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August 1, 2006

Patty Van Gerpen
Executive Director
South Dakota Public Utilities Commission
500 East Capitol Avenue
Pierre, South Dakota 57501

RE: In The Matter Of The Complaint Filed By Global Polymer Industries, Inc., Arlington, South Dakota, Against The City Of Arlington Regarding Electrical Service
Docket No. CE06-003

Dear Ms. Van Gerpen:

Enclosed herein is Commission Staff's Expert Report for filing as directed by the procedural schedule outlined in the Commission's Scheduling Order And Notice Of Hearing dated July 10, 2006.

Sincerely,

Sara Greff

Sara Greff
Staff Attorney

Cc: Mr. Richard Helsper
Mr. Gary Schumacher
Mr. Michael Jenkins

Expert Investigation
Complaint Review and Recommendations

In the Matter of the Complaint Filed by Global Polymer Industries, Inc., Arlington, South Dakota, Against the City of Arlington Regarding Electrical Service Docket CE06-003

Prepared for

Staff of the South Dakota Public Utilities Commission

August 1, 2006

Prepared By:

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Executive Summary

On June 7, 2006, Global Polymer Industries, Inc. (GPI), an industrial manufacturer of ultra high molecular weight polyethylene, UHMW-PE, products in Arlington, South Dakota filed a complaint with the South Dakota Public Utilities Commission (PUC) against the City of Arlington (City). The City provides electric utility service to this industrial customer. GPI claims that poor electric service reliability and the poor responsiveness to power interruptions from the City is adversely affecting its business operations.

As part of its inadequate service complaint, GPI is also concerned with inadequate service restoration procedures, contingency power plans for GPI, and the facilities management of maintenance activities for the electric utility system. In addition to service inadequacy, GPI is dissatisfied with its demand billing schedule from the City.

GPI is planning a plant expansion within the upcoming 24-months and wishes to have these concerns addressed and resolved before making this additional investment.

The PUC hired Power Delivery Associates (PDA) to evaluate the GPI complaint and to develop an Expert Report for an unbiased evaluation and recommendation. On July 24, 2006, PDA and Commission Staff visited with GPI at their industrial facilities and then with the City at the City Town Hall. The purpose of these visits was to review the details of the complaint with each party to gain insight on each party's operational details.

The following report outlines the filed complaints and concerns as interpreted by PDA. In section I, each complaint is identified and a brief review of any background information is given. In section II, the findings from the site visits are discussed along with relevant findings for each identified complaint. In section III, the recommendations are made for improvements in power quality, service reliability and operating procedures for both parties. In conclusion, PDA has taken a very thorough but independent look at both systems to identify recommendations for both GPI and the City for resolving the filed complaint and valid concerns. Attached to this report are the detailed findings from each site visit.

I. Identified Complaints and Concerns

a. Adequacy of Service - Extended Duration of "Nursing Home Fire & Outage"

Adequacy of service typically is relative to service voltage levels, power interruptions and their frequency of occurrence. Additionally, the utility's level of response to identified concerns and requests by the customer must be considered.

In GPI's case, the primary service complaint is the power outage that occurred during a fire that occurred at a nursing home facility served by the City. The fire involved one of the City's transformers. Power to the Nursing Home and GPI was interrupted as a result. This power interruption left GPI without electric service for approximately 4-hours. GPI feels that an alternate source of service was available from the City at the time of the outage but was not acted upon.

b. Adequacy of Service - System Maintenance and Planning

An ongoing concern for GPI is the fact that no improvements or repairs to the City's distribution system serving the GPI plant have been implemented. There is a concern that the primary feed to GPI passes through the Nursing Home transformer which is believed to have been damaged during the fire and is now susceptible to failure.

c. Adequacy of Service - Voltage Flickers and Blinks

Voltage flickers are cited by GPI but no specific situations are identified with this complaint.

d. Adequacy of Service - Contingency Planning

GPI feels the City is not prepared with a functional plan to restore power to the GPI plants in the event of an extended outage situation. Although an alternate supply is available from the City to serve the facilities, GPI does not feel that the alternate feed has enough capacity at all times to meet their needs.

e. Billing - Totalized Power Demand Charge vs. Independent Meter Demand Billing

GPI's manufacturing facility is served with two transformers from the City. At each transformer location, the City meters the energy and power consumption by GPI. GPI claims they have a standing agreement with the City to combine the metered values into a single bill with a single demand charge. The purpose of the single demand charge is to allow GPI to take advantage of power diversity with their operation and reduce the overall metered demand.

GPI claims the City is not currently providing this metering and billing scheme although it has been provided in the past. GPI claims the reason for the City not providing this service is their lack of capabilities and resources.

II. Onsite Visit Findings in Reference to Complaints and Concerns

a. Adequacy of Service - Extended Duration of "Nursing Home Fire & Outage"

The Nursing Home is served by the City with a pad-mounted, three-phase, 75-KVA transformer from the City's underground primary distribution system. An underground three-phase service is taken from the transformer and routed to a riser pole where the service changes from underground to overhead. The riser pole is within 15-feet of the transformer pad. From the riser pole, the overhead service travels to a through-the-roof service entrance mast where the City makes connection to the Nursing Home's service entrance conductors.

The pad mounted transformer is protected with three individual bayonet fuse units. The bayonet fuse units have under-oil cartridges that can be externally removed from the oil-wells. The fuse units are designed to disconnect electric power supply to the transformer windings and core in the event of an internal short-circuit or secondary overload.

The pad mounted transformer is also equipped with primary feed-in and primary feed-out terminations. This arrangement allows the utility to use the transformer as a junction point where the power feed into the transformer can be carried onto additional loads. The internal transformer winding and core is tapped from the feed-in terminations and is an under-oil termination.

In late summer or early fall 2005, the City received a fire call from the Nursing Home. In response to the call, the City assessed that the Nursing Home Center and building was not on fire but instead the electrical service conductors serving the premise was experiencing a high impedance fault and creating an electrical fire around the overhead service wire. To extinguish the fire, the pad-mounted transformer serving the overhead service had to be deenergized.

The City does not have any qualified linemen employed for operating and maintaining its electric distribution system. The City contracts the operation and maintenance to Kingsbury Electric Cooperative (Kingsbury), a nearby electric utility. Kingsbury provides a dedicated employee for the day-to-day activities as well as after normal hour outage response.

In response to the Nursing Home fire and outage, the Kingsbury lineman tried opening the bayonet style overcurrent protective fuses but the internal transformer oil was overflowing from the fuse well and could not be opened. The decision was made to disconnect the primary supply cables from the transformer which would de-energize the transformer. The disconnection of these cables however interrupted service to GPI as the primary feeder cables to GPI feed from the 75-KVA Nursing Home transformer.

The decision was made by the City to concentrate all efforts on repairing the secondary service to the Nursing Home and not utilize any time to back feeding the Industrial Park and GPI. Although in the evening, weather conditions were hot and the outage was after dark and the Nursing Home was apparently not equipped with adequate emergency backup power needed to provide basic medical needs, and due to the City's limited manpower, the City wanted to restore power to the Nursing Home as soon as possible.

Although the electrical system problem was limited to a secondary service, the City's distribution system serving the Nursing Home, GPI and approximately four additional customers was de-energized until the service wire was repaired.

b. Adequacy of Service - System Maintenance and Planning

Over the course of the past seven years, the City has embarked upon the task of converting the entire overhead electric distribution system to underground facilities. The City has completed nearly 70% to 75% of this 10-year project.

With this completed work, the City's infrastructure is relatively new and possess a higher than normal level of reliability. This predictive reliability is simply based upon the age of installed infrastructure and is not a guarantee of true operating reliability.

The City owns and operates two substations which serve all of the City's electric customers. The primary substation serving GPI has a capacity of 2,000 KVA and has not been updated in recent years. The substation did receive routine equipment maintenance approximately two years ago. The primary substation serving GPI is not scheduled for any upgrades or maintenance in the near future.

The City's alternate substation has limited capacity with a 1,500 KVA transformer installed. The alternate substation has received the addition of new voltage regulators in spring 2006 and full station insulators. This station is slated to have a refurbished transformer installed in the fall of 2006 which would increase the station transformer capacity to 3,000 KVA.

The primary distribution feeder serving GPI leaves the substation as an underground system and remains an underground system all the way to the GPI plant. The primary feeder has some taps from it that serve additional customers.

From the substation to GPI, the feeder is routed through the Nursing Home transformer. This arrangement does not allow the primary distribution cables to be disconnected from the transformer without interrupting service to GPI. The only way to prevent this occurrence is for the City to physically rearrange the underground cable terminations in nearby switching cabinets to shift the GPI power flow over to the alternate substation. This process requires a systematic series of steps to safely assure uninterrupted service to GPI.

In addition to the main power system being routed through the Nursing Home transformer, the individual phases of the underground cable system are routed through residential single-phase transformers. This arrangement creates the same disconnecting scheme as associated with the Nursing Home transformer.

For the concern of the damaged Nursing Home transformer, the transformer was not damaged during the fire and outage of 2005. Again, the fire was not a structural fire which overheated the transformer. The fire was a high impedance fault of the overhead service conductors serving the Nursing Home. The high impedance fault did not produce current levels above the ratings of the internal protective fuses and therefore was not damaging to the transformer itself.

c. Adequacy of Service - Voltage Flickers and Blinks

Voltage dips and sags on utility distribution systems is common to temporary faults caused by animals or vegetation contacting energized lines, weather and even other customer connected faults. Although these faults are unavoidable, the City's distribution system upgrades should help reduce these events.

GPI's molding machines have constant voltage and current monitoring but do not have event recording capability. GPI indicated they had experienced variances and momentary interruptions in their power supply but did not have any records to document any specific events. GPI could not remember a specific event in the past few months.

d. Adequacy of Service - Contingency Planning

The City has built into their electric distribution system the capability of back feeding the Industrial Park and GPI. This back-feed option is a manual process of plugging and unplugging the underground cables of the normal feed and the alternate feed in a very precise and systematic process to complete the back-feed process. This process requires the operation to be completed by a qualified underground lineman as well as the knowledge of the City system.

Although the facilities are in place for a contingency or back-feed plan there is not a documented operation procedure or switching scheme in place for guidance.

Also, until the alternate substation is upgraded with a larger power transformer, the back-feed option is limited to when GPI can be switched. The existing alternate substation transformer is rated for 1,500 KVA and is presently experiencing peaks of approximately 1,350-kW which places its loading at maximum levels. The GPI normal operating load is 500-kW which could only be shifted to the alternate substation when the station loading is below 800-kW due to the limitations in transformer capacity.

e. Billing - Totalized Power Demand Charge vs. Independent Meter Demand Billing

The City is currently providing appropriate metering and billing services to GPI. The City is using the electronic meters and metering software to totalize the energy and power usage of GPI into a single power bill.

III. Expert Recommendations

After reviewing the complaints and concerns of GPI and making the onsite visits with GPI and the City, the following recommendations are made:

a. GPI Distribution Feeder Routing

Although the City has invested tremendous capital in the conversion of its overhead electric distribution system to underground, there remain some operating concerns.

The routing of the main feeder to the Industrial Park through the Nursing Home transformer as well as through single-phase residential transformers should be eliminated.

This routing scheme sends the main GPI and Industrial Park feeder through distribution transformers that are much more susceptible to failure than standard junction cabinets. With the current scheme, if one of these transformers needs to be replaced or maintained, a major system switching scheme would need to be completed in order to keep service to GPI. This switching scheme may not be capable of being executed in a timely fashion due to the City staffing limitations but more so, the loading levels of the distribution system will not allow for back-feeding of GPI.

It is suggested the City install the necessary URD junction cabinets along the feeder to provide taps to the Nursing Home transformer and the single-phase transformers and provide a direct route of the feeder to GPI.

b. Installation of Underground Switching Cabinet for Improved Back-feeding Capability

The City has in place the infrastructure for providing a back-feed or alternate power supply to GPI through a series of systematic switching steps. This process requires the opening of energized cabinets, handling of energized cables, and the manual process of plugging and unplugging of the cables one phase at a time to complete the back-feed. It is recommended this process be simplified through the installation of a three-phase switching cabinet at the Industrial Park junction cabinet.

The three-phase junction cabinet will allow a single operator to manually switch the power feed to GPI and the Industrial Park at one central location with limited steps. The installation of this equipment will allow for a safe switching process to take only minutes without the need of handling and manipulating energized cables.

c. Development of Written Back-feed Switching Procedures

Although the dedicated Kingsbury Electric Cooperative employee may understand the operating dynamics of the City's electric system to safely and efficiently execute a back-feed operation, a documented switching procedure is needed. It is not guaranteed the dedicated lineman from Kingsbury will always be available to complete a planned or emergency back-feed.

A documented switching procedure will help guide any qualified lineman through the process of switching the GPI service between the normal and alternate substation feeders. Without this plan, any lineman outside of the normal Kingsbury operator would find it very difficult to execute. Further more, the safety of the linemen and the public warrant a switching procedure for such a task.

A copy of the switching plan and associated documents should be maintained inside the Underground Switching cabinet. This will allow any operator to have access to the

procedures and protocol.

d. Develop an After Hours Outage Reporting Method

During the site visit and discussions with the City, it was discovered that in the event of an outage after normal City work hours, no specific person is available to take outage calls from the customers. In fact, the customer must track down someone from the City to make notification if there is no one available at City Hall. The City needs to develop a system that directs an incoming outage call to a person or outage answering system. The system can be as simple as rolling the City Hall phones over to the on-call employee or to an outside answering service. In either case, a customer reporting a power outage should be able to telephone a single number to report a loss of power.

e. Compliance with the National Electrical Safety Code (NESC) for Pad-Mounted Equipment.

The NESC requires that pad-mounted or above-ground equipment either be locked or otherwise secured against unauthorized entry. In addition, two conscious acts must be completed before the equipment can be opened to expose the operator to energized parts.

During the visit with the City, it was observed that no underground enclosure or equipment was equipped with the double locking method. The City needs to install pad locks or similar devices to all of its pad-mounted equipment and enclosures to become compliant with NESC Rule 381.G, 1&2.

In addition, for the safety of the public and workers, it is an industry standard and recommendation by the NESC to have a prominent safety sign visible on the outside of all equipment to identify the hazardous voltages inside the equipment. The City needs to apply appropriate signs to all of its underground enclosures and equipment.

f. Installation of Backup Power Supplies on GPI's PLC controls and Computer Systems.

Because momentary power blinks and dips cannot be predicted but expected, many manufactures install short-term uninterruptible power supplies (UPS) or similar ride-through protection on the microprocessor controls. This protection provides enough backup power for the computer systems to retain the setups and programs for the manufacturing process. This allows the power capacity of the ride-through equipment to be limited to the computer system requirements only.

After reviewing the power supply requirements of the GPI molding machines and equipment, it was determined the PLC or computer control systems can receive a source of power separate from the main molding machine branch circuit. It is recommended that GPI install a separate branch circuit to each PLC/computer control and the branch circuit be equipped with a UPS.

The addition of this ride through capability should eliminate the shutdown of the molding machine processes due to momentary blinks and dips.

IV. Conclusions

After reviewing the complaints, concerns, and operating systems of both GPI and the City, it is believed that a satisfactory resolution can be reached. GPI is operating a productive and busy manufacturing process that heavily depends on reliable electric service. GPI is working in an on-demand market place that is time dependent on production and product delivery. GPI is sensitive to any interruptions in their manufacturing process whether it is the receiving of materials or available power to complete the manufacturing process. Therefore, the concern for the request to address operating limitations is understood and reasonable.

For the City, it has made a tremendous investment to improve its electrical distribution system by converting the overhead facilities to underground. The primary cause of power interruptions for typical utilities is vegetation related. The conversion to an underground distribution system will certainly help to improve this type of interruption.

Overall, the City has a stable and well maintained system. However, it has allowed the layout of its distribution feeders to reduce its operating strengths. The routing of the underground feeder through residential and commercial transformers increases the potential for a sustained outage to the Industrial Park. This strength of the underground system is limited to a single residential transformer.

With the installation of a series of junction cabinets and a switching cabinet, the City can truly realize the strengths of its investment in the underground system. The installation of this equipment will bring the distribution system in line with the acceptable standards of an industrial customer the size of GPI.

GPI is planning to expand its plant operation in the next 24-months with a new line of 36-molding machines. This expansion will require additional capacity from the City's distribution system of approximately 250 to 300-kW. This additional load onto the City's system can be supported from the existing primary substation but not from the alternate substation system at this time. The City plans to upgrade the alternate substation with additional capacity and if completed as scheduled in the fall of 2006, the alternate substation will be capable of supporting the proposed plant addition when needed.

With the goal of improving manufacturing reliability with improved power quality, GPI holds some responsibility itself. With the highest level of maintenance and the most improved system in place, the electric utility grid is susceptible to blinks, dips and interruptions which affect the electric customer. Therefore, the customer holds the responsibility of implementing Power Quality (PQ) improvement measures if these normal system anomalies are critical to the manufacturing and work flow process. For GPI, the implementation of UPS protected branch circuits to the PLC and computer

control systems would be considered a reasonable investment on their part.

It is of Expert opinion that if the City implements the recommended improvements and in doing so, GPI will be receiving acceptable and industry standard electric service from the City.

Attachment 1

City of Arlington Site Visit Evaluation and Findings
Global Polymer Industries, Inc. versus City of Arlington, South Dakota
July 24, 2006

On July 24, 2006, a site visit was conducted with the City of Arlington (City) by Power Delivery Associates, Inc.(PDA), consulting Expert for the South Dakota Public Utilities Commission and Commission Staff.

One of the purposes of this visit was to gain information in regards to the complaint of an extended outage on the City's electric distribution system affecting Global Polymer Industries, Inc. (GPI). Additionally, the site visit was used to develop an understanding of the City's Operation and Maintenance activities for its electric system.

Participants during the visit included:

- Michael Jenkins, P.E. -Power Delivery Associates
- Bob Knadle -SD Public Utilities Commission
- Martin Bettmann -SD Public Utilities Commission
- Amiel Redfish -Mayor, City of Arlington
- Regene Lohan -Foreman, City of Arlington
- Bradley Bunker - Councilman, City of Arlington
- Tim Muellenburg -Heartland Consumer Power
- Kevin L. Karel -Kingsbury Electric Cooperative
- Larry Jensen -Kingsbury Electric Cooperative

The following information outlines findings for inquires by PDA targeting specific concerns of the filed complaint:

Inquiry: What was the date and time for the outage associated with the filed complaint and referenced as the Nursing Home Power Outage?

Finding: The City did not have any information available at the time of the visit that documented the outage but remembered the outage being in the late summer or early fall of 2005. The outage was referenced to have occurred in the evening hours around 8:00 p.m.

Inquiry: How was the outage detected by the City?

Finding: The Mayor indicated that a fire call was received from the Nursing Home as well as a call from GPI.

Inquiry: How many total customers were affected by the outage?

Finding: The Nursing Home, GPI and approximately four additional residential customers were

affected by the outage.

Inquiry: What is the dispatch procedure for a typical outage?

Finding: Customers report their outages directly to City Hall during the day. After hours, outages are telephoned directly to either the Mayor or someone who is on call.

Inquiry: How many service personnel are normally on duty?

Finding: The City does not have any electrical system employees. The City contracts the operation of its electric distribution system to Kingsbury Electric Cooperative. Kingsbury provides one employee who is dedicated to the City's operation. This employee is primarily the repairman but the Mayor or another City employee may in fact be the first responder.

Inquiry: Who responded to the outage?

Finding: The Mayor, the Kingsbury Electric Cooperative employee, and a councilman responded to the outage.

Inquiry: What was the experience level of the responding personnel?

Finding: Only the Kingsbury Electric Cooperative employee was a qualified lineman.

Inquiry: What was the assessment in the field?

Finding: The City assessed that the Nursing Home Center and building was not on fire but instead the electrical service conductors serving the premise was experiencing a high impedance fault and creating an electrical fire around the overhead service wire. To extinguish the fire, the pad-mounted underground transformer serving the overhead service had to be de-energized. The Kingsbury lineman tried opening the bayonet style overcurrent protective fuses but the internal transformer oil was overflowing from the fuse well and could not be opened. The decision was made to disconnect the primary supply cables from the transformer which would de-energize the transformer. The disconnection of these cables however interrupted service to GPI as the primary feeder cables to GPI loop through the 75-KVA nursing home transformer.

Inquiry: What was the process in getting the power restored?

Finding: The decision was made by the City to concentrate all efforts on repairing the secondary service to the nursing home and not utilize any time to back feeding the Industrial Park and GPI. Although in the evening, weather conditions were hot and the outage was after dark and the nursing home was apparently not equipped with adequate emergency backup power needed to provide basic medical needs, and due to the City's limited manpower, the City wanted to restore power to the nursing home as soon as possible.

Inquiry: Did all of the customers remain out of power until the outage was completely repaired?

Finding: The Industrial Park which only has GPI as a tenant and the other 3 to 4 residential customers did remain out of power during the restoration process.

Inquiry: Did GPI contact the City about the outage?

Finding: The Mayor indicated that GPI called him at the beginning of the outage and prior to him responding to the nursing home. However, the power to GPI was not interrupted until the City disconnected the nursing home transformer after arriving on the fire call scene.

Inquiry: What reports and advice did the City give GPI regarding the outage?

Finding: The Mayor indicated that he did not talk with GPI again during the outage. The Mayor said that he made a couple of trips to the GPI facilities but no-one was available.

Inquiry: Is there a contingency plan in place for GPI?

Finding: The City has built into their electric distribution system the capability of back feeding the Industrial Park and GPI. However, there is not a documented contingency plan in place that provides guidance of when or how to address a back feed operation for GPI.

Inquiry: How many electric customers does the City serve?

Finding: The City serves approximately 450 electric customers with the grain elevators, Super 8 Motel and the public school being the additional large power customers.

Inquiry: How many miles of distribution line does the City operate?

Finding: The City does not have a record of their facilities but estimates the electrical system is comprised of 10 to 15 miles of distribution line.

Inquiry: How many substations does the City operate?

Finding: The City provides electric service to its customers with 2-substations with two distribution feeders from each substation.

Inquiry: What does the City own at the substation, i.e. high-side, power transformer, low-side, protective equipment, etc?

Finding: The City owns the entire substation components including the high-side facilities and transmission line tap. However, East River Electric Cooperative is contracted by the City to maintain these facilities.

Inquiry: Who operates the transmission system?

Finding: The City owns two, 1-mile radial 69-kV transmission line taps. Each radial tap serves one of the City's substations. The transmission grid from which the City taps are derived is owned by East River Electric Cooperative.

Inquiry: What are the operating voltages for the City system?

Finding: The entire distribution system is operated at 4160/2400-wye voltage.

Inquiry: What is the transformer rating of the substation serving GPI?

Finding: The base rating of the station power transformer is 2,000 KVA.

Inquiry: What is the maximum station peak experienced by the substation serving GPI?

Finding: Information was not available at the meeting but the peak was estimated at 1,300 kW with a total system peak of 2,700 kW.

Inquiry: What are the operating voltages of the substation serving GPI?

Finding: The voltage rating of the station is 69/4.1 kV.

Inquiry: What is the high-side protective device at the substation serving GPI?

Finding: Both substations are protected with expulsion fuses on the high-side of the transformers.

Inquiry: What types of distribution feeder protective devices are installed at the substation serving GPI?

Finding: Each substation has two distribution feeders exiting the station and each feeder is protected with oil filled hydraulically controlled reclosers.

Inquiry: What is the distribution feeder voltage for the feeder serving GPI?

Finding: Each feeder operates at 4.1-kV.

Inquiry: What is the feeder conductor size of the feeder serving GPI?

Finding: Each feeder exiting the substations are underground and has 4/0 aluminum, 15-kV, 220-mil insulated jacketed cable installed.

Inquiry: What types of down-line feeder protective devices are installed on the distribution feeder serving GPI?

Finding: The only down line protective devices installed are overhead protective fuses where underground-to-overhead taps are derived from the underground distribution system.

Inquiry: What is the electrical distance from the substation to GPI?

Finding: Exact measurements were not available but associations between city block distances and the electric supply route were made and an estimate of ¼ - mile was made.

Inquiry: What is the total electrical distance of the feeder serving GPI?

Finding: The distribution feeder ends at the Industrial Park where GPI is located so the total distance is approximately ¼ - mile.

Inquiry: What and when was the last maintenance completed on the substation serving GPI?

Finding: The last substation maintenance was completed by East River Electric Cooperative 2-years ago. East River completed standard maintenance on the substation bus regulators.

Inquiry: What are the future maintenance or expansion plans for the substation serving GPI?

Finding: There are no scheduled upgrades for the substation directly serving GPI. However, the City has scheduled a 1,500 KVA to 3,000 KVA transformer upgrade for its alternate substation. This substation upgrade is planned for the fall of 2006.

Inquiry: What are the secondary voltages for the GPI transformers?

Findings: There are two transformers serving the main manufacturing building for which the complaint has been filed. Each of the two transformers provides three-phase 120/240 four wire delta volts.

Inquiry: What is the electric connectivity relationship of the Nursing Home transformer to GPI's feeder?

Finding: The underground feeder from the substation runs directly through the 75-kva transformer at the nursing home. The nursing home transformer is equipped with loop feed bushings and the City is passing the primary feeder supply to GPI through the transformer.

Inquiry: Is the Nursing Home transformer equipped with protective devices to isolate it from the GPI feeder in the event of a failure or overload?

Finding: The 75-kva transformer is equipped with bayonet style high-side protective fuses. These fuses are designed to disconnect the primary supply from the transformer primary winding and core if a fault or overcurrent is developed by the transformer.

However, these fuses did not activate and disconnect the transformer during the nursing home service wire fire. The nursing home electrical fire appears to have been a high impedance fault which did not produce enough fault current to activate the internal transformer fuses. As a reminder, the electrical service fault did not interrupt service to GPI; the service to GPI was interrupted when the City disconnected the feeder cables from the transformer to interrupt the electrical service fault.

Inquiry: What was the ruling on the concern that the Nursing Home transformer was damaged during the fire?

Finding: The concern about the Nursing Home transformer is that it incurred damage to its insulating oil during the fire in 2005. Again, the Nursing Home fire was not a structure fire but a melt down of the overhead electrical conductors serving the Nursing Home facilities. The energy driving this fire was generated from the 75-kva transformer in question. During the response to the fire, the Kingsbury Electric employee attempted to interrupt power to the transformer by disengaging and removing the under-oil bayonet fuses from the open port. This overflow of oil was due to pressures developed from normal reaction to the electrical load of the high impedance fault that was active at that time. It is not uncommon even under normal conditions for the internal transformer oil to overflow from the transformer when the bayonet fuses are removed.

Inquiry: Is there an alternate source of service for GPI from the City?

Finding: The City does provide an alternate supply source to GPI and the Industrial Business Park. The City has a feeder that ends at the Industrial Park from its second substation which is electrically 1.5-miles away. The alternate feeder can be manually connected to the onsite supply to GPI through a series of switching operations of the underground cable system.

Inquiry: For the alternate source, what is the substation transformer rating?

Finding: The alternate substation currently has a 1,500 KVA power transformer installed but is scheduled to be upgraded to a 3,000 KVA unit in the fall of 2006.

Inquiry: What is the maximum station peak for the alternate source?

Finding: Individual substation information was not available from the City. However, the City combined peak is 2,700 kW and based upon the City's load control system, the total load is split evenly between the two substations. Therefore, the estimated load on the alternate substation is 1,350 kW.

Inquiry: How is the alternate feeder interconnected with the normal GPI service?

Finding: The alternate feeder is in a parked position inside an underground junction cabinet located at the Industrial Park site. The primary supply cables serving GPI must be disconnected at the junction cabinet, placed in a parked position and the alternate

feeder cables then connected to supply cables to GPI.

Inquiry: What has the City implemented since the Nursing Home Outage to better improve service reliability and improve restoration time?

Finding: No major changes to the City's electric system serving GPI or its operational procedures have been implemented.

Inquiry: How are the GPI services metered?

Finding: Each GPI service is metered with a transformer rated meter system installed at each of the GPI service transformers.

Inquiry: Who owns the revenue meters?

Finding: The City of Arlington owns the metering equipment at the GPI facilities.

Inquiry: What types of meters are used?

Finding: The transformer rated meters are ABB electronic and programmable style meters.

Inquiry: How are the meters read each month?

Finding: The City utilizes metering software provided by GPI to read the meters each month.

Inquiry: Is the City okay with totalized metering that synchronizes the demand intervals of each meter into one single summed interval?

Finding: The City uses the metering software to totalize the meter readings of the primary manufacturing facility to provide GPI with a single coincident demand charge.

Attachment 2

Global Polymer Industries Site Visit Evaluation and Findings
Global Polymer Industries, Inc. versus City of Arlington, South Dakota
July 24, 2006

On July 24, 2006, a site visit was conducted with Global Polymer Industries by Power Delivery Associates, Inc., consulting Expert for the South Dakota Public Utilities Commission and Commission Staff.

One of the purposes of this visit was to gain information about the Nursing Home outage and its effect on Global Polymer Industries (GPI). Additionally, the site visit was used to develop an understanding of GPI's manufacturing processes and the sensitivity to power outages and interruptions.

Participants during the visit included:

+ Michael Jenkins, PE -Power Delivery Associates
+ Bob Knadle -SD Public Utilities Commission
+ Martin Bettmann -SD Public Utilities Commission
+ Todd Huntimer -President, Global Polymer Industries
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The following information outlines findings for inquires by Power Delivery Associates targeting specific concerns of the filed complaint:

Inquiry: What was the date and time for the outage associated with the filed complaint and referenced as the Nursing Home Power Outage?

Finding: GPI did not have a record of the outage but remembered the outage being in late summer, 2005. The outage occurred in the evening hours as it was dark and GPI employees had to move from the manufacturing facilities to their cars.

Inquiry: Were both plant facilities interrupted with the outage?

Finding: Yes, all of GPI's operation was shutdown with the outage.

Inquiry: Did GPI notify the City of the Outage?

Finding: GPI attempted to telephone the City but no one could be reached. After not being able to reach the City on the telephone, one of GPI's managers drove around town and found the Mayor to notify him of the outage.

Inquiry: How long into the outage was it before a notification attempt was made to the City?

Finding: Within minutes of the outage, GPI began trying to contact the City.

Inquiry: Have there been any additional sustained outages since the Nursing Home Outage?

Finding: No.

Inquiry: What type of equipment is installed for the manufacturing processes that are adversely affected with a power outage?

Finding: In the primary manufacturing facility, GPI uses approximately 52-molding machines to form and produce the UHMW-PE materials. The molding machines combine hydraulic compression with heating elements to produce high levels of pressure and heat to mold the polyethylene resin into designed products.

Each of the molding process, the hydraulic press and heating system is controlled by a Programmable Logic Controller (PLC) which is a computer based system. If there is a loss of power, even momentarily, the computer program or setup for the machine is lost. When a molding manufacturing process is underway and a loss of PLC program occurs, the process must be aborted and restarted. When a molding process is aborted, the product is lost plus the machine must be placed through a series of cool-down and cleaning processes before it can be restarted.

In GPI's tooling and post molding facility, GPI uses several computer controlled milling machines and processes. The affects of a power blink or outage creates similar problems as in the molding processes.

Inquiry: Does GPI have any protection equipment installed on their facilities to prevent loss of computer system setups during a PQ event?

Finding: GPI does not have any backup equipment installed for the computer based equipment. At the present time, each of the 52-molding machines are served with an individual branch circuit which supplies power for both the molding process and computerized control circuitry. By far, the power requirement for the molding process of each machine is much greater than the control system. The two separate power requirements of each machine can be separated.

Inquiry: Is there any record of momentary outages or blinks?

Finding: GPI does not keep a log or record of power quality problems. GPI could not remember a power quality problem within the last several months.

Inquiry: Is there any equipment installed to monitor and/or record PQ events at the GPI facilities?

Finding: There is not any PQ monitoring equipment at the GPI facilities. However, the PLC controllers for the molding machines are equipped with control set-point alarms. If the monitored variables of voltage and current vary beyond their PLC setup levels for the

specific molding process, the PLC alarms the operator. If a variance in the power supply voltage occurs, the operating set-points of the molding machine vary creating an operator alarm.

Inquiry: How long has GPI been a customer with the City of Arlington?

Finding: GPI first began operations and received electric service from the City in 1993. This service was at a different location on the City's system. In 1995, GPI expanded and moved their operation to the Industrial Park.

Inquiry: How long was GPI a customer of the City when it decided to expand its operation at the Industrial Park?

Finding: In 1997, GPI decided to expand its manufacturing facility by constructing a new manufacturing addition to its existing building. In 2003, GPI expanded its operation again by moving some of its manufacturing processes into an existing building across the street in the Industrial Park.

Inquiry: What expansion plans are on the horizon for GPI?

Finding: GPI is planning to expand its operation with the addition of 36 molding presses and associated manufacturing processes. GPI is planning this expansion within the next 24-months.

Inquiry: Will GPI need additional service locations for this expansion?

Finding: Yes, an additional building will be constructed near the primary manufacturing facility of GPI.