Consultants for Resources Evaluation

Donald I. Hertzmark
Team Leader

September 4, 2008

Mr. Siseho Simasiku
Chief Executive Officer
Electricity Control Board of Namibia
8 Bismarck Street
P.O. Box 2923
Windhoek, Namibia

Cc: Mr. Gerrit Clarke: ECB Project managers for the USTDA Grant; Ms. Helene Vosloo, Director of Tariff Department

REFERENCE: **Task 4: Economic and Financial Analysis of IPPs: Modeling Training for ECB Managers and Staff**

IPP Investment Market Framework and Technical Assistance Phase II

Dear Mr. Simasiku:

We are pleased to enclose our Task 4 Report as required under the contract. Task 4 focuses on two key activities that are high priority for the ECB – (i) provision of a simple, yet powerful, economic and financial analysis model for ECB; and (ii) training of ECB staff in the use of such a model, including due diligence of proposed IPP investments.

CORE International and the CORE Team would like to express our very sincere appreciation to you and other ECB officials for supporting us as we progress on this study. We are especially grateful for the support that Mr. Clarke and Ms. Vosloo have provided us in getting the ECB staff motivated and in moving forward with the project activities.

On behalf of our Team, we wish to assure ECB of our continuing commitment to providing excellent services under this Project in a timely and efficient manner. Please do not hesitate to contact me if you need any additional information.

Yours sincerely,

Donald Hertzmark, Team Leader
ECB Independent Power Producer Framework Project

cc: Vinod K. Shrivastava, Corporate Project Director

Namibia IPP and Investment Framework Technical Assistance
Under a Grant by the U.S. Trade and Development Agency

TASK 4: Economic and Financial Analysis of IPPs: Modeling Training for ECB Managers and Staff

PREPARED FOR
ELECTRICITY CONTROL BOARD, NAMIBIA
(INTERIM CONTRACTUAL REPORT)

PREPARED BY

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1 INTRODUCTION AND OBJECTIVES OF TASK 4

1.1 INTRODUCTION

In November 2007, the Government of Namibia passed Electricity Act 2007, which permits and encourages private sector investment in the country's power sector. The Electricity Control Board (ECB), the regulator in Namibia, has been given the responsibility under the Act to implement the Independent Power Producer (IPP) regime in Namibia in accordance with the provisions of the Act and its own regulatory procedures approved by the ECB Board. Accordingly, ECB developed and posted a vast amount of information on its web site that would be of interest to prospective IPPs interested in Namibia's power sector.

In addition, ECB has developed a detailed procedure for the documentation and evaluation of the IPP applications. This procedure is currently being refined based on the experience ECB has had as a result of a number of application it has received for licenses for generation of power.

The U.S. Trade and Development Agency (USTDA) has provided a grant to the ECB as a follow-up to a previous grant that focused on developing various framework models for planning for an IPP regime in Namibia. The first USTDA grant supported the following key activities:

- Identification of barriers to IPP development in Namibia
- Market Model Recommendations
- Regulatory Recommendations
- Model document preparation for small and medium IPPs
- Policy Recommendations
- Barrier Mitigation

Since the completion of the first USTDA grant, Namibia has been forced to take concrete steps to address its power supply future. Key challenges facing the country include (i) the reduction in surplus electricity supply from South Africa; (ii) soaring prices for liquid and gas fuels; (iii) continuing increases in demand for mining products, and with that the electricity to process minerals; (iv) the long lead times involved in building new power plants; and (v) the desire to develop a secure power supply independently of South Africa.

Consequently, Namibia, through the ECB and NamPower, has taken several concrete steps to begin to tackle the electricity supply-side challenges facing the country. These steps include the following key ones:

- Construction of the Caprivi Link with Zambia
- Investment in rehabilitation of coal-fired station in Zimbabwe
- Encouragement of new IPP generators in Namibia

In the interim and prior to the current grant, ECB began receiving a number of IPP applications for licenses. The current project under the USTDA grant focuses on the provision of consulting services to ECB in the evaluation of IPP applications. ECB selected CORE International, Inc., an international management consulting company based in Washington, D.C., to provide technical advisory services in order for ECB to evaluate the various IPP applications in accordance with both the Government's policy and best international practices to ensure that the review process is transparent, fair, and accountable.

The Terms of Reference (TORs) for the USTDA Phase II Grant to ECB includes several tasks. Task 4 of the TOR focuses on providing assistance to the ECB in two key areas – (i)

provision of a simple, yet powerful, economic and financial analysis model for ECB; and (ii) training of ECB staff in the use of such a model, including due diligence of proposed IPP investments.

1.2 TASK 4 OBJECTIVES

The objectives and deliverables of Task 4, as stated in the contractual Terms of reference (TORs) are as follows:

"Typically, it is the IPP developer that conducts the economic and financial analysis as part of its application for license. However, it is the responsibility of the Grantee to perform due diligence on the project analysis submitted by the IPP. Accordingly, the Contractor shall develop a standardized methodology to be required of all IPP developers for the provision of an economic and financial analysis of the proposed project. The IPPs will be required to justify the proposed IPP both on the basis of national economic impacts and the financial viability of the project. Specifically, the methodology shall include the standard approach for calculating the economic and financial internal rates of return (IRR) of the proposed IPP projects. The Contractor shall also develop guidelines for Grantee review and due diligence of economic and financial analyses submitted by IPPs.

As part of Task 4, the Contractor shall prepare and deliver to the ECB the following deliverables:

- ***Standard Guidelines for IPPs for conducting and presenting Economic and Financial Analyses of proposed IPP Projects; and***
- ***Standard Guidelines for Grantee review of Economic and Financial Analyses of proposed IPP Projects."***

CORE International Team developed a standardized and internationally acceptable methodology for ECB for its economic and financial due diligence. The specific task elements and activities to accomplish the objectives of Task 4 included: (i) provision of a simple, yet powerful, economic and financial analysis model for ECB; and (ii) training of ECB staff in the use of such a model, including due diligence of proposed IPP investments. The CORE Team divided this task into three subtasks: (i) a course on economic & financial analysis; (ii) provision of an economic and financial analysis model and exercises on constructing economic & financial analysis based on current IPP applications; and (iii) documentation & templates for model and input data requirements. As part of this task, the CORE Team conducted two specific training programs for key ECB staff in the use of the model on actual IPP project license applications submitted to ECB.

1.2.1 Subtask 4.1: Conduct A Course on Economic & Financial Analysis

An activity that stresses the use of modern economic and financial analysis techniques must provide a firm grounding in the underlying methodology and theoretical foundations of the techniques. This grounding must necessarily begin with a set of economic and financial analysis first principles.

Under this subtask, the contractor shall:

- Provide a multi-day course in modern financial and economic analysis techniques; and
- Provide an introduction to the specific methods that will be used to assess the financial strength, sales prices and national (economic) benefit of proposed IPP projects.

1.2.2 Subtask 4.2: Provision of a Financial and Economic Analysis Model and Training

Under this Subtask 4.2, the Contractor shall provide a simulation model for economic and financial analysis that can be adapted to the specific conditions of Namibia, and used easily and quickly by the ECB staff.

Under this subtask, the Contractor shall:

- Develop and adapt a financial and economic simulation model for use by ECB staff to evaluate IPP applications;
- Train ECB staff in the use, strengths and weaknesses of such a model; and
- Use the model as an element in the due diligence to be performed on proposed private power generation plants.

1.2.3 Subtask 4.3: Documentation and Templates for Models and Data

Under this Subtask 4.3, the Contractor shall provide appropriate customization for the economic and financial simulation model to maximize its ease of use and appropriateness for Namibian IPP project analysis and assessment.

Under this subtask, the Contractor shall:

- Modify the already-provided economic and financial simulation model as needed;
- Document the instructions for using the model; and
- Indicate where appropriate sources of data may be found to keep the information used in the model up to date.

1.2.4 Task 4: Deliverables:

As part of this task, the Contractor shall deliver the following products:

- A training course in ECB headquarters in Namibia on economic and financial methods of project analysis;
- A simulation model appropriate to the needs of ECB for economic and financial analysis;
- Documentation for the model's proper use;
- A second training course focused on specific uses of the model for IPP application due diligence; and
- Ongoing technical assistance and advice for ECB during the lifetime of the project as needed and appropriate.

The next section of this report summarizes the activities completed by CORE International in fulfillment of the requirements of Task 4.

Annex 1 includes a schedule of Task 4 activities.

2 KEY TASK 4 ACTIVITIES

The CORE Team Leader worked closely with ECB's Head of Tariffs and staff in conducting Task 4. The activities under Task 4 were mostly split between deskwork conducted at the home office and training sessions with ECB staff in Windhoek. Two trips to Namibia were made in conjunction with this Task. The Team Leader provided an introduction to the skills required to analyze and assess projects from an economic standpoint, and the full presentation given at that time is included as Annex 2 of this report. Subsequent to that initial mission CORE adapted and developed a financial and economic simulation model based on a simulation model already used for numerous World Bank projects, as well as the Due Diligence task (Task 1) for this project. After initial exposure to the model some significant modifications were made to the modeling framework, including the use of additional foreign currencies and estimates of various project parameters.

Finally, a modified simulation model was provided for ECB, along with training in its use.

2.1 SUBTASK 4.1: CONDUCT A COURSE ON ECONOMIC AND FINANCIAL ANALYSIS

Subtask 4.1 focused on the following specific activities:

- Prepare ECB staff to use a financial and economic simulation model
- Conduct a course for ECB staff on the elements of economic and financial analysis
- Develop and adapt a financial and economic simulation model for use by ECB staff to evaluate IPP applications;
- Train ECB staff in the use, strengths and weaknesses of such a model; and
- Use the model as an element in the due diligence to be performed on proposed private power generation plants.

In February 2008 the Team Leader traveled to Namibia and presented a workshop on present value methods and economic/financial analysis. The Workshop took place over 4 days and was attended by the Tariff department at ECB plus Mr. Clarke. The presentation that was the basis of the Workshop is shown in Annex 2. An existing economic and financial simulation model of power plant investments was chosen to be adapted for modification for this project. Of a number of available simulation models, the particular one chosen has proved remarkably robust and adaptable to a wide variety of settings and project types. This model was introduced to the ECB staff in February 2008 and a copy of the model was left with ECB.

2.2 SUBTASK 4.2: PROVISION OF A FINANCIAL AND ECONOMIC ANALYSIS MODEL AND TRAINING

Subsequent to the February Workshop, there were further adaptations of the model for the ECB. These included the addition of new parameters for plant efficiency, plant operational factors (hours per year of operation), additional currency choices, expression of all energy analysis in SI units, among others. These additional capabilities are presented in easy-to-use menu formats. An earlier version of this model was used to perform the project due diligence that was included in the deliverable for Task 1, so the simulation analysis has been well adapted and vetted for the Namibian situation. The data requirements of the model were also used as the template for the financial and economic data requirements now imposed on potential investors. A cover

page of the model is shown in Annex 3 and the actual model transferred to ECB is on the CD-ROM that is supplied with this report.

A second training Workshop was conducted in late-July early August 2008 at ECB to hand over control of the economic and financial due diligence process to the ECB staff. This workshop focused on training in the specific uses of the financial/economic model, its application to real IPP opportunities and interpretation/reporting of results. It was critical to engage the ECB staff in the actual reporting and interpretation of results for current IPP applications in order to assess the degree of progress attained by the Tariff Department staff on the use of the model. Examples of the materials used in the second workshop are contained in Annex 4.

2.3 Documentation and Templates for Models and Data

Full Instructions for the use of the analysis model are included on the second sheet of that model. The instructions use hypertext connections so that the user can go quickly from the instructions to the model and back. Annex 4 shows the instructions sheet for the model as well as a final version of the data template that was provided for ECB to be used in its IPP applications.

2.4 Deliverables

All of the deliverables scheduled for this Task have been given to ECB in electronic form. Technical assistance is provided on an as-needed basis throughout the life of the project. As noted previously, these deliverables include the following:

- A training course in ECB headquarters in Namibia on economic and financial methods of project analysis;
- A simulation model appropriate to the needs of ECB for economic and financial analysis;
- Documentation for the model's proper use;
- A second training course focused on specific uses of the model for IPP application due diligence; and
- Ongoing technical assistance and advice for ECB during the lifetime of the project as needed and appropriate.

3 KEY FINDINGS AND CONCLUSIONS

Namibia is undergoing a rapid transformation in its electricity sector. ECB will need to continue to build its staff capabilities in order to keep up with its responsibilities to look after the interest of the nation and all of the constituent participants in the power sector during a period of dramatic change. The following key findings have emerged from the training in financial and economic analysis:

- ECB staff are able to perform many of the due diligence functions required to assess the financial impacts of proposed IPPs;
- Additional efforts will be needed to assure the sector participants that ECB is fully operational in its due diligence and tariff impact assessment capabilities. To do this ECB will need:
    - Additional contact time with IPP applicants and their data
    - Interaction with NamPower and with potential investors
    - Additional experience in meeting deadlines for completion of due diligence and issuance of reports on potential investors
- NamPower and ECB are almost "harmonized" with respect to the data that they require on the financial and economic side. Some additional steps are needed to make sure that there are no contradictory data or format requirements by the two. Ideally, the financial and operational data required by ECB should be a subset of that type of data required by NamPower.

ANNEX 1: SCHEDULE OF TASK 4 ACTIVITIES

January 2008:	Preparation of Economic and Financial Analysis Workshop
February 2008:	Workshop in Windhoek (ECB) on economic and financial analysis of projects and due diligence for IPP applications
	First version of Namibia model given to ECB
	Initial training in use of financial and economic model
March 2008:	Modified version of Namibia model given to ECB
July 2008:	Second Workshop
	Focused specifically on training is use of model, interpretation/reporting of results
	Further modifications of financial model made and given to ECB
September 2008:	Report on Task 4 Activities Provided to ECB

Annex 2: Presentation on Economic and Financial Analysis Methods

This entire presentation was provided to the ECB and is included with the attached CD-ROM.

Present Value Methods for Electricity Economic Analysis

CORE International

Donald Hertzmark, Team Leader

February 2008

Slide 2: What is *Present* Value Analysis?

- *Present value methods (aka present worth analysis) attempts to make numbers that occur at various points in the future (or past) commensurable*

What is Present Value Analysis?

- *To use PV methods you need the following information:*
- *Your accounting stance - what's inside the fence and what is excluded*
- *Discount rate(s) - interest rate at which future cash flows are discounted*
- *Time distributed cash flows:*
- *Fixed costs (investment, scheduled repairs fixed O&M)*
- *Variable costs (fuel, variable O&M, unscheduled maintenance)*

Slide 3: What is Present Value Analysis?

- *Time distributed cash flows (continued):*
- *Benefits/revenues*
- *Output*
- *Cost saving*
- *Key physical parameters:*
- *Production rate*
- *Conversion rate*
- *Substitution rate (fuels)*

Slide 4: What is Present Value Analysis?

- *PV methods are also used in financial analysis*
- *Add to the above:*
- *Borrowing and reinvestment rates*
- *Fees and financing charges*
- *Dividends*
- *Depreciation*
- *Taxes*
- *In-kind payments or receipts*

Slide 5: Key Differences Between Economic and Financial Analysis

- *Economic analysis attempts to eliminate the effects of tax and financial policies*
- *All projects are then comparable on same quantitative basis*

- *Means of mitigating risk from changes in tax and financial policies*
- *Many major companies have now changed to using economic analysis for project screening, including almost all major IOCs*

Key Differences Between Economic and Financial Analysis

Project Measures of Merit		
Measure	Notes	
	Economic	*Financial*
NPV	*The NPV is simply the total project benefits (value of electricity displaced by time of day and season) less the total project costs in each year of the project life, discounted to the present.*	*The NPV is the summed value of the discounted project revenues plus depreciation addbacks less the summed present value of all costs and taxes.*

Key Differences Between Economic and Financial Analysis

Project Measures of Merit		
Measure	Notes	
	Economic	*Financial*
IRR	*That discount rate at which the sum of annual project cash flows sums to zero (sometimes called EIRR).*	*Same as the ERR but taken after tax, dividend and depreciation considerations.*
Netback Value	*The maximum possible fuel price at which the proposed project can break even*	

Key Differences Between Economic and Financial Analysis

Project Measures of Merit		
Measure	Notes	
	Economic	*Financial*
Generation Cost	*The cost, in USD/MWh, of each hour of generation from the proposed project, using the economic cost of capital investment and variable cost.*	*The cost, in USD/MWh, of each hour of generation from the proposed project, using the **financial** cost of capital investment and variable cost.*

Key Differences Between Economic and Financial Analysis

Project Measures of Merit		
Measure	Notes	
	Economic	*Financial*
Economic Dispatch	*The dispatch of power plants according the calculation of each plant's energy cost of generation vis-à-vis other units available to operate at that time with plant ranked in a merit order from the least costly to the most costly for each time period.*	

Key Differences Between Economic and Financial Analysis

Project Measures of Merit		
Measure	Notes	
	Economic	*Financial*
Reserve Margin	Additional capacity that is *available* for dispatch *after meeting the system peak demand* – may be a daily, monthly, seasonal or annual figure	

Key Differences Between Economic and Financial Analysis

Project Measures of Merit		
Measure	Notes	
	Economic	*Financial*
Avoided Capacity Cost	*That investment which is not required if the proposed plant is constructed and dispatched.*	*N/A*

Key Differences Between Economic and Financial Analysis

Project Measures of Merit		
Measure	Notes	
	Economic	Financial
Avoided Energy Cost	*That energy input to generation which is not required if the proposed plant is constructed and dispatched.*	*N/A*

Slide 14: How To Set Up PV Analysis

- ***Establish your periodicity - years, months, etc. - for cash flows***
- ***Estimate* when *cash flow will occur***
- ***Lay out each type of cost on its own line***
- ***Compute cash flows by hand using the formula:*** $PV_{jt} = \sum_{o}^{T} (C_{jt})/((1+i)^{(t-0)}$

Just kidding, use the Excel financial functions

Slide 15: How To Set Up PV Analysis

Tips and Tricks

- ***Excel assumes that first cash flow in series is at beginning of year, so don't discount that one***
- ***IRR will not compute correct answer if zero line is crossed twice - in that case use the MIRR function and put in the discount rate for both the borrowing and reinvestment rates***
- ***You will need to discount the future output (that's right, discount a physical quantity) to compute both the AIC and Netback values (but only if you want to receive full credit)***

Slide 16: How To Set Up PV Analysis

MC, AIC - What's the Difference?

- ***Marginal cost represents the resources required to serve an additional unit of supply***

  In practice it is measured by the additional unit costs of moving the construction sequence forward to meet additional demand

- ***AIC represents the average cost of meeting future additional demand, defined as***

  AIC = PV incremental cost ÷ PV incremental demand

Slide 17: How To Set Up PV Analysis

MC, AIC - What's the Difference?

- ***LRMC is difficult to calculate correctly and unambiguously, while AIC is straightforward***

- ***AIC can be made to resemble MC if it is "periodized", that is, AICs are calculated for distinct time slices throughout the life of the analysis***

ANNEX 3: ECONOMIC AND FINANCIAL ANALYSIS MODEL

This is the first page of the economic and financial simulation model. The actual model is included on the CD-ROM.

Welcome to GenCalc, an Economic and Financial Analysis Model for Electricity

Summary of Operating Parameters and Assumptions

Type of Plant	gas	(can be renewable or fossil)
Plant Size (MW)	440	
Oil Price	77.13	USD per barrel
Initial Investment (w/o subsidies)	684,800,970	
Exchange Rate (per USD)	6.50	N dollar
Power Sales Price (initial)	0.072252794	USD/kWh

Summary of Renewable Energy Incentives

Grant Component (% of investment)	Fossil Plant
"Green Pricing" Multiplier (%)	Fossil Plant
Interest Rate Subsidy (points)	Fossil Plant
Hybrid Fossil Use (% of output)	Fossil Plant

Summary of Financial and Economic Results (Money is USD and Local Currency)

	USD	Local
Generation Cost per kWh	$0.1216	$0.79
Financial NPV	(854,383,060)	(5,553,489,891)
Financial IRR	-100.00%	-100.00%
Economic NPV	(121,592,853)	(790,353,544)
Economic IRR	6.65%	6.65%
"Green Pricing" ENPV	NA	NA
"Green Pricing" ERR	NA	NA

This model is simple and easy to use. All of the changeable parameters are found in the sheet "Parameters".
The only cells that should be changed are those in turquoise boxes =>. Parameter
The IRR and NPV results are viewable throughout the worksheet so that the user can see the results of changing parameters.
For analysis of fossil projects, the user simply chooses "coal", "oil" or "gas" in the box, "Fuel Type".
A cost recovery tariff is one that drops once the plant has been amortized. A level tariff does not change.
When the user chooses "renew" as the plant type, the user then has the option of allowing various incentives come into play.
The incentives are automatically excluded in the fossil versions.
The economic costs and returns are calculated without financial, tax or buyback tariff data.
The economic benefit is the cost of alternative generation *not* required if this investment is made.

Go to the worksheet, "Detailed Instructions" for a guide to each of the parameters to be set.

To print the parameters of the model double click:
Then press "print" in view sheet.

To print the main results listed above, double-click:
Then press "print" in view sheet.

ANNEX 4: EXAMPLES OF DUE DILIGENCE ACTIVITIES USING THE ECONOMIC AND FINANCIAL ANALYSIS MODEL

GAS-FIRED POWER PLANT

Summary of Operating Parameters and Assumptions

Type of Plant	**gas**	(can be renewable or fo
Plant Size (MW)	**245**	
Oil Price	**120.00**	**USD per barrel**
Initial Investment (w/o subsidies)	**197,860,000**	
Exchange Rate (per USD)	**7.25**	**N$**
Power Sales Price (initial)	**0.137**	**USD/kWh**

Summary of Renewable Energy Incentives

Grant Component (% of investment)	**Fossil Plant**
"Green Pricing" Multiplier (%)	**Fossil Plant**
Interest Rate Subsidy (points)	**Fossil Plant**
Hybrid Fossil Use (% of output)	**Fossil Plant**

Summary of Financial and Economic Results (Money is USD and Local Curren

	USD	Local
Generation Cost per kWh	**$0.1426**	**$1.034**
Financial NPV	**70,654,522**	**512,245,287**
Financial IRR	**21.58%**	**21.58%**
Economic NPV	**393,381,697**	**2,852,017,307**
Economic IRR	**42.62%**	**42.62%**
"Green Pricing" ENPV	**NA**	**NA**
"Green Pricing" ERR	**NA**	**NA**

WIND ENERGY PROPOSAL

Summary of Operating Parameters and Assumptions

Type of Plant	**renew**	(can be renewable or fossil)
Plant Size (MW)	**101**	
Oil Price	**120.00**	**USD per barrel**
Initial Investment (w/o subsidies)	**145,225,000**	
Exchange Rate (per USD)	**11.24**	**N$**
Power Sales Price (initial)	**0.050**	**USD/kWh**

Summary of Renewable Energy Incentives

Grant Component (% of investment)	**0%**
"Green Pricing" Multiplier (%)	**100%**
Interest Rate Subsidy (points)	**6**
Hybrid Fossil Use (% of output)	**0%**

Summary of Financial and Economic Results (Money is USD and Local Currency)

	USD	Local
Generation Cost per kWh	**$0.0636**	**$0.715**
Financial NPV	**(11,395,385)**	**(128,055,636)**
Financial IRR	**7.32%**	**7.32%**
Economic NPV	**64,388,394**	**723,564,578**
Economic IRR	**16.55%**	**16.55%**
"Green Pricing" ENPV	**64,388,394**	**723,564,578**
"Green Pricing" ERR	**16.55%**	**16.55%**

"MEXICAN" IPP APPLICATION: CCGT POWER PLANT

GENERATION LICENCE APPLICATION TECHNICAL REVIEW INFORMATION REQUEST

Comision Regulamento d'Electricidad

This document sets out a list of information requested by the Comision Regulamaento d' Electricidad (CRE) for reviewing all new generation applications. This document should be used in conjunction with all other relevant CRE documents, including the Electricity Act 2007 and the prevailing CRE rules and regulations including the Guidelines for IPP Licence Application for Generation of Electricity, Version 4, September, 2007, published on the CRE web site. www.ecb.org.na

The information should be submitted in the format as outlined below. The review process of an application will only commence once the CRE is satisfied with the information submitted. Costs are to be quoted in Mexican Pesos value unless other wise stated

This document may be revised in the future based on the actual experience with the application review process.

Version 3M, 1st August 2008

A) Technical review:

1) Plant's technical information
   a. Description – this section should be primarily descriptive and qualitative, except where noted
   b. Technology – CCGT, solid fuel steam, etc. – CCGT, Baja Province, Mexico
   c. Technology vendor – Competitive bid
   d. Individual unit description – size, fuel supply – 2*85 MW GT + 1* 75 MW HRSG
   e. Fuel storage & supply conditions- pipeline gas
   f. Tankage, storage pile (for coal) – N/A
   g. Storage sufficiency – days of operation from storage, etc. – 3 days
   h. Capacity
   i. Total Capacity (MW, kWh) - 245
   j. Gross Capacity (MW, kWh) - 245
   k. Net Capacity (MW, kWh) – 237
   l. (Expected) Capacity factor (annual hours and percentage) – 7446, 85%
   m. Seasonal output variations – 88% for 219 days, 82% for 146 days
   n. Plant factor

o. Plant availability (annual hour and percentage) – 94% overall

p. Plant availability during peak and non peak period (daily, weekly, and monthly) – 97%

q. Output availability

r. Responses to load fluctuations – additional plant availability

s. Conversion efficiency, including seasonal factors – 53% in season 1, 58% in season 2

t. Technology maturity – descriptive, where has this technology been used before, in the region? Worldwide? - everywhere

2) Fuel

a. Type – pipeline gas

b. Quality – as specified in Term sheet

c. Plant's gross consumption - fytfo

d. Plant's net Consumption - fytfo

e. Start up fuel – consumption per plant start, nr of starts per year anticipated – Naphtha, 12 starts at 10 tonnes/start

3) Construction Period

a. Months - 24

b. Detailed design

c. EPC contract

d. Completion & plant operation month 1, year 3

4) Plant life

a. Economic life – 20 years

b. Physical life – 25 years

c. Major maintenance overhauls during anticipated PPA period – intervals & expected costs – 0.5% per year decline in conversion efficiency

B) Economical and Financial review

1. Capital Cost

1.1 Total cost (Overnight cost) - $193,060,000

1.2 Cost per gross MW - fytfo
1.3 Distribution of cost over construction period (US$) – 40/60
1.4 Escalation of cost during construction and interest thereof (US$) – IDC rate = 12.5%
1.5 Transmission connection charge and costs – 4,800,000
1.6 Fixed Overhead and Maintenance (Escalations if any) – 1.3% of kcost
1.7 Variable Overhead and Maintenance (Escalations if any) – 2.6% of kcost
1.8 Decommissioning cost – N/A

2. Soft costs (US$)

2.1 Engineering costs – 2,300,000
2.2 Design – 750,000
2.3 Civil work – 3,250,000
2.4 Financial & legal – 1,175,000

3. Fuel

A brief discussion on the procurement process of fuel including the following; please provide the supporting contracts and agreements,

3.1 Source and procuring currency – USD, regasified LNG from Indonesia
3.2 Risk factors and mitigation – multiple sources of gas for regasification plant
3.3 Fuel price risk - market
3.4 Fuel price adjustment – cargo (12x annually)
3.5 Fuel Supply Agreement (FSA)
  3.5.1 Cost of production index
  3.5.2 Escalation formulae in FSA
  3.5.3 Market adjustment
  3.5.4 Quality index
3.6 Namibian dollar (N$) per Giga joule and joules per kWh – fytfo and fytfo
3.7 Coal prices should be quoted in South African Rand
3.8 Actions to be undertaken to mitigate fuel price increases, as appropriate.

4. Discount rate

Based on Mexican Government Bonds + 1.5 %

5. Output flexibility

5.1 Load following capability – moderate, should get some peak period credit

5.2 Seasonal variations in output – see above

6. Production rate of power - fytfo

6.1 Daily
6.2 Monthly
6.3 Seasonally

7. Price adjustment mechanisms

7.1 Describe how proposed mechanism will operation in accordance with the ECB's price adjustment methods for electricity customers – NP pays capacity charge of US$ 25/MWh, adjusted at inflation * 20%
7.2 Expected price adjustments prior to plant startup – 7.5%
7.3 Cost components to be adjusted
  7.3.1 Fuel – 100%
  7.3.2 Variable Operating and Maintenance – proportion to be adjusted using ECB index or other index – 100%
  7.3.3 Fixed Operating and Maintenance– proportion to be adjusted using ECB index or other index – 25%

8. Value of output

8.1 Tariff at application
  8.1.1 Overall tariff - Market capacity value = $0.011/kWh for base, $0.15 for intermediate, $0.060/kWh for peak
  8.1.2 Energy charge - $0.106/kWh for base, $0.131/kWh for intermediate, $0.211/kWh for peak
  8.1.3 Proposed Capacity Charge - $20/MWh
  8.1.4 Escalation formulae between date of application and proposed start up date
  8.1.5 Elements of the indexation formulae must be defined – see above
  8.1.6 Price indexation formulae must distinguish among the 4 elements defined above
8.2 Tariff at the year of initial operations – capacity + energy = $0.14095/kWh
8.3 Specify increments – as per ECB adjustment periods
8.4 Escalation adjustment
8.5 Price adjustment mechanism (in line with ECB methodologies; period and mechanism)

Note: periodic operational hours are:

Season	Season	Total

1	2	
876	876	1,752
2,190	1,460	3,650
2,190	1,168	3,358
5,256	3,504	8,760

9. Foreign Currency Exchanges (Local and US$ currency)

9.1 Specify Currency – US$ 100%
9.2 Specify value relationship: US$1.00=MP11
9.3 Specify tariff component to be paid in foreign currency – see 9.1

ANNEX 4: DOCUMENTATION AND TEMPLATES FOR MODELS AND DATA

MODEL INSTRUCTIONS:

Instructions For Filling in the Parameter Sheet

Go Back to Parameter Sheet

Plant

Capacity Factor	% of time the plant is on line, typical values are .85 for coal and .5 for small hydro. **Enter as %.**
O&M factor	% of capital costs for non-fuel O&M
Soft Costs (%)	Construction, land acquisition, permits, etc. as % of equipment costs

Equipment Cost

$/MW	USD per MW of installed capacity
MW	MW of installed capcity
Construction Period	number of years (assumed to be 2)
Proportion of Capex/y	year 1 and year 2 proportions of captial expenditures

Note: you may click on the link to the capex calculator if you have total capex *only* or capex in a *non-USD currency*

Market

Output Price	Main: USD per kWh for amortization period Secondary: USD per kWh after amortization completed
Use Currency . . .	If using non-USD for output price, enter "yes", otherwise enter "no"
Other Currency	Enter 1 for home currency, 2 for second foreign currency, 3 for third foreign currency, **Enter Output Price in Chosen Currency**
Oil Price ($/bbl)	Enter price in USD/bbl
Oil Price ($/GJ)	This is a calculated value
Fuel Type (gas, oil, coal, or renew)	Choose "gas", "oil", "coal", or "renew" and the model will make the appropriate adjustments Note: if the "renew" option is chosen, the user can then input selected incentive parameters (see below under "Renewable Power Plants") For hybrid power plants choose "hybrid" option under renewable paramter settings
Thermal Efficiency	This parameter has been set to default levels already, but can be changed by the user
Fuel Price Inflation	Expected rate of increase in fuel prices in % per year

Go Back to Parameter Sheet

Financing

Discount rate:	Enter the rate, in decimal form, of the rate to be used when discounting the cash flows
Term	Enter the term of the financing in years
IDC Rate	Enter the interest rate to be used during the construction period
Div Rate	Enter the rate in decimal form, of the rate to be used for divident payments to equity owners
D/E	Enter the proportion of the project to be financed using debt
Interest Rate Adder	Enter the points to be added or subtracted from the discount rate to derive the interest rate
Tax rate	Enter the corporate tax rate in decimal form
Depreciation	Enter the type for depreciation
Depreciation Term	Enter the depreciation term in years
Inflation	Expected change in price level in % per year
Rev S.T. Escalation	% of revenues subject to inflation at expected rate of price increase (simulates capital cost exclusion in PPAs)

Renewable Power Plants

Grant	Enter the proportion of the initial capital cost subject to a grant
Tariff Type	Enter the tariff type: "level" for a constant tariff level and "cost" for a main and secondary tariff keyed to the financing paramters
Interest Rate Subsidy	Enter the number of points by which the interest rate will be subsidized.
Hybrid	Enter the proportion of the electricity to be produced using fuel

Converter

Foreign Exchange Rate	Enter the foreign exchange rate in units per USD
Name of Currency	Enter the name of the currency

Go Back to Parameter Sheet

Avoided Cost Calculator

Avoided Plant (gas, oil or coal only)	Enter the plant type: "gas" "oil" or "coal"
Avoided Investment	do not enter anything in this cell
O&M	enter a percentage
Soft Costs (%)	enter a percentage to cover non-EPC costs
Pricing multiplier	Enter a number (usually >1) to reflect the "Green Pricing" premium for the renewable energy

DETAILED DATA SHEET FOR IPP APPLICATIONS

The following data sheet was provided to ECB as a part of CORE's Due Diligence in Task 1:

GENERATION LICENCE APPLICATION TECHNICAL REVIEW INFORMATION REQUEST

ELECTRICITY CONTROL BOARD, NAMIBIA

This document sets out a list of information requested by the Electricity Control Board (ECB) for reviewing all new generation applications. This document should be used in conjunction with all other relevant ECB documents, including the Electricity Act 2007 and the prevailing ECB rules and regulations including the Guidelines for IPP Licence Application for Generation of Electricity, Version 4, September, 2007, published on the ECB web site. www.ecb.org.na

The information should be submitted in the format as outlined below. The review process of an application will only commence once the ECB is satisfied with the information submitted. Costs are to be quoted in Namibian Dollar (N$) value unless other wise stated

This document may be revised in the future based on the actual experience with the application review process.

Second draft, 21st April 2008

A) Technical review:

1.1 Description
1.2 Capacity
  1.2.1 T o tal Capacity (MW, kWh)
  1.2.2 G r oss Capacity (MW, kWh)
  1.2.3 N e t Capacity (MW, kWh)
  1.2.4 C a p a c ity factor (annual hours and percentage)
1.3 Plant factor
  1.3.1 P lant availability (annual hour and percentage)
  1.3.2 P lant availability during peak and non peak period (daily, weekly, and monthly)
1.4 Output availability
  Responses to load fluctuations
1.5 Conversion efficiency
1.6 Technology maturity

2.1 Type
2.2 Quality
2.3 Plant's gross consumption
2.4 Plant's net Consumption
2.5 Start up fuel

3.1 Months

4.1 Economic life
4.2 Physical life

B) Economical and Financial review

1.1 Total cost (Overnight cost)
1.2 Cost per gross MW
1.3 Distribution of cost over construction period (US$)
1.4 Cost of construction during construction and interest thereof (US$)
1.5 Transmission charge and costs
1.6 Fixed Overhead and Maintenance (Escalations if any)
1.7 Variable Overhead and Maintenance (Escalations if any)
1.8 Decommissioning cost

2.1 Engineering costs
2.2 Design
2.3 Civil work

A brief discussion on the procurement process of fuel includes the following; please provide the supporting contracts and agreements,

3.1 Source and procuring currency
3.2 Risk factors and mitigation
3.3 Fuel price risk
3.4 Fuel price adjustment

A brief discussion on the procurement process of fuel includes the following; please provide the supporting contracts and agreements,

1.1 Source and procuring currency
1.2 Risk factors and mitigation
1.3 Fuel price risk
1.4 Fuel price adjustment
1.5 Fuel Supply Agreement (FSA)
    1.5.1 Cost of production index
    1.5.2 Escalation formulae in FSA
    1.5.3 Market adjustment
    1.5.4 Quality index
1.6 Namibian dollar (N$) per Giga joule and joules per kWh
1.7 Coal prices should be quoted in South African Rand

Based on Government Bonds + 1.5 %
5.1 In accordance with the ECB's price adjustment
5.2 Expected price adjustment
5.3 Cost component to be adjusted
    5.3.1 Fuel
    5.3.2 Operating and Maintenance
    5.3.3 Fixed Operating and Maintenance

6.1 Tariff at application
    6.1.1 Overall tariff
    6.1.2 Energy charge
    6.1.3 Capacity Charge
    6.1.4 Escalation formulae between date of application and proposed start up date
    6.1.5 Elements of the indexation formulae must be defined
    6.1.6 Price indexation formulae must distinguish among the 4 elements defined above
6.2 Tariff at the year of operations
6.3 Specify increments
6.4 Escalation adjustment
6.5 Price adjustment mechanism (in line with ECB methodologies; period and mechanism)
7.1 Specify Currency
7.2 Specify value relationship
7.3 Specify tariff component to be paid in foreign currency
8.1 Source
8.2 Escalation adjustment