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DC-AC/DC hybrid energy systems to increase efficiency implementing cyber protection

The electrical energy system is a critical infrastructure as all the interdependent domains in a modern society rely on the availability of electricity (e.g. transport, finance, communication, water supply). With the increasing penetration of renewables, the decentralization and digitalization of generation, the energy system is heading towards a transformation bringing along technical and socio-economic benefits, but also cybersecurity threats, which are difficult to fight due to the real-time requirements, the cascading effects and the coexistence of legacy with state of the art technologies. On the other hand, the energy transition suggests, looking at horizon 2050, the use of new technologies available today to optimise the electrical energy system. For example, the development of power electronics has increased the efficiency of converters to the point that DC systems can be considered as possible solutions at different voltage levels taking into account the DC nature of many generation and load units. The modular characteristic of DC interconnection allows the coexistence of AC and DC grids, a hybrid electrical system. Therefore, the architecture can be thought of as clusters of AC and DC local grids interconnected in DC. In such conditions, the electrical system is fractionated and in case of a failure or a cyberattack, the cascading effect is avoided due to the “firewall” characteristic of a DC link. Modelling is paramount to demonstrate, test and validate DC-AC/DC hybrid energy systems. The European Commission is technology neutral and supports R&D&I through the Work Programmes (ongoing Horizon 2020 and the next Horizon Europe 2021–2027), for innovative technologies aiming at a secure, clean and efficient energy at the benefit of EU citizens.

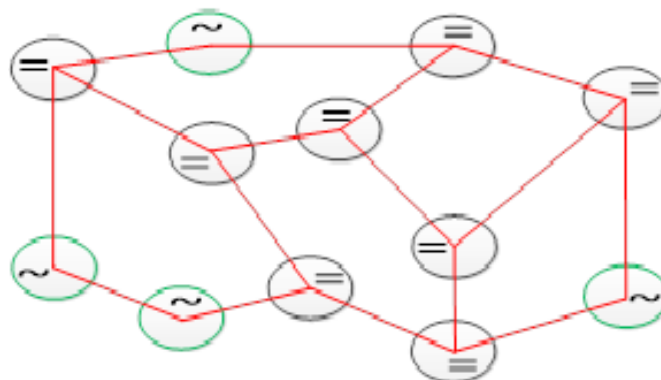


Figure 1: Symbolic representation of a hybrid grid

Biography

Mario Dionisio is a Programme Assistant for EU policies in the Directorate General for Energy of the European Commission in Unit C2 - New energy technologies, innovation and clean coal. He contributes to the development of relevant programmes or policies in the renewable energy domain. His main activities are focused on the digitalisation of the electrical energy system. He is involved as well in the development of the Energy Work Programmes within H2020 and the implementation, management, co-ordination and related follow-up of energy research projects. Mario holds a Master's degree in industrial engineering in electro mechanics. Prior to join the European Commission, he worked for 13 years in the National Laboratories of Gran Sasso of the National Institute for Nuclear Physics (Italy)

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