



**EU Grand Challenges Scholars Program**  
**Sapienza University**  
**Field Study Abroad and *Micro Grid Academy***

present



*es on-line*

*from 12<sup>th</sup> May 2020 to 23<sup>rd</sup> June 2020*



**"[ABROAD] You will discover different cultures, you will develop new perspectives and abandoning the daily life, you will improve your social and cultural awareness, which will make you valid for any team."**

**(Head of Department of Engineering at Columbia University)**



## 1. OVERVIEW and AWARDS

**“Renew-ABLE AGAINST CoVid”** is a vibrant on-line Community of Researchers, Professionals, Technicians and Students. The first aim is to realize projects based on Research, Innovation and Needs Collected on Field. The action is based on the delivery of TRAINING and INNOVATION to realize PV plants, and to Monitor, Operate and Maintain the new Energy Systems.

The new Micro Grid Academy and Field Study Abroad course on-line will improve 5 COMPETENCIES for the attendees to get the GRAND CHALLENGES CERTIFICATE. These are the necessary competencies, to be ready to face Grand Challenges and field activities. The National Academy of Engineering of Washington selected the following ones: Research, Management, Intercultural, Multidisciplinary, Social Awareness.

**GCSP- Field Study Abroad with the Micro Grid Academy** created this **“RenewABLE against COVID”** course having a common vision and common goals, interactions between theoretica and practica activities are elaborated during the **Field Study Abroad** and **MGA** experiences, and the **Grand Challenge Scholars Program** of the *University of Rome “Sapienza”*.

A central role is played by the non-profit organization **Technical Solidarity**, with the strong support of **Micro Grid Academy**, born in RES4Africa, with the aim of promoting development and dissemination of sustainable technologies from a social and environmental perspective.

Field Study Abroad places students within international **project management in the field of sustainable development and renewable energies, covering all phases from pre-feasibility to project-design, construction, monitoring and final evaluation**. Topics are approached with an academic methodology and a research-oriented approach, to involve students in scientific discussions.

The further goal of FSA-MGA **“RenewABLE in Emergencies”** is to render young professionals capable of discussing technological, political and social solutions to be addressed to the challenges of developing countries, in both urban and rural areas, with a participatory approach regarding the identification of needs.

The distinctive approach of FSA-MGA lies in the concept of **“learning by doing”**, with frontal lessons during field activities, as well as promoting students’ engagements in Universities, International Organizations and Public Institutions, through internships, training, or job opportunities.

From 2014 Field Study Abroad has seen 16 editions of one months, in Central America and East Africa, for a total of more than 300 participants, as well as MGA from 2018 performed 10 editions of one week modules mostly in East Africa with more than other 300 participants.

The Field Study Abroad had a **nomination of excellence** in the **“Italy-Decides Award 2018” for the Technological Innovation of Sustainable Development, and Innovation of higher education** the award was received by prof. Andrea Micangeli, FSA Founder at the Italian Chamber of Deputies, in the presence of the President of the Italian Republic, *Sergio Mattarella*.

**FSA and MGA already received experts, scholars, and volunteers ready to join the projects from:**

- DREAM Centres of Sant'Egidio Community (Italia - Africa), AINA no-profit organization (Italy – Kenya)
- Technical Solidarity - FSA Program (EU, Africa, Latin America)
- Électricien Sans Frontières (EU Italy)
- Micro Grid Academy, Fondazione RES4Africa (EU - Africa)
- NAE Grand Challenges - GCSP EU Chapter (USA - EU)
- Sapienza University (Rome)
- State University of New York (Syracuse - New York)
- Rochester University (New York -US)



- Kings' College London (UK)
- Oxford University (UK)
- University of Rochester (New York -US)
- University Guglielmo Marconi (Italy)

The classes of 90' are scheduled in Zoom meetings for experts and volunteers, on Tuesday about Renewable Energy System Design and Project Management, on Friday about inter-disciplinary competencies and project on-line tutoring.

### 1.1. Aim of the Course and Delivery proposal On-Line

Now, more than ever, there is a strong **need to reduce distances between the technical view of cooperation and the social sciences**, as well as between the didactics and the **practical experience on the field**. Professionals from technical, economic, and social sectors involved in development cooperation are called to interact in interdisciplinary and transnational contexts. Such skill has nowadays become essential for a meaningful and sustainable contribution within the working environment.

**Flipped Classes:** before the Classes, sufficient material will be distributed to be discussed during lectures, with adequate technical material and overviews on the socio-economic context.

The problem-solving process, as well as the results of each group, will be shared with other groups, to enhance spread of information and methodologies.

Teachers will follow the daily work, leaving the participants time for personal study.

### 1.2. Invited Experts and Agenda

All the 8 meeting from the **12<sup>th</sup> of May** to the **23<sup>rd</sup> of June** of one hour and half are delivered on **Tuesday** and **Friday** on Zoom at the same hour:

6.00 pm – 7.30 pm (Italy) - 8.00 pm – 9.30 pm (Kenya) - 12.00 pm – 1.30 pm (US Atlantic)

<b>12 May 2020 FSA – MGA</b>	<b>Presentation</b>
FSA Greetings	FSA COMPETENCES
MGA Greetings	MGA COMPETENCES
ESFI Greetings	ESF on line COMPETENCES
<b>15 May 2020 FSA – MGA</b>	<b>Work Group Presentations</b>
Energy Need Assessment	COMPETENCE #3: BUSINESS MANAGEMENT
Preliminary Site Assessment	COMPETENCE #1: ENGINEERING
Case Study Kenya Health Centre	COMPETENCE #4: SOCIAL AWARENESS
GCSP North Carolina US	COMPETENCE #5: INTERCULTURAL
Logical Framework Analysis	COMPETENCE #1: ENGINEERING FOR ALL
WORKING GROUPS	COMPETENCE #1: ENGINEERING
<b>22 May 2020 – MGA – FSA</b>	<b>Micro Grid and Emergencies</b>
GCSP New York US	5 COMPETENCES of GCSP
Role of UN-WFP in Renewable	COMPETENCE #2: MULTIDISCIPLINAR
Micro Grid PV System Design	COMPETENCE #1: ENGINEERING FOR ALL
Ehical issues & Smart Communities	COMPETENCE #2: MULTIDISCIPLINAR
Case Study Development	COMPETENCE #1: ENGINEERING



<b>29 May 2020 – MGA – FSA</b>	<b>Mini Grid &amp; Energy Consumption</b>
Special Italian Surprise	COMPETENCE #2: MULTICULTURAL
<b>Biomedical Devices Consumption</b>	COMPETENCE #2: MULTIDISCIPLINAR
<b>Social Return of Investment</b>	COMPETENCE #4: SOCIAL AWARENESS
<b>Mini Grid Optimization</b>	COMPETENCE #1: ENGINEERING FOR ALL
<b>Case Study</b>	COMPETENCE #5: INTERCULTURAL
<b>Case Study</b>	COMPETENCE #5: INTERCULTURAL
<b>6 June 2020 – MGA – FSA</b>	<b>PV Details and Personal Safety</b>
<b>PV Safety and Management</b>	COMPETENCE #1: ENGINEERING FOR ALL
<b>PV Mini Grid Case Study Ethiopia</b>	COMPETENCE #1: ENGINEERING
<b>PV Systems Design on line</b>	COMPETENCE #1: ENGINEERING
<b>PV Projects Trouble Shooting</b>	COMPETENCE #1: ENGINEERING
<b>Safety risks assessment</b>	COMPETENCE #1: ENGINEERING
<b>Battery technologies</b>	COMPETENCE #1: ENGINEERING
<b>Business Plan</b>	COMPETENCE #3: BUSINESS MANAGEMENT
<b>13 June 2020 – MGA – FSA Course</b>	<b>O&amp;M for solar PV hybrid micro grids</b>
<b>GCSP Incubator of Projects</b>	COMPETENCE #5: INTERCULTURAL
<b>O&amp;M for solar PV hybrid micro grids systems</b>	COMPETENCE #1: ENGINEERING FOR ALL
<b>Scheduled preventive maintenance tasks for PV systems</b>	COMPETENCE #1: ENGINEERING FOR ALL
<b>Visual inspection of micro-grids</b>	COMPETENCE #1: ENGINEERING FOR ALL
<b>PV array, inverter, and balance of system maintenance</b>	COMPETENCE #1: ENGINEERING FOR ALL
<b>Battery and Generators Maintenance - troubleshooting</b>	COMPETENCE #1: ENGINEERING FOR ALL
<b>O&amp;M for solar PV hybrid micro grids systems</b>	COMPETENCE #4: SOCIAL AWARENESS
<b>20 June 2020</b>	<b>On Site Inspections</b>
<b>PV systems site visits</b>	COMPETENCE #1: ENGINEERING FOR ALL
<b>Safety guidelines &amp; Equipment</b>	COMPETENCE #2: MULTIDISCIPLINAR
<b>Form for Off-grid PV Systems</b>	COMPETENCE #1: ENGINEERING FOR ALL
<b>Form for Grid-connected PV Systems</b>	COMPETENCE #1: ENGINEERING FOR ALL
<b>Case Study</b>	COMPETENCE #5: INTERCULTURAL
<b>23 June 2020</b>	<b>FINAL CERIMONY</b>
	COMPETENCE #1: ENGINEERING FOR ALL
	COMPETENCE #3: BUSINESS MANAGEMENT
	COMPETENCE #4: SOCIAL AWARENESS
<b>WORKING GROUPS Activities</b>	COMPETENCE #5: INTERCULTURAL
<b>Attendance Certificates</b>	





<b>OTHER SPECIAL ISSUES</b>	
Communication of the Projects	COMPETENCE #4: SOCIAL AWARENESS
Master Presentation	COMPETENCE #2: MULTIDISCIPLINAR
Wind plants for Mini Grids	COMPETENCE #1: ENGINEERING FOR ALL
Biomedical	COMPETENCE #2: MULTIDISCIPLINAR
Energy for Biomedical	COMPETENCE #2: MULTIDISCIPLINAR
Case Study Angola	COMPETENCE #4: SOCIAL AWARENESS
Case Study Hawaii	COMPETENCE #1: ENGINEERING FOR ALL
Financing Models	COMPETENCE #3: BUSINESS MANAGEMENT
Case Study Costa Rica	COMPETENCE #5: INTERCULTURAL
Business Models	COMPETENCE #3: BUSINESS MANAGEMENT
Battery Systems	COMPETENCE #1: ENGINEERING FOR ALL
PV mini Grids Studies	COMPETENCE #1: ENGINEERING FOR ALL
Master Presentation	COMPETENCE #2: MULTIDISCIPLINAR
Piano Presentation	COMPETENCE #2: MULTIDISCIPLINAR
Case Study Venezuela	COMPETENCE #5: INTERCULTURAL

## Students, partner organizations and local communities' outcome

- **Students:**
  - Thesis & Project work
  - Job opportunities
  - Stage (Internship)
  
- **Partners:**
  - Project Development
  - Joint research collaboration
  - Students exchange programs
  
- **Local communities:**
  - Project writing
  - Fundraising advisory
  - Scientific tourism increase

## 2. Co-organising partners

### 2.1 Sapienza University of Rome

Sapienza, University of Rome, started the cooperation through the Interuniversity Research Center for Sustainable Development, in the '90s. Nowadays the *Energy Engineering Didactic Area* (participated by Mechanical and Electric Engineering Professors) involves Students and Researchers in research, training, services, work methods and direct interventions on the territory. Researchers and Volunteers of this group have been working together in the past for the following emergency projects in South Africa (1991), Refugee camps of Ex-Yugoslavia(1993),Solar Panels for Solidarity in Italy, India Pakistan (1995), Chiapas Micro Hydro plant (1997), Afghanistan, Iraq (2001), Solar Prison in Italy (2003) Gaza Hospital Solar Plant (2005), Post Tsunami Crisis in Indonesia (2006), Solar Pumping at Saharawi refugee Camps(2007), Venezuela (2008), in Italy Solar energy for Aquila post-earthquake camps (2009), Chad



Camerun Crisis (2010), Central America Migrations (2012), in Italy for various refugees crisis (2016), East African Refugee Camps (2018), now in Italian Covid crisis (2020).

Most of these projects have been reported on international Scientific Journals and National Newspapers for their Innovation, Solidarity, Technical and Research values.

## 2.2 The Grand Challenges Scholars Program and the State University of New York

The Grand Challenges Scholars Program (GCSP), the Field Study Abroad, organized by Sapienza and SUNY (State University of New York), are pillars of the innovative training activities, promoted to participate to the ongoing projects managed by Technical Solidarity.

FSA promotes the Grand Challenges Scholars Program, as collaborative initiatives with 61 US universities under the US National Academy of Engineering. The main goal is to enhance interdisciplinary collaborations with national and international institutions, focusing on the spread of technical and scientific solutions to achieve social, economic and technological development. Those, in return, are believed to ensure growth and sharing of well-being, without harming the environment, nor any social group (il concetto geografico è già espresso in environment) or future generation.

## 2.3 Technical Solidarity (Tecnologie Solidali as original name)

**Technical Solidarity** as a non-profit organization, is in charge of the logistic and organizational aspects of Field Study Abroad. Further research is needed in order to achieve results that could make people's lives better. For instance, some researchers have great ideas but no possibility to realize them, especially because of a lack of funding. **Technical Solidarity** supports research initiatives, in particular in the field of technologies that reduce the damage caused by war, sustainable development of weaker societies, environmental protection, autonomy of people with disabilities, and other fields of social interest in which scientific development and technological innovation can produce important and durable advantages for people's lives.

## 2.4 Micro Grid Academy and RES4Africa Associates

**Micro Grid Academy** The Micro-Grid Academy (MGA) is a vocational capacity building project led by RES4Africa Foundation and based in Nairobi, that aims at creating skilled and conscious workforce to deploy decentralized renewable energy solutions within and beyond the East-Africa region, thus enhancing access to energy in rural communities while strengthening local enterprises and job creation.

Correspondingly, this positively impacts on health and education, female empowerment, environmental protection and climate change mitigation, as well as reliable water and food production, as highlighted by the framework of the UN SDGs.

Launched in January 2018, trained so far over 300 students from East Africa, Zambia, Ethiopia and Europe. the MGA goal is to train up to 300 people per year ranging from communities' technicians to project managers, developers, engineers and academic students.

The MGA is coordinated by RES4Africa, in partnership with the national Kenyan Utility KPLC, Strathmore University, AVSI Foundation and St. Kizito Vocational Training Institute, supported by Enel Foundation and endorsed by EACREEE. To support the theoretical lectures with practical learning, a hybrid mini-grid will be installed at St. Kizito Vocational Training Institute thanks to the contribution of RES4Africa members.

## 2.5 Companies and Media Partners

Other companies interested in low carbon technologies, rural electrification projects development and implementation, are supporting FSA. They help FSA and participants to be more and more effective, even in the production of books and web publications. Some examples follow:

- Technical scientific book of the activities in Village Projects
- Personalized Photographic Book with names and partner company's logos
- Backpacks and folders of Universities and Partner Companies
- Daily blog on [www.Rinnovabili.it](http://www.Rinnovabili.it)
- Weekly report on [www.TecnologieSolidali.org](http://www.TecnologieSolidali.org)
- Video report on [www.fieldstudyabroad.org](http://www.fieldstudyabroad.org)
- Academic related news on Sapienza on [www.ing.uniroma1.it](http://www.ing.uniroma1.it)



### 3. Field Study Abroad XVII – MICRO GRID ACADEMY ON-LINE

#### 3.1 Admission requirements and course duration

- **Admission requirements:** any student, regardless of age and nationality, interested in university education in a related field can participate in the Field Study Abroad.
- After the on-line Course 1 month course + 1 optional internship, are foreseen to complete the GCSP experience or for an additional period of work experience.

#### 3.2 Topics

- **Renewable energies:** wind turbines, photovoltaic systems, hydroelectric power generation, waste to energy systems, smart grids, urban and rural electrification. Agronomy and food processing technologies are discussed within the international cooperation for development, with the purpose of investigating appropriate solutions to identified problems; students can develop their thesis or project work directly on the field.  
**Project management tools:** Logical Framework Analysis, stakeholder analysis, environmental impact assessment, project monitoring and evaluation.
- **Financial evaluation:** funding opportunities, public-private partnerships, business planning, fundraising and management.
- **Feasibility study:** field survey methods, data collection, desktop analysis, need assessment, cross-cutting issues.
- The course also offers the opportunity to acquire and implement knowledge in the areas of **international cooperation**, political sciences and communication. . Social impact of projects: fieldwork involves a direct relationship with the rural realities (contexts) of Central America, thus facing poverty and real problems of the community. One of the core aims of the course is to encourage local communities to organize cultural and commercial initiatives, i.e. local development tools innovative solutions that boost development distort traditional uses and customs.

#### 3.3 “Learning by doing” approach

A direct field intervention is essential for excellent engineering preparation, and engineering is one of the most important disciplines that can contribute to sustainable development.

The innovative methodology of the course is the concept of "learning by doing" to learn on the field.

The course on "research by doing": it combines the theoretical aspects of design with the practical working experience, giving great importance to field data collection and identification of indicators for evaluation and planning of the intervention.

During the course, tutors assign project works to individuals or groups of students who will be responsible for finding solutions. Successively the students, together with tutors, who are specialized and experienced engineers, work on elaborating the project in all its aspects.

All topics will be explored both at theoretical level and through fieldwork, enabling participants to develop appropriate solutions and gaining experience in preparing action plans:



The student has the opportunity to identify the appropriate solutions to the context in which he intervenes:

- Developing proposals
- Preparing an action plan
- Switching to implementation
- Monitoring
- Managing projects between studies and applications

### 3.4 University contacts and partner institutions

The course also allows the students to get in touch with universities, international organizations and electric companies, thanks to numerous meetings organized during the study period. Various organizations and companies have already hosted FSA participants for internships or work experiences (the stage is for individual students, but in some cases, a small group of two to three students is allowed).

#### ● TRAINERS FROM Universities and Research Centres

- University "Sapienza" – Rome, Italy
- University of Pisa – Pisa, Italy
- State University of New York – New York, U.S.A.

#### ● TRAINERS FROM Partner Institutions and Companies:

- ENEL Green Power, Main power utility company in the world - Kenya
- RES4Africa - Kenya
- UN-WFP, United Nations Agency - Kenya
- AVSI NGO, Non-Governmental Organization for human development, Uganda, Rwanda & Kenya

### 3.5 Detailed Projects and Case Studies

#### - Rwanda – Rutenderi Rural Mini-grid

##### Description:

- Rutenderi is an off-grid village based on maize agriculture economy

##### Phase:

- Commissioning

##### Actions:

- Productive appliances analysis
- Water supply system design
- Community engagement



#### - Rwanda – Musanze 300 kw Mini Hydro

##### Description:







- Rwanda has an electrification rate of 20%

Phase:

- Works and installation

Actions:

- Resource mapping
- Preliminary design
- Link up with agriculture products processing and water supply

**Kenya – Kitonyoni Solar Mini-grid**

Description:

- Roof mounted solar and storage

Phase:

- Revamping

Actions:

- Customers mapping
- Performance analysis



**3.6 Some of the studied Softwares**

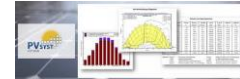
I. Homer

Software for microgrid and distributed generation power system design and optimization.  
<https://www.homerenergy.com/>



II. PV Syst

The PV software suite is the industry-standard for PV plant assessment, siting and energy yield calculation for PV Plants and minigrids.



III. I-tree

Software suite from the United State Forest Service (USDA) that provides urban and rural forestry analysis and benefits assessment.



**4. Costs and benefits**

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**4.1 Budget and participant selection**

In order to facilitate positive engagement for FSA participants in its (and others’) Rural Projects, the non-profit organization "Tecnologie Solidali Onlus" encourages the following:

1. Every interested person is welcome to candidate itself
2. To submit a candidature, send an email to [info@fieldstudyabroad.org](mailto:info@fieldstudyabroad.org) with name and motivation letter (maximum one Word page).
3. The selection of participants is based on CV, motivation, and of course, each donor can endorse a trusted witness.



4. Every candidate is invited to stimulate donations in crowdfunding by individuals and companies to be endorsed and then nominated "Volunteer and Witness of Rural Projects".
5. Upon a **Free** donation **for every class** to **Technical Solidarity Charity**, a new Candidate Participant is selected from the list as "Volunteer and Witness of Rural Projects", it will be invited to participate in the next FSA or MGA on field.

## Final Certification and Benefits for Attendees

- Attendance Certification by **MGA and Technical Solidarity**
- Every participant, after fulfilling the FSA experience, will be invited **to become a mentor** for the next editions, with compensation as an incentive.
- Every participant, after fulfilling the FSA On-Line experience, will be invited to complete a Report for Grand Challenge Scholar Program Prize by **the National Academy of Sciences**.
- Upon the evaluation of a personal project presented also **3 Credits by Sapienza** Engineering Faculty GCSP – Renewable Energy System Design will be assigned.

## Technical Solidarity Contacts

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● **FSA Staff**  
[info@fieldstudyabroad.org](mailto:info@fieldstudyabroad.org)

● **On site Team**

**Andrea Micangeli**

FSA Founder – Adj Professor at SUNY and University of Rome apienza  
[andrea.micangeli@uniroma1.it](mailto:andrea.micangeli@uniroma1.it)

**Carlo Tacconelli**

Technical Director - EnGreen Srl, Roma  
[carlo.tacconelli@meridianaenergy.com](mailto:carlo.tacconelli@meridianaenergy.com)

For a video resume please click:

<https://youtu.be/jhq5vgVZX5A>

● **Websites & Sponsor**



<https://www.res4africa.org/microgridacademy/>



[www.tecnologiesolidali.org](http://www.tecnologiesolidali.org)



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