FEASIBILITY EVALUATION OF BIOMASS BUSINESS SORTING AND PROCESSING OPERATIONS AT THE NORTH FORK MILL SITE

May 29, 2014 Update of
January 12, 2012 Final Report

Prepared for:

Yosemite-Sequoia Resource Conservation and Development Council
North Fork, California

Prepared by:

TSS Consultants
Rancho Cordova, California

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INTRODUCTION

The Yosemite-Sequoia Resource Conservation and Development Council (the Council) has retained TSS Consultants (TSS) to provide technical assistance in evaluating the feasibility for developing biomass accumulation, sorting and processing activities at the North Fork mill site in eastern Madera County.

The 135-acre North Fork site is strategically located tributary to cost effective and sustainably available forest biomass feedstocks. The site is managed by the North Fork Community Development Council (CDC) and currently has 10 acres leased[1] to a recycled lumber recovery enterprise (Crossroad Recycled Lumber) and 15 acres used for community services including a fire station, a Tribal Temporary Assistance for Needy Families (TANF) building, and a Tribal Transportation Center, all of which have been developed by the North Fork Mono Tribe.

The mission and stated goal of the CDC are as follows:

Mission: *To promote the social, economic and environmental welfare of North Fork, CA.*

Primary Goal: *To redevelop the North Fork Mill Site, helping to create jobs, green space and community serving facilities for the town of North Fork.*

Approximately 20 to 40 acres are available for an additional forest biomass value-added utilization enterprise, one that is complementary to the existing businesses. The CDC is in the process of completing a Parcel Map for the industrial area of the mill site which will subdivide the land into three to five acre parcels available for lease or sale.

Figure 1. North Fork Mill Site

[1]In negotiations for sale

FEASIBILITY EVALUATION OBJECTIVES

The community of North Fork and surrounding environs includes about 3,600 residents. Historically the region has been devoted to ranching, logging and lumber manufacturing. In 1994, the largest employer in the area, South Fork Timber Industries, closed its sawmill at North Fork, laying off 120 employees and effectively eliminating ancillary jobs such as logging and trucking. Unemployment in the region continues to be high, with the March 2014 unemployment rate for Madera County at 12.6%,[2] but the jobless rate in the North Fork area is likely closer to 20%.[3] Appendix A provides a detailed employment report compiled by the California Employment Development Department.

Unfortunately, the local Native American Tribe has been severely impacted as a result of the mill closure. Members of the North Fork Rancheria of Mono Indians made up a significant portion of the sawmill's workforce. The Tribe also had numerous members employed in the harvest and transport of sawlogs to the mill. Data provided by the North Fork Rancheria Indian Housing Authority indicate an inordinately high rate (57%) of low-income Indian families in the service area of Fresno and Madera Counties.[4]

There is a very high level of interest in the community for new, sustainable, family wage employment opportunities. Due to concerns regarding wildfire and the need to restore forest landscapes in the area, many residents believe that enterprises focused on forest restoration, hazardous fuels treatment, and value-added utilization of small stems and logs removed as a byproduct of restoration/fuels treatment activities show much promise. This evaluation is focused on development of strategies to support value-added utilization of forest biomass in concert with a forest restoration economy for the North Fork region.

The CDC has questions regarding biomass feedstock supply, existing value-added product markets and potential diversification to take advantage of local/regional markets.

The primary goal of this feasibility evaluation is to provide impetus for local entrepreneurs and other firms to consider sustainable woody biomass processing enterprises co-located at the North Fork site. By diversifying value-added product lines using robust business models and ramping up processing capacity, additional biomass material sourced sustainably from local fuels treatment and restoration activities can be utilized creating jobs and other economic benefits for local communities.

Additional goals for this preliminary feasibility analysis include:

- Review current operations and site conditions at the North Fork site.

- Evaluate current information/resources to analyze potential biomass processing business models that optimize utilization and value-added markets from locally available biomass feedstocks.

[2]As reported by the US Department of Labor, Bureau of Labor Statistics and the California Employment Development Department.
[3]Per discussions with Elissa Brown, Grant Writer, Sierra Nevada Conservancy.
[4]Ibid.

- Seek out stakeholder input to assure that local knowledge is a key component of any outcomes or suggestions/recommendations addressing next steps.

- Seek out highest value markets offering a diversified range of opportunities that provide revenue streams which facilitate procurement of locally available biomass feedstocks. This procurement strategy will (likely) result in an opportunity to contribute at least a portion of the costs to treat/remove hazardous fuels.

- Facilitate new and sustainable family wage jobs in rural communities.

- Generate findings that result in a summary of resources, potential opportunities, suggestions for optimized business models and detailed next steps to consider.

Figure 2. North Fork Community Development Council Office (located at the mill site)

SCOPE OF WORK

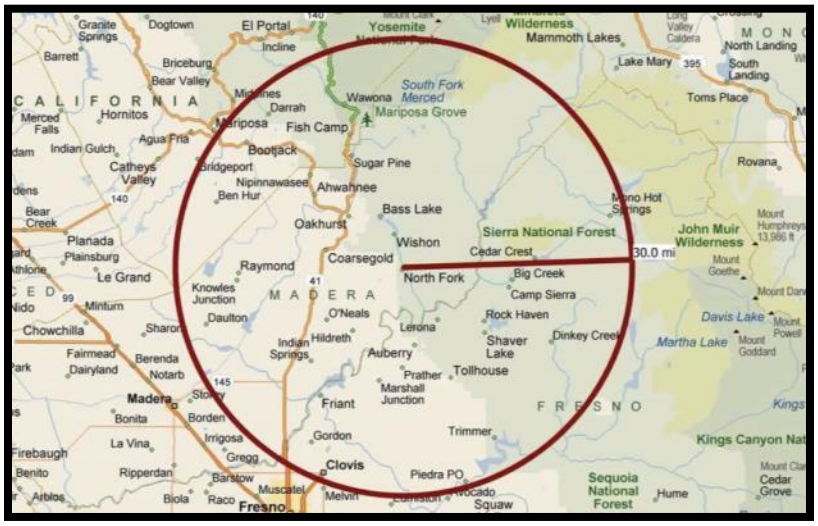
The tasks listed below were utilized to provide guidance in the implementation of the North Fork feasibility evaluation.

Task 1. Pre-Work Conference

Convene a meeting with the Council program managers. Review approach and implementation schedule/work plan for the feasibility study. Confirm primary Council contacts and project management team members. Review availability of existing studies and data. Confirm target study area for sourcing of potential biomass feedstock resources.

The map below highlights draft target feedstock sourcing areas for the North Fork/Mariposa and surrounding region. Analysis will be focused on the North Fork feedstock sourcing area.

Figure 3. Draft Target Study Areas



Task 2. Site Reviews and Initial Stakeholder Meetings

A. Arrange for site visits to review current operations and business models. Conduct pre-site visit conference calls with key staff to prepare for visits and to arrange for initial stakeholder meetings.

B. Secure stakeholder lists from Sierra Nevada Conservancy and the Council. Working with program managers, confirm final stakeholder list for outreach and invitation to initial stakeholder meeting at the North Fork site. Generate one page project overview document and meeting agenda for dissemination prior to meeting. Send out invitations with RSVP request.

C. Conduct site visits with operations staff. Review:
    i. Current business model

ii. Challenges/opportunities/lessons learned
iii. Local community support/concerns
iv. Site constraints (e.g., zoning, dust/fugitive emissions, odor, infrastructure, current capacity, etc.)

D. Conduct initial stakeholder meeting (preferably on site). Facilitate active discussions regarding current operations (e.g., presentation by operations management staff). Structure discussions so that stakeholders are encouraged to actively participate in a problem-solving exercise that pinpoints the heart of the matter addressing opportunities/challenges/issues regarding sourcing of appropriate feedstocks and processing operations that optimize value-added outcomes.

E. Summarize initial North Fork site stakeholder meeting outcomes and disseminate to meeting participants.

Task 3. Conduct Research Based on Outcomes from Site Visit and Initial Stakeholder Meeting

A. Utilizing outcomes from the site visit and stakeholder meetings, conduct research on key topics that are most likely to move site-based projects forward. Examples of key research areas that are potential outcomes from the meetings:
    i. Most economically feasible value-added products based on biomass feedstock supply and local/regional markets.
    ii. Value-added markets that show promise in the short term and long term.
    iii. Minimum volume required for economic processing and marketing of select value-added options.
    iv. Capacity of local/regional markets for these value-added products.
    v. Sustainable biomass feedstock supply availability within economic haul distance of the North Fork site.
    vi. Costs of collection, processing and transport.
    vii. Overview of processing equipment required to address key value-added market opportunities.
    viii. Limiting factors that if not corrected, could become fatal flaws to business models considered.
    ix. Site constraints based on:
        1. Available acreage
        2. Current zoning/environmental regulations
        3. Available infrastructure (e.g., water, power)

    Key topics considered for research and analysis will be selected and prioritized by the program managers and confirmed using outreach to key stakeholders.

Task 4. Convene Follow-up Meeting with Key Stakeholders

A. Convene second meeting with key stakeholders utilizing key outcomes from Task 3 as the basis for a meeting agenda. It is anticipated that discussion items will be focused on:
    i. What are the volumes of woody biomass feedstocks available on a long-term, sustainable basis?
    ii. What are the costs of collection, processing and transport?
    iii. What are the site improvements necessary to support new business models?
    iv. What are the capital costs of key processing equipment?
    v. What is the site capacity available for expanded operations?
    vi. What are the potential community concerns if expanded operations are initiated?

B. Critical business model related issues will be addressed so that key stakeholders have a set of recommendations and suggestions for next steps to consider, including:
    i. Are there key partnering opportunities that support a sustainable business model based on local/regional value-added products?
    ii. What are the next steps for securing sustainable feedstocks and attracting key partners?
    iii. What are the capital financing options available?
    iv. What grant funding may be available?
    v. What are the potential fatal flaws that may hamper new business model deployment?

Task 5. Draft Feasibility Evaluation Report

Based upon information, research findings and stakeholder input assimilated in Tasks 2 through 4, generate a draft planning document in the form of a feasibility evaluation report. The draft document will present a clear plan addressing specific steps to consider in moving forward with optimized business models at the North Fork site.

Task 6. Final Feasibility Evaluation Report

Based on input from key stakeholders and program managers, a final planning document and feasibility evaluation report will be issued. The final report will be generated within two weeks of receiving input from key stakeholders and program managers. Findings will be presented to key stakeholders (via conference call).

Task 7. Project Management

During the course of this feasibility evaluation, it will be very important that TSS and program managers communicate regularly. TSS has been conducting feasibility studies for over 25 years, and a key lesson learned is that client/contractor communication and coordination is paramount to assure successful analysis and delivery of work product that meets the goals of the project. TSS will provide project management services including:

- Monthly progress reports that highlight activities undertaken, results achieved, and challenges experienced.

- Regular communication and coordination via meetings (including conference calls) with program managers.

Updates from the January 12, 2012 Report

This report was updated with additional information an analysis require to meet the feasibility study standards of the Wood to Energy Grant in May 2014. The report was also updated to reflect current conditions and assumptions regarding the proposed bioenergy project.

FINDINGS

Summarized below are findings generated as a result of this feasibility evaluation analysis.

Forest Biomass Availability and Cost

Woody biomass material from forest operations, forest restoration and fuels treatment activities, local landfills/transfer stations and agricultural operations are sustainably available in volumes that could support commercial-scale, value-added utilization enterprises located at the North Fork mill site. Table 1 provides an overview of currently available wood waste volumes by biomass fuel type. Biomass volume is traditionally presented as bone dry tons (BDT),[5] as this is the unit of measure commonly employed by value-added utilization markets (pulp, paper, biomass power) when procuring woody biomass material.

Table 1. Biomass Material Potential Availability

BIOMASS MATERIAL SOURCE	BDT PER YEAR
Timber Harvest Residuals – USFS (Bass Lake RD)	4,500
Timber Harvest Residuals – Private	1,170
Pre-Commercial Thinning Activities – USFS (Bass Lake RD)	1,000
Fuels Treatment Activities – USFS (Bass Lake RD)	3,000
Fuels Treatment Activities – Eastern Madera County Fire Safe Council	2,500
Fuels Treatment Activities – Coarsegold Resource Conservation District	0
Agricultural Wood Waste – From the Central Valley	9,000
Urban Wood Waste – Local landfills and transfer stations	500
TOTAL	**21,670**

Table 1 indicates that up to 21,670 BDT per year is sustainably available for the project. Of the available biomass, 57% is from the forested landscape (39% is from National Forest lands), 42% from agriculture, and 2% is available from urban wood sources.

The proposed 1 MW bioenergy facility is expected to require up to 8,000 BDT resulting in a feedstock coverage ratio of 2.7:1.

Table 2 summarizes the estimated costs of collection, processing and transport of biomass material to the North Fork site.

[5]One bone dry ton represents 2,000 pounds of dry woody material (zero moisture content).

Table 2. Biomass Material Collection, Processing and Transport Costs with North Fork Mill Site as Delivery Point

BIOMASS MATERIAL SOURCE	DELIVERED MATERIAL	LOW RANGE	HIGH RANGE
Timber Harvest Residuals – USFS (Bass Lake RD)	Chips	$45/BDT	$60/BDT
Timber Harvest Residuals – Private land	Chips	$45/BDT	$60/BDT
Pre-Commercial Thinning Activities – USFS (Bass Lake RD)	Small Logs	$34/GT[6]	$40/GT
Fuels Treatment Activities – USFS (Bass Lake RD)	Chips	$45/BDT	$60/BDT
Fuels Treatment Activities – Eastern Madera County Fire Safe Council	Chips	$50/BDT	$70/BDT
Fuels Treatment Activities – Coarsegold Resource Conservation District	Chips	$50/BDT	$70/BDT
Agricultural Wood Waste – From the Central Valley	Chips	$30/BDT	$38/BDT
Urban Wood Waste – Local landfills and transfer stations	Chips	$40/BDT	$50/BDT

Wood resource in the form of chipped material is the predominant feedstock source. Based on projected availability, the preferred feedstock blend for chipped feedstock would be:

- 65% Bass Lake RD – Due to the proximity of the Bass Lake RD to the North Fork site, this feedstock is expected to characterize the majority of the feedstock blend;
- 15% Other Forest Lands – Based on availability and time of delivery, feedstock from private lands and the Eastern Madera County Fire Safe Council is expected;
- 15% Agriculture – During the winter when forest accessibility is limited, agricultural wood (primarily orchard removals) is expected to be a significant source of feedstock; and
- 5% Urban – During the winter when forest accessibility is limited, urban wood may be sourced although there is limited availability in the area.

With this feedstock blend, the low delivered price range is expected to be $42.75 per BDT with the high range of $56.70 per BDT. Average delivered feedstock price is forecast to be $49.73 per BDT.

Site Review

The North Fork mill site is zoned Heavy Industry and currently qualifies for a wide variety of biomass-related processing and utilization activities. The North Fork site formerly hosted a 10 MW biomass power generation facility although limited infrastructure remains.

In January 2014, the Madera County Board of Supervisors granted a Conditional Use Permit for the construction of a 1 MW bioenergy facility[7] at the North Fork Mill Site. The land use permitting for the project in this report has been completed.

[6]GT is one green ton or 2,000 pounds.
[7]A bioenergy facility was the selected preferred technology after the January 2012 report was conducted.

Stakeholder Meetings

Local and regional stakeholders are very supportive of new enterprises located on the North Fork mill site. There is a very strong interest in the value-added utilization of sustainably available forest biomass resources generated as a byproduct of forest restoration and forest fuels reduction activities. New family wage jobs and reduction of wildfire threats are high priority issues.

Stakeholder meetings and community outreach have been conducted on a regular basis and material has been posted on a public webpage.[8]

Value-Added Utilization

The preferred value-added utilization option for the North Fork site is addition of a small-scale (1 MW) biomass power generation facility. Initial financial analysis indicates that due to the relatively high cost of biomass material delivered to the North Fork site (see Table 2 above), the levelized cost of power generated will need to be at least $134/MWh[9] to attract private sector investment. There may be an opportunity to extract heat from the biomass power facility to support lumber drying and/or a greenhouse operation.

Conclusions

In order to attract private sector participation in the development of a small-scale biomass power generation facility at North Fork, it will be imperative that power sales rates be aligned with the cost of generation. At this time, the California Public Utilities Commission is finalizing guidelines for rollout of the Senate Bill (SB) 1122 bioenergy feed-in tariff program. The SB 1122 program is a market driven adjustable tariff starting at $124/MWh and is expected to escalate to $136/MWh within two price adjustment periods.[10]

Potential Grant Funding

In order to drive down the capital expenses associated with a 1 MW biomass power generation facility, the CDC should consider grant funding options including:

Wood to Energy Grant (USFS) – This grant program is administered by the USFS for the design and engineering phase of project development. The North Fork project successfully applied for funding through this grant in 2012; however did not request the total eligible amount and funding may still be available for additional design and engineering.

Electric Program Investment Charge (EPIC) Program – The EPIC Program is collected by the California investor-owned utilities (IOUs) for the purposes of providing public funding for research, development, demonstration, deployment, and market facilitation projects.

[8] http://northforkcdc.org/?cat=19
[9] MWh is a megawatt hour and represents 1,000 kilowatts per hour. This is enough power to sustain approximately 1,000 homes.
[10] Contingent on sufficient participation in the program to trigger a price adjustment.

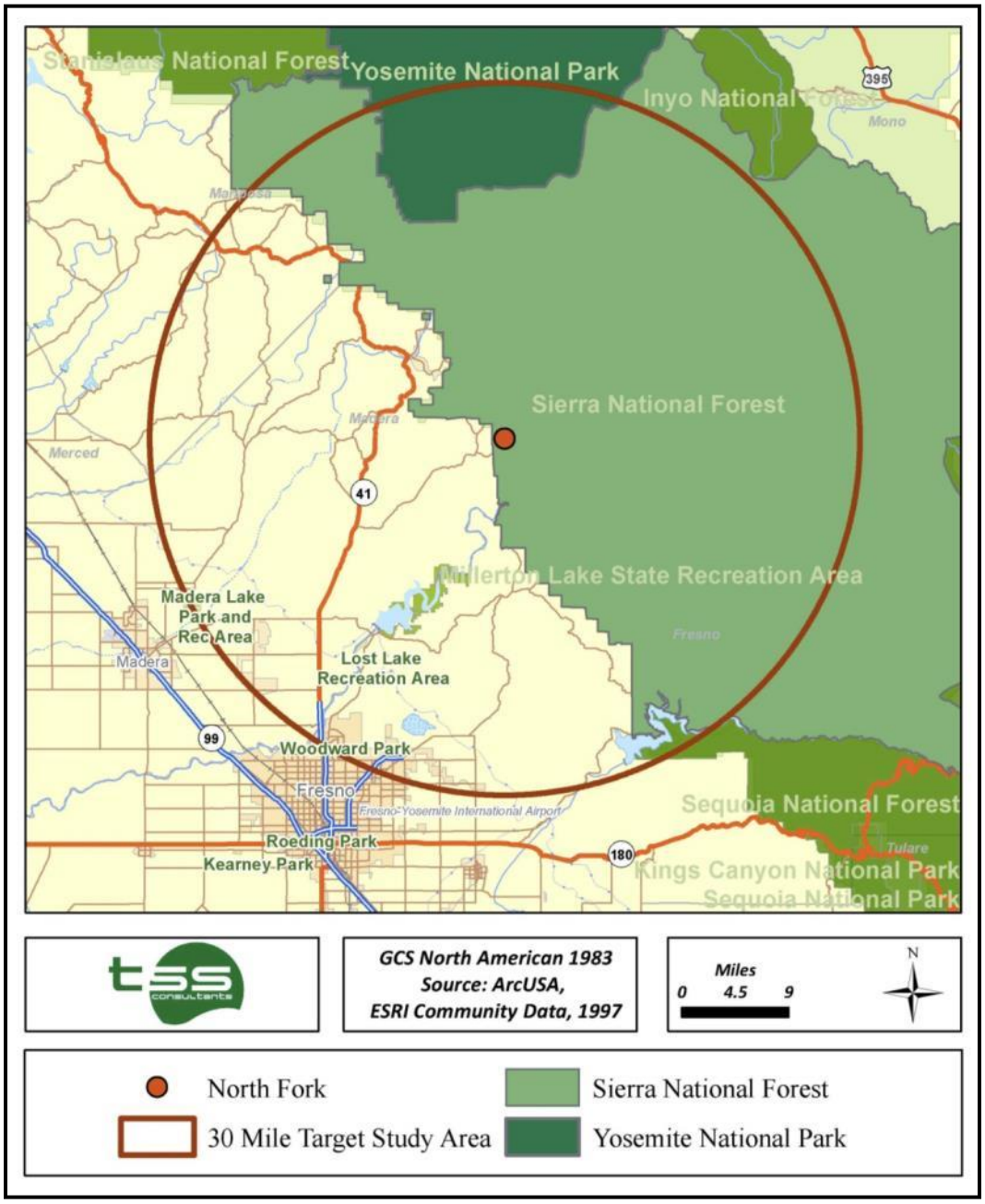
BIOMASS FEEDSTOCK AVAILABILITY REVIEW

In order to fully understand natural resource recovery and utilization opportunities from forest restoration and fuels treatment activities, it is imperative that a review of the current vegetation cover types in the region be analyzed. In addition, forest ownership patterns need to be assessed to understand current land management objectives in the region. The greater North Fork region includes heavily forested landscapes that are predominantly managed by public land management agencies (primarily the USFS).

Target Study Area

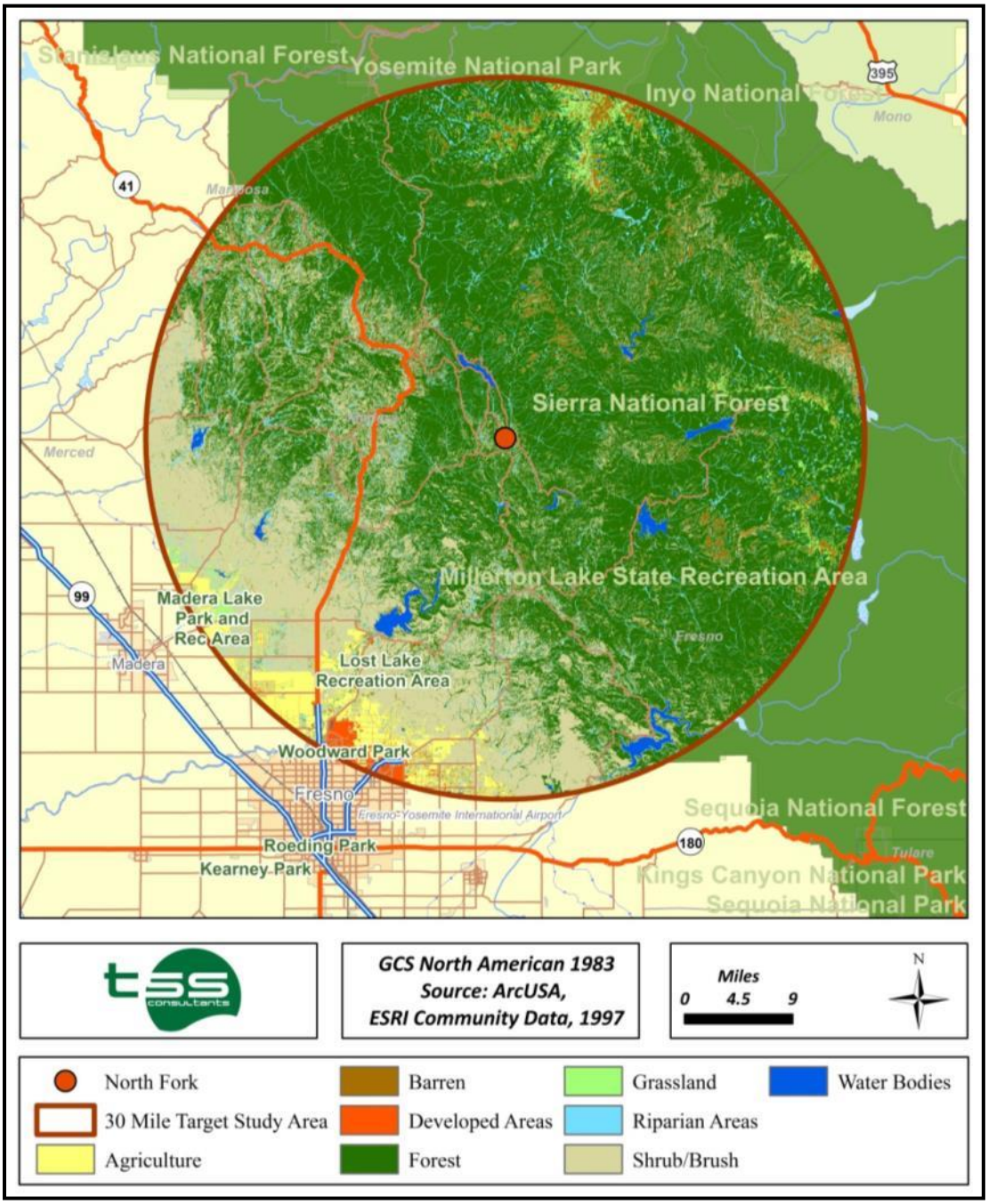
Consistent with the objectives of this biomass feedstock availability review, the forested landscapes and watersheds located within a 30-mile radius were included in the Target Study Area (TSA). Due to relatively high transportation costs associated with movement of forest biomass, TSAs are typically 25 to 50 mile radius in scale. Figure 4 highlights the 30 mile North Fork TSA.

Figure 4. Target Study Area



As stated previously, woody biomass availability for any given region is heavily dependent on vegetation cover, land ownership and management. Figure 5 shows vegetation cover types within the TSA.

Figure 5. Vegetation Cover within the Target Study Area



Vegetation cover dictates what vegetation types are predominant within a region and therefore influence woody biomass availability. Depending on management objectives, certain cover types could generate sustainable volumes of woody biomass material for use as feedstock for value-added enterprises. Table 3 summarizes vegetation cover by category within the TSA.

Table 3. Vegetation Cover within the North Fork TSA

COVER CATEGORIES	ACRES	PERCENT OF TOTAL
Agriculture	49,319	3%
Barren	35,882	2%
Developed Areas	22,233	1%
Forest	1,065,337	59%
Grassland	32,405	2%
Riparian Areas	104,754	6%
Shrub/Brush	463,505	26%
Water Bodies	18,505	1%
TOTALS	**1,791,940**	**100%**

Land ownership drives vegetation management objectives and within the TSA, the USDA Forest Service (USFS) is the most significant land manager with responsibility for approximately 60% of the forested landscape within the TSA. Private land makes up about 32%. Federal land management agencies (USFS, National Park Service and the Bureau of Land Management) together, manage approximately 68% of the forested land within the TSA. Table 4 summarizes land ownership and jurisdiction within the TSA.

Table 4. Land Ownership/Jurisdiction Forest Vegetation Cover within the TSA

LAND OWNER/MANAGER	FORESTED ACRES	PERCENT OF TOTAL
Bureau of Land Management	5,520	1%
Bureau of Reclamation	3,313	< 1%
Department of Defense	914	< 1%
National Park Service	75,007	7%
Private	343,497	32%
State of CA	242	< 1%
USFS	636,845	60%
TOTALS	**1,065,337**	**100%**

GIS analysis confirmed that 34% of the USFS managed lands with forest vegetation within the TSA include wilderness or roadless areas which will not provide opportunities for recovery of woody biomass material. Table 5 summarizes USFS jurisdiction and land classification within the TSA.

Table 5. USFS Jurisdiction/Land Classification within the TSA

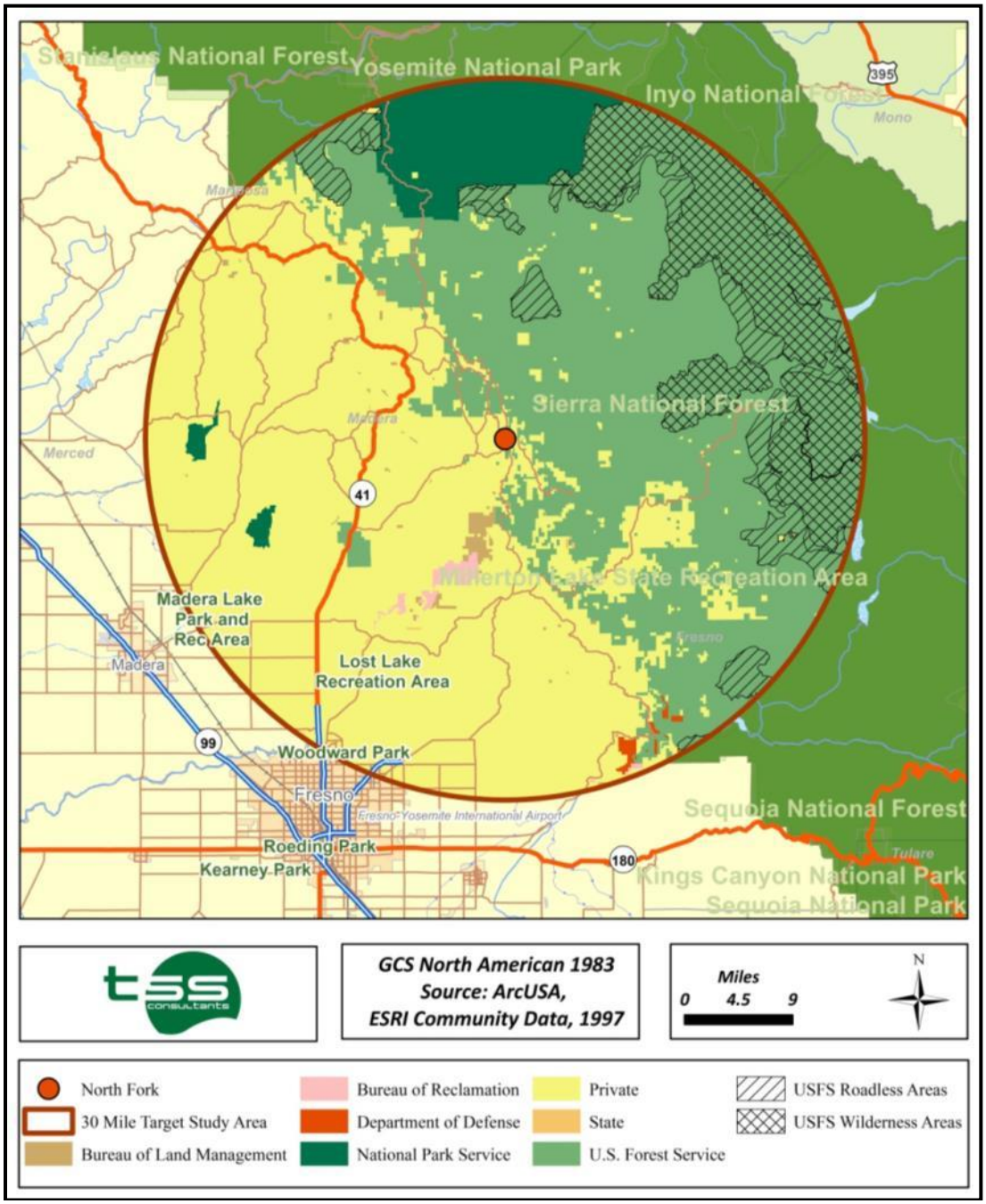
LAND OWNER/MANAGER	FORESTED ACRES	PERCENT OF TOTAL
USFS Wilderness	138,407	22%
USFS Roadless	75,269	12%
USFS Net Available	423,169	66%
TOTALS	**636,845**	**100%**

Additionally, very little forest biomass material is available from the National Park Service managed lands[11] (Yosemite Park) on a consistent basis. Forest biomass material is occasionally recovered within the park due to snow breakage or hazard fuel removal activities along roads or near structures.

Figure 6 highlights the locations of the various ownerships and jurisdictions.

[11]Per discussions with Brian Mattos, Park Forester, Yosemite National Park.

Figure 6. Land Ownership/Jurisdiction within the TSA



Agricultural land is almost exclusively privately held land. While only representing 3% of the TSA, significant wood resources are available through orchard removals. Orchard removals are common practices with tree crops (e.g., almond, pistachio, citrus) as commercial orchards become over-mature and crop yields drop. Table 6 shows the top crop types by acreage in the TSA. Almonds, pistachios, and orange crops will provide potential wood biomass feedstock. However, pistachio orchards have very long replacement rotations (100+ years), so very little

feedstock can be expected from these orchards on a sustainable basis. Almonds however have a 30 year rotation age and will be the primary source of agricultural feedstock.

Table 6. Agricultural Breakdown in the TSA[12]

COVER CATEGORIES	ACRES	PERCENT OF TOTAL
Almonds	18,974	38.5%
Grapes	13,435	27.2%
Pistachios	7,703	15.6%
Oats	1,787	4.7%
Oranges	1,278	3.3%
Subtotals	***44,047***	***89.3%***
TOTALS	**49,319**	**100%**

Biomass Material Availability

Woody biomass material from forest operations, fuels treatment activities, orchard removals, and local landfills/transfer stations are sustainably available in volumes that could support commercial-scale, value-added utilization enterprises located at the North Fork mill site. Table 7 provides an overview of currently available wood waste volumes by biomass fuel type.

Table 7. Biomass Material Potential Availability

BIOMASS MATERIAL SOURCE	BDT PER YEAR
Timber Harvest Residuals – USFS (Bass Lake RD)	4,500
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Agricultural Wood Waste – From the Central Valley	9,000
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TOTAL	**21,670**

Table 7 indicates that up to 21,670 BDT per year is sustainably available for the project. Of the available biomass, 57% is from the forested landscape (39% is from National Forest lands), 42% from agriculture, and 2% is available from urban wood sources

Assumptions used to calculate potential biomass availability:

[12] National Agricultural Statistics Service, Cropscape, 2013 Dataset

Bass Lake Ranger District:

- Annual sawlog harvest is 5 MMBF[13]/year.
- Fuels treatment activities on 300 acres/year.
- Timber stand improvement activities on 100 acres/year.

Private forest land:

- Annual sawlog harvest is 1.3 MMBF/year.

Eastern Madera County Fire Safe Council:

- Fuels treatment on 500 acres/year of which one-half may generate biomass material that can be recovered, processed and transported.

Coarsegold Resource Conservation District:

- Due to current funding challenges, no fuels treatment likely in the near term.

Agricultural Waste Wood: [14]

- Almond orchard rotations are 30 years
- Almond orchard removal yields are 28.5 BDT/acre
- Pistachio orchard rotations are 100 years
- Pistachio orchard removal yields are 22.0 BDT/acre
- Orange orchard rotations are 20 years
- Orange orchard removal yields are 20.1 BDT/acre

Mariposa landfill and North Fork Transfer Station:

- Minor volumes of recoverable construction debris and tree trimmings.

The proposed 1 MW bioenergy facility is expected to require up to 8,000 BDT per year leaving a feedstock coverage ratio of 2.7:1. The feedstock coverage ratio is an indicator of feedstock availability. The analysis finds there to be 60% more feedstock sustainably available than is required by the proposed facility.

Current Biomass Feedstock Competition

Current competition for biomass feedstock generated within the TSA is minimal due to the recent closure of several biomass power plants including Madera Power (25 MW facility at Firebaugh) and Sierra Power (9.5 MW facility at Terra Bella). Madera Power is located 42 miles from North Fork and was idled in 2012. Sierra Power, located 121 miles from North Fork was closed this year. TSS understands that both of these facilities were closed due to relatively low power prices, and not for lack of biomass feedstock supply.

The closest operating biomass power plant is Rio Bravo Fresno (25 MW) located 46 miles from North Fork. Primarily sourcing agricultural byproducts and urban wood waste, Rio Bravo

[13]MMBF is one million board feet. One board foot is a board that measures 12" by 12" and 1" thick.
[14] Data sourced from interviews with orchard growers, UC Ag Extension agents and orchard removal contractors.

Fresno does not currently utilize forest feedstock. This is due to the relatively abundant and cost competitive agricultural and urban feedstocks tributary to the facility.

Biomass feedstock availability is likely to continue to improve as older biomass power plants in the region reach the end of their power purchase agreements (PPA) with PG&E. Both Mendota Power (25 MW facility at Mendota, 79 miles from North Fork) and Dinuba Power (12 MW facility at Dinuba, 73 miles from North Fork) have PPA's that are set to terminate in 2015. Rio Bravo Fresno's PPA is currently set to terminate in 2019. All of these facilities may be successful in renegotiating the terms of their PPA's but this will likely be challenging due to the current relatively low wholesale power prices.

Potential Biomass Feedstock Competition

There is emerging interest amongst communities, project developers and independent power producers in the development of small (3 MW and less) distributed generation facilities that utilize agricultural, urban or forest sourced feedstocks. Currently Phoenix Energy has a 0.5 MW facility located at Merced that operates intermittently. In addition, Central Valley Ag Power is developing a 1 MW facility just east of Modesto at Oakdale. Neither of these facilities is likely to impact feedstock availability for the North Fork project.

The community of Auberry has recently expressed interest[15] in the possibility of siting a small-scale forest bioenergy facility in eastern Fresno County. Depending on the scale of the facility (likely to be less than 3 MW capacity) there may be some competition for biomass feedstock associated with this facility. Due to road systems in the region, a bioenergy project in the Auberry area might compete with the North Fork project for agricultural feedstocks, but not for forest sourced material.

TSS is not aware of any additional SB 1122 compliant facilities that may be developed in the region that could access biomass feedstock from the North Fork TSA.

Feedstock Supply Risk Mitigation

The primary mitigation measure to minimize the impact of potential or current biomass supply competition is to concentrate procurement efforts in the development of feedstock supply chains located close-in and tributary to North Fork. A project will have significant transportation cost advantages when sourcing biomass feedstock as near as possible to its location. An additional mitigation measure to minimize the impact of competing biomass purchasers is to secure stable and price competitive feedstock sources utilizing long-term supply agreements with a variety of reliable feedstock suppliers.

Time of Year Availability

Discussions with local foresters indicate that the typical season for field operations is May 1 through November 15. A variety of factors impact the season duration including snow depth and

[15]May 22, 2014 community workshop at Auberry sponsored by the Sierra Resource Conservation District, Sierra Nevada Conservancy District, and US Forest Service.

soil moisture (concerns regarding potential soil compaction). Wood feedstock from the forest will have to be stockpiled onsite for winter months when forest access is limited. Agricultural and urban wood can serve as useful alternatives during the winter months. Agricultural wood availability is seasonal with the high season during the winter months when the orchards are removed before replanting typically in the spring. Urban wood waste is typically generated year round with some seasonal fluctuations, specifically a downturn during the holiday season as construction projects are not as active.

Biomass Feedstock Prices

Commercial contractors equipped to collect, process, and transport woody biomass material exist in the North Fork area. Table 8 summarizes the estimated costs to collect, process, and transport biomass material to the project site. Assumptions used to calculate range of costs include:

- No service fees collected or cost share arrangement (e.g., goods for services).
- One-way transport averages 20 miles for biomass and sawlogs.
- Biomass is collected and processed into truck for $30/BDT at roadside landing.
- Small logs are harvested, collected and loaded onto log truck for $25/GT (about $150/MBF)[16] at roadside landing.
- Haul costs are $85/hour for standard chip truck/trailer.
- Haul costs are $100/hour for walking floor chip truck trailer.
- Haul costs are $85/hour for standard log truck.
- Biomass chips average 14 BDT/load.
- Small logs average 24 GT/load.

Table 8. Biomass Material Collection, Processing and Transport Costs with North Fork Mill Site as Delivery Point

BIOMASS MATERIAL SOURCE	DELIVERED MATERIAL	LOW RANGE	HIGH RANGE
Timber Harvest Residuals – USFS (Bass Lake RD)	Chips	$45/BDT	$60/BDT
Timber Harvest Residuals – Private land	Chips	$45/BDT	$60/BDT
Pre-Commercial Thinning Activities – USFS (Bass Lake RD)	Small Logs	$34/GT	$40/GT
Fuels Treatment Activities – USFS (Bass Lake RD)	Chips	$45/BDT	$60/BDT
Fuels Treatment Activities – Eastern Madera County Fire Safe Council	Chips	$50/BDT	$70/BDT
Fuels Treatment Activities – Coarsegold Resource Conservation District	Chips	$50/BDT	$70/BDT
Agricultural Wood Waste – From the Central Valley	Chips	$30/BDT	$38/BDT
Urban Wood Waste – Local landfills and transfer stations	Chips	$40/BDT	$50/BDT

Wood resource in the form of chipped material is the predominant feedstock source. Based on projected availability, the preferred feedstock blend for chipped feedstock would be:

- 65% Bass Lake Ranger District – Due to the proximity of the Bass Lake RD to the North Fork site, this feedstock is expected to characterize the majority of the feedstock blend;

[16]MBF is one thousand board feet. One board foot is a board that measures 12" by 12" and 1" thick.

- 15% Other Forest Lands – Based on availability and time of delivery, feedstock from private lands and the Eastern Madera County Fire Safe Council is expected;
- 15% Agriculture – During the winter when forest accessibility is limited, agricultural wood is expected to be a significant source of feedstock; and
- 5% Urban – During the winter when forest accessibility is limited, urban wood may be sourced although there is a limited availability in the area.

With this feedstock blend, the low range is expected to be $42.75 per BDT to the high range of $56.70 per BDT with an average cost of $49.73 per BDT. Table 9 represents a five-year biomass feedstock pricing forecast for a wood chip delivery to a facility at North Fork.

Table 9. Five-Year Feedstock Pricing Forecast 2015 to 2019

BIOMASS MATERIAL SOURCE	2015	2016	2017	2018	2019
Feedstock Price ($/BDT)	$49.73	$50.42	$51.13	$51.84	$52.57

The feedstock price forecast is based on the following assumptions:

- Feedstock supply chain is fully developed with feedstock available from forest-based operations;
- Diesel fuel prices remain near $4.25 per gallon through 2015, then escalated at 2% per year;
- Labor rates remain stable through 2015, then climb at 2% per year; and
- Biomass feedstock prices escalate at 1.4% annually due to the increased diesel fuel and labor costs.

SITE REVIEW

The North Fork mill property was the former site of a large sawmill. Of the 135 acres comprising the sawmill site, about 80 acres are usable, with approximately 35 acres already in other uses (or planned for uses such as a fire station). Of these 35 acres, approximately 10 acres are used for biomass processing activities, such as stockpiling, chipping and mulching, landscaping materials, and firewood sales. There is also a recycled lumber operation (Crossroads Recycled Lumber) on site. Additional biomass businesses could also be located at the site, plus there exists the potential for a small biomass-fueled electric generation system (1 to 3 MW)[17] to be sited at the North Fork mill site.

Figure 7 is an aerial photo of the North Fork mill property site. As can be seen from that photo, much of the property was highly disturbed and remains so in the present (the sawmill was operational at the site in excess of 50 years until its closure in 1994).

Figure 7. Aerial View of North Fork Mill Site

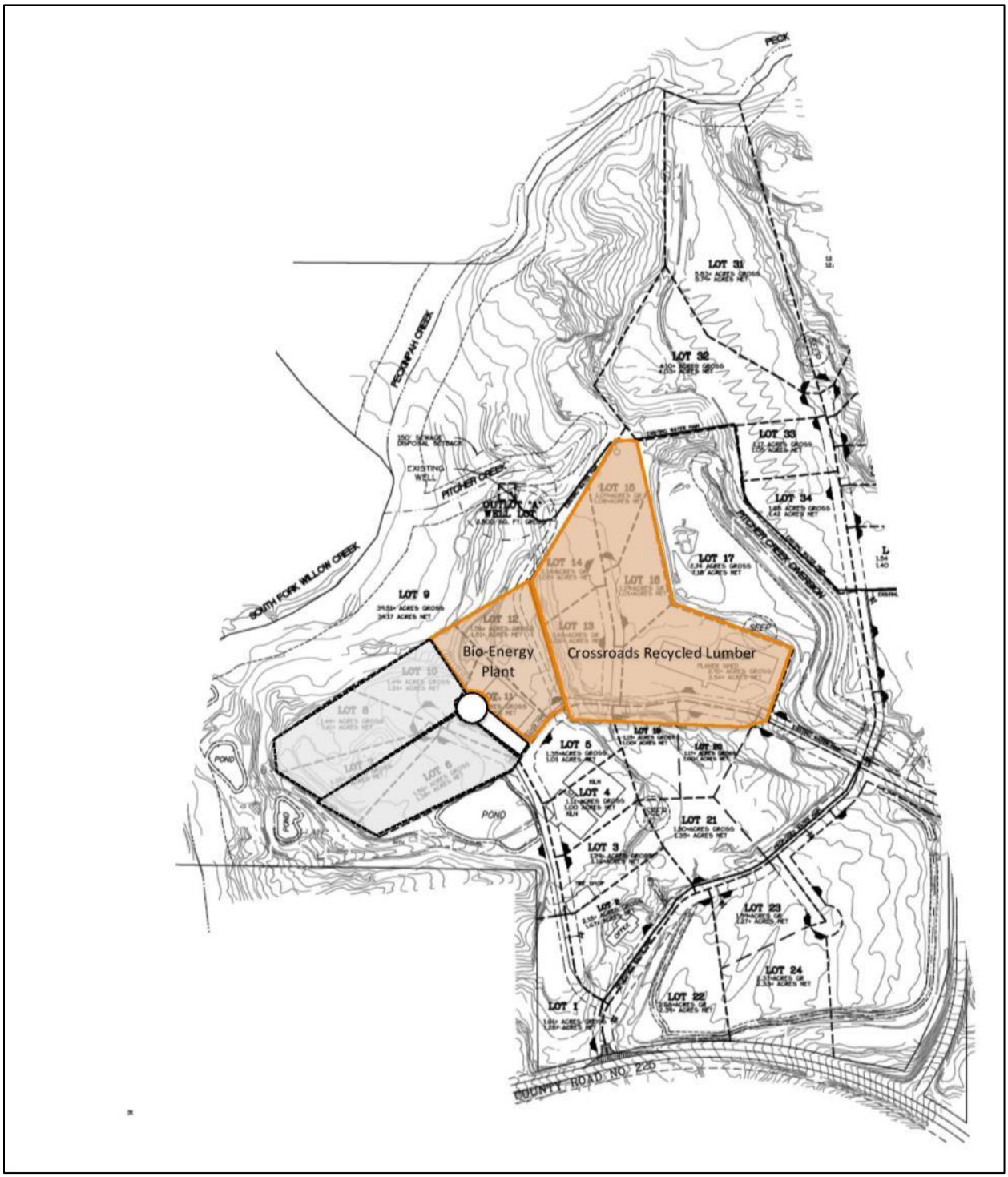
Figure 8 is a representative photo of the site, which still demonstrates the former industrial nature of the subject property.

[17]MW is a common unit of measure for power production and represents 1,000 kilowatts (about enough power for 1,000 homes).

Figure 8. Representative Photo Image of the North Fork Mill Site

Figure 9 is a subdivision map which shows the current biomass recycling tenants at the subject site.

Figure 9. Proposed Subdivision Map of North Fork Mill Site
(not reviewed or approved by Madera County)



Land Use and Zoning

The land use and zoning designation of the mill property site is Heavy Industry, as indicated on Figure 3-3 of the North Fork/South Fork Community Central Area Plan.[18] Table 1 of the Central Area Plan describes the permitted uses within the Heavy Industry zone (as allowed by Chapter 18.44, Madera County Code of Ordinances). Further, Section 18.04.245 of the Madera County Code defines heavy industrial uses as:

> "All those industrial and manufacturing uses not otherwise prohibited by law except the following: Manufacture of cement, lime, gypsum, or plaster of Paris, acid, explosives, fertilizer, glue, fat and bone products, or the storage of explosives, or the reduction of offal or dead animals, or the operation of stockyards or commercial slaughter houses. Other similar heavy industrial uses may be included in this definition by the interpretation of the zoning administrator."

In January 2014, the Madera County Board of Supervisors granted a Conditional Use Permit for the construction of a 1 MW bioenergy facility on the North Fork Mill Site.[19] Land use permitting for the project has been complete.

Site Infrastructure: Utilities, Access, and Transportation Systems

The North Fork property has its own water supply system fed by onsite wells with gravity-fed water storage. The water supply system has been certified by the Madera County Fire Marshall for adequate fire protection flows.

The North Fork property can be accessed from Madera County Road 225 and from Douglas Ranger Station Road. As a former mill site, large truck delivery to the site was not uncommon. There are no anticipated access challenges and none were identified during the CEQA review process.

Environmental Regulations and Constraints

As all of the proposed uses appear to be allowable on the subject site (due in large part to the favorable zoning), many potential environmental constraints are potentially eliminated. However, there remain the following potential constraints to be considered. These include:[20]

- Air quality
- Hazardous Waste Site Contamination
- Storm Water Drainage
- Endangered Species
- Wetlands Delineation and Preservation

[18]Prepared by QUAD Knopf and North Fork Community Development Council, November 2003.
[19]A bioenergy facility was the selected preferred technology after the January 2012 report was conducted.
[20]Identified in part within the North Fork/South Fork Community Central Area Plan.

Air Quality

Air quality would most likely only be a potential constraint if a biomass-fueled electric generation system were proposed. The site is within the jurisdiction of the San Joaquin Valley Air Pollution Control District (SJVAPCD), which has some of the most stringent air pollutant emissions limitations in California. However, a state-of-the-art small-scale electric generation system would have very low emissions, and additional add-on emissions controls are available. Recently, two small-scale electric systems were permitted by the SJVAPCD in Merced and in Stanislaus County.[21]

Hazardous Waste Site Contamination

The subject property has reported soil contamination from asbestos, fuel hydrocarbons, and wood preservatives, all used by the former sawmill and its operations. [22] However, it is also reported that the all known site contamination has been remediated.[23]

Storm Water Drainage

The former sawmill had significantly modified creeks located on the property (Peckinpah and Pitcher) for the construction and operation of the sawmill. However, since the closure of the sawmill in 1994, the modified drainage system has not been maintained, nor does it meet current standards. It will need to repaired and modified as the site is further developed.

Endangered Species

There is the possibility that species of concern (e.g., California red-legged frog) may use the riparian corridor of the subject property's creeks and the riparian areas associated with them. However, if development of biomass processing activities avoids these areas, any threats should be eliminated. No significant impacts were identified during the CEQA review process for the Conditional Use Permit.

Wetland Delineation and Preservation

The riparian zones of the creeks that border and traverse the subject property, as well as the water diversion areas for storm water, now meet the definition of wetlands. As such, these areas must be addressed (and protected) from additional biomass-related development that may encroach or border such areas. The project site appears to be large enough that impacts to federally-defined wetlands can be avoided. No significant impacts were identified during the CEQA review process for the Conditional Use Permit.

[21]Per discussions with Paul Elisas, VP Development, Phoenix Energy.
[22]North Fork/South Fork Community Central Area Plan 2003.
[23]Discussions with Elissa Brown, grant writer and North Fork resident.

STAKEHOLDER MEETINGS

Any consideration of value-added utilization enterprises at the North Fork mill site must include input from local and regional stakeholders. Local knowledge and experience (lessons learned) can provide invaluable information to guide decisions impacting communities and regions that seek economic development. In addition, it is important that local stakeholders have an active role in deciding which value-added utilization enterprises are most appropriate for possible development at the North Fork mill site.

Initial Stakeholder Meeting

TSS worked with the CDC and Sierra Nevada Conservancy representatives to generate a stakeholder invitation list and meeting agenda. In addition, a project overview document was crafted and distributed to provide stakeholders with background information and feasibility evaluation study objectives.

The initial stakeholder meeting was held on April 26, 2011 at the CDC office conference room and included 10 stakeholders. See Appendix B for meeting notes. Key stakeholder input included:

- Very high interest in the successful development of new sustainable enterprises that are complementary to existing businesses on the mill site (Crossroads Recycled Lumber and Alpine Sierra Greencycle).
- Concern regarding loss of local talent due to relatively little new employment opportunities.
- Job creation should be a priority.
- Opportunities exist to treat high levels of hazardous forest fuels to mitigate catastrophic wildfire in the area.

Meeting notes and outcomes were disseminated to meeting participants.

In addition to meeting with stakeholders, TSS and a Sierra Nevada Conservancy representative[24] met with Marc Mandel, owner of Crossroads Recycled Lumber, to review current operations and discuss possible interest in co-locating expanded or additional value-added processes. Mr. Mandel expressed a high level of interest in possible expansion but only if sustainable feedstocks are available and expansion plans are consistent with community interests.

TSS attempted unsuccessfully to contact and meet on site with Alpine Sierra Greencycling representatives.

Follow-Up Stakeholder Meeting

On June 2, 2011, a follow-up meeting was held (again at the CDC office conference room) with a similar stakeholder invitation list. The follow-up meeting was focused on presenting results of

[24]Mark Stanley, forester and biomass advisor for the Sierra Nevada Conservancy.

TSS findings regarding woody biomass material availability within the TSA and presentation of promising, value-added utilization processes/enterprises that should be considered for the North Fork mill site. See Appendix C for meeting notes. Discussions during the meeting included:

- TSS presentations addressed:
  - Sustainable availability of woody biomass resources within a 30-mile radius of North Fork mill site. Cost estimates to collect, process, and transport woody biomass material to North Fork.
  - Current biomass markets and uses in the region.
  - Mill site review and environmental permitting required if additional value-added enterprises were developed on site.
  - Matrix of value-added uses for woody biomass material. See Appendix D for the value-added utilization matrix created by TSS and University of California Cooperative Extension.[25]
  - Recommendations regarding steps forward including consideration for the following value-added technologies:
    - Addition of a small sawmill at the Crossroads Recycled Lumber operation.
    - Post and pole operation.
    - Expanded firewood operation (Alpine Sierra Greencycling already markets firewood).
    - 1 MW biomass power generation facility.
- Other discussion items included:
  - Any added enterprise at the mill site must be structured to utilize biomass material that is available in sustainable volumes and specifications.
  - Collaborative processes (like the effort to evaluate and restore the Willow Creek watershed) may facilitate availability of sustainable, long-term volumes of biomass material generated as a byproduct of forest restoration and fuels treatment activities.
  - County staff noted that an amended Conditional Use Permit might be the best option if considering a biomass power plant.
  - There may be an opportunity to utilize bug-killed pine trees removed from USFS lands. Blue stain lumber from milling these pine trees has character and may be valued in the marketplace.
  - Need to decide what entity or entities (e.g., CDC or Yosemite-Sequoia RC+D) will take the lead to manage or shepherd the addition of value-added enterprises on the mill site.

Continued Outreach

North Fork CDC has conducted 13 additional public meetings and briefings and has issued 11 press releases.

[25]Gareth Mayhead, UC Cooperative Extension staff.

Public Meetings and Briefings

1. January 9, 2012 – Biomass Stakeholder Group meets at the NFCDC building
2. November 27, 2012 – North Fork Community Meeting at Town Hall
3. November 30, 2012 – 1st North Fork Community-Scale Project Workshop
4. December 13, 2012 – High Sierra Chapter of the Society of American Foresters
5. January 2013 – Defend Rural America
6. February 12, 2013 - Oakhurst Rotary Club
7. February, 2013 – Sierra Club
8. March 11, 2013 – CDC Annual Meeting
9. March 27, 2013 - Central Sierra Watershed Committee
10. March 28, 2013 – Tom Wheelers North Fork Town Hall Meeting
11. April 2, 2013 – Todays Project Workshop
12. June 1, 2013 – Oakhurst Democratic Club
13. September 26, 2013 – WBUG Kick-off meeting with key partners and project team

Project Media Coverage

1. July 26, 2012 – USFS Press Release – "USDA Forest Service Awards Nearly $4 million for Renewable Wood Energy Project"
2. August 2, 2012 – Sierra Star – WBUG FUNDS - "Pre-development funding for North fork biomass plant"
3. December 12, 2012 – Mountain Press – "bio-mass energy project is proposed for NF mill site"
4. December 26, 2013 – Mountain Press – Foresters learn about biomass proposal"
5. January 1, 2013 - Community Alliance Fresno features 3.5 page article on project – "Sustainable North Fork"
6. January/February 2013 – North Fork Buzz Saw shares press release regarding project specific and community meeting opportunities
7. March 5, 2013 – Sierra News Online – "Biomass Project Meetings in North Fork"
8. March/April 2013 – North Fork Buzz Saw features press release regarding upcoming opportunities and project status
9. March 13, 2013 – Mountain Press – "Learn more about North Fork biomass project at meetings"
10. March 14, 2013 – Sierra Star – "Wheeler Town Hall in North ForkMarch 28" – project highlighted
11. Thursday March 21, 2013 – Sierra Star – "workshop to be held on proposed bioenergy facility"

VALUE-ADDED UTILIZATION

A wide variety of value-added utilization technologies were considered in the process of conducting this feasibility evaluation. The utilization matrix developed by TSS and UC Cooperative Extension (see Appendix D) summarizes the technology findings. This matrix served as an outline for discussion during the follow-up meeting with stakeholders.

Priority Technologies Considered

Four technologies reviewed with stakeholders during the June 2, 2011 meeting in North Fork, showed promise and were considered. One technology, biomass power generation, was selected for consideration as the best technology for the site. Outlined below are findings and outcomes from the technology evaluation process.

Small Sawmill

Sustainable feedstock (sawlog) supply is a major challenge, especially considering that the USFS manages the majority of the forested landscape in the TSA. In addition, there are already five small mobile sawmills operating in the area.[26]

Post and Pole Operation

Like the small sawmill, sustainable volumes of feedstock (small logs) available long term are a concern. Other post and pole operations in California have recently closed[27] due to poor market conditions for posts and poles.

Firewood Operation

There may be an opportunity to expand the existing firewood operation (Alpine Sierra Greencycling). Unfortunately, Alpine Sierra was not responsive to TSS inquiries, and it is assumed that they are not interested in participating in this evaluation.

Small Biomass Power Generation Facility

A small biomass power generation facility scaled at 1 MW could be developed at the mill site. At this scale, the facility would require approximately 8,000 BDT per year of biomass feedstock. TSS review of available biomass material found that just over 21,600 BDT/year are sustainably available resulting in a feedstock coverage ratio of 2.7:1.

[26] As noted by Walt Ellis during April 26, 2011 stakeholder meeting.
[27] Watershed Research and Training Center at Hayfork and Lance Forest Products at Bieber.

Preferred Biomass Utilization Project

Of the priority technologies considered, the small biomass power generation facility was identified by TSS and stakeholders as the preferred candidate. Listed below are important findings that drove this decision.

- TSS biomass availability review confirmed sustainable feedstock availability.
- North Fork site previously supported a 10 MW biomass plant[28] and there should be more than enough transmission and distribution capacity to support a 1 MW biomass plant.
- Market demand for renewable power generated in California is ramping up with recent legislation (SB 1122).
- There is a significant and compelling need to restore forest landscapes and treat hazardous forest fuels in the North Fork region (like much of the Sierra Nevada). A ready market (e.g., biomass fuel for power generation) for biomass removed will help to offset some of the costs of restoration/fuels treatment.
- Restoration of forest landscapes and treatment of hazardous forest fuels could employ local contractors. In addition, the power generation facility will require staff to operate and maintain the plant.[29]
- A small biomass power generation facility at North Fork could serve as a pilot or demonstration facility that may be replicated at other locations in the Sierra Nevada.

<u>Phoenix Energy</u>

Following the selection of a small biomass power generation facility as the preferred technology for evaluation, TSS conducted an informal technology search to find a technology vendor that showed promise and had already deployed the technology within California.

While there are other vendors (e.g., EnergyFlex, Inc.)[30] that have promising technologies, TSS chose Phoenix Energy as an example of a small biomass power generation technology. Phoenix has a pilot project now operating at Merced, California. Scaled at 0.5 MW, the Merced installation utilizes urban wood waste as a primary feedstock and is currently under contract to sell renewable power to Pacific Gas and Electric (PG&E). In addition, the plant is permitted by the same air district that has jurisdiction over the North Fork mill site, the San Joaquin Valley Air Pollution Control District.

TSS arranged for an August 29, 2011 tour of the Phoenix Energy, Merced facility. Posted below (Figure 10 through Figure 13) are images of the facility. In addition, Appendix E includes background information and a diagram showing process flow and layout of the technology.

[28]Per discussions with Patrick Emmert, formerly with Sequoia Forest Industries and South Fork Timber.
[29]Per discussions with Paul Elias, VP Development, Phoenix Energy.
[30]Data and contact information provided by Bernard Berrier, consultant for EnergyFlex, Inc.

Figure 10. Phoenix Energy Fuel Receiving System

Figure 11. Phoenix Energy Gasification Equipment

Figure 12. Phoenix Energy Gas Cleanup Equipment

Figure 13. Phoenix Energy Electrical Generator

The Phoenix Energy power generation technology is basically a four-step process.

- Step 1 - receive and store biomass fuel. Prefer fuel with 10% moisture content and sized between 4" and ¼". See Figure 10.
- Step 2 - convey biomass fuel to gasification unit for conversion to a synthetic gas (similar to natural gas or propane). See Figure 11.
- Step 3 - cool and clean up the synthetic gas. Remove impurities such as tars and particulates. See Figure 12.

- Step 4 - deliver synthetic gas to caterpillar generator set (internal combustion engine coupled to a generator. See Figure 13.

Other important data is outlined below.

- Thermal energy can be recovered and utilized to dry biomass fuel (forest biomass can have 50% moisture content) or to custom dry other products (e.g., lumber, firewood). Waste heat can be extracted at three locations in the process:
  - Heat exchanger at the gas-cooling step.
  - Water jacket around the Caterpillar engine.
  - Radiator at the Caterpillar engine.

- Biomass fuel usage is approximately 1 BDT per MWh or about 8,000 BDT per year for a 1 MW facility.

- Capital and construction costs for the Phoenix Energy system, with fuel receiving system and thermal energy extraction, are approximately $6.5 million.

- Footprint of the fuel receiving and power generation equipment is less than one acre. Fuel storage for stockpiling fuel through winter months (when forest operations are not active due to wet soil conditions and inclement weather) may take up an additional two acres.

Phoenix Energy has expressed an interest in moving forward with discussions regarding the possible siting of a small-scale biomass power generation facility at the North Fork site. A Letter of Interest was provided by Phoenix Energy confirming their commitment to continue discussions if results of this feasibility evaluation are favorable. See Appendix F for the signed Letter of Interest.

Preferred Technology Provider

A full technology assessment was conducted in November 2011 (Appendix G). Working closely with the North Fork CDC, the three preferred technology vendors were selected for further consideration, Energy Flex, Reliable Renewables, and Phoenix Energy. These three finalists were chosen based on the fit between their technology and the North Fork project site.

Requests for proposals were extended to each of the three finalists and evaluated. The North Fork CDC, with technical assistance from TSS, ranked the proposals (all three organizations replied to the RFP) based on the completeness of the application and the information provided within. (RFP is available in Appendix H). Ultimately, a partnership between the top two finalists, Reliable Renewables and Phoenix Energy was established for the purposes of this project. This partnership strengthened the development team bringing in local experience and an array of technologies to fit the site's needs.

FINANCIAL ANALYSIS

Using an excel-based proforma workbook, TSS conducted a financial feasibility analysis to determine what the sale price of power produced would have to be to make the project financially viable. Assumptions built into this analysis included an industry standard return on equity (15%) and currently available federal tax incentives, such as the Renewable Energy Production Tax Credit (PTC) and the Business Energy Investment Tax Credit (ITC). Cost data available from work conducted after the January 2012 report has been included in this update.

Biochar, a byproduct of gasification, is a carbon-based substance that has emerged in the soil amendment marketplace. Biochar has sold in small quantities for over $1 per pound in in bulk for $700 to $1,500 per ton. As this is an emerging market, TSS conservatively included a biochar sales price of $100 per ton to account for changes in the market or limited sustained demand.

Summarized below are assumptions used when conducting the financial analysis:

- 15% return on equity (after taxes)
- $6.5 million capital expense
- $300,000/year labor cost (approximately nine employees)
- $90,000/year maintenance cost
- $12,000/year land lease cost
- $38,000/year administration and other operating costs
- $49.50/BDT
- $100/ton biochar sales
- No thermal heat sales are included in this analysis
- 7-year depreciation schedule
- 15-year debt service (amortization period)
- 5% interest rate on debt
- 60% debt/40% equity in year one
- 1.4%/year escalation of fuel prices

The availability of grant funding (to underwrite capital expenses), were included and ramped both up and down to confirm the financial impacts. Table 10 and Table 11 summarize findings of the financial analysis comparing use of the PTC and the ITC.

Table 10. Financial Proforma Results Using the Production Tax Credit

CASH GRANT FOR CAPITAL EXPENSES ($)	LEVELIZED POWER SALES PRICE ($/kWh)
$0	$0.153
$750,000	$0.140
$1,250,000	$0.131

Table 11. Financial Proforma Results Using the Investment Tax Credit

CASH GRANT FOR CAPITAL EXPENSES ($)	LEVELIZED POWER SALES PRICE ($/kWh)
$0	$0.134
$750,000	$0.127
$1,250,000	$0.122

The ITC provides a more optimized outcome (lower power sales price required to meet Return on Equity assumption) and is the preferred tax credit option when compared to the PTC. While the existing ITC and PTC have both expired, new legislation, as part of H.R. 4426, the Clean Energy Victory Bond Act of 2014, the ITC would be extended until January 1, 2023 and the PTC would be extended until December 31, 2023. Following this legislation will be critical to the success of this project.

A 36-month cash flow statement is available in Table 12.

Table 12. Cash Flow, ITC, No Grants

	YEAR 1												YEAR 2					
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL	AUG.	SEPT.	OCT	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUN.
Electricity Sales ($)	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937
Biochar Sales ($)	$6,019	$6,019	$6,019	$6,019	$6,019	$6,019	$6,019	$6,019	$6,019	$6,019	$6,019	$6,019	$6,080	$6,080	$6,080	$6,080	$6,080	$6,080
Feedstock Costs ($)	$29,795	$29,795	$29,795	$29,795	$29,795	$29,795	$29,795	$29,795	$29,795	$29,795	$29,795	$29,795	$30,212	$30,212	$30,212	$30,212	$30,212	$30,212
O&M Costs ($)	$33,167	$33,167	$33,167	$33,167	$33,167	$33,167	$33,167	$33,167	$33,167	$33,167	$33,167	$33,167	$33,655	$33,655	$33,655	$33,655	$33,655	$33,655
EBITDA ($)	$37,994	$37,994	$37,994	$37,994	$37,994	$37,994	$37,994	$37,994	$37,994	$37,994	$37,994	$37,994	$37,149	$37,149	$37,149	$37,149	$37,149	$37,149
Debt PMT ($)	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760
Net Cash Flow ($)	$18,234	$18,234	$18,234	$18,234	$18,234	$18,234	$18,234	$18,234	$18,234	$18,234	$18,234	$18,234	$17,390	$17,390	$17,390	$17,390	$17,390	$17,390
	YEAR 2						YEAR 3											
	JUL	AUG.	SEPT.	OCT	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.
Electricity Sales ($)	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937	$94,937
Biochar Sales ($)	$6,080	$6,080	$6,080	$6,080	$6,080	$6,080	$6,140	$6,140	$6,140	$6,140	$6,140	$6,140	$6,140	$6,140	$6,140	$6,140	$6,140	$6,140
Feedstock Costs ($)	$30,212	$30,212	$30,212	$30,212	$30,212	$30,212	$30,635	$30,635	$30,635	$30,635	$30,635	$30,635	$30,635	$30,635	$30,635	$30,635	$30,635	$30,635
O&M Costs ($)	$33,655	$33,655	$33,655	$33,655	$33,655	$33,655	$34,153	$34,153	$34,153	$34,153	$34,153	$34,153	$34,153	$34,153	$34,153	$34,153	$34,153	$34,153
EBITDA ($)	$37,149	$37,149	$37,149	$37,149	$37,149	$37,149	$36,289	$36,289	$36,289	$36,289	$36,289	$36,289	$36,289	$36,289	$36,289	$36,289	$36,289	$36,289
Debt PMT ($)	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760	$19,760
Net Cash Flow ($)	$17,390	$17,390	$17,390	$17,390	$17,390	$17,390	$16,529	$16,529	$16,529	$16,529	$16,529	$16,529	$16,529	$16,529	$16,529	$16,529	$16,529	$16,529

Market Feasibility

Assuming no cash grant and use of the ITC, power sales from a 1 MW biomass power generation facility at North Fork must be at least $134/MWh ($0.134/kWh) to meet the 15% Return on Equity. With S.B. 1122 implementation expected this year (2014), the auction is expected to reach $134/MWh after two periods of prices adjusting upwards. This PPA price is very feasible for Category 3 Forest Bioenergy projects.

Feed-in Tariff Rulemaking Process

The North Fork bioenergy project is expected to be eligible for the SB 1122 ReMAT feed in tariff program. The CPUC has authorized two ReMAT programs, one for all renewable and one specifically for bioenergy projects, initiated by SB 1122. This project is expected to participate in the SB 1122 ReMAT because of the higher proposed starting price and the exclusion of lower cost solar, hydro, and wind projects.

The ReMAT is designed to balance cost-competitive renewable energy procurement with project developer timelines. The SB 1122 ReMAT is currently being finalized by the CPUC and is based on the standard ReMAT. To be eligible for the ReMAT developers must demonstrate the follow criteria:

1. Territory: The Project must be physically located within PG&E, SCE, or SDG&E's electric service territory and must be interconnected to PG&E, SCE, or SDG&E's electric distribution system.

2. Eligible Renewable Energy Resource: The Project must be an Eligible Renewable Energy Resource as defined in CPUC Section 399.12.

3. Qualifying Facility: The Project must be a Qualifying Facility, as defined by the Federal Energy Regulatory Commission (FERC). See 16 U.S.C. § 824a-3(b); 18 C.F.R. § 292.304(a) (2).

4. Contract Capacity: The Contract Capacity for the Project cannot exceed 3.0 MW.

5. Interconnection Study/Strategically Located: An Applicant must have passed the Fast Track screens, passed Supplemental Review, completed a PG&E, SCE, or SDG&E [based on the service territory] System Impact Study in the Independent Study Process; or completed a PG&E, SCE, or SDG&E [based on the service territory] Phase 1 Study in the Cluster Study Process for its Project (Interconnection Study).
    a. The Project must be interconnected to the PG&E, SCE, or SDG&E [based on the service territory] distribution system and the Project's most recent Interconnection Study or Interconnection Agreement must affirmatively support the Project's ability to interconnect (a) within twenty four months of the execution of the ReMAT PPA form #79-1150 and (b) without requiring transmission system Network Upgrades in excess of $300,000.

b. If both PG&E's, SCE's, or SDG&E's [based on the service territory] Rule 21 and Wholesale Distribution Tariff (WDT) are applicable and available to a Project in a given situation, the Project can chose to pursue interconnection under either Rule 21 or WDT, until the CPUC makes a determination otherwise. After such a CPUC decision, the Project must interconnect as stipulated in that CPUC determination unless the next sentence applies. Those Projects that request interconnection pursuant to Rule 21 or WDT and have submitted a completed Program Participation Request (PPR) under this Schedule prior to any final CPUC determination will not be required to switch interconnection tariffs and will continue to be eligible to receive service under this Schedule, provided the Project is otherwise eligible.

6. Site Control: The Applicant must provide to PG&E, SCE, or SDG&E [based on the service territory] an attestation that it has 100% site control for the Project through: (a) direct ownership; (b) lease; or (c) an option to lease or purchase that may be exercised upon execution of the ReMAT PPA. The Applicant is required to submit a map showing the boundary of the Site for which the Applicant has control as part of the PPR. PG&E, SCE or SDG&E [based on service territory] reserve the right to request additional information.

7. Developer Experience: The Applicant must provide an attestation that at least one member of its development team has: (a) completed the development of at least one project of similar technology and capacity; or (b) begun construction of at least one other project of similar technology and capacity. A project less that 1 MW will be deemed to be similar capacity to a Project up to 1 MW. A project between 1 MW to 3 MW will be deemed to be a similar capacity to a Project up to 3 MW. For example, for a 3 MW Project, a project of similar capacity cannot be smaller than 1 MW.

8. Daisy Chaining: The Applicant must provide an attestation that the project is the only exporting project being developed, owned or controlled by the Applicant on any single or contiguous pieces of property. PG&E, SCE, or SDG&E [based on service territory] may, at its sole discretion, determine that the Applicant does not satisfy this Eligibility Criteria if the Project appears to be part of a larger installation in the same general location that has been or is being developed by the Applicant or the Applicant's Affiliates.

9. Other Incentives: A Project that previously received incentives under the California Solar Initiative or the Self-Generation Incentive Program is ineligible for ReMAT if the incentives were received within ten years or less of the date that Applicant submits a PPR for ReMAT for such Project. An Applicant for a Project that previously received incentive payments under the California Solar Initiative or the Self-Generation Incentive Program must provide an attestation stating that, as of the date the Applicant submits the PPR: (1) the Project has been operating for at least ten years from the date the Applicant first received ratepayer-funded incentive payments under either incentive program for the Project; and (2) to the extent the CPUC requires reimbursement of any ratepayer-funded incentive, the Applicant can demonstrate the Project's owner has provided the applicable incentive administrator with any required refunds of the incentives.

10. Net Energy Metering: An Applicant that is a net energy metering (NEM) customer can only participate in ReMAT if the Applicant terminates its participation in the NEM program for the Project prior to the ReMAT PPA's Commercial Operation Date.

The following list discusses each of the ten Eligibility Criteria and their implications for the North Fork Project:

1. Territory: The North Fork proposed project site is within PG&E territory and passes this criteria.

2. Eligible Renewable Energy Resource: The biomass to electricity proposed project qualifies an eligible resource.[31]

3. Qualifying Facility: The proposed biomass to electricity project in North Fork qualifies as an FERC qualifying facility. [32]

4. Contract Capacity: The proposed biomass project is less than 3.0 MW.

5. Interconnection Study/Strategically Located: The North Fork project has not completed an Interconnection Study to identify projects costs for the definition of strategic location. This eligibility screen could be challenging for a project located in a rural area.

[31] The 5th Edition of the Commission Guidebook for Renewables Portfolio Standard Eligibility defines the Eligible Renewable Energy Resources. The definition for biomass is defined as:

> "any organic material not derived from fossil fuels, including, but not limited to, agricultural crops, agricultural wastes and residues, waste pallets, crates, dunnage, manufacturing, construction wood wastes, landscape and right-of-way tree trimmings, mill residues that result from milling lumber, rangeland maintenance residues, biosolids, sludge derived from organic matter, wood and wood waste from timbering operations, and any materials eligible for "biomass conversion" as defined in Public Resources Code Section 40106.
>
> Agricultural wastes and residues include, but are not limited to, animal wastes, remains and tallow; food wastes; recycled cooking oils; and pure vegetable oils.
>
> Landscape or right-of-way tree trimmings include all solid waste materials that result from tree or vegetation trimming or removal to establish or maintain a right-of-way on public or private land for the following purposes:
>
> 1) For the provision of public utilities, including, but not limited to, natural gas, water, electricity, and telecommunications.
> 2) For fuel hazard reduction resulting in fire protection and prevention.
> 3) For the public's recreational use."

[32] Qualifying Facilities fall into two categories: qualifying small power production facilities and qualifying cogeneration facilities. (http://www.ferc.gov/industries/electric/gen-info/qual-fac/what-is.asp)

> A small power production facility is a generating facility 80 MW or less whose primary energy source is renewable (hydro, wind or solar), biomass, waste, or geothermal resources. There are some limited exceptions to the 80 MW size limit that apply to certain facilities certified prior to 1995 and designated under section 3(17)(E) of the Federal Power Act (16 U.S.C. § 796(17)(E)), which have no size limitation. In order to be considered a qualifying small power production facility, a facility must meet all of the requirements of 18 C.F.R. §§ 292.203(a), 292.203(c) and 292.204 for size and fuel use, and be certified as a QF pursuant to 18 C.F.R. § 292.207.
>
> A **cogeneration facility** is a generating facility that sequentially produces electricity and another form of useful thermal energy (such as heat or steam) in a way that is more efficient than the separate production of both forms of energy. For example, in addition to the production of electricity, large cogeneration facilities might provide steam for industrial uses in facilities such as paper mills, refineries, or factories, or for HVAC applications in commercial or residential buildings. Smaller cogeneration facilities might provide hot water for domestic heating or other useful applications. In order to be considered a qualifying cogeneration facility, a facility must meet all of the requirements of 18 C.F.R. §§292.203(b) and 292.205 for operation, efficiency and use of energy output, and be certified as a QF pursuant to 18 C.F.R. § 292.207. There is no size limitation for qualifying cogeneration facilities.

6. Site Control: North Fork is anticipated to be able to work with the development team to arrange appropriate site control documentation after purchase of the site.

7. Developer Experience: Phoenix Energy has developed a project larger than 1 MW; therefore they will be able to meet the developer experience requirements.

8. Daisy Chaining: The proposed project is not part of any other energy development projects and should not have any issue with the daisy chaining provision.

9. Other Incentives: Since this project does not yet exist, no additional incentives have been received.

10. Net Energy Metering: Since this project does not yet exist, there is no NEM contract to cancel to meet the requirements of this provision.

The only ReMAT eligibility criteria that could be challenging for the North Fork bioenergy project would be the Interconnection Study/Strategically Located provision. The remainder of this task will be based on engineering necessary to prepare the project for the System Impact Study.

The SB 1122 ReMAT proceedings are still underway. There has been discussion amongst the CPUC and those organizations with party status to the proceedings (including PG&E, SCE, SDG&E, the Bioenergy Association of California, Placer County Air District, Phoenix Energy, Center for Biological Diversity, and Pacific Forest Trust among others). The SB 1122 proceedings are intended to identify any modifications to the standard ReMAT necessary to support bioenergy's specific needs. This proceeding should be watched to fully understand the SB 1122 ReMAT process.

Currently, the SB 1122 ReMAT program is expected to have a starting price of $0.124/kWh. Depending on industry participation, the offerings may increase, decrease, or remain constant. Offering will increase if there is sufficient industry participation (total number of potential projects) and if participants do not accept the previous offering. Price increases are $0.004/kWh to $0.128/kWh for the first price jump, $0.008/kWh to $0.136/kWh for the second price jump, and $0.012/kWh for all subsequent intervals. The price jumps begin again at the first price jump if a project accepts the offering. Offerings occur every 2 months. TSS reiterates that at the time of this report, the SB 1122 ReMAT proceedings have not been finalized.

Biochar

Biochar is a carbon-based byproduct of gasification technology. Biochar is largely fixed carbon and is a charcoal or ash-like substance. Biochar has physical characteristics that make it a potential soil amendment. The biochar market as a soil amendment is immature and subject to significant market fluctuations. Biochar has sold in small quantities for over $1 per pound and in bulk for $700 to $1,500 per ton. As this is an emerging market, TSS conservatively included a

biochar sales price of $100 per ton to account for changes in the market or limited sustained demand.

In addition to soil amendment, research is currently being conducted for the use of biochar as an activated charcoal feedstock. If biochar could be activated and compete with the existing activated charcoal market, a significant increase in demand would arise. However, this market does not currently exist for biochar as no biochar is current being activated outside of research settings.

TSS devalued the potential revenue stream for this potential resource due to the immaturity of the market and the potential for price destabilization as new producers enter the market. While the market is relatively small, several bioenergy facilities (for both electricity and biofuels) have announced biochar production and sales that will greatly increase the available supply if delivered.

Phoenix Energy is a leader in biochar sales and marketing and is therefore a strong partner for the North Fork project.

Labor Force Wages and Availability

Biomass CHP applications are expected to generate approximately nine to ten additional jobs onsite as a minimum of two employees are expected to be onsite during all hours of operation. Even with a 1 MW project, the feedstock demand is relatively low. However, the additional demand for forest-sourced material will help support existing jobs. Table 13 outlines the onsite jobs that are anticipated for the North Fork project.

Table 13. Labor Force Requirements

JOB TITLE	EXPERIENCE & SKILL SETS
Plant Manager (1)	Experience managing a biomass CHP facility preferred. Strong personnel management skills and experience with preventive, scheduled, and reactive maintenance on large mechanical equipment. Millwright skillsets.
Senior Operators (3)	Experience as lead operator at a biomass CHP facility preferred. Understanding of operating systems control software. Hands on experience operating and maintaining large engines. Instrument calibration experience.
Operators (5)	Basic understanding of power generation facility. Pipefitting and welding. Skill sets within the plant operators should include: • Journeyman level electrician, specifically with pumps, breakers, and small motors; • Journeyman level plumbing and pipefitting; • Metal fabrication skills; • Cross training in multiple disciplines is preferred; and • Operate rolling stock including forklift and loaders (chip handling equipment).
Office Manager (1)	Administrative and payroll experience preferred. Working knowledge and hands-on experience with Microsoft word/excel and Intuit QuickBooks.

With an unemployment rate of 12.6% throughout Madera County (see Appendix A), it is anticipated that most of the employment can be sourced from within North Fork as many of the skill sets required to run the bioenergy facility carry over from the sawmill (closed in 1994).

TEAM MEMBER QUALIFICATIONS

The North Fork development team will be led by Phoenix Energy as the technology lead developer and the North Fork CDC for local support, administration, and outreach. A limited liability corporation (LLC) was developed to finalize the partnerships, North Fork Community Biomass Power, LLC.

Phoenix Energy

Phoenix Energy has developed a 0.5 MW project (Merced) and a 1.0 MW project (Modesto). Both facilities have received Authority to Construct permits from the San Joaquin Valley Air Pollution Control District. At this time, Phoenix Energy has developed the two largest commercial-scale gasification systems in California.

Project Supervision – Gregory Stangl

Mr. Stangl has led Phoenix Energy since its inception in 2007 and was a founding partner of its European sister company Energy Investors in 1999. In addition to overseeing all aspects of the firms' developments Mr. Stangl has had personal responsibility for all of the gasification projects since conducting the first projects in Europe in 2003 as well as prior developments in biomass to heat applications. In addition to project management this has included directing all aspects of state & local permitting, finance, procurement, operations management, government and community relations, etc. Mr. Stangl holds an MBA and an MIA (Economics), with honors, from Columbia University and a BA, with honors, from Virginia Polytechnic Institute.

Design Engineering - Matt Cook

Mr. Cook has been working with Phoenix Energy as a design engineer and subsequently lead project engineer since 2010. Mr. Cook has been deeply engaged in design, construction and operations of the company's Merced, CA gasification plant as well as serving as lead project engineer, supervising all engineering aspects of the companies' 1 MW gasification plant near Modesto, CA. Mr. Cook has intimate working knowledge of solutions and approaches designed to make gasification both operator friendly and appropriate to the permit conditions in both the State of CA and the San Joaquin Valley Air Pollution Control District. Prior to joining Phoenix Energy, Mr. Cook worked in the wind power industry. Mr. Cook has a degree in Mechanical Engineering from UC Santa Barbara.

Engine Systems Design – Roger Fleig

Mr. Fleig has primary responsibility for power generation and switchgear design applications on the Phoenix team. Mr. Fleig oversaw the commissioning of the CAT 3516 at the Company's Merced facility and all aspects of power gen design at the Company's 1MW facility near Modesto. Over the past 15 years, Mr. Fleig has been involved in numerous projects utilizing low BTU fuels in reciprocating engines, in landfills, waste-water treatment, large livestock facilities and wellhead gas operations. After joining Phoenix Energy, Roger's design changes led to a 17% increase in power generation capacity above the rated 500KW of the Company's Merced facility.

Prior to his 15 years in the gas genset field, Mr. Fleig spent 22 years in the Aerospace industry working as a flight line electrical technician. Mr. Fleig attended the University of California Berkeley earning his degree in Electoral Engineering.

North Fork CDC

President – Dan Rosenberg

Dan Rosenberg is the President of the North Fork Community Development Council. A board member for 7 of the past 14 years, Dan has worked with fellow board members to complete the clean-up of contamination at the former mill site. He has also played a key role in the efforts to upgrade the site infrastructure and pave the way for businesses to locate there. Dan is a consultant with the College Brain Trust, a national community college consulting firm. He specializes in strategic planning and educational master planning. Dan earned a Bachelor of Science degree in Economics from the Wharton School at the University of Pennsylvania.

POTENTIAL GRANT FUNDING RESOURCES

TSS and The Grant Farm staff [33] conducted a literature search for grant and loan support targeting small-scale bioenergy projects. Outlined below are the results.

The Grant Farm is currently under contract with the Sierra Nevada Conservancy to provide advice and support, including grant-writing services.

Rural Energy for America Program (REAP)

Administered by the USDA Rural Business-Cooperative Service, this program replaced the Renewable Energy Systems and Energy Efficiency Improvements program in the 2002 farm bill. The program provides grants and loans for a variety of rural energy projects, including efficiency improvements and renewable energy projects. Assistance is limited to small businesses, farmers and ranchers with projects located in a rural community. REAP grants and guarantees can be used individually or in combination. Together the grants and loan guarantees can finance up to 75% of a project's cost. Grants alone can finance up to 25% of the project cost, not to exceed $500,000 for renewables and $250,000 for efficiency.

Wood to Energy Grants

Administered by the USFS, the Wood to Energy Grant program (formerly known as the Woody Biomass Utilization Grant program) is a nationally competitive grant program that supports wood energy projects requiring engineering services. The projects use woody biomass material removed from forest restoration activities, such as wildfire hazardous fuel treatments, insect and disease mitigation, forest management due to catastrophic weather events, and/or thinning overstocked stands. The woody biomass must be consumed in a bioenergy facility that uses commercially proven technologies to produce thermal, electrical or liquid/gaseous bioenergy. Maximum grant is $250,000.

Biomass Research and Development Initiative

Administered by the US Department of Agriculture and the US Department of Energy. Both agencies produce joint solicitations each year to provide financial assistance in addressing research and development of biomass based products, bioenergy, biofuels and related processes. Approximate funding per project is $7,500,000.

Business and Energy Guaranteed Loans

Administered through the US Department of Agriculture. To improve, develop, or finance business, industry, and employment and improve the economic and environmental climate in rural communities.

[33] Shawn Garvey, CEO, The Grant Farm.

Electric Program Investment Charge (EPIC)

The CPUC adopted the Electric Program Investment Charge (EPIC) in December 2011, authorizing the collection of system benefits charges for renewables and research, development, and demonstration purposes. Program funding is collected from California's three largest electric investor-owned utilities, PG&E, Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E) at the level of $162 million per year. The California Energy Commission is designated as the program administers for this funding. They publish a triennial investment plan which sets for funding priorities for each three-year period. Both the 2012-2014 and the 2015-2017 investment plans include the category: Demonstrating Bioenergy Solutions that Suppot California's Industries, the Environment, and the Grid. The 2012-2014 plan has allocated $27 million dollars for grants in the area with the maximum grant amount of $5 million.

OBSERVATIONS

The results of this feasibility evaluation indicate that the optimized outcome for development of a new value-added enterprise at the North Fork mill site is the siting of a small-scale, 1 MW biomass power generation facility.

Opportunities

Stakeholder meetings confirm a high level of support for development of a small-scale biomass power generation facility. Community support appears positive.

The CPUC is currently convening a feed-in tariff rulemaking process (SB 1122) that will result favorable power sales rates.

The Governor is very supportive of small renewable power generation systems.

There may be an opportunity to include the participation of the Central Valley Business Incubator and the Water, Energy and Technology Center when considering next steps. Members of both organizations attended the August 29, 2011 tour of the Phoenix Energy facility.

Obstacles

<u>Power Sales</u>

Favorable power sales rates are key to attracting private sector financing. If favorable power sales or a combination of grant funding and favorable power sales rates can be achieved, then project success should follow.

Feedstock Supply

Sustainable forest biomass availability is critical to the successful development of a new biomass power generation facility at North Fork. It is imperative that community outreach (e.g., Willow Creek Collaborative and Sustainable Forests and Communities Collaborative) process continue so that local residents can provide critical input to the USFS. Forest restoration and fuels treatment activities will only be implemented with stakeholder support. TSS is currently providing technical assistance to the Sierra Nevada Conservancy, the Bass Lake Ranger District, and the Sustainable Forests and Communities Collaborative. TSS worked closely with these organizations to convene a stewardship contacting symposium on May 22, 2014. The symposium attracted a variety of stakeholders, including local fuels treatment and timber harvest contractors. A primary focus of the symposium was a field review of the West Chiquito project that is a candidate for a long-term stewardship contract to conduct landscape level fuels treatment and restoration activities. The Bass Lake Ranger District staff is coordinating with the Regional Office (Region 5 USFS) to develop a 10 year stewardship contract to implement the West Chiquito project.

NEXT STEPS

This feasibility evaluation found that a small-scale biomass power generation facility sited at North Fork is an optimized arrangement utilizing locally available feedstocks and local talent (forest restoration and fuels treatment contractors) in support of a sustainable forest restoration economy.

Outlined below are next steps for the CDC and the North Fork Community Biomass Power, LLC to consider (in order of implementation).

- Develop and implement a communications plan to educate CPUC staff, elected officials (including Governor's staff), agencies and other target audiences on the societal benefits of siting sustainable, small-scale biomass power generation facilities at strategic forest landscape locations in California.
- Develop and implement a strategic plan to source federal and state grants/loan guarantees.
- Seek out potential private/public sector partnerships.
- Review options for use of thermal energy (e.g., lumber kiln, firewood kiln, greenhouse).
- Pursue SB 1122 eligibility requirements to be prepared for the beginning of the auction process.
- Secure state/federal grant support to offset a portion of capital expenses.
- Prepare a fuel procurement plan.
- Secure financing.
- Engineer, construct and start up.

APPENDIX A - MADERA COUNTY UNEMPLOYMENT STATISTICS

Madera County Profile

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About this area:

Centrally located, Madera is bordered by Mariposa and Merced to the north, Fresno to the south, and Mono to the east. The county combines the high, rugged country of the Sierra Nevada Mountains and the farming and industrial land of the valley floor below. Most of its industrial and residential activity is positioned along Highway 99, the area's primary transportation route, which provides a north-south corridor through the county.

EMPLOYMENT AND WAGES

Unemployment Rate and Labor Force (Not Seasonally Adjusted)

[Top]

Area	Year	Time Period	Labor Force	No. of Employed	No. of Unemployed	Unemployment Rate
Madera County	2014	Apr	66,100	58,700	7,400	11.2

More Areas Historical Data Get More Info (Data Library)

Employment by Industry (Not Seasonally Adjusted)

[Top]

Year	Time Period	CES Industry Title	No. of Employed
2014	Apr	Total Wage and Salary	15,810,000
2014	Apr	Total Nonfarm	15,421,100
2014	Apr	Service Providing	13,492,100
2014	Apr	Total Private	12,998,900
2014	Apr	Private Service Providing	11,069,900

More Historical Data Get More Info (Data Library)

Data for Madera County is not available. Data for California has been displayed for Employment by Industry (Not Seasonally Adjusted)

Occupations with Fastest Job Growth (% change)

[Top]

Occupation	Estimated Year - Projected Year	Employment Estimated	Employment Projected	Employment Change Number	Employment Change Percent
Demonstrators and Product Promoters	2010 - 2020	50	80	30	60.0
Team Assemblers	2010 - 2020	280	440	160	57.1
Printing Workers	2010 - 2020	20	30	10	50.0
Highway Maintenance Workers	2010 - 2020	20	30	10	50.0
Automotive Body and Related Repairers	2010 - 2020	20	30	10	50.0

More Get More Info (Data Library)

Projections of Employment by Industry

High Wage Occupations

[Top]

Hourly Hourly by Percentile

Occupation	Year	Time Period	Mean	25th	Median	75th
Physicians and Surgeons, All Other	2013	1st Qtr	$120.78	$0.00	$0.00	$0.00
Family and General Practitioners	2013	1st Qtr	$94.61	$77.52	$0.00	$0.00
Dentists, General	2013	1st Qtr	$91.30	$56.76	$0.00	$0.00
Chief Executives	2013	1st Qtr	$66.83	$38.07	$62.25	$0.00
Computer and Information Systems Managers	2013	1st Qtr	$66.74	$51.03	$60.00	$77.24

More Get More Info (Data Library)

Data for Madera County is not available. Data for Madera MSA has been displayed for High Wage Occupations

ECONOMIC INDICATORS

Building Permits (US Census Bureau)

[Top]

Type of Permit	Year	Time Period	No. of Permits	Total Costs
Multi-Family	2012	Annual	42	$2,140,944
Single Family	2012	Annual	115	$22,700,226
Total all types construction permits	2012	Annual	157	$24,841,170

More Areas Historical Data

Consumer Price Index (US BLS & Calif. DIR)

[Top]

Area	Consumer Price Index				% Change
	Time Period	2012	Time Period	2011	
United States	Annual	229.6	Annual	224.9	2.1
California	Annual	238.2	Annual	232.9	2.2

Historical Data Get More Info (Data Library)

Data for Madera County is not available. Data for California has been displayed for Consumer Price Index (US BLS & Calif. DIR)

Median Price of Existing Homes Sold (DQnews)

[Top]

Year	Time Period	Type	Median Price
2013	Sep	Median Price of Homes Sold	$160,000

More Areas Historical Data Data from the DQnews

State Revenues by Source

[Top]

Tax Type Description	Year	Time Period	Tax Revenue
Alcoholic Beverage Taxes and Fees	2011	Annual	$346,000,000
Bank and Corporation (Income) Taxes	2011	Annual	$7,949,000,000
Cigarette Tax	2011	Annual	$895,677,000
Horse Racing (Parimutuel) License Fees	2011	Annual	$15,838,000
Estate, Inheritance and Gift Taxes	2011	Annual	$0

More Areas Historical Data

Data for Madera County is not available. Data for California has been displayed for State Revenues by Source

Taxable Sales (Calif. Board of Equalization)

[Top]

Year	Time Period	Sales Type Description	Sales

2011	Annual	Retail	$1,281,869

More Areas Historical Data

POPULATION AND CENSUS DATA

Population

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Area	Year	Time Period	Source	Population
Madera County	2012	Annual	California Dept of Finance	151,790

More Areas Historical Data Get More Info (Data Library)

Measures of Income

[Top]

Income Type	Year	Time Period	Income	Population
Per Capita Personal Income - BEA	2011	Annual	$28,631	152,925
Total Personal Income - BEA	2011	Annual	$4,378,332	152,925

More Areas Historical Data Get More Info (Data Library)

County-to-County Commute Patterns (US Census Bureau)

[Top]

Year	Time Period	Area of Residence	Area of Work Place	Number of Workers
2000	Census	Madera County , CA	Madera County , CA	28,197
2000	Census	Madera County , CA	Fresno County , CA	9,765
2000	Census	Fresno County , CA	Madera County , CA	7,674
2000	Census	Merced County , CA	Madera County , CA	1,179
2000	Census	Madera County , CA	Merced County , CA	1,002

More Historical Data

JOB OPENINGS & TRAINING PROVIDERS

Job Openings from JobCentral National Labor Exchange

[Top]

Job Openings

Training Providers in Area

[Top]

Provider Name	Provider Type	Location
Madera Adult School	Schools with Occupational Programs (ROP)	Madera,CA
Madera Beauty College Inc.	Apprenticeship, Business, Career, & Tech Schools	Fresno,CA
Emerson Theological Institute	Other (incl. religious schools and seminaries)	Oakhurst,CA
State Center Community College District	Community Colleges (two-year school)	Madera,CA
State Center Community College District	Community Colleges (two-year school)	Oakhurst,CA

More

APPENDIX B - INITIAL STAKEHOLDER MEETING NOTES

April 26, 2011 Initial Community Stakeholders Meeting
Concerns and Vision Meeting
TSS Consultants – Rural Business Enterprise Grant Feasibility Evaluation Study
Meeting Notes

Attendees:

Tad Mason, CEO - TSS Consultants
(916) 266-0546 — tmason@tssconsultants.com
Mark Stanley, Forestry/Fire Specialist — Sierra Nevada Conservancy
(530) 644-1631 — mstandley@sierranevada.ca.gov
Dan Rosenberg, President - North Fork Community Development Council
(559) 877-6444 — lldanj@gmail.com
Steve Haze, First Vice President - Yosemite-Sequoia Resource Conservation & Development Council
(559) 970-6320 — stevehaze007@gmail.com
Elissa Brown, Grantwriter
(559) 877-6585 — elissa.j.brown@gmail.com
Steve Mitchell – NFCDC Board Member & North Fork Chamber
(559) 877-8708 — stevemitchell@netptc.net
Sandy Chaille – NFCDC Board Member & North Fork Volunteer Fire Department Auxiliary
(559) 760-4950 — c.chaille@netptc.net
Diann Miller – NFCDC Board Member & Foundation for Resource Conservation
(559) 877-4620 — djmiller@netptc.net
Sarah Rah – NFCDC Board Member & Consultant
(559) 877-7272 — rah.sarah72@gmail.com
Bernard "Barney" Berrier – Community member
(559) 760-4100 — bernardberrier@gmail.com
Walt Ellis – Rancher
559-930-5820 — PO Box 1, North Fork CA 93643

Discussion:

- Steve Haze and Elissa Brown gave an overview of the Biomass Feasibility Study project.

- Tad Mason introduced his consulting firm, which focuses on value-added woody biomass and biomass-to-energy projects.

- Elissa Brown sought input from attendees on what they wanted to see happen on the Mill Site, what their concerns might be, and ideas for future projects. Reviewed plans for development of a collaborative group in the area, one that can provided collective input to the USFS with regards to the Willow Creek Watershed Restoration Project.

- Steve Mitchell and Sandy Chaille emphasized the need for jobs, while expressing possible concerns over traffic and noise, depending on what types of projects might be proposed. Concerned about property values.

- Sarah Rah recapped prior community workshops, studies, land planning issues and Mill Site characteristics. One of the best options would be for a "master developer" or like firm that can take the lead to facilitate and attract sustainable businesses to the North Fork mill site. Lot's of local talent in the greater North Fork area. Region is located near a major recreational route (Hwy 41) and all weather road (Road 200).

- Steve Haze described YSRC&D's economic development initiatives for forest-related communities in Mariposa, Madera, Fresno and Tulare Counties, with nearly $800,000 in grants under contract or pending.

- Dan Rosenberg talked about objectives to develop the Mill Site and lot split opportunities. Looking for a suite of economically viable options. Need to attract enterprises that will add value to the community (jobs) and have sustainable business models. Reviewed some of the local population dynamics – median age of 49. Many retirees moving into the area due to attractive home prices and scenic beauty.

- Barney Berrier reflected on sustainability issues and how water + biomass + agriculture can all be inter-related. Concerned about losing local talent and skill sets. Provided overview of Energyflex, Inc. to Tad Mason. Briefly addressed the demographic mix in the immediate North Fork area – loggers/ranchers/retirees/Indians.

- Walt Ellis talked about the core expertise of local ranchers and loggers on rangeland and forest management. Stressed that the #1 issue facing the community is wildfire. Portable sawmill operators (maybe five in the area) are trying to salvage and utilize locally available timber. Trying to carve out a living but sustainable availability of sawlogs is challenging.

APPENDIX C – FOLLOW-UP STAKEHOLDER MEETING NOTES

June 2, 2011 Community Stakeholder Follow-up Meeting
TSS Consultants – Rural Business Enterprise Grant
Feasibility Evaluation Study
Meeting Notes

Attendees:

Tad Mason, CEO - TSS Consultants
916-266-0546 tmason@tssconsultants.com
Gareth Mayhead - Woody Biomass Technology Marketing, UC Berkeley
510-665-3662 gmayhead@berkeley.edu
David Martin - Ranger, Sierra Nevada Forest, Bass Lake Ranger District
559-877-2218 dmartin05@fs.fed.us
David Konno - Yosemite Sequoia Resource Development & Conservation
559-877-8663 konno95018@yahoo.com
Norman Allinder, Madera County Planning Director
559-675-7821 norman.allinder@madera-county.com
Larry Wright - Madera County Planning Commissioner
559-658-7201 wright2go@sti.net
Elissa Brown - Grantwriter
559-877-6585 elissa.j.brown@gmail.com
Jim McDougald - CalFire Battalion Chief, Pre-Fire Coordinator
559-243-4130 jim.mcdougald@fire.ca.gov
Clark Daley - CalFire Captain, Rancheria Forest Fire Station
559-877-2322 cdaley@fire.ca.gov
Christy Hansard - North Fork Mono Rancheria Environmental Department
559-877-2461 chansard@northforkrancheria-nsn.gov
Charles Sikora - Sikora Forest Consulting
559-658-5885 sikoraforestry@sti.net
Steve Mitchell - North Fork Chamber of Commerce
877-8708 stevemitchell@netptc.net
Bernard "Barney" Berrier - Community member
559-760-4100 bernardberrier@gmail.com
Marc Mandel - Crossroads Recycled Lumber
559-877-3645 marc@crossroadslumber.com
Diann Miller - North Fork Community Development Council & Foundation for Resource Conservation
559-877-4620 djmiller@netptc.net
Sarah Rah - North Fork Community Development Council
559-877-7272 rah.sarah72@gmail.com
Mike Gomez - Firefighter 1 - Rancheria Forest Fire Station
559-877-2322

Tad Mason, TSS Consultants introduced the preliminary draft report for the value-added biomass feasibility study his firm is preparing. The report will include a vegetation coverage map showing one million acres of forested lands and 460,000 acres of shrub and brushlands. Target Study Area includes region within 30 mile radius of North Fork. Major landowners/managers include Sierra National Forest (Bass Lake RD), Wilderness Preserves, National Park Service, State Recreation Areas, Bureau of Land Management and private owners. Areas within the 30 mile radius south of the San Joaquin River have been excluded for estimating biomass volumes, due to impractical access (transport issues). Within the 30 mile "practical" radius, historically 4-6 million board feet of sawtimber have been harvested per year on average over the past five years. Additionally, history shows 100 acres per years of pre-commercial thinning on USFS managed lands. Total woody biomass material considered practically available is approximately 12,670 bone-dry-ton of biomass available annually from the target Study Area. Existing markets for biomass material includes:

- Small pine logs to California Wood Shavings (animal bedding shavings facility near Sonora). Recent prices for small ponderosa pine logs - $32/GT.
- Biomass power – closest facilities are offering up to $48/BDT.
- Alpine Sierra Green Cycle

Other initial findings:

- There is enough woody biomass material available in the target study area to support a small biomass power generation facility scaled at 1MW. Small biomass gasification technologies like Phoenix Energy (currently operating .5 MW pilot plant at Merced, CA) show promise.
- Value added enterprises to consider at North Fork:
    - Mobile dimension sawmill
    - Post and pole operation
    - Firewood operation
- Long-term biomass feedstock availability is key. Business enterprises will not be able to secure capital needed to invest in new equipment unless raw material feedstocks are available long term. 10 year stewardship contracts would be very helpful.

Larry Wright, Planning Commission Chair suggested the County might offer fee mitigations for new projects sited at North Fork.

Norman Allinder, Planning Director recommended that a master conditional use permit or an amended conditional use permit could apply if a biomass power generation facility was sited at North Fork.

Elissa Brown, Grant Writer suggested there may be funding sources to address technical assistance and engineering to improve the Mill Site's development potential. She said it's important to identify what entities will implement the report's findings and recommendations — the County? North Fork CDC? Yosemite-Sequoia RC&D? Or others? Collaborative stakeholder process may assist with facilitation of long term sustainable supply of sawtimber through the use of stewardship contracts on the Bass Lake RD.

Gareth Mayhead of UC Berkeley reported he and TSS are developing a matrix defining value added utilization alternatives and options. He reviewed the matrix and discussed value added

options. Market opportunities will be defined by feedstock type and specifications.

Dave Martin, Bass Lake District Ranger explained special opportunities for North Fork's "blue stain" wood that is colored by beetle infestation to create a unique product with a niche market potential. He said the two primary bidders for USFS contracts are Sierra Forest Products and Sierra Pacific Industries. Of those, Sierra Forest Products is mostly like to be receptive to joint-venture opportunities. Currently planning timber sales scaled at 2 – 4 million board feet, due to cost effective scale (USFS staff time is more efficient when putting up large timber sales). Current timber sale contract term is three years.

Charles Sikora, Consulting Forester discussed handling slash piles and log trimming and other technologies. Mariposa and the Weaverville Community Forest concept may be models to consider.

Marc Mandel, Owner, Crossroads Recycled Lumber discussed possible interest in processing salvage logs (e.g., bluestain pine) at CRL. Currently have a small wood mizer sawmill on site. Might consider a mobile dimension mill, but would need consistent supply of 16" plus diameter sawlogs.

General discussion by all stakeholders covered other opportunities and ideas.
Next Steps:

- TSS will generate draft feasibility evaluation report by August 1, 2011.

APPENDIX D - VALUE-ADDED UTILIZATION MATRIX

Process or Product	Development Status	Feedstock Specifications	Jobs (FTE) Low	Jobs (FTE) High	Main Equipment	Market Potential	Comments
Wood fuel pellets	Commercially deployed	Clean, dry (<10% mc) chip, needs to be <1% ash.	15	85	Pellet mill, dryer, cooler, hammermill, packaging.	Domestic users now, animal bedding now, potential for boilers (including co-fire with coal), niche barbeque pellets? Large scale gives access to international markets for co-firing.	Use of biomass from forest possible (e.g., small logs or chips low in bark) - key issue and expense is drying system. Larger scale facility will face challenges in gaining market share for domestic stoves. Large scale export facility will have feedstock sourcing challenges and exposure to currency exchange rate risk.
Fuel bricks	Commercially deployed	Chip, dry (<15% mc), needles, bark okay.	3	6	Brick machine, dryer, cooler, hammermill, packaging.	Substitute for firewood is the primary market.	Potential to use field dried material as feedstock?
Fire logs	Commercially deployed	Clean, dry (<10% mc) chip, needs to be <1% ash.	3	9	Log machine, dryer, cooler, hammermill, packaging.	Substitute for firewood is the primary market.	Use of biomass from forest possible (e.g., small logs or chips low in bark) - key issue and expense is drying system.

Process or Product	Development Status	Feedstock Specifications	Jobs (FTE) Low	Jobs (FTE) High	Main Equipment	Market Potential	Comments
Wood plastic composites (WPC)	Commercially deployed	Clean, dry (2-12% mc) wood flour. Wood is ~55% of feedstock along with plastic and additives. Recycled wood use common.	0	0	Blender (compounder extruder), extrusion line, cooler, cut-off saw.	Landscape (bender board), decking, park furniture (picnic tables and seats).	Requires cost effective thermoplastic feedstock (HDPE, LDPE, PP, PVC). Utilize recycled plastics (milk jugs, plastic bags). Commercial facilities typically use pine, oak and maple. Blending (compounding) of wood and plastic may be 2 processes or single process depending upon equipment. Commercial molding processes typically continuous extrusion or batch injection molding. Other processes such as resin transfer molding (RTM) and others not commercially deployed. Could just make compounded wood-plastic pellets for WPC manufacturers.
Compound pellets for WPC production	Commercially deployed	Clean, dry (2-8% mc) wood flour. Wood is ~55% of feedstock along with plastic and additives. Recycled wood use common.	0	0	Compounder extruder.	Existing WPC mills (none in CA).	Cheaper way to get into WPC market place than making finished products.
Decorative bark	Commercially deployed	Small roundwood that is easily de-barked. Raw bark from sawmills is common feedstock source.	2	6	Debarker (flail, ring or rosser head), screen (trommel or flat).	High value up in urban areas (FOB $<100/ton)	As sawmill residuals become scarce, value of bark for landscape cover increases. Alternative use is hog fuel.

Process or Product	Development Status	Feedstock Specifications	Jobs (FTE) Low	Jobs (FTE) High	Main Equipment	Market Potential	Comments
Decorative chip	Commercially deployed	Bark free and sized (no fines) wood chip.	2	6	Debarker (flail, ring or rosser head), screen (trommel or flat).	Colorized landscape cover sold in bulk and/or bagged.	Colored landscape cover requires additional equipment (colorizer). Feedstock (bark free chip) has alternative markets such as pulp/paper and furnish for composite products (particleboard/hardboard/decking).
Heating (buildings)	Commercially deployed	Woody biomass chipped to 3"minus, 50% mc, 3% ash.	1	2	Boiler system and hot water or steam delivery system.	Especially cost effective if replacing existing heating oil or propane heat. Can use for cooling also (using absorption chillers).	Fuel sizing has been an issue with recently installed thermal energy facilities. Typical installations include schools, hospitals, and community buildings.
Firewood	Commercially deployed	Roundwood (hardwood is preferred) logs that can be processed using automated firewood processor.	2	8	Log splitter or firewood processor.	Could be marketed to urban centers in boxes or bundles. Hardwood worth more. Higher prices for firewood near to affluent urban areas.	Numerous firewood contractors already in place. Some large contractors have significant market share.
Post and pole	Commercially deployed	Straight, low taper softwood (lodgepole, ponderosa, white fir) is preferred.	5	15	Rosser head peeler and/or doweller. Sorting line. Bucking saw.	Sold to treating facilities. Market treated posts for landscape timbers, vineyards (used to suspend vine wires) fences, furniture.	Need to treat - where is nearest facility? See map of treating facilities on website.

Process or Product	Development Status	Feedstock Specifications	Jobs (FTE) Low	Jobs (FTE) High	Main Equipment	Market Potential	Comments
Small scale sawmill	Commercially deployed	Medium to large size roundwood.	2	10	Debarker, head rig, resaw, edger.	May need to target specialty markets to secure optimal value for products.	Tough to compete with large scale sawmills for logs and lumber sales. Niche markets for lumber is important. Most lumber is low value commodity product.
Lumber kiln	Commercially deployed	Lumber products or firewood	1	2	Kiln (steam or dehumidifier).	Kiln dried lumber has added value in the market place. Transport of dried lumber products is more cost effective (due to lower weight).	Could also dry firewood or heat treat lumber and packaging to meet ISPM15. Could use waste wood as a fuel source.
Gasification	Demonstration projects	Woody biomass chipped to 3"minus, 30% mc, 3% ash. Drier fuel preferred.	2	5	Gasifier, gas clean-up, IC engine or turbine-generator.	Technology is evolving quickly and is becoming more cost effective.	Only appropriate where electrical and thermal energy wholesale rates are high. Or in remote installations where power is not currently available.
Slow pyrolysis	Commercially deployed	Wood pieces (flexible spec).	1	2	Charcoal kiln	Charcoal for cooking, artists charcoal, filtration, soil amendment (biochar).	Very few slow pyrolysis units currently deployed.
Mild pyrolysis (torrefaction)	Pilot projects/R&D	Wood pieces (spec is vendor specific).	0	0	Reaction unit	Co-firing in coal power plants (no modifications required to coal handling systems). Or as fuel supplement for biomass power plants.	Torrefied fuel could be highly marketable due to BTU/pound and impervious to water. Coal is a key solid fuel in the marketplace and tends to set the price point.

Process or Product	Development Status	Feedstock Specifications	Jobs (FTE) Low	Jobs (FTE) High	Main Equipment	Market Potential	Comments
Fast pyrolysis	Pilot projects/R&D	Small (1/4" minus), dry, clean wood particles.	0	0	Reaction unit.	Char for filtration, cooking, soil improvement. No ready market for bio oil, except at oil refineries (upgrader).	Some significant investments made in R&D, including demonstration facilities (portable and fixed). Promising technology that may be commercially viable soon.
Solid fuel steam cycle (biopower)	Commercially deployed	Woody biomass chipped to 3"minus, 50% mc, 3% ash. Drier fuel preferred.	2	30	Fuel handling, boiler, turbine-generator, emissions control, water cooling and recovery.	Technology is evolving quickly and is becoming more cost effective.	Only appropriate where electrical and thermal energy wholesale rates are high. Typically found in states with attractive Renewable Portfolio Standards.
Air filtration media	Commercially deployed	Virgin material that will grind to large heterogeneous particles.	0	0	Grinder and screen.	Waste water treatment facilities etc.	Need other market for grinder material (e.g., hog fuel or landscaping) that does not meet specifications for filtration media.
Compost	Commercially deployed	Greenwaste (tree trimmings/grass clippings) is optimal.	2	6	Grinder, screen and windrow turner.	Soil amendment market is seasonal. Compost and mulch operations work best on same site. Typically sold in bulk or bagged.	There may be opportunities to install compost operation near existing landfills to divert greenwaste away from landfills.
Mulch	Commercially deployed	Greenwaste (tree trimmings/grass clippings) is optimal.	2	6	Grinder and screen.	Soil amendment market is seasonal. Compost and mulch operations work best on same site.	Very similar to compost operation. In fact compost/mulch operations typically share the same site.

Process or Product	Development Status	Feedstock Specifications	Jobs (FTE) Low	Jobs (FTE) High	Main Equipment	Market Potential	Comments
Chip for pulp/paper or composite panel furnish	Commercially deployed	Woody biomass chipped to 3"minus, 50% mc, bark free with few fines.	3	6	Debarking equipment (e.g., chain flail) chipper and screen.	No pulp/paper operations operating in CA. Two composite panel facilities in CA (Martel and Rocklin).	Very limited markets (no pulp mills and two composite panel operations) in CA. Chip export market may ramp up and demand in the Pacific Rim trends higher.
Anaerobic digestion	Commercially deployed	Wide range of feedstocks greenwaste, manure, and food waste.	1	2	Digester.	Compost market. Methane can be used for heat or electricity generation	Could complement agricultural or food waste streams. Typically collocated with ag operations (dairy).
Veneer	Commercially deployed	Straight logs with limited taper. 8"+ diameter.	40	80+	Steaming vats, veneer lathes, trimming, rolling stock.	Plywood and LVL mills are in Oregon, peeler cores (2"-4") sold into post and pole market.	Typically a large commercial scale facility (process 420 blocks per hour).
Animal bedding (shavings)	Commercially deployed	Small roundwood (ponderosa pine preferred)	2	6	Shaver, screens, drying, packaging.	Can be sold in bulk and/or in bags.	

APPENDIX E - PHOENIX ENERGY TECHNOLOGY DESCRIPTION AND LAYOUT

Basic Process Description

The Phoenix Biomass Energy system converts wood and agricultural waste biomass into a natural gas substitute ("syngas") through the process of thermo-chemical conversion ("gasification"). This syngas is then used to fuel a specially modified natural gas genset that produces renewable electricity and heat. A byproduct of the gasification process, called "biochar", is a wood char that has sequestered carbon in solid form (~74% fixed carbon) and is used as a beneficial soil amendment.

The biomass conversion process is a thermo-chemical one that 'cooks' biomass in an oxygen starved environment. By depriving the fuel of sufficient oxygen, the wood biomass does not burn, but rather gives off a hydrogen rich syngas. As the biomass gives off the syngas, it is transformed into bio-char and ash of approximately 1-5% of the volume of biomass fuel. The syngas is then captured, cleaned and cooled before being sent as fuel to the genset. The gensets we utilize come from variety of nationally known vendors such as Cummins, Caterpillar, and GE. This ensures that there are readily available spare parts and maintenance technicians available locally. Further, we have incorporated an on-site water treatment as part of our core model, re-using much of the water for cooling and filtration process, to maintain a small footprint. Finally, our largest by-product, the biohcar, is sold to a variety of potential users.

One unique aspect of our system is that the footprint is very small – less than half an acre to generate 1 megawatt; versus wind systems that need 1-2 acres per MW, or solar which needs 8-10 acres per MW. Along with our module design, this small footprint allows our solution to be deployed close to the biomass feedstock.

Fuel Preparation

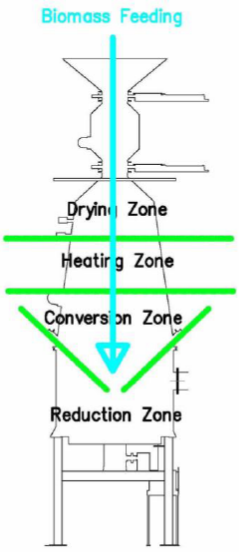


Figure 1

Fuel storage and handling is finalized with your company or host's personnel prior to site work being carried out. There are several design options to choose from, which complement a site's material flow. Currently, we believe a walking floor trailer and/or a combination conveyor fed hopper provide the most flexible solutions. Biomass fuel from your facility will be delivered via conveyer (or front-end loader,) to the fuel hopper. Once in the Phoenix Energy hopper, our automated system uses a robust transloading platform and fuel metering sensors to continuously feed the conversion unit in small batches as needed.

Biomass Conversion

The biomass conversion chamber (figure 1) is essentially a chamber where various complex thermo-chemical processes take place. As the material flows downward through the reactor, the biomass gets dried, heated, converted into gas and reduced into bio-char and ash.

Although there is a considerable overlap, each process can be considered to occupy a separate zone, where fundamentally different chemical and thermal reactions take place. The fuel must pass through all of these zones to be completely converted.

The downdraft conversion unit, employed by Phoenix Energy, is under negative air drawn by a high-pressure blower. The essential characteristic of the downdraft design is that the tars given off in the heating zone are drawn through the conversion zone, where they will be broken down or oxidized. When this happens, the energy they contain is usefully recovered with the mixture of gases in the exit stream being relatively clean, and ready for further processing. Expected total gas contaminant concentration prior to filtration is up to 100 times lower than what is often seen in updraft and fluid-bed systems.

Figure 2 – The P250 biomass conversion chamber (red) and filtering system (blue)

Gas Cleansing

After the syngas has been extracted from the conversion chamber it is cooled and cleaned by a series of scrubbers and filters. First, the gas passes through a venturi scrubber, which is known to remove particulate in the sub-micrometer range. The gas is then passed through a series of four filters. The first is a coarse filter to coalesce residual liquids. The second is a rejuvenating active sawdust filter, the third is a similar passive filter, and the fourth is a fabric bag filter. The filter media are sawdust and biomass chips so instead of using expensive synthetic filters that need to be thrown away, the used filter media can be simply placed back into the fuel hopper and consumed.

Power Generation

Phoenix Energy units are based on a spark-ignited engine genset. Depending on the size chosen, the engines are capable of providing 500 or 1,000KW operating on syngas. Phoenix Energy will customize the selected genset to allow syngas carburetion for this engine and provide standard paralleling switchgear for electrical output.

At present we believe the CAT 3516 or the Cummins 1710 offer the most attractive engine options for your firm, however we can work with *any* natural gas genset. First and foremost there is a large secondary market for CAT and Cummins engines and the service coverage in the US is very good. These engines also have unique features enabling good fuel economy, better emissions, high durability, and extended oil / filter change periods. They run on variety of gaseous fuels like natural gas, bio-gas, sewage gas, LPG etc. Engines are available in both types of aspirations, naturally aspirated and turbocharged, after-cooled

Figure 3 – A P500 installation in California

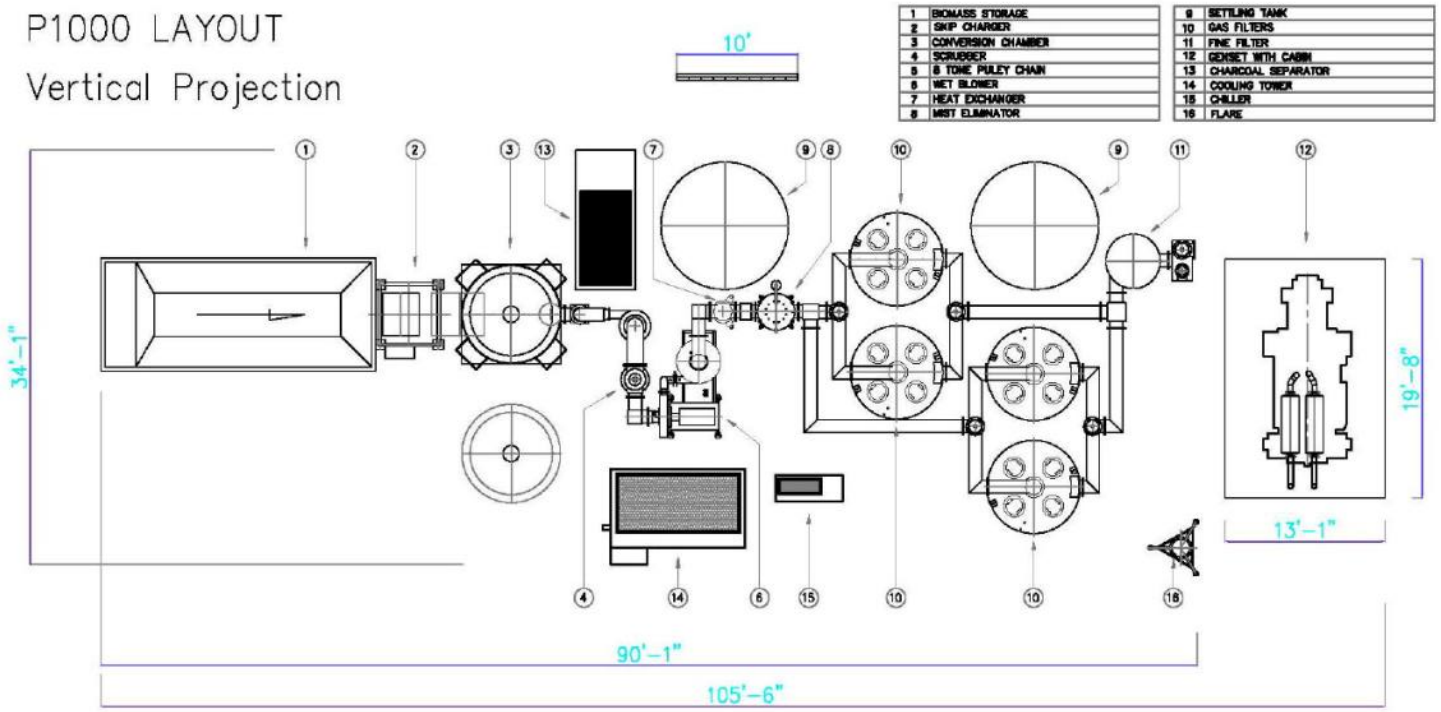
versions. Both CAT and Cummins engines have been designed to combine compact size, low emission levels and excellent performance characteristics of high-speed technology with the medium speed benefits of water-cooled exhaust valve seats, steel-crown pistons & combustion control.

Bio-char & ash handling, and Low Water usage

Bio-char & ash are removed from the conversion chamber using a dry extraction process designed around a water cooled auger at the base of the gasifier. Scrubbed particulate in the form of ash is extracted at the base of the cyclone. A closed water loop is used for both cooling and process water. On-site water treatment, utilizing biochar and sand filters allows for recirculation of both water loops reducing water usage to a minimum. In fact, at certain times of the year the system is actually water accretive as moisture is removed from the biomass and captured in the process water loop. Water levels are maintained in separate storage tanks for each loop and pumped through both the cooling and filtration process. The automated filter is typical for river sludge treatment and separates the solids from the re-circulated water. The biochar , is a "capture & store" byproduct that is separated out, using a special mechanical separator, for resale as a soil amendment or ADC, sequestering carbon in solid form while in the ground for up to 1,000 years! While we don't include these biochar sales in our conservative base financial forecast, we do believe that carbon credits related to biochar may become a valuable revenue source in the near future. Water leaving the filter is passed through a final stationary filter prior to heat exchange. The scrubbing water is absorbing heat from the syngas and must be cooled in a cooling tower prior to returning to the closed-loop scrubber.

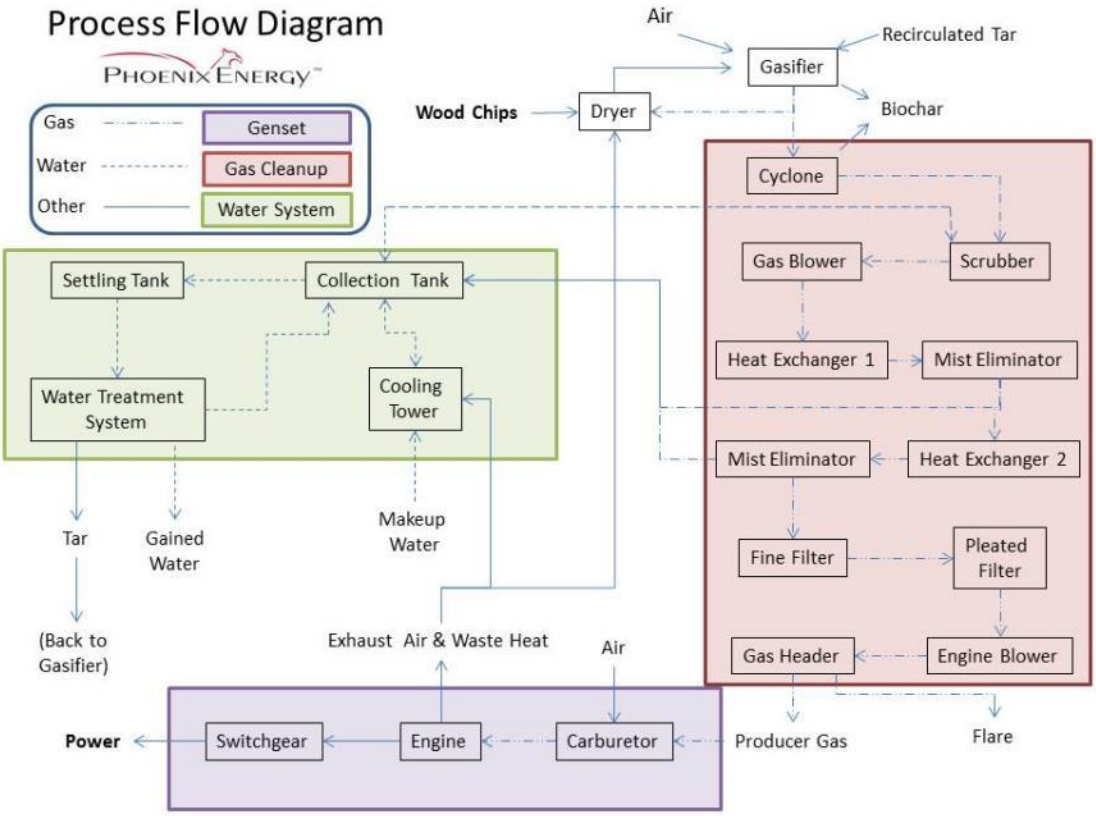
P1000 LAYOUT

Vertical Projection



Process Flow Diagram

PHOENIX ENERGY™



APPENDIX F - PHOENIX ENERGY LETTER OF INTEREST

PHOENIX ENERGY™

September 6, 2011

North Fork Community Development Council
Dan Rosenberg, President
P.O. 1484
North Fork, California 93643

Dear Mr. Rosenberg;

Thank you for talking the time to visit our Merced, California site on August 29 and view firsthand our renewable energy generation facility. We at Phoenix Energy feel that our small-distributed generation business model can be replicated in communities (like North Fork) located near forested landscapes that are in need of restoration.

Phoenix Energy is interested in commencing discussions with the North Fork Community Development Council (NFCDC) regarding the siting of a 1 MW distributed generation facility at the North Fork mill site. We are impressed with work that the NFCDC has completed on the mill site, including environmental clean-up and infrastructure development, as well as its current efforts to attract new and innovative technologies to co-locate at the site. The feasibility evaluation that TSS Consultants is currently conducting will be informative and will help confirm whether there is potential for a viable biomass generation project.

Assuming that the TSS feasibility study shows the availability of biomass supply and other necessary pre-requisites for a viable project, we would like to pursue the possibilities of expanding our operations to the North Fork mill site. We feel that Phoenix Energy would be complementary to the enterprises that are currently operating on site. We also feel confident that we have the know-how, the right technology and capacity to implement a project at North Fork. It is anticipated that the project would generate between 6 and 10 jobs during the construction phase (not including vendors) and 5 to 6 full time jobs when the project enters commercial service.

Please consider this correspondence to constitute a letter of interest to initiate discussions for the possible siting of a 1 MW distributed generation facility at North Fork.

We look forward to continuing discussions with the NFCDC.

Regards,

Paul B. Elias
VP Development
San Francisco, CA 94115
415-671-9300
elias@phoenixenergy.net

APPENDIX G – TECHNOLOGY REVIEW AND VENDOR MATRIX, NOVEMBER 2011

TECHNOLOGY REVIEW AND VENDOR MATRIX FOR A SMALL BIOMASS FEEDSTOCK COMBINED HEAT AND POWER FACILITY AT THE NORTH FORK MILL SITE

November 27, 2011

Prepared for:

Yosemite-Sequoia Resource Conservation and Development Council

North Fork, California

Prepared by:

TSS Consultants

Rancho Cordova, California

Funding for this evaluation was provided by the

US Department of Agriculture, Rural Business Enterprises Grant

Introduction

The North Fork Community Development Council (NFCDC) is considering next steps in the potential development of a small-scale (1MW) combined heat and power (CHP) facility located at North Fork, California. TSS Consultants (TSS) has recently completed a feasibility evaluation and findings indicate that a small biopower facility would provide a range of benefits to the local North Fork community including:

- Renewable energy generation,
- Value added utilization of forest biomass in support of hazardous fuels reduction activities, and
- Long term family wage jobs.

The next logical steps in the development and deployment of such a CHP facility includes a technology review of existing commercial technologies, a vetting process to identify the most appropriate three candidates, and a Request for Information (RFI) process to confirm technology vendor/developer interest and identify the preferred provider.

Scope of Work

This document represents the deliverables outlined in Task 1 of the amended contract between TSS and NFCDC: Conduct a technology review of commercially available and promising woody biomass CHP technologies currently available in both the United States and internationally.

This review will include:

- A technical review of direct-fired combustion and gasification systems that have the ability to utilize forest biomass as a primary feedstock.

- Preparation of a matrix of potential vendors (and developers) of small-scale systems. This matrix will include contact information, website address, and other related information (e.g., number of units deployed and in commercial operation). The technology matrix will include a list of operating small-scale systems based on available information from TSS files and existing feasibility studies, the U.S. Department of Energy, the National Renewable Energy Lab, the U.S. Energy Information Agency, and the International Energy Agency.

- Work with the North Fork CDC to review the technology matrix and select the top three candidates.

Technology Review of Direct-Fired Combustion and Gasification Systems

Introduction

Biomass, such as woody wastes from forest residues can be supplied to energy conversion systems and converted to useful steam, heat, or combustible gases. These energy conversion systems

vary widely but fall under two basic types for electricity generation: gasification[1], and direct combustion.[2] These two types of power generation represent the industry leading technologies.

Direct-fired combustion utilizes a steam cycle to produce electricity at an efficiency of approximately 15% – 25%. Gasification utilizes internal combustion cycles to produce electricity at an efficiency of approximately 20 – 35%.

Other technology systems for biomass conversion to electricity, such as fuel cells are neither currently economically available nor projected to be economically or technically available within the proposed timeframe of this project (operations in 2013).

Unlike larger-scale biomass-to-electricity systems (greater than 10 MW), of which there are scores in the United States and internationally, there are few small-scale biomass-to-electricity facilities operating in the United States or Europe. However, with the rising price of electricity, continued technological advancement, and governmental policy encouraging the development of biomass energy, community scale (less than 5MW) facilities are becoming more popular in areas with abundant biomass resources.

Direct-Fired Combustion

The most basic direct-fired combustion system for heat is a wood fire. Direct-fired combustion combined with steam cycles have been used for mechanic work since the 1600's and for electrical generation since the 1800's. Technological advances have greatly increased the efficiencies by maximizing heat transfer. Direct-combustion is responsible for the vast majority of large scale power generation across the world. For small-scale applications, direct-fired combustion has traditionally been the preferred technology for power generation. Unfortunately, there significant economic challenges associated with small-scale direct-fired combustion power generation systems including relatively high capital cost per unit of output ($/kW) and lower efficiency.

In direct-fired combustion systems, the biomass fuel is directly burned (combusted) in some type of furnace or combustion unit that then supplies heat to a boiler. Nearly all commercial biomass power applications today use boilers in conjunction with a steam turbine to generate electricity. Common boilers used for biomass direct combustion systems include traditional stoker boilers[3] and fluidized bed boilers[4]. Each combustion technology operates best on biomass fuel that meet certain specifications (size, moisture content, heat value). It is critical that careful analysis be conducted to match combustion technology to the locally available biomass fuel resource. Characteristics of locally available biomass feedstocks will determine the appropriate configuration of a direct combustion system. When using woody biomass as a fuel, the most common feedstock systems are round wood, chunk wood, wood chips, and pellets (listed by size from largest to smallest). The size of the feedstock is important as it affects the optimal temperature and oxidation rates in the furnace to achieve complete combustion. A schematic of a typical direct-fired combustion system is show in Figure 1.

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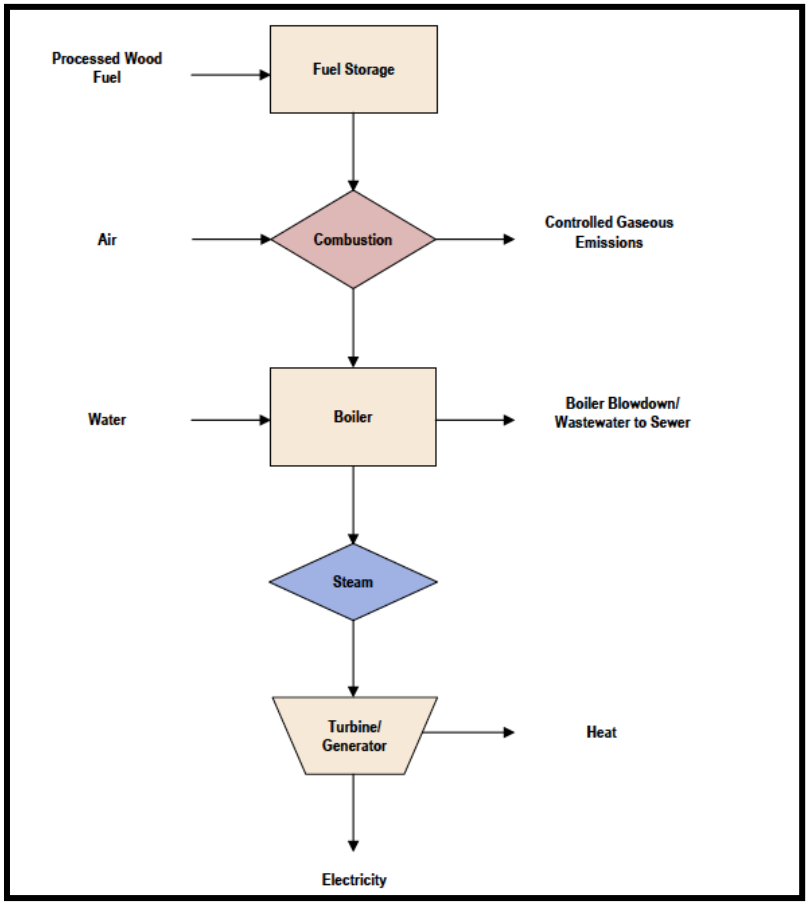
[1] Gasification systems generate electricity through combustion of syngas in an internal combustion engine or turbine generator. Electricity generation efficiency can range from 15% – 35%.

[2] Direct combustion systems generate electricity through the production of steam in a boiler, and utilization of the steam in a steam turbine. For small-scale systems, electricity generation efficiency is on the order of 15-20%.

[3] In stoker boilers, wood chips burn on a grate, with combustion air supplied both from under the grate and above the burning bed.

[4] In fluidized bed boilers, wood chips burn in a suspension with inert materials, forced through upward air jets.

Figure 1. Schematic of a Typical Direct-Fired Combustion System



In addition to the direct-fired combustion system depicted in Figure 1, hybrid systems exist where the fuel is gasified and the producer gas rises from the gasification vessel to a combustion chamber where it is combusted to heat the boiler. Some vendors call this configuration a gasification system. TSS Consultants classifies these systems as combustion systems because the producer gas cannot be collected and conditioned.

Gasification

The earliest uses of gasification date back to the production of city (or town) gas from coal in the late 1800's. Gasification has been in commercial use for more than 50 years with the production of synthetic gas (syngas) as a substitute for natural gas. The growth of gasification for power production has traditionally focused on large integrated gasification combined cycle (IGCC) plants with coal as the fuel source. Gasification of biomass resources is currently on the upswing in Europe and interest is growing in the United States. Advanced technologies are beginning to produce biomass-based syngas at rates that are competitive with retail natural gas rates and traditional direct-fired combustion biomass energy production.

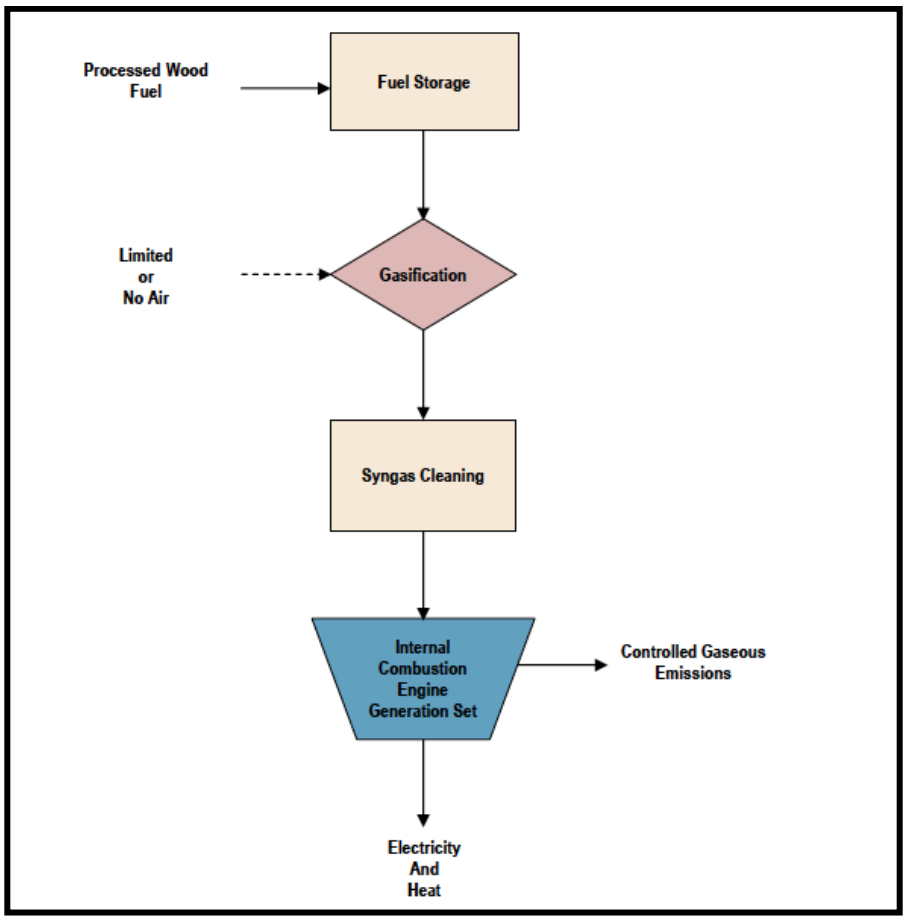
There are several variations on biomass gasification systems, but in general, these systems can be classified as either updraft or downdraft gasifiers. Updraft gasifiers consist of a fixed bed of biomass fuel through which the "gasification agent" (steam, oxygen and/or air) flows in counter-current

configuration (flowing from the bottom to the top of the gasifier). Thermal efficiency is high since the producer gas exit temperatures are relatively low. However, the low temperatures result in significant tar and methane being generated, so producer gas must be conditioned before use. The tar can be separated from the producer gas through a variety of controls and is traditionally collected and recycled in the gasification reactor. Once the producer gas is cleaned up so it can be used in applications normally reserved for natural gas or liquid petroleum gas, it is known as synthetic gas or syngas.

Downdraft gasifiers are configured the same way as an updraft gasifier, but the gasification agent flows in a co-current configuration (flowing from the top to the bottom of the gasifier). The producer gas leaves the gasifier at a high temperature, and most of this heat is often transferred to the gasification agent added in the top of the bed, resulting in energy efficiency on level with the counter-current type. Since all tars must pass through a hot bed of bio-char in this configuration, tar levels are much lower than the counter-current type and thus the producer gas require less cleaning to meet syngas specifications.

In either configuration, syngas is delivered to an internal combustion engine power generation process that allows for efficiency increases over direct-fired combustion energy production for small-scale systems. Figure 2 shows a schematic for a typical gasification system.

Figure 2. Schematic of a Typical Gasification System



Technology Matrix

This section summarizes the top 10 candidate technology vendors selected as a result of the technology review process. These technologies were selected for their ability to utilize biomass feedstocks at the targeted scale (1MW) for the North Fork site. The matrix objectively reviews vendors using five key attributes: proven technology, biomass utilization experience, air emissions, water impacts, and capital costs. These five attributes serve to differentiate the vendors based on important environmental and economic factors. The definitions for each attribute category can be found in the legend at the end of the matrix.

Technology Matrix							
Vendor and Lead Contact	**Technology Type***	**Proven Technology**	**Biomass Utilization Experience**	**Air Emissions**	**Water Impacts**	**Capital Costs**	**Comments**
Advanced Recycling Equipment, Inc. St. Marys, PA (814) 834-4470 Don Kunkel www.advancedrecyclingequip.com	Combustion	B	A	B	C	A	Needs NOx Control. No known experience with integrating thermal unit and electric turbine.
Chiptec Williston, VT (800) 244-4146 Bob Bender www.envioenergi.com	Combustion	A	A	B	C	A	High water consumption and discharge.
ElectraTherm Reno, NV (785) 398-4680 John Fox www.electratherm.com	Combustion	C	A	B	A	B	Use a closed-loop Rankine Cycle to capture heat. The Rankine Cycle transfers heat to work with a working fluid in a steam cycle.
Emery Energy Salt Lake City, UT (801) 363-0818 Ben Phillips www.emeryenergy.com	Gasification	C	A	A	A	B	Have a pilot facility in Wyoming.
EnergyFlex Calumet, MI (906) 337-5438 Ted Johnson No Website Available	Combustion	B	A	B	B	B	Vendor has not supplied cost information.

Vendor and Lead Contact	Technology Type*	Proven Technology	Biomass Utilization Experience	Air Emissions	Water Impacts	Capital Costs	Comments
Nexterra Vancouver, BC (604) 629-1022 Darcy Quinn www.nexterra.ca	Gasification	A	A	A	A	B	Notably High Capital Costs – More economical as CHP utilizing 50%+ waste heat.
Phoenix Energy San Francisco, CA (415) 367-2531 Greg Stangl www.phoenixenergy.net	Gasification	A	A	A	B	A	Very small amounts of wastewater that must be treated.
PowerHouse Energy Pasadena, CA (626) 683-3338 Kevin Butler www.powerhouseenergy.net	Gasification	A	A	A	B	B	Reclaims water from the moisture of the fuel, so water demand is proportional to the fuel's moisture content.
Primenergy, LLC Tulsa, OK (918) 835-1011 Bill Tietze www.primenergy.com	Gasification	A	C	A	B	B	Extensive experience with agricultural residue.
Reliable Renewables Houston, TX (832) 865-0593 Zach Scott www.reliable-renewables-usa.com	Gasification	B	A	A	A	A	Relatively new group working under Biogen (www.biogendr.com), a well-established company with over a dozen units operating overseas.

Legend

***Technology Type: Combustion and gasification systems are described in on pages 2 and 3.**

Proven Technology: Are there operating units in commercial applications?
A = Many similar scale units operating over 5 years with same design and fuels and the company has active commercial applications of similar scale.
B = Some similar scale units operating over 2 years with similar design and fuels but the company does not have any active commercial applications of similar scale. Or few similar scale units operating over 2 years with similar design and fuels, but the company has several active commercial applications of similar scale.
C = No similar scale units operating in the field.

Biomass Utilization Experience: Do they have experience in biomass feedstock utilization?
A =Experience in combusting or converting woody biomass forest residuals.
B = Experience in combusting or converting woody biomass, but not necessarily forest residuals.
C = No experience in combusting or converting woody biomass.

Air Emissions (projected): Demonstrated ability to control air emissions to comply with Best Available Control Technology (BACT) standards. **A = Demonstrated ability to control air emissions beyond current air district standards.** **B = Demonstrated ability to control air emissions that could meet air district standards.** **C = No demonstrated ability to control air emissions.**
Water Impacts: Water requirements and demonstrated ability to control wastewater effluent. **A = Requires little water for process, and effluence meets or exceeds regional water quality control board and/or local sanitation district standards.** **B = Requires considerable water for process, and effluence meets regional water quality control board and/or local sanitation district standards. Or requires little water for process, and effluence does not meet regional water quality control board and/or local sanitation district standards.** **C = Requires considerable water, and effluence may not meet regional water quality control board and/or local sanitation district standards.**
Capital Costs: Projected Costs and actual experience in installing units pursuant to total capital cost budget. **A = Low capital costs and demonstrated ability to complete a project in accordance with a capital budget.** **B = High capital cost and demonstrated ability to complete a project in accordance with a capital budget. Or low capital costs and little demonstrated ability to complete a project in accordance with a capital budget.** **C = No installation experience to date. Or high capital cost and little demonstrated ability to complete a project in accordance with a capital budget.**

Contact Information

Questions about this report should be directed to Matt Hart, TSS Consultants. Email: mhart@tssconsultants.com, Tel: 916.475.1223

Information regarding TSS Consultants can be obtained at www.tssconsultants.com.

APPENDIX H – RFP USED IN THE TECHNOLOGY SELECTION PROCESS

WOODY BIOMASS-FIRED COMBINED HEAT AND POWER PROJECT IN NORTH FORK, CALIFORNIA

Request for Information

TSS Consultants, in conjunction with the Yosemite-Sequoia Resource Conservation and Development Council, and the North Fork Community Development Council, have determined that a small combined heat and power facility is an appropriate project for the community of North Fork. The project is a strategic step to help utilize forest biomass material generated as a result of forest management and hazardous fuels treatment activities near North Fork, California. TSS has recently completed a feasibility evaluation and technology review. Technology Vendor has been selected as a preferred candidate to receive this Request for Information (RFI).

Community Objectives: In developing a biomass power facility on the North Fork mill site, the Community Development Council (CDC) hopes to meet the following objectives:

- Create jobs for local residents.
- Support local subsidiary businesses such as biomass harvesting, chipping and transport.
- Beneficially utilize woody biomass being removed from surrounding public and private land for purposes of fire safety and/or ecological restoration.
- Have minimal noise and odor impacts to nearby residents and businesses.
- Provide opportunities for additional businesses that can utilize potential heat from the power plant, such as kiln dried wood products, greenhouses, etc.
- The CDC's equity partnership in the enterprise should result in a reliable income stream to the organization (CDC owns the mill site).

Roles of Candidate and CDC: It is expected that the successful candidate will have the capacity to:

- Obtain all necessary private funding for the development of the facility.
- Make a contribution to grant writing for any available public funding for the facility. (There are several applicable federal and state grants that could provide a significant portion of the pre-development and development costs for the project).
- Carry the project through the permitting process, including CEQA, air quality permits, planning approvals, etc.
- Assist with project management for project development, including coordination and communication with the County, the CDC, and the community at large.

The CDC will provide the land for the project, will assist in the permitting process, will provide assistance in identifying and preparing grant applications, and will take primary responsibility for public information and relations.

Project Timeline: Plans are to review responses to the RFI and select the top ranked technology and project development team within 60 days of receipt of proposals. The CDC and the selected candidate will enter into negotiations that will result in execution of a memorandum of understanding and term sheet. Target commercial operating date is third quarter 2013.

Technology Requirement: The proposed facility should generate up to a 1 MW (net) of base load electricity delivered to the grid and operating at a minimum of 86% of capacity. Waste heat or excess steam may be used for fuel drying (average forest biomass fuel moisture will be 40% to 55%) and drying lumber (there is a small sawmill collocated on the North Fork site). The heat requirement is estimated to be about 1MMBtu/hr for the lumber drying kiln and may be supplied with waste heat at a minimum of 700°F into the heat exchanger or with syngas conditioned to run in a liquid propane engine. Several adjacent buildings could benefit from the waste heat produced by the facility, but heating loads are small and should not be accounted for in this RFI. Electricity will likely be sold to the local utility, PG&E.

Air Emissions: Air emissions are of particular concern as the proposed site is located in a non-attainment area for criteria air pollutants. Air emissions for the proposed system must meet San Joaquin Valley Air Pollution Control District air pollutant emissions standards.

Water Effluence: Water effluence is of particular concern as the proposed site is not located near a municipal water treatment system and all waste water must be carefully disposed of in accordance to Central Valley Regional Water Quality Control Board requirements. Submittals should also address water input and discharge in units of gallons per minute.

Noise: The proposed site is zoned industrial but there are residences in the area and other businesses on the site. For this reason, it is desirable that the process be as quiet as possible so as not to disturb nearby residents and businesses.

Feedstock Parameters: Available feedstock will be 95% forest harvest residuals (limbs and tops) and hazardous fuels (small stems and brush) processed to be sized at 3" minus. Average moisture content will range from 40% to 55% and high heating value (HHV) of the fuel is estimated to be 8,000 to 8,500 Btu/dry lb. Proposals should include fuel-handling systems for feedstock delivery including any necessary drying, and conveying equipment.

Selection Criteria: Responses will be evaluated based on the following criteria: (1) Ability to produce base load electricity for sale directly to the grid; (2) Ability to operate at a minimum of 86% capacity; (3) Environmental impacts including noise, air, water supply needs, and water discharge volumes; (4) Facility size (footprint); (5) Fuel consumption rates per unit of output (net heat rate); (6) Estimated capital and operating costs for entire system (including ancillary equipment such as fuel drying equipment); (7) Capacity and willingness to provide necessary up-front pre-development and development funding.

Contents of Response Submittal: All responses should include the following information. Responses should be organized in the following format:

1) A technical description of the unit from fuel receiving equipment through delivery of electricity to a substation.
2) Identify required resources including water supply, footprint, fuel consumption rates at various heat contents (Btu/dry lb.), etc.
3) Environmental impact summary including noise impacts, air emissions, water supply, water discharge, ash disposal, tar disposal, hazardous waste disposal, etc. An approximate chemical composition and/or concentrations of emissions (air, water, or solids) should be included for any emissions source.

4) Financials. This section may include any financial/ownership models available, including but not limited to outright client ownership, client and vendor partnership, vendor ownership and operation. Submittals should note the vendor's preferred business model. The financial section must include both estimated capital costs and annual operation and maintenance costs for any scenario. Financial models should be run with a range of feedstock pricing from $45/BDT to $60/BDT to provide an indicative cost estimate of base load power ($/kWh) and heat ($/MMBtu). All proposals should include all equipment necessary for emission control devices required to meet the standards outlined above (including but not limited to air emissions controls, fuel drying systems, fuel handling systems, electric grid connections, and water treatment facilities if required).
5) Statement of qualifications of manufacturer, including experience with woody biomass fuels, contact information for proposed or currently operating systems, available operating histories and references.
6) Supplementary information (at the discretion of the candidate).

Deadline for Responses: Electronic replies are due by close of business January 4, 2012. Reponses are to be submitted to mhart@tssconsultants.com unless other arrangements are requested in advance. Please limit your responses to no more than 30 pages. Candidate's responses should be delivered in digital format (no need to send hardcopies).

Contact: All communications should be directed to Matt Hart, TSS Consultants. Email: mhart@tssconsultants.com, Tel: 916.475.1223.