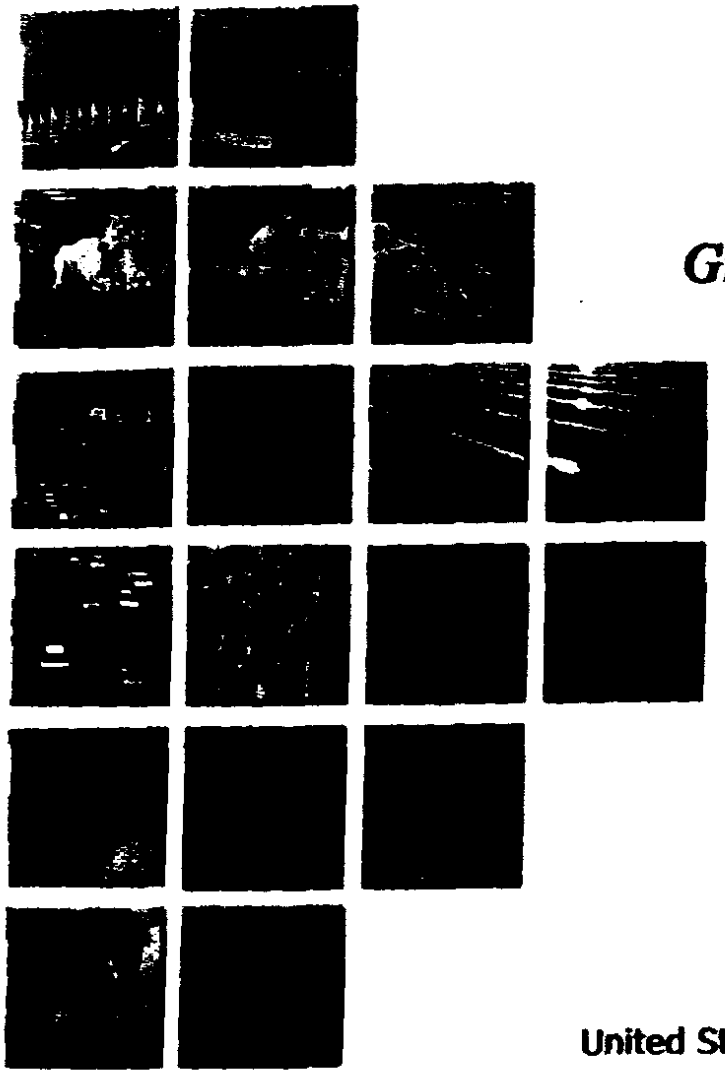
PN-ACY-132

CLIN 1: Fostering Climate Change Initiatives for Sustainable Development

Subtask 1.D Train the Trainer Program: Core Center Staff Trained/Certified as Training Providers



Greenhouse Gas Pollution Prevention Project - Climate Change Supplement

A Program of the:
United States Agency for International Development / India Mission

Implemented by:
The Louis Berger Group, Inc.
Global Environment Team

THE Louis Berger Group, INC.
2300 N Street, NW
Washington, DC 20037 USA

The Louis Berger Group, Inc.
Contract No. 386-C-00-00-00058-00
Sandeep Tandon, CTO

A Report on Capacity Building Activities to Foster Climate Change Initiatives for Sustainable Development

Part 1:
A Training on "Establishing Proficient Project Financial Analysis and Structuring Capabilities" for Development Alternatives

And

Part 2:
"Climate Change and Clean Energy Technology Curriculum Development" for the Lal Bahadur Shastri National Academy of Administration

Greenhouse Gas Pollution Prevention Project
Climate Change Supplement (GEP-CCS)
The Louis Berger Group, Inc.

Submitted as the Deliverable for:
CLIN 1: Fostering Climate Change Initiatives for Sustainable Development
Subtask 1D: Train The Trainer Program: Core Center Staff Trained/Certified

May 13, 2002

INTRODUCTION TO THIS REPORT

Contract Line Item (CLIN) 1 Subtask 1D of the USAID-India Greenhouse Gas Pollution Prevention Project-Climate Change Supplement (GEP-CCS) contract includes activities that work towards two outcomes: the capacity building for two previously established Climate Change Centers, and addressing climate change training needs in the curriculum of the Government of India primary training academy, the Lal Bahadur Shastri National Academy of Administration (LBSNAA).

Subtask 1D was effectively divided into two components – the first being the building of capacity at Development Alternatives (DA) to provide climate change project services and using its expertise to train other stakeholders to do the same, and the second being the development of curriculum for use by LBSNAA and training their faculty in the use and delivery of the curriculum.

The first component with DA was completed via a training conducted on February 25-26, 2002, entitled, "*Climate Change Center Project Development Training: Establishing Proficient Project Financial Analysis and Structuring Capabilities.*" Part one of this deliverable report includes an overview of this activity and its outcomes. The second component on development of curriculum and training of trainers at LBSNAA is the subject of Part 2 of this Subtask 1D deliverable report.

This report presents outcomes and conclusions from the respective trainings, and provides as annexes the actual training materials that were created. This report completes LBG's contractual requirement under Contract Subtask 1D.

PART I

"ESTABLISHING PROFICIENT PROJECT FINANCIAL ANALYSIS AND STRUCTURING CAPABILITIES"
FOR THE CLIMATE CHANGE CENTER AT DEVELOPMENT ALTERNATIVES

February 25-26, New Delhi

CLIMATE CHANGE CENTER - PROJECT DEVELOPMENT TRAINING

EXECUTIVE SUMMARY

The Louis Berger Group, Inc. conducted a training program entitled *Climate Change Center Project Development Training: Establishing Proficient Project Financial Analysis and Structuring Capabilities* during February 25-26, 2002 in New Delhi. The program was conducted as part of the Greenhouse Gas Pollution Prevention Project - Climate Change Supplement (GEP-CCS) capacity building activities.

The training program was intended to further build the ability of the Climate Change Center (CCC) at Development Alternatives (DA) to deliver value added services to diverse climate change mitigation project Developers. The content of the training was developed in collaboration with DA wherein LBG and DA discussed gaps in the CCC's capabilities and designed training content to fill those gaps. Just as importantly, LBG wanted to facilitate relationships between DA and key Indian financial institutions (FIs) as a means of giving DA concrete exposure to key issues that local FIs consider in making project finance decisions.

The trainers for the program were drawn from two premier and influential financial institutions ICICI and IDFC who maintain active clean energy project portfolios. The training was designed to utilize live case studies to apply topical project development themes and complex issues.

BACKGROUND OF CCC CAPACITY BUILDING ACTIVITY

GEP-CCS was designed, in part, to build the capacity of two CCCs at Development Alternatives (DA) and the Confederation of Indian Industry (CII), respectively, to deliver efficient climate change facilitation and project brokerage services. As a large industry association, CII provides services to medium to large-scale industry and the power sector. DA, a progressive NGO, works with small and medium entrepreneurs and on rural development. These CCCs, over time, would be staffed and trained with officers who would provide services to their respective clientele to identify, develop and structure bankable GHG mitigation projects as well as to conduct climate change related outreach activities.

As an initial measurement of the technical depth and institutional capacity of each CCC, GEP-CCS conducted a training needs assessment (TNA) in August 2000. The TNA identified the following capacity building needs:

1. Access to outside review of Climate Change Mitigation Projects (CCMPs) in pipeline
2. Increased analytical and technical evaluation skills
3. Establish potential "menu" of services for CCC clientele:
   - Project Advocate Services
   - Project Evaluation Services
   - Information Clearinghouse
   - General Business Services
4. Develop protocols on baseline and additionality for existing projects
5. Develop knowledge of carbon valuing and accounting
6. Represent India and select projects internationally for financing and showcasing

The TNA process established the foundation for designing a CCC capacity building strategy, which focused on:

- Development of baseline accounting computational toolkits for CCC staff (CLIN 1C)
- Targeted climate change project finance training for core CCC staff (CLIN 1D)

Over time, the senior decision maker of the CCC at CII decided that it would not focus on developing capability in CCMP development or services to its clients. Rather, that it would focus its efforts climate change policy, especially in collaboration with the Government of India (GOI). DA, on the other hand, decided to build its CCC capabilities in CCMP project structuring in anticipation of an emerging opportunity to provide such services.

DA and GEP-CCS have been working jointly on various activities relating to project development capacity building. DA participated in the first GEP-CCS FI training program and DA and LBG jointly organized a Project Developers workshop and a roundtable on renewable energy. Most importantly, DA and LBG collaborated on the development of five GHG mitigation projects. Through these series of activities, the DA staff developed skills in overall project development.

The CLIN 1, Subtask 1D activity provided the opportunity for LBG to further build DA's abilities while ensuring that the activity was targeted to deliver the highest possible impact. Though DA had already built its skills, LBG and DA worked together to identify remaining gaps in DA's capabilities in CCMP project development, structuring, and finance issues in order to design a training program with the necessary impact.

LBG and DA recognized that while it would be important to gain international perspective on CCMP development, chiefly Indian FIs rather than international interests would finance the projects that DA is most likely to develop over the short term. The major gaps in DA's understanding and experience in this context pertained to their lack of ability to assess project promoter strengths and ability to take up a project, need for better evaluation of project financials through initial due diligence, inadequate understanding of project contracts and familiarity with environmental and social analysis and risk analysis. It was, therefore, decided to focus on these aspects in the training program and to bring in trainers from key Indian FIs to provide their perspectives on these issues. The desired outcome was to help DA better understand the key factors that Indian FIs consider when making project finance decisions.

PROCEEDINGS AT THE TRAINING PROGRAM

On the Day 1, during the inaugural session, Mr. Ron Sissem Chief of Party, GEP-CCS provided the background, needs and approach of GEP-CCS in capacity building and cooperation with the DA CCC. Mr. John Smith-Sreen, Deputy Director, E^3 USAID provided his perspectives on CCC development. Mr. Anil Malhotra informed about ICICI's perspective towards development and assistance to GHG mitigation projects.

Mr. Virender Dhir of ICICI made the first technical presentation on appraising the project promoter company for its resourcefulness and experience in implementing projects. He went on to discuss the important parameters of a project, including market issues and the relationships between inputs, outputs and cash generation potential. He also reviewed and described how project contracts are used to reduce risk to FI investments.

Mr. Vinod Hari of IDFC brought out the importance of risk appraisal using a case study that focused on issues faced by project developers and investors. The case helped DA to better

understand the risks faced by infrastructure projects and by recourse-based projects. Vinod highlighted the mitigation measures that are typically used to effectively ameliorate project risks.

Ms. Bharti Solanky of IDFC guided the participants through the steps in conducting environmental and social appraisal of projects, especially infrastructure projects. DA was particularly interested in this particular aspect as it very strongly relates to DA's organizational efforts to promote sustainable development. DA has recognized the need to integrate environment and social appraisals into projects as related costs and benefits are not often accounted for in determining the viability and sustainability of projects.

Vinay Deodhar of LBG provided the background and function of the Detailed Project Report (DPR) Worksheet tool developed by LBG for GEP-CCS. The purpose of this tool is to condense much more lengthy DPR documents and business plans into more manageable and comparable format. Many of the DPR worksheets are no more than 15-20 pages in length. The purpose of this exercise was to focus DA on the key information inputs that FIs focus on to assess project viability; the DPR Worksheet was designed to do just that.

On the Day 2, Mr. Mohan Kumar of IDFC discussed the project appraisal process further with the help of a case of a municipal solid waste biomethanation cum power generation project. He discussed how the project risks were identified, quantified and addressed. Mr. Deodhar later detailed out the GHG analysis of the same project, wherein the baseline development, GHG mitigation potential identification, monitoring and verification design and integration with the financial analysis of the project was discussed.

Each of the sessions was highly interactive. DA staff raised questions, asked for clarifications and for the basis of FI decision-making on various issues. Many questions were framed based on the experience that DA has gained as part of its relationship with GEP-CCS. This fact illustrated that DA staff has been building on its experience and has gained well-grounded understanding of CCMP development, structuring, and finance issues.

CONCLUSIONS AND NEXT STEPS

DA staff expressed great interest in developing its skills in the use of finance evaluation tools used in project evaluation and development. The depth and nature of questions by the staff reflected a significant increase in its sophistication and understanding. This was particularly true during the last technical session on the integration of GHG analyses into the project financial analysis process.

The last and final session on Day 2 was a brainstorming session, which allowed DA staff to share their experiences, and to discuss how project development as an activity could establish the CCC as a sustainable venture within DA's overall mission. It was agreed that defining the specific service that DA would offer clients under this activity would be critical to this undertaking.

Issues regarding the types of market niches, and specific pricing policies to be pursued were also highlighted, especially as it relates to DA's overall institutional mission. LBG suggested that a valuable activity under CLIN 1, Subtask 1E could be a collaborative effort to build a business development plan for the CCC that would give it specific direction and milestones for building its financial sustainability. This plan would be central for assessing the "trade offs" that may be involved for the CCC in attaining institutional sustainability, and that of continuing to service its present client base at current levels, recognizing that financial

During this period, NSDART indicated the possibility of testing curriculum in December or January at LBSNAA by delivering it in a lower level training program. As a result, LBG began to target this timeframe for completing curriculum. LBG also retained the Credit Rating Information Services of India Limited (CRISIL) of India as a sub-consultant who would prepare the climate change curriculum under the guidance of LBG. The scope of work was based on assumption supported by USAID and NSDART that curriculum would be developed only for the In-Service level training courses. A contract was signed in October 2001 based on indications from NSDART and USAID that the draft curriculum materials targeted at In-Service level trainees should be completed by mid-December.

Given the large scope of the topics to be considered for a broad curriculum development effort and the relatively narrow scope of topics to be addressed by GEP-CCS (climate change and clean energy), USAID procured the services of the International Institute for Education (IIE) to prepare other power sector specific curriculum modules.

On November 7, 2001 all of the partners in the curriculum development effort gathered at USAID for a half-day meeting. LBSNAA and NSDART as well as USAID, LBG, IIE and several sub-consultants retained by LBG and/or IIE attended. The number of curriculum modules was defined based on a consolidation of the topics, as was the content and structure for each module. It was proposed that modules be designed so they could be collapsed or expanded to respond to the length of time available for their delivery at any type of course at LBSNAA. Timelines were discussed and focused on a desire to test the curriculum in a class at LBSNAA. Over the next month or two, LBG and CRISIL worked to develop information to include in a more detailed climate change/clean energy technology module.

Over the next few weeks, NSDART decided that an effort should not be made to complete a draft module in December. No subsequent completion date was suggested at that time. Rather, in subsequent months, the scope and target audience for the modules became more fluid. In fact, the focus began to change to preparing modules for the FC course rather than the In-Service level as a FC beginning in spring would provide an opportunity to test the materials. However, doing so meant that the focus of the module would be less technical as the audience would be much different than an In-Service course. Still, the time that would be allotted by LBSNAA for delivering the material from the five total modules was not defined – this made it difficult to determine how much material should be developed.

In conversations between USAID and LBSNAA, a decision was made to review the scaled down version of the modules with LBSNAA faculty and NSDART in Delhi on March 20, 2002. LBG organized a one-day workshop at the India Habitat Center for this purpose. LBG and CRISIL had revised and condensed information from the preliminary draft module for the In-Service course (as of yet not fully completed) to include in the FC module, as the FC module would require a very different approach than an In-Service oriented curriculum. The general response from LBSNAA and NSDART was that the materials were too complicated and technical for the FC level and that they needed to be simplified and condensed. As a next step, it was decided that the USAID/IIE/LBG team would come to Mussoorie May 6-9 to review the revised FC modules with faculty, possibly conduct a Train-the-Trainers event and test the modules in the on-going FC course.

On May 6th, LBG and CRISIL continued to refine and condense the climate change/clean energy technology module. LBG and CRISIL put efforts to continue developing a detailed module for the In-Service level on hold, as it was still unclear about how or when this module would be needed or how much time would be available for delivering it.

From May 6-9, the USAID team (USAID E3, LBG, IIE and associated sub consultants) held meetings at LBSNAA with the Academic Council and Faculty over the first two days, then delivered the FC module to FC trainees on the third day. During the first meeting, LBG and IIE presented "snapshots" of the FC modules to the Academic Council. Their overall response was positive and reflected their recognition that much work had gone into the curriculum development effort to date. Regarding the climate change/clean energy module, several useful comments were made, including the need to incorporate non-project/non-technology specific approaches to mitigation, such as forestry and land use management.

Meetings with the AC on the second day resulted in new information on the scope and depth of curriculum development for which LBSNAA was interested. By the end of the day, it was agreed that USAID's assistance can and should extend to all five levels of training conducted, including the FC, Phase I/II PC, the IC and the two levels of In-Service courses. Furthermore, a three-day Train the Trainers event was agreed on for delivery in August 2002. The Table below illustrates the range of courses and dates as well as the number of hours for each course the combined power/energy/climate change topics will be allotted. LBSNAA has also agreed to identify a nodal faculty person who will be responsible for delivering the curriculum to the FC and possibly IC courses and coordinating experts to deliver the material in more advanced courses.

Course Name	Duration	Likely time allotted to Energy & Environment Module	Tentative date of courses in calendar year 2002
Foundation Course	3 Months	3 Hours	Sept 2-Dec 13, 2002
Phase I Professional Course	24 Weeks	8 hours (two forenoon sessions) Also to give list of questions that the participants could cover in the winter break visit to utilities.	Starts Dec 14, 2002
Phase II Professional Course	6 weeks	2 Hrs	June 17-26, 2002
Induction Courses	8 weeks	4 Hrs	July 1 –Aug 23, 2002 & Nov 4 – Dec 27, 2002
In service (6-9 years)	4 weeks	Nil	Aug 26 – Sept 6, 2002 & Sept 30 – Oct 11, 2002
In service (17-20 years)	2 weeks	6 hrs (theme specific)	Sept 9-20, 2002 & Oct 21 – Nov 1, 2002

On the third day, May 8, 2002, IIE and LBG delivered their respective modules to the FC trainees. The Academy inserted the module in the 71st Foundation Course as "Energy and Environmental Issues" with a code PA-53-56. The Course was in progress from March 4-June 14 2002 and had newly recruited officers from the following Indian Services: Economic, Statistical, Postal, Police and others. The modules on power sector, reform & restructuring and DSM were delivered by IIE team comprising Mr. Romir Chatterjee, Mr. Govind Rao, Mr. D. K. Roy and Mr. S. K. Chowdhury. Mr. Hemant Joshi and Mr. Vinay Deodhar delivered the presentations on Climate Change and Clean Energy Technologies.

The Participants showed keen interest in the module and raised many issues that led to further discussions. The response to the GEP-CCS modules was quite encouraging even as the subject was very new to most of the participants. The feedback received by LBSNAA on its online system was quite positive. The course coordinator or the Academy suggested no

specific additions or changes. The subsequent discussions among USAID team concluded that the presentations were a good first start. However, there were some repetitions especially in the power sector module due to independent work by sub-consultants, which needed to be streamlined.

On the fourth day, discussions were held between, IIE, GEP-CCS and LBSNAA for detailing the next steps, especially the Train the Trainer Workshop. It was tentatively agreed to hold this on the first fortnight of August 2002 at the National Institute of Administrative Research (NIAR, formerly, NSDART). Furthermore, it was decided to prepare the tentative schedule of topics by June 1, 2002, using the IIE team and jointly identifying trainers to be drawn from LBSNAA, NIAR, and several states' Administrative Training Institutes (ATI). This workshop will enable transitioning the module to the Academy in the near future.

OUTCOMES, SUBMISSIONS AND RECOMMENDATIONS

As a result of the May 6-9 meetings, it is clear that LBSNAA is not only interested in, but has embraced USAID's technical assistance for supporting the development and delivery of training on power sector, energy and climate change issues. A longer term relationship is evolving – a highly desirable outcome. USAID and LBSNAA have agreed on a framework for carrying the curriculum development and training support effort forward that is likely to extend into 2003.

The need to respond to LBSNAA's needs over time did result in several changes in level of effort and objectives for LBG's assistance under GEP-CCS. What was originally conceived of as a defined, limited effort evolved into a somewhat open-ended activity. Given LBG's contractual constraints, namely level of effort and deliverable deadline for the LBSNAA initiative, LBG would not be in a position to respond to the expanded scope of technical assistance that was agreed on during the May 6-9 meetings unless resources that are external to the GEP-CCS contract are made available for this purpose. LBG would like to support this expanded effort and stands prepared to do so should such resources be allocated by USAID.

As agreed by USAID, LBG has submitted the attached curriculum module for the FC (please refer to Annex 4) as the deliverable under the LBSNAA component of CLIN 1, Subtask 1D. The module meets LBSNAA's basic needs in terms of content and format and can and will be used as the basis for the FC course. Several minor modifications to the module were made as a result of input during the May 6-9 meetings.

Annex 1

Agenda for the DA Climate Change Center Training
"Establishing Proficient Project Financial Analysis and Structuring Capabilities"

CLIMATE CHANGE CENTERS' PROJECT DEVELOPMENT TRAINING

Establishing Proficient Project Financial Analysis and Structuring Capabilities

Organized by: The Louis Berger Group, Inc./ Greenhouse Pollution Prevention Project, under auspices of USAID/India

February 25 – 26, 2002
Presidential Suite, 12th Floor, Hotel Park Royal, New Delhi

Monday, February 25, 2002

Day 1: Traditional Finance - Understanding the Fundamentals of Project Finance

9:30 am — Welcome and Introductions

9:35 am — **Strengthening CCCs for the Future**
- Mr. Ron Sissem, Chief of Party, GEP-CCS

9:45 am — **USAID perspective on CCC training**
- Mr. John Smith-Sreen, Deputy Director, E^3, USAID/India

9:55 am — **Innovative Finance for GHG mitigation Projects: ICICI Perspective**
- Mr. Anil Malhotra, Chief Manager, ICICI Ltd.

10:00 am — **Analyzing a Company's Annual Report and Performance: *What do the Numbers Really Say?***
- Mr. Virendra Dhir, Manager ICICI Ltd.

The participants will be led through an exercise by reviewing a company's annual report and "reading between the lines" in examining significant corporate or project financial information. The session will also employ strategies to deem represented project information credible and accurate.

11:00 am — Tea/Coffee Break

11:15 am — **Project Financial Analysis**
- Mr. Virendra Dhir, Manager ICICI Ltd.

Employing representative case studies, the session will focus on providing participants an understanding of analysis of cash flow, ratios and sensitivity.

12:15 pm — **Analysis of Important Project Contracts**
Mr. Virendra Dhir, Manager ICICI Ltd., with inputs from Vinay Deodhar, LBG

Key clauses of important project contracts like Engineering Procurement & Construction, Operations & Maintenance and Shareholders' Agreement, Power Purchase Agreement and Fuel Supply Agreement will be briefly analyzed

1:00 pm — Lunch

2:00 pm	**The Risk Analysis:** ***Key Factors towards Identifying Risks*** - Mr. Vinod Hari, Vice President Operations, IDFC Ltd. As risks are inherent in implementing a project, the session will focus on the qualitative and quantitative assessment of risk. These assessments will be instrumental in understanding the Financial Institution Risk Perception, Risk Mitigation Mechanisms, risk premium and risk adjusted rate of return calculations.
3:00 pm	Tea/Coffee Break
3:30 pm	**The Detailed Project Report:** ***A Systematic Project Development Tool*** - Mr. Vinay Deodhar, Project Finance Specialist, LBG/GEP India DPR of a project is an all-encompassing document on the project, promoters and business. DPR Worksheet, a tool developed by the LBG/GEP Team, provides a systematic process for extracting key project information for preparing project proposals and marketing materials.
4:30 pm	**Implications of Sustainable Development Criteria in Projects:** ***Social and Environmental Analysis*** - Ms. Bharti Solanky IDFC Ltd.
5:30 pm	Closing Words and Final Thoughts
7:00 pm	**Dinner** – ***By Invitation***

Tuesday, February 26, 2002

Day 2: Linking Traditional and GHG mitigation Project Elements: A Domestic Case Study Analysis

9:30 am	Review of 1st Day of Training
9:45 am	**Traditional Analysis** - Mr. Mohan Kumar, IDFC Ltd. A case study analysis will be conducted, incorporating the fundamental project finance components. The participants will apply the elements of analysis discussed during the first day of the training. The faculty will facilitate the discussions thereafter.
10:45 am	Tea/Coffee Break
11:00 am	**GHG Analysis of Projects** - Vinay Deodhar, LBG India The GHG Analysis will be conducted over three sessions, which will cover the main project components when structuring a viable CCMP. Each session will be conducted utilizing appropriate tools like simple spreadsheets, checklists and provide sample information for instructional purposes.

Baseline

The objective of this session will be to provide a basic understanding of the process of assessing and quantifying the GHG emission reduction resulting from the project. The session will utilize check-list and calculation tools to illustrate the fundamental steps to develop a credible baseline and to quantify emissions reduction.

1:00 pm Lunch

2:00 pm **Overview of Monitoring and Verification**

The M&V session will discuss the specific measures necessary in monitoring the GHG emissions reduction under internationally accepted standards, and estimating the additional costs of incorporating the M&V measures into the project design. The internationally accepted methodologies will be discussed and guidance will be provided for developing an implementation plan for a project.

3:00 pm Tea/Coffee

3:30 pm **Integration of GHG Analysis in Project's Financial Analysis.**
This session will discuss the integration of financial analysis of GHG estimation and discuss various scenarios and sensitivity analysis with respect to project specific parameters.

- Vinay Deodhar

4:30 pm **Group Discussions Based on Participants' experiences in Project Development under GEP-CCS**

5:30 pm Closing Words and Final Thoughts

Annex 2

List of Curriculum Topics Generated at the June Workshop at NSDART

	Managing Transition - impact on stakeholders, subsidies, tariffs, employees' issues, consumer issues, etc.	Yes	Yes	Yes	Yes	Yes	Yes	Management	
	Priorities and sequencing			Yes	Yes	Yes	Yes		
	Financial restructuring – debt restructuring, terminal benefits				Yes	Yes	Yes		
	Public/private partnerships		Yes	Yes	Yes	Yes	Yes	Economics	
Regulation & Deregulation	Current mechanisms for regulation - CERC, SERC, CEA & Funding				Yes		Yes		
	Objectives, areas of application, regulatory risks	Yes	Yes	Yes	Yes	Yes	Yes	Economics	
	Enabling legislation for regulation			Yes	Yes	Yes	Yes		
	Policy directives from government				Yes	Yes	Yes		
IPPs	Rationale, incentives/disincentives			Yes	Yes	Yes	Yes		
	Agreements & their impact				Yes		Yes		
Contracts & negotiations	Fuel			Yes	Yes	Yes	Yes		
	Procurement of material & services			Yes	Yes	Yes	Yes		
	Funding management			Yes	Yes	Yes	Yes		
	Plants & R&M agreements			Yes	Yes	Yes	Yes		
	Service agreements			Yes	Yes	Yes	Yes		
	Contracts incl. PPAs	Yes	Yes	Yes	Yes	Yes	Yes	Law	
Planning	Demand & Load forecasting				Yes	Yes	Yes		
	Integrated resource planning				Yes	Yes	Yes		
	Human Resource Planning				Yes	Yes	Yes		
	Sector investment planning				Yes	Yes	Yes		
	Project Development				Yes	Yes	Yes		
Environmental issues	Environmental issues – impact assessment	Yes	Yes	Yes	Yes	Yes	Yes		
	Climate change issues and evolution		Yes		Yes		Yes		
	Clean energy technologies		Yes		Yes	Yes	Yes		
	Instruments & mechanisms for environment management		Yes		Yes	Yes	Yes		
Resettlement & Rehabilitation		Yes	Yes	Yes	Yes	Yes	Yes		
Consumer issues	Public participation in decision-making				Yes	Yes	Yes		
	Obligations of consumers and consumer education		Yes		Yes	Yes	Yes		
	Quality of power, frequency, voltage, measurement, metering, pricing	Yes	Yes	Yes	Yes	Yes	Yes		
	Procedural issues - new connections, complaints, billing & payment,	Yes	Yes	Yes	Yes		Yes		
	Theft	Yes	Yes	Yes	Yes	Yes	Yes		
	Universal access & equity	Yes	Yes	Yes	Yes	Yes	Yes		
	Grievance redressal	Yes	Yes	Yes	Yes	Yes	Yes		
Future Scenarios	Emerging technologies				Yes	Yes	Yes		
	Convergence								
	Future structures for power sector		Yes	Yes	Yes	Yes	Yes		

Power trading	Inter-regional Transmission		Yes		Yes	Yes	Yes		
Distribution	Energy purchases	Yes	Yes	Yes	Yes	Yes	Yes	Economics	
	Distribution technologies				Yes		Yes		
	Maintenance - replacement of transformers, capacitors, conductors, etc.		Yes		Yes	Yes	Yes		
	Distribution performance – commercial incl. T&D losses	Yes	Yes	Yes	Yes	Yes	Yes		
	Distribution performance – technical incl. quality of supply and technical losses	Yes	Yes	Yes	Yes	Yes	Yes		
	Augmentation issues - strengthening, expansion		Yes	Yes	Yes	Yes	Yes		
	Distribution reforms	Yes	Yes	Yes	Yes	Yes	Yes		
	Right of way & Land acquisition	Yes	Yes	Yes	Yes	Yes	Yes		
	Metering, billing & collection	Yes	Yes	Yes	Yes	Yes	Yes		
Economic issues in distribution	Power restriction policy - load shedding	Yes	Yes	Yes	Yes	Yes	Yes		
	Power auditing						Yes		
Financial issues	Cash flows	Yes	Yes	Yes	Yes		Yes	Management	
	Financial accounting	Yes	Yes	Yes	Yes		Yes	Management	
	Resource raising	Yes	Yes	Yes	Yes	Yes	Yes	Management	
	Investment choices			Yes	Yes	Yes	Yes		
	Cost controls			Yes	Yes	Yes	Yes		
	Revenue Management			Yes	Yes	Yes	Yes		
	Payment security mechanisms			Yes	Yes	Yes	Yes		
Renewables- technologies & issues	Policies technologies, institutional issues, financing, regulation, incentives	Yes	Yes	Yes	Yes	Yes	Yes		
Rural electrification	Institutional alternatives in rural distribution - coops, rural energy utilities, panchayats, etc.	Yes	Yes	Yes	Yes	Yes	Yes		
	Distributed generation				Yes	Yes	Yes		
Power supply to agriculture		Yes	Yes	Yes	Yes	Yes	Yes		
Demand side management	Cost of saved capacity/ energy				Yes	Yes	Yes		
	Load management						Yes		
	End use efficiency (diff from DSM)				Yes	Yes	Yes		
Cogeneration – policy and regulatory issues				Yes	Yes	Yes	Yes		
Tariffs	Basis of fixation, procedures, cross-subsidies, Cost of service	Yes	Yes	Yes	Yes	Yes	Yes		
	Bulk & retail tariffs - interface issues				Yes	Yes	Yes		
	Electricity duty & cesses				Yes	Yes	Yes		
	Performance Guarantees			Yes	Yes	Yes	Yes		
	Financial assistance to utilities			Yes	Yes	Yes	Yes		
	Subsidies & subventions	Yes	Yes	Yes	Yes	Yes	Yes	Economics	
Reform process issues	Rationale for reform	Yes	Yes	Yes	Yes	Yes	Yes	Economics	
	Components of reform – efficiency improvement, unbundling of sector, regulatory framework, corporatization, privatization/ownership, ownership alternatives,	Yes	Yes	Yes	Yes	Yes	Yes	Economics	

Energy Sector Issues in Training Programs for IAS Officers

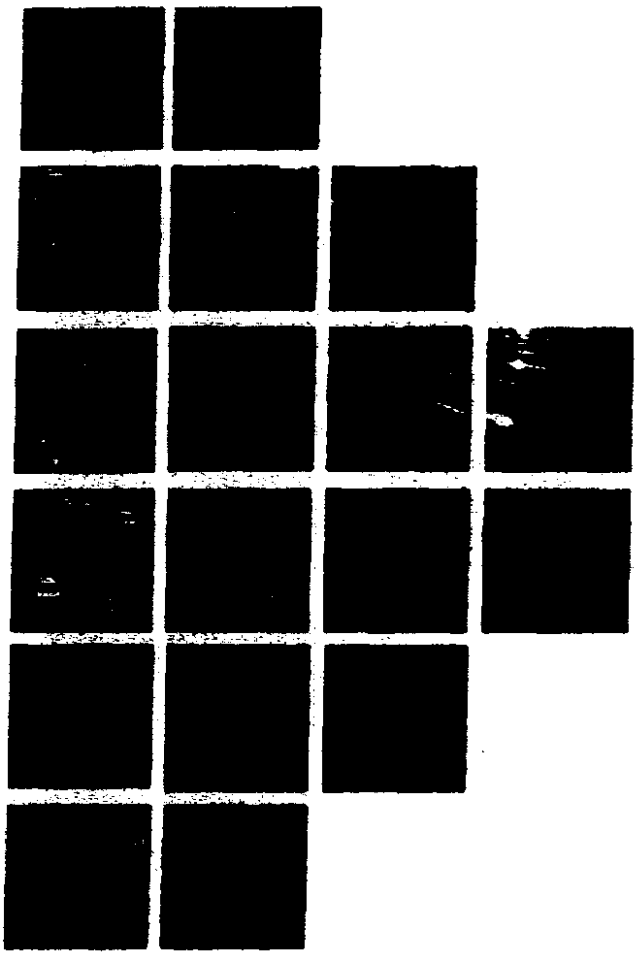
Theme	Sub-theme	Induction		3 day module		5 day module		Subject	Remarks
		Issue	Info.	Issue	Info.	Issue	Info.	Area	
Definitions & Terminology									
Power sector - background	Global scenario- all energy resources		Yes		Yes		Yes		
	Historical overview and current	Yes	Yes	Yes	Yes	Yes	Yes		
	Energy/GDP relationships		Yes		Yes		Yes		
	SEB structure	Yes	Yes		Yes		Yes	Economics	
	Financial performance		Yes		Yes		Yes		
	Grid and grid management	Yes	Yes	Yes	Yes	Yes	Yes	Economics	
	Coal and oil sector - relationship to power sector		Yes		Yes		Yes		
	Sector data - generation, distribution, consumption, sectoral demand, price & cost trends		Yes	Yes	Yes	Yes	Yes		
Energy Policy	National energy policy		Yes		Yes		Yes		
	State power policy	Yes	Yes		Yes	Yes	Yes		
	Involvement of local bodies	Yes	Yes	Yes	Yes	Yes	Yes		
	Import/export management of fuel and equipment	Yes	Yes	Yes	Yes	Yes	Yes		
	Policies and directions to CPUs						Yes		
	Subsidies, grants and incentives - national/ state				Yes	Yes	Yes		
	Guarantees		Yes	Yes	Yes	Yes	Yes		
	Managing external environment incl. external assistance			Yes	Yes	Yes	Yes		
Influences on structure of power sector (International and India)	Political, social, economic, technical and geographical				Yes	Yes	Yes		
	Capital mobilisation			Yes	Yes	Yes	Yes		
Legal Issues	Current laws			Yes	Yes	Yes	Yes		
	Legal//legislative issues in the reform process				Yes	Yes	Yes		
Generation Issues	Generation technologies - hydel, thermal, nuclear	Yes	Yes		Yes		Yes		
	Cost of generation, incl. Least cost generation options		Yes	Yes	Yes	Yes	Yes		
	Management			Yes	Yes	Yes	Yes		
	Maintenance of units				Yes		Yes		
	Renovation & modernisation of existing units			Yes	Yes	Yes	Yes		
	Cost control and cost management				Yes	Yes	Yes		
	Water sourcing			Yes	Yes	Yes	Yes		
	Fuel policy			Yes	Yes	Yes	Yes		
	Waste Management		Yes		Yes	Yes	Yes		
Transmission Issues	Transmission technologies				Yes		Yes		
	Right of way issues	Yes	Yes	Yes	Yes	Yes	Yes		
	Economic issues in transmission	Yes	Yes	Yes	Yes	Yes	Yes		
	Wheeling and banking				Yes		Yes		

Annex 3

Training Modules on "Establishing Proficient Project Financial Analysis and Structuring Capabilities" for Development Alternatives

CLIMATE CHANGE CENTERS' PROJECT DEVELOPMENT TRAINING

Establishing Proficient Project Financial Analysis and Structuring Capabilities



United States Agency for International Development / India Mission

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement

In Association with:

The Global Environment Team
The Louis Berger Group, Inc.

IDFC ICICI

21

Vinay Deodhar

CLIMATE CHANGE CENTERS' PROJECT DEVELOPMENT TRAINING

Establishing Proficient Project Financial Analysis and Structuring Capabilities

Organized by: The Louis Berger Group, Inc./ Greenhouse Pollution Prevention Project, under the auspices of USAID/India

February 25 – 26, 2002
Presidential Suite, 12th Floor, Hotel Park Royal, New Delhi

Monday, February 25, 2002
Day 1: Traditional Finance - Understanding the Fundamentals of Project Finance

9:30 am — Welcome and Introductions

9:35 am — **Strengthening CCCs for the Future**
- Mr. Ron Sissem, Chief of Party, GEP-CCS

9:45 am — **USAID perspective on CCC training**
- Mr. John Smith-Sreen, Deputy Director, E[3], USAID/India

9:55 am — **Innovative Finance for GHG mitigation Projects: ICICI Perspective**
- Mr. Anil Malhotra, Chief Manager, ICICI Ltd.

10:00 am — **Analyzing a Company's Annual Report and Performance: *What do the Numbers Really Say?***
- Mr. Virendra Dhir, Manager ICICI Ltd.

The participants will be led through an exercise by reviewing a company's annual report and "reading between the lines" in examining significant corporate or project financial information. The session will also employ strategies to deem represented project information credible and accurate.

11:00 am — Tea/Coffee Break

11:15 am — **Project Financial Analysis**
- Mr. Virendra Dhir, Manager ICICI Ltd.

Employing representative case studies, the session will focus on providing participants an understanding of analysis of cash flow, ratios and sensitivity.

12:15 pm — **Analysis of Important Project Contracts**
Mr. Virendra Dhir, Manager ICICI Ltd., with inputs from Vinay Deodhar, LBG

Key clauses of important project contracts like Engineering Procurement & Construction, Operations & Maintenance and Shareholders' Agreement, Power Purchase Agreement and Fuel Supply Agreement will be briefly analyzed

1:00 pm — Lunch

ICICI

Financial Analysis

February 25, 2002

Business drives the financials...

" Thorough understanding the company's business is critical to crack the company's financials "

ICICI

The balance sheet always balances....

As on date concept

Assets-Application of Funds		Liabilities-Sources of Funds	
Fixed assets		*Shareholder's Funds*	
GFA	10942	Share Capital	900
Less : Accumulated Dep	4850	Reserves & Surplus	4763
Net Fixed Assets	6092	**Tangible Networth**	**5663**
Capital WIP	217		
Sub-total	6309		
Investments	*782*	*Debt*	
		Secured Loans	2260
		Unsecured Loans	1755
		Sub-total	**4015**
Current Assets		*Current Liabilities*	*1425*
Inventory	1087	Provisions	343
Receivables	483	**Sub-total**	**1768**
Loans & Advances	857		
Cash & Bank balance	1928		
Sub-total	4355		
Deferred Revenue Expenditure	*0*		
Total	**11446**		**11446**

ICICI

The profit & loss statement

Period concept

	Rs Mn.	% of Income
Income		
Gross Sales	7142	
Less Excise Duty	-911	
Net Sales	6231	
Other related income	0	
Total Income (1)	6231	100%
Expenditure		
Change in Stock	-152	
Raw Materials consumed	2940	
Sub-total	2788	45%
Power, fuel, water	1032	17%
Consumable stores	284	5%
Repairs & maintenance	65	1%
Salaries	151	2%
Admin Expenses	159	3%
Selling Expenses	362	6%
Total Cost (2)	4841	78%
EBIDTA (3=1-2)	1390	22%
Interest (4)	439	7%
Depreciation (5)	429	7%
Operating profit (6=3-4-5)	522	8%
Other Income (7)	217	
PBT (8=7-6)	739	12%
Tax (9)	225	
PAT (10=8-9)	514	8%
Gross cash accruals (10+5)	943	
Divendend-Pref (A)		
Dividend-Equity (B)	248	
Net cash accruals (10+5-A-B)	695	

ICICI

Golden Rules...

- Never look at financials before reviewing the business
- Don't miss the
  - Composition of the Board of Directors
  - Director's report
  - List of Bankers
  - Auditor's comments
  - Notes to accounts
- Recast the Balance Sheet to take care the window dressing so as to reflect the true numbers
- Cash is the King
  - Profit but no cash !

ICICI

Key Financial Indicators....

- Margin analysis-GPM, OPM and NPM
- Return on Capital Employed (ROCE)
- Debt related ratios
  - Debt/Equity
  - NCA/Term Debt
  - Interest coverage
  - Debt Service coverage ratio
- Working Capital related ratios
  - Current Ratio, Quick Ratio, Inventory turnover Ratio average receivable levels
- Equity linked ratios
  - RONW
  - EPS
  - Dividend payout ratio

ICICI

Margin Analysis....

	Rs Mn.	% of Income
Income		
Gross Sales	7142	
Less Excise Duty	-911	
Net Sales	6231	
Other related income	0	
Total Income (1)	6231	100%
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Interest (4)	439	7%
Depreciation (5)	429	7%
Operating profit (6=3-4-5)	522	8%
Other Income (7)	217	
Extra-ordinary items	0	
PBT (8=7-6)	739	12%
Tax (9)	225	
PAT (10=8-9)	514	8%
Gross cash accruals (10+5)	943	
Divendend-Pref (A)		
Dividend-Equity (B)	248	
Net cash accruals (10+5-A-B)	695	

Income
less variable cost
= Contribution

Conversion Cost

GPM

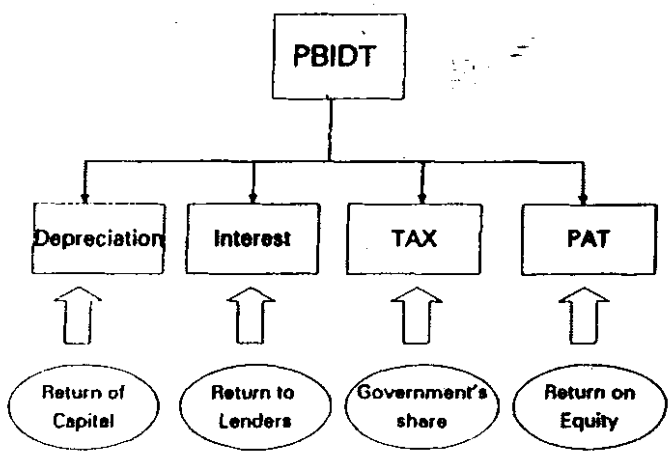
OPM

NPM

QUALITY OF EARNINGS

ICICI

Understanding PBIDT....



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ROCE- Du Pont analysis

Capital Employed:= Debt + Networth
Difference between Return on CE and Return of CE
ROnCE= [(PBT+Interest)/(capital employed)]
ROfCE= [(PBT+Interest+Dep)/(capital employed)]

Capital needs to yield a return

ROnCE 13.9%

Capital Productivity (0.74)

Sales Profitability 18.9%

(Sales/ Capital employed)

(PBIT) / (Sales)

COST of CAPITAL- WACC
Cost of debt*debt%
+
Cost of Equity *Equity%

ROCE > WACC

ICICI

Understanding Financial Leverage....

- Debt/Equity or Gearing — 0.90 times
  - Debt=All interest bearing liabilities — 4015
    - +
    - Preference Capital (less than 3 years)
    - +
    - Contingent Liabilities like corporate guarantee
  - Equity= Networth — 5663
    - -
    - Revaluation reserves — -1208
    - -
    - Deferred revenue expenditure
- Analysis of debt to include
  - Quantum of debt (reflected by D/E)
  - Cost of debt : foreign currency vs rupee debt
  - Maturity of debt
  - Details about security for debt

ICICI

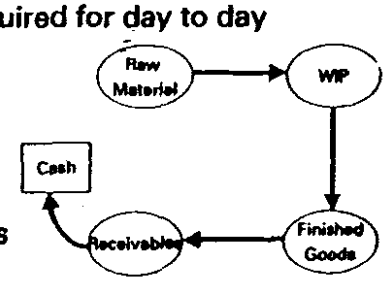
Other key debt related ratios....

- Net debt/Equity : Debt net of cash /equity
  { 2087/4015=0.47 times }
- NCA/Term Debt
  { 695/3441=0.20 times equivalent to 5 years to service debt }
- Interest coverage =(PBT+interest +Dep-tax) / (Interest charges)
  { 1607/439=3.66 times }
- Debt service coverage ratio
  (Net profit + depreciation + interest) / (Loan installments + Interest)

ICICI

Understanding working capital....

- Working Capital (WC) required for day to day working of the company
- WC =CA-CL
- CA=CL+Bank Borr (BB)
  +Margin money
- Current liquidity indicators
  - Current Ratio (CR)
    CA/(CL+BB+repayments in 1 year)
    Banking norm for minimum CR of 1.33, which is equivalent to 25% margin money
  - Quick Ratio or acid test ratio
    (CA-Inventories - Loans & advances)/CL



ICICI

Other working capital ratios....

- Inventory turnover
  (Inventory)/ (Total cost of Production) *365 days
- Analysis of receivables
  - Quality of receivables
    - % of receivables to group companies
    - % of receivables more than 6 months
  - Average days receivables
    - Receivables/(sales) *365 days
- Analysis of Loans & Advances
  - Advance to group companies
  - Others advances

ICICI

Analysis of Investments...

- Investments with associates at unfavourable rates
- What we should do
  - Examine percentage of unquoted investments to total
  - Examine Return from investments / Total investments
  - Examine Book value of quoted investments / Market value
  - Examine variation in amounts, extent and nature of investments year to year

ICICI

NOTICE FOR THE SIXTEENTH ANNUAL GENERAL MEETING

NOTICE is hereby given that the Sixteenth Annual General Meeting of the Company will be held at 3.05 p.m. on Thursday the 30th August 2001 at Kamaraj Arangam, No. 492 (Old No. 574-A), Anna Salai, Teynampet, Chennai 600 006 to transact the following business :

ORDINARY BUSINESS

1. To receive and adopt the audited Balance Sheet as at 31st March 2001 and Profit and Loss Account of the Company for the year ended 31st March 2001 and the Report of the Directors and Auditors.
2. To declare a dividend
3. To appoint a Director in the place of Thiru JB Dadachanji who retires by rotation and being eligible offers himself for re-election.
4. To appoint a Director in the place of Thiru P. Vedagiri who retires by rotation and being eligible offers himself for re-election.
5. To appoint a Director in the place of Thiru Ambuj Sharma who retires by rotation and being eligible offers himself for re-election.
6. To consider and if thought fit, to pass with or without modification the following resolution as a Special Resolution :

   "RESOLVED THAT A.F. Ferguson & Co., Chartered Accountants, the retiring Auditors be and are hereby reappointed as the Auditors of the Company to hold office until the conclusion of the Seventeenth Annual General Meeting on such remuneration as may be decided by the Board of Directors plus reimbursement of out of pocket expenses and levies such as service tax etc."

SPECIAL BUSINESS

7. To consider and if thought fit, to pass with or without modification the following resolution as an Ordinary Resolution :

   "RESOLVED THAT Thiru C. Ramachandran be and is hereby appointed as Director of the Company."

8. To consider and if thought fit, to pass with or without modification the following resolution as an Ordinary Resolution:

   "RESOLVED THAT the consent of the Company be and is hereby accorded in terms of Section 293(1)(a) and other applicable provisions if any, of the Companies Act, 1956, to mortgaging and / or charging by the Board of Directors of the Company of all the immovable and movable properties relating to Linear Alkyl Benzene Complex of the Company, present and future, and the whole of the undertaking of the Company together with power to take over the management of the business and concern of the Company in certain events, to or in favour of ICICI Limited to secure Rupee Term Loan of Rs.10,000 lakhs lent and advanced by ICICI Limited together with interest thereon at the respective agreed rates, interest, compound interest, additional interest, liquidated damages, commitment charges, premia on prepayment, costs, charges, expenses and other monies payable by the Company to ICICI Limited under the respective Heads of Agreement / Loan Agreement / Letters of Sanction / Memorandum of Terms and Conditions entered into / to be entered into by the Company in respect of the said term loan."

   "RESOLVED FURTHER that the Board of Directors of the Company be and is hereby authorised to finalise with IDBI, the documents for creating the aforesaid mortgage and / or charge and to do all such acts and things as may be necessary for giving effect to the above resolution."

9. To consider and if thought fit, to pass with or without modification the following resolution as a Special Resolution :

   "RESOLVED THAT pursuant to the provisions of Section 372A and other applicable provisions, if any, of the Companies Act, 1956, other Statutory approvals and subject to the approval of Financial Institutions, if required, approval be and is hereby given to the Board

of Directors of the Company (hereinafter referred to as "the Board" which term shall include any Committee(s) which the Board have or may hereafter constitute to exercise the powers of the Board including the powers conferred by this resolution), for investing upto US $ 50 Million by way of subscription or otherwise in the equity share capital of a wholly owned subsidiary of the Company to be established in Mauritius which will be the investment arm for the proposed overseas projects viz., N-Paraffin / Linear Alkyl Benzene Project in Gulf Co-operation Council Country and Linear Alkyl Benzene Project in South East Asian Region notwithstanding that the aggregate of such proposed investment in the wholly owned subsidiary together with the existing investments made and the loans / guarantees given by the Company may exceed the limits prescribed under Section 372A of the Companies Act 1956."

"RESOLVED FURTHER that the Board of Directors of the Company be and is hereby authorised to determine the actual sum to be invested and the time and manner of such investment and to do all and any of the matters arising out of and incidental to the said investment."

10. To consider and if thought fit, to pass with or without modification the following resolution as a Special Resolution :

"RESOLVED THAT in accordance with the provisions of Section 309 and other applicable provisions, if any, of the Companies Act, 1956, and subject to the approval of Central Government / Financial Institutions, a sum not exceeding 1% of the net profits of the Company for each year, computed in the manner referred to in sub section (1) of Section 198 of the Companies Act 1956, be paid to and distributed amongst the Directors of the Company (other than Managing / Whole-time Directors) in such amounts or proportions and in such manner and in all respects as may be directed by the Board of Directors, in addition to the sitting fees payable to Directors and such payment shall be made in respect of the profits of the Company for each year of the period of five financial years commencing from 1st April 2000."

By order of the Board
for TAMILNADU PETROPRODUCTS LIMITED

26th May 2001
Chennai - 600 034.

M.B.GANESH
Secretary

Notes :

1. A member entitled to attend and vote at the Meeting is entitled to appoint a Proxy to attend and on a poll to vote instead of himself and a proxy need not be a member of the Company.
2. An Explanatory Statement pursuant to Section 173(2) of the Companies Act, 1956 in respect of Resolutions set out against Item Nos.7 to 10 of the Notice is annexed hereto.
3. The Register of Members and the Share Transfer Books of the Company will remain closed from 17th August 2001 to 30th August 2001 (both days inclusive).
4. Members are requested to notify immediately any change in their address to the Company/ Share Transfer Agents / Depository Participants.
5. The unclaimed dividend upto the financial year ended 31st March 1995 has been transferred to the General Revenue Account of the Central Government. Claims on unclaimed dividend, if any, for the financial years 1995-96, 1996-97, 1997-98, 1998-99 & 1999-2000 shall be made to the Company or Share Transfer Agents.
6. Shareholders seeking any information with regard to accounts are requested to write to the Company at an early date so as to enable the Management to keep the information ready.
7. Members / Proxies should bring the Attendance slip duly filled in for attending the Meeting.
8. All documents referred to in the accompanying Notice and the Explanatory Statement are open for inspection at the Registered Office of the Company during office hours on all working days except Saturdays and holidays between 9-30 a.m. to 5-30 p.m. upto the date of the Annual General Meeting.

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EXPLANATORY STATEMENT PURSUANT TO SECTION 173(2) OF THE COMPANIES ACT, 1956

Item No.7

The Board of Directors at their Meeting held on 26th May 2001 co-opted Thiru C. Ramachandran as an Independent Director under Corporate Governance Guidelines. He was inducted taking into consideration his earlier association with TPL as Chairman and his valuable contribution to the growth of the Company. Thiru C. Ramachandran a retired Officer from Indian Administrative Service was Principal Secretary to Government of Tamilnadu, Industries Department. During his service in Government he had held senior positions and served as Director and Chairman of leading Public / Joint Sector Companies.

As per Section 260 of the Companies Act, 1956 (the Act), Thiru C. Ramachandran appointed as Additional Director shall hold office only upto the next Annual General Meeting. The Company has received Notice under Section 257 of the Act from a Member proposing Thiru C. Ramachandran for appointment to the Office of Director along with a deposit of Rs.500/-.

Hence the proposed resolution.

None of the Directors of the Company except Thiru C.Ramachandran is interested in the resolution.

Item No.8

The Company had availed a Rupee Term Loan of Rs.10,000 lakhs to fund part of the requirement for acquisition of Heavy Chemicals Division of SPIC and also to part fund the normal capital expenditure of the Company. The aforesaid term loan as per the terms and conditions is to be secured by an extension of first mortgage and charge on all immovable and movable properties of the Linear Alkyl Benzene Complex of the Company, both present and future ranking pari passu with the charges created and / or to be created in favour of the existing charge holders.

As per Section 293(1)(a) of the Companies Act, 1956 the Board of Directors shall not, without the consent of the shareholders in general meeting, sell, lease or otherwise dispose of the whole or substantially the whole of the undertaking of the Company or where the Company owns more than one undertaking, of the whole or substantially the whole, of any such undertaking.

Since mortgaging / charging by the Company of its movable and immovable properties as aforesaid in favour of ICICI Limited is regarded as disposal of the Company's properties / undertakings, approval of the Members is required under Section 293(1)(a) of the Companies Act, 1956, for creation of such mortgages / charges.

Hence the proposed resolution.

None of the Directors is interested in the resolution.

Item No.9

The Company is planning to expand its LAB business overseas based on the core competencies built by the Company in the LAB business. Various locations at Gulf Co-operation Council Countries in the Middle East Region and in the South East Asian Region have been identified. The Company is proposing to establish a wholly owned subsidiary in Mauritius which would be the investment arm for the overseas projects.

The above investment would be funded from borrowed funds.

The aggregate of the loans and investments so far made, the amounts for which guarantees or security so far provided to other bodies corporate along with the proposed investment to be made would exceed limits prescribed under Section 372A of the Companies Act, 1956 and therefore prior approval of the Members by way of a special resolution at a general meeting is required.

Hence the proposed Special Resolution.

None of the Directors of the Company is interested in the resolution.

Item No.10

The role and responsibility of Directors have considerably increased with introduction of various amendments to the Companies Act, 1956 and also under Corporate Governance Guidelines introduced by SEBI / Stock Exchanges. In view of the additional responsibility that the Directors have to shoulder and also for the contributions made by the Non Whole-time Directors at the Board and other Sub Committee Meetings spending their valuable time giving suggestions and formulating policies / plans for the further growth of the Company the practice of compensating the Non Whole-time Directors has become prevalent among most of the leading corporates. The remuneration payable by way of commission would be within the limits permitted under the Companies Act, 1956.

Hence the proposed Special Resolution.

The Non Whole-time Directors may be deemed to be concerned or interested in the resolution.

By order of the Board
for TAMILNADU PETROPRODUCTS LIMITED

M.B. GANESH
Secretary

26th May 2001
Chennai - 600 034

DIRECTORS' REPORT

To

The Shareholders

The Directors have pleasure in presenting their Sixteenth Annual Report on the business and operations of your Company and the audited Statement of Accounts for the year ended 31st March 2001.

FINANCIAL RESULTS

	(Rupees in Crores) 2000-2001	1999-2000
Profit Before Depreciation and Interest	151.33	142.01
Interest	34.53	23.05
Profit after Interest	116.80	118.96
Depreciation	42.89	35.48
Profit Before Tax	73.91	83.48
Provision for Tax	22.50	32.50
Profit after Tax	51.41	50.98
Extraordinary Item	63.02	–
Transfer to General Reserve	63.02	26.34
Balance Carried to Balance Sheet	47.87	30.00

OPERATIONAL PERFORMANCE

Linear Alkyl Benzene (LAB) Division

99631 MTs of LAB were produced as against 87461 MTs during last year. LAB production for the year was highest achieved by our Company. During the year there has been steep increase in the costs due to the surge in the world oil prices. On sales growth, efforts are focussed to concentrate in South and Eastern part of our country while expanding in the North markets as well. Continuous efforts to service the customers enabled the Company's products to be patronised well by the customers. Currently, our sales strategy is being designed to result in maximum demand growth to ensure a long term prospects of LAB business. During the year the LAB exports were limited to the extent of surplus available after meeting the domestic demand. The foreign exchange earnings through direct exports were Rs.39.60 Crores

Epichlorohydrin (ECH) Division

3620 MTs of ECH were produced as against 951 MTs during last year. The sale of ECH was restricted to Markets of remunerative segments only, due to international price scenario. The foreign exchange earnings through ECH exports was Rs.2.42 Crores. The installation of new mixer for Allyl chloride production in Epichlorohydrin plant for reduced consumption of raw materials and for increasing the on stream efficiency has been taken up and the various activities are in progress.

Chlor Alkali Division

26732 MTs of Caustic Soda and 18335 MTs of Chlorine was produced during the period from 27th September 2000 to 31st March 2001. The Chlor-Alkali business had to face pressure on prices due to excess supply over demand. However international prices have firmed up resulting in imports becoming dearer. This resulted in improvement in the price of caustic soda towards end of the year though the situation resulted in the softening of prices of chlorine front. Export of 63 MTs of Ammonium Chloride realised a total value of Rs.7.39 lakhs.

TAKE OVER OF CHLOR ALKALI BUSINESS

The Management exploring various options to improve the ECH business considered acquisition of Chlor Alkali Business (CAB) of SPIC to be ideal, as it would provide backward integration assuring chlorine supplies to enhance the capacity utilisation of ECH plant and thereby reduce the cost of production of ECH.

M/s Ernst & Young Private Limited were engaged to do business valuation of Heavy Chemicals Division of SPIC. The unit was acquired at a purchase consideration of Rs.125 crores plus / minus net current assets & loans and the payment will be made spread over two and half years commencing the take over. The take over was effective from 27th September 2000.

Consultants were also engaged for manpower study in the unit and based on their recommendation the business was taken over with a reduced manpower.

Increase in gross block of fixed assets following take over of Chlor Alkali Unit provides for tax shield in the form of depreciation besides savings in local taxes on supplies of chlorine. Plans are afoot to install a 18.8 MW captive power plant at the Chlor Alkali Unit to reduce the high cost of power incurred for production of caustic soda and chlorine.

DIVIDEND

Your Directors deciding to retain the same percentage of dividend as paid in the previous year have now recommended payment of dividend of 25% on the equity share capital, amounting Rs 22.49 Crores.

SAFETY, HEALTH & ENVIRONMENT

Your Company continues to maintain high standards of safety. Your Company has won "Safety Star Award" from National Safety Council, Tamilnadu Chapter for the year 1999 for good safety performance. Also Your Company has been awarded National Safety Awards by the Ministry of Labour, Government of India, during the year.

Your company had also implemented extensive preventive health care measures for the benefit of its employees.

RESEARCH & DEVELOPMENT

R&D efforts towards improvement in the manufacturing process of LAB is likely to materialise soon which would help in enhancing the quality of your Company's products. Your Company's R&D is actively pursuing development of a eco-friendly process for Epichlorohydrin manufacture. Your Company is also carrying out collaborative projects in association with SPIC Science Foundation towards adding value to by products. Continued efforts of research & development are being taken on Sodium heating medium.

CORPORATE OFFICE

The construction of Corporate Office of your Company at Cenotaph Road, Chennai, a prime locality, is fast progressing and is expected to be ready for occupation during last quarter of 2001. The proposed corporate office located at a vantage point would enhance the image and prestige of the Company.

FUTURE OUTLOOK

There is a good demand for your Company's LAB in the global market in South East Asia. Middle East and Europe. Your Company is planning capacity augmentation and hence is focussing also on long term export contracts to ensure stable export volumes resulting from the capacity augmentation. The capacity expansion programme of Normal Paraffin unit to 94,000 MTs and LAB unit to 1,20,000 MTs have been taken up and the engineering work is in progress. The Microprocessor based Distributed Control System for LAB Plant has been upgraded to meet the new capacities of plant and also to improve energy efficiency. The utilities expansion to meet the requirements of the expanded capacity of LAB plant has been started.

With measures taken for consolidation of ECH business, expansion of LAB capacity to retain our competitive edge in the domestic market, plans are also afoot to implement projects in Middle East, and explore avenues in South East Asia also with a view to spread our presence overseas and become a global player.

INVESTMENTS

(i) It was a year of consolidation for Henkel SPIC India Limited, recording an impressive sales of Rs.301 crores for the year (12 months) ended 31st December 2000 compared to Rs.272 crores (15 months) in the previous year. HSIL also posted a maiden net profit of Rs.3.04 crores compared to the loss of Rs.5.87 crores in the previous year.

(ii) Petro Araldite Private Limited (PAPL) achieved a turnover of Rs.64.60 crores for the year ending 31st March 2001. PAPL's production and sales have stabilised during the year. While the turnover has improved, the capacity utilisation of the plant continues to be under pressure. Consequent to Ciba divesting their stake in PAPL in favour of Vantico Performance Polymers Private

Limited. TPL waived the right of first refusal in respect of the shares sold, executed a new supply agreement after cessation of the existing supply agreement for supply of ECH to PAPL and released Ciba of its obligations and duties subsisting under various agreements In consideration of premature termination of the various contracts and surrendering the above mentioned rights a sum of around Rs.63.02 Crores was received as compensation from CIBA. Vantico is very keen to improve the operations of PAPL by consolidating their epoxy business in the country.

(iii) SPIC Electric Power Corporation (Private) Limited (SEPC) has obtained all the statutory clearances for establishment, operation and maintenance of the project including the Techno-Economic Clearance from the Central Electricity Authority. The Indian Financial Institutions led by IDBI have completed the appraisal of the project. Discussions are being held with Government of Tamilnadu and are awaiting allocation of Escrow from TNEB to expedite the project activities.

(iv) During the year the name of the Company of Van Ommeren Mac Tank Terminals Limited was changed to Vopak Sical Terminal Limited to reflect the change in the name of the promoters. The project is dependent to a large extent on the development of the Ennore Port Phase II facilities, clearance of which is still awaited from the Central Government. Negotiations are on with Government of Tamilnadu for allocation of land for the project. The project is expected to take off as soon as the above mentioned activities are completed.

(v) The winding-up proceedings of Standard Motor Products of India Limited by Official Liquidator are under way consequent to the winding up orders passed by the High Court of Madras in C.P. No.2/89 on 4th October 1996.

DEPOSITS

In view of the increase in the cost of serving the Fixed Deposit holders, the Company discontinued accepting Fixed Deposits from public and shareholders with effect from 3rd August 2000. However deposits already renewed and maturing after 3rd August 2000 would be repaid on the due dates. The total amount of deposits as on 31st March 2001 was Rs.5.01 crores. Of this an amount of Rs 2.63 crores is due for repayment during the financial year ending 31st March 2002. The Company has no over due deposits but unclaimed deposits as at the end of the period amounted to Rs.17 lakhs.

EMPLOYEES

Human Resource Development was given thrust by giving emphasis to prepare employees for multi skilling. The Management firmly believes in the concept of Total Quality Management initiatives and the implementation of which would bring about employees cheer both at work place and beyond. The industrial relation scene during the period was harmonious resulting in high level of performance. A statement giving information and particulars of the employees as required under Section 217(2A) of the Companies Act, 1956 is enclosed as part of the report.

DIRECTORS

The changes that had occurred in the composition of Board of Directors from the date of last Directors' Report are given below:

a) On 26th December 2000 Thiru M. Madhavan Nambiar, IAS was co-opted as Director in the place of R. Gopalan, IAS.

b) On 16th April 2001 Thiru Ambuj Sharma, IAS., was co-opted as Director in the place of Thiru L. Krishnan, IAS.

c) On 26th May 2001 the resignation of Thiru Praveen Kumar, IAS was accepted. On the same day Thiru C. Ramachandran, was inducted as Additional Director.

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The Directors also wish to place on record their appreciation of the valuable services rendered by Tvl. R. Gopalan, IAS and L. Krishnan, IAS, Praveen Kumar, IAS, during their tenure as Directors. Pursuant to the provisions of the Companies Act, 1956 and the Articles of Association of the Company Tvl. J.B. Dadachanji, P. Vedagiri & Ambuj Sharma shall retire by rotation and being eligible offer themselves for re-election. The term of Thiru C.Ramachandran shall end at this Annual General Meeting and notice in writing has been received proposing his candidature for appointment as Director of the Company.

DIRECTORS' RESPONSIBILITY STATEMENT

In compliance with the provisions of Section 217(2AA) of the Companies Act, 1956 (the Act) your Directors hereby confirm that

(i) in preparing the Annual Accounts for the year ended 31st March 2001 all the applicable accounting standards have been followed.

(ii) accounting policies were adopted and applied consistently and made judgements and estimates that are reasonable and prudent so as to give a true and fair view of the state of the affairs of the Company as at 31st March 2001 and of the profit or loss of the Company for year ended on that date.

(iii) proper and sufficient care for the maintenance of adequate accounting records in accordance with the provisions of the Act for safeguarding the assets of the Company and for preventing /detecting fraud and irregularities have been taken.

(iv) the Annual Accounts have been prepared on a "going concern" basis.

CORPORATE GOVERNANCE

The Corporate Governance Guidelines issued by SEBI are applicable to the Company from the financial year 2001-2002. Many of the features in the guidelines are already in practice in your Company. A Report on the compliance of Corporate Governance will be furnished from next year onwards and would form part of Annual Report.

AUDITORS

M/s. A.F. Ferguson & Company appointed as statutory auditors at the 15th Annual General Meeting held on 2nd August 2000 retire at the conclusion of the Sixteenth Annual General Meeting and are eligible for re-appointment.

ENERGY, TECHNOLOGY AND FOREIGN EXCHANGE

Particulars relating to conservation of energy, technology absorption and foreign exchange earnings and outgo as required under Section 217(1)(e) of the Companies Act, 1956 are enclosed as part of the report.

ACKNOWLEDGEMENT

The Management is grateful to the Government of India, the Government of Tamilnadu, Shareholders, the promoters, the financial institutions, consortium of Banks & Insurance Companies, Reserve Bank of India, Technology suppliers, Joint Venture Partners, Statutory Auditors, Contractors, Marketing Agents, Vendors and valued customers for the continued assistance and co-operation.

The Directors also wish to place on record their appreciation of the concerted efforts by all employees in extending full support to the Management in implementing various plans for the growth of your Company.

for and on behalf of the Board of Directors

26th May 2001
Chennai - 600 034

SHAKTIKANTA DAS
CHAIRMAN

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AUDITORS' REPORT TO THE MEMBERS OF TAMILNADU PETROPRODUCTS LIMITED

We have audited the attached balance sheet of Tamilnadu Petroproducts Limited, as at 31st March, 2001 and also the profit and loss account for the year ended on that date annexed thereto, and report that :

1. As required by the Manufacturing and Other Companies (Auditor's Report) Order, 1988 issued by the Company Law Board in terms of Section 227(4A) of the Companies Act, 1956, we enclose in the annexure a statement on the matters specified in paragraphs 4 and 5 of the said Order :
2. Further to our comments in the annexure referred to in paragraph 1 above, we report that :
   (a) we have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purpose of our audit ;
   (b) in our opinion, proper books of account as required by law have been kept by the company, so far as appears from our examination of books ;
   (c) the balance sheet and the profit and loss account dealt with by this report are in agreement with the books of account ;
   (d) in our opinion, the balance sheet and the profit and loss account dealt with by this report comply with the accounting standards referred to in sub-section 3(C) of section 211 of the Companies Act, 1956,
   (e) on the basis of written representations received from the directors as on 31st March, 2001 and taken on record by the Board of Directors, we report that the none of the directors is disqualified as on 31st March, 2001 from being appointed as a director in terms of section 274 (1) (g) of the Companies Act, 1956 ;
   (f) in our opinion and to the best of our information and according to the explanations given to us, the accounts give the information required by the Companies Act, 1956 in the manner so required and give a true and fair view :
      (i) in the case of the balance sheet, of the state of affairs of the company as at 31st March, 2001; and
      (ii) in the case of the profit and loss account of the profit for the year ended on that date.

For A.F. FERGUSON & CO.
Chartered Accountants

Place : Chennai
Date : 26th May 2001

H.L. SHAH
Partner

Annexure referred to in paragraph 1 of the report of even date of the auditors to the members of Tamilnadu Petroproducts Limited on the accounts for the year ended 31st March, 2001.

1. The company has maintained proper records showing full particulars including quantitative details and situation of fixed assets. The company has a programme of physical verification of fixed assets over a period of three years which is, in our opinion, reasonable having regard to the size of the company and the nature of its assets. In accordance with this programme, certain fixed assets have been physically verified by the management during the year and no serious discrepancies have been noticed on such verification.
2. None of the fixed assets has been revalued during the year.

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3. Physical verification of stocks of finished goods, spares and raw materials was conducted by the management during the year and, in our opinion, the frequency of verification was reasonable.

4. Procedures for physical verification of stocks followed by the company are reasonable and adequate, commensurate with the size of the company and the nature of its business.

5. No material discrepancies have been noticed on physical verification of stocks as compared to the book records.

6. In our opinion, the valuation of stocks is fair and proper in accordance with normally accepted accounting principles and is on the same basis as in the previous year.

7. The company has not taken any loans, secured or unsecured, from companies, firms or other parties listed in the register maintained under Section 301 of the Companies Act, 1956, where the rate of interest and other terms and conditions are prima facie prejudicial to the interests of the company. We have been informed that there are no companies under the same management as defined under Section 370(1-B) of the Companies Act,1956.

8. The company has not granted any loans, secured or unsecured, to companies, firms or other parties listed in the register maintained under Section 301 of the Companies Act, 1956, where the rate of interest and other terms and conditions are prima facie prejudicial to the interests of the company. As referred in paragraph(7) above, we have been informed that there are no companies under the same management as defined under Section 370 (1-B) of the Companies Act,1956.

9. In respect of loans and advances in the nature of loans given by the company, where stipulations have been made, the parties are repaying the principal amounts and interest as stipulated or as rescheduled.

10. In our opinion and according to the information and explanations given to us and having regard to the explanations that some of the items purchased are of a special nature and for which comparative quotations are not available, there are adequate internal control procedures commensurate with the size of the company and the nature of its business with regard to the purchase of stores, raw-materials including components, plant and machinery, equipment and other assets and for the sale of goods.

11. According to the information and explanations given to us, the transaction of purchase of goods and materials and sale of goods, materials and services, made in pursuance of contracts or arrangements entered in the register maintained under Section 301 of the Companies Act, 1956 and aggregating to Rs.50,000 or more during the year in respect of each party, have been made at prices which are reasonable having regard to the prevailing market prices of such goods, materials or services or the prices at which transactions for similar goods or services have been made with other parties.

12. As explained to us, unserviceable or damaged stores have been determined by the management and, where required, adequate provision has been made in the accounts for the loss arising on items so determined. There were no unserviceable or damaged raw materials and finished goods.

13. In respect of deposits accepted from the public, the company has complied with the provisions of Section 58-A of the Companies Act, 1956 and the Companies (Acceptances of Deposits) Rules, 1975.

14. As explained to us, the company is maintaining reasonable records for the sale and disposal of realisable by-products and scrap.

15. In our opinion, the company has an adequate internal audit system commensurate with its size and nature of its business.

16. We have broadly reviewed the books of account maintained by the company in respect of products where, pursuant to the Rules made by the Central Government, the maintenance of cost records has been prescribed under Section 209 (1) (d) of the Companies Act, 1956. We are of the opinion that prima facie the prescribed accounts and records have been made and maintained. We have not, however, made a detailed examination of the records with a view to determine whether they are accurate or not.

17. According to the records of the company, provident fund and employee state insurance dues have been regularly deposited during the year with the appropriate authorities.

18. According to the information and explanations given to us, there are no undisputed amounts payable in respect of income-tax, wealth-tax, sales-tax, customs duty and excise duty which are outstanding as on 31st March, 2001 for a period of more than six months from the date they became payable.

19. On the basis of examination of books of account carried out by us in accordance with generally accepted auditing practices and according to the information and explanations given to us, no personal expenses of the employees or directors have been charged to the profit and loss account, other than those payable under contractual obligations or in accordance with the generally accepted business practice.

20. The company is not a Sick Industrial Company within the meaning of clause (o) of sub-section(1) of Section 3 of the Sick Industrial Companies (Special Provisions) Act, 1985.

21. In respect of goods traded by the company there were no damaged stocks.

For A.F. FERGUSON & CO.
Chartered Accountants

H.L. SHAH
Partner

Place : Chennai
Date : 26th May 2001

BALANCE SHEET

As at 31st March, 2001

(Rupees in '000)

	SCHEDULE		As at March 31 2001		As at March 31 2000
SOURCES OF FUNDS					
Shareholders' Funds:					
Share Capital	1		899,715		899,715
Reserves and surplus	2		4,763,181		4,049,607
Loan Funds:					
Secured	3		2,259,936		2,086,667
Unsecured	4		1,755,268		1,406,272
TOTAL			9,678,100		8,442,261
APPLICATION OF FUNDS					
Fixed Assets:	5				
Gross block		10,941,635		9,516,252	
Less: Depreciation		4,850,324		4,238,701	
Net Block		6,091,311		5,277,551	
Capital work in progress/Advances		216,562		47,564	
			6,307,873		5,325,115
INVESTMENTS	6		781,546		772,180
CURRENT ASSETS, LOANS AND ADVANCES	7				
Inventories		1,087,016		766,438	
Sundry debtors		483,090		97,495	
Cash and bank balances		1,927,826		1,199,792	
Loans and advances		856,979		1,551,324	Receivable from SPIC
		4,354,911		3,615,049	
Less: CURRENT LIABILITIES AND PROVISIONS	8				
Current liabilities		1,424,580		1,136,694	
Provisions		341,650		219,036	
		1,766,230		1,355,730	
Net current assets			2,588,681		2,259,319
Miscellaneous Expenditure (Note 8) (to the extent not written off or adjusted)			-		85,647
TOTAL			9,678,100		8,442,261
Notes to the accounts	12				

Per our report of even date attached

For A.F. FERGUSON & CO.
Chartered Accountants

H.L. SHAH
Partner

Place : Chennai
Date : 26th May 2001

For and on behalf of the Board

SHAKTIKANTA DAS *Chairman*
Dr. A.C. MUTHIAH *Vice Chairman*
M. MADHAVAN NAMBIAR *Director*
A.C. CHAKRABORTTI *Director*
D. ARUNACHALAM *Managing Director*
P. VEDAGIRI *Finance Director*

M.B. GANESH
Secretary

PROFIT AND LOSS ACCOUNT

For the year ended 31st March, 2001

(Rupees in '000)

	SCHEDULE		Year ended March 31 2001		Year ended March 31 2000
INCOME					
Sales and services			7,141,669		5,702,084
Other income	9		123,531		40,209
			7,265,200		5,742,293
EXPENDITURE					
Manufacturing and other expenses	10		4,841,252		3,582,816
Excise duty			910,616		739,370
Interest etc. (Net)	11		345,308		230,478
Depreciation for the year		611,826		537,777	
Less: Credit for amount withdrawn from revaluation reserve		182,924		182,924	
			428,902		354,853
			6,526,078		4,907,517
PROFIT BEFORE TAXATION AND EXTRAORDINARY ITEM			739,122		834,776
Provision for tax (net of Rs.10,000 thousands in respect of earlier year)			225,000		325,000
PROFIT AFTER TAXATION BUT BEFORE EXTRAORDINARY ITEM			514,122		509,776
Extraordinary item (Note: 3)			630,248		–
PROFIT AFTER TAXATION AND EXTRAORDINARY ITEM			1,144,370		509,776
Transferred from investment allowance reserve account			37,500		–
Balance brought forward			300,000		300,000
AMOUNT AVAILABLE FOR APPROPRIATION			1,481,870		809,776
APPROPRIATIONS					
Dividends					
- Interim			–		221,963
- Final (proposed)			224,929		–
Tax on Dividends			22,943		24,416
Transfer to debenture redemption reserve			125,000		–
Transfer to general reserve			630,248		263,397
Balance carried to balance sheet			478,750		300,000
			1,481,870		809,776
Notes to the accounts	12				

As per our report attached to the Balance Sheet

For A.F. FERGUSON & CO.
Chartered Accountants

H.L. SHAH
Partner

Place : Chennai
Date : 15th May 2001

For and on behalf of the Board

SHAKTIKANTA DAS — *Chairman*
Dr. A.C. MUTHIAH — *Vice Chairman*
M. MADHAVAN NAMBIAR — *Director*
A.C. CHAKRABORTTI — *Director*
D. ARUNACHALAM — *Managing Director*
P. VEDAGIRI — *Finance Director*
M.B. GANESH — *Secretary*

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SCHEDULES

SHARE CAPITAL

SCHEDULE – 1
(Rupees in '000)

	As at March 31 2001	As at March 31 2000
Authorised		
20,00,00,000 equity shares of Rs.10 each	**2,000,000**	2,000,000
Issued		
8,99,76,899 equity shares of Rs.10 each (Note 6)	**899,769**	899,769
Subscribed and fully paid up		
8,99,71,474 equity shares of Rs.10 each (Note 6)	**899,715**	899,715

RESERVES AND SURPLUS

SCHEDULE – 2
(Rupees in '000)

	Balance as at 31st March, 2000	Transfer from profit and loss account/ additions during the year	Transfer to profit and loss account/ deductions during the year	**Balance as at March, 31 2001**
Capital reserve	4,223 (4,223)	– (–)	– (–)	**4,223** (4,223)
Securities premium account	528,510 (492,124)	- (36,386)	– (–)	**528,510** (528,510)
Debenture redemption reserve account	70,000 (70,000)	125,000 (–)	– (–)	**195,000** (70,000)
Investment allowance reserve account	269,800 (269,800)	– (–)	37,500 (–)	**232,300** (269,800)
Revaluation reserve account (Note 12)	1,391,052 (1,573,976)	– (–)	182,924 (182,924)	**1,208,128** (1,391,052)
General reserve	1,486,022 (1,222,625)	630,248 (263,397)	– (–)	**2,116,270** (1,486,022)
Profit and loss account	300,000 (300,000)	478,750 (300,000)	300,000 (300,000)	**478,750** (300,000)
	4,049,607 (3,932,748)	1,233,998 (599,783)	520,424 (482,924)	**4,763,181** **(4,049,607)**

Figures in brackets relate to previous year.

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SECURED LOANS

SCHEDULE -
(Rupees in '00

	As at March 31, 2001	As at March 31, 2000
Loans from financial institutions		
Term loans [Amounts due within one year Rs.209,882 thousands (Previous year Rs.257,305 thousands)]	1,533,650	837,422
Loans from banks		
Term loans [Amounts due within one year Rs.205,286 thousands (Previous year Rs.192,364 thousands)]	410,572	577,093
Others (Short term)	39,047	372,152
Non convertible debentures	276,667	300,000
	2,259,936	2,086,667

Note:

1. Term loans from financial institutions of Rs.533,650 thousands (previous year Rs.837,422 thousands) and non-convertible debentures from financial institutions of Rs.26,667 thousands (previous year Rs.50,000 thousands) and banks of Rs.250,000 thousands (previous year Rs.250,000 thousands) (other than 2,4 and 5 below) are secured / to be secured by a first mortgage by deposit of title deeds of all the company's immovable properties, both present and future ranking paripassu interse.

   The said debentures and term loans are further secured / to be secured by a first charge of all the company's movables (save and except book debts) including movable machinery spares, tools and accessories both present and future, subject to prior charges created / to be created in favour of the Company's bankers on inventories, book debts and other movables for securing the borrowings for the working capital requirements.(see also Note 5 below)

2. Other loans from banks of Rs.39,047 thousands (previous year Rs.372,152 thousands) are secured by hypothecation by way of charge on inventories both on hand and in transit, book debts and other receivables both present and future and are secured/to be secured by way of second charge on all immovable properties both present and future.

3. a) 17.5% debentures for Rs 30,000 thousands are redeemable in 24 quarterly instalments commencing from 1st April, 1996 (Rs 26,250 thousands redeemed) and 17.5% debentures for Rs 100,000 thousands and 19.6% debentures for Rs 10,000 thousands are redeemable in 24 quarterly instalments commencing 1st October, 1996. (Rs 87,083 thousands redeemed).

   b) 13.50% debentures for Rs 170,000 thousands are redeemable in three annual instalments commencing from 20th May, 2002 and 13.50% debentures for Rs 80,000 thousands are redeemable in three annual instalments commencing from 22nd October, 2002.

4. Term loans from banks includes external commercial borrowings from banks of Rs.410,572 thousands (previous year Rs.577,093 thousands) which is secured (subject to prior charges stated in note 1 above) by all movables but not limited to movable machinery spares, tools and accessories, furnitures, fixtures, automobiles, trucks and all kinds of movables present and future subject to prior charges created/to be created in favour of banks for the borrowings for working capital requirements.

5. Loans from financial institutions includes rupee term loan of Rs.1,000,000 thousands (previous year Rs.nil) which is to be secured by a first mortgage and charge on all the moveable and immovable properties of the LAB plant both present and future, and ranking pari passu with the loans and debentures stated in note 1 above and is further secured by a pledge of all the equity shares held by the company in Henkel SPIC India Limited.

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UNSECURED LOANS

SCHEDULE – 4
(Rupees in '000)

	As at March 31 2001	As at March 31 2000
Fixed deposits	50,053*	58,747
Short term loans from banks	50,000	150,000
Short term loans (from other than banks)	100,000	–
Floating rate convertible notes (Note 4)	1,138,864	1,112,788
Housing Development Finance Corporation Limited	81,351	84,737
Commercial Paper**	335,000	–
	1,755,268	1,406,272

* Includes repayable within one year Rs. 26,258 thousands (Previous year Rs. 31,191 thousands)

** Maximum amount outstanding at any time during the year Rs. 335,000 thousands (Previous year Rs. 330,000 thousands)

FIXED ASSETS

SCHEDULE – 5
(Rupees in '000)

Description	COST/VALUATION				DEPRECIATION				NET BOOK VALUE	
	As at 31.3.2000	Additions/ Adjustments	Deductions/ Adjustments	As at 31.3.2001	As at 31.3.2000	For the year	Deductions/ Adjustments	As at 31.3.2001	As at 31.3.2001	As at 31.3.2000
Land	230,208	25 816	–	2,56,024	–	–	–	–	256,024	230,208
Buildings	312,246	100,463	–	412,709	66,923	8,177	–	75,100	337,609	245,323
Plant and machinery	8,899,382	1,268,529	–	10,167,911	4,134,029	597,096	–	4,731,125	5,436,786	4,765,353
Furnitures and fixtures	10,515	2,470	59	12,926	5,571	671	5	6,237	6,689	4,944
Office and other equipment	45624	9,516	90	55,050	24,341	4,451	20	28,772	26,278	21,283
Vehicles	8,677	19,105	367	27,415	4,819	769	178	5,410	22,005	3,858
Ships - Barges	9,600	–	–	9,600	3,018	662	–	3,680	5,920	6,582
	9,516,252	1,425,899*	516	10,941,635	4,238,701	611,826	203	4,850,324	6,091,311	
Previous year	8,721,839	794,856*	443	9,516,252	3,701,075	537,777	151	4,238,701		5,277,551
Capital work in progress including advances against capital expenditure									216,562	47,564
									6,307,873	5,325,115

NOTE.
* Includes net additions Rs. 17,689 thousands on account of exchange fluctuation (Previous year net deletion of Rs. 31,302 thousands)

INVESTMENTS

SCHEDULE – 6

(Rupees in '000)

		As at March 31 2001		As at March 31 2000
Long Term Investments				
Shares, debentures and bonds.				
Trade (at cost) (Quoted)				
Henkel SPIC India Limited 1,93,95,900 Equity shares of Rs.10 each		420,245		420,245
Standard Motor Products of India Limited 40,00,000 Equity shares of Rs.10 each	40,000		40,000	
Less: Provision for diminution in value	40,000		40,000	
		—		—
Industrial Development Bank of India 5,48,800 (previous year 3,43,000) Equity shares of Rs.10 each. (2,05,800 shares allotted as bonus shares during the year)		44,590		44,590
Tamilnadu Newsprint and Papers Limited 14,90,000 Equity shares of Rs.10 each		163,900		163,900
Trade (at cost) (unquoted)				
Petro Araldite Private Limited 13,68,000 equity shares of Rs. 100 each		136,800		136,800
Gulf Petroproduct Company E.C., Bahrain 200,000 equity shares of one US dollar each (acquired during the year)		9,366		-
Non-trade (at cost) (Quoted)				
IDBI Bank Limited 2,58,100 equity shares of Rs. 10 each		4,645		4,645
Non-trade (at cost) (Unquoted)				
SBI Mutual Fund 3,30,000 Magnums of Rs.10 each [Repurchase price Rs.3,194 thousands (previous year Rs.8,336 thousands)]		2,000		2,000
		781,546		772,180
Aggregate value of unquoted investments		148,166		138,800
Aggregate value of quoted investments		633,380		633,380
Market value of quoted investments		734,019		1,385,676

CURRENT ASSETS, LOANS AND ADVANCES

SCHEDULE – 7
(Rupees in '000)

		As at March 31 2001		As at March 31 2000
A. CURRENT ASSETS:				
Inventories				
Stores	267,319		214,670	
Loose tools	777		903	
Raw materials	317,875		223,543	
Work in process	52,625		28,859	
Finished goods	448,420		298,463	
		1,087,016		766,438
Sundry debtors (Unsecured)				
Outstanding over six months				
Considered good	162,318		24,206	
Considered doubtful	34,994		26,500	
	197,312		50,706	
Outstanding under six months				
Considered good	320,772		73,289	
	518,084		123,995	
Less: Provision for doubtful debts (includes Rs.3,494 thousands on transfer of business)	34,994		26,500	
		483,090		97,495
Cash and bank balances				
Cash and cheques on hand	65,012		122	
With scheduled banks:				
On current accounts	171,450		97,597	
On deposit accounts	465,590		4,824	
On margin money account	371		371	
With non scheduled banks:				
On deposit account with Bank Leu (Maximum balance at any time during the year Rs.1,225,403 thousands; Previous year Rs. 1,248,956 thousands)	1,225,403		1,096,878	
		1,927,826		1,199,792
B. LOANS AND ADVANCES:				
(Unsecured, considered good)				
Advances recoverable in cash or in kind or for value to be received*	832,234		1,425,363	
Balances with excise and customs authorities	24,745		125,961	
		856,979		1,551,324
		4,354,911		3,615,049

* Includes due from an officer of the company Rs.222 thousands (Previous year Rs. 241 thousands) Maximum amount outstanding at any time during the year Rs.241 thousands (Previous year Rs.257 thousands)

CURRENT LIABILITIES AND PROVISIONS

SCHEDULE – 8
(Rupees in '000)

		As at March 31 2001		As at March 31 2000
A. CURRENT LIABILITIES				
Acceptances		76,368		116,110
Sundry creditors				
– Total outstanding dues to small scale industrial undertakings	135		217	
– Others	1,227,353		704,930	
		1,227,488		705,147
Unclaimed dividends		16,435		12,088
Interest accrued but not due		81,191		55,982
Advances received from customers		23,098		25,404
Interim dividend		–		221,963
		1,424,580		1,136,694
B. PROVISIONS				
Proposed dividend		224,929		–
Taxation (net)		116,721		219,036
		341,650		219,036
		1,766,230		1,355,730

OTHER INCOME

SCHEDULE – 9
(Rupees in '000)

	Year ended March 31 2001	Year ended March 31 2000
Scrap Sales	2,340	4,672
Dividend from trade investments	3,331	3,974
Exchange difference (net)	114,150	21,073
Miscellaneous income	3,710	10,490
	123,531	40,209

1144,33

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MANUFACTURING AND OTHER EXPENSES

SCHEDULE – 10
(Rupees in '000)

		Year ended March 31, 2001		Year ended March 31, 2000
Raw materials and intermediates consumed		2,587,358		1,482,423
Purchase of traded goods		352,525		355,167
Stores and spare parts consumed		283,523		400,346
Utilities consumed		55,836		71,138
Power and fuel		976,314		497,277
Licence fees		–		12,142
Payments to and provisions for employees				
Salaries and allowances		107,757		92,912
Contribution to Provident and other funds		12,276		10,673
Staff Welfare		31,070		20,166
Travel and conveyance		14,828		19,454
Insurance		49,968		57,682
Rent		26,844		15,785
Rates and taxes		41,384		48,663
Repairs and maintenance				
Machinery	48,067		48,087	
Buildings	5,222		3,468	
Others	11,720	65,009	6,878	58,433
Discounts		160,705		256,289
Commission		48,210		39,058
Freight		147,958		129,276
Directors' sitting fee		505		[illegible]
Provision for doubtful debts		5,000		11,000
Loss on sale/scrapping of assets (net)		134		143
Miscellaneous expenses		69,551		79,380
(Increase) / Decrease in work in process and finished goods				
Opening Stock				
Work in process	28,859		28,736	
Finished goods (including Rs.22,174 thousands taken over on transfer of business)	320,637		213,782	
	349,496		242,518	
Closing Stock				
Work in process	52,625		28,859	
Finished goods	448,420		298,463	
	501,045		327,322	
		(151,549)		(84,804)
		4,885,206		3,582,816
Less : Cost of internal transfers		43,954		–
		4,841,252		3,582,816

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INTEREST **SCHEDULE – 11**

(Rupees in '000)

		Year ended March 31 2001		Year ended March 31 2000
Interest expenses				
- On fixed period loans	273,408		220,060	
- Others	165,730		151,489	
		439,138		371,549
		439,139		371,549
Less: Interest income				
On bank and intercorporate deposits [Tax deducted at source Rs.5,861 thousands (Previous year Rs.15,143 thousands)]	85,878		114,386	
On others	7,952		5,989	
		93,830		120,375
		345,308		251,174
Less: Interest capitalised		–		20,696
		345,308		230,478

NOTES TO THE ACCOUNTS FOR THE YEAR ENDED 31ST MARCH 2001 **SCHEDULE – 12**

1. **ACCOUNTING POLICIES**

The accounts are prepared under the historical cost convention (except for revaluation of certain fixed assets as stated below) and materially comply with the mandatory accounting standards issued by the Institute of Chartered Accountants of India.

The significant accounting policies followed by the company are as stated below:

I. **FIXED ASSETS AND DEPRECIATION**

Fixed assets are stated at cost less depreciation. Cost comprises of purchase price (net of rebates and discounts), import duties, levies (net of modvat) and any directly attributable cost of bringing the assets to its working condition for the intended use. Certain assets have been revalued as on 31st March, 1996 and the resultant surplus has been added to the cost of the assets.

Depreciation is provided on a prorata basis, from the date the assets have been installed and put to use, on a straight line method at the rates and in the manner specified under Schedule XIV of the Companies Act, 1956 except as stated below:

Based on a technical evaluation carried out by the management the life of the plant and machinery used in the Epichlorohydrin plant has been determined as 10 years as against 18 years computed based on depreciation rates specified in schedule XIV of the Companies Act,1956. Consequently depreciation on the said plant has been provided accordingly.

II. **FOREIGN CURRENCY TRANSACTIONS**

Foreign currency liabilities (incurred for the acquisition of fixed assets) are translated at exchange rates prevailing on the last working day of the accounting year. The loss or gain arising out of the

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said translation is adjusted to the cost of the assets. In case of forward contracts,the translation is done at forward contract rates and net gain or loss and the forward cover premium is also adjusted to the cost of the assets. Gains or losses on account of cancellation of forward cover contracts are also adjusted to the cost of the asset.

Other foreign currency receivables/payables are translated on the same basis as above and gain or loss arising out of such translation and forward cover premium are adjusted to profit and loss account.

III. INVESTMENTS

Investments are valued at their acquisition cost. Provision for permanent diminution in value has been made, wherever necessary.

IV. INVENTORIES

Inventories are valued at lower of cost and net realisable value except stores and loose tools, which are valued at cost. The method of determination of cost of various categories of inventories are as follows:

a. Stores and loose tools at moving weighted average rates.

b. Raw materials at moving weighted average rates / annual average rates.

c. Work-in-process and finished goods - Full absorption costing method.

V. REVENUE RECOGNITION

Sales is recognised at the point of despatch of materials to customers from plant and stock points.

VI. RETIREMENT BENEFITS

Contribution to provident fund is made monthly, at a predetermined rate, to the provident fund trust and debited to the profit and loss account on an accrual basis. The company has an arrangement with Life Insurance Corporation of India (LIC) to administer its superannuation and gratuity schemes. The premium paid/payable as determined based on actuarial valuation carried out by LIC, is debited to the profit and loss account on an accrual basis. Provision for leave encashment on retirement is made on an actuarial basis.

VII. CONTINGENT LIABILITIES

All liabilities have been provided for in the accounts except liabilities of a contingent nature, which have been disclosed at their estimated value in the Notes to the Accounts.

2. The company has acquired on 27th September 2000, the Heavy Chemicals Division of M/s. Southern Petrochemical Industries Corporation Limited for a purchase consideration of Rs.1,068,269 thousands as per the details given below:

	(Rupees '000)
Net Fixed Assets	1,250,000
Net Current Assets	203,762
Less : Secured loans	385,493
Purchase consideration	1,068,269

The results for the year include the results of operation of this Division from 27th September 2000.

3. Consequent to Ciba India Private Limited (CIPL) divesting their stake in Petro Araldite Private Limited (PAPL) in favour of Vantico Performance Polymers Private Limited, the Company had to agree to waive the right of first refusal in respect of shares sought to be sold, cessation of existing supply agreement for supply of Epichlorohydrin to PAPL to be superceded by a new supply agreement and release CIPL from its obligation and duties subsisting under various agreements. In consideration of premature termination of the contracts and for surrendering the above rights, a sum of Rs.630,248 thousands was settled by CIPL as compensation which, being an extraordinary item, in the nature of capital receipt, has been shown as such in the profit and loss account and transferred to general reserve

4. The company had issued during the 1996-97 floating rate convertible notes (Notes) for a value of Swiss franc 45 million. The Notes are normally repayable at par on 9th December, 2003.

   The Notes are convertible at the option of the investors at Rs.18 per share at any time during the period, 16th December, 2000 to 9th November, 2003.

   The above conversion price is subject to adjustment in the event of alteration in the equity share capital of the company. The investor has an option for redemption on 9th December,2001 at a price of 100% of the principal amount.

   The company also has the option to call the outstanding Notes for redemption on 9th December, 2001 or thereafter at 100% of the principal amount on fulfilment of certain conditions. In addition, the company has the option to redeem the said Notes on 9th December, 2001 and 9th December, 2002 at 101.50% and 101% of the principal amount respectively.

5. Loan from banks (schedule 3) includes External Commercial Borrowings of US Dollar 8.82 million. (Previous year US $ 13.23 million) repayable in two equal annual instalments. An instalment of US $ 4.41 million has been repaid during the year

6. In December 1993 the Company came out with Rights cum Public issue of equity shares. The difference between issued and subscribed capital of 5425 (previous year 5425 shares) shares is due to said shares kept in abeyance under Section 206 A of the Companies Act, 1956.

7. Power and fuel consumed (Schedule 10) is net of Rs.10,830 thousands (previous year Rs.5,870 thousands) being the credit given by Tamilnadu Electricity Board for power transferred to the grid from the Windfarm.

8. Miscellaneous expenditure (to the extent not written off or adjusted) represents balance of deferred revenue expenditure amounting to Rs. nil (previous year 85,647 thousands) relating to cost of replacement of molecular seives with long term benefits and as such it has been decided to charge off the same to the profit and loss account (under the head 'stores consumed') over a period of three years commencing from 1998-99.

9. Loans and advances include Rs.280,338 thousands (previous year Rs.279,113 thousands) to be adjusted against equity shares to be issued by SPIC Electric Power Corporation Pvt. Limited and Vopak Sical Terminal Limited which are promoted by the Company

10. The company has certain investments whose market price is lower than the purchase cost. The company, after considering various factors, has come to the conclusion that the decline in market price is 'temporary'and therefore has not made any provision for diminution in value of these investments. Further the company has certain other investments whose market price is higher than cost which would more than offset the above diminution in value

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11. Research and development expenses incurred on revenue account is Rs. 1,809 thousands (previous year Rs. 2,059 thousands).

12. a) Fixed assets (other than furniture and fixtures, office and other equipment, vehicles, ships - barges, certain land and plant and machinery) have been revalued as on 31.3.1996 on the basis of 'Existing Use Value' by independent professional valuers. The resultant surplus on such revaluation over the written down value of these assets amounting to Rs. 2,140,920 thousands has been credited to revaluation reserve as on 31st March 1996.

b) The depreciation charge for the year shown in the profit and loss account is after deducting an amount of Rs. 182,924 thousands (previous year Rs. 182,924 thousands) representing extra depreciation arising on revaluation of fixed assets withdrawn from revaluation reserve.

	As at March 31 2001	(Rs. '000) As at March 31 2000
13. Estimated value of contracts remaining to be executed on capital account and not provided for (net of advances)	51,736	74,994
14. Contingent liabilities		
(a) Bills discounted	74,779	10,240
(b) Other claims not acknowledged as debts	18,433	14,472

	Year ended March 31 2001	Year ended March 31 2000
15. Dividend paid in foreign currency		
Number of shareholders	23	26
Number of shares held	1,998,400	2,438,000
Amount of dividend paid (Rs.thousands)	4,996	5,851
Dividend for the year ended	31.03.2000	31.03.1999
16. Managerial Remuneration		
Wholetime directors' remuneration	4,725	2,928
Directors' sitting fee	505	214
	5,230	3,142

(Rs.'000)

	Year ended March 31 2001	Year ended March 31 2000
17. Computation of net profit under Section 198 of the Companies Act, 1956		
Profit before taxation as per profit and loss account	739,122	834,776
Add: Managerial remuneration	5,230	3,142
Depreciation as per accounts	428,902	354,853
Provision for doubtful debts	5,000	11,000
Loss on assets sold/scrapped (net) as per accounts	134	143
	1,178,388	1,203,914
Less: Depreciation calculated under Section 350 of the Companies Act, 1956	428,902	299,204
(Profit)/Loss on assets sold / scrapped (net) as per Section 349 of the Companies Act, 1956	134	(40)
Net Profit in terms of Section 198 of the Companies Act, 1956	749,352	904,750
Commission payable to wholetime directors	22,481	18,849
Restricted to	1,620	945
18. Auditor's Remuneration		
Audit fee	700	700
Taxation	167	156
Management services	–	17
Other services	455	142
Reimbursement of expenses including service tax	53	34
19. CIF Value of Imports:		
Capital goods	4,161	184,831
Intermediates	469,525	353,600
Finished goods	333,076	269,723
Stores and spares	19,296	68,425
20. Expenditure in foreign currency:		
Travel and training	372	7,238
Interest and Commitment charges	102,498	87,469
Technical fees	3,935	11,679
Licence fees	–	9,714
Others	2,135	62
21. Earnings in foreign exchange		
Export of goods on FOB basis	507,363	275,002
Interest	62,047	59,363

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22. Capacity and Production

Class of goods	Unit of measurement	Licensed capacity		Installed capacity		Actual production	
		Current Year	Previous Year	Current Year	Previous Year	Current Year	Previous Year
Linear Alkyl Benzene	MT	**	**	75,000	75,000	99,631	87,461
Heavy Normal Paraffin	MT	**	**	15,000	15,000	–	28
Heavy Alkylate	MT	**	**	N.A	N.A	4,588	3,297
Epichlorohydrin	MT	**	**	10,000	10,000	3,620	951
Wind power		N.A	N.A	12,000 (KW)	12,000 (KW)	19,391,193 (Units)	22,221,412 (Units)
Caustic soda	MT	66,000	–	66,000	–	26,732[a]	–
Chlorine	MT	40,000	–	40,000	–	18,335[a]	–
Hydrochloric acid	MT	49,500	–	39,600	–	7,615[a]	–
Ammonium chloride	MT	21,000	–	21,000	–	3,662[a]	–

* as certified by the Management and relied on by the auditors without verification being a technical matter.

** these products are delicensed.

[a] relates to the period from 27th September 2000 being the date of acquisition of Heavy Chemicals Division. (see Note 2).

N.A Not applicable

23. (i) Raw Materials and Intermediates Consumed

	Year ended March 31, 2001		Year ended March 31, 2000	
	% of total consumption	Value (Rs. '000)	% of total consumption	Value (Rs. '000)
Imported	20.93	541,481	40.98	607,505
Indigenous	79.07	2,045,877	59.02	874,918
	100.00	2,587,358	100.00	1,482,423
(ii) Stores and Spare parts consumed				
Imported	36.87	104,542	67.27	269,313
Indigenous	63.13	178,981	32.73	131,033
	100.00	283,523	100.00	400,346

24. Purchase of Traded Goods

	Unit of Measurement	Year ended March 31, 2001		Year ended March 31, 2000	
		Quantity	Value (Rs.'000)	Quantity	Value (Rs.'000)
Kerosene	KL	20,211	272,026	32,239	355,167
Soyabean	MT	9,973	80,499	–	–
			352,525		355,167

25. Stock particulars of traded goods

	Year ended March 31, 2001				Year ended March 31, 2000			
	Opening Stock		Closing Stock		Opening Stock		Closing Stock	
	Quantity (KL)	Value Rs.'000	Quantity (KL)	Value Rs.'000	Quantity (KL)	Value Rs.'000	Quantity (KL)	Value Rs.'000
Kerosene	14,575	159,852	1,192	17,180	10,226	75,505	14,575	159,852

26. The company has obtained exemption from the Government of India, Department of Company Affairs, vide order dated, 24th May 2001 from giving information in respect of paras 3 (i) (a), 3(ii) (a) (1), and 3 (ii) (a) (2) of part II of Schedule VI to the Companies Act,1956.

27. a) Previous year's figures have been regrouped / recast, wherever necessary, to conform to current year's classifications.

b) Current year's figures include the results of operations of the Heavy Chemicals Division taken over with effect from 27th september, 2000 and therefore are not comparable with those of the previous year.

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28. INFORMATION PURSUANT TO PART - IV OF SCHEDULE VI OF THE COMPANIES ACT, 1956

BALANCE SHEET ABSTRACT AND COMPANY'S GENERAL BUSINESS PROFILE

I. Registration Details :

Registration No. 0 1 0 9 3 1 State Code: 1 8

Balance Sheet: 3 1 (Date) 0 3 (Month) 0 1 (Year)

II. Capital Raised during the Year (Amount in Rs.Thousands)

Public Issue	Rights Issue
- - - N I L - - -	- - - N I L - - -
Bonus Issue	**Private Placement**
- - - N I L - - -	- - - N I L - - -

III. Position of Mobilisation and Deployment of Funds (Amount in Rs.Thousands)

Total Liabilities	Total Assets
1 1 4 4 4 3 3 0	1 1 4 4 4 3 3 0

Sources of Funds

Paid-up Capital	Reserves & Surplus
8 9 9 7 1 5	4 7 6 3 1 8 1
Secured Loans	**Unsecured Loans**
2 2 5 9 9 3 6	1 7 5 5 2 6 8

Application of Funds

Net Fixed Assets	Investments
6 3 0 7 8 7 3	7 8 1 5 4 6
Net Current Assets	**Misc. Expenditure**
2 5 8 8 6 8 1	- - - N I L - - -
Accumulated Losses	
- - - N I L - - -	

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IV. Performance of Company (Amount in Rs.Thousands)

Turnover (including other income)	Total Expenditure
7265200	6526078

Profit/Loss Before Tax and extraordinary item	Profit/Loss After Tax and extraordinary item
+ ✓ 739122	+ ✓ 1144370

Earnings per Share in Rs	Dividend rate %
12.72	25

V. Generic Names of Three Principal Products/Services of Company (as per monetary terms)

Item Code No.	381710001
Product Description:	LINEAR ALKYL BENZENE
Item Code No	29103000
Product Description:	EPICHLOROHYDRIN
Item Code No.	281512
Product Description:	CAUSTIC SODA

SHAKTIKANTA DAS	*Chairman*	M.B. GANESH
Dr. A.C. MUTHIAH	*Vice Chairman*	*Secretary*
M. MADHAVAN NAMBIAR	*Director*	
A.C. CHAKRABORTTI	*Director*	
D. ARUNACHALAM	*Managing Director*	
P. VEDAGIRI	*Finance Director*	

Place : Chennai
Date : 26th May, 2001

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PURSUANT TO CLAUSE 32 OF THE LISTING AGREEMENT
CASH FLOW STATEMENT FOR THE YEAR ENDED 31ST MARCH 2001

(Rupees in '000)

		For the year ended 31st March 2001		For the year ended 31st March 2000
A. Cash Flow from Operating Activities:				
Net profit before tax and extraordinary items		739,122		834,776
Adjustment for				
Depreciation	428,902		354,853	
Loss on sale/scrapping of fixed assets (net)	134		143	
Exchange difference (net)	(114,150)		(21,073)	
Interest paid (net of interest capitalised)	439,138		350,853	
Interest received	(93,830)		(120,375)	
Income from investments	(3,331)		(3,974)	
		656,863		560,427
Operating profit before working capital changes		1,395,985		1,395,203
Adjustments for:				
(Increase) / Decrease in sundry debtors	(385,595)		2,150	
(Increase) / Decrease in inventories	(320,578)		(235,639)	
(Increase) / Decrease in loans and advances	518,262		(279,473)	
Increase/(Decrease) in current liabilities and provisions	509,849		363,324	
(Increase) / Decrease in Miscellaneous Expenditure	85,647		85,649	
		407,585		(63,989)
Cash generated from operations		1,803,570		1,331,214
Interest received		7,952		5,989
Direct taxes paid		(350,258)		(213,429)
Cash flow before extraordinay item		1,461,264		1,123,774
Extraordinary item		630,248		-
Net Cash from Operating Activities		2,091,512		1,123,774
B. Cash Flow from Investing Activities:				
Additions to fixed assets (including capital work in progress and advances)	(1,594,897)		(435,896)	
Advances to be adjusted against equity	(1,225)		(39,163)	
Proceeds from sale of fixed assets	179		149	
Purchase of investments	(9,366)		(312,539)	
Income from investments	3,331		3,974	
		(1,601,978)		(783,475)
Net cash from investing activities		(1,601,978)		(783,475)

Cash Flow Statement for the year ended 31st March 2001 (continued)

(Rupees in '000)

		For the year ended 31st March 2001		For the year ended 31st March 2000
C. Cash Flow from Financing Activities:				
Proceeds from issue of share capital	–		69,375	
Proceeds from new borrowings	3,047,630		1,827,845	
Repayment of borrowings	(2,525,365)		(2,173,089)	
Loans / Deposits with companies	177,308		191,990	
Exchange difference (net)	114,150		21,073	
Dividend paid	(221,963)		(208,014)	
Interest paid	(439,138)		(350,853)	
Interest received	85,878		114,386	
		238,500		(507,287)
Net cash from financing activities		238,500		(507,287)
Net cash flows during the year (A+B+C)		728,034		(166,988)
Cash and cash equivalents (Opening balance)		1,199,792		1,366,780
Cash and cash equivalents (Closing balance)		1,927,826		1,199,792

For and on behalf of the Board

D. ARUNACHALAM *Managing Director*
P. VEDAGIRI *Finance Director*
M.B. GANESH *Secretary*

Place : Chennai
Date : 26th May 2001

AUDITORS REPORT

We have examined the attached cash flow statement of Tamilnadu Petroproducts Limited for the year ended 31st March, 2001. The statement has been prepared by the Company in accordance with the requirements of the listing agreement with the stock exchanges and is based on and derived from the audited accounts of the Company for the year ended 31st March, 2001.

For A.F. FERGUSON & CO.
Chartered Accountants

H.L. SHAH
Partner

Place : Chennai
Date : 26th May 2001

Disclosure of particulars with respect to Conservation of Energy, Technology Absorption, Foreign Exchange Earnings and Outgo as required under Companies (Disclosure of Particulars in the Report of Board of Directors) Rules, 1988 and forming part of the Report of the Board of Directors for the period ended 31st March 2001.

CONSERVATION OF ENERGY

a. Energy Conservation measures taken

1. Installation of Pre-Heaters in HNP Column
2. Conversion of Aluminium blades to FRP blades in Fin Fan Coolers
3. Modified Electrical Control System to stop one electrically operated Fan in Heater
4. Introduction of VFD and Installation of lower capacity Motors to achieve energy saving
5. Installation of Magnetic Resonator in Boiler to save fuel Consumption.

b. The following proposals are being implemented.

1. New ALC Mixer for improved yield of products
2. Conversion of Reciprocating Air Compressor to Oil Free Screw Compressor
3. Buring off-gas in ECH process heater and avoiding fuel oil consumption
4. Sharing of utilities
5. Installation of Variable Frequency Drives (VFDs) to reduce power consumption in various rotating equipments

FORM – A

Form for disclosure of particulars with respect to Conservation of energy

A. Power and Fuel Consumption

1. Electricity :

	Current Year	Previous Year
a. Purchased	–	
Units (in lakhs)	554.49	50.46
Total amount (Rs.in lakhs)	1969.00	372.35
Rate / Unit (Rs.)		
Units Charges (Rs. / Unit)*	3.55	3.80
Demand Charges (Rs. / KVA)	150.00	150.00

*Variable cost includes peak hour charges and tax.

b. Own Generation

1. Through Diesel generator

Units** (in lakhs)	983.23	864.66
Units/Litre of Fuel	4.05	4.05
Rate/Unit (Rs.)	2.67	2.30

** Includes power exported to grid

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2. Coal (specify quality where used)		
Quantity (Tonnes)	–	–
Total cost	–	–
Average Rate	–	–
3. Furnace Oil		
Quantity (KL)	83043.92	70800.21
Total Amount (Rs.in lakhs)	7300.07	4617.95
Average Rate (Rs./KL)	8790.62	6522.51
4. Other/Internal Generation		
Windfarm		
Units (Lakhs)	193.91	222.21
Rate/Unit (Rs.)	0.59	0.34
Total amount (Rs. lakhs)	115.02	76.05

B. Consumption per unit (MT) of Production

Products with details (unit)	(Standard if any)	Current Year			Previous Year	
		LAB	ECH	HCD CAUSTIC	LAB	ECH
Electricity (KWHR/MT)	–	651.39	3299	2659	726.73	8084
Furnace Oil (MT)	–	0.4676	0.9201	0.080	0.4827	1.26
Coal (Specify quality)	–	–	–	–	–	–
Others (Specify)	–	–	–	–	–	–

Note : Previous year figures are not comparable since the current year figures include that of Heavy Chemicals Division also, acquired during the financial year effective 27th September 2000.

FORM – B

Form for disclosure of particulars with respect to absorption

RESEARCH AND DEVELOPMENT (R & D)

1. Specific areas in which R & D carried out by the Company
   a. An eco-friendly process of LAB manufacture
   b. Studies on LAB sulphonates- vs- molecular structure of LAB
   c. An easier solid catalyst based process for Epichlorohydrin manufacture
   d. Studies to improve the economics of the current Epichlorohydrin process
2. Benefits derived as a result of above R & D
   a. New grade of LAB with certain improved characteristics
   b. Value addition to by-products
3. Future Plan of Action:
   a. Generatioin of additional ECH from side streams
   b. Generation of intermediate required for ECH from side streams
   c. Pilot scale studies of the new process for Epichlorohydrin
   d. LAB quality improvements

Expenditure on R & D	(Rs.in lakhs)
a. Capital	247.18
b. Recurring	18.09
c. Total	265.27
d. Total R & D expenditure as a percentage of total turnover.	0.37

CHNOLOGY ABSORPTION, ADAPTATION AND INNOVATION

Nil

REIGN EXCHANGE EARNINGS AND OUTGO

a. Emphasis is laid on long term export contracts to ensure stable export volumes.

b. Foreign exchange outgo - Rs. 9349.98 lakhs

Foreign exchange earnings - Rs. 5694.10 lakhs

tement showing the particulars of employees of the Company as required under Section 217) of the Companies Act, 1956 read with the Companies (Particulars of Employees) Rules, 1975 l forming part of the Report of the Board of Directors for the year ended 31st March 2001.

o., Name, Designation and Nature of Duties, Age, Qualification and Experience, Last Employment and t held, Date of Commencement of employment, Gross Amount Rs.

D. Arunachalam, Managing Director, 52 years, B.Sc., DMIT; 29 years , Manager (Instrumentation), Southern Petrochemical Industries Corporation Ltd., Chennai, 01-02-87, 17,79,189.00.

M. Sundaram,Technical Director, 54 years; B.E.,(Mech.), 32 years, Senior Engineer, Engineers India Limited, New Delhi, 15-05-85, 14,72,943.00.

P. Vedagiri, Finance Director, 58 years; B.Com., F.C.A., 31 years, Executive Director (Finance), Southern Petrochemical Industries Corporation Ltd., Chennai - 04-02-99, 13,62,796.00.

e of the Employees is a relative of any Director of the Company and the appointment is contractual

he Equity Shares of the Company are listed with the following Stock Exchanges

1. Madras Stock Exchange Ltd.
   11, Second Line Beach,
   Chennai - 600 001.
2. The Stock Exchange Ahmedabad
   Kamadhenu Complex, Opp.Sahajanand College.
   Panjarapole, Ahmedabad - 380 015.
3. The Stock Exchange, Mumbai
   Phiroze Jeejeebhoy Towers,
   Dalal Street, Mumbai - 400 001.
4. The Delhi Stock Exchange Association Ltd.
   3/1, Asaf Ali Road
   New Delhi - 110 002.
5. National Stock Exchange of India Ltd.
   Exchange Plza, 5th Floor, Plot No.C/1,
   G Block, Bandra - Kurla Complex,
   Bandra (E), Mumbai - 400 051.

The Listing fees for the year 2001-2002 have been paid in time.

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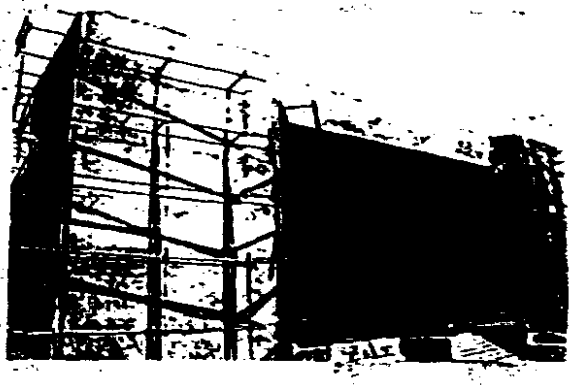
Proposed Corporate Office Bldg, Chennai - Architect's View

Corporate Office Bldg. Under Construction



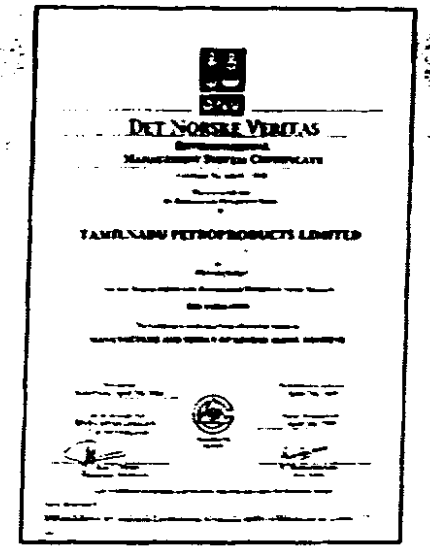
BRITISH SAFETY COUNCIL

SAFETY AWARD

TAMILNADU PETROPRODUCTS LIMITED

CHENNAI

British Safety Council Safety Award

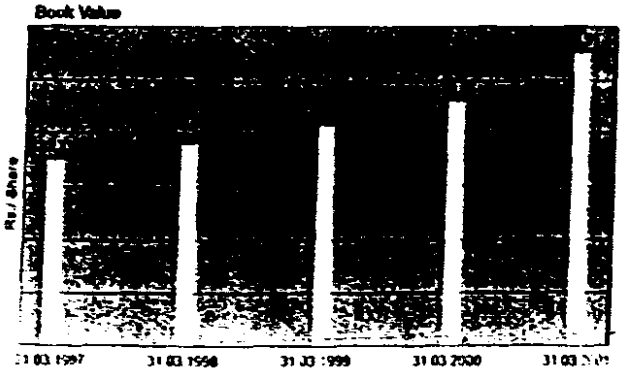


DET NORSKE VERITAS

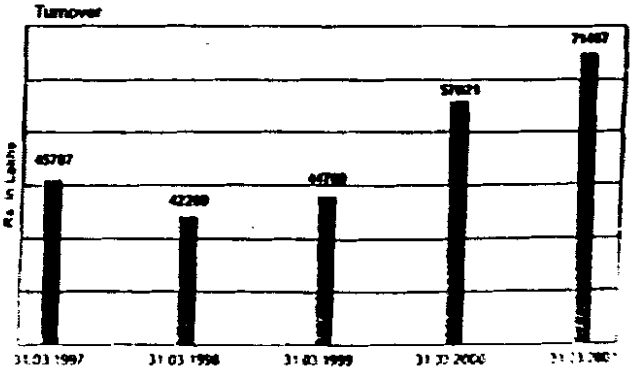
TAMILNADU PETROPRODUCTS LIMITED

Environmental Management System Certificate - ISO 14001

Book Value



Turnover



CLIMATE CHANGE CENTERS PROJECT DEVELOPMENT TRAINING

Establishing Proficient Project Structuring, Financial and Marketing Capabilities

PROJECT APPRAISAL : ANALYSIS SUMMARY

The Louis Berger Group, Inc.

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement

Project Appraisal (Power Project): Summary of Analysis

A. Promoter Analysis

Group Financial Performance Analysis

Growth and Profitability track record
Equity return track record

Financial Resourcefulness Analysis

Analysis of credit ratings of promoter group
Adequacy of internal resources and other funds for ongoing / proposed projects
Ability to bring in required promoters' contribution for present project
Commitments from partners, EPC, O&M, etc.
Credibility & relationship with Banks, FIs
Ability to tap equity markets in India and Abroad
Ability to fund overruns

Promoter Group Management Analysis

Market leadership / Industry position
Ability to deal with difficulties, delays, Govt. agencies, contingencies
Business focus – where does Power fit into their businesses
Professionalism in senior management
Extent of Competitive advantage & its sustainability in existing businesses
Ability to face imports, industry downturns, liberalisation / decontrol
Prior experience in Power sector
Past projects: timeliness and cost control
Commitment to environmental issues
Sustenance of relationships with co-promoters
Transparency & disclosure culture
Legal cases pending against group

Analysis of Management & Share-holding

Suitability of the Board and CEO to ensure quality of management
Adequacy of Project monitoring experience, manpower, MIS and audit process
Potential problems or delays in raising equity
Assurance on long-term commitment from promoters
Adequacy, safeguards to ensure shortfall / overrun undertaking enforcement

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B. Project Analysis

Location

Availability of land, expansion potential (if required)
Positive and negative aspects w.r.t connectivity, proximity to water & fuel sources, load-centre, evacuation facility, manpower availability
Potential social, environmental or safety problems

Process, Technology, Equipment

Proven reliability of equipment (no. of installations) & supplier
Supplier's ability to honour LD commitments
Track record of chosen systems on availability, operating and maintenance costs, efficiency, range and fuel-flexibility
Comparison on environmental & safety aspects
Reasonableness of cost

EPC

Reliability, experience & track record of EPC consortium
Financial strength to honour guarantee, LD commitments
Adequacy and appropriateness of scope definition
Reasonableness of payment terms
Adequacy of contractual terms & stipulations for enforcement of rights
Adequacy of LDs to cover company's obligations and loss of profit
In case of demonstrated capacity falling short, LD vs. Capital Cost disallowed
Potential for cost escalation, safeguards against
Reasonableness / comparison of cost, method of award of contract

O&M

Reliability, experience & track record
Financial strength to honour LD commitments
Adequacy and appropriateness of scope definition
Adequacy of contractual terms & stipulations for enforcement of rights
Adequacy of LDs to cover company's obligations and loss of profit
Guaranteed parameters and incentives - comparison with PPA commitments - PLF, AC, Heat Rate - ability to meet PPA terms even with degradation
Potential for cost escalation, safeguards against
Reasonableness / comparison of cost, method of award of contract

Water

Availability & adequacy of arrangements for water throughout the year
Adequacy of storage facility, transport/piping, pumping facilities
Safety of facilities
Potential for social problems due to water use
Statutory permissions

Fuel

Adequacy of allocation, availability of fuel
Adequacy of reserves
Adequacy of the fuel linkage development plan and budget for funding of the same
Reliability of supplier & fuel carrier based on past track record
Adequacy of storage, handling, transport and infrastructure facilities of supplier, carrier and at site
Adequacy of road, railway line capacity for transport
Fuel losses in storage and transport
Sharing of losses - reflection in model in fuel cost & pass-through costs
Potential for delay, shortfall in supplies due to inadequate infrastructure / finances of supplier/carrier
Adequacy of contractual terms & stipulations for enforcement of rights
Adequacy of LDs from supplier and carrier to cover all obligations, penalties and loss of profit
Financial ability of supplier and carrier to meet LDs
Alternate / Cheaper fuel possibilities and likelihood of switch

PPA

Basis of tariff – GCV or LHV of fuel, Aux. based on PLF or Gross, Heat Rate based on net or gross, etc
Adequacy / shortcomings in SEB default risk mitigation and credit enhancement mechanism (quality of escrow, guarantees, third party sale provisions, SEB credit quality)
Comparison of operating parameters committed vs. Commitments received from EPC/O&M operator (Available PLF, SHR, AC, Deterioration with time, PLF range of operation)
Mismatch of LDs receivable and payable during construction, operating phase
Satisfactoriness of test conditions and test performances stipulated
Uncertainties in loan servicing, returns to equity investor in case of Force Majeure events
Uncertainties in loan servicing, returns to equity investor in case of transfer / take-over of IPP by Govt.
Uncertainties in loan servicing, returns to equity investor in case of SEB un-bundling

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Evacuation of Power

Adequacy of SEB's planning and financial resources for timely completion
Potential for delay
Adequacy of LDs in case of delay to cover all cash outflows and loss of profit

Insurance

Comprehensiveness of cover, Risks inadequately or not covered
Adequacy of sums insured for

Schedule of completion

Land acquisition - likely in time for detailed tests and investigations?
Schedule of major investigation and test reports which are required for EPC design (whether these will be over by zero date)
Major pre-requisites pending completion
Statutory approvals and permissions to be obtained, renewed, modified, rectified
Key contracts yet to be signed, key milestones pending
Potential causes for delay in NTP, implementation

Lenders' Engineers Comments on

Past track record of selected equipment
Plant design capability to meet PPA requirements on operating parameters
Plant design capability on fuel quality range
Plant operating economics as projected
Adequacy of LDs and incentives to EPC, O&M
Suitability of site, layout w.r.t adequacy of land, environmental issues and design
Suitability of the contractors and sub-contractors and their capabilities
Benchmarking of project cost with best in the industry and justification for deviations

Project Cost and Financing Plan

Detailed Fund Deployment - month wise, head-wise, computation of IDC, commitment and other financial charges
Detailed Sources - month wise, Source wise
Extent of mismatch between FC linked expenses and FC sources of funds
Adequacy of provisions for all likely expenditure

- insurance during 1st operation period
- O&M mobilisation (check if part of the O&M agreement)
- Other elements - detailed basis and back-up (rates, man day estimates agreed to)
- IDC - detailed draw down, currency-wise and matching with actual expenditure phasing (currency-wise)

Project finance - Basic Principles

- Project finance includes Limited or no recourse to sponsors' balance sheet
  - Insulate sponsors from project debt and risk of project failure
  - Enables them to share some risks in a large project with others
  - Overcome the inability to borrow through a corporate loan as balance sheet cannot support the project debt Risk sharing approach
- Investments are large
- High leverage
- Long payback periods

3

ICICI

Project finance - basic principles (contd.)

- Limited recourse financing requires
  - Developing risk mitigating structures for key risks identified during the due diligence process
  - Effective risk allocation to various parties by way of tightly structured contracts for construction, take or pay obligations, O&M, fuel supply and sponsor commitments
  - Stipulation of stringent security structure to protect lenders' interest
- Key role of policy makers in creating a conducive environment

4

ICICI

Project finance - basic principles (contd.)

- Cash flow based financing for infrastructure projects
  - Significant value of the project is derived from intangibles and not from the assets created
  - Estimation of debt requirement of the project depends on the future cash flows of the project as against the capital expenditure incurred in conventional projects
    - Telecom/Ports : based on peak cash negative
    - Power : cash requirement till project completion

ICICI

Project finance vs. corporate finance

Project Finance	Corporate Finance
Recourse limited to identifiable pool of assets	Recourse to all the assets of the borrower
Contracts/license agreement/Take or pay contract is the key security	Physical assets are the key security

ICICI

Common Structures

- Build-Operate-Transfer (BOT)
  - facility against collection of user fee
  - investor rights revert back to the public authority at the end of the concession
  - ownership vests with the public authority
  - used for highways, utilities and ports
- Build-Own-Operate (BOO)
  - similar to BOT but without the transfer of rights
  - may also stipulate payment of some fee to the public authority for the right to operate the facility
  - used for telecom and power projects

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Common Structures...

- Build-Own-Operate-Transfer (BOOT)
  - similar to BOT
  - ownership rests with the investor during concession period
  - used for highway development, energy, and ports
- Lease-Develop-Operate (LDO)
  - the public authority retains ownership of an existing facility
  - receives payments as per lease agreement with a private lessee
  - lessee finances development and oversees the operation of the facility

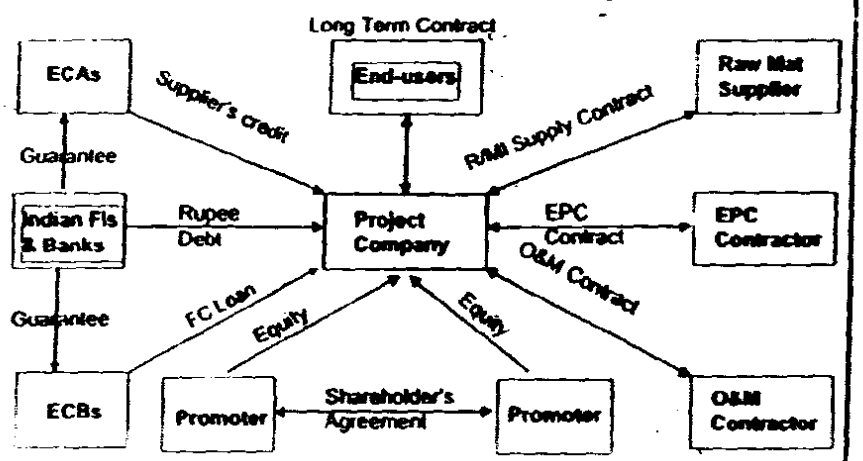
8

Common Structures...

- Built-Operate-Lease-Transfer (BOLT)
  - similar to BOT
  - assured revenue through lease rentals
  - proposed for Indian Railways
- Built-Own-Share-Transfer (BOST)
  - similar to BOT
  - revenue shared with the public authority
  - proposed for minor ports in Orissa

ICICI

Typical project structure



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ICICI

Sponsors/Developers

- Development process
- Project identification
- Structuring of key contracts
- Choosing an Arranger
- Negotiating
- Satisfying the Conditions Precedent
- Financial closure

ICICI

Shareholder's Agreement

- Project details specifying the total project cost, means of finance (Debt-Equity) and shareholding
- Authorised capital, issued & subscribed capital
- Schedule of equity contribution
- Further issue of shares
  - Right of first refusal
- Facilitate to achieve financial closure for the project
  - Commitment to infuse additional equity to fund cost overrun
- Representation on the company's board
  - Appointment of the chairman

ICICI

Shareholder's Agreement

- Powers of the Board
- Exclusivity
  - Not to enter into any other agreement within a defined territory which in competition to the existing project
- Dispose/transfer/pledge of shares
  - Lock-in period which could gradually reduce over a period of time
  - No sale, transfer,pledge or create any lien without the written consent of other party
    - First right of refusal to the other party
    - Pre-determined formula for the determine the price for transfer of shares
  - No assignment of rights without prior consent of either party

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ICICI

Shareholder's Agreement

- Repatriation of capital in event of sale by the foreign party
- Memorandum and articles of association to reflect the terms of shareholders agreement
- Dividend policy
- Confidentiality obligations
- Termination of the Agreement
  - upon liquidation of either party
  - Any change in equity structure of either party which has an impact on the party's interest in the project
- Governing law/Arbitration

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ICICI

Turnkey Contractors

- Execute contracts with
  - Fixed price
  - Fixed term
  - Guaranteed performance
- Assumes the construction risk
- Large & strong balance sheets
- Forward integration for equipment manufacturers
- Usually required to arrange financing
- Sector specific
- Mostly structured as Engineering, Procurement and Construction (EPC) contracts
- Equity contributor

15 ICICI

EPC- Engg,Procurement & Commissioning

- Scope of work
- LSTK basis
  - Fixed price =value of the contract
  - Fixed time
- Warranty period
  - 12-18 months from the date of completion of project
- Contract schedule
- Liquidity Damages (LDs)
  - 1-1.5% of the contract price per week of delay upto maximum of 10% of the contract price
- Aggregate liability of the contractor may not exceed 15% of the contract values
- Applicable law

16 ICICI

EPC- Engg,Procurement & Construction

- Commissioning & performance tests
- Liabilities under Force Majeure
  - Occurrence of an event beyond the control such as acts of God
  - Each party liable for its own costs, loss or damage
- Insurance
  - Such as Marine-cum-erection policy
  - Loss of profit policies
- Performance Security
  - Unconditional bank guarantee for performance of work and warranty obligations under the contract
  - Could be at 10% of the contract price
- Termination for default by the contractor
- Assignment

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ICICI

Project completion risk

- Project completion risk
  - Design and construction risk
  - Cost and time overrun risk
  - Performance risk
  - Syndication risk
- Risk mitigant
  - Independent Technical Consultant to review the project design and construction
  - Liquidated damages and penalties
  - Completion guarantee
  - Cost overrun support from sponsors
  - Drawdown subject to tying of means of financing

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ICICI

Operating Contractor

- Mitigation of operating risk
  - Guaranteed performance levels
  - Damages usually a function of contract price
- Strategic rationale
  - Equity stake
  - Equipment supplier

19 ICICI

Operating contracts - key provisions

- Structures
  - Fixed price
  - Cost plus structure
  - Bonus/Penalty structure
- Term
- Scope of Work
- Indemnity
- Termination
- Assignment
- Guarantees (if any)

20 ICICI

Operating risk

- Operating risk
  - performance risk
  - maintenance risk
- Risk mitigant
  - reputed O&M contractors & their past experience
  - specified performance parameters and penalty stipulation in the event of non-performance
  - direct agreements to protect lenders' interests

21 ICICI

Off-taker/Service user

- Key project participant
- Counter party risk concept
- Concession / licenses
- Two types of agreements
  - Guaranteed off-take
  - Variable off-take (market)

22 ICICI

Risk analysis - market risk

- Market risk
  - Volume risk
  - Price risk
  - Payment risk
- Risk mitigant
  - Committed offtake agreements, take or pay contracts
  - Throughput guarantees
  - Independent market studies
  - Letter of credit, escrow mechanism, government guarantees and establishing the creditworthiness of the buyer

23 ICICI

To conclude.....

- *Non/limited recourse financing requires developing risk mitigant structures to de-risk the projects.*
- *Identification and allocation of risks to participants best capable of managing it.*
  - *Need for tight contractual structures*
- *Future cash flows from the project are the primary source of debt repayment*
- *By their nature infrastructure projects are more vulnerable to market risk than conventional projects.*

24 ICICI

Thank you

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ICICI

Infrastructure Project Appraisal

Risk & Financial Analysis

Vinod Hari

IDFC

Investment Decision

- Do we invest in the Project ?
- If so,
  - what type of investments to make
  - How much to invest
  - When do we invest
- If not,
  - Under what conditions might we invest
  - How do we influence those conditions

2

Key Elements of Appraisal

- Risk Analysis
  - Qualitative
  - Identification of probable scenarios
  - Fixing probabilities for scenario occurrence
- Financial Analysis
  - Key input variables & their likely values
  - Expected values of decision variable
  - Default probabilities
  - Scenario Analysis

3

Key Elements of Appraisal (Contd.)

- Investment Decision
  - Yes / No
    - Risk Appetite
    - Return Expectation
  - Investment Mix (Product Mix)
  - Quantum

4

Appraisal Process

- Evaluate project risks & returns
  - Identification & Qualitative assessment of risks
  - Quantification of impact of uncertainties on project cash flows
    - default risk probabilities
    - expected values of decision variables
- Evaluate alternatives to improve returns
  - Project scope / phasing
  - Financing products / structuring of project

5

Appraisal Process (Contd.)

- Evaluate options to mitigate risks
  - Tighten Contractual Structures
  - Introduce suitable payment structures
  - Influence changes in Policy / Legal structures
  - Choose appropriate Financial Structures
    - Capital Structure
    - Products
- Decide on Investment & Investment Mix

6

Key Decision Variables

- IRR
- NPV
- Av. DSCR
- Min. DSCR
- Av. DSCR with Debt Service Reserve
- Min. DSCR with Debt Service Reserve

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Product Options

- Term Debt
  - Banks
  - FIs
  - DDBs with Take-outs
  - Multilateral lines
  - Bilateral Guaranteed Lines
  - Take-out with Convertible Options
  - Risk Participation
- Suppliers Credit
- Sub.Debt

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Strategic Options

- Resize
  - reduce scope of subsidised elements of Project
    - Sewage, Sanitation
  - increase scope of revenue earning components
- Reduce Cost
  - Renegotiate - EPC, O&M
  - Redesign - to reduce costs
- Rephase
  - Postpone non-revenue earning investments

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Infra vs. Corporate Appraisal

- Non-recourse / limited recourse
  - Contracts are critical
  - Higher dependence on experts for project design
- Appraisal focus is usually on
  - obligation of each participant vs. ability to honour
- Longer gestation & paybacks but more certainty
  - Longer maturity profiles for debt & equity
  - Ability of funder to manage tenure mismatches
  - Demand more certain in long run

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Infra vs. Corporate Appraisal (Contd.)

- **Cash flow based vs. Asset based securities**
  - **Special reserve creation**
  - **TRAs for cash utilisation control**
- **Nil default risk tollerance**
  - **Structuring is the key**
    - **Debt sizing based on downside & not base case**
- **Up-sides are invariably Regulated**
  - **Side flows are critical to attracting equity**
- **Heavy dependence on Govt.**
- **Promoter capability - Development vs. Mgmt.**

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CLIMATE CHANGE CENTERS PROJECT DEVELOPMENT TRAINING

Establishing Proficient Project Structuring, Financial and Marketing Capabilities

February 25 –26, 2002

CASE STUDY ON RISK ANALYSIS

The Louis Berger Group, Inc.

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement

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- financial institutions with a maximum tenor of 10 to 12 years:
- the issue of deep discount bonds with a 12-year tenor;
- debt funds from other multilateral agencies with a maximum tenor of 15 years;
- ID's World Bank line of credit with a maximum tenor of 20 years; and,
- Take-out financing with convertible options of tenure upto 15 years
- Other bilateral guaranteed funds with a tenor of 30 years.
- Risk participation facility for ID's WB line.

The long-term debt has enabled IWSSP to improve financial viability of the Project.

The project design provides for security arrangements for payments which do not require periodic funding or support from the state government. These include:

- the State Government (SG) would establish a water shortage period fund (WSPF), with an initial corpus equivalent to six months revenues (estimated at about Rs. 0.8 billion). This would be periodically topped up either by the SG and used to mitigate low water availability in the river.
- In addition, the risks of receivables for the Ideal Municipality for the charges for bulk water supply are mitigated through an escrow account charged to the IWSSP, along with a revolving security deposit equivalent to one month receivables and an irrevocable letter of credit from the municipality of the same amount.
- The bulk of revenues for the project come from the industrial users who will also provide a revolving security deposit equivalent to three months receivables.
- For mobilizing financing, a comprehensive security package has been developed comprising "assignment of project agreements and step-in rights, a charge on project assets, a charge on receivables (post operation and maintenance expenses), and, a charge on residual insurance proceeds".

Questions

Attempt to answer the following questions before proceeding with the reading of the rest of the case material.

1. What are the key objectives of risk analysis? What would be the key investment decisions to make based on risk analysis?
2. List out possible significant risk factors in this case. Which of these are controllable and which are not? Identify the parties who are best placed to mitigate / assume each risk.
3. What are the mechanisms to mitigate these risks? Identify key project contracts/ documents / legal agreements which are critical to risk allocation and mitigation. What are some of the key conditions/ clauses / legal covenants that should find a place in the main project contracts to ensure the same?

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4. Which of the various debt products listed are likely to be useful while structuring the financing for the project and why? (What specific benefit does each product confer on the project).
5. What specific mechanisms (funding) have been suggested which are different from conventional sponsor recourse lending?

PRINCIPAL RISKS AND PROPOSED MITIGANTS

PRE-CONSTRUCTION RISKS

Funding Risk

- Promoters are yet to commit on providing adequate completion support. However, Also, it is proposed to obtain a joint and several commitment from the sponsors for over-run support of at least 5% of project cost. Completion support would be vital considering the limited LDs available under the EPC contract for delays/non-performance.
- IEA and SG are expected to provide substantial investment as equity/sub-debt. IEA, especially, would have to collect this from its members, ie. almost 400 industries. Delay in infusing the same could affect the project. It is proposed that IEA, SG & GOI equity should be brought in fully prior to disbursement of loans.
- Funding of a Debt Service Reserve and Depreciation Sinking Fund are proposed out of equity or sub-debt. Commitments for the same would be obtained prior to financial closure.
- The computation of IDC for the project is based on a total debt of Rs.700 crores. However, the sponsors have proposed that sub-debt interest would also be serviced during the construction period. No provision has been made in the project cost for the same. It would have to be funded separately with sub-debt/equity. Commitments for the same would be required prior to commitment of loans.
- The EPC scope and cost are still under negotiation. As on date the final scope and project cost are yet to be finalized. However, the same would be examined by lenders prior to commitment and equity/sub-debt commitments would have to be obtained for any excess cost over and above the appraised cost.
- The tenure of term loans from FIs and Banks is 12 years post- project completion. In the event of some of the market risks materializing, a longer tenure would be more appropriate to ensure comfortable servicing of the loans.

Syndication Risk

- Equity & Sub debt: About Rs.350 crores of equity and sub-debt are yet to be tied-up. This constitutes 68% of the total equity & sub debt. The project has a high gestation for equity dividends and also a very uncertain profitability profile in initial years. Attracting equity investors could be a problem even though in the long run returns are assured.
- Rupee Debt: Of the Rs.400 crores to be syndicated from Banks and FIs, so far only Rs.120 crores is committed. The balance is yet to be syndicated.

- Risk Participation: ID has requested for risk participation assistance for the World Bank line of credit. As on date, no commitments have been received.

Legal Risk

- Delays in acceptance/finalization of the various contracts and agreements by the project participants and customers could take time, since this is the first project of its kind in India. Besides several risk mitigants have been suggested by lenders, which also need to be incorporated in the documents. A lenders' legal counsel is yet to be appointed. Delays could therefore occur in project start.
- Structuring of documents, commercial terms and various loop-holes in the present agreement drafts need to be sorted out prior to commitment of loans.

Regulatory Risk

- Delay in obtaining various approvals and sanctions could affect project schedule. The company has applied for the necessary clearances and is following up on the same.

Participant Risk

- Land acquisition by the SG for the project sites and for sludge disposal, and transfer to the company is a condition precedent to Financial close and NTP. Delay in this could delay the project start.
- IM is responsible for making alternate traffic arrangements within Ideal Town, prior to the laying of new distribution lines and sewage lines by IWSSP. Delays in this could also affect start of the project.
- The sponsors have agreed to obtain signed agreements from all industrial users indicating their commitment to off-take water from IWSSP at the proposed price in 2002. Delay in obtaining this could delay financial close.

CONSTRUCTION PERIOD RISK

Foreign Exchange Risk

- Currency mismatch to the extent of FC costs of US$ 30 mn (part of EPC costs) being funded out of Rupee funds. However, since the amount is very small and most of it is likely to be incurred up-front, there may not be any shortfall in funding. Contingency provision is also adequate.

Completion Risk

- Cost escalation due to design and scope uncertainty is a possibility
- Delay possibilities exist due to various uncertainties in the scope, statutory permissions, Govt. involvement in certain activities
- Credible overrun support from promoters not firmed up as yet

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- Parts of the project construction involve blockage of the National Highways and State Highways temporarily. In these circumstances, alternate routes have to be laid by the Govt. agencies to divert the traffic. Delay in completing these works could affect the scheduled completion and cost of the project.
- Coordination between the various contractors would be critical in avoiding completion delay. A wrap around guarantee for the entire project completion and performance, being provided by BE, the consortium leader, would help mitigate this risk.
- The EPC contract LD's specified for delays and performance shortfall are quite low. These need to be re-negotiated with the contractors & sponsors.

Participant Risk

- Completion of the power supply lines by State Electricity Board to meet the project commissioning and testing schedules: SEB has indicated that the plan is under preparation and since funding is provided for under the project cost, it should not pose any difficulty.
- Uninterrupted power availability for operating the project is uncertain given the poor power situation currently prevailing in Ideal. However, the use of the water period shortage fund for prolonged power outages, would mitigate this risk to some extent.

OPERATING PERIOD RISKS

Demand Risk

- At least 30% of industrial users would find the proposed tariff substantially higher than what they would incur from other sources (33% to 225 % higher). The Willingness-to-Pay (WTP) study carried out by IWSSP indicates that 50% of the industrial consumers are not willing to pay more than 70% of the proposed tariff (at 1998 equivalent prices).
- Effectiveness of ground water ban implementation by the SG is doubtful and could therefore affect demand for IWSSP's water, especially in later years when ground water quality is expected to improve substantially and also be a far cheaper alternative to IWSSP's water. Past experience with similar bans in other cities shows that there have been significant failures.
  Both these factors have been kept in mind while deciding the likely demand. The initial demand has therefore been de-rated by 30% (65 MLD instead of 93 MLD in 1997-98).
- Demand growth would depend on the ability of the industrial units to improve their global competitiveness. Growth likely in the post- quota abolishment period (quota abolishment under the WTO) is therefore uncertain.
  Possibility of industry-consolidation and temporary negative growth in overall volumes have been factored into the assumptions in the downside sensitivity. This scenario would result in a shortfall in cash available to service the proposed debt of Rs.700 crores
- Growth in demand would be affected by switch to soft-flow technology. A 2% increase in market switch of soft-flow every year has been factored into the projections. The

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high investment requirements would restrict the extent of shift. However, a more rapid shift than envisaged cannot be ruled out since quality would become a key to remaining competitive.

- Growth in demand could be affected by increased use of low salt dyes. This risk is quite real, especially in the light of the mitigation of Total dissolved solids (TDS) problem by use of such dyes. However, these have not been factored into the assumptions on the expectation that their high costs may act as a deterrent.
- Effluent TDS problems could result in action from the Pollution Control Board (PCB) and lead to closure of units which would adversely affect demand.

Tariff Risk: Cross-Subsidization of Domestic Consumers

- Over a period of time, the cross-subsidization of domestic users by industry, may face resistance from industry, as has happened in other Sectors like 'Power'. This is especially likely as competitive pressures mount. Required levels of tariff increases (required for servicing debt) may not be acceptable to the industrial users, especially when cheaper alternatives like recharged ground water become available after a few years.
  A sensitivity carried out by limiting tariff growth to about 5% p.a. reduces the debt service capacity, especially when combined with the industry growth risk. It is also proposed that a provision for gradually phasing out the subsidy element over several years be incorporated in the CA.

Low Promoters' Contribution & Dispersed Shareholding

- When the contribution of Govt. is excluded, the contribution of ID and BE amounts to just 6.88% of the project cost, which is low. Also, there is no single promoter who would take up management responsibility and provide the necessary completion support for a project of this size. Management accountability of sponsors could be substantially diluted which would affect the company in the event of adverse operations.
  It is suggested that the entire sponsor group shareholding is invested through a holding company, which would in turn be in a position to hire professionals or have representatives of all sponsors to manage and monitor the project company.

Participant Risk: IM's performance of obligations

- IM is expected to perform several obligations, which currently it is quite ill equipped to perform. These include maintenance of the system within IM with minimal leakages and levy and collection of tariffs.
  IWSSP proposes to train IM's personnel for the same. However, it is proposed that events of default by IM should allow lenders recourse to SG for settlement of dues

Environmental Risks: Sludge Disposal

- SG/ PCB have not framed a plan as yet for the disposal of 'toxic' sludge from the CETPs. This could lead to closure of units and affect demand.
  Resolution of this would be a pr-disbursement condition.

Political Risks

- SG is expected to provide sizable back-stop cash support to the project, by way of
  a) Mitigating IM defaults
  b) Maintaining and replenishing Water Shortage Period Fund,
  c) Guaranteeing wayside villages dues
  d) Buy-out in the event of Environmental risk due to sludge disposal problems.
  e) Water quality shortfall (through water shortage fund)

  Being the first water project in the Private sector and considering its importance to the survival of the entire industry at Ideal, it is expected that the accepted obligations would be fulfilled by the Government.

Operating Risk: Management

- ID, one of the main promoters has no experience in managing operations of a utility. Their dependence on the O&M contractor would therefore be extremely high. The O&M Operator is quite experienced and has a good track record overseas. However, the O&M contract itself does not place adequate penalties in the event of default by him. The equity stake of the O&M contractor is also negligible. This situation could lead to loss of revenue to the company in the event of under-performance by the operator.
  It is proposed that O&M penalties for under-performance be enhanced substantially through negotiations. Besides, the reputation and past track record of the operator are satisfactory.
- IWSSP could find it difficult to identify another operator to run the plant efficiently, in the event of consistent under-performance since there are very few operators worldwide in the field.
  It is important that the company's management induct its own team to be trained in the plant operations right from the time of commissioning. Also it is suggested that this obligation (to train) be one of the deliverables of the Operator. It is also suggested that the O&M contract be restricted to a period of 5 years initially and extendable in blocks of 5 years thereafter.

Collection Risk

- Ability of the company to effect the tariff increases proposed and collect all the dues from the wayside villages is uncertain.
  The revenues from IM and the wayside unions constitute a very low proportion (only 2%) of the total revenues of the Company. Nevertheless, the lenders would request for SG guarantee for their dues.

Operating Risk: Costs/Revenues

- Performance parameters in terms of actual operating parameters like power consumption are not guaranteed by the EPC contractors. However, capacity and leakage are guaranteed.
- There are no firm guarantees on the variable costs, major maintenance budgets and system availability by the O&M contractor. The penalties imposed on the O&M contractor are negligible and inadequate as per international norms. Any failure by the O&M operator in maintaining the capability of the company's facilities could lead to erosion in the profitability of the company.
  It is proposed that the sponsors re-negotiate the penalties with the Operator. If they fail to obtain better terms, sponsors and lenders would be taking the residual risk of under-performance of O&M contractor.
- Non-availability of water/power: The water intake system is designed to draw a maximum of 185 MLD with 24-hour operation. Any disruption in power supply would result in a shortfall in the water available for sale. However, being a utility providing an essential service, the company's facilities would be exempted from any power cuts (due to load shedding).

  Likewise, any shortfall in water availability in the river, which is a possibility during the summer months, would affect the revenues of the company. However, any prolonged period of water shortage would result in the company being eligible for compensation from the Water Shortage Period Fund of the SG.

  It is proposed that compensation from the WSPF should also be available for power failures and water non-availability for shorter periods as well. However this has to be accepted by SG.

Operating Risk: Quality of Water

- Quality of intake water could deteriorate due to discharge of untreated sewage by up-stream towns and villages. This could lead to failure of the Water Treatment System and leave the company open to accusations of negligence on health grounds.
  The CA specifically permits IWSSP to stop its plant if intake water quality falls below specified levels. Under these circumstances, supplies to domestic users would be hit. This would however, have very little revenue impact on the company.
  To ensure that the intake water quality is closely monitored, the company plans a systematic procedure for periodic monitoring and use of advanced sensing devices for measuring the same.

Questions

1. What are the financial implications of each risk? Which are the critical ones (with high

financial impact)? List out the key input variables/assumptions in the financial analysis, which would be affected by the risk factors.

2. What could be the possible strategies available to the project participants to
   a) improve financial viability
   b) enhance attractiveness to debt providers
   c) enhance attractiveness to equity providers
   d) These strategies could pertain to
   e) Capital structuring
   f) Special fund creation
   g) Project scope, Project phasing
   h) Project costs, operating costs
   i) Market risk mitigation
   j) Contractual comforts

CIRCULAR NO. 127/2001
INDEX Miscellaneous XIII
Other Particulars
Risk Management Systems

DATE : 16.07.2001

Subject: **Implementation of Risk Management Systems in the Bank - Introduction of CREDIT RISK RATING MODEL**

Earlier Ref.: **1. Chairman's Special Circular No.6/2001 dt. 23.04.2001**
2. Head Office Circular No.120/2001 dated 05.06.2001

Summary : **As a first step, Credit as well as investment exposures beyond Rs.6 Crores should be subjected to Risk Rating by using the in-house rating model developed by the Bank. To begin with, the rating exercise should be carried out at half yearly intervals and once the system stabilises, theperiodicity should be changed to quarterly, simultaneously reducing the cut-off point for coverage to beyond Rs.2 Crores. In due course, the uni-dimensional in-house manual risk rating model should be replaced by a multi-dimensional software module, to make the exercise more comprehensive.**

...

A. BACKGROUND:

The Reserve Bank of India has issued detailed guidelines on implementation of Risk Management System in banks, advocating adoption of a comprehensive approach and stressing upon the need to effectively manage the Credit Risk; by developing suitable methodologies and parameters to govern the choice of the risk exposure, which can be effectively monitored, managed and properly priced. As far as the Credit Risk Management is concerned; the thrust areas are

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measuring, quantifying, controlling as well as pricing the risk and the appropri[illegible] to achieve this, in a nutshell, are as below :-

Prudential exposure	• Setting borrower and group limits • Setting industry and sector-wise limits • Setting maturity / tenor limits
Risk Rating	• Evaluating industry, business, financial and management risks • Identifying standards and critical parameters • Defining rating thresholds for credit decisions
Risk Pricing	• Mapping expected probability of default • Estimating expected loss, based on risk rating and recovery rates • Using RAROC (Risk Adjusted Return on Capital) framework to price the credit risk • Allocating capital to cover the unexpected loss
Portfolio Management	• Setting rating-wise limits on exposure • Evaluating industry exposures and assessing concentration of risk • Proactive provisioning based on expected loss • Portfolio wide test to assess sensitivity to various credit risk factors
Loan Review Mechanism	• Identifying credit weaknesses to initiate corrective action. • Evaluating portfolio quality to isolate problem areas • Assessing adequacy of the loan loss provision • Monitoring compliance with internal policies • Generating Top Management reporting.

To ensure implementation of the above within a definite time frame as laid down by the RBI, the bank has already set up a Risk Management Committee, a Credit Policy Committee, a Loan Review Committee and a separate Risk Management Department. With the approval of the Board, the bank has already finalised its Lending Policy for 2001-2002 and this has addressed various aspects pertaining to Prudential Exposure limits as suggested by the RBI. As regards Loan Review Mechanism, a policy is being finalised and once it is put in place, various steps as prescribed by the RBI will be complied with. As regards Portfolio Management, which has to be carried out as an on going process; the Risk Management Department shall be doing the needful

In so far as Risk Rating is concerned, since the Bank does not have a rating model as of now, it has been decided to introduce a simple model to begin with, on the lines as indicated below:-

B. SCOPE:

The in-house Credit Risk Rating Model (enclosed as annexure to this circular) has been evolved in-keeping with the spirit of the RBI guidelines. It has recognised that the existing grading system, which is primarily intended for pricing of advances is inadequate to meet the present day's requirement of analysing and quantifying the risk associated with credit dispensation. It has also taken note of the fact that it does not afford a view of the complete risk picture, since it does not assess the credit risk in totality. Nevertheless, the model is basically an offshoot of the existing grading exercise, with the risk analysis aspects built into it

The Model is uni-dimensional and the risks are basically measured in a quantitative mode, although to an extent qualitative factors also have been reckoned. The model has reckoned certain vital factors which are rated separately and due weights are assigned. To arrive at the over all risk rating, these factors are aggregated and calibrated to obtain a single point indicator of risk associated with the client. This approach has its own limitations, in as much as it is purely based on bank's own experience and perceptions. Therefore, eventually we may have to move over to a multi dimensional rating system; which should not only be more exhaustive but also sector specific, borrower specific and facility specific. This however calls for revamping the existing MIS as also extensive computerisation for historical data building and data warehousing. As we will be attaining necessary progress in these areas only in course of time and since we are not fully conversant with the concept of risk rating as yet, a simplified in-house model is being introduced now, which is proposed to be replaced by a sophisticated customised software module, at a later date.

C. COVERAGE:

The Risk Rating exercise should cover all fresh advances, renewals as well as enhancements in the existing credit limits (classified as standard assets); as also all the investment proposals For the time being, only those exposures (fund based + non-fund based) which are beyond Rs.6 Crores should be subjected to this exercise. To compute this cut-off point, as regards operative limits the sanctioned limits should be reckoned and in respect of term loans and deferred payment obligations where full utilisation and part repayment have already taken place, the present outstanding liability should be reckoned. Once the system stabilises, but not later than 31.12.2002, the cut-off point should be brought down to beyond Rs.2 Crores.

Parameters	Aspects to be evaluated for appropriate scoring
Current ratio	Composition, quality and easy convertibility of the assets, comfortable liquidity as evidenced by surplus of current assets over current liabilities
Debt equity ratio	Structural strength of the financing pattern as reflected by sound equity/owned funds, retention of profits to improve the owner's stake in business, long term investment in associates denoting indirect withdrawal of capital, presence of intangible assets, preference share capital redeemable within a period of 12 years etc
Debt service coverage ratio	Ability of the borrower to service the term loan liability (principal + interest) with a comfortable cushion, evidencing that even if the performance or profitability levels come down, still the debt will be serviced without any difficulty.
Long term liabilities	Adequacy of owned funds / level of promoter's to Tangible Networth contribution, limiting the extent of long term investment by outsiders, denoting greater financial strength.
Return on capital employed (percentage)	Efficiency with which the long term funds have been deployed as evidenced by the ratio (where an yield of 15% is considered as satisfactory, although it varies from industry to industry).
Operating profit margin (percentage)	Efficiency with which the borrower has conducted his business (production and sales) as evidenced by a higher operating profit (excluding miscellaneous and other items of income).
Interest coverage ratio	A ratio of over and above 4 denoting low risk to the lenders.
Current assets turnover ratio	Lower ratio reflecting poor sales / bloated inventory / receivables difficult of recovery or high ratio indicating inadequate level of current asset build-up.

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Fixed assets turnover ratio	Efficiency with which the borrower has utilised the fixed assets / adequacy of sales in relation to the fixed assets acquired / level of increase in sales turnover for the given increase in the fixed assets over the period of time.

3. Management Risk

Management Risk analysis would bring out the borrower's structural strength, expertise, attitude, competency, creativity, track record, integrity and above all the risk bearing capacity and the willingness to assume risks without endangering or compromising any of the basics. The following are some of the relevant areas that could be looked into for a proper evaluation:

Parameters	Aspects to be evaluated for appropriate scoring
Proven leadership	Does the borrower have the requisite ability to lead over the competitors in the market, to influence and motivate the employees, to set tasks and to adopt strategies to forge ahead, what is their social commitment and do they have proper plans for diversification, modernisation, expansion, etc.
Professional management	Are the affairs managed by a team of professionally qualified and competent managers, does the management evince interest in the growth of the employees, does the management provide adequate training to the employees to improve their efficiency, which will also enable them to shoulder higher responsibilities.
Traditional Management	Is the management dictated by family traditions, is there unwillingness to adapt or to accommodate the changes in the environment, does the management lack clear vision with regard to future plans, etc.
Expertise	Is there sufficient number of adequately experienced employees, skilled and semi-skilled labour force and a professional management set-up. Are the business goals and strategies well defined and has the borrower been prompt with regard to timely completion / execution of projects, etc.

Parameter	
	Exposure in terms of years, promoter's track record in handling the affairs as whole time directors, their association with similar business entities, etc.
	Has the borrower been able to keep up the popularity of the product over a period of time / able to maintain and improve the quality of the product through quality control mechanisms (ISO 9001), effective post sale service, etc. and what is the level of interest shown by them to popularise the products by advertisements, etc.
Miscellaneous factors:	
Collateral	Extent of availability of easily encashable collaterals of good quality, equivalent to or more than the risk exposure by the bank.
Guarantee Cover	Availability of personal guarantee of the promoter(s) denoting their willingness to assume the risk and indemnify the Bank against any defaults / availability of corporate guarantee where the guarantor enjoys good market reputation and financial stability / availability of third party guarantees, where the net means of the guarantors is substantial / availability of guarantee covers such as ECGC, etc.
Conduct of the account	Track record of the borrower as reflected by due compliance with the lending covenants, good turnover in the account, prompt servicing of all types of dues, etc.
Inspection and audit comments	Lack of comments or full cooperation by the borrower for prompt rectification of the comments made by the internal / external inspectors.
Submission of Information	Prompt submission of stock statement, QIS, audited financial statements, tax paid receipts / copy of returns, renewal proposal and other information / statements as and when called for by the Bank.

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4. Pricing Determinants

Pricing determinants being non-risk parameters, so as to make the analysis very objective, only those aspects measurable in units are to be reckoned for evaluation As far as pricing is concerned, it should be noted that while a higher risk level would definitely disqualify an exposure for lower pricing, a low risk level exposure would not automatically qualify for low pricing unless the Bank is assured of a good yield on the exposure by way of interest and commission earnings due to full utilisation of the sanctioned fund based and non-fund based credit limits as also reciprocal deposit support.

Parameters	Aspects to be evaluated for appropriate scoring
Account earnings	Total earnings from the account (actual quantum of interest earned on the fund based limits plus the actual amount of commission and charges earned on the non-fund based limits) as a percentage to the aggregate quantum of the credit facilities extended to the borrower.
Deposit support	The level of compulsory deposit support provided by the borrower (as cash margin for non-fund based limits and as collateral security for the fund based limits) and also the unencumbered deposit support voluntarily provided by them as a reciprocal gesture, as percentage to the quantum of aggregate facilities sanctioned.

C. Special Features

As per the Lending Policy of the Bank for 2001-2002, the following borrower segments are placed under Restricted Category :

- Loans for setting-up of hotels, lodges, holiday resorts, private clubs & community / convention / meeting / marriage halls.
- Loans for construction of cinema theatres, production, distribution and display of motion pictures.
- Loans to educational institutions.
- Loans to real estate / property developers and builders.

assets, dependent on one type of business, cyclical trends, etc., which may adversely affect the borrower.

AVERAGE RISK [SCALE 2 - B]

Borrowers with smaller margins, where definite elements of reduced strength exist. Satisfactory asset quality & liquidity, good debt coverage and management in all critical areas, however with unstable earnings and cash flow patterns. A loss or a declining earning trend may also be present.

CAUTION RISK [SCALE 1 - C]

Borrowers exhibiting potential credit weakness or a downward trend which, if not checked or corrected, will weaken the asset or would not adequately protect the bank's position. While potentially weak, the borrower may appear to be marginally acceptable since no loss of principal or interest is envisioned in a turnaround situation. These accounts would not normally attract special mention by the regulatory authorities and would exhibit a distinct possibility that a partial loss of principal or interest will occur, if the deficiencies are not corrected immediately.

AWAY RISK [SCALE 0 - D]

Borrowers falling under this category are cases of potential loss. The possibility of loss is extremely high since they are generally not capable of meeting their debt repayment commitments. While the categorisation would not mean that the loan has absolutely no recovery or salvage value, it is practically not desirable to permit their continued presence in the portfolio.

Explanatory Notes :

1. IT IS TO BE NOTED THAT IT IS NATURAL FOR A BORROWER TO OBTAIN VARYING SCORE / MARKS FOR EACH TYPE OF RISK, THUS LEADING TO A DIFFERENT RISK RATING FOR EACH OF THE PARAMETERS. THIS NOTWITHSTANDING, THE CONSOLIDATED SCORE FOR ALL THE PARAMETERS PUT TOGETHER ALONE WOULD DECIDE THE FINAL RISK RATING.

2. EACH CATEGORY OF RISK IS COMPOSED OF A CLUSTER OF FACTORS AND MARKS HAVE BEEN ASSIGNED TO EACH ONE OF THEM. SOME OF THESE MAY NOT BE APPLICABLE TO CERTAIN TYPES OF ADVANCES, SUCH AS DEBT SERVICE COVERAGE RATIO FOR A CASH CREDIT LIMIT. IN SUCH CASES, NO MARK CAN BE AWARDED TO THE BORROWER FOR SUCH INAPPLICABLE AREAS. INSTEAD, THE MARKS ACTUALLY SCORED BY A BORROWER SHOULD BE

PROPORTIONATELY INCREASED. TO EXPLAIN, AS AGAINST 40 MARKS, ASSIGNABLE UNDER FINANCIAL RISK (FOR ALL THE 9 PARAMETERS PUT TOGETHER), IF A BORROWER HAS SECURED 25 MARKS FOR 8 PARAMETERS (WHERE THE TOTAL ASSIGNABLE MARK IS 35), THEN THE SCORING SHOULD BE INCREASED TO 28.57

$$\left[\frac{40 \times 25}{35} = 28.57\right]$$

H. APPLICABILITY OF THE DISCIPLINE:

1. In respect of borrowers securing Away rating, the bank should endeavour to unwind at the earliest opportunity, by choosing an exit route. If at all renewals are to be considered for unavoidable reasons, it should be on stricter terms, under closer monitoring and with a prefixed outer date for total liquidation of the dues.

2. In respect of borrowers securing Caution rating, our endeavour should be to arrest the exposure at the existing level, simultaneously attempting to safeguard the bank's position by obtaining additional collaterals, stipulating stringent loan covenants and intensifying the surveillance mechanism. No fresh proposals with Cautions rating should be entertained.

3. In respect of borrowers securing Average rating, we should attempt to upgrade the same to Moderate rating by the next renewal / next financial year.

4. Similarly, in respect of borrowers with Moderate risk rating, the Bank should endeavour to upgrade the same to Low risk category and thereafter to Minimal risk category, over a period of time.

I. MINIMUM STANDARDS:

In respect of all proposals where credit risk rating is compulsory, the Bank should observe certain hurdle ratios and keep away from such of those exposures, which exhibit any one or a combination of the following deficiencies:

- Debt Equity Ratio stretched beyond 5:1
- Current Ratio below 1:1
- Average Debt Service Coverage Ratio below 1.25
- Risk Rating beyond Caution Grade

However, with due justification; relaxation in the above regard may be considered in respect of

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	Demand equal to supply Non perishable goods Perishable goods		0.50		2 1	
	Supply exceeds demand		0		0	
6.	Market Position	3		5		
	Product					
	Good sales trend		0.50		1	
	Able to maintain quality		0.25		0.50	
	Good after sales service		0.25		0.50	
	None of the above		0		0	
	Price					
	Ability to withstand competition		0.50		1	
	Good brand equity		0.50		1	
	Inability to compete and no brand equity		0		0	
	PlaceGood Dealership Network		0.50		1	
	Wide coverage		0.50		1	
	Few/concentrated clientele base		0		0	
7.	Operating efficiency (Expenses as % to sales/income)	2		4		
	Reducing Trend		2		4	
	Proportionate Increase		1		3	
	Disproportionate Increase in expenses or decrease in income		0		0	
	Total	15		25		

RISK :

INDUSTRY/ BUSINESS RISK SUMMARY

Marks scored		SCALE	Risk category
GC	RC		
14 to 15	23 to 25	5	MINIMAL
12 to 13	20 to 22	4	LOW
10 to 11	17 to 19	3	MODERATE
8 to 9	13 to 16	2	AVERAGE
5 to 7	10 to 12	1	CAUTION
Below 5	Below 10	0	AWAY

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SCORE SHEET

FINANCIAL

(Maximum Assignable [illegible])

(BASED ON AUDITED ACCOUNTS [illegible])

1. Current Ratio (Current Assets / Current Liabilities)

Current Ratio Level	Risk category	Mark Assignable	Mark awarded (Actual)
At or above 1.60	Minimal	[illegible]	
Between 1.33 & 1.59	Low	[illegible]	
Between 1.25 & 1.32	Moderate	[illegible]	
Between 1.15 & 1.24	Average	2.00	
Between 1.00 & 1.14	Caution	1.00	
Below 1.00	Away	0.00	

2. Ratio of TOL to TNW (Total Outside Liabilities / Tangible Networth)

Debt Equity Ratio Level	Risk category	Mark Assignable	Mark awarded (Actual)
At or below 1.50	Minimal	5.00	
Between 1.51 & 3.00	Low	4.00	
Between 3.01 & 4.00	Moderate	3.00	
Between 4.01 & 5.00	Average	2.00	
Between 5.01 & 6.00	Caution	1.00	
At or above 6.01	Away	0.00	

3. Debt Service Coverage Ratio (Net profit + interest on term loan + depreciation / interest on term loan + annual long term obligations)

Average DSCR Level	Risk category	Mark Assignable	Mark awarded (Actual)
At or above 2.01	Minimal	5.00	
Between 1.81 & 2.00	Low	4.00	
Between 1.51 & 1.80	Moderate	3.00	
Between 1.41 to 1.50	Average	2.00	
Between 1.21 & 1.40	Caution	1.00	
At or below 1.20	Away	0.00	

BIOT_TAY

4. Ratio of Long Term Liabilities / Tangible Networth

Actual:

Long Term Debt Equity Ratio Level	Risk category	Mark Assignable	Mark awarded
At or below 1.0	Minimal	5.00	
Between 1.01 & 1.40	Low	4.00	
Between 1.41 & 2.00	Moderate	3.00	
Between 2.01 & 2.50	Average	2.00	
Between 2.51 & 3.00	Caution	1.00	
At or above 3.01	Away	0.00	

5. Return on capital employed (PAT + Interest X 100 / Long Term Funds)

Actual:

Return on capital employed (%)	Risk category	Mark assignable	Mark awarded
At or above 21.01	Minimal Risk	5.00	
Between 15.01 & 20.00	Low Risk	4.00	
Between 12.01 & 15.00	Modest Risk	3.00	
Between 10.01 & 12.00	Average Risk	2.00	
Between 8.01 & 10.00	Caution	1.00	
At or below 8.00	Away	0.00	

6. Operating Profit Margin (operating profit to sales turnover ratio)

Actual:

Operating Profit Margin (%)	Risk category	Mark assignable	Mark awarded
At or above 10.01	Minimal Risk	5.00	
Between 9.01 & 10.00	Low Risk	4.00	
Between 7.51 & 9.00	Modest Risk	3.00	
Between 5.01 & 7.50	Average Risk	2.00	
Between 2.01 & 5.00	Caution	1.00	
At or below 2.00	Away	0.00	

7. Interest Coverage Ratio (Profit before depreciation and interest / interest)

Actual

Interest Coverage Ratio Level	Risk category	Mark assignable	Mark awarded
At or above 5.01	Minimal	4.00	
Between 4.01 & 5.00	Low	3.00	
[illegible]	[illegible]	[illegible]	
Between 2.51 & 3.00	Average	2.00	
Between 2.01 & 2.50	Caution	1.00	
At or below 2.00	Away	0.00	

8. Current Assets turnover ratio (turnover [illegible]

Actual

Current Assets Turnover Ratio Level	Risk category	Mark assignable	Mark awarded
At or above 6.00	Minimal Risk	3.00	
Between 5.01 & 5.99	Low Risk	2.50	
Between 4.01 & 5.00	Modest Risk	2.00	
Between 3.01 & 4.00	Average Risk	1.50	
Between 2.01 & 3.00	Caution	1.00	
At or below 2.00	Away	0.00	

9. Fixed Asset Turnover Ratio (Gross turnover x 100 /net block - (Percentage)

Actual

Fixed Asset Turnover Ratio (%)	Risk categor	Mark assignable	Mark awarded
At or above 100	Minimal Risk	3.00	
Between 91 & 99	Low Risk	2.50	
Between 81 & 90	Modest Risk	2.00	
Between 61 & 80	Average Risk	1.50	
Between 51 & 60	Caution	1.00	
At or below 50	Away	0.00	

CONSOLIDATION

Sl No	Parameters	Max. marks	Mark awarded	Scale (5/4/3/2/1/0)	Risk category
1	Current Ratio	5			
2	Total Outside Liabilities / Tangible Net Worth	5			
3	Debt Service Coverage Ratio	5			
4	Long term Debt / Tangible Net Worth	5			
5	Return on Capital Employed	5			
6	Operating Profit Margin (%)	5			
7	Interest Coverage Ratio	4			
8	Current Assets Turnover Ratio	3			
9	Fixed Assets Turnover Ratio	3			
	Total	40			

RISK :

FINANCIAL RISK SUMMARY

Marks scored	Scale	Risk category
Between 36 and 40	5	MINIMAL
Between 35 and 32	4	LOW
Between 31and 26	3	MODERATE
Between 25 and 21	2	AVERAGE
Between 20 and 16	1	CAUTION
Below 16 .	0	AWAY

SCORE SHEET
MANAGEMENT RISK

Maximum Assignable marks : General Category (GC) and
: Restricted Category (RC)

Sl No	Parameter	GENERAL CATEGORY		RESTRICTED CATEGORY		Mark awarded
		Max. Marks	Assignable Marks	Max Marks	Assignable Marks	
1	Management Competence	12		6		
	Proven Leadership					
	Well established		2		2	
	New Entrant		1		1	
	Style					
	Professional		3		1	
	Traditional		2		0.50	
	Expertise					
	Qualified & Experienced		5		2	
	Qualified but in-experienced		3		1	
	Unqualified but experienced		2		1	
	Inexperienced & Unqualified		0		0	
	Performance					
	Higher than projected		2		1.00	
	Equal to projection (with 10% tolerance)		1		0.50	
	Lower than projection (beyond tolerance level)		0		0.00	
2.	Industry Experience	4		2		
	More than 10 years		4		2	
	6 years to 10 years		3		1.50	
	3 to less than 6 years		2		1	
	Less than 3 years		1		0.50	
	Not experienced		0		0	
3.	Market Reputation	4		2		
	Brand equity image		4		2	
	Market acceptance without brand equity image		3		1	
	None of the above		0		0	

4.	Miscellaneous Factors					
a)	Adequacy of Collaterals	4		4		
	To the full extent of the limit		4		4	
	76 to 99% of the limit		3		3	
	51 to 75% of the limit		2		2	
	25 to 50% of the limit		1		1	
	Below 25%		0		0	
b)	Guarantee Cover	4		4		
	Availability of third party Guarantees		4		4	
c)	Conduct of Account	3		3		
	Prompt servicing of interest and instalments		1		1	
	Satisfactory turnover and operations within the limit		1		1	
	Non devolvement under LC BG, DPG etc.		1		1	
d)	Rectification of inspection and Audit comments	2		2		
	[illegible] rectification		2		2	
	Partial rectification		1		1	
e)	Submission of QIS/Data	2		2		
	[illegible] submission		2		2	
	[illegible] submission		1		1	
	[illegible]		0		0	
	[illegible]	35		25		
			RISK			

MANAGEMENT RISK SUMMARY

Marks scored		Scale	Risk category
GC	RC		
31 to 35	23 to 25	5	Minimal
28 to 30	20 to 22	4	Low
22 to 27	19 to 16	3	Moderate
18 to 21	15 to 13	2	Average
14 to 17	12 to 10	1	Caution
Below 14	Below 10	0	Away

BEST AVAILABLE COPY

OVER ALL RISK RATING MATRIX

A) RISK PARAMETERS (TOTAL MARKS = 90)

Parameters	Max. assignable Marks		Mark awarded	Risk category
	General category	Restricted category		
I. INDUSTRY / BUSINESS RISK				
Input availability	2	3		X
Government Policy	2	3		X
Extent of Competition	2	3		X
Infrastructure	2	3		X
Operating Efficiency	2	4		X
Demand & Supply Position	2	3		X
Market Position				
Sub Total	15	25		
II. FINANCIAL RISK				
Ratio of TOL to TNW	5	5		X
Ratio of Term Liability to TNW	5	5		X
Current Ratio	5	5		X
Debt Service Coverage Ratio	5	5		X
Return on Capital Employed	5	5		X
Operating Profit Margin	5	5		X
Interest Coverage Ratio	4	4		X
Current Asset Turnover Ratio	3	3		X
Fixed Asset Turnover Ratio	3	3		X
Sub Total	40	40		
III. MANAGEMENT RISK				
Management Competency	12	6		X
Industry Experience	4	2		X
Market Reputation	4	2		X
Adequacy of Collaterals	4	4		X
Third party Guarantee Cover	4	4		X
Conduct of Account	3	3		X
Rectification of Inspection & Audit Comments	2	2		X
Prompt submission of Data	2	2		X
Sub Total	35	25		X
TOTAL (I + II + III)	90	90		

B) NON RISK PARAMETERS (TOTAL MARKS = 10)

Parameters	Maximum Marks	Assign -able Marks	Marks awarded
I. ACCOUNT EARNINGS			
(Interest / Commission as percentage to the aggregate limit sanctioned)			
FUND BASED LIMITS	3		
12% & Above (present PLR)		3	
Above 10% but below 12%		2	
Above 9% but below 10%		1	
9% and below		-	
NON FUND BASED LIMITS	3		
2.5% and above		3	
Between 2% and above		2	
Between 1% and above		1	
Below 1%		-	
SUBTOTAL	6		
II. DEPOSIT SUPPORT			
(As %age to the limit sanctioned / proposed)			
UNENCUMBERED DEPOSIT	2		
15% & Above		2	
Below 15%		1	
ENCUMBERED DEPOSIT	2		
25% & Above		2	
Below 25%		1	
SUBTOTAL	4		
TOTAL (I + II)	10		

RISK RATING & PRICING SCORE SHEET

REFERENCE AREA	MAXIMUM MARK	MARKS SCORED	RISK CATEGORY
A. RISK PARAMETERS			
Industry / Business risk	15 / 25		
Financial risk	40 / 40		
Management risk	35 / 25		
Sub total	90		
B. NON RISK PARAMETERS			
Pricing determinants	10		
Total (A + B)	100		

REFERENCE TABLE FOR RISK RATING AND PRICING

RISK RATING (90 MARKS)		PRICING (100 MARKS)		SUGGESTED
MARKS	SYMBOL & CATEGORY	MARKS	SYMBOL	INTEREST RATE
81 To 90	AAA (Minimal)	91 To 100	VB	PLR / SUB PLR
72 To 80	AA (Low)	81 To 90	VB1	PLR + 1%
57 To 71	A (Moderate)	66 To 80	VB2	PLR + 2%
45 to 56	B (Average)	51 To 65	VB3	PLR + 3%
36 To 44	C (Caution)	41 To 50	VB4	PLR + 4%
Below 36	D (Away)	Below 41	VB5	PLR + 4%

RISK RATING
RECOMMENDED PRICING

Analysis of PPA

Climate Change Centers' Project Development Training Program

February 25-26, 2002

Vinay Deodhar

The Louis Berger Group, Inc.

Presentation Overview

- Need for PPA
- What is PPA?
- Essential Elements of a PPA
- What should you see in a PPA?
- Case of a Deficient PPA

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Power Purchase Agreement

Need for a PPA

- A crucial document specifying the manner in which a power producer will generate power and the purchaser "buy" it
- Since power is a commodity that cannot be stored and also transferred easily to others a PPA is essential
- PPA has legal sanctity and operates within overall project framework that includes other agreements which authorize the power producer through a license to operate
- Important document not only for the project developer but also strategic investors, lenders and insurance companies

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What is a PPA?

Ideas???

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What is a PPA?

- A document specifying Rights & Obligations of Parties for a mutual activity
- Specifying the way business transaction would be done
- Also identifying how business would be Normally done and possible breaches that could hinder and the manner of addressing them
- A document that addresses risk mitigation issues and safeguards revenue streams

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Essential Elements of a PPA

- *Definitions*: Very important to clarify what the terms mean exactly in the context of the PPA
- *Conditions Precedent:* Conditions that have to fulfilled before the PPA takes effect
- *Sale & Purchase of Energy*: What amount of energy, how and when would it be generated transmitted and where and at what rates would it be purchased (also specifies security mechanism)
- *Metering & Billing*: How would the energy be measured and billed

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Thank You!

POWER GENERATION

from

MUNICIPAL SOLID WASTE

at

LUCKNOW

(5 MW Net)

POWER PURCHASE AGREEMENT

between

ASIA BIOENERGY (INDIA) LIMITED
824, Poonamalle High Road,
CHENNAI - 600 010

and

UTTAR PRADESH STATE ELECTRICITY BOARD
Shakti Bhawan, 14, Ashok Marg
LUCKNOW - 226 001

ARTICLE - 1

INTERPRETATION AND DEFINITIONS

1.1 INTERPRETATION

In this regard

(a) The headings and paragraphs numbering are for convenience only and shall be ignored in constructing or interpreting this Agreement ,

(b) References to persons include bodies corporate and partnerships ,

(c) References to any Agreement, enactment, ordinance or regulation includes any amendment thereof or any replacement in whole or in part ,

(d) References to Articles, Sections and Schedules, unless the context otherwise requires, refers to Articles, Sections of, and Schedules to this Agreement , and

(e) Singular shall, wherever the context so requires, include plural and vice versa.

1.2 DEFINITIONS

For the purposes of this Agreement the terms given hereunder shall have the following meanings, except where the context otherwise requires :

"Agreement" - This Power Purchase Agreement as may be amended from time to time in accordance with the terms and conditions hereof by mutual agreement of the Parties, but shall not contradict the provisions of the Energy policy of U.P. Govt. as in force on the date of signing of PPA and condition of sanctions of the project, save and except provisions modified to the extent in this Agreement.

"Associated Transmission System" - The transmission system required to be established by the company at its own cost to carry power from the feeder gantry of project switchyard upto the Grid Sub-Station of the Board. Associated Transmission System shall be owned, operated and maintained by the Company.

"Auxiliary Consumption" - The energy consumed in the various auxiliaries of the project during generation of electricity which shall be 20% of energy generated.

"Availability" - In relation to the Project means the capacity of the project (including all the generated units) to generate power on availability of Municipal Solid Waste (MSW). The annual availability of the project shall be determined as per the following

For ASIA BIOENERGY (INDIA) LTD.,

(Charat Chandra Rastogi)
Secretary
State Electricity Board

P. SUBRAMANI
MANAGING DIRECTOR

formula

Percentage Annual Availability $= \frac{(H_1 U_1 + H_2 U_2 + H_3 U_3)}{(U_1 + U_2 + U_3) \times 8760}$

Where U_1, U_2 and U_3 are the capacities in Mega watts of the three engines and H_1, H_2 and H_3 are the hours for which the respective engines were available for operation during the years.

In the leap year, instead of 8760 hours it shall be replaced by 8784 hours

Since power generation fully depends on the availability of the waste as per the agreed quantity. The company shall inform UPSEB if power generation is not possible due to non availability of waste. No penalty will be applicable. In case during running of the plant, the company finds that power generation can be increased, the company shall be allowed to add additional equipment at its cost. The increased power supply shall also be accepted at the tariff already agreed as per article 3.1.

Power irrespective of the quantity generated from (MSW) shall be accepted at the tariff already agreed as per article 3.1.

" Energy Bank" shall mean energy generated by the project and delivered to Grid Sub-Station for the purpose of Third Party sale which is to be delivered to Third Party as and when required by the Company during the tariff year. In case any part of energy banked is not utilised by the company payment of such banked energy shall be made at the end of tariff year by UPSEB.

"Board" shall mean Uttar Pradesh State Electricity Board.

"Capacity" shall mean capability of the unit measured in MW, to produce and deliver active power.

"Change in Law" shall have the meaning as specified in the Article 19.14.

"Check Meter" - any meter and/or metering device of accuracy class equivalent to the Main Meter installed, owned and maintained by the Board at the Grid Sub-Station to measure the delivery and receipt of energy and power for the purposes of checking the Main Meter.

"Control Centre" - Board Load Dispatch Centre located at Lucknow or such other control Centre designated by the Board from time to time (but not more than one at any time) from which the Board shall issue load dispatch instructions to the project

"Commercial Operation" shall mean the state of a unit when it is capable of delivering Active Power and Reactive Power on a commercial basis at the Grid Sub-Station bus bar as specified by Company.

"Commissioning (with respect to each generating unit)" - the act of successful completion of tests and synchronizing, as per Prudent Utility Practices/ manufacturer recommendations.

For ASIA BIOENERGY (INDIA) LTD.

"Maintenance Year" - Each twelve (12) month period commencing at 0000 hours Indian Standard Time on April 1 and ending at 2400 hours Indian Standard Time the following March 31, during the term of this Agreement.

"Metering Date" - The midday of the last day of the calendar month in which commercial operation of first generating unit occurs and the midday of the last day of each calendar month thereafter, irrespective of not being a working day.

"Month" - A calendar month according to the Gregorian calendar beginning at 0000 hours on the first day of the month and ending at 2400 hours on the last day of that month.

"MVAr" - Megavars (Reactive Mega Volt Amperes).

"MW" - Megawatts (Active Mega Volt Amperes).

"MSW" - Municipal Solid Waste.

"National Test House" shall mean any test house designated as National Test House including National Test House, Alipore, National Physical Laboratory, New Delhi, National Test House, Ghaziabad and National Test House, Bombay.

"Net Design Energy".: Design energy reduced by (a) auxiliary consumption at project and (b) transmission losses at project transmission system.

"Operating Month" shall mean the period from the midnight following unit 1 commercial operation date till the end of the month and thereafter subsequent months.

"PT" - shall mean Potential Transformer of accuracy class 0.1 as per BS 3941 or its latest revision.

"Parties" - shall mean collectively the Board and the Company and individually, either of them.

"Permissible Limits of Error" - shall mean permissible limits of error mentioned in applicable standards for the accuracy class of the concerned instruments.

"Project Contract" - shall mean any supply or works contract executed by the Company for implementation of the Project.

"Project" - Power generation from Municipal Solid Waste at site allotted by Nagar Nigam in Lucknow district in the State of Uttar Pradesh having an Installed Capacity of 5.65 MW formulated by the Company as approved by GOUP.

"Prudent Utility Practices" - Those practices, methods, techniques and standards, as adopted from time to time, that are generally accepted for use in electric utility industries taking into account conditions in India, and commonly used in prudent electric utility engineering and operations to design, engineer, construct, test operate

For ASIA BIOENERGY (INDIA) LTD.,

and maintain equipment lawfully, safely, efficiently and economically as applicable to power stations of the size, service and type of the Project, and that generally confirm to the manufacturer's operation and maintenance guidelines

"Purchase Price" - The purchase price shall be as agreed by U.P government (letters enclosed) and as per recommendation of Ministry of Non Conventional Energy Sources (accepted by Power Ministry of U.P).

"Reactive Power" - The wattless component of the product of voltage and current measured in MVAr, which the Project shall provide to or absorb from the Grid System

"Saleable Design Energy" - 100% of the Design Energy which shall be 40.05 MU during a year.

"Saleable Energy" - 100% of the Delivered Energy metered and delivered at the Sub-Station Busbars.

"Scheduled Commercial Operation Date (for each engine)" - shall mean the date identified by the company and conveyed in a written notice sent to and received by the Board atleast 120 (One hundred twenty) days prior to such date, as being the date on which the Company will commence power supply from the engine on a regular basis This date shall not exceed 15 (Fifteen) days from the date of Synchronization of that unit.

"Scheduled Date of Commissioning of Interconnection Facility" - shall have the meaning as specified in Article 8.3.

"Scheduled Date of Commissioning of the Project" - shall have the meaning as specified in the Article 8.4.

"Scheduled Outage" - A Planned interruption of the generating capacity of the Project that is scheduled as per Agreement and is for inspection , testing , preventive maintenance, corrective maintenance, repairs, replacement or improvement and is not a Maintenance or Forced Outage.

"Scheduled Synchronization Date(s) (with respect to each engine) - The date identified by the Company in a written notice sent to and received by the Board at least one-hundred and twenty (120) days prior to such date, as being the date on which the Company will attempt to start on (or all units as the case may be) to be electrically synchronized for the first time and connected to the Sub Station.

"Station" - 5 MW Lucknow MSW Project.

"Synchronization Date(s) (with respect to each Unit)" - The date on which such Unit is synchronized for the first time and connected to the Grid System.

"Synchronizing" - The act to cause paralleling of two A.C. circuits/systems when they are within the stipulated limits of frequency, phase angle and voltage.

For ASIA BIOENERGY (INDIA) LTD.

"Tariff Year" - Twelve (12) calendar months from the effective date during the term of this Agreement.

"Taxes" - shall mean any tax, charge, cess, import, tariff duty and fee of any kind charged, imposed or levied, directly or indirectly, by any Governmental Authority applicable to the Company/ Project or the Board but excluding all types of Corporate tax/Income tax or penalty imposed on the Company by reason of Company's default.

"Technical Ability" - The project shall be considered as technically able to produce electricity from the Scheduled Synchronization Date(s) and onwards except in the cases of Forced outage, Maintenance outage, Scheduled outage and Force Meajure events.

"Technical Limits" - The limits and constraints relating to the operation and dispatch. In respect to operation and maintenance, technical limits and constraints shall be in conformity with manufacturer's maintenance instructions and prudent utility practices.

"Test House" - shall mean any Test House recognised by State under/or Government of India having proper and adequate facilities for calibration of 0.2 accuracy class energy meters.

"Week"-A period of seven (7)consecutive Days beginning 00.00hours Indian Standard Time on Monday and ending 2400 hours on Sunday .

"Year" - Each twelve (12) months period commencing on (XXX) hours Indian Standard Time on January 1 and ending 2400 hours Indian Standard Time the following December 31, during the term of this Agreement.

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

[illegible] Chandra Rastogi
[illegible]
[illegible] Electricity Board
[illegible] Bhawan, LUCKNOW

ARTICLE - 2

SALE AND PURCHASE OF ENERGY

2.1 BOARD'S PURCHASE OF ENERGY

During the term of this Agreement as specified in Article 15.1, the Company shall feed all the energy from the project at the Grid Sub-Station, commencing from the date of synchronization of the first engine and Board shall evacuate all such energy from this point. Subject to and in accordance with the terms and conditions of this Agreement, the company shall sell and the Board shall purchase/wheel 100% of the energy delivered by the Company at Company Tariff as stipulated in Article 3 and paid for as per mode described in Article 6 from the date of Synchronization of the first engine. The metering for the entire energy shall be done at the Grid Sub-Station Busbars as described in Article 4.

2.2 COMPANY'S PURCHASE OF ENERGY

During such period, as may occur from time to time, as the Project is partially or totally unable to operate, the company may draw energy required for start up and maintenance of the project from the Board's system metered and paid for at the Board's tariff and adjusted in corresponding month's bill accordingly.

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

(Bharat Chandra Rastogi)
Secretary
U.P. State Electricity Board
Gurgaon, U.P. U.P.

ARTICLE - 3

COMPANY TARIFF AND SALE / PURCHASE OF ENERGY

3.1 Company Tariff including its escalation for Saleable Energy (as per Article 3.2) and Deemed Saleable Energy (as per Article 3.5) purchased by the Board from the Company shall be Rs.2.48 (Rupees Two and paise forty eight only) per unit on effective date. This tariff shall be valid for one calendar year from the effective date and shall be escalated as under :

3.1 (1) **RATE OF ESCALATION** - Increase in rate of Company Tariff payable to the Company shall be as follows. The base tariff as on the effective date shall be escalated and compounded @ 5% per annum for first 12 (twelve) years and subsequently compounded @ 4 %, 3 % and 2 % per annum for the slabs of 6 (six) years thereafter and the agreement shall be renewed on mutually agreed terms after thirty years as long as ABL desires or the Municipal Solid Waste is the source of energy.

No other escalation such as Operation and Maintenance (O & M) or forex variation etc., shall be applicable

3.2 **SALEABLE ENERGY**

Saleable Energy shall be the total energy delivered and metered at the Sub-Station.

3.3 Saleable Energy charges for a month shall be computed by multiplying Company Tariff with total energy delivered and metered as in Article 4 at Sub-Station busbar during the month. The aforesaid shall be payable on a monthly basis as detailed in Article 5.2.

3.4 Notwithstanding anything contrary to Articles 3.1 to 3.3 the aforesaid method of computation of Tariff may be modified in accordance with the ammendments if any, to Energy Policy of GOUP, from time to time or any other Government of Uttar Pradesh Notification only by mutual agreement of the UPSEB and the Company.

3.5 **DEEMED SALEABLE ENERGY**

Deemed Saleable Energy shall be payable in case of reduced generation or no generation due to the following reasons:

(a) UPSEB Grid System failure.
(b) Non-availability of evacuation/transmission system of UPSEB.
(c) Receipt of backing down instructions from control Centre.

In case the company is able to produce power but UPSEB / Control Centre is not able to receive power supply on account of the reasons explained above, the energy loss on account of such reasons shall be considered as

For ASIA BIOENERGY (INDIA) LTD.

P. SUBRAMANI
MANAGING DIRECTOR

(Chandra Rastogi)
Secretary
U.P. State Electricity Board

Deemed generation For energy loss in a month due to such interruption after the the annualexemption of 480 hours has expired, the corresponding (at company tariff), Deemed Saleable Energy as maintained and specified by the company and as verified by the Board on the need basis, shall be payable by the Board to the company. Deemed Saleable Energy shall be payable , if any, on the following basis:

(i) During first Year of operation , the Deemed Energy shall be calculated on a prorata basis based on the average energy sale figure during immediately preceding period of the year.

(ii) During all subsequent Years, the Deemed Energy shall be calculated on a prorata basis based on the average energy sales figure of the previous years.

In working out average energy sale figure of a calender year sale figure of days when such sale was reduced at Board 's instance as detailed in (a), (b) & (c) above as well as days of such reduced sales or no sale shall be ignored in working out the average figure. In addition to above the quantum of Deemed Saleable Energy as worked out above shall be reduced by corresponding units as calculated by 3.5 i & ii. corresponding to 480 hours in any one year.

3.6 In case the company, for some reason (technical/administrative) does not produce power, the company shall inform the Board within 24 hours and subsequently re-confirm time of generation again.

3.7 **TARIFF FOR INFIRM ENERGY**

The Infirm Energy shall also be metered at the Station as per provisions under Article 4 and delivered at the sub-station Busbars. The Board shall pay metered Infirm Energy at the rate determined as per Article 3.1

3.8 **COMPANY TARIFF COMPUTATION**

Company Tariff in terms of Article 3.1 shall be computed and shall be used by the company for invoicing.

3.9 **TAXES AND DUTIES**

The Board shall be liable to pay after the effective date, all taxes and duties levied on the company by any statutory authority as per statutory rules and forced from time to time, over and above company tariff as per Article 3.1

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

(Chetrai Chandra Rastogi)
Secretary
Uttar Pradesh Electricity Board
LUCKNOW

ARTICLE - 4

METERING ARRANGEMENT

4.1 Main Meters (Pair of Export and Import energy meters) required for the metering shall be owned by the Company and maintained by the Company. These shall be installed at the Grid Sub-station and maintained in accordance with Prudent Utility Practices. Such equipment shall include capability for hourly and monthly readings. The Company shall provide the Board metering results of Main meters. The Board shall also install Check meters for each Main meter installed by the Company at the power house and the Board shall maintain such check meters in accordance with Prudent Utility Practices. The Board shall provide to the Company metering results of Check Meters.

4.2 All the Main meters and Check Meters (Pair or Export and Import Energy Meters) installed at the Station shall be of 0.2 accuracy class. These shall be jointly inspected and sealed by the Parties concerned and shall not be interfered with by any Party except in the presence of the other party.

4.3 All the Main Meters and Check Meters shall be tested, checked jointly by the parties for accuracy every quarter. Each such Meter shall be deemed to be working satisfactorily and within permissible limits of error if the errors are within specifications for such Meter of 0.2 accuracy class. The consumption registered by the Main Meters alone will hold good for the purpose of billing as long as the error in the Main Meter is within the permissible limits.

4.4 If during the quarterly test checks, any of the Main Meters/Check Meters are found to be beyond the permissible limits of error, then billing will be as per the Meter which is within the permissible limits of error. The other meter shall, however, be calibrated immediately.There shall be no revision of the bills for the preceding months on this account.

4.5 (a) If during the quarterly test checks, both the Main Meters and the corresponding Check Meters are found to be beyond the permissible Limits of error, both sets of Meters shall be immediately calibrated and the correction as specified in Article 4.5(b) shall be applied to the consumption registered by the Main Meter to arrive at the correct consumption of energy for Billing purposes for the period of the month up to the time of calibration of the Main Meters. Billing for the period thereafter until the next monthly meter reading shall be as per the calibrated Main Meter.

(b) Corrections in billing wherever necessary shall be for the full value of the absolute error. For the purpose of the correction to be applied, the meter shall be tested at (a) 100 (b) 50 (c) 25 and (d) 10 percent load at unity power factor as well as 0.8 power factor of these eight values, the error at the load and power factor at the value nearest to the average monthly load served at the Grid

For ASIA BIOENERGY (INDIA) LTD.,

(Gopal Chandra Rastogi) P. S...

Secretary

...c Electricity Board

Sub - Station during the period shall be taken as the error to be applied for correction.

4.6 If both the Main and Check Meters fail to record or if any of the PT fuses are blown out, then the energy shall be computed for that period of defect on the basis of meter reading recorded by the Main Meter plus 100 percent of Design Energy as maintained and informed by the Company and as verified by the Board as per Annexure-I prorata for the period meters failed to record excluding outage in generation, if any, unless otherwise mutually agreed.

4.7 For the purpose of test and calibration, the sub-standard meter as per Article 4.6 shall be calibrated and sealed by the National Test House or mutually agreed Test House of repute. This sub-standard meter shall be calibrated once in every six months. These test results shall be made available to both the parties.

4.8 All the tests on the Main and Check Meters shall be conducted by the authorised staff of the parties and the results and correction so arrived at will be applicable and binding on all the parties.

4.9 Inspection and checking of CTs and PTs shall also be carried out by the parties every six months by monitoring the secondary output.

4.10 Monthly joint meter reading (both Main meters and Check meters) shall be taken on the date of synchronization, the date of commercial operation of the project, as well as at 12 noon on the last day of each month after the date of Synchronization. The joint meter readings shall be recorded and signed by the authorized representatives of both the parties. A Register shall be maintained at the Grid Sub -Station for the joint meter readings. Special joint meter readings shall also be taken at the time of removal/installation/reinstallation of any meter after calibration.

4.11 At the time of joint meter reading, the Company shall make available to the representative of the Board for his verification and certification of the following.

(a) Details in support of the generating units, along with relevant log books and records for the month required for this verification duly signed by authorised incharge.

(b) Calculation sheet in support of Deemed Energy along with relevant supporting data and records for the month signed by the Station incharge of Company. The documents shall have the quantity of gas generated/flared.

Provided that if the representative of the Board does not attend to the aforesaid verification and certification, the certificate of the Company relating thereto shall be the basis of payment subject only to a subsequent verification and certification by the Board's representative at the time of next joint meter reading.

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

(Nandita Pandegi)
Secretary
For Electricity Board

POWER FROM MUNICIPAL SOLID WASTE (LUCKNOW)
[illegible], LUCKNOW

ARTICLE - 5

BILLING

5.1 BILLING FOR INFIRM ENERGY

The Company shall submit to the Bank and Board a separate Bill for 100 percent of the Infirm Energy metered at the Sub-Station within 15 (fifteen) days of the date of Commercial operation of generating units. These bill(s) shall be raised on the basis of joint meter readings recorded at the grid sub-station (as provided in Article 4) on the date of Commercial Operation and shall be paid by the Board within 30 (thirty) days of presentation thereof.

5.2 BILLING FOR ENERGY CHARGES FOR SALEABLE ENERGY

Billing for Saleable Energy from the Date of Commercial Operation shall be done at Company Tariff as per Article 3.1 on the basis of joint meter readings at the Grid Sub-Station for the month as per Article 4.10. A bill (in triplicate) shall be submitted by the Company to the Bank as specified in Article 6.3 with a copy to the Board by the 7th (seventh) day of each succeeding month.

5.3 BILLING FOR ENERGY PURCHASED BY THE COMPANY

Energy purchased by the Company for consumption during maintenance/ shutdown period of the power plant shall be billed by the Board on monthly basis as per the prevalent Board tariff.

5.4 BILLING FOR DEEMED ENERGY

The Company shall furnish details of Deemed Energy as per Article 3.5 along with the monthly bill and submit the same in triplicate to the Bank as specified in Article 6.3 with a copy to the Board by 7th (seventh) day of each succeeding month.

5.5 SUPPLEMENTARY BILL

Supplementary bill if any shall be raised in case amount of bill exceeds the amount paid by the bank through L/C in according with Article 6.3 or other charges as necessary.

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

(Vineet Chandra Rastogi)
Secretary
U.P. State Electricity Board
Shakti Bhawan, LUCKNOW

ARTICLE - 6

PAYMENTS

6.1 ENERGY BILLS

(a) Within 45 (Forty five) days prior to the Scheduled synchronisation date, the Board shall open and maintain, in rupees, for the terms of this Agreement a confirmed irrevocable,asignable,divisible, unconditional, transferable standby, revolving letter of credit without recourse to drawer at Board's own cost in favour of Company on any nationalised bank that is acceptable to the Company (the "Letter of Credit"). The Letter of Credit shall contain terms reasonably acceptable to the Company and its lenders and shall be equal to an amount necessary to meet 30 days aggregate projected payments, based on 100% plant availability during such period (the "Letter of Credit Amount").

(i) Every monthly bill or supplementary bill shall be presented at the said bank for payment under the Letter of Credit and shall become payable on the Due Date of Payment.

(ii) Within three days of any drawdown by the Company, the Board must restore the Letter of Credit to an amount necessary to maintain the required Letter of Credit Amount. The Company may, in its sole option, assign such revolving letter of credit to lending agencies as it deems appropriate.

(b) As a support for Board's payment obligation under this Agreement, the Board shall establish a separate collateral arrangement, on or before Scheduled Synchronisation Date, pursuant to which the Board shall establish a separate account, called Escrow Account, with a nationalised bank acceptable to the Company and its lenders to receive and hold all revenues from the certain identified high tension consumers of the Board/revenues of the Board including those from the bulk consumers (the "Escrow Account"). The Board shall ensure that the amount in the Escrow Account shall not be less than 30 (Thirty) days aggregate projected payments based on a 100% plant availability during such period (the "Escrow Amount"). Incase there is no default in payment by Board during first two years then Escrow Account shall be equal to the amount necessary to meet one month billing from third year onward. However if there is any default on the part of Board then the Escrow amount shall be reverted to 45 days billing. Such accumulated revenues shall constitute security for the Board's obligations under this Agreement and may be accessed by the Company as more specifically set forth in the escrow agreement to be entered into simultaneously with the execution and delivery of this Agreement among the Board, the Company and such bank (the "Escrow Agreement"). The Escrow Agreement shall provide that, in the event the Board fails to make a payment as set forth in Section - 6.1.a. hereof, the bank shall, upon written notice by the Company, cease honour of cheques, drafts, requisitions and similar instruments drawn on the Escrow Account, except in satisfaction of the Company's claim. Upon satisfaction of the Company's claim, and written notice thereof by the Company, the trustee may permit payment of funds from the Escrow Account to persons other than the Company. The Escrow Agreement shall require such customers of the Board to acknowledge the existence of the Escrow Agreement and their

For ASIA BIOENERGY (INDIA) LTD.

(Sharat Chandra Reddy) SUBRAMANI
MANAGING DIRECTOR

of the Board to acknowledge the existence of the Escrow Agreement and their obligation to make payments directly to the Escrow Account. Escrow account shall be backed by GOUP guarantee.

(c) In the event of any dispute as to all or any portion of any billing or other statement, the Board shall nevertheless pay the full amount of the disputed charges when due and shall give written notice of the dispute to the Company as soon as reasonably possible after the Board discovers the same. To the extent possible, such notice shall identify the disputed bill, state the amount in dispute and set forth a full statement of the grounds on which such dispute is based. Upon final determination of the correct amount, any and all necessary adjustments at the rate of interest equal to the SBI prime lending rate plus interest tax plus 3% per annum, shall be included in the monthly Tariff Invoice next submitted to the Board.

(d) The parties to bear the expenses for opening and operating Escrow account shall be mutually discussed and decided when at the time of its opening.

6.2 Receipt by the Company of the GOUP Guarantee shall not in any way relieve the Board from any of its obligations hereunder, including, but not limited to the establishment of the Letter of Credit and Escrow Account.

6.3 PAYMENT

(a) The Company shall present the monthly Bills as per Articles 5.2 and 5.4 for payment to the Bank. Bills shall be payable upon the execution and presentation of the following documents through L/C or against the Escrow Account.

(i) Monthly bill in a mutually acceptable format indicating calculations of Saleable Energy and Deemed Saleable Energy and late payment charges, if any.

(ii) A certificate by an authorised officer of the Company stating that the amounts specified in the certificate are due and payable by the Board to the Company under this Agreement and supported by a meter reading statement accepted and signed by both the Company and the Board or a certification by the Company that the Board failed to sign the meter reading statement. Such meter reading shall be certified by notary.

6.4 REBATE

If the payment for each Operating Month is made in full via the letter of credit within three days of presentation of Bill to the Board. Board shall be entitled for 2.5% rebate in the amount of Bill. For payment thereafter, rebate will be reduced on pro-rata basis of 0.05% for each day upto 30th day of presentation of bill to the Board.

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

(Bharat Chandra Rastogi)
Secretary
U.P. State Electricity Board
Shakti Bhawan, LUCKNOW

6.5 LATE PAYMENTS

Late payments, i.e. payments 30 days after the Due Date of Payment shall bear interest at a rate equal to State Bank of India prime lending rate plus interest tax plus 3% per annum for the period of the delay (subject to a maximum of 15 days).

6.6 If the payment is not made within 180 days of the due date of payment, the Company shall be at liberty to invoke GOUP Guarantee and all damages to the company on account of non treatment of MSW on account of non-receipt of payment from Board shall be to Board's account.

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

(Kamla Chandra Rastogi)
Secretary
U.P. State Electricity Board
Shakti Bhawan, LUCKNOW

ARTICLE - 7

DISPUTE RELATING TO PAYMENT OF BILLS

7.1 At any time within 15 (fifteen) days of the receipt of any bill from the Company, the Board may serve a notice on the Company that the amount of any one or more bills is in dispute. Such notice shall specify the bill number concerned, the amount under dispute and basis thereof. On receipt of the Notice, the Company shall agree or disagree (with reasons) on the contention of the Board within 15 (fifteen) days of receipt of Notice, and in case of agreeing, shall make adjustment, as due, within 15 (fifteen) days of receiving the Notice, failing which the disputes shall be settled in terms of Article 16 herein after.

Notwithstanding any billing dispute, the bill shall be paid as per Article 6.3 and 6.4 thereof.

7.2 In case the payment has been made and parties are not in a position to resolve the dispute arising out of unacceptable billing within 15 (fifteen) days of the receipt of notice either party may initiate the proceeding set forth for resolution of dispute under Article 16. Upon the resolution of the dispute, the amount if any due to the concerned party shall be paid within 15 (fifteen) days together with the interest accrued at State Bank of India prime lending rate plus interest tax plus 3% per annum calculated from the date the excess amount was received by the Company till the date of repayment thereof by the Company to the Board.

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

(Bharat Chandra Rastogi)
Secretary
U.P. State Electricity Board
Shakti Bhavan, LUCKNOW

ARTICLE - 8

IMPLEMENTATION OF PROJECT

8.1 The Company shall complete the execution of the project and synchronise the generating units for supply of power to the grid sub-station by the end of 33 months from the effective date subject to availability of all clearences to the project within the six months from the effective date.

8.2 The Board shall make arrangements to set up necessary Interconnection Facilities at the grid sub-station in time to match the commencement of generation and availability of power from the Project to ensure transmission of power generated at the Project upto required load Centres. In case the Company is in a position to commission the project before the above stipulated time, the Company shall intimate the Board in writing, the commissioning dates six months in advance and the board shall make the arrangement of inter-connection facilities at sub-station to match the new commissioning date(s).

8.3 "Scheduled Date of Commissioning of the Interconnection Facility" - This shall be the date by which the Board shall ensure commissioning of Interconnection Facility at the Grid Sub-Station for utilisation of energy generated at the Project upto the required load Centres. This shall be three months prior to the date of commissioning of Unit I of the Project.

8.4 "Scheduled date of Commissioning of the Project" - This shall be within 33 months from effective date by which the Company shall commission all the units.

8.5 The Company shall keep the Board posted with the progress of various works from time to time on agreed program so that the Board is in a position to further co-ordinate with its own program of works with regard to transmission and utilisation of power.

8.6 The company shall alter/delete/add units required for segregation and any other unit operation. They can add additional power generation units if required at their cost but to intimate the excess power that will be generated on mutual agreement between both the parties.

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

(Neelima Rastogi)
Secretary
The Electricity Board
Shavan, LUCKNOW

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ARTICLE - 9

COMPENSATION IN THE EVENT OF DELAY

9.1 (a) Consequences of delay in commissioning of one or more generation unit by the Company.

Notwithstanding this Agreement, if any part of the Project including Power Station and Associated Transmission System which are the responsibility of the Company are not completed and operational on the Scheduled Synchronisation Date or revision thereof of various unit, for any reason not attributable to a Force Majeure Event or a default by the Board and if it is certified by the Board that the Inter-connection at the Sub-Station is ready for receiving power and this delay in Synchronization Date of the various units leads to a delay in receiving energy from the concerning unit, the concerning unit shall be treated as delayed commissioning and Company shall make payment from the scheduled synchronization date of concerning unit to the date of the unit is actually synchronized on the basis of 10% of design energy on company tariff subject to all inclusive maximum of Rs. 10 Lacs per MW of the Station Capacity to the Board for the total project.

(b) Consequences of delay by the Board in installation of Inter-connection at Sub-Station by Board

Notwithstanding this Agreement, if any part of the interconnection at grid sub-station, which are the responsibility of the Board are not completed and operational on the Scheduled Synchronization Dates or revision thereof as mutually agreed of various unit, for any reason not attributable to a default by the Company and it is certified by the Company that the concerning Unit is ready for Synchronization, and this delay in completion of Interconnection Facilities leads to a delay in the Scheduled Commercial Operation Date of the concerning Unit, the concerning Unit shall be deemed commissioned on the Scheduled Commercial Operation Date of concerning Unit and the Board shall make payments to the Company for deemed energy for the concerning Unit from the Scheduled Synchronization Date of Concerning Unit to the Date on which the interconnection facility is completed.

For the purpose of this provision, the Scheduled Synchronization Date shall be taken as intimated by the Company as per Article 10.3 (a) or revision thereof.

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

(Sharat Chandra Rastogi)
Secretary
U.P.State Electricity Board
Shakti Bhawan, LUCKNOW

9.2 The Company shall start the work on the Project, subject to timely availability of all clearances from the authorities and Government of India, and availability/acquisition of land for Project works and GOUP guarantee. If delay is caused in obtaining any of these clearances and availability/acquisition of land, the date of start of the project shall be suitably extended. The Company shall complete the execution of the Project at its own cost and commission the project within period of 33 months from the effective date (subject to the availability of the above mentioned clearances within six months of effective date).

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

(Sharat Chandra Rastogi)
Secretary
U.P.State Electricity Board
Shakti Bhawan, LUCKNOW

ARTICLE - 10

PREOPERATIVE PERIOD

10.1 The Company shall give 30 (thirty) days advance notice intimating the readiness of each engine to be electrically synchronized for the first time and connected to the Grid Sub-Station bus bars.

10.2 Similar notice shall be sent to the Company by the Board regarding the readiness of interconnection facility at the grid sub-station for the full evacuation and utilisation of power from the Project.

10.3 **DOCUMENTS TO BE SUBMITTED BY THE COMPANY**

The Board as a purchaser of power shall be entitled to see relevant records at appropriate times :

(a) Schedule for construction and commissioning of the Project.

(b) General layout drawings of the Project including the plant layout and protection schemes adopted.

(c) Copies of all Government authorisation including permits, licenses, approvals and other authorisations issued to the Company from time to time for construction, operation and maintenance of the Project.

(d) Copy of the Company's plan for operation and maintenance of the Project.

(e) Copy of start up and test schedule of the Project.

(f) Copy of all test results in respect of tests performed on various components of the Project.

(g) Copies of all Insurance policies and certificates of Insurance required for construction.

10.4 The Company and the Board shall mutually develop a written operating procedure for the Project not later than 30 (thirty) days prior to the scheduled synchronization date of the first unit. This procedure shall be based on design of the Project Interconnection facility at the Grid Sub-Station and shall be consistent with Prudent Utility Practices, the technical limits and this Agreement. Method of day to day communication, name of key personnel, clearance and switching practices, outage scheduling, capacity and energy reporting, operating log and reactive power support shall be fully described.

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

(Chandra Chandra Rastogi)
Secretary
U.P. State Electricity Board
Shakti Bhawan, LUCKNOW

10.5 BOARD'S OBSERVATION VISITS

The Board shall have the right upon reasonable prior notice to Company (excpet that no notice shall be required in an Emergency), to observe the progress and the qulaity of the construction and commissioning of the Project, in accordance with the schedule as per Article 10.3 (a) and also during the operation of the Project. The Company shall comply with all reasonable requests of the Board for, and assist in arranging, any such observation visits to the Project. All persons visting the Project on behalf of the Board shall comply with the reasonable instructions and directions of the Company or its contractors. The Company shall provide a suitable site office for use by the Board's visiting personnel. The Board's visting personnel shall cause to visit th site at Board's instance and the Company shall not be responsible for any injury or damge caused to such visiting representative of the Board and shall be fully indemnified of all claims of injury, loss of earning etc., to the Board personnel engaged or contracted by the Board.

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

(Chandra Rastogi)
Secretary
U.P.State Electricity Board
Shakti Bhawan, LUCKNOW

ARTICLE - 11

CONTROL AND OPERATIONS

11.1 FORCED OUTAGE

Except when the equipment of the Project is under forced outage, such equipment shall not be taken out for maintenance, testing or overhaul resulting in outages or reduced generation with the prior arrangement with the Control Centre or in accordance with the Scheduled Outage or Maintenance Outage.

11.2 The Company shall take all reasonable steps to bring back the equipment of the project that is under forced outage as early as may be reasonable practicable.

11.3 SCHEDULING AND CONTROL

Scheduling of operation and maintenance of the Project shall be prepared by the Company in consultation with the Control Centre taking into account full and optimum utilisation of water potential and grid parameters.

11.4 SCHEDULED OUTAGE

The Company shall at least 45 (forty five) days after the commercial operation date submit its planned schedule of outage for the period ending 30th June to the Control Centre. Thereafter, annual scheduled outages shall be submitted before 30th June of each year. The company shall use, subject to technical limits and prudent utility practices, its reasonable endeavour subject to technical limits, not to set any schedule outages during the summer and monsoon months.

11.5 The Control Centre shall notify the Company in writing within 2 months (allowable time) from the receipt of the planned outage Schedule from the Company of its acceptance thereof or modifications thereto required with reasons. The Control Centre shall take into account the maintenance schedule of Inter-connection with the Sub-Station and the Grid System and notify the Company of changes required in the Schedule within the aforesaid allowable time. Provided always that:

(a) Such rescheduled period shall be as close as reasonably practicable to the requested time; shall comply with the Technical Limits, shall be consistent with the Technical Limits and Prudent Utility Practices and the recommendations of Principal equipment manufacturers and shall be of equal duration as the requested period.

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

(Sharat Chandra Rastogi)
Secretary
U.P. State Electricity Board
Shakti Bhawan, LUCKNOW

(b) The Control Centre shall not require the Company that a single Scheduled Outage be split into two or more periods, unless subject to technical Limits, it is feasible and acceptable to the Company and is consistent with Prudent Utility Practices and the recommendations of manufacturers of principal equipment.

(c) The Control Centre shall not require that a Schedule outage be postponed or preponed by more than 30 (thirty) days, unless for special reasons which are acceptable to the Company.

(d) All scheduling and rescheduling pursuant to above shall be done without adverse distinction between the Project and all other Plants providing capacity and or Energy to the Grid System.

Notwithstanding the fixing of a time for a Scheduled Outage pursuant to Article 11.4, the Company shall be entitled to reschedule any Scheduled Outage upon 45 (forty five) days' prior written notice to Control Centre. The Company shall endeavour to reschedule the outages as far as possible in accordance with the request made by the Board, after mutual discussions.

11.6 **BOARD'S MAINTENANCE**

Board shall use its best efforts to coordinate the maintenance program for the sub-station Interconnection and the Grid System with the Scheduled Outages of the Company.

11.7 **MAINTENANCE OUTAGE**

When the need arises for a Maintenance outage, the Company shall advise the Control Centre of such need along with description of work required and date of commencement and estimated duration of the Maintenance outage. In case of urgency, the Company may intimate the Control Centre by a telephonic message of the above matters and the Control Centre shall respond by a return telephonic message within 24 (twenty-four) hours of such intimation. The Control Centre and the Company shall confirm their communications in writing within 3 (three) days. In any event Maintenance Outage shall comply with Technical Limits and be consistent with Prudent Utility Practices and recommendation of the manufacturer's of the principal equipment of the Project.

11. 8 **OPERATION**

(a) The Company shall furnish the following information and data for annual, monthly, weekly and daily generation to the Control Centre.

(b) As for as possible the Company will adhere to the Control Centre's schedule and changes, if any, shall be mutually discussed and agreed.

(c) The Company shall keep the Control Centre's inform as to the declared available capacity of the Project and will immediately advise the Control

For ASIA BIOENERGY (INDIA) LTD.,

(Sharat Chandra Rastogi)
Secretary
State Electricity Board

P. SUBRAMANI
MANAGING DIRECTOR

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Centre of any change in such declared available capacity due to changes in Scheduled Outage Maintenance Outage, or forced outage or otherwise.

(d) The operating staff of the Company shall carry out all switching operations as per the instructions of the Control Centre necessary to make the interconnection equipment / transmission lines dead for making these available for commencement maintenance work thereon during an outage.

(e) The Company shall provide the board sixty (60) Days prior to the Scheduled Synchronization Date, a copy of a draft written operating procedure to serve as the basis for the written operating procedure to be mutually developed by the Company and the Control Centre not later than thirty (30) days prior to Scheduled Synchronization Date. These procedures shall include, but not limited to, method of day-to-day communication, key personnel list, clearances, switching practices, outage scheduling capacity and energy reporting log and Reactive Power Support.

(f) The Company and the Board shall mutually develop an inter-tripping schedule not later than 30 (thirty) days prior to the Scheduled Synchronization Date.

(g) The Company shall make reasonable efforts to employ qualified personnel from within the State of Uttar Pradesh in the operation and maintenance of the Project and to institute appropriate training programmes for such personnel, provided however, that the company shall have sole discretion as to the personnel employed for the peration and maintenance of the project within the bounds permitted by law.

11.9 COORDINATION COMMITTEE

(a) The parties shall establish a Coordination Committee comprising four Members two each from the Company and the Board. The Members of the Committee should preferably be of the level of Executive Engineer. The Coordination committee shall be responsible for co-ordination during the construction, testing and commissioning and operation and maintenance of the Project. One of the Company's Representative shall be the Convenor of the Coordination Committee. The meeting shall normally be held once a quarter or as and when necessary at shorter intervals.

For ASIA BIOENERGY (INDIA) LTD.,

(Charu Chandra Rastogi)
Secretary
U.P. State Electricity Board
Shakti Bhawan, LUCKNOW

P. SUBRAMANI
MANAGING DIRECTOR

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b) The terms of reference of the Coordination Committee shall be as under:

(i) To coordinate the respective programs of the parties for the construction, testing and commissioning, operation and maintenance of the Project and matters arising under this Agreement.

(ii) To discuss steps to be taken on the occurrence of any event of Force Majeure, or the shutdown or reduction in capacity, for any reasons of the Project or any other such matter related to the Project.

(iii) Co-ordination of Scheduled and Maintenance Outages.

(iv) To coordinate forecast or requirement from theProject relating to Energy.

(v) To develop operating procedures referred to in Article 11.8.

(vi) To suggest safety measures affecting the systems of the two parties.

(vii) To review and revise protection schemes and devices.

(viii) To discuss any other mutually agreed matter related to the aforesaid systems.

(c) The coordination committee may decide upon procedures for holding of meeting and appointment of the sub-committees.

(d) In case of matters not resolved by consensus (unanimous agreement of the parties) Coordinating Committee or any of the two parties may refer the matters to the Chief Executive of the Developer and the Chief Engineer/Urban Distribution Zone for further consideration and appropriate action with a view to resolve the issue.

11.10 MAINTENANCE OF RECORDS :

(a) The Company and the Board shall keep complete and accurate records and all other data required by each of them for the purposes of proper administration of this Agreement. Among other records and data required, hereby or else where in this Agreement, the Company shall maintain the following :

(i) An accurate and up-to-date operating log sheet at the Project with records of Active and Reactive Power Generation for each clock hour at all times. The Company shall provide suitable recording device for the aforesaid purpose.

(ii) changes in operating status Scheduled Outages, maintenance Outages and Forced Outages, and;

(iii) any unusual condition found during inspection.

(b) Either Party shall have the right, upon reasonable prior notice to the other Party, and at reasonable times during normal office hours, to examine such records and data of the other party relating to this Agreement or the Operation and Dispatch of the Project hereinafter mentioned in sub-clause (c) within the associated Grid Sub-Stations. During the period, such records and data shall be maintained by the parties.

(c) All such records shall be maintained for a minimum of sixty (60) months after the creation of such records or data, provided however that the parties shall not dispose off or destroy any such records after such sixty (60) months period without 30 (thirty) day's prior written notice to the other party.

For ASIA BIOENERGY (INDIA) LTD.

(Rastogi)

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ARTICLE - 12

REPRESENTATION AND WARRANTIES

12.1 REPRESENTATION AND WARRANTIES OF THE COMPANY

The Company represents and warrants that : -

(a) The Company is a Company duly organised and validly existing under laws of India and has all requisite legal power and authority to execute this Agreement and carry out the terms, conditions and provisions hereof ;

(b) this agreement constitutes valid, legal and binding obligation of the Company, enforceable in accordance with the terms hereof, except as enforceability may be limited by applicable bankruptcy, insolvency, reorganization, moratorium or other similar laws affecting creditor's rights generally to the extent that the remedies of specific performance, injunctive relief and other forms of equitable relief are subject to equitable defenses, the discretion of the court before which any proceeding therefore may be brought, and the principles of equity in general;

(c) there are no actions, suits or proceedings pending or to the Company's knowledge threatened, against or affecting the company before any court or administrative body or arbitral tribunal that might materially adversely affect the ability of the Company to meet and carry out its obligations under this Agreement.

(d) the execution and delivery by the Company of this Agreement has been duly authorised by all requisite corporate or partnership action, and will not contravene any provision of, or constitute a default under any other agreement or instrument to which it is a party or by which it or its property may be bound.

12.2 REPRESENTATIONS AND WARRANTIES OF BOARD

Board represents and warrants that :

(a) the Board is a statutory body duly constituted under the Electricity (Supply) Act of 1948, as amended, and validly existing under the laws of India and has all requisite legal power and authority to execute this Agreement and carry out the terms, conditions and provisions hereof.

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

[illegible] Chandra Rastogi,
Secretary
[illegible] State Electricity Board
[illegible] Bhawan, LUCKNOW

(b) this Agreement constitutes the valid legal and binding obligation of the Board, enforceable in accordance with the terms hereof except as the enforceability may be limited by applicable bankruptcy, insolvency, reorganization, moratorium or other similar laws affecting creditor's right generally and to the extent that the remedies of specific performance, injunctive relief other forms of equitable relief are subject to equitable defenses, the discretion of the Court before which any proceeding therefor may be brought and the principles of equity in general.

(c) there are no actions, suits or proceedings pending or, to the Board's knowledge, threatened, against or affecting the Board before any court or administrative body or arbitration tribunal that might materially adversely affect the ability of the Board to meet and carry out its obligations under this Agreement; and

(d) the execution and delivery of this Agreement by the Board has been duly authorised by all requisite action, and will not contravene any provision of, or constitute a default under any other agreement or instrument to which it is a party or by which it or its property may be bound;

(e) Board will provide and maintain its Sub-Station equipment Interconnection facility at its own cost upto the required load Centres for evacuation and utilisation of full power generated at the project.

(f) it will provide reasonable assistance to the Company in obtaining all required Government Authorisations for the construction, commissioning, operation and maintenance of the Project and sale of the Energy there from in accordance with this Agreement.

For ASIA BIOENERGY (INDIA) LTD.,

B. SUBRAMANI
MANAGING DIRECTOR

(...ita Rastogi)
Secretary
... State Electricity Board
... Shavan, LUCKNOW

ARTICLE - 13

UNDERTAKINGS

13.1 COMPANY UNDERTAKING

The Company hereby convenants to and agrees with the Board to

(a) Complete the execution of the Project within the scheduled time as per article 8.1 subject to and in accordance with this Agreement;

(b) design, install and commission the project including transmission line upto the nearest Grid Sub-Station in a good workman-like manner only with materials and equipment that are new and of utility-grade quality, in such a manner as to provide reasonable likelihood that the useful life of Project will be at least equal to the Term and in accordance with this Agreement;

(c) maintain the dependable capacity of 5 MW throughout the term of this agreement from the commissioning of the project, subject to the outages in accordance with this agreement and normal under-rating/deterioration during the life of the project, subject to the availability of raw material.

(d) work with and cooperate in good faith with the Board with respect to all of the Board's obligations and rights hereunder;

(e) provide such periodic Report to the Board on the progress of the development and construction of the project as per the agreed proforma.

(f) operate and maintain the project in accordance with (I) Prudent Utility practices within the technical Limits and (ii) all applicable laws, rules regulations, permits and licences and (iii) sound engineering practices. Prudent Electrical Practices and Prudent Utility Practices and recommendations of manufacturers of the principal equipment of the project.

(g) To acquire land and also procure all clearances from the Govt. with active assistance from board/GOUP.

13.2 BOARD'S UNDERTAKING

Board hereby covenants to and agrees with the Company to :

(a) provide adequate construction power to the project work site at the cost of the Company including departmental charges as applicable to such category of consumers. The construction power shall be supplied at the Board's bulk supply tariff as applicable from time to time.

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

(Ashwani Chandra Rastogi)
Secretary
U.P. State Electricity Board
Shakti Bhawan, LUCKNOW

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(b) Make all necessary arrangement to set up the necessary equipment and Interconnection at the Sub-Station for evacuation and utilisation of full power generated by the Company at the project within the stipulated time schedule at Board 's own cost.

(c) Provide such assistance and support as the Company may reasonably require in identifying and preparing applications for Governmental authorizations and in interfacing with Governmental instrumentalities in connection with obtaining Governmental Authorizations for the constructions, completion and operation of the Project.

(d) work with and cooperate in good faith with the company with respect to all of the Company's obligations and rights hereunder.

(e) Provide GOUP guarantee to support the agreement as per Article -6.

13.3 MUTUAL COVENANTS

Each party will duly pay all rents, taxes, cesses, fees, revenues, assessments, duties, other outgoings and other amounts owing by it and will observe all the rules and regulations pertaining to the same, and will not do or omit to do or suffer to be done anything which could reasonably be expected to adversely affect or prejudice the interest and rights of the other party in any manner whatsoever.

For ASIA BIOENERGY (INDIA) LTD.,

B. RAMAMAN
MANAGING DIRECTOR

(Charat Chandra Rastogi)
Secretary
U.P.State Electricity Board
Shakti Bhawan, LUCKNOW

(vii) strikes, work-to-rule actions, go-slow or similar labour difficulties occurring inside India (excluding such events which are site specific and attributable to the Company or the Board).

(viii) inability despite due diligence to obtain, renew or maintain required licenses, permits or governmental approvals, provided such adverse action or inaction did not result from the Company's or any of its contractor's non-compliance with any applicable Law;

(ix) the failure of any Governmental department, ministry and instrumentality whose failure to perform under their obligations to the Company directly/indirectly, shall prevent and/or cause delay in implementation of the project as per schedule given in Article 8 and /or shall result in the Station's operations being affected Materially provided such adverse action or inaction did not result from the Company's or any of its Contractor's non-compliance with any applicable Law ;

(x) Geological or ground conditions that were not reasonably forseeable.

(xi) Earthquake, volcanic, eruption and floods.

(xii) any event or circumstance or a combination of the same of a nature analogous to any of the foregoing beyond the reasonable control of the Parties and affecting the performance of their obligations hereunder;

(c) the Board Force Majeure events or circumstances of the following types which affects the Interconnection Facilities at Sub-Station and prevents the Board from evacuating power produced by the Project, except to the extent they constitute or are caused by events and circumstances of political Force Majeure.

(i) any material effect of the natural elements including lightning, drought, fire earthquake, volcanic eruption, landslide, flood, cyclone, typhoon, tornado or storms;

(ii) any material effect of disease, epidemics, plagues or quarantines ;

(iii) geological or ground conditions that were not reasonably forseeable.

(iv) explosion, accident, breakage or breakdown of facilities, structural collpase, failure of or defects in major forging or casting or other items or major equipment which require long lead time to obtain either a replacement or repair, or chemical contamination (other than resulting from an act of war), in each case not attributable to failure to follow Prudent Utility Practices.

For ASIA BIOENERGY (INDIA) LTD.,

(Charat Chandra Rastogi)
Secretary
U.P.State Electricity Board
Shakti Bhawan, LUCKNOW

P. SUBRAMANI
MANAGING DIRECTOR

(v) air crash, ship wreck, train wreck or delay of transportation that were not reasonably foreseeable.

(vi) any event or circumstances of a nature analogous to any of the foregoing.

(vii) any unavailability of equipment, facility, material that was not reasonably foreseen.

Explanation :
The Board shall not be entitled to claim Force Majeure based upon an interruption of services due to action taken by itself.

14.2 **NOTIFICATION OBLIGATIONS**
Where a party is affected by any of the events described in Article 14.1, the affected party shall give the other party written notice describing the particulars of the Force Majeure Events as soon as reasonably practicable after its occurrence but not later than five (5) days after the date on which such Party knew or should reasonably have known of commencement of Force Majeure Event. Notwithstanding the above, if the event of Force Majeure Event results in a breakdown of communications rendering it not reasonably practicable to give notice within the applicable time limit specified herein then the Party claiming force Majeure shall give such notice as soon as reasonably practicable after the reinstatement of communications, but not later than seven (7) days after such reinstatement.

14.3 **PARTIES OBLIGATIONS IN CASE OF FORCE MAJEURE EVENT**

(a) the parties shall co-operate, negotiate in good faith and develop and implement plan of remedial and reasonable alternative measures to remove/remedy Force Majeure Event to enable the performance of the affected party provided however, that no party shall be required under this provision to settle strike or other labour disputes if considered to be unfavourable to it.

(b) Upon the occurrence and during the pendency of any Force Majeure Event, none of the party shall be relieved of their liabilities/obligations including liability for the payments as per this Agreement.

(c) In case the Force Majeure Event necessitates extension of time for project implementation, it will be duly accepted by both the parties ;

(d) the extra cost for completion of project due to Force Majeure Event including inter-alia the additional or extra work required to be done, interest during the extended period of project completion and escalation shall be duly considered in the project completion cost for all purposes of this agreement.

FOR ASIA BIOENERGY (INDIA) LTD.,

(Sharat Chandra Rastogi)
Secretary
U.P.State Electricity Board
Shakti Bhawan, LUCKNOW

P. SUBRAMANI
MANAGING DIRECTOR

ARTICLE - 16

RESOLUTION OF DISPUTES

16.1 GOOD FAITH NEGOTIATIONS

In the event of any Dispute or differences between the parties (a "Dispute"), concerning performance of this Agreement and/or the rights and liabilities of the Parties in respect of which a procedure for the resolution is not otherwise provided for in this Agreement, the following provisions shall apply;

(a) either Party shall give to the other party a written notice setting out the material particulars of the Dispute and requiring a senior officer not below the rank of Superintending Engineer or equivalent from both the Board and the Company to personally meet at former's headquarter, within 15 (fifteen) days of the date of receipt of such notice, to attempt in good faith, and using their best endeavours at all times to resolve the Dispute; and

(b) if the Dispute is not resolved as evidenced by the terms of the settlement being reduced to writing and signed by each of the above officers within 30 (thirty) days after the date of receipt of the notice described in Article 16.1 (a) by the relevant Party, then the matter shall be referred by the respective officers to the controlling Chief Engineer of the Board and Chief Executive of the Company who would meet the endeavour to settle the dispute within a further period of 30 (thirty) days i.e. within a total period of 60 (sixty) days of the initial date of receipt of notice of dispute as per Article 16.1 (a).

(c) For the period, dispute remains unsettled, both the parties may agree at Officers/Chief Engineer and Chief Executive level for compensation by the defaulting party to the aggrieved party for the losses and damages suffered by the latter. Such loss may be determined taking into consideration the prevalent commercial practices as adopted by CEA/NREB etc. from time to time;

(d) the Dispute shall be subject to the provisions of Article 16.2 dealing with Arbitration, or to any litigation, only after provisions of Article 16.1 (a) have been fulfilled and the Parties have failed to execute a written settlement in accordance with Article 16.1 (b).

16.2 ARBITRATION

Except as otherwise provided in this Agreement, any dispute that can not be resolved by the Parties pursuant to Article 16.1 arising out of or relating to this Agreement or the interpretation hereof of any arrangements relating hereto or contemplated herein or the breach, termination or invalidity thereof shall be referred finally to Arbitration. Such

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

Secretary
U.P. State Electricity Board
Shakti Bhawan, LUCKNOW

disputes or differences shall be referred to two Arbitrators appointed within (60) (Sixty) days, one appointed by the Company, and the other appointed by the Board, and the two Arbitrators shall appoint one Umpire before proceeding with the Arbitration. If the two Arbitrators to be appointed by the Parties fail to agree upon an umpire within thirty (30) day of their appointment, the third Arbitrator shall be appointed by GOUP. The Parties agree that any decision on award of the Arbitrators shall be final, conclusive & binding upon the Parties. The Arbitration shall be governed by the Indian Arbitration and Counsellation Act of 1996 and any modifications thereof and the venue shall be as decided mutually by the Arbitrators/Umpire. All Arbitration proceedings shall be in the English Language, judgement upon the award rendered in such Arbitration may be enforced in any court of competent jurisdiction, at Lucknow having jurisdiction in respect or any application made for the filling of the Arbitration agreement herein contained and/or for any interim relief or direction or otherwise, during the pendency of arbitration proceedings and upto the date of making of the award in such Arbitration.

For ASIA BIOENERGY (INDIA) LTD.,

R SUBRAMANI
MANAGING DIRECTOR

(Sharat Chandra Rastogi)
Secretary
U.P.State Electricity Board
Shakti Bhawan, LUCKNOW

ARTICLE - 17

LIABILITY AND INDEMNITY

17.1 LIMITATION OF LIABILITY

(a) Except as expressly provided in this Agreement, neither the Company nor the Board nor their respective officers, directors, agents, employees or Affiliates (or their, officers, directors, agents or employees), shall be liable or responsible to the other Party or its Affiliates, officers, directors, agents, employees, successors or assigns (or their respective insures) for incidental indirect or consequential damages, connected with or resulting from performance or non-performance of this Agreement, or anything done in connection herewith, including claims in the nature of lost revenues, income or profits (other than payments expressly required and property due under this Agreement, any increased expense of, reduction in or loss of power generation production or equipment used therefor, irrespective of whether such claims are based upon breach of warranty, tort (including negligence, whether of the Board, the Company or others), strict liability, contract, breach of statutory duty, operation of law or otherwise. The Board shall have no recourse against any officer, director or shareholder of the Company or any Affiliate of the Company or any of its officers, directors or shareholders. The Company shall have no recourse against any officer of the Board, or any affiliate of the Board or any of its officers.

(b) Notwithstanding this Article, a Party shall be liable to the other Party for any additional costs, expenses or loss suffered, arising directly from a willful default of the Party's obligations under this Agreement.

(c) For the purposes of this Article, "willful default" shall mean;

(i) an intentional or reckless breach disregard by a Party of its obligations under this Agreement;

(ii) a failure to remedy a breach resulting from an error of judgement or mistake arising in good faith; or

(iii) a failure to remedy a breach resulting from an action in accordance with Prudent Industry Practice.

17.2 THE COMPANY INDEMNITY

(a) The Company agrees to defend, indemnify and save harmless the Board, its officers, directors agents, employees and Affiliates from and against any and all actions, claims costs, demands demages, expenses (including reasonable legal fees), judgements, liabilities, losses, proceedings and suits by any Person that are caused by or substained on facilities owned or controlled by the Company unless caused by the action, negligence or the willful misconduct of an officer of the Board or any office, Director, Subcontractor, Agents, Employees of the Board.

(Shaval Chandra Rastogi)
Secretary
U.P. State Electricity Board
LUCKNOW

For ASIA BIOENERGY (INDIA) LTD.,

P. SUBRAMANI
MANAGING DIRECTOR

(b) Any claims under this Article shall be made in writing within a reasonable period of time from the time of alleged conduct giving rise to the claim, or within such shorter period as may be prescribed by any limitation statute applicable at the Project Site and/or the Power Station.

17.3 THE BOARD INDEMNITY

(a) the Board agrees and shall defend, indemnify and save harmless the Company, its officers, directors, agents, employees and Affiliates (their respective officers, directors, agents and employees) from and against any and all action, claims cost, demands, damages, expenses (including reasonable legal fees), judgements, liabilities, losses, proceedings and suits by any Persons that are caused by or sustained on facilities owned or controlled by the Board, unless caused by the action, negligence, or the willful misconduct of an officer of the Company or any officer, director, subcontractor, agent or employee of the Company.

(b) Any claims under this article shall be made in writing within a reasonable period of time from the time of alleged conduct giving rise to the claim, or within such shorter period as may be prescribed by any limitation statute applicable at the Project Site and/or the Power Station.

17.4 NOTICE OF PROCEEDINGS

(a) Where the Party receives a claim from a third party in respect of which it is entitled to be indemnified under Article 17.2 or 17.3, it shall promptly notify the other party of such claims.

(b) Neither Party shall settle or compromise any claim, action, suit or proceeding with third party in respect of which it is entitled to be indemnified by the other party without the prior written consent of that Party, such consent shall not be unreasonably withheld or delayed.

17.5 CONDUCT OF PROCEEDINGS

(a) A Party (the original Party) shall have the right, but not the obligation to contest, defend and litigate any claim, action, suit or proceedings by the third party alleging or asserting against it arising out of any matter in respect of which it is entitled to be indemnified by the other Party or indemnifying Party.

(b) The reasonable costs incurred by the original Party to contest, defend and litigate any claim, action, suit or proceeding by any third party shall be covered by the indemnity from the indemnifying Party.

(c) The indemnifying Party shall be entitled, at its option, to assume and control the defense of such claims, action, suit or proceeding at its expense provided it gives prompt notice of its intention to do so to the original Party contesting or defending the suit or proceeding by the third Party.

For ASIA BIOENERGY (INDIA) LTD.

(Sadhna Chandra Rastogi)
Secretary
U.P. State Electricity Board
LUCKNOW

P. SUBRAMANI
MANAGING DIRECTOR

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(d) The indemnifying Party shall reimburse the original Party for all reasonable costs previously incurred by it prior to the assumption of such defence by the indemnifying Party.

17.6 REPRESENTATION

The indemnified Party shall have the right to employ its own counsel and such counsel may participate in such claim, action, suit or proceeding, but the fees and expenses of such counsel shall be at the expense of such indemnified Party, when and as incurred, unless;

(a) the employment of counsel by such indemnified Party has been authorised in writing by the indemnifying Party;

(b) the indemnified Party shall have reasonably concluded that there may be a conflict of interest between the indemnifying Party and the indemnified Party in the conduct of the defence of such action;

(c) the indemnifying Party shall not in fact have employed independent counsel, reasonably satisfactory to the indemnified Party, to assume the defence of such action and shall have been so notified by the indemnified Party; or

(d) the indemnified Party shall have reasonably concluded and specifically notified the indemnifying Party either that there may be specific defence available to it which are different from or additional to those available to the indemnifying Party or that such claim, action, suit or proceeding involves or could have a material adverse effect upon it beyond the scope of this Agreement.

17.7 SURVIVAL ON TERMINATION

The provisions of the Article shall survive the termination/expiry of this Agreement.

For ASIA BIOENERGY (INDIA) LTD.,

R SUBRAMANI
MANAGING DIRECTOR

(Sharat Chandra Rastogi)
Secretary
U.P.State Electricity Board
Shakti Bhawan, LUCKNOW

ARTICLE - 18

NOTICES

18.1 ADDRESSES

Except as otherwise expressly provided in this Agreement, all notices or other communications which are required or permitted under this Agreement shall be in writing and shall be considered served on the other party for being taken notice of by other party, if delivered personally under acknowledgment or sent by registered or certified mails, tel-copier, fax, telex or telegram addressed to the following :

(a) If to the Company :

Attention : Director
Asia Bioenergy (India) Ltd.,
824, Poonamallee High Road
Kilpauk
Chennai - 600 010
TamilNadu
Telephone : 044- 641 1362/642 8992/642 7577
Fax : 044- 641 1788

(b) If to the Board :

Attention : Chairman
U.P. State Electricity Board
Shakti Bhawan, 14 - Ashok Marg
Lucknow (U.P.)
Telephone : 0522-280101.
Fax No. 0522-211169

(c) If to the Government :

Secretary, Urja Vibhag (Department of Energy)
Sachivalya Annexe
Govt. of Uttar Pradesh, Lucknow.

All notices or communications given by telecopier, fax, telex or telegram shall be confirmed by sending a copy of the same by post in an envelope, properly addressed to the appropriate party, for delivery by registered or certified mail.

18.2 CHANGE OF ADDRESS

Any party may, by notice of at least 15 (fifteen) days to the other Party, change the addresses and/or addresses to which such notices and communications are to be delivered or mailed.

For ASIA BIOENERGY (INDIA) LTD.,

(Sharat Chandra Rastogi)
Secretary
U.P. State Electricity Board

P. SUBRAMANI
MANAGING DIRECTOR

ARTICLE - 19

MISCELLANEOUS PROVISIONS

19.1 AMENDMENT

This Agreement cannot be amended except with the written and explicit consent of the parties to this Agreement.

19.2 HEADINGS

The Headings contained in this Agreement are used solely for convenience and shall not be used in any manner to aid in the interpretation of this Agreement.

19.3 THIRD PARTIES

This Agreement is intended solely for the benefit of the parties hereto. Nothing in this Agreement shall be construed to create any duty to or standard of care with reference to, or any liability to, any person not party to this agreement.

19.4 NO WAIVER

(a) No waiver by either Party of any default or defaults by the other Party in the performance of any of the provisions of this Agreement;

(i) shall operate or be construed as a waiver of any other or further default of defaults whether of a like or different character; or

(ii) shall be effective unless duly executed in writing by a duly authorized representative of such party;

(b) Neither the failure by either party to insist on any occasion upon the performance of the terms, conditions and provisions of this Agreement nor any time gap on this account not other indulgence granted by one Party to the other shall be deemed to act as a waiver of such breach of acceptance of any variation or the relinquishment of any such right or any other right hereunder, which shall remain in full force and effect during the term of this Agreement.

19.5 RELATIONSHIP OF THE PARTIES

This Agreement shall not be interpreted or construed or create an association, joint venture, or partnership between the parties or impose any partnership obligation or liability, upon either party. Neither party shall have any right, power or authority to enter into any Agreement or undertaking for, or act on behalf of, or to act as or be an agent or representative of, or to otherwise bind, the other party.

For ASIA BIOENERGY (INDIA) LTD.,

(Sharat Chandra Rastogi)
Secretary
U.P.State Electricity Board
Shakti Bhawan, LUCKNOW

P. SUBRAMANI
MANAGING DIRECTOR

19.6 SURVIVAL

Cancellation, expiration or earlier termination of this Agreement shall not relieve the parties of obligations that by their nature should survive such cancellation. expiration of termination, including, without limitation, warranties, remedies, promises of indemnity and confidentiality, provided, however, that all obligations surviving the cancellation, expiration or early termination of this Agreement shall only survive for a period of thirty (30) years.

19.7 LANGUAGE

The language of this Agreement being English, all documents, notices, waivers and all other communications, written or otherwise, between the parties in connection with this Agreement shall be in English.

19.8 GOVERNING LAW

This Agreement and the rights and obligations hereunder shall be interpreted construed and governed by the laws of India, as in force from time to time.

19.9 ENTIRETY

This Agreement and the schedules attached hereto are intended by the parties as the final expression of their agreement and are intended also as a complete and exclusive statement. All prior written or oral understandings, offers or other communications of every kind pertaining to the sale or purchase of energy and power to the Board or vice versa are hereby abrogated and withdrawn.

19.10 ASSIGNMENT

Save and except as provided in article 15, this Agreement shall not be assigned by either party other than by mutual agreement between the parties in writing provided however, that the Company may assign this agreement to a newly organized, affiliated Corporation or to any other affiliate controlled by the Company, in each case with the prior consent of the Board, which consent shall not be unreasonably withheld. Notwithstanding the foregoing, for the purpose of financing the Project, the Company may assign or create security over its rights and interests under or pursuant to (a) this Agreement, (b) any Agreement related to the Project, (c) the Project. (d) the movable property and intellectual property of the Company, or (e) the revenues or any of the rights or assets of the Company. The holder of any security (including Lender) created under this Article 19.10 shall not be prevented or impeded by Board from enforcing such security in accordance with its terms, including, without limitation, exercising any right it may have to re-assign this Agreement to a new qualified owner or operator of the Project. The Board shall execute all such consents to assignment and /or acknowledgments of any security created in accordance with this Article 19.10 as are reasonably requested by the Company, to give effect to the foregoing.

Notwithstanding the above, the Board shall have the right, with prior written notice to the Company, to assign this Agreement to any entity assuming all or part of the Board's rights and obligations in connection with the purchase of energy, provided, however,

For ASIA BIOENERGY (INDIA) LTD.

(Shar[illegible]chandra Rastogi)
Secretary

P. SUBRAMANI
MANAGING DIRECTOR

that such transfer does not materially and adversely affect the ability of the transferee to perform its obligations under this Agreement.

19.11 CONFIDENTIALLY

(a) Each of the parties shall hold in confidence the copyright documents and other secret technical or commercial information supplied to it by or on behalf of the other party relating to the design, construction, insurance, operation, maintenance, management and financing of the Project and shall not, save as required by law or appropriate regulatory/legislation authorities, or to the prospective lenders to or investors in the Company, or to the professional advisors of the parties hereto or of such lenders or investors, as aforesaid, publish or otherwise disclose or use the same for its own purposes otherwise than as may be required to perform its obligations under this Agreement.

(b) The provisions of paragraph (a) above shall not apply to ;

(i) any information in the public domain, otherwise than by breach of this Agreement;

(ii) information in the possession of the receiving party thereof before divulgence as aforesaid, and which was not obtained under any obligation of confidentially; and

(iii) information obtained from a third party who is free to divulge the same and which is obtained without any obligation of confidentiality.

(iv) disclosure of any information to any Government agency for obtaining, receiving, and/or maintaining any Government Authorizations.

19.12 SUCCESSORS AND ASSIGNS

This Agreement shall be binding upon and ensure the benefit of this parties hereto and their respective successors and permitted assigns.

19.13 RIGHTS OF LENDERS

(a) The company may encumber by mortgage or other proper instrument, its rights, title and interest in the project and in this Agreement in order to finance the development, construction, completion and operation of project. The execution of any such mortgage, or other instrument, or the foreclosure thereof, any sale thereunder either by judicial proceedings, or by virtue of any power reserved in such mortgage or indebtedness, or the exercising of any right, power or privilege reserved in any mortgage or other instrument shall not be held as a violation of any other terms and conditions hereof and is hereby expressly permitted by the Government/Board, or as an assumption by the holder of such indebtedness (the "Lender") personally of the obligations of this agreement (and the liability of such lender shall be limited to the interest of such lender in the project). No such encumbrance, foreclosure conveyance or exercise of right shall relieve the Company from its liability under this Agreement;

For ASIA BIOENERGY (INDIA) LTD.,

(Sharat Chandra Rastogi)
Secretary
Electricity Board

(b) if the company shall encumber its interest in all or any part of the project or the Agreement, the Company or any lender shall give notice to the Board of the existence thereof;

(c) All payments so made, by the Board to Lender shall be as effective under this Agreement as the same would have been if done and performed by the Company.

19.14 CHANGE IN LAW

(a) Definition of Law

For the purpose of this Agreement, "Law" means any Act, rule regulation, notification, directive order or instruction having the force of Law enacted or issued by any competent legislature, Government or Statutory Authority of India, Court or Tribunal.

(b) Definition of Change in Law

"Change-in-Law" means any of the following events occurring after the date of signing of Implementation MOU dated 14 th February, 1997 between the Company and Mukhya Nagar Adhikari, Lucknow Nagar Nigam as a result of, or in connection with, any action or inaction by any competent authority including any statutory authority, government, court, tribunal or legislature,:

(i) repeal, in whole or in part of an existing Law;

(ii) any enactment or making of a new Law or approval, permit, consent etc.

(iii) any amendment, alteration, modification or repeal or any existing Law by a competent court, Tribunal or legislature in India or;

(iv), any authoriative interpretation of an existing law issued by a competent Court, Tribunal, Government or Statutory Authority contrary to the existing official interpretation thereof, in each case coming into effect after the Effective Date, and directly or indirectly affecting the Parties to this Agreement in their performance of their obligation relating to the construction and cost of construction under this Agreement and provision for which has not been made elsewhere in the Agreement.

(v) cancellation or non-renewal or a change in the conditions applicable to any approval, consent, permit, clearance etc. granted in relation to the Project (other than due to a breach by the Company of such conditions);

(vi) commencement of any Law that has not yet entered into effect as of the date of this Agreement;

(vii) imposition of a requirement for any approval, permit, consent, clearance etc. not required as at the date of this Agreement;

(viii) change in the manner in which a Law is applied or interpreted by any competent body having authority for the interpretation, application or enforcement of such

FOR ASIA BIOENERGY (INDIA) LTD.

(Chandra Rastogi)

P SUBRAMANI

Law, on or after the date of the agreement dated 14 th February 1997 between the Company and Lucknow Nagar Nigam.

(ix) any other change in. or other alteration of, the application to the company in relation to the Project of rates of taxes/duties/imposts etc. or depreciation schedules.

(c) **Delays**

In the event any Change in Law coming into force prior to the Schedule Commercial Operation Date of any Unit causes any delay in Commercial Operation of the Unit, the Schedule Commercial operation date of that Unit shall be extended by a reasonable time as mutually agreed between the Board and the Company.

(d) **Additional Expenditure**

The amount of any additional expenditure incurred by the Company with regard to the Project which is reasonably necessary to comply with any Political Force Majeure coming into force prior to Unit (last) Commercial Operation date shall be added to the Capital cost subject to approval by GOUP and the Board. To the extent the amount of any such expenditure shall have been funded with equity and Debt, interest on Debt, and Debt Repayment attributable thereto and shall be reflected in the capital cost of the Project.

(e) **Change in Tariff due to Change in Law**

If there is any change in tariff as per Article 3, due to Political Force Majeure, then the same would be got approved by the Board/Government. Any additional cost resulting out of Political Force Majeure would be translated in to incremental tarrif which shall be added to the Company tarrif prevailing at that time and this changed tarrif shall be used for future energy payment. Annual escalation as provided Article -3.1 shall be applied on such tarrif for remaining term of the Agreement

19.15 ASSIGNMENT OF LENDER

The Board Acknowledges that this Agreement is an integral part of the Company's financing arrangement for the Project, and agrees to make reasonable efforts to assist with such financing, by the Company including executing a commercially reasonable consent to a assignment of this Agreement for the benefit of the Lenders supplying such financing.

19.16 NO THIRD PARTY BENEFICIARIES

This Agreement shall not confer any right of suit or action, whatsoever, on any third Party.

19.17 AFFIRMATION

The Company and the Board declare and affirm that neither Party. Nor its Directors employees, any of its agents or, in the case of the Company, its sponsors, has paid nor

FOR ASIA BIOENERGY (INDIA) LTD.

P.V.SUBRAMANI

has it undertaken to pay nor it shall in the future pay any unlawful commission, bribe, payoffs, kick-backs and that it has not in any other way or manner paid any sums, whether in Indian currency or foreign currency, in India or abroad, or in any other manner given or offered to give any gifts and presents in India or abroad to any person or Company to procure this Agreement. The Company and the Board undertake not to engage in any of the said or similar acts, during the terms of and relative to, this Agreement.

19.18 NO ADVERSE DISCRIMINATION

Board shall not practice any adverse discrimination against the Company in the exercise of its discretion or authority under this Agreement with respect to dispatching of the energy generated by the Project and approval of Scheduled Outages and a Forced Outages. The Company shall not unfairly discriminate against the Board under this Agreement with respect to its obligations hereunder:

19.19 WAIVER OF IMMUNITY

The Board hereby irrevocably agrees that it hereby expressly and irrevocably waives immunity including without limitation, immunity from (i) service of process, (ii) jurisdiction or judgement of any court of tribunal, (iii) execution of a judgement, and (iv) attachment of any of Board's property prior to any entry of judgement or from attachment of its property in aid of execution upon a judgement against the company or its successors, assigns, contractors, agents, representatives and employees, or the Lenders, and from set-off from any legal proceedings, to enforce or collect upon any liability or obligation of the Board related to or arising from the transactions contemplated by this Agreement.

For ASIA BIOENERGY (INDIA) LTD.,

(Sharat Chandra Rastogi)
Secretary
U P State Electricity Board
Shakti Bhawan, LUCKNOW

P. SUBRAMANI
MANAGING DIRECTOR

DPR Worksheet Elements

- GHG Mitigation potential of the technology/equipment
- Status of identification and negotiations with venture funds and GHG mitigation funding agencies
- Details of project agreements and contracts and their terms
- Description and quantification of risks and measures for mitigation or coverage

The Louis Berger Group, Inc.The Louis Berger Group, Inc. 11

DPR Worksheet Elements

- GHG Mitigation Application Macro Checklist Real, measurable emission reductions, sustainable development potential
- Emission reduction calculation check list
- Details of carbon accounting- Baseline, Project boundary identification and justification

The Louis Berger Group, Inc.The Louis Berger Group, Inc. 12

DPR Worksheet Utility

- It compiles the main DPR information in a concise form
- It is prepared after the first level of due diligence on promoters, technology, market for product and service, GHG estimation and after consultations with project developer and possibly with concerned Govt. agencies
- If prepared by an independent agency like Climate Change Center, it will lend more credibility to the project
- It could help the promoter to obtain GOI approval and funding

The Louis Berger Group, Inc.The Louis Berger Group, Inc. 13

Thank You!

Detailed Project Report (DPR) Worksheet

For GHG mitigating projects under
USAID's Greenhouse Gas Pollution Prevention Project – Climate Change Supplement

Managed by The Louis Berger Group, Inc.

I.
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Instructions:

This form is for the purpose of gathering relevant project and equipment finance information for projects developed under USAID India's Greenhouse Gas Pollution Prevention Project – Climate Change Supplement (GEP-CCS). It is designed for project developers and financial institutions involved with clean energy or other types of GHG mitigating projects that are placed into the GEP-CCS pipeline.

Format: The form is designed to capture two distinct types of projects: Section A) Basic Equipment Finance, and Section B) Project Finance.

Basic Equipment Finance is defined as the purchase of equipment, using external debt financing, in which corporate balance sheet financing is used to pay back the loan. An example of this might be where an Indian firm installs a bank of solar panels on the factory roof for captive energy. Since this would not involve a direct external revenue stream, it would need to be financed through balance sheet payments. Information requirements for simple equipment purchases are focused almost solely on the existing financial credit-worthiness of the buyer.

Project Finance, by contrast, is focused on anticipated revenue streams from the project activity (or off-balance sheet financing). For example, a grid-based biomass co-generation facility would likely depend upon energy payments from a local electricity board. Much more detailed information about the project, project promoter, power purchase agreement, debt and equity sponsors and profitability and cash flow analyses are necessary to determine the relative risk and financial viability of the project.

As both types of projects are eligible for support under the GEP-CCS, this form addresses each type of financing. For simple Equipment Finance, complete Section A only. For Project Finance, complete Section B to describe the entire project, and also complete a Section A form for each major piece of project equipment that is imported from US suppliers. This is a working electronic document/check-list. When each question is answered, place an electronic checkmark (√) in the left-hand box as a reference point for completion of the form.

1. Contact Information for the Prospective Borrower

	Name of Company	
	Address	
	City, State, Province	
	Contact Name	
	Contact Phone	
	Contact FAX	
	Contact EMAIL	

2. Availability of Financial Information on Borrower

	Audited financial statements available for last 3 fiscal years?		
	Audited financials being provided to LBG Washington?		
	Was firm in same general line of business for last 3 years?		
	Has firm reported operating profits AND net income during each of last 2 years?		

3. Borrower's Financial History (last three Fiscal Years)

	EBIDT			
	EBIDT/Total Income			
	Operating Profit (OP)			
	OP/TI			
	Net worth			
	Equity			
	EPS			
	Dividend			
	Major Capital Investments			
	Debt:Equity ratio			
	Fixed Asset Coverage Ratio			
	Current Ratio			
	Credit Rating by Lead FI/Bank			
	Depreciation/Amortization Expense			

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	Interest Expense			
	Current maturity of LTD			

4. Background information on all used and unused short and long-term debt

SECTION A: CLEAN ENERGY AND GHG MITIGATION EQUIPMENT FINANCE

About the Equipment/Technology: Larger clean energy or GHG mitigating projects (Project Finance) may involve more than one type of environmental equipment. Complete sections A 5 through A 10 for each piece of relevant GHG mitigating equipment.

5. **Description of technology/service to be purchased**

6. **Description of the GHG mitigating potential of the technology**

7. About the Business Negotiations

	Is the manufacturer of the technology a domestic company?		
	Is the manufacturer located overseas (exporter)?		
	Is the manufacturer a US company?		
	Have any price negotiations occurred?		
	Has a purchase order been submitted?		

How many units are in the Purchase Order? _____

What is the estimated unit cost of technology (US$)? _____

What is the total cost for the Purchase Order? _____

8. Contact Information on the Manufacturer

√	Name of Manufacturer	
	Address	
	City, State, Province	
	Contact Name	
	Contact Phone	
	Contact FAX	
	Contact EMAIL	

9. About the Trade Financing (For Equipment Imported Into India)

Is trade financing being sought for the import of the equipment to India? _____

What type of trade financing is being sought (insurance,guarantees, working capital?

_____

_____

10. Has a domestic or overseas lender been identified? _____

	Name of Lender	
	Address	
	City, State, Province	
	Contact Name	
	Contact Phone	
	Contact FAX	
	Contact EMAIL	

SECTION B: PROJECT FINANCE FOR CLEAN ENERGY AND GHG MITIGATION

Project Name:

Project Promoter:

Special Purpose Vehicle:

1. **Executive Summary: Project at a Glance**

2. **Project Costs**

√				
	Plant & Machinery			
	Land & Building			
	Civil, detailed Eng.			
	Erection & Commissioning			
	Preliminary & Preoperative Expenses			
	Working Capital Margin			
	Contingencies			
	Total Project Cost			

3. **Proposed Means of Financing**

√				
	Total Debt Portion			
	Total Equity Portion			
	Total Project Cost			

4. **Committed Financing (if any)**

a. **Committed Debt Providers**

Fin				

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b. Committed Equity Providers

Investment Institution	Stake [illegible] US$ [illegible]	Stake (as % of [illegible] equity)

5. Estimates of Profitability

	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7	Yr8	Yr9	Yr10
Revenue from power sale										
Other revenue										
Fuel cost										
O&M Cost										
Admn/selling cost										
PBIDT										
Depreciation										
Interest Term loan										
Working cap										
PBT										
Provision for Tax										
PAT										
Net Cash Flow										

6. Projected Cash Flow

	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7	Yr8	Yr9	Yr10
Sources of Funds										
PAT										
Depreciation										
Inc. in Equity capital										
Inc. in term loans										
Inc. in bank borrowings										
Total sources										
Application of funds										
Capital Expenditure										
Inc. in Current Assets										
Term loan repayment										
Taxes										
Dividend										
Total Application										
Net Surplus										
IRR										
DSCR										
Av DSCR										

7. **Status of Finance Negotiations**

Are you in negotiations with any prospective debt providers? If yes, please specify and elaborate on expected time frame. _____

Do you plan to submit this project to a private venture capital firm or an international equity organization (e.g. REEF)? If yes identify specific fund and elaborate on negotiations.

Do you plan to submit this project to an international tender for carbon emissions reductions (e.g. Oregon Climate Trust)? If yes, please specify tender and closing date for submission. _____

8. Project Promoter Contact Information

√		
	Name of Project Promoter	
	Address	
	City, State, Province	
	Contact Name	
	Contact Phone	
	Contact FAX	
	Contact EMAIL	

9. Project Management Team

√	Name	Title

10. Project Promoter Financial History

√		
	What were profitability figures last 3 years?	
	Book value of firm?	
	EPS reserves and surplus last 3 years?	
	What is current business?	
	What are synergies between business and this project?	

11. Project Promoter Relevant Experience:
Briefly describe the relevant experience, if any, possessed by the project promoter. Has the promoter developed similar projects?

12. Special Purpose Vehicle Contact Information (If applicable):

Name of SPV	
Address	
City, State, Province	
Contact Name	
Contact Phone	
Contact FAX	
Contact EMAIL	
Names and shares of the promoters	
Is a Shareholding agreement in place	
Salient terms	

13. Project Details

	Greenfield project or involves existing equipment?	
	Is GHG mitigation achieved by Process Improvement or Clean Energy Generation?	
	Size of Project (MW)?	
	Project Location? City, Province	
	Off or on-grid?	
	State Electricity Board?	
	Technology?	
	Type of Fuel?	
	Source of fuel supply?	

14. Feasibility Details

	Was Feasibility Study prepared independently?	
	What firm prepared the Feasibility Study? List address and contact details	

15. Background on the Power Purchase Agreement (If Applicable)

√	[illegible]	[illegible]
	Does Project involve PPA (Yes or No) If no, skip to next heading.	
	Has a PPA been signed? (Yes or No)	
	Nature of Agreement? Take or Pay? Other?	
	Name of state electricity board or primary PPA signatory?	
	What date was the PPA signed?	
	When does it enter into force?	
	What is the length of the PPA? (Years)	
	What is the initial purchase price?	
	What is the annual % increase in purchase price?	
	Can the project sell power directly to major consumers? (Yes or No)	
	What are the securities provided for the revenues? Have the domestic lenders approved these mechanisms? Are there any special clauses, or provisions of relevance to the investors?	
	What are the terms of Payment to the project developers? Any special clauses of relevance to the investors/lenders? Have the domestic lenders approved the payment terms?	
	What are the major provisions (event definitions, treatment of the off time, etc.) of the Force Majeure clauses?	
	What is the method of fixation of tariff (two part, availability etc.)? Are there any provisions for deemed generating/penalties? What is the treatment for infirm power?	
	Have the provisions for change in law, termination, liquidated damages , etc. been approved by existing lenders/investors?	
	Would the SEB/generating utility want a share in the ownership of carbon offsets?	

16. Other Agreements (where applicable)

√		
	Fuel supply agreement signed?	
	Water/utility supply agreement signed?	
	Shareholder's agreement been entered into between existing equity holders?	
	Special provisions of above agreements?	

17. Quantify and Describe Risks

	Risks	Low to High	Describe
	Market?		
	Counry/Sovereign?		
	Regulatory?		
	Contract/counter party		
	Construction?		
	Technology?		
	Management?		
	Enforceability of Contracts?		
	Competition?		
	Exit?		

18. For risks identified in section 14, discuss Mitigation/Coverage measures

	Risks	Describe Mitigation/Coverage
	Market?	
	Country/Sovereign?	
	Regulatory?	
	Contract/counter party	
	Construction?	
	Technology?	
	Management?	
	Enforceability of Contracts?	
	Competition?	
	Exit?	

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SECTION C: CARBON COMPONENT.

Checklists were adapted from a variety of sources including Natsource, LLC (www.natsource.com):

1. GHG Mitigation Applicability Macro Checklist (all answers should be YES)

√		Yes	No
	Does project generate real, measurable, long-term, additional and verifiable emissions reductions vis-à-vis current baseline alternatives?		
	Are there sustainable development benefits such as increased employment and protecting biodiversity?		
	Does the project rely on ODA from Annex B Countries?		
	Has the project received host country approval?		
	Does project meet size definition for Bonn Fast Track CDM? --under 15 MW for renewables projects --under <15 gigawatthours/year savings for energy efficiency projects --under15 kilotonnes CO2E for emissions reductions from process changes		

2. Emission Reduction Calculations, Monitoring and Verification Checklist

√		Yes	No
	Does the project involve a discrete reduction of emissions?		
	Have the emissions reductions been estimated with an accepted methodology?		
	Has a monitoring methodology been established?		
	Has a third party verifier been contracted to verify actual emissions reductions and sustainable development gains?		
	Has clear ownership of emissions reductions been determined and documented?		

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Environment & Social Monitoring

- ☑ Periodic information disclosure by project
- ☑ Site visit (if required)
- ☑ Tracking regulatory environment
- ☑ Update risk profile
- ☑ Audits
- ☑ Consultations

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E&SA Instruments

- ☑ Environmental Impact Assessment
- ☑ Environmental Audit
- ☑ Environmental Action Plan
- ☑ Risk Assessment
- ☑ Social Impact Assessment
- ☑ Resettlement Action Plan

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Environmental Impact Assessment

- To identify and assess the potential environmental impacts
- Evaluate alternatives
- Design appropriate mitigation, management and monitoring measures

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Environmental Audit

- Focuses on an existing installation, facility, or activity
- Involves a systematic, periodic evaluation of environmental management
- Review the performance of an organization, management and equipment with the aim of safeguarding the environment

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Environmental Action Plan

- ☑ Identifies and justifies appropriate measures
- ☑ Estimates costs
- ☑ Recommends a schedule of implementation
- ☑ Actions needed to implement identified measures

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Risk (Hazard) Assessment

- ☑ An instrument for identifying, analyzing and controlling risks associated with presence of dangerous materials and conditions at an installation

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Resettlement Action Plan

- Identifies measures required to address R&R issues
- Should cover income restoration plan
- Recommend costs
- Suggests implementation schedule
- Provides for monitoring & evaluation

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Benefits of EA

- Environmentally sustainable design and development
- Better compliance with standards
- Reduced time and costs for approvals
- Savings in capital and operating costs
- Reduced remedial costs and future liabilities
- Increased project acceptance

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Overview

- ☑ Environmental Risks are long tail risks that can seriously affect project viability
- ☑ Pose significant potential risks to financier especially in a rapidly changing domestic and global environment
- ☑ Need to understand and address these risks
- ☑ Complexity of issues to be recognized
- ☑ Environmental risks will be a significant factor in future business viability

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Detailed Project Report (DPR) Worksheet

For GHG mitigating projects under
USAID's Greenhouse Gas Pollution Prevention Project – Climate Change Supplement

Managed by The Louis Berger Group, Inc.

Bioenergy (India) Ltd.
(Project Finance)

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1. Contact Information for the Prospective Borrower

	Name of Company	Bioenergy (India) Ltd.
	Address	A-24 Poonamallee High Road, Kilpauk
	City, State, Province	Chennai, Tamil Nadu
	Contact Name	
	Contact Phone	
	Contact FAX	
	Contact EMAIL	

2. Availability of Financial Information on Borrower

	Audited financial statements available for last 3 fiscal years?	√	
	Was firm in same general line of business for last 3 years?	√	
	Has firm reported operating profits AND net income during each of last 2 years?	√	

3. Borrower's Financial History (last three Fiscal Years)

	EBIDT			
	EBIDT/Total Income			
	Operating Profit (OP)			
	OP/TI			
	Net worth			
	Equity			
	EPS			
	Dividend			
	Major Capital Investments			
	Debt:Equity ratio			
	Fixed Asset Coverage Ratio			
	Current Ratio			
	Credit Rating by Lead FI/Bank			
	Depreciation/Amortization Expense			

	Interest Expense			
	Current maturity of LTD			

4. Background information on all used and unused short and long-term debt

SECTION A: CLEAN ENERGY AND GHG MITIGATION EQUIPMENT FINANCE

About the Equipment/Technology: Larger clean energy or GHG mitigating projects (Project Finance) may involve more than one type of environmental equipment. Complete sections A 5 through A 10 for each piece of relevant GHG mitigating equipment.

5. **Description of technology/service to be purchased**

Not Applicable

6. **Description of the GHG mitigating potential of the technology**

Not Applicable

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7. **About the Business Negotiations**

√			
	Is the manufacturer of the technology a domestic company?		
	Is the manufacturer located overseas (exporter)?		
	Is the manufacturer a US company?		
	Have any price negotiations occurred?		
	Has a purchase order been submitted?		

How many units are in the Purchase Order? _____
What is the estimated unit cost of technology (US$)? _____
What is the total cost for the Purchase Order? _____

8. **Contact Information on the Manufacturer**

√		
√	Name of Manufacturer	
	Address	
	City, State, Province	
	Contact Name	
	Contact Phone	
	Contact FAX	
	Contact EMAIL	

9. **About the Trade Financing (For Equipment Imported Into India)**

Is trade financing being sought for the import of the equipment to India? _____

What type of trade financing is being sought (insurance,guarantees, working capital?

_____

_____

10. **Has a domestic or overseas lender been identified?**
Yes. _____

√		
	Name of Lender	Infrastructure Development Finance Company Ltd
	Address	ITC Center, 3rd Floor, 760 Anna Salai
	City, State, Province	Chennai, 600 002 Tamil Nadu India
	Contact Name	M Kumar
	Contact Phone	+91 44 855 9440/48/56
	Contact FAX	+91 44 854 7597
	Contact EMAIL	

SECTION B: PROJECT FINANCE FOR CLEAN ENERGY AND GHG MITIGATION

Project Name: Power generation & organic fertilizer production from Lalpur MSW

Project Promoter: Bioenergy (India) Ltd. (BIL)

Special Purpose Vehicle: Yes

1. Executive Summary: Project at a Glance

BIL, a special purpose vehicle company set up by Enviro Engineers India Ltd., proposes to set up a 5 MW power generation plant using biogas generated by biomethanation of Municipal Solid Waste (MSW) supplied by the Lalpur Nagar Nigam (Lalpur Municipal Corporation). The plant leads to capturing methane that would otherwise have been emitted had the MSW been dumped on open dumpsites as is practiced in all the Indian cities. The project shall serve as a demonstration project to illustrate the use of advanced anaerobic digestion technology to enhance the biodegradation process. The gas after cleaning shall be fired in a gas engine to generate power for export to the UP Power Corporation's grid. The process would also result in production of nutrient rich organic manure, which can substitute chemical fertilizers for horticulture, fruits, plantations and gardens. The project awarded to BIL under a competitive bidding process, costs about Rs. 740 million. BIL is a Special Purpose Vehicle company promoted by Enviro Engineers India Ltd. M/s ENERTECH GmbH, Austria, is providing the anaerobic digestion technology. The project is being implemented through EPC contract to several reputed international and Indian companies.

BIL approached IDFC for loan for the project. IDFC has a mission of encouraging environmentally safer technologies for the projects funded by them. IDFC and The Louis Berger Group, Inc. the contractor for USAID/India GEP-CCS project identified this project as a possible opportunity to demonstrate the identification of GHG emission reduction and its possible use. The project demonstrates environmental and social sustainability as it leads to reduction of a major health and methane (a major GHG) emission hazard. It leads to employment opportunities to the local population. It also helps the local rag pickers (scavengers of valued items like paper, plastics and rags) to collect these items in a safe way that helps in recycling of these items.

The project has three major streams of GHG mitigation (i) Methane captured from the MSW; (ii) reduction in the emission of carbon dioxide from the coal fired power stations in Northern India; and (iii) Partial replacement of use of chemical fertilizers like urea, DAP which are manufactured in GHG intensive processes. The current way of disposal of MSW in India is predominantly dumping in the open.

This leads to methane emissions through the degradation of volatile organics and also to pollution of the ground water by the leachate generated on the dumpsites. The power supply in India in general and in the northern region in particular is dominated by thermal sources mainly coal fired power stations. The output of the project would replace this carbon intensive power source thereby lead to reduction in carbon dioxide emission. Similarly, the organic manure will replace the chemical fertilizers thereby reduce the CO2 that would have been generated in the manufacture.

BIL shall set up measurement and verification systems to monitor and control the GHG reductions. The project risks have been identified and mechanisms to mitigate/cover them have been set in. Major project agreements like power purchase agreement, waste supply agreement etc. have been signed and approved by the funding agencies. Thus, overall the project offers an attractive opportunity for investment by investors especially the carbon investors.

2. Project Costs

		Rs. Million	US$	
	Plant & Machinery	188.75	6,000,000	61.75
	Land & Building			
	Civil, detailed Eng.	211.53	190,000	29.73
	Erection & Commissioning			
	Preliminary & Preoperative Expenses	63.00		8.52
	Working Capital Margin			
	Contingencies			
	Total Project Cost	463.28	6,190,000*	100

*** Equivalent to Rs. 276.32 million @ Rs. 44.66 per US $. Total cost Rs. 739.60 million**

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3. **Proposed Means of Financing**

	Total Debt Portion	265.00	35.83
	Total Equity Portion#	350.00	47.32
	Total Deferred Credit	114.60	15.50
	Total lease	10.00	1.35
	Total	739.60	100.00

Including MNES subsidy of Rs. 150 Million

4. **Committed Financing**

a. **Committed Debt Providers**

Financial Inst.	**Rs. Million**			
IDFC	**200.00**	**15.5%**	**10 years, 2 yrs moratorium**	**Under negotiations**
LIC	**65.00**	**15.5%**		
DC-Enviro	**20.00**	**15%**	**Repayable in 3 years from completion**	
DC-JEL	**66.60**	**15%**		
DC-ENTEC	**28.00**	**15%**		

b. **Committed Equity Providers**

Enviro	50.00	25
JEL	30.00	15
ENTEC	27.00	13.5
IDFC	25.00	12.5
Investment Funds	68.00	34
Total	200.00	100

5. Estimates of Profitability

(Rs. Million)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Revenue from power sale	119.16	130.81	137.35	144.22	151.43	159.00	166.95	175.30	184.06	193.26
Other revenue*	51.12	53.68	56.36	59.18	62.14	65.24	68.51	71.93	75.53	79.30
Total Revenue	170.28	184.48	193.71	203.39	213.56	224.24	235.45	247.23	259.59	272.57
Fuel cost										
O&M Cost	9.75	10.05	30.16	11.47	36.7	12.9	12.85	9.68	36.7	13.5
Admn/selling cost										
PBIDT	136.53	148.75	136.07	162.52	145.40	177.68	186.59	199.01	181.65	214.94
Depreciation	32.69	32.69	32.69	32.69	32.69	32.69	32.69	32.69	32.69	32.69
Interest Term loan Working cap	59.77	54.46	43.43	32.40	21.37	16.06	10.76	5.46		
PBT	44.08	61.60	59.95	97.44	91.35	128.93	143.14	160.86	148.96	182.25
Provision for Tax	3.31	4.62	4.50	7.31	6.85	9.67	10.74	12.06	11.17	13.67
PAT	40.77	56.98	55.45	90.13	84.50	119.26	132.40	148.80	137.79	168.58
Net Cash Flow	73.46	89.67	88.14	122.82	117.19	151.95	165.09	181.49	170.48	201.27

* Manure price assumed at Rs. 2,200 per ton without escalation each year as against Promoters assumption of Rs. 2,900 per ton with 5% annual escalation

6. Projected Cash Flow

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Sources of Funds															
Inc. in Equity capital	200														
Inc. in term loans	265														
Inc. in Suppliers credit	124.6														
Subsidy	150														
Net Cash Flows		0.00	73.46	89.67	88.14	122.82	117.19	151.95	165.09	181.49	170.48	201.27	211.10	205.63	232.06
Total sources	739.60	0.00	73.46	89.67	88.14	122.82	117.19	151.95	165.09	181.49	170.48	201.27	211.10	205.63	232.06
Application of funds															
Capital Expenditure	739.6														
loan repayment		0	94.02	126.91	115.88	104.85	55.62	50.31	45.01	40.71	0	0			
Total Application	739.6	0	94.02	126.91	115.88	104.85	55.62	50.31	45.01	40.71	0	0			
Net Surplus	0.00	0.00	(20.55)	(37.24)	(27.74)	17.97	61.57	101.64	120.08	140.78	170.48	201.27	211.10	205.63	232.06
IRR*	23%														
DSCR			2.7203	1.6829	1.6461	2.1126	4.4062	5.3842	5.6541	5.8532					
Av DSCR	3.6825														

* IRR with carbon revenue (at $ 3 per tCO2) 27%

7. **Status of Finance Negotiations**

Are you in negotiations with any prospective debt providers? If yes, please specify and elaborate on expected time frame. Yes. The company is negotiating a loan from IDFC and LIC for a part of the project cost. IDFC is in an advanced stage of appraisal and is likely to approve the project soon. The current thrust is on validating the contracts for sale of organic manure. PPA has been signed with UPSEB as also the contract with Lalpur MC has been signed.

Do you plan to submit this project to a private venture capital firm or an international equity organization (e.g. REEF)? If yes identify specific fund and elaborate on negotiations. No. This has not been planned.

Do you plan to submit this project to an international tender for carbon emissions reductions (e.g. Oregon Climate Trust)? If yes, please specify tender and closing date for submission. Promoters are interested in availing finance/investments in lieu of the carbon offsets from the project. IDFC, the main lender has also evinced interest in structuring this project with carbon offset. It is in contact with PCF and may like to prepare the project for their consideration at an appropriate stage. IDFC in consultation with BIL has approached LBG for technical assistance on estimating GHG reduction Potential.

8. **Project Promoter Contact Information**

√		
√	Name of Project Promoter	Enviro Engineers Pvt. Ltd.
√	Address	A-24 Poonamallee High Road, Kilpauk
√	City, State, Province	Chennai, Tamil Nadu India
√	Contact Name	Mr. S. Rangarajan , Director
√	Contact Phone	
√	Contact FAX	
√	Contact EMAIL	

9. Project Management Team

		Title
√	Mr. Rangarajan	Director, BIL
√	Mr. Kumaran	Project Engineer
√	Mr. Mahesh Kumar	Electrical Engineer
√	Dr. C. A. Thomas	Advisor – Microbiology
√	Dr. P. Suresh	Advisor – Organic Fertilizer
√	Mr. N. Ramachandran	Advisor – Digestor Technology

10. Project Promoter Financial History

√	What were profitability figures last 3 years?	Rs. 180 Mn (2000-01), Rs. 70 Mn (1999-00), Rs. 21 Mn (1998-99)
	Book value of firm?	
	EPS reserves and surplus last 3 years?	
	What is current business?	Consultancy and Turnkey contracts in the area of sewage and effluent treatment plants. They have so far executed more than 200 industrial effluent treatment plants in India for a variety of industrial effluents like municipal sewage, tannery CETPs, sugar mills, distillery spent wash, textile, coffee, pharma, food industries waste, chemical/petrochemical, tyre, solvent extraction and mechanical engg industries. Enviro has also established municipal water supply plants, pumping stations etc.
	What are synergies between business and this project?	The project is a diversification of their services in the area of solid waste treatment. The technology tie-up with a recognized supplier would be enhancing their capability. Enviro is also executing several orders for biogas plants from effluents from tanneries, poultries etc. This project has good synergies with their overall business plan.

11. Project Promoter Relevant Experience:

Briefly describe the relevant experience, if any, possessed by the project promoter. Has the promoter developed similar projects?

Enviro Engineers Pvt. Ltd.- The company has executed over 200 plants all over India with capacities ranging from 100 to 40, 000 m3/day for a value of US $ 7 – 8 million in the last 5 years.

ENERTECH GmBH, Austria, the technology provider is promoted by Rund Stahl Bau GmbH Austria a manufacturer of chemical reactors. ENERTECH has developed the anaerobic digestion systems for solid and liquid waste capable of handling up to 12% solid content. They have established over 50 plants world over for a variety of substrates.

Innovative Umwelttechnik GesmBH (IUT) have vast experience in design of MSW treatment projects. The major area of their focus is MSW segregation plants. They have designed plants with handling capacity of 300,000 tons/year, which is similar to the proposed plant.

JEL, Singapore shall be the supplier of the entire power plant including the gas engine and waste heat based power plant. JEL has a wide experience in manufacture, erection and operation of these systems and have executed many such projects world over.

CGEA – Onyx France a subsidiary of Vivendi would be the O&M contractor. CGEA's turnover in the waste management business is over US $ 3.6 Bn. They are operating over 50 solid waste management projects of various types world over.

12. Special Purpose Vehicle Contact Information:

√		
	Name of SPV	Bioenergy (India) Ltd.
	Address	824 Poonamallee High Road, Kilpauk
	City, State, Province	Chennai, Tamil Nadu
	Contact Name	Mr. Ragurajan, Director
	Contact Phone	+91 44 641 6428
	Contact FAX	+91 44 641 1250
	Contact EMAIL	enviro@md3.vsnl.net.in
	Names and shares of the promoters	Enviro Engineers Pvt. Ltd.
	Is a Shareholding agreement in place	Under negotiations
	Salient terms	NA

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13. Project Details

	Greenfield project or involves existing equipment?	Greenfield
	Is GHG mitigation achieved by Process Improvement or Clean Energy Generation?	Clean energy generation
	Size of Project (MW)?	5.1 MW
	Project Location? City, Province	Lalpur, Uttar Pradesh, India
	Off or on-grid?	On grid
	State Electricity Board?	UP Power Corporation Ltd.
	Technology?	Biomethanization followed by gas engine and waste heat recovery
	Type of Fuel?	MSW derived methane rich biogas
	Source of fuel supply?	City garbage supplied by Lalpur Municipal Corporation

14. Feasibility Details

	Was Feasibility Study prepared independently?	No. But independent analysis carried out.
	What firm prepared the Feasibility Study? List address and contact details	Independent economic analysis prepared by Madras School of Economics.

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15. Background on the Power Purchase Agreement

√		
	Does Project involve PPA (Yes or No) If no, skip to next heading.	Yes
	Has a PPA been signed? (Yes or No)	Yes
	Nature of Agreement? Take or Pay? Other?	Take or pay
	Name of state electricity board or primary PPA signatory?	UP Power Corporation Ltd.
	What date was the PPA signed?	
	When does it enter into force?	After satisfaction of the Conditions Precedents.
	What is the length of the PPA? (Years)	15 years
	What is the initial purchase price?	Rs. 3.16 in 2002
	What is the annual % increase in purchase price?	5%
	Can the project sell power directly to major consumers? (Yes or No)	No
	What are the securities provided for the revenues? Have the domestic lenders approved these mechanisms? Are there any special clauses, or provisions of relevance to the investors?	Letter of Credit followed by Escrow and then State Govt. Guarantee
	What are the terms of Payment to the project developers? Any special clauses of relevance to the investors/lenders? Have the domestic lenders approved the payment terms?	Payment to be made on the –th day from raising the bill, failing which the LC would be revoked. Incentives @ % for payments in days. IDFC has approved the PPA.
	What are the major provisions (event definitions, treatment of the off time, etc.) of the Force Majeure clauses?	FM clauses are fair to the promoters.
	What is the method of fixation of tariff (two-part, availability etc.)? Are there any provisions for deemed generating/penalties? What is the treatment for infirm power?	Availability based.
	Have the provisions for change in law, termination, liquidated damages, etc. been approved by existing lenders/investors?	Yes
	Would the SEB/generating utility want a share in the ownership of carbon offsets?	Not clear yet. TBD

16. Other Agreements

	Fuel supply agreement signed?	Garbage supply with LMC
	Organic Manure Purchase	Letter from the tea estate received. To be converted into an agreement in due course.
	Water/utility supply agreement signed?	Land lease agreement
	Shareholder's agreement been entered into between existing equity holders?	Being formulated.
	Special provisions of above agreements?	NA

17. Quantify and Describe Risks

Risks	Low to High	Description
Market?	Low	The commodities produced by the project power and organic manure are in deficit. Therefore, market risks are low except for the sale of manure, because it is not widely promoted to the farmers yet.
Country/Sovereign?	Low	India has stable legal system and has by and large following the legal process. Contracts have been honored and businesses of the multinationals have flourished. Thus, the sovereign risk is minimal.
Regulatory?	Low	The UP state has a functional electricity regulatory commission. The PPA has a legal validity. Also, the proposed project activity has overall support of the local/state/central govt. support
Contract/counter party	Low	The PPA and the waste supply agreements have been entered into. These agreements are sound and fair. The other contractual structure is also established and is robust. Although, UPPCL is not in good financial health, this project has a special status and is also small in size. As such, no contract related problems are expected.
Construction?	Low	The promoters have gathered strong EPC and other contractors. They have earlier experience in setting up such projects. The materials to be used are standard. Thus, construction is not likely to pose major challenges.
Technology?	Medium	The technology providers have set up similar facilities elsewhere in the world. The promoters have experience in working with other effluent treatment projects in India. Combined, their strengths are sufficient to address any technology related issues.
Management?	Low	The promoters have a very lean and efficient management, which is evident from a large number of projects they have implemented in a short span of time. In addition, they can draw any necessary resource from India or Austria

			resource from India or Austria.
	Competition?	Low	MSW treatment is a nascent activity in India and competition in the field of MSW methanation project is very low. Also the overall size of the MSW treatment market is quite large [with over 300 Class I cities generating over 39 million tons of MSW daily]
	Exit?	Low	GOI is currently in the process of easing the companies act to allow easier closure of firms. The investment rules have already been relaxed. The Indian financial market is mature and transactions such as leveraged buyouts, creeping acquisitions etc. are common. Therefore, Exit from the companies in general and better performing ones in particular is not difficult and risky.

18. Mitigation/Coverage measures

	Risks	Describe Mitigation/Coverage
	Market?	Promoters have received letter from a tea garden for purchasing the entire production of the manure. This is proposed to be converted into a proper agreement for sale once the financial closure takes place.
	Country/Sovereign?	The PPA has been securitized with additional payment mechanisms namely, Escrow and State Government Guarantee. It also stipulates arbitration as per accepted international norms.
	Regulatory?	No major risk.
	Contract/counter party	PPA has been signed and validated by the UPERC.
	Construction?	No major risk.

	Technology?	Performance guarantees have been stipulated.
	Management?	No major risk.
	Enforceability of Contracts?	No major risk.
	Competition?	No major risk.
	Exit?	No major risk.

SECTION C: CARBON COMPONENT.

Checklists were adapted from a variety of sources including Natsource, LLC

1. GHG Mitigation Applicability Macro Checklist

√		Yes	No
	Does project generate real, measurable, long-term, additional and verifiable emissions reductions vis-à-vis current baseline alternatives?	√	
	Are there sustainable development benefits such as increased employment and protecting biodiversity?	√	
	Does the project rely on ODA from Annex B Countries?		√
	Has the project received host country approval?		√
	Does project meet size definition for Bonn Fast Track CDM? –under 15 MW for renewables projects –under <15 gigawatthours/year savings for energy efficiency projects –under15 kilotonnes CO2E for emissions reductions from process changes	√	

^ The project has been accorded by MNES as a National Demo project on biometahnization of MSW. So, approval from host country may not be difficult.

2. Emission Reduction Calculations, Monitoring and Verification Checklist

√		Yes	No
	Does the project involve a discrete reduction of emissions?	√	
	Have the emissions reductions been estimated with an accepted methodology?	√	
	Has a monitoring methodology been established?	√	
	Has a third party verifier been contracted to verify actual emissions reductions and sustainable development gains?		√
	Has clear ownership of emissions reductions been determined and documented?	√	

3. **Carbon accounting details**

	Parameter	Particulars
1	Baseline methodology* (Refer to the note on GHG analysis)	For methane abatement open dumping as practiced today For Power supply to grid Power mix in the Northern region and For fertilizer supplement- Emission from manufacture of urea/ammonia
2	Baseline Emissions TCO2	192,000 t CO2 per annum
3	Project Emissions TCO2	Nil
4	Emission reductions TCO2 (2-3)	192,000 t CO2 per annum

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GHG Analysis of a Case Project

Power & Manure from Biomethanation of MSW

Climate Change Centers' Project Development Training Program

February 25-26, 2002

Vinay Deodhar

The Louis Berger Group, Inc.

Needs Prior to GHG Analysis

Traditional Analysis

- Promoters' capabilities and credit worthiness and resources
- Market analysis- Demand supply gaps, Sustainability of the project activity
- Mode of project promotion-project finance on a BOOM basis received through ICB
- Conventional Revenue streams- Power Tariff and manure sale
- Profitability indicators- IRR, DSCR, NPV
- Contracts- terms and other elements
- Risk Analysis

GHG Analysis is closely linked to the conventional project analysis

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Steps in Project Analysis

1. Review the Check-list to see if carbon finance is right for the project
2. Review the project to insure that: a) it can be realistically implemented, b) reduces GHG emissions, and c) can assist India in achieving sustainable development
3. Choose a business model: the traditional corporation vs. the special purpose vehicle
4. Valuing of the project
5. Complete a basic projected Income Statement for the project
6. Estimate the discount or hurdle rate
7. Calculate the Net Present Value
8. Calculate the Levelized Cost of the Project

Reference Carbon Finance Tool The Louis Berger Group, Inc. The Louis Berger Group, Inc. 3

Steps in Project Analysis

9. Identify Project Risk Factors
10. Distinguish between qualitative and quantitative risk
11. Develop a Risk Matrix
12. Decide the appropriate level of Debt the project
13. Decide the company's investment hurdle rate (or Cost of Capital)
14. Recalculate the project's net present value (NPV)
15. Decide the appropriate level of Debt for the project
16. Decide the best risk mitigation procedures for the project

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Steps in Project Analysis

17. Put in place the appropriate contract(s)
18. Decide what type of 'back-up' the project needs to cover non-project based Risk (Risk Insurance, Guarantee, Leases, etc...)
19. Calculate the Price per metric ton of carbon
20. Calculate the total revenue from potential carbon sales
21. Incorporate carbon revenues into the cash flow analysis
22. Decide on the right model to sell the Reductions
23. Sell the Reductions

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GHG Mitigation Checklist

- **Project leads to reduction of methane from biodegradation of ~ 300 TPD municipal solid waste, which otherwise would have been emitted from dumpsites**
- **The methane is captured through an advanced anaerobic digestion process and used to generate power in a 5 MW gas engine power plant which in turn replaces carbon intensive grid power**
- **The left over material serves to supplement inorganic fertilizer in plantations, gardens etc. This is an additional stream of GHG reductions in which CO2 emissions in manufacture of chemical fertilizers is avoided**

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GHG Mitigation Checklist

- Project declared as a waste to energy demo project by MNES and was originated by UP NEDA. Therefore, GOI approval is imminent
- The subsidy provided by MNES, GOI is out of its own funds, hence does not amount to diversion of Official Development Assistance (ODA)
- The project involves a sustainable and environmentally "additional" activity and could also provide cleaner work for the unorganized "rag pickers"

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Thus the project exhibits..

- Environmental Additionality – Better than business as usual scenario
- Technological Additionality – Advanced technology* being provided Investment Additionality – Need for additional funding to sustain GHG mitigation benefits & no diversion of ODA
- Social Additionality – through improving the health and hygiene in the city and also providing additional employment

*Based on information provided by promoters. LBG/USAID neither endorse nor certify the technology

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Hence We may proceed with further analysis…

- Baseline Analysis
- GHG Mitigation Potential Estimation
- Monitoring & Verification System
- Valuation and Integration into Financial Analysis
- Risk Assessment & Mitigation

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GHG Analysis of a Case Project

Power & Manure from Biomethanation of MSW

Baseline Analysis

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Presentation Overview

- **What is a baseline?**
- **Steps in Establishing Baseline**
- **Project Boundary**
- **Baseline Sources**
- **Data Sources**
- **Carbon emission reductions from the project**

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What is a Baseline?

- It represents the emissions that would occur in the absence of a GHG mitigation project
- International standards for CCMPs demand a credible, quantifiable and verifiable baseline of emissions
- Baseline determination is a step in judging additionality for projects for market based funding
- The difference between the baseline and the project case represents the value of the GHG emissions reduction

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Steps in Establishing Baseline

1. Define project boundary
2. Identify the appropriate baseline source
3. Gather required data
4. Calculate baseline carbon emission rate
5. Calculate emission reductions

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GHG Reduction Objectives of the Case Project

- Clean Technology Nature
  - One of the best technology options for MSW treatment and methane abatement
  - GHG abatement on three counts
- SD Objectives/Aspects
  - Direct and indirect employment potential for local population
  - Better & less work environment for unorganized scavengers/recyclers
  - Improvement in health & hygiene
- Host Country Objectives
  - Meets objectives of MOEF SWM Rules 2000
  - A WTE technology Demonstration project of MNES

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Project Boundary

The Project treats MSW, feeds power & generates organic manure

∴ Correspondingly, there are 3 project boundaries that include proposed plant & extend to

1. MSW: City Limits from where Waste is collected and transported to the plant
2. Power: Entire Northern Region as power is transmitted freely and frequently by the RLDC
3. Organic Manure: Fertilizer production and usage chain

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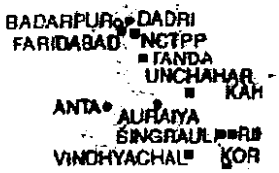
Baseline Sources

1. Power generation from methane & sale to UPPCL/Northern grid
   - UP state Grid of UPPCL well integrated with Northern Region comprising J&K, HP, Punjab, UP, Uttaranchal, Haryana, Rajasthan, Chandigarh & Delhi
   - No segregation of bio degradable and inert material
   - Organic matter putrefies in the dumps. Generated methane escapes into atmosphere
   - Thus, Business as usual is No recovery of methane from degrading urban solid waste



Baseline Sources

2. Methane capture
   - Current Practices in Indian cities- Open dumping of MSW
   - No segregation of bio degradable and inert material
   - Organic matter putrefies in the dumps. Generated methane escapes into atmosphere
   - Thus, Business as usual is No recovery of methane from degrading urban solid waste

Baseline Sources

3. Organic Manure
   - Chemical fertilizers like urea, ammonia, potash and DAP/SSP used to provide nutrients. However, only a small fraction of this is absorbed by the plants. Rest lost to the land causing damage
   - Organic manure would provide a viable supplement as it contains N P K
   - Slow release by MSW generated organic manure makes it suitable to plantations like tea
   - Large use of energy in chemical fertilizer manufacture

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Data Collection Sources

1. Electric Power Sector
   - CEA statistics
   - Planning Commission Annual Report on Working of SEBs and EDs
   - Reports of National Council of Power Utilities, Central Board of Irrigation & Power, MNES, MOP etc.
   - Report of World Bank
   - Meetings with state and regional utility officials

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Data Collection Sources

2. **Methane Capture from MSW**
   - MSW Generation statistics
   - Reports of Technical Advisory Group of Min. of Urban Development
   - Data from misc. reports of individual researchers
   - Methane recovery guaranteed by technology providers
   - US EPA methane generation from various ingredients
   - IPCC report on GHG from Waste

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Data Collection Sources

3. **Chemical Fertilizer Manufacture**
   - Fertilizer statistics published by Ministry of Fertilizers
   - Fertilizer statistics published by Fertilizers Association of India
   - *Study of CII on energy conservation in fertilizer* industry
   - Paper of LBNL EETD on GHG from fertilizer manufacture
   - Data on possible replacement by organic manure from promoters

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Electric Power Capacity

	UPSEB				NRLDC			
MW	2000	%	2001	%	2000	%	2001	%
Thermal	4542	75%	4102	73%	11698	79%	11468	75%
Hydel	1533	25%	1533	27%	3182	21%	3813	25%
Total	6075	100%	5635	100%	14882	100%	15285	100%

Source: Planning Commission Annual Report on Working of SEBs June 2001

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Electric Power Generation

	UPSEB				NRLDC			
Million kWh	2000	%	2001	%	2000	%	2001	%
Thermal	19096	78%	19474	79%	50849	81%	53686	83%
Hydel	5292	22%	5291	21%	11758	19%	10907	17%
Total	24388	100%	24765	100%	62607	100%	64593	100%

Source: Planning Commission Annual Report on Working of SEBs June 2001

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Revelations!!

- Although the Thermal:Hydel capacity mix improved towards Hydel both in UPSEB and NRLDC from 2000 to 2001, the actual generation mix tilted towards thermal in the same period !
- UP Purchases ~ 54.5% of the power it sales each year, 99.5% of which is from central PSUs, which comprises 86% thermal, 8-9% nuclear and 5-6% Hydel !
- Thus, overall mix of power purchased by UP consumers is Thermal: 82%, Hydel: 15% & Nuclear: 3%

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GHG reduction from sale of power

- Installed capacity of Central Thermal PSUs (mainly NTPC): 82% coal, 18% gas
- Indian Coal Bituminous coal with carbon content of ~65% has emission factor* of 26.2 tC/TJ#
- Overall conversion efficiency of PC fired plants in India ~33%, assuming average T&D losses ~ 20% (actually 23% during 2000-01 as per Planning Commission report)
- With these considerations, the weighted average emission factor for power replaced by proposed GHG mitigation project would be 21.5 tC/TJ [or 0.2844 tCO_2/MWh]
- Thus, the power supplied by 5.1 MW project @ 84% availability leads to reduction of 40,375 Tons of CO_2 per annum

Source: UNEP/OECD/IEA/IPCC 1996 The Louis Berger Group, Inc.The Louis Berger Group, Inc. 16

Methane avoided from MSW Dumping

- Proposed plant is expected to lead to faster digestion of the organic matter and recover maximum amount of methane
- Methane left over in the manure (only a small fraction) does not contribute to GHG abatement
- Thus, actual reduction of GHGs from this stream = methane captured in process
- Methane captured in the proposed project is 5,627 tons CH_4 p.a (@ 85% availability, 0.86 m^3/kg VS destroyed at 37°C and 2.5% reduction in gas volume as observed by technical review consultants)
- Equivalent CO2 emission reduction – 118,169 tCO_2 per annum

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GHG reduction due to organic manure

- Organic Manure (N- 0.2-0.8%, P- 0.8-4.0%, & K- 0.3-1.4%) would supplement Chemical fertilizers
- Likely replacement 2 kg of manure to substitute 1 kg chemical fertilizer
- Manufacture of chemical fertilizer generates GHGs by their energy use and in the manufacturing
- Fertilizer production 72% urea, 14% DAP rest misc. (Sp. Energy cons. GJ/ton Urea: 56.33 DAP: 8.24 Source: *Encon in fertilizer industry CII*)
- Weighted Av. Emission factor 2.628 tCO_2/ton based on specific energy consumption
- Overall GHG reduction due to 12780 TPA manure would be 33,587 tCO_2 per annum

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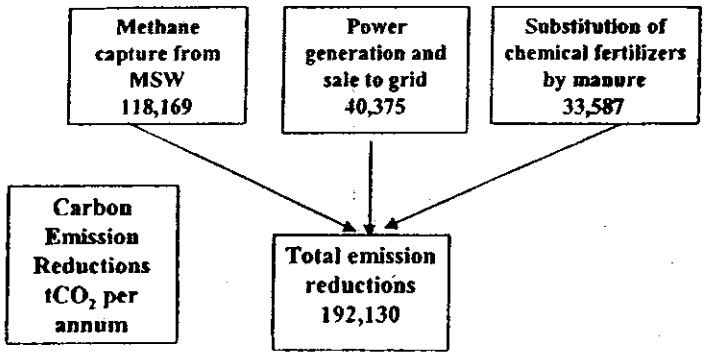
Summary of Carbon Reductions



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GHG Analysis of a Case Project

Power & Manure from Biomethanation of MSW

Monitoring & Verification

Climate Change Centers' Project Development Training Program

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Monitoring & Verification

- **In developing a baseline, projections are made about future parameters**
- **M&V is the process of measuring these parameters, for updating the emission reduction calculations**
- **The baseline emission rate and actual emission reductions must be measured and recorded so as to document and quantify project's performance**

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M&V Plan

- M&V plan must be prepared and validated during the design stage to ensure consistency in the indicators to be used throughout the project
- Technically credible M&V plans are considered an essential part of a carbon offset project plan

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Essential elements of an M&V Plan

- Identify a person/group to manage the M&V process
- Gather information from similar projects on M&V protocols, consult with experts
- Review and assess the M&V design
- Identify technological requirements and technical skills for M&V
- Identify cost of instituting the M&V protocol
- Initiate M&V at appropriate time

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M&V Protocol

- M&V system– An interdepartmental group with representatives of production, maintenance, quality control, finance and strategic planning for implementation
- A reputed international agency for validating the M&V system as also the baseline calculations

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M&V Philosophy

- Methane recovery MSW Biomethanation- MSW quantity, bio-degradable matter content will decide biogas flow rate and its composition; hence the quantity of methane
- Power generation- Clear relationship more power exported more emission reductions.
- Organic manure- Manure quantity, composition of nutrients will decide amount of chemical fertilizer replaced; hence the emission reductions
- Data collection on power capacity additions, solid waste management practices and trends in manufacture of chemical fertilizers

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M&V Implementing Group Shall

- Measure and record the quantity / composition of the MSW received
- Measure and record the quantity and composition of biogas produced its
- Meter and record the power generated and sold to the grid
- Measure and record quality/quantity of manure sold
- Keep track of solid waste management practices in the city and the country
- Keep track of source wise power supply in the northern electric power grid and the status of completion of the National Grid
- Keep track of production and use of chemical and organic fertilizers

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M&V Hardware needs

- MSW- Weigh bridge, laboratory apparatus for quality check, gas volume & composition
- Power- Export and check meter [0.2 accuracy class]
- Manure- Bag weighing machines, laboratory apparatus for quality check
- MIS system to monitor emission reductions

Almost all the equipment is necessary for plant operation except MIS/specific data loggers

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M&V System Cost Estimates

Item	Estimated cost Rs Million	Equivalent $ (Rs. 48 / US $)
Additional Hardware - Specialized MIS	0.2	4,167
GHG monitoring system design and maintenance expenses	0.2	4,167
Baseline methodology, emissions and reduction verification	0.5	10,417
Annual certification of emission reductions (10 years capitalized)	1.0	20,833

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GHG Analysis of a Case Project
Power & Manure from Biomethanation of MSW
Integration with Project Financials

Climate Change Centers' Project Development Training Program
February 25-26, 2002

Vinay Deodhar

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Presentation Overview

- **Risk Analysis**
- **Contractual Risk Mitigation Structure**
- **Integration of Emission revenues with Project financials**
- **Pricing of emission reductions**
- **Conclusions & Sensitivity Analysis**

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Risk Analysis

Risks	Extent	Description
Market?	Low	The commodities produced by the project power and organic manure are in deficit. Therefore, market risks are low except for the sale of manure, because it is not widely promoted to the farmers yet.
Country /Sovereign?	Low	India has stable legal system and has by and large following the legal process. Contracts have been honored and businesses of the multinationals have flourished. Thus, the sovereign risk is minimal.
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Construction?	Low	The promoters have identified strong EPC and O&M contractors with vast experience in setting up such projects. The materials to be used are standard. Thus, construction is not likely to pose major challenges.

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Risk Analysis

Risks	Extent	Description
Technology?	Medium	The technology providers have set up similar facilities elsewhere in the world. The promoters have experience in working with other effluent treatment projects in India. Combined, they can take the challenge of technology.
Management?	Low	The promoters have a very lean and efficient management, as evident from a large number of projects implemented in a short span of time. In addition, they can draw any necessary resource from India or Austria.
Competition?	Low	MSW treatment thru methanation is being introduced in India and so there is practically no competition. Also the size of MSW treatment market is quite large [with over 300 Class I cities generating over 39 million tons of MSW daily]
Exit?	Low	The Companies Act allows easier closure of firms. The investment rules have already been relaxed. The Indian financial market is mature and transactions such as leveraged buyouts, mergers & acquisitions etc. are common. Therefore, Exit from the companies in general and better performing ones in particular is not difficult and risky

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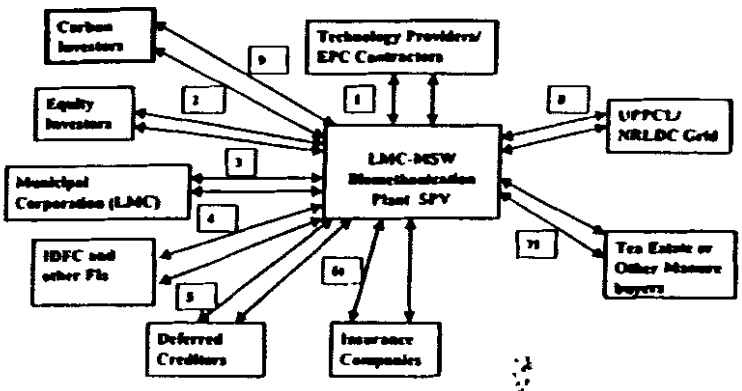
Contractual Risk Mitigation structure



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Contractual Risk Mitigation structure

Sr. No.	Service/ performance	Agreement	Transaction	Annual Transactions
1	Equipment/ Technology	EPC contract/ Tech transfer	Purchase of Equipment/ Tech	-
2	Equity capital	Shareholders Agreement	Equity Infusion	Dividend
3	Garbage	Garbage Supply Agreement	Supply of garbage of specified quality	
4	Loan	Loan Agreement	Provide Loan	Interest/Principle
5	Deferred Credit	DC/Loan Agreement	Deferred credit on specified equipment cost	Lease rental
6	Insurance Policy	Policy document	Cover fire and other risks	Insurance Premium
7	Organic Manure	Manure Purchase Agreement	Sale of manure power	Payment for manure
8	Power	Power Purchase Agreement	Sale of	Payment of Power tariff
9	Carbon offsets	Carbon Offset Purchase Agreement	Initial investment	Payment for Offsets

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Summary of GHG reductions

Stream of Reductions	GHG	Quantity TPA	Quantity of CO_2e TPA
Methane capture from MSW	CH_4	5,627	118,169
Power generation and sale to grid	CO_2	40,375	40,375
Substitution of chemical fertilizers by manure	CO_2	33,587	33,587
Total emission reductions			192,130

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Integration of Emission Revenues with Project Financials

- Pricing the emission reductions
  - Using recent benchmarks
  - Pricing of services provided
- Integrate the "new" revenue stream and related costs in the profitability analysis of the project
- Run sensitivity analysis with different pricing scenarios

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Pricing of Emission reductions

- **Two possible approaches for pricing in non-established markets**
  1. δ [Cost of Production between project and a similar project with traditional technology] / tons of emission reductions
  2. Total amount required to make the project IRR cross the Hurdle rate/tons of emission reductions
- Proposed project provides heterogeneous services that cannot be provided by traditional technology

  ∴ **Better to select Second Approach**

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Results

- **IRR on Equity with unchanging price of manure at Rs. 2,200/- and power tariff as specified in PPA- 22.85% and a hurdle rate of 25%**
- **Price of emission reductions from recent issues is $ 3 per ton CO2e**
- **At this price Project's IRR on equity is 27.12%**
- **Reasons for higher IRR – MNES tariff & grant, and relatively higher price of manure**

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Conclusions & Sensitivity Analysis

- IRR is sensitive to manure price
  - @ Rs. 1,500/ton IRR w/o carbon – 20.19% & with carbon 24.63%
- MNES subsidy and special tariffs help the project largely
- If MNES grant was replaced by Loan from existing lenders and tariffs were fixed as per new UPERC ruling [Rs. 2.25/kWh in 1999-00] IRR on equity w/o carbon 18.19% and with carbon 22.8%
- If the price of manure is fixed at Rs. 1,500 per ton IRR w/o carbon 16.09%, & with carbon 20.86%

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Summary

Conditions & constant Manure price Rs/Ton	IRR without Emission Reductions	IRR with Emission Reductions
MNES grant & Tariff, 2200	22.85%	27.12%
MNES grant & Tariff, 1500	20.19%	24.63%
W/o MNES grant, UPERC Tariff , 2200	18.19%	22.80%
W/o MNES grant, UPERC Tariff , 1500	16.09%	20.86%

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Thank You!

Executive Summary

Bioenergy India Limited (BIL) proposes to set up a 5 MW power generation plant using biogas generated by biomethanation of Municipal Solid Waste (MSW) supplied by the Lalpur Nagar Nigam (Lalpur Municipal Corporation-LMC). The plant leads to capturing methane that would otherwise have been emitted had the MSW been dumped on open dumpsites as is practiced in all the Indian cities. The project shall serve as a demonstration project to illustrate the use of advanced anaerobic digestion technology to enhance the biodegradation process. The gas, after cleaning, shall be fired in a gas engine to generate power for export to the UP Power Corporation's grid. The process would also result in production of nutrient rich organic manure, which can substitute chemical fertilizers for horticulture, fruits, plantations and gardens. The project awarded to BIL through a competitive bidding process costs about Rs. 740 million. BIL, a Special Purpose Vehicle company promoted by Enviro Engineers India Ltd., ENERTECH GmbH, Austria, Jurong Engg. Ltd. (JEL) and few funds and financial institutions is providing the anaerobic digestion technology. The project is being implemented through EPC contract to several reputed international and Indian companies.

BIL approached IDFC for funds in the form of loan and equity for the project, which is under active consideration. IDFC has a mission of encouraging environmentally safer technologies for the projects funded by them. IDFC and The Louis Berger Group, Inc. the contractor for USAID/India GEP-CCS project identified this project as a possible opportunity to demonstrate the identification of GHG emission reduction and its possible use. The project demonstrates environmental and social sustainability as it leads to reduction of a major health and methane (a major GHG) emission hazard. It leads to employment opportunities to the local population. It also helps the local rag pickers (scavengers of valued items like paper, plastics and rags) to collect these items in a safe way that helps in recycling of these items.

The project has three major streams of GHG mitigation (i) Methane captured from the MSW; (ii) reduction in the emission of carbon dioxide from the coal fired power stations in Northern India; and (iii) Avoidance of use of chemical fertilizers like urea, DAP which are manufactured in GHG intensive processes. The current way of disposal of MSW in India is predominantly dumping in the open. This leads to methane emissions through the degradation of volatile organics and also to pollution of the ground water by the leachate generated on the dumpsites. The power supply in India in general and in the northern region in particular is dominated by thermal sources mainly coal fired power stations. The output of the project would replace this carbon intensive power source thereby lead to reduction in carbon dioxide emission. Similarly, the organic manure will replace the chemical fertilizers thereby reduce the CO2 that would have been generated in the manufacture.

BIL shall set up measurement and verification systems to monitor and control the GHG reductions. The project risks have been identified and mechanisms to mitigate/cover them have been set in. Major project agreements like power purchase agreement, waste

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supply agreement etc. have been signed and approved by the funding agencies. Thus, overall the project offers an attractive opportunity for investment by investors especially the carbon investors.

BIL PROJECT - GREENHOUSE GAS (GHG) MITIGATION ASSESSMENT

1. Background of the project

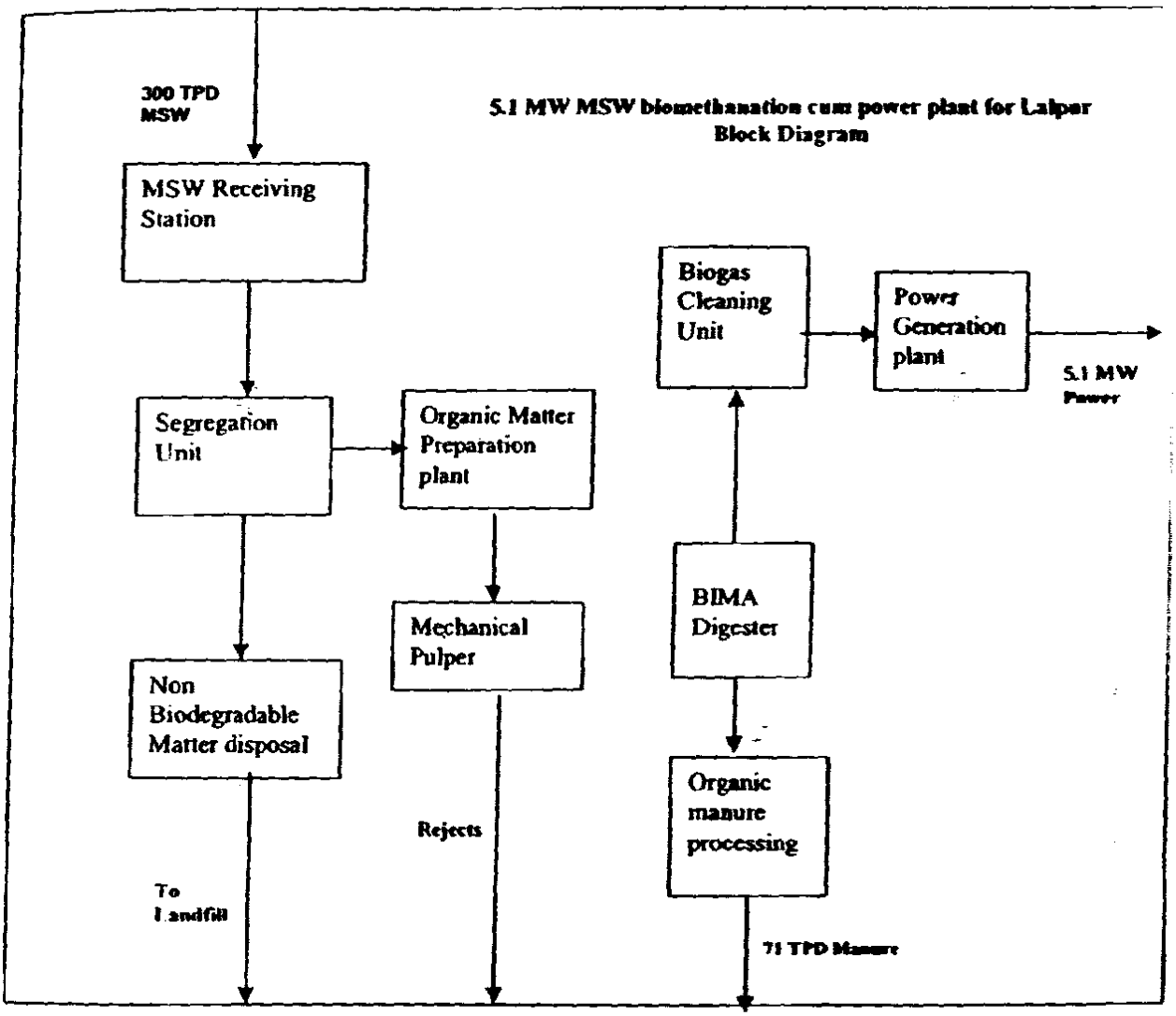
Bioenergy India Limited(BIL), a new Special Purpose Vehicle (SPV) company promoted by M/s Enviro Engineers Pvt. Ltd. (Enviro), Chennai, proposes to set up a project to generate 5.1 MW power (net) and 75 TPD Organic Manure from the municipal solid waste (MSW) to be supplied by the Lalpur Municipal Corporation (LMC), Lalpur, Uttar Pradesh (UP). Lalpur, a city in the state of UP with a population of around 3 million generates about 1500 Tons per day (TPD) of solid waste of this about 66% is collected. LMC has agreed to supply 300 TPD of the MSW to BIL for the above purpose that meets specifications as stated in the agreement.

BIL shall segregate the biodegradable matter from the MSW and process the same through anaerobic digestion in specifically designed reactors to generate a biogas rich in methane content. This gas shall be used, after due treatment, in gas engines to generate electric power. The waste heat contained in the flue gases from the engine shall be recovered for generation of additional electric power. After meeting the auxiliary power generation, BIL shall export power to the grid of UP Power Corporation Ltd. (UPPCL), originally known as UP State Electricity Board (UPSEB). BIL's contracted capacity to UPPCL is stated at 5.1 MW. After the generation and recovery of the biogas, the remaining material shall be dried and sold as a bacteria free manure rich in organics. This manure shall be suitable to agricultural and gardening / plantation purposes. The organic manure would be available to the extent of 75 TPD from the project. The plant shall be operating for 23 hours a day for about 324 days in a year and thus available to the extent of 85%. A flow chart of the plant is given in Figure 1.

BIL has entered into a 30-year power purchase agreement (PPA) with UPSEB on July 31, 1998 [renewable for a further period of 30 years] and a Waste Supply agreement with LMC on February 14, 1997 also for an equal term. It has received a letter of intent for purchase of organic manure from a tea estate, which is to be converted in a five-year agreement for 2500 Tons per month of bio fertilizer of specific characteristics.

The cost of proposed project is estimated at Rs. 760 million (including foreign currency expenses of US $ 5.81 million @ Rs. 43.5 per US $), which is proposed to be financed by equity of Rs. 244 million, and debt of Rs. 366 million. The National Bio-energy Board of Ministry of Non-Conventional Energy Sources (MNES) of Government of India (GOI) has accepted the project as a "National Demonstration Project". MNES has agreed to provide a subsidy of Rs. 150 million as per the scheme in view of the GHG mitigating nature of the project and its ability to demonstrate generation of energy from waste to other cities in India.

Figure 1: Process Flows



The primary Indian lender to the project appointed M/S Ernst & Young (E&Y) an international consulting of repute for conducting Techno-economic review of the project. E&Y conducted a careful review of the project documents, made a site visit and had discussions with concerned authorities for an independent assessment as also conducted some experiments with the MSW. Key conclusions of their report are as follows:

- The guarantees provided by LMC are enforceable and protect the project promoters from variations in waste quality
- The treatment system as proposed should be able to handle the MSW and generate power and biofertilizer
- The biogas generation and the associated power generation would be close to design figures (lower by about 2.5% than the design figures)
- The project risks are adequately covered to the maximum extent possible

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2. GHG emission reduction objectives of the proposed project

Technology options for MSW treatment

Municipal solid waste comprises various substances and differs from place to place. Thus, the approach to treat MSW from different countries differs. There are various options for this, starting from reducing waste and recycling to composting, incineration/pyrolysis, sanitary land filling and biomethanization. The first two options are desirable irrespective of the technology for treating the waste, as these reduce the quantity of the waste and thereby the load on the treatment plant. In the incineration or pyrolysis process the biodegradable matter is burnt off, thereby using the heating value. However, as the MSW is wet, major portion of heat is taken away in evaporating the water. Also, this process may result in emission of undesirable substances like dioxins; SOx etc. These gases are more dangerous as compared with main GHGs. The composting option enables treatment of bio-degradable matter, but the gases evolved in the aerobic digestion process mainly carbon dioxide escapes in the atmosphere and thereby does not help in GHG reductions. Also, the only saleable product in this process is the compost produced. This reduces the financial viability of the process. While, this could be the advisable option for smaller municipalities where the MSW generation is not enough to economically sustain higher treatment options such as biomethanation and engineered landfill. Engineered landfill is an option, which also permits recovery of methane. However, this requires comparatively larger land and elaborate and expensive construction. It is also essential to prevent leakage of leachate in land, which could contaminate the ground water. This option may also need a similar demonstration in India before it can be used on a wider scale by municipalities. Though costlier, biomethanation offers several advantages over these options as discussed further.

a. Clean Technology nature

In the biomethanization process, the process of digestion of biodegradable matter is carried out in a closed vessel, which helps in avoidance of emission of methane (a greenhouse gas with high global warming potential) as also any leachate that is generated. Further, since the process is catalyzed by enzyme secreted by microorganisms in the culture, it helps in recovering more methane than the composting process. The methane rich biogas is collected and gainfully utilized to produce power, which is fed to the grid, thereby replacing power from carbon intensive thermal sources. The process leaves behind organic manure, free of bacteria and can be a substitute for chemical fertilizers like ammonia and urea, which generate large amounts of CO_2 during manufacture. Thus, biomethanization process helps in mitigating three sources of potential GHG emission (i) Methane gas which could have otherwise escaped from open dumpsites or composting yards (ii) GHG emissions from coal fired thermal plants while producing equivalent amount of power; and (iii) substituting chemical fertilizers, during the manufacture of which GHG emission occurs.

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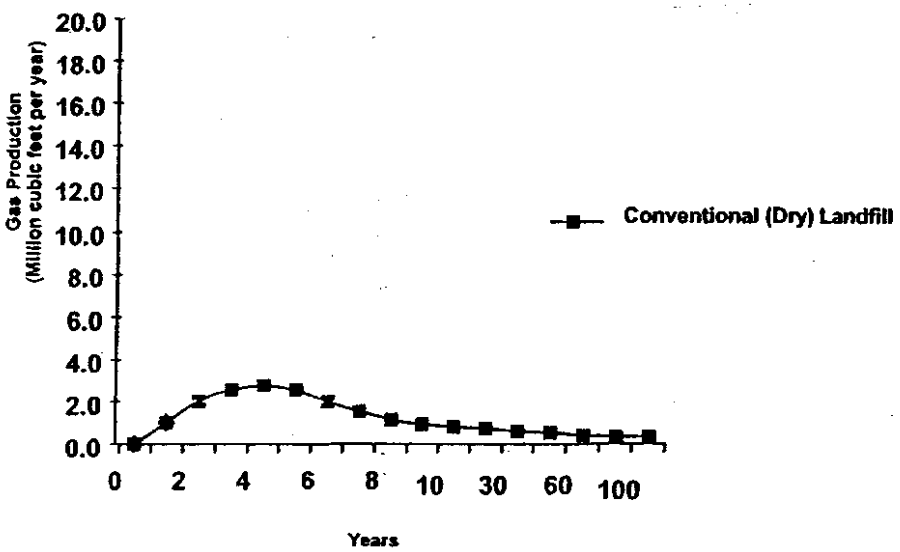
shaped curve Figure 1. Over a span of 2 to 6 years, this material would degenerate fully.



Source: Global Energy Partners LLC
Figure 1: Biogas production from dry landfills

Thus, the volatile degradable material in the waste forms methane rich biogas at a slow rate and is released in the atmosphere. Carbon contained in the biodegradable matter of the solid waste would degrade over a long period. The proposed process enables faster digestion of majority of carbonaceous material in gas. Therefore, the baseline for this stream of reduction is the total emission of methane that could occur from the typical MSW from the Lalpur city. [However, since the proposed project would capture methane reduction as per the process designed by ENERTECH, the net reduction is restricted to this amount.]

(ii) For power export to grid: The power generation is using a gas engine as against the normal Rankine cycle or gas turbine. This is an innovative approach. The project would feed about 5000 kW worth of power in the grid of UP Power Corporation Ltd. (UPPCL), which is an integral part of NRLDC. The emission factor of NRLDC would therefore be the baseline as this would be the source of power in the absence of the project. A careful analysis of the performance of the regional grid suggests that on an average in the year 2001 the UP grid had ~81% of power from thermal sources, both of UPPCL's own and procurements from the central power sector utilities (CPSU). About 14% was from hydroelectric sources and rest purchased from nuclear plants of CPSUs. The thermal power mentioned above is mainly from coal fired plants using sub bituminous coal mined in central India. The coal has large amounts of ash, which leads to low conversion efficiency. Indian power grid exhibits very high transmission and distribution losses. Although the actual figures revealed off late arte quite high in many states including UP, it is preferable to use the published figure of 20% to be on a conservative side.

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Since this a grid feeding power plant with a capacity < 15 MW, it would qualify for the fast track projects as defined under the Bonn agreement. The baseline is calculated from the data on installed capacities and generation details from various sources for both UPPCL and NRLDC. The data is available from the Planning Commission of India's Annual report of SEBs for June 2001 and Central Electricity Authority's report on NREB. The thermal plants are in majority based on pulverized coal fired technology. These plants mainly use sub-bituminous coal from the mines around central India. Based on the emission factors for this fuel for India as specified in the IPCC report and used by the World Bank GHG assessment handbook. The results are presented later.

(iii) For replacement of chemical fertilizer by organic manure: The proposed plant would generate 75 TPD of organic manure. The manure shall replace the use of chemical fertilizers like urea, diammonium phosphate (DAP), Potash and super phosphates mainly by plantations like tea/coffee gardens, horticultural use in municipal gardens etc. Since the manure has lower concentrations of N, P and K the release of these nutrients is slower than Chemical fertilizers. Based on the experience of the major users viz. the tea estates the equivalent amount of the manure to one ton of chemical fertilizer is found. Based on the specific energy consumption of urea and ammonia and the average of usage of these fertilizers in India, the weighted average emission factors of the chemical fertilizers is found out. The baseline emission reduction is the amount of emission by the equivalent amount of chemical fertilizers used. While, the manufacturing processes of chemical fertilizers also leads to emission of N_2O, for want of precise data these were not quantifiable and hence were not accounted for in the present analysis.

Here it needs to be clarified that the project generates organic manure, which replaces use of chemically manufactured fertilizers (in the same manner that the power generated replaces grid power.) therefore, these are NOT of the nature of embodied GHG emissions that the project replaces. Moreover, these reductions are measurable from the quantity of the chemical fertilizers, a product that would be used in absence of project's output; the carbon emission reductions from this source should qualify for CERs.

c. *Time dimensions of the baseline*

The biomethanization technology is being introduced for the first time in the country. There are over 300 Class I cities in the country, which generate an estimated quantity of about 39 million tons of solid waste per year. It s expected that the use of the technology will take a long time before it becomes a common practice. Thus, the baseline is not likely to shift during at least a decade during which the investors would buy the carbon offsets.

d. Annual /periodic estimations

In view of the innovative nature of the proposed technology, it may not be necessary to revise the baseline estimate during the course of the first ten years during which investors are likely to purchase the credits.

e. Baseline case emissions estimation

Based on the methodology presented earlier and data collected from various sources, the baseline GHG emissions were estimated. The summary of the same is presented below.

I Methane Capture from Solid wastes

Methane generated due to biological degradation of the volatile solids in the solid waste. If the solid waste were dumped in open a majority of this amount of methane would have been generated over a period of over ten years. In the proposed process the degradation takes place at enhanced rate with the help of microbial reaction. Thus, in the absence of the project activity, there could be entire degradation of the organic matter.

Parameter	Value	Unit
Total waste received	300	Tons/day
Inert material segregated	99	Tons/day
Treatable material	201	Tons/day
Dry volatile solids	104	Tons/day
Biogas generated at STP	42320	Nm3/day
Methane recovered	25392	Nm3/day
Annual methane captured	5627	TPA
Equivalent* CO_2	118,169	TPA

* GWP of methane for 100 year horizon = 21

II CO_2 Emissions from power used in the state grid

The requirement of power in the state is met through own generation, which includes coal fired thermal and hydroelectric power plants. In addition, the UP Power Corporation purchases power from the central public sector power generating companies, which have a mix of thermal, hydel and nuclear power. Based on the respective capacities, it is found that thermal power contributes about 80% of the capacity and 20% of the hydel sources. However, based on the statistics of power generated and purchased, it is observed that in 2001 of a total 39879 MU consumed by the state grid 82.2 % was supplied from thermal sources, mainly coal fired plants, 14.4 % from hydel and 3.4 % by nuclear sources. The composition was more or less same in the year 2000, with 81.4%, 15.5% and 3.1%. The thermal plants which are based on high ash Indian coal use sub bituminous variety coal as fuel. By and large the plants are old and exhibit conversion efficiencies in the range of 33%. Indian electric power grid especially at the sub transmission and distribution levels, which operate at low voltage ratings of 33 KVA and 11 KVA, exhibit high transmission & distribution losses, sometimes in the excess of 40%. However,

to be on a conservative side an estimated 20% T&D losses are assumed in the analysis.

The emission factors of these plants have been assumed on the basis of IPCC methodology (as discussed in: UNEP/OECD/IEA/IPCC 1995) for India, which is also being followed by several multilateral institutions like The World Bank. The emission factor of thermal power plants using bituminous/anthracite coals from India is 26.2 tons Carbon/TJ. To be on a conservative side, even though many of the hydel plants of National Hydroelectric Power Corporation (NHPC) are large in size it is assumed that they do not lead to any indirect GHG emissions. After considering the mix of supply from various sources as mentioned above, the weighted average emission factor of the UP state grid is 21.5 tC/TJ.

III CO_2 Emission from inorganic fertilizers during manufacture

One of the features of the proposed project is the generation of organic manure that substitutes the use of chemical fertilizers like urea, di ammonium phosphate, and potash. During the manufacture of the chemical fertilizers like urea, ammonia, single/triple super phosphate (SSP/TSP), di-ammonium phosphate (DAP) a large amount of energy is consumed. This energy is in both thermal as well as electrical forms. In addition, during processing, raw material, intermediates and finished goods are lost due to spillages, evaporation etc. Some of the reactions also evolve CO2; nitrous oxide, perfluoro carbons and many other pollutants like SO_2, NOx, particulate matter etc. The use of the chemical fertilizers (popularly referred as NPK fertilizers in India) has increased over a last few decades. While, it has contributed greatly to the green revolution to increase the food output in the country, excessive use also leads to increase in acidity of the soil, thereby degrading its quality.

The most important step in producing ammonia (NH3) is the production of hydrogen, which is followed by the reaction between hydrogen and nitrogen. A number of processes are available to produce hydrogen, differing primarily in type of feedstock used. The hydrogen production route predominantly used worldwide is steam reforming of natural gas. In this process natural gas (CH4) is mixed with water (steam) and air to produce hydrogen (H2), carbon monoxide (CO) and carbon dioxide (CO2). Waste heat is used for preheating and steam production, and part of the methane is burnt to generate the energy required to drive the reaction. CO is further converted to Co_2 and H_2 using the water gas shift reaction. After CO and Co_2 is removed from the gas mixture ammonia (NH_3) is obtained by synthesis reaction.

The specific Energy Consumption of fertilizer plants in India were 12.3 Gcal/ton of ammonia, 13.5 Gcal/ton of urea, and 0.06 Gcal/ton of DAP. The consumption of major fertilizers namely urea, DAP and SSP are 72%, 14% and 14% respectively. Based on the feedstock from which the fertilizers derive energy and the power consumption of process, the average emission

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factor of each ton of chemical fertilizer works out to approximately 2.63 tons CO_2/ton of fertilizer.[1,2,3]

[1] India's Fertilizer Industry: Productivity and Energy Efficiency *Katja Schumacher and Jayant Sathaye* Environmental Energy Technologies Division July 1999
[2] Energy Conservation at design stage, CII Energy Management Cell, under the ADB-ESP project
[3] TERI Energy Data Directory & Yearbook 1999/2000

4. GHG mitigation potential of the project

The project helps in avoiding emission of two main greenhouse gases; methane and carbon dioxide.

I The project enables capture of the methane from the biological degradation processes. If the waste is left in open it would require a long time for the microbes present in the waste as well as the soil and air to break the organic molecules into smaller molecules and ultimately methane gas. Estimated time of 15 – 20 years is needed to break various complex compounds. In the proposed plant the seed culture of microbes uses the nutrients in the waste to enhance the biodegradation process in absence of air. Thus, the anaerobic process enhanced by the enzymatic catalysis hastens the biodegradation process and increases the yield of methane. The left over solids in the waste are non degradable for all practical purposes. Based on the estimates from laboratory results and experience of the technology suppliers elsewhere, the gas generation is estimated to be around 0.86 m3/kg of volatile solids (49,290 m3/day from the project at 37^0 C) containing about 65% methane and the rest carbon dioxide, moisture etc. However, as per the technology review conducted by Ernst & Young, the gas generation has been over estimated by about 2.5%. When this is applied to the estimates gas generation is likely to be ~ 48,055 m3/day. Thus, the project helps in capturing about 25,392 m3 of methane gas at Standard Temperature and Pressure. This works out to 118,169 Tons per annum of CO_2 (GWP of methane is 21)

II The project generates a total of 5.6 MW of electric power and after meeting the plant needs exports power worth about 5.1 MW. Under assumptions of availability of 85%, the proposed project would feed 38.6 MU in the state grid of UP. In the absence of project activity, this could have been met with grid power, which has a high thermal power concentration. The state of UP generates its own power and also receives power from its share from the central power sector PSUs (Viz. NTPC, NHPC, NPC etc.). Based on the scenario outlined in the earlier section, the power generated by combustion of the methane captured would lead to reduction of carbon emissions from the coal fired grid power to the extent of 40,375 Tons per annum of CO_2.

III The proposed project generates organic manure to the extent of 71 TPD. The manure has adequate quantities of N, P and K as desired by plants especially plantations. The composition of the manure is given below:

Parameter	Range
Moisture	25 – 30
Solids	70 – 75
Organics	40 – 50
Nitrogen	0.2 - 0.6
Phosphorus	0.8 – 6.8
Potassium	0.3 – 1.4
Fe, Cu, Zn	Traces
PH value	6.0 – 7.0

6. Estimation of cost of carbon reductions

There are basically two approaches to estimating cost of carbon reductions in case of non established markets, where no pricing signals are available. (i) The difference in the total cost of production between the project and a similar project using a traditional technology divided by the total tons of carbon reductions produced; or (ii) The total amount necessary to make the project profitable (or meet the hurdle rate) divided by the total tons of carbon reductions produced. In case of the proposed project the valuable products/services provided include treatment of 300 TPD of MSW, 5 MW power generation and 71 TPD of Organic manure production. Since conventionally there is no technology that can provide such heterogeneous services, it would be appropriate to adopt the second approach.

The IRR on equity with the two valuable products from the project namely power and manure was calculated based on the price of power specified by the PPA and the market acceptable price of organic manure without accounting for the carbon reductions. This analysis suggests that at a price of Rs. 2,200 per ton for the manure in year 1, with no escalations and for a hurdle IRR of 25%, the carbon price works out at **$ 3.00 per ton.** It is observed that the IRR is sensitive to organic manure price; therefore the market acceptable price has been taken into account. The comparable commodity in this respect has been assumed to be the compost being produced in the Okhla plant in New Delhi, which is sold at Rs. 4 per KG in the retail market.

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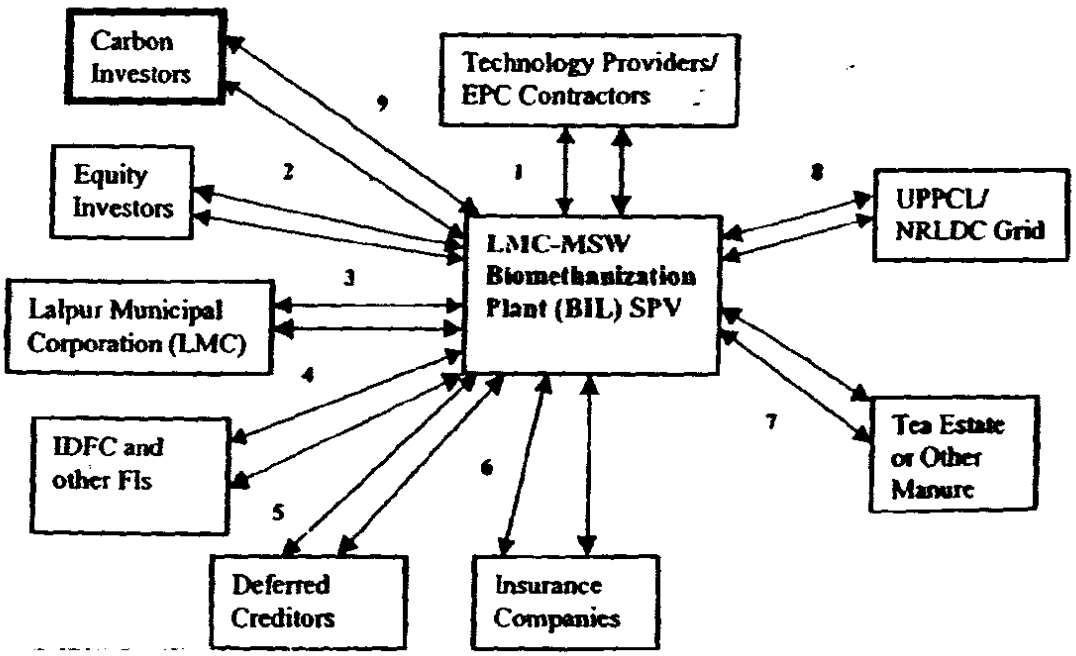
7. Risk assessment and mitigation mechanisms

The proposed project is exposed to various risks of various operational, technical, contractual and sovereign types. BIL has obtained performance guarantees from various technology/equipment suppliers to ensure proper working of the plant. In addition, Ernst & Young, a reputed consulting firm has reviewed the technology, waste characteristics and the underlying contracts. Addressing these business and political risks is one of the major factors for attracting investments in the project. It may be noted that this project has been awarded to BIL through a competitive bidding process that was conducted in a transparent manner. Thus, the risks of political acceptability are minimal. Moreover, India is faced with a formidable task of improving the solid waste disposal practices owing to various reasons like health, hygiene and aesthetics. Thus, the proposed activity is a highly socially desirable activity. The project not only addresses the problems of solid waste and emissions but also generates valuable resources and employment. In other words this is a socially and environmentally sustainable activity. All the major project agreements have been signed, reviewed and accepted by the FIs. The contractual framework is depicted in Figure 2.

Figure 2: BIL Contractual/Performance Structure



Sr. No.	Service/performance	Agreement ←→	Transaction ←→	Annual Transactions
1	Equipment/Technology	**EPC contract/Tech transfer**	Purchase of Eqpt/Tech	-
2	Equity capital	**Shareholders Agreement**	Equity infusion	Dividend
3	Garbage	**Garbage Supply Agreement**	Supply of garbage of specified quality	
4	Loan	**Loan Agreement**	Provide Loan	Interest/Principle
5	Deferred Credit	**DC/Loan Agreement**	Deferred credit on specified equipment cost	Lease rental
6	Insurance Policy	**Policy document**	Cover fire and other risks	Insurance Premium
7	Organic Manure	**Manure Purchase Agreement**	Sale of power	Payment for manure
8	Power	**Power Purchase Agreement**	Sale of manure	Payment of Power tariff
9	Carbon offsets	**Carbon Offset Purchase Agreement**	Initial Investment	Payment for Offsets

Various risks faced by the project along with the respective mitigation measures is described below.

Risks	**Low to High**	***Description***
Market?	Low	The commodities produced by the project power and organic manure are in deficit. Therefore, market risks are low except for the sale of manure, because it is not widely promoted to the farmers yet.
Country/Sovereign?	Low	India has stable legal system and has by and large following the legal process. Contracts have been honored and businesses of the multinationals have flourished. Thus, the sovereign risk is minimal.
Regulatory?	Low	The UP state has a functional electricity regulatory commission. The PPA has a legal validity. Also, the

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		commission. The PPA has a legal validity. Also, the proposed project activity has overall support of the local/state/central govt. support
Contract/counter party	Low	The PPA and the waste supply agreements have been entered into. These agreements are sound and fair. The other contractual structure is also established and is robust. Although, UPPCL is not in good financial health, this project has a special status and is also small in size. As such, no contract related problems are expected.
Construction?	Low	The promoters have gathered strong EPC and other contractors. They have earlier experience in setting up such projects. The materials to be used are standard. Thus, construction is not likely to pose major challenges.
Technology?	Medium	The technology providers have set up similar facilities elsewhere in the world. The promoters have experience in working with other effluent treatment projects in India. Combined, their strengths are sufficient to address any technology related issues.
Management?	Low	The promoters have a very lean and efficient management, which is evident from a large number of projects they have implemented in a short span of time. In addition, they can draw any necessary resource from India or Austria.
Competition?	Low	MSW treatment is a nascent activity in India and competition in the field of MSW methanation project is very low. Also the overall size of the MSW treatment market is quite large [with over 300 Class I cities generating over 39 million tons of MSW daily]
Exit?	Low	GOI is currently in the process of easing the Companies

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		Act to allow easier closure of firms. The investment rules have already been relaxed. The Indian financial market is mature and transactions such as leveraged buyouts, mergers & acquisitions etc. are common. Therefore, Exit from the companies in general and better performing ones in particular is not difficult and risky.

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Annex 4

Curriculum Modules on
Climate Change and Clean Energy Technologies for the LBSNAA
Foundation Course

BEST AVAILABLE

Curriculum Module on Climate Change and Clean Energy Technologies

Prepared for the Lal Bahadur Shastri
National Academy of Administration

May 6-8, 2002

Greenhouse Gas Pollution Prevention Project-Climate Change Supplement

Implemented by:

The Louis Berger Group, Inc.
The Global Environment Team

A program of the:

United States Agency for International Development / India Mission

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Clean Energy Technologies and Climate Change Modules - A Presenter's Guide

Objective of the Modules

To provide the participants an understanding of climate change & clean energy technologies (CET), greenhouse gas (GHG) emission mitigation strategies & options, current initiatives in India and the role of IAS officers in addressing climate change.

Training Session Structure:

The training on climate change and clean energy technology has been designed into two sequential and related modules or sessions. Both sessions are structured in a manner that describes topics from a general perspective, and then increasing levels of detail. These are compressed sessions and care must be taken by instructor to keep the students focused on key objectives of the presentations.

- **Session I** – A background orientation section on Climate change (CC), what are the sources, why it is of concern, and what is being done about it in the international arena (1 hour)
- **Session II** – This session takes a more in-depth look at the responses to climate change, including adaptation and mitigation, and also gives additional information on the technologies that can address/mitigate climate change emissions. (1 hour)

More details of the sessions are included in the attached presentation outline.

Navigating Through the Modules

To clearly see how the modules will appear on the screen, both modules should be viewed in the Slideshow View using PowerPoint.

Talking Points: Many of the slides include a **Slide Objective** and **Key Issues/Concepts** that can be found in the "notes" section. These are essentially talking points that provide additional topics, or elaborate on topics contained in the respective slide. These are meant as an aid to the instructor. Please note that the talking points can be viewed only in the 'Notes Page View' for PowerPoint presentations. *Instructors will need to use their best judgement in determining which level of detail is appropriate for a particular group of students.*

Background Information/References

It is assumed that for both modules, trainees would at least spend a modicum of time reviewing background materials on the topic. For this purpose, several types of background resource information would be available for review and/or as handouts. These include:

1. A glossary of common terms used in the climate change context
2. A detailed outline of the presentations
3. Background reading materials to provide information on particular topics or as a survey of climate change issues.
4. Bibliography & references for further information & clarity, along with relevant web site addresses.

SESSION II (1.0 Hour)

Overview of Strategies to Address Climate Change

1. Introduction and Session Objectives (Slides 1)
2. Strategies of Addressing CC Impacts (Slide 2)
3. Adaptation (Slides 3-4)
    a. Six general approaches for adapting
    b. Major considerations (costs, social implications, etc.)
4. Mitigation Flow Chart (Slide 5)
5. Command and Control (Slide 6)
6. Market Based Approach (Slides 7-9)
    a. Examples
    b. Barriers to MBI in India
    c. US Acid Rain Program – A Market Example
7. Comparison of Market Approaches (Slide 10)
8. Climate Change Mitigation Project Approach (Slide 11-13)
    a. What is Carbon Emission Reduction Trading?
    b. Benefits of CCMPs
9. Types of CCMPs (Slide 14)
    a. Renewable
    b. Energy Efficiency
    c. Fuel Switching
10. Technology Options in Energy Sector for CC Mitigation (Slide 15)
11. Climate Change Mitigation Options – Power Generation (Slides 16-20)
    a. Renewable Energies
    b. Distributed Energy Sources
    c. Co-Generation
12. Climate Change Mitigation Options – Urban Sector (Slides 21-24)
    a. Transportation
    b. Urban Solid Waste Management
13. Current Status of CCMPs in India (Slides 25-26)
    a. Available incentives
    b. Private sector responses
    c. GOI responses
14. Roles You Can Play (Slides 27-28)
    a. Direct
    b. Indirect
15. Conclusions (Slide 29)

APPENDICES

Bibliography and References

Glossary

Climate Change and Clean Energy Technologies

Curriculum Module Developed for the LBSNAA Foundation Course

By the Greenhouse Gas Pollution Prevention Project
Implemented by the Louis Berger Group Team
Under USAID/India

Module Components

Session I: Introduction to Climate Change

- Definitions
- Causes of global warming
- Economic, social and environmental impacts
- India's vulnerability to climate change
- International efforts to address climate change

Session II: Overview of Strategies to Address Climate Change

- Adaptation
- Mitigation options
- Project based mitigation
- Role of clean energy technologies in mitigation
- What you can do

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 2

Slide Objective:

•This slide provides trainees with a framework for what they will learn over the course of two sessions on climate change and clean energy technology.

•Subheadings indicate the key messages that trainees should take from the training

•It should be recognized that at the Foundation Course level, ***the material is an overview*** of the issues. Meant to sensitize trainees to global warming, its causes, potential strategies for addressing it, and roles of Administrative Officers

•The module will elaborate possible strategies to adverse impacts of climate change and discuss why should an administrative officer know about and how should he/she act to minimize them.

It is suggested that the instructor familiarizes with the subject through additional reading material such as the UNFCCC Climate Change tool and key web sites

Objectives of Session I: Introduction to Climate Change

To familiarize you with:

- Concepts of climate change (global warming) and its causes;
- The potential impacts of climate change and their relevance to India
- Highlights of international efforts to address climate change and India's role in these efforts
- The climate change profile of India

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 3

Slide Objective:

▪Clearly lay-out the goals/objectives of the initial session which will focus on the causes and potential impacts of global warming.

▪Begin the dialogue on what responses are being developed by the international community on climate change.

What is Climate Change?

Or

Global Warming?

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 4

Slide Objective:

▪To initiate discussion and elicit from trainees their understanding of the issue.

▪Uses references from news and other sources – to gauge understanding and set tone for the session.

▪Recognizes that the terms "global warming" and "climate change" are interchangeable, as global warming is likely a term with which the trainees are more familiar.

Key Issues/Concepts:

▪Definition of "climate change":

A change in climate which:

✓is attributed directly or indirectly to human (also known as ***anthropogenic***) activity

✓***alters*** the composition of the global atmosphere

✓is ***in addition to*** natural climate variability over comparable time periods

▪Please note that the terms global warming and climate change can be used interchangeably.

▪Recognition by many in the international community that climate change is the biggest environmental challenge facing the world today due to its magnitude and the fact that it knows no boundaries – a global phenomenon that requires all countries to work collaboratively towards a solutions.

Why Should You Care about Global Warming?

- **India is a focus** of global efforts to address global warming – an issue that is rapidly gaining priority international attention
- Climate change may create far reaching economic, social and environmental **impacts and costs** both globally and in India
- There may be potential to capture **foreign investment** and ***improved technology for India*** through projects that mitigate climate change

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 5

Slide Objectives:

▪Draws a linkage between the functional roles of administrative officers and the issue of climate change.

▪Facilitates a sense of responsibility for addressing this issue, wherever possible in their careers .....a "hook" to engage the trainees.

▪It is recognized that many Foundation Course (FC) trainees may not initially serve in positions where their decisions could affect climate change or its mitigation.

Key Issues/Concepts:

▪India is a focus

✓India considered the sixth largest contributor of greenhouse gases *by volume* in the world but has one of the lowest *per capita* rates in the world.

✓Considered to have the second highest rate of growth in greenhouse gases in the world.

✓This means there is *a significant opportunity to alter the path of development to one that reduces India's contribution to global warming while maintaining economic growth.*

▪Currently difficult to quantify specific economic costs and environmental impacts of climate change in India. Some research is being done, and general estimates are available.

▪The Intergovernmental Panel on Climate Change (IPCC) was constituted as an objective, scientific body whose key responsibility is to support international climate change negotiations with sound data and analysis.

▪The Government of India (GOI) tends to rely on IPCC findings.

▪Investment opportunities in India (or other developing countries) may arise from international market-based approaches to climate change mitigation.

Is Global Warming Relevant to You? Most Likely – YES!

In Your Early Careers, Might You:

- Be involved with industries, facilities, transport systems or other activities that generate or use energy?
- Account for the costs or use of energy?
- Enforce laws related to energy use?
- Plan or manage land use or development projects?
- Be responsible for social welfare?
- Promote economic development?
- Manage or promote agriculture or water use?
- Just to name a few!!!!!

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 6

Slide Objective:

▪Goal is to make the issue relevant to the trainees. List includes some roles that may be relevant to the trainees at the May 8, Foundation Course "piloting" day. The list may need to change based on the composition of any Course.

Key Issues/Concepts:

▪Any activity that affects energy generation or use affects global warming!

▪Accounting for the use and costs of energy generation and use is a first step in tracking how to improve energy efficiency or reduce waste and consumption.

▪Enforce laws? Use example of enforcing Pollution Under Control certifications – poorly maintained vehicles are a large contributor to global warming!

▪Social welfare? Example: global warming could adversely affect the poor and vulnerable populations. What should you do to minimize this problem?

▪Agriculture? Example: Agricultural productivity is especially vulnerable to climate change and pumping of irrigation water is a huge source of energy consumption!

Global Warming and Its Causes

- The Earth's atmosphere is comprised of gases whose balance is maintained through naturally occurring cycles such as the Nitrogen cycle, Carbon cycle, Oxygen cycle etc.
- Maintaining the balance of natural atmospheric processes is critical to human health and safety. Human activities have the potential to disrupt that balance.

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 7

Slide Objectives:

▪ Relay to the students that natural cycles help to maintain the balance of atmospheric gases – and that manmade activities are threatening that balance.

Key Issues/Concepts:

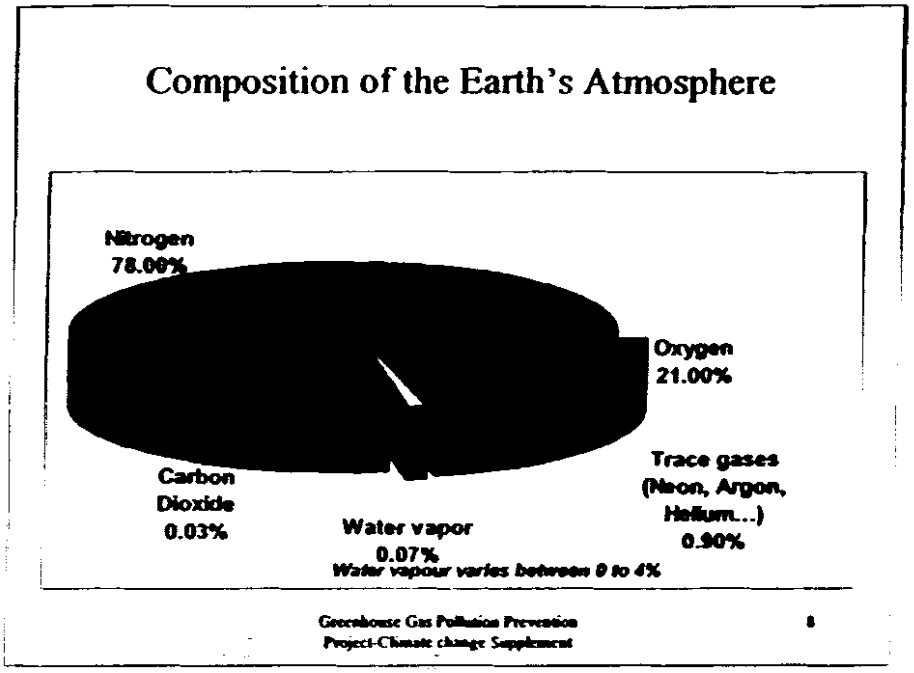
▪ Examples of key atmospheric functions:

✓Contains gases important for the sustenance of life.

✓Blocks harmful ultra violet radiation from the sun from reaching the earth's surface. UV radiation as a cause of cancer, can cause adverse effects on physiological and chemical processes (i.e damage to and mutation of cells in living organisms), etc.

✓Moderates climate through natural air convection and circulation – the process that is responsible for changing seasons, precipitation patterns and distribution.

✓Traps the appropriate amount of heat needed to maintain stable conditions to sustain life through a process called the "greenhouse effect" (which will be illustrated in a subsequent slide).

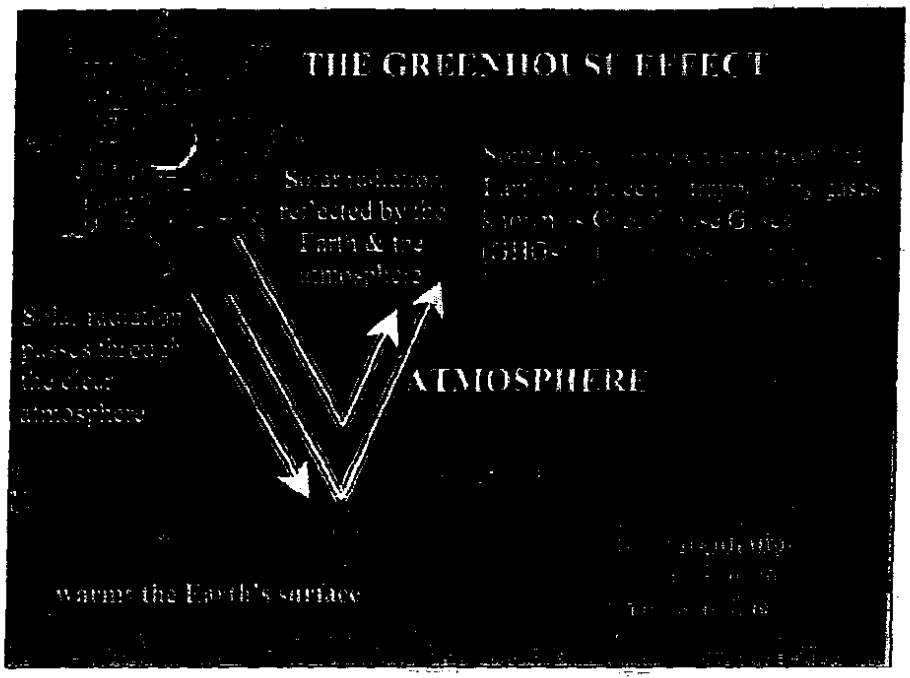


Slide Objective:

▪Gives trainees a basic understanding that maintaining the ratio of **naturally occurring** atmospheric gases is fundamental to sustaining natural processes that support life on earth.

Key Issues/Concepts:

▪Carbon dioxide, CO_2, is a minute fraction of the composition of the atmosphere, but plays a crucial role, along with other other specific gases in maintaining a stable temperatures, especially in the "biosphere" (that part of the atmosphere in which life exists).



Slide Objective:

▪Trainees should come away with a basic understanding of the fundamental physical/chemical mechanisms that affect create global warming.

▪Prompts trainees by asking if they understand the principles by which a functional greenhouse works:

> ***The glass panes of a greenhouse enable heat from the sun to pass through them (sunlight in the visible range), but trap the heat that is absorbed and re-emitted by the earth, thereby warming the inside of the greenhouse.***

▪Instructors should prompt the students by asking them to name as many greenhouse gases as possible.

Key Issues/Concepts

▪Brief overview of the Greenhouse Effect

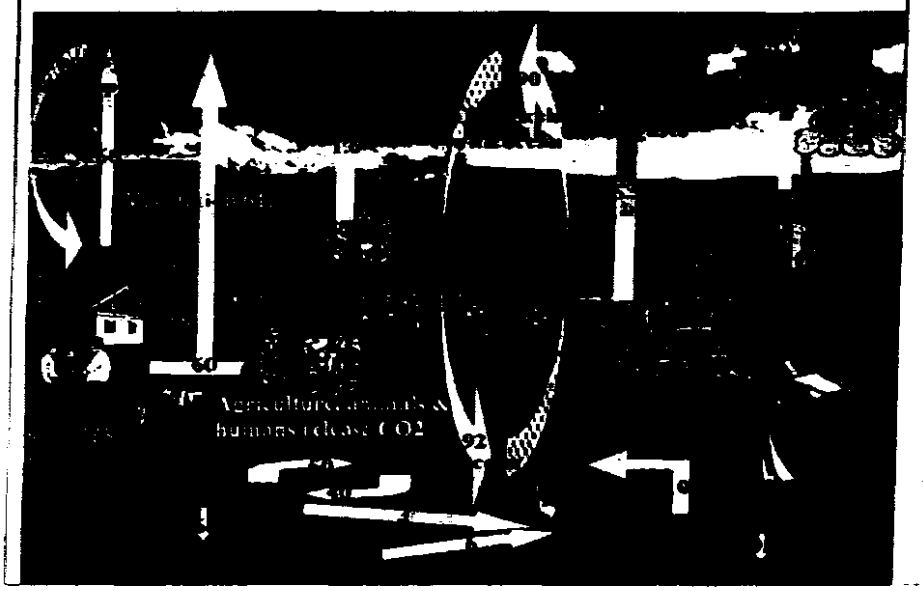
▪A large percentage of the rays of visible sunlight (radiation) pass through the atmosphere, strike the earth's surface and warm it.

▪A part of this energy is re-radiated by the Earth's surface in the form of long-wave infrared radiation. Molecules of certain gases that occur naturally in the atmosphere absorb or trap infra-red radiation, thereby preventing it from escaping back into space.

▪Human activities are adding greenhouse gases to the atmosphere, causing elevated absorption of re-radiated heat by these gases and intensifying the greenhouse effect. Long-term climatic changes may result on account of higher temperatures.

▪Carbon dioxide (CO_2) and methane (CH_4) are two of the primary GHGs. Will look at the types of GHGs and their sources in subsequent slides.

Human Influence on the Carbon Cycle



Slide Objective:

- This slide provides a useful graphic example of how human activities (anthropocentric) are artificially adding GHGs, in this case CO_2, to the atmosphere in a way that alters the natural Carbon Cycle
- Will discuss other types of GHGs and their sources in subsequent slides

Key Issues/Concepts:

- All figures indicate GIGATONS of CARBON – the atmosphere contains about 750 gigatons of carbon
- **Blue** numbers indicate **a flow of carbon** (eg. 60 GT emitted by agriculture, animals etc.)
- **Yellow arrows** indicate natural cycles
- **Red arrows** indicate **human caused emissions**
- Numbers in other colours indicate stored carbon in soil, water, etc.

- **THE CARBON CYCLE**

Carbon is **stored** on the earth in the following ways:

- ✓as organic molecules in living and dead organisms found in the biosphere
- ✓as carbon dioxide gas in the atmosphere
- ✓within the earth's mineral layers (the "lithosphere") as:
  - Inorganic - in fossil fuels (coal, oil, and natural gas and carbonate based sedimentary rock deposits such as limestone, dolomite and chalk)
  - Organic - litter, organic matter, and humic substances found in soils
- ✓In the oceans as dissolved atmospheric carbon dioxide and as calcium carbonate shells in marine organisms

Human Induced Sources of GHG Emissions

Carbon Dioxide (CO_2)

- **Combustion** of any fuel which contains carbon including **fossil fuels** (*Coal, Petroleum, Natural gas*) and **biomass** (wood, dung, plant material)
- **Conversion** of forests (burning) & change in use of land where the CO_2 absorbing ability of vegetation is lost

Methane (CH4)

- Fugitive emissions - *Gas flaring during oil & gas production,*
- Agriculture – *rice paddy fields, burning of residue*
- Livestock - *enteric fermentation, animal manure*
- Emissions from decomposition of municipal bio-degradable waste

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 11

Slide Objective:

- This slide takes trainees to a further level of detail by identifying the key chemical components of GHGs, and the human induced activities that generate them.

Key Issues/Concepts:

Carbon Dioxide

✓Carbon dioxide is currently responsible for nearly 70% of the "enhanced" greenhouse effect.

✓This gas occurs naturally in the atmosphere, but burning coal, oil, and natural gas is releasing the carbon stored in these "fossil fuels" at an unprecedented rate.

✓Likewise, deforestation releases carbon stored in trees. **Discuss forests as "sinks" and explain changes in land use and the difficult science behind estimating how forests and land recycles carbon**

✓Current annual emissions amount to over 23 billion metric tons of carbon dioxide, or almost 1% of the total mass of carbon dioxide in the atmosphere.

✓Although half the Carbon dioxide emissions produced by human activity are absorbed by the oceans and land vegetation, atmospheric levels continue to rise by over 10% every 20 years.

Methane

✓Methane levels have already increased by a factor of two and a half during the industrial era.

✓The rapid rise in methane started more recently than the rise in carbon dioxide, but methane's contribution has been catching up fast.

✓However, methane has an effective atmospheric lifetime of only 12 years, whereas carbon dioxide survives much longer.

Human Induced Sources of GHG Emissions – Lower Volumes but High Impact

- **Nitrous Oxides (N_2O)**
  - Combustion of fuels
  - Production of Nitric acid
- **Perfluorocarbons (PFCs)**
  - Electronics Manufacturing
  - Polymers (i.e. Polycarbonates, PVC)
  - Aluminum production
  - Semiconductor Manufacturing
- **Hydrofluorocarbons (HFCs)**
  - Refrigeration (Substitute to CFCs)
- **Sulphur Hexaflouride (SF_6)**
  - Leaks from electricity transmission and distribution equipment

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 12

Slide Objective:

▪Same as prior slide, noting the additional sources of emissions

▪Note to Instructor: Query the trainees whether they expect to be involved in activities/positions/organizations where GHG gases are being produced or could be reduced?

Key Issues/Concepts:

▪These gases all have much higher **Global Warming Potential (GWP)** than CO2. GWP is a quantification system that allows equal comparison of the intensity by which different GHGs can contribute to global warming. For example, methane has a GWP of 21 and nitrous oxide 310 times that of CO2.

Nitrous Oxide

▪Nitrous oxide plus a number of industrial gases, and ozone contributes to around 25% of the enhanced greenhouse effect.

▪Nitrous oxide levels have risen by 16%, mainly due to more intensive agriculture.

Global Indicators of Climate Change

- The global average surface temperature has increased over the 20th century by around 0.4 - 0.6 °C
- 10 of the warmest years in the 20th century recorded in the last 15 years (1998 - warmest year on record !)
- Increase in frequency & intensity of extreme weather events - floods,droughts & cyclones in recent decades
- Over the period 1990 to 2100:
  - Annual average surface air temperature projected to increase by 1.4 - 5.8°C.
  - Global average sea level projected to rise by 9 to 88 cms

Greenhouse Gas Pollution Prevention
Project-Climate change Supplement 13

Slide Objectives

▪This slide gives trainees tangible evidence that something is changing – the issue is very real.

Key Issues/Concepts:

▪All natural systems, including the atmosphere, are sensitive to even small change. Past or projected changes in temperature may not appear large, but may be significant in a sensitive natural system.

▪The Instructor may want to prompt trainees by asking if they've can name a few extreme events in India. Note that climate change researchers think climate and extreme events may well be linked.

*Data on surface temperature increases and projected surface air temperatures and sea level changes are from the IPCC.

Potential Environmental Impacts of Climate Change

- **Affect on Water (Hydrological) Cycles**
  - Impact on water resources through change in runoff/groundwater recharge
  - Increase in rain / snowfall and resultant soil erosion
  - Increase in frequency & magnitude of floods
- **Melting of Glaciers**
  - Rise in mean sea levels (~ 50 cms by 2100)
  - Decrease in sea-ice cover
  - Increased flooding & inundation of coastal areas
  - Seawater intrusion into freshwater sources:
    - Loss of wetlands & mangroves
  - Increase in sea-surface temperature
  - Changes in salinity, wave conditions & ocean circulation

Greenhouse Gas Pollution Prevention Project-Climate change Supplement

14

Slide Objective:

▪The next series of slides focus on the dramatic ENVIRONMENTAL and SOCIO-ECONOMIC impacts from climate change – again, instill a sense that this is a real issue with potentially enormous consequences

Key Issues/Concepts:

▪The global average sea level has risen by 10 to 20 cm over the past 100 years.

▪Models project that sea levels will rise another 9 to 88 cm by the year 2100.

▪Coastal zones and small islands are extremely vulnerable.

▪Flooding and coastal erosion would worsen.

▪Sea-level rise could damage key economic sectors and threaten human health.

▪Valuable coastal ecosystems will be at serious risk.

▪Ocean ecosystems may also be affected, affecting their productivity

▪Human activities will also play a role.

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Socio-Economic Impact of Climate Change

Worsening Health Effects

- Indirect impact of increased storms, cyclones & flooding on health
- Increase in heat waves, exacerbated by urban pollution & increased humidity
  - increased incidence of heat related illnesses
- Net increase in geographic range, incidence & seasonality of vector borne diseases
  - malaria, dengue, yellow fever & encephalitis
- Respiratory diseases/allergic disorders

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 16

Key Issues/Concepts:

- **Health**

✓ Climate change is expected to have wide-ranging consequences for human health.
✓ Heat waves are linked to cardiovascular, respiratory, and other diseases.
✓ By reducing fresh water supplies, climate change may affect water resources and sanitation.
✓ Any increase in the frequency or intensity of extreme weather events would pose a threat.
✓ Food security may be undermined in vulnerable regions.
✓ Higher temperatures may alter the geographical distribution of species that transmit disease.

- **People will have to adapt or intervene to minimize these enhanced health risks.**

✓ Adaptation strategies can include infectious disease surveillance, sanitation programmes, disaster preparedness, improved water and pollution control, public education directed at personal behaviour, training of researchers and health professionals, and the introduction of protective technologies such as housing improvements, air conditioning, water purification, and vaccination.

Sources:

1. www.unfccc.de
2. 2. Background Paper - Roundtable on Climate Change and Indian Industry: Preparing for the Year 2000 (CII and USAID)

Socio-Economic Impact of Climate Change

Impact on Agricultural Output

- Regional outputs of crop may be affected due to
  - changes in climate, water levels, heat conditions
- Food security risks are primarily local and national:
  - Regional effects could vary widely

Impact on Human Settlements

- Human Settlements are directly affected through extreme weather
- The most widespread risk - loss of life, land & property - is through increased rainfall, sea level rise, extreme climate events

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 17

Key Issues/Concepts:

▪Agriculture

✓Global agriculture will face many challenges over the coming decades.
✓Some agricultural regions will be threatened by climate change, while others may benefit.
✓Higher temperatures will influence production patterns.
✓Food security risks are primarily local and national: Regional effects could vary widely

...effective policies can help to improve food security. CC impacts can be limited by changes in crops and crop varieties, improved water-management and irrigation systems, adapted planting schedules and tillage practices, and better watershed management and land-use planning

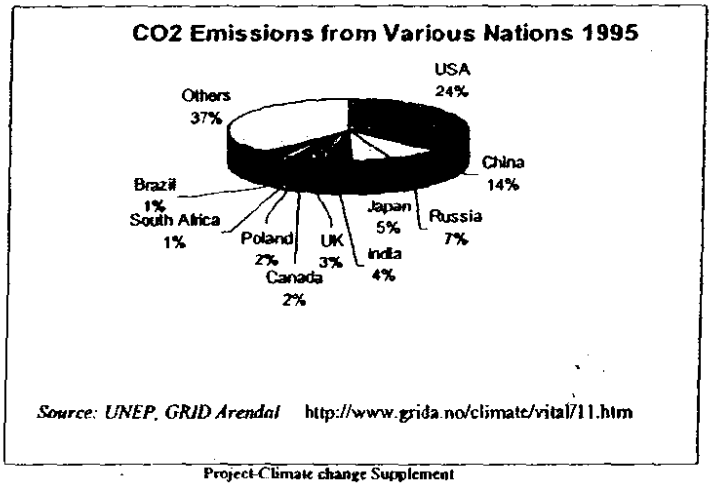
▪Human Settlements, Energy & Industry

✓Climate change will affect human settlements.
✓Infrastructure will become more vulnerable to flooding & landslides.
✓Tropical cyclones are expected to become more destructive in some areas.
✓Warming, dryness and flooding could undermine water supplies.
✓Agriculture and fisheries are sensitive to climate change.
✓Heat waves would become a greater threat to human health and productivity.
✓Sea-level rise will affect coastal infrastructure and resource-based industries.

...local capacity is critical to successful adaptation. The capacity of local communities to adapt tends to be strongly correlated with wealth, human capital and institutional strength. The most effective sustainable solutions are those that are strongly supported (and often developed) locally. The role of higher-level bodies is then to provide technical assistance and institutional support.

Source: 1. www.unfccc.de
2. Background Paper - Roundtable on Climate Change and Indian Industry: Preparing for the Year 2000 (CII and USAID)

India's Contribution to Global GHGs



Project-Climate change Supplement

Slide Objective:

▪To establish the fact that India is a key "player" in global warming

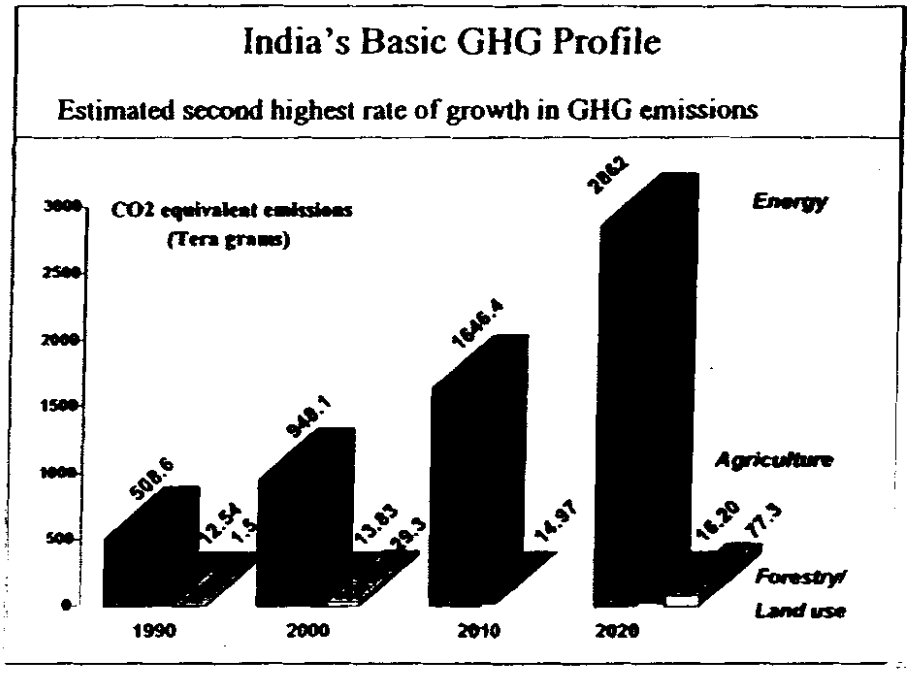
Key Issues/Concepts:

▪The US is obviously the largest contributor with high volume and high per-capita generation of GHGs. Current US administration is seeking ways to address climate change in a manner that does not substantially compromise economic development

▪Brazil, China and India are in similar situations in terms of emissions generation and socioeconomic conditions and have taken similar positions in addressing climate change

▪The EU is aggressively addressing it contributions to global warming and for all practical purposes, is leading international efforts to address the issue.

Country	*Total emissions (million tons/yr)*
US	5229
China	3007
Russia	1548
Japan	1151
India	803
UK	565
Canada	471
Others	9377
World	**22150**



Slide Objective:

To emphasize that **decisions and interventions made today** about how India plans and executes policies and programs for energy development and use are critical. Administrative Officers may be in a position to affect the "path" of energy generation or use and to promote (even in a small way) the reduction of global warming impacts.

Link this idea to the other Energy Modules which address energy efficiency, reform of the power sectors, etc. all of which will affect India's future demand for energy and how that energy is generated

Will give an overview of technologies that can contribute to improved efficiency and reduced GHG emissions in Session II.

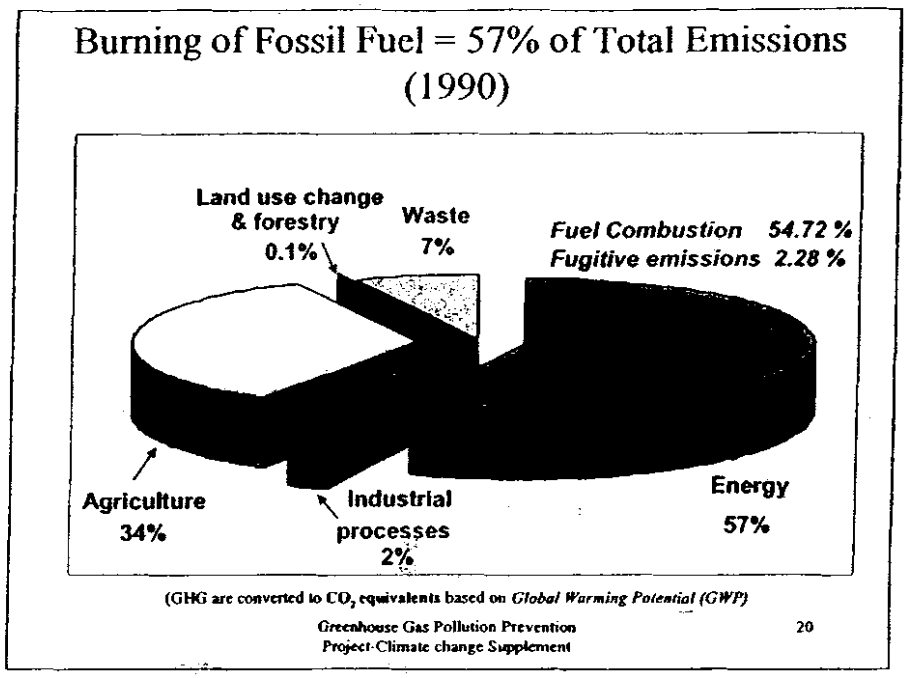
Key Issues/Concepts:

Figure represents projections of emissions till 2020

Per capita CO_2 emission - projected to increase from 1.19 tones of carbon (1990) to 460-485 tones carbon (2020)

Illustrates very high rate of growth – why? Combustion of coal in thermal power plants will be the main source of electricity generation into the future in India

Source: ALGAS India, ADB



Slide Objectives

Link this slide to the prior slide. Actions and policies that improve the efficiency with which fossil fuel based energy is utilized (either through production of electricity or in the transportation sector), that promote use of cleaner sources of fuel will have great impact on reducing India's GHG emission profile.

Key Information Points

We'll be taking a look at the technology options available in the Energy & Transport sector in the next session and take a brief look at the options under Agriculture & Land & Land use change & forestry.

The pie-chart represents the Sectoral contributions, in CO_2 equivalent, to the 1990 inventory:

Fuel combustion - refers to CO_2 emissions due to burning of fuels such as coal, generally to generate energy **(54.72%)**

Energy conversion - (Petroleum, Coal, Natural gas) -CO_2 & SO_2 **(45.15%)**

Road transport - CO_2, CO, NO_x and VOC **(5.82%)**

Burning traditional biomass fuels - (Cook stoves, open fires, charcoal production etc.) - CH_4 and NO_x **(3.75%)**

(Note: CO_2 from this source considered nil under IPCC approach)

Fugitive emissions - refers to release of Carbon due to unintended gas leaks from the processing, transmission, and/or transportation of fossil fuels **(2.28%)**

Fugitive emissions Coal mining and handling activities - CH_4

Oil & natural gas (e.g. During flaring, venting, leaks etc) - CH_4

Emissions from Industry (2%)

Cement manufacture during production of clinker - CO_2

Nitric acid production - N_2O

Forestry & Land use changes (0.1%)

Flux in CO_2 absorption/emission into atmosphere on account of Change in forests & other biomass stock, Forests & grassland conversion, Abandoning of managed lands that regrow into grasslands/forests

Agriculture (34%) (mainly generation of methane)

Enteric fermentation in domestic livestock - **(15.86%)**

Animal manure - **(1.90%)**

Rice fields & Agricultural soils - **(15.97%)**

Burning of agricultural crop residue - **(0.34%)**

Waste (7%) (mainly generation of methane)

Municipal solid waste decomposition - **(0.75%)**

Domestic and commercial waste water - **(0.15%)**

Industrial wastewater - **(6.1%)**

India's Vulnerability to Climate Change

- **Flooding - changes in surface water hydrology**
  - Economic costs of flood damage in India are rising due primarily to greater exposure of more people and settlements/infrastructure. Rising land scarcity and growing populations mean even higher vulnerability
- **Incidences of extreme events**
  - 19 flood and 21 drought years in the last 120 years in India
  - Due to high population densities in vulnerable areas, potential for damage/loss of property, infrastructure and utilities in India is high as is potential for mortality

Greenhouse Gas Pollution Prevention Projects-Climate change Supplement 22

Key Issues/Concepts:

•Flooding is of greatest concern to India, due to vast low lying areas, and long coast line.

•Droughts,cyclones and other events can have dramatic impact on agricultural productivity.

Global Responses to address Climate Change

Slide Objective:

- The instructor should pause and review the earlier part of the session

Specific Responsibilities of Developed and Developing countries

- Developed countries to:
  - Take the lead in climate change adaptation and mitigation – greater financial capacity and capability
  - Implement policies & measures to mitigate GHG emissions
  - Reduce GHG emissions to 1990 levels by 2012
  - Help developing country Parties adapt to climate change, identify sources of GHGs, facilitate technology transfers to help reduce GHG emissions
- Developing countries:
  - Do not initially take on commitments to mitigate GHG emissions to a specific level. Possibly after 2012
  - Facilitate actions within their own countries to identify and reduce GHG emissions

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 25

Key Issues/Concepts:

▪This slide elaborates on differentiated responsibilities of different parties

▪Annex I parties refers to industrialized countries who had only broad commitments to reduce GHG emissions to 1990 levels, and no specific mitigation targets. Commitments to demonstrate that developed countries were taking the lead in climate change mitigation.

▪Annex II parties refers to the highly developed countries (e.g. OECD) who would have the hardest targets and would also help finance non-Annex II mitigation. Annex II countries are a subset of Annex I parties.

▪The idea of the differentiated responsibilities is due to the fact that the current state of climate is mainly as a result of emission by the industrialized countries

Conference of Parties (COP)

- COP is the UNFCCC coordinating body
- Has met 7 times to date to devise concrete approaches for achieving UNFCCC goals:
- A long, complex process among 186 countries with diverse interests and needs
- Two subsidiary bodies for more detailed discussions:
  - Subsidiary Body for Implementation (SBI)
  - Subsidiary Body for Scientific & Technological Assessment (SBSTA)
- India is a party to the UNFCCC so has been engaged in the entire climate change negotiation process
- India is a leader in representing the interests of developing countries in climate change negotiations

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 26

Key Issues/Concepts:

COP 1: Berlin 1995	COP 2: Geneva 1996
COP 3: Kyoto 1997	COP 4: Buenos Aires 1998
COP 5: Bonn 1999	COP 6: Hague 2000
COP 6: Bonn 2001	COP 7: Marrakech 2002

Incidentally, COP 8 to be held in India in Oct - Nov 2002

COP 3
The Kyoto Protocol of 1997

- Sets forth a set of specific mechanisms for climate change mitigation
  - Legally binding commitments of GHG emission reductions on developed countries. These countries must "cap" their GHG emissions at 1990 levels by 2012
  - Developing countries are not required to set caps until after 2012

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 27

Slide Objective:

▪The slide discusses COP 3 in more detail as it was an Epoch in climate change dialogue

Key Issues/Concepts:

▪It came out for the first time with market based mechanisms as a means of addressing climate change impacts

▪It brought in the principle of equity; whereby the developing countries would get additional investment and advanced technologies thereby be able to adopt a cleaner path of development

The Kyoto Flexibility Mechanisms

- Developed countries naturally want to find least cost options for reducing GHG emissions
- Three flexibility mechanisms structured to provide options meeting emission reduction requirements:
  - Joint Implementation (JI)
  - Clean Development Mechanism (CDM)
  - International Emission Trading (ET)

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 28

Slide Objective:

▪This slide details out the flexibility mechanisms that specify a regulatory framework for allowing investments in climate change mitigation projects.

Key issues/Concepts:

▪The flexibility mechanisms recognize global nature of climate change impacts and treats emission reductions anywhere in the world as equal and enable its conversion into a globally tradable commodity

Flexibility mechanisms

- Joint Implementation
  - Emission reductions created by projects that reduce relative GHG emissions can be transferred between developed countries
- Clean Development Mechanism
  - Developed countries can invest in projects in developing countries that create emission reductions and use those reductions to meet their emission caps.
  - *India has the potential to benefit from foreign investments in India for this purpose*
- Emissions Trading
  - Developed countries trade emission reductions that are above and beyond their requirements

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 29

Slide Objective

- Show trainees that different mechanisms have been developed under Kyoto for addressing GHG reduction. All are related to the concept of creating "emissions reductions". Subsequent slide gives basic explanation
- The CDM and other up and coming regional or country specific emissions reduction programs (I.e. in Australia, the EU, UK, Netherlands, etc.) are of direct relevance to India

Key Issues/Concepts:

- **Joint Implementation** (JI) - *Under Article 6 of Kyoto Protocol.*

Project Requirements:

✓Approval of both Parties involved

✓Emissions reduction units (ERUs) are additional to any that would otherwise have occurred in the absence of the project (*Additionality*)

✓ERUs to accrue only if national system for estimation of emissions is in place, and reporting by developed countries is up to date

✓Acquisition of ERUs to be supplemental to domestic actions for meeting commitments

- **Clean Development Mechanism** *Under Article 12*

Objective is to assist developing countries in achieving sustainable development and in contributing to the objective of the Kyoto Protocol and UNFCCC and developed countries in achieving their commitments. Developing countries would benefit from projects that result in Certified Emissions Reductions (CERs) while developed countries could use CERs to comply with their reduction targets.

CDM Project Requirements:

✓Voluntary participation by both Parties involved

✓Real, measurable and long term benefits related to mitigation of climate change

✓Reductions to be additional to any that would occur in the absence of the project

What is an Emission Reduction?

- A climate change mitigation project (CCMP) like a wind energy project that generates power, creates no GHG emissions per unit of power produced relative to the existing "baseline" source of a unit of power, such as a thermal power plant that burns coal
- The difference between the baseline level of GHG emissions created by the coal fired power plant and that created by the wind project is the emission reduction created by the wind project
- Under JI, CDM and other evolving mechanisms – these reductions may have monetary value as a commodity and can be bought and sold like any other good

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 30

Slide Objective:

▪To describe the complexity of baseline evaluations/calculations which are critical to estimating the reductions created by a project.

Key Issues/Concepts:

▪The baseline represents the emissions that would occur in the absence of a climate change mitigation project.

▪The difference between the baseline and the project case represents the value of the carbon emissions reduction.

▪International standards for CCMPs demand a credible, quantifiable and verifiable baseline of emissions

▪Key step is in determining additionality for projects for market based funding

▪Project specific baseline necessary to accurately determine the CCMPs emission reductions

Reductions at Low Cost

- Reductions generated in developing countries are often cheaper to create per unit than in developing countries
- Emission reductions created in *developing countries* can be sold to developed countries
- Developing country project developers receive revenue (and possibly improved technology). Developed countries get reductions at a lower cost than they can achieve at home that can be used to meet their emission reduction requirements

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 31

Slide Objective:

•This slide brings up the motivations for buyers and sellers of reductions, which is that reductions can be achieved with marginal efficiency in developing countries.

•It stresses the importance of lower cost of emission reduction, which is the basic purpose of market forces/mechanisms

Key Issues/Concepts:

•ER generated in developing countries are likely to be significantly cheaper compared with those in industrialized countries

•Major benefits accrue to the industry in developing countries through fresh investments and transfer of advanced technologies

Session Review

- Evidence suggests that human activities, primarily burning of fossil fuels, are causing global warming
- The economic, social and environmental impacts and costs of global warming could be significant
- India has a key role in international climate change efforts due to its high volume and growth rate of GHG emissions
- Mechanisms are being developed for the international community, including India, to participate in common solutions
- The GOI is evolving policies and institutions to participate in international mechanisms for climate change mitigation

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 33

Slide Objective:

•The instructor should prompt the participants for doubts and their grasp of the subject

Preview of Next Session

- Project based GHG emissions reductions is the key mitigation approach today
- What kind of projects?
- What is the role of technology?

Greenhouse Gas Pollution Prevention Project-Climate change Supplement 34

Slide Objective:

•The slide leads the class into the next session that discusses the operational part of climate change mitigation through clean energy projects

Overview of Strategies to Address Climate Change – Session 2

GOAL OF THIS SESSION:

▪In the first climate change module, students learned about the causes and effects of climate change. As well, they had a brief introduction to the international negotiations that are taking place (most significantly the United Nations Framework Convention on Climate Change).

▪The purpose of this second module is to educate the students about two main strategies to address climate change impacts: **Adaptation** and **Mitigation**.

Key Issues/Concepts:

▪Students should understand that responses to climate change varies from reactive (Adaptation) to proactive (Mitigation).

▪Also, current "cutting-edge" mitigation concepts, such as tradeable emissions reductions (market based approaches) will be discussed.

▪Additionally, this module will investigate in greater detail some specific **technologies**, within key economic sectors (e.g. power, transportation), that can limit greenhouse gas emissions,

▪Finally, there will be opportunity towards the latter portion of the presentation to get **feedback** from the students on ideas/suggestions on how they can make a difference as civil servants in their day-to-day operations. Those discussion slides will serve as an important feedback loop for the training, as student-generated ideas can be included in future iterations of the training.

Strategies for Addressing CC Impacts

- Adaptation – A reactive strategy ***in response*** to, or in anticipation of, changed conditions.
- Mitigation – A strategy that helps prevent adverse effects of climate change through controls.
  - Two mitigation approaches:
    - Policy/regulatory or "Command and Control"
    - Market Based (Project Approach)
- Actual strategy adopted by a country is likely to be a mix of the two approaches

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 2

Slide Objective:

▪Purpose of this slide is to inform the students of two general types of responses to address climate change: Adaptation and Mitigation.

Key Concepts/Issues:

▪Adaptation is a **reactive** or defensive strategy that does not address the root cause but attempts to minimize the resulting impacts of greenhouse gas emissions.

▪Mitigation is a **proactive** strategy, based on understanding of the real causes, which offers a sustainable solution to reduce or limit generation of greenhouse gas emissions.

▪By adopting a balanced portfolio of policy options aimed at reducing emissions, adapting to climate change, and improving the knowledge base, national policymakers can reduce the risks of rapid climate change while promoting sustainable development.

▪Each country must formulate its own strategy, which is most likely a mix of the two approaches. Adaptation will always be necessary, as Governments will need to respond to the lingering effects of past greenhouse gas producing activities. However, mitigation approaches can help curtail the level of need for future adaptive measures.

Adaptation

Six general approaches for adapting to climate change

- Prevent losses through advance actions
- Reduce losses to a tolerable level
- Share losses through government disaster relief
- Change a use or activity that is no longer viable
- Change the location of an at-risk activity
- Reinforce a site/facility (e.g. against flood damage)

Slide Objective:

▪This slide breaks down Adaptation to six main approaches. The instructor should stress that these actions are responded to imminent or anticipated impacts. Though "we" can postulate the upcoming effects of climate change, there is no hard science on when and where these effects will impact most significantly (e.g. how to determine when and where rising sea levels will cause flooding).

▪It is also important to emphasize that these are **approaches** or **responses**, and to call them actual strategies is giving them more definition than deserved. The point being that adaptation is not a hard or firm strategic approach – but rather represent best-guess actions to address some future undefined ecological/social impact.

Key Issues/Concepts:

▪The broad range of Adaptation approaches essentially strive to reduce the aggravation of CC impact.

▪Some examples:

✓Spreading the "risk" amongst lower economic and higher economic communities and regions (Disaster Relief)

✓Re-siting activities from areas that scientific modeling indicates might be impacted by ecological changes

✓Employing innovative approaches such as redesigning crop mixes to ensure a guaranteed minimum yield (e.g. interspersing hardy but lower producing crops with higher production but less resilient strains – a sort of crop "hedging")

Adaptation – Major considerations

- Costs
- Social implications
- Impacts in future
- Side reactions
- Scope for administrative actions

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 4

Slide Objective:

▪This slide enumerates broad considerations that administrative officers must keep in mind while devising an adaptation approach – and which ultimately weigh into a Government's decision to whether or not to choose Mitigation measures in the future.

▪The field of environmental economics has shown us that traditionally, governments have not assigned accurate costs and value to human health and the environment. Clearly, regulatory (Mitigation) approaches may involve expenditures by the regulated community, which ultimately gets passed along to the consumer. However, Adaptation approaches also cost the consumer, through higher insurance premiums, through destruction of property, through crop and livestock loss, etc.

Key Issues/Concepts:

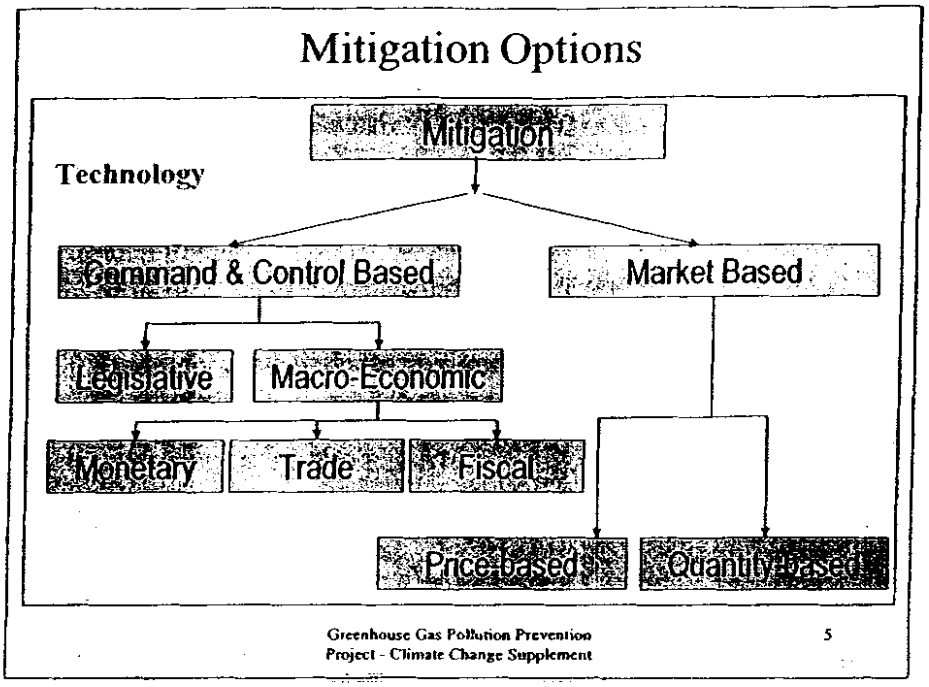
▪Each Adaptation approach has explicit and implicit costs. For example, re-siting a hydro-electric power utility, has capital cost implications as well as relocation and resettlement issues for the communities affected.

▪Success of an Adaptation approach is closely linked to social considerations as it can lead to drastic changes in the lifestyles of communities or affect incomes.

▪Approaches that postpone the adverse impact to future serve only as stopgap arrangements. These would, therefore have to be understood and followed up with long term solutions.

▪Decision makers have to consider any side effects that an approach might have. These side reactions might lead to increase in emissions of hazardous non-GHG substances.

▪Administrators have to keep the GOI sustainable goals in perspective in devising adaptation approaches.



Slide Objective:

▪This slide informs the student of the broad panorama of mitigation options available to governments and international treaty bodies. It will be important to stress in the next few slides that Mitigation is the only option which has the potential to reduce greenhouse gas emissions. This can be accomplished through a punitive regulatory approach – or through incentives or market-based approaches.

▪Students should understand that Governments can play an important role in how the regulated community perceives the problem and the solution.

Key Issues/Concepts:

▪The approaches are categorized according to their nature and degree of administrative control

▪Technology would be an inherent underlying need of all the mitigation approaches

Source(s):

India: Mainstreaming environment for sustainable development - Asian Development Bank, 2000

GEO-2000 (www.unep.org/geo2000) - The GEO Project report

Command & Control Approach

A 'Push' Strategy – To Enforce Pollution Control

- Through Legislation/Rules
  - Technology requirements, emission limits, etc.
  - Ambient environmental quality targets
- Through Policies
  - Monetary: focusing on capital related incentives (like interest rates, credit for investments)
  - Trade: focusing on incentives based on levies and tariffs
  - Fiscal: focusing on incentives like lower taxes, depreciation rates

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 6

Slide Objective:

- The purpose of this slide is to describe the traditional government regulatory approach which uses legal provisions to enforce pollution control, thus is termed as "Command & Control"
- This approach is based on a belief that society can be ruled through force. However, lacking significant incentives, this approach tends not work in the long run as the regulated community looks for loopholes or provisions which allow them to continue "business-as-usual."

Key Issues/Concepts:

Legislative Approach

Advantages

✓ Generally enforced through fines & penalties- in theory is easier to implement

Disadvantages

✓ Applicable to all polluters - irrespective of economics of abatement

✓ No incentives to reduce pollution beyond specified limits

✓ Standards generally based on best available technology which locks firms into accepted technology

✓ Requires auditors/inspectors to ensure compliance and levy fines

Policy Based Approach

Advantages

✓ Relates to central government functions, so is easier to mandate down to the states/localities

✓ Attractive to the central government as they may generate fiscal surplus

Disadvantages

✓ Indirectly influences environment

✓ Tends to be a passive approach

✓ Levy or tariff "incentives" may not be in scale to what industry would have to pay to comply, thus no real motivation for the regulated industry

Market Based Approach

A 'Pull' strategy – Incentives for Pollution Control

- Market Based Instruments – Economic Tools that give monetary incentives for environmentally sound options
  - Typically through a regulatory framework
- Market Based Instruments could be:
  - Price-based Example – CARBON TAXES
  - Transaction Oriented (i.e. Emission Trading) – two parties make a transaction for their mutual benefit. (US Acid Rain Programme)

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 7

Slide Objective:

•The slide introduces the concept of market-based mechanisms – or letting the "market" find the most efficient value of environmental and social well-being and the associated cost for deleterious actions which affect the ecology/society. Market-based mechanisms presupposes that society will eventually assign the most appropriate value to human health and the environment, and also determine the market value of related "derivatives" (such as tradeable emission permits, subsidies, etc).

•Clearly, there is a COST to comply – but what a market does is help show that there is an equal and just as significant COST for not complying.

Key Issues/Concepts:

•Under a Regulatory framework, stakeholders such as commercial organizations who have caps on their emissions, are allowed to "buy in" reductions through investment

•The main drivers are the reduced transaction costs.

•By creating economic interest/disincentives, the stakeholders become proactive in promoting GHG reduction projects

Price-Based Market Instrument Examples

✓Pollution tax: Emissions/effluent charges

✓Deposit refunds: Refundable deposits to encourage climate friendly activity

✓Subsidy for abatement inputs: tax concessions, loans etc. to encourage climate friendly activity

✓Input Taxes/Product Charges: Fees added to price of inputs/ outputs of polluting products

✓Differential taxes: Promotes consumption of environment friendly products

✓User/Administrative charges: Direct payments for costs of collective/public treatment of pollution

✓Demand management: Encourage public consumption of Eco labeled products

✓Transaction Oriented Based Market Instruments such as Emission Trading

Source(s):

India: Mainstreaming environment for sustainable development - Asian Development Bank, 2000

Barriers in India to Market-Based Approaches

- Policy
- Institutional and Organizational
- Financial

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 8

Slide Objective:

▪The purpose of this slide is to impress on the students that market-based approaches are no panacea, and that there are significant barriers in the India context to implementing these.

Key Issues/Concepts:

▪Significant barriers to implementation of market-based instruments in India:

Policy Barriers

✓Inadequate understanding of MBIs amongst stakeholders
✓Non existence of effective regulatory framework
✓Need for a shift of overemphasis on levels of emissions to quantity of emissions
✓Economic and power sector reforms yet to take effect
✓Radical changes required in current legislation

Institutional & Organizational barriers

✓Improvement required in effectiveness of institutional/organizational framework
✓Monitoring & enforcement agencies need to be effective
✓Current monitoring procedures need to be simplified

Financial

✓Uncertainty about compliance costs, as firms lack exposure to pricing of permits
✓Scope for financial malpractices exist; issue of credibility of permits is critical
✓Subsidies for resources may skew market for MBIs - eg. water (which is subsidized) could be used to dilute effluents

The US Acid Rain Program – A Market Example

- Regulatory Cap – Under "Clean Air Act of 1990" in the U.S. set a goal of reducing:
  - Sulphur Dioxide (SO_2) - by 10 Million Tons below base year (1980)
  - Nitrogen Oxides (NO_x) - by 2 Million Tons below base year (1980)
- Primarily aimed at reducing SO2 emission from electric power generation which accounts for 2/3 of all SO_2
- Creates a uniquely identifiable & fully bankable tradable unit:
  - "SO2 Allowance" = legal authorization to emit 1 ton SO2.
- Mandates continuous monitoring and accounting of permits
- One of the largest & most successful 'Emission Cap & Trade' programs

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 9

Slide Objective:

▪The purpose of the slide is to **illustrate** the Market based mechanisms through an operating example. The Instructor may decide to go into the details based on the students' interest.

Key Issues/Concepts:

Key Definitions Within "Cap and Trade" Programs:

✓An emission "cap": a limit on the total amount of pollution that can be emitted (released) from all regulated sources (e.g., power plants); the cap is set lower than historical emissions to cause reductions in emissions

✓Allowances: an allowance is an authorization to emit a fixed amount of a pollutant (eg; 1 t of SO_2) during or after a specified year

✓Measurement: for accurate tracking of all emissions

✓Flexibility: sources can choose how to reduce emissions, including whether to buy additional allowances from other sources that reduce emissions

✓Allowance trading: sources can buy or sell allowances on the open market. Excess allowances not sold can be banked for use in future years

✓Compliance: at the end of each compliance period, each source must own at least as many allowances as its emissions

Comparison of Market Approaches

Command & Control	Market Based
Advantages • Easy to implement • No intensive monitoring needed	**Advantages** • Real emission reductions are achieved • Lower cost of mitigation • Lesser risks • Incentives to innovate
Disadvantages • No incentive to reduce emissions • No incentives to upgrade technologies • Costly and inflexible	**Disadvantages** • Needs elaborate regulatory framework • Properly defined binding obligations • Needs effective institutional set up

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 10

Slide Objective:

•The objective of this slide is to bring out advantages and disadvantages of the two mitigation approaches.

Key Issues/Concepts:

•Command and Control is based on a belief that society can be ruled through force. However, this approach does not work in the long run, when loopholes in legislations are found.

•The instructor could elicit student response before projecting the slide and judge their understanding/interest

•The differentiation may be elaborated with some live examples from instructors or students experiences or some examples listed out in earlier slides

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CCMPs – A Market Based Mitigation Approach

- A Climate Change Mitigation Project (CCMP):

  Any project based on a "better than commonly used" technology that substantially reduces GHG emissions per unit of energy produced/ consumed or per unit of product/ service produced
  - Creates emission reductions that may become a "tradable commodity" in a GHG emission market
  - UNFCCC or voluntary schemes may recognize emission reductions created by a CCMP for attracting investors
  - Quick example: A bagasse based cogeneration project

Technology underlies most CCMPs

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 11

Slide Objective:

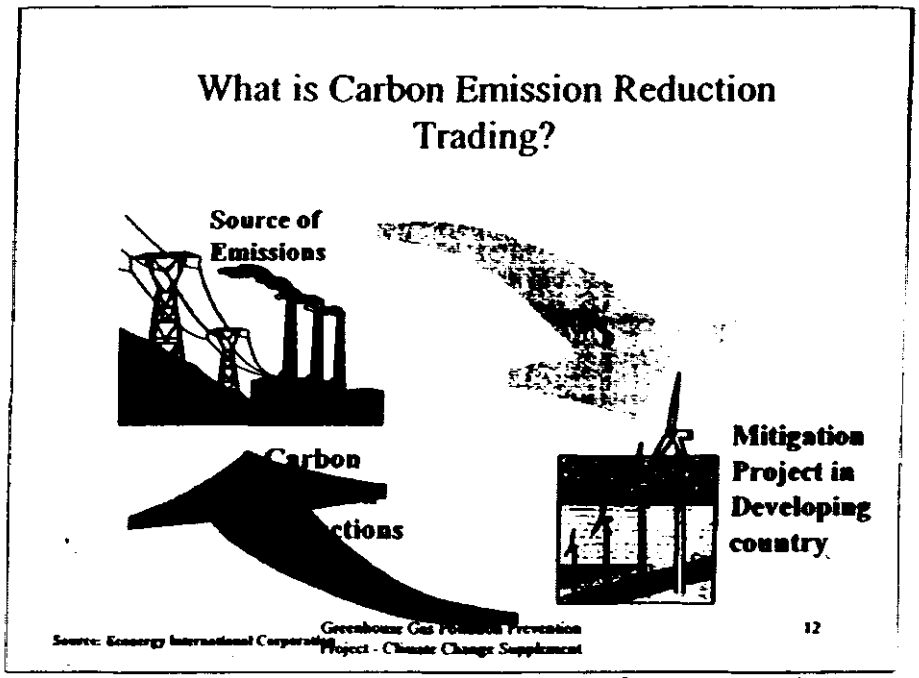
▪This slide will help instructor to explain how a climate change mitigation project forms basis for allowing trade in the commodity i.e. Emission reductions it would generate.

Key Issues/Concepts:

▪The thrust is to establish the link between a CCMP and use of the GHG abatement benefits to enable investments in them

▪It goes further in describing one of the regulatory framework as offered under Kyoto Protocol mechanisms that were described in Session 1

▪Lastly the instructor should emphasize the importance of upgraded technology can offer in CCMPs



Slide Objective:

▪This is a graphic representation of how a CCMP generates reductions, which are translated into "an asset" on the project company's books.

Key Issues/Concepts:

▪The Investors in a developed country, with a regulatory cap on quantity of emission, have an option to "purchase" reductions from the CCMP brings in investments in it in lieu of the sale of reductions

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Benefits of CCMPs

- Environment:
  - CCMPs substantially reduce adverse impacts on environment while delivering needed service
- Economic:
  - CCMPs can possibly attract additional investments
- Social:
  - Can lead to additional employment
  - Positive impact on human health near project site

CCMPs ➡ "Sustainable Development"!!!!

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 13

Slide Objective:

▪The purpose of this slide is to give the students an awareness of the three legs that support the chair of sustainability. Emphasis should be given here to understanding the interrelatedness of each of these societal goals – and how it is difficult to discuss one in the absence of the others.

▪The instructor should emphasize the Sustainable Development potential of a climate change mitigation activities – and that it can benefit all levels of society.

Key Issues/Concepts:

▪There are several definitions of "Sustainable Development", but the instructor may use a simplified one:

"A Developmental project/activity that does not lead to net consumption of natural resources over its lifecycle."

Types of CCMPs

Technology underlies most CCMPs

- ***Renewable energy technologies:***
  - Sustainably Grown Biomass-Combustion, gasification
  - Solar-Thermal, Photovoltaics
  - Wind, mini hydro, hydrogen, fuel cells
  - Waste to energy
- ***Energy Efficiency Improvement technologies:***
  - Waste heat recovery, Cogeneration, Combined cycle power
  - Renovation, modernization, repowering
- ***Fuel switching technologies:***
  - Coal or heavy oils to biomass or natural gas

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 14

Slide Objective:

▪The slide relays that technologies that are the underpinning of most climate change mitigation projects. The theme throughout these slides is that climate change mitigation will most likely be achieved through technological solutions – because altering or modifying human behavior is a much longer process.

▪The instructor may go over each category to establish how it meets the definition, benefits and other criteria of CCMP

▪He/she may illustrate with live example of Indian Projects

Climate Change Mitigation Options
- *Energy*

- Clean Energy Technologies (CET) within the Energy Sector are those that provide the same amount of energy with lesser amount of primary fuel, via:
  - –More efficient generation from same fuel
  - –Using alternative fuels (fuel-switching)
  - –Transmission of energy in a more efficient manner
    Generation:

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 15

Slide Objective:

▪The purpose of this slide to emphasize the critical linkage between clean energy technologies and CCMPs within the ENERGY SECTOR.

▪The important point here is that energy generation is a technology-intensive sector, therefore it is logical that the solutions for greenhouse gas production lie within technology improvements and modification.

Key Issues/Concepts:

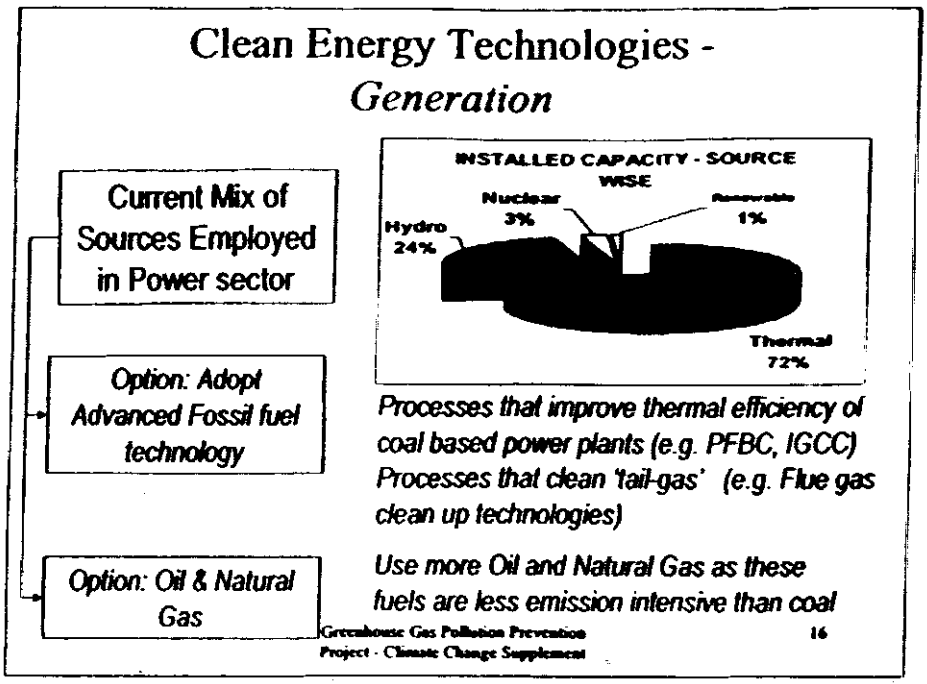
▪Generation, transmission and use of energy is by far the largest source of GHG emissions

▪Energy is a basic necessity of society. Its generation, especially in commercial form like electricity or gas natural resources, can undermine public health, environment and regional ecology

▪Energy generation also emits GHGs mainly CO2 causing global warming.

▪Use of carbon neutral energy options offers a mitigation option to control the growth rate of GHG emissions.

▪However, CETs may involve additional capital costs over the conventional fossil fuel based options. Therefore, their implementation by industry or utilities could be difficult.



Slide Objective:

- The purpose of this slide is to illustrate the current methods of energy generation, and to list out possible CETs in the generation process.

Key Issues/Concepts:

- Indian Energy sector- 72% of total power generation is based on thermal power plants primarily based on coal
- Annual Growth Rate in Energy Consumption is 8%; To meet this demand growth, 12000 MW capacity addition planned between 2002-07, most of it would be coal based
- Main reasons for high dependence on Coal for power generation
  - ✓Proven reserves of coal - approximately 82.4 billion short tons. It is the third leading coal producing producer in the world after China and the United States.
  - ✓Easier transport of coal through a large railway network
  - ✓Ease in setting up a coal based power plant due to standardized technologies; especially through a state owned electric utility with government budget support
  - ✓High cost, Rehabilitation and Resettlement issues affecting hydro electric projects, coupled with dwindling water sources
- Contribution by coal to GHG emissions. The quality of coal mined in open cast mines in India is poor and has a high ash content mainly on account of mining methods. This affects the performance of the power station adversely, thereby translating into a high emission factor
- Presently, fossil fuel conversion technologies operate in India at about 28 - 33% efficiency. The efficiency can be increased to 45% by adopting newer technologies like Pressurized Fluidized Bed Combustion (PFBC) or Integrated Gasification Combustion Cycle (IGCC)
- Renewable: Substitution of fossil fuels can be through utilization of renewable energy sources such as wind, solar, biomass or tidal energy. These enable no or low net CO_2 emissions.

Clean Energy Technologies - *Generation*

Renewable energy sources		
Geothermal heat	*Wave power*	*Photovoltaics*
Wind	*Tidal power*	*Municipal solid waste*
Hydro	*Energy crops*	*Biomass*

Renewable energy sources refer to energy sources that have a quicker cycle of conversion than the fossil fuel, sources which take million years to form

Benefits - Significantly 'cleaner' as compared to conventional processes as there is insignificant net addition of GHG emissions. Assumes importance in view of dwindling resources of fossilized fuels.

In India Ministry of Non-Conventional Energy Sources (MNES) has been promoting these since last 1 ½ decade!!

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 17

Slide Objective:

•This slide discusses the general benefits of renewable energies, and provides a graphic listing of the many renewable options that are available.

Key Issues/Concepts:

Renewable energy sources emit no or low net CO_2. A brief write up of the technologies is provided below as a summary for the instructor.

Wind: Winds turn the blades of a turbine, which in turn drive a generator that produces electricity, much like steam turbines. The longer the blades and the faster the wind speed, the more electricity the turbine generates.

Geothermal: Geothermal energy is power obtained by earth's natural heat Geothermal energy is energy extracted for heating and electricity generation from natural steam, hot water, or hot dry rocks in the Earth's crust.

Biomass: Biomass includes remains of living things, plants and animals that have either cellulose or other biologically degradable ingredients. Biomass is generated from all activities especially agricultural. Biomass can be used to generate through various routes, thermal, thermo-chemical, biological etc.

Waves: The rise & fall of waves alternately force & suck air through a chamber placed on the shoreline.

Solar: 2 types - PASSIVE & ACTIVE energy usage

✓**Passive:** We can use the sun to heat other things, including our homes.

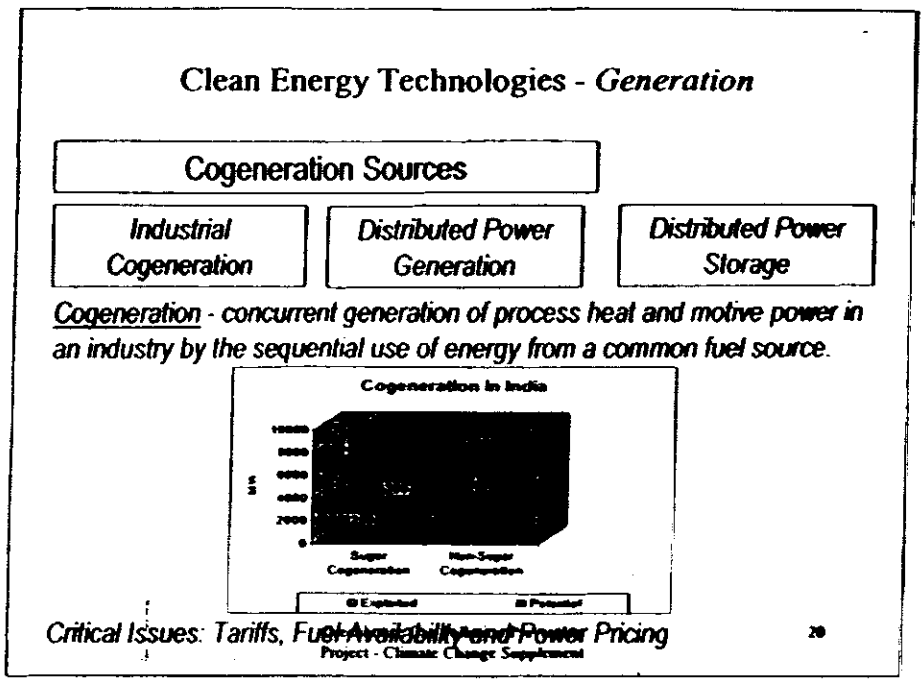
✓**Active:** active solar designs need additional mechanical components. The sun's energy can also be made directly into electricity using photovoltaic (PV) cells, sometimes called solar cells (eg.like those used in calculators & satellites).

Hydro: The water in rivers and streams can be captured and turned into hydropower, also called hydroelectric power.

Waste to energy –

✓**MSW: Biomethanation:** Process used for production of methane from solid wastes. The biogas can be utilized for cooking or heating or for generating power or electricity through gas engines, gas turbines or steam turbines.

✓**Land filling** is engineered or controlled disposal of solid wastes on the upper layers of the earth, minimizing environmental pollution; achieved through disposal, compacting, covering with a layer of earth & further compacting; Landfill gas (with methane content of about 50%) is generated over time; Can be used as source of energy for heating/cooking/power generation.



Slide Objective:

•To discuss additional Clean Energy Technology options, most namely co-generation which is the harnessing of waste heat from an industrial or energy production activity. This capture of waste heat, and subsequent energy generation through heating a boiler system, can generate additional energy…thus reducing the demand from the central electricity board.

Key Issues/Concepts:

Cogeneration: Cogeneration/CHP is the simultaneous production of electricity and useful heat from the same fuel or energy. Facilities with cogeneration systems use them to produce their own electricity, and use the unused excess (waste) heat for process steam, hot water heating, space heating, and other thermal needs. They may also use excess process heat to produce steam for electricity production.

Two basic types - Topping system & bottoming system

✓*Topping:* Electricity is produced first and thermal energy exhausted is captured for further use.

✓*Bottoming:* Thermal Energy is extracted from Waste Stream, after it has been used in a Process to Produce Power.

CCMPs in Urban Sector

- Urban transportation – A major contributor of GHG emissions
- Urban Solid & Liquid Wastes – Another major source of GHG emissions

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 21

Slide Objective:

▪This slide addresses another area in which GHG emissions occur, i.e. urban sector. This will relate directly to the student's day-to-day lives and should be stressed as significant sources of greenhouse gas emissions.

▪The next two slides look at mitigation options in these areas in more detail. The instructor may find it useful at this juncture to prompt the students about their ideas of mitigation approaches before proceeding.

Climate Change Mitigation Options
- *Transportation*

- Transport sector
  - Second major contributor of CO_2 emissions (26%) world-wide
  - Accounts for the highest growth rate in GHG emission world-wide
  - Also contributes to emissions of NO_x, SO_x and particulate matters
- Vehicular traffic: major cause of GHG emissions (mainly in Indian cities)
  - Direct CO_2 emissions from fuel consumption in Indian transport sector was around 27.85 million tones (carbon equivalent) in 1993-94
  - Of this, road transport accounts for 80%; rail (13%) and air transport (7%)
- Climate Change Mitigation Options
  - Traffic Management and Vehicle Management
  - Use of Technology and Alternate Fuels

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 22

Slide Objective:

- As stated in the previous slide, this slide lays out the sources of greenhouse gas pollutants within the transportation sector and begins a discussion on mitigation approaches.

Key Issues/Concepts:

- Transportation is an area where fossil fuels are used and leads to high GHG emissions.

- The following background information is provided to the instructor as a reference:

  The vehicle population in India has been growing over the last decade. The number of vehicles doubled in the 1986-95 period. The growing urban population, coupled with the growth in per capita income has lead to a very high demand for the vehicles. The type of vehicles vary from small two wheelers for personal use to large buses and trucks used for public transport of passengers and goods. Due to Government's policy the higher capacity vehicles are based on diesel fuel, while the small and personal transport vehicles are based on gasoline as fuel. Thus there is a wide variety of engines used for the transport vehicles in India.

- Reasons for high GHG emissions from Transport Sector:
  - ✓Significant growth in number of vehicles on roads due to
  - ✓Shift from rail-dominated transport to road-dominated transport
  - ✓Increasing urbanization, leading to increase in transportation demands
  - ✓Significant increase in the population of personal vehicles
  - ✓Vintage of Indian vehicles: Extended use of vehicles
  - ✓Outdated vehicle technologies: 2 stroke engines, single point fuel injection etc
  - ✓Dependence on diesel which has a relatively high sulfur content

Climate Change Mitigation Options
- *Transportation*

- Traffic management
  - Increase in transport efficiency through improved signaling systems,
- Vehicle Technology and Alternate Fuel based Approach include
  - Better fuel injection & higher engine compression ratios
  - New technologies such as electric vehicles based on batteries or fuel cells
  - Alternative fuels such as ethanol, Propane, CNG
- Most CCMPs likely in the later option
  - GHG benefits from transportation sector are difficult to quantify

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 23

Slide Objective:

- This slide continues the discussion on mitigation options within the transportation sector. In contrast to the Energy sector, transportation mitigation can involve procedural improvements just as much as technical solutions. Process changes such improving traffic patterns, restricting vehicle usage through on/off days, incentives for car-pooling etc.

Key Issues/Concepts:

Traffic Management Measures include:

- Improved traffic signal timing (at intersections)
- Traffic Management [Examples: Re-planning of Intersections, Bus Priority Systems – Bus Only Lanes & Roads, One Way Street Systems/Dedicated vehicle lanes, Segregation by Lane Markings]
- Infrastructure improvement [Examples: Intersection Modification, Improved pedestrian facilities, Over/Under Passes, New Road/Rail System]
- General Issues: [Examples: Land Use Re-distribution, Driver Training and Other User Training, Flexi-time Planning, Operate at optimal speeds and at full capacities, Increased occupancy ratios of vehicles, Substitution of motorized-travel by non-motorized travel, Usage of multi-modal transport options

Vehicle Management Measures include:

- Vehicle Controls: [eg: Restrictions on Usage, Restrictions on Ownership, Restrictions on Vehicle Licensing (retirement of old vehicles), Restrictions on licensing to Drivers, Stringent emission norms and inspections
- Access Controls: [Examples: By time of day/day of week, by vehicle type/specific roads, Flex-time Planning, Control on parking, User charge]
- Technology Options:

✓2 & 3 Wheelers: Improvement in Engine Design for Better Scavenging and Combustion, Electronic Engine Management, Advanced Catalytic Converters, 4 Stroke (for Gasoline engines) and 2-Stroke Direct Injection

✓Gasoline Cars: Electronic fuel injection, Engine with high Compression ratios, Turbo charging, Electronic Engine Management systems

✓Diesel Vehicles: Engine with high Compression ratios, Turbo charging and retarded timing, Electronic Engine Management systems

✓Modification of existing fuels / usage of alternative fuels

Climate Change Mitigation Options - Municipal Solid Waste

- Municipal Solid Waste (MSW) includes refuse from households, commercial establishments, institutions, market & yard waste etc.
  - Decomposition of organic components of MSW is one of the major sources of methane emission
- The technological options for MSW disposal are
  - Biological Options (with or without the aid of oxygen)
    - Composting
    - Biomethanation
    - Sanitary Land filling (with methane gas recovery)
  - Thermo-Chemical Option
- Composting is the only proven technology in India at present
- Two technology options (biomethanation & sanitary landfill with methane gas recovery) also provide Climate Change mitigation benefit

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 24

Slide Objective:

•This slide discusses the significance of methane emissions from MSW degradation in open dump sites in cities.

Key Issues/Concepts:

•Although the amount of methane emission from MSW is not very significant percentage, the global warming potential of methane and impact of degradation on streets on health make projects in this sector a need of hour.

•Instructor may discuss individual technological option based on student interest.

•It may be mentioned that under the Honorable Supreme Court's directive, MOEF has issued MSW treatment Rules in September 2000. These rules specify certain deadlines for implementation of MSW management and disposal in urban areas binding.

Current Status of CCMPs in India

- Currently implemented CCMPs include
  - Renewable energy
  - Industrial Energy Efficiency
  - Few fuel switching projects
- What are today's incentives for undertaking CCMPs?
  - Major benefits from fiscal policies, taxation etc.
  - Attractive tariffs provided by few states under the MNES guidelines
  - Climate Change Benefits are being seen by industry as something to count
- Are Benefits to project developers worth the expenditure?
  - Market and value of carbon
  - Projections for market

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 25

Slide Objective:

•The slide is meant to inform progress on consideration of CCMPs by industry and govt., both for their economic and environmental benefits

Key Issues/Concepts:

•It may be noted that CCMPs especially the renewables are being increasingly favored by industry in spite of the higher marginal cost of the technologies.

•Banks and FIs are also favorable to them due to the manageable size of the investments (capital requirements are typically a lesser order of magnitude than large high MW power plants.)

•However, the prime attraction as of today still is the fiscal benefits, subsidies and attractive tariffs by few states under MNES policy

Current Status of CCMPs in India

- Private Sector responses
  - Encouraging response to outreach programs
  - Increasing willingness to look at the Climate Change benefits
- GOI responses
  - Improving perspective for consideration of CEPs for their climate change benefits
  - Proactive structures being formed
  - Encouraging climate for project development in preparation for COP 8

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 26

Slide Objective:

•This slide discusses responses by private sector and Govt. for encouraging CCMPs for their environmental and social benefits

Key Issues/Concepts:

•Both Industry and GOI have taken some positive steps, as a result of which possibility of international investments in CCMPs has brightened

•GOI clearance of first batch of CCMPs for funding and hosting of next meeting of UNFCCC Conference of Parties (India, October, 2002) are encouraging signs.

After this slide the instructor may seek the reactions of the students as to whether they find any relevance to their jobs and responsibilities

Roles You Can Play

- Direct
  - In roles that directly involve decision making on choice of infrastructure
    - Promote efficiency improvements
    - Adopt environment friendly technologies and approaches
    - Choose approaches that reduce consumption of natural resources
    - Propagate clean energy approaches among your peers

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 27

Slide Objective:

▪This and the next slide are for promoting discussions among the participants to elicit possible roles that they may play in promoting energy efficiency

▪There are possibilities that the course participants may be positioned in organizations like planning commissions, electricity regulatory commissions, pollution control boards etc. where they would have scope to suggest, implement or comment on policies which would influence GHG emissions

Roles You Can Play

- Indirect
  - Facilitate designing accounting methodologies that better capture environmental and social costs
  - Spread awareness among your "clients"

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 28

Slide Objective:

•This and the previous slide are for promoting discussions among the participants to elicit possible roles that they may play in promoting energy efficiency

•The main thrust of this discussion point is that the students can play a critical "indirect" role through fostering dialogue with amongst their "clients" - which are the public at large.

Conclusions

- Increasing evidence that Global Warming and Climate Change is taking place and anthropogenic factors are major contributors
- Global Warming affects the poor and vulnerable population and nations
- Main reason for GW is increasing use of fossil fuels for energy generation and wastage of energy
- Market based instruments offer a better option to mitigate the adverse impacts of climate change
- CCMPs that generate emission reduction as a commodity are basic to introducing Market Based Mechanisms

Greenhouse Gas Pollution Prevention Project - Climate Change Supplement 29

Slide Objective:

▪The slide summarizes and synthesizes the climate change and clean energy modules. Hopefully, the students will have come away with a better understanding of the global impact of greenhouse gas emissions and the varied number of "sources" that are contributing to excessive CO2 emissions. For many students, just the awareness of these issues will have an impact as they can be "multipliers" of this message. The GOI can, and is, playing important roles in studying and addressing greenhouse gas impacts.

▪The students may not become experts but they should have a proper perspective of how the GHG emissions are leading to global warming that might affect the day to day living conditions of the society.

▪They should start thinking of the positive role that an administrator should play so as to minimize the impacts of climate change

▪In this session, the instructor will also summarize the "feedback" received from the students on their ideas of how GOI administrators can play a contributing role through their day-to-day activities. These suggestions or ideas should be passed along to LBSNAA Senior Management, in order that they be incorporated and addressed in future iterations of the training manual.

Bibliography & Recommended References on Climate Change and Clean Energy Technology

Websites:

International Agreements/Agencies on Climate Change:

UNFCCC Website – **www.unfccc.de** – Information and all documents related to the United Nations Framework Convention on Climate change and all Conference of Parties (COP). The site provides Parties, representatives of observer organizations and others interested in the UNFCCC process, with a one-stop source of news, data, information and documents.
Information is organized under seven main headings: What's New, The Secretariat, Programs, Resources, Sessions, Media Room and Site Information.

United Nations Environment Programme (UNEP) - **www.unep.org** -
UNEP was established in 1972 and works to encourage sustainable development through sound environmental practices everywhere. Its activities cover a wide range of issues, from atmosphere and terrestrial ecosystems, the promotion of environmental science and information, to an early warning and emergency response capacity to deal with environmental disasters and emergencies.

www.cdmcentral.com – A site dedicated as an information center on Clean Development Mechanism (CDM). The site is created by CDM Online, a joint venture between the Center for Sustainable Development in the Americas (CSDA) and The United Nations Development Program (UNDP). There are many web sites devoted to the topic of climate change. However, CDM Online distinguishes itself by focusing specifically on the Clean Development Mechanism (CDM), its history, potential development, and eventually, its operation.

IPCC Website: Website of Intergovernmental Panel on Climate change – **www.ipcc.ch** - Source of all documents, reports & publications by the different working groups of IPCC. Most relevant ones are identified below.

- *Climate Change 2001: Impacts, Adaptation & Vulnerability. 2001.* Sixth Session of IPCC Working Group II, Geneva, Switzerland.
- *The Economic and Social Dimensions of Climate Change* -IPCC Working Group III.
- *Emissions Scenario - A Special Report of IPCC Working Group III, 2000*
- *Climate Change 2001: Synthesis Report. 2001.* IPCC. Eighteenth Session, Wembley, UK.
- *IPCC Second Assessment: Climate Change.* 1995. IPCC.
- *Climate Change 2001: Mitigation - 2001.* Sixth Session of IPCC Working Group II, Accra, Ghana.

- *Third Assessment Report of Working Group I of the IPCC.* 2001. IPCC, Shanghai.
- *Vulnerabilities and Potential Impacts for Key Sectors.* The Regional Impacts of Climate Change.
- *Integrated Analysis of Potential Impacts.* The Regional Impacts of Climate Change.
- *Background Characterization of Region.* The Regional Impacts of Climate Change.

US Environment Protection Agency (EPA). - **www.epa.org** - EPA's mission is to protect human health and to safeguard the natural environment — air, water, and land — upon which life depends. For 30 years, EPA has been working for a cleaner, healthier environment for the American people.

Non-Governmental Organizations (NGOs) Relating to Climate Change:

World Resources Institute (WRI). **www.wri.org** . World Resources Institute provides information, ideas, and solutions to global environmental problems. A source of several discussion papers on environmental issues, including Climate change.

www.climatehotmap.org. A project site of World Resources Institute - this map illustrates the local consequences of global warming.

Resources for the Future (RFF). **www.rff.com** . RFF is a nonprofit and nonpartisan *think tank* located in Washington, DC that conducts independent research – rooted primarily in economics and other social sciences – on environmental and natural resource issues. A very good source for several discussion papers on CDM & climate change related issues.

Institute for Global Communication (IGC). **www.igc.org** . The Mission of IGC is to advance the work of progressive organizations and individuals for peace, justice, economic opportunity, human rights, democracy and environmental sustainability through strategic use of online technologies.

India Government /Business Associations Relating to Climate Change:

Ministry of Environment and Forest (MoEF). - **http://envfor.nic.in.** This is the nodal agency in the administrative structure of the Central Government, for the planning, promotion and co-ordination of environmental and forestry programs. A useful source of information regarding various policies and measures taken on climate change.

Confederation of Indian Industry (CII). **www.ciionline.org** The CII's Climate Change Center (4C) provides, besides background information on climate change,

information on funding, climate change projects, events related to climate change & also answers queries – mostly relevant to India.

Tata Energy Research Institute (TERI). www.ccasia.teri.res.in/ - TERI was established in 1974. While in the initial period the focus was mainly on documentation and information dissemination activities, research activities in the fields of energy, environment, and sustainable development were initiated towards the end of 1982.

Publications:

Market Based Instruments:

Asia Least-cost Greenhouse Gas Abatement Strategy (ALGAS) – INDIA. ADB. A report is part of the ALGAS report prepared by ADB based on a study of national GHG in 12 Asian countries, from 1995 to 1998. The report includes projections of GHG emissions to 2020, analysis of mitigation options in different economic sectors and formulation of national abatement strategies.

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Declarations of SAARC 1985-1998. South Asian Association for Regional Cooperation, Kathmandu, Nepal. 2001. This lists out all the declarations of various summits through the years. 2001

Grubb M., Michaelowa A., Swift B., Tietenberg T., ZhongXiang Z., Joshua, Frank T. *Greenhouse Gas Emission Trading. 1998.* United Nations Conference on Trade and Development.

INDIA: Mainstreaming Environment for Sustainable Development. ADB Identifies key environmental problems, regulatory framework for environmental management in India and proposes policies based on market-based instruments.

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Rosenzwieg, Richard and Mathew Varilek et al. *The Emerging International Greenhouse Gas Market.* Prepared for Pew Center on Climate Change by Natsource LLC, and University of St. Gallen. March 2002.

Ruitenbeek J., Richard M. Huber and Ronaldo Seröa Da Motta. *Market Based Instruments for Environmental Policymaking in Latin America and the*

Caribbean: Lessons from Eleven Countries. World Bank Discussion Paper No. 381. 1998. World Bank, Washington D.C.

Zhang, Zhong-Xiang. *Estimating the Size of the Potential Market for the Kyoto Flexibility Mechanisms*, University of Groningen, Netherlands. 1999

Climate Change – Glossary

A

1. Abatement
It is the reduction of the degree or intensity of emissions.

2. Accreditation Body
The accreditation body shall accredit independent entities, in accordance with the standards and procedures contai in Appendix A of the Kyoto Protocol and relevant decisions by the Executive Board and the COP/MOP.

3. Activities Implemented Jointly (AIJ)
Under a pilot phase that ends in 2000, AIJ activities can be carried out through partnerships between an investor fr a developed country and a counterpart in a host country. The purpose is to involve private-sector money in transfer of technology and know-how.

4. Adaptation
The degree to which adjustments are possible in practices, processes, structures or systems in response to projected actual changes in climate. Adaptation activities contribute to the mitigation of the effects of climate change terrestrial and aquatic ecosystems, hydrology and water resources management, agriculture and forestry, hum infrastructure, and human health. Examples of adaptation activities include introducing different crops to compens for local climate change and protection of coastal areas from sea-level rise.

Adaptation can be spontaneous or planned, and can be carried out after the fact or in anticipation of changes climatic conditions. Areas that are particularly vulnerable to the effects of climate change -- low lying islands, f example -- will need to consider adaptation options as a response to possible future changes. The Clean Developm Mechanism (CDM) under the Kyoto Protocol has a provision for assisting "developing country Parties that particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation although the terms this provision have yet to be decided upon.

5. Additionality
The Kyoto Protocol establishes the requirement that joint implementation and Clean Development Mechanis (CDM) projects may only count emissions reductions that are "additional to what otherwise would have occurred the absence of the certified project activity (environmental additionality). These reductions must be "real" an "measurable" and must be quantified against a project baseline against which the additionality of the project can b measured and tested. Central to the discussion of additionality is that of what constitutes a project baseline.

A COP-1 decision on Activities Implemented Jointly under the pilot phase expresses another form of additionali (financial additionality). It states that "the financing of activities implemented jointly shall be additional to the financi obligations of Parties included in Annex II of the Convention within the framework of the financial mechanism well as to current official development assistance (ODA). Another interpretation of financial additionality is th notion that a project is made commercially viable through its ability to generate value in the form of certifie emissions reductions. Here again, no internationally agreed upon method for determining additionality is available.

6. Ad hoc Group on Article 13 (AG13)
A subsidiary body (committee) created by COP-1 to explore how to help governments overcome difficulties they m experience in meeting their commitments to the Kyoto Protocol.

7. Ad hoc Group on the Berlin Mandate (AGBM)
A subsidiary body created by COP-1 to conduct the talks that led to the Kyoto Protocol; the AGBM concluded its final meeting on 30 November 1997.

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8. Afforestation
Planting of new forests on lands, which, historically, have not contained forests. These newly created forests included in the category 'Changes in Forest and Other Woody Biomass Stocks in the Land Use Change and Forest Module' (IPCC) of the emissions inventory calculations.

9. Allocation
It is the division of emissions permits or allowances among greenhouse gas emitters for the purpose of establishing market in tradable permits. There are several possible methods for allocating permits, including "grandfathering" permit auctioning.

10. Annex I Parties
Annex I to the Climate Convention (UNFCCC) lists all the countries in the Organization of Economic Cooperation and Development (OECD), plus countries with economies in transition, Central and Eastern Europe (excluding former Yugoslavia and Albania). By default the other countries are referred to as Non-Annex I countries. Under Article 4.2 (a&b) of the Convention, Annex I countries commit themselves specifically to the aim of returning individually or jointly to their 1990 levels by the year 2000. Ratification of the Kyoto Protocol would mean the acceptance of emission targets for the period 2008 – 2012 as per Article 3 and Annex B.

11. Annex II Parties
The countries listed in this Annex II to the UN Framework Convention on Climate Change. These countries have special obligation to help developing countries with financial and technological resources. They include the 24 origin OECD members plus the European Union

12. Annex A
Annex A of the Kyoto Protocol lists the Greenhouse Gases (GHGs) regulated by the Protocol as well sector/source categories. The gases are: carbon dioxide, methane, nitrous oxide, hydroflurocarbons(HFCs) perfluorocarbons (PFCs) and sulphur hexafluoride. The base year for calculating emission reduction commitments 1990 for the first three gases and 1995 for the other three.

13. Annex B
Since the Kyoto Protocol is a separate legal instrument and must be ratified separately, a new list of countries taking on legally binding commitments along with a listing of their actual commitments was created. Annex B consists of all of those countries listed in Annex I of the FCCC with the exception of Turkey and Czechoslovakia. New countries added to Annex B include: Croatia, the Czech Republic, Liechtenstein, Monaco, Slovakia and Slovenia. Annex B lists the Quantified Emission Limitation and Reduction Commitment (QELRC) for each country.

14. Anthropogenic
Derived from human activities.

15. Article 4.1 (UNFCCC)
This Convention article contains general commitments for all Parties – developing and developed, taking into account their common but differentiated responsibilities and their specific national and regional priorities, objectives and circumstances.

16. Article 4.2 (UNFCCC)
This Convention article contains specific commitments for developed country (Annex I) Parties only, notably to take measures aimed at returning greenhouse gas emissions to 1990 levels by the year 2000.

17. Assigned amounts
According to Article 3.7 in the Kyoto Protocol, " from 2008-2012, the assigned amount for each party included in Annex I shall be equal to the percentage inscribed for it in Annex B of its aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouses gases listed in Annex A in 1990, or the base year or period determined in paragraph 3.5, multiplied by five. 7 According to Articles 3.10, 3.11 and 3.12, "parts of" assigned amounts may be transferred from one Party to another via international joint implementation under Article 6 and emissions trading between Annex I countries under Article 17, and certified emissions reductions acquired via the Clean Development Mechanism (CDM) under Article 12 may by added to that Party's assigned amount.

18. Atmosphere

Gas layer surrounding the Earth. The Earth's atmosphere is composed of about 79.1% nitrogen (by volume), 20 oxygen, 0.036% carbon dioxide and trace amounts of other gases. According to chemical characteristics lar determined by thermal properties (temperature), the atmosphere has sub-layers. The troposphere is the layer from Earth's surface up to 17km above the equator. The stratosphere lies above the troposphere and extends to 50km. mesosphere, which extends up to 80-90 km, lies over the stratosphere, and finally, the thermosphere, or ionosph gradually diminishes, forming a fuzzy border with outer space. There is relatively little mixing of gases between lay

19. Auctioning

Auctioning of emissions permits is a method for greenhouse gas emissions may be allocated among emitters and fu in domestic emissions trading regime based upon willingness to pay for these permits. Supporters of this method emissions trading assert that the advantage of auctioning is that it would provide governments with revenue provide price signals to the new and developing market for permits. Critics contend that auctioning's disadvantag that it may be less politically acceptable to those entities that would stand to gain from granfathering of permits.

20. Avoidance

The avoidance of Greenhouse Gas emissions resulting from the substitution of a high emitting source with a lower non-emitting source or through improvements in energy efficiency.

B

21. Banking

Banking of emissions, which refers to the saving of emissions credits for future consumption or trading, can ta three forms: 1) holding reductions within a commitment period, 2) applying reductions earned from one period another, or, 3) applying reductions earned before the first compliance period via the Clean Development Mechanis

Articles 3. 13 and 12.10 of the Kyoto Protocol refer to banking. Article 3.13 states that "If the emissions of a Pa included in Annex I in a commitment period are less than its assigned amounts, the difference shall, upon the requ of that Party, be added to the assigned amount for that Party for the subsequent commitment period. This, in effe allows a Party which over-complies with its emission reduction commitments the choice whether to trade its exce reductions or "bank" them as a hedge against future difficulties in meeting them.

Article 12.10 states that certified emissions reductions (CERs) (under the Clean Development Mechanism) obtain during the period from 2000 up to the beginning of the first commitment period (2008) can be used to assist achieving compliance in the first commitment period.

22. Base year

According to the IPCC, the Base Year is that year for which a national inventory is to be taken, which is curren 1990 for Annex I countries. In some case (such as estimating Methane from rice production), the base year is simp the middle of a three-year period over which an average must be taken. A base year may also be used as a referen for establishing an emissions baseline. Under the Kyoto Protocol, the base year for hydrofluorocarbo perfluorocarbons and sulphur hexafluoride is 1995

23. Baseline

Standard by which to measure verifiable changes in carbon stocks for the purpose of determining net changes Greenhouse Gas emissions from anthropogenic activities.

24. Benefit-cost analysis

It is an economic technique applied to public decision making that attempts to quantify in dollar terms the advantag (benefits) and disadvantages (costs) associated with a particular policy. For example, a policy that requires power pla near the Grand Canyon to install pollution abatement equipment would reduce air emissions from the plant an improve the visibility at the Grand Canyon for visitors (a benefit), but would increase the cost of electricity customers (a cost).

25. Berlin Mandate
The Berlin Mandate launched the talks that led to the adoption of the Kyoto Protocol in 1997

26. Biomass
The total dry organic matter or stored energy content of living organisms. Biomass can be used for fuel directly burning it (e.g. wood), indirectly by fermentation to an alcohol (e.g. sugar), or by extraction of combustible oils (e.g. soybeans).

27. Binding targets refer to environment standards that are to be met in the future.

28. Borrowing
Within the context of a Greenhouse Gas emission-trading regime, borrowing refers to using future emissions reductions from future commitment periods in order to meet current emissions targets.

29. Bubble
The generic concept of a "bubble" refers to the idea that emissions reductions anywhere within a specific area count towards a common reduction goal -- as if a giant bubble were placed over the various sources to contain them in a common area.

30. Bureau
Responsible for directing the work of the COP. Its 10 members are delegates elected by each of the five regional groups and they include the COP President, six Vice Presidents, the Chairs of SBI and SBSTA, and a rapporteur. In addition, each subsidiary body also has its own Bureau

C

31. Capacity Building
Increasing skilled personnel and technical and institutional capacity

32. Carbon
A Chemical Element. Animals and plants are carbon-based.

33. Carbon-based resources
The recoverable fossil fuel reserves (coal, crude oil, oil shale, tar sands, natural gas) that can be used for energy production/consumption.

34. Carbon Cycle
The natural processes that influence the exchange of carbon (in the form of carbon dioxide, carbonates and organic compounds, etc.) among the atmosphere, ocean and terrestrial systems. Major components include photosynthesis, respiration and decay between atmospheric and terrestrial systems (approximately 100 gigatons/year); thermodynamic invasion and evasion between the ocean and atmosphere, operation of the carbon pump and mixing in the deep ocean (approximately 90 gigatons/year). Deforestation and fossil fuel burning releases approximately 7Gt into the atmosphere annually. The total carbon in the reservoirs is approximately 2000 Gt in land biota, soil and detritus, 750 Gt in the atmosphere and 38 000 Gt in the oceans.

35. Carbon Dioxide (CO_2)
A naturally occurring gas. It is also a by-product of burning fossil fuels and biomass, as well as land-use changes and other industrial processes. It is the principal anthropogenic GHG that affects the Earth's temperature. It is the reference gas against which other GHGs are measured and therefore has a Global Warming Potential (GWP) of 1.

Carbon dioxide equivalent (CDE)
A metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). Carbon dioxide equivalents are commonly expressed as "million metric tons of carbon dioxide equivalents (MMTCDE)." The carbon dioxide equivalent for a gas is derived by multiplying tonnes of the gas by the associated GWP.

MMTCDE = (million metric tons of a gas) * (GWP of the gas)

Carbon equivalent (CE)
A metric measure used to compare the emissions of the different greenhouse gases based upon their global warmi potential (GWP). Greenhouse gas emissions in the U.S. are most commonly expressed as "million metric tons carbon equivalents" (MMTCE). Global warming potentials are used to convert greenhouse gases to carbon dioxi equivalents — they can be converted to carbon equivalents by multiplying by 12/44 (the ratio of the molecular weig of carbon to carbon dioxide). The formula for carbon equivalents is:
MMTCE = (million metric tons of a gas) * (GWP of the gas) * (12/44)

36. Carbon Sequestration
The long-term storage of carbon CO2 in the forests, soils, ocean or underground in depleted oil and gas reservoir coal seams and saline acquifers. Examples include the separation and disposal of CO2 fuel gases or processing fos fuels to produce H2- and CO2-rich fractions, and the direct removal of CO2 from the atmosphere through land us change, afforestation, reforestation, ocean fertilization and agricultural practices to enhance soil carbon.

37. Carbon Sinks
Natural or anthropogenic systems that absorb CO2 from the atmosphere and store them. Trees, plants and th oceans all absorb CO2 and, therefore, are carbon sinks.

38. Carbon Source
A pool (reservoir) that gives up carbon to another reservoir within the Carbon Cycle. For example, if the net exchang between the Biosphere and the Atmosphere is toward the ocean, then the atmosphere is the source. Common humai sources include: fossil fuel combustion, solid waste decomposition, land use change, and transport.

39. Carbon Stocks
Carbon stocks include carbon stored in vegetation (above and below ground), decomposing matter, soils, wood products, and the carbon substituted by burning wood for energy instead of fossil fuels.

Carbon taxes discourage the use of fossil fuels and aim to reduce carbon dioxide emissions by placing a surcharge on the carbon content of oil, coal, and gas.

40. Certification
The process by which an independent accredited body (operational entity) gives written assurance of the emission reductions that have been achieved. In the case of an activity under the Clean Development Mechanism under the Kyoto Protocol, certification also gives assurances that the reductions occurred under the conditions (sustainable development objectives have been met) necessary for recognition by the Parties.

41. Certified Emission Reductions (CERs)
A unit of Greenhouse Gas reductions that has been generated and certified under the provisions of Article 12 of the Kyoto Protocol, the Clean Development Mechanism (CDM). In contrast, Emissions Reduction Units (ERUs) are used for Joint Implementation (JI) under Article 6 of the Protocol. According to Article 12, CERs must be "certified by operational entities to be designated by the Conference of the Parties (COP) serving as the Meeting of the Parties (MOP)".

42. Certified Tradable Offset (CTO)
A financial instrument that can be used to transfer (sell) Greenhouse Gas offsets in the international marketplace. A Certified Tradable Offset (CTO) represents a specific number of units of greenhouse gas emission expressed in carbon equivalent units reduced or sequestered. The home-country verification process certifies that the offsets are of high enough quality to allow them to count against national and company-level greenhouse gas reduction commitments, if such crediting is eventually permitted under the UNFCCC.

43. Chair (or chairman etc.) - The participating governments elect a Chair for the subsidiary bodies from amongst the delegates. Different Chairs may be elected for other informal groups. The Chair is responsible for facilitating progress towards an agreement and serves during the inter-sessional period until the start of the next COP.

44. Chlorofluorcarbons (CFCs) and Related Compounds
This family of anthropogenic compounds includes chlorofluorcarbons (CFCs), bromofluorcarbons (halons), methyl chloroform, carbon tetrachloride, methyl bromide, and hydrochlorofluorcarbons (HCFCs). These compounds have been shown to deplete stratospheric ozone, and therefore are typically referred to as ozone depleting substances. The most ozone depleting of these compounds are being phased out under the Montreal Protocol.

45. Clean Development Mechanism (CDM)
The text of Article 12 currently describes more of an idea than an operational entity. Highly innovative, it has the potential to meet the needs of both developing and industrialized countries. It could help solve non-Annex I needs for capital for the financing of technology transfer for clean, energy efficient economic development and for addressing environmental issues such as loss of biodiversity, while also providing a lower cost, more flexible alternative for Annex I countries to meet emissions reduction targets.

According to Article 12 of the Kyoto Protocol, the "purpose of the Clean Development Mechanism shall be to assist Parties not included in Annex I in achieving sustainable development, and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3."

46. Climate Change
A change in climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability over comparable time periods.

47. Climate Model
Large and complex computer programs used to mathematically simulate global climate. They are based on mathematical equations derived from our knowledge of the physics that governs the Earth-atmosphere system.

48. Co-control benefit refers to the additional benefits derived from an environment policy that is designed to control one type of pollution, while reducing the emissions of other pollutants as well. For example, a policy to reduce carbon dioxide emissions might reduce the combustion of coal, but when coal combustion is reduced, so too are the emissions of paticulates and sulfur dioxide. The benefits associated with reductions in emissions of particulates and sulfur dioxide are co-control benefits of reductions in carbon dioxide.

49. Co-generation
The use of waste heat from electric generation, such as exhaust from gas turbines, for either industrial purposes or district heating.

50. Command and control regulation requires polluters to meet specific emission-reduction targets and often requires the installation and use of specific types of equipment to reduce emissions.

51. Commitment Period
The commitment period, sometimes referred to as the "compliance period" or the "budget period", is the time frame given to Parties to the Kyoto Protocol to meet their quantified emission limitation and reduction commitments (QELRCs) established in Annex B. Under the Kyoto Protocol the first commitment period is 2008-2012, during which the assigned amount (of emissions) for each Party (on average, 5% below 1990 emission levels) included in Annex I must be equal to or lower than the percentage listed for it in Annex B multiplied by five.

52. Committee of the Whole - Often created by a COP to facilitate the process of negotiating text. When the Committee finishes its work it turns the text over to the COP which finalizes and then formally adopts it during a plenary session.

53. Conference of the Parties (COP)
The COP is the supreme body of the Convention. It currently meets once a year to review the Convention's progress. The world "conference" is not used here in the sense of "meeting" but rather of "association" the Parties.

Contingent valuation method is a survey based economic method that is often used to quantify in dollar terms the benefits (or costs) of an environmental policy.

54. COP/MOP - The Kyoto Protocol's supreme body will be the COP, which will serve as the Protocol's meeting of the Parties. The sessions of the COP and the COP/MOP will be held during the same period. This will improve cost effectiveness and coordination with the Convention.

55. COP Sessions
The first session of the Conference of the Parties (COP-1) was held in Berlin from 28 March to 7 April 1995, the second (COP-2) in Geneva from 8-19 July 1996, the third (COP-3) in Kyoto from 1-11 December 1997, the fourth (COP-4) in Buenos Aires from 2-13 November 1998, the fifth (COP-5) in Bonn from 25 October to 5 November 1999, and the sixth (COP-6) in The Hague from 13-24 November, 2000.

56. **Countries with Economies in Transition (EIT)** - Those Central and East European countries and former republics of the Soviet Union that are in transition to a market economy.

57. Credit
Originally defined as a "quantifiable and verifiable recognition of the reduction, avoidance or sequestration of carbon dioxide or other greenhouse gases as a result of carbon offset project", the word "credit" was discontinued in the official language of the climate negotiations after COP3 in favor of emissions reduction units (ERUs), and certified emissions reductions (CERs). "Credit" was a difficult term because it held a number of different technical meanings and connotations in different languages -- making negotiations on issues involving GHG "credits" confusing.

D

58. Deforestation
The removal of forest stands by cutting and burning to provide land for agricultural purposes, residential or industrial building sites, roads, etc., or by harvesting the trees for building material or fuel.

59. **Developing countries, or less developed countries (LDCs)**, are those countries which are in the process of becoming industrialized but have constrained resources with which to combat their environmental problems.

60. **Differentiation** in the context of the Framework Convention refers to differing national circumstances that might imply differing obligations. It can refer to North-South distinctions, or to differences within the rich Annex I countries. The differences can reflect population, income, economic composition, or energy endowment.

61. Discounting
A method used by economists to determine the dollar value today of a project's future costs and benefits. This is done by weighing money values that occur in the future by a value less than 1, or "discounting" them. Because environmental decision makers are increasingly forced to evaluate policies with costs and benefits that will be spread over tens – perhaps hundreds – of years, discounting is used to help evaluate the value of measures that deal with problems such as stratospheric ozone depletion and global climate change.

62. Double Dividend
The notion that environmental taxes can both reduce pollution (the first dividend) and reduce the overall economic costs associated with the tax system by using the revenue generated to displace other more distortionary taxes that slow economic grow at the same time (the second dividend).

63. **Downstream** refers to an point in the economy, and in particular, at the level of energy consumers rather than suppliers. It is commonly interpreted to be industrial boilers, electric utilities and other major energy users, but also applies, in theory, to all consumers of gasoline, coal, electricity etc. conversely, ***upstream*** refers to the point (or close to it) where fossil fuels enter the economy. In the US, it means at the input to oil refineries, at coal processing plants and where natural gas enters pipelines.

E

64. Economies in Transition
See Countries with Economies in Transition

65. Ecosystem is the complex of plant, animal, fungal, and microorganism communities and their associated non-living environment interacting as an ecological unit. Ecosystems have no fixed boundaries; instead, their parameters are set according to the scientific, management, or policy question being examined. Depending upon the purpose of analysis, a single lake, a watershed, or an entire region could be considered an ecosystem.

66. Emissions
The release of GHGs and/or their precursors (pollutants) into the atmosphere over a specified area and period of time. Emissions can also be released into waterways (streams, oceans, etc.).

67. Emissions Budgets
See Assigned amounts

68. Emissions leakage is a concept often used by policymakers in reference to the problem that emissions abatement achieved in one location may be offset by increased emissions in unregulated locations. Such leakage can arise, for example, in the short term as emissions in unregulated demand or timber supply, influencing world prices for these commodities and increasing the quantity emitted elsewhere; and it can arise in the longer term, for example, as industries relocate to avoid controls.

69. Emission Permit
A non-transferable, non-tradable allocation of entitlement by a government to an individual firm to emit a specified amount of a substance.

70. Emission Quota
The portion or share of total allowable emissions assigned to a country or group of countries within a framework of maximum total emissions and mandatory allocations of resources or assessments.

71. Emission Reduction Units (ERUs)
Emissions reduction units (ERUs) are units of Greenhouse Gas reductions (or, portion of a country's Assigned Amount) that have been generated via Joint Implementation under Article 6 of the Kyoto Protocol - as opposed to Certified Emission Reduction units (CERs) - which have been generated and certified under the provisions of Article 12 of the Kyoto Protocol, the Clean Development Mechanism.

72. Emission Standard
A level of emission that, under law, cannot be exceeded.

73. Emissions taxes are taxes levied on air or water emissions, usually on a per ton basis. Emission taxes provide incentives for firms and households to reduce their emissions and therefore are means by which pollution can be controlled. The greater the level of the emissions tax, the greater the incentive to reduce emissions.

74. Emissions Trading
The Kyoto Protocol, in Article 17, establishes a mechanism whereby (Annex I) Parties with emissions commitments may trade their emission allowances with other (Annex I) Parties. The aim is to improve to overall flexibility and economic efficiency of making emissions cuts.

75. Environmental Integrity Group
Composed of Switzerland, South Korea, and Mexico.

76. European Union (EU)
As a regional economic integration organization, the European Union can be and is a Party to the Convention; however, it does not have a separate vote from its members. The EU can also be a Party to the Protocol. Because it

signed the Convention when it was known as the EEC, it retains this name for all formal Convention-related purposes. Its members are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the UK.

77. **EU bubble** in the context of international climate change negotiations refers to the European Union (EU) as a whole would accept some aggregate limit on carbon reductions but that the limit would not have to be shared pro rata by all members. One could then have a weaker reduction limit for, say, Portugal than Germany, provided that the total reflected the internationally agreed-upon goal (e.g., stabilization at 1990 levels in 2010). In effect, a bubble allows the EU to achieve differentiation of national standards—something that is quite controversial in the negotiation process.

78. **Evapotranspiration** is the loss of water from the soil both by evaporation and by transpiration from the plants growing in the soil and rises with air temperature.

79. **Executive Board**
The Executive Board of the CDM is established in Article 12 of the Kyoto Protocol. Although many of the functions, makeup and terms of the executive board are still to be determined, the main role is to supervise the CDM and oversee the operational entities, which "certify" certified emission reductions.

F

80. ***Financial Mechanism***
As defined by the Convention, its role is to transfer funds and technologies to developing countries on a grant or consessional basis, under the guidance of the COP. The Global Environment Facility is "operating" the mechanism on an interim basis.

81. **Flexibility Mechanisms**
Refers to the three cooperative implementation mechanisms under the Kyoto Protocol (Joint Implementation, international Emissions Trading and Clean Development Mechanism) including the notion of differentiated commitments.

82. **Fluorocarbons**
Carbon-fluorine compounds that often contain other elements such as hydrogen, chlorine, or bromine. Common fluorocarbons include chlorofluorocarbons and related compounds (ozone depleting substances), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs).

83. **Forest**
Ecological systems with a minimum of 10% crown coverage of trees and/or bamboos, generally associated with wild flora, fauna and natural soil conditions, and not subject to agricultural practices.

84. **Forest dieback** refers to a high incidence of decline and individual tree death due to a change in climate conditions that makes trees vulnerable to disease and insect predation.

85. **Fossil Fuels**
Carbon-based fuels, including coal, oil and natural gas and their derived fuels such as gasoline, synthesis gas from coal, etc. Combustion of fossil fuels not only results in the liberation of carbon dioxide into the atmosphere but its by-products (unburned hydrocarbons and carbon monoxide) can oxidize to carbon dioxide.

86. **Friends of the chair** - Delegates who are called upon by the Chair (who takes into account the need for a political balance among various interests) to assist in carrying out specific tasks.

87. **Fuel cycle** refers to the total life in all its uses and forms. For example, the fuel cycle of coal is extraction; transportation; combustion; air emissions, and ash removal, transportation and disposal.

88. Fugitive Emissions
Fugitive emissions are intentional or unintentional releases of gases from anthropogenic activities such as the processing, transmission or transportation of gas or petroleum. In particular, they may arise from the production, processing, transmission, storage and use of fuels, and include emissions from combustion only where it does not support a productive activity (e.g., flaring of natural gases at oil and gas production facilities).

89. Fungibility
The inter-changeability of the emission reduction credits among the mechanisms.

G

90. General Circulation Model (GCM)
A global, three-dimensional computer model of the climate system, which can be used to simulate human-induced climate change. GCMs are highly complex and they represent the effects of such factors as reflective and absorptive properties of atmospheric water vapor, greenhouse gas concentrations, clouds, annual and daily solar heating, ocean temperatures and ice boundaries. The most recent GCMs include global representations of the atmosphere, oceans and land surface.

91. General equilibrium theory demonstrates the advantage of looking beyond first-stage effects. In the context of climate policy, it implies that the various parts of an economic system are interrelated and the net effect of an action may be markedly different from the initial (and intended) effect.

92. Geographic Information Systems (GIS) are organized collections of computer hardware, software, geographic data, and personnel designed to efficiently capture, store, update, manipulate, analyze and display all forms of geographically referenced information. GIS is being used by many researchers in the environmental field to view a number of different indicators simultaneously as data layers on a geographic grid. By associating data of all kinds with points on a map, GIS can illustrate patterns and trends that might otherwise be incomprehensive. For example, using GIS, a researcher can map multiple health indicators at and around a specific toxic waste site.

93. Global Environmental Facility (GEF)
The multi-billion-dollar GEF was established by the World Bank, the UN Development Programme, and the UN Environment Programme in 1990. It operates the Convention's "financial mechanism" on an interim basis and funds developing country projects that have global climate change benefits.

94. Global Warming
An increase in the near surface temperature of the Earth. Global warming has occurred in the distant past as the result of natural influences, but the term is most often used to refer to the warming predicted to occur as a result of increased emissions of greenhouse gases

95. Global Warming Potential (GWP)
Index created in the Kyoto Protocol that allows for equal comparison of the various greenhouse gases. It is the radiative forcing that results from the addition of 1 kilogram of a gas to the atmosphere compared to equal mass of carbon dioxide. Over 100 years, methane has a GWP of 21 and nitrous oxide of 310.

96. Grandfathering of emissions permits is a method by which permits for greenhouse gas emissions may be allocated among emitters and firms in a domestic emissions trading regime according to their historical emissions. Supporters of this method of emissions trading assert that this would be administratively, simple but some critics argue that this method would reward firms eith high historical emissions and unfairly complicate entry into markets by new firms and emitters.

97. Greenhouse Effect
The effect produced as greenhouse gases allow incoming solar radiation to pass through the Earth's atmosphere, but prevent most of the outgoing long-wave infra-red radiation from the surface and lower atmosphere from escaping into outer space. This envelope of heat-trapping gases keeps the Earth about 30°C warmer than if these gases did not exist.

98. Greenhouse Gases (GHGs)
Any gas that absorb and re-emit infrared radiation into the atmosphere.

99. GHG Reduction Potential
Possible reductions in emissions of GHGs (quantified in terms of absolute reductions of in percentages of baselin emissions) that could be achieved through the use of technologies and measures.

100. Group of 77 and China
The G-77 was founded in 1967 under the auspices of the United Nations Conference for Trade and Developmen (UNCTAD). It seeks to harmonize the negotiating positions of its 133 developing-country members.

H

101. Host country
The country where the reduction, avoidance or sequestration of greenhouse gas takes place.

102. "Hot Air"
Term developed by the NGO community to describe the difference in emissions reductions according to the established base year agreed to under the Kyoto Protocol, and actual emissions reductions as a result of reasons unrelated to climate mitigation, such as changes in the economies of Russia and other economies in transition. Since the base year of 1990, political and economic circumstances such as the reunification of Germany and the dissolution of the Soviet Union have resulted in emission trajectories in some countries that put expected emissions well below their assigned amounts under Annex B.

For example, since 1990, former Eastern Bloc countries have upgraded their energy generation and industrial processes significantly -- thereby resulting in much lower emission levels. In the case of Germany, this excess has been counted within the EU "bubble". Russia, and other former Soviet republics, however, will have excess emission reductions without taking any domestic action and will be able to meet targets without making investments in new emissions reductions. Without a trading scenario in place, this would not be an issue, but under a trading regime, the country "owning" these excess reductions, or "hot air", could sell them to countries not complying with their reduction targets.

I

103. Incentive based regulation uses the economic behavior of firms and households to attain desired environmental goals. Incentive-based programs involve taxes on emissions or tradable emission permits. The primary strength of incentive based regulation is the flexibility it provides the polluter to find the least-cost way to reduce emissions.

104. Industrialized countries are characterized by relative political stability and long-term industrial success. Their per capita income is comparable to those of Canada, Northern Europe, and the United States, and they have achieved a higher level of economic and environmental sustainability than developing countries because of higher levels of capital and natural resources.

105. Infrared Radiation
The heat energy that is emitted from all solids, liquids, and gases. In the context of the greenhouse issue, the term refers to the heat energy emitted by the Earth's surface and its atmosphere. Greenhouse Gases strongly absorb this radiation in the Earth's atmosphere, and reradiate some back towards the surface, creating the greenhouse effect

106. Intergenerational equity in the context of environmental policy refers to the fairness of the distribution of the costs and benefits of a long-lived policy when those costs and benefits are borne by different generations. In the case of a climate change policy designed to reduce greenhouse gas emissions, the costs of the emissions reductions will be borne by the current and near term generations, while the benefits of an unchanged climate will be enjoyed by far distant generations.

332

107. Intergovernmental Negotiating Committee (INC)
The INC met during five sessions between February 1991 and May 1992 to draft the Convention; it met six more times to prepare for COP1 before completing its work in February 1995

108. Intergovernmental Panel on Climate Change (IPCC)
The IPCC was established in 1988 by the World Meteorological Organization and the UN Environment Programme. It conducts rigorous surveys of the worldwide technical and scientific literature and publishes assessment reports that are widely recognized as the most credible existing sources on climate change. The IPCC also works on methodologies and responds to specific requests from the Convention's subsidiary bodies

109. Internalizing the externality is an economic concept where the polluter directly bears the cost created by his pollution.

110. International emissions trading
See Emissions trading

111. Inventory
Typically, a national inventory is the register of sources and sinks of greenhouse gases in a particular country. The UNFCCC calls for all Parties to commit to "develop, update periodically, publish and make available to the Conference of the Parties (COP) their national inventories of anthropogenic emissions by sources and removals by sinks of all Greenhouse Gases not controlled by the Montreal Protocol and, to "use comparable methodologies for inventories of GHG emissions and removals".

112. Irreversibilities refer to changes that, once set in motion cannot be reversed, at least on human scales.

J

113. Joint Implementation (JI)
The Kyoto Protocol establishes a mechanism whereby a developed country can receive "emissions reductions units" when it helps to finance projects that reduce net emissions in another developed country (including countries with economies in transition). Some aspects of this approach are being tested as Activities Implemented Jointly.

114. JUSSCANNZ
The non-EU industrialized countries meet as a group to discuss various issues; they are Japan, the US, Switzerland, Canada, Australia, Norway, and New Zealand. Iceland, Mexico, and the Republic of Korea may also attend meetings.

K

115. Kyoto Mechanisms
Economic mechanisms based on market principles that Parties to the Kyoto Protocol can use in an attempt to lessen the potential economic impacts of GHG emission-reduction requirements. They include Joint Implementation (Article 6), the Clean Development Mechanisms (Article 12) and Emissions Trading (Article 17).

The Kyoto Protocol is an international agreement struck by 159 nations attending the Third Conference of Parties (COP-3) to the United Nations Framework Convention on Climate Change (held I December 1997 in Kyoto, Japan) to reduce worldwide emissions of greenhouse gases. Delegates to COP-3 agreed to the following specific provisions:

Developed Countries-Thirty -eight developed countries agreed to reduce their emissions of six greenhouse gases. Collectively, developed countries agreed to cut back their emissions by a total of 5.2% between 2008 & 2012 from 1990 levels. The six gases include carbon dioxide, methane, nitrous oxide, and three ozone-damaging fluorocarbons not covered by the Montreal Protocol that banned global chlorofluorocarbons (hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride). The European Union agreed to reduce their emissions by 8% below 1990 levels; the United States on to 7% reduction; and Japan agreed to a 6% reduction. Some countries, including Russia and Ukraine, are not

bound to make any reductions while countries with smaller economics such as Iceland, Norway and New Zealand a allowed to actually in increase their emissions, Australia was also allowed to increase greenhouse gas emissions.

Countries with Economies in Transition— Countries undergoing the process of transition to a market economy but that a also classified along with the EU, Japan and the U.S. as Annex I parties to the Convention-including the Czec Republic, Hungary, and Poland, among others— face smaller reductions.

Developing Countries— Countries which are in process of becoming industrialized but have constrained resources wit which to combat their environmental problems— which include China and India— have no formal binding targets, bu have the option to set voluntary reduction targets.

The Protocol, drafted during the Berlin Mandate process, that, on entry into force, would require countries listed in it Annex B (developed nations) to meet differentiated reduction targets for their GHG emissions relative to 1990 level by 2008-2012. It was adopted by all Parties to the Climate Convention in Kyoto, Japan, in December 1997.

L

116. Leakage
Leakage is the indirect effect of emission reduction policies or activities that lead to a rise in emissions elsewhere (e.g fossil fuel substitution leads to a decline in fuel prices and a rise in fuel use elsewhere). For land use change and forestry activities, leakage can be defined as the unexpected loss of estimated net carbon sequestered. Specific to CDM/AIJ/JI projects in both forestry and energy sectors, leakage can be a result of unexpected effects including unforeseen circumstances, improperly defined baseline, improperly defined project lifetime or project boundaries, and inappropriate project design.

M

117. MAPPS model is a global biological and geographical model which simulates the potential natural vegetation that can be supported at any site in the world under a long-term steady-state climate. Its acronym stands for *Mapped Atmosphere-plant-soil.*

118. Market Barriers
In the context of climate change, this refers to conditions (such as policy and legal frameworks) that impede the diffusion of cost-effective technologies or practices that could mitigate GHG emissions.

119. Market-Based incentives
In the context of climate change, this refers to measures (such as subsidies, taxes, emissions trading) intended to directly change relative prices of "climate --friendly" technologies in order to overcome market barriers.

120. Market Potential
The portion of the economic potential for GHG emission reduction or energy-efficiency improvements that could be achieved under existing market conditions, assuming no new polices and measures.

121. Methane (CH_4)
One of the six GHGs to be mitigated under the Kyoto Protocol, it has a relatively short atmospheric lifetime (10 ± 2 years). Primary sources of methane are landfills, coal mines, paddy fields, natural gas systems and livestock (e.g. cows and sheep). It has a GWP of 21 (over a 100 year time horizon).

122. Measures
Actions that can be taken by a government or a group of governments, often in conjunction with the private sector, to accelerate the use of technologies or other practices that reduce GHG emissions.

123. Mitigation
An anthropogenic intervention to reduce the emissions or enhance the sinks of greenhouse gases.

N

124. **National communications** - A central requirement of the Convention (and the Protocol) is that each Party must inform the others about its national climate change activities. Many developed countries have submitted their second reports and developing countries have started to submit their first.

125. **National delegation** - One or more officials who are empowered to represent and negotiate on behalf of their government.

126. **Newly-industrialized economies** refer to regions, primarily in southeast Asia and the Pacific Rim, that have experienced rapid economic growth rates in the last several decades. These include the economies of Malaysia, Indonesia, South Korea, Taiwan, Hong Kong, and Singapore.

127. **Nitrogen Oxides (NOx)**
Gases consisting of one molecule of nitrogen and varying numbers of oxygen atoms. Nitrogen oxides are produced in the emissions of vehicle exhausts and from power stations. In the atmosphere, nitrogen oxides can contribute to the formation of photochemical ozone (smog), which is a greenhouse gas.

128. **Nitrous Oxide (N_2O)**
A powerful greenhouse gas emitted through soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning. This GHG is listed in Annex A of the Kyoto Protocol.

129. **No-regrets Mitigation Options**
Measures whose benefits – such as improved performance or reduced emissions of local/regional pollutants, but excluding the benefits of climate change mitigation – equal or exceed their costs. They are sometimes known as "measures worth doing anyway".

130. **Nonlinearities** occur when changes in one variable cause a more than propotionate impact on an other variable.

131. **Non-Governmental Organizations (NGOs)**
Many relevant NGOs attend the climate talks as observers in order to interact with delegates and the press and provide information. NGOs must be non-profit and can include environmental groups, research institutions, business groups, and associations of urban and local governments.

132. **Non-Party** - A state that has not ratified the Convention may attend talks as an observer.

133. **Non-revenue-raising instruments** are environmental policies that do not raise revenue as a by-product of their environmental regulation. Traditional command-and-control regulations are non-revenue-rasing and stand in contrast to to instruments like emission axes which raise revenue.

O

134. **Observer** - The COP and its subsidiary bodies normally permit observers to attend their sessions. Observers may include the United Nations and its specialized agencies, the International Atomic Energy Agency, non-Party states, and other relevant governmental or non-governmental organizations.

135. **OECD**
The organization for Economic Cooperation and Development consists of Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Republic of Korea, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, the UK, and the United States.

136. **Ozone (O_3)**

Ozone in the troposphere, or lower part of the atmosphere, can be a constituent of smog and acts as a GHG. It is created naturally and also by reactions in the atmosphere that involves gases resulting from human activities, including nitrogen oxides (NOx), from motor vehicles and power plants. The Montreal Protocol seeks to control chemicals that destroy ozone in the stratosphere (upper part of the atmosphere), where the ozone absorbs ultra-violet radiation.

P

137. Particulate matter (PM) is a form of air pollution that includes soot, dust, dirt and aerosols. It has readily apparent effects on visibility and exposed surfaces, and can create or intensify breathing and heart problems and lead to cancer and premature death.

138. Party
A state (or regional economic integration organization such as the EU) that agrees to be bound by a treaty and for which the treaty has entered into force.

139. Permit
A marketable instrument conferring a quantified emissions allowance during a specific time-frame.

140. Perfluorocarbons (PFCs)
A group of human-made chemicals composed of carbon and fluorine only: CF4 and C2F6. These chemicals, along with hydrofluorocarbons, were introduced as alternatives to ozone depleting substances. They are powerful greenhouse gases.

141. Policies and Measures
Countries must decide what policies and measures to adopt in order to achieve their emissions targets. Some possible policies and measures, which Parties could implement, are listed in the Kyoto Protocol and could offer opportunities for intergovernmental cooperation.

142. Policy Stringency is the strict adherence to policy goals and desired results by all relevant parties. An example of environmental policy stringency is typically measured as a targeted reduction in carbon dioxide emissions.

143. Polluter pays
The principle which states that those who cause industrial pollution should offset its effects by compensating for the damage incurred, or by taking precautionary measures to avoid creating pollution.

144. Precautionary Principle
From the UNFCCC (Article 3): "Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost."

145. President - Elected by the Parties to preside over the COP, the President is often a senior official or minister from the state or region hosting the meeting.

146. Project Assessment
Assessing AIJ or JI projects involves the following tasks:

Monitoring refers to the measurement and calculation of GHG emissions reductions and other impacts that occur as a result of the project.

Evaluation entails a more detailed analysis of project impacts than emissions monitoring. It involves both impact and process evaluation.

Reporting refers to the provision of information on measured project GHG and non-GHG impacts.

Verification refers to the assessment of whether the calculated GHG reductions from a project actually occurred. Verification is essentially an audit performed by a certified third party.

147. Protocol - A protocol is linked to an existing convention, but it is a separate and additional agreement that must be signed and ratified by the Parties to the convention. Protocols typically strengthen a convention by adding new, more detailed commitments.

Q

148. Quantified Emissions Limitation and Reduction Commitments (QELRCs)
Legally-binding targets and timetables under the Kyoto Protocol for the limitation or reduction of greenhouse gas emissions for developed countries. Also referred to as Quantified Emissions Limitation and Reduction Objectives (QELROs).

R

149. Radiative Forcing
A change in the balance between incoming solar radiation and outgoing infrared radiation. Without any Radiative forcing, solar radiation coming to the Earth would continue to be approximately equal to the infrared radiation emitted from the Earth. The addition of greenhouse gases traps an increased fraction of the infrared radiation, reradiating it back toward the surface and creating a warming influence (i.e., positive radiative forcing because incoming solar radiation will exceed outgoing infra-red radiation).

150. Ratification
After signing the Convention or the Protocol, a country must ratify it, often with the approval of its parliament or other legislature. The instrument of ratification must be deposited with the depositary (in this case the UN Secretary-General) to start the 90-day countdown to becoming a Party.

151. Reforestation
Reforestation, Afforestation and Deforestation are specifically mentioned in Article 3.3 of the Kyoto Protocol as activities that must be considered in the calculation of Carbon Stocks. This term is defined in the Glossary of the IPCC methodology for National Greenhouse Gas Inventories as "Planting of forests on lands which have, historically, previous contained forests but which have been converted to some other use".

152. Regional Groups
The five regional groups meet privately to discuss issues and nominate bureau members and other officials. They are Africa, Asia, Central and Eastern Europe (CEE), Latin America and the Caribbean (GRULAC), and the Western Europe and Others Group (WEOG).

153. Renewables
Energy sources that are, within a short timeframe relative to the Earth's natural cycles, sustainable, and include non-carbon technologies such as solar energy, hydropower and wind as well as carbon-neutral technologies such as biomass.

154. Revenue-raising instruments in environmental policy include emissions taxes, which are levied against producers of pollution; and tradable emissions permits, which can e bought or sold by coal-burning electric utilities and other industries.

155. Revenue-recycling occurs when the revenue raised by an environmental policy is used to reduce other distortionary taxes or government deficits or is rebated to households.

156. Review of Commitments
The Parties must regularly review the adequacy of the Convention's Article 4.2 (a) and (b) outlining developed country commitments to limit emissions. The first review took place at COP-1 and led to the Berlin Mandate and the adoption of the Kyoto Protocol. The second review is to take place in Buenos Aires.

S

157. Second Assessment Report (SAR)
Also known as Climate Change 1995, the IPCC's SAR was written and reviewed by some 2,000 scientists and experts worldwide. It concluded, "the balance of evidence suggests that there is a discernible human influence on global climate" and confirmed the availability of "no-regrets" options and other cost-effective strategies for combating climate change.

158. Secretariat
Staffed by international civil servants and responsible for servicing the COP and ensuring its smooth operation, the secretariat makes arrangements for meetings, compiles and prepares reports, and coordinates with other relevant international bodies. The Climate Change secretariat is institutionally linked to the United Nations.

159. **Sensitivity** is the degree to which a system will respond to a change in climatic conditions.

160. Sequestration
The capacity to absorb carbon dioxide out of the air through the process of photosynthesis.

161. Sinks
Under the Kyoto Protocol, developed countries can include changes in net emissions (calculated as emissions minus removals of CO_2) from certain activities in the land-use change and forestry sector. Calculating the effects of sinks (growing vegetation tends to absorb carbon dioxide from the atmosphere) is methodologically complex and still needs to be clarified.

162. Solar Radiation
Radiation emitted by the Sun. Also known as short-wave radiation. Solar radiation has a distinctive spectrum (i.e., range of wavelengths) governed by the temperature of the Sun. The spectrum of solar radiation is practically distinct from that of infrared (q.v.) or terrestrial radiation because of the difference in temperature between the Sun and the Earth-atmosphere system.

163. Subsidiary Body
A committee that assists the Conference of the Parties. Two permanent ones are defined by the Convention: the Subsidiary Body for Implementation (SBI) and the Subsidiary Body for Scientific and Technological Advice (SBSTA). COP-1 also established two other temporary bodies: the Ad hoc Group on the Berlin Mandate, which concluded its work on 30 November 1997, and the Ad hoc Group on Article 13. Additional subsidiary bodies may be established as needed.

164. Subsidiary Body for Implementation (SBI)
Makes recommendations on policy and implementation issues to the COP and, if requested, other bodies.

165. Subsidiary Body for Scientific and Technological Advice (SBSTA)
Serves as the link between the information and assessment provided by expert sources (such as the IPCC) on the one hand, and the policy-oriented needs of the COP on the other.

166. Sulfur hexafluoride (SF_6)
One of the six GHGs to be curbed under the Kyoto Protocol. It is largely used in heavy industry to insulate high-voltage equipment and to assist in the manufacturing of cable cooling systems. It has a large GWP (23 900 times that of CO_2 over a 100 year horizon).

167. Supplementarity
Article 17 specifies that trading be "supplemental" to domestic actions for the purpose of meeting quantified emission limitation and reductions under that article. According to one point of view, supplementarity should be implemented by imposing a cap, or fixed numerical restriction, on the quantity of emissions reductions that can be achieved internationally, as opposed to via domestic actions and policies. The theory behind this perspective is that, in the absence of pressure to change production and consumption patterns at home, countries with high energy intensities will not have an incentive to spur innovation and adopt new, cleaner technologies and practices.

168. Sustainable Development
Sustainable Development is a broad concept referring to the need to balance the satisfaction of near-term interests with the protection of the interests of future generations, including their need for a safe and healthy environment. As expressed by the 1987 UN World Commission on Environment and Development (the "Brundtland Commission"), sustainable development "meets the needs of the present generation without compromising the ability of future generations to meet their needs".

T

169. Tax-interaction effect can occur when environmental policies, such as emission taxes or permits, and the conventional tax system interact. This effect is the cost of the overall reduction in employment and investment caused by environmental policies, which exacerbate the distortionary effects of pre-existing taxes on labor and capital.

170. Technology Transfer
The broad set of processes covering the exchange of knowledge, money and goods amongst different stakeholders that lead to the spreading of technology for adapting to or mitigating climate change. In an attempt to use the broadest and most inclusive concept possible, the Report (IPCC) uses the word 'transfer' to encompass both diffusion of technologies and cooperation across and within countries.

171. Third Assessment Report (TAR)
The IPCC's Third Assessment Report is expected to be finalized in late 2000 and published in early 2001.

Tradable emissions permits are used in an environmental regulatory scheme where the sources of the pollutant to be regulated (most often an air pollutant) are given permits to release a specified number of tons of the pollutant. The government issues only a limited number of permits consistent with the desired level of emissions. The owners of the permits may keep them and release the pollutants, or reduce their emissions and sell the permits. The fact that the permits have value as an item to be sold gives the owner an incentive to reduce their emissions.

U

172. Umbrella Group
The Umbrella Group, which emerged at Kyoto and afterwards, brings the JUSSCANNZ countries except Switzerland together with the Russian Federation and Ukraine.

173. United Nations Framework Convention on Climate Change (UNFCCC)
A treaty signed in 1992 Earth Summit in Rio de Janeiro by more than 150 countries. Its ultimate objective is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system". While no legally binding level of emissions is set, the treaty states an aim by Annex I countries to return these emissions to 1990 levels by the year 2000. The treaty took effect in March 1994 upon the ratification of more than 50 countries; a total of some 160 nations have now ratified. In March 1995, the UNFCCC held the first session of the COP, the supreme body of the Convention, in Berlin. Its Secretariat is based in Bonn, Germany. In the biennium 2000-01, its approved budget and staffing level are approximately US$12 million annually with approximately 80 personnel.

V

174. Validation
The process of independent evaluation of a project activity by an accredited independent entity.

175. Verification
Verification involves a third party checking that the emissions reductions claimed in the national and international registers or "books" have actually occurred and evaluating the results that have been achieved against pre-set criteria. Verification is a "reality check" on the books. It could involve physical, on-site inspection, or where useful, deployment of techniques such as remote sensing, or interviewing relevant personnel in person or otherwise. It could be applied to each and every project or to a fraction of projects chosen randomly or selected according to agreed criteria.

176. Vulnerability
The degree to which a system is susceptible to, and unable to cope with, injury damage or harm

340

177. Voluntary Commitments - During the Kyoto negotiations, a draft article that would have permitted developing countries to voluntary adhere to legally binding emissions targets was dropped in the final hours. This issue remains important for some negotiators and may be discussed in Buenos Aires.

178. Voluntary Measures
Measures to reduce GHG emissions that are adopted by firms or other actors in the absence of government mandates. Voluntary measures help make climate-friendly products or processes more readily available or encourage consumers to incorporate environmental values in their market choices.

W

179. Water Vapor (H_2O)
Most abundant GHG. Anthropogenic activities are not significantly increasing its concentration, but warming leads to a positive water vapor feedback. The concentration of water vapor regulates the temperature of the planet, in part, because of its relationship with the atmosphere and the water cycle.