



Empowering the Renewable Energy Sector through Skilling

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Abstract: The Renewable Energy (RE) has shown its prominence in recent years in India. Like any other sector RE has also shown a Skill Gaps due to the expansion in the sector. There is an urgent need to set up Skill Standards tied to quantitative measurements of qualitative Skill parameters of Human Capital Assets required for the sector needing Capacity Building. The Skill Standards act as bench mark and compare two independent individuals and is useful to establish a correlation, measuring the same, testing the significance of the variation establish cause and effect relationship for course correction as required. The Skill Standards also can establish correlation between Institutions providing Skilling inputs, Skilling facilitators and the individuals from diversified regions and countries as well as other stakeholders. Process of Setting Skill Standards or the concept of Skill councils is a recent phenomenon in India that got attention after the Skill gaps started getting reflected in the requirements of the Industry, due to expansion in various industries, demographic concerns of aging work force in various countries, skilling curriculum remaining unchanged and not catching up with the dynamic technology changes. This resulted in on the job learning or self-learning which at times an expansive proposition is and Return of Investment in Skilling was not considered. Skilled manpower is needed for execution of an ambitious RE program. The Skills needed in this sector are broadly covered in this paper. The skilling domain in this paper will also include Soft Skills within the ambit along with Technical Skills.

Keywords: Skills, Renewable Energy, National Occupation Standards, Skill Standards, Skill Gaps, Skilling ROI, Technology needs.

I. Renewable Energy- Skill Standards

India a signatory to the Kyoto protocol for containing Global Warming, increasing Renewable Energy contribution for meeting Energy needs has made this sector vibrant. India's Grid Connected New & Renewable Energy accounts for 28,905 MWs as accounted for till July 2013¹. The capacity includes 835 MWs installed during the Year 2013-14 against a total target of 4325 MW with 1839MWs targeting for SPV. This capacity addition includes Solar Photovoltaic (SPV), Small

Hydro Power, Biomass Power, Bagasse Cogeneration, and Waste to Power. This however does not include Wind Power.

This Paper is focused on Skill Standards on SPV with peripheral touching upon the other RE technologies. India has set up Sector Skill Councils for initiating work on Skill Standards which are called National Occupational Standards (NOS) in India, while a few other countries call it National Skill Standards.

It is common to hear from employers reporting serious academic and job skill gaps among new

¹ Source: MNRE

hires and job applicants, especially among younger and less-experienced workers and job applicants. Basic math, writing and communication skills are often described as inadequate for entry-level employment. This is true for various nations including India. Challenge of Skill Gaps is getting compounded by changing demographic patterns world over.

As such the Skill Standards are required for every job occupation in every Industry and every sector and that are applicable nationwide irrespective of regional geography.

II. Skill Standards- What are these?

Skill standards or Occupational Standards are set up towards Specification performance identifying knowledge, skills, job competencies and soft skill abilities of an individual needs to succeed in the workplace and make contribution to enhance Productivity of the Organization. These Skill Standards are critical for improving workforce skills, raising living standards of individuals, and improving the competitiveness in the economy.

Skill Standards / National Occupational Standards have to be developed in most industries(Including the RE Sector).

II.1.Skill Standards in RE sector are set to:

- Bring together the skills, knowledge and values necessary to do the work in RE as statements of competence
- Provide managers with a tool for a wide variety of workforce management in RE sector, quality control and Specification tasks and recruitment in RE
- Act as a basis of training and qualifications in RE.

II.2.Principally, Industry based skill standards in any sector including RE sector are required to be:

- **Responsive** to changing work organizations, technologies and market structure.
- Benchmarked to world-class levels of industry performance and free from gender, racial, or other forms of bias.
- **Tied to measurable**, competency-based outcomes that can be readily assessed.
- Useful for **qualifying new hires** and **continuously upgrading employees'** skills.
- Applicable to a wide variety of education and training providers, based on National Vocational Education Qualification Framework (NVEQF).
- Developed in consultation with various stake holders, independent from prototype training/education provider.
- Provides opportunities to the employee for horizontal migration to other technologies like from SPV to Bio mass or Power Sector or any another sector altogether say Steel Sector by acquiring requisite modules of Skills as per the required standards in that sector. These Skills Standards also allow vertical mobility to the employee by acquiring higher competencies of laid down skill standards through learning in line with Life Long Learning (LLL) approach

III. Why is Skill Standard Important?

In today's work environment,

- § Jobs require high performance work processes & enhanced skills for cost Competiveness.
- § Skill standards reflect changing workplace realities.
- § Skill Standards - a tool for various stake holders.
- § Nationally recognized Skill standards in identified sectors form a common platform for certifying achievement benchmarked to these standards, **allowing portability** (even across Industry Sectors) of skills across geographical areas, companies and careers and also to abroad.
- § Skill and knowledge updating is a lifelong endeavor, forcing employers and employees to spend more effort, time /money on education and training.
- § Skill standards are benchmarks for deciding education and training, shaping curriculum, and directing funds toward highest value education and training investments.

These Skill Standards are useful to the perspective employee to help him know what is expected from him. The Institutions of Training take a reference of these to align the Training / Skilling Programs accordingly. The Employers take a cue to decide the training programs of their employees in line with dynamically changing technologies and hence the Skill Standards.

III.1. Status of Skill Council: As already indicated above, in India Skill Standards are yet to be set up. Let RE industry be proactive to initiate the process and offer its services to the concerned organizations

like NSDC/ FICCI to launch the RE Sector Skill council. A reference was drawn from USA for Electrician for Plant and based on the parameters set by them a study was conducted in India to understand the Skill gaps that exist between USA & Indian Electrician for similar Project occupation. A Plant Electrician comes under hard to find category. And the technicians are required more in numbers. .

III.2. Objectives of Skill Standards: The Specific Objectives of setting Skill Standards for RE technologies are listed hereunder:

- to identify the particular skills required to install and maintain renewable energy systems;
- to review the present training practices in the RE sector and consider the availability of training facilities for education and training ;
- to design curriculum of training as per skill standards in RE sector
- to devise a process of engaging the training institutions, learning and Sector Skills Councils and other stake holders involved in the planning of RE sector training with a aim of raising awareness about skills required in the renewable energy sector in India keeping in view expansion program of RE sector.

III.3. Way Forward in setting Skill Standards :The RE sector may include the following to begin with:

- Solar Photovoltaic (SPV)
- Wind

- Biomass-fuelled Power Plants / combined heat and power (CHP) and heat pumps

The Manpower requirements for RE Sector in India² are as under:

Growth Scenario	Estimated Current Employment (nos.)	Estimated Employment by 2015 (nos.)	Estimated Employment by 2020 (nos.)
Moderate	350,000	589,000	10,51,000
High		699,000	13,95,000

The employment potential in Green jobs in India³ is as under, with India's potential of 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 (manpower and more importantly, energy policies) are implemented. 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 undertake the steps for Skilling the manpower, along with smart business models and favorable policies as early as possible.

Generally for a direct employment of 24,000, an indirect employment of 48,000 is generated by the Solar Industry for PV off grid. Direct Employment of Manufacturing takes 20%, Installation takes 10%, O&M 20%, Marketing 40% and others 10%. The data as available has been presented. Solar roof Top heaters being another sub sector has not been discussed here.

With Solar Power getting an infusion of USD 3.25 Mn., Cabinet giving a nod to 750 MWs of Solar Energy, Govt. announcing a few lacs Solar roof tops to be getting ready, Solar Power has a big future.

The above manpower numbers in table 2 & 3 for Green Jobs some skills, which are broadly listed hereunder, These Skill requirements are for all Job occupations related to site activities in the Industry that include Engineers to Technicians.

The demand for skilled manpower in the sector is on the increase in Solar Sector with Govt. of India push for Solar Cities. Chandigarh has taken steps in setting up Grid Connected Roof tops Solar Plants in the city.

Gujarat also has announced to set up 60 MW Solar Roof Tops projects that will be grid connected.

IV. RE Business and Training / Skilling

Many of the businesses have been talked to; these were found to be headed by self-taught Engineers, who view training as the only way to both widen the renewable energy market and to employ staff with the necessary skills. The education and training in renewable energy is to be geared towards, qualified Electrician / Structural technicians/ Welders/ plumbers wishing to move in for horizontal mobility into renewable energy installations.

Based on the Skill Standards⁴ set by Texas Skill Standards Board in respect of Solar Projects is as under in table no.5:

² "Human resource Development Strategies for India's Renewable Energy Sector" developed jointly by MNRE & CII-2010

³ YP Chawla "Sun Emits rays of hope amongst REs – Developers' & Skill Gaps Perspective"

⁴ http://www.tssb.org/sites/default/files/wwwpages/repos/pdffiles/Finalized_Solar_Skill_Standards.pdf
"Distributed Renewable Solar Energy Technician Skill Standards dated 05Feb 2009"

	Manufacturing	O&M	Indirect	Ancillary	Total
Employment as per 2010	20	Very low			20
By the Year 2013 (Automation & Skilling)	9	4			
By the Year 2017	2.5	1.4			
By the Year 2022	4.5	5.9			
Off Grid	30		60		
Solar Thermal – Thumb Rule Study	3.86	Steam Cycle additional	23.18	8.1	35.16
A Solar Developer having executed Projects- Solar Thermal		7	5		

	Skills	No. of days involved in One Installation	No. of Installations / year
SPV- Domestic	Installer / Electrician	6 days for a typical roof top	27
SPV- Commercial	For a Typical 1 MW Ground Mounted		
	Engineer	20	2
	Installer / Electrician	10	11
Large- Wind	Structural Technician	10	35
	Administrative/ Design	40	2
Maintain Wind	Installer	15	11
	Engineer /Technician	2	35
Days available	Installer	180 (Technicians with 70% of available working time)	
	Engineer	70 (Engineer with 30% of available working time)	
The above data is sourced from London Renewables Studies with an objective to initiate the discussions in India.			

Broad Green Jobs Skills Requirements to Install an RE System
Solar Photovoltaic Industry Electrical/Electronics , Roofing & scaffolding for Roof Top Installation Structural Work for Ground mounted installation Health & Safety (implications of converting electricity from DC to AC)
Wind Industry Engineering/Design , Construction skills (for foundations) Crane driver (for larger turbines) , Electrical/Electronics
Biomass-fuelled CHP Electrical fitters , Mechanical fitters , Mechanical engineer

Table No 5

	Skills / Function Area	Site	Coordinati	System	System	Average	
		Assessm ent Work	ng Resources	Installatio n	Maintenanc e		
	a	b	c	d	e	f	g
1	Listening	4	3	3	3	3	3.2
2	Speaking	4	3	3	3	3	3.2
3	Inf. & Commn. Usage	4	3	3	3	3	3.2
4	Collect / analyze info	4	4	3	3	4	3.6
5	Prob. Analyze/ Solving	4	4	3	4	4	3.8
6	Judgment /Decision	4	4	3	4	3	3.6
7	Organize & Plan	3	3	3	4	3	3.2
8	Social Skills Usage	3	2	3	3	2	2.6
9	Adaptability	3	3	3	3	3	3
10	Team Work	2	3	3	4	2	2.8
11	Leadership	2	2	3	3	2	2.4
12	Consensus Building	2	3	3	3	2	2.6
	Enhancing Skill, Self/ Career Development	2	3	2	3	2	2.4
13	Writing	3	3	3	2	2	2.6
14	Reading	3	3	3	3	3	3
15	Maths.	4	4	3	3	3	3.4
16	Science	3	3	2	3	3	2.8

In various other Skill Standards only one Skill Rating on 1-5 Scale is indicated. But in this case Skill ratings have been varied as per the Job activity in the header row. Thus the table no.5 also covers the Skill levels of various activity roles.

The numbers and the Skills referred above led to a study by the authors in respect of an Electrician for a Plant. The results of the study from a sample collected from various organizations employing Plant Electricians with 1-2 years' experience in Power Sector initially and then expanded to the sectors where similar work profile exists like Refinery, Cement & Steel Sector etc.

Wherein under this ParaRE Business and Training / Skillinghas been talked about, it may be noted that an International program attended by RE professionals from 7 countries attended. The RE programs are in great demand and SESI can invest in training units to be run by retired professionals from the Industry to fill the Skill Gaps in this sector. The Experts may fend for themselves out of the programs. The investment of Skilling infrastructure can come from manufacturer - members of SESI. This will keep the pipeline of supply chain of the skilled manpower healthy.

IV.1. Methodology of the Study:

During an interaction with a focus group belonging to HR Managers of Power Sector utilities from various parts of India, a questionnaire was requested to be filled in to establish skill gaps of a Plant Electrician so as to benchmark this vis.-a-vis. Plant Electricians of USA for which results were available.

38 Skill Parameters in 7 broad groups (various Skills covering Basic, Thinking, Personal, Information usage, Team Participation, Plant system understanding, Use of Technology) were compared with USA average Score on 1-5 Scale, of 33 respondents and 26 respondents in case of an Indian sample of the population as under in Fig 1.

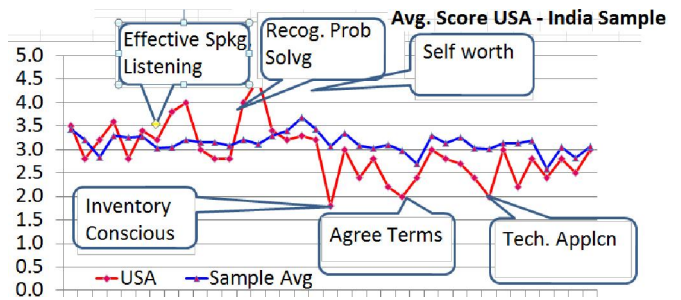


Figure 1: Skills of Plant Electricians in USA-India Comparison 38 Skill Parameters Compared

There are some surprises in the study, which is the advantage of these studies and fixing the Skill Standards, made it interesting to explore further and more requests were made to get the questionnaire filled in from Plant Managers. Initial respondents are from various State Utilities, and additional responses were received from organizations like NTPC, Power Grid, BHEL and one of the respondents is an Indian in Dubai. The responses were collected in person and through

Email and the population sample of respondents was increased to 40 numbers.

Selected few parameters of the study are presented hereunder in Fig 2. The Coloredbands in Red & Green are USA study and the arrows are for Sample in India. The numbers at the right end of the table are USA Score / Indian Sample Score.

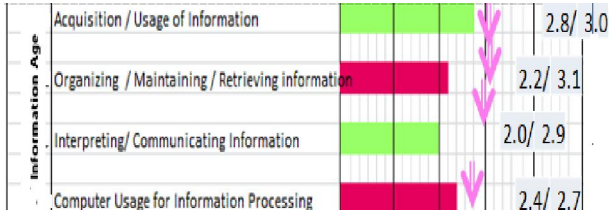


Figure 2 Comparison of Technicians Skills as per the respondents in India Vs. USA

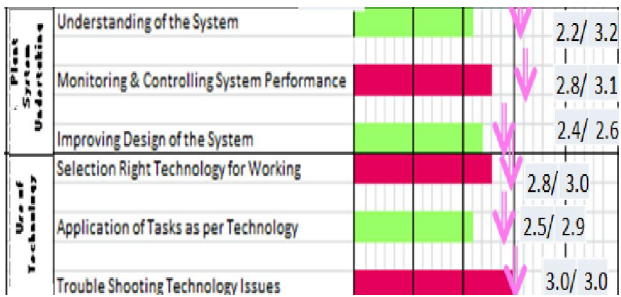


Figure 3 Correlated Skill Parameters of Plant Electrician

IV.2. Results of above Study: Some of the results are contrary to normal perception, but these were based on the data collected. Reasons for its being contrary to the perception were found out and got interesting findings that Indian Electrician is better in Inventory Management as compared to an American Plant Electrician, as the economy there is a replacement economy, while in India the Spare Parts and other inventory is all to be kept ready by the technician as getting the inventory could be a problem.

An American Electrician will go by rule book provided to him and would not go beyond that in experimenting anything, which in a way is good but Indians known for Jugad make the system work somehow.

V. Summary

1. The above study indicates that though there is a Skill Gap, but it is not do sharp. This can be corrected if the training is modified appropriately. The Soft Skills and High Technology Skills need attention at our end.
2. The Skill Standards can help the HR Professionals to develop suitable training packages and measure the Skills for improving the Plant productivity.
3. The Skill Standards can act as tools for rewarding the employees.
4. The Skill Standards, if set by SESI in collaboration with Employers, Technical Institutions will provide a guide to the

Correlation between various parameters of the Skill Gaps that affect other secondary factors and vice versa was also done by the authors in respect of a plant electrician. A few of these correlation factors that can help us deciding the intervention for improving the Skill Standards are hereunder in Fig 3:

Primary (Inducing) Factor	Correlation Co-eff. \$\$	Secondary (Indicator) Factor
Interpreting/Communicating Information	0.83	Organising / Maintaining / Retrieving information
Effective Speaking Capability	0.82	Effective Listening Skills
Acquisition / Usage of Information	0.82	Reasoning Skills
Time Management	0.82	Integrity & Honesty
Computer Usage - Information Processing	0.77	Acquisition / Usage of Information
Monitor & Controlling System Performance	0.76	Explains to Other members
Idea Generation & Creative thinking	0.75	Effective Speaking Capability
Reasoning Skills	0.75	Recognising & Solving Problem
Explains to Other members	0.74	Participates as a part of Team
Selection Right Technology for Working	0.74	Capability of Visualization
Recognising & Solving Problems	0.74	Decision Making Skills (Upto 1 mandate)
Interpreting/ Communicating Information	0.73	Managing Human Resource
Trouble Shooting Technology Issues	0.72	Selection Right Technology for Working
Organising / Maintaining / Retrieving Info.	0.72	Handling Machine / Material Inventory

perspective employees and can help promotions of the RE sector.

5. The Skill Standards drawn to fit in NVEQF program will motivate the employees

VI. Recommendations to SESI for taking up proactively in setting up a Skill Standard Council for RE Sector helping infixing the RE standards as under:

- i. Identifying the Occupation and Reviewing Resources
- ii. Helping Setting up of the Industry Technical Advisory Committee (Employers/ Researchers/), Associating Colleges Community & Technical institutions to develop Skill Standards
- iii. Setting up a Plan, Method of Analysis and Strategy for Validation of the Skill Standards.
- iv. Developing Process / Work-Oriented Information
- v. Developing Worker-Oriented Information
- vi. Analyzing, Synthesizing and Organizing Data
- vii. Integration of skill standards into a curriculum of Community Colleges & Institutions.
- viii. Setting up a Skilling institution for Indian manpower as well as for providing Skills abroad which may lead to RE business expansion overseas.
- ix. Recognizing the Application Process and Apply for program recognition, renewing

program recognition getting the Skills achieved accredited.

- x. Dynamically up-dating of the Skill Standards in line with Technology advancement.
- xi. The Skilling may also include understanding critical scenarios of RE Power evacuation based on system demand, having or not having a backing of Conventional power etc., micro grids etc.

VII. Caveat

DGE&T had tried to introduce a program at ITIs but there were no takers. Motivation and job prospects have to be propagated to the job aspirants by SESI appropriately.

Brief Profile of the Authors



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BE Tech. & MBA (Fin), PGDPM & PGDMM from Delhi University. Export Mgmt. from Oxford.

Pursuing PhD. in Skill Gaps in Power Sector, Over 4 decades of Experience in diversified sectors covering Energy including Solar & other Renewable Energy, (Ex. BHEL), Water Sector, Tyre Manufacturing, setting up Skill Center, Agriculture, and Infrastructure.

Widely travelled in India & abroad including some Foreign Postings. Because of these postings got opportunities to get a holistic approach of Power Sector. Have written papers on wide range of subjects (available on web)



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