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**TRAINING WORKSHOP  
ON  
HYDROPOWER PROJECT  
DEVELOPMENT IN SIERRA LEONE**

VENUE: Fourah Bay College,  
University of Sierra Leone

July 03 – 12, 2013



Alternate Hydro Energy Centre  
Indian Institute of Technology Roorkee  
India

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## TIME TABLE

### TRAINING WORKSHOP ON HYDROPOWER PROJECT DEVELOPMENT IN SIERRA LEONE

**VENUE:** *Fourah Bay College, University of Sierra Leone*

*July 3 – 12, 2013*

<b>Day One: Wednesday, July 3 2013</b>	
09:00 – 10:00	Registration of Trainees
10:00 – 11:00	<b>Welcome/Introductions:</b> Dr. Kelleh Gbawuru Mansaray, UNIDO Energy Coordinator. <b>Presentation:</b> Overview of Training Workshop, Dr. Arun Kumar, IITR, India. <b>Keynote Address &amp; Formal Opening:</b> Dy. Minister of Energy.
11:00 – 11:30	Tea/Coffee Break
<b>TRAINING MODULES</b>	
11:30 – 13:00	• Overview of SHP Development and studies done in the past – <i>Dr Arun Kumar, IITR, India</i>
13:00 – 14:00	Lunch Break
14:00 – 15:15	• Approach for identification of potential sites – <i>Dr Arun Kumar, IITR, India</i>
15:15 – 15:45	Tea/Coffee Break
15:45 – 17:00	• Hands on catchment area delineation and project layout – <i>Dr Arun Kumar, IITR, India</i>
<b>Day Two: Thursday, July 4 2013</b>	
09:00 – 10:30	• Structure for pre- feasibility report and feasibility report– <i>Dr Arun Kumar, IITR, India</i> • Different types of investigations – <i>Dr GCS Gaur, India</i>
10:30 – 11:00	Tea/Coffee Break
11:00 – 13:00	• Hydrological Observations – Methods, Limitations – <i>Dr GCS Gaur, India</i> • Flood estimations – <i>Dr Arun Kumar, IITR, India</i>
13:00 – 14:00	Lunch Break
14:00 – 15:15	• Hydrology of un-gauged catchments – <i>Dr Arun Kumar, IITR, India</i>
15:15 – 15:45	Tea/Coffee Break
15:45 – 17:00	• Flow duration and installation capacity estimation – <i>Dr Arun Kumar, IITR, India</i>
<b>Day Three: Friday, July 5 2013</b>	
09:00 – 10:30	• Existing practice for meeting energy demand – <i>Mr B K Bhatt, India</i> • Survey of load demand – <i>Dr GCS Gaur, India</i>
10:30 – 11:00	Tea/Coffee Break
11:00 – 13:00	• Strategy formulation and regulation for SHP development – <i>Dr Arun Kumar, IITR, India</i> • Survey of power evacuation and distribution lines – <i>Dr GCS Gaur, India</i>
13:00 – 14:00	Lunch Break
14:00 – 15:15	• Environmental impact assessment related investigations (Air, water, soil, flora, fauna, wild life) – <i>Dr GCS Gaur, India</i>
15:15 – 15:45	Tea/Coffee Break
15:45 – 17:00	• Public participation and response – <i>Mr B K Bhatt, India</i>
<b>Day Four: Saturday, July 6 2013</b>	
09:00 – 10:30	• Topographical surveys– <i>Dr RD Garg, IITR, India</i> • Different scales for topographical surveys– <i>Dr RD Garg, IITR, India</i>
10:30 – 11:00	Tea/Coffee Break
11:00 – 13:00	• Instruments used for surveys – <i>Dr RD Garg, IITR, India</i> • Modern equipments for topographical surveys– <i>Dr RD Garg, IITR, India</i>
13:00 – 14:00	Lunch Break
14:00 – 15:15	• Survey for muck disposal – <i>Dr GCS Gaur, India</i> • Geological investigations – <i>Dr GCS Gaur, India</i>
15:15 – 15:45	Tea/Coffee Break

15:45 – 17:00	<ul style="list-style-type: none"> <li>• Landslides and slope stability – <i>Mr B K Bhatt, India</i></li> </ul>
<b>Days Five: Sunday, July 7 2013</b>	
09:00 – 17:00	<ul style="list-style-type: none"> <li>• Travel to project site in university campus for hands on training on discharge measurement, use of GPS, survey equipment, load demand survey, selection of sampling locations, method of survey and investigations – <i>Dr GCS Gaur, Dr RD Garg, Dr Arun Kumar, Mr BK Bhatt</i></li> </ul>
<b>Days Six: Monday, July 8 2013</b>	
09:00 – 17:00	<ul style="list-style-type: none"> <li>• Travel to small hydro power station site outside of Freetown for hands on training on discharge measurement, use of GPS, survey equipment – <i>Dr GCS Gaur, Dr RD Garg, Mr BK Bhatt, Dr RP Saini, Mr MK Singhal, IITR</i></li> </ul>
17:00 – 18:00	<b>Dinner</b>
<b>Days Seven: Tuesday, July 9 2013</b>	
09:00 – 10:30	<ul style="list-style-type: none"> <li>• Planning and preliminary design of diversion weir and intake works - <i>Mr MK Singhal, IITR</i></li> </ul>
10:30 – 11:00	<b>Tea/Coffee Break</b>
11:00 – 13:00	<ul style="list-style-type: none"> <li>• Environment Impact Assessment – <i>Dr GCS Gaur, India.</i></li> <li>• Planning and preliminary design of desilting tank and forebay tank – <i>Mr MK Singhal, IITR &amp; Dr GCS Gaur, India.</i></li> </ul>
13:00 – 14:00	<b>Lunch Break</b>
14:00 – 15:15	<ul style="list-style-type: none"> <li>• Selection and specifications of hydraulic turbines – <i>Dr RP Saini, IITR, India</i></li> </ul>
15:15 – 15:45	<b>Tea/Coffee Break</b>
15:45 – 17:00	<ul style="list-style-type: none"> <li>• Selection and specifications of hydraulic turbines – <i>Dr RP Saini, IITR, India</i></li> </ul>
<b>Days Eight: Wednesday, July 10 2013</b>	
09:00 – 10:30	<ul style="list-style-type: none"> <li>• Planning and preliminary design of channel, tunnel and pipes – <i>Mr MK Singhal, IITR</i></li> </ul>
10:30 – 11:00	<b>Tea/Coffee Break</b>
11:00 – 13:00	<ul style="list-style-type: none"> <li>• Selection and specifications of hydro generators – <i>Dr RP Saini, IITR, India</i></li> </ul>
13:00 – 14:00	<b>Lunch Break</b>
14:00 – 15:15	<ul style="list-style-type: none"> <li>• Planning and preliminary design of penstock and surge tank – <i>Mr MK Singhal, IITR</i></li> </ul>
15:15 – 15:45	<b>Tea/Coffee Break</b>
15:45 – 17:00	<ul style="list-style-type: none"> <li>• Selection and specifications of power evacuation – <i>Dr RP Saini, IITR, India</i></li> </ul>
<b>Days Nine: Thursday, July 11 2013</b>	
09:00 – 10:30	<ul style="list-style-type: none"> <li>• Planning and preliminary design of power house building – <i>Mr MK Singhal, IITR</i></li> </ul>
10:30 – 11:00	<b>Tea/Coffee Break</b>
11:00 – 13:00	<ul style="list-style-type: none"> <li>• Planning and preliminary design of access road and temporary housing – <i>Mr MK Singhal, IITR</i></li> <li>• Preparation of feasibility report – <i>Mr MK Singhal, IITR, India</i></li> </ul>
13:00 – 14:00	<b>Lunch Break</b>
14:00 – 15:15	<ul style="list-style-type: none"> <li>• Cost estimates – <i>Mr MK Singhal, IITR, India</i></li> </ul>
15:15 – 15:45	<b>Tea/Coffee Break</b>
15:45 – 17:00	<ul style="list-style-type: none"> <li>• Cost estimates – <i>Mr MK Singhal, IITR, India</i></li> </ul>
<b>Day Ten: Friday, July 12 2013</b>	
09:00 – 10:30	<ul style="list-style-type: none"> <li>• Financial Analysis – <i>Mr MK Singhal, IITR, India</i></li> </ul>
10:30 – 11:00	<b>Tea/Coffee Break</b>
11:00 – 12:00	<ul style="list-style-type: none"> <li>• Specification for turnkey execution – <i>Mr MK Singhal, IITR, India</i></li> </ul>
12:00 – 13:00	<p><b>Closing Ceremony</b>  <b>Statement:</b> Trainee Representative  <b>Closing Statement:</b> Head of UNIDO Operations  <b>Certification:</b> UNIDO and IITR  <b>Chief Guest:</b> Dy. Minister of Energy.</p>
13:00 – 14:00	<b>Lunch</b>

## SMALL HYDROPOWER PROJECT DEVELOPMENT TRAINING WORKSHOP IN SIERRA LEONE

July 3 – 12, 2013

### LIST OF PARTICIPANTS

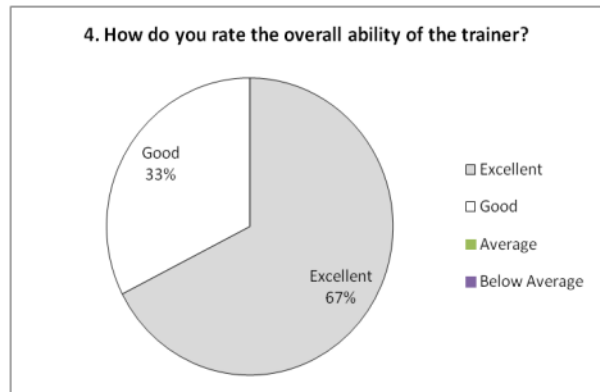
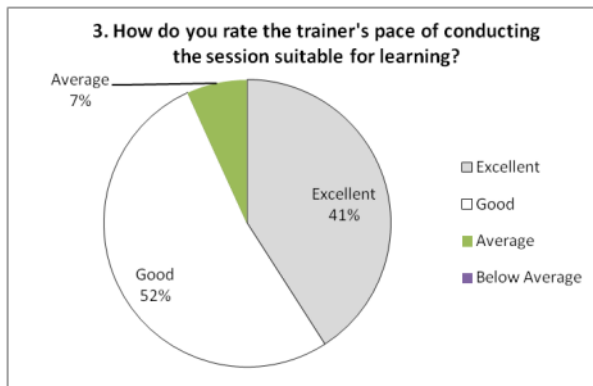
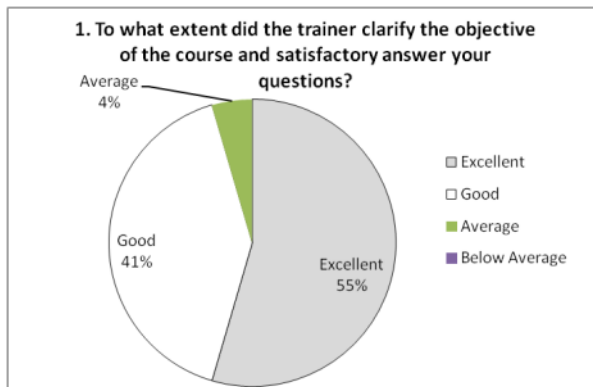
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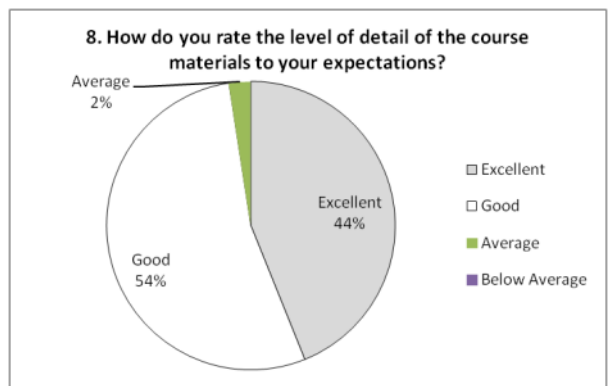
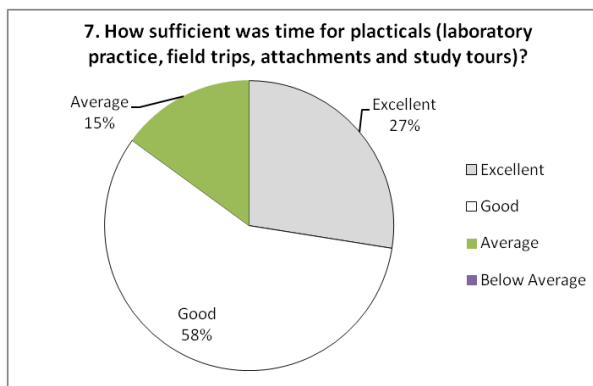
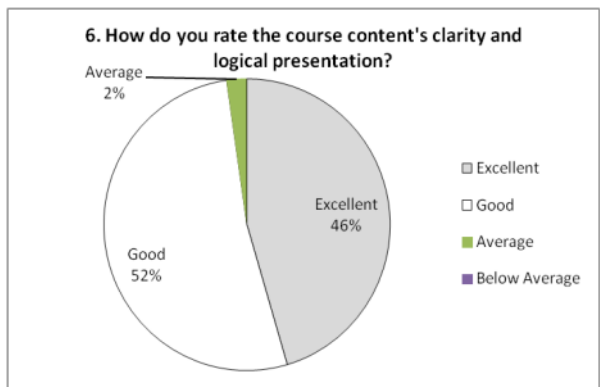
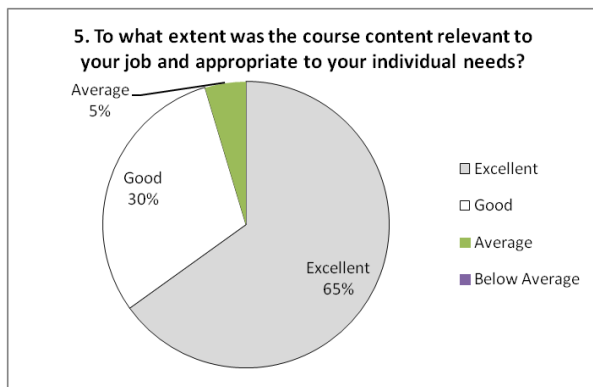
**FEEDBACK**  
on  
Programme for the  
“Training Workshop on Hydropower Project  
Development in Sierra Leone”  
at  
Fourah Bay College, University of Sierra Leone  
from 3<sup>rd</sup> to 12<sup>th</sup> July 2013  
Freetown, Sierra Leone  
Number of participants – 44



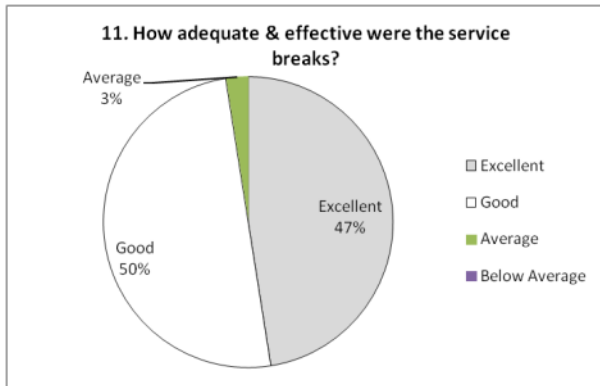
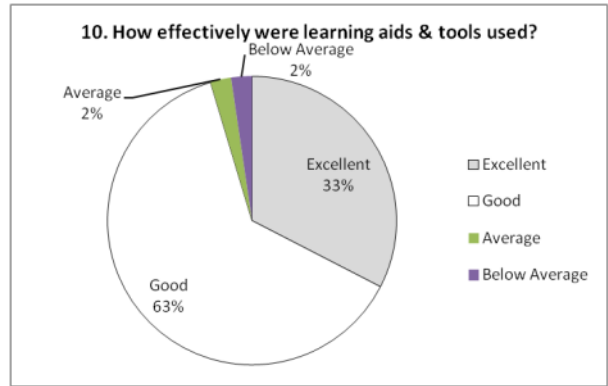
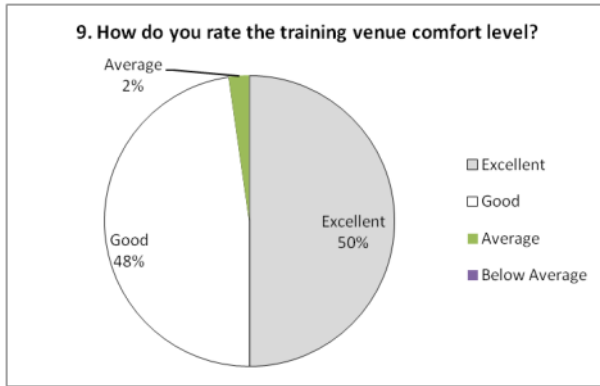
## TRAINER



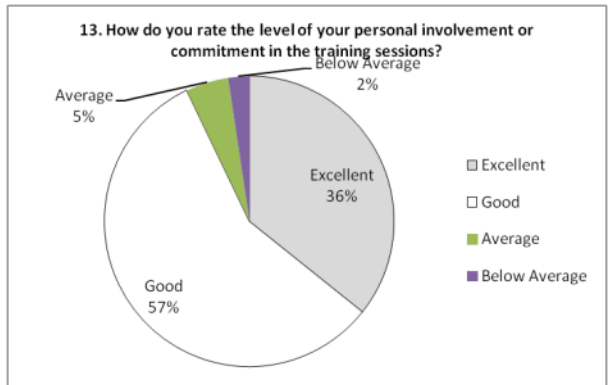
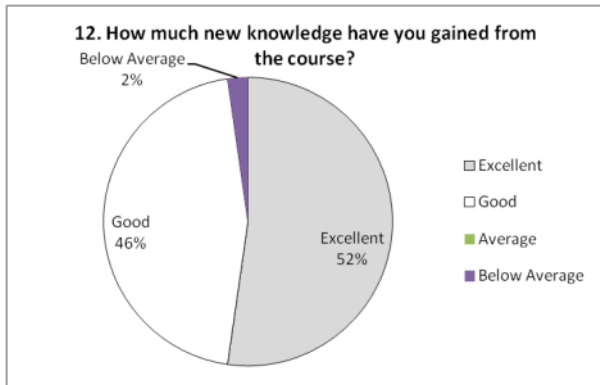
## CONTENT



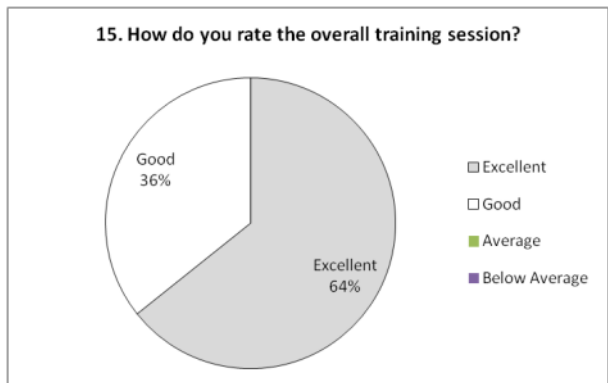
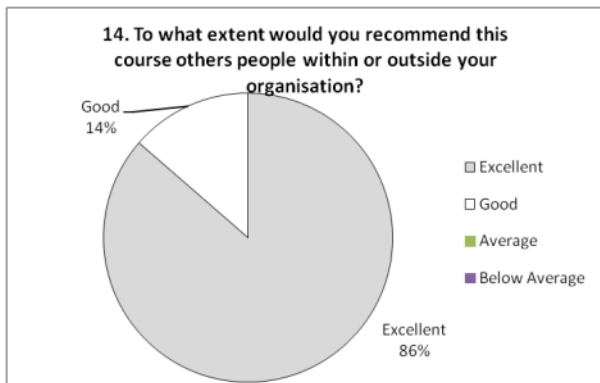
## FACILITY



## LEARNER



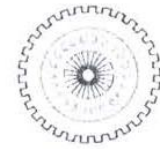
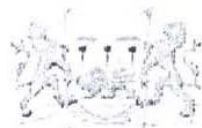
## OVERALL



## ADDITIONAL COMMENTS BY THE PARTICIPANTS:

1. The trainers have excellent knowledge about the programme. Fine if such a programme is conducted every year. The programme is very much appropriate for the development of Sierra Leone.
2. Appealing of UNIDO to be conducting such workshop at regular interval because it is really nice and educating. We appreciate you a lot for this wonderful gesture.
3. It will be nice next time for all participants to have a soft copy of the presentations at least one week before the start of the training.  
**Content:** Average for the industry. Need SCADA details. Soft copy of detail text looks will be necessary.
4. In conclusion, the entire process was worthy and very important for a developing nation (Sierra Leone); this type of training should be conducted in every 2 months.  
**Trainers:** The L1 was influencing the English making it very difficult to understand.  
**Facility:** They were not sufficient food served not good enough.
5. **Trainers:** This concept is good, simple method of teaching.  
**Content:** New Idea are developed, very interesting.  
**Facility:** Very comfortable.  
**Learner:** I can't explain the level of this knowledge.  
**Overall:** It is good to get this kind of training every time possible, very interesting.  
UNIDO to do continuation of the training.
6. I recommend for more detail trainings on Environmental and Impact Assessment for participants if possible extend invitations to more environmentalist.  
**Trainers:** Field instruments/equipments were insufficient for the practical.  
**Content:** As an environmentalist I am very much concern EIA issues. Not much priority was given to it. Weather conditions inhibited the field visits and also insufficient field equipments.  
**Facility:** Transportation was very difficult especially to the college campus.
7. Accent of some trainers were not clear to me. It would be nice for this kind of training to go on with a very good practical. **Content:** Trainees not well organized for practical training.
8. To redo such training again for both academic and professional level. Excellent training session and has contributed greatly towards my final year papers.
9. I will like this kind of course continuation and or go to India for additional training so we will have hydro engineers in Sierra Leone.
10. It is very good.
11. This group of trainers should be maintained.
12. This type of course requires a minimum time of 21 days for more hand on exercise and field visits. Participants of such projects should be attached to ongoing similar projects to enhance or improve on what they have learnt.
13. More training must be done in detail in future. This has been very educative. Mistake in the chauhoffe project have been clearly seen.  
**Trainers:** It was too compressive for the very short time, very good and experienced.  
**Content:** Time too short.
14. Trainers should be organized for specific areas for deeper understanding of concept.  
**Trainers:** Too fast especially for fresher.
15. Please extend this programme to at least all final year mechanical & maintenance engineering students on Campus.

16. Government should encourage student to pursue this course at higher level and also the course should be free of charge at university.
17. I recommend this type of training to the Sierra Leone Institute of Engineers for the maintenance of our hydro systems.
18. There should be follow up courses to further enhance the capacity of the trainees and empower more engineers in the area of tapping the abundant hydro resources in the country.
19. Much was gained from the training, but trainer's medium of communication in terms of accent need improvement for proper grasp by us trainees.  
**Trainers:** Accent of trainers was slight hindrance. More time and equipment needed for practical sessions.  
**Content:** Course materials were very relevant. Exercises were hurriedly done.
20. The course is excellent but we need to visit some sights (hydro) in the future for higher learning.
21. I recommend this kind of training to be offered us in new courses in IITs for more studies (to pay visit in our country for site seeing). Next training helps us to have clarity of the book use, so that we may see and understand.
22. In case of future training provision should be making to visit the Bubua hydro power station.
23. In order to building human capacity in energy development, such course should be done regularly.
24. I recommend that such a course be done in further modules to enhance proper capacity building of participants.
25. It is a good opportunity as a participant to this course as it widens my hydrological view, with a comment; I will be delighted for more apparatus, emphasis to be laid in home country.
26. Much experience gain in the train especially at the sections of turbines for the type of output to be generated. I wish this type of training will be done for further advancement study in the area.
27. For the development of our nation, there should be a continuation of such programme. Further studies involving other engineers for us to become fully experienced and stand on ourselves to develop our country.
28. The course is very interesting and it's very elaborate, so I think that the time should be increase for any time similar workshop is to done in the country. The experts were very good in their presentation and I suggest they are maintained for similar workshop in the near future.



**Programme on  
TRAINING WORKSHOP ON HYDROPOWER PROJECT  
DEVELOPMENT IN SIERRA LEONE**

Venue: Fourah Bay College, University of Sierra Leone  
(July 03 – 12, 2013)

**Course participant's Evaluation Form/Feedback Form**

Dear Participants,

We request you to provide us with objective feedback to make this training process more effective.

The rating scale is: 4 – Excellent, 3 – Good, 2 – Average, 1 – Below average (Please write your remarks in case the rating is 2 or 1)

Sl. No.	INDICATOR/DESCRIPTION	RATING	REMARKS
<b>TRAINERS</b>			
1.	To what extent did the trainers clarify the objective of the course and satisfactory answer your questions?	3	
2.	To what extent did the trainers able to help you learn through activities and exercise?	4	
3.	How do you rate the trainer's pace of conducting the session suitable for learning?	4	
4.	How do you rate the overall ability of the trainers?		
<b>CONTENT</b>			
5.	To what extent was the course content relevant to your job and appropriate to your individual needs?	4	
6.	How do you rate the course content's clarity and logical presentation?	4	
7.	How do you rate the hand on exercise and field visits?	3	
8.	How do you rate the level of detail of the course materials to your expectations?	3	
<b>FACILITY</b>			
9.	How do you rate the training venue comfort level?	3	
10.	How effectively were learning aids & tools used?	3	
11.	How adequate & effective were the service breaks?	3	
<b>LEARNER</b>			
12.	How much new knowledge have you gained from the course?	4	
13.	How do you rate the level of your personal involvement or commitment in the training sessions?	3	
<b>OVERALL</b>			
14.	To what extent would you recommend this kind of training to others and or go for new courses in future if offered?	4	
15.	How do you rate the overall training session?	4	

**Additional Feedback:** (Write in the space below any other comments concerning this course)

The trainers have excellent knowledge about the programme fine if such a programme is conducted every year. The programme is very much appropriate for the development of Sierra Leone.

Thank you for your time to complete this form.

**SOME PHOTOGRAPHS TAKEN DURING TRAINING PROGRAMME  
AND SITE VISIT**



Mr M A Bash Kamara, Dy. Minister of Energy, Govt. of Sierra Leone at the time of Inauguration



Training on Day 1



Mr M A Bash Kamara, Dy. Minister, Govt. of Sierra Leone



With Professor Ogunlade Davidson, Ex. Minister of Energy and Water Resources



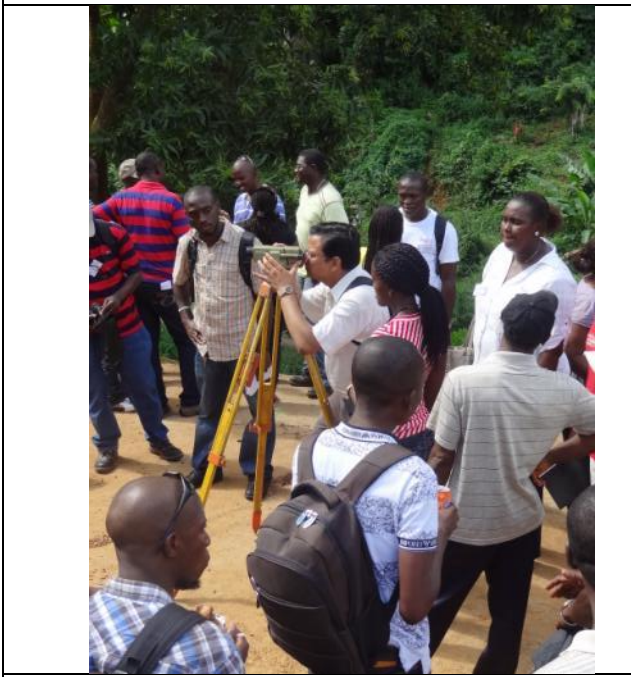
Trainers from IITR India with Dr. Kelleh Gbawuru Mansaray and Mr Benjamin Kamara, Director Energy



Dy Minister distributing the Certificates



Trainees In the field





## COUNTRY UPDATE

### UNIDO Concludes Ten Day Hydropower Development Training Workshop



Deputy Minister of Energy Martin Bash Kamara handing over a certificate to one of the participants

By John Josephata Sessay

As one of the implementing agencies for Global Environment Facility and the implementation of Small Hydro Power (SHP) at Singini Falls in the Moyamba District, the United Nations Industrial Development Organization (UNIDO) under the Mini Grid based \$32 Million project with an approximate capacity of 10MW to be applied between 2013 to 2017 has successfully completed a ten day Hydro Power (HP) development training workshop at the Committee room of Fourah Bay College.

Despite the fact that a key challenges facing SHP development in Sierra Leone are the lack of technical planning, design, operation and maintenance equipment and plant, yet UNIDO in concert with GEF, the Indian Institute of Technology (IIT) and the Ministry of Energy has exhibited delight in overcoming such challenges.

During a ten day training, trainees were exposed to planning, designing, operating, management, technical support for HP development in Sierra Leone and were given an insight to HP type and layouts, design of civil works, hydro mechanical components, turbine, generator, control monitoring and protection, power transformers,

switchyard and power evacuation system.

The objective of the training was to provide theoretical understanding and practical insights to planning and designing of SHP and as expressed by the participants through their representatives they are in a position to address the various stages of SHP development from site location, to design, implementation and cost analysis, analyze and create the preliminary design of a HP scheme and evaluate the impact of SHP plants on the environment and society.

The participant's expressed gratitude for the training and commended UNIDO and partners for imparting knowledge in them.

They confessed that HP is more efficient, beneficial and lasting, outlining the potential knowledge they have gained on HP. They added that Sierra Leone has the potentials to generate above 5,000MW HP expressing the awareness that such can be built and improved.

The participants expressed optimism that capacity building is a major component in any nation building and with what they have learnt they can undertake 1 to 15 MW solar installation and design, in soliciting the Energy

Ministry for continuous support, they promised that more testimonies will come from the group because value has been added to their lives. They called for the establishment of a HP group.

Victor Sawyer from the Environmental Protection Agency (EPA) underscored the essence of Environmental Impact Assessment stating that HP can be made easily available and does not contribute to environmental harm. He said environmental concern must be taken seriously and the gains of any environmental development should match with the development undertaken to prevent future danger. He advised that in as much as the country should develop, which he said is a must, the environmental consequences must be taken into consideration and appropriate actions taken to prevent it from harm.

The Deputy Minister of Energy-Martin Bash Kamara, in his short remarks said the potential for HP development in the country are enormous. He said he is impressed that there are engineers that have the willingness to be part of the country's HP development adding that as well equipped engineers they can be contacted to be involved in varied solar projects.

He congratulated UNIDO, the trainees

and trainers and pleaded for the sustainability and replication of the training as he joined the UNIDO Acting Country Director, Dr. Kelleh Gbawuro Mansaray to distribute certificates to the participants.

The resource person from IIT encouraged the trainees to base their knowledge on what have been learnt and to make good use of such knowledge assuring them that they can develop SHP. He asked the Energy Deputy Minister to always render support to the beneficiaries when it is necessary to do so.

Dr. Kelleh G. Mansaray reiterated that UNIDO is supporting yet another important government function for a better tomorrow. He said the training is well chosen prior to the launch of the Agenda for Prosperity.

He mentioned that the Moyamba 10MW project costing \$25M is a four to five years project of which capacity training is a requirement by the donor along side the EIA.

He assured that by 2017 the whole of Moyamba District will be powered. Dr. Kelleh G. Mansaray therefore commended the participants for the new adventure undertaken and said he is looking forward to their valuable contributions in hydro power development.



# UNIDO Commences 10-Day Hydro Power Development Training

*From Front Page*

implementation and cost analysis, analyze and create the preliminary design of a HP scheme and evaluate the impact of SHP plants on the environment and society.

The participants [40] are degree holders with engineering/scientific background and are representatives of selected government departments, academic institutions, industry and NGOs who are contributing or intend to contribute in HP development in Sierra Leone and therefore are of no age limit.

The resource persons are qualified individuals from Sierra Leone and India.

In his own response the acting head of UNIDO Operations in Sierra Leone Dr. Keeleh Gbawuru Mansaray who also is the UNIDO National Energy Coordinator said the training is the first of such kind. He said in the next five years there will be Industrial Growth Centers in all Chiefdom Head Quarter towns as they are assisting the government in achieving

its aim.

Officially opening the workshop, the Deputy Minister of Energy, Martin Alex Bash Kamara said no country develops without energy stating that it creates economic viability.

He said the president is focused on providing affordable electricity to all Sierra Leonean and therefore shared the determination the Energy Ministry has in generating electricity. He admonished the participants to pay attention to the training and make good use of the opportunity accorded them. He appraised UNIDO for been instrumental in their assistance and to develop Hydro Energy. He said the Moyamba Hydro project is between 10-11 Mega Watts to provide steady flow of electricity to the Southern Province.

He paid tribute to the Indian government for the help they have been rendering to the government and People of Sierra Leone and therefore declared the training open.

The training ends on the 12th July 2013.

# UNIDO Commences 10-Day Hydro Power Development Training

By John Josemata Sesay

The United Nations Industrial Development Organization (UNIDO) being one of the implementing agencies of the Global Environmental Facility (GEF) has been successful in obtaining GEF funds and leverage co-financing for the implementation of a Small Hydro Power (SHP) project at Singimi Falls in the Moyamba District Southern Sierra Leone.

The \$32 Million project dubbed 'Mini Grid Based on SHP for productive

Uses in Sierra Leone' has a capacity of approximately 10MW, and will be implemented between 2013 and 2017. Despite the fact that a key challenge facing the SHP development in Sierra Leone is the lack of technical capacity to plan, build and run Hydro Power (HP) projects, the success of any HP plants depends on successful planning, design, operation and maintenance of the plant and equipment.

In view of this challenge, UNIDO, in collaboration with GEF, Indian Institute

of Technology, [IIT] and the Ministry of Energy (ME) is organizing a 10 day training workshop to provide technical support for HP development in Sierra Leone at the Committee Room of the University House Fourah Bay College. The workshop will cover various aspects of SHP development including planning, design and operating management. The participants will be provided an insight to HP type and layouts, design of civil works, hydro mechanical components,

turbine, generator, control monitoring and protection, power transformers, switchyard and power evacuation system.

The objective of the training is to provide theoretical understanding and practical insights to planning and designing of SHP and it is expected at the completion of the training that participants will be able to address the various stages of SHP development from site location, to design,

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## UNIDO Hydropower Project Development Workshop commences at Fourah Bay College

BY ALIE SONTA KAMARA

The United Nations Industrial Development Organization (UNIDO), in joint effort with the Global Environment Facility (GEF), the Indian Institute of Technology and the Ministry of Energy, has commenced a ten-day Hydro-power Project Development workshop at the Fourah Bay College.

The training, which started past Wednesday to end next Friday at the same venue, saw the participation of forty participants amidst six seasoned Indian energy lecturers from the Indian Institute of Technology.

The training workshop will cover various aspects of Small Hydropower (HP) development, including planning, designing and operating management. The participants will be provided an insight to HP type and layouts, design of civil works, hydro me-



chanical components, hydro turbine, generator, control monitoring and protection, power transformers, switchyard and power evacuation system.

The objective of the training is to however provide theoretical understanding and practical insights to planning and designing of SHP plants.

In his remarks as the chairman of the opening ceremony, the Director of Energy at the Ministry of Energy, Mr. Benjamin Kamara, said their vision is to provide a modernized energy for the wellbeing of all. He

furthered that one cannot talk about prosperity leaving out energy. "It is our aim of developing 1000W energy by the end of 2017. In reality, we have more than 25 hydropower sites round the country, which will enable us to meet this target line," he said, revealing that the country is currently sustaining 91 mega watt energy, thanking UNIDO and the Indian delegates for their relentless effort.

The Acting Director of UNIDO Operations in Sierra Leone, who doubles as the Director energy in the country, Dr. Kelleh Mansaray, as-

sured all and sundry that by the end of the ten-day training, Sierra Leone will boast of 40 well trained hydropower development personnel. On matters of industrial development, he said it is part of UNIDO's plan to work towards having growth centers in all the chiefdoms in the country.

Prior to formally open the workshop, the Deputy Minister of Energy, Martin Alex Bash Kamara, believes that no one can live without energy. He said that it is the view of President Koroma that energy should be accessible to every Sierra Leonean at an affordable cost. "The Ministry is devising new ideas to have a year-round sustainable electricity supply as the Bumbuna Hydro Power plant provides less energy during the course of the dry season," he said, thanking UNIDO and line partners for their intervention. He urged the trainees to take the training seriously.

# UNIDO trains 40 Hydropower Engineers

BY ALIE SONTA KAMARA

The United Nations Industrial Development Organization (UNIDO), in joint effort with the Global Environment Facility (GEF), the Indian Institute of Technology and the Ministry of Energy, ended a ten-day Hydropower Project Development for 40 engineers, which took place at the Fourah Bay College early this month.

The training, which started past Wednesday and ended last Friday at the same venue, saw the forty participants become hydropower engineers having been taught the requisite skills by the Indian energy lecturers from the Indian Institute of Technology. The training workshop covered various aspects of Small Hydropower (HP) development, including planning, designing and operating management. The participants were provided with an insight to HP type layouts, design of civil works, hydro mechanical components, hydro turbine, generator, control monitoring and protection, power transformers, switchyard and evacuation system.

The objective of the training was to how provide theoretical understanding and practical insights to planning and design of SHP plants.

In his remarks as the Chairman of the closing ceremony, the Director of Energy at the Ministry of Energy Mr. Benjamin Kamara said their vision is to provide a modernized energy for the wellbeing of all. "We now count on you whenever the need for hy-



dropower programme arises", he stated. He furthered that one cannot talk about prosperity leaving out energy. "It is our aim of developing 1000W energy by the end of 2017. In reality, we have more than 25 hydropower sites round the country, which will enable us to meet this target line," he said, revealing that the country is currently sustaining 91 mega watt energy, thanking UNIDO and the Indian delegates for their relentless effort in providing the necessary support.

The Acting Director of UNIDO Operations in Sierra Leone, who doubles as the Director of Energy in the country, Dr. Kelleh Mansaray, expressed his gratitude for the funding of the programme. "We are doing this programme for the betterment of Sierra Leone. This project will contribute to the achievement of the energy dreams of the country. We are willing to support the government to achieving this target line," he said, thanking the participants for taking

part in the training and hoping that they will put to practice what they learned. On matters of industrial development, he said it is part of UNIDO's plan to work towards having growth centers in all the chiefdoms in the country.

Closing the ten-day workshop, the Deputy Minister of Energy, Martin Alex Bash Kamara, congratulated all for taking part in the programme. He appealed that the engineers be absorbed into the energy programmes in the country so that they can exercise their knowledge. He said that it is the view of President Koroma that energy should be accessible to every Sierra Leonean at an affordable cost. He believes that management is always important. "The Ministry is devising new ideas to have a year-round sustainable electricity supply as the Bumbuna Hydro Power plant provides less energy during the course of the dry season. "We rely on you," he said, thank-

ing UNIDO and line partners for their intervention. He urged the trainees to make use of the knowledge learned.

Two of the forty participants, one male and the other female, thanked UNIDO and the Indian delegates for the hydropower education given them. They realized that the country has the potential of producing 1000W of energy and that it is obvious that they can resolve for an energy revolution with the knowledge they now have. "We learnt about turbines and generators and how to use them. We believe we are going to make a positive impact in the energy sector. We know that capacity building is important", they maintained, appealing to UNIDO and the Government of Sierra Leone to once in a while be organizing such programmes.

The Indian delegates confessed that this was the only programme that they saw people eager to learn. They believe that hydropower can be started from a lower level. "We saw willingness in the trainees; this is good," they said.

The Representative from the Environment Protection Agency (EPA), Victor Sawyer, said that it is a necessity to undertake an Environment Impact Assessment programme to do energy work. "We should take environmental concerns very seriously. Unmanaged energy undertakings can destroy the environment by taking sediments to river basin. We should always think about environmental consequences when undertaking projects like this," he said.

The distribution of certificates to the trainees climaxed the ten-day workshop.

## LIST OF PRESENTATIONS

1. Overview of SHP Development and studies done in the past – *Dr Arun Kumar, IITR, India*
2. Approach for identification of potential sites – *Dr Arun Kumar, IITR, India*
3. Structure for pre- feasibility report and feasibility report– *Dr Arun Kumar, IITR, India*
4. Different types of investigations – *Dr Arun Kumar/Dr GCS Gaur, India*
5. Hydrological Observations – Methods, Limitations – *Dr GCS Gaur, India*
6. Flood estimations – *Dr Arun Kumar, IITR, India*
7. Hydrology of un-gauged catchments – *Dr Arun Kumar, IITR, India*
8. Flow duration and installation capacity estimation – *Dr Arun Kumar, IITR, India*
9. Existing practice for meeting energy demand – *Mr B K Bhatt, India*
10. Survey of load demand – *Dr GCS Gaur, India*
11. Strategy formulation and regulation for SHP development – *Dr Arun Kumar, IITR, India*
12. Survey of power evacuation and distribution lines – *Dr GCS Gaur, India*
13. Environmental impact assessment related investigations (Air, water, soil, flora, fauna, wild life) – *Dr GCS Gaur, India*
14. Public participation and response – *Mr B K Bhatt, India*
15. Topographical surveys – *Dr RD Garg, IITR, India*
16. Different scales for topographical surveys– *Dr RD Garg, IITR, India*
17. Instruments used for surveys – *Dr RD Garg, IITR, India*
18. Modern equipments for topographical surveys– *Dr RD Garg, IITR, India*
19. Survey for muck disposal – *Dr GCS Gaur, India*
20. Geological investigations – *Dr GCS Gaur, India*
21. Landslides and slope stability – *Mr B K Bhatt, India*
22. Planning and preliminary design of diversion weir and intake works – *Mr MK Singhal, IITR*
23. Environment Impact Assessment – *Dr GCS Gaur, India*
24. Planning and preliminary design of desilting tank and forebay tank – *Mr MK Singhal, IITR & Dr GCS Gaur, India*
25. Selection and specifications of hydraulic turbines – *Dr RP Saini, IITR, India*
26. Selection and specifications of hydraulic turbines – *Dr RP Saini, IITR, India*

27. Planning and preliminary design of channel, tunnel and pipes – *Mr MK Singhal, IITR*
28. Selection and specifications of hydro generators – *Dr RP Saini, IITR, India*
29. Planning and preliminary design of penstock and surge tank – *Mr MK Singhal, IITR*
30. Selection and specifications of power evacuation – *Dr RP Saini, IITR, India*
31. Planning and preliminary design of power house building – *Mr MK Singhal, IITR*
32. Planning and preliminary design of access road and temporary housing – *Mr MK Singhal, IITR*
33. Preparation of feasibility report – *Mr MK Singhal, IITR, India*
34. Cost estimates – *Mr MK Singhal, IITR, India*
35. Financial Analysis – *Mr MK Singhal, IITR, India*
36. Specification for turnkey execution – *Mr MK Singhal, IITR, India*