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RESEARCH MEMORANDUM

To: Utah Public Service Commission

From: Division of Public Utilities

Philip Powlick, Director
Artie Powell, Manager, Energy Section
Charles E. Peterson, Technical Consultant

Subject: The Division's Investigation into the avoided line loss issue related to non-firm Qualifying Facilities (QF) contracts.

Date: July 21, 2010

RECOMMENDATION (No Action)

As discussed below, the Division has concluded that the approaches taken in the most recent QF contracts are reasonable and, unless new information becomes available, the Division will support avoided line loss amounts where the calculations are based upon the methodology used in the most recent QF dockets.

ISSUE

The Commission opened Docket No. 03-035-14 (QF Docket) to deal with the pricing and other facets of contracts between PacifiCorp (Company) and QFs. Over a period of approximately three years and two formal hearings, the Commission dealt with most of the issues raised by various parties in that docket. However, one issue not resolved in that docket was the issue of avoided line, or transmission, losses for non-firm QF contracts. While the Commission did eventually resolve the issue of avoided line losses for wind QFs,¹ the Commission left open, for a case-by-case analysis, line losses for non-firm thermal or other types

¹ See Docket Nos. 06-035-42 and 06-035-76.

of QFs. Since 2006 the issue of avoided line losses has been a somewhat vexing issue in non-firm QF contracts and has been the subject of *ad hoc* analyses and settlements between the QFs, PacifiCorp, and the Division.² This Memorandum briefly reviews the controversy regarding avoided line losses for non-firm QF contracts and describes the Division's recent investigation into this matter and the Division's conclusions based upon that investigation.

DISCUSSION

Electric energy is lost between the point of generation and the delivery of the electricity to the point where it will be used. This loss of energy is a natural consequence of the resistance, impedance, and perhaps other factors of the transmission and distribution lines and equipment. This loss of energy is called "line losses." The issue of "avoided line losses" here is the result of a QF located closer to the load center than perhaps some other generator source of the Company. Since the QF is closer there should be less line loss for a given amount of generation than there would be from the Company's generator; therefore, there is an amount of line loss that is avoided when the QF operates. QFs have argued that when they are closer to the load center than Company generation, then the avoided line loss is part of the avoided costs that the QFs should be paid for under the federal PURPA law. The Division and the Company initially took the position that when a QF contract was for non-firm power, that this potentially created costs that might offset the avoided line loss. These other costs potentially made ratepayers non-neutral regarding paying non-firm QFs an avoided line loss.

Qualifying Facilities Docket No. 03-035-14

In Docket No. 03-035-14, the QF Docket, the issue of avoided transmission line loss adjustments was raised and discussed by several parties. In the end the Commission was not satisfied with any of the proposed solutions and declined to adopt guidelines for non-wind QFs.³ In the QF Docket, the Division argued that avoided cost transmission line loss adjustments should not be given to QFs with non-firm or "must-take" contracts in applying the methods that were proposed. The Division indicated it would be open to consider giving QFs avoided transmission line loss adjustments if ratepayer neutrality could be assured.^{4,5} The Division and

² For example, see Docket Nos. 07-035-06 and 07-035-71.

³ See Order dated April 19, 2006, pp. 13-15, Docket No. 03-035-14.

⁴ Direct Testimony on Rehearing of Andrea Coon, February 10, 2006, lines 99-101, Docket No. 03-035-14.

Company proposals in the QF Docket were similar in that they involved comparing distances from the QF and a proxy plant to the load center (i.e. the Wasatch Front) and the adjustment was to be calculated against the Company's FERC approved Open Access Transmission Tariff (OATT) percentage. The Commission appears to have left the issue open to be currently dealt with on a case-by-case basis.

Wind-QF Avoided Transmission Line Loss Costs

In wind-QF dockets⁶ the Division took the position that there could be some adjustment for avoided line loss even though wind power is by its nature non-firm. The Division noted that the foremost basis of the Division's testimony in those Dockets was the principle that in the QF Docket, the Commission had separated Qualifying Facilities into two types: wind and non-wind, each type with its separate method of calculating avoided costs. Avoided costs for wind QFs are, as approved by the Commission, calculated based upon a comparison to the Company's most recent purchase contract, which may include an allowance for line losses. In the wind-QF dockets, the Division primarily argued that the method for computing avoided transmission line losses should be consistent with the method used to compute other avoided costs, i.e. with respect to the specified proxy plant.⁷ The specific method for computing avoided line losses in those wind-QF dockets is directly tied to this position. Because of the distinction made between wind and non-wind QFs in the QF Docket, the Division believes that the methods to determine avoided transmission line losses may differ between the two groups.

2006 and Subsequent non-firm QF Contracts

There were no line loss adjustments in the negotiated PPAs (purchased power agreement) between PacifiCorp and Kennecott or any other QF approved by the Commission in 2006. Consequently this issue did not arise again until the next year.

⁵ PacifiCorp also recommended that no line loss adjustment be given non-firm QFs. See Reconsideration Direct Testimony of Bruce W. Griswold, February 10, 2006, lines 86-91, Docket No. 03-035-14.

⁶ See Docket Nos. 06-035-76 and 06-035-42.

⁷ See Direct Testimony of Abdinasir M. Abdulle, Ph.D., p 3, lines 10-22; Surrebuttal Testimony of Abdinasir M. Abdulle, Ph.D., p. 2, lines 14-19; both in Docket Nos. 06-035-76 and 06-035-42.

In 2007 PacifiCorp submitted QF contracts for Kennecott and Tesoro for Commission approval.⁸ In these contracts the Company agreed to an avoided line loss adjustment in contradiction to the position taken by the Company in the QF Docket.⁹ The Company provided a method that had some points of contact between the method espoused by the Division in the wind-QF matters and for thermal plants in the QF Docket. In both instances, there is at least the partial use of a proxy plant and distance enters in as a factor. In the wind-QF a specific proxy plant was selected based upon the guidance the Commission gave in the QF Docket. In the 2007 QF cases, the proxy plant was selected based on judgment. Distances were only loosely defined, e.g. nearby vs. outside the Salt Lake Valley. There was no attempt to trace the route of the power to specific substations or to calculate step-up or step-down voltages or other refinements found in the wind-QF Dockets.

PacifiCorp originally argued that these QFs operated in a similar manner to a firm resource and that the probable Company resource that would be backed down (Gadsby) due to the QFs would benefit ratepayers because the Company plant that would be backed off would be a relatively high-cost one. Upon investigation, the Division determined that the Tesoro plant historically had operated, arguably, as if it were a firm resource. However, the Kennecott QF turned out to be highly variable over short time periods in its output. For the 2007 matters, the Division accepted the argument of the Company with respect to Tesoro, but negotiated a reduced avoided line loss amount for Kennecott based on Kennecott's higher volatility. Whatever misgivings the Division had about departing from its position in the QF Docket, the Division was concerned that its arguments for not granting an avoided line loss, as a principle, seemed based more on conjectural rather than solid, factual grounds.

In 2008 and in 2009 the Division considered and recommended approval again of avoided line losses for Kennecott and Tesoro QF contracts, and in 2009 for a new U.S. Magnesium QF contract.¹⁰

⁸ See Docket Nos. 07-035-06 and 07-035-71.

⁹ Griswold, Op. Cit.

¹⁰ Docket Nos. 08-035-83 and 09-035-62 for Kennecott; 08-035-82 and 09-035-102 for Tesoro; and 09-035-20 for U.S. Magnesium.

The basic method that has been used to develop avoided line loss adjustments subsequent to 2007 is as follows. First, the location of the QF is determined. For example, the three QF contracts mentioned above, Kennecott, Tesoro, and U.S. Magnesium, are located in the Wasatch Front load center, which includes the “Utah North” and “Utah South” transmission “bubbles” as defined by the Company’s GRID production cost model. The Company argues that if the QF is located in these bubbles, avoided line losses may be warranted, as this will reduce the need for the Company to import energy from outside this area. This, in turn, decreases the amount of physical energy losses that would otherwise occur with the importation of energy from a more distant generation resource. The second step is to run the Company’s GRID model with and without the QF as an available resource (as is done to calculate the avoided costs generally with respect to the QF) and determine what resources are backed down when the QF is included. If the resource backed down is in the same transmission bubble as the QF, then there is no “credit” given the QF for avoided line losses. If the resource backed down is outside the transmission bubble the QF is in, then there is a “credit” given the QF for avoided line losses. The percentage of power backed down from resources outside the transmission bubble to the total energy backed down in the GRID model becomes a multiplicative factor against the Company’s OATT. For example if the OATT adjustment for line losses is 5.0 percent and 70 percent of the backed down energy is outside the bubble then the QF is credited with a 3.5 percent avoided line loss adjustment.

As indicated above, in 2007 the Division argued for a reduction to the avoided line loss adjustment for Kennecott due to its volatility. In 2008 an additional volatility adjustment was applied to both Kennecott and Tesoro. The Division argued that the volatility adjustment was appropriate in order to assure that ratepayers were receiving some compensation for the potential inefficiencies introduced into the PacifiCorp system by the random fluctuations of the QF energy output to the system.

However, in 2009 both Tesoro and U.S. Magnesium rejected a volatility adjustment arguing that volatility had nothing to do with avoided line losses. The Company also argues that there may be additional unique circumstances applicable only to the QF under examination that may also result in consideration of additional avoided line loss adjustments. Furthermore, in 2009 both the Company and US Magnesium argued that the level of a contract’s “firmness” has

no bearing on the determination of line losses. They claimed that line losses only occur when physical power is transmitted. In other words, line losses are not affected by the “firmness” of a resource.

For its part, the Company appeared to be unconcerned with this volatility. The Division decided not to contest the issue, but instead determined that it would again pursue an investigation into the avoided line loss issue to see if a resolution of the issue could be obtained.

The Division’s 2010 Investigation

When the Division began its investigation in March 2010, it proposed to the Company and interested parties to initially answer the following questions:

1. Why did the Company reverse itself from its original position of opposing avoided line losses for non-firm QFs?
2. How does the Company’s automatic generation control mechanisms (AGC) work and where are they located?
3. What are the system tolerances, that is, at what point in the fluctuations of the system voltages does the AGC or human operators have to intervene?
4. Does the system suffer uneconomic dispatches during periods of low demand (e.g late at night), when it is forced to accept randomly generated power from QFs?

The Division sponsored a meeting with the Company and interested parties in which the above questions were discussed. This meeting was held March 29, 2010. John Apperson, Bruce Griswold, and Paul Clements were in attendance representing the Company; Cheryl Murray represented the Office of Consumer Services; Roger Swenson was present representing industrial clients; and Philip Powlick and Charles Peterson were in attendance for the Division.

In response to the first question, Bruce Griswold, who was PacifiCorp’s witness in the QF Docket, explained basically that, since his 2005 testimony, the Company has gained much more experience in this matter. The Company has better scheduling information and there have been no significant problems with non-firm QFs.

Regarding questions two through four, Mr. Apperson was present via telephone to discuss the AGC. The Company always has one or two AGC units on in each of the Company's control areas. In the eastern control area (e.g. for Utah) PacifiCorp can coordinate with Idaho Power to use hydro power to supplement AGC control. The AGC units attempt to keep the system continuously in balance. The standard is that the system should be in balance every ten minutes 90 percent of the time each month. The system balance is measured every four seconds. The AGC is expected to control fluctuations up to plus or minus 30 MW; above 30 MW requires manual intervention.¹¹ Mr. Apperson indicated that the Company has never run out of "down regulation" (i.e. it has always had plant that it could back down more if a additional wind or QF power came on line) even in the middle of the night. In general, the inaccuracies in wind and general load forecasting generally results in much larger volatility than the other sources of variability (such as non-firm QFs) on the system.

Subsequent to the meeting the Division issued two sets of data requests. The additional information learned from these data requests included the following:

1. As expected AGCs are located at various natural gas and hydro plants. What was not expected is that several coal plants also serve as AGC plants including Naughton, Carbon, Huntington, Hunter, and Cholla.
2. In order to get some idea of what a "typical" month was like, the Division asked for the magnitude of fluctuations from scheduled load for the month of June 2009. The monthly hourly average fluctuation was 16 MW in the eastern control area. The largest fluctuation was 135 MW. It is likely that much higher fluctuations can occur during peak summer and winter months.
3. The Company confirmed that it has had no instances of having to rid itself of excess power at uneconomic prices due to QFs coming online during times of minimum load.
4. In DR 1.8 the Company gave a revised number from the informally given number in the March meeting for AGC capacity. The Company now indicates in the written data request that AGC in the eastern control area is designed to cover up

¹¹ In response to DPU DR 2.2 the Company reported that the number of manual interventions typically range from 25 to 75 per day.

to 75 MW in load variations and that anything below 75 MW is considered “noise.” At 75 MW, the affect of the Utah QFs is within the “noise” band.

CONCLUSION

Given the above information, the Division does not have a basis to continue to support its original position that would disallow an avoided line loss price adjustment in a non-firm QF contract. The information from our investigation suggests that ratepayers are not harmed by the inclusion of avoided line losses in QF contracts. During the last two or three years the Division has worked with the Company and QF representatives in developing a methodology to apply to non-firm QF contracts. The Division is now comfortable with continuing into the future the methodology used in 2009 until or unless new information becomes available that would change our opinion. Therefore, the Division will support avoided line loss amounts where the calculations are based upon the methodology used in the most recent QF dockets.

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