GrIPP-Net News

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Editorial

The GrIPP Network has completed another milestone when we successfully conducted our second region workshop last March at the Risoe National Laboratory in Roskilde. Invited speakers with experiences in investing in Southeast East Asian (SEA) projects discussed important and interesting topics on projects for power generation in the region. The participants gained more insights on the development of renewable energy like hydropower, wind and biomass and for launching projects in SEA. A lively exchange of ideas and experiences also resulted from the presentations in the main sessions (see summary of proceedings). The program as well as the papers presented during the workshop can be downloaded from our website.

After the workshop, the project partners met to discuss the Network's accomplishments as well as the future activities. One of the next milestones of the project is the launching of the developed databases. On the project website, databases with information about technology and resources, policy instruments in SEA and financing sources will be implemented in the next months. In addition, the partners firmed up preparations for the third regional workshop, which will be held on 25-26 September 2003 in Amsterdam, the Netherlands. ECN will spearhead the affair. More details about this workshop will be provided in our website as well as in our next newsletter.

Meanwhile, as part of the Network's continuing activities, this fifth issue of the newsletter features the important topic project structures and financing sources. The first article provides a background on the development of green IPPs in Southeast Asia. Some examples on existing project structures and financing are shown. The second article deals with the current structure of projects in CDM as financing source for SEA. The expected prices for the mitigation of CO_2 are compared with transaction costs of CDM projects. In addition, risks arising from CDM projects are shown.

The *GrIPP Net Newsletter*, the official publication of the Green IPP Network, is published quarterly to communicate network activites and to support the dissemination of relevant information and network results. It is provided free to network members and interested stakeholders, and can be downloaded from this site: www.ASEM-GreenIPPnetwork.net.

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Second Regional Workshop

"Renewable Energy Development in Southeast Asia— European Experiences and Perspectives"
27-28 March 2003; Roskilde, Denmark

Summary of proceedings

The second regional workshop of the ASEM Green IPP Network was successfully held on 27-28 March 2003 at Risoe National Laboratory in Roskilde, Denmark. The dual objectives of this workshop are, first, to present European perspectives and experiences in different fields linked to the Green IPP issue and, second, to review business opportunities and market conditions in Southeast Asia.

Special emphasis was placed on the discussion of opportunities and barriers under the changed market conditions in the energy sector. Issues such as Emission Trading, Joint Implementation and Clean Development Mechanisms are key features of the new market conditions that Green IPPs are operating within. Hence, they make up an important part of the framework—and the business opportunities—for Green IPP activities in connection with the project. Therefore, Session 1 of the workshop focused on these subjects from an European perspective.

In Session 2, the market conditions (macroeconomics, power systems and markets, prices, investment climates, policies, regulatory instruments, etc.) and opportunities in the Southeast Asian market were illustrated by Southeast Asian parties—each focusing on one of the three competence centres of the project. On this background, Session 3 addressed experiences of European parties working with projects and investments in Asia.

Finally, the perspectives linked to European developments in renewable energy were illustrated. What is being done to promote Green IPPs projects in Europe and with what results? What difficulties do Green IPPs encounter (e.g., with power system integration) and what experiences have been gained trying to surmount these difficulties? To what extent are these experiences transferable to Southeast Asia?

On the morning of second day of the workshop there was a site visit to two wind power plants in the central Copenhagen area. One of the wind farm is onshore (inaugurated in 1996) while the other is an off-shore park (from 2001). In spite of

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Inside

Project Structure and Financing of Green IPPs in SEA

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Introduction

The active promotion of Green IPPs in Southeast Asia started in the Philippines with Executive Order 215 in 1987, allowing private sector participation in power generation including from renewable energy sources, and the Mini-Hydro Incentives Act in 1991, allowing construction and operation of mini- and small hydropower by the private sector. In 1992, Thailand launched the small power producers (SPP) program to connect to the grid power plants under 90 MW. In 2002, to encourage more Green IPPs, the program selected 31 renewable SPPs (mostly using biomass) to receive tariff subsidies. Malaysia and Indonesia recently launched similar programs following the success of the SPPs in Thailand. In Malaysia, the Small Renewable Power program (SREP) was launched in May 2001 to promote grid-connected renewable energy. The program will buy renewable energy capacity under 5 MW on a "willing seller, willing buyer, take and pay" basis. In Indonesia, the Small Power Purchase Law announced in June 2002 guarantees purchase by PLN, the national utility, of electricity generated by small power producers up to 1 MW using non-conventional energy sources.

From corporate to project finance

Corporate (or on-balance sheet) finance is the traditional means of financing investments. It involves issuance of shares of stocks or bonds or internal reserves, but in most cases raising debt based on the full corporate strength of the borrower at a price that reflects the creditworthiness of the borrower [Gonzales and Carlos, 2002]. Project finance, on the other hand, is a means of raising fund in which equity shareholders rely primarily on project revenues for their return on investment and creditors, for interest payments and recovery of principal. In principle, projects developed in the framework of project finance rely more on the creditworthiness of the project than the creditworthiness of the sponsors.

Thailand's introduction of tariff subsidies for new renewable SPPs has caused a shift from the traditional corporate (or balance sheet) finance to the more innovative project finance in new projects that could be indicative of parallel trends in the other countries in the Southeast Asian region. The high availability of renewable energy resources—biomass (including agro-industrial residues), hydropower, and wind—and the supporting policies to promote their exploitation and development are both driving this trend (see previous issues of the *GrIPP-Net News*).

Since the Small Power Producers (SPP) program of Thailand started about 10 years ago, 23 of the 50 projects selling excess power to the national grid have run on renewable energy (mostly from bagasse).*

Seventeen of the 23 renewable SPPs currently operating and selling to the grid are bagasse-fired power plants. These have a total installed capacity of 365.5 MW and selling to the grid 88.7 MW. According to a study commissioned by the then National Energy Policy Office (NEPO, now EPPO, Energy Planning and Policy Office under the new Ministry of Energy), sugar mills are usually inefficient in producing energy, as their power requirements are small compared to the amount of energy their bagasse can produce [Hvid and Timilsina, 1998]. The SPP program opened opportunities for efficiency improvements financed by electricity sales.

The typical structure of a power plant that is fuelled by bagasse supplied by an adjacent sugar mill is shown in Figure 1.1. The power plant, which is owned by and integrated to the sugar mill, produces electricity and heat for the sugar mill and sells excess electricity to the grid. Based on the interviews conducted, since the start of the SPP program the sugar mill has invested on efficiency improvements on the power plant to be able to sell excess electricity to the grid. These investments are usually financed by corporate borrowings from local commercial banks at the rate of 50 to 100% of the investment costs; the difference is financed from the sugar mill's balance sheet or internal cash generation. In Thailand, banks lend to their agro-industrial customers to finance investments in renewable power projects based on their long-term relationship with their client and not exactly on the merit of the project.

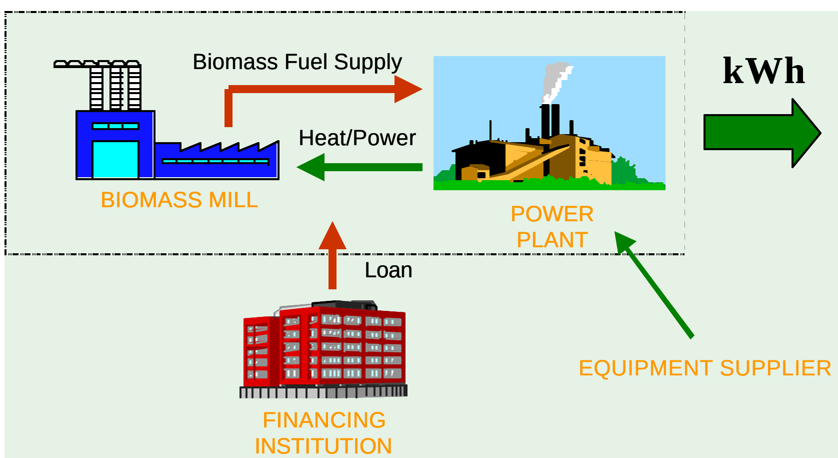

Figure 1.1. Structure of balance-sheet financed Green IPP

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* However, the total installed capacity of these renewable SPPs represents only 15% of the total from the 50 SPPs. Moreover, only three of these 23 renewable SPPs have firm contracts with the national utility, that is, receiving both energy and capacity payments for a contractual period of more than five years. The rest have non-firm contracts, that is, receiving energy payments only for a contractual period of less than five years.

In 2001, the government called for bids for 300 MW from renewable SPPs that will receive 5-year tariff subsidy of up to Bt0.36 per kWh (0.9 US cents/kWh) sold to the grid. The following year, the government approved in principle 31 projects (out of more than 50 proposals) that would receive the tariff subsidy. These projects have a total installed capacity of more than 800 MW and would sell to the grid around 500 MW. Twenty of these 31 projects are designed to have firm contracts.

The recent round of tariff subsidies created opportunities for setting up special project companies that will develop the power plant in the framework of project finance. The 5-year tariff subsidies averaged Bt0.15-0.18 per kWh and amount to almost Bt3 billion (USD71 million). The project developers and sponsors interviewed said that the tariff subsidy would not significantly improve project IRR or ROE considering the much longer contractual period of 20-25 years (power purchase agreement or PPA). However, the subsidy will provide much needed cash relief during the first five years of the project.

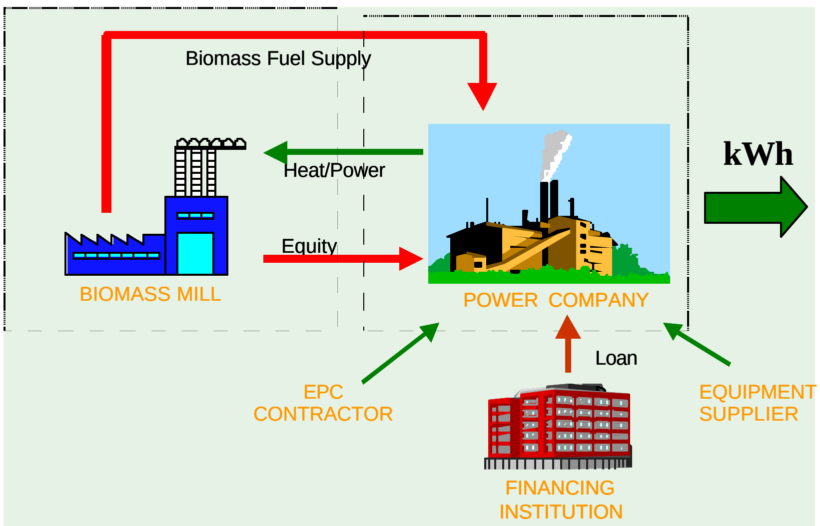

Figure 1.2: Structure of project financed Green IPP supplied by a single biomass mill

With the subsidy, two distinct basic project structures have emerged as far as fuel supply is concerned. The first is shown in Figure 1.2. In this case, the special project company that will develop the power plant is put up by the sugar mill or rice mill that will supply all its residues to the power plant in exchange for steam and electricity sales; excess electricity is sold to the grid. To finance the project, the biomass mill provides the equity portion, while debt is provided by local commercial banks. The typical debt-to-equity ratio for this kind of project is 3:1.

The second arrangement consists of a special project company put up by a project developer, this time dissociated from a biomass mill but with some experience in power project development. In this case, fuel supply is arranged with a number of biomass residue producers that in some cases also hold a small equity portion in the project. This project structure is illustrated in Figure 1.3. Local financing institutions provide up to 70-80% of investment costs. In Thailand, for example, Gulf Electric, which has an interest in a controversial coal IPP, and Asia Plywood Co. are developing a 23-MW rubber wood residue plant in southern Thailand. The two companies created a special purpose company called Gulf Yala Green to undertake the project. Asia Plywood will supply about 40% of the fuel requirements of the power plant through a subsidiary, Yala Waste, that in turn will have fuel supply agreements with other sawmills to supply the remaining wood residue requirements. Gulf Electric and Yala Waste will provide the 30% equity financing, while Gulf Electric is talking with a local bank for the remaining 70%. In Malaysia, Bumibiopower Holdings joint ventured with a palm oil mill to develop a 5.2-MW palm oil waste-fired power plant in Perak. The joint venture company will provide 25% of project cost as equity contribution, while the remaining 75% will be borrowed on "limited time full recourse" basis from local banks.

Financing Green IPPs

Despite the policy push in many countries in SEA to promote Green IPPs (and the positive developments in Thailand following the announcement of the tariff subsidy), financing remains among the biggest hurdle in the development of Green IPPs [Lacrosse, 2002]. For example in the Philippines, the financial setting is not supportive to small and mini-hydro project development: long-term loans for this kind of projects are not available, the rates applied by development banks are near commercial rates, and commercial banks charge even higher rates and require parent company guarantee [Ronquillo, 2002]. The reasons are interrelated. Firstly, developing renewable energy or Green IPP projects remains more expensive than

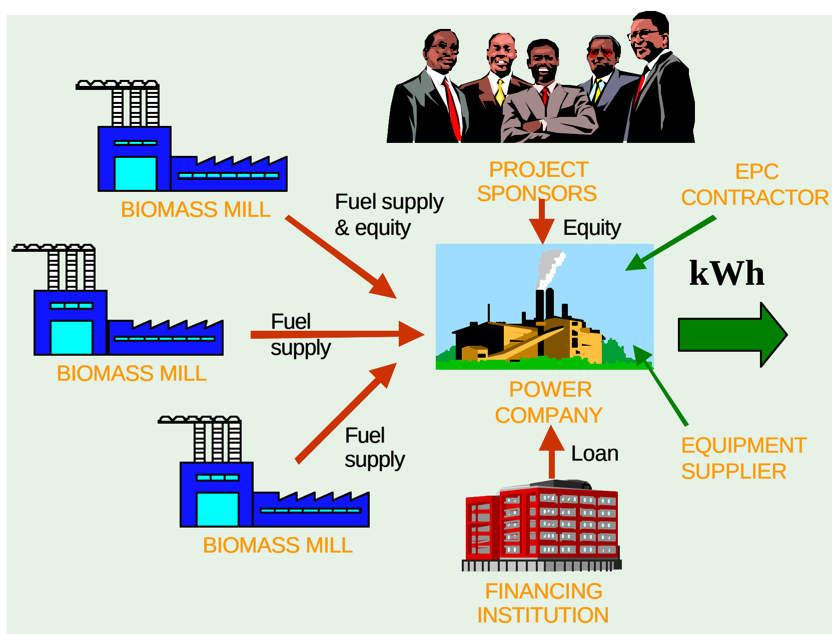

Figure 1.3: Structure project financed Green IPP supplied by many biomass mills

conventional power projects. For example, the project design document of the 23-MW rubber wood residue plant in Yala, Thailand, says it costs more to develop the Green IPP project than a conventional power project five times its size.

Secondly, there is limited experience in developing Green IPP projects. EC ASEAN Cogen interviewed a few project developers/sponsors and financial executives in Malaysia and Thailand, and most of those interviewed cite the lack of expertise in packaging this kind of projects and unfamiliarity with the renewable energy technology as the most important barriers in the development and financing of renewable energy projects [Gonzales and Carlos, 2002]. On one hand, small-scale project developers lack the in-house expertise to look for funds, prepare the financial plan of the project, and negotiate with lenders to obtain the most favourable financing terms. On the other hand, financial institutions lack the human resource and experience in evaluating renewable energy projects. For example, commercial banks in Thailand have been involved with conventional IPP projects but lack "real" exposure in renewable power projects developed in the framework of project financed.

Thirdly, obtaining financing for Green IPPs is not easy because of the persistent perceived and real high risks associated with biomass fuels in particular and to a lesser extent "real" risks of renewable energy technology in general. Banks, for instance, prefer that fuel suppliers take equity stakes in the project or that project sponsors themselves are the source of the renewable energy fuel like agricultural residues. One source of this perception is the difficulty in transporting this fuel especially if it comes from several fuel suppliers. Another is the seasonality associated with biomass fuels like agricultural residues, the productiion of which is not steady throughout the year or not all year-round.

The main motivation in lending to Green IPP projects is the long-term relationship banks have established with their clients, which decided to undertake a Green IPP. To minimize the risks associated with fuel supply, financial institutions require long-term fuel supply contracts.

However, the ease or difficulty in securing long-term fuel supply contract tends also to depend on the structure of the project. Securing long-term fuel supply contract is not a problem in situations where the power project is supplied by fuels exclusively from a rice or sugar mill that put up the power plant for its own consumption of electricity and steam and to earn extra revenue from selling excess electricity to the grid. Complications arise when project developers have to deal with independent fuel suppliers. The complications are magnified when project developers have to deal with many biomass residue producers. One rice-husk power developer interviewed, for example, has to deal with more than 100 small-, medium, and large-scale rice mills. To date, negotiations with these rice millers have already run to six years! But even dealing with few fuel suppliers remain a challenge because of their lack of experience in forging a long-term fuel supply contract that requires steady a supply of the biomass residues from eight to 25 years. According to the developers interviewed, instead of putting penalties for non-compliance or non-delivery of residues, they establish good and firm relations with fuel suppliers. The large-scale mills are invited to invest in the power project in terms of equity stakes, even minimal, in the special project company. Giving the fuel suppliers a sense of ownership will hopefully minimize the risk of unsteady fuel supply.

CDM—a financing opportunity?

In theory, the clean development mechanism (CDM) has been conceived to offer financing relief for energy projects, among others, that are otherwise unattractive for private financing. Through the CDM, emission reductions generated from Green IPP projects can be sold and provide additional cash inflows to the project that can cover a portion of the financing requirements. And the market for selling "carbon credits" is rapidly developing at the moment. In principle, emission reduction sales, depending on the price of carbon reductions, can also increase the financial performance or viability of the project.

In Thailand, at least three Green IPP projects are serious candidates for CDM. They are in the process of project validation, a step in the CDM process. One is the 23-MW Yala rubber wood residue plant that would sell 60,000 tonnes of CO_2 (tCO_2) per year; another is the 48-MW Mitr Phol bagasse power plant that would mitigate 270,000 tCO_2 per year; and the third is the 5x22 MW A.T. Biopower rice husk power project that would sell 430,000 tCO_2 per year.

Banks, however, do not count the cashflow from the sale of emission reductions in evaluating few projects that are up for CDM evaluation. Most investors are also not counting the potential for revenue from the sale of carbon credits. For them, the prospect for CDM remains blurred to be seriously considered. Those that did are backed by project sponsors that want to gain experience in CDM, but not really to benefit from it financially. In Thailand and in some other countries, there is still uncertainty as to the government's stand on CDM, causing investors to downplay, if not ignore, its potential.

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CDM as financing source for projects in SEA

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Introduction

Introducing restrictive emission ceilings at enterprise level as well as implementing an international emission trading system in which enterprises receive tradable emission permits for the basket of six greenhouse gases (GHG) as determined in the Kyoto Protocol would have a considerable impact on the production planning of business firms, especially in energy intensive sectors (electricity and heat production, iron and steel, refining, etc.). With the Clean Development Mechanism (CDM) of the Kyoto Protocol, new investment possibilities arise for European investors in Non-Annex 1 countries like those in Southeast Asia (SEA). Within this article, the CDM as a financing source for projects in SEA will be discussed. The article starts presenting expected prices per tonne CO_2, which have been ascertained by various research institutes and consultant companies. Due to the fact that CDM projects will only be realised if their production costs plus their transaction costs are lower than these prices, some estimations on transaction costs are given. Finally, risks arising from CDM projects will be shown and examples and types of other financing sources will be presented.

Financial viability of CDM projects

By means of the market-based Kyoto Mechanisms Joint Implementation (JI), Clean Development Mechanism (CDM) and International Emissions Trading (IET), it will be possible to trade emissions permits globally. Demand will be driven by the emission reduction commitments of industrialized countries and countries with economies in transition, the group of so-called Annex 1 countries. This emerging global market will offer challenging opportunities to a wide variety of different players in industry and business.

While for environmental taxes, the price is fixed through the states, for flexible instruments within the Kyoto Protocol the price will be achieved through the certificate market and hence will be economically optimal. Market participants can decide whether they buy certificates or implement reduction measures by themselves. Measures with negative CO_2 avoidance costs, so called no regret-actions, are economically profitable and should be chosen (see Figure 2.1).

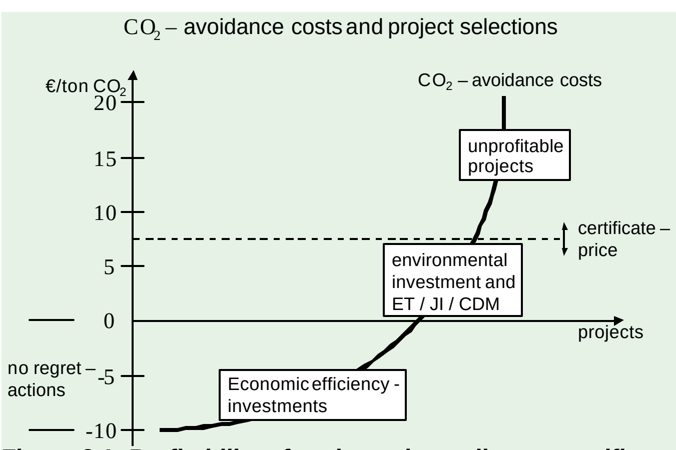

Figure 2.1: Profitability of projects depending on certificate price

Environmental protection projects, where the CO_2 avoidance costs are below the market price of the emission certificate, should also be implemented, because the costs for the environmental investment can be achieved or regained through flexible instruments. Projects with higher CO_2 avoidance costs will not be realised due to the fact that the buying of certificates is cheaper. Profitability of projects and with this project selection depends on the price for a tonne CO_2. Due to the fact that the three flexible mechanism create the same good (reduction of CO_2), the price for this traded good will be the same independent from the source and the market where it is traded on. But what will be the price for emission certificates? Some models and exemplary trading systems try to determine the prices for certificates (see Table 2.1). These estimates for CO_2 emission certificates vary widely. The minimum price is 4 USD/tCO_2, calculated by a model of ECN, and the maximum price is 22 USD/tCO_2. Bearing in mind that the prices calculated within these models depend on different assumptions and system boundaries (like e.g. a model for the whole world in comparison with a model for Europe), this wide price range is understandable.

Summarising these values and other prognoses, CO_2-certificate prices in Europe will be at about 15 Euro / tonne

Models	Price per tonne CO2 (USD)	Source
AIM	12	[Kainuma et al. 2000]
ECN	4	[Sijm et al. 2000]
EPPA	8	[Ellerman et al. 1999]
G-Cubed	7	[McKibbin et al. 1999]
GEM-E3	8	[Capros 1999]
GRAPE	13	[Kurosawa et al. 1999]
GREEN	7	[Mensbrugghe 1998]
PERSEUS	14	[Enzensberger 2003]
MERGE	22	[Manne & Richels 1999]
MS-MRT	10	[Springer 2000]
POLES	6	[Criqui & Viguier 2000]
RICE-98	5	[Nordhaus & Boyer 1999]
ZEW	13	[Böhringer 2000]

Table 2.1: Permit Prices in Emission Trading

CO_2 in the first commitment period. Due to higher reduction targets they will be higher in the following commitment periods.

Transaction costs

As early as 1937 Coase defined transaction costs to be the costs that arise from initiating and completing transactions. In the context of the Kyoto Mechanisms, transaction costs are caused by the administrative process and thus depend on the institutional framework. In principle, transaction costs of CDM projects can be differentiated into transaction costs arising from undertaking projects in developing countries and transaction costs arising from undertaking a project under the CDM framework. Furthermore, transaction costs accrue at different stages in the process of a transaction or project cycle (see Table 2.2).

In the following, we will focus on transaction costs arising from undertaking a project under the CDM framework, because the emerging structure of the CDM envisages a series of formalities and institutional hurdles that a project has to overcome in order to be officially regarded as a CDM initiative and be credited with Certified Emissions Reductions (CERs). This set of institutional requirements or stages, known as the CDM 'project cycle', is designed to ensure the environmental integrity of the CDM and a degree of comparability between CDM initiatives. These stages include the preparation of a project design document, gaining host country approval, validation of the design document by an independent third party or operational entity (OE), registration of the project with the CDM Executive Board and, following project implementation, the verification and certification of the claimed emissions reductions.

Transaction costs could have a significant impact on whether CERs add to the viability of a project. Undertaking a project under CDM framework will only be viable if the costs of transacting the CERs are substantially lower than the revenue they will generate. In Table 2.3 transaction costs for a typical electricity generation projects are shown.

When considering the financial viability of a project, lenders and investors are particularly interested in assessing the cash flows over the first few years of operation. This is the most critical period when attempting to attract finance. The impact of the first 5 years CER transaction costs in relation to the revenues over that period is shown in Table 2.4. Even if the operational transaction costs (Table 2.3 section B-Operational Phase Costs and Table 2.4) will only be of relevance if the project is considered viable based on pre-operational costs, they are also shown in Table 2.4. Project developers generally expect up-front costs to be no more than 5-7%. Having in mind that search costs (for seeking out possible investors for the selected CDM project) are not included in the calculation, they have to be added to the general up front cost. In the example shown in Table 2.4, the up front costs in percent of the emission reduction value are much higher (11,9-17,8%) than 5-7%. Therefore, this project would probably not be tenable under CDM aspects, especially as search costs would augment this figure. If the project would achieve a CO_2 reduction of about 80.000 tons, the up front costs in percent of the emission reduction value would come down to 5-7%. So, this example demonstrates a first pre-calculation for projects in SEA, whether they should start efforts to get CDM as financing source by comparing transaction costs with the value of emission reductions.

Transaction Cost Components	Description
Project based (JI,CDM): Pre-implementation	
Search costs	Costs incurred by investors and hosts as they seek out partners for mutually advantageous projects
Negotiation costs	Includes those costs incurred in the preparation of the project design document that also documents assignment and scheduling of benefits over the project time period. It also includes public consultation with key stakeholders
Baseline determination costs	Development of a baseline (consultancy)
Approval costs	Costs of authorization from host country
Validation costs	Review and revision of project design document by operational entity
Review costs	Costs of reviewing a validation document
Registration costs	Registration by UNFCCC Executive Board / JI Supervisory Committee
Project based (JI,CDM): Implementation	
Monitoring costs	Costs to collect data
Verification costs	Cost to hire an operational entity and to report to the UNFCCC Executive Board /Supervisory Committee
Review costs	Costs of reviewing a verification
Certification costs	Issuance of Certified Emission Reductions (CERs for CDM) and Emission Reduction Units (ERUs for JI) by UNFCCC Executive Board / Supervisory Committee
Enforcement costs	Includes costs of administrative and legal measures incurred in the event of departure from the agreed transaction
Trading	
Transfer costs	Brokerage costs
Registration costs	Costs to hold an account in national registry

Table 2.2: Transaction cost components
Source: Michaelowa 2003

It is also possible to determine the minimum amount of CERs that have to be generated, so that this project is viable in regard to the up front costs. In addition, the estimated

CDM Emission Reduction (CER)	
Project Cycle	**Estimate of Cost (USD)**
A) Up-front (pre-operational) Costs:	
1. CER Feasibility Assessment	12,000 - 20,000
2. Monitoring & Verification Plan	5,000 - 20,000
3. Registration	10,000
4. Validation	10,000 -15,000
5. Legal Work	20,000 – 25,000
Total Up-front Costs:	57,000 – 90,000
B) Operational Phase Costs:	
1. Sale of CERs:	Success fee in region of 5-10% of CER value. Higher for a small project than a large project
2. Risk Mitigation	1-3% of CER value yearly. Mitigation against loss of incremental ER value as a consequence of project risk.
3. Monitoring and Verification	USD 3,000 - 15,000 per year

Table 2.3: Estimates of transaction costs
Source: Harmelink 2001

Year	*1*	*...*	*5*
Emission Reductions (tCO2)	30.000	...	30.000
Value of Emission Reductions (Price 4 USD/tCO2)	120.000	...	120.000
Present Value of CERs (Discount rate 6%)	505.484		
	Minimum	*Maximun*	
Up Front costs	57.000	90.000	
Up Front costs as a % of emission reduction value	11,9%	17,8%	
Operational costs			
Monitoring and Verification	15.000		15.000
Risk Mitigation	3.600		3.600
Sales of CERs	12.000		12.000
Total Operational costs	30.600		30.600
Present value of total costs	128.898		

Table 2.4: Revenue and transaction costs

certificate price can be varied. However, it should be noted that the above analysis does not take into account other potential costs (administration charge, …) as well as risks in relation to CDM.

Risks in relation to CDM and risk management

To identify the different risk factors that could affect the value of CDM projects it is useful to distinguish between different categories of sources of uncertainty (see also Table 2.5).

Economic risks

Price Uncertainty of Emission Credits
Even assuming the existence of a liquid market for emissions credits, there remains the unpredictability of future prices and market development.

Creditability
Liabilities associated with credit quality are likely to be assumed by the buyer as it is for other existing tradable commodities like grain, minerals, etc. The credibility and reliability of the seller will largely determine the credit quality, and thus the price.

Policy risks

Ratification of the Protocol
With or without ratification of the Protocol, CER value can be reflected through domestic regimes in purchaser countries that accept the CER value of a particular project or project type.

Restrictions on Credit Use
The capping of the amount of emission reductions that Annex 1 countries can recognize through the flexible mechanisms could impact the value of particular CDM investments.

Eligible Energy Activities Under CDM
It remains unclear which types of energy activities will be eligible for emissions crediting under CDM.

Implementation of the Protocol
Different countries will perhaps implement their Kyoto ratification requirements in different ways, in accordance with their own national objectives and priorities. This could impact the viability of projects that fall outside those considerations.

Host Country Approval
CDM projects require host country approval.

Legal Aspects
In most countries, legalities relating to the allocation of carbon property rights, establishment of title, and carbon asset sales have not yet been addressed.

Political and Country Risks
This is an important area where conventional risks associated with cross border investment are evaluated for a country's strengths, weaknesses and areas of potential concern.

Technological risks

Uncertain emission factors
Considerable uncertainties about the amount of actual emissions due to random quality of fuel inputs or stochastic weather variables such as wind and rain and other environmental factors.

Uncertain activity levels
Emission level may vary due to fluctuations in production and uncertain product demand.

Measurement uncertainties
Even if emission level is not random, measurement errors in monitoring may give rise to an uncertain level of emissions that is ultimately certified or recognized by a regulatory authority.

Table 2.5: Types of risks
Source: Harmelink 2001

Economic risks: Immature market status, price risks and range of transactions structures for carbon assets.

Policy risks: Uncertainties in the Kyoto process and its implementation for the international and national context.

Technological risks: Technological risks are tied to the process of production. They imply uncertain output quantities. In the present context, technological risks imply uncertain quantities of emission reductions achieved.

Risks can be dealt through allocation to a party in the project structure, or it can be transferred out to third parties through risk mitigation products. This also applies to the CER asset, which can be guaranteed and insured against non-performance or under-performance. In the private insurance sector, companies are now providing carbon credit risk transfer services. In the next years, products for risk mitigation in relation to the flexible instruments will probably occur more and more on the market.

Investment vehicles for CDM and carbon funds in practice

Until now, no market for CDM projects or CERs is established. But there are some initiatives, that are investing in CDM projects and buying CERs, like CERUPT. Through CERUPT, the Netherlands Certified Emission Reduction Unit Procurement Tender, the Netherlands wants to implement CDM by providing funds for acquisition of CERs. Responsibility for CDM in The Netherlands is with the Minister of Housing, Spatial Planning and the Environment. The Minister has appointed Senter as tendering authority for CERUPT. Within the first CERUPT program in 2001 an average price of 4,8 EUR/tCO_2 has been paid. Comparing this price with the estimated certificate price for the first commitment period of about 15 EUR/tCO_2 shows promising chances for CDM projects depending on the project specific transaction costs.

On the “carbon market”, some financing sources have been already launched or announced (see [Janssen 2002]):

- World Bank’s Prototype carbon fund (http://www.prototypecarbonfund.com/)
- Dexia-FondElec Energy Efficiency and Emission Reduction Fund (http://www.fondelec.com/)
- Clean Energy Fund sponsored by D&B Capital (http://www.cleanenergyfund.org/)
- Renewable Energy and Energy Efficiency Fund initiated by the International Finance Corporation (http://www.ifc.org/enviro/EFG/index.html)
- Other financial institutions including Credit Lyonnais and UBS have announced plans to launch indirect investment vehicles aimed at generating GHG emission permits
- There also exist some renewable energy funds including Merril Lynch’s New Energy Technology Fund. So far, these funds have not announced any intentions to capture directly the value of GHG emission permits.

ASEM Green IPP network activities in this field

Within the ASEM Green IPP network a database about financing sources in the field of renewable energy projects will be established on the website, where more information about the above delineated carbon funds can be found. This database will be an inventory of lenders and investors who provide finance to the renewable energy and energy efficiency sectors. The project members hope it will assist the growing market of Green IPPs by lowering the cost to access information on available capital providers. This database will be designed to help investors and project developers seeking capital, as well as investors looking for financing vehicles in the renewable energy sectors.

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Calendar of Events

2003 International Conference on Energy and Environment
22 - 24 May 2003, Shanghai, China
URL: http://www.usst.edu.cn/2003ICEE/icee.htm

2003 European Geothermal Conference 2003
25 - 30 May 2003; Szeged, Hungary
URL: http://www.diamond-congress.hu/egc2003

International Cogeneration, Combined Cycle & Environment Conference & Exhibition
26 - 27 May 2003; Swissotel, Istanbul, Turkey
URL: http://www.icciconference.com/techinfo.asp

2003 Cogeneration Weeks in ASEAN
27 - 29 May 2003, Singapore
URL: http://cogen3.cogen3.com

ISES World Congress 2003 (The 26th Solar World Congress of International Solar Energy Society
14 - 19 June 2003, Svenska Mässan Congress Center, Göteborg, Sweden
URL: http://www.congrex.com/ISES2003/

2003 European Wind Energy Conference
16 - 20 June 2003; Madrid, Spain
URL: http://www.ewea.org/

PoweRisk 2003
Developing Key Risk Mitigation Strategies To Lower Exposure And Increase Returns To Your Asian Power Investments)
25 - 26 June 2003; Nikko Hotel, Kuala Lumpur, Malaysia
URL: http://www.iqpc.com.sg/AS-594/AEN

Waterpower XIII: Advancing Technology for Sustainable Energy
29 - 31 July 2003, Buffalo Convention Center, New York
URL: http://www.hcipub.com/wp/index.asp

Power Generation World 2003
18 - 20 August 2003, Sydney Convention & Exhibition Centre, Sydney, Australia
URL: http://www.powergenerationworld.com/2003/powergen_AU/index.asp?&T1=9/4/2003&T1=9/4/2003

More conferences, seminars and exhibitions related to Green IPPs can be found in our website.

SECOND REGIONAL WORKSHOP *............ continued from page 1*

this, the two parks are located adjacent to each other. Both of these farms are owned partly by the utility, Copenhagen Energy, and partly by individual shareholders. The site visit included a presentation by Niels Lund of KMEK (the Copenhagen Environmental and Energy Advisory Office) on the background of the wind farms, such as project organisation, financing and technology selection.

The proceedings and presentations of the workshop are available at the project website (www.asem-greenippnetwork.net).

In the News

Netherlands Approves 18 Climate Projects

On March 13, 2003, Pieter van Geel, State Secretary for Housing, Spatial Planning and the Environment, the Nethrlands, has approved 18 climate projects in developing countries, aiming to cut CO2 emissions by over 16 megatons. The Netherlands will buy these reductions and use them to meet part of its own reduction commitments. All 18 projects focus on sustainable energy and clean technologies and will take place in Bolivia, Brazil, China, Costa Rica, El Salvador, India, Indonesia, Jamaica and Panama. The projects were selected in the context of the Clean Development Mechanism (CDM) as set out in the Kyoto Protocol on climate change. With the approval of 18 projects the contracting phase of the CERUPT tender is completed. These projects will now be submitted to the CDM Executive Board of the United Nations Convention on Climate Change (UNFCCC), for approval and registration, so that transaction of emission reductions can take place.
Source: Senter International <http://www.senter.nl/asp/page.asp?id=i001381&alias=erupt>

Malaysia Goes for Mini Hydro Power Plants

The Ministry of Energy in Kuala Lumpur has approved four mini hydro power projects in peninsular Malaysia being developed by local company Ingress. The proposed plants have a total capacity of 4.8MW, and development must start by the end of January 2005. The projects still need a generation license and a power purchase agreement to be finalised before they can go ahead.
Source: Renewable Energy World (March-April 2003), via ACE <http://www.aseanenergy.org>

Two Bioenergy Plants for Thailand

Alstom Power has been awarded contracts for two large scale bioenergy plants in Thailand. The two 40-MW plants being developed for Mitr Phol Sugar Corporation will both be fired by bagasse, rice husks and other wood waste. They will provide process steam and power to nearby sugar mills, and sell surplus electricity to national grid. Based on a similar design to a plant in Queensland, Australia, the facilities should be operational early in 2004.
Source: Renewable Energy World (March-April 2003), via ACE <http://www.aseanenergy.org>

Uni. of Karlsruhe Builds Biogas Combustion Burner

As part of a combined project to investigate the economic advantages of biogas and solar power electricity, the University of Karlsruhe, Germany, has designed and constructed a biogas combustion burner. As part of the drive to reduce costs from €11.000/kW to €5.000/kW (US$12.000/kW to US$5.453/kW), a biogas combustion engine was developed to provide electricity in poor weather conditions. The Biogas Swirl combustion engine is set to provide a more stabilized level of electrical generation. Swirl combustion burners are able to operate on propane, natural gas and biogas.
Source: Solar Access, 02 April 2003 <http://www.solar-access.com>