Chapter – 6

Findings, Recommendations and Conclusion

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6.0 Introduction

This chapter outlines the findings, conclusions and recommendations on the ground of the outcomes revealed from the analysis of previous chapter of data analysis & interpretations. This chapter is framed in two parts: first part consist of demographic outcomes concerned with the research. Second part involves the findings and conclusions related to different factors related to the development of utility scale renewable energy projects of various states of India with reference to the various stake holders involved in the renewable energy fields. Lastly, recommendations are framed for the target population for this research study comprise of the stake holders, policy makers, financiers, investors, developers, Regulators, R&D institutions Consultants, EPC contractors, decision makers, Service providers, Equipment supplier, EPC companies select employees & management personnel's of public sector and private sectors as well as Academicians of our countries.

6.1 Demographic characteristics of Stake holders group for this research: Respondents located in select states of India:

- Result of the study depicts the distribution of the respondents from various regions / states of India. The data indicates that the respondents are from 12 (twelve) states, mostly having high renewable energy potentials zones. Out of total 252 respondents, 105 (41.7%) respondents are from Gujarat, 21 (8.3%) respondents are from Maharashtra, 45 (17.9%) respondents are from Karnataka, 9 (3.6%) respondents are from Madhya Pradesh, 6 (2.4%) respondents are from Rajasthan, 9 (3.6%) respondents are from Uttar Pradesh, 32 (12.7%) respondents are from NCR/ Delhi, 13 (5.2%) respondents are from Tamil Nadu, 7 (2.8%) respondents are from Hariyana, 3 (1.2%) respondents are from Uttara Khand, 1 (0.4%) respondents is from Telangana, 1 (0.4%) respondents is from West Bengal.

- **Distribution of respondents on the ground of Types of Organization:**

  Result of the research depict that the distribution of respondent from various organization shows that out of total 252 respondents, the majority of respondents are from private organization about 165 (65.5%), 28 (11.1%) respondents are from public organization, 9 (3.6%) respondents are from joint venture organization, 36 (14.3%) respondents are from government organization, 14 (5.6%) respondents are from non-government organization.

- **Distribution of respondents on the ground of years of experience group:**

  Result of the research study depicts the distribution of the respondents on the ground of years of experience group. The data indicates that the respondents are from 4 (four) experience group, mostly respondents are from renewable energy field. Out of total 252 respondents, 148 (58.7%) respondents are having more than 10 years of experience, 46 (18.3%) respondents are having 5 to 10 years of experience, 44 (17.5%) respondents are having 2 to 5 years of experience and 14 (5.6%) respondents are having experience up to 2 years.

6.2 Findings in view of respondent perceptions:

- **Respondents contribution in development of renewable energy projects**

  It is revealed that 45.2 percentage of manufacturers agree & 41.7 percentage are strongly agree for their contribution in development of renewable energy projects

  It is revealed that 61.5 percentage of suppliers agree & 25.4 percentage are strongly agree for their contribution in development of renewable energy projects

It is revealed that 59.9 percentage of EPC contractors strongly agree & 37.3 percentage are agree for their contribution in development of renewable energy projects

It is revealed that 73.8 percentage of project developers are strongly agree & 25.8 percentage are agree for their contribution in development of renewable energy projects

Moreover, It is view that 38.5 percentage of investors strongly agree & 30.6 percentage are agree for their contribution in development of renewable energy projects

It is found that 38.5 percentage of financiers agree & 30.6 percentage are strongly agree for their contribution in development of renewable energy projects

It is noticed that 58.7 percentage of policy maker strongly agree & 35.7 percentage are agree for their contribution in development of renewable energy projects

Further, It is revealed that 48.8 percentage of consultant agree & 19.4 percentage are disagree for their contribution in development of renewable energy projects

It is indicated that 63.1 percentage of power purchaser strongly agree & 29.0 percentage are agree for their contribution in development of renewable energy projects

It is clarified that 62.3 percentage of independent power producers strongly agree & 31.3 percentage are agree for their contribution in development of renewable energy projects

It is noticed that 52.8 percentage of captive users strongly agree & 37.3 percentage are agree for their contribution in development of renewable energy projects

It is further, noticed that 43.7 percentage of research institute agree & 22.2 percentage are dis-agree for their contribution in development of renewable energy projects

It is concluded that 64.3 percentage of promoter of renewable energy strongly agree & 29.8 percentage are agree for their contribution in development of renewable energy projects

It is further concluded that 53.2 percentage of renewable energy power trader strongly agree & 32.1 percentage are agree for their contribution in development of renewable energy projects

It is observed that 40.1 percentages of other stake holders agree & 44.8 percentages don't know for their contribution in development of renewable energy projects.

- **Respondents operating in renewable energy project basket**

  It is revealed that 91.6 percentages i.e. 230 out of total 252 respondents are operating in on grid utility scale solar renewable energy projects.

  It is further, revealed that 35.5 percentages i.e. 89 out of total 252 respondents are on shore utility scale wind renewable energy projects.

- **Respondents perception regarding potential of solar power project development:**

  It is revealed from the study that 50.79 percentages of respondents strongly agree and 19.4 percentages agree for tremendous potential of solar power project development.

  However, it is also revealed that only 2.77 percentages of respondents strongly agree and 11.11 percentages agree target of 100GW of solar power project will be achieved up to 2022. Majority of respondents i.e. 22.62 percentages are disagree and 6.74 percentages are strongly disagree for achievement of said target.

  Further, it is also revealed that only 5.55 percentages of respondents strongly agree and 3.57 percentages agree that the installation of solar power projects are growing as desired to fully utilize the available renewable energy sources. Majority of respondents i.e. 23.80 percentages are disagree and 21.82 percentages are strongly disagree.

- **Respondents perception regarding potential of wind power project development:**

  It is revealed from the study that 54.76 percentages of respondents strongly agree and 15.87 percentages agree for tremendous potential of wind energy source.

  It is also, revealed from the study that 44.84 percentages of respondents strongly agree and 23.41 percentages agree for tremendous potential of wind power project development.

  However, it is also revealed that only 1.98 percentages of respondents strongly agree and 10.71 percentages agree target of 60GW of wind power project will be achieved up to 2022. Majority of respondents i.e. 21.83 percentages are disagree and 10.32 percentages are strongly disagree for achievement of said target.

  Further, it is also revealed that only 1.19 percentages of respondents strongly agree and 3.96 percentages agree that the installation of wind power projects are not growing as desired to fully utilize the available wind energy sources. Majority of respondents i.e. 24.20 percentages are disagree and 23.80 percentages are strongly disagree.

- **Respondents perception regarding availability of renewable energy potential and achievement of government target:**

  It is revealed from the study that 56.2 percentages of respondents strongly agree that the available RE potential is more than government target requirements and 35.1 percentages agree that the available RE potential is sufficient for government target requirements.

  It is also, revealed from the study that 67.3 percentages of respondents opine that their support are very important for achievement of government target of renewable energy projects and 25.90 percentages of respondents opine that their support are important for achievement of government target of renewable energy projects

- **Respondents perception in view of organizational support for achievement of government target:**

  The study revealed that 59.92 percentages of respondents perceived very high importance (80% and more) organizational support and 23.80 percentages high (50 to 80%) organisanal support for achievement of government target of solar renewable energy projects.

  The study revealed that 32.54 percentages of respondents perceived very high importance (80% and more) organizational support, 15.47 percentages high (80 to 50%) and 20.63 percentages medium (50 to 20%) organisanal support for achievement of government target of wind renewable energy projects.

  It is also, revealed from the study that 65.07 percentages of respondents perceived very high significance (80% and more) and 20.63 percentages of respondents perceived high significance (80 to 50%) for organization to install solar renewable energy projects in order to utilize optimally the available potential of renewable energy sources.

  It is also, revealed from the study that 29.36 percentages of respondents perceived very high significance (80% and more), 14.28 percentages of respondents perceived high significance(80 to 50%) and 22.22 percentages of respondents perceived moderate significance (50 to 20%) for organization to install wind renewable energy projects in order to utilize optimally the available potential of renewable energy sources.

- **Respondents perception regarding opportunities of green employment to boost the India`s developing economy:**

  The study revealed that 98.81 percentages of respondents agree for creation of opportunities for solar power project green employment to boost India`s developing economy.

  The study revealed that 96.82 percentages of respondents agree for creation of opportunities for wind power project green employment to boost India`s developing economy.

- **Respondents perception regarding viable range of project cost for utility scale Solar renewable energy projects:**

  It is revealed from the study that 30.95 percentages of respondents perceived the viable project costing range of 5 to 4.5 Cr per MW, 26.59 percentages of respondents perceived the range of 4.5 to 4.0 Cr per MW, 25.40 percentages of respondents perceived the range of 5.5 to 5.0 Cr per MW. It is also revealed that only 4.36 percentages of respondents perceived the range of 6.0 to 5.5 Cr per MW, 3.17 percentages of respondents perceived the range of 3.5 to 3.0 Cr per MW as well as 9.13 percentages of respondents perceived the range of 4.0 to 3.5 Cr per MW.

- **Respondents perception regarding viable range of project cost for utility scale wind renewable energy projects:**

  It is revealed from the study that 34.13 percentages of respondents perceived the viable project costing range of 6 to 5.5 Cr per MW, 27.38 percentages of respondents perceived the range of 5.0 to 4.5 Cr per MW, 24.60 percentages of respondents perceived the range of 5.5 to 5.0 Cr per MW. It is also revealed that only 1.59 percentages of respondents perceived the range of 3.5 to 3.0 Cr per MW, 2.38 percentages of respondents perceived the range of 4 to 3.5 Cr per MW as well as 9.52 percentages of respondents perceived the range of 4.5 to 4.0 Cr per MW.

- **Respondents perception regarding initial project cost for utility scale solar renewable energy projects:**

  It is revealed from the study that 63.10 percentages of respondents perceived the high initial cost for utility scale solar renewable energy projects, 26.19 percentages of respondents perceived the normal initial cost. However, it is also revealed that only 9.52 percentages of respondents perceived very high initial cost and 0.79 percentages of respondents perceived low initial cost for development of utility scale solar renewable energy projects.

- **Respondents perception regarding initial project cost for utility scale wind renewable energy projects:**

  It is revealed from the study that 49.20 percentages of respondents perceived the high initial cost for utility scale wind renewable energy projects, 39.28 percentages of respondents perceived very high initial cost. However, it is also revealed that only 11.11 percentages of respondents perceived normal initial cost for development of utility scale wind renewable energy projects.

- **Respondents perception regarding operation & maintenance cost for utility scale solar renewable energy projects:**

  It is revealed from the study that 62.70 percentages of respondents perceived the normal operation & maintenance cost for utility scale solar renewable energy projects, 21.42 percentages of respondents perceived the high operation & maintenance cost. However, it is also revealed that only 10.32 percentages of respondents perceived low operation & maintenance cost, 3.17 percentages of respondents perceived very high operation & maintenance cost, 1.98 percentages of respondents perceived very low operation & maintenance cost for development of utility scale solar renewable energy projects.

- **Respondents perception regarding operation & maintenance cost for utility scale wind renewable energy projects:**

  It is revealed from the study that 47.22 percentages of respondents perceived the high operation & maintenance cost for utility scale wind renewable energy projects, 32.14 percentages of respondents perceived normal operation & maintenance cost. However, it is also revealed that only 13.88 percentages of respondents perceived very high operation & maintenance cost, 05.55 percentages of respondents perceived low

operation & maintenance cost for development of utility scale wind renewable energy projects.

6.2 Common finding & Conclusion:

- It is evident that the majority classes of respondents are highly reach in terms of experience of utility scale renewable energy projects as such 58.7 %age respondents are having more than 10 years of experience in the field.
- The majority of respondents are from Gujarat state containing 41.7 percentages next to which falls Karnataka contains 17.9 percentages and NCR/Delhi having 12.7 percentages of respondents.
- The majority of respondents i.e. 65.5 percentages are from Private companies, followed by government companies respondent to the tune of 14.3 percentages.
- The majority of stake holders respondents i.e. 21.29% are EPC contractor, followed by Project developer 18.07% and consultant 13.52%.
- The mean value revealed that stake holders like manufacturers, EPC contractors, Project developers, policy makers, power purchasers, Independent power producers, Captive users, Promoters of renewable energy, renewable energy power traders are strongly agree that they are the contributors for development of renewable energy projects. Further the mean values revealed that Suppliers, Investors, Financiers, consultants agree that they too are contributors for development of renewable energy projects.

6.4 Objective wise finding & Conclusion:

Objective 1: To understand the Global and Indian Renewable Energy mix scenario, available potential of renewable energy resources, present scenario of renewable energy projects, scope of development of Renewable Energy Projects.

- It is revealed from the mean score of descriptive statistics analysis for potential of solar renewable energy in India that India has tremendous potential for solar energy, indicates the **strength** as well as there are tremendous scope for solar power project development, indicates the **opportunity** . However, the stake holders perceived that they don`t know whether the target for 100 GW of solar power projects will be achieved or not. Further, mean score revealed that that majority of the stake holders don`t know that `Installation of solar power projects are growing at a speed as desired which may fully utilized the available solar resource` revealed a **weakness** factor for wind energy projects development.
- It is revealed from the mean score of descriptive statistics analysis for potential of wind renewable energy in India that majority of the stake holders strongly agree that India has tremendous potential of wind energy indicates the **strength** as well as there are tremendous scope for wind power project development indicates the **opportunity**. However, the majority of stake holders disagree that `The target of 60 GW of wind power project will be achieved up to 2022`. Again it is revealed that majority of the stake holders dis agree that `Installation of wind power projects are growing at a speed as desired which may fully utilized the available wind energy resource` revealed a **weakness** factor for wind energy projects development.
- It is also revealed that majority of the stake holders agree that Different state/area have different solar energy potential however, in case of wind energy potential majority of the stake holders strongly agree that Different state/area have different wind energy potential, which is **weakness** so far

as opportunity for equal devilment of renewable energy projects are concerned.

Objective 2: To understand the changing scenario, key driving policies & regulations, support mechanisms for renewable energy projects.

- It is revealed from the mean score of descriptive statistics for perception of various respondent/stake holders regarding various policies identified to help to promote the government target for development of renewable energy projects that majority of the stake holders strongly agree to a very great extent that the policies like Exemption from custom duty, Income tax holidays and Payment Security mechanism. As the majority of stake holders' respondents to a very great extent i.e. 54.40% for Exemption from custom duty, 56.0% for Income tax holidays and 44.0% for Payment Security mechanism, hence the said policies are the **strength** for to promote the government target.
- It is revealed from the mean score of descriptive statistics for perception of various respondent/stake holders regarding various policies identified to help to promote the government target for development of renewable energy projects that majority of the stake holders agree to a great extent that the policies like Feed in Tariff, Preferential Tariffs, Renewable Generation Obligation, No inter-state transmission charges, Foreign Direct Investment, Funding from government institutions for financing term loan, Enforcement of renewable purchase Obligation and Off-takers- Power Purchase Agreement hence the said policies are the **opportunity** for to promote the government target.
- It is revealed from the mean score of descriptive statistics for perception of various respondent/stake holders regarding various policies identified to help to promote the government target for development of renewable energy projects that majority of the stake holders agree to a moderate extent that the policies like Accelerated Depreciation, Generation Based Incentives (GBI), Renewable Energy Certificates (REC), Viability Gap Funding (VGF), Central Financial Assistance (CFA), Budgetary support

for R&D and demonstration of technology, Competitive bidding process, Introduction/revision of solar policy, Hybrid solar wind policy and Policy for revamping of existing solar-wind, hence the said policies are again the **opportunity** to promote the government target.

- It is revealed from the mean score of descriptive statistics for perception of various respondent/stake holders regarding various policies identified to help to promote the government target for development of renewable energy projects that majority of the stake holders agree to a moderate extent that the policies like Imposition of Safeguard duty. However majority of respondents i.e. 44.40% not at all agree that this policy supports to promote the government target for development of renewable energy projects hence the said policies are considered as **weakness** to promote the government target.

Objective 3: To understand the developmental opportunities and strengths for renewable energy project.

- The mean values of the variables measured for perception of various stake holders for their responsibility / contribution for the development of renewable energy projects based on descriptive statistics under table 5.5 revealed that contribution of all stake holders are less than the average score of 3. This indicates the **strength** that all stake holders contributes for development of renewable energy projects hence getting good opportunities for development of renewable energy projects.
- The mean values of the variables measured for perception of various respondent/stake holders regarding various policies identified to help to promote the government target for development of renewable energy projects based on descriptive statistics under table 5.8 revealed that majority of policies identified are less than the average score of 3. This indicates the **opportunity** that majority of available policies are favoring to promote the government target for development of renewable energy projects hence getting good opportunities.

- The mean values of the variables measured for potential of solar renewable energy in India shown under table 5.6 revealed that opportunities available as the mean average score are less than 3, which indicates that the development of solar renewable energy projects are having more **opportunity** factor.
- It is revealed from the mean score of descriptive statistics with respect to factors influencing the decision of installation of renewable energy projects that majority of the stake holders strongly agree to a very great extent that the factor like Payment security mechanism, Land policies, Waiver of transmission & wheeling charges, Exemption of custom duties, Availability of renewable energy resources, Availability of evacuation facility and Government target for RE capacity, which revealed the **strength**. As the majority of stake holders respondents to a very great extent i.e. 50.40% for Payment security mechanism, 65.1% for Land policies, 46.0% for Waiver of transmission & wheeling charges, 65.6% for Exemption of custom duties, 73.0% for Availability of renewable energy resources, 55.2% for Availability of evacuation facility and 59.1% for Government target for RE capacity.
- It is revealed from the mean score of descriptive statistics with respect to factors influencing the decision of installation of renewable energy projects that majority of the stake holders agree to a great extent that the factor like Centre level policy supports, State level policy support, Easy of procedure for RE project, Low cost funding from Government institutions, Low cost funding from Private Banks and Institutions, Development of Solar Parks at different states, Waiver of transmission & wheeling charges, Renewable Purchase Obligation (RPO), Imposition of safeguard duty, Availability of off takers and Supply chain network, which indicates the **opportunity** as far as given factors is considered.
- It is revealed from the mean score of descriptive statistics with respect to factors influencing the decision of installation of renewable energy projects that majority of the stake holders agree to a some extent that the factor like Policy for disposal of solar panels and Availability of facility for

disposal of solar panel which indicates the **opportunity** as far as given factors is considered.

- It is revealed from the mean score of descriptive statistics to assess the evaluation of perception of various respondent/stockholders regarding various "motivation support behind the decision on investing in utility scale renewable energy projects" that the motivation support like Renewable power are the future, Returns on generations, Congenial policies in renewable energy at state level, Government targets for renewable energy development, Lower operating cost, Secured payment mechanism, Availability of renewable energy resources, Open access / third party sale of power are having average mean score less than 3 which indicates the opportunities available hence this statement related having more **opportunity** factor.

Objective 4: To understand & analyze the manufacturing resources & value chain for development of renewable energy projects.

- It is revealed that there exists significant difference in the perception about effectiveness of value chain for RE project component from other countries across the Years of experience group.
- It is revealed that there does not exist significant difference in the perception about effectiveness of value chain for RE project component from other countries across Types of Organization.
- It is revealed that there exist significant association between Government target and available manufacturing capacity in India to meet target.
- It is revealed that 36.1% respondent perceived that the manufacturing capacity is not sufficient, 20.2% agree to a very less sufficient manufacturing capacity and 18.7% to a less sufficient manufacturing capacity, this concludes that insufficient manufacturing capacity effects the development of renewable energy projects. The mean score of descriptive statistics analysis also revealed that there is insufficient manufacturing capacity in India, which indicates the **weakness** factor.

Objective 5: To understand the market dynamic & cost competitiveness for development of renewable energy projects.

- It is revealed that there exists significant difference in the perception about cost competition for development of solar power projects across the various states of India, which revealed the threat that some of the states may not developed which have high cost competition. However, In the case of Wind power projects developments, it is revealed that there is no significant difference in the perception about cost competition for development of wind power projects across the various states of India, which indicates the **strength** for the wind project development.
- It is revealed that there exists significant difference in the perception regarding the initial cost of the setting up of utility scale solar power projects across Years of Experience group, which revealed **weakness**. However, In the case of Wind power projects developments, there is no significant difference in the perception regarding the initial cost of the setting up of utility scale solar power projects across Years of Experience group, which revealed that each state gets the equal **opportunity** irrespective of initial cost.
- It is revealed that there is no significant difference in the perception regarding the initial cost of the setting up of utility scale solar power projects across Types of Organization. However, In the case of Wind power projects developments, there exists a significant difference in the perception regarding the initial cost of the setting up of utility scale wind power projects across Types of Organization.
- It is revealed that there is no significant difference in the perception regarding the operation & maintenance cost of the setting up of utility scale solar power projects across Years of Experience group. Further, In the case of Wind power projects developments, it is also revealed that there is no significant difference in the perception regarding the operation & maintenance cost of the setting up of utility scale solar power projects across Years of Experience group, which indicates the equal **opportunity**

for both solar & wind projects to be established irrespective of operation & maintenance cost.

- It is revealed that there is no significant difference in the perception regarding the operation & maintenance cost of the setting up of utility scale solar power projects across Types of Organization. Further, In the case of Wind power projects developments, it is also revealed that there is no significant difference in the perception regarding the operation & maintenance cost of the setting up of utility scale solar power projects across Types of Organization which indicates the equal **opportunity** for both solar & wind projects to be established irrespective of operation & maintenance cost.
- It is revealed that there exists significant difference in the perception about cost of procurement of materials from India and Other countries across Types of Organization, which revealed the **threat** so far as the make in India concept is concerned.
- It is revealed that majority of respondents organization prefer to import main component from China (82.94%), Vietnam (55.95%) and Malaysia (49.60%) for solar power projects and Denmark (57.94%), Switzerland (42.46%), Germany (36.90%) for wind power projects, which is again a **threat** so far as the make in India concept is concerned.
- It is revealed that there exists association between investment risk and investment cost associated with renewable energy projects. Further, the analysis results indicate positive correlation to the tune of 52.2 percentages between two variables of `investment risk' and 'investment cost' associated with renewable energy projects.

Objective 6: To understand and analyze the challenges, weaknesses and threats of Renewable energy projects.

- It is revealed that there is no significant difference in the perception regarding challenges faced for development of utility scale renewable energy projects across Types of Organization. As a researcher, it is to be

considered as Strength for the organizations as there is equal opportunity for development of renewable energy projects to each state.

- It is also revealed that there is no significant difference in the perception about challenges faced for development of utility scale renewable energy projects across Years of experience group. Again, it is to be considered as Strength for the management personnel's as there is equal opportunity for development of renewable energy projects to each state.

- The mean values of the variables measured for `Installation of solar power projects are growing at a speed as desired which may fully utilized the available solar energy resource` shown under table 5.6 revealed that installations of solar projects are more than average score of 3, which indicates the **weakness** factor for development of solar renewable energy projects.
- The mean values of the variables measured for `the target of 60 GW of Wind power project will be achieved up to 2022` and `Installation of wind power projects are growing at a speed as desired which may fully utilized the available solar energy resource` shown under table 5.7 revealed that the variables are more than average score of 3, which indicates the **weakness** factor for achievement of government target for development of wind renewable energy projects.
- The mean values of the variables measured for perception of various respondent/stake holders regarding various policies identified to help to promote the government target for development of renewable energy projects based on descriptive statistics under table 5.8 revealed that some of policies identified are more than the average score of 3. This indicates the **weakness** factor that the available policies likes Renewable Energy Certificates, Viability Gap Funding, Imposition of Safeguard duty and Competitive bidding process are not favoring to promote the government target for development of renewable energy projects hence creating challenges.

- It is revealed from the mean score of descriptive statistics to assess the evaluation of perception of various respondent/stockholders regarding various "motivation support behind the decision on investing in utility scale renewable energy projects" that the motivation support that High tariff rates and provision of renewable energy certificates are having average mean score more than 3 which indicates the **weakness** exists hence this statement related having more **weakness factor**.
- It is revealed from the descriptive statistics for perception of various respondent/stake holders regarding grid connectivity / evacuation issues for development of renewable energy projects that the majority of stake holders respondents to a very great extent i.e. 42.00% for `Inadequate transmission infrastructure`, 44.44% for a `Mismatch between the available corridor and necessary demand Centre`, 34.92% for `Procedure for connectivity permission` 39.28% for `High cost of establishment of transmission lines`, 67.85% for `Right of Way (RoW) issues`, 38.09% for `Transmission system Supervision charges`, 37.70% for `Wheeling & transmission charges`. This contributes to the **weakness** factor

The impact of Regulatory policy related factors affecting the development of Renewable energy projects within different experience groups:

- The analysis revealed that there is no significant difference in Regulatory policy related factors like policy barrier, Regulatory barriers, Political barriers, Land policy barriers and Power purchase policy among the years of experience group as the significance value of each factors goes beyond the standard level of 0.05, which assumed to be the **strength** related to the given factors.
- However, it is further revealed that there exist significant difference in Regulatory policy related factors like support mechanism barrier, Environment barriers, Institutional & Administrative barrier, Public acceptance barrier and International Trade barrier among the years of experience group as the significance value stay within the standard

significance level of 0.05 which assumed to be the **weakness** related to the given factors.

The significance of the factors related to current challenges for installation of renewable energy projects within different organizational group:

- The analysis revealed that there is no significant difference in factors related to current challenges like Distribution & transmission facilities, reduced tariff, Initial investment, Market Competition, Cost Competition, Competitive bidding process and Safe guard & anti-dumping duties for installation of renewable energy projects within different organizational group as the significance value goes beyond the standard significance level of 0.05, which assumed to be the **strength** related to the given factors.
- Further, it is revealed that there exist significant difference in factors related to current challenges like Frequent changes in state policies, Difficulty in funding project, Financing cost, Variable output, International trade issues, Local Taxes & duties and Domestic Content Requirement (DCR) for installation of renewable energy projects within different organizational group as the significance value stay within the standard significance level of 0.05, which assumed to be the **weakness** related to the given factors.

The significant in operational related factors affecting the development of utility scale renewable energy projects within different states.

- The analysis revealed that there is no significant difference in operational related factors like Land acquisition issues affecting the development of utility scale renewable energy projects within different states, as the significance value goes beyond the standard level of 0.05, which is assumed to be the **strength** for the India that each state gets the equal opportunity for renewable energy projects developments.

- Further, the analysis revealed that there exist significant difference in operational related factors like Evacuation issues, Awareness & capacity development barriers, Sale of power barriers, Forecasting & scheduling barrier and Deviation Schedule Mechanism (DSM) affecting the development of utility scale renewable energy projects within different states, as the significance value stay within the standard significance level of 0.05, which revealed the **weakness** so far as the said factors considered.

The significant in functional challenges related factors affecting the development of utility scale renewable energy projects within different organizational groups:

- The analysis revealed that there is no significant difference in functional challenges related factors like Competition Challenges, Infrastructure Challenges, Investment Challenges and Supply chain Challenges affecting the development of utility scale renewable energy projects within different organizational groups, as the significance value goes beyond the standard level of 0.05 which is assumed to be the **strength** so far as the said factors considered.
- Further, it is revealed that there exists significant difference in functional challenges related factors like Financial Challenges, Costing Challenges and Technical Challenges affecting the development of utility scale renewable energy projects within different organizational groups, as the significance value stay within the standard significance level of 0.05, which revealed the **weakness** so far as the said factors considered.

The significant in General factors affecting the development of utility scale renewable energy projects within different states:

- The analysis revealed that there is no significant difference in general factors like Difficulty in finding buyers for generated electricity, Investment cost, Operation & Maintenance, Wheeling & supervision charges and Procedure for connectivity affecting the development of

utility scale renewable energy projects within different states, as the significance value goes beyond the standard level of 0.05, which is assumed to be the **strength** for the India that each state gets the equal opportunity for renewable energy projects developments.

- Further, it is revealed that there exists significant difference in general factors like Frequent changes in state level regulations, Seasonal availability of renewable resource, Distribution companies not willing to buy beyond Renewable Power Obligation, Process for obtaining Renewable Energy Certification (REC) and Procedure for permission, registration affecting the development of utility scale renewable energy projects within different states, as the significance value stay within the standard significance level of 0.05 which revealed the **weakness** so far as the said factors considered.

The significant respondent / stake holders perception about criticality of various risks associated to investment in utility scale renewable energy projects:

- The analysis revealed that there is no significant difference exists in the perception about criticality of counter party risks say construction contractor & O & M contractor, financial risk and Investment associated to investment in utility scale renewable energy projects across various organization groups, as the significance value goes beyond the standard significance level of 0.05, which indicates the **opportunity** so far as the said factors considered.
- Further, it is revealed that there exists significant difference in the perception about criticality of regulatory risks, power off taker risk, resource assessment risk, force majeure risk and deviation schedule mechanism (DSM) penalty risk associated to investment in utility scale renewable energy projects across various organization groups, as the significance value stay within the standard significance level of 0.05, which revealed the **weakness** so far as the said factors considered.

Objective 7: To study about the perception of stake holders on viability of Renewable Energy projects.

- It is revealed that there exists significant difference in the perception about project cost viability about solar power project across Types of Organization, which indicates **weakness** factor. However, In the case of Wind power projects development, there is no significant difference in the perception about project cost viability about Wind power Project across Types of Organization, which revealed **opportunity** for each state for setting up of wind energy projects.
- The mean values of the variables measured for perception of various respondent/stake holders regarding various "points contribute to make utility scale renewable energy project more affordable and viable" for development of renewable energy projects based on descriptive statistics under table 5.12 revealed that majority of points identified are less than the average mean score of 3. This indicates the points stated are supporting for viability that majority of the points contributing are favoring to viability for development of renewable energy projects, this revealed the **strength** factor so far as renewable energy project viability is concerned.

Objective 8: To outline a suggestive overview to overcome the challenges, weaknesses and threats associated with, for development of Renewable Energy projects.

- The analysis revealed that there exist significant association between Government target and available manufacturing capacity in India to meet target. However, it is revealed that majority of respondents i.e. 75.0% respondent perceived that the manufacturing capacity is not sufficient, to less sufficient manufacturing capacity, hence researchers suggestion is clear that government shall promote the local manufacturing facility for major/main

component of the utility scale renewable power projects to meet the increasing demand/ target set by government of India.

- The analysis revealed that there does not exists significant difference in the perception about grid connectivity / evacuation issues for statement like Inadequate transmission infrastructure, Mismatch between the available corridor and necessary demand Centre, High cost of establishment of transmission lines, Right of Way (RoW) issues. Transmission system Supervision charges and Wheeling & transmission charges as the significance value (p-value) for this statements is well beyond the significance level of 0.05 except in case of statement `` Procedure for connectivity permission``
- This concludes that the following challenges needs to be overcome as it persists for the perception point of view of stake holders from various states and organizations. The suggestive points are:
  - All states have to establishment transmission infrastructure facility on PPP model which supports in reduction in cost of transmission of renewable energy power. This also supports in reduction of mismatch between the available corridor and necessary demand Centre hence the renewable power generated can be consumed at respective load Centre
  - The government shall have to support to resolve the Right of Way (RoW) issues by notifying the charge for the private lands and also helps to remove encroachments of lands.
  - The different states have different charges for transmission & wheeling which is to be stream lined and to enhance the development of the renewable energy projects targets waiver of such charges is to be given for a particular development periods.
  - Single window policy is needs to be established for all procedures and registrations just like MSME registration window.

Objective 9: Suggestive measures to utilize optimally the available potential of renewable energy resources and development of renewable energy projects sustainably.

- ***Some of the suggestive measures/ recommendations to utilize optimally the available potential of renewable energy resources and development of renewable energy projects sustainably as perceived by the respondents are narrated as under:***
  - ✓ Facility development for domestic manufacturing of equipment's in large scale production.
  - ✓ Provision of government waste lands to developers on token lease rent for atleast 30 years, and
  - ✓ Government intervention for providing supports for lease private lands at certain fixed cost and support for right of way issues for development of renewable energy projects.
  - ✓ Government support for capital subsidy both for project & transmission network.
  - ✓ Government shall identify the high potential area for solar radiation and windy zones of each states and offer it for potential developers & EPC agencies for development of either large scale solar or wind projects along with providing of all supportive infrastructures like evacuation/ connectivity facility, Roads & transportation, all necessary permissions & registration, power purchase agreements for 25 year with defined charges.
  - ✓ Providing of transmission facilities and or support of government for land for establishing of transmission facility.
  - ✓ State electricity shall provide adequate capacity of connectivity at and near the renewable energy project sites to reduce cost & losses of renewable energy.
  - ✓ Removing/ waive off of safe guard duties / anti-dumping duties, basic custom duties for import of equipment's & materials from foreign countries.
  - ✓ Ease of procedure for Supply Chain Management for import of raw & finished goods, with waiver of custom & excise duty.

- ✓ State Government shall encourage tax holidays & tax exemptions policies.
- ✓ Aggressive Research & Development in technology up-gradation
- ✓ Assured off takers of RE power & power purchase agreements for 25 years without change / reduction in tariff.
- ✓ Assured payment security mechanism by government and strict adherence to must run status.
- ✓ Single window, one shot online registration & approvals of every document by state government and nodal agencies and timely approval of system from developers to avoid procedural delay.
- ✓ Secured government mechanism to mitigate high investment cost.
- ✓ Focus on the renewable energy projects across the country instead of concentrating to few states with either solar, wind or hybrid renewable energy projects.
- ✓ Each state government shall ensure the firm renewable energy policy throughout the life cycle of the projects.
- ✓ State & Centre government support for capital subsidy & low interest cost financing.
- ✓ Mandatory & stringent norms for renewable purchase obligation to industries & commercial customers.
- ✓ The government shall focus on awareness programs among the various states regarding the utilization of maximum available renewable energy resources

- ➢ ***Some of the initiatives needs to be implemented for aggressive development of renewable energy projects to utilize optimally the available renewable energy resources as perceived by the respondents are narrated as under:***
  - ✓ 90.8 percentage of respondent perceived to implement `government mandated approach`
  - ✓ 71.3 percentage of respondent perceived to implement top down mandated approach means initiatives is from the government or top management penetrating to bottom.

- ✓ 78.1 percentage of respondent perceived to implement outcome based incentive approach.
- ✓ 84.5 percentage of respondent perceived to implement incentive for domestic manufacturing capacity.
- ✓ 73.7 percentage of respondent perceived to implement incentive for technology development.
- ✓ 67.3 percentage of respondent perceived to implement time based incentive approach
- ✓ 72.1 percentage of respondent perceived to implement low cost long term laon.
- ✓ 62.9 percentage of respondent perceived to implement market enabled research approach.
- ✓ 62.2 percentage of respondent perceived to implement awareness & capacity building approach.

6.5 Limitations of the study

- ➢ As the data may be collected through the questionnaire there may be possibility that employees, management personnel, developers, investors, stake holders, institutions may not be fully loyal in answering the questions, also there is bias mind due to company to company competition which may cause misleading data.
- ➢ Due to work pressure and lake of time, interest as well as knowledge of the employees they may not fill the questionnaire properly.
- ➢ The Time Constraint in collecting the responses is one of the limitations as the data will be collected from out station developers, investors, stake holders, institutions within the period of one year, would be a limiting factor.
- ➢ The Cost Constraint is limiting factor as the increased sample size increases the cost of data collection.
- ➢ The sample size may not adequately represent the entire population.

- The data is collected from government, PSU organizations and private sector related to the research field. Hence the result may or may not be generalized.

6.5 Delimitations of the study:

- The studies is delimited to the large utility scale ground mounted solar photovoltaic (PV) and onshore wind renewable energy projects in Indian geographical boundary and not considers the small scale renewable energy projects hence, analysis and recommendations for tapping of untapped renewable energy sources and development of such renewable energy projects have been done.
- This study will not considered small scale hydro, solar heating system, solar rooftop, Concentrated solar projects, waste to energy, tidal power, geo thermal power, bio gas/biomass/baggage base projects, offshore wind projects and other form of renewable energy projects.
- This study will not criticize any policy, act, regulations, targets or guidelines provided by any of the Government. Also will not provide any specific recommendations on any private or government organizations/institutions which are outside the scope of the report.
- The study also will not explicitly examine the effect of climate change legislation in the form of an economy-wide cap or tax on greenhouse gas emissions, on bilateral cooperation in renewable energy, although it will describe how these mechanisms could affect the market for renewable energy power projects. Such legislation or a global agreement to reduce emissions would eventually influence the structure, financing and is motivated by a range of factors.

6.6 Management Implications:

- This study is useful for the electricity generation through renewable sources of energy.
- By designing SWOT analysis framework in a holistic manner facilitates a realistic, fact-based and data-driven set up for the strengths, Weaknesses. Opportunities and Threats.
- **Strength & Opportunity:**
    - In fact, the analysis have been made based on the collected data, the projects or company analyzed data accurately by avoiding pre-conceived belief or assumptions over the gray areas of the projects. Which ultimately supports the project to identify and address the points which are lacking in order to minimize risk involved in the projects.
- **Weakness and Threats:**
    - From the analysis, weakness & threat are identified and that can be converted into favorable support for current and future development of the renewable energy projects. All out efforts are made to focus on the real life based fact or contexts of the issues of the company or projects to find the trust and real scenario of the renewable energy projects for the short as well as long run
    - In such manner this SWOT analysis of renewable energy projects can be used by the company or any project as a preliminary guide for the current and future development of the renewable energy electricity industry to operates in the positive, proactive, supportive, encouraging and protective manner which supports for the development of industry, its related environment, society and nation as a whole.