ROCKY MOUNTAIN POWER
A DIVISION OF PACIFICORP

Customer & Regulatory Liaison
1407 West North Temple
Salt Lake City. Utah 84116

December 21, 2006

Julie Orchard, Commission Secretary
Utah Public Service Commission
400 Heber M. Wells Building
160 East 3rd South
Salt Lake City, UT 84111

Re: Formal Complaint of Tim Vetere
Docket No. 06-035-1 48

Dear Ms. Orchard:

PacifiCorp, dba Rocky Mountain Power (the Company), hereby responds to the complaint of Tim Vetere as shown below, and requests that the Commission find that PacifiCorp has not violated any provision of law, Commission order or rule, or Company tariff, and that the Complainant be denied the requested relief. PacifiCorp also requests that the Complaint be dismissed in its entirety, with prejudice.

Line Extension

The Complainant's ranch is located approximately seven miles from the substation at the end of a tap line which is on a long circuit with limited capacity. In March of 1999, the Complainant contracted with the Company to upgrade a single phase line to feed a 200 horsepower pump near the river and then extend the line up the hill six spans to a booster pump. Complainant's irrigation pivots were a mile beyond this point and the Complainant chose to install a 60 horsepower diesel generator to power his pivots and a 200 horsepower diesel pump to serve the rest of his operation in Green River, Utah.

The line extension requested by the Complainant involved changing several spans of single-phase to three-phase primary and adding several spans of new three-phase primary conductor and three, 75 KVA transformers to serve his 50 horsepower booster pump. The booster pump sends the water about a mile to the Complainant's irrigation pivots. The full cost of the line extension was approximately $50,000 and this cost was paid by the Company, not by the Complainant as he claims in his formal complaint. The Complainant paid none of the cost of the line extension since his line extension allowance exceeded the line extension cost. The term of the line extension contract between the Complainant and the Company was five years and expired in April of 2004.
In 1999 the Complainant chose to rely on diesel fuel for a portion of his farm since the cost to provide power to the locations served by the diesel generators would have been very expensive

due to the fact that the circuit that was expanded, as described above, could not have served these additional pumps because the expected load from these additional pumps would have exceeded the capacity of the circuit. The choice made by the Complainant to rely on diesel fuel for a portion of his operation was driven by the economic factors that existed at the time when diesel fuel was relatively inexpensive. With diesel fuel becoming less economical, the Complainant requested cost estimates to serve his entire operation with electricity. Two options were discussed: (1) serving the Complainant via an alternate circuit within 4.5 miles of his ranch; or (2) re-conductoring the existing circuit.

There is no other growth in the area to justify the Company to fund either of the alternatives described above. The first option would cost approximately $100,000 per mile to construct, or approximately $450,000. The Complainant would be eligible for a line extension allowance of approximately $260,000 and would be required to pay the difference up front. The second option would be more expensive and a detailed estimate has not been prepared for this option.

Between April and May of 2005, a customer other than the Complainant connected an approximate 50 kilowatt load at a location near the Complainant. The existing facilities were adequate to serve this customer. There have been no additional customers connecting to the facilities that are used to serve the Complainant. The impact of providing service to the second customer would be the same whether they were to take service fiom the facilities built to serve the Complainant or if they were to be served fiom facilities before the segment that was built to serve the Complainant.

In May 2006 the Complainant met with the Company to request service for a 30 horsepower pump and a pivot. The Complainant was advised that he would need to put in a soft start motor to accommodate this new load. This determination was made based on the Complainant's location on the feeder at the time the request was made to add new load. Since this time, the Complainant has requested and been provided with multiple estimates from the Company to supply more than 450 horsepower of additional capacity to his property which is approximately seven miles from the substation that serves his area. In order for the Company to provide the capacity and adequate voltage to power the Complainant's proposed equipment, 4.5 miles of new line from a different circuit would need to be constructed.

As stated above, the extension cost to serve the Complainant's estimated new load is approximately $450,000. In accordance with the Company's Electric Service Regulation No. 12, Section l(e), extension costs are defined as**:**

> "(e) Extension Costs - Extension Costs are the Company's total costs for constructing an Extension using the Company's standard construction methods, including services, transformers and meters, labor, materials and overhead charges."

The extension allowance that the Complainant would be allowed for the new load is approximately $260,000. This is based on a non residential allowance of up to sixteen times the estimated monthly revenue the Complainant would pay the Company for the new load. In accordance with the Company's Electric Service Regulation No. 12, Section l(d), the extension allowance is defined as:

> "(d) The Extension Allowance is the portion of the Extension that the Company may provide, or allow, without cost to the Applicant. The portion will vary with the class of service that the Applicant requests and shall not exceed the Extension Cost...."

In accordance with Regulation No. 12, the Complainant is entitled to an extension allowance as described above and, in turn, must advance the costs exceeding the extension allowance prior to the start of construction.

Voltage Issues

In the Spring of 2000 the Complainant contacted the Company and stated that his "pump keeps cutting out" and requested a voltage test. On April 27, 2000, a recording volt meter was placed on the line serving the Complainant. On May 23, 2000, the Company removed the recording volt meter and found that there were no problems with the voltage being provided to the Complainant. According to the Company's records, a copy of the recording volt meter chart showing the test results were delivered to the Complainant.

In August of 2006, the Complainant again complained about voltage and stated two fuses had been burned. A recording volt meter was installed on the line serving the Complainant to measure voltage. The results of the recording volt meter test indicated that voltage was within the parameters established by Utah Commission Rule 746-3 10-4B(1) which states:

> "Unless otherwise directed by the Commission, the requirements contained in the 1995 edition of the American National Standard for Electrical Power Systems and Equipment-Voltage Ratings (60 Hz), ANSI C84.1-1995 (R2001), incorporated by this reference, shall be the minimum requirements relative to utility voltages."

ANSI C84.1-1995 (the "Standard") required most service voltages supplied at the service meter to fall within a range ("Range A") of plus or minus five percent. The "occurrence of service voltages outside of these limits should be infrequent." ANSI C84.1-1995, section 2.4.1. The Standard also recognizes a wider permissible voltage range ("Range B") of plus six to minus eight percent which results from practical design and operating conditions on supply systems. According to the Standard, voltage excursions into Range B are to be limited in extent, frequency, and duration, and corrective measures are to be undertaken when such excursions occur. Beyond the voltages permitted by these ranges, section 2.4.3 of the Standard states:

> "It should be recognized that because of conditions beyond the control of the supplier or user, or both, there will be infrequent and limited periods when sustained voltages outside Range B limits will occur. Utilization equipment may not operate satisfactorily under these conditions, and protective devices may operate to protect the equipment. When voltages occur outside the limits of Range B, prompt, corrective action shall be taken."

The Standard also provides that the limits contained in Ranges A and B "shall apply to sustained voltage levels and not to momentary voltage excursions that may remit from such causes as switching operations, motor starting currents, and the like." Finally, Annex D to the Standard states electric supply systems "should be designed and operated to limit the maximum voltage unbalance to 3 percent when measured" at the service meter under no-load conditions.

Switching operations, motor starting currents and the like do not fall under the same ANSI Standard cited above and, instead, are considered as disturbances and governed by IEEE 1453, the voltage fluctuation and light flicker standard. The Company has incorporated this standard in the Company's Engineering Handbook, Section 1 C.5.1. These standards and related power quality standards are described in Attachment A.

Regarding Customer equipment protection, Commission Rule 746-3 10-2(c) states:

> "Utility's Responsibility-Nothing in these rules shall be construed as placing upon the utility a responsibility for the condition or maintenance of the customer's wiring, appliances, current consuming devices or other equipment, and the utility shall not be held liable for loss or damage resulting from defects in the customer's installation and shall not be held liable for damage to persons or property arising from the use of the service on the premises of the customer."

The Company's Electric Service Regulation No. 5, paragraph 5.2(a) also provides:

> "The Customer shall furnish, install, inspect and keep in good and safe condition all electrical wires and lines on the Customer's side of the point of delivery. The Customer shall provide devices to protect his/her equipment from high and low voltage, overload, single phasing, phase reversal or other abnormal conditions."

For Complainant's three-phase 480Y1277 volt service, the ANSI-specified Range A at normal loading for phase to neutral voltage, is 263 to 291 volts. Range B at the service meter extends from 254 to 293 volts. For unloaded phase to phase voltage, Range A is 456 to 504 volts while Range B extends from 440 to 508 volts. These voltage ranges, along with the Standard's three percent phase imbalance requirement and the Company's voltage fluctuation and light flicker standard, constitute the standard by which the Company's delivered voltage quality is determined.

The recording voltmeter tests conducted at the request of the Complainant indicated that voltage was within the parameters established by Utah Commission Rule 746-3 10-4B(1). The details of these recording voltmeter results are provided in Attachment B.

Even though the recording voltmeter results indicate the voltage supplied to the Complainant is within the Standard approved by the Commission, the Company adjusted the voltage at the

Green River #12 circuit regulator from 121 volts to 123 volts in August 2006 to attempt to address the Complainant's concerns. The Complainant indicated he would contact the Company again if he had any voltage problems. The Complainant has not contacted the Company since August 2006 with regard to any voltage problems.

In summary, the Company has correctly applied its Electric Service Regulation No. 12 as it applies to the Complainant's line extension requests. In addition, the voltage supplied the Complainant is within the parameters established by Commission rule. Accordingly, the Company has not violated any statute, rule, or tariff provision and requests dismissal of this complaint.

Sincerely,

Carole Rockney, Director
Customer & Regulatory Liaison

cc: Tim Vetere
Rea Petersen

Encl: Attachment A, Summary Voltage Quality Standards
Attachment B, Recording Voltmeter Test Results and Summary

Summary of Voltage Quality Standards Commonly Applied to Agricultural Water Pumping

PacifiCorp7s standards for voltage quality commonly applied to agricultural water pumping, are two-fold: (1) *steady-state voltage levels and ranges*, and (2) *voltage disturbances***.** These are described separately below.

Steady-state Voltage Levels and Ranges

Steady-state voltages are the rms* voltage levels supplied by PacifiCorp to its customers nearly all the time. vThese are nominal voltage levels, and ranges about those levels that are considered acceptable throughout North America by standard. This standard is *American National Standards Institute (ANSI) C84.1*.

For most common residential service the level and range at the billing meter are:
Residential Meter Nominal Voltage Level: 120 Vrms* +5/-5% (126V / 114 V)
During tap changer or voltage regulator operation (up to 90 sec): approx. +6/-8% (127 V / 110 V)

By the time electrical service gets to the typical wall receptacle it is called utilization voltage. The electric utility has no control over the voltage drop in customer facilities through building wiring. The steady-state voltage typically drops 1-5% in this wiring, depending on a number of factors. ANSI C84.1 suggests that this voltage drop be designed to no more than 3%, or 117 V nominal. Utilization voltage can also dramatically increase if building loads are incorrectly wired. Incorrect grounding is one way this can happen.

The nominal voltage at typical agricultural pump motors is 480 V, 3-phase, in order to accommodate the more powerful loads of the pump motors. The line-line voltage level and range at the meter are:
Pump Motor Meter Nominal Voltage Level: 480 Vrms* +5/-5% (504 / 456 V)
During tap changer or voltage regulator operation (up to 90 sec): approx. +6/-8% (508 V / 440 V)
The unloaded voltage of any phase is to be balanced within 3% of the average of all 3 phases.

The same voltage drop/rise considerations just mentioned for residential service also apply for the utilization voltages for pumps. Voltage drop/rise within a facility is not under the control of the utility.

Voltage Disturbances

The voltage levels described above are for continuous operation when nothing is disturbing the power system. Occasionally the power system is disturbed, but these disturbances usually last for just a moment. Some of these are voltage sags and interruptions (caused by temporary short circuits), capacitor switching, inductive load switching, and lightning transients. Such disturbances are outside the purview of ANSI C84.1, yet are a fact of life for electrical equipment. All of these disturbances except lightning or similar transients (surges) rarely cause a problem or damage because they are very limited in both magnitude and duration. It is the responsibility of the equipment owner to install and adjust equipment to protect against all potentially damaging disturbances.

Sags and Swells

One common type of disturbance on a power system--especially in agricultural pumping areas--is caused by large water pump motors starting. When a large pump motor starts the starting current typically increases for a few seconds to several times its normal running current. This increased current draw causes a *voltage sag* until the motor is up to speed. Such voltage sags often cause the voltage to dip below the ANSI C84.1 A and B continuous ranges.

In order to avoid too much sagging the PacifiCorp field engineer needs to approve the installation of all larger motors. If the sagging is found to be too great a motor starter or similar mitigation may be required. The specifics of the policy governing this are found in PacifiCorp's *Voltage Fluctuation and Light Flicker* Standard 1C.5.1, section 4.6. For Rocky Mountain Power these and other PQ standards may be found on the Internet at: http://www.rockymtnpower.net/Navigation/Navigation1891.html. PacifiCorp's *Voltage Level and Range* Standard 1C.2.1 may also be found at this same website.

Whenever the rms voltage temporarily increases a small amount due to a disturbance such as a large motor tripping off or other fluctuating load, this is called a *voltage swell.* It will persist until the effects of the disturbance are finished and regulation returns the voltage closer to optimal. Swells are normal and short-lived. They do not cause damage to properly-applied and protected equipment.

***RMS** voltage is the magnitude of ac voltage that would produce the same heating effect on an electric heater as if a dc battery voltage of that magnitude were connected. Vrms is one shorthand way of referring to rms voltage. More often in the electric power industry, the rms designation is omitted entirely, and the term *V* or *volts* is understood to mean rms voltage. However, in doing this we should remember that the ac voltage is cycling both above and below the rms level 60 times each second.

Attachment B

Voltage Quality Monitoring Summary Analysis
Tim Vetere Water Pumping
Green River, Utah

21 December 2006

Scope

This page summarizes in simple terms the more detailed three-page analysis of the voltage quality data shown on the charts of Tim Vetere's Green River, Utah, pumping installation.

Setup

An SLM-8 voltage recorder was applied to the 277/480 V source to Mr. Vetere's 50 hp agricultural water pumping motor. The recording sessions were through much of August and September 2006. Three kinds of voltage recordings were made every 30 seconds: average rms voltage, minimum rms voltage, and maximum rms voltage. In this case voltages were recorded phase-neutral, and hence all numbers should be normalized to a nominal 277 V base.

Results

The voltage recordings indicate that average rms voltage was within ANSI C84. I * range A nearly all the time with occasional excursions into range B. Many voltage sags were also recorded that dipped the voltage below the ANSI ranges. These disturbances are normal for this kind of pumping load. In addition, several sudden fluctuations in voltage are noted, likely due to load or generation changes in the area. However, none of these fluctuations were of a magnitude to cause damage.

Minimum and maximum voltage data also show nothing abnormal for this type of load and environment. It should be remembered that voltage values on these min/max charts outside of ANSI limits indicate the presence of short-lived disturbances, not continuous voltages, and hence are not evaluated in terms of ANSI C84.1 limits.

Dennis Hansen, P.E.
Principal Engineer
Power Quality and Reliability

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*See attachment *Summary of Voltage Quality Standards Commonly Applied to Agricultural Water Pumping* for a more complete description of ANSI C84.1 ranges, sags, and swells.

Power Quality Monitoring Results

Tim Vetere, Account #00670609-001

Prepared by Greg Bean, Engineer
Rocky Mountain Power

Date: Aug. 8 - 15,2006

Location: 50 HP pump near the Hastings Rd. (north of Green River city and on the east side of the river)

As requested by Mr. Vetere, a Metrosonics SLM-8 voltage recorder was installed at the point of delivery on the service to his pump on August 8, 2006 and recorded until August 15. The recorder was set to provide recordings of average RMS data plus 1 cycle response to minimum and maximum voltages (with recording of peak and minimum values only) during each 30 second period.

The chart of the recording shows average voltages ranging between 265 (apparently when Mr. Vetere's pump is running), and 282 volts (when it is apparently shut down) and that the voltages are within this range for the vast majority of the recording period.

It shows four voltage swells, one to about 282 volts, one up to 285 volts, and two up to 291 volts. All swells above nominal voltage (277 volts) are within ANSI range B limits (293 volts) for this recording period and all but one are within ANSI range A limits (291 volts). These appear to be quicker fluctuations, except for one and may be caused by a short pump shut down (8/11, 1:27); by operation of the small hydro generating station on the river; by voltage regulator action, possibly in response to the hydro-generator; or by system voltage response after a motor start (8/14, 5:25).

The recording also shows 24 voltage sags. These range down to 252 volts and appear to be caused by normal across-the-line motor starts, except for three which range down to 220 volts (may also be a motor start), to 15 1 volts (appears to be a system outage), and to 190 volts (apparently a single phase outage). Voltage sags due to motor starts do not fall under the same ANSI C284.1 standard, but are considered disturbances and governed by IEEE 1453, the voltage fluctuation and light flicker standard, and PacifiCorp's extension of this for infrequent events (See Engineering Handbook 1C.5.1).

Date: Aug. 23 - 30,2006

Location: 50 HP pump near the Hastings Rd. (north of Green River city and on the east side of the river)

The Metrosonics SLM-8 used in the previous recording was used elsewhere for the week of Aug. 15 - 22. It was brought back and installed at the same point of delivery on the service to Mr. Vetere's pump on August 23,2006. The recorder settings were the same as above.

The chart of the recording shows average voltages ranging between 275 volts (apparently when Mr. Vetere's pump is running), and 288 volts (when it is apparently shut down).

The voltages are within this range for the vast majority of the recording period. It appears that Mr. Vetere's pump was shut down much of the time during this recording period. Also, the hydro generation mentioned above may have been running during this time and might contribute to the apparently higher average voltage shown on the recording.

The charts show five more voltage swells, two to about 299 volts, one to about 297 volts, one up to 292 volts, and one to 295 volts. Four of these swells are outside ANSI range B limits (293 volts) for this recording period. The first two of these last 2-3 minutes and less than a minute, respectively. The other three follow a common pattern with a steep voltage rise followed by a gradual return, over a period of 1-2 minutes to previous levels. All of these except the last one appear to be three phase anomalies. The last one is apparently a two phase event. The same possible causes are suspected as during the previous recording session.

The recording also shows a half hour outage and four momentary outages. Three large voltage sags were recorded at 190,2 20, and 230 volts. These all appear to be due to the starting of a large motor, likely the one driving Mr. Vetere's large pump. There are also 13 smaller sags down to the 267-270 volt range. These all appear to be due to the starting of smaller motors.

<u>Date: Aug. 29 - Sept. 7,2006</u>

Location: 50 HP pump near the Hastings Rd. (north of Green River city and on the east side of the river)

The same Metrosonics SLM-8 voltage recorder was downloaded and left at the same point of delivery on the service to Mr. Vetere's pump on August 29,2006. These last two recordings, and the next two, show that there is a clock accuracy problem between the monitor and the computer used to download the data. This does not affect the accuracy of the data.

The chart of this recording shows average voltages ranging between 273 (apparently when Mr. Vetere's pump is running), and 285 volts (when it is apparently shut down). The voltages are within this range for the vast majority of the recording period.

The charts show two more voltage swells, one to about 299 volts and one to about 293 volts. The first swell is outside ANSI range B limits (293 volts) for this recording period. It lasted 2-3 minutes and showed the same pattern as the highest swell in the previous recording. Further analysis showed that this swell occurred immediately after a momentary outage mentioned below. The other swell lasted less than a minute. The same possible causes are suspected as during the previous recording session.

The recording also shows another momentary outage. There are also 24 smaller sags down to about 267 to 270 volts. These all appear to be due to the starting of smaller motors. Many of them are due to the starting of the motor connected to this service delivery point.

<u>Date: Sept. 6 - Sept. 12, 2006</u>

1,ocation: 50 HP pump near the Hastings Rd. (north of Green River city and on the east side of the river)

The same Metrosonics SEM-8 voltage recorder was downloaded again and left at the same point of delivery on the service to Mr. Vetere's pump on September 6,2006.

The chart of this recording shows average voltages ranging between 273 and 288 volts. The voltages are within this range for the vast majority of the recording period.

The charts show one more voltage swell to about 293 volts. It lasted 2-3 minutes and showed the same pattern as the highest swell in the previous recording. Further analysis showed that this swell occurred immediately after a voltage sag. The same possible causes are suspected as during the previous recording session.

There was one more momentary outage during this recording. There are 15 small voltage sags due to motor starts following the same pattern as during the previous recordings and two larger sags which also follow the previous patterns.

<u>Date: Sept. 11 - Sept. 15, 2006</u>

Location: 50 HP pump near the Hastings Rd. (north of Green River city and on the east side of the river)

The same Metrosonics SLM-8 voltage recorder was again downloaded and left at the same point of delivery on the service to Mr. Vetere's pump on September 11, 2006.

The chart of this recording shows average voltages ranging between 277 and 280 volts and that the voltages are within this range for the vast majority of the recording period. It appears that Mr. Vetere did not run his pump during this period. Other pumping load in the area may also have been off line during this time.

The charts show one more swell to about 293 volts. It lasted 2-3 minutes and showed the same pattern as the highest swell in the previous recording. Further analysis showed that this swell occurred immediately after a momentary outage mentioned below. The other swell lasted less than a minute. The same possible causes are suspected as during the previous recording session.

The recording also shows 11 smaller sags down to about 261 to 262 volts and one larger one to 250 volts. These all appear to be due to the starting of smaller motors. Based on these recordings, there would not appear to be enough over-voltage to cause Mr. Vetere's motor failure. The voltage dips and even the outages shown on these charts are all part of as normal power system operating condition in an irrigation pumping area such as this one.