

# McCamey Wind Generation Transmission Improvement Plan

October 14, 2002

Page 1 of 14

From August 1999 through July 2000 there were requests for 900 MW of wind generation to be interconnected into the West Texas Utilities (WTU) Transmission system in and around the McCamey area with generation in-service dates between 2/1/01 and 12/01/01. About 750MW of wind generation capacity additions were interconnected by year-end 2001. Since then, an additional 300 MW of new wind generation capacity is now planned to be interconnected by year-end 2003. Wind generators are already producing energy and additional wind generation interconnection requests are continuing to materialize as a result of the renewable energy mandate of SB7 and the Federal Tax Credit recently extended through 2003. (For additional details see interconnection studies 00INR0022, 01INR0025, 01INR0034, 01INR0035, 01INR0027 and 02INR0032)

At present there is less than 150 MW of fossil generation in-service in the Western region of WTU, which has a non-coincident peak load of 138 MW with a current load projection of 162 MW by year 2010. Of the 150 MW of generation, 140 MW is the conventional natural gas fired Rio Pecos Power Plant, and the remainder is made up of small internal combustion plants and a small combustion turbine located southwest of McCamey. The McCamey area has only two 138-kV paths that provide generation an interconnection to the bulk 345-kV transmission system. One path is north through Crane to the Odessa area and the other is east through Big Lake to San Angelo. Today there exists only one 138-kV line that connects the Rio Pecos substation to the Crane substation and this circuit is currently the limiting element during export of wind generation from the McCamey area. There is also only one existing 138-kV line that connects the North McCamey substation to the Big Lake substation, which would otherwise constrain the export of wind energy.

In order to accommodate the wind generator interconnections of over 1000.785 MW in the region, the study was broken into two parts. The first part focused on the infrastructure required to accept the generation into the local network, and the second focused on bulk transmission paths necessary to transport the generation from the local network to the two 345 kV corridors at Odessa and at San Angelo. Full compliance is maintained with all Transmission Planning Reliability Criteria and Standards set forth by West Texas Utilities (WTU), Electric Reliability Council of Texas (ERCOT), and the North American Electric Reliability Council (NERC).

## LOCAL NETWORK IMPROVEMENTS

The local network improvements can be designated as three transmission triangles: (refer to attached drawing)

1. Rio Pecos to Crane to North McCamey to Rio Pecos
2. Rio Pecos to Ft. Stockton to 16<sup>th</sup> Street to Rio Pecos
3. Rio Pecos to Mesa View Switch Station to West Yates Switch Station to North McCamey to Rio Pecos

The improvements identified in this plan ensure that adequate transmission capacity exists in each of the three triangles in order to facilitate the injection of generation into the local network, while maximizing the use of the existing transmission system by minimizing the need for new right-of-way and the need for CCNs (Certificate of Convenience and Necessity). Since the in-service dates for the wind power generators with interconnection agreements is no later than 12/31/03, the typical five year lead time required to certify and build a new 345 kV line has necessitated the upgrade of the 138 kV transmission system to provide timely transmission enhancements that result in incremental increases of transfer capability within the next three years.

Thus far all wind farm interconnections have been at locations that surround McCamey. As a result, there is an opportunity to use the North McCamey substation as a transmission hub for the collection of wind energy from four transmission line spokes. The spokes are comprised of the North McCamey to West Yates Switch, North McCamey to ~~Big Lake~~ SW Mesa Tap, North McCamey to Crane and North McCamey to Rio Pecos 138 kV lines. If each of these spokes is constructed with structures capable of a second circuit as they are rebuilt under the original interconnection plan, then the second circuit can be certified and installed to handle any existing and future expansion of wind generation at the existing wind farm sites. With the exception of the wind farms at Indian Mesa and Woodward Mountain, all other wind farm interconnections could directly be interconnected to one of the four spokes. Even the remote wind farms, which would not be directly interconnected to a spoke, inject power at the Rio Pecos, which is the termination of one of the spokes. Additionally, the capability to add a second circuit to the 138 kV corridors from Rio Pecos-to-San Angelo and Rio Pecos-to-Crane provide the flexibility to interconnect new wind generation as circumstances dictate.

## BULK NETWORK IMPROVEMENTS

In order to maximize the long term export capability of the region, power collected at North McCamey can be transferred to the 345 kV bulk system via a new 345 kV line from North McCamey to Twin Buttes. Without such a line, the capacity of the 138 kV transmission system would ultimately be limited to about 1500 MW of generation in the McCamey area. This limitation is further aggravated by bulk 345 kV transmission constraints as power received from the 138 kV system would continue to flow on the congested Odessa to Abilene to DFW 345 kV path. A 345 kV line from North McCamey to Twin Buttes would direct power to the southern San Angelo to Comanche Peak to DFW 345 kV path, and improve the overall transfer capability out of West Texas. Additionally, the last two 138 kV upgrades to be completed in 2006, Rio Pecos to Crane and North McCamey to Big Lake can be displaced with the new 345 kV line.

Generation Interconnection Agreements for Wind Generators in the McCamey area to date are as follows:

<u>No.</u>	<u>Plant</u>	<u>In-Service</u>	<u>Capacity</u>
1	Southwest Mesa /FPL	1999	75 MW
2	Indian Mesa / FPL	2001	83 MW
3	Woodward Mt./FPL	2001	160 MW
4	King Mt./FPL	2001	280 MW
5	Desert Sky/AEP	2001	160 MW
6	Capital/Cielo	2003	60 MW
7	Noelke Hill/Cielo	2003	240 MW
<u>TOTAL</u>		<u>2003</u>	<u>1058 MW</u>

The original transmission plan set out to rebuild existing lines, where practical, to avoid the need for new right-of-way. This plan supported approximately 1000 MW of generation, but, without construction of a new line, has reached the ultimate capacity of the 138 kV transmission grid in the McCamey area. Since additional wind generation interconnection requests are continuing to materialize due to the renewable energy mandate of SB7 and the Federal Tax Credit recently extended through 2003, any new transmission lines should accommodate both expected and future wind generation additions. The proposed 345 kV line from North McCamey to Twin Buttes does so by providing an incremental 500 MW increase of transmission capacity.

Since much of the current transmission construction is sequential, in-service dates of the final and most critical lines, have been stretched out to the summer of 2006. The proposed 345 kV line from North McCamey to Twin Buttes will take about five years to certify and construct, which would result in a significant increase in transmission capacity only one year after the final 138 kV rebuilds are to be completed. There are 70 miles of 138 kV line rebuilds (North McCamey to Big Lake and Rio Pecos to Crane) that go in-service just prior to completion of the 345 kV line, and which, while the rebuilds are under construction, will cause curtailments of wind generation. Given the clear need for the new 345 kV line and the minimal benefit of rebuilding these 138 kV lines, it is prudent to avoid the rebuilds entirely by implementing a special protection scheme (SPS). The SPS would allow the most if not all of the wind generation to operate under pre-contingency conditions, and only when overloads occur due to contingency outages, would remove specific wind generation facilities from service.

Roughly a third of the cost of the new 345 kV line is required to rebuild these 138 kV lines, which is avoided by the SPS, while still allowing wind generation to be operated relatively unconstrained. The SPS will be implemented with the help of the hub-and-spoke configuration, which creates two transmission systems, one to serve load and the other to route wind power to the 345 kV system. By diverting the wind power to the upgraded Crane to Odessa or the Fort Lancaster to Twin Buttes 138 kV paths, curtailment due to the constraint limited by the existing North McCamey to Big Lake and Rio Pecos to Crane 138 kV lines is avoided. Specialized substation designs and a proposed fiber optic loop make it possible to automatically route power flow to the extent possible, and remove generation when necessary. Isolating distribution substations from the spokes serving the wind generators retains the reliability of and improves power quality for the retail customers.

With completion of the North McCamey to Twin Buttes 345 kV line, roughly 1500 MW of wind generation will be supported under first contingency criteria. Constructing the North McCamey to Odessa 345 kV line in conjunction with two additional 600 MVA autotransformers at North McCamey could accommodate over 2000 MW of wind generation. This would allow the entire SB7 mandate for renewable generation to be met in the McCamey area alone. It would also serve as a second 345 kV path out of the Midland/Odessa area, improving transfer capability out of West Texas and enhancing access to wind generation from those areas north and west of Odessa. Should the federal tax credits for wind energy be extended beyond 2003, wind generation will remain competitive with conventional energy sources. Given the potential of all of West Texas to produce wind energy and the load growth in Texas, the production and consumption of this source of renewable energy can only be facilitated by the availability of transmission to transport the power from the source to the sink.

The following information details the criteria violations that result from the interconnection of over ~~785~~ 2000 MW wind farm generation into the McCamey area, and the specific transmission system improvements, and their associated schedule, that have been determined to be necessary to relieve the criteria violations.

<i>Project Number</i>	<i>Title</i>	<i>TP/PM</i>	<i>Type</i>	<i>TSP</i>	<i>Status</i>
TP-2001-011	Indian Mesa Wind Generation Interconnection	GR / AB	IPP	WTU	IA Executed

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<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas - TU Crane to Odessa EHV 138 kV	N. McCamey to Big Lake 138 kV line exceeds its emergency rating	Addition of a Ft. Lancaster to Friend Ranch 2x794 ACSR 138 kV line with double circuit capable structures

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<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Interconnect Indian Mesa 80 MW	ETN100716 10472		Customer Line	06/01
Over current relay at Illinois to Ft. Lancaster	ETN101846 10458		n/a	<u>04/02/12/02</u>
System protection and interrupting devices as result of new and rebuilt lines	ETN101849 9736		n/a	<u>09/05/12/05</u>
Add new 138 kV Terminal @ Ft. Lancaster and Friend Ranch	ETN101847 9948		n/a	<u>09/05/12/05</u>
Add new 40 mile 138 kV Ft. Lancaster to Friend Ranch with 2x795 ACSR) and DC structures	ETN101848 9913	40	To be filed	<u>09/05/12/05</u>

**(04/02 posting assumed no CCN intervention, 10/02 posting includes CCN intervention, which is now anticipated)**

<i>Project Number</i>	<i>Title</i>	<i>TP/PM</i>	<i>Type</i>	<i>TSP</i>	<i>Status</i>
TP-2001-012	Woodward Wind Generation Interconnection	GR / BM	IPP	WTU	IA Executed

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
FPL Energy Power Partner's Woodward #1 wind farm	Interconnection	FPL Energy Power Partner's Woodward #1 Wind Farm generation in Pecos County

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Interconnect FPL Energy Power Partner's 83 MW wind generation facility with RTU / Motorized Switch at generation line switch tap	ETN101850 10438/10476		Customer Line	04/01
Add new 138 kV Terminal at Ft. Stockton	ETN101845 10478		n/a	09/0208/02
Convert 5.6 miles of 69 kV from 16 th Street to Fort Stockton to 138 kV and Airport substation to 138 kV	TNMP	5.6	Exempt Line	09/0212/02

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas - SW Mesa to Big Lake 138 kV	WTU Crane to TU Crane 138 kV bus tie exceeds its emergency rating	Reconfigure WTU/TU Crane substation to a breaker and half scheme and Replace 138/69 kV autotransformer with 130 MVA

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Reconfigure WTU/TU Crane substation to a breaker and half scheme and Replace 138/69 kV autotransformer with 130 MVA	ETN101854 9950		n/a	05/03

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas - Rio Pecos to Crane 138 kV line	WTU Crane to Rio Pecos 69kV line exceeds its emergency rating	Convert 69 kV North McCamey to Crane line to 138 kV with <u>double circuit</u> 2x795 ACSR conductor <u>and double circuit capable structures</u>

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Over current relay Rio Pecos to WTU Crane 69 kV	ETN101851 10429		n/a	12/02
System protection and interrupting devices as result of re-conductors and new lines	ETN101852 10430		n/a	05/03
<del>Rebuild Convert</del> 25 miles of 69 kV from North McCamey to Crane to 138 kV with 2x795 ACSR and DC structures, build new double circuit line section (requires CCN) from Mc Elroy to Crane	ETN101853 9915	25	To be filed	05/03
<u>Construct 1.5 miles of 69 kV from McElroy to Crane to close the 69 kV Crane area loop</u>		1.5	To be filed	05/03
<u>Convert 25 miles of 69 kV from North McCamey to WTU Crane to 138 kV 2x795 ACSR and transfer King Mt. from Rio Pecos/Crane line</u>			exempt	09/03
<u>Add second circuit to the North McCamey to Crane 138 kV line and transfer King Mt. from first North McCamey/Crane circuit</u>			To be filed	12/04

<i>Project Number</i>	<i>Title</i>	<i>TP/PM</i>	<i>Type</i>	<i>TSP</i>	<i>Status</i>
TP-2001-013	King Mt Wind Generation Interconnection	GR / BM	IPP	WTU	IA Executed

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
King Mountain Wind Farm 280 MW generation	Interconnection	King Mountain Wind Farm generation in Crane County

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Interconnect King Mt NW 80 MW and King Mt SW 80 MW	ETN101857 10447		Customer Line	05/01
Interconnect King Mt NE 80 MW and King Mt SE 40 MW	ETN101858 11472		Customer Line	06/01

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas - normal conditions	Crane to Odessa 138 kV line exceeds its rating	Convert 69 kV line from Crane to Midkiff to 138 kV with <u>795-ACSS conductor rated for 1800a</u> , and rebuild 138 kV Crane to Odessa line with <u>795-ACSS conductor rated for 1800a</u>

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Convert 34 miles of 69 kV Crane to Midkiff line to 138 kV with <u>795-ACSS conductor rated for 1800a</u>	Oncor	34.3	Exempt Line	TBD
Rebuild 32 miles of 138 kV from Crane to Odessa with <u>795-ACSS conductor rated for 1800a</u>	Oncor	31.8	Exempt Line	TBD

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas - Rio Pecos to North McCamey 138 kV	WTU Crane to Rio Pecos 138 kV line exceeds its emergency rating	<u>Addition of a Twin Buttes to North McCamey 2x1590 ACSR 345 kV line with double circuit capable structures, install 600 MVA autotransformer at North McCamey and second 300 MVA autotransformer at Twin Buttes</u> <u>Re-conductor 138 kV WTU-Crane to Rio Pecos line with 2x795-ACSR conductor and double circuit capable structures</u>

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
<del>Re-conductor 11.5 miles of 138 kV from King Mnt West Tap to WTU Crane 138 kV (2x795-ACSR) with DC structures</del>	<del>ETN101861 10404</del>	<del>11.5</del>	<del>Exempt Line</del>	<del>03/04</del>

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas - Big Lake 138 kV Bus Tie	Big Lake 69/138 kV autotransformers exceed their emergency rating	Reconfigure Big Lake 138 kV to ring bus

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Reconfigure Big Lake substation 138 kV bus to five position ring	ETN101862 10482		n/a	09/05

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas - Friend Ranch to Ft. Lancaster 138 kV	North McCamey to SW Mesa 138 kV line exceeds its emergency rating	Construct 138 kV North McCamey to King Mnt East Tap & SW Mesa with 2x795 ACSR and double circuit capable structures

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
System protection and interrupting devices as result of re-conductors and new lines	ETN101859 11474		n/a	<del>07/03</del> 09/03
Construct 5.85 miles of 138 kV from SW Mesa and King Mt East Tap to North McCamey with 2x795 ACSR and DC structures	ETN101865 10392	5.85	To be filed	<del>07/03</del> 09/03
Reconfigure North McCamey 138 kV substation to breaker and one-half	ETN101866 10466		n/a	09/03

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas - Crane to Odessa 138 kV	Midkiff to Sprayberry to 138 kV line exceeds its rating	Rebuild 138 kV line from Midkiff to Sprayberry with <del>795 ACSR</del> conductor rated for 1800a

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Rebuild 23 miles of 138 kV from Midkiff to Sprayberry with <del>795 ACSR</del> conductor rated for 1800a	Oncor	23.0	Exempt Line	TBD

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas - TU Crane to Odessa EHV 138 kV	SW Mesa to Big Lake 138 kV line exceeds its emergency rating	<del>Addition of a Twin Buttes to North McCamey 2x1590 ACSR 345 kV line and double circuit capable structures. install 600 MVA autotransformer at North McCamey and second 300 MVA autotransformer at Twin Buttes 2x795 ACSR conductor and double circuit capable structures</del>

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Install Line Monitoring Equipment on the King Mnt to WTU Crane 138 kV line	ETN101860 11475		n/a	<del>03/02</del> 09/02
<del>Re-conductor 46.79 miles of 138 kV from N. McCamey to Big Lake (2x795 ACSR)</del>	<del>ETN101863 10384</del>	<del>46.79</del>	<del>Exempt Line</del>	<del>06/06</del>

<i>Project Number</i>	<i>Title</i>	<i>TP/PM</i>	<i>Type</i>	<i>TSP</i>	<i>Status</i>
TP-2001-014	<del>Desert Sky</del> Indian-Mesa I Wind Generation Interconnection	GR / BM	IPP	WTU	IA Executed

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Desert Sky I Wind Farm generation	Interconnection	Desert Sky I Wind Farm generation in Pecos County

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Interconnect Desert Sky I 80 MW wind generation facility	ETN101867 10450		Customer Line	05/01

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas - Rio Pecos to Mesa View 138 kV	Ft. Lancaster 69/138 kV autotransformer exceeds its emergency rating	Convert 69 kV North McCamey to Mesa View line to 138 kV with 2x795 ACSR conductor and double circuit capable structures, add new switching station at Mesa View tap, add switching station at West Yates Tap, and move North McCamey 138/69 kV autotransformer to West Yates Switch

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Install Line Monitoring Equipment on the North McCamey to Big Lake 138 kV line	ETN101868 11460		n/a	<u>03/0209/02</u>
System protection and interrupting devices as result of re-conductors and new lines	ETN101869 11456		n/a	<u>06/0209/03</u>
Over current relay West Yates Tap to Iraan 69 kV	ETN101870 11449		n/a	<u>06/0212/02</u>
Re-build 13.46 miles of 69 kV from North McCamey to Tippet to 138 kV with 2x795 ACSR and DC structures, Operated at 69 kV	ETN101880 10423	13.5	Exempt Line	12/02
Re-build 9.98 miles of 69 kV Tippet to West Yates Switch Station 138 kV with 2x795 ACSR and DC structures <u>and operated at 69 kV</u>	ETN101876 11462	10.0	Exempt Line	05/03
<u>Add West Yates and Tippet load to Mesa View 138 kV</u>	<u>ETN101879 11461</u>		<u>Exempt Substation</u>	<u>04/03</u>
<del>Convert Tippet 69 kV substation to 138 kV</del>	<del>ETN101874 11463</del>		<del>n/a</del>	<del>09/03</del>
<del>Convert West Yates Pump 69 kV Substation to 138 kV</del>	<del>ETN101879 11461</del>		<del>n/a</del>	<del>09/03</del>
Convert McCamey 69 kV substation to 138 kV	ETN101873 11459		n/a	09/03
Add new West Yates 138 kV Switching Station (five position ring) and move North McCamey 69/138 kV auto to West Yates	ETN101871 10483		Exempt Substation	09/03
<u>Convert 23.5 miles of 69 kV North McCamey to West Yates Switch Station to 138 kV</u>		<u>23.5</u>	<u>Exempt Line</u>	<u>09/03</u>
Convert 4.5 miles of 69 kV from West Yates Switch Station to Mesa View to 138 kV with 2x795 ACSR and DC structures	ETN101878 11458	4.5	Exempt Line	<u>08/0309/03</u>
<del>Add new Mesa View 138 kV Switch Station (five position ring)</del>	<del>ETN101872 10480</del>		<del>Exempt Substation</del>	<del>09/03</del>
Re-build 5.57 miles of 138 kV from Mesa View to Mesa View Switch Station to 138 kV with 2x795 ACSR and DC structures	ETN101875 11451	5.6	Exempt Line	01/04

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<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas - Crane to Rio Pecos 138 kV	Rio to WTU Crane 69 kV line exceeds its emergency rating	Convert 69 kV Rio Pecos to WTU Crane line to 138 kV with 2x795 ACSR and double circuit capable structures

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Convert 23 miles of 69 kV from Rio Pecos - WTU Crane to 138 kV with 2x795 ACSR and DC structures	ETN101881 10366	23.0	Exempt Line	<del>10/04/12/03</del>
Add new 138 kV line terminal @ Rio Pecos	ETN101855		n/a	<del>10/04/12/03</del>
Convert Spudder Flat 69 kV substation to 138 kV	ETN101856 10372		n/a	<del>10/04/12/03</del>

<i>Project Number</i>	<i>Title</i>	<i>TP/PM</i>	<i>Type</i>	<i>TSP</i>	<i>Status</i>
TP-2001-015	<del>Desert Sky</del> Indian Mesa II Wind Generation Interconnection	GR / AB	IPP	WTU	IA Executed

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Desert Sky II Wind Farm generation	Interconnection	Desert Sky II Wind Farm generation in Pecos County

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Desert Sky II 80 MW wind generation facility	ETN101882 11470		Customer Line	10/01

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas - Crane to Odessa EHV 138 kV	N. McCamey to Big Lake 138 kV line exceeds its emergency rating	Construct 138 kV Friend Ranch to Twin Buttes line with 2x795 ACSR conductor and double circuit capable structures

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Overcurrent relay Rio Pecos to McCamey 69 kV	ETN101883 11471		n/a	<del>06/02/02</del>
Add new 138 kV terminal at Twin Buttes	ETN101884 10475		n/a	<del>09/05/02/06</del>
Add new 138 kV terminal at Friend Ranch	ETN101885 10477		n/a	<del>09/05/02/06</del>
Add new 70 mile 138 kV line from Friend Ranch to Twin Buttes with 2x795 ACSR and DC structures	ETN101886 10449	70	To be filed	<del>07/05/03/06</del>

**(04/02 posting assumed no CCN intervention, 10/02 posting includes CCN intervention, which is now anticipated)**

<i>Project Number</i>	<i>Title</i>	<i>TP/PM</i>	<i>Type</i>	<i>TSP</i>	<i>Status</i>
TP-2001-016	Capital Hill Wind Generation Interconnection	GR / BM	IPP	WTU	Proposed

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Capital Hill Wind Farm	Interconnection	Capital Hill Wind Farm generation in Upton County

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Interconnect Capital Hill 60 MW wind generation facility <u>at Rio Pecos</u>	ETN101887 10386		Customer Line	<u>03/0209/03</u>

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas - Fort Lancaster to Mesa View Switching Station 138 kV line	Rio to North McCamey 138 kV line exceeds its emergency rating	Re-conductor 138 kV Rio Pecos to North McCamey line with <u>double circuit</u> 2x795 ACSR conductor <u>and double circuit capable structures</u>

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Re-build 9.67 miles of 138 kV from Rio Pecos to North McCamey with 2x795 ACSR and DC structures	ETN101894 10387	9.67	Exempt Line	<u>03/05-05/04</u>
<u>Add second circuit to the Rio Pecos to North McCamey 138 kV 2X795 ACSR</u>		9.67	To be filed	12/04

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas - <u>Rio Pecos to North McCamey 138 kV</u>	Rio to Mesa View 138 kV line exceeds its emergency rating	Re-conductor 138 kV Rio Pecos to Mesa View Switching Station line with 2x795 ACSR conductor and double circuit capable structures

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
System protection and interrupting devices as result of re-conductors and new lines	ETN101888 11440		n/a	03/02
Upgrade Indian Mesa substation bus to 2x795 ACSR	ETN101892 11441		n/a	03/04
Re-conductor 27.13 miles of 138 kV from Rio Pecos to Mesa View Switch Station with 2x795 ACSR and DC structures	ETN101893 10388	27.13	Exempt Line	08/04

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas - Rio Pecos to Indian Mesa 138 kV	Mesa View Switching Station to Ft. Lancaster 138 kV line exceeds its emergency rating	Re-conductor 138 kV Mesa View Switching Station to Ft. Lancaster line with 2x795 ACSR conductor and double circuit capable structures

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Re-conductor 19.8 miles of 138 kV from Mesa View Switch to Ft. Lancaster with 2x795 ACSR and DC structures	ETN101895 10396	19.8	Exempt Line	02/05

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Addition of 750 MW of wind generation in West Texas	McCamey area voltages fall below <u>95% and rise above 105%</u>	<u>Add 28.8 MVAR 138 kV Capacitor Bank and 2x20 MVAR reactors @ Rio Pecos</u> <u>Add 15 MVAR Capacitor Bank @ Mesa View Switching Station 138 kV, 15 MVAR Capacitor Bank @ West Yates Switching Station 138 kV, and 15MVAR Capacitor Bank @ Ft. Lancaster 138 kV</u>

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
Add 28.8 MVAR 138 kV Capacitor Bank and 2x20 MVAR reactors @ Rio Pecos		28.8 MVAR cap	n/a	04/03
<del>Add 10 MVAR and 15 MVAR 138 kV Capacitor Banks @ West Yates</del>	<del>ETN101889 10360</del>	<del>15 MVAR cap</del>	<del>n/a</del>	<del>09/03</del>
<del>Add 10 MVAR and 15 MVAR 138 kV Capacitor Banks @ Mesa View Switch</del>	<del>ETN101891 10410</del>	<del>15 MVAR cap</del>	<del>n/a</del>	<del>09/03</del>
<del>Add 10 MVAR 69 kV Capacitor Bank @ Ft. Lancaster</del>	<del>ETN101911 10417</del>	<del>10 MVAR cap</del>	<del>n/a</del>	<del>03/03</del>

<i>Project Number</i>	<i>Title</i>	<i>TP/PM</i>	<i>Type</i>	<i>TSP</i>	<i>Status</i>
	Cielo/Noelke Hill Wind Generation Interconnection	GR / CS	IPP	LCRA	IA Executed

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Noelke Hill 240 MW Wind Farm	Interconnection	Upgrade West Yates Switching Station and add second circuit to the North McCamey to West Yates Switching Station 138 kV line

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
<u>Interconnect Noelke Hill Wind 240 MW</u>			Customer Line	10/03
<u>Add new 138 kV Terminal at West Yates Switching Station for IPP</u>			n/a	10/03
<u>Add second circuit to the North McCamey to West Yates Switching Station 138 kV line</u>			To be filed	12/04
<u>Add new 138 kV Terminals at West Yates Switching Station and North McCamey</u>			n/a	12/04

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Wind generation in excess of 1050 MW in the McCamey area - TU Crane to Odessa EHV 138 kV	North McCamey to Big Lake 138 kV line exceeds its emergency rating	Addition of a Twin Buttes to North McCamey 2x1590 ACSR 345 kV line with double circuit capable structures, install 600 MVA autotransformer at North McCamey and second 300 MVA autotransformer at Twin Buttes

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
<u>Add new 138/345 kV 600 MVA autotransformer at North McCamey with associated terminations</u>			n/a	12/07
<u>Add new 110 mile 345 kV Twin Buttes to North McCamey line with 2x1590 ACSR and DC structures</u>		110	To be filed	12/07
<u>Add new 138/345 kV 300 MVA autotransformer at Twin Buttes with associated terminations</u>			n/a	12/07

<i>Project Number</i>	<i>Title</i>	<i>TP/PM</i>	<i>Type</i>	<i>TSP</i>	<i>Status</i>
	West Texas Regional Planning Group	GR / BM	ERCOT	LCRA	Proposed

<i>Contingency</i>	<i>Problem</i>	<i>Solution</i>
Wind generation in excess of 1500 MW in the McCamey area - North McCamey to Twin Buttes 345 kV line	North McCamey to Big Lake 138 kV line exceeds its emergency rating	Addition of a Odessa to North McCamey 2x1590 ACSR 345 kV line with double circuit capable structures, install two additional 600 MVA autotransformers at North McCamey and addition of West Yates to Ft. Lancaster 138 kV line

<i>Transmission Improvement Description</i>	<i>CI IDs</i>	<i>Mileage</i>	<i>CCN</i>	<i>In-service date</i>
<u>Rebuild 23.8 mile 69 kV West Yates to Ft. Lancaster line to double circuit 69/138 kV with 2x795 ACSR (existing distribution substations to remain 69 kV)</u>		24	proposed	01/06
<u>Add new 138 kV termination at West Yates</u>			n/a	01/06
<u>Add new 138 kV termination at Ft. Lancaster</u>			n/a	01/06
<u>Add two new 138/345 kV 600 MVA autotransformers at North McCamey with associated terminations</u>			n/a	12/07
<u>Add new 50 mile 345 kV Odessa to North McCamey line with 2x1590 ACSR and DC structures</u>		50	proposed	12/07
<u>Add new 345 kV termination at Odessa</u>			n/a	12/07

# WEST TEXAS WIND GENERATION TRANSMISSION IMPROVEMENT PLAN

