ΕΛΙΔΕΚ
Ελληνικό Ίδρυμα Έρευνας & Καινοτομίας

Ancillary services in aCTIVe distribution networks bAsed on moniToring and control tEchniques

Project: **ACTIVATE**
Deliverable Number: **D7.2**
Deliverable Name: **Project final release**

Document Properties	
Dissemination level	Public
Prepared by	T. Papadopoulos
Checked by PI	16/06/2023
Submission due date	16/06/2023
Actual submission date	16/06/2023

H.F.R.I. Hellenic Foundation for Research & Innovation

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: HFRI-FM17-229)

Document History

Version	Date	Contributor(s)	Description
1.0	16/06/2023	Theofilos Papadopoulos	Final

Disclaimer: "*This document has been prepared in the context of ACTIVATE project, funded by the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: HFRI-FM17-229). This document reflects only the authors' views and H.F.R.I. are not responsible for any use that may be made of the information it contains.*"

Table of contents

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: HFRI-FM17-229)

1. Executive summary

Nowadays, electrical networks are facing a transition towards the proliferation of distributed generation, caused by the advent of distributed renewable energy sources (DRESs), and is promoted by national and international policies. This, however, poses unprecedented technical challenges for the reliable network operation, such as voltage regulation issues, overloading of network equipment, etc. The objective of ACTIVATE was to develop novel and ready-to-apply ancillary service solutions for transmission and distribution system operators. The solutions aim at addressing the emerging grid operation challenges caused by the increased DRES penetration. ACTIVATE proposes:

- Innovative control strategies to provide ancillary service to distribution system operators (DSOs) solutions aiming to mitigate overvoltages and congestion issues. The optimal distribution grid operation will be an additional target. To accomplish this, coordinated control strategies will be developed, achieving specific optimization objectives. Moreover, advanced TSO-oriented ancillary services will be proposed, focusing on the frequency control of the transmission system. These ancillary services will be provided to TSOs by DSOs and will include advanced features such as virtual inertia and power smoothing capabilities.
- Innovative, decentralized monitoring techniques to enhance the observability and visibility of Active distribution networks (ADNs) and facilitate the real-time application of the proposed ancillary services. The distinct feature of these techniques lies on the fact that they can be easily incorporated into power converters, thereby increasing the monitoring capabilities in ADNs.
- A prototype grid-interfaced converter for both energy storage systems (ESSs) and DRES units will be developed, incorporating all control strategies and monitoring techniques to be developed within ACTIVATE. Therefore, the developed converter will act not only as a conventional control unit but also as a monitoring device, further facilitating the penetration of DRESs in the frame of ADNs.

The first interim report (18/12/2019 – 17/06/2021) has been approved. During the last project period (18/06/2021 – 17/06/2023), WP2 has progressed and been completed. Respectively, WP3 has been progressed and completed. WP4 was launched and was completed on month 29. The results of WP2, WP3 and WP4 have fed WP5, which included the final technical evaluation of the various parts of the proposed monitoring and control system. At the same time, WP6 have been progressed, including tasks to disseminate the results and publicity of the project, as well as WP7, which ensured the best possible monitoring and development of the project. Relevant activities took place during the reporting period, which are presented in detail in the following tables. Deliverable **D7.2 "Project final report"** includes a brief report of the project.

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: HFRI-FM17-229)

2. Work Package 1

WP Number: 1	WP Title:
Starting Month: 01	Ending Month: 06

WP Objectives

This WP focuses on identifying the application requirements from a technical implementation and evaluation perspective that will serve as the core foundations for all technical activities foreseen within the context of ACTIVATE.

Work Description – Degree of Work Package Objectives Implementation

The work of this WP was divided into three tasks (Task 1.1 – 1.3) to cover the state-of-the-art and requirements related to the three project key objectives, i.e., a) develop advanced ancillary services solutions for distribution system operators and transmission system operators, b) develop innovative network monitoring techniques and c) prototype three-phase converter implementation.

The WP objectives have been fully implemented (100%); deliverable D1.1 has been completed and milestone MS1 has been achieved.

In **Task 1.1 (Ancillary services solutions)** state-of-the-art solutions for ADNs, including operation control and stability issues have been examined. Of main importance is the incorporation of the new emerging technologies in control applications. Scope of this task was to address the resulting needs and possible solutions for tools to better observe, understand and operate ADNs.
In **Task 1.2 (Network monitoring technologies and techniques)**, all state-of-the-art techniques and technologies considering network monitoring and measuring with special emphasis to ADNs have been examined.
In **Task 1.3 (Power converter technologies)**, the state-of-the-art for power converters has been reviewed. Specifically, the technical specifications regarding the power control, communication, recording capabilities as well as implementation requirements have been examined.

Within the frame of the WP and as a result of D1.1, the following journal paper was published (additional achievement not considered in the original DoW) within the previous reporting period (18/12/2019 – 17/06/2021):

- G. C. Kryonidis, E. O. Kontis, T. A. Papadopoulos, K. D. Pippi, A. I. Nousdilis, G. A. Barzegjar-Ntovom, A. D. Boubaris and N. P. Papanikolaou, 'Ancillary services in active distribution networks: A review of technological trends from operational and online analysis perspective,' *Renewable and Sustainable Energy Reviews, vol. 147, September 2021.*

Deliverables

D1.1: Review of the state-of-the-art and technical solutions
This deliverable is a public report and summarizes the state-of-the-art, challenges and possible technical solutions regarding the three key objectives of the project. Therefore, a public report has been published in the previous reporting period in the project website (https://activate.ee.duth.gr/deliverables/) describing the a) the ancillary services in ADNs with special emphasis to the TSO and DSO interaction, b)

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: HFRI-FM17-229)

architecture technologies and techniques of network monitoring systems in ADNs and c) power converters.
Milestones
MS1 (Literature review – State-of-the-art): An in-depth review and analysis of the state-of-the-art, challenges and possible technical solutions regarding the three key objectives of the project has been done in M06 (previous reporting period).

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: HFRI-FM17-229)

3. Work Package 2

WP Number: 2	WP Title: Ancillary services solutions for DSOs and TSOs
Starting Month: 04	Ending Month: 32

WP Objectives

Scope of this WP is to develop novel control strategies, incorporating energy storage systems (ESSs), to address technical issues related to the steady-state operation of ADNs, i.e., overvoltages, voltage unbalances, and overloading. Next targets are to optimize the steady-state operation of ADNs by exploiting coordinated, generalized, and straightforward control strategies, with low communication requirements. Moreover, at WP2 novel dynamic control functionalities, such as virtual inertia and power smoothing techniques will be developed to ensure the stable and reliable network operation.

Work Description – Degree of Work Package Objectives Implementation

The WP objectives have been fully implemented (100%); deliverables D2.1 and D2.2 have been completed and milestones MS2 and MS3 have been achieved.

By using the findings of Task 1.1 the proposed strategies and coordination procedure in WP2 were developed, in terms of the following Tasks:
In **Task 2.1 (Development of control strategies to tackle network operational issues)** enhanced decentralized control strategies to address, on a local level, technical issues related to the penetration of DRESs into the existing distribution grids, such as overvoltages, voltage unbalances, and overloading of network equipment has been designed and implemented.

In **Task 2.2 (High level control strategies via optimization techniques)** a coordinated and generalized control strategy, with low communication requirements, that ensures the reliable distribution network operation has been developed. The proposed voltage regulation, voltage unbalance mitigation and contingency solving issues control strategies (developed in Task 2.1) are coordinated, in an individual way, to maximize the effectiveness of the proposed control strategy scheme and tackle operation challenges on a grid level.

Within **Task 2.3 (Development of control strategies to optimize network frequency responses)**, virtual inertia, power smoothing and primary frequency regulation capabilities were investigated to be integrated to DRESs to ensure improved frequency responses.

Within the frame of this WP, the following journal and conference papers have been published (additional achievements not considered in the original DoW):

- K. D. Pippi, T. A. Papadopoulos and G. C. Kryonidis, 'Impact assessment framework of PV-BES systems to active distribution networks,' *IET Renewable Power Generation*, vol. 16, iss. 1, pp. 33-47, 2022
- I.S. Lamprianidou, T.A. Papadopoulos, G.C. Kryonidis, E. Fatih Yetkin, K.D. Pippi, A.I. Chrysochos, 'Assessment of load and generation modelling on the quasi-static analysis of distribution networks,' *Sustainable Energy, Grids and Networks*, vol. 27, 2021, 1005091.

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: HFRI-FM17-229)

- K. D. Pippi, T. A. Papadopoulos and G. C. Kryonidis, 'Methodology for the Techno-Economic Assessment of Medium-Voltage Photovoltaic Prosumers Under Net-Metering Policy,' *IEEE Access*, vol. 9, pp. 60433-60446, 2021.
- K. D. Pippi, T. A. Papadopoulos and G. C. Kryonidis, "Impact Assessment Framework of PV-BES Systems to Active Distribution Networks", *Med. Conf. Power Gener., Transm., Distrib. Energy Convers. (MedPower 2020), pp. 1-6.*
- K. D. Pippi, T. A. Papadopoulos and G. C. Kryonidis, "Viability Assessment of PV Systems in University Campuses Under the Net-Metering Policy," *2020 55th International Universities Power Engineering Conference (UPEC)*, Torino, Italy, 2020, pp. 1-6.
- K. D. Pippi, G. C. Kryonidis, A. I. Nousdilis and T. A. Papadopoulos, "Assessing the Provision of Ancillary Services Considering BES Capacity Degradation," *2022 International Conference on Smart Energy Systems and Technologies (SEST)*, 2022, pp. 1-6.

Deliverables

D2.1: A unified control strategy for optimal voltage regulation and congestion management in ADNs

In this deliverable the ACTIVATE unified control strategy to effectively address voltage and congestion issues in modern distribution grids is proposed. The operation of the DRESs and ESSs is coordinated by the proposed control strategies providing ancillary services to DSOs and consequently to TSOs. The deliverable has been accepted and published in an international journal.

- K. D. Pippi, G. C. Kryonidis, A. I. Nousdilis and T. A. Papadopoulos, "A unified control strategy for voltage regulation and congestion management in active distribution networks," Electric Power Systems Research, vol. 212, 2022, 108648.

D2.2: Power smoothing control strategies using ESSs

This deliverable includes the proposed power smoothing control strategies by exploiting and properly dimensioning ESSs. The deliverable has been accepted and presented in an international conference.

- G. C. Kryonidis, A. I. Nousdilis, K. D. Pippi and T. A. Papadopoulos, "Impact of Power Smoothing Techniques on the Long-Term Performance of Battery Energy Storage Systems," *2021 56th International Universities Power Engineering Conference (UPEC)*, 2021, pp. 1-6.

Milestones

MS2 (Initial control strategies framework): The milestone has been achieved as scheduled (M15) including an initial control strategy framework that was used in D2.1.

MS3 (Fined tuned control strategies): After the completion of Task 2.2 and Task 2.3 specific properties and parameters of the proposed control strategies have been fine-tuned. The milestone has been achieved as scheduled (M23).

H.F.R.I. Hellenic Foundation for Research & Innovation

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: HFRI-FM17-229)

4. Work Package 3

WP Number: 3	WP Title: Real-time network monitoring and operating techniques
Starting Month: 4	Ending Month: 27

WP Objectives

Scope of this WP is to develop online monitoring techniques for the analysis of ADNs. Towards this objective, measurement-based multi-channel identification methods are developed, and a three-level monitoring architecture is proposed.

Work Description – Degree of Work Package Objectives Implementation

The WP objectives have been fully implemented (100%); deliverables D3.1 and D3.2 have been completed and milestones MS4 and MS5 have been achieved.

Task 3.1 (Converter-level identification methods) targeted to develop real-time measurement-based identification techniques, which can be applied at all levels of power systems. The main objective of these techniques is the estimation of network modal parameters and the derivation of virtual inertia constants.

Within Task 3.2 (DSO-level multi-channel identification methods), multi-channel measurement-based identification methods have been developed. In this context, several signals, acquired from different network buses are processed together to derive network modal estimates and to develop reduced order equivalent models, describing the dynamic and steady-state behavior of the grid.

In **Task 3.3 (Network dynamic performance evaluation on a CMU-level)**, modal estimates and reduced order equivalent models, derived at the DSO level, are transferred to the TSO. Modal estimates are used to evaluate in real-time the stability margins of the overall grid, while reduced order equivalents are used to assess the dynamic behavior of the grid under several contingencies. This way, close to real-time dynamic stability assessment is performed.

Within the frame of this WP, the following journal and conference papers have been published (additional achievements not considered in the original DoW):

- G. Barzegkar-Ntovom, E. O. Kontis, T. A. Papadopoulos and P. Papadopoulos, 'Methodology for Evaluating Equivalent Models for the Dynamic Analysis of Power Systems,' IEEE Transactions on Power Delivery, vol. 37, no. 6, pp. 5059 – 5070, 2022.
- T. A. Papadopoulos, G. Barzegkar-Ntovom, E. O. Kontis and E. A. Koukouliantas, 'Combined Transmission and Distribution Test System for Small-Signal Stability Analysis: Initial Results,' *2022 57th International Universities Power Engineering Conference (UPEC)*, Istanbul, Turkey, 2022, pp. 1-6.
- T. A. Papadopoulos, G. A. Barzegkar-Ntovom, E. O. Kontis and G. K. Papagiannis, "Identification of Closed-spaced and Poorly-damped Oscillatory Modes in Ringdown Responses of Power Systems," *2022 2nd International Conference on Energy Transition in the Mediterranean Area (SyNERGY MED)*, 2022.
- E. P. Saroudis, T. A. Papadopoulos, G. A. Barzegkar-Ntovom, E. O. Kontis and G. K. Papagiannis, "Wavelet-based Automatic Processing of Dynamic Responses for the Development of Dynamic

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: HFRI-FM17-229)

Load Models," *2022 2nd International Conference on Energy Transition in the Mediterranean Area (SyNERGY MED)*, 2022.

- G. A. Barzegkar-Ntovom, E. O. Kontis, T. A. Papadopoulos, "Application of a performance assessment method to identify the applicability range of distribution network equivalent models", *Electric Power Systems Research (EPSR)*, vol. 220, pp. 109245, 2023

Deliverables

D3.1: Multi-channel measurement-based identification methods for the analysis of ADNs

Multi-channel identification methods have been developed and their applicability in modern power systems has been thoroughly evaluated. The deliverable has been accepted for presentation in the International Conference on Power Systems Transients 2021 (IPST 2021). It has been included in a Conference Special Issue as a journal paper in Electrical Power Systems Research Journal. It has been delivered as scheduled (M20):

- E. O. Kontis, I. S. Avgitidis, **T. A. Papadopoulos**, G. A. Barzegkar-Ntovom, G. K. Papagiannis," Multi-channel measurement-based identification methods for mode estimation in power systems," *Electric Power Systems Research*, vol. 195(2), 2021.

D3.2: A three-level distributed architecture for the real-time monitoring of ADNs

This deliverable describes in detail the proposed three-level monitoring technique. The deliverable has been accepted for publication:

- T. A. Papadopoulos, E. O. Kontis, G. Barzegkar-Ntovom, and P. Papadopoulos, 'A Three-Level Distributed Architecture for the Real-Time Monitoring of Modern Power Systems,' *IEEE Access*, vol. 10, pp. 29287-29306, 2022.

Milestones

MS4 (Decentralized monitoring techniques): Monitoring techniques have been implemented at converter-level to determine modal and virtual inertia parameters. The milestone has been achieved within the previous reporting period as scheduled (M09).

MS5 (Network monitoring architecture): Holistic three-level network monitoring architecture. The milestone has been achieved as scheduled (M24).

H.F.R.I. Hellenic Foundation for Research & Innovation

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: HFRI-FM17-229)

5. Work Package 4

WP Number: 4	WP Title: Development of converter
Starting Month: 20	Ending Month: 29

WP Objectives

This WP is dedicated to the technical investigation, design and development of the proposed three-phase power converter. A functional prototype converter has been designed, integrating all proposed control strategies and monitoring techniques. The activities were aligned to the analysis performed in WP2 and WP3 ensuring the smooth future integration of the proposed holistic solution.

Work Description – Degree of Work Package Objectives Implementation

The WP objectives have been fully implemented (100%); deliverable D4.1 has been completed and milestones MS6 and MS7 have been achieved.

Task 4.1 (Technical specifications of the prototype converter) aimed at the determination of the technical specifications of the proposed power converter. All required activities to design and manufacture the converter have been determined, based on the summary and findings of Task 1.3. Then, the technical specifications and requirements of the converter (power rating, hardware, and software) have been explicitly defined.

Task 4.2 (Development of a prototype converter equipped with the proposed control strategies) aimed at the development of the prototype converter, which was used to test the proposed control strategies. The converter was developed in the Electrical Machines Laboratory of DUTH and is three-phase four-wire (3 phases and neutral). It integrates the control strategies, designed and developed in Tasks 2.1, 2.2, 3.1, and 3.2. The DC side of the converter is able to be connected either to a DC source, or to an ESS (or both forming a hybrid unit). Moreover, a user-friendly interface has been developed allowing the researcher to easily implement and test the developed strategies. The developed converter design was patented.

Within the frame of this WP, the following journal and conference papers have been published (additional achievements not considered in the original DoW):

- K. D. Pippi, A. D. Boubaris, G. C. Kryonidis, N. P. Papanikolaou, T. A. Papadopoulos, “Transient performance of a unified control system for the provision of ancillary services in low-voltage distribution networks”, *Electric Power Systems Research*, vol. 220, pp. 109293, 2023.

Deliverables

D4.1: Patent of the developed converter for voltage and frequency regulation of ADNs

A patent has been approved describing in detail the implementation of the power electronics converter (M29).

- "An Integrated System for Voltage and Frequency Control", No 1010420, Kalliopi Pippi, Alexandros Boubaris, Georgios Kryonidis, Christos Athanasiadis, Nick Papanikolaou, Theofilos Papadopoulos.

Milestones

MS6: Implementation of converter - beta release

The milestone has been achieved as scheduled (M24).

MS7: Tested and fine-tuned converter - final release

The milestone has been achieved as scheduled (M27).

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the “First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant” (Project Number: HFRI-FM17-229)

6. Work Package 5

WP Number: 5	WP Title: Validation of the proposed holistic approach
Starting Month: 22	Ending Month: 41

WP Objectives

The control strategies, the monitoring architecture and the converter developed in WP2, WP3 and WP4 will be validated in this WP by means of simulation and laboratory tests via power hardware-in-the loop experiments (PHIL). Different scenarios, including steady-state and dynamic conditions will be investigated.

Work Description – Degree of Work Package Objectives Implementation

The WP objectives have been fully implemented (100%); deliverable D5.1 has been completed and milestones MS8 and MS9 have been achieved.

In **Task 5.1 (Evaluation using simulations),** the performance of the control strategies, developed in the framework of WP2, have been tested by means of simulations. For this purpose, benchmark medium and low voltage grids with high penetration levels of DRESs were analytically modeled using engineering software such as NEPLAN, PSCAD, and DigSILENT. A portfolio of base case scenarios has been defined. Initially, steady-state and dynamic simulations were conducted, assuming that all DRESs are equipped with conventional control strategies. Technical problems such as overvoltages, overloading and frequency deviations were recorded and analyzed. Afterwards, the proposed control schemes were integrated in all DRESs and their performance was evaluated by means of appropriate key performance indicators. Topologies and results from the above-mentioned analysis was used for the preparation of the corresponding laboratory experiments (see Task 5.2). The performance of the proposed three-level monitoring scheme was tested by means of simulations using the following approach: Dynamic simulations were conducted on the selected benchmark power systems. Subsequently, simulated dynamic responses of voltage and current, acquired from several network buses, were used to estimate modal parameters and to derive reduced order equivalent models. Modal estimates were compared with actual grid eigenvalues, computed based on eigen-analysis methods. The accuracy of the derived equivalents were assessed by comparing estimated responses with the responses obtained through detailed simulations.

In **Task 5.2 (Validation through lab tests)**, simulations conducted in Task 5.1 were used to prepare a detailed test plan of lab test scenarios. The performance and the functionalities of the proposed converter were tested at the dynamic power system laboratory (D-NAP) of UoS via PHIL experiments. More specifically, a benchmark low-voltage grid was modeled on a digital real time simulator (DRTS) from RTDS Technologies. A virtual converter, such the proposed one, was connected at one node of this model. Several scenarios were examined to test the foreseen functionalities of the proposed converter, while its monitoring functions were evaluated using power loggers.

Within the frame of this WP, the following journal and conference papers have been published (additional achievements not considered in the original DoW):

- C. L. Athanasiadis, T. A. Papadopoulos, G. C. Kryonidis and K. D. Pippi, “A Benchmarking Testbed for Low-Voltage Active Distribution Network Studies,” *in IEEE Open Access Journal of Power and Energy*.

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the “First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant” (Project Number: HFRI-FM17-229)

Deliverables
D5.1: Validation of the proposed holistic approach The proposed holistic approach has been validated by means of simulation results and lab tests. The findings have been published in an international journal (M41): • T. A. Papadopoulos, K. D. Pippi, G. A. Barzegkar-Ntovom, E. O. Kontis, A. I. Nousdilis, C. L. Athanasiadis, G. C. Kryonidis, "Validation of a Holistic System for Operational Analysis and Provision of Ancillary Services in Active Distribution Networks", Enegies, 16(6), 2787, 2023.
Milestones
MS8: Definition of lab experiments Detailed definition of lab experiments (examined topologies, scenarios, etc.). Feedback from the performed simulations will be considered for the design of lab experiments. The milestone is expected to be achieved on M30. **MS9: Validation of the holistic approach** Remarks and conclusions obtained from the simulations and the lab tests. The milestone was achieved on M39.

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: HFRI-FM17-229)

7. Work Package 6

WP Number: 6	WP Title: Dissemination of results and exploitation
Starting Month: 1	Ending Month: 42

WP Objectives

The horizontal activities for dissemination and exploitation were intended to be active throughout the project's lifetime. A continuous monitoring of the advances, outcomes, achievements and conclusions was considered crucial for raising maximum external awareness as well as defining a realistic and viable exploitation plan. Project results were published in prestigious IJs and peer review ICs.

Work Description – Degree of Work Package Objectives Implementation

This WP has been completed included four tasks. According to the WP objectives, four deliverables (D6.1, D6.2, D6.3 and D6.4) and one milestone (MS10) have been considered.

A user-friendly website has been developed. The website was updated on a regular basis to include project progress and the main outcomes of the project. Furthermore, newsletters were regularly submitted to the stakeholders (seven newsletters in total). Another activity of this WP included the dissemination of the project results through scientific publications. More specifically, the project results were presented in international conferences and published in international journals with high impact factors. Finally, this WP has foreseen the organization of one international workshop to promote the project and to further disseminate the scientific results.

In **Task 6.1 (Setting up the dissemination plan)** the dissemination plan of ACTIVATE has been organized. This was essential in general to ensure the international visibility of the project. The dissemination plan included the development of the mailing lists (TSOs and DSOs, partners in academia, research centers, industry, students, trainers, teachers, policy makers, wider public), a list of target conferences that the members of the research team may participate to disseminate the results of the project.

Task 6.2 (Designing and maintaining the ACTIVATE website) aimed to increase public awareness and communicate the project advances and outcomes through the project web-site (https://activate.ee.duth.gr/) accompanied and interlinked with its respective social media accounts:

- Facebook Page (https://www.facebook.com/ACTIVATE-107734704150149),
- LinkeIn (https://www.linkedin.com/company/activate-research-project)
- Research gate (https://www.researchgate.net/project/ACTIVATE-Ancillary-services-in-aCTIVe-distribution-networks-bAsed-on-moniToring-and-control-tEchniques)

The project website alongside with the social media profiles and channels have been launched and are continuously updated and refined to ensure maximized exploitation of web-based communication possibilities. All relative activities have been reported and demonstrated in D6.3 newsletters. The newsletters were periodically updated (every 6 months) with any additional material generated in-between its delivery dates. Moreover, this task included the design and development of project material used for dissemination purposes, such as: project logo, project leaflet, project banners and project posters.

In **Task 6.3 (organizing international workshop)**, a scientific international workshop has been organized on 19/05/2023 in Democritus University of Thrace. The members of the research group as well as an invited speaker gave talks on the project results and issues relevant to the project subject.

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: HFRI-FM17-229)

Task 6.4 (Deployment of project results) considered activities focusing on the design of the potential exploitation strategy related to the outcomes of the project. Scope of this task was to ensure a successful commercialisation of the project results and the continuation of the research after the end of this project.
Deliverables
D6.1: First accessible version of social media accounts The project social media accounts and website have been launched in the first months of the project ensuring public awareness and communicate the project advances. A public report has been published in the project website (https://activate.ee.duth.gr/deliverables/) **D6.2: List of published scientific papers** A public report with all published scientific material has been uploaded at the project website (M42). **D6.3: Newsletters** Newsletters have been published every six months in the project website (https://activate.ee.duth.gr/news/), social media accounts as well as by submitting e-mails. The seven newsletters have been also uploaded in the project website as a public deliverable (M42). **D6.4: Closing event. International workshop** An international workshop in Xanthi was organized on 19/05/2023. Details on the closing event can be found in the project website at https://activate.ee.duth.gr/news/ (M42).
Milestones
MS10: The website of the project has been set up on M03 (previous reporting period)

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: HFRI-FM17-229)

8. Work Package 7

WP Number: 7	WP Title: Project management
Starting Month: 1	Ending Month: 42
WP Objectives	
This WP was related to managerial and coordination activities throughout the project's lifetime. The principal investigator continuously monitored the outcomes' quality from a technical perspective, the on-time achievements, the on-time delivery of the material as well as the smooth evolution of the project financial resources. Quality management and Risks mitigation plans were established at early stage in the framework of this WP, as a roadmap for ensuring high quality project outcomes.	
Work Description – Degree of Work Package Objectives Implementation	
This WP has been completed. According to the WP objectives, two deliverables are considered (D7.1 and D7.2). This WP comprised the day-to-day management of the project and aims to conduct the administrative management, to handle all financial issues and to perform a close follow up of the daily project activities. The main tasks of this WP included: (a) the establishment and maintenance of the project handbook, (b) the scheduling of regular team meetings, (c) the review of the work progress, (d) the assurance of scientific and technical quality of all project activities/deliverables and (e) the update of the work plans. This WP contains a single Task, i.e., 7.1 supervised by a Quality Control Board (QCB) consisting by the PI and the collaborating Professors. A quality and contingency plan has been created at the beginning of the project that considers the quality requirements of the project and the respective guidelines to achieve this quality level. A detailed risk assessment has been performed for all modules that comprise the project methodology, along with the proposed mitigation actions (see A.8 of this report). The QCB was also in charge of the integrative management related to Intellectual Property Rights (IPR) issues as well as background and foreground knowledge that has been generated in the project.	
Deliverables	
D7.1: Establishment of the project handbook This project handbook uses the frame of the overall existing quality system, specific details regarding the project has to be filled in (tasks, dates, names, deliverables, etc.). It is available as a public report in https://activate.ee.duth.gr/deliverables/ **D7.2: Project final report** Closure of ACTIVATE, includes all technical advances achieved and introduced, list of publications, dissemination results, etc. This deliverable can be also found in https://activate.ee.duth.gr/deliverables/.	
Milestones	
This WP does not include any milestones	

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: HFRI-FM17-229)

ΕΛ.Ι.Δ.Ε.Κ.
Ελληνικό Ίδρυμα Έρευνας & Καινοτομίας

This project has received funding from the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: HFRI-FM17-229)