



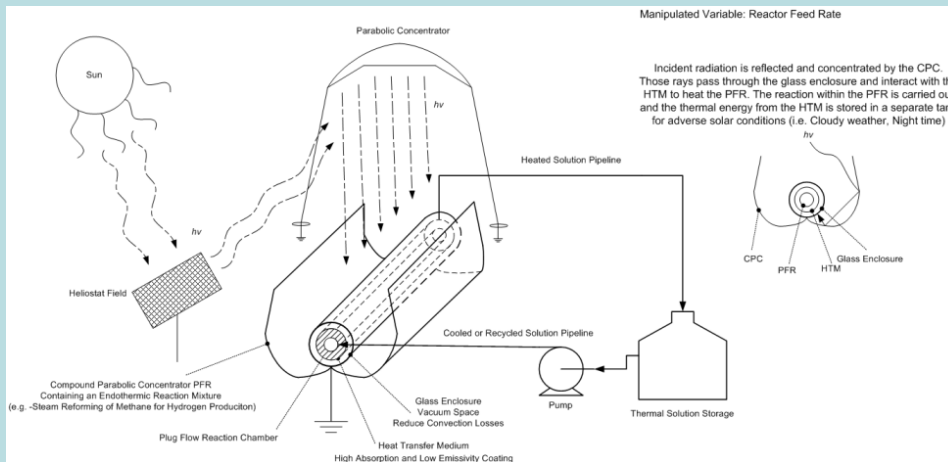
Dynamic Model of a Solar Thermochemical Water Splitting Reactor with Integrated Energy Collection and Storage

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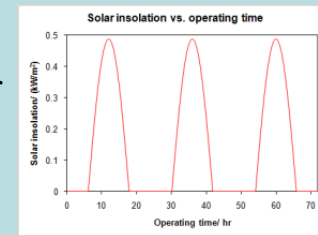
A key challenge to utilizing solar energy to split water to hydrogen and oxygen is its *intermittency*.

- Solar energy only available during daytime, and fluctuates due to weather and season.
- The resultant unsteady state operation leads to poor utilization of equipment and lowered competitiveness with fossil fuel and nuclear energies.
- Can insolation be smoothed with reasonable amounts of molten salt storage?
- We propose a solar receiver-reactor with integrated energy collection and storage.

Water-Splitting Thermochemical Cycle with Integrated Energy Collection and Storage

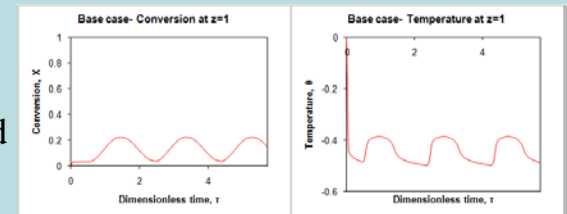


Variable Solar Input

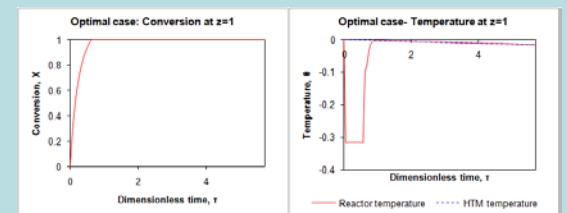


Without energy storage

Exit reactor conversion and temperature



With energy storage



- Addition of intermediate storage can sustain steady 100% conversion during 24/7 operation with a reasonable plant layout.
- Storage of heat transfer medium for a six MT/day hydrogen plant requires two tanks of dimension 15 m high and 90 m in diameter, covering ~1.3 hectares (3.2 acres) of land, a reasonable plant layout.