

**PRELIMINARY BIOMASS FUEL  
AVAILABILITY AND FEASIBILITY REVIEW  
FOR SITING BIOMASS POWER FACILITIES  
IN EL DORADO COUNTY, CALIFORNIA**

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Prepared for:

El Dorado County Fire Safe Council  
P.O. Box 1237  
Pollock Pines, CA 95726

Prepared by:

TSS Consultants  
2724 Kilgore Road  
Rancho Cordova, CA 95670



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- David Ganz, Fire Scientist, TSS
- Tad Mason, Forester and Chief Executive Officer, TSS
- Fred Tornatore, Director of Environmental and Technology Services and Executive Vice President, TSS
- David Saah, Landscape Ecologist, Spatial Informatics Group LLC (SIG)

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## INTRODUCTION

The El Dorado County Fire Safe Council (EDFSC) is assessing woody biomass fuel resources and the potential feasibility of siting appropriately-scaled commercial and non-commercial biomass power and/or heat generation facilities within El Dorado County. This study assesses the feasibility of a biomass project that is environmentally compatible, acceptable to the community, capable of receiving the necessary regulatory permits, and utilizes locally and regionally available fuels that are typically considered wasted resources. Specifically, the study defines and examines the local and regional conditions and assumptions necessary for developing a successful biomass utilization facility within El Dorado County.

The EDFSC has retained TSS Consultants to conduct a preliminary feasibility study that concentrates its efforts on the review of key biomass fuel availability constraints and parameters. TSS has focused on these constraints because they have the potential to impact the long-term sustainable supply of economical biomass fuel within El Dorado County. The EDFSC represents stakeholders that are interested in siting biomass power generation facilities within this county.

Primary drivers include:

- Creating a market-driven solution to support forest fuels reduction and forest restoration/remediation activities within El Dorado County.
- Improving air quality impacts by finding alternative uses for woody biomass material that would normally be burned in the open, thus impacting air quality and contributing to regional haze.
- Reducing the amount of woody material now being deposited in local landfills, thus extending the service life of the landfills.
- Supporting renewable energy development, thus diversifying local power generation and providing opportunities to efficiently utilize waste material (wood waste) for co-generation of both power and heat. Stakeholders are generally encouraged by the development and use of newer technology capable of higher efficiency rates. With these higher efficiencies and newer technologies, less biomass would be needed to support electrical generation and El Dorado County may be able to reduce carbon emissions. Additionally, stakeholders have recognized that the utilization of waste heat may also improve operational and economic efficiencies.
- Providing employment opportunities in the form of sustainable living-wage jobs. Stakeholders have expressed optimism that a proposed biomass project in El Dorado County would create additional jobs and tax revenues for local communities.

## BACKGROUND

Despite substantial infrastructure and budgets dedicated to fire suppression in the United States, the annual area burned by wildfire has increased in the past decade. Wildfires burned a record 9.7 million acres of U.S. forests and wildlands in 2006, compared with an annual average of 6.6 million acres during 1999-2006. The upward trend is due in part to forests that are heavily overstocked with small-diameter trees and brush, substantially increasing the risks of catastrophic wildfires.<sup>1</sup>

A primary factor influencing the intensity of these wildfire events is the unnaturally high concentrations of vegetation. This is noted in the April 1999 General Accounting Office report, *Western Forests: A Cohesive Strategy is Needed to Address Catastrophic Wildfire Threats*.

*“The most extensive and serious problem related to the health of national forests in the interior West is the over-accumulation of vegetation.”<sup>2</sup>*

Clearly, over a century of successful fire suppression efforts have facilitated a very serious buildup of vegetation—mostly small, traditionally sub-merchantable trees. In order to restore the health of western forests and reduce the risk of wildfire, these over-stocked stands require treatment. Treatment typically includes the removal of small trees, both commercial, as sawlogs, and non-commercial, many times in the form of woody biomass fiber suitable for use as feedstock for power generation or other value-added options (compost, residential fuel pellets, or firewood).

The National Fire Plan (NFP), as implemented by the USDA Forest Service and the Bureau of Land Management, seeks to treat millions of acres of overstocked forests in the Western United States. Complementary to this effort, there exists a significant opportunity for utilization of these small trees in the form of sawlogs for conversion to forest products (lumber/veneer/panel products) and woody biomass for use as fuel in the generation of heat and power.

In addition to reducing the costs and losses from wildfires, there are a number of public and private benefits from reducing forest fuels and diverting the biomass for use as fuel in the generation of renewable electrical power. These additional benefits include new jobs and businesses in rural communities, new property income and sales tax revenues for local and state agencies to provide more public services, and potential air quality improvements from significantly reducing air pollutants from wildfires or the open burning of woody biomass. Studies indicate that approximately 4.9 new jobs<sup>3</sup> are generated for every newly-developed megawatt of biomass power.

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<sup>1</sup>Polagye, B.L.; Hodgson, K.T.; Malte, P.C. An Economic Analysis of Bio-Energy Options Using Thinning from Overstocked Forests. *Biomass Bioenergy* 2007, 31 (2–3), 105–125.

<sup>2</sup>GAO Report (GAO/RCED-99-65) - April 2, 1999: *Western National Forests – A Cohesive Strategy is Needed to Address Catastrophic Wildfire Threats*, p. 3.

<sup>3</sup>Morris, Gregory. 1999. *The Value of the Benefits of U.S. Biomass Power*, NREL/SR-570-27541. National Renewable Energy Laboratory, Golden, CO.

## STUDY OBJECTIVES

The objective of this preliminary review is to determine if there is enough raw material feedstock, community support and ready markets for the sale of renewable electrical power to site appropriately-scaled commercial biomass power generation facilities within El Dorado County. This report addresses the following tasks as part of the preliminary review.

**Task 1.** Preliminary review and estimate of current biomass fuel volumes by fuel type potentially available for a biomass power project. Fuel types considered include:

- Timber harvest/fuels treatment residuals
- Urban wood waste
- Forest products manufacturing residuals
- Agricultural by-products

**Task 2.** Preliminary review of current costs to harvest, process and transport biomass by type. This includes a woody biomass fuel market survey to determine current fuel pricing and availability trends within El Dorado County. Included in the cost estimates of recoverable biomass is a detailed examination of current processing and transport costs for timber harvest residuals generated within El Dorado County.

**Task 3.** Preliminary alternative market and competition review of where and how much available biomass material is currently utilized. For this task, TSS has developed a competition analysis noting where available fuel is currently dedicated to competing plants (and/or competing uses) and estimated current delivered prices (\$/bone dry ton<sup>4</sup>). TSS has characterized the origin, quality, and current disposition of identified available fuel supply.

**Task 4.** Preliminary review of current biomass power markets in an effort to develop potential opportunities and secure a long-term power sales agreement. For this task, TSS has identified some future fuel supply sources and risks.

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<sup>4</sup>One bone dry ton (BDT) is 2,000 pounds of biomass (usually in chip form) at zero percent moisture.



# WOOD FUEL SUPPLY ANALYSIS

## Wood Fuel Supply and Study Area

TSS Consultants reviewed the potential availability of woody biomass fuel material within El Dorado County and found between 128,630 and 358,394 bone dry tons (BDT) of woody biomass fuel are potentially available on an annual basis. This volume of biomass fuel is more than sufficient to support a proposed facility in Camino between 12 and 14 megawatts (MW) of power generation (the size is restricted by the county’s air quality concerns). Table 1 reports potential biomass fuel availability by fuel type within El Dorado County and Figure 1 shows the county’s geographic location.

**Table 1. Summary of Woody Biomass Fuel Potentially Available on an Annual Basis within El Dorado County (Expressed as BDT)**

FUEL TYPE	LOW ESTIMATE	HIGH ESTIMATE
Timber Harvest - Residuals	86,830	190,535
Fuels Treatment - Public	0	45,500
Fuels Treatment - Private	6,500	60,000
Urban Wood and Green Waste	17,300	37,179
Agricultural By-Products	3,000	5,180
Forest Products Manufacturing Residuals	15,000	20,000
<b>TOTAL</b>	<b>128,630</b>	<b>358,394</b>

**Figure 1. El Dorado County**



## Wood Waste Streams

In assessing the amount of wood fuel potentially available within El Dorado County, TSS has considered three distinct sources.

- Urban
  - Urban wood waste – construction/demolition wood, pallet, miscellaneous residential and commercial wood waste.
  - Tree trimmings – plant material generated from residential and commercial landscape maintenance activities.
- Agricultural
  - Orchard removals – commercial crop trees removed as a result of crop replacement activities.
  - Orchard prunings – commercial crop trees are pruned annually to improve vigor and productivity.
  - Nut shells – annual processing of almond and walnut crops generates byproduct in the form of nut shells.
  - Grape pomace – annual processing of wine grapes generates grape seeds and skins.
- Forest
  - Timber harvest residuals – limbs and tree tops generated during commercial timber harvest activities.
  - Fuels reduction residuals – small stems removed as a result of forest fuels reduction and maintenance activities.
  - Highway corridor and road clearance – small stems removed as a result of CalTrans and County road-clearing activities.
  - Forest products manufacturing residuals.

Additional woody biomass residuals are generated by commercial-scale forest products manufacturing operations located within El Dorado County. Forest products manufacturing residuals produced in the form of chips, bark and shavings are marketed and sold to established utilization facilities that generate high-value products (e.g., paper, composite panels and landscape cover) and due to their relatively high value are not economically available as wood fuel.

## Urban Sources

### *Urban Sourced Biomass Waste*

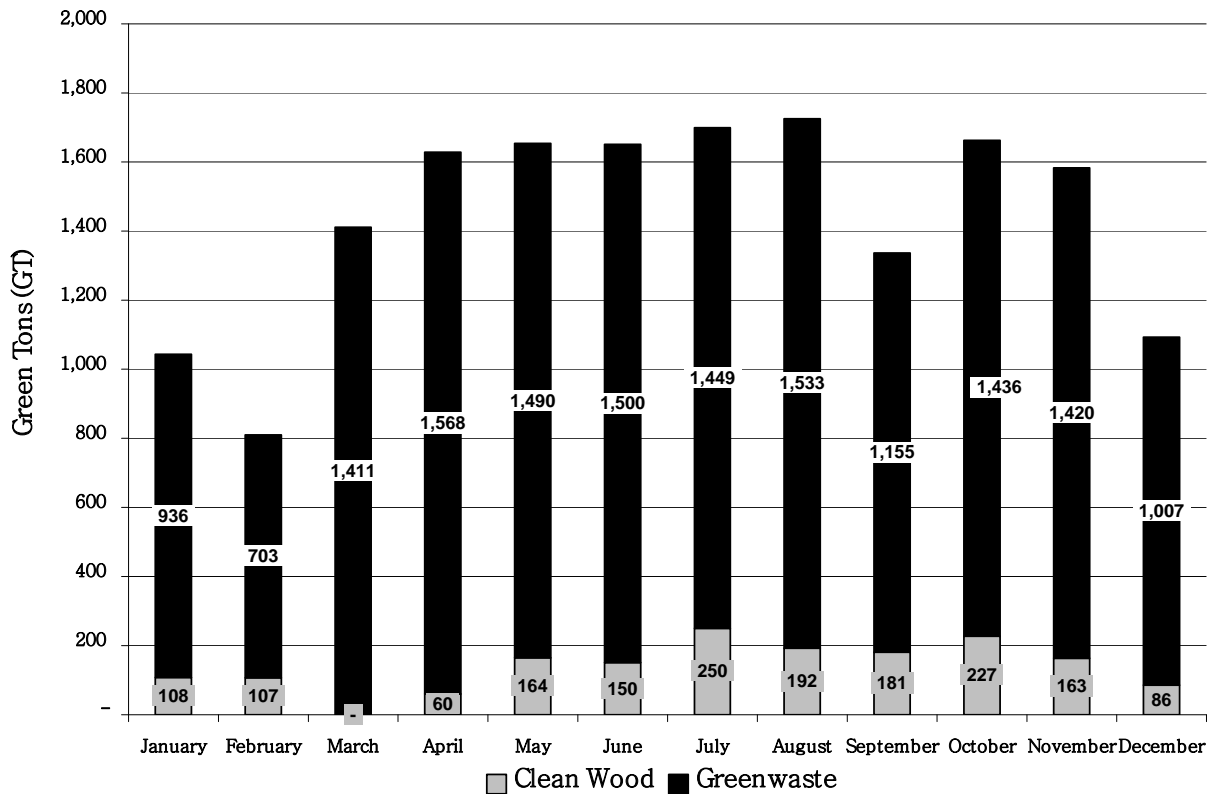
Within the county, there is an estimated population of 178,066 residents.<sup>5</sup> Based on TSS's experience with urban wood waste generation, approximately 11.5 pounds/capita of waste are generated daily with 10.5% of the solid waste stream generated as urban wood waste. Using this generation factor, it was calculated that approximately 31,392 BDT of urban wood waste are available annually. Based on our previous assessments in certain areas of the Sierra Nevada and

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<sup>5</sup>U.S. Census Bureau Quick Facts 2006: <http://quickfacts.census.gov/qfd/states/06/06017.html>

foothill ecological communities, TSS has converted the volumes of wood waste to a bone dry ton basis assuming that the average moisture content of the urban wood waste is 20%. Typically about 65% of the total wood generated is estimated to be recoverable; however, due to the rural nature of the county and the disposal alternatives (pile and burn, home heating) of such a population, TSS estimates that only 25% of the total wood generated would be available as biomass fuel.

**Figure 2. 2007 El Dorado Disposal Urban-Sourced Biomass Material by Month in Green Tons**



Historically, El Dorado County has been in compliance with the California Integrated Waste Management Board’s (CIWMB) total diversion target of 50% as stated in AB 939.<sup>6</sup> This was accomplished by adopting an Integrated Waste Management Plan (IWMP) created by the cities and county which includes an integrated approach for source reduction, composting and recycling. As part of the IWMP, the El Dorado County Waste Management franchises built a regional Material Recovery Facility (MRF). This facility processes solid wastes through a sorting line and recyclables are diverted to market. As proof of success, El Dorado County Waste Management received an award from the CIWMB for 63% diversion in 2005. Based on TSS’s interviews with El Dorado Disposal Service, total urban biomass waste delivered monthly

<sup>6</sup>Assembly Bill 939 became law on January 1, 1990 and mandates that every county and city divert their waste from landfills 25% by 1995 and 50% by 2000 or face \$10,000 per day fines.

to the Diamond Springs transfer station fluctuates between 810 green ton (GT)<sup>7</sup> to 1,725 GT (Figure 2). El Dorado County has five independent franchise companies handling urban waste with El Dorado Disposal on the west side of the county and South Lake Tahoe Refuse on the east slope. Only El Dorado Disposal (EDD) has a curb-side collection system for wood waste. EDD is by far the largest of the five franchise companies operating in the county. According to TSS's fuels study interviews, El Dorado County is currently diverting 53-54% of its total waste, including 5% for biomass energy diversions (approximately 10,000 BDT going to Rocklin and Woodland).

TSS's discussions with the county staff<sup>8</sup> have indicated a strong interest to recover and utilize urban wood waste as wood fuel rather than pile and burn or bury this waste in landfills (current methods). County solid waste department staff and private sector waste haulers are quite interested in recovery and utilization of urban wood for a variety of reasons, including the following:

1. Communities are attempting to extend the life of landfills by diverting material to alternative uses. Tip fees at the landfills are on the rise to provide an incentive for increased recycling/alternative utilization efforts.
2. New residential and commercial development generates land-clearing material, construction and demolition wood. This creates waste in the form of brush, small trees, and other woody material. In addition to land-clearing material and demolition wood, residual framing materials may be considered for a steady supply of dry, clean wood. Discussions with developers and framing contractors (such as Production Framing Systems, Inc.) have indicated that there are four companies with large sources, each with approximately 15 BDT of clean wood-generated waste per day.<sup>9</sup> Currently these companies are disposing this waste at the Kiefer Landfill with tipping fees ranging from \$7-40/ton.<sup>10</sup>
3. Air quality concerns have placed increased restrictions upon the open burning of wood waste.
4. Recovery and utilization of urban wood will count towards compliance with AB 393 California Waste Board's target of 50% diversion (by weight).

In response to this interest, TSS has generated a list of urban wood waste that would be considered acceptable and unacceptable as raw material for wood fuel. The following wood wastes would qualify as acceptable material for processing into wood fuel for any proposed wood waste recovery operation in El Dorado County:

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<sup>7</sup>One green ton (GT) is 2,000 pounds.

<sup>8</sup>John Souza, El Dorado County Environmental Management Department.

<sup>9</sup>David King, Production Framing Systems, Inc. Using wood conversion assumptions for 40 cubic yards dumpster and 85% full as defined by the EPA: <http://www.epa.gov/epaoswer/non-hw/recycle/recmeas/download.htm>

<sup>10</sup><http://www.saggreenteam.com/facilities/kieferrates.htm>

- Tree limbs/tops
- Logs and stumps (substantially free of rocks and soil)
- Clean wood pallets
- Clean, untreated construction wood waste (paint free)
- Clean, untreated demolition wood waste (paint free, sheetrock or metal); some nails are acceptable
- Creosote-treated railroad ties and power-supply poles (not accepted by Kiefer landfill)<sup>11</sup>

The following wastes are considered unacceptable for processing into wood fuel:

- Grass, leaves and other non-woody yard waste
- Non-combustible material (concrete, metal, glass, sand, soil, rocks, etc.)
- Plastics
- Painted wood
- Pressure-treated wood
- Tar paper, composition roofing material

#### *Tree Trimmings*

Based on previous studies performed by TSS, it is estimated that approximately 100 dry pounds of tree trimmings are generated annually per capita. Based on a population of 178,066 and an assumption that 65% of tree trimmings generated from this population is actually recoverable as biomass fuel, approximately 5,787 BDT of tree trimmings are available each year sourced from urban areas in El Dorado County. Table 2 provides a summary of the urban-sourced biomass material potentially available on an annual basis. A monthly summary of the urban-sourced biomass material as it comes into the El Dorado Disposal facility in Diamond Springs is illustrated in Figure 2 (page 6).

**Table 2. Urban-Sourced Biomass Material Based Upon Population Estimate**

<b>POPULATION WITHIN EL DORADO COUNTY</b>	<b>URBAN WASTE (BDT)</b>	<b>TREE TRIMMINGS (BDT)</b>
178,066	31,392	5,787

#### **Agricultural Sources**

##### *Nut Crop Orchard Removals*

Within El Dorado County, TSS estimates that 219 acres of almonds and walnuts are harvested annually.<sup>12</sup> These nut crops have had an historical replacement/removal rate of approximately 4% of total cultivated acres per year. However, due to high nut prices in recent years, the removal rate has dropped to approximately 2% per year. For purposes of this assessment, TSS has assumed an annual removal rate of 3% for nut crops. The typical removal volume for a mature almond or walnut orchard is around 17 BDT per acre. Based on these estimates, TSS has

<sup>11</sup>Several biomass power plants in California are now permitted to utilize rail ties and utility poles as wood fuel.

<sup>12</sup>2006 El Dorado County Crop Report: <http://www.co.el-dorado.ca.us/ag/cropreport.html>

calculated that approximately 6.5 acres of nut orchards are available for removal on an annual basis. This results in 110.5 BDT of nut orchard removals available each year. The nut crops, particularly almonds, are some of the most desirable species for agricultural air emissions offset fuel and as such, may be in high demand for purchase by other biomass power plants attempting to meet agricultural offset fuel procurement requirements.

#### *Stone Fruit Orchard Removals*

The stone fruit market has not been as strong as the nut markets and consequently there has been an accelerated removal rate for several fruit varieties including Bartlett pears, apples, apricots, peaches, plums and cherries. For example, in 2006 there were 972 acres of pears and apples harvested in the county. These fruit orchards tend to generate less volume of usable biomass fuel than the nut orchards. These fruit crops have had an historical replacement/removal rate of approximately 6% of total cultivated acres per year. TSS estimates that approximately 13 BDT per acre are produced from fruit orchard removals. The 2006 El Dorado Crop Report indicates that approximately 1,219 acres of stone fruit orchards are now in cultivation in the county. Based on these estimates, TSS has calculated that approximately 73 acres of fruit orchards are available for removal in El Dorado County on an annual basis. This results in approximately 950 BDT of fruit orchard removals available each year. Unlike the nut orchards, fruit trees tend to be softer and produce a stringier fuel.

#### *Orchard Prunings*

In addition to orchard removals, prunings are also available annually from commercial orchard operations. While the average volume of prunings varies by type of orchard, TSS has estimated that on average, approximately 0.5 BDT per acre are generated each year. The 2006 El Dorado Crop Report indicates that approximately 3,494 acres of orchards are now in cultivation within the county. Annual pruning activities on these orchards could produce approximately 1,747 BDT of pruning material per year. At present, there is a limited number of operators actively engaged in pruning, collection and processing. The low volumes per acre and the specialized processing equipment needed tend to make this fuel relatively expensive to produce. In addition, because of the physical characteristic of the prunings, this fuel tends to be stringy and can be difficult to process. TSS has estimated that 50% of this volume, approximately 873.5 BDT per year, could be reasonably available as fuel within the study area.

#### *Vineyard Removals*

Presently only a limited volume of vineyard removals are processed as fuel. Vineyards are problematic as a fuel source for a number of reasons, including wire trellising, metal grape stakes, and the presence of pressure-treated wooden grape stakes. The number of vineyard acres in commercial production is increasing in El Dorado County, up 1,069 acres from the 2005 and 2006 crop reports to 5,720 acres.<sup>13</sup> An additional 2,058 non-bearing vineyard acres are projected to come on-line in the next two years.<sup>14</sup> The current practice of open field burning will continue to be available as a viable disposal method for vineyard managers until June, 2010. Provisions in California Senate Bill 705 (see Appendix A) stipulate that open burning of vineyard removals and orchard removals/prunings be discontinued. After that time, new and innovative techniques

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<sup>13</sup>The 2007 El Dorado Crop Report has not yet been published.

<sup>14</sup>2006 El Dorado Crop Report: <http://www.co.el-dorado.ca.us/ag/cropreport.html>

will need to address these removals. Vineyard removals may provide a source of low-cost fuel; however, the quality of this fuel tends to be poor with high ash and dirt. For this reason, TSS has not included vineyard removals or vineyard prunings as viable available fuel in this assessment.

*Nut Shells*

In addition to orchard removals and prunings, nut shells are also generated from commercial agricultural operations annually from within the county. TSS utilized the 2004 California Energy Commission’s report, An Assessment of Biomass Resources in California, to estimate the total nut shells produced annually from the walnut orchards in El Dorado County. While production of walnuts has increased from 36 tons to 76 tons for the county,<sup>15</sup> TSS estimates there are only 26 BDT of walnut shells annually available as a biomass resource. This volume of shell is so minimal that economies of loading and transporting are prohibitive. For the purposes of this analysis it was assumed that nut shell is not practically available as a potential fuel source.

*Grape Pomace*

TSS determined the amount of wine grape pomace generated and available as fuel utilizing the County Agricultural Commissioner’s annual crop reports which assess the tons of wine grapes produced within the area. In addition, TSS contacted the University of California at Davis Viticulture Department to secure an estimate of the pomace in relation to total grape crush. Based upon this information, it is estimated that approximately 20% of the grape (by weight) is available as pomace after the crush. This can be broken down into 5% seeds and 15% skins and other residue. Based upon these estimates, approximately 572 BDT of wine grape pomace is available each year from within El Dorado County. Currently, grape growers in El Dorado County use the pomace as a natural soil enhancer/fertilizer for their vineyards. Table 3 provides a summary of the agriculture-sourced biomass material potentially available in El Dorado County.

**Table 3. Annual Agriculture-Sourced Biomass Material**

<b>STONE FRUIT ORCHARD REMOVAL (BDT)</b>	<b>NUT CROP ORCHARD REMOVAL (BDT)</b>	<b>ORCHARD PRUNINGS (BDT)</b>	<b>GRAPE POMACE (BDT)</b>
950	110	1,750	572

**Forest Sources**

*Timber Harvest Residuals*

El Dorado County contains several heavily forested regions capable of producing consistent volumes of commercial saw timber. Residuals generated as a result of timber 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 by-products of timber harvesting activities and as such can be a relatively economical raw material. Once collected and processed using portable grinders, this material is an excellent biomass fuel source. Table 4 summarizes

<sup>15</sup>2006 El Dorado County Crop Report: <http://www.co.el-dorado.ca.us/ag/cropreport.html>



forest harvest activities (and potential biomass fuel) from 2006<sup>16</sup> compared to an average historic (2002-2006) perspective within El Dorado County.

**Table 4. 2006 Forest Harvest Activities vs. Average Historic (2002-2006) Perspective**

<b>TIME PERIOD</b>	<b>AVERAGE ANNUAL VOLUME (MBF)</b>	<b>POTENTIAL BIOMASS FUEL<sup>17</sup></b>
<b>2006</b>	99,500	44,775
<b>2002-2006</b>	72,000	32,561

Based on TSS’s experience working with logging and chipping contractors in this region, the recovery factor for fuel processed from timber harvest residuals is approximately 0.9 BDT of woody biomass (tops and limbs) that could be generated from each MBF<sup>18</sup> of timber harvested. Table 4 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 chip trucks (for transport of biomass fuel) will limit the volume of biomass fuel recovered from timber harvest activities. For this reason, the recovery numbers in Table 4 assume that approximately 50% of harvest operations are conducted on land that will accommodate recovery of biomass fuel. TSS has also generated a spatial analysis of those lands that do not lend themselves to recovery of harvest residuals known as a Go-No Go analysis.

*El Dorado County Ownership and Operable Area Analysis*

Using a Geographic Information System (GIS), TSS and Spatial Informatics Group, LLC (SIG) were able to evaluate the available woody biomass by vegetation and ownership types within El Dorado County. Public and private ownership classifications were generated from the CERES Government Ownership layers.<sup>19</sup> Using the CDF-FVEG: Multi-source Land Cover Data<sup>20</sup> and the California Forest Practice Rules,<sup>21</sup> TSS and SIG identified areas where treatment activities are not feasible or appropriate for harvesting. Combining these data sets identified locations where treatment activities may be conducted in the near and long term (also termed “Go” acres). The Go-No Go analysis was performed on all vegetation types and ownerships within the county with a 100 foot buffer along all Class I, II, and III watercourses and prohibited on slopes steeper than 35%.

<sup>16</sup><http://www.boe.ca.gov/proptaxes/pdf/vtr362006.pdf>

<sup>17</sup>Assumes 50% of harvested lands will allow recovery of harvest residuals at 0.9 BDT/MBF.

<sup>18</sup>MBF represents 1,000 board foot measure. One board foot is a solid wood board measured 12 inches square by 1 inch thick.

<sup>19</sup>California Environmental Resources Evaluation System: <http://ceres.ca.gov/>

<sup>20</sup>California Department of Forestry and Fire Protection. 2002. Fire and Resource Assessment Program (FRAP Multi-source landcover data, v.02\_2 [Fveg 02\_2g] 2002).

<sup>21</sup>[http://www.fire.ca.gov/resource\\_mgt/resource\\_mgt\\_forestpractice.php](http://www.fire.ca.gov/resource_mgt/resource_mgt_forestpractice.php)

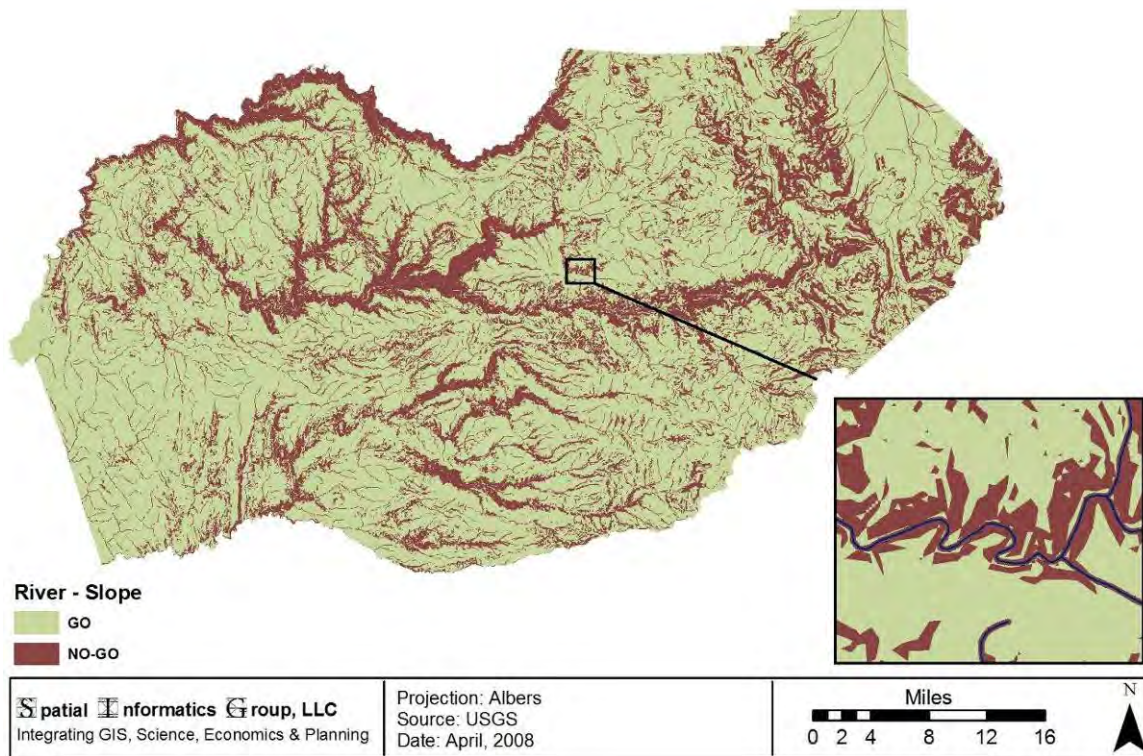


Table 5 highlights the operable acres by ownership within the county. The purpose of this GIS analysis is to exclude lands that are not expected to sustain forest residue recovery operations over time. Of the 1.14 million acres in the county, approximately 846,349 acres are considered operable for biomass operations. Figure 3 demonstrates where these Go acres exist within the county.

**Table 5. Go-No Go Analysis by Ownership within El Dorado County**

<b>OWNER</b>	<b>AGENCY</b>	<b>GO (ACRES)</b>	<b>NO-GO (ACRES)</b>	<b>TOTAL</b>
Federal	BIA	145	3	148
	BLM	11,527	10,910	22,437
	BOR	3,230	1,377	4,607
	USFS	326,887	168,387	495,274
<b><i>Federal Total</i></b>		<b><i>341,789</i></b>	<b><i>180,677</i></b>	<b><i>522,466</i></b>
<b><i>None</i></b>	<b><i>Water Body</i></b>	<b><i>33,538</i></b>	<b><i>1,456</i></b>	<b><i>34,993</i></b>
Private	Conservancy	342,774	80,808	423,582
	Private	119,175	30,201	149,377
<b><i>Private Total</i></b>		<b><i>461,949</i></b>	<b><i>111,010</i></b>	<b><i>572,959</i></b>
State	Fish & Game	724	1,264	1,988
	Parks & Recreation	5,173	1,040	6,213
	Undeclared	3,176	253	3,429
<b><i>State Total</i></b>		<b><i>9,073</i></b>	<b><i>2,557</i></b>	<b><i>11,630</i></b>
<b>TOTAL</b>		<b>846,349</b>	<b>295,700</b>	<b>1,142,048</b>

**Figure 3. Go-No Go Analysis Excluding Lands with Slopes Greater than 35% and 100 Foot Streamside Protection Zones (Riparian Buffers) within El Dorado County**

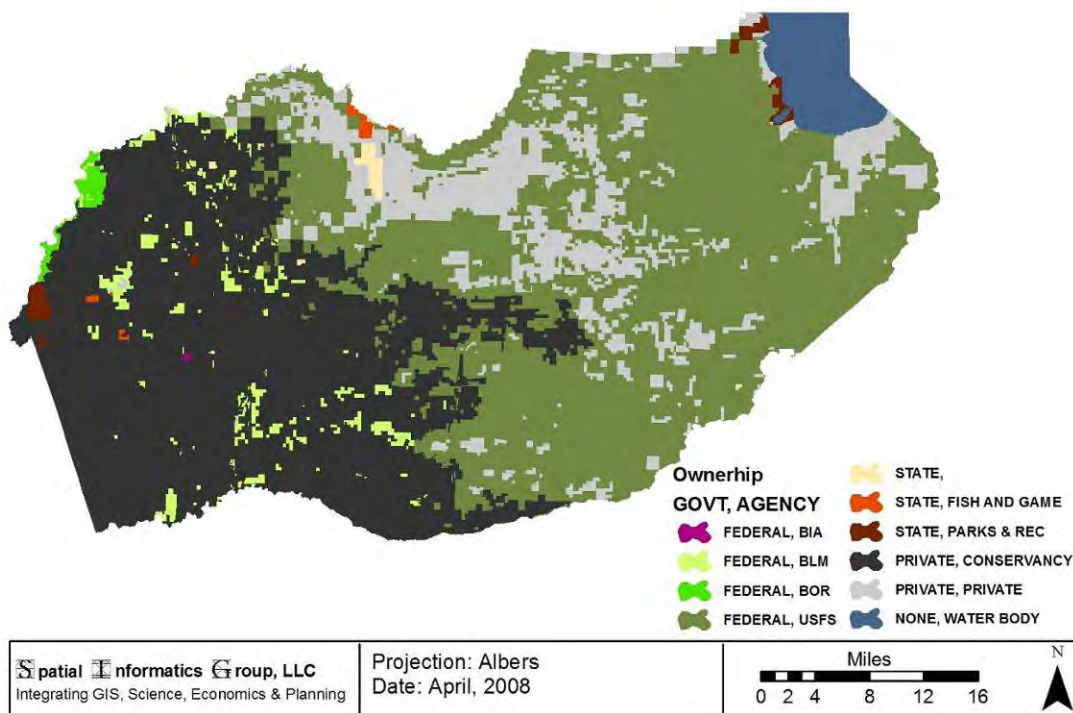


In analyzing the acres where treatment activities may be performed in the county, 55% are owned and managed by the private sector and the Sierra Nevada Conservancy (SNC) (41% of the total operable acres). The Sierra Nevada region, in which the Conservancy operates, is comprised of 25 million acres, all or part of 22 counties, 20 incorporated cities, 40 special districts and 212 communities. The SNC initiates, encourages, and supports efforts that improve the environmental, economic and social well-being of the Sierra Nevada region, its communities, and the citizens of California. Given its mandate and focus on watershed restoration and reduction of fire risk, the SNC has been performing forest restoration activities. It is expected that operable acres will continue to receive fuels reduction treatments.

The federal ownership contributes less than 40% with 341,789 acres in the county and the majority managed by the U.S. Forest Service (USFS). Figure 4 demonstrates where these ownerships are in relation to the county's boundaries. Stewardship contracts in El Dorado County have been successfully administered by the USFS. In addition, discussions with the Bureau of Land Management (BLM) indicated that the BLM intends to utilize stewardship contracts as well.<sup>22</sup> TSS anticipates the continued development of numerous stewardship contracts by the USFS and new BLM stewardship contracts will provide more comprehensive land management opportunities and more stable fiber and fuel supplies from federal lands.

<sup>22</sup>Brian Mulhollen, BLM Fuels Management Specialist.

**Figure 4. Federal, State and Private Ownerships within El Dorado County**



The Healthy Forest Restoration Act of 2003 (HFRA) allows the USFS and the BLM to implement stewardship contracts for up to ten years in duration. These contracts allow for a “goods for services” type arrangement whereby the value of commercial timber can be leveraged to offset the expense to conduct fuels treatment, forest restoration/thinning and salvage operations. Stewardship contracts present a unique opportunity for fuel procurement entities (such as a proposed biomass power generation facility in El Dorado County) to contract with a federal land management agency for long-term commitments that may yield significant volumes of woody biomass fuel. These contracts could also facilitate a procurement strategy whereby stewardship contracts are used as a hedge against times when fuel availability is constrained (e.g., reduced timber harvest levels). The El Dorado National Forest is facilitating a series of workshops to enhance the capabilities of stewardship contracts for fuels reduction activities as well as watershed restoration, wildlife habitat improvement, forest health, and noxious weed control projects. The contracting officer<sup>23</sup> continues to utilize stewardship contracts as another tool for the USFS to achieve its land management objectives as it provides distinct advantages like increasing the amount of work that can be accomplished and a shortened time frame for completing fuels reduction projects.

<sup>23</sup>Patricia Ferrell, El Dorado National Forest Contracting Officer:  
[http://www.fs.fed.us/r5/eldorado/news/2006/stewardship\\_mtg\\_nr.pdf](http://www.fs.fed.us/r5/eldorado/news/2006/stewardship_mtg_nr.pdf)

*El Dorado County Land Cover, Ownership, and Operable Area Analysis*

As previously mentioned, TSS and SIG used the CDF-FVEG: Multi-source Land Cover Data<sup>24</sup> and the California Forest Practice Rules<sup>25</sup> to identify areas where treatment activities are not feasible or appropriate for recovery of woody biomass material. Combining these data sets identified locations within the county where treatment activities may be conducted in the near and long term (also termed “Go” acres). In addition to ownerships, the same Go-No Go analysis was performed on all vegetation types so that similar comparisons can be made between those areas that are forested and those that are agricultural. Vegetation can be described by its habitat type, which for El Dorado County is best delineated and described by the California Department of Fish and Game’s California Wildlife Habitat Relationships (CWHR). The CWHR system provides a relatively simple and accurate method for classifying large patches of vegetation, and this system is widely used by professional foresters and wildlife biologists throughout California. The system contains life history, geographic range, habitat relationships, and management information on 692 species of amphibians, reptiles, birds, and mammals in California. Table 6 highlights the operable acres by CWHR vegetation class and ownership within the county.

**Table 6. Go-No Go Analysis by CWHR Class and Ownership within El Dorado County**

<b>CWHR CLASS</b>	<b>OWNERSHIP</b>	<b>GO (ACRES)</b>	<b>% GO</b>	<b>NO-GO (ACRES)</b>	<b>% NO-GO</b>	<b>TOTAL ACRES</b>	<b>% OF TOTAL</b>
Agriculture	Private	7,666	1%	467	0%	8,133	1%
	Public	314	0%	31	0%	345	0%
Barren/Other	Private	1,788	0%	352	0%	2,139	0%
	Public	16,249	2%	11,766	4%	28,015	2%
Conifer Forest	Private	170,895	20%	53,576	18%	224,471	20%
	Public	280,226	33%	128,463	43%	408,689	36%
Hardwood Forest	Private	96,621	11%	29,408	10%	126,029	11%
	Public	8,969	1%	15,421	5%	24,390	2%
Hardwood Woodland	Private	37,107	4%	6,516	2%	43,623	4%
	Public	2,938	0%	1,061	0%	3,999	0%
Herbaceous	Private	65,335	8%	5,322	2%	70,657	6%
	Public	2,962	0%	1,989	1%	4,951	0%
Shrub	Private	36,865	4%	9,428	3%	46,293	4%
	Public	26,637	3%	23,035	8%	49,671	4%
Urban	Private	34,468	4%	2,427	1%	36,895	3%
	Public	1,726	0%	726	0%	2,452	0%
Water	Private	35,656	4%	2,238	1%	37,894	3%
	Public	14,027	2%	1,930	1%	15,957	1%
Wetland	Private	2,496	0%	679	0%	3,175	0%
	Public	3,895	0%	1,038	0%	4,932	0%
<b>TOTAL</b>		<b>846,841</b>	<b>100%</b>	<b>295,871</b>	<b>100%</b>	<b>1,142,711</b>	<b>100%</b>

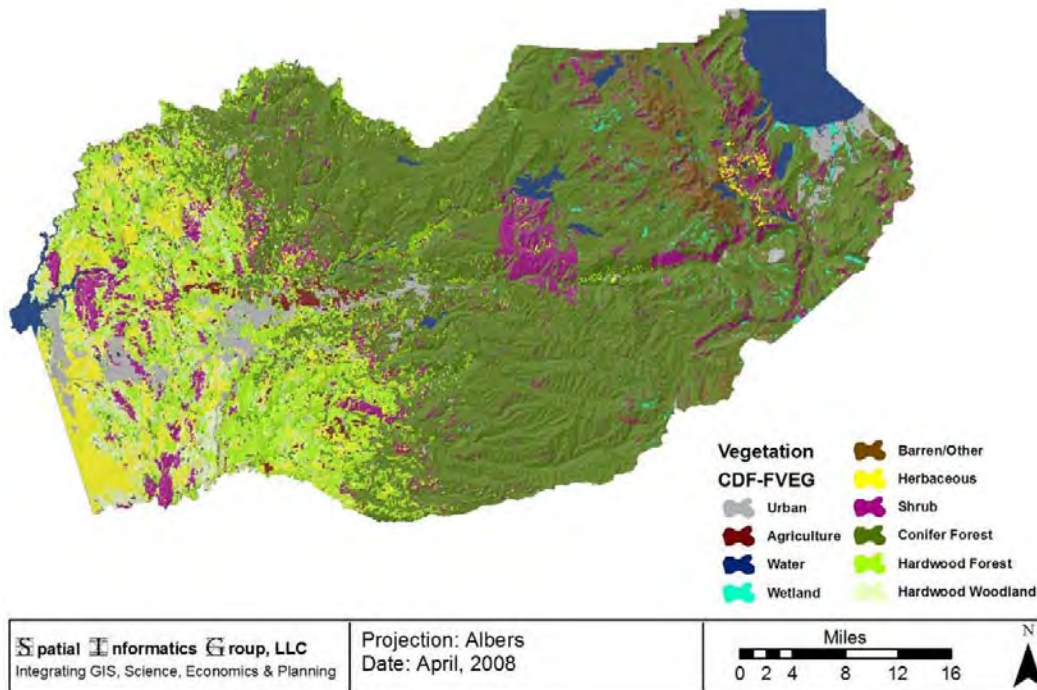
<sup>24</sup>California Department of Forestry and Fire Protection. 2002. Fire and Resource Assessment Program (FRAP Multi-source landcover data, v.02\_2 [Fveg 02\_2g] 2002).

<sup>25</sup>[http://www.fire.ca.gov/resource\\_mgt/resource\\_mgt\\_forestpractice.php](http://www.fire.ca.gov/resource_mgt/resource_mgt_forestpractice.php)



Again, the purpose of this GIS analysis is to exclude lands that are not expected to sustain forest residue recovery operations over time. The CWHR type with the highest number of accessible acres is the coniferous forest on public lands with 280,226 acres or 33% of the total operable area. Together with the acres on private lands, the coniferous forest comprises 53% of the operable landscape. This reinforces the fact that the county’s biomass resources are dominated by forest resources (primarily timber harvest residuals and fuels treatment activities). Figure 5 demonstrates the land cover distributions throughout the county used in the Go No-Go analysis.

**Figure 5. Federal, State and Private Ownerships within El Dorado County**



*Surface Fuel Biomass Surrogate Study*

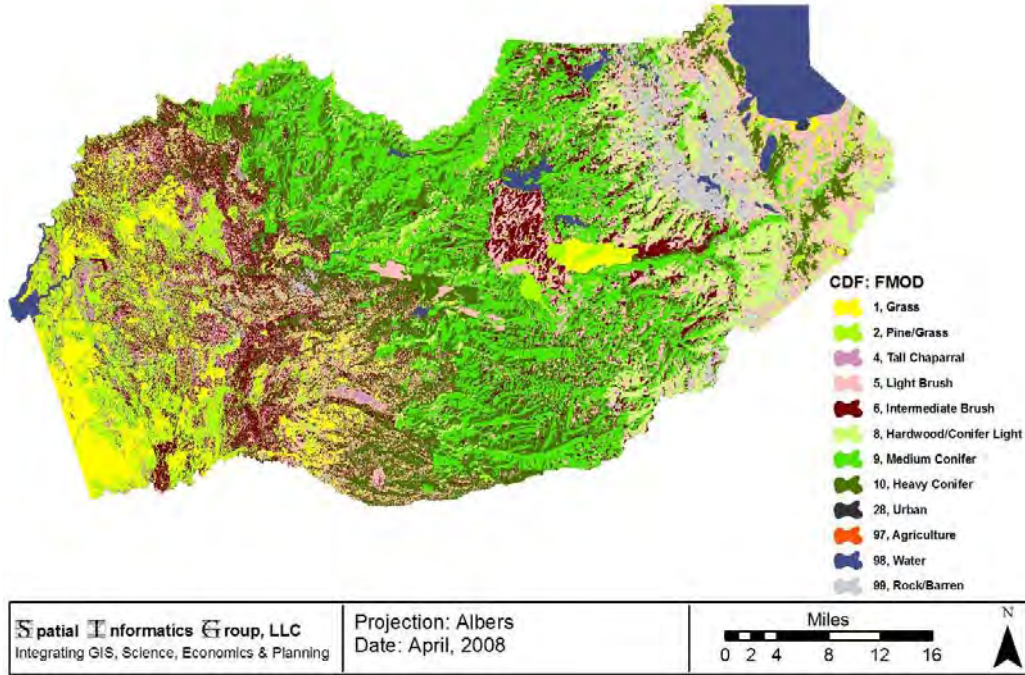
While the Go-No Go analysis confirmed that the county’s biomass resources are dominated by forest resources (primarily coniferous and hardwood forests), it is important to consider that not all CWHR classes have the same volumes of biomass. In order to predict the relative volumes of biomass for different parts of the county, TSS and SIG used a fuel model as a surrogate of the amount of potential biomass from a given pixel on the landscape. Since these models are designed to depict natural fuel conditions,<sup>26</sup> they are a good representation of total biomass available. This analysis focused on surface fuel loads (in the form of 1, 10, 100, and 1000 hour fuels) because there is a strong relationship between overstory forest biomass (for example, standing volume) and understory fuel characteristics (for example, surface area to volume ratio, fuel load, size, shape, compactness, horizontal and vertical continuity, moisture of extinction, etc.). Fuel model biomass calculations relied upon a vetted fuel model layer.<sup>27</sup> Figure 6 gives

<sup>26</sup>Forest Encyclopedia Network: <http://www.forestencyclopedia.net/p/p458>

<sup>27</sup>CALFIRE Fire and Resource Assessment Program: <http://frap.cdf.ca.gov/data/frapgisdata/download.asp?rec=fmod>

the Fuel Model (FMOD) layer used in this analysis and Figure 7 shows the distribution of potential biomass throughout the county.

**Figure 6. Fuel Model Layer Used for El Dorado County Potential Biomass Calculations**



**Figure 7. El Dorado County Potential Biomass in Tons/Acre**

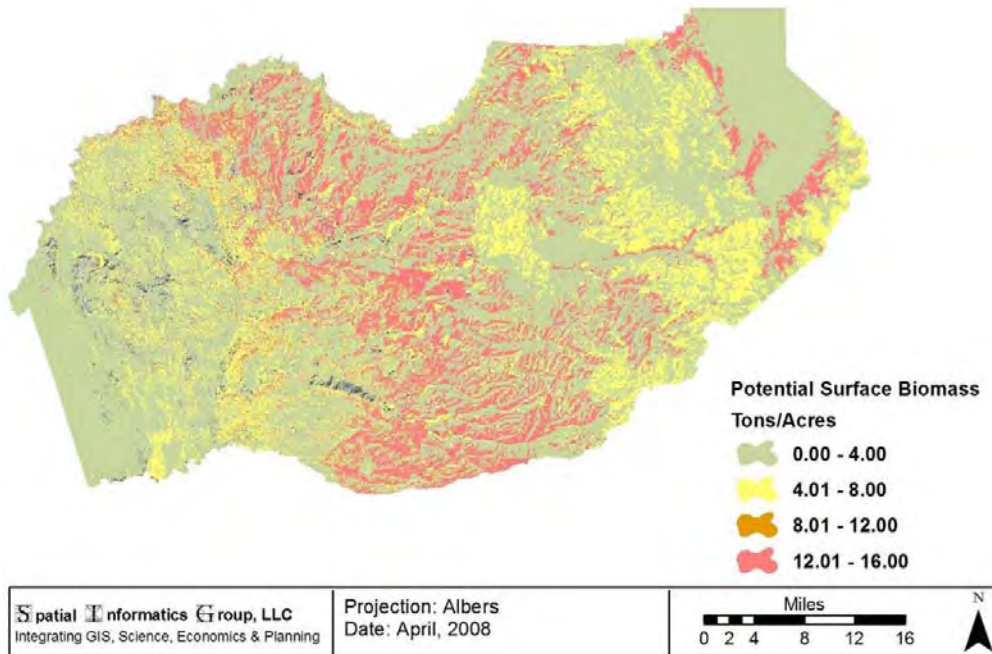


Table 7 highlights the potential biomass by CWHR type. Using the fuel models to calculate potential surface biomass also allows for estimating a distance to existing biomass facilities and a proposed site within El Dorado County. This distance-traveled analysis is described in the Demand for Wood Fuel section of this assessment.

**Table 7. Potential Biomass by CWHR Class and Ownership within El Dorado County**

CWHR CLASS	POTENTIAL BIOMASS (GT)			TOTAL ACRES		
	FEDERAL	STATE	PRIVATE	FEDERAL	STATE	PRIVATE
Agriculture	1,343		27,442	320		7,660
Alpine-Dwarf Shrub	1,148		8	311		2
Annual Grassland	5,161	491	143,691	2,335	222	65,738
Aspen	919	4	119	150	1	22
Blue Oak Woodland	5,940	4,778	148,497	1,033	943	32,934
Blue Oak-Foothill Pine	513	563	14,975	77	99	2,479
Chamise-Redshank Chaparral	2,916	850	19,070	289	59	1,949
Douglas-Fir	76,956	896	118,757	11,688	147	15,492
Eucalyptus			110			22
Jeffrey Pine	35,786	5,633	16,332	7,138	1,115	4,440
Lodgepole Pine	64,589	1,672	7,844	14,780	241	1,920
Mixed Chaparral	57,899	2,623	179,681	6,921	373	24,766
Montane Chaparral	80,164	894	51,315	17,953	222	10,016
Montane Hardwood	49,952	3,400	567,380	7,608	547	96,841
Montane Hardwood-Conifer	29,118	979	166,560	3,993	174	25,522
Ponderosa Pine	164,527	1,333	240,540	20,490	193	29,744
Red Fir	257,139	256	30,926	61,900	51	6,975
Sagebrush	401		1,298	139		397
Sierran Mixed Conifer	893,812	24,773	517,201	137,133	3,384	82,233
Subalpine Conifer	7,911		3	2,381		1
Valley Oak Woodland	287		10,781	58		2,386
Wet Meadow	15,468	0	9,589	3,755	0	2,607
White Fir	66,941	266	20,382	14,808	28	4,747
<b>TOTAL</b>	<b>1,818,890</b>	<b>49,411</b>	<b>2,292,501</b>	<b>315,260</b>	<b>7,797</b>	<b>418,894</b>

#### *Fuels Reduction Residuals*

Forest managers responsible for land management activities on public and private forests are actively seeking alternatives to current pile and burn practices associated with the disposal of small stems removed as a by-product of forest fuels reduction activities. Foresters interviewed for this analysis indicated that approximately 500-4,500 acres of forest are scheduled for treatment annually on private lands (including those acres treated through federal community assistance grants). The El Dorado Fire Safe Council continues to secure funding for active forest fuels reduction activities in such areas as Grizzly Flats, Sly Park and Cameron Park. The El Dorado Fire Safe Council, partnering with the El Dorado County Resource Conservation District, is currently planning to hire a contractor to treat brush and small trees along the western edge of the Grizzly Flat Community to continue the shaded fuel break constructed by the U.S.

Forest Service (Last Chance Fuels Reduction). Federal lands may reach similar targets but it is conservatively estimated that they will treat between 1,200 and 3,500 acres per year. The Quintette Fuels Reduction Project alone<sup>28</sup> will contribute 3,494 acres over a three-year period. This fuels treatment will use commercial thinning as the initial treatment and follow up with tractor piling on the majority of the acres. The Quintette Fuels Reduction Plan also includes an additional 930 acres with tractor piling (137 acres) or mastication of pre-commercial thinning in plantations (793 acres). The BLM expects to contribute an additional 100-200 acres per year for fuels treatment. From both TSS’s experience in the region and interviews with forest managers, it can be assumed that an average of 13 BDT per acre are potentially available as woody biomass fuel from fuels reduction activities within El Dorado County.

*Forest Products Manufacturing Residuals*

Currently there is only one commercial-scale forest products manufacturing facility operating in El Dorado County, the Sierra Pacific Industries (SPI) sawmill at Camino. Sawmill facilities like the Camino operation generate significant volumes of residuals in the form of bark, chips, shavings and sawdust. As noted earlier in this report, the value-added markets for residuals such as bark, chips and shavings are significant and preclude their availability as biomass fuel. Only sawdust is considered potentially available as biomass fuel. Interviews with SPI personnel<sup>29</sup> indicate that between 15,000 and 20,000 BDT per year of sawdust residuals could be available as biomass fuel from the Camino facility.

Log yard waste from sawmill operations (processed and unprocessed) could be available as biomass fuel at a relatively economical rate. However, this material typically contains a high percentage (5 to 10% by weight) of non-combustibles (dirt and rock) and is not considered a premium biomass fuel. Most sawmill/veneer plants do not have log yard waste processing equipment (water bath separation and screens) on site. For the purposes of this biomass availability review, log yard waste was not considered a viable fuel source.

Table 8 provides a conservative estimate of the forest-sourced biomass material potentially available within the county. Summarized in Table 9 are conservative estimates of biomass material generated within the county and potentially available as woody biomass fuel.

**Table 8. Forest-Sourced Biomass Material**

<b>TIMBER HARVEST RESIDUALS (BDT)</b>	<b>FUELS REDUCTION RESIDUALS (BDT)</b>	<b>FOREST PRODUCTS MANUFACTURING RESIDUALS (BDT)</b>	<b>TOTAL (BDT)</b>
86,830	60,000	20,000	166,830

<sup>28</sup>The Quintette Fuels Reduction Project encompasses National Forest System land bordering Rock Creek on the west, south to the community of Swansboro, bordering Slab Creek and Blodgett Experimental Forest to the east. As of fall 2007, equipment operators began grinding up shrubs and small trees in plantations along the Bald Mountain East Road (12N72).

<sup>29</sup>Personal communication, Bob Mertz, SPI Area Manager, Lincoln/Camino.

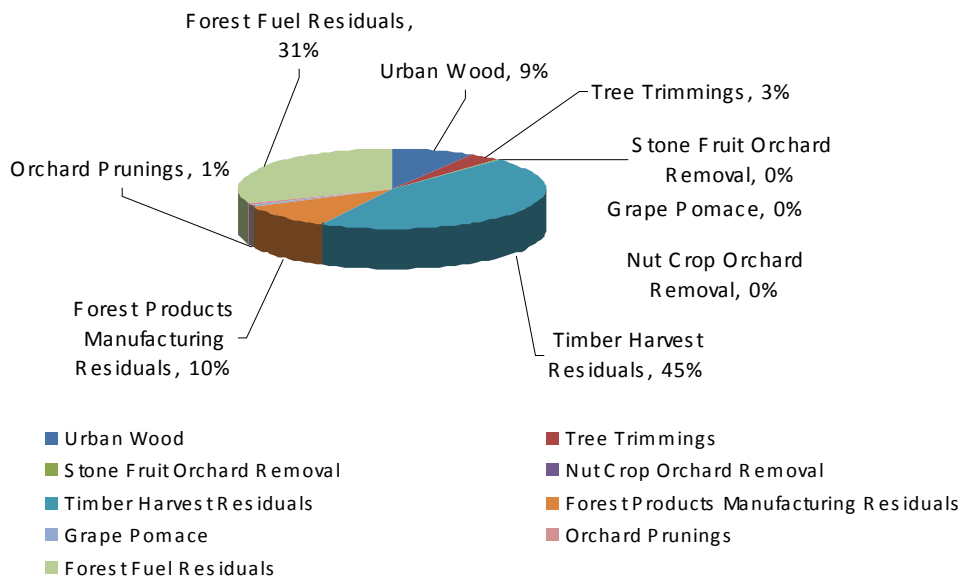


**Table 9. Biomass Material Generated Within El Dorado County**

<b>WOODY BIOMASS MATERIAL</b>	<b>WEIGHT (BDT)</b>
Urban Wood	17,300
Tree Trimmings	5,787
Stone Fruit Orchard Removals	950
Nut Crop Orchard Removals	110
Timber Harvest Residuals	86,830
Forest Products Manufacturing Residuals	20,000
Grape Pomace	600
Orchard Prunings	873
Fuels Reduction Residuals	60,000
<b>TOTAL</b>	<b>192,450</b>

Figure 8 provides a summary of biomass material generated within the county. As previously mentioned, the vast majority of the biomass resources are from the county’s forested lands. The land cover type with the highest number of accessible acres is the coniferous forest on public lands with 280,226 acres or 33% of the total operable area. Hence, the county’s biomass resources depend on the ability of the federal ownerships (primarily USFS and BLM) to perform treatments in the form of fuels reduction projects or to make available timber harvest residuals.

**Figure 8. Summary of Fuel Sources for El Dorado County**



## Demand for Wood Fuel

A survey of the regional enterprises that are currently marketing woody biomass fuel found that a number of biomass power generation facilities are currently accessing wood fuel from El Dorado County. Table 10 provides a list of biomass power generation facilities currently procuring woody biomass fuel generated within the county. This table also includes an estimate of the volume of fuel originating in the county and currently being purchased by existing power plants. A distance analysis will be used to determine which regions of the county are likely to have major competitive advantages from siting a biomass power generation facility in the county.

There are six power plants that are currently competing for biomass fuel generated within El Dorado County. Annual procurement estimates for these six power plants are estimated at 92,250 BDT per year sourced from El Dorado County.

Locations of the power plants listed in Table 10 and discussed in the previous paragraph are highlighted in Figure 9 below. Obviously the haul distance to locations like Tracy will be reflected in the pricing of biomass fuel delivered to these facilities. A biomass power generation project located in El Dorado County will have significant transportation cost advantages over the facilities located outside the county.

**Table 10. Biomass Power Plants Located in Immediate Vicinity of El Dorado County**

FACILITY	LOCATION	TYPE	MW	FUEL (BDT)	URBAN (BDT)	AG (BDT)	OTHER (BDT)
Covanta Chinese Station	Jamestown	BFB <sup>30</sup>	22	160,000	94,000 (3,500)*	50,000	16,000 (2,800)*
Sierra Pacific Industries	Sonora	Stoker	8	65,000	33,000 (1,750)*	12,000	20,000 (4,200)*
Woodland Biomass	Woodland	CFB <sup>31</sup>	25	180,000	130,000 (3,000)*	45,000	5,000 (1,750)*
Rio Bravo Rocklin	Rocklin	CFB	25	180,000	175,000 (43,000)*	0	5,000 (1,750)*
Sierra Pacific Industries	Lincoln	Stoker	18	145,000	40,000** (12,000)*	5,000	100,000 (7,000)*
Tracy Biomass	Tracy	Stoker	21	155,000	85,000 (11,500)*	70,000	0
<b>TOTAL</b>			<b>119</b>	<b>885,000</b>	<b>542,000</b>	<b>179,000</b>	<b>146,000</b>

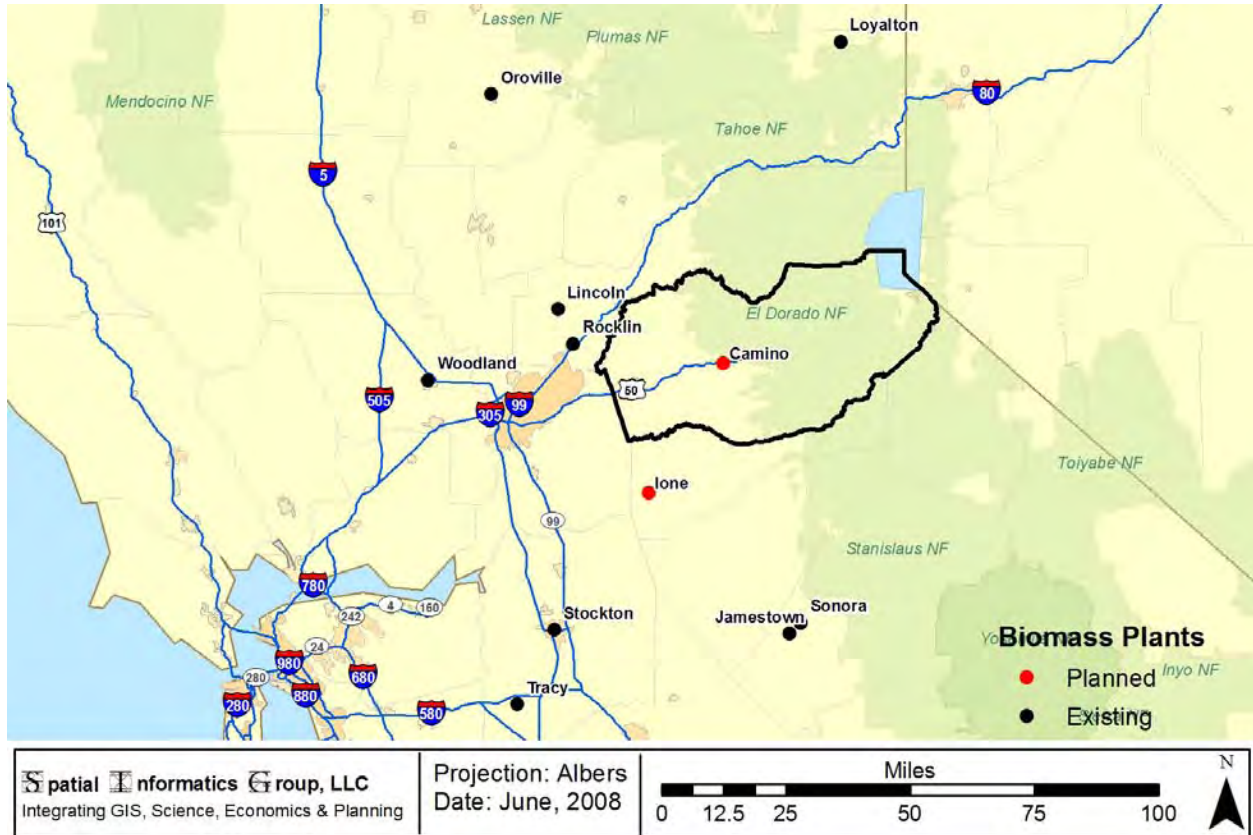
\*Estimated volumes originating from El Dorado County.

\*\*Historically, this SPI Lincoln site has procured urban wood waste as fuel; however, in 2007 this facility's operating permit was modified to exclude urban wood waste as an acceptable fuel source.

<sup>30</sup>BFB: bubbling fluidized bed.

<sup>31</sup>CFB: circulating fluidized bed.

**Figure 9. Biomass Power Plants Accessing Fuel from El Dorado County**



## BIOMASS POWER PLANT SITING IN EL DORADO COUNTY

The siting of a power plant which utilizes woody biomass is severely constrained in El Dorado County due to the local air district's current non-attainment status for ozone air emissions. This non-attainment status is imposed by both the U.S. Environmental Protection Agency and the California Air Resources Board, as El Dorado County exceeds both the state and federal thresholds for ozone. One of the principal air emissions precursors to ozone that is routinely emitted by biomass power plants are oxides of nitrogen (NO<sub>x</sub>).

As part of the County's requirements to come into compliance with current ozone thresholds, the El Dorado County Air Quality Management District (EDCAQMD) has established various thresholds for NO<sub>x</sub> emissions from stationary sources (such as a new biomass power plant) proposed for the district.

Of particular concern for the permitting of a new biomass power plant would be the offset requirement for NO<sub>x</sub> (as listed in Table 11). The threshold for NO<sub>x</sub> emissions whereby a proposed power plant would need to acquire NO<sub>x</sub> emission offsets is 2.5 tons of NO<sub>x</sub> emissions per quarter, with a not-to-exceed threshold of 10 tons per year (TPY). Thus, if a new biomass power plant were to be sited in the EDCAQMD, it would need to offset NO<sub>x</sub> emissions by

acquiring NOx emission credits generated within the district. Calculations based on emissions from existing biomass power plants and the U.S. EPA’s AP-42 emissions factors guidance document<sup>32</sup> (specifically Chapter 1.6 – Wood Combustion) indicate that a standard biomass power plant in excess of 1 MW could reach the NOx offset requirement threshold. Therefore, any biomass power generation facility rated at 1 MW or larger would likely need to acquire NOx emission credits. However, there are currently no NOx emission credits available within the EDCAQMD nor are there any indications that new NOx emission credits will be generated in the foreseeable future.

**Table 11. Offset Requirements and Emission Limits by Major Stationary Source as Established by the El Dorado County Air Quality Management District (Expressed in Tons Per Year)**

EMISSION SPECIES	MAJOR STATIONARY SOURCE	BACT*	OFFSET REQUIREMENT
NOx	25	1.37	10
ROC (VOC)	25	1.37	10
CO	100	100	15
PM10	100	14.6	15
SOx	100	10	25

\*BACT = Best Available Control Technology needed at these levels.

Previous contact has been made with the Air Pollution Control Officer (APCO), Marcella Taggart, of the EDCAQMD. The APCO confirmed the relatively low thresholds for projects needing emission offset (as listed in the above table). The APCO also confirmed that there are absolutely no NOx Emission Reduction Credits (ERC) available for projects located in the county, which essentially prohibits a new biomass facility (exceeding 1 MW in size) anywhere in the county. The exception to this could be the siting of a new biomass power plant at the Sierra Pacific Industries sawmill site in Camino, which is currently the only significant major stationary source of air emissions in the county. The Camino facility currently has a 150 million BTU<sup>33</sup> per hour wood-fired boiler that has no NOx controls. If this boiler was replaced with a new boiler and NOx emissions controls (such as non-selective catalytic reduction), the Camino facility would generate its own NOx emission offset credits that could be used for power plant permitting. This creation of NOx offset credits at the Camino site could allow a 12 to 14 MW biomass-fired electrical generating power plant at the site.

It may also be possible to further augment the NOx emissions credits by considering the creation of credits diverting woody biomass that may be open-burned in the forest after timber harvest or hazardous fuels reduction activities into the controlled combustion system of a biomass power plant. A program to evaluate this potential is currently underway in the nearby Placer County Air Pollution Control District.<sup>34</sup>

<sup>32</sup>U.S. EPA Technology Transfer Network Clearinghouse for Inventories & Emissions Factors: <http://www.epa.gov/tn/chief/ap42/index.html>

<sup>33</sup>British thermal unit is a unit of measure representing the quantity of heat required to raise the temperature of one pound of water from 60° to 61°F at a constant pressure of one atmosphere.

<sup>34</sup>Tom Christofk, Air Pollution Control Officer, Placer County Air Pollution Control District.

## **FUEL AVAILABILITY**

In addition to biomass fuel, wood waste generated within the county has limited alternative markets. Due to inconsistent biomass fuel prices and increasing processing and transportation costs (especially as diesel fuel prices increase), many wood recyclers in other parts of the state have diversified into alternative higher-valued markets. Such markets include mulch and compost as well as particleboard and composite panel raw material furnish. Currently, only limited volumes of wood waste generated within El Dorado County are being sold into these markets. Another alternative use for biomass within the county is as Alternative Daily Cover (ADC) at landfills. TSS estimates that approximately 37,000 BDT of wood waste and green waste are used in this capacity.

Based on this macro level fuel availability and usage analysis, TSS estimates that there are approximately 358,394 BDT of biomass fuel potentially available within the county. The total volume should not be considered immediately and practically available.

The most economically available and better quality fuels are urban wood waste, forest products manufacturing residuals and orchard removals. Other fuels such as grape pomace, while more readily available, tend to be more difficult to handle. Forest-sourced fuels are an excellent quality fuel but are generally more costly.

Orchard prunings have limited availability at this time due to a lack of processing equipment and uncertain combustion characteristics in large quantities. In addition, the areas with cultivated acres of orchards within the county tend to experience rain during the pruning season, which makes collection and processing problematic. Grape pomace has special handling considerations and combustion characteristics that can make it difficult to handle in large quantities, and it is likely that a potential El Dorado County biomass facility would only be able to utilize relatively small quantities. If timber harvest residuals and forest harvesting fuels are removed or greatly reduced from the potential fuel mix, the fuel supply situation becomes very uncertain and potentially problematic.

## **FUEL PRICING**

There appears to be a cyclical downturn in wood fiber supply throughout the industry. Along the entire west coast region there is a wood fiber supply shortage. Driven by the slowdown in new housing construction and lumber production and a robust pulp and paper market in Asia, the situation shows little sign of subsiding in the near future. The impact on wood fiber pricing appears to be reflected more in the higher-value fiber markets such as furnish for medium density fiberboard (MDF) and composite lumber products. Prices as high as \$60 per BDT for some spot purchases (priced on board truck) at urban wood processing facilities have been reported for Northern California.

Important considerations for the proposed Camino site<sup>35</sup> and fuel pricing are the fuel transportation logistics. There are numerous backhaul opportunities along Highway 80 and 89 (with connections to Interstate 5 and Highway 99) which is why biomass power plants in Sacramento and Tracy are able to access fuel out of the foothills. Because there are few opportunities available for backhauls to El Dorado County, a proposed facility in El Dorado County would have a distinct transportation disadvantage when attempting to access urban wood from major metropolitan centers such as Stockton and Sacramento. In consideration of these issues as well as the currently existing competition for biomass fuel, TSS has developed the following volume and pricing estimates for fuel considered practically available.

**Table 12. Woody Biomass Fuel Practically Available within El Dorado County on an Annual Basis**

<b>FUEL TYPE</b>	<b>ESTIMATED BDT</b>	<b>ESTIMATED PRICE RANGE (\$ PER BDT)</b>
Urban Wood/Tree Trimmings	5,787	23.00-25.50
Orchard Removals	1,060	28.00-34.00
Orchard Prunings	1,747	28.00-30.00
Grape Pomace	572	15.00-20.00
Timber Harvest Residuals	86,830	47.00-50.00
Forest Fuels Residuals	15,943	50.00-52.00
Forest Products Manufacturing Residuals	15,000	14.00-20.00
<b>TOTAL</b>	<b>126,939</b>	

## FUEL TRANSPORTATION ANALYSIS

Using a Geographic Information System (GIS), TSS and SIG were able to evaluate the distance that potential biomass fuel needs to be transported in order to reach one of the six existing biomass power locations now sourcing biomass fuel from El Dorado County. Using a distance less traveled analysis and zonal statistics, it is possible to determine which land cover types contribute the most potential biomass and can benefit from the existence of the Camino facility through a savings of mileage traveled (expressed here as net mileage savings). Figures 10 and 11 show the intermediate steps of this analysis with all nine power plants around the county.<sup>36</sup> Table 13 demonstrates the findings of this analysis by cover type and total biomass for that type. Similar to earlier findings, Sierran Mixed Conifer cover type on federal lands has the most potentially available biomass and the Camino site would save, on average, 22 miles of hauling distances. Figure 12 shows the zones of the power plants under analysis and average net mileage savings for biomass to travel to Camino compared to existing facilities.

<sup>35</sup>See Biomass Power Plant Siting section of this report.

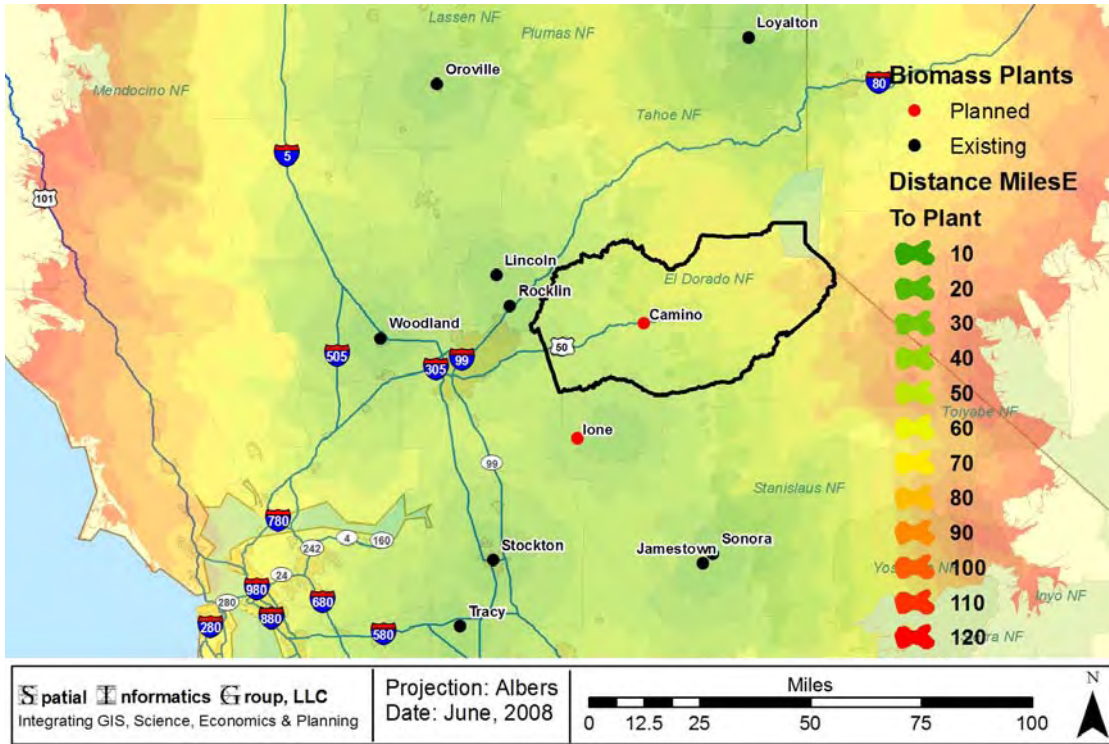
<sup>36</sup>Note: Not all nine plants are drawing woody biomass fuel from El Dorado County due to high transportation costs.

**Table 13. CWHR Classes, Ownerships, Potential Biomass and Net Mileage Savings**

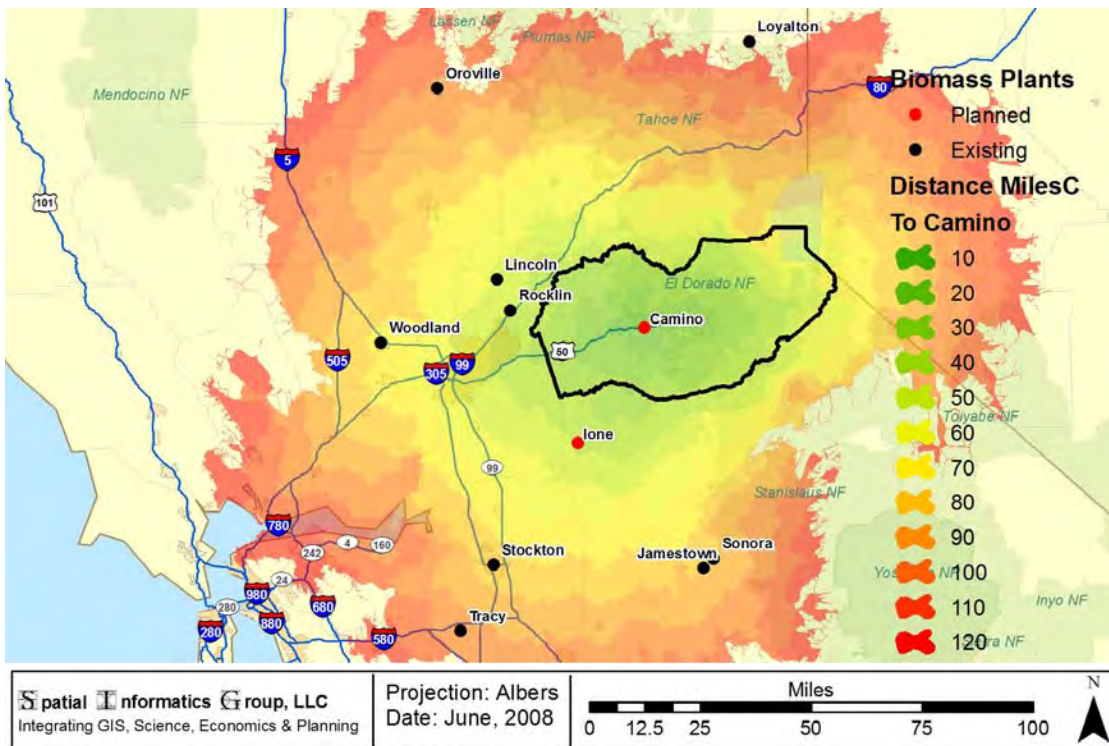
CWHR CLASS	FEDERAL			STATE			PRIVATE		
	POTENTIAL BIOMASS (GT)	TOTAL ACRES	AVERAGE MILEAGE SAVINGS	POTENTIAL BIOMASS (GT)	TOTAL ACRES	AVERAGE MILEAGE SAVINGS	POTENTIAL BIOMASS (GT)	TOTAL ACRES	AVERAGE MILEAGE SAVINGS
Agriculture	1,343	320	17				27,442	7,660	12
Alpine-Dwarf Shrub	1,148	311	21				8	2	30
Annual Grassland	5,161	2,335	13	491	222	13	143,691	65,738	13
Aspen	919	150	22	4	1	10	119	22	24
Blue Oak Woodland	5,940	1,033	(3)	4,778	943	1	148,497	32,934	6
Blue Oak-Foothill Pine	513	77	2	563	99	(6)	14,975	2,479	7
Chamise-Redshank Chaparral	2,916	289	1	850	59	(6)	19,070	1,949	3
Douglas-Fir	76,956	11,688	14	896	147	18	118,757	15,492	14
Eucalyptus							110	22	12
Jeffrey Pine	35,786	7,138	18	5,633	1,115	2	16,332	4,440	16
Lodgepole Pine	64,589	14,780	14	1,672	241	(3)	7,844	1,920	15
Mixed Chaparral	57,899	6,921	12	2,623	373	16	179,681	24,766	13
Montane Chaparral	80,164	17,953	16	894	222	2	51,315	10,016	15
Montane Hardwood	49,952	7,608	11	3,400	547	10	567,380	96,841	12
Montane Hardwood-Conifer	29,118	3,993	12	979	174	12	166,560	25,522	13
Ponderosa Pine	164,527	20,490	17	1,333	193	15	240,540	29,744	15
Red Fir	257,139	61,900	17	256	51	14	30,926	6,975	17
Sagebrush	401	139	25				1,298	397	22
Sierran Mixed Conifer	893,812	137,133	16	24,773	3,384	12	517,201	82,233	16
Subalpine Conifer	7,911	2,381	20				3	1	30
Valley Oak Woodland	287	58	(3)				10,781	2,386	8
Wet Meadow	15,468	3,755	18	0	0	20	9,589	2,607	19
White Fir	66,941	14,808	19	266	28	6	20,382	4,747	19
<b>TOTAL</b>	<b>1,818,890</b>	<b>315,260</b>	<b>14</b>	<b>49,411</b>	<b>7,797</b>	<b>9</b>	<b>2,292,501</b>	<b>418,894</b>	<b>14</b>



**Figure 10. Distance Traveled from Biomass Source to Power Plant Locations**

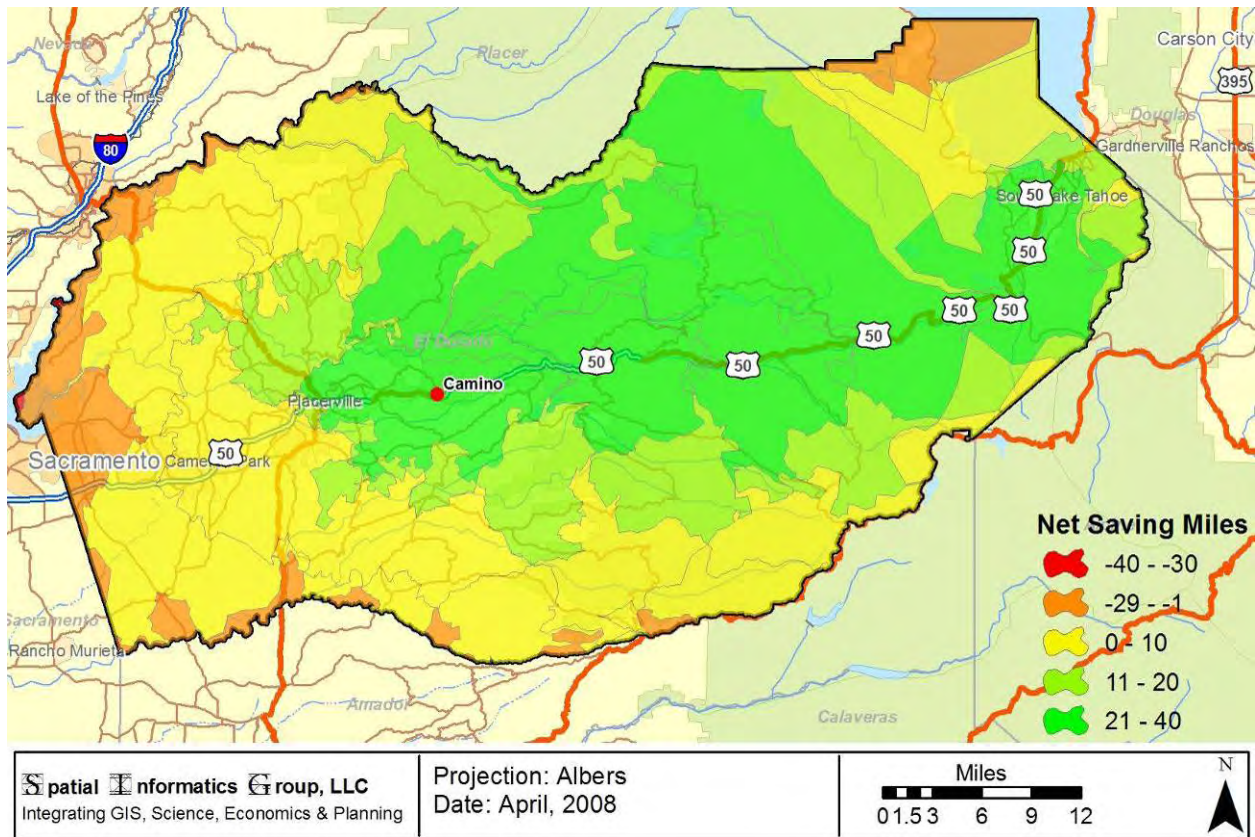


**Figure 11. Distance Traveled from Biomass Source to Camino Location**





**Figure 12. Average Net Savings from Positioning a Biomass Facility in Camino (in Miles)**



## BIOMASS POWER SALES MARKET REVIEW

A key component of a biomass power generation feasibility review includes a study of power sales marketing opportunities. This includes identifying potential markets for the long-term sale of base-load renewable power from a biomass power project located within El Dorado County. All of El Dorado County is located within Pacific Gas and Electric Company (PG&E) service territory. However, because the county has a well-developed transmission/distribution system, a new biomass power plant located in the county would be able to market base-load power generation to a variety of potential utility-based customers. Outlined below is a discussion of potential power marketing opportunities.

### *Pacific Gas and Electric*

As an Investor Owned Utility (IOU), PG&E is regulated under the California Public Utilities Commission and is required to meet certain legislated mandates, including the California Renewable Portfolio Standard (RPS). California's RPS was enacted in September of 2002 with the passage of California Senate Bill 1078. The RPS currently requires retail sellers of electricity to purchase not less than 20% of electricity sold to California retail customers from renewable

energy resources by 2010, and the state is studying the feasibility of increasing the RPS mandate to 33% renewables by 2020. Qualifying renewable resources as defined by the California RPS include:

- Solar (thermal and photovoltaic)
- Wind
- Geothermal
- Fuel cells utilizing renewable fuels
- Small hydropower (less than 30 MW)
- Digester gas
- Landfill gas
- Ocean wave
- Biomass

Under the RPS, retail sellers are required to increase their procurement of eligible renewable energy by at least 1% per year so that 20% of their retail sales are procured from renewable resources by 2010 and possibly 33% by 2020.

In addition to the RPS, Governor Schwarzenegger signed an Executive Order on April 25, 2006, in support of a Bioenergy Action Plan that sets targets for biomass power generation to make up 20% of renewable power generation in 2010 and 2020. Currently, biomass power capacity in California amounts to approximately 550 MW generated at 26 commercial-scale biomass power facilities. The Governor's Executive Order supports an additional 350 MW of biomass power by 2010 and another 1,100 MW of biomass power by 2020 (see Appendix C for the executive summary of the Governor's Bioenergy Executive Order). The California Energy Commission is currently analyzing policy options to implement this Executive Order.

Investor owned utilities such as PG&E typically issue a request for proposals (RFP) or a request for offers (RFO) announcing their interest to entertain proposals or offers from qualified independent power producers to sell renewable energy generation to PG&E to help the utility meet the state-mandated RPS. PG&E issued a renewable energy RFO on March 7, 2008 with bids due by May 12, 2008 (see Appendix D for the PG&E RFO Solicitation Protocol). It is expected that PG&E and the other California IOUs will continue to issue RFP or RFO annually requesting proposals for additional renewable power to meet the RPS mandate. There are four California IOUs, as follows:

- Pacific Gas and Electric Company
- Pacific Power and Light
- San Diego Gas and Electric
- Southern California Edison

#### *Sacramento Municipal Utility District*

While not held to the same RPS requirements as the IOUs, retail electricity sellers in California such as Municipal Electric Utility Districts have established internal targets for renewable energy

development and purchases. One of the largest Municipal Electric Utilities in the State, Sacramento Municipal Utility District (SMUD), has set targets for renewable energy that are similar to the California RPS: 23% renewable energy by the year 2011. SMUD maintains two renewable energy programs: the RPS and Greenergy<sup>®</sup>, a voluntary green pricing program. The utility's 2011 target is divided into 20% RPS and 3% Greenergy. Like the California IOUs, SMUD has issued several RFO for renewable energy proposals over the past five years. The last SMUD RFO was issued January 11, 2008 with bids due by April 7, 2008. Attached as Appendix D is the draft power purchase agreement that SMUD expects to use as a contract template to formalize the long-term purchase of renewable power. Like PG&E, SMUD is expected to issue RFO annually to secure renewable power generation to meet its targets. SMUD also accepts and encourages submittals of unsolicited proposals; bidders are welcome to submit their offers any time. Discussions with SMUD staff<sup>37</sup> indicate that SMUD may issue additional renewable energy RFO in the fourth quarter of 2008.

#### *Northern California Power Agency*

In addition to RFO issued by the IOUs and larger Municipal Electric Utilities like SMUD, other entities (such as the Northern California Power Agency) are expected to issue renewable energy RFO or RFP in the near future.

The Northern California Power Agency (NCPA) is a nonprofit California joint powers agency. Formed in 1968, NCPA provides power generation purchase, aggregation, transmission, and scheduling of electric power for 15 members and 3 associate members. Membership is open to municipalities, rural electric cooperatives, irrigation districts and other publicly-owned entities. Many of NCPA members are seeking to meet California's RPS requirements through NCPA's RFO for renewable energy. The most recent renewable energy generation RFO was issued by NCPA on October 22, 2007, and offers were due by November 5, 2007. NCPA staff<sup>38</sup> interviewed noted that the agency may not be issuing a renewable energy RFO in 2008. Unsolicited offers, however, outside of the RFO process will be considered.

The California markets for renewable electrical power are significant and will continue to evolve consistent with implementation of the State's RPS and the Governor's Bioenergy Executive Order. Multiple Northern California entities are now (or will soon be) issuing RFP and RFO seeking to procure renewable electrical power generated long term. These entities include:

- Pacific Gas and Electric Company
- Sacramento Municipal Utility District
- Northern California Power Agency

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<sup>37</sup>Marco Lemes, Engineer, Advanced, Renewable, & Distributed Generation Technologies Program, SMUD.

<sup>38</sup>Dana Griffith, Power Coordinator and Planning Engineer, Northern California Power Agency.

## **FUTURE WOOD FUEL SUPPLY SOURCES AND RISKS**

Much speculation has revolved around the upcoming ban on agricultural burning as a result of California Senate Bill 705 (SB 705). This bill amends the California Health and Safety Code (CH&SC) and requires the San Joaquin Valley Unified Air Pollution Control District to ban the open burning of waste produced by commercial agricultural operations. Under the terms of the ban, all orchard removal materials are to be banned from open burning commencing June 1, 2007 and other materials, such as vineyard removals and prunings, from surface-harvested crops by June 1, 2010. It is anticipated that such a burn ban would provide fuel to biomass power plants. However, based on this assessment, TSS believes that only a slight increase in potential orchard removal fuel volume will result. In addition, it is too early to assume that SB 705 will automatically lead to increased volume of biomass fuel and decreased prices for such fuel. It should be noted that the CH&SC allows the Air District to postpone burn prohibition commencement dates under certain conditions. One such condition is the determination by the District that there is no economically feasible alternative for eliminating the waste. A case in point is the recent amendment proposed by the District to postpone the June 1, 2007 commencement date of the burn prohibition for citrus orchard removals until June 1, 2010. After discussions with industry experts, air quality engineers and others familiar with this ruling, TSS believes that any attempt by the biomass power plants to leverage use of SB 705 to increase the cost of orchard removals to the growers (resulting in cheaper biomass fuel) will be met with similar postponement actions.

TSS has estimated that approximately 37,000 BDT of wood waste and green waste are used as ADC at landfills. This is primarily because the State of California allows the counties to count 100% of ADC as diversion credit for meeting State-mandated recycling levels. Therefore, every ton of wood waste which is used for ADC is considered recycled. Considering the quality control requirements necessary to produce biomass fuel versus the production of ADC, it is not surprising that significant volumes of wood waste end up as ADC. There have been various legislative efforts in the past to ban the use of wood waste and green waste for ADC. However, none of the state legislative initiatives have proved successful. TSS believes that within the next three years, there is a strong possibility that legislation reducing the use of wood waste and green waste for ADC will be enacted in California. Such legislation would lead to increased volumes of wood waste and green waste entering the market. TSS estimates that only about 30% of this ADC volume would be suitable for biomass fuel with the bulk going into the compost and mulch markets. However, legislation as noted could substantially increase the amount of biomass fuel within the State of California.

Although this study has focused on the more traditional biomass fuels, there may be some opportunities to utilize other fuels with fewer market outlets and therefore lower costs. Such fuels as tire-derived fuel (TDF), roofing tear-off, and non-recyclable paper may offer some attractive below market-priced fuels. However, these fuel sources may not be consistent with renewable fuel standards and therefore could potentially impact power sales agreement negotiations.

There are numerous risks associated with biomass fuel availability for this proposed biomass facility. In addition to the increased woody biomass fuel demand, there is also a lack of processing infrastructure in the forest fuels treatment sector. Since the closure of the Wheelabrator Martell biomass power plant in 2002, there has been no forest fuels production along the Highway 88 corridor. In order to address this lack of forest fuels processing infrastructure, considerable effort will be required to initiate contact with existing timber harvest contractors to suggest re-investment in forest residual processing equipment. Timber harvest contractors will require multiple year fuel sales agreements before committing significant capital investment into new biomass fuel processing equipment.

## **OBSERVATIONS/RECOMMENDATIONS**

With the National Fire Plan policy implementation, fuels treatment goals set and public stakeholders input, the El Dorado National Forest and the Bureau of Land Management (Folsom District) have been relying on the treat and remove hazardous fuels treatment method. Both of these agencies' land managers recognize the opportunities of using contracting tools such as stewardship contracts that can facilitate the treatment of thousands of acres over a maximum contractual term of 10 years. Stewardship contracts present a unique opportunity for fuel procurement to contract with a federal land management agency for long-term commitments that may yield significant volumes of woody biomass fuel. These contracts could also facilitate a procurement strategy whereby stewardship contracts are used as a hedge against times when fuel availability is constrained (e.g., reduced timber harvest levels). Certainly the SPI forestry staff at Camino<sup>39</sup> is in a good position to initiate discussions with federal, state and county forestry and fire staff regarding the establishment of agreements to access fuel (e.g., stewardship contracts) on a long-term basis.

Similarly, communities with a Community Wildfire Protection Plan (CWPP) may receive significant benefit in the future should funding be appropriated through HFRA for fuels reduction and fire prevention. Central to the concept behind the CWPP is use of multiple stakeholders in the process of community-based planning initiatives. Complementary to this effort, there exists a significant opportunity for utilization of the woody biomass generated by hazardous fuels reduction activities to be used as fuel for the generation of renewable power. Examples within El Dorado County include Cameron Park, Sly Park and Grizzly Flats. With CWPPs being initiated in other communities like Georgetown, the opportunities for utilizing woody biomass from hazardous fuels reduction activities will only increase throughout the County.

The political momentum for biomass power is certainly a consideration for El Dorado County as it considers this opportunity. While the air quality containment issues are not likely to disappear the opportunity to convince policy makers of the community safety implications of not treating hazardous fuels may far outweigh the emissions from a biomass power plant. The California markets for renewable electrical power are significant and will continue to evolve consistent with implementation of the State's RPS and the Governor's Bioenergy Executive Order. With this woody biomass fuel study, El Dorado County and the Fire Safe Council will certainly understand what volume of material may be available over time for use as biomass fuel. The volume of biomass fuel

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<sup>39</sup>Personal communication, Bob Mertz, SPI Area Manager, Lincoln/Camino.

is more than sufficient to support a proposed facility in Camino between 12 and 14 megawatts. However, a plant of this size will not address all of the areas of the county where hazardous fuels reduction activities are needed and the economics of biomass fuel (especially transportation) are restricting land management opportunities. The lessons learned from the Eight Mile Fire (which destroyed 14 homes) and the Cleveland Fire (which destroyed over 40 homes and claimed the lives of two aircraft pilots) are quickly forgotten when it comes to the economics of implementing hazardous fuels reduction activities. By demonstrating the amount of woody biomass fuel and surface fuel loadings throughout various habitats in the county, this study reminds those in decision-making positions of the high-risk conditions which need immediate attention.

As noted in this report, the potential availability of biomass fuel for use in the generation of renewable energy is significant. Between 128,630 and 358,394 BDT of woody biomass fuel are potentially available on an annual basis within El Dorado County. Interviews with El Dorado County residents, conducted as part of this review, indicated strong community support for establishment of economical, value-added markets in support of woody biomass utilization. Many of those interviewed expressed a concern that any such new or expanded markets should have the following attributes:

- Ensure environmental care – no negative impacts to the environment (air, water, forest resources, wildlife/fisheries).
- Provide societal benefits – generate products that are environmentally sustainable and provide multiple benefits to society.
- Employ local residents – provide family-wage jobs.

## APPENDIX A

### CALIFORNIA SENATE BILL NO. 705

#### Senate Bill No. 705

#### CHAPTER 481

An act to add Sections 41855.5 and 41855.6 to the Health and Safety Code, relating to air quality.

[Approved by Governor September 22, 2003. Filed with Secretary of State September 22, 2003.]

#### LEGISLATIVE COUNSEL'S DIGEST

SB 705, Florez. Air quality: agricultural burning: San Joaquin Valley Unified Air Pollution Control District. (1) Existing law prohibits any person from knowingly setting or permitting agricultural burning unless he or she has a valid permit designated by the State Air Resources Board to issue a permit in the area where the burning is to take place. Existing law requires the state board to designate public fire protection agencies or other equivalent agencies to issue permits, and to adopt rules and regulations to provide a procedure for the issuance of those permits.

This bill would prohibit the issuance of any permit to a person to burn certain categories of agricultural waste, as defined, within the jurisdiction of the San Joaquin Valley Unified Air Pollution Control District, commencing on the date specified for each category, except that the bill would authorize the district to postpone those dates under certain circumstances. The bill also would require the district to develop and adopt, by June 1, 2005, rules establishing the best management practices for certain other weeds and maintenance, as defined, and would require those rules to become operative by June 1, 2006. The bill would require the district to develop and adopt rules to regulate the burning of diseased crops. The bill would prescribe the circumstances under which a conditional crop burning permit would be authorized to be issued.

The additional duties of the bill for the district would impose a state-mandated local program.

(2) Existing law makes a violation of any rule, regulation, or order of the state board or a district a misdemeanor.

By expanding the scope of a crime, this bill would impose a state-mandated local program.

(3) This bill would make findings and declarations regarding the inapplicability of a general statute within the meaning of Section 16 of the California Constitution.

(4) The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state.

Statutory provisions establish procedures for making that reimbursement.

This bill would provide that no reimbursement is required by this act for specified reasons.

*The people of the State of California do enact as follows:*

SECTION 1. Section 41855.5 is added to the Health and Safety Code, to read:

41855.5. (a) Notwithstanding any other provision of law, no permit may be issued to a person to burn any of the following categories of agricultural waste within the jurisdiction of the San Joaquin Valley Unified Air Pollution Control District, commencing on the following dates:

(1) Commencing June 1, 2005, for field crops, prunings, and weed abatement.

(2) Commencing June 1, 2007, for orchard removals.

(3) Commencing June 1, 2010, for other materials, vineyard removals, and surface harvested prunings.

(b) The San Joaquin Valley Unified Air Pollution Control District, in consultation with the University of California Cooperative Extension, shall develop and adopt, not later than June 1, 2005, rules establishing best management practices for the control of other weeds and maintenance. The rules adopted pursuant to this subdivision shall be operative not later than June 1, 2006.

(c) For the purposes of this section, the following terms have the following meanings:

- (1) "Field crops" means any of the following crops:
- (A) Alfalfa.
  - (B) Asparagus.
  - (C) Barley stubble.
  - (D) Beans.
  - (E) Corn.
  - (F) Cotton.
  - (G) Flower straw.
  - (H) Hay.
  - (I) Lemon grass.
  - (J) Oat stubble.
  - (K) Other field crops, as determined by the state board.
  - (L) Pea vines.
  - (M) Peanuts.
  - (N) Rice stubble.
  - (O) Safflower.
  - (P) Sugar cane.
  - (Q) Vegetable crops.
  - (R) Wheat stubble.
- (2) "Orchard removals" includes, but is not limited to, any of the following:
- (A) Orchard removal matter.
  - (B) Stumps.
  - (C) Untreated sticks.
- (3) "Other materials" includes, but is not limited to, any of the following:
- (A) Brooder paper.
  - (B) Deceased goats.
  - (C) Diseased bee hives.
- (4) "Other weeds and maintenance" includes, but is not limited to, any of the following:
- (A) Ditch bank work.
  - (B) Canal bank work.
  - (C) Dodder weed.
  - (D) Star thistle.
  - (E) Tumbleweed.
  - (F) Noxious weeds.
  - (G) Pesticide sacks.
  - (H) Fertilizer sacks.
- (5) "Prunings" means prunings from any of the following:
- (A) Apple crops.
  - (B) Apricot crops.
  - (C) Avocado crops.
  - (D) Bushberry crops.
  - (E) Cherry crops.
  - (F) Christmas trees.
  - (G) Citrus crops.
  - (H) Date crops.
  - (I) Eucalyptus crops.
  - (J) Fig crops.
  - (K) Kiwi crops.
  - (L) Nectarine crops.



- (M) Nursery prunings.
  - (N) Olive crops.
  - (O) Other prunings, as determined by the state board.
  - (P) Pasture or corral trees.
  - (Q) Peach crops.
  - (R) Pear crops.
  - (S) Persimmon crops.
  - (T) Pistachio crops.
  - (U) Plum crops.
  - (V) Pluot crops.
  - (W) Pomegranate crops.
  - (X) Prune crops.
  - (Y) Quince crops.
  - (Z) Rose prunings.
  - (6) “Surface harvested prunings” includes, but is not limited to, any of the following:
    - (A) Almond prunings.
    - (B) Walnut prunings.
    - (C) Pecan prunings.
    - (D) Grape vines.
    - (E) Vineyard removal materials.
  - (7) “Vineyard materials” includes, but is not limited to, any of the following:
    - (A) Grape canes.
    - (B) Raisin trays.
  - (8) “Weed abatement” includes, but is not limited to, any of the following:
    - (A) Berms.
    - (B) Bermuda grass.
    - (C) Fence rows.
    - (D) Grass.
    - (E) Pasture.
    - (F) Ponding or levee banks.
  - (d) (1) The San Joaquin Valley Unified Air Pollution Control District shall develop and adopt, by January 1, 2005, rules to regulate the burning of diseased crops. The rules shall become operative no later than June 1, 2005. The rules shall provide for the issuance of a conditional crop burning permit if all of the following criteria are met:
    - (A) The fields to be burned are specifically described.
    - (B) The applicant has not been cited for a violation of burning rules or regulations in the past 3 years, unless the violation was of a de minimis nature, as determined by the district and the county agricultural commissioner.
    - (C) The county agricultural commissioner has determined all of the following:
      - (i) During the growing season for that crop, there is the presence of a disease that will cause a substantial, quantifiable reduction in yield or poses a threat to the health of adjacent vines, trees, or plants in the field proposed to be burned, during the current or next growing season.
      - (ii) There is no economically feasible alternative means of eliminating the disease other than burning.
    - (2) A conditional crop burning permit shall authorize the burning of only the identified diseased crop.
    - (3) The holder of a permit may not transfer, sell, or trade the permit to any other individual.
    - (4) A citation for a violation of burning rules or regulations may be appealed to the San Joaquin Air Pollution Control District Hearing Board.
- SEC. 2. Section 41855.6 is added to the Health and Safety Code, to read:

41855.6. The district may postpone the commencement dates set forth in subdivision (a) of Section 41855.5 for any category of agricultural waste or crop described if all of the following applies:

(a) The district determines that there is no economically feasible alternative means of eliminating the waste.

(b) The district determines that there is no long-term federal or state funding commitment for the continued operation of biomass facilities in the San Joaquin Valley or development of alternatives to burning.

(c) The district determines that the continued issuance of permits for that specific category or crop will not cause, or substantially contribute to, a violation of an applicable federal ambient air quality standard.

(d) The State Air Resources Board concurs with the district's determinations pursuant to this section.

SEC. 3. The Legislature finds and declares that, due to the unique circumstances applicable to agricultural waste and its impacts on air quality in the San Joaquin Valley, a statute of general applicability cannot be enacted within the meaning of subdivision (b) of Section 16 of Article IV of the California Constitution.

SEC. 4. No reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution for certain costs that may be incurred by a local agency or school district because in that regard this act creates a new crime or infraction, eliminates a crime or infraction, or changes the penalty for a crime or infraction, within the meaning of Section 17556 of the Government Code, or changes the definition of a crime within the meaning of Section 6 of Article XIII B of the California Constitution.

In addition, no reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution for certain other costs that may be incurred by a local agency or school district because a local agency or school district has the authority to levy service charges, fees, or assessments sufficient to pay for the program or level of service mandated by this act, within the meaning of Section 17556 of the Government Code.

## APPENDIX B

### GOVERNOR'S BIOENERGY EXECUTIVE ORDER

[Please click here to return to the previous page.](#)

#### Executive Order

EXECUTIVE DEPARTMENT

STATE OF CALIFORNIA



EXECUTIVE ORDER S-06-06  
by the  
Governor of the State of California

WHEREAS, abundant biomass resources from agriculture, forestry and urban wastes can be tapped to provide transportation fuels and electricity to satisfy California's fuel and energy needs; and

WHEREAS, ethanol is a renewable transportation biofuel that California consumes more than 900 million gallons a year which is approximately 25 percent of all the ethanol produced in the United States; and

WHEREAS, California produces less than five percent of the ethanol it consumes; and

WHEREAS, biomass fuels, including ethanol produced from cellulose and bio-diesel produced from a variety of sources, can reduce the state's reliance on petroleum fuels and work to lower fuel costs for consumers; and

WHEREAS, in the Hydrogen Highway plan, the state has invested \$6.5 million to support a network of more than 16 filling stations and a growing fleet of cars and buses that run on this clean fuel of the future; and

WHEREAS, biofuels can be a clean, renewable source for hydrogen; and

WHEREAS, biofuels offer greenhouse gas reduction benefits; and

WHEREAS, biomass as a source of energy has the potential to power more than three million homes or produce enough fuel to run more than two million automobiles on an annual basis; and

WHEREAS, biomass is a renewable resource which currently contributes two percent of the state's electricity mix, or nearly 1,000 megawatts of the state's generating capacity and is one of the options needed to achieve the State Renewables Portfolio Standard requirements; and

WHEREAS, improvements in the use of waste and residues from forests and farms for energy production can actually decrease the greenhouse gas emissions associated with biomass decomposition that otherwise would occur; and

WHEREAS, harnessing California's biomass resources to produce energy and other products is good for the state's economy and environment and contributes to local job creation; and

WHEREAS, the increased use of biomass resources contributes solutions to California's critical waste disposal and environmental problems, including the risk of catastrophic wild fires, air pollution from open field burning, and greenhouse gas emissions from landfills; and

WHEREAS, sustained biomass development offers strategic energy, economic, social and environmental benefits to California, creating jobs through increased private investment within the state.

NOW, THEREFORE, I, ARNOLD SCHWARZENEGGER, Governor of the State of California, by virtue of the power invested in me by the Constitution and the statutes of the State of California, do hereby order effective immediately:

1. The following targets to increase the production and use of bioenergy, including ethanol and bio-diesel fuels made from renewable resources, are established for California:

a. Regarding biofuels, the state produce a minimum of 20 percent of its biofuels within California by 2010, 40 percent by 2020, and 75 percent by 2050;

b. Regarding the use of biomass for electricity, the state meet a 20 percent target within the established state goals for renewable generation for 2010 and 2020; and

2. The Secretary for the California Resources Agency and the Chair of the Energy Resources Conservation and Development Commission ("Energy Commission") shall coordinate oversight of efforts made by state agencies to promote the use of biomass resources; and

3. The Air Resources Board, Energy Commission, California Environmental Protection Agency, California Public Utilities Commission, Department of Food and Agriculture, Department of Forestry and Fire Protection, Department of General Services, Integrated Waste Management Board, and the State Water Resources Control Board shall continue to participate on the Bioenergy Interagency Working Group chaired by the Energy Commission; and

4. The Energy Commission shall coordinate with other responsible state agencies to identify and secure federal and state funding for research, development and demonstration projects to advance the use of biomass resources for electricity generation and biofuels for transportation; and

5. The Energy Commission shall report to the Governor and the State Legislature through its Integrated Energy Policy Report, and biannually thereafter, on progress made in achieving sustainable biomass development in California; and

6. The California Air Resources Board is urged to consider as part of its rulemaking the most flexible possible use of biofuels through its Rulemaking to Update the Predictive Model and Specification for Reformulated Gasoline, while preserving the full environmental benefits of California's Reformulated Gasoline Programs; and

7. The California Public Utilities Commission is requested to initiate a new proceeding or build upon an existing proceeding to encourage sustainable use of biomass and other renewable resources by the state's investor-owned utilities; and

8. As soon as hereafter possible, this Order shall be filed with the Office of the Secretary of State and that widespread publicity and notice be given to this Order.



**IN WITNESS WHEREOF** I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this the twenty-fifth day of April 2006.

/s/ Arnold Schwarzenegger

Governor of California

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## APPENDIX C

### PG&E 2008 RENEWABLES SOLICITATION NOTICE OF INTENT TO BID

This Notice of Intent to Bid (“NIB”) shall serve as notice to PG&E that the company listed below (“Bidder”) is interested in participating in PG&E’s 2008 Renewables Solicitation for Bids Solicitation”.

PG&E requests that the Bidder return this nonbinding NIB by March 14, 2008. The NIB should be returned to the contact listed below (through either email or fax).

Bidder:	
Full legal name of Bidder:	
Bidder address:	
Contact:	
Name:	
Title:	
Address (if different from above):	
Phone number:	
Cell number:	
Fax number:	
Email address:	
Names of Bidders Conference Attendees:	
Project Name:	
Project Acquisition (PSA)? (Y/N)	
PPA? (Y/N)	
Site Acquisition? (Y/N)	
5-year Buyout Option? (Y/N)	
10-year Buyout Option? (Y/N)	
Technology Type	
Product (Baseload, Peaking, Dispatchable or As-Available)	
Term (10, 15, 20, Other)	
Contract Capacity (MW)	
Approx. Annual MWHrs	
Est. Commercial Operation Date	
Project Location	
Brief Description of Project	

**APPENDIX D**

**Proposed Terms of  
Power Purchase Agreement**

**for**

**Completed Biomass Electric Generation Projects (no construction required  
for full offered deliveries)**

**By and Between**

**SACRAMENTO MUNICIPAL UTILITY DISTRICT**

**And**

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November xx, 2008

**Seller:** Seller (Seller)

**SMUD:** The Sacramento Municipal Utility District (SMUD)

**Source Project:** Electric generation from \_\_\_\_\_ Biomass fueled generators located at \_\_\_\_\_.

**Total Net Project Capacity:** XX.X MW (see definitions this is a defined term)

**Contract Capacity:** With the exception of Planned Outages, forced outages (including derates), and Force Majeure, the amount of Capacity that shall be provided from the Project to SMUD at the Delivery Point shall be: XX.X MW.

**First Deliveries Date:** The First Deliveries Date shall be yyyy y, 200y.

**Delivery Term:** First Deliveries Date through xxxx xx, 20xx.

**Delivery Point:** Depending on the Project location the Delivery Point shall be as follows:

<b>PROJECT LOCATION</b>	<b>DELIVERY POINT</b>
<b>Within the SMUD Distribution Service Territory</b> (see definitions – the SMUD Distribution Service Territory is smaller than the SMUD Control Area)	The point of interconnection between the Project and the SMUD Distribution System or SMUD Transmission System
<b>Within the SMUD Control Area, but outside of the SMUD Distribution Service Territory</b>	The point at which the Host Electric Utility delivers* the power to a high voltage Transmission System of an electric utility within the SMUD Control Area
<b>Within the California Independent System Operator (CAISO) Control Area</b>	The point at which the Host Electric Utility delivers* the power to a high voltage Transmission System controlled by the CAISO
<b>Pacific Northwest</b> (via AC transmission)	The California Oregon Border
<b>Other areas outside of both the SMUD and CAISO Control Areas</b>	A specific point of interconnection with either the CAISO Control Area or the SMUD Control Area (Seller will be responsible for any TMM)
* See the Section on Distribution Service	

The specific Delivery Point, in compliance with the chart above, is

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**Product Type:** Unit Contingent Firm Power (Capacity and Energy) in the amount of the Contract Capacity with Environmental Attributes (as evidenced by Renewable Energy Credits or “RECs”). Environmental Attributes shall be delivered in an amount equal to the Energy actually produced by the Project and delivered to SMUD at the Delivery Point. Unit Contingent Firm Power means that the Energy, Capacity and RECs (the “Products”) subject to this transaction shall be supplied only from the Project, and shall be supplied from the Project whenever available, that Seller has an obligation to maximize availability, and that Seller may not interrupt deliveries for economic reasons. Deliveries may be interrupted/reduced only due to Force Majeure, Planned Outages and forced outages (and derates). This is also a baseload transaction in that the Energy and Capacity are delivered in all hours of the Delivery Term.

**Total Price:** \$xx.xx/MWh in total, which shall be split into \$x.xx/MWh for the REC (“REC Price”) and \$xx.xx/MWh [or index price description goes here if applicable] for the Energy (“Energy Price”). Seller and SMUD shall negotiate a split of the total price, such that the REC Price component is no less than 5 percent, and no greater than 15 percent of the total price.

**Price Escalation:** On the first day of the second full year of the Delivery Term, and annually thereafter, the Energy Price shall be increased by x.xx%. (SMUD will favor proposals that escalate only the portion of costs related to operating and maintenance or other legitimate forms of expected cost inflation. SMUD generally does not view capital costs as such.)

**REC Payment:** SMUD shall pay the negotiated REC Price to Seller for the volume (MWh) of RECs associated with the actual Energy generation produced by (the SMUD Project Percentage Share of) the Project and delivered to SMUD at the Delivery Point for which a corresponding Attestation and Bill of Sale (or other mutually agreed documentation) has been delivered to SMUD.

**Energy Payment:** SMUD shall pay the negotiated Energy Price for the amount of Energy that is delivered to SMUD at the Delivery Point. All hourly deliveries shall be in whole MWh’s unless the Project is within the SMUD Distribution Service Territory, or unless SMUD is performing the Scheduling Coordination Service on the Seller’s behalf.

**Credit Support during Term of Agreement:** After the definitive agreement is executed, SMUD will not normally require surety of Sellers that are in good financial condition and with whom SMUD has no existing credit exposure. Should SMUD determine that Seller’s financial condition, or SMUD’s exposure thereto, warrants that surety be required of the Seller (for example if a rated company falls below investment grade status) then Seller shall post credit support in an appropriate amount in favor of SMUD. Prior to the Negotiation Period, SMUD will inform Seller of any initial requirement to maintain surety during the Delivery Term, which SMUD reserves the right to change based on any information which subsequently becomes known to SMUD. (Note: this Section does not refer to the letter of credit required during the Negotiation Period.)



**Definition of Annual Capacity Factor (ACF):** The Annual Capacity Factor for any particular Contract Year shall be equal to (a) the total MWh generated by the Project and delivered to SMUD in that Contract Year, divided by (b) the number of hours in the same Contract Year multiplied by the Contract Capacity.

**Expected Annual Capacity Factor (EACF):** The EACF shall be 90%, except in a Contract Year in which Seller conducts an Overhaul Outage (as defined herein), in which case the EACF shall be 85%. (It is possible that some Sellers may be able to demonstrate to SMUD's satisfaction that different numbers are warranted here due to the unique nature of a specific Project.)

**Minimum Annual Capacity Factor (MACF):** The MACF shall be 85%, except that in a Contract Year in which Seller conducts an Overhaul Outage (as defined herein) the MACF shall be 80%. (It is possible that some Sellers may be able to demonstrate to SMUD's satisfaction that different numbers are warranted here due to the unique nature of a specific Project.)

**Planned Outages:** Maintenance Outages and Overhaul Outages as defined below in this Section, shall both constitute Planned Outages. Seller may not schedule or take any Planned Outages in the Months of June through September, unless otherwise agreed by the Parties in writing. Seller shall take all reasonable measures to minimize the frequency and actual duration of Planned Outages. Further, Planned Outages do affect the Annual Capacity Factor as defined herein. All Planned Outages shall be scheduled in advance according to notice provisions to be negotiated.

Maintenance Outages. "Maintenance Outages" shall mean outages that conform to the requirements of this Subsection. In every Contract Year in which Seller does not conduct an Overhaul Outage, Seller shall be entitled to take two (2) Maintenance Outages; provided, however, that (a) each Maintenance Outage shall be scheduled no less than four (4) months apart; and (b) the cumulative duration of all Maintenance Outages scheduled for each Contract Year shall not exceed fourteen (14) days.

Overhaul Outages. "Overhaul Outages" shall mean outages that conform to the requirements of this Subsection. No more than once every five (5) years during the Delivery Term, Seller shall be entitled to take one (1) Overhaul Outage and one (1) Maintenance Outage in a single Contract Year; provided, however, that (a) the Overhaul Outage and the Maintenance Outage shall be scheduled no less than four (4) months apart; (b) the duration of the Overhaul Outage shall not exceed twenty-one (21) days; and (c) the total cumulative duration of any Maintenance Outage and Overhaul Outage in a single Contract Year shall not exceed twenty-eight (28) days.

**Project Performance Adjustment:** Seller shall follow prudent utility practices as well as all manufacturer's guidelines and warranty requirements in operating and maintaining the Project and shall make any needed repairs in a reasonably timely manner so as to maximize the availability for generation of electricity. Provided that Seller has complied with the foregoing

and any other contractual obligations, then damages for failure to achieve a reasonable Annual Capacity Factor (ACF) relative to the Expected Annual Capacity Factor (EACF) shall be limited to a financial adjustment as follow:

ACF greater than the EACF	no effect;
ACF below the EACF by less than 10%	\$2 Energy Price reduction in the next year;
ACF below the EACF by 10% or more	\$5 Energy Price reduction in the next year.

**Conditional Right to Terminate Agreement for Sub-Standard Availability:** If the Project fails to achieve the Minimum Annual Capacity Factor for any two consecutive Contract Years, including failure caused by reason of Force Majeure (Note: see cure provisions below), then SMUD shall have the right to terminate this Agreement with advance notice. Notice of such termination (“Notice of Termination”) shall be given in writing a minimum of 60 days prior to effectiveness of such termination and within 120 days of the end of the second of the applicable two Contract Years. The ability to exercise such termination right shall be deferred for up to one year if Seller has demonstrated to SMUD, and is actively implementing, a reasonably acceptable plan to cure or correct any such failure or damage (“Cure Plan”). Such notice of an acceptable Cure Plan must be submitted to SMUD in writing within fifteen (15) Business Days of Seller’s receipt of SMUD’s Notice of Termination. SMUD shall then have fifteen (15) Business Days after SMUD’s receipt of the notice of Cure Plan to inform Seller in writing of the acceptance or rejection of the Cure Plan, which it will not unreasonably reject. If SMUD rejects Seller’s Cure Plan the Parties will continue reasonable efforts to agree upon an acceptable alternate Cure Plan prior to the effective date of termination. Failing such efforts the Agreement shall terminate pursuant to SMUD’s Notice of Termination.

**Provision of Operating Reserves and Hourly Firming:** Unless the Project is located in the SMUD Distribution Service Territory, Seller shall provide Operating Reserves for all schedules hereunder. Payment of any Liquidated Damages does not relieve Seller of its obligation to arrange for the provision of Operating Reserves. Seller shall ensure that it delivers to SMUD all Scheduled Project Energy in the amount of the Hour-Ahead Schedule, once established, regardless of the actual amount of Project Energy generated in such hour, including the provision of Energy at Seller’s expense from other sources (such as, without limitation, from a third party provider of Operating Reserves or the CAISO) when Project Energy from SMUD’s Project Percentage Share does not match the scheduled Project Energy.

**Interconnection Costs:** Should the Project at some time during the term of this agreement become located within SMUD’s Distribution Service Territory, Seller agrees to incur those costs imposed by SMUD which are the customary requirements that SMUD imposes upon similar generators interconnected to the SMUD distribution system, provided that Seller shall not be required to bear any costs attributable to any decision by SMUD to create or require a new interconnection between the Project and the SMUD distribution system or the SMUD Transmission System.

**Interconnection at SMUD’s Request:** With regard to Projects that are not initially connected within the SMUD Control Area or SMUD Distribution Service Territory (as applicable), Seller shall provide any reasonable cooperation requested by SMUD in establishing a direct interconnection (or Dynamic Scheduling arrangement) between the Project and the SMUD Control Area or the SMUD Distribution System at SMUD’s sole cost. Seller acknowledges that should the Project ever be interconnected with the SMUD Distribution System or the SMUD owned Transmission System, then Seller shall be required to execute a Coordination and Interconnection Agreement with SMUD before operation of the Project within the SMUD System.

**Emissions Credits:** Seller will be responsible for acquiring all necessary emissions credits for operation of the plant at the highest capacity factor achievable.

**Fuel Supply:** *Seller shall use best efforts to obtain the necessary Renewable Fuel to operate the Project so as to deliver to SMUD Power from the Project at the Delivery Point in the amount of the Contract Capacity throughout all hours of the Delivery Term, except to the extent that it is known in advance that the Project will not be operating due to a Planned Outage, Force Majeure or Forced Outage. Seller shall not exceed the maximum allowed usage of supplemental fuel (which is not Renewable Fuel) to qualify as an Eligible Renewable Energy Resource with the California Energy Commission. Seller shall specify the assumed amount of supplemental fuel use, if any, (other than Renewable Fuel) upon which it’s offered price is based. Adjustments to the price for exceeding this amount of supplemental fuel use will be negotiated, if applicable.*

**Transmission:** Seller shall deliver Energy to the Delivery Point using Firm Transmission, meaning that the applicable transmission provider(s) will provide transmission service for the entire Contract Capacity during all hours of the Delivery Term.

**Distribution Service:** For Projects not located within SMUD’s Distribution Service Territory, the Seller shall be responsible for obtaining (at Seller’s sole cost), from the applicable Host Electric Utility, any Distribution Service necessary for deliveries hereunder. Such service may be required for Seller to transmit power up to the high voltage Transmission System (as opposed to the Distribution System) of an applicable transmission provider, such as the CAISO.

**Scheduling Coordination Service:** Unless otherwise agreed in writing, Seller shall be responsible for meeting all requirements of any transmission providers as necessary to ensure the required deliveries at the Delivery Point, including the performance of Scheduling Coordinator duties required by the CAISO, if applicable. For practical purposes, SMUD may at its sole election consider offering Scheduling Coordination Service to Sellers with small Projects for appropriate compensation.

**Transmission Losses and Meter Multipliers:**

Except as specifically stated otherwise, all Capacity and Energy amounts specified herein are amounts as provided at the Delivery Point, without additional reduction by Transmission Losses, Generator Meter Multipliers or Transmission Meter Multipliers incurred by Seller in transmitting

such products to the Delivery Point. Seller shall have considered such factors prior to specifying the amount of net Energy and Capacity to be made available at the Delivery Point. All Schedules shall be for amounts to be delivered to SMUD or to be provided on SMUD's behalf at the Delivery Point. In the case of Projects located in the SMUD Distribution Service Territory for which Energy is measured using a SMUD Revenue Meter, a SMUD Loss Factor shall be applied to the SMUD Revenue Meter Data to determine the amount of Energy delivered to the Delivery Point.

**Liquidated Damages for Energy, Capacity or Environmental Attributes:** Except where such failure is excused by either (a) the other Party, (b) the other Party's failure, or (c) by reason of Force Majeure, a Party's material failure to receive or deliver Energy, Capacity and Environmental Attributes (or the corresponding attestation) as required herein, shall constitute a breach and each party has an otherwise unqualified obligation to make such receipts or deliveries. However, as a practical matter for unforeseen events, the Party's shall negotiate and agree upon specific Liquidated Damages mechanisms which the non-breaching Party may pursue as one potential remedy for any such event (whether deemed material or not). With regard to failure to receive or deliver Capacity and Energy, the parties will make use of commercially reasonable replacement costs, when applicable, or when such Capacity and Energy is not replaced, the Parties shall make use of market prices or indices that are most appropriate for the Delivery Point. Failure to deliver Environmental Attributes or the corresponding attestation as required herein shall make Seller liable for Buyer's replacement costs or the REC Price, whichever is greater. Further, Buyer may withhold payment of the REC Price until suitable delivery or settlement of replacement costs occurs. Seller has an unqualified obligation to deliver the Energy, Capacity and Environmental Attributes and SMUD has an unqualified obligation to receive such deliveries, and neither Party shall rely on Liquidated Damages as an alternative to delivery.

**CAISO and Transmission Provider Fees:** All charges and costs charged to generators or experienced in getting the power to the "Delivery Point", which shall include any GMM or TMM, shall be borne by Seller. All charges and costs charged to loads or experienced in taking delivery at the "Delivery Point" including any congestion costs experienced in further transmission of the power to the SMUD Control Area shall be borne by SMUD.

**Resource Adequacy and Congestion Hedging Rights:** Seller shall attest to any authorities, as necessary, as to SMUD's exclusive rights to the Energy, Capacity and RECs from the project, as necessary for scheduling, satisfaction of any resource adequacy requirements, transmission service applications or congestion management purposes.

**Right of First Look:** In the event that Seller expands its generation Capacity at the general location of the Project (beyond the Contract Capacity), Seller and SMUD shall make good faith efforts, for a period of at least 90 days, to negotiate an agreement for the sale of the additional Energy and RECs to SMUD, prior to Seller's offering of such to any third party. In such negotiations, neither party shall be required to reach an agreement or accept any particular terms.

**Defined Terms:** Capitalized words for which the definition does not appear in this term sheet shall have the meaning given in the list of defined terms included in the SMUD Request for Offers document.