

# **Bushfire Response R&D Mission**





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# THE NSW BUSHFIRE RESPONSE R&D MISSION

The NSW Government's Bushfire Response R&D Mission (the Mission) was a recommendation of the 2020 NSW Bushfire Inquiry.

The Office of the NSW Chief Scientist & Engineer (OCSE), within the NSW Government, leads the Mission. The Mission's vision is to:

- accelerate innovation to better prepare and respond to future bushfires
- protect first responders and communities, and
- establish NSW as a global centre of bushfire-related research, innovation and technology.

Four initiatives were established to address this:



## **ADOPT** *Page 8*

### **Bushfire Technology Pilots Program (BTPP)**

Adopt new technologies by supporting innovative NSW businesses to connect with and field test their products with NSW Government agencies.



## **GROW** *Page 23*

### **Bushfire Commercialisation Fund (BCF)**

Grow early-stage bushfire technology businesses to succeed.



## **INSPIRE** *Page 29*

### **Bushfire STEM in Schools Program**

Inspire NSW students to participate in natural hazards-related STEM activities.



## **CONNECT** *Page 33*

### **Building a Bushfire R&D Ecosystem**

Connect and increase collaborations between businesses, NSW Government agencies and researchers to drive innovation.



## MESSAGE FROM THE NSW CHIEF SCIENTIST & ENGINEER

The Black Summer bushfires of 2019-20 were a catalyst for change. They highlighted the need for new innovations and technologies to address the complex challenges faced in preparing for and responding to such extreme weather events. With another hot summer approaching, these solutions are more relevant than ever.

The 2020 Bushfire Inquiry, commissioned by the NSW Government after that devastating period, delivered several recommendations to establish the state as a global centre of bushfire-related technology innovation and commercialisation.

The Bushfire Response R&D Mission was established to accelerate the development and adoption of new technologies to address future bushfire threats, to inspire students to consider a career in STEM-related fields and to foster the growth of a bushfire technology ecosystem in NSW.

The Mission is managed by the Office of the NSW Chief Scientist & Engineer, which plays a key role in bringing together academia, government and industry to drive the translation and commercialisation of research and support the growth of innovative new businesses.

The Mission is now in its second year. It already supports 13 businesses under the Bushfire Technology Pilots Program, five businesses developing early-stage products under the Bushfire Commercialisation Fund and two bushfire-specific STEM courses delivered by the Rural Fire Service and the Hunter Innovation and Science Hub.

Much has been achieved in a short time. Early outcomes from the Mission are accelerating the testing and adoption of new technologies by NSW Government agencies and supporting early-stage businesses to scale and grow.

I would like to thank the Mission team in my office, the expert panel members who assessed the funding applications and the successful stakeholders for their efforts.

**Professor Hugh Durrant-Whyte**



# 1 ADOPT

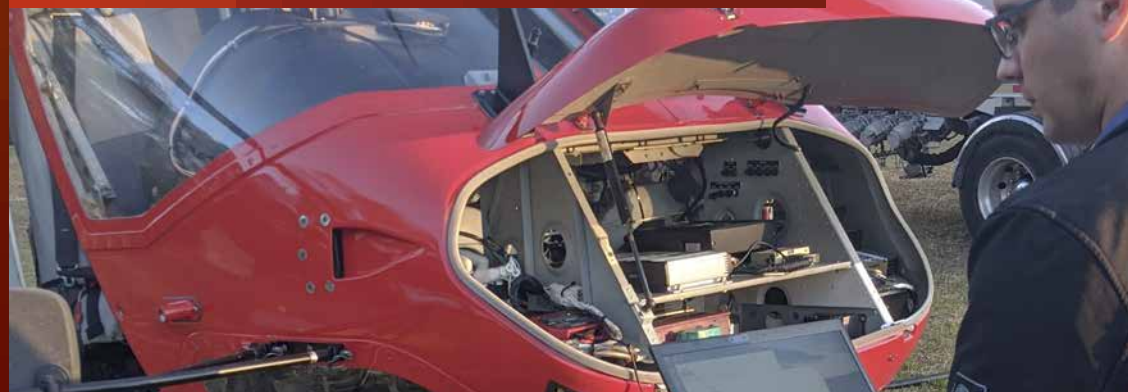
## Adopt new technologies by supporting innovative NSW businesses to connect with and field test their products with NSW Government agencies through the Bushfire Technology Pilots Program (BTPP)

The BTPP provides funding through a competitive process. Now in its second year, the BTPP is supporting 13 companies.

### Airbourne Mission Systems (AMS)

Project: AFDAU - T1

Category: Connectivity solution



AMS's platform automatically collects aircraft flight data previously collected and recorded manually, significantly reducing labour costs while improving strategic decision-making.

At the heart of the platform is the AFDAU-T1, an onboard computer that collects and analyses aircraft sensor data, delivering vital insights about firefighting operations, crew and passenger manifests and aircraft performance (fuel and engine data).

AFDAU-T1 event data is transmitted to a cloud-based database, enabling larger data sets to be recorded and analysed. At the same time, the improved communication capability of this product delivers innovative safety enhancements to address areas of concern identified in recent aircraft safety investigations.

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## Australian UAV Technologies (Silvertone UAV)

**Project:** Eyes and Ears over the Fire Ground  
**Category:** Situational awareness



Australian UAV Technologies manufactures the Flamingo Mk3 remotely piloted aircraft that can fly for up to six hours and provide coverage of over 250 square kilometres in a single flight.

The Flamingo Mk3 has customisable payloads, including onboard radio repeaters, LiDAR sensors, mapping cameras and video streaming technology. Ground crew receive live video feed of the fire ground leading to improved communications and situation awareness.

The Flamingo Mk3 can take off and land in small areas and operate under challenging conditions, including night and severe weather, to deliver superior communications and data solutions for firefighters and decision-makers at a fraction of the cost of manned aviation.

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## BioScout

**Project:** FireScout  
**Category:** Early detection



Early detection will help NSW Government agencies better respond to bushfires. BioScout is adapting their patented autonomous air sampling units, used to detect disease in agriculture, to detect bushfires from microscopic imaging of air samples.

BioScout's analysis of air samples, together with their suite of weather and air quality sensors, AI and machine learning algorithms, allows for early and more affordable detection of fires.

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## Decon Technologies

**Project:** Smart Power Cell  
**Category:** Resilient power supply

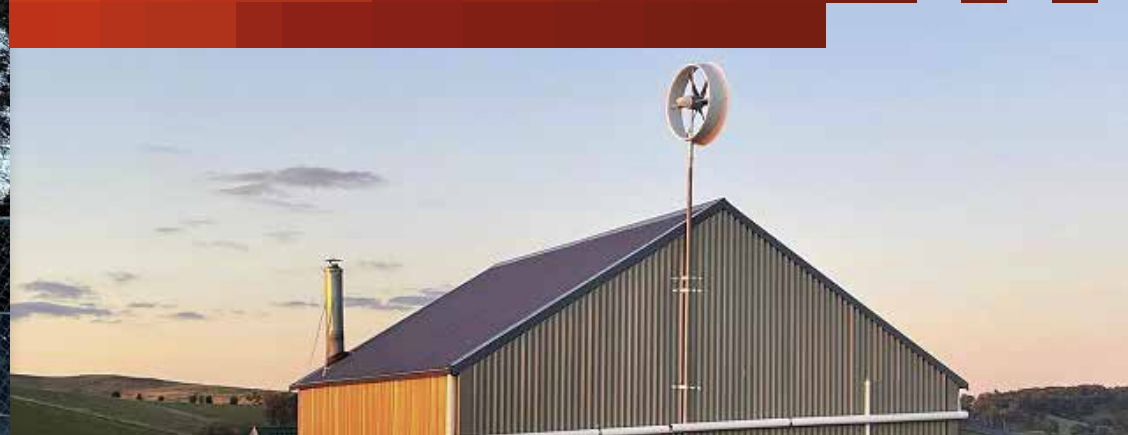


Decon Technologies' Smart Power Cell (SPC) provides remote-controlled solar power for sites where bushfires have damaged or interrupted power supply.

The SPC integrates solar power, a battery and a diesel charger into a compact, environmentally friendly system, minimising reliance on other fuel sources. The SPC produces solar energy during the day, which can also be stored in the battery for night use. The SPC has a diesel generator as a backup, which can provide power for four to 12 weeks, dependent on the site loads.

## Diffuse Energy

**Project:** Hyland Wind Turbine  
**Category:** Resilient power supply



Having an alternate power source, especially during bushfires, increases the resilience of power systems to maintain communications for both the community and emergency services. The Hyland Wind Turbine is a powerful, small wind turbine developed by Diffuse Energy for remote, off-grid locations that need power with a minimal footprint.

The Hyland Wind Turbine is specially designed with a cylinder enclosure around the blades to increase airflow and allow more energy to be extracted from the wind while taking up less space. The turbine can easily be integrated into existing direct current systems used in telecommunications (24V and 48V) and has self-monitoring capabilities for protection in severe weather.

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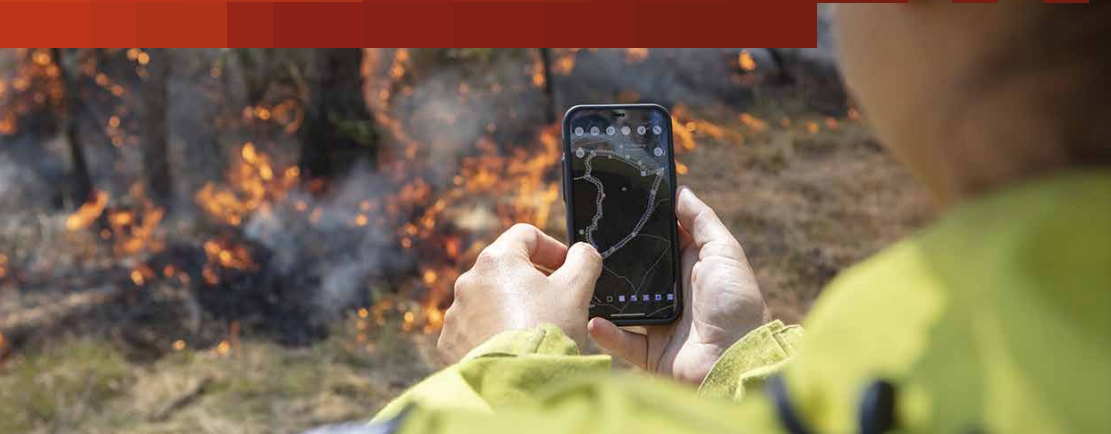


[www.diffuse-energy.com](http://www.diffuse-energy.com)



## Fire Front Solutions

**Project:** FireMapper - Interagency Situational Awareness Capability  
**Category:** Situational awareness



FireMapper is a real-time situational awareness, planning and electronic mapping solution to improve the quality of information for field personnel and decision-makers.

FireMapper integrates with existing agency tools and systems, including operational data sets, computer-aided dispatch systems and fire prediction systems. It runs on Apple and Android devices in the field to provide electronic mapping and real-time information, as well as via a web-based portal designed for control centres and incident management teams.

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## FLAIM Systems

**Project:** FLAIM Trainer – Wildfire  
**Category:** Training specifically for bushfire scenarios



Firefighters undertake bushfire training without realistic fire scenarios because of the inherent health and safety risks.

FLAIM Systems has developed the world's first multi-sensory immersive learning solution for firefighters to safely replicate the stress and uncertainty of real-world emergency situations.

FLAIM Trainer – Wildfire is an immersive technology-enabled firefighter training solution, combining high-fidelity virtual hazardous fire environments, audio and industry-standard equipment to deliver a fully immersive, multi-sensory physical training experience.

FLAIM Trainer – Wildfire is a new module that delivers a realistic, repeatable training environment for bushfire scenarios to efficiently train and upskill NSW firefighters.

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# Kablamo

## Project 1: Remote Ignition Detection in High-Risk Areas Category: Fire detection and risk assessment software



Firestory is the first cloud-based platform that is a single source of intelligence and insights for predicting, managing and preventing bushfires.

The 'Remote Ignition Detection in High-Risk Areas' module is a map-based workflow that operates inside the existing Firestory solution. The module will visualise potential ignition locations (derived from satellite infrared sensors, lightning strike data and social media) on a spatial interface before being overlaid with fire prediction modelling of possible fire spread and time-to-impact assets and infrastructure. This information gives fire agencies the risk information and context to prioritise decision-making around confirming a detection or initiating a response.

## Project 2: Custom Bushfire Image & Smoke Image Recognition Engine Category: Fire detection and risk assessment software



The Custom Bushfire Image & Smoke Image Recognition Engine (Engine) will assist with the early detection of bushfires via fire and smoke imagery on social media using computer vision machine learning and real-time inference.

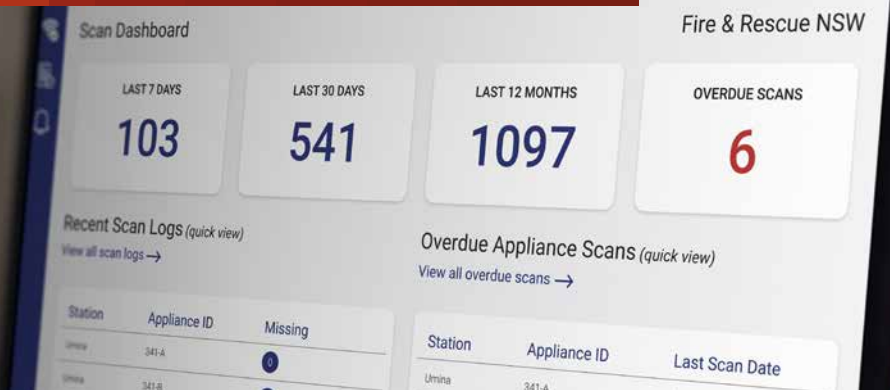
Current models exist in both the open-source and commercial domains. However, these are generally not contextualised to the Australian environment and terminology. With the Engine, rapid identification and geolocation of a fire can be determined when a member of the public uploads a picture of a bushfire or smoke plume on social media, even without reporting it.

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## Know-Where

**Project:** Good-To-Go  
**Category:** Field readiness



Good-To-Go is an asset visibility system using Radio Frequency Identification (RFID) tags and handheld readers. The solution allows firefighters to confirm the presence of hundreds of items on the firetruck in minutes, a task that used to take hours, improving field readiness and ensuring crew safety.

The Good-To-Go platform will be further developed into an operational assessment system. This will allow firefighters to check the presence of equipment, prompt the need for and record completion of maintenance undertaken, and instantly record this in the agency's central asset management system.

## Mangan Logging

**Project:** Ponsse Firefighting System  
**Category:** Firefighting equipment



Mangan Logging is a third-generation harvesting and haulage business specialising in the harvesting, processing, extraction and delivery of sustainably managed softwood pine plantations in the Oberon and Southern Highland areas of NSW.

The Ponsse firefighting system delivers fire suppression capabilities in areas and terrain inaccessible by vehicles, especially in commercial forest environments.

The Ponsse firefighting system utilises the excellent all-terrain ability and powerful hydraulics of a Ponsse Forwarder vehicle. The water tank has a capacity of 10,000 litres and can deliver 950 litres per minute from its hydraulic water pump to a remotely controlled cannon, spraying water over 40 metres from the unit.

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## Meshed Pty Ltd

**Project:** Fire Hazard and Environmental Monitoring Kit  
**Category:** Hazard and environmental monitoring



Meshed designed the Fire Hazard and Environmental Monitoring Kit as an 'out of the box' portable IoT sensor and telemetry system.

The system provides real-time data displayed on a dashboard via sensors, long-range Wi-Fi and low-powered data networks. It enables agencies to accurately assess weather measurements critical for prescribed burn planning, fire danger rating and bushfire behaviour prediction.

There is also the potential to include data from existing sensors, such as visitor monitoring and water levels, to support decision-making before and during fires.

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## Milvus Fire Units

**Project:** Milvus Remote Area Fire Unit  
**Category:** Firefighting equipment



Milvus Remote Area Fire Units are designed to extinguish fires in remote or difficult-to-access terrain. The unit is easy to deploy with flexible capabilities for a variety of bushfire situations.

The Milvus Remote Area Fire Unit holds 800 litres of water. It has 400 metres of high-pressure hose, plus storage for essential equipment like chainsaws, rake hoes, crew provisions and first aid.

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MILVUS FIRE UNITS

## Unleash Live

**Project:** Live Stream AI Analysis

**Category:** Situational awareness and intelligence gathering



Unleash Live provides a tailored Live Stream AI analytics platform, which monitors and analyses multiple live-streamed data/video feeds from drones to frontline agencies.

The technology is equipped with zero-latency live streaming capability, which allows remote experts to monitor the situation, enabling the fast-tracking of operations. Additionally, with real-time AI analysis and the ability to combine multiple data points from video and photo imagery, along with geo-reference information onto maps, Unleash Live provides an instant overview of the on-the-ground situation to improve decision-making.

The platform can map the extent of the fire before, during and after the incident to observe fire behaviour and its direction, and assess damage faster. This reduces risks and improves the safety of the community and crew.

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UNLEASH

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## 2 GROW

### Grow early-stage bushfire technology businesses to succeed through the Bushfire Commercialisation Fund (BCF)

The BCF provides funding through a competitive process to enable businesses to take their innovations to market. The program targets products that are at Technology Readiness Levels 4-7, commonly referred to as the 'Valley of Death' and supports each business to scale and grow.

The BCF is based on the highly successful Physical Sciences Fund and Medical Devices Fund.



## Agensio Pty Ltd trading as Zetifi

**Project:** Connecting Bushfire Operations  
**Category:** Connectivity solution



Agensio is building on the capabilities of Zetifi's existing wireless network system, ZetiLink, to provide reliable, last-mile connectivity where bushfires have damaged the network or power infrastructure, delivering connectivity for fireground management and operations.

Zetifi uses proprietary radiofrequency, power management and intelligent networking technologies to extend and optimise the range of existing networks while providing options to fill in coverage gaps using long-range Wi-Fi.

This new capability will be integrated into Zetifi's power-conserving network to deliver up to 10 times greater range and better penetration through vegetation.

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## Fire Front Solutions

**Project:** Electronic Mapping and Sharing Without Internet  
**Category:** Situational awareness



Fire Front Solutions is developing a shared offline electronic mapping solution that integrates into their existing FireMapper system using a 'mesh' network from personnel mobile devices.

The system will enable incident management teams to continue receiving data from personnel, aircraft and appliances on the fireground, even when working in remote areas or where communications infrastructure is unavailable. It will provide access to crucial real-time fireground information without needing specialised hardware or internet access.

The solution is technology-agnostic, compatible with Apple and Android devices, and purpose-built for use by emergency service personnel. It provides an automated, two-way, multi-personnel and inter-agency capability, requiring limited training.

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## Halsyon Pty Ltd

**Project: Responder HQ**  
**Category: Resource management software**

### Northern Region



Halsyon is developing Responder HQ, a resource management tool that helps emergency services and incident management teams to efficiently plan, coordinate and deploy people and vehicles during emergencies. The technology enables different organisations to work seamlessly together during emergencies, allowing agencies to collaborate using one resource management system.

Responder HQ is a cloud-based web application that addresses resource planning and tracking challenges. The solution manages resources including people, appliances, equipment and aircraft. It also provides detailed resource information such as availability, pre-incident deployments, location, organisational structure, deployment history and planned allocations. A unique workflow ensures busy operational control rooms can record deployments in real-time, providing resource planners with access to tools linked to live data.

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## SiNAB Pty Ltd

**Project: Phoenix Pod**  
**Category: Situational awareness**



The Phoenix Pod (the Pod) is a fully integrated, self-contained sensor and rapid air-to-ground communication system which attaches to an aircraft to provide ISR (intelligence, surveillance, and reconnaissance) capabilities commonly used by Defence.

The Pod is designed to aid in bushfire response via live video and data transfer to the firefighter, enabling wide-area detection of hotspots, identification of high-fire risk areas and rapid response to bushfires for fire tracking and greater situational awareness.

The true advantage of the Pod comes from its integrated communication systems, which allow live, long-range data transmission to any firefighter with the appropriate radio. Furthermore, the Pod can easily attach to any aircraft with standard NATO pylons, is self-contained and ready for rapid deployment during emergencies.

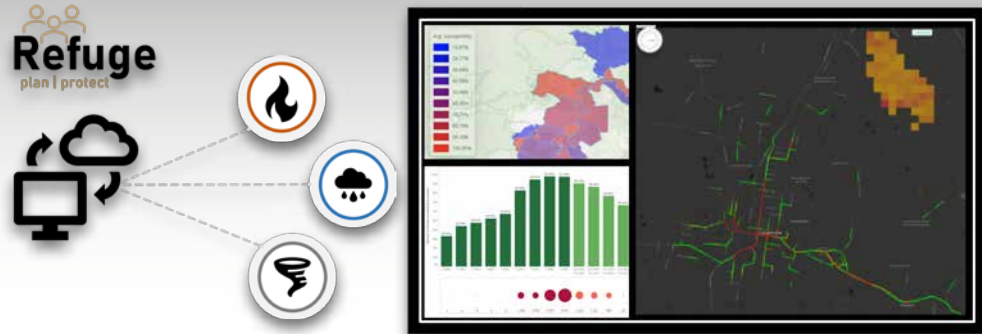
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# Urban Research and Planning Pty Ltd

Project: Refuge

Category: Evacuation management software



Refuge is a software tool to better manage community safety and evacuation from natural hazards like bushfires, floods and cyclones, by producing up-to-date evacuation and avoidance routes.

Refuge is a web-based, cloud-hosted software-as-a-service platform for assessing community evacuation-related risks during natural hazards. Refuge utilises state-of-the-art, high-fidelity, data-driven models to simulate community behaviours and related emergency services responses during a developing hazardous event, producing estimates of consequences for community safety.

Refuge is a real-time evacuation solution to assist emergency services with natural disasters and prevent risk to life and property. It can be used to improve local emergency plans, plan infrastructure upgrades, assess evacuation risks of newly planned developments and educate communities.

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## 3 INSPIRE

### Inspire NSW students to participate in natural hazards-related STEM activities through the Bushfire STEM in Schools Program

The Program aims to engage students in STEM-related fields of study to inspire the next generation of problem-solvers. By supporting the development of bushfire-specific courses for the NSW Education curriculum (Kindergarten to Year 12), students can now learn about technologies used in bushfire management and response.

This knowledge plays an important role in preparing young people to deal with disasters and emergencies.



## Hunter Innovation and Science Hub

Project: Fire-Ed Up Secondary STEM Initiative



# Fire-Ed Up

IGNITE A PASSION FOR BUSHFIRE EDUCATION



Hunter Innovation and Science Hub (HISH) is a network of organisations that collaboratively deliver world-leading STEM events, activities and competitions to engage school students and the community within the Hunter Region.

Fire-Ed Up Secondary is an innovative program within HISH's existing STEM- and bushfire-focused initiatives across NSW primary and secondary schools, engaging over 30,000 students.

Fire-Ed Up Secondary is a student-centred, cross-curricular program in line with best practice approaches in STEM. It will deliver hands-on problem-based learning focused on bushfire response technologies, for example simulating fire detection using satellite technologies.

It will develop students' technical skills such as coding while completing challenges with a strong focus on the technologies required for bushfire mitigation, management and response.

Course targets: Students in Years 7-10.



## NSW Rural Fire Service (RFS)

Project: Project Firestorm



# PROJECT FIRESTORM

Project Firestorm is a national Resilient Australia award-winning, integrated STEM unit of work for Stage 3 students in NSW. In Project Firestorm, students join the elite team of Firestormers in their mission to battle bushfires and protect communities.

Co-designed with teachers, Project Firestorm provides an immersive digital experience for students. It challenges them to solve an authentic problem relating to bushfire detection, response and management. It also embraces students' ingenuity and creativity to explore how we can better prepare for, prevent, respond to, and recover from bushfires.

To complement the program, the RFS is rolling out 'Project Firestorm: Design Thinking for Bushfire Resilience', a NESA-accredited professional development workshop. The free course provides teachers with the knowledge and skills to successfully deliver Project Firestorm and support their students on their inquiry-based learning journey.

Course targets: Students in Years 5 and 6.





## 4 CONNECT

### Connect and increase collaborations between businesses, NSW Government agencies and researchers to drive innovation

The Office of the NSW Chief Scientist & Engineer is actively engaging with stakeholders to increase the awareness, connections and impact of NSW businesses and researchers in the bushfire sector.

Key aims include:

- creating new businesses and high-quality jobs
- helping NSW to better prepare for bushfires, and
- protecting first responders and communities.

Check out the links below to keep in touch or contact us.



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# THE NSW BUSHFIRE AND NATURAL HAZARDS RESEARCH CENTRE

The NSW Government established the NSW Bushfire and Natural Hazards Research Centre (BNHRC) to support early R&D that underpins future innovation and technology.

The BNHRC is a collaboration between the NSW Government and a university consortium led by Western Sydney University's Hawkesbury Institute for the Environment.



The consortium represents internationally recognised expertise and research strengths in all key aspects of bushfire and natural hazards management.

The research program will be co-designed with stakeholders to address knowledge gaps and research needs identified in the 2020 NSW Bushfire Inquiry. The areas of focus are environment, community, prevention, data management, operations and future capability.

The Research Centre is administered by the NSW Department of Planning and Environment.



