



CSIRO Submission 18/653

Inquiry into Fair Dinkum Power

Senate Select Committee into Fair Dinkum Power

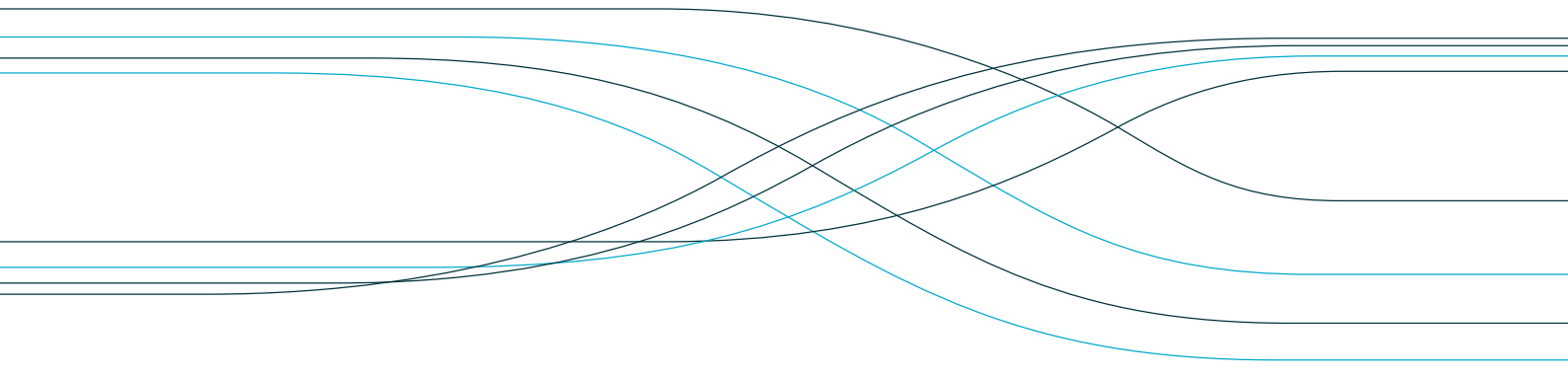
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Introduction

CSIRO welcomes the opportunity to provide input to the Senate Select Committee's inquiry into fair dinkum power.

CSIRO energy research spans the entire energy resource and utilisation value chain, from exploration through automation, extraction and processing; from the creation of new fuels, to increased use-efficiency of existing supplies; from renewable energy generation and integration, to distributed generation and storage; and from deep-data analytics, through machine learning.

As part of CSIRO's energy research portfolio, CSIRO is addressing the challenge of transitioning Australia's current centralised electricity grid system to a low-emissions, more distributed future state, while maintaining energy affordability and reliability. Our work includes macro- and micro economic, engineering and social analysis across the entire energy sector that provides guidance to government policy makers, regulators and industry.

The following information provides an overview of key research reports and activities that have been delivered in recent years that are of relevance to the inquiry. CSIRO would be happy to provide further information regarding any of this information should that be of interest to the Committee.

GenCost (2018)

CSIRO's GenCost project provides annual updates as to the current and forecast cost of electricity generation from various sources, and the current and forecast cost of various electricity storage technologies. A collaboration between CSIRO and the Australian Electricity Market Operator (AEMO), Gencost is a key input to models and analysis trying to understand the current and future trends for the electricity sector. Gencost 2018 also starts to include consideration of the cost of support services needed in electricity networks based on high proportions of variable renewable energy generation.

The GenCost 2018 report is available here:

<https://publications.csiro.au/rpr/pub?list=SEA&pid=csiro:EP189502&sb=RECENT&expert=false&n=1&rpp=25&page=1&tr=1&q=GenCost&dr=all>

Broad Consumer Energy Research Programme (2012-current)

CSIRO has had an extensive programme of social science research seeking to understand how consumers may respond to various energy incentives, technologies and tariff designs. One example report from this programme of research considered how consumers are likely to respond to various electricity tariff structures. This report is available here:

<https://publications.csiro.au/rpr/download?pid=csiro:EP152667&dsid=DS2>

Electricity Network Transformation Roadmap (2017)

The Electricity Network Transformation Roadmap (ENTR) is a collaboration between CSIRO and the Electricity Networks Association that takes a scenario-based approach to inform industry and government on a structured transformation of Australia's electricity industry. It explores how technologies, operational approaches and business models will need to change in order to deliver energy reliability, security and affordability for Australia out to 2050.

The roadmap covers options and describes implementation pathways across key interrelated categories as follows:

- Customer oriented electricity
- Power system security
- Carbon abatement
- Incentives and network regulation
- Intelligent networks and markets

The roadmap identifies a number of possible pathways, subject to anticipated technology development and cost reduction.

The Electricity Network Transformation Roadmap's Key Concepts report was published in December 2016, and identifies key measures to be taken, that can achieve a positive energy future for Australian energy customers enabling choice, lower emissions, lower costs and high security and reliability. The final report was released on 28 April 2017. Further information is available here:

<http://www.energynetworks.com.au/electricity-network-transformation-roadmap>

Low Emissions Technology Roadmap (2017)

The Low Emissions Technology Roadmap is a project that CSIRO completed for the Australian Government, looking at possible pathways to achieve COP21 emissions reduction across the whole Australian energy sector. The project had two objectives:

1. To identify the emission reduction technology options within the energy sector that Australia could pursue in order to meet or exceed its 2030 emission reduction target and achieve deeper decarbonisation post-2030. The report also considers what actions might be required to achieve rollout of these technologies, while continuing to maintain energy security and affordability.
2. To identify the main opportunities presented by low emissions technologies, in terms of economic value and job creation. The transition to a low emissions economy is often framed in terms of cost; this roadmap seeks to broaden the discussion by also highlighting the opportunities and net benefits that the identified technologies and associated industries can provide.

Further information is available here:

<https://www.csiro.au/en/Do-business/Futures/Reports/Low-Emissions-Technology-Roadmap>

Future Grid Research Cluster (2016)

The Future Grid Research cluster was a 3-year collaboration between CSIRO and four leading Australian universities to develop the nation's capacity to plan and design the most efficient, low emission electricity grid for Australia.

Comprising the University of Sydney, University of Newcastle, University of Queensland and University of New South Wales, the Future Grid cluster comprised research that drew together engineering, economic and policy aspects of grid development and optimisation to focus on four major areas:

- Improved understanding of impacts of different loads, generation sources and energy storage on system security.
- Grid planning and co-optimisation of electricity and gas networks.

- Economics of alternative network development paths and estimates of total cost and price impacts.
- Policy measures and regulatory changes to facilitate a smooth transition to a decarbonised future grid.

Further details on the cluster, and the final reports, can be found here:

<http://www.futuregrid.org.au>

Future Grid Forum (2012)

The Future Grid Forum was Australia's first extensive whole-of-system evaluation of the future of our electricity system, encompassing the entire energy chain from generation through to consumption. The forum brought together more than 120 representatives of the electricity industry, government and community, and was the first widely-accepted detailed analysis of four possible scenarios for Australia's electricity system:

- Set and forget- where consumers continue to rely on utilities
- Rise of the prosumer – where consumers actively design or customise solutions
- Leaving the grid – where consumers disconnect from the grid
- Renewables thrive – where storage play a large part in entire electricity system

The Forum's work was based around the detailed engineering and economic examination of each of the above scenarios. Further details on the forum, and the final reports, can be found here:

<https://www.csiro.au/en/Research/EF/Areas/Electricity-grids-and-systems/Economic-modelling/Future-Grid-Forum>

Intelligent Grid Research Cluster (2011)

The Intelligent Grid research cluster was a three-year collaboration between the CSIRO and five universities investigating technologies and practices to make our electricity networks smart, greener and more efficient.

The program focused particularly on the benefits and challenges around the application of distributed energy technology, such as microturbines, rooftop solar, demand response and cogeneration technology.

Finishing in June 2011, the Intelligent Grid cluster included the University of Technology, Sydney, University of Queensland, and University of South Australia, Queensland University of technology and Curtin University. This significant program included a wide range of investigations- from economic analysis on the benefits of distributed energy approaches, to social research on attitudes to new energy technologies and their uptake, to the institutional barriers that will need to be addressed before such technologies see widespread uptake. Further details on the cluster, and the final reports, can be found here:

<http://igrid.net.au/>