Energy Efficiency – Draft Forecasts

APRIL 2021

Strategy. Policy. Research.

Making the business case for sustainability

Approach

- EE change over time is measured against a baseline of frozen (FY2003) efficiency
- For the first time this year, we estimate *total* energy efficiency change in the historical period and seek to reconcile this with a) market-led or autonomous energy efficiency improvement (AEEI) and b) policy impacts
  - Not feasible for BMM Industrial, given data limitations
  - AEEI is not directly observable but is estimated with reference to typical values by sector and adjusted, as needed, for model fit
- We then estimate the policy-induced savings, measure by measure, discounting each as appropriate.

Measures modelled

- Major policy measures were modelled
  - Reflecting current & announced settings (Current trajectory)
  - … and possible expansion under "high ambition" scenarios

Measures	Residential	Commercial	Industrial (excl LILs)
Greenhouse & Energy Minimum Standards (GEMS)	✓	✓	✓
National Construction Code (NCC) – incl NSW BASIX	✓	✓	
NSW Energy Saving Scheme (ESS)	✓	✓	✓
Victorian Energy Upgrades (VEU)	✓	✓	✓
SA Retailer Energy Productivity Scheme (REPS)	✓	✓	✓
National Australian Built Environment Rating System (NABERS)		✓	
Commercial Building Disclosure (CBD)		✓	
Emission Reduction Fund (ERF)		✓	
Clean Energy Finance Corporation (CEFC)		✓	
Other State Energy Savings Schemes (high ambition scenarios	✓	✓	✓
Industrial Assessment (including former EEO)			✓

Workshop feedback

- Stakeholder input
  - Workshop (24 March): discussed methodology, assumptions, gaps & improvements
  - 70 participants

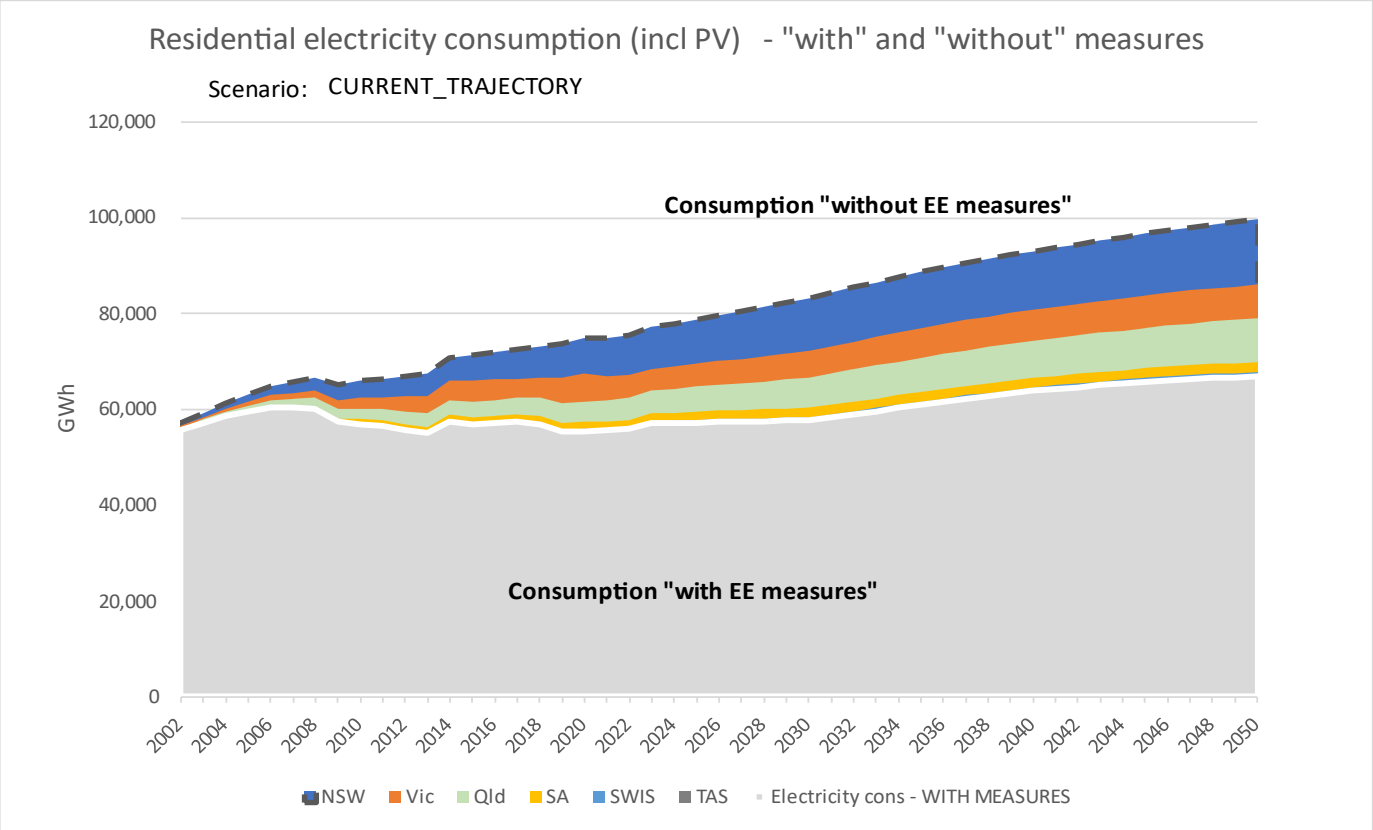
- Key feedback/ take-outs:
  - Broad acceptance of proposed method & assumptions
  - Some support for stronger policy EE action reflected in Net Zero scenario
  - Identified options for better collaboration/data support between AEMO/ABS/DISER
  - Viewed NCC and GEMS as major attenuators of peak energy demands, and scope for better modelling of peak impacts of EE policies (but not in scope this year)

Adjustments

- Adjustments/discounts are made uniquely for individual measures
- Eg, modelled savings from the NCC commercial building energy performance requirements ('Section J') are discounted by 25% - 30% for (apparent) non-realisation of modelled savings
  - For residential, discounts of up to 50% are applied (depending on the climate zone) due to factors such as occupancy patterns, thermostat set-points and zoning
- Where available, we use observations from evaluations, eg, for the former Energy Efficiency Opportunities program
  - ACIL Allen (2013) found 'at least 50%' additionality to AEEI
- Non-additionalities between policy measures can be very significant
  - Eg, NABERS (Energy for offices) and Commercial Building Disclosure for offices > 1,000sqm, where 100% of CBD savings must be deducted from NABERS (office energy) savings

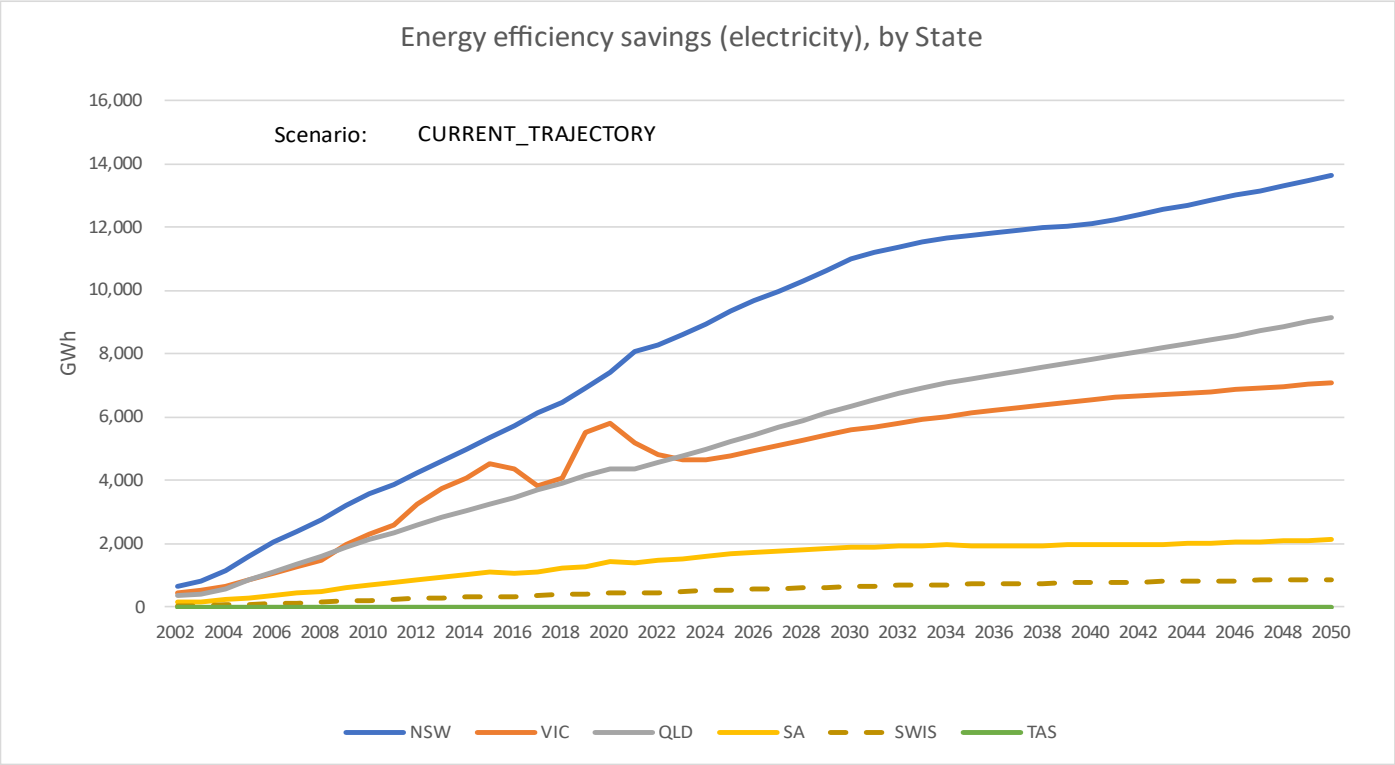
Draft Forecasts – Residential (electricity, overview)

- Energy efficiency expected to be a significant brake on residential consumption
- Significant savings are already 'baked in' - assuming no weakening of established EE standards
- Current projections: Total RES electricity demand ≈ 60 TWh pa, cf 105 TWh by FY2053
  - Note: baseline projections are our modelling (not AEMO's)
  - Note: VIC data is currently under review



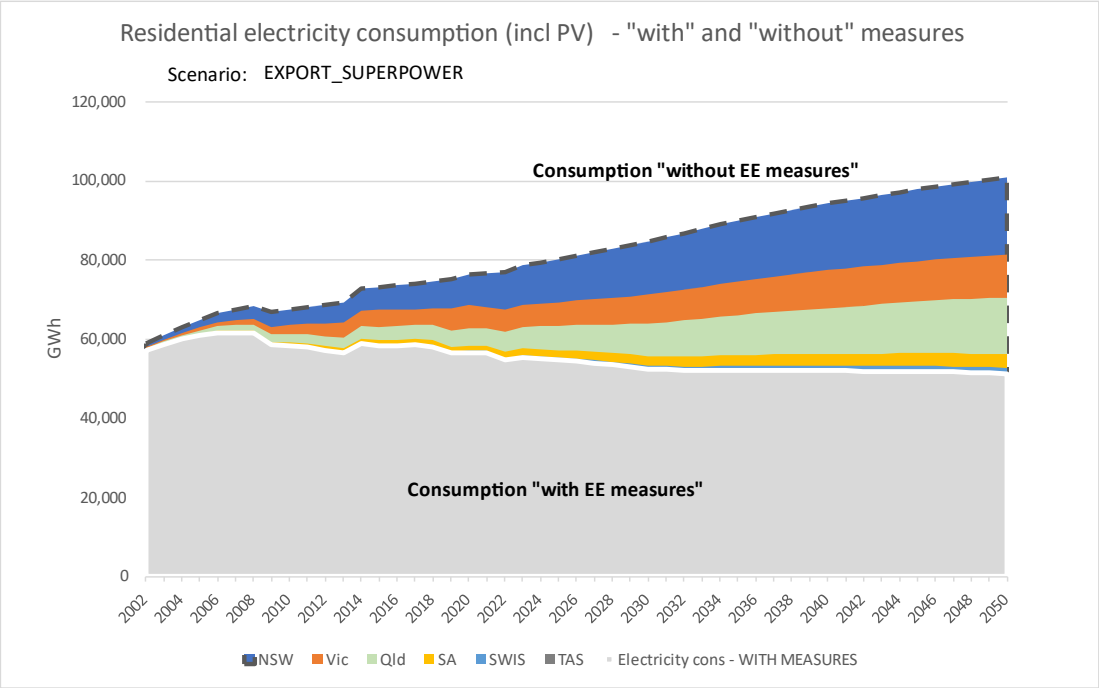
Draft Forecasts – Residential (electricity, by region)

- State EE savings total about 38.3 TWh pa, relative to FY2002
  - Equivalent to 18.7 TWh from FY2020



- VIC savings trajectory reflect historical outcomes under VEU

Draft Forecasts – Residential (electricity, by scenario)



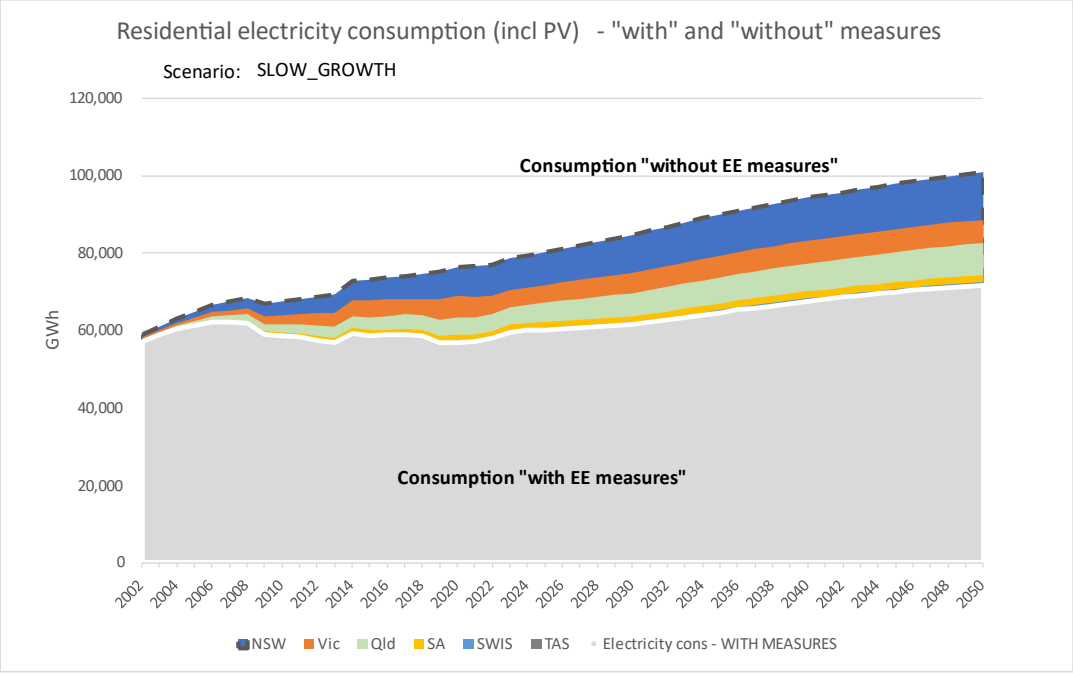
"Export Superpower"
High growth, high EE

2050 consumption = 61.6 TWh pa

Recall: baseline consumption is our modelling – NOT AEMO estimates

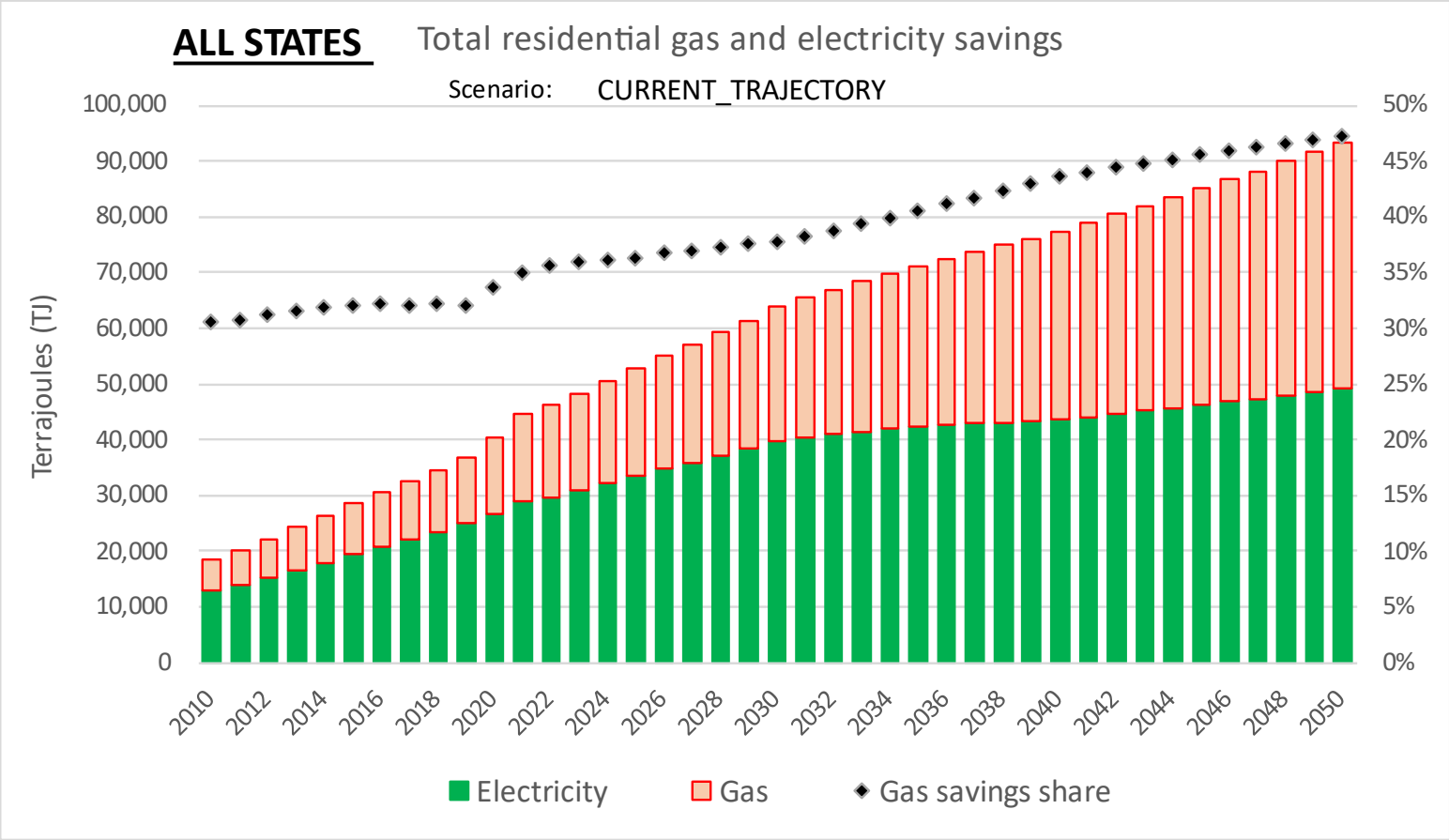
"Slow Growth"
BAU growth, minimal EE expansion

2050 consumption = 68.5 TWh pa



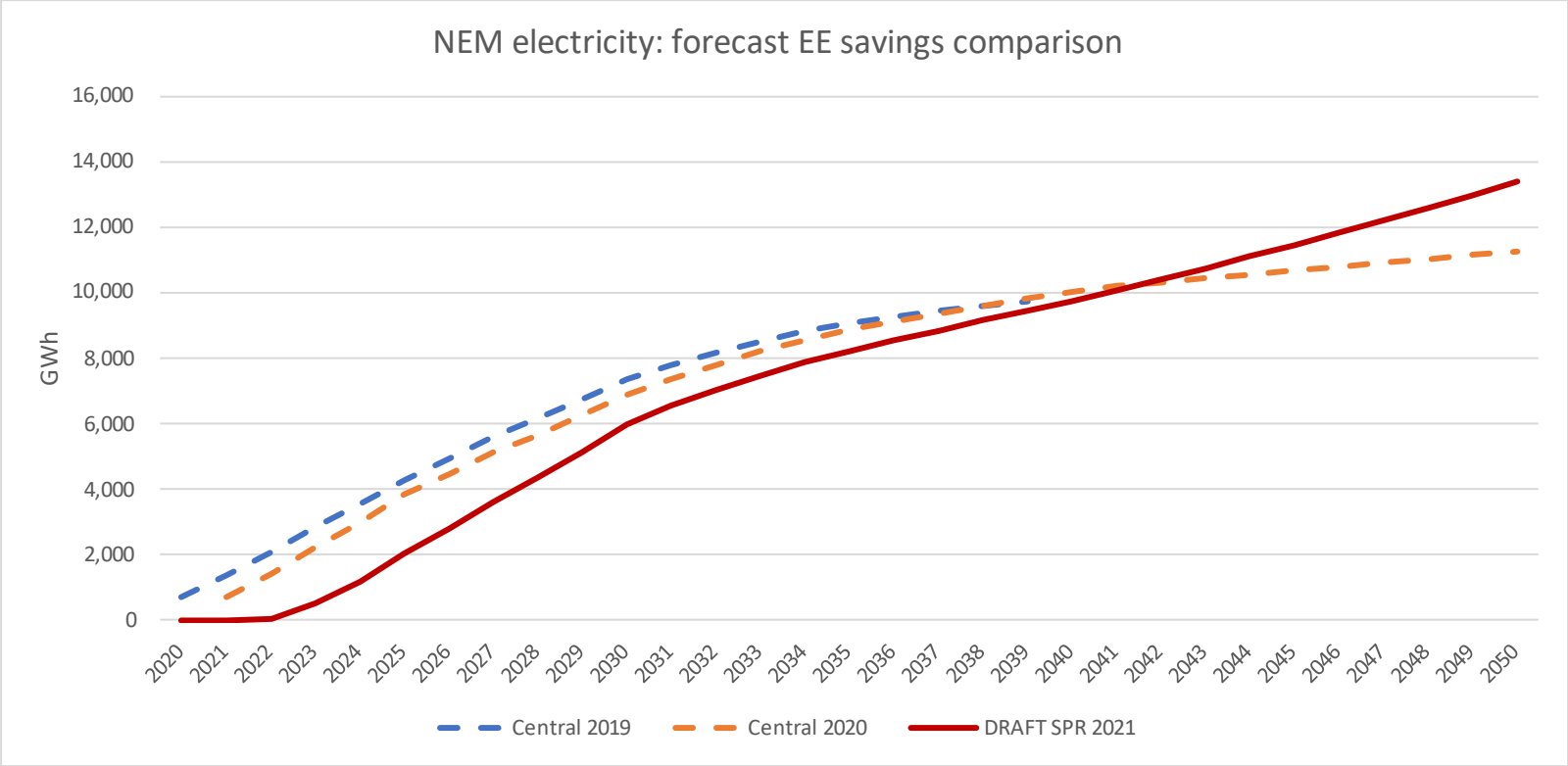
Draft Forecasts – Residential (overview, by fuel)

- Gas accounts for an increasing share of household energy savings
  - This reflects an expectation that most new housing will use heat pumps for cooling and then double as main space heater



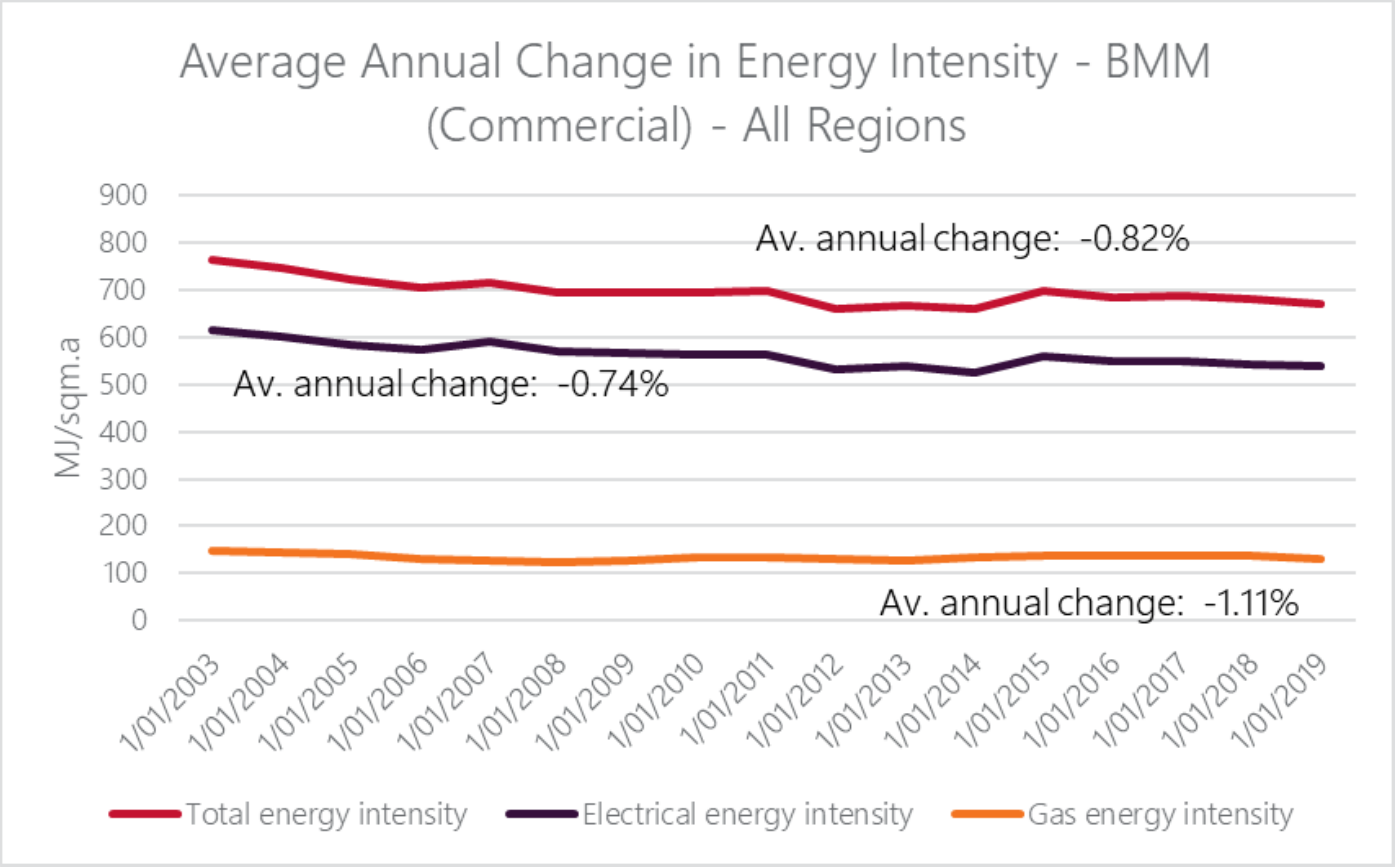
Comparison – 2021 Draft with 2019/2020 (electricity) forecasts - Residential

- SPR draft 2021 savings estimates for NEM are lower than 2019 and 2020 AEMO estimates, for the Current Trajectory –earlier forecasts included an additional a 20% discount not (yet) applied to 2021
- SPR 2021 utilises more detailed location & dwellings data than SPR 2019, and a compounding 5% pa GEMS discount, AEEI and changes in VIC (VEU and additional budget measures)



Draft Forecasts – BMM Commercial – total EE trends

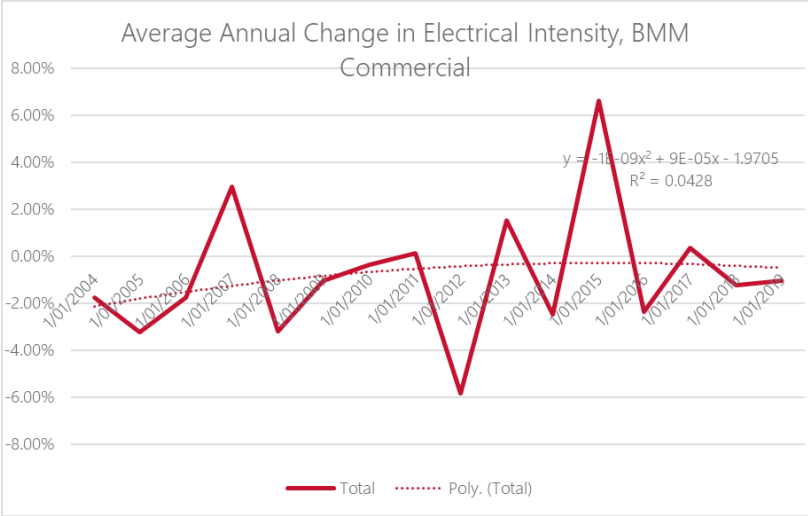
- On average over FY2003 – FY2019, average energy intensity fell by around 0.8% per year
  - Somewhat higher for gas, reflecting fuel switching
- Overall, this leaves only modest room for market-led and/or policy-induced efficiency change, as these must sum to the total

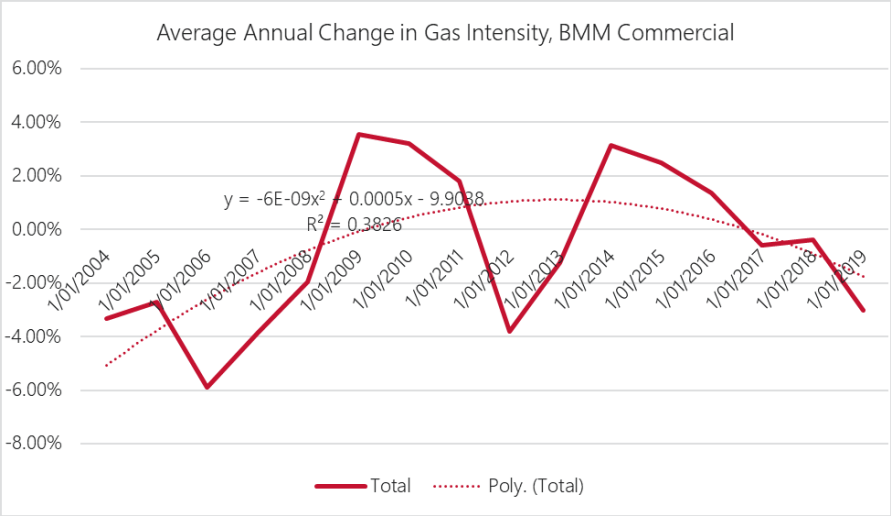


Draft Forecasts – BMM Commercial – total EE trends

- There is evidence that the *rate* of efficiency improvement (intensity reduction) appears to have slowed, during the last decade, for both gas and electricity, towards ~0%
  - Gas intensity reductions appear to have reversed, then resumed since ~2015, and possibly more recently for electricity also

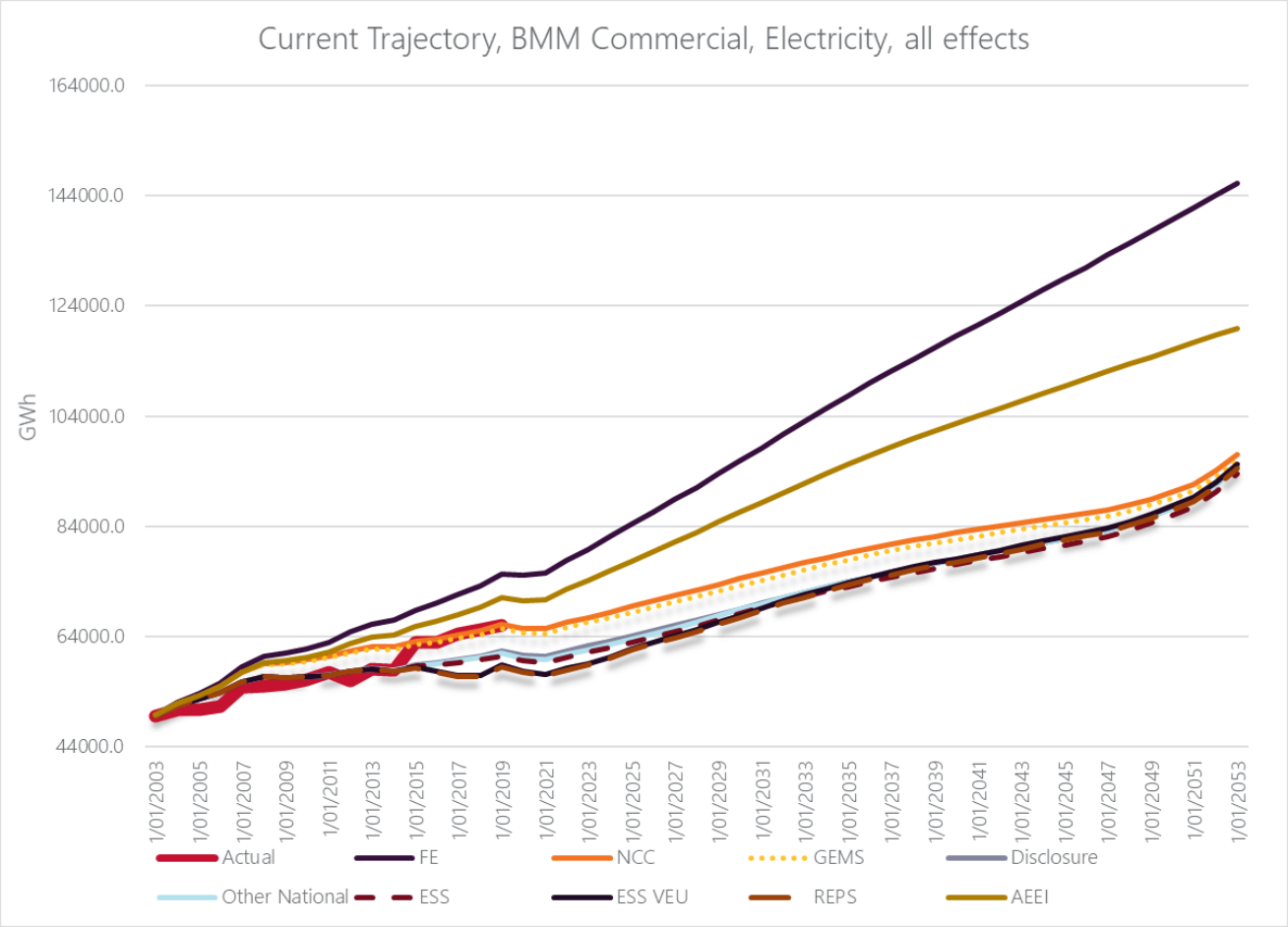
- Raises questions about potential *intensification* of energy use - potentially due to longer trading hours, reduced floor area/worker, greater cooling demands, data centres
  - This would appear as slowed or even negative AEEI – for this study we cut AEEI to low levels (0.1%/year)





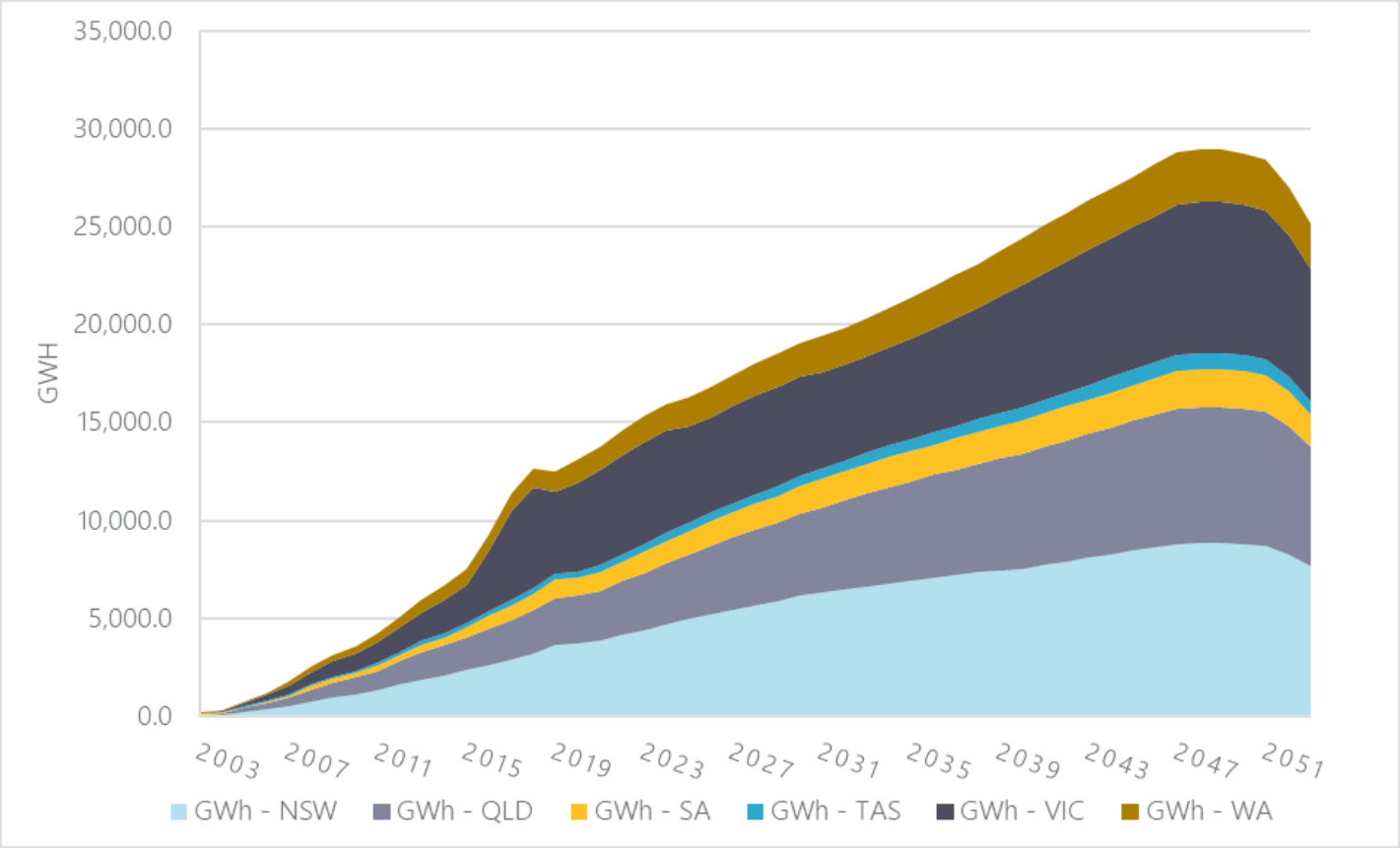
Draft Forecasts – BMM Commercial – model fit (electricity)

- Even with this, and policy discounts, our model *appears* to over-estimate historical electricity savings
  - However, the upward tick in electricity consumption in Australian Energy Statistics from 2015 on is not replicated in AEMO data
  - DISER has offered, at the EE Workshop, to engage with AEMO around data agreement questions



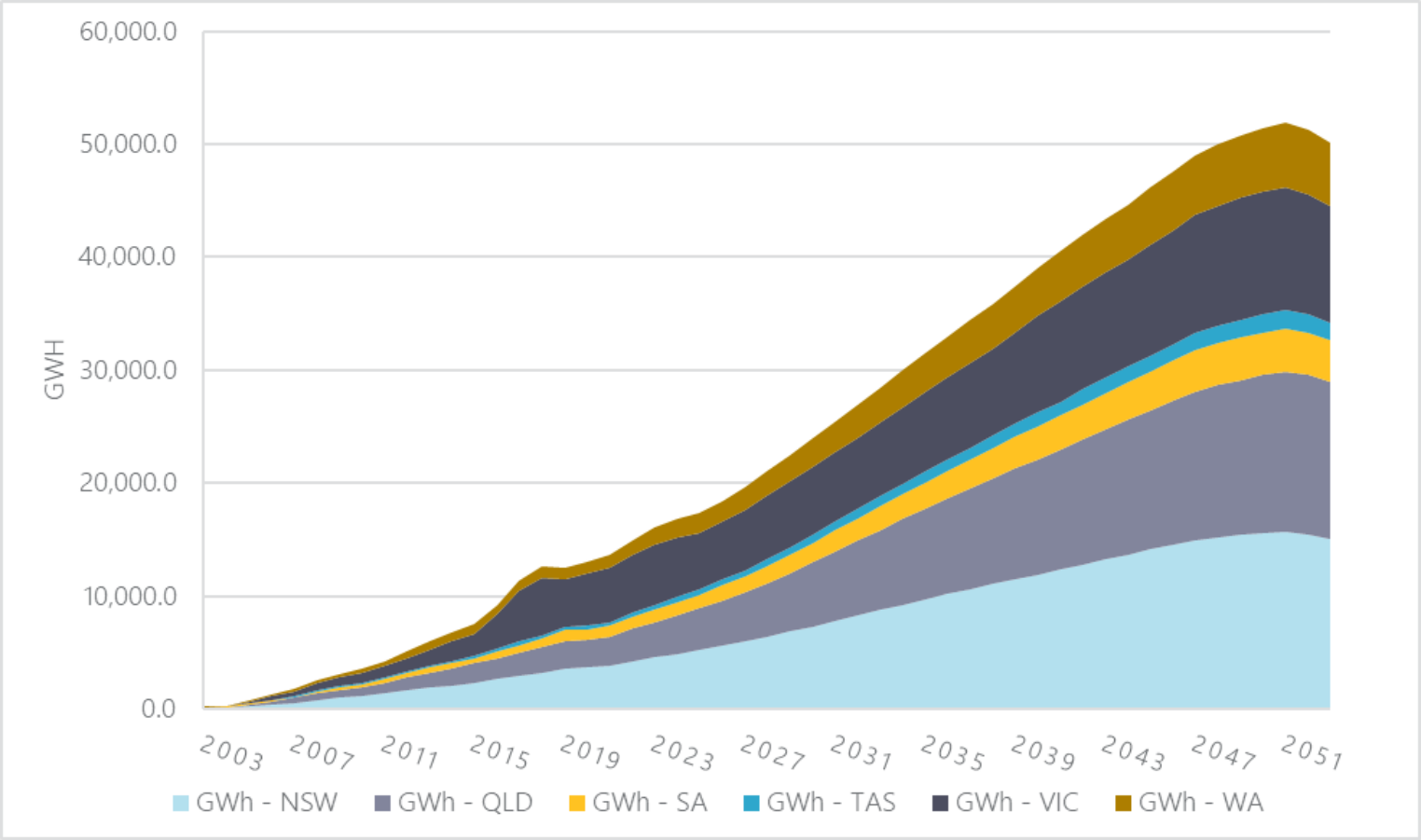
Draft Forecasts – BMM Commercial (Current Trajectory, Electricity, by Region)

- Bumps for VIC and NSW ~2017-2018 related to above-pro-rata years for VEU and ESS
- 2021 COVID-19 GSP flat-spot is evident
- Down-turn in later years is due to stock turnover (eg, roll-off of savings from 40+ year old buildings, now assumed to be retired from the stock



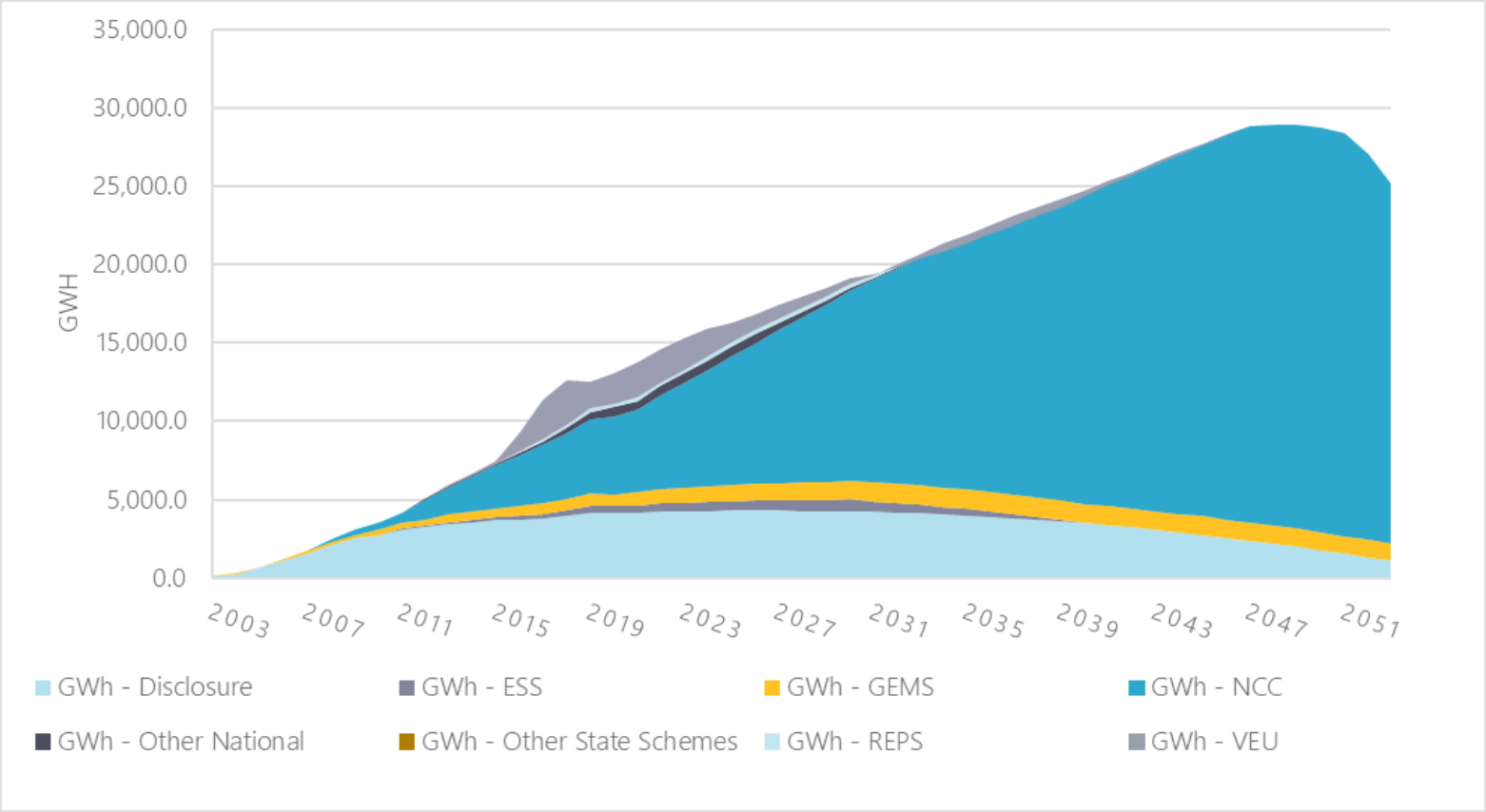
Draft Forecasts – BMM Commercial (Export Superpower, Electricity, by Region)

- Similar pattern for Export Superpower but ~24,000 additional GWh of savings (noting consumption will also be significantly higher)
- Stronger demand drivers, more ambitious policy settings, higher AEEI



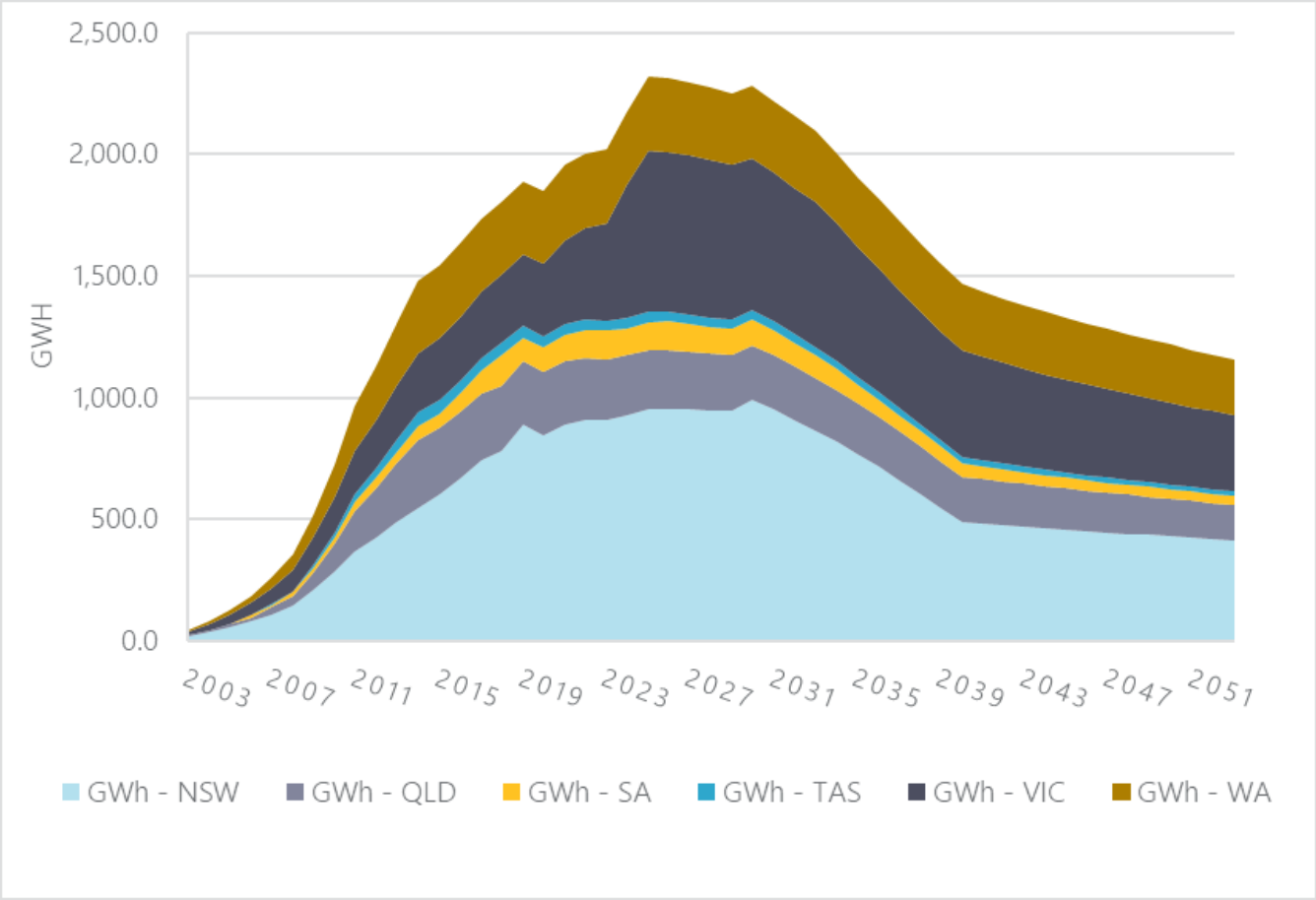
Draft Forecasts – BMM Commercial (Current Trajectory, Electricity, by Measure)

- NCC Section J is easily the major source of electricity savings, followed by disclosure (NABERS + CBD)
  - NCC savings accumulate annually with net increase in stock, *plus* replacement of retiring stock, *plus* major refurbishments/conversions
- Relatively large size of VEU (cf ESS or REPS) is also apparent



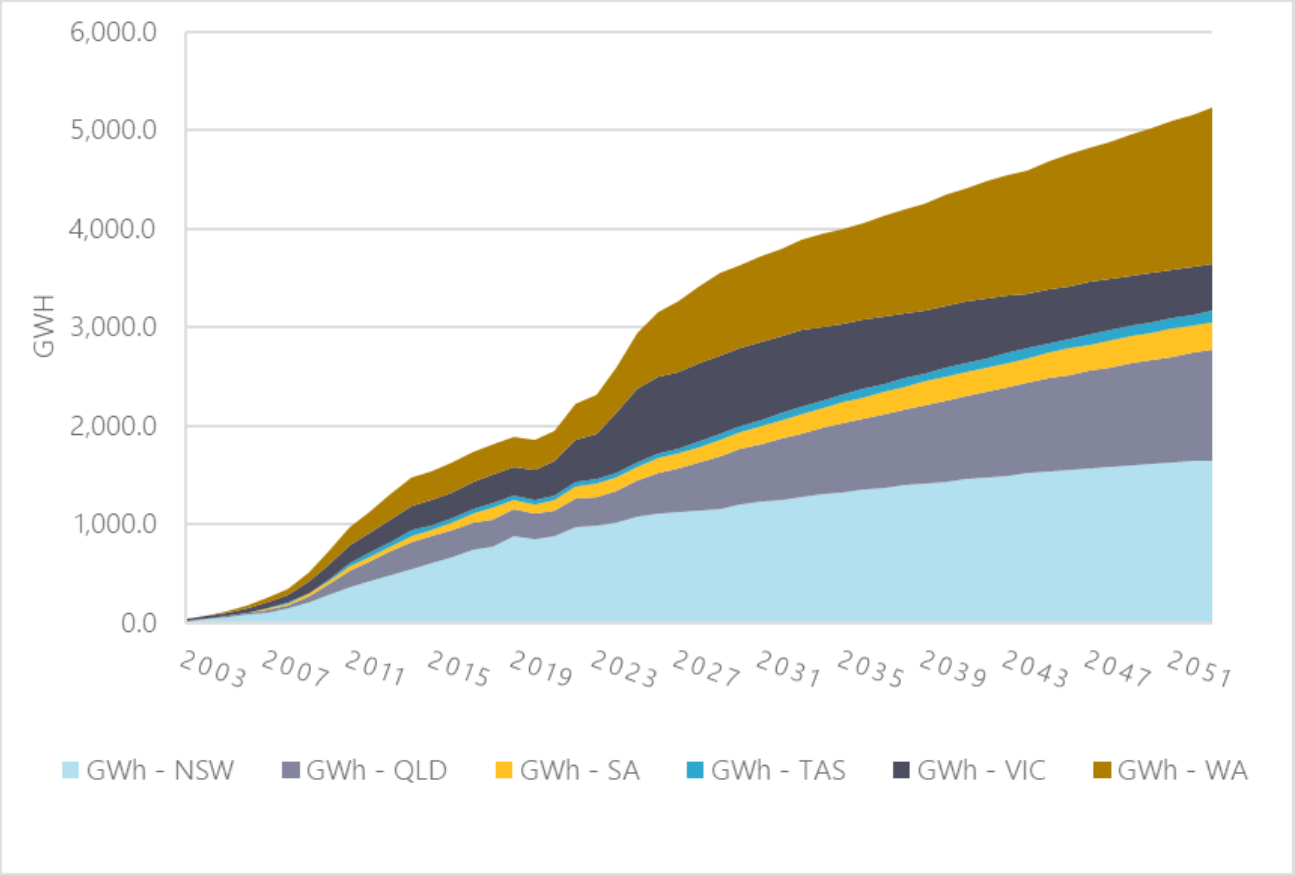
Draft Forecasts – BMM Industrial (Current Trajectory, Electricity, by Region)

- Overall policy-induced savings are modest (*total* EE change is not readily able to be measured for industrial, due to data limitations)
- NSW dominates due to ESS, which as a relatively greater industrial component than other state schemes (in addition to GEMS, which applies in all states)
  - State schemes do not extend past currently-announced dates in this scenario



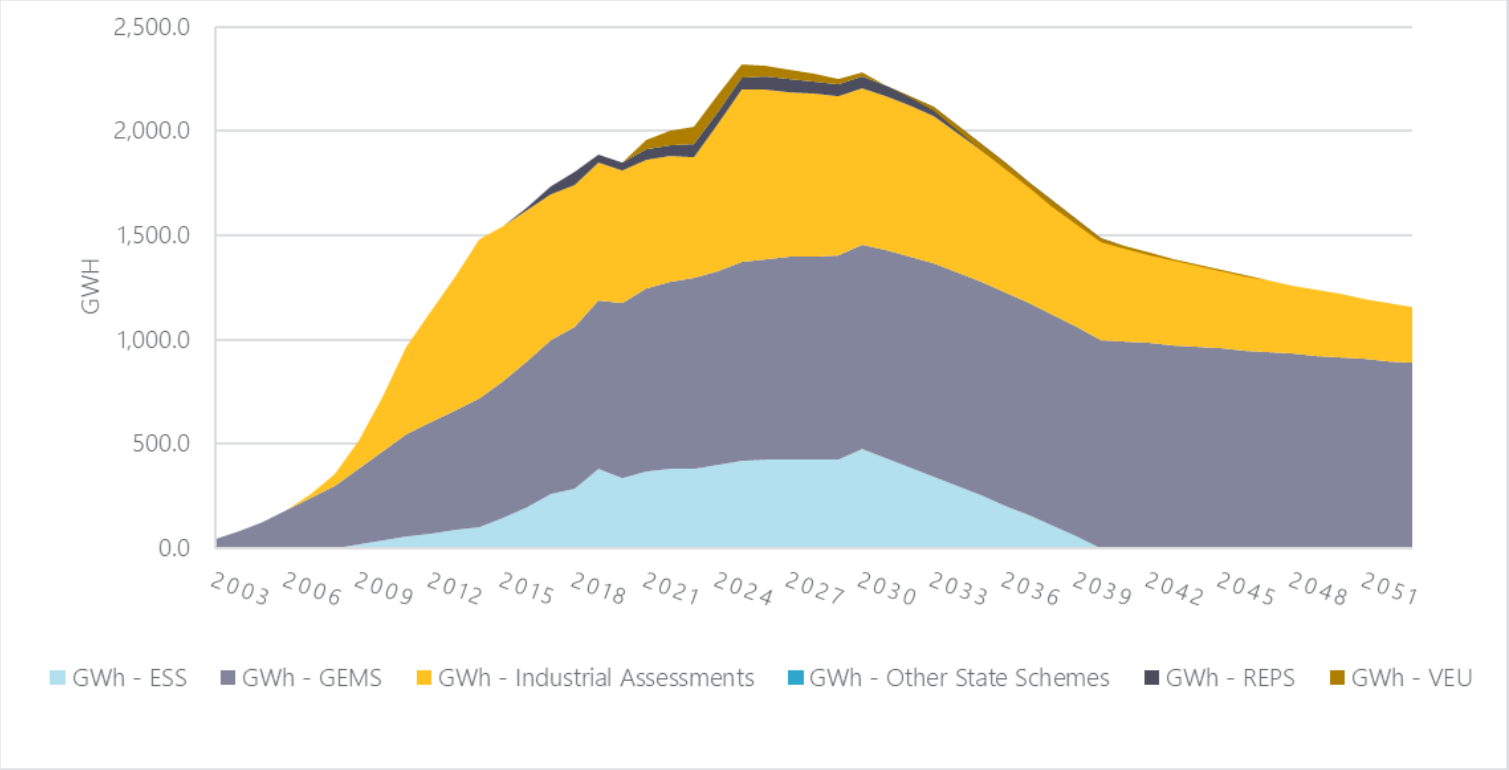
Draft Forecasts – BMM Industrial (Export Superpower, Electricity, by Region)

- Under the Export Superpower scenario, electricity savings are expected to continue to rise, due primarily to modelled 'industrial assessments' scheme
  - Still reasonably modest, as we have made conservative estimates for potential new policy settings
- Higher targets for existing state schemes (ESS, VEU, REPS), and the presence of assumed 'other states' schemes', contribute to the rising savings total



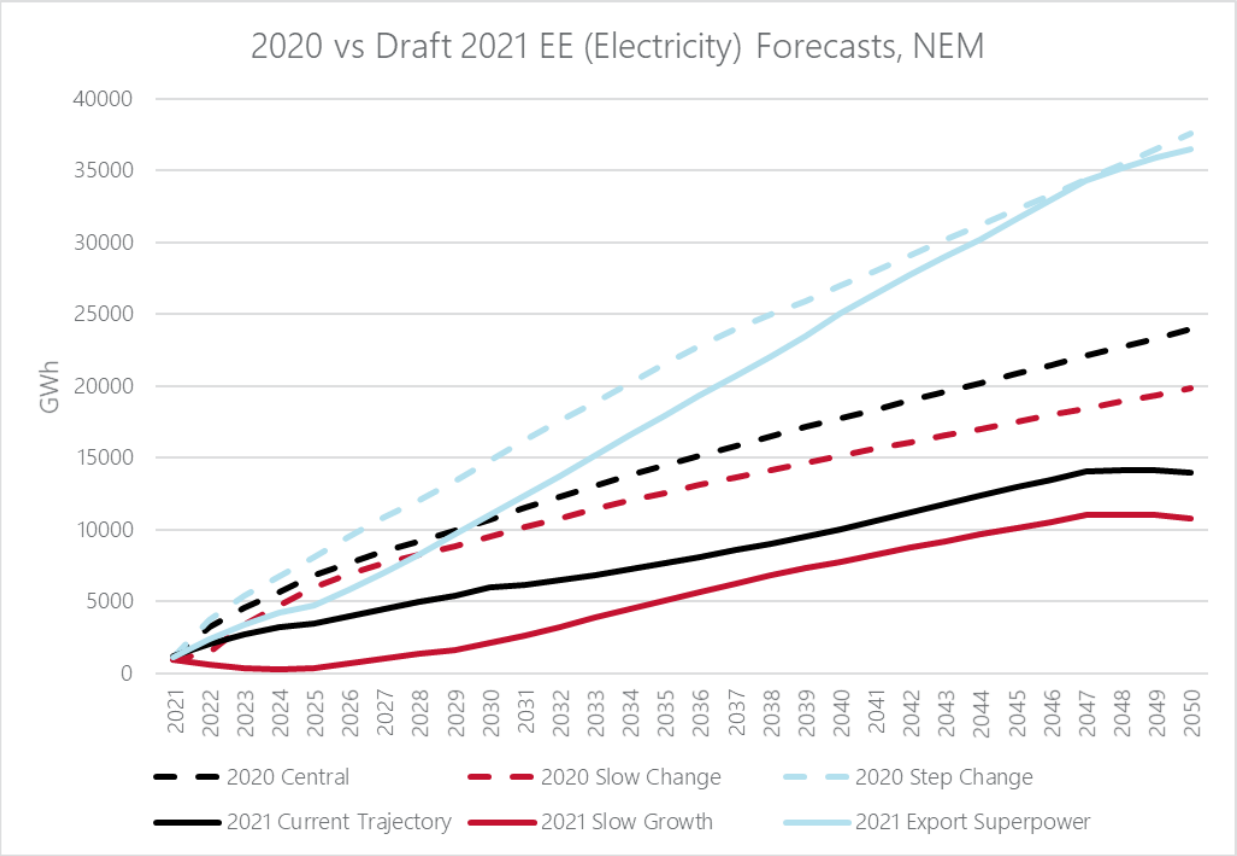
Draft Forecasts – BMM Industrial (Current Trajectory, Electricity, by Measure)

- The largest policy impact, on Current Trajectory, is GEMS (covers large electric motors, chillers, pumps and fans, etc)
- EEO legacy impacts are assumed to remain significant, due to the energy-intensive nature of this sector, with strong incentives to retain learnings
- State schemes make a lesser impact in this scenario, as only current targets modelled



Comparison – 2021 Draft with 2019/2020 (electricity) forecasts - BMM

- Generally, draft 2021 forecasts for BMM (NEM) are lower than 2020
  - Higher discounting, in particular due to 'Total EE' analysis and discounts needed to fit modelled savings to historical consumption data
  - GSP flat spot due to COVID-19
  - Delays to significant policies – NCC2019 and GEMS
  - Export Superpower on a faster trend due to assumed new policies + demand drivers



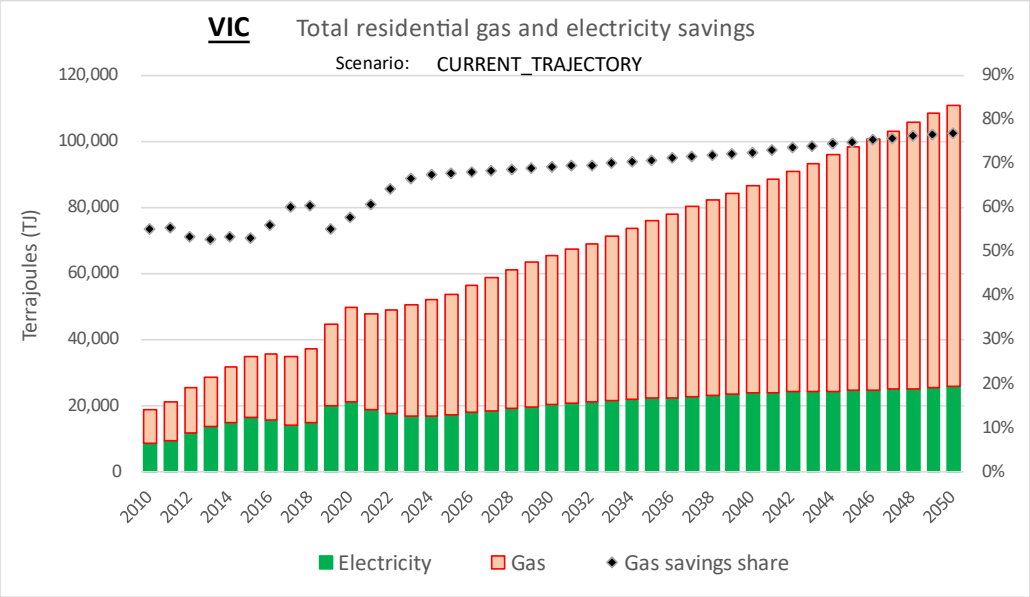
Draft Energy Efficiency Forecasts 2021 (conclusions)

- Overall – EE impacts generally lower in 2021, attributable to both policy-induced and market-led effects
  - may need to further discount efficiency savings prior to finals, particularly for BMM Commercial
- Data uncertainties are significant and should be addressed where feasible
- Market segmentation in BMM, based on consumption size, is challenging, as energy consumption and output statistics are not organised this way
- Greater research on/evaluations of actual, incremental policy impacts would assist with verification of policy-induced savings
- Greater research on AEEI is merited, but also challenging – should AEEI be modelled separately in AEMO's forecasts?
- Q & A?

Additional EE Slides

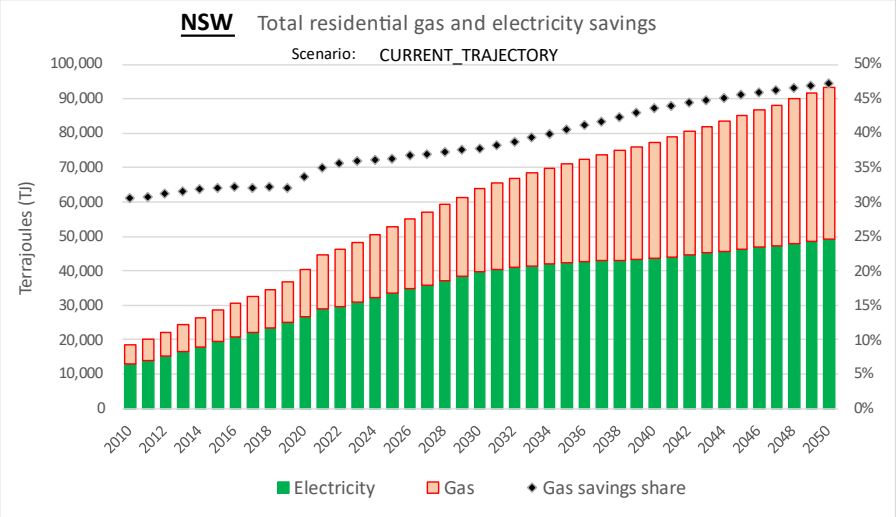
Draft Forecasts – Residential (by region and fuel)

- Gas savings are concentrated in VIC and NSW
  - … substantially driven by higher building efficiency standards



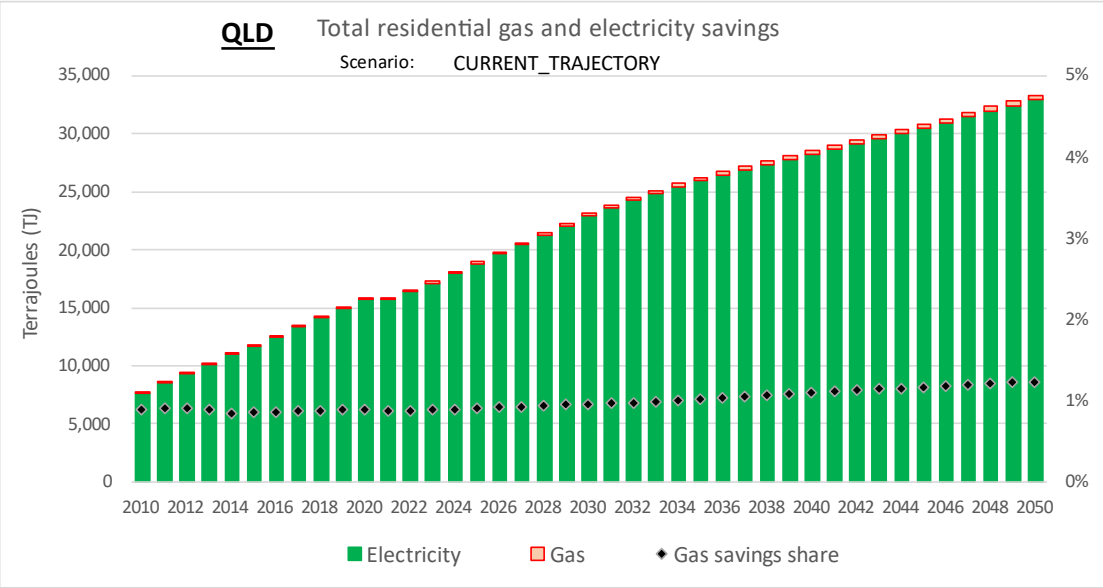
Vic: gas share of savings in 2030 = 69% of 65 TJ total

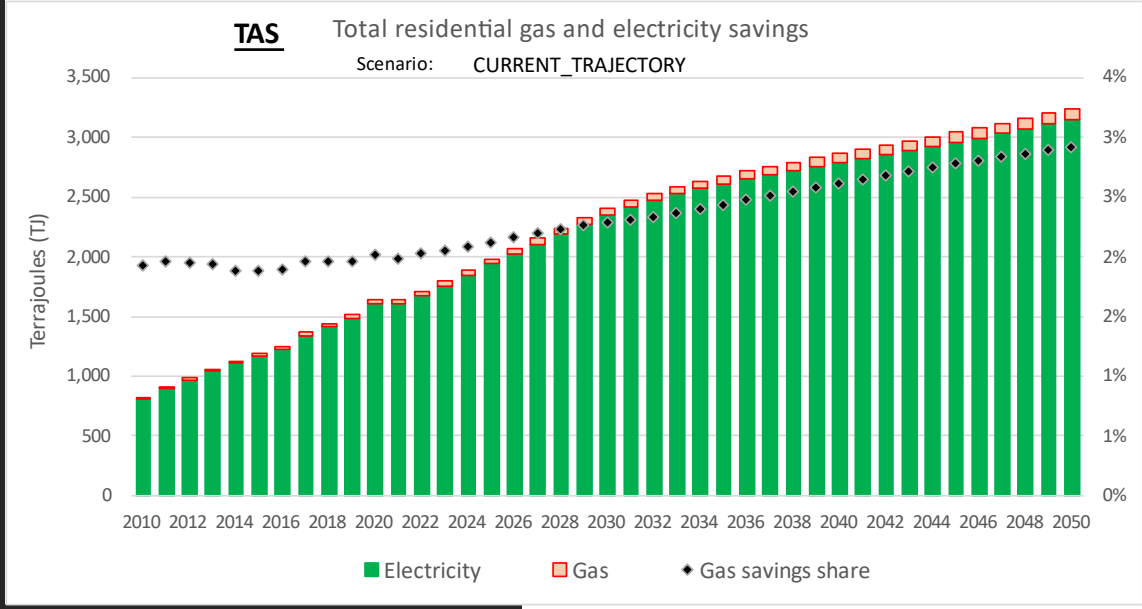
NSW: gas share of savings in 2030 = 38% of 64 TJ total

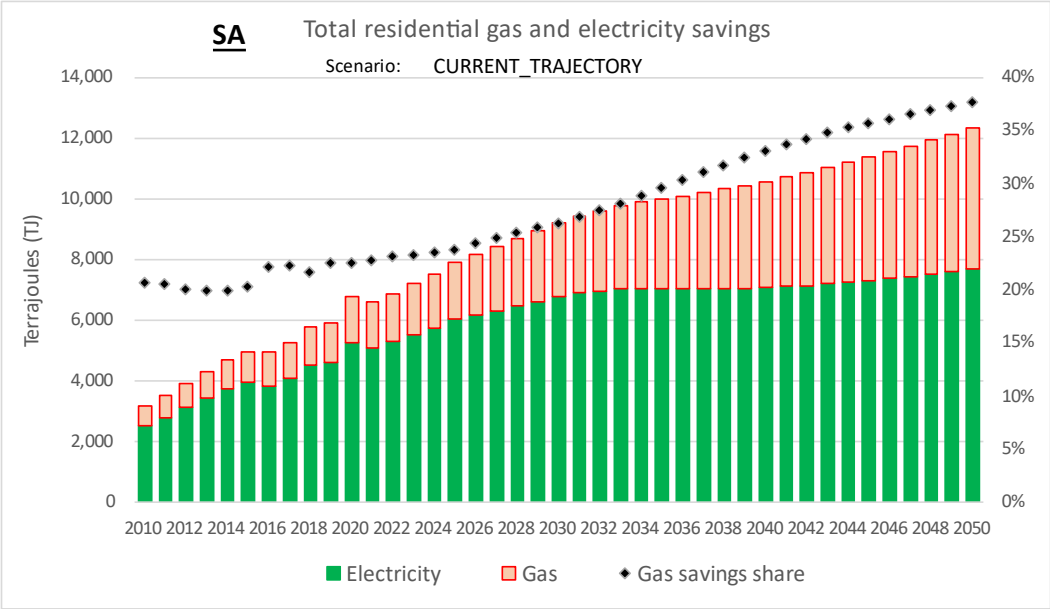


Draft Forecasts – Residential (by region and fuel)

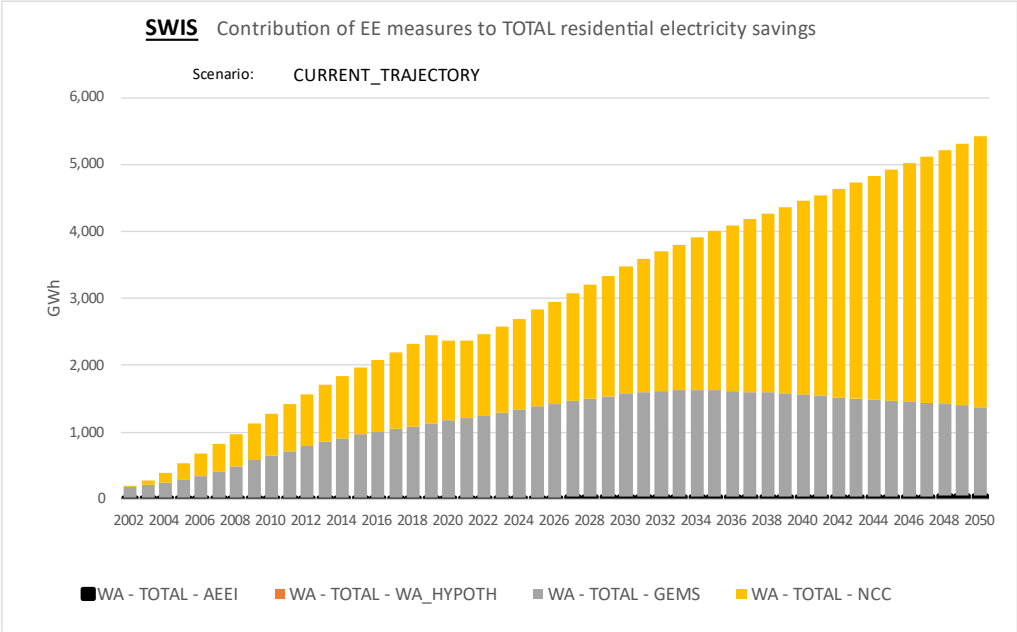
- Electricity savings dominate elsewhere





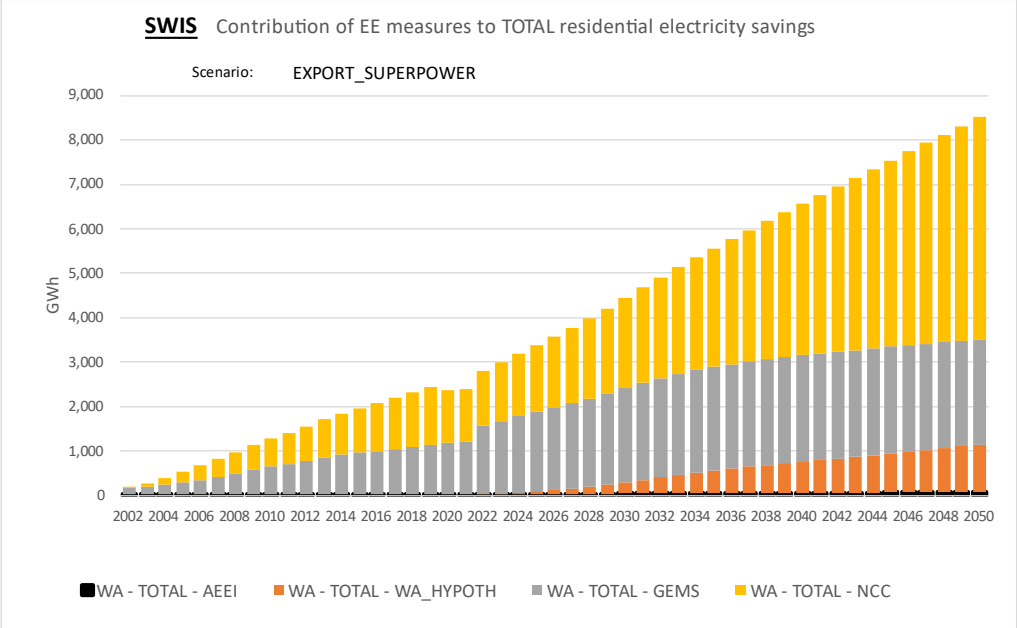


Draft Forecasts – Residential (by region and measure)



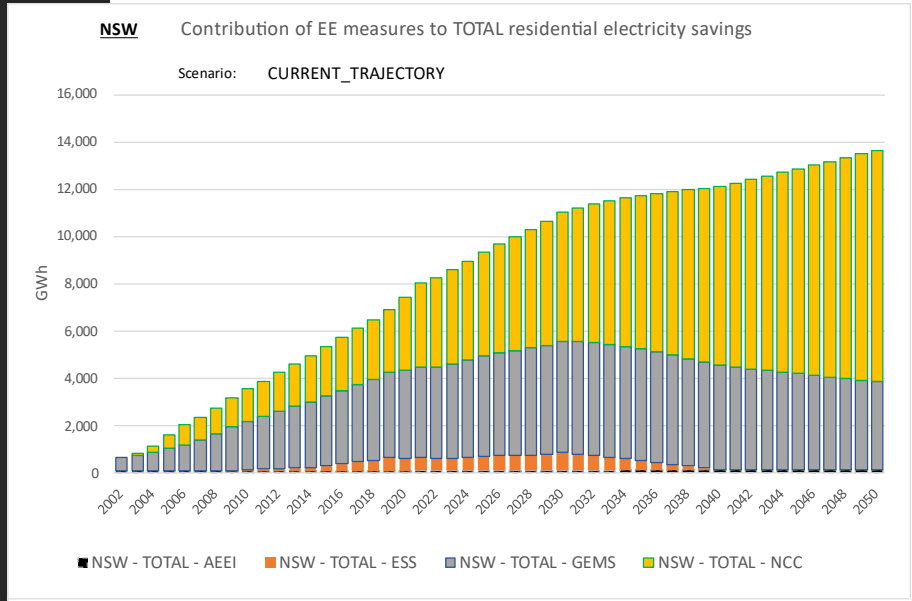
NCC and GEMS are major EE drivers, and AEEI contribution generally modest

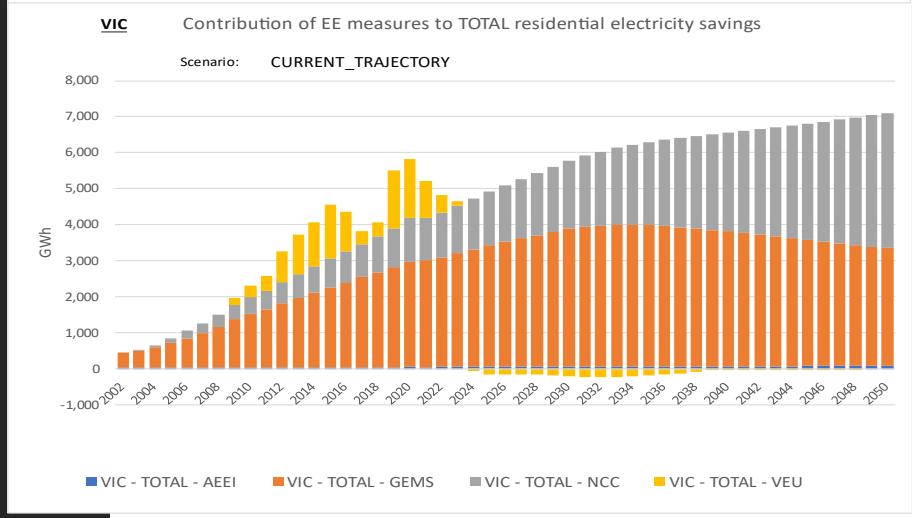
AEEI, however, is treated by assumption, with little recent literature

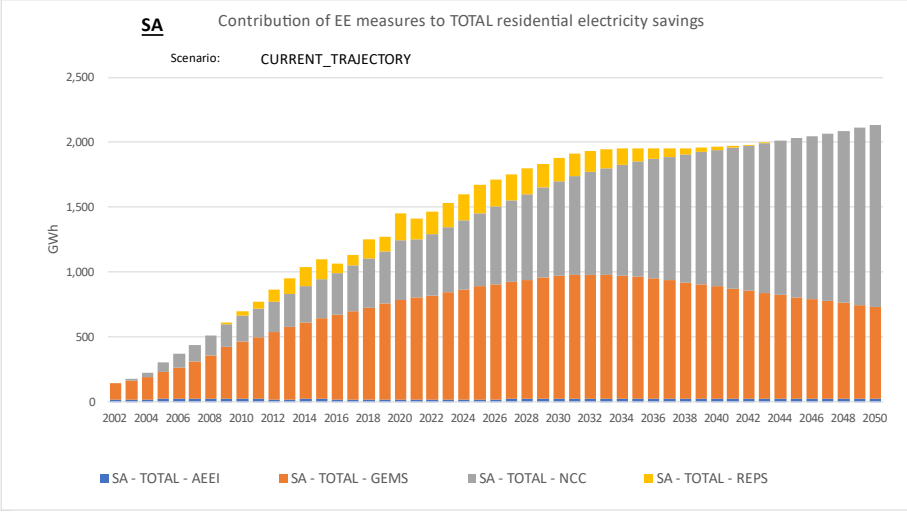


However, State based measures add to savings…

Draft Forecasts – Residential (by region and measure)





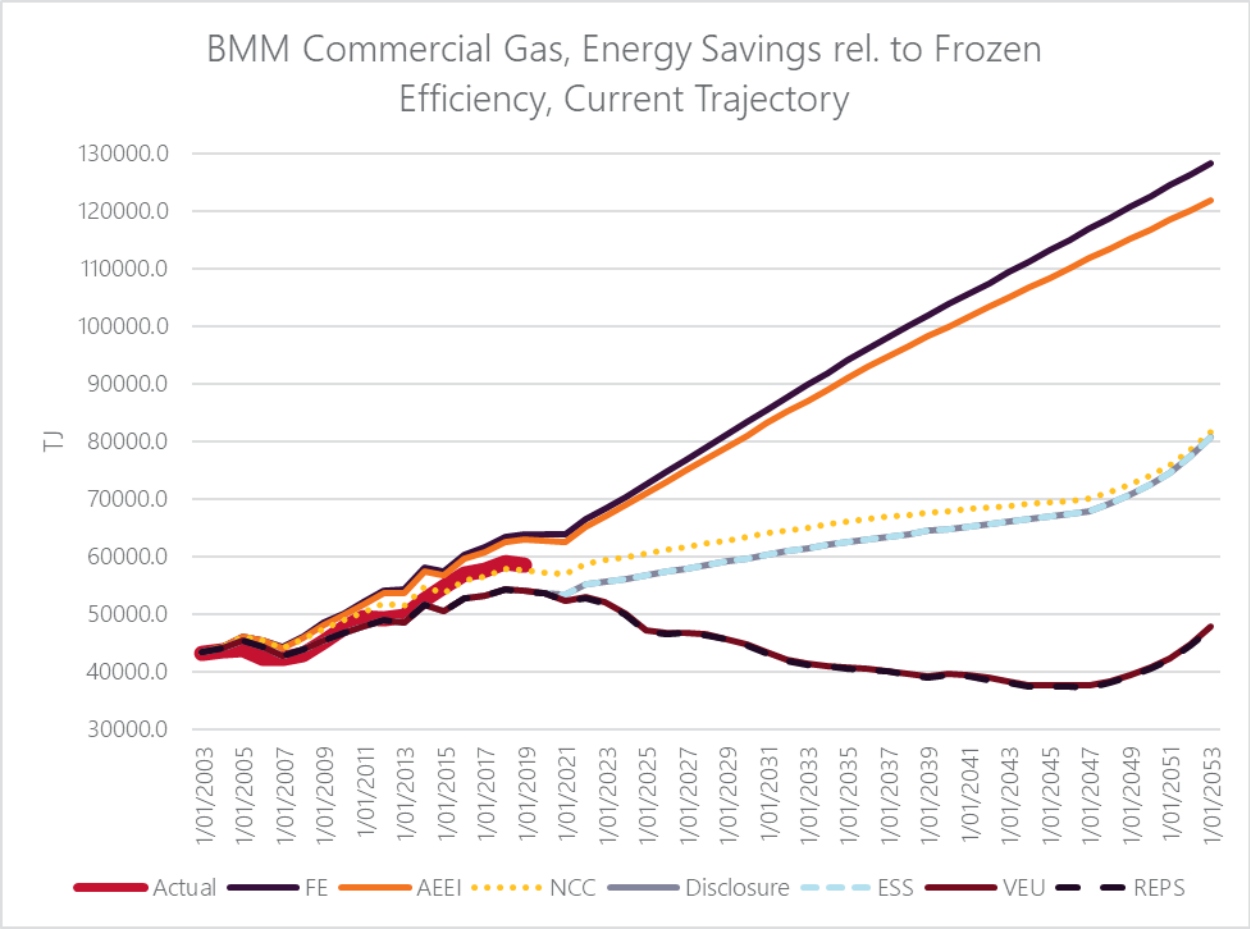


Additional savings are being achieved by State schemes in NSW, VIC and SA.

We are still refining gas savings estimates

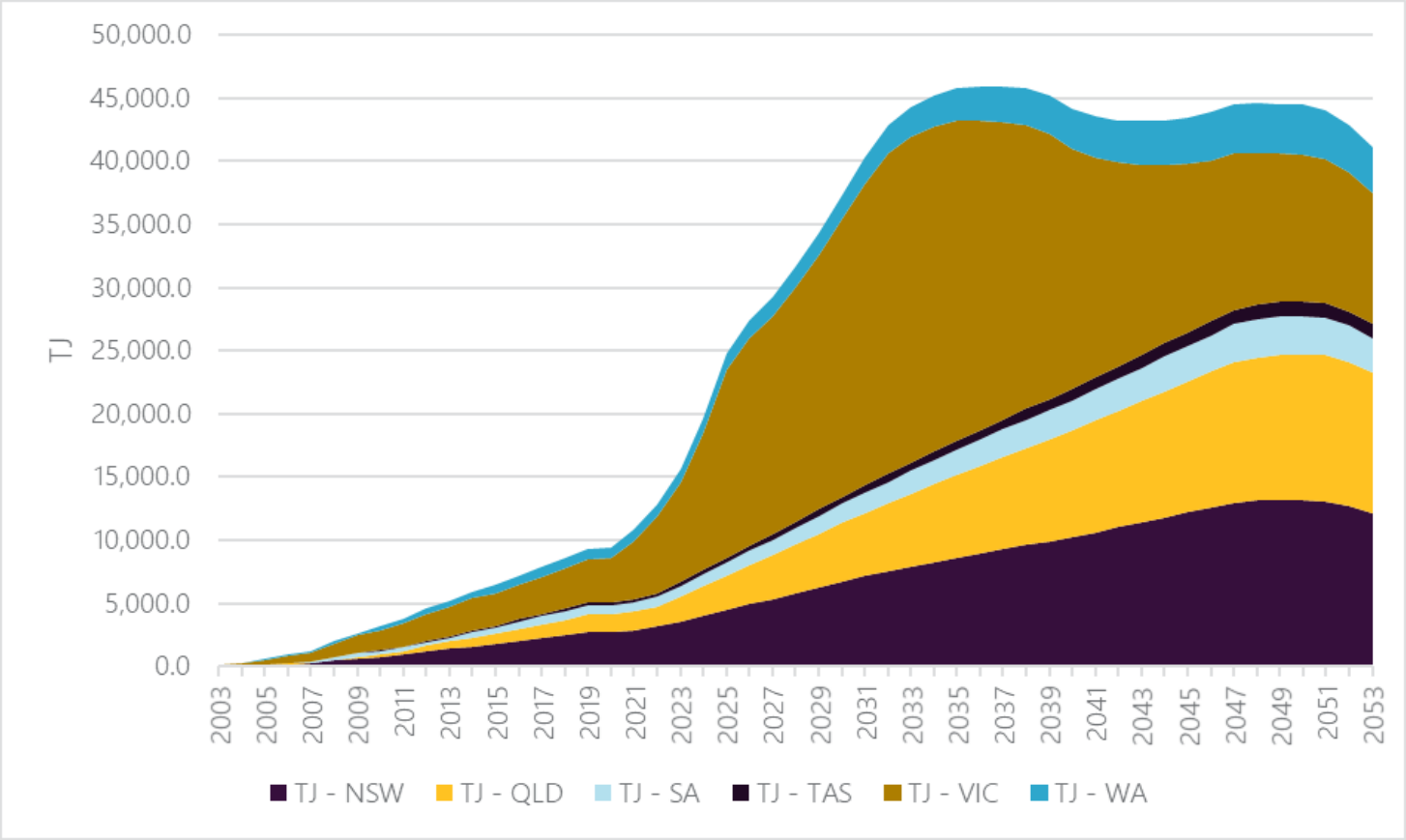
Draft Forecasts – BMM Commercial – model fit (gas)

- The model also appears to be over-estimating total gas savings in the historical period, based on comparison with AES data – this will be further reviewed



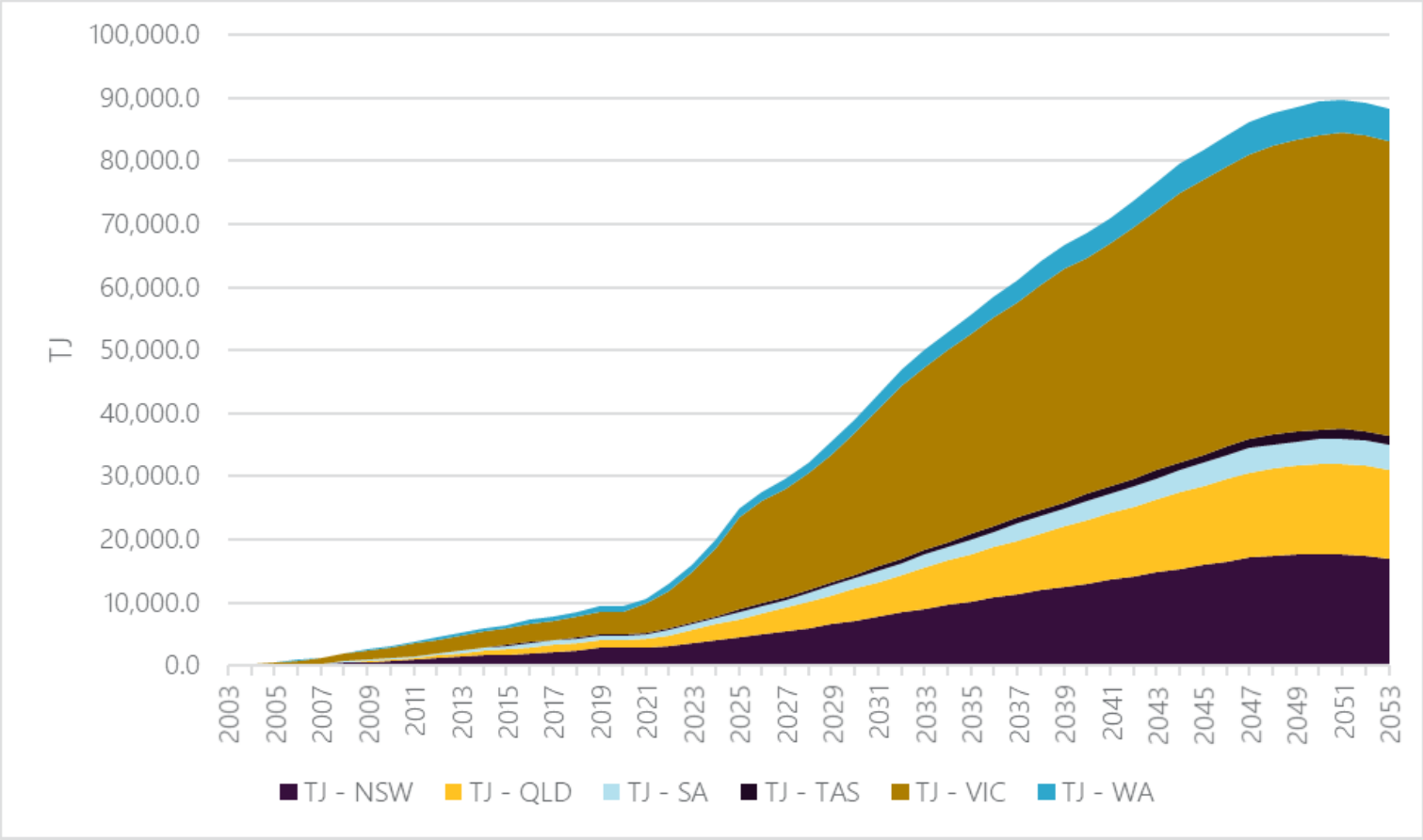
Draft Forecasts – BMM Commercial (Current Trajectory, Gas, by Region)

- Gas savings are largest in Victoria, which is the largest gas user
  - largely driven by VEU, where data from VIC shows an expectation of significant electrification
- NCC savings also assume electrification, as per simulation modelling for 2018 Decision RIS.



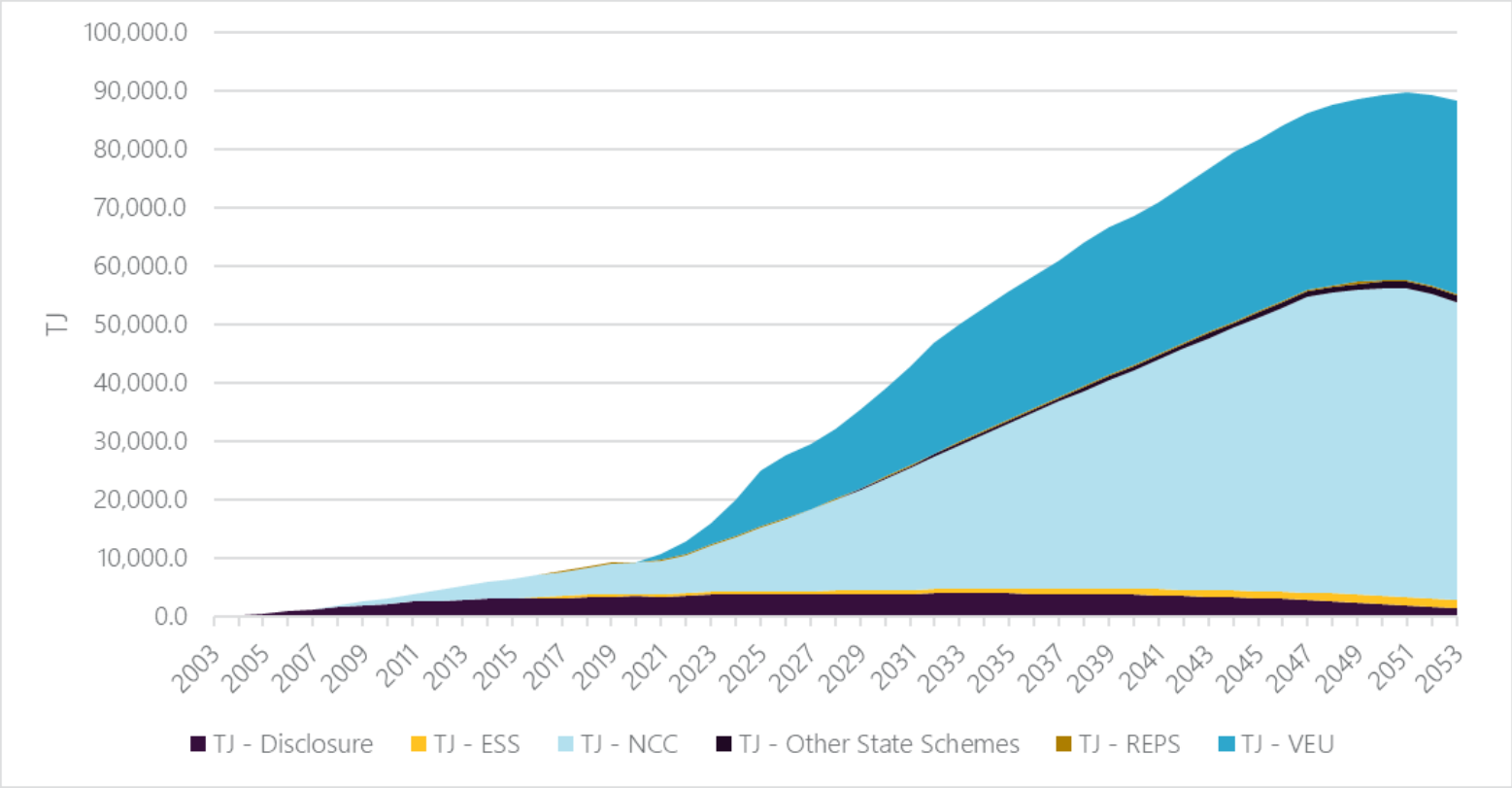
Draft Forecasts – BMM Commercial (Export Superpower, Gas, by Region)

- Similar pattern for Export Superpower (as for Current Trajectory) but gas savings around double
  - As with electricity, this reflects both stronger policy settings and faster growth



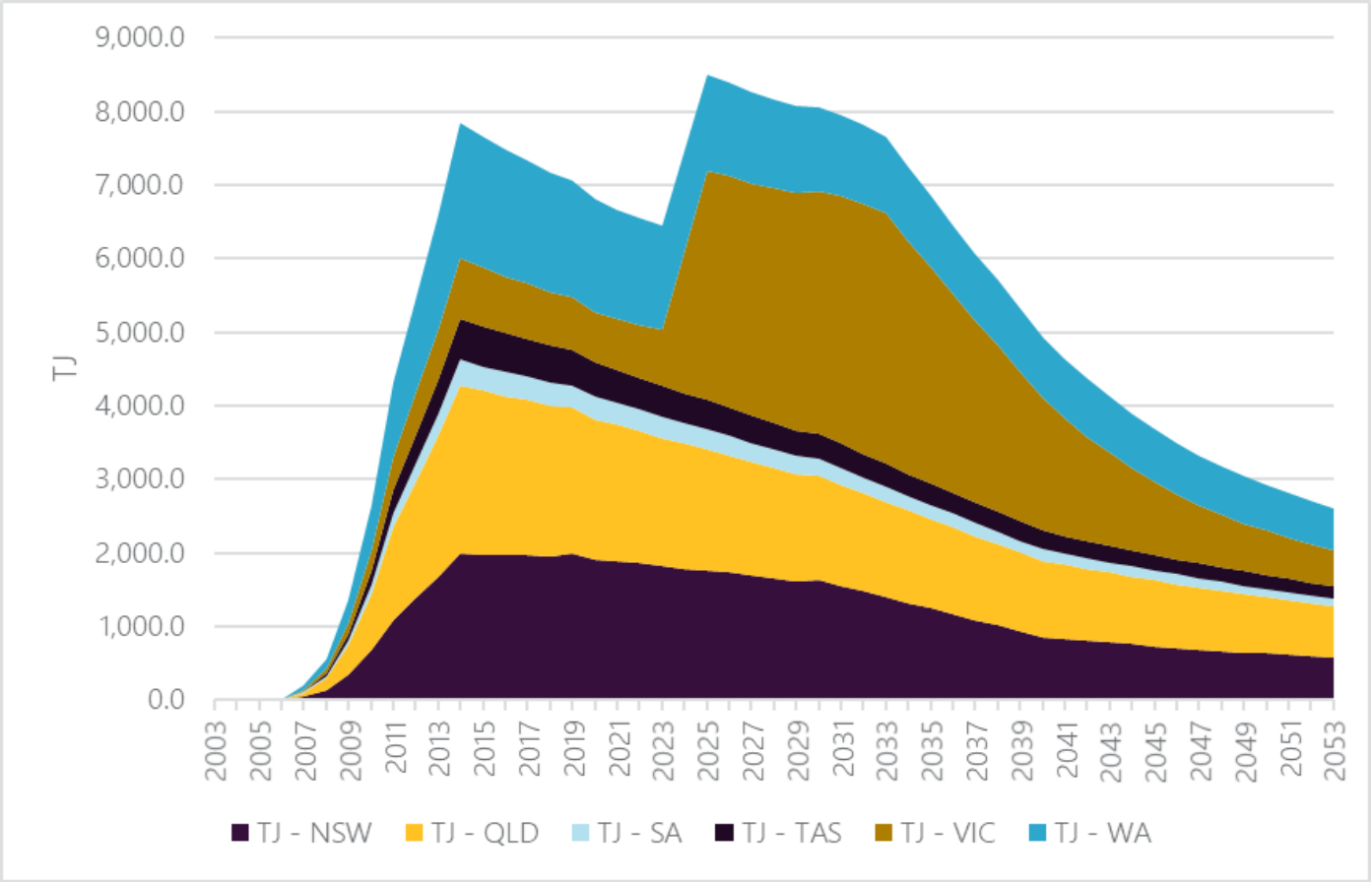
Draft Forecasts – BMM Commercial (Current Trajectory, Gas, by Measure)

- NCC Section J also dominates gas savings, including due to electrification in addition to efficiency
- VEU gas savings relatively large, primarily due to electrification



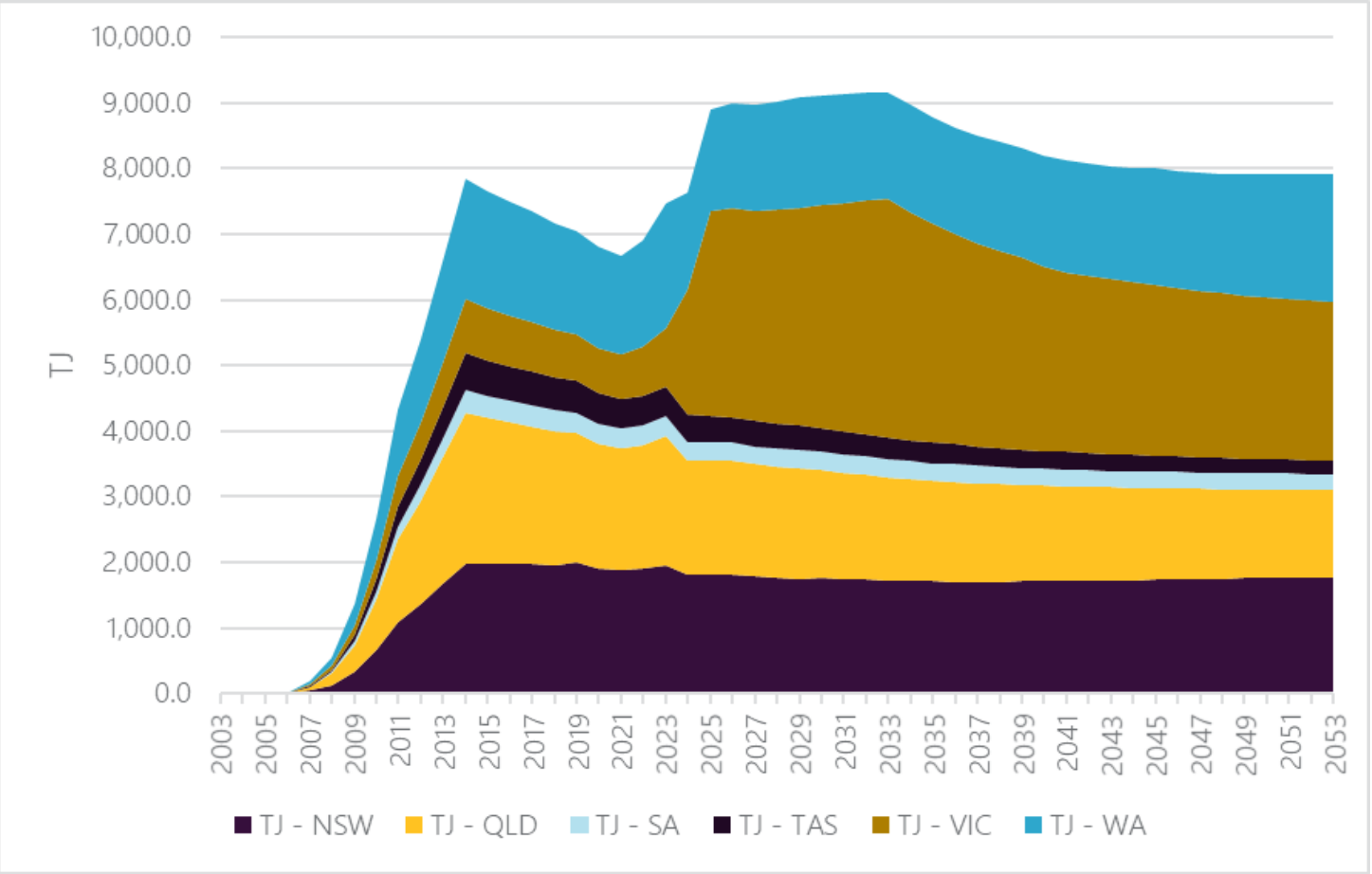
Draft Forecasts – BMM Industrial (Current Trajectory, Gas, by Region)

- Two main elements in this scenario
  - Early savings are Energy Efficiency Opportunities, wound up in 2014, but legacy savings expected to continue
  - VEU electrification + Business Recovery EE Fund (smaller impact)



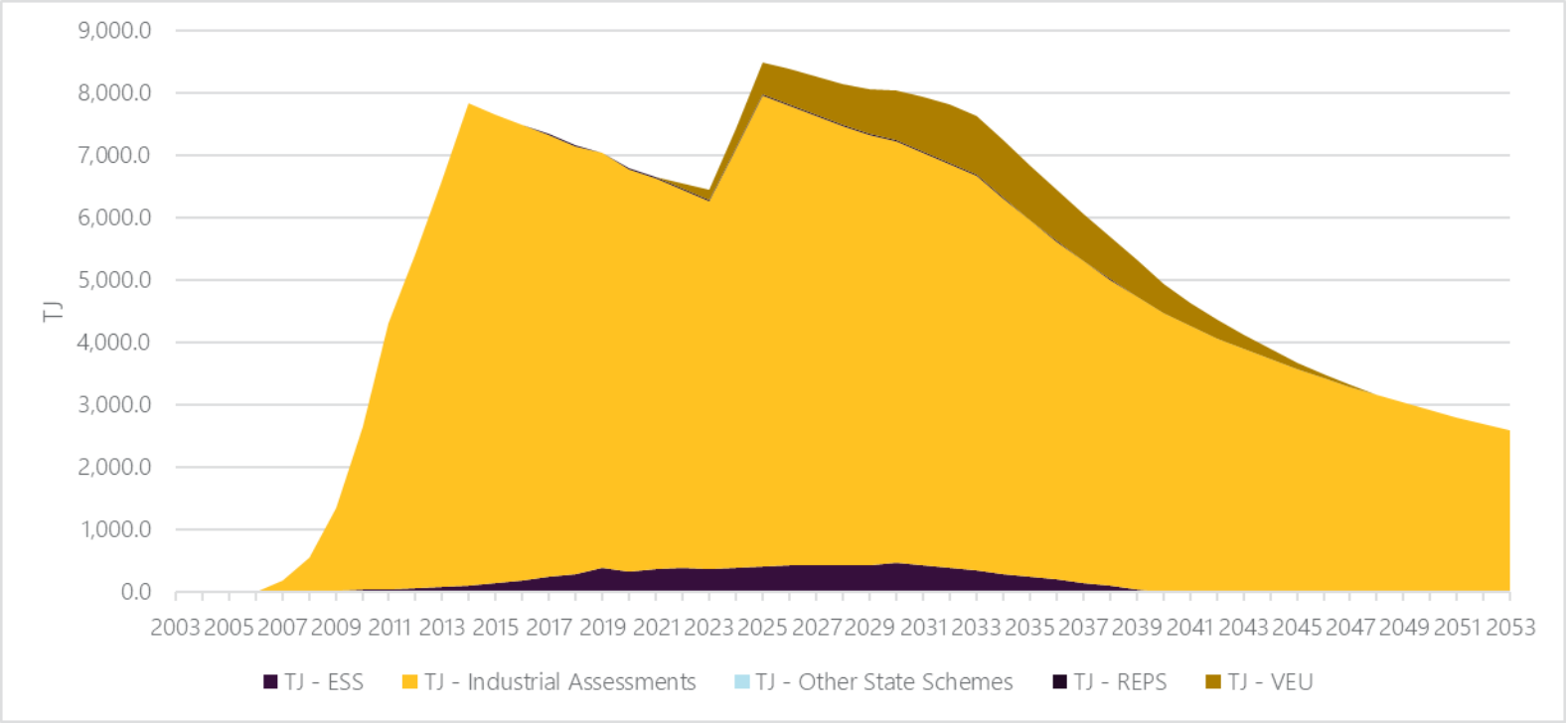
Draft Forecasts – BMM Industrial (Export Superpower, Gas, by Region)

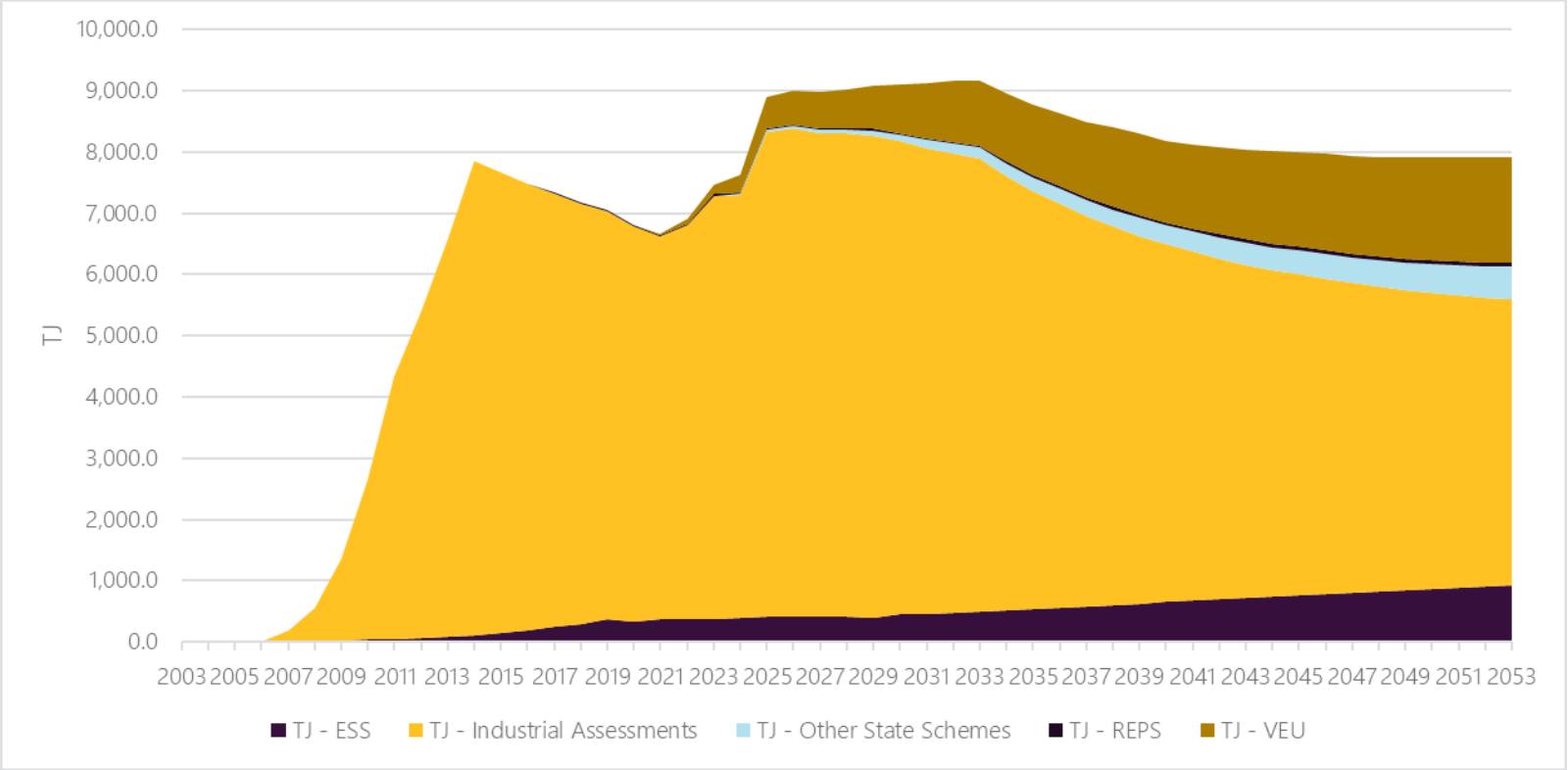
- Gas savings modestly higher under Export Superpower
  - The new element is a mooted Industrial Assessments program, similar in design to EEO (some non-additionality with BREEF)



Draft Forecasts – BMM Industrial (Current Trajectory, Gas, by Measure)

- Gas savings are slightly larger than for electricity
- Former EEO program is the major influence, with contributions from VEU and ESS
- Lift in gas savings in Vic from BREEF



Draft Forecasts – BMM Industrial (Export Superpower, Gas, by Measure)

- Additional savings in this scenario due primarily to new Industrial Assessments program