Wood Pole Lines

Sustain Program

Asset Management Strategy



Rob Ochs, Program Manager

March 2012

Executive Summary

Equipment and facilities covered

Performance objectives

Asset condition, performance and cost

Risk assessment

Asset management strategy

Asset management plan

Executive Summary

Background

In 2010 BPA began implementation of a new strategy for maintaining and replacing wood pole transmission line assets. The focus shifted from individual components of the line, like wood poles, to an Asset Lifecycle Strategy, which combined life extension and systematic replacement of aged, poorly performing wood pole lines. The life extension portion of the program includes continuing the danger pole and priority pole replacement program, but these were expanded to include replacing all of the aged components on the structure, not just the wood poles. The systematic wood line replacement element of the sustain program addresses rebuilding wood lines that are assessed as the worst performing, poorest condition, highest maintenance cost, and have significant safety risk to lineman and the public.

Strategy Implementation Progress (FY 2010 – 2011)

Since early 2010, BPA's Line crews have replaced a total of 2,130 wood poles as part of the life extension portion of this strategy, 1,278 poles in FY10 and 852 poles in FY11. As we transition from single pole replacements to complete structure rebuild the total number of poles replaced will continue to decline. Implementing the structure rebuild strategy is costing a little more up front, primarily materials and incremental construction time, but it will eliminate the need for crews to return to the same structure to address additional age related maintenance tasks in the next 20 to 30 years.

The systematic replacement portion of the program has been implemented with a total of 9 wood pole line rebuild projects initiated to date. As of end of calendar year 2011, approximately 146 miles of wood pole transmission lines have been rebuilt through the Contract Management Office (CMO) using the Owners Engineer (OE) and Procure and Construct (PC) contracts.

Executive Summary (continued)

Line Rebuild Project specific status is as follows:

1. Chehalis-Raymond No. 1 (Chehalis-PeEll section, 18.4 miles) – (CMO) The design was completed during winter and spring of 2010 and construction took place over the summer and fall of 2010.
2. Albany-Eugene No. 1 (30.9 miles) – (CMO) The design is complete, and the project is currently out for bid for contract construction. Construction is expected to occur July through November 2012.
3. Bandon-Rogue No. 1 (46 miles) – (CMO) The design was completed in FY10-11, and the project is completed as of end of calendar year 2011.
4. Walla Walla-Tucannon River No. 1 (46.7 miles) – (CMO) The design was completed during FY10-11. Construction is completed and the rebuilt line was energized on November 1, 2011.
5. Colville-Republic No. 1 (Colville-Kettle Falls Tap section, 13.2 miles) – (CMO) The design was started and completed in FY11. Construction started on August 15, 2011, and was completed on November 08, 2011. The remaining 31 miles of this line is a radial feed to the town of Republic that is being rebuilt by the Bell TLM crew. The crew has been rebuilding 6 to 8 miles per year, and is expected to complete the project by 2015.
6. Alvey-Fairview No. 1 (97.4 miles) – (CMO) The design was started in FY11, with construction scheduled for FY13 and FY14.
7. Creston-Bell No. 1 (53.8 miles) – (CMO) The design was completed in FY11, and the project is currently out for bids for construction. Construction is scheduled to take place May-November 2012.
8. Midway-Benton No. 1 (28.8 miles) – (CMO) Preliminary design work is underway. BPA is currently negotiating with the tribes and DOE to relocate the line to avoid sacred areas. Construction is scheduled to take place during FY13.
9. Cardwell-Cowlitz No. 1 (7.7 miles) – (CMO) The design was completed in FY11, and the project was completed by calendar year end 2011.

Executive Summary (continued)

Lessons Learned/Next steps

The typical two year project schedule used to lay out the program does not provide an adequate amount of time to complete a line rebuild project. The following issues have been encountered:

- Majority of lines have inadequate access road rights and the land acquisition process adds up to a year to the project.
- Many lines have Environmental issues and the NEPA process can take one to two years to complete.
- In order to utilize Procure and Construct (PC) contracts, the contractor needs additional time to acquire materials prior to the outage date.

A three year project schedule has been incorporated into the work plan. Some smaller, less complicated projects were moved up in the initial schedule to keep the overall program on track with targets. The three year schedule will have an impact on the program budget in FY14, as some of the postponed construction work will be stacking up with scheduled construction projects during that year. There was a slight increase in the overall program cost due to updating the typical estimates to reflect actual costs to date. In addition, material procurement costs now show up in the direct costs as a result of the PC contracts.

Retirement of old de-energized lines needs to be addressed in the program. Abandoned wood pole lines pose a safety and liability risk. These lines present a maintenance responsibility that is an expense to the agency. Abandoned wood pole lines will be properly retired and removed, materials will be recycled if possible, and properly disposed of. Little or no impact to the program budget is expected, as salvage value of the old conductor will cover most of the removal costs.

The extent of bad crossarms that pose a risk to the system on lines not being rebuilt or containing danger poles, needs to be addressed. A systematic replacement program will be developed.

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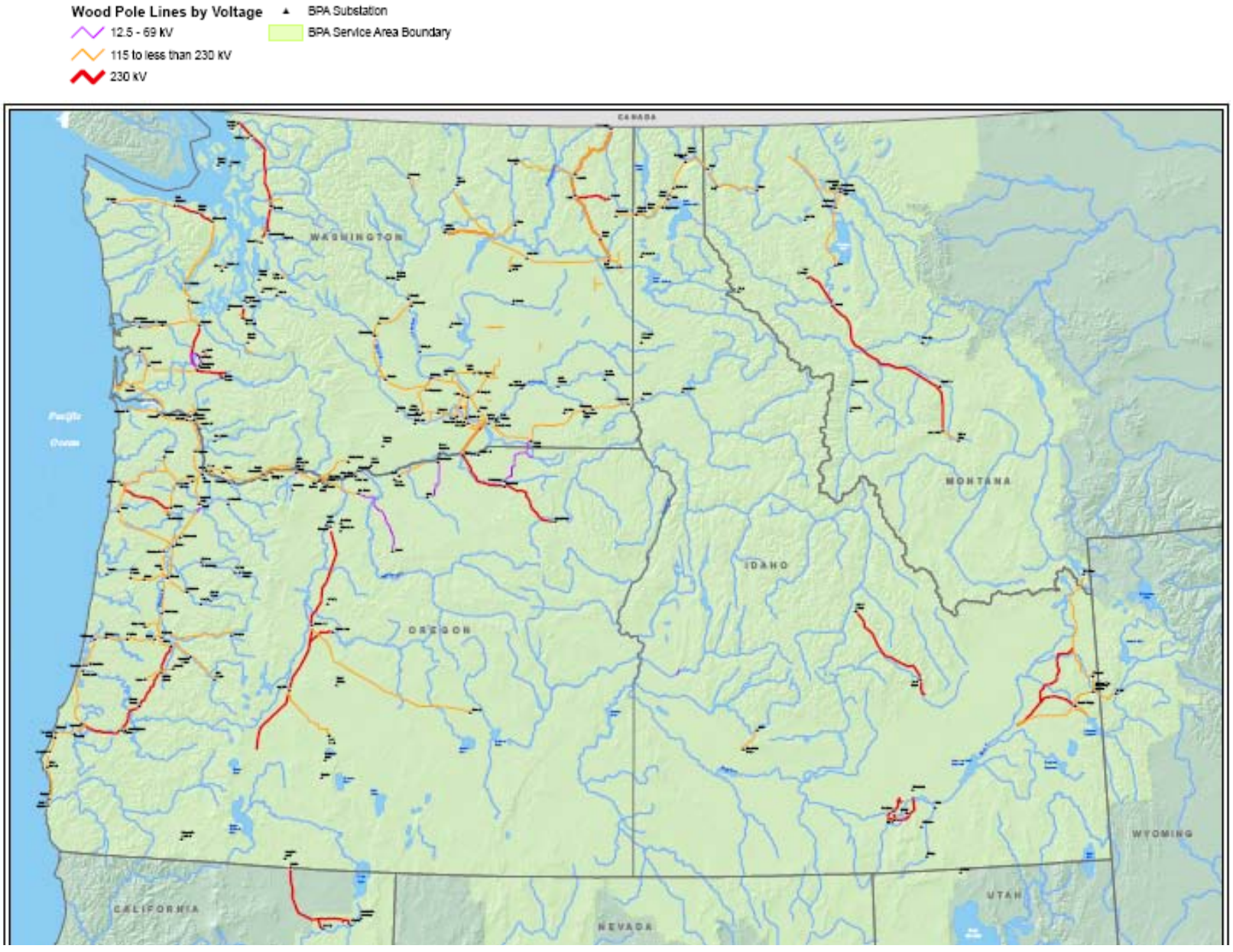
Wood Lines Situation Assessment

- Wood pole lines consist of approximately 5,000 miles on 336 separate transmission lines
- Equipment includes wood poles, guys, hardware, conductor and insulators
- 0ver 2,000 miles (40%) of the wood pole lines are over 50 years old; average expected life of a wood pole transmission line is approximately 60 years. On average, approximately 1/3 of the wood poles on lines over 50 years of age have been replaced at some point in time, but the other line components are original vintage and reaching end-of-service-life condition.
- Over past decade, the program has focused on replacing poles >60 years of age – without addressing other line components such as guys, hardware and insulators
- Overall performance of these lines has been acceptable, but performance risks are increasing as they continue to age and deteriorate
  - Oldest lines typically have the original hardware, insulators, guying and counterpoise in place and condition of these assets in many cases is unknown
  - Over 500 miles of lines have obsolete copper conductor that is difficult to repair and replace once it fails
  - Over 19,000 wood poles are classified for priority replacement due to condition and/or age
- Limited planned outage time, unavailability of some needed resources, and environmental issues constrain the amount of maintenance and construction activity that can be performed each year
- Over the past 2 years (FY 2010 and 2011) the Program has ramped up to conduct health inspections, manage replacement maintenance backlogs, and address a the bow wave of needed line rebuild work (9 projects completed and/or underway).

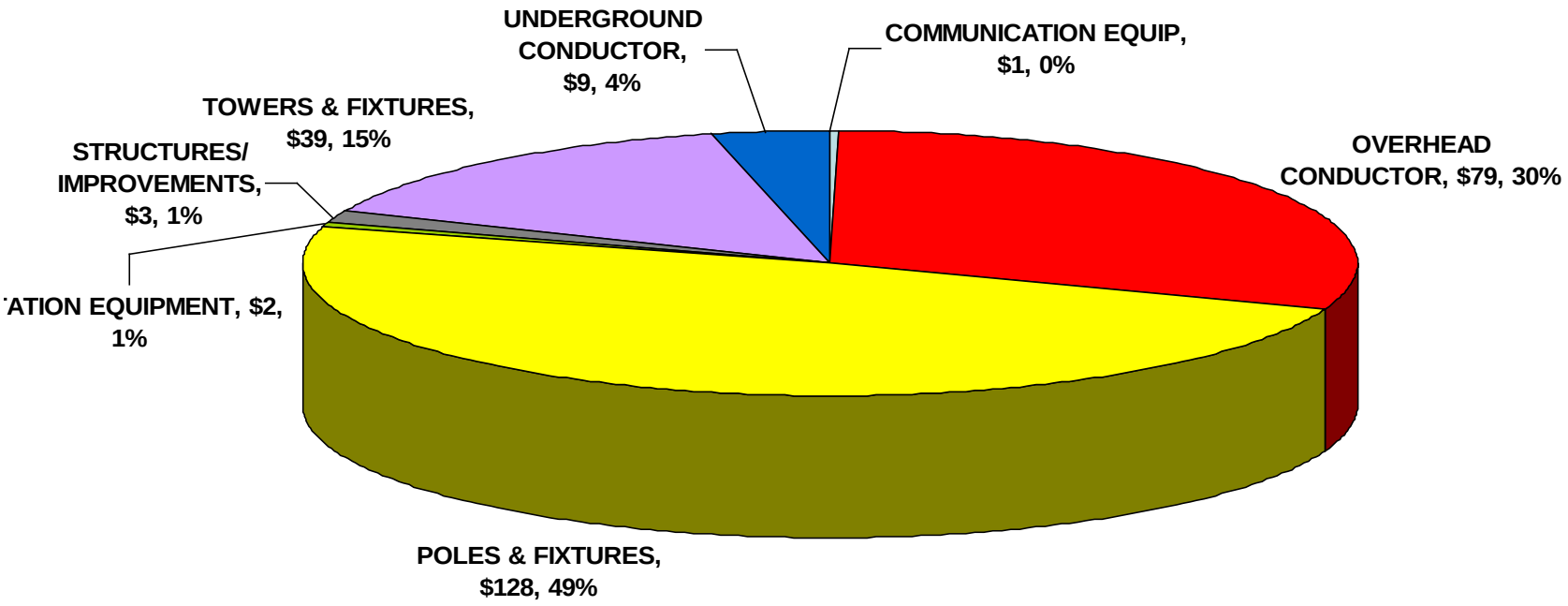
BPA Wood Pole Transmission Lines



Lines – Wood Pole: Net Book Value

(Cumulative historical investment net of depreciation) as of 9/30/2011
Millions $, % of Total

Wood Pole Transmission Lines:
$262 million total net book value
7% of total Transmission net book value



Source: BPA Asset Accounting

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Performance objectives

- Reliability objective

Frequency of unplanned outages

- Performance objective: Minimize the ***number*** of unplanned transmission line outages on the most critical wood pole transmission lines (categories 1 through 4, 1 being most critical).
- Measure: System Average Interruption Frequency Index (SAIFI) – average number of automatic outages by BPA Line Category
- End-stage Target: Control Chart violation per year:
  - No more than 1 control chart violation per year for Wood Pole Transmission classified lines (typically line importance categories 3 and 4).

Duration of unplanned outages

- Performance objective: Minimize the ***duration*** of unplanned transmission line outages on the most critical wood pole transmission lines (categories 1 through 4, 1 being most critical).
- Measure: System Average Interruption Duration Index (SAIDI) – average number of automatic outage minutes by BPA Line Category
- End-stage Target: Control Chart violation per year:
  - No more than 1 control chart violation per year for wood pole transmission classified lines (typically line importance categories 3 and 4).

For both SAIFI and SAIDI, a control chart violation is defined as follows:

- Latest fiscal year above the Upper Control Limit (short-term degradation)
- 2 of last 3 fiscal years above the Upper Warning Limit (mid-term degradation)
- Continuous worsening trend in the last six fiscal years (long-term degradation)

Performance objectives (continued)

- Availability objective
  - Performance Objective: Optimize availability of service from BPA's transmission lines.
  - Measure: Line availability percentage (includes planned and unplanned outages)
  - End-stage Target:
    - BPA's most important transmission lines (Category 1 and 2) are available for service at least 98.0 percent of the time.
    - BPA's next most important transmission lines (Category 3 and 4, and generally primarily wood pole structure type) are available for service at least (X) percent of the time. (target being determined)
- Adequacy objective
  - Performance Objective: Provide adequate transmission capacity to serve future customer load growth.
  - Measures: Forecasted peak load on transmission line segments.
  - End-Stage Targets: Mitigate risk of overload transmission lines (category 3 and 4) to a less than 1 in 20 chance.
  - Key driver: Agency 20 year load forecasts
- Compliance objective
  - Performance objective: Maintain and inspect wood pole transmission lines in accordance with NERC/WECC requirements.
  - Measures: Transmission Maintenance & Inspection Plan (TMIP) is reviewed and revised annually; Wood pole lines are maintained in accordance with the TMIP; Maintenance records are maintained as required by the TMIP
  - End-Stage Targets: BPA wood pole line maintenance & inspection practices comply with NERC/WECC standard PRC-STD-005-1
- Safety objective
  - No public safety event or injuries.
  - No BPA or contracted employee fatalities or injuries.

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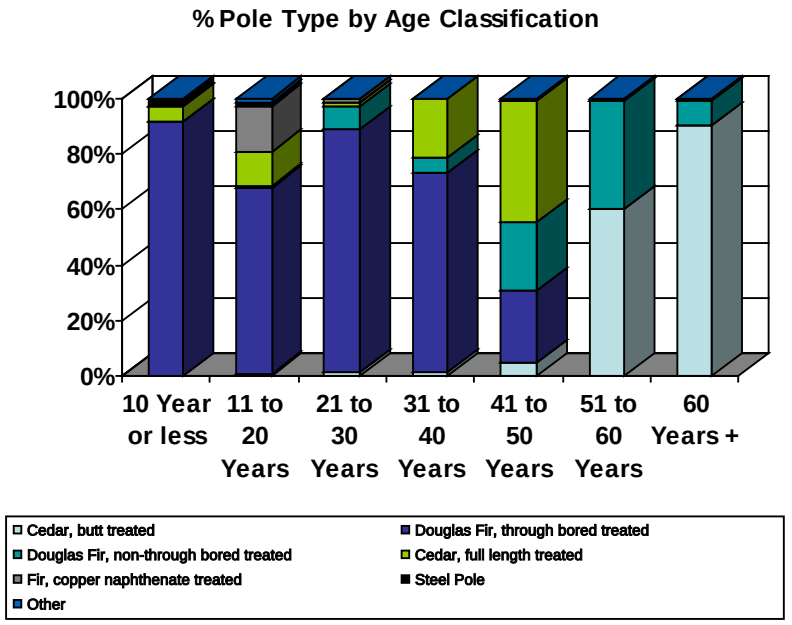
Wood pole condition assessment

Wood pole condition assessment

- Approximately 74,000 wood poles on 4,775 miles of wood pole transmission lines
- Expected service life of 60 years
- 10% of wood poles exceed 60 years of age (over 7,100 poles). This is an increase from 2 years ago. Older poles tend to be butt treated cedar
- Pole strength and capability declines with age
- Loss of 1/3 of original strength = need to replace-pole no longer meets standards
- Since September 2009, approximately 4500 wood poles have been replaced on the BPA system.



Pole Mix as of 12/31/2011	Cedar, butt treated	Douglas Fir, through bored treated	Douglas Fir, non-through bored treated	Cedar, full length treated	Fir, copper naphthenate treated	Steel Pole	Other	12/31/2011 Total	9/30/2009 Total	Change
10 Year or less	47	17,658	36	1,001	20	466	34	19,262	16,248	3,014
11 to 20 Years	67	4,539	41	853	1,135	51	114	6,800	4,830	1,970
21 to 30 Years	180	11,238	1,037	202	149	1	7	12,814	13,592	(778)
31 to 40 Years	122	5,878	451	1,707	2	-	14	8,174	8,926	(752)
41 to 50 Years	482	2,472	2,444	4,205	5	-	82	9,690	10,246	(556)
51 to 60 Years	5,997	6	3,894	24	2	-	68	9,991	13,749	(3,758)
60 Years +	6,406	10	644	17	-	20	4	7,101	6,227	874
Total	**13,301**	**41,801**	**8,547**	**8,009**	**1,313**	**538**	**323**	**73,832**	**73,818**	**14**

Status on 9/30/2009	16,496	37,300	9,335	8,233	1,422	530	502	73,818
Change	(3,195)	4,501	(788)	(224)	(109)	8	(179)	14

Wood poles in the highest risk condition

- Approximately 30% of the wood poles are classified for priority replacement.
- Danger poles, classified in priority 1, must be replaced with 12 months after being classified as a danger pole.
- The majority, 17,517, are classified as priority 5, which is based on age – Original Cedar 55 years or older and Original Fir, 45 years or older.
- Issue: Uncertainty on actual condition of priority 5 poles. If not replaced, some of these may become future danger poles and have to be replaced within 12 months.

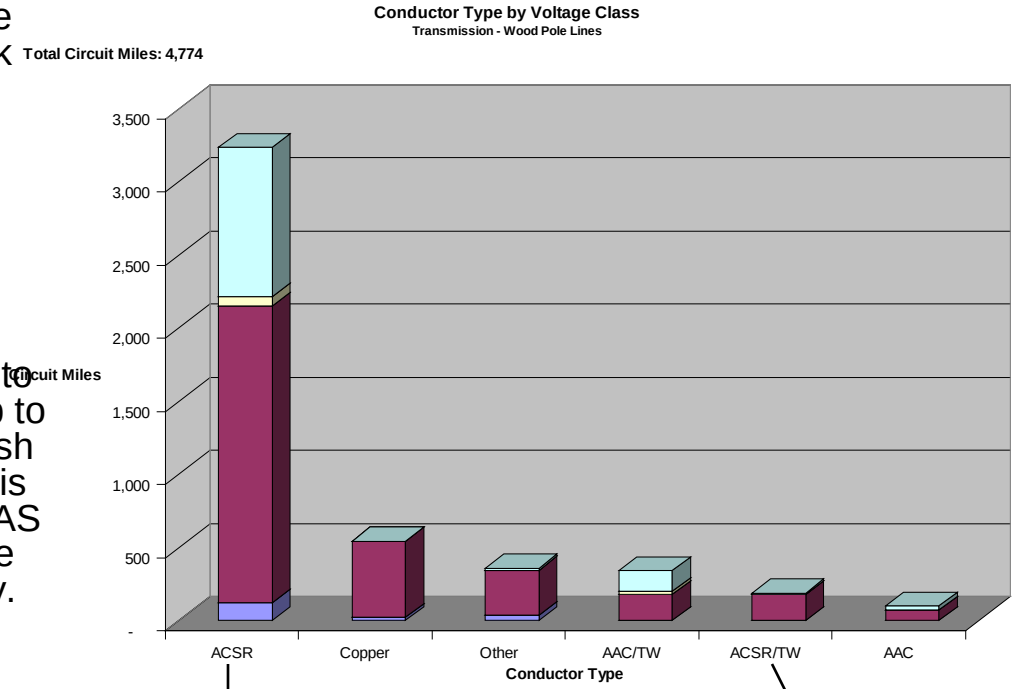
As of 1/13/2012

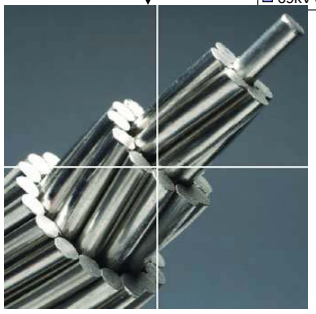
Replacement Priorities	Pole Count
Priority 1	
Danger Poles	570
Priority 2	
Danger Pole Candidates	310
Priority 3	
Evaulated Poles	356
Priority 4	
Minor Decay	1,055
Priority 5	
OC-Sound	11,057
OF-45	6,460
Subtotal Priority 5	17517
Total (all Categories)	19,808

Note: Aging Overhead Transmission Asset: Condition and Risk Assessment study completed in December 2007 provides a preliminary health assessment of wood pole structures on pages 129-141.

Conductor condition assessment

- For all transmission lines, we know the type and vintage of conductor, but lack adequate condition assessments.
- Information on other line equipment including hardware, insulators, guying and counterpoise is also lacking and antidotal at best.
- Various retired line components need to be collected and tested in the BPA lab to identify component issues and establish base-line and benchmarking data. This data will be made available through TAS for easy access for adjusting the future pace and priority of line rebuild activity.
- Based on current progress of TAS-Outside the Fence development, this information will not be readily available until after FY 2015.





Note: Aging Overhead Transmission Asset: Condition and Risk Assessment study completed in December 2007 provides a preliminary health assessment of conductor on pages 58-64.

Classification of Wood Lines

To facilitate strategy development and establishing priorities around inspection, test and treat, replacement and rebuild, these lines were grouped based on line components, age and condition as follows:

Grouping Name	Definition
Lines 20 to 40 years old	Transmission lines that are 20 to 40 years of age with majority of components in good to excellent condition. No known performance issue with the line.
Rebuilt Wood Pole lines <20 years old	Transmission lines that are no older than 20 years of age and are meeting performance objectives
Original cedar pole, butt treated	Transmission lines with a large percentage of wood poles that exceed 55 years of age and are original cedar, butt treated
Old Fir Wood Poles, Westside	Transmission lines located east of the Cascades with a large percentage of wood poles that exceed 45 years of age and are old fir, butt treated
Old Fir Wood Poles, Eastside	Transmission lines located west of the cascades with a large percentage of wood poles that exceed 45 years of age and are old fir, butt treated
Steel lines with wood poles	Transmission lines that predominately have steel structures supporting conductor, high voltage (230, 345 and 500kV), and have a few wood poles in certain locations along the line to support the conductor.
Wood pole lines with copper conductor	Transmission lines with any type of wood pole but have some portion or all of the line consist of copper conductor
Worst Performing Circuits	Transmission lines that have been assessed through actual performance and condition assessments by SME's to pose an unacceptable risk of component failures and sustained unplanned outages.
Other	Other includes lines with fewer than 50 wood poles, short segments, tie lines, service lines and taps. These lines could have any species of wood pole, including old fir and original cedar.

Line – Wood Pole Groupings

- The following table provides line miles and number of wood poles for each of the groupings as of January 2012.

Transmission-Wood Pole Line Classifications	Line Miles	Number of Wood Poles
Wood Pole Lines 20 to 40 Years old	1,300	19,000
Rebuilt wood pole lines <20 Yrs	461	6,548
Original cedar pole, butt treated	1,137	17,672
Old fir wood poles, Westside	300	4,700
Old fir wood poles, Eastside	338	5,400
Steel lines with wood poles	NA	1,800
Wood pole lines with copper conductor	557	8,837
Worst performing circuits - wood pole lines	240	3,443
Other Wood Pole Lines - service lines, PSC, taps, etc.	442	6,418
Total	4,775	73,818

Historical Replacement Costs

Wood Pole Replacement Costs – FY 2010 through FY 2011

	Number of Poles Replaced as Structure Rebuilds	Total Capital Wood Program Cost *2	Average Structure Replacement Cost per Pole	Line Rebuild Cost $/ Mile
BPA TLM Priority Pole Replacements	2,218	$13,075,195	$5,895 *1	NA
Bandon - Rogue No. 1 (46 miles)	560	$14,132,423	$25,236	$307,226
Cardwell - Cowlitz No. 1 (7.7 miles)	168	$2,764,585	$16,455	$359,037
Chehalis - Raymond No. 1 (18.4 miles)	363	$3,664,388	$10,094	$199,151
Colville - Republic No. 1 (13.2 miles)	223	$3,752,149	$16,825	$284,253
Walla Walla - Tucannon River No. 1 (46.7 miles)	634	$13,367,083	$21,083	$286,233
Line Rebuild Sub-Total	1,948	$37,680,628	$19,343	Ave $285,459
Grand Total	4,166	$50,755,823	$12,183	NA

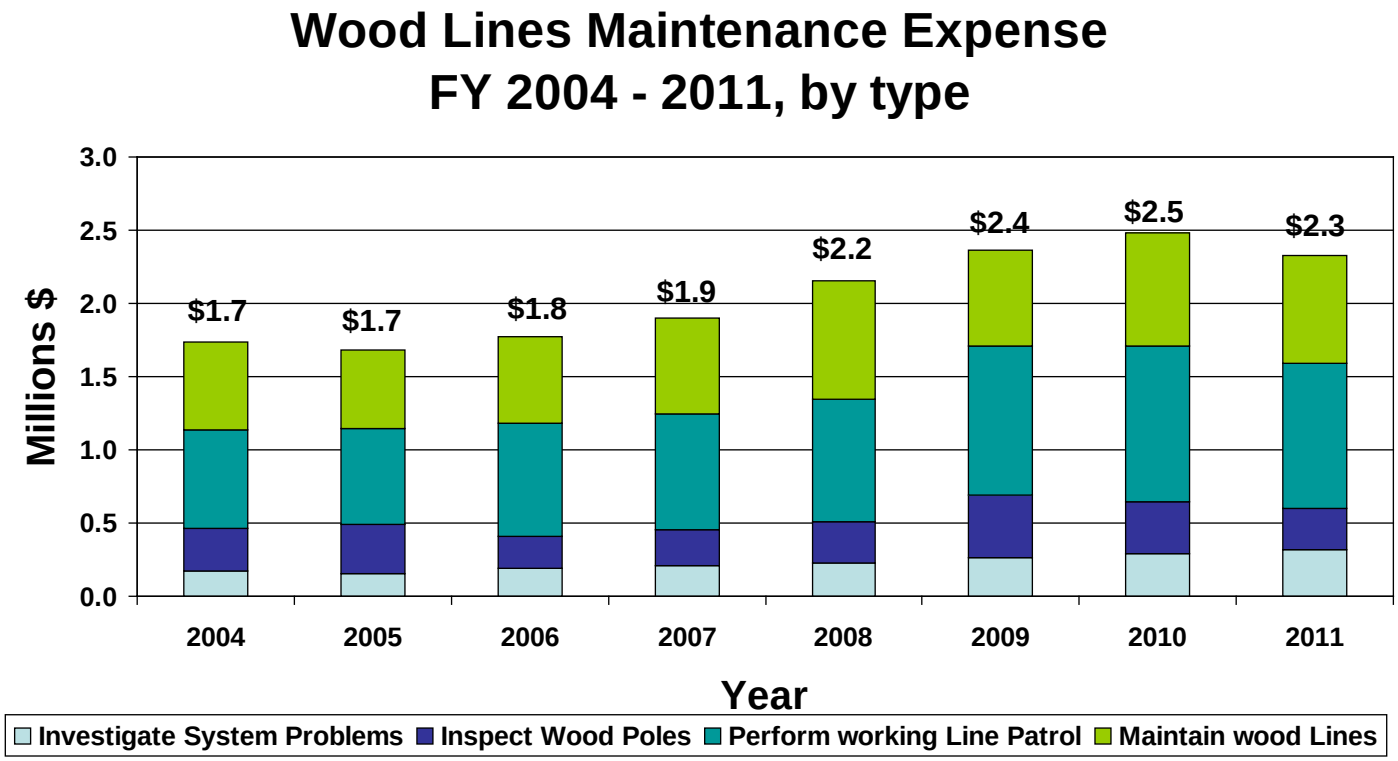
Notes:

***1 TLM Structure rebuild approach was phased in during FY10 and 11, so average structure replacement cost shown is low.**

***2 Line rebuild costs exclude easement, environmental and access road related costs**

Historic Inspection and Maintenance Expense

- Annual maintenance costs for 4775 miles of wood transmission line – FY 2004 through FY 2011



- A major component of this cost is labor hours, to inspect and maintain these lines. Costs exclude right-of-way maintenance, access roads and vegetation management.
- The strategy for these lines, as well as steel, includes improvements in asset information – component condition, line performance and cost.

Wood pole maintenance costs vary greatly by line

- Wood pole lines in relatively poor condition cost more to maintain than wood pole lines that are new and in good condition. Maintenance cost per mile varies greatly. Here are some selected examples:

Adno	Line Name	Op Kv	Circuit Miles	Pole Count	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	Total Cost	Average Cost per Mile
7410	BANDON-ROGUE NO 1	115	46	597	14,069	13,789	17,253	18,230	22,422	20,348	23,433	21,909	151,453	3,292
9210	BENTON-FRANKLIN NO 1	115	21	305	2,215	1,989	3,142	2,638	3,975	2,110	4,093	3,760	23,921	1,137
9211	BENTON-FRANKLIN NO 2	115	21	298	2,638	1,869	10,502	50,147	7,717	2,531	5,039	2,360	82,803	3,937
7140	ALLSTON-ASTORIA NO 1	115	41	560	10,554	159	38,382	7,210	42,187	53,438	39,126	30,808	221,864	5,359
7305	ALBANY-EUGENE NO 1	115	40	688	68,923	38,904	34,854	22,695	26,974	28,203	13,458	11,447	245,458	6,167
6104	ALBENI FALLS-SAND CREEK NO 1	115	30	601	10,019	5,445	11,261	27,973	9,896	27,110	15,461	27,439	134,606	4,537
6136	COLVILLE-REPUBLIC NO 1	115	44	728	14,129	35,535	29,292	35,498	41,860	28,539	15,578	19,404	219,835	4,943
7236	KEELER-TILLAMOOK NO 1	115	58	988	36,067	24,677	35,723	30,435	64,303	61,346	51,289	59,456	363,295	6,284
9290	WALLA WALLA-TUCANNON RIVER NO 1	115	48	646	24,140	37,857	48,369	14,716	19,675	13,390	13,798	7,010	178,956	3,720

- Benton-Franklin #1 was rebuilt back prior to FY 2004. Average cost per mile to maintain over the past 8 years has been $1,137.
- In contrast, the Albany-Eugene No 1 line built in 1940, which is considered to be one of the poorest condition lines on the BPA system average cost per mile to maintain is $6,167.
- Maintenance savings can be achieved by keeping wood pole transmission lines in good condition, but that alone doesn't justify a complete rebuild of a wood pole transmission line. Safety and performance of the line also needs to be a consideration.

Wood Line Forced Outage History – 2002 through 2011

Wood Pole Transmission Line System Performance

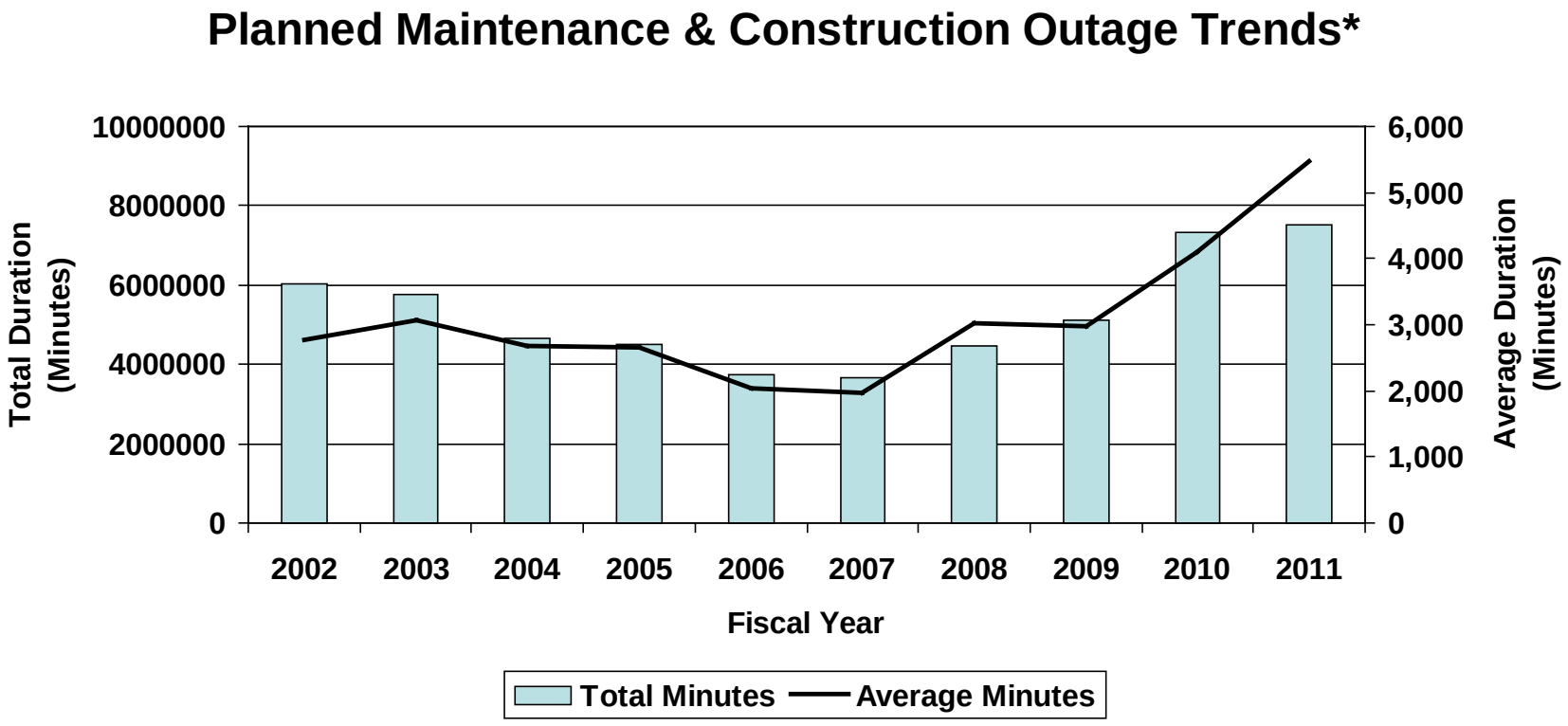
- 10 year period, 2002 through 2011
- Forced outages caused by line material failure: such as conductor, insulator, pole, other structure failure
- Wood lines with majority of wood poles original cedar, butt treated and lines with copper conductor have almost 90% of the forced outage minutes and represent about 40% of line miles.

Over 80% of the forced outages due to component failures are on lines with original cedar poles and lines with copper conductor

Wood Pole Line Group	Forced Outages	Total Minutes	SAIDI	Percentage of Line Miles
Maintain and operate	7	3,290	470	28%
Rebuilt wood pole lines <20 Yrs	1	740	740	7%
Old fir wood poles, Eastside	2	1,079	540	7%
Old fir wood poles, Westside	2	1,840	920	6%
Original cedar pole, butt treated	28	15,253	545	26%
Wood pole lines with copper conductor	21	21,271	1,013	12%
Worst performing circuits - wood pole lines	4	20,769	5,192	5%
Tap line & Lines with less than 50 poles	1	515	515	8%
Total	**66**	**64,757**	**981**	**100%**

Wood Line Planned Outage History – 2002 through 2011

- To address the aging asset issue, planned line outages went up significantly in FY 2010 and 2011 for critical maintenance work and line rebuild/construction.
- Prior to FY 2010, the majority of the planned outages were for maintenance type activities. With the plan to rebuild approximately 150 miles of wood lines each year BPA expects this trend will level off and continue until line rebuild activity declines.



* Note: Chart includes all lines 230 kV and less

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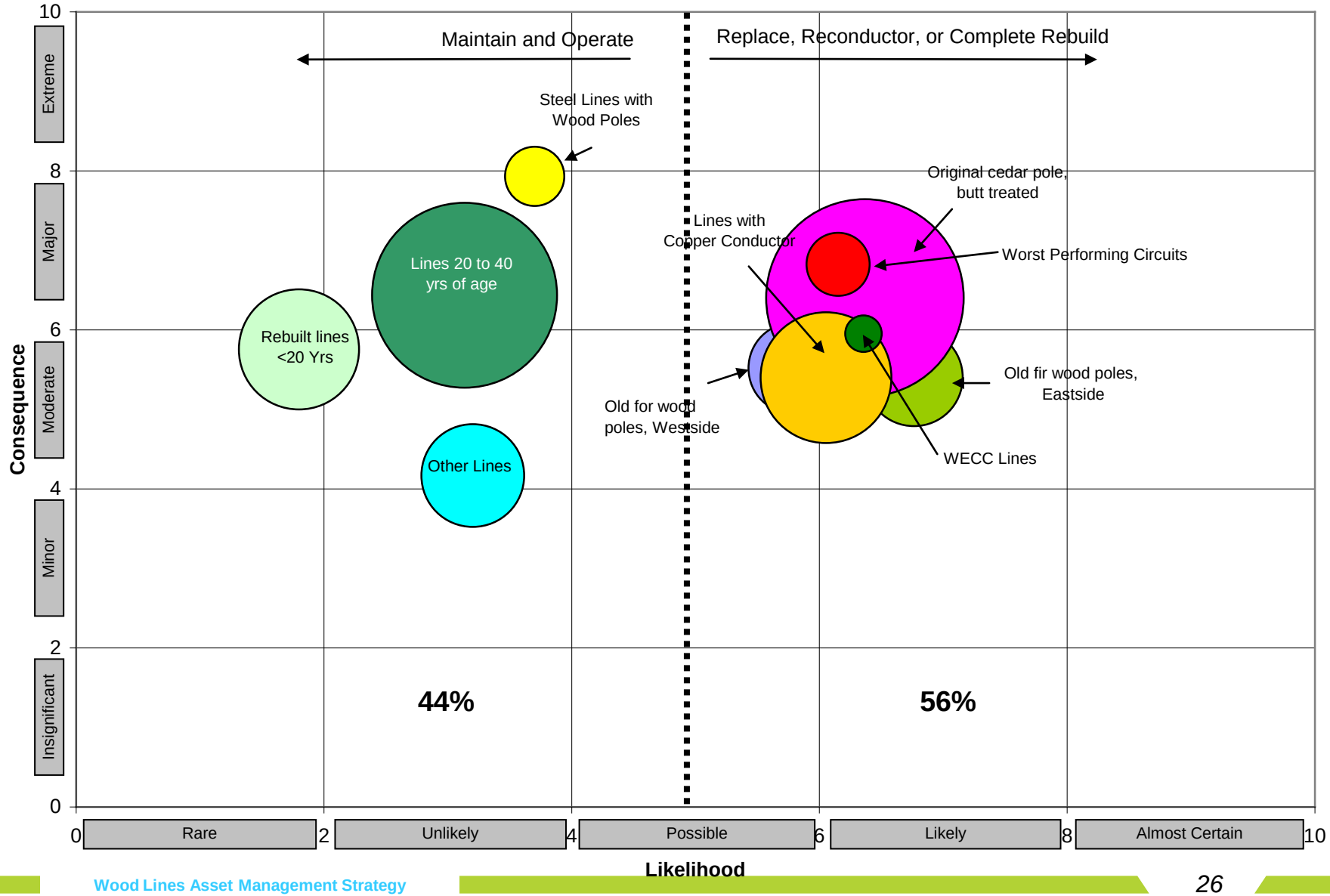
Risk Assessment and Analysis

Risks addressed by this strategy:

1. Reliability Risk:
   - Risk that a component (conductor, wood structure, insulator, or hardware) would fail to perform its intended purpose resulting in an unplanned transmission line outage interrupting service to customers.
   - Likelihood: Components fail due to a variety of causes on these transmission lines every year
   - Consequence: Usually it is inconsequential but in the case of a radial feed line it could result in customers going dark for a short period of time until crews can be dispatched to restore service.
2. Safety Risk:
   - Risk that a line structure would fail while an employee is working on the structure which could result in serious injury or even fatality.
   - Likelihood: Rare – wood poles and hardware usually are replaced before they would get in a condition that would pose a safety hazard to employees that might have to work on these structures and lines.
   - Consequence: Significant consequence – loss of human life.
3. Availability Risk:
   - Risk that a backlog of transmission line maintenance and capital replacement work could accumulate such that planned outages would be difficult and if not possible to schedule to complete the work in a timely manner.
   - Likelihood: Likely to happen every year and limit the amount of work that could be completed.
   - Consequences: As a result of not getting a planned outage to complete work may result in a future unplanned outage where work would be completed in an emergency situation.
4. Adequacy Risk:
   - Risk that a transmission line may not have adequate capacity to meet required future demand.
   - Likelihood: Rare – load growth in region relatively flat and not expected to be significant driver for sustain program.
   - Consequence: Significant – may result in customers not being serviced, outage.

Current State Risk Map (FY 2012)

(Bubble size represents volume of poles in each grouping)



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Wood Line Asset Management Strategy

- **Systematic replacement of aging line assets.** Asset replacement program evolves from a wood pole condition-centric program to a comprehensive approach that considers health of all line components, line performance (actual and anticipated) and criticality.
  - **Worst Performing Circuits.** When overall condition and performance of lines deteriorate to the point that it poses an unacceptable risk to meeting asset objectives, then these lines are targeted for future replacement. Transmission lines will be prioritized for replacement based on condition, performance and line importance and criticality.
  - **Obsolete components will be replaced.** Opportunities to replace obsolete components with standard components in conjunction with other scheduled work and replacement opportunities will be considered. For example, copper conductor no longer manufactured and difficult to repair and find spare parts.
- **Pole Replacement.** When poles fail to meet the required strength and their conditioned has deteriorated to the point that it poses a risk to individual component failure, i.e. classified as a danger pole, then these poles will be scheduled for replacement within 12 months.
- **Timely and comprehensive line inspections.** Line working patrols are conducted annually on all transmission lines. Working patrols are conducted per the BPA Transmission Line Maintenance standards and guidelines.
- **Managing backlog of line conditions.** Proactively manage backlog of conditions (problems) found through working patrols and logged for later repair or replacement.

Wood Line Asset Management Strategy (continued)

- **Transmission line rebuild execution strategy:**
  - **Standardization of replacement components.** Standardization of structures, conductor and insulators when rebuilding. Components stock items and quicker to restore service in the event of an unplanned outage.
  - **Utilize Owner/Engineers.** Design work, for existing line rebuilds will be contracted to Owners/ Engineers when the workload for design exceeds what can be done with BPA design resources.
  - **Contract rebuilds.** With the exception of small rebuild jobs, most of this work will be performed by contractors.
- **Identify additional asset health data needs and develop a process to collect, store and analyze the data.**
  - Develop short-term plan that fills the asset health data gaps on specific line components where data is lacking. Assess retired component health.
  - Develop a long-term plan for collecting asset condition assessment data for all line components (from currently 14 to 40 components)
  - TAS Lines IT project will address additional line component condition data, it will not be operational for a couple of years.
- **Fiber optic cable replacement and maintenance.** In conjunction with partial and major line rebuild projects, fiber optic cable, if present, will be evaluated and assessed for replacement.

Emerging Issues and Strategy Direction

- **Crossarm replacement strategy**
  - There are a number of crossarms in poor condition that pose a risk to the system. This issue is being addressed while replacing structures with bad poles, and on lines that are being rebuilt, but a systematic replacement plan needs to be established to address the remaining bad arms.
  - The quality of crossarm data in TLM Apps inhibits our ability to analyze the extent of the problem. A number of arms are labeled as bad in the data base that have already been replaced and are actually in good condition. There are also arms that are actually in fair condition, but have been labeled as bad simply because they are wood.
  - In the next two years efforts will be directed at improving crossarm data through the annual line patrols and update TLMApps. In addition, lines with poor condition crossarms will be identified and plans developed for systematic crossarm replacements.
- **Stubbed Pole Replacement**
  - There are a number of structures with stubbed wood poles that are currently not flagged for replacement in TLM Apps until some other form of decay is reported on the structure. Some of the wood stubs are beginning to decay, and pose a risk to the system. A systematic replacement plan will be established to replace these structures as part of the priority pole replacement program.

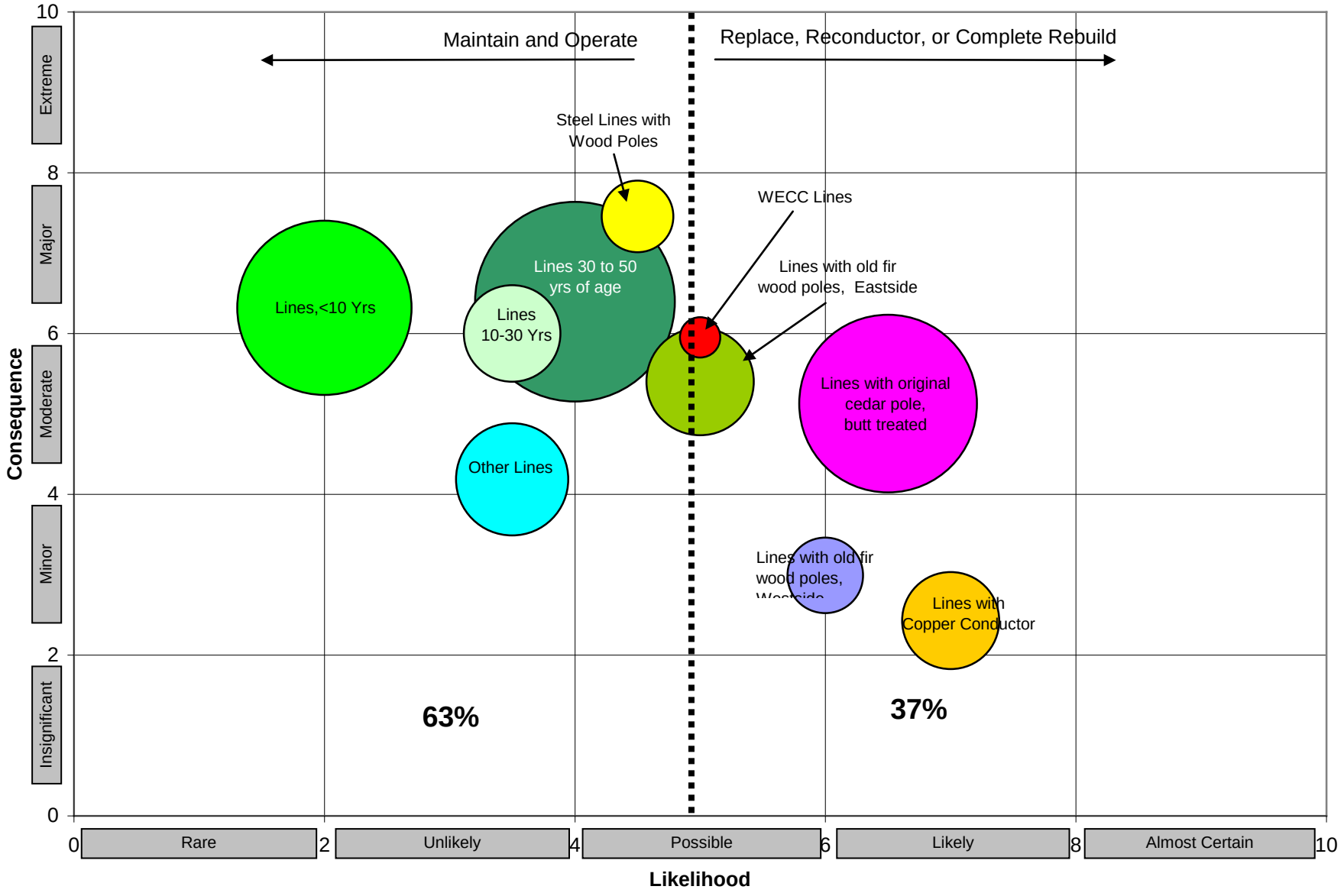
Asset Life Cycle strategy (Approved in 2010)

List of potential lines that are targeted for partial or complete rebuild over next 10 years (these are the priority replacements)

Line Name	Miles	Group	Op Kv	Total Poles	Priority Poles	Percent Condition	Customers Served	No. of Taps
Completed Projects								
Bandon-Rogue No. 1	46.0	Original cedar pole, butt treated	115	637	NA			4
Cardwell-Cowlitz No. 1	7.7	Original cedar pole, butt treated	115	168	NA			0
Chehalis-Raymond No. 1	18.4	Wood pole line with copper conductor	115	363	NA			0
Colville-Republic No. 1	13.2	Worst performing circuits, wood pole lines	115	223	NA			1
Walla Walla-Tucannon River No. 1	46.7	Worst performing circuits, wood pole lines	115	689	NA			0
Projects to be started during the next 3 years								
Albany-Eugene No. 1	30.9	Worst performing circuits, wood pole lines	115	688	326	47%		5
Alvey-Fairview No. 1	97.4	Old fir wood poles, Westside	230	1576	391	24%		3
Creston-Bell No. 1	53.8	Wood pole line with copper conductor	115	992	351	35%		3
Midway-Benton No. 1	28.8	Wood pole line with copper conductor	115	420	170	40%		1
Keeler-Tillamook No. 1	57.8	Worst performing circuits, wood pole lines	115	988	319	32%		4
Palisadies-Swan Valley No. 1	12.4	Old fir wood poles, Eastside	115	190	151	79%		0
Salem-Albany No. 1	23.9	Wood pole line with copper conductor	115	580	66	11%		1
Salem-Albany No. 2	27.9	Wood pole line with copper conductor	115	628	168	24%		2
Maupin-Tygh Valley No. 1	3.2	Wood pole line with copper conductor	69	59	42	72%		1
Grand Coulee-Creston No. 1	28.3	Wood pole line with copper conductor	115	520	140	27%		2
Midway-Moxee No. 1	34.0	Wood pole line with copper conductor	115	459	195	43%		1
Cowlitz Tap to Chehalis-Covington No. 1	6.3	Tap line	230	155	34	22%		0
Benton-Othello	11.0	Wood pole line with copper conductor	115	212	81	38%		1
Goshen-Drummond No. 1	72.7	Worst performing circuits, wood pole lines	161	1164	0	0%		0
Kalispell-Kerr No. 1	41.4	WECC	115	732	332	45%		1
Vera Tap to Trentwood-Valley Way	3.8	Tap line	115	80	50	63%		2
Priority projects beyond year 3								
Lane-Wendson No. 1	41.3	Original cedar pole, butt treated	115	647	215	33%		5
Murray-Custer No. 1	26.0	Original cedar pole, butt treated	230	442	233	53%		1
Rattle Snake-Garrison No. 1	22.8	Original cedar pole, butt treated	230	417	320	77%		0
Hills Creek-Lookout Point No. 1	24.8	Old fir wood poles, Westside	115	476	198	42%		1
Shelton-Fairmont No. 1	60.2	Original cedar pole, butt treated	115	916	475	52%		3
Alston-Astoria No. 1	42.0	Wood pole line with copper conductor	115	543	46	8%		6
Garrison-Anaconda No. 1	31.3	Original cedar pole, butt treated	230	506	430	85%		0
Snohomish-Murray No. 1	17.4	Original cedar pole, butt treated	230	317	248	78%		0
Benton-Scooteney No. 1	20.3	Original cedar pole, butt treated	115	335	247	74%		3
McNary-Roundup No. 1	38.4	Original cedar pole, butt treated	230	691	591	86%		0
Brasada-Harney No. 1	112.8	Old fir wood poles, Eastside	115	1721	866	50%		3
Roundup-La Grande No. 1	45.0	Original cedar pole, butt treated	230	813	716	88%		0
Grand Coulee-Foster Creek No. 1	32.6	Original cedar pole, butt treated	115	577	319	55%		2
Midway-Grandview No. 1	25.1	Original cedar pole, butt treated	115	366	186	51%		3
Columbia Falls-Trego No. 1	46.0	Old fir wood poles, Eastside	115	807	584	72%		1

Future State Risk Map (FY 2030)

(Bubble size represents volume of poles in each grouping)



Executive Summary

Equipment and facilities covered

Performance objectives

Asset condition, performance and cost

Risk assessment

Asset management strategy

Asset management plan

Forecasted Capital Spending Levels

(Un-inflated)

Program Forecasts:

Group	Line Miles	# Priority Poles Repalced	Estimate FY 2012	IPR Estimate FY2013	IPR Estimate FY2014	IPR Estimate FY2015	IPR Estimate FY2016	IPR Estimate FY2017	IPR Estimate FY2018	IPR Estimate FY2019	IPR Estimate FY2020	IPR Estimate FY2021
			2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
COMPLETE LINE REBUILD (INCLUDING NEW CONDUCTOR)												
Wood pole lines with copper conductor	156.9	863.0	$1.7	$11.6	$16.5	$10.8	$1.1	$0.0	$0.0	$0.0	$0.0	$0.0
WECC	41.4	332	$0.0	$0.5	$0.5	$9.5	$1.5	$0.0	$0.0	$0.0	$0.0	$0.0
Tap Line	10.1	84.0	$0.2	$0.4	$1.8	$1.4	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Original cedar pole, butt treated	119.3	967.0	$0.0	$0.0	$0.3	$0.3	$6.0	$5.8	$5.4	$1.7	$11.4	$3.5
Old fir wood poles, Westside	24.8	198	$0.0	$0.0	$0.3	$0.3	$4.7	$1.8	$0.0	$0.0	$0.0	$0.0
Old fir wood poles, Eastside	158.8	1,450.0	$0.0	$0.0	$0.0	$0.0	$0.5	$0.5	$15.3	$16.0	$11.1	$7.3
Total	511.3	3,894.0	$1.9	$12.5	$19.4	$22.3	$13.8	$8.1	$20.7	$17.7	$22.5	$10.8
WOOD STRUCUTURE REBUILD (RE-USE EXISTING CONDUCTOR)												
Old fir wood poles, Westside	97.4	391	$0.5	$8.5	$10.2	$5.0	$0.0	$0.0	$0.0	$0.3	$0.2	$5.0
Old fir wood poles, Eastside	12.4	151	$0.3	$2.2	$0.5	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Original cedar pole, butt treated	180.9	2,538	$0.0	$0.0	$0.6	$1.1	$8.3	$13.1	$6.0	$9.5	$4.8	$4.2
Total	290.7	3,080.0	$0.8	$10.7	$11.3	$6.1	$8.3	$13.1	$6.0	$9.8	$5.0	$9.2
LINE RECONDUCTORING (REBUILD DEAD END'S)												
Wood pole lines with copper conductor	42.0	46	$0.0	$0.0	$0.0	$0.3	$0.3	$7.3	$1.5	$0.0	$0.0	$0.0
Worst performing circuits, wood pole lines	130.5	331.0	$0.9	$5.7	$7.5	$4.5	$2.2	$0.0	$0.0	$0.0	$0.0	$0.0
Original cedar pole, butt treated	60.2	475	$0.0	$0.0	$0.5	$0.5	$6.0	$6.0	$0.5	$0.5	$0.5	$8.0
Total	232.8	852.0	$0.9	$5.7	$8.0	$5.3	$8.5	$13.3	$2.0	$0.5	$0.5	$8.0
PROJECTS CURRENTLY "INFLIGHT" for FY 2012												
Worst performing circuits - wood pole lines	30.9	326	$11.3	$2.3	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Wood pole lines with copper conductor	53.8	351	$13.6	$3.1	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Total	84.7	677.0	$24.9	$5.4	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
POLES/STRUCTURES REPLACED BY TLM CREWS												
Pole and Switch replacements			$7.5	$8.5	$8.5	$8.5	$8.5	$8.5	$8.5	$8.5	$8.5	$8.5
PROGRAM TOTAL	1,119.5	8,503.0	$36.0	$42.8	$47.2	$42.2	$39.1	$43.0	$37.2	$36.5	$36.5	$36.5

Note: This implementation plan is a replacement program with the optimal funding, staffing resources, and outage availability to best mitigate risks identified in the strategy. These numbers are not aligned with the currently constrained IPR budget. Each sustain program is under review to determine a revised implementation plan that will align with capital budget availability, priorities, and resource constraints. This review will be complete by March 2012.

Forecasted Expense, Labor and Units

Wood Pole Transmission Line Planning Estimates

	Actual	Current Year Est.	Forecast									
	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY2021	Total
EXPENSE (thousand $)												
Working Patrols	1000	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	10800
Line Maintenance Expense [2/]	1250	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	11700
Retired Asset Health Assess/Lab testing	50	50	50	50	50	50	50	50	50	50	50	450
Total Expense	2300	2550	2550	2550	2550	2550	2550	2550	2550	2550	2550	22950

2/ Expense includes misc repair work, working line patrol and pole inspections. Does not include access road maintenance and vvegetation management work.

	Actual	Current Year Est.	Forecast									
	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY2021	Total
TLM Resource Requirements (Hours)												
TLM Labor Hours (Est.)												
Capital projects -e.g. pole replacements	25000	16000	24000	24000	24000	22000	20000	18000	15000	13000	160000	320000
Maintenance work [3/]	38800	38800	38800	38800	38800	38800	38800	38800	38800	38800	38800	349200
Total labor hours	63800	54800	62800	62800	62800	60800	58800	56800	53800	51800	198800	669200

3/ Hours exclude access road maintenance and vegetation management work

	Actual	Current Year Est.	Forecast									
	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY2021	Total
Units of Work												
Miles of Line Rebuilt	62.5	111.6	115.6	192.8	93.6	101.8	150.5	97.2	110.1	108.8	112.2	1082.6
Number of Poles Replaced	2003	2542	2647	3464	2166	2336	3068	2591	2800	2750	2850	24672