Wind Energy Projects in Kerala,India – considerations for Investors

John Cyriac
john.e.cyriac@gmail.com

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1 Agenda

2 Abbreviations

ANERT	Agency for Non-Conventional Energy and Rural Technology
C-WET	Centre for Wind Energy Technology
CER	Certified Emission Reduction Credit
CTU	Central Transmission Utility
DWK 04	Policy Guidelines for the development of wind power in Kerala through private developers. G.O. (MS) No: 23/2004/PD Dated 06 November 2004.
EA 2003	Electricity Act 2003
ERC 1998	Electricity Regulatory Commissions Act 1998
ESA 1948	Electricity (Supply) Act of 1948
IE 1910	Indian Electricity Act of 1910
INR	Indian Rupees
IPP	Independent Power Producer
IREDA	Indian Renewable Energy Development Agency
KSEB	Kerala State Electricity Board
KSERC	Kerala State Electricity Regulatory Commission
MNES	Ministry of Non-conventional Energy Sources
NLDC	National Load Dispatch Centre
PPA	Power Purchase Agreement
PPRDL 06	Power procurement from renewable sources by distribution license regulations, 2006
RE	Renewable Energy
RLDC	Regional Load Dispatch Centre
SEB	State Electricity Board
SLDC	State Load Dispatch Centre
STU	State Transmission Utility

3 Abstract

This paper analyses the legal and financial aspects of investing in Wind Energy Projects in Kerala, India. Although the paper focuses on Kerala State, it can provide a basis for a framework to analyze the viability of wind energy projects in other States of India also. The paper starts with an overview of the wind energy sector in India and the scope for investors in the sector. It then outlines the various policies at the central government level, which forms the basis of State level regulations. The second section of the paper analyses the Kerala State level policies and administrative frameworks applicable for an Independent Power Producer (IPP) in the wind sector. The third section critically analyses the Kerala Model Power Purchase Agreement (PPA) and summarizes risk allocation depicted by the PPA. The fourth section of this paper considers a hypothetical wind energy project in Kerala using standard figures assumed in the PPA and related policies and conducts an investment appraisal. The paper concludes with a summary of findings from the legal and financial analysis.

4 Introduction

4.1 Wind energy in India

Renewable energy (RE) is a growing area in India's power sector. "India has an RE target of 10% (of total power supply) or 10,000 MW during 2003 to 2012"[1]. "The estimated potential of RE in India is estimated to be 80,000 MW"[2]. As of 2006, "5.5% (6050 MW) of installed power capacity in India is from RE"[3]. As of January 31, 2007, Indian RE installation rose to 9373 MW"[4]. This translates to a growth of more than 50% in a year." By 2022, India is expected to have installed RE of 54,003 MW"[5]. By the tremendous growth rate already proved in the recent years, the target for 2022 looks achievable for India's RE sector.

When it comes to RE from wind, "India is ranked fourth worldwide in terms of installed wind capacity and is set to advance markedly on its installed capacity figure"6. The wind capacity figures as of 2005 released by the Global Wind Energy Council are Germany (18,428 MW), Spain (10,027 MW), the USA (9,149 MW) and India (4,430 MW)7. "The cumulative installed capacity of grid-interactive wind power projects up to 31 March 2006 was 5382 MW. During 2006-07, 888 MW have been installed (up to 31 December 2006) and

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[1] Government of India (2006) **Renewable Energy Policy.**
[2] Ibid.
[3] ibid
[4] Ministry of new and renewable energy(2007) **Annual Report 2006-2007.**
[5] Ministry of new and renewable energy (2006) **XITH PLAN PROPOSALS FOR NEW AND RENEWABLE ENERGY**.
[6] Hauber, Grant(2007) **Wind Energy Finance – Mobilising European Investment in the Indian Wind Sector.**
[7] Adapted from Envis Centre on Renewable Energy and Environment (2006) **Wind Energy Information.**

as per trends it is likely that a total of 1700 MW would be added during the year"8. This translates to a growth of more than 20% in a year. "By 2022, India is expected to have installed RE from wind energy of 40,000 MW"9. This target for wind energy also looks achievable by considering the achievements and growth shown by the industry in the recent years.

From the above figures and trends, it is clear that the wind energy sector which boasts around 75% of the total RE projections is the biggest RE investment opportunity in India compared to other sources of RE.

4.2 Policy framework for Wind Energy Project in India

4.2.1 Electricity Act 2003 (EA 2003)[10]

The electricity sector in India was governed in the earlier days by mainly two policies, the Indian Electricty Act of 1910 (IE 1910) and the Electricity (Supply) Act of 1948 (ESA 1948). IE 1910 propagated a licensing system for electricity in India and ESA 1948 created State control on electricity. State Electricity Boards (SEB) were created as per ESA 1948 and they controlled the generation, transmission and distribution of electricity. However, many SEBs were not able to meet the increasing demand of electricity and to bridge the demand gap, ESA 1948 was amended in 1970, which allowed central government sponsored massive power projects and the acceptance of captive power plants. IE 1910 and ESA 1948 were further amended in the 1990s to allow private participation in power projects but were fully controlled by the SEBs. These reform acts prompted SEBs to create separate generation, transmission and distribution entities but prompted a Single Buyer model where transmission and distribution were regulated. Electricity Regulatory Commissions Act was introduced in 1998 (ERC -1998) which created independent regulatory setups in the centre and state levels. The Electricity Act 2003 (EA 2003) was enacted to consolidate all the previous policies and to create a sustainable growth environment for electricity sector in India. EA 2003 aims to create a multi-buyer, multi-seller system for electricity in India. As per Section 7 of EA 2003, electricity was made a non-licensed activity and IPPs can generate and sell electricity to consumers other than SEBs. But as per section 62(1)(a) of the EA 2003, the tariff of sale of electricity by the IPPs to the distribution licensee is controlled by the state regulatory commission and there is no central method of tariff determination. Therefore, the state regulatory commissions are free to choose the method of determining the tariff based on general guidelines. In a later part of this paper, we will see the effect of this regulation in action in the selected case study. EA 2003, Section 12 (a) maintains the transmission as a regulated activity, which requires a license. In line with the previous regulations, there will

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[8] [8] Ministry of new and renewable energy(2007) **Annual Report 2006-2007.**
[9] Ministry of new and renewable energy (2006) **XITH PLAN PROPOSALS FOR NEW AND RENEWABLE ENERGY**.
[10] Adapted from Bhattacharyya, Dr. Subhes C (2003) **Review of the Electricity Act 2003 of India.**

still be a Central Transmission Utility (CTU) and State Transmission Utility (STU), which is in charge of transmission. In addition, as per sections 2, 4 and 5 of EA 2003, the central government is responsible for creating 1) National Tariff Policy and 2) Renewable Energy Policy. As per section 110 and 111 of EA 2003, Appellate Tribunals are created to settle disputes in relation to electricity contracts as they are more knowledgeable in the sector than High Courts. EA 2003 also created a three tier load dispatching system. They are National Load Dispatch Centre (NLDC), Regional Load Dispatch Centre (RLDC) and State Load Dispatch Centre (SLDC). Load Dispatch Centers are separate government companies to avoid conflicts of interest.

4.2.2 Central Government RE policies related to Wind Energy

4.2.2.1 Fiscal Incentives

As per the central government policy, "the SEB will purchase electricity offered by the producer at a minimum rate of INR 2.25/unit, with no restriction on time or quantum of electricity supplied for sale. This rate will be reviewed every year, and will be linked to standard criteria such as wholesale price index. The producer will also have the option to sell the electricity generated by him to a Third Party within the State, at a rate to be mutually settled between them"[11].

There are various tax incentives and concessions in customs tariffs provided by policy provisions. However, these provisions change frequently and are not considered in this study.

4.2.2.2 Market Development Programme[12]

The current level of capacity addition have been achieved in India due to the market development initiatives taken up by the Ministry of Non-conventional Energy Sources (MNES). The market development initiatives of the MNES include:

- A comprehensive wind-mapping programme, largest in the world
- Analysis, compilation and publishing of wind speed and wind energy data
- Setting up of demonstration wind power projects
- Issuing guidelines to the State Electricity Boards to formulate policies towards grid interfacing of wind power, banking and wheeling arrangements and the purchase rate of electricity from the wind farms
- Policy of accelerated depreciation, concessions in import duty etc

[11] Ministry of Non-Conventional Energy **Government of India Non-conventional Energy Policy Guidelines to States.** Available at Appendix A of Hauber, Grant(2007) **Wind Energy Finance – Mobilising European Investment in the Indian Wind Sector.**
[12] Envis Centre on Renewable Energy and Environment (2006) **Wind Energy Information.**

- Encouragement towards development of indigenous wind turbine manufacturing facilities
- Setting up of Indian Renewable Energy Development Agency (IREDA) and enabling soft financing to wind farm projects through it.

4.3 Wind Energy in Kerala, India

Kerala is one of the Indian states in the southwestern region. "Kerala boasts 58% of the installed capacity from RE (2079 MW from RE with a 3565 MW total capacity). Out of the 2079 MW of RE in Kerala, 2.03 MW is from wind energy and 1842 MW is from hydel. Total RE potential in Kerala is 4,200 MW comprising of Wind Energy (850 MW), Bio Mass (50 MW), Small Hydro (1000 MW) and Solar photovoltaic (2300 MW)"[13].

Kerala has been selected for this case study in Wind Energy on account of the 99% unused potential of the total wind energy resource and a strong political sentiment towards RE in the State. In this case study, we will consider the legal and financial framework for doing a wind energy project in Kerala. We will see the way; central policies and programs as described in the previous sections are implemented at the State level. We will consider a typical wind project based on certain assumptions and conduct an investment appraisal to decide the feasibility of the project in Kerala.

5 Administrative, Legal and financial framework for Wind Energy Projects in Kerala

5.1 Overview of Administrative framework

5.1.1 Kerala State Electricity Regulatory Commission (KSERC)[14]

The Kerala State Electricity Regulatory Commission (KSERC) is a quasi-judicial body and was created as per Subsection (1) of Section 17 of the "Electricity Regulatory Commissions Act, 1998"[15]. Among the other functions, "KSERC is responsible for the following activities in relation to Renewable Energy in Kerala"[16].

- promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person

[13] Adapted from Kerala Planning Board (2006) **Energy Development.**
[14] The Commission was constituted vide Government of Kerala Order (Ms) No.34/2002/PD dated 14th November, 2002 notified in the Govt. of Kerala Gazette, Extra Ordinary dated 18th November, 2002.
[15] Government of India (1998) **THE ELECTRICITY REGULATORY COMMISSIONS ACT, 1998.** With effect from 10th June, 2003, the Commission has come under the purview of the Electricity Act, 2003, as the Electricity Regulatory Commissions Act, 1998 has since been repealed.

[16] Refer http://www.erckerala.org/codes/about.htm

- adjudicate upon the disputes between the licensees and generating companies and to refer any dispute for arbitration

5.1.2 Power Department, Government of Kerala

"This department functions as the administrative department of the State Electricity Board. This department handles tariff revision, new investments etc and issues related to the power policy. It is headed by a Secretary to Government functions."[17]

5.1.3 Kerala State Electricity Board (KSEB)

KSEB is the State Transmission Utility (STU), which provides transmission, planning and co-ordination of transmission systems etc. Although the Electricity Act 2003 (EA 2003) calls for a multi-buyer, multi-seller system, Kerala has not yet moved away from the ESA1948 and KSEB is not unbundled owing to various political issues.

5.1.4 Agency for Non-Conventional Energy and Rural Technology (ANERT)[18]

ANERT is an autonomous body of the Government of Kerala under the Department of Power. It is engaged in the field of development and promotion of non-conventional/renewable sources of energy in Kerala. ANERT is the nodal agency in Kerala for implementing the renewable energy programs of the Union Ministry of Non-conventional Energy Sources (MNES). ANERT also provides commercial services like wind energy potential and analysis for developers.

"ANERT has identified the technical wind potential available in Kerala to be 600 MW"[19]. ANERT lays down procedures for project preparation, approvals, monitoring etc and promote RE sources. It is a single window clearing Agency for most of the RE power projects. ANERT makes recommendations to the Government on the issues related to RE development and certifies devices to RE sources.

5.1.5 Centre for Wind Energy Technology (C-WET)[20]

MNES established the Centre for Wind Energy Technology(C-WET) at Chennai in 1998–99 to cater to the felt-need of the emerging wind industry. C-WET's broad aim is to address the issue of making the Indian wind turbine designers and manufacturers take informed decisions on designs that are suitable for the Indian market. From its inception, C-WET has been providing the industry with much-needed wind resource assessment, testing, certification etc.

C-WET comprises five units, which are functionally organized.

[17] Refer http://www.kerala.gov.in/dept_power/index.htm
[18] Refer http://education.vsnl.com/anert/
[19] Government of Kerala (2004) **Policy Guidelines for the Development of Wind Power in Kerala Through Private Developers. G.O. (MS) No: 23/2004/PD Dated 06 November 2004.**
[20] Information in this section is from Government of India, Ministry of Non Conventional Energy Sources(2005) **Centre for Wind Energy Technology.** Also refer C-WET website at http://www.cwet.tn.nic.in/

- Research and Development
- Wind Resource Assessment
- Wind Turbine Testing
- Standards and Certification
- Information, Training, and Commercial Services

5.2 Overview of Legal framework governing the Kerala Model PPA

5.2.1 Kerala Renewable Energy Policy, 2002[21]

This policy by the Kerala Government is to comply with MNES guidelines for state-level renewable energy. This policy establishes the role of ANERT and is recognized as the State Nodal agency for clearing all renewable energy projects in Kerala. This policy allows all legal structures of private developers (sole traders, partnerships, limited companies etc) to develop power plants in Kerala. Among other details, grid interfacing, tariff and other financial details are set out in this policy. The tariff structure is provided as per Government of India Non-conventional Energy Policy Guidelines to States**.**

5.2.2 Power Procurement from renewable Sources by Distribution Licensee regulations, 2006 (PPRDL 06)[22]

This policy sets out the minimum amount of renewable purchase and most importantly the tariff of purchase. The structure of tariff outlined in Section 4.6 of Renewable Energy Policy, 2002 (base rate and 5% escalation in later years) is changed by this policy. Annex II of PPRDL 06 gives specific guidance on wind energy tariff. Table 1 outlines the assumptions and the tariff structure outlined by this policy. This policy is used as a guiding principle for Kerala Model PPA, which is discussed later in this paper.

Capacity Utilisation Factor (CUF)	22%
Auxiliary Consumption	0.5%
Capital Cost (including connection till interconnection point)	Rs. 4.4 Crore/MW
Life of Plant	20 Years
Depreciation Rate	4.5% for 20 years with 10% residual value
Operation & Maintenance Cost	1.3% of capital invested with escalation

[21] Government of Kerala (2002) **Kerala Renewable Energy Policy.**
[22] Kerala State Electricity Regulatory Commission (2006) **Power procurement from renewable sources by distribution license regulations, 2006.**

	of 4%
Interest cost on long term debt	9%
Loan repayment period	10 years
ROE	14% on equity portion of capital cost
Minimum Alternative Tax	10.1% of ROE (Reduction in tariff owing to Tax holiday to be passed to customers)
Tariff	Rs. 3.14/unit for 20 years. (levelised tariff at 12% discount rate for 20 years)

Table 1. Wind Energy Generation commercials for PPA as per PPRDL 06

5.2.3 Policy Guidelines for the development of wind power in Kerala through Private Developers, 2006 (DWK 06)[23]

This policy was created as a modification for Kerala Renewable Energy Policy, 2002 by incorporating EA 2003 provisions with specific emphasis on wind energy. The process of approval of a wind energy project is outlined in this document along with modifications to provisions related to grid interface, transmission etc. Figure 1 illustrates the workflow of approvals for a wind energy developer as per DWK 06.

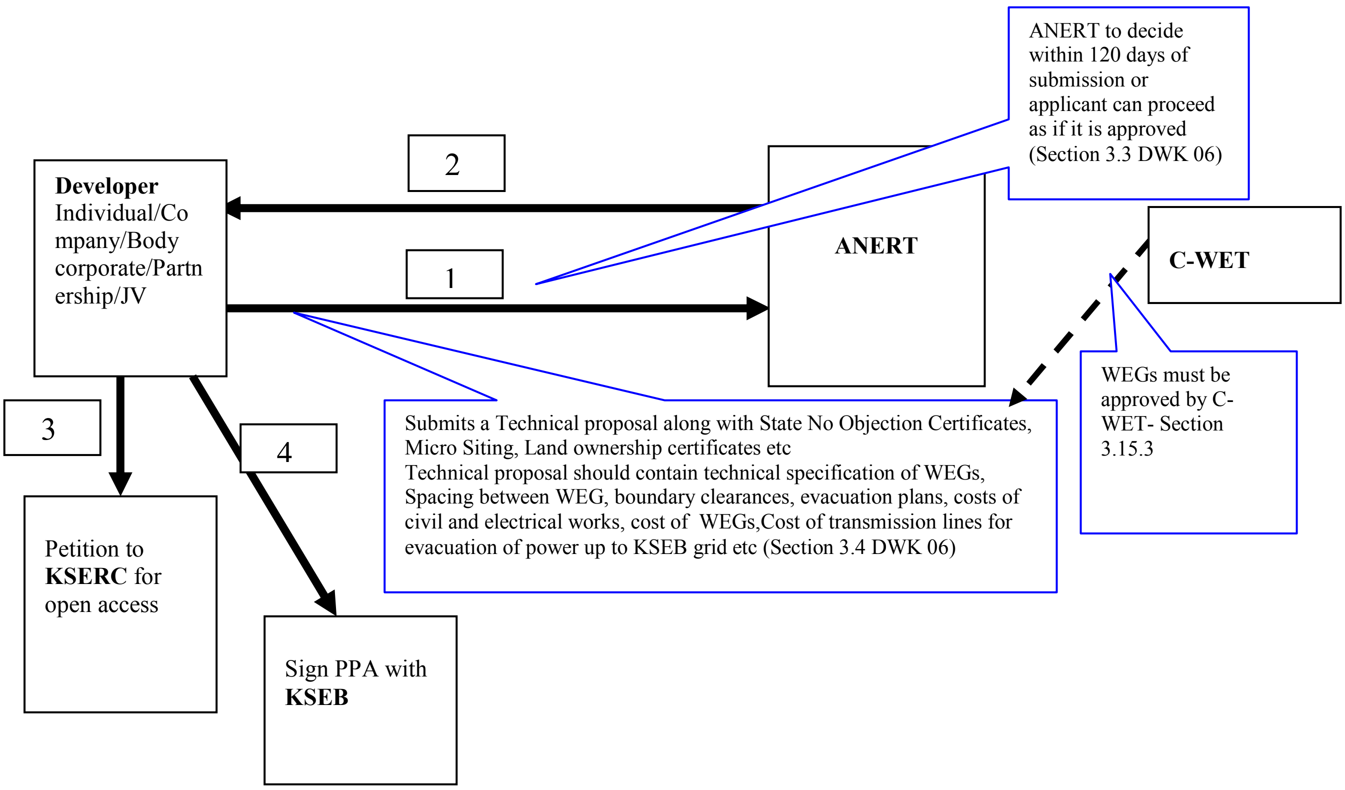

Figure 1. Workflow for Wind Energy Developer as per DWK 06

[23] Government of Kerala(2004) **Policy Guidelines for the development of wind power in Kerala through private developers.**

6 Analysis of Kerala Model Power Purchase Agreement

"Contracts that represent the obligation to make a payment to the project company on the delivery of some product or service are very important because these contracts govern cash flow".[24] In this section, we will review the Model PPA, which governs the cash flow to the IPP.

6.1 Overview of the PPA

Table 2 gives an overview of the major features of the Model PPA to be considered by an investor in a Kerala Wind Energy project.

Sl. No	Feature	Description
1.	Basic Features	
1.1	Parties and Term	PPA is between KSEB and the IPP. This is a 20 year contract
1.2	Delivery of Power	IPP agrees to deliver power on a dispatchable basis at the interconnection point.
1.3	Performance Guarantees	IPP is not obliged by any guarantee to produce electricity. Buyer promises to buy all electricity produced, subject to grid constraints and on a dispatchable basis.
1.4	Engineering warranties	IPP to make good any losses to KSEB because of the parallel operation of the WEG
1.5	Other guarantees	KSEB is not providing any guarantee to the IPP for implementing the project. Enforceability of the PPA may be limited by applicable bankruptcy, insolvency, reorganization, moratorium or other similar laws.
2.	Transmission	
2.1	Transmission and distribution	KSEB is the STU in charge of transmission and distribution.
2.2	Interconnection	IPP at its own cost maintain the tie line up to interconnection point.
3.	Dispute resolution	If a dispute is not amicably resolved within 30 days between Chairman of KSEB and CEO of IPP, dispute to be referred to KSERC for adjudication as per EA 2003

[24] Hoffman, Scott L. (1998) **The Law and Business of International Project Finance.** p.7

4.	Tariff	Fixed tariff of INR. 3.14/unit for 20 years
5.	Carbon Credits & Benefits	IPP to organize the benefits and the credits or benefits is shared equally by IPP and KSEB
6.	Payment related terms	If the payment by KSEB is delayed more than 60 days from billing, 1.25% interest per month from the due date. IPP to pay a rebate of 2% if KSEB pay within due date of the bill

Table 2 Major features of Kerala Model PPA

6.2 Market/Demand risk allocation

Section 6.1 of the Model PPA specifies the terms for purchasing energy from the private developer as follows.

"The Company agrees to sell and the Buyer agrees to purchase the entire energy made available by the Company at the interconnection point as per the Tariff specified in the Article 9 during the term of this agreement or till the termination date in the event of termination.

It is further agreed by, and between the parties that the Project will be operated on dispatchable basis and that the company shall operate the project at the nominal capacity or less, as may be directed by the Buyer from time to time, subject to Technical limits, Prudent Utility Practices, availability declaration by the Company and at a power factor as per Article 4.1 (h) and within the frequency range between 48.5 Hz and 51.0 Hz."[25]

In this section, we will consider the implication of the agreement to purchase power on a dispatchable basis.

6.2.1 Market/demand risk and renewable energy

Electric energy production by the producer and usage by the consumer are in real time. This creates demand risk for parties involved in power contracts since consumer usage is a variable. A dispatchable contract gives KSEB to dictate the Seller the quantity of power to generate and schedule for production. "Renewable generation technologies are typically more difficult to dispatch than natural gas-fired generation technologies"[26].

6.2.2 Effect of purchase on a dispatchable basis

Wind energy is an intermittent power source. "An intermittent resource is an electric generator that is not dispatchable and cannot store its fuel source and therefore cannot

[25] Kerala State Electricity Regulatory Commission **Model Power Purchase Agreement for IIPs In Private Land** Article 6.1

[26] Wiser, Ryan (2003) **Comparing the risk profiles of renewable and natural gas-fired electricity contracts.**

respond to changes in system demand or respond to transmission security constraints."[27] Wind energy is a weather-driven energy resource and the current technology is not cost effective for energy generation in a dispatchable basis.

It is a common practice by purchasers to use dispatchable natural-gas contracts and non-dispatchable renewable energy contracts. Consider the example of "California DWR, none of the renewable contracts are dispatchable while natural-gas fired plants are dispatchable"[28].

Also, as per the European Union Directive for renewable energy production, "Member States shall take the necessary measures to ensure that transmission system operators and distribution system operators in their territory guarantee the transmission and distribution of electricity produced from renewable energy sources. They may also provide for priority access to the grid system of electricity produced from renewable energy sources. When dispatching generating installations, transmission system operators shall give priority to generating installations using renewable energy sources insofar as the operation of the national electricity system permits"[29]. "Spain, Denmark, Germany and Greece all provide priority dispatch of Renewable Energy in accordance with EU Directive 2001/77/EC"[30].

Moving from a Single Buyer model to a Single Energy Market is common when the market matures. One could also consider the example of Ireland during its move towards a Single Energy Market (SEM). "Under the SEM it is proposed that this obligation (priority dispatch of Renewable Energy generators) will be fulfilled through enabling renewable generators to become Price Takers in the market"[31].

"Numerous utility studies have indicated that wind can readily be absorbed in an integrated network until the wind capacity accounts for about 20% of maximum demand. Beyond this, some modest changes to operational practice may be needed, but there are no "cut-off" points"[32]. "As of 2006, Kerala has 2.03 MW of wind energy in comparison to the total installed capacity of 3565 MW"[33]. In addition, PPRDL 06 stipulates a target of "2% of total consumption per year for wind energy"[34].

To conclude, for a meaningful growth of renewable energy production in Kerala, the model PPA should not be insisting on purchase of power on a dispatchable basis.

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27 Federal Energy Regulatory Commission 18 CFR Part 35 footnote 1

28 Refer Wiser, Ryan (2003) **Comparing the risk profiles of renewable and natural gas-fired electricity contracts.**

29 The European Parliament and the Council of the EU (2001) **2001/77/EC** Article 7.1

30 Scott, N.C (2007) **European practices with grid connection, reinforcement, constraint and charging of renewable energy projects**

31 A&L Goodbody Solicitors (2007) **Renewable PPAs, CfDs And the Transition to the Single Electricity Market.**

32 Envis Centre on Renewable Energy and Environment (2006) **Wind Energy Information.**

33 Kerala Planning Board (2006) **Energy Development.**

34 Kerala State Electricity Regulatory Commission (2006) **Power procurement from renewable sources by distribution license regulations, 2006.**

6.3 Performance risk

6.3.1 Grid Performance risk

Section 4.1 (i) of the Model PPA specifies the responsibilities of the private developer (Seller) as follows.

"The Company shall, in case of constraints in the Kerala grid or in Buyer's evacuation system, back down the generation till such time normalcy is restored as directed by State Load Dispatch Centre"[35].

As per the law governing the PPA, "The Developer shall abide by grid discipline and will not be eligible for any compensation in the event of grid failure, shut down, interruption in power supply etc., resulting in non-consumption of generated energy"[36].

6.3.1.1 Hidden cost and commitment by developer in relation to the grid/transmission

The governing law as of 2006 for the PPA states that the "cost of any modification/ up-gradation/ strengthening of substation of KSEB/ STU for drawing power from the Wind Farm shall be borne initially by ANERT, which will also be included in the cost being collected from the Developer".

Previous version of Kerala's renewable policy (2002) stipulates the following,

"Kerala State Electricity Board will undertake to augment the sub-station capacity at its cost to receive the power generated by the eligible producer. The KSEB will also undertake the augmentation of transmission lines and laying of new lines if required".

Specific instruction on grid interfacing as per central government policy on non-conventional energy is as follows,

"Depending upon the generation capacity, if the sub-station capacity at 33/11 KV or higher levels is required to be augmented or 66KV or higher capacity transmission lines are to be provided, this will be undertaken by the SEB, at their cost"[37].

The governing law in the State has changed against the private developer and it seems to take advantage of the powerful negotiating position of the STU thereby diminishing the chance of growth. Other than bearing the risk of performance of the grid, developer is to finance the cost of upgrading the grid. This adds an unknown cost during project development and the money is to be spent with the knowledge that it will not mitigate the risk of a non-performing grid.

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[35] Kerala State Electricity Regulatory Commission **Model Power Purchase Agreement for IIPs In Private Land** Section 4.1 (i).

[36] Government of Kerala(2004) **Policy Guidelines for the development of wind power in Kerala through private developers.**

[37] Ministry of Non-Conventional Energy **Government of India Non-conventional Energy Policy Guidelines to States.** Available at Appendix A of Hauber, Grant(2007) **Wind Energy Finance – Mobilising European Investment in the Indian Wind Sector.**

It is worthwhile to consider the example of the USA when it comes to improvement costs to grid performance. In the US, the Federal Energy Regulatory Commission is a comparison for SERC in India. As per the rules in the US, "Any electric utility, Federal power marketing agency, or any other person generating electric energy for sale or resale, may apply to the Commission for an order under this subsection requiring a transmitting utility to provide transmission services (including any enlargement of transmission capacity necessary to provide such services) to the applicant"[38]. "Senator Johnston's proposal for allowing transmitting utilities to recover a fully embedded cost rate as well as the cost of any transmission system improvements from transmission customer was not approved for FERC pricing policies"[39].

6.4 Summary of Model PPA Analysis and Risk Allocation

To conclude, the Kerala Model PPA's risk allocation jeopardizes IPP interests. Table 3 gives a summary of risks and allocation between parties as per the Model PPA.

Type of Risk	Event	Consequences	Risk Owner	Mitigation
Political Risk	Changes in Law, Regulation	Project Stopped Project Delay	Developer	Additional Cost
Environment	Force Majeure Compliance Issue	Repair Cost No Dispatch	Developer	Insurance, Additional Cost
Performance Risk	Grid Capacity	Upgrading of grid	Developer	Additional Capital expense
	Grid Unavailability	No Dispatch	Developer	Lowering revenue
Market Risk	Reduced Demand/Market	Reduced Dispatch	Developer	Lowering revenue

Table 3 Model PPA – Risk Allocation

[38] Excerpt from 16 U.S.C 824j (SEC.211 of the USA Federal Power Act as amended by the Energy Policy Act of 1992.)
[39] Dudley, William M et al (1993) **Electric Power Purchasing Handbook.** P.201

7 Investment appraisal of a hypothetical Wind Energy Project in Kerala

In this section, we will conduct the investment appraisal of a hypothetical Wind Energy Project in Kerala. We are considering the location "Pullikanam in Idukki district in Kerala with a mean annual wind speed of 4.91 m/second and a mean annual wind power density of 200 W/m^2 at an elevation of 50m "[40]. For this analysis, we are considering the values as per PPRDL 06 as explained in the 5.2.2. The only different value used in this analysis is the applicable interest rate. "The interest rate for a fixed period of 10 years is used as 11.25% as per current guidelines of IREDA"[41] instead of 9% as suggested by PPRDL 06.

We have not considered the impact of revenue from CER and the impact of 10.1% minimum alternate tax on revenues in this analysis. We are also limiting this analysis to a single financing option. We are considering project finance from IREDA Wind Power Development Programme. As the finance is sourced in India itself, we are not considering foreign exchange and related risks and sensitivity.

The discount rate was calculated by adding an assumed optimistic spread of 2% to weighted average cost of capital (WACC). WACC was calculated using the following formula.

Wc = (Equity Contribution/Total Cost) X Required Return on Equity +

(Debt/Total Cost) X Required rate of return on debt X (1- Tax rate)

In Table 4, we are calculating the NPV and IRR at a discount rate of 13.28% and we considered the required return on equity as 14% as per 5.2.2. However, the hurdle rate to consider in India for investing in a similar project is considered in the region of "20 to 25%"[42]. That is the typical rate of return expected by private investors for investing in infrastructure projects in developing countries.

As we can see from Table 4, we are getting a negative NPV with calculations based on 14% required return on equity itself and we conclude that the project is not viable.

[40] Centre for Wind Energy Technology (July 2007)**List of 216 Potential Sites for WindPower Projects in the Country**

[41] Indian Renewable Energy Development Agency Limited (2007) **Wind Power Development Programme Guidelines for Loan Assistance.**

[42] Ahluwalia, Montek S **Financing Private Infrastructure: Lessons from India**

Parameter	**Value**	**Comments**
Rated Capacity of the Turbine	1 MW	
Capacity Utilisation Factor (CUF)	22%	
Yearly energy production	1927200 KWH	1. Considering 8760 hours of production in an year. 2. 1MW=1000KW 3. Rated capacity X CUF X hours
Tariff	INR 3.14/unit for 20 years.	1 unit = 1KWH
Revenue per year	INR 0.61 Crores **Risk Factor: Revenue may go down as the production is on dispatchable basis.	1. 1 Crore INR = 100X100,000 2. For 20 years
Capital Cost (including connection till interconnection point)	Rs. 4.4 Crore **Risk Factor: This may go up if there is a need to upgrade the grid.	Cost for 1 MW.
Cost of debt	11.25%	Repayment period of 10 years, fixed interest, IRDEA loan. 70% debt and 30% equity 1% processing fee for the loan
Interest payable per year for 10 years	INR 0.53 Crore	
Depreciation Rate	4.5% for 20 years with 10% residual value	Only the residual value is used in calculating cashflow to calculate NPV
Operation & Maintenance Cost	1.3% of capital invested with escalation of 4%	
Discount Rate	13.28%	Weighted Average Cost of capital = 11.28% Spread considered for risk of investor profile= 2% Alternatively, if we take Bloomberg for India data for market premium and risk free rate, we arrive at a figure of 12.1%. If a 2% spread is added, we can arrive at 14.1% discount rate. (Using a beta of 1 for a company of no trading history)
NPV	(INR 3.47)	With a negative NPV, the investment does not look viable.
Modified IRR	6%	Considering a reinvestment rate of 18%

Table 4 Investment Appraisal Summary[43]

[43] Please refer Appendix I for the excel sheet which was used to create this summary table.

8 Conclusion

India is growing at a very fast pace in the RE sector, especially in Wind Energy. There are definitely many opportunities for investors in this area. India's central government policies in this sector are open and investor friendly. However, as we conclude from this case study, the way in which State level policies are implemented could jeopardize investor interests in this sector and alienate small power developers or similar wind farm operators. Potential investors in this sector need to consider the apparent risk factors of the model PPA while preparing for PPA negotiation.

9 Bibliography

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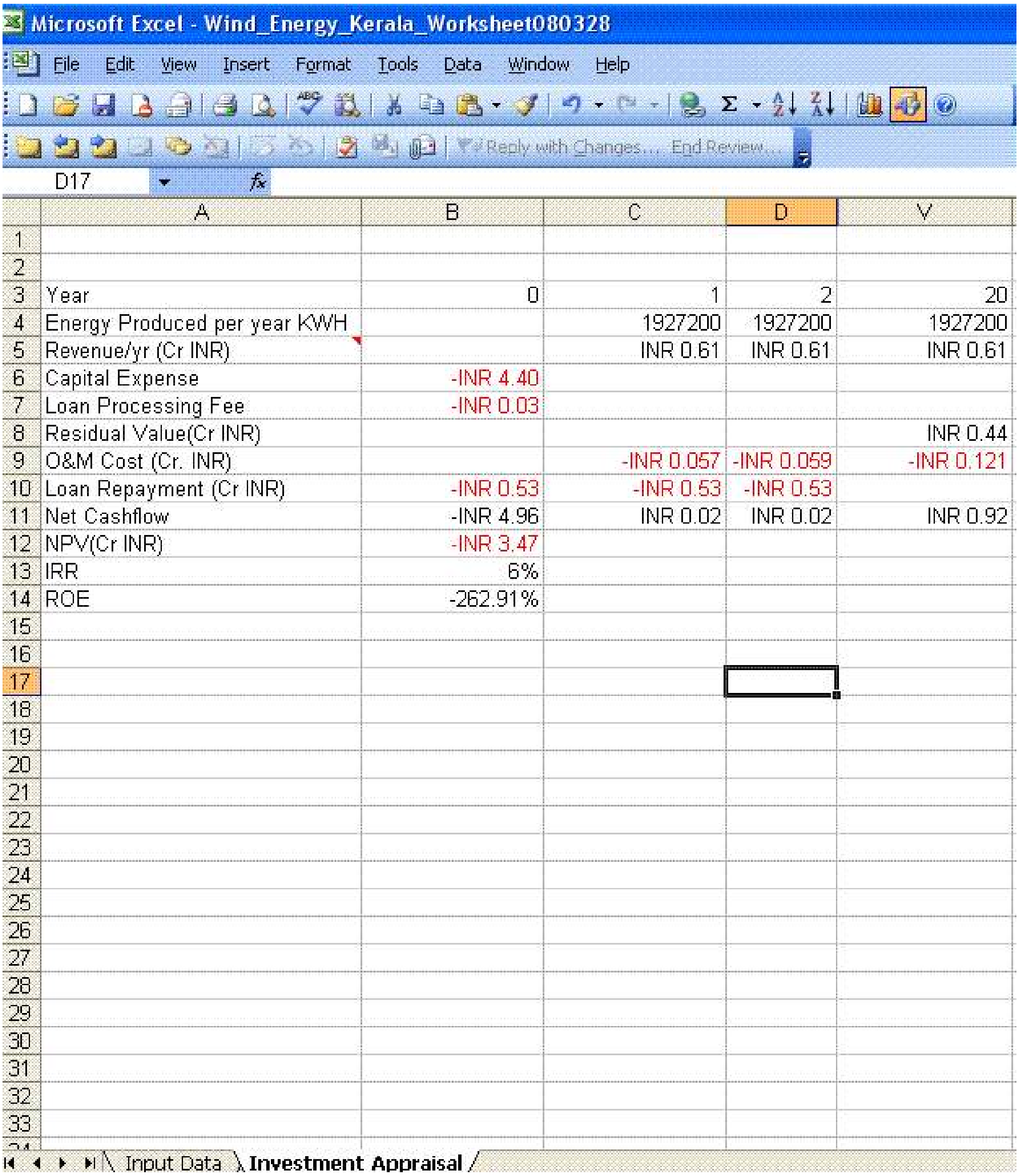
10 Appendix I

Microsoft Excel - Wind_Energy_Kerala_Worksheet080328

	A	B	C
3		Assumptions	Actual Amount
4			
5	Tariff (Rs/KWH)	INR 3.14	
6	1GWH	1000000	
7	1 MW	1000	
8	Number of hrs in 1 Yr	8760	
9	1 Crore INR	INR 10,000,000.00	
10			
11	Capacity of Turbine	1	
12	Capital cost	INR 44,000,000	
13	Capacity Utilization Factor	22.00%	
14			
15	Equity	30.00%	
16	Loan interest rate	9.00%	11.25%
17	Debt	70.00%	
18	Loan Term	10	
19	Loan Processing Fee	1%	
20			
21			
22	O & M Cost	1.30%	
23	Escalation of O&M/year	4.00%	
24			
25	Return on Equity(Re)	14.00%	20.00%
26	Reinvestment rate	18.00%	
27			
28			
29	Tax (T)	10.10%	
30	Depreciation rate	4.50%	
31	Residual Value	10.00%	
32			
33	Percentage to add to Wc for real IRR	2.00%	
34	Weighted average cost of capital(Wc)	11.28%	
35	Discount rate for real IRR	13.28%	

Input Data / Investment Appraisal



	A	B	C	D	V
3	Year	0	1	2	20
4	Energy Produced per year KWH		1927200	1927200	1927200
5	Revenue/yr (Cr INR)		INR 0.61	INR 0.61	INR 0.61
6	Capital Expense	-INR 4.40			
7	Loan Processing Fee	-INR 0.03			
8	Residual Value(Cr INR)				INR 0.44
9	O&M Cost (Cr. INR)		-INR 0.057	-INR 0.059	-INR 0.121
10	Loan Repayment (Cr INR)	-INR 0.53	-INR 0.53	-INR 0.53	
11	Net Cashflow	-INR 4.96	INR 0.02	INR 0.02	INR 0.92
12	NPV(Cr INR)	-INR 3.47			
13	IRR	6%			
14	ROE	-262.91%			