BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

*** * * ***

IN THE MATTER OF THE APPLICATION OF	**)**
PUBLIC SERVICE COMPANY OF COLORADO	**) DOCKET NO. 11A-869E**
FOR APPROVAL OF ITS 2011 ELECTRIC	**)**
RESOURCE PLAN	**)**

SUPPLEMENTAL DIRECT TESTIMONY AND EXHIBITS OF JOHN T. WELCH

ON

BEHALF OF

PUBLIC SERVICE COMPANY OF COLORADO

February 13, 2012

LIST OF EXHIBITS

Exhibit No. JTW-1	Winter Generation Adequacy Report
Exhibit No. JTW-2	Winter Generation Adequacy Study

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I. INTRODUCTIONS AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS

A. My name is John T. Welch. My business address is 1800 Larimer Street, Denver, Colorado 80202.

Q. BY WHOM ARE YOU EMPLOYED AND WHAT IS YOUR POSITION?

A. I am employed by Xcel Energy Services Inc., the service company subsidiary of Xcel Energy, as Director, Power Operations.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?

A. I am filing testimony on behalf of Public Service Company of Colorado ("Public Service" or "Company"), an electric utility subsidiary of Xcel Energy Inc. ("Xcel Energy"). Xcel Energy is a registered holding company and owns several electric and natural gas utility operating companies and a regulated gas pipeline company.[1]

[1] Xcel Energy is the parent company of the following four wholly owned utility operating companies: Northern States Power Company, a Minnesota corporation; Northern States Power Company, a Wisconsin corporation; Public Service Company of Colorado, a Colorado corporation ("PSCo"); and SPS (collectively, "Operating Companies", or individually, "Operating Company"). Xcel Energy's gas pipeline subsidiary is WestGas InterState, Inc.

Q. PLEASE OUTLINE YOUR RESPONSIBILITIES AS DIRECTOR, POWER OPERATIONS.

A. I am responsible for directing the economic dispatch activities of Xcel Energy's generation resources and power purchase resources for the Xcel Energy Operating Companies, including Public Service. Duties in this role include short-term economic resource planning, or "setting up" the system on a next-day basis as well as real-time generation dispatch functions.

Q. HAVE YOU INCLUDED A DESCRIPTION OF YOUR QUALIFICATIONS, DUTIES, AND RESPONSIBILITIES?

A. Yes. A description of my qualifications, duties, and responsibilities is included as Attachment A.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to sponsor and discuss the Winter Generation Adequacy Study ("Study") that Public Service conducted to evaluate the impact of firm natural gas supply on the reliable winter operation of Public Service's generation portfolio for both owned and power purchase resources. I also sponsor and discuss the accompanying Winter Generation Adequacy Report ("Report"), which gives details on the drivers and inputs for the Study and our overall evaluation process.

II. PUBLIC SERVICE WINTER SEASON ENERGY PLANNING REQUIREMENTS

Q. WHY IS IT IMPORTANT TO CONSIDER NATURAL GAS SUPPLY IN WINTER ELECTRIC SEASON PLANNING?

A. Reliably managing the electric system during peak winter conditions is challenging in part because of the increasing interdependency of electric and gas systems. On days when the Public Service electric system experiences its peak winter firm electric demand, the natural gas systems are likely also taxed as customer demand for gas peaks due to heating load. During a period of peak winter firm electric demand when gas systems are also operating at peak capacity, Public Service will not be able to nominate natural gas supply to operate gas-fired electric generators that do not have firm natural gas transport contracts. As a result, generation resources that do not have reliable firm fuel supplies should not be included in seasonal planning processes or operating plans. For this reason, it is important to consider the natural gas supply for electric generators when planning to serve peak winter firm electric demand.

Q. DO YOU BELIEVE THAT THE QUALITY (*I.E.* FIRM OR NON-FIRM) OF A GENERATOR'S NATURAL GAS FUEL SUPPLY SHOULD FACTOR INTO PUBLIC SERVICE'S WINTER PLANNING PROCESSES?

A. Yes, it is a critical element to consider in a reliable electric plan.

Q. COULD PUBLIC SERVICE RELY SOLELY ON INTERRUPTIBLE NATURAL GAS TRANSPORT SERVICE AND RELIABLY OPERATE THEIR SYSTEM DURING THE WINTER?

A. No, not exclusively given the generation resource portfolio make up and forecast peak winter firm electric demand. However, we cannot require that service to all resources be firm, as this could be cost prohibitive. Given these

constraints, the Winter Generation Adequacy Study assists us in determining the appropriate amount of firm generating resources that are needed to reliably serve the peak winter electric load.

Q. IF A FACILITY WAS DESIGNED AND CAPABLE TO OPERATE ON A SECONDARY FUEL, SUCH AS FUEL OIL, AND HAD SUFFICIENT ONSITE STORAGE FOR THIS FUEL, WAS THE FACILITY INCLUDED IN PUBLIC SERVICE'S WINTER PLANNING PROCESSES?

A. Yes. Either firm natural gas transportation service or interruptible natural gas transportation supplemented with adequate secondary fuel capability storage satisfied the firm fuel requirement for dispatchable generation.

Q. BRIEFLY EXPLAIN THE EVALUATION PROCESS THAT WAS EMPLOYED TO DETERMINE WHETHER SUFFICIENT FIRM GENERATION RESOURCES WERE AVAILABLE TO SERVE THE PEAK WINTER FIRM ELECTRIC DEMAND?

A. Our Winter Generation Adequacy Study involved determining from an operational perspective whether we have a sufficient amount of owned and power purchase generating resources with firm fuel supplies to meet upcoming forecast peak winter firm electric demand while maintaining our required operating reserves. As noted earlier, natural gas fired generation resources only qualify for consideration if the facility has firm natural gas service allowing unrestricted reliable operation during periods of high gas and electric demand. Additionally, if the generation site does not have firm natural gas supply but does have an available and sufficient secondary fuel source,

such as fuel oil inventory in on site storage tanks, then the facility may still qualify for consideration. Our Study included development of a metric termed the “Winter Generation Adequacy Net Capacity” for the Public Service system to gauge whether sufficient firm fuel supplied generation resources were available or not. At a high level, the capacity metric was calculated by adding the capacity of qualifying generating resources and then subtracting the peak winter firm electric demand (forecast load reduced by contractually interruptible load under demand side management programs), the operating reserve requirements, and a contingency margin. A positive figure indicates that adequate resources with firm fuel supply are available to help ensure system reliability. A negative figure indicates that insufficient resources with firm fuel supply are available for reliable system operation. This calculation was performed for December of each year starting in 2012 and continuing through 2022. The month of December is used because it is the month that is projected to have the highest forecast monthly peak winter firm electric demand during each winter season through the same period. The net capacity position is increased by an increase in available owned and purchase power resources including coal, hydro, wind and gas-fired resources with firm gas transportation service as well as gas-fired resources with adequate back-up fuel supply. The net capacity position is reduced by increases in peak electric demand, operating reserve requirements or the contingency margin.

Q. DID PERSONNEL PARTICIPATING IN THE CONDUCT OF THE STUDY ALSO DRAFT A REPORT TO PROVIDE ADDITIONAL DETAILS ON THE PROCESSES EMPLOYED WHEN EVALUATING THE ADEQUACY OF WINTER GENERATION?

A. Yes. The Report is included as Exhibit No. JTW-1 to my testimony.

Q. WHAT ARE THE RESULTS OF THE 2011 WINTER GENERATION ADEQUACY STUDY?

A. Our 2011 Winter Generation Adequacy Study indicates that at present we anticipate having sufficient firm winter generation resource adequacy through 2017. Although these findings will need to be updated to incorporate updated electric load forecasts or other inputs as appropriate throughout the 2011 ERP's Resource Acquisition Period, Public Service expects to need to take action to increase firm fuel supply to resources. These actions could include such things as firming gas transport contracts, increasing secondary fuel options on existing resources or adding generating resources with firm winter fuel sources starting in 2018. The 2011 Winter Generation Adequacy Study, included as Exhibit No. JTW-2 to my testimony, sets forth the details of these options.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, this concludes my testimony.

Attachment A

Statement of Qualifications

John T. Welch

I graduated from the University of Iowa in Iowa City, Iowa with a Bachelor of Fine Arts degree in 1997.

I am currently employed as Director, Power Operations for Xcel Energy Services Inc. in Denver, Colorado. My group is responsible for directing the economic generation operations of the Xcel Energy operating companies. This includes optimizing and reliably dispatching the Public Service Company of Colorado, Northern States Power, and Southwestern Public Service owned and purchased power generation resources to meet the electric system demand. The Power Operations group is also responsible for the short-term modeling of our electric resource portfolios.

I have eleven years of experience in system operations at Xcel Energy and its former subsidiary NRG. I have performed various functions within power system operations, including direct control over system dispatch decisions as a NERC certified system operator. I was hired as Manager, Generation Control and Dispatch and responsible to oversee the real-time dispatch personnel for all of the Xcel Energy operating companies starting in October of 2002 and remained in the position for the three and a half years, reporting to the Director of Power Operations. I was then promoted to my current position of Director, Power Operations in February of 2006.

2011 Electric Resource Plan Winter Generation Adequacy Study Report

Background, Purpose and Drivers:

Over the course of the next several years Public Service's portfolio of owned and purchased power generation resources will undergo changes that will impact the overall fuel mix utilized to generate the electricity needed to serve our customers. Changes in Public Service's portfolio of coal-fired resources, for which ample fuel supply can be stored on site, will have the greatest effect on the system. The changes made in Public Service's portfolio of coal-fired resources to comply with the 2010 Clean Air-Clean Jobs Act ("CACJA") include retirement of units and switching units to operate on natural gas. Additionally, some power purchase agreements ("PPA") and other long-term contracts, some of which are also sourced from coal-fired generation, will terminate. On account of these changes Public Service will rely more heavily on natural gas-fired generation resources to serve firm electric customer load.

Natural gas (in contrast to coal) is not stored on site at generation stations so Public Service must rely on daily purchases, gas storage, and transportation availability in order for the fuel to be delivered when the plant is dispatched. Therefore the availability of fuel at each gas-fired generation station is dependent on the level of transportation services (volume and service level) under contract and how much lead time is available between when the plant is dispatched and the fuel is required. Plants without firm pipeline gas transportation service and access to gas storage may be restricted as to when they can be dispatched due to fuel availability. This is typically most restricted during the winter heating season when firm gas transportation contracts on the pipeline are being used to meet gas heating demands.

Presently, some of the generators in Public Service's electric resource portfolio have non-firm or interruptible gas supplies/contracts and, consequently, may have their fuel availability interrupted from time to time. To date this approach to gas transportation

contracting has been successful, helping to maintain lower service costs for customers without imposing any reliability concerns for Public Service as our portfolio of generation resources is sufficiently weighted with coal-fired resources which in essence maintain a "firm" supply of fuel on-site. Additionally, in the summertime when annual electric demand peaks on the Public Service system, the gas pipeline systems tend to operate well below their capacity and generation may utilize non-firm service without expectation of restrictions. Therefore to date, there has been an appropriate amount of interruptible natural gas service to ensure the adequacy of the Public Service generation fleet (both owned and purchased) to maintain electric service to our customers. However, as our generation portfolio changes in the coming years and becomes increasingly reliant on gas-fired generation, Public Service will have to adapt to these changes and maintain an appropriate balance of fuel services to manage the system.[1]

The need to specifically evaluate multi-year winter generation adequacy is new. Although Public Service has reviewed the short-term winter resource adequacy each fall for the upcoming winter season, our long-term generation planning efforts have focused on the summer season when Public Service experiences their highest electric demand. Coincident with the changes in our resource portfolio, there has also been new industry focus on winter season adequacy planning. This is primarily a result of wide spread electric outages that occurred in the Southwest region of the United States and Texas when extreme cold settled over the region in February 2011. For a period of time utilities did not have enough generation capability, (due to planned outages and generation unit failures) to meet peak winter electric demand, resulting in the need to shed load in order to restore electric resource and load balance and prevent uncontrolled or cascading outages. Staff from the Federal Energy Regulatory Commission ("FERC") and North

[1] The portfolio changes associated with CACJA were specifically coordinated such that replacement resources would include firm fuel supply.

American Electric Reliability Corporation ("NERC") formed a task force and issued a joint report on the outages in August of 2011 wherein they recommended greater winter reliability or adequacy reviews. Two recommendations from the FERC and NERC report in particular resonated with Public Service.

> *"While the probability of a winter event in the predominantly summer peaking Southwest appears to be low, shedding load in the winter places lives and property at risk. The [Staff] task force recommends that all entities responsible for the reliability of the bulk power system in the Southwest prepare for the winter season with the same sense of urgency and priority as they prepare for the summer peak season."*
>
> *"Planners should undertake a sensitivity study, using the 2011 actual conditions as a possible scenario, that reflects expected limits on available generation. These limits would include those due to planned outages, limited operations during periods of extreme cold weather, ambient temperature operating limitations, and any likely loss of fuel sources."*

In light of the report from FERC and NERC Staff and recognizing that gas-fired generation will become a greater part of the Company's power supply portfolio over the next several years, Public Service determined it should: 1) perform an evaluation to determine the level of firm fuel resources required to reliably serve winter peak electric demand ("Winter Generation Adequacy Study" or "Study"); and, 2) supplement its 2011 Electric Resource Plan ("2011 ERP") filed in October of 2011 with the results of this Study and the corresponding Winter Generation Adequacy Report ("Report") .

The approach Public Service took for determining winter generation adequacy is similar in many regards to determining summer generation adequacy. However, the interdependency between the availability of gas and the status of the electric supply system, especially during peak winter electric demand conditions, creates unique circumstances and introduces new complexities that are not present for traditional

summer generation adequacy planning. The Company intends to update the Study as part of our normal course of business. By monitoring and adjusting winter resource plans accordingly, Public Service can help maintain lower customer costs by only securing firm fuel supplies when it is deemed necessary to maintain reliable electric service.

Public Service understands the interdependence of the gas and electric supply systems and has a full appreciation for the need to plan these systems to meet extreme winter conditions. Many of these lessons were learned from our experience with the cold weather event on February 18, 2006 and the resulting investigation the Company initiated to improve processes and procedures to minimize controlled outages under similar conditions in the future. Many of the lessons learned from that event helped Public Service manage subsequent events successfully; but it is important to also continue to learn, adapt, and improve our ability to economically and reliably serve customers. The Study is one example of our commitment to continually improve processes.

Winter generation adequacy study overview:

This Study involved determining from an operational perspective whether we have a sufficient amount of owned and purchased generating resources with firm fuel supplies to meet upcoming forecast peak winter firm electric demand while maintaining our required operating reserves. As part of that process, natural gas fired generation resources only qualify for consideration if the facility has firm natural gas transportation service from an interconnected pipeline allowing unrestricted operation during periods of high gas and electric demand. Additionally, if the generation site does not have firm natural gas supply but does have an available and sufficient secondary fuel source, such

as fuel oil inventory in on site storage tanks, then the facility still qualifies for consideration.

This Study included development of a metric termed the "Winter Generation Adequacy Capacity" for the Public Service system for gauging whether sufficient firm fuel supplied generation was available or not. This net capacity metric was calculated by summing the capacity of qualifying generating resources and then subtracting: 1) the winter peak electric demand (reduced by contractually interruptible load under demand side management programs); 2) the operating reserve requirements; and, 3) a Contingency Margin. A positive net capacity value indicates that adequate resources are available to ensure system reliability and a negative value indicates that insufficient resources are available for reliable system operation. This calculation was performed for December's peak electric load of each year starting in 2012 and continuing through 2022. The month of December was used because it is the month that is projected to have the highest forecast monthly peak electric demand during each winter season through the same 2012-2022 period.

The winter peak electric demand used for the analysis was based on Public Service's analysis of the 90th probability bandwidth which is the 1.65 standard deviation from base case native load peak demand as determined by the Xcel Risk department. The operating reserves are required to ensure that Public Service may continue to respond to real-time contingencies from the Rocky Mountain Reserve Group, of which Public Service is a member, even during peak conditions.

Additionally, a Contingency Margin was developed to reflect and account for operational uncertainties such as unscheduled outages of generation or transmission system facilities. It is Public Service's experience that generation and other related equipment is more prone and apt to fail in extreme winter conditions as compared with extreme summer conditions. This is supported by a NERC report on seasonal

performance trends where it was suggested that "extreme cold conditions present greater equipment and personnel difficulties than extreme heat, at least on fossil steam units."[2] Public Service also reviewed data from 2001 through 2011 out of the NERC Generating Availability Data System ("GADS") and confirmed that coal and gas fired units experienced greater unplanned outages in the winter (December – February) compared with the summer (June – August).

In order to calculate the Winter Generation Adequacy Net Capacity position Public Service used a deterministic approach. However, it is not static and should be refreshed as inputs, such as the winter peak electric demand, are updated.

Key analysis steps and study inputs:

Temperature Threshold

Consistent with recommendations put forth in the FERC and NERC Staff report, winter generation adequacy calculations and analysis should take into account electric loads that could occur during extreme weather conditions and generation limitations, such as fuel curtailments, that could reasonably be expected in those circumstances. Therefore, when determining Public Service's Winter Generation Adequacy Capacity position for the 2011 ERP's Resource Acquisition Period ("RAP"), which extends from 2011 through 2018, we first established the proper cold weather threshold. Making use of a Denver metropolitan area temperature dataset back to 1948 we determined that the proper cold weather threshold is when the average daily temperature is less than or equal to zero (0) degrees Fahrenheit. Denver records were selected because of the completeness of the dataset and the fact that it is where the bulk of the Company's electric load originates. Denver on average has experienced one day per winter season (December – February) where the average daily temperature was at or below 0 F.

[2] http://www.nerc.com/files/Seasonal-Performance-Trends.pdf

Because on average we expect to face one day per winter season with daily average temperatures at or below 0 F we need to plan to reliably serve electric loads given these conditions.

Load

The second step in the Study was to select a proper load probability to use based on the established temperature threshold. The 90th probability bandwidth or a 1.65 standard deviation from the base case native load peak, both of which were determined in September 2011 by Xcel's Risk group, was determined to be the most appropriate to utilize for the analysis (see Table 2.6-12 "Native Peak Demand Weather Variability" in Volume II, Technical Appendix). Consistent with the FERC report recommendation to undertake a sensitivity study using actual conditions as a possible extreme scenario, Public Service analyzed the actual winter peak electric demand of 5,706 MW (excludes Holy Cross Energy and Intermountain Rural Electric Association load served under their joint ownership arrangement on Comanche 3) for the 2010–2011 winter season in comparison with Public Service's Peak Probability Distribution forecasts for the same period. The actual peak electric demand was greater than the 95% Public Service Peak Probability Distribution for load as released in the 2011 Budget forecast (issued in October of 2010). Additionally, averaging the Dec, Jan and Feb (Winter Season) Peak Day Weather (Temp) Probability Distributions from Risk, a daily average temp of 0 degrees F is approximately consistent with 90% probability forecast peak load (average temp of 0 F occurs between 85-90%).

Generation Capacity Ratings

The electric generating capacity capabilities used in the analysis were based on seasonal Net Dependable Capacity ratings published by the Company's Performance Monitoring engineers and which were determined consistent with the processes established in support of planning for the summer peak. Generation retirements as well

as PPA terminations are reflected within the study (if the facility is available in December of each winter season it is considered in the analysis since the forecast winter peak occurs in that month). Units that do not have firm fuel supply are excluded (highlighted yellow in Pages 2 and 3 of Exhibit No. JTW-2) unless they have an adequate secondary fuel supply (fuel oil).

Facilities that can operate on an alternate fuel supply, such as fuel oil, are considered firm as long as the plant has ample storage to allow operation for 3 days. Public Service analyzed Denver temperature data and determined that there is a 10% probability of a cold weather event, where daily average temperatures are 0 degrees F or lower, lasting three days or longer in any 1 year. Public Service also determined for purposes of this study that a plant would need to be capable of operating on fuel oil at maximum generating output for 8 hours a day and at minimum output for 16 hours per day (allows maximum operation for four hours during the two peak electric load periods experienced on winter days) during the three day event. The qualification for fuel oil back up also considers the ability to deliver inventory during the same three day run period, which extends the capacity of on site tanks. If a facility does not have the capacity to operate at full load according to these specifications, the generation capacity rating is adjusted in accordance with the operating guideline of running 8 hours at an adjusted maximum output and 16 hours at minimum per day.

Intermittent Resources

Consistent with all 2011 ERP analyses, wind resource capacity was determined using a capacity credit of 12.5% of the nameplate capacity. PV solar resources were given no capacity credit due to the lack of generation (based on current technology) during the peak electric demand periods on winter days (lack of sunlight or sufficient solar radiation for generation).

Contingency Margin

The next step was to determine an appropriate Contingency Margin to account for the probability that some level of the systems generation capacity would not be available due to unexpected unit outages or derates. Public Service determined the loss of 100% of the largest generating resource and 50% of second largest generating resource represented an appropriate contingency level to consider. For Public Service, this amounted to a Contingency Margin of 1,036 MW based 100% of Comanche 3 and 50% of Pawnee being unavailable. This contingency amount is within a reasonable range given that on average, outages for generation (owned and PPA facilities combined) during the past 5 highest peak winter load days from each of the past 3 winter seasons was 729 MW with a standard deviation of 541 MW.

Operating Reserves

As a Comanche 3 outage is already factored into the Contingency Margin for purposes of this study, Public Service considered an operating reserve requirement reflective of our Rocky Mountain Reserve Group member allocation when the Comanche 3 unit is offline (which lowers our overall requirement). The reserve requirement with Comanche 3 offline is forecast to be 309 MW based on the latest Public Service reserve requirement quota issued by the group.

Short-term Purchases and Other Imports

Imports or market purchases are not included in the reliability assessment as widespread weather events can significantly diminish access to such supply throughout a region. Long-term firm capacity contracts that are sourced outside of the Public Service Balancing Authority Area and provide for the transmission necessary to delivery the power to the Public Service system are included in the study (e.g. Basin and Tri-State long-term contracts).

Report findings:

The analysis indicates that we will have sufficient firm winter generation resource adequacy (or positive Winter Generation Adequacy Capacity) through 2017. Please see Exhibit No. JTW-2, Pages 1 through 3, for more detail. Starting in 2018 and continuing through 2022 the analysis indicates that Public Service will need to secure additional firm fuel supply in order to ensure we can reliably meet peak winter electric demand.

Conclusion:

Public Service has sufficient firm fuel resources to reliably serve winter peak electric demand through the 2017 winter season. Public Service's Winter Generation Adequacy Study indicates that the Company will, however, need to take action to increase firm fuel supply to resources, which could include such things as firming gas transport contracts, increasing secondary fuel options on existing resources or adding generating resources with firm winter fuel sources starting in 2018.

Winter Owned Unit Capacity	Winter Net Dependable Capacity (NDC)	Dec-12	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22
Steam Turbine Units												
Arapahoe 3	44	44	44	0	0	0	0	0	0	0	0	0
Arapahoe 4	109	109	109	0	0	0	0	0	0	0	0	0
Cherokee 1	107	0	0	0	0	0	0	0	0	0	0	0
Cherokee 2	106	0	0	0	0	0	0	0	0	0	0	0
Cherokee 3	152	152	152	152	152	0	0	0	0	0	0	0
Cherokee 4	352	352	352	352	352	352	352	352	352	352	352	352
Comanche 1	325	325	325	325	325	325	325	325	325	325	325	325
Comanche 2	335	335	335	335	335	335	335	335	335	335	335	335
Comanche 3 - Xcel	522	522	522	522	522	522	522	522	522	522	522	522
Craig 1	42	42	42	42	42	42	42	42	42	42	42	42
Craig 2	42	42	42	42	42	42	42	42	42	42	42	42
Hayden 1 - Xcel	139	139	139	139	139	139	139	139	139	139	139	139
Hayden 2 - Xcel	98	98	98	98	98	98	98	98	98	98	98	98
Pawnee 1	505	505	505	505	505	505	505	505	505	505	505	505
Valmont 5	184	184	184	184	184	184	184	0	0	0	0	0
Zuni 2	65	0										
Subtotal	**3127**	**2849**	**2849**	**2696**	**2696**	**2544**	**2544**	**2360**	**2360**	**2360**	**2360**	**2360**
Simple Cycle CT Units												
Alamosa 1	17	17	17	17	17	17	17	17	17	17	17	17
Alamosa 2	18	18	18	18	18	18	18	18	18	18	18	18
Fruita	18	18	18	18	18	18	18	18	18	18	18	18
Blue Spruce 1	144	144	144	144	144	144	144	144	144	144	144	144
Blue Spruce 2	148	148	148	148	148	148	148	148	148	148	148	148
Ft. Lupton 1	50	50	50	50	50	50	50	50	50	50	50	50
Ft. Lupton 2	50	50	50	50	50	50	50	50	50	50	50	50
Ft. St. Vrain 5	160	160	160	160	160	160	160	160	160	160	160	160
Ft. St. Vrain 6	159	159	159	159	159	159	159	159	159	159	159	159
Valmont 6	53	0	0	0	0	0	0	0	0	0	0	0
Subtotal	**817**	**764**	**764**	**764**	**764**	**764**	**764**	**764**	**764**	**764**	**764**	**764**
Combine Cycle Units												
Fort St Vrain 1-4	716	716	716	716	716	716	716	716	716	716	716	716
Rocky Mtn Energy Center	615	615	615	615	615	615	615	615	615	615	615	615
Cherokee 2x1 CC						624	624	624	624	624	624	624
Subtotal	**1331**	**1331**	**1331**	**1331**	**1331**	**1955**	**1955**	**1955**	**1955**	**1955**	**1955**	**1955**
Hydro and Wind Units												
Cabin Creek	**300**	300	300	300	300	300	300	300	300	300	300	300
Conventional Hydro	**19**	19	19	19	19	19	19	19	19	19	19	19
Ponnequin	**3**	3	3	3	3	3	3	3	3	3	3	3
Subtotal	**322**	**322**	**322**	**322**	**322**	**322**	**322**	**322**	**322**	**322**	**322**	**322**
PSCo Owned Gen NDC Total (winter)	**5597**	**5266**	**5266**	**5113**	**5113**	**5585**	**5585**	**5401**	**5401**	**5401**	**5401**	**5401**

Yellow Highlight Indicates Lack of Firm Fuel

Winter LT Contract and Purchased Power Capacity	Dec-12	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22
Basin Electric Power Cooperative No.1	100	100	100	100							
Tri-State G&T No.2	100	100	100	100	100						
Tri-State G&T No.3	75	75	75	75							
PacifiCorp (w/ reserves)	150	150	150	176	176	176	176	176	176	176	176
Thermal Non-Facility Specific Subtotal	**425**	**425**	**425**	**451**	**276**	**176**	**176**	**176**	**176**	**176**	**176**
ManChief Power Company	297	297	297	297	297	297	297	297	297	297	
SWG Valmont 7 & 8	0										
SWG Arapahoe 5, 6, 7	0										
SWG Fountain Valley Midway	258										
Brush 1&3	0	0	0	0							
Brush 4D	0	0	0	0	0	0	0	0	0	0	0
Tri-State Limon	0	73	73	73							
Tri-State Brighton	0	154	154	154							
Cogentrix Plains End	0	0	0	0	0	0	0	0	0	0	0
Thermo Fort Lupton	129	129	129	129	129	129	129				
Thermo Power (UNC)	76	76									
Invenergy Spindle CT	290	290	290	290	290	290	290	290	290	290	290
Thermal Facility Specific Subtotal	**1050**	**1019**	**943**	**943**	**716**	**716**	**716**	**587**	**587**	**587**	**290**
Effective Wind Capacity at 12.5%	**264**	**264**	**264**	**264**	**259**	**259**	**259**	**239**	**239**	**239**	**239**
SPS Diversity Exchange	**101**	**101**	**101**	**101**	**101**	**101**	**101**	**101**	**101**	**101**	**101**
PSCo Purchased Net Dependable Capacity	**1840**	**1809**	**1733**	**1759**	**1352**	**1252**	**1252**	**1103**	**1103**	**1103**	**806**

Yellow Highlight Indicates Lack of Firm Fuel

2011 Winter Generation Adequacy Study (2012 - 2022)

Winter Season	December-12	December-13	December-14	December-15	December-16	December-17	December-18
Owned Gen Net Capacity	5,266	5,266	5,113	5,113	5,585	5,585	5,401
LT Contract and PPA Net Capacity	1,840	1,809	1,733	1,759	1,352	1,252	1,252
Total Resources (a + b)	7,106	7,075	6,846	6,872	6,937	6,837	6,653
90th Probability Peak Demand	5,406	5,481	5,554	5,621	5,700	5,754	5,815
Interruptible Load	256	258	259	260	261	262	263
90th Prob Firm Peak Demand (d - e)	5150	5223	5295	5361	5439	5492	5552
Contingency Margin	1,036	1,036	1,036	1,036	1,036	1,036	1,036
Operating Reserve Requirement	309	309	309	309	309	309	309
Winter Generation Adequacy Capacity (c - f - g - h)	**612**	**508**	**207**	**167**	**154**	**1**	**-243**

Winter Season	December-19	December-20	December-21	December-22
Owned Gen Net Capacity	5,401	5,401	5,401	5,401
LT Contract and PPA Net Capacity	1,103	1,103	1,103	806
Total Resources (a + b)	6,504	6,504	6,504	6,207
90th Probability Peak Demand	5,868	5,932	5,971	5,786
Interruptible Load	264	265	223	224
90th Prob Firm Peak Demand (d - e)	5604	5667	5748	5562
Contingency Margin	1,036	1,036	1,036	1,036
Operating Reserve Requirement	309	309	309	309
Winter Generation Adequacy Capacity (c - f - g - h)	**-444**	**-507**	**-588**	**-699**