Argonne NATIONAL LABORATORY

# TECHNOLOGY TESTING AND VALIDATION

*Argonne Facilities Integral for Nuclear Power Future*

## OVERVIEW

Argonne researchers conduct experimental work in reactor thermal-hydraulics and reactor safety behavior in a number of radiological and non-radiological facilities onsite. These facilities are used to test reactor materials, components, and instruments under demanding service conditions relevant to reactor applications. They are also used to perform high-quality measurements under well-characterized conditions, which can be used to test and validate computational models of reactor performance and safety behavior.

**Argonne's SNAKE facility is used to study the effects of S-$CO_2$ leakage within advanced reactor heat exchangers.**

## NSTF

The Natural convection Shutdown heat removal Test Facility (NSTF) is a state-of-the-art, large-scale laboratory for evaluating performance and validating computational models of passive safety systems that employ natural circulation to cool the outer surface of reactor vessels.

## MCCI

Argonne's unique "Melt Coolability and Concrete Interactions" (MCCI) facility allows the largest corium/concrete interaction experiments to support development of severe accident code models, which are used to predict the consequences of reactor core melt events such as those at the Fukushima-I power station in Japan. Data are used by reactor safety analysts developing models to predict the course of such accidents.

## MAX

Computational fluid dynamics (CFD) codes are increasingly being used to predict heat transfer and fluid flow in nuclear power plant systems. Argonne's MAX facility supports CFD code validation by generating high-resolution data and using state-of-the-art instrumentation.

## SFR TECHNOLOGY

Argonne's unique capability for experimental work with sodium (and other liquid metals) as a coolant is well maintained and continually enhanced. Historically, this capability has been employed for testing fast reactor components and technologies. Several sodium loops have been established at Argonne to test diverse components and technologies of advanced sodium-cooled fast reactors (SFRs).

A Mechanism Engineering Test Laboratory (METL) allows for the testing of diverse components of advanced SFRs in liquid sodium. Performance data from METL will be employed in the development of advanced SFR equipment and components to assure their performance and reliability during reactor plant operations.

A facility for testing ultrasonic techniques for under-sodium "viewing" has also been established to improve and facilitate the inspection of components, equipment, and structures in a sodium environment. And two facilities have been built to investigate key aspects of the proposed coupling of a closed Brayton cycle power conversion system, employing supercritical carbon dioxide (S-$CO_2$) as the working fluid, with an SFR:

- The SNAKE facility is used to study reactions that would result from leakage of S-$CO_2$ into sodium within compact (diffusion-bonded) printed circuit heat exchangers.
- A "plugging phenomena" loop is used to study the potential plugging of narrow sodium channels in such heat exchangers.

## CONTACT

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