in the San Juan Basin but are not common in the Permian Basin, which is the supply source that LDCs in the Southwest region typically rely upon when cold weather threatens production in the San Juan Basin.

- Electrical outages contributed to the cold weather problems faced by gas producers, processors, and storage facilities in the Permian and Fort Worth Basins, with producers being more significantly affected by the blackouts; however, based on information obtained from a sampling of producers and processing plants in the region, the task force concluded that the effect of electric blackouts on supply shortages was less important than the effect of freezing temperatures.

- Although producers in the New Mexico and Texas production areas implemented some winterization measures such as methanol injection, production was nevertheless severely affected by the unusually cold weather and icy road conditions, which prevented crews from responding to wells and equipment that were shut in.

- The extreme cold weather also created an unprecedented demand for gas, which further strained the ability of the LDCs and pipelines to maintain sufficient operating pressure.

- The combination of dramatically reduced supply and unprecedented high demand was the cause of most of the gas outages and shortages that occurred in the region.

- Low delivery pressures from El Paso Natural Gas interstate pipeline, caused by supply shortages, contributed to gas outages in Arizona and southern New Mexico.

- Some local distribution systems were unable to deliver the unprecedented volume of gas demanded by residential customers.

- No evidence was found that interstate or intrastate pipeline design constrains, system limitations, or equipment failures contributed significantly to the gas outages.

- The pipeline network, both interstate and intrastate, showed good flexibility in adjusting flows to meet demand and compensate for supply shortfalls.
Additional gas storage capacity in Arizona and New Mexico could have prevented many of the outages that occurred by making additional supply available during the periods of peak demand. Natural gas storage is a key component of the natural gas grid that helps maintain reliability of gas supplies during periods of high demand. Storage can help LDCs maintain adequate supply during periods of heavy demand by supplementing pipeline capacity, and can served as backup supply in case of interruptions in wellhead production. Additional gas storage capacity in the downstream market areas closer to demand centers in Arizona and New Mexico could have prevented most of the outages that occurred by making additional supply available in a more timely manner during peak demand periods.

Recommendations – Natural Gas

1. Lawmakers in Texas and New Mexico, working with their state regulators and all sectors of the natural gas industry, should determine whether production shortages during extreme cold weather events can be effectively and economically mitigated through the adoption of minimum, uniform standards for the winterization of natural gas production and processing facilities.

2. The gas and electric sectors should work with state regulatory authorities to determine whether critical natural gas facilities can be exempted from rolling blackouts.

3. State utility commissions should work with LDCs to ensure that voluntary curtailment plans can reduce demand on the system as quickly and efficiently as possible when gas supplies are disrupted.

4. State utility commissions should work with balancing authorities, electrical generators, and LDCs to determine whether and under what circumstances residential gas customers should receive priority over electrical generating plants during a gas supply emergency.

5. State utility commissions and LDCs should review the events of early February 2011 and determine whether distribution systems can be improved to increase flows during periods of high demand.

6. State utility commissions should work with LDCs to determine whether the LDC distribution systems can be improved so that curtailments can be implemented, when necessary, in a way that improves the speed and efficiency of the restoration process.

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26 Id., pp. 212 – 214.


2 El Paso Electric Company

During the final weekend of January, EPE was monitoring the actual weather and the forecast as is always done. The weather forecast was indicating significantly colder weather, but not as severe as ultimately occurred. Every year, EPE verifies that its cold weather preparations are in place and effective at its outdoor generating plants prior to the beginning of winter weather. This winterization encompassed verifying that heat tracing and heat strips were properly functioning as well as making sure insulation was properly installed at its local generation facilities. Similarly, prior to winter weather, EPE verifies that equipment in its substations, the part of the transmission and distribution system most susceptible to cold temperature extremes, can withstand the expected cold temperatures. In addition, on January 31, prior to this severe weather event, EPE initiated its severe weather preparations which included verifying winterization of generation, transmission and distribution facilities; reviewing system operations plans; reviewing availability of fuel; preparing for potential natural gas pipeline constrains; and putting employees on call as needed during the weather event. The System Operations group requested EPE’s Power Marketing and Fuels group to keep additional generation on-line and, in response, Power Marketing made arrangements to leave on Rio Grande Unit 6, continued with the start-up of Newman Units GT-3 and GT-4 and verified the ability of Newman Unit 3 to operate on fuel oil.

As the temperature rapidly fell to subfreezing levels, EPE began experiencing freezing equipment at its generation facilities. Not only did critical water lines freeze but instrumentation which control the generation froze as well. Due to these events, EPE lost most of its local generation over a period of 7 hours beginning Tuesday, February 1, evening and into early Wednesday, February 2, which reduced its load-serving capability. EPE did have approximately 55 MW of location generation from its combustion turbine, Copper Generating Station, running during the entire time of the weather event. This generation combined with purchases from nearby generation resources provided dynamic reactive voltage support that made it possible for EPE to import power, including the remote generation owned by EPE at Palo Verde in Arizona and Four Corners in New Mexico, and to maintain the system. During the next three days, February 2, 3, and part of February 4, EPE struggled against extreme weather conditions to return more local generation to service, with limited success.

When it became apparent that EPE local generation would not be quickly returned to service, EPE first curtailed its interruptible customers. In addition, between the peak load hours on February 2, 3 and 4, EPE executed controlled load shedding to help protect the integrity of the system and avoiding the very real risk of an entire system collapse. This load shedding was done on a non-discriminatory basis across the entire system in both New Mexico and Texas with the exception of those circuits containing critical customers (e.g., hospitals, 911, etc).

On the day of February 4, EPE was able to return 300 MWs of generation to service and eliminate any load shedding. On February 5, EPE was able to allow interruptible customers to return to the system, and all interruptible customers were allowed to return to their normal operations by February 6.
3 Public Service Company of New Mexico

PNM’s system has both a summer peak load and a winter peak load. Typically, the winter peak load occurs during the month of December or January. The peak day of the winter of 2010-2011 occurred on February 2, and set a new high for total system winter load of 1,709 MW, including PNM North, PNM South and wholesale loads. By comparison, the comparable system peak demand during the summer of 2010 was 1,973 MW.

PNM began preparation for the winter at the San Juan Generating Station (“SJGS”) during the fall of 2010, which included walk-downs and testing of freeze protection systems, inspecting insulation, ensuring doors and other protective devices were in-place and closed, completing numerous other reliability based maintenance and inspections and implementing work performance improvement initiatives.

During the extremely cold period of early February, SJGS Unit 1 was down for a major planned outage. As the cold weather approached, PNM stopped all non-critical work on Unit 1 to ensure that the reliability of the remaining generating units would not be compromised, even though the result was a slow-down of the work being performed on Unit 1 and an extension of the planned outage. Additionally, PNM commenced several work performance initiatives, which were designed to prevent human error and mishaps. SJGS Units 2, 3 and 4 operated well throughout the week of January 30 through February 5, and there were no operational problems encountered due to the cold weather.

PNM also received base load generation from Units 4 and 5 of the Four Corners Generating Station (“FCGS”), which is a coal-fired generating plant operated by Arizona Public Service Company. Unit 4 began to develop issues relating to freezing sensing lines in the early morning on February 2 and tripped off-line due to the freezing of the sensing line that provided a reading of the throttle pressure. The unit came back on-line February 3 but tripped off-line later the same day due to a drop in the temperatures of the steam to the turbine (low main steam temperature). The unit was placed back on-line February 4 but then tripped off-line due to a loss of auxiliary steam to the auxiliary feed pump. The unit was placed back in service on February 5. Unit 5 performed well throughout the period of extreme cold weather but was de-rated by about 5% during February 3 and 4 while supplying auxiliary steam to Unit 4 for startup.

The Reeves Generating Station (“Reeves”) consists of three gas-fired generating units that provide critical load-side reliability in the Albuquerque area. Natural gas supply is delivered to Reeves via NMGC through interconnections with EPNG, TW and Williams Field Services. Reeves has no back-up fuel capability.

As the extreme cold weather approached, PNM instructed its plant operators to schedule overtime and to keep the boilers in hot standby throughout the upcoming period of frigid weather. All three Reeves units were run for load-side support during February 1 through 4, and Units 1 and 3 on February 5 and 6. Freezing temperatures from February 1-4 resulted in frozen pipes that temporarily impacted availability. However, for each event, PNM implemented solutions for the frozen pipes, for example by thawing and installing additional insulation, and the units were quickly brought back on line.

The Delta Person Generating Station (“Delta”), formerly known as Cobisa, is a single unit combustion turbine used for load-side support in Albuquerque and is designed to operate on natural gas or diesel fuel. Gas supply is delivered to Delta by NMGC. Preventive maintenance
was performed on the plant in preparation for the cold weather. However, the plant failed to run on February 2. After the problem was fixed, the unit was started after the evening peak on February 2 and operated on natural gas throughout the night and into the morning of February 3. On the morning of February 3, PNM asked the operator to switch the unit to run on diesel fuel. However, a valve failed and the unit would not operate. The unit remained off until February 8.

The Valencia Generating Station (“Valencia”) is a gas-fired station located south of Albuquerque and TW delivers gas supply to it. Preventive maintenance was performed on the plant in preparation for the cold weather. The unit was started on February 2. Generation from Valencia generation was not needed and was taken offline at 11:21 a.m. on February 4 and then restarted again that day at 2:50 p.m.

The Afton Generating Station (“Afton”) is a gas-fired plant owned by PNM that can be operated in either single cycle or combined cycle modes and has gas supply delivered by EPNG. Initially, Afton was not planned for use during the February cold weather. However, on February 2, EPE declared an emergency and the call came to start Afton. However, due to numerous systems and transmitters that were frozen, it could not be started in combined cycle mode. It was started in gas-turbine only cycle mode at 10 a.m. on February 2 and ran through Thursday, February 8. However, numerous issues had to be addressed due to freezing.

The Lordsburg Generating Station (“Lordsburg”) is a PNM-owned gas-fired generation plant (two units) with gas supply delivered by EPNG. Both units were brought online early on February 2. Around noon, gas pipeline pressures from EPNG deliveries began to fall below set points. As a result, the units’ outputs were limited. Both units were off on February 3 due to fuel availability. On February 4, Unit 2 was started but experienced problems due to frozen sense lines.

The Luna Energy Facility (“Luna”) is a gas-fired generating plant, owned in part by PNM, which receives its gas supply from EPNG. On February 2, Luna experienced problems on startup due to freezing problems. These issues continued throughout the day, however, the units were able to stay online throughout the night of February 2 and through February 3. Some problems were also experienced on February 4.

During the extremely cold weather of early February, there was a fall-off in wind at the New Mexico Wind Energy Center causing generation to fall as well. Other than lack of wind, there were no weather related issues. Generation on February 3 was only 72 MWh, compared to 4,180 MWh on February 1.

Coming into the first week of February, PNM adjusted its natural gas purchasing strategy to include Permian Basin natural gas supplies in addition to San Juan Basin gas to diversify supply and pipeline sources through EPNG and TW. PNM also increased purchases in the “day ahead” market and planned for “intra-day” gas purchases to mitigate potential pipeline or supply curtailments and to enhance PNM’s flexibility for extended or additional generation requirements to the power plants, if necessary. PNM strived to utilize multiple delivery points on the NMGC system to deliver gas to both the north and south ends of the NMGC pipeline system.

All of the above strategies proved beneficial during the period of extreme cold, although PNM did encounter gas supply problems due to curtailed supply and low pipeline pressures on both
interstate and NMGC pipelines, beginning on February 2 and lasting into February 5. PNM is aware that both EPNG and TW recorded some of their lowest pipeline pressures in recent times.

On February 1, the transmission system and generating system conditions on the PNM and neighboring systems required the PNM Transmission Operator on duty to take actions to direct the startup of all PNM northern New Mexico generation.

On February 2, Valencia and Reeves Unit stayed on line and operated reliably. However, the frigid weather continued throughout and the day impacted the generating units.

On February 3, localized transmission problems near Clayton and Alamogordo resulted in the loss of service to customers in those areas. These localized transmission problems did not affect customers outside of these immediate service area. All northern New Mexico generation was held on-line at minimum output levels to try to assure that the transmission system would remain secure.

In the Alamogordo and Ruidoso areas a rolling blackout was implemented at 5:21 a.m. by PNM’s Distribution Operations Center as a result of a transmission line outage. Approximately 20,207 customers were affected. All circuits were fully restored by 8:08 a.m.

4 Southwest Public Service Company

Throughout the cold weather event during the week of January 31, SPS was able to meet the power supply needs of its firm customers as well as maintaining the required reserves for contingency events.

SPS interrupted service to some of its interruptible customers. SPS called upon its Interruptible Credit Option (“ICO”) customers to interrupt service on February 3 and was able to reduce load on the system by 14 MW. The ICO customers are retail customers.

Other interruptible customers were not interrupted. SPS contacted its wholesale interruptible customer in New Mexico to ask what types of loads this wholesale customer served. SPS decided to not interrupt this interruptible customer after it was determined that some of these loads were natural gas-related.

As early as January 26, SPS’s generating plants were put on notice that it would be operating in a conservative mode and calling for off-line units to be brought on-line if the forecasted weather pattern developed. Beginning on February 1, SPS brought on-line all available generating units that were not already on-line and were not natural gas turbines. On February 2, SPS had all available generation on-line and was purchasing additional power.

In response to the curtailment of natural gas by EPNG, SPS’s gas supply department worked to arrange for gas that had been scheduled to be delivered to an SPS affiliate. This arrangement provided SPS with additional gas supply and replaced all of SPS’s natural gas needs for its generation resources at its Hobbs facility.

On February 3, ENPG was still in an Emergency Energy Alert so, in order to prevent customer outages, SPS increased its purchases. A total of 1,595 distribution customers experienced outages with an average duration of 234 minutes each.

On February 4, cold weather related issues for SPS’s generating plants began to subside, but the gas supply situation remained under close watch as pipelines used to deliver natural gas to the gas-fired plants continued to re-build line pack.
SPS plants returned to normal operation on February 5 as temperatures climbed above freezing.

5 New Mexico Gas Company

The extreme cold weather during the week of January 30 through February 5, and its effect on electric utility service, pipeline operations, and gas production resulted in a significant disruption to the supply of natural gas to NMGC. At the same time, the weather resulted in a significant increase in demand by NMGC customers. This combination led to decreased pressures on NMGC’s system, resulting in the declaration of a system emergency, first on the south segment in the Alamogordo, Tularosa and La Luz areas and in the Silver City area, and then the declaration of a system emergency on the north segment in the Bernalillo and Placitas area, and for the communities serviced by the Taos Mainline including Taos, Espanola, Questa, Red River and surrounding communities and Pueblos. The result was the curtailment of over 28,000 of NMGC’s customers.

The majority of the gas NMGC purchases for use by its customers comes from New Mexico and is received into its system either directly from the San Juan Basin, near Farmington, or through the TW and EPNG interstate pipelines. NMGC also has contract storage at the Chevron Keystone Storage Facility located in Texas, and the interstate pipelines named above are used to transport gas from this facility. Under normal operating conditions, the gas supply split for NMGC is approximately 80% from the San Juan Basin and 20% from the Permian Basin. During extreme cold weather periods in New Mexico, the San Juan Basin is more likely to experience well freeze-offs than the Permian Basin and NMGC’s typical practice cold weather is to rely more on the Permian Basin as a source of gas. The supply split during extreme cold weather periods change to approximately 60% from the San Juan Basin and 40% from the Permian Basin.

Preparation for the anticipated cold weather and spike in customer demand began on January 30 and 31 through a series of measures intended to increase the gas supply available to NMGC’s customers and to prepare for severe winter operating conditions. NMGC began packing gas (increasing “line pack”) into its transmission lines to safe limits. Line pack in a given section of pipe is the total amount of gas that can be contained in that section of pipe without exceeding the maximum allowable operating pressure of that section of pipeline. Typical practice of natural gas utilities is to increase line pack as a form of storage to accumulate gas in times of lower demand (such as overnight hours) so that gas is available at times of higher demand (such as early workday mornings) and pressures can be maintained within appropriate profiles.

Because this storm was forecasted to be a colder-than-normal winter storm, on Monday, January 31, NMGC increased its line pack to 82,760 Mcf, and on Tuesday, February 1, to 76,640 Mcf. At 5:00 a.m. on Wednesday, February 2, the system line pack stood at 70,720 Mcf.

In addition to building line pack, NMGC prepared for the impending storm by scheduling additional deliveries of gas. These additional gas purchases were substantially above the amounts that modeling indicated would be necessary to meet customer demand for gas in this period. NMGC purchased significantly larger quantities of gas for February 1 (35% more), February 2 (55% more), and February 3 (61% more) than its forecasting models indicated would be required to meet the needs of its customers. Finally, throughout the week of January 30 through February 5, NMGC was in communication with suppliers, interstate pipelines, shippers and large end-use customers. NMGC also confirmed that its contracted storage facility was positioned for withdrawals, if needed, to meet customer demand. On January 30, NMGC had a
total storage inventory volume of 1,412,379 MMBtu. This allowed a total withdrawal right of 160,000 MMBtu/day.

NMGC Operations and Engineering Departments either placed field employees on call or notified them that they may be called out for the remainder of the week, verified that employees had the materials needed for emergency response, filled vehicles with fuel, and also placed management and engineering personnel on call. NMGC staff reviewed potential low pressure areas in the distribution systems, NMGC’s curtailment and sectionalizing plans, and monitored systems to verify that operating levels were at appropriate pressures. Review concentrated on any locations in the NMGC system where, under strained operating conditions such as very cold weather, operational issues may be faced. On February 2 and overnight into February 3, teams of service employees were dispatched low gas pressures locations.

NMGC’s pipeline compressors were prepped for cold weather. Starting February 1, major compressor stations were manned 24/7 and any units not running were started every two hours to ensure they would start if needed.

On the morning of Wednesday, February 2, NMGC contacted large industrial and commercial consumers to request voluntary curtailment of their natural gas usage. Some consumers were able to switch from natural gas to diesel or took other actions. At 12:24 pm on February 2, NMGC issued a media advisory statewide requesting all categories of consumers to voluntarily reduce their natural gas usage if possible. NMGC advised that “this temporary situation is expected to last through tomorrow afternoon.”

On February 3, about 80% of scheduled gas deliveries were made, limited by upstream constraints or inability to produce. At various NMGC city gate stations, interstate pipeline pressures fell to the point where gas did not flow into the NMGC’s transmission and distribution system at rates sufficient to maintain adequate system pressures. Early in the morning on February 3, the drop in interstate pipeline pressures was first evident on NMGC’s southern segment. This segment is connected to the EPNG interstate pipeline. Interstate pipeline pressures dropped later that day on the northern segment of NMGC’s system.

EPNG and TW routinely submit operational and situational notices to all their shippers. Throughout the winter weather event NMGC received non-critical notices, critical system condition notices, informational notices, cut notices and force majeure notices from either EPNG or TW. These notices provided information such as system wide performance issues, notice of daily scheduled volumes by point cuts, strained and critical operating conditions at receipt points, system wide notices of low line pack, critical underperformance issues at receipt points, daily scheduled deliveries by pooling contract and point cuts, volume capping notices at various locations due to performance issues, and force majeure at certain compressor stations.

At the same time that interstate pipeline system pressures were dropping, the use of natural gas by customers to heat and provide hot water for their homes and businesses soared. At NMGC, even with public announcements that customers should conserve gas and both voluntary and mandatory curtailments of gas utility service to industrial customers, demand for gas on the northern segment of NMGC’s system on the morning of February 3 was 69% higher than an
average February peak day and 14% higher than on February 2. This spike in demand on February 3 occurred even though it was about 10 degrees warmer than on February 2.

A system emergency was declared on the south segment, and gas utility service was first curtailed on the morning of February 3 to over 2,800 customers in Alamogordo, Tularosa, La Luz, and Silver City. Interstate pipeline pressure in this area is typically a minimum of 600 pounds per square inch (psi). At 2:36 a.m. on the morning of February 3, even before customers had awakened and demand for gas had increased as thermostats were turned up and hot water was used for morning showers and other domestic uses, the pressure on the EPNG connection had fallen to 563 psi.

NMGC experienced the first northern segment scheduled gas delivery failure at 9 p.m. on February 2. A second scheduled gas delivery failure occurred at 8:00 a.m. on the morning of February 3, leading to the eventual curtailment of service to over 25,000 customers. A system emergency was declared on February 3 for the north segment, and NMGC began to isolation processes shortly after the second scheduled gas delivery did not arrive. Service was curtailed in Taos, Espanola, Red River, Questa and surrounding communities, including various Native American pueblos, and to the communities of Bernalillo and Placitas and Santa Anna Pueblo. Preparations were also begun to curtail service in parts of Albuquerque and Santa Fe, in case the northern segment system pressures did not stabilize.

Preparations for service restoration were also started. Personnel shut off each individual meter, isolating the customer's service location from the distribution system, in anticipation of relighting. When pressures stabilize, systems are purged of air by re-pressuring the lines with gas. Individual home appliances valves are closed and then each individual meter is physically re-opened. Appliances and other gas-fired equipment pilot lights are opened and relit individually as gas flows again past the meter and into the individual lines serving each customer and individual appliance. Customers must be at their homes or businesses for the relighting process. Federal safety regulations require that only qualified personnel can turn a meter on or off and, in the State of New Mexico, only licensed plumbers can perform the relighting work inside a home or business. The restoration process starts at the parts of the utility transmission and distribution system closest to the source of gas. Service was restored to virtually all NMGC customers by February 8, except for those not home or unavailable.

6 Raton Natural Gas Company

In anticipation of the forecasted cold weather pattern approaching New Mexico, Raton Natural Gas Company (“RNG”) increased gas volume nominations by 15% for delivery in the month of February. In addition, during the months of December and January withdrawals from storage were kept at a minimum in order to ensure sufficient storage amounts to meet any unexpected demand. Moreover, with the NNT (No Notice Transport) contracts held by Raton Gas Transmission (“RGT”) and utilized by its shippers RNG and ZIA, any demand would have been met by available gas. RNG was able to provide adequate gas while minimizing any penalty cost to the consumer for use of extreme volumes of storage. Neither RNG nor RGT declared any emergencies during this period.

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Although colder than predicted and historically low temperatures enveloped Raton, as well as the majority of the state, RNG was able to maintain ample gas pressure and volume to supply its customer base. In addition, RGT exercised extreme measures which allowed sufficient supply to be delivered to all points South of Raton including the City of Las Vegas. No RNG consumer or RGT service point was in jeopardy of losing service throughout the winter storm. RNG had previously prepared by ensuring that the majority of their Gate Stations and District Regulator Stations were contained within fully enclosed metal structures that serve as complete facility protection as well as protection for personnel from increment weather conditions.

### 7 Zia Natural Gas Company

ZNG was operating in three separate service areas when the cold snap hit on the first three days of February. The three service districts are the Hobbs District, which serves Hobbs, Jal and a few customers on the Texas state line; the Ruidoso District, which serves Ruidoso, Ruidoso Downs, Alto, Capitan and Carrizozo and rural customers around these areas; and the Maxwell District, which serves Maxwell, Springer and Cimarron, some customers around the town of Raton and the City of Las Vegas (a sale for resale customer).

ZNG performed no system curtailments in the Hobbs District during the period from February 1 through 4. Zia approached pressure problems by either bypassing or increasing pressure at system regulator stations. Although ZNG saw large flow rates throughout the system, most of the customer issues can be linked to electric power outages which created maximum flow rates created by all gas appliances starting at the same time when the electric power was restored. In addition, supply problems at the DCP plant compounded the pressure experienced in Hobbs on February 2. Fortunately, DCP was able to redirect supply to ZNG’s city gate from the NNG Transmission Line. Overall, ZNG lost gas to 406 customers in the Hobbs Area and was able to restore a majority of the gas service the same day.

For the Ruidoso District, ZNG receives its gas supply from United Energy Trading, transported through EPN’s interstate pipeline. ZNG has 45 miles of 8” transmission line connected to EPN’s interstate pipeline approximately 35 miles north of Capitan. Gas is delivered to the EPN interconnect at between 350-500 psig. At the city gate south of Capitan, the pressure is regulated down to 250 psig. The distribution system is normally operated at 45 psig. ZNG serves approximately 12,850 customers in Lincoln County.

On February 3, ZNG began receiving calls from customers in its Ruidoso District reporting loss of gas or low pressure in their neighborhoods. ZNG received approximately 50 calls from its customers in the Ruidoso District. In Upper Canyon, the pressure level had dropped to almost zero. The regulator station feeding this area was bypassed in order to increase gas flow. During this time, ZNG contacted the one local radio station to make a public service announcement asking customers to reduce their gas usage by turning down thermostats and not using hot water. By 12:00 p.m. on February 3 system pressures had been stabilized and all regulator stations, including the city gate, were restored to normal operating pressures. Customers needing pilot lights relit were contacted and gas was restored by the end of the working day. With the exception of those 50 customers there were no outages in the system and no curtailments occurred. There were no problems in the Capitan and Carrizozo areas.

The Maxwell System in northeastern New Mexico serves approximately 1,100 customers as well as delivering gas to the City of Las Vegas as a resale customer. On the morning of February 3,
ZNG was advised that the City of Las Vegas was reporting low pressures in its system. ZNG advised the City of Las Vegas to encourage voluntary reduction in non-essential usage. Additionally, ZNG contacted 12 of its larger users to request a reduction in their non-essential gas usage. There were no problems reported to ZNG and ZNG experienced no customer outages in the Maxwell System.
Summary of Actions Considered by NM Utilities To Mitigate Future Severe Weather Impacts

1. **El Paso Electric**

Components of EPE’s local generating units cannot withstand prolonged periods of low temperatures and wind effect of the levels experienced during the first week of February. EPE, who has historically been most challenged by the operating conditions of extremely high temperatures of the summer months, is reviewing its preparation plans for severe winter conditions of extreme and prolonged cold temperatures of the type that EPE experienced.

EPE’s emergency reporting protocols are substantial in scope and cover many reporting jurisdictions (city, state, federal). EPE plans to develop a quick reference checklist that covers all the reporting jurisdictions that would improve the efficiency of the reporting process.

EPE’s Load Block/Restore program currently uses a manual timer for keeping track of the time the load in an individual “block” has been out of service. EPE plans to evaluate and consider automating the Load/Block timer and implement changes, if feasible.

In the Load Shed/Restore program software, EPE will consider color-coding each of the different load-shed block priorities. For example, priority 1 blocks could be shaded red, priority 2 blocks could be shaded orange, priority 3 blocks could be shaded yellow, etc. This might improve situational awareness “At-A-Glance”. EPE plans to develop a software package for any updated Load Shed/Restore Program and shall utilize this in training on the operation of the Load Shed/Restore Program.

During the event, as load was shed, EPE sought to maintain service to known critical loads. EPE plans to review and update its critical load data base and implement any necessary changes.

The fundamental cause of the loss of the local generation units was the extreme and prolonged cold weather combined with the high winds that created severe conditions beyond the current operating limits of components of those units. EPE plans to implement a process to analyze, explore and recommend feasible, cost effective steps and measures which would allow continued operation of EPE’s local generation in extreme weather conditions.

The engineering firm of Black & Veatch completed its cold weather assessment of EPE’s generation facilities on June 14. Black and Veatch has made recommendations for modifications and upgrades to EPE’s generation facilities to facilitate continuous and reliable operation during periods of extreme cold weather as experienced in February. In addition, EPE is developing detailed plans to implement plant modifications identified as Priority 1 recommendations for each of the units considered essential for winter operation (Rio Grande Unit 8, Newman Unit 3, and Newman Blocks 4 and 5). The Priority 1 category includes those items which caused a unit to trip or prevented a restart during the February event. Also included in this category are items which may not have been the primary cause of loss of a unit, but which are judged to have had a high probability of forcing the unit off line if the primary issue had not already caused the trip. Additionally, items which may not have caused unit unavailability but which present a significant risk of damage to the facility are included. The recommended improvements for the specified units include:
Critical Instrumentation (primarily boiler drum level and de-aerator level instrumentation).

Upgrade heat tracing and insulation on instrument lines to withstand -10 degree Fahrenheit temperatures. Install heated instrument enclosures, if not already provided. Where instruments are located remotely from the equipment being monitored, relocate instruments closer to point of connection to equipment to shorten lines and reduce exposure to freezing conditions.

Major control valves actuators.

Upgrade or install insulation to withstand -10 degrees Fahrenheit to protect against freezing of sensing lines on actuators and/or freezing of fluid in valve due to heat transfer through exposed actuator.

Flue gas recirculation systems.

If units can be operated for limited periods without flue gas recirculation without violating air permit requirements, provide means for tight shutoff of flue gas recirculation flow. If units cannot be operated without flue gas recirculation under these circumstances, install heating system for incoming fresh air or a means of protecting the guide vanes from freezing.

Fire protection systems.

For fire protection systems which may be subjected to freezing conditions, especially those systems installed indoors, but in a location near a building opening, consider providing heated enclosures for fire protection valve stations. Although inoperable fire protection systems would not typically cause unit unavailability, operation of the plant with automatic fire protection systems out of service presents risks of personnel safety and damage to the plant.

In addition, EPE is continuing to review the recommendations identified in the report as Priority 2 and Priority 3 items. After EPE receives the estimated costs for each of these items, EPE will evaluate which recommendations are cost effective and feasible and will develop implementation for those additional recommendations.

2 Public Service Company of New Mexico

In the face of severe regional generation shortfalls, PNM operations personnel made decisions to dispatch local gas fired generation at the appropriate times and in the minimum amounts needed to ensure PNM system security.

PNM has four wind farms connected to its transmission system. Although the wind speed was in a range that should have allowed for production of significant amounts of energy, wind energy was much lower during this period than expected due to the extreme cold. This may have been prevented by installation of an optional cold weather package, which consists of heaters throughout the turbine to keep the vital components warm. However, wind is an
intermittent resource and an optional cold weather package does not provide assurance that wind generation would be available in a cold weather event.

Although there were simultaneous alarms in PNM’s energy management system indicating low gas pressures (sulfur hexafluoride (SF₆)) on circuit breakers from several transmission line locations in the field, PNM’s personnel were able to methodically prioritize and process the alarms, dispatching field crews first to the most critical locations. Customer outages during the extreme weather event were limited and the overall transmission system continued to provide reliable service to its transmission customers throughout the emergency period.

PNM is cooperating with the National Electric Reliability Council and the FERC in its investigation of the events in the Southwestern U.S. during this period and in an evaluation of the circuit breakers that went into alarm due to the low gas pressure caused by the extremely cold weather.

The frigid temperatures of the first week of February tested PNM’s gas fired generation facilities at both the planning and operational levels. In evaluating the results of that week, past experiences with adverse weather/temperature conditions and standard practices for handling adverse weather conditions are being reinforced. For example:

- As the winter season had approached, PNM had conducted pre-inclement weather testing and inspections and undertook any repairs or preemptive measures to address issues identified and prepare for cold weather conditions, such as stocking up of temporary heating equipment that could be quickly moved to areas of the plant that would require temporary, supplemental heating to address a weather impact.

- As the February storm approached, PNM requested “no touch” maintenance at the plants to ensure that they would be available if needed.

- PNM called employees to work early as a precautionary measure and personnel levels at the plants were kept high to conduct inspections and take prompt actions when required.

PNM is installing additional heat tracing and more insulation at the Afton plant, for example, which had not previously experienced such severe ambient conditions. The Delta plant, which had failed to operate once it had been switched from natural gas to fuel oil, will now be tested twice a year to ensure its capability to operate on fuel oil.

PNM and NMGC have begun discussions to develop a plan for improved communications and coordination between the two companies that would be implemented in response to certain defined criteria, for example, in anticipation of severe weather events.

### 3 Southwestern Public Service Company

Several years ago a program was created to increase reliability with distribution feeder improvements. The Feeder Improvement Program (“FPIP”) uses outage data from the previous year to identify low performing feeders. Outages on the identified feeders are studied to determine the cause of the outages and measures needed to prevent future outages. Work orders are created for construction and maintenance jobs to improve the feeders. FPIP budgeted
funds are used to work the jobs through the years to make the improvements. The FPIP system will be utilized to review the 2011 severe weather events.

Restoration guides were created for all of SPS’s distribution and transmission circuits.

An Outage Management system was activated in September of 2009.

In 2010, SPS’s Vegetation Management Group had completed tree trimming on all of SPS’s circuits on a five-year cycle.

Special construction projects are underway in the Clovis and Portales regions to upgrade infrastructure that had limited capacity during the February cold weather event.

### 4 New Mexico Gas Company

The February weather related disruption of supply to the NMGC system and resulting system emergencies and outages was materially different than prior weather events. As a direct result of the February weather event and resulting system emergencies, NMGC has commenced several initiatives including various remedial measures in an effort to learn from and avoid a reoccurrence of the events of February. Because the events that impacted NMGC in early February were due to an unforeseeable severe-weather-related disruption of gas supply, this disruption and its underlying causes should be addressed to prevent this in the future.

NMGC is continuing to conduct a complete review of its processes and procedures and is working with outside consultants (including engineering firms and other consultants with experience in the gas utility business) in this undertaking. NMGC is analyzing methods to avoid the adverse impacts on its distribution system caused by upstream supply disruptions including: additional system valving to allow more confined isolation, reviewing supply and transportation contracts, additional possible storage, possible additional pipelines, alternative local systems such as liquefied natural gas (“LNG”) and possible operation changes to existing facilities.

The following summarizes NMGC’s considered actions. Please refer to the appendix section for NMGC for details of these actions.

1. NMGC has revised its Emergency Communications Plan (“ECP”) to more effectively communicate with customers, members of the public, government officials, and others to provide timely, accurate information about events as they unfold. This ECP was filed as a tariff with the NMPRC, and became effective for service on July 1, 2011.
2. NMGC has reviewed and updated its Emergency Operating Procedures and Policies for all regional offices.
3. NMGC employees at various levels have participated in Incident Command System Training with the Department of Homeland Security.
4. NMGC is reviewing possible changes to the Company’s filed tariffs, including Rule 21 regarding curtailment plans and procedures, and Rule 28 regarding transportation tariffs, imbalances and emergency gas services.
5. NMGC has reviewed its customer curtailment and service restoration procedures and has updated its curtailment plans and customer lists for voluntary and involuntary curtailment in all regions.

6. NMGC is obtaining GPS locations on all meters in the Questa, Red River, Taos and Espanola areas – including Pueblos.

7. NMGC is evaluating alternatives for additional local and regional above-ground and underground storage facilities, installation of new pipeline feeds to areas of the system or looping existing lines. Such system alternatives may provide NMGC with alternative supply sources not currently available.

8. NMGC is examining the feasibility of adding a second suction header to the Redonda Compressor Station to compress both TW and EPNG gas simultaneously.

9. NMGC has had discussions with many of its gas suppliers for contract terms that would provide for a higher level of firm supply. The Company has been successful in negotiating new contract terms with a handful of these suppliers.

10. NMGC negotiated a higher minimum EPNG interstate pipeline delivery pressure at Rio Puerco from 500 to 625 psig.

11. Chevron Keystone has agreed to install backup power generation for their Keystone natural gas storage facility.

12. NMGC has participated in discussions with TW and EPNG to improve communications and information on high demand days or when conditions constrain transportation capacity or supply.

13. NMGC and PNM have held discussions to develop a plan for improved communications and coordination between the two companies that would be implemented in response to certain defined criteria, including in anticipation of severe weather events.

14. NMGC contracted with LANL to evaluate the decisions made to curtail gas utility service in reaction to the early-February supply disruptions to assist NMGC in learning from these events and with a view towards avoiding or minimizing the consequences of such an event in the future. The LANL study was filed with the Commission in NMPRC Case No. 11-00039-UT.

15. NMGC voluntarily participated in a cross-industry mock tabletop exercise sponsored by EPNG. The focus of this exercise was to improve communications along the EPNG supply chain during emergency situations.

16. NMGC participated in the Federal Energy Regulatory Commission ("FERC") investigation to help that federal agency identify methods to mitigate the affect that cold weather and freeze-offs or rolling electric outages have on the supply of natural gas to New Mexico and throughout the southwestern United States. The FERC Report was issued in August
2011. NMGC continues to analyze the report and to work on its own and with others to implement the report’s findings and recommendations.

17. While relatively minor in comparison to the issues discussed above, during the 2011 Weather Event, NMGC personnel experienced problems such as travel delays due to the closure of Interstate-25, delayed travel due to road conditions statewide, and difficult working conditions due to the severe cold and, in the northern areas, heavy snow at times.

18. NMGC has developed and implemented a system which gives it the ability to track transportation shippers’ nominations compared to actual usage. Shippers will be notified immediately of differences between actual usage and gas being delivered on their behalf to NMGC’s system.

19. NMGC continues to review its distribution system configurations to achieve maximum efficiency. Recent modifications to the systems include:
   a. NMGC exchanged a compressor at the Chaparral Compressor Station (Alamogordo Mainline) with and Arrey Compressor Station (T or C Mainline) unit. This compressor move allows NMGC to move a greater volume of gas up the Alamogordo Mainline in the event of low interstate pipeline pressures, while retaining adequate capacity for the T or C Mainline.
   b. NMGC uprated the Santa Fe VHP and Richards Avenue VHP systems to allow higher operating pressure in the Santa Fe distribution system and NMGC installed reinforcement for St. Vincent’s Hospital and removed some restrictions found on St. Michael’s Road.
   c. In Taos, NMGC installed a 4-inch reinforcement for the Blueberry Hill system.
   d. In Silver City, NMGC installed a reinforcement in the city distribution system.
   e. In the Albuquerque Metro distribution systems, NMGC installed reinforcements to the San José system and the Sabana Grande system, installed additional SCADA to monitor the Ventana Ranch and San José systems, resolved an issue at a regulator station feeding the High Desert area and has other projects planned for next year. In addition, NMGC is awaiting rights-of-way to reinforce the Four Hills system.
   f. NMGC has installed isolation valves in various parts of the Albuquerque metropolitan area to allow better sectionalization of areas of the Company’s system.

20. NMGC has contracted for additional underground storage in various storage facilities in Texas.
5 Raton Natural Gas Company

If the winter storm of 2011 had also deposited a heavy layer of ice in northern and central New Mexico, RNG system operations, maintenance and emergency response efforts could have been hampered due to limited vehicular movement on icy local, county and state roadways.

RNG had previously prepared by ensuring that the majority of their Gate Stations and District Regulator Stations were contained within fully enclosed metal structures that serve as complete facility protection as well as protection for personnel from increment weather conditions.

RNG has considered the addition of a storage-based backup gas supply system that delivers Liquefied Natural Gas (LNG) as a fuel supplement during the inadvertent loss of gas supply capabilities. This consideration has been abandoned due to impracticality.

RNG has updated the customer curtailment procedure, and included it as a part of the RNG Emergency Plan, which prescribes an orderly service curtailment based on customer type, size, and backup power supply capabilities.

6 Zia Natural Gas Company

Zia’s Lincoln County System also experienced cold weather and high usage over the weekend of December 31, 2010 and January 1, 2011. Based on pressure data throughout the Lincoln County distribution system, Zia was able to identify several opportunities for short loops to tie-in one area to another. Zia was able to extend those lines before the cold weather during the first part of February and did not see the same pressure issues in those subdivisions. Zia is continuing to identify and install pipeline loops in various areas.

In the Hobbs System, the pressure and flow data gathered during the cold weather in February will enable Zia to make better engineering decisions when replacing and sizing pipe. In addition, although Zia did not lose gas service to customers along Highway 132, Zia also identified a need to add an additional loop to the line running along the highway to eliminate future pressure problems.

In the Maxwell System, Zia intends to install a pressure alarm at the distribution pressure regulation station serving Cimarron, as that is the only area where Zia experienced some low pressures.
Recommendations for the NMPRC to Mitigate Future Severe Weather Impacts

**Recommendation NMPRC1:**

The Commission should consider implementing a central location on its internet site where utility customers can obtain information on interruptions or curtailments. The Commission should strive for information to be up-to-date and real time.

**Problem Statement:** Generally, utility customers that are impacted by curtailments or service interruptions do not have a central location where they can find information. An uninformed customer or a customer on a master meter system or a renter may not necessarily know their utility service providers. This recommendation, along with Recommendation NMPRC2 below, would allow a customer to access outage information through a single portal.

**Discussion:** Many utilities have outage information on their webpage. Some utilities do not. The Commission should consider a prominent webpage on its internet site where hyperlinks would direct customers to existing utility outage web pages. Additionally, limited upload/edit access could be provided to those utilities that do not have individual webpage status capabilities to upload outage information. It is important that responsibility for maintaining the status information be left to the utilities thus avoiding an administrative burden on the Commission. Customers would benefit by being provided 24-7 information and without placing a call to NMPRC Consumer Relations Division or to other staff. While initially targeted at the NMPRC regulated electric and natural gas utilities, webpage access could eventually be extended to water, sewer, telecom or other utilities not regulated by the NMPRC. Voluntary participation from these other entities should be sought.

**Recommendation NMPRC2:**

The Commission should consider implementing a central location on its internet site where utility customers can obtain information on how and where to report outages and other emergencies and where Commission staff can obtain information on utility contacts regarding normal information, outages and emergencies at their various locations, during both business and non-business hours.

**Problem Statement:** Generally utility customers or the general public that are impacted by curtailments or service interruptions do not have a central location where they can find information. An uninformed customer or a customer on a master meter system or a renter may not necessarily know their utility service providers. This recommendation would work in concert with Recommendation NMPRC1 above. The public page part of this recommendation would allow the general public to find out which NMPRC-regulated utility provides electric or gas service to their location and the contact information for normal inquiry, outage and emergency communication during business and non-business hours. The private part of this page would be accessible only to NMPRC staff, and would provide the name and telephone contact information at the company level and at the business district level during both business and non-business hours. As with Recommendation NMPRC1, the utility should be made
Discussion: All electric and gas utilities publish customer service and outage/emergency contact information, including through internet means. Because of limited resources, many other NMPRC-regulated utilities publish this information on a limited basis and do not have on-line access. The Commission should consider a prominent publicly-accessible webpage on its site where a customer could enter his/her zip code (for example) and county, and a pop up screen would appear showing the electric and gas companies that operate or own facilities in that vicinity. Clicking on the individual companies would make a screen (or hyperlink to that utility) appear showing the customer service and emergency contact information. On the non-public side, a similar approach could be used by clicking on an operator which would bring up the public-side information, and also information at the company level and at the district level (if different from the public information). Opportunities may exist to link with and take advantage of other systems that exist, such as the NM One Call Inc. underground facility mapping information system. The system could also possibly be linked in the future with systems belonging to or be made available to other entities such NM Department of Homeland Security.

Recommendation NMPRC3:

The Commission should consider modifying its rules to more explicitly require regulated electric and natural gas utilities to consider fuel diversity, alternative or redundant fuel delivery systems, and back-up fuel capability in their planning processes.

Problem Statement: As was seen during the severe weather, critical electricity driven or natural gas fired facilities in New Mexico and Texas, did not, for one reason or another, have options to operate during the emergency because they could not switch to an alternate fuel or did not have an alternate delivery system, if they could not switch.

Discussion: Over the course of the last several years and for the foreseeable future, it is likely electric utilities will become more dependent on natural gas as a power plant fuel. It is similarly apparent that electric-driven pumps and compressors will continue to be the choice for pipeline compressors. It is evident that generation or compression located near urban population will favor natural gas (as power plant fuel) and electricity as a prime mover (for compressors, etc). Thus fuel interdependence will increase, and so will the potential for cascading events. Electric and natural gas utilities are required by the Commission to go through extensive planning processes (see 17.7.3 NMAC and 17.7.4 NMAC) involving public participation. Fuel and fuel delivery diversity should explicitly be considered in these planning processes. Commission rules do not explicitly identify fuel and fuel delivery diversity. It is recommended that Commission rules be modified accordingly.
Recommendation NMPRC4:

The Commission should consider modifying its rules to require utilities to: 1) recognize natural gas-dependent generating facilities that directly or indirectly serve retail load as critical load; and, 2) require utilities to recognize electricity-dependent natural gas storage and transportation or distribution facilities that directly or indirectly serve retail load as critical load. See also Recommendation NMPRC6.

Problem Statement: There are numerous valid reasons why natural gas fired power plants, or other types of power plants that require natural gas as temporary, back up or start-up fuel, are typically the first end-user to be a candidate for natural gas curtailment. It is evident, however, that curtailing power plant operations during emergency conditions by curtailing natural gas supply can actually aggravate the problem for the public. Similarly, curtailment of large demand electric customers such as electric-driven pipeline compressors (used on pipelines or at storage locations) or natural gas processing facilities during emergencies can also result in aggravated and unintended consequences for the public.

Discussion: Natural gas and electric utilities operate pursuant to system emergency and curtailment plans (see 17.9.560 NMAC, 17.9.570 NMAC, 17.10.650 NMAC, and 17.10.660 NMAC). The emergency plans require the utilities to categorize customers by priority of service, and to minimize service interruptions to high priority customers. It is recommended that Commission rules be modified to classify electric-driven equipment used in natural gas processing, storage and transportation facilities (such as electric-driven compressors) as, similarly, natural-gas fired electric generating facilities, as high priority customers, as conditions warrant.

Recommendation NMPRC5:

The Commission should modify rule 17.9.560.15 NMAC dealing with reporting of electric system outages to the Commission to incorporate a reporting requirement that was instituted by letter in late 2005, but that is not contained in the rule when last revised in 1988. To the extent possible, outage reporting requirements for both electric utilities and natural gas utilities should be consistent. Modification of rule 17.9.660 NMAC may be required to accomplish this.

Problem Statement: Outage reporting requirements for electric utilities are described in rule 17.9.560.15.E NMAC, originally codified in 1988 and last revised in 2005. Further reporting requirements are also prescribed in a letter issued by then Public Utility Commission Chair in 1997, and which staff is following today. The requirements of the 1997 letter are not in the rule, however. This is a housekeeping matter.
Recommendation NMPRC6:

For regulated natural gas and electric utility emergency plans, the Commission should consider requiring such plans to include:

1. A process whereby the utilities identify “escalating” levels of emergency response that may be needed;
2. A method to contemporaneously document the occurrences and the action contemplated for each level; and
3. A plan for contemporaneous communication at each emergency level of the potential impacts or actions with potentially affected customers, government agencies and emergency response entities, and the public.

Problem Statement: System emergencies can develop instantaneously, or, as was evident in the February severe weather event, can surge over a long time frame to a critical condition. In both cases, effective documentation and communication with all stakeholders is necessary for proper preparation of the critical condition and for restoring service after the critical condition has waned. All regulated utilities have some form an emergency plan and a communication plan, but current Commission rules are silent on the need to anticipate and formally identify, communicate and document events as they develop.

Discussion: Electric utilities are required to comply with NERC’s Standard EOP-002-2. This 4 level alert system specifies the conditions that an electric utility must experience for each level and specifies the type of actions the utility must undertake to contain or reverse a potential emergency. The NERC Standard also prescribes the minimum documentation required at each level and requires certain, minimum information dissemination, mostly through the NERC webpage. Natural Gas utilities must have response plans and communication plans to comply with federal and state Pipeline Safety Regulations, but these requirements are geared to local pipeline incidents rather than system emergencies and curtailments. Neither the NERC Standard nor the Pipeline Safety Regulations require communication plans that encompass wide ranging community or government impact. The Commission’s rules should recognize (or give deference to) NERC and federal Pipeline Safety Regulation requirements.
Recommendations for Other State and Federal Entities To Mitigate Future Severe Weather Impacts

Recommendation O1:

Properly marked utility service response vehicles should be afforded access privileges in emergencies, consistent with safety considerations, when public road access is otherwise curtailed to the general public.

Problem Statement: Road closures occurred on several occasions during the February cold weather event because of weather or security reasons. It was reported by several utilities that road closures resulted in delay of properly marked utility service vehicles from reaching their destinations along with the general public.

Discussion: Decisions to restrict road travel are based on either security or safety concerns for the general traveling public. Properly marked utility vehicles responding to an emergency should be allowed access, consistent with occupant safety and overarching security concerns.

Recommendation O2:

Electric generating facilities that utilize natural gas as the primary fuel should be allowed to utilize a back-up fuel (such as diesel fuel) during system emergencies.

Problem Statement: New and repowered electric generating facilities tend to favor natural gas as a fuel because of the expected price stability and favorable environmental attributes of natural gas. This is especially true for plants that are located near population centers. Dependence on a single fuel and/or a single delivery system has demonstrated that such plants could be susceptible to natural gas or delivery outages.

Discussion: Back-up fuel and/or alternative fuel delivery systems can be invaluable during system outages. Inability to operate gas-fired power plants, especially those located near urban centers which typically provide critical local electrical system support, can result in electricity curtailments to residential customers and high-value, human-need customers such as hospitals, emergency response facilities, etc. Allowing power plants to operate on back-up fuel during system emergencies would help alleviate the emergency. Permission to periodically test the back-fuel system would be necessary to assure that the back-up fuel system properly operates when called upon.

Recommendation O3:

To reduce fuel interdependencies, natural gas processing plants, pipeline and natural gas storage facilities should utilize natural gas as the primary fuel for driving equipment whenever possible. Permitting processes should encourage the use of natural gas for these applications whenever possible.

Problem Statement: Similar to Recommendation O2 above. When possible, permitting processes should encourage the use of natural gas as a fuel for primary drivers, especially in locations that may otherwise favor electrically-driven equipment. Failure of the local electrical...
systems to could affect the amount of gas delivered from storage systems or that is produced and processed for delivery to the pipeline system.

Discussion: Similar to Recommendation O2 above.

**Recommendation O4:**

Consider allowing natural gas processing plants to bypass (by flaring or other means) natural gas during plant downtime during system emergencies, to avoid production shutdown.

**Problem Statement:** Natural gas production facilities rely on natural gas processing plants to process natural gas to pipeline quality. If the processing plants are unable to accept produced gas, then production facilities must be shut-in or flared.

**Discussion:** During severe cold weather, shutting-in gas production and gas gathering tends to increase freeze-off which causes curtailment in supply and delays the response time for re-establishing production after the processing plant is capable of being brought back-on-line.

**Recommendation O5:**

New Mexico should consider: 1) creating an inventory of potential natural gas storage locations in New Mexico and 2) various means of encouraging development of identified viable locations including incentives and fast-track approval methods.

**Problem Statement:** Underground storage of natural gas is particularly useful in supplying natural gas to pipelines and eventually to customers in severe weather condition when demand is at its peak. New Mexico lacks supply storage options within the state.

**Discussion:** The US Energy Information Administration indicates that New Mexico only had two active natural gas storage fields as of 2009.\(^{29}\) A quick review of the Internet further indicated that an inventory of viable underground storage locations in New Mexico does not exist. Commissioning such a study should be considered. The study could possibly be led by a state agency or one of the state’s institutions of higher learning and through a cooperative arrangement with industry. In addition, various ways of encouraging development can be considered, such as monetary or tax incentives or fast-track approvals, for those viable locations that are on public lands.

**Recommendation O6:**

Local, state, and federal governments should encourage winterization and redundancy in critical electrical system and natural gas supply chain components. Methods such as tax incentives, streamlining approval processes, or other innovations could be employed.

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\(^{29}\) U.S. Energy Information Administration
Recommendation O7:

As a precaution and because of greater reliance on publicly-available systems such as mobile telephones, all critical services (including electric utility, natural gas utility, water utility, wastewater utility, telecommunications utility, and other critical services) should review their physical communications systems for weaknesses or possible failure points. The Task Force did not examine this topic since there was no telecommunications system failure reported during the February event.

Recommendation O8:

Given the complexity and interdependence of the natural gas supply chain and the electrical system, a permanent structure, possibly a committee or task force, should be established at the state level to review system failures of the nature experienced in February.\(^{30}\)

Problem Statement: A broad variety of issues that span multiple jurisdictions have been raised as a result of the review of the February severe weather event. A coordinated approach to investigating occurrences and implementing lessons learned may be appropriate.

Discussion: The February severe weather event clearly demonstrated that today’s natural gas supply, transportation and distribution chain and the electricity generation, transmission and distribution chain are inextricably linked. This link is likely to increase for the foreseeable future. It is also clear that the upset conditions, while normally local in impact, can be systemic. A mechanism needs to be created whereby all stakeholders (industry participants, regulators, local/state/regional government officials, and members of the public), using expert review of events and working with federal entities as appropriate, can coordinate changes or improvements to mitigate future adverse results. This recommendation does not mean to imply that separate organizations need to be created. The end result could possibly be achieved by focusing this responsibility to an existing state-level department or organization or committee.

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\(^{30}\) The original version of Recommendation O8 was made by NNSA and was directed at the NMPRC. Because of the implications beyond the NMPRC’s jurisdiction, staff of the NMPRC does not believe that this coordination responsibility should be “assumed” by the NMPRC. The original NNSA language has been therefore modified and is being located in this section of the report. NNSA does not agree with these modifications and with the location change.
Appendices

The following reports were produced by each company for the purpose of describing areas being reviewed or investigated by each company for possible measures that may be employed to reduce impacts of future severe weather occurrences. Viable options initially identified will be subject to further engineering and economic analysis. Additional considerations may also result from continuing FERC, NERC, NMPRC and other agency analyses.

1 Actions Taken and Being Considered by EPE

Components of EPE’s local generating units cannot withstand prolonged periods of low temperatures and wind effect of the levels experienced during the first week of February.

Recommendations or lessons learned:

1. Utilities, like EPE, that have historically been most challenged by the operating conditions of extremely high temperatures of the summer months should consider how they could prepare for severe winter conditions of extreme and prolonged cold temperatures of the type that EPE experienced.

2. EPE emergency reporting protocols are substantial in scope and cover many reporting jurisdictions (city, state, federal), making it sometimes cumbersome for certain types of quick references (for example: Is contact information for local representative John Smith by email, phone or fax? How many hours are permitted in which to submit form XYZ?).

   **Recommendation:** EPE shall develop a quick reference checklist that covers all the reporting jurisdictions that would improve the efficiency of the reporting process.

3. EPE’s Load Block/Restore program currently uses a manual timer for keeping track of the time the load in an individual block has been out of service.

   **Recommendation:** EPE shall evaluate and consider automating the Load Block/Restore timer and implement changes, if feasible. In the Load Shed/Restore program software, EPE shall consider color-coding each of the different load shed block priorities. For example, priority 1 blocks could be shaded red, priority 2 blocks could be shaded orange, priority 3 blocks could be shaded yellow, etc. This might improve situational awareness At-A-Glance. EPE shall develop a software package for any updated Load Shed/Restore Program and shall utilize this in training on the operation of the Load Shed/Restore program.

4. During the event, as load was shed, EPE sought to maintain service to known critical loads. Since the event, certain of EPE’s customers with
multiple service accounts have questioned whether they have kept EPE informed of the existence of load that may qualify as critical load.

**Recommendation:** EPE shall review and update its critical load data base and implement any necessary changes.

5. The fundamental cause of the loss of the local generation units was the extreme and prolonged cold weather combined with the high winds that created severe conditions beyond the current operating limits of components of those units.

**Recommendation for corrective actions:** EPE shall implement a process to analyze, explore and recommend feasible, cost-effective steps and measures which would allow continued operation of EPE local generation in extreme winter weather conditions.

With respect to this last recommendation, above, the engineering firm of Black & Veatch (a global engineering consulting company) completed its cold weather assessment of El Paso Electric’s generation facilities on June 14. Black & Veatch has made recommendations for modifications and upgrades to our generation facilities to facilitate continuous and reliable operation during periods of extreme cold weather as experienced in February. In addition to the improvements identified above, EPE is developing detailed plans to implement plant modifications identified as Priority 1 recommendations for each of the units considered essential for winter operation (Rio Grande Unit 8, Newman Unit 3, and Newman Blocks 4 and 5). The Priority 1 category includes those items which caused a unit to trip or prevented a restart during the February event. Also included in this category are items which may not have been the primary cause of loss of a unit, but which are judged to have had a high probability of forcing the unit off line if the primary issue had not already caused the trip. Additionally, items which may not have caused unit unavailability but which present a significant risk of damage to the facility are included. The recommended improvements for the specified units include:

**Critical Instrumentation (primarily boiler drum level and deaerator level instrumentation).** Upgrade heat tracing and insulation on instrument lines to withstand -10° F. Install heated instrument enclosure, if not already provided. Where instruments are located remotely from the equipment being monitored, relocate instruments closer to point of connection to equipment to shorten lines and reduce exposure to freezing conditions.

**Major control valve actuators.** Upgrade or install insulation to withstand -10° F to protect against freezing of sensing lines on actuators and/or freezing of fluid in valves due to heat transfer through exposed actuator.

**Flue gas recirculation systems.** If units can be operated for limited periods without flue gas recirculation without violating air permit requirements, provide means for tight shutoff of flue gas recirculation flow. If units cannot be operated without flue gas recirculation under these circumstances, install heating system for incoming fresh air or a means of protecting the guide vanes from freezing.

**Fire protection systems.** For fire protection systems which may be subjected to freezing conditions, especially those systems installed indoors, but in a location near a building opening, consider providing heated enclosures for fire protection valve stations. Although inoperable fire protection systems would not typically
cause unit unavailability, operation of the plant with automatic fire protection systems out of service presents risks of personnel safety and damage to the plant.

In addition, EPE is continuing to review the recommendations identified in the report as Priority 2 and Priority 3 items. After EPE receives the estimated costs for each of these items, the Company will evaluate which recommendations are cost effective and feasible and will develop implementation plans for those additional recommendations.
2 Actions Taken and Being Considered by PNM

This Action Plan has been prepared by Public Service Company of New Mexico (“PNM” or “Company”) at the request of the Staff of the New Mexico Public Regulation Commission (“Commission” or “NMPRC”) for inclusion in the appendix of the report entitled “Severe Weather Event of February, 2011 and its Cascading Impacts on New Mexico Utility Service” that is being prepared by an Informal Task Force under the direction and coordination of the Staff.

This Action Plan summarizes key measures that PNM has taken or is undertaking to address issues identified as a result of the severe weather events of the first week of February that affected PNM’s operations of its transmission system and its generation facilities, which have been described in two previous reports provided to Staff and other participants in the Informal Task Force. ³¹

GENERAL ACTIONS:

- PNM will continue its participation with Commission Staff and other parties in any continuing evaluations regarding weather related impacts that may affect PNM’s electric system and service to customers.
- PNM will continue participation in the ongoing investigation being conducted by the North American Electric Reliability Corporation (“NERC”) and the Federal Energy Regulatory Commission (“FERC”) as may be requested by those agencies regarding the events in the U.S. Southwest caused by the extremely cold weather. To date, PNM’s participation has been limited to responding to inquiries by the Staff of those agencies.
- PNM personnel from both generation and transmission operations will meet with New Mexico Gas Company (“NMGC”) personnel to initiate the development of improved communications and protocols between the companies concerning the dispatch of PNM’s gas-fired generation power plants that could impact NMGC operations during adverse weather conditions.

GENERATION SYSTEM ACTIONS:

- PNM will continue its standard practices used for preparation of adverse weather conditions, e.g., pre-inciplement weather testing, stocking-up heating equipment at the generation plants that can be deployed as required to those areas experiencing freezing, implementing “no-touch” maintenance, and arranging employee work schedules to ensure their prompt availability during adverse weather conditions.

• At a minimum, prior to the winter weather season PNM will test the capability of the Delta Person Generating Station to operate on alternative fuel and to start on a timely basis.

• At the Afton Generating Station, PNM will install as necessary, additional cold weather protection such as heat tracing, enclosures, and/or insulation to outdoor instrumentation and components particularly vulnerable to extremely cold weather.

• When adverse weather conditions are forecasted, PNM will continue with the practice of diversifying gas supplies for PNM’s gas-fired generation plants through the following:
  * Procure natural gas supplies from multiple supply areas, i.e., the San Juan and Permian basins;
  * Utilize suppliers who have demonstrated excellent delivery performance;
  * Utilize multiple North/South points of delivery locations into the NMGC pipeline; and
  * Monitor and adjust intra-day gas supply based on pipeline curtailments.

**TRANSMISSION OPERATIONS ACTIONS:**

• PNM will continue transmission construction, operations and maintenance planning using industry and PNM standards that take into account the impacts of adverse weather conditions.

• PNM will continue to develop improved communication methods with NMGC regarding outages and managing service restoration during periods of extreme weather or other defined circumstances.

• PNM will confirm with NMGC whether any of NMGC’s buildings and facilities should be identified as critical for purposes of managing electric system outages and restoration.

• PNM will incorporate into its cold weather planning the lesson learned that wind generation from facilities interconnected to its transmission system can be significantly reduced by the impact of extremely cold weather.
3 Actions Taken and Being Considered by SPS

This Action Plan has been prepared by Southwestern Public Service Company ("SPS") at the request of the Staff of the New Mexico Public Regulation Commission ("Commission" or "NMPRC") for inclusion in the appendix of the report entitled “Severe Weather Event of February, 2011 and its Cascading Impacts on New Mexico Utility Service” dated August, 2011 that is being prepared by an Informal Task Force under the direction and coordination of the Staff.

This Action Plan summarizes key measures that SPS has taken or is undertaking to address issues identified as a result of the severe weather events of the first week of February that affected SPS’s operations of its transmission system and its generation facilities, which have been described in two previous reports provided to Staff and other participants in the Informal Task Force.  

SPS Cold Weather Event Feb. 2011 – Assessment

Event Overview:

An arctic cold front moved across the SPS region causing temperatures to fall well below normal during the first several days of February. Record low daily high temperatures were set on February 1 in Amarillo and February 2 in Lubbock. A record low temperature was set in Amarillo February 3. These temperatures led to high Balancing Authority loads of 4,103 MW on February 2, and 3,906 MW on February 3. The peak on the 2 was nearly 250 MW above the forecast peak load for February.

Beginning on February 2 at 5:43 AM, ERCOT implemented controlled load shedding of 4,000 MW for a period of nearly 8 hours. This had the unintended impact of disrupting a number of gas processing facilities, several of which take a lengthy time to restart, and compressor stations. There were also widespread reports of gas well head freezing. These factors, coupled with high customer demand for natural gas led to a shortage of supply, and a corresponding drop in pipeline pressures on the three primary pipelines (El Paso, Oneok/Westex and Northern Natural Gas) that supply the SPS system. This gas supply problem impacted both our owned generation and a number of our PPAs.

An Orange Situation Room was called by Transmission Operations at 4:09 PM CST February 2. The Gas Supply Director reported that gas supplies from the El Paso pipeline were being curtailed, and that the supply of gas to the 573 MW Hobbs CC plant was in jeopardy. The anticipated loss of the El Paso gas supply led to the belief that we could not support Hobbs, Maddox and Cunningham operation at the same time, so the plan was to maximize the burn at Hobbs to take advantage of its lower heat rate. The decision was also made to start Jones on fuel oil. In recognition of the severity of the gas supply issues, we filed an OE-417 and issued a “soft” public appeal to the New Mexico region. Part of the reason for the tight system conditions was that the 535 MW Tolk 2 unit was down for scheduled maintenance during the entire event. Other than issues with natural gas supplies, the fleet was surviving the record cold temperatures well, with only 180 MWs unavailable (X1, Brandon and Maddox 1) due to forced outage.

On February 3, at 10:41 AM CST, Transmission Operations convened a second Orange Alert Situation Room. The Hobbs CC had lost a turbine, and was de-rated by approximately 285 MWs, and two of our neighboring utilities were in a state of emergency (El Paso was in EEA2, shedding firm load, and Sunflower was in EEA3). Further, the regional problems continued to impact gas supplies for SPS, as we saw El Paso and Oneok/Wes Tex curtail 134,000 decatherms during the gas day, nearly 50% of our actual gas supplies burned on the system. Gas Supply came up with a creative solution to bring 3,000 decatherms per hour from Minnesota to Texas using the Northern National pipeline.

A third Orange Alert Situation Room was called by Transmission Operations at 5:00 PM CST that afternoon. At this time, Gas Supply had made successful adjustments to our gas purchases, and the system could withstand the loss of a significant amount of supply from El Paso. As long as Hobbs CC returned by evening peak, it looked like we would have sufficient fuel and generation available to meet our firm load commitments. The plant did return to service at 5:30 PM that afternoon, and with additional power purchases coming in across the Lamar and Black Water tie line the system was in reasonably good shape. The EEA-1 that SPS declared at approximately 12:15 and was terminated at approximately 22:00. With gas supply conditions improving, Transmission issued a return to normal alert at 23:42 PM CST.

A more detailed event timeline is located after the Assignment section of the report.

**Event Findings:**

- Personnel successfully prepared and managed the system during a wide reaching regional energy and fuel emergency. Proactive steps were taken to develop and implement a cold weather operating plan, modeled after a similar cold weather event on the PSCo system. Plant personnel took steps to prepare their facilities for cold weather operations and implemented cold weather plans. Affected operating areas maintained excellent coordination and communication during the event.

- Gas Supply employed innovative solutions to help support gas supply issues that confronted SPS, using Public Service Company of Colorado support to replace gas being cut to serve the Blackhawk plant and also diverted gas through the NNG system from Northern States Power by starting the Wescott LNG facility. Absent a coordinated effort to procure additional gas supplies that could be delivered to SPS plants, the likelihood of firm load curtailment would have been high.

- Commercial Operations meteorologists identified the cold weather system early on and provided notice that it would impact the SPS service territory. The Trading Analysts reliably set up the system and issued sound cold weather operating plans. The Real-time Dispatch group implemented cold weather plans and effectively communicated with Transmission and Gas Supply regarding generation and fuel requirements. Real-time Trading and Real-time Dispatch utilized available import paths to reduce the strains on the SPS system by purchasing power and adjusting SPP market offers for the SPS fleet. The Lamar and Blackwater DC Ties proved again to be critical lifelines enabling SPS to schedule power to avoid a potential emergency in
real-time, though PNM could not redispach to allow SPS to fully utilize our conditional firm transmission service from Four Corners.

- Overall, the Energy Supply generation fleet performed very well through the cold weather; however some smaller units were forced offline due to cold weather related issues. The company directed the utilization of fuel oil to lessen the strains on the gas system at the dual fuel capable sites and the units were able to operate on secondary fuel but some problems and delays were experienced. Early circulation and minimum burns of fuel oil at the Jones units allowed them to avert gelling fuel problems. Plant X experienced burned wires in a relay that initially delayed operating on secondary fuel and later they did have gelling fuel issues, but the plant worked until the problems were resolved. Plant X may need to evaluate winter operation guidelines to mitigate the gelling condition.

- The generation under Purchase Power Agreements performed adequately, however, various units totaling approximately 415 MWs (Blackhawk 2, Brandon, Hobbs) were forced offline due to cold weather related issues at various times during the cold weather event.

- The filing of two OE-417 reports and the communication to the Texas Commission was appropriate and timely.

- Upon review, it was appropriate to issue public appeals to reduce consumption during the event, although the impact of such appeals cannot be measured.

- Interdependence with neighboring utilities was evident in this event as there emergency plans and actions proved to impact SPS. SPS recognized and was properly prepared to mitigate a potential fuel emergency and helped to prevent such a situation from deteriorating into an energy emergency.

- An Orange Alert was not issued during the event. Orange Alert Situation Rooms were used. This created some confusion, as not all impacted employees were being updated on the event.

- The use of the Situation Room was appropriate. Transmission Operations effectively assumed the Incident Leader role for all three Situation Rooms. The Incident Leader checklist was followed.

- The Green Alert announcing the return to normal system operating conditions was issued prematurely, as the system went back into Yellow Alert shortly thereafter.

**Recommendations and Follow-ups:**

- Advocate to ERCOT, and other utilities as appropriate in industry forums, that gas processing plants should be identified as critical electric loads.

- Plant X and Jones Station management should reevaluate their winter preparation plans and ensure proper provisions for the prevention of gelling fuel oil.
- Energy Supply and Purchase Power should identify generation facilities that have experienced repeated freezing related failures during cold weather events and determine mitigation schemes.
- Transmission Operations should evaluate and ensure that we do not have any gas processing plants or compressor stations (to the extent practical to exclude) as part of our manual load shedding schemes.
- Marketing should assess whether we have any gas or oil production or supply customers party to interruptible load tariffs. If we do have such customers on active programs, Marketing should consider whether it is necessary to procure attestations that they can fulfill their firm obligations when curtailed by SPS or whether it is appropriate to remove these customers from the interruptible programs.
- Incident Leader Training should be held this spring for those who lead incidents, and/or issue alerts.

### Follow-up Assignments

<table>
<thead>
<tr>
<th>Finding</th>
<th>Recommendation for Follow-Up</th>
<th>Action, Resp., Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>The reduction of power to gas processing plants in the ERCOT system caused upstream gas supply problems for the SPS generation.</td>
<td>Communicate with ERCOT on the need to designate gas processing plants are critical load in emergency or unusual situations so their disruption of services will be mitigated in the future.</td>
<td>Bill Grant Completed</td>
</tr>
<tr>
<td>Plant X had gelling problems with the diesel fuel that delayed them from switching to alternate fuel for generation that would have helped with this event earlier in the time frame of events.</td>
<td>Review the wintertime operation guidelines for the SPS gas plants that have alternate fuel capability i.e. Jones and Plant X to ensure that the gelling issue is addressed when winter time conditions such as this event take place in this region.</td>
<td>David Low/Plant Managers Completed</td>
</tr>
</tbody>
</table>
### Finding

<table>
<thead>
<tr>
<th>Recommendation for Follow-Up</th>
<th>Action, Resp., Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluate whether any generation facilities have experienced repeated freezing related failures.</td>
<td>Review plant failures…</td>
</tr>
<tr>
<td>Evaluate and ensure that we do not have any gas supply facilities as part of our manual load shedding schemes.</td>
<td>Review manual load shed schemes… Complete load shed assessment for SPS Distribution IDs</td>
</tr>
<tr>
<td>Assess whether we have any gas or oil production or supply customers party to interruptible load tariffs</td>
<td>Review interruptible load customers…</td>
</tr>
<tr>
<td>The process calls for an orange alert as well as a situation room alert and none was issued.</td>
<td>Hold incident leader training in SPS this Spring to walkthrough the process.</td>
</tr>
<tr>
<td>Some felt the return to system condition green was premature and SPS should have been in a yellow condition 2/4/2011 until the cold snap subsided.</td>
<td>Review de-escalation process with those accountable for making those decisions. Incident Leader Training includes this; may be useful.</td>
</tr>
</tbody>
</table>

### Event Timeline:

(Tranmission Control Center Manager, Commercial Operations Director and Gas Supply Director)

It was recognized early that a developing weather pattern could impact the SPS system. Staff meteorologists had identified that this front would cause a prolonged period of extreme cold temperatures within our service territory and began issuing notices on January 31 to plant personnel, Power Operations personnel, Transmission Operations and management to keep them informed of the weather system. Commercial Operations Trading Analytics acted on these notices and began implementing cold weather operation plans on Monday, January 31, which we continued to follow throughout the remainder of the week to maximize reliability. Generation
not already committed over the weekend prior to the cold weather event was issued notice on Sunday January 30 that they would need to prepare and then come online in advance of the arrival of the extreme cold weather. This plan would allow the units to start up while temperatures were warmer, minimizing the potential for start-up failures that could occur due to inclement weather. Trading Analytics planned for all committed units to remain online and operate through the entire cold stretch to further diminish freezing equipment potential.

Natural gas pipelines started to curtail nominated gas on February 2 as a consequence of supply shortfalls. The shortfalls were a result of extremely cold temperatures throughout the south-central US that caused natural gas wells to freeze and generation to fail causing rolling electric blackouts in the ERCOT system. The rolling blackouts further contributed to deteriorating the gas system integrity as some gas processing and production facilities in the region were customers who lost electric service after utilities shed load. El Paso Natural Gas Company (EPNG), Oneok/Westex and Northern Natural Gas (NNG) were all reporting supply concerns to SPS and did initiate gas nomination curtailments, which diminished supplies available for the gas fired power plants in SPS. SPS recognized the potential for a fuel supply emergency to materialize, and took actions to mitigate it, avoiding the impact to electric power system adequacy and reliability. Building on knowledge and experience gained by managing through a fuel driven electric emergency on the Public Service of Colorado system years before, SPS personnel took actions to help prevent exhausting available fuel supplies to the point that could have caused an electric emergency.

At approximately 12:15 CPT on February 2 SPS elevated their system condition to system condition Yellow as a precaution and notified personnel throughout the organization of this change. This action causes plant personnel to avoid unnecessary maintenance that could possibly jeopardize unit reliability. The factors contributing to the elevated condition included the higher system loads that materialized due to the colder temperatures, concerns regarding the availability of gas supply and the fact that while all available resources were online, the uncommitted capacity was approximately equivalent to the amount necessary to replace our largest generating unit (prior to taking other actions); resources remained in excess of our load obligation plus required reserves throughout the event.

At approximately 16:00 CPT on February 2, an Orange Situation Room Alert was called by Transmission Operations for the purpose of discussing the gas supply situation and to determine whether it was appropriate to file a Department of Energy Emergency Incident and Disturbance Report (OE 417 report) as a precautionary measure. Fuel Supply conveyed information about the current and forecast gas nomination curtailments that could impact our power plant operation during the call and accordingly consensus was to file the report. The NERC Standard EOP-004 establishes disturbance reporting requirements, including fuel supply emergencies that could impact electric power system adequacy or reliability. The decision to file the report was made; the report was completed and distributed by Transmission Operations.

In order to maximize the use of the available natural gas, we were burning fuel oil at Jones Station and Gas Supply diverted gas through the NNG pipeline system from the Northern States Power system by starting the Wescott facility to displace storage volumes that could then be diverted to the south end of the NNG system for use at the SPS plants.

At approximately 10:00 on February 3, Hobbs unit #2 was forced offline due to a flow control valve issue. Despite this failure, resources would have been adequate to serve obligation load, but only if fuel supplies remained available to allow its operation. SPS believed that the coordinated
electric plan developed between Commercial Operations and Gas Supply would result in adequate gas supply for the power plants to operate and allow SPS to meet the current electric demands, but there was concern regarding SPS’s ability to handle a trip of our largest coal fired resource.

At approximately 10:30 CPT, the System condition was elevated to level “Orange” and a Orange Situation Room Alert was called to allow updates to be supplied to various sectors of the organization, informing them on the gas situation and the status of the Hobbs unit. Following this conference call, SPS coordinated with other neighbors to issue a public appeal for energy conservation as a precautionary measure, and also requested SPP to declare an Energy Emergency Alert (EEA) Level 1 in accordance with our Transmission emergency operating procedures. SPS did not want to allow the condition to worsen before notifying customers, alerting them to the situation and engaging them to help manage the situation. SPS also initiated curtailment of our customers on interruptible tariffs at approximately this same time. The only interruptible customers that were specifically not curtailed were those whose business is involved in gas and oil production/distribution. SPS did not interrupt these customers intentionally so as to avoid potentially worsening the fuel supply situation.

Gas Supply and Power Operations continued to work together to develop and refine generation plans and fuel utilization expectations through the day on February 3. That afternoon Commercial Operations adjusted their energy offers into the SPP Market to maximize the potential for market flows into the SPS BA. SPS also purchased significant amounts of energy from other entities to help minimize gas burns at the SPS owned and purchase power generation fleet. For the second time, Gas Supply creatively engaged an affiliated Xcel Energy company (which was not experiencing similar strained conditions) and coordinated the purchase of storage gas delivered into the EPNG system from Public Service Company of Colorado to replace gas being cut to serve the Blackhawk plant.

A third Situation Room was called by Transmission Operations at 17:00 CPT on February 3 to procure another update on the gas and electric situation from Commercial Operations and Fuel Supply. Fuel Supply reported that they were receiving more gas nomination cuts from EPNG but that we had been able to make other adjustments and had enough gas without the EPNG gas to run our units to meet loads and maintain electric reserves given the other actions were ongoing. These other actions included continuing to purchase market energy and that Commercial Operations and Energy Supply were able to switch fuels and begin burning oil Plant X to help preserve natural gas supplies.

The Hobbs unit was able to return their second unit to service shortly after the evening conference call on February 3 and then later, at approximately 22:00, SPS was able to terminate their EEA-1. SPS then deescalated the system condition after further reports were received from gas pipelines that their systems were stabilizing on the morning of February 4. From this point forward SPS was confident with the adequacy of fuel supplies for the SPS system.
INTRODUCTION

The New Mexico Public Regulation Commission’s Utility Division Staff (“Staff”) is leading a Weather Response Informal Task Force (the “Task Force”) regarding the February winter weather event. Representatives from Staff, El Paso Electric, Public Service Company of New Mexico (“PNM”), Raton Natural Gas Company, Zia Natural Gas Company, New Mexico Gas Company (“NMGC” or the “Company”), Xcel Energy, the New Mexico Attorney General’s Office, New Mexico Rural Electric Cooperative Association, New Mexico Industrial Energy Consumers, the Federal Energy Regulatory Commission, and Michael Johnson have participated in meetings of the Task Force.

Given the unforeseeable events of February and the unprecedented disruption of supply of natural gas to NMGC, this report supplements the Company’s prior reports to the Task Force by discussing several categories of options for subsequent remedial measures to avoid the adverse impacts on its distribution system caused by upstream supply disruptions similar to those which occurred in February including: possible additional storage, possible additional pipelines, possible liquefied natural gas (“LNG”) and propane-air systems, and possible operational changes to existing facilities. For each option, this report will give a general description, approximate cost estimate, supply impact, timeframe for implementation, and a brief discussion of some of the pros and cons of each option. Each of these alternatives requires further study and analysis and a full cost benefit analysis before any specific recommendation can be made. Many of the alternatives in this report are costly and indentifying the mechanism for the recovery of these costs, if any, is an integral part of the process for considering the viability of the proposed projects.

Litigation is currently pending against NMGC, and this report does not attempt to, nor should it be construed as any attempt to assess the underlying causes of NMGC’s February system emergencies and resulting curtailments. This report is not an attempt to assess legal or other liability, nor is it to be taken as an admission of any liability by the Company, for any of the events of February. As requested by the Task Force, this report is solely intended to be a forward looking document, and is intended for discussion purposes as requested by the New Mexico Public Regulation Commission (“NMPRC”), Staff, and the Task Force to foster a discussion of possible subsequent remedial measures to be implemented to alleviate or lessen the impact of any future supply disruptions to the NMGC system similar to those that occurred in February.

4 Actions Taken and Being Considered by NMGC
A. COMMUNICATIONS, ISOLATION PLANS AND COMPRESSOR CHANGES

Emergency Communications Plan
NMGC has revised and filed its Emergency Communications Plan ("ECP") with the NMPRC as a proposed tariff. By operation of law it became effective July 1, 2011. The ECP includes a dial-out early warning system, a customer communications plan, and communication plans with state and local elected officials and government agencies, Native American pueblos, New Mexico’s Emergency Operations Center, and New Mexico’s Department of Homeland Security. NMGC has also implemented the use of social media which will aid in communication during emergencies.

Communications with Interstate Pipelines
NMGC has worked with Transwestern Pipeline ("TW") and El Paso Natural Gas Company ("EPNG") to improve communications and information exchange on high demand days and when supply or capacity is constrained. In late May 2011, NMGC participated in a mock table-top exercise sponsored by EPNG. This exercise was intended to improve communications between the interstate pipelines and the utilities served by the pipelines. NMGC participated in a Winter Preparedness exercise in October 2011, also sponsored by EPNG, to review and comment on communication improvements implemented by EPNG as a result of the mock table-top exercise in May.

Emergency Operations Plans
NMGC has worked on a review of Company-wide and local plans for emergency operations and will implement changes in 2011.

Isolation Valves in the Albuquerque Metropolitan Area
NMGC has installed isolation valves in the Albuquerque metropolitan area which allow the Company to more quickly curtail customers in the metropolitan area.

Exchange Chaparral Compressor Unit with Arrey Unit
NMGC has exchanged a compressor at the Chaparral Compressor Station with an Arrey Compressor Station unit. The Chaparral Compressor Station is located near Chaparral, New Mexico at the start of the Alamogordo Mainline where gas is received from EPNG to serve White Sands Missile Range, Holloman Air Force Base and the towns of Alamogordo, Tularosa and La Luz. Previously, the Chaparral Compressor Station could move 20 million cubic feet per day ("MMcf/d") with a suction pressure of 575 pounds per square inch ("psig") and a discharge of 700 psig.
The unit exchange with Arrey unit will increase the flow to 24
MMcfd given the same pressures.

Communications with Electric Providers

NMGC is in the process of communicating with providers of
electricity to identify all facilities served by the providers that are
critical to NMGC’s operations. NMGC has also initiated
discussions with PNM regarding its gas-fired power plants and
the impact of those loads on NMGC’s operations.

B. STORAGE OPTIONS AND CONTRACTUAL MODIFICATIONS IN PROGRESS

Contracted Storage Options

NMGC has contracted for an additional 1.0 billion cubic feet
(“bcf”) of storage at the Chevron Keystone facility in Anderson,
Texas. This was completed on April 1, 2011. This added capacity
will be available for the 2011/2012 winter season. NMGC is
currently negotiating longer term contract extensions with
Chevron Keystone to extend storage rights through 2021. NMGC
is also working with Chevron Keystone Gas Storage, Inc to assess
the feasibility of installing backup power to allow operation of the
facility during an electricity outage.

NMGC has entered into an agreement for 2 bcf of storage at
ENSTOR’s Waha facility currently in development. Located
approximately 20 miles south of the Chevron Keystone facility in
Texas, this storage will be constructed in bedded salt. If
completion of the facility and connections to the interstate
pipelines serving NMGC proceeds on schedule, storage services
will be available for the 2012/2013 winter season.

Negotiated Supply Contracts

NMGC has had discussions with over 26 of its gas suppliers in an
effort to negotiate contract terms which would provide for a
higher level of firm gas supply. Topics include elimination of
Force Majeure language in regard to cold weather and freeze-offs.
While willing to discuss changes, most suppliers are resistant to
the idea of eliminating Force Majeure provisions from supply
contracts. NMGC has entered into several contracts with suppliers
including contracts with supply exclusivity and replacement
provisions, higher degrees of supply reliability, more favorable
weather and freeze-off Force Majeure language, greater
nomination options, and flexibility to choose delivery points.

Interstate Transportation Contracts

NMGC has participated in discussions with TW and EPNG to
improve communications and information to NMGC on high
demand days or when conditions constrain transportation
capacity or supply. NMGC is also negotiating for additional
transportation rights to provide a firmer level of transportation for gas from the recently acquired storage rights and other supply receipt points including agreements with EPNG and TW for additional firm transportation rights from the Chevron Keystone Storage Facility to the Rio Puerco Interconnect to support newly acquired storage withdrawal rights.

C. POSSIBLE SUPPLY AND OPERATIONAL OPTIONS

Each of these supply and operational options are complex and in the preliminary analysis and evaluation stage. The descriptions and cost estimates are subject to change as the projects are further analyzed and developed.

Possible Raton Basin Pipeline

NMGC is evaluating options for a new pipeline from the Raton Basin in Colorado to NMGC’s Taos Mainline.

Given the interstate aspect of the project, and anticipated construction difficulties and costs, NMGC is evaluating all construction and routing options. One alternative would entail an extension of CIG’s system in Colorado to Costilla, New Mexico and then another new pipeline from Costilla to either Taos or Otowi. Other options include more southerly routes through New Mexico to the NMGC system. Regardless of the specific route, as currently envisioned, the new pipeline would tie directly into the NMGC system thereby providing additional supply. Additionally, this project would provide approximately 50 MMcfd supply to the NMGC system from a new supply basin not connected to the existing interstate pipelines.

Because of the variations in routes and capacity, the estimated cost of the project runs from approximately $180,000,000.00 to approximately $300,000,000.00. The timeframe for these projects is approximately 3 to 4 years for permitting, rights of way and construction.

Possible L-bar Ranch Storage Facility

The L-bar Ranch is located approximately 20 air miles west of NMGC’s current Albuquerque Mainline transmission corridor and has the potential to be considered as either a reservoir or an aquifer gas storage project. Public Service Company of New Mexico investigated the possibility of developing a gas storage facility at this location in 2001. Analysis of the geology by PNM indicated there may be a potential for 11.0 bcf of natural gas storage capacity, nearly equally split between storage and working gas. In 2001, it was assumed that nearly 6 bcf of base gas would have to be injected into the formation. Deliverability of the one existing well was estimated between 5-20 MMcfd.
Initial cost estimates are based on typical costs per mile for construction of either a 20 or 30 mile pipeline corridor to connect to either the NMGC Albuquerque or Rio Puerco Transmission Mainlines. Development of a storage field is currently being considered but more work remains to determine the total number of wells that would be needed to provide the required withdrawal capacity.

The timeframe for this project is 3 to 5 years. The potential storage facility is located close to the NMGC load center of Albuquerque and could tie into either of two NMGC transmission mainlines. The ability to withdraw gas under peak load in such a close proximity to the load is highly desirable and NMGC would not be dependent on other pipeline companies to deliver additional storage volumes to customers under peak day conditions.

To be effective, withdrawal rates from the facility would need to be in the 100-150 MMcfd range. This would require drilling an undetermined number of additional wells at the site and adding compression at the facility and possibly at the interconnection to the transmission mainline. There are potential deliverability concerns with aquifer storage fields that would need to be explored further.

More study will be necessary before the full costs of the development of the storage facility itself can be determined. Construction, permitting and right of way for a pipeline connecting this facility is estimated to cost roughly $35,000,000-$45,000,000, and base cost gas estimate is approximately $24,000,000 - $36,000,000. The base gas costs are taken from the 2001 study done by PNM and are based on an estimated quantity, priced at $5.43 per MMBtu, which is slightly higher than current market prices.

Possible NMGC Owned Storage

NMGC has investigated the possibility of developing its own gas storage facility in southeast New Mexico. There is suitable bedded salt geology near NMGC, TW, and EPNG gas transmission pipelines. Cost estimates range from $15 to $25 million per bcf of storage capacity, depending on the overall size of the facility. Development and construction timeline estimates range from 2 to 10 years.

The location of this storage would necessitate reliance on existing interstate transmission pipelines for transportation and would still be subject to the same limitations on the ability to deliver gas under low pressure conditions as those experienced in February 2011. Environmental permitting could be extensive and the location in Southeast New Mexico would require transportation on the interstate pipelines.
Possible Loop of the Rio Puerco Pipeline
This proposal loops the existing 16-inch Rio Puerco pipeline from the Redonda Compressor Station to the Santa Fe Junction. The proposed route follows an existing NMGC pipeline corridor across the Pueblo of Laguna, terminating at the West Mesa takeoff just north of I-40. This new line would tie into NMGC’s 24-inch diameter pipeline that was completed in 2003 and would provide additional supply capacity of approximately 200 MMcfd onto the NMGC Rio Puerco pipeline. The project is estimated to cost $41.2 million and would require approximately 3 years of lead time for permitting and construction.

As described, this pipeline would not tap any new sources of supply as it would rely on existing interstate transmission pipelines and would still be subject to the same limitations on the ability to deliver gas under low pressure conditions as those experienced in February. In addition, new compression would likely be needed to allow for the full capacity of the new line. Cost estimates for this compression will require further research.

Looping this line would require negotiation with Laguna Pueblo for installation of a new line under terms of the existing rights-of-way agreement.

Possible Added Compression at the Redonda Compressor Station
NMGC has examined the feasibility of adding compression to the Redonda Compressor Station. Estimated additional horse power (“HP”) required is 4,500 and this could be accomplished by adding four reciprocating compressors, three turbines or a combination of both types. Estimated cost is $10.8 million assuming no further emission controls are required for the existing compression. Assuming the installation would be within the existing footprint of the station, it would not require negotiation with Laguna Pueblo under the terms of the existing rights of way lease. This project would take 26 months to complete.

The current Redonda Compressor Station can move 82 MMcfd with a suction pressure of 550 psig and a discharge of 650 psig. This change would increase the station flow by 240 MMcfd bringing the total to 322 MMcfd. This flow rate diminishes greatly as discharge pressure increases.

Adding additional compressors to the Redonda Compressor Station would increase flexibility while increasing total station throughput, thus allowing the delivery of the full capacity of the Rio Puerco Mainline. This project would not tap any new sources of supply as it would rely on existing interstate transmission pipelines and would still be subject to the same limitations on the
ability to deliver gas under low pressure conditions as those experienced in February.

There are significant issues with regard to air permits at this location. The increase in horsepower at the location would require “major source” permitting from the Environmental Protection Agency (“EPA”) Region VI. Air permits on tribal land are not regulated by the NMED but are instead regulated directly by EPA. The EPA may delegate this authority to a qualifying tribal permitting program. Currently Laguna Pueblo does not have a delegated program. This project would also increase dependence on renewable term right-of-way agreements; the terms of such are negotiated with the trends towards shorter agreements.

Possible Pipeline from Ojito to DOE Pipeline with Compression

The proposed line would run approximately 29 miles along State Highway 537 from the Company’s Williams Ojito Compressor Station to the interconnect with the Company’s 12-inch D.O.E. Transmission Mainline near US Highway 550. The pipeline would continue another 23 miles, to interconnect with the 18-inch and 20-inch Albuquerque Transmission Mainlines in the northeast corner of McKinley County, approximately 6 miles southeast of NMGC’s Star Lake Compressor Station for a total of 52 miles of new pipeline. In addition, a 5,500 HP compressor station near the intersection of Highway 537 and 550 would need to be constructed.

The estimated cost of the pipeline, compression and metering is $115 million with a 3 year lead time required for permitting and construction. The assumption is made that sufficient incremental firm supply is secured to satisfy peak day needs. This project would provide an additional supply capacity of 100 MMcf/d into the Albuquerque Mainlines within the San Juan Basin.

Additional compression would be geographically difficult to access from either the Northwest or Metro operational areas. Staffing such a new station would require additional operation and maintenance expenditures. The majority of the route traverses the Jicarilla Apache Nation and would require term rights-of-way acquisition that must be renewed.

Possible Pipeline from Ojito to Taos Mainline at Hernandez

This project calls for construction of approximately 102 miles of 10-inch diameter pipeline south and east from the Williams Ojito Compressor Station to the 8-inch Taos Mainline near Hernandez, New Mexico. The selected route would generally follow State Highway 96 through the communities of Gallina and Coyote, New Mexico. This project is presently estimated to cost
approximately $191 million and would also require approximately 3 years of lead time for permitting and construction.

As envisioned, this project would provide an additional supply capacity of 100 MMcf/d directly into the Taos Mainline just north of Española. The route maximizes the use of private and highway rights-of-way where perpetual easements may be obtained to provide more operational certainty. The new pipeline would also provide NMGC the opportunity to serve additional communities within the state located along Highway 96.

Supply from the San Juan Basin would still be subject to freeze-offs.

**Possible East Mountain Pipeline**

This proposed project consists of approximately 96 miles of 24-inch diameter pipeline from a new interconnect with the interstate pipelines in Torrance County, New Mexico. The route would follow existing road corridors and interconnect with the NMGC system just south of Santa Fe. An alternative to continuing the pipeline all the way to Santa Fe would be to follow an existing oil pipeline corridor (not NMGC’s) to tie into the Santa Fe Mainline near Placitas. Costs for this alternative should be less than the entire route, but have not been developed. As described, this project is estimated to cost $100 million and would require approximately 2 years of lead time for permitting, right-of-way, and construction.

This project would provide additional supply capacity of approximately 300 MMcf/d directly to Santa Fe and the pipelines feeding the northern communities. The identified route would follow existing roads and would allow for private rights-of-way acquisition. As an all private route, permitting and rights-of-way acquisition would likely be completed in less time than the other identified routes.

This pipeline would not tap any new sources of supply and would rely on existing interstate transmission pipelines making it subject to the same limitations on ability to deliver gas under low pressure conditions, such as those experienced in February.

**Possible Added Second Header at the Redonda Compressor Station**

NMGC has examined the feasibility of adding a second suction header to the Redonda Compressor Station to compress both TW and EPNG gas simultaneously. This project is estimated at $850,000 assuming the air permit can be obtained without adding further emission controls to any existing compression. Rights-of-way costs are not included in this estimate. The project would take eight months to complete.

This project would not increase station capacity and would not tap any new sources of supply as it would rely on existing
interstate transmission pipelines and would still be subject to the same limitations on ability to deliver gas under low pressure conditions, such as those experienced in February. However, this would allow NMGC’s Gas Control more flexibility to start compressors and run them on the different supply pipelines individually. Currently both compressors can only compress gas from one interstate pipeline or both. This project would allow a compressor to move varying volumes of gas from either pipeline. It would allow the compressor to run during times that it currently cannot.

Possible CNG, LNG and Propane Air Systems
NMGC is actively examining the use of liquefied natural gas (“LNG”) as a storage and peak-shaving system to supplement supply during extreme weather events. These systems involve storing products in vessels at high pressures and complex mechanical systems that enable the products to be injected into NMGC’s systems. Estimated costs range widely depending on size and configuration, with a timeframe of 1 to 4 years for design, permitting, construction and start-up. Permitting, operational and safety concerns, and regulations and land requirements would be significant.

These systems are costly to maintain, especially considering the minimal number of hours that they may be operated over the lifetime of the systems. These plants are above-grade facilities which require fencing, certain security requirements, continual monitoring, and site set-backs.

Possible Other Compressor Options
Several additional potential changes in NMGC’s compressor utilization, such as relocation of existing compressors, have been investigated. Costs for these options range from $200,000 to $500,000. Some of the options considered require additional rights-of-way and environmental permits. Timeframe for these projects range from several months to several years. In addition, NMGC looked at adding new compression at various locations. Costs for these options are significantly higher and timeframes for completion are also significantly longer. Some of the options considered require additional rights-of-way and environmental permits.

D. LEGAL/REGULATORY
Possible Rule Changes
NMGC is reviewing possible changes to the Company’s filed tariffs based on the February Events.
5  **Actions Taken and Being Considered by RNG**

The following items have been identified by Raton Natural Gas Company as potential topics to be reviewed annually by NM natural gas system operators during a pre-heating season roundtable. This session should be hosted by a joint NMPRC/NMGA committee and include discussion topics such as those listed below in preparation for potential emergency scenario action:

1. Individual operator Emergency Curtailment Procedures.
2. Customer Meter Shutdown/Relighting Procedures.
3. Communication among interconnected pipelines.
4. Operators and LDC’s. Gas System Operator Pre-Heating season verification that all City Gate and District Regulator Stations meet the design/operational requirements of 49 CFR Part 192.739 (a)(2) for main runs and especially regulated bypass and/or parallel redundant runs. This requirement is intended to demonstrate adequate deliverability and continued reliable gas service under typical New Mexico operating conditions.

In addition, the NMPRC should issue an advisory to all New Mexico Gas System Operators, specifically those operating as a "intrastate gas pipeline facility” defined under TITLE 49 USC, Pipeline Safety Statute, and emphasize that such gas facilities are solely under the direct and complete jurisdiction of “the appropriate State or local authority”, in this case, the New Mexico Public Regulatory Commission. Therefore, all provisions of the US Natural Gas Act must be adhered to by all natural gas system operators, LDC or pipeline.

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33 The Pipeline Safety Statute 49 USC, §60101. Definitions, (a) GENERAL, (9) “intrastate gas pipeline facility”.
6 Actions Taken and Being Considered by ZNG

Zia’s Lincoln County System also experienced cold weather and high usage over the weekend of December 31, 2010 and January 1, 2011. Based on pressure data throughout the Lincoln County distribution system, Zia was able to identify several opportunities for short loops to tie-in one area to another. We were able to extend those lines before the cold weather during the first part of February and did not see the same pressure issues in those subdivisions. We are continuing to identify and install pipeline loops in various areas.

In the Hobbs System, the pressure and flow data gathered during the cold weather in February will enable us to make better engineering decisions when replacing and sizing pipe. In addition, although we did not lose gas service to customers along Hwy 132, we have also identified a need to add an additional loop to the line running along the highway to eliminate future pressure problems.

In the Maxwell System, we intend to install a pressure alarm at distribution pressure regulation station serving Cimarron, as that is the only area where we experienced some low pressures.

Identification of problems that may occur in these situations and actions that could alleviate or mitigate these problems.

The utility industry needs to look at two issues for future response to the weather events similar to the event experienced during the first of February:

1. The electric and natural gas utilities serving an area need to coordinate with each other during power outages. The power outage in Hobbs on February 2 and the power outage in Ruidoso on February 3 were directly linked to pressure loss and gas outages experienced by customers in those systems. Although Zia was able to build pressure back into those areas quickly and limit the number of customers affected, we believe that a coordinated effort between the utilities to restore power to smaller areas over a period of time would eliminate the immediate loss of pressure caused by all of the gas appliances coming on simultaneously. Bringing smaller areas back up over a period of time would also reduce the surge on the electrical systems caused by all electric appliances turning back on immediately; and,

2. Curtailment plans need to extend to all utilities served along a single feed or transmission line with no compression capabilities.
List of New Mexico Electricity Generating Units by Operator, Location, Size, Primary Fuel, and Back-up Fuel
7.1 PNM

<table>
<thead>
<tr>
<th>Generating Facility or Unit (Subject to NMPRC Jurisdiction)</th>
<th>Location</th>
<th>PNM Ownership Share</th>
<th>Capacity in MW (1)</th>
<th>Primary Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afton Generating Station</td>
<td>La Mesa, Doña Ana County</td>
<td>100%</td>
<td>230</td>
<td>Natural Gas</td>
</tr>
<tr>
<td>Delta Generating Station</td>
<td>Albuquerque, Bernalillo County</td>
<td>PPA</td>
<td>132</td>
<td>Natural Gas or No. 2 Diesel Fuel</td>
</tr>
<tr>
<td>Four Corners Unit 4</td>
<td>Fruitland, San Juan County</td>
<td>13%</td>
<td>100</td>
<td>Coal</td>
</tr>
<tr>
<td>Four Corners Unit 5</td>
<td>Fruitland, San Juan County</td>
<td>13%</td>
<td>100</td>
<td>Coal</td>
</tr>
<tr>
<td>Lordsburg Generating Station#1</td>
<td>Lordsburg, Hidalgo County</td>
<td>100%</td>
<td>40</td>
<td>Natural Gas</td>
</tr>
<tr>
<td>Lordsburg Generating Station #2</td>
<td>Lordsburg, Hidalgo County</td>
<td>100%</td>
<td>40</td>
<td>Natural Gas</td>
</tr>
<tr>
<td>Luna Energy Facility</td>
<td>City of Deming, Luna County</td>
<td>33.3%</td>
<td>185</td>
<td>Natural Gas</td>
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<tr>
<td>New Mexico Wind Energy Center</td>
<td>House, Quay and DeBaca Counties</td>
<td>PPA</td>
<td>200</td>
<td>Wind</td>
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<tr>
<td>Palo Verde Nuclear Generating Station, Unit 1</td>
<td>Wintersburg, Arizona</td>
<td>10.2% (2)</td>
<td>134</td>
<td>Nuclear</td>
</tr>
<tr>
<td>Palo Verde Nuclear Generating Station, Unit 2</td>
<td>Wintersburg, Arizona</td>
<td>10.2% (2)</td>
<td>134</td>
<td>Nuclear</td>
</tr>
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<td>Reeves Generating Station, Unit 1</td>
<td>Albuquerque, Bernalillo County</td>
<td>100%</td>
<td>44</td>
<td>Natural Gas</td>
</tr>
<tr>
<td>Reeves Generating Station Unit 2</td>
<td>Albuquerque, Bernalillo County</td>
<td>100%</td>
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<td>Natural Gas</td>
</tr>
<tr>
<td>Reeves Generating Station Unit 3</td>
<td>Albuquerque, Bernalillo County</td>
<td>100%</td>
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<td>Natural Gas</td>
</tr>
<tr>
<td>San Juan Generating Station, Unit 1</td>
<td>Waterflow, San Juan County</td>
<td>50%</td>
<td>170</td>
<td>Coal</td>
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<tr>
<td>San Juan Generating Station, Unit 2</td>
<td>Waterflow, San Juan County</td>
<td>50%</td>
<td>170</td>
<td>Coal</td>
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<td>San Juan Generating Station, Unit 3</td>
<td>Waterflow, San Juan County</td>
<td>50%</td>
<td>221 (4)</td>
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<td>San Juan Generating Station, Unit 4</td>
<td>Waterflow, San Juan County</td>
<td>38.45%</td>
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<td>PNM Solar Generating Facilities</td>
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<td>100%</td>
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<td>Solar Photovoltaic</td>
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<td>Valencia Generating Station</td>
<td>Belen, Valencia County</td>
<td>PPA</td>
<td>145</td>
<td>Natural Gas</td>
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</table>

Footnotes:

1. MW associated with PNM’s ownership share or entitlements under a PPA.
2. Ownership share of Palo Verde Nuclear Generating Station includes leases: Unit 1: 30 MW owned, 104 MW leased; Unit 2: 60 MW owned, 74 MW leased.
3. In-service or under construction for completion by year-end 2011. Locations include Alamogordo, Albuquerque, Algodones, Deming, Las Vegas and Los Lunas.
4. Reflects operating agreements that swap generation output shares of Units 3 and 4.
### Generating Facility, Unit, or PPA Location (City, State)

<table>
<thead>
<tr>
<th>Generating Facility, Unit, or PPA</th>
<th>Ownership Share</th>
<th>Capacity in MW (ownership share or PPA entitlement)</th>
<th>Primary Fuel</th>
<th>Backup Fuel (if any)</th>
<th>Technology</th>
<th>Owner</th>
<th>COD</th>
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</thead>
<tbody>
<tr>
<td>Carlsbad Eddy - NM</td>
<td>100%</td>
<td>10</td>
<td>Natural Gas</td>
<td>None</td>
<td>Simple Cycle</td>
<td>SPS</td>
<td>1968</td>
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<td>Cunningham Lea - NM</td>
<td>100%</td>
<td>470</td>
<td>Natural Gas</td>
<td>None</td>
<td>Simple Cycle</td>
<td>SPS</td>
<td>1957-1958</td>
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<tr>
<td>Harrington Potter - TX</td>
<td>100%</td>
<td>1030</td>
<td>Coal</td>
<td>Natural Gas</td>
<td>Steam</td>
<td>SPS</td>
<td>1976-1980</td>
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<td>Jones Lubbock - TX</td>
<td>100%</td>
<td>485</td>
<td>Natural Gas</td>
<td>Oil - partial</td>
<td>Steam</td>
<td>SPS</td>
<td>1971-1974</td>
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<td>Maddox Eddy - NM</td>
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<td>186</td>
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<td>Steam Simple Cycle</td>
<td>SPS</td>
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<td>Steam</td>
<td>SPS</td>
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<td>Nichols Potter - TX</td>
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<td>None</td>
<td>Steam</td>
<td>SPS</td>
<td>1960-1968</td>
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<td>Plant X Lamb - TX</td>
<td>100%</td>
<td>412</td>
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<td>Oil - partial</td>
<td>Steam</td>
<td>SPS</td>
<td>1952-1964</td>
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<td>Tolk Lamb - TX</td>
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<td>1063</td>
<td>Coal</td>
<td>Natural Gas (at reduced capacity)</td>
<td>Steam</td>
<td>SPS</td>
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<td>Riverview Hutchinson - TX</td>
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<td>None</td>
<td>Simple Cycle</td>
<td>SPS</td>
<td>1973</td>
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<td>Tucumcari Quay - NM</td>
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<td>0</td>
<td>Oil</td>
<td>None</td>
<td>Reciprocating Engine</td>
<td>SPS</td>
<td>1959</td>
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<td>Sid Richardson Hutchinson - TX</td>
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<td>Cogen</td>
<td>Sid Richardson Carbon, LTD</td>
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<td>Cogen</td>
<td>Engineering Carbons, Inc.</td>
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<td>None</td>
<td>Gas Turbine</td>
<td>Borger Energy Associates</td>
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<td>LP &amp; L</td>
<td>1964-1978</td>
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<td>Massengale Lubbock - TX</td>
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<td>None</td>
<td>Steam Gas Turbine</td>
<td>LP &amp; L</td>
<td>1957-2000</td>
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<td>Brandon Lubbock - TX</td>
<td>0%</td>
<td>20</td>
<td>Natural Gas</td>
<td>None</td>
<td>Gas Turbine</td>
<td>LP &amp; L</td>
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<tr>
<td>Lea Power Lea - NM</td>
<td>0%</td>
<td>525</td>
<td>Natural Gas</td>
<td>None</td>
<td>Combustion Turbine</td>
<td>Lea Power Partners</td>
<td>2008</td>
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<tr>
<td>Wildorado Oldham, Potter, Randall - TX</td>
<td>0%</td>
<td>161</td>
<td>Wind</td>
<td>None</td>
<td>Wind Turbine</td>
<td>Other</td>
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<tr>
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<td>0%</td>
<td>79.5</td>
<td>Wind</td>
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<td>Wind Turbine</td>
<td>Llano Escantado, L.P.</td>
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<tr>
<td>San Juan Wind Elida - NM</td>
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<td>120</td>
<td>Wind</td>
<td>None</td>
<td>Wind Turbine</td>
<td>Other</td>
<td>2005</td>
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<td>Caprock Wind Quay - NM</td>
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<td>80</td>
<td>Wind</td>
<td>None</td>
<td>Wind Turbine</td>
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<tr>
<td>Aeolus Hansford - TX</td>
<td>0%</td>
<td>3</td>
<td>Wind</td>
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<td>Wind Turbine</td>
<td>Other</td>
<td>2004</td>
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<tr>
<td>National Wind Project Lubbock - TX</td>
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<td>0.7</td>
<td>Wind</td>
<td>None</td>
<td>Wind Turbine</td>
<td>Other</td>
<td>2005</td>
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<tr>
<td>High Plains Wind Power Carson - TX</td>
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<td>10</td>
<td>Wind</td>
<td>None</td>
<td>Wind Turbine</td>
<td>Other</td>
<td>2008</td>
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<tr>
<td>Exelon 1 - 4 Hansford - TX</td>
<td>0%</td>
<td>109.8</td>
<td>Wind</td>
<td>None</td>
<td>Wind Turbine</td>
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<td>2005-2007</td>
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<td>Exelon 5 - 6 Sherman - TX</td>
<td>0%</td>
<td>20</td>
<td>Wind</td>
<td>None</td>
<td>Wind Turbine</td>
<td>Other</td>
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<td>Exelon 7 - 11 Moore - TX</td>
<td>0%</td>
<td>50</td>
<td>Wind</td>
<td>None</td>
<td>Wind Turbine</td>
<td>Other</td>
<td>2008</td>
</tr>
<tr>
<td>Sunray 1 &amp; 2 Moore - TX</td>
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<td>15</td>
<td>Wind</td>
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<td>Wind Turbine</td>
<td>Other</td>
<td>2008-2009</td>
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### 7.3 EPE

<table>
<thead>
<tr>
<th>Generating Facility, Unit, or PPA (NMPRC Jurisdiction)</th>
<th>Location (City, State)</th>
<th>Ownership Share</th>
<th>Capacity in MW (ownership share or PPA entitlement)</th>
<th>Primary Fuel</th>
<th>Backup Fuel (if any)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rio Grande 6</td>
<td>Sunland Park, NM</td>
<td>100%</td>
<td>45</td>
<td>Natural Gas</td>
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<tr>
<td>Rio Grande 7</td>
<td>Sunland Park, NM</td>
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<td>46</td>
<td>Natural Gas</td>
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<tr>
<td>Rio Grande 8</td>
<td>Sunland Park, NM</td>
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<td>138</td>
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<tr>
<td>Newman 1</td>
<td>El Paso, TX</td>
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<td>74</td>
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<td>Fuel Oil</td>
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<td>Newman 2</td>
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<td>Fuel Oil</td>
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<td>Natural Gas</td>
<td>Fuel Oil</td>
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<td>227</td>
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<tr>
<td>Four Corners 4</td>
<td>Farmington, NM</td>
<td>7%</td>
<td>54</td>
<td>Coal</td>
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<tr>
<td>Four Corners 5</td>
<td>Farmington, NM</td>
<td>7%</td>
<td>54</td>
<td>Coal</td>
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<tr>
<td>Palo Verde 1</td>
<td>Wintersburg, AZ</td>
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<td>Nuclear</td>
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<tr>
<td>Palo Verde 2</td>
<td>Wintersburg, AZ</td>
<td>15.80%</td>
<td>211</td>
<td>Nuclear</td>
<td></td>
</tr>
<tr>
<td>Palo Verde 3</td>
<td>Wintersburg, AZ</td>
<td>15.80%</td>
<td>211</td>
<td>Nuclear</td>
<td></td>
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<tr>
<td>Hueco Mountain Wind Ranch</td>
<td>near Horizon City, TX</td>
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<td>1.32</td>
<td>Wind</td>
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<td>Hatch Solar Facility PPA</td>
<td>Hatch, NM</td>
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<td>5</td>
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<td>NRG Solar Facility PPA</td>
<td>Santa Teresa, NM</td>
<td>0%</td>
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<td>Wrangler Solar Facility</td>
<td>El Paso, TX</td>
<td>100%</td>
<td>46.8kW</td>
<td>Solar</td>
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<tr>
<td>Rio Grande Solar Facility</td>
<td>Sunland Park, NM</td>
<td>100%</td>
<td>64kW</td>
<td>Solar</td>
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<td>Newman Solar Facility</td>
<td>El Paso, TX</td>
<td>100%</td>
<td>64kW</td>
<td>Solar</td>
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<td>Shell Energy PPA (1)</td>
<td>Lordsburg, NM</td>
<td>0%</td>
<td>40MW</td>
<td>Natural Gas</td>
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<tr>
<td>Freeport-McMoran (2)</td>
<td>Deming, NM</td>
<td>0%</td>
<td>125MW</td>
<td>Natural Gas</td>
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</tr>
</tbody>
</table>

**Notes:**

1. The Company entered into an agreement in 2009 to purchase capacity of up to 40 MW and unit contingent energy during 2010 from Shell Energy North America ("Shell"). Under the agreement, the Company provides natural gas to Pyramid Unit No. 4 where Shell has the right to convert natural gas to electric energy. The Company entered into a contract with Shell on May 17, 2010 to extend the term of the capacity and unit contingent energy purchase from January 1, 2011 through September 30, 2014.

2. The Company initiated a purchased Power and Sale Agreement with Freeport-McMoran formerly Phelps Dodge. The contract provides for Freeport to deliver energy to EPE from its ownership interest in the Lune Energy Facility and for EPE to deliver a like amount of energy at Greenlee, Arizona. EPE may purchase up to 125MW at a specified time when energy is not exchanged under the Power Purchase and Sale Agreement. The contract continues through December 31, 2021.
Service Territory Maps
8.1 PNM
8.2 SPS
8.3 EPE

EL PASO ELECTRIC SERVICE TERRITORY
8.4 NMGC

Major Gas Transmission Facilities within New Mexico
8.5 ZNG
8.6 RNG