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BEFORE THE UTAH UTILITY FACILITY REVIEW BOARD

ROCKY MOUNTAIN POWER Petitioner vs. MIDWAY CITY Respondent	**DIRECT TESTIMONY OF JOHN NELSON** Docket Number 20-035-03

PURPOSE OF TESTIMONY

Q: Why are you providing this testimony?

A: I have been asked to provide expert opinions regarding (1) whether the transmission line proposed by Rocky Mountain Power ("RMP") through Midway City is necessary and must be constructed by the end of 2020; (2) whether the conditions placed by Midway City on construction of the proposed line will impair the ability of RMP to provide safe, reliable, and adequate service to its customers; and (3) whether the bids proffered by RMP in this case are competitive bids that accurately reflect the actual cost of constructing the proposed line underground.

WITNESS BACKGROUND AND QUALIFICATIONS

Q: Please state your name, business address and present position.

A: My name is John P. Nelson and I am semi-retired living at 30997 Niakwa Road, Evergreen, Colorado, 80439. I perform part time work for NEI Electric Power Engineering as a Senior Power System Consultant.

Q: Please describe your education and business experience.

A: I received a Bachelor of Science degree from the University of Illinois in 1970 and a Master of Science degree from the University of Colorado in 1975. I performed graduate studies in the MBA program at the University of Colorado from 1976-1979. I taught graduate and undergraduate power engineering classes at the University of Colorado from 1998-2000.

I have over 50 years of power engineering experience, including 10 years at the Public Service Company of Colorado, 5 years with Power Line Models and over 35 years with NEI Electric Power Engineering, which I founded in 1984. Please see my CV, which is attached hereto.

Q: What experience and qualifications do you have regarding power companies and transmission lines?

A: I have over fifty years of experience in the planning, design, construction, maintenance and operation of generation, transmission, distribution and utilization of electric power from 120 Volts through 500 kV. My experience includes extensive work not only in the United States but also internationally where I have worked on utility and industrial power systems. I am quite

familiar with RMP's system in the states of Utah and Wyoming, where I have worked as a consultant to Amoco Production, later BP, in the Evanston, Wyoming area, P&M Coal near Kemmerer, Wyoming, Chevron in the Evanston, Wyoming Area, Lehi Power, Provo Power and Brigham City Power, Heber Light and Power and other industrial and utility companies. I jointly performed power system studies with Utah Power and Light, the predecessor of RMP, for the Evanston Wyoming area for the development of the 138 kV loop transmission system originating at the Naughton Power Station and ultimately including the development of the Railroad Substation.

Q: Have you provided expert witness opinions and testimony before?

A: Yes. I began providing technical assistance for the attorney's representing Public Service Company of Colorado (PSCO), now Xcel Energy in 1975 while I was employed by PSCO. When I left PSCO in 1979 to become a consulting engineer, I continued to assist PSCO in numerous cases and through different law firms. As a consulting engineer, I continued to receive cases to review resulting in expert reports, depositions and court testimony. Although I was a practicing engineer, I have probably spent upwards of between 5 and 10% of my profession career on legal investigations primarily involving electric utilities. I have testified on electrical injury cases, electrical related fires, electrical outages and other electrical power issues including professional audits of a number of electric Utility Companies such as Commonwealth Edison in Chicago, Duke Energy (South Carolina), ConEd (New York), LA Light and Power, and several other large utilities.

Q: In summary, what qualifies you to provide these expert opinions?

A: I have first-hand knowledge of the electric power system in question along with expert skilld, knowledge and experience in the generation, transmission, distribution and utilization of electric power. I have also provided numerous expert studies, reports, depositions and court testimony on major power system incidents. I am familiar with planning studies and construction projects similar to the project involved in this case. Please refer to my attached CV for more detailed information regarding my qualifications.

EXPERT DATA

Q: What documents and materials have you reviewed related to this case?

A: I have reviewed the testimony of the following RMP witnesses and experts:

- Jake Barker – Director Transmission Planning and Power Quality (RMP)
- Darin Myers, Project Manager, Rocky Mountain Power
- Benjamin Clegg, Operations Manager and Principal Project Manager, Sigma Utility Solutions, LLC
- Benjamin LeFevre, Managing Director and Certified General Appraiser, Integra Realty Resources
- Jason Norlen, General Manager, Heber Light & Power
- Craig Michaelis, Lead Electrical Engineer, Intermountain Consumer Professional Engineers, Inc.

- I have reviewed the RMP 138 kV transmission system and substations between Hale, Cottonwood and Railroad substations using Google Earth Pro.
- I also reviewed the following documents:
  - Okonite 138 kV power cable catalog sheets – Product Data Section 2: Sheet 55
  - Okonite shield fault current calculations
  - RMP underground cable bids from bidders 13, 15 and 17
  - Numerous technical articles
  - Petition Before the Utah Facility Review Board dated Jan 15, 2020
  - Midway Response Before the Utah Facility Review Board dated Feb 21, 2020
  - Technical Provisions, specifications, Drawings and Maps – Jordanelle-Midway Underground 138 kV Line Section – Underground Transmission Project for Bidding – Issue Date Feb 21, 2020
  - Heber Light and Power Underground Communications and Power Specification Drawings
  - Heber Light and Power Underground Transmission Cost/Feasibility Study – Dated April 24, 2018
  - Summary of RMP Park City Area Planning Study
  - Response from RMP on Geotech Midway Studies

Q: What did you learn from those materials?

A: The knowledge that I gained from those materials provided me with a relatively clear understanding of the issues being raised in this case. In particular, the materials showed a clear

indication, in my professional opinion, that RMP is not a proponent of placing the RMP and HL&P systems underground. The materials appear to show high costs, unnecessary requirements and unreasonable time constraint on the project. Much of what I have learned in this case is presented in my testimony below.

EXPERT OPINIONS

Q: Do you have an opinion whether the transmission line proposed by RMP through Midway City is necessary and must be constructed by the end of 2020?

A: Yes. In my expert opinion and to a reasonable degree of scientific certainty, the transmission line proposed by RMP is necessary, but the specific routing is not, and the construction completion date by the end of 2020 is arbitrary.

Q: Why did you reach these conclusions?

A: RMP has indicated that the proposed line through Midway City is necessary and must be constructed by the end of 2020. In my opinion, the end of 2020 is an optimistic date that has no firm basis. This is not to say that having the line constructed by the end of 2020 is not a reasonable goal. With the information provided by RMP, there appears to be a valid basis for completing the construction as soon as possible. In particular, the discussion by RMP on the occurrence of a single contingency 138 kV line outage resulting in unacceptable system voltages shows that this problem has evolved over a number of years where RMP should have taken corrective action years earlier. The argument that the 138 kV line in question must be completed by the end of 2020 could have been made years earlier; for example by the end of 2017, 2018, 2019 or even an earlier date. The loads in the Heber City and Park City areas have materialized over the years increasing the risk of power outages each year. While the risks have increased each year, there is no unique circumstance requiring the line in question to be completed by the end of 2020. In fact, with the present COVID-19 crisis and resulting economic downturn, the loads most likely will decrease the impact of a single contingency outage. Furthermore, the worst-case conditions that RMP took into consideration are statistically low, further reducing the probability of such a condition. While it would be commendable to have the line completed by the end of 2020, it is no more essential by 2020 than years earlier. With that said, the line should be completed as soon as practical to improve the system reliability.

Q: What is the likelihood that delaying the proposed line until a start date of spring of 2021 would result in "an array of negative system outcomes . . . [that] include outages lasting days or weeks to thousands of customers of both companies", as alleged by RMP?

A: The likelihood is very low, but it is statistically possible.

Q: What is the likelihood of the power system need exceeding the capacity of the Cottonwood-Snyderville and Hale-Midway transmission lines between now and the end of 2021?

A: The likelihood is very low, but it is statistically possible.

Q: What is the likely outcome if, hypothetically, the Hale-Midway 138kv transmission line were to have an outage, reducing the nominal voltage to 73%?

A: First, the probability of losing the Hale-Midway line is statistically low but could occur. Assuming the hypothetical loss of the Hale-Midway line under the conditions for which RMP has found the nominal voltage would reduce to 73%, the following is the likely outcome:

- Automatic load shedding in any substations where RMP may have undervoltage load shedding capability.
- System controller/dispatcher would shed loads in such a manner to restore voltages to tolerable levels.
- Local generation may trip off-line if the undervoltage is sustained for any period of time.

Q: In the foregoing hypothetical, do you agree that blackouts or equipment damage would result, as RMP claims?

A: We must keep in mind that the foregoing hypothetical is very unlikely and has also existed for years. With that said, I agree that blackouts could result from the worst-case scenario. However, I do not believe any electrical equipment in normal operating condition would be damaged. Electrical equipment is more susceptible to damage from overvoltage than from undervoltage. It should be noted that 73% is a serious condition that should be avoided.

Q: How would a hypothetical loss of a power source, like an outage in the Hale-Midway 138kv line, affect the power system and customers of RMP?

A: First, at this time the HLP system would experience a total power loss since the Hale-Midway 138 kV line is the sole source to HLP. In addition, it is probable that other RMP loads would need to be shed if the system becomes overloaded. As RMP has determined in their load flow studies, load shedding would be required and some customers could lose power until the line

is restored. If the outage is extended, RMP may need to resort to rotating blackouts until the system is restored. Again, this hypothetical scenario is worst-case and very unlikely, and the condition has also existed for years.

Q: What are the planning standards to remain above 90% of nominal voltage during an outage, and what happens if the nominal voltage dips below this?

A: Utility industry standards are typically developed by organizations like IEEE (Institute of Electrical and Electronic Engineers), ANSI (American National Standards Institute), NEMA (National Electrical Manufactures Association) and others through consensus in order to have consistent requirements across the industry. The 90% limit on the nominal voltage for the transmission system is based on consensus agreement across the industry. The 90% minimum voltage has been determined to be an acceptable minimum normal transmission line voltage just as 105 - 110% has been determined to be the maximum normal voltage. Utilities would like to operate their transmission systems typically within a 95-105% range. The ultimate reason is to provide voltage to the customer that is reasonable, safe and consistent. Finally, extended periods of undervoltage can be detrimental to electrical equipment and loads, although not nearly as detrimental as overvoltage.

Q: If the nominal voltage drops to 63%, as suggested by RMP, what are the foreseeable outcomes in this case?

A: This is a hypothetical scenario that is unlikely to occur. Should it occur, loads will be shed in sufficient quantity to restore voltage to the system.

Q: In the unlikely event of a power outage on either of these transmission lines (i.e., Hale-Midway or Cottonwood-Snyderville), how long would it take to repair and restore service?

A: The vast majority of outages with 138 kV transmission lines are momentary in nature and may be caused by such events like lightning, wind or unloading of ice causing lines to slap together. The momentary outages are typically a fraction of a second. However, a more severe outage could take hours or days to locate and repair. If the line trips and stays out, a trouble-man may be required to inspect the line, determine the cause and have a crew repair the problem. Minor problems could be restored in two to ten hours. A major problem like a snow or rockslide could take a crew one or two days or possibly even longer, depending on the event. Again, this risk has existed for years and has not materially worsened or become more acute in 2020.

Q: What is the likely outcome if, hypothetically, the Cottonwood-Snyderville 138kv transmission line were to have an outage, reducing the nominal voltage to 73%?

A: The answer is similar results would occur as in the loss of the Hale-Midway line. However, different loads and substations may be involved. This is likewise an unlikely event and a risk that has existed for years.

Q: Does the system still operate in that case?

A: Yes, on a temporary reduced level. Rotating blackouts could be required, depending on the severity.

Q: Do you agree with RMP's conclusion that there will be 620 hours of exposure to risk for inadequate voltage in the years 2020-2021 if the proposed transmission line does not go in now? Why or why not?

A: We have requested documents from RMP relating to this issue but we have not received them. Without the benefit of reviewing those documents, I will assume that to be correct based on RMP's studies. However, a year includes 8,760 hours, so 620 hours of exposure is roughly 7% of the year. That 7% would also most like occur during the peak load hours and may result in a few hours of each day during the summer peak and winter peak.

Q: Is it common for all power systems to have certain exposure to this type of risk?

A: No. Good utility practice is to plan for no loss of customers on standard single contingency outages on a transmission system. However, there are risks for radially fed customers. Moreover, this is a risk that has existed for years, and nothing has recently changed to increase the risk.

Q: How much, if at all, will the risk increase if the proposed transmission line is delayed one year to 2021?

A: The overall increase in risk from 2019 to 2020 to 2021 is minor. However, RMP has shown that the present risk is real and present.

Q: What is the real risk to the system if the proposed transmission line is delayed for one year and completed by the end of 2021?

A: The real risk is low, but in the worst-case scenario, some customers could experience a longer than normal power disruption at peak times.

Q: Do you have an opinion whether the conditions placed by Midway City on construction of the proposed line will impair the ability of RMP to provide safe, reliable, and adequate service to its customers?

A: Yes. In my expert opinion and to a reasonable degree of scientific certainty, the conditions placed by Midway City on the construction of the proposed line will not impair the ability of Rocky Mountain Power to provide safe, reliable and adequate service to its customers.

Q: Why did you reach this conclusion?

A: The placement of all or part of a 138 kV transmission line underground is common throughout the electric industry. The placement of a 138 kV transmission line underground is a proven technology with excellent results. In fact, the placement of a 138 kV transmission line underground typically and significantly improves the reliability of the transmission line since the underground cable is well protected by its inherent design. It is not subject to normal adverse conditions such as lightning, high winds and icing. Furthermore, it reduces the exposure of high voltage to the general public. In summary, the proposed underground cable will not impair the ability of RMP to provide safe, reliable and adequate service to RMP customers. The time delay from completing the project in 2020 versus 2021 will not decrease the safe and reliable delivery of power to the system any more than what RMP has accepted for a number of years to this date.

Q: Do you have an opinion whether the bids proffered by RMP in this case are competitive bids that accurately reflect the actual cost of constructing the proposed line underground?

A: Yes. In my expert opinion and to a reasonable degree of scientific certainty, the bids proffered by RMP in this case appear to be high based on RMP's overly conservative specification. Furthermore, RMP received only three bids from a group of eighteen bidders. The limited number of bidders raises questions about the difficulty of each bidder to reasonably present a bid. There are several reasonable changes to the specifications that can be incorporated, which would significantly reduce the bids. The table below summarizes the bids RMP received for the project and include the cost placing the 138 kV line underground, the cost of terminating structures at each end of the underground circuit and a surcharge by RMP for overseeing the project. The primary difference between the three options is the length of overhead line being placed underground, with Option 1 being the shortest proposed length.

			Bidder 13	Bidder 15	Bidder 17
Option 1			$14,087,283	$22,369,008	$12,646,665
Option 2			$14,890,375	$24,245,299	$12,905,369
Option 3			$17,315,492	$28,356,571	$14,773,386

Q: What were your cost estimate conclusions?

A: I have reviewed the cost estimates from the three bidders identified as Bidders 13, 15 and 17. I performed an engineering estimate on a per mile basis for placing the 138 kV overhead line underground. My first estimate is based on the RMP specification and is approximately $8.1 million per mile. My second estimate is based on reducing some of the conservative RMP specification requirements and is approximately $6.3 million per mile. As a result, I believe that the cost based on the RMP specifications, $8.1 million, versus the cost of $6.3 million for a reasonable alternative set of specifications is approximately 29% higher. In reviewing Option 1 of the RMP bid document, the distance specified is 6990 feet where my measured distance using Google Earth Pro is approximately 5810 feet. The distances for Option 2 and 3 in the specifications also appear to be longer than my measurements. The additional distance of 6990 from 5810 feet alone may result in a 20% higher bid.

Making a comparison of RMP's lowest cost from Bidder 17 including the riser poles is $12.6 million and reducing the bid by $0.4 million for RMP's surplus costs results in a comparative bid to my estimates of $12.2 million. The $12.2 million RMP is 42% higher than my cost estimate of $8.9 million. Next, lowering my cost estimate for the reduced specification results in a cost estimate of $6.9 million for 5810 feet. The $12.2 million RMP cost is 83% higher. In conclusion, the RMP proposed costs are considerably higher than would be expected. The comparisons in the table below are based on what I actually believe the length of the circuit to be in comparison with the RMP bid. The percent differences should be lower based on a comparison of equal lengths.

	5280 ft ($million)	5810 ft ($million)	Bidder 17 6990 ft ($million)	% Difference
RMP Spec Comparison	$8.1	$8.9	$12.2 million	42%
Reduced Spec Comparison	$6.3	$6.9	$12.6 million	83%

Detail supporting my estimates is attached hereto.

SUMMARY OF TESTIMONY

Q: Please summarize your testimony.

A: While I am a proponent of installing transmission power lines overhead and understand the philosophy of electric utilities to do so, it is apparent that RMP would prefer to quickly install the 138 kV transmission line in question overhead due to time and costs. Likewise, it is apparent that RMP has presented arguments against constructing a segment of their 138 kV transmission underground line and has provided what appear to be a very conservatively high cost estimates for placing the 138 kV lines in question underground. In addition, there are no extenuating circumstances to complete the construction by the end of 2020, as alleged, and the cost of doing such work should be much less expensive than that proposed by RMP.

Q: Does this conclude your direct testimony?

A: Yes.

RMP Midway UG Cable Cost Estimate										
Two, 138 kV UG Circuits 1250 MCM CU										
Per Mile (5280 Ft) 4 Conductors and Based on RMP Specs										
	1 mile	Quantity	Material	Material Cost	Labor & Equip	Labor & E Cost	Total	Comments		
EQUIPMENT	Units									
138 kV, 1250 MCM CU Cable	8	42240	$ 45.00	$ 1,900,800.00	$ 10.00	$ 422,400.00	$ 2,323,200.00	5280 ft Circuit	8 Conductors	
Fiberglass conduit, 6," 20 ft sections/ft	8	42240	$ 15.00	$ 633,600.00	$ 7.50	$ 316,800.00	$ 950,400.00	8 conduits		
Fiberglass conduit, 4," 20 ft sections/ft	2	10560	$ 10.00	$ 105,600.00	$ 5.00	$ 52,800.00	$ 158,400.00	2 Conduits		
Fiberglass conduit, 3," 20 ft sections/ft	1	5280	$ 4.00	$ 21,120.00	$ 4.00	$ 21,120.00	$ 42,240.00	8 conduits		
138 kV Surge Arresters		16	$ 2,000.00	$ 32,000.00	$ 2,500.00	$ 40,000.00	$ 72,000.00			
138 kV Termination kit		16	$ 5,500.00	$ 88,000.00	$ 4,500.00	$ 72,000.00	$ 160,000.00			
Four 6" x 3 conduit spacers - Electric	4	2485	$ 9.28	$ 23,058.07	$ 10.00	$ 24,847.06	$ 47,905.13	8.5 ft spacing		
Spacerss for Communications	1	422	$ 6.00	$ 2,534.40	$ 4.40	$ 1,858.56	$ 4,392.96	12.5 ft spacing		
Manholes - Electric		16	$ 25,000.00	$ 400,000.00	$ 10,000.00	$ 160,000.00	$ 560,000.00			
Manholes - Communications		8	$ 15,000.00	$ 120,000.00	$ 7,500.00	$ 60,000.00	$ 180,000.00			
Hardware for each support - Electric		2485	$ 2.00	$ 4,970.00	$ 3.00	$ 7,455.00	$ 12,425.00			
Hardware for each support - Com		2485	$ 2.00	$ 4,970.00	$ 3.00	$ 7,455.00	$ 12,425.00			
138 kV Termination Structures										
138 kV Termination OH-UG		4	$ 75,000.00	$ 300,000.00	$ 25,000.00	$ 100,000.00	$ 400,000.00			
Grounding		0	$ -	$ -	$ -	$ -	$ -			
4/0 CU Stranded Bare Conductor	2	10560	$ 3.01	$ 31,785.60	$ 1.00	$ 10,560.00	$ 42,345.60	Two 5280 ft Circuits		
Copperclad Grnd Rod 5/8" x 8 ft		20	$ 25.00	$ 500.00	$ 25.00	$ 500.00	$ 1,000.00			
Hardware - Misc		100	$ 15.00	$ 1,500.00	$ 20.00	$ 2,000.00	$ 3,500.00			
Concrete										
138 Termination Structures		4	$ 600.00	$ 96,000.00	$ 600.00	$ 96,000.00	$ 192,000.00	40	40 cyd/structure	
RMP Duct Bank electric- cyd	1	782	$ 30.00	$ 23,466.67	$ 30.00	$ 23,466.67	$ 46,933.33	2 ft x 2 ft		
RMP Thermal Concrete Backfill - cyd	1	1173	$ 37.50	$ 44,000.00	$ 37.50	$ 44,000.00	$ 88,000.00	2 ft x 3 ft		
Communications Duct Bank - Cy	1	196	$ 30.00	$ 5,866.67	$ 30.00	$ 5,866.67	$ 11,733.33	1 ft x 1 ft		
HL&P Duct Bank Electric - cyd	1	782	$ 30.00	$ 23,466.67	$ 30.00	$ 23,466.67	$ 46,933.33	2 ft x 2 ft		
HL&P Thermal Concrete Backfill - cyd	1	1173	$ 37.50	$ 44,000.00	$ 37.50	$ 44,000.00	$ 88,000.00	2 ft x 3 ft		
Trenching and Road Work										
RMP Trench - 5 ft x 2 ft	1	5280	$ -	$ -	$ 35.00	$ 184,800.00	$ 184,800.00			
HL&P Trench - 5 ft x 2 ft	1	5280	$ -	$ -	$ 35.00	$ 184,800.00	$ 184,800.00			
Concrete cutting - ft	2	10560	$ -	$ -	$ 10.00	$ 105,600.00	$ 105,600.00			
Environmental - Material removal - cyd	2	3911	$ -	$ -	$ 20.00	$ 78,222.22	$ 78,222.22			
Road Repair - 6 ft wide - ft	1	5280	$ 25.00	$ 132,000.00	$ 15.00	$ 79,200.00	$ 211,200.00			
Miscellaneous										
Miscellaneous Materials		1	$ 250,000.00	$ 250,000.00	$ 200,000.00	$ 200,000.00	$ 450,000.00			
Mob/Demob/Site Reclamation		2	$ 20,000.00	$ 40,000.00	$ 50,000.00	$ 100,000.00	$ 140,000.00			
Subtotal 1			**$ -**	**$ 4,329,238.07**	**$ -**	**$ 2,469,217.84**	**$ 6,798,455.91**			
				Material		Labor & Equip	M&L			
Sales/Use Tax - 7.5 % Est Midway - Material							$ 324,692.86			
Engineering - 5%							$ 339,922.80			
Cable Testing							$ 80,000.00			
Const Mgt - 7.5%							$ 509,884.19			
Total							**$ 8,052,955.76**			

RMP Midway UG Cable Cost Estimate										
Two, 138 kV UG Circuits 1250 MCM CU										
Per Mile (5280 Ft) 3 Conductors/Circulit & Reduced Specs										
	1 mile	Quantity	Material	Material Cost	Labor & Equip	Labor & E Cost	Total	Comments		
EQUIPMENT	Units									
138 kV, 1250 MCM CU Cable	6	31680	$ 45.00	$ 1,425,600.00	$ 10.00	$ 316,800.00	$ 1,742,400.00	5280 ft Circuit	6 Conductors	
Fiberglass conduit, 6," 20 ft sections/ft	8	42240	$ 15.00	$ 633,600.00	$ 7.50	$ 316,800.00	$ 950,400.00	8 conduits		
Fiberglass conduit, 4," 20 ft sections/ft	1	5280	$ 10.00	$ 52,800.00	$ 5.00	$ 26,400.00	$ 79,200.00	1 conduit		
Fiberglass conduit, 3," 20 ft sections/ft	0	0	$ 4.00	$ -	$ 4.00	$ -	$ -	0		
138 kV Surge Arresters		12	$ 2,000.00	$ 24,000.00	$ 2,500.00	$ 30,000.00	$ 54,000.00			
138 kV Termination kit		12	$ 5,500.00	$ 66,000.00	$ 4,500.00	$ 54,000.00	$ 120,000.00			
Four 6" x 3 conduit spacers - Electric	4	2485	$ 9.28	$ 23,058.07	$ 10.00	$ 24,847.06	$ 47,905.13	8.5 ft spacing		
Spacerss for Communications	1	422	$ 6.00	$ 2,534.40	$ 4.40	$ 1,858.56	$ 4,392.96	12.5 ft spacing		
Manholes - Electric		8	$ 25,000.00	$ 200,000.00	$ 10,000.00	$ 80,000.00	$ 280,000.00			
Manholes - Communications		4	$ 15,000.00	$ 60,000.00	$ 7,500.00	$ 30,000.00	$ 90,000.00			
Hardware for each support - Electric		2485	$ 2.00	$ 4,970.00	$ 3.00	$ 7,455.00	$ 12,425.00			
Hardware for each support - Com		2485	$ 2.00	$ 4,970.00	$ 3.00	$ 7,455.00	$ 12,425.00			
138 kV Termination Structures										
138 kV Termination OH-UG		4	$ 75,000.00	$ 300,000.00	$ 25,000.00	$ 100,000.00	$ 400,000.00			
Grounding		0	$ -	$ -	$ -	$ -	$ -			
4/0 CU Stranded Bare Conductor	2	10560	$ 3.01	$ 31,785.60	$ 1.00	$ 10,560.00	$ 42,345.60	Two 5280 ft Circuits		
Copperclad Grnd Rod 5/8" x 8 ft		10	$ 25.00	$ 250.00	$ 25.00	$ 250.00	$ 500.00			
Hardware - Misc		50	$ 15.00	$ 750.00	$ 20.00	$ 1,000.00	$ 1,750.00			
Concrete										
138 Termination Structures		4	$ 600.00	$ 96,000.00	$ 600.00	$ 96,000.00	$ 192,000.00	40	40 cyd/structure	
RMP Duct Bank electric- cyd	1	782	$ 30.00	$ 23,466.67	$ 30.00	$ 23,466.67	$ 46,933.33	2 ft x 2 ft		
RMP Thermal Concrete Backfill - cyd	1	1173	$ 37.50	$ 44,000.00	$ 37.50	$ 44,000.00	$ 88,000.00	2 ft x 3 ft		
Communications Duct Bank - Cy	1	196	$ 30.00	$ 5,866.67	$ 30.00	$ 5,866.67	$ 11,733.33	1 ft x 1 ft		
HL&P Duct Bank Electric - cyd	1	782	$ 30.00	$ 23,466.67	$ 30.00	$ 23,466.67	$ 46,933.33	2 ft x 2 ft		
HL&P Thermal Concrete Backfill - cyd	1	1173	$ 37.50	$ 44,000.00	$ 37.50	$ 44,000.00	$ 88,000.00	2 ft x 3 ft		
Trenching and Road Work										
RMP Trench - 5 ft x 2 ft	1	5280	$ -	$ -	$ 35.00	$ 184,800.00	$ 184,800.00			
HL&P Trench - 5 ft x 2 ft	1	5280	$ -	$ -	$ 35.00	$ 184,800.00	$ 184,800.00			
Concrete cutting - ft	2	10560	$ -	$ -	$ 10.00	$ 105,600.00	$ 105,600.00			
Environmental - Material removal - cyd	2	3911	$ -	$ -	$ 20.00	$ 78,222.22	$ 78,222.22			
Road Repair - 6 ft wide - ft	1	5280	$ 25.00	$ 132,000.00	$ 15.00	$ 79,200.00	$ 211,200.00			
Miscellaneous										
Miscellaneous Materials		0.25	$ 250,000.00	$ 62,500.00	$ 200,000.00	$ 50,000.00	$ 112,500.00			
Mob/Demob/Site Reclamation		2	$ 20,000.00	$ 40,000.00	$ 50,000.00	$ 100,000.00	$ 140,000.00			
Subtotal 1			**$ -**	**$ 3,301,618.07**	**$ -**	**$ 2,026,847.84**	**$ 5,328,465.91**			
				Material		**Labor & Equip**	**M&L**			
Sales/Use Tax - 7.5 % Est Midway - Material							$ 247,621.36			
Engineering - 5%							$ 266,423.30			
Cable Testing							$ 60,000.00			
Const Mgt - 7.5%							$ 399,634.94			
Total							**$ 6,302,145.51**			