



**Annual Report
2019**

***Committed to fostering the sustainable
development of communities.***

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Who we are

FOSS Research Centre for Sustainable Energy of the University of Cyprus is a research powerhouse in the field of sustainable energy solutions and in particular photovoltaics, demand side management, energy storage, smart cities and micro/nanogrids. Committed to undertaking high quality research in order to tackle the climate and energy security challenges of today and the future, FOSS has currently over 40 active research projects, mainly funded by European agencies, achieving imposing results.

FOSS' deep and lasting collaborations with other research institutions, industry and policymakers assist in translating the pioneering research it generates into

environmental and social benefit in the wider world. Driven by the vision to conduct transformative research with long-term impact, FOSS organizes numerous workshops and trainings on an annual basis to engage with communities and key stakeholders, to disseminate knowledge and lead discussions which assist in influencing and informing energy policies.

At the heart of what FOSS does and the activities it engages in, is the vision to bridge the gap between research and practice, link education with state-of-the-art real-life solutions and merge technological developments with practical requirements.

Vision	Establish a Research and Innovation hub of excellence that generates novel ideas, provides a strong stimulus for interdisciplinary co-operation and internationally respected, state-of-the-art training and education centre.
Mission	Generate an effective research and innovation culture in Cyprus and the surrounding region, promoting effective co-operation between academia, industry and business sectors, as well as contributing to the transfer of knowledge from advanced European clusters to the region. The centre aims to create a test-bed and "living lab" in the areas of energy and sustainability, which will be a major driver to facilitate commercialization of innovation in energy-related fields in Cyprus, Europe and the Middle East / North Africa region.
Expertise	<ul style="list-style-type: none"> • Renewable energy sources with emphasis on solar energy (Photovoltaics) • Distributed generation • Smart cities, microgrids, nanogrids • Smart electricity networks • Nearly Zero Energy Buildings • Enabling technologies including energy storage, demand side management • Electric mobility • Energy policy and regulations • Energy economics

Our Year in Numbers



Director's Foreword



“
***We think big,
 start small,
 from residential,
 rural regions.***
 ”

There has never been a more exciting time for FOSS Research Centre for Sustainable Energy. 2019 was a spectacular, highly successful, hugely rewarding year with significant progress made on all fronts, setting strong foundations for the years ahead. FOSS continues growing its community, currently having over 50 members, primarily consisting of research fellows and PhD students.

FOSS' lifeblood is to conduct and disseminate cutting-edge research and engage in activities that have positive impact, and benefit the society, environment and climate. In 2019, we reached a new record of active research projects, exceeding 42, contributing over 9 million euros of funding to the University of Cyprus. It was particularly rewarding that FOSS was the only coordinating partner from Cyprus to have been selected for funding from the ENI CBC Med Programme. The research project 'BERLIN', which won a 2.8 million euros funding, is a landmark project for the University of Cyprus as well, as it will assist the campus on its road to achieving energy smartness self-sufficiency.

It was also extremely encouraging to see one of the completed research projects FOSS was a coordinating partner for, namely SmartPV, winning 'LIFE+ Citizen's Award', highlighting the substantial contribution the project made to the society. Smart-PV demonstrated that anyone can become an active citizen, supporting their community and contributing to the energy transition. The award was

a recognition that FOSS engages in research that translates into benefits for the society.

Very noteworthy is that FOSS stepped-up to a new challenge in 2019, of launching research and innovations into the marketplace. FOSS' first start-up, 'SOLEX', received funding from the highly competitive Cyprus Seeds and subsequently was the winner of the 'Environmental and Social Impact Award' of the Reload Greece Young entrepreneurship Program 2019. This is a stepping stone for FOSS in bridging the gap between academia and industry, paving the way in becoming a start-up hub for the commercialization of research and technological innovations.

Reflecting on what FOSS has delivered in 2019, it is evident that we ended the year significantly better positioned than we had begun it. This report sets out the activities we committed to over the past year, our achievements and the areas in which we have been making progress. Although 2019 raised substantially the bar for FOSS, I have no doubt that we will continue to thrive. With FOSS' wealth of knowledge, exceptional experience and enthusiasm, we will continue to expand, strengthen the depth and breadth of our activities, and fulfil our mission of engaging in research that positively influences our world of tomorrow and assists in achieving a greener and more sustainable future for all.

Prof. George E. Georghiou

Chairman's Foreword



The University of Cyprus and FOSS in 2019 fulfilled their set out objectives strengthening their presence both domestically and at EU level. FOSS continued from the successes of 2018 delivering in all fronts: at EU level through the active memberships of EUREC, EERA JP4SG and DERlab, domestically through the strong collaboration with the industry and the municipalities and internationally through the long binding relations with the PV industry.

A notable example in this wealth of deliverables is the work done through the PANTERA coordination and support action (CSA) project which, FOSS is coordinating with the participation of 8 strong partners from various EU countries mostly coming from areas that are low spending in R&I in the field of energy. The work through this Horizon 2020 CSA project proves to be of much wider impact since through its visionary work, it has raised interest in two DGs Ener and RTD transforming it into a true European project in the full meaning of the words. The Joint Research Centre of the Commission has taken a decision to work closely with the PANTERA consortium to deliver the multi-functional interactive platform and progress made until today is truthfully enviable. Moreover, the consortium under the leadership of FOSS is working closely with the European Technology and Innovation Platform Smart Network for Energy Transition in delivering a project evaluation methodology that will serve the R&I community in EU and the efforts for a coordinated approach between national and European research activities in the field of energy and smart grids.

The good work at EU level continued throughout 2019 through the active participation in the very

successful associations EUREC, EERA Joint Program for Smart Grids and DERlab. Our presence in all three associations was well received bringing a lot of success and visibility to FOSS, the University of Cyprus and our country. More specifically FOSS has received the following prestigious positions / outcomes through the high-level contributions of its members:

- The Chairman of FOSS has been elected in the Board of Directors of EUREC
- FOSS has been approved by the members of EERA JP4SG to lead Sup program 3 "Distribution Network Flexible Operation"
- FOSS is a partner with DERlab in 3 Horizon 2020 projects: (i) PANTERA, (ii) INTERPLAN, (iii) ERIGrid 2.0

FOSS is doing a lot to be in real terms, responsive and adaptive to the requirements of the Cyprus economy. Evidence is given in this annual report of our activities but more openly through the rolling presentation of our work in the public media. All the valued work of FOSS is constantly breeding our next steps since progress to us is a continuous process building on past successes and learning from shortcomings. We are constantly striving for a brighter sustainable presence in the service of our future researchers that, we reiterate, they are of high quality, characterized with optimism and vision for the Cyprus of tomorrow.

Dr Venizelos Efthymiou

Committees

Board Members

Prof. George E. Georghiou

University of Cyprus
(FOSS Director)

Dr. Venizelos Efthymiou

University of Cyprus
(FOSS Chairman)

Prof. Costas Georghiades

Texas A&M University

Mr Marios Tsiakkis

Secretary-General of Cyprus Chamber of
Commerce and Industry

Prof. Nikos Hadjiargyriou

National Technical University of Athens

Academic Committee

**Department of Electrical and Computer
Engineering, University of Cyprus**

Prof. Charalambos D. Charalambous

Prof. George E. Georghiou

**Department of Architecture, University of
Cyprus**

Dr. Aimilios Michael

Dr. Christos Hadjichristos

Dr. Marios C. Phocas

Dr. Panayiota Pyla

**Department of Mechanical and Manufacturing
Engineering, University of Cyprus**

Dr. Andreas Kyprianou

Dr. Stavros Kassinos

**Department of Civil and Environmental
Engineering, University of Cyprus**

Prof. Panos Papanastasiou

Memberships

FOSS continues to be an active member in various associations, exchanging knowledge and thus assisting in further developing its research activities.

European Distributed Energy Resources Laboratories (DERlab)

DERlab is the association of leading laboratories and research institutes in the field of distributed energy resources equipment and systems. The association develops joint requirements and quality criteria for the connection and operation of distributed energy resources and strongly supports the consistent development of such technologies. DERlab offers testing and consulting services for distributed generation to support the transition towards more decentralized power systems.

Find out more: <http://der-lab.net/>

European Energy Research Alliance (EERA AISBL)

EERA AISBL, is formally the organization that works on Energy Research at European level to deliver on the Strategic Energy Technology Plan. The purpose of the association is to strengthen and to expand Europe's capabilities in sustainable energy research by connecting and joining European energy research activities.

Find out more: <https://www.eera-set.eu/>

European Energy Research Alliance (EERA) Joint Programme for Smart Grids

An extended cross-disciplinary cooperation involving many Research and Development participants with different and complementary expertise and facilities, aims at addressing in a medium- to long-term research perspective, one of the most critical areas directly relating to the effective acceleration of smart grid development and deployment.

Find out more: <http://www.eera-set.eu/eera-joint-programmes-jps/smart-grids/>

The Association of European Renewable Energy Research Centres (EUREC)

EUREC, is the leading association representing research centres and university departments active in the area of renewable energy. The purpose of the association is to promote and support the development of innovative technologies and human resources to enable a prompt transition to a sustainable energy system. EUREC is the voice of renewable energy research in Europe, representing European Research Centres active in renewable energy.

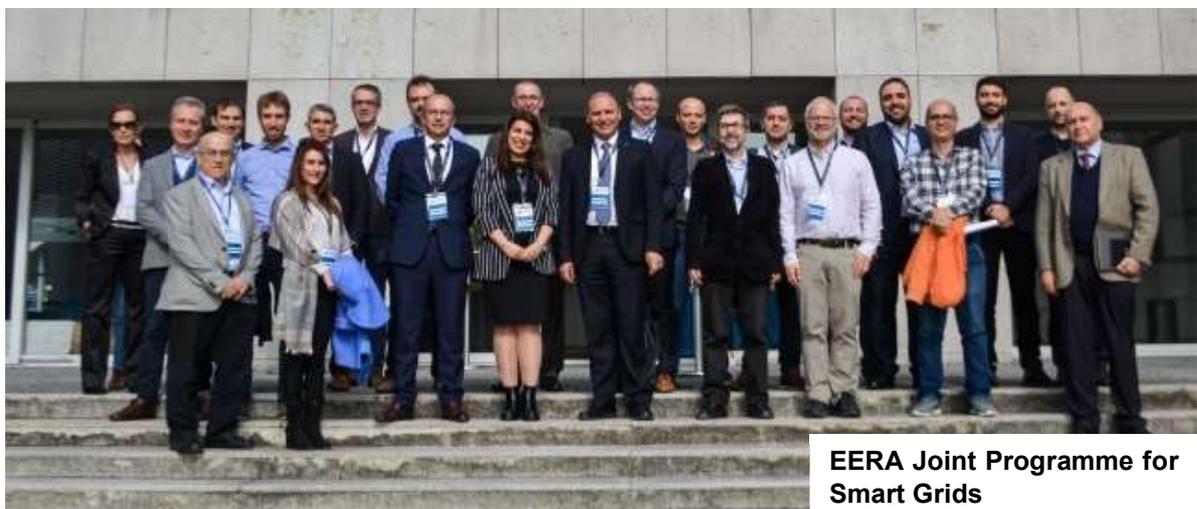
Find out more: <http://www.eurec.be/en/>



DERLab



EUREC



EERA Joint Programme for Smart Grids

Awards and Honours

FOSS is committed to engage in research that makes a difference and benefits the society beyond academia. It thus has an active role in the uptake of research findings by the community and industry as well as influence policies and regulations. 2019 was a particularly rewarding year for FOSS, as one of the completed projects FOSS was a coordinating partner of, SmartPV, won an award. Further, FOSS recently embarked on a new journey to assist its students on their route to convert their research ideas to successful and sustainable business with breakthrough products. SOLEX, the first start-up for FOSS is a milestone project.

Winner of LIFE Citizens' Prize 2019: SMARTPV

SmartPV Project was announced the winner of LIFE Citizen's Prize 2019, at the LIFE Awards Ceremony which was held on 16th May 2019 at Bluepoint Conference Centre in Brussels, Belgium. The ceremony took place within the 2019 EU Green Week which is considered as Europe's biggest environmental event.

Although the project was completed in 2017, it was selected amongst a shortlist of 15 other projects for the 2019 award in the "Environment, Nature or Climate Action" category. The award epitomizes that FOSS engages in research that has significant and far-reaching social and environmental impact. The award was also an acknowledgement of the outstanding contribution that FOSS makes to the society not just locally but globally as well.

***Research that has long-lasting
social and environmental impact***





SmartPV

Smart net metering for promotion and cost-efficient grid-integration of PV technology in Cyprus



University of Cyprus
TV Technology

Ανεξάρτητη Αρχή
Επιτελεστική Αρχή
Επιτελεστική Αρχή
Επιτελεστική Αρχή
Επιτελεστική Αρχή

ΕΠΙΧΕΙΡΗΣΙΑΚΟ ΠΡΟΓΡΑΜΜΑ
ΠΕΡΙΒΑΛΛΟΝΤΟΣ ΚΑΙ ΑΝΑΦΟΡΑΣ
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ΠΕΡΙΒΑΛΛΟΝΤΟΣ ΚΑΙ ΑΝΑΦΟΡΑΣ

Deloitte

Project reference number: LIFE/12/ENV/CY/000276



With the financial support of the European Commission

UCY Participation: Coordinator

Duration: July 2013 – December 2017

Summary:

- Develop and validate optimum price-based demand side management schemes for promoting higher renewable energy sources penetration, and especially photovoltaics in the energy mix of Cyprus.
- Examine the energy consumption and production profiles of about 300 consumers-producers (prosumers) and 3000 “smart” consumers in Cyprus.

Find out more: <http://www.smartpvproject.eu/>

Reload Greece Young Entrepreneurs Program Social and Environmental Impact Award 2019

FOSS's first start-up, SOLEX, won the Reload Greece Young Entrepreneurs Program, Social and Environmental Impact Award 2019 which includes working with a UK company to develop a market promotion strategy. FOSS Special Scientist, Michalis Florides, co-founder of SOLEX, presented his research idea which is to development a low-cost sensor to be installed on photovoltaics systems for early detection of faults without interrupting the operation of the system. SOLEX received funding and guidance from the Cyprus Seeds.

Find out more: <https://www.reloadgreece.com>



Flagship project SOLEX FOSS's first start-up

ITC Conference Grant for Innovative Research

Research conducted by FOSS members was awarded the ITC Conference Grant by the COST Action PEARL PV to attend the 36th European Photovoltaic Solar Energy Conference and Exhibition (EU PVSEC), which took place on 09-12 September 2019 in Marseilles, France.

The paper entitled "Performance analysis of mechanistic and machine learning models for photovoltaic energy yield prediction" (Livera, *et al.*, 2019), was selected to be presented in a plenary session, amongst 1,500 scientific papers. This was reassuring that FOSS engages in outstanding, groundbreaking research, as EU PVSEC is considered as the largest conference for photovoltaics in Europe.



Raising Awareness

FOSS embraces the challenge of assuring that the excellent research it conducts has value beyond the academic world. Committed to positively contribute to the society and environment, FOSS organizes numerous workshops, trainings and seminars annually, to expand its reach and thus broaden the influence of its research.

2019 was an exceptionally productive year for FOSS, organizing and participating in over 15 stimulating events (e.g. workshops, trainings, seminars), attracting over 400 participants in total. The benefits of which are multifold:

- Engage with diverse audiences (e.g. key stakeholders, governments and communities) to better understand concerns, challenges and opportunities.
- Exchange knowledge.
- Share key research developments.
- Raise debates around key environmental issues.
- Empowering citizens to be active.
- Showcase FOSS work.

**Engaging with communities
to shape our world together**



1

Workshop: The Strategic Energy Technology (SET) PLAN Stakeholder Workshop of the European Commission

Date: 18 February 2019

Organizer: FOSS in collaboration with the Ministry of Energy (Cyprus), Commerce and Industry of Cyprus and the European Commission

Overview:

Focused on Europe's energy system and more specifically the Clean Energy for all Europeans' legislative package that has reached a political agreement, setting the legal framework for the most comprehensive and deepest transformation of energy systems in Europe since the industrial revolution.



2

Workshop: Technical support on evaluating the potential and defining a policy framework for Demand Response (DR), Distributed Generation (DG), Renewable Energy Sources (RES) and Energy Storage (ES) in Cyprus

Date: 3 April 2019

Organizer: FOSS in collaboration with the European Commission Joint Research Centre

Overview:

FOSS hosted the European Commission Joint Research Centre for this workshop. Key tasks presented/discussed included reviews on policy framework for utilizing demand response technologies, introducing energy storage technologies and provision of ancillary services. The meeting concluded with policy recommendations made by the Joint Research Center.



3

Workshop: E-learning for Teaching Renewable Energy and Smart Grids

Date: 24-26 April 2019

Organizer: FOSS

Research project framework: AT-SGIREs

Overview:

During the workshop a tutorial was given on e-learning platforms for teaching Renewable Energy and Smart Grid, as well as discussed the capabilities and features of the AT-SGIREs e-learning platform.



4

Workshop: Energy Communities: Operational and functional needs

Date: 07-08 May 2019

Organizer: FOSS, in collaboration with the European Energy Research Alliance of the Joint Programme on Smart Grids (EERA), the Association of European Renewable Energy Research Centres (EUREC)

Research project framework: PEGASUS

Overview:

The EUREC College of Members #56 was held in Cyprus on 07-08 May 2019. On the first day two brainstorming sessions were held related to the upcoming H2020 proposals and opportunities, followed by, an internal affairs meeting and new board members being elected. The workshop was held on the second day, where around 50 participants attended including representatives from industry, research and the Ministry of Energy Commerce & Industry. The workshop's objective was to give a clearer understanding of the potential opportunities Energy Communities may contribute to accomplishing EU climate and nation-wide energy objectives.



5

Training: Nearly Zero Energy Buildings (NZEB)

Organizer: FOSS

Research project framework: DIEGO

Overview:

The training included an introduction to nearly zero energy buildings, architectural design, comfort considerations, photovoltaics (technologies, technical characteristics and specifications).



6

Training: Energy Day: The Role of Battery Storage Systems in our Future Energy Mix

Organizer: FOSS

Research project framework: StoRES & PV-ESTIA

Overview:

Discussed the crucial role battery storage systems will have in our future energy mix. Storage systems allow users to increase self-consumption from PV generation whilst controlling the amount of PV energy injected into the grid, thus not only avoiding grid congestion but also allowing for more PV installations.



7

Workshop: Energy Communities: PEGASUS: Promoting Effective Generation and Sustainable USEs of electricity

Date: 24 June 2019

Organizer: FOSS

Research project framework: PEGASUS

Overview:

FOSS with the participation of the Municipality of Aglantzia. the European vision for Energy Communities for optimal utilization of local energy resources.



8

Workshop: Novel concentrating PV/T & T solar collector and automated production methods

Date: 26 June 2019

Organizer: FOSS

Research project framework: CPC PVT
Production

Overview:

Discussed photovoltaic design and installing methodologies.



9

Workshop: Train-the-Trainers-Workshop V: Photovoltaic System Designer and Installer

Date: 8-12 July 2019

Organizer: FOSS

Research project framework: HEBA

Overview:

Discussed photovoltaic design and installation methodologies.



10

Workshop: Energy Communities: Microgrids and their role in the development of Energy Communities

Date: 24 September 2019

Organizer: Cyprus Employers and Industrialists Federation in collaboration with FOSS

Research project framework: PEGASUS

Overview:

Discussed the European vision for energy communities for energy transition to zero emissions.



11

Event: European Researcher's Night 2019

Date: 30 September 2019

Organizer: Research and Innovation Foundation in collaboration with academic and research institutions and other organisations in Cyprus

Overview:

FOSS participated in the European Researcher's Night 2019, which was held at the Filoxenia Conference Centre. Visitors of different ages who visited the FOSS stall had the opportunity to learn about smart, green, sustainable energy. Key areas covered were different photovoltaic generations, battery storage, e-mobility, smart cities.



12

Workshop: Innovative Photovoltaic System Performance Monitoring for Improved Reliability and Optimized Levelized Cost of Electricity

Date: 30 September 2019

Organizer: FOSS

Overview:

Provided cutting edge insights and extensive technical information in the area of next-generation photovoltaic performance monitoring systems that leverage machine learning and data analytics to ensure improved reliability and optimized levelised cost of electricity. Intended for project developers and EPCs, O&M service providers, investors, consultants and researchers in the renewable energy sector.



13

Training: Battery Energy Storage Systems Coupled with Photovoltaics

Date: 8 October 2019

Organizer: FOSS

Research project framework: StoRES & PV-ESTIA

Overview:

Participants got the opportunity to learn about the latest developments in battery energy storage systems and their role in increasing the penetration of photovoltaics, as well as obtain hands-on experience from the systems currently operating at FOSS.



14

Training: Microgrid Systems and Emerging Microgrid Business Models**Date:** 8 October 2019**Organizer:** FOSS**Research project framework:** PEGASUS**Overview:**

Discussed how microgrids improve the resilience of grids particularly in vulnerable areas such as islands and rural areas, as well as the implementation of the FOSS microgrid.



15

Workshop: Emerging Energy Systems and the Role of Demand Response**Date:** 22 November 2019**Organizer:** FOSS**Research project framework:** DELTA & DRIMPAC**Overview:**

Discussed the future of energy markets, vision of power systems, emerging benefits of demand response and how available resources may efficiently be used to boost energy flexibility.



16

Workshop: Energy technologies and the reconstruction of the traditional architecture**Date:** 25 November 2019**Organizer:** FOSS in association with the Municipality of Aglantzia**Research project framework:** HYBUILD**Overview:**

Discussed environmental aspects of traditional architecture in Nicosia, the building integration of active solar systems and future challenges and prospects.



Education and Training

Education is a powerful tool for raising awareness and driving change to achieve a more sustainable future. FOSS, certified as an Educational and Testing Centre by the Ministry of Energy, Commerce, Industry and Tourism, is devoted to convey its knowledge, through interactive learning to assist in the race against climate change.

FOSS engages in a variety of educational activities, to reach to a wider audience:

- Academic courses
- Vocational trainings
- Educational visits
- Internships

FOSS educational activities continually expand to enable for a greater interaction with everyone (e.g. students, professionals, simple citizens)

The free educational visits of FOSS highlight its determination and dedication to significantly contribute to the uptake of renewable energy sources (particularly photovoltaics) and to achieve climate change resilient societies.

**Together we can create a
brighter and greener future**





FOSS Educational Centre

Propelling Change through Action



Vocational Training

FOSS also provides a variety of vocational training courses to professionals which are subsidized by the Human Resource Development Authority of Cyprus. In 2019, FOSS launched a new vocational training course, bringing the total to five. The new course titled “Fundamentals of Battery Energy Storage Systems”, specifically addresses the design and operation of renewable energy sources, specifically photovoltaics coupled with battery energy storage systems.

Other vocational courses offered by FOSS are:

- PV System Designer and Installer
- Grid connected PV System minimum requirements for system documentation, commissioning tests and inspection according to EN 62446
- New electricity market rules in Cyprus
- Course on Nearly Zero Energy Buildings (NZEB)

FOSS strongly believes in experiential learning therefore through its vocational courses, it covers both theoretical and practical aspects for trainees to equip them with the necessary tools and knowledge and develop skills on the respective topics.

Trainees have the opportunity to operate professional state-of-the-art equipment, which are located only in a few places globally, and to be trained by worldwide renowned personnel.

**Education:
Driving behaviour change
for sustainability**

Academic Courses

FOSS members provide teaching to undergraduate and postgraduate students at the University of Cyprus, as well as guidance for dissertations.

FOSS currently provides two academic courses:

- Renewable Energy Sources: Photovoltaics (*Course: ECE447*)
- BIPV – Towards Nearly Zero Energy Buildings (NZEB) (*Course: ECE687*)

Both courses cover theoretical and practical aspects for trainees to develop skills and an understanding on the respective topics.

**Committed to address the
practice to research gap**

Internships

FOSS supports young talented students to undertake summer internships at its centre, facilitating them to develop further their technical skills and inspiring them to continue their research journey. Interns may conduct a desk-based research study (e.g. simulations) and/or design and construct new experiments.

2019 was a milestone year for FOSS with eleven interns from various universities around the world as well as marking the first student exchange between Texas & AM University and the University of Cyprus.



<p>1</p> <p>2</p>	<p>University: Texas & AM University, USA</p> <p>Intern Details: <i>Intern 1:</i> Mustafa Peatiwala <i>Project:</i> Performance Analysis and Future Assimilation of the Solarus Power Collector</p> <p><i>Intern 2:</i> Nicklaus Ward <i>Project:</i> Modelling the FOSS Research Centre's Nanogrid</p>
<p>3</p>	<p>University: University of Jaen, Spain</p> <p>Intern Details: <i>Intern:</i> Irene Romero Fiances <i>Project:</i> Robust and universal methodology for calculating the degradation rate of photovoltaic systems</p>
<p>4</p>	<p>University: Imperial College London, UK</p> <p>Intern Details: <i>Intern:</i> Andreas Chatzileonidas <i>Project:</i> Angle, irradiance and temperature measurement of a PV module on a solar tracker</p>
<p>5</p> <p>6</p>	<p>University: Aristotle University of Thessaloniki, Greece</p> <p>Intern Details: <i>Intern 1:</i> Anastasios Koumis <i>Project:</i> Electronic Load and PV inverter - Data monitoring and control</p> <p><i>Intern 2:</i> Anastasios Nedos <i>Project:</i> Modelling of the University microgrid in the presence of PV and storage systems</p>
<p>7</p>	<p>University: National Technical University of Athens, Greece</p> <p>Intern Details: <i>Intern:</i> Demetris Englezos <i>Project:</i> Designed an experiment '<i>Dual axis solar tracker</i>'</p>
<p>8</p> <p>9</p> <p>10</p>	<p>University: University of Cyprus, Cyprus</p> <p>Intern Details: <i>Intern 1:</i> Georgios Konstantinidis <i>Project:</i> Developed an educational experiment</p> <p><i>Intern 2:</i> Ioannis Papadopoulos <i>Project:</i> Visual indicator (ball-in-tube) of PV module output power</p> <p><i>Intern 3:</i> Titos Avraamides <i>Project:</i> Developed a '<i>Solar mobile phone charger</i>'</p>
<p>11</p>	<p>Other: Student from Venezuela joined FOSS for an internship through the EUREC internship programme</p> <p>Intern Details: <i>Intern :</i> Jorge Bracho Luis Zabala <i>Projects:</i> Modelling of a residential area with high PV penetration and battery energy storage systems in the Republic of Cyprus</p>



Developing innovative ideas to make a difference

Enhancing skills and deepening learning by doing



Vibrant and supportive environment



Educational Visits

FOSS shares its accumulated knowledge through its free educational visits, to raise awareness on climate change and sustainable energy solutions and provide people of all ages with the necessary information to make informed decisions and encourage behaviour change. Significant work has been undertaken in 2019 to strengthen FOSS's activities for the educational visits with new experiments being designed by FOSS members and interns to ensure an inspirational, interactive and informative visit for everyone.

School Visits

2019 a new record high of school visits, bringing the total number to over 300. Students of all ages, have the opportunity to learn about photovoltaics, battery storage and electric mobility, through interactive learning.

Adult Group Visits

FOSS had numerous adult group visits in 2019, not just from within Cyprus but from abroad as well. Examples of adult group visits were from SciShops.eu with visitors from over 12 countries, Cyprus Energy Agency, students from Nigeria. Visitors learning about:

- PV indoor testing facilities
- PV outdoor degradation
- PV coupled with Energy Storage Systems
- Variety of Battery types
- PV technologies
- Demand Side Management
- Applications of PVs
- Electric Mobility

Other Educational Activities

FOSS mentored a team from Athienou Secondary School who took part in the "Pupils in Research – MERA" Competition, who researched the use of photovoltaics in producing electrical energy in their municipality. The competition is run by the Research and Innovation Foundation and the Ministry of Education and Culture on an annual basis. The team was selected in the three top winners.

Further, in 2019 representatives of the Cyprus Ministry of Education, Culture, Sport and Youth, Mr. Marios Charalambous, Science Inspector in Primary Education, and Professor Zacharias Zacharia, lecturer at the University of Cyprus and director of the Committee for the development of STEM schools, visited FOSS to discuss potential experiments with photovoltaics to be developed for the STEM actions of the Ministry of Education in the Primary Education. A FOSS team member is currently working on the design which is expected to be completed in the year 2020.

**Together we can create a
brighter and greener future**



Projects

FOSS sustains its excellence in research and this is reflected by its trajectory of successful proposals over the years. In 2019 FOSS won a total of €2.16 million funding from 12 new projects from various funding bodies, bringing the total number of active projects to 42. FOSS is a coordinator partner for 6 of the new projects.

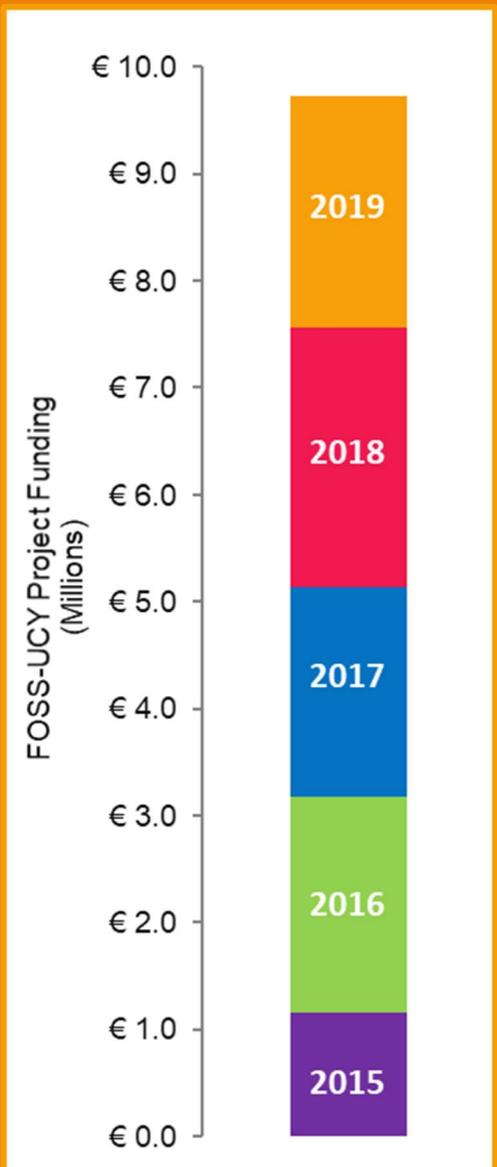
FOSS's proposals continue to be selected for funding from highly competitive calls. However, it was a remarkable success for FOSS to be the only coordinating partner from Cyprus to be selected for ENI CBC Med funding in 2019. The research project BERLIN was launched in October and a press conference was held where representatives from the ENI CBC Med, Italian Embassy and Greek Embassies as well as the Israeli Ambassador attended.

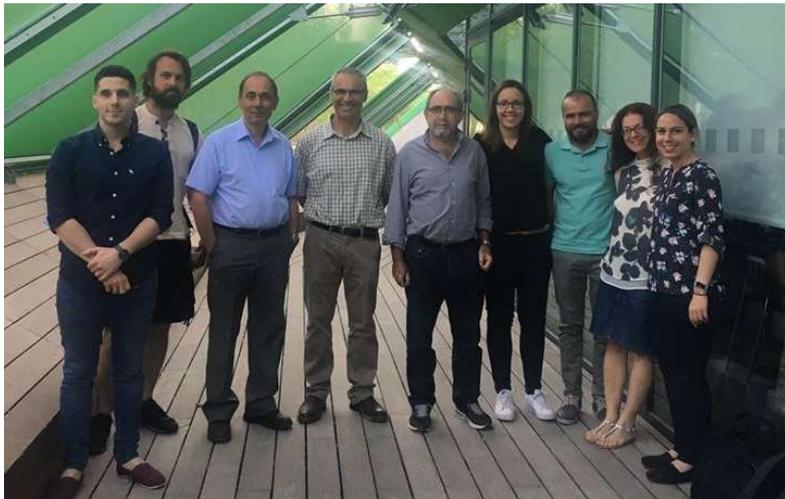
The current pathway is quite reassuring that the volume of research that FOSS conducts will continue to grow. FOSS members are passionate about conducting research that has meaningful impact, and aim to continue to be at the forefront of producing cutting-edge research.

Find out more:

<http://www.foss.ucy.ac.cy/Projects.html>

*Research that translates into
benefits for our society,
industry and world*





Prof. A. Athienitis, Lecturer in the Building Engineering at the Concordia University and his PhD student, Mr. Z. Ioannidis, visited FOSS to discuss potential collaborations.

(May – June 2019)

Fruitful project meetings held in Cyprus and abroad

Meetings to discuss new potential collaborations





1

Title: Cost-effective rehabilitation of public buildings into smart and resilient nanogrids using energy storage

Funding Body: ENI CBC Med

Partners: 7

UCY Participation: Coordinator



Duration: September 2019 – September 2022

Financial Data:

Total Budget: €2.87 million **UCY Budget:** €557,000

Summary

- Implement cross-border pilot measures to support innovative and cost-effective energy rehabilitations in public buildings based on the nanogrid concept.
- Increasing PV grid penetration, combined with energy storage and demand side management, along with enhancement of energy efficiency in buildings.

Find out more: <http://www.enicbcmed.eu/projects/berlin>

2

Title: High-efficiency bifacial PV modules for BIPV applications

Funding Body: Solar Era Net / RPF

Partners: 6

UCY Participation: Partner

Project acronym:

BI-FACE

Duration: October 2019 – October 2021

Financial Data:

Total Budget: €865,400 **UCY Budget:** €10,000

Summary:

A new bifacial BIPV module integrated into the built environment will be designed, and tested.

3

Title: A novel smart grid architecture that facilitates high RES penetration through innovative markets towards efficient interaction between advanced electricity grid management and intelligent stakeholders

Funding Body: H2020

Partners:

UCY Participation: Partner

Duration: October 2019 – September 2022

Financial Data:

Total Budget: €3.89 million **UCY Budget:** €300,000

Summary:

Facilitate energy sector stakeholders (DSOs, TSOs, ESPs and RESPs) to:

- Easily and effectively create advanced energy services.
- Interact in a dynamic and efficient way with their environment (electricity grid) and the remaining of the stakeholders.
- Automate and optimize the planning and the operation of their energy services.

Find out more: <https://flexgrid-project.eu/>



4

Title: Innovative Design for Improved Application of Glass BIPVs on Buildings

Funding Body: RPF

Partners: 3

UCY Participation: Participant

Duration: May 2019 – April 2021

Financial Data:

Total Budget: €256,400 **UCY Budget:** €80,300

Summary:

Develop a complete BIPV system abiding to all building regulations, according to the resilience, safety and fire requirements to be installed in commercial buildings.

Find out more: <https://www.k-energy.com.cy/impact-bipv/>



5

Title: Pan European Technology Energy Research Approach

Funding Body: H2020

Partners: 17

UCY Participation: Coordinator

Duration: January 2019 – December 2022

Financial Data:

Total Budget: €3.89 million **UCY Budget:** €427,900

Summary:

Set up a European forum composed of Research & Innovation stakeholders active in the fields of smart grids, storage and local energy systems, including policy makers, standardisation bodies and experts in both research and academia, representing the EU energy system.

Find out more: <https://pantera-platform.eu/>



6

Title: Early and reliable detection of degradation and failures in Photovoltaics for improved lifetime output

Funding Body: University of Cyprus

Partners: 1

UCY Participation: Participant

Duration: July 2019 – June 2021

Financial Data:

Total Budget: €51,000 **UCY Budget:** €51,000

Summary:

Establish repeatable methods, which will ensure optimal PV plant performance through the development of algorithms to identify and classify performance loss and degradation without disrupting the normal operation of the system.

Find out more: <http://www.foss.ucy.ac.cy/projects/PV4Life/>



7

Title: Advanced photovoltaic system monitoring and analytics solution enhanced with intelligent interoperable data-driven features for efficient big data real-time analysis, failure diagnosis, automated management and integrated micro-grid control

Funding Body: Solar Era Net / RPF

Partners: 3

UCY Participation: Participant

Duration: November 2019 – November 2022

Financial Data:

Total Budget: €460,100 **UCY Budget:** €160,100

Summary:

Develop an advanced monitoring solution enhanced with smart data analytic functions, interoperability features and algorithms that significantly improves the performance, ensures operation quality and interoperability in terms of control and bidirectional communication for grid-connected PV systems.

Project acronym:

PV-ANALYTIC

8

Title: Reducing the photovoltaic operation and maintenance (O&M) costs through an advanced online platform

Funding Body: Solar-Era.Net / RPF

Partners: 3

UCY Participation: Coordinator

Duration: December 2019 – December 2022

Financial Data:

Total Budget: €485,000 **UCY Budget:** €199,000

Summary:

Develop and commercialize a product that will enable preventive and predictive maintenance and ensure optimal PV plant performance while reducing costs associated to O&M.

Find out more: <http://www.foss.ucy.ac.cy/projects/rompv/>

ROM-PV

9

Title: Ensuring an optimum and reliable photovoltaic performance

Funding Body: University of Cyprus

Partners: 3

UCY Participation: Coordinator

Duration: May 2019 – May 2020

Financial Data:

Total Budget: €102,500 **UCY Budget:** €85,700

Summary:

Develop a product for the assessment of PV plant performance to ensure the reliability and optimal performance of PV systems by quickly identifying and accurately quantifying the factors behind the various failure and degradation mechanisms.

Find out more: <http://www.foss.ucy.ac.cy/projects/smarterpv>



10

Title: Innovative early detection of faults in Photovoltaic (PV) Systems

Funding Body: Cyprus Seeds

Partners: 1

UCY Participation: Coordinator

Duration: July 2019 – June 2020

Financial Data:

Total Budget: €50,000 **UCY Budget:** €50,000

Summary:

Develop a low-cost sensor to be installed on PV systems for the early detection of faults without interrupting the operation of the system.

Find out more: <http://www.cyprusseeds.com/wp-content/uploads/2019/06/florides.pdf>

Project acronym:

SOLEX

11

Title: Upgrading the capabilities of the FOSS experimental facilities

Funding Body: University of Cyprus

Partners: 1

UCY Participation: Coordinator

Duration: May 2019 – May 2021

Financial Data:

Total Budget: €64,600 **UCY Budget:** €64,600

Summary:

The project aims to enhance the research facilities of the FOSS Research Centre for Sustainable Energy, University of Cyprus and to support their smooth operation.

Project acronym:

upgradingFOSS

12

Title: One intelligent cloud for PV Assets Diagnosis and Maintenance

Funding Body: Solar-Era.Net / RPF

Partners: 3

UCY Participation: Partner

Duration: November 2019 – March 2022

Financial Data:

Total Budget: €582,700 **UCY Budget:** €172,600

Summary:

Provide an integrated platform for cost reduction and revenue optimization for PV based on advanced and automated functions for data analysis, fault detection, diagnosis and O&M recommendations.

Find out more: <http://foss.ucy.ac.cy/projects/1c4pv/index.php>

1C4PV

Publications

Publications in highly prestigious journals and conference participations are a tremendous opportunity to interact with other academics and industry peers interested in the field, as well as exchange technical knowledge and disseminate research undertaken by FOSS. In 2019, FOSS published 9 journal and 43 conference papers, bringing the total of its publications to over 500. This is quite encouraging that FOSS engages in unique research, addressing contemporary issues and challenges that has value to the academic world.

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