Project Dissertation Report on

Status of Renewable Energy in India and a case on financing viability of Wind Energy Project

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CERTIFICATE

This is to certify that Monica Priyadarshini, Roll No: 2K18/EMBA/518, student of Masters of Business Administration (Executive 2018-2020) at Delhi Technological University, Delhi has accomplished the project titled "**Status of Renewable Energy in India and a case on financing viability of Wind Energy Project**" under my guidance and to the best of my knowledge completed the project successfully, for the fulfilment of the course Executive MBA.

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DECLARATION

Monica Priyadarshini, student of EMBA 2018-20 of Delhi School of Management, Delhi Technological University declare that Dissertation Report on '**Status of Renewable Energy in India and a case on financing viability of Wind Energy Project**' submitted in partial fulfilment of Degree of Masters of Business Administration (Executive) is the original work conducted by me.

The information and data given in the report is authentic to the best of my knowledge. This report is not being submitted in any other university for award of any other Degree, Diploma and Fellowship.

Monica Priyadarshini

Place:

Date:

ABSTRACT

Indian Power sector is in a period of transition, spurred by the governments' mega target of installing 175 Giga Watt (GW) of renewables by 2022, the world's largest renewable energy capacity expansion plan, out of which 100 Giga Watt from solar and 60 Giga Watt will be from wind energy. India ranks fourth in wind energy, fifth in terms of renewable energy. India is the only country which have an exclusive ministry for renewable energy i.e. Ministry of New and Renewable Energy (MNRE). Renewable Energy Sources Installed capacity has grown substantially from 34 GW in 2014 to 87 GW in 2020. In recent years, the percentage of renewables has increased in total installed capacity. In 2013-2014, the contribution was 12.92%, rising to 23.5% by March 2020. Wind and solar energy are the major contributors in the enhanced capacity of renewables.

Wind is one of the largest RE source in India, based on mean annual wind power density. States with high wind power potential are Gujarat, Tamil Nadu, Maharashtra Andhra Pradesh, Karnataka, Kerala and Madhya Pradesh. With an installed capacity of 37.69 GW (Mar 20) of wind energy, Wind Energy holds the major portion of 43% of 87.03 GW (Mar-20) total RE capacity among renewable and continued as the largest supplier of clean energy.

India as a tropical country is blessed with good sunshine in most of its parts and the number of clear days of sunshine a year is also quite high. According to MNRE, India receives annually solar energy equivalent to more than 5,000 trillion units. Hot and dry climate of the country with about 300 days of sunshine; making this area a great place to harness solar energy. "Jawaharlal Nehru National Solar Mission (JNNSM)" was launched in 2010 to support the growth of solar energy installations in India.

Government came up with many schemes time to time to make renewable energy sector attractive to investors. Few such schemes/ incentives are Viability Gap Funding for solar projects, Generation based incentives for wind projects, MAT credit for RE projects, Accelerated depreciation for wind projects, Must run for Renewable energy projects etc.

Approx. Rs 2,14,800 Crores investments has been made in Renewable energy sector since 2014 till Jul-2019. Private, PSU banks, NBFCs, Development banks

etc are lending debt to renewable energy projects. Many Private Equity players are participating in the equity financing of these projects. Indian Renewable Energy Development Agency Limited (IREDA), a government enterprise, was set up in 1987 under MNRE to support financial assistance to renewable energy projects. As per MNRE, country needs approx. Rs 4 Lakh Crores investment to achieve target of 175 Giga Watt of Renewable Energy Installations. Investments to this tune can only be made if it is a viable investment.

In order to understand different viability parameters involved in the financing of renewable energy projects, a 100 MW wind energy project has been considered in this study. The project has a long term PPA at a tariff of 2.90 per unit for a period of 25 years. The estimated project cost (excluding Interest During Construction) is Rs 600 Cr to be funded in Debt : Equity ratio of 75:25. Financials have been worked out using excel tool. Financial modelling has been done to assess the viability parameters based on different assumptions.

Further, to understand the risk factors involved in renewable energy projects, phase wise risk analysis has been done along with mitigation measures. Challenges have been explored to identify the gap in installation of renewable energy sources. Various recommendations have been suggested to overcome these challenges.

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CHAPTER 1

INTRODUCTION

This chapter deals with the global statistics related to renewable energy and the need of the cleaner form of energy in India. The objective of research, motivations, literature review and methodology followed have been detailed out in this chapter covering the various aspects behind this study.

1.1 Background

India is a developing nation having umpteen growth potential due to its demographic dividend. India is among few countries with an annual GDP growth between 5-7%. India is classified as an industrial hub, it is emerging as a major economy these days. Hence, the need of energy is huge in this country, energy is the foundation upon which any country can grow and become a developed nation. Currently, India is heavily dependent on conventional sources of energy which are limited and polluting in nature. India needs to develop its reliance on greener form of energy i.e. non-conventional source of energy such as solar, wind, biomass etc. India is growing every year in terms of renewable energy addition, with the addition of more renewable energy, more electricity unit is generated from renewable energies than in the previous year.

Globally, countries are shifting their focus towards clean energy which can be seen from the statistics that total global renewable capacity installed is 2537 GW, out of which Hydropower is 1190 GW, Wind power 623 GW and solar energy 586 GW in 2019. Other renewables included 124 GW of biomass energy and capacity 14 GW of geothermal, and 500 MW capacity of marine energy. Hydropower accounts for around 47% of renewables in 2019, followed by wind power (25%), solar PV (23%) and others (5%).[1]

Although renewable electricity is rapidly gaining ground in many individual countries and regions, it faces the challenge of achieving a greater share of the global total. This is mainly due to the continued strong growth of total electricity

[1]Source : International Renewable Energy Agency (IRENA)

generation as well as continued investment in capacity and subsidies for fossil fuel plants.

1.2 Objective of study

The objective of this study are following:

- To get an overview about the energy mix of power sector in India i.e. percentage of conventional vs non-conventional sources of energy;
- To know about different sources of renewable energy, its potential, current installations, state wise details in India;
- To understand various growth drivers for installation of Renewable energy technologies;
- To assess financial viability of one of the renewable energy project (wind), its project cost estimation, capital budgeting, calculation of viability parameters i.e. Debt service coverage ratio, Loan life coverage ratio, Internal Rate of Return;
- To elaborate different types of risks involved in a Renewable Energy project and its mitigation measures;
- To perform SWOT Analysis of a Renewable Energy project;
- To explore various limitations, challenges and recommendations for developing renewable energy projects;

1.3 Motivations

The motivation behind this study is to understand India's efforts and its current position in terms of actual installation of renewable energy plants. To promote green energy, government has set a huge target of 175 GW installation of renewable energy projects, however to understand the ground reality in terms of on ground installations this study has been conducted.

As the entire world is shifting towards sustainable and green energy sources, the potential of these sources in India are adequate or not and how these can be harnessed. Renewable energy sources are mostly free and non-polluting, then the financials behind their development is a motivating factor for this study. Renewable energy projects are self-sustainable and high growth yielding investment or they are bad investment for any investor. The level of risk associated with these sources and their mitigation measures.

1.4 Literature Review

Several papers elaborate installations of renewable energy technologies, generation potentials in India published from time to time. Latest study such as Arun Kumar Singh & K.K. Gautam (2018) elaborated “current status and future prospects of renewable energy in India. They have observed in their study that there are challenges in the installation of renewable energy technologies in India, related to high cost of installations for solar projects, other renewable energy technologies are at par with conventional energy sources”.

Albadi and El-Saadany (2007) conducted “viability study of different wind turbines in Ontario estimating Internal Rate of Return, Net Present Value and Pay back period”.

Melo (2012) conducted “economic and financial analysis of Brazilian wind farm using tools such as Internal Rate of Return and Net Present Value”.

Study by Li et al. (2013) elucidated “the viability of wind projects in China by analysing investment risk through Net Present Value estimation and calculated the pay back period of projects”.

Macedo, Albuquerque and Moralles (2017) studied “the economic and financial feasibility of potential wind project in different locations of Brazil using IRR method of assessing risk associated with investment”.

In spite of substantial capacity of wind energy projects installed in India, there are no study available elaborating financial viability of wind energy projects in the country. Also, there is study related to status of renewable energy status in India but that is not the latest one, although it has been published in 2018. The major challenge highlighted in that research has already be done away with.

1.5 Methodology

The initial part of this study focuses on the current capacity installations in India, potential of different technologies, state wise installations and major drivers behind the growth of these installations.

In the subsequent section of study, financial viability of one of the renewable energy project has been analysed by calculating Internal rate of return, Debt service coverage ratio and Loan Life coverage ratio.

- **Debt Service Coverage Ratio (DSCR)**

  DSCR measures the ability to service current debt obligations based on the cash flow available. This ratio projects net operating income as a multiple of annual debt servicing i.e. interest and principal. DSCR has been calculated using following formula:

$$\text{DSCR} = \frac{\text{Net Operating Income}}{\text{Total Debt Service}}$$

  where:

  Net Operating Income = Revenue – Operating Expenses

  Total Debt Service = Interest + Principal due

  Minimum DSCR has been calculated using minimum of all DSCR calculated year on year during the tenure of loan.

- **Loan Life Coverage Ratio (LLCR)**

  LLCR estimates the ability of a project to repay its debt obligations. LLCR can be calculated by dividing the NPV of the cash flow available for servicing the debt by the amount of outstanding debt.

  LLCR has been calculated using following formula:

$$\frac{\sum_{t=s}^{s+n} \frac{CF_t}{(1+i)^t} + DR}{O_t}$$

  where:

  CF_t = Cash flows available for servicing the debt

  t = Time period in years

  s = Tenure of loan

  i = Rate of Interest

  DR = Reserve created for servicing debt

  O_t = Outstanding debt

- **Internal Rate of Return (IRR**)

  IRR is the discount rate at which the NPV of all cash flows input or output to the project shall be zero. IRR has been calculated as follows:

$$0 = \text{NPV} = \sum_{t=1}^{T} \frac{C_t}{(1+IRR)^t} - C_0$$

where:

C_t = Net cash inflow during the period t

C_0 = Cost of initial investment

t= Time period in years

The above ratios have been calculated to understand the viability of the project. Further, risk has been assessed in the project and its mitigation measures have been suggested in this study. Challenges related to installations of renewable energy projects have also been assessed and recommendations have been suggested.

1.6 Concluding Remarks

This chapter dealt with the basics of research such methodology, objective, motivations etc. which will be elaborated in detail in next chapters. The major motivation behind the research is the target set by Government of India for setting up renewable energy projects in India. The next chapter deals with the overview of power sector and more specifically renewable energy sector in India.

CHAPTER 2

POWER SECTOR IN INDIA

This chapter deals with the current scenario of various capacity installations in India i.e. the contribution of different types of energy sources producing power in the country as on 31.03.2020. Also, an overview about the renewable energy installations, its overall potential in the country, investment requirement and the growth drivers behind the renewable energy installations have been elaborated.

2.1 Indian Power Sector : Overview

Today, India can be treated as one of the leader in terms of global energy scenario, being one of the leading power consuming and generating nations. Economic growth, population growth, low energy consumption per capita and rapid urbanization are expected to further boost energy demand. India has rapidly developed capacity over the years to meet the growing demand. Traditional fuels like Coal and Gas are the dominant power sources, accounting for about 66% share. The average capacity utilization factor for thermal power plants (coal, gas, diesel) has fallen dramatically in recent years due to the increasing shortage of coal and gas supplies.

Because of the biased energy profile, the government needed to reduce reliance on traditional sources and promote sustainable growth by leveraging the abundant potential of renewable energy. The government aims to enhance the share of green energy through the installation and expansion of renewable technologies.

As of March 31, 2020, the total installed capacity of all energy sources was approx. 370 GW, the thermal power plants accounted for 230.6 GW, followed by renewable energy sources at about 87 GW, hydro power projects at 45 GW and nuclear energy at about 7 GW.

Table 2-1 Total Installed Capacity (As on 31.03.2020)

Technology	Installed Capacity (in GW)	% of Total
Thermal (total)	230.60	62.8%
Coal	198.53	54.2%
Lignite	6.61	1.7%
Gas	24.94	6.9%
Diesel	0.51	0.1%
Large Hydro (More than 25 MW)	45.70	12.4%
Nuclear	6.80	1.9%
Renewable Energy Sources	87.03	23.5%
Total	**370.11**	

(Source : Central Electricity Authority)

2.2 Indian Renewable Energy Industry : Overview

The Ministry of New and Renewable Energy (MNRE) has established itself as a Ministry for renewable projects in India. The ministry has facilitated the implementation of broadband programs, including the use of renewable energy, standalone systems in rural India which can be used various purposes such as for lighting, cooking and propulsion, renewable technologies is also useful for urban population, industries and business.

There are different forms of Renewable Energy sources classified by MNRE, majorly hydro, wind, solar, bio-mass and waste to energy.

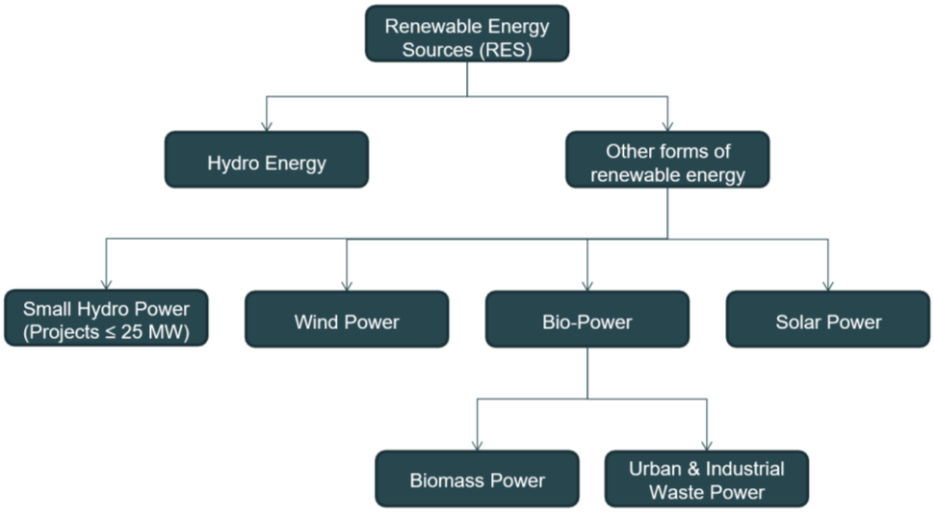

Figure 2-1 Different sources of Renewable Energy

(Source - Central Electricity Authority)

MNRE has taken several steps to implement the most ambitious renewable energy capacity development programme around the globe, which is being implemented by the country. Government of India (GoI) has started focusing on clean energy installations after it the ratification of Paris Agreement. In the year 2015, the GoI announced that 175 Gigawatts renewable power capacity will be installed by 2022 which includes 100 Gigawatts from Solar power projects, 60 Gigawatts from wind projects, 10 Gigawatts from bio-mass projects and 5 Gigawatts from small hydro power to be achieved by 2022.

Table 2-2 Potential of Renewable Energy in India

Sources	Potential (%)	Potential (GW)
Wind Power (Onshore)	11%	103
Solar	83%	749
Small Hydro	2%	20
Biomass /Bagasse	3%	23
Waste to Energy	0%	2.7
Total Potential (GW)	100%	897.7[#]
Wind Power (Offshore)		127
Grand Total Potential (GW)		1024.7

(Source - Wind Energy Mission Doc, C-Wet , NISE estimates, MNRE)

It can be inferred from above table that India has a potential of 1024.7 GW whereas the target set for installations of renewable technologies by GOI is 175 GW till 2022 which is even less than 20% of total potential.

As on 31.03.2020, India has total generation capacity installed of is 370.11 GW out of which 87.03 GW (excluding large hydro) is in renewable energy technologies (~23.5%).

Table 2-3 Renewable Energy Installations(excl. large hydro) in India (As on 31.03.2020)

Technology	Renewable Energy Capacity installed in India (in GW)
Wind Power	37.69
Solar Power	34.63
Small Hydro Power	4.68
Biomass & WtE	10.02
Total	**87.03**

(Source – MNRE)

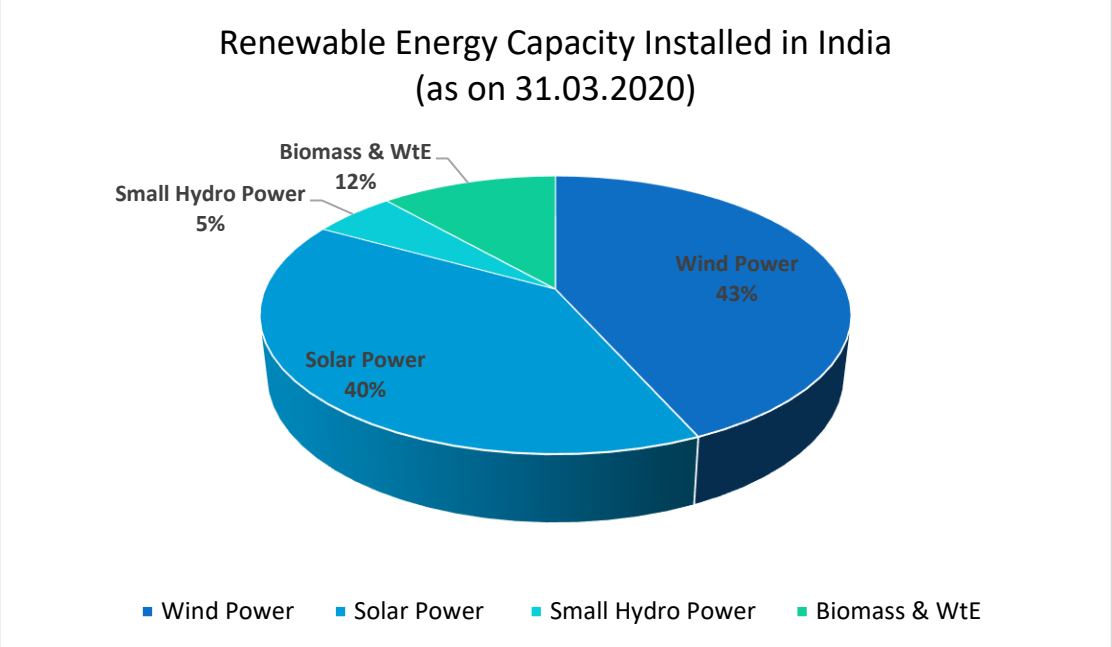

Figure 2-1 Contribution of various technologies in total Installed power capacity in India

(Source – MNRE)

Large hydro power projects over 25 MW has been approved as renewable energy. At the end of Mar-20, installation of hydro power project is 45.7 GW, which is 12% of the cumulative capacity installed in India[2]. Total installed capacity of Renewable

[2] CEA

Energy (RE) including Large Hydro is 132.7 GW, accounts for 35.8% of the installed capacity. RE generation capacity installation has increased at a fast pace over the past few years, posted a CAGR of 17.28% between FY2014 – FY2019.[3] Energy generated from renewable energy sources in India was 101.84 billion units in FY 2018 and 126.76 billion units during Apr 2018-Mar 2019.[4] Wind and Solar have been the predominant contributor to the capacity growth.

The continuative support of government and better economies of scale has made renewable business more attractive from the perspective of investment. As India is thriving to meet its energy security on its own, which is forecasted to achieve 15,820 Terra Watt hours by 2040, going forward renewable technology is the main driver to bridge the gap. Renewable technologies are expected to support meeting 40% of India's electricity demand.

As per IEA, India attracted the highest investments in RE during 2015-2019. Going forward, RE will remain the most relevant investment opportunity within power sector. In India, RE will meet bulk of the incremental capacity requirements.

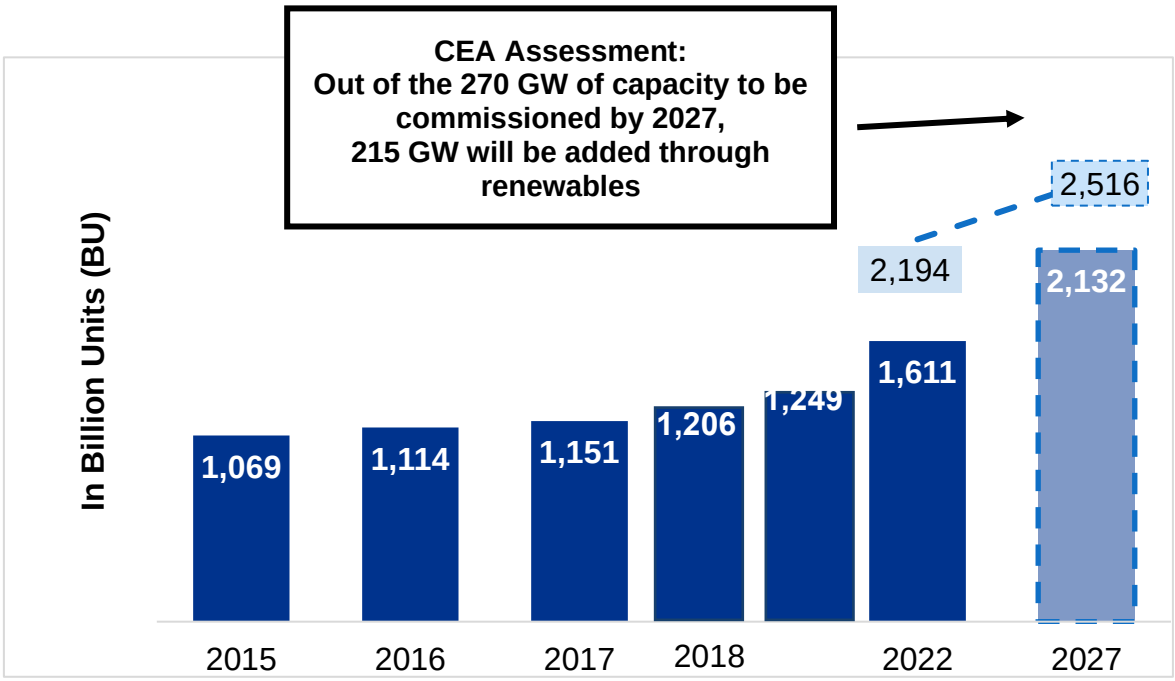

Figure 2-2 Energy Demand vis-à-vis renewable requirement

(Source - CEA)

[3] IBEF
[4] CEA

2.2.1 Renewable Energy: Growth Drivers

Major growth drivers for the development of Renewable Energy projects include:

- Gap in Demand and supply in meeting energy needs of country.
- India has geographic advantages which allows India to have renewable energy resources such as sun, wind, biomass, waste and hydro resources.
- Shorter construction period for Renewable Energy projects lead to lower risk with fast return.
- India is blessed to have huge Renewable Energy resources like solar insolation, wind resources, bio-mass materials, wastes and hydro resources
- India already has sufficient capacity of Wind projects, Biomass projects and Hydro projects operational for years which boosts the technological expertise available with us. Solar projects installations are rapidly growing in the country in last 2-3 years.
- Support from government in terms of Viability Gap Funding, Generation based Incentives and other subsidies.
- Availability of different financing options for capital equipment related to renewable technologies.
- Making the industry aware that it makes business sense to be aware of the environment.
- Government's awareness in terms of maintaining cleaner environment.
- Need of the country to be secured in terms of energy requirements.
- Stabilising foreign exchange by reducing the total imports which is majorly contributed by crude oil.
- Policy on Renewable Purchase Obligation and making it mandatory for states to follow the RPO requirements
- By Promoting plug and play concept and developing Parks specific to solar energy and Solar Power Projects of capacity more than 500 MW.
- Green Energy Corridor development for evacuation of green energy projects.
- Roof top solar can be installed by taking loans from commercial banks under the provision of home loan.
- Waiving off Transmission Charges between states for Renewable Energy Projects, they can use open access route to sell to customers based in different states.

- Repowering has been allowed for old wind projects to improve their capacity utilization factor and efficiency.
- Government is exploring various options for setting up offshore wind energy projects on the coasts of India.
- Government incentives for standalone systems supporting the rural population to have light and energy.
- Foreign Direct Investment of 100% is permitted in renewable energy sector through automatic route

2.3 Concluding Remarks

India is heavily relying on conventional energy sources for meeting the energy requirement in the country, which are polluting in nature creating lot of negative impact on the environment. The same needs to be replaced by cleaner form of energy i.e. non-conventional source of energy. India has huge untapped potential of renewable energy sources available which needs to be harnessed and these sources have become cheaper with the help of technology as well as various supports made available by the government. The next chapter will deal with the technology wise installations in different states in India.

CHAPTER 3

RENEWABLE ENERGY TECHNOLOGIES : POTENTIAL & CURRENT INSTALLATIONS

This chapter explains major renewable energy technologies, its potential and current installations in India. The details of state wise installations have been elaborated in terms of major four technologies i.e. Wind Energy, Solar Energy, Small Hydro and Biomass Energy.

3.1 Wind Energy

Wind energy is being used as source of energy for many years. In last few years, energy generated by wind projects has increased significantly due to considerable prices advances in turbine technology, higher hub heights available for turbines, which is making wind energy projects economically viable and even cheaper than conventional sources energy.

In India, National Institute of Wind Energy (NIWE) first estimated the Wind Potential to 49 GW at 50m hub-height. However according to a study at 80m hub height level, estimated potential was 102 GW. Further, a new study has been conducted by NIWE at 100m hub height, according to that the estimated potential is 302GW.

The installed capacity of wind energy projects in India as on 31-12-2019 is 37.50 Giga Watt and state-wise capacity installed is shown in table below:

Table 3-1 Wind Energy installation in various states (As on 31-12-2019)

States	**Wind Energy Installed (in GW)**
Tamil Nadu	9.28
Gujarat	7.36
Maharashtra	5.00
Karnataka	4.75
Rajasthan	4.30
Andhra Pradesh	4.09
Madhya Pradesh	2.52
Others	0.20
Total (in GW)	**37.51**

(Source - MNRE Annual Report 2019-20)

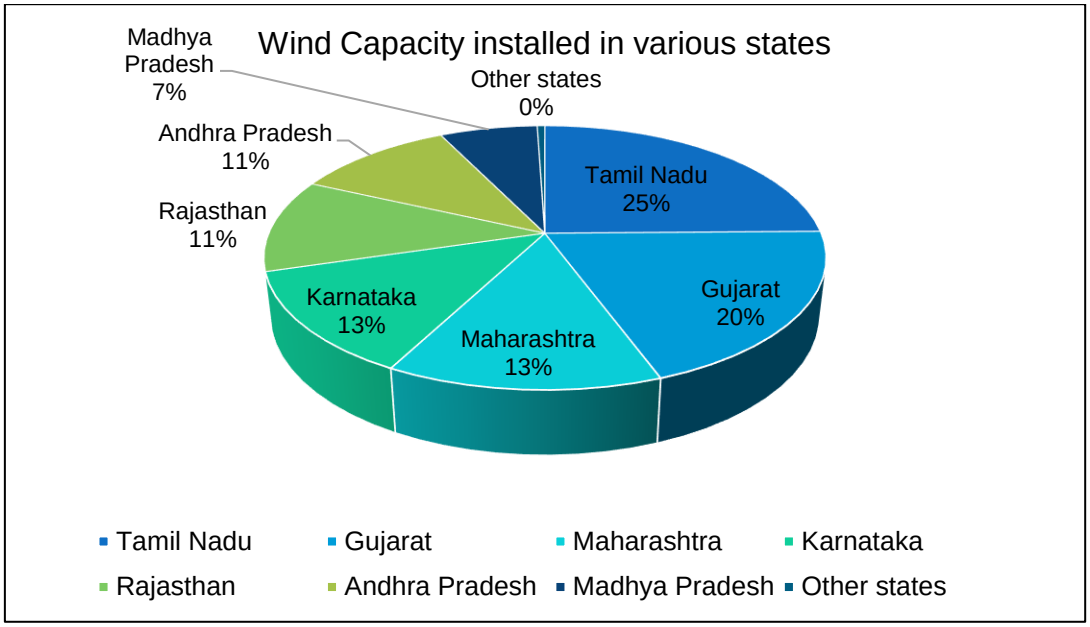

Figure 3-1 Installed capacity of wind projects in various states
(Source - MNRE Annual Report 2019-20)

As on 31.12.2019, wind capacity under implementation in the country is 9.355 GW adding this with the already installed capacity which accounts for total 46.86 GW capacity. With the help of competitive bidding in different phases, total 11.9 GW has been bidded by various central/ state agencies.

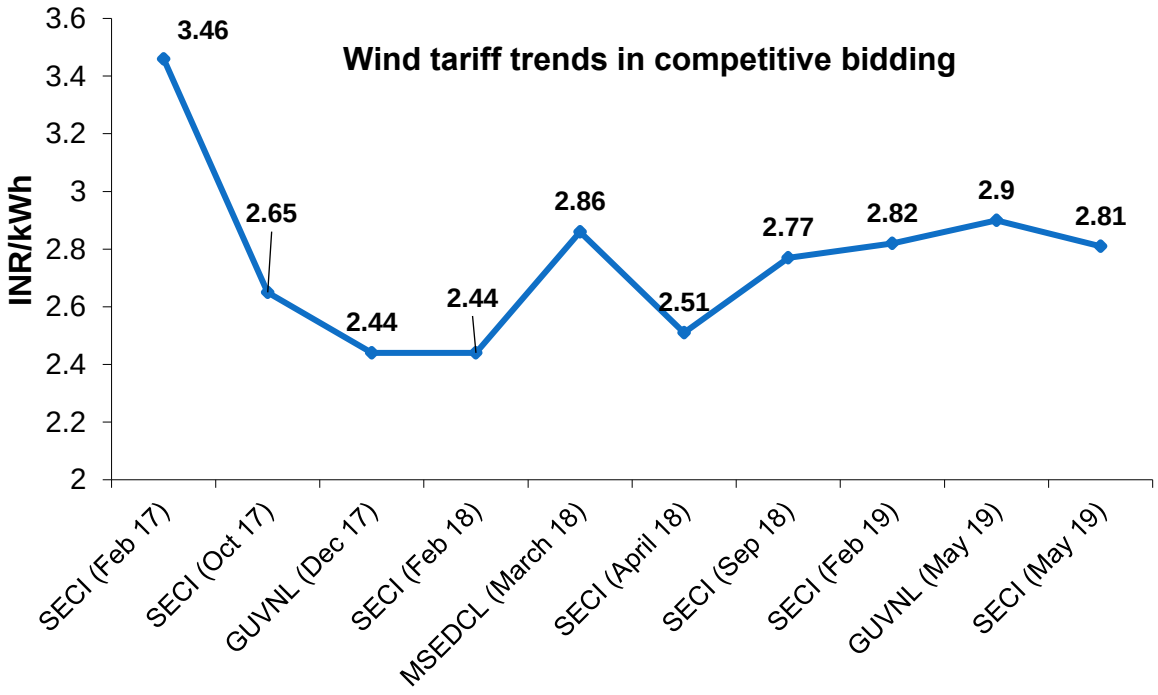

Figure 3-2 Wind Energy Tariff Trends in Competitive Bidding

(Source – MNRE)

Competitive bidding led to discovery of tariff as low as Rs 2.44 p.u. which is even lower than the tariff of thermal projects.

3.2 Solar Energy

Solar energy projects are cleaner form of energy which can be easily harnessed at any location. Every solar project implemented and installed on ground/ roof top it helps in reducing the pollution level in the entire atmosphere. It helps in reducing the harmful impacts created by thermal power plants and helps in creating cleaner environment.

Solar energy is modular and decentralized in nature which makes it lesser less prone to failures and more availability for generation. Typically, 1 MW solar PV project is spread over an area of 3 - 3.5 Acres.

As on 31-12-2019, solar power projects of 33.73 GW capacity has been installed in the country. Additionally, tenders of around 51.42 GW are in various tendering stages. Considering the availability of land and solar irradiance in the country, the potential of approx. 750 GWp solar power has been assessed in India.

Table 3-2 Solar Energy installations in various states (As on 31-12-2019)

State	**Solar Power Installed (in GW)**
Karnataka	7.27
Rajasthan	4.84
Tamil Nadu	3.78
Telangana	3.62
Andhra Pradesh	3.56
Gujarat	2.76
Madhya Pradesh	2.24
Maharashtra	1.66
Other states	4.00
Total (in GW)	**33.73**

(Source - MNRE Annual Report 2019-20)

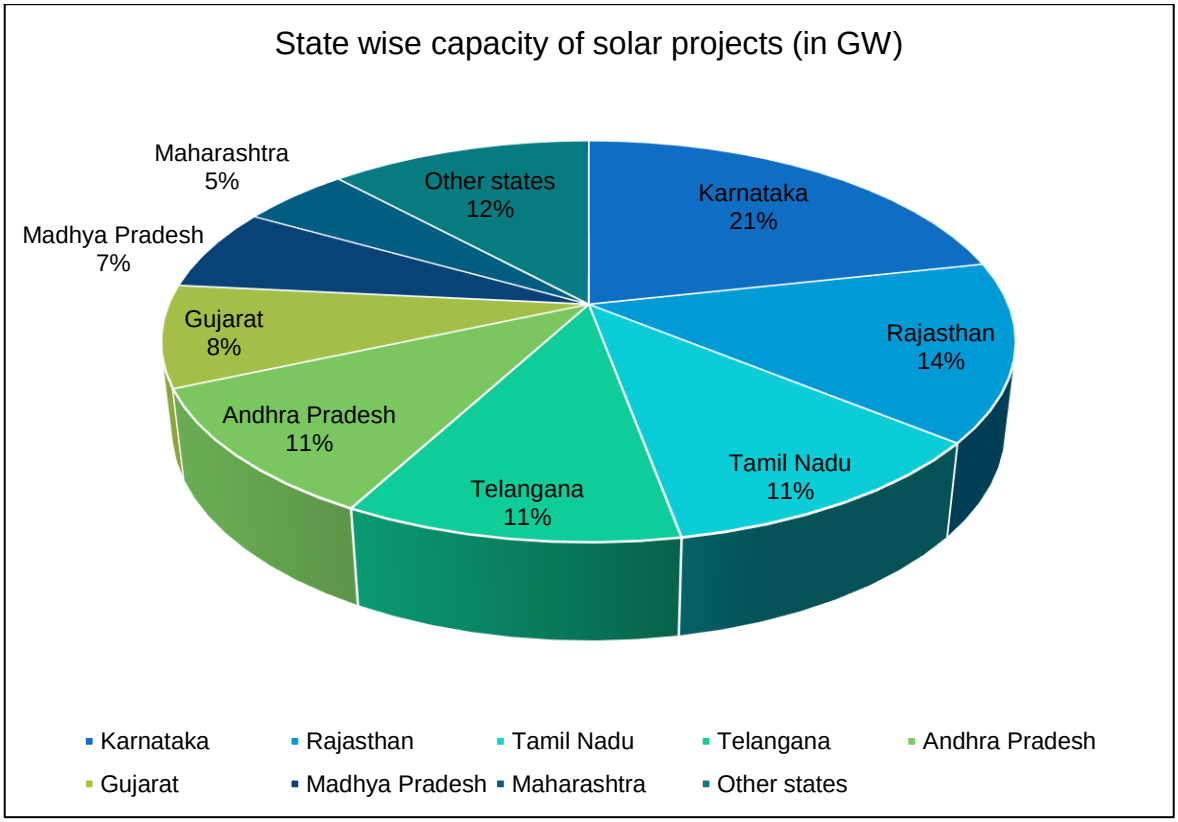

Figure 3-3 Solar power projects installed in various states

(Source - MNRE Annual Report 2019-20)

Competitive bidding led to discovery of tariff as low as Rs 2.44 p.u. which is even lower than the tariff of thermal projects.

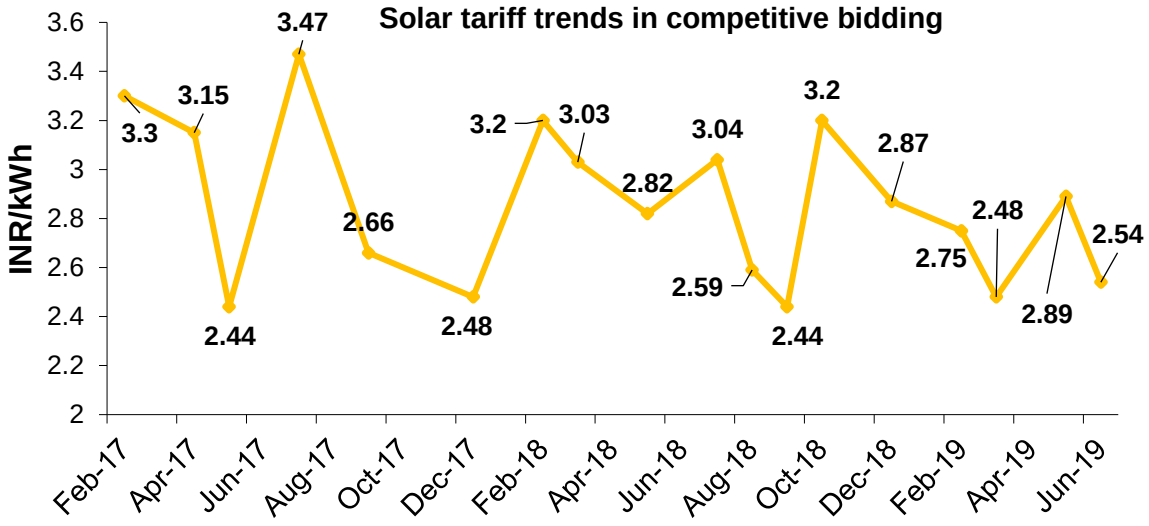

Figure 3-4 Solar Energy Tariff Trends in Competitive Bidding

(Source – MNRE)

3.3 Bio-Energy

Bio-Energy refers to energy generated from bio-mass, cogeneration of sugarcane, waste to energy etc. This form of energy comes from various carbon wastes in humans and plants. India being an agrarian country has huge quantum of bio-mass available in the country. Also, the recent installations in terms of development of waste to energy plants have enhanced the share of bio-energy in the current installations.

As on 31-12-2019, approximately 500 bio-energy projects with cumulative capacity of 9.18 GW have been set up in the country.

3.4 Small Hydro Power

Hydropower plants up to 25 MW, termed as Small Hydro Power Project (SHP) considered a "renewable" energy source. This projects may meet the electrically isolated and remote electricity needs besides offering job opportunities to the local community.

The estimated potential of small hydro projects in India is 21.13 GW based on the 7,133 sites located in different states of India.

As on 31-12-2019, capacity of 4.67 GW has been installed through 1127 small hydropower projects. Additionally, 109 project amounting to capacity of approx. 530 MW are in different stages of execution.

3.5 Concluding Remarks

Every state in India is helping the country to meet its target of installing more renewable energy capacity. The windy states such as Tamil Nadu, Gujarat, Maharashtra, Karnataka lead in terms of wind project installations majorly because of their geographical advantage. Similarly, Karnataka, Rajashtan, Tamil Nadu and Telangana lead in terms of solar project installations in the country. As India is focussing on increasing the share of renewable energy technologies, the tariffs of these projects have fallen drastically such that they are at par with thermal projects. Hence, creating opportunity for investors to invest and gain higher returns. The next chapter will deal with the analysis in respect of financial viability of these projects.

CHAPTER 4

FINANCIAL VIABILITY ANALYSIS OF PROJECT

This chapter deals with the financial viability analysis of case project of 100 MW wind project in Karnataka having firm offtake arrangement for entire project life with a tariff of Rs 2.90 per unit. The project viability has been worked out based on certain assumptions as notified by the central regulatory commission i.e. Central Electricity Regulatory Commission (CERC) / state regulatory commission i.e. Karnataka Electricity Regulatory Commission (KERC). Also, the financing norms have been assumed on the basis of norms notified by IREDA (leading lender of renewable energy technologies in India). The project financials have been analysed by Financial modelling in MS Excel.

4.1 Financial Assumptions

Various financial parameters which have been assumed in this analysis are highlighted below:

4.1.1 Capital Cost

The Capital cost for a project includes land cost, EPC cost as hard cost and other cost such as contingency, Interest during construction, Debt Service Reserve Amount as soft cost. Capital cost comprises of cost of plant, evacuation infrastructure till the substation connection point etc.

Capital cost has been estimated as Rs 6 Cr/ MW as per the benchmark cost notified by MNRE. Considering 100 MW capacity, capital cost works out as Rs 600 Cr.

4.1.2 Debt to Equity Ratio

Capital cost in a project is usually financed by pure equity or a mix of debt and equity. Considering limited amount of equity available and the tax benefit for debt financing, developers prefer debt financing.

As per KERC Tariff order, debt to equity ratio has been allowed as 70:30. The same is also allowed as per IREDA financing norms. Hence, the same (70:30) has been considered for analysis.

4.1.3 Interest Rate

As per the financing norms of IREDA, for private sector wind projects the interest rate varies from 9.80 % to 10.95%. Also, as per KERC tariff order for wind projects for 2019-20, rate of interest has been notified as 10.50%.

Accordingly, Interest rate during construction as well as operation phase is considered at 10.50% p.a. in the financial analysis.

4.1.4 Interest During Construction (IDC)

IDC has been worked out considering 2 years of construction period and phasing of 40% and 60%. IDC has been calculated as 17 Cr.

4.1.5 Repayment Tenure

Repayment Tenure has been considered based on the financing norms of the major lender in financing renewable energy in India i.e. IREDA. The same has been reproduced below:

“The repayment periods shall be maximum upto 25 years or 80% of the balance PPA period, whichever is lower, depending on the project cash flows, DSCR of the project etc., and it shall be after the construction & grace periods, with a condition that lender shall have the right to call option after 15 years of repayment.” (Source – IREDA)

In line with the above financing norms of IREDA, loan tenure of 20 years have been considered which is 80% of PPA period.

4.1.6 Useful life

As notified by CERC, useful life of a wind project has been notified as 25 years. The same has been considered for this analysis.

4.1.7 Depreciation

Straight line method (SLM) for depreciation is considered for the calculations which is taken as 4.67% p.a. of capital cost for initial 15 years and remaining depreciation amount is spread equally over balance 10 years of the useful life in line with the assumptions of KERC tariff order for wind projects for 2019-20.

4.1.8 Working Capital

The working capital has been considered as receivables equivalent to 2 months of energy sales and interest on working capital as 11.50% in line with the assumptions of KERC tariff order for wind projects for 2019-20.

4.1.9 Operation and Maintenance Expenses

Operation and Maintenance expenses include expenses related to plant maintenance, salaries, overheads & any other expenses related to plant operation.

It has been assumed as 8 Lakhs per MW with an annual escalation of 5% y-o-y in line with the notification as per KERC tariff order for wind projects for 2019-20.

4.1.10 Capacity Utilization Factor (CUF)

"CERC in its Order dated 17.04.2017 adopted CUF from 22% to 35% based on the annual mean wind power density at 100 m hub-height. The CUF achieved by new wind projects during FY18 ranged from 25.26% to 35.92%."[5] Accordingly, in this study CUF of 33% has been considered.

Annual Generation has been calculated as per following formula:

Energy = Capacity*8760*CUF

Also, auxiliary consumption of 0.5% has been considered for calculating energy for sale.

4.1.11 Tariff

Tariff of wind projects in India varied from 2.44 to 3.46 per unit in the competitive biddings held for last 3 years.

Accordingly, Rs 2.90 per unit has been considered for the calculation of revenue by multiplying energy sale units with tariff.

4.2 Financial Analysis

Financial Modelling has been worked out in MS excel utilizing formulas of excel. The assumptions considered for preparing the financial model and ascertaining the viability are listed below:

[5] CERC

Table 4-1 Financial Assumptions

Description	Value	Basis
Capacity (MW)	100	Assumption
Tariff per unit (Rs)	2.9	CERC
CUF (%)	33%	CERC
Auxiliary Consumption (%)	0.5%	KERC
Useful life (years)	25	CERC
LT Debt (Cr)	402	KERC
Equity (Cr)	181	KERC
IDC (Cr)	17	Calculated
Debt including IDC (Cr)	419	KERC
Repayment Tenure (Years)	20	IREDA
Rate of Interest	10.50%	KERC/IREDA
Depreciation Related Assumptions		
Depreciation rate for first 15 years	4.67%	KERC
Rate for residual period	2.00%	
Gross block	600	
Residual Value	10%	
O&M cost Assumptions		
O&M Cost (Lakhs per MW)	8	KERC
Escalation in O&M cost (Annual %)	5%	KERC
Income Tax rate (%)	29.12%	CERC
Working Capital Assumptions		
Receivables (Months)	2	KERC
Interest On Working Capital (%)	11.50%	KERC

(Source – KERC, CERC, IREDA)

4.3 Projected Income Statement

Table 4-2 P&L Statement for Year 1st - 8th

Description	**Unit**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Energy Generated	MU	289.1	289.1	289.1	289.1	289.1	289.1	289.1	289.1
Auxiliary consumption	MU	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Energy Sale	MU	284.7	284.7	284.7	284.7	284.7	284.7	284.7	284.7
Tariff	Rs	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
Revenue	**Rs Cr**	**82.6**	**82.6**	**82.6**	**82.6**	**82.6**	**82.6**	**82.6**	**82.6**
O&M expense	Rs Cr	8.0	8.4	8.8	9.3	9.7	10.2	10.7	11.3
EBITDA	**Rs Cr**	**74.6**	**74.2**	**73.7**	**73.3**	**72.8**	**72.4**	**71.8**	**71.3**
Interest on LT debt	Rs Cr	44.0	42.8	41.4	39.9	38.2	36.4	34.4	32.1
Interest on Working Capital	Rs Cr	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58
Depreciation	Rs Cr	28.02	28.02	28.02	28.02	28.02	28.02	28.02	28.02
PBT	**Rs Cr**	**1.0**	**1.8**	**2.7**	**3.8**	**5.0**	**6.3**	**7.9**	**9.6**

Income tax	Rs Cr	0.3	0.5	0.8	1.1	1.5	1.8	2.3	2.8
PAT	**Rs Cr**	**0.7**	**1.3**	**1.9**	**2.7**	**3.5**	**4.5**	**5.6**	**6.8**
Operating Cash flow	**Rs Cr**	**72.7**	**72.1**	**71.4**	**70.6**	**69.8**	**68.9**	**68.0**	**66.9**
Debt Repayment	Rs Cr	11.74	12.97	14.33	15.84	17.50	19.34	21.37	23.61
Loan O/s	419	407	394	380	364	347	327	306	282
Interest on LT Debt	Rs Cr	44.0	42.8	41.4	39.9	38.2	36.4	34.4	32.1
Total Debt Servicing	**Rs Cr**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**	**55.8**
DSCR		**1.30**	**1.29**	**1.28**	**1.27**	**1.25**	**1.24**	**1.22**	**1.20**

(Source – Author's Analysis)

Table 4-3 P&L Statement for Year 9th - 17th

Description	**Unit**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Energy Generated	MU	289.1	289.1	289.1	289.1	289.1	289.1	289.1	289.1	289.1
Auxiliary consumption	MU	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Energy Sale	MU	284.7	284.7	284.7	284.7	284.7	284.7	284.7	284.7	284.7
Tariff	Rs	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
Revenue	**Rs Cr**	**82.6**	**82.6**	**82.6**	**82.6**	**82.6**	**82.6**	**82.6**	**82.6**	**82.6**
O&M expense	Rs Cr	11.8	12.4	13.0	13.7	14.4	15.1	15.8	16.6	17.5
EBITDA	**Rs Cr**	**70.7**	**70.2**	**69.5**	**68.9**	**68.2**	**67.5**	**66.7**	**65.9**	**65.1**
Interest on LT debt	Rs Cr	29.7	26.9	23.9	22.4	20.8	19.0	17.0	14.9	12.5
Interest on Working Capital	Rs Cr	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58
Depreciation	Rs Cr	28.02	28.02	28.02	28.02	28.02	28.02	28.02	11.97	11.97
PBT	**Rs Cr**	**11.5**	**13.6**	**16.0**	**16.9**	**17.8**	**18.9**	**20.1**	**37.5**	**39.1**
Income tax	Rs Cr	3.3	4.0	4.7	4.9	5.2	5.5	5.8	10.9	11.4
PAT	**Rs Cr**	**8.1**	**9.7**	**11.4**	**11.9**	**12.6**	**13.4**	**14.2**	**26.6**	**27.7**
Operating Cash flow	**Rs Cr**	**65.8**	**64.6**	**63.3**	**62.4**	**61.4**	**60.4**	**59.3**	**53.4**	**52.1**
Debt Repayment	Rs Cr	26.09	28.83	13.94	15.40	17.02	18.81	20.78	22.96	25.37
Loan O/s	419	256	228	214	198	181	162	142	119	93
Interest on LT Debt	Rs Cr	29.7	26.9	23.9	22.4	20.8	19.0	17.0	14.9	12.5
Total Debt Servicing	**Rs Cr**	**55.8**	**55.8**	**37.8**	**37.8**	**37.8**	**37.8**	**37.8**	**37.8**	**37.8**
DSCR		**1.18**	**1.16**	**1.67**	**1.65**	**1.62**	**1.60**	**1.57**	**1.41**	**1.38**

(Source – Author's Analysis)

Table 4-4 P&L Statement for Year 18th – 25th

Description	Unit	18	19	20	21	22	23	24	25
Energy Generated	MU	289.1	289.1	289.1	289.1	289.1	289.1	289.1	289.1
Auxiliary consumption	MU	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Energy Sale	MU	284.7	284.7	284.7	284.7	284.7	284.7	284.7	284.7
Tariff	Rs	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
Revenue	**Rs Cr**	**82.6**	**82.6**	**82.6**	**82.6**	**82.6**	**82.6**	**82.6**	**82.6**
O&M expense	Rs Cr	18.3	19.3	20.2	21.2	22.3	23.4	24.6	25.8
EBITDA	**Rs Cr**	64.2	63.3	62.3	61.3	60.3	59.2	58.0	56.8
Interest on LT debt	Rs Cr	9.8	6.8	3.6	0.0	0.0	0.0	0.0	0.0
Interest on Working Capital	Rs Cr	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58
Depreciation	Rs Cr	11.97	11.97	11.97	11.97	11.97	11.97	11.97	11.97
PBT	**Rs Cr**	**40.9**	**42.9**	**45.2**	**47.8**	**46.7**	**45.6**	**44.4**	**43.2**
Income tax	Rs Cr	11.9	12.5	13.2	13.9	13.6	13.3	12.9	12.6
PAT	**Rs Cr**	**29.0**	**30.4**	**32.0**	**33.9**	**33.1**	**32.3**	**31.5**	**30.6**
Operating Cash flow	**Rs Cr**	**50.7**	**49.2**	**47.6**	**45.8**	**45.1**	**44.3**	**43.5**	**42.6**
Debt Repayment	Rs Cr	28.04	30.98	34.23					
Loan O/s	419	65	34	0					
Interest on LT Debt	Rs Cr	9.8	6.8	3.6					
Total Debt Servicing	**Rs Cr**	**37.8**	**37.8**	**37.8**					
DSCR		**1.34**	**1.30**	**1.26**					

(Source – Author's Analysis)

The working sheets of various calculations related to Depreciation, Working Capital, IRR have been attached as Appendix to this report.

4.4 Result

Based on the analysis done above and the financial model, following parameters have been calculated and is summarized below:

Table 4-5 Result of Financial Analysis

Result of Financial Analysis	
Average DSCR	1.34
Minimum DSCR	1.16
Loan Life Coverage Ratio	1.31
Project IRR	11.05%

(Source – Author's Analysis)

4.5 Concluding Remarks

- Average DSCR – 1.34 i.e. more than 1 which implies that there is cushion in operating cash flows debt servicing of 0.34 times.
- Minimum DSCR – 1.16 i.e. more than 1 which implies that there is sufficient cashflows available every year for debt servicing.
- LLCR – 1.31 i.e. more than 1 which implies the NPV of future cashflows is 1.31 times the outstanding debt obligation.
- Project IRR – 11.05% is more than the Interest rate which implies that the project has high growth potential.

Hence, it can be inferred that the project has sufficient amount of cashflows available for servicing the debt and the higher IRR indicates a better investment option for an investor looking for higher returns.

The next chapter will deal with the various risk associated with the investments made in renewable energy projects.

CHAPTER 5

RISK ASSESSMENT

This chapter deals with the risk associated with investment in renewable energy projects. Every investment has some risk associated with it which needs to be identified and mitigated at the right stage to save the investment.

5.1 Risk Analysis & Mitigation

The risks associated with a renewable energy project are divided into the following phases:

- **Pre-Construction Risk Phase**
- **Post-Construction Risk Phase**
- **Risk in Both Pre and Post Construction Phase**

Table 5-1 Risk Analysis And Mitigation

S.No	Risk	Mitigation
Pre-Construction		
1	Technological Planning risk or Design Risk	• LDs related to delay can be captured in EPC contract • Penalties needs to be paid by OEMs supplying Major equipments • Energy Yield assessment can be done by Third party firm
2	Construction Risk	• Fixed Price Turnkey contract • Project assets can be insured with requisite Insurance Policies.
Post-Construction		
1	Operational Risk	• Turnkey agreement (Performance test clause captured) • Project assets can be insured with requisite Insurance Policies. • Penalty Payment clause for O&M contractor can be added in contract
2	Supply Risk	• There are no raw material required for renewable project except for biomass project, hence less risk is perceived.
3	Demand/ Market Risk	• Usually firm PPA for 25 years period are being executed. Hence less risk is perceived in terms of demand.
Risk in Both Pre and Post Construction Phase		

1	Exchange Rate Risk	• 70-80% indigenous products are being used in most of the renewable projects except solar. Derivative products can be bought to mitigate risk in case of solar.
2	Interest Rate risk	• Derivative products can be bought to mitigate risk.
3	Inflation Risk	• There is less inflation risk because of negligible requirement of raw materials for operation of project.
4	Environmental Risk	• Project assets needs to be insured with requisite Insurance Policies to reduce the risk.
5	Regulatory Risk	• All the clearances needs to be obtained for the construction and operation of project.

(Source – Author's Analysis)

5.2 SWOT Analysis

Strengths	Weaknesses
• Firm Power off take arrangements**:** 25 years PPA is being executed with offtakers • Experience of Promoter in Renewables Sector**:** Many Promoters have experience of implementing renewable projects majorly wind and solar projects in India.	• Renewable power cannot be generated through out the day: Generation from renewable power project is dependent on seasons, sun etc which is variable upon factors such as monsoon, climate, wind velocity etc. hence power is not generated throughout the 24 hours. ***Mitigation:*** *All the renewable projects are in the locations which are the most suitable location for renewable energy generation.*
Opportunities	**Threats**
• Focus on Renewable Energy: Government of India has an ambitious target of renewable energy installations of 175 GW by the year 2022. • Increased Demand Supply Gap: The present demand for electrical power is growing continuously and will outstrip the available and planned generation capacity leading to shortage of available power and energy sources in the coming years. Ongoing stress in thermal power generation is also contributing to this gap.	• Envisaging the opportunities, many private players are already in fray to set up a renewable energy project in the country which may even out the competitive advantage expected by the Sponsor. *Promoter can develop in-house expertise in implementation of RE projects.*

(Source – Author's Analysis)

5.3 Concluding Remarks

Renewable energy projects are very much dependent on geography, climate and are also intermittent in nature. However, by assessing the different aspects of variations involved the risk can be minimized. The next chapter deals about conclusion, challenges and recommendations.

CHAPTER 6

CONCLUSION, CHALLENGES & RECOMMENDATIONS

This chapter deals with the actual installations of renewable energy in India and its available potential. The various government initiatives which have led to the growth of renewables in India has been summarised. Also, the challenges which are being faced have been detailed along with recommendations.

6.1 Conclusion

India has a huge potential of renewable energy sources which can be harnessed at any location in the country. Few locations are rich in terms of solar resources, few in terms of wind, few in terms of hydro and few in terms of bio-mass. There is huge government thrust in terms of installing renewable energy projects by way of subsidies, incentives, tax holiday, single window clearance, a separate ministry etc which led growth in terms of installation of renewable energy projects. However with so much government support and availability of renewable energy sources, India could harness only 8.5% of renewable energy potential available. The major reason which can be seen behind this gap is unavailability of easy and cheap financing instruments for renewable energy sector.

As it can be seen from the analysis that the project selected is viable in terms of debt ratios and IRR which pose a better opportunity for investment by equity as well as debt investors. Even if the renewable projects are viable but still there are challenges in terms of their financing.

6.2 Challenges

Despite favourable policies and support from central/ state government, renewable energy project faces issues in installations due to unavailability of finances. The major challenges which can be observed in financing are as follows:

1. Durability:

   The rapidly changing technology in solar projects and the question about their durability is a bigger concern for investors. In India solar projects are

hardly 10-15 years old and these projects are not in good shape. Hence, it raise a concern about their life as assessed as 25 years.

2. Exposure limit:

   Banks have already reached their exposure limits by lending to Thermal power projects according to the RBI guidelines. In addition, there is continuous Asset and Liability mismatch due to the long-term nature of the renewable energy projects. These factors lead to lending crisis and high borrowing costs.

3. Payment security issue / Poor health of DISCOM:

   Give the lenders some comfort, which worsens the financial health of public utilities makes it difficult for the lenders to finance state-subsidized renewable energy projects. Lenders tend to divide wind projects into high-risk categories which leads to increase in the borrowing cost.

4. Smaller Size of Projects:

   Large Solar/ Wind Projects are fragmented into small capacities which is having lesser capacity than conventional power plants. Therefore, lenders are reluctant to finance small projects. Even when it comes to finances available, the financing costs are higher.

5. Uncertainty in resources:

   Electricity and errors in the estimation of solar/hydro/wind resources create uncertainty in the future returns. Therefore, the lack of wind resource data results in lenders for energy production at (P90 - P95) levels and revenue.

6. Sensitive to variable interest rates:

   The projects are very sensitive to change in interest rate and has a significant impact on project costs, as all investments are in advance and projects are financed with loan. Hence, sometimes due to heavy burden of interest cost during construction converts a viable project as unviable.

7. Evacuation arrangements:

   Evacuation infrastructure is a big risk for the renewable projects. If the project has been installed and evacuation infrastructure is not adequate then the entire investment will go haywire. As government is pushing for installation of renewable energy projects, transmission networks are not developed in line with the installations hence this leads to unavailability of required evacuation arrangements.

In view of the above challenges, it is difficult for developers of renewable energy projects to get financial assistance for their projects.

6.3 Recommendations

- Green bonds need to be floated in market for the financing of commissioned wind projects. That will help banks/ FIs to have funds for greenfield projects. It would allow banks access to a long term of dedicated funds for the sector. Power Finance Corporation (PFC), REC Limited (REC) together with IREDA can float bonds and finance projects.
- Renewable energy sector should be considered as a separate sector for the measurement of sectoral exposure limits of banks.
- The establishment of a larger and dedicated fund to support any public sector deficit contributes significantly to reducing the perceived risk of default. That could be done by allocating budget funds from the National Clean Energy Fund.
- Refinancing of loans or take-out financing will reduce the asset and liability mismatch and specialized non-bank financial corporations (NBFC) can be set up for lending to renewable energy projects.

6.4 Concluding Remarks

Although various challenges are there, but India is emerging as a nation which will teach the entire world about its story in installing renewables. This has been seen in last few years that the country is adding huge capacities every year. The entire industry is learning and innovatively changing technologies and huge research & development works are being done to enhance the quality of solar cells, increase their efficiency, increase the hub-height of wind turbines to generate more energy etc. The price of solar projects have fallen sharply in last few years making them cheaper than conventional projects. The Financial Institutions are considering renewable energy projects as their major source of business in future hence they are trying to align their norms and practices to help this industry bloom.

The next chapter will deal about the limitations and future works.

CHAPTER 7

LIMITATIONS & FUTURE WORK

This chapter deals with the limitations in this study and future work which can be carried out.

7.1 Limitations

Viability criteria vary from lender to lender and investor to investor. Hence, it is difficult to define a range of parameters or a single parameter to judge the viability of a project. Also, the calculations are based on certain estimation which might go in favour or against the investment decision. Hence, there are always chances that a project which looks very much viable can turn out to be a bad investment in reality because of many factors which are beyond the scope of developer and can not be factored in financial modelling / viability studies. There are limitations in terms of historical performance of solar projects as these projects are installed recently and the technology is changing every 2-3 years. Hence, it is difficult to comment on their quality and performance.

7.2 Future Work

The viability study has been conducted only specific to wind energy project. However, the same can be conducted for other technologies because every technology is different than other and there are different norms / assumption criteria in terms of calculating their investment potential.

There are discrepancy in applicable approvals/ clearances in different states for installing renewable energy projects. The same can be studied to understand the hurdles being faced by developers to install renewable energy projects.

Renewable energy sector and its technologies are changing day by day. Hence, there is huge scope of future studies which can be carried out.

7.3 Concluding Remarks

This chapter dealt with the various limitations and future works which can be carried out in renewable energy sector.

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Appendix

Appendix – I Plagiarism Check Report

Plag

ORIGINALITY REPORT

9%	7%	5%	8%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	dspace.dtu.ac.in:8080 Internet Source	1%
2	www.scielo.br Internet Source	1%
3	www.econstor.eu Internet Source	<1%
4	Submitted to Indian Institute of Management, Bangalore Student Paper	<1%
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7	Submitted to Hochschule Bremen Student Paper	<1%
8	Submitted to Symbiosis International University Student Paper	<1%
9	www.prsindia.org	

Appendix – II Financial Modelling Working Sheets

Project IRR Calculation

Year	-1	0	1	2	3	4	5	6	7	8	9	10	11	12
Cash outflow														
fund drawl	-233.2	-350												
Cash inflow														
EBITDA			74.56	74.16	73.74	73.30	72.84	72.35	71.84	71.31	70.74	70.15	69.53	68.88
Increase in working capital			13.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Terminal value														
Net cashflows	-233.2	-349.8	88.32	74.16	73.74	73.30	72.84	72.35	71.84	71.31	70.74	70.15	69.53	68.88
Project IRR	**11.05%**													

Year	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Cash outflow														
fund drawl														
Cash inflow														
EBITDA	68.20	67.48	66.72	65.93	65.10	64.23	63.31	62.35	61.34	60.28	59.16	57.99	56.76	0.00
Increase in working capital	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-13.76
Terminal value														59.99
Net cashflows	68.20	67.48	66.72	65.93	65.10	64.23	63.31	62.35	61.34	60.28	59.16	57.99	56.76	46.23
Project IRR														

(Author's Analysis)

Depreciation Calculation

Gross block	Cr	**600**
Depreciation Rate for first 15 years	%	**4.67%**
Rate for residual period	%	**2.00%**
Residual Value	%	**10%**

Years	Unit	1	2	3	4	5	6	7	8	9	10	11	12
Opening Balance	Cr	599.90	571.88	543.87	515.85	487.83	459.82	431.80	403.79	375.77	347.76	319.74	291.73
Depreciation	Cr	28.02	28.02	28.02	28.02	28.02	28.02	28.02	28.02	28.02	28.02	28.02	28.02
Closing Balance	Cr	**571.88**	**543.87**	**515.85**	**487.83**	**459.82**	**431.80**	**403.79**	**375.77**	**347.76**	**319.74**	**291.73**	**263.71**

Years	Unit	13	14	15	16	17	18	19	20	21	22	23	24	25
Opening Balance	Cr	263.71	235.70	207.68	179.67	167.70	155.73	143.76	131.80	119.83	107.86	95.89	83.93	71.96
Depreciation	Cr	28.02	28.02	28.02	11.97	11.97	11.97	11.97	11.97	11.97	11.97	11.97	11.97	11.97
Closing Balance	Cr	**235.70**	**207.68**	**179.67**	**167.70**	**155.73**	**143.76**	**131.80**	**119.83**	**107.86**	**95.89**	**83.93**	**71.96**	**59.99**

(Author's Analysis)

Working Capital Calculations

Receivables for Debtors	2	Months
Interest On Working Capital	11.50%	%

Particular	Unit	1	2	3	4	5	6	7	8	9	10	11	12
Receivables	Cr	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76
Total Working Capital	Cr	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76
Interest on Working Capital	Cr	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**

Particular	Unit	13	14	15	16	17	18	19	20	21	22	23	24	25
Receivables	Cr	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76
Total Working Capital	Cr	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76	13.76
Interest on Working Capital	Cr	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**

(Author's Analysis)

Balance sheet at the End of Construction Phase				
	Years	1	2	Total
Progress		40%	60%	
Asset				
CWIP	Cr	233	350	583
Cumulative	Cr	233	350	
Total Interest	Cr	0	17	17
Total Asset	Cr			600
Liability				
Equity	Cr	72	108	181
LT Debt	Cr	161	241	402
Total Interest	Cr	0	17	17
Total Liability	Cr			600

(Author's Analysis)