



Public Service Company of Colorado

**Operating Procedures and Practices
For Existing and Potential
2003 Least Cost Resource Plan Wind
Generation**

April 2006

Ponnequin 30 MW Wind Facility

Operating Procedures & Practices for PSCo

Summary:

Ponnequin is a 30 MW wind facility with a point of interconnection at Ponnequin 115 kV Switching Station on the Cheyenne to Ault 115 kV circuit, which is owned by WAPA. The generation is in the WAPA control area, and WAPA is responsible for providing transmission service to PSCo points of delivery.

1. Tot 3

This plant is connected to a TOT 3 element, but does not impact TTC or ATC.

2. Reliability

There is no history of reliability issues with the 115 kV circuit or any instability issues related to these wind generators.

3. Notification

PSCo operator and/or WAPA will notify the generator of any outages or restoration issues related to the 115 kV transmission line.

Ridge Crest 30 MW Wind Facility

Operating Procedures & Practices for PSCo

Summary:

Ridge Crest is a 30 MW wind generation facility with a point of interconnection at Peetz Switching Station, which is on the Sterling – Sidney 115 kV line. This generation is in the WAPA control area, and WAPA is responsible for providing transmission service from the facility to PSCo load delivery points.

1. 115 kV Configuration

When the 115 kV circuit from Sterling to Sidney (owned by WAPA) is tripped, the wind generation is removed, as the line is not sectionalized for a fault.

2. TOT 3

This plant is connected to a TOT 3 element, but does not impact TTC or ATC.

3. Reliability

Power flow and stability studies as well as operating experience have indicated that there is no reliability or stability issue with loss of the wind generator or the loss of the Sterling to Sidney 115 kV line.

Colorado Green

Existing: 162 MW Wind Facility; Potential: 75 MW in 2007

Operating Procedures & Practices for PSCo

Summary:

Colorado Green is a 162 MW wind generation facility that is interconnected at the Lamar 230 kV Switching Station via a 44-mile radial 230 kV circuit that is owned and operated by the Colorado Green facility. From the 2003 Least Cost Resource Plan, there is a potential 75 MW expansion of Colorado Green, which is projected to be in service in 2007. The entire facility will be operated as a single plant with a total installed capacity of 237 MW.

1. Boone—Lamar 230 kV line limit

The Boone to Lamar 230 kV line has a higher thermal rating (495 MVA) than the total potential wind generation (237 MW) plus HVDC import (210 MW). Contingency plans for the loss of this line include complete shutdown of the wind generation and the Lamar HVDC tie flow, accomplished through protective relaying. Rocky Mountain Reserve Group (RMRG) activation is required if Colorado Green and HVDC net inflow is 200 MW or greater when the Boone to Lamar 230 kV line (circuit 5337) trips.

In the event of the loss of Boone to Lamar 230 kV line, the Operations Control Center will notify the Colorado Green Wind Facility of the loss and the expected restoration times.

2. Lamar autotransformer

The 100 MVA autotransformer is protected from overload by the same protective relaying scheme that trips Colorado Green and the Lamar HVDC tie for the loss of the Boone to Lamar 230 kV line (circuit 5337).

3. Transmission Rights on Boone—Lamar

PSCo will redispatch the Lamar HVDC tie or secure transmission capacity so the generation from Colorado Green and the Lamar HVDC East to West transfer do not exceed PSCo transmission rights on the Boone to Lamar 230 kV line. PSCo transmission rights on the Boone - Lamar 230 kV line are 272 MVA or 55% of the line rating.

4. Reliability

There have been no reliability or instability issues associated with the wind generation or with an outage of the Boone to Lamar line.

Spring Canyon Energy 60 MW Wind Facility

Operating Procedures & Practices for PSCo

Summary:

Spring Canyon Energy is a 60 MW wind generation facility with a point of interconnection at the Spring Canyon 230 kV Switching Station, on the Sidney to North Yuma (N. Yuma) 230 kV line. This generation is in the WAPA control area. PSCo is a joint owner in the 230 kV line from Sidney to N. Yuma.

1. Spring Canyon—N. Yuma 230 kV line outage

For the loss of the Spring Canyon to N. Yuma 230 kV line, Spring Canyon wind generation automatically ramps to zero net power output within eighteen seconds, in order to prevent potential operating limit violations. The Spring Canyon wind facility is tripped offline through protective relaying (“watch dog relay”) after eighteen seconds, if the net output has not been adequately reduced. As of April 2006, loss of Story – N. Yuma 230 kV line will require reduction of Spring Canyon generation unless additional transmission capacity is purchased.

Operations Control Center will notify the Wind Facility in the event of the loss of the Spring Canyon - N. Yuma 230 kV line, or the N. Yuma – Story 230 kV line.

2. Pawnee Station—Denver load center restriction

Potential overloads for N-1 conditions on the 230 kV lines from Pawnee Station into Denver Metro Area may require a reduction in power injected into Pawnee from all the generation sources including gas, coal and wind.

The Power Control and Dispatch group in Energy Supply will be given power limit guidance from the Operations group as needed when actual limits are approached based on the use of Real-Time Contingency Analysis (RTCA).

In the event of the loss of any line from Pawnee Station and its restoration the Operations Control Center will notify the Wind Facility.

3. TOT 3

This plant is connected to a TOT 3 element, but does not impact TTC or ATC.

4. Reliability

Power flow and stability studies as well as operating experience have indicated that there are no reliability or stability issue with loss of the wind generator or the loss of the 230 kV line from Sidney to N. Yuma.

Logan Wind Potential 400 MW Wind Facility in 2007

Operating Procedures & Practices for PSCo

Summary:

Logan Wind is a potential wind project from the 2003 Least Cost Resource Plan. It is a 400 MW facility that would interconnect at the Pawnee 230 kV switching station via a 70-mile radial 230 kV line that would be owned and operated by the generation owner.

1. Pawnee Station—Denver load center restriction

Potential overloads for N-1 conditions on the 230 kV lines from Pawnee Station into Denver Metro Area may require a reduction in power injected into Pawnee from all the northeast area generation sources including gas, coal and wind.

The Power Control and Dispatch group in Energy Supply will be given power limit guidance from the Operations group as needed when actual limits are approached based on the use of Real-Time Contingency Analysis (RTCA).

2. Reliability

Power flow and stability studies have indicated that there are no reliability or stability issues with loss of the wind generator or the loss of the radial 230 kV line.

3. Future

A more detailed operating procedure will be developed as more operating details are known about the plant and we come closer to the commercial operation date.

Cedar Creek Wind Potential 300 MW facility in 2007

Operating Procedures & Practices for PSCo

Summary:

Cedar Creek (CC) Wind is a potential wind project from the 2003 Least Cost Resource Plan. It is a 300 MW facility that would interconnect at a new Cedar Switching Station on one of the 230 kV lines (circuit 5279) between Rocky Mountain Energy Center (RMEC) and Green Valley Switching Station. The facility would connect to the Cedar Switching Station via a 50-mile radial 230 kV line that would be owned and operated by the generation owner.

1. RMEC / Cedar – Green Valley Flow Restriction

With the prior outage of either the RMEC - Green Valley 230 kV line (5271) or the CC to Green Valley 230 kV line (5279), subsequent loss of the other line will sever the connection of RMEC and CC to Green Valley and cause the generation to be tripped at both RMEC and CC. Therefore, for either of these prior outages, Operations may limit the combined generation output of the RMEC and CC facilities to 565 MW. This restriction is imposed because loss of the remaining line would require Rocky Mountain Reserve Group (RMRG) activation if generation totals 200 MW or greater, which cannot exceed the RMRG's largest hazard of 565 MW.

The Power Control and Dispatch group in Energy Supply will be given power limit guidance from the Operations group as needed when actual limits are approached based on the use of Real-Time Contingency Analysis (RTCA).

2. Reliability

Power flow and stability studies as have indicated that there are no reliability or stability issue with loss of the wind generator or the loss of the neighboring 230 kV line.

3. Future

A more detailed operating procedure will be developed as more operating details are known about the plant and we come closer to the commercial operation date.