

## **Long-Range Planning**

## **Comments Regarding ERCOT's Long-Term Transmission Analysis 2010 - 2030**

**April Pinkston, PE** 

ERCOT Regional Planning Group Meeting Austin, Texas July 15, 2011

## **Our System**

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- Wires Only" Company formerly known as TXU Electric Delivery (DPL, TESCO & TPL)
- Substitution System Substitution System Substitution System
- § More than 6,300 Transmission Circuit Breakers
- § More than 983 Stations
- **§** More than 1,588 Power Transformers
- § More than 172 Autotransformers
- § More than 15,300 miles of Transmission:
  - § 5,325 circuit miles of 345 kV
  - 7,080 circuit miles of 138 kV
  - § 2,899 circuit miles of 69 kV
- § More than 103,000 miles of distribution lines
- Solution Series Seri
- § Employs ~3,800 people
- § Keeps the lights on for more than 7 million Texans

**Our Objectives** 

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#### Enhance the Long-Term Study Task Force (LTSTF) through Transmission Service Provider (TSP) input

Provide input that will enhance the quality and feasibility of the longterm study

Propose projects that can be used to resolve transmission limitations experienced while performing transmission analysis

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## Transmission Service Providers (TSPs) help the long-term study

- Knowledge of the system
- Individual voltage criteria
- Identified future projects
- Information regarding developmental restrictions
- Information on standard equipment and installations
- Information on available expansion capability
- Increase feasibility



#### Lines

- 345 kV Circuit Capacity of 5000 Amps (suggest modeling as bundled 1926.9 kcml ACSS TW conductor)
- Double Circuit Capable Structures
- Maximize use of existing Right of Way
- Provide full capacity for new Right of Way
- 138 kV system will need new lines, new stations and many upgrades to meet load projections
- Voltage adversely affected by exceeding circuit surge impedance

#### Line Impedances and Cost Estimates

- 30% adder due to variations in line route and length
- 50% to 100% increase may be needed in highly urban areas
- Cost adder for change to monopole

### 345/138 kV Autotransformers

600 MVA rating (standard size and configuration)

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## **Design Limitations**

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## Non-standard Equipment Proposals

- Autotransformer size
- Increased cost
- Complicates replacement & maintenance

## **Developmental Restrictions**

- Lack of available space within existing substations
- Lack of available ROW/Easement
- 345 kV switching stations proposed where there are no 345 kV lines
- Fully developed areas

## Non-standard Installation Proposals

• Size of proposed switched shunt devices to be installed in a station

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Taking lines out of service creates a short-term adverse impact on reliability and the market

### **Construction timeline very constraining**

Multiple clearances at the same time may not be possible

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## Consideration of Environmental Restrictions and Land Owner Rights

### **Environmental Agencies**

- U.S. Army Corp of Engineers
- Texas Commission of Environmental Quality
- Texas Parks and Wildlife
- U.S. Fish and Wildlife

**Political Acceptance** 

Land Owner Acceptance

**Local Zoning Ordinances** 

Number of habitable structures affected

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## West Plano Proposed Project in a Highly Developed Area





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## **Underground Consideration**

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Significantly Higher Cost Above Traditional Transmission 1500% to 3000% Increase

## **Design Limitations**

Size and number of cables limited
Capacity limited due to heat
3,200 Amps or less

Repairs Are Very Complex Longer Time Out

#### Installation

Significant Right of Way Impact

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## **Future Long-Range Project Proposals**

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### Autotransformer Replacements

Eagle Mountain #1

Eagle Mountain #2

Benbrook

Everman #1

Everman #2

Norwood #1

Venus Switch

Renner Switch #1

NW Carrollton

Allen Switch #1

Autotransformer Installations at Existing Stations

Cedar Hill Switch #2

DeSoto Switch #2

Seagoville Switch #2

Watermill #2

Hutto #2

Sargent Road #2



## **Future Long-Range Project Proposals**



#### New 345 kV Switching Stations with Autotransformer Installations

Hicks	2 Autotransformers
Tarrant West	2 Autotransformers
Trinity	2 Autotransformers
Mountain Creek	2 Autotransformers
North Lake	2 Autotransformers
Lavon	2 Autotransformers
Hebron	2 Autotransformers
Lake Hubbard	2 Autotransformers
Payne	2 Autotransformers
Prairie Creek	2 Autotransformers



## **Future Long-Range Project Proposals**

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Line Additions	
Benbrook – Decordova 345 kV 2 <sup>nd</sup> circuit	
Jacksboro Switch – Krum West 2 <sup>nd</sup> circuit	
Benbrook – Tarrant West – Parker 345 kV line	
Tarrant West – Eagle Mountain/Calmont double-circuit (DCKT) 138 kV line	
Forney – Sargent Road 345 kV line	
West Levee – NW Carrollton 345 kV line	
Watermill – Navarro DCKT 345 kV line	
Navarro – Lake Creek DCKT 345 kV line	
Whitney – Johnson Switch DCKT 345 kV line	
Hicks – Elizabeth Creek DCKT 138 kV line	
Liggett – Trinity 345 kV line	
Sandow Switch – Temple Switch DCKT 345 kV line	
Payne – Valley South 345 kV line	

## **Future Line Additions**

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## **Future Long-Range Project Proposals**

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#### 345 kV Line Upgrades

Benbrook – Decordova 345 kV line

Collin Switch - NW Carrollton 345 kV line

Trinidad – Richland Chambers DCKT 345 kV line

## 345 kV Line Upgrades

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Neylandville

Farmersville

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#### SPENCER Frisco ellite TMPA Cumby GREENVILLE Allison Allen SwOLINGER Woodie 12 Colony TMP Mel Bridgeport rmot Argyle Burro GEUS Lake FEC Bridgeport Lewisville Explorer Rhome Cross Lake Liberty Grapevine Timber Eagle Mountain McK Lake RAINS WISE Royse Tawakani Loke Roanoke Cíty **NW Carroliton** Lone Quinlan Alliance Springtown Oak Iron Wataua Bridge ountai Bridge KWAL Cove Brigh Stor R Duck Sw. er ۶K/ FMAN rd orney AS MAIN Terrell Weatherford Wills Point Rose KCEC Logur Hill Vista Live O Glenn Kaufman 668898ille Sw. Pine Lake Benbrook TVEC Conton orners DALLAS Benbrool a India Oak Pool Grove De soto Löke Canton JOHNSON Lake Granbury TVEC S errett Explorer illior VAN ZANDT RCE Cedar Sw. Ô .Kemp Ennis Sw. Creek Walton Joshu Chaparral Steel Griffith Crisp Lake Mabank DeCordova Ennis Eustac lvarada Waxahaci **(5)** MEI Fores NEEC cord AGleburne ENDERSON Reager S. prings Ennis Alma 🔨 Grove Squaw Creek fort Mayned Forrest OwLake 45 $\Delta$ Bardwell, Pat Grandview Clebur ne Loke Malakoff Rice Chatfield Nipak City Trinidad Mil Rio Visto Kerens Itasca Cors ana SOMERVELL ELLIS Willow arry HILL Powell Equilon orings um Coon Creek Frost Walnut Springs Blanton Good Lake Mertens Cors. Mob Whitney Eureka Navarro Navarro Mills ANDERSON Navarro Hillsboro Mills Blackfoot BOSQUE Lake Haney 🌾 hat Bynum Richland Creek Amoco Meridian Abirfield WHITNE **Richland Chambers**

Collin

St

McKinney

Navo

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## **High Voltage Direct Current (HVDC)**

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Transmit large amounts of power into Dallas/Fort Worth

**Maximize flow control** 

Provides voltage control, damps oscillations and increases stability

**HVDC Light IGBT Technology** 

Replace autotransformers by connecting from 345 kV to 138 kV

Not sensitive to line route/length (does not affect capability or flow)

Consider Three to Six 500 MW to 800 MW HVDC lines injecting into DFW



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## Dynamic simulation analysis should be performed

- System stability
- Angular stability
- Voltage control and response
- Fault Induced Delayed Voltage Recovery (FIDVR) Blackout
- Added significant fixed shunt capacitors (~8,000 Mvar)
- Need Dynamic Reactive Devices (16 300 Mvar SVC's)
- High reactive losses due to exceeding circuit surge impedance
- HVDC may provide possible solution
- Significant cost adders for reactive power facilities, dynamic reactive devices, series capacitor compensation, FACTS and Smart Grid



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## **Evaluate Generation Development North Side of DFW**

- Near West Krum
- Near Anna
- Near Farmersville
- Existing retired or mothballed generation sites





#### In order to bolster the long term study process, Oncor urges:

- Incorporation of TSP and other stakeholder comments in the long term study will enhance the quality and results to the benefit of ERCOT DOE and the market
- This involvement bridges theory and practice by recognizing differences in operating regions and specific plans; e.g. Oncor has (16) auto transformer projects, (20) new 345kV station projects, (13) new line projects, and (3) upgrades
- Only through TSP involvement can the feasibility be improved around local physical design limitations, land & right-of-way plans, standard equipment, and existing projects





# Questions? Further Discussion

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