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A PREFEASIBILITY ASSESSMENT OF THE POTENTIAL OF WOOD WASTE POWER SYSTEMS FOR THE INDONESIAN WOOD PRODUCTS INDUSTRY

PHASE 1 REPORT

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PHASE I REPORT

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ACRONYMS

ADB	Asian Development Bank
APKINDO	The Indonesian Wood Panel Association
BPPT	Badan Pengkajian Penerapan Teknologi - Indonesian Agency for the Assessment and Application of Technology
BST	Bioenergy Systems and Technology Program, Office of Energy, U.S.A.I.D.
BWI	Babcock and Wilcox Indonesia
IFC	International Finance Corporation
IKPT	P. T. Inti Karya Persada Technik - Engineering and Construction Company (Jakarta)
ISA	The Indonesian Sawmill Association
LSDE	Combustion Research Laboratory (within BPPT)
PLN	Perusahaan Listrik Negara (PLN) - the State Electric Power Company
U.S.A.I.D.	U.S. Agency for International Development

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Staff of the Office of Energy, U.S.A.I.D. Washington, especially Dr. Samuel Schweitzer*, Dr. Marcia Gowen, and Mr. John Kadyszewski, provided ongoing support, advice, and encouragement for this work. Dr. Gregory Morris of Future Resources Associates, Inc. (FRA) conducted indicative pro forma project financial analyses that have helped us assess the potential viability of wood waste-power generation in Indonesia.

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* Dr. Schweitzer is presently on an extended assignment with the International Energy Agency, Paris.

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EXECUTIVE SUMMARY

The Bioenergy Systems and Technology Program (BST) of the U.S.A.I.D. Office of Energy, in cooperation with private industry and U.S.A.I.D./Jakarta, carried out a prefeasibility study of the prospects for the use of wood waste produced at Indonesian forest product industry sites, especially plywood factories, to substitute for diesel fuel for on-site power generation. Presently the industry uses diesel fuel for primary or supplementary power generation at virtually all of its sites. In most cases outside of Java there is no local grid to provide power to the industry. The wood waste, which can constitute as much as 50% of the total raw lumber entering the factory, is either piled in heaps and burned, used for landfill, or dumped in rivers and the ocean. This waste constitutes a potential energy resource for on-site power generation within the Indonesian wood products industry, and eventually for rural electrification as well. Its use as a fuel in generating power at plywood industry sites would also mitigate the environmental consequences of its dumping.

There is a significant associated potential market for U.S. industry to supply or provide equipment for small standardized multi-megawatt integrated wood waste-fired power plants and cogeneration plants to the Indonesian wood products industry. Over the next ten years the total market for U.S. equipment suppliers could be as high as $400 million. The technology is well suited for private power initiatives by U.S./Indonesian joint ventures that would build, own, and operate, and in some cases, transfer this technology at Indonesian plywood industry locations.

The use of wood waste power generation in Indonesia could address important social and economic development goals as well as benefit the Indonesian wood products industry directly. Wood waste currently produced at Indonesian sawmills and plywood

factories is sufficient to power some 1,000 MWe of distributed small steam power plants.

The widespread use of this technology ultimately could provide significant power for economic and social development on Indonesia's outer islands, establish new private sector initiatives for the production, sale, installation, and maintenance of wood waste power systems, increase the stability of the private wood products industry, increase diesel fuel exports, and improve the environmental and health conditions of the plywood manufacturing industry.

Environmental impacts* from possible future expansion of the Indonesian plywood industry are considered in this study. The tropical forests of Kalimantan and of Brazil constitute the World's last great virgin tropical rain forests. While the Indonesian government has indicated that commercial forest concessions in Kalimantan will not expand significantly over the coming decade, the foreign exchange revenues of the Indonesian forest products industry may foster reconsideration of this. Yet reforestation in Indonesia can be difficult, and the BST staff and consultants are exploring ways in which the proposed project could be used to stimulate effective private sector participation in sustainable forest management.

The work reported here indicates that even with the present 50% subsidy of diesel fuel in Indonesia, small (ca. 2.5 - 3 MWe) integrated standardized wood waste-fired power plants could be economically attractive. Joint U.S./Indonesian private sector initiatives could lead to establishment of an important new industry in Indonesia. Several U.S. and Indonesian companies

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* The proposed project would make use of wood waste presently produced by the forest products industry; wood is far too valuable in the form of exported products to be used in its primary form as fuel.

participated in this study and have indicated a strong interest in establishing such an industry. This report provides an overview of the possibilities.

1. INTRODUCTION AND PROJECT OBJECTIVES

Introduction

The Bioenergy Systems and Technology Program (BST) of the U.S.A.I.D. Office of Energy (Washington, DC), in cooperation with U.S.A.I.D./Jakarta, and with private U.S. and Indonesian industry, carried out a prefeasibility study of the prospects for the use of wood waste* produced at Indonesian forest product industry sites, especially plywood factories, to substitute for diesel fuel for on-site power generation. This report presents the results of that study. Presently the industry uses diesel fuel for primary or supplementary power generation at virtually all of its sites. In most cases outside of Java there is no local grid to provide power to the industry, necessitating the use of captive power. In addition, the plywood industry requires reliable power, so full backup generating capability is required even when grid connections are available.

Wood waste, which represents up to 50% of the total raw lumber entering a plywood factory, is typically piled in heaps and burned, used for landfill, or dumped in rivers and the ocean. This waste constitutes a potential energy resource** for on-site power generation within the Indonesian wood products industry. Its use as a fuel in generating power at plywood industry sites would mitigate the environmental consequences of its dumping.

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* It must be emphasized that this project is considering only the use of wood waste presently produced as an inevitable byproduct of the forest products industry, and whose disposal is presently a serious environmental liability.

** Wood waste generated by sawmills could eventually be used as a fuel for rural electrification, but this has not been examined in any detail in this study.

There is a significant potential market for U.S. industry to supply or provide equipment for small (multi-megawatt) integrated wood waste-fired power plants and cogeneration plants to the Indonesian wood products industry. Over the next ten years the total market for U.S. equipment suppliers could be as high as $400 million. A major study[1] conducted for the Asian Development Bank in 1984/85 has confirmed the potential significance of this market for Kalimantan, and by extension, for all of Indonesia.

The use of wood waste power generation in Indonesia addresses a number of important social and economic development goals for the country as well as benefit the Indonesian wood products industry directly. The wood waste currently produced at Indonesian sawmills and plywood factories is sufficient to power 1,000 MWe of distributed small steam power plants for base- and intermediate-load operation. Wood waste at the plywood plants would be sufficient to support ca. 150 MWe of distributed captive power which would be consumed entirely on site. Wood waste produced at sawmills would be more difficult to use as a fuel for power generation, but the resource could support ca. 800 MWe of distributed capacity, most of which would not be required for the sawmills themselves. A separate study is required to determine the opportunities and requirements for using wood waste at sawmills for private power generation.

The initial step in introducing modular wood waste-fired generation technology would be to make use only of the wood wastes produced at the plywood plants, and exclusively for on-site power generation. In general there will be little or no additional wood waste available for generating power for sale outside of the plywood mills. Subsequently, if the wood waste produced at sawmills can be mobilized at an attractive price, it may be possible to provide excess power for rural electrification.

Some of the long-term consequences of the widespread use of this technology in Indonesia could be:

- Provision of a significant level of electric power for economic and social development for Indonesia's outer islands, especially on Kalimantan, Sumatera, and Maluku, using wood wastes produced at sawmills;
- Establishment of new private sector initiatives for the production, sale, installation, and maintenance of wood waste steam power plants and cogeneration systems;
- Increased stability and diversification of the private wood products industry in Indonesia;
- Increased Indonesian exports of diesel fuel;
- Substantial reduction or elimination of the negative environmental and health impacts related to present wood waste disposal practices of the plywood manufacturing industry.

Environmental impacts* from possible future expansion of the Indonesian plywood industry are considered in this study. The tropical forests of Kalimantan and of Brazil constitute the World's last great virgin tropical rain forests. While the Indonesian government has indicated that commercial forest concessions in Kalimantan will not expand significantly over the coming decade, the foreign exchange revenues of the Indonesian forest products industry may foster reconsideration of this. Yet reforestation in Indonesia can be difficult, and the BST staff and consultants are exploring ways in which the proposed project could be used to stimulate effective private sector participation in sustainable forest management.

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* The proposed project would make use of wood waste presently produced by the forest products industry; wood is far too valuable in the form of exported products to be used in its primary form as fuel.

Project Concept

The purpose of this study is to determine the financial and commercial attractiveness of construction and operation of standardized modular wood-fired power plants in the range of 2-4 MWe in Indonesia. The market is sufficiently large to permit replication of the basic power generation units at several dozen identified sites with an aggregate potential capacity of roughly 150 MWe of wood-fired power generation.

Preliminary financial analysis suggests that even under the present conditions of highly subsidized diesel fuel prices such installations are commercially attractive. Several alternative approaches to introduction and commercial diffusion of the technology are possible. One approach is for a U.S./Indonesian joint venture firm to build, own, and operate such plants on-site, using wood waste supplied under a long-term contract by the plywood mill, as the fuel for modular power generation units. A second approach is for one or more firms to build, operate, and transfer these plants to those mills interested in ownership of the power generation units. In both cases several financing approaches are possible, including a mix of debt and equity financing from sources including the Asian Development Bank (ADB), the International Finance Corporation (IFC), and the private investment arm of U.S.A.I.D.

A major obstacle to the establishment of an ongoing private business appears to be the relatively large up-front costs for the design of the modular unit to be marketed. These costs can only be recovered through the sale of multiple units. Prior to the establishment of an ongoing private business activity to build such facilities, a fully commercial demonstration of the technology <u>may</u> be required to demonstrate to all participants that the concept is technically, economically, financially, and institutionally feasible in Indonesia.

Phase I Objectives and Approach

The goal of Phase I was to complete a preliminary market, technical, economic, and institutional assessment for wood waste-fired power generation and cogeneration facilities within the Indonesian forest products industry.

The specific objectives* of this phase were the following:

1. Determine the market for wood waste power systems in Indonesia, and establish a technical overview of typical plywood manufacturing facilities in the country,

2. Establish preliminary market-based technical, economic, and financial criteria for the technology,

3. Determine the likely range of costs of suitable wood waste-powered electric generation systems,

4. Review the status of wood-waste steam and power generation within the Indonesian forest products industry,

5. Conduct a preliminary site identification study (through field visits), and

6. Conduct a preliminary project financial analysis for a specific wood waste-power generation concept applicable to the Indonesian plywood industry

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* See the initial project document "Small Power Systems for Economic Development in Rural Indonesia: New Opportunities for the Private Sector" (May 1987) for greater discussion of the Phase I objectives and approach.

Initial Results - Project Economics

The analysis* reported here suggests (Tables 1-2, 1-3 and Figure 1-1) that even with the present 50% subsidy of diesel fuel in Indonesia a 2.5 MWe wood waste-fired power plant would be fully paid for in six years or less, with a 25% return on equity. This return would be earned by just the savings in diesel fuel costs, assuming that the wood waste is available at no cost for use as fuel. If the operation and maintenance costs and short life of diesel generators are included in the analysis, the effective payback time becomes even shorter. If the Indonesian government were to phase out the present diesel fuel subsidies over a five-year period (starting in 1990 - the projected first year of plant operation), the payback time would decrease to three years and the return on equity would be 60%.

In the U.S. a project using conventional technology and generating a 25% return on equity would have little trouble attracting investors. However, financial conditions in Indonesia dictate short payback periods (often two years or less) and high rates of return (well over 25%). Attracting financing for the initial wood waste power plants in Indonesia will require some incentives and guarantees beyond those typically required in the U.S. These additional measures can be provided through careful structuring of the financing arrangements, and will be explored in detail during the project feasibility analysis stage.

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* These figures are preliminary and indicative; a detailed Indonesia-specific project financial analysis will be required using current data, as part of a full feasibility study. This preliminary assessment was conducted in order to determine the general financial characteristics of the project based on information available to S&T/EY at the time of the analysis.

Table 1-1

FINANCIAL SENSITIVITY ANALYSIS

CASE	DIESEL PRICE ($/Liter)	WOOD WASTE PRICE[5] ($/ton)	PAYBACK TIME[1] (Years)	RETURN ON EQUITY[2]
1	0.13	5.43[3]	12.5	12.9 %
2	0.13	0.00	6.25	25.2 %
3	0.26	5.43[3]	1.25	> 100 %
4	0.26	0.00	1.0	> 100 %
5	Subsidy Phaseout[4]	5.43[3]	4.25	44.3 %
6	Subsidy Phaseout[4]	0.00	3.0	60.7 %

1. On equity.

2. Pre-tax internal rate of return on equity.

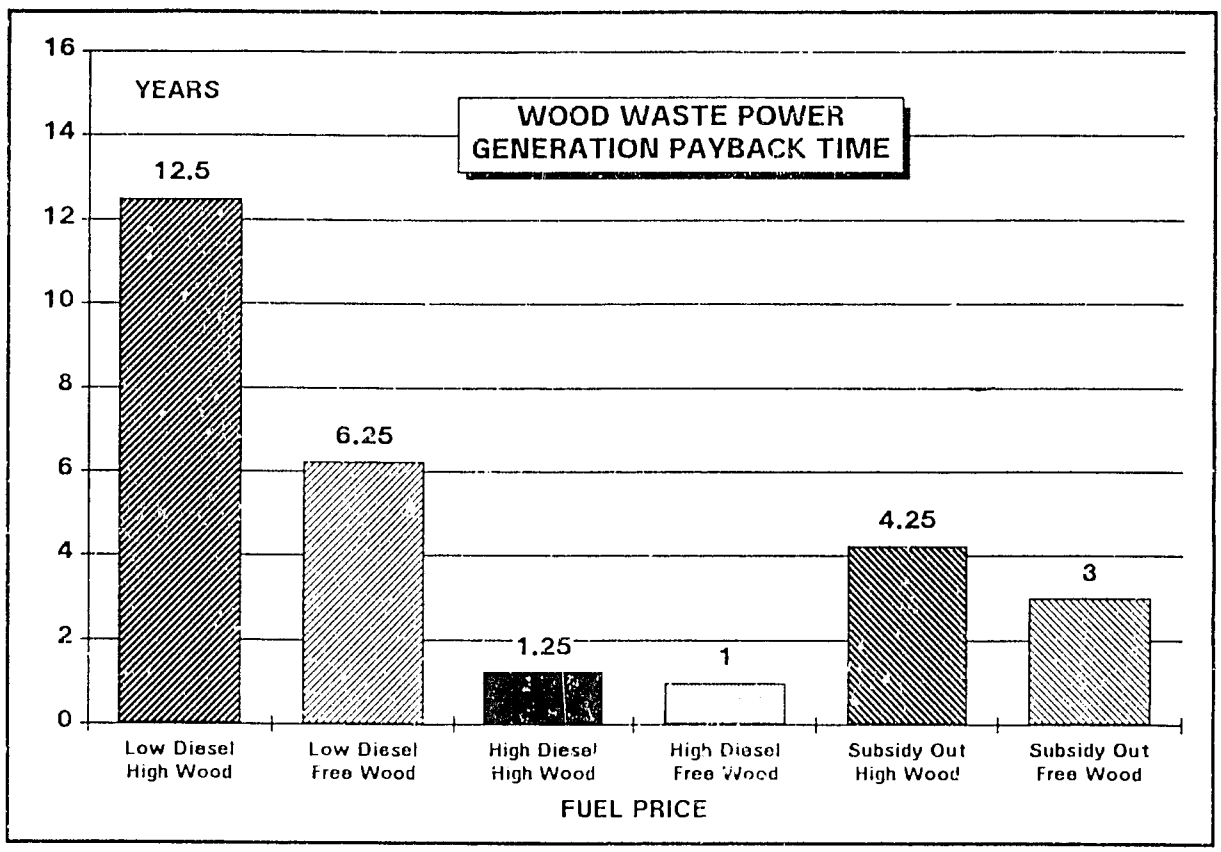
3. Equivalent to $3.00/m^3 of green wood (23% moisture content).

4. Present 50% subsidy phased out linearly over a 5-year period beginning in 1990.

5. It is assumed that all of the wood waste could be sold at this price. In practice only 5 - 30% of the wood waste is sold for firewood and as scrap for building huts.

Figure 1-1

PAYBACK TIME FOR AN INVESTMENT IN
WOOD WASTE-POWER GENERATION SYSTEMS
IN INDONESIA*



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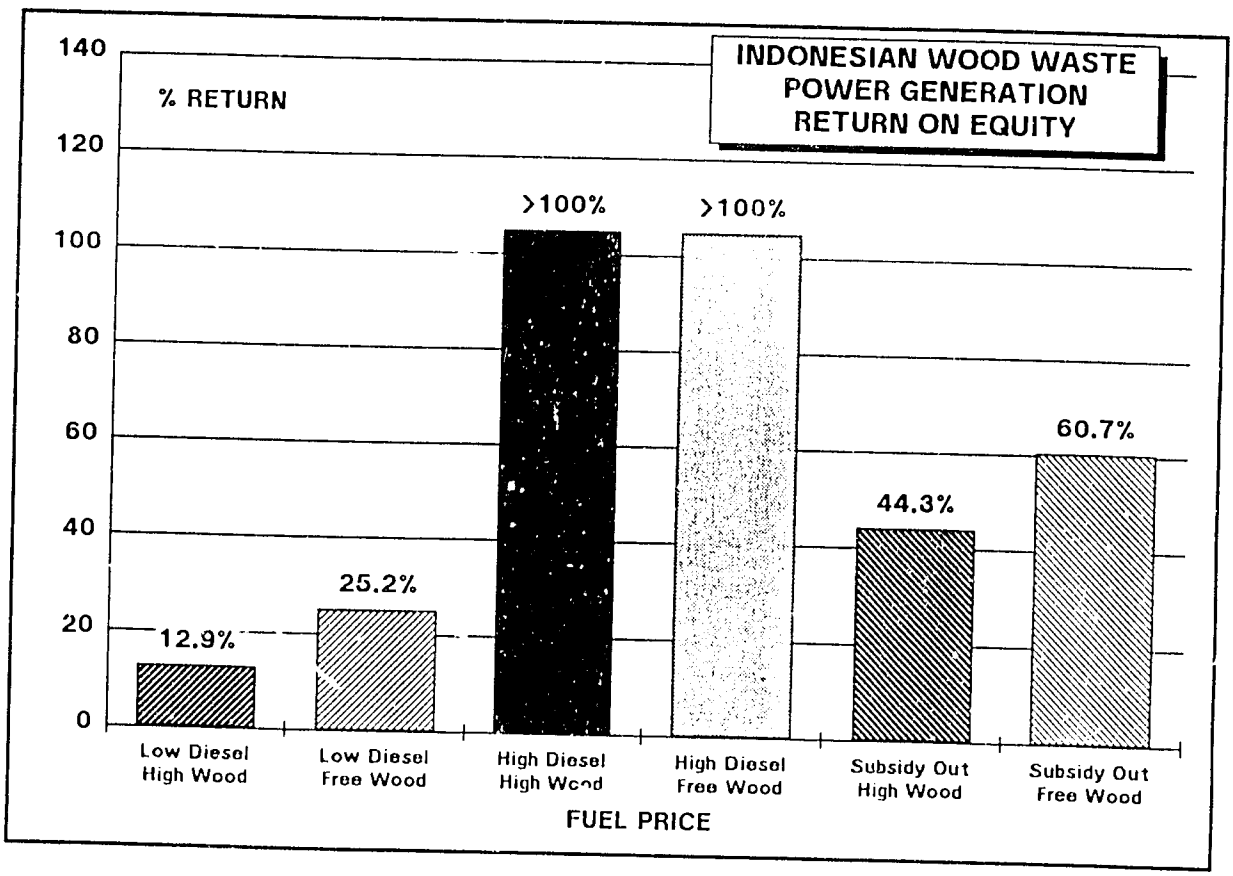
* The six fuel price scenarios shown are defined in Table 1-2 and discussed further in Section 5 (Project Economics and Financing)

Figure 1-2

RETURN ON EQUITY FOR AN INVESTMENT IN WOOD WASTE-POWER GENERATION SYSTEMS IN INDONESIA*



* The six fuel price scenarios shown are defined in Table 1-2 and discussed further in Section 5 (Project Economics and Financing)

Phase I Pre-investment Results

The results of this study are based largely on site visits made by Dr. Jezek to 28 plywood plants in 21 complexes on Java, Kalimantan, and Maluku during June and July 1987. Subsequent to Dr. Jezek's return to the U.S. a preliminary project financial analysis was conducted by the team (Jezek, Weingart, and Morris) for one of the proposed wood waste power plant configurations.

During the Indonesian visits, technical, operational, and financial data were collected for these facilities, as was key market information. These data include some indicative site-specific information on energy balances and wood balances for individual plants.

A total of 48 MWe of potential wood waste-fired generation capacity was identified at the plywood plants visited. The displacement of diesel fuel by wood waste-fired plants at these plants would be 68 million liters/year with potential foreign exchange export earnings of $12 million (1977$).

On the basis of the site visits a preliminary set of technical and economic requirements for wood waste-fired power plants suitable for the Indonesian plywood industry was established using the technical data obtained for the plywood plants. Technical data compiled include the on-site power generation capacity (MWe), electricity production (kWhe/month), and steam production requirements for each of the plants, as well as the quantities of wood waste generated and consumed on site.

These data indicate that pre-packaged wood waste-based power generation systems in the range of 2 - 3 MWe ("standard plants") are well suited for most of the plywood plants, and that sufficient wood waste is available to provide electricity and steam at levels above those currently required by these plants. Since all

of the plywood plants are located* either on the coast or on a river, the boiler assembly and skid-mounted turbine generator system can be shipped via barge to the site. The boiler is then field-erected with other plant subsystems installed as pre-built modules.

The predesigned plant could be offered by an U.S./Indonesian joint venture supplier on a packaged "turnkey" (installed and fully operational) basis. The same supplier could also provide plant operation and maintenance services or train operators to run the plant and assist in trouble shooting, completing repairs, obtaining spare parts, etc. Although definitive cost estimates were not available from vendors, preliminary estimates indicate an installed turnkey equipment cost of approximately $2.4 million for 2.5 MWe ($960/kWe) of wood waste-fired power generation, including the (waste wood) fuel handling and storage facilities. More definitive cost estimates for the boiler and power generation subsystems must be obtained during a more detailed feasibility study.

Total fully burdened project costs are projected conservatively to be as much as $4 million (see Section 5 for details). This latter figure was used in this study for the pre-investment financial analysis. Feasibility studies for specific plants will be required to develop a more definitive set of capital and operating cost estimates through vendor quotations, and to establish the specific set of relevant financial parameters. The latter will be established through meetings with Indonesian plywood plant owners, government officials, and potential local lenders and investors, as well as with representatives of the ADB, the World Bank, the IFC, and other potential lenders and investors.

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* Logs are delivered to the plywood factories as rafts or by rafts, barges, or coastal freighters. Similarly the finished plywood is transported by ship since much of it is exported.

The present use of on-site diesel power and steam power equipment was determined for the 28 plants visited (see Section 2). During discussions held both in Jakarta and at the plant sites, plant owners and operators indicated strong interest in displacing diesel fuel with wood waste technology, but a clear demonstration of technical, economic, and financial feasibility is required before they will invest in this technology.* Successful design, fabrication, installation, and operation of a wood waste-fired power plant using off-the-shelf components and available technology (e.g. for boiler fabrication) will be required to pave the way for widespread use of this technology in Indonesia.

Results of Phase I Pre-Investment Financial Analysis

A preliminary *pro forma* project financial analysis was conducted by the team to make explicit the technical, economic, and financial conditions under which this technology will be attractive to Indonesian plywood plant owners. This analysis (Section 5) calculates the payback time and rate of return on equity for a plant financed by a combination of plant owner equity and external debt financing.

This pre-investment analysis provides the framework for future discussions with potential investors, lenders, and equipment vendors that may result in the first installation of the packaged system.

The existing wood waste-powered plants in Indonesia are old, transplanted units not representative of current technology, and therefore are not useful in helping investors or lenders evaluate the risks and benefits of the proposed modular technology.

Phase I has established that:

- A substantial market for wood waste power generation technology exists at Indonesian plywood factories,

- Under highly conservative technical and economic assumptions, the return on equity and payback time are attractive for some project development scenarios,

- Many plywood plant owners have expressed a strong interest in having wood waste-powered generation units, but

- To make investment decisions and to lower the risks of investment, plywood plant owners require authoritative information for these units including:

  - Installed capital costs
  - Projected operation and maintenance costs,
  - Maintenance requirements relative to present operations
  - After-tax rate of return on equity
  - Financial payback time
  - Equipment performance and plant life
  - Indonesian government policy regarding wood waste-based captive power, both independent and grid-connected
  - PLN interest in or opposition to the commercial diffusion of the wood waste-based power generation technology in Indonesia
  - Readiness of commercial and multi-lateral development banks, and other institutions, to take debt and equity positions in such a project

Based on the results of the Phase I prefeasibility assessment, it is recommended that an initial plant be developed to catalyze a new U.S./Indonesian private sector initiative in Indonesia that would make this technology available to the Indonesian wood products industry. This would be preceeded by a project feasibility analysis.

Phase II Feasibility Study Objectives

Second phase feasibility studies are required to

- Establish the detailed engineering specifications and cost breakdown for the wood waste-fired power plant systems,
- identify the most suitable locations (specific sites) for the first plants,
- conduct detailed technical, economic, and financial project feasibility analysis,
- determine the potential environmental benefits and liabilities associated with the proposed project and with subsequent broad commercial application of the wood waste power generation technology in Indonesia,
- determine the extent to which private sector involvement in on-site power generation can assist in enhanced forest management in Indonesia,
- meet with U.S. and Indonesian developers to determine their interest in and requirements for participation in the proposed project, and
- prepare the necessary financing arrangements for the first plant.

The broad objective of the Phase II studies is the identification of bankable wood waste power generation projects. The specific Phase II objectives are:

- Determine the maximum acceptable capital and operating costs for these power plants to be economically justified
- Identify the qualified equipment suppliers (turbines, generators, condenser, water treatment, etc.)
- Determine the specific plant costs for predetermined plant configurations and sizes
- Establish the detailed technical and financial feasibility of projects at specific plants with identified U.S. and Indonesian participants
- Establish the overall viability of this project in consultation with potential plant owners

The first plant(s) installed will demonstrate technical and economic performance to potential owners, investors, lenders, and others, thereby reducing the perceived risks of investing in wood waste-power generation technology.

2. MARKET ASSESSMENT

The Forest Products Industry in Indonesia

In recent years about 35 million cubic meters (m^3) of logs have been produced[2] annually in Indonesia. For 1987/88 the log production is projected to be 37 million m^3, of which 65% (24 million m^3) will be processed by sawmills and 35% (13 million m^3) will be used for plywood production. The Indonesian forest products industry is an important source of foreign exchange. In 1985 the export earnings from plywood were $811 million. Over 3.8 million m^3 of plywood were exported in a year in which both price and demand for plywood were depressed.

Under a recent decision of the Government of Indonesia and the Indonesian Wood Panel Association, no permits will be issued in the near future for new plywood plants. Thus the current production capacity of approximately 7 million cubic meters per year will be held constant. The concession holders claim[3] that they have sufficient concession holdings to sustain this level of production for at least 20 years. The extent to which this activity compromises the size and quality of tropical forest holdings in Indonesia is being explored.

Until the early 1970s Indonesian wood exports were primarily in the form of raw logs. In May 1981 a Government decree clamped a quota on log exports at about 25% of total production, and these exports have practically been eliminated. Another Government regulation required that logging companies build integrated wood industries. These policies were aimed at increasing the value added in the Indonesian economy from the forest products industry.

Consequently the logging industry rapidly expanded to production and export of wood products, primarily sawn timber and plywood.

Today there are 115 plywood factories and integrated wood product plants in Indonesia. The majority of the timber comes from Kalimantan, with plywood plants in Java, Kalimantan, Sumatera, and Maluku.

The Indonesian plywood industry started in 1973 and has been growing steadily since then. In 1973 there were two plywood mills with a total production of 19,000 m^3. By 1980 there were 29 mills with a combined output of slightly over 1 million m^3. In 1985 total plywood production reached almost 5 million m^3, 80% of which was exported. In 1987 plywood production is expected to reach 7 million m^3.

Some projections indicate that this may be a sustainable industry, providing effective reforestation and forest management can be implemented. All of the plywood plants have logging concessions with a life span of 20 years or more. The industry is now beginning to diversify. Under the leadership of the directors of the Wood Panel Association, the industry is starting to produce high value products including paper overlay, paneling, moldings, and furniture.

Electricity Use in the Indonesian Plywood Industry

The on-site consumption of electricity is significant in this industry. The total electricity demand for plywood factories in Indonesia is 126 MWe. About 100 MWe is supplied by diesel generators, with the balance provided by PLN or by on-site steam turbine generators. Total on-site diesel-based electricity production is approximately 728,000 MW-hr per year. The associated diesel fuel costs $34 million per year at the presently subsidized price of $0.13/liter. At the world market price of $0.26/liter, annual fuel costs would be $68 million. The cost of replacing 100 MWe of diesel capacity with wood waste-fired steam

power plants is estimated to be on the order of $80 - $100 million.

Present and Potential On-Site Use of Wood Wastes

At present 80% of Indonesian plywood factories use diesel generators to produce their electricity. Only 20% use wood wastes to produce electricity. However, all Indonesian plywood plants use wood wastes to generate process steam for dryers and hot presses. This industry requires extremely reliable electric power. The factories operate around the clock 6 days a week, and a power failure of less than five minutes can seriously damage the plates in a hot press. Power interruption of as little as three minutes will ruin any plywood in the presses at the time.

Indonesian plywood mills have an average recovery rate (fraction of logs ending up as finished product) of 52%. The balance of the wood (about 3 million m^3 annually) ends up as waste. The total wood wastes generated by the plywood mills are sufficient to operate 200 MWe at a 70% annual average capacity factor. This is twice the present installed diesel generator capacity of the industry.

Sawmills generate an additional 12 - 14 million cubic meters of wood waste annually. This is sufficient to generate 800 MWe at 70% annual capacity factor. However there is relatively little electricity demand at sawmills compared with plywood mills, and virtually none of the sawmills require process steam. This wood waste eventually could be a significant resource for rural electrification on the outer islands, and support the Government of Indonesia's transmigration program.

The present focus of this project is displacement of diesel fuel now used for power generation with waste wood, to satisfy in-plant electricity demand. Once the wood waste power generation

industry is well established, use of this technology for production of electricity for rural electrification could become a routine activity of PLN and/or private power generation companies.

Plywood Plant Characteristics

Plywood plants are located in sparsely populated areas. They appear in clusters of ten or more plants located along a stretch of river or coastline. Routine access to the majority of the plants is by boat. On Java the plants can be reached by road.

The typical Indonesian plywood plant is a sprawling complex employing several thousand workers who work and live at the site. The largest plant in the country has 7,500 employees. Each plant has a sawmill and typically three plywood production lines. The plants operate 24 hours per day, 6 days per week, with employees working 12-hour sifts.

In addition to the plywood production facilities, there are extensive housing facilities. Most of the employees reside on site in housing provided by the companies. Moreover all of the meals are provided in company cafeterias.

Most of the plants are 6 - 7 years old, and were installed soon after the government prohibited the export of raw logs in 1981. At that time anyone who held a logging concession in Indonesia had to install a sawmill and/or plywood operation. Diesel generators were universally chosen for electricity production since they were the most readily available and diesel fuel was (and still is) subsidized.

3. SITE VISITS

Introduction

Site visits were conducted by Dr. Jezek in June and July 1987 to collect field data and to talk with plywood plant owners and operators. He visited 28 plants in 21 complexes on Java, Kalimantan, and Maluku. Through these visits Dr. Jezek was able to develop site-specific data including approximate plant wood and energy balances. A potential for 48 MWe of wood waste-fired generation capacity was identified at the 28 plants.

Because of the proprietary nature of some of the information gathered, the data developed during the site visits are presented with the plywood plants identified only by a number. The data were developed with the aid of a questionnaire (Figure 3-1) developed by Dr. Jezek and filled out in consultation with plant owners and operators.

The questionnaire was distributed to the plant owners prior to the site visits. During the site visits, a meeting was held with the plant manager, chief boiler engineer, and chief electrical engineer. In some instances a maintenance supervisor was also available for discussions. The questionnaires were completed at these meetings, and the data were validated or corrected.

Very few plants actually measure the wood waste fuel input to their boilers. In all instances the steam production data shown below represent a best guess or at best an estimate. These data are the best that can be obtained at this time, but are sufficient for a preliminary* assessment of on-site steam demand.

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* Steam production may have to be measured at the candidate sites to permit proper sizing and design of the boiler system.

After the office discussion, there was a tour of the plant during which supplemental information was obtained and previously supplied data were verified or corrected. After the plant tour there was a subsequent office discussion on the status of plant operation. Issues discussed included operational problems, any previous consideration given to installation of steam turbines, and the view of the staff regarding the future possibility of using wood waste fired boilers and steam turbines.

With several of the groups there was a follow-up visit with their headquarter offices in Jakarta to discuss financial and commercial issues that would impact the proposed project. In particular, the criteria for project viablity from the perspective of the plant owners were discussed.

Interest of Plywood Plant Owners in the Technology

In general, the plant owners expressed strong interest* in the possible use of wood waste for power generation. This concept was clearly not new to them, and several plant owners were entertaining offers from European and Korean suppliers to provide equipment for on-site power generation using wood waste.

Based on the plant visits it was clear that almost all of the plywood plants have moderate to severe difficulties in operating their steam production and power generation systems. It appears that the plant owners would be very interested in the possibility of a third party organization taking these problems off their hands, since their principal business is production and sale of plywood products, not the production of electricity and steam.

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* This reflects discussion held in Indonesia in mid-1987. A current (mid-1988) assessment of the interests of Indonesian wood product industry leaders in the proposed project area is required.

Indonesian plywood plant owners and operators typically have neither the technical background nor the interest in operating power generation and steam generation systems. Therefore it could be very attractive to them to purchase power generation and cogeneration systems on a package basis that would include the subsequent operation and maintenance of the systems.

An alternative approach would be a leasing arrangement in which a company would install, operate, and maintain the wood waste powered facilities on a contract basis. They would also remove, refurbish, and sell some of the present on-site diesel generators to reduce the overall cost of the installation. One of the Tasks of any Phase II studies will be to explore these alternative arrangements in detail.

Figure 3-1

QUESTIONNAIRE FOR WOOD PRODUCT PLANTS

Plant Name:

Plant Location/Address:

Installed Capacity Input (CM/month):

Electric Generating Capacity:
(List units - manufacturer, model, kW capacity, year installed, purchased new or used)

The following data should be provided as average per month or for 1 year (12 months)

Hours plant in operation:
Lumber Output:
Product Output:
Sawn Timber:
Plywood:
Blockboard:
Other Products:

Woodwaste Produced:

Woodwaste in Cu. M. used for
Generating Electricity:
Generating Process Steam:
Other Purposes - Describe:

Electricity Produced (kWh per month or year):
Electricity Demand - Plant:
Diesel Fuel Consumed (liters):
Diesel Fuel Cost per Year:
Cost of Electricity (if available):
Electricity Sold (kWh):

Process Steam Production
Boiler Manufacturer and Model:
Date of Installation:
Rating - Pressure:
Temperature:
Steam Production (tons/hour):
Fuel (woodwaste) Consumption:
Average Operation (hours per month or year):

Process Steam requirements
Pressure:
Temperature:
Volume (tons/hour):

Plant Operation and Wood Processing Data

Data on plant operation and wood processing were developed for 21 wood product facilities in Java, Kalimantan, and Maluku. Four complexes in Java, two in Maluku, and fifteen in Kalimantan were visited. The following technical data were obtained:

- Plant operating hours per month
- Log input in thousands of cubic meters per month (10^3 m^3/mo)
- Plywood, block board, and sawn timber production (10^3 m^3/mo)
- Total wood waste produced on site (10^3 m^3/month)
- Wood waste used for steam generation (10^3 m^3/month)
- Wood waste available for power generation and for additional steam production (10^3 m^3/month)

These data are summarized in Table 3-1. They represent an average for conditions typical of the second half of 1986 and first half of 1987. The data show that the plants are operated from 6 to 6-1/2 days per week, 24 hours per day (two 12-hour shifts per day). The rate of wood consumption for processing ranges from 12,000 to 100,000 m^3 per month. Plywood production ranges from 4,000 to 40,000 m^3 per month.

Only three of the 21 complexes visited produced block board (plywood with the core consisting of wood strips rather than veneer). Fourteen of the plants also produce sawn timber. In all cases the production is dominated by plywood.

The average recovery rate of plywood factories in Indonesia is 52% (i.e. 48% of all wood coming into the plant ends up as waste). The actual recovery rate for the various plants visited is 0.54 +/- 0.1.

Table 3-1

WOOD CONSUMPTION AND WASTE IN INDONESIAN PLYWOOD FACTORIES

PLANT	HOURS/ MONTH	LOGS (INPUT)	OUTPUT: PLYWOOD	OUTPUT: BLOCK BOARD	OUTPUT: SAWN TIMBER	WASTE: TOTAL	WASTE: USED	WASTE: REMAINING
1	624	100	40	3	10	47	29	18
2	600	13.4	5	0.4	2	6	3.6	
3	620	50	19.7	7.7	4.2	14.5		
4	600	13	6		0.4	6		
5	590	37	17			18	All	
6	550	12	6		0.7	5.3	2	
7	688	16	8.5		0.3	5.3		2
8	600	7.8	4.5				2	
9	600	15	9			6.7		
10	580	13	4		2.5	6.5		
11	580	13	4		2.5	6.5		
12	580	13	4		2.5	6.5		
13	620	17.5	6		2.2		7.4	
14	600	12	7			4.5		
15	600	19	9.6			9	6.4	
16	600	15	6.2		1.2	6.3		
17	624	31	18			15		
18	594	24	9.5		2	7.7	6.9	
19	620	26	10		0.4	15.6		
20	672	49	21		6	22		
21		13.5	8			5.5	5.5	

Source: P. Jezek tour of Indonesian plywood plants (1987)

Plywood Plant Electricity Production and Consumption

Preliminary data (Table 3-2) for the production and consumption of electricity at the plants visited were assembled using the on-site interviews and the results of the distribution of the questioners. The data developed for each plant site include:

- Installed diesel generation capacity (MWe)
- Installed steam turbine generator capacity (MWe)
- PLN connection (MVA)
- Peak Demand (MWe)
- Electricity consumption (MWhe per month)
- Diesel fuel consumption for power generation only (10^3 liters/month)
- Average monthly fuel expenditures (thousands of U.S. dollars equivalent)

The detailed data for on-site power equipment, both diesel and steam turbine systems, are shown in Table 3-3. Diesel generator units range in size from 200 to 3,000 KVA. Steam turbine generators range from 2.2 MWe to 6.8 MWe. Typical plant electric power demand ranges from 1 MWe to 11 MWe, with most of the plants in the range of 2 - 5 MWe.

Plywood Plant Process Steam Production and Consumption

Data (Table 3-4) were obtained for steam production and consumption. Steam conditions (temperature and pressure) were determined for 12 of the facilities together with steam demand (tons/hour) and total boiler production capacity. Table 3-5 provides information on the make, model, capacity, and number of boiler units for each of the sites visited. With few exceptions, the boilers are rated at 30 tons/hour.

Table 3-2

POWER GENERATION AND ELECTRICITY CONSUMPTION IN INDONESIAN PLYWOOD FACTORIES

PLANT	INSTALLED CAPACITY (MWe) DIESEL	STEAM	PLN	DEMAND MWhe	MWe	DIESEL FUEL ('000 L/MO)	FUEL COST ($'000/MO)
1	9.4	---	7.9	3,818	11.0	760	138
2	4.0*	---	2.8	1,164		---	47
3	5.4	---	2.8	2,540	7.1	756	92
4	3.3	---	---	780	1.5	232	28
5	4.0	6.0	---	2,725	4.7	---	N/A
6	2.8	---	---	790	2.0	220	31
7	4.4	---	---	1,210	2.4	360	44
8	2.6	---	---	580	1.0	180	24
9	0.45	2.5	---	900	1.5	---	---
10	---	6.8	---	2,200		---	---
11	---	6.8	---	2,200		---	---
12	---	2.5	---				
13	0.54	2.0	---	1,200	2.2	28	4
14	3.6	---	---	1,600	1.8	474	58
15	3.2	---	---	N/A	2.2	367	47
16	3.9	---	---	810	1.8	195	24
17	6.4	---	1.4	2,500	7.2	600	72
18	4.0	2.2	---	1,480	2.7	400	52
19	6.4	---	---		2.4		
20	12.7	---	---	2,950	5.4	787	115
21	4.1	---	---	1,500	2.7	345	44

Table 3-3

POWER GENERATION EQUIPMENT AT INDONESIAN PLYWOOD FACTORIES

DIESEL GENERATORS				STEAM TURBINE GENERATORS	
Plant	Make	Units	Total Capacity	Make	Capacity
1	*	9	1,300 KVA		
2	*	5	800 kWe		
3	Ruston	3	1,700 kWe		
4	Yanmar	4	1,000 KVA		
		1	200 KVA		
5	Cat	4	750 KVA		
	Yanmar	3	700 KVA		
				Shinko	6,000 kWe
6	Cat	4	700 kWe		
7	Deutz	5	1,230 KVA		
		1	650 KVA		
8	Yanmar	3	700 KVA		
	Mercedes Benz	1	312 KVA		
9	*	2	225 kWe		
10					2,500 kWe
11				GE	6,800 kWe
12				GE	6,800 kWe
13	Cat	4	180 kWe	GE	2,500 kWe
				Shinko	2,500 kVA
14	Avk	7	646 KVA		
15	Yanmar	4	1,000 KVA		
16	Yanmar	3	1,000 KVA		
	Cat	3	625 KVA		
17	*	8	1,000 KVA		
18	Yanmar	4	1,000 KVA		
	AEG	4	240 KVA		
				Blohm & Voss	2,200 kWe
19	Yanmar	4	1,000 KVA		
20	Niigata	5	3,000 KVA		
		1	925 KVA		
21	Avk	5	590 KVA		
	Avk	1	1,000 KVA		

Table 3-4

PROCESS STEAM PRODUCTION AND USE AT INDONESIAN PLYWOOD FACTORIES

Plant	Prod Lines	Pressure Kg/cm^2	Temp ^oC	Demand In T/hr	Boiler Prod Cap In T/hr
1	18	15	157-180		137
2	3	9-10	180	15-17	30
3	5	8	160		60
4	3	15	160	17.5	25
5	7				85
6	3	15	180		25
7	3	15-18	150-175	24	30
8	2	15	190		10
9	3	15			30
10	3				50
11	3				50
12	3				30
13	3				30
14	3	12	180	25	55
15	3	12	160	20	40
16	2.5	13	187	12-16	25
17	6	17	160		
18	3	19		17	40
19	6	10-12			70
20	12	7- 8	170-180	30	120
21	3	12		16-20	45

Table 3-5

BOILERS INSTALLED AT
INDONESIAN PLYWOOD FACTORIES

Plant	Make	Model	Units	T/hr	Kg/cm^2	Notes
1	Shimizu		2	20		
	Shimizu		1	27		
	Takuma		2	20		
	Daelim		1	30		
2	Takuma	N850	1	30	17	
3	Weiss		3	20	28	
	Taiwan		1	10	8	
			1	3		(Fuel Oil)
4	Takuma	N750	1	25	19	
5	Takuma	N1600	1	60	35	385°C
	Takuma		1	25		
6	Korea		1	15	15	
	Korea		1	10	15	
7	Takuma	N900	1	30	21	
8	Takuma	N600	1	10	19	
9	Takuma	N1100	1	30	30	380°C
10	Kipper & Sons		1	50	34	
11	Kipper & Sons		1	50	34	
12	Takuma	N900s	1	30	34	
13	Takuma	N900	1	30	30	350°C
	Takuma		1	20		(will add)
14	ChuanLi	TW250	1	30		
	ChuanLi		1	25	20	
15	ChuanLi		1	25	18	
	ChuanLi		1	15	18	
16	Han Kook	N2500	1	25	18	
17	Takuma		1			
	Std Fasel		2	15*	19	(super heated
18	ChuanLi		2	20	19	water)
19	Takuma	N1100	1	40	19	
	Takuma	N900	1	30	21	
20	Han Kook		3	30	18	
	Han Kook		1	30		(diesel fuel)
21	Takuma	N900	1	30	19	
	Takuma		1	15		
	ChuanLi		1	8		

*mill kcal/hr

Because the steam is used primarily for drying and hot presses, the steam pressure is low (12 - 15 kg/cm^2). The average peak electricity demand for plywood production is 70 $kWhe/m^3$ of plywood produced.

Conclusions

The data developed during the prefeasibility assessment are indicative of the more detailed information that will have to be assembled and analyzed during the feasibility study. However, the preliminary data support the conclusions that an integrated 3 MWe standardized wood waste power plant would be very suitable for the needs of the Indonesian plywood industry.

4. TECHNOLOGY REQUIREMENTS AND RECOMMENDATIONS

This study has been conducted from a market-driven rather than technology-oriented perspective. This means that the market and business environment (i.e. Indonesian plywood industry) will determine the requirements that any new technology for on-site power generation must meet in order to be attractive as an investment by the industry. Some of the major considerations are summarized below.

Wood Waste Fuel Characterization

During the initial project development, it is anticipated that the wood waste available as fuel at the selected candidate sites can be analyzed by the LSDE Combustion Research Laboratory near Jakarta. The energy content of the wood waste typical of Indonesian plywood factories is 6,600 Btu/lb. The average moisture content of the wood waste that is used as fuel in the steam boilers is 23%.

Technology Requirements

A principal objective of initial project development will be to identify the most effective way to package available and proven off-the-shelf hardware to best meet the requirements and constraints of the Indonesian plywood industry. An integrated predesigned standardized hardware package using available off-the-shelf technology presently appears to be the most appropriate approach to penetrating the identified markets in Indonesia. Emphasis should be placed on designs that can minimize capital costs, assure simplicity of operation, and provide opportunities for local employment. This package would incorporate existing off-the-shelf equipment that can be shop-assembled into skid-mounted modules, to minimize the requirements for skilled labor

at the site. This technology is expected to exhibit ease of operation, low operation and maintenance costs, and attractive environmental characteristics.

Compared with conventional architect/engineering approaches to on-site power plant design, this modular approach can:

- Minimize costs
- Shorten implementation schedules
- Assure in-factory quality control
- Permit standardization of the module design and assembly
- Permit the manufacturing and assembly processes to benefit from industrial learning curve effects

Specific technical requirements for the steam turbines and wood waste boilers have been identified. Based on the field observations of Phase I, the peak demand in the plywood factories/integrated complexes ranged from 2 MWe to about 11 MWe. Based on the preliminary investigations carried out during the prefeasibility study, it appears that a 3 MWe net turbine-generator may be the most suitable size for Indonesian plywood plants. This issue of the optimum size will be further explored during development of the initial plant.

Steam Turbines

The suitability of several types of U.S.-manufactured steam turbines will be evaluated in detail during the feasibility study. These turbine designs include:

- straight condensing turbines
- steam extraction turbines
- back-pressure turbines

The turbine technology will be evaluated with the understanding that electricity and process steam are required in these plants at the same time. Based on efficiency considerations, back pressure or extraction turbines appear most suitable. However, considerations of capital cost and operating complexity may favor the simplest equipment in the initial plants, e.g. straight condensing turbines.

Boiler Requirements and Fabrication

During the prefeasibility study, no engineering analysis was conducted. However, relevant preliminary engineering estimates were made to determine the suitability of the proposed technology for applications in the Indonesian wood products industry. At the plants that use steam turbines, on-site inspection during Phase I indicates that 12.1 - 12.2 lbs/steam are required to generate 1 kWhe and one pound of wood chips produces about 4.5 lbs of steam at a pressure of 34 kg/cm^2.

During the feasibility study, the required steam flows will be established for each type of turbine under consideration. These data will be provided to a boiler manufacturer, and the boiler design and pricing will be completed by them. Babcock and Wilcox Indonesia,(BWI) currently is the only firm in Indonesia that can shop-fabricate and assemble wood chip fired boilers with capacities up to 30 tons of steam per hour at 725°F and 600 psig. For straight condensing turbines this is sufficient for generating 5 MWe net.

5. PROJECT ECONOMICS AND FINANCING

Introduction

Pre-investment economic and financial analyses were conducted by the team for a projected standard wood waste-fired power plant for use in Indonesia. The analysis showed that the economics of wood waste power generation at Indonesian plywood factories and sawmills depend strongly on the following factors:

- Capital cost of the installation ($/kWe)
- Incremental operating and maintenance costs, both fixed ($/kW-year) and variable ($/kWh)
- Other costs including insurance, fees for reforestation program, etc.
- Salvage or recovery value of existing diesel equipment whose sale can be used to partially offset the costs of the wood waste power generation equipment
- Financial variables (interest rate on debt, after-tax required return on equity, etc.) associated with project financing
- Avoided cost of on-site diesel generated electricity or of PLN-supplied electricity, including projected escalation or decline in these costs (including impacts of potential increases in diesel fuel prices)
- The value of alternative uses of the wood waste that would be consumed for power generation purposes
- Financing mechanisms and ownership arrangements for the power generation facilities

Interviewed plant owners have indicated they need the following information regarding both the economics of substituting wood waste power generation for their present use of diesel power generation and the proposed project to develop one or more commercial installations:

- Required front-end capital (equity investment)
- Payback time and return on equity
- Operation and maintenance requirements relative to present operations
- Reliability of power generation relative to present operations
- Security of their investment (in the event of sudden changes in government policy affecting the operation of the Indonesian wood products industry or of privately owned power generation units)

Arguments that potential owners may find persuasive in considering investments in wood waste power generation systems are:

- The costs of power generation using on-site wood waste power systems will be predictable and will change very little over the lifetime of the equipment (30 years).
- The on-site wood waste fuel supply is assured and the fuel is virtually free.
- By contrast, the future price of diesel fuel is uncertain. The Government of Indonesia is experiencing very substantial foreign exchange and domestic revenue problems, and the present 50% subsidy on diesel fuel may well be removed over the coming three to five years.

Pro Forma Project Financial Analysis

A preliminary pro forma financial analysis* was conducted for the proposed wood waste-power generation project. A base case (indicated as Case 1) was defined using conservative technical, economic, and financial assumptions shown in Tables 5-1 and 5-2.

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* The financial analysis was conducted using a pro forma financial analysis model developed and used by Future Resources Associates, Inc. of Berkeley, California for private power project financial analysis.

Table 5-1

TECHNICAL AND ECONOMIC PARAMETERS FOR
INDONESIAN WOOD WASTE-POWER GENERATION SYSTEMS

TECHNICAL	
Turbine Type	Straight condensing
Steam Extraction	None
Gross/Net Electrical Capacity	2.75/2.50 MWe
Parasitic Load	0.25 MWe
Fuel Consumption	4 green tons/hour
Heat Rate, gross	19,264 Btu/kWh
Heat Rate, net	21,190 Btu/kWh
Scheduled Outage	104 Hrs/mo.
Forced Outage	42 Hrs/mo.
Operating Hours (annual)	7,008 hours/year
ECONOMIC	
Capital Cost (U.S.$ x 1,000)	
Installed (turnkey) Facilities Cost	$ 2,840
Misc. Construction Costs	200
Contingency	240
Start-up Costs	150
Closing Costs	100
Development Fee	125
Owner's Costs	250
Working Capital	36
Debt Service Reserve	258
Commitment Fees	69
Interest During Construction	208
Total Loaded Capital Cost	$ 4,036
Operation and Maintenance Costs ($ x 1,000/year)*	
Direct Power Plant Expenses	$ 110
Project Management Fee	40
Property Taxes & Insurance	62
Land Lease	10
Total Operation and Maintenance (first year)	$ 222

* Assumed to escalate at 4%/year

Table 5-2

FINANCIAL PARAMETERS FOR
INDONESIAN WOOD WASTE-POWER GENERATION SYSTEMS
Project Startup Date: January 1989

PROJECT FINANCING

Fraction of Capital Cost Financed	0.85
Amount of Debt	$ 3,431,000
Debt Rate	11.0 %
Debt Term	12 Years
Interest on Debt Service Reserve Fund	7.0 %
Annual Debt Payment	$ 516,000
Amount of Equity	$ 605,400

CONSTRUCTION FINANCING

Construction Interest Rate	10.0 %
Funds Commitment Fee	2.0 %
Construction/Startup (quarters)	5
Project Funding Date	October 1987

AVOIDED COSTS

Diesel Fuel Price (3 cases)	
Subsidized Price	Rp 200/liter = $ 0.13/liter
World Market Price	Rp 400/liter = $ 0.26/liter
Subsidy Phaseout Scenario	Straight-line over 5 years
Scrap Value of Wood Waste (2 cases)	
"High" price	$ 3.00/cubic meter
Free	No charge to plant owner/operator
Diesel Production of Electricity	3 kWhe/liter

PROJECT OWNERSHIP

Third-party ownership, with leaseback or with on-site operation and sale of electricity.

Note: Avoided diesel power plant O&M costs have not been included due to lack of definitive data.

The parameters that were varied in the preliminary analysis were diesel fuel price and the selling price of the wood waste generated at the plywood factory, as indicated in Table 5-2 above.

Each of the six financial analyses is represented by a separate data sheet in which the following information is displayed:

1. Statement of income and expenses
2. Overall project summary
3. First year system performance summary (by month)
4. Project revenues
5. Project operation and maintenance costs
6. Capital costs and financing

Technical Assumptions

Scheduled Outage

The assumption is that all of the scheduled maintenance can be conducted on Sundays, at which time backup diesel can be used. If several wood waste steam plants were available on site, maintenance schedules would be staggered to permit continuous electricity supply from these plants, without use of diesel fuel for power generation.

Based on experience world wide with wood-fired steam power plants, scheduled maintenance should require about 5% of the annual hours, or 438 hours per year (36.5 hours/month). Thus the 104 hours per month available for maintenance due to plant shutdown on Sundays is more than adequate for complete maintenance.

Forced Outage

Based on international experience with well-maintained plants, a forced outage rate of 6% (ca. 42 hours/month) can be expected.

Operating Total

This is the number of hours in a month less the hours for scheduled and forced outage.

Electrical Capacity

The gross capacity for a straight or full condensing turbine system is assumed to be 2.75 MWe. The parasitic load is typically on the order of eight to ten percent of the gross output for conventional wood burning steam power plants in the 3 MWe power output range. The net capacity of the system is 2.5 MWe.

Steam Extraction Rate

It is assumed that the first plants will be for power generation only, with separate wood waste boilers used for production of steam for hot presses. Hence the steam extraction rate is zero. After the technology is introduced and accepted in Indonesia, more complex systems employing cogeneration and steam extraction would probably be more efficient, both in terms of fuel use and total costs.

Fuel Consumption Rate

A fuel (wood waste) consumption rate of 4 green tons per hour is required to produce sufficient steam (about 15 tons/hour) to power a 2.75 MWe straight condensing turbine. The energy density of the air-dried fuel (23% moisture content) is 6,622 Btu/green lb.

Project Capital Costs and Financing

The turnkey price for a 2.5 MWe (net) wood-fired facility in Indonesia was estimated* at $2.84 million. This estimate is based on preliminary and incomplete quotes from several U.S. and U.S./Indonesian vendors of the major equipment contacted during Phase I and on the experience of the team with projects of similar size and type. Construction is assumed to require 12 months (4 quarters), with an additional 3 months (1 quarter)

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* The two decimal places in the figure of $2.84 million reflects the way in which the project costs were estimated, not the precision in the estimate, which is probably good to only 10-20%.

required for plant startup. Included in the total capital cost (Table 5-3) is a ten-percent contingency, and $200,000 for miscellaneous construction needs not covered by the turnkey contractor's scope. Start-up costs of $150,000 are assumed.

Table 5-3

WOOD WASTE POWER GENERATION SYSTEM
PROJECT CONSTRUCTION COST (U.S. $)

(Preliminary Estimate)

Capital Cost ($ x 1,000)	
Installed Facilities Cost	$ 2,840
Misc. Construction Costs	200
Contingency	240
Start-up Costs	150
Closing Costs	100
Development Fee	125
Owner's Costs	250
Working Capital	36
Debt Service Reserve	258
Commitment Fees	69
Interest During Construction	208
Fully Burdened Project Capital Cost	**$ 4,036**

The estimates for closing costs ($100,000), developer's fee ($125,000), and owner's costs during construction ($50,000 per quarter) are based on costs typical in the U.S. context. Working capital of $61,000 is calculated based on the need for the project to be able to cover cash costs with a two month lag in the payment of accrued revenues. The debt service reserve is calculated at one-half year's debt service, a typical value for similar projects financed in the U.S. The project contingency may be too low. Some investors in Indonesia have privately reported experience with substantial cost overruns in large capital-intensive projects. However, the nature and relatively small size of this project should permit tight project management.

The project is assumed to be built with 100% construction financing at 10% interest and 2% commitment fees, typical of the rates charged in the U.S. This leads to a total financing cost of $277,000 ($69,000 commitment fee, $208,000 interest during construction).

At the completion of construction and startup, permanent project financing is obtained with a debt structure of 85% of the total loaded cost, and 15% equity. The debt is for a term of 12 years, at an interest rate of 11%. Equity is contributed by an investor, who receives two-thirds of the distributable cash flow, and the remaining one-third of the distributable cash flow is paid to the developer.

Operation and Maintenance Costs

Many of the costs of operations and maintenance are site specific, and depend on various contractual arrangements that are made in the course of project development. The analysis is conservative in its O&M cost assumptions; in actual practice the plants should be capable of operation at considerably less cost than shown.

Total annual fuel consumption is calculated from the hourly fuel consumption data and hours of performance data on page 3 of the pro forma model output, and shown on page 5. The actual cost of fuel for the project depends on the alternatives that are available for the waste wood resources produced at the mills. There is a limited market for wood waste at plywood mills in Indonesia, with a typical value of up to $3.00/cubic meter (density 0.5) paid for the small fraction of waste that is sold. This translates into a fuel cost of $5.43/ton and is considered as an upper limit on the price that would be charged to a wood-burning power generation plant located at a plywood mill.

At the other extreme, it is probable that most or all of the fuel required to run the power-generating operation would be at zero cost, and might even save the mill the cost of disposal of the waste wood. For the purposes of bounding the range of fuel costs, we have presented three runs with a fuel cost of $5.43/ton, and three runs with a fuel cost of zero.

The costs of project management and of the lease of the project site will depend on the ownership and contractual arrangements made for each individual project. For the purposes of this analysis, it is assumed that the project will be owned independently of the mill, and will pay the mill for the lease of the project site at a rate of $10,000/year. The project will be charged $40,000/yr as a management fee.

Operations of the plant will require a staffing level of 15 to 20 people, who will earn a monthly income of about $50/month per person. This leads to an annual salary load of $10,000/year. We have assumed world-market prices for operating supplies and annual (routine and contract) maintenance. These values are $50,000 and $40,000 respectively. Ash disposal and administrative and office expenses are estimated at $5,000/year each. The project is not expected to require any purchased or backup power from PLN, as on-site backup diesels are available.

Project Revenues

The project revenue spreadsheet shown as Page 4 of the pro forma analysis was developed for the complex pricing structure for power generation and sales in California. In the case of the Indonesia project, where the electricity produced is consumed totally on-site, we assume neither time of day or seasonal pricing, nor capacity credits.

If this technology is eventually used for the production of excess power to be sold to PLN, such considerations may be appropriate, especially the payment of capacity credits to the project.

The revenues for the project as modelled are exclusively the avoided diesel fuel cost. These revenues care calculated based on a 1989 (subsidized) diesel fuel cost of $0.47/gal in Indonesia, and a conversion efficiency for electricity production from diesel of 3 kWh/liter (11.1 kWh/gal). As a sensitivity analysis, we allowed the cost of diesel to rise to its world market value (about double the subsidized price) for two of the runs.

Results of the Economic/Financial Analysis

Two of the most important financial indicators are the payback time and the return on equity for the project. These were calculated for the six cases indicated above and are shown below in Table 5-4 and in Figures 1-1 and 1-2 above. The annual cash flows (before taxes) are shown with and without diesel fuel subsidies respectively in Figure 5-1 and 5-2.

Table 5-4

FINANCIAL SENSITIVITY ANALYSIS

CASE	DIESEL PRICE ($/Liter)	WOOD WASTE PRICE[5] ($/ton)	PAYBACK TIME[1] (Years)	RETURN ON EQUITY[2]
1	0.13	5.43[3]	12.5	12.9 %
2	0.13	0.00	6.25	25.2 %
3	0.26	5.43[3]	1.25	> 100 %
4	0.26	0.00	1.0	> 100 %
5	Subsidy Phaseout[4]	5.43[3]	4.25	44.3 %
6	Subsidy Phaseout[4]	0.00	3.0	60.7 %

1. On equity

2. Pre-tax internal rate of return on equity

3. Equivalent to $3.00/m^3 of green wood (23% moisture content)

4. Present 50% subsidy phased out linearly over a 5-year period beginning in 1990

5. It is assumed that all of the wood waste could be sold at this price. In practice only 5 - 30% of the wood waste is sold for firewood and as scrap for building huts.

Figure 5-1

Wood Waste Power Generation Project Cash Flows
(50% Domestic Diesel Fuel Subsidy)

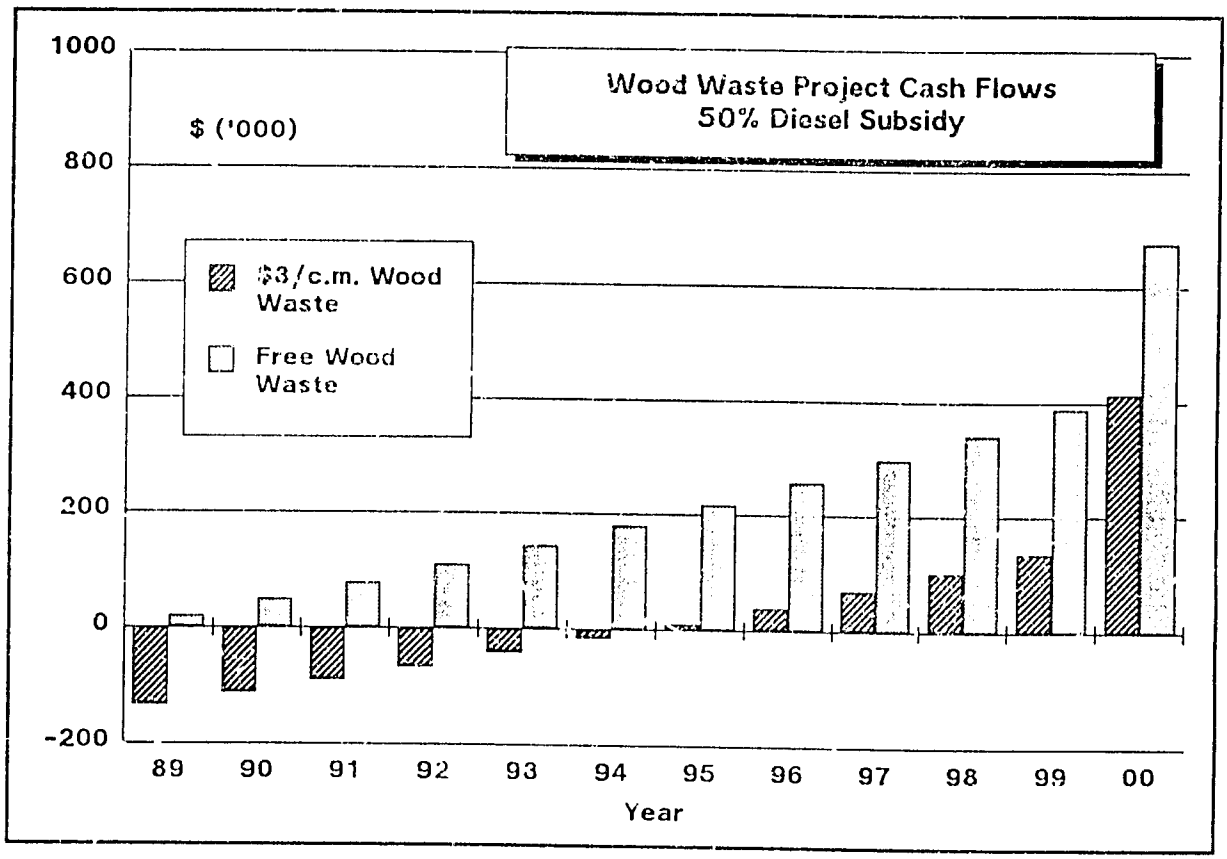
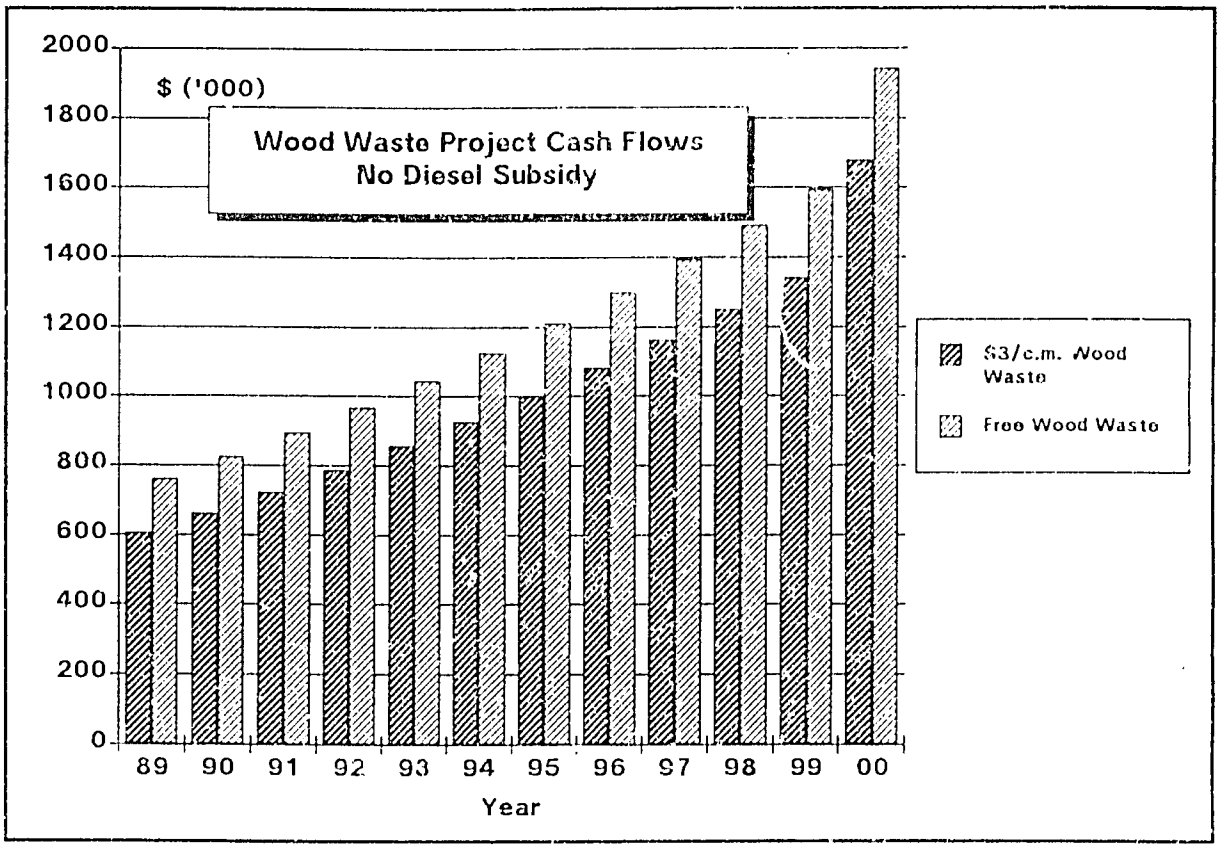


Figure 5-2

Wood Waste Power Generation Project Cash Flows
(No Domestic Diesel Fuel Subsidy)



For the conservative assumptions used in the analysis and with the present diesel fuel price subsidy (Figure 5-1), imposing a fuel charge for wood waste results in negative cash flow for the first six years of the project, with an associated payback time of 12.5 years and a 12.9% return on equity -- an unattractive investment environment. If the wood wastes are free, the cash flows are positive and the payback time is 6.25 years with a (before tax) return on equity of 25.2%

By contrast (Figure 5-2), if the price of diesel fuel is at the world market price, the fuel price savings are so great that the payback time is relatively insensitive (1.0 vs. 1.25 years) to whether or not there is a $\$3/m^3$ charge for the wood waste. The before-tax return on investment is well above 100% (the owner's equity is repaid in the first year!).

It was projected that the diesel fuel subsidy might be gradually phased out in Indonesia. For purposes of analysis, it was assumed that the price would be gradually raised over a five-year period to the world market priced. Under this condition, the payback time is 3.0 years (if wood waste is free) or 4.25 years (if wood waste costs $\$3.00/m^3$ to the plant operator), and the respective before-tax return on equity is either 60.7% or 44.3%.

Financing Mechanisms

As discussed earlier, there are several approaches to making this technology readily available to the Indonesian forest products industry These include financing of a new business venture to sell and/or lease the equipment and provide operation and maintenance services to the industry, and direct financing of the plants themselves.

Some of the financing options that will be explored in detail during the feasibility study include the following:

- Loan from PRE (U.S.A.I.D.) to finance up to 50% of the capital cost (in U.S. currency) of the installation at interest rates slightly above and tied to current T-Bill interest rates.

- PRE could provide loan guarantees for 50% of the selling price of the stock (either publicly traded or purchased through private placement) for a joint venture U.S./Indonesian business that would package the system and provide the necessary operation and service contracts.

- The Asian Development Bank (ADB) could provide a loan for up to 20% of the project. (However the ADB has a minimum level for such loans which may require financing of several installations as a single financial activity.)

We emphasize that <u>the economic and financial analyses presented here are indicative, not definitive.</u> Although the financial analyses are quite detailed, reflecting the structure of the financial model used, there was insufficient opportunity to determine all of the Indonesia-specific financial variables that would apply to this project under various financing mechanisms. Prior to project financing, project developers will need to conduct furthur detailed analyses.

6. ENVIRONMENTAL AND HEALTH CONSIDERATIONS

There are several environmental issues to be addressed in this project. Direct project-related environmental issues include emissions to the atmosphere, discharge of waste water, and disposal of ash. The proposed project would make use only of wood waste currently generated at plywood industry sites, and would not use wood from logging activities as fuel. The high cost of wood resulting from logging activities rules out the use of virgin timber as a boiler feedstock; the value added for plywood production is considerably greater.

The proposed plants will use debris and waste wood that currently presents disposal problems. Moreover the use of wood waste power generation in place of diesel power generation has the potential for a significant improvement in the physical environment of the plant and in worker health and safety.

Sustainability of Indonesia's Tropical Forest Ecosystems

The most important long-term environmental consequence* of the Indonesian forest products industry is damage to the unique and ecologically important forests of Kalimantan and Sumatera, although at present the high rate of deforestation in Indonesia is attributable principally to clearing for agriculture. At present Indonesian loggers pay $4/cubic meter to the government for reforestation and the government is responsible for imple-

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* The ecological importance of Indonesia's forests and the threat to them posed by agricultural and forest industry activities is discussed by Robert Repetto in his recent (May 1988) report The Forest for the Trees? Government Policies and the Misuse of Forest Resources for the World Resources Institute, Washington, DC. Indonesia is only one of seven countries, including the United States, in which present forest management and exploitation practises are criticized.

menting reforestation programs. However this program has not proceeded rapidly enough to inhibit the present rate of deforestation. Alternative solutions must be explored for sustainable forest management. The responsibility for reforestation could be turned back to the local governors or to the wood products industry itself in order to accelerate and expand the reforestation area. This aspect should be a consideration in any detailed project feasibility assessment study.

Mitigation of Present Local Environmental Impacts

At present all plywood plants in Indonesia use wood waste to generate process steam in relatively primitive boilers with no flue gas controls. Waste wood generated in the plants is usually either thrown in the river, used as land fill, or burned in the open as trash, creating conditions that we would regard as environmentally unacceptable in the U.S. These conditions include dust, smoke, floating debris in the river, and smoldering heaps of wood waste, etc.). The combustion of unused waste (log cores, chips, sawdust, bark, etc.) will clean up the plant environment and improve local air, water, and soil conditions.

Air Pollution Issues

In properly equipped combusters and boilers, particulate matter is recycled back to the boiler to achieve more complete combustion, thereby minimizing air pollution. However, the combustion of tree bark will result in production of sulphur dioxide (SO_2); emission controls may be required to limit these emissions.

Soil and Ground Water Pollution

Wood ash, when returned to the soil, is broken down by bacteria in the soil and contributes to soil stability and nutrient level, provided it is not first exposed to salt. If wood ash is exposed to salt there is a chemical reaction* that produces a highly toxic material that can leach into the soil, poisoning both the soil and any associated water table. Since many of the plywood plants are located on ocean coasts this is a potential problem that will have to be mitigated. In addition, the waste water from the cooling towers will have to be treated so that its dumping into the nearby river or coastal waters will not constitute an environmental danger.

Health and Safety Considerations

The present methods of disposal of wood waste at the plywood plants pose potentially serious health and safety issues for plant workers. These include:

- Respiratory diseases due to air-borne saw dust and smoke from open burning of wood waste heaps, and
- Potential explosions from saw dust.

In order to increase the amount of fuel available, a policy dialogue should be initiated with the Indonesian Ministry of Forestry to extract from the forests presently discarded top sections of the trees (less than 30 cm in diameter). This would not only increase the fuel available but would also help clean up the jungle floor and make it more accessible for reforestation.

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* Information on the consequences of the present dumping of wood ash at Indonesian plywood factories was not available to the authors when this report was prepared.

7. NOTES AND REFERENCES

1. Asian Development Bank (November 1985). Indonesia: Rural and Renewable Energy Development Study in Kalimantan. 4-volume study prepared by the Center for Energy Studies - CESEN (Genoa, Italy), Energy/Development International (New York and Washington, DC), Future Resources Associates, Inc. (Berkeley, California), and P.T. Widya Pertiwi Engineering (Jakarta)

2. A decailed overview of the Indonesian forest products industry is provided in the Directory of the Plywood Industry in Indonesia, 2nd Edition (June 1986) published by the Indonesian Wood Panel Association, Jakarta

3. P. Jezek, private discussions with Indonesian forest product industry executives

Attachment A

PREFEASIBILITY PROJECT PARTICIPANTS

During Phase I several U.S. and Indonesian private sector organizations and a number of private individuals have actively contributed to the prefeasibility assessment project. These participants included:

- Babcock and Wilcox Indonesia (U.S./Indonesian joint venture)
- Stone and Webster International Corporation (Boston, MA)
- Murray Turbomachinery Corporation (Burlington, Iowa; sales & service in Indonesia)
- IKPT (private engineering and construction Co., Jakarta)
- Indonesian Wood Panel Association
- Sixteen individual owners of one or more Indonesian plywood manufacturing facilities
- Indonesian Sawmill Association

In addition to these individuals and private companies, other participants included:

- BPPT/LSDE (Combustion Research Center of the Agency for the Assessment and Application of Technology, Jakarta)
- U.S. Embassy Foreign Commercial Service (Jakarta)

ATTACHMENT B

Preliminary Pro Forma Financial Analyses

PRO FORMA FINANCIAL ANALYSIS

A preliminary pro forma financial analysis was conducted for the conceptual wood waste-power generation project. A base case was defined using conservative technical, economic, and financial assumptions discussed in Section 5 and summarized below. The input data and results of the analysis are presented in this Attachment. Each of the four financial analyses is represented by six data sheets in which the following information is displayed:

1. Statement of income and expenses
2. Overall project summary
3. First year system performance summary (by month)
4. Project revenues
5. Project operation and maintenance costs
6. Capital costs and financing

Technical Performance Assumptions

It is assumed that the plants operate six days a week throughout the year. Scheduled outage is assumed as being every Sunday plus other times when maintenance is required.

Scheduled Outage

The assumption is that all of the scheduled maintenance can be conducted on Sundays, at which time backup diesel can be used. If several wood waste steam plants were available on site, maintenance schedules would be staggered to permit continuous electricity supply from these plants, without use of diesel fuel for pwoer generation.

Based on experience world wide with wood-fired steam power plants, scheduled maintenance should require about 5% of the annual hours, or 438 hours per year (36.5 hours/month). Thus 104 hours per month of time available for maintenance due to plant shutdown on Sundays is fully adequate to permit complete maintenance.

Forced Outage

Based on world wide experience with well-maintained plants, a forced outage rate of 6% (ca. 42 hours/month) can be expected.

Operating Total

This is the number of hours in a month less the hours for scheduled and forced outage.

ELECTRICAL CAPACITY

The gross capacity for a straight or full condensing turbine system is 2.75 MWe. The parasitic load is typically on the order of eight to ten percent of the gross output for conventional wood burning steam power plants in the 3 MWe power output range. The net capacity of the system is 2.5 MWe.

Steam Extraction Rate

We assume that the first plants will be for power generation only, with separate wood waste boilers used for production of steam for hot presses. Hence the steam extraction rate is 0. After the technology is introduced, more complex systems employing cogeneration and steam extraction would probably be more efficient, both in terms of fuel use and total costs.

Fuel Consumption Rate

A fuel (wood waste) consumption rate of four green tons per hour is required to produce sufficient steam (about 15 tons/hour) to power a 2.75 MWe straight condensing turbine. The energy density of the fuel (23% moisture content) is 6,622 Btu/green lb.

Project Revenues

The project revenue spreadhseet shown as Page 4 op the pro forma analysis was developed for the complex pricing structure for power generation and sales in California. In the case of the Indonesia project, where the electricity produced is consumed totally on-site, we assume neither time of day or seasonal pricing, nor capacity credits.

If this technology is eventually used for the production of excess power to be sold to PLN, such considerations may be appropriate, especially the payment of capacity credits to project.

The revenues for the project as modelled are exclusively the avoided diesel fuel cost. These revenues care calculated based on a 1989 (subsidized) diesel fuel cost of $0.47/gal in Indonesia, and a conversion efficiency for electricity production from diesel of 3 kWh/litre (11.1 kWh/gal). As a sensitivity analysis, we allowed the cost of diesel to rise to its world

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market value (about double the subsidized price) for two of the runs.

Project Operations and Maintenance Costs

Many of the costs of operations and maintenance are site specific, and depend on various contractual arrangements that are made in the course of project development. We have tried to be quite conservative in making assumptions about the costs of O&M, and in actual practice the plants will be able to operate at considerably less cost than shown.

The project, for tax purposes, is assumed to have a useful life of 20 years, and straight-line depreciation is used. Both property taxes and insurance are estimated to cost one percent of the project's capital cost. Annual inflation is assumed to be four percent, and interest paid on escrow funds (debt service reserve) is assumed to be seven percent.

Total annual fuel consumption is calculated from the hourly fuel consumption data and hours of performance data on page 3 of the model, and shown on page 5. The actual cost of fuel for the project depends on the alternatives that are available for the waste wood resources produced at the mills. There is a limited market for this type of material in Indonesia, with a typical value of up to $3.00/cubic meter (density 0.5).

This value, which translates into a fuel cost of $5.43/ton, is an upper limit on the price that would be charged to a wood-burning generation plant associated with a mill. At the other extreme, it is probable that most or all of the fuel required to run the power-generating operation would be at zero cost, and might even save the mill the cost of disposal of the waste wood. For the purposes of bounding the range of fuel costs, we have presented two runs with a fuel cost of $5.43/ton, and two runs with a fuel cost of zero.

The costs of project management and of the lease of the project site will depend on the ownership and contractual arrangements made for each individual project. For the purposes of this analysis, we have assumed that the project will be owned independently of the mill, and will pay the mill for the lease of the project site at a rate of $10,000/year. The project will be charged $40,000/yr as a management fee.

Operations of the plant will require a staffing level of 15 to 20 people, who will earn a monthly income of about $50/month per person. This leads to an annual salary load of $10,000/year. We have assumed world-market prices for operating supplies and annual (routine and contract) maintenance. These values are $50,000 and $40,000 respectively. Ash disposal and administra-

tive and office expenses are estimated at $5,000/year each. The project is not expected to require any purchased or backup power from PNL, as on-site backup diesels are available.

Project Capital Costs and Financing

The turnkey construction price for a 2.5 MWe (net) wood-fired facility in Indonesia is estimated at $2.4 MM. Construction is assumed to take 12 months (4 quarters), and start-up an additional 3 months (quarter). We have included in the capital cost a ten-percent contingency, and another $200,000 for miscellaneous construction needs not covered by the turnkey contractor's scope. Start-up costs of $150,000 are also included.

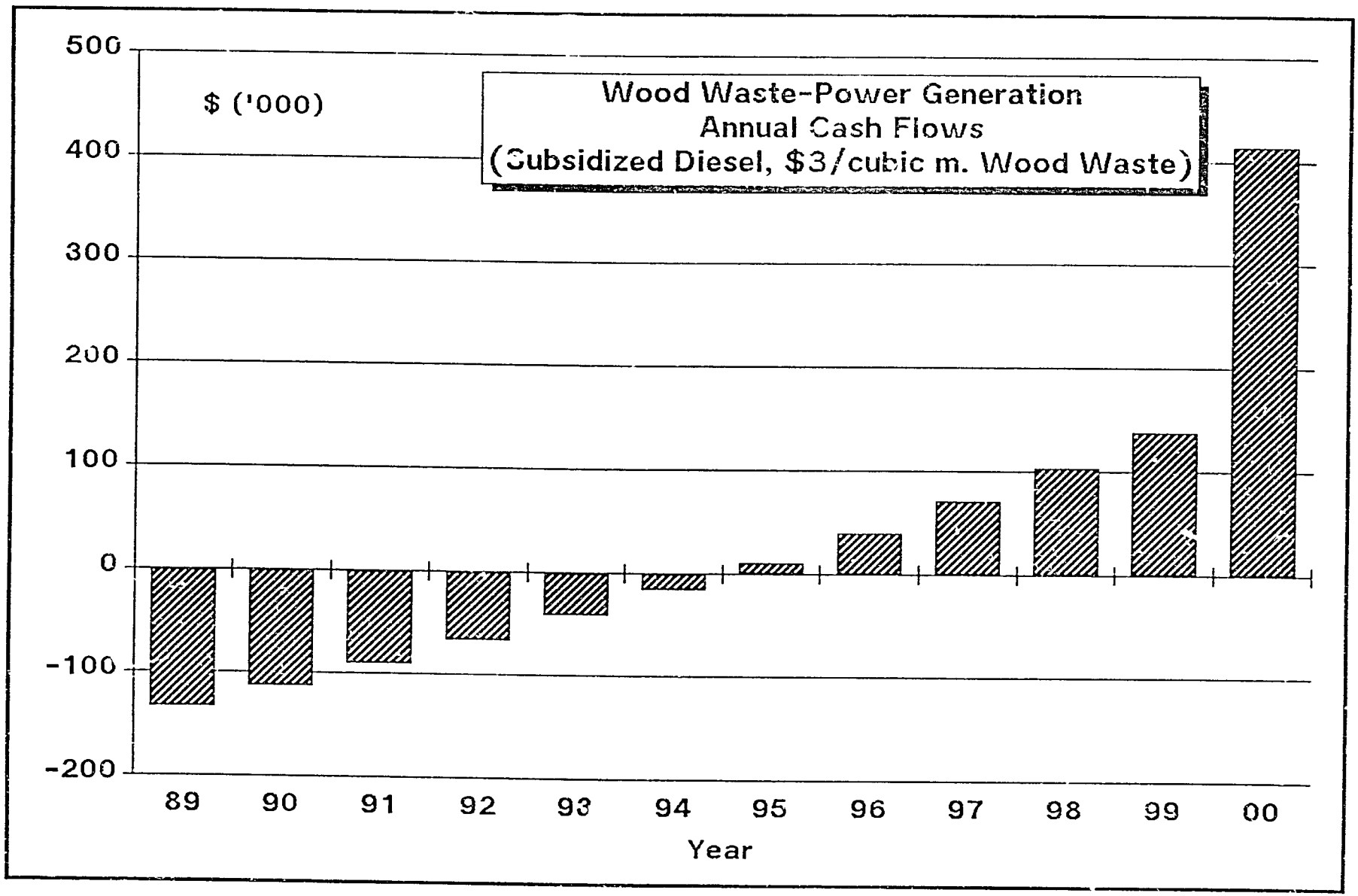
The estimates for closing costs ($100,000), developer's fee ($125,000), and owner's costs during construction ($50,000 per quarter) are based on costs typical in the U.S. context. Working capital of $61,000 is calculated based on the need for the project to be able to cover cash costs with a two month lag in the payment of accrued revenues. The debt service reserve is calculated at one-half year's debt service, a typical value for project finance in the U.S.

The project is assumed to be built with 100% construction financing at 10% interest and 2% commitment fees, typical of the rates charged in the U.S. This leads to a total financing cost of $277,000 ($69,000 commitment fee, $208,000 interest during construction).

At the completion of construction and startup, perment project financing is obtained with a debt structure of 85% of the total loaded cost, and 15% equity. The debt is for a term of 12 years, at an interest rate of 11%. Equity is contributed by an investor, who receives two-thirds of the distributable cash flow, and the remaining one-third of the distributable cash flow is paid to the developer.

CASE 1

(Subsidized Diesel Fuel, High Wood Waste Price)


Wood Waste-Power Generation
Annual Cash Flows
(Subsidized Diesel, $3/cubic m. Wood Waste)
$ ('000)
500
400
300
200
100
0
-100
-200
89
90
91
92
93
94
95
96
97
98
99
00
Year

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, SUBSIDIZED DIESEL, MAXIMUM FUEL COST.

PROFORMA STATEMENT OF INCOME AND EXPENSES

(first operating year begins on January 1)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
REVENUE ($000)																				
ELECTRICAL ENERGY SALES	741	778	817	858	901	946	993	1,043	1,095	1,150	1,207	1,268	1,331	1,397	1,467	1,541	1,618	1,699	1,784	1,873
CAPACITY SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STEAM SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMMODITY SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST FROM DEBT SERVICE RESERVE FUND	18	18	18	18	18	18	18	18	18	18	18	0	0	0	0	0	0	0	0	0
***** TOTAL REVENUE	759	796	835	876	919	964	1,011	1,061	1,113	1,168	1,225	1,268	1,331	1,397	1,467	1,541	1,618	1,699	1,784	1,873
EXPENSES ($000)																				
PURCHASED FUEL	152	160	168	176	185	194	204	214	225	236	248	260	273	287	301	316	332	349	366	385
CONTRACT OPERATION & MAINTENANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OPERATION & MAINTENANCE--COMMODITY PLANT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OPERATIONS--DIRECT POWER PLANT EXPENSES	110	114	119	124	129	134	139	145	151	157	163	169	176	183	190	198	206	214	223	232
TRANSMISSION LINE MAINTENANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PROJECT MANAGEMENT FEE	40	42	43	45	47	49	51	53	55	57	59	62	64	67	69	72	75	78	81	84
PROPERTY TAXES & INSURANCE	62	64	66	68	70	72	74	76	78	81	83	86	89	91	94	97	100	103	107	110
LAND LEASE	10	10	11	11	12	12	13	13	14	14	15	15	16	17	17	18	19	19	20	21
***** TOTAL EXPENSES BEFORE DEBT PAYMENT	374	390	406	424	442	461	480	501	522	545	568	593	618	645	673	702	732	764	797	832
***** NET OPERATING INCOME ($000)	385	406	429	452	477	503	531	560	591	623	657	675	713	753	795	839	885	935	986	1,041
PROJECT DEBT PAYMENT	520	520	520	520	520	520	520	520	520	520	520	520	0	0	0	0	0	0	0	0
RECOVERY OF DEBT SERVICE RESERVE	0	0	0	0	0	0	0	0	0	0	0	260	0	0	0	0	0	0	0	0
RECOVERY OF WORKING CAPITAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61
***** PROJECT CASH FLOW BEFORE TAXES ($000)	(134)	(113)	(91)	(67)	(42)	(16)	11	40	71	103	138	415	713	753	795	839	885	935	986	1,102
***** DEBT COVERAGE RATIO	0.74	0.78	0.83	0.87	0.92	0.97	1.02	1.08	1.14	1.20	1.26	1.30	NA	NA	NA	NA	NA	NA	NA	NA
PARTNER 1 CASHFLOW BEFORE TAXES ($000)	(693)	(75)	(61)	(45)	(28)	(11)	8	27	47	69	92	277	475	502	530	559	590	623	658	735
CASHFLOW AFTER TAXES ($000)	(663)	(48)	(42)	(36)	(30)	(24)	(18)	(12)	(6)	(0)	5	119	359	377	395	416	437	459	482	535
PARTNER 2 CASHFLOW BEFORE TAXES ($000)	(45)	(38)	(30)	(22)	(14)	(5)	4	13	24	34	46	138	238	251	265	280	295	312	329	367
CASHFLOW AFTER TAXES ($000)	(46)	(43)	(40)	(37)	(34)	(31)	(28)	(25)	(22)	(19)	(17)	40	160	169	179	189	199	210	222	248
PARTNER 3 CASHFLOW BEFORE TAXES ($000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CASHFLOW AFTER TAXES ($000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, SUBSIDIZED DIESEL, MAXIMUM FUEL COST.

OVERALL PROJECT SUMMARY

SYSTEM COSTS AND VALUE

Installed Facilities Cost	2,840 000$s
Total Loaded Capital Cost	4,064 000$s
Initial Fuel Cost	8.69 mills/kWh
Initial O&M Cost	0.00 mills/kWh
Project NPV (pre-debt, 12% DR)	37 000$s

PROJECT DEBT FINANCING

Amount of Debt	3,454 000$s
Debt Rate	11.0%
Debt Term	12 Years
Minimum Coverage Ratio	0.74
Average Coverage Ratio	0.90

INVESTMENT PERFORMANCE

	Ptn 1	Ptn 2	Ptn 3
Initial Investment (000$s)	610	0	0
Pre-Tax IRR (%)	12.9%	24.4%	NA
After-Tax IRR (%)	10.1%	14.0%	NA
Pre-Tax NPV (12% DR)	93	318	0

COGENERATION SYSTEM OPERATING PARAMETERS

Fuel Use	4.00 ton/hr
Ave. Capacity, Gross	2.75 MW
Average Parasitic Load	0.25 MW
Average Capacity, Net	2.50 MW
Firm Capacity	0.00 MW
Heat Rate, gross	19,264 Btu/kWh
Heat Rate, net	21,190 Btu/kWh
Operating Standard	0.0%
Efficiency Standard	17.9%
Average Steam Output	0.00 mlb/hr
Operating Hours-yr 1	7,008
Operating Hours-yr 2	7,008

DEGRADATION FACTORS

	Yr 2	Yr 3	Yr 4
Capacity	0.00%	0.00%	0.00%
Fuel Use	0.00%	0.00%	0.00%
Cap. Bonus	0.00%	0.00%	0.00%

DATA BY TIME-OF-USE PERIOD

	Ann. Hours	Avail	Hrs Yr 1	Hrs Yr 2-	Net kW	Steam lb/hr	Fuel ton/hr	Capacity($/kWh) Firm	Capacity($/kWh) Avail	Energy($/kWh) Fixed	Energy($/kWh) Short
SUMMER											
On Peak	504	94.1%	474	474	2,500	0	4.00	0.000	0.000	0.042	0.000
Partial Peak	756	94.1%	712	712	2,500	0	4.00	0.000	0.000	0.042	0.000
Off Peak	926	59.5%	551	551	2,500	0	4.00	0.000	0.000	0.042	0.000
Dispatch Hours	670	79.9%	535	535	2,500	0	4.00	NA	0.000	NA	0.000
WINTER											
On Peak	680	94.3%	641	641	2,500	0	4.00	0.000	0.000	0.042	0.000
Partial Peak	1,530	94.3%	1,443	1,443	2,500	0	4.00	0.000	0.000	0.042	0.000
Off Peak	2,364	67.2%	1,588	1,588	2,500	0	4.00	0.000	0.000	0.042	0.000
Dispatch Hours	1,330	80.0%	1,064	1,064	2,500	0	4.00	NA	0.000	NA	0.000

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, SUBSIDIZED DIESEL, MAXIMUM FUEL COST.

ANNUAL (FIRST YEAR) SYSTEM PERFORMANCE SUMMARY

MONTHLY HOURS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Scheduled Outage	104	104	104	104	104	104	104	104	104	104	104	104
Forced Outage	42	42	42	42	42	42	42	42	42	42	42	42
Operating Total	598	526	598	574	598	574	598	598	574	598	574	598
GROSS ELECTRICAL CAPACITY (kW), FULL CONDENSING EQUIVALENT												
Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Partial Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Off Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Dispatch Hours	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
PARASITIC LOAD (kW)												
Peak	250	250	250	250	250	250	250	250	250	250	250	250
Partial Peak	250	250	250	250	250	250	250	250	250	250	250	250
Off Peak	250	250	250	250	250	250	250	250	250	250	250	250
Dispatch Hours	250	250	250	250	250	250	250	250	250	250	250	250
NET ELECTRICAL CAPACITY (kW)												
Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Partial Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Off Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Dispatch Hours	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
STEAM EXTRACTION RATE (lb/hr @ 1,276 Btu/lb, electric loss @ 10.00 lb/kWh)												
Peak	0	0	0	0	0	0	0	0	0	0	0	0
Partial Peak	0	0	0	0	0	0	0	0	0	0	0	0
Off Peak	0	0	0	0	0	0	0	0	0	0	0	0
Dispatch Hours	0	0	0	0	0	0	0	0	0	0	0	0
FUEL CONSUMPTION (green ton/hr @ 6622 Btu/green lb)												
Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Partial Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Off Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Dispatch Hours	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, SUBSIDIZED DIESEL, MAXIMUM FUEL COST.

PROJECT REVENUES

		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
NET ELECTRICAL ENERGY OUTPUT (MM kWh/YR)		17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
AVOIDED DIESEL FUEL COST ($/kWh)		0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
SHORT-RUN AVOIDED COST ESCALATION RATE		5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
SUMMER	Price Alloc.																				
On-Peak	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
Part-Pk.	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
Off-Peak	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
Dispatch	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
WINTER																					
On-Peak	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
Part-Pk.	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
Off-Peak	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
Dispatch	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069

FIRM CONTRACT CAPACITY (MW) 0.0
FIRM CAPACITY PRICE ($/kWy) 0
FIRM CAPACITY BONUS

Monthly Firm Capacity Payment = kW x $/kWy x Conversion Factor x Period Performance Factor, summed for each time period (on peak, part peak, off peak).
Monthly Firm Capacity Bonus = (kW x $/kWy x bonus(%)) / 12, for each month in which peak-period capacity factor > 85% (bonus depends on actual CF).

SUMMER	Conversion Factors	Period Performance Factors	WINTER	Conversion Factors	Period Performance Factors
On-Peak	0.1643	1.00	On-Peak	0.0245	1.00
Part-Pk.	0.0028	1.00	Part-Pk.	0.0123	1.00
Off-Peak	0.0025	0.74	Off-Peak	0.0036	0.74

			1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
AS AVAILABLE CAPACITY PRICE -FIXED ($/kWy)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	As-Available	Alloc.																				
SUMMER	Capacity (MW)	Factors	Time-Differentiated As-Available Capacity Price (c/kWh)---------->																			
On-Peak	2.50	0.12444	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Part-Pk.	2.50	0.00136	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Peak	2.50	0.00062	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dispatch	2.50	0.00000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WINTER																						
On-Peak	2.50	0.02975	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Part-Pk.	2.50	0.00667	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Peak	2.50	0.00074	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dispatch	2.50	0.00000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STEAM EXTRACTION (MM LBS/YR)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STEAM SALES (MM LBS/YR)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STEAM PRICE ($/1000 LBS)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STEAM PRICE ESCALATION RATE			5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
FERC OPERATING STANDARD			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
FERC EFFICIENCY STANDARD			17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, SUBSIDIZED DIESEL, MAXIMUM FUEL COST.

PROJECT OPERATIONS AND MAINTENANCE COSTS

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
TAX CREDITS (INVESTMENT, ENERGY)	0.0%																			
FEDERAL DEPRECIATION	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
STATE DEPRECIATION	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PROPERTY TAXES ------ % OF CAPITAL COST: 1.00%	$31	$32	$32	$33	$33	$34	$35	$35	$36	$37	$38	$38	$39	$40	$41	$42	$42	$43	$44	$45
PROPERTY TAX ESCALATION RATE	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	
FUEL CONSUMPTION (TONS/YR)	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032
FUEL COST ($/TON @ 6,622 Btu/lb)	$5.43	$5.70	$5.99	$6.29	$6.60	$6.93	$7.28	$7.64	$8.02	$8.42	$8.84	$9.29	$9.75	$10.24	$10.75	$11.29	$11.85	$12.45	$13.07	$13.72
FUEL COST ESCALATION RATE	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
GENERAL INFLATION RATE	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	
INTEREST RATE ON DEBT SERVICE RESERVE FUND	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
PROJECT MANAGEMENT FEE	$40	$42	$43	$45	$47	$49	$51	$53	$55	$57	$59	$62	$64	$67	$69	$72	$75	$78	$81	$84
LAND LEASE COST	$10	$10	$11	$11	$12	$12	$13	$13	$14	$14	$15	$15	$16	$17	$17	$18	$19	$19	$20	$21
INSURANCE ---------- % OF CAPITAL COST: 1.00%	$31	$32	$33	$35	$36	$38	$39	$41	$42	$44	$46	$48	$49	$51	$54	$56	$58	$60	$63	$65
TRANSMISSION LINE MAINTENANCE	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
COGENERATION PLANT OPERATIONS																				
==========	(Enter all first-year costs as the full-year equivalent)																			
REIMBURSABLE CONTRACT O&M	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
CONTRACT O&M FEE AND OVERHEAD @ 20.0%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
OPERATING LABOR	$10	$10	$11	$11	$12	$12	$13	$13	$14	$14	$15	$15	$16	$17	$17	$18	$19	$19	$20	$21
OPERATING SUPPLIES	$50	$52	$54	$56	$59	$61	$63	$66	$68	$71	$74	$77	$80	$82	$87	$90	$94	$97	$101	$105
ROUTINE AND CONTRACT MAINTENANCE	$40	$42	$43	$45	$47	$49	$51	$53	$55	$57	$59	$62	$64	$67	$69	$72	$75	$78	$81	$84
WATER	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
LETTER OF CREDIT	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
ASH DISPOSAL	$5	$5	$5	$6	$6	$6	$6	$7	$7	$7	$7	$8	$8	$8	$9	$9	$9	$10	$10	$11
ADMINISTRATIVE AND OFFICE EXPENSES	$5	$5	$5	$6	$6	$6	$6	$7	$7	$7	$7	$8	$8	$8	$9	$9	$9	$10	$10	$11
PURCHASED POWER (kW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PURCHASED POWER COST ($/kWh)	$0.0730	$0.0767	$0.0805	$0.0845	$0.0887	$0.0932	$0.0978	$0.1027	$0.1079	$0.1132	$0.1189	$0.1249	$0.1311	$0.1377	$0.1445	$0.1518	$0.1593	$0.1673	$0.1757	$0.1845
PURCHASED POWER ANNUAL COST	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
PURCHASED POWER ESCALATION RATE	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
STAND BY CHARGE RATE ($/kW Mo) 0.2 MW @	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANNUAL STAND BY CHARGES	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, SUBSIDIZED DIESEL, MAXIMUM FUEL COST.

PROJECT CAPITAL COSTS AND FINANCING

CAPITAL COST ($000):

Construction Draws (Detailed Below)	3,090
Start-Up Costs, Fees (Detailed Below)	375
Commissioning Fees (Detailed Below)	321
Commitment Fees	69
Interest During Construction	208
TOTAL CAPITAL COST	4,064

CONSTRUCTION FINANCING PARAMETERS:

CONSTRUCTION INTEREST RATE	10.00%
FUNDS COMMITMENT FEE	2.0%
CONSTRUCTION/STARTUP (QUARTERS)	5
PROJECT FUNDING DATE	Oct-87

PROJECT FINANCING PARAMETERS:

INTEREST RATE	11.00%
TERM (YEARS)	12
PERCENT OF CAPITAL COST FINANCED	85%
AMOUNT FINANCED ($000)	3,454
ANNUAL PAYMENT ($000)	520
PROJECT STARTUP DATE	Jan-89

OWNERSHIP FINANCING PARAMETERS

TOTAL PARTNERSHIP EQUITY ($000) 610

	EQUITY SHARE	CF SHARE	FED TAX	STATE TAX
PARTNER 1	100.0%	66.7%	25.0%	10.0%
PARTNER 2	0.0%	33.3%	25.0%	10.0%
PARTNER 3	0.0%	0.0%	0.0%	0.0%

CONSTRUCTION DRAWDOWN SCHEDULE

	TOTAL	1Q	2Q	3Q	4Q	5Q	6Q	7Q	8Q
PERCENTAGE OF TOTAL SPENT	100.0%	10.0%	20.0%	20.0%	25.0%	25.0%	0.0%	0.0%	0.0%
Turnkey Construction, Cogen	2,400	240	480	480	600	600	0	0	0
Miscellaneous, Construction	200	20	40	40	50	50	0	0	0
Contingency	240	24	48	48	60	60	0	0	0
Start-Up Costs	150	0	0	0	0	150	0	0	0
Closing Costs	100	100	0	0	0	0	0	0	0
Development Fee	125	125	0	0	0	0	0	0	0
Owner's Costs	250	50	50	50	50	50	0	0	0
Working Capital	61	0	0	0	0	61	0	0	0
Debt Service Reserve	260	0	0	0	0	260	0	0	0
TOTAL FUNDS REQUIRED	3,786	559	618	618	760	1,231	0	0	0

CASE 2

(Subsidized Diesel Fuel, Free Wood Waste)

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, SUBSIDIZED DIESEL, NO FUEL COST.

PROFORMA STATEMENT OF INCOME AND EXPENSES

(first operating year begins on January 1)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
REVENUE ($000)																				
ELECTRICAL ENERGY SALES	741	778	817	858	901	946	993	1,043	1,095	1,150	1,207	1,268	1,331	1,397	1,467	1,541	1,618	1,699	1,784	1,873
CAPACITY SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STEAM SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMMODITY SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST FROM DEBT SERVICE RESERVE FUND	18	18	18	18	18	18	18	18	18	18	18	0	0	0	0	0	0	0	0	0
***** TOTAL REVENUE	759	796	835	876	919	964	1,011	1,061	1,113	1,168	1,225	1,268	1,331	1,397	1,467	1,541	1,618	1,699	1,784	1,873
EXPENSES ($000)																				
PURCHASED FUEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CONTRACT OPERATION & MAINTENANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OPERATION & MAINTENANCE--COMMODITY PLANT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OPERATIONS--DIRECT POWER PLANT EXPENSES	110	114	119	124	129	134	139	145	151	157	163	169	176	183	190	198	206	214	223	232
TRANSMISSION LINE MAINTENANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PROJECT MANAGEMENT FEE	40	42	43	45	47	49	51	53	55	57	59	62	64	67	69	72	75	78	81	84
PROPERTY TAXES & INSURANCE	62	64	66	68	70	72	74	76	78	81	83	86	89	91	94	97	100	103	107	110
LAND LEASE	10	10	11	11	12	12	13	13	14	14	15	15	16	17	17	18	19	19	20	21
***** TOTAL EXPENSES BEFORE DEBT PAYMENT	222	230	239	248	257	266	276	287	297	309	320	332	345	358	371	385	400	415	431	447
***** NET OPERATING INCOME ($000)	537	566	596	628	662	698	735	774	816	859	905	935	986	1,040	1,096	1,155	1,218	1,283	1,353	1,425
PROJECT DEBT PAYMENT	516	516	516	516	516	516	516	516	516	516	516	516	0	0	0	0	0	0	0	0
RECOVERY OF DEBT SERVICE RESERVE	0	0	0	0	0	0	0	0	0	0	0	258	0	0	0	0	0	0	0	0
RECOVERY OF WORKING CAPITAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
***** PROJECT CASH FLOW BEFORE TAXES ($000)	21	50	80	112	146	181	219	258	299	343	389	677	986	1,040	1,096	1,155	1,218	1,283	1,353	1,462
***** DEBT COVERAGE RATIO	1.04	1.10	1.16	1.22	1.28	1.35	1.42	1.50	1.58	1.66	1.75	1.81	NA	NA	NA	NA	NA	NA	NA	NA
PARTNER 1 CASHFLOW BEFORE TAXES ($000)	(591)	33	54	75	97	121	146	172	200	229	259	452	657	693	731	770	812	856	902	975
CASHFLOW AFTER TAXES ($000)	(589)	26	35	45	55	66	76	87	97	108	119	238	482	506	532	559	587	616	647	697
PARTNER 2 CASHFLOW BEFORE TAXES ($000)	7	17	27	37	49	60	73	86	100	114	130	226	329	347	365	385	406	428	451	487
CASHFLOW AFTER TAXES ($000)	(11)	(6)	(2)	3	8	14	19	24	29	35	40	100	222	234	247	260	274	289	304	329
PARTNER 3 CASHFLOW BEFORE TAXES ($000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CASHFLOW AFTER TAXES ($000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, SUBSIDIZED DIESEL, NO FUEL COST.

OVERALL PROJECT SUMMARY

SYSTEM COSTS AND VALUE

Installed Facilities Cost	2,840 000$s
Total Loaded Capital Cost	4,036 000$s
Initial Fuel Cost	0.00 mills/kWh
Initial O&M Cost	0.00 mills/kWh
Project NPV (pre-debt, 12% DR)	1,641 000$s

PROJECT DEBT FINANCING

Amount of Debt	3,431 000$s
Debt Rate	11.0%
Debt Term	12 Years
Minimum Coverage Ratio	1.04
Average Coverage Ratio	1.26

INVESTMENT PERFORMANCE

	Ptn 1	Ptn 2	Ptn 3
Initial Investment (000$s)	605	0	0
Pre-Tax IRR (%)	25.2%	NA	NA
After-Tax IRR (%)	19.3%	50.9%	NA
Pre-Tax NPV (12% DR)	1,160	850	0

COGENERATION SYSTEM OPERATING PARAMETERS

Fuel Use	4.00 ton/hr
Ave. Capacity, Gross	2.75 MW
Average Parasitic Load	0.25 MW
Average Capacity, Net	2.50 MW
Firm Capacity	0.00 MW
Heat Rate, gross	19,264 Btu/kWh
Heat Rate, net	21,190 Btu/kWh
Operating Standard	0.0%
Efficiency Standard	17.9%
Average Steam Output	0.00 mlb/hr
Operating Hours-yr 1	7,008
Operating Hours-yr 2	7,008

DEGRADATION FACTORS

	Yr 2	Yr 3	Yr 4
Capacity	0.00%	0.00%	0.00%
Fuel Use	0.00%	0.00%	0.00%
Cap. Bonus	0.00%	0.00%	0.00%

DATA BY TIME-OF-USE PERIOD

	Ann. Hours	Avail	Hrs Yr 1	Hrs Yr 2-	Net kW	Steam lb/hr	Fuel ton/hr	Capacity($/kWh) Firm	Capacity($/kWh) Avail	Energy($/kWh) Fixed	Energy($/kWh) Short
SUMMER											
On Peak	504	94.1%	474	474	2,500	0	4.00	0.000	0.000	0.042	0.000
Partial Peak	756	94.1%	712	712	2,500	0	4.00	0.000	0.000	0.042	0.000
Off Peak	926	59.5%	551	551	2,500	0	4.00	0.000	0.000	0.042	0.000
Dispatch Hours	670	79.9%	535	535	2,500	0	4.00	NA	0.000	NA	0.000
WINTER											
On Peak	680	94.3%	641	641	2,500	0	4.00	0.000	0.000	0.042	0.000
Partial Peak	1,530	94.3%	1,443	1,443	2,500	0	4.00	0.000	0.000	0.042	0.000
Off Peak	2,364	67.2%	1,588	1,588	2,500	0	4.00	0.000	0.000	0.042	0.000
Dispatch Hours	1,330	80.0%	1,064	1,064	2,500	0	4.00	NA	0.000	NA	0.000

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, SUBSIDIZED DIESEL, NO FUEL COST.

ANNUAL (FIRST YEAR) SYSTEM PERFORMANCE SUMMARY

MONTHLY HOURS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Scheduled Outage	104	104	104	104	104	104	104	104	104	104	104	104
Forced Outage	42	42	42	42	42	42	42	42	42	42	42	42
Operating Total	598	526	598	574	598	574	598	598	574	598	574	598
GROSS ELECTRICAL CAPACITY (kW), FULL CONDENSING EQUIVALENT												
Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Partial Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Off Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Dispatch Hours	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
PARASITIC LOAD (kW)												
Peak	250	250	250	250	250	250	250	250	250	250	250	250
Partial Peak	250	250	250	250	250	250	250	250	250	250	250	250
Off Peak	250	250	250	250	250	250	250	250	250	250	250	250
Dispatch Hours	250	250	250	250	250	250	250	250	250	250	250	250
NET ELECTRICAL CAPACITY (kW)												
Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Partial Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Off Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Dispatch Hours	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
STEAM EXTRACTION RATE (lb/hr @ 1,276 Btu/lb, electric loss @ 10.00 lb/kWh)												
Peak	0	0	0	0	0	0	0	0	0	0	0	0
Partial Peak	0	0	0	0	0	0	0	0	0	0	0	0
Off Peak	0	0	0	0	0	0	0	0	0	0	0	0
Dispatch Hours	0	0	0	0	0	0	0	0	0	0	0	0
FUEL CONSUMPTION (green ton/hr @ 6622 Btu/green lb)												
Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Partial Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Off Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Dispatch Hours	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, SUBSIDIZED DIESEL, NO FUEL COST.

PROJECT REVENUES

		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
NET ELECTRICAL ENERGY OUTPUT (MM kWh/YR)		17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
AVOIDED DIESEL FUEL COST ($/kWh)		0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
SHORT-RUN AVOIDED COST ESCALATION RATE		5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
SUMMER	Price Alloc.																				
On-Peak	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
Part-Pk	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
Off-Peak	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
Dispatch	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
WINTER																					
On-Peak	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
Part-Pk.	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
Off-Peak	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069
Dispatch	1.000	0.0423	0.0444	0.0466	0.0490	0.0514	0.0540	0.0567	0.0595	0.0625	0.0656	0.0689	0.0723	0.0760	0.0798	0.0838	0.0879	0.0923	0.0970	0.1018	0.1069

FIRM CONTRACT CAPACITY (MW) 0.0
FIRM CAPACITY PRICE ($/kWy) 0
FIRM CAPACITY BONUS

Monthly Firm Capacity Payment = kW x $/kWy x Conversion Factor x Period Performance Factor, summed for each time period (on peak, part peak, off peak).
Monthly Firm Capacity Bonus = (kW x $/kWy x bonus(%)) / 12, for each month in which peak-period capacity factor > 85% (bonus depends on actual CF).

SUMMER	Conversion Factors	Period Performance Factors	WINTER	Conversion Factors	Period Performance Factors
On-Peak	0.1643	1.00	On-Peak	0.0245	1.00
Part-Pk.	0.0028	1.00	Part-Pk.	0.0123	1.00
Off-Peak	0.0025	0.74	Off-Peak	0.0036	0.74

			1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
AS-AVAILABLE CAPACITY PRICE--FIXED ($/kWy)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	As-Available Capacity (MW)	Alloc. Factors	Time-Differentiated As-Available Capacity Price (¢/kWh)---------->																			
SUMMER																						
On-Peak	2.50	0.12444	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Part-Pk.	2.50	0.00136	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Peak	2.50	0.00062	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dispatch	2.50	0.00000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WINTER																						
On-Peak	2.50	0.02975	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Part-Pk.	2.50	0.00667	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Peak	2.50	0.00074	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dispatch	2.50	0.00000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STEAM EXTRACTION (MM LBS/YR)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STEAM SALES (MM LBS/YR)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STEAM PRICE ($/1000 LBS)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STEAM PRICE ESCALATION RATE			5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
FERC OPERATING STANDARD			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
FERC EFFICIENCY STANDARD			17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, SUBSIDIZED DIESEL, NO FUEL COST.

PROJECT OPERATIONS AND MAINTENANCE COSTS

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
TAX CREDITS (INVESTMENT, ENERGY)	0.0%																			
FEDERAL DEPRECIATION	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
STATE DEPRECIATION	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PROPERTY TAXES ------ % OF CAPITAL COST: 1.00%	$31	$32	$32	$33	$33	$34	$35	$35	$36	$37	$38	$38	$39	$40	$41	$42	$42	$43	$44	$45
PROPERTY TAX ESCALATION RATE	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	
FUEL CONSUMPTION (TONS/YR)	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032
FUEL COST ($/TON @ 6,622 Btu/lb)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
FUEL COST ESCALATION RATE	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
GENERAL INFLATION RATE	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	
INTEREST RATE ON DEBT SERVICE RESERVE FUND	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
PROJECT MANAGEMENT FEE	$40	$42	$43	$45	$47	$49	$51	$53	$55	$57	$59	$62	$64	$67	$69	$72	$75	$78	$81	$84
LAND LEASE COST	$10	$10	$11	$11	$12	$12	$13	$13	$14	$14	$15	$15	$16	$17	$17	$18	$19	$19	$20	$21
INSURANCE ---------- % OF CAPITAL COST: 1.00%	$31	$32	$33	$35	$36	$38	$39	$41	$42	$44	$46	$48	$49	$51	$54	$56	$58	$60	$63	$65
TRANSMISSION LINE MAINTENANCE	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
COGENERATION PLANT OPERATIONS																				
==========	(Enter all first-year costs as the full-year equivalent)																			
REIMBURSABLE CONTRACT O&M	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
CONTRACT O&M FEE AND OVERHEAD @ 20.0%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
OPERATING LABOR	$10	$10	$11	$11	$12	$12	$13	$13	$14	$14	$15	$15	$16	$17	$17	$18	$19	$19	$20	$21
OPERATING SUPPLIES	$50	$52	$54	$56	$58	$61	$63	$66	$68	$71	$74	$77	$80	$83	$87	$90	$94	$97	$101	$105
ROUTINE AND CONTRACT MAINTENANCE	$40	$42	$43	$45	$47	$49	$51	$53	$55	$57	$59	$62	$64	$67	$69	$72	$75	$78	$81	$84
WATER	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
LETTER OF CREDIT	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
ASH DISPOSAL	$5	$5	$5	$6	$6	$6	$6	$7	$7	$7	$7	$8	$8	$8	$9	$9	$9	$10	$10	$11
ADMINISTRATIVE AND OFFICE EXPENSES	$5	$5	$5	$6	$6	$6	$6	$7	$7	$7	$7	$8	$8	$8	$9	$9	$9	$10	$10	$11
PURCHASED POWER (kW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PURCHASED POWER COST ($/kWh)	$0.0730	$0.0767	$0.0805	$0.0845	$0.0887	$0.0932	$0.0978	$0.1027	$0.1079	$0.1132	$0.1189	$0.1249	$0.1311	$0.1377	$0.1445	$0.1518	$0.1593	$0.1673	$0.1757	$0.1845
PURCHASED POWER ANNUAL COST	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
PURCHASED POWER ESCALATION RATE	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
STAND-BY CHARGE RATE ($/kW-Mo) 0.2 MW @	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANNUAL STAND-BY CHARGES	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, SUBSIDIZED DIESEL, NO FUEL COST.

PROJECT CAPITAL COSTS AND FINANCING

CAPITAL COST ($000):

Construction Draws (Detailed Below)	3,090
Start-Up Costs, Fees (Detailed Below)	375
Commissioning Fees (Detailed Below)	295
Commitment Fees	69
Interest During Construction	208
TOTAL CAPITAL COST	4,036

CONSTRUCTION FINANCING PARAMETERS:

CONSTRUCTION INTEREST RATE	10.00%
FUNDS COMMITMENT FEE	2.0%
CONSTRUCTION/STARTUP (QUARTERS)	5
PROJECT FUNDING DATE	Oct-87

PROJECT FINANCING PARAMETERS:

INTEREST RATE	11.00%
TERM (YEARS)	12
PERCENT OF CAPITAL COST FINANCED	85%
AMOUNT FINANCED ($000)	3,431
ANNUAL PAYMENT ($000)	516
PROJECT STARTUP DATE	Jan-89

OWNERSHIP FINANCING PARAMETERS

TOTAL PARTNERSHIP EQUITY ($000)	605

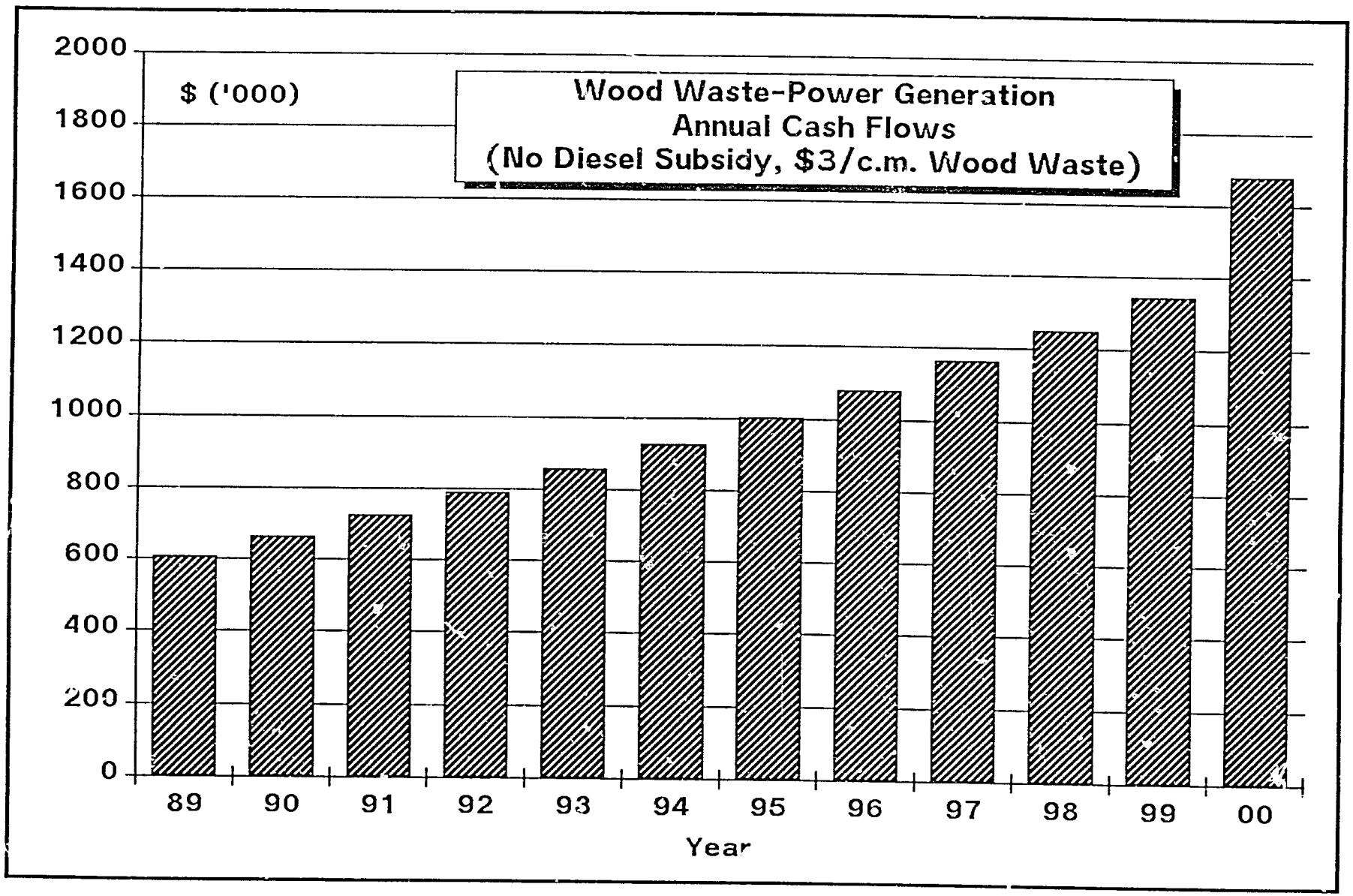
	EQUITY SHARE	CF SHARE	FED TAX	STATE TAX
PARTNER 1	100.0%	66.7%	25.0%	10.0%
PARTNER 2	0.0%	33.3%	25.0%	10.0%
PARTNER 3	0.0%	0.0%	0.0%	0.0%

CONSTRUCTION DRAWDOWN SCHEDULE

	TOTAL	1Q	2Q	3Q	4Q	5Q	6Q	7Q	8Q
PERCENTAGE OF TOTAL SPENT	100.0%	10.0%	20.0%	20.0%	25.0%	25.0%	0.0%	0.0%	0.0%
Turnkey Construction, Cogen	2,400	240	480	480	600	600	0	0	0
Miscellaneous, Construction	200	20	40	40	50	50	0	0	0
Contingency	240	24	48	48	60	60	0	0	0
Start-Up Costs	150	0	0	0	0	150	0	0	0
Closing Costs	100	100	0	0	0	0	0	0	0
Development Fee	125	125	0	0	0	0	0	0	0
Owner's Costs	250	50	50	50	50	50	0	0	0
Working Capital	36	0	0	0	0	36	0	0	0
Debt Service Reserve	258	0	0	0	0	258	0	0	0
TOTAL FUNDS REQUIRED	3,760	559	618	618	760	1,205	0	0	0

CASE 3

(World Market Diesel Price, High Wood Waste Price)


Wood Waste-Power Generation
Annual Cash Flows
(No Diesel Subsidy, $3/c.m. Wood Waste)
$ ('000)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
89
90
91
92
93
94
95
96
97
98
99
00
Year

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, WORLD MARKET DIESEL, MAXIMUM FUEL COST.

PROFORMA STATEMENT OF INCOME AND EXPENSES

(first operating year begins on January 1)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
REVENUE ($000)																				
ELECTRICAL ENERGY SALES	1,482	1,556	1,634	1,716	1,802	1,892	1,986	2,086	2,190	2,299	2,414	2,535	2,662	2,795	2,935	3,081	3,235	3,397	3,567	3,745
CAPACITY SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STEAM SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMMODITY SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST FROM DEBT SERVICE RESERVE FUND	18	18	18	18	18	18	18	18	18	18	18	0	0	0	0	0	0	0	0	0
***** TOTAL REVENUE	1,500	1,574	1,652	1,734	1,820	1,910	2,004	2,104	2,208	2,318	[illegible]	2,535	2,662	2,795	2,935	3,081	3,235	3,397	3,567	3,745
EXPENSES ($000)																				
PURCHASED FUEL	152	160	168	176	185	194	204	214	225	236	248	260	273	287	301	316	332	349	366	385
CONTRACT OPERATION & MAINTENANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OPERATION & MAINTENANCE--COMMODITY PLANT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OPERATIONS--DIRECT POWER PLANT EXPENSES	110	114	119	124	129	134	139	145	151	157	163	169	176	183	190	198	206	214	223	232
TRANSMISSION LINE MAINTENANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PROJECT MANAGEMENT FEE	40	42	43	45	47	49	51	53	55	57	59	62	64	67	69	72	75	78	81	84
PROPERTY TAXES & INSURANCE	62	64	66	68	70	72	74	76	78	81	83	86	89	91	94	97	100	103	107	110
LAND LEASE	10	10	11	11	12	12	13	13	14	14	15	15	16	17	17	18	19	19	20	21
***** TOTAL EXPENSES BEFORE DEBT PAYMENT	374	390	406	424	442	461	480	501	522	545	568	593	618	645	673	702	732	764	797	832
***** NET OPERATING INCOME ($000)	1,126	1,185	1,246	1,310	1,378	1,449	1,524	1,603	1,686	1,773	1,864	1,942	2,044	2,150	2,262	2,380	2,503	2,633	2,770	2,914
PROJECT DEBT PAYMENT	520	520	520	520	520	520	520	520	520	520	520	520	0	0	0	0	0	0	0	0
RECOVERY OF DEBT SERVICE RESERVE	0	0	0	0	0	0	0	0	0	0	0	260	0	0	0	0	0	0	0	0
RECOVERY OF WORKING CAPITAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61
***** PROJECT CASH FLOW BEFORE TAXES ($000)	607	665	726	[illegible]	858	930	1,005	1,083	1,166	1,253	1,345	1,683	2,044	2,150	2,262	2,380	2,503	2,633	2,770	2,975
***** DEBT COVERAGE RATIO	2.17	2.28	2.40	2.52	2.65	2.79	2.93	3.08	3.24	3.41	3.59	3.74	NA	NA	NA	NA	NA	NA	NA	NA
PARTNER 1 CASHFLOW BEFORE TAXES ($000)	(205)	443	484	527	572	620	670	722	777	835	896	1,122	1,362	1,433	1,508	1,586	1,669	1,755	1,847	1,983
CASHFLOW AFTER TAXES ($000)	(330)	302	326	350	376	402	429	458	487	517	549	690	958	1,006	1,056	1,109	1,165	1,224	1,285	1,377
PARTNER 2 CASHFLOW BEFORE TAXES ($000)	202	222	242	264	286	310	335	361	389	418	448	561	681	717	754	793	834	878	923	992
CASHFLOW AFTER TAXES ($000)	121	132	144	156	168	182	195	209	224	239	255	326	460	484	509	535	563	592	623	669
PARTNER 3 CASHFLOW BEFORE TAXES ($000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CASHFLOW AFTER TAXES ($000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, WORLD MARKET DIESEL, MAXIMUM FUEL COST.

OVERALL PROJECT SUMMARY

SYSTEM COSTS AND VALUE

Installed Facilities Cost	2,840 000$s
Total Loaded Capital Cost	4,064 000$s
Initial Fuel Cost	8.69 mills/kWh
Initial O&M Cost	0.00 mills/kWh
Project NPV (pre-debt, 12% DR)	7,712 000$s

PROJECT DEBT FINANCING

Amount of Debt	3,454 000$s
Debt Rate	11.0%
Debt Term	12 Years
Minimum Coverage Ratio	2.17
Average Coverage Ratio	2.59

INVESTMENT PERFORMANCE

	Ptn 1	Ptn 2	Ptn 3
Initial Investment (000$s)	610	0	0
Pre-Tax IRR (%)	ERR	NA	NA
After-Tax IRR (%)	ERR	NA	NA
Pre-Tax NPV (12% DR)	5,209	2,877	0

COGENERATION SYSTEM OPERATING PARAMETERS

Fuel Use	4.00 ton/hr
Ave. Capacity, Gross	2.75 MW
Average Parasitic Load	0.25 MW
Average Capacity, Net	2.50 MW
Firm Capacity	0.00 MW
Heat Rate, gross	19,264 Btu/kWh
Heat Rate, net	21,190 Btu/kWh
Operating Standard	0.0%
Efficiency Standard	17.9%
Average Steam Output	0.00 mlb/hr
Operating Hours-yr 1	7,008
Operating Hours-yr 2	7,008

DEGRADATION FACTORS

	Yr 2	Yr 3	Yr 4
Capacity	0.00%	0.00%	0.00%
Fuel Use	0.00%	0.00%	0.00%
Cap. Bonus	0.00%	0.00%	0.00%

DATA BY TIME-OF-USE PERIOD

	Ann. Hours	Avail	Hrs Yr 1	Hrs Yr 2-	Net kW	Steam lb/hr	Fuel ton/hr	Capacity($/kWh) Firm	Capacity($/kWh) Avail	Energy($/kWh) Fixed	Energy($/kWh) Short
SUMMER											
On Peak	504	94.1%	474	474	2,500	0	4.00	0.000	0.000	0.085	0.000
Partial Peak	756	94.1%	712	712	2,500	0	4.00	0.000	0.000	0.085	0.000
Off Peak	926	59.5%	551	551	2,500	0	4.00	0.000	0.000	0.085	0.000
Dispatch Hours	670	79.9%	535	535	2,500	0	4.00	NA	0.000	NA	0.000
WINTER											
On Peak	680	94.3%	641	641	2,500	0	4.00	0.000	0.000	0.085	0.000
Partial Peak	1,530	94.3%	1,443	1,443	2,500	0	4.00	0.000	0.000	0.085	0.000
Off Peak	2,364	67.2%	1,588	1,588	2,500	0	4.00	0.000	0.000	0.085	0.000
Dispatch Hours	1,330	80.0%	1,064	1,064	2,500	0	4.00	NA	0.000	NA	0.000

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, WORLD MARKET DIESEL, MAXIMUM FUEL COST.

ANNUAL (FIRST YEAR) SYSTEM PERFORMANCE SUMMARY

MONTHLY HOURS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Scheduled Outage	104	104	104	104	104	104	104	104	104	104	104	104
Forced Outage	42	42	42	42	42	42	42	42	42	42	42	42
Operating Total	598	526	598	574	598	574	598	598	574	598	574	598
GROSS ELECTRICAL CAPACITY (kW), FULL CONDENSING EQUIVALENT												
Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Partial Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Off Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Dispatch Hours	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
PARASITIC LOAD (kW)												
Peak	250	250	250	250	250	250	250	250	250	250	250	250
Partial Peak	250	250	250	250	250	250	250	250	250	250	250	250
Off Peak	250	250	250	250	250	250	250	250	250	250	250	250
Dispatch Hours	250	250	250	250	250	250	250	250	250	250	250	250
NET ELECTRICAL CAPACITY (kW)												
Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Partial Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Off Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Dispatch Hours	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
STEAM EXTRACTION RATE (lb/hr @ 1,276 Btu/lb, electric loss @ 10.00 lb/kWh)												
Peak	0	0	0	0	0	0	0	0	0	0	0	0
Partial Peak	0	0	0	0	0	0	0	0	0	0	0	0
Off Peak	0	0	0	0	0	0	0	0	0	0	0	0
Dispatch Hours	0	0	0	0	0	0	0	0	0	0	0	0
FUEL CONSUMPTION (green ton/hr @ 6622 Btu/green lb)												
Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Partial Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Off Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Dispatch Hours	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, WORLD MARKET DIESEL, NO FUEL COST.

PROJECT REVENUES

		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
NET ELECTRICAL ENERGY OUTPUT (MM kWh/YR)		17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
AVOIDED DIESEL FUEL COST ($/kWh)		0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
SHORT-RUN AVOIDED COST ESCALATION RATE		5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
SUMMER	Price Alloc.																				
On-Peak	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
Part-Pk.	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
Off-Peak	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
Dispatch	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
WINTER																					
On-Peak	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
Part-Pk.	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
Off-Peak	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
Dispatch	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138

FIRM CONTRACT CAPACITY (MW) 0.0
FIRM CAPACITY PRICE ($/kWy) 0

Monthly Firm Capacity Payment = kW x $/kWy x Conversion Factor x Period Performance Factor, summed for each time period (on peak, part peak, off peak).
Monthly Firm Capacity Bonus = (kW x $/kWy x bonus(%)) / 12, for each month in which peak-period capacity factor > 85% (bonus depends on actual CF).

FIRM CAPACITY BONUS

SUMMER	Conversion Factors	Period Performance Factors	WINTER	Conversion Factors	Period Performance Factors
On-Peak	0.1643	1.00	On-Peak	0.0245	1.00
Part-Pk.	0.0028	1.00	Part-Pk.	0.0123	1.00
Off-Peak	0.0025	0.74	Off-Peak	0.0036	0.74

			1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
AS-AVAILABLE CAPACITY PRICE--FIXED ($/kWy)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	As-Available Capacity (MW)	Alloc. Factors	Time-Differentiated As-Available Capacity Price (c/kWh)---------->																			
SUMMER																						
On-Peak	2.50	0.12444	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Part-Pk.	2.50	0.00136	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Peak	2.50	0.00067	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dispatch	2.50	0.00000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WINTER																						
On-Peak	2.50	0.02975	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Part-Pk.	2.50	0.00667	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Peak	2.50	0.00074	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dispatch	2.50	0.00000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STEAM EXTRACTION (MM LBS/YR)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STEAM SALES (MM LBS/YR)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STEAM PRICE ($/1000 LBS)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STEAM PRICE ESCALATION RATE			5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
FERC OPERATING STANDARD			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
FERC EFFICIENCY STANDARD			17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, WORLD MARKET DIESEL, MAXIMUM FUEL COST.

PROJECT OPERATIONS AND MAINTENANCE COSTS

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
TAX CREDITS (INVESTMENT, ENERGY)	0.0%																			
FEDERAL DEPRECIATION	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
STATE DEPRECIATION	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PROPERTY TAXES ------ % OF CAPITAL COST: 1.00%	$31	$32	$32	$33	$33	$34	$35	$35	$36	$37	$38	$38	$39	$40	$41	$42	$42	$43	$44	$45
PROPERTY TAX ESCALATION RATE	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	
FUEL CONSUMPTION (TONS/YR)	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032
FUEL COST ($/TON @ 6,622 Btu/lb)	$5.43	$5.70	$5.99	$6.29	$6.60	$6.93	$7.28	$7.64	$8.02	$8.42	$8.84	$9.29	$9.75	$10.24	$10.75	$11.29	$11.85	$12.45	$13.07	$13.72
FUEL COST ESCALATION RATE	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
GENERAL INFLATION RATE	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	
INTEREST RATE ON DEBT SERVICE RESERVE FUND	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
PROJECT MANAGEMENT FEE	$40	$42	$43	$45	$47	$49	$51	$53	$55	$57	$59	$62	$64	$67	$69	$72	$75	$78	$81	$84
LAND LEASE COST	$10	$10	$11	$11	$12	$12	$13	$13	$14	$14	$15	$15	$16	$17	$17	$18	$19	$19	$20	$21
INSURANCE ---------- % OF CAPITAL COST: 1.00%	$31	$32	$33	$35	$36	$38	$39	$41	$42	$44	$46	$48	$49	$51	$54	$56	$58	$60	$63	$65
TRANSMISSION LINE MAINTENANCE	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
COGENERATION PLANT OPERATIONS																				
==========	(Enter all first-year costs as the full-year equivalent)																			
REIMBURSABLE CONTRACT O&M	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
CONTRACT O&M FEE AND OVERHEAD @ 20.0%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
OPERATING LABOR	$10	$10	$11	$11	$12	$12	$13	$13	$14	$14	$15	$15	$16	$17	$17	$18	$19	$19	$20	$21
OPERATING SUPPLIES	$50	$52	$54	$56	$58	$61	$63	$66	$68	$71	$74	$77	$80	$83	$87	$90	$94	$97	$101	$105
ROUTINE AND CONTRACT MAINTENANCE	$40	$42	$43	$45	$47	$49	$51	$53	$55	$57	$59	$62	$64	$67	$69	$72	$75	$78	$81	$84
WATER	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
LETTER OF CREDIT	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
ASH DISPOSAL	$5	$5	$5	$6	$6	$6	$6	$7	$7	$7	$7	$8	$8	$8	$9	$9	$9	$10	$10	$11
ADMINISTRATIVE AND OFFICE EXPENSES	$5	$5	$5	$6	$6	$6	$6	$7	$7	$7	$7	$8	$8	$8	$9	$9	$9	$10	$10	$11
PURCHASED POWER (kW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PURCHASED POWER COST ($/kWh)	$0.0730	$0.0767	$0.0805	$0.0845	$0.0887	$0.0932	$0.0978	$0.1027	$0.1079	$0.1132	$0.1189	$0.1249	$0.1311	$0.1377	$0.1445	$0.1518	$0.1593	$0.1673	$0.1757	$0.1845
PURCHASED POWER ANNUAL COST	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
PURCHASED POWER ESCALATION RATE	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
STAND-BY CHARGE RATE ($/kW-Mo) 0.2 MW @	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANNUAL STAND-BY CHARGES	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, WORLD MARKET DIESEL, NO FUEL COST.

PROJECT CAPITAL COSTS AND FINANCING

CAPITAL COST ($000):

Construction Draws (Detailed Below)	3,090
Start-Up Costs, Fees (Detailed Below)	375
Commissioning Fees (Detailed Below)	295
Commitment Fees	69
Interest During Construction	208
TOTAL CAPITAL COST	4,036

CONSTRUCTION FINANCING PARAMETERS:

CONSTRUCTION INTEREST RATE	10.00%
FUNDS COMMITMENT FEE	2.0%
CONSTRUCTION/STARTUP (QUARTERS)	5
PROJECT FUNDING DATE	Oct-87

PROJECT FINANCING PARAMETERS:

INTEREST RATE	11.00%
TERM (YEARS)	12
PERCENT OF CAPITAL COST FINANCED	85%
AMOUNT FINANCED ($000)	3,431
ANNUAL PAYMENT ($000)	516
PROJECT STARTUP DATE	Jan-89

OWNERSHIP FINANCING PARAMETERS

TOTAL PARTNERSHIP EQUITY ($000) 605

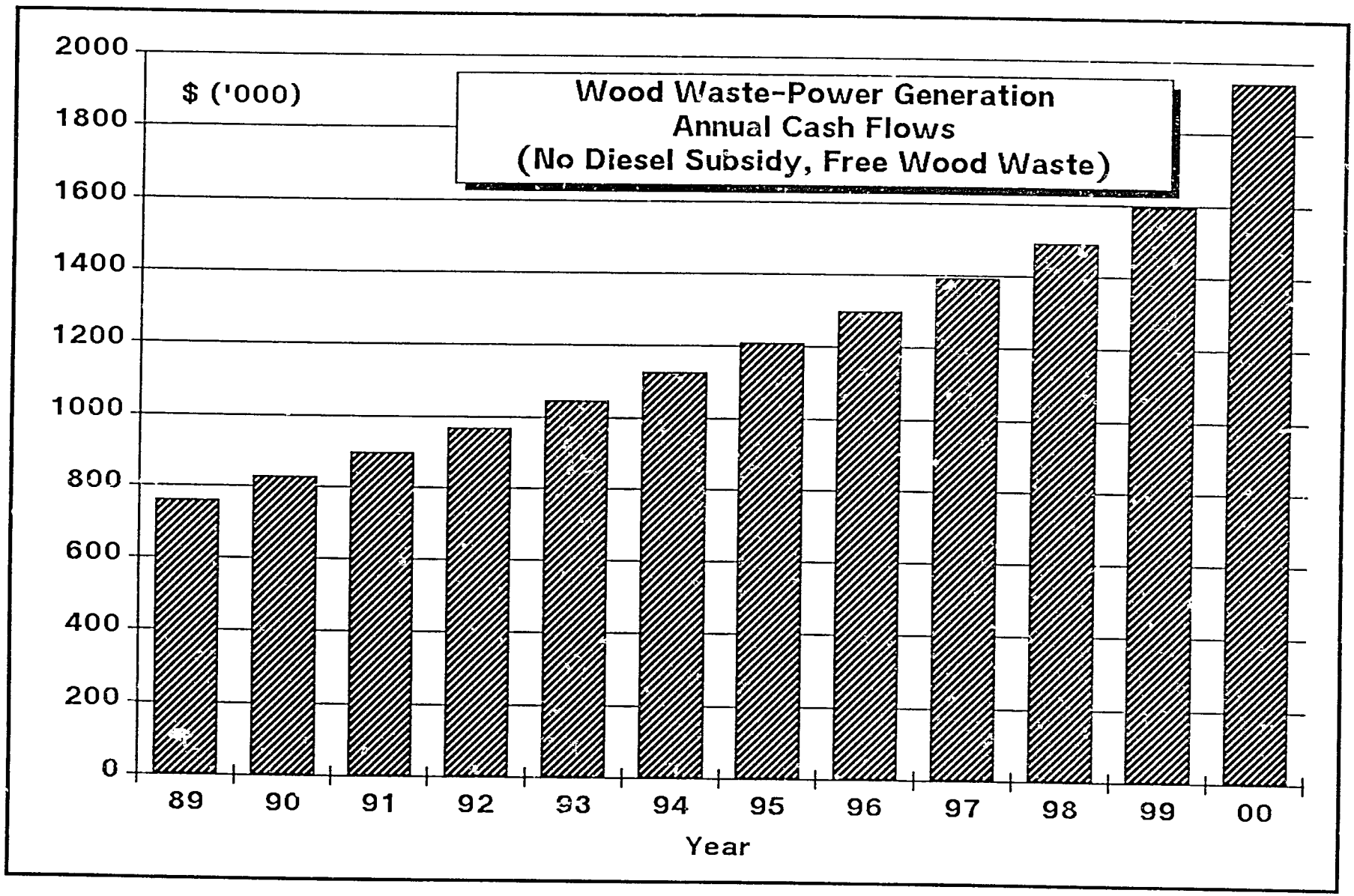
	EQUITY SHARE	CF SHARE	FED TAX	STATE TAX
PARTNER 1	100.0%	66.7%	25.0%	10.0%
PARTNER 2	0.0%	33.3%	25.0%	10.0%
PARTNER 3	0.0%	0.0%	0.0%	0.0%

CONSTRUCTION DRAWDOWN SCHEDULE

	TOTAL	1Q	2Q	3Q	4Q	5Q	6Q	7Q	8Q
PERCENTAGE OF TOTAL SPENT	100.0%	10.0%	20.0%	20.0%	25.0%	25.0%	0.0%	0.0%	0.0%
Turnkey Construction, Cogen	2,400	240	480	480	600	600	0	0	0
Miscellaneous, Construction	200	20	40	40	50	50	0	0	0
Contingency	240	24	48	48	60	60	0	0	0
Start-Up Costs	150	0	0	0	0	150	0	0	0
Closing Costs	100	100	0	0	0	0	0	0	0
Development Fee	125	125	0	0	0	0	0	0	0
Owner's Costs	250	50	50	50	50	50	0	0	0
Working Capital	36	0	0	0	0	36	0	0	0
Debt Service Reserve	258	0	0	0	0	258	0	0	0
TOTAL FUNDS REQUIRED	3,750	559	618	618	760	1,205	0	0	0

CASE 4

(World market Diesel Price, Free Wood Waste)


Wood Waste-Power Generation
Annual Cash Flows
(No Diesel Subsidy, Free Wood Waste)
$ ('000)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
89
90
91
92
93
94
95
96
97
98
99
00
Year

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, WORLD MARKET DIESEL, NO FUEL COST.

PROFORMA STATEMENT OF INCOME AND EXPENSES

(first operating year begins on January 1)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
REVENUE ($000)																				
ELECTRICAL ENERGY SALES	1,482	1,556	1,634	1,716	1,802	1,892	1,986	2,086	2,190	2,299	2,414	2,535	2,662	2,795	2,935	3,081	3,235	3,397	3,567	3,745
CAPACITY SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STEAM SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMMODITY SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST FROM DEBT SERVICE RESERVE FUND	18	18	18	18	18	18	18	18	18	18	18	0	0	0	0	0	0	0	0	0
***** TOTAL REVENUE	1,500	1,574	1,652	1,734	1,820	1,910	2,004	2,104	2,208	2,317	2,432	2,535	2,662	2,795	2,935	3,081	3,235	3,397	3,567	3,745
EXPENSES ($000)																				
PURCHASED FUEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CONTRACT OPERATION & MAINTENANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OPERATION & MAINTENANCE--COMMODITY PLANT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OPERATIONS--DIRECT POWER PLANT EXPENSES	110	114	119	124	129	134	139	145	151	157	163	169	176	183	190	198	206	214	223	232
TRANSMISSION LINE MAINTENANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PROJECT MANAGEMENT FEE	40	42	43	45	47	49	51	53	55	57	59	62	64	67	69	72	75	78	81	84
PROPERTY TAXES & INSURANCE	62	64	66	68	70	72	74	76	78	81	83	86	89	91	94	97	100	103	107	110
LAND LEASE	10	10	11	11	12	12	13	13	14	14	15	15	16	17	17	18	19	19	20	21
***** TOTAL EXPENSES BEFORE DEBT PAYMENT	222	230	239	248	257	266	276	287	297	309	320	332	345	358	371	385	400	415	431	447
***** NET OPERATING INCOME ($000)	1,278	1,344	1,414	1,486	1,563	1,643	1,728	1,817	1,910	2,009	2,112	2,203	2,317	2,437	2,563	2,696	2,835	2,982	3,136	3,298
PROJECT DEBT PAYMENT	516	516	516	516	516	516	516	516	516	516	516	516	0	0	0	0	0	0	0	0
RECOVERY OF DEBT SERVICE RESERVE	0	0	0	0	0	0	0	0	0	0	0	258	0	0	0	0	0	0	0	0
RECOVERY OF WORKING CAPITAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
***** PROJECT CASH FLOW BEFORE TAXES ($000)	762	828	898	970	1,047	1,127	1,212	1,301	1,394	1,493	1,596	1,945	2,317	2,437	2,563	2,696	2,835	2,982	3,136	3,335
***** DEBT COVERAGE RATIO	2.48	2.61	2.74	2.88	3.03	3.18	3.35	3.52	3.70	3.89	4.09	4.27	NA	NA	NA	NA	NA	NA	NA	NA
PARTNER 1 CASHFLOW BEFORE TAXES ($000)	(97)	552	598	647	698	752	808	867	930	995	1,064	1,297	1,545	1,625	1,709	1,797	1,890	1,988	2,091	2,223
CASHFLOW AFTER TAXES ($000)	(255)	376	403	431	461	491	523	556	590	626	662	808	1,081	1,135	1,192	1,252	1,315	1,381	1,450	1,539
PARTNER 2 CASHFLOW BEFORE TAXES ($000)	254	276	299	323	349	376	404	434	465	498	532	648	772	812	854	899	945	994	1,045	1,112
CASHFLOW AFTER TAXES ($000)	156	169	182	196	211	226	242	259	276	294	312	385	521	548	577	607	638	671	706	750
PARTNER 3 CASHFLOW BEFORE TAXES ($000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CASHFLOW AFTER TAXES ($000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, WORLD MARKET DIESEL, NO FUEL COST.

OVERALL PROJECT SUMMARY

SYSTEM COSTS AND VALUE

Installed Facilities Cost	2,840 000$s
Total Loaded Capital Cost	4,036 000$s
Initial Fuel Cost	0.00 mills/kWh
Initial O&M Cost	0.00 mills/kWh
Project NPV (pre-debt, 12% DR)	9,316 000$s

PROJECT DEBT FINANCING

Amount of Debt	3,431 000$s
Debt Rate	11.0%
Debt Term	12 Years
Minimum Coverage Ratio	2.48
Average Coverage Ratio	2.96

INVESTMENT PERFORMANCE

	Ptn 1	Ptn 2	Ptn 3
Initial Investment (000$s)	605	0	0
Pre-Tax IRR (%)	ERR	NA	NA
After Tax IRR (%)	ERR	NA	NA
Pre-Tax NPV (12% DR)	6,276	3,408	0

COGENERATION SYSTEM OPERATING PARAMETERS

Fuel Use	4.00 ton/hr
Ave. Capacity, Gross	2.75 MW
Average Parasitic Load	0.25 MW
Average Capacity, Net	2.50 MW
Firm Capacity	0.00 MW
Heat Rate, gross	19,264 Btu/kWh
Heat Rate, net	21,190 Btu/kWh
Operating Standard	0.0%
Efficiency Standard	17.9%
Average Steam Output	0.00 mlb/hr
Operating Hours-yr 1	7,008
Operating Hours-yr 2	7,008

DEGRADATION FACTORS

	Yr 2	Yr 3	Yr 4
Capacity	0.00%	0.00%	0.00%
Fuel Use	0.00%	0.00%	0.00%
Cap. Bonus	0.00%	0.00%	0.00%

DATA BY TIME-OF-USE PERIOD

	Ann. Hours	Avail	Hrs Yr 1	Hrs Yr 2-	Net kW	Steam lb/hr	Fuel ton/hr	Capacity($/kWh) Firm	Capacity($/kWh) Avail	Energy($/kWh) Fixed	Energy($/kWh) Short
SUMMER											
On Peak	504	94.1%	474	474	2,500	0	4.00	0.000	0.000	0.085	0.000
Partial Peak	756	94.1%	712	712	2,500	0	4.00	0.000	0.000	0.085	0.000
Off Peak	926	59.5%	551	551	2,500	0	4.00	0.000	0.000	0.085	0.000
Dispatch Hours	670	79.9%	535	535	2,500	0	4.00	NA	0.000	NA	0.000
WINTER											
On Peak	680	94.3%	641	641	2,500	0	4.00	0.000	0.000	0.085	0.000
Partial Peak	1,530	94.3%	1,443	1,443	2,500	0	4.00	0.000	0.000	0.085	0.000
Off Peak	2,364	67.2%	1,588	1,588	2,500	0	4.00	0.000	0.000	0.085	0.000
Dispatch Hours	1,330	80.0%	1,064	1,064	2,500	0	4.00	NA	0.000	NA	0.000

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, WORLD MARKET DIESEL, NO FUEL COST.

ANNUAL (FIRST YEAR) SYSTEM PERFORMANCE SUMMARY

MONTHLY HOURS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Scheduled Outage	104	104	104	104	104	104	104	104	104	104	104	104
Forced Outage	42	42	42	42	42	42	42	42	42	42	42	42
Operating Total	598	526	598	574	598	574	598	598	574	598	574	598
GROSS ELECTRICAL CAPACITY (kW), FULL CONDENSING EQUIVALENT												
Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Partial Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Off Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Dispatch Hours	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
PARASITIC LOAD (kW)												
Peak	250	250	250	250	250	250	250	250	250	250	250	250
Partial Peak	250	250	250	250	250	250	250	250	250	250	250	250
Off Peak	250	250	250	250	250	250	250	250	250	250	250	250
Dispatch Hours	250	250	250	250	250	250	250	250	250	250	250	250
NET ELECTRICAL CAPACITY (kW)												
Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Partial Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Off Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Dispatch Hours	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
STEAM EXTRACTION RATE (lb/hr @ 1,276 Btu/lb, electric loss @ 10.00 lb/kWh)												
Peak	0	0	0	0	0	0	0	0	0	0	0	0
Partial Peak	0	0	0	0	0	0	0	0	0	0	0	0
Off Peak	0	0	0	0	0	0	0	0	0	0	0	0
Dispatch Hours	0	0	0	0	0	0	0	0	0	0	0	0
FUEL CONSUMPTION (green ton/hr @ 6622 Btu/green lb)												
Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Partial Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Off Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Dispatch Hours	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, WORLD MARKET DIESEL, MAXIMUM FUEL COS..

PROJECT REVENUES

		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
NET ELECTRICAL ENERGY OUTPUT (MM kWh/YR)		17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
AVOIDED DIESEL FUEL COST ($/kWh)		0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
SHORT-RUN AVOIDED COST ESCALATION RATE		5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
SUMMER	Price Alloc																				
On-Peak	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
Part-Pk	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
Off-Peak	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
Dispatch	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
WINTER																					
On-Peak	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
Part-Pk	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
Off-Peak	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138
Dispatch	1.000	0.0846	0.0888	0.0933	0.0979	0.1028	0.1080	0.1134	0.1190	0.1250	0.1312	0.1378	0.1447	0.1519	0.1595	0.1675	0.1759	0.1847	0.1939	0.2036	0.2138

FIRM CONTRACT CAPACITY (MW) 0.0
FIRM CAPACITY PRICE ($/kWy) 0
FIRM CAPACITY BONUS

Monthly Firm Capacity Payment = kW x $/kWy x Conversion Factor x Period Performance Factor, summed for each time period (on peak, part peak, off peak)
Monthly Firm Capacity Bonus = (kW x $/kWy x bonus(%)) / 12, for each month in which peak-period capacity factor > 85% (bonus depends on actual CF).

SUMMER	Conversion Factors	Period Performance Factors	WINTER	Conversion Factors	Period Performance Factors
On-Peak	0.1643	1.00	On-Peak	0.0245	1.00
Part-Pk	0.0028	1.00	Part-Pk	0.0123	1.00
Off-Peak	0.0025	0.74	Off-Peak	0.0036	0.74

		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
AS-AVAILABLE CAPACITY PRICE--FIXED ($/kWy)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	As-Available Capacity (MW)	Alloc. Factors	Time-Differentiated As-Available Capacity Price (c/kWh)---------->																		
SUMMER																					
On-Peak	2.50	0.12444	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Part-Pk	2.50	0.00136	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Peak	2.50	0.00022	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dispatch	2.50	0.00000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WINTER																					
On-Peak	2.50	0.00375	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Part-Pk	2.50	0.00667	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Peak	2.50	0.00074	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dispatch	2.50	0.00000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STEAM EXTRACTION (MM LBS/YR)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STEAM SALES (MM LBS/YR)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STEAM PRICE ($/1000 LBS)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STEAM PRICE ESCALATION RATE			5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
FERC OPERATING STANDARD			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
FERC EFFICIENCY STANDARD			17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, WORLD MARKET DIESEL, NO FUEL COST.

PROJECT OPERATIONS AND MAINTENANCE COSTS

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
TAX CREDITS (INVESTMENT, ENERGY)	0.0%																			
FEDERAL DEPRECIATION	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
STATE DEPRECIATION	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PROPERTY TAXES ------ % OF CAPITAL COST: 1.00%	$31	$32	$32	$33	$33	$34	$35	$35	$36	$37	$38	$38	$39	$40	$41	$42	$42	$43	$44	$45
PROPERTY TAX ESCALATION RATE	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	
FUEL CONSUMPTION (TONS/YR)	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032
FUEL COST ($/TON @ 6,622 Btu/lb)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
FUEL COST ESCALATION RATE	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
GENERAL INFLATION RATE	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	
INTEREST RATE ON DEBT SERVICE RESERVE FUND	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
PROJECT MANAGEMENT FEE	$40	$42	$43	$45	$47	$49	$51	$53	$55	$57	$59	$62	$64	$67	$69	$72	$75	$78	$81	$84
LAND LEASE COST	$10	$10	$11	$11	$12	$12	$13	$13	$14	$14	$15	$15	$16	$17	$17	$18	$19	$19	$20	$21
INSURANCE ---------- % OF CAPITAL COST: 1.00%	$31	$32	$33	$35	$36	$38	$39	$41	$42	$44	$46	$48	$49	$51	$54	$56	$58	$60	$63	$65
TRANSMISSION LINE MAINTENANCE	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
COGENERATION PLANT OPERATIONS																				
==========	(Enter all first-year costs as the full-year equivalent)																			
REIMBURSABLE CONTRACT O&M	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
CONTRACT O&M FEE AND OVERHEAD @ 20.0%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
OPERATING LABOR	$10	$10	$11	$11	$12	$12	$13	$13	$14	$14	$15	$15	$16	$17	$17	$18	$19	$19	$20	$21
OPERATING SUPPLIES	$50	$52	$54	$56	$58	$61	$63	$66	$68	$71	$74	$77	$80	$83	$87	$90	$94	$97	$101	$105
ROUTINE AND CONTRACT MAINTENANCE	$40	$42	$43	$45	$47	$49	$51	$53	$55	$57	$59	$62	$64	$67	$69	$72	$75	$78	$81	$84
WATER	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
LETTER OF CREDIT	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
ASH DISPOSAL	$5	$5	$5	$6	$6	$6	$6	$7	$7	$7	$7	$8	$8	$8	$9	$9	$9	$10	$10	$11
ADMINISTRATIVE AND OFFICE EXPENSES	$5	$5	$5	$6	$6	$6	$6	$7	$7	$7	$7	$8	$8	$8	$9	$9	$9	$10	$10	$11
PURCHASED POWER (kW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PURCHASED POWER COST ($/kWh)	$0.0730	$0.0767	$0.0805	$0.0845	$0.0887	$0.0932	$0.0978	$0.1027	$0.1079	$0.1132	$0.1189	$0.1249	$0.1311	$0.1377	$0.1445	$0.1518	$0.1593	$0.1673	$0.1757	$0.1845
PURCHASED POWER ANNUAL COST	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
PURCHASED POWER ESCALATION RATE	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
STAND-BY CHARGE RATE ($/kW-Mo) 0.2 MW @	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANNUAL STAND-BY CHARGES	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.4 MW, WORLD MARKET DIESEL, MAXIMUM FUEL COST.

PROJECT CAPITAL COSTS AND FINANCING

CAPITAL COST ($000):

Construction Draws (Detailed Below)	3,090
Start-Up Costs, Fees (Detailed Below)	375
Commissioning Fees (Detailed Below)	321
Commitment Fees	63
Interest During Construction	203
TOTAL CAPITAL COST	4,064

CONSTRUCTION FINANCING PARAMETERS:

CONSTRUCTION INTEREST RATE	10.00%
FUNDS COMMITMENT FEE	2.0%
CONSTRUCTION/STARTUP (QUARTERS)	5
PROJECT FUNDING DATE	Oct-87

PROJECT FINANCING PARAMETERS:

INTEREST RATE	11.00%
TERM (YEARS)	12
PERCENT OF CAPITAL COST FINANCED	85%
AMOUNT FINANCED ($000)	3,454
ANNUAL PAYMENT ($000)	520
PROJECT STARTUP DATE	Jan-89

OWNERSHIP FINANCING PARAMETERS

TOTAL PARTNERSHIP EQUITY ($000)	610

	EQUITY SHARE	CF SHARE	FED TAX	STATE TAX
PARTNER 1	100.0%	66.7%	25.0%	10.0%
PARTNER 2	0.0%	33.3%	25.0%	10.0%
PARTNER 3	0.0%	0.0%	0.0%	0.0%

CONSTRUCTION DRAWDOWN SCHEDULE

	TOTAL	1Q	2Q	3Q	4Q	5Q	6Q	7Q	8Q
PERCENTAGE OF TOTAL SPENT	100.0%	10.0%	20.0%	20.0%	25.0%	25.0%	0.0%	0.0%	0.0%
Turnkey Construction, Cogen	2,400	240	480	480	600	600	0	0	0
Miscellaneous, Construction	200	20	40	40	50	50	0	0	0
Contingency	240	24	48	48	60	60	0	0	0
Start-Up Costs	150	0	0	0	0	150	0	0	0
Closing Costs	100	100	0	0	0	0	0	0	0
Development Fee	125	125	0	0	0	0	0	0	0
Owner's Costs	250	50	50	50	50	50	0	0	0
Working Capital	61	0	0	0	0	61	0	0	0
Debt Service Reserve	260	0	0	0	0	260	0	0	0
TOTAL FUNDS REQUIRED	3,786	559	618	618	760	1,231	0	0	0

CASE 5

(Diesel Fuel Subsidy Phaseout, High Wood Waste Price)

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.5 MW, 5-YR DIESEL SUBSIDY PHASE-OUT, MAXIMUM FUEL COST.

PROFORMA STATEMENT OF INCOME AND EXPENSES

(first operating year begins on January 1)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
REVENUE ($000)																				
ELECTRICAL ENERGY SALES	741	933	1,144	1,373	1,621	1,892	1,987	2,086	2,190	2,300	2,415	2,536	2,662	2,796	2,935	3,082	3,236	3,398	3,568	3,746
CAPACITY SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STEAM SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMMODITY SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST FROM DEBT SERVICE RESERVE FUND	18	18	18	18	18	18	18	18	18	18	18	0	0	0	0	0	0	0	0	0
***** TOTAL REVENUE	759	952	1,162	1,391	1,639	1,910	2,005	2,104	2,208	2,318	2,433	2,536	2,662	2,796	2,935	3,082	3,236	3,398	3,568	3,746
EXPENSES ($000)																				
PURCHASED FUEL	152	160	168	176	185	194	204	214	225	236	248	260	273	287	301	316	332	349	366	385
CONTRACT OPERATION & MAINTENANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OPERATION & MAINTENANCE--COMMODITY PLANT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OPERATIONS--DIRECT POWER PLANT EXPENSES	110	114	119	124	129	134	139	145	151	157	163	169	176	183	190	198	206	214	223	232
TRANSMISSION LINE MAINTENANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PROJECT MANAGEMENT FEE	40	42	43	45	47	49	51	53	55	57	59	62	64	67	69	72	75	78	81	84
PROPERTY TAXES & INSURANCE	62	64	66	68	70	72	74	76	78	81	83	86	89	91	94	97	100	103	107	110
LAND LEASE	10	10	11	11	12	12	13	13	14	14	15	15	16	17	17	18	19	19	20	21
***** TOTAL EXPENSES BEFORE DEBT PAYMENT	374	390	406	424	442	461	480	501	522	545	568	593	618	645	673	702	732	764	797	832
***** NET OPERATING INCOME ($000)	385	562	755	967	1,197	1,450	1,525	1,603	1,686	1,773	1,865	1,943	2,044	2,151	2,263	2,380	2,504	2,634	2,771	2,914
PROJECT DEBT PAYMENT	520	520	520	520	520	[illegible]	520	520	520	520	520	520	0	0	0	0	0	0	0	0
RECOVERY OF DEBT SERVICE RESERVE	0	0	0	0	0	0	0	0	0	0	0	260	0	0	0	0	0	0	0	0
RECOVERY OF WORKING CAPITAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61
***** PROJECT CASH FLOW BEFORE TAXES ($000)	(134)	42	236	447	678	930	1,005	1,084	1,167	1,254	1,345	1,683	2,044	2,151	2,263	2,380	2,504	2,634	2,771	2,976
***** DEBT COVERAGE RATIO	0.74	1.08	1.45	1.86	2.30	2.79	2.93	3.09	3.25	3.41	3.59	3.74	NA	NA	NA	NA	NA	NA	NA	NA
PARTNER 1 CASHFLOW BEFORE TAXES ($000)	(699)	28	157	298	452	620	670	723	778	836	897	1,122	1,363	1,434	1,508	1,587	1,669	1,756	1,847	1,984
CASHFLOW AFTER TAXES ($000)	(663)	22	105	196	294	402	429	458	487	518	549	690	959	1,006	1,057	1,110	1,165	1,224	1,285	1,378
PARTNER 2 CASHFLOW BEFORE TAXES ($000)	(45)	14	79	149	226	310	335	361	389	418	448	561	681	717	754	793	835	878	924	992
CASHFLOW AFTER TAXES ($000)	(46)	(8)	33	79	128	182	195	210	224	239	255	326	460	484	509	536	562	593	623	670
PARTNER 3 CASHFLOW BEFORE TAXES ($000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CASHFLOW AFTER TAXES ($000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.5 MW, 5-YR DIESEL SUBSIDY PHASE-OUT, MAXIMUM FUEL COST.

OVERALL PROJECT SUMMARY

SYSTEM COSTS AND VALUE

Installed Facilities Cost	2,840 000$s
Total Loaded Capital Cost	4,064 000$s
Initial Fuel Cost	8.69 mills/kWh
Initial O&M Cost	0.00 mills/kWh
Project NPV (pre-debt, 12% DR)	5,887 000$s

PROJECT DEBT FINANCING

Amount of Debt	3,454 000$s
Debt Rate	11.0%
Debt Term	12 Years
Minimum Coverage Ratio	0.74
Average Coverage Ratio	2.21

INVESTMENT PERFORMANCE

	Ptn 1	Ptn 2	Ptn 3
Initial Investment (000$s)	610	0	0
Pre-Tax IRR (%)	44.3%	ERR	NA
After-Tax IRR (%)	35.9%	ERR	NA
Pre-Tax NPV (12% DR)	3,992	2,268	0

COGENERATION SYSTEM OPERATING PARAMETERS

Fuel Use	4.00 ton/hr
Ave. Capacity, Gross	2.75 MW
Average Parasitic Load	0.25 MW
Average Capacity, Net	2.50 MW
Firm Capacity	0.00 MW
Heat Rate, gross	19,264 Btu/kWh
Heat Rate, net	21,190 Btu/kWh
Operating Standard	0.0%
Efficiency Standard	17.9%
Average Steam Output	0.00 mlb/hr
Operating Hours-yr 1	7,008
Operating Hours-yr 2	7,008

DEGRADATION FACTORS

	Yr 2	Yr 3	Yr 4
Capacity	0.00%	0.00%	0.00%
Fuel Use	0.00%	0.00%	0.00%
Cap. Bonus	0.00%	0.00%	0.00%

DATA BY TIME-OF-USE PERIOD

	Ann. Hours	Avail	Hrs Yr 1	Hrs Yr 2-	Net kW	Steam lb/hr	Fuel ton/hr	Capacity($/kWh) Firm	Capacity($/kWh) Avail	Energy($/kWh) Fixed	Energy($/kWh) Short
SUMMER											
On Peak	504	94.1%	474	474	2,500	0	4.00	0.000	0.000	0.042	0.000
Partial Peak	756	94.1%	712	712	2,500	0	4.00	0.000	0.000	0.042	0.000
Off Peak	926	59.5%	551	551	2,500	0	4.00	0.000	0.000	0.042	0.000
Dispatch Hours	670	79.9%	535	535	2,500	0	4.00	NA	0.000	NA	0.000
WINTER											
On Peak	680	94.3%	641	641	2,500	0	4.00	0.000	0.000	0.042	0.000
Partial Peak	1,530	94.3%	1,443	1,443	2,500	0	4.00	0.000	0.000	0.042	0.000
Off Peak	2,364	67.2%	1,588	1,588	2,500	0	4.00	0.000	0.000	0.042	0.000
Dispatch Hours	1,330	80.0%	1,064	1,064	2,500	0	4.00	NA	0.000	NA	0.000

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.5 MW, 5-YR DIESEL SUBSIDY PHASE-OUT, MAXIMUM FUEL COST.

ANNUAL (FIRST YEAR) SYSTEM PERFORMANCE SUMMARY

MONTHLY HOURS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Scheduled Outage	104	104	104	104	104	104	104	104	104	104	104	104
Forced Outage	42	42	42	42	42	42	42	42	42	42	42	42
Operating Total	598	526	598	574	598	574	598	598	574	598	574	598
GROSS ELECTRICAL CAPACITY (kW), FULL CONDENSING EQUIVALENT												
Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Partial Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Off Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Dispatch Hours	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
PARASITIC LOAD (kW)												
Peak	250	250	250	250	250	250	250	250	250	250	250	250
Partial Peak	250	250	250	250	250	250	250	250	250	250	250	250
Off Peak	250	250	250	250	250	250	250	250	250	250	250	250
Dispatch Hours	250	250	250	250	250	250	250	250	250	250	250	250
NET ELECTRICAL CAPACITY (kW)												
Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Partial Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Off Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Dispatch Hours	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
STEAM EXTRACTION RATE (lb/hr @ 1,276 Btu/lb, electric loss @ 10.00 lb/kWh)												
Peak	0	0	0	0	0	0	0	0	0	0	0	0
Partial Peak	0	0	0	0	0	0	0	0	0	0	0	0
Off Peak	0	0	0	0	0	0	0	0	0	0	0	0
Dispatch Hours	0	0	0	0	0	0	0	0	0	0	0	0
FUEL CONSUMPTION (green ton/hr @ 6622 Btu/green lb)												
Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Partial Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Off Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Dispatch Hours	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.5 MW, 5-YR DIESEL SUBSIDY PHASE-OUT, MAXIMUM FUEL COST.

PROJECT REVENUES

		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
NET ELECTRICAL ENERGY OUTPUT (MM kWh/YR)		17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
AVOIDED DIESEL FUEL COST ($/kWh)		0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138
SHORT-RUN AVOIDED COST ESCALATION RATE		26.0%	22.9%	20.0%	18.1%	16.7%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
SUMMER	Price Alloc.																				
On-Peak	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138
Part-Pk.	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138
Off-Peak	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138
Dispatch	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	[illegible]	0.1847	0.1940	0.2037	0.2138
WINTER																					
On-Peak	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	[illegible]	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138
Part-Pk.	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138
Off-Peak	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138
Dispatch	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138

FIRM CONTRACT CAPACITY (MW) 0.0
FIRM CAPACITY PRICE ($/kWy) 0

Monthly Firm Capacity Payment = kW x $/kWy x Conversion Factor x Period Performance Factor, summed for each time period (on peak, part peak, off peak).
Monthly Firm Capacity Bonus = (kW x $/kWy x bonus(%)) / 12, for each month in which peak-period capacity factor > 85% (bonus depends on actual CF).

FIRM CAPACITY BONUS

SUMMER	Conversion Factors	Period Performance Factors	WINTER	Conversion Factors	Period Performance Factors
On-Peak	0.1643	1.00	On-Peak	0.0245	1.00
Part-Pk.	0.0028	1.00	Part-Pk.	0.0123	1.00
Off-Peak	0.0025	0.74	Off-Peak	0.0036	0.74

			1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
AS-AVAILABLE CAPACITY PRICE--FIXED ($/kWy)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	As-Available	Alloc.	Time-Differentiated As-Available Capacity Price (c/kWh)---------->																			
SUMMER	Capacity (MW)	Factors																				
On-Peak	2.50	0.12444	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Part-Pk.	2.50	0.00136	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Peak	2.50	0.00062	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dispatch	2.50	0.00000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WINTER																						
On-Peak	2.50	0.02975	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Part-Pk.	2.50	0.00667	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Peak	2.50	0.00074	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dispatch	2.50	0.00000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STEAM EXTRACTION (MM LBS/YR)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STEAM SALES (MM LBS/YR)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STEAM PRICE ($/1000 LBS)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STEAM PRICE ESCALATION RATE			5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
FERC OPERATING STANDARD			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
FERC EFFICIENCY STANDARD			17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.5 MW, 5-YR DIESEL SUBSIDY PHASE-OUT, MAXIMUM FUEL COST.

PROJECT OPERATIONS AND MAINTENANCE COSTS

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
TAX CREDITS (INVESTMENT, ENERGY)	0.0%																			
FEDERAL DEPRECIATION	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
STATE DEPRECIATION	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PROPERTY TAXES ------ % OF CAPITAL COST: 1.00%	$31	$32	$32	$33	$33	$34	$35	$35	$36	$37	$38	$38	$39	$40	$41	$42	$42	$43	$44	$45
PROPERTY TAX ESCALATION RATE	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	
FUEL CONSUMPTION (TONS/YR)	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032
FUEL COST ($/TON @ 6,622 Btu/lb)	$5.43	$5.70	$5.99	$6.29	$6.60	$6.93	$7.28	$7.64	$8.02	$8.42	$8.84	$9.29	$9.75	$10.24	$10.75	$11.29	$11.85	$12.45	$13.07	$13.72
FUEL COST ESCALATION RATE	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
GENERAL INFLATION RATE	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	
INTEREST RATE ON DEBT SERVICE RESERVE FUND	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
PROJECT MANAGEMENT FEE	$40	$42	$43	$45	$47	$49	$51	$53	$55	$57	$59	$62	$64	$67	$69	$72	$75	$78	$81	$84
LAND LEASE COST	$10	$10	$11	$11	$12	$12	$13	$13	$14	$14	$15	$15	$16	$17	$17	$18	$19	$19	$20	$21
INSURANCE ---------- % OF CAPITAL COST: 1.00%	$31	$32	$33	$35	$36	$38	$39	$41	$42	$44	$46	$48	$49	$51	$54	$56	$58	$60	$63	$65
TRANSMISSION LINE MAINTENANCE	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
COGENERATION PLANT OPERATIONS																				
==========	(Enter all first-year costs as the full-year equivalent)																			
REIMBURSABLE CONTRACT O&M	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
CONTRACT O&M FEE AND OVERHEAD @ 20.0%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
OPERATING LABOR	$10	$10	$11	$11	$12	$12	$13	$13	$14	$14	$15	$15	$16	$17	$17	$18	$19	$19	$20	$21
OPERATING SUPPLIES	$50	$52	$54	$56	$58	$61	$63	$66	$68	$71	$74	$77	$80	$83	$87	$90	$94	$97	$101	$105
ROUTINE AND CONTRACT MAINTENANCE	$40	$42	$43	$45	$47	$49	$51	$53	$55	$57	$59	$62	$64	$67	$69	$72	$75	$78	$81	$84
WATER	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
LETTER OF CREDIT	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
ASH DISPOSAL	$5	$5	$5	$6	$6	$6	$6	$7	$7	$7	$7	$8	$8	$8	$8	$9	$9	$10	$10	$11
ADMINISTRATIVE AND OFFICE EXPENSES	$5	$5	$5	$6	$6	$6	$6	$7	$7	$7	$7	$8	$8	$8	$8	$9	$9	$10	$10	$11
PURCHASED POWER (kW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PURCHASED POWER COST ($/kWh)	$0.0730	$0.0767	$0.0805	$0.0845	$0.0887	$0.0932	$0.0978	$0.1027	$0.1079	$0.1132	$0.1189	$0.1249	$0.1311	$0.1377	$0.1445	$0.1518	$0.1593	$0.1672	$0.1757	$0.1845
PURCHASED POWER ANNUAL COST	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
PURCHASED POWER ESCALATION RATE	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
STAND-BY CHARGE RATE ($/kW-Mo) 0.2 MW @	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANNUAL STAND-BY CHARGES	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.5 MW, 5-YR DIESEL SUBSIDY PHASE-OUT, MAXIMUM FUEL COST.

PROJECT CAPITAL COSTS AND FINANCING

CAPITAL COST ($000):

Construction Draws (Detailed Below)	3,090
Start-Up Costs, Fees (Detailed Below)	375
Commissioning Fees (Detailed Below)	321
Commitment Fees	69
Interest During Construction	208
TOTAL CAPITAL COST	4,064

CONSTRUCTION FINANCING PARAMETERS:

CONSTRUCTION INTEREST RATE	10.00%
FUNDS COMMITMENT FEE	2.0%
CONSTRUCTION/STARTUP (QUARTERS)	5
PROJECT FUNDING DATE	Oct-87

PROJECT FINANCING PARAMETERS:

INTEREST RATE	11.00%
TERM (YEARS)	12
PERCENT OF CAPITAL COST FINANCED	85%
AMOUNT FINANCED ($000)	3,454
ANNUAL PAYMENT ($000)	520
PROJECT STARTUP DATE	Jan-89

OWNERSHIP FINANCING PARAMETERS

TOTAL PARTNERSHIP EQUITY ($000) 610

	EQUITY SHARE	CF SHARE	FED TAX	STATE TAX
PARTNER 1	100.0%	66.7%	25.0%	10.0%
PARTNER 2	0.0%	33.3%	25.0%	10.0%
PARTNER 3	0.0%	0.0%	0.0%	0.0%

CONSTRUCTION DRAWDOWN SCHEDULE

	TOTAL	1Q	2Q	3Q	4Q	5Q	6Q	7Q	8Q
PERCENTAGE OF TOTAL SPENT	100.0%	10.0%	20.0%	20.0%	25.0%	25.0%	0.0%	0.0%	0.0%
Turnkey Construction, Cogen	2,400	240	480	480	600	600	0	0	0
Miscellaneous, Construction	200	20	40	40	50	50	0	0	0
Contingency	240	24	48	48	60	60	0	0	0
Start-Up Costs	150	0	0	0	0	150	0	0	0
Closing Costs	100	100	0	0	0	0	0	0	0
Development Fee	125	125	0	0	0	0	0	0	0
Owner's Costs	250	50	50	50	50	50	0	0	0
Working Capital	61	0	0	0	0	61	0	0	0
Debt Service Reserve	260	0	0	0	0	260	0	0	0
TOTAL FUNDS REQUIRED	3,786	559	618	618	760	1,231	0	0	0

CASE 6

(Diesel Fuel Subsidy Phaseout, Free Wood Waste)

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.5 MW, 5-YR DIESEL SUBSIDY PHASE-OUT, NO FUEL COST.

PROFORMA STATEMENT OF INCOME AND EXPENSES

(first operating year begins on January 1)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
REVENUE ($000)																				
ELECTRICAL ENERGY SALES	741	933	1,144	1,373	1,621	1,892	1,987	2,086	2,190	2,300	2,415	2,536	2,662	2,796	2,935	3,082	3,236	3,398	3,568	3,746
CAPACITY SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STEAM SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMMODITY SALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST FROM DEBT SERVICE RESERVE FUND	18	18	18	16	18	18	18	18	18	18	18	0	0	0	0	0	0	0	0	0
***** TOTAL REVENUE	759	952	1,162	1,391	1,639	1,910	2,005	2,104	2,208	2,318	2,433	2,536	2,662	2,796	2,935	3,082	3,236	3,398	3,568	3,746
EXPENSES ($000)																				
PURCHASED FUEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CONTRACT OPERATION & MAINTENANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OPERATION & MAINTENANCE--COMMODITY PLANT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OPERATIONS--DIRECT POWER PLANT EXPENSES	110	114	119	124	129	134	139	145	151	157	163	159	176	183	190	198	206	214	223	232
TRANSMISSION LINE MAINTENANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PROJECT MANAGEMENT FEE	40	42	43	45	47	49	51	53	55	57	59	62	64	67	69	72	75	78	81	84
PROPERTY TAXES & INSURANCE	62	64	66	68	70	72	74	76	78	81	83	86	89	91	94	97	100	103	107	110
LAND LEASE	10	10	11	11	12	12	13	13	14	14	15	15	16	17	17	18	19	19	20	21
***** TOTAL EXPENSES BEFORE DEBT PAYMENT	222	230	239	248	257	266	276	287	297	309	320	332	345	358	371	385	400	415	431	447
***** NET OPERATING INCOME ($000)	537	721	923	1,143	1,382	1,644	1,728	1,817	1,911	2,009	2,113	2,203	2,318	2,438	2,564	2,697	2,836	2,983	3,137	3,299
PROJECT DEBT PAYMENT	516	516	516	516	516	516	516	516	516	516	516	516	0	0	0	0	0	0	0	0
RECOVERY OF DEBT SERVICE RESERVE	0	0	0	0	0	0	0	0	0	0	0	258	0	0	0	0	0	0	0	0
RECOVERY OF WORKING CAPITAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
***** PROJECT CASH FLOW BEFORE TAXES ($000)	21	205	407	627	866	1,128	1,212	1,301	1,395	1,493	1,597	1,945	2,318	2,438	2,564	2,697	2,836	2,983	3,137	3,336
***** DEBT COVERAGE RATIO	1.04	1.40	1.79	2.22	2.68	3.19	3.35	3.52	3.70	3.89	4.09	4.27	NA	NA	NA	NA	NA	NA	NA	NA
PARTNER 1 CASHFLOW BEFORE TAXES ($000)	(591)	137	271	418	577	752	808	868	930	996	1,064	1,297	1,545	1,625	1,709	1,798	1,891	1,989	2,091	2,224
CASHFLOW AFTER TAXES ($000)	(589)	96	162	277	379	491	523	556	590	626	663	809	1,082	1,136	1,192	1,252	1,315	1,381	1,450	1,540
PARTNER 2 CASHFLOW BEFORE TAXES ($000)	7	68	136	209	289	376	404	434	465	498	532	648	773	813	855	899	945	994	1,046	1,112
CASHFLOW AFTER TAXES ($000)	(11)	29	72	119	170	226	242	259	276	294	312	385	521	548	577	607	638	671	706	751
PARTNER 3 CASHFLOW BEFORE TAXES ($000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CASHFLOW AFTER TAXES ($000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.5 MW, 5-YR DIESEL SUBSIDY PHASE-OUT, NO FUEL COST.

OVERALL PROJECT SUMMARY

SYSTEM COSTS AND VALUE

Installed Facilities Cost	2,840 000$s
Total Loaded Capital Cost	4,036 000$s
Initial Fuel Cost	0.00 mills/kWh
Initial O&M Cost	0.00 mills/kWh
Project NPV (pre-debt, 12% DR)	7,490 000$s

PROJECT DEBT FINANCING

Amount of Debt	3,430 000$s
Debt Rate	11.0%
Debt Term	12 Years
Minimum Coverage Ratio	1.04
Average Coverage Ratio	2.57

INVESTMENT PERFORMANCE

	Ptn 1	Ptn 2	Ptn 3
Initial Investment (000$s)	605	0	0
Pre-Tax IRR (%)	60.7%	NA	NA
After-Tax IRR (%)	46.9%	ERR	NA
Pre-Tax NPV (12% DR)	5,059	2,800	0

COGENERATION SYSTEM OPERATING PARAMETERS

Fuel Use	4.00 ton/hr
Ave. Capacity, Gross	2.75 MW
Average Parasitic Load	0.25 MW
Average Capacity, Net	2.50 MW
Firm Capacity	0.00 MW
Heat Rate, gross	19,264 Btu/kWh
Heat Rate, net	21,190 Btu/kWh
Operating Standard	0.0%
Efficiency Standard	17.9%
Average Steam Output	0.00 mlb/hr
Operating Hours-yr 1	7,008
Operating Hours-yr 2	7,008

DEGRADATION FACTORS

	Yr 2	Yr 3	Yr 4
Capacity	0.00%	0.00%	0.00%
Fuel Use	0.00%	0.00%	0.00%
Cap. Bonus	0.00%	0.00%	0.00%

DATA BY TIME-OF-USE PERIOD

	Ann. Hours	Avail	Hrs Yr 1	Hrs Yr 2	Net kW	Steam lb/hr	Fuel ton/hr	Capacity($/kWh) Firm	Capacity($/kWh) Avail	Energy($/kWh) Fixed	Energy($/kWh) Short
SUMMER											
On Peak	504	94.1%	474	474	2,500	0	4.00	0.000	0.000	0.042	0.000
Partial Peak	756	94.1%	712	712	2,500	0	4.00	0.000	0.000	0.042	0.000
Off Peak	926	59.5%	551	551	2,500	0	4.00	0.000	0.000	0.042	0.000
Dispatch Hours	670	79.9%	535	535	2,500	0	4.00	NA	0.000	NA	0.000
WINTER											
On Peak	680	94.3%	641	641	2,500	0	4.00	0.000	0.000	0.042	0.000
Partial Peak	1,530	94.3%	1,443	1,443	2,500	0	4.00	0.000	0.000	0.042	0.000
Off Peak	2,364	67.2%	1,588	1,588	2,500	0	4.00	0.000	0.000	0.042	0.000
Dispatch Hours	1,330	80.0%	1,064	1,064	2,500	0	4.00	NA	0.000	NA	0.000

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.5 MW, 5-YR DIESEL SUBSIDY PHASE-OUT, NO FUEL COST.

ANNUAL (FIRST YEAR) SYSTEM PERFORMANCE SUMMARY

MONTHLY HOURS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Scheduled Outage	104	104	104	104	104	104	104	104	104	104	104	104
Forced Outage	42	42	42	42	42	42	42	42	42	42	42	42
Operating Total	598	526	598	574	598	574	598	598	574	598	574	598
GROSS ELECTRICAL CAPACITY (kW), FULL CONDENSING EQUIVALENT												
Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Partial Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Off Peak	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Dispatch Hours	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
PARASITIC LOAD (kW)												
Peak	250	250	250	250	250	250	250	250	250	250	250	250
Partial Peak	250	250	250	250	250	250	250	250	250	250	250	250
Off Peak	250	250	250	250	250	250	250	250	250	250	250	250
Dispatch Hours	250	250	250	250	250	250	250	250	250	250	250	250
NET ELECTRICAL CAPACITY (kW)												
Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Partial Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Off Peak	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Dispatch Hours	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
STEAM EXTRACTION RATE (lb/hr @ 1,276 Btu/lb, electric loss @ 10.00 lb/kWh)												
Peak	0	0	0	0	0	0	0	0	0	0	0	0
Partial Peak	0	0	0	0	0	0	0	0	0	0	0	0
Off Peak	0	0	0	0	0	0	0	0	0	0	0	0
Dispatch Hours	0	0	0	0	0	0	0	0	0	0	0	0
FUEL CONSUMPTION (green ton/hr @ 6622 Btu/green lb)												
Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Partial Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Off Peak	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Dispatch Hours	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

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PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.5 MW, 5-YR DIESEL SUBSIDY PHASE-OUT, NO FUEL COST.

PROJECT REVENUES

		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
NET ELECTRICAL ENERGY OUTPUT (MM kWh/YR)		17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
AVOIDED DIESEL FUEL COST ($/kWh)		0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138
SHORT-RUN AVOIDED COST ESCALATION RATE		26.0%	22.5%	20.0%	18.1%	16.7%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
SUMMER	Price Alloc.																				
On-Peak	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138
Part-Pk.	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138
Off-Peak	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138
Dispatch	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138
WINTER																					
On-Peak	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138
Part-Pk.	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138
Off-Peak	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138
Dispatch	1.000	0.0423	0.0533	0.0653	0.0783	0.0925	0.1080	0.1134	0.1191	0.1250	0.1313	0.1378	0.1447	0.1520	0.1596	0.1675	0.1759	0.1847	0.1940	0.2037	0.2138

FIRM CONTRACT CAPACITY (MW) 0.0
FIRM CAPACITY PRICE ($/kWy) 0

Monthly Firm Capacity Payment = kW x $/kWy x Conversion Factor x Period Performance Factor, summed for each time period (on peak, part peak, off peak).
Monthly Firm Capacity Bonus = (kW x $/kWy x bonus(%)) / 12, for each month in which peak-period capacity factor > 85% (bonus depends on actual CF).

FIRM CAPACITY BONUS

SUMMER	Conversion Factors	Period Performance Factors	WINTER	Conversion Factors	Period Performance Factors
On-Peak	0.1643	1.00	On-Peak	0.0245	1.00
Part-Pk.	0.0026	1.00	Part-Pk.	0.0123	1.00
Off-Peak	0.0025	0.74	Off-Peak	0.0036	0.74

AS-AVAILABLE CAPACITY PRICE--FIXED ($/kWy)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUMMER	As-Available Capacity (MW)	Alloc. Factors	Time-Differentiated As-Available Capacity Price (c/kWh)---------->																		
On-Peak	2.50	0.12444	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Part-Pk.	2.50	0.00136	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Peak	2.50	0.00062	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dispatch	2.50	0.00000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WINTER																					
On-Peak	2.50	0.02975	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Part-Pk.	2.50	0.00667	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Peak	2.50	0.00074	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dispatch	2.50	0.00000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STEAM EXTRACTION (MM LBS/YR)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STEAM SALES (MM LBS/YR)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STEAM PRICE ($/1000 LBS)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STEAM PRICE ESCALATION RATE			5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
FERC OPERATING STANDARD			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
FERC EFFICIENCY STANDARD			17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.5 MW, 5-YR DIESEL SUBSIDY PHASE-OUT, NO FUEL COST.

PROJECT OPERATIONS AND MAINTENANCE COSTS

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
TAX CREDITS (INVESTMENT, ENERGY)	0.0%																			
FEDERAL DEPRECIATION	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
STATE DEPRECIATION	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PROPERTY TAXES ------ % OF CAPITAL COST: 1.00%	$31	$32	$32	$33	$33	$34	$35	$35	$36	$37	$38	$38	$39	$40	$41	$42	$42	$43	$44	$45
PROPERTY TAX ESCALATION RATE	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	
FUEL CONSUMPTION (TONS/YR)	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032	28,032
FUEL COST ($/TON @ 6,622 Btu/lb)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
FUEL COST ESCALATION RATE	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
GENERAL INFLATION RATE	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	
INTEREST RATE ON DEBT SERVICE RESERVE FUND	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
PROJECT MANAGEMENT FEE	$40	$42	$43	$45	$47	$49	$51	$53	$55	$57	$59	$62	$64	$67	$69	$72	$75	$78	$81	$84
LAND LEASE COST	$10	$10	$11	$11	$12	$12	$13	$13	$14	$14	$15	$15	$16	$17	$17	$13	$19	$19	$20	$21
INSURANCE ---------- % OF CAPITAL COST: 1.00%	$31	$32	$33	$35	$36	$38	$39	$41	$42	$44	$46	$48	$49	$51	$54	$56	$58	$60	$63	$65
TRANSMISSION LINE MAINTENANCE	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
COGENERATION PLANT OPERATIONS																				
==========	(Enter all first-year costs as the full-year equivalent)																			
REIMBURSABLE CONTRACT O&M	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
CONTRACT O&M FEE AND OVERHEAD @ 20.0%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
OPERATING LABOR	$10	$10	$11	$11	$12	$12	$13	$13	$14	$14	$15	$15	$16	$17	$17	$18	$19	$19	$20	$21
OPERATING SUPPLIES	$50	$52	$54	$56	$58	$61	$63	$66	$68	$71	$74	$77	$80	$83	$87	$90	$94	$97	$101	$105
ROUTINE AND CONTRACT MAINTENANCE	$40	$42	$43	$45	$47	$49	$51	$53	$55	$57	$59	$62	$64	$67	$69	$72	$75	$78	$81	$84
WATER	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
LETTER OF CREDIT	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
ASH DISPOSAL	$5	$5	$5	$6	$6	$6	$6	$7	$7	$7	$7	$8	$8	$8	$9	$9	$9	$10	$10	$11
ADMINISTRATIVE AND OFFICE EXPENSES	$5	$5	$5	$6	$6	$6	$6	$7	$7	$7	$7	$8	$8	$8	$9	$9	$9	$10	$10	$11
PURCHASED POWER (kW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PURCHASED POWER COST ($/kWh)	$0.0700	$0.0767	$0.0805	$0.0845	$0.0887	$0.0932	$0.0978	$0.1027	$0.1079	$0.1132	$0.1189	$0.1249	$0.1311	$0.1377	$0.1445	$0.1518	$0.1593	$0.1673	$0.1757	$0.1845
PURCHASED POWER ANNUAL COST	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
PURCHASED POWER ESCALATION RATE	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
STAND-BY CHARGE RATE ($/kW-Mo) 0.2 MW @	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANNUAL STAND-BY CHARGES	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

PROJECT: REPRESENTATIVE BIOMASS POWER PLANT FOR INDONESIA. 2.5 MW, 5-YR DIESEL SUBSIDY PHASE-OUT, NO FUEL COST.

PROJECT CAPITAL COSTS AND FINANCING

CAPITAL COST ($000):

Construction Draws (Detailed Below)	3,090
Start-Up Costs, Fees (Detailed Below)	375
Commissioning Fees (Detailed Below)	294
Commitment Fees	69
Interest During Construction	208
TOTAL CAPITAL COST	4,036

CONSTRUCTION FINANCING PARAMETERS:

CONSTRUCTION INTEREST RATE	10.00%
FUNDS COMMITMENT FEE	2.0%
CONSTRUCTION/STARTUP (QUARTERS)	5
PROJECT FUNDING DATE	Oct-87

PROJECT FINANCING PARAMETERS:

INTEREST RATE	11.00%
TERM (YEARS)	12
PERCENT OF CAPITAL COST FINANCED	85%
AMOUNT FINANCED ($000)	3,430
ANNUAL PAYMENT ($000)	516
PROJECT STARTUP DATE	Jan-89

OWNERSHIP FINANCING PARAMETERS

TOTAL PARTNERSHIP EQUITY ($000) 605

	EQUITY SHARE	CF SHARE	FED TAX	STATE TAX
PARTNER 1	100.0%	66.7%	25.0%	10.0%
PARTNER 2	0.0%	33.3%	25.0%	10.0%
PARTNER 3	0.0%	0.0%	0.0%	0.0%

CONSTRUCTION DRAWDOWN SCHEDULE

	TOTAL	1Q	2Q	3Q	4Q	5Q	6Q	7Q	8Q
PERCENTAGE OF TOTAL SPENT	100.0%	10.0%	20.0%	20.0%	25.0%	25.0%	0.0%	0.0%	0.0%
Turnkey Construction, Cogen	2,400	240	480	480	600	600	0	0	0
Miscellaneous, Construction	200	20	40	40	50	50	0	0	0
Contingency	240	24	48	48	60	60	0	0	0
Start-Up Costs	150	0	0	0	0	150	0	0	0
Closing Costs	100	100	0	0	0	0	0	0	0
Development Fee	125	125	0	0	0	0	0	0	0
Owner's Costs	250	50	50	50	50	50	0	0	0
Working Capital	36	0	0	0	0	36	0	0	0
Debt Service Reserve	258	0	0	0	0	258	0	0	0
TOTAL FUNDS REQUIRED	3,759	559	618	618	760	1,204	0	0	0