

## Distribution System Loss Factors AEP-Texas Central Company (TCC) and AEP-Texas North Company (TNC)

The AEP companies are submitting for use during calendar year 2016 Coefficients for use in determining the Settlement Interval Loss Factors as defined in the ERCOT Protocols for both AEP-TCC and AEP-TNC. The required coefficients are derived from loss analysis completed in June 2015 for the AEP TCC and AEP TNC transmission and distribution systems based on calendar year 2013 system operation. These analyses referred to as “Loss Studies” are applicable to the current TCC and TNC service areas respectively.

The AEP loss studies are used to develop energy expansion factors for selected system voltage levels that would be used to adjust metered energy deliveries to the generation level. The energy expansion factors are applicable to annual and monthly energy for cost allocation, rate design and billing purposes. These energy expansion factors are applicable to the average of all load intervals from the minimum to the maximum over the year. Thus the energy expansion factors represent the average distribution losses and are the basis of using the system loss studies to define the required SILF coefficients for the Protocols.

Since the energy loss studies are for the entire system including the transmission voltage level, the results are adjusted to be applicable to the distribution system only. This calculation is shown on Attachment A in column “d”. In addition, the loss factors as determined in the loss studies represent expansion factors to be applied to metered energy to determine energy at a higher level on the system. In column “e” the expansion factors are converted to average loss factors that are used for determining the losses for the respective service levels.

The coefficients submitted are calculated based on the allocated losses and voltage level deliveries (sales) used to determine the energy expansion factors in the loss studies. Attachment B shows the no-load and load portion of losses for the distribution system as shown in the loss studies. These amounts are summed for the distribution primary and distribution secondary systems and the ratio of no-load losses to total losses for the voltage level is determined. The proper determination of losses allocable to deliveries from a particular voltage level is performed in Attachment C. The simple ratio of no-load and load losses for the voltage level is adjusted to account for actual deliveries (sales) at the respective voltage level which results in a ratio applicable to the loss factor for the delivery voltage level. The resulting coefficients are calculated from the average loss factors and the loss ratios in Attachment A.

The coefficient  $F_1$  is based on the portion of losses that vary as the square of the distribution load. The coefficient  $F_3$  is based on the portion of losses that does not vary with the load level. The coefficient  $F_2$  is zero because there is not a portion of losses that can be identified as varying linearly with the load.

The resulting SILF equation coefficients are as follows:

		<u><math>F_1</math></u>	<u><math>F_2</math></u>	<u><math>F_3</math></u>
AEP-TCC	Secondary	0.02710	0	0.03236
	Primary	0.02143	0	0.01106
		<u><math>F_1</math></u>	<u><math>F_2</math></u>	<u><math>F_3</math></u>
AEP-TNC	Secondary	0.02424	0	0.03677
	Primary	0.00848	0	0.02135

The DLF codes that correspond to the generic rate classifications for the AEP DSP are as follows:

<u>DSP Rate Classification</u>	<u>DLF Code</u>
Residential	A
General Service < 10 kw	A
General Service > 10 kw	A
Lighting	A
Primary	B
Transmission	T

The classifications with a DLF code of A are for delivery voltages up to and including 2400 volt single or 3 phase delta and 2400Y/4160 volt 3 phase service. Delivery voltages higher than this but less than 69 kV are DLF code B. Delivery voltages of 69 kV or higher are DLF code T. Certain exceptions apply to delivery voltages of 2400 volt single or 3 phase delta and 2400Y/4160 volt 3 phase where the primary distribution system in the area is operated at these voltages. Service taken directly from the distribution line in these cases is considered primary and will have a DLF code of "B".

The coefficients for the SILF equation are applicable during calendar year 2016 and AEP will make another submittal in October 2016 to be consistent with the ERCOT Protocols at that time.

Note: Attachments A-C are contained in the pdf file with the file name:  
AEP TCC & TNC SILF 2016.pdf

## Attachment A

## Summary of SILF equation coefficients- 2016

## Texas Central Company (AEP-TCC)

a	b	c	d	e	f	g	h	i	J
SERV LEVL	DLF	ENERGY	ENERGY	Average		No-Load			
CODE	CODE	SYSTEM	DISTRIB	Dist	Load Loss	Loss			
		LOSS	LOSS	Losses	Factor	Factor	F1	F2	F3
(Formula)		Divide by							
		transmission loss		(d-1)/d	(Att C)	(Att C)	e*f		e*g
Secondary	A	1.081140	1.063225	0.059465	0.4557	0.5443	0.02710	0	0.03236
Primary	B	1.050990	1.033574	0.032484	0.6596	0.3404	0.02143	0	0.01106
Transmission	T	1.016850	1.000000						

\* From TCC 2013 System Loss Study

## Texas North Company (AEP-TNC)

a	b	c	d	e	f	g	h	i	J
SERV LEVL	DLF	ENERGY	ENERGY	Average		No-Load			
CODE	CODE	SYSTEM	DISTRIB	Dist	Load Loss	Loss			
		LOSS	LOSS	Losses	Factor	Factor	F1	F2	F3
(Formula)									
				(d-1)/d	(Att C)	(Att C)	e*f		e*g
Secondary	A	1.101580	1.064966	0.061003	0.3973	0.6027	0.02424	0	0.03677
Primary	B	1.066180	1.030743	0.029826	0.2843	0.7157	0.00848	0	0.02135
Transmission	T	1.034380	1.000000						

\* From TNC 2013 System Loss Study

## Attachment B

### Calculation of AEP TCC Electric Distribution Loss Factors- 2016 Ratio of No-Load and Load losses on primary and secondary systems

	Energy Losses, MWh *		
	Load	No-Load	Total
Dist. Substation	33,647	193,865	227,512
Primary Feeders	392,297	0	392,297
Line Transformers	33,216	336,356	369,572
Residential Sec. Lines	71,755	14,034	85,789
Total Primary & Sec	530,915	544,255	1,075,170

#### Distribution System

Primary	425,944	193,865	619,809
Secondary	104,971	350,390	455,361
Total Primary & Sec	530,915	544,255	1,075,170

Primary ratio	0.68722	0.31278
Secondary ratio	0.23052	0.76948

\* From Summary of Sales and Calculated Losses in 2013 Loss Analysis for TCC

### Calculation of AEP TNC Electric Distribution Loss Factors- 2016 Ratio of No-Load and Load losses on primary and secondary systems

	Energy Losses, MWh *		
	Load	No-Load	Total
Dist. Substation	7,888	42,689	50,577
Primary Feeders	110,686	0	110,686
Line Transformers	6,127	97,290	103,417
Residential Sec. Lines	17,075	3,276	20,351
Total Primary & Sec	141,776	143,255	285,031

#### Distribution System

Primary	118,574	42,689	161,263
Secondary	23,202	100,566	123,768
Total Primary & Sec	141,776	143,255	285,031

Primary ratio	0.73528	0.26472
Secondary ratio	0.18746	0.81254

\* From Summary of Sales and Calculated Losses in 2013 Loss Analysis for TNC

## Attachment C

### AEP TCC- Calculation of Electric Distribution Loss Factors- 2016 Portion of Loss Factor Not Sensitive to Load

Voltage Level	At	Input Reqmt. Responsibility Factor	Energy Loss Fraction		Energy, kWh			
			Load	No-Load	Sales*	Load Losses	No-Load Losses	Total
Secondary	Sec. Sales @ Meter	1.028687	0.2305	0.7695	16,986,071,000	112,329,848	374,953,609	487,283,457
	Input to Sec. Level Losses due to Sec. Sales				17,473,354,457			
Primary	Output (=Sec. Input)	1.033574	0.6872	0.3128	17,473,354,457	403,160,094	183,495,088	586,655,181
	Input to Pri. Level due to Sec. Sales				18,060,009,639			
	Pri. Sales	1.033574	0.6872	0.3128	2,353,425,000	54,300,223	24,714,312	79,014,535
	Losses due to Pri. Sales				2,432,439,535			
	Total Input				20,492,449,173			

\* Deliveries at the distribution primary and secondary level are from calendar 2005

#### Distribution System

Losses due to:	Losses, kWh		
	Load	No-Load	Total
Secondary Sales	515,489,941	558,448,697	1,073,938,639
Primary Sales	54,300,223	24,714,312	79,014,535
Total	569,790,165	583,163,009	1,152,953,173

#### Distribution System

	Fraction of Total Loss	
	Load	No-Load
Secondary Sales	0.4800	0.5200
Primary Sales	0.6872	0.3128

**AEP TNC-** Calculation of Electric Distribution Loss Factors- 2016  
Portion of Loss Factor Not Sensitive to Load

Voltage Level	At	Input Reqmt. Responsibility Factor	Energy Loss Fraction		Energy, kWh			
			Load	No-Load	Sales*	Load Losses	No-Load Losses	Total
Secondary	Sec. Sales @ Meter Input to Sec. Level Losses due to Sec. Sales	1.033203	0.7353	0.2647	3,815,830,000 3,942,525,663	93,157,212	33,538,451	126,695,663
Primary	Output (=Sec. Input) Input to Pri. Level due to Sec. Losses due to Sec. Sales Pri. Sales	1.030743	0.1875	0.8125	3,942,525,663 4,063,730,942	22,721,583	98,483,696	121,205,279
	Losses due to Pri. Sales Total Input	1.030743	0.1875	0.8125	1,434,708,000 1,478,815,305 5,542,546,247	8,268,516	35,838,789	44,107,305

\* Deliveries at the distribution primary and secondary level are from calendar 2005

**Distribution System**

Losses due to:	Losses, kWh		
	Load	No-Load	Total
Secondary Sales	115,878,795	132,022,146	247,900,942
Primary Sales	8,268,516	35,838,789	44,107,305
Total	124,147,311	167,860,935	292,008,247

**Distribution System**

	Fraction of Total Loss	
	Load	No-Load
Secondary Sales	0.4674	0.5326
Primary Sales	0.1875	0.8125