Green TVET Capacity Building in Green Energy Power Generation- Building a sustainable Engineering Skill Base

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1 Mn. Manpower to be Skilled in Green TVET
Power Market – Emerging Trends

Programmable Communicating Thermostats
respond to pricing signals and grid disturbances

Rooftop Solar
provides renewable energy coincident with peak demand

Fixed Electricity Storage Batteries
stores off-peak power to use during peak periods and backs up

Smart Appliances
Respond to grid disturbances and shifts consumption during peak demand periods

Plug-In Hybrid Vehicles
draw energy from its roaming plug-in location. It can store energy for utility use.
GoI has embarked upon a Massive Solar Power Generation Target along with Solar Roof Top Targets for 2022

- Strong policy and regulatory push is required to realise the envisaged target
- Focused approach by the States should be applied
- Capacity building and market may be the key component for realising the targets
- Risk taking appetite of the consumers are less as compare to other RE segment

Electricity Regulatory Commissions could be obliged for 8% of power generation from solar sources by March 2019, up from original target of 3% by 2022, - a proposed policy amendment.
Figure 2: The Roof Top Capacity Estimated Solar Generation Potential (Source TERI)

TERI estimate (Total realizable potential: 124 GW)

Bridge to India estimate (Total realizable potential: 57 - 76 GW by 2024)

Estimated Solar Generation Potential (Source TERI)
Skill Levels for various Functional areas for GTVET

| Career Slots in Green Technologies | Skill Level | 1 | 2 | 3 | 4 | 5 |
|------------------------------------|-------------|---|---|---|---|---|
|                                    | 06          |   |   |   |   |   |
|                                    | 05          |   |   |   |   |   |
|                                    | 04          |   |   |   |   |   |
|                                    | 03          |   |   |   |   |   |
|                                    | 02          |   |   |   |   |   |
|                                    | 01          |   |   |   |   |   |

- Various Functional areas in RETs
- Various Elements of Value Chain of Green TVET
- Cross Cutting / enabling activities, supportive policies/ regulations
- Operation & Maintenance- Project Life Cycle
- Installation at site & related services- Technician Construction Skills
- Developing a RE Project
- RE Equipment Manufacture
## Skill Levels for Various Functional Areas

| Sl. | Skills / Function Area          | Site Assessment Work | Design for Site Coordinating Resources | Coordinating Resources | System Installation | System Maintenance | Average |
|-----|---------------------------------|----------------------|----------------------------------------|-------------------------|---------------------|-------------------|---------|
| 1   | Listening                       | a                    | b                                      | c                       | d                   | e                 | f       | g       | 3.2    |
| 2   | Speaking                        | 4                    | 3                                      | 3                       | 3                   | 3                 | 3       |         | 3.2    |
| 3   | ICT Usage                       | 4                    | 3                                      | 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                   | 3                 | 2       |         | 2.6    |
| Sl. | Skills / Function Area               | Site Assessment Work | Design for Site | Coordinating Resources | System Installation | System Maintenance | Average |
|-----|-------------------------------------|----------------------|-----------------|------------------------|---------------------|-------------------|---------|
| 9   | Adaptability                        | 3                    | 3               | 3                      | 3                   | 3                 | 3.0     |
| 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     |
| 13  | Enhancing Skill, Self/ Career       | 2                    | 3               | 2                      | 3                   | 2                 | 2.4     |
| 14  | Writing                             | 3                    | 3               | 3                      | 2                   | 2                 | 2.6     |
### Skill Levels for Various Functional Areas.... Contd.

| Sl. | Skills / Function Area | Site Assessment Work | Design for Site | Coordinating Resources | System Installation | System Maintenance | Average |
|-----|------------------------|----------------------|-----------------|------------------------|---------------------|-------------------|---------|
| 16  | Mathematics            | 4                    | 4               | 3                      | 3                   | 3                 | 3.4     |
| 17  | Science                | 3                    |                 | 3                      | 2                   |                   | 3       |
|     | Average Skill Score    | 3.18                 | 3.12            |                        |                     |                   | 2.88    |
|     | Median Skill Score     | 3.00                 | 3.00            |                        |                     |                   | 3.00    |

Higher Skill Score of 4 is required yellow; Skill Score of 3 is in Green. Median of Skills is 3. GTVET Skills are required above an average score of 2.5.
Based on the Primary Research the Skills Scatter Diagram

Most of the skills scatter around the median of Skill score level of 3 on the above scale
### GET or RET Value Chain Deployment & Skills Required thereof.

| Success factors                  | Proximity - existing production | Skilled workforce | Cluster quality | value chain Integration |
|----------------------------------|--------------------------------|------------------|-----------------|-------------------------|
| **Right Niche**                  |                                |                  |                 |                         |
| Metals                           | ++                             | ++               | +               | +                       |
| Machinery                        | +++                            | +++              | +++             | +                       |
| Electrical devices               | ++                             | ++               | +               | ++                      |
| Electronic parts                 | +++                            | +++              | ++              | ++                      |
| Process and controls             | ++                             | ++               | ++              | +                       |
| Construction                     | +                              | +                |                 |                         |
| Installation, Construction       | ++                             | ++               | +               | +                       |
| Trade, whole Sale                | +                              | +                | ++              | ++                      |
| Banks                            | +                              |                  | ++              | ++                      |
| Insurance                        | +                              |                  | +               | +                       |
| Industrial Services              | ++                             | +++              | ++              | +++                     |
A joint journey Dev. Green Technologies Govt. (firm arrows) & Industry (Dotted arrows).

| Opportunities for Value Creation along Value Chain of Green Technologies | Countries following Good Practices |
|---|---|
| Policy areas Investment promotion | R&D, Manufacture, Project Dev. | Installation | O&M | Costa Rica, Canada |
| Local content requirements | | | | Ontario |
| Linking investment to employment and capabilities | | | | Germany, Canada |
| Developing productive clusters | | | | California, Germany |
| Suppliers development programs/ Entrepreneurs / SMEs | | | | Ireland, Singapore, Mexico |
| Links between public research institutions and enterprises | | | | Germany, Canada |
| Advanced Skill Development | | | | Malaysia, Spain |
Conclusions: An investment of USD 47 bn for Roof Top Solar and a total of USD 100 bn investments have been talked of. 100 GW solar requiring 1Mn. full time jobs,
How do we reach this manpower pool with GTVET is a big question. MNRE has come up with arranging skilling of 50,000 people, who will train the balance workforce reaching a total 1 Mn.
The Road Map for reaching the above target of providing GTVET is required to be drawn.

Assessing GTVET components as core ingredients in respect of Green Energy Technologies, is important as in any other high technology sector, and in principle the GTVET curricula to be competency based, wherein outcome based learning and assessment to be responsible for skill development.
The skill standards are to be developed for Solar Power Generation keeping in view the industry requirements.
Snap Shots of the Paper:

• Emphasis of the Paper is on Skills which is required for an holistic growth of Solar Power Generation.

• This paper by way of secondary research as well as primary research has brought forwards the elements to focus on the GVET curricula.

• The paper gels with the Power Gen theme of this conference
Way Forward: For Building a Sustainable Engineering Skill Base of GTVET in Green Energy Generation.

1. You and me being the stakeholders, with your survey response on the web link [https://www.surveymonkey.com/r/R88L9L3e](https://www.surveymonkey.com/r/R88L9L3e); the work on establishing Skill Gaps can be initiated. Action: Your good selves

2. Choosing a road map for developing Green Energy Technologies (Ref Tata Solar- Bridge to India Study) Action: Government / Electricity Regulators.

3. Aligning Skilling programs of GTVET aligned with ii above, developing Skill Standards, Validation. Action: CBIP as Nodal agency, Government, Skilling Institutions, Industry.

4. Setting up a Skilling institution for Indian manpower as well as for providing Skills / accreditation for lesser developed countries abroad which may lead to GE business expansion overseas and competing with other Skill Providers in Europe/ Australia. Action: Govt. Skilling Institutions, Industry
5. The Skilling to also to include understanding critical scenarios of Green Energy Technologies Power evacuation based on system demand, having or not having a backing of Conventional power or micro grids etc.

6. Extending the concept of investment from CSR to this sector also Skill Ministry while recasting ITIs to tap CSR funding for Solar Sector, along with deployment of funds received towards Skilling under Foreign Contributions Development Fund exempted under section 11 of Foreign Contribution Regulation Act 2010 (FCRA), keeping in view large expansion envisaged.

7. India needs Vishwamitras (Trainers) for Transforming our Work force through Transition like Rama & Lakshman were trained. These Vishwamitras can being in excellence in plant management needed for enhancing growth of GETs/ RETs. **Action: Industry & Skilling Institutions.**

8. Scale and Speed (with in a time frame are a must for Skilling India- a must for excelling in the GETs/ RETs; otherwise we will miss the bus to reach the growth levels we are aspiring for under “Make in India” and envisaged growth in the Solar Power Generation sector to let Sun smile on India to make it shine. Till Sector Skill Councils finalize Skill Standards, Industry can come up these standards of their own and can make a contribution in developing these voluntarily **Action: Industry & Skilling Institutions.**
9. Skill development needs-Sharp Focus (identify what is needed in Short term and long Term), Shape (decide on how and where to start disrupting), & Speed growth (projecting and nurturing disrupting innovation). **Action: Industry & Government**

10. Indian Population has made Indian Political empowerment achieve a rank of 15 / 142 at World’s Economic forum 2014 but ranks poorly in Education attainment 126/142, Economic Participation & Opportunity Index 134/142. The Govt. has now in turn is required to empower its people with Skills and Employment, Employment opportunities by facilitating FDI by investor friendly policies, rules, laws, procedures in terms of Labour laws, Land acquisition and approvals to help uplift India’s global rank of “ease of doing business” to help India get technologies, Finances for people’s empowerment. **Action: Govt. of India.**

11. India to quickly bring in a Road Map for Vocational training/GTVET programs matching the aspirations of youth, to be adaptive of the economy, collaborative and be credible (and portable) certifications. Portability to be between certificates, diplomas, degrees and also geographical across globe. **Action: Government, Vocational Education Institutions**
| Occupational Skill Knowledge | Performance Parameters | Key Activities-Capabilities | Supporting Conditions |
|------------------------------|------------------------|-----------------------------|-----------------------|
| Elect AC/DC, Mech. Sys, Plumbing Sys, Pumps, Energy Sources, Blue Print | Customer Interaction, Site Assessment, Eqpt. Location, Space Constraint, Tilt Angle, System Connection Points, System energy inputs | Prel. Site Assessment, customer readiness, Create final design | Language, Literacy, Numeracy, PC, Blue Print, Equipment Manual |
| Proc. From appd. Sources, Inventory Chek, Proj Mgmt, Appls./ Permits, Staging Matls. | Co-ordinate Resources | Above + Safety |
| Occupational Skill Knowledge | Performance Parameters | Key Activities-Capabilities | Supporting Conditions |
|------------------------------|------------------------|----------------------------|-----------------------|
| Deviations from Mfrr. Recommend. – Site conditions, Tools reqd.as per Manufrr. | System Installation at site | Understand Hand Tools, Grounding Eqpt, Hoisting, work vehicles, Wiring, Glues, Safety Equipment | |
| Guaranteed Output of Sys | Commissioning Eqpt. | Elect/ Elect Test Equip, Voltage/ Power Test Equipment | |
| Customer Satisfaction | Maintaining System | Log Perf. Data, analyze, Periodic Maintenance | |
Thanks for your kind attention to

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