

Final Report



Biomass Power Generation Feasibility Assessment



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Final Technical Report

White Mountain Apache Cogeneration¹ Feasibility Assessment

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¹ Recommended configuration is cogeneration. Several non-cogeneration configurations were also reviewed.

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** All attachments except D, G, and Z are proprietary and remain confidential to the White Mountain Apache Tribe.*

1 Introduction/Project Summary

The White Mountain Apache Tribe (Tribe) contracted with consultants in the electric power industry to perform a feasibility review and prepare this report, herein referred to as “Report”, for locating a biomass power generation facility on the Fort Apache Indian Reservation (Reservation). This facility would be fueled by biomass from several on-Reservation sources as outlined below. The purpose of this analysis is to determine if such a generation facility, utilizing the Reservation biomass as fuel, would be economically feasible. The advantages to the Tribe (compared to the benefits enjoyed by privately developed biomass facilities elsewhere) if such a facility were economical include the following:

- Would provide a cleaner alternative to field burning slash generated from logging and Reservation forest management practices
- Would provide a solution to the growing inventory of biomass at the Fort Apache Timber Company (FATCO) facilities in Whiteriver and Cibecue
- Both construction and operation of such a facility would generate much needed jobs in the Reservation
- May provide energy efficiencies for the FATCO operation if a coordinated configuration is utilized
- May provide emission credits that have market value

A Department of Energy grant funded this study and report preparation under Solicitation No. DE-PS36-02GO92006. Project tasks were completed between August, 2002 and December, 2003.

This Report updates and expands a report prepared in September of 1998 by New Energy-Environmental Options and Solutions (NEOS), outlining the feasibility of a 2.4-megawatt cogeneration power generation facility at the FATCO facility in Whiteriver. This NEOS report has been utilized in part, as a resource for this Report and is included in the Appendix as Attachment Z. It was relied on to provide estimates of the quantities of fuel processed by FATCO’s two sawmills in Whiteriver and Cibecue, Arizona, the quantity of fuel consumed by FATCO’s boilers, and the types, quantities and pricing of the biomass sold to market by FATCO. This Report also reviews the biomass available from FATCO’s sawmill and logging activities, available from the Tribal Forestry Department forest management practices, potential fuel availability if the forest management activities were increased as a result of a market for this product being generated by a new generation facility, and a recognition that there is biomass available adjacent to but outside of the Reservation.

This Report includes a broad spectrum of costs, equipment and site considerations, operations, legal, and marketing issues. These elements have been quantified and

incorporated into a financial model that has been utilized to evaluate the project's financial feasibility. This model was also utilized to evaluate and screen alternatives identified by the project team and lastly, to provide project sensitivities to changes in selected variables. It should be noted that if the Tribe proceeds with this project, it will need to compare actual costs to the estimates used in this analysis. Should the actual data differ significantly from the estimates, an update of the analysis should be undertaken to confirm that the project is still feasible. These alternatives identified and included in the analysis include:

- Various equipment configuration and plant locations to compensate for the shortage of adequate water supply
- Different combinations of fuel sources and their associated costs
- Various energy marketing plans including sale of power to Tribal enterprises, to Public Service New Mexico (PNM) and other third parties
- Differing dispatch and operating profiles
- Configurations that include providing steam to FATCO and configurations where all steam is utilized for power generation.

This model can be utilized by the Tribe for further evaluation, when and if, additional refinements to the input values are identified, and to provide further screening as desired by WMAT.

Locating a biomass power generation facility on the Reservation has several advantages not enjoyed by most greenfield (completely new site requiring development of all new infrastructure and interconnections) biomass projects. Most of these advantages exist because of the uniqueness of the Reservation and Tribal relationships. The advantages identified include the following:

- Availability of high quality, low cost fuel from FATCO's excess biomass production and Reservation forest management activities
- Close proximity of fuel requiring little or no transportation cost
- The presence of an existing handling and storage infrastructure
- Ability to realize labor synergies with the Reservation forest management crews
- The ability to share fuel related labor optimization with FATCO
- Fewer and less complicated permitting requirements
- Efficiency advantages through cogeneration with FATCO by the proposed facility providing steam for FATCO's kiln needs (if this option is pursued)
- Tax advantages because of the facility's status as a tribal enterprise

These advantages and the Tribe's desire to achieve the objectives listed above provided the driving forces for undertaking this study.

2 Executive Summary

The White Mountain Apache Tribe contracted with the consultants noted on the cover page of this Report to analyze the feasibility of constructing an on-Reservation power generation facility that utilizes biomass generated by Reservation forest management and logging activities. Most aspects of project development were reviewed by the project team and are discussed in greater detail in the body of this Report. The primary purpose of this analysis is to determine if such a generation facility, utilizing the Reservation biomass as fuel, would be economically feasible.

The team considered the benefits and risks of the Tribe utilizing the power from the proposed facility to serve the Reservations loads. Reviewing historical power utilization records it was determined that the five (5) enterprises that utilize the greatest power would require approximately 10 megawatts for service. Approximately 14 megawatts would be needed to serve all loads on the Reservation. The preliminary results of this Report show that it is economically favorable to market all the power generated by the proposed facility rather than use the power to serve the Tribes' power needs. Since the enterprises do not require significant power during the evening and off-peak hours, the proposed facility would be underutilized during this period if this power was used to serve the Tribe, whereas revenue can be generated 24 hours a day if marketed to third parties.

The power generated by the proposed facility could be delivered to market, as discussed below, at the pricing levels mentioned. Another option available is to apply displacement. With this approach, there is no wheeling charge because the power is not physically moved from point A to the point of sale at point B. Instead, the physical electrons of the power that is currently being furnished to the reservations by Navopache would not be furnished by Navopache but rather by the proposed facility. However, the contractual purchase of the Reservation power would remain with Navopache. With this approach there is a displacement or offset of power such that the wheeling charges and line losses are reduced or eliminated. A full explanation and exploration of this alternative is beyond the scope of this Report.

The fuel source for the proposed facility is the biomass generated from existing or expanded Reservation forest management practices and Tribal logging operations. These fuel-generating activities offer significant advantages to a power generation facility located on the Reservation because of the low transportation cost of most of this fuel and its plentiful supply. The fuel quantities generated by these Tribal activities and the fuel costs for the various fuel sources utilized in the economic analysis incorporate some labor synergy cost savings that may be realized if the facility is developed.

All other conditions being equal, there are economies of scale that any project will realize if a larger facility is developed. The facility size is limited by many considerations including the amount of fuel available, the capacity level of the power sales agreement, the ability of the existing transmission system to transport the power to market, the availability of adequate water supply and many others. Sometimes these controlling factors offer opposing results. The proposed facility will benefit from the economies of scale of a larger facility, but the fuel cost is lower if the facility is smaller, because the project avoids the need to utilize fuel from higher cost sources. These factors have been incorporated into the financial analysis, which indicates that a 20 megawatt biomass generation facility may optimize the controlling factors. Twenty megawatts was utilized in the financial analysis as the base case. A 10 megawatt facility, a 14 megawatt facility, and a 20 megawatt facility operated at 16 megawatts were all considered in the assessment.

Utilizing the discharge from the Canyon Day Wastewater Treatment facility as the water source for the proposed facility was considered in the assessment. The capital costs, operating costs, and other operating differences were evaluated for various equipment configurations and facility locations. These costs were gathered and compared for a dry condenser configuration, a wet/dry hybrid and the utilization of wet technology and dry technology during different periods of the year. In order to utilize this alternate equipment, it became necessary to consider the capital and operating costs of various plant locations and water sources. This Report includes an analysis of locating the generation facility at Canyon Day to allow use of its water discharge. This may require the installation of a transmission line from Canyon Day to Whiteriver to export the generated power. This configuration also eliminates the ability of the proposed facility to utilize the fuel currently being consumed by FATCO's boilers. Canyon Day is too far from Whiteriver to transport the necessary steam to supply FATCO's demands, to make the FATCO fuel available for use by the proposed facility.

The results of the financial analysis of the above mentioned alternatives were similar as demonstrated by the after tax Internal Rate of Return (IRR) values presented in Table 7 of this Report (Cases AB – AD). While the IRR values presented for these cases are similar, analysis and discussion presented later in the Report show that it is more advantageous to locate the proposed facility at Whiteriver (thereby allowing use of the relatively low cost FATCO fuel currently being consumed by their boilers) and transport the Canyon Day discharge stream to Whiteriver via a newly installed pipeline. This recommendation assumes (for now) that there is not adequate water from the White River for the proposed facility.

The air impacts from the proposed 20 megawatt facility will potentially trigger Prevention of Significant Deterioration (PSD) permitting requirements. If the facility is sited in Whiteriver (because this would be near the existing emission source of FATCO sawmill), Best Available Control Technology (BACT) may be triggered. There is some potential for generation of emissions credits (which may have market value) if the proposed facility is sited near FATCO because the modern emission controls of the

proposed facility would likely cause a net reduction in emissions of the combined existing FATCO boilers and the proposed facility.

Proceeding with the development and installation of the proposed facility may provide additional demand or market for the biomass that is generated by on-Reservation activities (and logging) which could provide additional funding to allow these activities to expand to reduce the chances that a fire similar to the Rodeo-Chediski fire of 2002 will be repeated. There may also be labor efficiency gains realized if the proposed project proceeds. If the proposed facility proceeds, the impact on FATCO's operations should be small. The project should provide labor synergies through labor sharing of the two facilities and proceeding with the project may provide a second source of steam for FATCO's kilns thereby enhancing the reliability and flexibility of the steam supply.

This project would provide approximately 17 full time employment opportunities for operation and maintenance of the project and would provide many construction jobs for 14 to 18 months.

A comprehensive detailed construction cost estimate was *not* prepared for this Report. The team relied on discussions with vendors and its own experience with the purchase and construction of other power generation facilities, including facilities similar to the proposed facility, to develop a reasonable cost estimate. This cost estimate considers the size of the facility, the anticipated technology, financing costs, required reserve funds and other soft costs (costs not directly associated with the equipment or its installation). Significant opportunity to reduce the capital costs is available through the careful selection and purchase of certain used refurbished equipment. A reprint of used equipment available is presented by Attachment D in the Appendix.

The operating costs associated with the proposed facility change with the case being considered by generally are approximately \$783,000 for staff, payroll taxes and benefits, \$738,000 for maintenance, consumables and operating costs, \$250,000 for administrative costs and \$464,000 for fuel costs. These costs total to \$2,235,000 per year to operate the proposed facility.

Preliminary findings show that typical market pricing for power generated by the proposed facility and delivered to the nearest market trading hub is approximately \$0.048/kWh for on-peak sales and \$0.030/kWh for off-peak sales for unit contingent power (power not available for delivery when the generation facility is out of service for routine or emergency repairs). However, costs are incurred to transport this power from the point of origination to the trading hub and the market price is lowered for unit contingency power and for the non-standard size of the biomass generator's output (less than 25 or 50 megawatts which are typical trading blocks). Therefore, the prices utilized in the economic analysis were lowered to \$0.040/kWh and \$0.022/kWh for on and off-peak power respectively, to account for these adjustments.

Several options were considered for the sale of the power generated by the proposed facility including selling all the power to the Reservation, selling some power to the

Reservation and some to third parties, and selling all the power generated to third parties. The results of the assessment, as discussed in the second paragraph of this Executive Summary, indicates that selling to third parties is likely the best choice. Green tags are becoming more important and prevalent in the industry. A green tag is a certificate associated with renewable power that is separated from the power sales. Many firms will purchase green tags to demonstrate their support of renewable power, even though they may not choose to or may not be able to purchase power generated from a renewable energy facility. A few firms that specialize in marketing these green tags were contacted in an attempt to determine the likely value of the green tags from the proposed facility. Further work is needed to more accurately value this product. The team utilized a price of \$0.020 per kWh as the green tag value. The financial analysis includes revenues from green tags for 50% of the proposed facility's generation for the first five (5) years and 100% thereafter.

As already mentioned, the Report suggests that selling the power generated by the proposed facility to third parties would optimize the revenues. For the cases where this power was proposed for sale to the enterprises, the various standby power sources were reviewed. This analysis demonstrated that installing reciprocating engines would incur an annual cost similar to purchasing this power from Navopache. However, the Tribe would incur a capital cost of between \$5 million and \$9 million depending on whether the desired generation was 10 megawatts or 14 megawatts, if they elected to utilize the reciprocating engines option. This is more fully presented in Tables 4 and 5 and Attachment N.

There are various funding sources that could be considered for the project, including tax exempt bonds. The terms of the funding will be dramatically improved if a power sales agreement has been established prior to making application for funding. Typically, non-recourse debt funding for more than 70% of the required capital is difficult to locate in the current market. The terms of the loan will also vary significantly with the lender's familiarity with the power industry and perhaps their history with the Tribe. There are a number of Federal energy funding programs, any one of which would provide considerable upside to the project if the project met the program requirements. A careful review of the scope and applicability of these programs will be necessary should the Tribe decide to move forward with project implementation.

A summary of the financial results which are modest but acceptable, are provided in Table 7 and Attachment A. Small changes in the assumptions may cause changes in the results as demonstrated by the sensitivities section of the financial results (See Table 7). Some of these inputs can be better quantified after the Next Steps are completed. Financial results may improve after the Next Steps are completed because vendors, contractors and others providing information for the Report, typically provide conservative budgetary costs which may be reduced once negotiations begin in earnest. Using the inputs shown in Attachment E, the financial model and analysis indicate that locating the proposed facility in Whiteriver is likely the best alternative primarily because it maximizes the proposed facility's access to low cost fuel. There are several additional

unquantified advantages listed in this Report that the Tribe, FATCO and/or the proposed facility would realize if the proposed project is located near FATCO.

The best combination of water source and equipment configuration that provide the most advantageous economics, is not as clear. The wet cooling tower, combined with use of the Canyon Day Wastewater Treatment Facility discharge stream as its water source, provide a slight economic edge over other alternatives. This assumes (for now) that there is not adequate water in the Whitewater River to adequately furnish the facility its water requirements when wet cooling tower technology is employed.

The financial analysis demonstrates that utilizing the above mentioned facility location and equipment configuration for development of the facility would likely provide an after tax IRR of approximately 12.5%. Information received by the team from one lending institution included a scenario where 30 year financing at an interest rate of 6% was discussed. Case AT in Table 7 and Attachment A is identical to the selected Case AF except for a modification to include the above mentioned financing terms. This creates a far more favorable after tax IRR of 20.3%. The availability of these financing terms must be validated as project implementation tasks are initiated.

Recommendations:

It is recommended that the Tribe proceed with the Next Steps below to develop and construct a 20 megawatt biomass power generation facility near the FATCO facility in Whiteriver. The best economic results and plant efficiency are achieved if FATCO's steam needs are met by the proposed facility and the power generated is sold to third parties. The fuel needs for the proposed facility would be best provided by utilization of the excess FATCO fuel combined with the fuel currently consumed by FATCO's boilers. Depending on the final size and configuration, additional fuel required should be provided from Reservation forest management activities. The lowest cost financing should be pursued and decisions regarding the business structure and equity source will be important elements for the Tribe to consider and determine.

This Report provides modestly favorable results utilizing conservative assumptions as inputs to the financial model. To further define the expected financial results if this project were completed, there are areas that require additional investigation. It is recommended that PNM and other potential third party power purchasers be fully engaged in discussions regarding their willingness to negotiate a contract for purchase of power from the proposed project. Obtaining a clearer understanding of the final fuel pricing paid FATCO for the fuel generated by their operations would solidify this important cost item for the project. A detailed equipment procurement and installation cost estimate should be obtained that extends the work already completed by this Report. The specific financing terms that can be negotiated for the project should be identified. This is best achieved after the stakeholders have decided to begin development of the project and the lending institution recognizes that the project is a reality. Commencing preliminary permitting activities would allow the Tribe's representatives to engage the appropriate jurisdictions in specific discussions regarding the project to clarify the likely emission and corresponding abatement equipment requirements. Finally, defining the

desired business structure of the project and the level of equity the Tribe is able and willing to provide are other important steps toward full project development.

3 Tribal Energy Demand

A. WMAT Reservation Electrical Power Usage

1. Distribution System Description

Navopache Electric Cooperative, Inc. (Navopache) provides electrical power to the Reservation from four (4) Navopache substations. Two (2) of the substations are on-Reservation and two (2) are off-Reservation. The voltages of the distribution circuits serving the Reservation are either 14.4 kV or 24.9 kV. Below is a listing of the four (4) substations and the approximate areas served by each. There are approximately six radial distribution circuits serving the Reservation.

Table 1 – Distribution System

Substation	Area Served	Number of Circuits Serving Reservation & Area On Reservation
Greer	Greer / Sunrise	1 – Sunrise
Wagon Wheel	Lakeside / Show Low	1 – Cedar Creek, Carrizo & Cibecue
Alchesay	McNary	2 – McNary
Drum Beat	Whiteriver	2 – Whiteriver & Ft. Apache

2. Reservation Electrical Load

The overall load on the Reservation is approximately 14 MWs and 58,000,000 kWhs per year, serving around 3,400 customers. In addition, the load required to meet FATCO's demand is around 4 MWs and 14,000,000 kWhs are utilized annually. Depending on the size of the biomass project developed, a portion of the output could be used to serve the load at FATCO with the additional output being sold into the market. However, since FATCO requires firm power the cost-effectiveness of the biomass project may be impacted if it has to purchase firming energy to serve FATCO.

B. Wholesale Power

1. Delivery Location

In addition to the distribution substations serving the Reservation, Navopache takes delivery of its electrical power at 69 kV at four locations listed below. It should be noted that three (3) of Navopache's substations (Zaniff, Linden and Show Low) are fed from the Cholla Substation owned and operated by Arizona Public Service (APS).

- a. Zaniff – Heber
- b. Linden – W. Show Low (25kV)
- c. Show Low
- d. Coronado – St Johns

As is shown in Attachment G, the 69 kV system is used to deliver power to the distribution substations. Distribution circuits emanate from the distribution substations and generally connect to distribution transformers that serve customer loads. Thus not only will the Tribe need to use Navopache's 69kV system, but it will also need to use Navopache's distribution system to deliver power both to and from the biomass plant to the market. This above information assumes that a new transmission line will not be built for the proposed project since Navopache's infrastructure is already installed. It was further assumed that Navopache would allow the Tribe to use its infrastructure as long as the Tribe met all Navopache's interconnection requirements.

4 FATCO's Existing Agreements

FATCO currently purchases its electricity through an interruptible service agreement with Navopache. The last rate agreement was entered in 2002 and extends for five (5) years. The annual average cost of power for FATCO is \$0.038/kWh at Whiteriver and \$0.0585 at Cibecue. Interruptions can occur between 11:30 a.m. and 4:30 p.m. from April through September and between 5:00 p.m. and 10:00 p.m. from October through March. FATCO is supposed to be provided twenty (20) minutes notice by phone regarding a pending interruption. The agreement can be cancelled by either party upon provision of certain notice.

5 Interconnection and Regulatory Considerations

A. Navopache Electric Cooperative's Interconnection Requirements

The following summarizes the interconnection requirements of Navopache Electric Cooperative (Navopache):

The customer must meet minimum interconnection, safety, and protection requirements as established by Navopache.

The customer must sign an interconnection agreement and electric supply/purchase agreement with Navopache and Public Service of New Mexico (PNM- Navopache's power supplier) or any other current wholesale supplier of relevance.

The customer must comply with and be subject to all applicable service and rate schedules and requirements, rate tariffs, and other applicable requirements as filed with and approved by the appropriate state regulatory body.

The customer must obtain all required permits and inspections indicating that the Customer's generating facility (like the proposed project in this Report) complies with applicable safety codes. Navopache can disallow the interconnection of a Customer's generating facility if, upon review of the Customer's design, it determines that the proposed design is not in compliance with applicable safety codes or is such that it could constitute a potentially unsafe or hazardous condition.

B. FERC Interconnection and Regulatory Considerations

1. FERC Interconnection Requirements

At present, Indian tribes remain non-jurisdictional with respect to FERC. Consequently, no FERC interconnection procedures automatically apply.

However, in "Order 888" titled "Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities" FERC provided that non-jurisdictional entities (i.e. those other than "public utilities") could be brought into the requirements of the rule through its reciprocity provisions. [See Order 888, issued on April 24, 1996, <http://www.ferc.gov/news/rules/pages/order888.htm>.]

FERC justified its assertion on the basis of fairness:

“The purpose of this provision is to ensure that a public utility offering transmission access to others can obtain similar service from its transmission customers. It is important that public utilities that are required to have on file tariffs be able to obtain service from transmitting utilities that are not public utilities, such as municipal power authorities or the federal power marketing administrations that receive transmission service under a public utility’s tariff.” [See Order 888 at pages 163-164].

In this way, FERC argued, any electric utility, even those that are not “public” over which FERC has no other jurisdiction, can be subject to the Order 888 requirements.

FERC’s recent Standard Market Design proposal also contains this requirement. Citing Order 888 at 31,760 it states:

“all [entities], including non-public utility entities, that own, control or operate interstate transmission facilities and that take service under a public utility’s open access transmission tariff, must offer comparable (not unduly discriminatory) services in return.” [See SMD NOPR, at paragraph 383].

Ownership, control, or operation of interstate interconnection facilities are not anticipated for the proposed project so no FERC regulations will likely apply.

2. Regulatory Considerations

FERC also asserts jurisdiction over wholesale power sales. See 16 U.S.C. § 824. A subsequent section limits this jurisdiction, however.

824(f) “United States, State, political subdivision of a State, or agency or instrumentality thereof exempt

No provision in this subchapter shall apply to, or be deemed to include, the United States, a State or any political subdivision of a State, or any agency, authority, or instrumentality of any one or more of the foregoing, or any corporation which is wholly owned, directly or indirectly, by any one or more of the foregoing, or any officer, agent, or employee of any of the foregoing acting as such in the course of his official duty, unless such provision makes specific reference thereto.”

FERC has ruled that tribal power marketing enterprises are exempt from FERC jurisdiction because such enterprises “perform inherent government functions and the funds . . . generated would be used by . . . Tribe[s] on the behalf of [their] government and in performance of government functions.” FERC determined that this was consistent with the spirit of the exclusion expressly provided for in subparagraph (f). [See July 13, 1998 decision in *Sovereign Power, Inc.*, 84 FERC 61,014, Docket No. ER98-2995-000, Order Disclaiming Jurisdiction.] As such, it is unlikely that FERC would assert jurisdiction over the Tribe in its sale of power from its own biomass-fueled generation facility.

6 Transmission & Distribution

There are two (2) possible approaches for delivering the power to market. One approach is to apply displacement. Displacement in this case means that the purchasing entity deems that the power is delivered to Four Corners. This assumes that the purchasing entity has the ability to deliver power to the retail load on the Reservation.

The second approach is to use Navopache’s distribution and transmission facilities to access the energy market. From the Navopache system, power will need to be delivered over the high-voltage facilities owned by APS. The logical location for participating in the wholesale energy market is the Four Corners area, since this location is a hub for market transactions in this area. Attachment G shows the transmission system that would be used to deliver the biomass power to the market.

7 Fuel Supply

The fuel source for the proposed biomass power generation facility, including its quality, quantity, distance from the generation facility and its cost, have the greatest effect on the profitability of a biomass power generation facility of any other cost. It is for this reason that a biomass power generation facility sited on the Reservation is a very logical choice. There are several fuel-related benefits to siting the facility on the Reservation, especially if sited at FATCO, which provide significant advantages over biomass facilities sited elsewhere.

A. Advantages of FATCO Site

1. Excess FATCO Fuel

There is excess fuel being generated at FATCO that is a disposal problem and/or is sold at very modest prices to reduce the magnitude of the disposal dilemma. As a consequence this fuel has a very low commodity cost and nearly no transportation costs.

2. Existing Infrastructure

The existing storage and handling infrastructure at FATCO reduces the capital cost requirements of a new biomass facility sited nearby.

3. Labor Synergy

The labor savings synergy of the Reservation forest management activities (and potential, future expanded forest management activities) reduces the fuel collection costs while aiding the forest management activities. This also allows a reduction in the piling and burning costs incurred during the Reservation forest management efforts.

4. Shared Staff

The ability to share fuel related staffing resources with FATCO will provide benefits to both enterprises.

5. Close Fuel Source

Having a fuel source adjacent to the project site provides an immense benefit over other biomass projects by avoiding the transportation costs associated with nearly all other facilities. This transportation cost is one of the major costs associated with collection and transportation of fuel to a centralized location.

The costs and biomass fuel quantities associated with the existing forest management practices and logging activities were gathered through extensive discussions with Tribal Forestry Department and the BIA personnel in addition to interviews with FATCO personnel. The fuel sources, their quantities and their associated costs are quite varied. The costs represent the costs of the fuel *delivered to the proposed facility*. These costs do not necessarily represent the total cost to gather and haul this fuel, since some of these fuel activities are already occurring as part of existing programs or on-going operations, as discussed later in this section.

Each of the power generation configurations studied requires different quantities of biomass fuel. These differing quantities of fuel require utilization of differing combinations of the fuel sources, resulting in different weighted average costs of the fuel required by the biomass generation facility for each of the configurations considered. This changing fuel cost is one of the largest single cost factors affecting the economics of

the various facility configurations and therefore creates some configurations that are more economically desirable than others. This fluctuation in the fuel price created by greater and lesser fuel needs of the proposed facility can be more fully identified by reviewing Attachment A, which presents the various cases and sensitivities run by the team. It is this principle that causes any case that includes placing FATCO's boilers on standby and providing their steam needs from the proposed facility to generate more favorable results when compared with other configurations. This occurs because this configuration makes additional relatively inexpensive fuel available to the proposed facility.

B. Existing Reservation Fuel Reduction

Because the biomass is currently being gathered and burned as part of the Existing Reservation Fuel Reduction/Forest Management Programs, it will not be necessary for the proposed facility to incur these costs. These costs have not been included in the cost for this fuel. Further, a proposed contribution by the BIA toward the removal of this biomass, for use by the proposed facility, has been incorporated into the total cost of this fuel. This proposed contribution is to account for the amount of estimated labor economies from (1) the elimination of the majority of slash burning labor by the BIA and (2) the reduction of labor cost for piling that will be realized by the BIA as a result of the labor synergies between their crews and that of the crews chipping and hauling this material to the proposed facility. In other words, since this reduction in labor cost is generated by the construction of the biomass facility, the biomass facility has been shown to receive the benefit of the reduced labor cost.

It can be seen that the cost of this fuel is several orders of magnitude less than the Existing Fuel Reduction Program. These values reflect the cost of the fuel to the proposed facility, recognizing that the Existing Fuel Reduction Program is already performing some of the functions necessary to gather this biomass which allows the proposed facility to avoid incurring these same costs. The proposed contribution increases the apparent discrepancy between this program and the Expanded Reservation Fuel Reduction Program discussed below.

C. Expanded Reservation Fuel Reduction

The cost for the Expanded Reservation Fuel Reduction Program was developed utilizing estimates from third party contractors experienced in this work. The costs include those required to complete the typical steps of slash collection and removal, identified as the work activities for the feller/buncher and skidder. These costs are added to the costs associated with hogging or chipping the fuel, hauling the material to the proposed plant and miscellaneous logging road maintenance costs. Fuels considered include only those relating to timber lands. Expansion to woodland areas is also a possibility for the

program; the additional fuels generated would increase the totals noted. These costs do **not** include any subsidy (or labor sharing) from the BIA or any other third party. The work sheet utilized to develop these costs is included as Attachment C and the results are summarized in Attachment B.

D. FATCO Logging Slash

The FATCO Logging Slash costs utilized in this study are the current costs incurred by FATCO to process this material, based on the discussions with FATCO personnel after adjustment by the same factor as discussed above for the Existing Reservation Fuel Reduction Program and as further delineated in Attachment B. Further clarification is desired regarding FATCO's current practice or ability to include in their operations the removal of limbs and tops after skidding the whole tree to a deck such that this material will be accumulated in a central location for later processing as fuel for the proposed facility. Currently, the project economics include costs to skid this material to central location even though FATCO's crews may already perform this activity.

E. Excess FATCO Fuel

The next fuel available and utilized in this study is the Excess FATCO fuel that is currently moved to the outer areas of FATCO's sawmill property to be stored and/or later sold. This fuel is clearly the lowest cost fuel available for the proposed biomass generation facility because the portion of this fuel that cannot be sold elsewhere is stored on site and considered a disposal challenge, and the fuel that is sold is tendered at very low prices. In the Financial Analysis section presented later in this Report, the assumed price for purchase of this fuel from FATCO by the generation facility was borrowed from FATCO's estimated income received from existing sales of this material as noted in the NEOS report. Of course the quantity of material sold to third parties represents only a modest portion of the total amount generated. For those cases where this material is sold to the proposed facility, all of the material is assumed to be a part of the sale, including the material sold to third parties. FATCO would receive some revenue through the pricing structure proposed and challenges historically faced in disposing of surplus material would also be removed.

The older excess fuel currently stored on FATCO's property has not been included in the analysis at this time because the quality and quantity of this biomass is unknown and it is suspected that this fuel may have deteriorated such that there is little or no heat value remaining. If this proposed project proceeds, this fuel should be tested for heat value and general quality to assess its suitability as a biomass fuel.

F. Fuel Currently Utilized by FATCO's Boilers

The Fuel Currently Burned in FATCO's Boilers was assigned a value similar to that of the Excess FATCO Fuel, except for its intrinsic value to FATCO as fuel to power their existing boilers to meet the kiln steam demand. It is important to recognize that the scenarios studied in this Report include some options where FATCO's existing boilers would be placed on standby, and their steam needs would be met by the proposed biomass facility. As already mentioned, this option provides significant quantities of fuel for the proposed facility at modest prices, with the assumed pricing structure. A more complete discussion of this option and its advantages is provided in the "Financial Analysis" section later in this Report.

It has been assumed that the fuel requirements of the proposed facility, depending on the scenario examined, will be met by purchasing the necessary available fuel in the order of their respective, increasing costs. In the financial model, the least expensive fuel is the first to be utilized, relying on the more expensive fuel to provide the last portion of the required fuel. Therefore, the scenarios requiring less fuel or where additional low cost fuel is available (such as where the proposed facility provides steam to FATCO), have an inherent economic advantage over other scenarios. This will be discussed further in the "Financial Analysis" section of the report.

8

Scale, Location and Design

A. Economies of Scale

A portion of this study includes determining the optimum size of the proposed facility. Both the amount of fuel available and the electrical demand of the Tribal enterprises and of the entire Reservation were all considered. It is important to understand the economies of scale before proceeding with a discussion of the size of the proposed facility.

1. Capital Costs

Larger scale facilities offer several advantages well known to power generation developers and owners. Smaller facilities require all the same equipment as a larger facility, just smaller in scale. All facilities, for example, need condensate pumps, cooling water pumps etc. It is generally accepted and well understood that if you double the size of a pump and motor, it does *not* double its cost. The magnitude of the increase would depend on the equipment but the cost increase would likely have a range of 10% to 80%. This principle holds true for nearly

all capital cost items. So to the extent that the other parameters used to select the size of a facility don't preclude developing a larger scale facility, there will be economies realized and value added, by selecting a larger scale facility over a smaller facility. This is further emphasized by the discussion below regarding other costs.

2. Development Costs

There are many development costs that are fixed regardless of the size of the facility. This statement does not directly apply to facilities that are orders of magnitude different in size, but the following principle is still sound for the facility sizes considered in this Report. For example, the costs to permit a facility, the cost to design a facility, legal costs, and project management costs, will be nearly the same for all facility sizes considered in this study. Therefore, the cost "per kilowatt of installed generation" can be lowered to the extent the facility's scale can be increased.

3. Fixed Operating Costs

Within reason, it requires the same level of staffing to run a smaller facility as it does to run a larger facility. As above, this is particularly true for all size facilities considered in this study. A facility that requires two or maybe three personnel per shift, will require the same staffing whether the facility is a 10 megawatt plant or a 20 megawatt plant. Therefore, the staffing cost on a "per kilowatt of installed generation" basis will be considerably lower for the larger scale facility. The liability insurance, office expenses, and other basic infrastructure costs, for example, may increase some as the facility scale is increased, but they will not increase proportionally, just like the cost of a pump does not increase proportionally. Therefore, the best value will be achieved by selecting the largest facility that is reasonable, based on all other criteria.

4. Fuel Costs

The above discussion demonstrates that larger facilities may enjoy significant economies of scale. However, the various fuel sources and their associated costs, may cause the proposed facility to have financial "drivers" that are counter to the typical financial inducements toward larger facilities discussed above. In other words, a smaller facility may not enjoy the economies of scale of a larger facility, but will benefit from use of the smaller amounts of the higher cost fuel. Fuel source costs were varied from \$2 per green ton to \$28 per green ton. A facility sized such that none of the higher priced fuel is required will offer significant cost savings over a larger facility that requires purchases of the higher cost fuel. *These opposing financial inducements have been compared and weighed in the financial analysis to arrive at the most economically beneficial configuration(s).*

One potential, physical constraint that could override the entire discussion above regarding scale, is the availability of water. Recognizing this, the team developed alternatives to mitigate the water shortage matter. These are discussed below.

B. Water Supply

The team is keenly aware of the scarcity of water for use by the proposed project. The largest magnitude of water required by any power generation facility is used by the cooling tower to condense the steam to its liquid state for reuse by the boilers. The amount and cost of water available for this facility has been given careful consideration and creative alternates have been developed and evaluated.

1. Equipment Alternatives

The team evaluated the benefits of an air cooled condenser that eliminates 1) the need for a wet cooling tower for condensing steam into liquid and 2) the need for water to provide this cooling. However, this configuration increases capital and operating costs. Another option considered and evaluated was the installation of a wet/dry, hybrid cooling tower that was thought to require substantially less water than a conventional wet cooling tower. These capital equipment alternatives have been priced and their economics evaluated in the Financial Analysis section found later in this Report.

2. Water Source Alternatives

Besides evaluating various equipment configurations that utilize different amounts of water and have differing capital costs and operational considerations, the *source* of the water necessary to operate the facility, was also reviewed. It has been identified that the water currently discharged to the river after treatment by the Canyon Day Wastewater Treatment facility, may be a prudent option as a source of water for the proposed generation facility. A very preliminary review of the water quality and quantity of the Canyon Day facility's water discharge has been completed and found to be suitable. The water quality is such that additional water treatment equipment may be required to properly prepare the water for use by the proposed facility. Two proposed facility configurations were considered that allows utilization of this water source.

a. Siting Facility At Canyon Day

Siting the power generation facility adjacent to the Canyon Day Wastewater Treatment facility would allow easy access to the Canyon Day water discharged. Since an adequate water source would be readily available with this alternative, use of conventional cooling tower equipment that is less expensive than alternative

configurations, could be utilized. This option would likely require the addition of a transmission line from Canyon Day to Whiteriver to allow exporting the power generated. However, placing the proposed facility at Canyon Day, eliminates the ability of the proposed facility to provide steam to FATCO's kilns. It has already been stated that utilizing the proposed facility to provide the steam to FATCO's kilns, and to thereby gain access to the relatively inexpensive fuel currently being consumed by FATCO's boilers, is an important economic incentive to the success of the proposed facility.

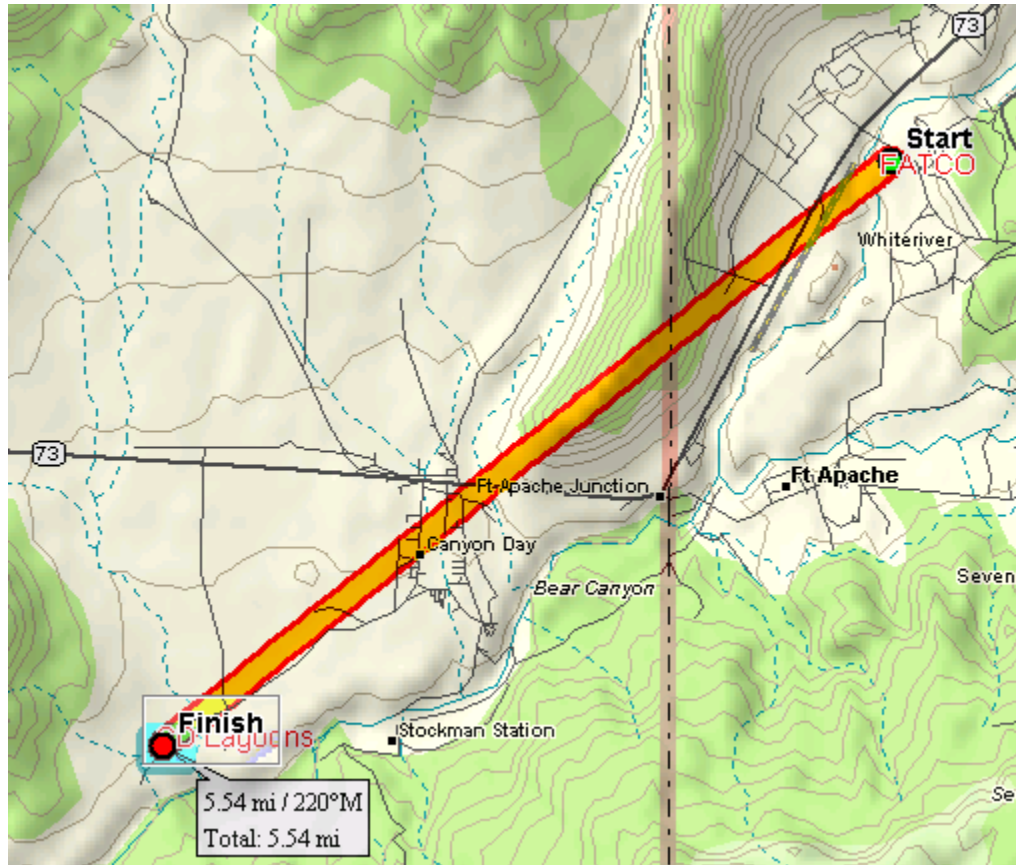
b. Install New Pipeline

Installing a six-mile pipeline from the Canyon Day Wastewater Treatment facility to Whiteriver to provide the Canyon Day facility's discharge water to the proposed power generation facility for those configurations where the facility is sited in Whiteriver, has also been considered. The actual direct distance from the treatment facility discharge to Whiteriver is less than six miles but it is anticipated that this pipeline would follow existing roads and other right-of ways. The actual pipeline distance following a more circuitous route has been estimated to be six miles in length. Figure 1 below provides a layout of the relative location of the Canyon Day Wastewater Treatment Facility and Whiteriver. This configuration would also require the addition of a pumping station to move the water from Canyon Day to Whiteriver. This alternative incurs additional expenses that include the following:

- Additional capital for the installation of the pipeline to transport the Canyon Day discharge water to Whiteriver,
- Additional capital for a pumping station to move the water to Whiteriver,
- Additional operating costs to provide pumping power to transport the water from Canyon Day to Whiteriver, and
- Additional operating expenses for moving the excess FATCO fuel and/or fuel currently utilized by FATCO boilers, from Whiteriver to Canyon Day. The economics of these alternatives have been evaluated and discussed in the Financial Analysis section of this Report.

These various configurations and their associated capital and operating costs have been evaluated through the use of the financial model, and their results reported in Attachment A and further discussed in the "Financial Analysis" section of this Report.

Figure 1 – Canyon Day to Whiteriver Aerial – Proposed Water Pipeline



9 Potential Environmental Impacts

A. Air Emissions

Siting of any combustion-based facility necessitates an evaluation of emissions and their impacts. Air impacts from the proposed 20 megawatt biomass-fueled generation facility are estimated as follows and assume the use of an electrostatic precipitator:

CO	NO _x	PM
300 tons/year	250 tons/year	35 tons/year

These totals may trigger federal Prevention of Significant Deterioration requirements. [See 42 U.S.C. §7470(4) and 40 CFR §51.166(b)(1)(i)(b)].

Also, siting the facility adjacent to FATCO may trigger additional requirements since the emissions increase exceeds the following:

CO	NO _x	PM
100 tons/year	40 tons/year	25 tons/year

Tribal representatives dispute the automatic application of these requirements to this project. In the event that they are ultimately applied, however, these levels will require that the Best Available Control Technology be employed. [See 40 CFR §51.166(j)(2) *et seq.*]. Best Available Control Technology or (“BACT”) considers the cost to the owner to add the necessary equipment to achieve the next level of emissions reduction (dollars per ton of emissions removed). As the emission levels are reduced further by the purchase of additional emission removal equipment, the cost per ton of emissions removal increases. Once the cost for emissions removal reaches certain levels, EPA will not require that additional reductions be achieved. BACT would likely require that SNCR (urea or ammonia injection) be utilized. This cannot be confirmed without further discussions with EPA representatives as recommended in the Next Steps section of this Report.

If FATCO’s own steam generation is utilized only for backup purposes, however, there may be some potential to trade off emissions between the two facilities (one facility uses the emission allowances while the other is not operating). This also would need to be discussed with EPA to determine allowable permitting conditions.

B. Water

Water availability on the Fort Apache Indian Reservation has been declining in recent years. Maintaining minimum stream flows nevertheless remains a priority for the Tribe. Endangered and threatened aquatic species protections, competing consumptive uses, and recreational and cultural values all underscore the need to conserve remaining Reservation water resources.

Operation of a biomass-fueled power generating facility on the Reservation must be evaluated in conjunction with other water uses. Several water-demand scenarios, as previously discussed, are outlined in the Financial Analysis section of this Report. These include utilizing conventional wet cooling tower, wet/dry hybrid towers, and dry or air condensers that require no water. It also includes locating the facility at Canyon Day to allow utilization of the Canyon Day Water Treatment discharge waters and the addition of a pipeline and pumps to move the Canyon Day Water Treatment facility water to Whiteriver, for the cases where the generation facility is located at Whiteriver.

10

Potential Impacts on Tribal Programs

A. Forest Management

Acting in its trust capacity, the Bureau of Indian Affairs (BIA) executes the Reservation Forest Management Plan Tribal Forestry office staff coordinate with the BIA on the Tribe's behalf, provide technical advice to the Tribal Council on forest management and assist as needed with respect to other Reservation activities.

If cost-effective, a Reservation biomass power plant could facilitate the Tribal goal of thinning 7,000 acres per year within the Reservation boundaries; at present only 2,000 acres/year is harvested for this purpose. With the catastrophic impacts of the Rodeo-Chediski fire in 2002, the need for increased thinning operations has become critical. Labor efficiencies, discussed in the Fuel Supply section of this Report, will likely be realized if the proposed biomass facility utilizes biomass generated from any of the Reservation forest management activities.

B. FATCO Operations

Implementation of a biomass facility near the FATCO facility would provide advantages to FATCO and require small adjustments by FATCO, but little or no significant effects (none detrimental anticipated) would be realized by their operation.

- It is anticipated that FATCO and the generation facility would enjoy the benefits of some staff sharing as outlined in the Jobs Provided section of this Report. This will provide greater staffing flexibility for FATCO, especially during mill outages or breakdowns.
- If the steam for FATCO's kilns is provided by the proposed facility, it will reduce maintenance costs for the existing FATCO boilers and equipment.
- Such a change will enhance the reliability of their steam supply, which could now be supplied from either of two potential sources (the proposed facility and the FATCO boilers).
- The proposed facility would provide a market for the excess biomass not currently being consumed in FATCO's boilers, eliminating the current disposal challenge. The pricing presumed, however, is subject to further evaluation and discussion by FATCO and WMAT.
- The proposed facility would reduce the regulatory risk of FATCO being required to meet new tougher air emission limits.

11

Jobs Provided

A. Staffing Levels

Some team members have significant experience and exposure to other biomass power generation facilities. This experience allowed the team to consider the staffing levels necessary to successfully operate and maintain the proposed facility. The type of equipment purchased, the operating philosophy, certain safety considerations and the amount of synergy with FATCO's staff, all impact the recommended staffing. A discussion of these variables, as it relates to staffing the facility, is provided below.

1. Equipment

If the fuel handling equipment is compromised it may require nearly full time attention by the operator to maintain the fuel supply flow. The costs included in this study provide sufficient funds to offer adequate fuel

handling equipment to allow periods when the equipment will operate unattended. These breaks in the demand for attention can be utilized by the operator to manage the fuel storage pile, perform routine maintenance and complete cleanup duties. This is just one example of how the equipment provided can affect the level of staffing required. The equipment included in the cost estimates of this study has been selected to provide a reasonable compromise between capital cost and staffing levels.

2. Operating Philosophy

Besides the equipment configuration, there are several items to consider when determining the proper level of staffing. This is partially determined by the operating philosophy of its owner and how aggressive or lean the owner chooses to staff the facility. One must consider what costs will be incurred if the facility is forced out of service because there was not adequate staff in place to respond to an operating emergency. The owner must determine how much time will be allowed for training and the method of covering vacations and sickness, which all affect the staffing levels requirements.

3. Safety

Most owners are not willing to allow a shift to be staffed by a single individual because if that individual were to become injured or have a medical emergency, staffing in this manner may jeopardize the individual's safety. Of course, with a single individual covering the shift, the staff is far less prepared to deal with an operating emergency. Other owners have developed regular call-in schedules for the single staff shift as a means of regularly validating his or her safety, thereby allowing single staff shifts.

B. Recommended Staffing

The team included all these considerations when developing its recommended staffing levels. The staffing plan provided below is not extremely aggressive but is fairly lean and assumes a certain synergy with the FATCO staff. It includes full staffing for all shifts to provide the added ability to immediately respond to operating emergencies. This staffing level will allow some on-shift training and self-improvement activities such as online orientation and training. It does not include any single staff shifts and thereby avoids the risks associated with this staffing arrangement. The recommended staffing was able to be reduced slightly because the team anticipates that some assistance from personnel with electrical and mechanical capability will be provided by FATCO in exchange for the biomass facility providing maintenance staff assistance with instrument and controls expertise, or some similar exchange of staff and expertise.

The recommended staffing for this facility is as follows:

- **1 Plant Manager**

The plant manager should be an experienced power plant operator and manager who will be responsible for hiring and training the remaining staff. This manager will also interface with the plant owners regarding capital expenditures, annual budgets, safety record, incentive programs, training, and environmental compliance. The Plant Manager must be a very experienced individual with significant prior power plant operation experience.

- **1 Operations Supervisor**

The Operations Supervisor will act as a resource for training other personnel and provide shift relief for vacation and sickness. This staff position will be responsible for directing the Plant Operators and Assistant Operators as necessary. The Operations Supervisor will interface continuously with the Plant Manager regarding all operations issues.

- **4 Plant Operators (1 per shift)**

These individuals will be the most highly trained shift personnel and will be the individual in charge of each shift. This individual will always remain at the controls of the facility, making decisions regarding the operation and completing the necessary adjustments to the operating equipment. This individual will assist with the training of junior staff members and will regularly interface with the Operations Supervisor. One of the four Plant Operators may be designated as the Lead Plant Operator.

- **4 Assistant Operators (1 per shift)**

The Assistant Operator will be the outside eyes and hands for the Plant Operator. He or she will make all physical adjustments to the equipment that cannot be completed from within the control room. This individual will assist the Plant Operator and maintenance staff with trouble-shooting activities. The Assistant Operator will be responsible for operating the water treatment equipment, taking water samples and running the water tests as required. Most importantly, this individual will make rounds of all operating equipment and provide routine preventative maintenance such as cleaning strainers and greasing equipment. This position will also be responsible for assisting with operating emergencies, especially fuel or ash handling equipment failures or plugs.

- **4 Fuel Operators (1 per shift)**

The Fuel Operator(s) will receive all fuel deliveries and assure they are properly weighed and unloaded. He/she will be responsible for assuring that the truck unloading area has been cleared of fuel to make it ready for the next delivery. By utilizing a front-end loader, these individuals will manage the fuel pile to assure a steady and uniform supply of fuel is supplied to the boilers and to assure that the oldest fuel is consumed first.

They will also maintain the ash collection area and facilitate changing the ash collection bins as they become full. Any fuel or ash equipment failures or plugs will be the direct responsibility of these individuals. The Fuel Operators and the Assistant Operators will work together as necessary to address any operating emergencies.

- **1 Instrument and Controls Technician (I&C Tech – Day Shift)**

It has been assumed that there will be staff sharing with FATCO, to support the maintenance staffing levels and expertise recommended in this Report. Assistance from this FATCO maintenance staff will be required mostly during outages or major failures of equipment requiring additional staff.

The new biomass facility will utilize modern instruments and equipment, some of which may not be currently utilized in FATCO's facility, thereby requiring staff who will possess the specific skills needed and the ability to become thoroughly familiar with the biomass facility instruments. This individual will be responsible for maintaining all instruments in the facility, repairing or replacing failed equipment, maintaining the equipment in proper calibration and performing preventative maintenance. This will include maintaining the stack continuous emissions monitoring system (CEMS) and the instruments that supply the operational signals to the plant control system. If implemented as planned, this individual will also provide I&C assistance to FATCO.

- **1 Mechanic (Day Shift)**

A power generation facility is filled with mechanical equipment including pumps, motors, fans and gearboxes, but it also includes a variety of piping systems. This position will handle all mechanical troubleshooting activities, execute mechanical repairs of all kinds and perform routine preventative maintenance activities. This position will be responsible for maintaining the work order and maintenance tracking system. Ideally, this staff position would have the ability to weld, also. If implemented as planned, this individual will provide supplemental labor to FATCO as needed.

- **1 Administrative Assistant**

The Administrative Assistant will provide administrative assistance to the Plant Manager and perform all forms of office duties to support the operation. This work will include word processing, filing and answering phones. As this person becomes familiar with the plant, the Plant Manager may ask this staff person to gather data for, and prepare certain routine reports for outside agencies or management. The Plant Manager may ask this person to track all training, vacations, sick time etc. for each member of the staff.

- **2 Staff Positions Provided by FATCO**

This proposed staffing plan anticipates the execution of a staff exchange agreement with FATCO. This agreement would offer some time of the I&C technician and mechanic from the proposed facility in exchange for time from an electrician and an additional mechanical maintenance person from FATCO's staff. The electrician would be utilized for all electrical repairs that the proposed facility's maintenance staff is unable to complete. The maintenance person that FATCO would share could be a junior mechanic who would primarily assist the proposed facility's lead mechanic.

- **Other Staffing Needs**

The operating budget provides modest funds for third party contracts to provide legal, accounting and auditing services. It has been assumed that payroll and other routine human resource activities will be handled by the Administrative Assistant or existing Tribal enterprise staff.

- **Special Responsibilities**

Several of the operating and/or maintenance staff will have supplementary responsibilities such as, safety coordinator, training coordinator, spare parts coordinator, work order management activities, operating procedures and emergency procedures manager and I/T activities.

C. Compensation and Cost

The total full time staffing needs of the proposed facility is 17, recognizing that it has been assumed the maintenance staff will be shared with FATCO and that FATCO will share two maintenance personnel with the proposed facility. This is considered an adequate but minimum staffing level for this facility. One or two additional personnel would provide greater scheduling flexibility for vacations, training and illness and would offer additional personnel for maintenance support during major outage periods. But the recommended staffing is adequate. The salaries for this staff have been estimated as follows:

The Plant Manager will be far more skilled and experienced than the remainder of the staff and may have to be hired from outside the Reservation if an individual with adequate experience cannot be located from within the Reservation. The compensation level for this position has been estimated at \$70,000 per year.

Operations Supervisor, Plant Operator, Assistant Operator, Fuel Operator, Mechanic and I&C Technician will be compensated at different levels based on their experience, their abilities and on which position they hold. The *average* salary for these positions has been estimated to be \$30,000.

The Administrative Assistance's compensation has been assumed as \$20,000.

The salaries utilized in the model can of course, be adjusted if these values for some reason do not reflect levels of compensation that are commensurate with the employment market on the Reservation.

The financial model incorporates other staffing costs including the following Table:

Table 2 – Staffing

Staffing Cost Item	Cost
Benefits and Payroll Liabilities	30% of salary
Overtime expense	10% of base salary
Safety and Production Bonuses*	5% of base salary
*Industry standard practice. May be strongly recommended by off-Reservation partner if partner utilized.	

The total of these staffing related costs is \$783,000 per year with an additional \$25,000 per year allowed for third party accounting and legal services.

12 Construction Costs

Both the purchase cost of capital equipment as well as the cost for installation of power generation equipment will vary significantly depending on the business activity of the industry at the time of purchase. Deep discounts (up to 40%) have been experienced during the past slump in new development of power generation facilities. This introduces a significant variable that cannot be predicted. A comprehensive detailed construction cost estimate was **not** prepared for this Report. The team relied on its experience with the purchase and construction of other power generation facilities including facilities similar to the proposed facility to develop a reasonable cost estimate. This considers the size of the facility, the anticipated technology, financing costs, required reserve funds and other soft costs (costs not directly associated with the equipment or its installation). The estimated capital, financing costs, and reserve fund costs are shown in Attachment E. These estimated costs vary depending on the case considered and total \$47.4 million (see cell E43) for the recommended Case AF. The cost estimate utilized in the model is a reasonable cost estimate of a facility utilizing quality equipment, properly selected. It is not a “cheap down” estimate that anticipates equipment shortcuts or omissions.

A. General Description of Equipment

The final equipment and project configuration will be affected by several factors including size, location and availability of water. However, the following provides a general description of the anticipated configuration and what was considered and included when developing the projected costs.

1. Boiler

A stoker fed boiler system (or similar) consisting of a field-erected, two-drum, water tube steam generator with a pendant type superheater. The boiler will include a forced draft fan to provide undergrate and overgrate air and an induced draft fan to pull the boiler flue gases through the combustion air preheater, economizer and finally through the ash collectors. A combustion air preheater will utilize stack gases to warm the combustion air to provide greater combustion stability, combustion efficiency, and allow utilization of fuels with higher moisture content. This system will include a boiler feedwater economizer to transfer heat energy from the flue gases to the boiler feedwater for greater efficiency and multiple cone collectors to provide the first step of ash removal from the stack gases.

2. Ash Removal

A boiler ash removal system will collect the ash separated by the multiple cone collectors and ash discharged from the bottom of the boiler. A pug mixer will be utilized to wet the ash prior to transport.

3. Particulate Removal

The induced draft fan exhausts into an electrostatic precipitator that utilizes electrically charged plates to clean the boiler gases prior to discharging into the exhaust stack. The electrostatic precipitator will include an ash handling system for collection of the ash removed from the stack gas.

4. NOx Removal

The equipment required for NOx removal will depend on the permit requirements. The construction estimate includes costs for a selective non-catalytic reduction (SNCR) system, utilizing ammonia or urea injection for NOx reduction.

5. Controls

The boiler system includes a computerized distributed control system (DCS) for centralized control, data collection, data archiving and trending of operating parameters.

6. Steam Turbine-Generator & Electrical Equipment

The electric generation equipment will consist of a condensing steam turbine generator, exciter and condenser. Controls, relays, breakers and switchgear to allow parallel operation with the utility grid are included.

7. Cooling tower

A field erected, wet, mechanical draft cooling tower with associated circulating water pumps to provide cooling water to the condenser and other plant auxiliaries is equipment utilized in the base case.

Alternate configurations reviewed include a forced draft, air cooled condenser to replace the wet condenser and a hybrid wet/dry cooling tower configuration. The final configuration will be determined by capital costs and water availability.

8. Switchyard

Supplemental equipment such as switchyard equipment, protective relays, motor control centers, and DC power system are also provided. Estimated costs to provide and install all typical equipment to interconnect with Navopache have been included in the cost estimate.

9. Scales & Truck Dump

A truck scale and truck dump will provide means to measure the fuel deliveries and to unload the trucks. If sufficient self-unloading van type trucks are available, the truck dump could be eliminated from the scope of supply.

10. Fuel Handling

A drag chain type relaimer is provided for admitting fuel into the fuel handling system. Fuel will be transported from the relaimer to the disc screen, hog and magnet by way of belted conveyors. The disc screen will remove oversized materials that will be sent to the hog for size reduction. If it is determined after a more complete analysis and discussions with potential fuel suppliers that oversized material will be minimal, the hog could be eliminated from the scope. If the hog was eliminated, the oversized materials that are received would be disposed of in a landfill, given away for firewood or disposed of by other means.

Wood-fuels will be stored in small surge bins located on the front of the boiler that will automatically meter the fuel into the boiler by way of a stoker spreader. A few weeks' supply will be stored on the ground in the immediate area. This will allow some drying of the fuel and provide adequate surge capacity for periods when the continuous flow of fuel to the site might be interrupted.

11. Water Treatment

Boiler feed pumps and condensate pumps will transport makeup water and condensed steam to the boiler. The water supply for the boiler will be conditioned by water treatment equipment that will be selected based on the final chemistry of the water supply. This may include a demineralizer or an electronic ionizer and associated neutralization tank and chemical storage. Water storage tanks to retain raw water and demineralized water are included.

12. Other Materials & Services

Site preparation, foundations, engineering, equipment installation and spare parts costs are included in the construction cost estimate.

Development costs including permitting, engineering and project management as well as startup, training and pre-operational costs are included in the cost estimate.

Soft costs such as interest during construction, working capital reserves, major maintenance reserves, debt service reserves, owner's legal costs, lender's legal costs, lender's engineer costs, loan fees, and commitment fees are all included in the cost estimate.

B. Used, Refurbished Equipment

Utilizing some used, refurbished equipment is a viable approach that can reduce costs significantly. This has not been modeled in this Report since pricing of used, refurbished equipment cannot realistically be accomplished until a purchase is anticipated because the supply and pricing changes dramatically with time and availability. From the sensitivities that have been run (Table 7 and Attachment A), it can be seen that the results for a 10% increase (or likewise decrease) in the capital cost (Case AM) produces significant changes in the financial results. This small change in the capital cost caused the IRR to drop 2.1 percentage points (12.5% for Case AF to 10.4% for Case AM) and the net present value to drop by \$3.5 million (+\$781,000 to -\$2,800,000). If the capital costs could be reduced by 10% or more, the financial benefits would be equally significant.

A reprint of a notice of two used power plants that were offered for sale earlier this year is provided in Attachment D, simply as an example of what is sometimes available in the used equipment market. To utilize used equipment the buyer must be able to reliably identify its condition and functionality and all removal, transportation, refurbishment (if not already completed) and installation costs must be included in the evaluation of used equipment compared to new equipment so that an accurate comparison can be made.

13 Operation and Maintenance Costs

The costs associated with the staffing levels identified in the Recommended Staffing section have been included in the financial review. All other fixed and variable operating costs have been estimated based on the expected plant configuration, size and the ability to share a few personnel with FATCO for those cases where the facility is located next to FATCO's Whiteriver sawmill. A detailed buildup of these costs is provided in Attachment E – Financial Inputs & Results. These costs vary some depending on which scenario is being considered. Of all the cost items, the fuel costs have the largest range of values depending on the mix of the fuel sources necessary to obtain the required quantities. The operation and maintenance costs for the selected case (Case AF) are as follows:

Table 3 – Operation & Maintenance Costs

Cost Item	Annual Cost
Staff Costs Including Benefits, Payroll Taxes and Bonuses	\$783,000
Basic Operating and Maintenance Costs	\$738,000
Administrative and Insurance Costs	\$250,000
Fuel Costs	\$464,000
Total Operating and Maintenance Costs	\$2,235,000

The details of these costs are identified in Attachment E, column K and the other Attachments relating to each of the categories listed in Attachment E.

14 Electricity Pricing

Representatives of WMAT had discussions with several energy providers to obtain an estimated market price for the sale of the biomass power. Because the biomass power is unit contingent, which means that power is delivered to the buyer only if the unit is running, the market price of power for such a product is less than that paid for firm power. However, the cost to provide a firm product versus the increase in the market price was deemed not to be cost-effective. While WMAT has not obtained a firm commitment from an entity to purchase the output, WMAT was able to obtain estimates for such a purchase price. At the current time the estimated purchase price **at Four Corners**, based on these discussions with other energy providers, is assumed to be as shown below:

On – Peak	\$0.048/kWh
Off – Peak	\$0.030/kWh

An adjustment to the above purchase price was made to estimate the value of the energy at the busbar of the generator. An adjustment of 8 \$/MWH was made to the Four Corners price to reflect the unit contingency, wheeling and the non-standard size of the biomass generator as it relates to market transaction, which are typically made in 25 MW blocks. The resulting estimated value of the energy at the busbar (the exit of the proposed biomass facility) is assumed to be as shown below:

On – Peak	\$0.040/kWh
Off – Peak	\$0.022/kWh

If WMAT's representatives enter into discussions in earnest with energy providers as suggested in the Next Steps section of Report, it might be found that this pricing has changed or that the discount for being unit contingent power is slightly different than the current market suggests. These changes could significantly affect the project's economics and therefore would need to be reevaluated at the time a firm commitment is obtained.

15 Power Sales

A. General

One option considered by the project team, is the sale of the power generated by the proposed facility to the Tribal enterprises to meet all existing Tribal power needs. This option requires that firm backup power be available during periods of unanticipated and routine maintenance outages. This backup or "firming power" is very expensive to purchase and creates a significant financial hurdle for the project. Since the six or seven largest Tribal enterprises utilize approximately 10 megawatts of power, this suggests a proportionate size for the proposed facility. The entire Reservation requires approximately 14 megawatts to be properly serviced, however. This is another size benchmark that was considered.

Providing power to FATCO from the proposed generation facility does not appear to be a cost-effective option based on the low cost interruptible rate FATCO receives from Navopache. It would be difficult for the proposed generation facility to provide power to FATCO at a price below what is currently available.

However, the other Tribal enterprises pay Navopache's retail rate. This cost is considerably higher than the wholesale rate Navopache or PNM offers to other power

generators like the proposed facility. Selling power to the Tribal enterprises may provide cost savings to the Tribal enterprises while offering a higher pricing structure to the proposed project. However, the price of needed standby power, if purchased from Navopache, may be so high that it will reverse these favorable economics. The Financial Analysis section of this Report addresses this subject further by providing the specific economics of the various scenarios.

All these factors have been considered by the team and were evaluated and analyzed to determine the best scale and location for the proposed biomass power generation facility as well as the most desirable marketing arrangement for the proposed generation facility, the Tribe, and its enterprises. This Report will show that offering power to the Tribal enterprises is not economical primarily because the enterprise's capacity factors are so low that there are many kWh's of electricity that are not able to be sold to the enterprises during the off-peak hours.

B. Green Tag Sales

"Green tags" are available for many types of renewable energy. Tags are based on the emissions reductions that result when energy is generated from renewable energy sources rather than conventional fuels like coal; tags act as a pricing offset to the renewable power pricing, which is still slightly higher than energy generated from conventional processes.

Organizations act as marketers of the tags. The Bonneville Environmental Foundation (BEF), for example, currently sells green tags for wind and solar generation projects. Because this concept is relatively new, the market for green tags for biomass projects is not as mature as other renewable energy tags. BEF does not currently have any contracts to market green tags from power generated from biomass, but they intend to create a product for market that is a blend of wind, solar and biomass green tags.

From the team's research, it appears that many green tag marketers are focusing primarily on solar, wind, and some hydro-type generation projects. Sterling Planet, a group based in Georgia, supports biomass generation, however.

In addition, many green tag marketers require certification of the projects for which they sell green tags. The "renewable electricity certification" process involves either a national accreditation or regional approval through an established stakeholder group. At present, no stakeholder group exists for the Southwest; Green-e, a group that is relied upon for certification, expects to form a group in this region by early 2004, however.

In order to incorporate potential sales of green tags from the power generated by the proposed facility, the team elected to incorporate into the model some green tag value for the power generated. The cases presented in this Report include revenue of \$0.020/kWh for 50% of the power generated by the proposed facility for three years, after which revenue for 100% of the power generated was included in the projections. These values

require validation as the project progresses by entering the next phase of development allowing more serious discussions with potential marketers of these green tags.

Selling green power credits *with* the power rather than *separately* is also an alternative. Arizona Public Service has issued Requests for Proposals in the past and has stated they would accept an unsolicited proposal for the proposed facility should the Tribe proceed with development.

16 Back Up (Standby) Power

Several project configurations were considered that would not modify FATCO's power supply or steam supply. However, some cases were evaluated where power is provided by the proposed project to FATCO or to other Tribal enterprises requiring backup power supply to meet the needs of the enterprise during scheduled or forced outages of the proposed project. There are few practical and economic options available to provide this backup power. Gas or oil fired reciprocating engines are the most practical *capital equipment* option. The power required to backup the larger Tribal enterprises is approximately 10 MW and to provide backup for the entire Reservation is approximately 14 MW. The approximate capital and annual operating cost for installing adequate backup power to provide 100% backup power for these power requirements for the Tribal enterprises are provided in Table 4 below. The annual operating and maintenance costs presented in Table 5 below, include the costs associated with operating the engines, overhauling the engines as necessary, operational testing to assure their reliability and general preventative maintenance costs associated with this equipment. This equipment would require the diligence of personnel trained to properly maintain the equipment so it will reliably provide the required power as needed.

Table 4 – Reciprocating Engine Capital Cost

Reciprocating Engine Cost Item	Estimated Capital Cost (\$)	
	10 MW Installed Serve Larger Enterprises ²	14 MW Installed Serve Entire Reservation ³
No. of Self Contained 2 MW Recip. Engines	5	7
Installed Capacity (MW)	10	14
Maximum Load Demand (MW)	9.5	14
Annual Energy Use (kWh)	2,409,000	40,000,000 ⁴
Capital Cost To Purchase & Install	\$4,800,000	\$8,400,000
Fuel Tanks, Truck Unloading Station & Step Up Transformer	\$175,000	\$325,000
Total Capital Cost	\$4,975,000	\$8,725,000

Table 5 – Reciprocating Engine Operating Cost

Reciprocating Engine Cost Item	Estimated Annual Operating Cost (\$)	
	10 MW Installed	14 MW Installed
Estimated Annual Operation & Maintenance Costs	80,500	113,000
Estimated Fuel Costs	241,000	337,000
Estimated Annual Total Operating & Maintenance	\$ 321,500	\$ 450,000
Annualized Capital Cost Over 20 Years	248,750	436,250
Estimated Annualized Total O&M and Capital Costs	\$ 570,250	\$ 886,250

Executing a standby or firming power agreement with Navopache and/or PNM is an alternative to the above mentioned capital equipment approach. ***This alternative will require no capital and no equipment to maintain or operate.*** Executing a standby power contract with Navopache in accordance with their standard tariff would incur annual fixed costs to assure the standby power is available and the estimated variable

² Based on meter data for the Tribal enterprises.

³ Based on meter data for the Tribal enterprises plus estimates for the remaining portion of the Reservation load.

⁴ Rough approximation.

costs (dollars per kWh of energy consumed) when the standby power is utilized. These estimated costs are provided in the Table 6 below. The annualized cost for the Navopache option is considerably less than the annualized cost for the capital equipment option, when the capital costs are considered. A more sophisticated net present value comparison could be performed but the results would not differ significantly from those presented here. Either option would perform the needed function. Contracting with a third party (like Navopache) seems like the most straightforward, simplistic, and least costly approach. This evaluation is only relevant if the proposed biomass facility is utilized to provide power to the Reservation or some of its enterprises.

Table 6 – Purchased Standby Power Costs

Navopache Standby Cost Item	\$/kWh	Estimated Annual Cost (\$)	
		10 MW	14 MW
Basic Service	N/A	1,450	1,450
Contract Capacity Charge	N/A	355,200	497,280
Estimated Annual Standby Energy Charge	0.05197	124,730	174,620
Maintenance Energy Charge	0.02747	97,800	136,910
Demand Side Management Adder	0.0005	3,000	4,170
Annual Estimated Total		\$ 582,180	\$ 814,430

17 Funding Sources & Terms

A. Introduction

Funding for power generation projects has changed dramatically over the last five years. These changes have been driven by many factors beyond the scope of this Report. Funding merchant facilities (generation facilities without a long term power sales agreement and selling to the open market) has become increasingly difficult as the financial institutions witness a softer power market and generally become less willing to accept the merchant risk. The California power crises, the black mark on the power industry created by Enron and other alleged perpetrators, and the current imbalance of installed capacity and demand (excess installed capacity) have all contributed to a more conservative financing market. However, the proposed facility is anticipated to proceed only when or if a power sales agreement is negotiated with a power purchaser. For example, a contract for the sale of this power could be executed with a

utility like PNM or Navopache or perhaps the Tribe, some of the Tribal enterprises with larger loads, or FATCO. Negotiating and executing a power sales agreement is, of course, the most important step toward being able to obtain economical financing for any power generation project.

Non-recourse project financing (financing that has recourse only to the generation facility, whose payment is guaranteed only by the revenues of the proposed facility) of up to 70% of the project cost is likely still available and at reasonable rates of around 7%. The financing term for non-recourse debt will almost assuredly be required to be coterminous with the power sales agreement. The term of the loan and the power sales agreement has been set at 10 years in the financial model. The team believes that the market interest rates may begin to slowly firm as the economy begins recovery and other interests rates begin to rise. Because of the excessive supply of generation capacity generally present in most parts of the country, some lending institutions may request more conservative lending terms. The team believes that the terms utilized in the financial model are reasonable and achievable. If for some reason significant time passes before it is decided to proceed with this project, the debt terms utilized in the model should especially be reviewed.

It is difficult to obtain specific financing terms until the lender is able to become completely familiar with the project and its stakeholders. For this reason, a range of financing terms was provided to the team as typical. Information received by the team included a scenario where 30 year financing at an interest rate of 6% was proposed. Case AT is identical to the selected case of Case AF except with a modification to include the above mentioned financing terms. This creates a far more favorable after tax IRR of 20.3%. The availability of these financing terms must be validated.

B. Bond Financing

Tax exempt bonds are also an option to be considered for the Tribe. The status is available as it is for local governments.

Federally recognized Indian tribal governments can issue tax-exempt bonds for certain governmental and qualified purposes. Tribal governments are treated as states for purposes of issuing valid debt obligations under Section 103. [See Internal Revenue Code Section 7871(a)(4)]. However, tribal governments that issue taxable bonds do not have to comply with the requirements applicable to the issuance of tax-exempt bonds.

Tribal governments must be federally recognized by revenue procedure. [See Revenue Procedure 2002-64].

Tax-exempt bonds may be issued by tribal governments to finance both the provision of "essential governmental functions" and the construction of certain qualified manufacturing facilities. [See Internal Revenue Code Section

7871(c)]. The allowance is available “to any obligation issued by an Indian tribal government (or subdivision thereof) only if such obligation is part of an issue substantially all of the proceeds of which are to be used in the exercise of any essential governmental function.” [See Section 7871(c)(1)]. Tax-exempt bonds can also be issued to finance the acquisition, construction, reconstruction, or improvement of property which is of a character subject to the allowance for depreciation and which is part of a manufacturing facility if required use, location, ownership, and employment criteria are met. [See Sections 144(a)(12)(C) and 7871(c)(3)(B)].

Wells Fargo, with whom the Tribe has had some experience, has indicated that bond financing may extend out to 30 years and interest rates are currently around 6%. Partial underwriting by another source would greatly strengthen the project potential, as would a purchase power contract.

18 Federal Energy Funding Programs

The 2002 Farm Bill authorized USDA to expend \$75 million over six years on biomass research, development and demonstration projects. [See also Biomass Research and Development Act of 2000]. The expenditures are overseen by representatives from both DOE and USDA. Nineteen projects have been funded through the program this year. Project budgets average between \$1,000,000 and \$2,000,000.

Rural renewable energy systems and energy efficiency improvement grants were also recently awarded by the two agencies. More than \$21,000,000 was awarded to entities spanning 24 states. Agricultural producers, rural small businesses, and U.S. citizens or legal residents that demonstrate financial need. The program will award an additional \$23 million to selected applicants and funds can be used to underwrite up to 25 percent of the total eligible project costs. Biomass projects are eligible for funding. No entities from Arizona received an award during this year’s process.

USDA has also recently entered into a Memorandum of Agreement with Colson Service Corporation, a subsidiary of JPMorgan Chase Bank. Pursuant to the Agreement, USDA will issue certificates to investors who purchase guaranteed portions of Rural Development business loans. The certificates will then be available to investors who appoint Colson as a registrar and paying agent for the guaranteed portions of Business & Industry program loans purchased in the secondary market. USDA views the Agreement as an important step toward a “mandatory central agent” for the Business & Industry Guaranteed Loan Program, enabling USDA to monitor the secondary market and increase efficiency, hopefully increasing the rate of loan originations.

The Business and Industry Guaranteed Loan Program guarantees up to 90 percent on loans made by commercial lenders. [See 7 CFR § 1710.102(e)]. Loan proceeds can be applied toward working capital needs, machinery and equipment expenses, buildings and real estate, and for certain types of debt refinancing. Lenders must originate from rural areas, defined as “all areas other than cities of more than 50,000 . . . and their immediately adjacent urban or urbanizing areas.” This assistance is available to virtually any “legally organized entity,” including Indian tribes. Applicants can be approved for third party financing and still qualify for this program.

The Rural Utility Service also provides financing for utility projects, including those based on renewable technologies. “The Rural Utilities Service, under the Rural Electrification Act of 1936, as amended, is able to finance projects developed by eligible non-profit utility organizations, such as electric cooperatives and public utility districts. The Agency is pursuing options for eligible organizations to develop renewable energy, and has financed both photovoltaic and wind powered renewable energy projects developed by current borrowers.”

Rural Business Enterprise Grants, rural economic development loans, and the Intermediary Relending Program all offer funding for different aspects of utility business development. For example, the Intermediary Relending Program offered through USDA’s Rural Business-Cooperative Service would enable the Tribe to borrow funds that it could then relend to a new utility enterprise. Funds are currently available to the intermediary at an annual rate of 1 percent and can be repaid over a period of up to 30 years. The Tribe would then be able to charge the enterprise an inflated rate, proceeds from which could be applied to loan administration expenses or extended to another eligible recipient. This arrangement is only available, however, if alternate financing “at reasonable rates and terms” is unavailable. [See www.rurdev.usda.gov/rbs/busp/irp.htm].

Rural Business Enterprise Grants are available to Indian tribes and can be used to assist “small and emerging businesses.” Funds can be made available in the form of revolving loans, or through equipment leasing programs. The business to benefit from the assistance must have less than 50 new employees and generate less than \$1 million in gross annual revenues.

Rural Economic Development loans are also available to RUS utilities for relending, at zero percent interest, the loan proceeds to an “eligible ‘third party recipient’ for the purpose of financing job creation projects and sustainable economic development within rural areas.” “Business expansions and business startups, including cost of buildings, equipment, machinery, land, site development, and working capital” are all eligible purposes.

RUS utilities are those that have received RUS financing for electric distribution, transmission or generation facilities. [See 7 CFR § 1710.106(a)(1) and (2)]. Loans can be extended to corporations, states, territories, and subdivisions and agencies thereof that provide or propose to provide retail electric service to rural area

customers or meet power supply needs of distribution borrowers. [See 7 CFR §1710.101]. Tribes in Arizona have obtained RUS funding for telecommunications and utility project purposes. [See “Arizona Native American Report 2001” at www.rurdev.usda.gov/az/NatAmerIndx.htm]. Loan applicants whose projects will assist rural area residents receive priority. [See 7 CFR §1710.104(a)].

It is important to note that Navopache already borrows from RUS. Because of this, RUS has indicated that it will scrutinize funding requests by the Tribe to ensure that any lending it provides will not jeopardize repayment of its loans already extended to Navopache.

19 Other Tax Considerations

A. Accelerated Depreciation

Five (5)-year depreciation is available to biomass facilities that are “qualifying facilities” meeting certain IRS criteria. Biomass facilities are “qualifying” if they rely solely on biomass fuel resources, do not exceed 80 Megawatts in production capacity, and are “owned by a person not primarily engaged in the generation or sale of electric power” (other than from cogeneration or small power production facilities).

Entities must also meet applicable Federal Energy Regulatory Commission requirements. A facility “qualifies” if it is a topping-cycle facility, its thermal energy output must be at least 5 percent of the total energy output during a 12 month period; ***there are no requirements for bottoming-cycle facilities that do not rely on natural gas or oil.*** (like the proposed facility) [See 18 CFR §292.205(a) and (b)]. Cogeneration or small power production facilities may not be owned by any “person primarily engaged in the generation or sale of electric power other than from cogeneration or small power production facilities.” [See 18 CFR §292.206]. Ownership is determined by evaluating whether “more than 50 percent of the equity interest in the facility is held by an electric utility or utilities, or by an electric utility holding company, or companies, or any combination thereof.” [Id.] Wholly or partially owned subsidiaries of electric utilities or electric utility holding companies with ownership interests are equivalent to ownership by a parent company only. [Id.] Electric utility subsidiaries that are either exempt from PURPA or are deemed to not be utilities by SEC order are excepted from this rule. [Id].

Qualifying status can be obtained through a self-certification process, completing the relevant FERC forms and by serving notice to each electric utility with which the certifying entity expects to interconnect, transmit or sell electric energy to or purchase supplementary, standby, back-up and

maintenance power from. The entity is also required to notify the State regulatory authority of each state where the facility and each affected utility is located. [See 18 CFR §292.207].

The relevant Internal Revenue Code accelerated depreciation allowances include provisions in effect prior to November, 1990. These provisions allow for the facility boiler, burner, “equipment for converting the [biofuel] into a synthetic liquid, gaseous, or solid fuel,” pollution control equipment required by law that is installed in conjunction with the boiler, burner or conversion equipment, equipment used for unloading, transfer, storage, reclaiming from storage, and preparation of the fuel material for its use in the boiler, burner, or conversion equipment. Equipment used for storage of fuels derived from “garbage” also qualifies. [See 26 U.S.C. §48(l) *et seq.* (1990) incorporated at 26 U.S.C. §168(e)(3)(B)(vi)(II)].

Therefore, the proposed project will benefit from the accelerated 5-year depreciation, which has been incorporated into the economic model. This accelerated depreciation allows greater tax deductions earlier in the project than those allowed for some other capital projects. It is likely that this depreciation will allow the owners of the proposed project to avoid paying income tax for most of the project’s life. If the Tribe is the sole owner of the proposed project, this favorable depreciation will not be of much benefit since the Tribe is already exempt from federal income tax, as outlined below.

B. Tribal Federal Tax Status

Pursuant to IRS ruling, a federally-chartered Indian tribal corporation has the same tax status as the associated Indian tribe and is not taxable on income from activities carried on within the boundaries of the reservation. [See Revenue Ruling 81-295].

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Financial Analysis

A. Overview

A financial model has been developed that incorporates all the costs and revenues discussed above associated with buying the equipment, purchasing the fuel, hiring the staff, operating the facility and selling the power. This financial model has been utilized to evaluate various plant locations, equipment options and power sales alternatives. Below is a narrative of this process and its findings. Please refer to Attachment A for the results of the various options run and to Attachment E for all the input values. Of course the

enclosed Attachment E is configured for Case AF and therefore does not currently exhibit all inputs for all cases in order to simplify the various permutations for this Report.

B. Water Considerations

1. Equipment – Cases AB & AC

The first series of considerations evaluated using the model were those developed to help mitigate the projected water resource limitations. An air-cooled condenser was considered as alternate equipment for condensing the steam back to a liquid for reuse. This equipment uses no water and would reduce the water consumption by approximately 90%. However, this equipment is significantly more expensive to purchase and has significantly greater power requirements that will consume a greater portion of the facility's generation, leaving less available to market. The costs and increased power demand is presented in Attachment F and has been incorporated into the financial model. Refer to Attachment A and Table 7 (approximately 5 pages below) for the specific financial results.

Another equipment alternative evaluated was a hybrid system that utilizes both wet and dry cooling. It was determined that there are two forms of this equipment. One approach is a true hybrid design that utilizes both wet and dry elements combined into the same equipment. However, this equipment still uses nearly the same amount of water as a wet system and is significantly more expensive.

The other form of wet/dry cooling utilizes *both* a conventional wet, cooling tower and a dry condenser. When the ambient temperature is cooler, the dry system is operated and when the ambient temperature is very warm, the wet system is utilized. This approach can offer water savings depending on the number of hours of operation of each system. However, the capital cost is five times that of a simple wet cooling tower, making this approach difficult to justify. A full financial analysis was not completed for either of the wet/dry alternatives because, as we will see below, there are other configurations that offer superior results.

2. Water Source – Cases AD & AE

The water discharged from the Canyon Day Wastewater Treatment facility was identified as a possible source of water as discussed in the Water Source Alternatives section of the report, above (a subsection of Scale, Location and Design). The economics of running a pipeline from the Canyon Day waste treatment facility to a power generation facility located at Whiteriver were evaluated. The cost of this pipeline and pumping station is a little over \$ 1 million. This is competitive with the alternate equipment option of utilizing an air-cooled condenser that needs

no water and would add approximately \$2.5 million to the capital cost and consume some of the generated power.

The economics of placing the power generation facility at Canyon Day to gain direct access to this water was also evaluated. This option would generate additional fuel handling and transportation expenses because of the need to transport the fuel generated by FATCO in Whiteriver to the generation facility in Canyon Day. The transportation costs of other fuel would not significantly change since hauling to Whiteriver or Canyon Day would still average nearly the same distance when considering all locations within the Reservation.

All costs required for both options (running a pipeline from Canyon Day and locating the proposed facility at Canyon Day) were included in the economic analysis, which demonstrated that both have very similar economics making either option viable (see Attachment A). However, as mentioned earlier, placing the power generation facility at Canyon Day eliminates the possibility of providing steam to FATCO. As you will see from the financial analysis, this is a very important consideration. Locating the facility adjacent to FATCO offers several important advantages:

- a. Allows more efficient use of the steam by utilizing not only the sensible heat of the steam (the heat given up when the steam transfers heat to the board product as the steam temperature drops), but also by allowing utilization of the latent heat in the steam (the heat given off when the steam changes to a liquid). This is the heat that must be removed by the cooling tower to convert the steam to liquid if the steam is used to only generate power.
- b. The steam utilized in the kiln can first be used to generate electricity by reducing its pressure from approximately 850 psia to 150 psia, after which it will be utilized in the kilns. This provides significant efficiency gains to the process by utilizing the steam in this manner.
- c. It provides access to the low cost fuel currently being utilized by the FATCO boilers for use by the proposed facility.
- d. This configuration may generate emission credits that have market value. These may be created since it is likely that the proposed power generation facility will have far less emissions than the existing FATCO boilers because the proposed facility will employ modern emission mitigation equipment. This potential net reduction in emissions may generate emissions credits.

- e. Placing the FATCO boilers on standby and furnishing the FATCO kiln steam from the proposed facility will likely be viewed more favorably by the EPA because it will generate a net reduction in emissions. If the proposed facility is built elsewhere and/or not utilized to provide the kiln steam, there will be a net increase in emissions between the proposed facility and FATCO's existing boilers. A favorable view of the project by EPA can significantly affect the equipment requirements the agency imposes in the its permitting process.

For all these reasons, the team recognized that locating the facility near FATCO would be advantageous. However, based solely on the results of the financial analysis, any of the three options AB, AD or AE, are worthy of consideration and with fine-tuning of the inputs, the results could change slightly causing any of these options to become the best economic choice.

However, for the purpose of continuing the analysis, the team selected Case AD as the preferred selection to use for the remaining evaluation and discussion. This case was selected because it offers the greatest economic benefits and because in this case the facility will be located near FATCO, allowing the steam generated to be used by FATCO, which in turn allows the proposed facility to also utilize the low cost fuel currently being consumed by FATCO in their boilers.

C. Scale Evaluation

Having selected Case AD as the preferred case (for now) to be utilized for further screening, the team considered various scale options. The three cases considered are discussed below and presented in Table 7, a few pages below.

1. Selling Steam to FATCO, Using Canyon Day Water - Case AF

Locating the proposed facility near FATCO, selling steam to FATCO for their kilns and using water from the Canyon Day Wastewater treatment facility provided reasonable financial results and in comparison to other scenarios considered, represents the best option reviewed so far in the analysis for several reasons.

- a. The configuration provides access to the Canyon Day Wastewater discharge.
- b. It provides the proposed facility access to the relatively low cost fuel available at the FATCO facility that is currently being consumed by FATCO's boilers.
- c. It allows installation of a configuration that first utilizes the steam generated to produce power for sale and then utilizes this same

steam to provide heat for the FATCO kilns resulting in significant efficiency benefits.

- d. It will likely reduce emissions and may create emission credits.
- e. It will replace FATCO's relatively inefficient fire tube, low pressure boilers with a water tube, higher pressure, more efficient boiler.
- f. It will likely reduce total emissions, which may result in emissions credits that have market value.
- g. The ability to share fuel related labor optimization with FATCO

The intent is to provide steam to FATCO from the proposed facility at a cost similar to that currently incurred by FATCO to generate their own steam. The cost for FATCO to generate their own steam was estimated by the team by drawing on their experiences with similar plants and utilizing costs that were estimated for the proposed plant that would be incurred in both the proposed facility and the FATCO operation.

2. Operating Below Design Capacity – Case AG

Operating below the full design capacity creates a financial strain because it requires the same capital as a facility that is operated at the design capacity, yet receives reduced revenues as a result of the reduced operating profile. There is a corresponding reduction in the variable costs, but these are so small relative to the other costs that the end result is a less profitable facility. The financial results in this case again demonstrate that it is unwise to purchase excess capacity for future growth. It is better to purchase the equipment required to meet the needs and operate it at its full capacity. As shown in the Table 7 and Attachment A, this alternative does not provide acceptable results.

3. Reduced Size Facility – Case AH

Reducing the size of the facility is contrary to the economies of scale principles discussed above. The only reason this was considered was because of the range of fuel costs. It was considered feasible that a smaller facility, requiring less fuel, might allow a reduction in the fuel costs by eliminating the need to utilize high cost fuel. However, as it turns out, Case AF only relies on a combination of the fuel consumed by FATCO's boilers and the fuel moved to the storage area or sold to market. This fuel from FATCO is the lowest cost fuel available to the project. Reducing the plant size does not eliminate any high cost fuel. Since this advantage will not be realized and the economies of scale will work against this option, it did not merit any further review.

D. Dispatch & Market – Cases AI, AJ & AK

Various dispatch and market options were evaluated to determine if there are any creative dispatch alternatives or other markets that would enhance the project. These cases were considered utilizing the plant configuration in Case AD to compare the dispatch and market options. Below is a brief explanation for each of the alternatives considered and why they do not make economic sense.

1. Selling On Peak Only, No Off Peak Sales – Case AI

This case has the same detrimental affect as the case where we operate the facility at less than full capacity, although in this case it is operated less than 24 hours each day. The capital costs do not decrease but the revenue drops significantly. The reduction in variable costs is very small and does not compensate for the required capital dollars. The financial result is not satisfactory.

2. Selling 10MW to PNM & 10MW to WMAT – Case AJ

This option really looked promising because the power sold to WMAT would bring retail rates to the project rather than wholesales rates while adding autonomy to the Tribe by allowing it to gain its own internal power supply. Economically, it is difficult to make this arrangement work because the load demand of the WMAT enterprises drops dramatically during the off-peak hours. This creates many hours each day when the power generation facility would be underutilized. It has already been demonstrated that the economics are unfavorable if the proposed facility is not fully utilized.

3. Selling 17MW to PNM & 3MW to WMAT – Case AK

This option is similar to Case AJ except that by dropping FATCO from the Enterprises considered, the rate received by the proposed facility for the power supplied to the remaining Enterprises, increases. This occurs because FATCO is by far the largest power user of all the enterprises and its rate is significantly lower than the other enterprises. When this power is removed from the power to be supplied by the proposed facility, the average price paid the proposed facility for the remaining enterprises, increases. The financial results demonstrate that this case is an improvement over Cases AI and AJ, but nevertheless does not provide acceptable returns.

E. Sensitivities – Cases AL through AS

Having evaluated the above mentioned cases, the equipment utilized, the plant location, and the plant configuration options were each assessed. ***From this we can see that locating the facility at Whiteriver (Case AD) and selling steam to FATCO (Case AF) create the best combination (see Attachment A and Table 7), with the current assumptions utilized in our analysis.*** Various

sensitivities were run for Case AF to determine how dramatically the economics would shift if any of the variables were modified. Since this is a feasibility study rather than a comprehensive review, there is margin for error in the inputs and running these sensitivities will help quantify the potential changes in the results with different input values. If the Next Steps (below) are implemented, it may be determined that some of the input data needs adjustment, which will affect the economic results. These sensitivity runs in the model help quantify how sensitive the economics are to possible adjustments of the input values. This provides a better understanding of the “risks” to the project of later adjustments to these input values.

By referring to Table 7, the results of these *arbitrary sensitivities* can be observed. It would be unwise to decide to proceed with this project only to later find that some of the input values need adjustment to the extent that the project becomes unfavorable. The following Next Steps section discusses how to mitigate the risks of proceeding on that basis and how to reduce the chances that such adjustments to the input values will be required *before* the Tribe is committed to the project.

Table 7 – Financial Sensitivities (Target After Tax IRR = 13% to 15%)

Case	Description	After Tax IRR ⁵
AA	Base Case – Sell at \$0.04/kWh On Peak & \$0.022/kWh Off Peak ⁶	5.5%
Water Considerations		
AB	AA With Air Cooled Condenser	4.4%
AC	AA With a Wet/Dry Cooling Tower - NOT EVALUATED	
AD	AA With a Water Line Run From Canyon Day	5.0%
AE	AA Locating the Facility At Canyon Day	4.8%
Scale Evaluation		
AF	AD, & Selling Steam to FATCO, Using Canyon Day Water	12.5% Best
AG	AD, & Running 20 MW Facility at 16 MW	3.6%
AH	AD, & Building a Reduced Size Facility	Not Evaluated
Dispatch & Market		
AI	AD, & Selling On Peak Only, No Off Peak Sales	-0.9%
AJ	AD, & Selling 10MW to PNM & 10MW to WMAT	#DIV/0!
AK	AD, & Selling 17MW to PNM & 3MW to WMAT	1.3%
Sensitivities		
AL	AF, With Reduced Moisture (40%) Fuel	12.7%
AM	AF, With 10% Higher Capital Costs	10.4%
AN	AF, With 10% Higher O&M Costs	11.6%
AO	AF, With 10% Higher Revenues From PNM	14.3%
AP	AF, With 10% Higher Green Power Revenues	13.4%
AQ	AF, With 75% Debt Financing Rather than 70%	12.6%
AR	AF, With 0.25% Lower Financing Rate	12.7%
AS	AF, With 12 Year Financing Instead of 10 Year	13.2%
Sensitivities		
AT	AF, With 30 Year Financing at 6%	20.3%
AU	AF, With 0% Equity, 6% Interest Rate, 30 Yr Term	N/A
AV	AF, With 30% Equity, 7% Int, 10 Yr , W/ 5 Yr Tax Incentive Sales Revenue	16.2%

⁵ IRR is the rate of return that would make the present value of future cash flows plus the final market value of an investment or business opportunity equal the current market price of the investment or opportunity. Essentially, this is the return that a company would earn if they expanded or invested in themselves, rather than investing that money elsewhere. In other words, the higher the IRR the more favorable the project. The target after tax IRR is 13% to 15%. <http://www.investopedia.com/terms/i/irr.asp>

⁶ This is not a viable option by itself because it does not address the water shortage challenge. It is used as a base case to evaluate options developed to address the water challenge.

21 Recommendations

Based on the estimated values used as inputs by the project team in the financial analysis and this report, the following is a summary of the team's recommendations:

It is recommended that the Tribe proceed with the Next Steps listed below to develop and construct a 20 megawatt biomass power generation facility near the FATCO facility in Whiteriver. The best economic results and plant efficiency are achieved if FATCO's steam needs are met by the proposed facility and the power generated is sold to third parties. The fuel needs for the proposed facility would be best provided by utilization of the excess FATCO fuel combined with the fuel currently consumed by FATCO's boilers. Depending on the final size and configuration, additional fuel required should be provided from the Tribal Forestry Department forest management activities. The lowest cost financing should be pursued and decisions regarding the business structure and equity source will be important elements for the Tribe to consider and determine.

Many of the inputs utilized in this assessment may have changed or may change prior to implementation of the project. All assumptions and economic model input values should be validated by the Tribe prior to fully committing to the project.

22 Next Steps – Risks & Mitigation

Before committing to any development project, there are approximately six key economic factors that must be considered to verify a project's viability. The following outlines some steps that can be taken to accomplish this.

A. Power Sales

Having an accurate indication of the revenue the project can earn is obviously critical to the project's economic viability. It is recommended that PNM and other possible power purchasers *be engaged in further discussions* regarding their interest in purchasing power from the proposed project. A *Letter of Understanding or a Letter of Intent* obtained from the power purchaser offering their best price is an important "next step" mitigation of the revenue risk and naturally, an important step toward completion of the project. Once a decision is made to proceed with the project, the Letter of Intent can be converted to a contract.

B. Fuel Cost

As stated earlier, the fuel cost is by far the largest operating and maintenance cost of any power plant. It is noteworthy that in this particular case the fuel is not the largest operating and maintenance cost, primarily because of the low cost fuel available from the FATCO operation. In addition, the cost of the fuel available for this project is quite well understood since the fuel is all originating on the Reservation. Decisions regarding the *price paid FATCO for the fuel generated by their operations* would solidify this cost item for the project. It is noteworthy that in this particular case, the fuel is not the largest operating and maintenance cost, primarily because the fuel available from the FATCO operation has such a reasonable cost (no transportation cost etc).

C. Construction & Development Costs

A *detailed equipment procurement and installation cost estimate* should be obtained. This would include soliciting budgetary proposals from the major equipment suppliers and contractors.

D. Operation & Maintenance Costs

Fine tuning the operating and maintenance costs can be accomplished through further analysis of each of the individual cost items. Most of these costs were estimated based on the team's past experiences with similar projects. Some cost items may have unique values because of the Tribe's status or because of unique conditions on the Reservation. This area probably has a smaller chance of experiencing significant changes from the model assumptions than the other areas.

E. Financing Terms

Potential financial institutions *should be engaged in serious discussions* regarding the debt terms they will offer. This is difficult to achieve (as with the power purchaser) if the project is only in the "study" stage. However, by engaging in these discussions with the attitude that the project is proceeding, the financial institution will not want to "miss out" on the opportunity to be a part of the project. This level of discussion was not possible when the project is only in the review stage.

F. Permitting Requirements

A clearer understanding of the permitting requirements will affect what equipment is required. If the project is located near FATCO, as recommended by the team, it is likely that the proposed project could be built through a permit modification of FATCO's existing permit for their boilers. The limits would of course be reduced but the overall process is easier than permitting a greenfield project (completely new site requiring development of all new infrastructure and interconnections). Without detailing all the specifics, it can

be stated ***that reaching a clearer understanding of the likely permitting scenario*** is an important element of the process of reducing the risk of receiving unexpected information after the stakeholders have committed to proceed with the project.

G. Other Steps

Initiating a dialogue within the Tribe regarding the ***desired business structure of the project*** will be an important element of the next steps. Whether or not there is to be a partner in the enterprise is an important detail to any outside entities that are queried to participate. Also, it will be helpful to determine the ***level of equity*** the Tribe is able and willing to provide toward the project. The team believes there are structures involving third parties that may allow the Tribe to build this project without contributing any equity toward its completion, but this arrangement will necessitate the inclusion of a partner.

Appendix

Attachment D - Examples of Used Power Plants for Sale

11.4 MW COMPLETE BIOMASS POWER PLANT - This power plant operated continuously from commercial operation from 1986 through May 1, 1999. The local utility purchased the PPA back from the Owners. Plant is located on West coast of US. It is still in excellent operating condition. Can be purchased and operated on site or relocated. Principal equipment consists of: Boiler: ZURN. Conventional water tube boiler, pneumatic spreader stoker, positive as conveying grate. Design: Fuel used: Waste wood: Design Capacity (lb/hr) 105,000. Design outlet pressure (psig) 900. Design outlet temperature (F) 825 Fuel Firing Rate (lb/hr) avg. 23,500 – 24,000 @ 45% . Turbine Generator and Auxiliaries: Turbodyne/Electric Machine. Nameplate Rating (Gross MWE) 13.8MW. Maximum Dependable Capacity (net) 11.4MW . KVA: 13,806 Volts:12,470 RPM:3,600. Hertz:60 .P.F.85 lagging to .95 leading .Throttle Steam: Pressure (psig) 885 . Temperature (F)825. Flows (lb/hr)105,000 . Exhaust: Pressure (HgA)2 . Flows (lb/hr) 87,600. Wood Handling Equipment consists of: Truck unloader, main storage pile, receiving hopper, screen infeed conveyor, magnet, hogger, transfer conveyor, yard reclaimers, reclaim & out feed conveyors, boiler metering bin, stack gas drying system. Ash Handling. Solid Waste Disposal: approx. 6,400 Tons/yr. Air Quality Control Equipment. CEMS new and used, installed 5/99 w/ ESP Instrumentation and Control.

PRICE: \$5,250,000

17MW WOOD-FIRED POWER PLANT- COMPLETE - Plant in Excellent Condition consists of a single systems with a fuel bin and boiler, turbine/generator (17 MW), water cooled condensers, and associated ancillary equipment including emission controls, fuel conveyors, water softeners, all controls, etc. The boilers operate with an underfire stoker system. The building and a wide range of spare parts are included. Turbine type: Straight condensing single flow. Driving 20,000 KVA; 13,800 V, air-cooled GE generator, 250V, bus-fed exciter. PERFORMANCE: Rating: 15,700 kW, Initial pressure: 850 psi. Initial temperature: 900°F. Back Pressure: 1.5-inches Hg absolute. Rated:3600 rpm. Primary trip: 3960 rpm. Emergency trip: 4032 rpm. Extractions: 2. BOILER: Keeler Dorr Oliver. Bottom support. 140,000 lb/hr, 1,050 psig, 920°F CONDENSERS: Ecolaire s/n 85-113 surface: 16,030 sq. ft., size: 32F-RG-22. This plant was built in 1985 and ran until 1993. It was restarted for production in October of 2000, and was successfully operating when it was shutdown in April 2001. Shutdown occurred as a result of loss of fuel source. The fuel consisted primarily of mill residues, bark, and chips. All equipment must be removed from site. Purchaser will be responsible for dismantling and moving plant from site and paying all costs associated with dismantling and removal. Will only sell as a complete plant. Other terms apply.

PRICE: \$6,500,000 at the site with all items “As Is/ Where Is”.

[illegible]

Table 3-1 FATCO Mill Residue Production Summary (May 1995 – April 1996)

Type of Residue	Quantity Produced (green tons)				MC (%)	Quantity Produced (bone dry tons)			
	TOTAL Waste (P5-90)	Monthly Average	Estimated Annual Total	Estimated Hourly Total		Estimated Annual Total	Avg. Monthly	Avg. Daily	Avg. Hourly
WR/RM Sawdust (New)	3,434	95	1,145	0.13	56	304	42	1	0.06
WR Sawdust (Old)	39,234	1,090	13,078	1.49	50	6,539	545	18	0.75
WR/RM Shavings	12,136	337	4,045	0.46	10	3,641	303	10	0.42
WR Bark	58,436	1,623	19,479	2.22	50	9,739	812	27	1.11
WR Chips	70,927	1,970	23,642	2.70	46	12,767	1,064	35	1.46
Bag Fuel Sold	1,932	161	1,932	0.22	55	870	72	2	0.10
WR Boiler Fuel Consumption	304,810	8,467	101,603	11.60	55	45,721	3,810	125	5.22
WR Boiler Overflow (Not Sold)	21,786	605	7,262	0.83	55	3,256	271	9	0.37
WR/RM Total	512,605	14,349	172,186	19.66		83,036	6,920	227	9.48
CBQ Sawdust (new)	18,823	523	6,274	0.72	50	3,137	261	9	0.16
CBQ Sawdust (old)	12,479	347	4,160	0.47	51	2,038	170	6	0.23
CBQ Chips	23,596	655	7,865	0.90	55	3,539	295	10	0.40
CBQ Total	54,899	1,525	18,300	2.09		9,715	726	24	0.99
GRAND TOTAL	567,593	15,874	190,486	22	-	91,751	7,646	251	10