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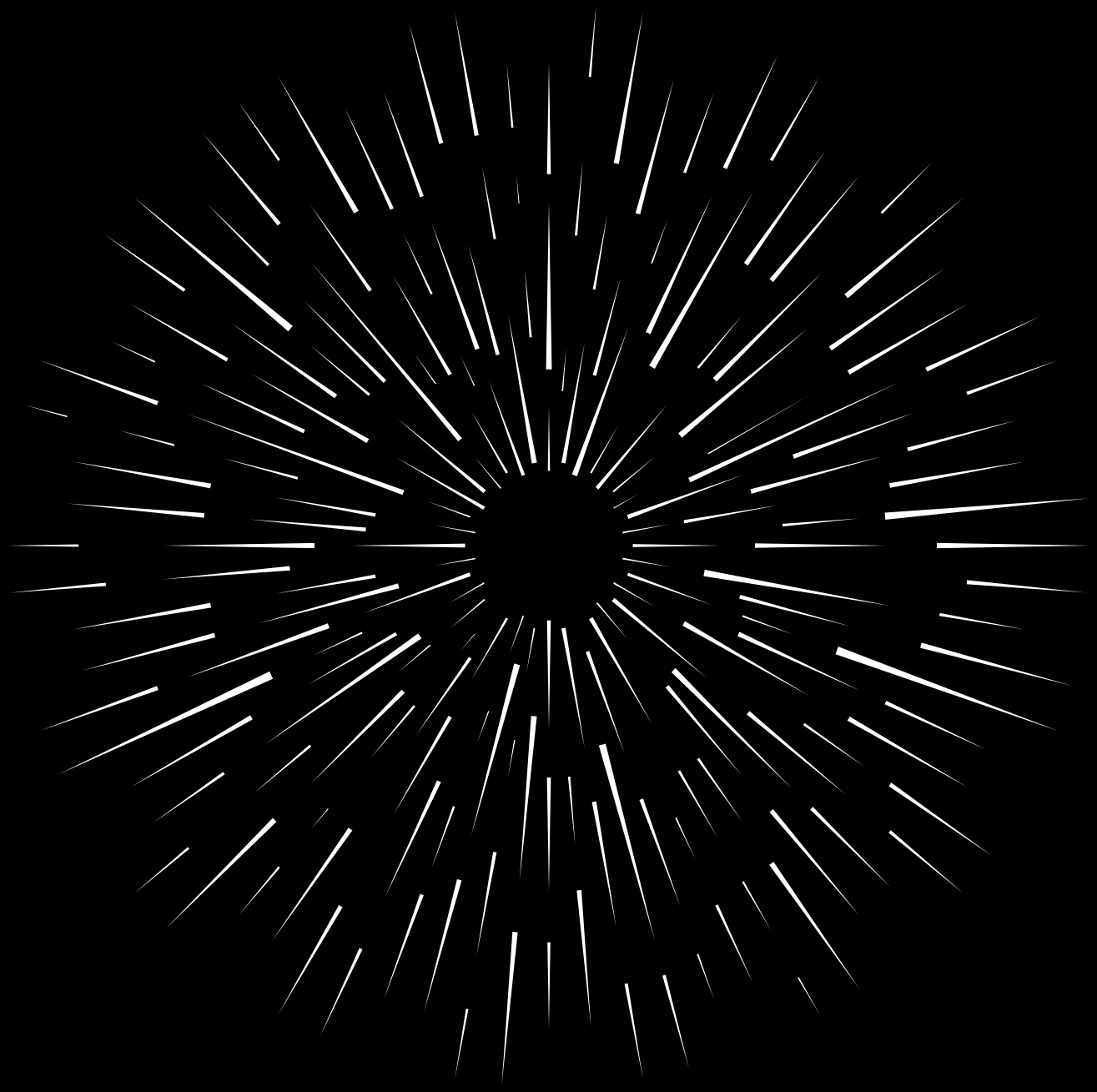


# Energy accelerated

A future focused Australia

What will you do today to embrace the energy transition and shape the future of energy?

# Contents

# Insights

# Preparing for tomorrow, *today*

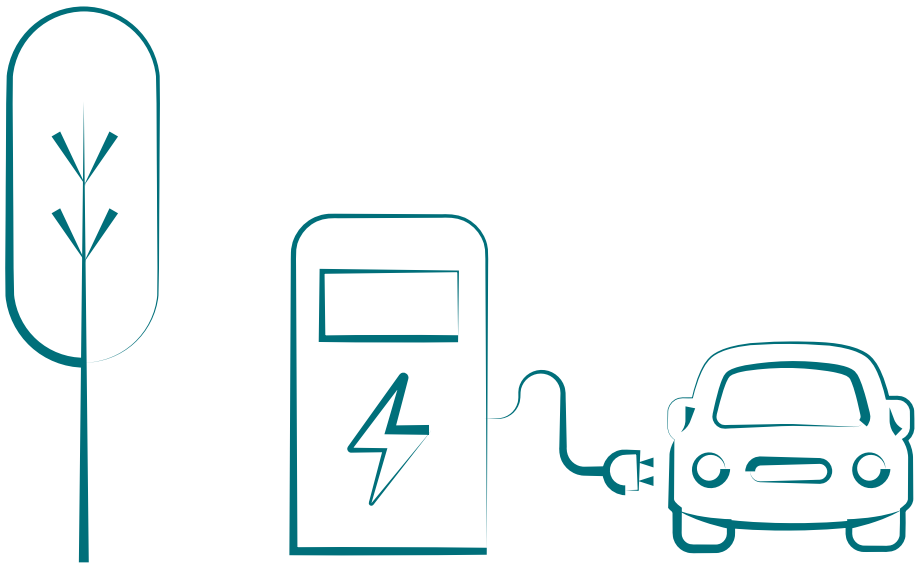
We are in the middle of an energy transition.

The traditional energy supply chain, which has delivered reliable electricity to consumers for decades, is increasingly being disrupted by innovative ways to produce, supply, store, share and consume energy. New technologies, ideas and business models coupled with consumer empowerment and environmental objectives are driving a new wave of energy services that focus on how things could be done.

Amid all this disruption, there is significant uncertainty facing the industry, business and government. The pace of change is so fast that being able to invest with confidence in future investment returns is increasingly difficult. Governments are grappling with policy and regulation design to enable rather than inhibit new services that provide long-term consumer benefits. At the same time, consumers, from households to industrials, are becoming increasingly frustrated as they seek affordable, reliable and environmentally responsible energy services.

In this state of flux, we all need to reimagine what tomorrow looks like, today. It is critical to understand a range of possible futures to make decisions today that provide the best possible outcome regardless of which future eventuates. This holds true for energy sector incumbents, new entrants, consumers, investors and regulators.

Change is the only constant and the faster we mobilise and collaborate, the better the outcome will be.



# The key energy question

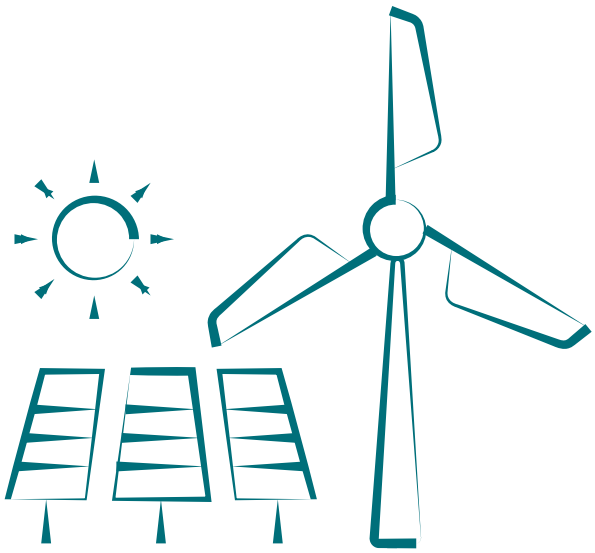
Disruption is a daily news headline. Consumers are seeking alternatives to what they see as an industry determined to charge them more for unchanged service levels. This leaves them open to new business models seeking to capitalise on this consumer discontent.

The nature and pace of new products entering the market is in direct response to consumers seeking practical alternatives. Consumers are the market. Trends in their preferences are a key indicator that the market has moved on and is embracing a new and dynamic energy world. There will still be a role for many within the traditional supply chain, but extracting maximum value from investments will depend on the industry providing services consistent with market demands.

To drive action, at the heart of this report is the key question:

*What will you do today to embrace the energy transition and shape the future of energy?*

With the energy sector going through a period of transition and uncertainty not experienced since the industrial revolution, it is naïve to view the world through a single lens. Our report provides multiple lenses that offer insights into possible future worlds.



# The current state of play

Across the current Australian energy landscape, governments, businesses and the media are focusing more squarely on the risks associated with change rather than activating the opportunities. For businesses that proactively consider what consumers want and how to deliver it, the future state of the market could be rosy.

## What should the market be delivering?

The original objectives of establishing a competitive market for electricity provides some context. The National Electricity Law, which establishes the competitive market for electricity, outlines that the National Electricity Objective is:

> *"...to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to—*
>
> *(a) Price, quality, safety, reliability and security of supply of electricity; and*
>
> *(b) The reliability, safety and security of the national electricity system."* [1]

While the objective acknowledges two of the critical limbs of the 'energy trilemma' – affordability and reliability – it is notably silent on any environmental objective for the energy market. There has been some discussion on whether the National Electricity Objective should include an environmental objective. Such an objective would require investment decisions that balance the affordable, secure, safe, reliable and environmentally responsible delivery of electricity.

To date, policy makers have declined to adjust the National Electricity Objective, arguing that environmental objectives are best pursued outside the market framework.

## Consumers expect more value

While electricity remains a relatively small proportion of household expenditure, its cost has risen quickly relative to the cost of other household services. However, despite paying more for energy the lights do not shine brighter. This undermines trust in the market to deliver a high-value product, encouraging more consumers to seek alternative solutions.

Consumers have proven that they do care about the affordability and environmental impacts of their energy use. Investment in energy efficiency and behind the meter technologies, including rooftop solar, has meant that consumption of grid-supplied electricity has steadily declined on a per capita basis over recent years. This points to consumers choosing to make investments in technologies that reduce their use of grid-supplied electricity.

This is not just limited to households – businesses too are choosing to invest in technologies that reduce the energy intensity of their business processes. With energy a major cost input to production, more businesses are actively considering alternative sources of energy, such as solar, to manage their exposure to rising energy costs. Increased investment in solar is particularly notable in heavy industry located in remote locations.

While managing increasing energy costs is generally the primary driver of business-led investment in new technologies, a social licence to operate for Australian businesses and industries is increasingly becoming important. Rising interest in demand response, distributed energy resources and corporate power purchase agreements (PPA) in the business community is evidence that businesses are starting to proactively consider sustainable business practices as a way to enhance their legitimacy. Two-thirds of Fortune 100 companies have now set renewable energy targets and are leading global corporate procurement through PPAs. Many of them have joined RE100, a group of 140 companies (as of September 2018) that have committed to sourcing 100 per cent of their electricity from renewables.[2]

## Reliability and security under the spotlight

Commencing with the South Australian blackout in 2016, the spotlight has well and truly been on the ability of the energy system to consistently deliver reliable and secure services.

As outlined in Alan Finkel's review into the Future Security of the National Electricity Market:

- **Security** is a measure of the ability of the power system to tolerate disturbances and maintain electricity supply to consumers.
- **Reliability** is a measure of the ability of generation and transmission capacity to meet consumer demand.

The reliability and security performance of the National Electricity Market (NEM) is reviewed annually. In the most recent review, security performance had deteriorated with 11 security incidents in 2016—2017 up from seven incidents in 2015—2016. However, the review found the market had performed well with respect to reliability, finding only one reliability incident in South Australia over the time period.[3]

While much policy debate and media attention has centred on the ability of the market to provide reliable services, the findings of the 2016—2017 review of the market's performance indicate there is no reliability issue in the market at this time. In contrast, the market is facing security issues associated with the ability of the market to ride through disruption.

## Global warming, technology changes, emissions and policy uncertainty

The 21st Conference of Parties in Paris 2015 (the Paris Agreement) established a global agreement and commitment to address climate change. Embedded in the Paris Agreement is an aim to hold global average temperature increases to 'well below' two degrees above pre-industrial levels, and to pursue efforts to limit the average temperature increase to one and a half degrees above pre-industrial levels.

Australia announced its ratification of the Paris Agreement in November 2016. In signing up to the Paris Agreement, Australia committed to a reduction in economy wide greenhouse gas emissions of 26 to 28 per cent on 2005 levels by 2030. The electricity sector contributes 35 per cent of Australia's total emission and so will need to play a key role in order for the Australian economy to meet this commitment.

Australia has one of the lowest costs globally for new wind and the lowest costs for solar photovoltaic (PV). What this means is that increasingly investment in new wind and solar is not just about environmental responsibility but also a solution to affordability.

However, despite Australia's commitment to reduce greenhouse gas emissions, a consistent policy mechanism to encourage a reduction in emissions from the energy sector has not been established. There is nothing stopping the industry from pursuing investments in line with the expectation that there will be a policy that encourages a reduction in emissions in the future. However, without some certainty about the mechanism through which reductions will be pursued, investors are understandably nervous that future revenue avenues could be forfeited by investing early.

## A focus on four

The scenarios set out in this report build on the current state of play to consider how different futures for the energy market may evolve, highlighting what is possible rather than what is likely.

These scenarios provide a framework to consider what you can do today to embrace the energy transition, build resilience into your business and shape the future of energy.

# Scenarios

"You cannot change your destination overnight, but you can change your direction overnight"

**Jim Rohn**
*American entrepreneur*

# What will drive the energy future?

The energy sector is changing rapidly – locally and globally. As the energy sector transitions, challenges will continue to arise around how best to ensure the market delivers affordable, environmentally responsible, reliable and secure services consistent with consumer preferences.

The speed and scale of transformation creates significant uncertainty, which can be difficult to navigate effectively. Scenario analysis provides a tool to look towards the unknown future, and to understand the risks and opportunities in the energy transition. It provides a pathway to tackle uncertainty with information, and apply it back to effective decision-making today.

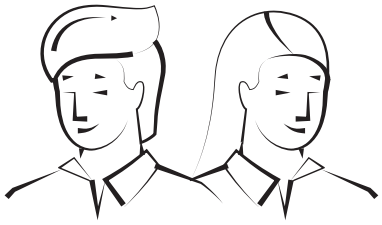
The time is now – to shape and cultivate the future of energy. We have developed a series of four powerful scenarios to depict a diversity of challenges and opportunities.

The idea underlying our scenarios is a quote from Al Gore's Nobel Peace Price acceptance speech:

> "There's an old African proverb that says 'If you want to go quickly, go alone. If you want to go far, go together.' We have to go far — quickly. And that means we have to quickly find a way to change the world's consciousness about exactly what we're facing, and why we have to work to solve it."
>
> **Al Gore**
> *45th Vice President of the United States*

The scenarios developed test how far and how fast we can go to transition the energy industry by 2050 by both going together and going alone. All scenarios deliver reliable electricity services.

When designing scenarios, our approach is to start with drivers that will likely affect outcomes in a specific market. There are many key drivers, both at a macro and micro level, that will affect Australia's electricity market transformation. However, for this analysis we consider that the most critical drivers that will determine the future state of the market are consumer choice, the global rate of change and Australian policy.



## Consumer choice

It can be seen that "where national leadership is retreating on decarbonisation efforts, cities, communities and corporations have become the most relevant actors. They have stepped up to fill the vacuum and demand has continued to grow."[4] How consumers choose to fill the vacuum and the types of services they demand as a result will have a significant impact across the market, including for elements of the supply chain that do not generally have direct contact with end use consumers.

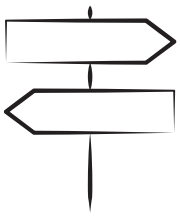
Our scenarios explore the implications for the energy market of different consumer choices and motivations, specifically whether consumers make choices motivated by price or by environmental concerns. All our scenarios deliver reliable energy services.

The extent to which consumers are motivated by price or by environmental concerns will affect the uptake of both new business models and emerging technologies, such as electric vehicles, solar, energy storage and smart meters. It will also influence consumer choice about to how, when and where they consume electricity from the grid.

## Global rate of change

While the rate of investment in new technology in Australia will impact on the costs of developing new projects, the scale at which these projects are commissioned in Australia will do little to affect the cost of the technology itself. In contrast, large-scale investment in different technologies globally can significantly influence the cost curve of these technologies.

Consequently, the global rate of transition is an important driver of change in the Australian electricity market. It will influence the types of technologies that are deployed in the local market, and also when and where these investments occur. Further, the rate of global change will impact on the cost of transition with fast global change resulting in lower costs than a slower rate of global change. This is not to say that if global transition is slow, the cost of transition would be higher than not transitioning but that the cost would be higher than under a fast global transition.



## Australian policy

Despite the Australian Government stating its commitment to reduce emissions nearly three years ago, it is no closer to an agreed and proactive policy mechanism to achieve this level of reduction across the economy. The electricity industry is expected to at least play its part to contribute to lower emissions future.

The extent to which government policy supports a clear pathway to a lower emissions future will influence the future state of the Australian electricity industry. In our scenarios, we have considered two roles for government policy: one in which it supports an energy market transition and one in which it does not. Our scenarios do not rely on policy certainty.

# Future energy scenarios

Using consumer choice, global rate of change,Australian policy, we designed and modelled four future energy scenarios:

### Fast & Together

Proactive consumer
Fast global transition
Supportive policy

### Laggard

Passive consumer
Fast global transition
Ambivalent policy

### Leader

Proactive consumer
Slow global transition
Supportive policy

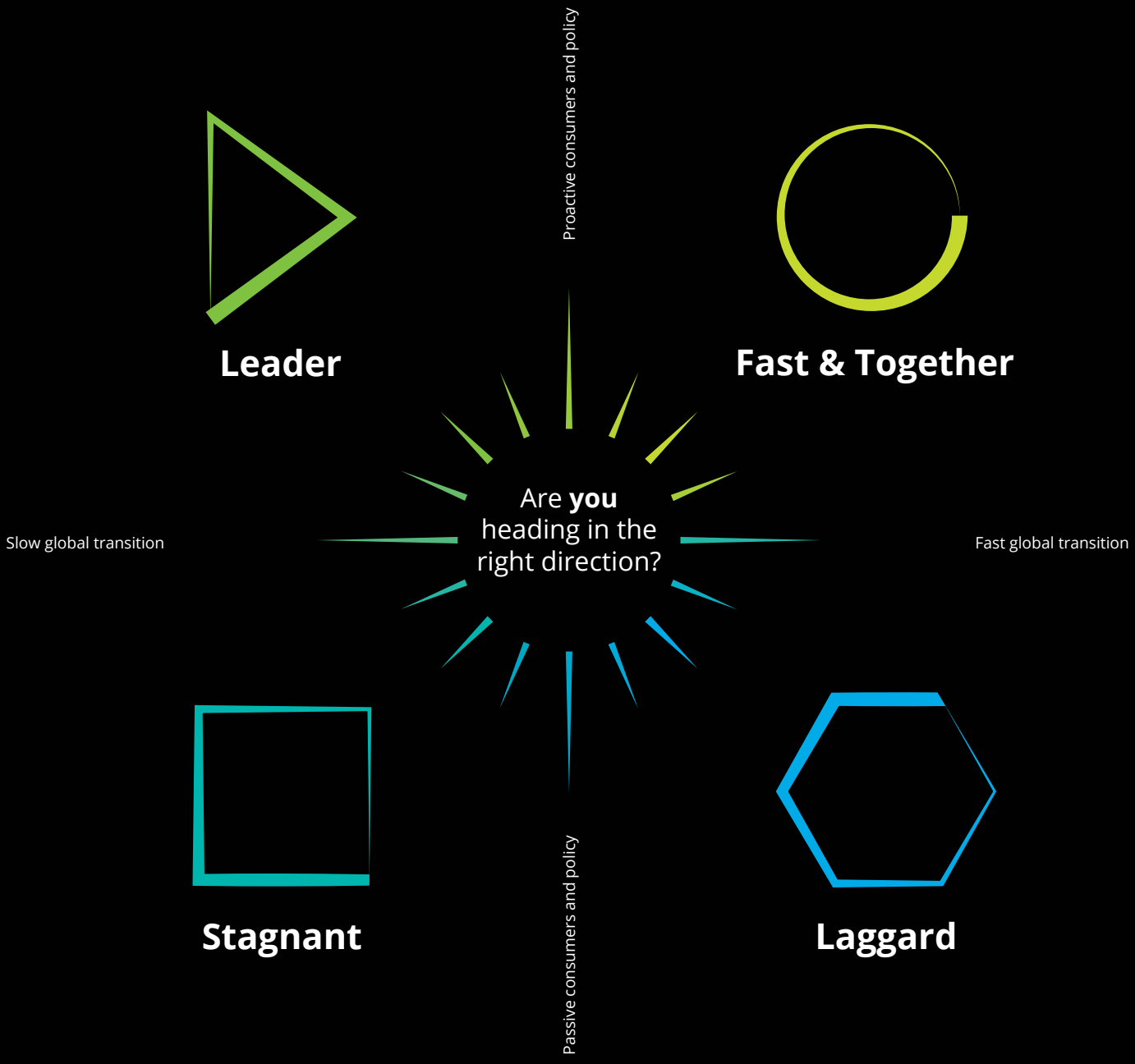
### Stagnation

Passive consumer
Slow global transition
Ambivalent policy

The outputs of the scenarios illustrate that there are significant new opportunities for businesses in the energy market transition. However, opportunities are greater and the transition is smoother where there is coordination and collaboration between different parties. If everyone goes alone, we will not achieve optimum outcomes for consumers nor businesses.

Figure one is a graphical representation of the four scenarios. The drivers of consumer choice and Australian policy certainty have been combined into a single driver, reflecting the degree of Australian proactivity in undertaking the energy transition.

**Figure 1:** The four scenarios




The race is on to find new solutions to drive a prosperous, sustainable and efficient future. Businesses can choose how they want to play in this world.

**Scenario one**

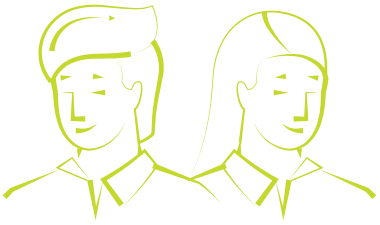
# Fast & Together

## What do we see?

Strong global leadership accelerates the energy market transition. Coordinated action across governments, businesses and consumers creates momentum, facilitating a fast transformation of energy markets. Consumers lead the charge – demanding services that are affordable and environmentally responsible. Active and engaged consumers, coordinated global action to limit global warming, and Australian commitment to work with other countries sees new opportunities emerge for the Australian electricity industry.

"My mother always told me that inaction is not an option. And neither is going it alone."

**Phumzile mlambo-ngcuka**
*South African politician and United Nations official*



## Proactive consumer

**Consumers are highly engaged, proactive and informed**

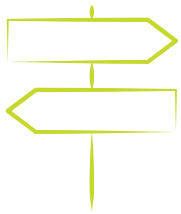
Large and small energy consumers are environmentally conscious and are prepared to put their money where their mouth is to address climate change resulting in significant investment in distributed energy resources. This is complemented by demand response, which reduces grid dependency for many consumers. With the possibility of being grid independent not just feasible but viable, consumers actively seek out better and more innovative electricity products, no longer prepared to just accept the service they are given. The exercise of choice increases the affordability of energy services.

Inexpensive electric vehicles (EV) will be widely available for ride sharing and in home garages, increasing residential electricity demand and allowing new business models in EV charging, fleet management and automation.

## Fast global rate of change

**Global energy transition is swift**

Global agreement and commitment to transition energy markets to a lower carbon future is steadfast and unwavering. This creates an environment that is conducive to investment in the transition globally. The scale and pace of investment reduces the costs of new technologies, including large-scale renewables, electric vehicles, energy storage and behind the meter products.



## Supportive policy

**Australian policy is supportive of the transition**

Australia is an active member of the global movement to transition energy markets, supporting efforts to limit global warming related effects, including drought, flooding, catastrophic storms and rising sea levels. Australian governments enact policies that are supportive of the energy market transition, placing a limit on the allowable emissions from the industry to transition to zero emissions by 2050.

The Australian energy industry is a central player in the drive to transition the energy market, actively investing in renewable energy technology solutions in response to the demands of the market. Cheap renewables will fill the void left by the exit from fossil fuel generation, with the diversity and spread of variable renewable resources and increased energy storage capacity ensuring that the market continues to deliver reliable services. Network investment will facilitate optimal investment in new capacity to meet demand, ensuring a diversity of resources spread across the market firming up the availability of large-scale generation. Increased investment in demand response and smart grid technologies help to balance short-term issues associated with peaking load.

| Fast & Together | | 2017 | 2035 | 2050 |
|---|---|---|---|---|
| **Large-scale electricity generation mix** | GWh – Coal | 156,272 | 76,171 | 0 |
| | GWh – Gas | 29,444 | 335 | 0 |
| | GWh – Hydro | 12,912 | 13,339 | 14,902 |
| | GWh – Wind | 12,833 | 72,955 | 84,868 |
| | GWh – Solar PV | 655 | 45,071 | 122,288 |
| | GWh – Concentrated solar thermal | 0 | 5 | 51,429 |
| | GWh – Other | 575 | 804 | 787 |
| **Electricity greenhouse gas emissions** | Mt, annual | 185 | 74 | 0 |
| | Mt, cumulative from 2019 onwards | | 1,869 | 2,390 |
| **New rooftop PV installations** | GW, cumulative from 2019 onwards | | 26 | 41 |
| **Investment in generation capacity** | $b, cumulative from 2019 onwards | | 51 | 156 |
| **Transport** | *Penetration of EVs* % of fleet | <1% | 47% | 97% |
| | *Estimated avoided emissions from electrification of transport* Mt CO2 e – cumulative from 2019 onwards | | 150 | 825 |
| **Industrial gas** | *Electrification of industrial gas* GWh | | 13,077 | 18,190 |
| | *Estimated avoided emissions from electrification of gas usage* Mt CO2 e – cumulative from 2019 onwards | | 34 | 107 |

Source: *Deloitte analysis. Data sources include AEMO, National Greenhouse Account Factors, National Transport Commission, ABS Survey of Motor Vehicle Use*

## In focus

# Electric vehicles

The Australian transport sector was the second largest contributor to greenhouse gas emissions in 2017, behind electricity generation. Decarbonisation of transport is an important part of meeting Australia's long-term emissions reduction obligations.

Electric vehicles present a potential pathway to decarbonisation of the transport sector. However, effective decarbonisation through electric vehicles depends on the emissions profile of the electricity used to power the vehicles. The other main avenue for decarbonising transport currently being explored is adoption of hydrogen vehicles. However, this in turn requires decarbonised electricity to generate hydrogen through electrolysis.

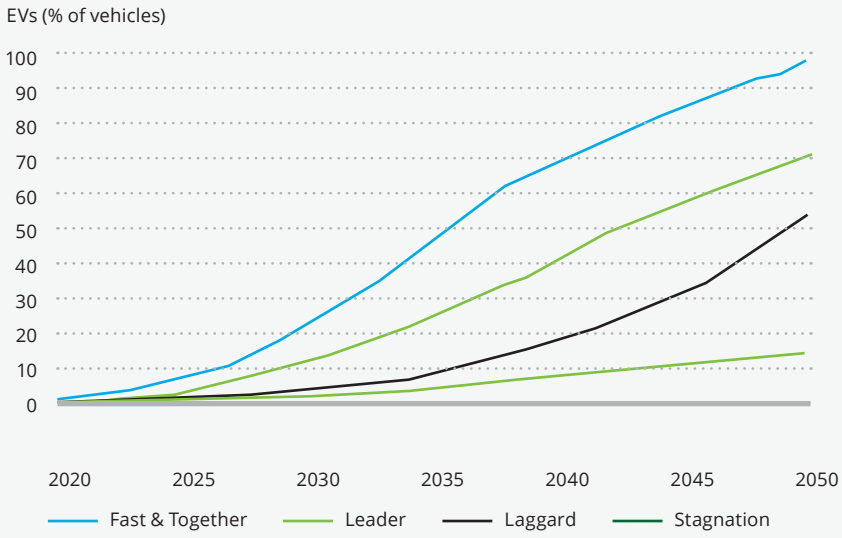
A Deloitte Access Economics report for Infrastructure Australia due to be released later in 2018, explores the impact of electric vehicles on the operation of the electricity system. This report finds that electric vehicle charging from a large fleet may contribute significantly to electricity demand.

Charging patterns and consumer behaviour may also influence the daily load, including the timing and sharpness of peak demands. 'Smart' charging of electric vehicles can help to shape electricity load around solar and wind generation, supporting the efficient use of renewable energy. By contrast, if business models, market design and technology do not align consumer incentives with efficient behaviour, even a modest increase in electric vehicles could strain our generation and network infrastructure.

Figure two presents our projected take up of electric vehicles in Australia in each of the scenarios.

In the 'Fast and Together' scenario, we project electric vehicles to make up over 90 per cent of the small vehicle fleet by 2050. This would require a combination of strong government leadership, consumer uptake, and rapid cost improvement. By contrast, in the 'Stagnation' scenario, we project uptake of less than 20 per cent by that time. It is important to view these two sectors in tandem, both in terms of contribution to decarbonisation, and impact on the other sector operationally.

**Figure 2:** Electric vehicles as proportion of small vehicles (NEM average)




Source: *Deloitte analysis*

**Scenario two**

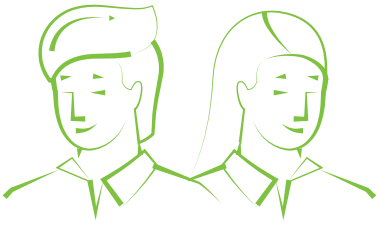
# Leader

## What do we see?

There is a global retreat from the Paris Agreement. Australian consumers, concerned about the impacts of global warming on their livelihood, demand continued action to transition the electricity industry. The electricity industry responds to these demands, despite technology costs falling at less aggressive rate. Australia's early move to transition the energy market creates opportunities to lead global markets in the development of goods and services with a green supply chain, with vast room for local innovation.

"Example is not the main thing in influencing others. It is the only thing."

**Albert Schweitzer**
*Theologian*



## Proactive consumers

**Consumers are highly motivated to limit the impacts of global warming**

Large and small energy consumers demand action to limit the impacts of global warming on the Australian economy. The energy industry, with its significant contribution to Australian emissions, becomes one of the primary targets of consumer dissatisfaction. Small consumers, fearing the effects of extreme weather events on their property and their livelihoods, invest in small-scale renewable energy technologies that reduce their reliance on the relatively emissions intensive grid. Other consumers seek to reward service providers that share their values with their loyalty.

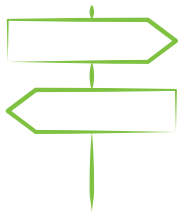
Medium and large energy consumers, who share the concerns of small consumers about the effects of global warming, see further advantages in investing early in the development of green supply chains. These consumers invest heavily in their green credentials foreseeing an opportunity to exploit this investment when the global environment turns.

## Slow global rate of change

**Global energy transition slows**

The global retreat on the Paris Agreement results in a shift away from embracing and encouraging change and innovation. Instead, globally, the comfort of some undefined golden age is sort, where local industry boomed and energy was produced and consumed without guilt.

Turning their back on energy transformation, there is less investment in innovation and new technologies. Consequently, the costs of these technologies fall less rapidly than otherwise anticipated. However, this short to medium term trend reverses in the longer term as extreme weather events affect the global population, causing a mass civil society movement that places pressure on governments to act.



## Supportive policy

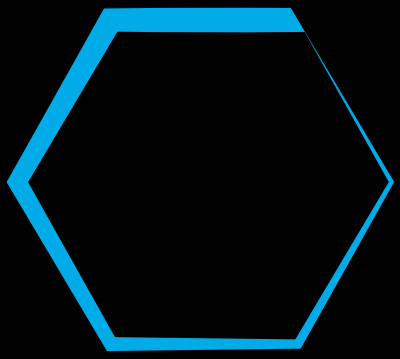
**Australian policy is supportive of the transition**

With consumers highly engaged and environmentally motivated, policy settings are introduced that complement consumer preferences for low emission technology, including a constraint on the level of allowed emissions from the electricity industry.

The Australian energy industry, having embraced the transition, will actively invest in low emissions generation technology. Initial global apathy towards the transition means that the costs of new technologies do not fall as rapidly as expected. However, energy businesses responding to the demands of their consumers, invest anyway. This helps the energy industry's credibility with consumers, who see the energy industry actively pursuing solutions consistent with their preferences. Businesses that moved early have an advantage and are able to capitalise on their history of sustainability, but newcomers that provide innovative products also benefit from a consumer base that is active, informed and interested in how things could be done better.

| Leader | | 2017 | 2035 | 2050 |
|---|---|---|---|---|
| **Large-scale electricity generation mix** | GWh – Coal | 156,272 | 59,738 | 0 |
| | GWh – Gas | 29,444 | 423 | 0 |
| | GWh – Hydro | 12,912 | 13,349 | 13,735 |
| | GWh – Wind | 12,833 | 91,880 | 83,689 |
| | GWh – Solar PV | 655 | 41,153 | 127,602 |
| | GWh – Concentrated solar thermal | 0 | 73 | 63,073 |
| | GWh – Other | 575 | 804 | 813 |
| **Electricity greenhouse gas emissions** | Mt, annual | 185 | 58 | 0 |
| | Mt, cumulative from 2019 onwards | | 1,699 | 1,960 |
| **New rooftop PV installations** | GW, cumulative from 2019 onwards | | 26 | 41 |
| **Investment in generation capacity** | $b, cumulative from 2019 onwards | | 80 | 192 |
| **Transport** | *Penetration of EVs* % of fleet | <1% | 24% | 70% |
| | *Estimated avoided emissions from electrification of transport* Mt CO2 e – cumulative from 2019 onwards | | 79 | 519 |
| **Industrial gas** | *Electrification of industrial gas* GWh | | 16,461 | 28,021 |
| | *Estimated avoided emissions from electrification of gas usage* Mt CO2 e – cumulative from 2019 onwards | | 47 | 151 |

Source: *Deloitte analysis. Data sources include AEMO, National Greenhouse Account Factors, National Transport Commission, ABS Survey of Motor Vehicle Use*



Scenario three

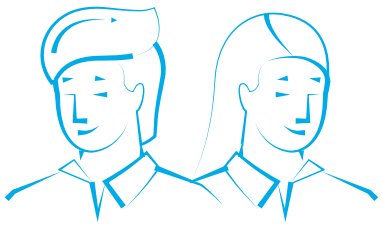
# Laggard

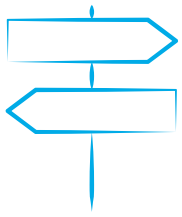
## What do we see?

Rising electricity costs and ongoing debate about the ability of the renewable energy sector to deliver reliable energy services triggers a backlash against energy market transformation, while global energy markets continue marching forward. Australian consumers are price motivated, seeking solutions that provide them better value for money, with policy continuing to focus on short-term gains over long-term transformation. Failure to act in an environment of strong global movement sees the Australian economy penalised with trade tariffs, reducing economic activity with corresponding impacts on employment and standards of living.

"To sit back hoping that someday, some way, someone will make things right is to go on feeding the crocodile, hoping he will eat you last – but eat you he will."

**Ronald Reagan**
*40th President of the United States*





## Passive consumers

### Consumers seek better value for money

Large and small energy consumers are driven by price, with a preference for affordable energy services over environmental responsibility. This sensitivity to price leads consumers to actively explore alternative options for the supply of energy. Cheap technology from overseas is attractive to consumers, resulting in large investment in behind the meter technologies for both large and small consumers. However, this longer term trend is tempered in the short term as lower levels of investment in the energy market transformation reduces grid-supplied electricity prices. Large consumers, in particular, benefit from these short-term lower prices and increase output to take advantage of global competitiveness in the short term.

Uptake of electric vehicles is strong in the medium-term outlook, driven by the cost competitiveness of the technologies. Consumers seek to charge their electric vehicles via the cheapest means possible, which limits the extent to which they are grid-independent.

## Fast global rate of change

### Global energy transition surges

Global agreement and commitment to transition energy markets to a lower carbon future to limit the effects of global warming is steadfast and unwavering. Consequently, there is a significant flow of finance into energy markets, new technology and innovation. This causes prices for new technology to fall rapidly.

The strong level of global buy-in to energy market transition results in a backlash on countries that do not share the global level of commitment. Tariffs and sanctions are imposed on countries that do not move to transition their energy markets, with these actions intended to put pressure on governments to act.

## Ambivalent policy

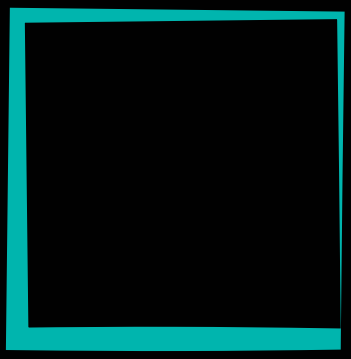
### Australian policy focuses on short-term advantages

Australian policy focuses on measures designed to increase the short-term affordability of energy services, which does not include a mechanism to reduce the emissions intensity of the energy industry. This benefits the Australian economy in the short term. However, in the medium to long term as global tariffs and sanctions take effect, Australian governments scramble to put in place policy measures to reduce the emissions intensity of the economy to limit exposure to the harmful effects of these tariffs and sanctions on sectors that are trade exposed. This results in a hasty transition as Australia tries to catch up.

The energy industry continues to invest in renewables under this scenario. This is because the cost of large-scale renewables falls in Australia as a result of global rates of investment, albeit at a slower rate than would have been expected with Australian buy in to the energy market transformation. However, the cost of extending the lifespans of coal-fired plants remains competitive with new renewables. As a result, coal-fired power stations remain open for longer, keeping the emissions intensity of the energy industry high. Incentives to innovate will be low, leaving Australia ill-equipped to quickly transition the energy industry in response to global pressure.

| Laggard | | 2017 | 2035 | 2050 |
|---|---|---|---|---|
| **Large-scale electricity generation mix** | GWh – Coal | 156,272 | 98,170 | 29,070 |
| | GWh – Gas | 29,444 | 16,134 | 16,384 |
| | GWh – Hydro | 12,912 | 13,338 | 14,306 |
| | GWh – Wind | 12,833 | 42,811 | 75,684 |
| | GWh – Solar PV | 655 | 21,311 | 113,214 |
| | GWh – Concentrated solar thermal | 0 | 0 | 6,960 |
| | GWh – Other | 575 | 804 | 800 |
| **Electricity greenhouse gas emissions** | Mt, annual | 185 | 102 | 36 |
| | Mt, cumulative from 2019 onwards | | 2,154 | 3,152 |
| **New rooftop PV installations** | GW, cumulative from 2019 onwards | | 14 | 20 |
| **Investment in generation capacity** | $b, cumulative from 2019 onwards | | 19 | 79 |
| **Transport** | *Penetration of EVs* % of fleet | <1% | 9% | 54% |
| | *Estimated avoided emissions from electrification of transport* Mt CO2 e – cumulative from 2019 onwards | | 26 | 275 |
| **Industrial gas** | *Electrification of industrial gas* GWh | | 6,146 | 10,041 |
| | *Estimated avoided emissions from electrification of gas usage* Mt CO2 e – cumulative from 2019 onwards | | 20 | 58 |

Source: *Deloitte analysis. Data sources include AEMO, National Greenhouse Account Factors, National Transport Commission, ABS Survey of Motor Vehicle Use*



Scenario four

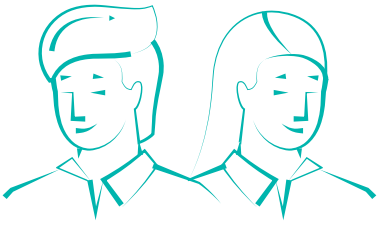
# Stagnant

## What do we see?

The global retreat from the Paris Agreement extends to Australia, and global and local focus turns to how to return to the good old days in which energy was cheap, freely available, and produced and consumed without guilt. Deliberately choosing not to engage with an energy market transition stalls innovation and progress. Lack of change and progress frustrates consumers, who see no improvement or innovation in energy products leading to increased levels of disengagement with the market. With no change in service, the energy industry struggles to maintain the trust of consumers.

"The most ominous of fallacies – the belief that things can be kept static by inaction."

**Freya Stark**
*Anglo-Italian explorer and extensively published travel writer*



## Passive consumers

**Consumers become disenfranchised**

Large and small energy consumers are motivated by affordability, but with no change in their energy service and stable electricity prices, they become increasingly disenfranchised with their energy providers. With behind the meter generation and storage too expensive to pursue, consumers remain entirely dependent on the grid. This lack of alternatives frustrates consumers, who put pressure on governments to regulate. Some smaller energy service providers develop solutions for residential consumers, but without scale and cheap technology, these solutions remain on the fringes.

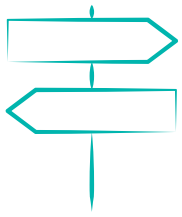
Once technology does become cost competitive, consumers invest heavily in behind the meter assets. However, due to their distrust of the energy industry they seek alternative providers for these services. Fossil fuels will remain the fuel of choice for vehicles for several decades as the price of electric vehicles remains high.

## Slow global rate of change

**Global energy transition disintegrates**

Global agreement and commitment to transition energy markets to a lower carbon future falls apart, with governments turning away from action. This correlates with a collapse in investment in the energy market transition, limiting future innovation and resulting in higher new technology costs.

In the longer term, the global environment shifts as increased extreme weather events put pressure on governments to act. Essentially, this means that the energy market transition starts with a significant time delay.



## Ambivalent policy

**Australian policy shifts towards heavy regulation**

Australian policy shifts towards heavy regulation, with governments seeking to establish tighter control over the energy industry. Regulation of the industry does not encourage the energy industry to embrace transition to provide better outcomes for consumers. Rather than empowering the industry to innovate and create new products, services and ways of doing business, the regulatory framework puts a tight constraint around what the industry can do.

While this environment dominates for the short to medium term, consistent with global trends, an increase in the number and severity of extreme weather events puts pressure on Australian governments to encourage the transformation of the energy sector.

The cost of renewables declines slowly in this scenario due to a lack of investment at home and overseas. This lack of global investment also prevents many new breakthroughs in the field. Extending the life of coal-fired generation will be a financially viable option, so plant lifespans will be extended for as long as upkeep costs allow. Energy costs will remain high without new technologies to reduce wholesale and network costs.

| Stagnant | | 2017 | 2035 | 2050 |
|---|---|---|---|---|
| **Large-scale electricity generation mix** | GWh – Coal | 156,272 | 113,345 | 55,602 |
| | GWh – Gas | 29,444 | 12,737 | 22,037 |
| | GWh – Hydro | 12,912 | 13,338 | 14,499 |
| | GWh – Wind | 12,833 | 42,308 | 45,833 |
| | GWh – Solar PV | 655 | 15,031 | 83,599 |
| | GWh – Concentrated solar thermal | 0 | 0 | 6,917 |
| | GWh – Other | 575 | 804 | 974 |
| **Electricity greenhouse gas emissions** | Mt, annual | 185 | 118 | 66 |
| | Mt, cumulative from 2019 onwards | | 2,206 | 3,520 |
| **New rooftop PV installations** | GW, cumulative from 2019 onwards | | 9 | 14 |
| **Investment in generation capacity** | $b, cumulative from 2019 onwards | | 20 | 65 |
| **Transport** | *Penetration of EVs* % of fleet | <1% | 5% | 14% |
| | *Estimated avoided emissions from electrification of transport* Mt CO2 e – cumulative from 2019 onwards | | 16 | 103 |
| **Industrial gas** | *Electrification of industrial gas* GWh | | 4,882 | 7,748 |
| | *Estimated avoided emissions from electrification of gas usage* Mt CO2 e – cumulative from 2019 onwards | | 17 | 47 |

Source: *Deloitte analysis. Data sources include AEMO, National Greenhouse Account Factors, National Transport Commission, ABS Survey of Motor Vehicle Use*

## In focus

# The hydrogen economy

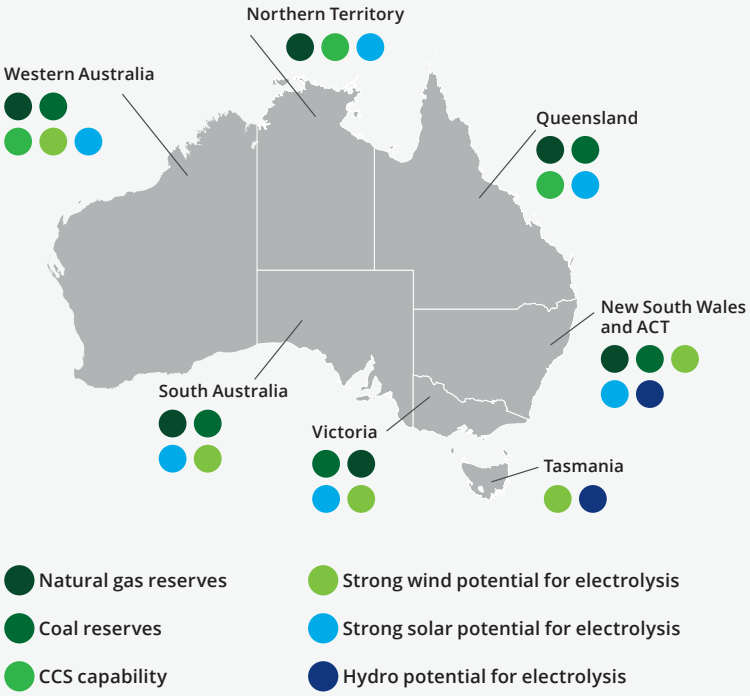
Decarbonising the Australian energy sector provides an opportunity to take advantage of technologies that highlight our comparative strengths in the energy sector and the broader economy. Producing a market for low or zero emissions hydrogen is one of these opportunities. Hydrogen has the potential to meet some of Australia's domestic energy requirements, as well as an export opportunity as countries across Asia and the world transition from fossil fuels.

In August 2018, the Hydrogen Strategy Group, led by Alan Finkel, presented its paper 'Hydrogen for Australia's future' to the Council of Australian Governments (COAG) Energy Council, drawing on the 'National Hydrogen Roadmap' produced by the Commonwealth Scientific and Industrial Research Organisation (CSIRO). It found hydrogen presented three broad opportunities: exporting to other countries, domestic use (for heating, transport, and industrial processes), and to provide energy system resilience. It argued Australia had a competitive advantage, due to its abundance of renewable energy sources, existing infrastructure, and close trading relationship with Asian economies. This followed a report by Deloitte Access Economics for Energy Networks Australia, which found that decarbonising domestic gas consumption presented opportunities to reduce the cost of decarbonising the economy, with hydrogen playing a significant role in this process.

Hydrogen is an energy carrier with a wide range of potential uses. Similar to natural gas, it can be burned to directly produce heat or electricity. It can be used as a transport fuel for hydrogen vehicles. It can also be used directly as a chemical input to industrial processes. Zero emissions hydrogen can be produced in two main ways: First, using renewable electricity for electrolysis (splitting water into hydrogen and oxygen), and second, producing hydrogen from fossil fuels using thermochemical processes (such as coal gasification or steam methane reforming) and capturing emissions using carbon capture and storage (CCS). Australia is well suited to both these approaches, with significant resources in renewable energy, fossil fuel, and potential CCS locations across Australia, as shown in the figure below.

Countries such as Japan and Korea have made commitments to decarbonise under the Paris Agreement. However, they are relatively reliant on energy imports and are limited in renewable energy resources. Producing zero emissions hydrogen for export to these countries presents an opportunity to the Australian economy, and makes use of our advantages in renewable energy, and large-scale energy export infrastructure and experience. Over the longer term, the export opportunity for hydrogen is likely to increase, as countries explore the role for hydrogen across Asia in particular. Australia is not the only place in the world well suited to hydrogen, and if we miss the boat, it won't wait for us this time.

**Figure 3:** Australian energy resources for hydrogen production




Source: *Deloitte Access Economics, Decarbonising Australia's gas distribution networks, 2017*

# The Deloitte Electricity Market Model

We have undertaken energy market modelling of the four scenarios using the Deloitte Electricity Market Model (DEMM). The DEMM is built using PLEXOS, a leading energy market simulation software.

The DEMM simulates generator behaviour and market outcomes in the NEM. It is based on an extensive database of generators and other market particpants and new market entrants. Broadly, the DEMM is built around two complementary components: long-term capacity optimisation and dispatch simulation.

The long-term capacity optimisation module models efficient entry and exit of capacity based on a range of factors including:

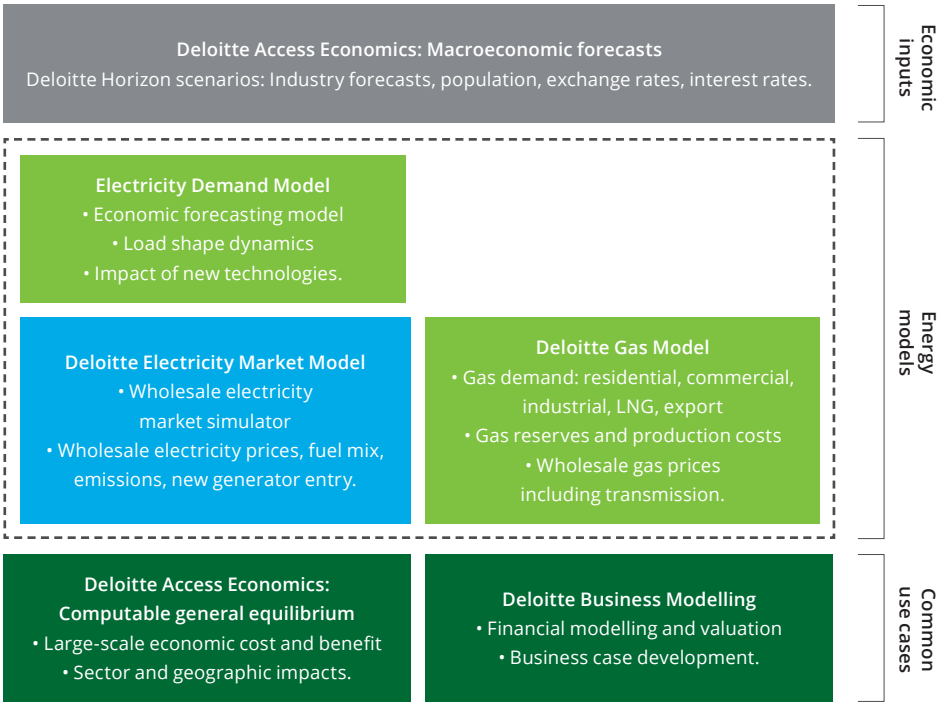
- Technology costs, including capital and operating costs
- Electricity demand and load shape
- Government energy and environment policy.

The dispatch simulation module simulates detailed granular chronological dispatch. It simulates competitive market behaviour from generators and factors such as:

- Unit commitment constraints
- Detailed hydroelectric modelling
- Generator maintenance
- Reliability requirements
- Detailed battery and demand response modelling
- Variable renewable energy production.

The DEMM is closely linked to other models used by the Deloitte Access Economics (DAE) and Commercial Advisory practice, as part of the Deloitte Energy Modelling Ecosystem. This enables a comprehensive integration of factors from across different energy markets and the broader economy.

**Figure 4:** Deloitte Energy Modelling Ecosystem



# Headline modelling results

The energy market can transition to provide consumers with energy services that are both affordable and environmentally responsible. The scenarios all continue to deliver the existing high reliability standards of the energy market.

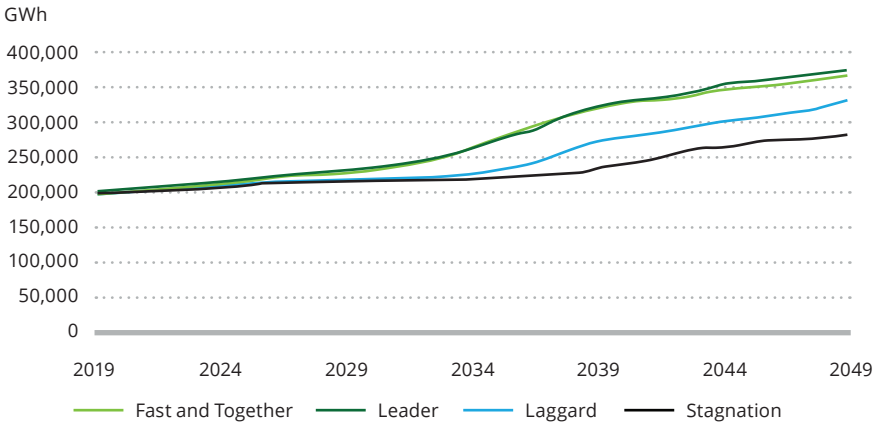
While the absolute outcome of each scenario is interesting in its own right, the differences between the scenarios provide the most insight about the range of possible futures for the energy market. This range points to where opportunities and risks may lie for the energy industry.

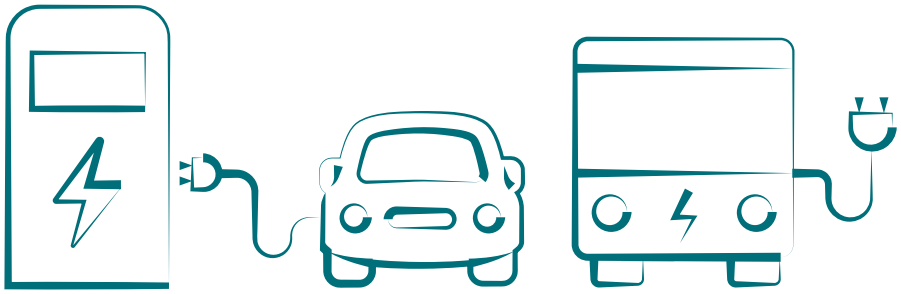
## Consumer choice will increase demand for electricity in all scenarios

We forecast electricity consumption to increase over the long term of each of the scenarios, as Australia's economy and population grow. However there are differences between the scenarios, particularly from 2030 onwards.

Consumer behaviour, incentives through policy, and technology costs have an impact on the drivers of electricity demand such as the uptake of electric vehicles and the electrification of industrial processes. We forecast electricity consumption to grow from approximately 195 TWh in 2020 to 376 TWh in Leader, compared with 282 TWh in the Stagnation scenario.

**Figure 5:** Forecast total electricity demand





## Consumers get in the driver's seat of their electric vehicles

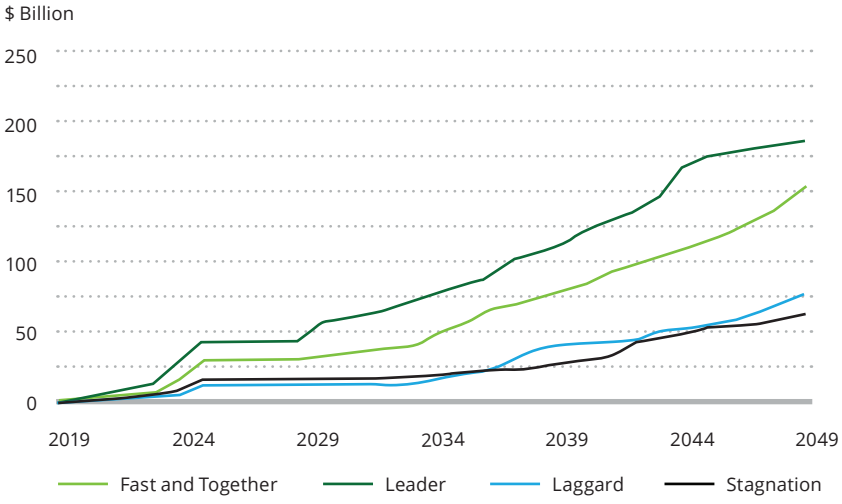
The uptake of electric vehicles has a significant impact on electricity demand. As outlined in 'In focus: Electric Vehicles', we expect the electricity and transport sectors to continue to converge in all scenarios at different rates and magnitudes. This is a major driver of the differences in electricity demand growth, particularly from 2030 onwards.

By 2050, we project electric vehicles to contribute up to 52 TWh of electricity demand in **Fast and Together**, compared with 8 TWh in **Stagnation**. Electricity consumption grows quickly in **Laggard** from around 2035, as Australia begins a fast but delayed electrification of transport as costs decrease and it faces increasing pressure to decarbonise. By 2050, this transition is still far from complete.

Beyond the raw numbers, the way that consumers use electricity varies significantly between the scenarios, facilitated by electric vehicles, smart meters, and behind the meter technologies. Electric vehicles provide a clear opportunity to reconsider the role of households and businesses as passive consumers of energy. With the support of appropriate technical solutions and market structures, electric vehicles can be charged 'smartly', to minimise the strain on generation and network infrastructure, even as consumption grows. In **Fast and Together**, we model 55 per cent of electric vehicle load as 'smart' charging, corresponding with the periods of lowest demand and/or abundant wind and solar generation. By contrast, in the **Laggard** and **Stagnation** scenarios, only 30 per cent and 20 per cent of charging is responsive in this way, with a large proportion continuing to sit at peak periods as consumers charge based on convenience rather than making the most efficient use of our resources and infrastructure.

The electrification of industrial gas consumption will also impact on demand. In **Leader**, we forecast that approximately 28 TWh of industrial gas demand will be electrified by 2050, as the broader economy transitions with the energy sector, and makes the most of manufacturing opportunities associated with a decarbonised electricity system and green supply chains. This supports the broader economy to meet its long-term emissions reduction commitments while maintaining our comparative advantages. All of the scenarios feature some electrification, however to a reduced degree.

**Figure 6:** Forecast investment in generation capacity




Source: *Deloitte analysis*

## Electrification and falling technology costs drive investment in generation

The growth of the electricity sector under all of the scenarios provides opportunities for investment in generation capacity. Our energy market modelling shows a requirement for significant investment in the period to 2050, driven by decreasing technology costs, supportive government policy (in some scenarios), and the need to meet increasing demand. The forecast investment ranges between the scenarios, from $192b in **Leader**, to $64b in **Stagnation**.

In the **Fast and Together** and **Leader** scenarios, there is ongoing investment in generation capacity throughout the period to 2050. Investment in new generation is required to replace existing generation, as we assume existing coal generators reach the end of their technical life and are retired. Beyond the existing fleet, further investment is required to meet increased demand from electric vehicles and the electrification of gas. In **Leader**, the cost of investment is somewhat higher than **Fast and Together** for similar capacity as Australia moves ahead of the world, facing increased technology costs.

In **Laggard** and **Stagnation**, our modelling forecasts limited investment in generation capacity up to around 2035. We assume a narrow focus on electricity prices in the short term which leads to an extension of some existing generators beyond useful life. Combined with a lack of policy support, this feeds ongoing uncertainty, increasing the cost of finance for generation projects, delaying investment. Despite the slow start, the energy transition still occurs in these scenarios, with investment required to support it. By 2050, it is still in progress, both in terms of electricity, and its linking with other sectors, with further investment likely required in subsequent years.

For this analysis, we have only considered the levels of investment in the wholesale electricity market required under each scenario. This investment will need to be matched with investment in other aspects of the supply chain, including in transmission and distribution networks, retail and behind the meter services. There are different estimates available about the magnitude of this investment, with ENA and CSIRO estimating that in total, $880 billion of investment will be needed across the sector to 2050.[5]

## Solar shines a light on the opportunities in the energy transition

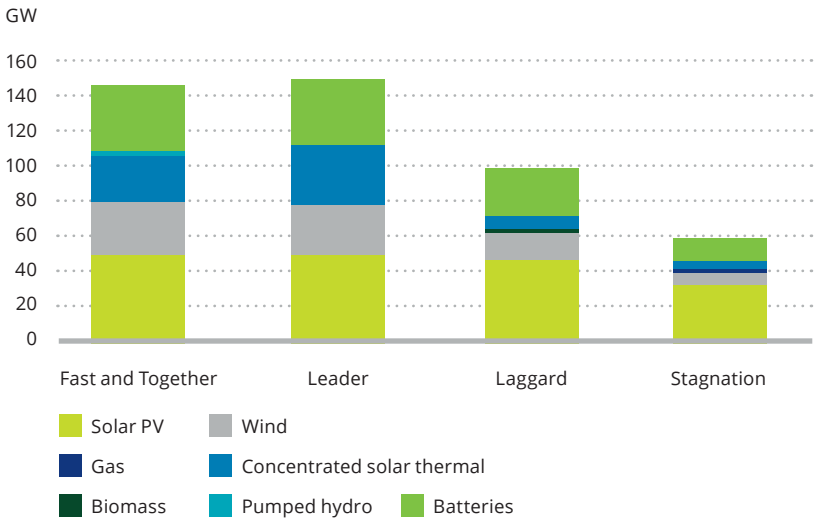
As outlined above, all scenarios have significant investment in new generation and storage capacity, although differing in scale and timing. Figure 7 displays the forecast generation and storage capacity entry to 2050 by each technology type.

Both the **Fast and Together** and **Leader** scenarios will see more than 100 GW of new large-scale generation entry in the period to 2050, driven by solar PV, with significant amounts of wind, and concentrated solar thermal. This is driven by the cost competitiveness of new solar generation, which is the lowest cost source of new generation capacity. Approximately 40 GW of small-scale solar will also enter the market in each of these scenarios.

As the electricity sector transitions to zero emissions in these scenarios, concentrated solar thermal plays an important role as a dispatchable source of energy. This is supported by significant amounts of battery storage for ensuring reliability. This largely enters from 2030 onwards, as we assume existing thermal generators reach the end of life. The smart charging properties of the electric vehicle fleet and broad deployment of demand response also play an important role in efficiently matching supply with demand in an electricity system with large amounts of variable renewable energy.

In **Laggard** and **Stagnation**, new generation entry is similarly led by large scale solar PV, due to its decreasing cost profile despite a lack of policy support for renewable energy. Although there is limited entry of new gas generation capacity, existing generators increase output to play a more prominent role in the system from 2030 onwards.

**Figure 7:** Total forecast investment in generation capacity by type




Source: *Deloitte analysis*

## Renewables and cost top of mind

As set out above, under all of our scenarios, we see retirement of coal-fired generation as these assets reach the end of their engineering and economic lives. Replacement fleet is mainly solar plus wind, as the most cost-competitive forms of new generation.

These outcomes are reflected in each of the scenarios, with even the Stagnation scenario relying on coal-fired generation for less than 17 per cent of total generation in 2050 (compared to complete exit of coal in the Fast and Together, and Leader scenarios).

The timing of the retirement of coal plant differs between scenarios. Ultimately, these decisions are likely to be made with a number of considerations by owners, such as:

- Asset condition and cost implications, with older assets subject to higher maintenance costs and unplanned outages
- Consumer sentiment and pressure, and political and regulatory incentives, which can also drive economics.

On one hand, holding onto ageing coal generation assets could lower prices in the short term. However, this may come at the expense of reliability and volatility, with ageing infrastructure more subject to unplanned outages.[6] In the longer term, delaying the transition is likely to drive up costs, via policy uncertainty (as we have seen in the current environment) and higher costs for new forms of generation when the transition is made.

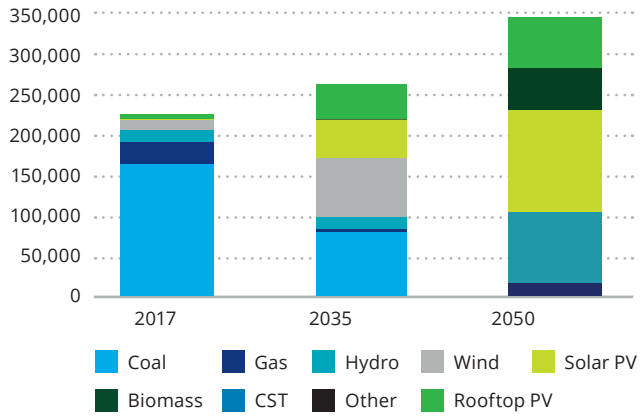
Solar (including PV, CST and rooftop) and wind generation increases to more than half of generation in all scenarios, from 57 per cent in Stagnation to more than 80 per cent in Fast and Together and Leader. Output from rooftop PV in Fast and Together and Leader is 60–70 per cent higher than in Laggard.

As noted above, we model all scenarios on meeting reliability targets. To achieve this, different sectors play a supporting role to maintain reliability across our scenarios:

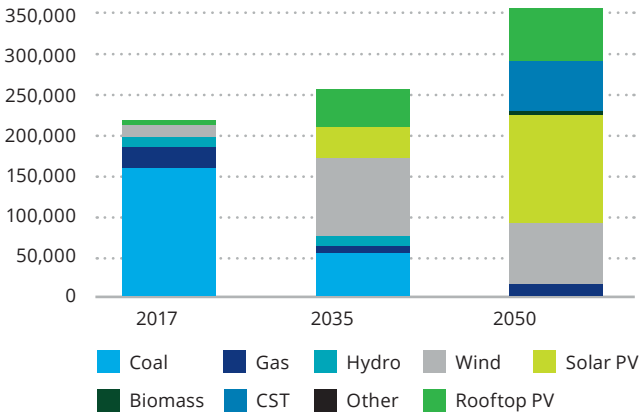
- Battery discharge is broadly similar across all scenarios, other than Stagnation, where higher technology costs are driven by global factors, and existing thermal generation plays a greater role in the system for a longer period.
- Gas continues to play a small, but important role all scenarios for the vast majority of the forecast period, but is largely absent from Leader by 2045 and Fast and Together by 2050. This generally reflects policy drivers, rather than economics, and does not consider the role of gas in the home. For example, we note that a reduced role in the electricity generation market could improve the competitive nature of distributed gas, due to easing demand.

**Figure 8:** Electricity fuel mix

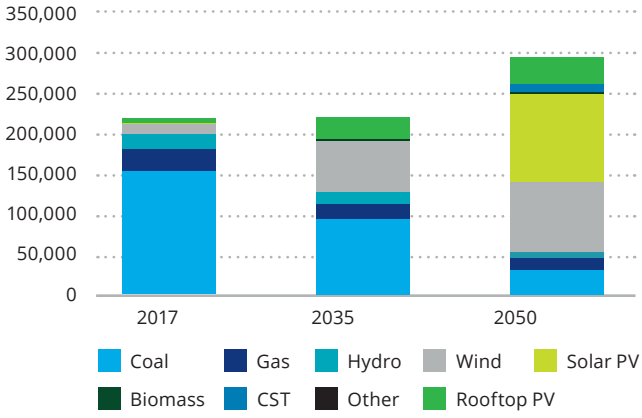
### Fast and together



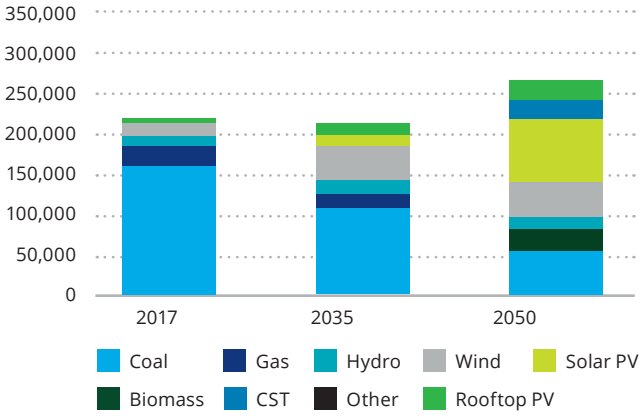

### Leader




### Laggard




### Stagnation




Source: *Deloitte analysis*

## Emission intensity declines from investment in renewable energy generation

Consistent with the reduction in coal-fired generation and the relatively small role of gas in meeting demand, our scenarios all show significant decarbonisation. Even under the Laggard and Stagnation scenarios, the cost-driven transition from fossil-fuels to renewables results in all scenarios delivering a level of decarbonisation in excess of the abandoned National Energy Guarantee by 2030.

The electricity sector is completely decarbonised in Fast & Together (by 2050) and Leader (by 2045).

Significant decarbonisation is also delivered in the other scenarios, albeit generally post 2030. By 2050, emissions from the electricity sector are:

- 66% below 2005 levels in the Stagnation scenario
- 82% below 2005 levels in the Laggard scenario.

Figure 9 illustrates the total NEM emissions over the period for the four scenarios.

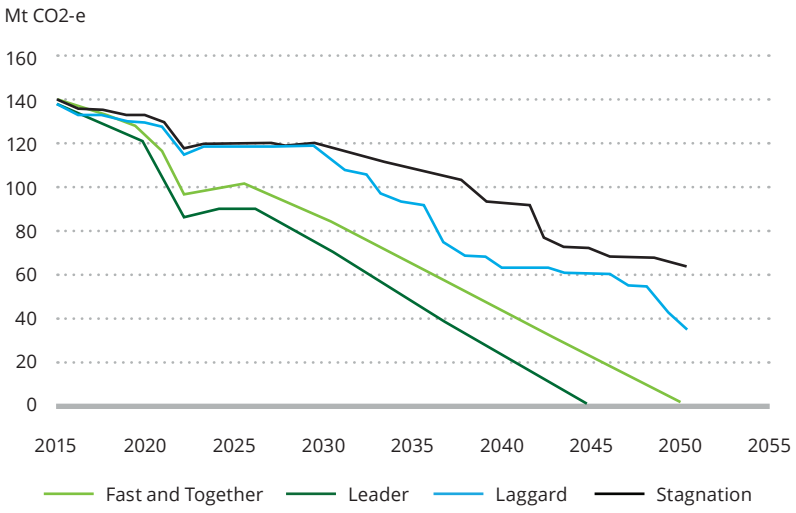
These scenarios illustrate not just the feasibility of achieving our previously envisaged targets in the electricity sector, but the role that the electricity sector can (and some might say, should), play in delivering emissions reductions across the economy.

The emissions reductions achieved under these scenarios result in emissions reductions in other sectors, including transport, manufacturing and industrial processes, due to the electrification of these sectors.

Regardless of the ultimate path, one thing is for certain – extensive decarbonisation of the electricity sector is coming, sooner, or later.

The path we take will be defined by consumer preferences, which, as we have outlined above, are ultimately manifested in commercial and political decisions. Businesses and leaders can play a role in shaping these preferences and determine whether they will be agents for change – or whether they will be playing catch-up, with new products and new policies coming from abroad.

**Figure 9:** Emissions




Source: *Deloitte analysis*

# Next steps

# Opportunities and risks

There are significant new opportunities for businesses in the energy market transition. From Fast and Together to Stagnation, Leader to Laggard the energy market is on the move. These four scenarios highlight opportunities and risks across the energy sector.

Scenario analysis is particularly useful for identifying opportunities and risks that are common across a range of different possible future states, and where there is divergence. While it is futile to try to predict the future, the range of outcomes under scenario analysis allow businesses to make informed decisions and put in place mitigation strategies to balance potential risks. By considering how different future states may evolve, businesses can also watch out for the signs that point out which future state is evolving and quickly respond to take advantage of opportunities or to mitigate risks.

Despite the significant differences between our scenarios, there are a number of opportunities and risks that consistently feature across the results. These are summarised in Table 1.

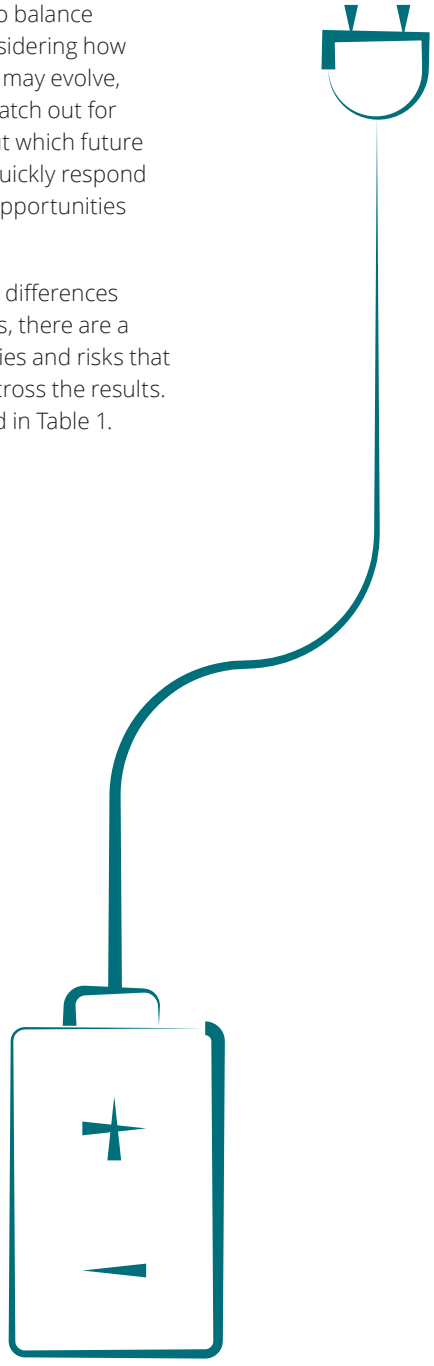


**Table 1:** Opportunities and risks across all scenarios

| Opportunities | Risks |
|---|---|
| • Regardless of whether consumers make decisions on price or on broader values, they will continue to demand new electricity services and products. Under all scenarios, demand for electricity increases. This demand does not need to be served under the same model we have always used and there are signs that consumers do not want this. This creates opportunities for new ideas.<br>• The transition to a lower emissions energy sector will strengthen over time. Products and services that can reduce the emissions intensity of the energy industry or tangent industries (such as transport) will likely see significant demand.<br>• Moving fast will allow for the early capture of opportunities that would likely eventuate regardless of global change and policy settings. Our scenarios show that the market will evolve in a vaguely consistent manner to 2050. Businesses that move fast will capture the benefits of new opportunities, leaving those that wait to potentially forego.<br>• Even low levels of electric vehicle uptake will increase demand for electricity, which will have implications for investment across the supply chain. This level of demand will not be able to be served by off-grid solutions entirely, creating a strong opportunity for more investment in the centralised system.<br>• Dispatchable capacity will have a role to play in the market, as coal fired generation exits. Across the scenarios, there is significant entry of new dispatchable capacity. Innovation and cost will greatly influence the type of capacity that enters. However, while some types of capacity are likely to be more impacted by any trend towards decarbonisation, the modelling results suggest that there is some degree of discretion.<br>• The lowest cost new generation in all scenarios is large scale solar and wind. Consequently, all scenarios see substantial investment in wind and solar to 2050. | • Short-term perspectives and a focus on the bottom dollar could mean that opportunities are missed as they are considered 'too hard' or 'too expensive'. With the transition all but guaranteed, those who wait until they have a sure win, will miss out as they will not be able to mobilise fast enough to catch up to those who took early, calculated risks.<br>• Long-term outcomes are very uncertain – as with any consideration of possible futures, the outcomes of our scenario analysis are uncertain. They rely on the development and uptake of new technologies that are untested in the market. While there is every reason to believe that electric vehicles will continue to improve and reduce in price given the statements of car manufacturers, there is also a possibility that the technology does not develop as expected.<br>• Consumer preferences and government policy could be misaligned. Our scenarios assume that the government responds to support consumer preferences, but this may not always be the case. There is a risk that governments put in place policies that do not support the preferences of consumers leaving businesses between a rock and a hard place.<br>• To be successful in launching new products and services that cater to the changing values of consumers, businesses will need to be conscious of the cost of delivering these products. With ready alternatives to complete grid dependency becoming more viable, a price ceiling will in effect be established for many consumers.<br>• The market will need time to get ready for electric vehicles – a large amount of investment will be needed to support growing uptake. However, to make the business case for this investment stack up, there needs to be a market for the services. To overcome this 'chicken and the egg' dilemma, government intervention will likely be needed. |

# Five fundamentals to drive your decision-making

There are a range of opportunities and risks that could eventuate under our scenarios. In considering what you do today to embrace the energy transition and shape the future of energy, here are five fundamentals to keep top of mind:

## 1. Know the market

Understanding the evolving market is an important first step for most businesses. This includes developing an awareness of the actions of consumers, regulators, governments, competitors and suppliers, as well as a holistic view of how trends in the wider economy may impact the energy sector over the short and medium term. Threats and opportunities can come from any part of the market or the economy.

It is also critical to understand the latest developments in international markets – these developments can preview new risks, opportunities and technologies that may be able to be adapted for our market. The scenarios modelled show that the global rate of change does influence the opportunities available within Australia, and the cost of pursuing these opportunities. Businesses that monitor developments in international markets are likely to get a headstart in the race to launch new products and services.

## 2. Understand the consumer

Ongoing and proactive consumer consultation will be vital to ensure a business is ahead of the evolving demands of the market. Existing customers are a good place to start – finding out what they need and offering them tailored products and services. This can also involve extending the brand to offer them 'surprisingly useful' services that go above and beyond in exceeding their expectations. However, engaging with dissatisfied customers may provide the best input – the 'exit interview' is often the moment of truth.

Organisations need to pay close attention to understanding the needs of different customer segments and potentially the need to create new brands, new alliances or entirely new product ranges. The scenarios show that in particular, increased uptake of electric vehicles will likely create new demands from consumers for smart charging and other services.

## 3. Know your business and identify options

Businesses must have an in-depth understanding of their business, its capabilities and its gaps. Deep knowledge of the strengths and weaknesses of the business ensures that time is not wasted down rabbit holes that are unlikely to be fruitful. Knowing the capabilities of your business allows you to really understand the opportunities and the risks of different options and act fast. The market is changing quickly so accessing and digesting current information on an ongoing basis is critical. Understanding what you can and cannot influence allows for a prioritisation of effort.

Opportunities outside of a business' obvious sphere of influence might still have important implications for the business and its partners and must be routinely monitored with robust contingency plans put in place. In particular, the modelling shows that there are likely to be opportunities in tangent industries such as transport and industrial processes. These opportunities may not be a natural fit for many in the industry, but by knowing your business and monitoring change, you can make strategic decisions to position yourself to win in new markets.

The only certainty is that the future operating market will be very different from what exists today. Companies that do not lift their gaze to the fast approaching future will find themselves in difficulty and those that develop resilient and flexible options will be the ones that thrive in this uncertain future.

## 4. Take a long-term view, but act quickly

It is necessary for businesses to balance the need to enter the market quickly with the need to understand what the long-term consequences of market entry might be. It is the challenge of creating a 'no-regrets' or maybe at least 'minimising your maximum regret' strategy.

Scenario analysis is an effective and flexible framework that enables businesses to quickly identify and understand a range of possible outcomes, opportunities and threats when considering a new market strategy. Scenario analysis can help a business get more comfortable with a new market strategy and act decisively to capture benefits. Scenario analysis can help businesses to launch innovative new products and services into market without delay, while still making decisions that do not block other potentially profitable futures.

Our modelling shows that the transition is happening even in the most conservative scenarios. Obstacles or inaction will delay but not avoid the transition as renewables are quickly becoming the cheapest form of new generation. Businesses that act quickly can exploit new opportunities while others potentially miss out.

## 5. Manage risk intelligently

Full market launch of a new product is not the only option for businesses. While new technologies are being evaluated, a small and extremely fast pilot can carry low financial risk for a business, and provide both a first-mover advantage and market acceptance testing.

Small trials can also help overcome internal resistance to change which can often be the biggest hurdle to negotiate for those that can see how the market is evolving. With the correct strategic plan in place, success can be scaled up quickly while a failure can be cut off before causing damage to the business' finances or reputation.

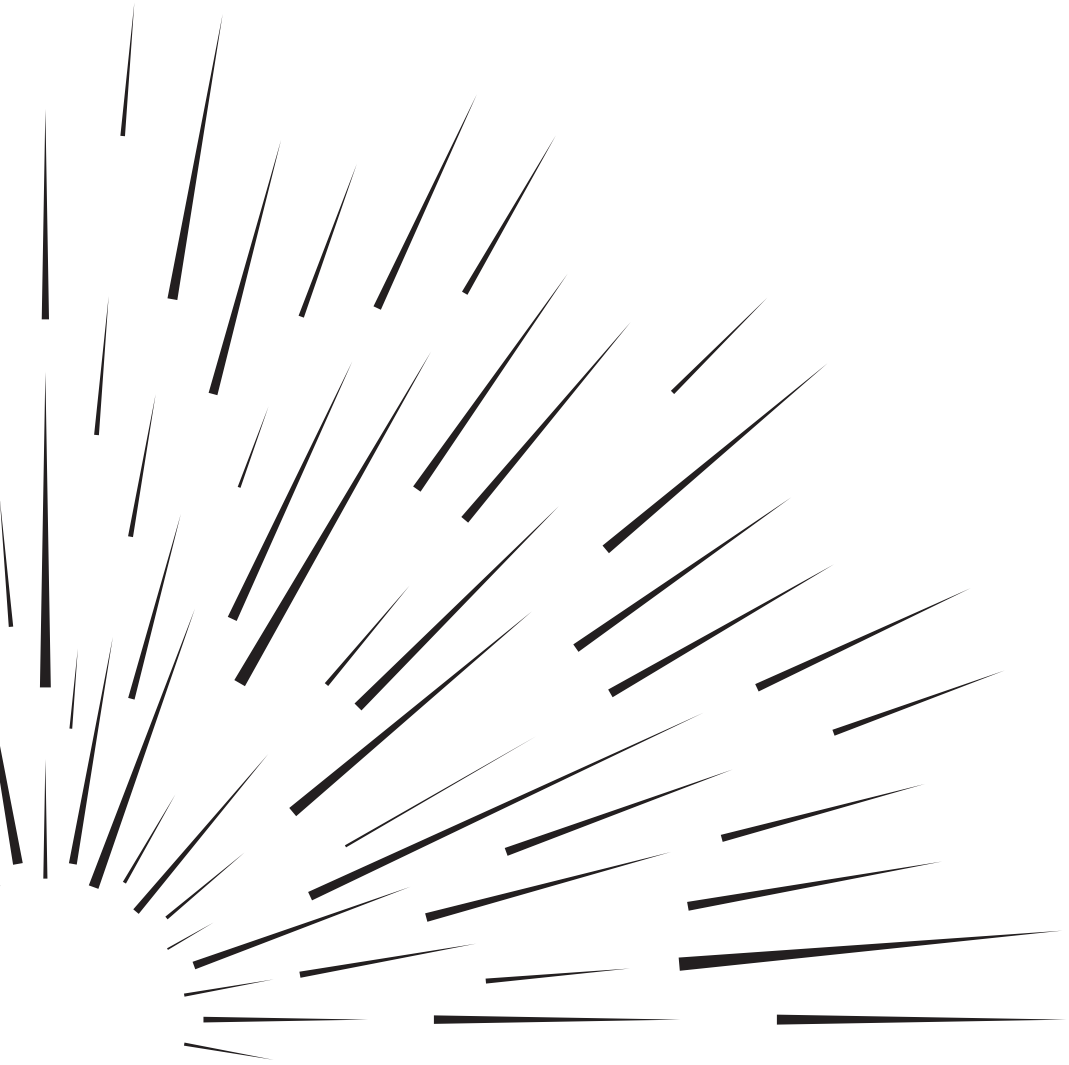
Collaborating with innovators or other businesses also diversifies risk and provides a way to test future options.

**As our energy scenarios reveal, we all have a role to play as we accelerate our thinking for a future focused Australia.**

# What will you do today to embrace the energy transition and shape the future of energy?

# Endnotes

[1] Section 7 of the National Electricity Law.
[2] Deloitte, Global Renewable Energy Trends, September 2018.
[3] See Reliability Panel AEMC, Annual Market Performance Review 2017: Final Report, 20 March 2017.
[4] Deloitte, Global Renewable Energy Trends, September 2018.
[5] Energy Networks Australia and CSIRO, 2017, Electricity Network Transformation Roadmap: Final Report
[6] AEMO, 2018 Energy Statement of Opportunities, 2018, p. 52.



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