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A Nightly Conditioning Method to Reduce Parasitic Power Consumption in Molten-Salt Central-Receiver Solar-Power Plants

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ABSTRACT

A method to reduce nightly parasitic power consumption in a molten salt central receiver is discussed where salt is drained from the piping and heat tracing is turned off to allow the piping to cool to ambient overnight, then in the morning the pipes are filled while they are cold. Since the piping and areas of the receiver in a molten-nitrate salt central-receiver solar power plant must be electrically heated to maintain their temperatures above the nitrate salt freezing point (430°F, 221°C), considerable energy could be used to maintain such temperatures during nightly shut down and bad weather. Experiments and analyses have been conducted to investigate cold filling receiver panels and piping as a way of reducing parasitic electrical power consumption and increasing the availability of the plant. The two major concerns with cold filling are: 1) how far can the molten salt penetrate cold piping before freezing closed and 2) what thermal stresses develop during the associated thermal shock. Experiments and analysis are discussed.

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