VIRTUAL

WHOLE-OF-GOVERNMENT

R&D SHOWCASE

SERIES 2:

BUILDING RESILIENCE AND INNOVATION EQUITY

Homeland Security

Science and Technology

KEY S&T RESEARCH EFFORTS:

PROJECT JACK RABBIT

- Spectroscopic Detection of Nerve Agents
- Hurricane Evacuation Planning
- Analysis for Coastal Operational Resiliency
- Low-Cost Flood Sensors
- Radiological Dispersal Device Response Guidance Planning for the First 100 Minutes

H2RESCUE

- Homeland Explosive Consequence and Threat Modeling
- Smart City Interoperability Reference Architecture

CIVIC INNOVATION CHALLENGE

- Position, Navigation, and Timing Conformance Framework
- Child Exploitation Image Analytics
- Human Trafficking Prevention

ARCTIC DOMAIN AWARENESS CENTER

- Pre- and Post-Disaster Assessment
- Smart City Internet of Things Innovation Labs

■ **The Department of Homeland Security Science and Technology Directorate (S&T) is working with U.S. Government Partners to mobilize research, science, and innovation to ensure no community is left behind.**

Research Impacts to Address Chemical and Biological Threats:

Project Jack Rabbit

"Dozens of atmospheric physicists, scientists, and engineers from around the world...came together to undertake these unique experiments and analyze the results."

— Journal of Atmospheric Environment special issue, Comparisons of Widely-Used Dense Gas Dispersion Models using Observations from the 2015-2016 Jack Rabbit II Chlorine Release Experiments

"Outdoor field testing affords the unique opportunity to study this type of release scenario and directly address critical data and knowledge gaps to improve hazard prediction modeling, emergency response, and industrial safety and security."

— Dr. Shannon Fox, Director, DHS S&T Chemical Security Analysis Center

Research Impacts to Address Chemical and Biological Threats:

Project Jack Rabbit

The country relies on S&T's labs to do the science and turn research into action to protect our way of life and security well-being. Since 2010, S&T has collaborated with the Defense Threat Reduction Agency (DTRA) and other U.S. and international partners across government, industry, and academia on Project Jack Rabbit—a groundbreaking field and laboratory research program investigating the toxic inhalation hazards of industrial chemicals like ammonia and chlorine.

Jack Rabbit I, II, and III have all been led by S&T's Chemical Security Analysis Center, following an experimental approach that builds on previous knowledge gained. These research trials have greatly contirbuted to our nation's understanding of the behavior and consequences of large-scale chemical releases. Key outcomes of this work include improved chemical hazard modeling and HazMat training and safety as well as more effective mitigation measures to reduce the burden on impacted populations and infrastructure.

Watch on-demand showcase panel 2.1 discussion

Read more about this topic

Enhancing Community Resilience Equity:
Civic Innovation Challenge

"Knowing disasters take no breaks, Civic Innovation Challenge is turning foundational research into societal impacts, enabling communities to customize solutions that enhance resilience adaptability, readiness, and risk mitigation."

— David Corman, Program Director, Cyber-Physical Systems and Smart and Connected Communities, National Science Foundation

"The events of the last year have shown us the importance of preparing our communities for all kinds of disasters. At DHS, we are inspired by the work underway by the Resilience Track awardees and are confident they will generate meaningful impact on a national scale."

— Dr. David Alexander, Director, S&T Office of Research and Partnerships

Enhancing Community Resilience Equity:

Civic Innovation Challenge

S&T is partnering with the National Science Foundation and U.S. Department of Energy to co-sponsor the Civic Innovation Challenge. This research and action competition will fund ready-to-implement, research-based pilot projects that have the potential for scalable, sustainable, and transferable impact on community-identified priorities.

Fifty-two teams of civic and academic partners have already been awarded $50,000 to support refinement of their civic concepts for innovations addressing “Communities and Mobility” or “Resilience to Natural Disaster”. S&T has selected, through a merit-review process, a number of Stage-two awardees who will each receive up to $1 million each to carry out their civic concepts over a one-year period.

Civic prioritizes community engagement, transdisciplinary research, and real-world solutions to enhance science and create lasting community impact by addressing mobility and resilience priorities across the country.

Watch on-demand showcase panel 2.2 discussion

Read more about this topic

Building Infrastructure Resilience:
H2Rescue

"This will be a useful tool for FEMA, or any disaster relief agency, as well as the Department of Defense, but think of the applications for this once it's been developed. This could be the beginning of taking a lot of diesel engines off the road."

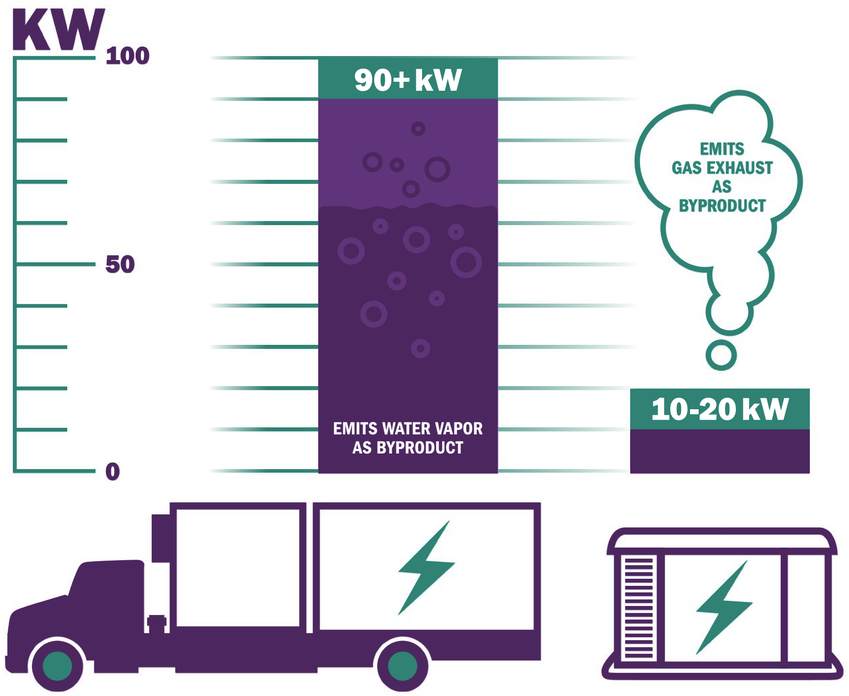
— Nick Josefik,
Industrial Engineer,
U.S. Army Engineer
Research & Development Center

"This project is incorporating the need to address climate change in a very proactive way. Imagine a hydrogen-powered temporary shelter operating fully without noise, exhaust, or emissions. In addition, the potential exists to capture both heat and water to further support the operation."

— Ron Langhelm,
S&T Program Manager,
First Responders & Detection Group

Building Infrastructure Resilience:

H2Rescue



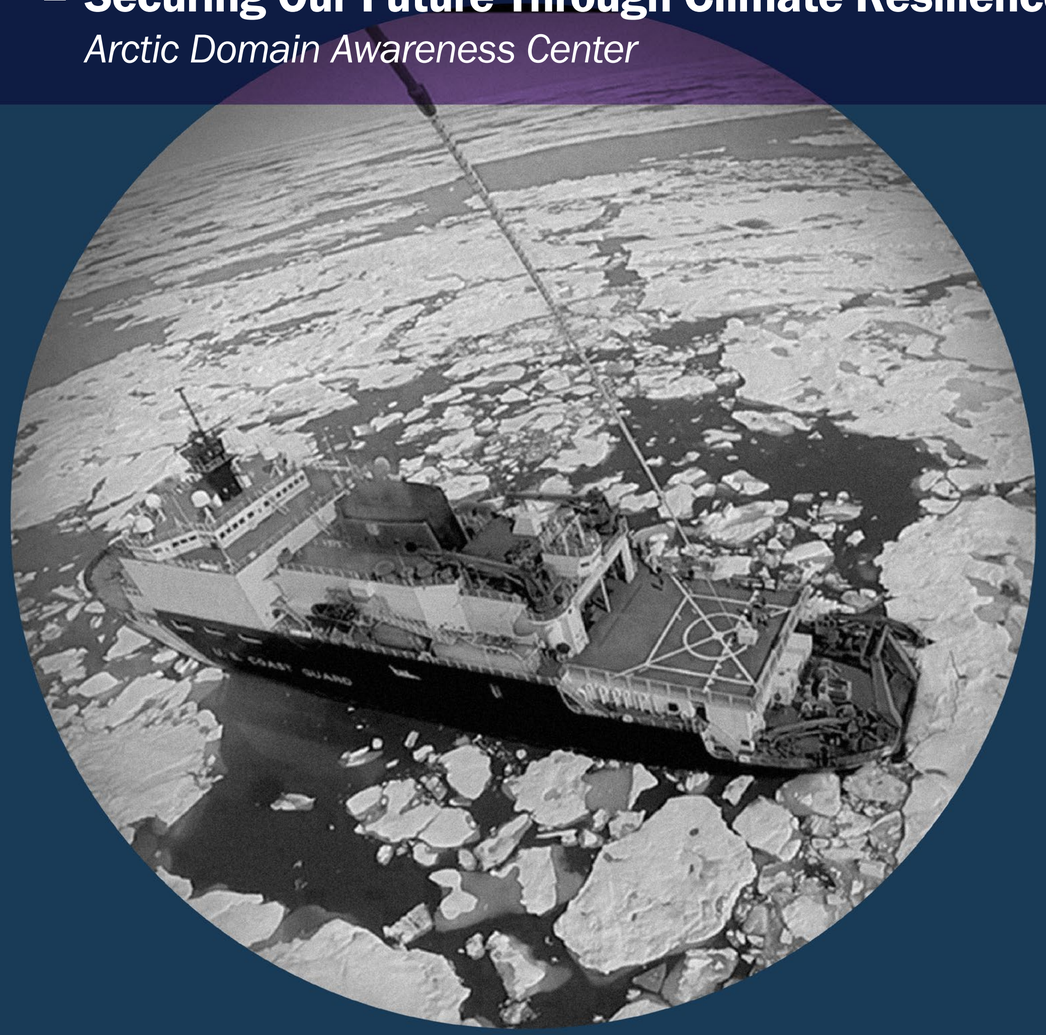
S&T, along with the Federal Emergency Management Agency, Department of Energy, Army Corps of Engineers, and U.S. Naval Research Lab, is funding the design and creation of an innovative new truck that will be a lifeline to responders and community members during times of chaos and uncertainty.

The H2Rescue is a fully hydrogen-powered vehicle designed to bring in supplies to disaster areas while also serving as a robust energy generator and emmitting only water vapor. The H2Rescue HD 90 fuel cell will produce 90+ KW while a typical whole-house backup generator produces 10 - 20 KW. The specifics of the hydrogen fuel cell storage system are still being designed, but the goal is to have a vehicle that can fill up with hydrogen, drive up to 90 miles to reach an emergency location, stay on site for 72 hours providing heat, power and potentially even potable water from the fuel cell power pack, and then drive up to 90 miles back to refuel. Green vehicles like H2Rescue, along with other science and technology advances in energy, autonomy, sensors, and modeling and simulation, offer new solutions to tackle immediate challenges and enhance resilience for our infrastructure of the future.

Watch on-demand showcase panel 2.3 discussion

Read more about this topic

Securing Our Future Through Climate Resilience:
Arctic Domain Awareness Center



"ADAC is part of a collaborative Arctic research network that seeks to characterize climate risks in Arctic to benefit operational and tactical U.S. Coast Guard decision makers and other maritime operators across the region. The R&D showcase is contributing important insights for DHS security operations who are in the Arctic, investing in climate resilience to secure the homeland and prepare the country against future threats."

— Randy "Church" Kee,
Maj Gen, USAF (Ret),
Executive Director,
Arctic Domain Awareness Center

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Securing Our Future Through Climate Resilience:

Arctic Domain Awareness Center

The impact of climate change is keenly felt around the globe, though Alaska has been experiencing its effects earlier than other places and thus provides a warning of emerging challenges. This is why the research at S&T's Arctic Domain Awareness Center (ADAC) is crucial. Based at the University of Alaska Anchorage, the Center of Excellence develops and transitions technology solutions, innovative products, and educational programs to improve situational awareness and crisis response capabilities related to emerging maritime challenges posed by the dynamic Arctic environment.

To provide communities the tools they need and protect the stability of our country, DHS is taking a multi-disciplinary and multi-agency approach to combating the climate crisis. ADAC has supported U.S. Coast Guard missions and the maritime community through innovative projects such as the propeller-driven Long Range Autonomous Underwater Vehicle for mapping oil spills and environmental hazards and the All-Hazards GIS (Geographic Information System) Platform for comprehensive domain awareness.

Watch on-demand showcase panel 2.4 discussion

Read more about this topic

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AccelerateH2O
innovating US water resiliency

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