



Aquila Networks
WestPlains Energy Colorado

Generation Interconnection Feasibility Study
WPC-2005-01

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1 Introduction

A Customer in the Aquila, Inc d/b/a Aquila Networks-WPC (WPC) interconnection queue has requested a feasibility study for interconnecting up to 200 MW of generation in eastern Fremont County, Colorado. The proposed generation location is near the existing Holcim Cement Plant with a proposed interconnection into the Portland 115 kV bus. The customer has further requested that Aquila determine the maximum size of the generating facility that can be interconnected without significant transmission upgrades.

2 Model Development

The proposed interconnection was evaluated using models that represented the WPC system as well as the surrounding bulk electric transmission system. Western Electricity Coordinating Council (WECC) load flow models for 2011 Summer Peak and 2016 Summer Peak, as modified for use by the Colorado Long Range Transmission Planning Group (CLRTPG), were used as a starting point for this study. The WPC system was modeled with projected 2011 and 2016 Summer Peak loads.

The base cases were modified by adding the proposed new generation to a new 115 kV bus connected to the existing Portland 115 kV bus with approximately one mile of 115 kV transmission line. The output from the proposed project was varied from 155MW to 200MW.

3 Generation and Interchange

Generation in the WPC system was modeled as in the CLRTPG cases. Output from the proposed addition was dispatched to the Public Service of Colorado (PSCO) control area for the purposes of this study. Note that this study was not intended to fully study transmission delivery aspects of the proposed project. These impacts will need to be studied when a transmission service request is made. As such, this study should not be interpreted to fully assess the ability to deliver output from the proposed project to any specific loads.

4 Load Flow Analysis

All models (including base cases) were subjected to a single-contingency analysis to identify any voltage or loading violations due to the addition of the proposed new generation. The list of contingencies included all single lines and transformers in the Colorado system (area 70). Any violations of WECC criteria were subsequently noted. This consisted of any voltage levels below 0.90 for single contingencies and thermal overloads were flagged for loadings at or above the appropriate facility rating.

Results of the contingency analysis were compared for different generation outputs from the proposed generation addition, including 155MW, 160MW, 170MW, 180MW, 190MW, 200MW.

4.1 Voltage Violations:

No violations of voltage criteria were noted were noted for any of the cases studied.

4.2 Facility Overloads:

Thermal overload impacts for the proposed project varied depending on the size of the proposed project. Table 4.2A summarizes the thermal overloads observed for various levels of output from the proposed project.

Table 4.2A - Overloads

Overloaded Element	Generation(MW)					
	155	160	170	180	190	200
70040 ARSENAL 115 70217*HAVANA2 115 1					x	x
70040*ARSENAL 115 70153 DERBY 1 115 1						x
70065 BROMFLD1 115 70382*SEMPER 115 2						x
70086 CANONCTY 115 70390*SKALA 115 1			x	x	x	x
70086*CANONCTY 115 70550 W CANON 115 1			x	x	x	x
70148 DENVTM 115 70478*ZUNI1 13.8 1						x
70292*MOSCA 69.0 70376 SAN LUIS69.0 1						x
70330*PORTLAND 115 70390 SKALA 115 1			x	x	x	x
70330*PORTLAND 115 70456 W.STATON 115**		x	x	x	x	x
70352*READER 115 70353 READER 69.0 1						x
70352*READER 115 70353 READER 69.0 2						x
70154 DERBY 2 115 70216*HAVANA1 115 1			x	x	x	x

**Assuming terminal equipment has been upgraded to allow for conductor limit rating

An important factor in determining the amount of generation that can be interconnected without significant transmission upgrades is the rating of the Portland-West Station 115kV line. Presently it is limited to 80 MVA by a current transformer (CT). However, upgrading this CT would allow Portland-West Station to be rated at the conductor rating of 99MVA. It was assumed for the purposes of this study that upgrading the CT did not represent a significant transmission upgrade. Therefore, this improvement was assumed in order to arrive at a final answer.

The limiting outage when determining the maximum size of the proposed project was the loss of the Portland-Skala 115kV line. This forces all the flow from the new plant onto the Portland-West Station 115kV line. Note that in the study it is assumed that the Holcim Cement Plant load was 35MW. Additionally, 22 MW was flowing from the Portland 115 kV bus to the WPC 69 kV system in the area. Based on this amount of load from the Portland 115 kV bus, a maximum proposed project size of 155 MW was allowable without overloading the Portland-West Station 115kV line. Note that in time periods when the load from Portland would be reduced, the allowable output from the proposed project would be reduced by a corresponding amount. For example, if Holcim was operating at 20 MW and

the load flowing to the WPC 69 kV system was 10 MW, the proposed project would be able to produce a maximum of approximately 128 MW.

5 Short Circuit Study

Table 5.1

BUS #	BUS NAME	BEFORE(3 PHASE)	AFTER(3 PHASE)	INCREASE	%
420	PORTLAND	5245(amps)	7640(amps)	2395(amps)	46
1100	SKALA	5159	6706	1547	30
152	CAÑON	7012	7661	649	9.3
1000	CAÑON 69	5000	5148	148	3
1105	CAÑON WEST	7022	7394	372	5.3
151	WEST STATION	12336	13132	1065	8.6
1029	DESERT COVE	9679	10057	378	3.9
79	MIDWAY(WAPA)	12909	13095	186	1.4
75	MIDWAY(PESCO)	8573	8703	130	1.5
843	HYDE PARK	11124	11657	533	4.8
404	PUEBLO PLANT	10981	11390	409	3.7
349	READER	13931	14354	423	3

The above table shows the results of a short circuit study performed to assess the short circuit impact of the proposed project. As can be seen, the largest fault current increases were in the vicinity of the Portland Substation. A cursory comparison of maximum fault currents versus equipment interrupting ratings was performed. This comparison did not reveal any equipment requiring replacement due to the addition of the proposed project.

6 Conclusion

The proposed project studied in this feasibility study can be dispatched at levels as high as 155 MW for Summer Peak conditions. At lower load levels in the Portland area, the output of the proposed project would need to be reduced appropriately. The required minimum output level of the proposed project would be approximately 95-97 MW. Note that these results are predicated on upgrading CT's on the Portland-West Station 115 kV transmission line.