STATE SPECIFIC ACTION PLAN

Uttar Pradesh New and Renewable Energy Development Agency

Name of the Project:	Capacity Building of SNAs and other key stakeholders for promoting RET based off-grid solutions for electrification in rural areas
Contract No:	11/15/2013/PMU/WB-2
Funding Agency:	Ministry of New and Renewable Energy, GoI / World Bank
Consultant:	World Institute of Sustainable Energy, Pune
Date:	April 2015

EXECUTIVE SUMMARY

The State Nodal Agencies (SNAs) originally were responsible for implementing the Ministry of New and Renewable Energy (MNRE) sponsored subsidy-driven renewable energy programs /schemes, mostly centered on stand-alone renewable energy devices such as solar home lighting systems, bio-gas plants, etc. Therefore, the SNAs were structured and equipped to handle RE based off-grid programs mostly using stand alone RE devices / systems by distribution of subsidies/grants received from MNRE. With the change in policy scenario, MNRE wants SNAs to enhance their capabilities for taking bigger responsibilities and perform their role in up-scaling off-grid RE program with the help of private entrepreneurs with sustainable market approaches. One of the key barriers for up-scaling and large-scale commercialization of RE-based-off-grid programs for energy access as identified by MNRE is the weak institutional and individual capacities of the SNAs.

To overcome this, MNRE and the World Bank has commissioned SNA capacity building study, wherein the consultant is required to undertake a study on capacity building of SNAs and other key stakeholders to enhance their understanding and vision in implementing RET based off-grid programs with the help of private entrepreneurs. WISE has been awarded the work of capacity building of SNAs of states comprising 1) Uttar Pradesh 2) Bihar 3) Jharkhand and 4) West Bengal. The study has been broadly divided into two parts – stage 1 and stage 2. During stage 1 of the study, the consultant is required to prepare state specific action plans (SSAP) for each of the states awarded for study. While preparing the SSAP, the consultant has to look into the key functional areas of the SNA namely (i) program planning and program implementation (ii) organization structure and human resource (iii) financial management and governance structure (iv) policy and regulatory framework. The scope of work under stage 2 involves actual implementation of the short term interventions proposed in the SSAPs. Stage 2 of study involves holding minimum of two combined skill up-gradation and training programs for the personnel of 4 states and other stakeholders to meet the requirement of skilled manpower for the development of rural energy access projects followed by a concluding workshop at the end of the study.

As part of the study, the consultant had made visit to the SNA and interact with the key officials of SNA. Necessary information and supporting documents were collected from the SNA to know the present state of working of SNA in the key functional areas and program implementation practices followed. Subsequent to visit of SNA, the consultant had reviewed the functioning of the SNA in the key functional areas by examining the data collected from the SNA. Whenever necessary, more information / clarifications were sought from the designated officers of the SNA. A diagnostic review report has been prepared for the SNA identifying the gaps/ short comings in the key functional areas of SNA. Based on the diagnostic review report, a state specific action plan (SSAP) has been prepared. Following interventions / measures has been suggested in the key functional areas of the SNA so as to enhance capacities of SNA and make it prepared for scaling up RET based off-grid programs in the state.

PROJECT PLANNING AND PROJECT IMPLEMENTATION

- UPNEDA needs to impart necessary training to its staff to undertake renewable energy potential assessment / mapping the potential areas for implementation of various RET

based off-grid systems / solutions across the districts / regions in the state. The necessary application software like PV-syst, GIS tools, METEONORM database should be made available to the staff by the SNA.

- Standardization of the technical specifications of the RET based equipments / systems to be procured under different programs / schemes would help in reducing the capital cost of the system as well and O&M cost in future. .
- The SNA shall involve the engineering colleges / polytechnic institutes from the state in conducting testing of the RET based system/equipments on regular basis to ensure adherence to standards specified in the tenders floated for various works.
- UPNEDA should formulate strategies for effective operation and maintenance of RET based off-grid systems / projects by involving local NGOs; self help groups (SHGs). The local people needs to be trained to look after the operation and maintenance of RET based off-grid systems / solutions installed in their area, open supply outlets for spare parts in the rural areas.
- Standard guidelines / document for preparation of feasibility report / DPR study for RE based mini-grid project can be prepared as reference document. This document should outline the standard methodology for site survey, RE potential assessment, demand survey, socio-economic survey, selection of RE technology and sizing of mini-grid power plant, design of power distribution network and techno-economic viability check for such projects. *The consultant is preparing such manual / standard document for the SNA which can be used while undertaking feasibility study / DPR for RE based mini-grid projects in the state. The brief content of the document is presented in* ***Annexure 1*** *of this report. The consultant proposed to consider this as short term intervention.*
- The SNA shall organize capacity building training programs for stakeholders like community, banks, FIs, NGOs and electrical utilities for awareness creation about RET based Mini-grid power projects and its importance to society.

ORGANIZATION STRUCTURE AND HUMAN RESOURCE

- Restructuring of organization would help in effective implementation of RET based off-grid programs for electrification of rural areas. The consultant has suggested restructuring of the organization structure by keeping in mind the various RET based programs being implemented by the SNA at present.
- Recruitment of technical staff at the UPNEDA head-quarters to assist the Project Officers / Sectional Heads.
- Recruitment of ‘specialist’ as provided in the UPNEDA service rules having specialized degree / knowledge in renewable energy technologies.
- Impart training to the managerial and mid-managerial staff on policy, regulations, business models and best practices in implementing RET based off-grid programs/schemes. The mechanic-cum-operators and junior engineers deployed at the field level shall be trained to handle the solar and other RET based off-grid systems/ projects installation / O&M work.
- As suggested by the SNA, the consultant has designed a comprehensive skill up-gradation training workshop module for the field level staff of SNA (technicians/ operators) on solar PV based off-grid applications. The program shall be of 2 days duration shall have class room session as well as hands on training at field.

- Followed by the 2 day duration skill up-gradation workshop for technicians, the consultant shall organize a 1 day workshop for the senior level /managerial level staff of the SNA office on RE based mini-grid projects covering policy, regulations, finance, business models and case studies from global best practices on implementation of RE based mini-grid projects.

  The consultant has designed the training module along with the program structure, course material and a manual for conducting O&M of solar PV based off-grid systems / applications in the field. The content of the training program and course material is detailed out in ***Annexure 2*** *of this report. The consultant proposes to consider this as short term intervention which will be delivered in stage II of the project.*

FINANCIAL MANAGEMENT AND GOVERNANCE STRUCTURE

- The state government could create a Green Energy Fund by imposing green cess of, say, 5 to 10 paise per unit on commercial and industrial electricity users (similar to that in Maharashtra, which generates about Rs 100 crore annually). The proceeds from the green energy fund can be utilized for promotion of RET based grid connected and off-grid programs in the state.

  The consultant has given the step wise procedure for creation of Green Energy Fund for promotion of Renewables in Uttar Pradesh. The brief procedure explaining the roles of the state government / department in preparation of draft bill by making necessary amendments in Uttar Pradesh Electricity Duty Act -1952 has been elaborated under ***Annexure -3*** *of this report. The consultant proposes to implement this as a short term intervention and assist the SNA in preparing the case for creation of Green Energy Fund in UP during stage 2 of the assignment. .*

POLICY AND REGULATORY FRAMEWORK

- For scaling up implementation of RET based off-grid programs in the state, the SNA should devise appropriate policies to involve all stakeholders including the banks, FIs, NGO, suppliers /manufacturers , community in program implementation. Innovative financing scheme with appropriate business models required to be put in place.
- The SNA should take initiative in providing easy and soft financing to RET based off-grid projects by utilizing micro-credit organization/ rural and cooperative banks / facilitating medium and small scale industries (SME) for manufacturing of RE based off-grid equipment /systems.
- Technical specifications of Solar home systems, street lights etc should be standardized to reduce the manufacturing and O&M cost.
- SNA could follow up with the UPERC for notifying the Regulations on implementation of RE based Mini-grid projects for supply of electricity to un-electrified villages and hamlets in rural area
- The SNA shall involve the engineering colleges / polytechnic institutes in conducting testing of the RET based equipments / systems on regular basis RET to insure adherence to standard specification announced by the SNA. .

CONTENT

1	**Introduction**	**7**
1.1	Power Sector Review - Uttar Pradesh	7
1.2	Scope of Work	8
1.3	Approach and Methodology	8
2	**Project Planning and Project Implementation**	**11**
2.1	Diagnostic Review and Identification of Critical Gaps	13
2.2	Suggested Interventions and Action Plan	14
3	**Organization Structure and Human Resource**	**16**
3.1	Diagnostic Review and Identification of Critical Gaps	20
3.2	Suggested Interventions and Action Plan	21
4	**Financial Management and Governance Structure**	**26**
4.1	Diagnostic Review and Identification of Critical Gaps	26
4.2	Suggested Interventions and Action Plan	27
5	**Policy and Regulatory Framework**	**28**
5.1	Diagnostic Review	29
5.2	Suggested Interventions and Action Plan	30
	Enclosures	**31**
1	Design of Web based Online Complaint Registration and Grievance Redressal System for the SNA	32
2	Content of the Standard Document / Manual being Developed for Conducing Feasibility Study / DPR for RE based Mini-Grid Projects in the State	33
3	Training Module, Program Structure, Content of Course Material and a Manual for Conducting O&M of Solar PV Based Off-Grid Systems / Applications in the Field.	38

1. INTRODUCTION

1.1 POWER SECTOR REVIEW - UTTAR PRADESH

In India Uttar Pradesh is one of the lowest among the major states with per capita power consumption of about 316 units against the national average of 778.71 units. In addition to the low level of electricity consumption, the state is characterized by very low level of accessibility, with only 32% of households having access to electricity. Over the last 10 years of so, the power supply growth in UP has remained sluggish, plugging the state into a chronic power deficit situation. The overall shortage of energy has remained within the range of 10-14 percent and shortage in the periods of peak demand ranging at even higher levels. In 2013, even a gap of up to 43% opens up between the state's demand and supply of electricity. As per figures presented in the Power Ministry's review meeting in March 2013, the state's projected demand for summer 2013-14 is 15,839 MW showing a gap of 6,832 MW. This situation also repeatedly forces the UP government to purchase power for high prices from other states.. This practice regularly incurs significant financial losses to the State Electricity Board, which (in part) have to be borne by the UP state government, constraining the state's expenditures in areas of social development such as education and public health.

The shortages have been resulted in poor and unreliable power supply with rampant power cuts and prolonged periods of low voltage. As a result industrial investment in UP has been constrained, with industries preferring to locate themselves elsewhere. In many cases industries have been compelled to go off-grid and set up captive power plants. Also several farmers have been forced to switch to pump sets run by diesel.

The installed capacity of the state is 9361 MW, share of central sector is 4933 MW as on March 2013.

Table **1** Census data of Households in Uttar Pradesh as per source of Lighting

Total no. of households	**3,29,24,266**
No of households having electricity access for lighting	1,21,20,231
No of households using kerosene/ other oil/any other sources for lighting	2,05,79,962
No of households using solar lighting systems	1,56,837
No of households no lighting source	67,236
Total un-electrified households	2,08,04,035
% of un-electrified households	63%

(Ref: Census 2011- Household by Main Source of Lighting

The state government and the central government have the obligation to provide access to electricity for uplifting the livelihood of the population. Hence, providing access to all households has been accorded the highest priority.

Relevance for promoting RETS based off-grid projects /solutions: Presently, 63% of the households in Uttrar Pradesh do not have access to electricity and have to depend on fossil fuels for lighting purposes. The decentralized off-grid RET based energy systems or micro-grids based on locally available RE resources can provide these households with an alternative solution for providing uninterrupted electricity supply. The conventional grid extension may not

be possible or financially viable in several pockets of the state. The programme based on off-grid RET based systems can be implemented in those places with locally available resources. This will prove to be a cost-effective solution to meet the local demand of electricity, and also save the state expenditure on the capacity addition of generating station as well as extension of transmission network.

Considering the future growth in demand of electricity and constraints arising out of conventional power generation in the state, large-scale deployment of RE would be a better solution in terms of energy access and energy security for Uttar Pradesh .

1.2 SCOPE OF WORK

WISE has been awarded the work of capacity building of SNAs in 'Block A' states comprising 1) Uttar Pradesh 2) Bihar 3) Jharkhand and 4) West Bengal. The scope of the work as agreed between MNRE and WISE, as given under the Request for Proposal (RFP) and the contract signed between MNRE and WISE is elaborated below:

Stage-I: Preparation of State Specific Action Plan (SSAP)

- Undertake diagnostic review of 4 states i.e. Uttar Pradesh, Bihar, Jharkhand and West Bengal.
- Sensitize the SNA management and state government on the critical issues that may exist in various functional areas, specifically governance structure, autonomy, available skills etc;
- Identify priority areas for capacity building and institutional strengthening; and
- Develop a State Specific Action Plan (SSAP) for given four states.

Stage –II: Implementation of the State Specific Action Plan (SSAP)

- Implementing a maximum of three short term interventions on organizational strengthening for the states which would be identified as quick wins from the previous stage.
- Holding minimum of two combined skill up-gradation and training programs for the personnel of 4 states and other stakeholders to meet the requirement of skilled manpower for the development of rural energy access projects.
- Holding final workshop in each state.

1.3 APPROACH AND METHODOLOGY

The concise objective of MNRE behind commissioning this study is to undertake Capacity Building of SNAs and prepare them for promoting RET based Off-grid solutions for electrifications in Rural Areas in more innovative ways. Traditionally in India the rural electrification program has been based predominantly on extension of centralized grid through RGGVY scheme. However, progress in household electrification under RGGVY has remained slow due to high cost of grid extension to remote areas, low paying capacity of the consumers and limited electricity demand in such areas. It is therefore advisable to extend the central grid only where it makes economic sense; alternatively following two off-grid RE options are advisable:

- Promote off-grid RE based energy access solutions for electrification of rural areas like solar home lighting in sparsely populated area with weak demand potential.

- Promote RE based decentralized distributed generation and supply projects (mini-grids) in the villages outside the reach of central grid where agriculture/commercial demand can come up in the future.

The consultant had therefore focused attention on the areas mentioned in (i) and (ii) above, while collecting the data as well as developing the diagnostic review report of the SNA. The State Specific Action Plan (SSAP) being developed by the consultant shall be directed towards capacity building of individual officials together with **strengthening of the institution for effective scaling up of the off-grid energy/ electricity access projects.**

Methodology

As part of the study, the consultant has got opportunity to visit the SNA for data collection and holding interaction with the key officials of SNA. At beginning of the study the consultant has designed the questionnaire / data collection format for collecting the data on the key functional areas of the SNA viz organization structure and HR, Project Planning and project implementation, Financial management and governance structure and policy and regulatory framework prevailing in the state. Prior to visiting the UPNEDA office (18-20 December 2014), the consultant had circulated the questionnaire / data collection format designed for collecting data on the key functional areas of the SNA. The Project Officer, UPNEDA designated as nodal officer for this study helped WISE team in collecting the requisite data / information available in the office. During the visit, discussions were held with the In-charge Director, UPNEDA and other Departmental heads looking after the technical, financial, accounts, and planning activities in the SNA. Information was collected along with supporting documents on key functional areas with respect to the RE programs being managed by UPNEDA with special focus on RET based off-grid programs for electricity / energy access.

Preparation of Diagnostic review Report

Subsequent to visit to SNA, the consultant had reviewed the functioning of the SNA in the key functional areas by examining the data collected from the SNA. Whenever necessary more information / clarifications were sought from the designated officers of the SNA over telephone. The consultant had critically examined the present organization structure, human resources, project planning and project implementation procedures followed, financial management and governance structure and policy and regulatory framework that prevails in the state from the point of view of promotion of RET based off-grid solutions / systems in the rural areas. A diagnostic review report was pepared highlighting the gaps/ short comings noticed in the key functional areas of SNA which the consultant feel are directly or indirectly hampering the scaling up of RET based off-grid RE programs in the state.

Preparation of State Specific Action Plan

The State Specific Action Plan (SSAP) is to be prepared so as to overcome the gaps / issues identified in the diagnostic review analysis. The SSAP shall clearly specify the suggestions / interventions required to overcome the issues / gaps identified in the key functional areas of the SNA. The draft SSAP shall be presented before the SNA for incorporating their suggestion before finalizing it. Three short term interventions from the SSAP shall be selected for

implementation after taking consent of MNRE and the SNA. The consultant shall help the SNA in implementing the three short term interventions.

Training Program and concluding workshop

The consultant shall organize two training programs for capacity building of the SNAs and other Key stakeholders. The concluding workshop shall be organized at the end of the project to share the findings and experience.

2. PROJECT PLANNING AND PROJECT IMPLEMENTATION

The UPNEDA is implementing both, MNRE-sponsored, as well as state government-sponsored RE programs (grid-connected as well as off-grid mode) in the state. In addition, the UPNEDA has been declared as a State Designated Agency for implementation of decentralized distributed generation (DDG) projects under the RGGVY scheme of Ministry of Power.

RET-based Programs / Schemes Implemented by the UPNEDA

The following RET-based off-grid programs / schemes involving Installation of RET based Off-Grid systems/ applications for electrification of rural areas are being implemented by UPENEDA for electrification of remote areas in Uttar Pradesh.

I. Solar Home Lighting Systems (SHS):

Solar Urja Sahayata Yojana: The Labour Department of the Government of Uttar Pradesh is implementing this scheme for the welfare of labourers in the state. Under this scheme, Solar home lighting systems (SHS) comprising of a solar panel of 24 W, a battery of 12V-20A, along with 4 LED lights of 3 W each is provided to the beneficiaries. The Government of Uttar Pradesh provides 100% capital subsidy to this scheme.

Lohia Awasiya Yojana: The Government of Uttar Pradesh under this scheme provides SHS systems consisting of a 120 W solar module, a 25V-5A battery, 3 LED lamps and a 25 W DC fan along with the newly constructed house for economically backward people. The state government provides 100% capital subsidy to this scheme.

II. Solar Street Light (Project Mode): Under this scheme, solar street lighting systems consisting of a solar panel of 75 W, a battery of 12V-75A along with a 12 W LED light are installed to provide community lighting in rural areas. Solar street light systems are installed with financial support in the form of subsidy from the state and central governments, with the balance share coming from the Gram Panchayat / local government.

III. Ram Manohar Lohia Samagra Gram Vikas Yojana: The Government of Uttar Pradesh implements this scheme with an objective of overall development of villages. UPNEDA was made responsible for implementing solar street lighting systems in such villages. During FY 2012-13, a total of 18,444 solar street lights have been installed in 1598 identified villages. In FY 2013-14, 12,453 nos. of such systems have been installed in 1084 villages agreed upon by the Government of India. The state government provides financial support for this program.

IV. Border Area Development Program (BADP): This scheme is being operated by MNRE. Under this scheme, during FY 2012-13, a total of 1562 solar home lighting systems, 1291 solar lanterns, 30 SPV pumps (drinking water), 1 SPV power plant, 5273 solar street lights, and 2 SPV irrigation pumps have been set up. In FY 2013-14, a targeted capacity of 1022 solar street lights was proposed in the Plan.

V. Remote Village Electrification Program: MNRE offers 90% capital subsidy under this scheme, while the remaining cost is incurred either by state government/ beneficiary. UPNEDA has so far electrified 113 villages and 325 hamlets under this scheme.

VI. Mini Grid Solar Power Plant Program: Out of 1, 06,407 villages in the state of UP, many are beyond the reach of the conventional grid, and out of those connected to the grid, many still do not receive continuous supply of electricity. To overcome this problem, the Government of Uttar Pradesh announced a Mini Grid Solar Power Plant Program, wherein UPNEDA has been authorized to implement mini grid solar power plants with the help of private entrepreneurs by following a competitive bidding process. The state government will be providing capital subsidy equivalent to that of the central government i.e. 30%. The developer has to arrange for the balance 40% amount.

VII. DDG program under Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY): Under the RGGVY program, the Central Government is providing 90% of the requirement as grant and the remaining 10% as loan from the Rural Electrification Corporation. Decentralized Distributed Generation (DDG) is one of the components under RGGVY for development of stand-alone mini-grids with generation based on conventional or non-conventional sources, where grid extension is not feasible. UPNEDA is declared as the designated agency for implementing DDG program in the state.

VIII. Biogas-based Power Generation Scheme: Under this scheme, biogas based power generation units in the range of 3 KW-250 kW are established in line with design and drawing approved by MNRE. MNRE offers capital subsidy of Rs 30,000 to 40,000 per kW for these systems. UPNEDA has so far set up three such systems in the state. In FY 2014-15, under the Kamadhenu Dairy Scheme, biogas based power generation units of 10 kW are to be established in each dairy of all districts in the state.

PROJECT IMPLEMENTATION ARRANGEMENT

Procurement Process for Departmental / Turn-Key / Labour Contracts

A project-wise purchase budget shall be prepared by each division of the UPNEDA Head Office for the entire financial year. This purchase budget, as far as possible clearly shows the items to be purchased separately under centralized purchasing indicating physical quantity and financial estimates of each item. Purchase budgets of each division shall be put up before the Director, UPNEDA for approval in the month of April each year. After approval of the purchase budget, every division shall initiate purchase of each item.

The types of purchases made by UPNEDA for RET based off-grid systems / equipments / projects can be broadly classified under two types.

- **Supplies & Services:** Any item of purchase which is required to be supplied only and not required to be installed by the supplier shall come in the **category of supplies**. Solar home lighting systems and solar street lighting systems supplied under the RET based off-grid programs mentioned at item number I to IV above comes under this type of contract. UPNEDA has empanelled the list of suppliers / manufacturers of RET based off-grid power systems in the state. Purchases are generally made either by calling quotations or by inviting tenders from these empanelled manufacturers. The tender document contains the technical specifications of the RET-based system required to be supplied by the manufacturer / suppliers. The bids are evaluated by the tender evaluation committee constituted by the Director, UPNEDA. The rate of the successful bidder would be

considered for the purchase. The purchase can be made as centralized purchase, wherein the UPNEDA head office makes bulk purchase, or it can be made as partly centralized purchase, wherein the orders for purchase are placed by field offices of UPNEDA as per the rate and suppliers/ manufacturers approved by UPNEDA head office. This type of contract is also termed as 'Rate contract'.

- Contractual Works: Any item of purchase which includes installation work and any work involving construction of any kind shall come in the category of contractual work. The RET based off-grid power projects viz projects under mini-grid solar power plant policy, DDG scheme, and biogas based generation plant comes under this category of the work. Purchases made for such type of projects are made by open tender method so as to have competitive offers on a wider basis.

Operation and Maintenance: The manufacturer/ supplier of RET based off-grid systems is made responsible for conducting operation and maintenance of the systems for the next five years after installation and commissioning. The scope of work under the Work Order issued to the manufacturer/ supplier covers supply installation, and operation and maintenance for a five-year period. The payment release terms are accordingly designed and part payment is retained so as to cover the operation and maintenance period.

Project Monitoring and Evaluation: There are no specific procedures / guidelines for project monitoring, data collection, report preparation and evaluation. UPNEDA website provides statistics of few RET based off-grid systems installed with details of the beneficiaries to whom it has been supplied in the past.

Complaint Redresser Mechanism: UPNEDA had established mechanism for recording complaints about the RET based off-grid systems / application installed in the past from the beneficiaries through toll free telephone numbers. A complaint register is maintained at the headquarters and linked with the UPNEDA website. The complaint register records the complaint date, time of receipt of complaint and mobile number of the beneficiary. Record of the complaints received from other sources i.e. through letters etc has also be maintained and linked to the website of UPNEDA.

2.1 DIAGNOSTIC REVIEW AND IDENTIFICATION OF CRITICAL GAPS

- Undertake renewable energy resource assessment to map the potential areas across the regions/ districts for implementation of RET based off-grid systems / projects in the state. The assessment should comprise such other information as would be useful in developing RET based off-grid systems / projects by private entrepreneurs, such as infrastructure availability, village-wise energy demand, purchasing capacity of consumer, etc.
- Standardize technical specifications for RET based off-grid systems / equipments / devices to be procured by UPNEDA / other state government departments which will bring in uniformity and facilitate smooth operation and maintenance services.
- Specify guidelines for preparation of Detailed Project Report / preparation of standard bidding documents for the RET based off-grid projects to be implemented under contractual works, especially mini-grid solar power plants, DDG projects and biogas projects for power generation.

- Devise mechanism for effective operation and maintenance of RET based off-grid systems / projects though own staff. Development of supply outlets for easy availability of RET based off-grid systems / parts and services in all regions of the state.
- UPNEDA had established mechanism for recording complaints from the beneficiaries through toll free telephone number. A complaint register is maintained at the headquarters and linked with the UPNEDA website. In a similar manner as specified in the job responsibility chart of UPNEDA, mechanism for monitoring, verification and performance analysis of the RET based off-grid systems / equipments installed in the past shall be established.
- Impart capacity building training to other key stakeholders like community, banks/ FIs, NGOs and electrical utility for ensuring successful implementation of mini-grid solar power plants under the Mini Grid Solar Plant Policy.

2.2 SUGGSTED INTERVENTIONS AND ACTION PLAN

- UPNEDA needs to impart necessary training to its staff to undertake renewable energy potential assessment / mapping the potential areas for implementation of various RET based off-grid systems / solutions across the districts / regions in the state. The necessary application software like PV-syst, GIS tools, METEONORM database should be made available to the staff by the SNA.
- It has been noticed that UPNEDA is implementing various programs / schemes for electrification of rural areas using Solar PV based off-grid systems / equipments. However the technical specifications of the equipments / systems proposed under these programs vary in specifications. For e.q. solar home lighting system / solar street light system proposed under various schemes / programs have different specifications. Standardization of the technical specifications of the RET based equipments / systems to be procured under different programs / schemes would help in reducing the capital cost of the system as well and O&M cost in future.
- The SNA shall involve the engineering colleges / polytechnic institutes from the state in conducting testing of the RET based system/equipments on regular basis to ensure adherence to standards specified in the tenders floated for various works.
- UPNEDA should formulate strategies for effective operation and maintenance of RET based off-grid systems / projects by involving local NGOs, and self help groups (SHGs). The local people needs to be trained to look after the operation and maintenance of .RET based off-grid systems / solutions installed in their area, open supply outlets for spare parts in the rural areas.
- Standard guidelines / document for preparation of feasibility report / DPR study for RE based mini-grid project can be prepared as reference document. This document should outline the standard methodology for site survey, RE potential assessment, demand survey, socio-economic survey, selection of RE technology and sizing of mini-grid power plant, design of power distribution network and techno-economic viability check for such projects. The Government of UP has notified separate policy for development of solar based mini-grid project in the state with the help of private entrepreneurs. For large scale deployment of mini-grid projects in the state such type of standard document /manual would be prove useful for the SNA staff.

*The consultant is preparing such manual / standard document for the SNA which can be used while undertaking feasibility study / DPR for RE based mini-grid projects in the state. The brief content of the document is presented in **Annexure 1** of this report. The consultant proposed to consider this as 2nd short term intervention.*

- The SNA shall organize capacity building training programs for stakeholders like community, banks, FIs, NGOs and electrical utilities for awareness creation about RET based Mini-grid power projects and its importance to society

3. ORGANIZATION STRUCTURE AND HUMAN RESOURCE

UPNEDA is registered as a Society under the Societies Registration Act 1860, in the year 1983. The organization is headed by a Director (an IAS officer), assisted by a Secretary / Chief Project Officer deputed by the state government from the Provincial Service Commission Services. The SNA is housed in its own three-storied building located at Lucknow. The SNA has a total staff of 455 on its roll, which includes staff deployed at the UPNEDA head office as well as at district-level field offices. The state sponsored / MNRE sponsored grid-connected as well as off-grid RE programs are being looked after by 10 Project Officers / Section In-charge with the help of supporting staff at the head office. The field offices have a Project Officer assisted by a Senior Engineer and few mechanics-cum-operators and Class IV Staff for overseeing implementation of RE programs at the field level.

UPNEDA has a well-equipped training centre with accommodation facility for around 80-100 participants situated in 10 acres area at Chinhat near Lucknow.

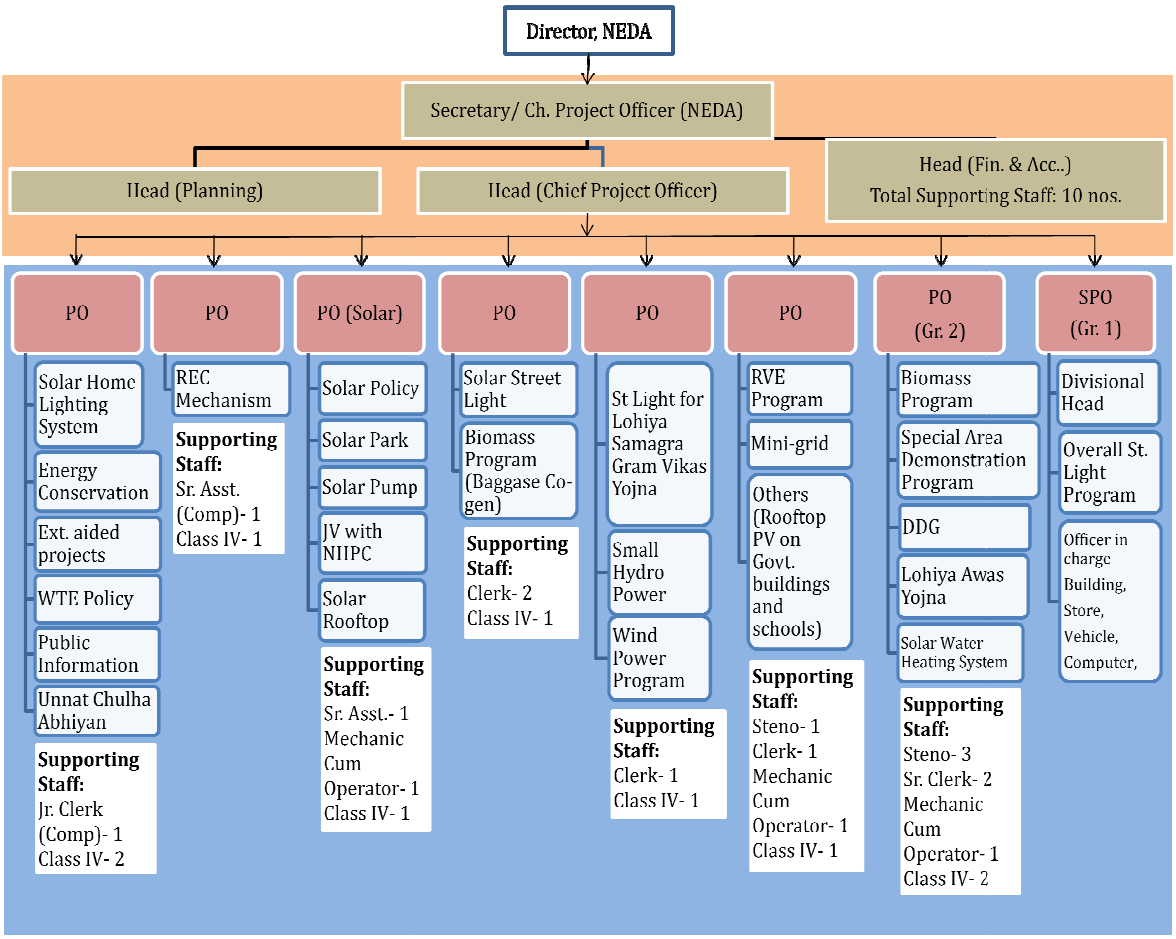

Figure **1** Existing organization structure of UPNEDA Head office

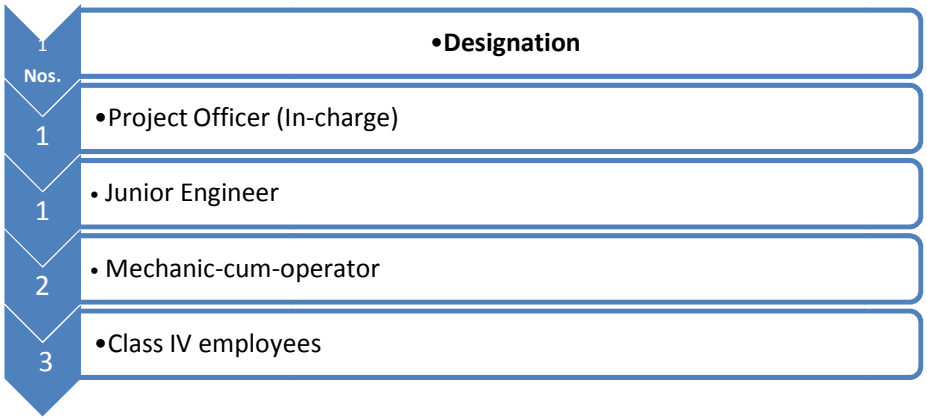

Figure **2** Staffing Pattern at UPNEDA District Office

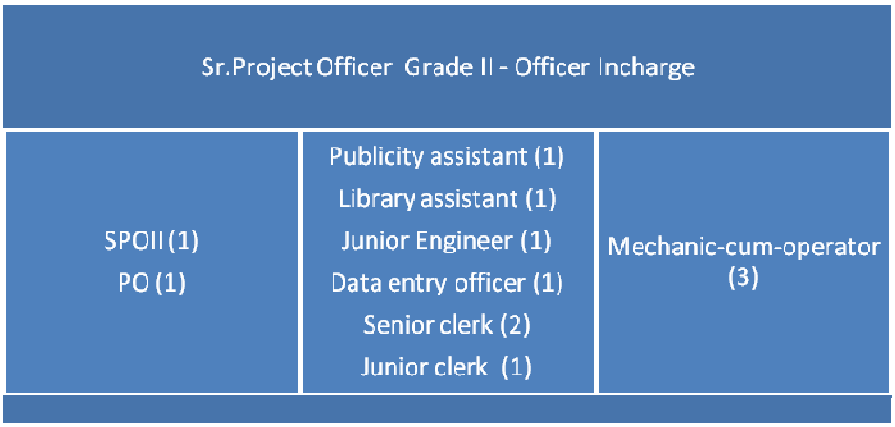

Figure **3** Staffing Pattern at UPNEDA Training Centre, Chinhat

Table **2** List of Officials Working at Present in UPNEDA

S No.	Division of Posts	Sanctioned Posts as per Service Rule Book	Nos. of Regular Working Employees
1	Director		1 (On Deputation)
2	Secretary & Chief Project Officer	01+01 (Class- I PCS)	1 (On Deputation)
3	Finance & Accounts Officer	01+01 (Incumbent)	1 (On Deputation)
4	Sr. Project Officer (Grade- I & II)	03	02 (Grade- I)
5	Project Officer	49	51
6	Finance Officer/ Project Economist	01 (Deputation)	01
7	Publicity Officer	01	01
8	Computer Programmer- 1	01 (Grade- I & II)	01
9	Sr. Assistant	05	04
10	Jr./Sr. Clerk	90 (Jr. Asst. Grade- I & II)	87
11	Administrator	01	01
12	Accountant/ Cashier/ Asst. Accountant	01	03
13	Executive Engineer	79 (JE)	47
14	Mechanic Cum Operator	75	69
15	Publicity Assistant	01	01

S No.	Division of Posts	Sanctioned Posts as per Service Rule Book	Nos. of Regular Working Employees
16	Cost Assistant	01 (Accountant)	01
17	Electrician	01	01
18	PBX Operator	02	02
19	Draftsman Cum Clerk	01	01
20	Surveyor	10	05
21	Data Entry Operator	04	04
22	Driver	18	16
23	Library Assistant	01	01
24	Personal Assistant/ Stenographer	3/ 8	11
25	Urdu Translator Cum Sr. Clerk		01
26	Cyclo Style Operator	01	01
27	Grade IV	138	138
28	Gardner	02	01
29	Sweeper	02	01
30	Specialist	05	00
31	Manager (Marketing)	01	00
32	Marketing Assistant	01	00
33	Private Secretary	02	00
34	Junior Assistant (Training)	01	00
35	Telex Operator	01	00
36	Asst. Accountant	03	00
	Total	517	455

ORGANIZATION STRUCTURE

The senior management including the Director, Secretary, Finance Officer and senior project officers sit at the UPNEDA headquarters. The total employee strength of the head office is around 60, whereas, the remaining 400 employees are posted at project offices located at district headquarters. Project offices of UPNEDA are established in 55 districts out of the 70 districts of Uttar Pradesh. Some of the project offices hold the charge of remaining 15 districts of the state. In terms of geographical spread, the project offices are uniformly located across eastern, central, western UP and Bundelkhand region. Bundelkhand being remote and comparatively undeveloped area in UP has highest numbers of project offices established at the district level. The project offices are represented by a Project Officer In-charge, supported by a junior engineer, few mechanic-cum-operators and Class IV employees. UPNEDA residential training centre at Chinhat has total staff strength of 12 employees of various cadres as shown in the figure above. The training centre is headed by a Grade II Senior Project Officer who acts as In-charge of training centre. Around 60% of the total staff in the SNA is non-technical, and 40% posses technical qualification at different levels (degree, diploma, ITI, etc).

Assessment of Capacity of Each Department

UPNEDA consists of the Planning, Administration, Technical, Finance & Accounts and Publicity departments at the head office where as project offices are located at district level.

Planning department: The Planning Department is headed by a Project Economist who is supported by a Data Entry Operator and two junior assistants. The Planning Department is responsible for preparation of the annual plan, budget, project evaluation and monitoring, conducting monthly meetings etc. The section also involve in preparing replies to questions raised by the Chief Minister as well as those which come up during the legislative assembly and Parliament sessions.

Administration Department: No separate department exists in UPNEDA.

Technical Department: A total of eight project officers are entrusted with the responsibility of implementation of various RET-based grid-connected and off-grid programs / schemes in the state. The details of such project officers including the type of programs / schemes being handled by them and the supporting staff available for assistance is shown in Figure 1 titled 'Existing Organization Structure of UPNEDA. The Senior Project Officers (Grade 1) possess degree in Engineering or post-graduate degree in Science with more than 10 years of experience in project implementation. The Project Officers are engineering graduates, and most of them have more than 10 years of experience in project implementation.

Finance and Accounts (F&A) Department: The Finance and Accounts Department is headed by Finance and Accounts Officer deputed from the state government department. The F&A officer is supported by ten subordinates including Accounts Officer, Accountant, Data Entry Operator, Senior Assistant, etc.

Publicity Department: The Publicity Department consists of a Publicity Officers supported by an assistant, three junior assistants and four Class IV employees. The department mainly looks after the exhibition, and print and electronic media related work.

IT and Communications: The IT and Communication Department consists of one Computer Programmer, three Data Entry Operators, two assistants and one Class IV employee.

Office Assets and Facilities

- Desktop Computers: Head office -44, Field office - 55
- Laptops: 3
- Computer Server: No
- Scanner: 1
- Printer: HO -40. FO-55
- Photocopiers: 1
- Fax: 2
- LCD Projector: 1
- Video Conferencing Facility: No
- Intercom/ EPBAX: Yes
- LAN/ WAN: Yes
- Broadband Connectivity: Yes
- Geographical Information System (GIS) Software: No
- Landline Phones: 5 lines
- Power Back-up: Generator back up

3.1 DIAGNOSTIC REVIEW AND IDENTIFICATION OF CRITICAL GAPS

- UPNEDA is implementing various types of grid-connected / off-grid solar power schemes / programs in the state. At present such programs are shared amongst 8 project officers / sectional heads in the head office. The respective project officers are made responsible for implementation of those programs. For effective implementation of RET based off grid programs/schemes, reorganization of the organization structure is essential. RET based off-grid programs/ schemes meant for electrification of rural areas need to be separated out and assigned to a separate project officer / section in UPNEDA.
- Instead of assigning the Mini Grid Solar Power Plant Program and the DDG Program under two different departments, these two programs can be brought under the purview of the same department / sections as they have a similar implementation framework.
- The supporting staff assisting the Project Officers at the headquarters is inadequate. The Project Officers / Sectional Heads at the Head Office are responsible for planning, techno-economic evaluation, tendering, monitoring of RET based programs and therefore should have supporting technical subordinates to assist them in day to day work.
- Number of sanctioned posts in the Junior Engineer category under UPNEDA Service Rules are 79, against which 47 number of posts are filled at present. Recruitment of Junior Engineers at the Head Office can ease the work of Project Officers.
- UPNEDA service rules provide for appointment of a specialist having specialized degree / knowledge in renewable energy technologies. Such specialists having knowledge in RET based off-grid technologies / project implementation if appointed to implement specialize programs can be useful in up-scaling the RET based off-grid programs/ schemes in the state.
- The staffing pattern and staff deployed at field offices / district level offices looks adequate. The district offices having additional charge of 15 districts should be strengthened by infusing additional supporting staff.
- A state-of-the-art video conferencing facility is required to be put in place at the Head Office for effective communication and program implementation.
- The UPNEDA training centre at Chinhat mostly conducts training programs on installation, repair and maintenance of solar PV systems. These training programs are basically designed for capacity building of technicians / ITI-trained operators working in the solar PV arena in the state. Besides the technicians / operators, capacity building of other stakeholders like NGOs, local government, banks/FIs, utility officials is equally important for up-scaling of RET based off-grid programs / schemes in the state. Specific training can also be imparted to the staff of UPNEDA on policy, regulation, business models, and best practices in implementing RET based off-grid programs/schemes.

3.2 SUGGSTED INTERVENTIONS AND ACTION PLAN

- The consultant has suggested restructuring of the organization structure by keeping in mind the various RET based programs being implemented by the SNA at present. Attempt has been made to bring technology specific / programs of similar nature under one head which will be looked after by the in-charge project officer. The proposed restructuring of the organization, when adopted shall bring simplicity in program implementation and ultimately

result in scaling up of RET based programs in the state. The technical section of the revised organization structure of the SNA shall consist of 7 Project officers who will oversee all RET based off-grid and grid connected RE programs / schemes being undertaken by the SNA. The Project Officer (Grade 1) shall be proposed to be made in-charge of Administration and HR, The Accounts and Finance department shall be remain as it is, while the Planning department is proposed to be strengthen by inclusion of additional supporting staff. The Publicity Department shall be renamed as Publicity and Marketing Department. The technical, Admin, Accounts & Finance, Planning and Publicity and Marketing Department shall report to the Secretary cum Chief Project Officer who will report to Director, UPNEDA. The proposed organization set up, programs handled by individual department and the staffing pattern is elaborated in more detail in Figure 2.

- The suggestion for additional supporting staff for strengthening of the Technical section, Planning section, Publicity section etc are based on the analysis of number of sanctioned post reported in UPNEDA service Rules vis a vis the regular staff working in UPNEDA at present. Therefore creation of new posts for appointment is not required, additional staff can be recruited within the sanctioned post under UPNEDA service Rule.
- As part of SSAP and as suggested by the SNA, the consultant has designed a comprehensive skill up-gradation training workshop module for the field level staff of SNA (technicians/ operators) on solar PV based off-grid applications. The program shall be of 2 days duration, shall have class room session as well as hands on training at field.
- Followed by the 2 day duration skill up-gradation workshop for technicians, the consultant shall organize a 1 day workshop for the senior level /managerial level staff of the SNA office on RE based mini-grid projects covering policy, regulations, finance, business models and case studies from global best practices on implementation of RE based mini-grid projects.
  The consultant has designed the training module along with the program structure, course material and a manual for conducting O&M of solar PV based off-grid systems / applications in the field. The content of the training program and course material is detailed out in ***Annexure 2*** *of this report. The consultant proposes to consider this as short term intervention which will be delivered in stage II of the project.*

- Periodical training to the SNA staff is essential to keep them up-date on latest knowledge in technical /financial / policy –regulatory aspect of renewable energy business. Training is also required to be imparted to the SNA staff dealing with the administrative / accounts / HR related works. Needless to say, the proposed future activities will need specialized training to make them capable of handling new job responsibilities. For enhancing the technical and administrative skills of the staff members, it is necessary to have special fund provision and training plan for all streams of staff members. The training may be organized in-house or externally. Some very essential training modules, institutions who could provide such training, duration, etc, are suggested below:

Table **3** Key areas of staff training and suggested Institutions

Module 1: Technical Areas

Training module	Topic	Duration (Days)	Target Group	Coverage	Training Institute
Module A	Solar Power Technologies	3	Div Head, Project Officer ,	Solar insolation and potential	Solar Energy Centre of India,

Training module	Topic	Duration (Days)	Target Group	Coverage	Training Institute
			Junior Engineer or equivalent	sites, site suitability conditions, grid connected technologies (thermal and PV), world scenario, technology trends, etc.	WISE, IIT. Mumbai,
Module B	Project Appraisal and Approval Procedure	2	Div Head, Project Officer , Junior Engineer or equivalent	Grid and off-grid RE projects pre-feasibility report preparation, Techno-economic proposal evaluation criteria, Vendor/promoter selection procedure	WISE
Module C	Energy Conservation and Efficiency	5	Div Head, Project Officer , Junior Engineer or equivalent	EC Act, 2001, Sector-wise EC &EE potential; Auditing process and techniques; Role of Energy Auditors & Energy Managers, etc.	BEE, SEEM, IIT Mumbai, NPC
Module D	RE Policies and Regulatory Matters	5	Div Head, Project Officer , or equivalent	RE Policies (grid and off grid), Tariff calculation parameters, Renewable Purchase Obligation, Renewable Energy Certificates, Open access and energy trading mechanisms, Energy exchange, etc.	WISE, IIT Roorkee

Module 2: Admin and HR

Training module	Topic	Duration (Days)	Target Group	Coverage	Training Institute
Module A	Service Rules and Labour Law	2	Div Head, Establishment head, Finance and Accounts	Central and State Government service rules, Company service rules, Applicability of Labour Law and important relevant cases, etc.	ASCI
Module B	RTI and Customer Care	2	PIO, Asst. PIO as designated or equivalent	Central and state RTI acts, effective utilisation and impact on system improvement, Customer care practices, Citizen charter and its wide publicity, etc.	State Govt trg Institute
Module C	Organizational Effectiveness.	3	Div Head, Project Officer , Junior Engineer or equivalent	Self awareness. Interactive communication skills. Group dynamics. Leadership styles. Negotiation skills. Motivating and developing subordinates. Managing stress.	NPC, NITIE
Module D	Human Resource Management	5	Div Head, Project Officer , or equivalent	Manpower planning, Recruitment, Performance, career and succession management, Training, development and redeployment, Retention and motivation, Empowerment and team	NPC, NITIE

Training module	Topic	Duration (Days)	Target Group	Coverage	Training Institute
				working.	

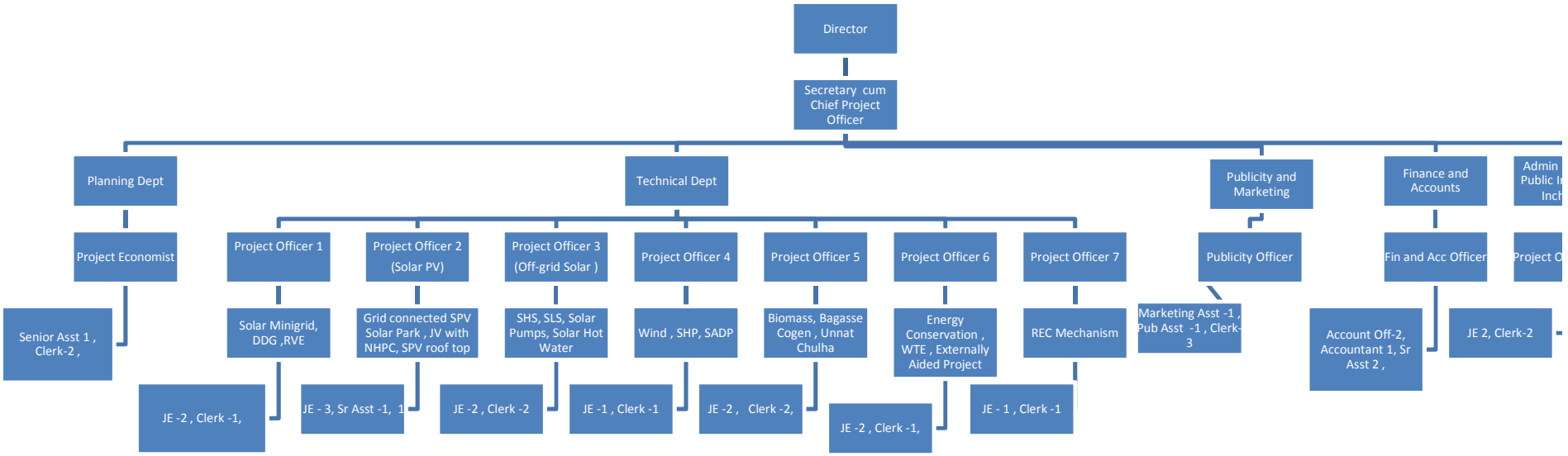

Figure **4** Proposed Organization structure of UPNEDA

*In addition to above staff the Departmental head have other supporting staff like Data entry operator, Steno, MCO, Class IV as per requirement, which can be made available from th existing manpower.

4. FINANCIAL MANAGEMENT AND GOVERNANCE STRUCTURE

The Planning section headed by the Project Economist in UPNEDA prepares the business plan for the state government sponsored schemes for the SNA. The business plan is generally co-terminous with the Five Year Plan of the state government. At the beginning of the financial year, annual business plan indicating the targets for various off-grid / grid-connected RET based schemes / programs along with funding requirement for implementing such programs with state support shall be submitted to the state government. Once the program is sanctioned by the state government, the Finance and Accounts Department monitors the disbursement of funds from the state government as well as timely payment to the agencies implementing the programs.

- Besides, MNRE sponsored programs, the SNA implements various state-government supported RET-based off-grid schemes/ programs, especially based on solar PV technology.
- UPNEDA budget is divided into plan and non-plan expenses. Plan budget is provided for implementation of various RET based programs/schemes in the state, whereas non-plan budget is provided for meeting the salary and administrative expenses. The plan budget has provisions for development of both, grid-connected RE projects as well as RETS based off-grid schemes / programs. The budget approved for FY 2014-15 has provision for planned expenditure of Rs.77.89 Cr, out of which Rs.36 Cr is allocated for development of power evacuation infrastructure proposed under the Solar Power Policy 2013, Rs.5.50 Cr is allocated for state programs, Rs .4.7 Cr for meeting various expenses for the UPNEDA training centres, and Rs. 30.29 Cr for implementation of various RET based off-grid schemes at the district level through the Chief District Officer.
- The Finance and Accounts Department conducts quarterly meetings with the concerned departments to monitor the expenditure made on the various schemes.
- The internal and external audit is being conducted at regular intervals to check the cash inflow and outflow.
- The Establishment Section has prepared a document specifying the roles and responsibilities for staff of the level of Project Officer and below. Periodic orders are issued to the staff by the Director, UPNEDA at appropriate times to specify the roles and responsibilities.
- The staff has access to the circulars and orders issued by the Head Office. The copy of such orders / circulars is displayed on the notice board and circulated to concerned officers as well as to other sectional heads for information.

4.1 DIAGNOSTIC REVIEW AND IDENTIFICATION OF CRITICAL GAPS

- SNAs need to be financially sustainable in long term. At present there is no revenue generating activity carried out by the SNA.
- SNA do not charge service fee or processing fee for providing the services to other departments/ processing applications of investors for approval.
- No capital investment program is planned at present.
- No policy for time-bound career growth or mechanism for granting allowances and incentives to the staff.

- Management Information System is not established at present, and therefore no mechanism to track the day-to-day activities, progress, mid- term review and follow-up action.
- No monitoring mechanism has been set up so far for ensuring compliance to Rules and Regulations.

4.2 SUGGSTED INTERVENTIONS AND ACTION PLAN

- The state government could create a Green Energy Fund by imposing green cess of, say, 5 to 10 paise per unit on commercial and industrial electricity users (similar to that in Maharashtra, which generates about Rs 100 crore annually). The proceeds from the Green Energy Fund can be used for development of RET based programs in the State. Support in the form of subsidy, grant, low interest debt, infrastructure development, capacity building of stakeholder can be extended by utilizing such fund. SNA may install power projects with its own investments to ensure a long-term revenue source (Rajasthan is one such success story). In addition, the SNA may charge private promoters reasonable processing fees as a service charge for facilitating power projects in the state, which can also be a good revenue source (processing fees vary from Rs 0.25 lakh to Rs 5 lakh per megawatt from state to state). Other minor sources of revenue to make the SNA self-sustainable are tender fees, business operations, consultancy etc. Needless to say, the deployment of funds in an efficient manner is also one of the key requirements for success. Hence, the ideal SNA will make optimum use of funds to achieve its social and commercial goals.

  The consultant has given the step wise procedure for creation of Green Energy Fund for promotion of Renewables in Uttar Pradesh . he brief procedure containing the roles of the state government / department in preparation of draft bill by making necessary amendments in Uttar Pradesh Electricity Duty Act -1952 has been elaborated under ***Annexure -3*** *of this report. The consultant proposed to implement this as a short term intervention and assist the SNA in preparing the case for creation of Green Energy Fund in UP during phase 2 of the assignment. .*

5. POLICY AND REGULATORY FRAMEWORK

The state government has not announced an integrated renewable energy policy for the state as on date. However, RE technology specific policies like solar policy, small hydro policies have been announced for development of RE projects in the state.

Solar Policy 2013: Solar Power Policy 2013 aims at development of utility-scale grid-connected solar power projects in the state. The policy will remain effective till 2017. The policy has following provisions for encouraging the private sector for setting up the solar projects in the state.

- The state government shall provide financial incentive equal to the tariff agreed between the IPPs and UPPCL for 12 years for the first 200 MW solar projects commissioned in the state under this policy.
- To encourage solar projects in Bundelkhand region, where barren land is available for development, the state government shall bear the cost associated with establishing the sub-stations and evacuation lines.
- The state government encourages setting up of solar farms in the state. All solar power projects that commissioned under this policy will be given industrial status and shall be eligible for availing the incentives specified under State Industrial Policy 2012.

Small Hydro Policy: UPNEDA has a mandate for development of SHP projects up to 15 MW capacity, whereas the Uttar Pradesh Jal Vidyut Nigam Ltd is responsible for implementing the SHP projects greater than 15 MW capacity. The state government has notified a policy for development of SHP projects identified at the canal falls / and at the foot of the dams in the state with the help of the private sector. The SHP policy has the following provisions for encouraging the private sector:

- State government shall provide government land on lease to the private sector. If required, the state government will acquire private land for setting up the projects by the private entrepreneurs.
- For laying the power evacuation lines, the state government shall provide the right of way facility to the private entrepreneur.
- The electricity generated from such plants shall be exempted from the levy of electricity duty.

Mini Grid Solar Power Plant Policy: Mini Grid Solar Power Plant Policy has been announced with the objective of providing electricity to the un-electrified villages / hamlets situated away from the centralized grid and which are not likely to be electrified in the near future. Under this policy, private entrepreneurs are allowed to set up solar PV power plants of capacity ranging from 10 kW–500 kW at places identified by UPNEDA. UPNEDA shall conduct feasibility study for such projects considering the electricity demand, presence of commercial activities and paying capacity of the consumers. Based on the feasibility study reports, UPNEDA shall float a tender and invite offer for planning, designing, erecting and commissioning, and operation of such projects for a period of 10 years. Some important features of the policy are presented below:

- The capacity of the solar PV plant to be set up shall be in the range of 10 kW–500 kW.
- The capital subsidy of upto 30% of the benchmark cost available from MNRE, GoI, will be provided to the entrepreneurs.
- Additionally, equivalent subsidy of 30% of benchmark cost will be provided by the state government.
- The entrepreneurs are required to invest 40% share from their own account.
- The policy has also recommend tariff structure for such projects . The state government has made a budgetary provision to the tune of Rs.7.225 Cr during FY 2014-15 for implementation of solar mini-grid projects.

Other State Sponsored Programs: Besides above, the state government is also implementing various other off-grid programs / schemes for electrification of rural areas, wherein solar PV technology based applications (solar home lighting / solar street lighting system) are provided as part of the main program / scheme or as a main program. The information on such programs/schemes viz Solar Urja Sahayata Yojana, Lohia Awasiya Yojana, solar street light program, etc is provided under (A) above. The state government usually provides 100% subsidy for such schemes.

REGULATORY FRAMEWORK

The Uttar Pradesh Electricity Regulatory Commission (UPERC) periodically specifies generic feed-in tariff for grid connected RE projects viz bagasse based generation and cogeneration plants, biomass (rice husk based) generation plants, municipal solid waste based generation plants, biogas based generation plants, biomass gasifier based generation plants, small hydro generation plants and solar power generation plants. For RE technologies other than those covered in the regulations, the investors can approach the Commission for project-specific tariff determination on a case-to-case basis.

The UPERC has notified 'Promotion of Green Energy through Renewable Purchase Obligation Regulations', 2010, and specified the Renewable Purchase Obligation on the obligated entities, namely, the distribution licensees, captive consumers, and open access consumers. At present the obligated entities are required to procure 6% of generation from renewable based power projects. Grid-connected renewable energy based projects are allowed to avail the benefit of the REC mechanism.

5.1 DIAGNOSTIC REVIEW AND IDENTIFICATION OF CRITICAL GAPS

- The state government has made adequate provision for RET based off-grid programs/schemes. In fact, the state budget approved for FY 2014-15 has more than 50% budgetary provision for implementation of RET based off-grid programs/schemes. However, it has been observed that most of the programs/schemes are being supported by the state government by providing 100% grant/ subsidy from state government. The funds utilized for providing subsidies can be leveraged for the benefit of more people with the help of innovative market based business models and participation of other stakeholders like NGOs, banks/FIs, manufacturers, suppliers, etc.

- Technical specifications for solar home lighting system /solar street lights under different state supported programs/schemes are not uniform and differ from scheme to scheme.
- For successful operation of mini-grid projects to be set up with the private investors. Capacity building of all stakeholders is required to create awareness about mini grid projects.
- Mandate for development of SHP is divided between UPNEDA and Uttar Pradesh Jal Vidyut Nigam Ltd. UPNEDA is responsible for implementing SHP schemes up to 15 MW, whereas UP Jal Vidyut Nigam Ltd is responsible for implementation of SHP schemes between 15 MW to 25 MW.
- Regulations for promotion of distributed generation and supply projects (mini-grids) in the state are not yet notified by UPERC.
- The state nodal agency has not taken any steps for formulating policy for providing easy and soft financing to RET based systems / projects such as utilizing micro-credit organizations/ rural and cooperative banks to promote RET based off-grid applications. Facilitating small and medium scale industries for manufacturing RET based off-grid systems/applications.

5.2 SUGGESTED INTERVENTION AND ACTION PLAN

- For scaling up implementation of RET based off-grid programs in the state, the SNA should devise appropriate policies to involve all stakeholders including the banks, FIs, NGO, suppliers /manufacturers, community in program implementation. Innovative financing scheme with appropriate business models required to be put in place.
- The SNA should take initiative in providing easy and soft financing to RET based off-grid projects by utilizing micro-credit organization/ rural and cooperative banks / facilitating medium and small scale industries (SME) for manufacturing of RE based off-grid equipment /systems.
- Technical specifications of solar home systems (SHS), street lights etc should be standardized to reduce the manufacturing and O&M cost.
- SNA could follow up with the UPERC for notifying the Regulations on implementation of RE based Mini-grid projects for supply of electricity to un-electrified villages and hamlets in rural area.
- The SNA shall involve the engineering colleges / polytechnic institutes in conducting testing of the RET based equipments / systems on regular basis RET to insure adherence to standard specification announced by the SNA. .

***

ENCLOUSERS

Proposed Short Term Interventions for Implementation during Stage 2 of the Project

Annexure 1 Content of the Standard Document / Manual being developed for conducing feasibility study / DPR for RE based mini-grid projects in the state

Annexure 2 Training module, Program structure, content of course material and a manual for conducting O&M of solar PV based off-grid systems / applications in the field.

Annexure 3 A Case for creation of Green Energy Fund for promotion of RET based projects in Uttar Pradesh

ANNEXURE 1

CONTENT OF THE STANDARD DOCUMENT / MANUAL BEING DEVELOPED FOR CONDUCING FEASIBILITY STUDY / DPR FOR RE BASED MINI-GRID PROJECTS IN THE STATE

Renewable Energy based distributed generation and supply projects (mini-grids) are identified as a thrust area along with decentralized RE based energy access solutions /systems for electrification of remote areas in the states allocated to the consultant. The states if put in descending order show highest percentage of un-electrified households deprive from electricity compare to other states in India, Bihar (83%), UP (63%), Jharkhand (53%), & West Bengal (45%). There is ample scope for implementation of mini-grid projects which can use the local RE sources to generate electricity and distribute it to the surrounding areas. It has been noticed that large scale deployment of RE based mini-grid projects in rural areas can improve the socio-economic conditions of the villages since availability of electricity can encourage local commercial / industrial activities and create job opportunities.

During consultants visit and interaction with the SNA, it has been noticed that at present the SNAs do not have any standard manual /handbook which can be used as guidebook for preparation of feasibility study and DPR for the mini-grid projects. The consult is of the opinion that the such standard manual / handbook on mini-grid project shall be useful for the SNA. Such reference document can be used while conducting feasibility studies and DPRs for mini-grid projects/ appraisal of the feasibility reports / DPRs submitted by the entrepreneurs . The standard manual on mini-grid projects shall cover the following topics:

Content of the Standard document manual

- Policy and regulatory framework for promotion of RET based off-grid projects in India
- Preliminary surveys / investigations to check the feasibility of mini-grid projects
- RE resource assessment studies
- Load profile survey of the consumers
- Socio-economic survey of the area
- Technology selection and sizing of power plant
- Power distribution network design consideration
- Economic viability of mini-grid project
- Questionnaires / survey forms for data collection

ANNEXURE 2

TRAINING MODULE, PROGRAM STRUCTURE, FOR CONDUCTING O&M OF SOLAR PV BASED OFF-GRID SYSTEMS / APPLICATIONS IN THE FIELD

i. Capacity building of field staff (technicians/ operators) in installation and maintenance of off-grid solar PV systems including preparation of O& M manual (Duration – 2days).
ii. Capacity building of managerial staff on Policy, Regulations, financing and business models related with RE based off-grid projects (Duration – 1 Day).

Proposed Venue: For UP and Bihar - UPNEDA Training Centre at Chinhat, Lucknow

The field level staff of SNAs designated as technician / operator / mechanic is actually responsible for supervision and implementation of RET based off-grid programs at the field level. These persons are either posted at the field offices of the SNAs or deputed at the office of District Divisional Commission (DDC) of District Magistrate (DM). These technicians / operators are responsible for overseeing the implementation of RE based off-grid program implementation under the supervision of the Project Officer or sometime higher officers posted at SNA headquarters. The state of Uttar Pradesh, Bihar, Jharkhand and West Bengal have 150,108, 18 and 6 numbers of filed level technicians / operators respectively. It has been noticed that these technicians are recruited long back at the time of establishment of SNAs and has undergone certificate course from Industrial Training Institute (ITI) or some of these technicians are SSC pass.

The technicians are basically trained to oversee the bio-energy programs such as improved chullhas, biomass gassifier systems etc. Very few periodic skills up-gradation programs have been conducted for these staff and therefore they have limited exposure to the new technological advances and applications related to Off-grid RE technologies especially solar based applications. All the four states have huge potential for deployment of decentralized solar based applications / systems for providing electricity / energy access to the rural people. With Central /state governments increased interest in solar power, it become imperative to train these field level technicians /officer in installation and maintenance of solar based off-grid systems / applications.

The proposed training module is developed keeping in mind the educational level of the field staff and the type of task /work they supposed to have performed. Hence in consultation with the SNA this particular training module is developed to train the SNA field level staff in installation and O&M of solar based off-grid systems /applications. The training module is developed to impart all requisite basic knowledge on Solar PV systems. The training program is divided in two parts:

(i) Lectures /presentation on installation, O&M of SPV systems
(ii) Hands on Training on the Field. The details of the program are given below.
(iii) Explaining the use of O&M manual developed for solar PV based off-grid systems / applications

Following topics shall be covered in the 2 day training program developed for the technicians

SN	Topics
A	**Lectures**
1	Solar Photovoltaic market and applications
2	Basics of Solar Photovoltaic and Electricity
3	Solar resource assessment, site survey and PV module orientation
4	System components of Solar PV (module, battery, controller and inverter)
5	Stand alone solar PV system sizing
6	Installation of Mechanical and Electrical components of SPV System
7	O&M, and troubleshooting of SPV System
B	**Hands on Training**
1	How to use Measuring Instruments
2	Measuring of Electrical Circuit
3	Function Check of Charge controller
4	Inspection of SHS
5	Monitoring of existing PV system
6	Measuring Module output

WISE is developing a comprehensive course material which will cover the above topics in detail. The training module shall be delivered in 2 day training program with the help of internal /external experts in the field.

Training module for Senior officers of SNA

Capacity building of managerial staff on Policy, Regulations, financing and business models related with RE based off-grid projects (Duration – 1 Day).

This training module is developed for the managerial / senior level staff of the SNA. The course is designed so as to sensitize the managerial staff of the SNA with regard to the recent policy and regulatory development in RE based off-grid projects. Global best practices in implementation of RE based off-grid programs including financing and successful business models shall also covered in this training module.

Program content

- Policy Framework for development of RE based off-grid projects in India
- Recent developments in formulation of Regulations for operation of RE based mini-grid projects
- Techno-economic viability analysis of RE based mini-grid projects
- Different Business models for RE based off-grid projects
- Best practices / selected case studies – National level
- International Best Practices in operating RE based off-grid projects (Bangladesh, Nepal, Philippines, Lao PDR)

Training Programme on

Installation, Operation and maintenance of off-grid solar PV systems for field staff (technicians/ supervisors) of SNA

Lucknow / Kolkata / Ranchi | …… 2015

Venue:

Programme schedule

Day 1, ……. 2015 (Lectures)

Time	*Content*	*Speaker*
0930–1000	Registration	
	Opening Session: 1000 hrs to 1030 hrs	
1000-1005	Welcome	
1005-1015	Opening remarks	
1015-1025	Objective of the training programme	
1025-1030	Self Introduction of the participants	
	Tea: 1030 hrs to 1045 hrs	—
	Session 2: 1045 hrs to 1315 hrs	
1045–1130	Solar Photovoltaic market and applications	
1130–1230	Basics of Solar Photovoltaic and Electricity	
1230–1315	Solar resource assessment, site survey and PV module orientation	
	Lunch: 1315 hrs to 1415 hrs	—
	Session 3: 1415 hrs to 1545 hrs	
1415–1500	System components of Solar PV (module, battery, controller and inverter)	
1500–1545	Stand alone solar PV system sizing	
	Tea: 1545 hrs to 1600 hrs	—

	Session 4: 1600 hrs –1730 hrs
1600–1645	Installation of Mechanical and Electrical components of SPV System
1645–1730	O&M, and troubleshooting of SPV System

Day 2,…. 2015 (Hands on training)

	Session 5:1000 hrs to 1130 hrs
1000–1045	How to use Measuring Instruments
1045–1130	Measuring of Electrical Circuit

Tea: 1130 hrs to 1145 hrs —

	Session 6: 1145 hrs to 1330 hrs
1145–1245	Function Check of Charge controller
1245–1330	Inspection of SHS

Lunch: 1330 hrs to 1430 hrs —

	Session 7: 1430 hrs to 1600 hrs
1430–1600	Monitoring of existing PV system

Tea: 1600 hrs to 1615 hrs —

	Session 8: 1615 hrs to 1745 hrs
1615–1745	Measuring Module output

	Valedictory Session: 1745 hrs to 1800 hrs
1745–1800	Feedback Valedictory

Draft Program schedule for Training Programme on

Policy, regulations, financing and business models related with RE based off-grid projects

Lucknow / Kolkata / Ranchi | …… 2015

Venue:

Programme schedule

Day 1, ……. 2015

Time	*Content*	*Speaker*
0930–1000	Registration	
	Opening Session: 1000 hrs to 1030 hrs	
1000-1005	Welcome	
1005-1015	Opening remarks	
1015-1025	Objective of the training programme	
1025-1030	Self Introduction of the participants	
	Tea: 1030 hrs to 1045 hrs	—
	Session 2: 1045 hrs to 1245 hrs	
1045–1145	Policy Framework for development of RE based off-grid projects in India	
1145–1245	Recent developments in formulation of Regulations for operation of RE based mini-grid projects	
	Lunch: 1245 hrs to 1345 hrs	—
	Session 3: 1345 hrs to 1530 hrs	
1345–1445	Techno-economic viability analysis of RE based mini-grid projects	
1445–1530	Different Business models for RE based off-grid projects	
	Tea: 1530 hrs to 1600 hrs	—
	Session 4: 1600 hrs –1730 hrs	
1600–1645	Best practices / selected case studies – National level	
1645–1730	International Best Practices in operating RE based off-grid projects (Bangladesh, Nepal, Philippines, Lao PDR)	
	Valedictory Session: 1730 hrs to 1800 hrs	
1730–1800	Feedback Valedictory	

ANNEXURE 3

A CASE FOR CREATION OF GREEN ENERGY FUND FOR PROMOTION OF RET BASED PROJECTS IN UTTAR PRADESH

- At national level, green energy, popularly known as renewable energy or non conventional energy, has been recognized as high priority sector as evidenced by the provisions of Section 61(h) and Section 86 (1)(e) of the Electricity Act, 2003 . In addition, Section 3 & 4 of the Act envisages active role of the state governments. Government of Uttar Pradesh has a greater role to play in promotion of renewable energy through the enabling instruments of Electricity Act, 2003.
- Saving conventional (polluting) energy is also considered as indirect green energy. Chapter 6 and Section 57 of the Energy Conservation Act, 2001 require the state government's proactive role to implement its provisions making sufficient funds available. Uttar Pradesh needs to take timely actions in this sector.
- The Uttar Pradesh Electricity Regulatory Commission has notified 'Promotion of Green Energy through Renewable Purchase Obligation Regulations', 2010, and specified the Renewable Purchase Obligation on the obligated entities, namely, the distribution licensees, captive consumers, and open access consumers. At present the obligated entities are required to procure 6% of generation from renewable based power projects. There is earnest need for provision of sufficient funds by the UP government to enable required growth of renewable energy in the state so that the green energy obligation by the utilities could be realistically fulfilled.
- The National Action Plan on Climate Change has set a goal of a 1% annual increase in renewable energy in the national grid starting from 5% in FY 2009-10 and increasing to 15% of the energy mix of India by 2020. This 15% RE by 2020 has thus effectively become a 'National RPO' though it is not legally mandated. After the announcement of the NAPCC (June 2008) and the JNNSM (November 2009), various initiatives have been taken by the government, the Central Electricity Regulatory Commission and SERCs, to set the momentum to achieve this target. UP being one of the potential states in India in terms of land and solar resource availability has required to pay a major role and contribute significantly to achieve the national capacity addition goal.
- The Jawaharlal Nehru National Solar Mission (JNNSM) aims to establish India as a global leader in solar energy by achieving grid parity by 2022, with 20,000 MW of installed solar power capacity. Besides, for off-grid systems 20 million sq.m. solar thermal collector area and 20 million home lights will be established by 2022.
- Section 8.9 of National Rural Electrification Policy 2006 requires institutional arrangements for back-up services and technical support to systems based on non-conventional sources of energy to be created by the State Governments. Government of Uttar Pradesh will have to take required steps in this direction.
- The Government of India has announced ambitious plan to enhance the current installed RE capacity (32 GW) by multifold. The solar power targets set out in the Jawaharlal Nehru National Solar Mission (JNNSM) are raised from 20 GW to 100 GW by 2022. Additional 15 GW target set for wind power during 12th Five year plan is revised to an additional 40 GW

by 2019. Enhanced budgetary provision by state government is required to contribute to MNRE target.

Constitutionality, Legality and Propriety of Amendment:

- Constitutionality: The Constitution of India empowers the state government to make amendment in the act vide Section 162, 166, 189, 196, 199 (a), 206, 207.
- Legality:
  a) The Green Energy Cess at the rate of Rs 0.05 / per unit is proposed to be levied only on commercial and industrial consumers. Remaining consumers such as residential, agricultural and other non-commercial entities would be unaffected by this additional cess. Thus common man is not affected by this amendment.
  b) As regards, commercial and industrial consumers, they are already paying tariff of around Rs 6.50 to 7 / per unit and further addition of Rs 0.05 through cess will be a minor enhancement.
  c) Further, the amendment in existing act is the prerogative of the state government and does not required previous sanction or assent from the President of India as it does not attract the provisions of Articles 31(2), 31-A(1) and 31-C of the Constitution of India.
  d) In addition, fundamental rights of the citizens of India remain unaffected by this amendment.
- Propriety:
  e) For the targeted RE capacity addition announced in various state government policies considerable government funding is required for supporting the developers as well as creating the necessary evacuation infrastructure. The present budgetary provision of the state government (for FY 2014-15 has provision for planned expenditure of Rs 77.89 Cr, out of which Rs.36 Cr is allocated for development of power evacuation infrastructure proposed under the Solar Power Policy 2013) may not be sufficient Green energy cess provides opportunity to the government to raise required fund.
  f) Union Budget for 2010-11, has made the provision for the imposition of Clean Energy Cess as a duty of excise on coal, lignite and peat with an effective rate of Rs 50 per tonne, which is further increased to Rs 100 per tonne. Collection of even estimated `3000 crores cess per year will be insufficient for such a vast country against the required average `10,000 crores yearly in this sector. Therefore the State of Uttar Pradesh needs to make its own provisions to create Clean Energy Fund.
  g) Availability of Green Energy Cess of estimated Rs 118 Crores annually envisaged as per the consumer wise electricity sale figures of DISCOMs for FY 2014-15. The proposed amendments in the act will help reducing power crisis; generate employment opportunities; keeping the environment cleaner; and attracting large private investment in the state. Thus green energy cess will help the state in socio-economic development.

Table **4** Electricity consumption (MU) by Industrial and Commercial consumers during FY 2014-15

	DVVNL	MVVNL	PuVVNL	PVVNL	KESCO	NPCL	Subtotal (category

							wise)
LMV-2:Non-Domestic	946.56	1018.00	1242.00	1275.03	319.55	32.85	4833.99
LMV 6: Small and Medium Power	760.95	632.00	562.55	1043.65	301.49	47.49	3348.13
HV-1: Non-Industrial Bulk Loads	333.93	453.00	261.66	557.42	118.92	79.24	1804.17
HV-2: Large and Heavy Power	2891.64	1632.00	1312.24	6653.47	427.75	749.78	13666.88
Sub total (Utility wise)	4933.08	3735.00	3378.45	9529.57	1167.71	909.36	23653.17

Source: UPERC

Points for decision:

Following are the points for decision for the consideration of the council:

a) Levy ` 0.05 per unit Green Energy Cess to commercial and industrial consumers of electricity in Uttar Pradesh by making appropriate amendments in the Uttar Pradesh Electricity Duty Act -1952 read with amendment as on dated 3 January 1997.
b) Creation of special purpose fund namely “Clean Energy Fund” under the major head of “Taxes and Duties on Electricity”, which will be utilised only for promotion of renewable energy, energy conservation and capacity building / institutional development for these sectors.

TENTATIVE WORK FLOW AND TIME LINE

Table **5** The tentative Work Flow and Time Line

Sr. No.	Actions to be taken	Tentative Time Frame
1	UPNEDA to get the approval of Board of Directors	0 date
2	UPNEDA to submit proposal to Energy Department	5 days
3	Energy Department to scrutinize the proposal, prepare “Memorandum” for the decision of council and send it to Advisory Departments such as Public Enterprises Department, Finance Department and Law Department and get the file back after their comments	20 days
4	Energy Department to submit final case, with comments of Advisory department, to the Law Department to prepare tentative draft bill and send it to Energy Department	25 days
5	Energy Department to get the draft bill approved from Energy Minister for approval	30 days
6	Bill to be introduced in the legislature through proper procedure and passing the bill by Legislative Assembly.	45 days
7	Getting assent of the Governor	50 days

Sr. No.	Actions to be taken	Tentative Time Frame
8	Law Department to cause the bill to be published in Uttar Pradesh Gazette as an Act of legislation	55 days
9	Law Department to forward to the Govt. of India, Ministry of Home Affairs, a copy of bill as passed by legislative assembly and 10 copies of Act to Law Department of Govt. of India, Ministry of Law.	60 days
10	Energy Department to send 5 copies of the Act to Ministry of Home Affairs, 1 copy to Ministry of Defence and 1 copy to Law Department to Ministry of Home Affairs, Govt. of India	60 days

Note: This proposal to the council need not be referred to UPERC, since, as per the power and duties of SERCs in the Electricity Act, 2003, taxes and duties do not fall in their ambit and is exclusively the prerogative of the state government. UPERC is mandated to regulate only tariff and its other ancillary matters.