



26th MICRO-GRID ACADEMY

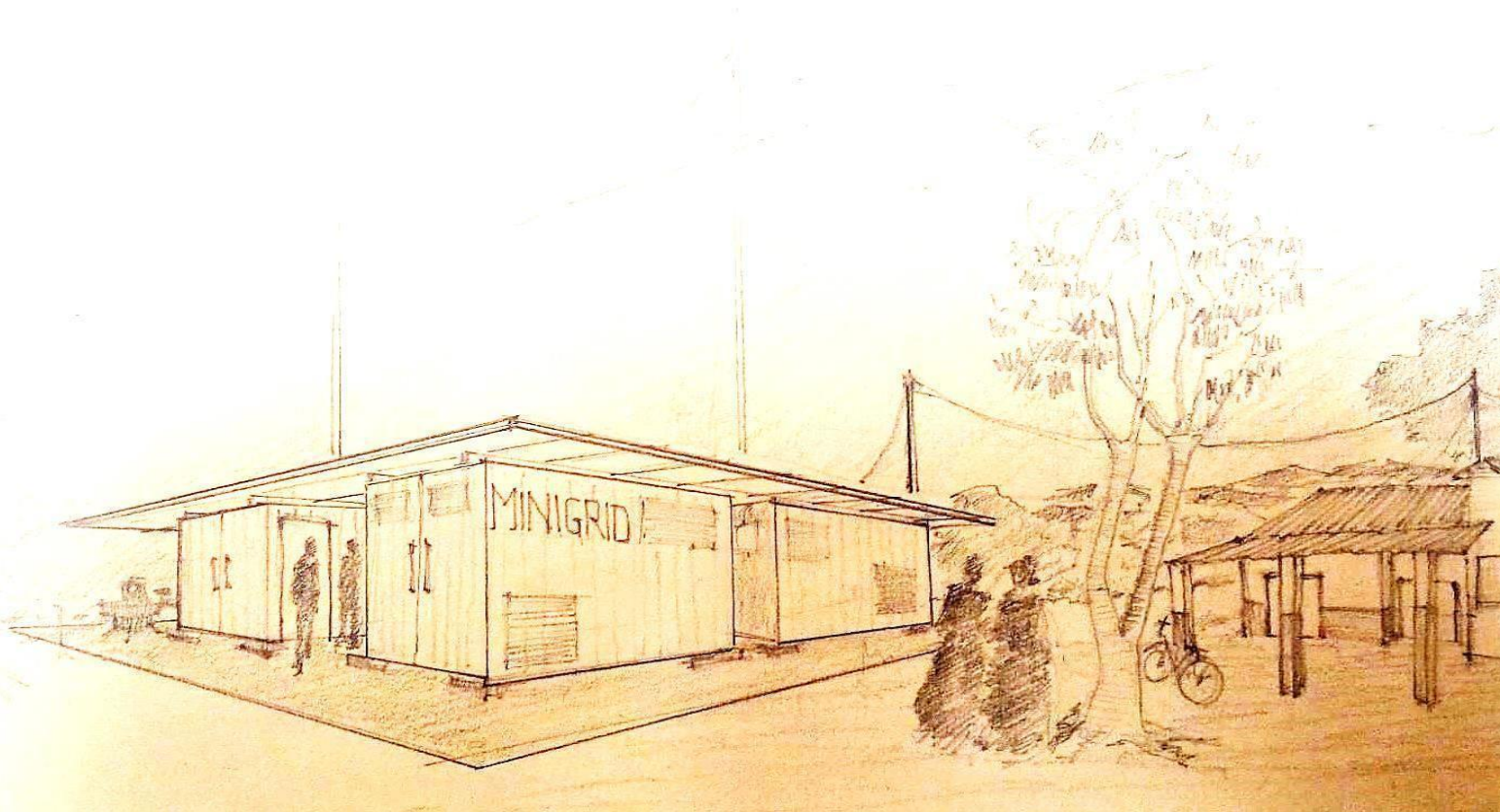
Module #3 - Online Training

**Decentralized Renewable Energy, System Design,
Operation & Maintenance and Safety**

Online training 29-30 November, 1 and 5-6-7 December 2022

Possible Field visit in Kenya, Uganda and Ethiopia

Concept Note



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1. INTRODUCTION AND CONTEXT

The provision of affordable, reliable, and sustainable energy is essential for the development of sustainable economies, as it advances and strengthens productive capacities that promote socio-economic development in an environmentally sound manner. However, all the East African Community (EAC) partner states face significant energy challenges. A huge proportion of the population within the EAC region remains without access to modern energy services and subsequently, the progress in expanding electricity access has lagged behind despite the ever-growing population in the region. Although there has been some progress in scaling up access to modern energy in the EAC region, electricity access in the area is still just about 30%. A lot still has to be done in order to achieve electricity for all by 2030, as per the aspirations expressed in the Sustainable Development Goals (Goal#7). Micro-grids (MGs) are one of the most viable options for generation capacity increase in Africa to solve raising urban and rural electricity needs. Electricity from micro-grids can support new businesses in a village, generating economic development.

In fact, the EAC region has several operational small hydropower plants based on solar photovoltaic, mini-hydro, and other renewable energy technologies. Despite some clear advantages of private sector participation in electrification efforts, there are several challenges that must be overcome to make these projects attractive to potential investors and project developers. The challenges include security of revenue streams, long-term risks and policy certainty, regulatory transparency and complexity, as well as practical challenges relating to local organizational structures and technical skills for operation and management of micro-grids.

2. OBJECTIVES OF THE MICRO-GRID ACADEMY

The Micro-Grid Academy (MGA) was launched in January 2018. In its pilot years of training activities, it has aimed to train over 200 students per year and has managed to reach more than 1600 people mainly from over 40 African countries in the East-Africa, Sahel, SADC such as Ethiopia, Kenya, Mozambique, Zambia, South Africa, and others. The specific objective of the MGA is to conduct capacity-building activities on energy access and decentralized renewable energy solutions directed to African young technicians, managers, and engineers in order to create a specialized local workforce. This will contribute to increasing and improving access to energy in rural communities while fostering local entrepreneurship and job creation through the empowerment of young people's knowledge and skills.

The training program provides participants with comprehensive theoretical and practical training, including technical, economic and regulatory competencies, and advanced tools to assess and deploy the most appropriate solutions in different African energy contexts. This approach enables efficient and effective integration of renewables in emerging electricity markets, whilst nurturing an international network of experts.

Among others, the MGA will contribute to the following:



- Build human capacity for the development and implementation of new energy technologies;
- Strengthen the capacity of key stakeholders and decision-makers to develop and effectively implement RE programs;
- Overcome regulatory, financial, and technical barriers that are preventing the engagement of international private-public sectors;
- Strengthen and expand national and regional networks, stimulating regional cooperation and knowledge exchange;
- Create managerial, technical, soft and entrepreneurial skills among African professionals, including project management and market design, Operation & Maintenance (O&M), and best practices in the policy and regulatory domains;
- Focus on social inclusion, specifically integrating youth and women participation;
- Create networking opportunities and a community of peer experts and professionals that will encourage the exchange of experiences also in the future.

3. COURSE CONTENTS

The training will focus on solar mini-grids through the guide of the new curriculum developed in collaboration with Strathmore University. The new curriculum will provide a general overview of the whole mini-grids value chain for rural electrification and practical learning in labs about renewable energy technologies.

More specifically, this course will deal in detail with Module 3 Decentralized Renewable Energy, System design, O&M and Safety of the MGA Curriculum, namely:

- Module 3.1: System design - manual design and design of software tools
- Module 3.2: O&M of renewable energy systems
- Module 3.3: Safety, health and environmental risks and hazards
- Business and entrepreneurial skills

Relevant topics belonging to

- Module 3.1 are, Load analysis for off-grid system, PV off-grid system design computer aided, Shade analysis, PV module strings – wiring and testing, Wiring diagrams for DC-coupled off-grid PV systems, Lighting and surge protection,
- Module 3.2 PV systems, Operation and Maintenance; Monitoring, control and metering (Solar PV Hybrid Micro-Grids), PV system visits/inspections, Energy consumption.
- Module 3.3 Occupational health and safety; general plant design and operation communication and monitoring; Environmental risks and hazards i.e. physical, chemical, biological and social.

In addition, the training will provide *Entrepreneurship skills* and practical demonstration exercise will be done inside the *Working Groups* dedicated to Productive use of energy in Mini grids for Rural Electrification.

4. METHODOLOGY



The methodology foreseen for this course will be based on e-learning dynamics. More specifically:

- 1) The majority of the training will be delivered via live online lectures (about 4 hours per day). Participants will be granted access to MGA-managed digital tools (Moodle E-learning platform Zoom, YouTube Channel);
- 2) Additionally, the MGA Moodle platform will be used to upload didactic materials, gather feedback, administer surveys, exams, and questionnaires, access the training recordings, provide certificates, etc.
- 3) The e-lectures will be complemented, if possible, by one or more field visits at St. Kizito's mini-grid facility in Nairobi, and/or at Strathmore University Research Center and in other countries (Ethiopia & Uganda) in order to put in practice what the trainees learned beforehand;
- 4) The e-lectures will be managed by lecturers belonging to MGA and RES4Africa stakeholders and partners from private-public high-level entities operating in the energy sector;
- 5) At the end of the training, the students will take a final survey and a final exam to assess the newly acquired skills and knowledge.

5. CERTIFICATE

Upon successful completion, the participants will receive certificates of attendance. The official Certificate of attendance will be granted to the trainees who will have attended at least 70% of the total amount of training hours, and who will have successfully taken the final exam and participated in the final survey.

6. PARTICIPANT'S QUALIFICATIONS AND PREPARATION

- The course is open to about 120 participants from the African States. Priority will be given to nationals of countries belonging to the East African Community;
- Participants will be technicians, students, operators, entrepreneurs, and professionals dealing with Renewable Energy Sector;
- Applicants must be able to speak and read in English;
- Applicants up to 30 years old and women (of any age) will be given priority.

7. REGISTRATION AND SELECTION PROCESS

Applicants should complete the [Application form](#) (uploading in it their CV and Motivation Letter in .pdf). A notification e-mail should be sent to info@microgridacademy.org. The deadline for the completion of the Application form and notification email is 14th of November 2022 at 12:00 pm CET. Endorsement by an employer or a supervisor will be considered a plus, with the reference letter to be uploaded into the Application form. Incomplete applications or applications received after the deadline will not be considered.

The applications will be evaluated by Res4africa; the selected candidates will receive a confirmation email and will be requested to confirm their attendance. Only the confirmed candidates will receive detailed instruction with credentials to get access in the e-learning and virtual platform.



8. FINANCIAL ARRANGEMENTS AND LIABILITIES

Tuition fees will be covered by RES4Africa thanks to the support of Enel Foundation. The organizers will provide course materials. On the occasion of the field visits in Kenya, Ethiopia, and Uganda, the Micro-Grid Academy will only cover costs related to the visit (trainers, venues, etc.), insurance, and a light meal whereas it will not cover travel expenses or other costs of the participant.

1. ORGANIZERS AND PARTNERS

The course is jointly organized by Renewable Energy Solutions for Africa (RES4AFRICA), AVSI Foundation, Kenya Power and Lighting Company (KPLC), Strathmore University, St. Kizito Vocational Training Institute, East African Centre of Excellence for Renewable Energy and Efficiency (EACREEE), Ethiopian Women in Energy (EWiEn), and supported by Enel Foundation. For further information and queries, get in touch with the MGA team (info@microgridacademy.org).

2. FIELD VISIT AND PRACTICAL EXERCISES

The field visits in Kenya, Ethiopia, and Uganda will be a unique chance, for the students, to experience in first person the technologies, concepts, and tools studied in class. The field visit will be destined to those students residing in the city/ country where the visit is implemented. Detailed info will be provided during the course.

3. TIMELINE

Activity	Proposed Date
Launch of the call for applications	28 th October 2022
Deadline of the call for applications	14 th November 2022
Training implementation online	29 th -30 th Nov. and 1 st – 5 th ,6 th ,7 th Dec. 2022
Field visit	TBD

4. TENTATIVE PRELIMINARY AGENDA

6 online training days – schedule under definition from 9.00 am to ca. 2.00 pm CET

Day 1			29/11/2022	Module 3.1: systems design – manual design and design with software tools
Mins	Timeslot (CET)	Timeslot (EAT)	Lesson	Title
15	09:00-09:15	11:00-11:15	INTRO 1	Introduction to MGA, MGA Vision and Partners
10	09:15-09:25	11:15-11:25		Introduction of Training Agenda and methodology



30	09:25-09:55	11:25-11:55	INTRO 2	Introductory session for participants
45	09:55-10:40	11:55-12:40	Opening Lesson	General Overview on Decentralized Renewable Energies
60	10:40-11:40	12:40-01:40		Break
60	11:40-12:40	01:40-02:40	WG	Introduction of Working Groups - focus on Productive Uses of Energy
60	12:40-01:40	02:40-03:40	3.1.1	EPC – Engineering (Design of off-grid hybrid systems)
5	01:40-01:45	03:40-03:45		Closing of the session
285	4.75			
Day 2			30/11/2022	Module 3.1: systems design – manual design and design with software tools
Mins	Timeslot (CET)	Timeslot (EAT)	Lesson	Title
50	09:00-09:50	11:00-11:50	3.1.2	Load analysis for off-grid system
50	09:50-10:40	11:50-12:40	3.1.3	PV off-grid system design computer aided
60	10:40-11:40	12:40-01:40		Break
50	11:40-12:30	01:40-02:30	3.1.4	Shade analysis
70	12:30-01:40	02:30-03:40	WG	Working Groups
5	01:40-01:45	03:40-03:45		Closing of the session
285	4.75			
Day 3			1/12/2022	Module 3.1: systems design – manual design and design with software tools
Mins	Timeslot (CET)	Timeslot (EAT)	Lesson	Title
50	09:00-09:50	11:00-11:50	3.1.5	PV module strings – wiring and testing
50	09:50-10:40	11:50-12:40	3.1.7	Wiring diagrams for DC-coupled off-grid PV systems
60	10:40-11:40	12:40-01:40		Break
50	11:40-12:30	01:40-02:30	3.1.8	Lighting and surge protection
70	12:30-01:40	02:30-03:40	WG	Working Groups
5	01:40-01:45	03:40-03:45		Closing of the session
285	4.75			
Day 4			5/12/2022	Module 3.2: O&M of renewable energy systems
Mins	Timeslot (CET)	Timeslot (EAT)	Lesson	Title
90	9:00-10:30	11:00-12:30	3.2.1	Operation and Maintenance of Micro-grids
60	10:30-11:30	12:30-01:30	3.2.2	Monitoring, control and metering (Solar PV Hybrid Micro-Grids)
60	11:30-12:30	01:30-02:30		Break
70	12:30-01:40	02:30-03:40	3.2.3	PV system visits/inspections



30	01:40-02:10	03:40-04:10	3.2.4	Energy consumption monitoring
5	02:10-02:15	04:10-04:15		Closing of the session
315	5.3			
Day 5			6/12/2022	Module 3.3: safety, health and environment
Mins	Timeslot (CET)	Timeslot (EAT)	Lesson	Title
60	09:00-10:00	11:00-12:00	3.3.1	Occupational health and safety, general plant design and operation communication and training and monitoring
70	10:00-11:10	12:00-01:10	3.3.2	Environmental risks and hazards
60	11:10-12:10	01:10-02:10		Break
45	12:10-12:55	02:10-02:55	3.3.3	Electrical and Fire Safety in Solar PV Microgrids
45	12:55-01:40	02:55-03:40	WG	Working Groups
5	01:40-01:45	03:40-03:45		Closing of the session
285	4.75			
Day 6			7/12/2022	Module 3: DRE, system design, O&M and safety - practical overview
Mins	Timeslot (CET)	Timeslot (EAT)	Lesson	Title
40	09:00-09:40	11:00-11:40	ES-1	Entrepreneurial and business skills
40	09:40-10:20	11:40-12:20	ES-2	Entrepreneurial and business skills
60	10:20-11:20	12:20-01:20		Break
120	11:20-01:20	01:20-03:20	WG	Working Groups Presentation
30	01:20-01:50	03:20-03:50		Closing Remarks
290	4.83			
			TBD	Field Visit
Mins	Timeslot (CET)	Timeslot (EAT)	Lesson	Title
			N/A	Field visit to Ethiopia, Uganda and Kenya