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## Alternative Sources of Energy Modeling and Automation

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Micro-power domestic organic Rankine cycle (ORC) systems and the selection of the expander and the working fluid are presented, analyzed thoroughly, and numerically evaluated. A promising decentralized hybrid PV-SOFC system is investigated for providing useful energy supply to commercial buildings, capable of power and heat generation at a lower cost. A hybrid solar-combined cycle power plant integrated with a packed-bed thermal energy storage system with a novel recycling configuration enables robust control of collector temperature and net power during times of high solar activity. An automated hybrid (solar and biomass) power plant for thermal energy production for indoor space heating loads coverage is presented. A comprehensive and up-to-date literature review is presented of non-iterative methods for the extraction of the single diode model parameters of photovoltaic modules. A prototype custom built two-speed gearbox with a single stage transmission electric vehicle achieves significant reductions in the overall energy consumption. Two new fuzzy models are presented of high concentrator photovoltaics using the high-accuracy Takagi-Sugeno-Kang approach and the ease of interpreting the Mamdani linguistic rules. Finally, the impact of plug-in hybrid electric vehicles (PHEVs) in the primary frequency regulation is studied and the effects of PHEVs in non-interconnected isolated power systems with significant renewable energy source (RES) penetration are demonstrated through simulations of the isolated power system of Cyprus Island.

