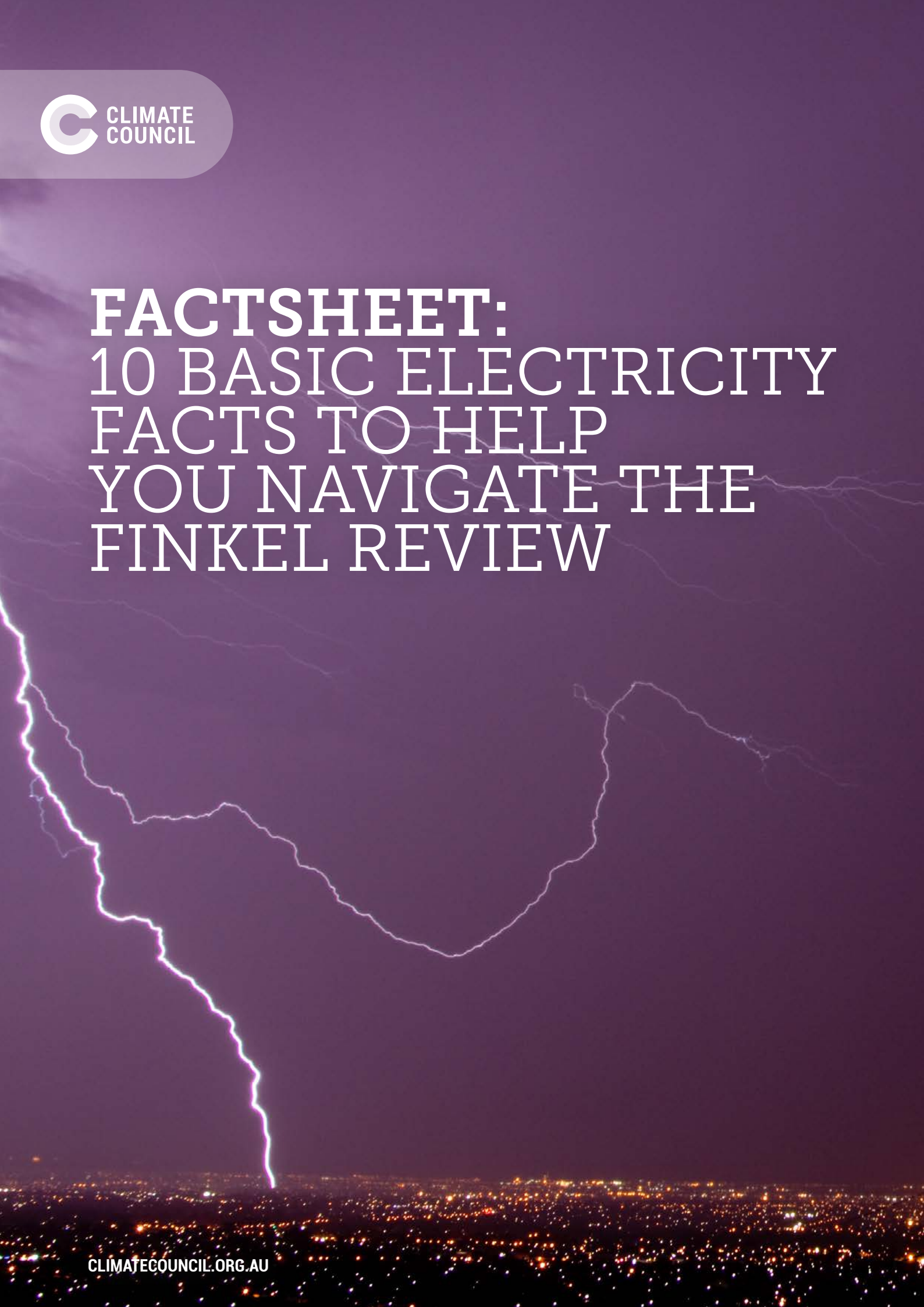
CLIMATE COUNCIL

FACTSHEET:
10 BASIC ELECTRICITY FACTS TO HELP YOU NAVIGATE THE FINKEL REVIEW



INTRODUCTION

Our energy system needs overhauling

Australia's energy system is ageing, inefficient and polluting. It is not coping with escalating extreme weather, like heatwaves and storms. It is not adequately adapted to 21st century, smart technology.

In addressing this major issue The Finkel Review (led by Chief Scientist, Dr Alan Finkel), has been tasked with developing a blueprint for the future of Australia's national electricity market which:

- delivers on Australia's emissions reduction commitments
- provides affordable electricity, and
- ensures a high level of security and reliability (Finkel 2016).

The key test of the final report from the FInkel Review will be whether proposed policies and recommendations are consistent with limiting global temperature rise below 2 degrees Celsius, delivering the lowest cost outcome for Australian businesses and households, and ensuring a secure and reliable electricity system into the future.

With the final report from the Finkel Review into the future security of the National Electricity Market imminent, the Climate Council takes this opportunity to set out 10 basic facts about electricity costs, emissions and security.

COST

1. **Fact:** The cheapest form of new power generation is renewable

Wind and solar are now the cheapest form of new power generation in Australia.

Low wind prices are reflected in recent contracts for wind, for example less than AUD 60/MWh at Stockyard Hill Wind Farm, Victoria; AUD 65/MWh at Silverton Wind Farm in NSW; and AUD 73/MWh Hornsdale Stage 3 Wind Farm in SA.

Worldwide, the cost of large-scale wind and solar plants continues to fall. Onshore wind fell 18%, and solar PV fell 17% in the past year. Globally, wind prices have reached record lows of AUD 40/MWh in Morocco and AUD 40/MWh for solar in Dubai and Chile (Frankfurt School-UNEP Centre/BNEF 2017).

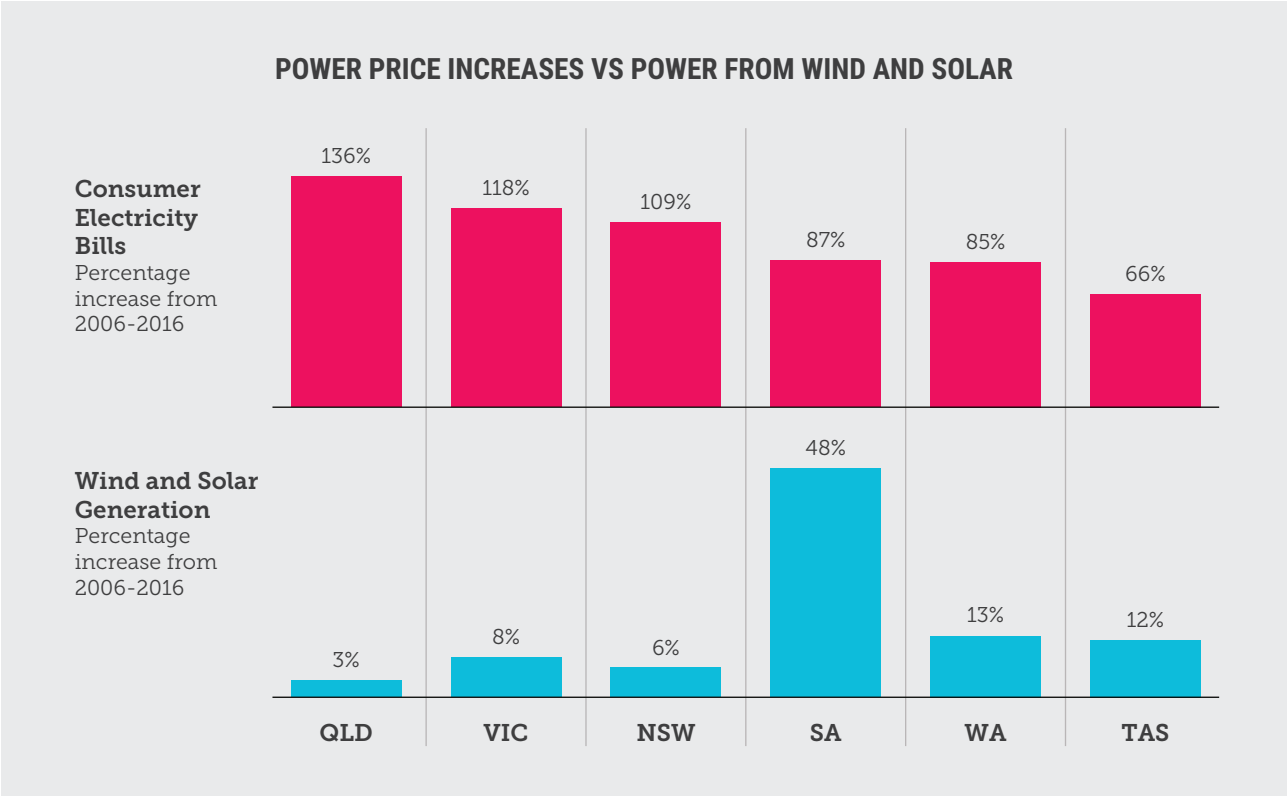
Generation source	AUD/MWh
Wind	61 – 118
Solar	78 – 140
Combined cycle gas stations	94 – 114*
Ultra-supercritical coal	134 - 203
Coal with carbon capture and storage	352+

Sources: BNEF 2017; * Climate Council 2017 (costs reflect current gas prices).

2. **Fact:** Electricity prices have risen most in fossil fuel dominated states

Power bill pain is being felt most in fossil fuel dominated states with the least renewable energy growth. The fossil fuel dominated states of Queensland, Victoria and New South Wales have seen the largest increase in their electricity bills over the past decade (2006-2016). These states had the lowest growth in wind and solar generation.

A significant driver of increased wholesale electricity costs in Australia is uncertainty regarding electricity policy in Australia (AEMC and CCA 2017).



Sources: Adapted from Clean Energy Council 2017; Phillips 2017.

3. **Fact**: Gas power is expensive and high prices are locked in for the foreseeable future

High gas prices are now locked in for the foreseeable future in Australia (AEMO 2016). Ramped-up Liquefied Natural Gas (LNG) exports from Australia's east coast are driving up domestic gas prices, with prices reaching as high as $20/gigajoule (five times the prices from 2011 and earlier) (AER 2017; AiG 2017). Australia is set to be the largest LNG exporter in the world by 2018, and by 2020 will be exporting over 70% of all gas produced in eastern and southeastern Australia (AER 2017).

Gas price increases are due to a number of factors, mostly linked to expanded LNG exports, including:

- Gas prices on Australia's east coast are now linked to the ups and downs of world market prices (AEMO 2016; Climate Council 2017, AiG report 2017)
- Prices are increasing due to the increased demand for gas to meet export contracts on top of domestic needs, overbuilding of LNG infrastructure and greater reliance on increasingly high cost gas fields (AEMO 2016; Forcey and McConnell 2017)
- Market power and lack of competition has enabled gas companies to drive electricity price spikes, particularly in South Australia and Queensland (Climate Council 2016).

4. **Fact**: Coal with carbon capture and storage is expensive

Building new coal plants with carbon capture and storage is the most expensive way to replace Australia's ageing, inefficient coal fleet (BNEF 2017).

There are only two operating coal power plants with carbon capture and storage in the world: Boundary Dam in Canada ($1.5 billion USD for 110MW) and Petra Nova in US ($1billion for 240MW). A further project under construction in Kemper County, US, is already billions of dollars over budget and not complete. These plants have required very large government subsidies to build.

Solar and wind projects are substantially cheaper to build. The estimated cost of building a coal plant with carbon capture and storage in Australia is upwards of $352/MWh – five times the equivalent cost of power from wind and solar. Unlike renewable energy costs, which continue to fall, the cost of carbon capture and storage is increasing substantially overtime (Rubin 2015).

EMISSIONS

5. Fact: Coal is polluting

No matter how efficient a coal-fired power station is, it is always polluting. The term "clean coal" is a misnomer.

While the coal industry claims carbon capture and storage technology reduces emissions from coal power plants, in fact the opposite is true for the few already built.

The three coal power plants with carbon capture and storage either operating or under construction will pump their emissions underground as a means to extract more oil. This is called "enhanced oil recovery" (EOR) (Rubin et al 2015). The result - coal plants with carbon capture and storage can result in more emissions than a standard coal plant once this extra extracted oil is burnt.

For example, the carbon capture and storage process for the Petra Nova power plant in the US results in 32% more carbon dioxide emissions overall due to the additional oil extracted.

- Coal burnt at Petra Nova power plant produces around 21 million tonnes of CO_2 per year.
- Carbon capture and storage only treats a 10% slipstream of this power plant, 2.1 million tonnes of CO_2 a year. Though 90% of these emissions are captured, a new 70MW gas power plant was needed to produce the energy to run the process, adding emissions. The net result 1.5 - 1.6 million tonnes of CO_2 is captured (Global CCS Institute 2017).
- The CO_2 is injected underground in EOR, producing 14,500 barrels of extra oil a day (Upstream Online 2017).
- When burnt (in cars, planes and heating) this additional oil produces 2.2 million tonnes CO_2 per year (EPA 2017).
- The net result - emissions from the coal plant, the gas plant and additional oil extracted total 2.7 million tonnes of CO_2 per year - an extra 600,000 tonnes more CO_2 per year.
- In Australia, the opportunities to use carbon capture and storage to extract more oil are limited. Unless CO_2 emissions are priced here, this expensive way of capturing CO_2 from coal is uneconomic. At the prices needed to make it economic with these very expensive plants, it would be cheaper to shut coal and build renewables and storage.
- Coal's health impacts cost Australian taxpayers an estimated $2.6 billion every year (ATSE 2009).

6. **Fact:** Gas is polluting

Gas is a significant source of greenhouse gas pollution driving climate change. Using gas for power generation releases carbon dioxide (directly from power plants and gas processing plants). In addition, gas production can release methane (a potent greenhouse gas) across a multitude of gas leaks, venting, equipment purging, incomplete combustion, potential migratory emissions and other sources associated with the gas supply chain (Climate Council 2017).

Gas is not sufficiently less polluting than coal to garner any climate benefit from switching from coal to gas, as:

- Old, inefficient gas plants in Australia, such as Torrens Island, are as polluting as coal fired power stations.
- While, new gas power plants are less polluting than coal, however, when the entire supply chain of gas production is considered, gas is not significantly less polluting than coal.
- Greenhouse gas emissions are produced both from gas power stations in the form of carbon dioxide and gas production (for instance, methane from gas leaks). Methane is 86 times more potent as a greenhouse gas than carbon dioxide over a 20-year period.
- The carbon budget, a measure of how much carbon can be burnt and stay below a 2 degrees Celsius rise in global temperature, leaves little room for new gas.

In addition to phasing out coal power, reliance on gas power in Australia must also be rapidly reduced in order to limit global temperature rise below 2°C (Climate Council 2017).

SECURITY AND RELIABILITY

7. Fact: 98.8% of power interruptions are caused by events affecting power lines

The National Electricity Market provides highly reliable electricity to consumers. The current reliability standard requires that electricity is supplied to meet consumers needs 99.998% of the time.

98.8% of all interruptions to power supply are caused by events affecting distribution or transmission lines - not due to lack of sufficient generation (AEMO 2017). Common causes of black outs include fallen tree limbs, birds, possums, vehicle impacts, bushfires, lightning strikes and storms.

8. Fact: Ageing fossil fuel plants struggle in extreme heat

Ageing coal and gas power plants suffer in the heat. On multiple occasions in February 2017 across Queensland, New South Wales and South Australia ageing coal and gas power plants operated below capacity or were withdrawn entirely due to technical faults caused by the heat (RenewEconomy 2017).

This highlights the vulnerability of Australia's fossil fuelled power plants to extreme weather. Climate change will make heatwaves longer, hotter and more frequent, increasing stresses on Australia's ageing energy infrastructure.

9. Fact: Integrating wind and solar into the grid can be "easily managed"

The International Energy Agency (2017) says integrating higher levels of wind and solar onto the grid can be managed "easily" by updating operational practices and grid flexibility, ensuring appropriate grid connection processes, planning for interconnections, and by combining wind and solar together.

Numerous countries have higher share of wind and solar generation than Australia.

Denmark (50%+) Ireland, Spain and Germany (20%+) have all increased their proportion of wind and solar generation without compromising the reliability of electricity supply (IEA 2017).

10. Fact: Renewable power and storage can provide secure electricity 24/7

To maintain electricity supply, electricity systems need to keep supply (electricity generation from power plants) closely matched to demand (electricity use by households, businesses and industry). In addition, certain types of power plants and energy storage systems provide "inertia" which helps to maintain power when supply and demand become unbalanced, or unequal over short time periods.

Renewable energy such as biomass, hydro, solar thermal with storage and solar PV and wind with storage can provide secure, reliable power round-the-clock.

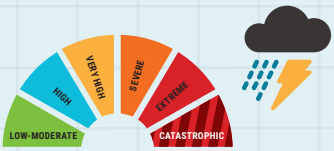
It is a myth that integrating higher levels of wind and solar must be matched by storage. Integrating higher levels of wind and solar requires greater flexibility in the operation of the grid. In addition to energy storage, this flexibility can be provided by "dispatchable" generators (hydro, biomass, solar thermal), which are able to deliver electricity on demand, interconnections between states, and demand management (IEA 2017).

HOW DOES RENEWABLE ENERGY PROVIDE A SECURE ENERGY SUPPLY?

CRITERIA

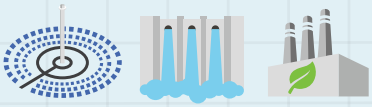
MEET GRID STABILITY REQUIREMENTS

BALANCE ELECTRICITY DEMAND AND SUPPLY



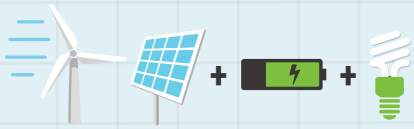
RESILIENCE TO EXTREME WEATHER

SOLUTIONS



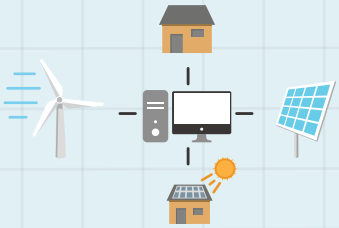
GRID STABILITY SOLUTIONS

- Solar thermal, hydropower and sustainable biomass power plants
- Wind turbines with grid stabilisation technology
- Battery storage



RENEWABLE ENERGY AND STORAGE

- Renewable power plants (solar, wind, hydro, biomass)
- Energy storage (batteries, pumped hydro)
- Energy efficiency and demand management



A MODERN POWER GRID

- More distributed and diverse power generation
- Interconnection (transmission lines)
- Smart grid

Renewable electricity and storage can provide secure power 24/7.

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IMAGE CREDITS

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