# Draft 2020 NEM Electricity Consumption Forecasts

Summary of key drivers and annual forecasts

# FRG context for today's 2020 Draft Consumption Forecasts

| Meeting | ESOO related discussion | Presenter |
|---|---|---|
| Jan FRG | • Draft economic forecasts | BIS Oxford Economics |
| Feb FRG | • Assumptions, inputs and methodologies for the 2020 DER forecasts | GEM, CSIRO, AEMO |
| Mar FRG | • Initial COVID-19 Update<br>• DER draft forecast update<br>• ESOO inputs and assumptions | AEMO |
| Apr FRG | • Estimated COVID-19 Economic Impacts<br>• Final DER information | BIS Oxford, GEM, CSIRO, AEMO |
| Early May FRG | • Estimating COVID-19 impact on electricity consumption | AEMO |
| **Today** | • **Draft annual electricity consumption forecasts** | **AEMO** |
| Jun FRG | • Draft minimum and maximum demand forecasts | AEMO |

Purpose:

- Discuss Draft NEM electricity consumption forecasts
- Discuss additional sensitivities
- Provide feedback to AEMO on each of the above

Agenda will include:

- Recap of key Forecasting terms
- COVID-19 impacts included in the Draft forecasts
- Residential forecasts and key drivers that have changed since 2019
- Business and Industrial forecasts
- Total Consumption forecasts
- Key Regional Insights
- Further discussion on additional sensitivities
- Discussion

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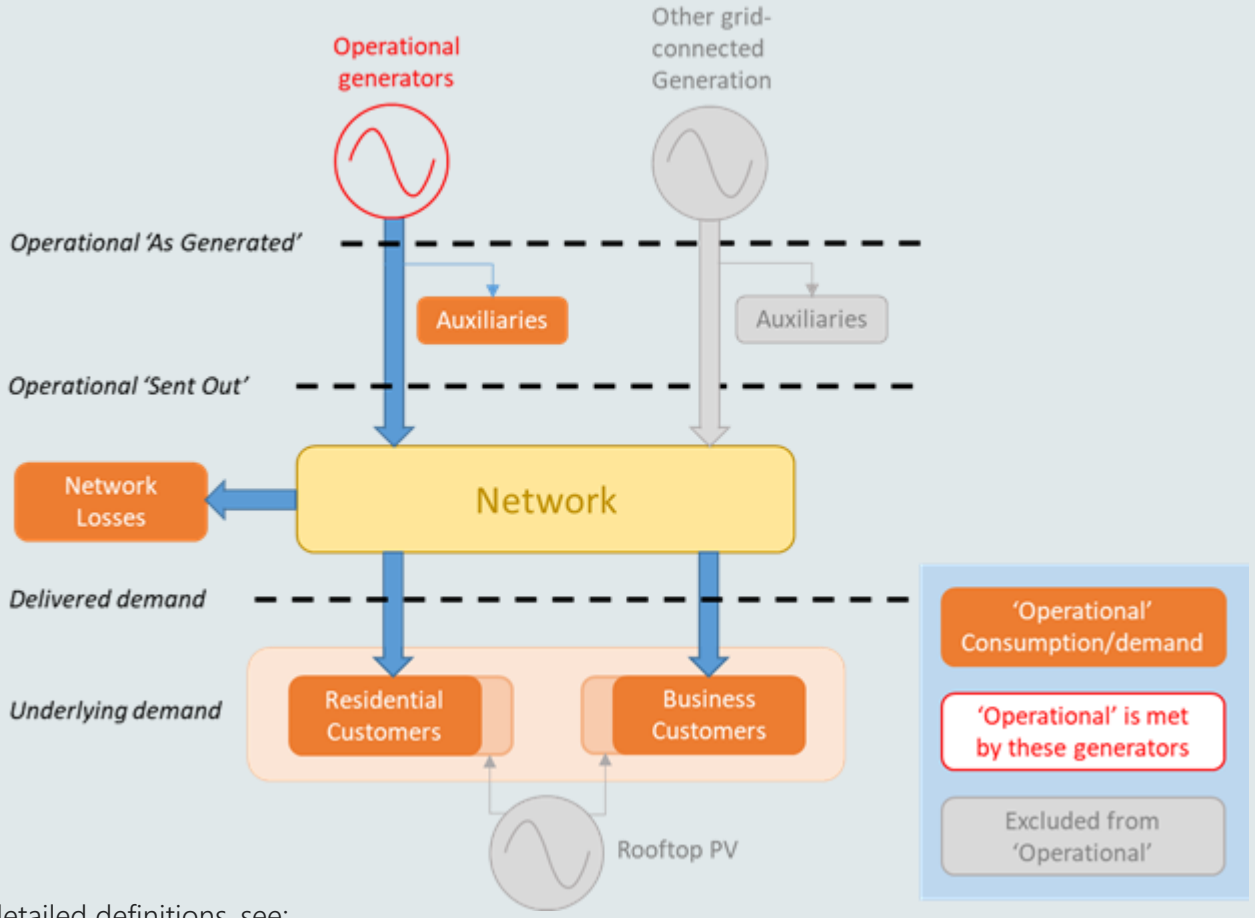
# Understanding the language of forecasting electricity consumption

## Key forecasting definitions in use today:

- **Underlying Demand:**
  - Underlying demand is the "power point" demand of consumers, irrespective of where that power is generated (from the grid or within the home).
- **Delivered Demand:**
  - Delivered demand is the demand that is met from the transmission grid, net of any distribution-generated energy such as rooftop PV
- **Operational Demand**
  - What is consumed by consumers, as supplied by scheduled, semi-scheduled and significant non-scheduled generating units >= 30MW (with some exceptions).

## Key demand measurement points:

- **"Sent Out"**
  - Electricity supplied to the grid by scheduled, semi-scheduled and significant non-scheduled generators (excluding auxiliary loads)
- **"As Generated"**
  - As per Sent Out, but including auxiliary loads (that load which is used within a power station)




For detailed definitions, see: https://www.aemo.com.au/-/media/files/electricity/nem/security_and_reliability/dispatch/policy_and_process/2020/demand-terms-in-emms-data-model.pdf?la=en

# COVID-19 increases forecast uncertainty

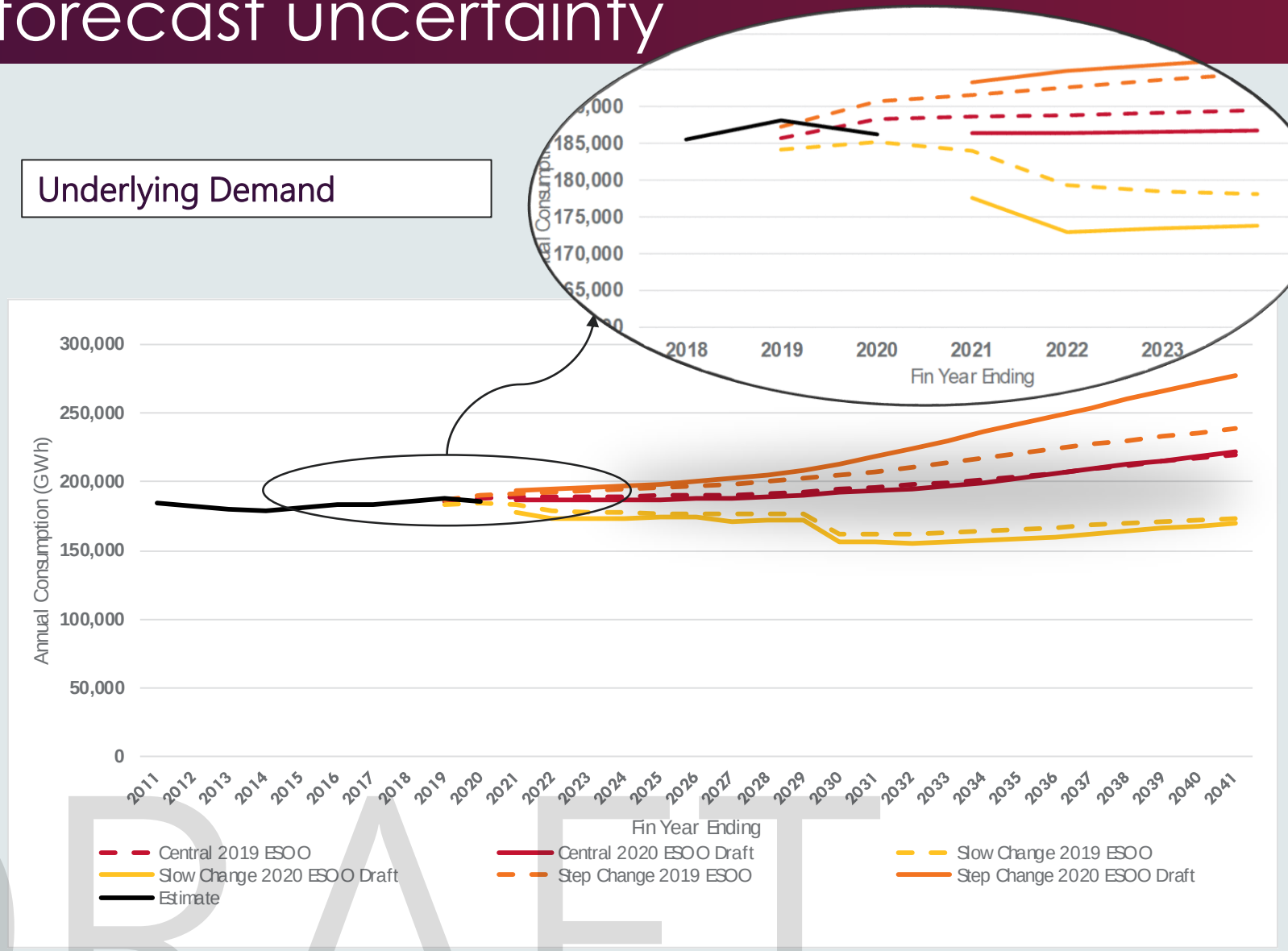
## COVID-19 impacts:

- Greater uncertainty driving a wider range of forecasts
  - 2019-20 estimate for consumption is now **186.3 TWh**
  - estimated consumption if COVID-19 did not occur: approx. **188.4 TWh,** in line with 2019 ESOO forecast
  - ***2019-20 COVID-19 estimated to be approx. -2.1 TWh***
  - 2020-21 forecast range of 15.1 TWh - between 177.7 TWh and 193.4 TWh, a wider range than in 2019 ESOO
- Greater risks of commercial and industrial business closures lowers Slow Change outlook

## Other considerations:

- Electric vehicle growth provides consumption growth potential in the longer term. Timing and magnitude of the emergence of this sector is uncertain.
- Forecast energy efficiency savings lower underlying consumption.

Underlying Demand

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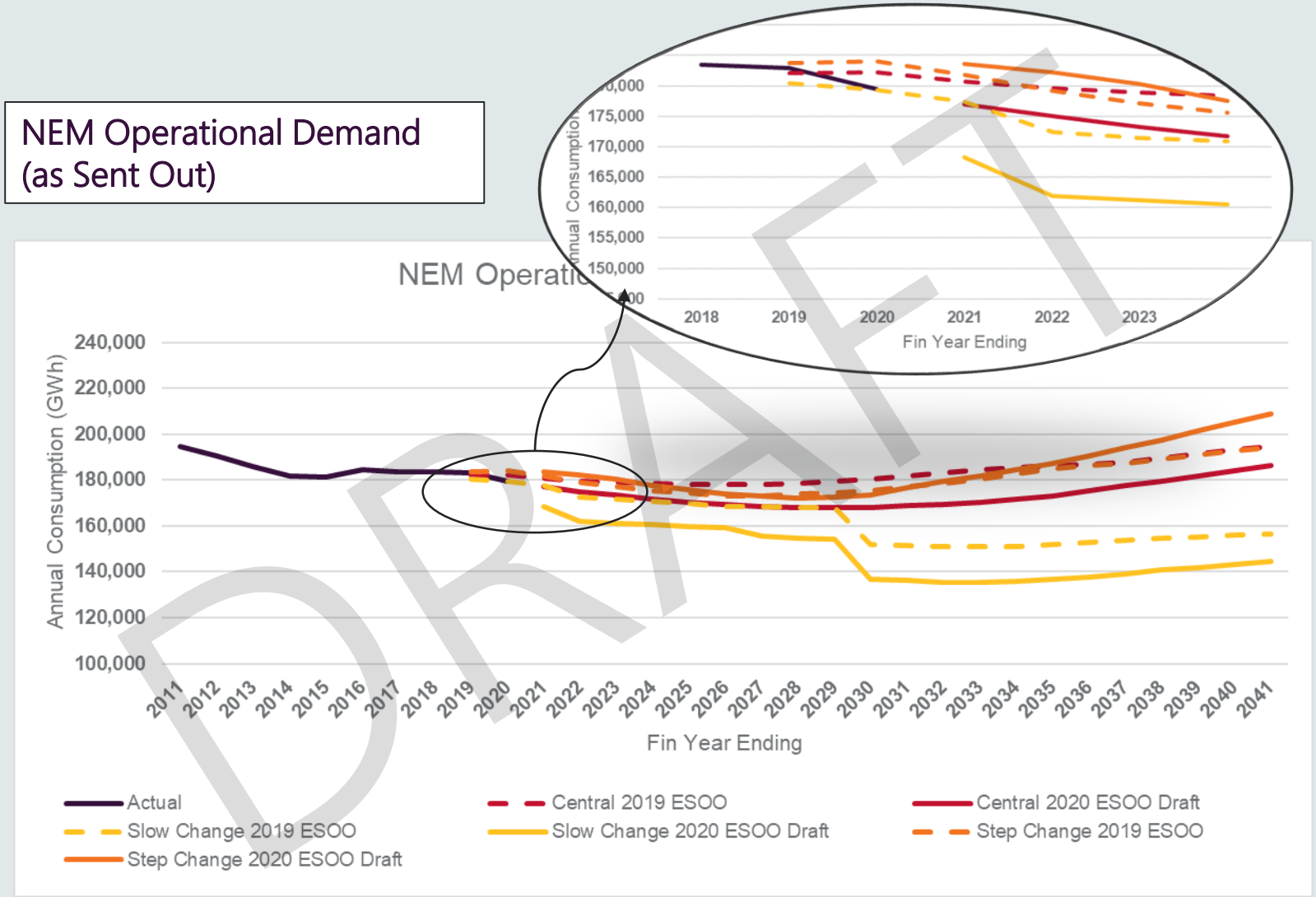
# Australia's embrace of DER cushions rising underlying consumption

## DER growth is lowering grid consumption:

- DER generation lowers the demand required to be delivered from the grid. Increased DER uptake will lower the 'Operational' demand.
- Strong DER development in 2019-20 – at the upper end of 2019's forecasts in many regions (i.e. Step Change)
- COVID-19 has been assumed to slow PV sales and installation rates, reducing forecast rooftop PV installations by approximately 800 MW by 2023-24 (Central scenario)
- Over the longer term, DER uptake rates are higher than 2019's forecast, including the role that electric vehicles plays in driving consumption growth.
- By 2041 forecast DER uptake may reduce grid consumption by between 25 TWh and 69 TWh, depending on the scenario.

NEM Operational Demand (as Sent Out)

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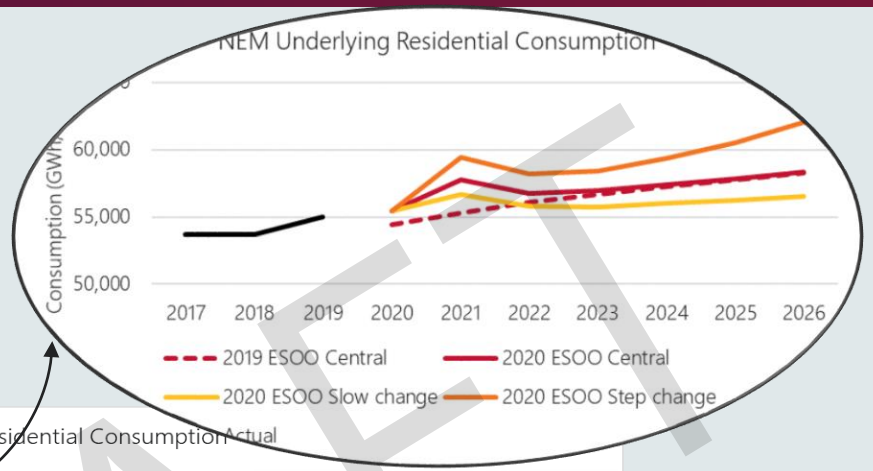
# Residential consumption continues to grow but delivered energy remains flat

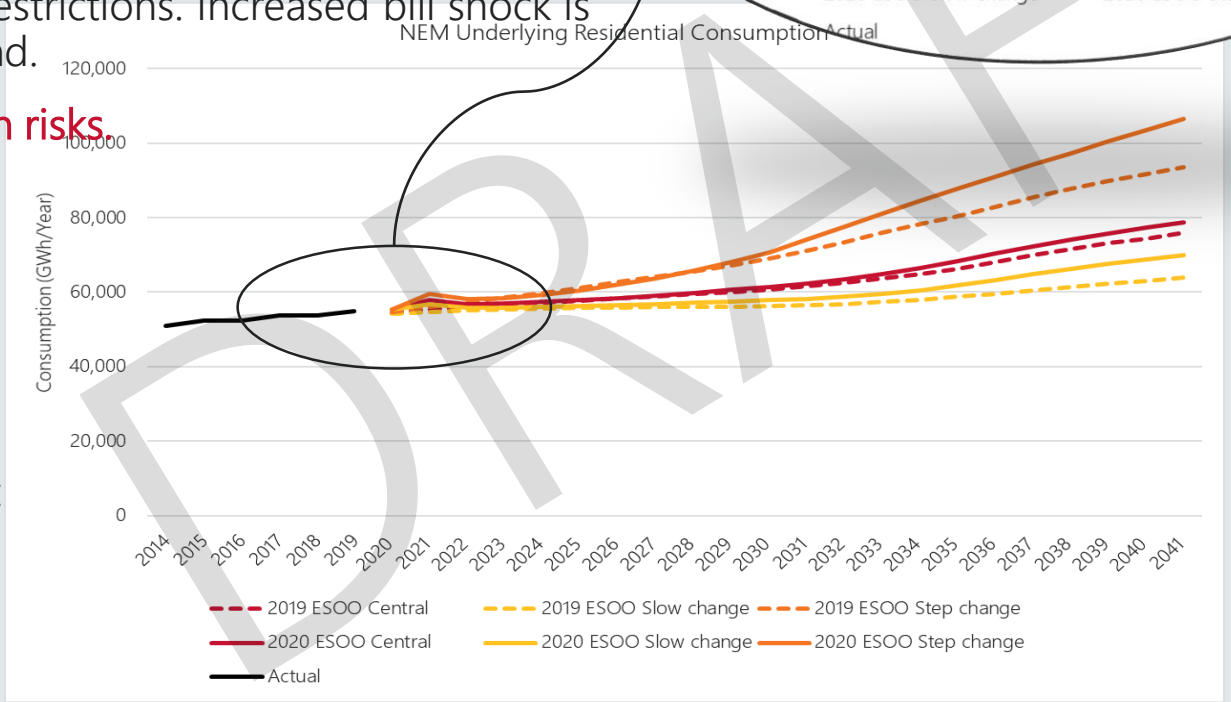
COVID-19 Impacts:

- Estimated to increase residential consumption during social restrictions over the next 6-18 months.
- Connections growth is assumed to slow, in line with Housing Industry Association recent estimates. This lowers annual new connections by up to 43% over the next 2-3 years.
- Slow Change captures longer / stronger COVID-19 restrictions. Increased bill shock is assumed to limit residential consumption above trend.
- Additional sensitivities will further examine downturn risks.

Other observations:

- Increasing energy efficiency and changing appliance usage lowers average household consumption over the next decade.
- Connections growth increases overall residential consumption.
- Delivered energy is forecast to remain flat in the first 10 years due to strong growth in rooftop PV
- EV uptake is forecast to be the most material driver of increasing consumption, with Step Change have the most rapid growth

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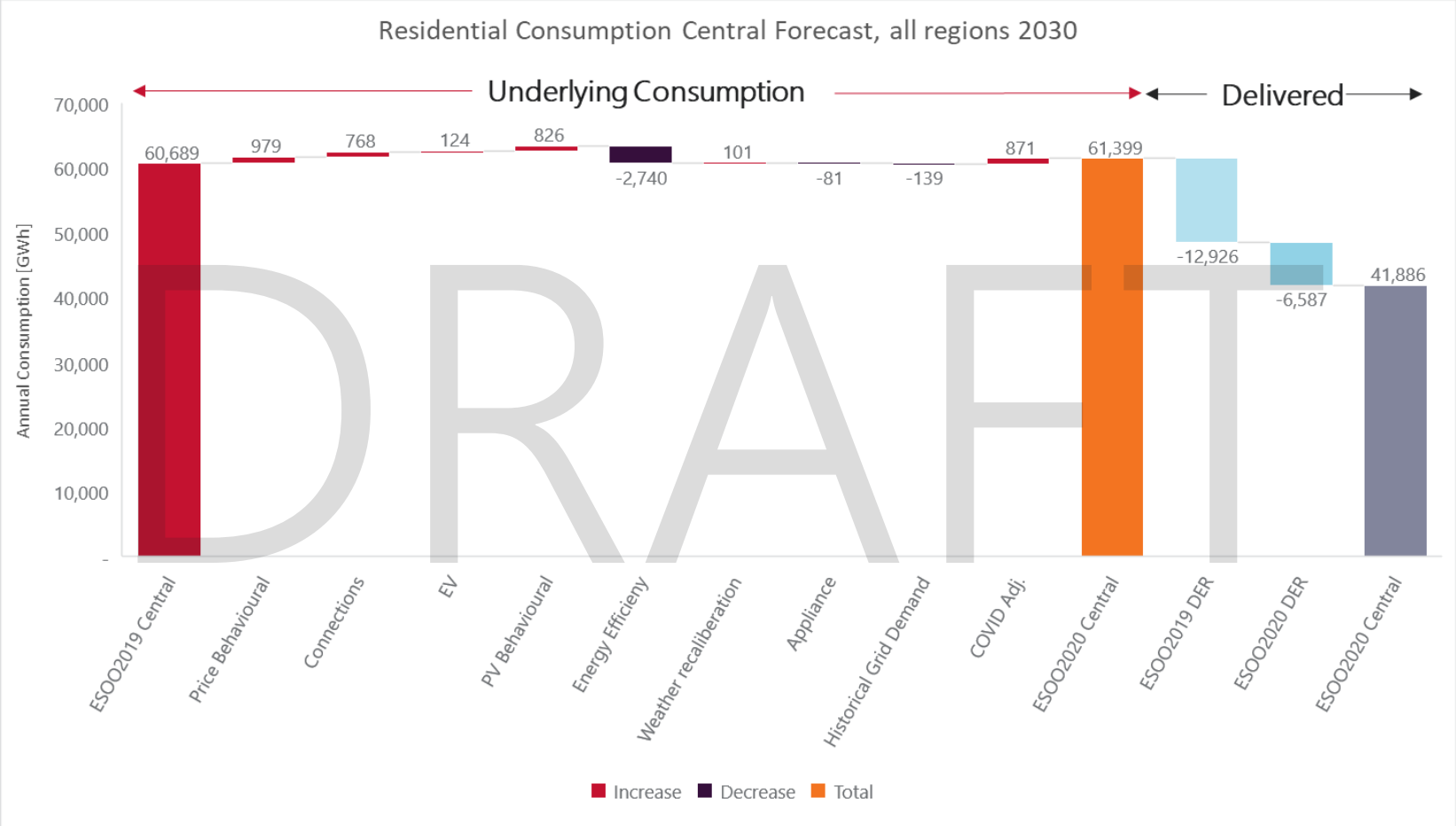
# Energy efficiency savings offset growth drivers, and higher DER lowers delivered consumption

- Forecast residential underlying consumption to 2030 is similar to the 2019 ESOO forecast, however consumption drivers have shifted:
- Drivers increasing underlying consumption:
  - Higher PV uptake (**but lowers delivered consumption)**
  - Higher connections growth, after initial COVID-19 slow down.
  - Reduced exposure to energy costs from PV installations
  - (Short term) COVID-19 consumption influence*
- Drivers lowering underlying consumption:
  - Higher energy efficiency, with State policy expansion in some regions.

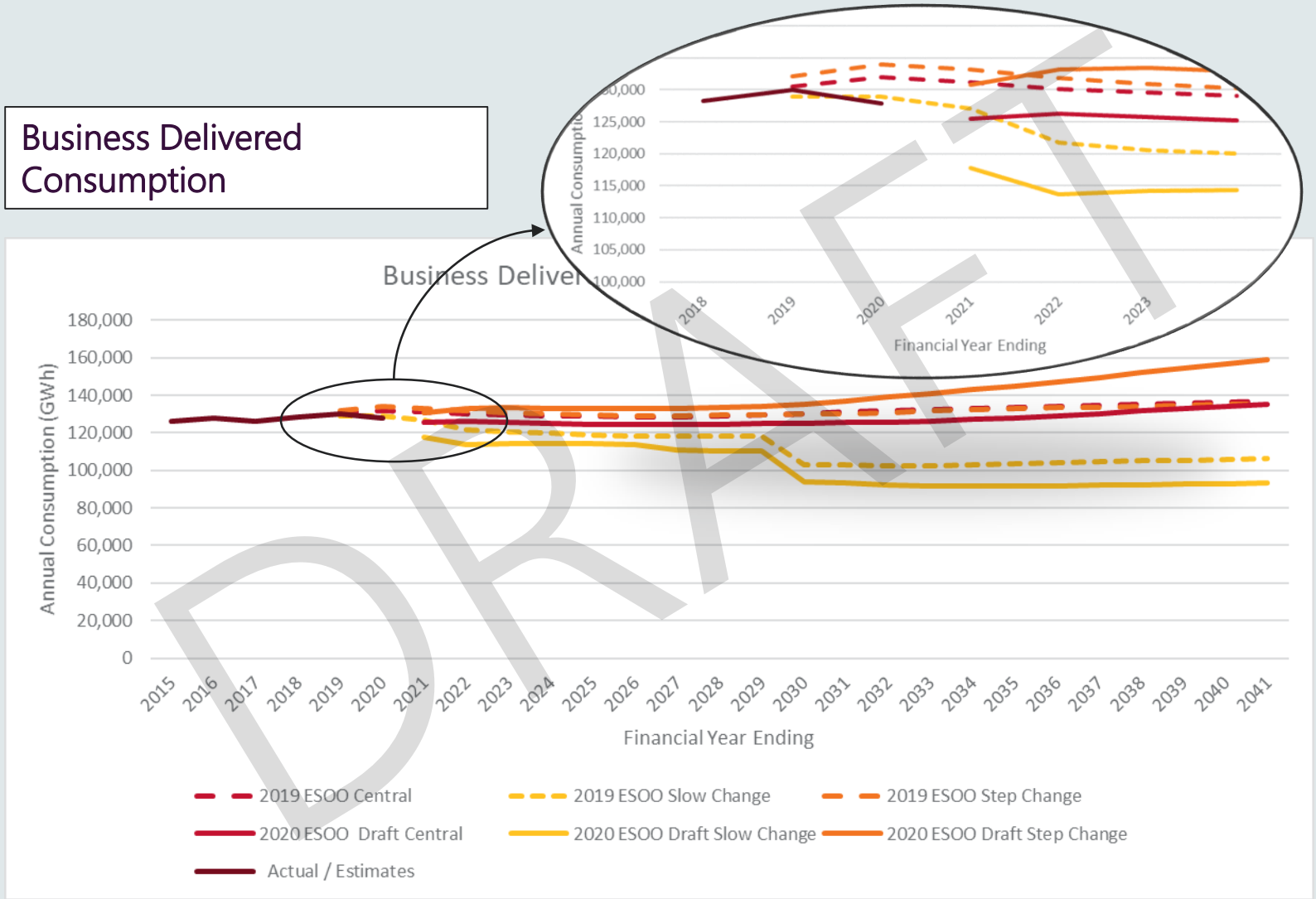



** COVID-19 has been modelled in the short-term to slow connections growth, lower energy efficiency uptake and increase appliance usage which leads to a net increase in consumption in 2030 relative to the 2019 ESOO. The "Connections" category above excludes COVID-19 connection slowdown impacts, which are captured in the COVID Adj. category.*

# Business: Increased downside risks and increased electrification potential widens the scenario spread

- COVID-19 affects all scenarios, reducing consumption as business suffers – particularly manufacturing, hospitality and services businesses
- Increasing PV uptake forecast to limit delivered energy growth until electrified transportation sector emerges
- Greater risk to industrials, with closures captured in the Slow Change scenario
  - Slow Change applies closures at timings influenced by AEMO analysis and direct feedback from industrials
  - Additional sensitivity (not shown) will consider COVID-19 downturn induced closures. This sensitivity is under development.

Business Delivered Consumption

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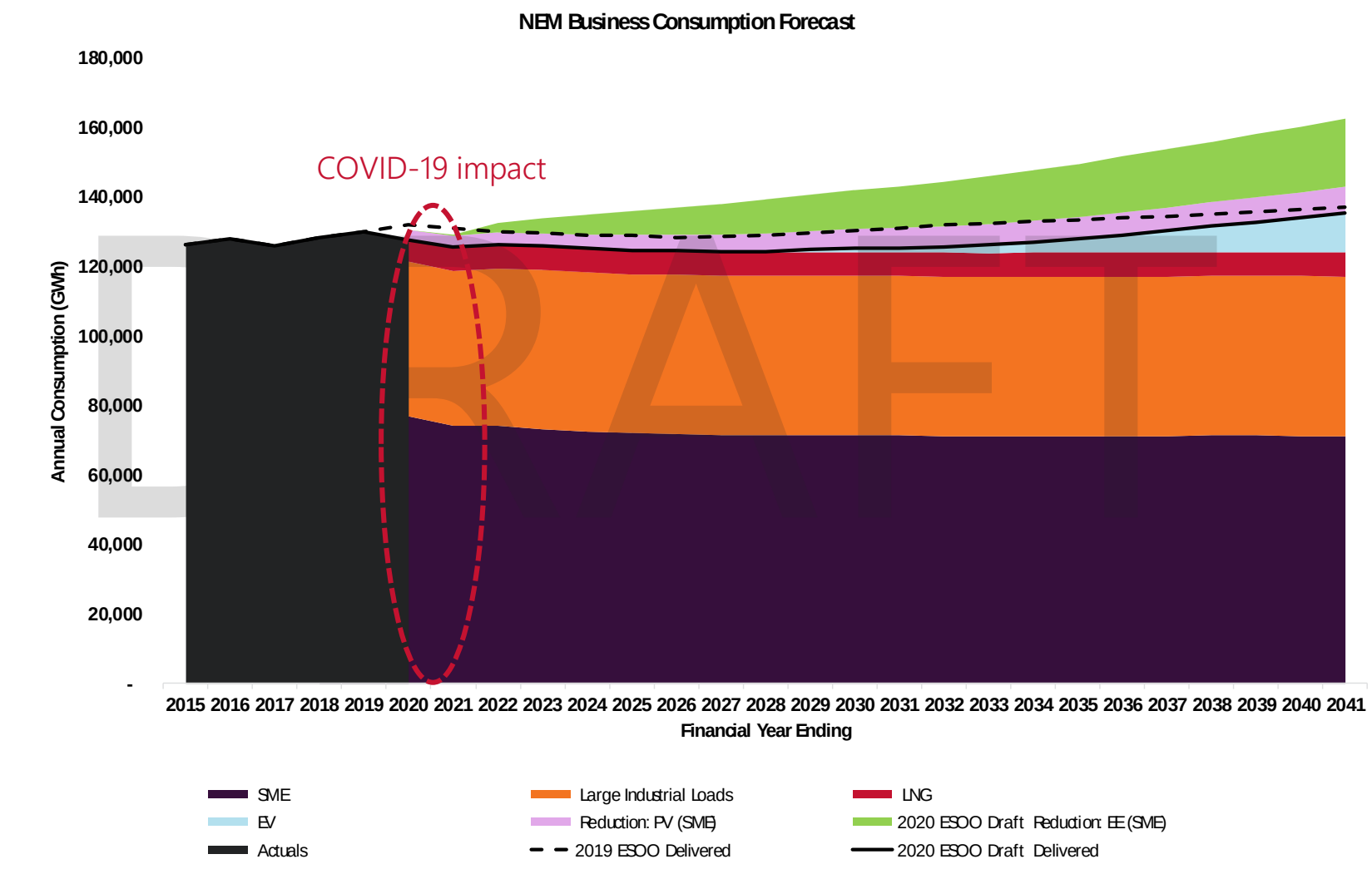
# DER and energy efficiency limit business growth, while EV provides growth potential

- Forecast Business consumption is projected to fall this decade due to:
  - COVID-19 impact, mainly affecting small-medium enterprises (SME).
  - Increasing commercial PV.
  - Increases in commercial energy efficiency (EE) activities due to expansion of some State schemes.
- Energy efficiency forecast increase (relative to 2019 forecasts) due to:
  - State scheme expansion, particularly in NSW and SA
  - Updated (commercial and residential) building stock estimates
- From 2028 in the Central Scenario, consumption is forecast to increase, driven by forecast growth in electric vehicles
- Compared to FYE2019, the total consumption for FYE2020 is forecast to sit 1.7% lower, and FYE2021 at 3.5% lower mostly due to expected less activity resulting from COVID-19 .



# NEM Regions: NSW, VIC, SA operational consumption forecast to decline, TAS and QLD remain relatively flat.

New South Wales (including the Australian Capital Territory)

- Expanded state energy efficiency schemes encourage greater energy savings for the commercial sector.
- Approximately 19% of all residential connections are forecast to have a PV system installed by 2030, up from 16% in 2020, with larger PV systems
- Industrial closure risks increase, with material closure risks of large energy users by 2030 within Slow Change

Queensland

- Energy efficiency forecasts remain relatively unchanged since 2019.
- Approximately 35% of all residential connections are forecast to have a PV system installed by 2030 up from 32% in 2020, with larger PV systems
- Industrial closure risks increase, with material closure risks of large energy users by 2030 within Slow Change

Victoria

- Increased energy efficiency forecast relative to the 2019 projections
- Approximately 33% of all residential connections are forecast to have a PV system installed by 2030 up from 17% in 2020, with larger PV systems
- High uncertainty in industrial activities over the near term

# NEM Regions: NSW, VIC, SA forecast to decline, TAS and QLD remain relatively flat.

## South Australia

- State energy efficiency schemes encourage greater energy savings for the commercial sector.
- Approximately 37% of all residential connections are forecast to have a PV system installed by 2030 up from 33% in 2020
- Lowest forecast risk of industrial load disruption across NEM regions.

## Tasmania

- Energy efficiency forecasts mostly unchanged, but with greater upside potential than previously forecast.
- Lowest DER penetration of all NEM regions. Approximately 18% of all residential connections are forecast to have a PV system installed by 2030 up from 14% in 2020, with larger PV systems
- High uncertainty in industrial activities over the forecast period

# Additional sensitivities under development

## ESOO Scenarios, as presented today

| | Step Change | Central Scenario | Slow Change |
|---|---|---|---|
| Economy | Higher growth | Central (Baseline) | Slow Growth |
| Commodity Outlook | Strong | Neutral | Weak |
| COVID restrictions | 6-9 months | 6-9 months | 15-18 months |
| DER uptake | High | Central | Low |
| Business / Industrial activity | Fastest recovery | Moderate recovery | Slow recovery, with greatest economic loss |
| Connections Growth | Strong growth | COVID adjustment in 2021, recovery by 2022. Overall growth by 2041 | COVID adjustment in 2021, recovery by 2024. Overall growth by 2041 |
| Consumer price elasticity | Unchanged | Unchanged | Reduced * |

## Additional sensitivities under development

| | Central (Downside) | Downside (DER uplift) | Downside (industrial closures) |
|---|---|---|---|
| Economy | Central (Downside) | Central (Downside) | Central (Downside) |
| Commodity Outlook | Neutral | Neutral | Weaker |
| COVID restrictions | 15-18 months | 15-18 months | 15-18 months |
| DER uptake | Central | Central-High (*Fast Change*) | High |
| Business / Industrial activity | Slow recovery, with moderate economic loss | Slow recovery, with moderate economic loss | Slow recovery, with greatest near-term exposure to industrial closures |
| Connections Growth | As per Slow Change | As per Slow Change | As per Slow Change |
| Consumer price elasticity | Reduced | Reduced | Reduced |

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* Consumer price elasticity effects not yet incorporated into these draft forecasts

# Discussion prompts

- Are the draft forecast consumption trends in line with your expectations?
- Do the COVID-19 adjustments align with your expectations?
- Across sectors, do the main drivers align to your expectations?
  - Residential:
    - Connections growth
    - DER production / EV growth
    - Energy efficiency savings
  - Business/industrial:
    - SME / large industrial trends
    - DER production / EV growth
    - Energy efficiency savings

- Would you expect a wider or narrower scenario dispersion?

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# Appendices

Key model inputs for Residential and Business models

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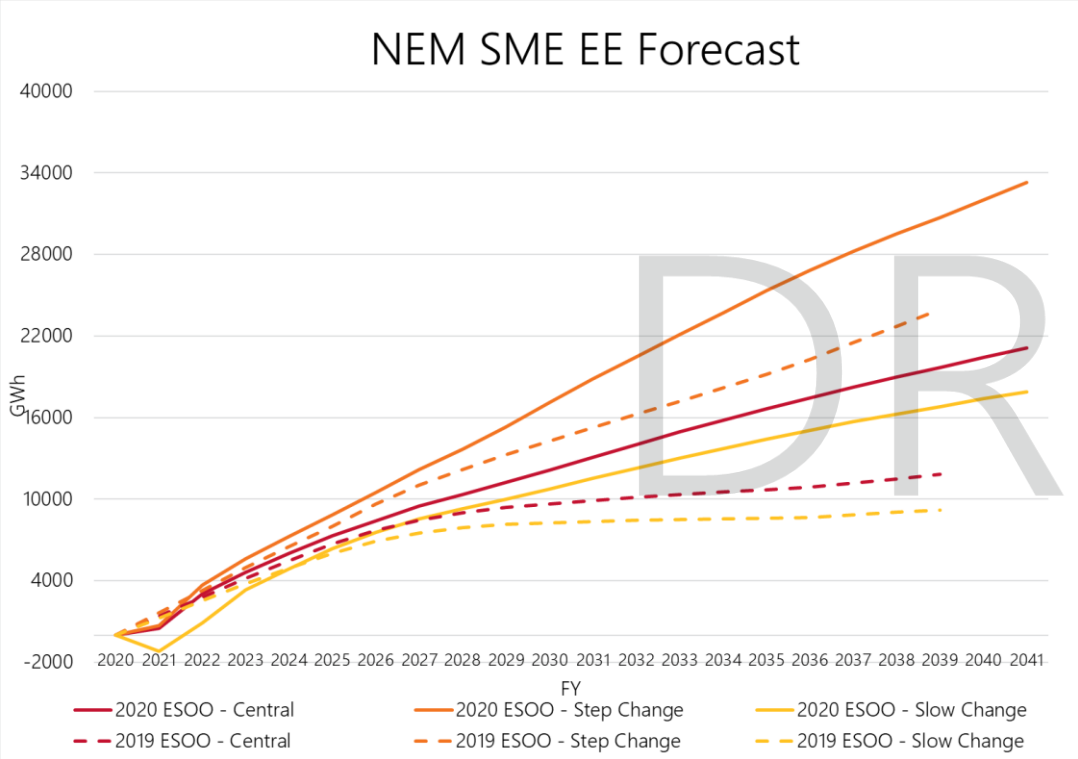
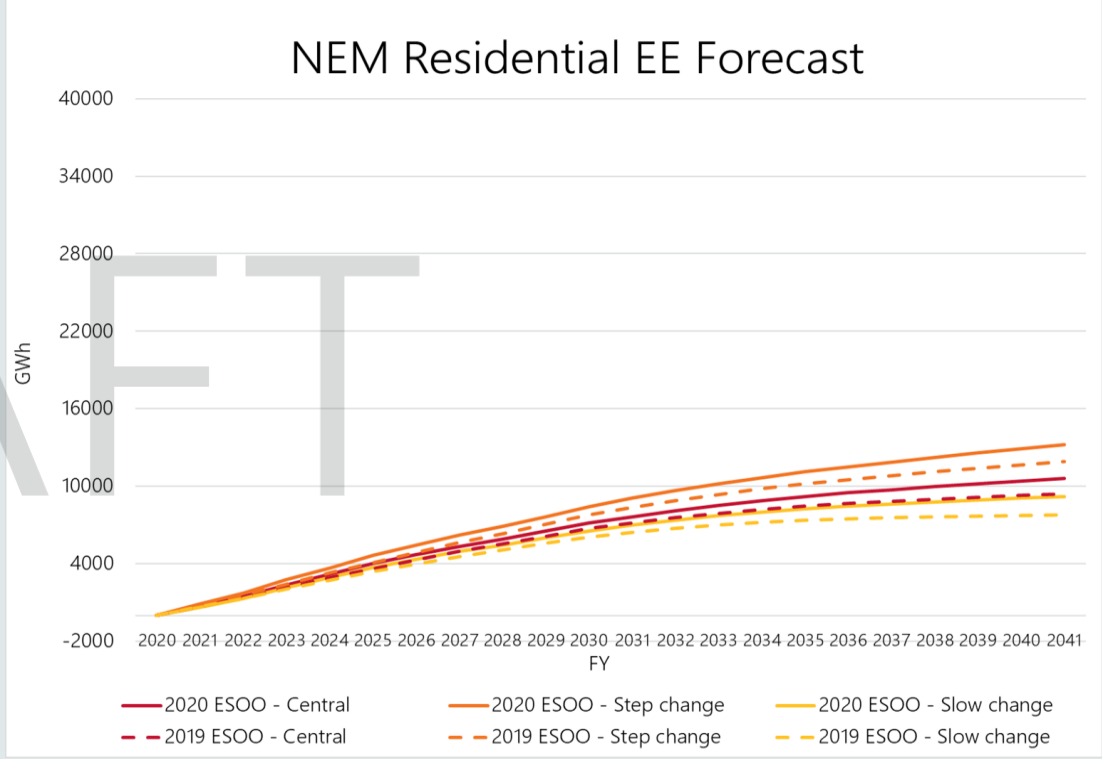
# Energy Efficiency savings are forecast higher than in 2019

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- 2020 SME updates include:
  - Extension of state schemes in NSW (all scenarios) and SA (Step Change) results in higher forecasts compared to 2019.
  - Data from some jurisdictions on state schemes has improved forecasts
  - Updated economic indicators affect stock model, National Construction Code (NCC) and Greenhouse and Energy Minimum Standards (GEMS) savings

- 2020 Residential updates include:
  - Extension of state schemes in NSW (all scenarios) and SA (Step Change) results in marginally higher forecasts compared to 2019.
  - Data from some jurisdictions on state schemes has improved forecasts
  - New Residential building stock model affects NCC savings
  - Updated connection forecasts

# Connections Methodology

Updated connection model now contains economic information, building classes along with a time-series trend to enable more alignment to AEMO scenario drivers, energy efficiency inputs and short-term accuracy.

1. The residential consumption model that AEMO uses requires a forecast of active residential electricity connections (dwellings)
2. Previous model used Housing Industry Association (HIA) and Australian Bureau of Statistics (ABS) household and population forecast
3. The residential model has been updated:
   - Consultant advice for a dwelling stock model split by climate zone and building class (Class 1 and Class 2*), based on HIA data
   - Spread between scenarios drawn from ABS population series differences and scenario forecasts of the construction sector activity (Division E) provided by AEMO's economic forecasts (BIS Oxford Economics)
   - Underlying growth in the short-term (3-5 year) is driven by time-series trend in electricity connections which have historically been quite stable
   - **AEMO has included adjustments to the next 1-4 years to capture assumed impacts of COVID-19, guided by the latest update from the HIA**.**

* The building codes of Australia classify Class 1 buildings as detached houses and Class 2 containing two or more sole-occupancy units each being a separate dwelling

** HIA update, available: https://www.businessnewsaus.com.au/articles/hia-forecasts-new-home-building-to-fall-in-half.html Accessed 21/5/2020

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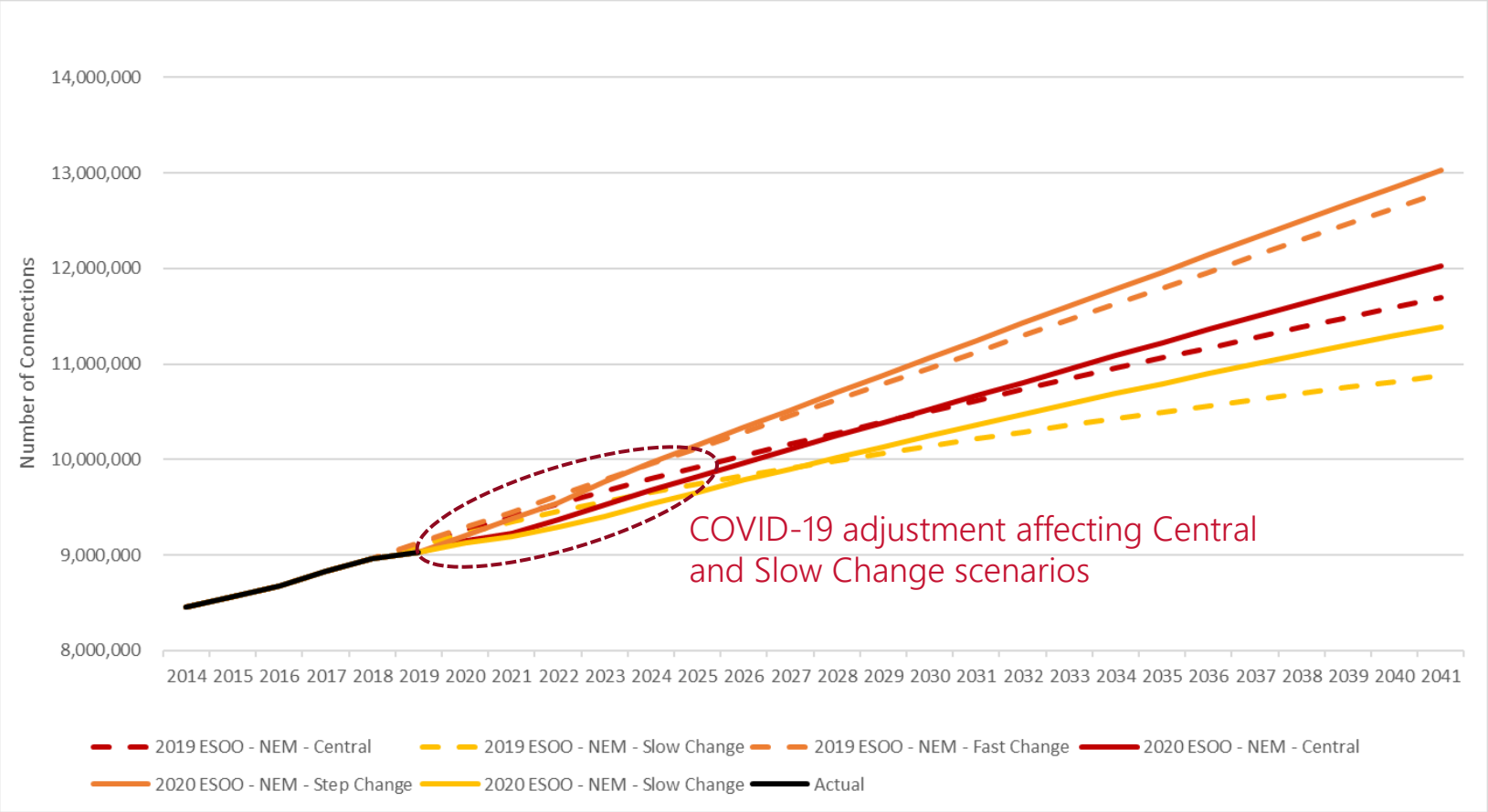
# Connection Forecasts

- Impact from applying COVID-19 adjustments to the connections forecast is a 43% decline of NEM connections for 2021 for the Central scenario.
- The Slow Change scenario adopts a more sustained COVID-19 effect until 2024.

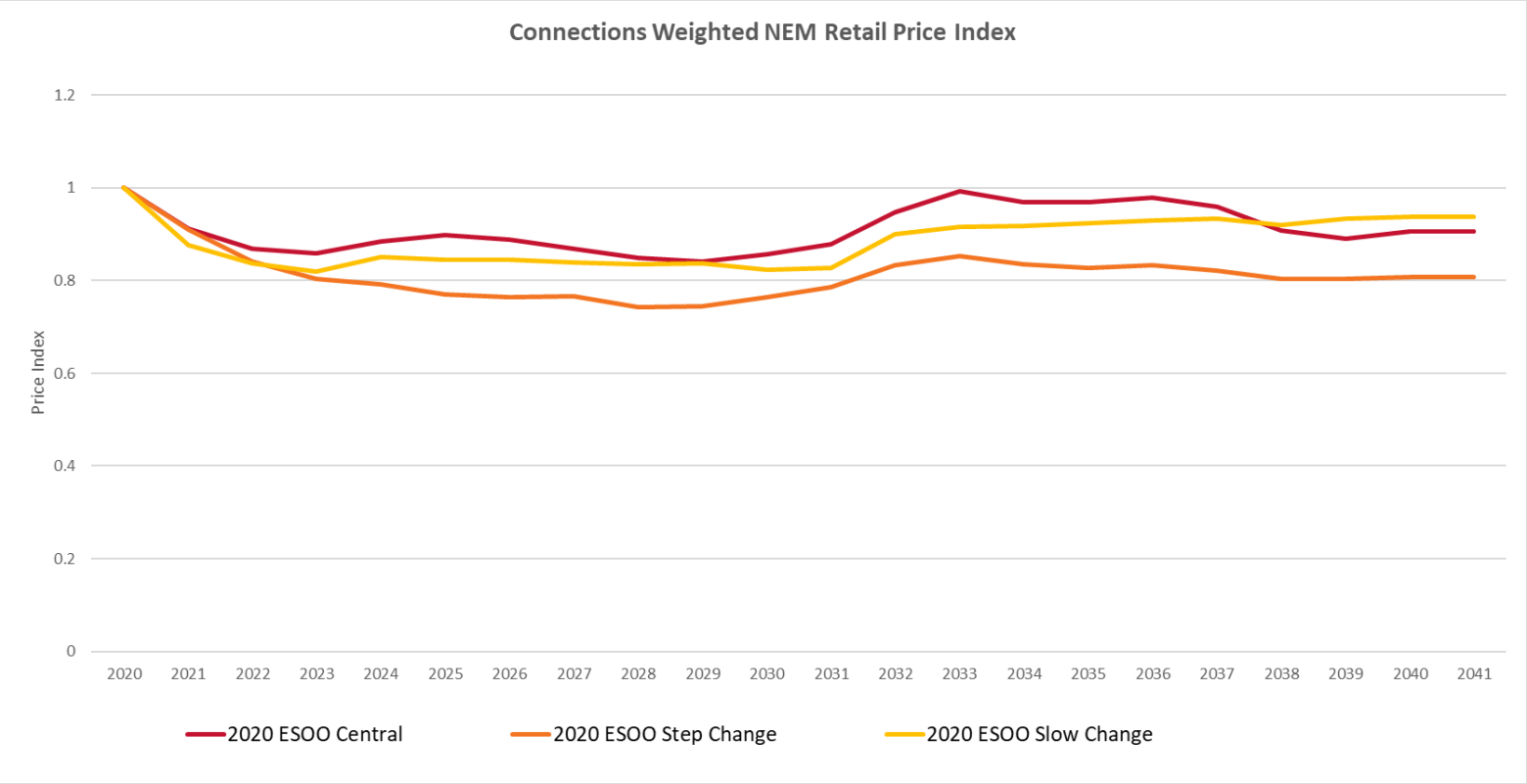


# Retail price forecast

Consumers are typically sensitive to price changes.

Declining prices in the short-term as more renewable generation comes online may result in higher levels of electricity consumption, across both residential and business sectors

AEMO will further consider the appropriate elasticity settings. The price elasticity during an economic slowdown (Slow Change) is under review.

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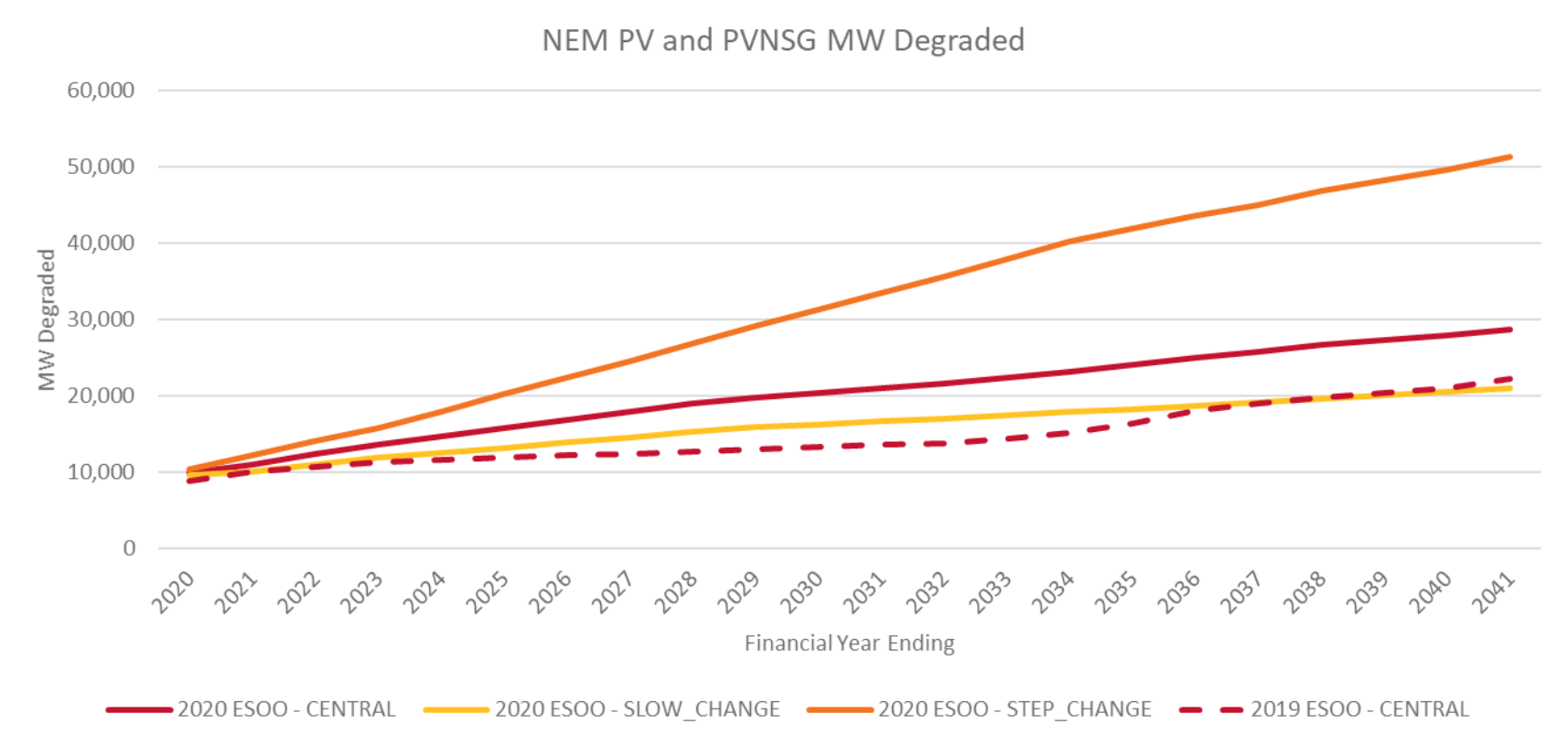
# Higher DER potential to offset consumption growth

- Higher DER uptake forecast, consistent with FRG feedback and recent history
- DER uptake forecast to slow from COVID-19 in near term - forecast rooftop PV installations lower by approximately 800 MW by 2022-23 (Central scenario)
- An additional sensitivity will investigate the impact of DER uptake that is less influenced by COVID-19.

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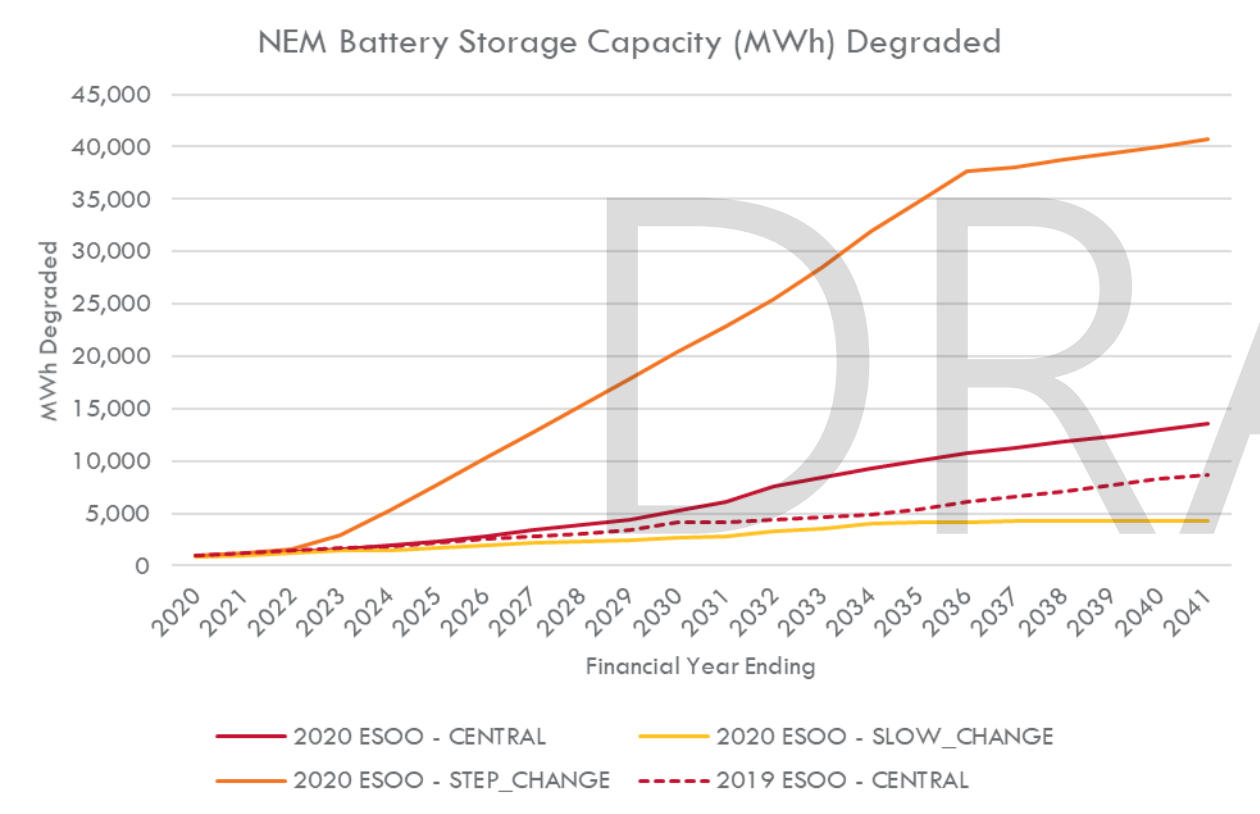
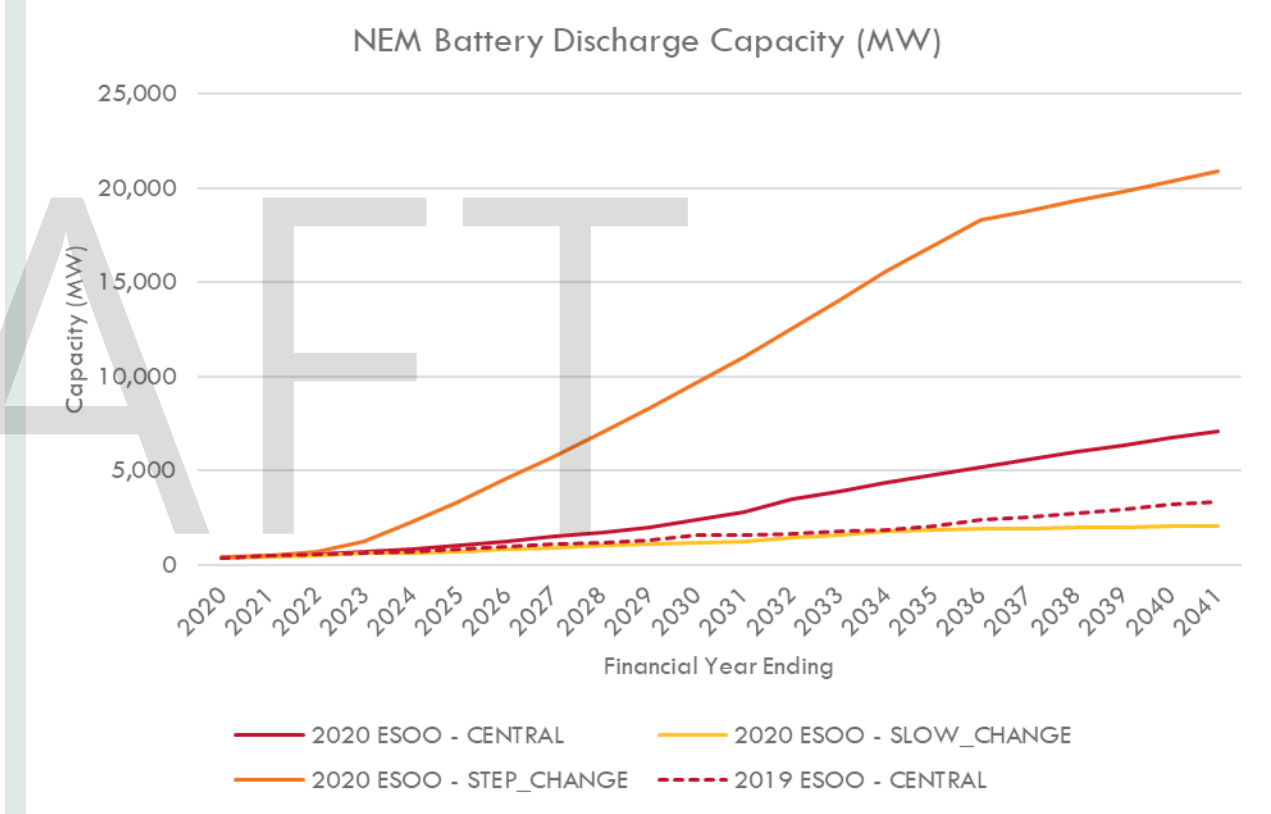
# Higher battery storage behind the meter growth forecast than 2019

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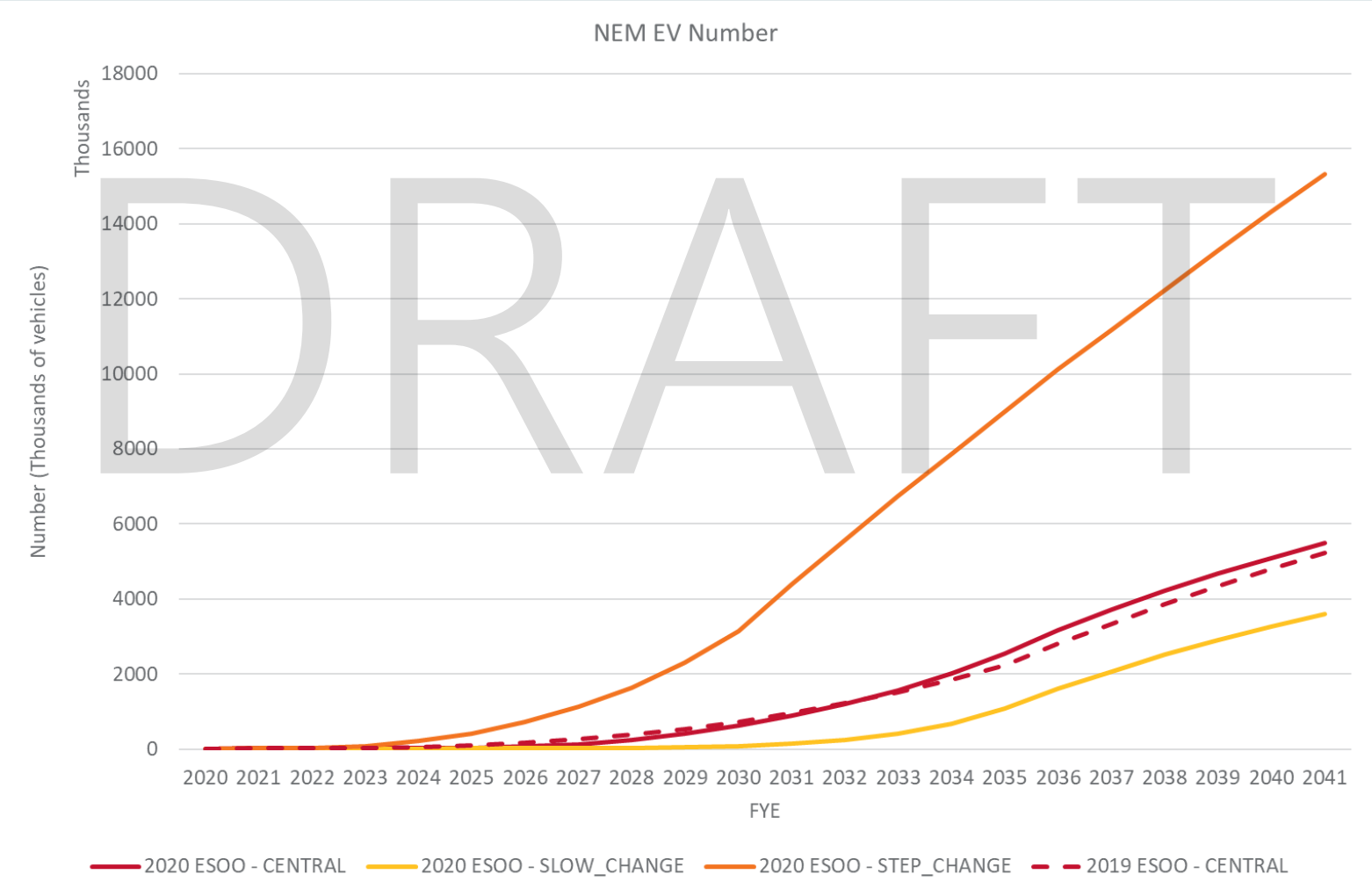
# Emerging EV sector remains a significant driver of increased consumption… but timing is uncertain

- Significant uncertainty regarding the scale and timing of EV emergence
- Ambition to 100% EV or alternative fuelled vehicles by 2050 in Step Change providing a much greater consumption potential from electrified transport

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# NEW SOUTH WALES & AUSTRALIAN CAPITAL TERRITORY

Detailed regional results

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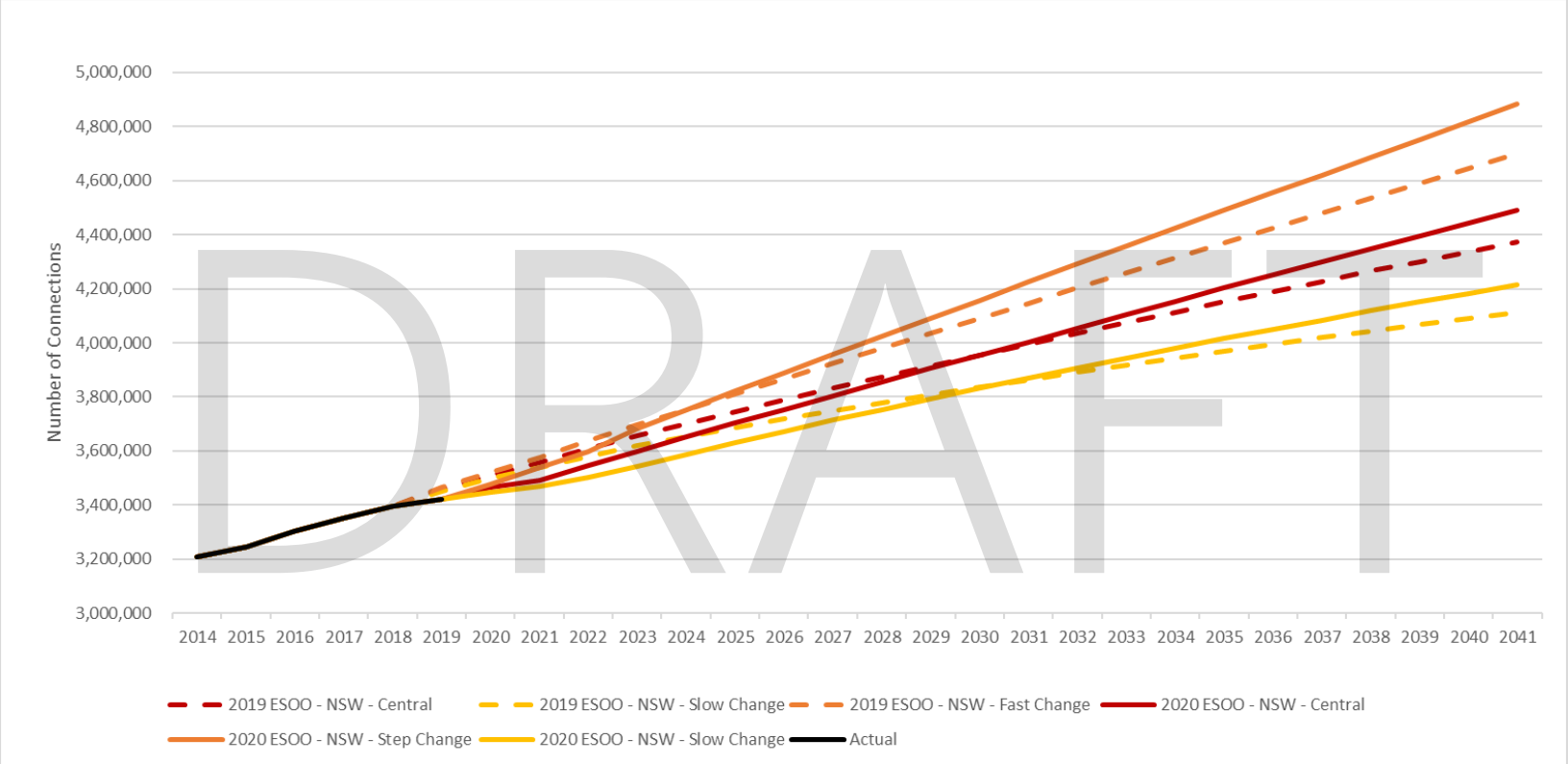
# NSW & ACT – Draft Connections Forecast

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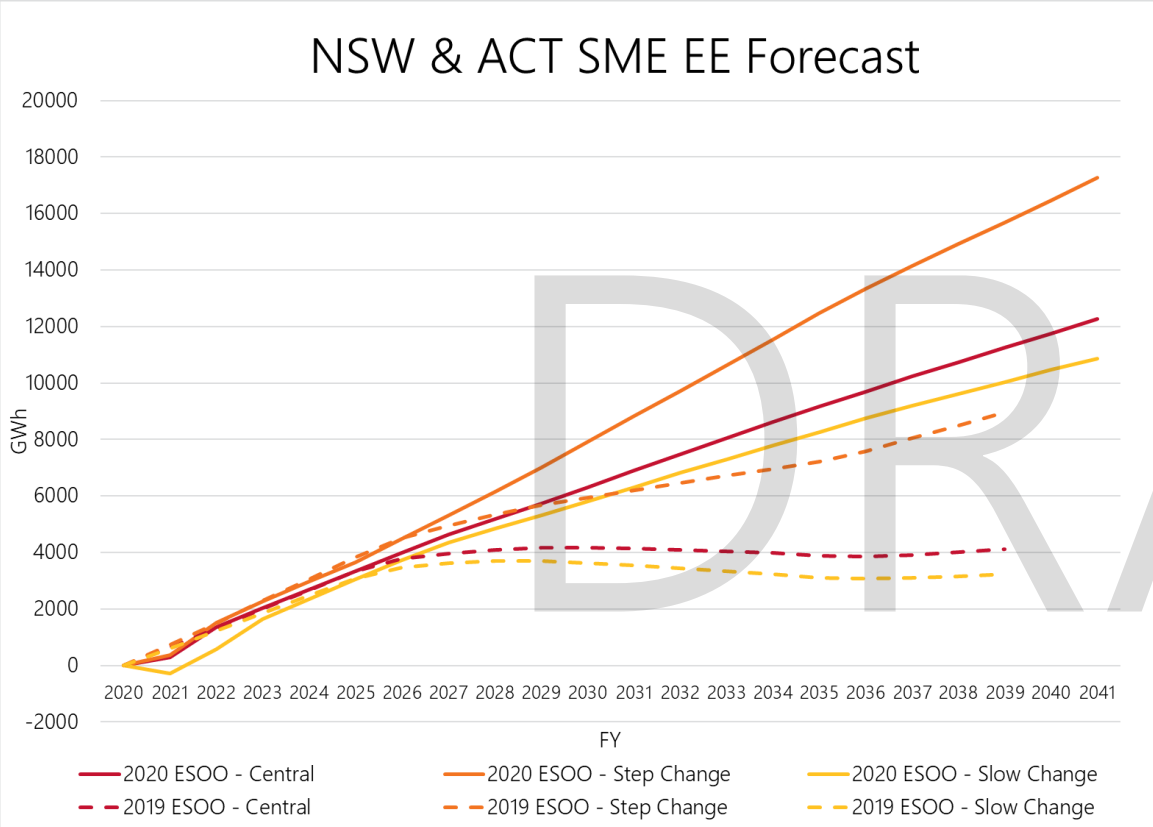
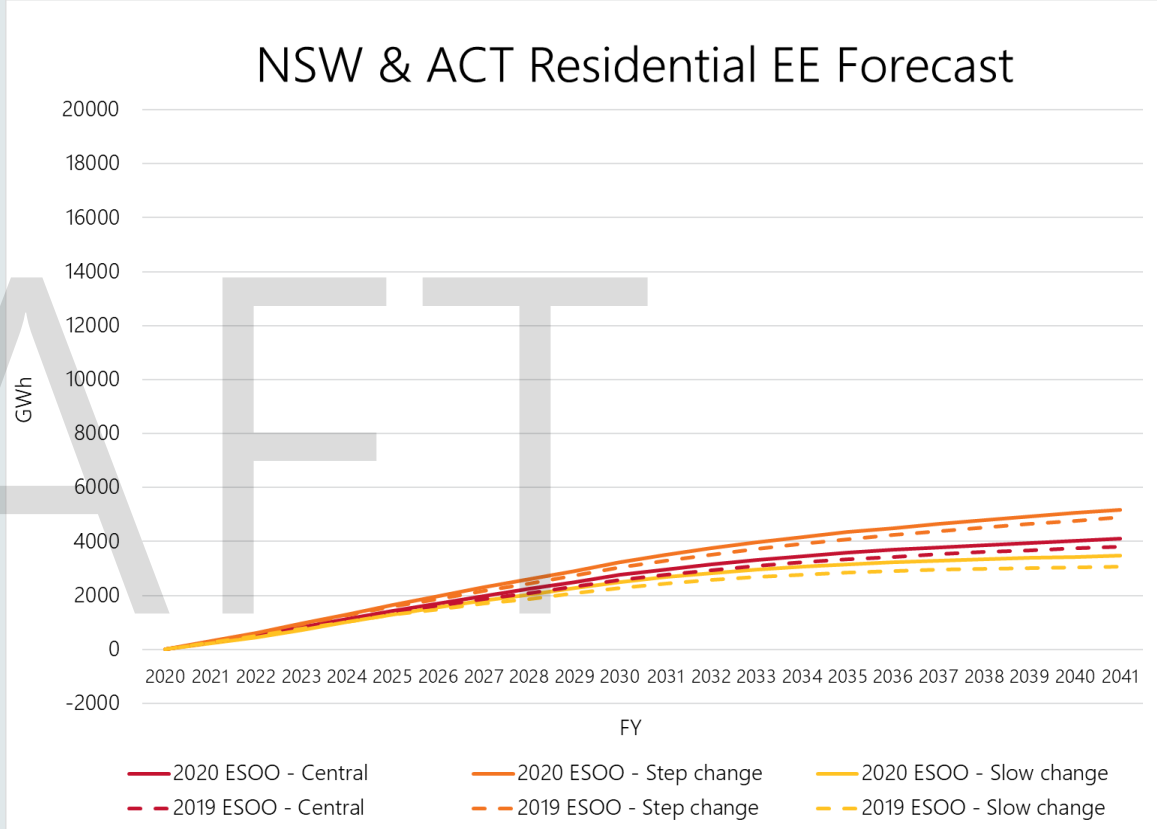
# NSW & ACT Energy Efficiency

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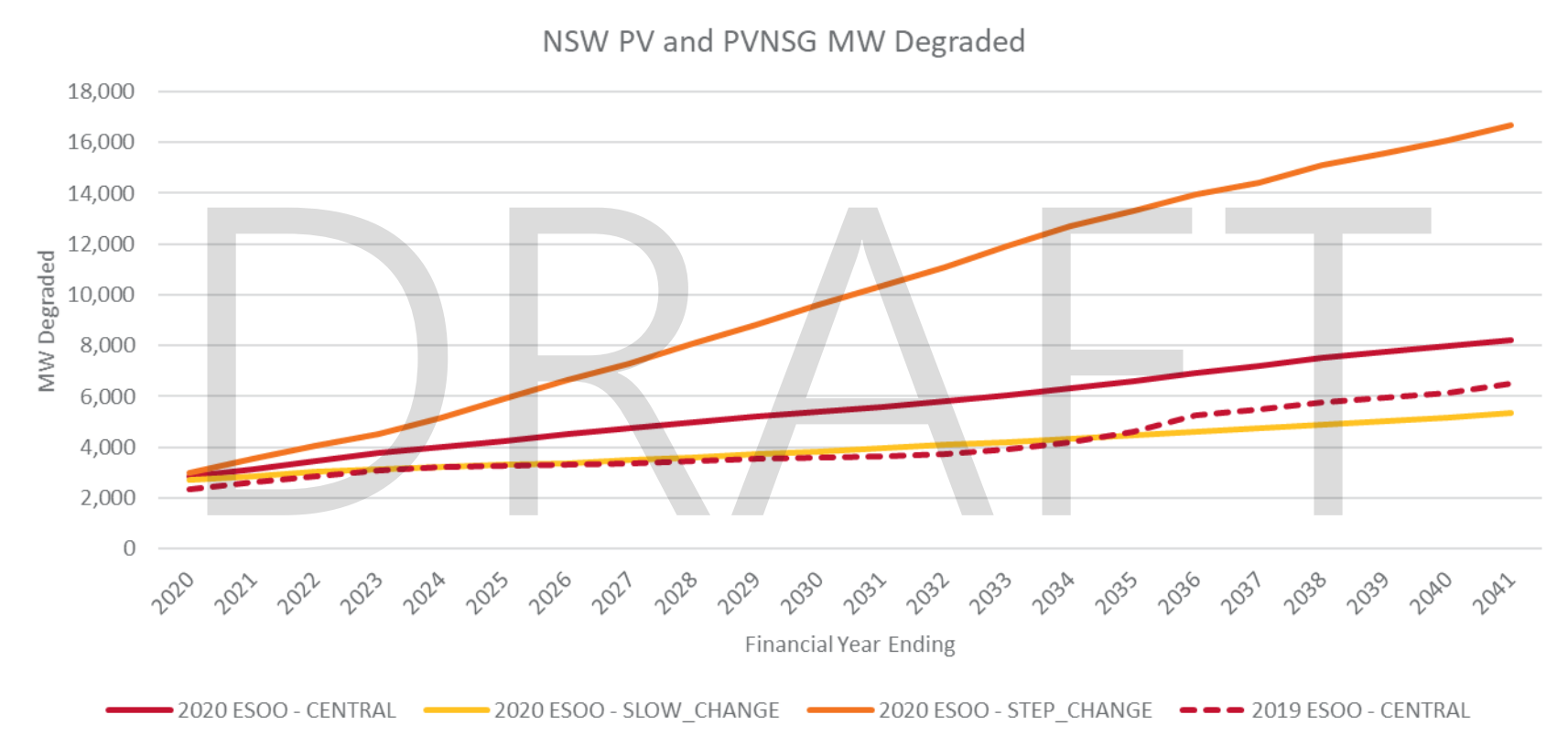
- NSW energy savings scheme (ESS) extended from 2026 to 2050 with higher savings target of 13% by 2030 across all scenarios (assumption based on govt announcements). SME activities dominate scheme. Assumed continuation of savings by 75% beyond activity deeming period.
- New Residential building stock model and updated HBC split cause marginal changes to Residential forecast.

# NSW & ACT PV Projections

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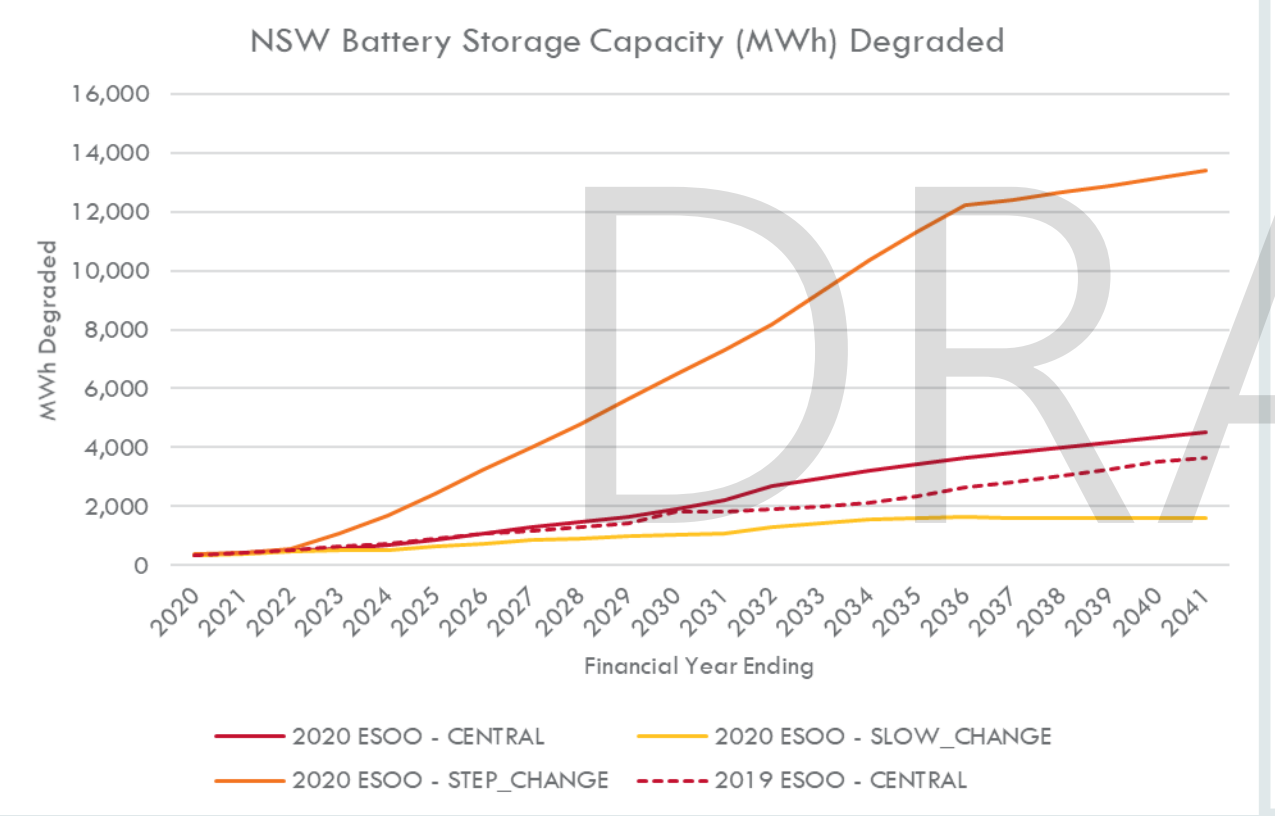
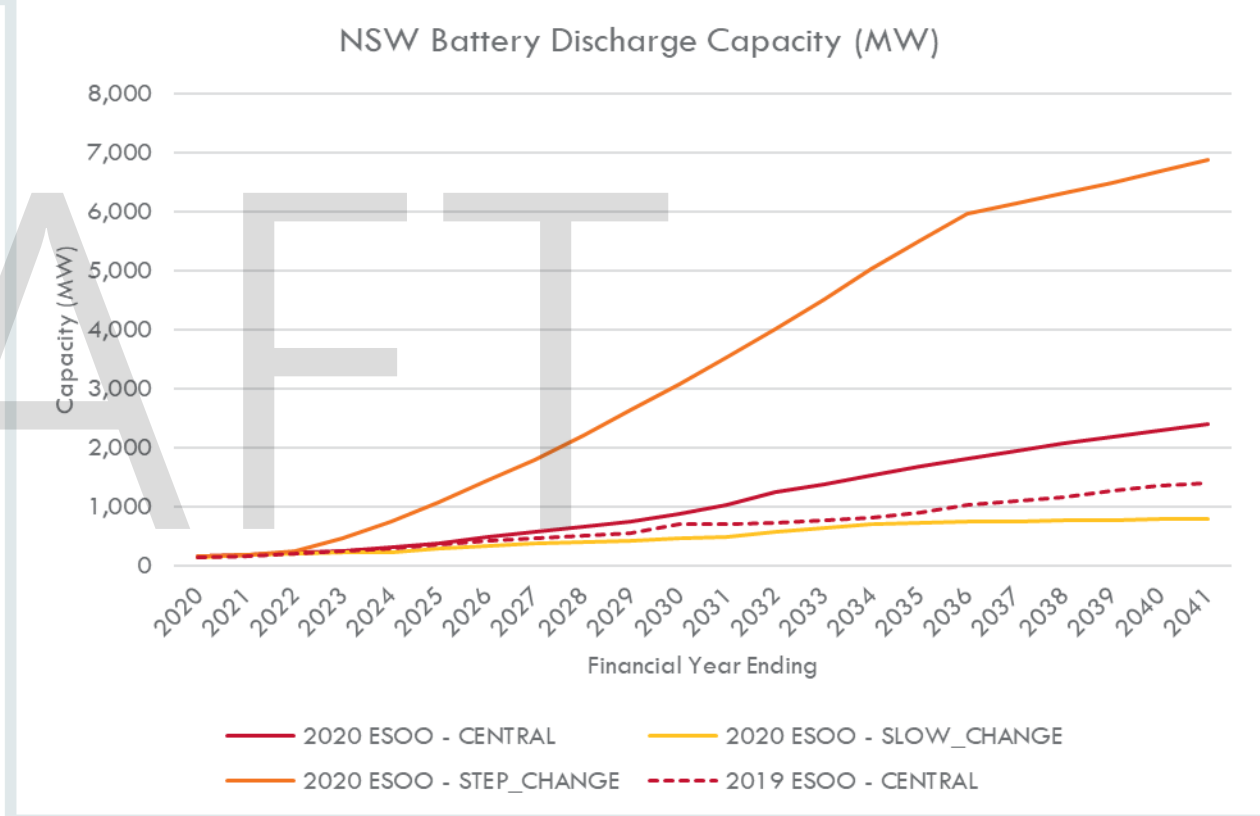
# NSW & ACT Battery Projections

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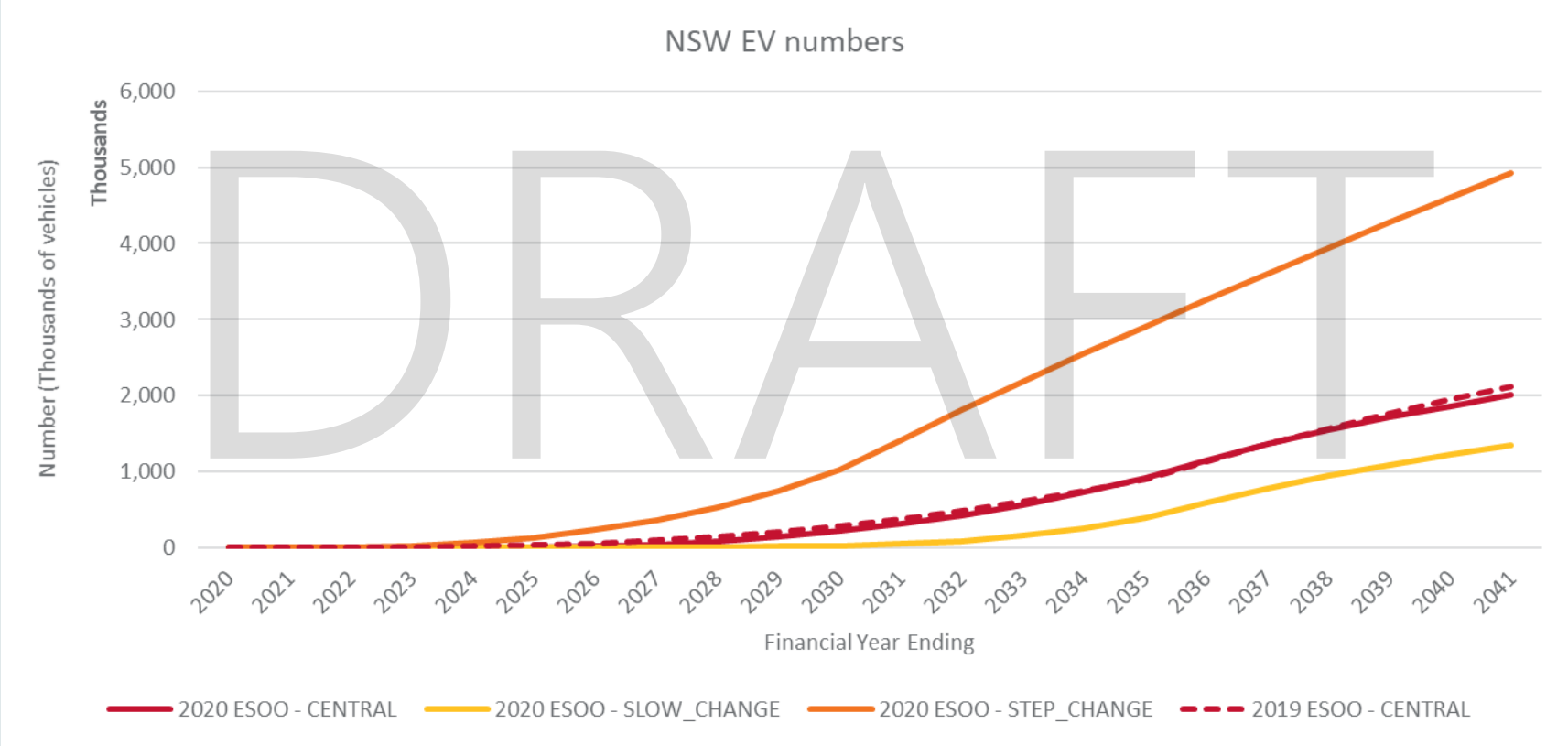
# NSW & ACT EV Projections

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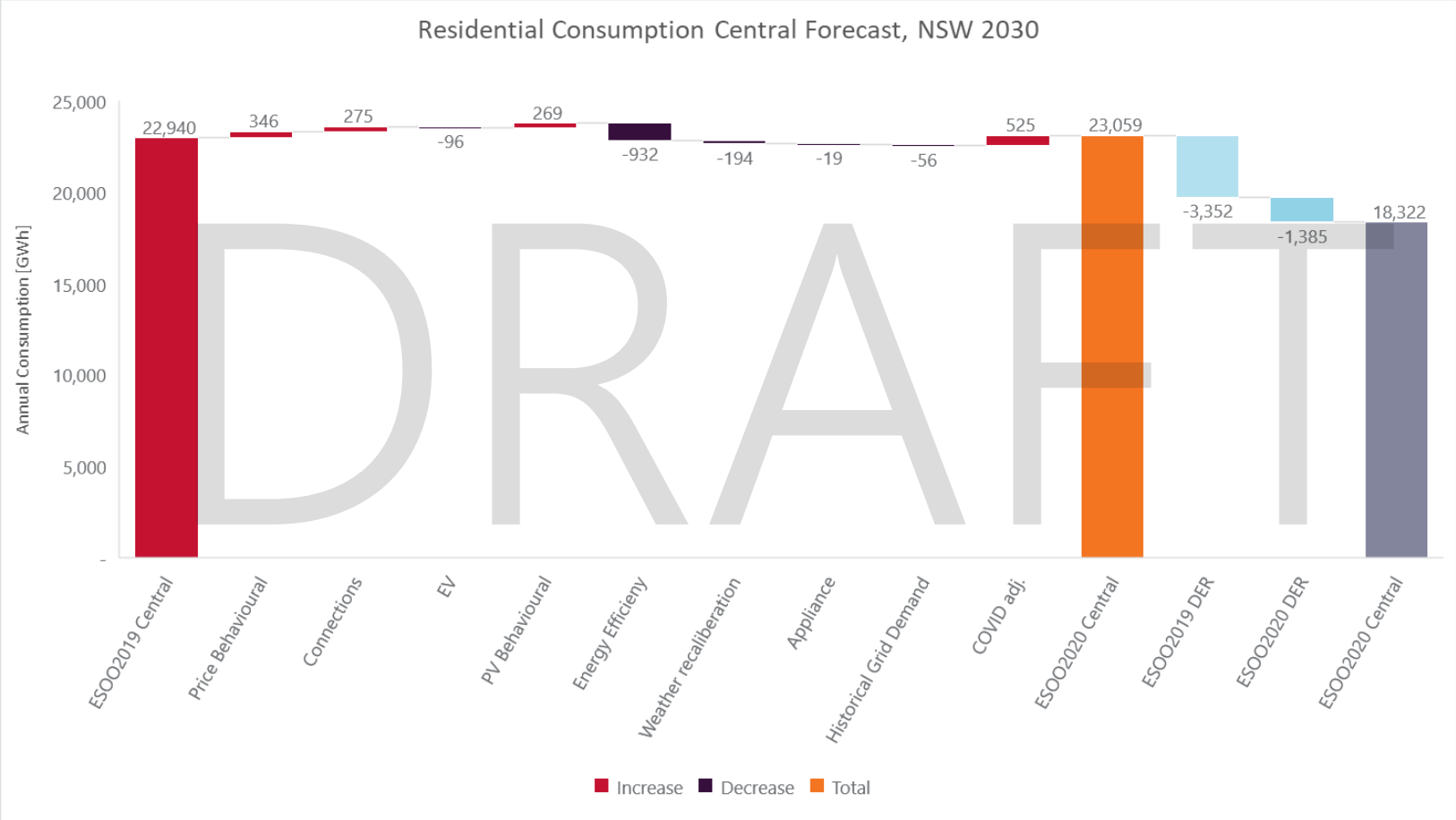
# NSW & ACT Residential Consumption

Drivers increasing underlying consumption:

- Higher PV uptake (but lowers delivered consumption)
- Marginally higher connections (but reduced initially due to COVID-19)
- Reduced exposure to energy costs from PV installations

Drivers lowering underlying consumption:

- Higher energy efficiency
- Weather recalibration

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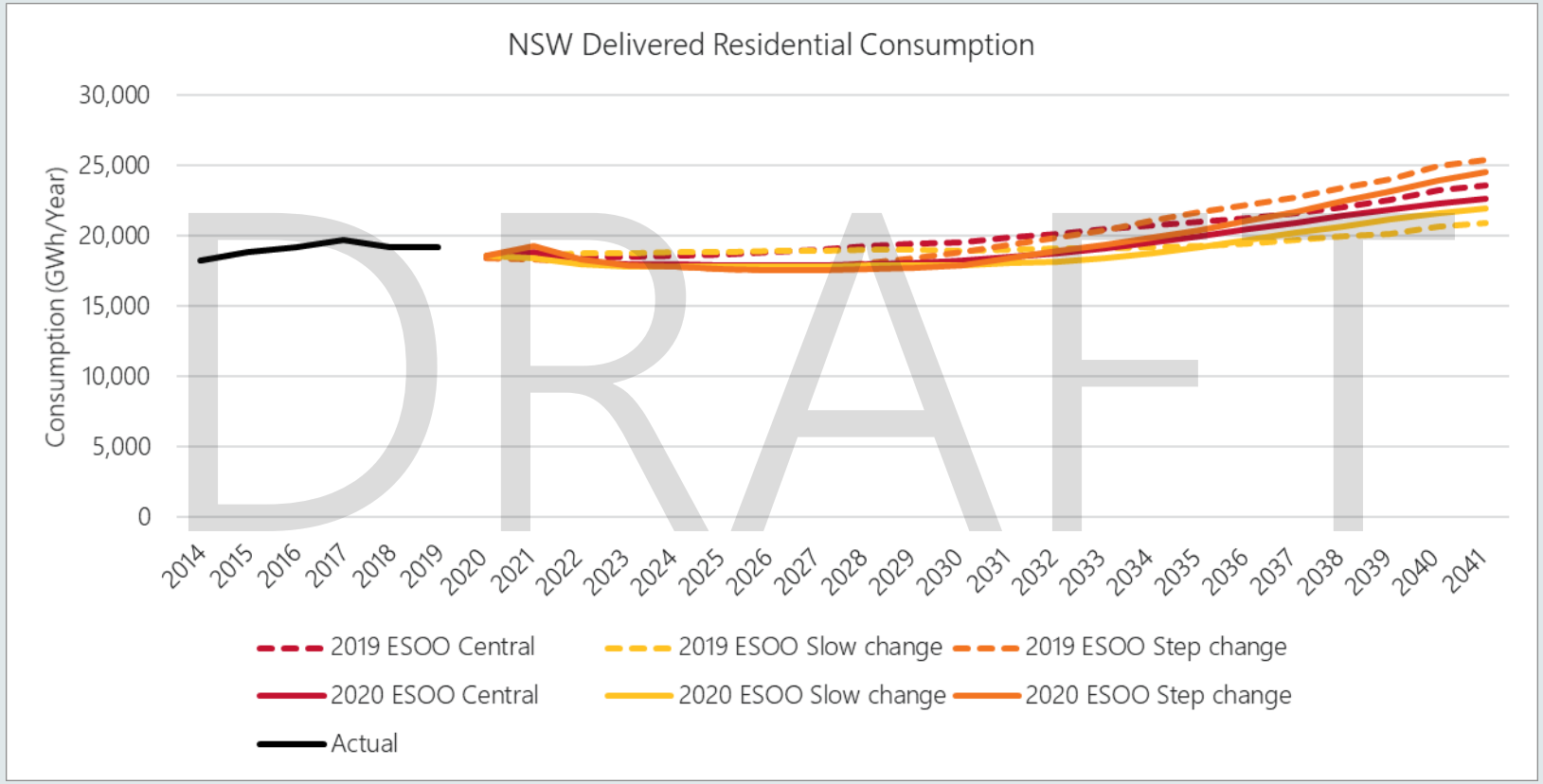
# NSW & ACT - Draft Residential Consumption by Scenario

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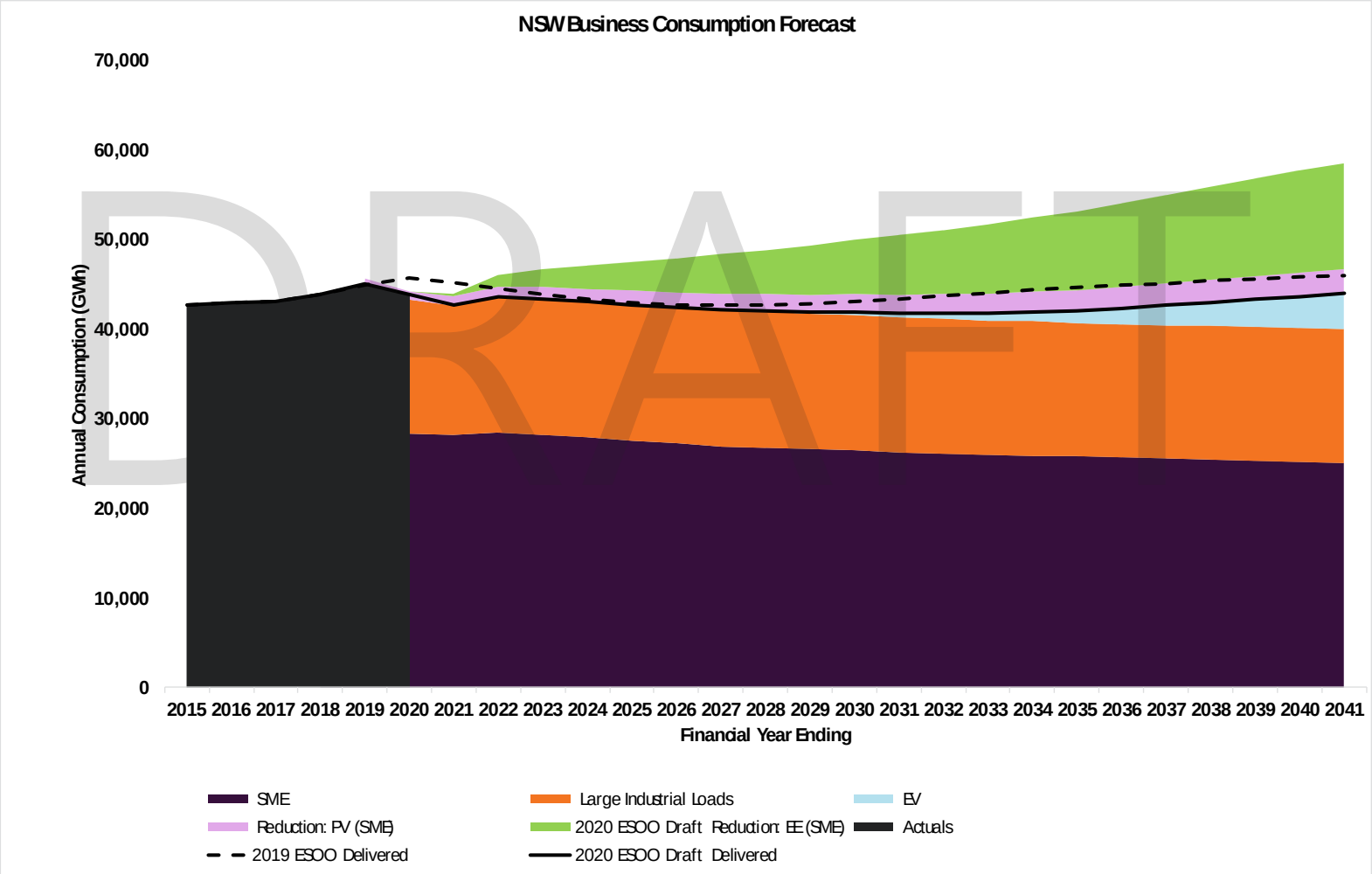
# NSW & ACT - Draft Business Consumption

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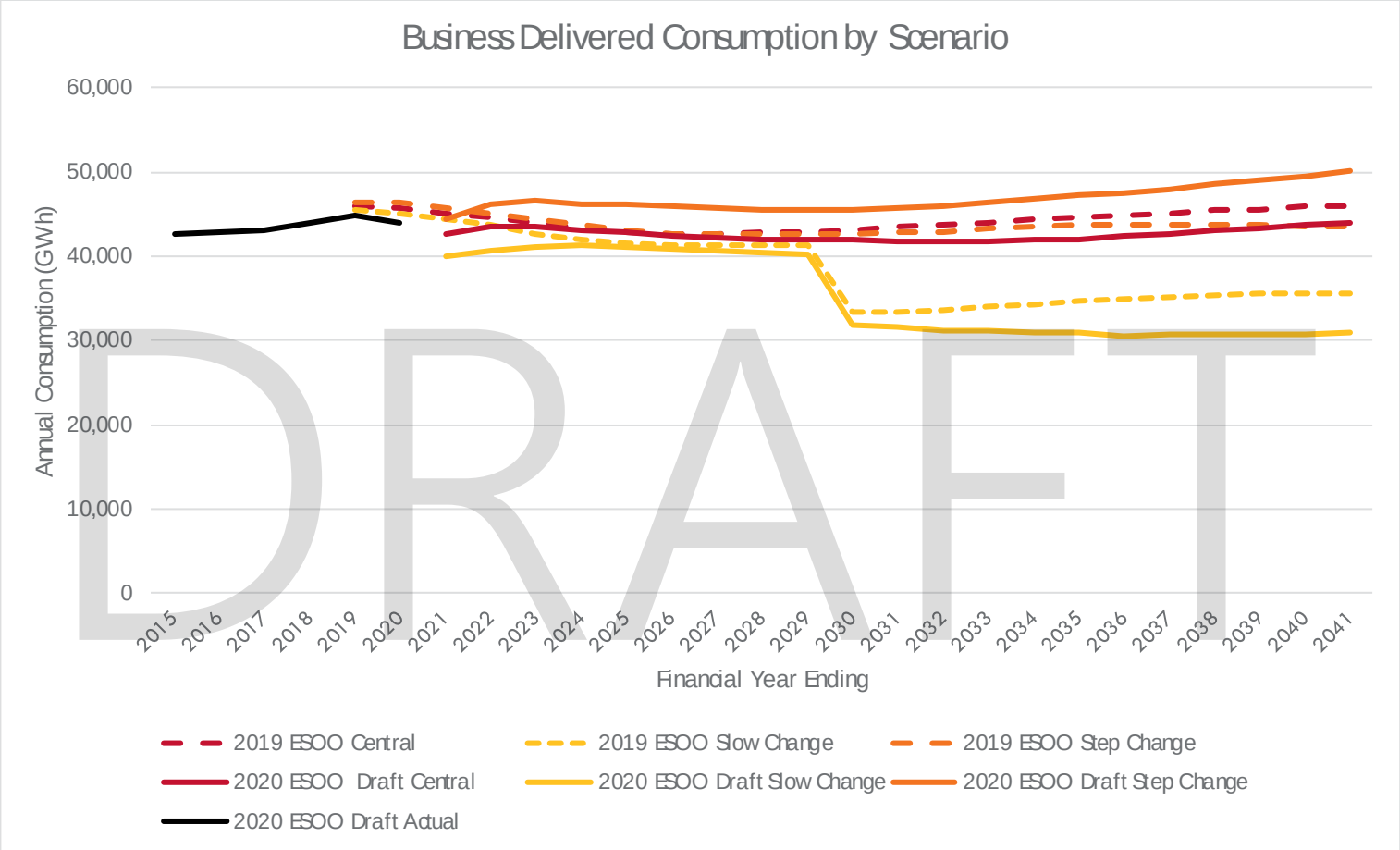
# NSW & ACT - Draft Business Consumption by Scenario

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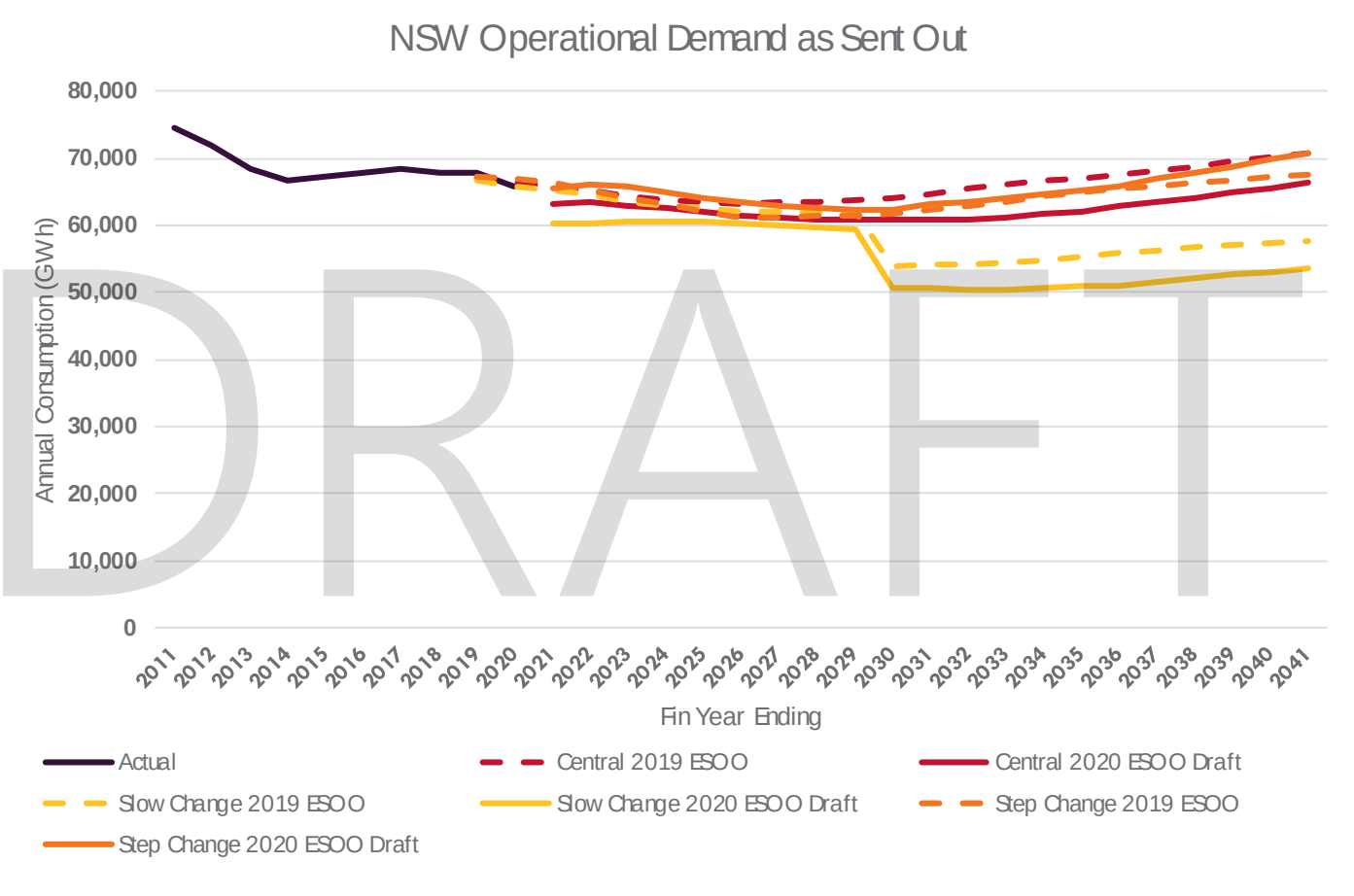
# NSW & ACT - Draft Operational Consumption

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# QUEENSLAND

Detailed regional results

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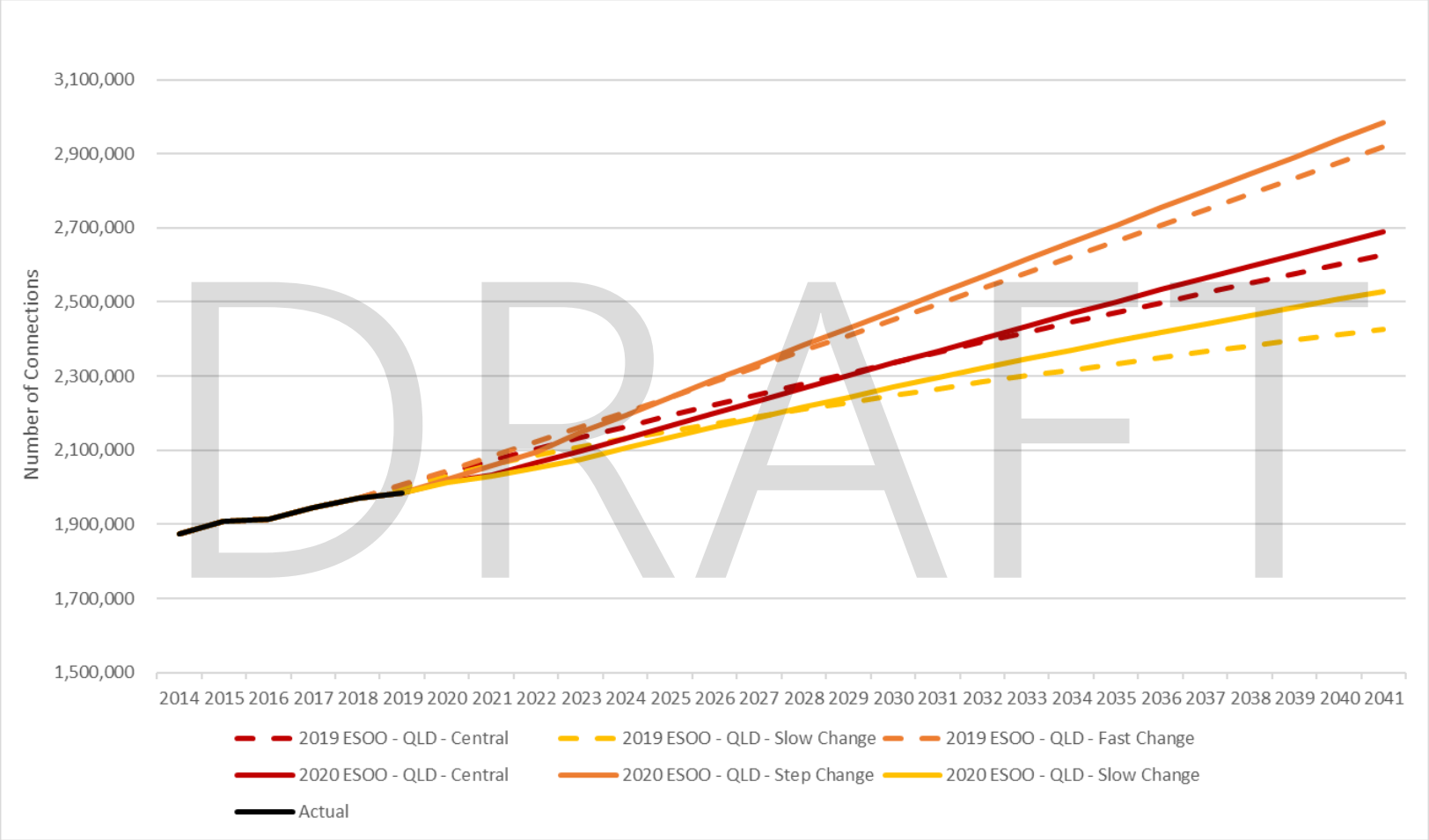
# QLD – Draft Connections Forecast

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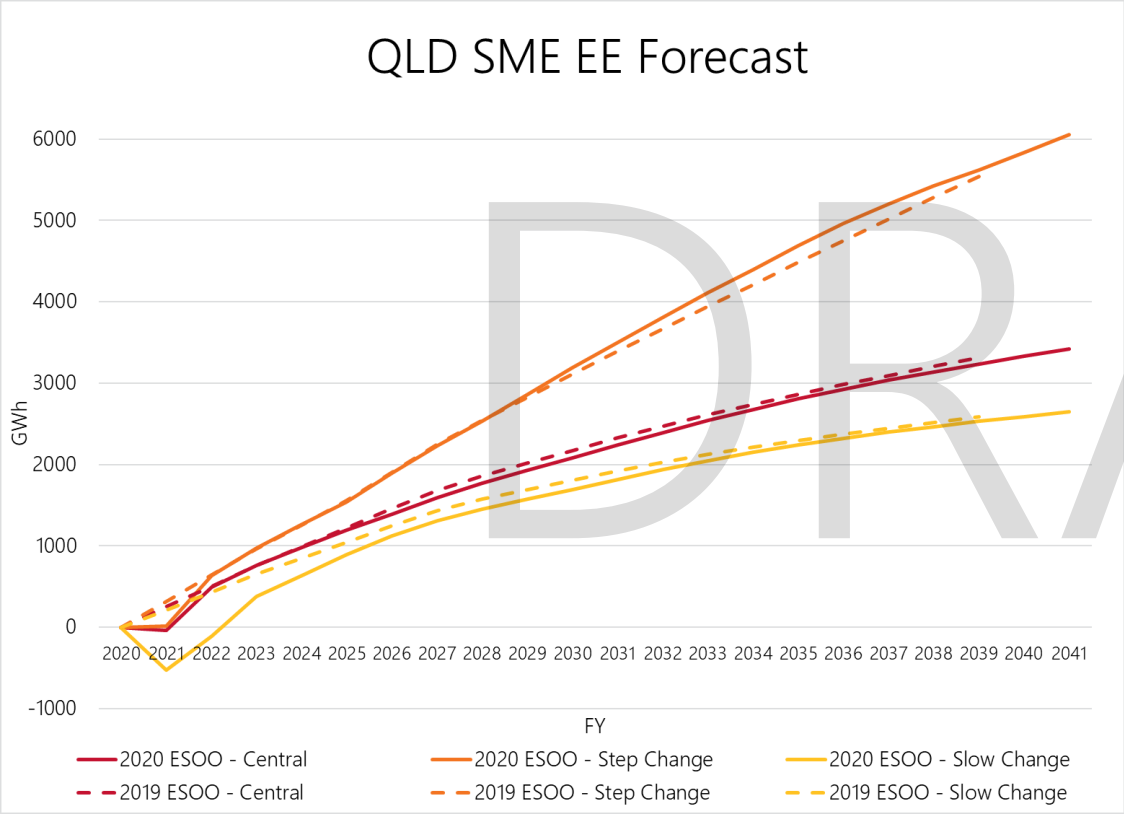
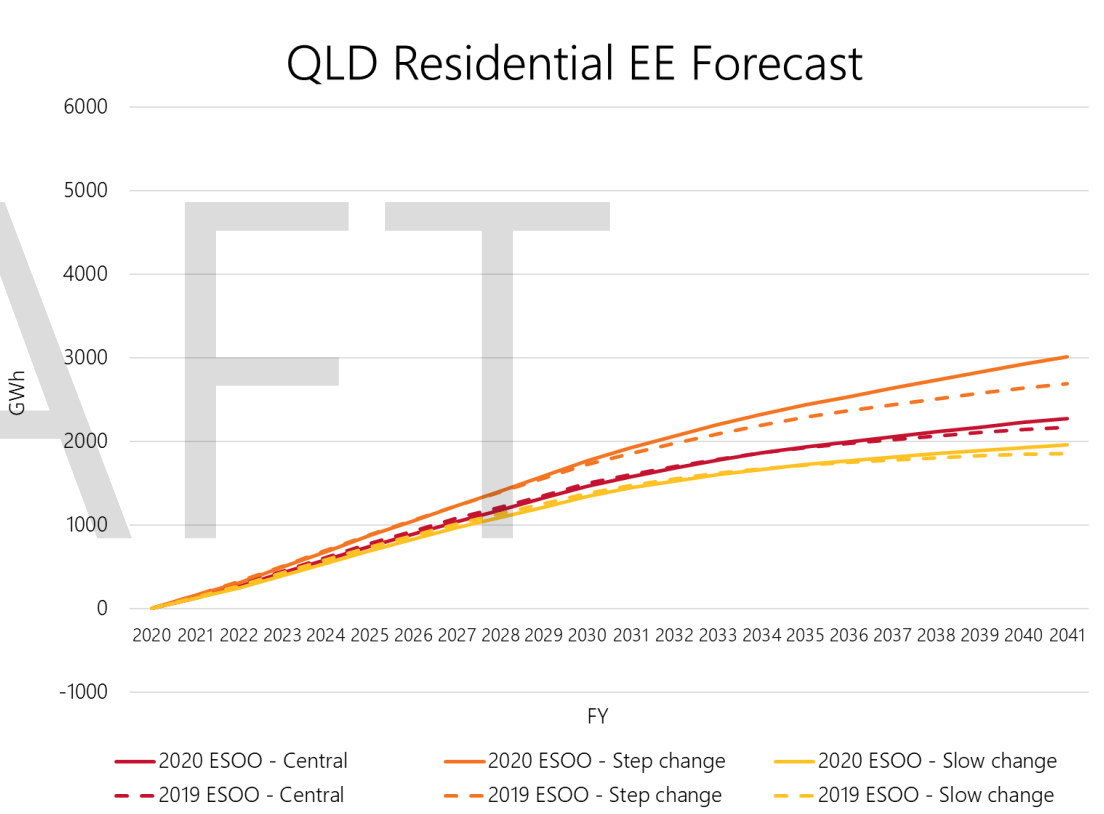
# QLD Energy Efficiency




DRAFT

- No policy changes applied in 2020 ESOO beyond 2019 assumptions
- New residential building stock model and updated heat-base-cool consumption split cause marginal changes to Residential forecast

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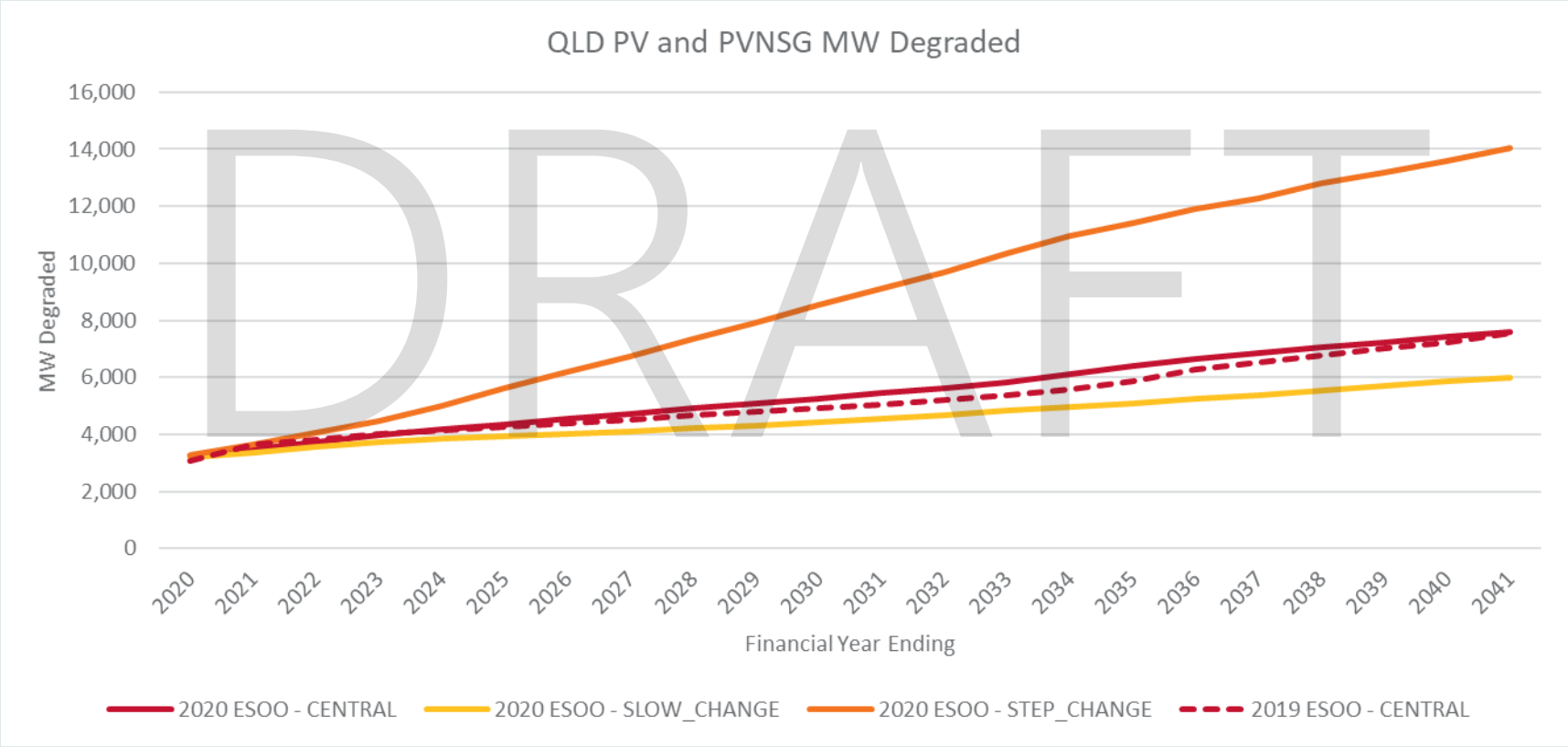
# QLD PV Projections

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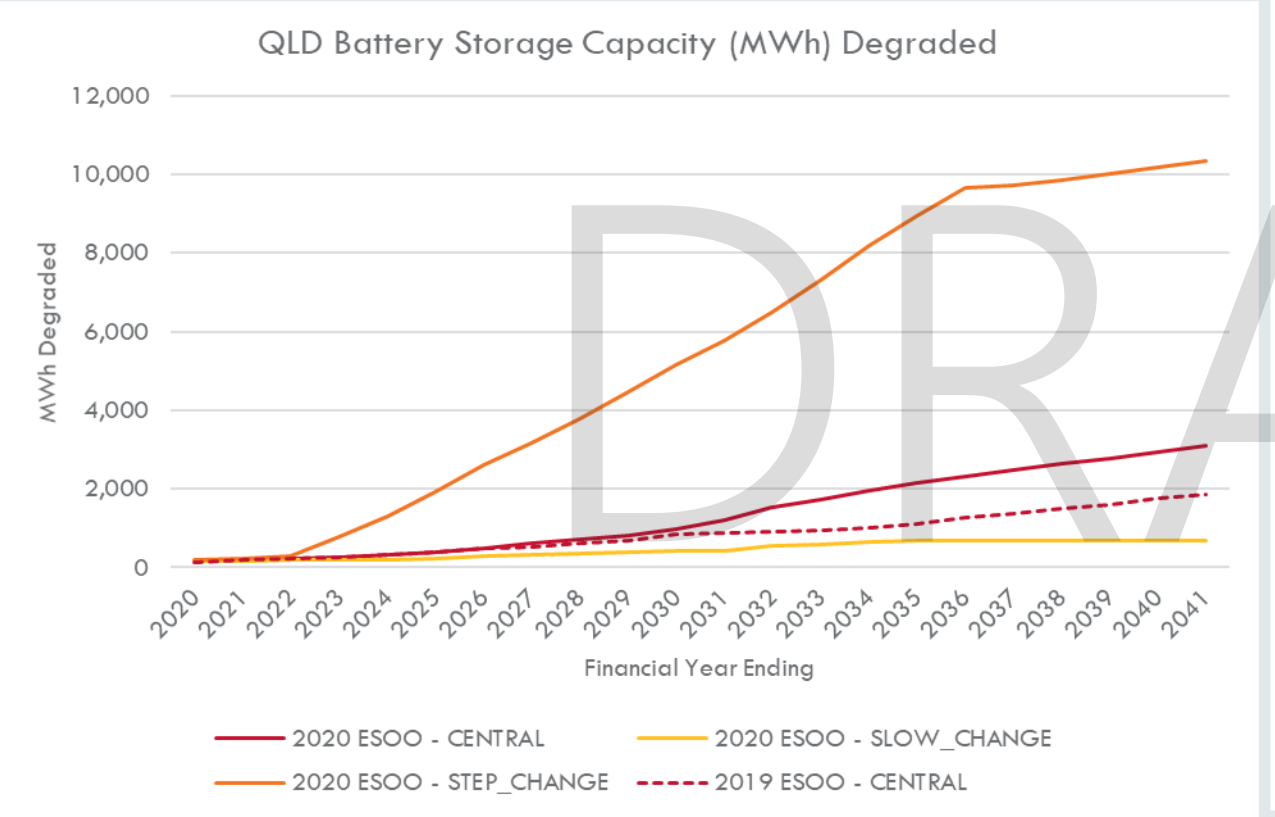
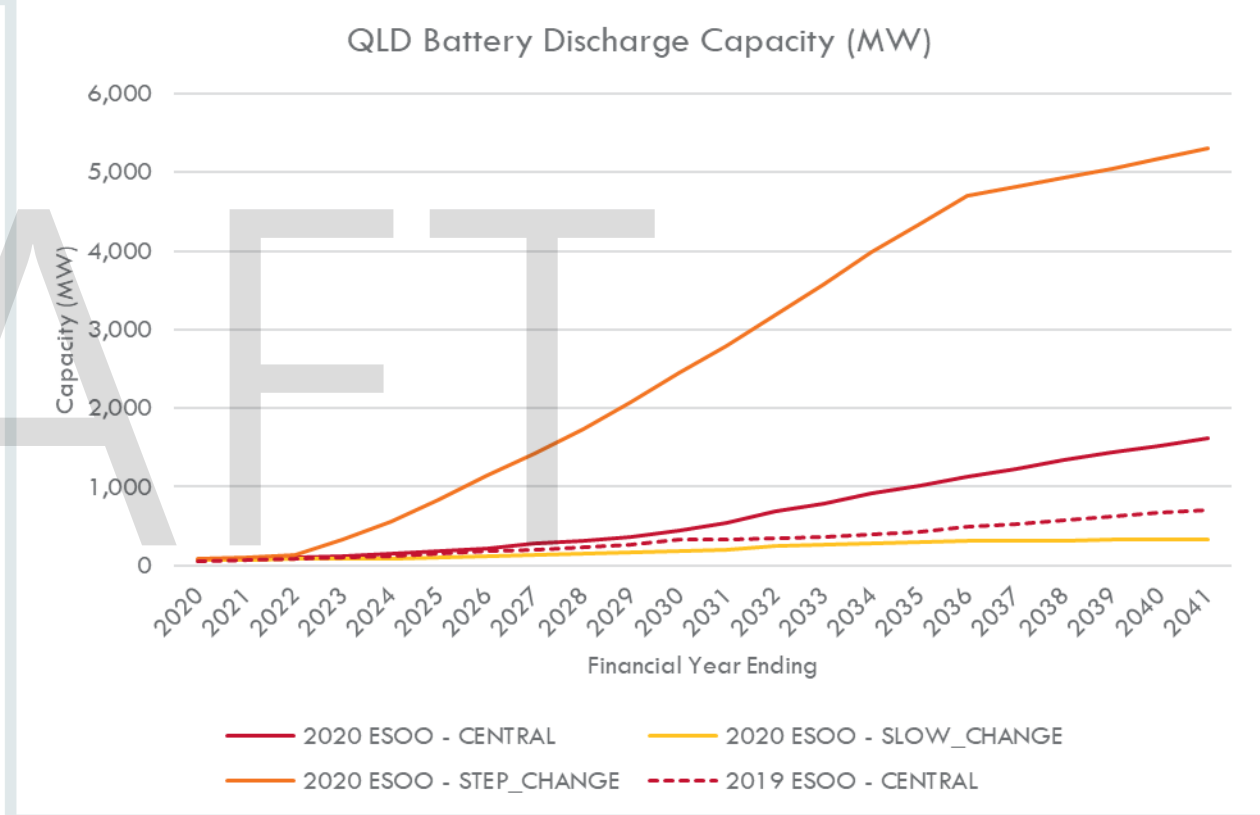
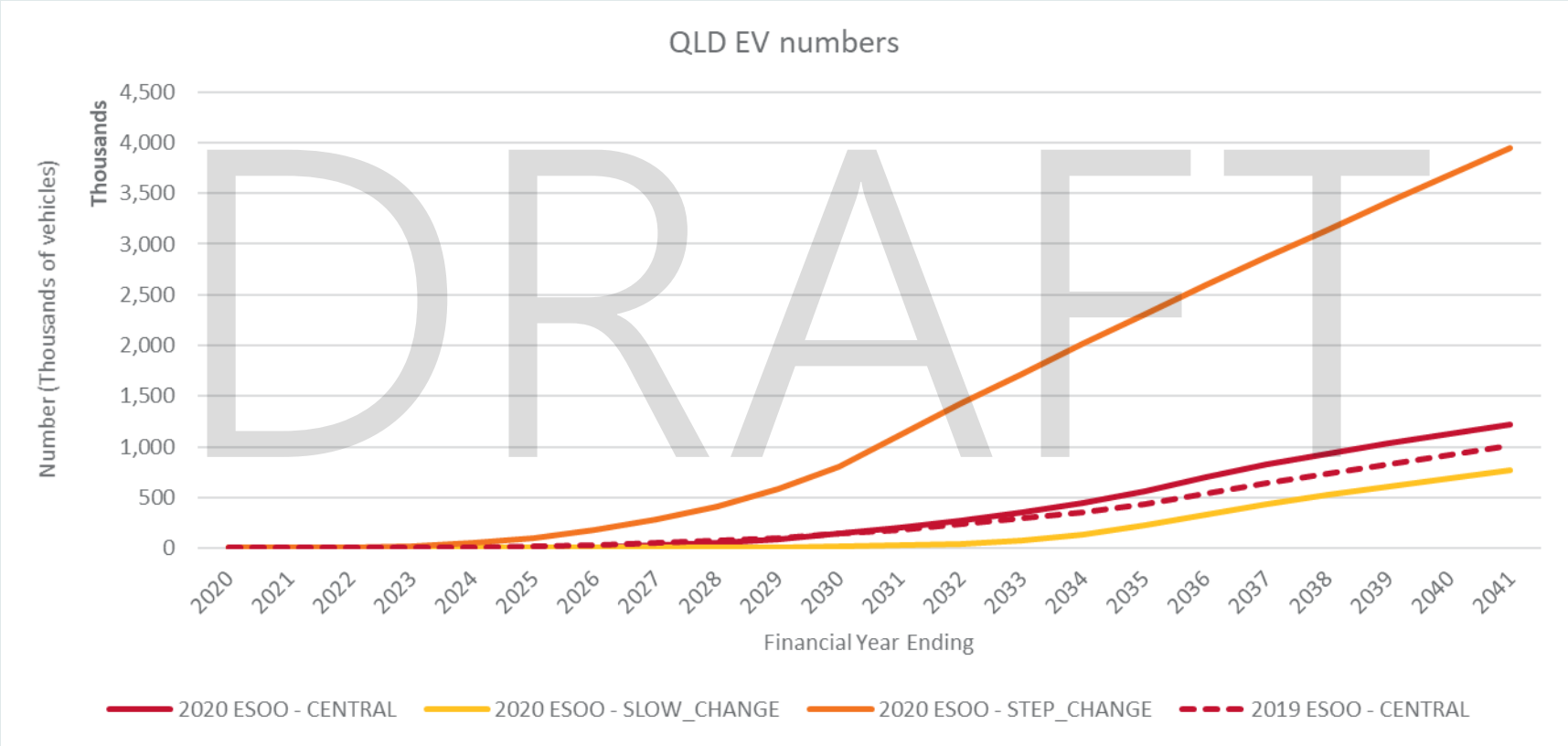
# QLD Battery Projections




DRAFT

# QLD EV Projections

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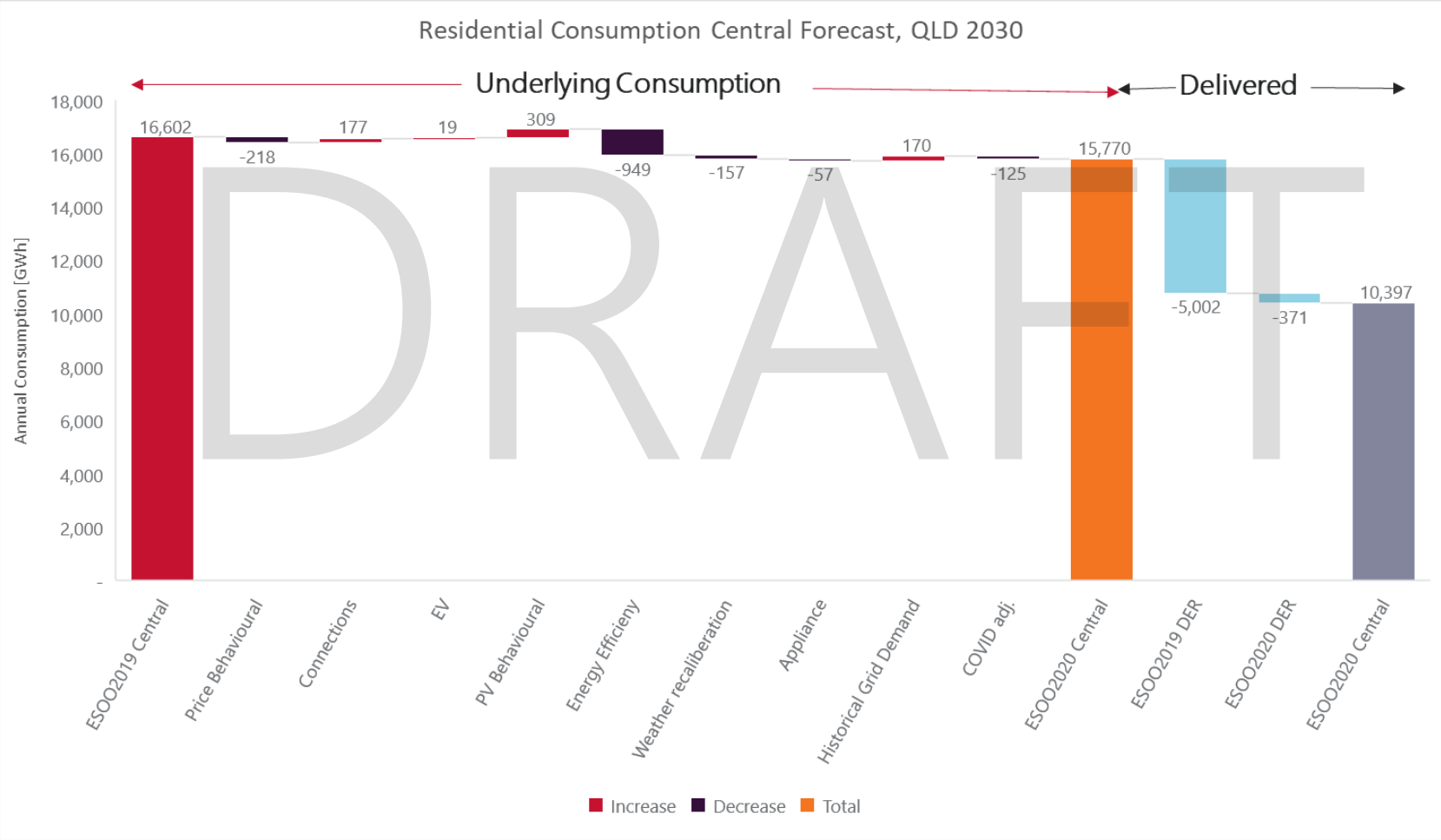
# QLD - Draft Residential Consumption

Drivers increasing underlying consumption:

- Higher PV uptake (but lowers delivered consumption)
- Marginally higher connections (but reduced initially due to COVID-19)
- Reduced exposure to energy costs from PV installations

Drivers lowering underlying consumption:

- Higher energy efficiency
- Weather recalibration

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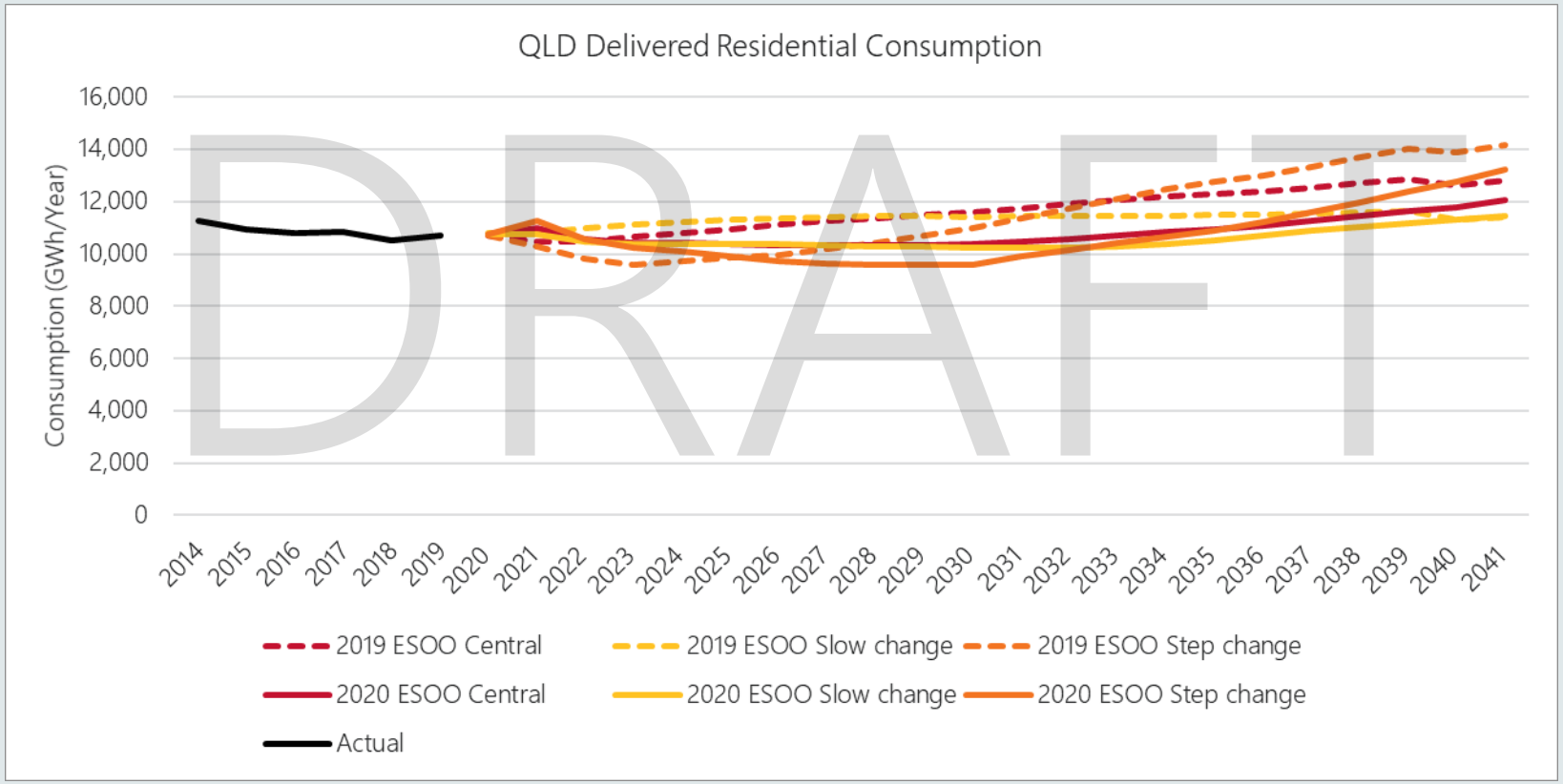
# QLD - Draft Residential Consumption by Scenario

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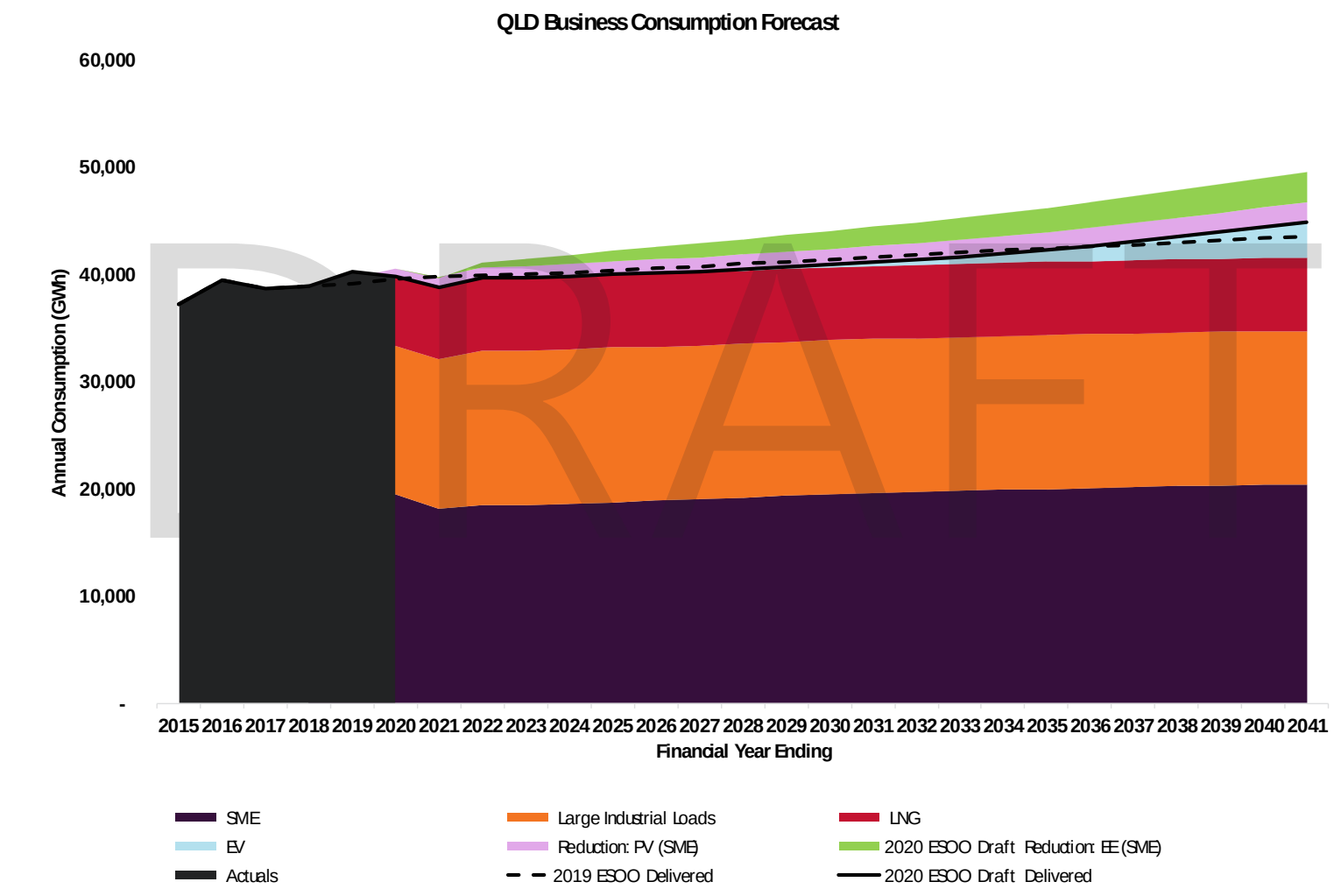
# QLD - Draft Business Consumption

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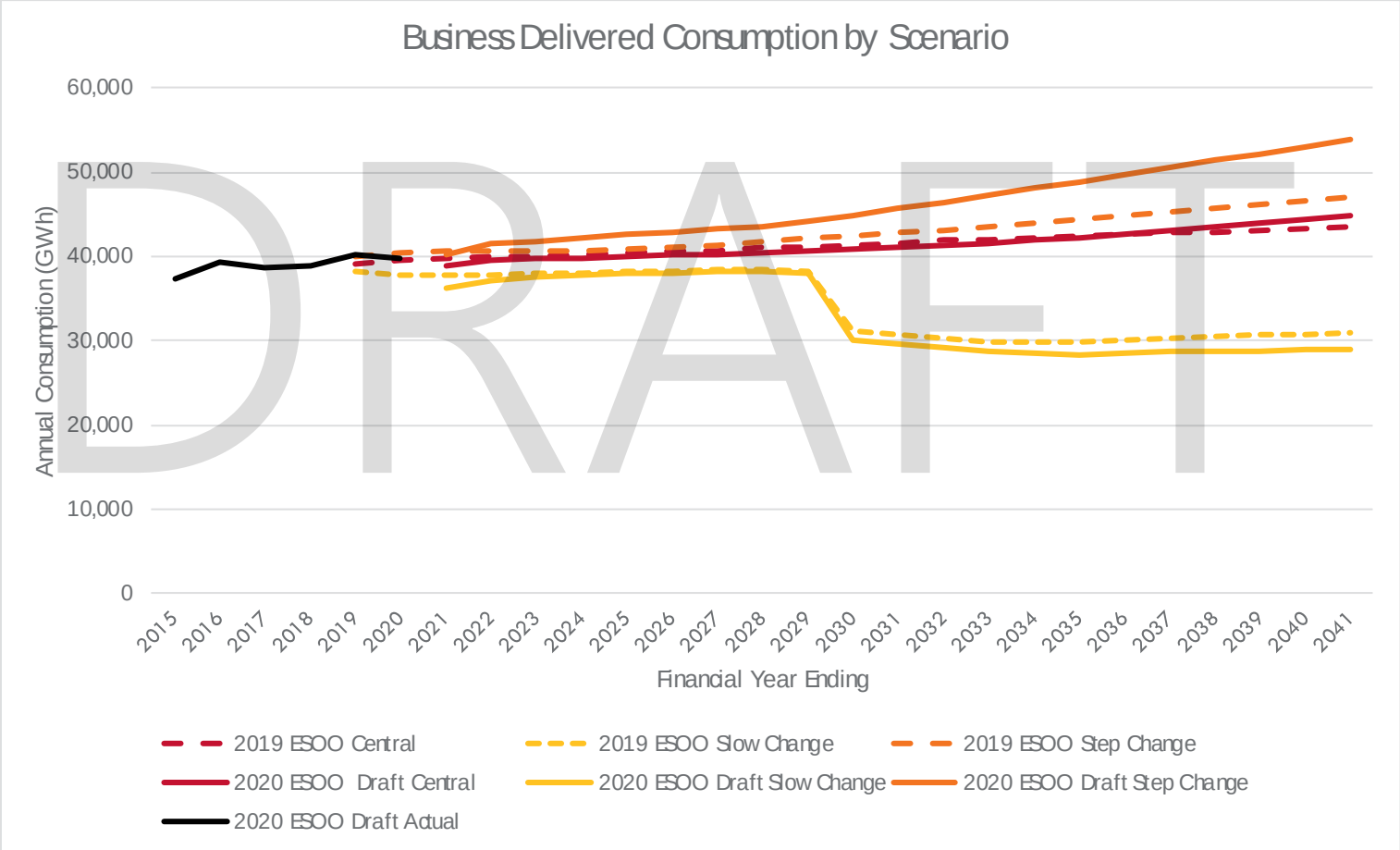
# QLD - Draft Business Consumption by Scenario

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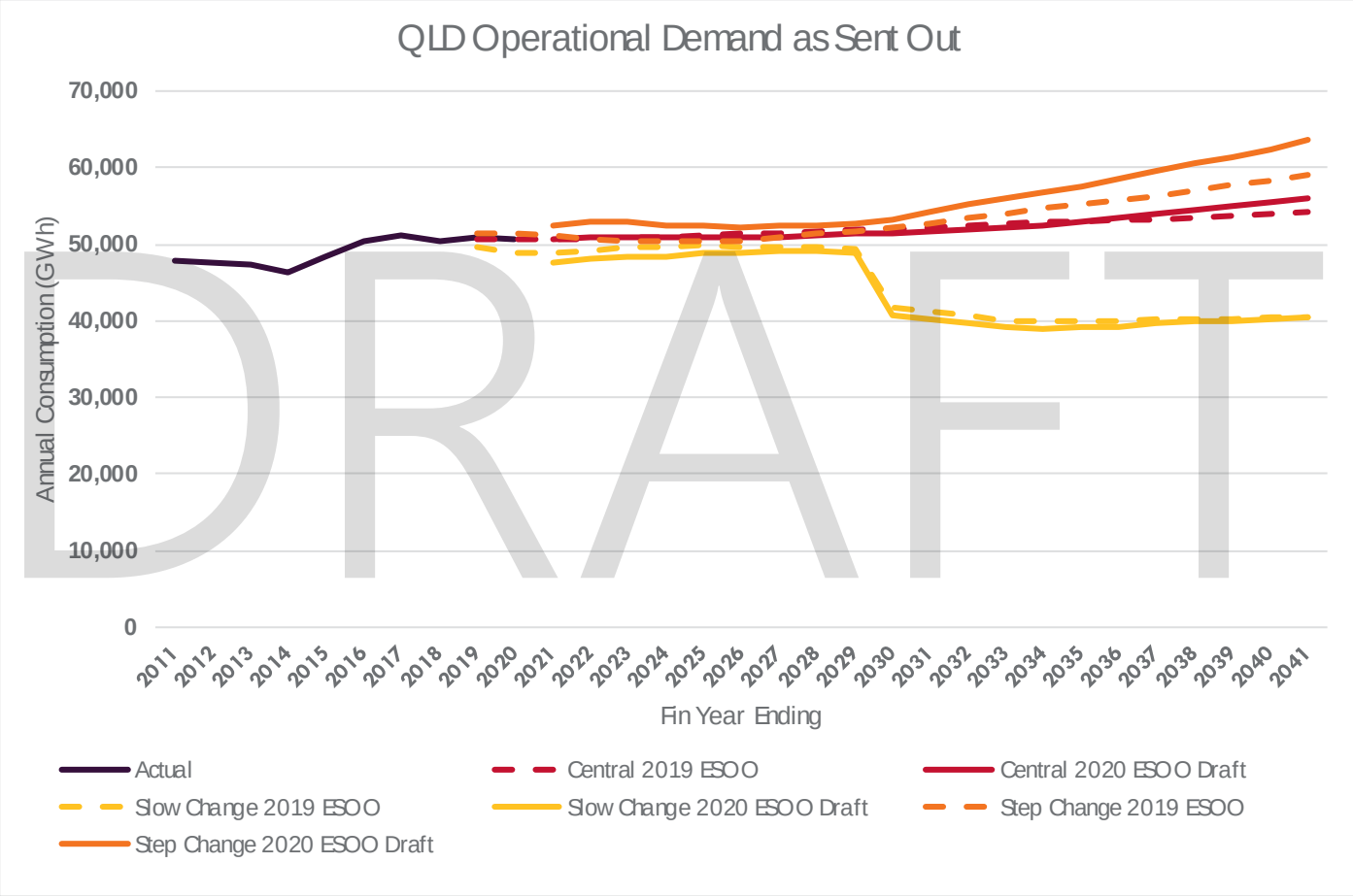
# QLD - Draft Operational Consumption

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# SOUTH AUSTRALIA

Detailed regional results

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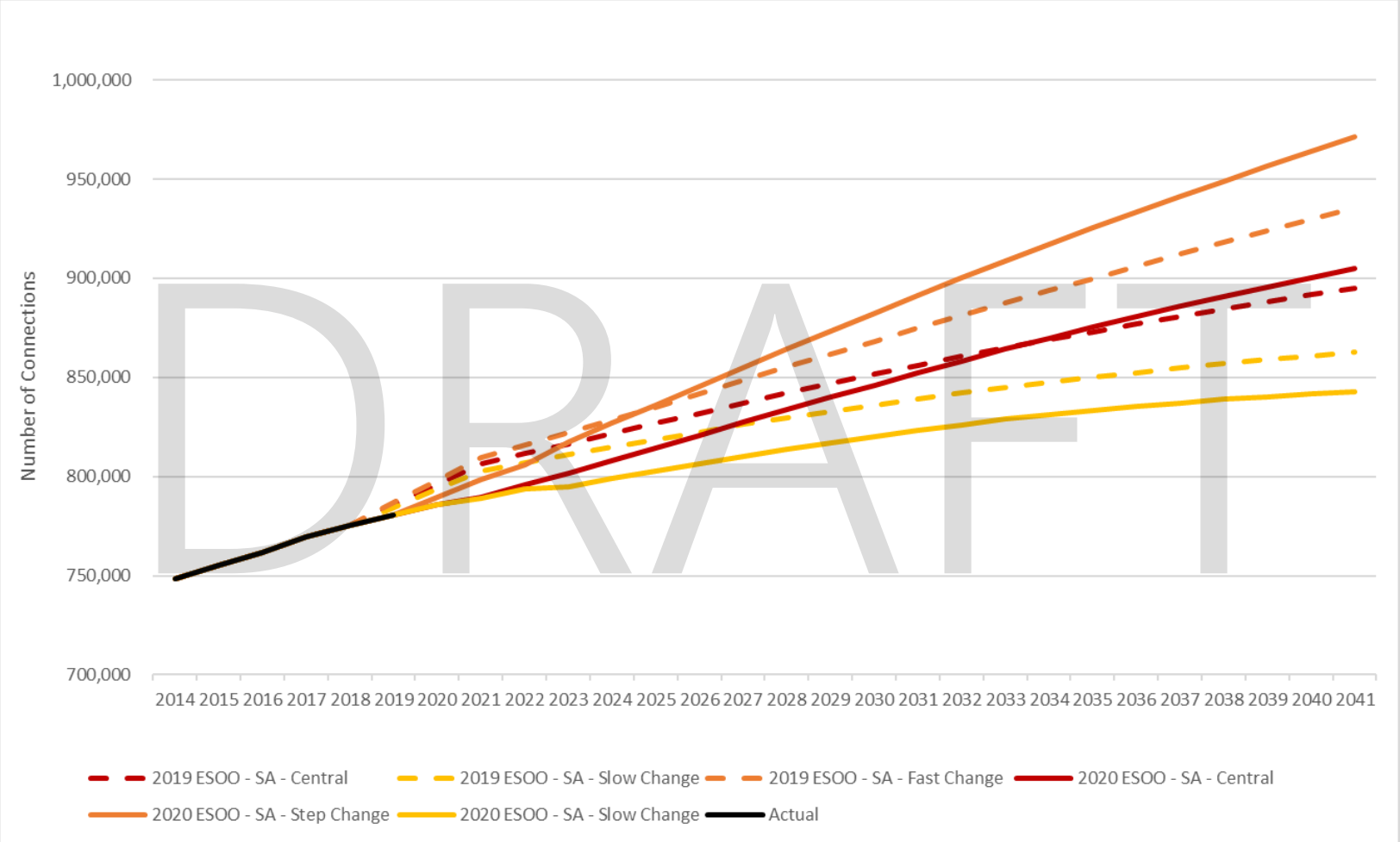
# SA – Draft Connections Forecast

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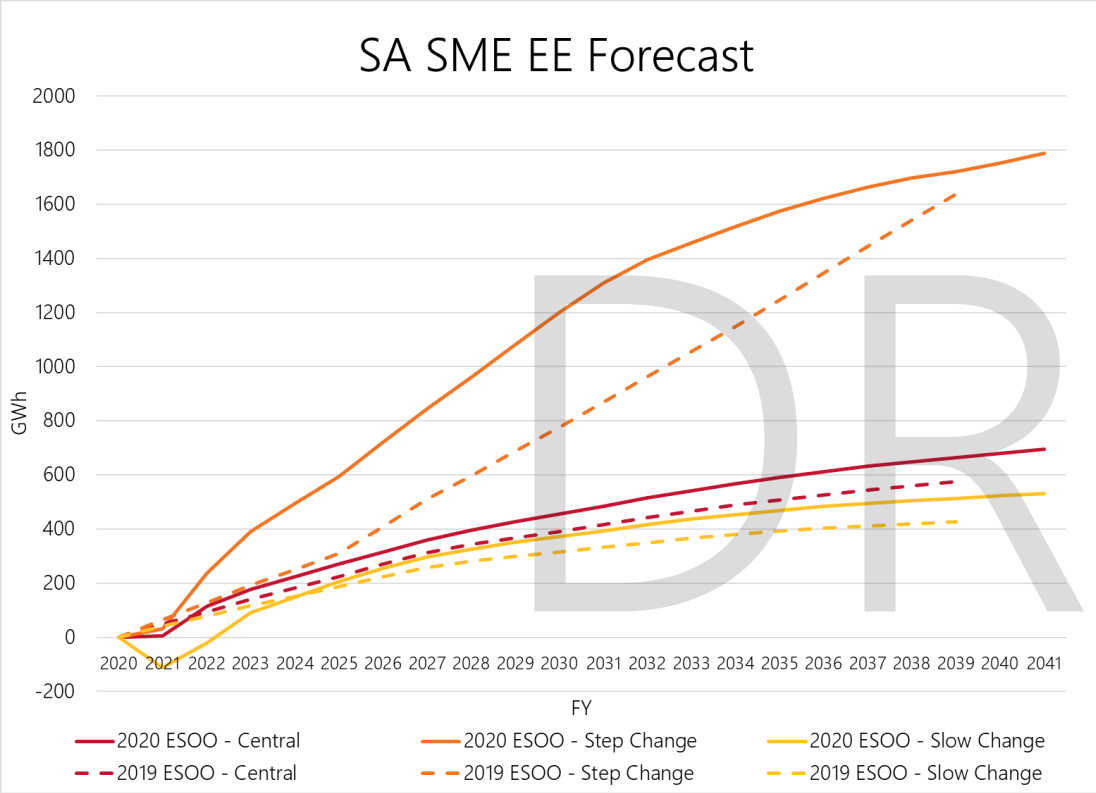
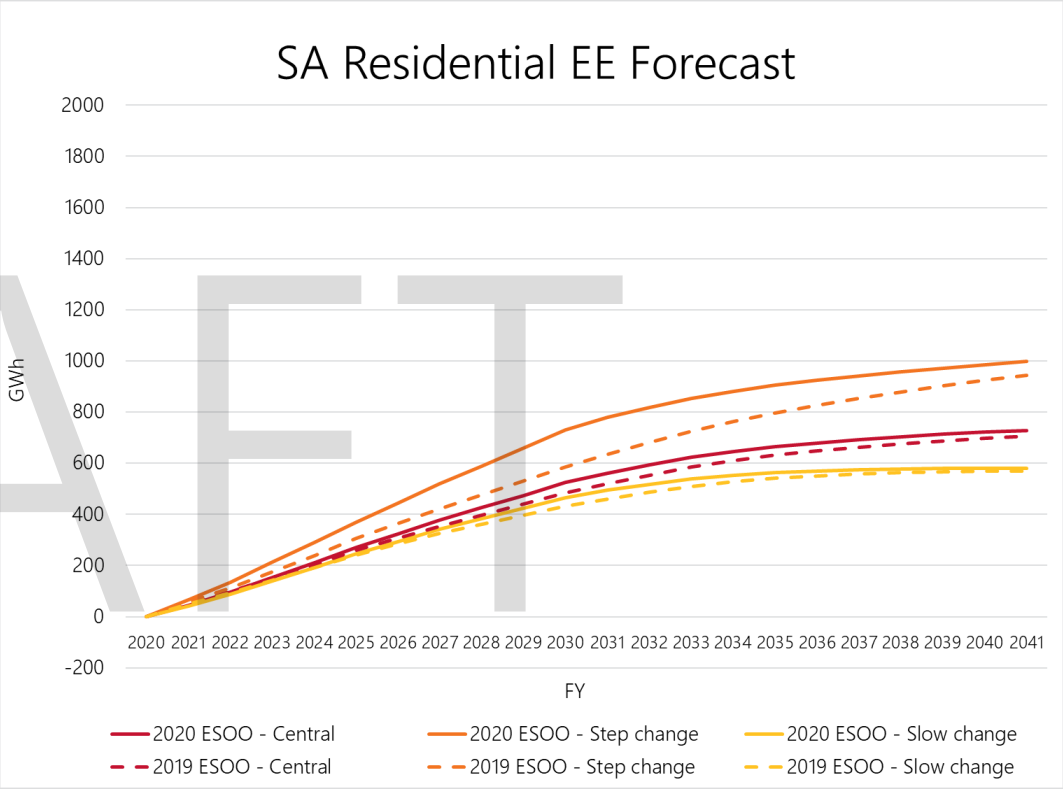
# SA Energy Efficiency




DRAFT

- SA Retailer Energy Efficiency Scheme extended by 10 years to end 2030 for Step Change scenario (assumption based on published information), causing an increase in savings for this scenario compared to 2019. Assumed continuation of savings by 75% beyond deeming period.
- New Residential building stock model and updated heat-base-cool split cause marginal changes to Residential forecast

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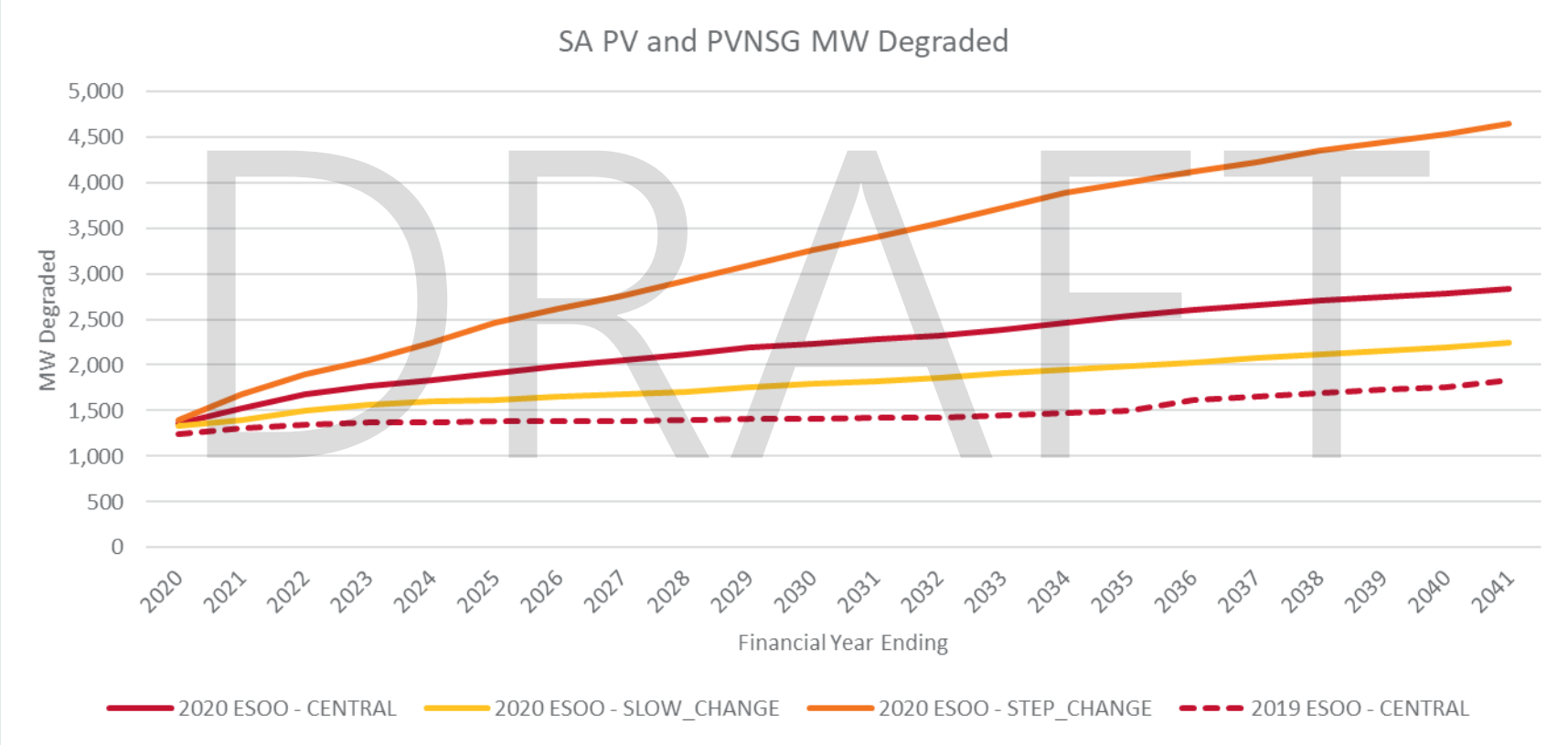
# SA PV Projections

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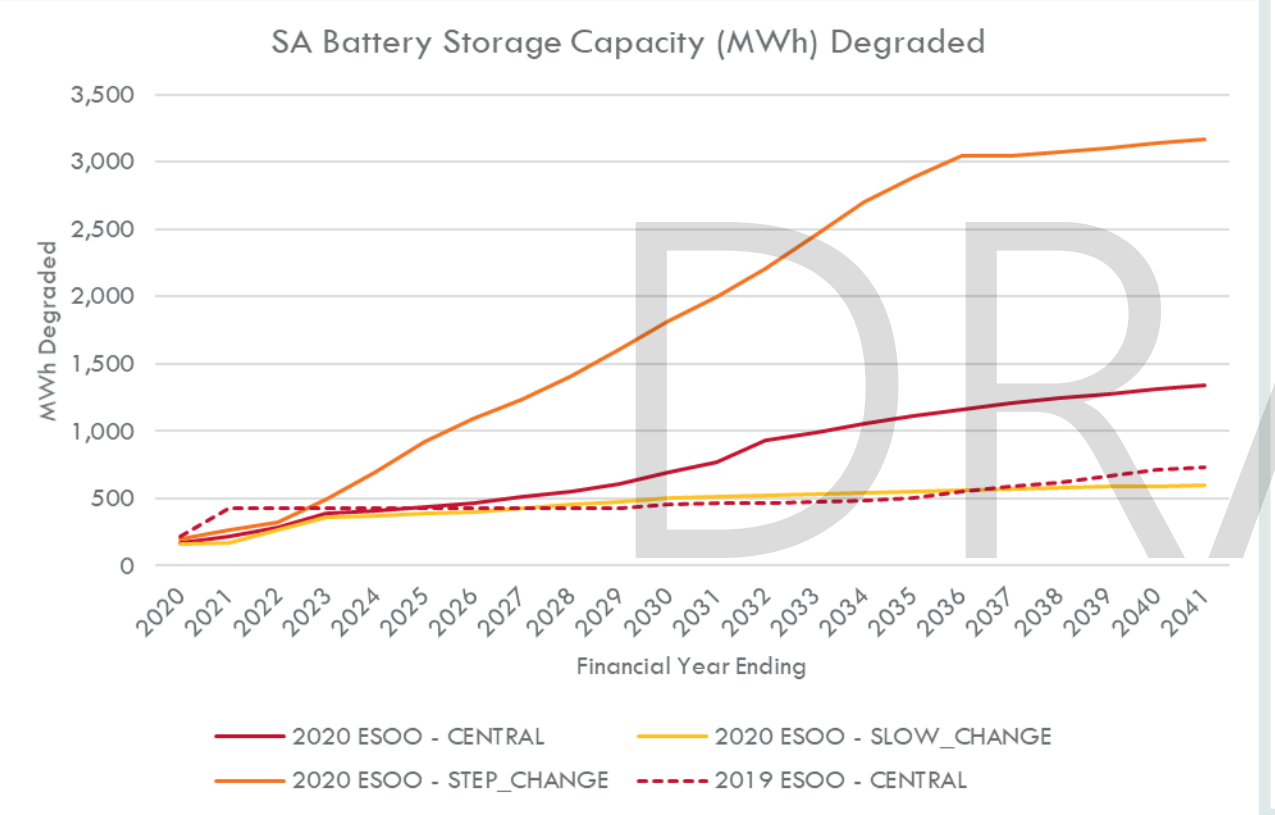
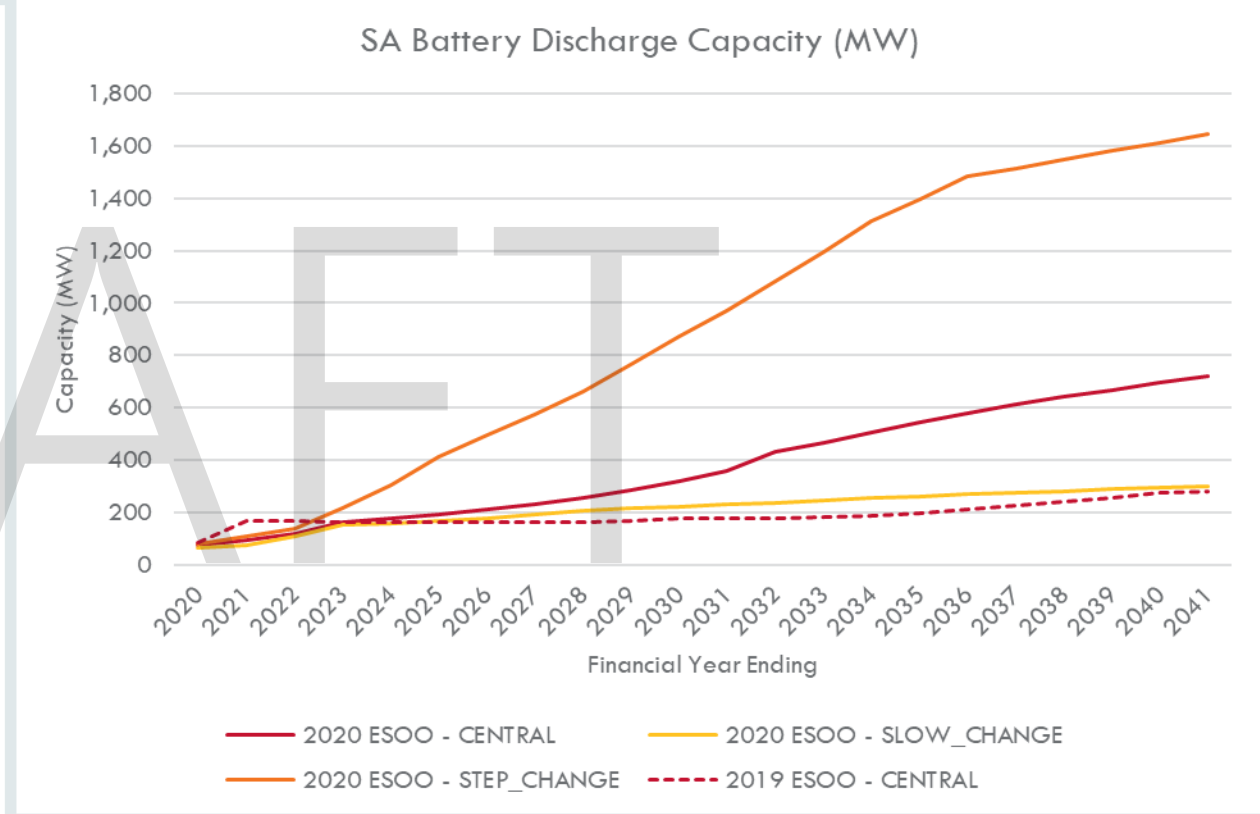
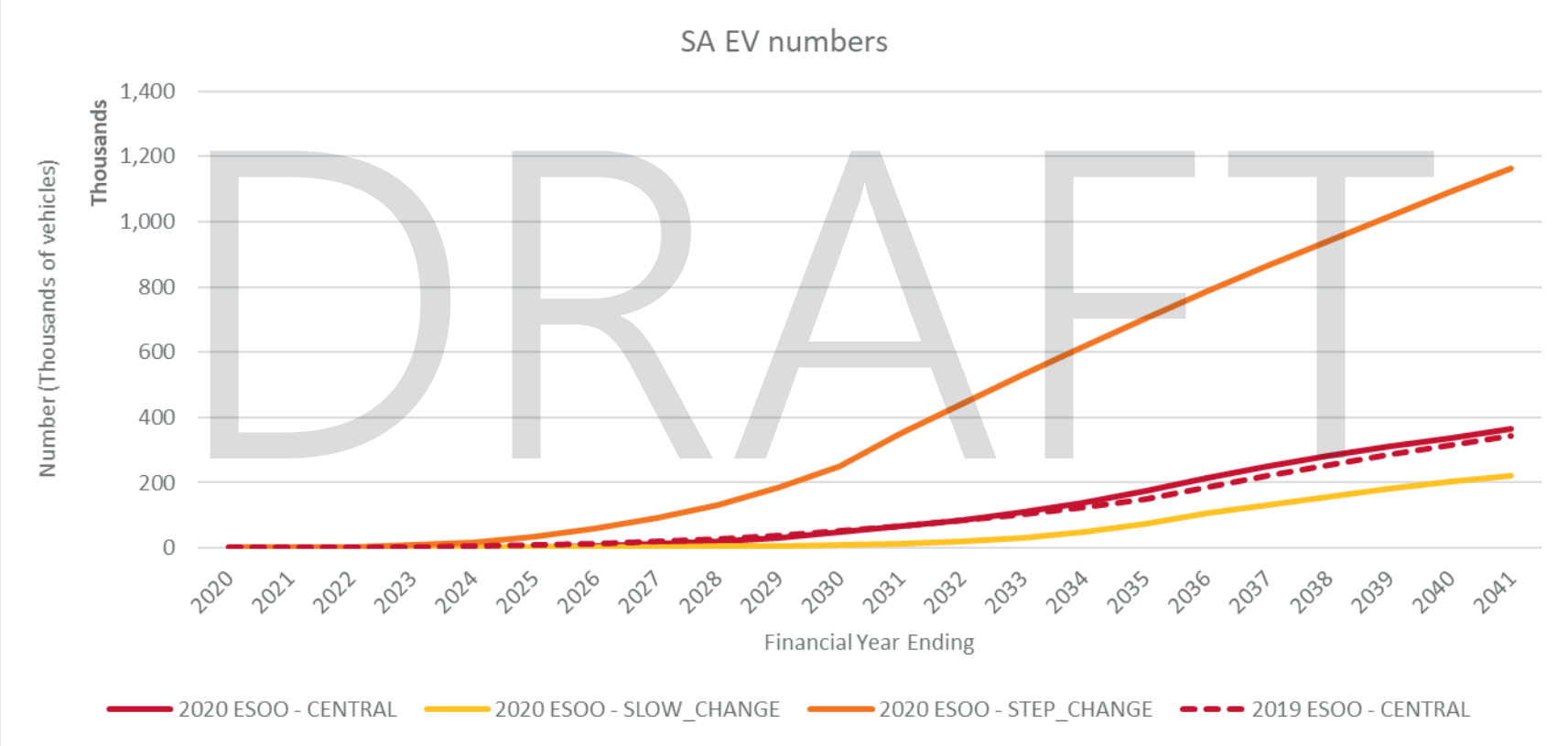
# SA Battery Projections




DRAFT

# SA EV Projections

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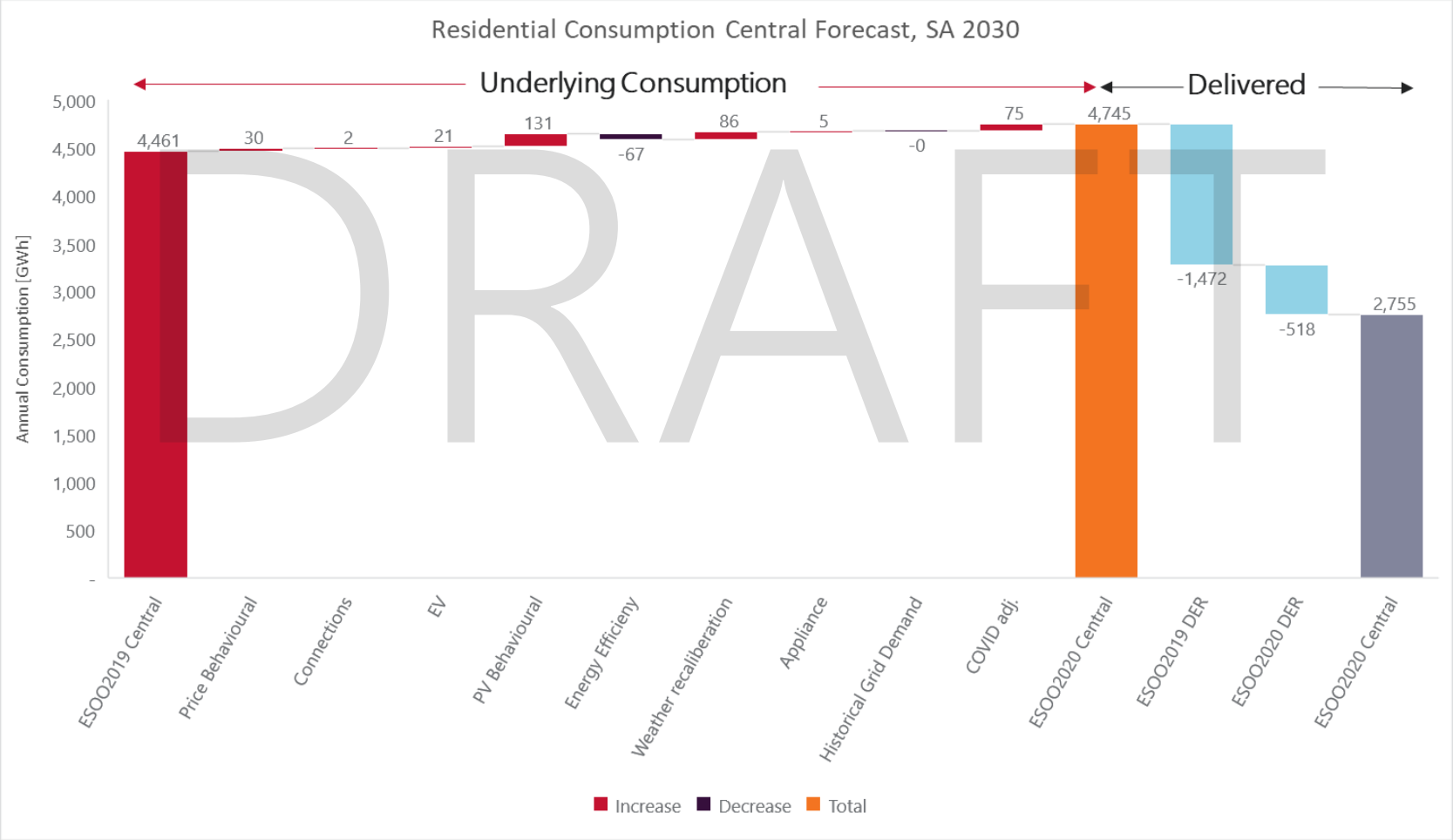
# SA - Draft Residential Consumption

Drivers increasing underlying consumption:

- Higher PV uptake (but lowers delivered consumption)
- Reduced exposure to energy costs from PV installations
- Weather recalibrations

Drivers lowering underlying consumption:

- Higher energy efficiency
- Weather recalibration

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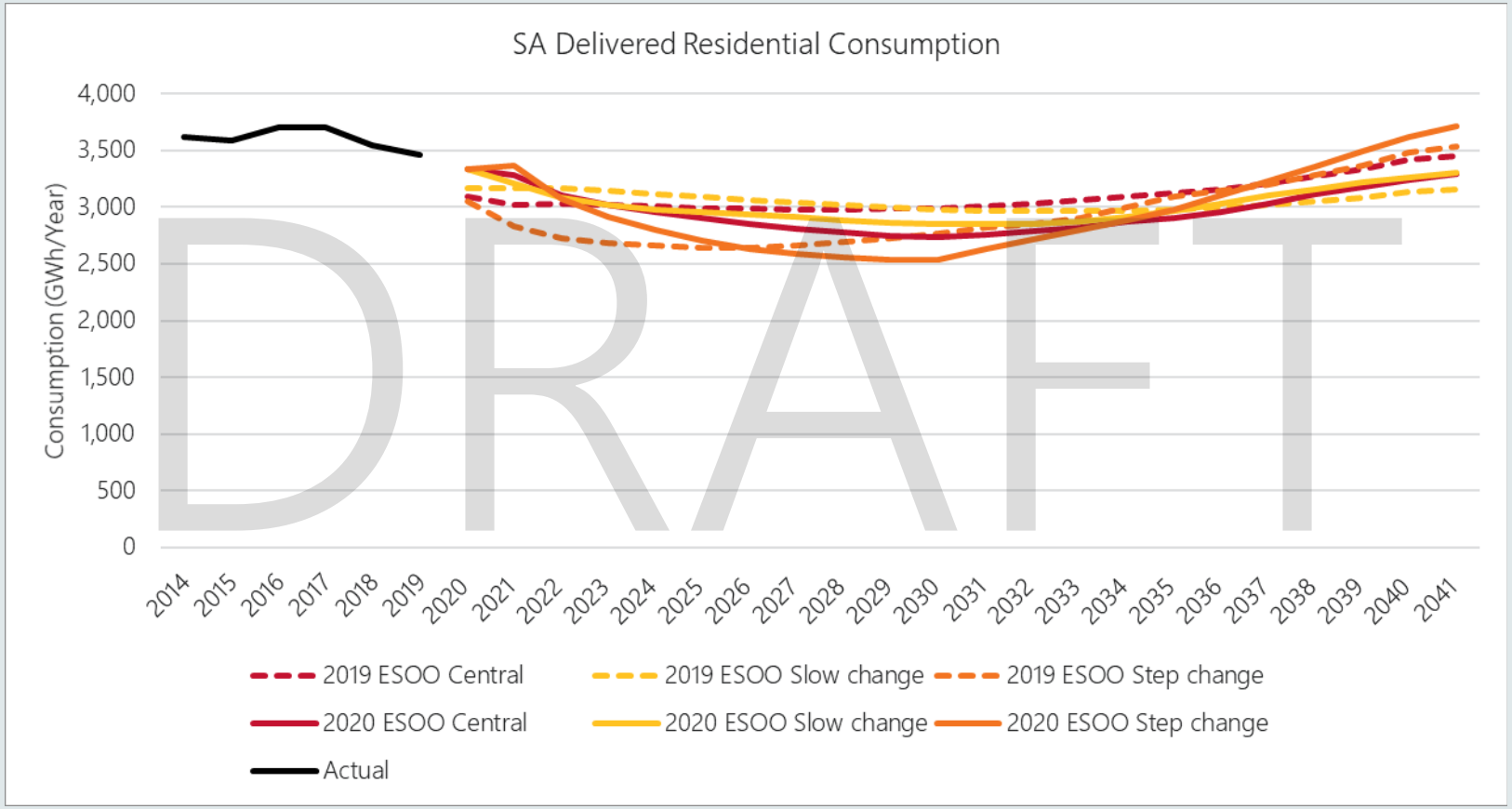
# SA - Draft Residential Consumption by Scenario

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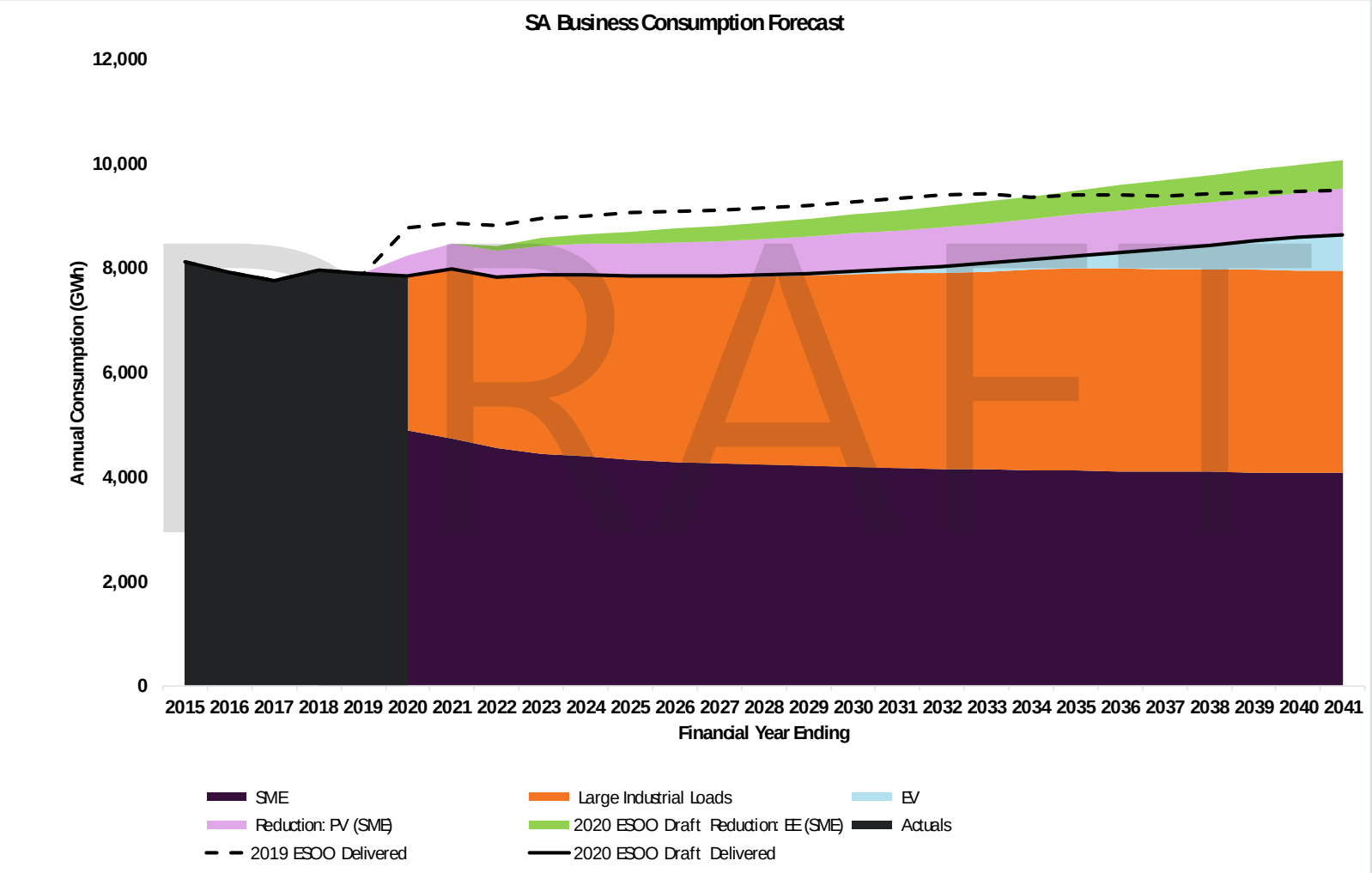
# SA - Draft Business Consumption

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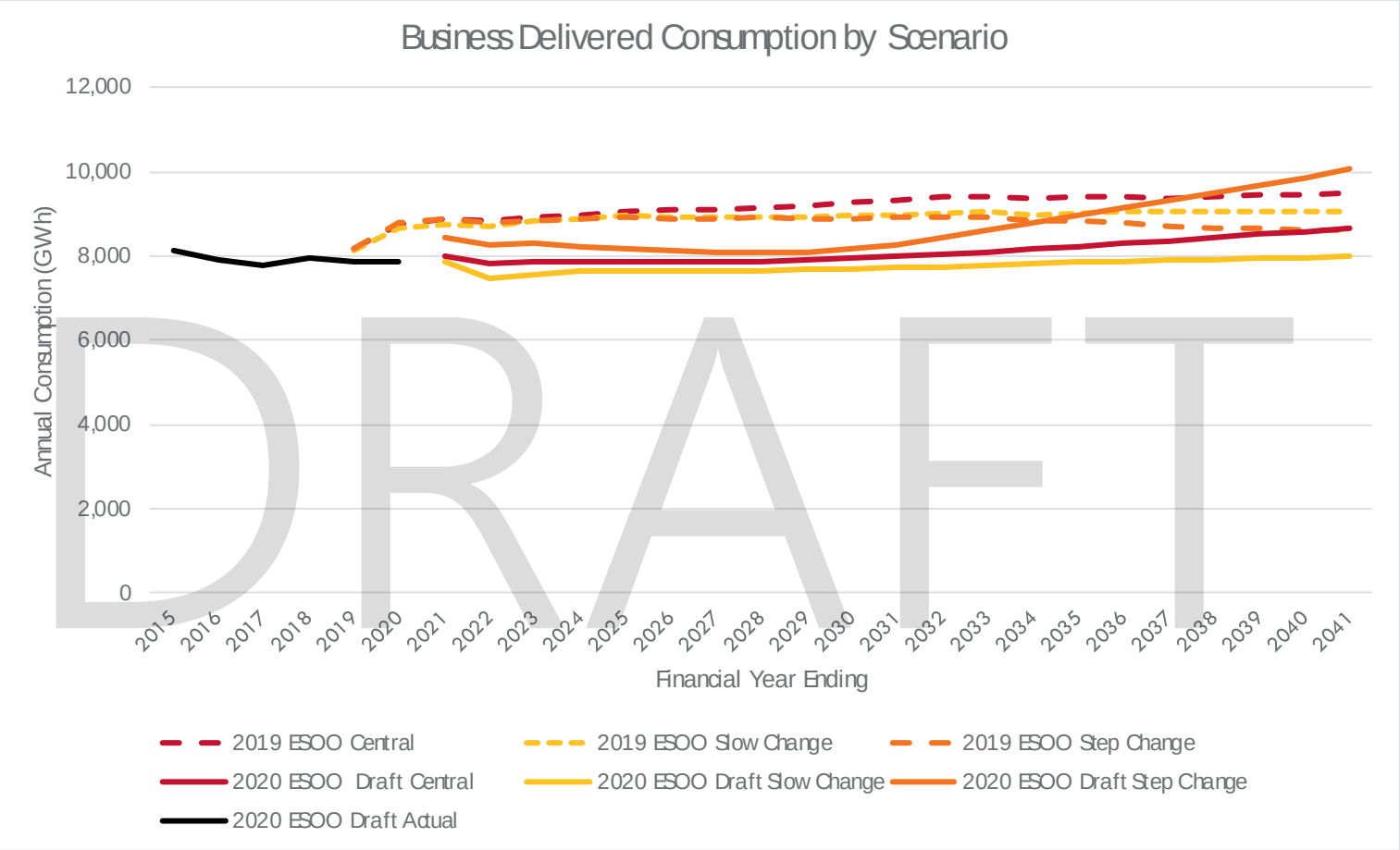
# SA - Draft Business Consumption by Scenario

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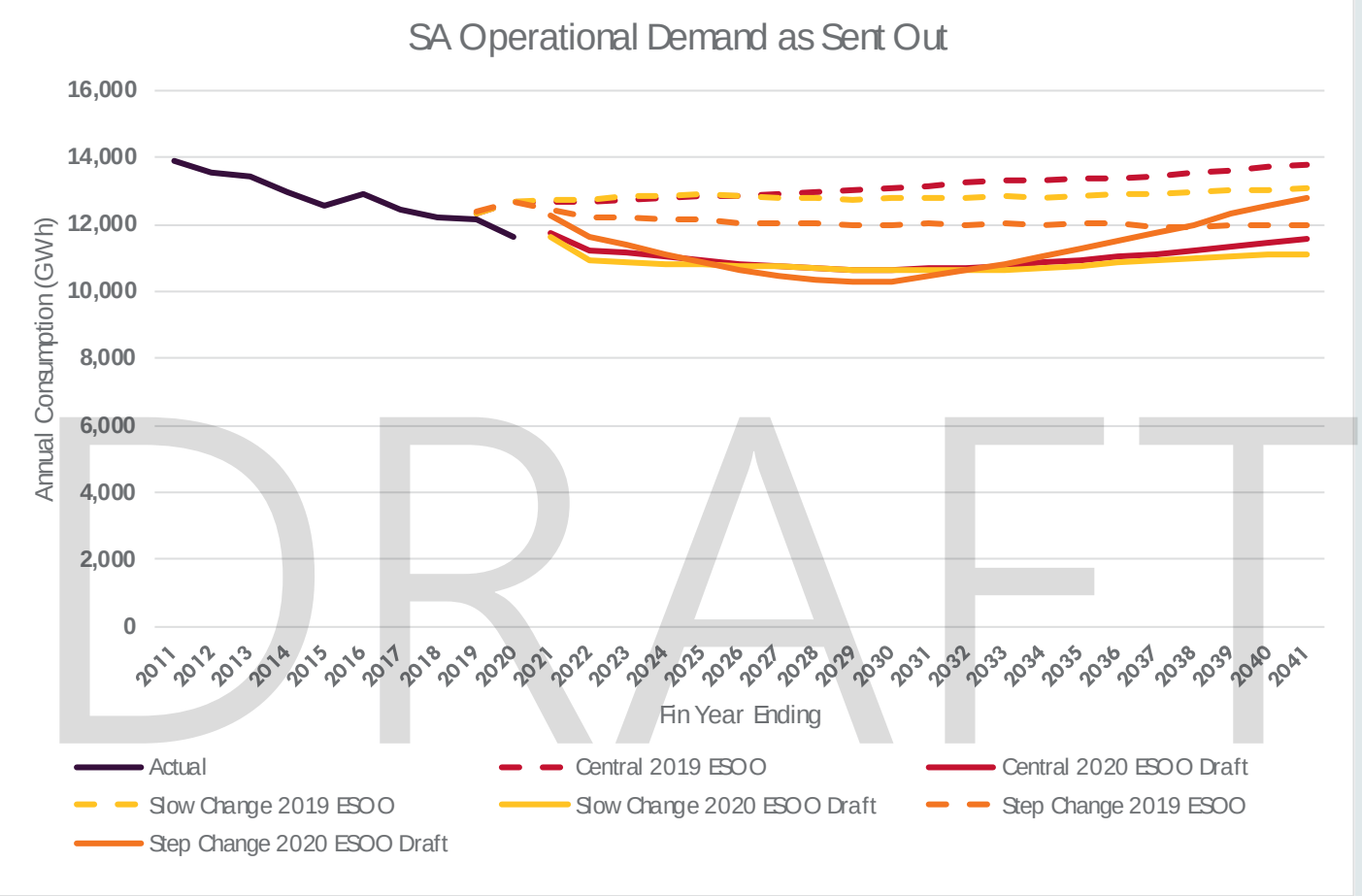
# SA - Draft Operational Consumption

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# TASMANIA

Detailed regional results

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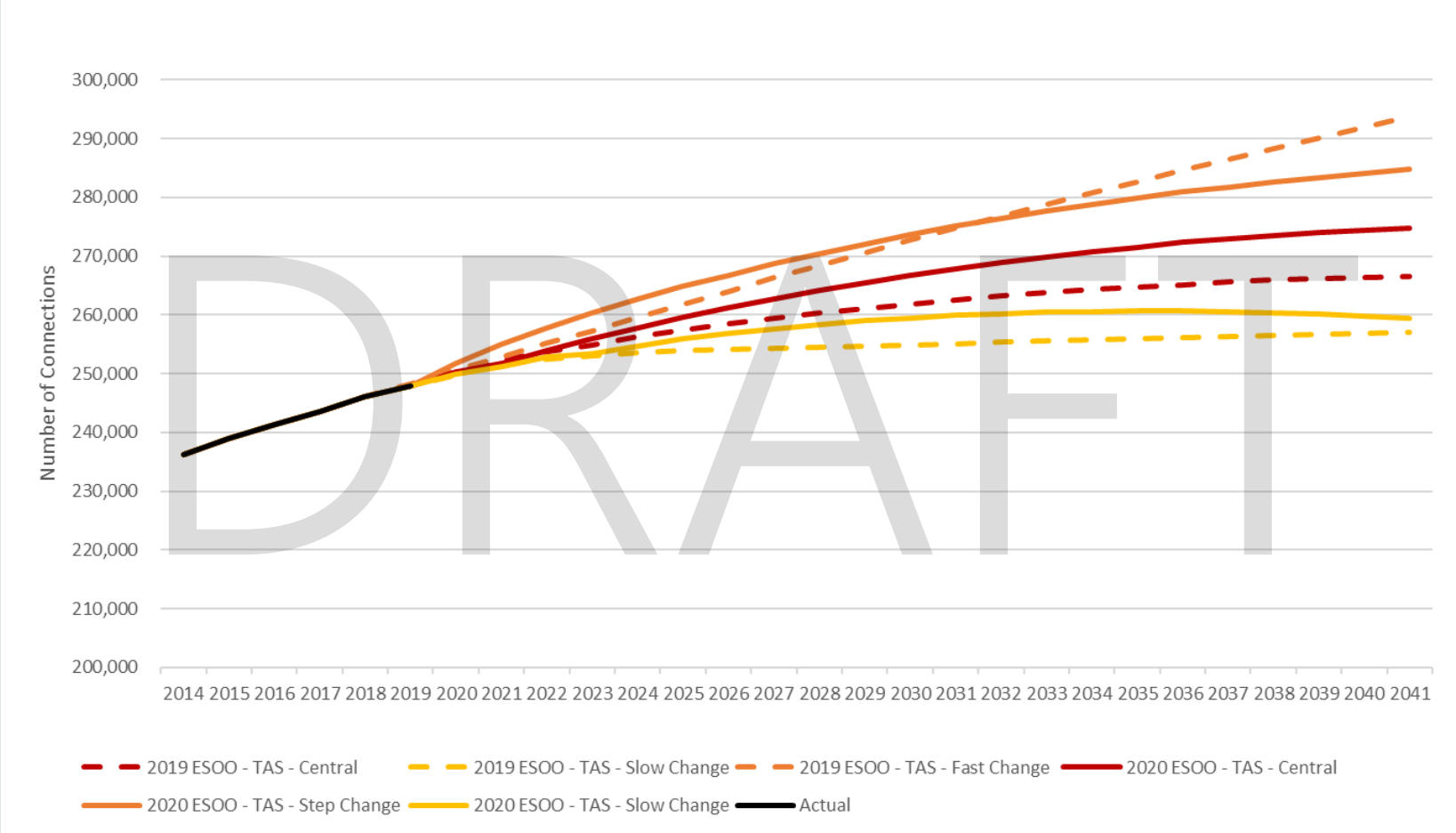
# TAS – Draft Connections Forecast

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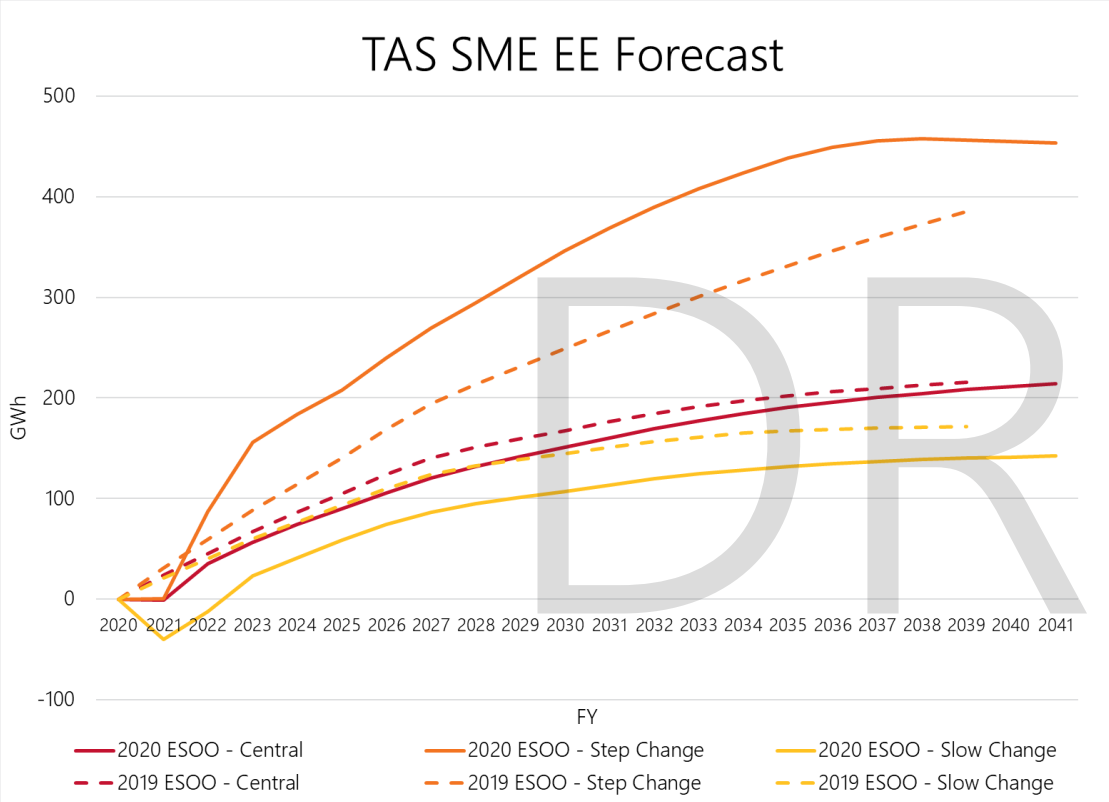
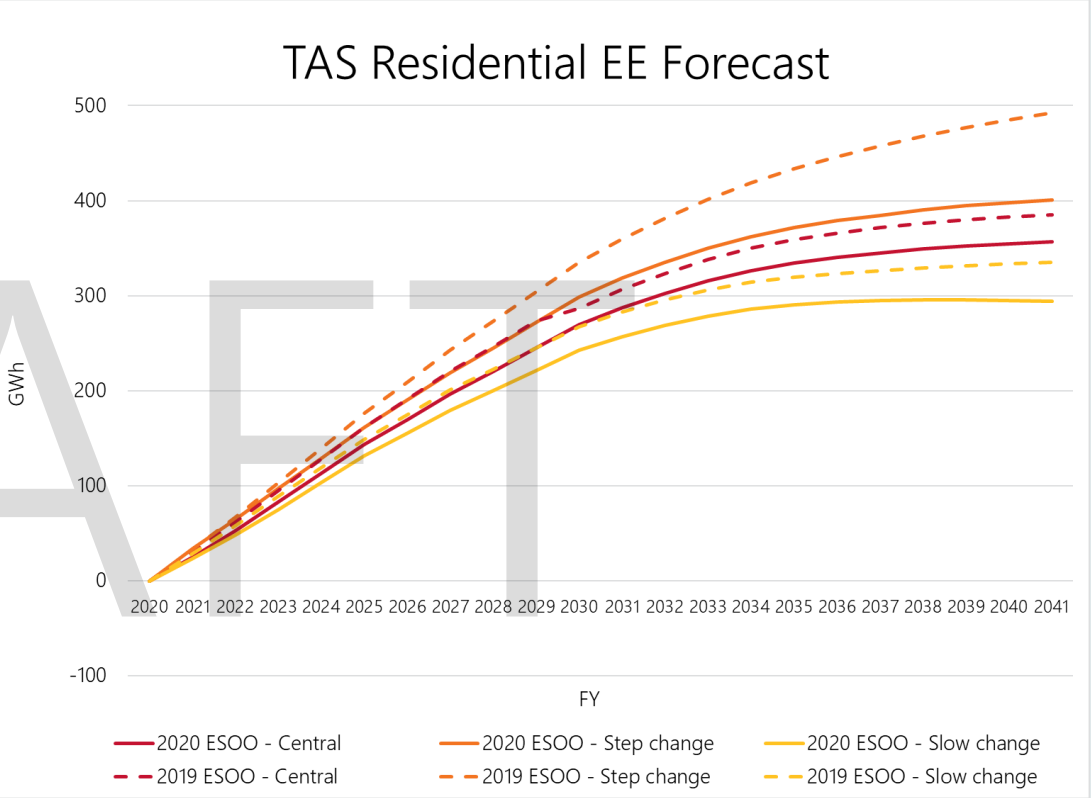
# TAS Energy Efficiency




DRAFT

- Redistribution of building stock across climate zones and regions reduces NCC 2019 and NCC Fast savings in the SME forecast. For Step Change, savings in 2020 remain higher, due to a one-off post-model adjustment in 2019 that lowered savings that year.
- New Residential building stock model in particular, and updated HBC split reduce Residential forecast in 2020

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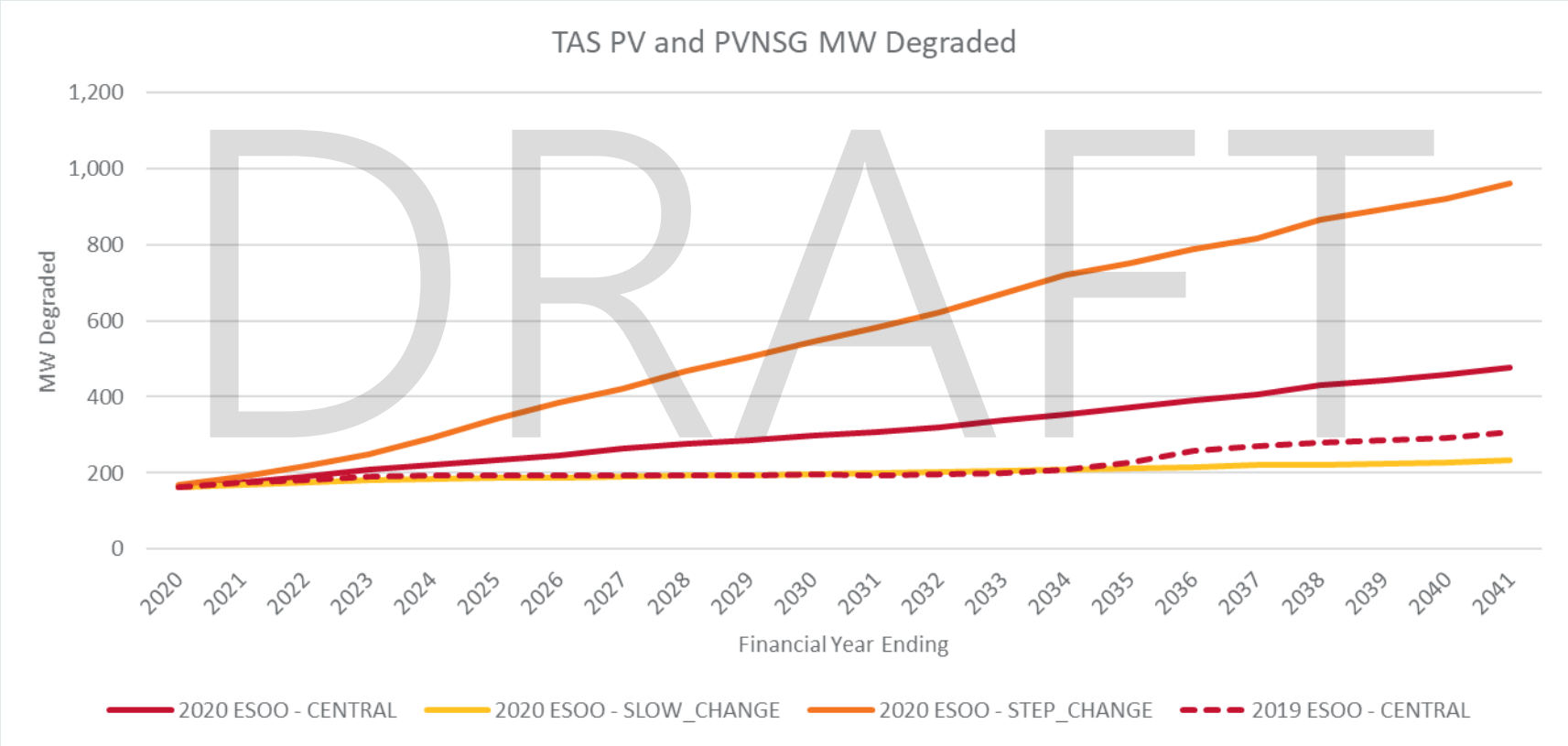
# TAS PV Projections

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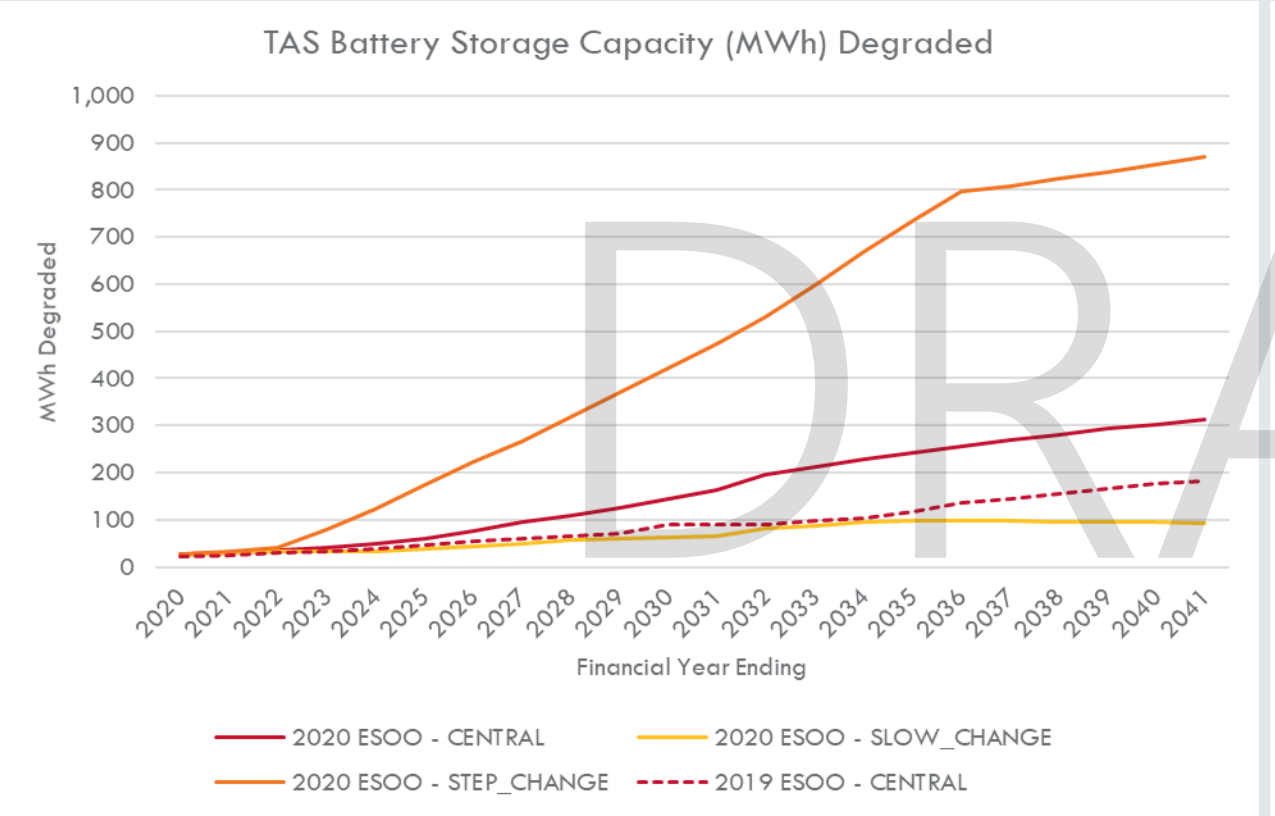
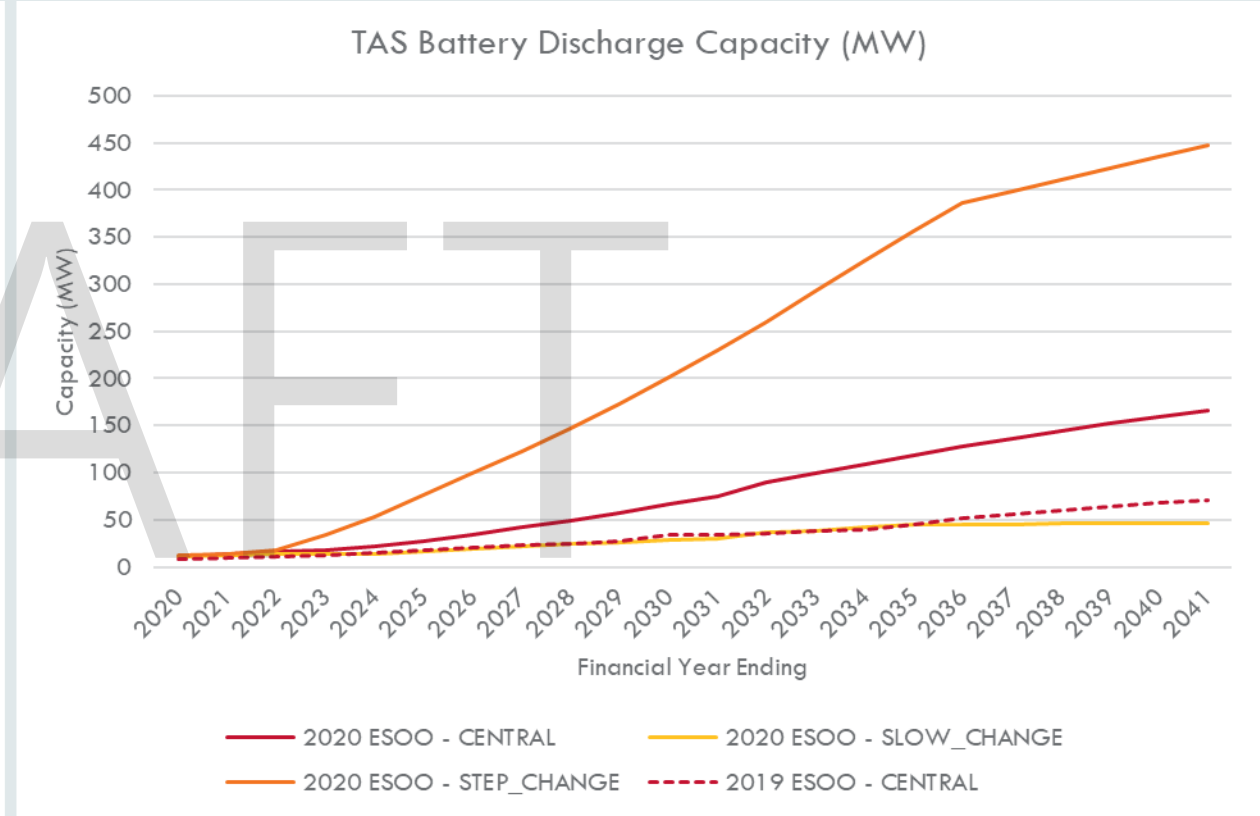
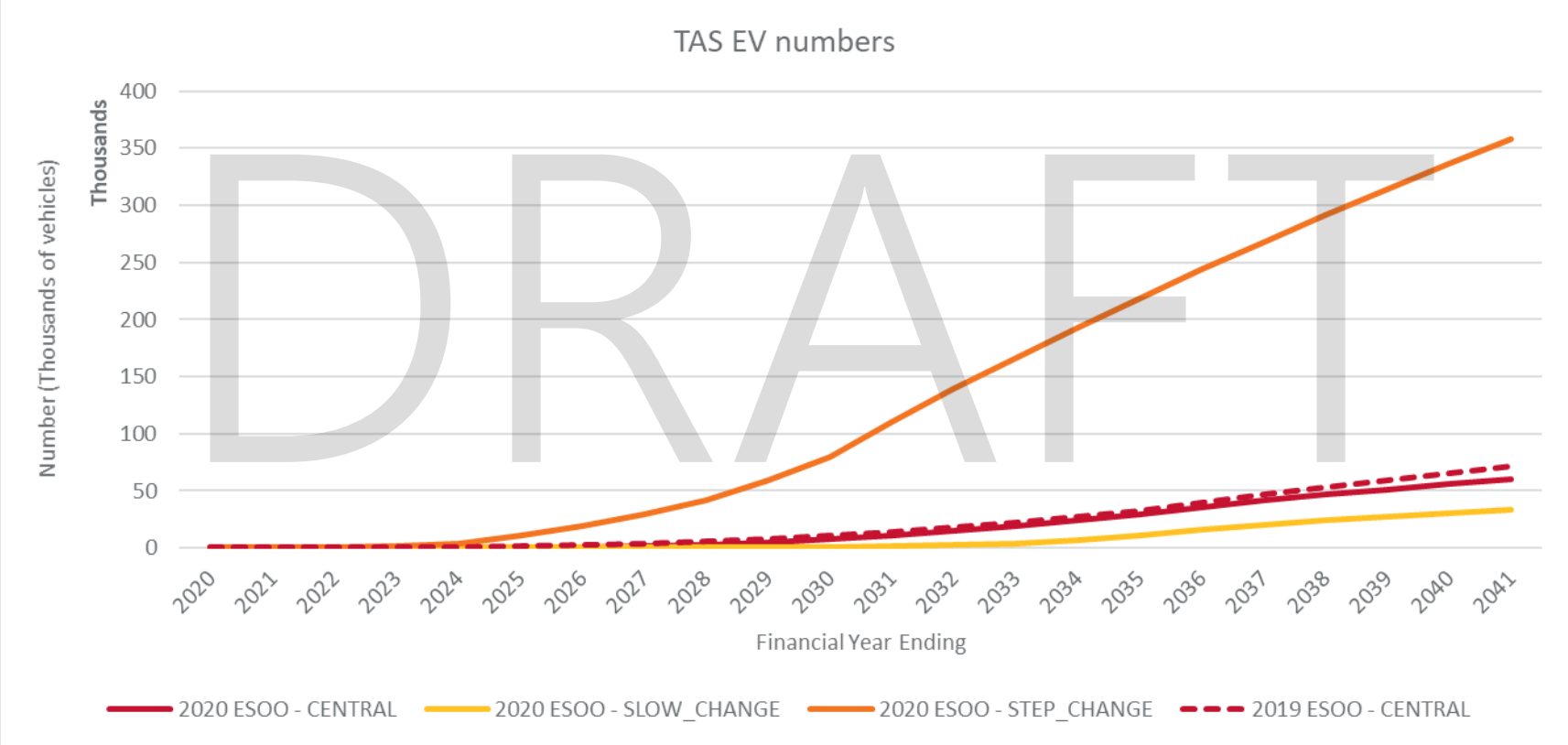
# TAS Battery Projections




DRAFT

# TAS EV Projections

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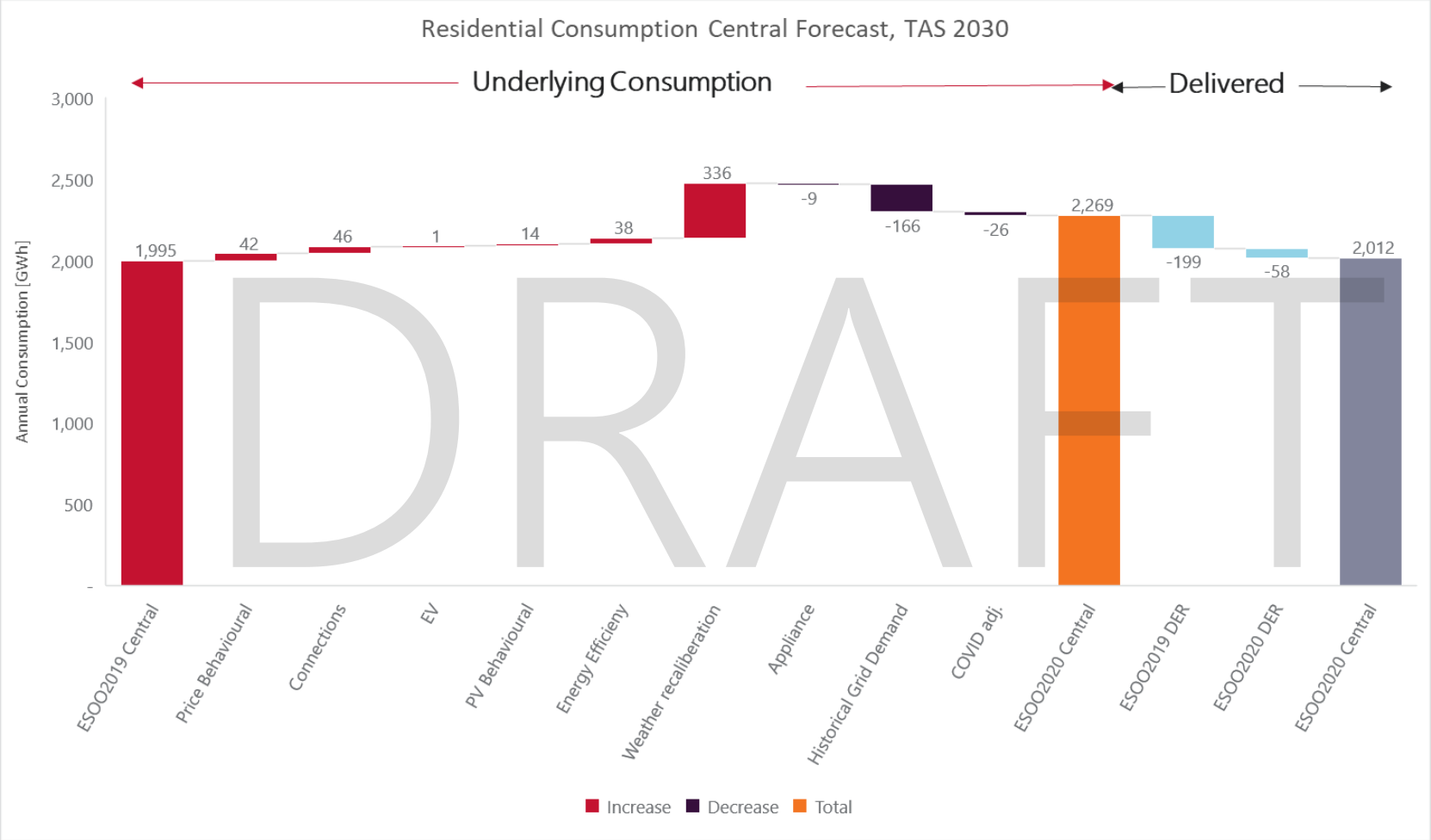
# TAS - Draft Residential Consumption

Drivers increasing underlying consumption:

- Higher PV uptake (but lowers delivered consumption)
- Higher connections (but reduced initially due to COVID-19)
- Reduced exposure to energy costs from PV installations
- Weather recalibration

Drivers lowering underlying consumption:

- Higher energy efficiency

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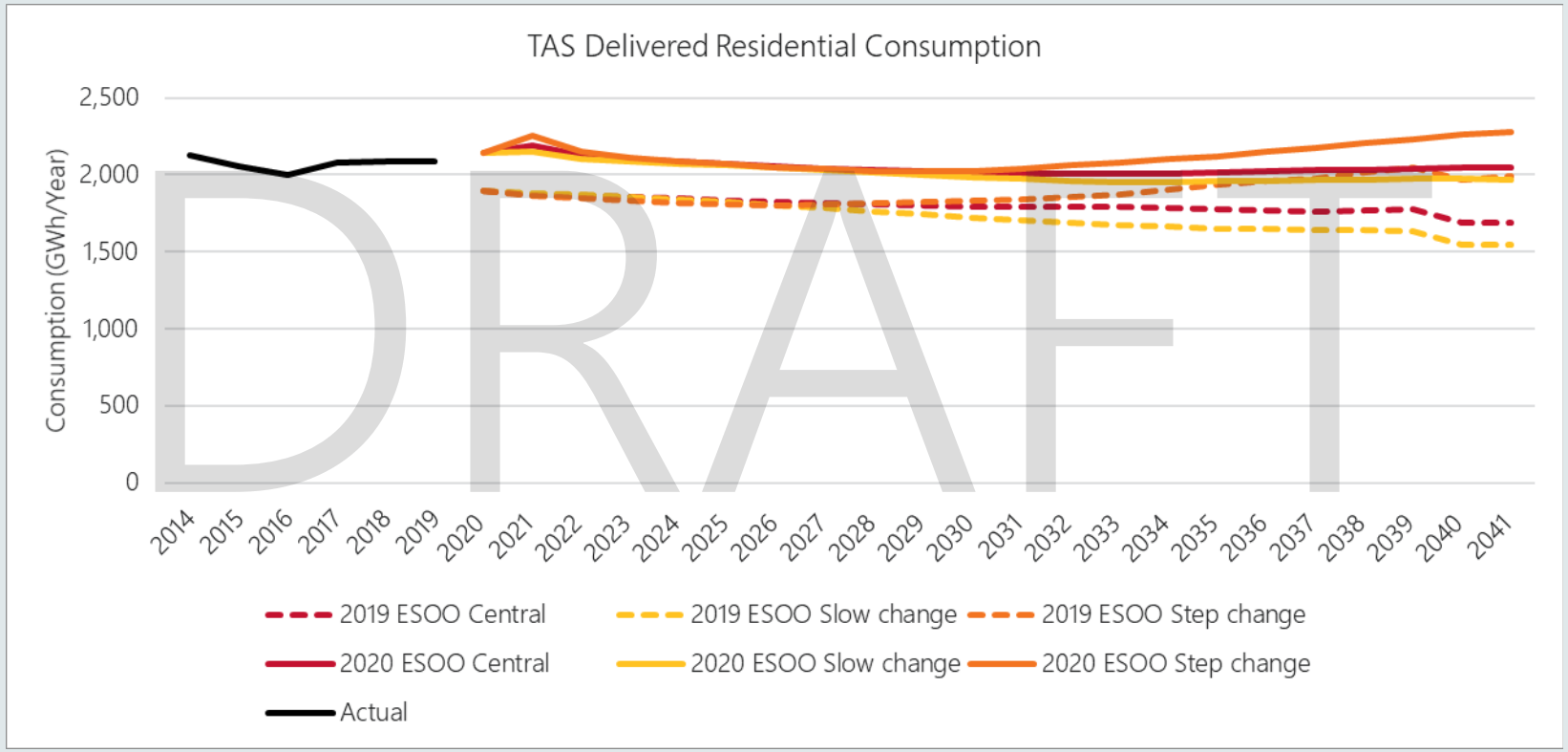
# TAS - Draft Residential Consumption by Scenario

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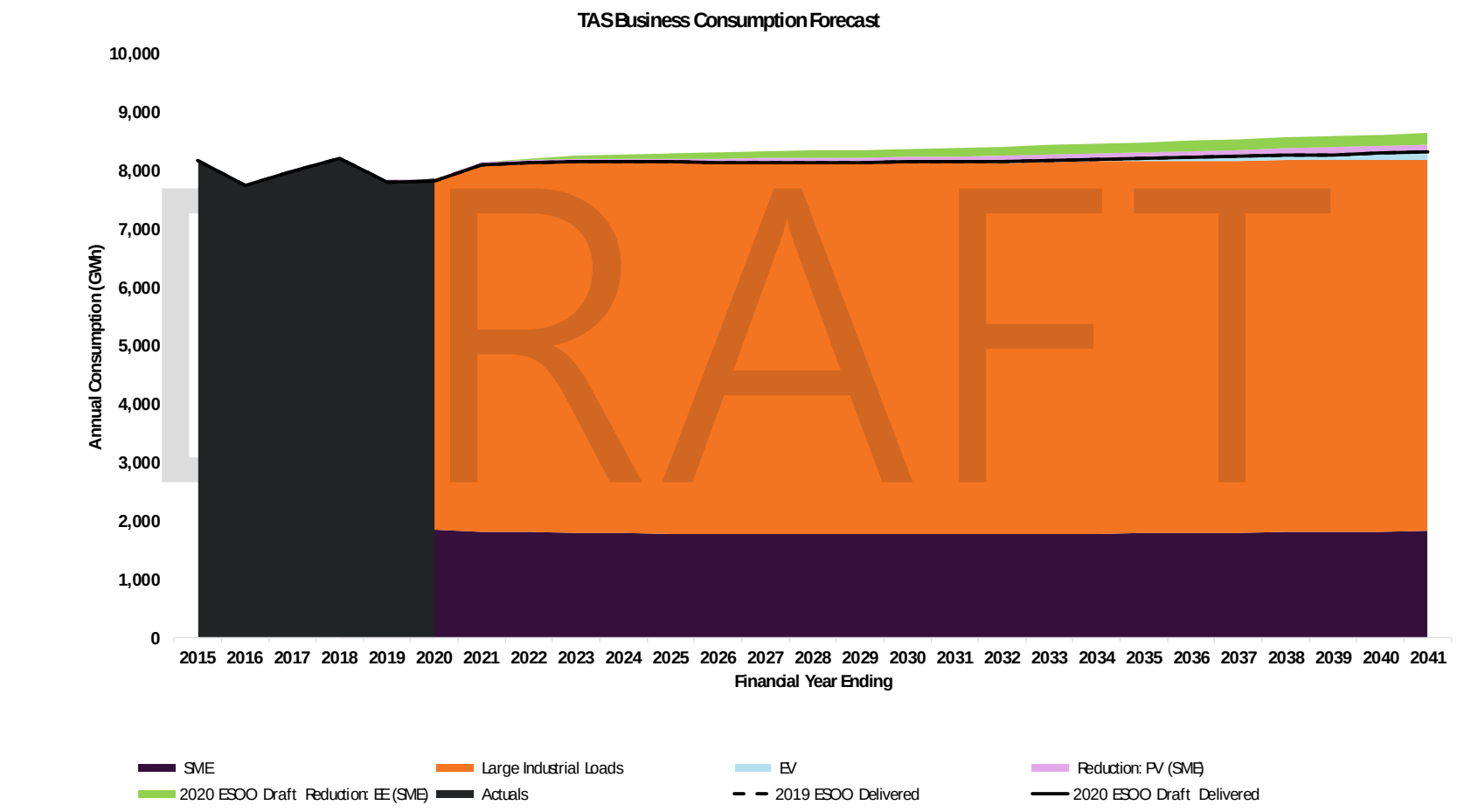
# TAS - Draft Business Consumption

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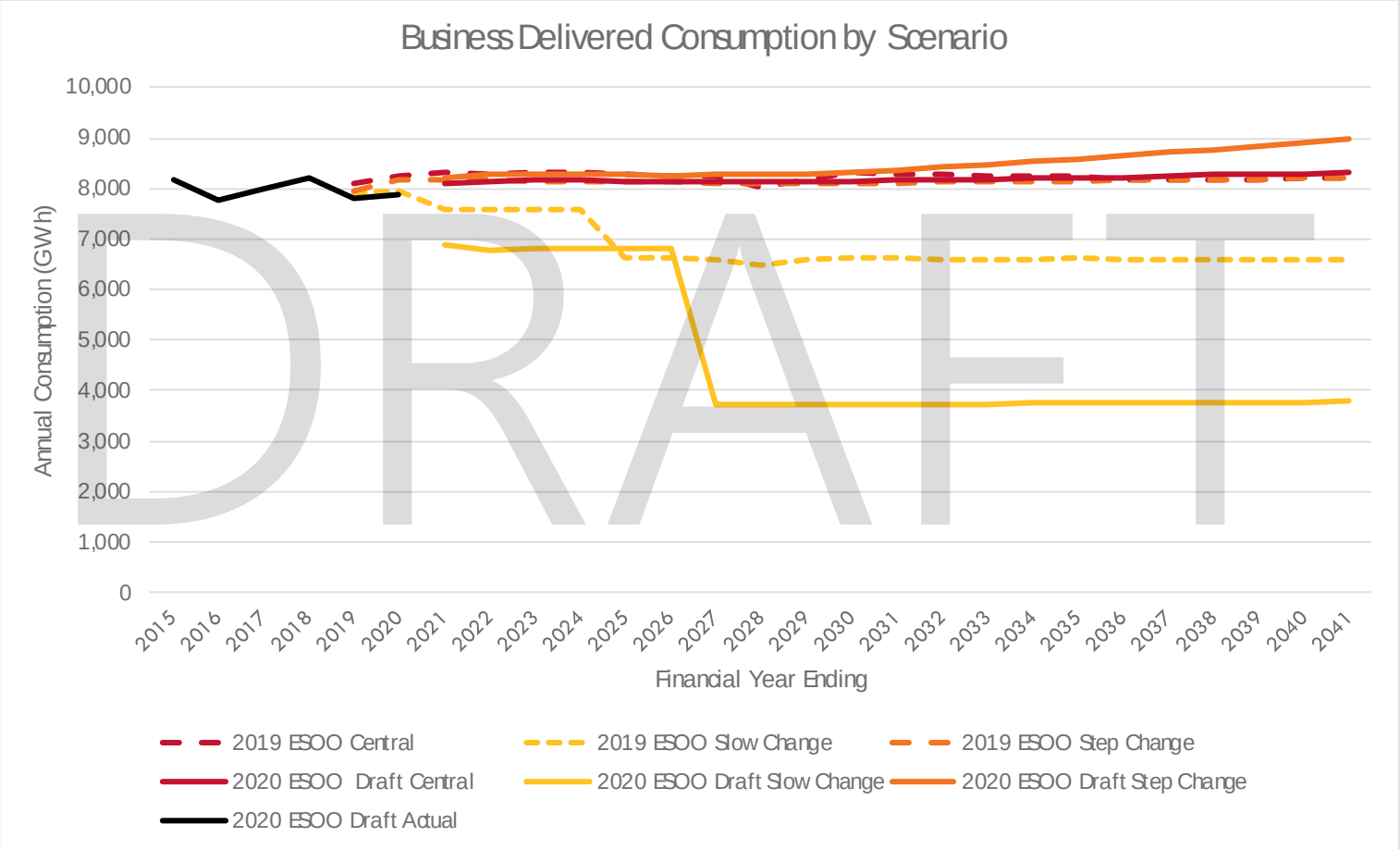
# TAS - Draft Business Consumption by Scenario

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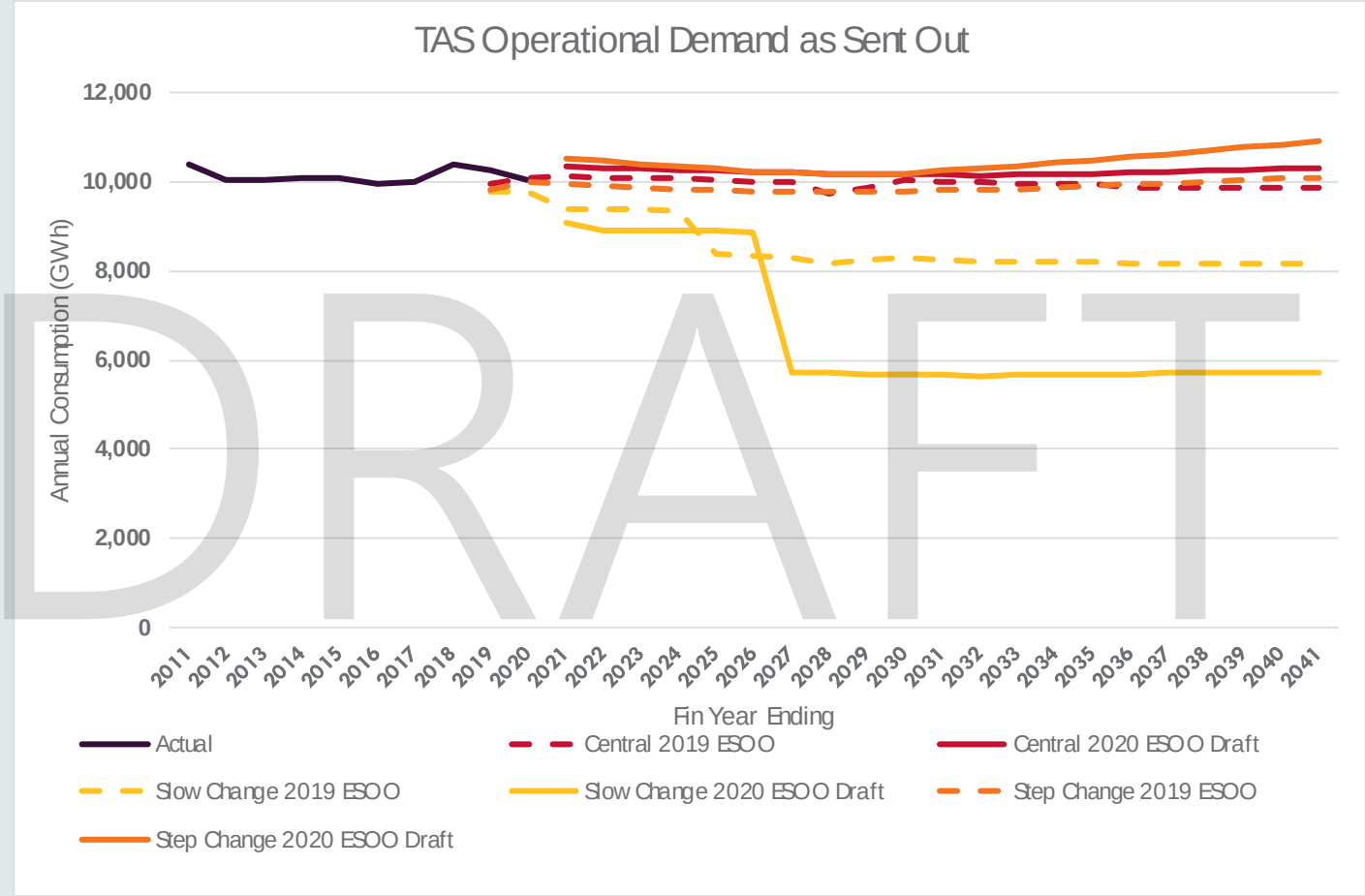
# TAS - Draft Operational Consumption

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# VICTORIA

Detailed regional results

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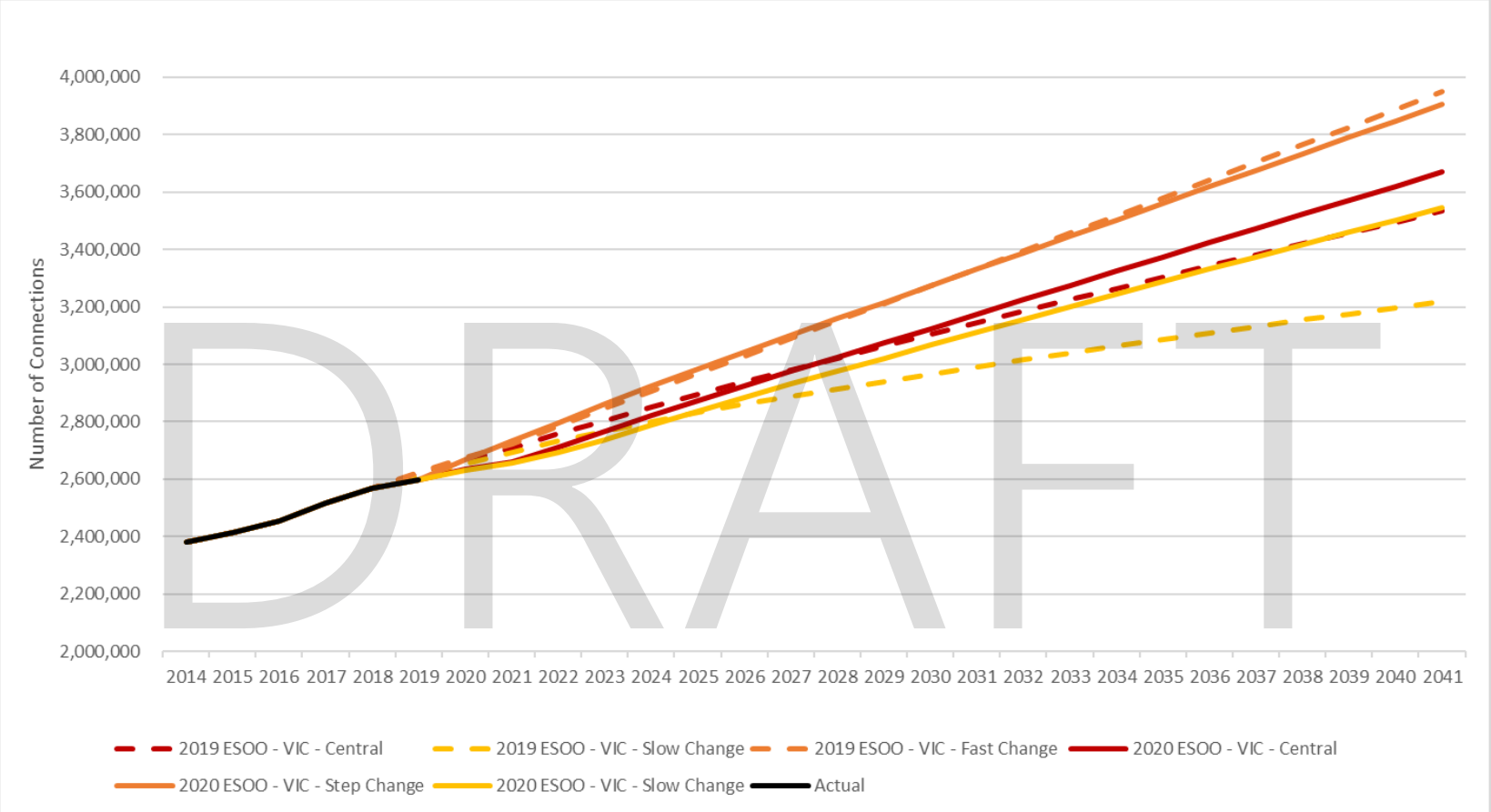
# VIC – Draft Connections Forecast

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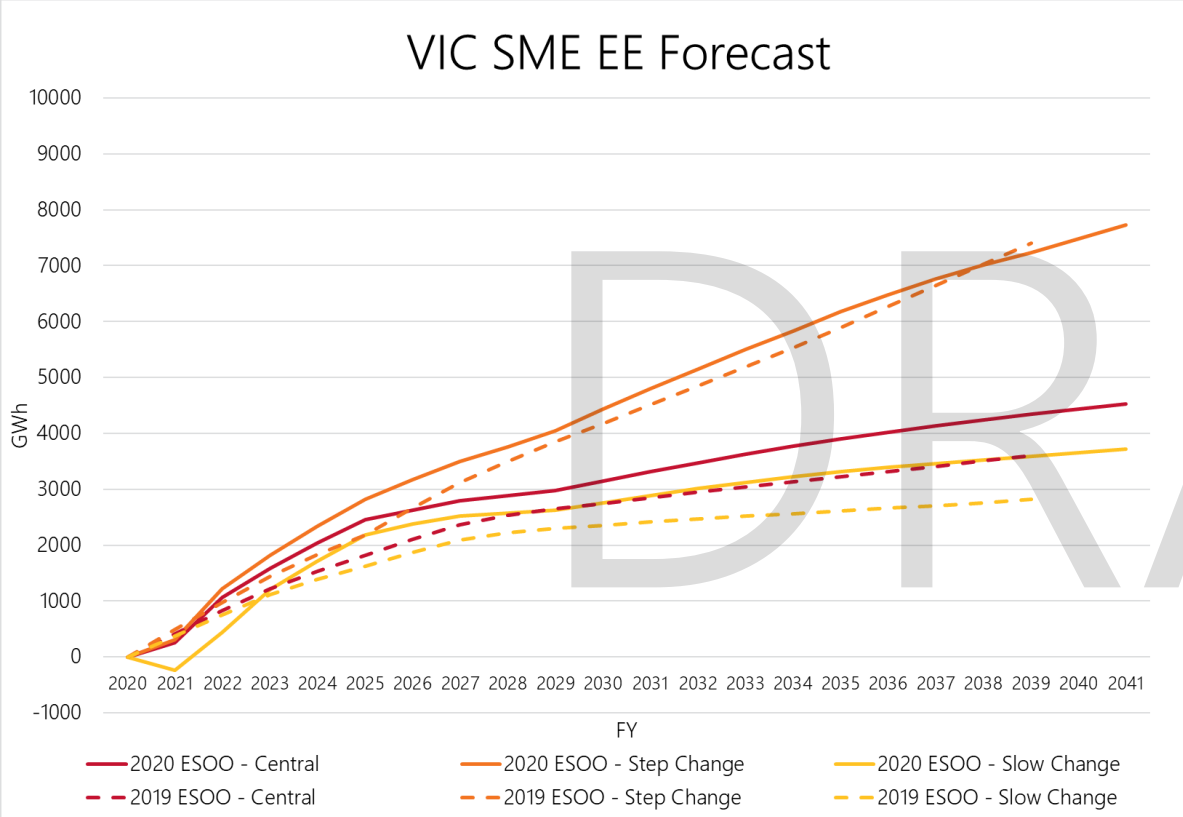
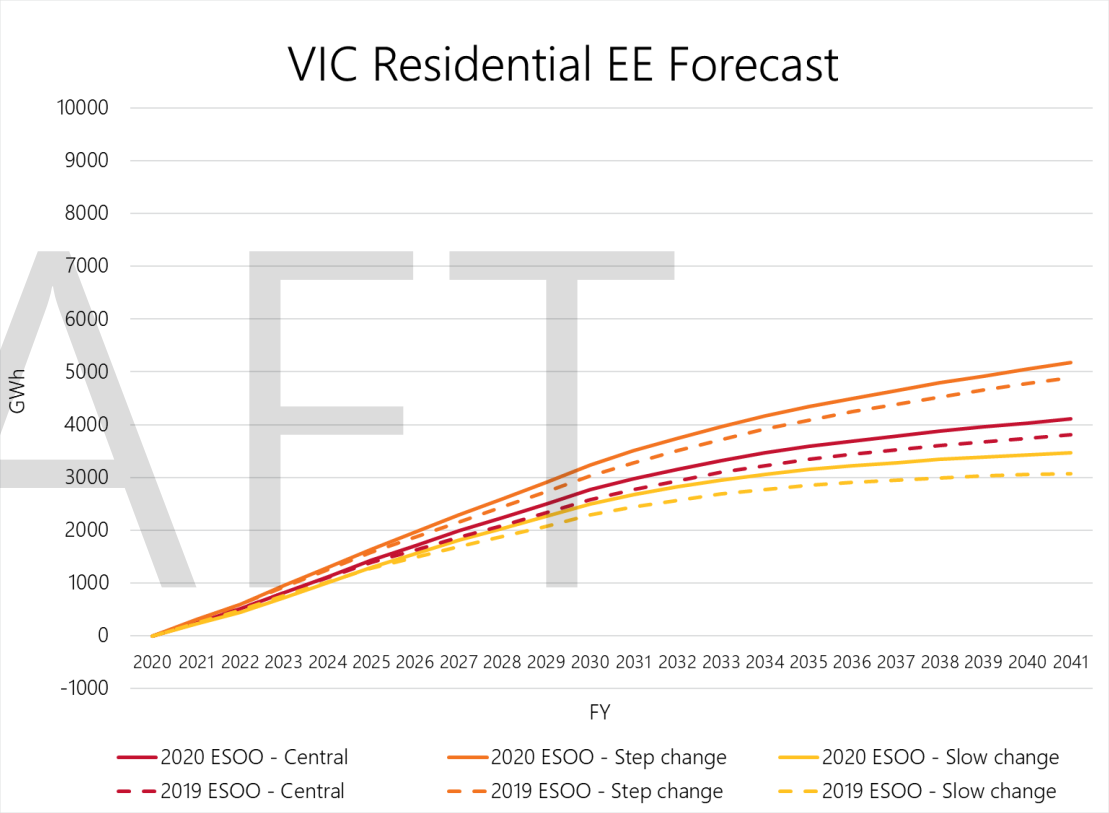
# VIC Energy Efficiency




DRAFT

- Revised analysis of Victorian Energy Upgrades Program savings results in higher savings in mid 2020s. Assumed continuation of savings by 75% beyond deeming period
- New Residential building stock model and updated HBC split cause changes to Residential forecast

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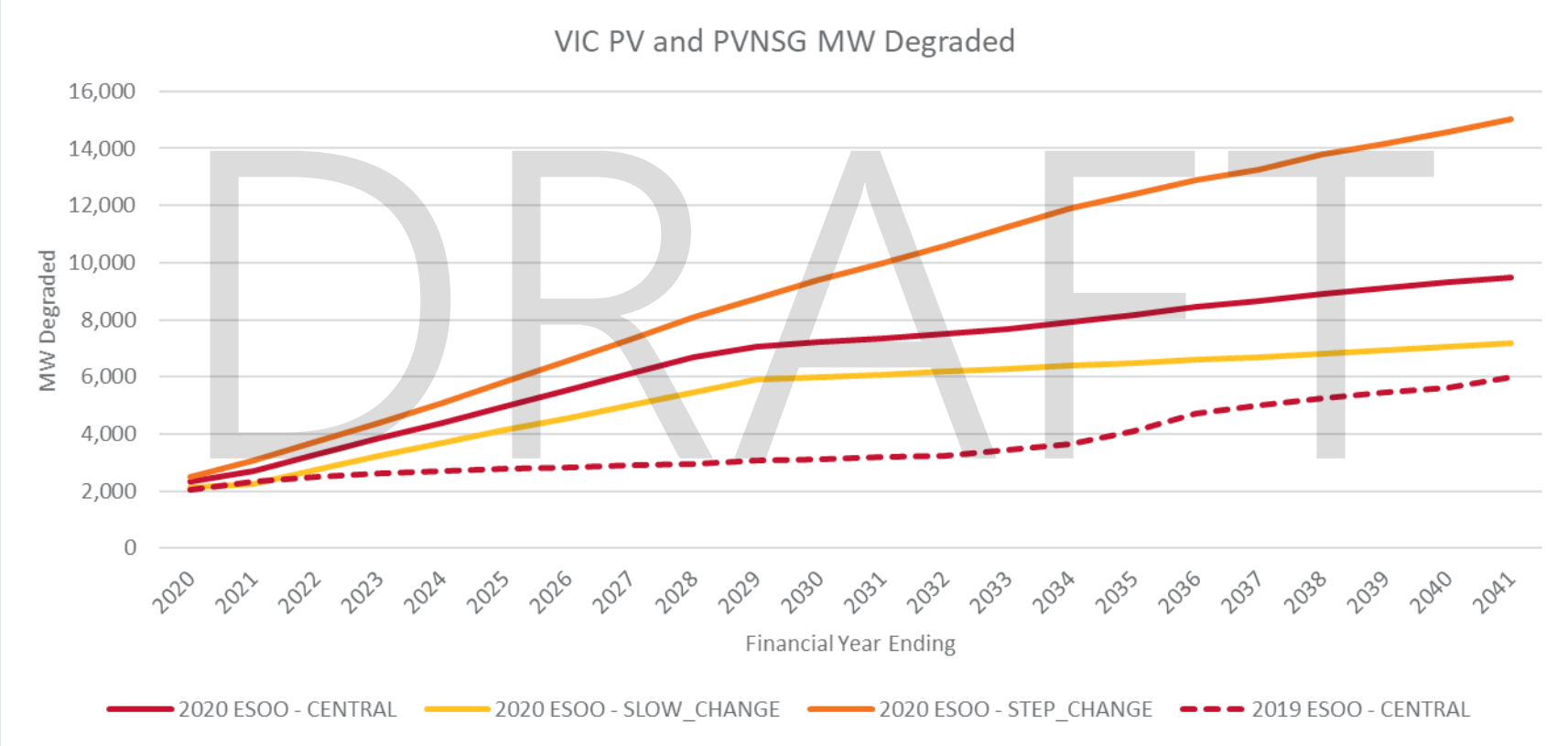
# VIC PV Projections

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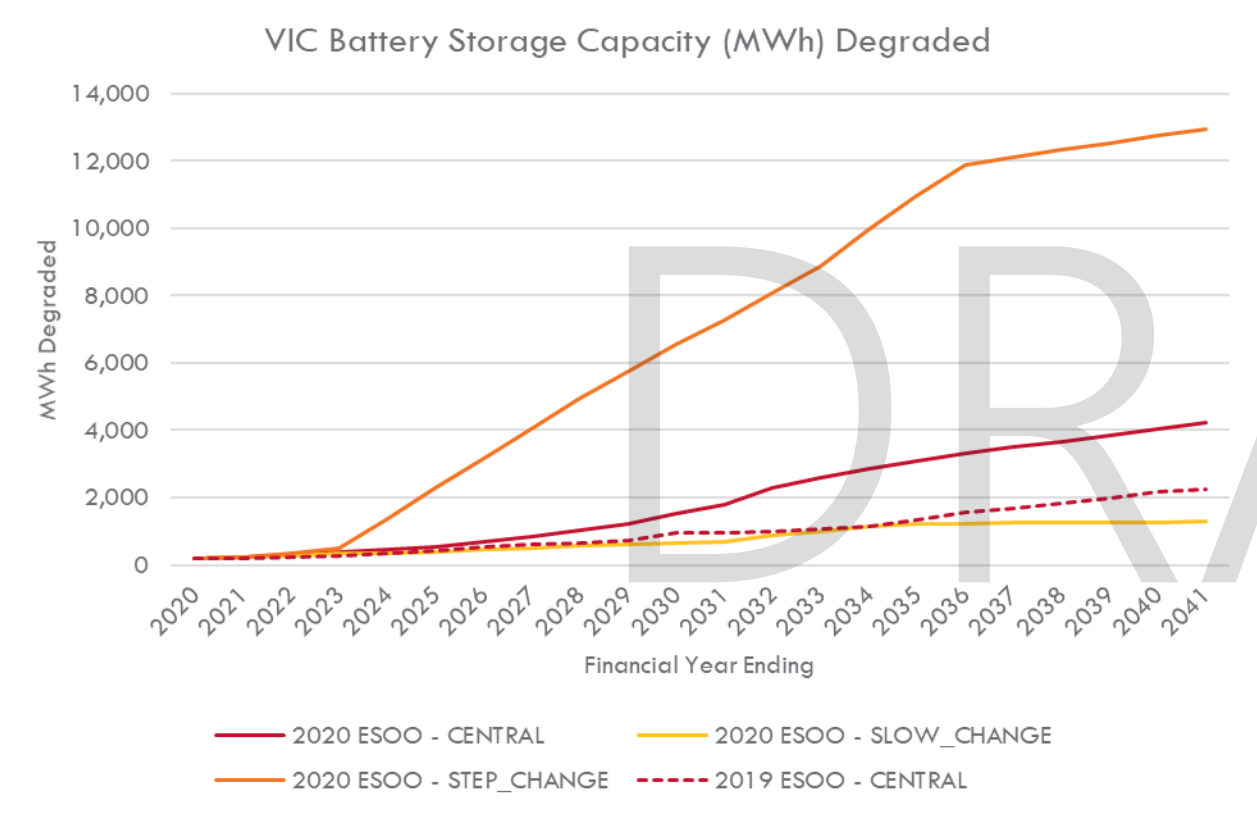
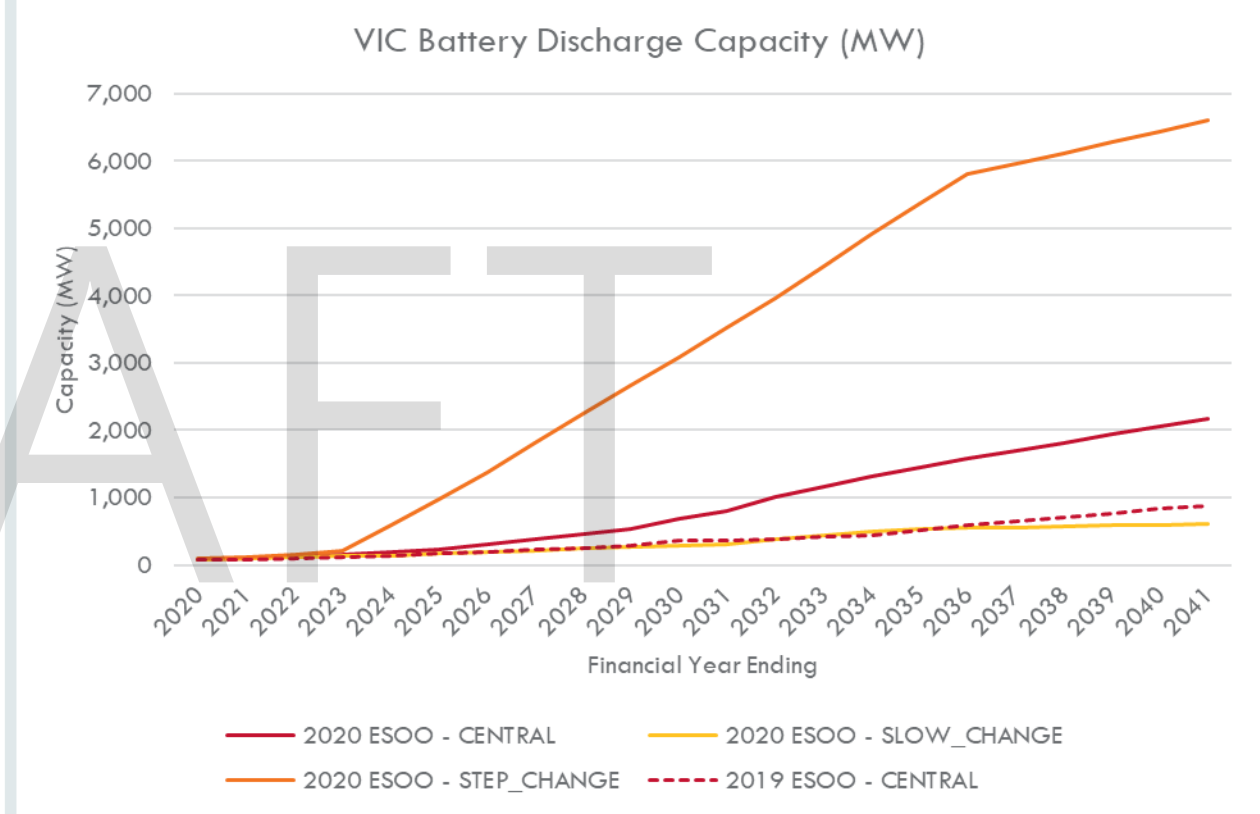
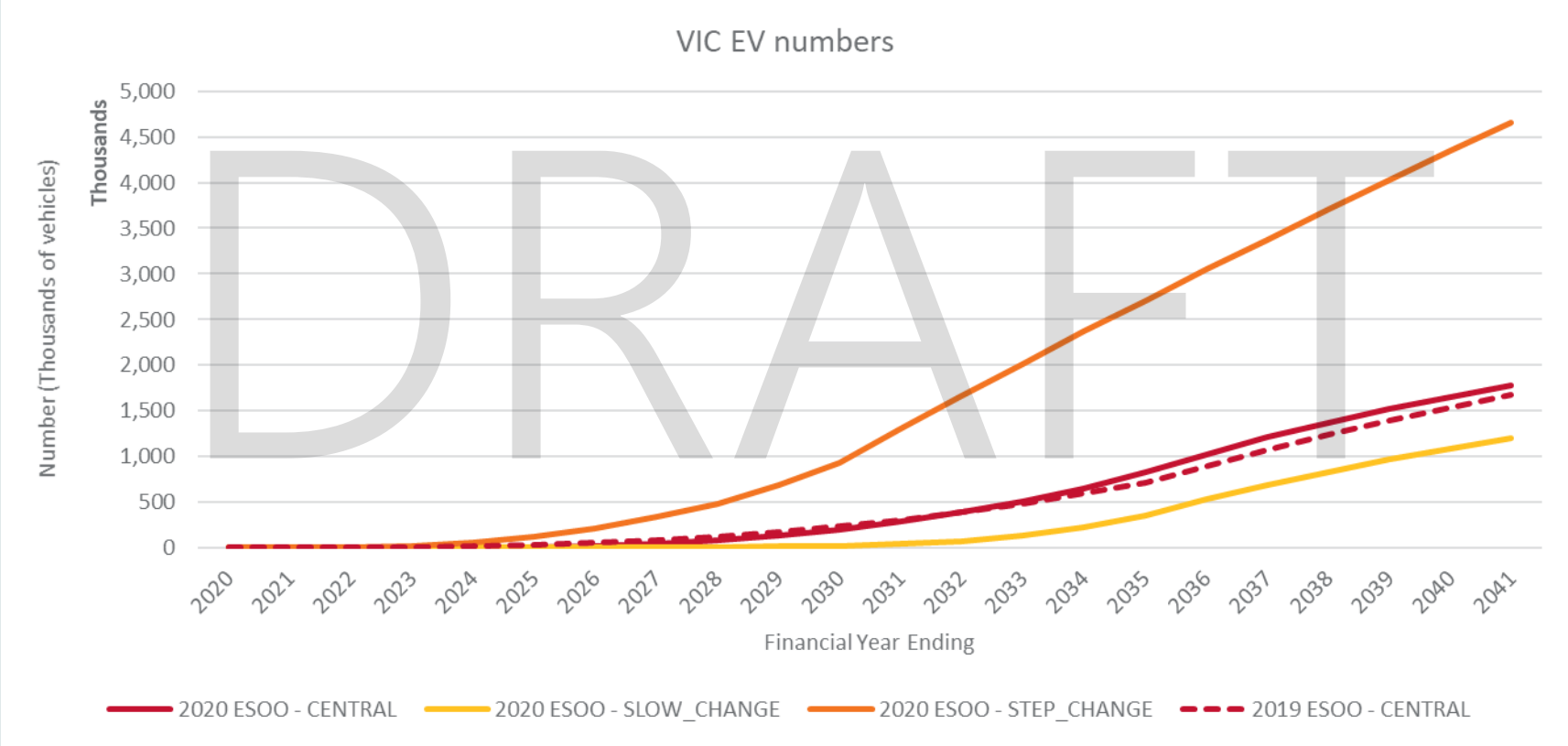
# VIC Battery Projections




DRAFT

# VIC EV Projections

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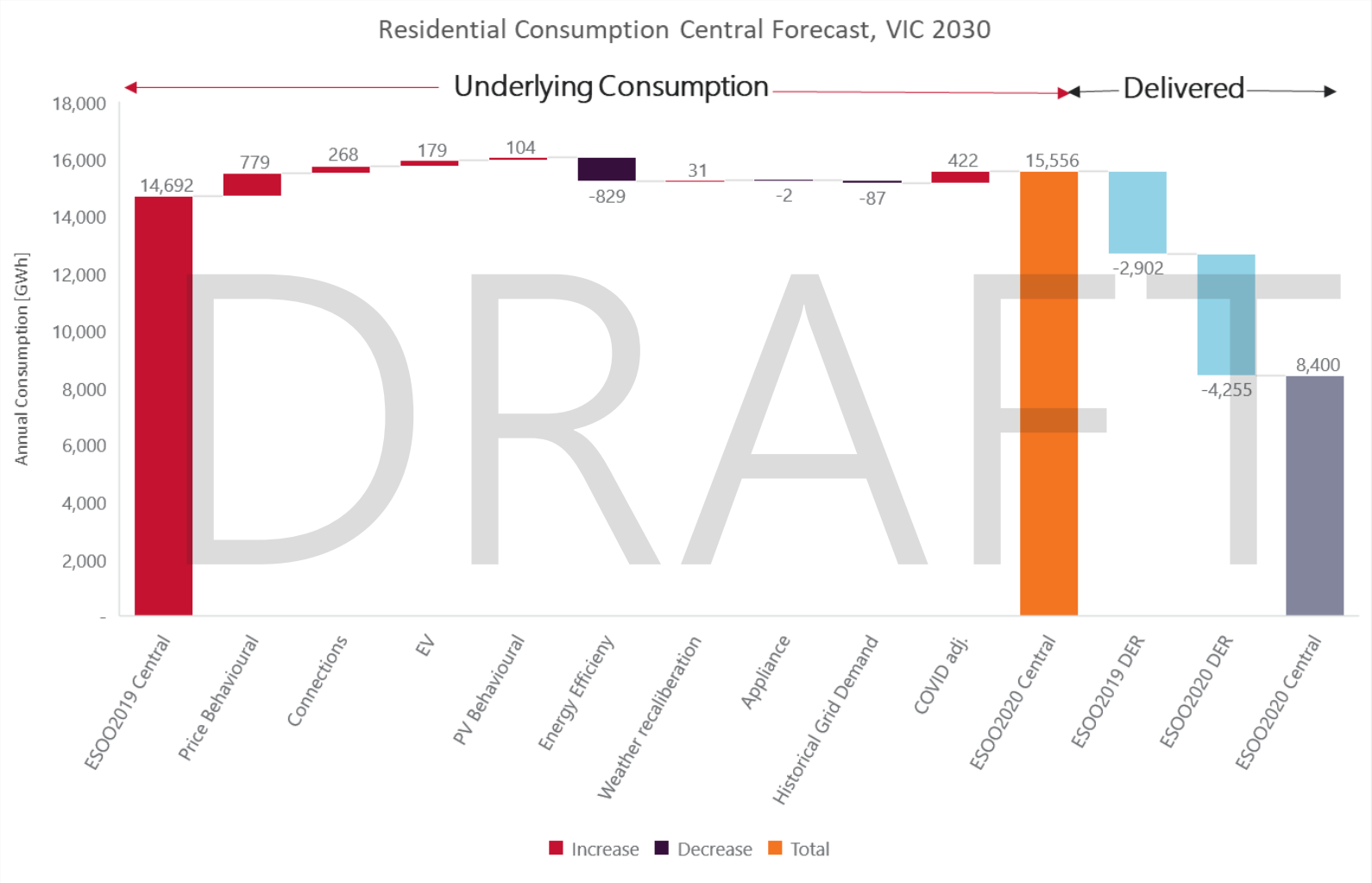
# VIC - Draft Residential Consumption

Drivers increasing underlying consumption:

- Higher PV uptake (but lowers delivered consumption)
- Higher connections (but reduced initially due to COVID-19)
- Reduced exposure to energy costs from PV installations

Drivers lowering underlying consumption:

- Higher energy efficiency
- Weather recalibration

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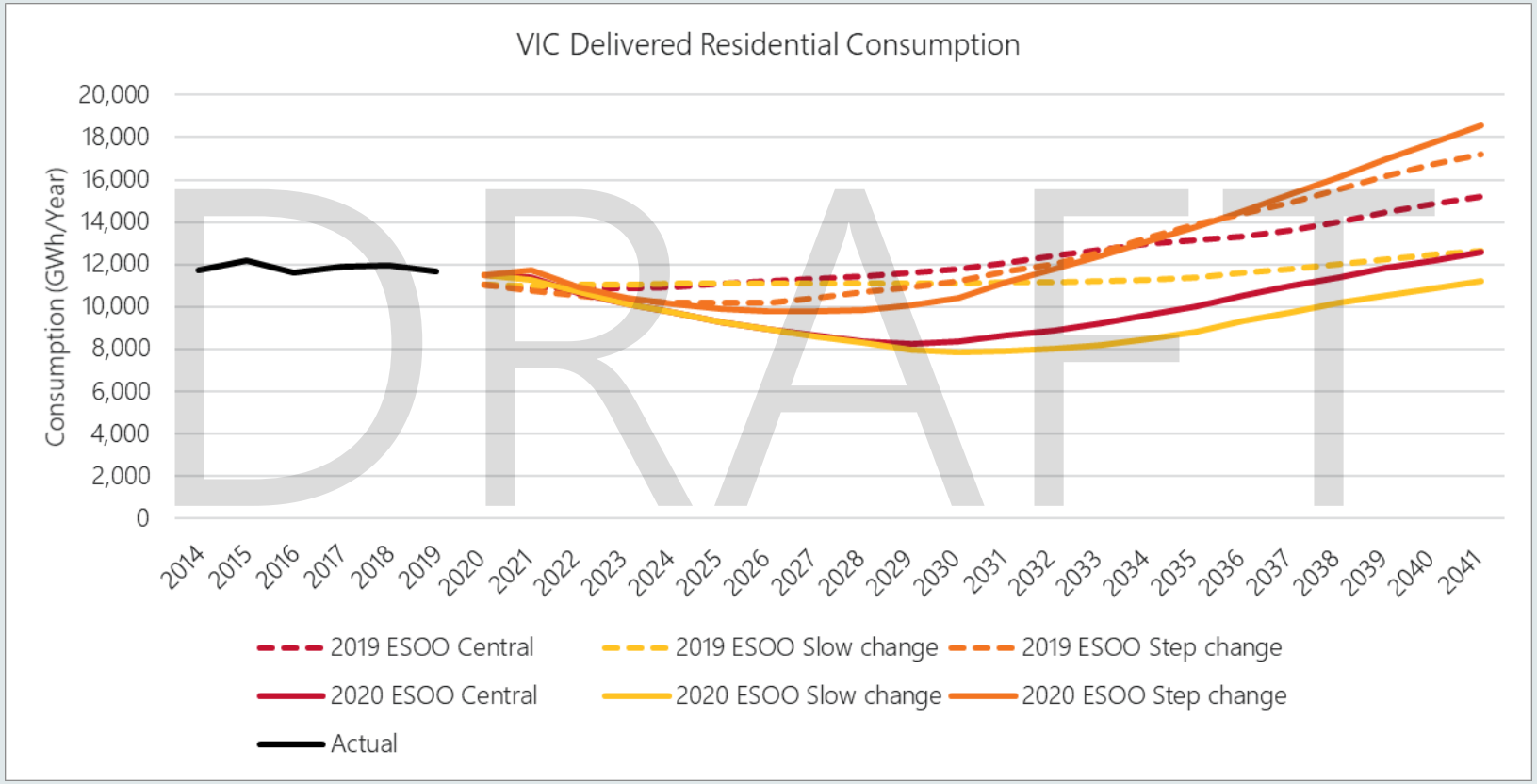
# VIC - Draft Residential Consumption by Scenario

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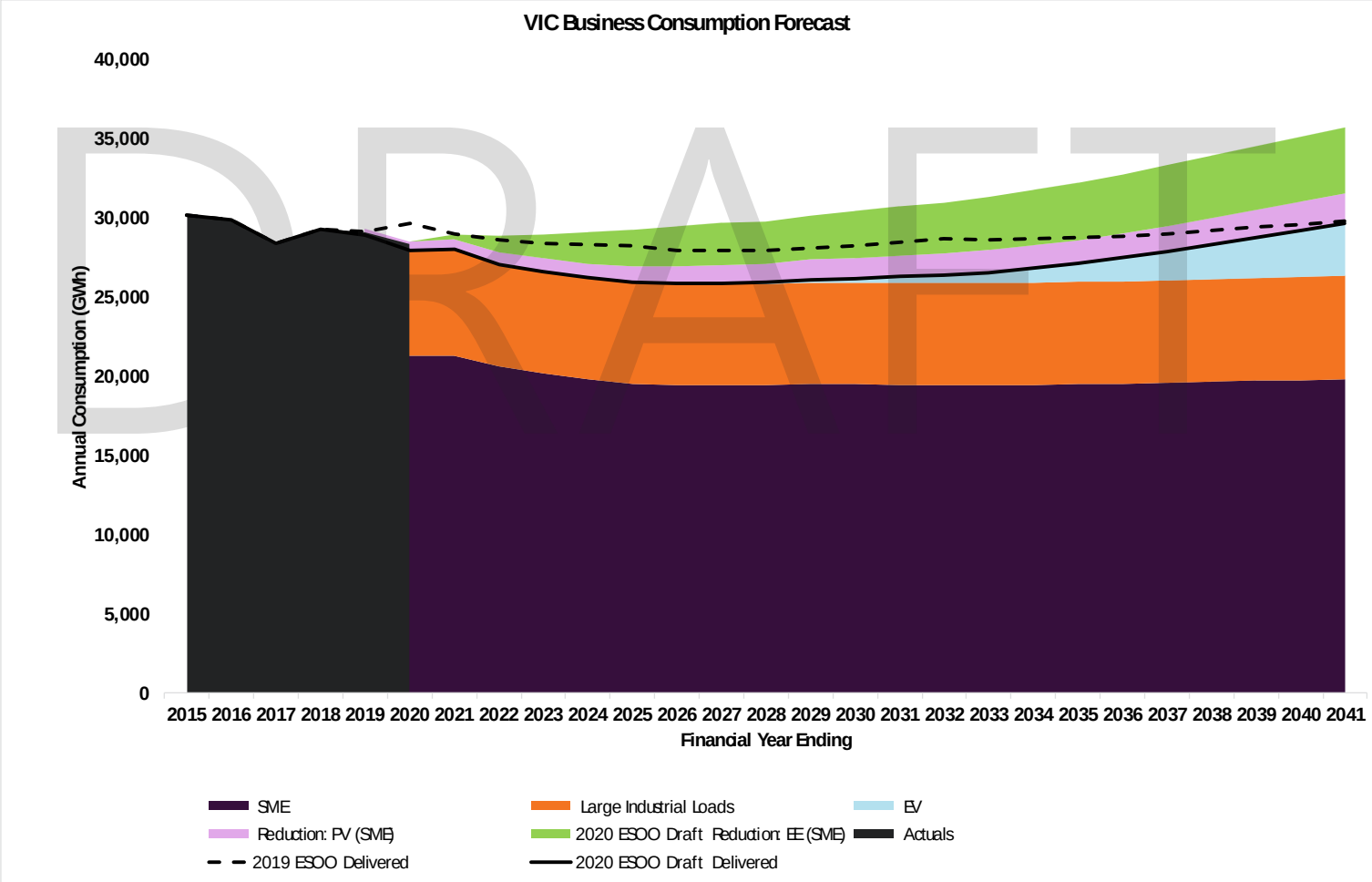
# VIC - Draft Business Consumption

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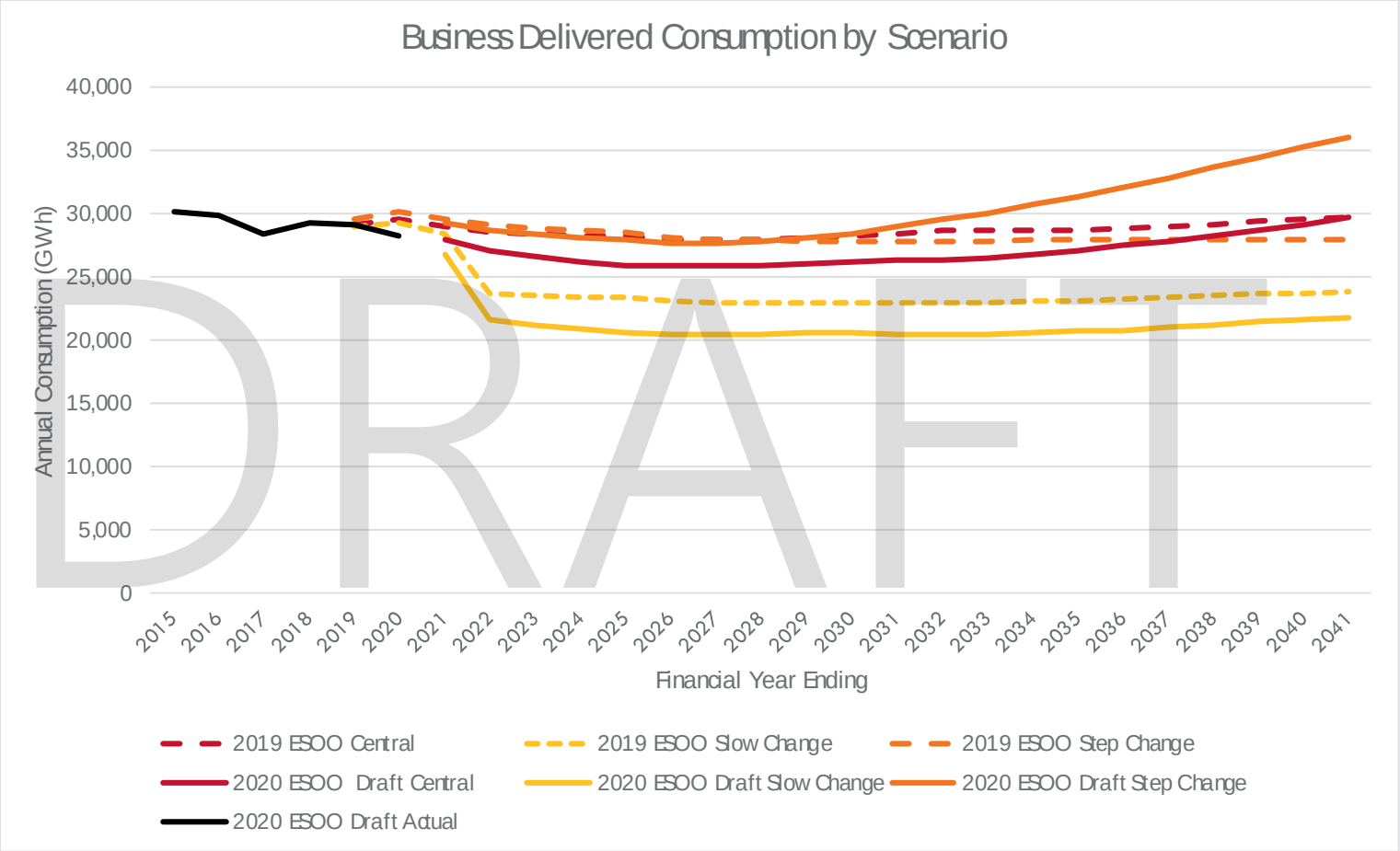
# VIC - Draft Business Consumption by Scenario

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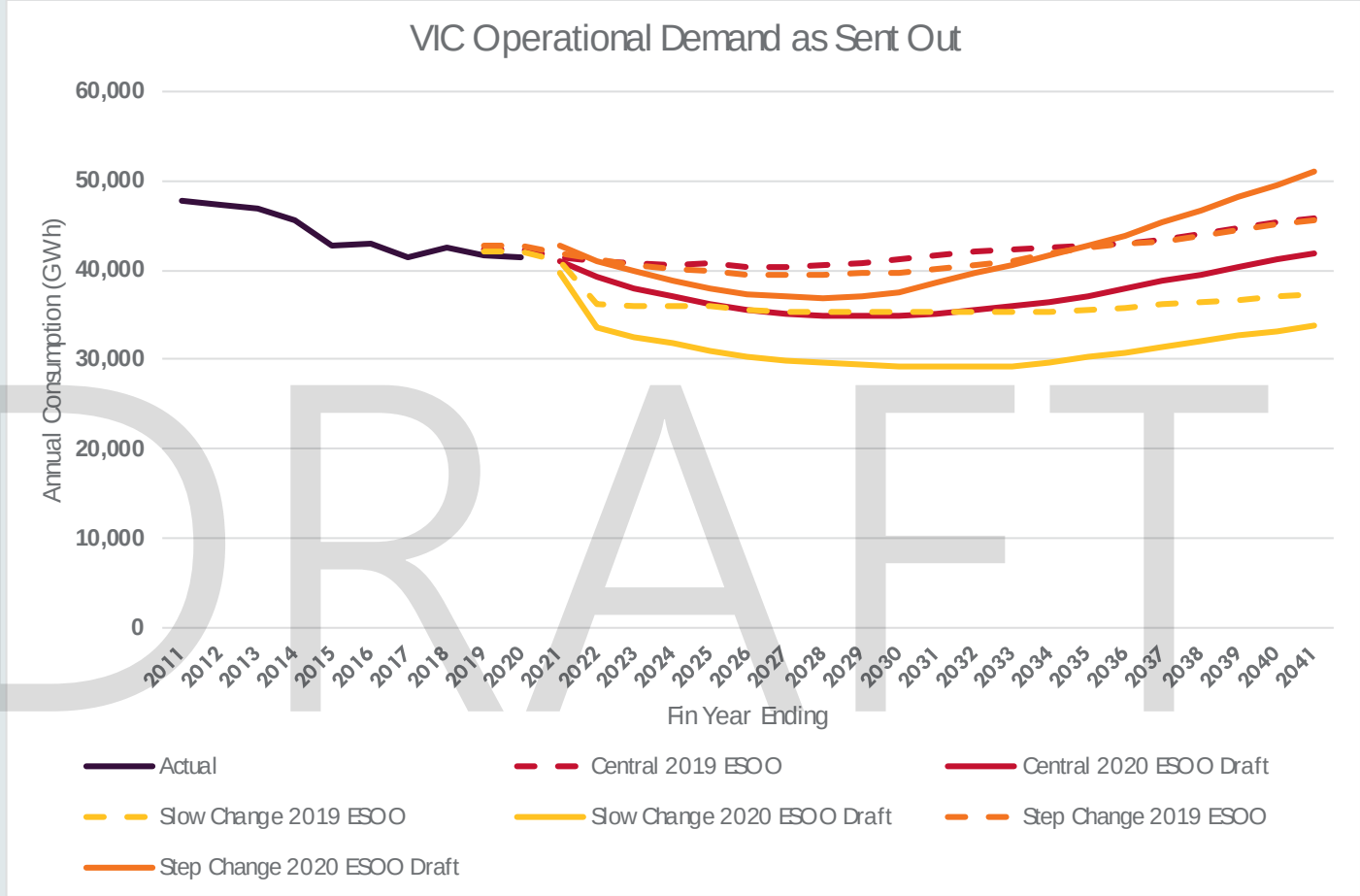
# VIC - Draft Operational Consumption




DRAFT

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