Power, placement and LEC evaluation to install CSP plants in northern Chile
Nicolás Corral, Nicolás Arquique*, Dalila Fernandes, Cristóbal Parrado, Gustavo Cáceres
Facultad de Ingeniería y Ciencias, Universidad Adolfo Ibáñez, Diagonal Las Torres 2560, Peñalolén, Santiago, Chile

ABSTRACT
Chile is expecting a 5.4% growth in energy consumption per year until 2030, requiring new and better solutions for the upward trend of its electricity demand. This state leads to select and study one of the potential alternatives for electricity generation: concentrated solar power (CSP) plants. Such renewable technology found in Chile a very favorable condition. Recent researches indicate Atacama Desert as one of the best regions for solar energy worldwide, having an average radiation higher than in places where CSP plants are currently implemented, e.g. Spain and USA. The aim of this study is to present an analysis of levelized energy cost (LEC) for different power capacities of CSP plants placed in distinct locations in northern Chile. The results showed that CSP plants can be implemented in Atacama Desert with LEC around 15 $/kWh when a gas-fired backup and thermal energy storage (TES) systems are fitted. This value increases to approximately 28 $/kWh if there is no backup system.

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1. Introduction

Chile is nowadays passing through a period of uncertainty in what regards its energy sector, which is found to be unprepared to provide the estimated growth of 5.4% in energy consumption per year until 2030 [1]. The current energy situation in Chile and its radiation conditions gives the opportunity to investigate the potential and viability of implementing solar thermal power plants in the north of the country [2-4]. However, there are only a few researches available in this subject regarding Chile, and the majority of them date from two or three decades ago [5-9]. In addition to that, it is noted that none of the existing researches consider economic aspects to install a concentrated solar plant in Chile.

Regarding Chilean energy regulations, it is important to remark that, since 2008, the electricity companies selling directly to final customers must incorporate a certain percentage of non-conventional renewable energy (NCRE) into the electricity they trade [10]. This law consolidates the efforts to remove barriers to the incorporation of NCRE into the national power mix, thereby