DEPARTMENT OF PLANNING, INDUSTRY & ENVIRONMENT

NSW Climate Change Fund

Annual Report 2018–19

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Minister's foreword

The Hon Matt Kean MP

Minister for Energy and Environment

NSW households, businesses and communities need access to reliable, affordable and sustainable energy. The people of NSW also expect decisive and responsible action on climate change.

The Climate Change Fund is helping us to deliver on these objectives. Through the Fund, we deliver programs that provide energy security in times of peak demand, help lower energy costs and smooth the transition to a low emission future.

The Fund is contributing to the NSW Government's goal of net-zero emissions by 2050 and making NSW more resilient to a changing climate.

During 2018–19, we invested more than $31 million in energy efficiency programs and more than $17 million in clean energy programs. We also invested nearly $192 million in community resilience programs.

The Fund supports households, businesses and local communities to save energy and money by installing rooftop solar and batteries, LED lighting and other energy efficiency upgrades. It supports vulnerable households to replace older household appliances with newer, more energy-efficient appliances.

These measures help NSW maintain a reliable energy supply by reducing the demand on the grid, lowering energy costs for all consumers and creating skilled jobs across the State.

Through the Fund, the NSW Government is saving consumers money, smoothing our transition to a low emissions energy future and helping our communities adapt to a changing climate.

The Hon Matt Kean MP

Minister for Energy and Environment

1. NSW Climate Change Fund

1.1 The Climate Change Fund in 2018–19

The Climate Change Fund invested $248 million

In 2018–19, the Fund invested $248 million in practical measures to help our households and businesses save energy and money, improve energy reliability and affordability and improve the climate change resilience of communities across NSW. This is $67 million more than the Fund's 2017–18 investment of $181 million. As shown in **Figure 1**, the Fund has invested $429 million in initiatives to mitigate and reduce the impacts of climate change since 1 July 2017.

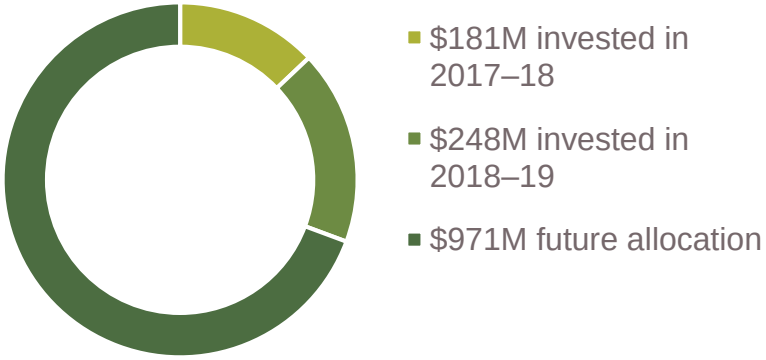


Figure 1 Proportion of total Fund allocation invested from 1 July 2017 to 30 June 2019

The Fund invested $17 million in clean energy programs

The Fund invested over $17 million in programs to help households, businesses and communities benefit from clean energy as NSW transitions to a modern and secure energy system.

We added 74 megawatts of electricity capacity to our energy system through a demand response program with the Australian Renewable Energy Agency (ARENA) and Australian Energy Market Operator (AEMO). This extra reserve capacity will help NSW respond to critical peak demand events.

We announced and commenced other clean energy programs including the Empowering Homes Program, the Emerging Energy Program, the Regional Community Energy Programs, the Smart Energy Storage for Key Government Buildings Program and the Solar for Low-Income Households Trial. These programs are delivering real benefits for NSW households, businesses and communities.

The Fund invested $31 million in energy efficiency programs

During 2018–19, the Fund invested more than $31 million to help NSW households, businesses and communities improve energy efficiency by funding:

- 18,600 new energy efficient fridges and televisions to replace older less efficient appliances in more than 16,800 vulnerable households
- energy efficiency upgrades for more than 850 social housing properties
- solar photovoltaic (PV) rooftop panels on 15 Tweed Bryon Local Aboriginal Land Council properties
- lighting upgrades for 2735 households and 1440 businesses
- commitments from 10 local councils in western Sydney and Illawarra to upgrade 30,000 streetlights to more energy efficient light-emitting diodes (LEDs).

The Fund invested $192 million in programs to enhance our resilience to climate impacts

During 2018–19, the Fund invested almost $192 million to enhance our resilience to climate impacts by:

- funding 32 tree planting projects across 20 metropolitan councils under the Five Million Trees for Greater Sydney program
- funding 44 local coastal and estuary management projects
- completing Light Detection and Ranging (LiDAR) mapping of 6862 square kilometres of sea floor along the NSW coast
- funding 34 local floodplain risk management projects
- helping private landholders protect over 21,000 hectares of biodiversity through conservation agreements with the Biodiversity Conservation Trust
- supporting programs that help protect and conserve NSW's 7-million-hectare national parks estate
- supporting a further six carbon sequestration activities located in our national parks estate register under the Emissions Reduction Fund
- protecting 139,338 hectares of national parks estate with 1463 bushfire hazard reduction activities
- supporting environmental and social impact assessments to inform the Hawkesbury–Nepean Flood Risk Management Strategy
- supporting the management of the Hunter Valley Flood Mitigation Scheme which comprises over 1000 flood mitigation infrastructure assets located on private land
- enhancing the Government Resource Efficiency Policy.

A further $8 million was invested in small, short-term programs.

1.2 The Climate Change Fund in 2019–20

In 2019–20, the NSW Climate Change Fund will support:

- the NSW demand response program which will add 80 megawatts of extra electricity capacity to our energy system to help NSW respond to critical peak demand events
- the Empowering Homes Program to help build new residential energy storage capacity in NSW
- new renewable generation, new dispatchable energy capacity and storage capacity in regional NSW through the Regional Community Energy Program grant applicants for projects under the regional community energy program
- new energy storage and virtual power plant capacity in key government buildings such as schools and hospitals, to save energy and money and improve energy security
- new private investment in the next generation of large-scale dispatchable energy and storage programs by supporting the emerging energy program
- the Solar for Low–Income Households Trial to help people on low incomes reduce their electricity bills by installing three-kilowatt solar systems on their homes
- more incentives for households and small businesses to upgrade to more energy efficient appliances and technologies
- more energy management services and funding for energy intensive businesses and industries to help them save energy and money
- pilots in western Sydney and regional NSW for more efficient homes for low income tenants
- the first streetlights being replaced with more energy efficient LED lighting
- more seabed LiDAR mapping of the NSW coast for coastal hazard assessment
- more investment by the Biodiversity Conservation Trust in private land conservation, bringing the complementary benefits of biodiversity conservation and adaptation, carbon sequestration, and more resilient and productive landscapes
- updates to the climate data portal to enhance the NSW regional climate projections (NARCliM1.5), which helps local government, businesses and the community manage risks of future extreme events and hazards by building their understanding of climate change impacts
- research with University of Sydney under the Human Health and Social Impacts node to strengthen the delivery of health services in the face of climate change
- more grant funding to local councils and communities under the increasing resilience to climate change grants program and developing case studies of council action to guide local community and council programs
- the enhanced Government Resource Efficiency Policy.

1.3 The purpose of the Fund and this annual report

The Climate Change Fund was established in 2007 under Part 6A of the *Energy and Utilities Administration Act 1987* (the Act) to address the impacts of climate change, encourage energy and water saving activities and increase public awareness and acceptance of the importance of climate change and water and energy savings measures. More information on the Fund's legislative objectives is set out in **Appendix A** to this document.

An independent review of the Fund in 2015 found it to be an efficient and effective mechanism for funding energy and climate change-related actions, returning more than $4 for every dollar invested. Based on this review, the Expenditure Review Committee approved funding of $1.4 billion for the Fund for a further five years from 2017 to 2022. The $1.4 billion is fully invested in the programs described above.

The Fund is mainly funded by annual contributions from electricity distributors and its costs are passed on to electricity customers. Water distributors, such as Sydney Water and Hunter Water, can also be issued with orders to raise funds for water related programs.

The Minister for Energy and Environment has responsibility for the Climate Change Fund under the Act. This responsibility includes approving payments to the Fund, allocating funding to programs and reporting annually to Parliament on the Fund's performance. The Department of Planning, Industry and Environment (DPIE) administers the Fund on behalf of the Minister.

This annual report has been prepared according to the requirements of section 34H of the Act. As required by the Act, this annual report provides information on the Fund's allocated programs and the anticipated benefits of these programs. Where possible, this annual report gives program performance against the Fund's key performance indicators, including:

- funds allocated ($)
- energy savings (megawatt hours per year)
- greenhouse gas emissions reduction (tonnes of carbon dioxide equivalent per year)
- annual bill savings ($ per year)
- clean/renewable energy generated (megawatt hours per year).

2. Saving energy and money while reducing emissions

'It helps the grid and it's also good for the environment'

The Fund invests in energy efficiency and clean energy programs to help households, businesses and communities save money and energy, while reducing greenhouse gas emissions associated with energy use.

These programs also have economic benefits for NSW. The energy efficiency programs reduce the demand on the State's energy network, particularly in times of peak demand. Over time, this lower demand reduces network costs for households and businesses.

Many programs are based on a partnership delivery model between the NSW Government, local government, financial institutions, businesses and energy distributors to attract investment to the State.

The Fund's investment grows all sectors of the NSW economy and increases employment, with a focus on growing the regional economy around clean, modern energy networks and supporting a skilled labour force.

2.1 Delivering reliable, clean and affordable energy

In 2018–19, the Fund invested over $17 million in clean energy programs including the Empowering Homes Program, the Emerging Energy Program, Regional Community Energy Programs, smart energy storage for key government buildings and the rooftop solar systems for eligible low-income households program.

These clean energy programs help vulnerable households and regional communities reduce their energy bills. The investment is also an opportunity for the NSW Government to lead by example through the smart batteries for key government buildings program.

These programs are designed to leverage additional private sector investment for a comprehensive response to climate change. The programs will grow skilled employment across the State, particularly in regional areas, and will support a smooth transition to a modern energy system.

2018–19 highlights

74 megawatts

Extra electricity capacity added to our energy system in 2018-19 under the Demand Response Program.

- Opened the Emerging Energy Program by calling for applications for the pre-investment studies and expressions of interest for funding for capital projects.
- Announced the Empowering Homes Program to support the installation of up to 300,000 solar battery systems across the ate over the next 10 years.
- Delivered the Demand Response Program with ARENA and the AEMO which added 74 megawatts to our energy system to help us respond to critical peak demand events.
- Opened the first funding round under the Regional Community Energy Programs.
- Executed partnership agreements with the Department of Education and the Ministry of Health to support installation of smart batteries at pilot sites and conducted the initial feasibility assessments for the selected sites.
- Opened the Solar for Low Income Households Trial, announced the geographic regions for the trial, commenced selecting the installers and program partners, and opened for enquiries.

More information on the Fund's clean energy programs is available on the Energy NSW website.

Program outcome indicators

Table 1 Benefits from clean energy programs 2018–19

Clean energy programs outcome	Unit	2022 target	30 June 2019
Create additional demand response capacity to respond to critical peak demand events in NSW	Megawatts (MW)	Up to 80 MW (by 2020)	74 MW

CASE STUDY

NSW–ARENA demand response program and Sell & Parker Metal Recycling Services help the grid and the environment

Sell & Parker Metal Recycling Services is the dominant buyer of demolition scrap in Sydney, with recycling facilities at Blacktown, Banksmeadow, Ingleburn, Coffs Harbour, Nowra and Newcastle.

Metal recycling is an energy-intensive activity and Sell & Parker's energy costs are high. The Blacktown site's (pictured) maximum energy demand regularly exceeds four megawatts (MW). The Managing Director, Luke Parker, is keen to improve the company's energy management to save money and energy.

Sell & Parker participates in the NSW–ARENA demand response program, which pays companies to voluntarily defer energy usage during times of peak demand. During tests performed with the Australian Energy Market Operator, Sell & Parker achieved a load reduction of three megawatts.

'Unless we are extremely busy, we can usually arrange our day's processing to avoid running the large machines at times of peak demand. It helps the grid and it's also good for the environment, which is what recycling is all about. It's good to get the payments, but that's not the only reason to be in the program', said Luke. 'We like to help where we can.'

The NSW demand response program is a $14 million program co-funded through the Fund and ARENA.

More information on NSW's demand response program is available at: Energy NSW Demand Response Program.

Figure 2 Sell & Parker Metal Recycling Services Blacktown
Photo: Gavin Jowitt

2.2 Delivering energy savings and reducing emissions

Helping vulnerable households save energy and money

The Home Energy Action Program is a partnership between the NSW Government, community housing providers, the community services sector and the energy retail industry.

The program provides discounts on more energy efficient household appliances to low income households, provides social housing upgrades and installs rooftop solar systems for energy hardship assist customers. The social housing upgrades can include solar PV panels, ceiling insulation, draught proofing, LED lighting, heat-pump hot water systems and split system air conditioning.

2018–19 highlights

- Delivered more than 18,600 energy efficient fridges and televisions to more than 16,800 households, with over 50% of these households from regional NSW.
- Upgraded more than 850 social housing properties under agreements with social housing partners. The upgraded households are together saving more than 2100 megawatt hours of electricity and more than $540,000 off their energy bills per year.
- Completed the first solar PV installation upgrade project with Tweed Byron Local Aboriginal Land Council. The 15 upgraded properties will together save 74 megawatt hours and over $12,000 off their energy bills per year.

Program outcome indicators

Table 2 Benefits of the appliance replacement offer 2018–19

Appliance type	Number of appliances	CCF investment ($)	Estimated energy savings (MWh/yr)	Estimated GHG emissions savings (tCO_2-e/yr)	Estimated energy cost saving ($/yr)	Potential cost effectiveness ($/MWh)
Televisions	3,600	641,168	1,789	1,646	622,572	35.84
Fridges	15,039	5,147,780	10,498	9,658	3,653,304	40.86
Total	18,639	5,788,948	12,287	11,304	4,275,876	40.24

CASE STUDY

The Energy Hardship Assist program helps the Tweed Byron LALC install rooftop solar systems

Gina Combo is the administrator and tenancy manager for the Tweed Byron Local Aboriginal Land Council (LALC). Gina lives with her partner and two children in a LALC-owned house.

Gina and the LALC want to save energy and money, while reducing emissions; however, there are challenges. The Tweed Byron LALC tenants find it hard to pay their energy bills and could struggle to find the extra money to install solar systems.

The Energy Hardship Assist program is a partnership between energy retailers and DPIE which provides funding to install solar systems for social housing tenants, like the Tweed Byron LALC tenants.

Gina and the LALC team successfully applied to the Energy Hardship Assist program for funding and other support. The LALC received $51,000 to help with the cost of installing solar PV panels at 15 properties.

The project is expected to deliver approximately 74,102 kilowatt hours energy savings and each household is expected to save over $800 per year in energy costs.

Figure 3 Solar installation in Tweed Byron.
Photo: Rest your eyes production/DPIE

CASE STUDY

The appliance replacement offer helps Lorraine afford a more efficient fridge

Lorraine lives with her husband in their rented home at East Kempsey. She first heard of the appliance replacement offer at her local Service NSW service centre while waiting for her husband to renew his driver's licence.

As a concession card holder, Lorraine qualified for a discount on a new fridge. Service NSW staff assisted with Lorraine's application. Lorraine chose her new fridge at her local Good Guys shop and it was delivered to her home two days later. She received a discount on her delivery charges and the team removed her 29-year-old fridge for her.

Lorraine saved money off the cost of her new fridge, but her savings do not end there. She will continue to save money on future energy bills for the life of her fridge.

More information on the appliance replacement offer is available on the Energy NSW Buying appliances webpage.

Energy efficiency upgrades for households and small businesses

The Household and Small Business Upgrade Program helps households and small businesses save money and energy while reducing emissions, by providing incentives for upgrades to energy efficient appliances.

The program's funding rounds focus on specific technology such as lighting, air conditioning units and refrigeration cabinets.

2018–19 highlights

- Provided over $4.2 million worth of incentives to 2735 households and 1440 businesses to upgrade their lighting through partnerships with six suppliers.
- Partnered with Service NSW's Cost of Living program to promote energy efficiency programs for NSW small businesses.

Program outcomes indicators

Table 3 Lighting round savings for small business projects 2018–19

Number of projects funded	Incentives paid ($)	Estimated energy savings (MWh/yr)	Estimated GHG emissions savings (tCO_2-e/yr)	Estimated energy cost saving ($/yr)	Potential cost effectiveness ($/MWh)
1,440	3,033,224	11,031	10,148	3,838,749	27.50

Table 4 Lighting round savings for household projects 2018–19

Number of projects or grants	Incentives paid ($)	Estimated energy savings (MWh/yr)	Estimated GHG emissions savings (tCO_2-e/yr)	Estimated energy cost saving ($/yr)	Potential cost effectiveness ($/MWh)
2,735	1,348,797	3,268	3,007	1,137,290	27.81

Table 5 Air conditioning round savings for small business projects 2018–19

Number of projects or grants	Incentives paid ($)	Estimated energy savings (MWh/yr)	Estimated GHG emissions savings (tCO_2-e/yr)	Estimated energy cost saving ($/yr)	Potential cost effectiveness ($/MWh)
10	5,789	6.6	6.1	2,310	87.22

Table 6 Air conditioning round savings for household projects 2018–19

Number of projects or grants	Incentives paid ($)	Estimated energy savings (MWh/yr)	Estimated GHG emissions savings (tCO_2-e/yr)	Estimated energy cost saving ($/yr)	Potential cost effectiveness ($/MWh)
455	330,203	122	113	42,565	269.97

Note: In June 2019, following a proactive audit of the program, the discounted energy efficient air conditioning round was suspended due to instances of non-compliance with current standards.

Training for businesses to save energy and money

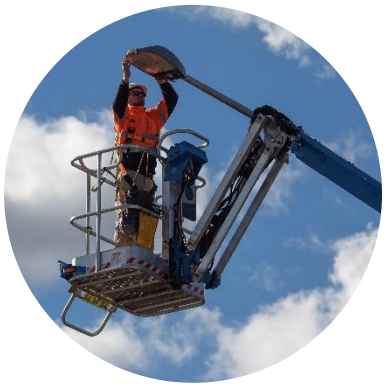
The energy management services program provides training, skills and tools to assist businesses across NSW to save money and energy while reducing greenhouse gas emissions.

The program aims to help 5000 businesses make a sustainable change to their energy management and use by 2022.

2018–19 highlights

- Trained over 4000 businesses in energy management through online training, workshops and webinars.
- Developed an energy management benchmarking tool for energy intensive sectors.

More efficient streetlighting



The more efficient streetlighting program is a targeted grants program which supports local councils to replace inefficient public lighting with more efficient LEDs.

The program also provides support services for councils to help them save money and energy and improve their awareness when undertaking resource efficiency projects.

2018–19 highlights

- Commitments to upgrade 30,000 lights by 10 local councils including Blacktown, Wollongong and Hawksbury in the Endeavour Energy network beginning in August 2019. These commitments alone represent 50% of the program's target.

More efficient homes for low income tenants

This program provides discounts to landlords to invest in energy efficiency upgrades for properties which have low income tenants. The upgrades will help reduce the tenants' energy costs.

The program covers upgrades such as solar PV, energy efficient hot water systems and ceiling insulation. It aims to help landlords choose the most appropriate energy saving technologies for their property or properties.

Property upgrades are expected to commence in early 2020.

Energy savings for energy intensive manufacturers

The manufacturing efficiency funding program provides $16 million in grants to help up to 250 manufacturing businesses save around $80,000 each year by upgrading their technology.

The first funding round of the program will close in July 2019. Under this grant, manufacturing businesses can apply for up to $120,000 matched funding to install or upgrade energy metering and monitoring systems, improve manufacturing processes and replace or retrofit old, inefficient equipment with new energy efficient equipment.

There has been a high level of interest with over 320 individuals and businesses registered for the program via the Energy Saver website.

More information on how to save money and energy is available on the Charge up your energy savings webpage.

3. Supporting our resilience to the impacts of climate change

The NSW Government is committed to improving our resilience to climate impacts. Through the Fund, the Government is working with NSW communities, local councils, industries, businesses and landholders to build their resilience to the impacts of climate change.

The Fund's investment supports local councils with coastal and estuary management and floodplain risk management through grants programs; helps resource constrained councils in regional NSW and western Sydney become more energy efficient; supports primary producers adapt to climate change through research and respond to the changes in our energy system; supports private landholders to conserve significant biodiversity on their property; and helps businesses adapt to climate change and respond to the changes in our energy system.

The Fund's investment is also helping local communities implement specific adaptation and resilience programs. Specific targeted programs include the Hawkesbury–Nepean Flood Risk Management Strategy, the Hunter Valley Flood Mitigation Strategy, and the Five Million Trees for Greater Sydney Program.

Across the State, the Fund protects our national parks, nature reserves and other conservation areas, supports bushfire management and provides grants to local councils and community groups for climate resilience programs.

3.1 Supporting local coastal and estuarine management

The Fund's investment in grants to local councils helps to reduce risk to NSW's coastal and estuarine environments and supports more sustainable coastal management.

The Coastal and Estuary Management Program provides scientific and technical advice and supports councils to plan and deliver coastal management projects. These local coastal management projects balance economic, social and environmental outcomes, mitigate current and future risks, and enhance community understanding of the potential impacts of climate change. The program also supports the NSW Coastal Council, which advises the Minister on the NSW coastal reforms.

The Fund's coastal and estuary grants program provides up to 50% funding to local councils for a coastal management program.

More information on the program is available on the Coastal and estuary management grants webpage.

2018–19 highlights

- Awarded $10,035,175 in grants for 44 projects under the coastal and estuary grants program. Projects that received funding included coastal protection works at Collaroy Narrabeen, wetland rehabilitation at Minnamurra, developing a coastal management program for Tweed Shire Council, preparing a coastal management program for Newcastle local government area coastline, and restoring sand dunes at Warilla.
- Completed large-scale LiDAR mapping of 6862 square kilometres of sea floor along the NSW coast, which will provide data for models to assess the condition of coastal habitats and the likelihood and impact of climate change on our coastal environment.

3.2 Supporting local government to manage flood risk

The Fund invests in a floodplain management grants program, which supports local councils and eligible public land managers to manage flood risk in their communities. The program aims to reduce the impacts of existing flooding and flood liability on communities and to reduce private and public losses resulting from floods.

The Floodplain Management Program typically funds $2 for every $1 contributed by the local council or land manager.

2018–19 highlights

- Awarded funding of $10,316,523 for 34 local floodplain management projects. Projects that received funding included a levee for flood mitigation at Perthville on the Macquarie River, floodplain risk management studies and plans for several catchments in the Penrith local government area, a flash flood warning system for coastal creeks in the Tweed local government area and a detailed design of a possible levee upgrade at South Albury.

More information on the floodplain management program is available on the Floodplain management grants webpage.

3.3 Tidal and flooding data collection (Manly Hydraulics)

The Manly Hydraulics Laboratory maintains and operates DPIE's extensive network of data relating to floodplain management, ocean tides and wave climate. This data allows changes in the coastal environment to be monitored and assessed and improves our understanding and

awareness of current and future risks of flooding and coastal hazards, including climate change.

The data network includes 171 flood and 48 estuary automatic water level recorders and seven offshore Waverider buoys located along the coast. Manly Hydraulics Laboratory also operates and maintains multiple river entrance and ocean tidal recording stations along the NSW coast, comprising 19 coastal ocean sites including Lord Howe Island and four offshore tidal sites. The Laboratory also operates and maintains 72 automatic rainfall recording stations at various coastal sites.

2018–19 highlights

- Prepared five annual data summary reports for government agencies and industry using data collected from more than 320 recording stations along the NSW coast.

More information is available on the Manly Hydraulics Laboratory website.

3.4 Helping landholders conserve biodiversity

The NSW Biodiversity Conservation Trust (the Trust) encourages and supports private landholders to conserve biodiversity. As a result, many unique landscapes and many threatened ecosystems and habitats for our threatened native plant and animal species are now protected and being managed by the landholders for conservation.

The Trust's investment priorities are set out in the NSW Biodiversity Conservation Investment Strategy. The strategy guides the Trust to deliver the Government's investment in private land conservation to areas where it will have the greatest conservation benefits.

Under the Trust, landholders who wish to manage and conserve biodiversity on their land have a choice of two funded programs.

First, the Conservation Management Program, which is aimed at encouraging private landholders to participate in private land conservation in 'priority investment areas' or with 'conservation assets' on their property identified in the investment strategy. The program is available via tenders, fixed rate offers, and a revolving fund.

Second, the Conservation Partners Program, which is for landholders wishing to protect and manage biodiversity on their land. It is available on an ongoing basis for landholders who are not seeking or are ineligible for conservation management payments.

During 2018–19, the Fund invested $50 million in private land conservation programs through the Trust. This investment supports the purposes of the Fund and the NSW Government's Climate Change Policy Framework in several ways, including:

- supporting adaptation of our native species and ecosystems to a changing climate
- complementing carbon sequestration efforts, and
- building the agricultural sector's resilience to climate change by preserving and strengthening the ecosystem services needed to support productive landscapes.

More information on the Trust, its work and the Biodiversity Conservation Investment Strategy is available in the Trust's 2018–19 annual report.

2018–19 highlights

- Protected over 21,000 hectares of land through 110 agreements with private landholders.
- Issued 69 grants paying over $270,000 and covering nearly 43,000 hectares.
- Supported around 2000 landholders including 770 site visits and attending over 180 events.

Program outcome indicators

Table 7 Benefits of the Biodiversity Conservation Trust

Private land conservation outcome1	Unit	2023 target	30 June 2019
Protection of NSW landscapes that the Biodiversity Conservation Investment Strategy (2017) indicated were inadequately protected	No	By 2023, private land conservation agreements will protect examples of 30 NSW landscapes that are either not represented within, or are inadequately protected in, the protected area system in 2017.	53
Protection of NSW landscapes not previously sampled within the protected area system	No		2
Investment committed in NSW rural and regional areas	$M	By 2023, diversified income streams will improve the financial sustainability of participating landholders relative to similar local businesses.	73.8
Landholders accessing a diversified income stream	No		74

[1] The Biodiversity Conservation Investment Strategy (BCIS) sets the Government's priorities for investing in private land conservation including short- and long-term targets (5 and 20 years respectively) to help measure progress in meeting the strategy's environmental and socioeconomic objectives. The Trust met target 1 in February 2019, four years early.

CASE STUDY

The Biodiversity Conservation Trust helps Martin and Elizabeth Timmins protect significant biodiversity on *Woodhouse* in the Snowy Monaro Region

Martin and Elizabeth Timmins produce beef cattle and merino sheep on *Woodhouse*, a 745-hectare property located in the Snowy Monaro region in southern NSW. The Snowy Monaro region is a designated priority investment area for the Trust's Conservation Management Program.

Woodhouse contains significant biodiversity, including two endangered ecological communities. The Natural Temperate Grassland is listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* as critically endangered. The Monaro Cool Temperate Grassy Woodland is listed in NSW as critically endangered. *Woodhouse* also contains the vulnerable silky Swainson-pea (*Swainsona sericea*).

In 2018, the Timmins successfully applied for a conservation agreement under the Monaro Grasslands tender, which is a $12 million initiative under the Trust's Conservation Management Program. They now receive annual conservation management payments which help them fund a range of conservation management activities, such as fencing, and pest and weed control.

Areas on *Woodhouse* containing significant biodiversity are fenced off from grazing stock. This allows the native trees, grasses and shrubs to grow back, and allows for a mixed-use property with diverse income streams.

Figure 4 Martin Timmins with Biodiversity Conservation Trust ecologist Donna Hazell on the Woodhouse conservation area.

Figure 5 Gate sign at *Woodhouse*.

Photos: Harriet Ampt/BCT

3.5 The NSW Primary Industries Climate Change Research Strategy

The NSW Primary Industries Climate Change Research Strategy (CCRS) investigates program and policy areas to support the primary industries sector as it adapts to climate change and responds to the changes in our energy system.

The CCRS includes a strategic portfolio of new actions that will complement existing programs and involves partnering with leading industry bodies and research institutions, on-ground pilots of new and emerging technologies and systems, and communication and engagement with the primary industries sector.

The CCRS supports primary industries meet the challenges of climate change and capitalise on opportunities across three theme areas in line with the Fund:

Energy – innovative clean energy solutions; more information on new technologies/practices to address rising energy costs; and alternative electricity generation options

Carbon opportunities – preparing primary industries for net-zero emissions by identifying emission reduction and sequestration opportunities and helping farmers access carbon markets

Climate resilience – developing cutting-edge knowledge on the vulnerability of our primary industries to climate change and testing new technologies and adaptation options to respond to climate change.

2018–19 highlights

Energy

- Held first Community Energy Forums in Nowra and Bega to enhance understanding of energy improvement options.
- Established partnerships with major energy generators to test innovative biomass processing technology, and species and sites (Glen Innes, Tamworth, Scone, Orange and Yanco) selected for biomass trial plantings.

Carbon opportunities

- Developed research partnerships to assess best land management practices for carbon sequestration, biodiversity and agricultural production.
- Developed an initial set of environmental co-benefit indicators for evaluation of carbon sequestration projects.
- Held stakeholder focus group meetings to inform the design of a carbon farming platform.

Climate resilience

- Explored the role of new technology in helping farmers adapt to climate variability and change through two pilot projects; using water salinity and temperature sensors at Batemans Bay to help oyster growers better understand and manage changes in water conditions and installing remote water tank sensors in Central West NSW to help livestock producers better manage their water resources and understand how technology can improve resilience to climate variability and change.
- Established vulnerability assessment nodes covering major industry sectors of livestock, dryland cropping, irrigated cropping, horticulture, fisheries, and cross cutting issues of biosecurity and drought. Each of these nodes will engage with industry to assess how different sectors are affected by and can respond to climate change.

CASE STUDY

Primary Industries CCRS

The Biomass for Bioenergy project: exploring the potential of biomass as an energy source for NSW

Regional NSW has significant potential for growing woody biomass crops. These crops, in turn, have the potential to provide an alternative energy source for regional NSW.

The Biomass for Bioenergy project is running trials to identify the most appropriate species for different regions of the State. These assessments will take into account proximity to processing facilities and provision of co-benefits. Several species of mallee, other eucalypt species and acacia will be used in the planting trials that will commence shortly, to assess their potential use on less productive marginal land.

Using biomass to produce bioenergy aims to achieve co-benefits for the landholder and regional communities, such as regional employment, soil improvement, biodiversity benefits, and carbon sequestration. Landholders can benefit from improved land productivity, potential for carbon sequestration and new revenue streams from the sale of the biomass.

The trial's findings will inform potential biomass for bioenergy policy and further development of a woody biomass crop industry in regional NSW.

Figure 6 Eucalypt mallee planting in Condobolin, NSW
Photo: Fabiano Ximenes

CASE STUDY

Energy Efficiency Solutions

Primary Industries CCRS

Helping south coast dairy farmers save energy and money with better energy management

Bega and Nowra dairy farmers improved their knowledge of on-farm energy efficiency and energy management at two recent energy efficiency solutions forums. These forums covered a range of on-farm energy saving measures from futuristic possibilities like hydrogen power to practical changes farmers can implement in the short term, like heat recovery systems or solar PV.

The forums also gave dairy farmers an understanding of the electricity grid, power usage charges and how these can be managed operationally on farm. The farmers were given the opportunity for further training on on-farm energy management and advised of financial assistance to help with implementing energy saving measures in their businesses.

The forums are also an opportunity to share experiences. At the Bega forum, dairy farmer Michael Shipton told how he had saved energy costs by installing a heat recovery unit on his refrigeration compressor and using his solar PV system to chill water for later milk cooling.

Michael also saved water by improving the design of his water and irrigation systems. He is now looking at other on-farm energy saving measures.

Sharing of these practical experiences at forums can influence others to take action to save energy and money in their agribusiness.

Figure 7 Lee Stewart (Director, Ndevr Environmental Pty Ltd) presented information on network set-up and energy management at forums in Bega and Nowra.
Photo: Cathy Waters

CASE STUDY

Primary Industries CCRS

Remote management of stock water supplies

Dave Weston manages a sheep property about 60 kilometres north of Orange in the Central Tablelands. The property has a large number of water tanks in multiple paddocks and sites. Dave needs to make a daily round trip to inspect the tanks and physically check the water level in each tank to ensure there is always water available for his flock.

Under the Climate Smart Pilots project, Dave has connected to the NSW Department of Primary Industries Open Sensor Network. Dave can now monitor essential farm resources, like water, from his phone or desktop even in areas where there is no mobile phone coverage. Dave can view the water level in his tanks from his phone, no matter where he is. He is saving time, fuel costs and money with this phone-based tool.

Enabling landholders to connect to a free public network opens up new opportunities to use sensors to help respond to climate variability and change.

Figure 8 Dave Weston, one farmer who has benefited from the Climate Smart Pilots project.

Photo: Christine Weston

Figure 9 A digital tank monitor, which sends water levels to the cloud and to the farmer's phone, informing them of potential leaks and improving decision-making.

Photo: Matt Pierce

3.6 Sustainable Government

The Sustainable Government Program is a NSW Government program to encourage all government agencies to improve sustainability practices, implement energy reduction projects and move towards net-zero emissions in their operations.

This program supports the development and integration of sustainability plans, embeds sustainability leadership within the NSW Government, develops key sustainability solutions and reduces the environmental impact of activities while increasing resource efficiency. These activities help build the NSW Government's internal capacity to make informed decisions to meet and exceed its Government Resource Efficiency Policy targets.

2018–19 highlights

- Enhanced the Government Resource Efficiency Policy to ensure agencies undertake resource efficiency planning at eligible sites and install rooftop solar systems in accordance with the NSW Government's solar target.
- Partnered with TAFE NSW, Property NSW and a range of Local Health Districts to co-deliver agency-wide energy efficiency and renewable energy upgrades.
- Developed technical and assessment tools and supported capacity building for agencies to support their planning and decision-making.

Solar rollout for NSW Government agencies

The Solar Rollout Program supports NSW Government agencies by investing in rooftop solar installations on NSW Government buildings to generate 25,000 megawatt hours per year by 2021, and 55,000 megawatt hours per year by 2024.

The program, which forms part of the Government Resource Efficiency Policy, gives agencies access to a pre-qualified solar services supplier panel, access to low-interest finance or solar power purchase agreements, and an advisory and analytics service to assist with feasibility assessments and investment priorities.

2018–19 highlights

- Submitted solar investments worth $8 million for approval for low-interest government finance.
- Supported 46 NSW Government sites to assess solar opportunities, with 27 additional sites currently in the pipeline.

- Supported the Department of Education with its rooftop solar installation program as part of its broader $500 million Cooler Schools initiative.
- Investigated solar installation opportunities with TAFE NSW and Sydney Olympic Park Authority.

3.7 Sustainable councils and communities

The Sustainable Councils and Communities (SCC) Program is a four-year initiative which gives up to 18 resource-constrained local government areas focused NSW Government support. The program targets 16 local councils in regional NSW and two local western Sydney councils.

The SCC program provides partner local councils with technical expertise, assistance with energy use audits and assessments, assistance with supplementary sources of funding, and supports capacity building of council staff.

The program also assists communities by encouraging and enabling engagement with the Fund's energy efficiency programs including business energy management and use training, lighting upgrades, appliance replacement offers and upgrades to social housing.

The program tailors other Fund programs to suit local needs and delivers significant savings to resource-constrained councils and their communities.

2018–19 highlights

- Engaged specialist energy and resource efficiency contractors to identify and map project opportunities for local councils.
- Delivered over 20 tailored solutions across 11 participating councils ranging from general advisory services and community capacity building to developing energy efficiency action plans for councils to transition to renewable sources of energy.

CASE STUDY

The Sustainable Councils and Communities program helps Kyogle Council plan to source 100% of energy needs from renewables by 2030

Kyogle Council is a regional local council in northern NSW. The council is one of 16 resource-constrained regional councils we work with to help them save energy and money.

Kyogle Council commissioned a consultancy firm, *100% Renewables*, to develop a Sustainable Councils Action Plan, supported by DPIE's Sustainable Councils and Communities program team. The action plan commits the council to source:

- 25% of its energy from on-site solar energy generation by 2025
- 50% of its energy from renewables by 2030
- 100% of its energy from renewables by 2030.

The council hopes these targets will directly encourage and support the use of renewable energy by the community, particularly in new developments.

The council has now developed a Climate Change Adaptation Risk Assessment.

The council's 2019–20 plans include developing business cases on those projects most likely to deliver its electricity targets; and a sustainable community action plan which addresses the specific needs of local businesses and households.

Figure 10 Graham Kennett, General Manager Kyogle Council.
Photo: Kelly Stock/DPIE

3.8 Collaborative Sustainable Housing Initiative

The Collaborative Sustainable Housing Initiative is a NSW program that builds strong partnerships between the NSW Government, research organisations and the construction industry to increase the demand and supply of sustainable homes. By working with state and national partners, the program aims to encourage householders across NSW to adopt sustainable and low-carbon practices when renovating or building.

The program aims to increase consumer demand as well as industry supply with the anticipated flow through to an increase in the supply and demand of sustainable housing and materials.

Renovate or Rebuild

- 4200 people watched the pilot
- 3300 visits to the *Renovate or Rebuild* website
- 30% of viewers watched the full 30-minute YouTube episode
- 100 websites linked the pilot to their pages

2018–19 highlights

- Developed *Renovate or Rebuild* pilot – a 30-minute pilot lifestyle show via YouTube and the associated website (www.renovateorrebuild.com.au).
- Established *My Renovation Planner* – an online platform which will provide renovators with sustainability information at the point of decision. The platform will be launched in early 2020.
- Developed the *Growing the Market for Sustainable Homes: Industry Roadmap* – in collaboration with the Cooperative Research Centre for Low Carbon Living, Australian Sustainable Building Environment Council (ASBEC), CSIRO and Green Building Council of Australia (GBCA) to outline a voluntary pathway towards sustainable housing. This approach could deliver up to half a billion dollars of additional investment to the construction industry by 2030 and save Australians $600 million on their energy bills.
- Delivered sustainability training for planners – a pilot training program in partnership with the Planning Institute of Australia (PIA) for NSW planners. More than 60 planners from the public and private sectors attended four workshops that covered sustainable building and precinct designs to facilitate a zero-carbon pathway, increasing their capacity to incorporate best sustainability practice into planning instruments.
- Held workshops for the housing industry sector which provided technical support to the industry to address the opportunities and barriers in delivering sustainable housing.

CASE STUDY

The Collaborative Sustainable Housing Initiative and *Renovate or Rebuild*: using a mass media communications approach to help Australian households choose healthier and more energy efficient homes

Renovate or Rebuild is a 30-minute pilot lifestyle TV show that is the result of a NSW Government partnership with the CRC for Low Carbon Living and others.

Renovate or Rebuild uses popular storytelling, in the form of reality TV, alongside a 'call to action' website and an 'impact community' while promoting sustainable homes as comfortable, affordable, efficient and healthy. A pilot episode of *Renovate or Rebuild* was made available on YouTube.

The 'impact community', modelled on the *War on Waste* and *The Block* television shows, included research partners, peak industry bodies, residential volume builders and developers, construction material suppliers, industry media, utilities, real estate, finance providers and other state and federal government departments. The website actively promoted companies that supply net-zero energy home products, and the call to action was designed to influence consumer purchasing behaviours.

Learn more: renovateorrebuild.com.au**. Case study with thanks to** ASBEC
Photo: BlueTribe Co

3.9 Sustainability Advantage

Sustainability Advantage

Highly Commended in the Public Service and Government Category of the International Circular Awards at the World Economic Forum in Davos, Switzerland

The Sustainability Advantage program is an international award-winning program that continues to help organisations increase their competitiveness, resilience and improve their bottom lines through better sustainability practices.

Sustainability Advantage works with individual organisations such as businesses, governments and not-for-profits to make real progress towards sustainability. Sustainability Advantage members are willing to invest in innovative actions that will reduce energy use, water use, waste and emissions. They also have the leadership capability to influence their supply chains and networks for long-term behaviour change.

Sustainability Advantage members have saved more than $130 million per year through resource efficiencies, such as reducing energy, water and waste since the program began in 2005.

2018–19 highlights

- Gained 27 new partner members, many through referrals, taking the program to 150 active project partners of which nearly 40% are in regional NSW.
- Supported 14 members to attend the internationally renowned Cambridge Institute for Sustainability Leadership programs, taking the total number of alumni to 48 since the partnership began in 2015.
- Collaborated with members and partners to significantly increase the reach and impact of the program, including:
    - improved decision-making around waste and resource management through the National Australian Built Environment Rating System (NABERS) waste project
    - adopted and integrated the United Nations Sustainable Development Goals into members' strategic planning processes
    - supported the new Product Stewardship Cluster, a collaboration of 23 Product Stewardship Organisations plus Sustainability Advantage members, which acts as an incubator for project development between major brands, retailers, manufacturers, recyclers and innovators
    - identified opportunities for members to share knowledge and resources to address problematic wastes such as adult hygiene products, textiles, carpets, cigarette butts, tyres, paint, crushed glass and soft plastics

- supported the Responsible Construction Leadership Group including the Environment Protection Authority, DPIE, City of Sydney, Lendlease, other major construction and hire companies, University of NSW and Western Sydney University to embed sustainable procurement, waste reduction and circular economy principles in the construction sector.

Program outcomes indicators

Table 8 Benefits of the Sustainability Advantage program from 2005 to 30 June 2019

Estimated energy savings (MWh/yr)	Estimated natural gas savings (GJ/yr)	Water savings (ML/yr)	Waste savings (tonnes/yr)	Estimated GHG emissions savings (tCO_2-e/yr)	Estimated resource cost savings ($/yr)
272,000	588,000	205,000	1,529,000	285,000	$131,027,000

3.10 Green Globe Awards

The Green Globe Awards is NSW's leading sustainability and environmental awards program showcasing excellence, leadership and innovation. The awards recognise and celebrate those people and projects making real progress towards a more sustainable future.

The Green Globe Awards increase public awareness of the impacts of climate change and the importance of water and energy saving measures by:

- showcasing sustainability leaders and their work to protect local communities
- sharing sustainability knowledge and how individuals and organisations can participate
- ensuring the State is more resilient to a changing climate.

2018–19 highlights

- Received over 150 nominations across 13 award categories from outstanding businesses, local government, community groups, non-government organisations, entrepreneurs, industry experts, academia and individual environmental champions.
- Received 60 nominations from regional NSW applicants.

3.11 Protecting communities in western Sydney from flood risk

Floods in the Hawkesbury–Nepean River Valley pose a significant risk to people's lives, livelihoods and property.

The Fund invests in the Hawkesbury–Nepean Flood Risk Management Strategy to protect communities from current and future flood risk. Investment from the Fund supports:

- increasing flood risk awareness for improved community preparedness, response and recovery
- improving flood risk information and its availability
- integrating emergency planning with land-use planning
- assessing the environmental and social impacts of raising Warragamba Dam wall for flood mitigation.

2018–19 highlights

- Commenced an environmental impact statement for the proposed raising of the Warragamba Dam wall.
- Developed a region-wide flood study.
- Delivered community flood resilience programs with the NSW State Emergency Service, other agencies and local councils.
- User tested and installed a new evacuation road signage system to direct the Hawkesbury–Nepean Valley community out of the floodplain in the event of a flood.

3.12 Protecting communities in the Hunter Valley from the risk of flooding

The Fund invests in the Hunter Valley Flood Mitigation Scheme, which manages 1031 flood mitigation infrastructure assets. The Fund's investment also supports local communities to improve the condition of the upper Hunter catchment.

The program supports the Fund's objectives by:

- maintaining and building resilience in the scheme's infrastructure which is located on privately owned land
- understanding risks posed by future climate change scenarios and planning to manage that risk
- improving catchment conditions in the upper Hunter including reducing the risk to the community from old river works sites
- building community resilience to potential flood events.

2018–19 highlights

- Commenced a hydraulic review of the Hunter River valley catchment to assess the impacts of climate change on the scheme's infrastructure. The review will set a precedent for the strategic management of and investment in flood mitigation infrastructure in large river catchments.
- Established the Hunter Aboriginal Riverkeeper Team project in partnership with the NSW Soil Conservation Service. The team supports the scheme's maintenance works program and provides employment and training opportunities for Aboriginal people in the Hunter Valley.
- Developed a community engagement strategy to address the community's expectations for flood asset maintenance and flood mitigation in their area.

3.13 Planting trees to protect Greater Sydney during hot weather

The Five Million Trees for Greater Sydney Program incentivises and supports tree planting efforts across the Greater Sydney region, particularly in suburbs with less tree cover.

The program is increasing resilience to climate change through strategic tree planting in urban areas which increases tree canopy, creates shade and mitigates the urban heat island effect.

The program underpins the Premier's Priority to increase tree canopy and green cover across Greater Sydney by planting one million trees by 2022, a step towards the NSW Government's longer-term objective of five million more trees planted by 2030.

2018–19 highlights

- Launched the Rosemeadow Demonstration Project, in partnership with Campbelltown City Council, to demonstrate how to create leafier and healthier suburbs for communities in western Sydney.
- Funded 32 tree planting projects across 20 metropolitan councils with grants worth $5.4 million.

CASE STUDY

Rosemeadow Demonstration Project: innovative community-based tree planting to raise our awareness of the impacts of climate change

As part of the Five Million Trees for Greater Sydney Program, DPIE is undertaking innovative tree planting projects that demonstrate best practice methods that can be recorded and replicated in other local government areas.

These demonstration projects will focus on challenges the community and stakeholders are facing as they work towards achieving a 40% urban tree canopy across Greater Sydney. Rosemeadow is the first demonstration project for the program. Located in the Western City District, Rosemeadow, a suburb within the Campbelltown City local government area, has been identified as a demonstration project to:

- improve the amenity and walkability of Rosemeadow by increasing urban canopy to achieve the cooling and greening of streets and parks
- establish a healthy tree canopy supported by the management of stormwater as a way of mitigating nuisance flooding and urban heat island effects
- document the methodology and learnings from the project for industry knowledge to encourage future urban canopy projects
- educate and advocate to the community and stakeholders on the benefits of urban canopy
- encourage local residents to plant trees in their own yards to increase the urban canopy in the private realm
- provide habitat for urban wildlife
- achieve best practice collaborative outcomes with project stakeholders
- incorporate leading-edge plant species research.

See Five Million Trees for Greater Sydney for more information.

Figure 11 The Five Million Trees Rosemeadow Demonstration Project launch at Heydon Park.
Photo: Josh Tredinnick /DPIE

3.14 Protecting our national parks estate

Managing protected areas

The Fund helps protect 7.22 million hectares of NSW reserves (national parks, nature reserves and other conservation areas). This investment supports the resilience of the protected reserve estate and increases our awareness of climate change impacts through targeted research programs, such as tree planting for carbon sequestration.

Managing bushfire hazards

The Fund's investment in bushfire management has three components: hazard reduction, the Rapid Aerial Response Teams under the enhanced bushfire management program, and scientific bushfire research through the Bushfire Risk Management Research Hub.

The Fund's investment in hazard reduction activities aims to increase the amount of hazard-reduced areas to 135,000 hectares while also targeting areas of greatest risk of bushfire.

The Rapid Aerial Response Teams (RARTs) work to contain bushfires before they impact communities. The teams are placed on stand-by in remote reserve areas at highest risk of bushfire when conditions indicate increased potential for new fire ignitions.

The NSW Bushfire Risk Management Research Hub, established in February 2018, is a five-year, state-based collaboration between the NSW Government, research institutions and bushfire experts. Through this initiative, the Fund invests in research that improves fire management strategies and reduces the risk bushfires pose to people, property and the environment.

Reducing emissions on the land

The Fund invests in tree planting on degraded former farming and/or forestry land that is now national park land. This investment helps DPIE apply for further funding under the Australian Government's Climate Solutions Fund (CSF) because mature trees absorb carbon dioxide, which reduces levels of carbon dioxide in the atmosphere. The Fund currently supports 18 tree planting projects with 13 of these projects registered under the CSF.

In addition to reducing carbon dioxide levels in the atmosphere, these pilot tree planting projects provide habitat, conserve biodiversity, improve water quality and soil condition and improve land stability. Where possible, the tree planting projects involve community members, including local Aboriginal people, which also contributes to public awareness of the impacts of climate change and adaptation measures.

2018–19 highlights

- Developed the NSW National Parks Climate Change Adaptation Strategy which addresses the impacts of climate change on our parks and reserves at the strategic planning level. The strategy informed a climate change assessment for Montague Island Nature Reserve, and climate change risk management in the protection of Aboriginal cultural heritage in jointly managed parks and in the protection of Gondwana Rainforest World Heritage properties in NSW.
- Implemented an Asset Management System which improves the monitoring and reporting of climate change impacts on national parks' infrastructure assets. The enhanced trigger-based decision tool now signals when action is required to adapt to the observed change. The system will be tested in 2019–20.
- Developed a 10-year management strategy for the 386.5-hectare Towra Point Nature Reserve Ramsar Site, to protect, restore and enhance the site's nationally significant sea and shorebirds populations and its unique aquatic flora communities. Towra Point is critical habitat for many of Sydney's fish and seafood species, such as Botany Bay and Georges River oysters.
- Protected 139,338 hectares of the national estate with 1463 hazard reduction activities.
- Supported the work of the RARTs. All responses took 30 minutes or less in 2018–19.

Program outcomes indicators

Table 9 Benefits of the NSW protected area management program

Community adaptation and resilience outcome	Unit	2022 target	30 June 2019
Number of hazard reduction activities	Number	>800 hazard reduction activities conducted per year	1,463
Area treated by hazard reduction activities	Hectares (ha)	>135,000 ha treated annually	139,338
Time from report of fire to initial RART response action	Per cent (%)	>90% of fires responded to within <30 minutes of detection	100%
Bushfires involving RART operations managed to acceptable size	Per cent (%)	>80% of fires kept to <10 ha in size	91%
CSF registered projects	Number	18 registered projects	13

CASE STUDY

Protected Area Management: the Everlasting Swamp National Park and CSF registered sites

Everlasting Swamp National Park is a large freshwater coastal wetland north of Grafton in the Clarence Valley. The park contains wetlands of state and national importance, which provide habitat for 26 threatened species of birds. It also contains degraded former agricultural land.

The Fund supported large-scale tree planting at this previously degraded site, reducing levels of atmospheric carbon and rendering it eligible for registration under the CSF.

In early 2018–19, the NSW National Parks and Wildlife Service, local Aboriginal people and other community representatives planted a diverse mix of over 35,000 native seedlings at this site. Over a 12-month period, most of the 15–20 centimetre seedlings (or small trees) initially planted have now reached two metres or more in height.

CSF registered sites also provide opportunities for public land managers to source additional funding for land rehabilitation activities through the sale of carbon credits. These carbon credits give public land managers, including DPIE, the opportunity to actively rehabilitate degraded areas of land which otherwise may receive little attention.

The Everlasting Swamp tree planting project is integrated with broader park planning processes, and will improve biodiversity conservation, water quality and soil condition across the park.

Figure 12 12-month plantings on degraded former agricultural land in Everlasting Swamp National Park.
Photo: Josh Chivers/DPIE

3.15 Researching climate change impacts on koala populations

The Fund is investing in research into the impacts of natural hazards and weather events on koala populations. The key research priorities focus on the impacts of climate change on the incidence of disease, habitat and extreme weather events, including fire, as well as cumulative impacts.

The funded research will increase our knowledge of koalas and build our awareness of climate change impacts on the NSW koala population. It will also enhance our ability to manage and minimise these impacts on koalas.

3.16 Funding local communities' climate resilience programs

The Fund supports the Increasing Resilience to Climate Change grants program for NSW local councils and community groups. The program encourages:

- actions to manage climate change risks, reducing future climate impacts and reducing potential liability for local and regional decision-makers
- regional and/or sectoral consideration of climate change impacts in decision-making
- climate change adaptation actions beyond business-as-usual projects and programs.
- building adaptive capacity by developing a community of practitioners and resources from across sectors and disciplines with practical experience in implementing adaptation responses across NSW.

2018–19 highlights

- Funded 10 local council projects worth more than $1 million to help councils address issues relating to coastal inundation, impacts of urban heat, using recycled water to maintain gravel roads during drought, piloting a Cool Suburbs rating tool and engaging communities to better design, plan and build their resilience to climate change. Grant recipients included five regional local councils, Blacktown local council and the Western Sydney Regional Organisation of Councils.

More information on the Increasing Resilience to Climate Change grants program is available on the Local Government NSW website.

4. Increasing our awareness and understanding of the impacts of climate change through science and research

The NSW Government leads the science of understanding how our climate is changing and invests to understand and respond to the impacts of climate change in NSW. The Government provides climate data and information, technical guidance, education and tools which informs climate adaptation decision-making by the NSW Government, businesses and industry, and local communities.

The Fund invests in climate science programs to increase our awareness and understanding of the importance of climate change. Funded science and research programs include regional climate projections, air quality monitoring and forecasting, researching and assessing climate change impacts on critical infrastructure, and climate change risk assessment and management, as well as other climate science research initiatives and partnerships.

4.1 Enhancing regional climate projections

Current climate data and information helps local government, businesses and the community manage risks of future extreme events and hazards by building their understanding of climate change impacts.

The Fund's climate science program provides information that is integral to the effective management of the impacts of climate change in NSW. The program focuses on enhancing and updating regional climate projections, determining local impacts from multi-hazards, as well as compound and coincident hazards.

2018–19 highlights

- Provided support and assistance to end-users so that they not only have access to the best available climate data and information but that they have the capability and support to use that information effectively.
- Enhanced the NSW climate projections delivered by the NSW and ACT Regional Climate Modelling (NARCliM) project ensures that projections are based on the best available information and meet user needs. Designing and delivering updated projections ensures that the regional climate projections for NSW continue to be based on the best available information. Ongoing research supports the evaluation and assessment of enhanced down-scaled climate projections.

More information about NARCliM is available on the AdaptNSW – About NARCliM webpage.

4.2 Supporting NSW's air quality monitoring network

NSW's comprehensive air quality monitoring network of 85 monitoring stations is the largest in Australia. The network supports an air quality monitoring and forecasting program that provides accurate, up-to-date air quality data to inform decision-making on managing potential risks from air pollution.

2018–19 highlights

- Expanded the air quality monitoring network with new monitoring stations at Rouse Hill, on the Bradfield Highway at Milsons Point and at Orange.
- Completed reviews and studies of Sydney, Newcastle and Kooragang Island air quality and monitoring networks.
- Provided air quality data and information to report and forecast air pollution episodes, major dust storms, heatwaves and hazard reduction burns.
- Supported universities and other industry partners in collaborative air quality monitoring studies.

4.3 Identifying related climate change impacts to infrastructure

XDI award

XDI Sydney was awarded the 2019 international 'Better Together Award' for Collaborative Solutions to Local Climate Action, sponsored by the German Federal Government

The Cross-Dependency Initiative (XDI) Sydney project is a pilot project that identifies cross-dependent climate change impacts in critical water, electricity, transport, telecommunications and built environment infrastructures across Greater Sydney. The project has developed an XDI tool which provides detailed insights into hazards, exposure and vulnerability across a complex system of highly interdependent critical infrastructure.

The XDI tool is supported by the regional climate projections developed under the climate science program.

2018–19 highlights

- Confirmed the XDI Sydney partnerships with key stakeholders including Sydney Water, Climate Risk, Sydney Trains and Transport for NSW, NBN Co, and local government.
- Expanded the pilot project into regional NSW and launched the XDI NSW project.

More information on the XDI Sydney project is available on the AdaptNSW – Infrastructure webpage.

4.4 Embedding climate change risk management across the NSW Government

The Climate Risk Ready NSW program embeds climate risk management into existing risk management frameworks across the NSW Government.

The program gives practical guidance to help NSW Government risk practitioners identify, assess and manage potential climate change risks to the NSW Government's $285 billion infrastructure assets and services.

Treasury supports the program's governance to ensure alignment to existing NSW Government risk management policies and a collaborative inter-agency approach to improve the NSW Government's response to a changing climate.

2018–19 highlights

- Piloted a project with the Sydney Opera House to test approaches for assessing climate change risks to Government assets, infrastructure and services.

4.5 Climate change information and knowledge delivery

AdaptNSW Annual Forum

200 scientists, risk managers, policy-makers, climate change businesses and non-profit organisations

The climate change information and knowledge delivery program provides tailored information and resources on climate change, and possible impacts of scale relevant to local decision-makers, to enable government, businesses and communities prepare for a changing climate.

The program uses the valuable insights gained from end users to inform the ongoing design and delivery of a range of NSW Government climate change programs, as well as the knowledge sharing website AdaptNSW.

2018–19 highlights

AdaptNSW website attracts a quarter of a million visits every year

- The AdaptNSW website attracted a quarter of a million visits.
- Completed four end user needs assessments of the infrastructure, finance, small business and not-for-profit sectors, which provided important insights into how each sector uses climate change information, their perceived information gaps and the challenges each have in accessing and using climate change information.
- The AdaptNSW Annual Forum, held in Sydney in November 2018, attracted nearly 200 scientists, risk managers, policy-makers, climate change businesses and not-for-profit organisations to share learnings from the Adaptation Research Hub to apply in their organisational practices.

More information on the climate change information and knowledge delivery program is available at www.climatechange.environment.nsw.gov.au.

4.6 The Climate Change Fund Research and Evaluation Initiative

The Climate Change Fund Research and Evaluation Initiative provides communities, businesses and NSW Government agencies with the information they need for improved resource efficiency and greater resilience to climate change.

2018–19 highlights

- Enhanced the NSW SEED Open Data Portal with new urban heat and vegetation cover baseline data for the Greater Sydney region in April 2019. The new datasets provide a baseline to guide local strategic land-use planning and future monitoring and evaluation of green cover programs. These datasets are among the most viewed datasets on the portal.
- Collaborated on research into the relationship between climate change and health through the Human Health and Social Impacts Node. This research focuses on addressing urban design and the built environment, vulnerable populations, physical and mental health, and health assets and services.
- Collaborated on research into energy efficiency program and policy design through the Energy Efficiency Decision Making Node. The research program includes identifying opportunities for reducing greenhouse emissions in the transportation sector, energy efficiency decision-making in the NSW social housing sector and the decision-making processes to meet or exceed BASIX requirements for new builds in NSW.

More information on the work programs of these and other research initiatives is available at the Adaptation Research Hub and the Energy Efficiency Research Hub.

4.7 Supporting innovative solutions

The Australian Climate Knowledge and Innovation Community (Climate-KIC Australia) is a public–private partnership that links research, business, entrepreneurs, investors and government to facilitate systemic change. The partnership addresses the challenges and harnesses the opportunities of climate change.

Climate-KIC Australia seeks to support innovative solutions to the challenges NSW and Australia face in reducing emissions and adapting to climate change.

2018–19 highlights

- Supported more than 10 clean energy start-ups in NSW with mentoring, training, office space and investment capital.
- Delivered low-cost Climate Information Needs Analysis for the finance sector, building on KIC's broad network of insurance and banking partners.
- Established the Fairwater Living Lab project to inform sustainable housing using geothermal heating/cooling, providing data from both a business and consumer perspective. This project leveraged NSW Government investment to access Commonwealth ARENA funding and a total project value of $1.7 million.
- Established the Adaptation Finance Project to increase funding for climate change adaptation projects by convening leaders from institutional banking, insurance, technology, research and local and state governments.

4.8 Appliance Standards

The Appliance Standards program supports NSW's delivery of a Trans-Tasman initiative by collaborating with Australian state, federal and New Zealand agencies to increase energy efficiency standards and energy labelling for a range of energy using products.

The program team is leading three workstreams to increase the efficiency of commercial catering equipment, space heating, and appliances already subject to efficiency standards internationally.

NSW's contribution explores and enhances energy intensive products and sectors not previously investigated including commercial cooking, cleaning and storage equipment, and household appliances such as vacuum cleaners and dehumidifiers.

The reduction in energy use brought about by this program is estimated to save $5.5 billion across NSW households and $1.5 billion for NSW businesses by 2040.

2018–19 highlights

- Commenced data collection on a range of products under investigation, collating information on suppliers, product performance, models and volume of sales. This data is being used to estimate the current energy usage of existing appliances and future potential savings from enhanced energy efficient technologies to contribute to NSW's 2050 net-zero emissions target.
- Undertook preliminary research into domestic hot water use that will be used by a range of agencies and energy efficiency programs, such as the 'More efficient homes for low income tenants' program, to better understand how hot water is produced and used by households.

5. Climate Change Fund's governance arrangements

5.1 Governance arrangements and risk management

The Fund is established under Part 6A of the *Energy and Utilities Administration Act 1987* (the Act). The Minister for Energy and Environment has statutory responsibility for the Fund and oversees the delivery of all funded programs and the Fund's financial management.

The Climate Change Fund is established under Part 6 of the *Energy and Utilities Administration Act 1987* (the Act). The Minister for Energy and Environment has statutory responsibility for the Fund and oversees the delivery of all funded programs and the Fund's financial management.

DPIE administers the Fund on behalf of the Minister. It consults with the Department of Premier and Cabinet, the Treasury and all implementing agencies on all funded programs and all proposals for new funded initiatives.

DPIE's responsibilities include the strategic oversight of the Fund and advising the Minister on all Fund related matters, including Fund revenue and expenditure and performance of the Fund's programs. DPIE has established the Climate Change Fund Administration Committee (the committee) to implement these responsibilities.

The committee provides strategic governance and administration for the Fund. The committee's responsibilities include the monitoring and evaluation of the Fund's programs, the financial management of the Fund, risk management for the Fund as a whole, and the evaluation of the Fund according to the principles in the Climate Change Fund Evaluation Framework.

DPIE delivers most of the Fund's programs, but not all. To ensure all funded programs are implemented effectively and efficiently, an inter-agency Climate Change Fund Implementation Committee coordinates and monitors the implementation of funded programs across relevant government agencies and provides advice and assurance to the Minister and the NSW Government on all programs.

Appendix A gives more information on the purposes of the Fund and the Minister's responsibilities.

5.2 The Climate Change Fund Evaluation Framework

The Climate Change Fund Evaluation Framework (the evaluation framework) establishes the evaluation requirements for all funded programs. The evaluation framework ensures that all evaluations of Fund programs are aligned with the NSW Government's evaluation principles, norms and standards. The evaluation framework also sets out the institutional responsibilities of the different entities participating in the Fund.

The evaluation framework helps to ensure the NSW Government's climate change policies and programs are working together effectively to deliver our long-term climate change objectives.

There are two types of evaluation under the Fund: program evaluations and overarching evaluations. Under the evaluation framework, program evaluations can include economic evaluations, outcome evaluations, impact evaluations or process evaluations. The overarching evaluation frameworks seek to assess the effectiveness of the Fund's performance and outcomes in delivering social, economic and environmental benefits at the regional and state level.

Programs currently funded through the Fund will be evaluated toward the end of their program life, in accordance with peer-reviewed plans established for the programs. Where appropriate, programs have commenced process evaluation activities in line with these plans.

The overarching energy evaluation framework and resilience evaluation framework are being designed and integrated across the relevant Fund programs. These evaluations will be implemented in line with program delivery timeframes.

In 2019–20, DPIE will finalise 20 program evaluation plans as well as the overarching energy evaluation framework and resilience evaluation framework. When finalised, program evaluation plans will enable funded programs to undertake process evaluations. The evaluation framework will also be reviewed, building on lessons learned while implementing evaluations.

Program monitoring and evaluation is supported by robust data and evidence collected under the Climate Change Fund Research and Evaluation Initiative (see Section 4.6 in this report).

6. Climate Change Fund budget and administration

6.1 2018–19 budget

Revenue

The Fund's revenue is raised through annual contributions from electricity distributors and its costs are passed on to electricity customers. The electricity distributors are requested to recover no more than 25% of costs from household customers. Commercial, business and industrial customers cover the remainder.

Water distributors, such as Sydney Water and Hunter Water, may also be issued with orders to raise funds for water related programs, depending on the NSW Government's priorities.

The Fund's 2018–19 revenue was $289 million. A breakdown of this revenue is shown in Table 10.

Table 10 NSW Climate Change Fund 2018–19 revenue

Climate Change Fund revenue sources	Amount ($)
Ausgrid	135,587,381
Endeavour Energy	86,404,911
Essential Energy	59,161,902
Sydney Water	3,240,000
Return of grant	1,103,280
Interest	3,723,253
Miscellaneous revenue	112,380
Total	**289,333,107**

Expenditure

The Fund's total expenditure in 2018–19 was $248.4 million. Expenditure in 2018–19 for each funded program is shown in Figure 13 and listed in Table 11.

The difference between total revenue and total expenditure is mainly due to timing differences of program commitments approved by the NSW Government. In the 2018–19 budget, unspent moneys in the Fund were carried forward to 2019–20 for spending in that year.

Table 11 Climate Change Fund 2018-19 program expenditure

Climate Change Fund program	2018–19 Expenditure ($M)
Energy saving upgrades for social housing clients and discounts to replace inefficient fridges and TVs for concession card holders	18.1
Discounts on high efficiency fixed household appliances	3.1
Discounts for small businesses to upgrade equipment	3.5
Training for small businesses to save energy and money	0.4
More efficient homes for low income tenants	1.2
Energy savings for energy intensive manufacturers	2.2
More efficient street lighting	1.2
New energy efficiency standards for appliances, buildings and infrastructure.	1.4
Empowering Homes program	0.8
Smart energy storage for key government buildings	0.9
Emerging energy generation fund	1.9
Regional community energy projects	0.9
Solar for Low-Income Households Trial	0.6
National energy regulation contribution	12.1
Five Million Trees initiative	1.2
Grant funding to help households, businesses and councils reduce their exposure to natural hazards and climate risks	5.5
Private land conservation through the Biodiversity Conservation Trust	50.0
Enhanced bushfire management program and research	15.2
Bushfire management (ongoing program)	12.0
Coastal risk management	6.7
Coastal, Flood, Estuary Flood Grant Programs	14.8
Hawkesbury-Nepean Flood Risk Management Strategy	24.7
Hunter Valley Flood Mitigation Scheme	7.4
Primary Industries Climate Change Research Strategy	5.5
Air quality monitoring and forecasting	5.8
Manly Hydraulics Laboratory	3.9
Sustainability use of our energy and resources	4.8
Protected Area Management	33.1
Climate and Resource Efficiency Policy	0.7
Community Engagement	0.1
Other ongoing adaptation and sustainability	0.5
Koala Strategy	0.3
Tweed Shire Council Flood Strategy	3.0
Climate Change Fund program administration	2.1
Other government priorities on energy efficiency	2.7
Total 2018-19 Expenditure ($M)	**248.3**

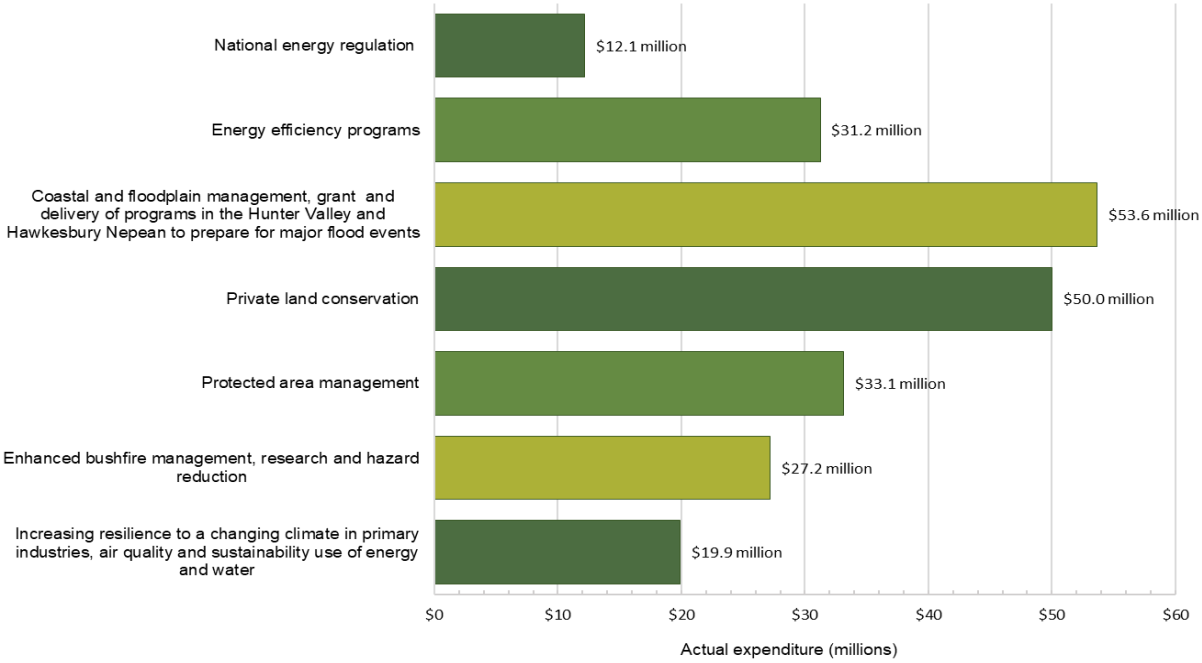


Figure 13 2018–19 Climate Change Fund expenditure for major programs only

6.2 2018–19 administration and market regulation

Under section 34J of the Act, the Minister for Energy and Environment requires licensed electricity distributors and Sydney Water to make contributions to the Fund via the annual gazettal of Contributions Orders. The Minister seeks the concurrence of the Minister for Water and the Treasurer as required when preparing Contributions Orders.

The Minister for Energy and Environment approves payments from the Fund if satisfied that the project promotes the Fund's purposes as outlined in section 34F of the Act.

National energy regulation

The Fund provides the NSW Government contribution to national energy regulation initiatives, as provided for under section 34H of the Act.

Under established funding arrangements agreed between relevant jurisdictions, NSW is responsible for approximately 35% of the Australian Energy Market Commission's budget.

NSW paid $10.05 million in 2018–19 as its share of the Australian Energy Market Commission's operating budget.

NSW also contributed $2.4 million to the work of the Council of Australian Governments' Energy Council, Energy Programs and Services on national energy regulation.

Appendix A – Legislative requirements

The Fund was established in 2007 under Part 6A of the *Energy and Utilities Administration Act 1987*. The Act describes the purposes of the Fund. Relevant provisions in the legislation are provided below.

Division 2 – Climate Change Fund

34F Purposes of Climate Change Fund

The purposes of the Fund are as follows:

(a) to provide funding to reduce greenhouse gas emissions and the impacts of climate change associated with water and energy activities

(b) to provide funding to encourage water and energy savings and the recycling of water

(c) to provide funding to reduce the demand for water and energy, including addressing peak demand for energy

(d) to provide funding to stimulate investment in innovative water and energy savings measures

(e) to provide funding to increase public awareness and acceptance of the importance of climate change and water and energy savings measures

(f) to provide funding for contributions made by the State for the purposes of national energy regulation.

34G Payments into Climate Change Fund

(2) There is payable into the Fund:

(a) all money received from contributions required to be made to the Fund under Division 3

(b) all money advanced by the Treasurer for the Fund

(c) all money appropriated by Parliament for the purposes of the Fund

(d) the proceeds of the investment of money in the Fund

(e) all money directed or authorised to be paid into the Fund by or under this or any other Act or law

(f) all money received from voluntary contributions to the Fund made by any other person or body.

Without limiting subsection (1)(f), state agencies are authorised by this section to make voluntary contributions to the Fund.

Subsection (2) does not authorise a state water agency or a distribution network service provider to refuse to pay a contribution to the Fund that is payable under Division 3.

34H Payments out of Climate Change Fund

(1) There is payable from the Fund:

(a) any money approved by the Minister to fund all or any part of the cost of any measure that the Minister is satisfied promotes a purpose referred to in section 34F

(b) any money approved by the Minister to fund all or any part of the contributions that the State is required to make for the purposes of national energy regulation

(c) any money required to meet administrative expenses related to the Fund

(d) any money required to meet administrative expenses of the Minister in connection with the Minister's functions under this Act in relation to savings action plans

(e) any money directed or authorised to be paid from the Fund by or under this or any other Act or law.

(2) In exercising the Minister's functions under subsection (1)(a) (but without limiting the generality of that paragraph), the Minister may:

(a) approve selection criteria from time to time to be applied to determine the kinds of water or energy savings measures that will be eligible for funding

(b) approve the funding of community grants from the Fund, being grants awarded based on their merit in advancing one or more of the purposes referred to in section 34F, established through a competitive selection process

(c) require a person or body seeking funding for a water or energy savings measure to do either or both following as a precondition to applying for or obtaining funding:

(i) to submit a water savings action plan or energy savings action plan (as the case requires) that includes details about the measure

(ii) to provide any other information requested by the Minister about the measure, and

(d) obtain and have regard to any advice, recommendations or other information provided to the Minister by a committee established by the Minister under Division 5, or by any other person or body, that the Minister considers relevant.

(3) The Minister is to produce an annual report detailing Fund allocations and programs and anticipated benefits, by reference to key performance indicators, to be achieved in advancing any one or more of the purposes referred to in section 34F.

(4) The annual report is to include an evaluation of the effectiveness of each program as it is completed under the Fund.

(5) The annual report is to be tabled in each House of Parliament within six months after the end of the financial year to which it relates.

(6) The Minister is to publish each annual report to promote, to the NSW public, schemes, technologies and processes that address climate change, and to inform the NSW public about consumer choices and procurement decisions.

Appendix B – Tariffs and information sources

Savings estimates

All program savings are conservatively estimated from the available information. Any apparent discrepancy in the totals shown is due to rounding.

Where possible, this annual report uses retail prices published by the Australian Energy Market Operator (AEMO) for National Electricity and Gas Forecasting. Bill savings for some programs such as Gas Efficiency Funding are site-specific.

Energy bill savings may include savings attributed from electricity, natural gas, LPG and operating and maintenance costs.

The cost effectiveness of funding is calculated by dividing the funding allocated or expended by the lifetime of the savings, which varies by technology (e.g. 10 years for a television, 12 years for a refrigerator).

Greenhouse gas emission conversion factors are from the National Greenhouse Accounts Factors July 2017 (see Table 12).

Table 12 Emissions factors

Fuel	Unit	Factor
Electricity	tCO_2-e/MWh	0.91
Natural gas	tCO_2-e/GJ	0.07
LPG	tCO_2-e/GJ	0.07

Regions

Regional NSW is defined as the local government areas outside Greater Metropolitan Sydney. For more information see the DPIE ***Regional plans*** webpage.

Glossary

Term	Definition
the Act	*Energy and Utilities Administration Act 1987*, under which the NSW Climate Change Fund is established
BASIX	Building Sustainability Index; a sustainable planning measure that aims to deliver equitable, effective water and greenhouse gas reductions across NSW
cost effectiveness	A cost per megawatt hour or other metric that is calculated by dividing the funding allocated to the energy savings over their lifetime
DPIE	NSW Department of Planning, Industry and Environment
efficiency (energy or water)	Reducing the amount of energy or water required to provide a given level of service (e.g. for lighting, air conditioning or toilet flushing)
the Fund (or CCF)	The NSW Climate Change Fund
gigajoule (GJ)	A joule is a unit of energy, equivalent to the power of one watt for one second; a gigajoule is 1000 million joules
gigawatt hour (GWh)	A gigawatt hour is equivalent to 1000 megawatt hours or one million kilowatt hours. Gigawatt hours are often used as a measure of the output of large electricity power stations (see definition under kilowatt hour)
GHG	Greenhouse gas, usually with reference to emissions
hazard reduction	In the context of bushfire management, hazard reduction provides areas of reduced fuel that can significantly reduce fire behaviour and aid fire suppression activities. Hazard reduction activities may include prescribed burning or mechanical clearing like slashing undergrowth, mowing or reducing the ground fuel by hand
kilowatt (kW)	A unit of energy equal to 1000 watts (see definition under watt)
kilowatt hour (kWh)	A measure of energy use equivalent to consumption of 1000 watts for one hour
LED	Light-emitting diode; a type of energy efficient lighting
LiDAR	Light Detection and Ranging is a remote sensing method used to examine the surface of the Earth. It uses pulsed laser light to measure ranges (variable distances) to the earth and data is often collected by air. These light pulses – combined with other data recorded by the airborne system – generate precise, three-dimensional information about the shape of the Earth and its surface characteristics. A LiDAR instrument comprises a laser, a scanner, and a specialised GPS receiver.
LPG	Liquified petroleum gas; a type of fuel often used in industrial, commercial, agricultural and manufacturing applications
megawatt (MW)	A unit of energy equal to one million watts (see definition under watt)
megawatt hour (MWh)	A megawatt hour is equal to 1000 kilowatt hours (see definition under kilowatt hour)
NABERS	National Australian Built Environment Rating System; NABERS is managed nationally by DPIE, on behalf of Commonwealth, state and territory governments

Term	Definition
passive housing design	A sustainable building standard that makes use of local climate and site conditions to provide for greater indoor temperature stability. It incorporates renewable energy to provide household heating, cooling, ventilation and lighting, reducing energy usage
PV	Photovoltaic; a form of solar energy that converts light directly into energy
power purchase agreement	A financial arrangement in which a solar service provider owns and pays for the installation of a solar PV system, and a customer hosts the system on their property and purchases the energy it produces from the solar services provider for a predetermined period and price, usually cheaper than the retail electricity rate paid to the customer's energy retailer
renewable energy	Energy generated from renewable sources, including the sun, waves, waste, water (hydroelectricity) and wind, as opposed to fossil fuels that emit greenhouse gases
retrofit	Upgrading an existing system or building, typically to make it more energy or water efficient
solar energy	Solar power refers to the sun's potential to produce energy. Solar energy can be generated using a wide variety of methods, ranging from simple water recirculating systems used to heat homes and commercial offices, to sophisticated networks of solar cells that produce enough energy to supply small cities
sustainable housing	Sustainable housing features include passive housing design, insulation, double glazing, solar energy, efficient appliances and sustainable materials
tCO_2-e	An abbreviation of 'tonnes of carbon dioxide equivalent', the internationally recognised measure of greenhouse gas emissions
volume builders	Builders that offer a series of standard home designs and generally build at large scale, i.e. hundreds or thousands of homes per year
watt (W)	The unit for measuring electrical power; the rate of energy consumption by an electrical device when it is in use is measured in watts