



TNMP SYSTEM RELIABILITY & IMPROVEMENT OVERVIEW

Presented by
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History

Originally Texas-Louisiana Power Co. incorporated 1925

A Conglomerate acquiring various utilities and municipalities during the late 1920's

Acquisitions included ice plants, bottling plants, water, gas and electric systems in multiple states.

Purchased the Lewisville electric system in 1927 for \$35,000 from the owner of the local cotton gin and a local banker.

Population: 1930 – 850 Today – 106,000

TNMP's eventual focus became electricity serving more than 71 incorporated cities and approximately 250,000 customers with over 365 employees

❖ TNMP has proudly served Lewisville for 91 years

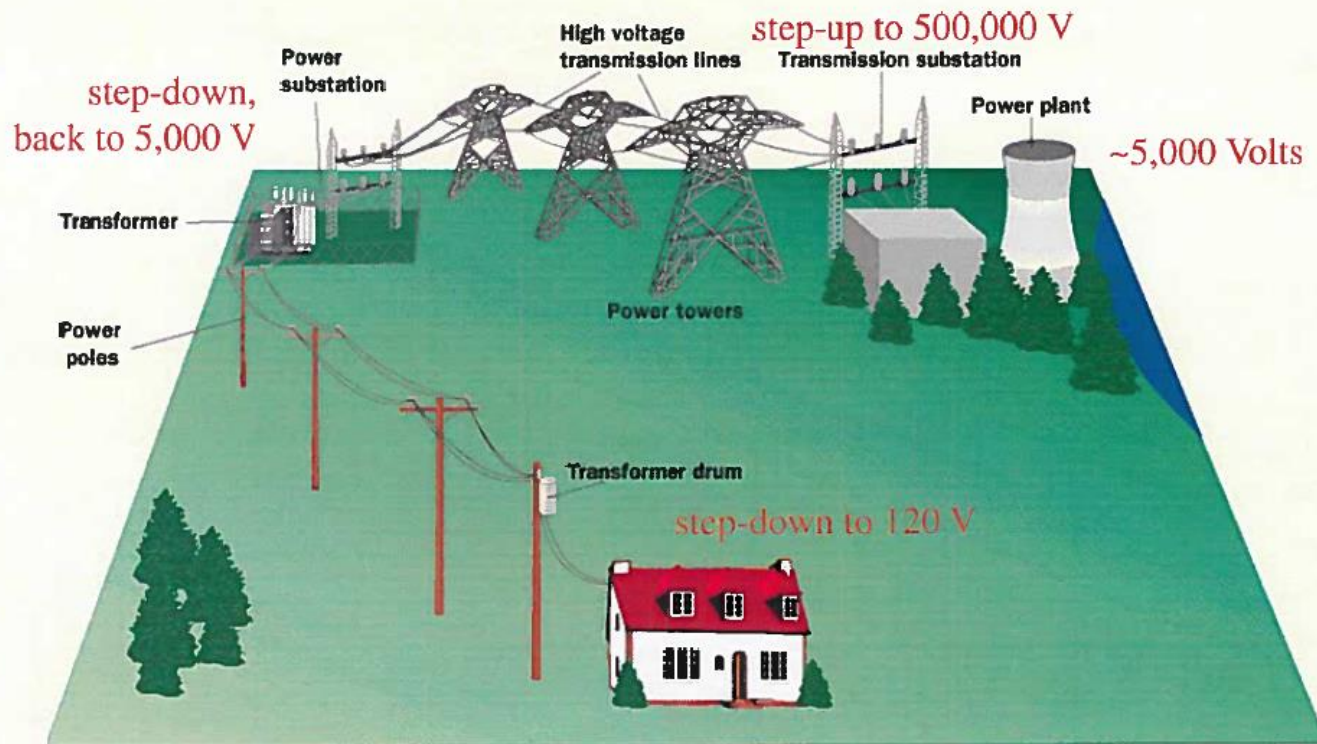


1937 Lewisville Good Roads Committee

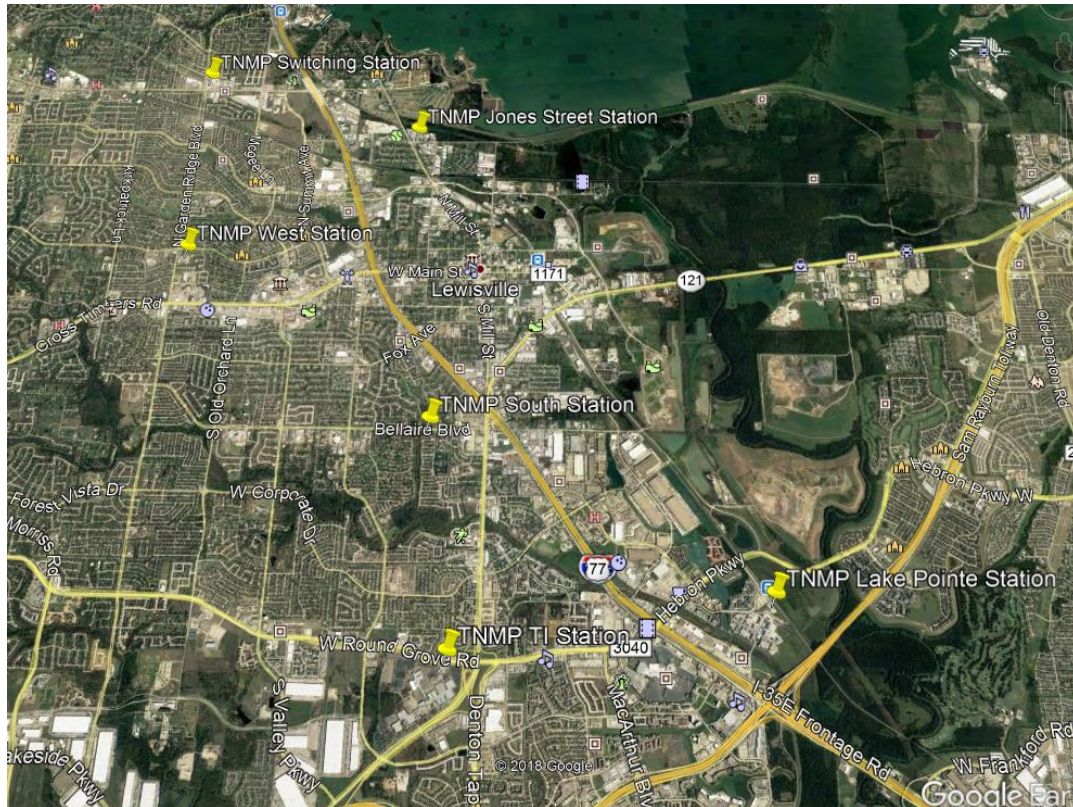
Generation to Meter Overview

UCSD: Physics 8; 2006

A way to provide high efficiency, safe low voltage:



High Voltage Transmission Lines
Low Voltage to Consumers



TNMP LEWISVILLE SUBSTATIONS

- Transmission Loop Fed from Oncor with feeds from North & South.
- Each Substation has at least two transmission feed sources.
- Five Distribution Substations
- One Transmission Switching Yard
- ESID Served 44,372 [meter accts]

Capacity & Load

Station	Dist Ckts	Dist Voltage	July 2018 Peak	Available MVA	Transformers
West	9	12.5Kv	66 MVA	126 MVA	3 - 42 MVA
South	6	12.5Kv	63 MVA	84 MVA	2 - 42 MVA
Jones	5	12.5Kv	34 MVA	84 MVA	2 - 42 MVA
TI Station	8	12.5Kv	47 MVA	84 MVA	2 - 42 MVA
	2	14.4Kv	12 MVA	168 MVA	2 - 84 MVA
Lake Pointe	7	14.4Kv	70 MVA	168 MVA	2 - 84 MVA
Totals	37		292 MVA	714 MVA	

System Performance

Outage Durations

Note: TNMP files an annual service quality report for all circuits with the PUCT found @ <https://www.puc.texas.gov/industry/electric/reports/sqr/default.aspx>

System Average Interruption Duration Index (SAIDI)

SAIDI = Total Outage Minutes / Total Customers

Rank	SAIDI	2015	2016	2017	2018 YTD	Avg.
	Lewisville	32.43	64.86	55.01	24.90	44.30
1	El Paso	51.50	43.06	47.03		47.20
2	TNMP	58.14	61.27	75.28	48.28	60.74
3	AEP TNC	84.71	81.61			83.16
4	Oncor	90.84	89.58	79.26		86.56
5	SPS	138.45	76.81	119.98		111.75
6	Centerpoint	154.16	119.81	102.73		125.57
7	AEP Texas Inc.			133.19		133.19
8	Sharyland	171.85	132.95	101.76		135.52
9	AEP TCC	162.98	150.94			156.96
10	Entergy	207.60	173.20	174.82		185.21
11	SWEPSCO	206.06	173.13	179.76		186.32
	AVERAGE	140.96	115.68	117.32		124.65

System Performance

Outage Frequency

System Average Interruption Frequency Index (SAIFI)

$$\text{SAIFI} = \text{Total \# Interruptions} / \text{Total Customers}$$

<u>Rank</u>	<u>SAIFI</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>Avg.</u>
	Lewisville	0.38	0.58	0.46	0.37	0.45
1	El Paso	0.53	0.41	0.58		0.51
2	TNMP	0.53	0.64	0.73	0.45	0.59
3	AEP TNC	0.79	0.86			0.83
4	SPS	1.00	0.77	0.90		0.89
5	Oncor	0.94	0.97	0.86		0.92
6	Centerpoint	1.46	1.22	1.04		1.24
7	AEP Texas Inc.			1.27		1.27
8	Entergy	1.51	1.40	1.28		1.40
9	AEP TCC	1.40	1.42			1.41
10	Sharyland	1.84	1.56	1.21		1.54
11	SWEPSCO	1.71	1.73	1.50		1.65
	AVG:	1.11	1.08	1.01		1.07

Note: TNMP files an annual service quality report for all circuits with the PUCT found @ <https://www.puc.texas.gov/industry/electric/reports/sqr/default.aspx>

Outage Types & Tracking

- **Top Four Outage Causes**
 - **Weather Related**
 - **Vegetation**
 - **Wildlife**
 - **Traffic Related**



Year	Month	Interruption Type	Area	Interruption Date	Substation	# Customers	Circuit	Customers Interrupted	Cust Outage Mins	Outage Code	Reason Code	Date Off	Time Off	Time On
2018	April	Distribution	Lewisville	4/18/2018	West Substation	2393	1223	1117	197709	Forced	Urd Cable Failure	4/18/2018	7:52AM	10:49AM
2018	March	Distribution	Lewisville	3/16/2018	Texas Instruments Substation	1421	1012	1425	85500	Forced	Arrester Failure	3/16/2018	11:17AM	12:17PM
2018	May	Distribution	Lewisville	5/13/2018	Texas Instruments Substation	2283	1033	2283	136980	Forced	Foreign Object On Line	5/13/2018	7:48PM	8:48PM
2018	April	Distribution	Lewisville	4/18/2018	West Substation	2393	1223	1073	139490	Forced	Urd Cable Failure	4/18/2018	7:52AM	10:02AM

2017 & 2018

Major Outages

Year	Month	Date	Time Off	Station	Circuit	# Customers	Outage Min	Customer Outage Mins	Reason Code	Contributing Reason
2017	January	01/02/17	5:19AM	Texas Instruments Substation	1033	2265	162	366930	Phase Off Insulator	Weather/Wind
2017	March	03/29/17	2:43AM	South Substation	1103	1077	97	104469	Trees	Weather/Wind
2017	April	04/29/17	4:51AM	Lakepointe Substation	2544	731	106	77486	Snake	Station Recloser Failure
2017	May	05/09/17	6:35AM	Lakepointe Substation	2544	729	96	69984	Snake	catastrophic failure
2017	June	06/24/17	12:05AM	South Substation	1103	1078	90	97020	Lightning	Weather/Wind
2017	September	09/26/17	7:50AM	Lakepointe Substation	2512	2304	11	25344	Urd Cable Failure	Open to clear fault
2017	September	09/26/17	7:50AM	Lakepointe Substation	2544	779	11	8569	Urd Cable Failure	Open to clear fault
2017	September	09/26/17	5:25AM	Lakepointe Substation	2512	2304	120	276480	Urd Cable Failure	Unknown
2017	November	11/10/2017	4:37PM	Lakepointe Substation	2544	544	53	28832	Vehicle Hit	catastrophic failure swithgear
2017	November	11/13/2017	5:32PM	Lakepointe Substation	2540	556	128	71168	Fused Swithc Burned Up	Crane Or Dragline
2018	January	1/26/2018	1:35AM	West Substation	1235	96	215	20640	Trees	Weather/Wind
2018	March	3/16/2018	11:17AM	Texas Instruments Substation	1012	1425	60	85500	Arrester Failure	Ckts tied for Const tripped both
2018	March	3/16/2018	11:17AM	Texas Instruments Substation	1033	2273	54	122742	Arrester Failure	Ckts tied for Const tripped both
2018	April	4/18/2018	7:52AM	West Substation	1223	1117	177	197709	Urd Cable Failure	Unkown FM1171 Crossing
2018	April	4/25/2018	4:45PM	South Substation	1103	1647	44	72468	Capacitor Failure	Catastrophic Failure
2018	May	5/13/2018	7:48PM	Texas Instruments Substation	1033	2283	60	136980	Foreign Object On Line	Milar Balloon
2018	August	8/23/2018	7:19AM	Lakepointe Substation	2508	468	55	25740	Fault Not Identified after patrol	Unkown



Annual Reliability Review and Planning

- January of each year each Business Unit submits annual reliability and maintenance plan to improve system performance.
- Includes:
 - Review of worst performing SAIDI CKTS [LV-37ea]
 - Review of outage causes and types
 - Transmission Inspected twice annually
 - 20% of Distribution ckts inspected once annually
 - Tree Trimming scheduled
 - Engineering analysis/reviews system protection schemes and equipment
 - WO's developed and system improvements scheduled

Goal Is to Improve Over Previous Year

Outage Frequency					Outage Frequency				
2018 LV CKT Rank	Substation	CKT	2017	2018 YTD SAIFI	2018 LV CKT Rank	Substation	CKT	2017	2018 YTD SAIFI
30	Texas Instruments Substation	1033	1.022	2.039	15	Lakepointe Substation	2544	3.936	0.040
29	Lakepointe Substation	2508	0.518	1.677	14	Lakepointe Substation	2516		0.038
28	West Substation	1223	0.086	1.100	13	West Substation	1203		0.024
27	West Substation	1235	0.239	1.094	12	Jones Street Substation	1413	0.272	0.024
26	South Substation	1103	2.248	1.062	11	South Substation	1109	0.057	0.016
25	South Substation	1108	0.436	1.035	10	Texas Instruments Substation	1032	0.098	0.014
24	Texas Instruments Substation	1012	0.006	1.010	9	South Substation	1104	0.050	0.013
23	Jones Street Substation	1433	0.503	0.241	8	Texas Instruments Substation	1013	0.128	0.011
22	Jones Street Substation	1431	0.091	0.141	7	Jones Street Substation	1411	0.219	0.009
21	Jones Street Substation	1412	1.183	0.139	6	West Substation	1202	0.055	0.009
20	Lakepointe Substation	2512	1.941	0.088	5	Lakepointe Substation	2536	0.032	0.007
19	West Substation	1201	0.004	0.071	4	West Substation	1234	0.009	0.005
18	South Substation	1107	0.057	0.060	3	Lakepointe Substation	2540	2.032	0.005
17	West Substation	1222	0.052	0.056	2	South Substation	1102	0.027	0.002
16	West Substation	1221	0.318	0.055	1	West Substation	1233	0.002	0.002



Outage Response

- Customer reports outage to TNMP Distribution Operations Center. [DOC]
- Outage dispatched Immediately to on-call Personnel.
- Lewisville has one supervisor on call each week who also serves as a local dispatcher for emergency system switching needs and assist with all major outages.
- In addition, two lineman are on call each week.
- On major holidays, one four man crew is placed on call for that week.
- Lewisville has one four man substation crew that has one technician on call each week and is available to assist with all substation issues.





Other Resources

- Lewisville has three four man line crews & three full time service men qualified to work system.
- Access to an additional six line crews and one substation crew in NTX.
- Various contractor crews.
- Access to all TNMP company crews if needed.
- Active members of both the Texas Mutual Assistance Group [13 companies] and the South East Electrical Mutual Asst Group. [27 Companies]



System Investment

Year	Substation Cap Improvement	Distribution Reliability Cap Improvement	Total
2014	\$ 2,255,744	\$1,244,358	\$ 3,500,102
2015	\$ 104,696	\$ 1,252,247	\$ 1,356,943
2016	\$ 265,525	\$ 1,331,940	\$ 1,597,465
2017	\$ 1,771,466	\$ 1,277,982	\$ 3,049,448
2018	\$ 815,000	\$ 1,293,719	\$ 2,108,719

- Lewisville Average Annual Operating Budget \$4,400,000
- Note: Specific System Improvement Projects Designed and Budgeted for Separately in 5 year operating plan.