Contribution ID: **216** Type: **Poster**

Modeling a Reactive Power Compensation System for Renewable-Based Grid Stabilization

Thursday 10 July 2025 14:45 (15 minutes)

The integration of renewable energy sources into isolated power systems presents significant challenges related to voltage stability and power quality. This study focuses on modeling a reactive power compensation system to stabilize a solar-powered grid in the isolated region of Crișan, Tulcea County, within the Danube Delta. Two simulation models were developed using MATLAB/Simulink: one employing capacitor banks and the other utilizing a Static VAR Compensator (SVC). The simulations incorporated both dynamic phasor and steady-state analysis methods. Results indicate that while capacitor banks offer a cost-effective solution for steady-state reactive power compensation, SVCs provide superior dynamic response and voltage regulation through real-time control using a PI regulator. The study concludes that a hybrid approach, combining both technologies, can enhance grid stability and ensure reliable integration of renewable energy sources in remote areas. This work underscores the importance of reactive power management in the transition to sustainable, emission-free energy systems.

Primary author: GHERASIM, Angela Andreea (University of Bucharest, Faculty of Physics, PO Box MG-11, Bucharest, Măgurele, Romania)

Co-authors: BALAN, Adriana (University of Bucharest, Faculty of Physics, PO Box MG-11, Bucharest, Măgurele, Romania); VOINEA, Sanda (University of Bucharest, Faculty of Physics, PO Box MG-11, Bucharest, Măgurele, Romania)

Presenter: VOINEA, Sanda (University of Bucharest, Faculty of Physics, PO Box MG-11, Bucharest, Măgurele, Romania)

Session Classification: Poster Session 3

Track Classification: S06 –Interdisciplinary Physics, Mathematical and Computational Methods