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Advanced Energy Conversion for Sodium-Cooled Fast Reactors

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Advanced energy conversion using the supercritical carbon dioxide (sCO₂) Brayton cycle has been under development at Argonne National Laboratory (ANL) for over twelve years. It has been shown to enable the SFR capital cost per unit output electrical power (\$/kWe) or Levelized Cost of Electricity (LCOE) to be significantly reduced improving SFR economics (a U.S. DOE SFR goal) and eliminating sodium-water reactions, although there still remains a need to understand potential sodium-CO₂ interactions that is being addressed through ongoing sodium-CO₂ interaction tests. It has been shown that the cycle enables the use of dry air cooling whereby heat is rejected directly to the air atmosphere through the use of finned tube air coolers. A Plant Dynamics Code for system level dynamic analysis of sCO₂ cycles has been developed, coupled to the SAS4A/SASSYS-1 SFR transient analysis code, and is being validated through comparison with data from sCO₂ integrated cycle test loops.

Country/Int. Organization

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