

Electrification and Energy Systems Network

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NSW Decarbonisation Innovation Hub





Electrification and Energy Systems Network

NSW Government – OCSE

NSW Department of Primary Industry

University of Newcastle

University of New South Wales

University of Technology Sydney

University of Wollongong

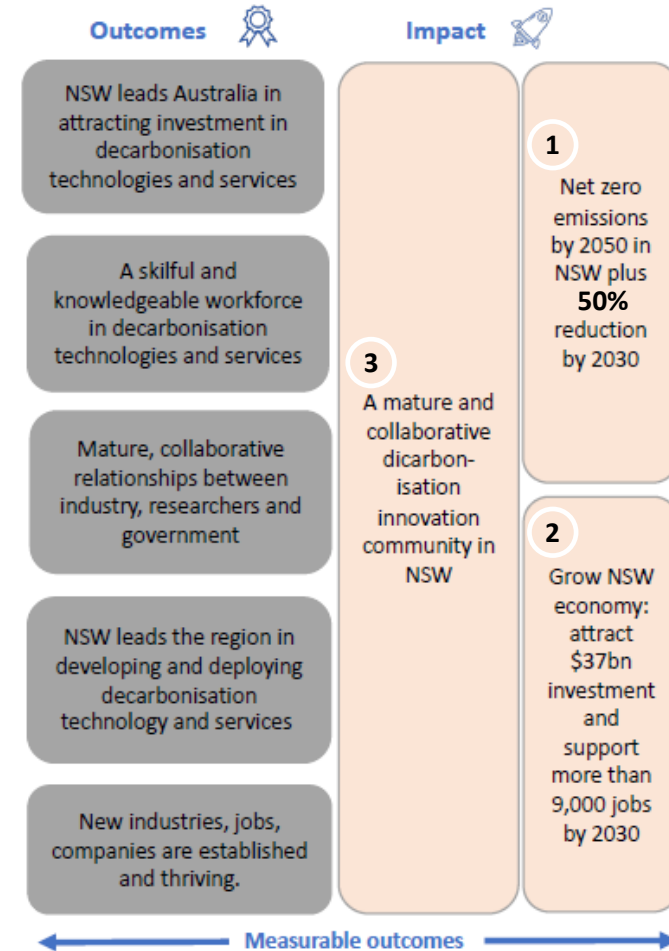
A complementary set of skills, experiences, and stakeholder networks in critical sectors of decarbonisation technologies: from research through to deployment and impact.

Vision

NSW is an international leader in decarbonized energy system deployment and the associated research, development and manufacture of electrifying technologies

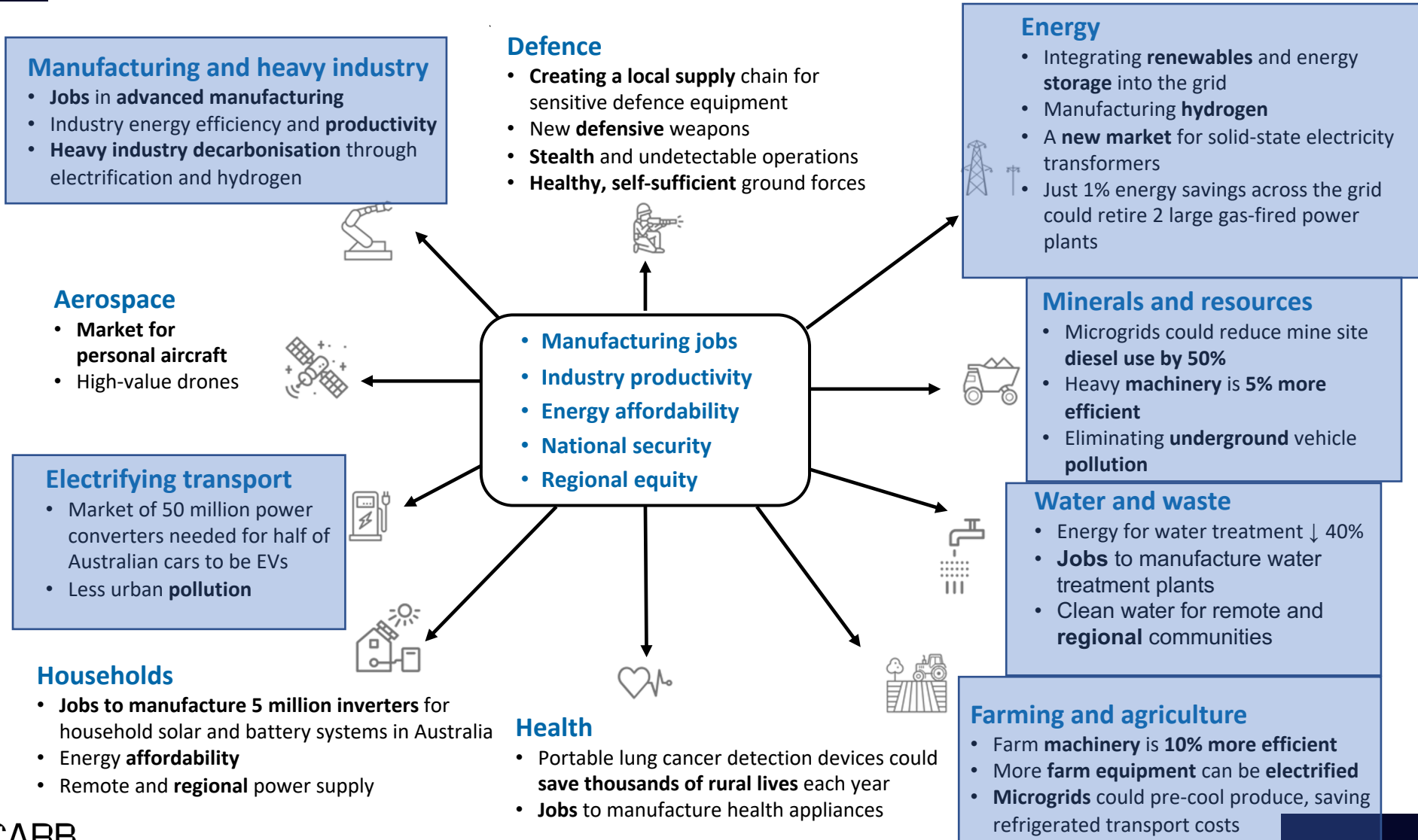
Mission

To translate energy systems research into clear business opportunities for SMEs, new start-ups and established industry players.





Opportunities created by electrification





EESN Workplan

1. Initial Network development operations and activity

2. Focus Area: Energy in Rural and Agricultural Centres:

- Case study 1: Overcoming electricity supply constraints with regional renewable energy supply solutions
- Case study 2: Digital Twins for Technical and Economic De-Risking
- Case study 3: **Beyond Off-road Fossil Diesel Project (cross-Network activity with Power Fuels including Hydrogen)**

3. Community Engagement and Engagement Science



EESN Snapshot

1. Supporting SMEs developing Electrification technology:
Coachair, Hysata, Jetwave,
2. Developing short courses and network proposals for battery safety – a growing challenge
3. Seed funding grants – focus on projects that cross applications or geographical locations or networks
4. Galvanise local teams of experts across the range of technical and non-technical subjects



Lead Technology Translator

- Support Hysata to model their electrolyzer technology and power supply. This work translated into a \$300k industry project with Hysata as part of the ARC IESS Hub.
- Supported CoachAir in debugging issues with their bus air-conditioning motor controllers.
- Secured a donation from the Stanley Black & Decker (SBD) Makers Grant in collaboration with TAFE NSW to create a short course called 'Risk Assessing High Energy Lithium-Ion Battery Systems.' This course will educate over 100 tradespeople to safely handle lithium-ion batteries by September this year.





Power conversion is critical to the electricity grid

Grid planning & operations

- Stability, reliability, improved dispatchability
- Control hardware to keep the grid stable in a low- or no-inertia grid
- Ultra-fast control algorithms to improve switching speeds and frequencies of next gen power converters, guaranteed reaction times.
- Advanced relay and protection schemes for bi-directional energy flows and massive power converter-integrated energy resources
- Realtime digital twins

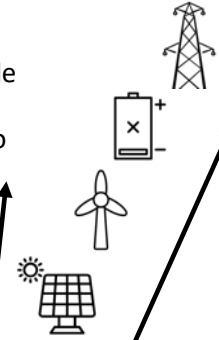


Energy use

- Energy efficiency & productivity (homes, industry)
- DER standards & grid integration, VPPs
- Efficient, smaller, lighter, cheaper inverters
- Advanced controls and energy management systems, autonomous switches & devices
- Coping with a fleet of EVs and other electrified machines

Generation

- Integrating high penetration variable renewables and energy storage into the grid
- Improving dispatchability



Transmission systems

- Renewable energy integration and improved dispatchability
- Renewable Energy Zone planning & operations
- Meshed multi-terminal HVDC systems
- Utility-scale inverters with improved synthetic inertia



Distribution systems

- Managing low inertia
- Millions of inverter connected nodes that can react in microseconds
- Non-linear control
- DER operations for grid support
- DER standards
- Solid state transformers



Renewable energy export

- Renewable energy to hydrogen, synthetic fuels
- Meshed multi-terminal HVDC systems



Advanced power conversion is becoming critically important to planning and operating electricity assets

Storage

- Improved battery functions: power quality, flexible inertial response, microgrid stability, power factor compensation, active filtering, ...
- Hydrogen and synthetic fuel manufacture



Microgrids

- Stable operations without traditional system strength, incorporation of different generation and load shapes
- Control without fast, or any, telecoms systems





Long term workplan

- Create an ecosystem for an industry in Electrification Technologies – testing and verification infrastructure
- Foster an innovation culture in our higher education sector so that more useful impacts result from the research in our laboratories
- Provide rapid technical support for SME's – a roadside assistance service for technical bottlenecks
- Develop education and training solutions that can quickly deliver the scale of workforce essential to deliver rapid change

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help you
succeed in YOUR
ambitions to
decarbonise.**

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