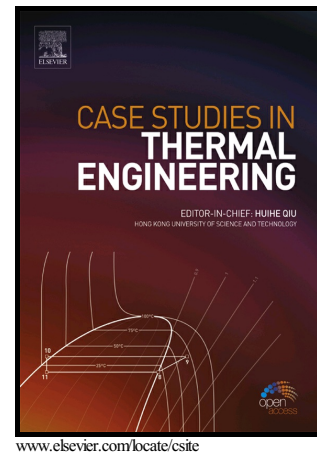


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An integrated program of a stand-alone parabolic trough solar thermal power plant: Code description and test

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Abstract- Solar thermal systems produce steam after being energized by solar parabolic trough concentrators, are incorporated with a steam turbine-generator assembly to produce electricity. This study presents a code for prediction of performance, while under-taking preliminary plant-sizing for a variety of parabolic trough solar fields operating under nominal conditions. The code, named as PTPPPP (Parabolic Trough Power Plant Performance Predictor) consists of four blocks. The code allows prediction of variables including: heat loss coefficient, U_L , aperture effective direct normal irradiance, I , heat gain, Q_{gain} , and the thermal efficiency of stand-alone parabolic trough solar thermal power plant in commerce, η_p . The conceptual design of the stand-alone parabolic trough solar involves: selection and sizing of system components, power generation cycles, working fluid types, and power block sizing. The input weather parameters and the operational parameters to the code have been acquired from in-situ measurements. The prediction results of the code have been found in good agreement with literature data with mean error of 0.18% in prediction of output power. In addition, this code is able to provide a flexibility in terms of temperature, heat transfer, and pressure range.

Keywords:

Direct normal radiation; direct steam generation; parabolic trough solar thermal power plant.

1. Introduction

With no doubt that there is a rapid global increment in the demand of a clean energy. One of the major concerns in the world is to protect our environment through controlling pollution such as greenhouse gas emissions. Even though, the fossil energies are still available, it is not guaranteed that it will last for a long period from now. Therefore, it has become crucial to investigate alternate source of energy, in particular to renewable energy; while addressing the issues associated with environment [1]. A study predicts that there is a high expectation towards

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