Oak Ridge National Laboratory: Celebrating 80 years of impact through collaboration

Presented to the
IACMI Members Meeting

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Energy Science and Technology

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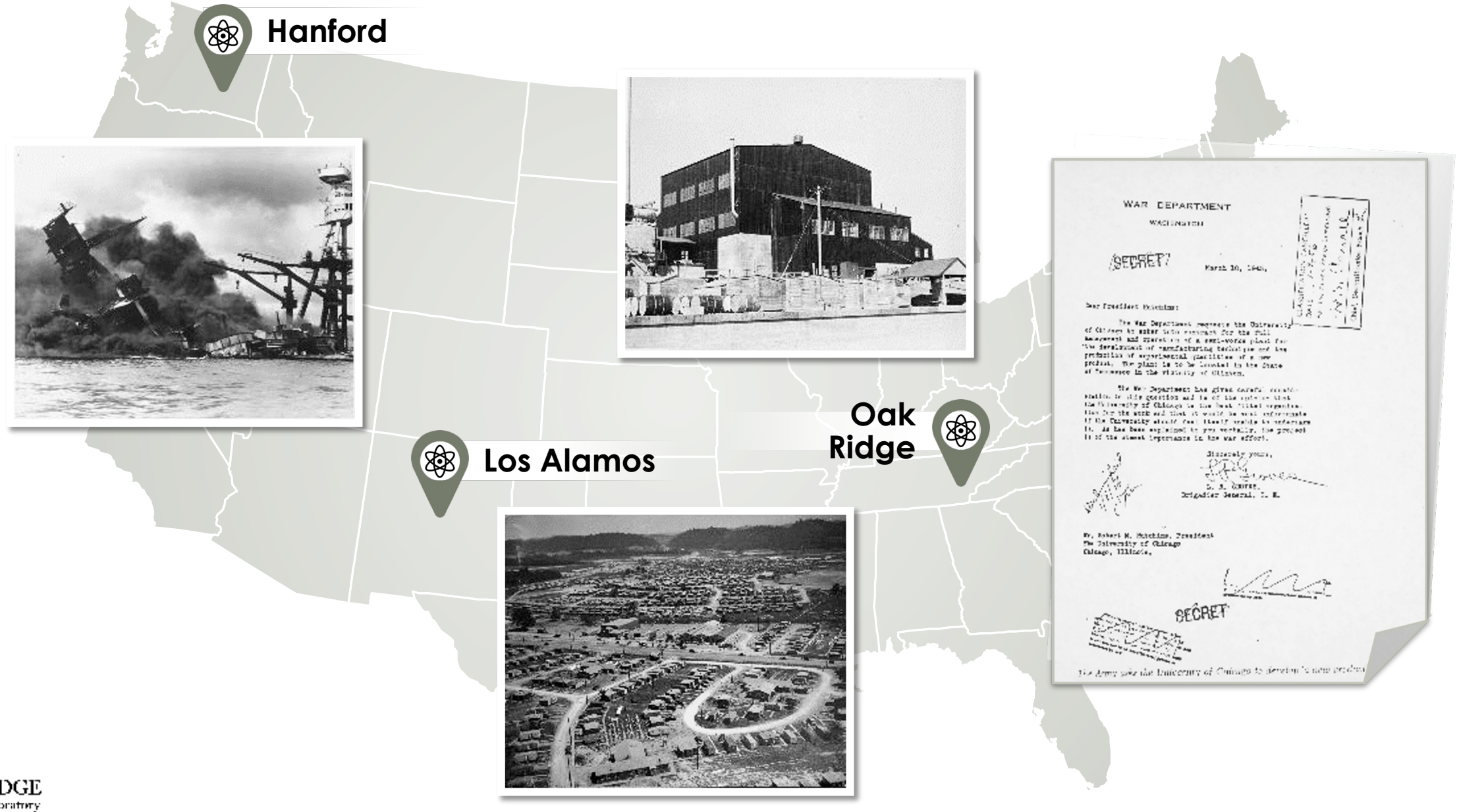
ORNL is managed by UT-Battelle LLC for the US Department of Energy

ORNL was born of the Manhattan Project



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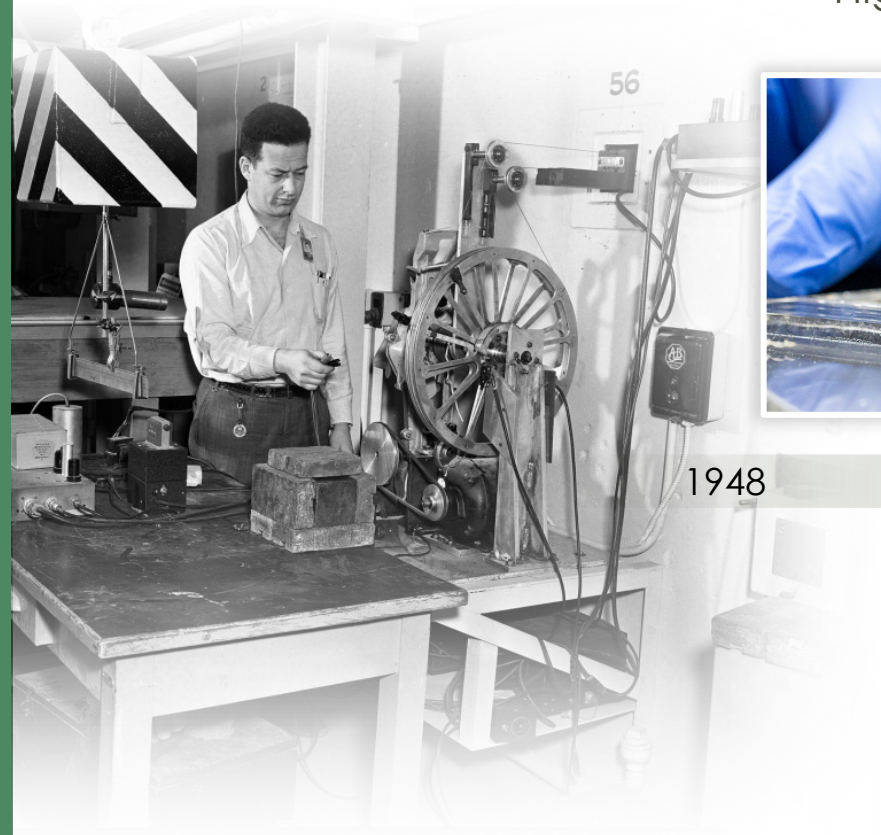
The Manhattan Project facilities evolved into the national laboratories

- Capitalize on the extraordinary scientific and technical capabilities assembled for the war effort
- Continue nuclear R&D with a focus on peaceful use
- Conduct unclassified fundamental research on a scale beyond the reach of a single university or industry

August 1, 1946: President Truman signs the Atomic Energy Act

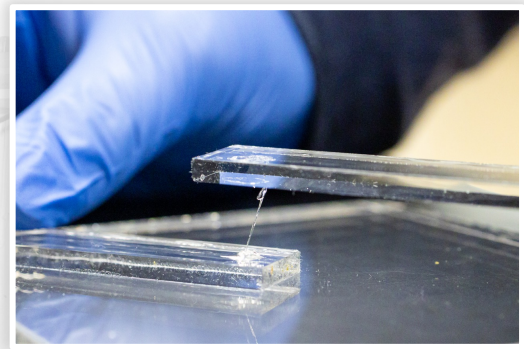
R&D on reactor materials and chemistry broadened to address a wide range of energy concerns



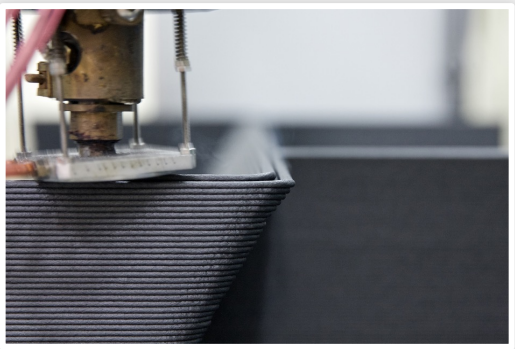
1948

Today

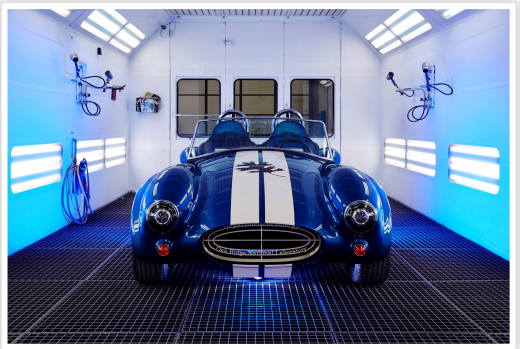
High-temperature materials



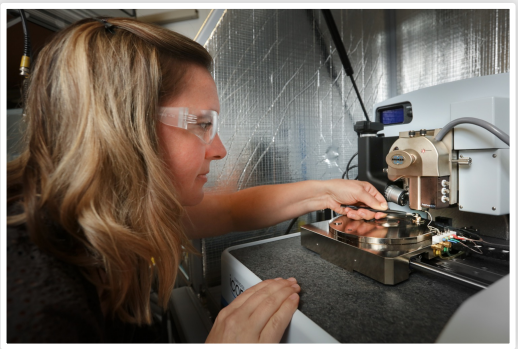
Building technologies



Advanced manufacturing

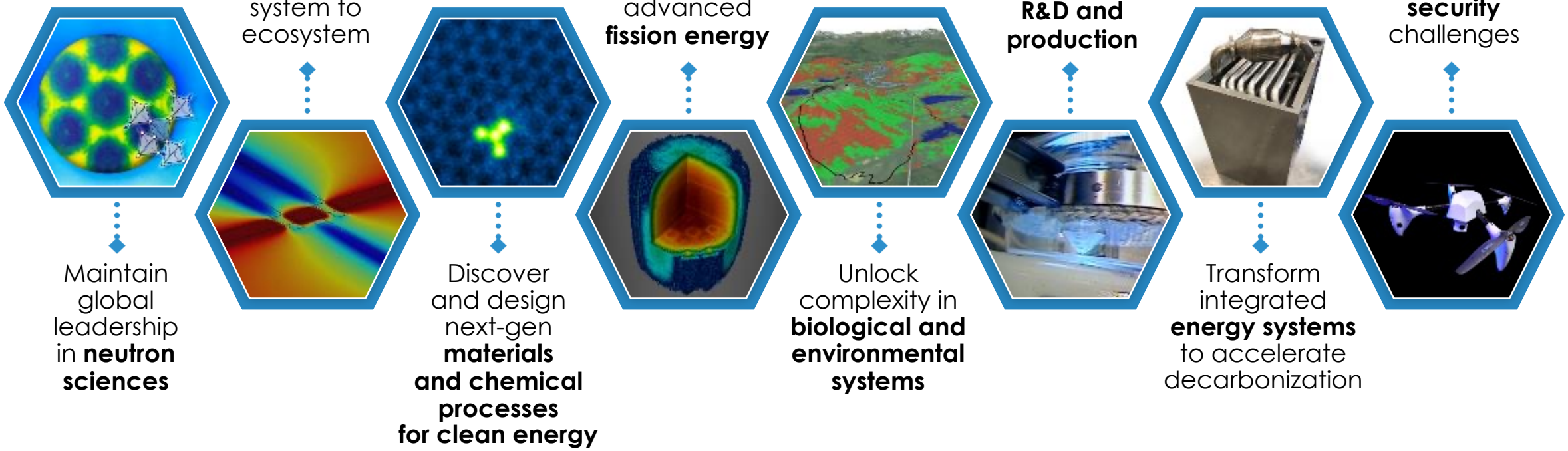


Transportation technology



R&D at the nanoscale

ORNL continues to build off the past 80 years, but with the same focus of answering the nation's call



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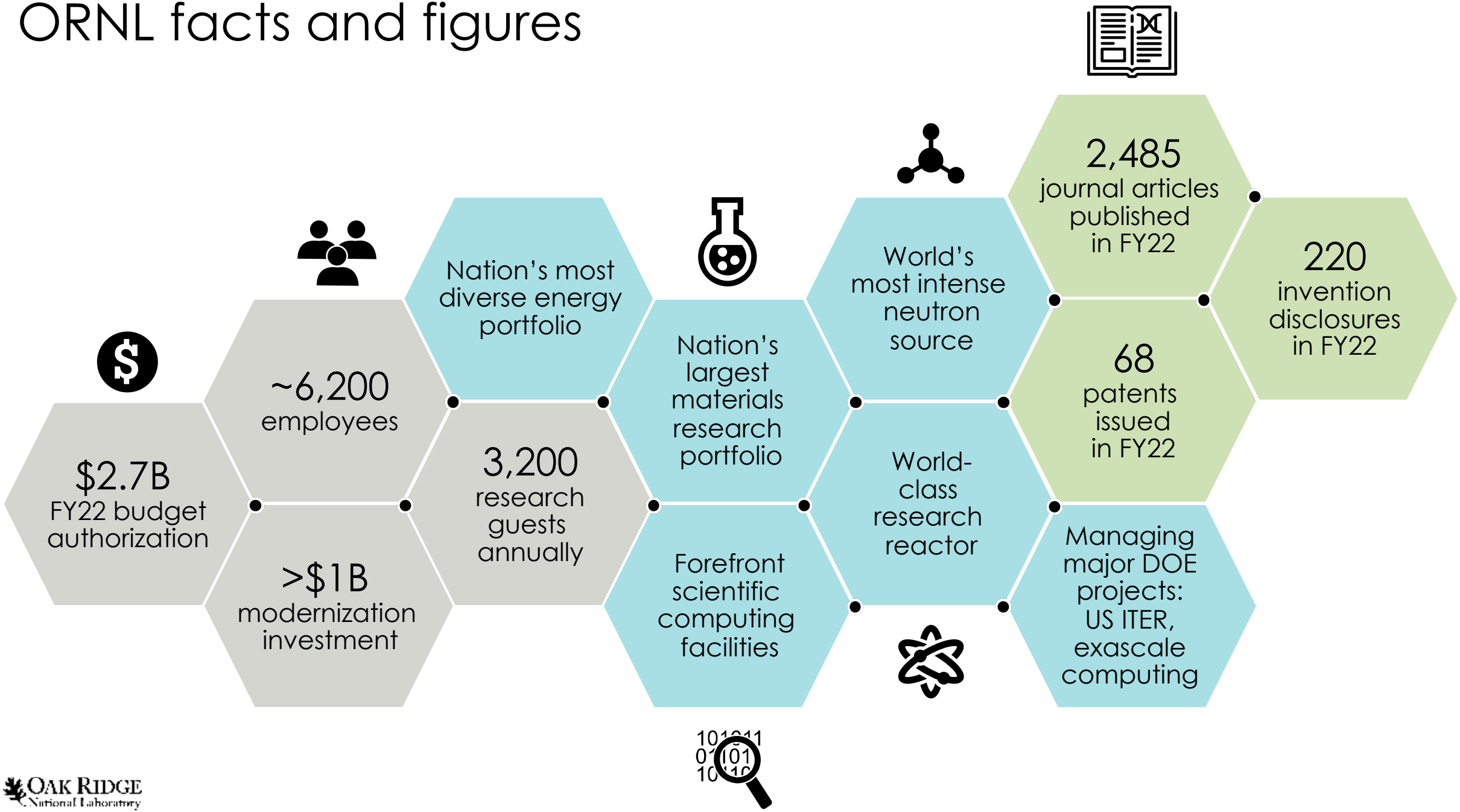
ORNL facts and figures



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ORNL innovations have had billion-dollar impacts

Additive manufacturing	>$1B	US industry investment
Fueleconomy.gov	$1B	$1B in cost savings
Ceramic matrix composites	$150B	Gas turbines
Cesium extraction	$1.3B	Nuclear waste processing
Reactor life extension	$20B	60-year licenses for >75% of US fleet
Advanced alloys		Chrome-moly steel in widespread use
Ion implantation		Integrated circuits and medical implants
Cryopreservation		Livestock and endangered species management
Centrifuge technology	>$1B	Vaccine purification and isotope enrichment
Instrumentation	>$1B	Products and spinoffs from ORTEC and TENNELEC
Reactor technology		Light water, high temperature, and molten salt concepts
PUREX		Nuclear fuel reprocessing techniques used worldwide
Medical radioisotopes	>$5B/year	Multibillion dollar industry (>100 million procedures per year)

1940s Today

ORNL is proud to be a founding member of IACMI

Carbon Fiber
Technology Facility

Manufacturing
Demonstration Facility

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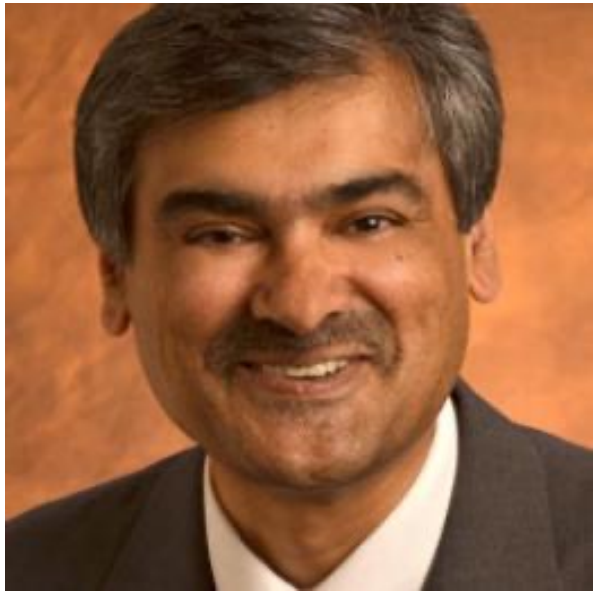
ORNL, IACMI, and UT recruit world-leading talent



Uday Vaidya,
CTO of IACMI

Craig Blue,
defense manufacturing
program director

Vlastimil Kunc, section
head for Composites
Science and
Technology

Merlin Theodore,
CFTF director

Workforce development is crucial for the next generation

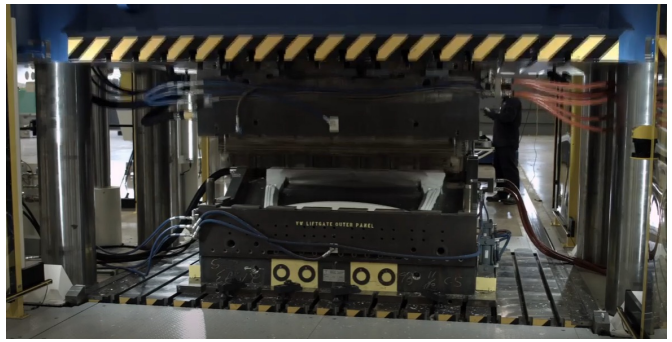
- ORNL collaborates with IACMI in **America's Cutting Edge** to rebuild U.S. capabilities in the machine tools sector.
- The **Manufacturing Demonstration Facility** hosts online courses, onsite training to align top national experts with students from all experience levels.
- **5,000 students** from all **50 states** have participated in free online courses and in-person training in the automated control of machine tools.

ORNL is contributing to IACMI's success

Recyclable thermoplastic wind blade

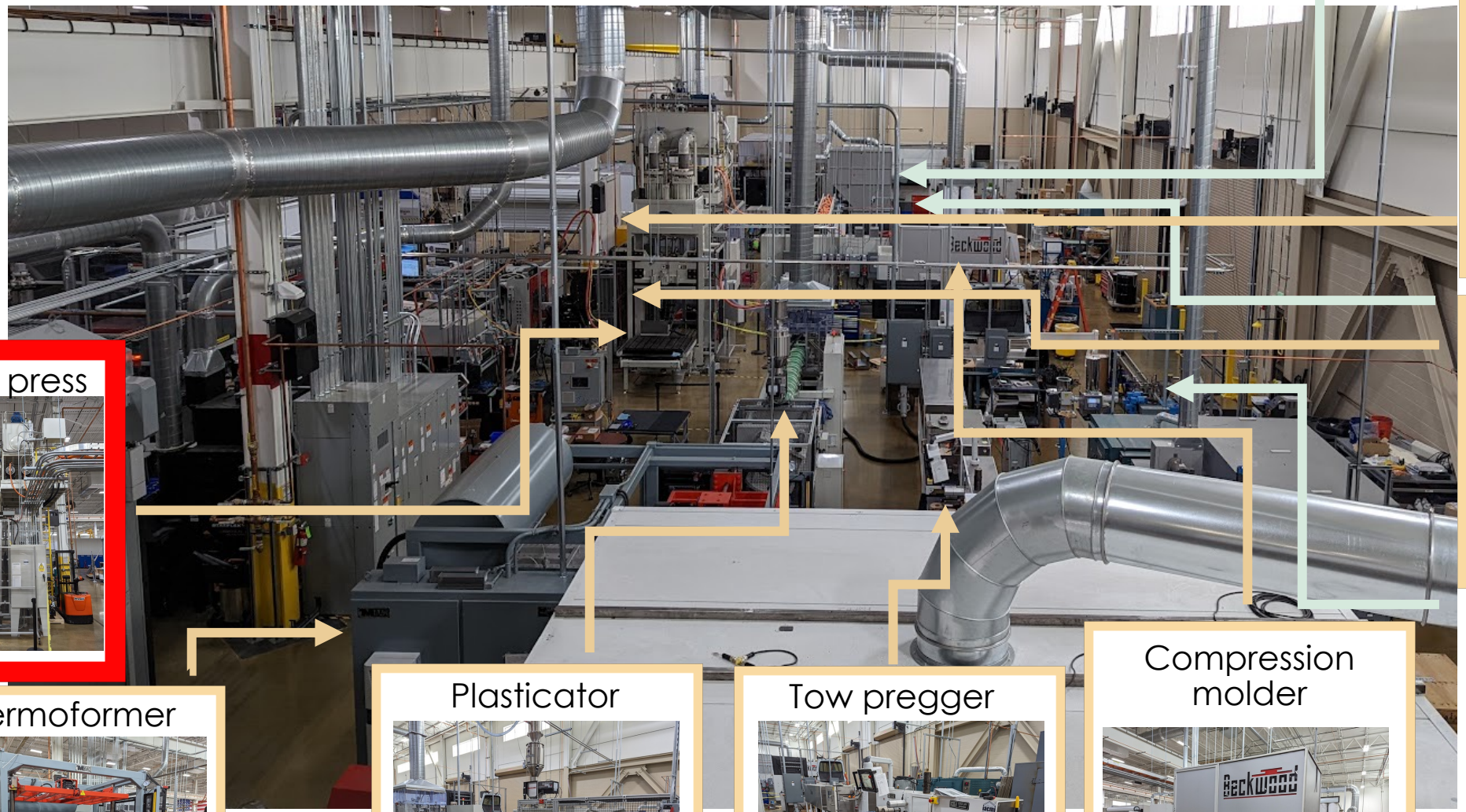
- Novel polymerizing thermoplastic technology
- Small infusion studies, then scaling to 13m blade
- Static and fatigue testing coupon and at full scale
- Lower tooling and recurring costs demonstrated
- R&D 100 winner

Lightweight composite liftgate

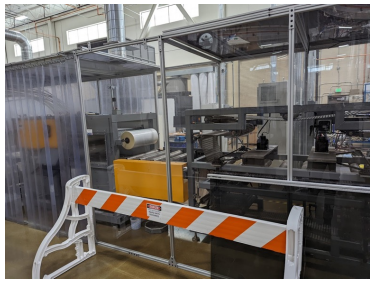


- Optimized design using fiberglass composite
- Sub three-minute cycle time
- 36% lighter than steel, 77% reduction in investment
- Recurring costs 9% lower vs. steel, 37% lower vs. Al
- Qualified for future production on U.S. electric platforms

IACMI investments at ORNL



SMC



Injection molder

500T press

Thermoformer

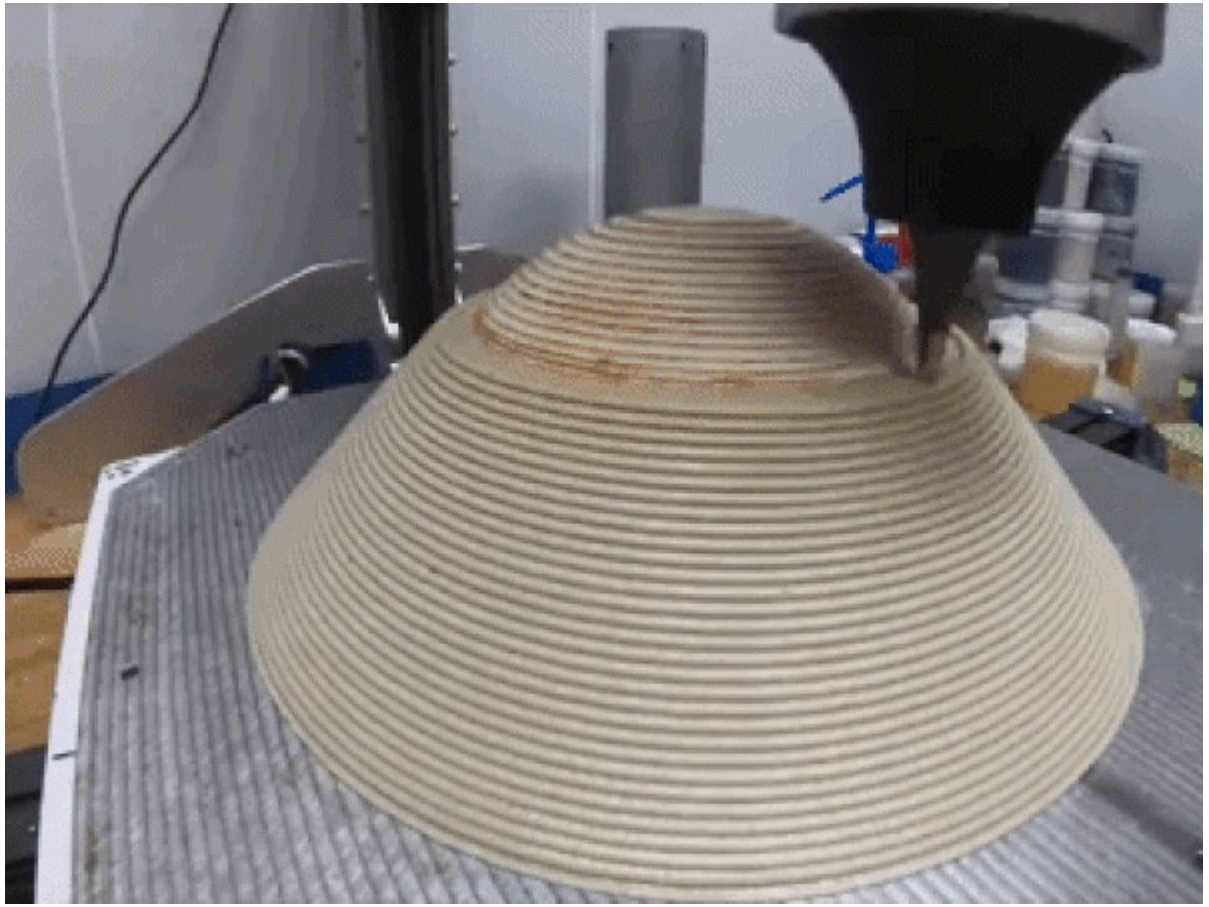
Plasticator

Tow pregger

Compression molder

MDF technology demonstration and deployment: First additively manufactured heat shield sent to space

- Research team 3D printed a thermal protection shield (TPS) which was launched to the International Space Station.
- Scientists worked with NASA to develop materials designed to withstand extreme temperatures encountered when objects reenter the atmosphere.
- TPS successfully protected capsule that recorded and transmitted data upon reentry.



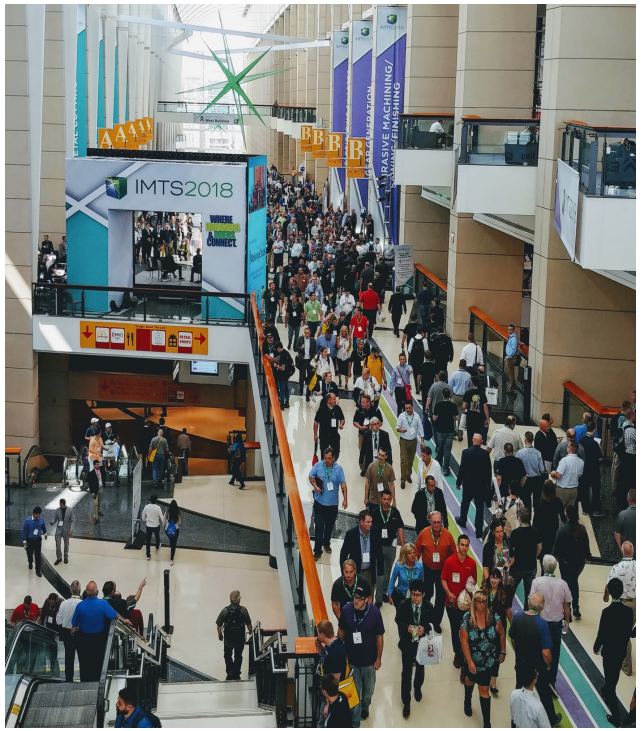
IACMI wins ACE award for project completed with ORNL

IACMI and ORNL integrate CF and composites into the renovated Friendship Bell Park

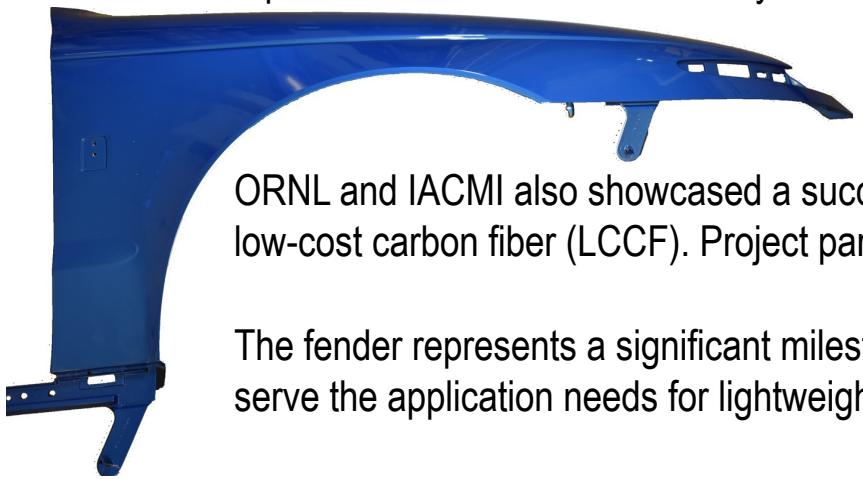
Members of IACMI and ORNL after receiving the CAMX ACE award for the “most creative application” category

Industry activities: Producing a die in a day

Showcasing additive capabilities to over 130,000 people



ORNL, IACMI and industry illustrated the concept of producing a “Die in a Day” at the International Manufacturing Technology Show, the largest manufacturing conference in North America. Over **130,000** attendees witnessed five dies being **designed, printed, machined** and **used** to mold parts on the show floor in six days.



ORNL and IACMI also showcased a successfully produced injection molded automotive fender using ORNL low-cost carbon fiber (LCCF). Project partners include IACMI and TechmerPM.

The fender represents a significant milestone in demonstrating the capability of low cost, textile-based CF to serve the application needs for lightweight automotive parts at lower costs than ever before.

IACMI and ORNL thrive on impact and collaboration

CAMX Combined Strength Award

Lightweight composite liftgate

Recyclable thermoplastic wind blade

2022 R&D 100 FINALIST

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Discussion