DC Number	DC6
Title of the PhD Project	Optimal operation of electric vehicles and heat pumps in Active Distribution Grids
Keywords	Electric vehicles, heat pumps, optimization methods, Active Distribution Grids
Recruitment organisation	Electricity Authority of Cyprus (EAC) – Distribution System Operator https://www.eac.com.cy/EL/RegulatedActivities/Distribution/Pages/default.aspx
Supervisors names and contacts	Chrysovalantis Spanias (cspanias@eac.com.cy) and Phivos Therapontos (ptherapo@eac.com.cy)
Scientific context and objectives	The increasing penetration of renewables, accompanied by the decommissioning of conventional power plants, has reduced inertia in many electric power systems. This is particularly more prominent in islanded networks and leads to several problems affecting the stability and resilience of the system. At the same time, the increasing electrification of transportation (mainly electric vehicles) and heating (mainly heat pumps) leads to technical challenges in Distribution Networks (DNs) and energy management challenges in the bulk transmission system. However, the optimal operation of these highly controllable loads through new Vehicle-to-Grid (V2G) technologies can offer solutions to technical challenges within the DNs and, simultaneously, support the low-inertia problems in the bulk transmission system. In this project, we will investigate the design of optimal operation strategies for EVs and heat pumps located in DNs. The project's primary objectives are: • The development of centralized optimization-based algorithms, implemented in the DN SCADA system, that incorporate both static and dynamic network constraints; • The increase of fault tolerance and resilience of low-inertia power systems through DSO-to-TSO support and coordination; • The reduction of the cost of operation of low-inertia power systems.
Required skills	• A degree in engineering, preferably with a focus on electrical engineering, optimization, control engineering or power engineering - alternatively you have a comparable qualification. • Sound knowledge of electricla engineering, control engineering or optimization methods or electric power system modeling and analysis • Experience in at least one higher programming language (preferably Python, C++, Julia or Matlab) • Ability to work scientifically, independence, flexibility, teamwork and communication skills • Interest in applied research work in sustainable and intelligent power systems • Desire for professional and personal development • Very good knowledge of English
References	[1] A. Kasis, E. Devane, C. Spanias and I. Lestas, "Primary Frequency Regulation With Load-Side Participation—Part I: Stability and Optimality," in IEEE Transactions on Power Systems, 2017 [2] F. Escobar, J. M. V'iquez, J. Garc'ia, P. Aristidou, G. Valverde, "Coordination of DERs and Flexible Loads to Support Transmission Voltages in Emergency Conditions", IEEE Transactions on Sustainable Energy, 2022. [3] S. Karagiannopoulos, J. Gallmann, M. G. Vayá, P. Aristidou and G. Hug, "Active Distribution Grids Offering Ancillary Services in Islanded and Grid-Connected Mode," in IEEE Transactions on Smart Grid, 2020.

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