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Burning gas in a net-zero world?

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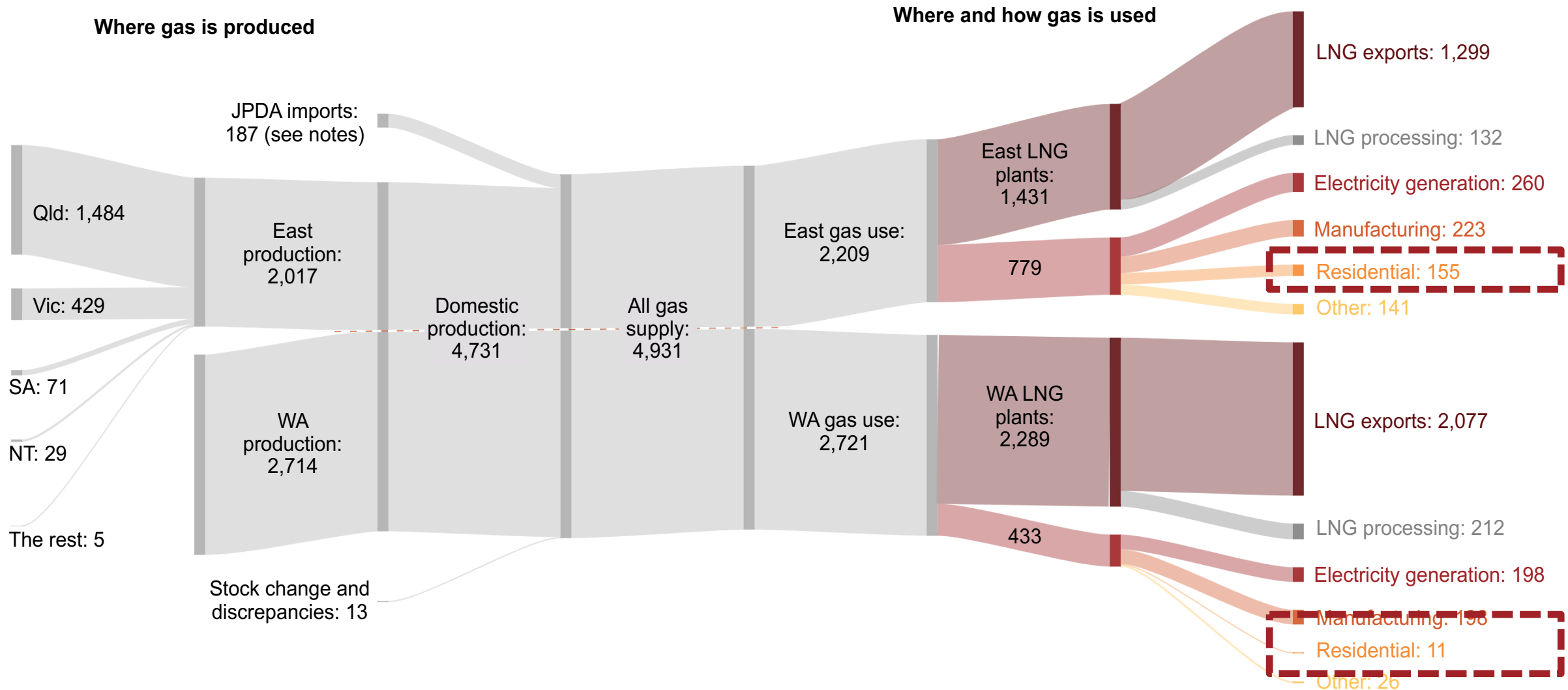
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Burning gas in a net-zero world home?

Guy Dundas
Grattan Institute

Energy Futures webinar
Melbourne Energy Institute & Grattan
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Residential gas use is relatively small, but creates a range of interesting policy issues



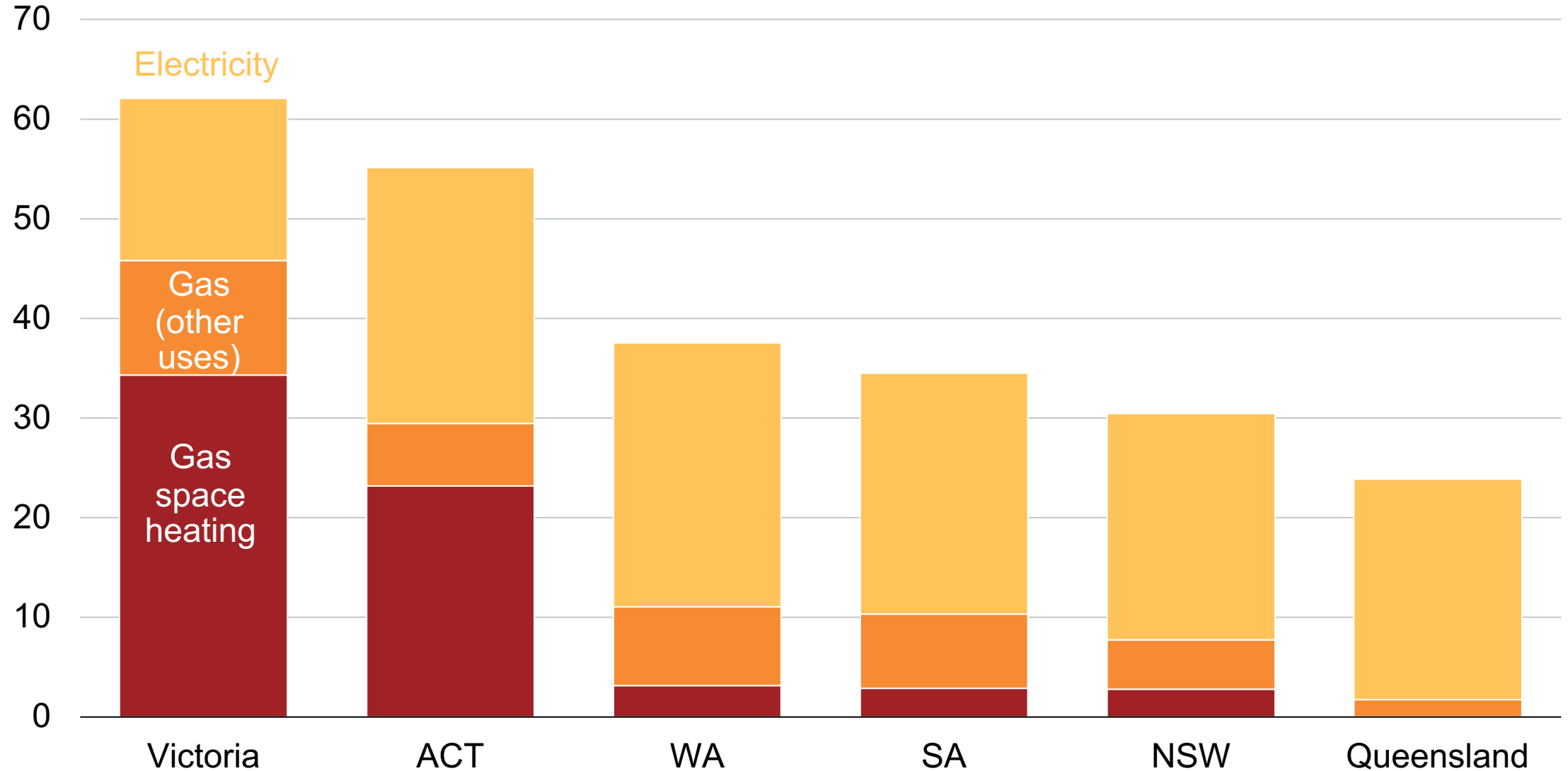
Notes: JPDA is the Joint Petroleum Development Area shared by Australia and Timor-Leste. Data is for 2017-18.

There are three main ways to reduce emissions from household gas use

- Switch from gas to electric appliances, and take advantage of the decarbonising power grid
- Replace natural gas (a fossil fuel mainly comprising methane) with biomethane, which is chemically equivalent but carbon neutral as it is produced from biomass
- Replace natural gas with low-emissions hydrogen, either:
 - Hydrogen with CCS: converting natural gas to hydrogen ('steam methane reforming'), or gasifying coal, and capturing and storing the resulting carbon dioxide
 - Renewable hydrogen: Using low-emissions electricity to 'electrolyse' (split) water into its constituent elements, hydrogen and oxygen

Gas use varies greatly between states, and so the best way to reduce emissions may well too

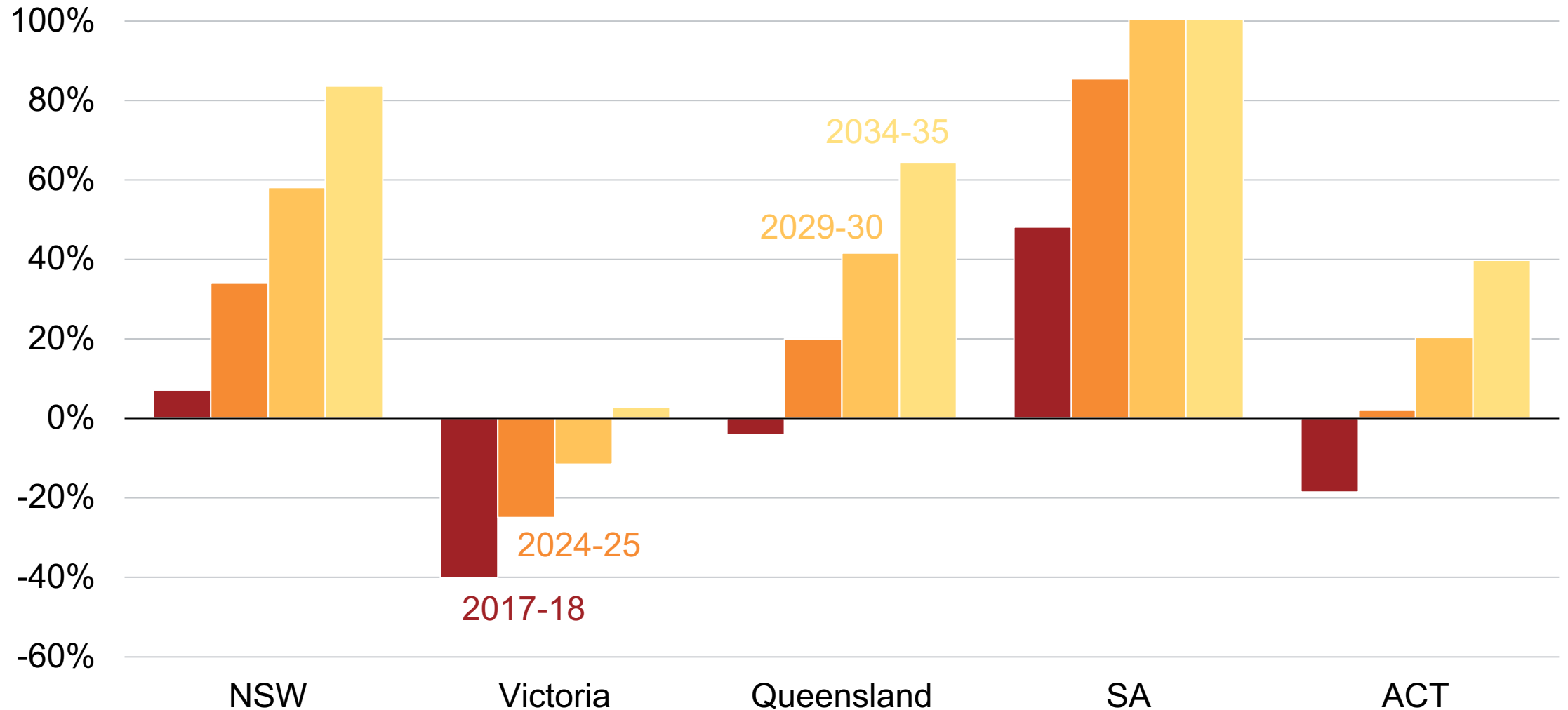
Energy use per household, 2017-18, gigajoules



Notes: data is for all households, not just those with a gas connection. Excludes LPG ('bottled gas').

The decarbonising power grid means that efficient all-electric homes are increasingly cleaner than those with gas

Change in emissions when choosing gas rather than electricity



Notes: Analysis based on homes with efficient electric appliances (induction cooking, heat pump water heater and reverse cycle air conditioner). Electricity emissions intensity assumed to reduce in line with AEMO Integrated System Plan, Central Scenario. Calculations assume no use of rooftop solar.

New all-electric homes with efficient appliances are generally cheaper than those with gas connections

State	Gas appliances switched to electric	Saving over 10 years (\$)
NSW	Cooking, hot water	900
NSW	Cooking, hot water, space heating	5,200
Victoria	Cooking, hot water, space heating	1,300 to 2,000
Queensland	Cooking, hot water	3,200
WA	Cooking, hot water	-1,300
WA	Cooking, hot water, space heating	2,500 to 3,100
SA	Cooking, hot water	2,200
SA	Cooking, hot water, space heating	5,600 to 6,100
ACT	Cooking, hot water, space heating	9,000 to 9,800

Notes: Savings rounded to nearest \$100. Analysis based on homes with efficient electric appliances (induction cooking, heat pump water heater and reverse cycle air conditioner). Savings are calculated as a net present value over 10 years at a 1.5 per cent real discount rate. When presented, ranges reflect different choices of air-conditioning (cooling) appliances. Calculations assume no use of rooftop solar.

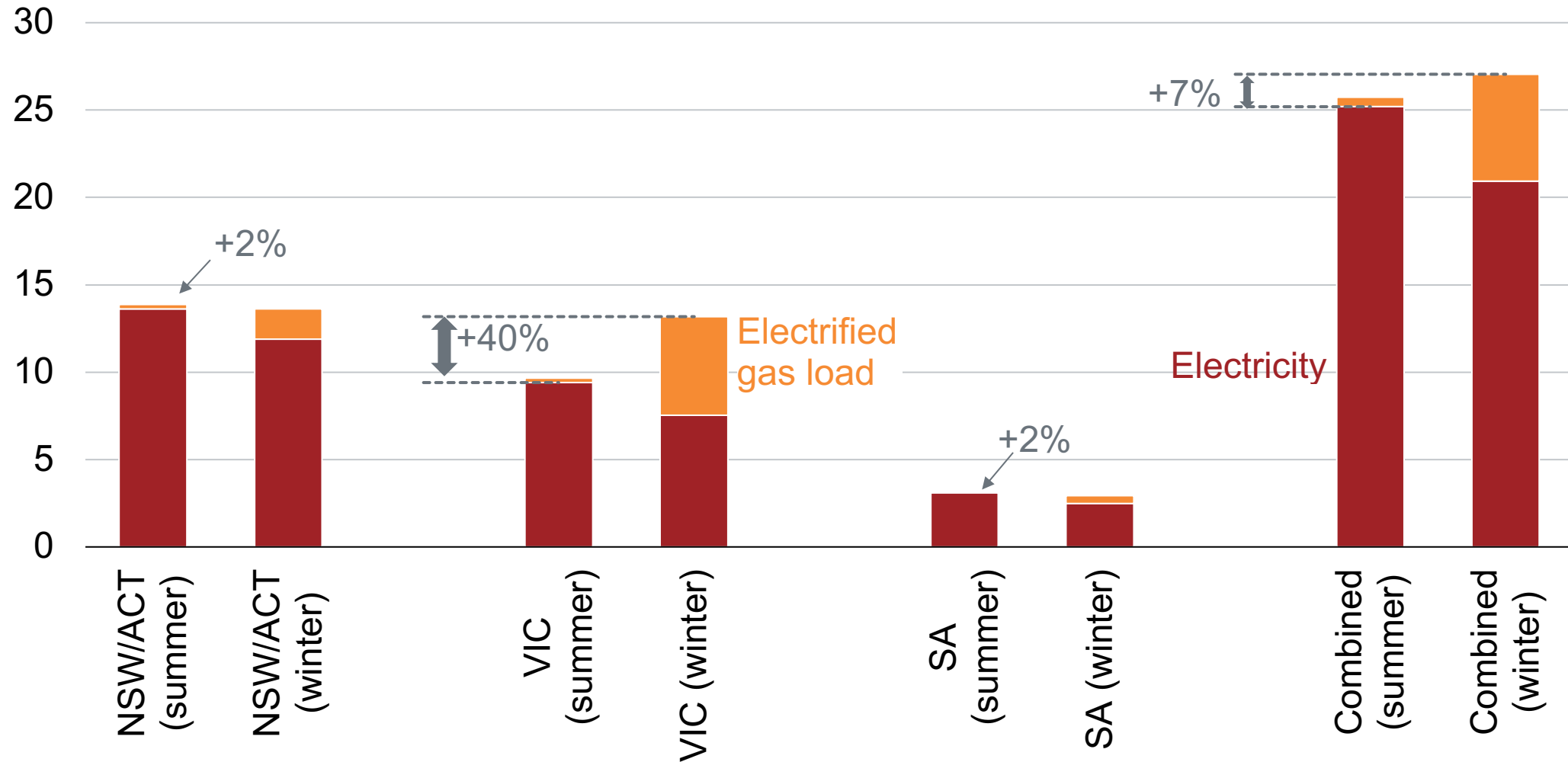
Policy conclusions: a moratorium on new gas connections is a no regrets measure in many places

State	Lowest cost fuel choice (new house)	Lowest emissions fuel choice (new house)	Restrict new gas connections?
NSW	All-electric	All-electric	No regrets
Victoria	All-electric	Dual-fuel	Higher emissions
Queensland	All-electric	All-electric	No regrets
WA	Dual-fuel (cooking and hot water)	Probably all-electric	Higher costs
SA	All-electric	All-electric	No regrets
ACT	All-electric	All-electric	No regrets

Notes: Analysis based on homes with efficient electric appliances (induction cooking, heat pump water heater and reverse cycle air conditioner). Emissions estimated over the coming decade, assuming no rooftop solar. An efficient all-electric WA house produces comparable emissions to a dual fuel house today, and is likely to be cleaner over the decade as grid emissions reduce – but a core projection of grid emissions intensity is not available.

Electrifying small user gas loads significantly increases peak demand in Victoria, but not in NSW or SA

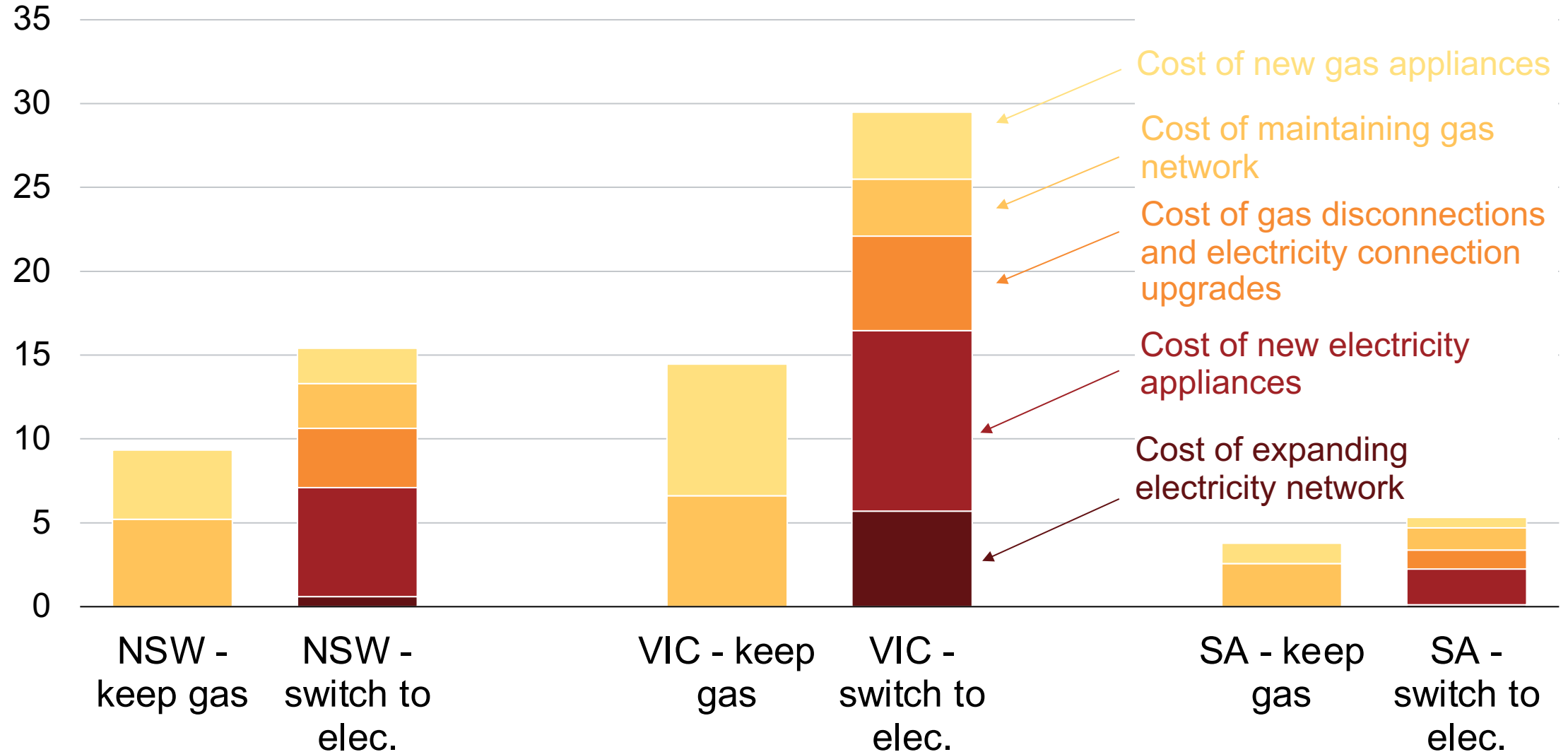
Peak electricity demand by season, gigawatts



Notes: hourly gas load data attributable to small customers (households and small commercial) converted to electricity based on assumed appliance efficiency.

The economics of switching existing homes from gas are more challenging...

Present value over 20 years, \$billion



Notes: the 'switch to elec.' scenario involves linearly phasing out gas connections over 20 years. Present value calculated using a 2.3 per cent real discount rate

... but do not rule out system-wide electrification

- The 'keep gas' scenario fails to address decarbonisation
- Lower emissions gas substitutes are likely to be more expensive than natural gas:
 - Wholesale natural gas is presently \$8 to \$10 per gigajoule
 - Biomethane in Europe ranges from \$7 to \$51 per gigajoule
 - Low-emissions hydrogen at \$2 per kilogram is equivalent to more than \$16 per gigajoule.
- Governments should:
 - work to examine the economics of different pathways in more detail
 - consider how to manage transitional issues.
- In the meantime, implementing gas moratoria in NSW, Queensland, SA and the ACT is a no regrets measure that:
 - saves cost and emissions immediately
 - avoids the potential cost and uncertainty of a future switch to low-emissions gas substitutes.
- Moratoria can preserve choice and flexibility, e.g. through:
 - allowing LPG connections in new homes
 - allowing new connections for discrete networks that will deliver low-emissions gas.