



**Aggregated Life Cycle Assessment and
Best Practice Recommendations for Utility Wood Poles
*INTERIM DRAFT REPORT***

Report Produced by:

Pacific Northwest Pollution Prevention Resource Center
for the Electric Utility Industry Sustainable Supply Chain Alliance
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1.0 Industry Profile

1.1 Utility Alliance Overview and Objectives

The electric utility industry prides itself on developing new innovations and solving larger than life problems through the collaboration of its members. Achieving such a collaborative approach to defining a sustainable supply chain for the industry is the intent of the Electric Utility Industry Sustainable Supply Chain Alliance. Through collaboration, the industry will avoid duplicate efforts among its members and will also avoid unnecessary complexity for its suppliers.

The Members of the Alliance acknowledge that our industry is made up of a diverse group of companies, varying widely in size, complexity, and service offerings. We expect that each company will evolve at its own pace and based upon its unique situation, moving toward supply chain environmental excellence as resources and business direction allow.

The Alliance's goals include developing supply chain voluntary standards (best practices and metrics) to evaluate and improve the environmental performance of

- Products and services purchased by electric utilities
- Supplier operations
- Electric utility supply chain operations

2.0 Overview and Key Considerations

The following section provides an overview of the Alliance's best practice recommendations for transport, use, maintenance, and end of life disposal, along with the manufacturing phase of best practices identified for wood pole manufacturers, also known as "Suppliers" in this report. Supplier recommendations were compiled as a result of five Green Suppliers Network (GSN) lean and clean reviews conducted onsite at five U.S. pole manufacturing facilities.

2.1 Project Overview

This study focuses on developing best practices for utility wood poles through identifying utility and supplier best practices to reduce the overall life cycle environmental impacts of the product. Due to the Alliance members' predominate spend in distribution wood poles under 65 feet in height, this initial study will focus on distribution wood poles under 65 feet and the life cycle of this product. The chemical treatment of the wood pole is not explicitly considered in this study due to the sensitivity and complexities of chemical preservatives and the optimal preservative for different wood species. Therefore, the key focus of this report is on the manufacturing and utility utilization processes of the wood pole. Upon completion of this project phase, the Alliance may conduct analysis and assessments on preservatives such as pentachlorophenol (PCP), creosote, copper naphthenate, chromate copper arsenate (CCA) and others in subsequent phases of the project.

The Alliance conducted a Utility Life Cycle Assessment to address elements that a utility customer can directly influence, including transportation, use, re-use, maintenance, and disposal (segments depicted in yellow in Figure 1). In conjunction, the Supplier Environmental Assessments for utility pole manufacturers are intended to cover the manufacturing stage (depicted in blue in Figure 1). Many thanks to the Oregon and South Carolina Manufacturing Extension Partnerships for their efforts on conducting the GSN Supplier Environmental Assessments.

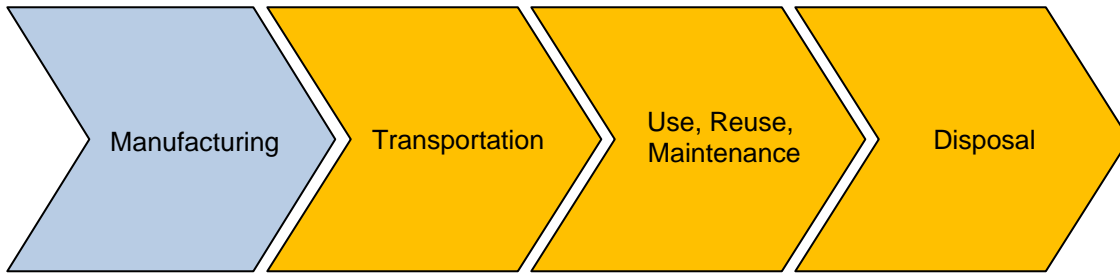


Figure 1: Life Cycle Elements (Excludes Timber Harvest)

2.2 How to Use the Findings and Best Practice Recommendations in this Report

These findings and best practice recommendations are intended to provide initial ideas and spur exploratory efforts by utilities and pole suppliers to move towards improved sustainability and environmental performance.

Utilities can use the best practice recommendations identified in Section 3.0 and Appendix 5, to influence the transport, use and maintenance and disposal of the wood pole. This includes the potential recommendations to modify specifications to drive greater sustainability in the utilization of wood poles. In addition, utilities can use the manufacturing best practice recommendations in Section 4.0 to support the development of sustainability evaluation criteria in RFPs and contracts to identify and track suppliers' environmental performance.

Wood pole manufacturers (suppliers) can review key best practice recommendations in Section 4.0 below, in addition to recommendations in Tables A through G below for potential new opportunities to reduce operating costs and improve environmental performance. Suppliers should use internal and external resources/expertise to prioritize recommendations most suitable for the supplier then analyze top opportunities for feasibility, implementation, benefits and ROI.

3.0 Best Practices for Utility Life Cycle

3.1 Summary of Key Best Practice Recommendations for Consideration by Utilities

This study of lifecycle resulted in these key best practice recommendations that a utility can adopt to reduce the overall impact on the environment through transportation, use, maintenance, and disposal of wood poles. More details are discussed in Appendix 5.

To reduce carbon emissions, utilities can adopt the following practices:

- Ship wood poles directly from supplier to job site
- Reduce third party inspections
- Aggregate poles to transport the maximum number of orders in a truck load
- Develop and adopt universal pole specifications across the industry to reduce manufacturers' inventory

To reduce hazardous material and waste, utilities can adopt the following practices:

- Inspect weeping poles, ensure strict standards for weeping in specifications and do not install excessively weeping poles
- Burn creosote, penta and copper naphthenate in biomass power facility and use as boiler fuel

The Alliance developed best practices for the utility life cycle of a wood pole namely transportation, use, re-use and maintenance and end of life disposal. (See yellow shaded items in Figure 1 above). The Alliance used the tier rating system below to aid in evaluating trade-offs with respect to resource constraints and benefit expectations. Tier 1 takes the least amount of time and cost to implement but yields the lowest benefit. Tier 2 requires more time and cost to implement but has improved benefits. Tier 3 takes the most amount of time and cost to implement with the corresponding greatest benefit yield. Each tier may be acceptable based on the preferred variable to optimize.

The utility life cycle assessment performance analysis utilized the guidelines and definitions shown below. As you would expect, economic and environmental trade-offs are present within each best practice

- ◆ while (a) maintaining or enhancing asset life, (b) maintaining or reducing current Total Cost of Ownership (TCO), and (c) can be implemented relatively quickly at minimal incremental cost

	Time to Implement	Investment Cost to Implement	Environment Benefit	Example of Change
TIER 1	< 3 months	Zero	< 5%	Process
TIER 2	3 to 12 months	< 10%	5 – 25%	Specification
TIER 3	> 1 year	> 10%	> 25%	Regulation

Figure 1: Tier Rating System

3.2. Utility Alliance Life Cycle Analysis: Transportation Best Practice Recommendations

Emissions

Best Practice Recommendation	Environmental Benefit	Tier
Ship poles directly to jobsite from supplier	Less fuel consumption and emissions	Tier 1
Aggregate orders and transport maximum number of poles per load and/or maximum cubic feet or number of poles per truck. The utility should schedule poles to be delivered in one drop or multiple drops per truck load in a specific geographical location	Reduces number of deliveries, less fuel consumption and emissions	Tier 1
Ship by rail	Minimizes emissions	Tier 1

Hazardous Waste

Best Practice Recommendation	Environmental Benefit	Tier
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Inspection of weeping poles - visually inspect incoming poles and increase inspections at third party off-site storage areas, reject weeping poles, ensure pole specifications have a standard for weeping, require certification from suppliers of compliance to specifications	Prevents contamination in storage and less leaching into soils	Tier 1
Minimize physical damage to poles when loading, unloading and handling to reduce scrap and waste (offloading process from supplier's transport is normally not a utility responsibility)	Less scrap and waste to landfills	Tier 1

3.3. Utility Pole Life Cycle Analysis: Use, Re-Use, and Maintenance Best Practice Recommendations

Emissions

Best Practice Recommendation	Environmental Benefit	Tier
Backhaul and recycle used poles	Better use of fuel in optimizing backhauling capacity	Tier 1
Adopt universal pole specifications across the industry to reduce manufacturers' inventory	Reduces environmental emissions at supplier facilities	Tier 3

Hazardous and Toxic Material

Best Practice Recommendation	Environmental Benefit	Tier
Maintain minimum stock of poles to meet operations	Reduces treated wood exposure minimizing chemical runoff in rain	Tier 1
Specify upper level preservative retention at an aggregate level to reduce weeping	Minimizes amount of preservatives	Tier 1
Do not install excessively weeping poles	Minimizes amount of treatment at pole base	Tier 1
Apply post-treatment steaming to minimize preservative residuals. Treatment processes minimize preservative residuals on the surface of the poles which reduces potential in-service releases to the environment. Such processes may include post-treatment steaming or other methods to provide a clean pole surface	Minimizes preservative chemicals released into soil	Tier 2

Solid Waste

Best Practice Recommendation	Environmental Benefit	Tier
Brief public on issues with treated poles prior to donation	Donated poles allow for continuous use and reduces amounts in landfills	Tier 1

Limit where poles are donated	Avoid environmentally sensitive locations	Tier 1
Routinely inspect poles for strength and decay issues; reinforce and treat for decay/insects as necessary.	Reduces replacement which reduces materials in landfills	Tier 3

3.4. Utility Pole Life Cycle Analysis: Disposal Best Practice Recommendations

Hazardous Material and Waste

Best Practice Recommendation	Environmental Benefit	Tier
Recycle poles by returning to pole manufacturer for retreatment and re-use as utility poles	Reduces waste in landfills	Tier 2
Leverage information technology to manage and track disposal alternatives	Better information yields better disposal alternatives	Tier 2
Burn creosote, penta and copper naphthenate in biomass power facility and use as boiler fuel	Reduces waste in landfills	Tier 2

4.0 Supplier Environmental Assessment Findings

4.1 Key Environmental and Lean Best Practice Recommendations for Consideration by Wood Pole Manufacturers

These are key best practice recommendations a pole manufacturer can adopt to reduce the overall impact on the environment through its manufacturing operations. These opportunities arose mostly as a result of issues or inefficiencies identified during the GSN supplier reviews (Refer to Appendix 1). The recommendations listed below represent higher priority issues based on the opportunity to reduce environmental impact. Additional and more specific recommendations are provided in Section 4.2.

Energy: To reduce carbon and improve energy efficiency, manufacturers can adopt the following:

- Recover heat from boiler, kiln, and other heat producing equipment.
- Optimize motor and pump efficiency with upgrades, variable frequency drives (VFDs), operate fans for efficient flow, set motors to run at full load and implement total productive maintenance.
- Resolve causes of uneven drying in kilns and uneven preservative penetration which can necessitate retreatment, consume additional energy, water, and preservative.
- Maximize efficiency of compressed air systems – match air demand with supply, continual leak detection and minimize conveyance distance of air.

Fuel: To reduce carbon emissions and improve fuel efficiency, manufacturers can adopt the following:

- Optimize outbound shipment loads: ship maximum allowable weight; consolidate multiple customer shipments; and/or, work with customers to consign in order to ship a full load.
- Minimize frequency and distance of on-site pole transport and unstacking and re-stacking.
- Implement a no-idling policy for mobile and diesel equipment. If necessary, use engine or cab heaters.
- Ensure equipment is tuned and operating at top efficiency.

Water: To improve water efficiency, manufacturers can adopt the following practices:

- Evaluate reuse of treated storm water, or possibly groundwater or process water (pending permitting) to use in washing, dust control, boiler or cooling makeup, or other suitable processes.
- Use high pressure low volume sprays (hoses, nozzles, pressure) for equipment and pole washing.

Air: To improve ambient and occupational air quality, manufacturers can adopt the following practices:

- Ensure wood and site dust are contained and employees/neighbors are protected from inhalation.
- Use ultra low sulfur diesel (ULSD) for all diesel uses.
- Install emissions retrofits on loaders.
- Maintain gas-fired boilers with right air and fuel mixture to minimize NOx emissions.
- Ensure employees use proper personal protective equipment (PPE) during handling of preservatives, diesel, and solvents, and during retort chamber changeover.

Chemicals, Materials, and Waste: To improve chemical and materials waste management, manufacturers can adopt the following practices:

- Minimize overtreatment of poles, possibly by batching customer's poles that require similar penetration level, and/or poles that have similar physical characteristics.
- Minimize preservative loss: backflow controls, leak detection, spill control, and drip collection/reuse.
- Use bio-based carrier oils.
- Debark as soon as possible to reduce potential for insect damage.
- Maintain structural integrity and cleanliness of drip pads (minimize dust, debris, traffic).
- Replace individual, high-toxicity aerosol marking paints with lower toxicity and bulk spray system.
- Recycle paper, bottles, plastics, strapping/banding, metals, packaging, used oil and hydraulic fluids, aerosol cans, spent fluorescent lamps, iron cores from penta blocks, solvents, tires, and batteries.

Lean/Productivity: To improve productivity, (and therefore reduce wastes and inefficiency), manufacturers may adopt the following lean practices (as applicable to their operations).

- Determine and address causes of post-treatment rejects, which result in a lower-value end product or require a second round of treatment, including segregation of logs with similar treatment needs and characteristics (e.g., moisture content, diameter, or sapwood thickness) for treatment.
- Work with customers to set industry-wide standards for framing hole locations.
- Reduce staging processes to achieve more continuous flow and reduce inventory between processes.
- Work with customers to eliminate third-party inspection – which requires staging of the product for inspection, delay of shipment, and waiting waste.
- Peel "barkies" as soon as possible to minimize loss associated with insect damage.
- When there are not enough orders to utilize the full manufacturing capacity, use supermarkets (with an established maximum inventory level) in between process steps, rather than inventory triangles
- Lean framing operations; implement centralized tool storage, tool maintenance, more direct pole flow through framing and standard work procedures. Consolidate to one skid area to reduce foot travel, tool movement, and space.
- Complete a detailed Value Stream Map (VSM) analysis of the process from the purchase of the trees to the utility pole delivered to the customer.
- Implement a balance flow process based on the VSM that eliminates the maximum non-value added wastes.

4.2 Compilation of All Environment and Lean Best Practice Recommendations for Suppliers (Wood Pole Manufacturers)

The lean and environmental best practices listed in the tables below contain best practices that were already existing/in place at one or more facilities, and those identified as new best practices as a result of the Supplier Environmental Assessments. To compile a list of all best practices within this section, the quantified best practices presented in Section 4.0 are also listed here. Recommendations listed were identified as existing or new best practices for one or more of the pole manufacturing facilities.

Each environmental best practice (Tables A through G) is categorized under the most applicable heading: energy efficiency, fuel & fuel efficiency, water, air and chemicals, waste and other general stewardship.

Each lean best practice (Tables H through J) is categorized under the most applicable heading: quality, inventory and flow, total productive maintenance and standardization.

Table A: Best Practice Recommendations in Energy Efficiency

Opportunity Area	Specific Steps/Suggestions
Energy management	<p>A1. Form an internal energy management team to set company or corporate energy goals, conduct energy data analysis, including benchmarks and energy balance and implement energy efficiency measures. Prioritize on high-energy consuming processes.</p> <p>A2. Maintain a database on all electricity, gas, and/or steam accounts to record consumption and incremental charges. At a minimum, this should be done for the high cost process areas (pole machine, dry kilns, treating plant and boiler plant). Use to analyze production changes as well as provide a red flag when rate changes take place or when equipment malfunctions and use more energy as a result of inefficiencies.</p>
Boilers	<p>A3. Check boiler and kiln systems for heat and steam loss.</p> <p>A4. Recovery on boiler, kiln, and other heat producing equipment to pre-heat new makeup water or for other uses.</p> <p>A5. Determine consistent steam pressure for operations based on demand.</p> <p>A6. Achieve a minimum of 85% condensate return rate.</p> <p>A7. Pre-dry moist wood waste that is used in wood-fired boilers using low grade heat - possibly ducted from boilers or other hot processes to and through the wood fuel storage area. Burning moist wood waste "heats water" which takes excess energy for no value.</p>
Pump and motor efficiency	<p>A8. Inventory older pumps and motors that are candidates for high-efficiency replacements or variable frequency drive upgrades.</p> <p>A9. As motors fail, do not rewind – this sacrifices horsepower and efficiency and inevitably costs in the long run.</p> <p>A10. Set motors to run at full load. An under-loaded motor, energy efficient or not, is less efficient than a fully loaded motor.</p> <p>A11. Make sure cooling fins on all motors are clean and unobstructed by dust, dirt and woody debris.</p>
Optimize kiln operation	<p>A12. Insulate exterior.</p> <p>A13. Upgrade fan motors and direct air flow for maximum efficiency and flow.</p> <p>A14. Resolve causes of uneven drying in kilns (which contributes to a potential</p>

Opportunity Area	Specific Steps/Suggestions
	<p>second round of drying and/or second preserving treatment). Potential considerations include spacing and stack configuration in kilns, improved fan design and placement for optimal convection/air flow, and exterior insulation.</p> <p>A15. Insulate steam/condensate return lines.</p>
Compressed air	<p>A16. Find ways to cut back needless use of compressed air. An industry standard is that the true cost of compressed air is the electric cost multiplied by four to account for ancillary costs associated with the compressors such as maintenance, cooling water (if used), lubricants, filters, cost of ownership, etc.</p> <p>A17. Initially, measure air leaks and calculate true costs. One assessment body's experience shows that even with the best of systems, approximately 15-20% of compressed air at manufacturing facilities is lost due to leaks. "Listening" for air leaks is inadequate. Implement a scheduled leak survey and detection method, and use automated or manually operated ultrasound leak detection. Repair leaks on a timely basis.</p> <p>A18. Determine the compressed air demand in each building and evaluate it against the current supply. If discharge pressure can be reduced, each one pound per square inch (psi) reduction in line pressure, will yield an approximate reduction of 1/2 horsepower.</p> <p>A19. Ensure compressor(s) are strategically located to minimize conveyance of air.</p>
Optimize equipment operation	<p>A20. Implement policy to turn processing equipment off when not being used.</p> <p>A21. Make sure equipment is tuned and operating at top efficiency.</p>
Minimize retreatment or over-treatment	<p>A22. Evaluate causes necessitating re-treatment or overtreatment of poles. Rejects require retreatment, consuming additional energy, water, and preservative. Contributing causes may include, but are not limited to, uneven drying, different size logs, stacking patterns in retort that do not allow adequate penetration.</p>
Lighting	<p>A23. Implement policy to turn lights off when a space is not occupied. Consider installing occupancy sensors in some areas.</p> <p>A24. Replace failed 400 watt metal halide bulbs 360 watt bulbs.</p> <p>A25. Replace T12 fluorescents and magnetic ballasts with T8 fluorescents with electronic ballasts.</p> <p>A26. Replace incandescents with compact fluorescent bulbs or LEDs in exit signs.</p> <p>A27. Consider LED fixtures, where suitable technology is available, for warehouse, storage, and security lighting.</p>

One facility assessment resulted in compiling the pie chart in Figure 2 below – which illustrates the value of understanding energy use consumed by different pole manufacturing operations. This type of information allows for prioritization of energy improvement efforts and can contribute to sound energy management at a facility.

Energy Consumption by Process or Operation

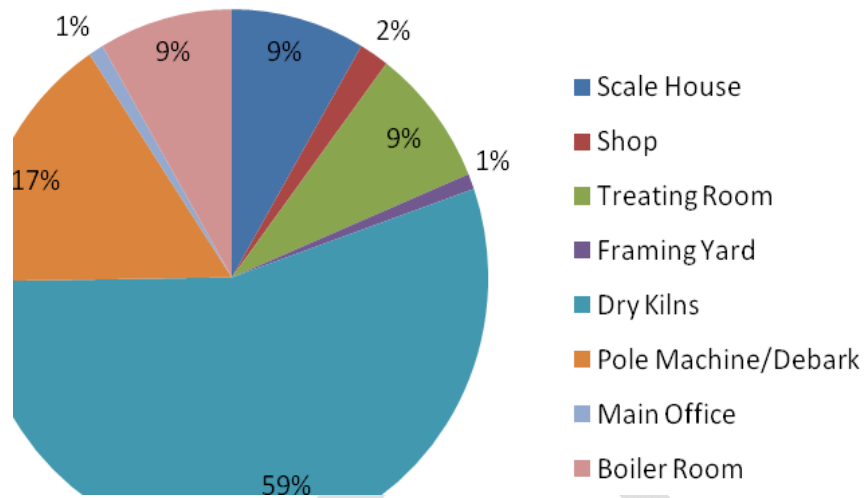


Figure 2 – Energy Consumption by Process

Table B: Best Practice Recommendations in Fuel & Fuel Efficiency

Opportunity Area	Specific Steps/Suggestions
Outbound shipments	<p>B1. Optimize outbound shipment loads to maximum allowed shipping weight by convincing customers to consign (store finished inventory at their site so a full load can be shipped), or combine shipments.</p> <p>B2. Ensure poles are completely dripped dry.</p> <p>B3. Consolidate multiple customer shipments to on one truck allowing a full load and lower freight costs.</p>
Mobile and diesel-powered equipment operation	<p>B4. Implement no-idling policy for mobile and other diesel-powered equipment off when it will not be used again within a set time period (e.g., five minutes).</p> <p>B5. Use engine warmers and cab heaters during colder weather to reduce “live” warm up for loaders, and/or idling to keep cabs defrosted and warm.</p> <p>B6. Make sure equipment is tuned and operating at top efficiency.</p> <p>B7. Train loader operators in energy-efficient driving techniques, e.g., avoiding rapid acceleration and braking.</p> <p>B8. Minimize travel distance and frequency of moving poles on site</p> <p>B9. Dedicate pole moving equipment to specific areas of the yard to reduce fuel consumption and emissions from reduced transit.</p>

Table C: Best Practice Recommendations in Water Management

Opportunity Area	Specific Steps/Suggestions
Reuse	<p>C1. Evaluate the reuse of treated storm water or groundwater, or possibly treated process water, for equipment washing, dust control onsite, dust</p>

Opportunity Area	<i>Specific Steps/Suggestions</i>
	control at the peeler, for boiler or cooling makeup water or other suitable processes. Work with permitting agency if necessary. C2. Reuse wastewater from retorts for treatment formulation of other water-based treated lumber products.
Minimize water use	C3. Use small diameter hoses and possible higher pressure water stream, along with appropriate nozzles, to reduce water used in washing activities.
Manage storm water and runoff	C4. Follow a storm water management plan. C5. Evaluate catch basin filters to reduce treatment needs. C6. Consider collecting rainwater from rooftops - in barrels or cisterns, to reuse on site and reduce storm water treatment needs.

Table D: Best Practice Recommendations in Air Quality (Occupational & Ambient)

Opportunity Area	<i>Specific Steps/Suggestions</i>
Dust and particulate control	D1. Ensure wood dust and site dust is sufficiently contained and employees and neighbors are protected from inhalation exposure. The State of California is adding wood dust to their Prop 65 list due to inhalation exposures.
Fuel combustion	D3. Use ultra low sulfur diesel (ULSD) for all diesel applications/uses. D4. Consider emissions retrofits on loaders. D5. Maintain gas-fired boilers with right air and fuel mixture to minimize NOx emissions. If replacing an existing boiler, purchase low NOx.
Other emissions and releases	D6. Ensure employees use proper personal protective equipment (PPE) during handling of preservatives, diesel, and solvents, and especially during exposure to vapor mist upon opening the retort chamber after treatment. D7. Conduct pole clean-up and deburring prior to retort, to minimize employee exposure to treatment chemicals during to post-treatment cleanup. D8. Maintain retort and condenser function, and other related operations to minimize release of volatile releases.

Table E: Best Practice Recommendations for Chemical & Material Use

Opportunity Area	<i>Specific Steps/Suggestions</i>
Pole treatment	E1. Minimize retreatment and overtreatment of poles, possibly by batching customer's poles that require similar penetration level, and/or poles that have similar characteristics (sapwood thickness, moisture level, diameter, and level of incising). E2. Perform timely leak detection checks on retort systems.
Water treatment chemicals & materials	E3. Look for sources of pure, spent caustic solutions from other local manufacturers. E4. Reactivate carbon rather than purchasing virgin.
Paint use	E5. Replace individual aerosol marking paints that are emit vapors and may contain metals, with lower toxicity alternatives with non-hazardous, water-based paint. E6. Evaluate a bulk dispensing system to reduce labor to manage individual can waste, residual paint waste.
Liquid preservative transfer	E7. Implement liquid transfer system controls such as backflow preventer and spill & drip control/prevention for transfer points of the treatment chemicals and carrier fluid to equipment.

Opportunity Area	Specific Steps/Suggestions
Alternative carrier oil	E8. Use bio-based to reduce volatile releases and use less of non-renewable resource.
Solvents /Degreasers	E9. Use non-chlorinated solvents. E10. Identify lower toxicity alternatives for items such as brake cleaners. E11. Use aqueous washers for parts cleaning. E12. Tightly cover all containers to minimize evaporation.
Laboratories	E13. Update lab chemicals (e.g., green chemistry), and lab equipment (e.g., XRF fluorescence, micro scale) to minimize lab chemical toxicity, use, and waste generation.

Table F: Best Practice Recommendations for Solid & Hazardous Wastes

Note: Some of the opportunities mentioned above will reduce solid or hazardous waste reduction. Additional opportunities not captured above are listed here.

Opportunity Area	Specific Steps/Suggestions
Wood & other solid waste	F1. As possible, reduce pole end cuts from two to one during framing. F2. Debark as soon as possible to reduce potential for insect damage. F3. Ensure highest value-added uses for unusable poles, scrap wood, chips, sawdust, etc., such as composting, fuel, animal bedding, alternative daily landfill cover or other use. (Access local material exchange resources). F4. Reactivate carbon rather than purchasing virgin. F5. Use anti-checking devices on pole ends. F6. Minimize removal of wood during debarking with adjustable cutters. F7. Review solid waste contracts to ensure appropriate and minimal billing.
Chemicals	F8. Ensure all spill control measures are current and in place.
Recycle	F9. Recycle paper, bottles, plastics, strapping/banding, metals, packaging, used oil and hydraulic fluids, punctured aerosol cans, spent fluorescent lamps, iron cores from penta blocks, solvents, tires, and batteries.
Hazardous wastes	F10. Ensure hazardous wastes - that are not always obvious hazardous wastes - are properly managed and disposed of, such as metal halide and fluorescent bulbs, treated wood waste & chips, cored samples, etc.
Drippage	F11. Use and maintain containment system to recapture drippings from post-treatment drying. Reuse the preservative. F12. Maintain structural integrity of drip pads. F13. Minimize dust, debris, and traffic on drip pads. F16. Avoid movement of treated logs off drip pad until no longer dripping.

Table G: Best Practice Recommendations for Additional Environmental Stewardship

Opportunity Area	Specific Steps/Suggestions
Purchase recycled	G1. Retread tires. G2. Recycled content paper for office use (suggest minimum 30% post-consumer).
Employee	G3. Investigate employee incentives to carpool, cycle, and bus to work.

Opportunity Area	Specific Steps/Suggestions
commute	
Supply Chain	G4. Encourage pole suppliers to provide environmentally sound transport and delivery of materials. G5. Ask suppliers for suggestions on lower-toxicity material alternative – such as bio-based solvents or hydraulic fluids, dust palliatives, reusable packaging.
Carbon	G6. Calculate and communicate greenhouse gas emission reductions due to energy and fuel efficiency improvements.

Table H: Best Practice Recommendations for Product Quality

Opportunity Area	Specific Steps/Suggestions
Post-treatment rejects	H1. Perform root cause analysis to address post-treatment rejects, which result in a lower-value end product or require a second round of treatment. Considerations might include: differences in sapwood thickness in one treatment batch, stacking and spacing patterns in the kiln and/or retort chamber, and inadequate drying/seasoning of poles prior to treatment. H2. If sapwood thickness variability is a significant contributor, consider paying a premium for consistency in sapwood thickness. H3. If pole characteristic variability is a significant contributor, segregate poles by size, moisture content, and sapwood thickness for drying and treatment. This may reduce excessive or inadequate treatment within in a batch.
Insect damage	H4. Peel “barkies” as soon as possible to minimize loss associated with insect damage.
Pole damage from movement	H5. Change layout and reduce staging between process steps to minimize movement and need for stacking and re-stacking poles. H6. Train operators in best movement practices.

Table I: Best Practice Recommendations for Inventory & Flow

Opportunity Area	Specific Steps/Suggestions
Raw material	I1. Schedule incoming logs to meet peeler capacity.
Inventory reduction	I2. Reduce inventories. One site is expected to be able to reduce by 25% across the board; several sites had excessive finished good (FG) inventory.
Flow between process steps	I3. For FG inventories for key customers, or to level production when orders do not meet capacity - institute supermarkets (with an established maximum inventory level) I4. Institute STOP signals when inventory (both in-process and (FG) exceeds a defined limit and first in first out (FIFO) lanes from kiln to ship. I5. Reduce staging processes to achieve more continuous flow and eliminate staging and inventory between processes, e.g., combine pole and day kiln staging.
Framing	I6. Work with customers to set across the board, industry-wide standards for framing hole locations. I7. Consolidate framing operations to one skid/set area to reduce foot travel,

Opportunity Area	<i>Specific Steps/Suggestions</i>
	<p>tool movement, and space.</p> <p>I8. Implement a more direct material flow through framing stations.</p> <p>I9. Organize, store, have central location for tools and equipment.</p>
Pole movement	<p>I10. Dedicate pole moving equipment to specific areas of the yard.</p> <p>I11. Reduce staging, improve layout to minimize.</p>
Third-party Inspection	<p>I12. Third-party inspection requires staging of the product for redundant inspection, delay of shipment, excess motion, underutilized employees, and cost. Convince customers to train and certify supplier employees to provide the necessary inspection.</p>

Table J: Best Practice Recommendations in Total Productive Maintenance

Opportunity Area	<i>Specific Steps/Suggestions</i>
Reliability	<p>J1. Improve machine and tool reliability to a minimum level of 95% by implementing total productive maintenance (TPM) for peelers, incisors, other heavy equipment and tools. In addition to reducing unexpected downtime, this increases longevity of motors, blades, knives, pumps, seals, etc.</p>
Motor and pump inventory	<p>J2. Develop a database of motors and pumps currently in service. Use the database for a preventive and predictive maintenance program, particularly for motors greater than 25 Hp.</p>

APPENDIX 1 – ENVIRONMENTAL AND LEAN ISSUES IDENTIFIED AT SUPPLIER SITES

The following findings were compiled from the current state value stream mapping at the facilities. Some of the listed findings may only occur at one facility, while other conditions may be experienced by several facilities.

The findings are listed by environmental category of energy efficiency, fuel efficiency, water use, air and chemicals, and waste. In instances where a 'deficiency' actually results in impacts that might overlap categories, it is listed under the category that is most impacted. For instance, e.g., if uneven drying resulted in running a log through the kiln a second time, –it could be categorized as having an energy impact, but if the wet pole results in having to run the pole through treatment a second time, it would consume energy, but also chemicals, and potentially result in wastewater. In this case, the deficiency would be listed under energy.

Energy Efficiency

- Inefficient, older lighting such as T12 fluorescents with magnetic ballasts, and high-wattage metal halides
- Lights and equipment remain on when areas and operations are unoccupied and idle
- Air compressor systems were found of varying vintages, unknown efficiencies, operating with leaks (and no leak detection system), varying discharge pressures at one site, and lack of routine preventive maintenance
- No energy management system in place
- Uneven drying (kiln or via seasoning). Treating green poles can result in having to dry and/or treat poles a second time
- Probable overtreatment of some poles, possibly due to batch treatments of different size poles, or different moisture-content or sapwood thickness, or having to retreat poles that are not sufficiently penetrated on first retort. (Overtreatment consumes added energy, water, and treatment chemicals, and contributes to waste generation)
- Lack of heat recovery/economizer on heat streams – such as boiler flue gas, boiler blowdown, or return condensate
- Numerous older, low-efficiency pumps and motors

Fuel Efficiency

- Idling of equipment and loaders when not in actual use, sometimes to keep engines warm in colder weather
- Non-optimized shipping loads results in more frequent shipments- and loads that are significantly lighter than allowable transit weight limits.
- For those using wood waste generated on site as boiler fuel, there are difficulties in handling this material when it has high moisture content, and energy is wasted burning wet fuel

Water & Water Quality

- Water is consumed to control dust in unpaved yard areas
- Storm water management plans are in place
- Rainwater is collected from the roof for reuse on site
- Hypalon liner installed under drip pad

Air & Chemicals

- Use of toxic aerosol spray paints for framing marking (also contributes to hazardous and solid waste)
- Wood dust (from peeler) and dirt dust (from unpaved yards) are controlled to the extent required by local air agencies, and do not pose air compliance issues for any of the facilities, but are mentioned herein because some dust is released). These dust sources are of concern for inhalation exposure

Waste

- Reject poles are caused by pole movement. One estimate revealed up to 15% loss in product due to stacking and re-stacking of poles as they are pulled for additional processing
- Some treated and some untreated lumber is land filled by at least one facility
- Some rejects arrive directly from the field. Full inspection is hampered when bark is intact

The following lean challenges were compiled from the current state value stream mapping at the supplier facilities. Some of the findings may only be applicable at one facility, while other conditions may be experienced by several facilities. The findings are listed categorically by product quality, inventory and flow, total productive maintenance, and standardization.

Product Quality & Rejects

- Although scaling /grading procedures are followed in the field, it is sometimes difficult to determine pole suitability until the bark is removed at the production facility.
- A delay in peeling contributes to a small percentage of rejects, as unpeeled logs are prone to insect damage.
- Stacking and re-stacking of poles inevitably leads to an estimated 10-15% loss in product due to damage.
- Post-treatment rejects, measured over 5% at one facility, necessitating re-treatment of poles to achieve specified penetration depth.
- Incoming raw material (poles) are inconsistent in sapwood thickness, contributing to over 7% re-treatment pass.

Inventory & Flow

- Retorts and/or drying are significant constraint on overall system throughput.
- Excessive inventory: in one case, over 30 days in front of drilling, over 50 days of raw material waiting to be put into production, and over 50 days of finished goods inventory.
- Double handling of poles, e.g., pole staging and then day kiln staging.
- Poor categorization and grouping, and organization of pole inventory (e.g., by size, sapwood thickness, moisture content, or other variables) impacts transport frequency and distances between operations.
- Inefficient layout of framing operations results in inefficiencies because tools and necessary framing implements are located too far from the point of work.
- No readily available inventory of motors or motor efficiencies is kept at the site.
- As an industry, customers do not have standard framing hole locations, which requires suppliers to carry more inventory than if all poles had the same framing requirements.
- Third party inspection is required at least two facilities, requiring staging of the raw material or treated finished goods for inspection, causing delayed shipment, and waiting waste.

Total Productive Maintenance (TPM)

- Machine and equipment reliability at some facilities is subpar, especially peelers and pole loaders/moving equipment.
- Tools, especially those used in framing and coring, are unorganized, have inadequate storage, and are in need of maintenance.

Standardization

- There is a lack of standard work, especially notable in framing operations.

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APPENDIX 2 – QUANTIFIED COST SAVINGS

The Supplier Environmental Assessments resulted in a comprehensive set of environmental improvement recommendations. Evaluators were able to estimate potential annual savings for some of the best practice recommendations for individual supplier facilities. Savings presented may have been projected as an environmental metric, and/or as cost savings. The recommendations, listed in Table 1, with projected environmental and cost savings are estimates for the site(s) at which the improvement opportunity was identified.

Table 1: Environmental Activities or Opportunities Analyzed for Potential Cost Savings

Opportunity Area	Specific Improvement(s)	Measure	Estimated Annual Cost Savings *	Cross Reference (Table A to G)
Energy Reduction	Motor & pump upgrades and operation	Reduction in Electricity (kwh)	Over \$24,000	A8 to A11
	Heat recovery	50,029 therms	\$57,500	A4
	Air compressor leaks	Estimate 15-30% losses in leakage	\$5,000	A17
	Energy management plan	Electricity (kwh)	\$4,000	A1, A2
	Improve power factor	Improve from 75% to 85%	\$2,000 avoided penalty	N/A
	Upgrade lighting	Electricity (kwh)	\$4,600	A23 to A27
	Reduce re-treatment	Natural gas (therms)	\$9,000	A22
Fuel	Reduce idling, improve driving skills, reduce pole movement	3-4% fuel reduction	\$10,800	B5 – B8
	Consolidate loads for shipment (One site has significant opportunity).		\$81,000	B1, B2
Water	Expand onsite use of treated water, including treated storm water for site dust control	Reduce city water use by 15%	\$2,500	C1
		1.2 M gal/year	\$3,700	C1
Chemical and Material Use	Switch from hazardous aerosol paint to water-based, bulk spray system	25 gallons of hazardous waste & time to manage; 1,900 cans; Reduced toxics	\$2,400 (after purchase of bulk spray)	E5
Hazardous and Solid waste	Revise solid waste contract to reflect actual volume/weight .	N/A	\$12,000	F9
	Maximize reuse of unusable poles - expedient shipping of non-usable poles to saw mill before checking occurs.		\$1,000	F5
Total Aggregate Projected Cost Savings for Environmental Recommendations			\$189,500	

The Supplier Environmental Assessments resulted in a comprehensive set of lean improvement recommendations. Evaluators were able to estimate potential annual savings for some of the best practice recommendations for individual supplier facilities. Savings presented may have been projected as a lean metric, and/or as cost savings. The lean recommendations, listed in Table 2, with projected productivity and cost savings are estimates for the site(s) at which the improvement opportunity was identified.

Table 2: Lean Activities or Opportunities Analyzed for Potential Cost Savings

Lean Category	Improvement Opportunities	Measure	Estimated Annual Cost Savings *	Cross Reference (Table H to K)
Inventory	Standard framing (if specified by all customers)	50% increase in inventory turns	Not specified	I6
	Inventory reduction and management plan	Reduce inventories by up to 25%	\$65,000	I2
	Reduce excessive FG stock; review customer demand	Possible 50% FG reduction		I2
Staging / Processing Lead Time	First in first out (FIFO) lane from kiln to ship and stop signals	21% increase in throughput		I4
	Staging inventory reduction	Reduce total lead-time by 65 days		I4
		Reduce FG from 50 days to <30 days		I5
	Reduce incoming material lead time – schedule incoming logs to peeler capacity		\$21,000	I1
Re-treatment	Improve first-pass yield on treatment	Range from 5 to 16% retreat, Reduce to <5%		H1, H2, H3
		Improve yield from 88.4 to 90.2%	\$44,000	H1, H2, H3
Damaged poles	Reduce pole movement with improved layout, staging, continuous flow, debark sooner to avoid insect damage		~\$70 cost per inbound pole (untreated)	H4, H5, H6
Third-party inspection	Stop redundant approvals & waiting for customer inspection	Improve take time by up to 3 days		I12
Other general lean	Improve framing operations and reduce footprint		\$53,900	I8, I9, I10, I11
Total Aggregate Projected Cost Savings for Lean Recommendations			\$183,900	

APPENDIX 3 – Supplier Profiles, Process Description and Current Observations

3.1 Supplier Facilities

Five suppliers participated in assessments to identify best practice recommendations. To maintain confidentiality, specific facility names and locations are not mentioned.

Processing capabilities and stats/information are as follows:

- All participating suppliers manufacture treated utility poles, while some sites produce additional products such as landscaping poles, pressure-treated lumber, plywood, pilings, railroad ties, and/or cross arms.
- Preservative treatments used at the facilities include pentachlorophenol (PCP), copper naphthenate (CuNap) and copper chromate arsenate (CCA), with most facilities only using one preservative for their utility poles.
- Four suppliers use dry kilns to dry lumber, while one seasons poles outdoors.
- Two facilities also have the equipment to treat via a boultonizing process.
- At the time of the assessments, the number of full time equivalents (FTEs) ranged from 24 to 76 FTEs.
- Shifts vary, with kilns typically operating 24 hours/day for 6-7 days/week. Treatment shifts typically run 24 hours for 5 days/week.
- Three facilities have gas-fired boilers. Two have wood-fired boilers that use wood waste generated on site to fuel the boiler.

3.2 Individual Supplier Environmental Assessments: Process Description

Each of the five facilities received the appropriate level of lean manufacturing and environmental training, based on their pre-existing knowledge of these strategies. Training was followed by an assessment of the facility for lean and environment improvement opportunities, and followed-up with recommended opportunities for improvement.

The purpose of the assessment was to identify financial, process, and environmental savings for participating companies. Specifically, the assessment teams looked for improvement opportunities in pole production efficiency, pole quality, lead time, and reduced energy and water use, material use, solid and hazardous waste, toxic materials, and emissions and effluents.

In summary, the typical Supplier Environmental Assessment consisted of the following activities:

- Lean and green fundamentals training including Value Stream Mapping (VSM)
- 1 day documenting the Current State value stream map, including lean and environment data
- 1 day creating the Future State value stream map
- Energy or steam analysis, either integrated within the VSM events, or conducted independently
- Several days of off-site analysis, development, and verification of lean environmental recommendations and solutions

APPENDIX 4 – ADDITIONAL RESOURCES AND REFERENCES

- **Energy Star - Guidelines for Energy Management Overview -**
http://www.energystar.gov/index.cfm?c=guidelines.guidelines_index
- **Compressed Air Challenge - Department of Energy Industrial Technology Program Air Master+ Compressed air system assessment and analysis software -**
<http://www.compressedairchallenge.org/toolbox/index.html>
- **Compressed Air Tipsheets -**
http://www1.eere.energy.gov/industry/bestpractices/tip_sheets_compressed_air.html
- **American Wood Preservers Association (AWPA) -** <http://www.awpa.com>
- **Green Suppliers Network -** <http://www.greensuppliers.gov/>
- **Electric Utility Industry Sustainable Supply Chain Alliance -** www.euissca.org/
- **Oregon Manufacturing Extension Partnership -** <http://www.omep.org/>
- **South Carolina Manufacturing Extension Partnership -** <http://www.scmep.org/>
- **Pollution prevention Resource Center -** <http://www.pprc.org/>

APPENDIX 5 – ADDITIONAL DETAILS ON UTILITY LIFE CYCLE BEST PRACTICES

The Alliance developed best practices for the utility life cycle of a wood pole namely transportation, use, re-use and maintenance and end of life disposal. (See yellow shaded items in Figure 1 above). The Alliance used the tier rating system below to aid in evaluating trade-offs with respect to resource constraints and benefit expectations. Tier 1 takes the least amount of time and cost to implement but yields the lowest benefit. Tier 2 requires more time and cost to implement but has improved benefits. Tier 3 takes the most amount of time and cost to implement with the corresponding greatest benefit yield. Each tier may be acceptable based on the preferred variable to optimize. Reference Section 3.0 above for the summary.

The utility life cycle assessment performance analysis utilized the guidelines and definitions shown below. As you would expect, economic and environmental trade-offs are present within each best practice

- ◆ while (a) maintaining or enhancing asset life, (b) maintaining or reducing current Total Cost of Ownership (TCO), and (c) can be implemented relatively quickly at minimal incremental cost

	Time to Implement	Investment Cost to Implement	Environment Benefit	Example of Change
TIER 1	< 3 months	Zero	< 5%	Process
TIER 2	3 to 12 months	< 10%	5 – 25%	Specification
TIER 3	> 1 year	> 10%	> 25%	Regulation

Transportation Analysis – Opportunity 1

Best Practice :	Ship directly to jobsite from supplier
Change Mechanism:	Internal PO is the common mechanism. However, there may be utilities that outsource their pole programs. In an outsourced environment poles are vendor managed at a supplier's yard and poles are delivered directly to the job site by the program provider
Time to Implement:	Normally, < 3 mo. However in an outsourced environment, it may take 1-3 years before the process is running smoothly
Cost to Implement:	Minimal incremental cost. Potential savings to utilities under an in-house solution. In an outsourced model, incremental costs are offset by internal process changes
Impact on Asset Life / Asset Performance:	Minimizes exposure time (storage time), longer active pole life.
Environmental Benefits:	(1) Less fuel consumption and minimizes emissions. (2) Removal of utility storage process would reduce treated wood exposure to rain and help reduce amount of Penta, Creosote and CCA in rainwater runoff
Other Benefits:	Use natural resources when needed – no need to manufacture poles when demand is low. Supplier has a more visibility of market demands and changes. Less storage, shelf, and warehouse, and depreciation costs for utility.

■ Tier 1 Best Practice

■ Tier 2 Best Practice

■ Tier 3 Best Practice

Transportation Analysis – Details for Opportunity 2

Best Practice :	Aggregate orders or requirements to ship maximum cubic feet or number of poles per truck. The utility should schedule poles to be delivered in one drop or multiple drops per truck load in a specific geographical location
Change Mechanism:	Policy/procedural modification through PO or contract amendment
Time to Implement:	Approximately 30 days
Cost to Implement (or savings):	Minimal incremental cost and potential freight cost savings ~10%. The cost per pole is less when the delivery truck is fully utilized
Impact on Asset Life / Asset Performance:	None
Environmental Benefits:	The practice of aggregation would reduce the number of deliveries, impacting fuel consumption, vehicle emissions, and maintenance materials (rubber, lubricants, etc.)
Other Benefits:	Less LTL (Less than Truckload) fill rates for transportation and eliminates break-bulk cargo. Engages FTL (Full Truckload) fill rates.

 Tier 1 Best Practice

 Tier 2 Best Practice

 Tier 3 Best Practice

Transportation Analysis – Details for Opportunity 3

Best Practice :	Ship by rail when possible
Change Mechanism:	Feasible only if rail access is readily available. Can be managed by the pole program provider in an outsourced model
Time to Implement:	> 1 year
Cost to Implement:	Minimal incremental cost and up to 20% cost reduction over truck deliveries to the pole yards Note that there maybe costs related to shipping by rail if a third party storage yard is needed to accommodate rail siding locations. However, this is still less expensive than shipping by truck directly from the treating plant to the customer when distances are greater than 500 miles. The utility will have a ready inventory closer to their location to service storms and other emergencies
Impact on Asset Life / Asset Performance:	None
Environmental Benefits:	Every ton of freight being carried on rail produces at least 80% less carbon dioxide than by road transport. Compared with carrying the same tonnage by road, rail produces less than one tenth of the carbon monoxide; around one twentieth of the nitrogen oxide; less than 9% of the fine particulates and around 10% of the volatile organic compounds.
Other Benefits:	Mass delivery 20,000+ lbs freight. Less liability for utility and maintenance for fleet vehicle.

 Tier 1 Best Practice

 Tier 2 Best Practice

 Tier 3 Best Practice

Transportation Analysis – Details for Opportunity 4

Best Practice :	Visually inspect incoming poles and increase inspections at third party off-site storage areas, reject weeping poles, ensure pole specifications have a standard for weeping, require certification from suppliers of compliance to specifications
Change Mechanism:	Contract specifications and training
Time to Implement:	< 3months
Cost to Implement:	Minimal cost to return weeping poles to manufacturer to re-dry
Impact on Asset Life / Asset Performance:	None
Environmental Benefits:	Prevents contamination in storage yards, transfer to handlers of poles and general public, less leaching into the soils
Other Benefits:	

- Tier 1 Best Practice
- Tier 2 Best Practice
- Tier 3 Best Practice

Transportation Analysis – Details for Opportunity 5

Best Practice :	Minimize physical damage to poles when loading, unloading and handling to reduce scrap and waste (offloading process from supplier's transport is normally not a utility responsibility)
Change Mechanism:	Training programs for new drivers by third party carrier. Trained storekeepers who know how to handle poles
Time to Implement:	< 3 months
Cost to Implement:	Minimal incremental cost
Impact on Asset Life / Asset Performance:	
Environmental Benefits:	Less scrap and waste to landfills
Other Benefits:	

- Tier 1 Best Practice
- Tier 2 Best Practice
- Tier 3 Best Practice

Use, Re-Use, and Maintenance Analysis – Details for Opportunity 1

Best Practice :	Maintain minimum operationally practical stock of new poles
Change Mechanism:	Policy/procedural modifications May also require contractual agreements with suppliers to maintain on-hand stock for emergency deliveries
Time to Implement:	30 to 90 days
Cost to Implement (or savings):	Minimal incremental cost. Savings from carrying costs of inventory
Impact on Asset Life / Asset Performance:	None
Environmental Benefits:	Minimum stock would reduce treated wood exposure to rain and help reduce amount of chemicals in rainwater runoff
Other Benefits:	Greater inventory turns and less inventory dollars. This may impact having an adequate supply of poles ready to respond during a storm or other emergency.

- Tier 1 Best Practice
- Tier 2 Best Practice
- Tier 3 Best Practice

Use, Re-Use, and Maintenance Analysis – Details for Opportunity 2

Best Practice :	Specify an upper level of preservative retention at an aggregate level to reduce eventual weeping of preservatives.
Change Mechanism:	Limits are stipulated in the purchase contract/specification
Time to Implement:	During contract renewal. 1 year or less
Cost to Implement (or savings):	Minimal costs. performed during contract renewal
Impact on Asset Life / Asset Performance:	None
Environmental Benefits:	Minimize the amount of preservative being released from poles from "cradle to grave". American Wood Preservatives mandates standard chemical levels from .080 lbs/ft ³ to 2.5lbs/ft ³ depending on retention.
Other Benefits:	Safety – less preservative contamination being transferred to pole handlers. less product being added to poles thereby minimizing the amount of preservatives used

- Tier 1 Best Practice
- Tier 2 Best Practice
- Tier 3 Best Practice

Use, Re-Use, and Maintenance Analysis – Details for Opportunity 3

Best Practice :	Do not install excessively weeping poles
Change Mechanism:	Utility internal policy and procedures. Address the issue of weeping poles earlier in the supply chain process (i.e. supplier qualification)
Time to Implement:	3-12 months
Cost to Implement (or savings):	Moderate costs associated with program development, training and implementation
Impact on Asset Life / Asset Performance:	None
Environmental Benefits:	Minimizes the amount of pole treatment and chemicals collected at the pole base. Use minimum level of chemicals required for wood poles. American Wood Preservatives minimum standard chemical level is .060 lbs/ft' per wood pole.
Other Benefits:	Poses less of a safety concern for linemen handling the poles

- Tier 1 Best Practice
- Tier 2 Best Practice
- Tier 3 Best Practice




Use, Re-Use, and Maintenance Analysis – Details for Opportunity 4

Best Practice :	Treatment processes minimize preservative residuals on the surface of the poles which reduces potential in-service releases to the environment. Such processes may include post-treatment steaming or other methods to provide a clean pole surface
Change Mechanism:	Requirements in purchase specifications and concurrence with treating plants
Time to Implement:	6 months to 1 year
Cost to Implement (or savings):	< 10%
Impact on Asset Life / Asset Performance:	No impact on asset life or performance
Environmental Benefits:	Minimizes preservative chemicals released into soil
Other Benefits:	

- Tier 1 Best Practice
- Tier 2 Best Practice
- Tier 3 Best Practice




Use, Re-Use, and Maintenance Analysis – Details for Opportunity 5

Best Practice :	Public is briefed on environmental concerns associated with treated poles prior to donation; recipients to sign a consent/release form. Note: some utilities cannot donate poles
Change Mechanism:	Utility internal policy and procedures
Time to Implement:	Approximately 30 days
Cost to Implement (or savings):	Minimal costs associated with preparation and printing of public information and release forms
Impact on Asset Life / Asset Performance:	None. However, donated materials would allow for continued use of treated wood products in secondary roles
Environmental Benefits:	Donated poles would allow for continued use and would reduce amount of wood being sent to landfills
Other Benefits:	

-  Tier 1 Best Practice
-  Tier 2 Best Practice
-  Tier 3 Best Practice

Use, Re-Use, and Maintenance Analysis – Details for Opportunity 6

Best Practice :	Limit where poles are donated
Change Mechanism:	Utility internal policy and procedures
Time to Implement:	3-12 months
Cost to Implement (or savings):	Moderate costs associated with procedure development, training and implementation
Impact on Asset Life / Asset Performance:	None – Donated poles have met their asset life
Environmental Benefits:	By limiting where poles are donated, highly sensitive locations can be avoided
Other Benefits:	Extends the useful life of poles and avoids them being disposed in a landfill.

-  Tier 1 Best Practice
-  Tier 2 Best Practice
-  Tier 3 Best Practice

Use, Re-Use, and Maintenance Analysis – Details for Opportunity 7

Best Practice :	Routinely check poles for strength, then reinforce and treat for decay and insects
Change Mechanism:	Negotiate contract with third party inspection and treatment service
Time to Implement:	Approximately 180 days
Cost to Implement (or savings):	Approximately 10%-20% cost increase to implement regular ground line inspection and treatment program. Long term - can provide savings by reducing pole replacements
Impact on Asset Life / Asset Performance:	Asset life can be doubled or tripled if the ground line program is maintained on a regular cycle
Environmental Benefits:	Extended pole life reduces pole replacements which reduces material being placed in landfills. National average of maintenance is \$25-40 per pole inspection – can extend life up to 20 years. There is an added benefit of sequestering atmospheric carbon over a longer period of time
Other Benefits:	Pole reinforcement improves electric distribution reliability

 Tier 1 Best Practice

 Tier 2 Best Practice

 Tier 3 Best Practice

Use, Re-Use, and Maintenance Analysis – Details for Opportunity 8

Best Practice :	Backhaul and recycle used poles
Change Mechanism:	Utility procedure and agreement with supplier
Time to Implement:	1-3 months
Cost to Implement (or savings):	None to moderate, including cost of lading and back haul rate
Impact on Asset Life / Asset Performance:	None
Environmental Benefits:	Returned poles can be evaluated and disposed of by supplier and better use of fuel with increased usage of backhauling capacity
Other Benefits:	TWW (Treated Wood Waste) is roughly 60-70% recyclable and can be re-sold for 25% of original non-recycled content. Study shows that recycled utility poles were use in the following categories: <ul style="list-style-type: none"> • 8% re-used as utility poles • 15% re-used as roof shingles • 35% re-used for saw logs (4.9 & 2.4 meter saw poles) • 22% re-used as posts or firewood • 10% landfill disposal

 Tier 1 Best Practice

 Tier 2 Best Practice

 Tier 3 Best Practice

Use, Re-Use, and Maintenance Analysis – Details for Opportunity 9

Best Practice :	Develop universal pole specifications to reduce manufacturer's inventory
Change Mechanism:	Utility standard
Time to Implement:	> 12 months
Cost to Implement (or savings):	Cost benefit analysis required – costs may be significant
Impact on Asset Life / Asset Performance:	None
Environmental Benefits:	Reduction in environmental releases at supplier facilities by minimizing the amount of inventory that must be carried to service multiple utilities
Other Benefits:	Safety – Eliminate field drilling. Aids in emergency response and allows interchanging of poles between utilities

 Tier 1 Best Practice

 Tier 2 Best Practice

 Tier 3 Best Practice

Disposal Analysis – Details for Opportunity 1

Best Practice :	Recycle poles by returning to pole manufacturer for remanufacture and retreatment as necessary
Change Mechanism:	Recycling procedures change from burning or landfill to recycle and retreat. Internal and external changes (i.e. new supplier)
Time to Implement:	6-12 months
Cost to Implement (or savings):	Minimal net cost impact
Impact on Asset Life / Asset Performance:	Asset life could double, but pole would be smaller due to remanufacturing process (width/length)
Environmental Benefits:	Immediate impact – not sending poles to landfill or other solution. Reuse of pole
Other Benefits:	Increase supply of poles in the market, possibly reducing prices. No federal or state regulation on recycled poles.

 Tier 1 Best Practice

 Tier 2 Best Practice

 Tier 3 Best Practice

Disposal Analysis – Details for Opportunity 2

Best Practice :	Explore information technology databases and tracking systems to ensure proper reuse versus disposal as alternate treated wood product
Change Mechanism:	New database/tracking system to catalog products and make available to pertinent end users
Time to Implement:	6-12 months
Cost to Implement (or savings):	Use of existing technology requires a minimal cost to implement. New technology could cost \$10K or more, does not include personnel time to manage and update database
Impact on Asset Life / Asset Performance:	Positive impact due to life extension of existing asset
Environmental Benefits:	Benefit will occur with better reuse of products versus disposal
Other Benefits:	

 Tier 1 Best Practice

 Tier 2 Best Practice

 Tier 3 Best Practice

Disposal Analysis – Details for Opportunity 3

Best Practice :	Use as fuel in biomass power facility; support use as boiler fuel, minimizing land fill for poles not able to be recycled
Change Mechanism:	Develop utility internal policy/procedures; to define work processes for transportation, logistics, and chipping. Establish contract agreements with power generation facilities
Time to Implement:	3-12 months
Cost to Implement (or savings):	Must perform cost benefit. Transportation costs may make one disposal approach more attractive than the other
Impact on Asset Life / Asset Performance:	No impact on pole life
Environmental Benefits:	Use as a fuel source for the production of electricity limits the amount of waste being placed in a landfill. As fuel, a typical 40 ft pole will generate BTU equivalent to 33 gallons of oil
Other Benefits:	Eliminates the long term liability associated with disposing in a landfill

 Tier 1 Best Practice

 Tier 2 Best Practice

 Tier 3 Best Practice