

Tres Amigas Interconnection to PNM System

7/23/13 Update

Background

The Tres Amigas Super Station (Tres Amigas) is proposed to connect America's three main power grids creating a market hub for exchange of energy between WECC, SPP and ERCOT. Presently, studies of the interconnection are underway for the WECC and SPP interconnections. PNM is leading the study of the Tres Amigas interconnection to the western grid.

Interconnection Process

PNM interconnects its own and third party generators and transmission lines to its system on a non-discriminatory basis. The Large Generator Interconnection Procedures are governed by the FERC and these procedures define the process to be used leading to the interconnection of generation. The interconnection of transmission facilities to the PNM system follows the same general process. The interconnection process involves an initial application and agreement by the applicant to fund technical studies. The studies are necessary to ensure there will be no adverse impacts of the proposed interconnection to PNM's system and to the reliability of existing customers. It is the industry practice to assess the impacts of a proposed interconnection in a sequential set of studies, (for generation interconnections, these are referred to commonly as: Feasibility Study; System Impact Study; and Facility Study). The studies progressively address and provide an increasing level of definition of the impacts and required interconnection facilities, any mitigating network upgrades that may be required and the costs and construction schedule for the proposed interconnection facilities and network upgrades. In this way, the Interconnection Customer can assess the potential impacts and costs at each step and make a decision to continue with the process or take an off-ramp and withdraw the application. PNM's Large Generation Interconnection Procedures and Large Generator Interconnection Agreement are provided in attachment N of PNM's Open Access Transmission Tariff (OATT or Tariff).

The proposed interconnection of the Tres Amigas facility is considered a "wire-to-wire" interconnection, rather than a generator interconnection and is not governed by the OATT. The study scope and timelines of this proposed interconnection were therefore mutually agreed to by PNM and Tres Amigas and documented in a "non-tariff" study agreement executed in March 2011.

The Tres Amigas project proposal is a first of its kind, in that it proposes to interconnect the three primary US grids, and proposes to use technologies never before used in this country. The scale of the fully developed project is unprecedented. The Tres Amigas project also proposes to use high speed voltage and power control systems in close proximity to other voltage control systems at PNM'S existing Blackwater HVDC station and nearby wind farms. The transmission system is not well developed in the area of the proposed interconnection and the lack of system strength as well as proposed technology makes the interconnection study very complex.

Because of the complexity and the enormous amount of on-going activity in its interconnection queue, PNM hired an outside consultant, with expertise in HVDC and control systems, to perform the studies in order to expedite the study process. The consultant chosen also has in depth knowledge of the performance and operational characteristics of the PNM system.

The scope of the studies mutually developed and agreed to by PNM and Tres Amigas that will lead to the development of an interconnection agreement are as described below.

Phase 1 System Impact Study

Phase 1 will assess both the short circuit capability at Blackwater Station and the steady state and dynamic effects to the PNM transmission system as described below.

1. Assess the short circuit capability at Blackwater station to determine if there is sufficient short-circuit capability to support the proposed interconnection.
2. Assess steady state and dynamic effects of the proposed interconnection on the PNM transmission system using positive sequence models. To perform this assessment, the existing firm transmission commitments will be reduced to analyze power delivery capability (power in or out) of the proposed Tres Amigas interconnection facility up to 750 MW. The purpose of this study is to assess possible impacts of the proposed interconnection on the PNM transmission system. This assessment will initially be an approximate investigation of possible impacts. It is recognized that future studies will be required once Tres Amigas or others seek to obtain firm Point-to-Point delivery service as described below.

Delivery of power in or out of proposed Tres Amigas interconnection facility beyond Blackwater (over PNM's transmission system) would be on an "as-available" basis only, using non-firm transmission capacity. PNM existing and pending transmission commitments exceed the transmission capacity of the Blackwater to BA Station 345 kV Line ("the BB Line") from east to west and west to east.

The limitation on long-term-firm available transmission capacity between Four Corners and Blackwater (west to east) arises from congestion on WECC Path 48 ("Path 48"), requiring new transmission to be constructed. A determination of the extent of additional facilities required to provide firm transmission service over this path would be addressed in the assessment of specific Transmission Service Requests that may or may not be made at a future time.

Present Status of Phase 1 Studies – As of 3-29-2012

Phase 1 study work is complete and a draft executive summary and report was delivered to Tres Amigas on 12/16/2011 and 12/21/2011, respectively. The complete Report is posted on the PNM OASIS¹.

¹ http://www.oatioasis.com/PNM/PNMdocs/Tres_Amigas_Phase_1_SIS_Final.pdf

The Parties now desire to change the sequence of the normal study process set out above and to proceed directly to a Facility Study associated only with the Phase 1.

Phase I Facility Study

This Facility Study will determine a schedule and estimate the cost to expand the Blackwater Station to a three (3) breaker station and interconnect the Project to the Blackwater Station

Present Status of Facility Study - As of 3-29-2012

Phase 1 Facility Study work is complete and a report was delivered to Tres Amigas on 3-23-12. The complete Report is posted on the PNM OASIS².

Interconnection and Construction Agreement

This agreement will define the commercial and operational terms and conditions for the wire-to-wire interconnection of the Tres Amigas facility to the PNM transmission system including all required interconnection facilities and network upgrades, cost estimates, and construction schedule.

Present Status of Interconnection and Construction Agreement- As of 8-25-2012

The Interconnection and Construction Agreement was executed on July 27th 2012 and includes a provision that the Phase II study (as listed below) is to be completed at a later date with such completion date a minimum of twelve (12) months prior to energization of the Tres Amigas project interconnection to the Blackwater Station. Subsequent to the completion of the Phase II Study, the Parties will execute a second Facilities Study agreement associated only with the Phase II Study to determine a schedule and estimate the cost of network upgrades and other facilities additions identified in the Phase 2 Interconnection Study. The Interconnection and Construction Agreement will be amended to include the results of the Phase II Facilities Study once it is completed

The Interconnection and Construction Agreement is posted on the FERC eLibrary system at:

http://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20120808-5122

² http://www.oatioasis.com/PNM/PNMdocs/Tres_Amigas_Phase_1_SIS_Final.pdf

Preparation Work for Phase II

Prior to initiation of the Phase II Study work, certain “Preparation Work for Phase II” related to modeling and design requirements in preparation for the Phase II studies had to be completed. The scope of the “Preparation Work for Phase II” included PNM working with consultants and vendors to provide certain PSCAD models/model information to Tres Amigas, obtaining and executing required Non-Disclosure Agreements required in association with providing the models/model information to Tres Amigas and development of related agreements for transitioning models/model information to Tres Amigas. This “Preparation Work for Phase II” is scheduled to be completed by early September 2013.

After the “Preparation Work for Phase II” is completed, then either PNM or Tres Amigas’ design engineer (Alstom) will complete all or parts of the work outlined in the Phase II studies below.

Phase II System Impact Study

As described above, existing interconnections to the BB Line involve facilities with power electronics systems, all of which have fast closed-loop controls. Following Phase 1, the Phase II study effort will employ a 3-phase model (PSCAD, etc) in order to capture the control features at Blackwater Station, Taliban Mesa wind farm, and the Argonne Mesa wind farm with its static var compensator (referred to as “STATCOM”) that the positive sequence analysis performed in Phase I cannot fully model. Phase II analysis will include control interaction between devices, temporary over-voltages, coordination of control and protection, evaluation of single pole switching, low order harmonic resonance and AC filter performance, and dynamic over voltages.

Phase II studies will determine, for example, whether additional shunt compensation related to Tres Amigas can introduce low-order harmonic resonance (resonance at 2nd or 3rd harmonics), which will impact equipment (possibly requiring a low-order harmonic filters) or whether harmonics produced from Blackwater or Tres Amigas converters could impact the loadings of the ac filters on the other converter. All of these considerations can have equipment impacts and will be factored into the Facility Study.

For PNM to proceed with the Phase 2 Studies Tres Amigas needs to provide PNM a notice to proceed with the PSCAD model development

Present Status of Phase II System Impact Study – As of 8-25-2012

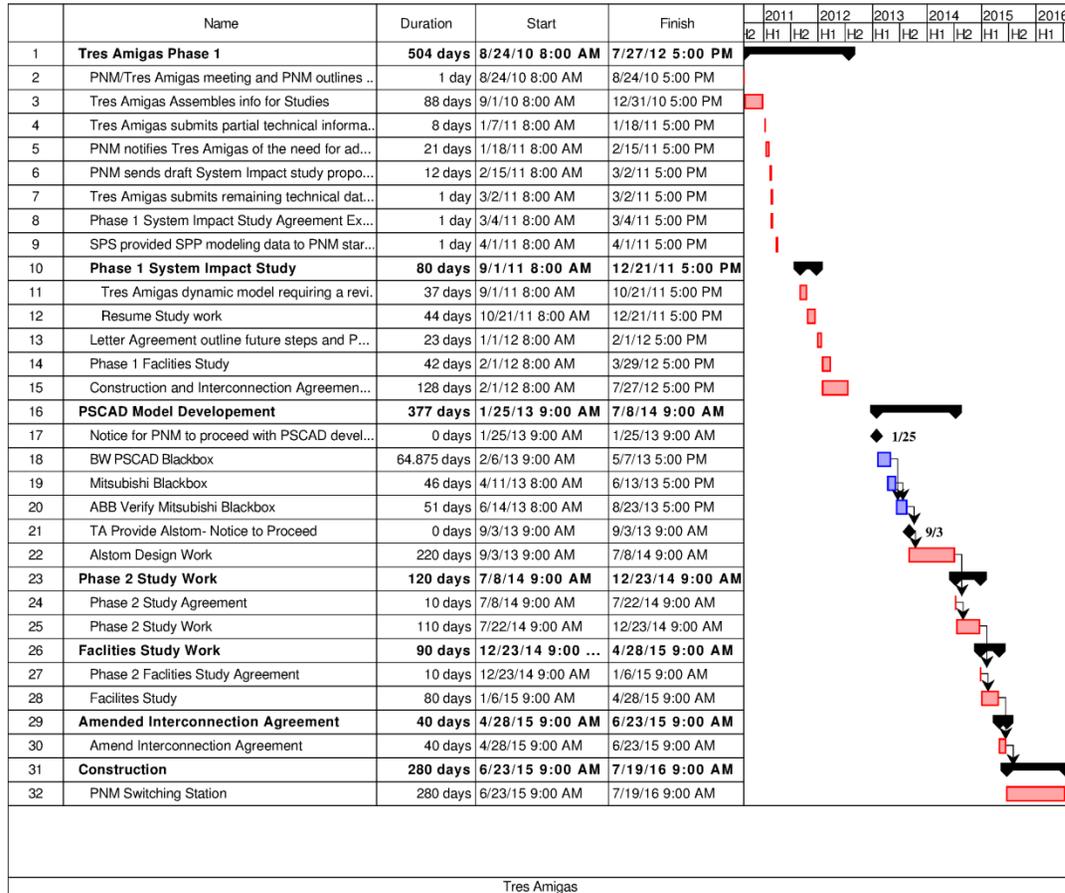
This study has not been started. The study will be started once Tres Amigas provides PNM notice to proceed with the Phase II model development and studies.

Phase II Facility Study

The Facility Study will develop detailed cost estimates for the interconnection facilities and any network upgrades, defined as being required as a result of the Phase II System Impact Study.

Present Status of Facility Study - As of 8-25-2012

Studies have not started and are pending the completion and results of the Phase II Study.



Major Milestone Activity Notes:

- Interconnection Study Agreement Signed 3/8/2011 (Phase 1 Studies - 22 weeks from receipt of data)
- Phase 1 Studies initiated 5/27/2011 upon receipt of SPS Data
- 7 week delay from 9/1/2011 - 10-19-2011 due to Tres Amigas dynamic model requiring a revision by Tres Amigas
- Phase 2 study expected to begin 7/8/14 and continuing for 5 months assuming no significant findings.