BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO
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IN THE MATTER OF THE APPLICATION OF	**)**	
PUBLIC SERVICE COMPANY OF COLORADO	**)**	**DOCKET NO. _____E**
FOR APPROVAL OF ITS 2011 ELECTRIC	**)**	
RESOURCE PLAN	**)**	

DIRECT TESTIMONY OF KEITH PARKS

ON

BEHALF OF

PUBLIC SERVICE COMPANY OF COLORADO

October 31, 2011

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DIRECT TESTIMONY OF KEITH PARKS

I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Keith Parks. My business address is 1800 Larimer Street, Denver, Colorado 80202.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Xcel Energy Services Inc., the service company subsidiary of Xcel Energy Inc., the registered public utility holding company parent of Public Service Company of Colorado ("Public Service", or "Company"). My title is Senior Trading Analyst.

Q. PLEASE PROVIDE A STATEMENT OF YOUR QUALIFICATIONS.

A. A statement of my qualifications is presented in Attachment A.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. I describe the Company's existing 30-Minute Reserve Guideline for Wind

Generation, including 1) why this guideline is necessary, 2) how this guideline was developed, and 3) whether the Company has sufficient resources to comply with this guideline during the RAP of this 2011 ERP.

II. 30-MINUTE RESERVE GUIDELINE

Q. WHY IS IT IMPORTANT FOR PUBLIC SERVICE TO MAINTAIN RESERVES FOR WIND GENERATION?

A. Wind ramp events, which are sustained increases or decreases in wind generation, impact the balance between generation and load. Wind ramp up events can ultimately be mitigated by limiting the output of the wind farms (a.k.a, curtailing) for short periods and therefore do not pose an immediate threat to the generation and load balance. Ramp down events, however, do pose a reliability threat because the reduction in wind generation must be replaced by increasing the output of dispatchable generation resources or starting off-line generation resources.

Public Service must continually maintain adequate regulating reserves to respond to short-term changes in the balance between generation and loads as well as contingency reserves to respond to large, unexpected generating unit outages. Ramp down events cause online thermal generators to increase their electric output to maintain the balance between generation and load, thereby eroding regulating reserves. Large wind ramp down events can exhaust regulating reserves and lead to a deficiency in contingency reserves if offline units are not brought online in a timely manner. It is not acceptable for wind ramp down events to deplete contingency reserves

because that would impair Public Service's ability to respond to large unexpected unit outages, which could jeopardize our ability to maintain service to firm electric load customers.

The 30-Minute Reserve Guideline helps guard against depleting contingency reserves due to wind ramp down events. The Guideline ensures there are sufficient resources that can be synced to the grid in 30 minutes or less of the beginning of a ramp down event.

Q. DO YOU HAVE EXPERIENCE WITH LOSS OF WIND GENERATION RESOURCES THAT DICTATED THE NEED FOR THIS 30-MINUTE RESERVE GUIDELINE?

A. Public Service has extensive experience with our wind generation portfolio, with an installed capacity of 1,059 MW as of December 2007 and 1,234 MW since September 2009. In Calendar year 2010, there were 18 wind ramp down events of 300 MW or more in 30 minutes. For example, the largest loss of wind generation in 30 minutes was 469 MW. The dispatchers have been able to manage these large ramp down events through deployment of resources that can be brought on-line within 30-minutes and not deplete contingency reserves. The 30-Minute Reserve Guideline codifies operating practices that ensure reliability congruent with a large and growing wind portfolio.

Q. WHY IS THIS TOPIC BEING ADDRESSED NOW?

A. Public Service anticipates that wind ramps will increase in both size and frequency as the installed capacity of our wind generation portfolio increases.

As stated before, Public Service has experience with a 1,234 MW wind portfolio. Public Service is slated for much higher installed wind capacity of 1,735 MW by year-end 2011 and 2,135 MW by year-end 2012. Analysis of this issue at an installed capacity of 1,234 MW estimated 20 wind ramp down events greater than 300 MW in 30-minutes, with the largest 30-minute ramp down being 480 MW. Similarly, this same analysis at an installed capacity of 2,135 MW produced 56 wind ramp downs greater than 300 MW in 30-minutes with the largest 30-minute ramp down being 612 MW. A 30-Minute Reserve Guideline helps ensure consistent levels of reserves are maintained as the level of wind generation on our system grows. In addition, to the extent the Company's analysis showed a need for additional 30-minute capable generation resources over the 2011 ERP's Resource Acquisition Period ("RAP"), we could assess how best to achieve the desired level.

Q. HOW IS THIS RESERVE GUIDELINE DIFFERENT FROM OTHER RESERVE REQUIREMENTS?

A. The Company's 30-Minute Reserve Guideline for wind generation is a voluntary guideline that varies continually depending on the location and volume of wind generation on the Public Service system at any one time. Failing to balance electric load and generating resources has clear reliability ramifications. This voluntary guideline adopted by Public Service in response to our large wind portfolio is in addition to the North American Electric Reliability Corporation ("NERC")-required contingency reserve requirement. The NERC requirement is compulsory, it is monitored for compliance, and it

only changes during times of very high loads or when the largest credible contingency changes due to a unit outage or other unusual system conditions.

Q. WHEN DID THE COMPANY ADOPT THIS NEW GUIDELINE?

A. The 30-Minute Reserve Guideline for wind was first adopted in the Spring of 2010.

Q. BRIEFLY EXPLAIN THE PROCESS USED TO DETERMINE THE 30-MINUTE RESERVE GUIDELINE.

A. The Company based the 30-Minute Reserve Guideline on the Company's Typical Year Wind Profile – an hourly wind energy profile used for internal modeling and analysis purposes. The profile is based on ten years of hourly averaged wind speed data from a northern Colorado wind farm. The profile also includes observed generation data from existing wind farms and observed wind speed data run through the turbine manufacturer's power curves for two prospective wind farms, i.e., Cedar Creek II and Cedar Point, resulting in 1,735 MW of installed wind capacity. There were 33 large wind down ramps (300 MW ramp or greater in 30 minutes) in this annual generation profile.

Geographic diversity plays an important role in the size and speed with which wind ramps occur. The Public Service system has relatively poor geographic diversity with 72% of the installed wind capacity along the northern Colorado border and 14% each in Lamar (Colorado Green and Twin Buttes) and Limon (Cedar Point). Ninety percent of the contribution to these

large ramps was attributable to the northern Colorado border. In contrast, the contribution from wind farms in Lamar or Limon was often marginal or even negative. A statistical relationship between the size of the ramp in MW and the total generation from northern Colorado wind farms in MW at the beginning of the large wind ramp down was created using a least square curve. This formula represents the reserve requirement for large ramp down events.

At low levels of generation from wind farms along the Northern Colorado border, i.e., less than 250 MW of generation, the northern Colorado wind farms no longer dominate wind ramp down events. In fact, the average ramp down event is less than the maximum of the three separate geographic wind generation clusters (Northern Colorado border, Lamar, or Limon). Thus, a reserve guideline equal to the maximum generation from any geographic area would be sufficient to cover a negative wind ramp when each geographic area has a total generation output of less than 250 MW.

The 30-Minute Reserve Guideline is a piece-wise curve based on the generation output of the northern Colorado cluster. When the northern Colorado cluster is below 250 MW, the 30-Minute Reserve Guideline is the maximum of the three geographic clusters. Above 250 MW, the statistical relationship between northern Colorado wind farm output and historic ramp down events determines the reserve requirement.

Q. DO YOU BELIEVE THAT THE ABILITY OF THERMAL GENERATORS TO MEET THE 30-MINUTE RESERVE GUIDELINE SHOULD FACTOR INTO

PUBLIC SERVICE'S RESOURCE PLANNING PROCESSES TO HELP ENSURE RELIABLE ELECTRIC SYSTEM PLANNING?

A. Yes. As mentioned earlier, to the extent the Company's analysis showed a need for additional 30-minute capable generation resources over the RAP, we could assess how best to achieve the desired level. One approach would be to focus on modifications to the existing fleet of owned generation. There are a number of retrofit projects that could be implemented on existing Company-owned generating units that would increase the availability of 30-minute capable generation resources. Another approach would be to ensure that additional resources acquired through the 2011 ERP are 30-minute capable. A combination of these two approaches is also an option.

Q. WHAT DID THE COMPANY'S ANALYSIS CONCLUDE REGARDING THE NEED FOR ADDITIONAL 30-MINUTE CAPABLE RESOURCES DURING THE RAP OF THIS 2011 ERP?

A. The analysis concluded that the Company will have a sufficient level of 30-minute capable generation assets through the RAP to comply with the 30-Minute Reserve Guideline for the 2,135 MW of wind we will have on the system during that same timeframe. This analysis considered existing and planned Company-owned resources as well as existing PPAs' through the term of their current contracts.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

Attachment A

Keith Parks

Statement of Qualifications

I graduated from the University of Auckland in Auckland, New Zealand in 1997 with a Bachelor of Engineering Degree in Engineering Science.

I am currently employed as a Senior Trading Analyst for Xcel Energy Service Inc.'s Commercial Operations group in Denver, Colorado. This group is responsible for generation dispatch for all of Xcel Energy's generation fleet including owned and contracted assets. I have been in my current position for six years.

Previously, I worked at the National Renewable Energy Laboratory (NREL) in Golden Colorado as a Staff Analyst in the Strategic Energy Analysis Center, Stratus Consulting in Boulder Colorado, and Henwood Energy Services Inc. (now Ventyx) in Sacramento, California as a consultant and computer programmer. I have spent my career modeling complex systems such as electricity generation dispatch, carbon markets, energy storage, hydrogen infrastructure for transportation fuels, and wind energy forecasting.

I have filed testimony with the Colorado Public Utilities Commission and have testified before the Colorado Public Utilities Commission.