

THE INTRODUCTION OF WIND POWERED PUMPED STORAGE SYSTEMS IN ISOLATED POWER SYSTEMS WITH HIGH WIND POTENTIAL

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ABSTRACT

In this paper, wind powered pumped storage systems for the electricity production in isolated power systems with high wind potential, are presented. The prerequisites under which the introduction of such systems in isolated power systems may be technically and economically feasible are investigated. The proposed systems aim at the wind power penetration maximization and the imported fossil fuels minimisation, consumed in the electricity production. The proposed system consists of wind parks, pumped storage systems and thermal power plants. The wind parks are the fundamental power production unit. The pumped storage systems (PSS) adapt the stochastic wind production to the power demand. Two case studies, for the Greek islands of Crete and Rhodes, are accomplished. The introduced systems initial and operational cost are estimated. The projects are economically evaluated. A dynamic security assessment is implemented in order to ensure the dynamic security of the proposed systems. The proposed systems exhibit lower energy production specific costs than the ones of the existing systems of the investigated islands. The annual renewable energy sources penetration reaches 90%. The

fossil fuels consumption is minimised. The investments may exhibit, under certain prerequisites, attractive indexes. The proposed systems were proved to be dynamically secure. The proposed systems represent highly promising solutions for an alternative, environmentally friendly electrification of isolated power systems with high wind potential, met in Greece and worldwide.