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3 June 2016

Essential Services Commission of Victoria

Level 37, 2 Lonsdale St
MELBOURNE VIC 3000

Via email: energy.submissions@esc.vic.gov.au

Re: Draft Report (Energy Value) of Distributed Generation Inquiry

To Whom It May Concern:

Australian Gas Networks Limited is one of Australia's largest natural gas distribution companies. AGN owns approximately 23,000 kilometres of natural gas distribution networks and 1,100 kilometres of transmission pipelines, serving over 1.2 million consumers in Victoria, South Australia, Queensland, New South Wales and the Northern Territory.

AGN facilitates the safe and reliable supply of natural gas to around 620,000 Victorian customers. Natural gas is a low carbon energy choice for Victoria and delivers safe and reliable energy with significantly lower carbon intensity than electricity generated from coal. Additionally, the continued use of natural gas ensures a diversified and competitive energy mix in Australia, thereby increasing the security of supply to customers.

AGN welcomes the opportunity to make a submission to the Essential Services Commission of Victoria (the Commission) regarding "*The Energy Value of Distributed generation – Distributed Generation Inquiry Stage 1 Draft Report*" (the report).

AGN provided a submission in relation to the Commission's issues paper in February 2016, supportive of the Commission's continued investigation into reducing the barriers to entry hindering the viability of distributed generators.

AGN is generally supportive of the high level direction of most of the recommendations outlined in the report, however AGN continues to believe there is an important role for not only renewable energies but also low carbon fuel sources (such as natural gas) to play in Australia's transition to a low carbon economy. AGN continues to encourage the Commission to advocate for technology neutral policy that does not attempt to 'pick winners' by adversely impacting on particular energy sources.

AGN considers that technology-neutrality as a policy principle is important because:

- It ensures market forces are able to determine the future energy mix, rather than government policy supporting the development of particular technologies; and

- It enables least cost carbon abatement for energy users as we move toward a low carbon future.

As the Queensland Productivity Commission (QPC) states in its "*Solar Feed-In Tariff Pricing in Queensland*" Issues Paper:

> *"Policy frameworks typically include a principle that policies should be technologically neutral. The idea is that what is important is the quality and price of the service, not the specific platform, technology or approach to delivering the service. The focus is on the long-term interests of consumers and not the industry or the development of a specific technology."*[1]

The QPC also goes on in its Draft Report to state that:

> *"Evidence presented to this inquiry suggests the Queensland Government should ensure… Future policy design does not provide rooftop solar PV with an unfavourable advantage over other sources of generation including, but not limited to, commercial and large-scale solar/renewables, community solar and other low-emissions technologies, such as gas."*[2]

Consistent with this view, AGN considers that a key policy principle of the Commission should be technology neutrality.

The output of the Commission's report is summarised in a series of Draft Recommendations, with Draft Recommendation 2 detailing the eligibility for payments restricted to the following technologies:

> *"Solar photovoltaic (PV), wind, hydro and biomass remain eligible technologies for receipt of feed-in tariff payments, and eligibility be retained for units up to a generating capacity of 100kW."*[3]

Under this recommendation no new low emission fuels would be included in the technologies eligible for payment under the feed-in tariff, thereby disadvantaging particular energy sources such as natural gas.

As further evidence of the benefits of technology-neutral policy, AGN (through the Energy Networks Association) has worked with Jacobs to develop a further understanding of least cost carbon abatement policy options Australia-wide. Jacobs' findings indicate that technology neutral policy would achieve lower cost carbon abatement than the current policy mix.

In particular, Jacobs conducted analysis to understand the least cost abatement path for Australia under three policy scenarios:

- "Business as usual": a continuation of the diverse range of various State and Federal abatement initiatives (which frequently prescribe specific technologies or scale, such as solar feed-in-tariffs);
- "Level playing field": replacing current initiatives with technology-neutral programs focused on the outcome of lower emissions; and
- "Alternative level playing field: current policies are replaced with a carbon equivalent mechanism.

---

1 Queensland Productivity Commission, "*Issues Paper – Solar Feed-In Tariff Pricing in Queensland*", pg. 12.

2 Queensland Productivity Commission, "*Solar Feed-in Pricing in Queensland Draft Report*", March 2016, pg. xiii-xiv.

3 Essential Services Commission of Victoria, "*The Energy Value of Distributed Generation*" (Draft Report), http://www.esc.vic.gov.au/wp-content/uploads/2016/05/RPT-Distributed-Generation-Inquiry-Stage-1-Energy-Value-Draft-Report-20160506.pdf.html, April 2016, pg. 5.

Importantly, Jacobs found that more cost-effective abatement outcomes can be achieved through technology-neutral policy (i.e. the "level playing field" option), rather than technology-specific abatement programs that seek to encourage the up-take of renewable energies (i.e. "business as usual), for example.

Additionally, Jacobs developed forecasts of the typical residential bill under each of these three scenarios and has found the following:

> *"Jacobs' analysis shows a typical residential electricity bill in 2030 would be lower under a 45% target scenario with a Level Playing Field, than under the smaller 26-28% abatement target with our current, inefficient policy mix".*[4]

For further information regarding the analysis developed by Jacobs, please refer to Attachments A-C of this submission. AGN encourages the Commission to actively consider the analysis undertaken by Jacobs and AGN would be pleased to discuss the Jacob's findings further with the Commission.

Jacobs' work indicates that policies that do not maintain technology-neutrality can cause higher cost emission abatement than a technology-neutral policy, as well as creating perverse outcomes in the appliance markets for competing low emission technologies.

Please contact either Ashley Muldrew or myself if you would like to discuss the matters raised in this submission, further.

Yours sincerely,

Craig de Laine
General Manager - Regulation

[4] Energy Networks Association, "*Media Release: Technology neutral policies will deliver lower bills*", 10 March 2016, pg. 1.

energy networks association

ENA

THE EVOLUTION OF THE NETWORK

A YEAR IN REVIEW AND KEY ISSUES LOOKING AHEAD TO 2017

AUSTRALIAN DOMESTIC GAS OUTLOOK

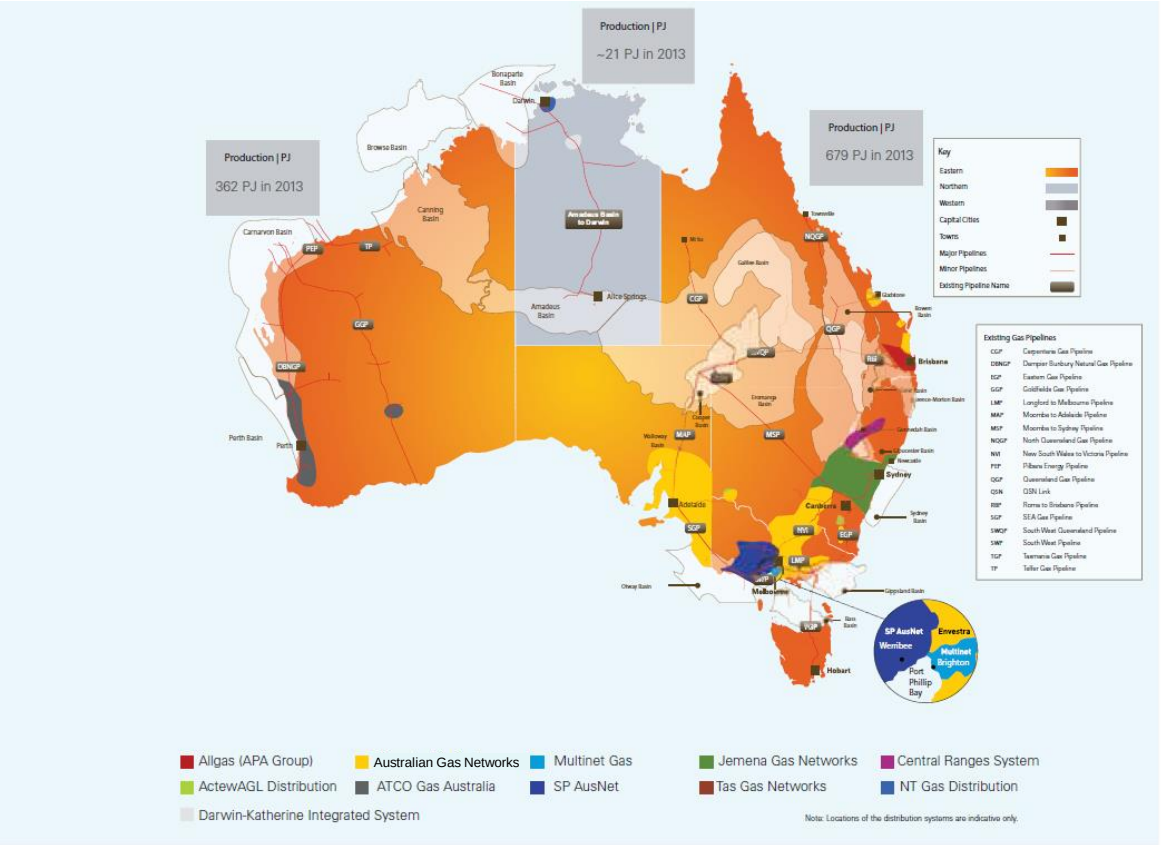
JOHN BRADLEY, CEO, ENA

10 MARCH 2016

ENA & Gas Distribution

- 74,000 km Distribution pipelines
- 4.1 million gas customers

- Gas Penetration:
  - 90% in Victoria
  - 80% in ACT
  - 60% in South Australia
  - 45% in NSW
  - 10% in Queensland
  - 5% in Tasmania



Source: AER State of the Energy Market 2015

Source: Core Energy

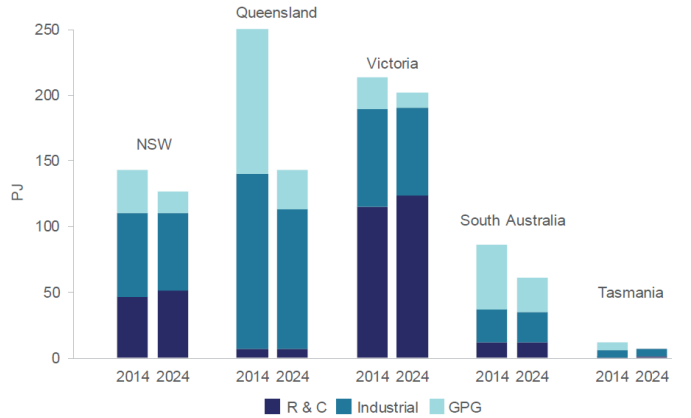
Outline

- Domestic gas challenges
- *Australia's Bright Gas Future*
- The role of gas in climate policy options

Domestic Gas Challenges

> Impact of export LNG markets on domestic prices and availability

Figure 2.3: Gas demand by sector, by state, 2014 and 2024



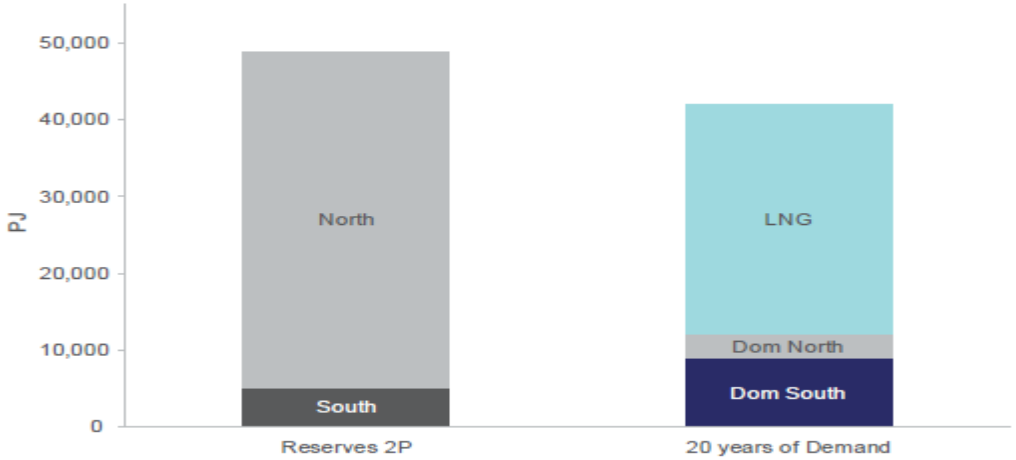
Source: AEMO (2015) National Gas Forecasting Report

Source: Australian Government, Office of the Chief Economist (2016), *Gas Market Report 2015*, Figure 3.2

Source: Woodside Energy Ltd.

Domestic Gas Challenges

> *Regional Mismatch of Supply & Demand*

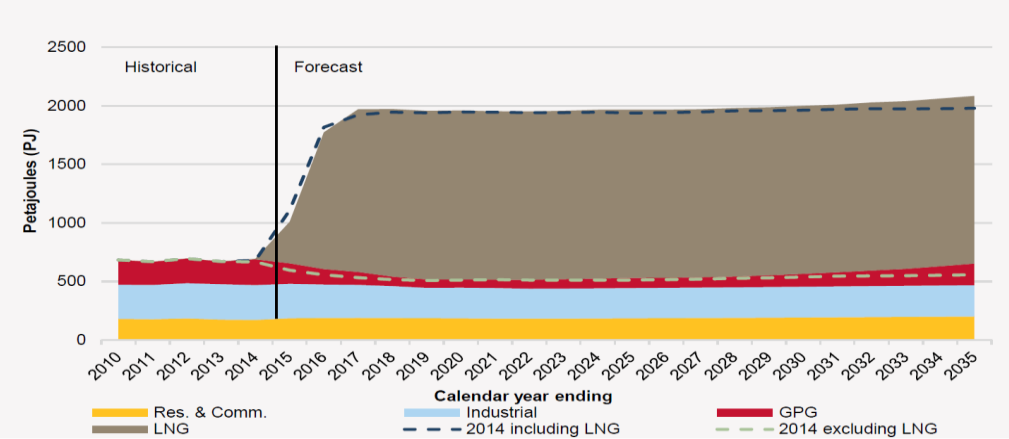


Source: Australian Government, Office of the Chief Economist (2016), *Gas Market Report 2015*, Figure 3.2

Domestic Gas Challenges

> *Technology-specific policies leading impacting least cost abatement*

Total annual gas consumption



"In an oversupplied market, new renewable generation displaces GPG from the electricity dispatch merit order …"(AEMO, 2015)

"Electricity generation from renewables and black and brown coal increased over 2014-15, while generation from gas and hydro fell…" (DoE, 2015)

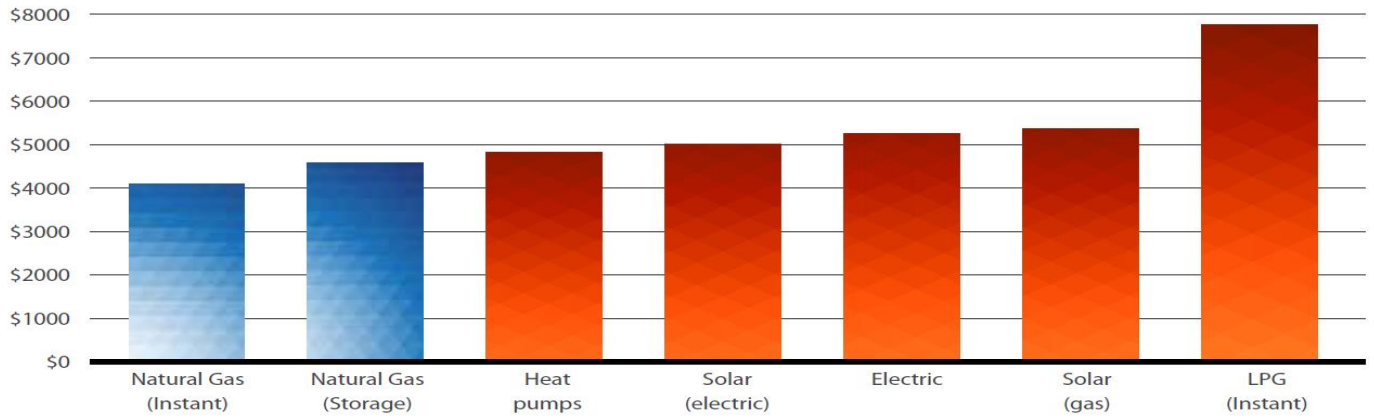
Source: AEMO (2015), Nati*onal Gas Forecasting Report*, Figure 1

Department of the Environment (2015), *Tracking to 2020*, pp 9

Domestic Gas Challenges

> *Technology-specific policies leading impacting least cost abatement*

Comparison of Water Heating Lifecycle Cost



Source: Core Energy Group (2014), *Gas Network Sector Study*, Figure 6.8

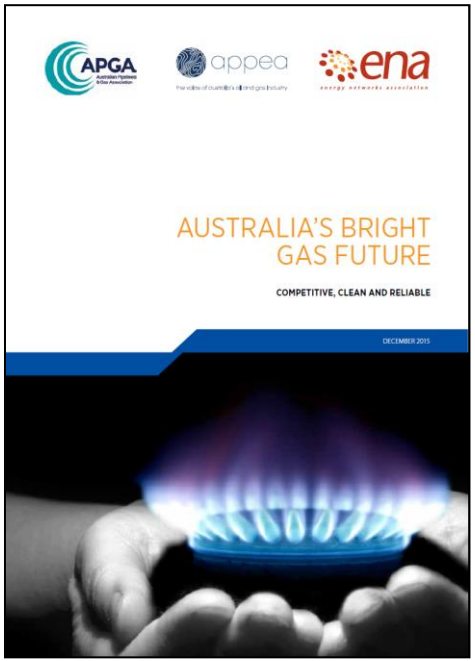
A strong value proposition for households….

> Gas is a **low cost**, **low carbon** and **convenient** fuel of choice for Australian consumers when it comes to cooking, hot water and winter heating.

> Natural gas from a distribution network delivers energy which is **1/4 to 1/6 of the carbon intensity of mains electricity.**

> Can deliver **a hot water system that never goes cold** and **up to 83% less emissions** than a electric resistance HWS.

> **Control for home chef, amenity and warmth**



…and innovative applications

WHAT'S NEXT ?

Australians are enjoying innovative new uses for household gas appliances

GAS REVERSE CYCLE AIR CONDITIONING

For the larger homes, ducted gas reverse cycle air conditioning is now an option. This is even lower emissions and running cost than electric air conditioning and performs better at low temperatures. If you need to manage your peak electricity demand, gas fired air conditioning is a great option.

GAS DRYERS[4]

Comparisons show that that the 54% of Victorians who have clothes dryers will add $123 a year to their electricity bill to run a large electric dryer 1.5 times a week. For the same load, gas dryers are more efficient and will save a customer $87 annually whilst reducing drying times and greenhouse gas emissions.

GAS BARBEQUES AND PATIO HEATERS[5]

Natural gas barbeques and patio heaters allow warm outdoor entertaining all year round. A networked natural gas patio heater provides substantial warmth, requires no lifting of heavy cylinders and can save you money. Networked natural gas costs about one quarter to one-third of the cost of LPG cylinders, without the inconvenience or transport emissions of refueling.

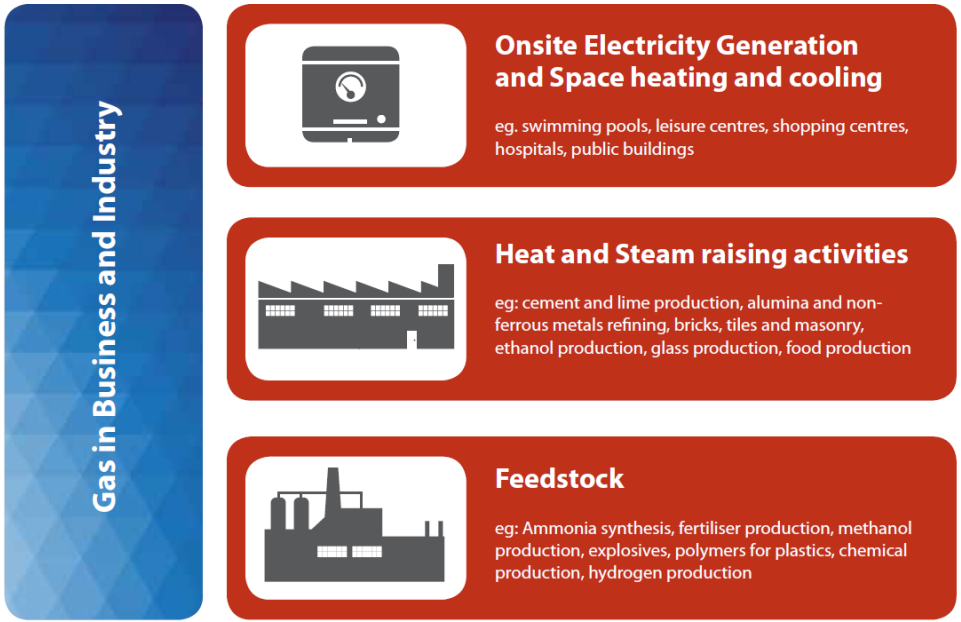
GAS MICRO GENERATION

Gas microgenerators are being developed in Europe, North America and Asia to assist balancing residential electricity demand. These can provide hot water and cooling as useful by-products, and being onsite, gas-fired micro generation can help to avoid electricity losses and lower carbon emissions.

4 Washer and Dryers, Sustainability Victoria, April 2014
5 natural-gas.com.au - Natural Gas your questions answered, p.2

AUSTRALIA'S BRIGHT GAS FUTURE COMPETITIVE, CLEAN AND RELIABLE

A vital input to Business and Industry



… new commercial opportunities

GPAC

CASE STUDY: GPAC

The ATCO Gas site in Jandakot, WA utilises clean, reliable and safe natural gas for cooling through Gas Powered Air Conditioning. The building uses four, 85kW gas powered air conditioning units to cool a total of 3,127 m². Using GPAC has saved the business 40% on the running cost of an equivalent electricity system. It has improved environmental performance also, adding an extra star under the Green Star building rating scheme.

Co-gen & Tri-gen

CASE STUDY: Co-Generation[9]

A year after the installation of a 229kW Cogeneration System at the Oasis Regional Aquatic Centre in Wagga Wagga NSW, the Centre has reduced its electricity bill by over $20, 000 a month and its greenhouse gas emissions by 945 tonnes.

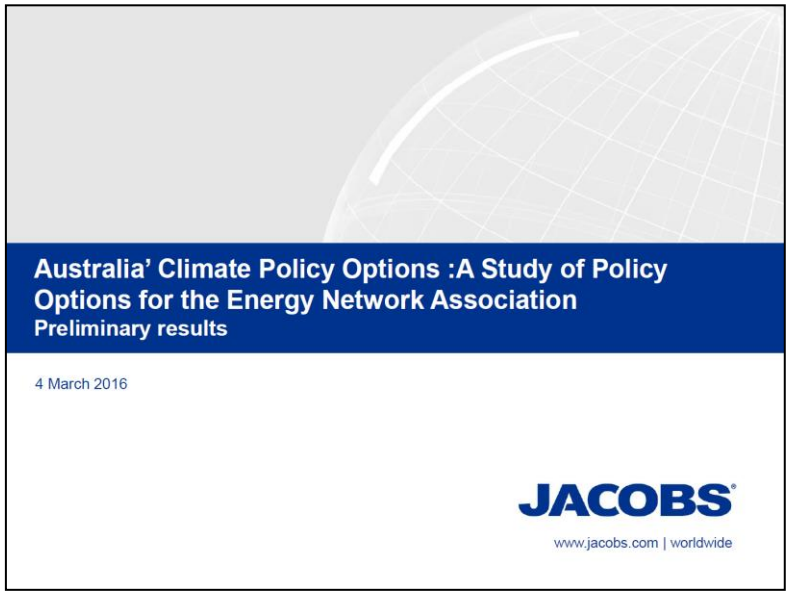
The Cogeneration System is fuelled by Natural Gas but supplements the existing gas fired hot water boilers. With the total investment of the system including installation of $373,636 and factoring in maintenance costs, an estimated payback of just over 2 years has been achieved.

Natural Gas Vehicles

TABLE1. Payback periods based on 40c/litre/equivalent price spread between CNG, NGV and petrol/diesel. Figures include fuel excise.[10]

	Km/yr	Fuel use l/yr	CNG premium	Annual saving	Payback period years
Car 2.5l	30000	3000	$4,500	$1,200	3.75
	60000	6000	$4,500	$2,400	2.5
Taxi	150000	20000	$4,500	$6,000	0.75
Light duty van	30000	3600	$7,000	$1,440	4.86
	75000	9000	$7,000	$3,600	1.94
Light duty truck	30000	7500	$13,000	$3,000	4.33
	75000	18750	$13,000	$7,500	1.73
Medium duty truck	30000	9000	$18,000	$3,600	5
	75000	22,500	$18,000	$9,000	2

Climate Policy & the Role of Gas



Two targets – Three Policy Scenarios…

- ***Objective:*** Quantify the impacts of alternative policy approaches to achieve the stated national emission reduction target in 2030.

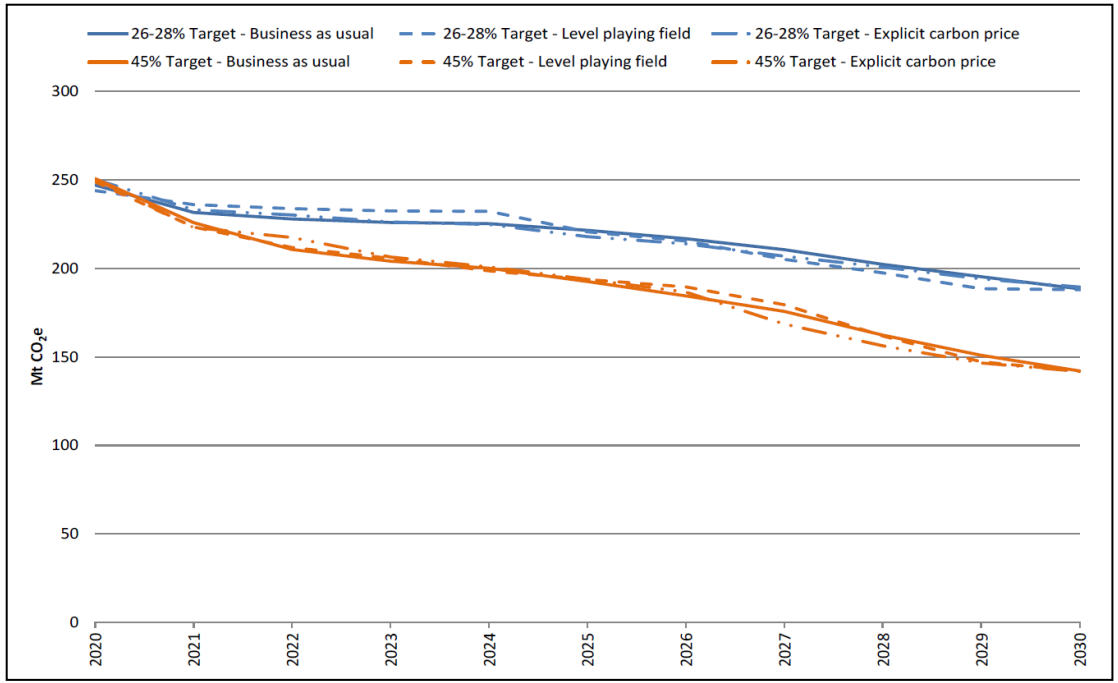
	26-28% Target	45% Target
Business as usual	☑	☑
Level playing field	☑	☑
Explicit carbon price	☑	☑

Scenarios:

1. **Business as usual:**
   - Continue diverse State and Federal abatement initiatives which prescribe **specific technologies** (e.g. renewables) or **scale** (e.g. SRES, FiT).
   - Extend use of a binding **Safeguards Mechanism** that limits sectoral emissions without trading.
   - *PLUS in the 45% target scenario a carbon price and 50% RET is assumed).*
2. **Level playing field scenario:**
   - Abatement initiatives maintained but made **technology neutral** (eg. via a low emissions target scheme) and indifferent to scale.
   - In the 26-28% target scenario, the Safeguards Mechanism evolves to a **baseline & credit mechanism** permitting trading among participants.
   - *PLUS in the 45% target scenario, a carbon price and 50% LET is assumed.*
3. **Explicit carbon price scenario:**
   - This scenario assumes that an explicit carbon price is established through a mechanism equivalent to a whole of economy carbon tax or emissions trading scheme.
   - All other abatement policies (eg RET, SRES) are removed.

Key Findings

1. Carbon reduction targets for 2030 for the stationary energy sector can be met using all of the different policy approaches.



Key Findings

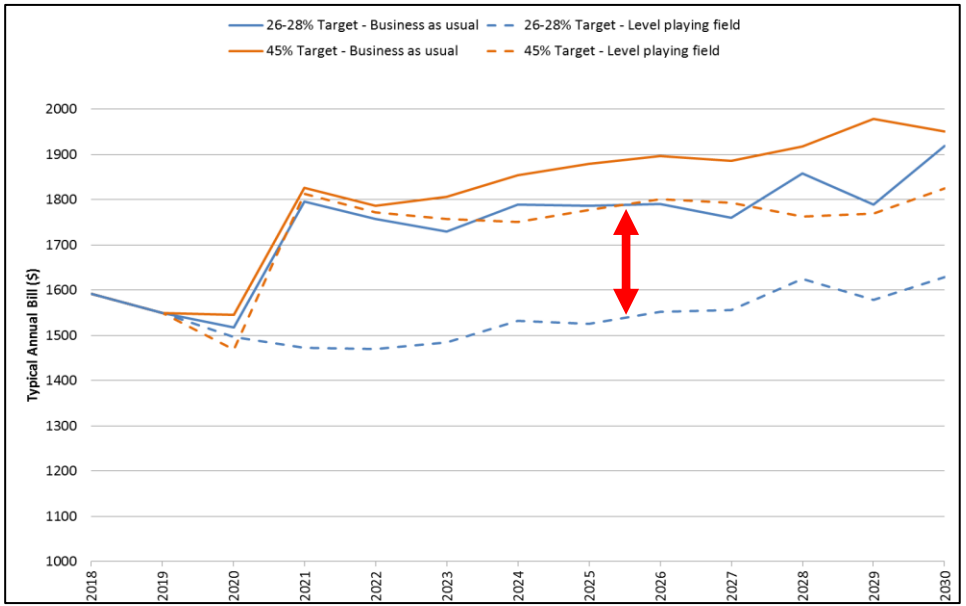
2. Technology neutral policies would achieve Australia's carbon abatement targets at lower costs in the stationary energy sector.

	Abatement Target			
	26 to 28%		45%	
Policy Settings	***Total Cost***	***Savings***	***Total Cost***	***Savings***
Business as usual	$129.2 bn	-	$152.5 bn	-
Level playing field	$128.6 bn	$600 m	$150.9 bn	$1.5 bn
Explicit carbon price	$128.5 bn	$700 m	$144.3 bn	$8.2 bn

Key Findings

3. The technology neutral framework provides the lowest residential electricity bills from 2020-30.

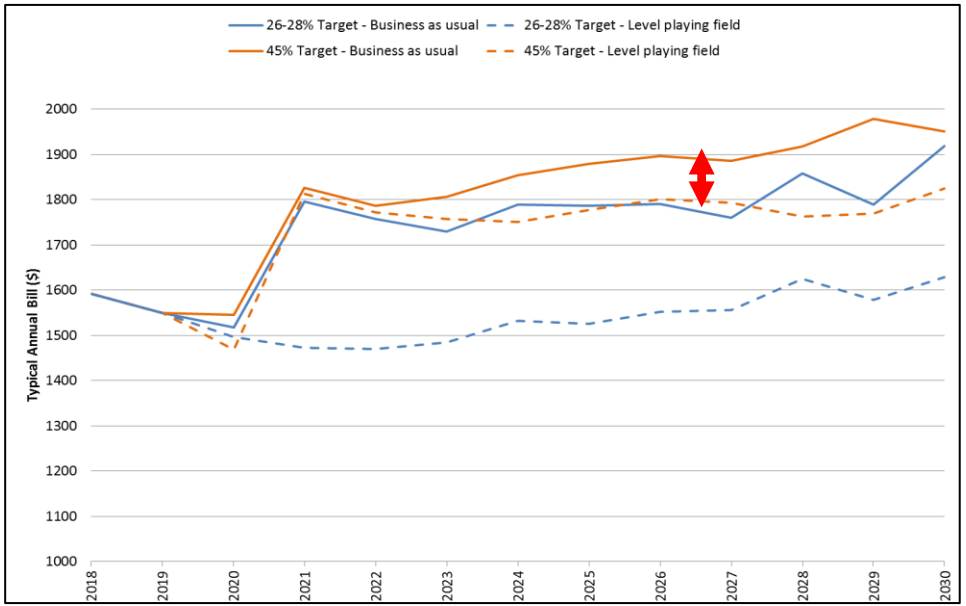
- Savings from a 'level playing field' compared to "BAU" in 26-28% target:
  - Typical residential bills average $234 pa lower in period 2020-30.
  - Cumulative savings up to $2,570.



Key Findings

3. The technology neutral framework provides the lowest residential electricity bills from 2020-30.

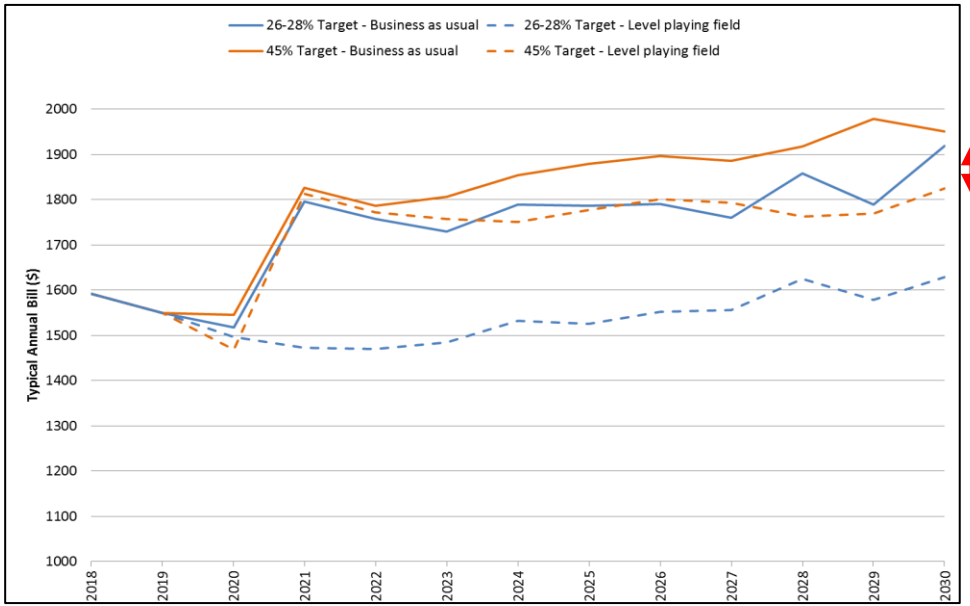
- Savings from a 'level playing field' compared to "BAU" in 45% target:
  - Typical residential bills average $94 pa lower in period 2020-30.
  - Cumulative savings up to $1,033



Key Findings

3. The technology neutral framework provides the lowest residential electricity bills from 2020-30.

- Efficiency benefits of technology neutral policy settings are enough to offset impacts of a higher target (45% vs 26-28%).



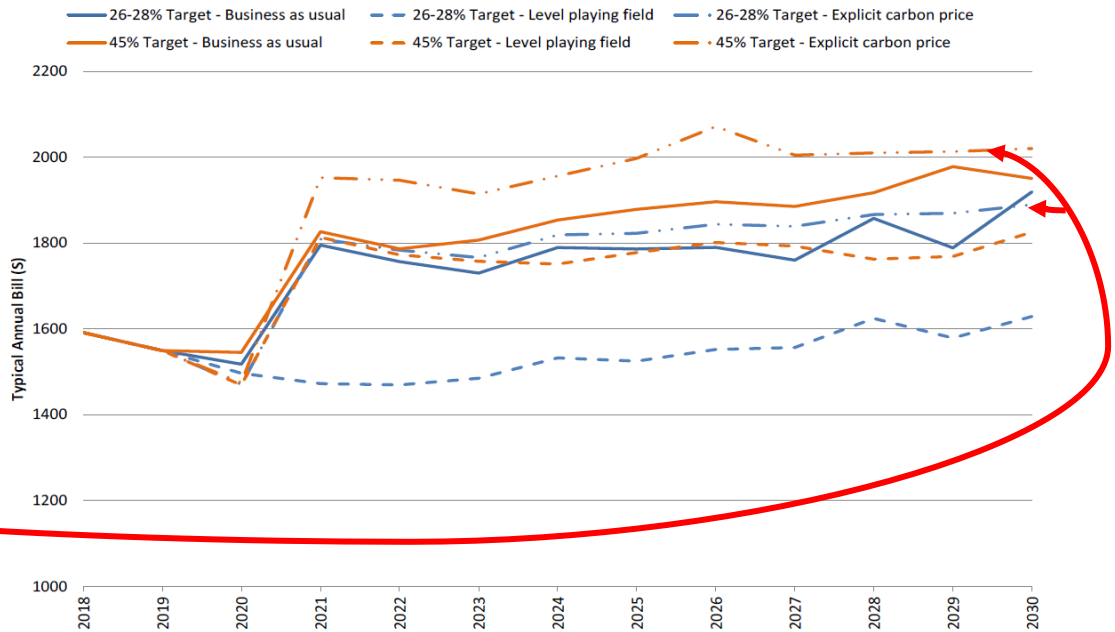
Key Findings

4. Residential outcomes of Carbon Price Scenario depend on approach to household transfers.

NOTE:

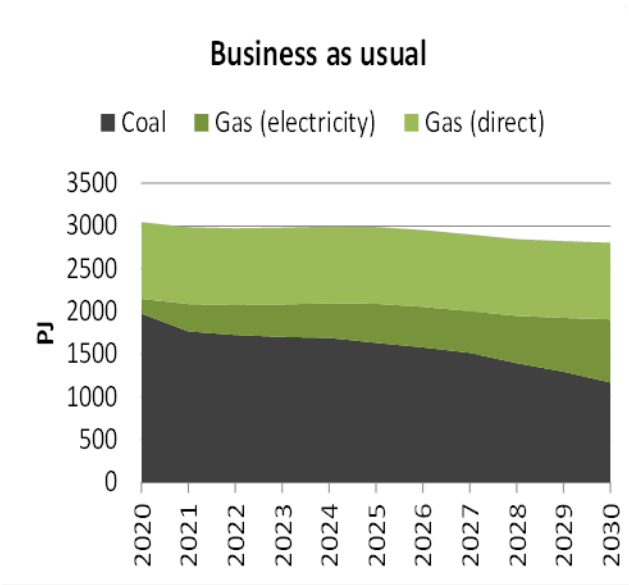
Explicit Carbon Price scenario bill outcomes do not reflect the final household financial outcome.

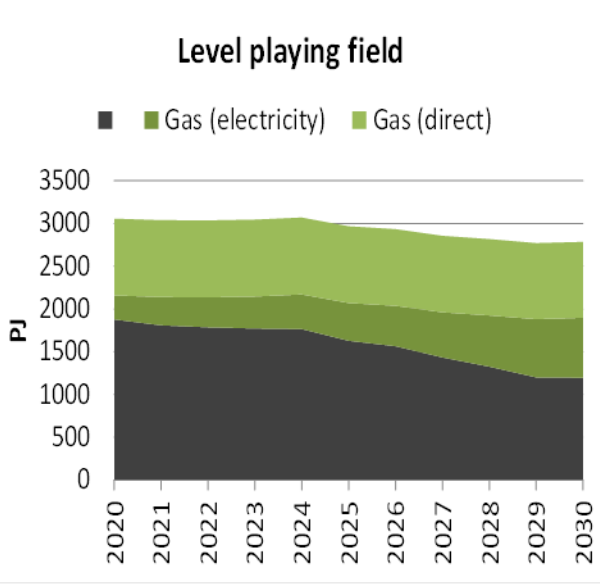
No adjustment has been made for any offsetting household payment/relief which would be possible from scheme revenue.

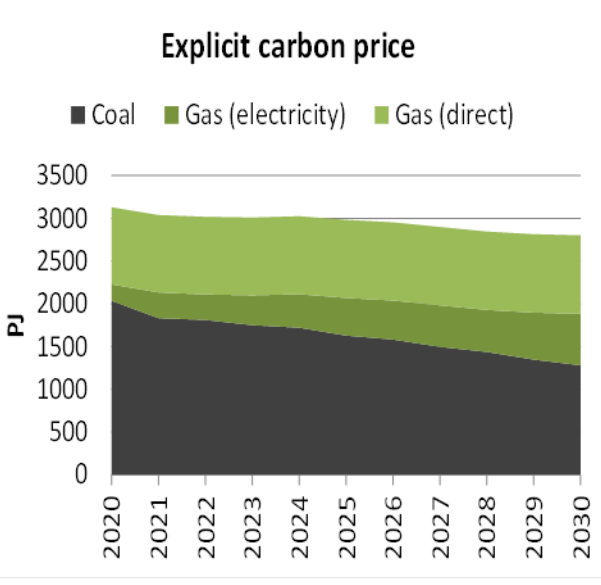


The Role of Gas in Climate Policy Options

> Key Results – gas usage in the 26-28% scenario

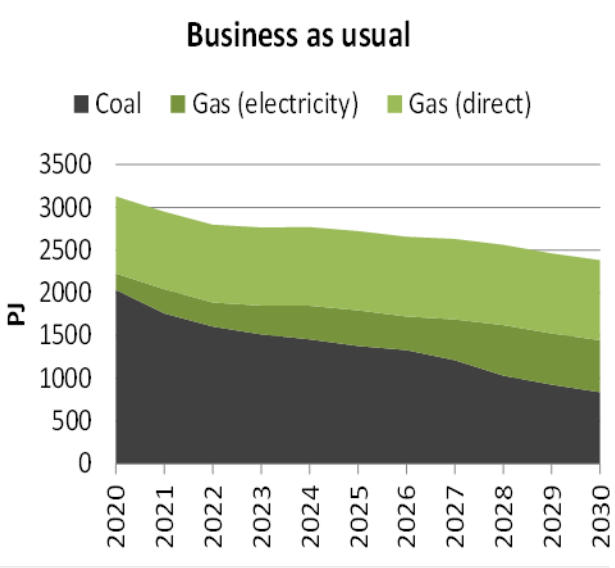


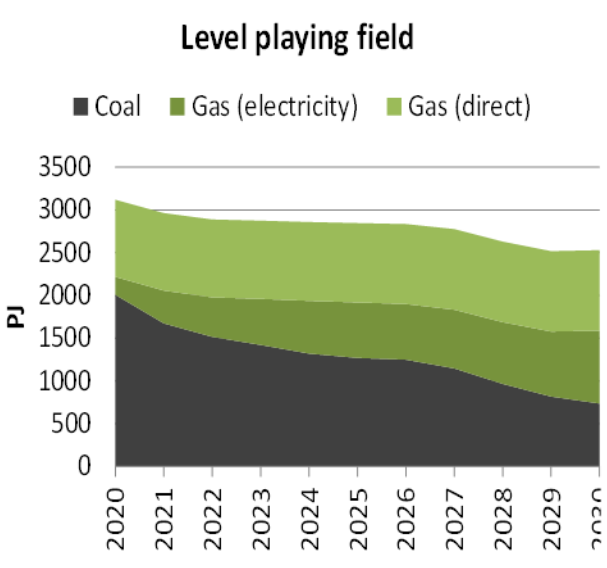


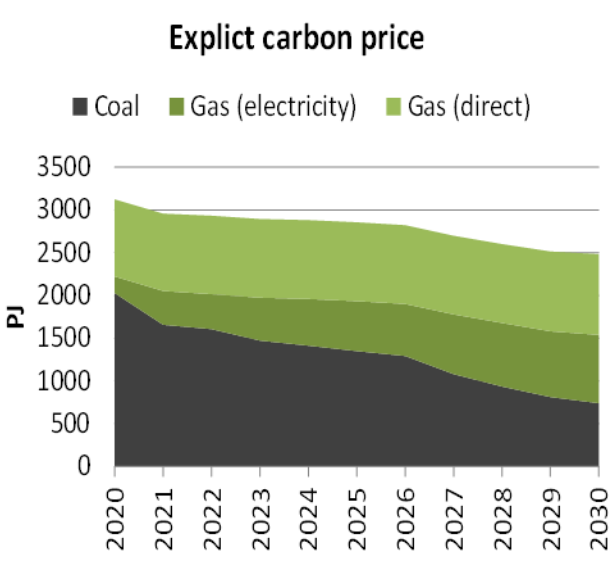


The Role of Gas in Climate Policy Options

> Key Results – gas usage in the 45% scenario







Key Findings

- The achievement of Australia's abatement targets does not require technology-specific abatement programs.

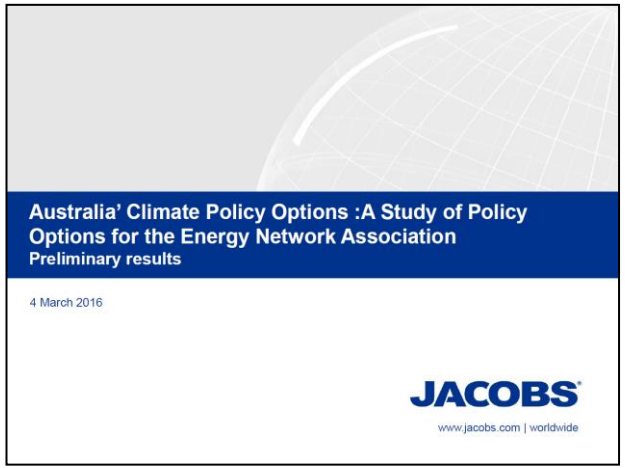
- The lowest economic cost is associated with:
  - Market based mechanisms applied broadly across the energy sector that allow for the lowest cost options to be adopted
  - Technology neutral policies

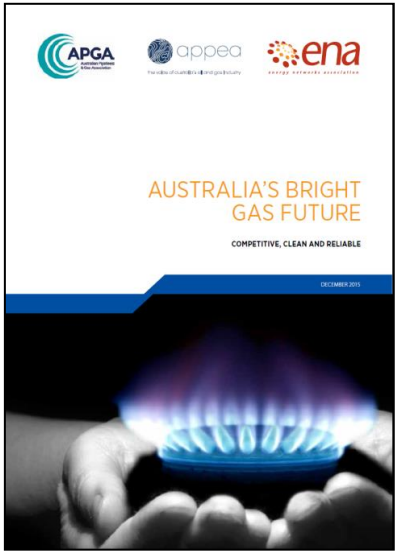
- The lowest residential electricity bills occur with:
  - Level playing field for technologies to participate in mitigation
  - Where trading around liabilities is allowed

- In the period under study, Australia's domestic gas usage needs to increase in all scenarios from 2020 to 2030 due to the need to deploy low emission technologies

More information….

www.ena.asn.au





MEDIA RELEASE

EMBARGOED: 10 March 2016

Technology neutral policies will deliver lower bills

A move to "technology neutral" carbon policy could save a typical residential electricity customer $234 per year while still meeting Australia's emission reduction targets.

Speaking at *Australian Domestic Gas Outlook 2016,* Energy Networks Association (ENA) CEO, John Bradley, released analysis from a forthcoming Jacobs report on carbon abatement policy options and the outcomes for consumers.

"Australia's carbon policy is at a crossroads and the next Federal Government will determine how efficiently we meet the 2030 carbon abatement commitments from Paris," Mr Bradley said.

"Governments can save the Australian economy over $600 million and electricity customers $234 per year by allowing all low emission technologies to play their role in meeting current targets.

"Left as they are, Australia's abatement programs will see residential electricity bills 15% higher than they need to be to achieve our emission reduction targets."

The Jacobs analysis compared a *Business as Usual* scenario (where current State and Federal policies continue to focus on renewables) with a *Level Playing Field* scenario (using a Low Emission Target and subsidies based on abatement not technology) and an *Explicit Carbon Price* scenario.

"Our current policy settings squeeze out low emission fuels like gas that can have one-quarter to one-sixth the carbon intensity of mains electricity," Mr Bradley said.

"The analysis shows, if policies focus on least cost abatement, Australia will still see a surge in renewable generation, but will also make efficient use of high quality gas resources and save customers over $2500 by 2030."

Mr Bradley said the savings from technology neutral policy settings could be enough to offset an increase in the abatement target from 26-28% below 2005 levels by 2030, to 45%.

"Jacobs analysis shows a typical residential electricity bill in 2030 would be lower under a 45% target scenario with a Level Playing Field, than under the smaller 26-28% abatement target with our current, inefficient policy mix.

"The lowest residential electricity bills were achieved with a Level Playing Field, where the Renewable Energy Target evolves to a low emissions target and today's Safeguard Mechanism becomes a 'baseline and credit' scheme allowing some trading."

Mr Bradley said the Jacobs analysis indicated an explicit carbon price delivered the lowest cost to the Australian economy, with savings of up to $8.2 bn under a 45% target, when compared to current policy settings.

ENERGY NETWORKS ASSOCIATION WWW.ENA.ASN.AU
PHONE +61 2 6272 1555 EMAIL info@ena.asn.au ADDRESS Level 1, 110 Giles Street, Kingston ACT
ABN: 57106735406

However, in this scenario, residential electricity bills were higher and the household financial outcome would depend on how any offsetting payments were made from scheme revenue.

"Australian energy ministers rightly recognise the need for better integration of carbon and energy policy," Mr Bradley said.

"Australia can achieve its current and future carbon targets efficiently and minimise the impacts on electricity customers, but this will require a level playing field from government policy."

-Ends-

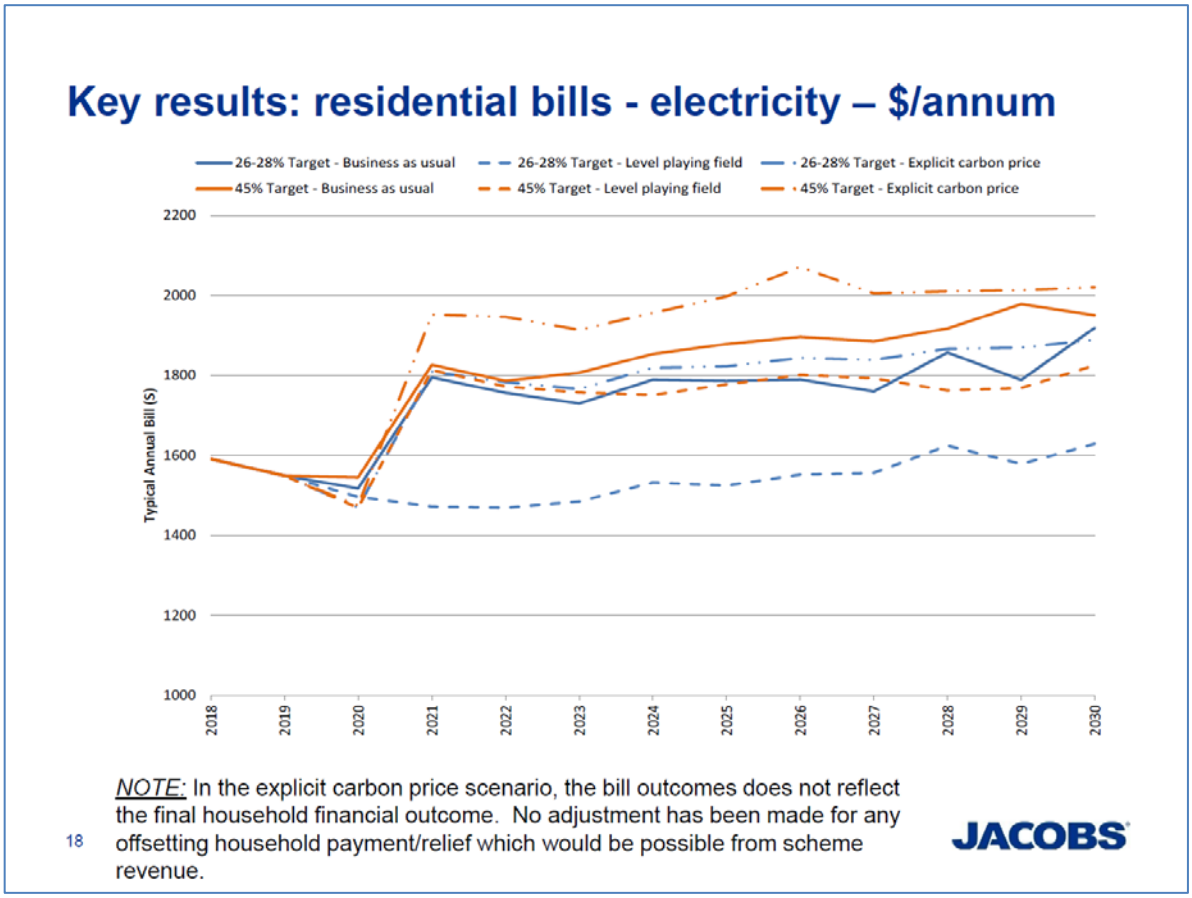
See attached Fact Sheet.

Media Contact:
Simone Reading
02 6272 1524 or 0447 569 029

The Energy Networks Association is the peak national body representing Australia's electricity transmission and distribution networks and gas distribution networks on economic, technical, environmental and safety regulation, and national energy policy issues. ENA members provide energy to virtually every household and business in Australia.

Fact Sheet: Jacobs analysis of carbon policy options

Scenario	Key Features
Business As Usual	Assumes the continuation of the diverse range of various State and Federal abatement initiatives which prescribe specific technologies (e.g. renewables) or scale (e.g. SRES, FiT) and the extended use of a binding Safeguards Mechanism which limits sectoral emissions without trading. In addition, in the 45% target scenario a carbon price and 50% RET is assumed.
Level Playing Field	Assumes the current abatement initiatives are made technology neutral (eg. via a low emissions target scheme) and indifferent to scale. In the 26-28% target, it assumes that the Safeguards Mechanism evolves to a baseline & credit mechanism permitting trading among participants. In addition, in the 45% target scenario a carbon price and 50% LET is assumed.
Explicit Carbon Price (only)	This scenario assumes that an explicit carbon price is established through a mechanism equivalent to a whole of economy carbon tax or emissions trading scheme. All other abatement policies (eg RET, SRES) are removed



Australia's Climate Policy Options: A Study of Policy Options for the Energy Networks Association

Preliminary results

4 March 2016

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Disclaimer

Important

The material in this presentation has been prepared by Jacobs®.

JACOBS®

Key Findings

- Carbon reduction targets for 2030 for the stationary energy sector can be met using the different policy approaches modelled.
  - The greater the target reduction the higher the contribution from electricity generation compared to direct combustion in meeting the target
- The lowest economic cost is associated with:
  - Market based mechanisms applied broadly across the energy sector that allow for the lowest cost options to be adopted
  - Technology neutral policies
- The lowest residential electricity bills occur with:
  - Level playing field for technologies to participate in mitigation
  - Where trading around liabilities is allowed
- In the period under study, Australia's domestic gas usage needs to increase in all scenarios from 2020 to 2030 due to the need to deploy low emission technologies

Objective

- Quantify the impacts of alternative policy approaches to achieve the stated national emission reduction target in 2030.
- The analysis focuses on achieving this target in stationary energy activities through 3 alternative means:
  - *Business as usual*: Assumes the continuation of the diverse range of various State and Federal abatement initiatives which prescribe specific technologies (e.g. renewables) or scale (e.g. SRES, FiT) and the extended use of a binding Safeguards Mechanism which limits sectoral emissions without trading. *In addition, in the 45% target scenario a carbon price and 50% RET is assumed.*
  - *Level playing field scenario:* Assumes the current abatement initiatives are made technology neutral (eg. via a low emissions target scheme) and indifferent to scale. In the 26-28% target, it assumes that the Safeguards Mechanism evolves to a baseline & credit mechanism permitting trading among participants. *In addition, in the 45% target scenario a carbon price and 50% LET is assumed.*
  - *Explicit carbon price scenario*: This scenario assumes that an explicit carbon price is established through a mechanism equivalent to a whole of economy carbon tax or emissions trading scheme. All other abatement policies (eg RET, SRES) are removed.

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Objective

- There are two targets in 2030 to be covered under the analysis:
  - a 26 to 28% reduction on 2005 levels and
  - a 45% reduction on 2005 levels.
- The relevant target is met in each of the six scenarios using 3 different policy frameworks

	26-28% Target	45% Target
Business as usual	☑	☑
Level playing field	☑	☑
Explicit carbon price only	☑	☑

- Note: all 45% target scenarios include a carbon price mechanism

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Method

- Integrated modelling approach.
- The models used:
  - *DEAM (part of the SEAM suite of modules covering the direct combustion sector): provided insights on abatement options and costs for the direct combustion sector).*
  - *DOGMMA: provides projections of uptake of small scale generation and electricity displacement systems.*
  - *Strategist: Model of electricity markets: determines dispatch of plant and investment in new plant using least cost programming methods.*
- Study period: 2015 to 2035
  - Study went beyond 2030 as investment choice to 2030 are affected by what happens after 2030 given the long life of energy assets.
  - Policies announced assume a 2020 start.

Method

- Abatement policies modelled:
  - RET/LET: determine uptake of eligible options to meet cumulative target to 2030.
    - Under RET, only renewable energy options allowed.
    - Under LET, all low emission options with an emission intensity below a benchmark of 0.6 t/MWh earnt certificates with the proportion of certificates earnt based on their emission intensity relative to the benchmark.
    - Based on least cost choice of options.
    - Certificate price determined by LRMC of last plant required to meet the target.
  - SRES: projections of uptake of small scale generation and electricity displacement systems (extending eligibility in level playing field scenarios to microgeneration, trigeneration and efficient gas heating).
  - Safeguarding mechanism: Gradually reducing the absolute baselines for facilities operating at emissions above sectoral baselines. For the 26 to 28% target current policy scenarios, this was the main mechanism to meet long term targets.
  - Baseline and credit: Used in the level playing field 28% target scenario. Sectoral baselines were established reducing from 2020 to 2030 to meet the emission target. Generators with emission intensity above the baselines can trade with generators with emission intensities below the baseline to cover their emission liabilities.
  - Carbon pricing: applying a carbon price to fuel combustion emissions. Gradually increased starting price to achieve 2030 target. Used only in 45% target scenarios and in the 28% Explicit carbon pricing scenario.

Method

- Iterative process:
  - First determine level of emissions from technology pull policies
  - Then meet target by adjusting residual policy (absolute baselines, sectoral baselines, carbon prices)

Policy assumptions

	Carbon	RET	ERF & AB	SRES	LET	State and territory EE and RE policies
G1	N/A	33,000 GWh renewable generation	Set to achieve the 26-28% target	Extended to 2030	N/A	Extended to 2030
G2	N/A	N/A	Set to achieve the 26-28% target	Expanded to low emission technologies and extended to 2030	Higher RET type target but extended to cover all low emission technologies	Expanded to low emission technologies and extended to 2030
G3	Carbon price path to achieve 26-28% target	N/A	N/A	N/A	N/A	N/A
O1	Carbon price commences in 2020 to assist in achieving 45 % reduction by 2030	Higher GWh target to achieve 50% of electricity demand and scheme extended to 2040	N/A	Extended to 2040	N/A	Extended to 2030
O2	Carbon price commences in 2020 to assist in achieving 45 % reduction by 2030	N/A	N/A	Expanded to low emission technologies and extended to 2040	Higher GWh target extended to all low emission technologies	Expanded to low emission technologies and extended to 2030
O3	Carbon price path only measure to achieve 45% target	N/A	N/A	N/A	N/A	N/A

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Assumptions

	Energy Sector Emissions (Mt CO_2-e pa)		
	Electricity	*Gas (direct combustion)*	*Total*
2005 Emissions (DoE)	197	61	258
26-28% Target	144	45	188
45 % Target	108	34	142
2013 Emissions	187	70	257

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Key results

- If emission targets are higher (i.e. 45%), the electricity sector does proportionally more to meet emission targets
  - Direct combustion sector has already done the fuel switching (to gas) so limited opportunities for further fuel switching from high emission fuels to low emission fuels. Opportunity is switching end use from electricity to gas.
  - For electricity: abatement comes mainly from a switch to gas and renewable energy generation with the proportion determined by policy mix
  - For direct combustion: abatement comes from energy efficiency (including cogeneration in industrial sector), and fuel switching, mainly to gas.

Key results

- Fuel/technology mix results:
  - Overall fuel usage over the period declines because overall energy demand declines and because of higher renewable energy generation in some scenarios.
  - Gas usage needs to increase in all scenarios from 2020 levels by between 35 and 61%.
    - Usage is highest in the technology neutral scenarios
  - Mixed results for coal usage particularly from electricity generation
    - Overall coal reduces in all scenarios by between 36 & 64%.
    - In some scenarios there is a switch from brown coal generation to black coal generation as that produces a lower emission option.
  - Increase in renewable electricity generation in all scenarios (from 45 to 202%)

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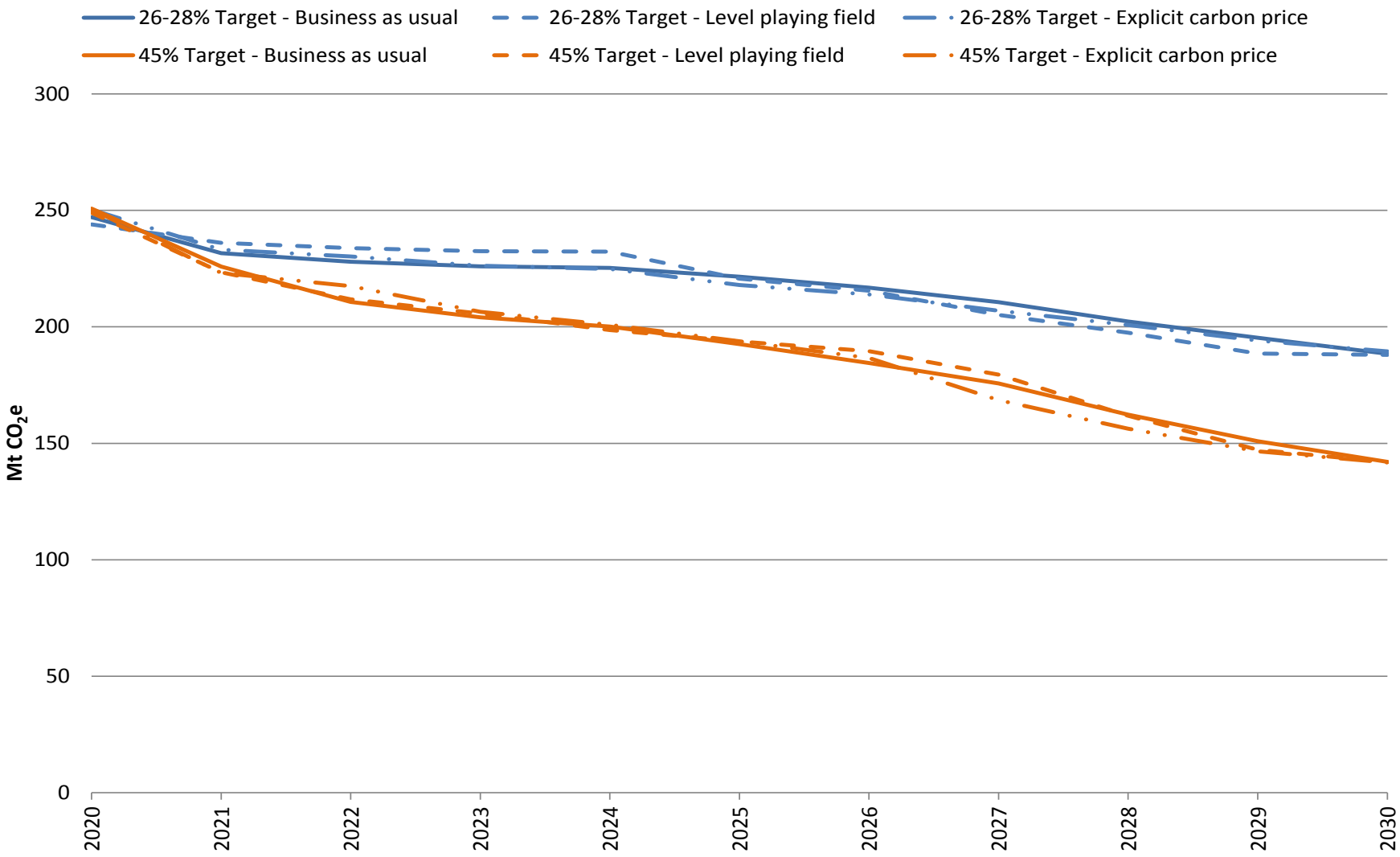
Key results

- Costs:
  - Lowest economic cost for explicit carbon pricing scenarios
    - The cost difference is higher under the higher carbon reduction target scenarios (45%)
    - The level playing field has lower economic cost than business as usual
  - Increase in investment is required in new gas and renewable generation plant under all scenarios
    - Gas plant investment ranges from 6,600 MW to 7,500 MW in the 28% target scenarios, and 8,200 MW to 10,000 MW in the 45% target scenarios
    - Renewable plant investment ranges from 4,800 MW to 8,400 MW in the 28% target scenarios and 13,000 MW to 22,000 MW in the 45% target scenarios

Key results: emissions



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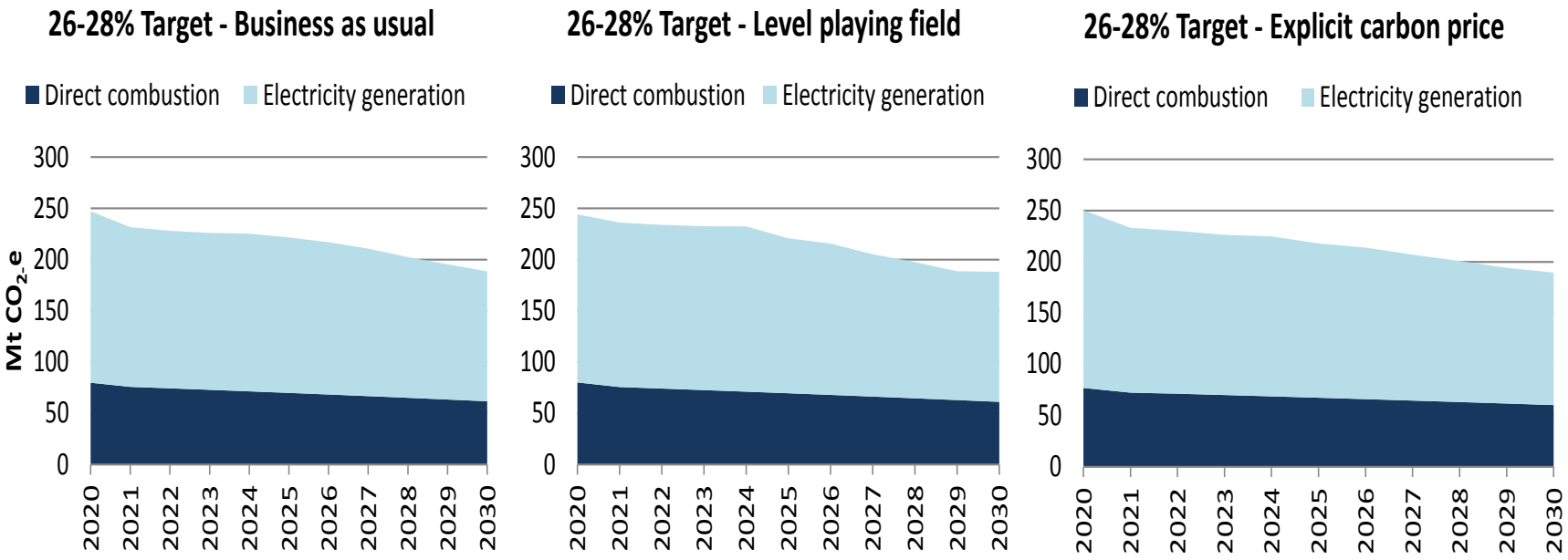
Key results: emissions



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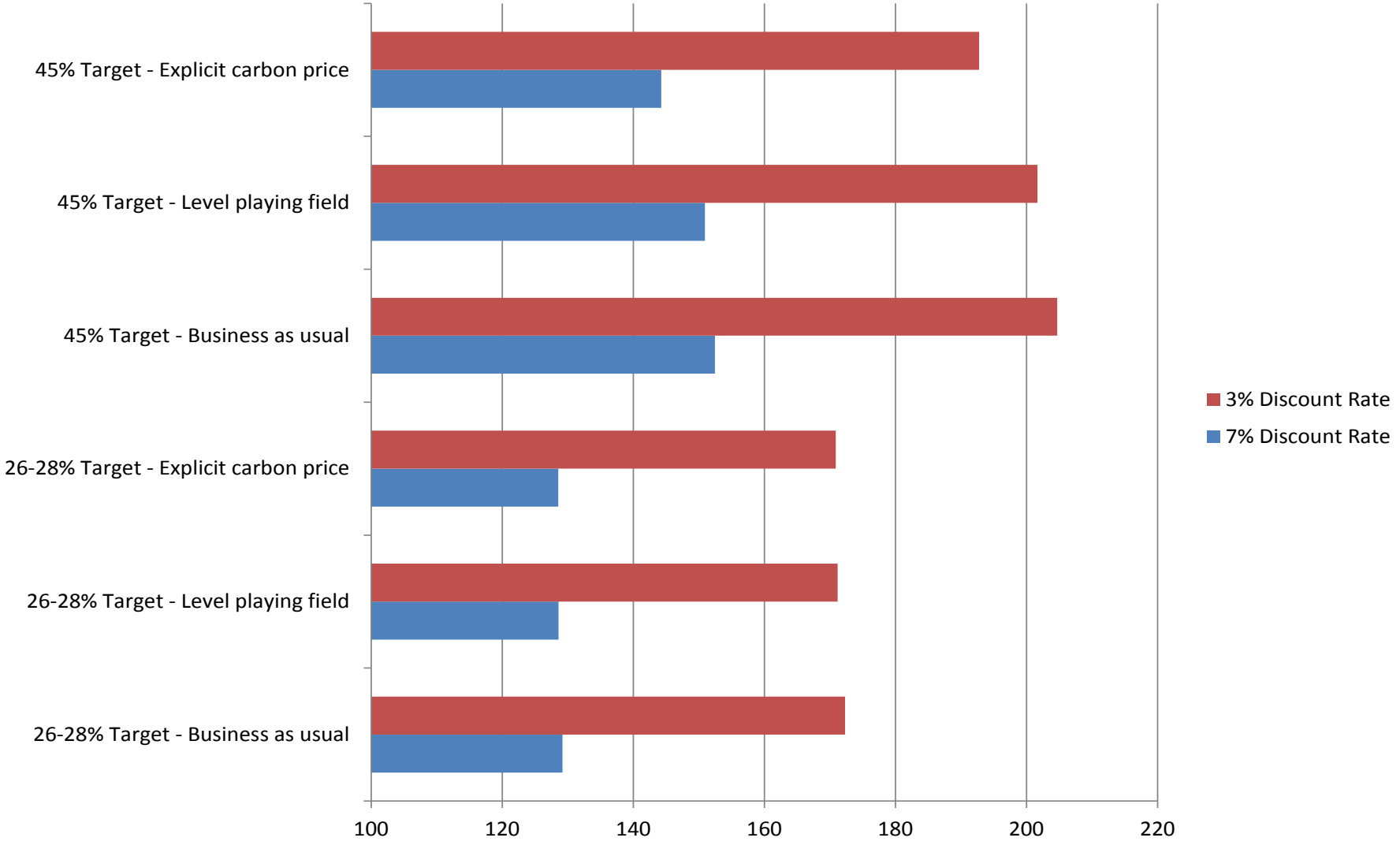
Key results: resource costs - electricity – $ billion



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Key results: resource costs - electricity – $ billion

	Abatement Target			
	26 to 28%		45%	
Policy Settings	***Total Cost***	***Savings***	***Total Cost***	***Savings***
Business as usual	$129.2 bn	-	$152.5 bn	-
Level playing field	$128.6 bn	$600 m	$150.9 bn	$1.5 bn
Explicit carbon price	$128.5 bn	$700 m	$144.3 bn	$8.2 bn

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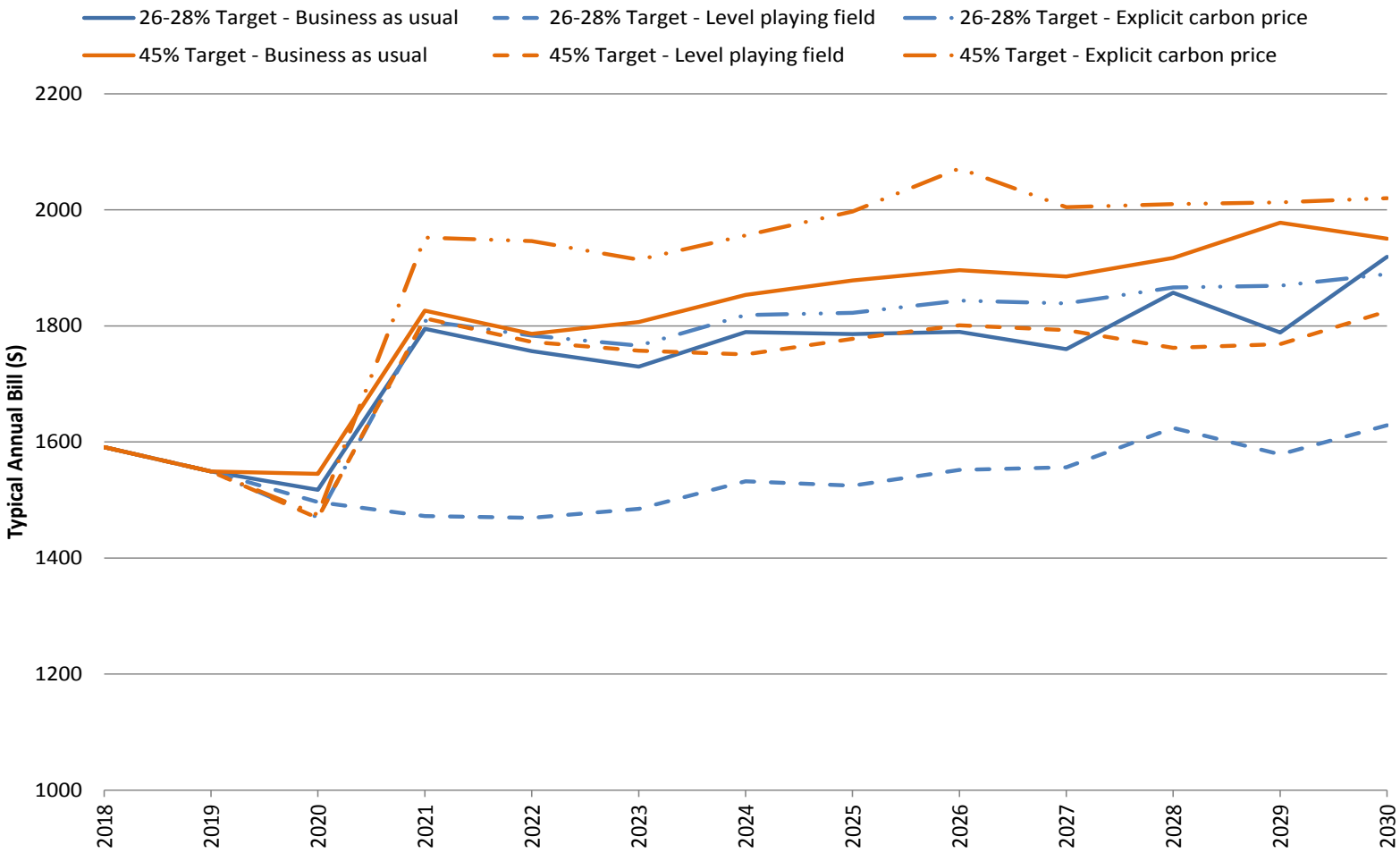
Key results: residential bills - electricity – $/annum



NOTE: In the explicit carbon price scenario, the bill outcomes does not reflect the final household financial outcome. No adjustment has been made for any offsetting household payment/relief which would be possible from scheme revenue.

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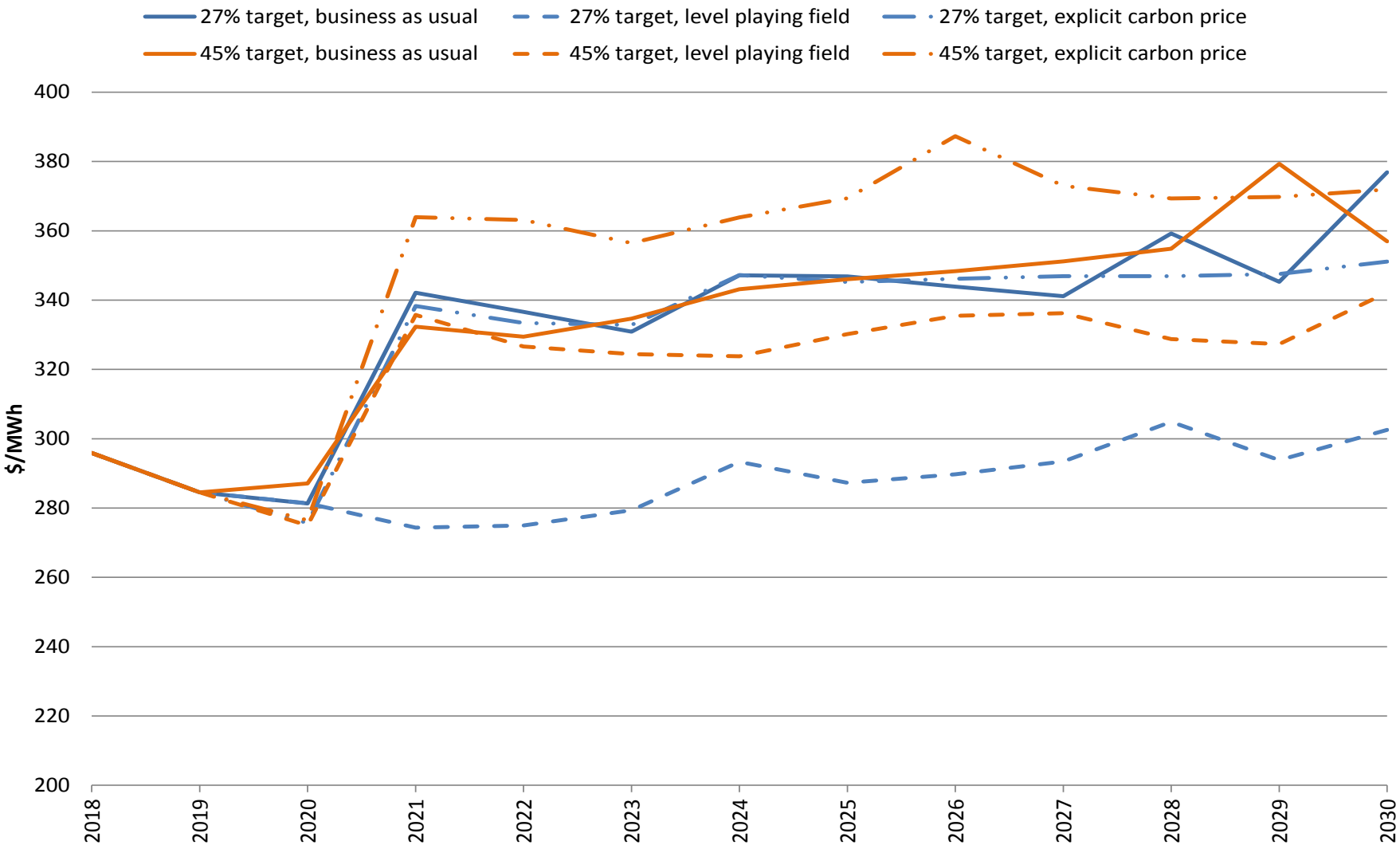
Key results: residential prices - electricity – $/MWh



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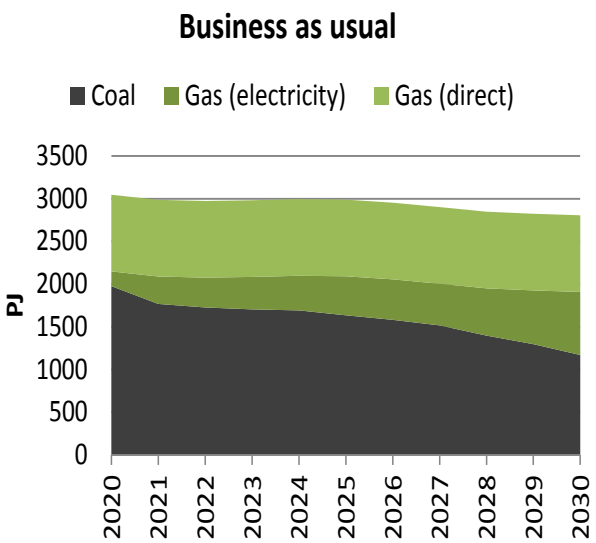
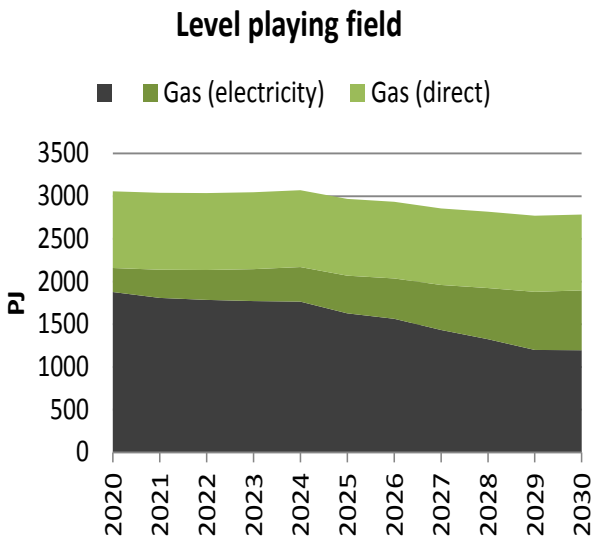
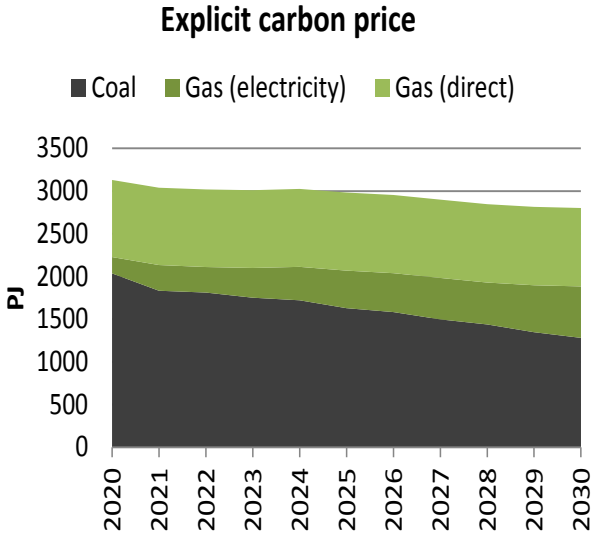
Key results: fuel usage – 26 to 28% target







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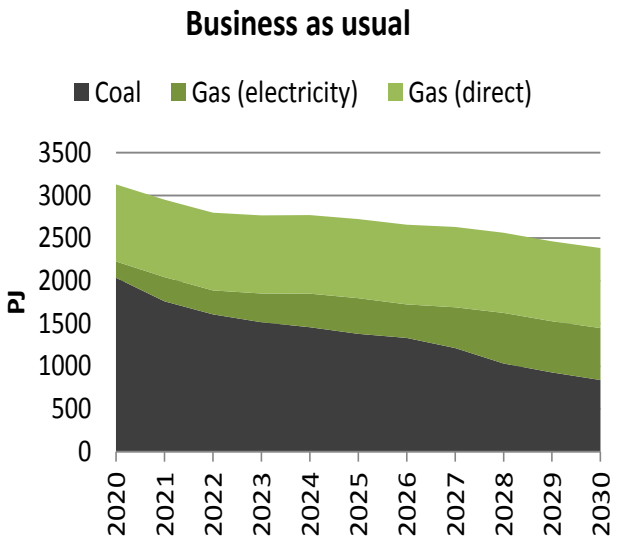
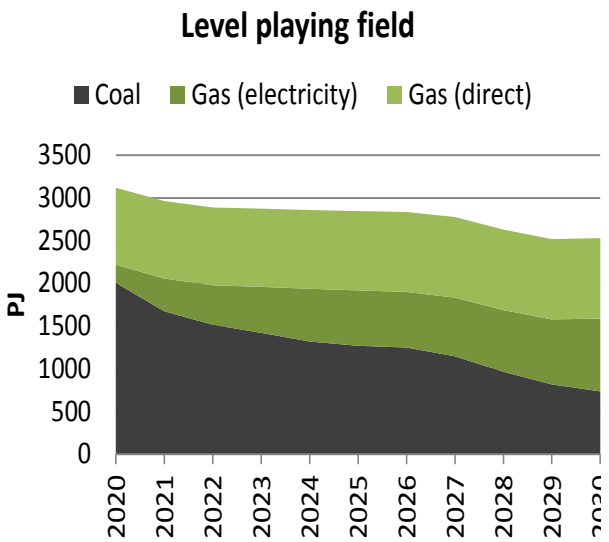
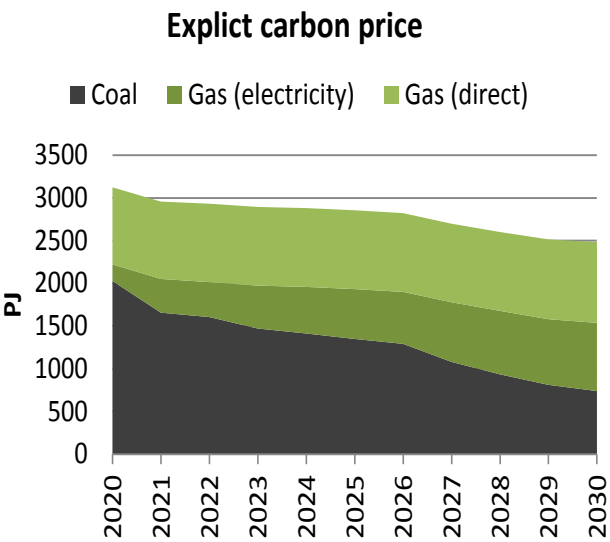
Key results: fuel usage – 45% target







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Limitations

- The energy mix will be affected by post 2030 targets.
- Potential industrial plant closures (and subsequent net reduction in energy demand) not included in modelling
- Abatement options for direct combustion sector limited to energy efficiency and fuel switching

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