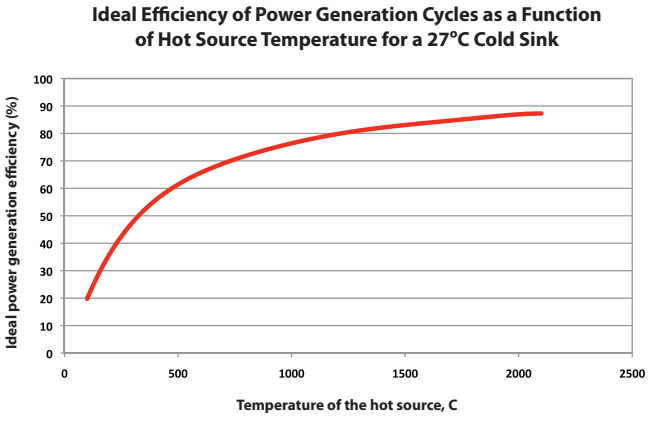
Chemically Reactive Working Fluids

ARGONNE	Argonne NATIONAL LABORATORY
PROGRAM:	SunShot CSP R&D 2012
TOPIC:	Advanced Receivers
LOCATION:	Argonne, Illinois
AWARD AMOUNT:	Up to $1 million
PROJECT TERM:	2012–2014



This chart illustrates the ideal efficiency of power generation cycles as a function of the temperature at which heat is transfered. The higher the temperature of heat transfer, the higher the cycle efficiency, and thus, the need for heat transfer fluids (HTFs) operating between 650° and 1200°C. *Graphic from Argonne*

CONTACTS

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Partnering Organization:
- ALD Nanosolutions

MOTIVATION

Improvements in heat transfer fluids (HTFs), which transmit the sun's heat from the receiver to the power cycle, are required to fully realize concentrating solar power (CSP) energy collection potential. Although state-of-the-art CSP systems have a maximum solar-to-electric efficiency of approximately 30%, typical industrial-scale plants operate at efficiencies around 15% in part due to the limited capabilities of current HTFs.

PROJECT DESCRIPTION

Argonne National Laboratory is demonstrating the feasibility of employing chemically reactive working fluids (CRWFs) as an HTF for CSP systems. CRWFs are able to:

- Capture solar heat as chemical energy in addition to sensible heat and latent heat
- Enable substantially more heat per unit mass to be captured
- Function at operating temperatures in the range of 650°C–1200°C.

The research will investigate and rank order several CRWFs for their ability to meet target metrics for the SunShot goals and demonstrate the efficiency and longevity of candidate systems by repeated cycling in the temperature ranges of 650°C–1200°C.

IMPACT

While current HTFs are generally limited to temperatures less than 600°C, CRWFs are able to more effectively capture, store, and transfer solar heat. Power system computations indicate CRWFs have the potential to more than double the power output of CSP systems.

For more information, visit the project page at: www.solar.energy.gov/sunshot/csp_sunshotrnd_anl.html.

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