

# **DEPARTMENT OF PUBLIC UTILITIES**

## **ELECTRIC SYSTEM CONDITION**

### **ASSESSMENT**



# **Introduction**

The condition assessment is an ongoing effort to evaluate the physical condition of the switches, poles, transformers, and conductors. Field verification and analysis of the system connectivity, equipment identification and safety were performed.

# System Overview

## Los Alamos County

- 236 Miles of Electric Distribution Lines
- 66% Underground
- 34 % Overhead
- Age – From 1960's to Present
- 9045 Customers

# System Overview

## Town site

- 13.2 KV from the LANL Substation
- 2- Tie Circuits to New Switch Station
- 6 Townsite Circuits
- E- A4 Feeder  
( WWTP & WATER WELLS)
- S-6 FEEDER  
( L.A. MEDICAL CENTER)



# System Overview

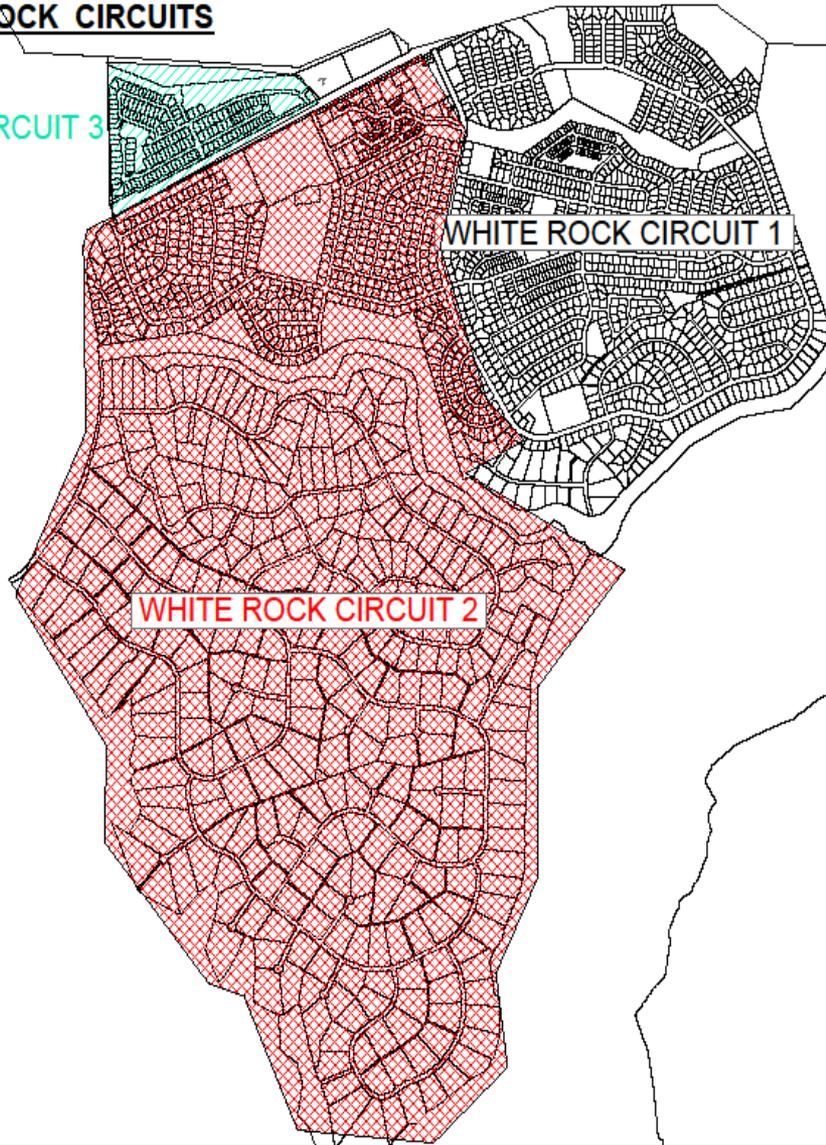
## White Rock

- 12.47 KV from 115KV Norton Line
- Transformers – Unit 1 5000KVA  
New Unit 2 7500 KVA
- Switchgear on Unit 2 with 3 Circuits
- New Switchgear on Unit 1 with 3 Circuits



**WHITE ROCK CIRCUITS**

WHITE ROCK CIRCUIT 3



WHITE ROCK CIRCUIT 1

WHITE ROCK CIRCUIT 2

# **System Components Assessed**

- Switches- ( Padmount & Polemount)
- Transformers ( OH & UG)
- Power Poles
- Substation and Switch station
- Conductors ( OH & UG)
- Manholes, Vaults, Pull Boxes, Conduit
- Meters
- Overcurrent Devices & Regulators

# Switches

- 122 Pad mount Switches
- Service Life Estimated @ 20 Years
- 94% of Switches installed since 2000
- 6% of Switches installed in the 1970's and 1980's

## SWITCHES BY AGE AND CIRCUIT

QUANTITY		< 1979	1980 - 1989	1990 - 1999	2000 - 2006	2006-2019
<b>CIRCUIT 13</b>	<b>25</b>				<b>2</b>	<b>20</b>
<b>CIRCUIT 14</b>	<b>16</b>				<b>5</b>	<b>11</b>
<b>CIRCUIT 15</b>	<b>31</b>				<b>16</b>	<b>15</b>
<b>CIRCUIT 16</b>	<b>15</b>				<b>4</b>	<b>11</b>
<b>CIRCUIT 17</b>	<b>9</b>					<b>9</b>
<b>CIRCUIT 18</b>	<b>10</b>					<b>10</b>
<b>WHITE ROCK 1</b>	<b>9</b>	<b>2</b>	<b>2</b>		<b>1</b>	<b>4</b>
<b>WHITE ROCK 2</b>	<b>7</b>					<b>7</b>
<b>TOTAL</b>	<b>122</b>	<b>5</b>	<b>2</b>	<b>0</b>	<b>28</b>	<b>87</b>

# Transformers

- 217 Three Phase Transformers  
24% Over 30 Years Old  
Replacement Cost Approximately  
\$15,000 each
- 1246 Single Phase Transformers  
11% Over 30 years Old  
Replacement Cost Approximately  
\$2,000 each
- Service Life 25 to 40 Years

## 3-Phase Transformers by age and circuit

<b>3-Phase Transformers</b>	<b>QUANTITY</b>	<b>1980 - 1989</b>	<b>1990 - 1999</b>	<b>2000 - 2006</b>	<b>2006-2019</b>
<b>CIRCUIT 13</b>	<b>57</b>	<b>20</b>		<b>3</b>	<b>34</b>
<b>CIRCUIT 14</b>	<b>22</b>		<b>8</b>	<b>5</b>	<b>9</b>
<b>CIRCUIT 15</b>	<b>22</b>		<b>5</b>	<b>4</b>	<b>13</b>
<b>CIRCUIT 16</b>	<b>12</b>		<b>5</b>	<b>2</b>	<b>5</b>
<b>CIRCUIT 17</b>	<b>43</b>	<b>4</b>		<b>20</b>	<b>19</b>
<b>Circuit 18</b>	<b>25</b>			<b>15</b>	<b>10</b>
<b>WHITE ROCK 1</b>	<b>17</b>			<b>10</b>	<b>7</b>
<b>WHITE ROCK 2</b>	<b>19</b>			<b>13</b>	<b>6</b>
<b>TOTAL</b>	<b>217</b>	<b>24</b>	<b>18</b>	<b>72</b>	<b>103</b>

## 1- Phase Transformers by age and circuit

<b>1 Phase Transformers</b>	<b>QUANTITY</b>	<b>1980 - 1989</b>	<b>1990 - 1999</b>	<b>2000 - 2006</b>	<b>2006-2019</b>
<b>CIRCUIT 13</b>	<b>158</b>	<b>48</b>	<b>30</b>	<b>35</b>	<b>45</b>
<b>CIRCUIT 14</b>	<b>127</b>	<b>52</b>	<b>24</b>	<b>31</b>	<b>20</b>
<b>CIRCUIT 15</b>	<b>287</b>	<b>58</b>	<b>49</b>	<b>80</b>	<b>100</b>
<b>CIRCUIT 16</b>	<b>257</b>	<b>67</b>	<b>30</b>	<b>47</b>	<b>113</b>
<b>CIRCUIT 17</b>	<b>0</b>				
<b>CIRCUIT 18</b>	<b>12</b>			<b>6</b>	<b>6</b>
<b>WHITE ROCK 1</b>	<b>188</b>	<b>25</b>	<b>43</b>	<b>49</b>	<b>71</b>
<b>WHITE ROCK 2</b>	<b>217</b>	<b>50</b>	<b>60</b>	<b>57</b>	<b>50</b>
<b>TOTAL</b>	<b>1246</b>	<b>300</b>	<b>236</b>	<b>305</b>	<b>405</b>

# Power Poles

- 2386 Poles
- Inspected for Structural Integrity and Treated in 2006 and 2013
  - 286 Rejects (12%)
  - 160 Priority (7%)
  - Useful Life 60+ Years if Treated in Regular Intervals
  - LACU Poles were not treated regularly

**2006 Power Pole Study and Treatment  
By PMC ( Pole Maintenance Company)**

*Results in 258 rejected poles being braced with steel  
to insure integrity of each structure until replacement*

**2013 Power Pole Study and Treatment  
By Osmose**

*Results in the 28 rejected poles added to the list*

**2015 Power Pole Replacement Project  
By Elite Power and Recovery**

*Results in the replacement of 286 Power Poles*

**Future 2021 Power Pole Study and Treatment Project**

## 2006 Power Pole Study

TABLE 3.3	Totals by Area					
	Pole Series	Area	Pole Count	Total Rejects	Considered Priority of the Rejects	Percent of Total Rejects
1000	Western Area	363	36	16	10%	4%
2000	Eastern Area	155	14	8	9%	5%
3000	North Community	656	60	39	9%	6%
4000	North Mesa	128	13	11	10%	9%
5000	Barranca Mesa	256	44	18	17%	7%
6000	White Rock	343	53	35	15%	10%
7000	Pajarito Acres	250	22	16	9%	6%
8000	Ski Hill	44	2	2	5%	5%
9000	S-18	191	26	15	14%	8%
<b>Grand Totals</b>		<b>2386</b>	<b>270</b>	<b>160</b>	<b>11%</b>	<b>7%</b>

## Power Poles Replaced Since 2006



<b>Pole Series</b>	<b>Area</b>	<b>POLES REPLACED SINCE 2006</b>
<b>1000</b>	<b>Western Area</b>	<b>36</b>
<b>2000</b>	<b>Eastern Area</b>	<b>14</b>
<b>3000</b>	<b>North Community</b>	<b>60</b>
<b>4000</b>	<b>North Mesa</b>	<b>13</b>
<b>5000</b>	<b>Barranca Mesa</b>	<b>44</b>
<b>6000</b>	<b>White Rock</b>	<b>53</b>
<b>7000</b>	<b>Pajarito Acres</b>	<b>22</b>
<b>8000</b>	<b>Ski Hill</b>	<b>18</b>
<b>9000</b>	<b>S-18</b>	<b>26</b>
<b>Grand Totals</b>		<b>286</b>



# - O&M results from 2013 OSMOSE Pole Assessment & Testing Project

Ending Date	Poles Inspected	Reject Poles	Guy wire (broken or slack) Leaning Pole	Bad Insulator, LA	Groundwire Missing	Trees on Line	Guy Guard Missing	Vines on Pole	Fire Damage	Woodpecker holes	Split Top	Damaged Top	Shell Rot	
Thru 9-21	71	1	1		10					0	2	2	12	
Thru 9-25	175		1		17	1				4	1	9	50	
Thru 10-5	208	2	3	3	15	19	5			4	1	7	3	
Thru 10-12	264	2	2	1	1	13	14	4	2	2	16	4	0	
Thru 10-18	346	11	3		1	8	13		1	4	2	17	10	11
Thru 10-24	238	2	3	5		27	12	7		8	1	8	8	1
Thru 11-1	233	2	8	5	1	2	11	10	1	2	4	2	8	1
Thru 11-8	248	6	8	8		2	18	9	4		17	21	19	1
Thru 11-15	327	2	8	16			13	4			24	21	13	
	2110	28	36	39	3	94	101	34	13	14	58	89	80	79
		Priority 1 Items		Priority 2 Items		Priority 3 Items			Concerns					

Replaced 30 of 32 rejected (2 are not accessible), plus 15 other poles



# Pole Top Assemblies

- Inspected on an Annual Rotation  
by LACU Operations Staff to support  
AMT recommendations in preparation of the  
Annual Budget
- **Goals: NESC Compliant**
  - Condition of Pole Assemblies**
  - Identify Attachments**
  - Structural Integrity of Crossarms  
and Equipment**

# Conductors

- Overhead 34% of Total Service Life Approximately 30 Years
- Underground 66% of Total
  - In Conduit 72%
  - Direct Bury 28%Service Life Approximately 20 Years  
Depending on installation method and type

## Age of Underground Conductors by Circuit

	1980 - 1989	1990 - 1999	2000 – 2006	2006-2019
<b>CIRCUIT 13</b>	<b>30%</b>	<b>10%</b>	<b>10%</b>	<b>50%</b>
<b>CIRCUIT 14</b>	<b>20%</b>	<b>10%</b>	<b>10%</b>	<b>60%</b>
<b>CIRCUIT 15</b>	<b>20%</b>		<b>80%</b>	
<b>CIRCUIT 16</b>	<b>30%</b>		<b>40%</b>	<b>30%</b>
<b>CIRCUIT 17</b>			<b>100%</b>	
<b>CIRCUIT 18</b>			<b>60%</b>	<b>40%</b>
<b>WHITE ROCK 1</b>	<b>65%</b>		<b>25%</b>	<b>10%</b>
<b>WHITE ROCK 2</b>	<b>65%</b>		<b>15%</b>	<b>20%</b>

## Age of Overhead Conductors by Circuit

	1980 - 1989	1990 - 1999	2000 – 2006	2006-2019
<b>CIRCUIT 13</b>		20%		10%
<b>CIRCUIT 14</b>				
<b>CIRCUIT 15</b>		20%		80%
<b>CIRCUIT 16</b>	24%		25%	51%
<b>CIRCUIT 17</b>				
<b>CIRCUIT 18</b>				
<b>WHITE ROCK 1</b>	75%	10%	5%	
<b>WHITE ROCK 2</b>	85%	10%	5%	

## System Operational Condition

### Perform System Analysis

- Utilize Milsoft/GIS interface for system model and mapping;
- Protective device coordination
- Circuit configuration to provide redundancy
- New Los Alamos Switch Station for added redundancy

### Ensure GIS maps and Feeder 1-lines are up-to-date;

- For accurate switching procedures and crew/public safety

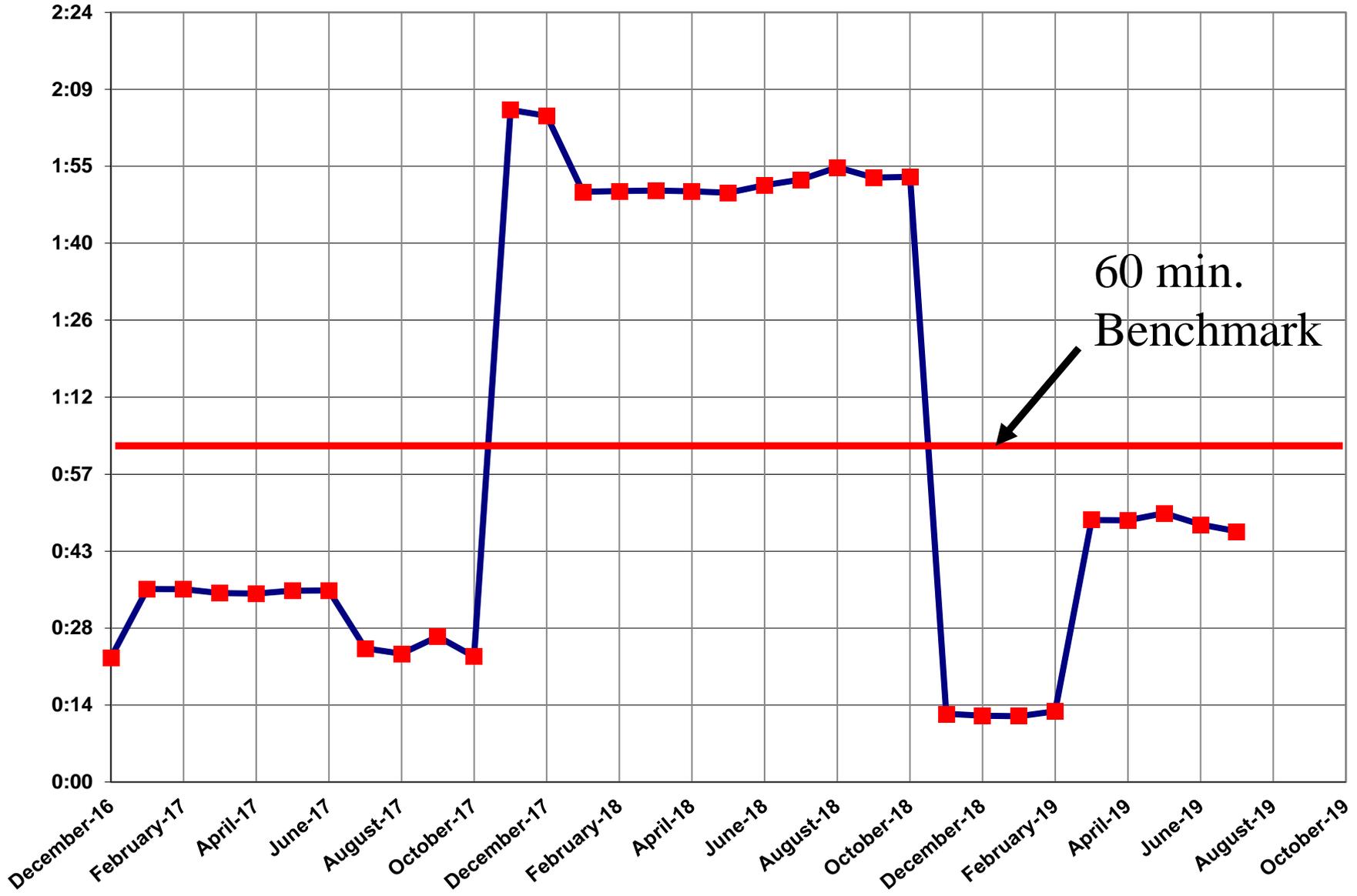
# System Reliability

- Systemic:  
Overhead and Underground Failures
- Non Systemic:  
Third Party Damage  
Animals  
Weather  
Trees  
Unknown

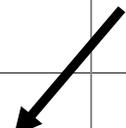
SAIDI = SYSTEM AVERAGE INTERRUPTION DURATION INDEX

The standard for measurement of system reliability according to IEEE  
And APPA. Our benchmark for reliability is 60 minutes.

EACH POINT IS A 12 MONTH SAIDI HISTORY  
1:00:00 = APPA BENCHMARK SAIDI



60 min.  
Benchmark



SAIDI

Questions?