

## Attachment A



**ERCOT Independent Review**  
**Centerpoint Energy/Texas New Mexico Power Alvin 345 kV Tie**  
**Project**  
**November 7, 2006**

ERCOT Regional Planning

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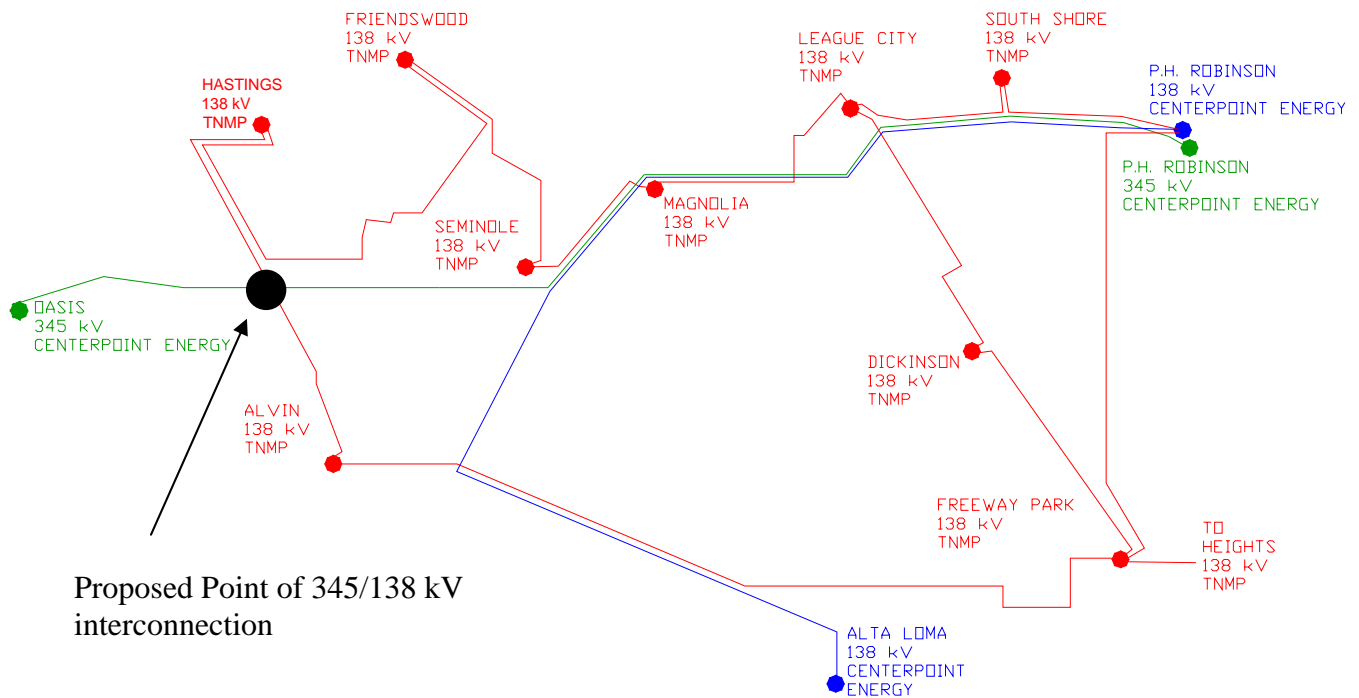
# ERCOT Independent Review

## Centerpoint Energy/Texas New Mexico Power Alvin 345 kV Tie Project

### ***Project Submitted***

Centerpoint Energy (CNP) and Texas New Mexico Power (TNMP) submitted a project in July 2006 to solve reliability problems in TNMP's Bay Area Loop. This loop is shown in Figure 1 in red from PH Robinson to League City to Alvin to Freeway Park.

This project proposes to construct a new 345/138 kV station between the Hastings and Alvin 138 kV stations on the west side of the bay area loop. This new station will then be looped into the existing PH Robinson to Oasis 345 kV and Hastings to Alvin 138 kV circuits.



**Figure 1: TNMP Bay Area Transmission System**

### ***Project Analysis***

#### **Base Cases**

The 2007 and 2009 SSWG cases created in November 2005 and last modified in March 2006 were used for all UPLAN analysis. These cases used the SSWG load levels with an 8,760 hour load profile that have been modified during work on the ongoing Five-Year Plan project to have all unapproved projects removed. Non-coincident peak loads for the bay area stations for 2007, 2010, and 2015 were added to

the base case as shown in Table 1 as TNMP did because the coincidence factor for these loads is approximately 1.0. The 2015 case was used to determine the amount of rebuilding that will be required as load grows. A seemingly low cost option for year 2007 may require more transmission lines to be rebuilt in future years, thus making it actually the more expensive option. These cases will be referred to as 20XXReliability with XX being the corresponding last two digits of the year the case is modeled to represent.

<b>Bus Number</b>	<b>Bay Area Stations</b>	<b>TNMP NC Load 2007(MW)</b>	<b>TNMP NC Load 2010 (MW)</b>	<b>2015 = TNMP NC Load 2010 + 25% (MW)</b>
38820	FRWYPARK	49.7	53.8	67.3
38850	DICKNSON	62.2	66.3	82.9
38890	SOUSHORE	48.1	54.1	67.6
38920	LEAGCITY	57.3	64.5	80.6
38950	MAGNOLIA	52.7	59.3	74.1
38980	FRDSWOOD	65.1	70.2	87.8
38990	SEMINOLE	16.9	19.6	24.5
39010	HASTINGS	3.5	3.5	4.4
39030	ALVIN	81.3	87.2	109.0
39040	MAINLAND	4.2	4.7	5.9
	<b>Total</b>	<b>441</b>	<b>483.2</b>	<b>604.0</b>

**Table 1: Bay Area Stations with load modified to NC peak in 20XXReliability Case**

The 2010Reliability case used the 2009 case with the loads at the stations listed in Table 1 set according to the TNMP NC Load 2010 (MW) column. The 2009 case was used instead of the 2010 case because it was the most suitable UPLAN case available. Likewise the 2015Reliability case was also based on the 2009 case with the 2010 loads multiplied by 1.25 to simulate 2015 loads in the bay area loop.

It was further necessary to reset the line parameters and ratings for all the circuits in the bay area loop to their unimproved state before beginning the analysis as some of the lines had been upgraded in the model. This action caused unserved energy to exist in the bay area.

The latest 2009 Five-Year Plan economic case consisting of reliability and economic projects for 2007 to 2009 was used for economic analysis. This case used the ERCOT generated load forecast over 8,760 hours and will be referred to as 2009Economic.

The SSWG 2007 and 2010 summer peak cases were used for steady state AC analysis with all line parameters and ratings in the bay area set to their unimproved value. This was to compare the DC UPLAN results with an AC power flow. The 2010 SSWG case was also modified with the 2015 loads from Table 1 to compare with UPLAN results for that year. Results from the AC power flows were very close to the DC power flows for all three years.

## Option Description

The options depicted in the table below were alternatives considered by TNMP. ERCOT briefly studied four of the six options to determine upgrades necessary and relative costs and then concentrated on the

two least expensive alternatives, Options 5 and 6. Detailed descriptions of all the alternatives can be found in TNMP's project documentation.

OPTION #	OPTION DESCRIPTION	NECESSARY 2006 NPV	RECOMMENDED 2006 NPV	TOTAL 2006 NPV
2	Uprate circuits & equipment as needed	\$33,576,000	\$15,515,000	\$49,091,000
3	Interconnect at Oasis	\$16,183,000	\$9,018,000	\$25,201,000
4	348-138 kV interconnect at Magnolia	\$28,556,000	0	\$28,556,000
5	Interconnect near Seminole	\$24,603,000	0	\$24,603,000
6	Interconnect near Alvin	\$13,094,000	\$9,018,000	\$22,112,000
7	138 kV interconnect at Magnolia	\$32,183,000	0	\$32,183,000
	Not studied in ERCOT Independent Review			

**Table 2: TNMP Submitted Alternatives**

## Reliability Analysis

The 2007 Reliability case was first run in UPLAN after resetting the line parameters and ratings and before adding any improvements from TNMP's two options listed in Table 2. UPLAN showed unserved energy existed at the busses listed in Table 3.

Bus Name	Zone Name	Year	UnservedEnergy (MWh)	Mont Line	Cont1	Cont2	Cont3	Cont4
MAGNOLIA	HOUSTON	2007	1,054.62	LEAGMAGN	FRWYMAIN	0	0	0
SOUSHORE	HOUSTON	2007	5,729.05	SOUSP_H_	FRWYDICK	0	0	0

Bus Name	Zone Name	Year	UnservedEnergy (MWh)	Mont Line	Cont1	Cont2	Cont3	Cont4
ALVIN	HOUSTON	2007	34,469.49	FRWYMAIN	DICKLEAG	SOUSLEAG	0	0
LEAGCITY	HOUSTON	2007	915.533	FRWYMAIN	DICKLEAG	SOUSLEAG	0	0
MAINLAND	HOUSTON	2007	4,892.51	FRWYMAIN	DICKLEAG	SOUSLEAG	0	0

**Table 3: Unserved energy prior to modeling Alternatives in 2007 top – Single Line Outages, bottom – Multiple Line Outages.**

The intent of the following analysis was to compare the two least expensive options from TNMP's report to show construction needed for 2007 and ultimate construction needed with each option. To accomplish this Options 5 and 6 were added to the 2007, 2009, and 2015 Reliability cases and unserved energy was checked. If present, additional upgrades were added to eliminate the unserved energy.

When all unserved energy was eliminated, the dollar value of each option was computed using tables provided by TNMP. This shows, for each option, what will need to be built in 2007 and ultimately in 2015 to eliminate unserved energy and the corresponding cost.

In Tables 4 and 5, a 3% inflation factor and 10% rate of return on investments was assumed to match TNMP's methodology.

PROJECT	PROJECT YEAR	2006 COST	PROJECT YEAR COST	2006 PRESENT VALUE
Build a new 345 kV switching station near Seminole (2006 cost estimate prepared by CNP).	2007	\$4,600,000	\$4,738,000	\$4,307,273
Loop the CNP PHR - Oasis 345 kV line into the new 345 kV switching station near Seminole (2006 cost estimate prepared by CNP).	2007	\$1,300,000	\$1,339,000	\$1,217,273
Build a new 138 kV switching station near Seminole.	2007	\$3,641,000	\$3,750,230	\$3,409,300
Loop Seminole - Magnolia into the new 138 kV switching station near Seminole.	2007	\$485,000	\$499,550	\$454,136
Install a 345-138 kV autotransformer at the new stations (2006 cost estimate prepared by CNP. The cost estimate assumes relocation of an existing auto-transformer. The cost estimate would be higher if a spare auto-transformer is not available and a new	2007	\$1,100,000	\$1,133,000	\$1,030,000
<b>TOTAL 2007</b>		<b>\$11,126,000</b>		<b>\$10,417,982</b>
Rebuild the 138 kV circuit between Seminole and the new switching station near Seminole.	2009	\$698,000	\$762,723	\$573,045
Rebuild Friendswood - Seminole.	2011	\$3,128,000	\$3,626,209	\$2,251,591
Friendswood Sub – Replace all 138 kV bus.	2011	\$534,000	\$619,052	\$384,383
Rebuild Freeway Park - Alvin.	2011	\$14,831,000	\$17,193,194	\$10,675,621
Alvin Sub - Replace all 138 kV bus and jumpers.	2011	\$700,000	\$811,492	\$503,873
Rebuild the 138 kV circuit between Magnolia and the new switching station near Seminole.	2015	\$698,000	\$910,732	\$386,239
Rebuild South Shore - PHR (This 2006 cost estimate includes a CNP prepared cost of \$184,000 related to the line termination at P.H. Robinson).	2015	\$3,970,000	\$5,179,950	\$2,196,804
<b>TOTAL 2015</b>		<b>\$35,685,000</b>		<b>\$27,389,537</b>
Rebuild League City - Dickinson.	2010	\$3,938,000	\$4,432,254	\$3,027,289
League City Sub – Replace all 138 kV ring bus and jumpers on the ring. <sup>†</sup>	2010	\$977,000	\$1,099,622	\$751,057
<b>TOTAL 2015 with Texas City Additional 500 MW</b>		<b>\$40,600,000</b>		<b>\$31,167,883</b>

**Table 4: Option 5 Construction needed to eliminate unserved energy from 2007 – 2015**

For option 5, upgrading the Magnolia to new 138 kV switching station 138 kV circuit by 2015 was added to TNMP's original list of projects needed without additional Texas City generation. The Seminole to new 138 kV switching station and Friendswood to Seminole 138 kV circuits were moved forward one year.

PROJECT	PROJECT YEAR	2006 COST	PROJECT YEAR COST	2006 PRESENT VALUE
Build a new 345 kV switching station (2006 cost estimate prepared by CNP).	2007	\$4,600,000	\$4,738,000	\$4,307,273
Loop the CNP PHR - Oasis 345 kV line into the new 345 kV switching station (2006 cost estimate prepared by CNP).	2007	\$1,300,000	\$1,339,000	\$1,217,273
Build a new 138 kV switching station.	2007	\$3,641,000	\$3,750,230	\$3,409,300
Loop the Alvin - Hastings line into the new 138 kV switching station.	2007	\$485,000	\$499,550	\$454,136
Install a 345-138 kV autotransformer at the new stations (2006 cost estimate prepared by CNP. The cost estimate assumes relocation of an existing auto-transformer. The cost estimate would be higher if a spare auto-transformer is not available and a new	2007	\$1,100,000	\$1,133,000	\$1,030,000
Rebuild the 138 kV circuit between Hastings and the new switching stations.	2007	\$1,977,000	\$2,036,310	\$1,851,191
Hastings Sub – Replace all jumpers on the 138 kV ring.	2007	\$2,000	\$2,060	\$1,873
Rebuild Friendswood - Hastings.	2007	\$7,117,000	\$7,330,510	\$6,664,100
Friendswood Sub – Replace all 138 kV bus.	2007	\$534,000	\$550,020	\$500,018
<b>TOTAL 2007</b>		<b>\$20,756,000</b>		<b>\$19,435,164</b>
Rebuild South Shore - PHR (This 2006 cost estimate includes a CNP prepared cost of \$184,000 related to the line termination at P.H. Robinson).	2011	\$3,970,000	\$4,602,318	\$2,857,677
Rebuild Friendswood - Seminole.	2011	\$3,128,000	\$3,626,209	\$2,251,591
<b>TOTAL 2015</b>		<b>\$27,854,000</b>	<b>\$0</b>	<b>\$24,544,432</b>
Rebuild League City - Dickinson.	2015	\$3,938,000	\$5,138,197	\$2,179,097
League City Sub – Replace all 138 kV ring bus and jumpers on the ring. <sup>†</sup>	2015	\$977,000	\$1,274,763	\$540,624
Rebuild League City - Magnolia.	2015	\$3,657,000	\$4,771,556	\$2,023,605
<b>TOTAL 2015 with Texas City Additional 500 MW</b>		<b>\$36,426,000</b>		<b>\$29,287,758</b>

Table 5: Option 6 Construction needed to eliminate unserved energy from 2007 – 2015

For option 6, upgrading the Friendswood to Seminole 138 kV circuit by 2011 was added to TNMP's original list of projects needed without additional Texas City generation. The South Shore to PHR 138 kV line rebuild was moved up one year. Rebuilding the League City to Magnolia 138 kV was added to TNMP's list of projects with additional Texas City generation.

As seen from comparing Tables 4 and 5, Option 5 has the lower 2007 cost but the 2015 cost is higher than option 6.

ERCOT analyzed the case where more generation, possibly 500 MW or more, is modeled at Texas City to match TNMP's work. ERCOT's analysis showed the cost of Option 6 with improvements for additional generation at Texas City is still slightly less than that of Option 5. It should be noted that numerous other improvements will have to be made between the study area and the generation site before these improvements will need to be made regardless of the options studied in this report.

## **Economic Analysis**

The 2009 Economic case showed that the two options are nearly identical in production cost savings.

### ***Summary***

Based on the lower ultimate construction costs, ERCOT supports the construction of Option 6 as shown by ERCOT in Table 5 of the Alvin 345/138 kV tie project.

### ***Designated Providers of Transmission Facilities***

In accordance with ERCOT's Power System Planning Charter and Processes, ERCOT staff is to designate transmission providers for projects reviewed in the regional planning groups. These providers can agree to provide or delegate the new facilities or inform ERCOT they do not elect to provide them. For the project scope recommended in this report, Centerpoint Energy is the designated provider for the 345 kV side of the new station up to and including the 345/138 kV autotransformer and Texas New Mexico Power is the provider for the remainder of the project.