PID 276
Feasibility Study Report
4.4MW Distribution Inter-Connection
Mermentau Substation

Prepared by:

Entergy Services, Inc.
T & D Planning
639 Loyola Avenue
New Orleans, LA 70113

Rev	Issue Date	Description of Revision	Revised By
0	April 29, 2011	Initial Review	L.Scott
A	May 10, 2011	Approved for Release	A. Donaldson S. Kolluri

DISCLAIMER

This study has been prepared without the benefit of detailed engineering or study data. The solution set reflects the current understanding of the proposed project. **This study is intended to be used as a screening tool by the Customer**. There are many variables which are unknown at this time. These variables could significantly change the scope of work and estimated cost. In order to proceed with the project, a System Impact Study and Facility Study will need to be developed.

TABLE OF CONTENTS

I. INTRODUCTION 3

II. DISTRIBUTION SYSTEM ANALYSIS 3

1. SHORT CIRCUIT ANALYSIS/BREAKER RATING ANALYSIS 3

A. MODEL INFORMATION 3

B. SHORT CIRCUIT ANALYSIS 3

C. ANALYSIS RESULTS 4

D. PROBLEM RESOLUTION 4

2. LOAD FLOW ANALYSIS 4

A. MODEL INFORMATION 4

B. LOAD FLOW ANALYSIS 4

i) Circuit Loading Criteria 4

ii) Power Factor Criteria 4

C. ANALYSIS RESULTS 5

D. PROBLEM RESOLUTION 5

3. INTERCONNECTION FACILITIES 5

III. TRANSMISSION SYSTEM ANALYSIS 6

1. SHORT CIRCUIT ANALYSIS/BREAKER RATING ANALYSIS 6

A. MODEL INFORMATION 6

B. ANALYSIS RESULTS 6

C. PROBLEM RESOLUTION 6

2. LOAD FLOW ANALYSIS 6

A. MODEL INFORMATION 6

B. LOAD FLOW ANALYSIS 6

C. PROBLEM RESOLUTION 6

IV. GROUNDING 7

1. GROUNDING INFORMATION 7

V. COORDINATION 7

1. COORDINATION INFORMATION 7

I. Introduction

The following Feasibility Study is based on the request for inter-connection of Entergy's distribution system at Mermentau substation. The objective of this study is to assess the impact of the new facility on the Entergy distribution and transmission system by identifying:

- Any system protection equipment short circuit capacity limits exceeded
- Thermal overload, frequency, or voltage limitations
- Grounding requirements and coordination

The study is intended to determine whether the distribution and transmission system planning criteria are met when the facility is connected to Entergy's system. If not, appropriate system improvements will be identified.

The Feasibility Study process required a load flow analysis to determine if the existing distribution and transmission lines are adequate to handle the full output from the proposed generation facility. A short circuit analysis is performed to determine if the generation would cause the available fault current to exceed the fault duty of existing equipment within the Entergy distribution and transmission system.

This study was based on information provided by PID 276 and assumptions made by Entergy's Distribution and Transmission Planning groups. If the actual equipment installed is different from the supplied information or the assumptions made, the results outlined in this report are subject to change.

II. Distribution System Analysis

1. SHORT CIRCUIT ANALYSIS/BREAKER RATING ANALYSIS

A. MODEL INFORMATION

The short circuit analysis was performed on the Entergy system using SynerGEE software. This model includes all proposed generators and transformers interconnected to the Entergy system, and any approved future distribution projects.

B. SHORT CIRCUIT ANALYSIS

The method used to determine if any short circuit problems would be caused by the addition of the PID 276 generation is as follows:

Three phase and single phase to ground faults were simulated on the Entergy system. Facility generators and transformers were modeled to generate a revised short circuit model. The base short circuit results were then compared with the results from the revised model to identify any breakers that were under-rated as a result of additional short circuit contribution from PID 276 generation.

Any breakers identified to be upgraded through this process are mandatory upgrades.

C. ANALYSIS RESULTS

Initially, the results of the short circuit analysis indicate that the additional PID 276 generation causes an additional 1,277 amps of fault current to the distribution system. Even with this increase, short circuit current does not exceed the fault interrupting capability of the circuit breakers within the vicinity of the proposed generation site.

D. PROBLEM RESOLUTION

As a result of the short circuit analysis findings, currently no resolution is required.

2. LOAD FLOW ANALYSIS

A. MODEL INFORMATION

The load flow analysis was performed using a 2010 summer peak model in conjunction with summer peak data, historic Pegasus load data from the past 12 months, proposed future loads, and an area growth rate based on historic peak loading. In addition, the load flow analysis was projected out over five growth years. The transformers, generators (including future considerations), and interconnecting lines were modeled according to the information provided by PID 276.

B. LOAD FLOW ANALYSIS

i) Circuit Loading Criteria

As per Distribution Planning Guidelines, the maximum safe, continuous ampacity rating for bare conductor is limited by the effect of high temperature on the mechanical properties of the conductor material. The conductor's 90°C rating is used to determine the maximum operating capacity.

ii) Power Factor Criteria

As per Distribution Planning Guidelines, the target power factor during summer peak for the low voltage bus of substation transformers is 98% lagging. While it is not possible or practical to operate all substation transformers at a 98% lagging power factor, an attempt should be made to maintain that as a system average by load area. In the event that, under normal operating conditions, the customer facility does not meet the prescribed power factor requirements at the point of interconnection,

the customer shall take necessary steps, such as the installation of reactive power compensating devices, to achieve the desired power factor.

C. ANALYSIS RESULTS

Noted issues to the Mermentau feeder, 13.2kV system due to the proposed inter-connection of PID 276 generation are as follows:

- Overloading of #6C and #4C conductor from Hwy 90 and 4th Street to the proposed site at Port Road for approximately 8,300 feet.
- Overloaded S&C,125QR fuses at Hwy 90.
- Increased backbone exposure

D. PROBLEM RESOLUTION

As a result of the load flow analysis findings, the following resolutions would be required:

- Reconductor approximately 8,300' of three phase primary to 336ACSR
- Install 3 phase electronic recloser at intersection of Hwy 90 and 4th street.

Reconductor 8,300' of primary to 336ACSR……..	$350,000
Install electronic recloser……	$ 50,000
Total estimated cost of listed work to be performed…….....	$400,000

3. INTERCONNECTION FACILITIES

The Interconnection Customer's designated Point of Interconnection (POI) is a local 13.2 kV distribution feeder, 535ME, sourced from Mermentau Substation. The interconnection customer is responsible for all facilities required to connect the generator to the POI.

The estimated cost of a typical 13.2 kV Interconnection is $20,000. This cost is based on parametric estimating techniques for primary metering and associated hardware "typical" to a 13.2 kV interconnection.

A detailed evaluation of the interconnection facilities has not been performed at this time. A specific estimate for PID 276 will be provided as part of the Facility Study. Typical interconnection cost may not be representative of the costs required to interconnect this generator.

III. Transmission System Analysis

1. SHORT CIRCUIT ANALYSIS/BREAKER RATING ANALYSIS

A. MODEL INFORMATION

The short circuit analysis was performed on the Entergy system using ASPEN software. This model includes all generators interconnected to the Entergy system or interconnected to an adjacent system and having an impact on this interconnection request, IPP's with signed IOAs, and approved future transmission projects on the Entergy transmission system. Proposed generators were, conservatively, modeled at Mermentau 13.2kV bus.

B. ANALYSIS RESULTS

The evaluation projected an increase of less than 245 Amps at the Mermentau 69kV bus. The present interrupting duty of the breakers installed at Jennings 69kV has adequate margin to accommodate the projected increase in short circuit current.

C. PROBLEM RESOLUTION

There were no problems identified for this part of the study that were a result of the additional PID-276 generation.

2. LOAD FLOW ANALYSIS

A. MODEL INFORMATION

The load flow analysis was performed based on the projected 2012 summer peak load flow models using PSS™E 30.3 and PSS™MUST 9.0. The loads were scaled based on the forecasted loads for the year. All firm power transactions between Entergy and its neighboring control areas were modeled for the year 2012 excluding short-term transactions on the same transmission interface. An economic dispatch was carried out on Entergy generating units after the scaling of load and modeling of transactions. The proposed 4.4MW PID-276 generation was then modeled in the case to build a revised case for the load flow analysis.

.

B. LOAD FLOW ANALYSIS

Single contingency analyses on Entergy's transmission facilities (including tie lines) 69kV and above were considered. All transmission facilities on the Entergy transmission system above 69kV were monitored.

C. PROBLEM RESOLUTION

There were no problems identified for this part of the study that were a result of PID-276 generators.

The load flow results are for information only. This interconnection does not in and of itself convey any transmission service.

IV. Grounding

1. GROUNDING INFORMATION

Information provided indicates that the PID 276 transformer is rated at 5,625KVA, 3 phase, 12KV primary and secondary side connection will be 3 phase, 480 volts, delta-wye (no tertiary windings). The transformer primary side will connect 3 phase, and adjust or regulate to 13.2KV to synchronize to 535 Mermentau feeder. Impedance listed is 5.65% on 1000KVA. Max physical export capability requested is 4,400KW.

V. Coordination

1. COORDINATION INFORMATION

As per the Protection/Interface Requirements section of Entergy Standard DR07-01 titled "Connecting Large Electric Generators to the Entergy Distribution System (500kVA to 20MVA)", protecting both the Customer's facilities and the Entergy facilities are of great importance. Proper protective systems shall be established in the design phase and confirmed prior to start-up of the Customer's generation facilities. An inter-connection between Entergy and the Customer will not be allowed prior to proper coordination of protective devices.

As per the Specifying Protective Equipment section of Entergy Standard DR07-01 titled "Connecting Large Electric Generators to the Entergy Distribution System (500kVA to 20MVA)", Entergy will have the right to specify certain protective devices, including relays and circuit breakers that the customer must install.

Previous studies for generators connected to the Distribution System have identified a need to install Transfer Trip schemes with fiber communications between the generator and Entergy's Substation. A System Impact and/or Facility Study will be required to determine if Transfer Trip Schemes will be required for this project. The cost to implement a Transfer Trip Scheme on a prior project was approximately $450,000.