

ELECTRICAL CONSULTANTS, INC.

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May 14, 2015

Mr. Mike Baughman, PhD
Intertech Services Corporation
PO Box 2008
Carson City, NV 89702

Re: Proposed Substation Interconnection Location for Generation Addition_Rev 1

Dear Mike:

Electrical Consultants, Inc. (ECI) has been tasked by the Lincoln County Regional Development Authority (LCRDA) to evaluate existing Lincoln County Power District No. 1 (LCPD) electrical substations as candidates for interconnection of base load electrical energy for export over the LCPD transmission system to access the NV Energy system in Clark County. This letter provides a high level cursory review of possible interconnection facilities and corresponding cost options for varying generation interconnection levels. Beyond substation capacities, this letter does not address other issues which must be analyzed when considering the possibility of interconnecting generation at any of the substations listed in this letter. These other issues include, power flow, voltage regulation, line losses and other power quality issues that must be analyzed on a case-by-case basis for each specific project that may be proposed. This version of the letter includes analysis of three (3) additional substations for potential interconnect as well as consideration of 20 MW of generation to interconnect to LCPD's system.

Generation Sites

The desired generation sites by LCRDA are those located on private land which are in close proximity to existing LCPD electrical substations. In order to evaluate the LCPD facilities, ECI developed a map which specifically identifies substations under consideration within Lincoln County. The following LCPD substations were evaluated for potential generation interconnections:

- 1) Pony Substation; 69-22 kV, 5 MVA capacity
- 2) Prince Substation; 69-22 kV, 5/6.25 MVA capacity on Transformer #1 and 10/12.5 MVA capacity on Transformer #2
- 3) Antelope Substation; 69-22 kV, 7/9.375 MVA
- 4) Alamo North Substation; 69-24.9 kV, 3.75 MVA capacity
- 5) Tempiute Substation; 69-13.8 kV, 6.25 MVA capacity
- 6) Joe Wilkin Substation; 69-22 kV, 5/6.25 MVA capacity
- 7) Mesa Substation; 138-12.47 kV, 10/12.5 MVA

Figure 1, *Lincoln County Regional Development Authority Overview Map*, located at the end of the letter illustrates all of the substations within Lincoln County as well as the land ownership of each of these respective facilities. Since the Alamo North Substation is only an LCPD delivery

point and is owned by a separate entity (Alamo Power District #3), this particular substation was not included in the cost analysis.

Cost Estimates for Use of Existing Substation Facilities

For each of the substations (Pony, Prince, Antelope, Tempiute, Joe Wilkin and Mesa Substations) the estimated cost of upgrading the substation facility to accommodate interconnection of a project generating at 1 MW, 3 MW, 6 MW, 10 MW and 20 MW was evaluated. Since the Prince and Mesa Substations have individual available transformer capacity up to 12.5 MVA, it was assumed for the cost estimates that the generation could be interconnected to the Low Voltage bus without addition of transformer capacity at the facility for up to 10 MW of generation. For the Pony, Tempiute and Joe Wilkin Substations, the available transformer capacity is less than 6.25 MVA and consequently, any additional generation beyond the 6 MVA transformer capacity of the substation facility would require a new substation transformer and major expansion of the yard resulting in significantly increased costs as compared to the option of interconnecting to the LV bus (22 kV or 13.8 kV). For the Antelope Substation, the transformer capacity is 9.375 MVA and therefore the 10 MW and 20 MW generation addition options would require a new substation transformer. *Table 1, Breakdown of Unit Cost Estimates Based Upon No Expansion Constraints*, summarizes high level indicative cost estimates for substation facility expansion associated with proposed generation interconnections ***based on the premise that there are no constraints to expansion***. Note that the cost of a feeder addition at 22 kV and all of the associated engineering, construction and testing costs is estimated at \$400,000 for 1-6 MW and \$610,000 for 10-20 MW. The cost of a 69-22 kV substation transformer and substation expansion to accommodate the additional equipment is estimated at \$960,000 for 1-6 MW and \$1,200,000 for 10-20 MW. These unit costs were considered as basis for the high level costs as indicated in *Tables 2 and 3* on the following page.

	Feeder Bay (Breaker, Foundations, Conduit, Grounding)		Transformer Addition (Transformer, Foundations, Conduit, Grounding, Oil Containment)	
	1-6 MW	10-20 MW	1-6 MW	10-20 MW
Materials	\$200,000	\$305,000	\$560,000	\$680,000
Labor	\$200,000	\$305,000	\$400,000	\$520,000
Total	\$400,000	\$610,000	\$960,000	\$1,200,000
<i>Table 1</i>				
<i>Breakdown of Unit Cost Estimates Based Upon No Expansion Constraints</i>				

Substation	Voltage	Top Xfmr rating	Expansion	Estimated Substation Expansion cost for Generation Addition				
				1 MW	3 MW	6 MW	10 MW	20 MW
Pony	69-22 kV	5 MVA	constraints	\$ 400,000	\$ 400,000	\$ 1,360,000	\$ 1,810,000	\$ 1,810,000
Prince	69-22 kV	6.25 + 12.5 MVA	constraints	\$ 400,000	\$ 400,000	\$ 400,000	\$ 610,000	\$ 1,810,000
Antelope	69-22 kV	9.375 MVA	expandable	\$ 400,000	\$ 400,000	\$ 400,000	\$ 1,810,000	\$ 1,810,000
Alamo North	69-24.9 kV	3.75 MVA	constraints	--	--	--	--	--
Tempiute	69-13.8 kV	6.25 MVA	constraints	\$ 400,000	\$ 400,000	\$ 400,000	\$ 1,810,000	\$ 1,810,000
Joe Wilkin	69-22 kV	6.25 MVA	expandable	\$ 400,000	\$ 400,000	\$ 400,000	\$ 1,810,000	\$ 1,810,000
Mesa	138-12.47 kV	12.5 MVA	expandable	\$ 400,000	\$ 400,000	\$ 400,000	\$ 610,000	\$ 1,810,000

Table 2

Estimated Substation Upgrade Costs without consideration of constraints

Pony Substation, Prince Substation and Tempiute Substation were not originally designed for future expansion. Any generation additions connected direct to these facilities could result in significant expansion costs beyond those costs outlined in *Table 1* & *Table 2*. To account for cost impacts due to expandability, *Table 3* illustrates overall estimated costs with consideration of an additional \$400,000 for a feeder expansion and \$840,000 for a transformer expansion at the substation facilities with expansion constraints.

Substation	Voltage	Top Xfmr rating	Expansion	Estimated Substation Expansion cost for Generation Addition				
				1 MW	3 MW	6 MW	10 MW	20 MW
Pony	69-22 kV	5 MVA	constraints	\$ 800,000	\$ 800,000	\$ 2,200,000	\$ 2,650,000	\$ 2,650,000
Prince	69-22 kV	6.25 + 12.5 MVA	constraints	\$ 800,000	\$ 800,000	\$ 800,000	\$ 1,010,000	\$ 2,650,000
Antelope	69-22 kV	9.375 MVA	expandable	\$ 400,000	\$ 400,000	\$ 400,000	\$ 1,810,000	\$ 1,810,000
Alamo North	69-24.9 kV	3.75 MVA	constraints	--	--	--	--	--
Tempiute	69-13.8 kV	6.25 MVA	constraints	\$ 800,000	\$ 800,000	\$ 800,000	\$ 2,650,000	\$ 2,650,000
Joe Wilkin	69-22 kV	6.25 MVA	expandable	\$ 400,000	\$ 400,000	\$ 400,000	\$ 1,810,000	\$ 1,810,000
Mesa	138-12.47 kV	12.5 MVA	expandable	\$ 400,000	\$ 400,000	\$ 400,000	\$ 610,000	\$ 1,810,000

Table 3
Estimated Substation Upgrade Costs including cost for constraints

Summary

In summary, the least cost option with use of LCPD's existing facilities for up to 20 MW of interconnected generation within Lincoln County and located on private land is for interconnection at the *Antelope, Joe Wilkin or Mesa Substations*. These substations have the most available transformer capacity compared to the other facilities and are configured for future expansion.

Alternate Consideration


Through coordination with LCPD, project developers could consider a shared switchyard facility to collect all of the generation proposed within LCPD's service area and transmit this generation to LCPD's transmission system through this facility. Each of the respective developers would be responsible for getting their generation to this shared facility, which would likely be 69 kV since this is a common transmission voltage within LCPD's system. The developer facilities would likely consist of a step-up substation and 69 kV transmission line to the LCPD common switchyard.

There are several other considerations prior to final determination of a preferred location for interconnection of generation facilities and this is only a high level cursory review of possible least cost options with use of existing LCPD substation facilities. Other specific considerations include proximity of the generation facility to the substation and corresponding tie line interconnection length to the respective substation; additional impacts to LCPD's existing electrical infrastructure in the area as a result of the generation interconnection including voltage levels, losses and line capacity; ability to negotiate power purchase agreement with power suppliers in the area; and environmental/permitting considerations.

Third parties considering development of generation in Lincoln County should be advised by the LCRDA Board that LCPD utilizes a standardized, three study process, which follows FERC guidelines and is similar to that used by other utilities in the WECC reliability region to analyze proposed generation projects. This process involves completion of a feasibility study, impact study, and a facility study for each proposed interconnection to the utility system. Through these additional studies, the impacts and mitigation for each specific generation interconnection will be identified and analyzed and the high level cost estimates contained in this letter will be revised and refined.

Please do not hesitate to contact ECI at 406-259-9933 with any questions pertaining to this cursory analysis of potential locations for generation interconnection within LCPD's service area.

Sincerely,


David R. Maehl, P.E.

DM:bs

cc: Robert Hurtig, ECI
Dave Luttrell, LCPD

