ANNEX II: TERMS OF REFERENCE

1. BACKGROUND INFORMATION

1.1 Beneficiary country

The Former Republic of Macedonia

1.2 Contracting Authority

Faculty of Electrical Engineering and Information Technologies of Ss. Cyril and Methodius University in Skopje

1.3 Country background

Macedonia is a candidate country for membership expecting commencement of membership negotiations. The next phase in the accession process is acquiring negotiation date for European Union membership.

The negotiation process of the Republic of Macedonia for EU membership will signify completion of the approximation process to the European Union, adoption of its benefits and values as well as complete adaptation of the Macedonian institutions towards functioning to that of the Union institutions. The negotiations will also signify establishing grounds and preparation for a successful functioning of the Republic of Macedonia as a Union Member State.

In February 2008, the Council of Ministers of the European Union adopted the 2008 Accession Partnership of the Republic of Macedonia. The negotiations as a comprehensive dynamic undertaking, require full preparation of the state authorities and institutions as well as of the structures established for coordination and conducting negotiations prior to the commencement of the negotiations themselves.

1.4. Current situation in the sector

The Balkan Med (BM) region is facing the challenge of sustaining and increasing the growth of PV systems that is endangered by several barriers and their unpredictable nature. This is especially important in the built environment as member states are developing plans to increase the number of Nearly Zero Energy Buildings (NZEB), which most probably employ PV's, in order to reach their 2030 climate change targets.

The project approach hasn't been applied before in BM region. Most outputs are novel worldwide (e.g specialized tools) as well. A transnational approach is needed as the climate change problem faces no borders and a unified approach will multiply positive effects. Moreover, the region's electrical grids are already interconnected with high interdependence and will be even more in the future.

As the number of NZEBs increase, PV integration in the distribution grids of BM region will be very difficult, unless buildings become more grid-friendly and policies/regulations are suitably adapted. In the above context, the overall objective of project is to enhance the penetration of PV's in built environment. This will be achieved by using storage, which will transform the building into a more predictable power source. With the high solar potential of the BM region and the decreasing cost of PV/storage systems, such a solution is becoming cost-efficient as well Project aims to change the way buildings with PV's are treated (i.e. selling energy to grid) and instead conceptualize them as systems that must efficiently interact with grids. Also, it aims to alleviate the above barriers and pave the way for unobstructive NZEB development.

1.5 Related programmes and other activities

N/A

2. OBJECTIVE, PURPOSE & EXPECTED RESULTS

2.1. Overall objective

The overall objective of the project of which this contract will be a part is as follows:

1) An innovative management scheme of PV+storage hybrid, making buildings grid-friendlier;

2) A generalized model capable to assess alternative policies related to implementation of such hybrids;

3) An online user-friendly tool able to provide a good first estimate of the profitability of such systems under a specified policy, targeting prospective investors and stakeholders;

4) An advanced tool able to evaluate multiple policy scenarios, targeting policy makers;

5) Set of joint regulation recommendations in the form of roadmap for BM region, targeting grid operators and relevant stakeholders/engineers;

6) Set of joint policy recommendations targeting mainly policy makers and interested stakeholders.

2.2. Purpose

The purposes of this contract are as follows:

- Purpose 1: To specify a monitoring scheme for a) consumers (households) and for b) pilot project of PV and storage hybrid in the premises of the Faculty of Electrical Engineering and Information Technologies.
- Purpose 2: To provide a cost-benefit analysis of innovative management scheme
- Purpose 3: To devise a set of country specific policy recommendations related to PV+storage integration in NZEBs.
- Purpose 4: To participate in delivery of a joint regulation recommendations of BM region
- Purpose 5: To design a system for data collection
- Purpose 6: To perform data analysis of the collected data

2.3. Results to be achieved by the Contractor

- Result 1: Report for a realization of the monitoring scheme
- Result 2: Report for cost-benefit analysis of innovative management scheme and its validation
- Result 3: Report for a country specific policy recommendations
- Result 4: Report for a joint regulation recommendations of BM region
- Result 5: Report for design of a system for data collection
- Result 6: Report for data analysis of the collected data during the lifetime of the project

3. ASSUMPTIONS & RISKS

3.1. Assumptions underlying the project

The project builds upon results from previous actions and projects, mostly of specific ones that project partners have worked before. Specifically, ARISTOTLE UNIVERSITY OF THESSALONIKI

(AUTH), UNIVERSITY OF CYPRUS (UCY) and FACULTY OF ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGIES OF SS. CYRIL AND METHODIUS UNIVERSITY IN SKOPJE (UKIM) have worked in the NZEB related project MEnS (www.mens-nzeb.eu), where NZEB techniques are transferred to energy professionals. Also, UCY, AUTH and Technological Research Centre of Western Macedonia (TRCWM) worked in the PV-NET project, that implemented pilots related to smart measurements in PV prosumers and an online optimization tool for net-metering was constructed (pvnet.ee.teiwm.gr:8080). The project makes use of previous experience acquired in the pilot implementation of "Countdown to Low Energy Homes" project, where measuring equipment was installed at the premises of 40 consumers in Thessaloniki and Cyprus, so as to monitor electrical energy consumption. This experience is planned to be transferred to IPA project partners. Finally, Electricity Authority of Cyprus (EAC) and UCY will bring to consortium the experience from the Smart PV project, where PV pilots were implemented in 300 prosumers houses.

The project PV-ESTIA was designed by partners that have a long history of collaboration in various projects related to NZEB, energy efficiency, PV, energy storage, RES, implementation of ICT in power systems, including smart grids. Consequently, the project deliverables are planned to be reached by work assigned to each project partner, but also by collaborative efforts of all partners as the assumptions that underline the realization of all project objectives. The project assumes the strong collaboration of project partners in the following areas:

- UCY will design and test at laboratory scale the innovative management scheme and define the specifications for field implementation, with the aid of other partners
- TRCWM will lead the development of both the online tool and the advanced tool for policy makers
- All partners will build a common ground and will form joint recommendations for updating current regulations concerning integration of storage in built environment.

3.2. Risks

No maintenance is required and equipment will remain at consumers' premises, to be able to continue acquiring data 3 years after the end of project. Regarding pilot project of PV and storage hybrid the maintenance and data collection will be done by the Faculty of Electrical Engineering and Information Technologies, as beneficiary institution for this pilot. No profit will be generated whatsoever, as these are experimental pilot installations.

4. SCOPE OF THE WORK

4.1. General

Description of the assignment

The scope of the contract can be described by the foreseen activities of the contractors:

- The contractor(s) (Key Experts) will define common monitoring schemes and set the objectives for data assessment. They will specify a monitoring scheme for both: a) consumers (households) and for b) pilot project of PV and storage hybrid in the premises of the Faculty of Electrical Engineering and Information Technologies.
- The contractor(s) will use the developed online tool and the advanced tool for policy makers (by TRCWM, based on a generalized model developed by AUTH) for data analysis, using collected data from pilot. They will provide a cost-benefit analysis of the proposed management scheme.
- The contractor(s) will be in charge for drafting the FYROM policy recommendations related to the integration of PV and storage in the built environment, towards NZEB transformation.
- The contractor(s) will participate in identification of common features of BM region, despite diversities regarding socioeconomic, energy policy and technical/market characteristics. The

goal is to build on common ground and form joint recommendations for updating current regulations concerning integration of storage in built environment.

- The contractor(s) will participate in the supervision of the pilot site and in the proper formulation of the database. Thus, the required data to be stored will be defined, while potential data formulations for database development will be commonly decided with all project partners. Upon completion of the pilot, the collection of measured data will start and continue until for at least 3 year after the end of project. Data will be collected and stored centrally at a dedicated server.
- Both tools (the online tool and the advanced tool for policy makers) will be used by contractor(s) for data analysis, using collected data from the pilot. The aim is to understand the different load and production patterns and develop characteristic curves. The evaluation of this scheme will be based on quantified metrics that illustrate how "grid-friendly" a building is.

Geographical area to be covered

The territory of the country (for consumers), the premises of the Faculty of Electrical Engineering and Information Technologies (Skopje) and countries of Project Partners.

Target groups

Consumers (households), national authorities and policy makers, Electrical Grid operator, local and regional governments, SME's, installers, construction companies, engineers, various associations and NGO's, scientific community.

4.2. Specific work

Task 1 (defined as deliverable D4.6.4 in the project)

a) To specify a monitoring scheme for 20 consumers (households):

b) To specify a monitoring scheme for pilot project of PV and storage hybrid in the premises of the Faculty of Electrical Engineering and Information Technologies Skopje

Based on the design of the innovative management scheme for pilot project of PV and storage hybrid to collaborate with UCY to define the technical specifications for field implementation

To coordinate and supervise the installation of the monitoring system in the premises of the Faculty of Electrical Engineering and Information Technologies Skopje (system configuration, battery technology, technical solution features)

Task 2 To provide a cost-benefit analysis of innovative management scheme and model validation (defined as deliverable D5.6.4 in the project)

- To perform a cost-benefit analysis of the proposed management scheme: weigh cost against benefits of the innovative PV+storage scheme for all stakeholders.

Task 3 To deliver a country specific policy recommendations (defined as deliverable D6.6.1 in the project)

- Examine national policy about PVs, storage & NZEBs
- Create alternatives to current national policy
- Promote storage integration in buildings

Task 4 To participate in delivery of a joint regulation recommendations of BM region (defined as deliverable D6.6.2 in the project)

- Identify common features of BM region, regarding: socioeconomic characteristics, energy policy, technical characteristics, market characteristics.

- Deliver joint policy recommendations for updating current regulations (grid codes, etc.) concerning integration of storage in built environment
- Create a win-win scenario for investors and DSO's/public authorities in the region.

Task 5 To design a system for data collection (defined as deliverable D4.6.5 in the project)

- Define the required data to be stored, while potential data formulations for database development will be commonly decided by all project partners. Upon completion of the pilot, the collection of measured data will start and continue until for at least 3 year after the end of project. Data will be collected and stored centrally at a dedicated server.

Task 6 To perform data analysis of the collected data (defined as deliverable D5.6.3 in the project)

- Starting from the collected data, the aim is to make simulations to: evaluate the tariffs, optimize energy policy, improve the online storage tool and perform cost & benefit analysis.

4.3. Project management

The contractor(s) according to their scope of work may be required to travel to the planned meetings of the project partners to present the result of their work. The travel costs are on their behalf.

Responsible body

Responsible body is the Contracting Authority specified above.

Management structure

The effective management of the project will be ensured by the Contracting Authority.
The project manager, Prof. Marija Kacarska will be in charge for the overall coordination.

Facilities to be provided by the Contracting Authority and/or other parties

The Candidate should ensure the equipment and the provision of working space needed to fulfil the services assigned to it. No facilities or equipment will be provided by the Contracting Authority.

5. LOGISTICS AND TIMING

5.1. Location

The project will be implemented at the territory of Skopje, FYROM.

5.2. Start date & Period of implementation of tasks

The intended start date is 15.01.2018 and the period of implementation of the contract will be 19 months from this date, but not later than 31.07.2019. Please see Articles 19.1 and 19.2 of the Special Conditions for the actual start date and period of implementation.

6. REQUIREMENTS

6.1. Staff

Note that civil servants and other staff of the public administration of the beneficiary country, or of international/regional organisations based in the country, shall only be approved to work as experts if well justified. The justification should be submitted with the tender and shall include information on the added value the expert will bring as well as proof that the expert is seconded or on personal leave.

Key experts

Key experts are defined and they must submit CVs and signed Statements of Exclusivity and Availability.

All experts who have a crucial role in implementing the contract are referred to as key experts. The profiles of the key experts for this contract are as follows:

Lot 01: External expert for specifications of pilot projects and national policy

Key expert – Power systems expert

Qualifications and skills

- PhD in technical sciences (electrical power engineering)
- Fluent in Macedonian and English language

General professional experience

- Minimum 30 years of professional experience in the field of power systems engineering.

Specific professional experience

In order to be able to realize tasks 1-4, the candidate has to have a demonstrated expertise in all of the following areas: NZEB, RES, energy efficiency, smart grids, power systems, control and monitoring systems. The candidate has to have an experience as a team leader in minimum 10 international projects including each of the following funded programs: DAAD, GIZ, GTZ, SECO, TEMPUS, FP6, COST and particularly HORIZON 2020. The candidate has published at least 20 publications in the field of energy efficiency, smart grids and implementation of ICT in power systems.

Lot 02: External expert for pilot projects data collection and analysis

Key expert – ICT Expert

Qualifications and skills

- PhD in technical sciences (computer science)
- Fluent in Macedonian and English language

General professional experience

- Minimum 12 years of professional experience in the field of computer science.

Specific professional experience

In order to be able to realize tasks 5-6, the candidate has to have a demonstrated expertise in all of the following areas: NZEB, energy efficiency, smart grids, data mining, WSAN, intelligent systems, mobile applications, nonlinear dynamics, eco-informatics, GIS, image processing and managing intelligent energy efficiency systems (HEMS). The candidate has to have a participation in minimum 5 international projects including each of the following funded programs: TEMPUS, COST, GIZ, SECO, FP6 and particularly HORIZON 2020. The candidate has published at least 20 publications in the field of smart grids, data mining, WSAN, intelligent systems, mobile applications, nonlinear dynamics, eco-informatics, GIS, image processing and managing intelligent energy efficiency systems (HEMS).

All experts must be independent and free from conflicts of interest in the responsibilities they take on.

Other experts, support staff & backstopping

No other experts are foreseen.

6.2. Office accommodation

Office accommodation for each expert working on the contract is to be provided by the Contracting Authority.

6.3. Facilities to be provided by the Contractor

The Contractor shall ensure that experts are adequately supported and equipped. In particular it must ensure that there is sufficient administrative, secretarial and interpreting provision to enable experts to concentrate on their primary responsibilities. It must also transfer funds as necessary to support their work under the contract and to ensure that its employees are paid regularly and in a timely fashion.

6.4. Equipment

No equipment is to be purchased on behalf of the Contracting Authority / beneficiary country as part of this service contract or transferred to the Contracting Authority / beneficiary country at the end of this contract.

7. REPORTS

7.1. Reporting requirements

The Contractor will submit the following reports in English in one original and one copy:

- **Inception Report** of maximum 12 pages to be produced after one month from the start of implementation. In the report the Contractor shall describe e.g. initial findings, progress in collecting data, any difficulties encountered or expected in addition to the work programme and staff travel. The Contractor should proceed with his/her work unless the Contracting Authority sends comments on the inception report.

- **Interim Report** of maximum 12 pages to be produced after half of the time needed for delivering the dedicated task from the start of implementation. In the report the Contractor shall describe e.g. initial findings, progress in collecting data, any difficulties encountered or expected in addition to the work programme and staff travel. The Contractor should proceed with his/her work unless the Contracting Authority sends comments on the inception report.

- **Draft final report** of maximum 30 pages (main text, excluding annexes). This report shall be submitted no later than one month before the end of the period of implementation of tasks.

- **Final report** with the same specifications as the draft final report, incorporating any comments received from the parties on the draft report. The deadline for sending the final report is 10 days after receipt of comments on the draft final report. The report shall contain a sufficiently detailed description of the different options for fulfilling the given task. The detailed analyses underpinning the recommendations will be presented in annexes to the main report. The final report must be provided along with the corresponding invoice.

7.2. Submission and approval of reports

The report referred to above must be submitted to the Project Manager identified in the contract. The Project Manager is responsible for approving the reports.

8. MONITORING AND EVALUATION

8.1. Definition of indicators

The successful implementation of the contract will be assessed on the base of the following indicators of achievement:

- Inception, Interim, draft final and Final reports submitted and approved by the Contracting Authority according the timetable given below for each Lot:

Lot 1

Task No. / Deliverable No.	Start/Finish date	Report/date	Max budget in Euro
Task 1/D4.6.4	March 2018/June 2018	Inception April 2018	1000
		Interim May 2018	1000
		Final June 2018	1000
Task 2/D5.6.4	January 2019/April 2019	Inception February 2019	500
		Interim March 2019	500
		Final April 2019	1000
Task 3/D6.6.1	September 2018/May 2019	Inception October 2018	750
		Interim February 2019	750
		Final May 2019	1000
Task 4/D6.6.2	September 2018/July 2019	Inception October 2018	750
		Interim March 2019	750
		Final July 2019	1000
		Total budget	**10000**

Lot 2

Task No. / Deliverable No.	Start/Finish date	Report/date	Max budget in Euro
Task 5/D4.6.5	August 2018/July 2019	Inception September 2018	1400

		Interim February 2019	1400
		Final July 2019	1450
Task 6/D5.6.3	September 2018/April 2019	Inception October 2018	1300
		Interim January 2019	1300
		Final April 2019	1400
		Total budget	**8250**

8.2. Special requirements

The communication between the Contractor and the Contracting Authority must be in writing. The Contracting Authority will appoint a contact person for the contract.