GENERATOR INTERCONNECTION SYSTEM IMPACT STUDY REPORT

for

Up to 305 MW of New Generation On the 138 kV Transmission System In the Twin Falls Area

to

IDAHO POWER COMPANY, Transmission Provider TRANSMISSION SYSTEM

FINAL REPORT June 8, 2006

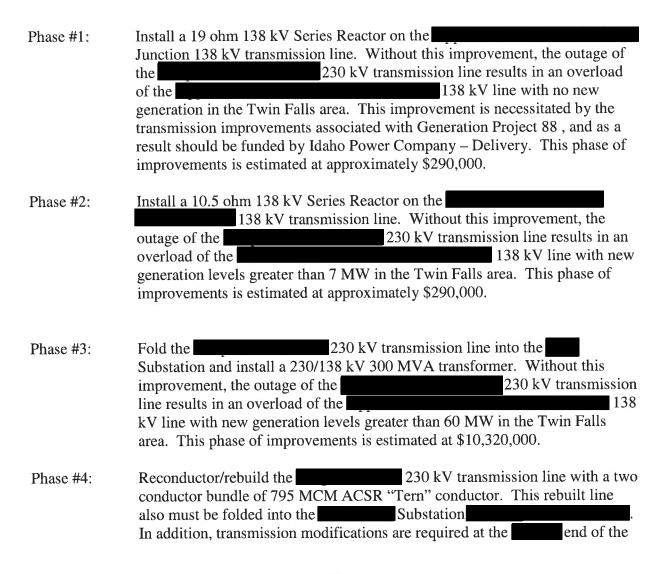
1.0 Introduction

Multiple new generation projects have contacted Idaho Power Company (IPC) to perform Generator Interconnection System Impact Studies for Network Resource Interconnection Service at 138 kV for the integration of new generation projects in the Twin Falls area

This report documents the basis for and the results of this System Impact Study. It describes the backbone transmission system improvements required for Network Resource Interconnection Service of the new generation proposed, the study cases used, outage scenarios assumed and results of all work in the areas of concern.

2.0 Summary

The performance of the backbone transmission system was evaluated to integrate up to 200 MW of new generation on the 138 kV transmission system in the Twin Falls area. Four phases of transmission system improvements are required to provide 200 MW of new generation Network Resource Interconnection Service.



line. Without this improvement, the outage of the 230 kV transmission line results in an overload of the 138 kV line with new generation levels greater than 135 MW in the Twin Falls area. This phase of improvements is estimated at \$47,525,000.

These cost estimates include direct equipment and installation labor costs, indirect labor costs and overheads, and allowance for funds used during construction (AFUDC). The proposed cost allocation is subject to change, as more information is known. These are cost estimates only and final charges to the customer will be based on the actual construction costs incurred.

3.0 Summary of Interconnection Requests

Requests were made to Idaho Power Co. by multiple generation projects in the Twin Falls area to study the interconnection of the proposed generation projects to Idaho Power's transmission system at the 138 kV level for Network Resource Interconnection Service.

4.0 Scope of Interconnection System Impact Study

The Interconnection System Impact Study was done and prepared in accordance with the FERC Order 2003-A, Standard Large Generator Interconnection Procedures, to provide a preliminary evaluation of the System Impact of the interconnection of the proposed large generating project to the Idaho Power transmission system. This study will only be concerned with the capabilities of the Idaho Power system to manage this new resource within the study area of the proposed interconnection.

5.0 Description of Existing Transmission Facilities

As shown in Figure 1 of Section 7.0, lines that carry bulk power westward to the Boise area.	has three 230 kV line utilizes single
715.5 MCM conductor and has a continuous rating of 33	
line utilizes a 2 conductor bundle of 715.5 MC	CM. This line has a continuous rating of
	lar conductors and the same rating as the
line. In the	
planned to carry bulk power westward. The	line
utilizes single 1272 MCM conductors(478 MVA) from	single 1590
MCM conductors(550 MVA) from	, and a two conductor bundle of 795
MCM(700 MVA) from The	transmission lines
are required for the interconnection of Generation Project	ct 88; scheduled to be in-service Spring of
2008.	
In addition to the area 230 kV lin	es previously mentioned, there are two
138 kV circuits which can carry power from the Twin Falls area to the Mountain Home area.	
They are:	
•	138 kV Line

• 138 kV Line

Generators located in the Twin Falls area which are intended to serve load growth in the Treasure Valley area, will be adding new incremental flows on top of existing committed east-to-west transactions across the transmission cutplane. This System Impact study will model approximately 1100 MW of transfers across the cutplane, prior to this proposed generator addition. For these studies, the flow level of the cutplane is defined as the sum of the flows on the following lines:

230 kV line
230 kV Line
230 kV Line
138 kV Line
138 kV Line

6.0 Description of Configurations Studied

Since the most limiting operating conditions are expected during heavy production on the upper and middle Snake and Boise River hydro plants, with heavy east-west transfers across the Idaho Power transmission system, the injection of the new generation at 138 kV bus was inserted into a power flow case that would simulate committed (approximately 1100 MW) pre-contingency flows on the transmission path.

7.0 Post-transient Study Results

This Interconnection System Impact Study Report is for Network Resource Interconnection Service at 138 kV, for numerous proposed generation additions in the Twin Falls area. System transfers across the cutplane are modeled at approximately 1100 MW prior to the proposed transmission improvements or the proposed generators producing any power. Hydro generation production for the Boise & Snake plants, were modeled at heavy, but realistic levels. Ouput levels for the existing peakers at were varied over their operating ranges as appropriate. N-0 and N-1 outage performance for the existing system are recorded. Generation levels at 138 kV bus are increased until system thermal limits are reached during N-1 outages. The most effective and cost-efficient transmission system improvements are then added to the model and generation is then increased until system thermal limits are reached during N-1 outages.

Existing System

The following one line diagram depicts the existing system with no outages.



Existing System – No Outages Figure 1

Existing System N-1 Outages

The following one line diagram depicts the existing system with no new generation in the Twin Falls area, and the only N-1 outage between area that results in loadings above continuous thermal ratings.

Existing System –

Figure 2



The Series Capacitor banks are capable of 110% of thermal rating on a continuous basis. As a result, only the 103% overload is problematic. The most effective and cost-efficient transmission improvement to alleviate this overload is the installation of a series reactor on the 138 kV line to better balance flows on the transmission network. The optimum size of the series reactor was determined to be 19 ohms for the ultimate build-out of the transmission grid. Since this N-1 overload condition pre-exists the addition of any new generation in the Twin Falls area, Idaho Power Company would take responsibility to fund this series reactor installation.

The following one line diagram depicts the system with Phase #1 improvements added, no new generation in the Twin Falls area, and the same N-1 as Figure 2.



Phase #1 Transmission Improvements – #2 Outage
No New Generation
Figure 3

Phase #2 Transmission Improvements

The following one line diagram depicts Phase #1 transmission improvements and 7 MW of new generation in the Twin Falls area, and the only N-1 outage between area that results in loadings above continuous thermal ratings.



Phase #1 Transmission Improvements –
7 MW of New Generation
Figure 4

The most effective and cost-efficient transmission improvement to alleviate this overload is the installation of a series reactor on the 138 kV line to better balance flows on the transmission network. The optimum size of the series reactor was determined to be 10.5 ohms for the ultimate build-out of the transmission grid. This overload is the result of the addition of new generation in the Twin Falls area, and as a result the costs of this improvement will be allocated to new generation interconnections.

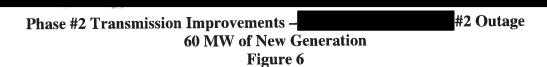
#2 Outage

The following one line diagram depicts the system with Phase #2 improvements added, 7 MW of new generation in the Twin Falls area, and the same N-1 as Figure 4.

Phase #2 Transmission Improvements – #2 Outage 7 MW of New Generation Figure 5

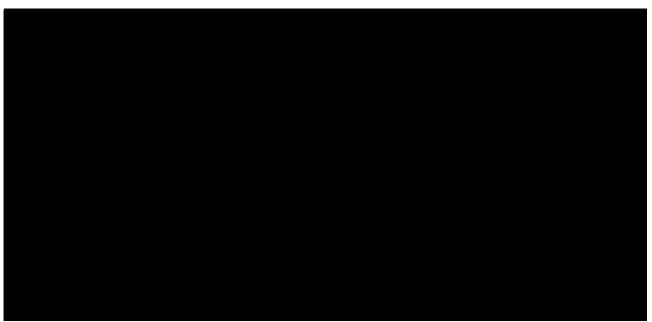
Phase #3 Transmission Improvements

The following one line diagram depicts Phase #2 transmission improvements and 60 MW of new generation in the Twin Falls area, and the only N-1 outage between area that results in loadings above continuous thermal ratings.



To interconnect generation quantities greater than 60 MW will require additional transmission system improvements. The required system improvements are referred to as "Phase #3" and include folding the 230 kV transmission line into and back out of the Substation and installing a 230/138 kV 300 MVA transformer. This overload is the result of the addition of new generation in the Twin Falls area, and as a result the costs of this improvement will be allocated to new generation interconnections.

The following one line diagram depicts the system with Phase #3 improvements added, 60 MW of new generation in the Twin Falls area, and the same N-1 as Figure 6.



#2 Outage

Phase #3 Transmission Improvements – 60 MW of New Generation Figure 7

Phase #4 Transmission Improvements

The following one line diagram depicts Phase #3 transmission improvements and 135 MW of new generation in the Twin Falls area, and the only N-1 outage between area that results in loadings above continuous thermal ratings.

Phase #3 Transmission Improvements – #2 Outage 135 MW of New Generation Figure 8

The following one line diagram depicts the system with Phase #4 improvements added, 135 MW of new generation in the Twin Falls area, and the same N-1 as Figure 8.



Phase #4 Transmission Improvements – #2 Outage 135 MW of New Generation Figure 9

Phase #4 transmission improvements are capable of accomodating approximately 305 MW of new generation in the Twin Falls area. The following one line diagram depicts the system with Phase #4 improvements added, 305 MW of new generation in the Twin Falls area, and the loss of the 230/138 kV transformer.



Phase #4 Transmission Improvements – Xfmr Outage 305 MW of New Generation Figure 10

For generator interconnections in excess of 305 MW, the addition of a second 230/138 kV transformer at the second 230/138

8.0 Fault Study Results

Since this System Impact Study lumps all the proposed generation additions at bus, this Draft Report makes no attempt to address fault study concerns. Each proposed generation project will have to be evaluated individually based on its specific location.

9.0 Transient Stability Study Results

The Transmission System is not transient stability limited. Therefore, no transient stability studies were performed.

10.0 Conclusions

The System Impact of interconnecting up to 200 MW of new generation in the Twin Falls area to Idaho Power's 138 kV transmission system was studied. Four phases of transmission system improvements are required to provide Network Resource Interconnection Service to 200 MW of new generation. Phase #1 is the installation of a 19 ohm 138 kV Series Reactor on the 138 kV transmission line. This improvement corrects a N-1 overload that exists before any new generation is added in the Twin Falls area. As a result, the estimated \$290,000 cost of this improvement will be borne by Idaho Power Company. After approximately 7 MW of new generation is added, Phase #1 improvements are no longer sufficent. Phase #2 improvements require the installation of a 10.5 ohm 138 kV Series Reactor on the

