

**Theme 6-6: Smart Grid - 2023**

Title	Name of the PI	List the Names of the Co-Is	Department	Abstract	Starting Date	Ending Date	Funding	Amount of Funding
Toward Cost-Effective Protection of AC/DC Microgrids	Ahmed Osman	Maher Azzoz	ELE	<p>Green energy and smart grid initiatives are driving the move from legacy power systems toward sustainable systems with new features such as microgrids and inverter-interfaced renewable energy sources (IRESs). Nonetheless, the unconventional characteristics of the IRES current waveforms, which are totally unlike conventional generators, make protection relays fail to protect AC microgrids. On the other hand, DC microgrids have recently received substantial interest from both the industrial and academic communities. Compared with their AC counterparts, DC microgrids offer better reliability, higher efficiency, simpler control and are easier to accommodate IRESs and modern loads, such as electric vehicle chargers (EVCs). However, protecting DC microgrids against short-circuit faults remains the main barrier behind the wide proliferation of these DC grids. The challenge stems from the significant and rapidly rising DC fault currents from converters, along with the absence of no natural zero crossing. The goal of the proposed research is to realize cost-effective protection for AC/DC microgrids that guarantees the main protection requirements, i.e., speed, selectivity, sensitivity, and reliability, and cost. In alignment with this goal, the following objectives will ensure cost-effective (i.e., communicate-free) protection of AC/DC microgrids with IRESs through developing: (i) adaptive harmonic-based optimal protection coordination (OPC) for AC microgrids, OPC in DC microgrids with current-limiting capabilities, and artificial intelligent (AI)-tuned current derivative protection for DC microgrids.</p>	01/06/2022	31/05/2024	FRG	468,250