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BEFORE THE ARIZONA CORPORATION COMMISSION

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IN THE MATTER OF THE APPLICATION OF UNS ELECTRIC, INC. FOR APPROVAL OF A RATE INCREASE.	DOCKET NO. E-04204A-09-0206

NOTICE OF FILING

The Utilities Division of the Arizona Corporation Commission ("Staff") hereby gives notice of filing of the evaluation and recommendation regarding Black Mountain Generating Station prepared by W. Michael Lewis and Kenneth Strobl in compliance with Decision No. 71914. This report is attached hereto as Exhibit A.

RESPECTFULLY SUBMITTED this 21st day of December, 2010.

Arizona Corporation Commission
DOCKETED
DEC 21 2010
DOCKETED BY

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Original and thirteen (13) copies of the foregoing filed this 21st day of December, 2010 with:

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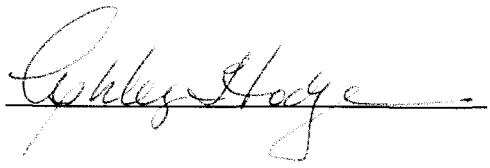

EXHIBIT A

ENGINEERING REPORT
ON
THE BLACK MOUNTAIN
GENERATING STATION

PREPARED BY:
W. MICHAEL LEWIS
AND
KENNETH C. STROBL

ON-BEHALF
THE UTILITIES DIVISION STAFF
OF
THE ARIZONA CORPORATION COMMISSION

IN COMPLIANCE WITH
DECISION NO. 71914
ON
UNISOURCE ELECTRIC, INC RATE CASE
DOCKET NO. E-04204-09-0206

DECEMBER 21, 2010

EXECUTIVE SUMMARY

ENGINEERING REPORT ON THE BLACK MOUNTAIN GENERATING STATION

The Report to the Arizona Corporation Commission ("Commission") is prepared by W. Michael Lewis, P.E. and Kenneth C. Strobl, P.E. and presents the results of our findings of a field investigation of the Black Mountain Generating Station ("BMGS") and to supplement the Direct and Surrebuttal Testimony of W. Michael Lewis in the most recent UNS Electric, Inc. ("UNSE" or "Company") case before the Commission, Docket No. E-04204A-09-0206. The purposes of the visitation to BMGS was an evaluation of the current operations at BMGS because of UNSE's proposal to purchase BMGS from UniSource Energy Development Company ("UED") as well as to investigate the operations of Unit No. 1 subsequent to the turbine failure in 2009. Accordingly, the report focuses on certain engineering aspects of the current operations of the two Units at BMGS.

Discovery And Site Visit

In addition to reviewing UNSE's responses (November 1, 2010) to our data requests regarding BMGS (October 20, 2010), we commenced a field visit to BMGS on November 8, 2010. We met with UNSE personnel and viewed the various individual plant and equipment facilities at the BMGS site in Kingman, Arizona. The purposes of our discussions with these UNSE personnel were two-fold: (1) to review current operations at BMGS; and, (2) to obtain firsthand information on the repairs to Unit No. 1 at BMGS. These individuals were very knowledgeable concerning all aspects of the operations at BMGS, and were able to satisfy our inquiries regarding station maintenance, water availability, and repairs to Unit No. 1.

Maintenance/Inspections. Our inquiries focused on annual and periodic preventative maintenance and inspection measures undertaken by UNSE of the plant and equipment facilities at BMGS. Besides the discussions with UNSE personnel, UNSE responses to Commission Staff Data Request Nos. STF 25.6 and 25.7 provide information and scheduling procedures at BMGS. The BMGS substation/switchyard had been recently inspected and included a thermal scan which had been recommended in Mr. Lewis's Direct and Rebuttal Testimony in the rate application case. The demonstrated ability of personnel at BMGS to undertake scheduled preventative maintenance and respond to operational problems should contribute to the maintenance of a high availability factor for BMGS.

Unit Operations. UNSE responses to Commission Staff Data Requests; e.g., STF 25.1, 25.3, and 25.11 through 25.14, and discussions with UNSE personnel indicate satisfactory operations are anticipated in the future for both Unit No. 1 and Unit No. 2. The capacity factors for both Units are reasonably high compared to the level for such factors for peaking units that we have encountered operating in other utilities. A decrease in heat rates; i.e., an improvement, has also been calculated by UNSE for the two Units since initial information received from

UNSE in the rate application case. This should be beneficial to the future operations of the Units regarding the running costs which are essentially fuel costs. The capacity factors, heat rates and the generation output (kWh) of the Units are summarized in Attachment II of our report.

With respect to the repairs to Unit No. 1, neither UED nor UNSE incurred any of the repair costs because of the warranty agreement. UNSE's and General Electric's (manufacturer of Units) evaluations could not confirm whether the turbine damage was due to Foreign Object Damage ("FOD") or Domestic Object Damage ("DOD"). Unit No. 1 was unavailable from October 2009 until February 2010. There currently is no warranty coverage for either of the two Units, although there was a 3-month extension of the original 2-year agreement due to the repair work.

Water Availability. UNSE personnel described the current configurations and capacities of the raw water and treated water facilities at BMGS. BMGS's raw water treatment equipment as currently configured can provide up to 200 gallons per minute ("GPM") of treated water at maximum operating capacity. The two UED-owned and 10 County-owned wells at the site are capable of providing about 400 GPM of raw water to the BMGS site. UNSE showed us the raw and treated water facilities, equipment, and stores during our visit. We have no further concerns as to the raw water availability at the site.

Turn-Key Cost Estimates

To evaluate the reasonableness of the claimed peaking capacity cost savings resulting from the inclusion of the BMGS into the UNSE rate base at the expected purchase price of approximately $59 million, we developed a cost estimate for a peaking installation equivalent to BMGS. The cost estimate for a turn-key installation of our conceptual plant is $79.2 million. The detailed estimated cost component is contained in Attachment III of our Report. Our cost estimate is about 5-6 percent greater than other cost estimates, and confirms the reasonableness of our procedure and resulting cost estimates.

Evaluations/Conclusions

We believe that BMGS is a well constructed facility and is back to full operation after the repairs to Unit No. 1. Moreover, our concerns expressed in Mr. Lewis's Direct Testimony in the rate application case regarding the adequacy of water availability, and the thermal scanning of the substation/switchyard have been sufficiently put to rest. Additionally, our cost estimate of $79 million for a comparable installation to that of BMGS is about 22 percent higher than UNSE's purchase price from UED of approximately $59 million.

I. INTRODUCTION

The purpose of this report is to provide the Utilities Division of the Arizona Corporation Commission ("Commission") the results of our findings of a field investigation of the Black Mountain Generating Station ("BMGS"), and to supplement the Direct and Surrebuttal Testimony of W. Michael Lewis in the most recent UNS Electric, Inc. ("UNSE" or "Company") case before the Commission, Docket No. E-04204A-09-0206.[1] The genesis of the visitation was the Commission Order to have an evaluation of the current operations at BMGS essentially for two reasons. First, and foremost, is UNSE's purchase of the generating facility from UniSource Energy Development Company ("UED") for inclusion in rate base.[2] And second is to investigate the operations of Unit No. 1 at BMGS subsequent to the turbine failure in 2009.

The Commission's Opinion and Order, Decision No. 71914 ("Opinion and Order") dated September 30, 2010 at Page 10 states that the Commission Staff recommends that the Commission Staff conduct a prudence or due diligence evaluation of the BMGS prior to any purchase of BMGS by UNSE from UED. Moreover, the Opinion and Order at Page 13 (specifically Footnote 29) states that the Commission Staff contemplates additional engineering evaluations of the performance of BMGS, particularly subsequent to the turbine repairs to Unit No. 1. The Commission directed such undertakings by Commission Staff in Item 62 of the Findings of Facts in Decision No. 71914.

Part of the Commission Staff's evaluation of BMGS is an evaluation of BMGS as currently configured and operated. Our investigation and evaluation addresses the current operations and utilization of Unit No. 1 and Unit No. 2, as well as impacts and consequences of the unexpected turbine damage and shutdown of Unit No. 1. The evaluations herein are based on our field investigation, discussions with Company personnel, reviews of Company responses to data requests and other documentation, and independent research regarding information relevant to the operations of the two 45 MW (each capable of sustained operation at 48 MW) gas-fired units at BMGS. It is our understanding that our evaluation, in conjunction with that of other Commission Staff personnel and consultants, will contribute to the Commission Staff's recommendations regarding the rate base treatment of BMGS and the rate reclassification proposed by UNSE. Accordingly, this report focuses on certain engineering aspects of the current operations of the two Units at BMGS.

II. COMMISSION STAFF DATA REQUESTS

A. <u>Data Requests to UNSE</u>. As a means of expediting our evaluations and field visit to BMGS, data requests were submitted to UNSE on October 20, 2010, and were designated

[1] The preparation of this report and the field investigation were undertaken by W. Michael Lewis, P.E. and Kenneth C. Strobl, P.E. Mr. Lewis is President of the firm of W.M. Lewis and Associates, Inc., and Mr. Strobl is Vice President of Technical Associates, Inc.

[2] It is our understanding that the Commission Staff and/or other consultants to the Staff, as well as the Federal Regulatory Commission and UNSE, will be providing their respective reports on the acceptability of transferring ownership of BMGS from UED to UNSE.

as Staff's Twenty-Fifth Set of Data Requests to UNS Electric, Inc., Docket No. E-042014A-09-0206. This set (Data Request Nos. STF 25.xx) consisted of 14 data requests addressing the operating status of BMGS from September 2009 to the present.[3] Our intention was to have responses to these data requests to limit the questioning of UNSE personnel, as well as the time at the BMGS facility, and to provide information to prepare a report to the Commission Staff to meet their needs for an evaluation of BMGS to be submitted to the Commission as required by Decision No. 71914.

B. Data Request Responses. UNSE provided responses to our data requests (set STF 25.xx) on November 1, 2010 for all 14 data requests by E-mail to Mr. Lewis. A copy of the data requests and responses are contained in Attachment I to this report. The responses included a number of tables and schedules with operational and other data associated with the operations at BMGS. We have not submitted any subsequent written data requests to UNSE relevant to our engineering investigation and evaluation at BMGS, and no follow-up requests to the STF 25.xx set of data requests were submitted by us to UNSE prior to our visitation.

III. BMGS FIELD VISITATION

A. General Aspects. Our field visit commenced on November 8, 2010. At the BMGS site, we met with UNSE personnel,[4] reviewed data relevant to past and current operations of BMGS, and viewed the various individual plant and equipment facilities at the BMGS site in Kingman, Arizona. Certain of these personnel; e.g., Mr. DeJulio, were the operational individuals that we had talked to during our visit in October 2009.

Our discussions with these personnel were to both review the current operations of BMGS, and obtain firsthand information on the results of the repairs to Unit No. 1. Our discussions with these personnel were aimed at reviewing certain aspects of the operations at BMGS, as well as to clarify certain of the responses to our data requests. These individuals were very knowledgeable concerning all aspects of the operations at BMGS, and were able to satisfy our inquiries.

One of our initial inquiries related to the land on which BMGS had been constructed. The land had been owned by Citizen's Electric Company, was acquired by UNSE in 2003, and consisted of about 300 acres and included one water well.[5] The current boundaries of the plant site occupy about 150 acres, with over 60 acres encompassing BMGS's plant and equipment, and outbuilding facilities. UNSE personnel indicated that there is adequate room for future

[3] Our initial field visitation to BMGS was in October 2009 in conjunction with our engineering evaluation of UNSE facilities proposed by UNSE for inclusion in rate base in the rate case application of UNSE filed with the Commission on April 30, 2009 (Docket No. E-04204A-09-0206).

[4] Personnel at the site included: Thomas McKenna (Vice President UNSE/TEP); Bill DeJulio (BMGS Plant Manager); Don Gin (Director, Remote Generation/Special Projects for Tucson Electric Power); and Operations I&E Technicians.

[5] The current site contains two (2) wells owned by UNSE and ten (10) wells that are owned by the County, which provide raw water to BMGS.

expansion, which could consist of additional turbine-generator units of General Electric LM 6000 type and capacity, with potentially a total of four of this type of unit with additional steam generation configurations to facilitate combined cycle unit operations. According to UNSE personnel, however, there are no specific near term plans for generation configurations other than the current two 45 MW gas-fired units at BMGS. Any additional gas turbine units and/or steam generation configurations would require the upgrading of the transmission capacity out of BMGS and the interconnection with UNSE's network in this area and expanded auxiliaries.

B. Maintenance/Inspections. Our inquiries, regarding these aspects of the operations at BMGS, focused on the annual and/or periodic preventive maintenance and inspection measures undertaken by UNSE of the plant and equipment facilities at BMGS. In addition to the verbal responses regarding these measures by the aforementioned personnel throughout our visit, UNSE responses to Data Request Nos. STF 25.6 and 25.7 provided information and preventive maintenance schedules for procedures at BMGS. These responses are included in Attachment I to this report.

In particular, the maintenance schedules provided by UNSE appear to be more than adequate to service a facility such as BMGS. Moreover, our review of the individual plant and equipment at the site indicates an elevated level of attention to these facilities which should result in more than satisfactory performance of the plant and equipment when needed.[6] The substation/switchyard had been recently inspected, and included a thermal scan[7] of the bus structures. Substation/switchyard maintenance is being performed by UNSE personnel on a timetable and with procedures followed as with UNSE substations.

The BMGS facility has inventories of replacement equipment; e.g., gaskets, valves, cables, etc., for much of the auxiliary facilities as well as the turbine/generator units themselves. A portion of the replacement equipment inventoried by UNSE at BMGS reflects the recommendations of General Electric, the manufacturer of Units No. 1 and No. 2.[8] Additionally, BMGS stores supplemental chemicals, analysis equipment and piping spares for use in the raw water treatment and chiller systems[9] as needed to maintain the integrity of these systems. UNSE also inventories various fixtures, lifts and other equipment to enable the technicians to undertake maintenance and inspection procedures.

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[6] To illustrate, the generating station fire suppression equipment appeared well maintained, and inspections and rebooting of the digital recording devises were current. While the fire suppression system capacity seemed somewhat in-excess of what may be necessary for the current generating station configuration, there is no reason at this time to question UNSE's safety measures in this regard at the site.

[7] Thermal scanning was one of the recommendations presented in Mr. Lewis's Direct and Rebuttal Testimony in the rate application case. The infrared detection procedures scheduled are included in the listing of preventive maintenance and inspection measures listed in the response to Data Request No. STF 25.6.

[8] The two 45 MW gas-fired units are designated as LM 6000 Turbines, with additional auxiliary or optional plant equipment to enhance their operational performance.

[9] The chiller system is utilized to reduce the temperature of ambient air to approximately 50°F for intake air flow into the turbine units.

The facility is manned by 2-3 permanent personnel normally on a 5-day, 8-hour schedule. While the units can be operated on local control, normal operation, monitoring, and dispatch is performed by TEP Control Center. This allows the on-site personnel to perform scheduled preventive maintenance and to respond promptly to any abnormalities in the operation of the units. This practice should contribute to the maintenance of a high availability factor for BMGS.

C. **Unit Operations.** While discussions with personnel on the operations of the two Units were fairly general in nature, UNSE responses to data requests include detailed data regarding the operations of the Units since our visit in October 2009. Our requests and UNSE responses addressed the operations of both Units, as well as what has transpired since the Unit No. 1 turbine failure damage in July-August 2009.

At the time of our October 2009 visit to BMGS, UNSE and General Electric personnel were reviewing vibrational data recording readout information available regarding the turbine failure, and subsequent shut-down of Unit No. 1. The Unit had been taken out of service just before we arrived for our field investigation at BMGS which was part of other evaluations of UNSE distribution and transmission plant and equipment facilities for the Commission Staff.

1. Operational Characteristics

Mr. Lewis's Direct Testimony (Dated November 6, 2009) in the rate application case presented information on the operational characteristics of both Units No. 1 and No. 2 over the period June 2008 through June 2009. The information was obtained through data requests to UNSE (specifically in Staff Data Requests STF 8.6, 8.8 and STF 21.3) as well as from personnel at BMGS. This information showed that both of the Units had operated for a substantial number of hours producing energy (kWh) for UNSE. Specifically, the data showed that there was generation output to the UNSE grid from each Unit in each of the 13 months from June 2008 through June 2009 through the Purchased Power Agreement between UNSE and UED.

Our most recent data requests (set STF 25.xx) requested similar operating information on the two Units from September 2009 to the present. These data and other information were provided by UNSE in response to a number of our data requests; i.e., Staff Data Request Nos. 25.1, 25.3 and 25.11 through 25.14. UNSE's response to Staff Data Request STF 25.1 in particular provides the hour by hour generation (kW and kWh) for each of Units No. 1 and No. 2 at BMGS over the period September 1, 2009 through September 30, 2010. In response to Staff Data Request STF 8.6 in the rate application case, UNSE provided monthly generation (kW and kWh) for each of the Units at BMGS over the period June 2008 through June 2009.[10]

Attachment II to this report presents a comparison of certain operating characteristics of the Units at BMGS. The capacity factors for both Units during the periods shown are reasonably high compared to the level for such factors for peaking units that we have encountered operating

[10] UNSE personnel stated that while the generation from BMGS can be sold on the open-market, to date UED has only provided generation from BMGS to UNSE.

in other utilities.[11] UNSE's utilization of the generation of BMGS is, therefore, more in the nature of a load-following intermediate capacity source than one utilized strictly to meet short-duration peaks in system capacity requirements.

With respect to Unit heat rates[12], the levels for each of the Units at BMGS are very reasonable and within the range of these types of gas-fired combustion turbine units. As can be seen in Attachment II, the heat rates for each of the Units has decreased which means that less input energy (BTUs) is required to produce output energy (kWhs). Moreover, these heat rates as now reported compare favorably with the heat rate of 8,133 BTU/kWh (nominal at ISO conditions) quoted in General Electric's LM 6000 specifications in the copy of the Turbine Purchase Agreement between GE Packaged Power Inc. and Consolidated Edison Development, Inc. provided by UNSE in response to Staff Data Request 8.5 in the rate application case. The 8,133 BTU/kWh heat rate is also for a 43.3 MW unit essentially identical to the BMGS's nominal 45 MW units. Additionally, the 8,133 MW heat rate would be affected by the actual operating environment of a unit such as operating level, altitude, humidity, cooling, and inlet/exhaust loss conditions that would be present.

The reported decrease in Unit heat rates is of interest given the magnitude and distribution of the changes and implications for future fuel cost decreases. Unit No. 1 heat rate, post blade repair and with the addition of various recommended improvements made during the repair, decreased from 9,503 to 9,159 BTU/kWh, an improvement of about 3.6 percent. Unit No. 2 heat rate has improved from 9,436 to 8,779 BTU/kWh, an approximate 7 percent improvement-without the benefit of any improvements or other modifications of which we are aware. Thus, as most recently reported, Unit No. 2 is demonstrating an approximate 4.3 percent efficiency advantage over that of Unit No. 1. While this difference is within the variance sometimes seen in "identical" units, and can also be attributed to differences in operating times at different levels of output, power factor, chiller performance, etc.; the variance may also be due to the characteristics of the gas flow and kW output metering. We were informed by the BMGS personnel during our field visit that while the engine flow meters are currently used to measure gas flow, TEP engineering personnel are aware of the need for accurate heat rate determination and have proposed to install "stand-alone" flow meters of high accuracy in Fiscal Year 2011. Given that the assumed heat rate of the Units influence projected fuel costs and cumulative annual emissions limitations, such improved metering should be included at BMGS.

In terms of generation output (kWh), Unit No. 1 generation over the most recent 13 months (2009/2010) is only about 75 percent of the generation of the comparable period (2008/2009) shown in Attachment II. The most recent 13 month period, however, includes the period October 2009-February 2010 when Unit No. 1 was being repaired. Generation from Unit No. 2 is similar over the two time periods shown in Attachment II, which implies its operational status has been consistent and dependable.

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[11] At Page 13 of his Direct Testimony in the rate application case, Mr. McKenna refers to BMGS as a "two-unit peaking facility."

[12] Heat rate is the ratio of energy (BTU) input to the generation (kW) output of the system --- in this case the gas-fired generating units.

The decrease in total generation for the two Units for the 13 months September 2009-September 2010 compared to the 12 months July 2008-June 2009 likely stems from increased production from other UNSE – owned generation units and/or a decrease in the levels of load to be met by capacity resources --- perhaps due to the economic slowdown.

2. Unit No. 1 Turbine Failure

UNSE personnel stated that Unit No. 1 had experienced turbine failure due to turbine blade damage. UNSE's on-site vibration monitoring instrumentation on Unit No. 1 measured the level of turbine vibrations prior to the shut-down of the Unit.[13] After initial on-site evaluations of the Unit, which was under a two-year warranty from General Electric, the turbine unit was transported to Houston, Texas for repairs and refurbishment. According to UNSE personnel, neither UED nor UNSE incurred any of the repair costs because of the warranty agreement.[14]

General Electric's evaluation of the turbine unit at the Texas facility, again according to UNSE personnel during our recent visit to BMGS, indicated that the turbine failure was initially due to a 3rd stage blade damage which resulted in collateral damage to blades in down-stream stages of the turbine. Based on its evaluations, General Electric could not definitely conclude that the initial 3rd stage blade damage was due to Foreign Object Damage ("FOD") or Domestic Object Damage ("DOD").[15]

Our discussions with UNSE personnel regarding the turbine failure focused on the vibration measurements from the sensors on the Unit No. 1 turbine assembly. The detailed explanation from the UNSE personnel related the analysis of General Electric which supports UNSE's response to Commission Staff Data Request STF 21.4 in the rate application case regarding vibration measures. In particular, the output sensors showed Unit No. 1 was running at 0.1 inches per second, and peaked at 0.2 inches per second, presumably at the time of the blade damage in the turbine unit. There are two monitoring sensors on the Unit with an alarm point of 2.0 inches per second and a shutdown point of 3.0 inches per second. Obviously since the vibrational output data never reached the alarm point and the trip point, the Unit continued to operate. It was not, however, the spike in the output data (from 0.1 inches per second to 0.2 inches per second) that caused the UNSE personnel monitoring the operations at BMGS to shut down the unit and initiate internal inspection of the Unit; i.e., borescope inspection. The borescope inspection was a part of the normal maintenance schedule. After the discovery of the blade failure, vibration records were reviewed and the spike was noted at that time. The internal inspection precipitated the mutual agreement between UED and General Electric to analyze the turbine failure, and the subsequent repairs and refurbishment of Unit No. 1.

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[13] UNSE response to Staff Data Request STF 25.9 indicates the vibration monitoring set points and sensors are in accordance with manufacturers recommendations.

[14] UED afforded itself the opportunity when the turbine unit was dismantled to have some upgrades undertaken which were mutually agreeable to General Electric. Based on the response to STF 25.10, the upgrades cost about $350,000.

[15] The difference between the two designations was the introduction of an object that damaged the blade from outside (Foreign) or from inside (Domestic) the turbine unit. See UNSE's response to Data Request STF 25.8.

The repaired turbine assembly was installed and Unit No. 1 was again operational in February 2010. According to data provided by UNSE in response to STF 25.01 and STF 25.11, Unit No. 1 has been available for most of the period from its on-line status in February 2010 to the present. UNSE's responses to these two data requests, respectively, show the hour by hour generation of the Units, and the availability or outage times for each of the Units. The unavailability of the Units is further separated into two categories: Forced Outages ("FO") and Planned Outages ("PO") over the period September 2009 through September 2010. The data in response to Staff Data Request STF 25.11 shows that Unit No. 2 was unavailable for only a very small amount of time in both 2009 and 2010, with the bulk of the unavailability due to PO. In contrast, there was an extended period of unavailability of Unit No. 1 because of the FO due to the turbine failure. Unit No. 1 was off-line and unavailable from October 2009 until February 2010. As the data in response to Staff STF 25.11 show, the availability of Unit No. 2, and Unit No. 1 after the repairs compare favorably with similar installations.

The warrantee agreement between UED and General Electric for the Units extended from March 2008 until June 2010. There currently is no warranty coverage for either of the two Units. We inquired as to why there was not an extension and/or other provisions to extend a warranty, at a minimum for Unit No. 1. UNSE personnel indicated that the original contract between UED and General Electric was not an "evergreen"[16] contract, and that with the repairs and the on-line time of the Units the warranty period had expired. The original two-year warranty contract, which would have extended from March 2008 through February 2010, had essentially been extended due to the repair work. The two-year agreement, therefore, was actually 27 months; i.e., March 2008 through June 2010. We consider this a reasonable accommodation by the parties.

D. Auxiliary Facilities. The BMGS site includes auxiliary facilities in addition to the two 45 MW gas-fired turbine-generator assemblies and switchyard facilities. The auxiliary facilities include raw water pumps and storage tanks; water treatment equipment and treated water storage tanks; gas supply equipment; fire suppression equipment; diesel engine power unit; Continuous Emission Monitoring system; battery stores; control room monitoring facilities; line circuit breakers; and SCADA (a combination of fiber and microwave provided by Tucson Electric Power Company) communications equipment for integration into Tucson Electric Power Company's network control system. The capacity of the auxiliary facilities is sufficient, and typically exceeds, the capacity needed for the continuous operation of the two Units at a net output of about 48 MW each. While BMGS is capable of local control, typical operation is monitored and dispatched by TEP network control. The SCADA appears to be sufficient for this duty.

Breaker/Switching Gear. Over the last year, there have been two significant equipment additions at BMGS: a new circuit breaker and the addition of synchronizing to the existing switchyard circuit breaker. The new 69 kV circuit breaker has been installed in-line to the

[16] The "evergreen" designation reflects a concept that the original agreement or contract continues as originally provisioned unless modified by the consent of both parties.

Navajo substation. UNSE's response to Staff Data Request STF 25.10 lists the line item expenditures to integrate this switch into the BMGS facilities. With this addition, BMGS now has the capability to isolate its generation from UNSE's distribution system faults, and this will also facilitate possible operation of the BMGS to function in an "island" mode to supply the Kingman area in the event of a regional grid outage.

The second addition is the addition of (in effect) synchronizing relaying to allow the two switchyard buses to be operated ("tied") together. UNSE's response to Staff Data Request STF 25.10 lists the line item expenditures to integrate this switch into the BMGS facilities. These additions have enhanced the operational flexibility of BMGS.

Water Availability. One of our concerns had been the adequacy of the water supply at BMGS during our October 2009 visit to the site. Our most recent discussions with UNSE personnel and observations of facilities at BMGS confirmed our understanding based on UNSE's responses to Staff Data Requests that there now are ample facilities at BMGS to meet the water requirements for the Units. UNSE responses to Staff Data Requests STF 15.4 and STF 21.1 stated that with UED's then current water supply plans, the availability of water for the BMGS operations was not going to be a problem. UNSE's response to Staff Data Request STF 25.10 identifies a number of items of investment in water treatment and storage facilities at BMGS that have been implemented since our October 2009 visit.

We were informed by UNSE personnel that the 2 UED-owned and 10 County–owned wells are capable of providing about 400 gallons per minute ("GPM") of raw water to the BMGS site. Our understanding is that at BMGS the current generation configuration requirements are somewhat less than 100 GPM at full operation (about 85-90 GPM). In addition to raw water supplies, BMGS has the capability of about 300,000 gallons of raw water storage and three separate 85 gallon treated water storage tanks. BMGS's raw water treatment equipment as currently configured can provide up to 200 GPM of treated water at maximum operating capacity.

As we have found with regard to other facilities at BMGS, the raw water and treated water equipment are well constructed and maintained. UNSE personnel at BMGS showed us all the raw and treated water facilities, equipment and stores during our visit. The UNSE personnel described the operations of these facilities and how they integrate with the overall operations of the Units at BMGS. We have no further concerns as to the raw water availability at the site.

IV. PURCHASE PRICE

Independent "turn-key" cost estimate(s)

To evaluate the reasonableness of the claimed peaking capacity cost savings resulting from the inclusion of the BMGS into UNSE rate base at the expected purchase price equal to the net plant value at the time of purchase, we developed a cost estimate for a peaking installation equivalent to BMGS. The estimate was prepared using two separate methods with an objective

of developing a $/kW unit cost. First, we surveyed recent proposed and installed peaking installations with multi-unit gas turbine units with a net plant capacity of 80-120 MW at projected heat rates of 8800-9700 BTU/kWh. Then as a confirmation, we developed a cost estimate based on a conceptual design equivalent to BMGS.

Our basis for comparison and conceptual design was a two generating unit configuration with identical gas-fired turbine-generator sets, each of 50-52 MW (performance enhanced) output (nominal rating of 45 MW) at full load at the generator terminals. Performance enhancing options are included as well as a chiller installation sufficient to provide the necessary cooling for two unit operation at full load at an ambient of 104 degrees F. We considered Alstom GT8 units with emission control options with a nominal rating (ISO) of 46 MW as well as GE LM 6000 units rated 44 MW with equivalent performance options with a projected output of 50-52 MW. Our subsequent conceptual design is for the GE units based on their currently less costly procurement compared to Alstom and comparable Japanese units. The generators were assumed to be of air-cooled design, class F insulated, 13.8 kV, with a rated power factor of 0.85.

The auxiliary peak load for each unit was estimated at 1,700 kVA (1.5 MW) including plant fixed auxiliary loads. Auxiliary loads were assumed to be supplied by 13.8 kV-4160 V or 480 V transformers as further described on the Cost Estimate in Attachment III. Cable bus was assumed for generator to auxiliary transformers and to the generator step-up transformers located in the adjacent substation. The necessary 4160 V and 480 V auxiliary buses were assumed to consist of cable tray installations.

The conceptual design for the substation included two typical generator step-up transformers of OA/FA ratings of 45/60 MVA, at 55 degree rise but rated for continuous operation at 65 degree rise, 13.8 kV-69 kV and full BIL. Outgoing busing for two 69 kV lines was arranged in a two circuit breaker per bus configuration with aluminum tube bus work. The circuit breakers were assumed to be of SF6 design. Control, instrumentation, and relaying cables were assumed to utilize Trenwa enclosures. The substation would include a control/relaying enclosure, typical relaying, ground grid, oil containment, and a 125 volt DC rectifier-battery supply for control and relaying power requirements.

A common office, control, and maintenance building with restroom and shower facilities was assumed to be included in the cost of the installation as well as fencing, lighting, water lines and gas lines within the plant boundaries and their connection to their source, a fire water system, storage for raw water needs and water treatment.

The above is a somewhat conservative configuration as compared to the BMGS which includes higher capacities in many areas of the auxiliaries, capacities of transformers, etc. Therefore, our cost estimate for a facility of similar output and performance is conservative.

We did **not** include provisions for: land or land rights, initial site development, SCADA facilities beyond the local control, transmission facilities other than a dead-end structure, permitting efforts and negotiations for water quality and emissions, initial substation design,

"Owner's Costs" of financing, inspection during construction, design and material approvals, or fencing and other security beyond the immediate station needs.

The cost estimate for a turn-key installation of our conceptual plant is $79,164,000 for a peaking capacity of a nominal 96 MW net output. This equates to a capacity unit cost of $825/kW. The detailed estimated cost component is included herein as Attachment III.

For comparison and confirmation of our cost estimate we reviewed a cost estimate by others for a similar peaking plant that is currently under development in the Midwest.[17] This plant is to replace a proposed coal-fired base load generating station for a consortium of municipal utilities. The coal-fired option was abandoned in favor of a peaking installation after the initial site development, land procurement, water availability, and transmission facilities were in place. Also, many of the same "Owner's Costs" as described above as not included in our estimate have been completed or not projected to be included for this plant as well. These features allow for a reasonable comparison to a BMGS equivalent. This plant's estimated cost of installed capacity is about $780/kW.

The estimated cost of our conceptual plant, therefore, is 5-6 percent greater than those other cost estimates. Accordingly, we believe that this is a confirmation of the reasonableness of our procedure and resulting cost estimates.

V. EVALUATIONS AND CONCLUSIONS

Based on our visual inspection of BMGS, discussions with UNSE personnel at BMGS, and reviews of UNSE responses to Staff Data Requests, we believe BMGS is a well constructed facility and is back to full operation after the repairs to Unit No. 1. Moreover, the concerns expressed in Mr. Lewis' Direct Testimony in the rate application case regarding the cost of repairs to Unit No. 1, the adequacy of water availability, and the thermal scanning of the substation/switchyard have been sufficiently put to rest. Neither UED nor UNSE has paid for any of the repairs to Unit No. 1; UNSE has sufficiently demonstrated the adequacy of its water availability, and thermal scanning was undertaken during the last substation (switchyard) inspection by UED.

Based on our cost estimate of $79 million for an equivalent installation to that of BMGS, UNSE's purchase price equal to the net plant value at the time of purchase is a reasonable purchase price for UNSE to pay for BMGS. It is our understanding that the purchase price of net plant value provides an "as is" generating facility with its current capabilities of generating power from two – 45 MW gas-fired Units which have demonstrated a capacity of 48 MW net generation, including the auxiliary plant and equipment to allow for operations as needed by UNSE. That is, while certain of BMGS's auxiliary facilities, such as its water pumping and treatment facilities and fire suppression facilities, may be considered over-built given the current generating facilities at BMGS, these will contribute to the increased capacity required if any

[17] The cost estimate is contained in a report to the member municipals and is marked as "Business Confidential".

expansion in the future of BMGS generation is increased. Moreover, the potentially overbuilt facilities are of the safety and security-type which is always of great concern to engineers and technicians designing and constructing such facilities.

ATTACHMENT I

UNSE REPONSES TO
STAFF DATA REQUESTS
STF 25.1 THROUGH STF 25.14

Attachment II
BMGS Units
Operating Characteristics

	Unit #1	Unit #2
Capacity Factor		
June 2008 to June 2009 1/	10.3%	18.0%
Most Recent 12 months 2/	11.3%	10.5%
Heat Rates (BTU/kWh)		
Response In Rate Case 3/	9503	9436
Recent Response 4/	9159	8779
Generation (kWh)		
12 mos. July 2008-June 2009 1/	74,753,176	43,576,252
13 mos. Sept 2009-Sept 2010 2/	44,711,970	41,373,850

1/ Calculated based on UNSE's response to Staff Data Request STF 8.6 in the rate application case using annual net kWh generation and annual net peak kW output for each Unit.

2/ Per data and calculations provided by UNSE in response to Staff Data Request STF 25.14.

3/ Per UNSE response to Staff Data Request STF 8.6 in the rate application case.

4/ Per UNSE response to Staff Data Request STF 25.12.