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CARBON FINANCING MODELS TO MITIGATE CLIMATIC CHANGE A CASE STUDY OF IP-APPML CDM PROJECT RAJAMAHENDRAVARAM

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Abstract:
Climate refers to the weather which is a natural gift for a place, region or nation. The changes that comes in day to day natural environment without the impact of human interaction is called weather which is also called as climate of that place. But Climate change (CC) implies a change in the typical or average weather of a region or city. CC is a global concern that cannot be addressed without the support of all developed and underdeveloped economies. Kyoto protocol agreement which was initiated in 1997 was finally approved in 2005 COP -3 of UNFCCC. As per this protocol UNFCCC certifies Clean Development Mechanism(CDM) projects established in developing economies such that a developed country shall be under compulsory obligation to sponsor a GHG reduction project in a developing country. KP-2005 of UNFCCC is a starting point of International financing for reducing GHG and activities to mitigate the CC.
Carbon Financing models implies application of capital budgeting tools to verify the financial feasibility of GHG reduction initiatives. Current study focused on International paper – APPM Ltd Rajahmundry (IP-APPML), CDM project approved by UNFCCC during the credit period covering 2000 – 01 to 2009 – 10. The study clearly indicated that CC mitigating projects are have general profitability but highly volatile due to huge technological investments. Support from Government can make projects more profitable and initiate the process of mitigating CC happen at a faster phase.
Key words: CC (Climate Change), Carbon Financing, UNFCCC (United Nations Convention on Climate change), CDM (Clean Development Mechanism) and GHG (Green House Gases)

INTORDUCTION

As it is rightly said that energy saved is energy produced, policy frameworks at national and international stages should contribute to achieving energy efficiency, reduction in energy spending and helping the environment. Notably, improved energy intensity has been the biggest factor behind the recent flattening of GHG emissions.(Dr.Fatih Birol-2017). Technological innovation is creating new opportunities for progress on efficiency. Digitalization is beginning to have a significant impact on the energy sector and energy efficiency is emerging as a key arena for innovation. This is evident from the general understanding of increased efforts of manufacturers of automobile and electronic gadgets, investing in technologies that reduce the energy consumption and set new benchmarks for fuel or power efficiency. International energy agency in its recent report on energy efficiency indicated that 68% of world's energy consumption is much below the efficiency codes and standards. So there is an immediate need for policy makers to encourage the innovation and replacement of energy inefficient equipments by developing financing models. Carbon financing models like, allowing accelerated depreciation on new energy efficient equipment u/s 32 of Income tax act, providing government grants, allowing carbon accounting to add environmental depletion as overhead cost or introduction of green tax or cess.

CC is a global concern that cannot be addressed without the support of all developed and underdeveloped economies. Kyoto protocol agreement which was initiated in 1997 was finally approved in 2005 COP -3 of UNFCCC. As per this protocol CER (carbon emersion reduction) has been imposed on the developed countries and developing counties like India, china and Brazil etc are to implement renewable energy sources in both domestic and commercial sector. The source of finance in this direction shall be availed by developing economies from the developed economies in the form of selling their carbon credits. UNFCCC certifies Clean Development Mechanism(CDM) projects established in developing economies such that a developed country shall be under compulsory obligation to sponsor a GHG reduction project in a developing country. KP-2005 of UNFCCC is a starting point of International financing for reducing GHG and activities to mitigate the CC.

OBJECTIVES OF STUDY

This study has been conceived with basic objective to investigate and analyze the sources of finance for activities that are intended to mitigate the CC and to provide the necessary suggestions to improve the general profitability in financial terms.

a) To investigate into financial feasibility of CDM projects sponsored by UNFCCC through the application of Capital budgeting techniques in International papers - APPML.
b) To ascertain various problems and challenges encountered by the CDM projects in light of observations obtained from analysis of cashflows.
c) To analyze system of compensation provided by UNFCCC through Carbon Credit financing and discuss its adequacy as a source of financing CDM projects.
d) To study the impact of changing macroeconomic variables in India on the cashflow streams of the project during the period of study.
e) To highlight the areas that can make a significant improvement to CDM projects and offer constructive suggestions to UNFCCC, IP-APPM, and GOI

METHODOLOGY

This study primarily depends on secondary data sources only. Data published by UNFCCC at the time of granting the permission for Carbon Credits and accepting the initiatives of IP-APPML as a CDM project. Annual reports and data gathered from records of IP-APPML are also important sources of secondary data for computing the cashflows. Published data from department of Income tax on rates of taxes and rates of depreciation during 10 years of study period as accessed through web sources is also a very significant secondary sources.

RESULTS AND DISCUSION

The Andhra Pradesh Paper Mills Limited, Rajahmundry is one of the leading paper manufacturing unitsin India. The present production capacity of the plant is 300 MT per day. There are five paper machinesinstalled in the mill which produces paper of different M.F & M.G varieties in the range of 28 to 250GSM. The mill is manufacturing largest range of papers and boards. To improve the operationalefficiency of the plant and to develop into a more environmentally friendly operation, the mill has beencontinuously taking several steps in the plant. The energy efficiency improvement initiative is one ofsuch tools towards accomplishment of this mission.

Location

Plant is located at Rajahmundry, which is situated on the left bank of the river Godavari in East Godavari district. It has a hoary past and is said to have been constructed by the Eastern Chalukya ruler RajarajaNarendra in A.D. 1022.Rajahmundry city is well connected with all means of transportation. The nearest railway station and airport are located in Rajahmundry. The district is surrounded by West Godavari on South side and Visakhapatnam on north side. Also, it shares border with Khammam district towards west. The latitude and longitude of the plant location is 16059'N and 81047'E respectively.

Salient Features of APPML - CDM Project:

Project participant has implemented various technologically advanced equipments at APPML,Rajahmundry under its programme for energy efficiency improvement initiative. The efficiency
improvementprogramme mainly consists of: -

- Installation of Variable Frequency Drives
- Replacement of existing equipments with more efficient equipments
- Optimisation in operation of equipments and controls

The total cost of all these modernization processes shall cost net 104 lakhs after trading with the salvage value of old out energy efficient equipment. Installation of all considerable activities are completed during the year 2000-01 itself and balance of activities we completed in phased manner as per the technical demands of the project

Impact

The energy efficiency measures would reduce the indirect coal combustion for the same production quantity. The reduction in specific electricity consumption for paper production reduces equivalent amount of carbon dioxide emissions into the atmosphere. The estimated emission reductions from the project activity would be around 28768 t of CO2 equivalent during the 10 years crediting period.

Table – 1 Estimated amount of emission reductions over the chosen crediting period

Operating Year	CO_2 Emission Reductions (tones of CO_2)
2000-2001	248
2001-2002	325
2002-2003	382
2003-2004	3599
2004-2005	4856
2005-2006	4844
2006-2007	3872
2007-2008	3548
2008-2009	3548
2009-2010	3548
Total	28768

Total number of crediting Years	10
Annual average (t CO_2)	2877
Source : Filed work	

Source : Filed work

During the years 2000 – 2001 to 2002-2003 being the initial years of implementation of the CDM project, the amount of saving in power consumption was low and carbon credits earned were also low during these three years. From 2003-2004, full scope impact of CDM was identified throughout the tenure of the project. Units of carbon credits earned were highest during the year 2004-05. However due to general decline of production capacities due to demand adjustments in the plant, there is a little decline in the credits earned by the firm. UNFCCC methodology of awarding carbon credits depends on baseline emersion reduction mechanism. Accordingly the total process of power generation using the combustion of coal is considered and CO2 emersion done at each of these different processes is totaled for production of 1 MWh of power.In the process of determining the carbon credits, authorities of UNFCCC had determined that 909 t CO2 is released for production of 1 MWh or 1000 KWh. Thus the fraction of CO2 emersion for each KWh power produced = 909 / 1000 = 0.909. During the year 2000-01 power saved was 272000 units. Which is equal to 272 KWh since 1000 units of power consumption is equal to KWh. Carbon emersion reduction = 272 * 0.909 = 248 t CO2. Thus a saving of power by 272 KWh shall save CO2 emission reduction of 248 t CO2. The project energy savings are estimated based on the KW reduced and operating hours of theequipment in a year. As some of the fans connected to boilers might stop running during the creditingperiod due to the stoppage of boiler to which they are connected, the energy savings for those items areconsidered only during the period they operate.

ANALYSIS OF FINANCIAL DIMENSION OF CDM PROJECT

Table – 2 Computation of Cash Inflows over the Crediting period of the project

Sl.No	Details	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
1	Total Energy saved (KWh-Units in Lakhs)	2.72	3.58	4.2	3.96	5.34	5.33	4.26	3.9	3.91	3.9
2	Unit cost of power `per KWh	2.52	2.48	2.56	2.84	2.77	2.8	2.95	2.87	3.13	3.02
3	Savings in (`) - 1 * 2	6.85	8.88	10.75	11.25	14.79	14.92	12.57	11.19	12.24	11.78
3	Depreciation as per Income tax Rules	26	19.5	14.63	10.97	8.23	6.17	2.78	2.36	2	1.7
4	Earnings before tax	-19.15	-10.62	-3.88	0.28	6.56	8.75	9.79	8.83	10.24	10.08
5	Tax	7.37	4.2	1.39	-0.1	-2.35	-3.14	-3.3	-2.97	-3.48	-3.43
	(4)* (Tax rate)	-38.50%	-39.55	-35.7	-36.75	-35.875	-35.893	-33.66	-33.66	-34%	-34%
6	Earnings after Tax – (4 – 5)	-11.78	-6.42	-2.49	0.18	4.21	5.61	6.49	5.86	6.76	6.65
7	Depreciation (= 3)	26	19.5	14.63	10.97	8.23	6.17	2.78	2.36	2	1.7
8	Cash Flow = (6+7)	14.22	13.08	12.14	11.15	12.44	11.78	9.27	8.22	8.76	8.35
9	Income from sale of Carbon Credits.	0	0	0	0	0	0	0	0	211.72	96.41
10	Net Cash flow.	14.22	13.08	12.14	11.15	12.44	11.78	9.27	8.22	220.48	104.76

* Tax rates information - https://www.scribd.com/doc/43961085/Direct-Tax-Rate,

** Power cost Information, Income from sale of carbon credits – Annual reports of APPM from 2000 to 2010.

*** Depreciation rates - http://www.incometaxindia.gov.in/charts%20%20tables/depreciation%20rates.htm

ANALYSIS OF CASHFLOWS

An analysis of cashflows table, indicate that the scope of power saving was low during the initial crediting period granted by UNFCCC. During the years 2000-01 and 2001-02, where considerable investments are undergoing for replacement of energy saving organization could not generate significant savings. If these 10 years crediting period might have been delayed or is requested in that manner by the participant company, more credits could have been earned from reduction in energy savings and their equivalent CER's.

Monetary value of the savings in terms of ` is computed by multiplication of the energy saved with purchase price of the energy paid / payable to APTRANSCO. That means this could be the appropriate cash out flow that might have ariased to the participant if had not gone for energy saving drives through replacement of modern technology.

Sec 32 of Income tax Act provides that, depreciation on assets should be based on block of assets concept (as defined in sec 2(11)). The class of assets used in this modernization program of APPML falls under 25% rate of depreciation

upto the year 2005-06. From assessment year 2006-07 onwards, there is an amendment in sec 32 whereby the rate of depreciation was reduced to 15%. This is a discouraging move from tax savings perspective.

Corporate tax rates had changed significantly during the study period. During the year 2000-01, tax rate is high at 35% with 10% surcharge, thus total tax at 38.5%. In the year 2001-02, while tax rate remained at 35%, surcharge increased to 13% as such total tax rate is 39.55%. This is infact highest tax rate ever applied in India. Anexure -1 gives tax rates applicable in India during the study period.

As per the agreement entered into with UNFCCC, terms provides that APPML shall be eligible for award of carbon credits only after 2005-06. Accordingly the participant had received the credits, in installments during the last four years. Based on AS-11 revenue recognisation requirements, APPML had reported the revenue generated from sale of carbon credits in the years in which they were sold under the heading "Other Incomes" in their annual reports of 2008-09 and 2009-10.

CAPM approach to determination of Cost of Capital (or) Discounting rate

Beta of APPML (as reported by REUTERS a US based web stock market analytics) is 1.50. This beta value is accessed on https://www.reuters.com/finance/stocks/overview/IP. Again the risk free rate of return The yield on a 364 day Treasury bill during the year 2017 averages 6.40 as reported by official web portal of RBI.. This value can be accessed at https://www.rbi.org.in/ Scripts/BS_NSDPDisplay.aspx?param=4 is 12.27.

Using this information an appropriate discounting rate for APPML can be calculated using the CAPM (Capital Assets Pricing Model).

Required rate of return = Rf + Beta (Rm – Rf) = 6.40 + 1.50(12.27 – 6.40) = 15.20 %

Analysis of Financial Feasibility

- Using Payback Period approach
- NPV
- Cost Benefit Ratio (or) Profitability Index
- IRR (Internal rate of return)

Table - 3 PAY BACK PERIOD OF CDM Project of APPML

Year	Cash Flow	Cumulated Cash Flow
0	-104	-104
1	14.22	-89.78
2	13.08	-76.7
3	12.14	-64.56
4	11.15	-53.41
5	12.44	-40.97
6	11.78	-29.19
7	9.27	-19.92
8	8.22	-11.7
9	220.48	208.78
10	104.76	313.54

Pay Back Period =

8 Years + 11.70 / 208.78 = 8.06 Years

By the end of 8 years of project life, still there is – 11.70 lakhs of investment needed to be collected from the project. This clearly indicates the vulnerability of CDM projects. Such a long payback period increases the risk of investments in environmental friendly projects. Behavioural Finance which explains the heuristics of investors indicates possibility for likely irrational attitude from participants by looking at such a lengthy payback period. If UNFCCC grants carbon credits soon after the implementation of the project the pay back might have been lower than this. Again production capacity enhancements can increase the possible annual savings in power cost. Tax dimensions in terms of rates of tax and depreciation allowances should be relaxed for encouraging CDM projects to be undertaken by participants from India.

Interpretation of Graph

Above graph represents, PB (Payback) period proportion and PBP (Post Payback) period proportion of the CDM Project. A project with such a low post payback profitability is highly sensitive to volatility conditions existing in the paper market. Financial feasibility study of modernization projects is different from that of normal financial decisions. Certain factors like demand, production etc have similar impact, but other factors tax rates, depreciation and power cost shall have opposite effect due the concept of shadow price.

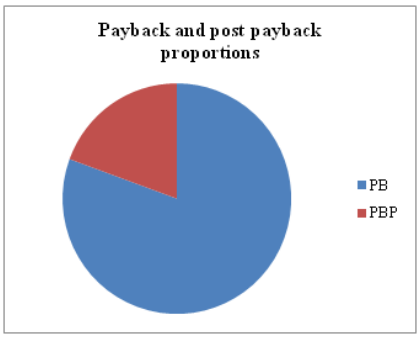


Table - 4 NPV (Net Present value) of CDM Projects

Year	Cash Flows	Discounting Factors	Present Values
0	-104	1	-104
1	14.22	0.86806	12.3438
2	13.08	0.75352	9.85605
3	12.14	0.6541	7.94075
4	11.15	0.56779	6.33089
5	12.44	0.49288	6.13138
6	11.78	0.42784	5.04
7	9.27	0.37139	3.44281
8	8.22	0.32239	2.65004
9	220.48	0.27985	61.7017
10	104.76	0.24293	25.449
	NET PRESENT VALUE		36.8863

Net Present value of the project indicates a positive value, which implies that wealth of the shareholder is not minimized due to CDM Projects. However the delayed release of carbon credits by UNFCCC and sales of such credits by APPML had decreased the prospective NPV. In the years 9 and 10 absolute CF seems very significant, but their corresponding present values had turned comparatively lower due to time value of money.

Table – 5 COST BENEFIT ANALYSIS

Cost of the Project	104 Lakhs
Present value of all cash inflows	140.88 Lakhs

Profitability Index = Total of the PV / Cost of the project = 140.88 / 104 = 1.35

A ratio in excess of 1 indicates the economic feasibility of the project. Generally a cost benefit ratio around 1.6 shall encourage further investments. Investments in the normal line of business of APPML had a C/B ratio near to 2 times. Thus by all means 1.35 is not a great encouragement for APPML in investing for sustainable growth. But still APPM is continuing its commitment to CC due the fact that there are several non-quantifiable or long term benefits claimed by the directors of the company in their communication to shareholders through annual reports.

IRR (Internal Rate of Return)

Year	CF	DF = 20 %	PV	DF = 21%	PV
0	-104	1	-104	1	-104
1	14.22	0.83333	11.85	0.82645	11.7521
2	13.08	0.69444	9.08333	0.68301	8.93382
3	12.14	0.5787	7.02546	0.56447	6.85271
4	11.15	0.48225	5.37712	0.46651	5.20156
5	12.44	0.40188	4.99936	0.38554	4.79616
6	11.78	0.3349	3.9451	0.31863	3.75347
7	9.27	0.27908	2.58709	0.26333	2.44108
8	8.22	0.23257	1.91171	0.21763	1.78891
9	220.48	0.19381	42.7305	0.17986	39.6553
10	104.76	0.16151	16.9193	0.14864	15.5719

	NET PRESENT VALUE	2.429	NPV =	-3.2531

For computing IRR, "X" is taken at the unkown discount rate that will equal the NPV of the project to "Zero". Simple interpolation technique provides an equation like……

(X – 20) / (21 – 20) = (0 – 2.43) / (- 3.25 – 2.43)

(X – 20) = - 2.43 / -5.68

X – 20 = 0.43

X = 20.43 %

As seen from the above calculation the IRR implied in this project is 20.43%. Required rate of return is already computed as 15.20% considering the risk class of the APPM. Results indicate a general profitability and feasibility of the project since the IRR is more than cost of capital. In the absence of carbon credits support there could not be any positive rate of return. Thus it is clearly indicative that support from UNFCCC and Government of India is vital for transformation to energy conservation and sustainable measures for APPML.

CONCLUSION

Financing the CC mitigating through financing of CDM Projects in developing economies is a great initiative requiring propaganda and support from member nations. Every economy around the globe is experiencing the impact of global warming and every one of them agreed to the fact that increased CO2 emissions is the main cause for it. Currently carbon market is experiencing a transition difficulties as support from developed economies is subjected to self-interest dominance over common interest. This is a quite common phenomenon in every move towards a change in system. Role of United States of America is very crucial in this direction. US had principle agreed to Kyoto Protocol but requires certain modalities for its convenience which are under discussion in UNFCCC.

The applied techniques i.e Payback period, NPV, C/B Ratio and IRR all passed the general acceptable criteria needed for accepting a project. Thus study reveals that CDM projects are not wealth minimization activities. In the process of contributing to the CC mitigation, the CDM project of IP – APPM had benefited in the form of 36.88 lakhs positive present value over the investment of 104 lakhs. Thus the wealth of the shareholders of IP-APPM were increased by 36.88 lakhs for undertaking of CDM project by management. Similarly the payback period 8.06 years indicate that there is 1.94 years of post payback profitability in the select project of IP-APPM. Financial profitability with such a long payback period does not allow the human mind to think in a rational way. That means increased delay in payback increases the risk aversion and decision makers may irrationally consider loss aversion and avoid such dual purpose projects.

In light of these financial analysis UNFCCC is strongly advised to use relaxed standards in awarding CER's so that considerable delay in awarding of credits is reduced. UNFCCC should also see that participants are encouraged to continue with such initiatives through continuation of communication with them.

Government of India had a great role to play in CDM projects. As it had been felt in analysis of cashflows generated from CDM projects, the impact of tax rates and depreciation was considerable and capable of making the projects vulnerable to these changes.Government of India therefore provide tax incentives in the form of allowing 100% depreciation allowance for investments selected for CDM projects. For the assessment year 2017-18, Sec 115-BBG was introduced thereby income from carbon credits shall be taxable at 10%. This will decrease the profit potential of CDM projects and can become a hurdle in progress of Indian participants in CDM projects. This conclusion is supported by the values of NPV and IRR which are indicating a very general margin of overall profitability.

Results from the application of various capital budgeting techniques indicates that CDM projects that have dual advantage of annual saving in power cost due to modernization and income from sale of carbon credits are still highly sensitive. This information is of exceptional importance to policy makers because a sensitive projects can be motivated easily by providing incentives and desired end (mitigating CC) can be achieved fast in this sensitive phase.

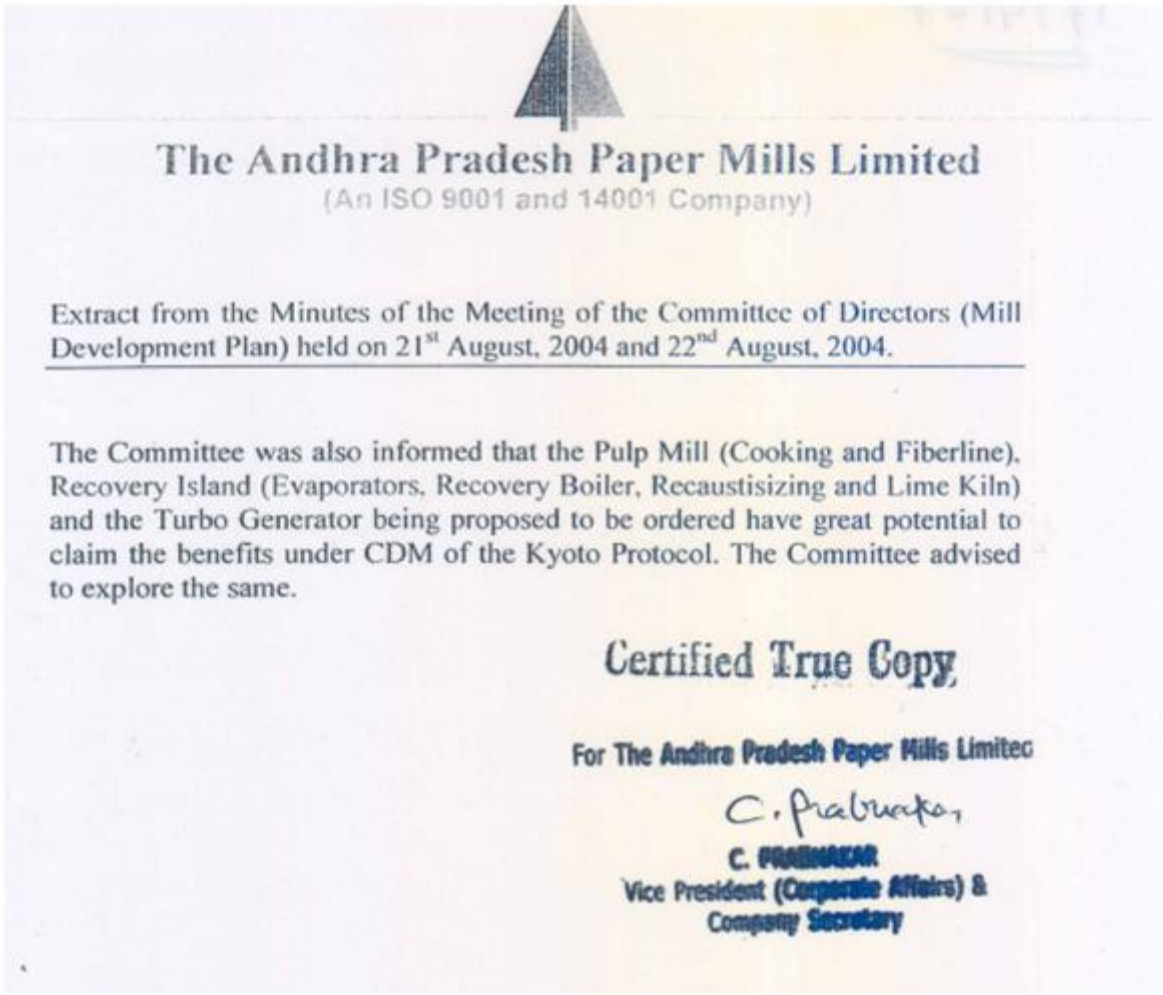
ANEXURE – 1 TAX RATES

Assessment years [Rates (in percentage)]			
	1998-99 To 2001-02	2002-03 To 2005-06	2006-07 To 2009-10
1. In the case of a domestic company	35	35	30
2. In the case of a foreign company; (a) Royalties received from an Indian concern in pursuance of an agreement made by it with the Indian concern after 31-03-1961; or fees for rendering technical services received from an Indian Concern in pursuance of an agreement	50	50	50

Surcharge, EC & SHEC for 1998-99 to 2009-10 (Rates in %)									
	98-99 & 99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07 & 07-08	08-09 & 09-10
Surcharge In the case of domestic company	-	10	13	2	5	2.5	2.5	10	10*
Surcharge In the case of a foreign company	-	-	-	-	5	2.5	2.5	2.5	2.5*
Education Cess	-	-	-	-	-	-	2	2	2
SHEC	-	-	-	-	-	-	-	-	1

* If Total income of a company > Rs. 1 crore.

ANEXURE – 2
AUTHORIZATION AND LETTER OF ENGAGEMENT



The Andhra Pradesh Paper Mills Limited
(An ISO 9001 and 14001 Company)

Extract from the Minutes of the Meeting of the Committee of Directors (Mill Development Plan) held on 21st August, 2004 and 22nd August, 2004.

The Committee was also informed that the Pulp Mill (Cooking and Fiberline), Recovery Island (Evaporators, Recovery Boiler, Recaustisizing and Lime Kiln) and the Turbo Generator being proposed to be ordered have great potential to claim the benefits under CDM of the Kyoto Protocol. The Committee advised to explore the same.

Certified True Copy

For The Andhra Pradesh Paper Mills Limited

C. Prabhakar,

C. PRABHAKAR
Vice President (Corporate Affairs) &
Company Secretary