

East African Regional Training on Operation and Maintenance of Small-scale Hydro Power Plants (SHPP)

Dar es Salaam Workshop Report



Held at the University of Dar es Salaam, Tanzania
26-30 November, 2018



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Jointly organized by the



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



THE FORUM

The training workshop held in Dar es Salaam, Tanzania from 25 to 30 November 2018, was the second workshop on hydropower organized by EACREEE following a study mission in China in March 2017. The training aimed at enhancing the competence of the specialized aspect of operation and maintenance of hydropower station including basics of the electro-mechanical equipment, upkeep during the operation of the plant.

ORGANIZERS

The training workshop was organized by the East African Centre of Excellence for Renewable Energy and Efficiency (EACREEE), in collaboration with the International Centre for Hydropower (ICH) and the University of Dar es Salaam (College of Engineering) and supported by the United Nations Industrial Development Organization (UNIDO).



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SUMMARY

The five-day training workshop brought together 27 small hydropower operators from Tanzania, Uganda, Burundi, Rwanda and Kenya.

The training focused on;

1) Operations

- Operational problems and maintenance in turbines
- Operational problems in generators
- Control and protection equipment
- Operational limitations and application consideration in transformers
- Standards and practices for operation of electro-mechanical equipment
- Operations in the event of an emergency
- Surveillance and Record keeping

2) Maintenance

- Breakdown and preventive maintenance
- Troubleshooting and failure maintenance

3) Health, Safety and Environment (HSE) – Plant safety

4) Latest technology for maintaining reliable electrical connection

5) Renovation, life extension and upgrading of existing stations

6) Technical visit and site inspection

DAY 1

Day 1 of the training workshop was officially opened by Dr Ambrose Joseph Itika – Director Innovation and Entrepreneurship Centre, University of Dar es Salaam after introductory speeches from Mr Victor Akim, National Expert on Energy and environment at UNIDO, Mr Fred Ishugah, Sustainable Energy Expert at EACREEE, Ms Carole Rosenlund, Head of Africa at International Centre for Hydropower, and Mr Emilian Nyanda, Energy Officer at the Ministry of Energy Tanzania.

Read the press release below (also available at: https://www.eacreee.org/sites/default/files/articles/files/Press%20Release%20on%20EAC%20Small%20Hydropower%20Training%20in%20Dar%20Es%20Salaam%20TZ_V1.pdf)



Photo after official opening session



Press Release

East African Regional Training Course on Operation and Maintenance of Small-scale Hydro Power Plants (SHPP) officially opened at the College of Engineering and Technology, University of Dar es Salaam, Tanzania

The East African Centre of Excellence for Renewable Energy and Efficiency (EACREEE), in collaboration with the United Nations Industrial Development Organization (UNIDO), International Centre for Hydropower (ICH) and University of Dar es Salaam (College of Engineering) officially opened the East African Regional Training Course on Operation and Maintenance of Small-scale Hydro Power Plants (SHPP), on 26th November, 2018. The five-day regional capacity building training course is hosted by Centre for Mini-Hydropower (CMHP), College of Engineering and Technology (COET), University of Dar es Salaam, Tanzania

The training course aims at enhancing the competence of the specialized aspect of operation and maintenance of hydropower station including basics of the electro-mechanical equipment, upkeep, operation and maintenance during the operation of the plant.

The opening session was moderated by Dr Bakari Mwinyiwiwa – Principal College of Engineering and Technology, University of Dar es Salaam who emphasized the importance of sharing and gaining new knowledge in the energy sector.

Statement on behalf of UNIDO was delivered by Mr Victor Akim – National Expert on Energy and environment. He said that UNIDO focusses on promoting industrial development for poverty reduction, inclusive globalization and environmental sustainability. He added that UNIDO's Energy-related activities are being carried out under the thematic pillar of Safeguarding the Environment and most of them are aligned with the objectives of Sustainable Development Goal (SDG) No. 7 and the Sustainable Energy for All (SE4All) Initiative. One of the key UNIDO Energy

projects in Tanzania, has been the project for "Development of Mini-grids based on Mini Hydropower resources to augment rural electrification in Tanzania", which was being executed in collaboration with the Vice President's Office – Division of Environment. "It is my pleasure to note that this project has had some significant achievements, including establishment of the Small Hydro Power Centre, here at the College of Engineering and Technology - University of Dar es Salaam, support to around 8 small hydropower demonstration sites which are represented by some of the participants who are attending this training programme," he noted. He said that the development of the SHP Centre at COET has been one of the cornerstone developments of the project and everyone would like to see that the Centre stepping up and playing a leading role in the development of the Small Hydro Power sector. He closed by reiterating UNIDO's commitment to continue working with all stakeholders in the development of the renewable energy sector in the region.

Mr Fred Ishugah – Sustainable Energy Expert, EACREEE, appreciated all participants. He also appreciated the International Centre for Hydropower (ICH), UNIDO, and University of Dar es Salaam for making this training workshop a reality. He noted that the EAC region has a huge potential for small hydropower that remains untapped. "Technical and economic potential of small hydropower in the EAC region stands at 4,097 MW while only 518 MW is being exploited," said Mr Ishugah. He added that small can be in trying to achieve Sustainable Development Goal seven (SDG7) addition to being climate change responsive.

Ms Carole Rosenlund – International Centre for Hydropower, Norway noted that Operation and Maintenance need to be considered at the very initial stage of development of both small and large hydropower. She appreciated the presence of a number of women participating in this workshop. "Women are key stakeholders in such workshops that have traditionally been male-dominated," said Ms Corole. She expressed confidence that there is much to learn from each other's experience in addition to what will be gained from the experts.

Mr Emilian Nyanda – Energy Officer at the Ministry of Energy Tanzania in his intervention cited the efforts of the Government in the promotion of renewable energy. He thanked the initiative in conducting this important workshop as a means to enhance the capacities of operators to be able to deliver sustainable

energy services. Furthermore, he talked of the Government of Tanzania's desire to see a big proportion of renewable energy in the energy mix and willing to support investment together with the private sector and donor organization or countries.

The workshop was officially opened by Dr Ambrose Joseph Itika – Director Innovation and Entrepreneurship Centre, University of Dar es Salaam. In his speech, Dr Itika welcomed all the participants and appreciated UNIDO for continued trust in the college of Engineering and Technology through their support as a Centre for training in Small Hydropower. He further appreciated all the organizers for making this training workshop a reality. He informed the participants that it is now time to focus on delivering sustainable energy services, including exploiting huge untapped potential small hydropower has in the region. He noted that other than being clean if all environmental aspects are considered, hydropower energy is cheap as compared to generation from other sources.

The technical sessions of this training workshop will be composed of theoretical training and practical visits to small hydropower plants. The workshop was attended by 27 participants (18 from Tanzania, 5 from Uganda, 2 from Burundi, 1 from Rwanda and 1 from Kenya).



DAY 2

Day 2 of the training course involved a study tour to Yovi Hydropower Project in Morogoro.



*Study tour to Yovi Hydropower
Project in Morogoro*

DAY 3

Day 3 of the training course focused on detailed discussions and sharing on measures to improve plant efficiency, reliability, availability, and maintainability. The trainer emphasized that the maintenance strategy should optimize asset management by balancing the performance and availability with a reasonable cost. He detailed five maintenance approaches i.e Preventive maintenance (PM), Corrective maintenance (CM), Condition-based maintenance (CBM), Operator-based maintenance, and Reactive maintenance. He noted that good planning and scheduling could be an important aspect to eliminate or minimize risks and improve health, safety and operation environment.



Training in progress



Trainees sharing experiences

DAY 4 AND 5

Day 4 and 5 of the training course focused on electromechanical equipment. Detailed discussion looked at operation problems in turbines and generators, considerations for upgrading small hydropower plants, operations in the case of an emergency, and protection equipment for small hydropower plants.



Illustration to clarify concept



Helping in translation

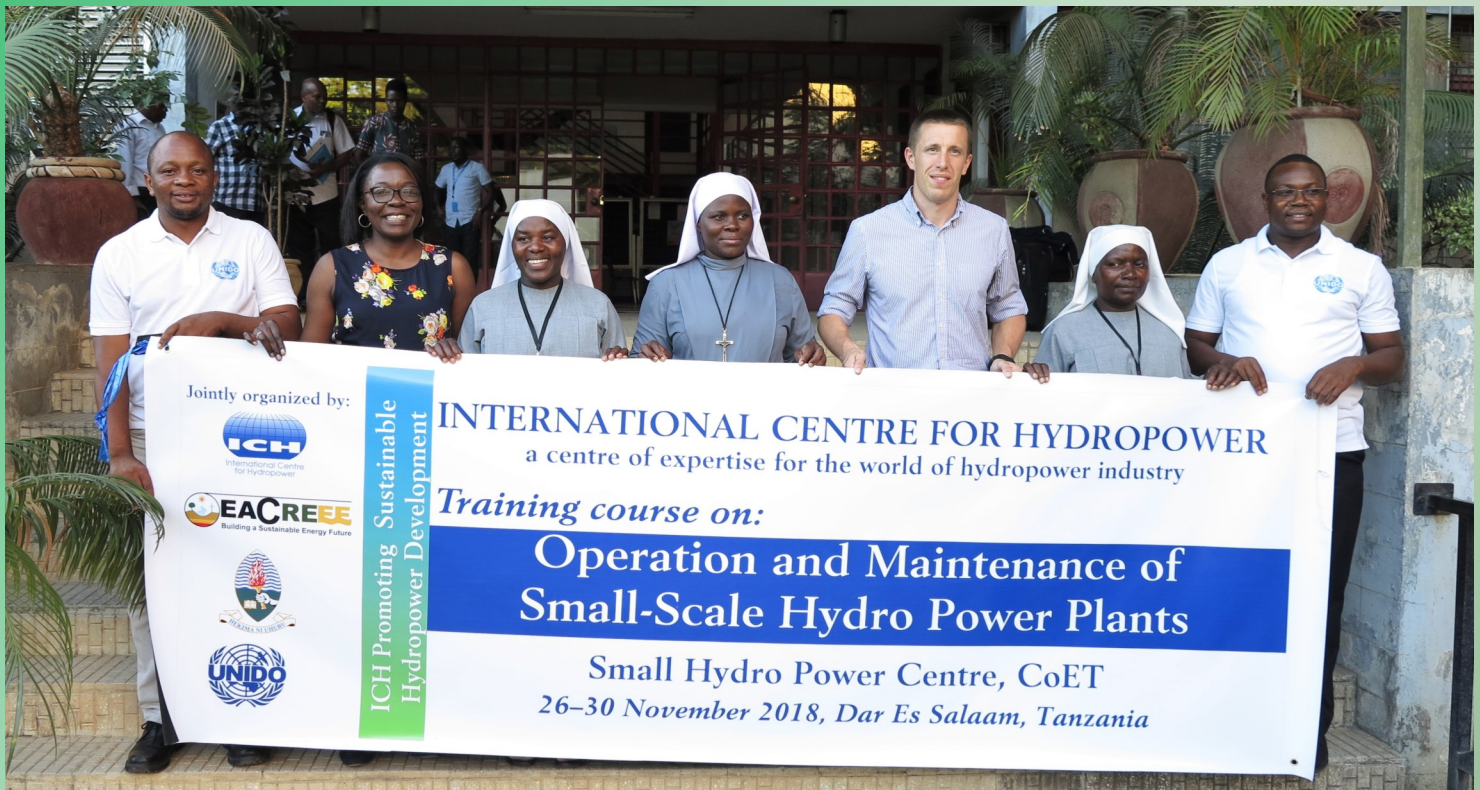


Sharing experiences

CONCLUSION

Participants expressed a desire to work towards improving maintenance and operation of their plants through improving their maintenance strategies, proper planning and scheduling, prioritizing aspects of health, safety and environment and continuous knowledge sharing and gathering.

The training workshop was very interactive with participants sharing challenges they face in operation and maintenance of their assigned small hydropower plants. 27 participants (18 from Tanzania, 5 from Uganda, 2 from Burundi, 1 from Rwanda and 1 from Kenya) who received a certificate of participation after the training attended the workshop. This jointly organized five-day workshop is one component of the many regional training workshops EACREEE is organizing to build capacity.



LIST OF PARTICIPANTS

	Trainee Name	Sex	Host Institute	Country
1	Pierre Claver Muregancuro	M	Burundi Renewable Energy Association	Burundi
2	Anselme Mugabo	M	Hydro Operation Great Lakes Ltd —Rwaza HPP,	Rwanda
3	Jonathan Busungwe	M	Operations & Maintenance Energy (U) Ltd	Uganda
4	Gerald Opolot Kadapawo	M	Operations & Maintenance Energy (U) Ltd	Uganda
5	Emmy Matovu	M	Marma Technical Services Ltd	Uganda
6	Denis Rukundo Nilingiye	M	Centre for Research in Energy and Energy Conservation (CREEC)	Uganda
7	Jasper Bubelwa	M	Andoya Hydroelectric Power, Mbangamao	Tanzania
8	John Fungo	M	Ifumbo SHPP	Tanzania
9	Imakulata Mlowe	F	Lupali SHPP	Tanzania
10	Justine Awario Mungure	M	Arusha National Park	Tanzania
11	Majuto Elias Mtiliko	M	Arusha Technical College	Tanzania
12	Lufunyo Betania Lupenza	M	Arusha Technical College	Tanzania
13	Daniel George Ngwenya	M	Tanzania Renewable Energy Association (TAREA)	Tanzania
14	John Ombeni Mdee	M	SmallHydropower Centre (CoET), UDSM	Tanzania
15	Felix Raphael Mwend'emeke	M	CEFA—Matembwe Village Company	Tanzania
16	Virgilio Modestus Kihwele	M	CEFA—Matembwe Village Company	Tanzania
17	Omega Henry Mangula	M	Chamai SHPP	Tanzania
18	Seventa A. Limpeta	F	Ifumbo SHPP	Tanzania
19	Sipriana Masombwe	F	Lupali SHPP	Tanzania
20	Damson Daniel	M	Tanzania Renewable Energy Association (TAREA)	Tanzania
21	Jimson Asilia Sanga	M	Salala Microhydro project	Tanzania
22	Nicodemus M. Katumbi	M	University of Eldoret	Kenya
23	Ayubu Michael Lwilla	M	Salala Microhydro project	Tanzania
24	Kulwa Masanja	M	Madope Hydro Company Limited	Tanzania
25	Joseph Ngowi	M	SmallHydropower Centre (CoET), UDSM	Tanzania
25	Joseph Kihedu	M	SmallHydropower Centre (CoET), UDSM	Tanzania
27	Wakati R. Mwaruka	M	SmallHydropower Centre (CoET), UDSM	Tanzania

TRAINERS

1. Simen Vogt-Svendsen
2. Rune Dyrkolbotn