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Design and off-design models of a hybrid geothermal-solar power plant enhanced by a thermal storage

Martina Ciani Bassetti, Daniele Consoli, Giovanni Manente, Andrea Lazzaretto

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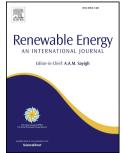
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| 4 | Martina Ciani Bassetti ^a , Daniele Consoli ^b , Giovanni Manente ^{c*} , Andrea Lazzaretto ^d |
| 5 | ^{a,c,d} University of Padova, Department of Industrial Engineering, via Venezia 1, 35131, |
| 6 | Padova, Italy. |
| 7 | ^b Enel Green Power - Innovation and Sustainability, Viale Regina Margherita 125, |
| 8 | 00198, Rome, Italy. |
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10 Abstract

Geothermal resources are subject to thermal depletion during the lifetime of geothermal power 11 plants. The decline of the geofluid temperature significantly affects both the magnitude and quality 12 of the thermal energy available for electrical conversion and, in turn, plant efficiency and power 13 output. Furthermore, the performance of geothermal power plants based on air-cooled Organic 14 Rankine Cycle systems (ORCs) markedly decreases at warm ambient temperatures because of the 15 higher turbine exhaust pressures. In this study a new hybrid Geothermal - Concentrating Solar 16 17 Power (GEO-CSP) plant is modelled, which enables a better utilization of geothermal energy and improves the performance of the geothermal ORC system during the whole lifetime of the power 18 plant. Solar energy is used to heat up the geothermal fluid entering the heat exchanger of the ORC. 19 The CSP plant is equipped with a thermal energy storage (TES) unit which accumulates the surplus 20 of solar thermal energy available during daytime, while releasing it during night-time when the 21 22 efficiency of the power system is higher. The integration of the storage unit in the parabolic trough CSP system enables a 19% gain in the incremental annual energy production from solar, which 23

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