SATTVA
Delivering High Impact.

DR. REDDY'S FOUNDATION

Demand-led courses for youth, women and PwDs (with mild motor disability) in the sustainable energy sector

Final insights deck

October 2022

Agenda

Overview of the Sustainable Energy Ecosystem

- *Mapping of priority sectors using growth and skill related parameters*
- *Challenges in demand and supply ecosystem*

Methodology

- *Process to arrive at high priority green jobs sectors and job roles*
- *Key criteria of DRF*

Summary of insights

- *Summary of insights for EV and Solar*
- *Summary of Job Role prioritisation process*

Job Role Prioritisation

- *Mapping of relevant sectors that have immediate growth potential for jobs (Level 1)*
- *Shortlisting roles with growth potential and scope of skilling across value chain of EV and Solar respectively (Level 2)*
- *Evaluation of the shortlisted job roles (Level 3)*
- *Recommendation of top job roles and skilling solutions for them (Final)*

Next Steps

- *Next steps ahead of job roles shortlist*

Study Limitations

- *Limitations of the current study*

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- *List of documents, secondary research referred to within the EV and Solar sectors*

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Overview | India is standing at an inflection point of transition to a green economy. This project aims to identify high potential job roles in the green jobs market and develop a course module for pilot implementation

India is vulnerable to the detrimental effects of climate change…

7th most vulnerable country to climate disaster (based fatalities and economic losses)

34M full-time jobs to be lost due to heat stress by 2030

92% existing jobs are informal (lack of decent work conditions) making the workers more vulnerable to climate shocks

3-10% GDP loss annually (depending on temperature increase) due to climate change by 2100

…however there is a tangible opportunity to decarbonise and mitigate climate risk in India…

4.7% Increase in GDP expected by achieving Net zero carbon emission target by 2070

50% of India's energy requirement is targeted to be met with renewable energy by 2030

$1T addition to Indian economy by 2030, by transitioning to net zero economy

~35M additional jobs will be created across sectors* by 2047

45% reduction in CO2 emissions intensity by shift to targeted renewable energy by 2030

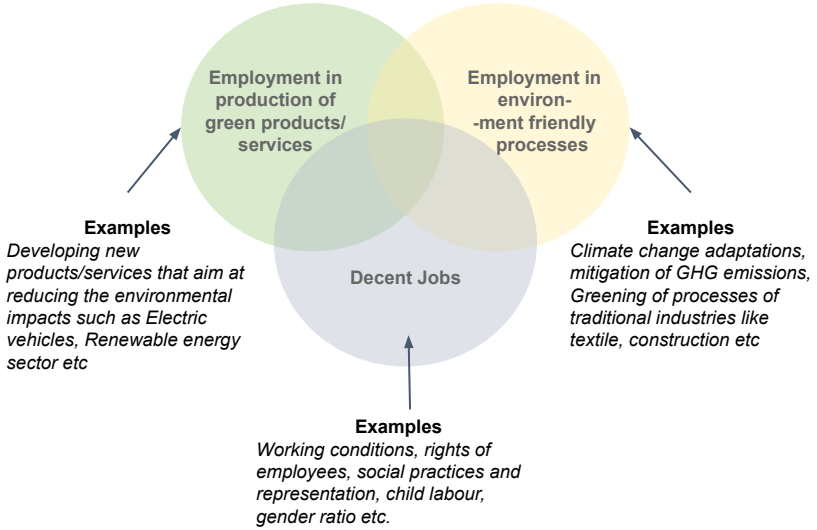
…that is expected to create more jobs across traditional and green sectors

Engagement objectives

- **Identify demand-led courses** for green jobs in the sustainable energy sector
- **Evaluate the fitment of the courses** to youth, Women and PWD and **shortlist two courses** for DRF to pilot
- **Provide broad training modules** for selected two courses along with
  - Guidelines for effective roll out including lab set up requirements, counselling checklist, and trainer JDs
  - Connections with 5-7 potential employers and procuring intent letters/emails from 2-3 potential employers
  - Facilitating connects with 2-3 CSR funders

Overview | Green Jobs are classified as all jobs in businesses benefiting the environment and those specifically involved in making existing businesses environment friendly and less resource intensive

Green Jobs[1] include 3 major aspects of employment in green products/services, in environment friendly process and decent jobs



Emerging green sectors that have potential for growth, information on job availability, and clarity of skills required in job roles, supply of skilling opportunities

#	Sector (listed alphabetically)
1	Bioenergy
2	Electric vehicles
3	Hydro Power (small)
4	Solar PV
5	Waste to energy
6	Wind

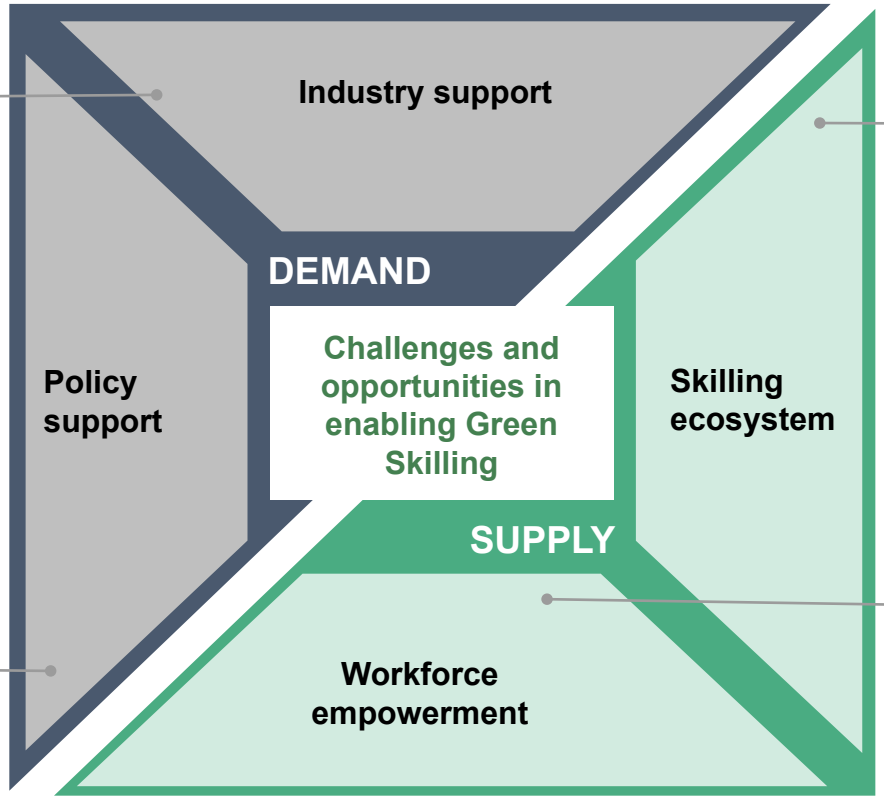
1. As per Bureau of Labor standards of USA, Green Jobs are either in ***businesses that produce goods and services that benefit the environment or conserve natural resources or jobs in which worker duties involve making their establishment's production processes more environment friendly or use fewer natural resources***

Challenges and Opportunities in enabling Green Jobs | Gaps across demand and supply landscape can be addressed with policy push, industry support, workforce empowerment and improving skilling ecosystem

DEMAND ECOSYSTEM

- **Environmental and other regulatory Compliance standards and targets** such as ESG, Zero carbon, being adopted
- **Job-role definitions**
- **In-demand qualifications** for skilling and remuneration policies for skilled workers
- **Linkages for OJT/ Apprenticeship and Placement participation**

- **Global and domestic decarbonisation targets**
- **National policies** amplifying green sectors' investments



SUPPLY ECOSYSTEM

- **Extent of skilling** in terms of landscape and institutions involved in the sector
- **Supportiveness of policies for skilling** in the sector (ABs/SSC, presence of QPs, public funding for training)
- **Effectiveness of skilling** in the sector
- **Inclusiveness of skilling programs** in the sector

- **Aspirations of Youth**
- **Awareness of sector** and specific job roles in the sector
- **Willingness to work** in the sector

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Methodology | Insights were synthesised from Primary Research with 8+ employers, Sattva's Livelihood practice area expertise* and Secondary Research to identify opportunities in green jobs value chain across 6 shortlisted sectors

** Sattva's Internal expertise is built on analysis of 75+ players in the ecosystem, survey of 2300+ skilling candidates, along with a review of over 140+ reports to get both demand and supply perspectives and identify gaps in green skilling ecosystem. Snapshot of the*

Multiple Key Informant Interactions Across Priority Sectors of EV and SOLAR

4 **KIIs in EV**

ATHER

ALTIGREEN DRIVE ELECTRIC

BatteryPool

3 **KIIs in Solar**

JAKSON EMPOWERING PEOPLE Solar Energy Systems

Shapoorji Pallonji

SELCO FOUNDATION

2 **KII with training partners**

NSTI

OLA MOBILITY INSTITUTE

Extensive Secondary Research Across Sectors

- 20+ reports across both sectors analysed for understanding growth of specific job roles apart from going through 5+ job portals for capturing nuances to map fitment for women and PwDs

Step by step process | Sattva followed a 4 step process over a duration of 3 months to arrive at high potential job roles for pilot implementation

Identified 6 Sustainable Energy Sectors

Level 0

Identified 6 emerging green sectors that are expected to witness growth, are high in demand and have a scope for skilling intervention via **secondary research, initial expert conversations and insights gathered by Sattva internal expertise**

Shortlisted 2 sectors with the highest growth potential

Level 1

Shortlisted top 2 sectors that have high green jobs creation, positive government policy push, high industry update, augmentation scope in courses offered by training institutes and high potential for employment on the basis of **internal expertise and ongoing key informant interactions**

Mapped 35+ semi / low-skilled job roles

Level 2 and Level 3

Mapped potential job roles, with high and medium growth rate, across the value chain of the shortlisted sectors via **secondary research and interactions with 8+ employers**

Level 2: Analysed a longlist of 35+ job roles on potential to create green jobs in the next 3-5 years and need for skilling interventions
Level 3: Shortlisted 10 job roles with the highest potential to create green jobs in the immediate + next 3-5 years and with the highest scope of skilling

Narrowed down to 4 roles that require skilling

Step 4

Evaluated the 10 shortlisted job roles on the basis of **green jobs creation time frame (within 3-5 years), scope of skilling, nature of job, fitment to women and PwD and minimum education qualification** to arrive at top job roles to recommend to DRF to design training courses on

Green Sectors → **Job Roles** → **Recommended Job Roles**

List of experts / employers interviewed for the purpose of this study can be found in 'References'

Selection criteria | 5 key criteria were aligned with DRF to shortlist high potential job roles in the priority sectors of EV and Solar

Scope of skilling	Educational Qualification	Fitment to women	Fitment to PwD*	Nature of employment
Whether the identified job roles have **scope for a skilling intervention** assessed on the basis of **demand for job role** and **ecosystem maturity**	Whether a **10th/12th pass or an ITI/Basic Diploma with skilling** will be able to perform the job	Whether the job roles are suitable for women in terms of **relocation requirement, physical strength, etc**	Whether the job roles are suitable for PwDs and require **limited strenuous activity and physical strength**	Whether the job is **decent in nature** i.e. is of a full time / part time / seasonal nature

**working understanding of mild motor impairment for this engagement is someone who does not require to use any external aid for functioning*

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Summary of insights EV | By 2030, the electric vehicles segment is expected to create 10M jobs. Most semi and low- skilled jobs would be in manufacturing, sales and maintenance

Upskilling existing ICE workforce can meet emerging demand for semi and low-skilled jobs across EV value chain, especially within EV manufacturing and assembly segments

Overview

Available workforce
35 million ICE workers employed directly/ indirectly

Immediate demand
10 million semi & low- skilled workers

Regulatory demand drivers
Incentive of INR 20 lakh cr through PLI, FAME II schemes boosting EV manufacturing & worker demand

Industry demand drivers
Large players like TATA, Hyundai, TVS & Mahindra, along with 486 EV startups

States driving demand
KA, AP, MH, TN, UP, Kerala, Uttarakhand

Opportunity

As there is limited range of skilling options available, there is an opportunity to

- Invest in creation of **new skilling programs** for job roles in value chain segment- **Manufacturing Battery/ EV components, charging infrastructure and after sales services**

Due to scarcity of trainers aligned to rapidly evolving industry needs like changing battery chemistries, differing vehicle ranges, swapping vs charging processes etc. There is opportunity to

- **Create trainer certification programs**

For after course market linkages, there is opportunity for,

- **Facilitating collaboration between industry & skilling ecosystem** for knowledge and placement

Summary of insights Solar | With strong policy tailwinds and industry investments, the solar sector can see a 11x growth in jobs across sub-sectors by 2050 (1/2)

Rooftop solar PV (on-grid & off-grid) has most jobs as compared to utility scale systems, however, semi-skilled jobs in the sector are seasonal and not future-ready

Overview

Available workforce
0.86 lakh (2021) available for both utility and rooftop

Immediate demand
7,87,800 utility scale jobs & 23,17,100 rooftop solar jobs are projected despite COVID impact

States driving demand
While growth in the solar sector would enable job-creation in states with highest capacity such as Karnataka, Rajasthan, Tamil Nadu and Gujarat, **decentralization of solar systems would see growth across other geographies** too

Regulatory demand drivers

20,000 MW on-grid & 2000 MW off-grid capacity; promotion of decentralised RE systems such as rooftop PV and grid-edge technologies by JNNSM & PM KUSUM scheme

56 solar parks with a cumulative capacity of 38,266 MW sanctioned in 15 states through Ultra Mega Solar Power scheme

INR 19,500 Cr allocated with the recent **PLI scheme to boost domestic manufacturing.** $8.1 billion to be invested by Reliance to build gigafactories

MNRE's program has **incentivised job-role based skilling (Suryamitra program)**

Summary of insights Solar | Despite skilling landscape being mature, there are challenges as the focus is on limited job roles (2/2)

As the mature solar ecosystem continues to train incoming workforce for solar jobs, it needs to overcome challenges related to the current skilling programs not being effective and inclusive

Opportunity

As there is limited range of skilling options available, there is an opportunity to

- Invest in creation of **new skilling programs** for job roles in value chain segment with high potential such as design and installation for job roles that have minimum entry barriers such as Solar Lighting Technician
  - Opportunity for working on transversal skills like Welders, fitters, electricians, computer assisted machine operators.

The course content for utility and rooftop within designing are not catering to industry demands, thus there is opportunity for

- Creating course content which is
  - relevant for both rooftop & utility scale for - Solar PV Structural Assistant Design Engineer
  - includes modules like AC / DC power and troubleshooting techniques for Electricians
  - Enhances automation / software tools for Solar PV maintenance technician - civil / electrical (ground mount)

There is paucity of trainers due to irregular payment cycles and cost for retraining, and thus opportunity of

- Improving quality of training processes by funding for equipments, paying the trainers during off-periods therefore enabling retention

Prioritisation process: Sattva followed a 3 level prioritisation process to arrive at the top 2 recommended courses across EV and Solar sectors.

Legend: High priority sector | Medium priority sector | Low priority sector

Level 1 — From the top 6 sectors, 2 sectors that have a potential for growth, employment and skilling of semi-skilled candidates

- **EV**
- **Solar PV**
- Water waste
- E waste management
- Wind energy
- Bio energy

Level 2 — Mapping of semi-skilled job roles across value chain of both sectors that show growth potential within next 3 years

Level 3 — Evaluation of job roles filtered out against DRF criteria such as nature of job, fitment for women/PwDs,

- **Scope of skilling**
- **Educational Qualification**
- **Fitment to women**
- **Fitment to PwD***
- **Nature of employment**

Final — 2 job roles shortlisted for pilot training module

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Sector Prioritisation: Sattva reviewed key metrics across 6 sectors to identify high potential sectors for DRF

Legend: High priority sector | Medium priority sector | Low priority sector

		Prioritisation criteria		
#	Sub sectors	Current green jobs employment	Policy tailwind (Actualisation/Uptake)	Total number of training institutes (SSC affiliated and unaffiliated)
1	**EV**	Not available	**High uptake**- FAME II, Vehicle scrappage, draft battery swapping	80+
2	**Solar**	0.86 lakh (2021)^	**High uptake**- National Solar Mission, PM KUSUM, PLI	150+
3	**Water Waste**	6 lakh (2020)	**Low uptake**-Environment Protection Act, 1986, Water Act 1974	~80 *(Recognition of prior learnings)*
4	**E Waste**	1.36 lakh (2020)	**Low uptake**- E-waste management rules- 2018	<20
5	**Wind**	0.5 lakh (2020)	**Low uptake**- Policy push exists at a very nascent stage - GOI aims to achieve 140 GW, National Wind-Solar hybrid policy	<10
6	**Bio Energy**	0.25 lakh ↠ (2020)	**Low uptake**- Policy push exists but largely for supporting entrepreneurship SATAT Scheme, Over 4.6 billion spent by GOI	<20

Note: The top 3 sectors are prioritised basis information available on demand of youth. The rationale for suggesting these courses is mapped in the sheet here.

^includes utility scale and rooftop solar; https://www.ceew.in/publications/indias-expanding-clean-energy-workforce

↠ IRENA, Renewable Energy and Jobs Annual Review 2020

Demand for green jobs in EV | By 2030, the electric vehicles segment is expected to create 10M jobs, with majority semi and low- skilled jobs in manufacturing, charging infrastructure, sales & services

Legend: High green job creation | Medium green job creation | Low green job creation

	R&D and design	Manufacturing for batteries	Manufacturing EV components	Assembly	Charging infrastructure	Sales & services
Rationale for mapping	*AI & IOT would drive the sector with >50% brainstorming with AI, highlighting a need for decentralised service centre network. Demand for high-skilled jobs.*	*Incentive of 26cr through PLI scheme for reducing imports, FAME II boosting local EV Manufacturing and demand for semi and low-skilled job roles*		*Currently, parts are imported & locally assembled; can absorb existing ICE workforce*	*India would need 4 lakh charging stations by 2026 and draft battery swapping policy would enable charging infrastructure*	*With increased support needed for AI, a huge network of service providers will be needed for customers.*
Potential semi and low-skilled job roles	• Tool designer/ tool room supervisor or technician • Assembly line/ QC supervisor	• Electrode fabricators • Cell assembly support • Charger assembler • Battery packaging technician	• Shop floor technicians • Tool room operator • Equipment assembler • Heat treatment supervisor/ technician	• Equipment assembler/ technician • Shop floor technicians • MIG welder	• Electrician • Fabricator • Battery swapping attendant	• Service engineers (on-road/workshop) • Sales/customer support executives

AMBITIONS IN THE EV SECTOR

1. **Drive transition of existing ICE workforce to EV roles across the value chain**
2. **Create competent workforce supply for battery manufacturing & charging infrastructure**
3. **Generate a strong cadre of qualified after-sales and service workers**

EV Deep Dive | Manufacturing as a value chain segment both for batteries and EV appear to show more growth potential for job as well as skilling scope in the immediate future (1/2)

Legend: High job creation in next 3-5 years | Medium job creation in next 3-5 years

#	Value Chain Segment	Job Role	Description	Scope of skilling
1	**Related to manufacturing of Battery**	1.1 Electrode manufacturer	S/he will need understanding and working knowledge of Lithium ioN cell parameters, types of batteries and classification etc.	This is a high priority role for skilling as this is where the near term (within 5 years) but not immediate growth of sector and requirement for labour will be
		1.2 Cell assembler	S/he is primary responsible to assemble cells and other components in container (battery case) to make complete storage battery:	This is a high priority role for skilling as this is where the near term growth of sector and requirement for labour will be
		1.3 EV Supply Equipment (EVSE) manufacturing/operators or Charger Assembler	S/he will need understanding and working knowledge of charging stations management, Home charging management, Set up service, Solar charging station installation and EV Battery station	This role overlaps with the value chain segment of charging infrastructure.
		1.4 Battery packaging technician	S./he will need working knowledge of Battery Pack Sizing Considerations. Battery Charging, Protection, and Management System, Battery Pack Sizing Battery Pack construction,Battery Pack Assembly process, Financial Projection of Li ion battery pack Manufacturing	This is a high priority role for skilling as this is where the immediate growth of sector and requirement for labour is projected
2	**Related to charging infrastructure**	2.1 Electrician	S/he will be responsible for installing and maintaining electrical systems contained in automotive vehicles inspect and repair, and maintain all the electrical parts contained in a vehicle.	Transversal / Non core technical skilling role. Very little skilling specific to EV, can be rather OJT in the existing general courses
		2 .2 Fabricator	S/he will be responsible for the creation of parts from manufactured raw materials	Transversal / Non core technical skilling role. Very little skilling specific to EV, can be rather OJT in the existing general courses

PFA the detailed analysis of each job role across 5 parameters undertaken by Sattva

EV Deep Dive | Manufacturing as a value chain segment both for batteries and EV appear to show most growth potential for job as well as skilling scope in the immediate future (2/2)

#	Value Chain Segment	Job Role	Description	Scope of skilling
3	**Related to manufacturing of EV**	3.1 EV Vehicle Maintenance technicians (Electrical & Electronic components/Mechanical)	S/he at this job performs assembly of electric vehicle and its components (as per ASDC), organize work and resources (Manufacturing), interact effectively with colleagues, customers and others,interpret engineering drawings and perform electric vehicle assembly operations	This is a high priority role for skilling as this is where the immediate growth of sector and requirement for labour will be. There is a high need for semi-skilled candidates to aid in scaling up and modifying assembly lines to enable greater adoption of EVs. Presently, very few QPs exist for semi-skilled roles
		3.2 Assembly line supervisors	S/he will work as assembly supervisor in a factory or production setting overseeing the work of a team of assembly workers	This job role requires at least 8 years of experience apart from high education
		3.3 Tool Room Operator	S/he will be a tool room operator job is machinist/operator job. This job role is going to repeat in battery manufacturing ecosystem, most parts are imported as of now	The domestic manufacturing capacity is being built so not an immediate need
		3.4 Equipment Assembler	S/he will supervise and coordinate with other heat treating equipment setters, operators, and tenders, ensuring their work meets the required technical specifications and is completed promptly.	This job role will not be different from ICE and may not need new skilling
4	**Related to Sales and Maintenance**	4.1 Service technicians (on-road/workshop)	S/he will be responsible for customer complaint/management, assist in installing the equipment, analyze, inspect and review findings to determine the solution to the problem that the customer demands. Work alongside with technical sales engineers to provide before sales and after sales support as and when required. Offer customer training for the product, Monitors performance of the product	This is a high priority role for skilling as this is where the immediate growth of sector and requirement for labour will be
		4.2 Battery swapping attendant	S/he will • Perform battery swapping, otherwise called battery-as-a-administration, to supplant depleted batteries with charged ones at trade stations.	This role may not be immediate in nature as the battery ecosystem is still developing and may require short technical skilling workshop

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Demand for Green Jobs in Solar | Design, business management, installation and construction as value chain segments show highest growth potential for employing and skilling semi-skilled candidates

Legend: High green job creation | Medium green job creation | Low green job creation

	Design, Business management	Manufacturing	Installation / construction	O&M	Sales, end of life cycle
Rationale for mapping	*Increase in EPC projects can mean permanent jobs; for every 10 MW, up to 7 jobs may be for Business development & land acquisition clearances*	*Recent PLI policy is set to spur expansion of manufacturing jobs, but growth trends needs to be observed in the short term to steadily predict the intensity of jobs*	*It has the highest manpower capacity as it can employ 24.72 person per MW rooftop installed capacity, with a high potential for the semi-skilled workforce working off-site*	*When compared to installation only 10% of the workforce may be required in O&M*	*The decade-long installations and impetus in manufacturing could result in more disposed solar panels in the near term and long term*
Potential Semi and low-skilled job roles	• Engineers (electrical / mechanical) • Solar PV site surveyor • Solar PV designer • Solar PV structural design technician *These jobs require more than basic level of education and thus may not be ideal for this engagement*	• Solar PV manufacturing technicians • Computer-controlled machine operators • Welders, cutters, solderers, coaters, painters, and spraying machine setters • Electrical and electronic equipment assemblers, operators	• Solar PV installer (civil/ electrical) • Rooftop solar grid engineer • Solar off grid entrepreneur • Rooftop solar photovoltaic entrepreneur • Plumbers, pipefitters, and steamfitters • Electricians • Solar Pump operators	• Solar PV maintenance technician - civil / electrical (ground mount) • Solar site in-charge • Electrical and electronics repairers	• Waste sorter

AMBITIONS IN THE SOLAR SECTOR

1. **Augment existing skilling programs by improving content & practical exposure/reducing trainer cost/innovation/outreach**
2. **Create competent workforce for jobs in installation and construction value chain segments**
3. **Driving industry buy-in for diversity and inclusion in onboarding workforce**

Solar Deep Dive | Jobs under the design and business management value chain segment shows growth potential both for rooftop and utility scale systems. (1/3)

#	Value Chain Segment	Job Role	Description	Scope of skilling
1	**Related to Design, Business management**	1.1 Solar Engineers (electrical / mechanical)	S/He will be trained to prepare site feasibility study report, Design of solar PV power plant, installation and commissioning of solar PV power plant, Quality Assurance of solar PV power plant components,Maintain personal health safety at project site, work effectively with others, S/He would be able to take responsibility of design, installation and commissioning of solar power plant at site, its quality QA and HSE issues	The demand generation may require additional efforts as there are courses but uptake is low from Training Partners as there are no students/demand from the industry to train students urgently.
		1.2 Solar PV site surveyor	S/He will be trained to conduct solar site assessment for prospective customers using a smart phone/tablet and provided surveying equipment,conduct a physical site survey using a variety of company provided equipment including measuring devices, ladders, personal protective equipment, etc., maintain a solid knowledge base of local code requirements, products, roofing processes and solar installation practices, facilitate communication between customers and operations pertaining to special job needs, take roof measurements and photos of necessary electrical panels, meters, and general property to document project site, verify equipment locations with homeowner, and upload all project information from site survey, including photos, measurements and Suneye readings.	There is a need to augment existing skilling - This job, for both rooftop or utility scale system, and such skills to adapt to dual settings emerging as an increased need. TPs expressed that candidates ask for these specific courses
		1.3 Solar PV designer	S/He will be trained on and will be able to review the structural design of solar PV power plant, review electrical design of solar PV power plant, prepare energy simulation report, maintain personal health safety at solar PV project site, work effectively with others, S/He would be able to review civil and electrical design of the Solar PV power plant prepare the energy simulation report	There is a need to augment existing skilling - This job for both rooftop or utility scale system, and such skills to adapt to dual settings is emerging as an increased need. TPs expressed that candidates ask for these specific courses
		1.4 Solar PV structural design technician	• S/He will be trained on and will be able to Prepare the civil and structural design of solar PV power plant • Maintain personal health safety at solar PV project site & work effectively with others	There is a need to augment existing skilling - This job for both rooftop or utility scale system, and such skills to adapt to dual settings is emerging as an increased need. TPs expressed that candidates ask for these specific courses

PFA the detailed analysis of each job role across 5 parameters undertaken by Sattva

Solar Deep Dive | Installation as a value chain segment shows highest growth potential for employing and skilling semi-skilled candidates (2/3)

#	Value Chain Segment	Job Role	Description	Scope of skilling
		1.4 Solar PV structural design technician	S/He will be trained on and will be able to Prepare the civil and structural design of solar PV power plant,maintain personal health safety at solar PV project site	There is a need to augment existing skilling - This job for both rooftop or utility scale system, and such skills to adapt to dual settings is emerging as an increased need. TPs expressed that candidates ask for these specific courses
2	**Related to Installation and Construction**	2.1 Solar PV installer (civil/ electrical)	S/He will be trained on and will be able to carry out the manufacturing of Solar PV Modules, maintain personal health & safety in a manufacturing facility	There is a need to augment existing skilling - This job, for both rooftop or utility scale system, and such skills to adapt to dual settings are emerging as an increased need.
		2.2 Rooftop solar grid technician	S/He will be trained to check, audit,inspects, commission an test different components of the grid connected Solar PV Power Plant in compliance with all relevant codes, standards,and safety requirements	This is a high priority role for skilling as this is where the near term growth of sector and requirement for labour will be
		2.3 Solar Plumbers, pipefitters, and steamfitters	S/He will be trained to install or repair tanks, piping, and other components of solar systems. Ensure work complies with plumbing and building laws/regulations in place in the region. and sell (may be) related equipment and systems	Upskilling of existing ITI plumbing/fitter graduates or experienced plumbers may be required
		2.4 Solar Technician/Electricians	S/He will be trained to and will be able to site Survey for installation of Solar PV System, install Electrical components of Solar PV System, test and Commission Solar PV System and ,personal Health Safety at project site	There is scope of Investing in creation of new skilling programs
		2.5 Solar Pump operators	• Solar Water Pumping as part of optional learning, s/he would also be able to install and commission solar water pumping systems	Skill development module on this is a part of another larger module/ There is a module part of larger course on Solar PV engineer

PFA the detailed analysis of each job role across 5 parameters undertaken by Sattva

Solar Deep Dive | Manufacturing as a value chain segment shows growth potential within next 5-10 years for employing and skilling semi-skilled candidates (3/3)

#	Value Chain Segment	Job Role	Description	Scope of skilling
2	Related to manufacturing of Solar PV	3.1 Solar PV manufacturing technicians	S/He will be trained on and will be able to carry out the manufacturing of Solar PV Modules	There is a need to augment existing skilling - This job, for both rooftop or utility scale system, and such skills to adapt to dual settings are emerging as an increased need.
		3.2 Computer controlled machine operators	S/He will be well versed with softwares relevant for Solar Plant functioning	This is a high priority role for skilling as this is where the near term growth of sector and requirement for labour will be but this is high costing and may just be a small workshop
		3.3 Welders, cutters, solderers, coaters, painters, and spraying machine setters	S/He will be well versed with operating machineries and maintaining the same that are relevant for Solar Plant functioning	Upskilling of existing ITI plumbing/fitter, diploma/graduates or experienced plumbers may be required
		3.4 Electrical and electronic equipment assemblers, operators	S/He will be well versed with electrical equipments, parts thereof, machineries and maintaining the same that are relevant for Solar Plant functioning	Upskilling of existing ITI electrical/fitter graduates or experienced electricians may be required

Revision of Job Role Shortlisting Criteria for Solar:

- Given that the Solar skilling ecosystem is quite mature with 2 certification bodies involved (SCGJ has 14 QPs and ESSC has 9 QPs) along with at least a 100 training partners, it was aligned that focusing on job roles that are basic and introductory in nature will help DRF pilot into the sector with rationale to understand the ecosystem first hand.
- Thus, the evaluation criteria for Solar sector is revised to include job roles with minimum entry barriers and educational qualifications in Level 3

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EV shortlist | Battery packaging and charger assembler job roles show immediate growth, while cell manufacturing ecosystem could pick up in the next 3-5 years

Legend: High | Medium

Sector	Job Role	Scope of skilling	Entry qualification a minimum (someone with 10/12th certification)	Nature of Job	Fitment for women	Fitment for PwDs	Remarks
#	**Legend Explanation (--->)**	High here means there is scope of creating new course, augmenting existing courses	High here means there is minimum entry barriers for intake	High here means the job is more full time with social security	High here means the job has no or low barriers for entry of women	High here means the job has no or low barriers for entry of PwDs	
EV	1.1 Electrode manufacturer						Although not immediate, these jobs are going to boom within the next 3-5 years due to strong governmental push
	1.2 Cell assembler						
	1.3 Battery Packaging Technician						Primary and secondary research shows that battery packaging shows will be growing in India and the role requires technical skilling as well
	1.4 EV Supply Equipment (EVSE) manufacturing/operators or Charger Assembler						Manufacturing of EVs needs to grow domestically as there is currently a low level of EV production in India.
	1.5 EV Service technicians						This is a technical job role and is customer facing, it probably needs more education and experience- at least an ITI in electrical education upto 3 years of experience

PFA the detailed analysis of each job role across 5 parameters undertaken by Sattva

Solar shortlist | The courses that have a minimum entry barrier are short-term, without any barriers for women/PwDs. But their recruitment is via sub-contracting and there is limited scope of skilling (1/2)

Revised evaluation criteria:
- Unlike EV, for Solar sector, it was aligned with DRF that there is a need to pilot a course in Solar sector as there is increase in demand for jobs and the government policy push
- Sattva and DRF will identify a job role with a lower entry barrier and work on designing/augmenting existing skilling courses (as skilling ecosystem is already mature)
- Therefore, to make the possess more inclusive, it was decided to identify job roles with minimal education qualification of 5th-8th grade where introductory courses with low effort can be rolled out

Legend: High | Medium

Sector	Job Role	Entry qualification a minimum (someone with 15/8th certification)	Remarks
#	**Legend Explanation (--->)**	High here means there is minimum entry barriers for intake	
Solar	2.1 Rooftop solar grid technician	Diploma EEE	Only 80 hours of training required
	2.2 Solar PV Project Helper	5th Standard	NSQF level 2- very low earning potential
	2.3 Solar Lighting Assembler(Options: Home Lighting System/ Street Lights)	8th Standard	This job role seems most relevant for an introductory module by DRF
	2.3 Plumbers, pipefitters, and steamfitters	8th Standard	Less than 1% women work with waste water and they may not be interested in the job role

PFA the detailed analysis of each job role across 5 parameters undertaken by Sattva

Solar shortlist | The courses that have a minimum entry barrier are short-term, without any barriers for women/PwDs. But their recruitment is via sub-contracting and there is limited scope of skilling (2/2)

Legend: High | Medium

Sector	Job Role	Entry qualification a minimum (someone with 15/8th certification)	Remarks
#	**Legend Explanation (--->)**	High here means there is minimum entry barriers for intake	
Solar	2.4 Electricians	8th Standard	Transversal role without much specific technical training
	2. 5. Semiconductor processors	8th Standard	Technically experienced, may require more base knowledge
	2. 6. Computer-controlled machine tool operators, metal and plastic	8th Standard	Softwares like SCADA can be taught like in a short workshop
	2.7. Welders, cutters, solders, and brazers	8th Standard	Transversal role without much specific technical training
	2.8. Glaziers	8th Standard	Transversal role without much specific technical training
	2.9. Electrical and electronic equipment assemblers	8th Standard	Transversal role without much specific technical training
	2.10. Industrial production managers	8th Standard	Not entry level, requires experience
	2.11. Coating, painting, and spraying machine setters, operators, and tenders	8th Standard	Transversal role without much specific technical training

PFA the detailed analysis of each job role across 5 parameters undertaken by Sattva

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Overview of the Sustainable Energy Ecosystem

- *Mapping of priority sectors using growth and skill related parameters*
- *Challenges in demand and supply ecosystem*

Methodology

- *Process to arrive at high priority green jobs sectors and job roles*
- *Key criteria of DRF*

Summary of insights

- *Summary of insights for EV and Solar*
- *Summary of Job Role prioritisation process*

Job Role Prioritisation

- *Mapping of relevant sectors that have immediate growth potential for jobs (Level 1)*
- *Shortlisting roles with growth potential and scope of skilling across value chain of EV and Solar respectively (Level 2)*
- *Evaluation of the shortlisted job roles (Level 3)*
- ***Recommendation of top job roles and skilling solutions for them (Final)***

Next Steps

- *Next steps ahead of job roles shortlist*

Study Limitations

- *Limitations of the current study*

References

- *List of documents, secondary research referred to within the EV and Solar sectors*

Final Recommendation | Sattva recommends DRF to establish courses for following of job roles

Legend: High | Medium

#	Sector	Job Role	Description	Rationale
1	**EV**	1 A well rounded EV battery and maintenance assistance course that includes 1.1 Battery packaging technician 1.2. Certain aspects of EV maintenance 1.3. Service technician	1.1 S./he will need working knowledge of Battery Pack Sizing Considerations. Battery Charging, Protection, and Management System, Battery Pack Sizing Battery Pack construction,Battery Pack Assembly process, Financial Projection of Li ion battery pack Manufacturing 1.2 Also working knowledge of maintenance elements in the course such as checking battery status/systems, reading and recording from the same 1.3 Apart from certain elements of service technicians that include customer management can be added on top of the course for battery pack assembler.	1.1 According to various demand side conversations and secondary research, there is projected growth within the battery packaging role. 1.2. It adds value to include EV maintenance elements specifically related to battery servicing. It is also high in demand as well as they are more full-time in nature according to most of the employer interactions Sattva had. *(Ola/AltiGreen/Urjabolt/Batterypool/AtherEnergy)* 1.3. Adding on the softer skills aspects service technician of customer management makes the candidate all-round for the job
2	**Solar*** *(WIP, To be aligned with DRF)*	2.1 Solar Lighting Technician *(Options: Home Lighting System/ Street Lights)*	S/He will be trained on assembly of different types of solar lamps, repair of solar lamps, maintain personal health safety in a manufacturing facility, ,maintain Personal Health and safety at project site Option 1 Home lighting system - Assembly and Repair of solar home lighting systems Option 2 Street light- Assembly and Repair of solar street lights	Despite all the job roles in solar being high in demand, they may not require a new course rather augment of existing courses may be sufficient. - Apart from this, they may also not be high priority for the target group of women/PwDs considering they may be more entrepreneurial than employment oriented

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Next steps

- **Trainer Qualifications:** Finalise the JD for the trainer, define the functional core competencies, etc.
- **Screening Checklist:** Develop a screening checklist for the two shortlisted course to enable DRF to screen students on the basis of certain skills and criteria, core competencies, age, gender, qualification, etc.
- **Counseling Checklist:** Review the early level of Counseling Checklist prepared by DRF that is used by the center team / area manager to ask certain questions regarding suitability and aspirations and rate the students while interviewing to make a call on hiring. There are different sheets for different programs and Sattva would develop one for the shortlisted course.
- **Develop the Training Module:** Set up working session to align on the exact training requirements, technical and soft skills required, etc.
- **Course curriculum:** Share contacts / recommendations of course curriculum designers / subject matter experts for development of the detailed trained module and course curriculum

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Limitations of the study | After conversations with key stakeholders, Sattva came up with the prioritised sectors and job roles however, there are a few limitations of this study that need to be noted

- **Limited data on job roles due to emerging nature of the Green Jobs sector at large:** Owing to evolving nature of the Green Jobs sector, despite there been conversations in the ecosystem, the formalisation of many job roles is not very well articulated
- **Limited access to training course contents by industry players across sectors:** As training content being intellectual property of skilling industry and employers who leverage internal trainings specific to their value chain
- **Women/PwDs face systemic challenges:** There are systemic challenges that women/PwDs face when it comes to access of training courses/employment post the same that are due to inherent nature of society/family constraints such as limited access to internet/technology/opportunities to move freely/limited aspirations/motivation and lack of enough role models within the ecosystem etc.
- **Informal employment due to less sensitized/motivated employers :** Though legally mandated, many a times employers don't have necessary infrastructure to accommodate women and PwDs (mild motor disabilities) due to the contractual and informal nature of most of the semi-skilled job roles
    - Women such as- separate/washrooms, feeding space/changing stations, maternity benefits etc) and for
    - PwDs (mild more disabilities) women such as - accessible washrooms, accessibility elevators/ramps

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Electric mobility

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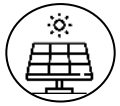
Appendix

Recommendations for prioritised sector | Automotives (Electric Mobility) and Solar Sector

	Recommendation	Specific action point	Stakeholders for partnership
 **Automotive (Electric mobility)**	Augment current skilling programs with industry collaboration to enable ICE workers shift to EVs	Inclusion of **EV specific content in existing Automobile sector QPs** for assembly job roles and **upskilling current ICE assembly** workforce	**Industries, Private skilling partners** *Eg: Autobot academy, Academy of EV Technology (AEVT) to provide upskilling courses*
	Enable creation of new skilling programs in few segments critical for sustainable growth of EVs	Promotion and creation of short-term finishing courses for interested ITI candidates on: 1. **Battery manufacturing process (eg: Electrode manufacturing)** 2. **EV component assembling (eg: chip manufacturing)**	**SSCs, private skilling players and Industry** *Eg: AEVT provides similar courses which can be made more specific*
 **Solar energy**	Increase effectiveness of existing skilling programs to make them more industry-aligned	1. Include modules in existing rooftop & utility scale programs that enables candidates to **transition across both** 2. Support skilling programs with **equipment support to make them industry-oriented and explore introduction of higher QPs**	**SSCs and universities** *Few universities are already adapting to such emerging needs and SSCs could incorporate these in the relevant QPs / course syllabus*
	Drive inclusivity in existing skilling programs for women and PwD for workforce expansion	1. **Pilot model batches consisting of women** for job roles like Rooftop installer, or Solar grid technician 2. **Enable content creation** in Braille, sign language for PwD for them to participate in skilling effectively	**NGOs and SSCs** Eg: Barefoot college has courses in Braille as well as colour-coded manuals for those who cannot read; enabling inclusivity

Recommendations for deprioritised sector | Wind energy, Bioenergy, E-waste management and Waste water Management

	Recommendation	Specific action point	Stakeholders for partnership
 **Wind energy**	Enable creation of new skilling programs in wind energy production job roles	Create and pilot short-term finishing courses for ITI Graduates for emerging job roles like **WTG Operator or Wind turbine technicians**	**SSCs, Universities, private skilling players and Industry** *Eg: NIWE has created these courses in collaboration with institutes like IITs*
 **Bioenergy**	Support awareness programmes to attract workforce to opportunities across the value chain	Create awareness programs and facilitate Industry visits to help candidates understand **job roles & entrepreneurship opportunities; specifically for the feedstock supply segment**	**Industry, Polytechnic institutes, ITIs** *Eg: Run awareness programs in Polytechnic institutes and ITIs*
 **E-Waste management**	Drive upskilling and inclusive models in waste collection and segregation	**Run pilot programmes in tech parks** where workforce can get trained in techniques of recycling and refurbishment, safety procedures, while rights are ensured as per E-Waste rules 2018	**Industries, PROs, MEITY affiliated centres & Universities** *Eg: CMET Hyderabad has piloted such programmes in tech parks*
 **Wastewater management**	Support creation of industry specific skilling programs for ETP operations	**Create and pilot industry specific QPs for jobs in ETP operations** and **water tank process technicians** working in industries such as textiles etc	**SSCs - Water management & Plumbing council, Universities, private skilling players and liquid waste recycling industry** *Eg: The food processing and life sciences SSCs have created QPs for industry-specific ETP operators*

Thank you