Report and Recommendation of the President to the Board of Directors

Project Number: 41939
December 2008

Proposed Loan and Partial Credit Guarantee Biomass Power Project (Thailand)

In accordance with ADB's public communications policy (PCP, 2005), this abbreviated version of the RRP excludes confidential information and ADB's assessment of project or transaction risk as well as other information referred to in paragraph 126 of the PCP.

Asian Development Bank

CURRENCY EQUIVALENTS

(as of 9 September 2008)

Currency Unit	–	baht (B)
B1.00	=	$0.0287
$1.00	=	B34.8

ABBREVIATIONS

AA Group	–	Double A Alliance Network
APCF	–	Asia Pacific Carbon Fund
KKT	–	Khan-na and Khet-Thee Company
BOI	–	Board of Investment
CARG	–	compound annual growth rate
CDM	–	Clean Development Mechanism
CER	–	certified emission reduction
CFB	–	circulating fluidized bed
CMI	–	Carbon Market Initiative
CO_2	–	carbon dioxide
DMC	–	developing member country
DSCR	–	debt service coverage ratio
EGAT	–	Electricity Generating Authority of Thailand
EIRR	–	economic internal rate of return
EPPO	–	Energy Policy and Planning Office
FIRR	–	financial internal rate of return
HPEC	–	Harbin Power Equipment Company
IPP	–	independent power producer
LNGK	–	Liaoning Gaoke Energy Group
MEA	–	Metropolitan Electricity Authority
NEPC	–	National Energy Policy Council
NPS	–	National Power Supply Company
PCG	–	partial credit guarantee
PEA	–	Provincial Electricity Authority
PPA	–	power purchase agreement
PPMC	–	Power Plant Maintenance Services Company
PRC	–	People's Republic of China
PROPARCO	–	Promotion et Participation pour la Coopération économique (Investment and Promotions Company for Economic Cooperation)
SPP	–	small power producer
VSPP	–	very small power producer

NOTE

In this report, “$” refers to US dollars.

WEIGHTS & MEASURES

GWh	–	gigawatt-hour
kV	–	kilovolt
kWh	–	kilowatt-hour
MW	–	megawatt

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PROJECT SUMMARY

[CONFIDENTIAL INFORMATION HAS BEEN DELETED]

Borrower	A limited project company to be incorporated in Thailand (Biomass Co) by the Sponsor
Classification	Targeting classification: General intervention Sector: Energy Subsector: Renewable energy generation Themes: Sustainable economic growth, environmental sustainability, private sector development Subthemes: Fostering physical infrastructure development; cleaner production, control of industrial pollution; private sector investment
Project Description	The Project will construct and operate a 125 megawatt (MW) biomass power plant using wood waste products (wood) as fuel. The Project will be located in the 304 Industrial Park in Prachinburi Province, about 150 kilometers (km) east of Bangkok. The Project will supply power (90 MW) to the Electricity Generating Authority of Thailand under a 25-year power purchase agreement under the small power producers program, as well as to industrial customers in the 304 Industrial Park (21 MW) and for internal consumption (14 MW). The Project has arrangements with wood processing industries to ensure adequate fuel supply.
Environment and Social Assessment	Environment: Category A Involuntary resettlement: Category C Indigenous peoples: Category C
Sponsors/Shareholders	The ultimate sponsor is Double A Alliance Network (the AA Group)—one of the largest conglomerates in Thailand actively involved in, among other things, power generation, agribusiness, pulp and paper production, and industrial park development. The sponsor and majority shareholder of Biomass Co will be a holding company, the National Power Company (the sponsor) under which the AA Group is grouping its power business. The AA Group is the industry leader in renewable energy generation in Thailand, and owns and operates eight power plants, with 494.8 MW of total installed capacity utilizing biomass as a primary or secondary source of fuel. Biomass-fired generation is a strategic fit with the Thai conglomerate as it (i) supports its pulp and paper and industrial park development business by providing electricity and steam, (ii) recycles biomass waste from its forestry and agricultural businesses as a fuel, and (iii) supports the company's commitment and policy to develop environmentally friendly and sustainable businesses.

Proposed Credit Guarantee for Project Bond Issue	Biomass Co plans to issue secured project bonds for a total amount of up to B2.5 billion (approximately $72.9 million) The Asian Development Bank's (ADB's) partial credit guarantee (PCG) will guarantee the timely payment of principal.
Proposed Loan	The proposed loan of up to $5 million (or its equivalent in baht) will be provided from ADB's ordinary capital resources without government guarantee.
Project Investment Plan	The total project cost is estimated at B6 billion (approximately $172.4 million). The cost includes land, equipment and plant, capital parts, pre-operating expenses, interest during construction, financing fees, and allowances for contingencies.
Development Impact	The Project aims to promote sustainable economic development in Thailand through contributions towards achieving minimum-share targets for renewable energy in the generation mix. Biomass-based energy is expected to contribute two thirds of the increase in renewable energy generation. Representing 15% of the planned increase in biomass-based electricity generation in Thailand until 2011, the proposed Project will make a significant contribution to the Government's renewable energy targets. The Project will mitigate significant amounts of greenhouse gas emissions and improve energy security by developing indigenous energy sources. In addition, the Project will provide extra income to over 1 million small farmers from the sale of agricultural waste, and improve the air quality by cleanly burning agricultural residues, which formerly were burned without emission control. The Project will also catalyze private sector investment in Thailand's renewable energy sector. ADB's PCG will support the first project bond issue by a renewable energy company in Thailand, and enable the link between local currency long-term fixed-rate investors (pension funds and insurance companies) and infrastructure projects. ADB's credit enhancement will crowd in local institutional investors in a sustainable way as they become more familiar with investing in clean energy projects.

I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on (i) a proposed loan, (ii) proposed partial credit guarantees to a limited project company to be incorporated in Thailand (Biomass Co) for the Biomass Power Project, a portion of which will be provided by a bilateral development finance institution under ADB's guarantor-of-record structure.

II. INTRODUCTION

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2. Thailand's energy generation is highly dependent on imported fuels. This makes the country vulnerable to energy supply disruptions and global price fluctuations. At the same time, Thailand is endowed with abundant renewable energy sources—biomass, biogas, mini-hydro, solar, and wind. Therefore, tapping the potential of renewable energy can increase Thailand's energy security, save foreign exchange, and protect against global price fluctuations by using domestic energy sources.

3. As part of Thailand's energy strategy to diversify its energy mix and promote renewable energy, the Government has set a target for 8% of primary commercial energy to come from renewable energy sources by 2011. To implement this strategy, the Ministry of Energy is promoting renewable energy through several types of incentives, such as the renewable portfolio standard, small power producer (SPP) program,[1] the very small power producer (VSPP) program, and the energy conservation promotion fund. Thailand has also signed the Kyoto Protocol, and is preparing to take advantage of the Clean Development Mechanism (CDM) to obtain additional financing for projects that reduce greenhouse gas emissions.

4. The regulations for the purchase of power from SPPs published by the Electricity Generating Authority of Thailand (EGAT) in 1992 promote the construction of small power plants to provide power and steam to private industry directly, thereby relieving electricity demand either on EGAT or industrial users. The SPP scheme also promotes the use of renewable energy and efficiency of primary energy by defining an SPP as a private or state enterprise that generates electricity either (i) from renewable energy sources such as wind, solar, mini-hydro, waste, or biomass, or (ii) from conventional sources (natural gas, coal, or oil) and using cogeneration (combined cycle units capable of producing power and steam). Renewable energy SPPs receive a fixed renewable energy promotion payment of B0.39 per kilowatt-hour (kWh) and are in addition eligible for an "adder" subsidy, which is awarded on a competitive basis for biomass projects. In October 2007, seven renewable energy SPPs were selected, accounting for a total proposed sale of 335 megawatts (MW) to EGAT and 458 MW installed capacity, including direct sales to industrial users.[2] Thanks to its high efficiency, the proposed Project has won the maximum adder available for biomass-fueled energy producers (B0.30 per kWh over 7 years).

5. Biomass-based energy is expected to contribute two-thirds of the increase in renewable energy generation, reflecting Thailand's substantial agricultural sector and vast biomass fuel

[1] The small power producer (SPP) program includes projects selling 10–90 megawatts (MW) to the Electricity Generating Authority of Thailand (EGAT), while the very small power producer (VSPP) program comprises facilities that sell up to 10 MW to EGAT.

[2] All selected SPPs are fueled with bagasse, rice husks, and wood chips, as other renewable energy projects are normally small and come under the VSPP program.

potential.[3] In addition to enhancing energy security, biomass-based electricity generation provides extra income to farmers from the sale of agricultural waste and improves the air quality by cleanly burning agricultural residues, which formerly were burned without emission control. Representing 15% of the planned increase in biomass-based electricity generation in Thailand until 2011, the proposed Project will make a significant contribution to the Government's renewable energy targets.

6. Growth in renewable energy in Thailand will increase with improvements in technology, favorable Government policies, and the ability to tap the country's vast biomass potential. However, while some biomass-fueled energy projects may be technically and economically viable, many of them may never be implemented because of difficulties finding suitable long-term fixed-rate financing in local currency. Despite many initiatives and successes in building bond markets in Southeast Asian developing member countries (DMCs), which would provide such fixed-rate local currency financing, these markets remain small and relatively illiquid. Local currency bonds cannot yet provide the long-term tenor required for infrastructure projects. ADB has an opportunity to act as a catalyst for the bond markets and crowd-in investors through its partial credit guarantee (PCG) program. ADB's PCG will enhance the credit rating of the bonds issued by Biomass Co, which for the first time will allow a renewable energy company to issue local currency bonds in Thailand and raise finance directly from local institutional investors.[4] Through its PCG, ADB will contribute to investor confidence in the Thai bond market and encourage renewable energy development as local institutions become more familiar with this asset class. Appendix 2 provides more information on catalyzing the Thai bond market for infrastructure projects. At the same time ADB also, through cofinancing for certified emission reductions under the ADB Carbon Market Initiative (CMI), has the opportunity to act as a catalyst for the largest biomass power project in Thailand today.

7. The ultimate sponsor of the Project, Double A Alliance Network (the AA Group), is a leading biomass-based energy producer in Southeast Asia, leveraging on its agriculture and forestry business and its extensive biomass procurement network. It has extensive experience in constructing, operating, maintaining, and supplying both small-scale and large-scale biomass-fired generation plants. The AA Group currently has eight power plants with 494.8 MW of total installed capacity that utilize biomass as a primary or secondary source of fuel. The first power plant belonging to the AA Group began commercial operations in March 1999, and members of AA Group's current management team have operated biomass power plants since 1987.

III. BACKGROUND

A. Power Sector in Thailand

1. Organization

8. Thailand's electricity sector has adopted an enhanced single buyer model whereby the state utility enables limited private participation in the generation sector while maintaining control over system planning, operation, and pricing. EGAT, the Metropolitan Electricity Authority, and the Provincial Electricity Authority (PEA) are three wholly state-owned electricity utilities that perform a dominant and important role in Thailand's electricity sector. EGAT,

[3] The National Energy Policy Council has relaunched the SPP program in 2007 after a pause due to the 1997 Asian financial crisis, with the aim of increasing renewable energy generation from 2,061 MW in 2006 to 3,246 MW in 2011. Biomass-fueled capacity is expected to represent 69.5% of this additional renewable energy generation. Narupat Amornkosit. 2007. Energy System Analysis Bureau. Energy Policy and Planning Office of Thailand. Bangkok.

[4] Mainly life insurance companies and pension funds.

Thailand's largest generator and sole transmission owner, is also the country's single wholesale purchaser of electricity and supplier to the only two electricity distribution authorities—the Metropolitan Electricity Authority and PEA. More details on Thailand's power sector are provided in the Supplementary Appendix A.

9. The Government has opened access for the private sector to participate in the generation business through the independent power producer (IPP), SPP, and VSPP programs. The IPP and SPP programs allow private developers to construct, own, and operate power projects and enter into power purchase agreements (PPAs) with EGAT with terms up to 25 years. The VSPP program allows power producers with projects of 10 MW or less to sell power to the Metropolitan Electricity Authority and PEA. Thailand currently imports a small amount of electricity from the Lao People's Democratic Republic and Malaysia, and intends to import from Myanmar and possibly the People's Republic of China (PRC). Thailand also exports electricity to neighboring utilities in Cambodia, the Lao People's Democratic Republic, and Malaysia.

10. Recent fluctuations in global energy prices have led Thailand to sharpen its focus on energy efficiency as a means to achieving more sustainable growth and development. The Ministry of Energy prepared a comprehensive national energy strategy that defines strategic approaches to increase energy security and to enhance the country's competitiveness. These are detailed in four strategic plans that identify specific targets, measures, and responsible agencies.[5] Energy efficiency targets are to be achieved by numerous measures, including the promotion of public transit systems, the creation of multimodal transport networks, and investments in new technologies. To increase Thailand's renewable energy consumption, the Government has been promoting the use of biomass, solar energy, and hydropower. Appendix 4 has more details on the SPP and VSPP program supporting renewable electricity generation, and Supplementary Appendix B reviews the incentives for renewable energy projects in Thailand.

2. Supply and Demand

11. As of June 2008, Thailand had a total installed capacity of 30,664 MW, of which, 15,794 MW (51%) was produced by EGAT power plants, 12,151 MW (40%) by IPPs, 2,079 MW (7%) by SPPs, and 640 MW (2%) came from foreign power purchases. Thailand's electricity generation market is concentrated, with approximately 80% of total generation capacity controlled by only three operators.[6] Thailand's production of electricity is highly dependent on fossil fuels, with 67% of generation produced by natural gas and 17% produced by coal and lignite. Hydropower generation represents 6%, oil-based generation 6%, imports 3%, and renewable energy 1%.

12. The industry sector is the largest consumer of electricity, accounting for approximately 45% of Thailand's total electricity consumption, followed by the business sector with 25%, and the residential sector with 21%. In 2007, total electricity consumption was approximately 132,492 gigawatt-hours (GWh), with a record peak demand of 22,586 MW. While reserve margins are still above the Ministry of Energy's minimum of 15%, they have fallen steadily since 2001.[7]

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[5] The four strategic plans include (i) strategic plan for energy efficiency, (ii) strategic plan for renewable energy development, (iii) strategic plan for energy security enhancement, and (iv) strategic plan for Thailand to be the "regional energy center".

[6] EGAT controls 53%, the Electricity Generating Public Company (EGCO) 14%, and Ratchaburi Electricity Generating Holdings (RATCH) 13%. EGAT also has a 45% stake in RATCH and 25.4% stake in EGCO.

[7] Thailand's national reserve margin has fallen from a high of 36% in 2001 to 20% in 2007 due to an economic rebound and lower planned new capacity.

13. In the Power Development Plan 2007,[8] EGAT projected an average annual growth rate of 5.6% in electricity generation demand and 5.8% annual average increase in peak demand between 2007 and 2021. By 2021, EGAT forecasts that energy consumption will reach 320,376 GWh, an increase of 173,350 GWh, with peak generation of 48,958 MW. To meet future demand, the Government plans to increase generation capacity by 38,093 MW by 2021, to have a total installed capacity of approximately 58,200 MW.[9] Natural gas will remain the dominant choice of fuel for power generation, accounting for 70%. Nuclear power will be introduced into Thailand's energy mix for the first time, with a commission date of January 2020 and 2021, supplying 4,000 MW.

B. Biomass Electricity Generation in Thailand

14. Thailand's well-endowed agriculture and forestry sector has produced a vast untapped resource of energy-rich residual by-products known as biomass. Both Government and private sector participants believe this domestic storehouse of biomass will contribute substantially to solving Thailand's energy quandary. The Government is now aggressively promoting renewable energy through its SPP and VSPP programs. The size and growth of the biomass power sector is primarily dependent on these two programs, which are highly dependent on biomass for securing their least-cost renewable energy targets.

15. The Department of Alternative Energy Development and Efficiency identified biomass as having the largest commercial potential out of all renewable energy sources available to Thailand for power generation.[10] In 2006, approximately 3,300 MW of biomass-fired generation potential was identified, which led the Government to set a target of tapping 2,800 MW of this potential by 2011. This target represents approximately 85% of Thailand's total renewable energy supply in 2011, and approximately 10% of Thailand's total peak generation. Supplementary Appendix A provides detailed information on Thailand's biomass sector and renewable energy targets.

16. As of April 2008, there were 31 SPP biomass energy projects with an installed capacity of 721 MW, as well as four combination fuel projects, which utilize renewable and conventional fuel, with a total installed capacity of 476 MW under the SPP program. The majority of these projects utilize bagasse, rice husks, and wood chips as their primary renewable energy fuel. A portion of the electricity is sold to EGAT under PPAs, with the remaining electricity being sold to local industrial clients as distributed generation. Table 1 shows the biomass and combination SPP projects by fuel types as of April 2008.

[8] Electricity Generating Authority of Thailand. 2008. *Thailand Power Development Plan 2007–2021*. Bangkok. *(PDP 2007: Revision 1)*.

[9] This forecast accounts for 8,424 MW retiring and 38,093 MW additional supply during this time frame.

[10] Potential by renewable energy source: biomass 3,300 MW, wind 1,600 MW, biogas 190 MW, mini and micro hydro 700 MW, municipal solid waste 147 MW, and solar > 50,000 MW (not competitive).

Table 1: Small Power Producers—Biomass and Combination Projects in Operation
(as of April 2008)

Energy Type	Number of Projects	Installed Capacity (MW)	Sale to Grid (MW)
Biomass			
Bagasse	11	273.6	81.5
Rice Husks	5	57.3	46.8
Black Liquor	1	32.9	25.0
MSW	1	2.5	1.0
Waste and Flared Gas	2	21.0	7.7
Mixed Biomass and Others[a]	11	333.8	220.3
Subtotal	**31**	**721.1**	**382.3**
Combination			
Waste Gas/Coal	1	108.0	45.0
Black Liquor/Coal	1	40.0	8.0
Eucalyptus Bark/Coal	2	328.0	180.0
Subtotal	**4**	**476.0**	**233.0**

MSW = municipal solid waste, MW = megawatt.
[a] Mixture of bagasse, rice husks, eucalyptus bark, wood chips, palm waste, or cassava rhizome.
Source: Thailand's Energy Ministry.

17. The VSPP program has also been very successful in promoting biomass-fired generation in Thailand. As of June 2008 there were 42 VSPP biomass projects with an installed capacity of 509.4 MW supplying 197 MW of power to the system. This represents 94% of the total installed capacity under the VSPP program, which includes conventional fuel, solar, wind, mini and micro hydro, and other renewable sources. A summary of the VSPP biomass projects by fuel type in operation as of June 2008 is presented in Table 2.

Table 2: Very Small Power Producers—Biomass Projects in Operation
(as of June 2008)

Fuel Type	Number of Projects	Installed Capacity (MW)	Sale to the Grid (MW)
Rice Husks	9	49.3	41.1
Bagasse	24	423.3	135.3
Palm Wastes	4	23.0	12.9
Rice Straw	3	1.6	1.5
Corn Cobs	1	0.2	0.1
Other Biomass	1	12.0	6.2
Total	**42**	**509.4**	**197.0**

MW = megawatt.
Source: Thailand's Energy Ministry.

C. ADB Operations

1. Country Strategy

18. Addressing the main constraints that the country faces in achieving sustainable economic growth is the central organizing theme of ADB's rebounding development partnership with Thailand.[11] The country partnership strategy for Thailand 2007–2011[12] focuses on three

[11] As one of ADB's 31 founding members, Thailand's long-standing relationship with ADB dates back to 1966. Cumulative ADB lending to Thailand as of 31 December 2007 was close to $5.4 billion, comprising more than 80 loans, mainly in the energy, transport and communications, finance, water supply, sanitation, and waste management sectors. However, no new public sector loans have been approved since 2000, and disbursements have steadily declined since 1997. While ADB's most recent private sector loan in Thailand was approved in 2003,

core strategic areas of partnership—infrastructure development, capital market development, and environmentally sustainable development. Thailand's 10th national plan prioritizes infrastructure development to enhance its competitiveness and support long-term growth. Specifically, the country partnership strategy envisages that ADB will focus on projects involving power generation, mass rapid transit rail systems, highway development, urban water supply, and sanitation. Given that the Government's core challenge is to ensure that public resources are used efficiently and effectively, public–private partnerships are being promoted as a means to reduce the financial burden, promote new technology, ensure timely construction, and achieve operational efficiencies. In line with Thailand's Capital Market Development Master Plan[13] II, which aims to expand the size of the bond market, the country partnership strategy emphasizes that ADB should explore new financial products and credit enhancement instruments, which can be applied to promote public–private partnerships and private investments.

19. The proposed assistance reflects the strategy as it will foster infrastructure development, environmentally sustainable development, and capital market development. The Project will make a contribution to the strategy's implementation by supporting public–private partnerships through the SPP program and by promoting the use of advanced technology and operational efficiencies in renewable energy generation. In addition, the Project furthers the aim of ADB's collaboration with Thailand to identify cost-effective financing strategies and explore innovative ways of financing. ADB's PCG will support the first project bond issue by a renewable energy company in Thailand, and enable the link between local long-term fixed rate investors (life insurance companies and pension funds) and infrastructure projects. ADB's credit enhancement aims to crowd-in local institutional investors in a sustainable way as they become more familiar with investing in clean energy projects.

2. Sector Strategy

20. ADB's energy sector strategy of 2000,[14] which is currently in force, strongly encourages ADB interventions to increase investment in the renewable energy subsector, as well as to increase private sector participation in the energy sector in order to take advantage of the higher operational efficiencies that private operators can achieve and to meet the large capital requirements. The new energy strategy, which is in consultation and is expected to be approved before the end of 2008, requires ADB to place greater focus on meeting energy security and transition to a low-carbon economy. The strategy recommends that ADB's support for renewable sources of electricity should be increased substantially. Through the Carbon Market Initiative under the ADB clean energy and environment program,[15] ADB will also continue to provide assistance in designing projects which are eligible to sell certified emission reductions (CERs) under the CDM, and provide technical assistance to underwrite the transaction costs for CDM registration. The Carbon Market Initiative technical support facility can support projects with preparation of required documentation as well as facilitate the steps in the CDM process up to first issuance of CERs. Furthermore, the Asia Pacific Carbon Fund (APCF), under the Carbon

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there is growing interest among Thai private companies in ADB's new financial products and credit enhancement instruments. Since ADB's resident mission in Thailand was reopened in 2005, the Southeast Asia Department and Private Sector Operations Department have made significant efforts to generate new projects in Thailand, and these are starting to come to fruition.

[12] ADB. 2007. *Country Partnership Strategy (2007–2011): Thailand.* Manila.

[13] ADB. 2007. *Technical Assistance to the Kingdom of Thailand for Supporting the Implementation of the Capital Market Development Master Plan*. Manila (TA 4826).

[14] ADB. 2000. *Energy 2000: Review of the Energy Sector Policy of the Asian Development Bank*. Manila.

[15] ADB. 2007. *Climate Change ADB Programs-Strengthening Mitigation and Adaptation in Asia and the Pacific*. Manila

Market Initiative, can provide cofinancing to a project on an advance payment basis in return for future CERs generated from a CDM project. The proposed Project may benefit from the CMI technical assistance and APCF's assistance. CMI team has constituted a part of the ADB project team from the start of discussions of the Project and has in parallel with ADB loan and PCG discussions worked on the CDM component with the project sponsors (Appendix 3).

3. Strategy 2020

21. ADB's long-term strategic framework (Strategy 2020)[16] emphasizes ADB's support for environmentally sustainable development and private sector development that would expand its promotion of, and investment in, sound environmental management while simultaneously capitalizing on its operational strength, such as infrastructure development and finance. The strategy seeks to meet the region's growing energy demand by helping DMCs to develop their economies using environmentally friendly technologies, specifically addressing energy efficiency and expanding the use of clean energy sources. The strategy also aims to promote a larger role for the private sector in financing infrastructure by supporting public–private partnerships.

IV. THE PROPOSED PROJECT

A. Project Description

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22. The Project will construct and operate a 125 MW biomass power plant using wood chips as fuel. The Project will use circulating fluidized bed (CFB) technology, which provides flexibility to use and combine a wide range of biomass fuels. The Project will be located in the 304 Industrial Park in Prachinburi Province, about 150 kilometers (km) east of Bangkok. The power plant complex will occupy an area of about 2.62 hectares of vacant land adjacent to the existing 328 MW biomass coal-fired power plant of the National Power Supply Company (NPS), an affiliated company. The Project will supply power (90 MW) to EGAT under a 25-year power purchase agreement under the SPP program, as well as to industrial customers in the 304 Industrial Park (21 MW) and internal consumption (14 MW). The Project has arrangements with wood processing industries to ensure adequate fuel supply. The 304 Industrial Park and the suppliers of fuel are affiliated with the Project.

B. Management and Owners

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23. The Project will be developed and operated by Biomass Co, a special-purpose company incorporated in Thailand. The sponsor and majority shareholder of Biomass Co will be a newly formed holding company, the National Power Company (the sponsor), under which the Dumnernchanvanit family of Thailand is grouping its power business. The Dumnernchanvanit family founded and currently controls the Double A Alliance Network (the AA Group), one of the largest conglomerates in Thailand, which is actively involved in, among other things, power generation, agribusiness, pulp and paper production, and industrial park development. Appendix 5 provides a detailed review of the AA Group, the sponsor, and other affiliated companies.

24. The AA Group is the industry leader in renewable energy generation in Thailand. The group owns and operates eight power plants with 494.8 MW of total installed capacity that

[16] ADB. 2008. *Strategy 2020: The Long-Term Strategic Framework of the Asian Development Bank 2008–2020.* Manila.

utilizes biomass as a primary or secondary source of fuel. Biomass-fired generation is a strategic fit with the Thai conglomerate as it (i) supports its pulp and paper and industrial park development business by providing electricity and steam, (ii) recycles biomass waste from its forestry and agricultural businesses as a fuel, and (iii) supports the company's commitment and policy to develop environmentally friendly and sustainable businesses.

C. Implementation Arrangements

1. Power Offtake

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25. Biomass Co will have a gross output of 125 MW. Of the plant output, 90 MW will be sold to EGAT and 21 MW will be sold to industrial customers in the 304 Industrial Park. The auxiliary power consumption of the plant is estimated as 14 MW. Biomass Co has entered into a PPA with EGAT, setting out the terms on which Biomass Co has agreed to develop, construct, finance, operate, and maintain the Project. The PPA is for a term of 25 years from the Project's completion. Under the terms of the PPA, EGAT is required to make (i) capacity payments based on the declared unit capacity issued by Biomass Co,[17] and (ii) energy payments based on energy actually dispatched to EGAT. Due to the Government policy favoring alternative energy, Biomass Co will be entitled to receive the following additional tariff components as monetary subsidy: (i) fuel savings payment, (ii) renewable energy promotion payment, and (iii) renewable energy adder payment.

26. Capacity payments are designed to cover Biomass Co's fixed costs, debt service, and a return on equity. Energy payments cover fuel costs, start-up costs, and variable operating costs. Energy payments are indexed to the coal price, which reflects the cost structure of biomass power plants more closely than the indexation to natural gas (as was the case for earlier biomass SPPs), because substitution between biomass and coal in the cement and power generation industries have caused the prices of various types of biomass to move more in line with the price of imported coal.[18] The PPA is EGAT's standard PPA applied to renewable energy SPPs.

27. In addition to the PPA with EGAT, Biomass Co will enter into a power supply agreement with industrial customers in 304 Industrial Park to sell the remaining capacity (21 MW).

2. Biomass Supply

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28. Biomass Co has entered into a long-term supply contract for eucalyptus waste wood chips and bark with Khan-na and Khet-Thee Company (KKC, an AA Group company) for 12 years from commercial operation date for a quantity of 1 million tons of wood chips. The contracted supply exceeds Biomass Co's requirement for fuel. The supply contract term is longer than the proposed term of the debt facility. The cost of biomass fuel is indexed to the consumer price index. The AA Group is a vertically integrated conglomerate that manages or controls its raw material input from distributing seedlings, to harvesting trees, processing wood chips and waste by-products, transporting, and handling. This inherently gives Biomass Co a

[18] P. Amranand. 2008. *Alternative Energy, Cogeneration and Distributed Generation: Crucial Strategy for Sustainability of Thailand's Energy Sector.* Bangkok.

close relationship with all the parties along the supply chain. Lessons learned from existing biomass power plants have shown that close relationships with fuel suppliers is one of the key success factors for biomass power plants.[19] The biomass supply contract with KKT is expected to be on arms length commercial terms.

29. The AA Group was a pioneer in the introduction of farmed eucalyptus trees in Thailand over 2 decades ago and has developed expertise in producing eucalyptus trees with high yields to supply its growing pulp and paper business. The AA Group has one of the world's largest eucalyptus nurseries for the production of pulp where young seedlings are grown before being distributed to regional farmers; no wood is sourced from natural forests. Over 1 million small farmers have contracts with guaranteed minimum prices with the AA Group to grow and harvest trees. This arrangement provides additional income for small farmers and business opportunities in this relatively poor area of Thailand. The AA Group works closely with its farmers by providing technical assistance and training to ensure the highest yield and return for both parties. In consideration of the lead time of 3–4 years for eucalyptus plantations, the supply of biomass for Biomass Co at start of operations has already been planted in 2007, when AA Group planted 216 million trees. The total amount of eucalyptus trees that will be available in 2010 is equivalent to 10.8 million t. The by-product wood waste from these trees, when processed into wood chips and used for pulp mills, will amply cover the required quantity of fuel for Biomass Co and other biomass power plants of the AA Group.

3. Logistics and Supply Management

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30. Biomass Co is strategically located in the 304 Industrial Park, which is central to Thailand's eucalyptus wood region. The tree plantations are predominantly located within a 200 km radius of the power plant, with a maximum distance of 400 km. The location of the plant near a hub of Thailand's pulp and paper industry provides crucial expertise in wood chips and wood waste handling. When the eucalyptus trees are mature for the pulp process they are cut and stripped of their bark and the logs are then processed through a chipper to produce wood chips. The wood chips are separated by size; chips greater than 6.35 centimeters are suitable for making pulp, while those smaller than this are considered waste and are suitable for biomass fuel. There are hundreds of AA Group debarking and chipping centers scattered throughout the eucalyptus region to serve local farmers. The wood chips and waste bark are then transported to the 304 Industrial Park by an AA Group trucking company via an existing network of all-weather roads. AA Group's fleet of approximately 500 mostly natural gas fueled trucks will be used for the simultaneous collection of pulp wood chips and wood waste, resulting in an efficient supply management system and lower transport cost

4. Construction

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31. The sponsor will construct the Project through various packages. This approach, driven by economics and the AA Group's experience, follows the approach used for the AA Group's two NPS power plants, which also use CFB technology and are located adjacent to the Project.

[19] G. Wiltsee. 2000. *Lessons Learned from Existing Biomass Power Plants.* Oak Ridge, Tennessee: US Department Of Energy (National Renewable Energy Laboratory).

5. Operations and Maintenance

[CONFIDENTIAL INFORMATION HAS BEEN DELETED]

42. Biomass Co will operate the plant in-house. It will enter into a 5-year renewable maintenance services agreement with the Power Plant Maintenance Services Company (PPMC), a company of the AA Group. The AA Group power companies operate and PPMC maintains the power plants within AA Group's portfolio. The AA Group management team has extensive experience in operating both small-scale and large-scale biomass-fired generation plants since 1987. Currently the AA Group operates the largest renewable energy portfolio in Thailand, including five power plants greater than 35 MW that utilize biomass fuels such as wood bark, wood chips, and rice husks.

D. Environmental and Social Aspects

43. The Project is classified as category A under the ADB Environment Policy, and an environmental impact assessment (EIA) was undertaken; its SEIA has been posted on ADB website on 28 February 2008. The EIA was submitted to the Thai Office of Natural Resources and Environmental Policy and Planning (ONEPP) on 22 August 2005, followed by four supplementary documents submittal, the last one on 28 August 2007, to provide additional details. The Project has received environmental clearance from ONEPP. Initiated in response to the energy policy of the Government of Thailand to use renewable resources for electricity generation, the Project is located in an industrial park that is neither ecologically nor culturally sensitive, and does not require land acquisition. Therefore the Project is classified as category C for indigenous peoples and involuntary resettlement.

44. The Project is expected to have insignificant impacts with implementation of the mitigation measures detailed in the Environmental Management Plan (EMP). Mitigation measures include pollution control technologies such as cyclones tow electrostatic precipitators and two bag filters, low combustion temperature in the CFB furnace, and selective non-catalytic reduction of nitrogen dioxide (NO2) using urea to minimize emissions. The Project anticipates emission levels within national standards and those laid out in the World Bank's Pollution Prevention and Abatement Handbook (PPAH) except for TSP. However, the World Bank guidelines are for coal-fired power plants as no specific guidelines are available for biomass power plants. The national standard such as 120 mg/m3 for TSP is considered more appropriate as they are specifically for biomass power plants. The TSP emissions for the maximum use of rice husks were estimated at 68 milligrams (mg)/m^3 and will meet the national standards of 120 mg/m^3. The expected PM emission based on the fuel mix change, and scaled down design is expected to be about 10 mg/Nm^3, which falls within the PPAH limit. A comparison of the Project's estimated emissions during operations with national and World Bank emission standards are presented in Table 4. However, the new fuel mix formula of mostly woodchips and wood bark with less proportion of rice husks and the Project's scaled down design (from 150 MW to 125 MW) are likely to decrease project's expected emissions levels especially TSP.

Table 4: Estimated Emissions during Operations

Fuel Mix (% rice husks, waste wood, and wood chips)	TSP (mg/m^3)		**SO_2** (ppm)	**NO_2** (ppm)
	Normal	**Blowing Soot**		
90, 10, 0	68	108	44	44
75, 25, 0	60	96	43	49
75, 0, 25	58	92	45	41
National emission standard[a]	120		60	200

World Bank guidelines[b]	50	33 tpd[c]	365

mg/m^3 = milligram per cubic meter, NO_2 = nitrogen dioxide, ppm = parts per million, SO_2 = sulfur dioxide, TSP = total suspended particulates.

[a] Standards promulgated by the Ministry of Industry for biomass power plants

[b] For coal-fired power plants.

[c] 0.2 tons per day MW or 33 tons per day for 165 MW.

Sources: EIA Reports, 2005–2007.

45. An environmental management unit (EMU) will be established within the project sponsor's company for effective management of the environmental, health, and safety issues. As part of the EIA, the Project has formulated an EMP, including an environmental monitoring program, which will be implemented by the contractors during construction and by the sponsor as routine and integral activities of project operation. The contractors will provide appropriate training to their workers in environment, safety, and health aspects of construction; and provide necessary protective measures to the workers to minimize safety risks.

46. Public consultation was undertaken which included a public hearing on 9 May 2003 attended by over a thousand participants consisting of representatives of local Government agencies and people from 10 districts. More than 80% of the participants gave positive responses. A tripartite committee consisting of representatives of local government, local community, and the project sponsor will meet monthly to review environmental complaints as relevant. Further surveys were carried out in the study area to understand the attitudes and opinions of the community leaders and local people. While the public consultation was conducted before the requirements of ADB *Public Communications Policy* (2005) was mandated in 2006, the sponsor has nevertheless committed to maximizing the project benefits through demand-driven community development programs such as providing mobile health and medical services. Furthermore, new consultation activities have been organized by the sponsor with neighboring communities and stakeholders in 2008.

E. Development Impact

1. Impact, Outcome, and Output

47. The Project aims to promote sustainable economic development in Thailand through contributions towards achieving minimum-share targets for renewable energy in the generation mix. Biomass-based energy is expected to contribute two thirds of the increase in renewable energy generation. Representing 15% of the planned increase in biomass-based electricity generation in Thailand until 2011, the proposed Project will make a significant contribution to the Government's renewable energy targets. The Project will mitigate significant amounts of greenhouse gas emissions (about 4 million tons of CO2 savings during the first 10 years of operation) and improve energy security by developing indigenous energy sources. In addition, the Project will improve the air quality by cleanly burning agricultural residues, which formerly were left to decay.

48. The Project will provide extra income to over 1 million small farmers from the sale of agricultural waste. There AA Group provides guaranteed prices to farmers and has over 500 farmer support centers in the region, which provide technical assistance to small farmers. These are one-stop shops, which support the farmers in (i) plantation and soil preparation, (ii) seedling production, (iii) technical assistance and training in cultivated forestry management and irrigation techniques, (iv) harvesting and transportation, (iii) guaranteed buying at pre-agreed prices, and (v) replanting of trees.

49. The Project will also catalyze private sector investment in Thailand's renewable energy sector. ADB's PCG will support the first project bond issue by a renewable energy company in Thailand, and enable the link between local currency long-term fixed-rate investors (pension funds and insurance companies) and infrastructure projects. ADB's credit enhancement will crowd in local institutional investors in a sustainable way as they become more familiar with investing in clean energy projects. More information on catalyzing the Thai bond market for infrastructure projects is in Appendix 2. The Project's design and monitoring framework is in Appendix 1.

2. Development Effectiveness

50. The development effectiveness of the Project will be assessed in terms of private sector development, business success, and economic sustainability as per the guidelines for implementing the good-practice standards for evaluation of private sector investment operations,[20] prepared by the evaluation cooperation group of the multilateral development banks. The Project will lead to private sector development by introducing a new source of financing for clean energy projects in Thailand by tapping local currency long-term bond investors. Being the largest private sector biomass power generator in the country, the Project will have a demonstration effect for future private sector investments in biomass power generation. The Project is financially and economically sustainable and also plays a significant role in mitigating greenhouse gas emissions, thus delivering global environmental benefits. The Project also makes a direct contribution to poverty alleviation by providing extra income to over 1 million small farmers. The summary poverty reduction and social strategy is in Appendix 10.

V. PROPOSED ASSISTANCE

A. Loan

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51. The proposed loan of up to $5 million (or its equivalent in baht) will be provided from ADB's ordinary capital resources without government guarantee.

B. Partial Credit Guarantee for the Bond Issue

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52. Biomass Co will be the issuer of the bonds (debentures). Biomass Co plans to issue debentures for a total amount of up to B2.5 billion (approximately $72.9 million). ADB's PCG will guarantee the timely payment of principal.

C. Justification

53. The Project merits ADB's support for the following reasons:

(i) As an integral part of the Government's least-cost power development plan, the Project will provide 90 MW under the SPP program of additional reliable base-load capacity at a competitive power bulk-sale tariff to EGAT to cope with increasing power demand in Thailand.

[20] Multilateral Development Banks Evaluation Cooperation Group. 2006. *Good-Practice Standards for Evaluation of Private Sector Investment Operations – Third Edition*.

(ii) The Project supports the Government's strategy of promoting renewable energy to help meet the Government's target of 8% of all primary commercial energy to come from renewable sources by 2011. The Project represents 90 MW of 335 MW (or 27%) of firm renewable energy contracts approved in the recent SPP solicitation undertaken by EGAT.

(iii) The Project supports efficient generation through CFB technology and decentralization of power generation to serve dedicated industrial load centers, which reduces costly investment in additional transmission.

(iv) The Project supports the Government energy strategy to diversify its energy mix and increase security of supply from national resources. Thailand currently relies heavily on natural gas and lignite to a lesser extent as its major sources of fuel for power generation.

(v) The Project will help reduce poverty by promoting economic growth through supplementing income to farmers selling an agricultural waste product. The project will also increase local employment opportunities as biomass generation is inherently very labor intensive compared to other conventional forms of generation.

(vi) In line with the Government's priorities, the Project helps to encourage more enterprises to settle in the poorer northeastern region as more reliable energy is available. This supports Thailand's Board of Investment (BOI) incentive strategy to encourage more industrial and commercial development in the poorer BOI zone 3 region.

(vii) The Project will promote specific environmental benefits by reducing greenhouse gas emissions and pollutants such sulfur dioxide (SO_2) and nitric oxide (NO_x) by reducing the need to construct fossil-based power generation to meet growing demand. The Project will also provide a good sink for mass amounts of wood waste which is currently burned in an uncontrolled manner producing copious amounts of smoke and pollutants.

(viii) ADB's presence is deemed critical in catalyzing long-term fixed rate baht debt; with the ADB PCG, the Project will be able to obtain a favorable rating and issue a long-term fixed rate baht bond to secure long-term financing that will match the long-term operating period of the Project.

(ix) ADB will assist in developing Thailand's capital markets; investor appetite for long-dated bond issues (i.e., longer than 5 years) is limited to issuers with credit ratings of A+ or above. ADB's PCG will enable the issue of long-term bonds that are targeted to meet the demand of institutional investors, such as life insurance companies and pension/provident funds, and in turn enhance their role as key participants in the development of the Thai capital market. Institutional investors with more expertise and knowledge in investments and capital markets can play a role to promote corporate governance of issuers of capital market instruments.

(x) The Project is consistent with ADB's country partnership strategy for Thailand (2007–2011) where the three core strategic areas of partnership are infrastructure development, capital markets development, and environmentally sustainable development, and ADB's own thematic priorities of private sector

development. Furthermore, the Project is consistent with ADB's present energy sector strategy and the draft revisions thereto.[21]

VI. ASSURANCES

54. Consistent with the Agreement Establishing the Asian Development Bank, the Government will be requested to confirm that it has no objection to the proposed assistance to Biomass Co. No funding will be disbursed until ADB receives such confirmation. ADB will enter into suitable documentation, in form and substance satisfactory to ADB, following approval of the proposed financing by the Board of Directors.

VII. RECOMMENDATION

55. I am satisfied that the proposed loan and partial credit guarantees would comply with the Articles of Agreement of the Asian Development Bank (ADB) and recommend that the Board approve (i) the loan of up to $5,000,000 (or its equivalent in baht) to Biomass Co, without government guarantee, (ii) the partial credit guarantee of bonds issued by Biomass Co of up to B2.5 billion denominated in baht, without government guarantee, from ADB's ordinary capital resources, and (iii) the partial credit guarantee of bonds issued by Biomass Co of up to B1.33 billion denominated in baht, without government guarantee, provided by a bilateral development finance institution under ADB's guarantor-of-record structure, on such other terms and conditions as are substantially in accordance with those set forth in this report, and as may be subsequently reported to the Board.

Haruhiko Kuroda
President

04 December 2008

[21] ADB. Forthcoming. *Energy Strategy 2007–2012.* Manila.

DESIGN AND MONITORING FRAMEWORK

Table A1.1: Design and Monitoring Framework

Design Summary	Performance Targets/Indicators	Data Sources/ Reporting Mechanisms	Assumptions and Risks
Impact Diversification of the energy mix through the addition of renewable energy capacity	8% of primary commercial energy to come from renewable energy by 2011 (increase from 3% in 2005)	Statistics and information disclosed by the Ministry of Energy	**Assumptions** Stable and consistent regulatory policies for the renewable energy sector Demand from EGAT or industrial users is lower than expected
Outcome Increased supply of clean energy sourced from biomass	720 GWh of biomass based electricity delivered to EGAT and 110 GWh delivered to industrial users every year from 2011 for the next 10 years Generation of about 4 million tons of CO_2 savings during the first 10 years of operation At least 500,000 tons/year of agricultural waste is sourced and income paid to small farmers	Biomass Co's reports Statistics and information disclosure by EGAT CDM Executive Board reports	**Assumptions** Plant achieves forecasted availability Offtakers comply with their purchase and payment commitments. **Risks** Cultivated forestry operations are smaller than expected and are insufficient in supplying sufficient fuel for projected generation levels
Outputs 1. Installation and operation of biomass power generating facility and associated infrastructure 2. Bond issuance from a renewable energy company	125 MW of biomass power capacity commissioned at 304 IP by December 2011 Biomass Co's bond issuance successful with 100% subscription	Biomass Co's reports Statistics and information disclosure by EGAT Biomass Co reports and market reports	**Assumptions** Project agreements are adhered to as agreed by third parties. Thailand capital markets remain stable

Activities with Milestones	**Inputs**
1.1. Construction work in progress, as scheduled. 1.2. Commissioning of Biomass Co —February 2012 2.1. Bond documentation and/or loan agreement signed by March 2009 2.2. Bonds successfully sold to local institutional investors by July 2009	Equity from AA Group • B2 billion ADB • $5 million loan • PCG B2.5 billion Bond investors and Lenders • B3.88 billion

ADB = Asian Development Bank, CDM = Clean Development Mechanism, CO_2 = carbon dioxide, GHC = greenhouse gas, EGAT = Electricity Generating Authority of Thailand, MW = megawatt, GWh = gigawatt-hour, O&M = operation and maintenance.

CATALYZING THE THAI BOND MARKET FOR INFRASTRUCTURE DEVELOPMENT

A. Local Currency Bond Financing for Energy Infrastructure

1. For many developing countries the vertically integrated monopoly—where a state utility undertakes all the generation, transmission, and distribution activities—has been the traditional model of the electricity sector. In the past 2 decades, many of these countries have reformed their system by opening access to independent power producers (IPPs) in order to provide generation capacity expansions. This has reduced the financial burden on the state utility and provided one-off competition in the solicitation process.

2. In recent years, developing countries have been encouraging the incorporation of sustainable renewable energy into their generation mix, and much of this generation will be competitively solicited to IPPs or small power producers (SPPs). To provide low-cost generation, IPPs and SPPs will, to a large extent, depend on obtaining competitive sources of financing.

3. IPPs and SPPs have a variety of sources and options when financing energy projects. Equity markets, bond markets, and bank lending represent the three major sources, and these sources can be accessed domestically and internationally. Historically, project companies in developing member counties have had limited access to some of these commercial sources, in particular local currency bonds due to the limitations in the local capital markets.

4. For long-term energy infrastructure projects, local bond financing provides a better match between assets and liabilities and limits exchange rate exposure. Long-term local currency bonds are particularly well-suited to financing infrastructure projects because the project's revenues are earned in local currency and over the long term. In addition, bonds are issued at a fixed coupon instead of at variable interest rates, and therefore reduce the interest rate risk faced by project companies. The challenge for Southeast Asia is to develop robust bond markets that offer competitively priced products in order to meet the large and growing demand for infrastructure projects like energy generation.

5. The success of regional capital markets can be measured by the confidence level of market participants. Despite many initiatives and successes in building bond markets in Southeast Asia, many of these markets remain small, relatively illiquid, and still possess contractual, political, and regulatory risks. Local currency bonds cannot yet provide the long-term tenor required for infrastructure finance. It is important to continue fostering and promoting these infant markets, and in due course they will become vibrant and attractive sources of capital that will play a pivotal role in financing infrastructure projects, much as they do in developed economies.

B. Thailand's Bond Market

6. Since the 1997 Asian financial crisis, the volume of domestic baht bond issuance has increased substantially. The more regular issuance and more active trading of government bonds, coupled with the development of the legal framework and market infrastructure, helped spur the issuance of corporate bonds. Most corporate bonds have a tenor of up to 5 years. Only the issuers with a strong credit rating of A+ or above can issue long-dated bonds with a maturity of more than 5 years. Government bonds continue to dominate, making up about two-thirds of

all bonds issued. Government debt obligations have increased over four times since 2000, while corporate debt obligations outstanding have only doubled.

7. There are two main reasons for this trend. Firstly, the Government bond market itself suffers from a lack of supply of suitable bonds to create the critical transaction volume for a liquid and efficiently priced benchmark yield curve. Without an efficient reference curve, the pricing of corporate debt obligations also remains inefficient and uncompetitive. Secondly, the limited usage of derivatives makes it hard for both issuers and investors to hedge unwanted risks. Investors demand a premium to assume long-term corporate debt obligations in illiquid markets where they cannot hedge effectively.

8. Insurance companies, pension funds, mutual funds, and other collective savings vehicles have grown rapidly, which has created good demand for investible assets, but only for the most highly rated issues such as those from the Government. On the other hand, corporate entities and projects have to rely on funding from banks because long-term funding from the capital markets is largely unavailable to them.

9. Current infrastructure financing requirements provide Thailand with a unique opportunity to increase the range and sophistication of financial products, as well as to strengthen the existing policy and regulatory framework. Thailand's diversification from a predominantly bank-based system of financial intermediation will expand alternative sources of credit, thereby also limiting systemic risks. By stimulating healthy competition with the banking sector, a vibrant capital market can lower financing costs for all borrowers.

C. Bridging the Gap

10. Growth in renewable energy infrastructure in Thailand will increase with improvements in technology, favorable Government policies, and the ability to tap the country's vast biomass potential. Large-scale biomass-fired plants are capital-intensive, offer predictable revenue streams, and are considered to be the most viable renewable energy projects in Thailand. Although many biomass projects may be technically and commercially viable, some of these projects may never be implemented because of difficulties finding suitable long-term financing.

11. The Asian Development Bank (ADB) can act as a catalyst for long-term local currency bonds for infrastructure projects through its partial credit guarantee program. ADB's partial credit guarantee for local project bonds will provide issuers with an enhanced credit rating, which will attract local institutional investors who limit their investments to only credit ratings of A+ or above. By partially guaranteeing the bonds, ADB allows these projects to tap the local institutional investors markets, and at the same time offers new investible assets to the undersupplied market of long-dated high-quality issues (i.e., longer than 5 years).

12. The renewable energy project receives lower financing costs, limited foreign exchange risk, and is able to match long-term financing with the long-term operating period of the project. Thailand benefits by further developing its capital markets and becoming closer to meeting its clean energy targets. Moreover, assisting clean energy projects seeking local bond financing through partial credit guarantees will (i) boost investor confidence in the Asian bond market as local institutions become familiar with the asset class, and (ii) encourage renewable energy development and help Thailand to meet its clear energy targets.

ASSISTANCE TO THE PROJECT BY ADB'S CARBON MARKET INITIATIVE

A. Carbon Market Initiative

1. The Carbon Market Initiative (CMI) is one of the Asian Development Bank's (ADB) initiatives under its Clean Energy and Environment Program. It is an innovative financing scheme that supports the development of clean energy, energy efficiency, and greenhouse gas abatement projects in developing countries in the Asia and Pacific region that are eligible under the Clean Development Mechanism (CDM) of the Kyoto Protocol. It builds upon, and adds value to, ADB's sustainable development focus in core public and private financing activities. The CMI offers to provide

(i) up-front carbon cofinancing against purchases of 25%–50% of certified emission reductions (CERs) generated up to and including 2012 through the Asia Pacific Carbon Fund (APCF);
(ii) comprehensive technical support, including project design document development and registration up to the issuance of first year CERs through the technical support facility;
(iii) flexibility and access to open market for remaining CERs which are not purchased by the Asia Pacific Carbon Fund through the credit marketing facility; and
(iv) up-front carbon cofinancing against purchases of CERs generated post-2012 through the Future Carbon Fund.

1. The Asia Pacific Carbon Fund

2. The APCF is a commercial trust fund to which seven European sovereign states are participating with a total of $152 million; ADB is the trustee for the fund. The objectives of the fund are to (i) increase the volume of clean energy and energy efficiency projects with greenhouse gas abatement potential in developing Asia and Pacific, (ii) assist fund participants satisfy Kyoto Protocol targets, and (iii) catalyze investment and energy access in the Asia and Pacific region. APCF purchases CERs from CDM projects in ADB's developing member countries, and seeks to procure CERs from a diverse pool of technologies and countries in the region.

2. Technical Support Facility

3. The technical support facility is based on grant money, supplied partially from the same countries participating in the fund. As such, the support is provided to the projects at no cost to the client. The technical support facility supports ADB projects eligible for CDM with support in the project preparation phase, project execution, and commercialization.

3. Carbon Marketing Facility

4. The carbon marketing facility is grant-based assistance offered to the client for the sale of credits not purchased by the fund to facilitate project completion. Buyers of CERs will bid for CERs offered under a competitive process to achieve the best prices and terms for the client.

4. Future Carbon Fund

5. The Future Carbon Fund has been established to pre-purchase future carbon credits (post-2012) from projects supported by ADB financing and the CMI. The fund was approved by the ADB Board on 4 July 2008, and is scheduled to become operational in January 2009. The Future Carbon Fund will become the fourth component of the CMI.

B. ADB Carbon Market Initiative Cooperation with Biomass Co

6. The ADB CMI offers to cofinance by purchasing CERs generated from Biomass Co and offers to support the client through the CDM process.

7. The CMI APCF may purchase 50% of future generated emission reductions up to and including 2012 on an advance payment basis. The advance payment would be made after the Project is successfully registered as a CDM project. The Project is estimated to generate around 400,000 tons of carbon dioxide (CO_2) emission reductions every year. The crediting period for issuing CERs is 10 years, starting in 2012. For the APCF this implies a 2-year generation period of CERs.

8. The CMI technical support facility may support the project with preparation of required documentation as well as with the steps in the CDM process up to first issuance of CERs. This support would include (i) guidance on which CDM methodology to use, (ii) preparing the project design document, (iii) seeking approval from the host government, and (iv) support (through project validation) with project registration, structuring of a monitoring plan over emission reductions, and through first year verification and issuance of CERs.

9. The project has the option to sell the remaining 50% of the CERs from the project through the CMI carbon marketing facility.

10. ADB has also established the Future Carbon Fund, which is to be in operation from January 2009. This fund may purchase future CERs being generated by the project post-2012.

SUMMARY POVERTY REDUCTION AND SOCIAL STRATEGY

Country/Project Title: Thailand: Biomass Power Project			
Lending/Financing Modality:	Partial Credit Guarantee and Loan	Department/ Division:	Private Sector Operations Department Infrastructure Finance Division 2

I. POVERTY ANALYSIS AND STRATEGY

A. Linkages to the National Poverty Reduction Strategy and Country Partnership Strategy

1. Based on the country poverty assessment, the country partnership strategy, and the sector analysis, describes how the project would directly or indirectly contribute to poverty reduction and how it is linked to the poverty reduction strategy of the partner country.

The Project is consistent with ADB's country partnership strategy for Thailand 2007–2011 where the three core strategic areas of partnership are infrastructure development, capital markets development, and environmentally sustainable development, and ADB's own thematic priorities of private sector development. Furthermore, the project is consistent with ADB's present Energy Sector Strategy (2000) and the draft revisions thereto (Energy Strategy 2007–2012). The project is expected to indirectly help reduce poverty by promoting economic growth through supplementing income to farmers selling agricultural waste products and increasing employment opportunities in rural regions.

B. Poverty Analysis **Targeting Classification: GI**

1. Key Issues

The project will help alleviate unmet power demand in the poorer northeastern region of Thailand. By providing reliable power supply, the project is expected to encourage more enterprises to settle in the area, thereby stimulating economic growth and creating opportunities for employment and business. The project also encourages hiring of local labor during the construction phase of the project, thus providing income-earning opportunities.

2. Design Features. The Project will construct and operate a 125-megawatt (MW) biomass power plant using wood waste products (wood chips and wood bark). The use of wood waste products as fuel will generate additional income to over 1 million small farmers from the sale of agricultural wastes to the plant. The project will encourage hiring of local labor during the construction phase, thus providing income-earning opportunities.

C. Poverty Impact Analysis for Policy-Based Lending

1. Discuss the impact channels of the policy reform(s) (direct and indirect, short and medium term) to the country and major groups affected. N/A
2. Discuss the impact of the policy reform(s) on vulnerable groups and ways to address it/them. N/A
3. Discuss how the policy reform(s) contribute(s) to poverty reduction, pro-poor growth, and the MDGs. N/A

II. SOCIAL ANALYSIS AND STRATEGY

A. Findings of Social Analysis

The project will indirectly improve the socioeconomic condition of the poorer northeastern regions of Thailand by stimulating economic growth and generating additional income to small farmers. With respect to land requirements, vacant land inside the industrial park will be used, and therefore no land acquisition and involuntary resettlement impacts are expected. The project is also not expected to affect any ethnic minorities and was categorized as C with respect to ADB's *Policy on Indigenous Peoples* (1998).

During construction, a maximum of about 300 workers will be employed. About half or more of the required workers will be recruited from nearby areas to minimize the need for temporary worker accommodation. As the construction site is in the 304 Industrial Park, social and cultural conflicts with local residents are not expected. During operation, about 83 people will be employed and will reside in residential areas near the 304 Industrial Park. Therefore, no social and cultural conflicts with local residents will result. The construction workers and power plant personnel will create demand for food and services, thus benefiting the local economy.

B. Consultation and Participation

1. What level of consultation and participation (C&P) is envisaged during the project implementation and monitoring?
☒ Information sharing ☒ Consultation ☐ Collaborative decision making ☐ Empowerment

2. Was a C&P plan prepared? ☐ Yes ☒ No
If a C&P plan was prepared, describe key features and resources provided to implement the plan (including budget, consultant input, etc.). If no, explain why. Public consultation was undertaken, which included a public hearing on 9 May 2003 attended by over 1,000 participants consisting of representatives of local government agencies and people from 10 districts. More than 80% of the participants gave positive responses. A tripartite committee consisting of representatives of local government, the local community, and the project sponsor will meet monthly to review environmental complaints as relevant. Further surveys were carried out in the study area to understand the attitudes and opinions of the community leaders and local people. While the public consultation was conducted before the requirements of ADB *Public Communications Policy* (2005) was mandated in 2005, the sponsor has nevertheless committed to maximizing the project benefits through demand-driven community development programs such as providing mobile health and medical services.

C. Gender and Development

1. Key Issues. The biomass power plant will be constructed inside an industrial park. Power generated by the plant will be sold to the Electricity Generating Authority of Thailand and to consumers inside the industrial park. The project is not expected to cause any specific cultural or social impact or exclude any socioeconomic group, including women, from benefiting from the project.

2. Key Actions. Measures included in the design to promote gender equality and women's empowerment—access to and use of relevant services, resources, assets, or opportunities and participation in decision-making process:
☐ Gender plan ☐ Other actions/measures ☒ No action/measure

Summarize key design features of the gender plan or other gender-related actions/measures, including performance targets, monitorable indicators, resource allocation, and implementation arrangements.

III. SOCIAL SAFEGUARD ISSUES AND OTHER SOCIAL RISKS

Issue	Significant/Limited/ No Impact	Strategy to Address Issue	Plan or Other Measures Included in Design
Involuntary Resettlement	No impact. The power plant complex will occupy an area of about 2.62 hectares of vacant land inside 304 Industrial Park.	None	☐ Full Plan ☐ Short Plan ☐ Resettlement Framework ☒ No Action
Indigenous Peoples	No impact	None	☐ Plan ☐ Other Action ☐ Indigenous Peoples Framework ☒ No Action
Labor ☒ Employment opportunities ☐ Labor retrenchment ☒ Core labor standards	Plant construction and operation will provide employment opportunities to qualified local population. Employment arrangements will comply with employment and labor standards as provided in the applicable laws and regulations.	None	☐ Plan ☐ Other Action ☒ No Action
Affordability	No impact. Power will be sold to the Electricity Generating Authority of Thailand and to commercial consumers inside the industrial park.	None	☐ Action ☒ No Action
Other Risks and/or Vulnerabilities ☐HIV/AIDS ☐Human trafficking ☐Others(conflict, political instability, etc), please specify	No impact	None	☐ Plan ☐ Other Action ☒ No Action

IV. MONITORING AND EVALUATION
Are social indicators included in the design and monitoring framework to facilitate monitoring of social development activities and/or social impacts during project implementation? ☐ Yes ☒ No