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Nanogrids are smaller-scale energy systems than larger microgrids, says George Georghiou, the director of the FOSS Research Centre for Sustainable Energy at the University of Cyprus. He notes that nanogrids and microgrids share the same operational modes and provision of services. However, the significantly smaller size of nanogrids in terms of power capacity results in quicker and more cost-effective deployment. The smaller size of nanogrids also opens up opportunities for aggregation and the implementation of new business models.

With this in mind, the FOSS Research Centre - in cooperation with Ecotricity Holdings, a local energy developing firm - has built the first hybrid nanogrid systemin Cyprus on the campus of the University of Cyprus. The project features a 40 kWp building tegrated photovoltaic (BIPV) system, combined with 66 kWh (60 kW) of energy storage capacity, a 21 kW EV charging station, and an energy management system.

An Ecotricity Holdings spokesperson told us that a key feature of the pilot is the seamless transition from a grid-connected mode to an islanding mode of operation. The developer says that this is the first time that an islanded system has been put into operation in Cyprus. The battery inverter is equipped with grid-forming capabilities and can ensure that critical loads are supplied with power without interruption (power from batteries and PV system) in case of a contingency or external signal triggering.

"The main benefits of nanogrids for Cypriot consumers is to provide cheaper and cleaner electricity from renewables, and improved self-consumption from renewable technologies such as solar," says Georghiou.

"Nanogrids can provide balancing services in grid-connected mode of operation since exchange of energy can be bidirectional," says Georghiou. "In more detail, nanogrids can provide active and reactive power support, supplemental reserve and backup supply in open competitive market, while they can easily sell power for system black start."

Georghiou"s remarks underscore why the University of Cyprus pilot project matters for the research community, the PV sector, and smart energy technologies. Nevertheless, its practical applicability in Cyprus is currently limited. The country has only partially liberalized its electricity sector in recent years, primarily for industrial users.

Competition remains absent in the residential market, and there is no ancillary market. Despite government statements promising full liberalization and competitiveness in the electricity market next year, such assertions have been made for several years, leading to skepticism about the government"s intentions.

Georghiou says the transition of the Cypriot electricity market has sparked interest from both the distribution system operator and the Electricity Authority of Cyprus (EAC). They are eager to explore and comprehend

new grid services, including frequency regulation, voltage support, black start, and ramp rate control. The center"s researchers are currently closely collaborating with the EAC to showcase these new ancillary services within the nanogrid framework and to incorporate emerging technologies like vehicle-to-grid and green hydrogen.

The University of Cyprus intends to convert its pilot project into an accessible "living lab" for policymakers, regulators, and the Cyprus grid operator to implement novel concepts through collaboration with university researchers.

In addition to providing ancillary market services, Georghiou says nanogrids offer business opportunities for financial firms. These opportunities could arise from aggregating portfolios of nanogrids, allowing financial firms to introduce energy-as-a-service and other innovative financing models.

"That is due to the possibility of optimizing energy use, storing excess energy production and monetizing grid support," says Georghiou. "Finally, nanogrids can also provide resilience from extreme weather events and man-made events (cyberattacks)."

The University of Cyprus and energy developer Ecotricity Holdings have jointly installed a nanogrid system for a single building in Cyprus. The aim is to minimize the site’s energy consumption costs and eliminate the power system’s carbon footprint.