ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 3, Issue 11, May 2014

Techno-Economic Assessment of Renewable Energy Technologies using Integrated Analysis

Rupesh Thakre, Dutt Subroto*,
* Electronics & Power Engineering, R.C.E.R.T, Chandrapur, India *

Abstract: ***Electricity demand is steeply increasing with the new challenges like; depletion of fossil fuel, need of efficient electricity generating technologies, environmental issues etc. and with the rapid depletion of fossil fuel reserves, it is feared that the world will soon run out of its energy resources. Furthermore, the global economic and political conditions that tend to make countries more dependent on their own energy resources have caused growing interest in the development and use of renewable energy based technologies This is a matter of concern for developing countries whose economy heavily leans on its use of energy . Renewable Energy Technologies are coming in front and participating localized generation of electrical power. Off Grid & Grid connected generators are gaining popularity especially in country like ours. But still no formal performance evaluation method is in use, because of such lacking one cannot assess and estimate the strength & weaknesses of such valuable projects. This integrated analysis will provide valuable insights into the current state of deployment, types of technologies available and their costs and performance, payback period. In terms of its environmental advantages, renewable energy sources generate electricity with insignificant contribution of carbon dioxide (CO2) or other greenhouse gases (GHG) to the atmosphere and they produce no pollutant discharge on water or soil and hence power generation from renewable becomes very important. Major types of renewable energy sources include solar, wind, hydro and biomass, all of which have huge potential to meet future energy challenges. Solar photovoltaic technology in one of the first among several renewable energy technologies (RET) like DDGthat have been adopted worldwide for meeting the basic needs of electricity particularly in remote areas.***

Keywords: **Integrated analysis (IA), DDG, payback period**.

I. INTRODUCTION

India needs a radical transformation of its energy system to the use of renewable energy, especially solar wind and biomass, to end the "India's addiction to oil .Lift its massive population out of poverty and combat climate change. India can't afford to delay renewable energy deployment to meet its future energy needs.[5] India's present generation capacity is about 200,000MW. The country could potentially increase grid-connected solar power generation capacity to over 200,000 MW and wind energy to over 100,000 MW by 2030 if the right resources (and more importantly, energy policies) were developed. India can develop massive commercial wind farms to harness the strong onshore coastal area and offshore wind to boost the country's supply of clean renewable energy But, to tap this vast resource, India must develop and implement smart business models and favorable policies as quickly as possible.[9][10] Total global participation in MW is around 2 lack out of that 12.5% is renewable energy resources[1] Government of India has decided to increases the renewable energy projects per year by 1% Renewable energy technologies (including solar) have enjoyed a period of rapid growth in recent years, through a combination of government subsidies and purchaser altruism. [4].The Indian government is taking many measurable steps toward improving infrastructure and power reliability, including the development of renewable energy from solar and wind. But clearly, more needs to be done, and fast. One step in the right direction was the establishment of the Jawaharlal Nehru National Solar Mission (JNNSM) in late 2009. However, the present JNNSM target of producing 10 percent of its energy from solar – 20 GW – by 2022 is totally inadequate. JNNSM needs to take bold steps with the help of central and state governments in order to play a greater role in realizing India's solar energy potential. Likewise biomass power generation technologies but also touches on the technical and economic characterization of biomass resources, preparation and storage. There can be many advantages to using biomass instead of fossil fuels for power generation, including lower greenhouse gas (GHG) emissions, energy cost savings, improved security of supply, waste management/reduction opportunities and local economic development opportunities.[1] Projects will be selected for Renewable energy to re-energize India's economy by creating millions of new jobs, allowing the country to achieve energy independence, reduce its trade deficits and propel it forward as a "Green Nation."[5]

II. TECHNO-ECONOMIC EVALUATION

The assessment of a particular energy system for its techno-economic feasibility is of utmost importance if the system has to function satisfactorily at a given location. The techno-economic feasibility assessment of a particular technology begins with evaluating the

Techno-logical appropriateness, economic viability and other financial incentives of a technology for it to get success-fully disseminated at a given location. This section deals with the literature

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pertaining to the techno economic evaluation of various RES. [7]

The economic competitiveness of RES in developing countries and showed that even after including externality costs, the economics of RES .In this work it is concluded that The proposed work aimed to avail opportunities develop a methodology for the Techno-Economic Analysis based financial modeling of GRID interactive DDGs.[3] This will provide valuable insights into the current state of deployment, types of technologies available and their costs and performance. The analysis is meant for developing a uniform methodology that supports comparison across renewable technologies in execution especially in Maharashtra. Cost of electricity and cost trends, as well as their variability to be assessed using techno-economical analysis. Analysis of Grid connected Solar, Wind and Biomass based electricity generation. Model prepared by us will prove the feasibility of any RET [14]

III. METHODOLOGICAL FRAMEWORK OF INTRGRATED ANALYSIS

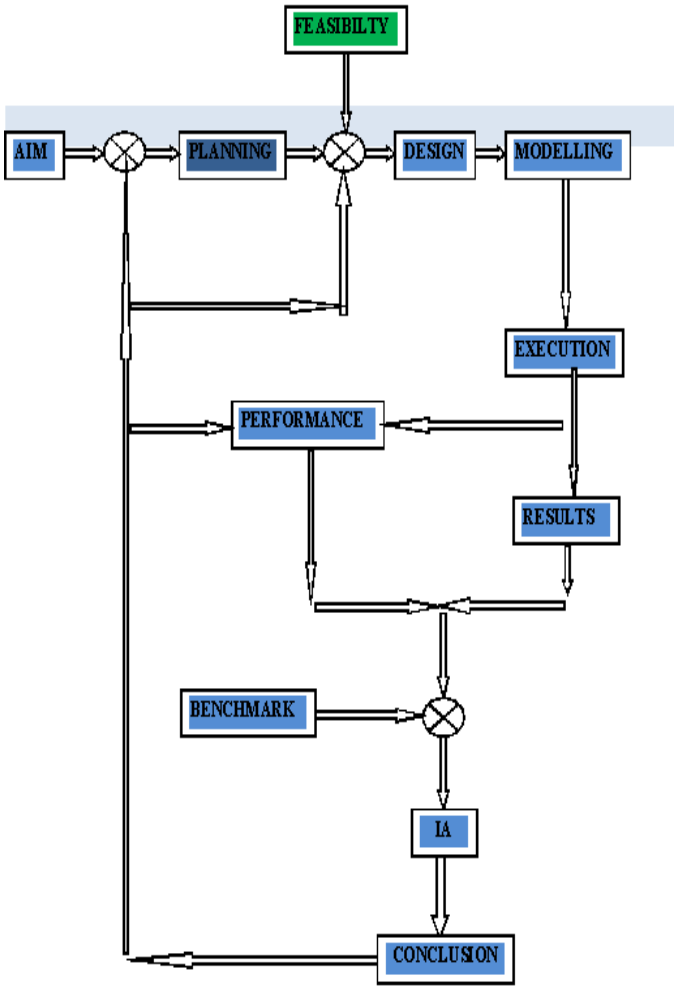

Fig 1. Diagrammatical representation methodological framework of INTRGRATED ANALYSIS of various RES

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This model will give us perception for starting projects and will help in creating the blue print of any energy project; it can also enhance performance of any projects. IA will help in analyzing all components involved in project like

- Gestation period
- Performance evaluation
- Project execution
- Benchmarks
- Design
- Modeling

Integrated analysis is necessary for performance evaluation of RES model in execution. The outcome of IA aimed for techno-economic feedback in up gradation of designing aspects.

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IV. A COMPARITIVE ANALYSIS OF DIFFERENT ALTERNATE ENERGY PROJECTS

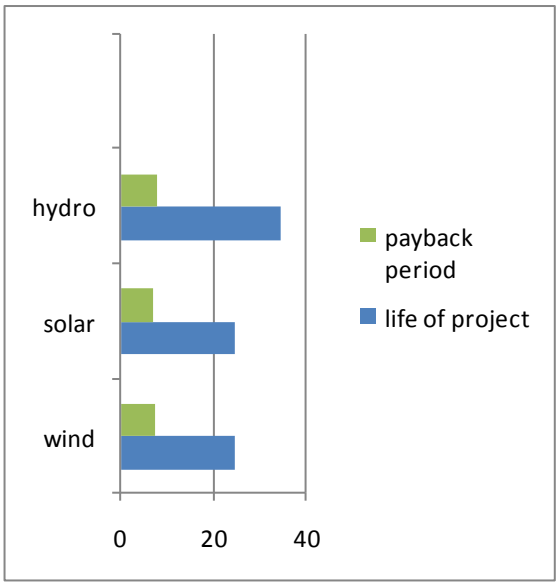

Fig: 1 presents the payback periods for the alternative energy projects.

The figure shows comparative analysis of the different projects Any projects prior to installation is analysed as its feasibility is matter of concern, the first and foremost thing about any investment is the benefit returns .The following data has been collected from the financial model of wind, hydro and biomass projects prepared by us with analysis and studying the norms and policies of CERC and SECR.

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TECHNOLOGY	POWER PLANT COST (RS LAC/MW)	PAY BACK PERIODS (YEARS)
1) SOLAR POWER PROJECT	800	6.95
2) WIND POWER PROJECT	540.66	7.22
3) HYDRO POWER PROJECT	525.22	7.62

V. CONCLUSION

The following conclusions can be drawn from the thorough review of the literature available on techno-economic feasibility analysis of the RE systems. A generalized approach to assess suitability of RE systems at a given location, based on techno-economic and environmental feasibility does not find good amount of coverage. However, if data based on system costs, operation and maintenance cost and other relevant cost details are made available along with the learning's from the case studies, the techno-economic feasibility assessment objective could be easily accomplished. It was found that the techno-economic assessment of RE systems lacks the data related to economic parameters like payback period, net present value, rather they are generally based on annualized life cycle cost methods Integrated analysis is necessary for performance evaluation of RES model in execution. The outcome of IA aimed for techno-economic feedback in up gradation of designing aspects.

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AUTHOR'S PROFILE

Rupesh Jaidas Thakre Department of electronics and power engineering M.Tech IV sem, Energy Management System, R.C.E.R.T, Chandrapur, India