FUEL PROCUREMENT PLAN FOR THE LAKE TAHOE BASIN BIOMASS ENERGY GENERATION FACILITY

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EXECUTIVE SUMMARY

Placer County has retained TSS Consultants (TSS) to complete a fuel availability assessment and develop a fuel procurement plan for the Lake Tahoe Basin Biomass Energy (LTBBE) facility project. This fuel assessment and procurement plan is consistent with task 7.0 of the U.S. Department of Energy (DOE) award No. DE-FG36-08GO88026. Additional investigation of long-term sustainable supply obtainable via forest stewardship contracts and other viable contracting opportunities was conducted to assist in determining if successful deployment of a one to three megawatt (MW) woody biomass-to-energy facility in the Kings Beach area of Lake Tahoe can be accomplished. Such a facility would benefit hazardous forest fuels reduction programs in the Lake Tahoe Basin (LTB) and is consistent with Placer County's Strategic Plan for Wildfire Protection and Biomass Utilization.

The LTBBE facility will also provide a ready alternative to the current preferred disposal method of piling and burning material removed as a byproduct of hazardous fuels treatment activities. The net reduction in air emissions (e.g., particulate matter, CO, NOx, SOx) by diverting this material into a controlled combustion system equipped with maximum achievable control technology will be significant. As fire districts, land management agencies and local residents ramp up fuels treatment activities (as planned), it is anticipated that significant volumes of biomass material will be generated as a byproduct.

From June through August 2010, TSS conducted a comprehensive review of biomass markets, resource availability and current demand for biomass feedstocks in the greater Lake Tahoe region. This fuel assessment utilized a 40-year planning horizon, as this is the projected service life of the LTBBE facility. Only strategic, sustainable fuel resources consistent with the project objectives and compliant with state (California Environmental Quality Act, State of Nevada Title 47 Regulations), regional (Tahoe Regional Planning Agency rules and guidelines), and federal (National Environmental Policy Act) regulations were considered as potentially available fuel.

Results of this fuel assessment concur that there is more than sufficient biomass material available to sustain a one to three MW biomass power generation facility sited at Kings Beach, California. TSS found that there is approximately 112,440 bone dry tons (BDT) per year of biomass fuel practically available within a 30-mile radius of Kings Beach. Current demand amounts to about 40,350 BDT per year resulting in a net availability of 72,090 BDT per year.

Assuming that the LTBBE is scaled at two MW of electrical output and utilizes 20,000 BDT of biomass fuel annually, then a 3.6:1 fuel cover ratio exists. Fuel coverage ratio represents the net availability of fuel relative to new demand in the marketplace. The higher the fuel coverage ratio, the more fuel is forecast to be available. Private financial markets and project developers prefer a fuel coverage ratio of 2:1 or more for new bioenergy projects.

This fuel assessment confirmed that the LTBBE facility (scaled at two MW) could be sustainably supplied with biomass fuel sourced from within a 20-mile radius of Kings Beach. With a 20-mile radius fuel sourcing area, over 80% of the fuel could be provided by fuels treatment activities within the LTB and the balance (20%) provided by tree trimmings and pine needles from the Eastern Regional Landfill and transfer station at Truckee. Most of this material would not be available economically to other markets or biomass power plants, as transport costs are very significant and Placer County is working with land management agencies to cost share the collection, processing and transport expenses for biomass material that is currently open pile burned or masticated (chipped and scattered).

An optimized fuel blend for this facility assumes that 75% of the facility's fuel usage will be sourced from hazardous fuels treatment activities, with the balance being made up of forest thinning residuals and urban-sourced (primarily tree trimmings and pine needles) wood. While urban-sourced wood represents the most cost effective fuel, utilizing large volumes of urban wood fuel would defeat the primary objective of the LTBBE project – which is to provide a ready, sustainable market for biomass fuel generated as a byproduct of hazardous fuels reduction activities.

ABBREVIATIONS

ASTM	American Society for Testing and Materials
BDT	Bone Dry Ton(s)
Btu	British Thermal Unit
CFSA	Core Fuel Supply Area
CWPP	Community Wildfire Protection Plan
GT	Green Ton(s)
IRSC	Integrated Resource Service Contract
LTB	Lake Tahoe Basin
LTBBE	Lake Tahoe Basin Biomass Energy Facility
LTBMU	Lake Tahoe Basin Management Unit
MBF	One thousand board feet
MW	Megawatt (1,000 kW of electrical power)
RPS	Renewable Portfolio Standard
USFS	USDA Forest Service
WUI	Wildland Urban Interface

GLOSSARY OF TERMS

Listed below are terms that are utilized in this plan. Definitions presented here are from a variety of sources including the USDA Forest Products Lab and the Society of American Foresters – Forestry Dictionary.

Biomass – Organic matter in trees, agricultural crops and other living plant material. Carbohydrates are the organic compounds that make up biomass. These compounds are formed in growing plant life through photosynthesis, a natural process by which energy from the sun converts carbon dioxide and water into carbohydrates, including sugars, starches and cellulose.

Board Foot – The amount of wood contained in an unfinished board 1 inch thick, 12 inches long, and 12 inches wide (abbreviated "BF"). Common units as related to saw log volume measurement include 1,000 BF or MBF and 1,000,000 BF or MMBF.

Bone Dry Ton – Traditional unit of measure used by industries (pulp/paper, biomass power) that utilize biomass as a primary raw material. One bone dry ton (BDT) is 2,000 pounds of biomass (usually in chip form) at zero percent moisture. Typically biomass collected and processed in the forest is delivered "green" to the end use facility at 50% moisture. One BDT (assuming 50% moisture content) is two green tons (4,000 pounds at 50% moisture content).

British Thermal Unit – The quantity of heat required to raise the temperature of one pound of water from 60 degrees F (Fahrenheit) to 61 degrees F at a constant pressure of one atmosphere.

Chip – A small piece of wood typically used in the manufacture of pulp/paper, composite panels, fuel for power/heat generation, and landscape cover/soil amendment.

Cogeneration – The combined generation of both heat and power at one facility using the same fuel source.

Ecosystem Services – The processes by which the environment produces resources that include clean water, timber, recreation, and wildlife habitat.

Generation – The process of creating electricity. Typically generation is accomplished to supply electricity to an on-site facility and/or for sale to an electric utility.

Green Ton – Traditional unit of measure used by industries (pulp/paper, biomass power) that utilize biomass as a primary raw material. One green ton (GT) is 2,000 pounds of biomass (usually in chip form) with no correction for moisture content.

Hazardous Forest Fuels – Woody biomass material that poses a substantial fire threat to human or environmental health.

Kilowatt – A standard unit for expressing the rate of electrical output.

Megawatt – One thousand kilowatts. Enough electricity to support approximately 750 to 1,000 households.

Moisture content – The amount of moisture contained in biomass material. Typically expressed as a percentage of total weight.

Sawlog – A log that meets minimum regional standards of diameter, length, and defect, intended for sawing into lumber products.

Urban Wood – Wood waste generated as a result of tree trimming, yard clean up (e.g., pine needles, brush), pallets, clean construction and demolition wood (paint free). Typically transported and disposed of at transfer stations, this wood is separated by hand for processing into fuel quality material.

LAKE TAHOE BASIN BIOMASS ENERGY PROJECT OVERVIEW

Placer County, in cooperation with California Pacific Electric Company, is in the process of developing a one to three MW biomass energy facility at Kings Beach, California. The project is strategically located to economically utilize woody biomass material generated as a byproduct of hazardous forest fuels reduction activities conducted within the Lake Tahoe region. Locating the LTBBE facility near forest landscapes targeted for fuels reduction activities mitigates costs associated with transport of biomass material. Transportation costs are a very significant barrier to utilization of biomass material that is typically open burned in place or chipped and left on site. Air emissions associated with transport activities (diesel fumes) and open burning of hazardous fuels are also mitigated.

There are a number of benefits associated with implementation of the LTBBE project, most of which are summarized in the project objectives outlined below.

- Construct and operate a small-scale, sustainable, and low-impact biomass power plant in the LTB;
- Improve regional air quality and reduce greenhouse gas emissions associated with open burning of biomass material;
- Improve the water quality of Lake Tahoe by reducing deposition of particulate matter associated with open burning of biomass material;
- Support healthy forest management practices that improve watershed health and wildlife habitat through planned forest thinning operations designed to reduce catastrophic wildfire risks in the LTB;
- Contribute to California's renewable energy production goals through the operation of a woody biomass power plant that provides a long-term renewable electrical supply to the LTB and reduces dependency on fossil fuels used to generate electricity for local consumption;

- Provide a local source of reliable, consistent power to minimize electricity disruptions and use of existing emergency back-up diesel fuel-fired generation;
- Demonstrate the use of waste heat from electricity production to heat on-site buildings and melt snow and ice on sidewalks, parking lots, and roadways;
- Create the potential for future export of waste heat energy to proposed projects and for community benefit in the North Lake Tahoe area;
- Reduce transportation costs and related air pollution associated with the current practice of transporting woody biomass out of the LTB to distant utilization facilities and/or disposal sites;
- Demonstrate the Public Private Partnership model that includes partnerships between local, state, and federal agencies and local businesses for renewable energy development and forest health initiatives;
- Provide new employment opportunities to the residents of the LTB and surrounding areas; and
- Utilize existing appropriately zoned land for enhancement of public power supply while minimizing impacts to commercial, residential, recreational, and open-space uses.

BIOMASS FUEL PROCUREMENT PLAN

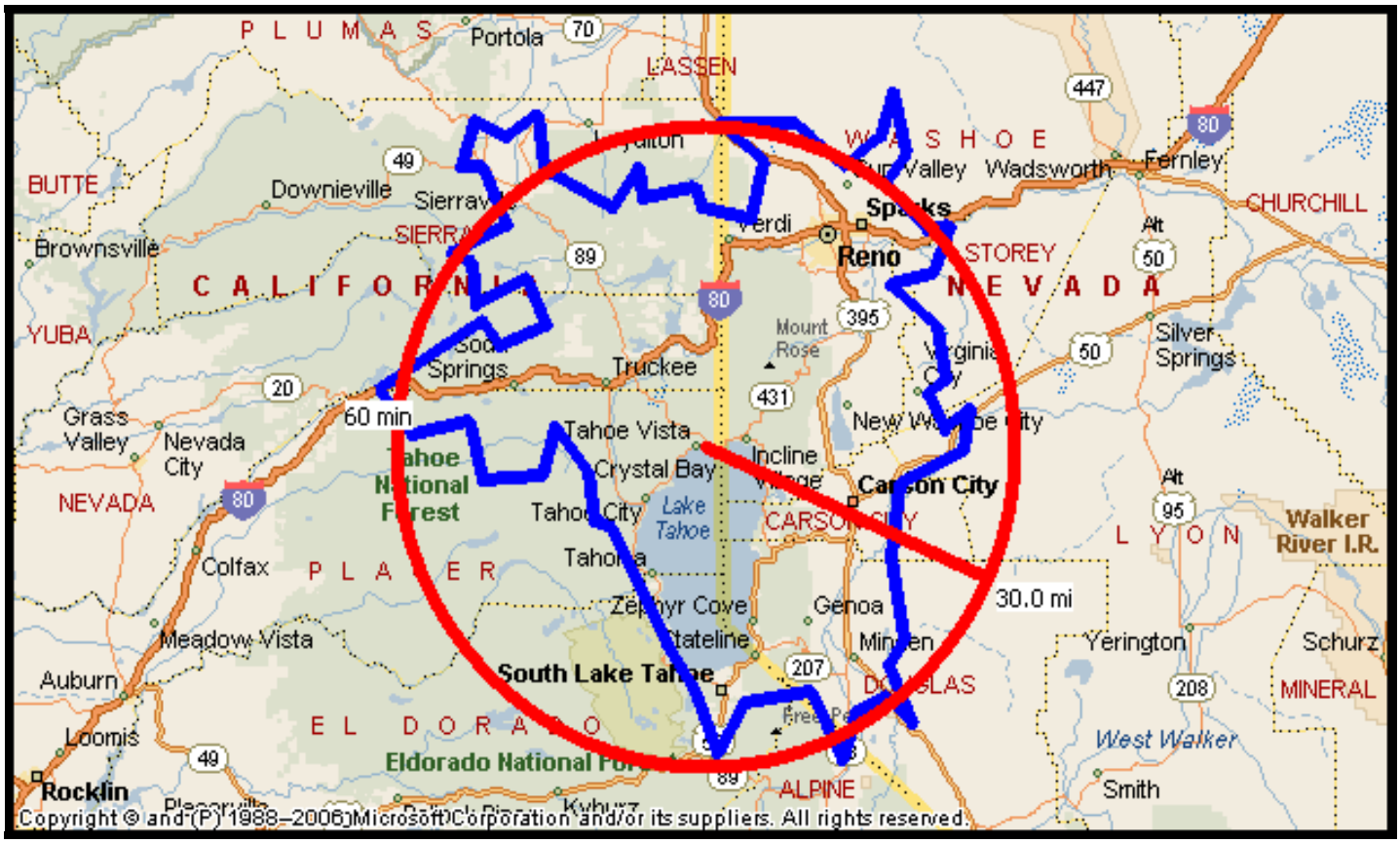
This procurement plan provides a detailed analysis of the sustainable availability of woody biomass fuel resources within the LTBBE Core Fuel Supply Area (CFSA). Specifically, this plan seeks to complement the unique location of the LTBBE, identify strategic fuel resources consistent with the project objectives, and comply with state (California Environmental Quality Act, State of Nevada Title 47 Regulations), regional (Tahoe Regional Planning Agency rules and guidelines), and federal (National Environmental Policy Act) regulations while confirming sustainable fuel supply. Biomass fuel availability estimates included in this plan utilize a 40-year planning horizon that is consistent with the expected service life of the LTBBE facility. In addition, this plan provides relevant information to the LTBBE development team, as it sets the appropriate project scale and selects the optimal biomass energy conversion technology considering local fuel resources.

CORE FUEL SUPPLY AREA

Based on TSS' experience in California, the CFSA for commercial-scale biomass fired power generation facilities is typically located within a 50-mile radius of the facility. Due to the relatively small scale (one to three MW) of the LTBBE facility, a 30-mile

radius CFSA was utilized. Figure 1 highlights the CFSA (red line) as well as a one-hour drive time projection for transport of biomass fuel (blue line).

Figure 1. Lake Tahoe Basin Biomass Energy Project Core Fuel Supply Area



WOOD FUEL SOURCES

The CFSA highlighted in Figure 1 is a heavily forested region that includes the Sierra Nevada Mountains and the LTB. It is anticipated that up to 75% of the biomass fuel procured for the LTBBE will be forest-sourced material generated as a byproduct from hazardous forest fuels treatments and forest thinning activities.

In addition, there is wood waste from tree trimming and yard clean up (pine needles) as well as construction/demolition wood from building/remodeling activities. Known as urban-sourced material (to differentiate it from forest-sourced material), this fuel type is an expanding fuel source as communities seek to divert this material away from traditional disposal options such as landfills. Transfer stations in the LTB region (e.g., Eastern Regional Sanitary Landfill and transfer station at Truckee) are unique in that tree

trimmings comprise a significant portion (40%) of the wood waste received.[1] Tree trimmings and pine needles are a major opportunity fuel for the LTBBE.
Two primary fuel types were considered in this plan including:

- Forest-sourced fuels
  - Hazardous fuels residuals
  - Forest thinning and harvest residuals
- Urban-sourced fuels
  - Tree trimmings and pine needles
  - Clean construction and demolition wood

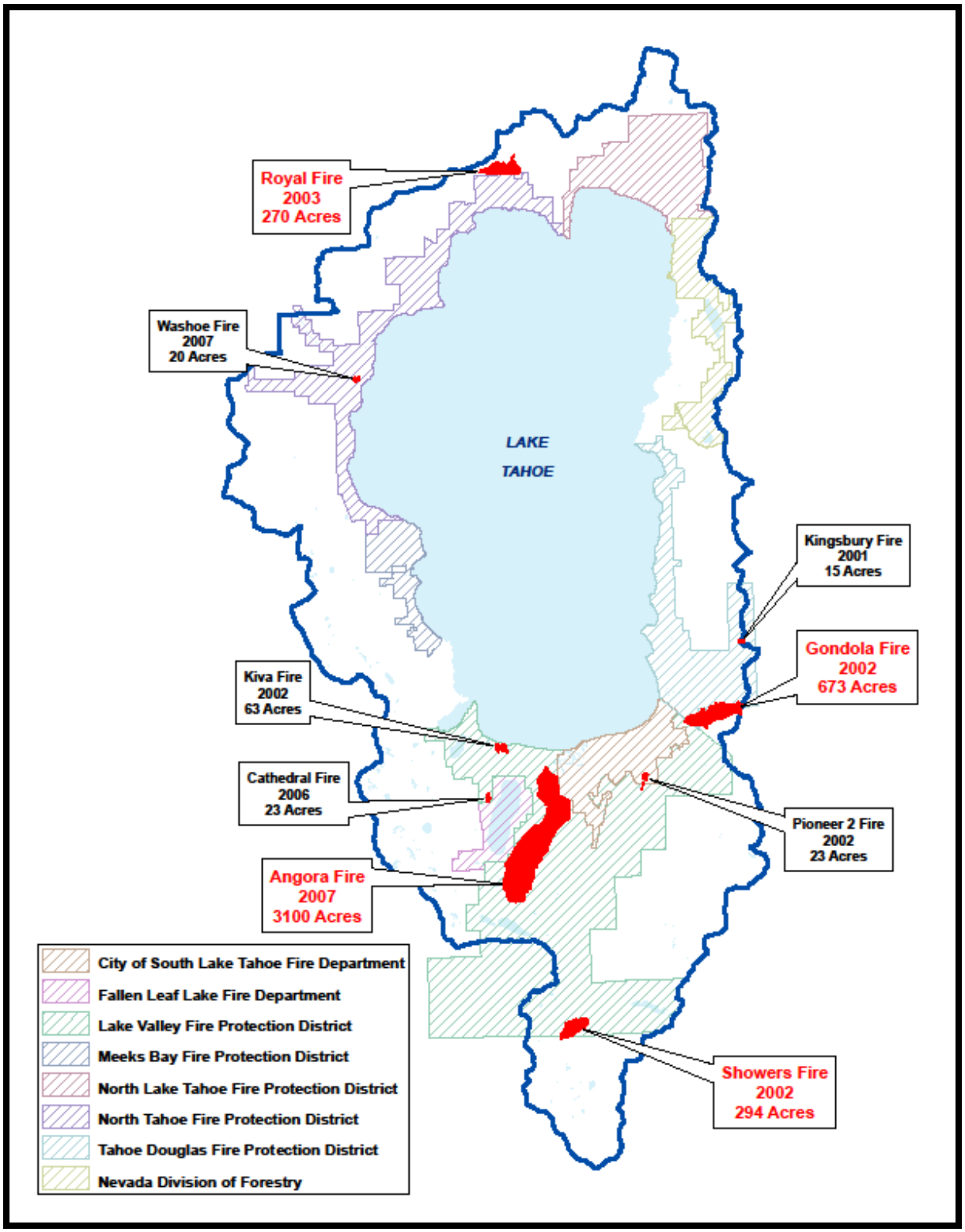
Forest-Sourced Fuels

Hazardous Forest Fuels Removal in the Lake Tahoe Basin Region

A major consequence of wildfire suppression efforts of the past century has been a significant buildup of forest fuels. This unnatural accumulation of hazardous fuels represents a serious threat to forest ecosystems and communities. During the past 10 years, the LTB has experienced wildfire events on approximately 4,500 acres. Due to the fact that much of the LTB is accessible by road and that fire response infrastructure is well equipped and highly organized, most wildfires have not exceeded 100 acres in size. However, the Angora Fire of 2007 was an exception, consuming 3,100 acres and 254 homes over the span of 48 hours and is an indication of the wildfire threat that exists in the LTB. Figure 2 is a fire history map showing the location of wildfires (over 20 acres in size) within the LTB in the last decade.

[1]Per discussions with Chris Donica, Operations Manager, East Regional Sanitary Landfill.

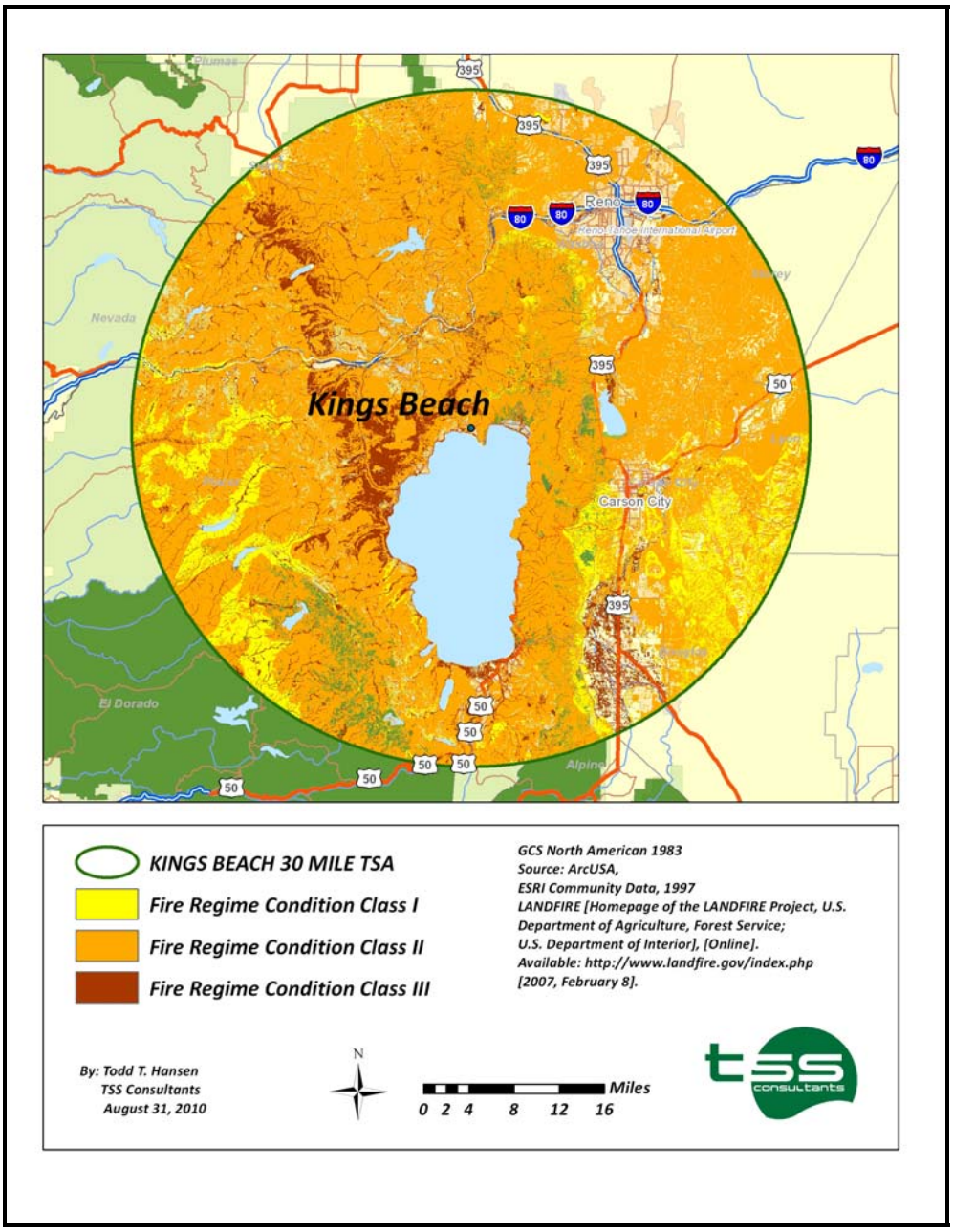
Figure 2. Recent Wildfire History (2000-2009) in the Lake Tahoe Basin



Map is provided courtesy of the California Tahoe Conservancy.

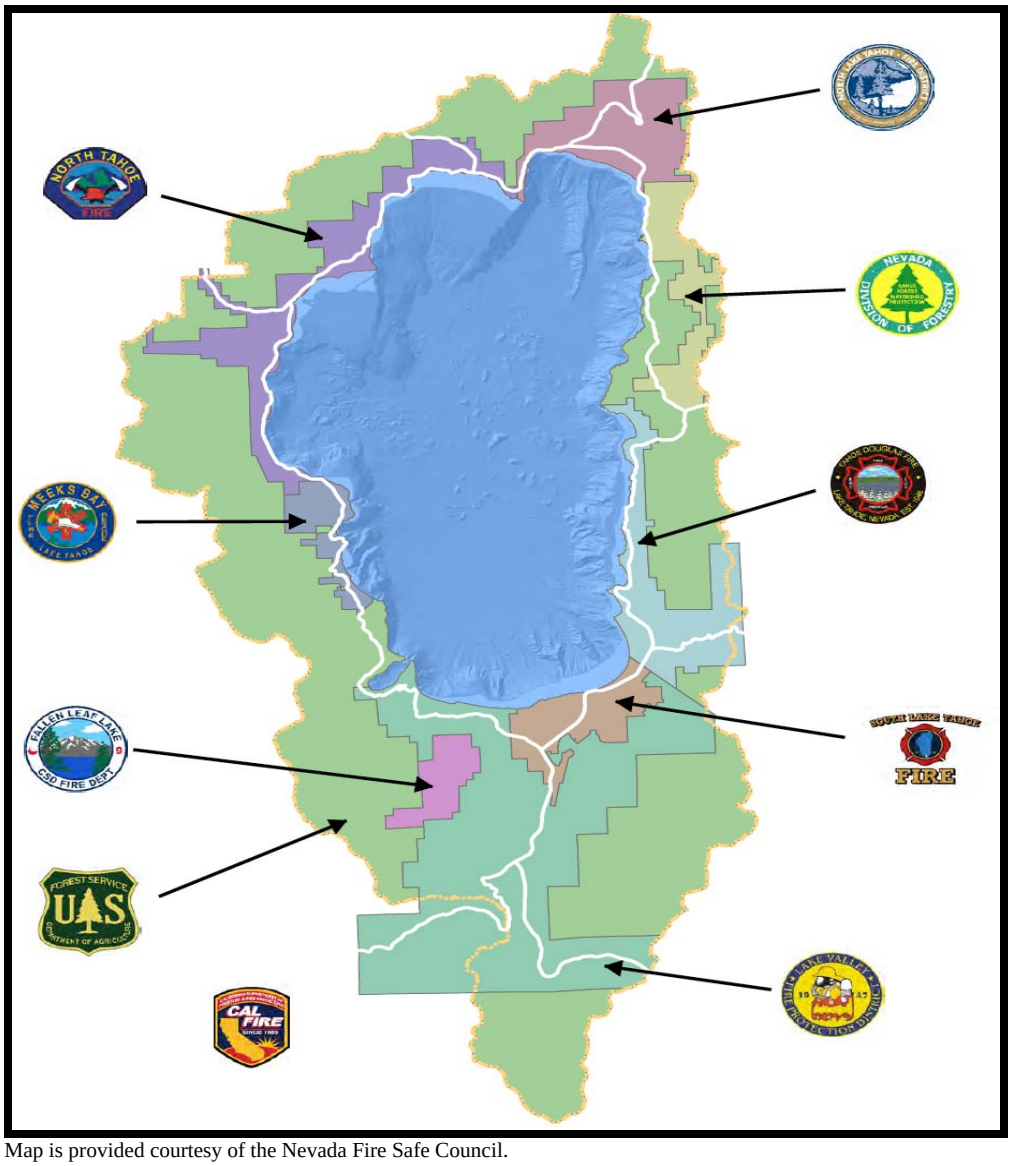
In the last 15 years there has been a decrease in the overall amount of forest thinning being done to reduce fire hazard on national forest land in the West. This reduced level of forest management has contributed to the increase of overstocked forest stands and resulting wildfire threat. It is anticipated that hazardous forest fuels reduction activities planned within the CFSA will generate significant volumes of biomass material available as fuel. Figure 3 is a map highlighting the fire hazard ratings across the CFSA.

Figure 3. Fire Regime Condition Class Map for the LTBBE CFSA



Fire Regime Condition Classes mentioned in Figure 3 refer to the number of fire return intervals that have been missed (primarily due to successful fire suppression efforts). Fire Regime Condition Class II implies that this landscape has missed at least two fire cycles. As illustrated in Figures 2 and 3, the CFSA is at significant risk to catastrophic wildfire. In direct response to this threat, there has been a concerted effort to treat hazardous forest fuels within the region with emphasis on the LTB. Significant state and federal resources have been allocated to strategically treat forest fuels in the LTB. Currently ten fire management agencies are actively treating forest fuels within the LTB. Figure 4 is a map highlighting these agencies and their jurisdictions.[2]

Figure 4. Lake Tahoe Basin Fire Management Agencies



Map is provided courtesy of the Nevada Fire Safe Council.

[2]Note that CALFIRE responsibilities include fire suppression activities on private lands in California.

All of the agencies highlighted in Figure 4 are involved in current planning efforts to address fuels and forest health within the LTB including:

- ***10-Year Fuel Reduction and Wildfire Prevention Strategy for the Lake Tahoe Basin***

  Fire and land management agencies operating within the LTB have crafted a 10-year fuel reduction and wildfire prevention strategy. Completed in December 2007, this document sets general plans and goals for coordinated fuels treatment activities within the LTB (focused primarily on lands managed by the USDA Forest Service). This strategy is currently being implemented and increased fuels treatment activities have ramped up hazardous fuels removal including piling and burning of biomass material generated as a byproduct. Diversion of this material for use as fuel in the controlled combustion system at the LTBBE will result in a significant[3] decrease in air emissions. An updated version of this plan is currently being drafted. This fuel procurement plan will be updated as the new 10-year plan becomes available.

- ***Biomass Utilization Strategic Plan for the Lake Tahoe Basin***

  TSS Consultants has been retained to assist LTB fire and land management agencies with development of a biomass utilization strategic plan. Sponsored by the California Tahoe Conservancy and the Nevada Fire Safe Council, this planning effort seeks to set biomass recovery and utilization goals with specific metrics (acres treated, tons removed). All seven fire districts, state agencies (California Tahoe Conservancy, Nevada Division of Forestry, California State Parks and CALFIRE), USDA Forest Service and the Tahoe Regional Planning Agency are coordinating to provide historic data on accomplishments (acres treated, tons removed). This historic data, along with a five-year forecast, will provide key information on potential fuel availability for the LTBBE. A draft biomass utilization strategic plan is currently being reviewed and should be finalized in March 2011. Data from this strategic plan was utilized for this report.

These two planning efforts are complementary and will facilitate continued fuels treatment coordination across agency jurisdictions and land ownership within the LTB.

Draft findings from the Biomass Utilization Strategic Plan include a five-year forecast of fuels treatment activities planned within the LTB. Table 1 provides a summary of these draft findings (note that these are subject to change). This procurement plan will be updated once the final Biomass Utilization Strategic Plan document is available.

[3]Per discussions with Placer County Air Pollution Control District staff.

Table 1. 2010-2014 Draft Forecast of Fuels Treatment Activities in the LTB (Average per Year)[4]

FIRE DISTRICT/AGENCY/ ORGANIZATION	TOTAL ACRES TREATED	BROADCAST BURN (ACRES)	HAND THIN, PILE AND BURN (ACRES)	HAND THIN AND CHIPPED (ACRES)	MECHANICAL REMOVAL (CTL AND MASTICATION) (ACRES)	BIOMASS TONNAGE FROM MECHANICAL REMOVAL AND HAND THIN/ CHIPPED (BONE DRY TONS)
California State Parks	150	30	10	30	80	1,430
North Lake Tahoe FPD	361	100	241		20	260
USFS – LTBMU	4,400	450	2,950		1,000	13,000
North Tahoe FPD	520		300	200	20	2,860
CA Tahoe Conservancy	100		40	60		780
City of South Lake Tahoe FD	139		53		86	1,118
Fallen Leaf Lake FD	58		29		29	377
Tahoe Douglas FPD	250		200		50	650
Meeks Bay FPD	45			30	15	585
Lake Valley FPD	319		34	165	120	3,705
Nevada Division of Lands	240		140		100	1,300
Placer County Biomass Program	50			50		650
TOTALS	**6,632**	**580**	**3,997**	**535**	**1,520**	**26,715**
PERCENT OF TOTAL		**9%**	**60%**	**8%**	**23%**	

[4]Note that figures for California State Parks and CA Tahoe Conservancy do not include acres treated by the fire agencies on behalf of these organizations on their land.

Important data provided in the five-year forecast shown in Table 1 includes:

- Fuels treatment activities are planned for over 6,600 acres per year.
- Biomass fuel could be recovered from about one-third of these fuels treatments (approximately 2,055 acres per year).
- Potentially available biomass fuel of 28,860 bone dry tons could be generated annually as a byproduct of fuels treatment activities within the LTB.
- An average of approximately 13 bone dry tons (BDT)[5] are potentially available per acre of fuels treatment implemented.

While the five-year forecast indicated the potential availability of 26,715 BDT of biomass material per year, there are operational considerations that need to be addressed to assess the volume of biomass material considered to be practically available. Operational challenges include road systems that are inadequate for chip transport, challenging topography (steep slopes or sensitive soils) and economics of biomass collection, processing and transport. Considering these factors, together with TSS' past experience with forest biomass collection, processing and transport, it is estimated that approximately 60% or 16,030 BDT per year of biomass fuel is considered practically available for this fuel procurement planning effort.

In certain regions where fuels treatment activities have occurred for some time (such as the LTB), the initial round of treatments will have addressed a large portion of the hazardous fuels. Subsequent maintenance treatments will likely produce less biomass material. The 40% reduction from potentially available to practically available biomass fuel (per previous discussion) takes this dynamic into account.

Hazardous Forest Fuels Removal Outside the Lake Tahoe Basin Region

Between 2000 and 2009, more than 7.2 million acres burned in California as a result of wildfire.[6] As residential development has continued to spread into forested areas, outside the LTB it has become more and more important to maintain well-managed fuel breaks within wildland urban interface (WUI) areas. In addition, counties in these forested regions are promoting fuel reduction programs to encourage homeowners to clear and remove vegetation from around residences and in the WUI.

Several counties have established Fire Safe Councils that are assisting with coordination of fuels treatment activities including the development of Community Wildfire Protection Plans (CWPP). CWPP are being utilized to strategically locate fuel breaks adjacent to communities, provide for evacuation routes, and implement strategies for long-term maintenance of fuel breaks.

[5]One bone dry ton (BDT) is 2,000 pounds of biomass (usually in chip form) at zero percent moisture.
[6]Data provided by CALFIRE.

Placer County has established the Placer County Fire Safe Alliance, El Dorado County has the El Dorado County Fire Safe Council and Nevada County has the Fire Safe Council of Nevada County. All three of these organizations are actively engaged in promoting fuels reduction activities within the CFSA. TSS estimates that approximately 1,500 BDT of biomass material are practically available per year from fuels treatment activities sponsored by the Fire Safe Alliance and Fire Safe Councils outside the LTB.

In addition to the Fire Safe Alliance and Councils, the USDA Forest Service is actively conducting fuels treatment activities outside the LTB. The Sierraville and Truckee Ranger Districts on the Tahoe National Forest are currently treating between 850 and 1,000 acres per year[7] using mastication and pile/burn techniques. Approximately 10 to 12 BDT of woody biomass are treated per acre. Assuming that 500 acres of these projects are located tributary to road systems that facilitate removal and transport of biomass fuel and that 10 BDT per acre are economically recoverable, then there is approximately 5,000 BDT per year of practically available biomass from fuels treatment activities on the Tahoe National Forest.

Forest Thinning and Harvest Residuals

The LTBBE facility is located immediately adjacent to a heavily forested region that supports significant stands of conifers including ponderosa pine, white fir, Douglas fir, and incense cedar. Residuals generated as a result of forest thinning and harvest activities can provide a significant volume of woody biomass material. Typically available as limbs, tops and un-merchantable logs, these residuals are generated as byproducts of timber harvesting activities and as such, can be a relatively economical raw material. Once collected and processed using portable chippers, this material is an excellent biomass fuel source (high heating value, low ash content).

At one time, the central Sierra Nevada region supported a robust and active forest products industry. In recent years, much of the forest products manufacturing infrastructure has closed, primarily due to lack of readily available saw timber. A majority of timberland within the CFSA includes public lands managed by the USDA Forest Service. Over the past 15 years, this agency has adapted forest management practices to focus less on timber outputs and more on ecosystem services. Timber harvest levels on public lands in California have declined by nearly 95% since 1990.[8]

Table 2 provides a historic perspective summarizing forest harvest activities from 2005 through 2009 within the three county forested region (Placer, Sierra and Nevada) located in the CFSA. Note that timber harvest levels are reported in thousand board feet measure (MBF).[9]

[7]Data provided by Tahoe National Forest staff.
[8]Timber harvest data provided by the California Board of Equalization.
[9]A board foot (BF) is the amount of wood contained in an unfinished board 1inch thick, 12 inches long, and 12 inches wide. Common units as related to saw log volume measurement include 1,000 BF or MBF.

Table 2. Historic Timber Harvest Levels by County Within the CFSA (2005-2009)

COUNTY	AVERAGE ANNUAL TIMBER VOLUME[10] (MBF)	TIMBER HARVEST RESIDUALS AVAILABLE AS BIOMASS FUEL (BDT)
Placer	11,535	10,380
Sierra	7,060	6,355
Nevada	1,800	162
TOTALS	**20,395**	**16,897**

Based upon TSS' experience working with logging and chipping contractors in this region, the recovery factor for biomass fuel processed from timber harvest residuals is approximately 0.9 BDT of woody biomass (tops and limbs) that could be recovered from each MBF of timber harvested. Table 2 summarizes potential biomass fuel available from timber harvest residuals using the 0.9 BDT/MBF biomass fuel recovery factor.

Not all timber harvest operations lend themselves to ready recovery of harvest residuals. Steep slopes, remote locations, and road systems that will not accommodate large chip trucks (for transport of biomass fuel) will limit the volume of biomass fuel recovered from timber harvest activities. For this reason, not all of the potentially available timber harvest residuals reported in Table 2 (16,897 BDT) are recoverable. TSS' experience in the region suggests that approximately 50% of harvest operations are conducted on topography and road systems that will accommodate recovery of biomass fuel. Approximately 8,450 BDT per year of timber harvest residuals are practically available within the CFSA.

Table 3 provides a summary of the forest-sourced biomass material practically available within the CFSA.

Table 3. Forest-Sourced Biomass Fuel Practically Available Within the CFSA (Expressed as BDT/Year)

HAZARDOUS FUELS RESIDUALS INSIDE THE LTB	HAZARDOUS FUELS RESIDUALS OUTSIDE THE LTB	FOREST THINNING AND HARVEST RESIDUALS	TOTAL
17,300	**6,500**	**8,450**	**32,250**

[10]Timber harvest data as reported by the California Board of Equalization.

Urban-Sourced Fuels

Tree Trimmings

Based on previous studies performed by TSS, it is estimated that approximately 100 dry pounds of tree trimmings and pine needles suitable for fuel are generated annually per capita. Based on a population estimate of 553,820 residents[11] within the CFSA, approximately 27,690 BDT of tree trimmings are calculated to be generated annually. TSS estimates that approximately 65% of the wood generated is actually recoverable as biomass fuel. Therefore, approximately 18,000 BDT of tree trimmings are practically available each year from within the CFSA. Approximately 1% of the tree trimmings volume (180 BDT per year) is made up of pine needles.

Construction and Demolition Wood

As noted above, there are approximately 553,820 residents within the CFSA. Based on TSS' experience with urban wood waste generation, approximately 11.5 pounds of solid waste are generated daily per capita with an estimated 10.5% of the solid waste stream generated as wood waste (pallets, construction/demolition wood). Using this waste generation estimate, it was calculated that approximately 122,045 green tons (GT) of urban wood waste are generated annually within the CFSA. The average moisture content of urban wood waste, as defined by random sampling and laboratory analysis, is approximately 20%, which calculates to approximately 97,635 BDT of urban wood waste. Approximately 65% of this volume is recoverable as fuel resulting in 63,460 BDT as practically available.

Table 4 provides a summary of the urban-sourced biomass material practically available within the CFSA.

Table 4. Urban-Sourced Biomass Material Practically Available Within the CFSA (Expressed in BDT/Year)

PINE NEEDLES	TREE TRIMMINGS	URBAN WOOD	TOTAL
180	17,820	63,460	81,460

As noted earlier, the urban-sourced raw material blend at the Eastern Regional Landfill includes a high percentage of tree trimmings and pine needles (40%) which will be the primary urban-sourced fuel blend utilized at LTBBE. While other urban-sourced raw material is available (e.g., clean construction and demolition wood), the tree trimmings and pine needles, when blended with forest-sourced biomass material, represent the best quality (high Btu, low ash) fuel available within the CFSA. Procuring good-quality fuel will be essential to meet the air emission standards within the LTB. A fuel quality assurance program (see Table 13 Task List Timeline) will be utilized to monitor

[11] U.S. Census Bureau 2009 population estimates. Most of this population resides in the Reno/Sparks metropolitan area.

incoming fuel deliveries to confirm that fuel suppliers are providing quality fuel that meets stringent fuel specifications (see Appendix C).

WOOD FUEL SUPPLY ESTIMATES

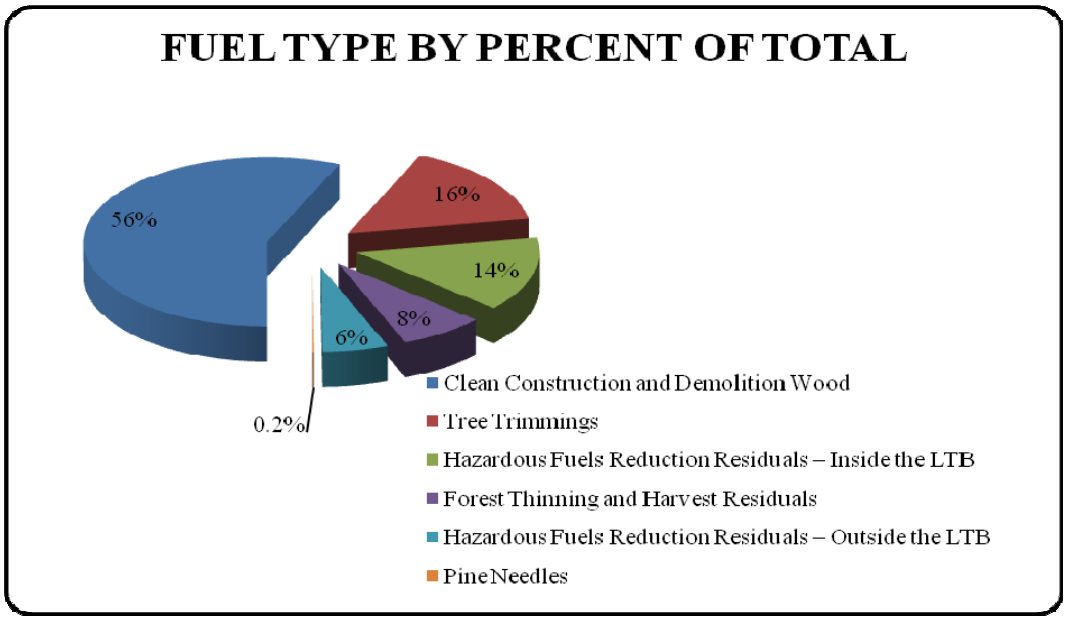
Summarized in Table 5 are estimates of biomass material generated within the CFSA and practically available as woody biomass fuel.

Table 5. Practically Available Biomass Fuel by Type Within the CFSA (Expressed in BDT/Year)

FUEL TYPE	VOLUME
Hazardous Fuels Reduction Residuals – Inside the LTB	16,030
Hazardous Fuels Reduction Residuals – Outside the LTB	6,500
Forest Thinning and Harvest Residuals	8,450
Tree Trimmings	17,820
Pine Needles	180
Clean Construction and Demolition Wood	63,460
TOTAL	**112,440**

Figure 5 provides a summary of biomass material generated within the CFSA.

Figure 5. Practically Available Fuel Type by Percent of Total



WOOD FUEL COMPETITION

Within the CFSA there exists a variety of value-added uses for woody biomass material including:

- Fuel for biomass power generation facilities;
- Furnish for composite panel manufacturers;
- Feedstock for soil amendment/landscape cover;
- Raw material for firewood.

While these value-added uses represent existing markets and infrastructure, there are technologies that may evolve in the next five to ten years and provide additional value-added opportunities. The most promising technologies involve the conversion of biomass material to liquid transportation fuels such as cellulosic ethanol and diesel. In addition, there has been recent progress in the development of conversion technologies for biomass based chemicals and chemical feedstocks. At this time, there are no commercially viable biomass-to-liquid fuels or chemical feedstock conversion technologies in the marketplace. TSS' experience in this market sector suggests that "bankable" technologies that convert biomass to liquid fuels and/or chemicals may be available in five to seven years.

Biomass Power Generation Facilities

Operating Biomass Power Plants

Three biomass power generation facilities are currently sourcing wood fuel from the CFSA: Sierra Pacific Industries (Quincy, California), Rio Bravo (Rocklin, California), and Honey Lake Power (Wendel, California). At one time there were five operating biomass plants sourcing fuel from the CFSA. However, two facilities (see discussion below) have curtailed operations within the last six months.

Idle Biomass Power Plants

The two biomass power generation facilities which have recently curtailed operations are Sierra Pacific Industries in Loyalton and the Northern Nevada Correctional Center.

- ***Sierra Pacific Industries – Loyalton, California***
  Originally developed as a 20 MW cogeneration facility providing power and process steam for a collocated sawmill complex, this plant first entered commercial service in 1989. In 2001 the sawmill was closed and the power plant was converted to a generation facility producing only power for sale to NV Energy. On August 20, 2010, Sierra Pacific Industries announced (see Appendix

A, SPI Press Release) plans for the immediate closure of the Loyalton facility due to fuel supply issues.

- ***Northern Nevada Correctional Center – Carson City, Nevada***
  Collocated at the Northern Nevada Correctional Center (NNCC), this 1.2 MW cogeneration plant entered commercial service in 2007. Initially designed to be operated and maintained using prisoner labor, this facility experienced operational and fuel sourcing issues soon after start-up. Due to the complexity of plant operations and maintenance, outside contractors were retained. Fuel sizing has been a challenge from the start due to a fuel handling system that did not account for local fuel characteristics. In May 2010, the NNCC announced plans to close the facility (see Appendix B, May 24, 2010 Bio Energy News article).

Table 6 summarizes the operational and idle biomass power plants that have historically sourced biomass fuel from the CFSA.

Table 6. Biomass Power Plants Currently Sourcing Fuel from the CFSA

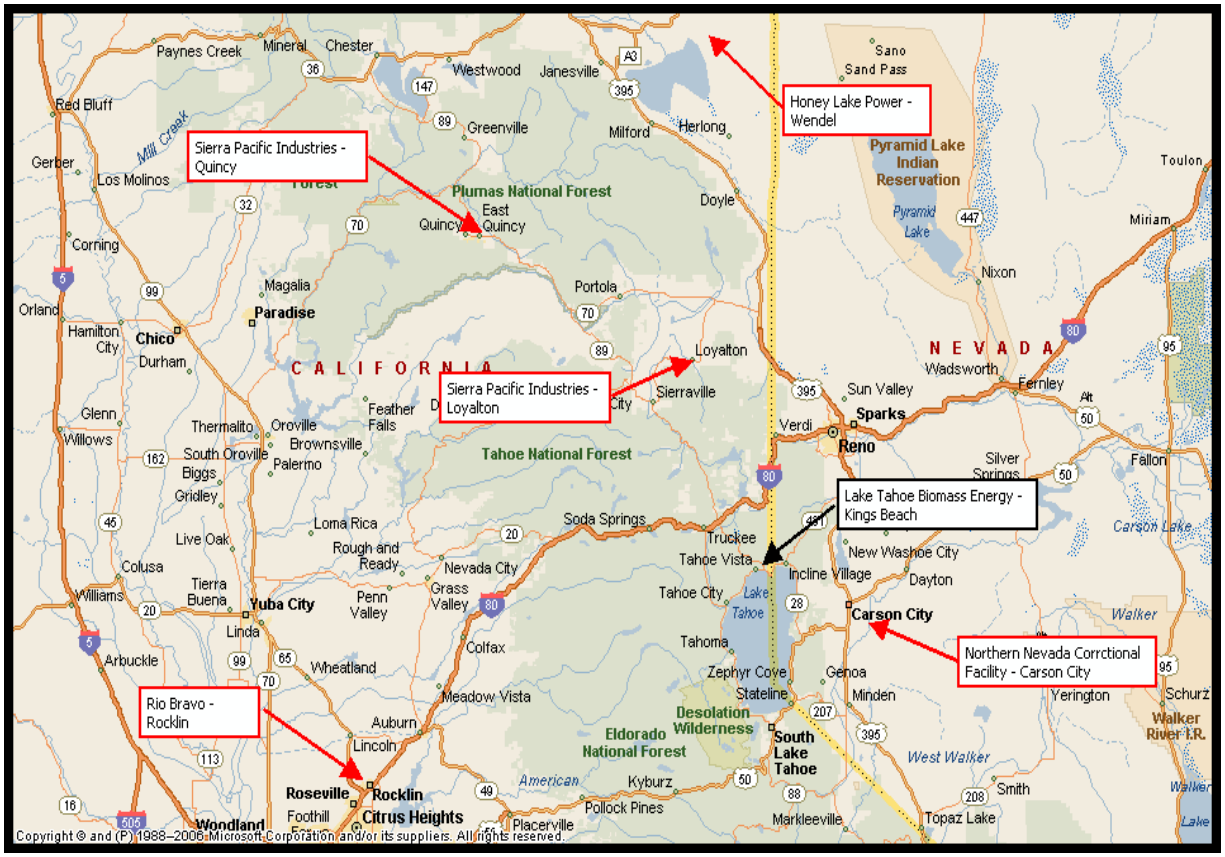
FACILITY AND LOCATION	DISTANCE FROM KINGS BEACH (MILES)	GENERATION CAPACITY (MW)	ANNUAL FUEL USAGE (BDT)	ANNUAL FUEL VOLUME SOURCED FROM THE CFSA (BDT)
Northern Nevada Correctional Center (Carson City, NV)	31	1.2	12,000[12]	0
Sierra Pacific Industries (Loyalton, CA)	49	20	120,000[13]	20,000
Sierra Pacific Industries (Quincy, CA)	81	25	200,000	5,000
Rio Bravo (Rocklin, CA)	93	25	180,000	2,000
Honey Lake Power (Wendel, CA)	135	32	200,000[14]	2,000
TOTALS		**123**	**712,000**	**29,000**

Table 6 includes the recently curtailed facility at Sierra Pacific Industries (Loyalton), as this facility is an existing asset that may operate again. The Northern Nevada Correctional Center biomass facility will not likely operate again at the Carson City location (it is currently for sale).

Figure 6 highlights the location of the biomass power plants listed in Table 6.

[12]Currently closed and for sale.
[13]Currently not operating although was operating at reduced capacity during recent years (2006 through 2010).
[14]Operating at a reduced capacity due to constrained fuel supply.

Figure 6. Location of Biomass Power Plants Historically Sourcing Fuel from the CFSA



Other Value-Added Uses

While the most significant market for biomass material generated within the CFSA is for use as biomass fuel in the production of renewable energy, there are other value-added uses to be considered, including the following.

- **Firewood:** The USDA Forest Service, California Tahoe Conservancy, and the Nevada State Parks issue personal use and commercial firewood permits. Much of the firewood generated is for residential use. This is a fairly consistent and predictable market.
- **Landscape Cover and Soil Amendment:** There are three commercial-scale businesses sourcing raw material from the CFSA that serve the landscape cover, soil amendment and soil restoration markets. Due to the recent downturn in the national economy and overall reduction in new housing starts, the current market demand for this material is very depressed. All three of the soil amendment businesses are not paying for delivered material but will accept it for free or charge a nominal disposal fee.

- **Composite Panels:** The one composite panel manufacturer (SierraPine Composite Solutions) is currently operating on a curtailed basis due to the depressed housing market and is not actively sourcing raw material from forest fuels treatment activities. From time to time, SierraPine will arrange for purchase of forest-sourced material.

Table 7 describes the soil amendment, firewood and composite panel markets that have historically sourced biomass material generated within the CFSA.

Table 7. Current Markets for Woody Biomass Material Generated Within the CFSA

FACILITY AND LOCATION	DISTANCE FROM KINGS BEACH (MILES)	VALUE-ADDED USE	ANNUAL BIOMASS MATERIAL USAGE (BDT)	ANNUAL VOLUME SOURCED FROM THE CFSA (BDT)
Full Circle Compost (Minden, NV)	40	Landscape products - compost and mulch	2,000 to 3,000	2,500
Bently Agrowdynamics (Minden, NV)	40	Landscape products - compost and mulch	4,500 to 5,000	4,000
Firewood	NA	Thermal energy (typically for residential heating)	500 to 700	600
SierraPine (Rocklin, CA)	94	Composite	40,000 to 72,000	3,000
Integrated Environmental Restoration Services (Tahoe City, CA)	NA	Soil restoration activities primarily in the LTB	250 to 1,250	1,250
TOTALS			**47,250 to 81,950**	**11,350**

WOOD FUEL AVAILABILITY

TSS estimates that there are 112,440 BDT of biomass fuel that are practically available on an annual basis. Current demand for this material is primarily from the biomass power generation sector at 29,000 BDT per year (including one plant that has curtailed operations). Other value-added uses (soil amendment, firewood, composite panels) currently utilize approximately 11,350 BDT per year. Table 8 summarizes these market dynamics.

Table 8. Biomass Availability and Usage for Material Generated Within the CFSA (Expressed as BDT/Year)

FUEL TYPE	AVAILABLE
Hazardous Fuels Reduction Residuals – Inside the LTB	16,030
Hazardous Fuels Reduction Residuals – Outside the LTB	6,500
Forest Thinning and Harvest Residuals	8,450
Tree Trimmings and Pine Needles	18,000
Clean Construction and Demolition Wood	63,460
PRACTICALLY AVAILABLE TOTAL	**112,440**
CURRENT MARKETS	**CURRENT DEMAND**
Biomass Power Generation Facilities	29,000[15]
Soil Amendment/Soil Restoration	7,750
Firewood	600
Composite Panels	3,000
CURRENT MARKET DEMAND TOTAL	**40,350**
MARKET ADJUSTED TOTAL	**72,090**

Based on this fuel availability analysis, TSS estimates there are approximately 72,090 BDT per year of biomass fuel available within the CFSA. Assuming that the LTBBE facility is scaled at 2 MW of electrical output and utilizes 20,000 BDT of biomass fuel annually, then a 3.6:1 fuel cover ratio exists. Fuel coverage ratio represents the net availability of fuel relative to new demand (LTBBE facility) in the marketplace. The higher the fuel coverage ratio, the more fuel is forecast to be available. Private financial markets and project developers prefer a fuel coverage ratio of at least 2:1.

WOOD FUEL CHARACTERIZATION

The main fuel types targeted for utilization by the LTBBE have been utilized as fuel by California biomass power generation facilities since the mid 1980s. Due to this developed infrastructure, TSS has access to fuel testing records that provide historic trends regarding fuel characterization. Fuel characterization represents key physical and chemical properties that will help the LTBBE project development team determine optimized technologies suitable for the project.

Table 9 provides characteristics for the various fuels that are available within the CFSA.

[15]This figure is subject to change based on whether the Sierra Pacific Industries (Loyalton) facility is re-started.

Table 9. Wood Fuel Characteristics by Specific Fuel Type

FUEL TYPE	HIGH HEATING VALUE (BTU/DRY POUND)	PERCENT ASH (BY DRY WEIGHT)	MOISTURE CONTENT
Hazardous Fuels Reduction Residuals	8,500-8,800	2-3%	35-55%
Forest Thinning and Harvest Residuals	8,500-8,600	5-7%	35-50%
Urban-Sourced Wood (including tree trimming material)	7,900-8,200	3-6%	20-30%

WOOD FUEL PRICING

Wood fuel pricing within the CFSA is trending downward as demand for wood fuel has dropped. Recent curtailments at Sierra Pacific Industries (Loyalton) and the Northern Nevada Correctional Center have removed demand for 132,000 BDT from the marketplace. As with any market commodity, pricing is impacted by supply and demand. Due to current demand dynamics, fuel pricing is trending downward.

In consideration of the logistical impacts, the supply/demand balance in the CFSA, and market intelligence gathered from existing biomass fuel suppliers and buyers, TSS has developed a fuel price estimate. Table 10 provides a summary of the estimated fuel price ranges that operating biomass power plants are paying for delivered wood fuel sourced from the CFSA. A range of fuel prices is provided due to the fact that biomass is typically procured based on quality (higher prices for better quality fuel) and sometimes haul distance (higher prices for fuel transported longer distances).

Table 10. Wood Fuel Pricing Within the CFSA

FUEL TYPE	ESTIMATED PRICE RANGE ($/BDT)
Hazardous Fuels Reduction Residuals	$42 to $55
Forest Thinning and Harvest Residuals	$35 to $50
Urban-Sourced Wood (including tree trimming material)	$26 to $38

An important consideration for LTBBE fuel pricing is fuel transportation logistics and costs. Due to the strategic location of the LTBBE facility (close to forest-sourced fuel), the cost to deliver this fuel will be much less than current delivery options (closest operating biomass power plant is at Quincy, California, located 81 miles from Kings Beach).

OPTIMIZED FUEL BLEND

Based upon TSS' experience with biomass fuel procurement and knowledge of the current wood fuel markets within the CFSA, an optimized fuel blend was developed. This fuel blend recommendation assumes that a 2 MW facility is developed at the Kings Beach site with annual fuel demand of 20,000 BDT per year.

Presented in Table 11 is the forecasted volume and pricing of an optimized fuel blend for the LTBBE facility.

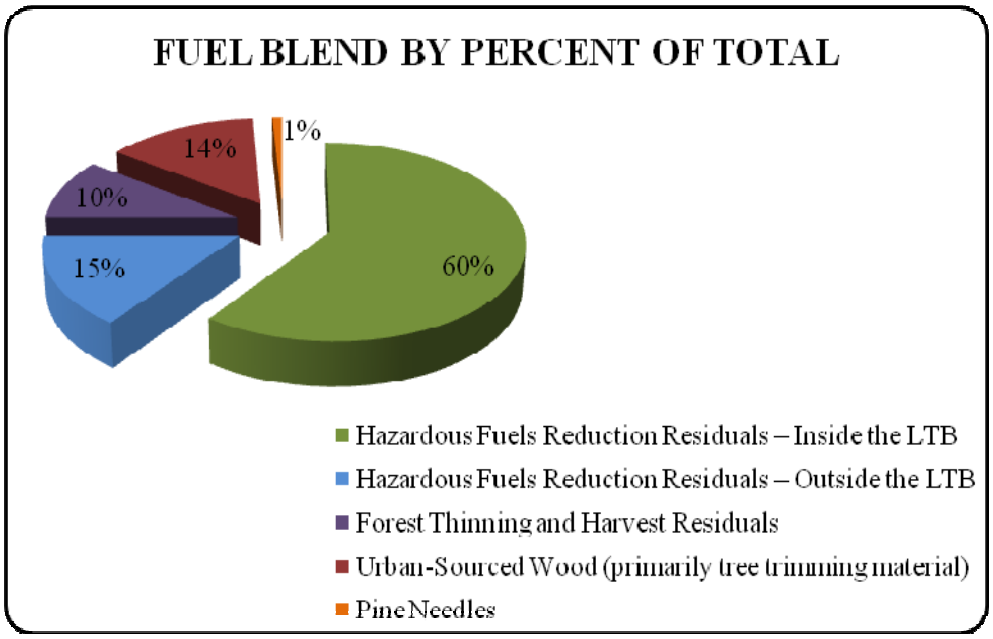
Table 11. Optimized Fuel Blend

FUEL TYPE	PERCENT BLEND	AMOUNT (BDT)
Hazardous Fuels Reduction Residuals – Inside the LTB	60%	12,000
Hazardous Fuels Reduction Residuals – Outside the LTB	15%	3,000
Forest Thinning and Harvest Residuals	10%	2,000
Urban-Sourced Wood (primarily tree trimming material)	14%	2,820
Pine Needles	< 1%	180
TOTAL	**100%**	**20,000**

Table 11 provides guidance to the LTBBE project development team for procurement and logistical planning activities. TSS will assist the development team in configuring the fuel yard capacity and fuel handling system. In addition, TSS will help with the scheduling of fuel deliveries in order to position the LTBBE facility to benefit from economic spot market purchases while maintaining a manageable fuel inventory on site.

Figure 7 shows the allocation of fuel type from the optimized fuel blend in Table 11 by percent of the total.

Figure 7. Fuel Blend by Percent of Total



This fuel blend was selected to meet LTBBE objectives of providing a long-term market solution for fuels reduction activities in the region. Urban wood is the most cost effective fuel; however, procuring large volumes of urban wood does not meet the project's objective of providing a ready market for forest-sourced fuels reduction residuals. This optimized fuel forecast assumes a fuel blend comprised of 75% hazardous fuels reduction residuals, thus meeting the project's stated objectives.

This fuel assessment confirmed that the LTBBE facility (scaled at two MW) could be sustainably supplied with biomass fuel sourced from within a 20-mile radius of Kings Beach. With a 20-mile radius fuel sourcing area, over 80% of the fuel could be provided by fuels treatment activities within the LTB and the balance (20%) provided by tree trimmings and pine needles from the Eastern Regional Landfill and transfer station at Truckee. Most of the fuels treatment material would not be available economically to other markets or biomass power plants, as transport costs are very significant. Placer County is working with land management agencies to cost share the collection, processing and transport expenses for biomass material that is currently open pile burned or masticated (chipped and scattered).

FUTURE FUEL SUPPLY SOURCES AND RISKS

There are opportunities to expand the recovery and utilization of both forest-sourced fuel and urban-sourced fuel. Collection and recovery techniques and equipment have evolved significantly over the last several decades. Continued innovation and improved

technologies will likely expand and ramp up the volume of wood fuel that can be recovered and utilized over time.

Future Forest-Sourced Fuels

Innovative fuel collection and processing technologies employing lessons learned from European experience show much promise and have recently been deployed within the LTB.[16] In addition, there are plans to conduct field trials within the LTB for deployment of equipment that recovers forest biomass material from steep slopes. Currently there are regulatory restrictions limiting the use of equipment on 30% and steeper slope conditions. Field trials will be used to demonstrate innovative steep slope biomass recovery techniques for both environmental compliance (low impact) and economical feasibility. Impacts to sensitive resources such as soils (disturbance, compaction) will be monitored and documented.

Future Urban-Sourced Fuels

California has a very robust urban wood recovery market sector. This is primarily due to legislative mandates as a result of California Assembly Bill 939, The Integrated Waste Management Act. At this time there are no legislative mandates in Nevada. Very little urban wood recovery is currently being conducted in Nevada. Past contact with the Lockwood Regional Landfill (closest Nevada landfill to Kings Beach) staff indicated little to no interest in the recovery of urban wood from incoming waste material. Should the Nevada state legislature mandate urban wood recovery/diversion requirements or the Lockwood Landfill staff change on-site practices, there may be opportunities to source additional urban wood in the Reno/Sparks metropolitan region. Again, this does not meet the objectives of the proposed facility, so this material would not factor in any sourcing decisions.

Future Supply Risks

Future fuel supply risks are primarily a function of potential competing value-added uses for biomass material targeted as fuel. At this time, TSS is not aware of any additional commercial biomass utilization facilities being planned in the CFSA. In fact, the trend recently has been just the opposite: there has been a concerted reduction in demand for biomass material with the closures of Sierra Pacific Industries (Loyalton) and the Northern Nevada Correctional Center facilities. At some future date, the technology to convert woody biomass material into transportation fuels will evolve and demonstrate commercial viability. However, this will not likely occur in the near term.

Fulcrum Bioenergy has announced plans to site an ethanol production facility at McCarron, Nevada. Known as Sierra BioFuels, this facility would primarily utilize municipal solid waste (MSW) as feedstock with plans to convert 90,000 GT of MSW to 10.5 million gallons per year of transportation grade ethanol. A portion of the MSW

[16]Per discussions with David Mercer, forest fuels treatment contractor.

blend will likely be greenwaste (grass, tree trimmings). Fulcrum Bioenergy plans to break ground on the Sierra BioFuels facility later this year.

FUEL PROCUREMENT

This section of the procurement plan is focused on confirming the existing fuel processing infrastructure and opportunities to expand it in addition to ranking suppliers and contracting for fuel.

Fuel Processing Infrastructure

Forest-Sourced Fuel Processing Infrastructure

There are currently several commercial-scale contractors actively treating forest fuels and/or processing thinning/forest harvest residuals within and adjacent to the CFSA. The current downturn in forest-sourced fuel demand will likely impact these contractors short term due to reduced demand and pricing for biomass fuel in the region. However, as stated previously, the Sierra Pacific Industries facility at Loyalton is expected to re-start, and this will add fuel demand in the marketplace.

There has been infrastructure development using innovative approaches to the recovery of biomass material. For example, Placer County has implemented a biomass collection program that provides bins for local residents, contractors, and fire agencies. The biomass collection program also facilitates processing and transport of biomass material removed and stockpiled at biomass accumulation yards that are located strategically near high concentrations of hazardous fuels adjacent to residential areas and the WUI. These yards have produced significant volumes of limbs, brush and small stems that would have normally been piled and burned. Initiated in 2007, this program has been very successful with local homeowners and has facilitated the removal of hundreds of tons of biomass material.[17] Most of the biomass collected was transported to biomass plants for use as fuel. In 2010, Placer County began working with the California Tahoe Conservancy and California State Parks to collect and remove biomass material from their operations as well.

Due to the demonstrated success of the Placer County Biomass Collection Program, other communities have replicated this model. A similar program is now underway in the South Lake Tahoe area. Managed by the Nevada Division of Forestry, the biomass recovery program has been using biomass bins to collect processed biomass for use as fuel at the Northern Nevada Correctional Center biomass cogeneration plant. Now that the NNCC facility has closed, the Nevada Division of Forestry is seeking alternative value-added markets.

[17]Per discussions with Placer County staff.

Urban-Sourced Fuel Processing Infrastructure

The major urban wood processing facility within the CFSA is the Eastern Regional Landfill. Located along Highway 89 south of Truckee, this facility currently services Placer County residents located east of Colfax. From 2005 through 2009, this facility has processed and sold an average of 14,000 BDT per year of biomass fuel to biomass plants operating in the region.[18] Due to the general economic downturn and reduction in housing construction, there has been a 35% reduction in wood waste processed between 2008 and 2009. As the economy returns to a more normalized state, construction and demolition activities will ramp up, generating more wood waste. As noted earlier in this report, approximately 40% of the urban-sourced wood coming in the gate at the Eastern Regional Landfill is tree trimmings and pine needles. Most of the urban-sourced wood utilized at LTBBE will be tree trimmings and pine needles from this facility.

Urban wood recovery and processing in the Reno/Sparks metropolitan area is not well developed. The Lockwood Regional Landfill located in Sparks, Nevada, is not currently recovering wood waste for use as biomass fuel. Unlike California regulatory policy,[19] there are no waste diversion requirements for Nevada landfills. There is little motivation for recovery and processing of wood waste. This may change over time, and the current owners of the Lockwood Landfill (Waste Management Inc.) may reconsider wood waste recovery options.

Ranking Top Tier Suppliers

In order to facilitate procurement of an optimized blend of fuel for the LTBBE facility, a strategic ranking of current and emerging fuel suppliers should be conducted to target top tier suppliers that can provide economical, quality fuel on a long-term basis. Metrics to consider when ranking fuel suppliers include:

- Total fuel volume produced;
- Fuel pricing;
- Fuel quality;
- Financial stability;
- Reliability as a fuel supplier.

Contracting For Fuel

Once a prioritized list of top tier fuel suppliers has been generated, targeted negotiations for short-term or long-term fuel supply contracts can commence. A phased-in approach

[18]Per discussions with Eastern Regional Sanitary Landfill staff.
[19]California Assembly Bill 939, the Integrated Waste Management Act.

with key potential suppliers is important. Examples of tasks to consider when contacting fuel suppliers and beginning negotiations are outlined below.

- Make initial contact. Provide LTBBE project overview, projected fuel usage requirements and fuel specifications. Secure pertinent data (contact information, historic fuel production, fuel types generated, current equipment mix).

- Meet in the field to view operations firsthand. Secure two fuel samples, one for testing and one to review with LTBBE project development team.

- Confirm current markets available for fuel supplier and current pricing.

- Enter key findings into the fuel supplier ranking matrix.

- If ranked as a top tier fuel supplier, approach with one of the following:
  - Letter of Intent (LOI), or
  - Letter of Intent/Term Sheet (LOI/TS).

- Once LOI or LOI/TS is signed, begin negotiations for short-term or long-term fuel supply agreement.

- Secure fuel supply agreement.

Consistent with this fuel plan, TSS has created draft fuels specifications (Appendix C) for each of the two primary fuel types targeted for LTBBE: forest-sourced and urban-sourced fuel. These fuel specification documents provide very detailed information regarding fuel quality requirements and will be utilized in fuel procurement agreements to assure delivery of clean, high-quality fuel.

In addition, a letter of intent template (Appendix D) has been drafted for use by the LTBBE fuel procurement manager.

Fuel Procurement Agreements

While a Letter of Intent will serve to confirm the prospective fuel suppliers' interest in providing fuel, it is not considered a binding agreement. There are a number of fuel procurement agreement types, and each has a specific purpose. Summarized below is a brief description of fuel procurement agreements commonly utilized in Northern California.

- Letter of Intent. A non-binding agreement to formally begin discussions regarding fuel availability and pricing. This is typically the initial agreement, one that brings the parties to the table.

- Binding Letter of Intent. Similar to the letter of intent but with language that "binds" the parties to a commitment for fuel volume and pricing. This is commonly used by project developers seeking project financing. It demonstrates to the private financial markets that binding commitments for fuel are available.

- Spot Purchase Agreement. Fuel procurement agreement with a duration of less than one year. Defines delivery schedule, fuel specifications, volume committed, and pricing. May have defined monetary incentives for delivery of quality fuel (low ash, high Btu) and/or for pro-rated volumes of fuel (higher fuel delivery volumes equal higher delivered prices).

- Long-Term Purchase Agreement. Similar to spot purchase agreement, but the contract term is two to five years in length. Fuel pricing may be indexed to account for increases in labor and diesel fuel costs. Typically, the Consumer Price Index and New York Mercantile Exchange diesel price index are utilized if price indexing is considered.

Fuel Procurement Organization

Considering the relatively small scale of fuel procurement activities (20,000 BDT per year) required to maintain wood fuel deliveries to the LTBBE facility, TSS recommends that the fuel procurement services be contracted out or included in the general manager's responsibilities. A job description (see Appendix E) provides details regarding responsibilities and skill sets required for the fuel procurement manager position.

Procurement Plan Implementation Task List/Timeline

A fuel procurement plan should incorporate a task list and timeline for implementation. Table 13 is a draft list of tasks with timeline to initiate procurement activities to support the LTBBE facility.

Table 12. Task List Timeline for Fuel Procurement Activities

TASK LIST	COMPLETION DATE
Define fuel specifications (for fuel procurement agreements) by fuel type. (Timing of this task assumes that preferred combustion technology has been selected by this date.)	November 2011
Draft fuel procurement agreement templates sent to legal staff for review.	November 2011
Generate job description for procurement manager.	January 2012
Advertise for procurement manager services (if seeking a contractor to fulfill the procurement services).	February 2012
Interview and secure contract with procurement manager.	April 2012
Finalize fuel procurement agreement templates and fuel specifications.	May-June 2012
Meet with USFS to discuss stewardship contracting opportunities.	July-August 2012
Draft fuel quality assurance and moisture content monitoring program procedures and protocols.	September 2012
Finalize and implement Communications Plan targeting fuel suppliers, land management agencies and fire districts.	September 2012
Utilize ranked list of potential fuel suppliers to begin securing Letters of Intent.	October-December 2012
Prepare stewardship contract proposal for submittal to USFS.	January-April 2013
Finalize long-term fuel procurement agreements with preferred suppliers.	July-August 2013
Finalize stewardship contract with USFS.	September 2013
Commence wood fuel deliveries to the LTBBE facility.	December 2013
Initiate fuel quality assurance program.	December 2013

OBSERVATIONS

Summarized below are observations generated during the course of this fuel availability assessment and fuel procurement plan effort.

Stewardship Contracting

A very significant portion of the forested landscape surrounding the LTBBE is managed by public land management agencies, with the USFS as the largest and most active in the region. In recent years, the USFS has utilized a relatively new contracting tool known as Stewardship Contracting. Stewardship Contracting allows the USFS to combine traditional forest management fuels treatment activities and other resource-beneficial activities into long-term agreements (not to exceed 10 years). Known as Integrated Resource Service Contracts (IRSC), these agreements target treatment activities at a landscape scale (100+ acres). Targeted outcomes are typically based on end result objectives described (for example) as “desired future conditions.” IRSC are a means of carrying out forest management activities and must be compliant with all federal laws and regulations, including the National Environmental Policy Act. The USFS has authorization to implement Stewardship Contracting agreements through September 30, 2013. Congress is considering the extension of this authority. Placer County is currently in discussions regarding Stewardship Contracting opportunities within the LTB. IRSC

could play an important role in carrying out forest management activities that meet the LTBBE project objectives and provide sustainable fuel supply over time.

Off Site Fuel Storage

The proposed LTBBE site at Kings Beach is currently designed to accommodate a seven day fuel inventory. Due to the relatively seasonal availability of forest-sourced fuels treatment residuals and forest thinning residuals, there will be a need for off site fuel storage. Inclement weather conditions and limited operating seasons will restrict forest operations in any given year. Typical operating seasons (depending on weather) will be limited to six to eight months in a calendar year. At this time, the Eastern Regional Landfill site is targeted for off-site fuel storage. Placer County is currently developing a fuel storage, management, and delivery logistics plan.[20]

Innovative Fuels Treatment Technology

Forest treatment technologies have evolved over time in response to changing forest management objectives. Concerns regarding sensitive soils, operations on steep topography or in sensitive habitat (e.g., riparian areas) have motivated forest equipment manufacturers to adapt their technologies to address these challenges. Placer County, in conjunction with the LTBMU, is sponsoring field trials to demonstrate new and innovative technologies facilitating fuels treatment activities on challenging landscapes within the LTB. These field trials should be an ongoing and well-monitored activity so that as technologies evolve and are found effective, they can be deployed in the field.

[20]Task 3.0 (Logistics Study) of the U.S. Department of Energy (DOE) award No. DE-FG36-08GO88026.

APPENDIX A – Sierra Pacific Industries Press Release

Sierra Pacific Industries

P.O. Box 496028 • Redding, CA 96049-6028 • (530) 378-8000

For Immediate Release
August 20, 2010

Contact: Mark Pawlicki
530-378-8000

Sierra Pacific Industries to Close its Loyalton, CA Power Plant

Anderson, CA – Sierra Pacific Industries (SPI) today announced that it has sent a notice to NV Energy in Nevada stating that SPI will suspend operations at its Loyalton, CA power plant immediately. The plant's fifteen power plant operators who will be directly affected by this announcement were notified today.

Numerous government decisions, including decisions not to implement laws passed by Congress, have cut off SPI from feasible fuel supplies and otherwise made it impossible to operate. Additionally, Nevada Energy recently lowered the rates it pays to SPI for electricity generated from the Loyalton plant. The combination of uncertain fuel supplies and reduced energy rates made the facility uneconomic to run.

The circumstances forcing the shutdown include: First, the United States Forest Service failed to carry out its legally mandated timber sales under the 1998 Herger-Feinstein Quincy Library Group Forest Recovery Act ("QLG Act") (the act mandates unequivocally certain timber sales on Federal Land in the vicinity of the power plant). SPI rebuilt its sawmill in Loyalton relying on the QLG Act, only to have to close it about two years later when the timber supply failed to materialize. Second, litigation filed by environmental groups has blocked certain attempts by the government to offer timber sales that would have produced in-woods biomass from federal land surrounding Loyalton.

> As a result of these events, beyond SPI's control, SPI has been unable to procure sufficient supplies of suitable fuel to operate its power plant in compliance with legal requirements of federal, state, and local law.
>
> Notwithstanding these events, Sierra Pacific Industries is exploring opportunities that might allow it to reopen the facility.

APPENDIX B - Bio Energy News Article – NNCC Closure

NNCC: Prison's biomass plant to be locked up

From: Bio Energy News
24 May 2010

Costing in the region of $8.8 million and developed with the aim of slashing the US-based Northern Nevada Correction Center's utility bills, Nevada's first biomass project has been deemed unsuccessful.

The biomass plant burns wood for the generation of heat and power. It was originally thought that it would be able to heat all of the water used at the prison, as well as produce enough power to reduce the centre's monthly electricity bills of $40,000. Any excess electricity would be sold to NV Energy.

However Howard Skolnik, the director at NNCC has explained that the power producing facility 'doesn't pencil out' in the future and if a buyer cannot be found by the summer of this year, the plant will be closed. 'The original design was just not large enough to make it truly profitable in the long term,' he said.

However some believe that the plant, of which $6.5 million was provided by the state, should not be shut as it utilizes tons of forest waste that could otherwise cause catastrophic forest fires on the Sierra Front and Tahoe Basin.

Another problem facing the plant is the question of who will man it. In the original proposal it was stated that the prison inmates would operate it but Jeff Mohlenkamp, the deputy director at NNCC, has come forward and explained that the plant is too high-tech and complicated for this to become a reality. Mohlenkamp remarked: 'But that doesn't mean the technology and the concept is a bad thing. It's a lesson learned. It doesn't mean plants like this can't be successful.'

APPENDIX C - Urban Wood and Forest Fuel Specifications

URBAN WOOD FUEL SPECIFICATIONS

1. **Fuel Description**. Wood Fuel shall be from urban sources, including tree limbs, tree tops, prunings, wood boxes, pallets, and clean construction waste wood. (Paragraph 5 below lists certain excluded materials.) The Higher Heating Value ("HHV") of the Fuel shall be a minimum of 7,900 British Thermal Units ("BTU") per dry pound, for each delivery. The ash content, as determined by an independent third party testing service shall not exceed four percent (4%) by dry weight of each delivery.

2. **Maximum Moisture Content**. The maximum moisture content for the Wood Fuel delivered to the LLC Facility under the Agreement shall be thirty percent (30%) by weight. Moisture content with respect to any delivery shall be determined in accordance with ASTM specifications and procedures, or equivalent.

3. **Maximum Size**. Ninety percent (90%) or more of a delivery by volume shall be less than three (3) inches in every dimension. One hundred percent (100%) shall be less than four (4) inches in any dimension.

4. **Minimum Size**. (**Fines and Sawdust)**. The Fuel will be processed by a mechanical screen during manufacture. Fines and sawdust, defined as Wood Fuel of a size 1/4 inch or less, shall comprise no more than ten percent (10%) of gross tonnage for any individual truckload.

5. **Excluded Materials**. The Wood Fuel shall not contain any free ash, soil, cinder, residual of palm, or mulberry and shall be free of foreign material, including, but not limited to, sand, stone, metal, glass, rubber, plastics, pressure treated or lead based painted wood, chemicals, and any hazardous or toxic substances as defined under California or federal law. The Wood Fuel shall be substantially free of grass and leaves.

Fuel ash shall not exceed the California established thresholds for classification of the ash as a hazardous waste per §66261.24 (a) (2). These thresholds are listed in Table A1 below.

Fuel will meet or exceed the requirements defined for Renewable Fuel in order to ensure that the Project will qualify as an Eligible Renewable Energy Resource under the California Energy Commission.

TABLE A-1 STATE OF CALIFORNIA
REGULATORY LEVEL CONCENTRATION OF METALS
PER TITLE 22, SECTION 66261.24
CALIFORNIA CODE OF REGULATIONS

Metal[21]	STLC[22] (mg/L)	TTLC[23] (mg/kg)
Antimony	15	500
Arsenic	5.0	500
Asbestos (all forms)		1.0 (as %)
Barium (except barite)	100	10,000
Cadmium	1.0	100
Chromium (VI)	5	500
Chromium (III)	5	2,500
Cobalt	80	8,000
Copper	25	2,500
Lead	5.0	1,000
Mercury	0.2	20
Molybdenum	350	3,500
Nickel	20	2,000
Selenium	1.0	100
Silver	5	500
Thallium	7	700
Vanadium	24	2,400
Zinc	250	5,000

[21] Include elemental metal and/or metal compounds
[22] Soluble Threshold Limit Concentration
[23] Total Threshold Limit Concentration

FOREST FUEL SPECIFICATIONS

1. **Fuel Description**. Wood Fuel shall be from forest sources, including fuels treatment activities, thinning operations and timber harvest operations. (Paragraph 5 below lists certain excluded materials.) The Higher Heating Value ("HHV") of the Fuel shall be a minimum of 8,300 British Thermal Units ("BTU") per dry pound, for each delivery. The ash content, as determined by an independent third party testing service shall not exceed three percent (3%) by dry weight of each delivery.

2. **Maximum Moisture Content**. The maximum moisture content for the Wood Fuel delivered to the LLC Facility under the Agreement shall be fifty percent (50%) by weight. Moisture content with respect to any delivery shall be determined in accordance with ASTM specifications and procedures, or equivalent.

3. **Maximum Size**. Ninety percent (90%) or more of a delivery by volume shall be less than three (3) inches in every dimension. One hundred percent (100%) shall be less than four (4) inches in any dimension.

4. **Minimum Size**. (**Fines and Sawdust)**. Fines and sawdust, defined as Wood Fuel of a size 1/4 inch or less, shall comprise no more than ten percent (10%) of gross tonnage for any individual truckload.

5. **Excluded Materials**. The Wood Fuel shall not contain any free ash, soil, cinder, residual of palm, or mulberry and shall be free of foreign material, including, but not limited to, sand, stone, metal, glass, rubber, plastics, pressure treated or lead based painted wood, chemicals, and any hazardous or toxic substances as defined under California or federal law. Fuel ash shall not exceed the California established thresholds for classification of the ash as a hazardous waste per §66261.24 (a) (2). These thresholds are listed in Table A1 below.

6. **State and Federal Regulatory Compliance.** Fuel will meet or exceed the requirements defined for Renewable Fuel in order to ensure that the Project will qualify as an Eligible Renewable Energy Resource under the California Energy Commission. Fuel will be collected, processed and transported in compliance with state (California Environmental Quality Act, Nevada Division of Environmental of Environmental Protection) and federal (National Environmental Policy Act) regulations.

TABLE A-1 STATE OF CALIFORNIA
REGULATORY LEVEL CONCENTRATION OF METALS
PER TITLE 22, SECTION 66261.24
CALIFORNIA CODE OF REGULATIONS

Metal[24]	STLC[25] (mg/L)	TTLC[26] (mg/kg)
Antimony	15	500
Arsenic	5.0	500
Asbestos (all forms)		1.0 (as %)
Barium (except barite)	100	10,000
Cadmium	1.0	100
Chromium (VI)	5	500
Chromium (III)	5	2,500
Cobalt	80	8,000
Copper	25	2,500
Lead	5.0	1,000
Mercury	0.2	20
Molybdenum	350	3,500
Nickel	20	2,000
Selenium	1.0	100
Silver	5	500
Thallium	7	700
Vanadium	24	2,400
Zinc	250	5,000

[24] Include elemental metal and/or metal compounds
[25] Soluble Threshold Limit Concentration
[26] Total Threshold Limit Concentration

APPENDIX D - Letter of Intent Template

FOREST HARVEST RESIDUALS WOOD FUEL
LETTER OF INTENT

This is a Letter of Intent between _____(known as the "Owner"), and Lake Tahoe Biomass Energy (known as "LTBE").

LTBBE is developing a woody biomass fired cogeneration facility at Kings Beach, California. This project is designed to utilize a variety of woody biomass materials including wood fuel sourced from forest harvest operations in the greater Lake Tahoe region. Attached is a fuel specification sheet that provides standards that define forest harvest residuals as wood fuel for the LTBBE facility.

The Owner generates approximately _____ bone dry tons (BDT) of wood waste on an annual basis. LTBBE desires to receive _____ BDT per year of this wood waste as fuel for use in it's Kings Beach facility.

This Letter of Intent serves to confirm the Owner's interest in developing a contract to provide LTBBE with this wood fuel, and confirms the interest of LTBBE in receiving this wood waste.

The Owner may not assign this Letter of Intent without the written consent of LTBE.

Each of the parties has caused this Letter of Intent to be executed by its duly authorized representatives as of the last date set forth below.

Owner:

By _____

Title _____

Date _____

LAKE TAHOE BIOMASS ENERGY

By _____

Title _____

Date _____

APPENDIX E - Fuel Procurement Manager Job Description

FUEL PROCUREMENT MANAGER JOB DESCRIPTION

Fuel Procurement Manager – Responsibilities

- Coordinates fuel purchases and scheduling of deliveries with Lake Tahoe Biomass Energy (LTBBE) plant manager and accounts payable manager.
- Generate Annual Fuel Procurement Plan:
    - Define strategies to monitor long term fuel supply agreements consistent with LTBBE's fuel specifications and annual operations budget.
    - Provide for procurement of fuel on spot market basis as pricing and quality fuel procurement opportunities arise.
    - Update locations of existing and potential fuel sources.
    - Update locations of current and potential fuel competitors.
    - Examples of contracting instruments that will be utilized:
        - Letter of Intent
            - Binding and non- binding
        - Short term purchase agreement
        - Long term purchase agreement
        - Fuels treatment contractor – project implementation agreement/contract
        - Product transport agreements
        - Agreements must include specific requirements for suppliers to meet including:
            - Insurance (general liability, auto, workers comp, etc)
            - Fuel quality specifications
        - Other contract provisions

- Generate monthly, quarterly and annual fuel procurement projections to meet the budgeting and inventory control needs of LTBE.
- Monitor fuel quality by supplier and source. Work with LTBBE staff to assure that fuel sampling and testing meet LTBBE and ASTM (or equivalent) standards.
- Work with the LTBBE scale masters to schedule fuel deliveries so that weigh in of products can be handled efficiently and cost effectively.
- Monitor fuel deliveries to confirm contractual compliance of suppliers and shipping contractors.
- Work with LTBBE staff to monitor liability insurance requirements for all fuel processing contractors and haulers under contract to LTBBE for processing and/or delivery of fuel.
- Monitor hauling contractor staff to assure complete compliance with LTBBE safety guidelines while making deliveries to LTBBE facility.

- Review and approve monthly fuel payment summaries prior to final payment being issued to fuel suppliers, processing contractors and haulers.
- Monitor fuel supply inventory to confirm that it is consistent with "booked" inventory.
- Serve as primary contact and fuel buyer representing LTBBE with a variety of individuals and organizations in Central and Southern California:
    - Wood waste processors (forest, agricultural and urban)
    - Forest products manufacturing facilities
    - Landfill and transfer station managers
    - Private landowners
    - California Dept of Forestry
    - Federal land management agencies (e.g. US Forest Service)
    - Professional Organizations (e.g. Society of American Foresters)
    - Stakeholder groups focused on forest health and defensible communities (e.g., Fire Safe Councils, California Forestry Association)

Fuel Procurement Manager – Skill Sets

- Strong written, verbal and communication skills.
- Comfortable making presentations at public forums, conferences and hearings.
- Well versed regarding state and federal regulatory guidelines pertinent to timber harvesting and over the road transport of commodities.
- Understanding of California and Nevada wood fiber markets, units of measure, current harvesting/processing equipment and transport technologies.
- Respected and considered credible amongst peers within and outside of the biomass power generation market sector.
- Computer literate; conversant in Microsoft Word, Excel and Power Point.
- Current California Drivers License.