Draft 2023 electricity consumption forecasts

For the 2023 ESOO

31 May 2023

Forecasting Reference Group Meeting

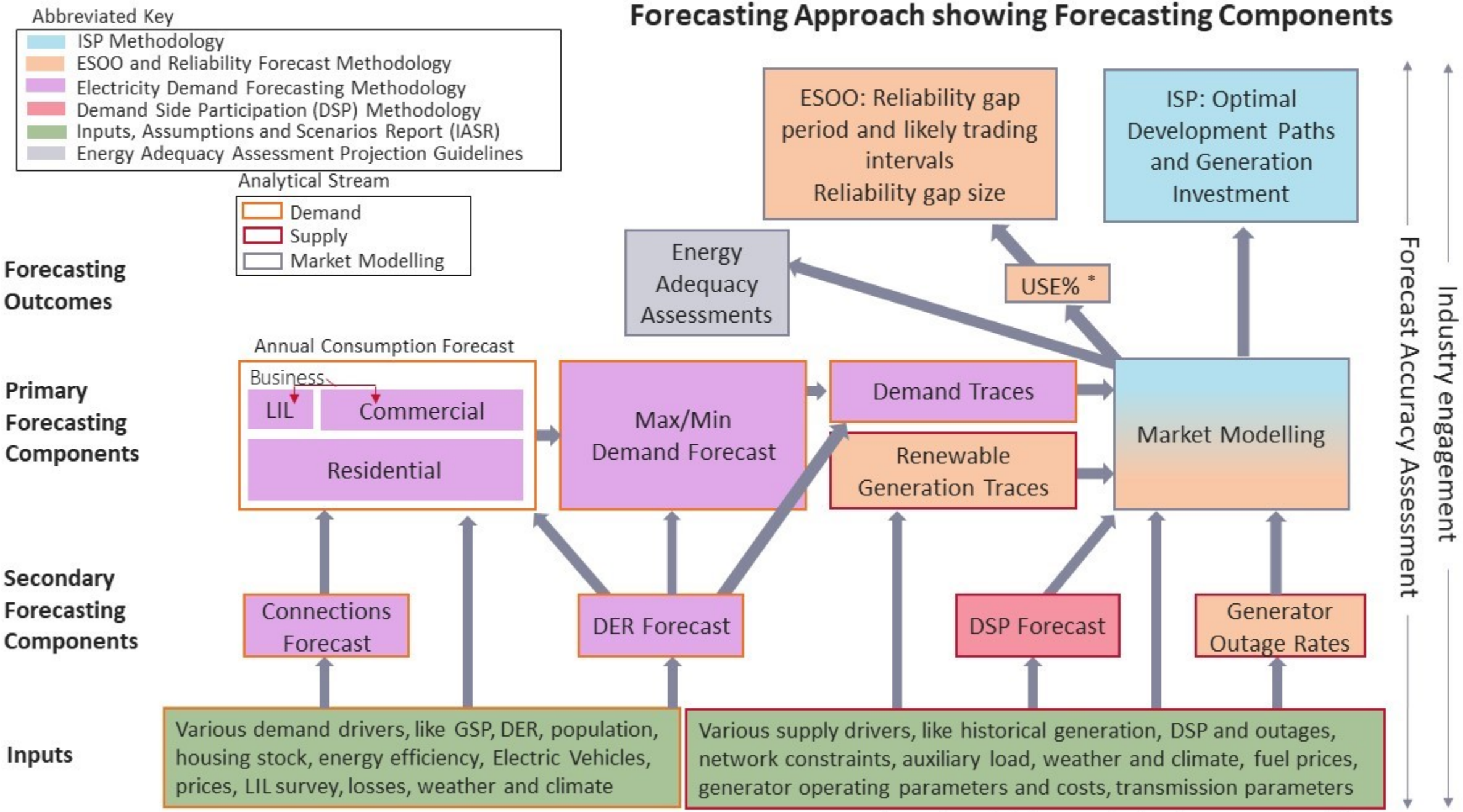
Purpose and agenda

The purpose of this presentation is to *consult* with the FRG on draft 2023 Electricity Statement of Opportunities (ESOO) electricity consumption forecasts.

- Today's Agenda includes:
  - Definitions
  - Model inputs
  - Component draft forecasts
  - Appendices with regional forecasts and select model input forecasts

Timing	Relevant topic	Responsible
Dec 22 – Feb 22	IASR consultation	Stakeholders, AEMO
Feb 2022	ESOO Update published	AEMO
Today	**FRG presentation and discussion on draft consumption forecasts**	**AEMO, FRG**
14 June 23	FRG presentations and discussions: • Draft minimum and maximum demand forecasts • Generator Forced Outage Rates	AEMO, FRG
End Aug	2023 ESOO publication	AEMO

Forecasting Approach showing Forecasting Components



See AEMO's Forecasting Approach

* See also Reliability Standard Implementation Guidelines

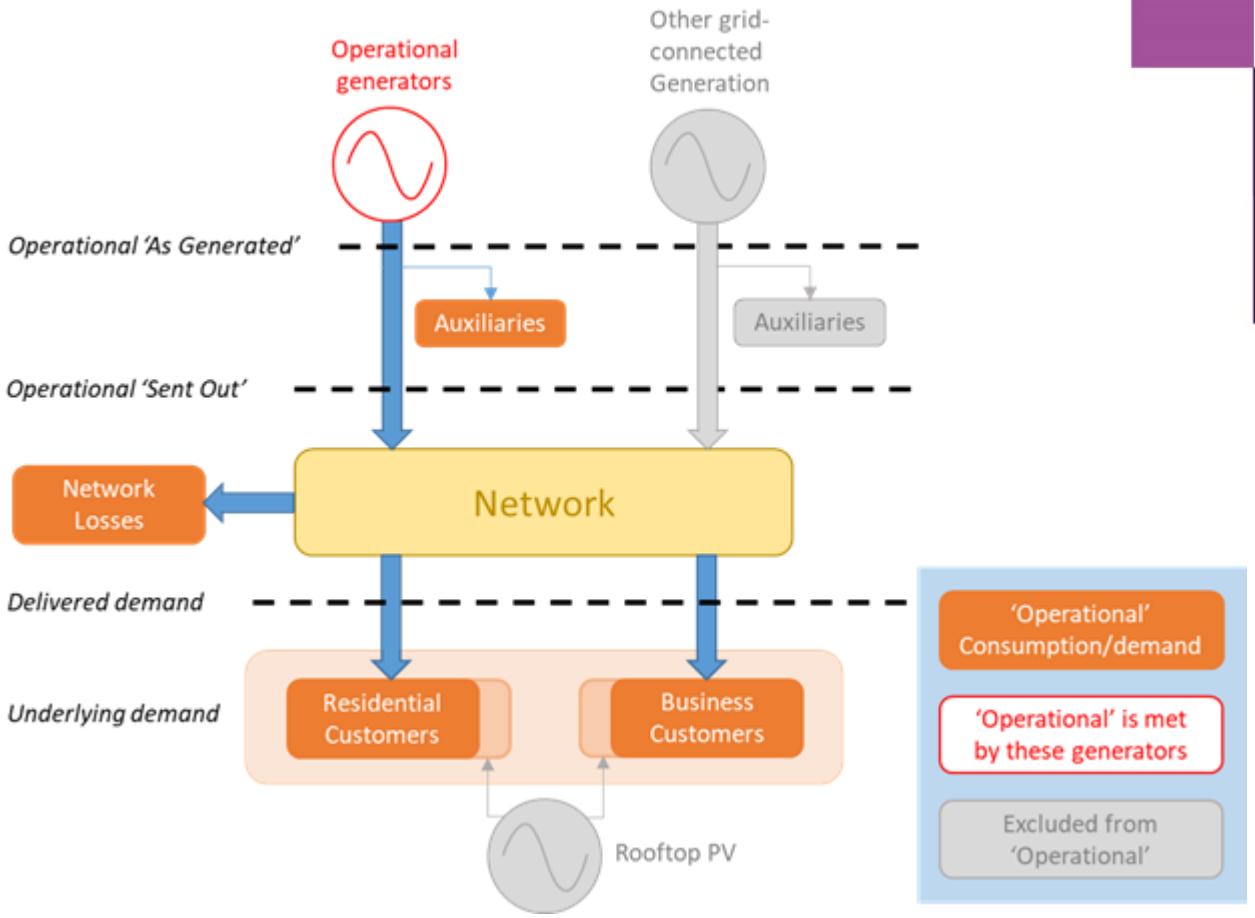
Understanding the language of forecasting electricity consumption

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: demand-terms-in-emms-data-model.pdf (aemo.com.au)

Model inputs

Changes to model inputs (1/3)

Model inputs	Component forecast	Changes since 2022 ESOO/ Draft 2023 IASR	Status
Distributed PV	RES and BUS PV, and PVNSG	Rebased using latest actuals as at 31-Mar 2023	Final
Battery / Virtual Power Plant (VPP)	RES and BUS	As per Draft 2023 IASR	Final
Appliance Index	RES and BUS	Updated using new energy use projections from the 2021 Residential Baseline Study (RBS2.0) by DISER	Final
Energy Efficiency	RES and BUS	Updated with policy-driven forecasts by Strategy Policy Research (SPR). Draft SPR forecasts were shared at the March FRG.*	Final
Electrification	RES and BUS	Updated using CSIRO/ClimateWorks 2022 multi-sector modelling study; residential electrification adjusted in line with GSOO*	Final

*Refer to Appendix – Model inputs for details

Changes to model inputs (2/3)

Model inputs	Component forecast	Changes since 2022 ESOO/ Draft 2023 IASR	Status
Electric Vehicles	RES and BUS	Updated with actuals data to March 2023 (93,000 EVs vs 64,000 EVs estimated in 2022 ESOO). Fast charging profiles moved to a flatter daily peak, based on charging data. ToU and convenience charging behaviour updated, with higher weekend charging and a lower evening peak for convenience profile.*	Final
Large industrial load (LIL) forecast	BUS	Updated existing LIL forecast to include latest survey responses and desalination. Greater consideration of new loads.	Final draft
Hydrogen Production	Total	Removed SMR hydrogen from all scenarios, reduced hydrogen to 10% by volume in distribution in *Green Energy Exports* scenario.	In progress (not included in draft ESOO forecasts)

*Refer to Appendix – Model inputs for details

Changes to model inputs (3/3)

Model inputs	Component forecast	Changes since 2022 ESOO/ Draft 2023 IASR	Status
Connections	RES	Updated number of actual residential NMI connections. Updated actual and forecast of new dwelling numbers provided from BIS Oxford Economics.*	Final
Retail Price	RES and BUS	Updated forecast using ACCC Pricing Inquiry Report (Nov 2022) and Network Service Provider (NSP) Pricing Proposals submitted to AER, rather than AEMC Price Trends Report (last published in 2021). Minor methodological changes to wholesale price and retail components.	Draft

*Refer to Appendix – Model inputs for details

Residential-Business Split

Background

- AEMO approximates the split of distribution load into RES and BUS, because the breakdown is not perfectly-visible

Current methodology

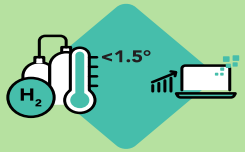
- Considers a combination of AER Regulatory Information Notices (RIN) data and interval meter sampling to perform the 'RES-BUS' split

Revised methodology

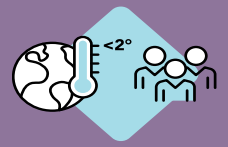
- Stakeholder feedback at AEMO's *Technical Demand Forecasting Workshop* (Feb 2023) suggested the current methodology may introduce bias due to the reliance on interval meter data only
- The revised approach aims to eliminate this bias, by matching the sampling distribution with the population's distribution
- AEMO continues to use AER RIN data to validate residential load, which is particularly helpful for regions with a lower penetration of interval meters

Draft component forecasts

Component forecasts shown today are developed for the following draft 2023 IASR scenarios:



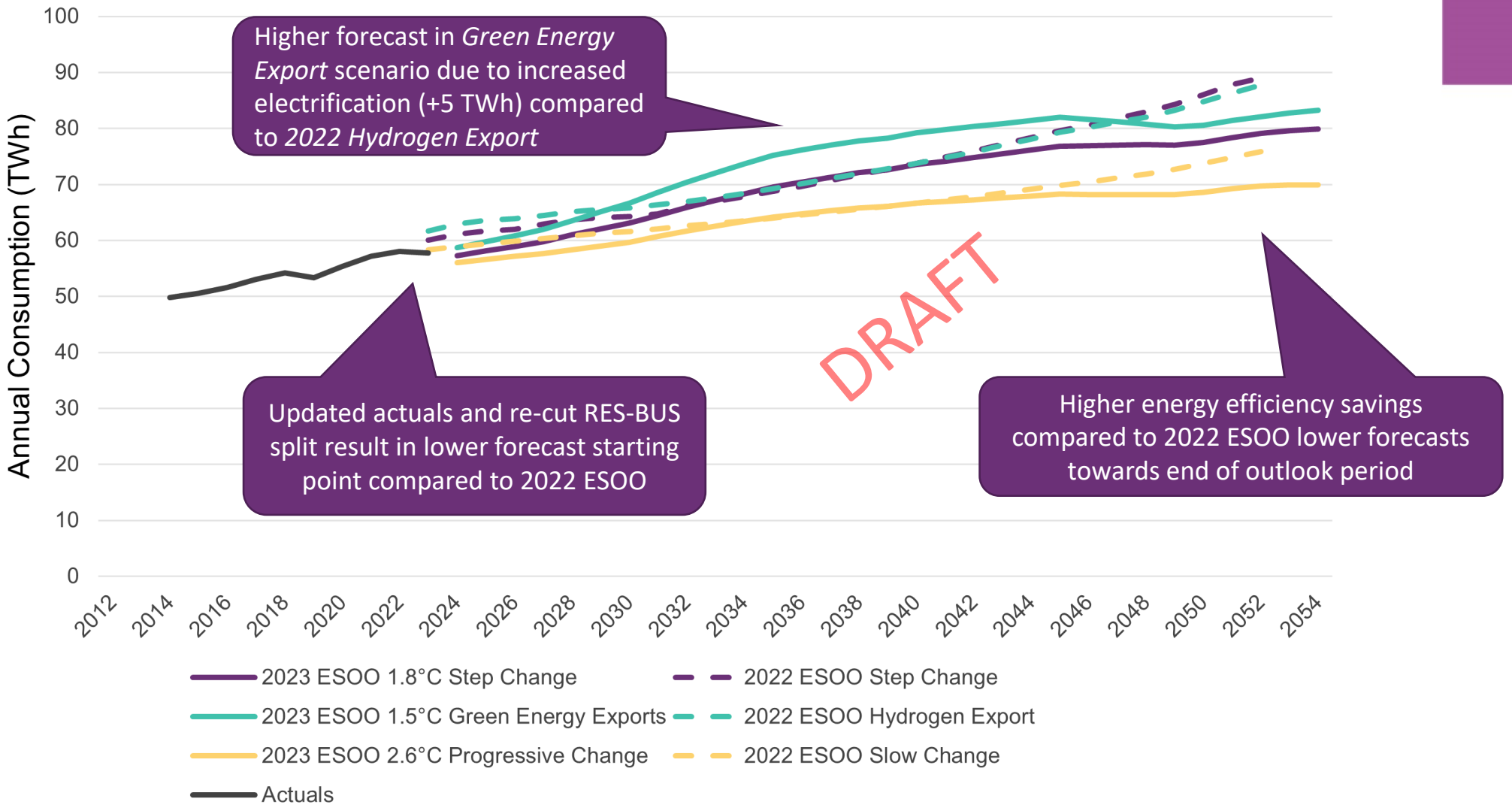
1.5°C Green Energy Export



1.8°C Step Change

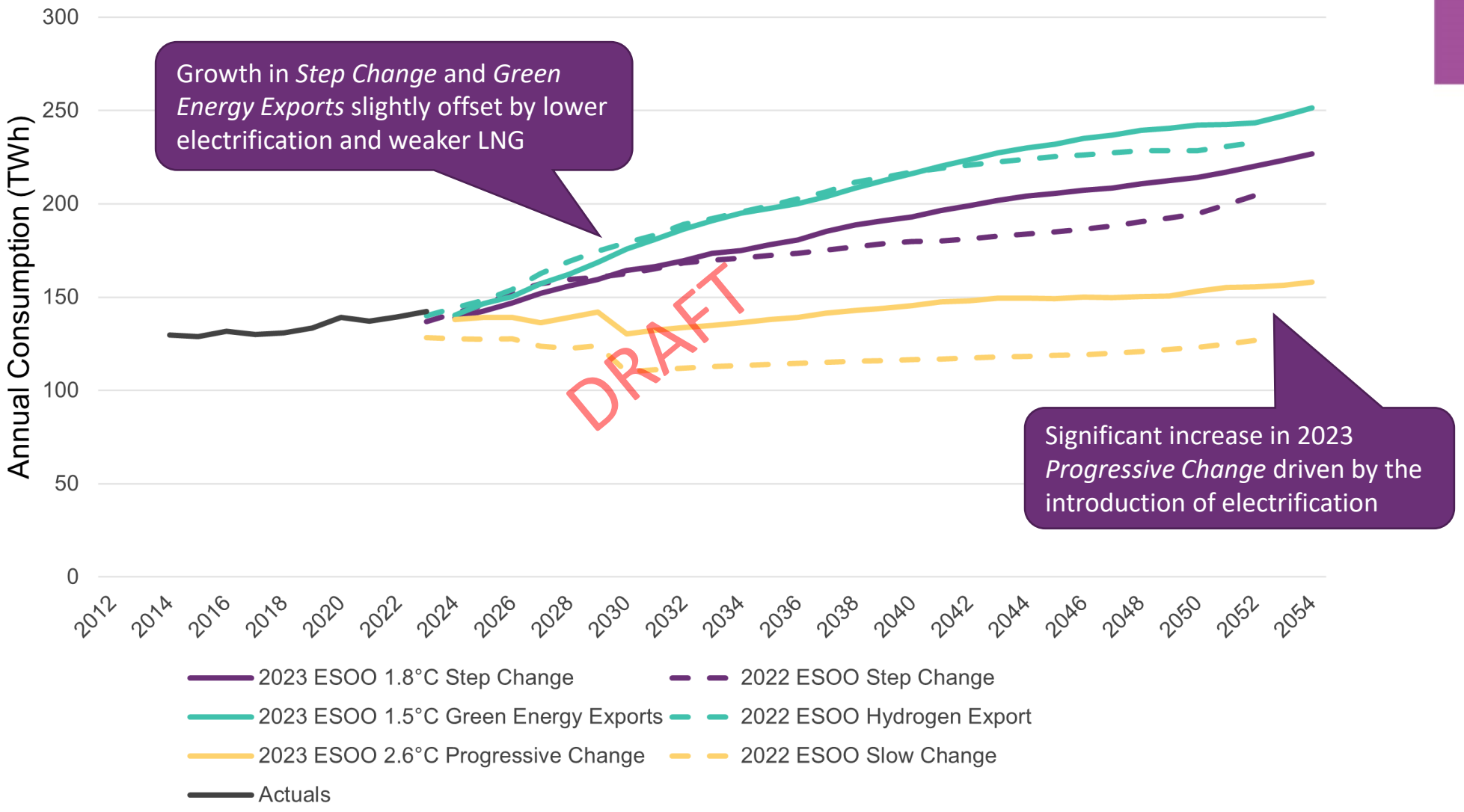
2.6°C Progressive Change

Residential forecast (Underlying)

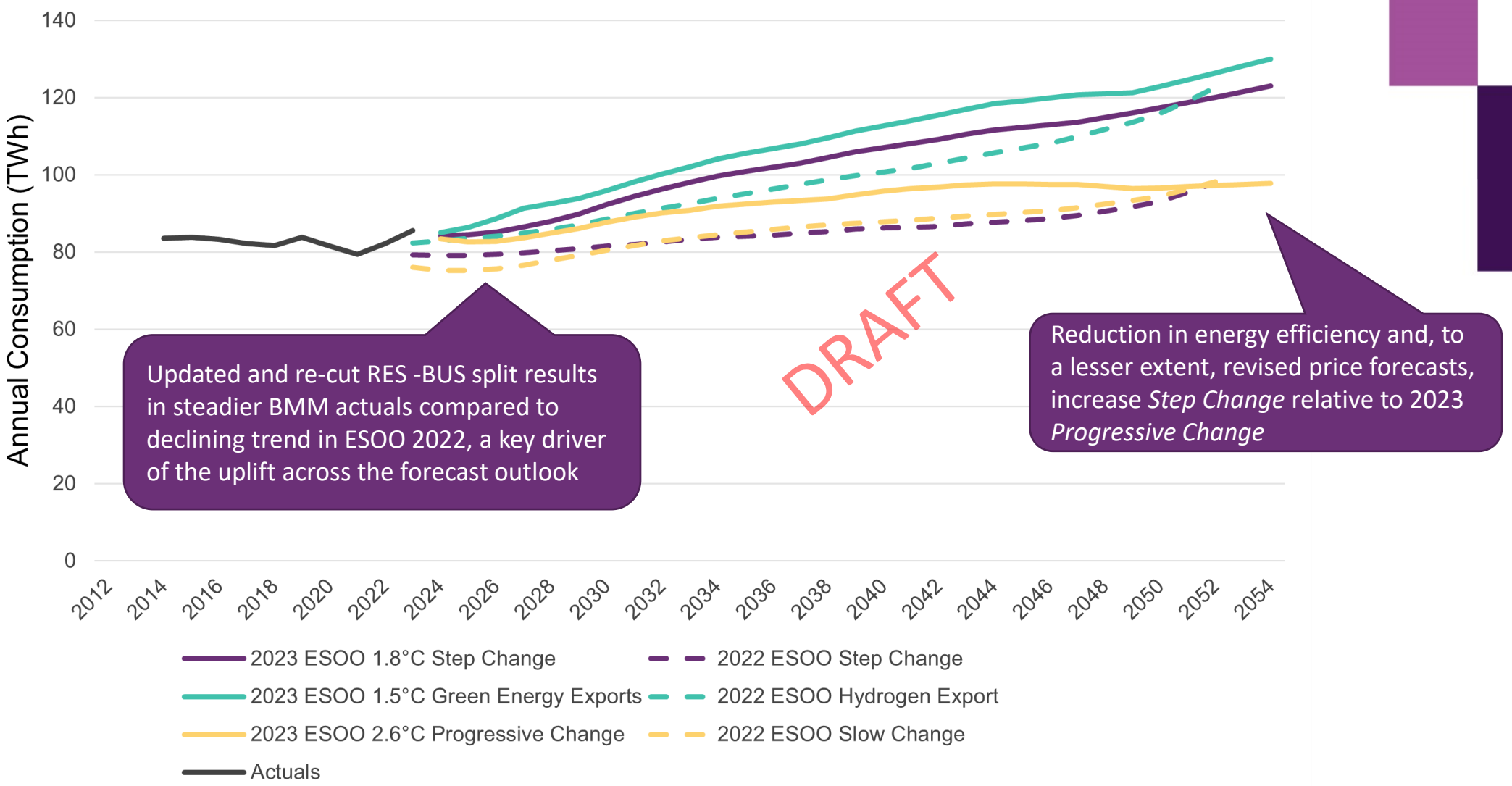


* Refer to Appendix, 'Model Inputs' for energy efficiency and electrification forecast comparisons

Business consumption forecasts (Underlying)



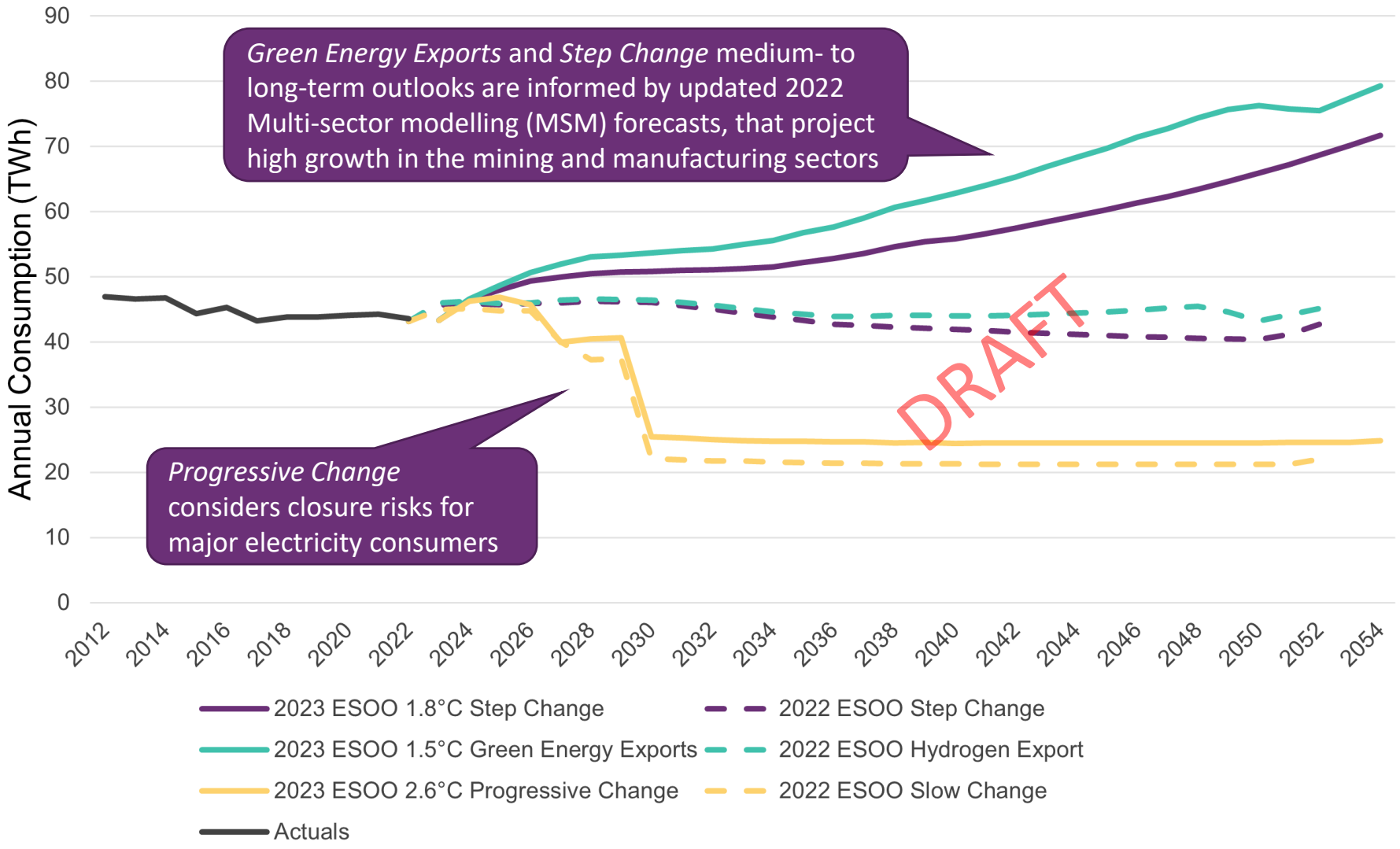
Business mass market forecast (BMM)* (Underlying)



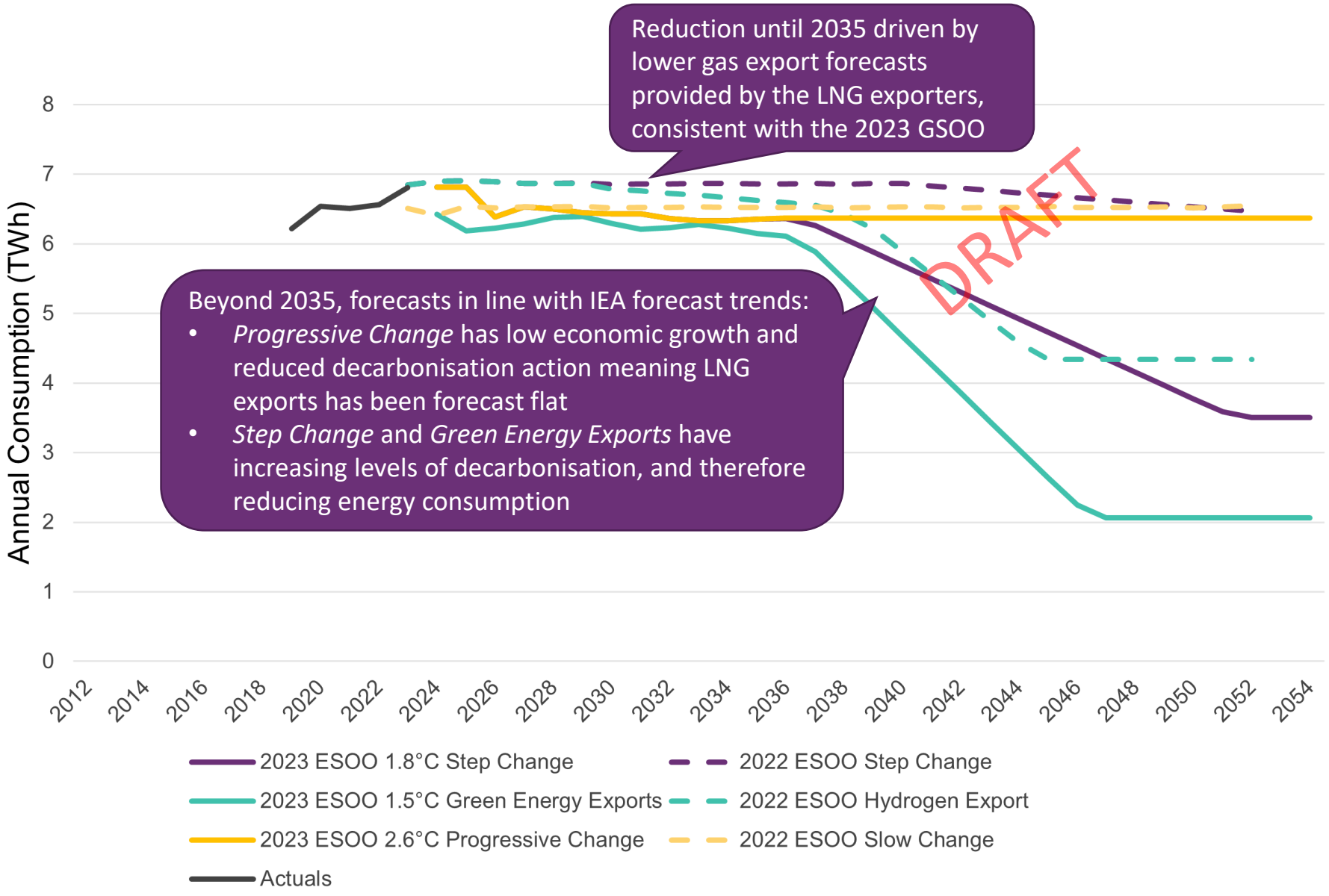
*Electrification impact not in BMM forecast; included in the Business consumption forecast

^ Refer to Appendix, 'Model Inputs' for energy efficiency and electrification forecast comparisons

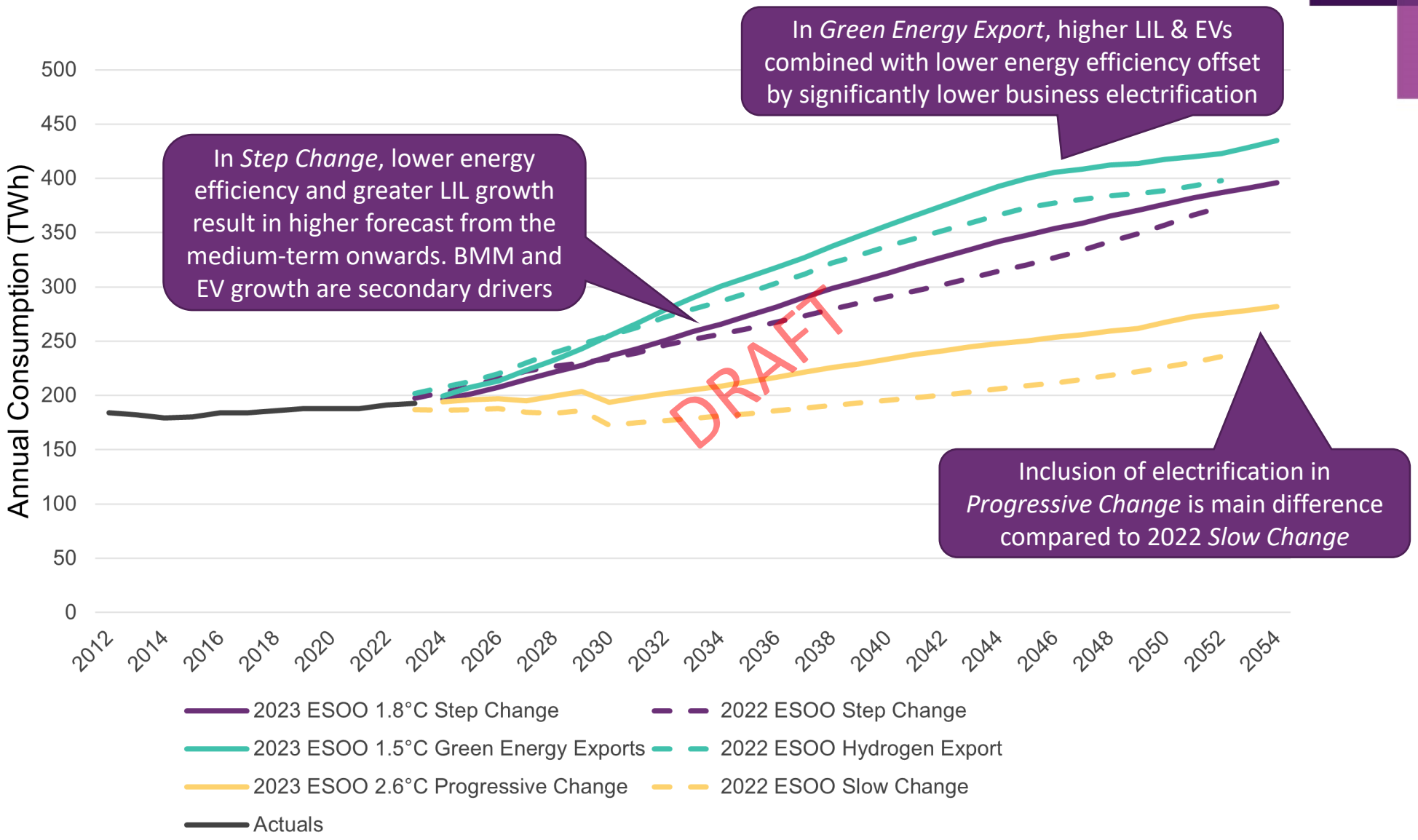
Large Industrial Load (LIL) forecast



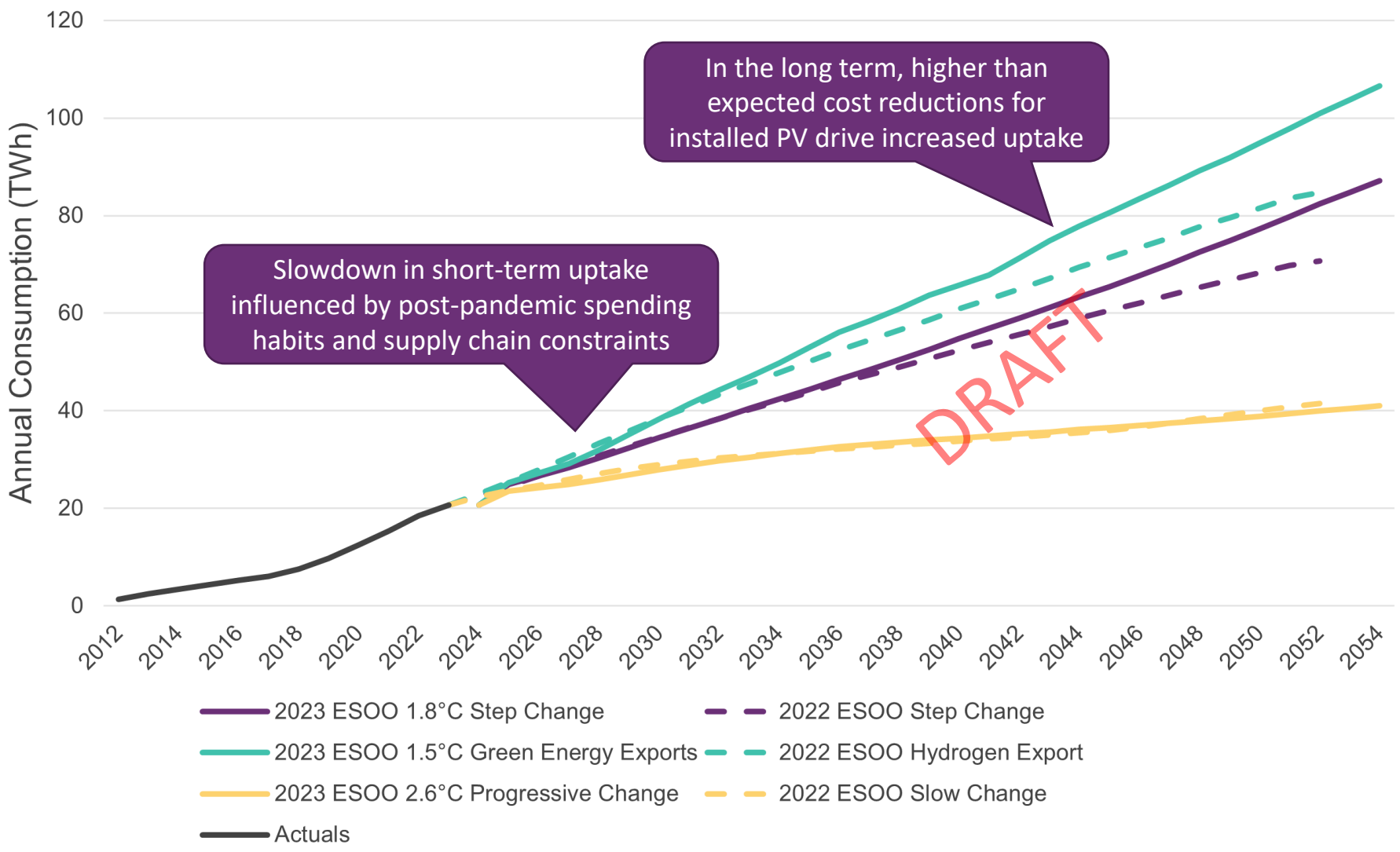
Liquefied natural gas (LNG) forecasts



Total underlying consumption (excluding hydrogen)

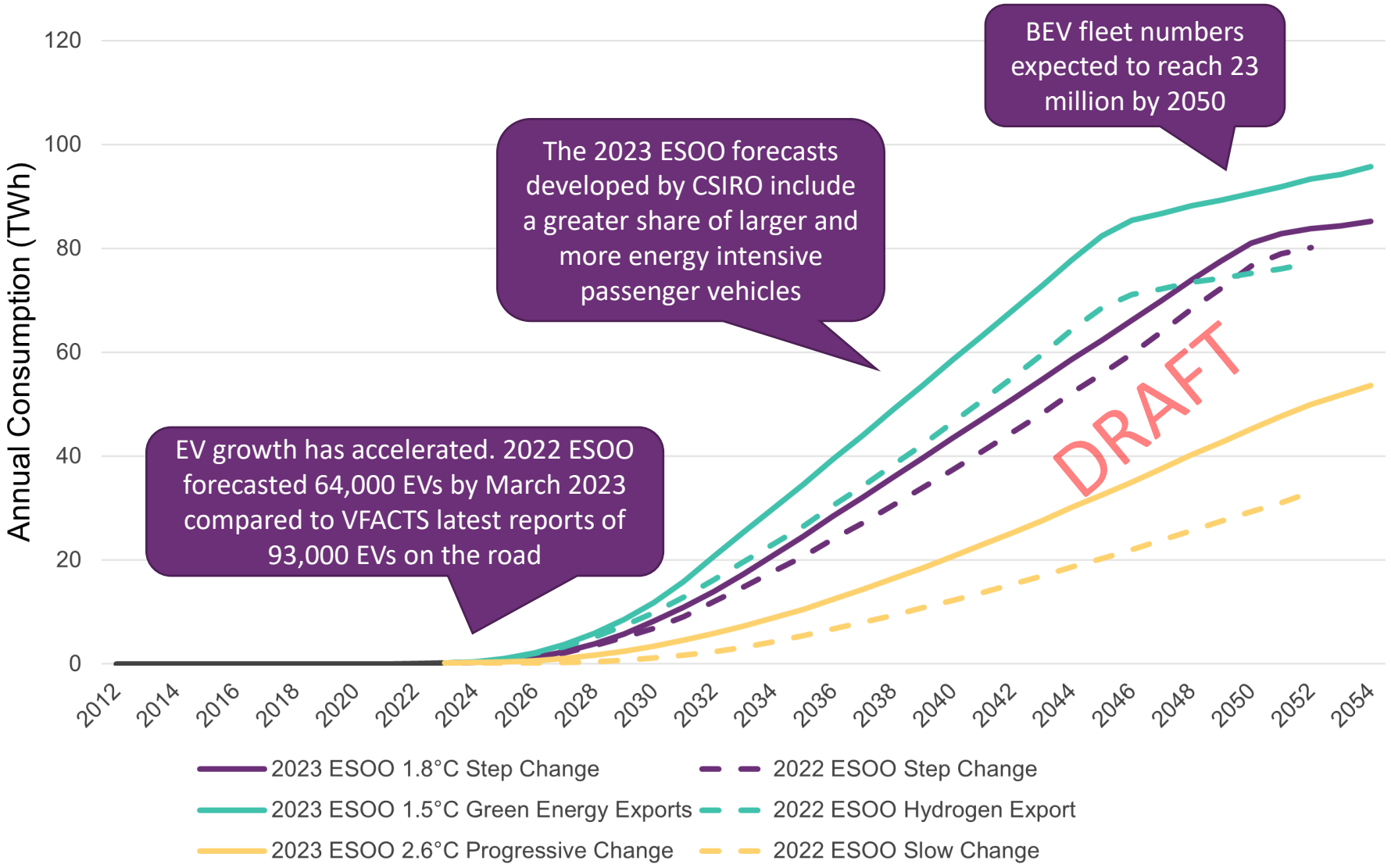


Distributed PV generation (rebased)*



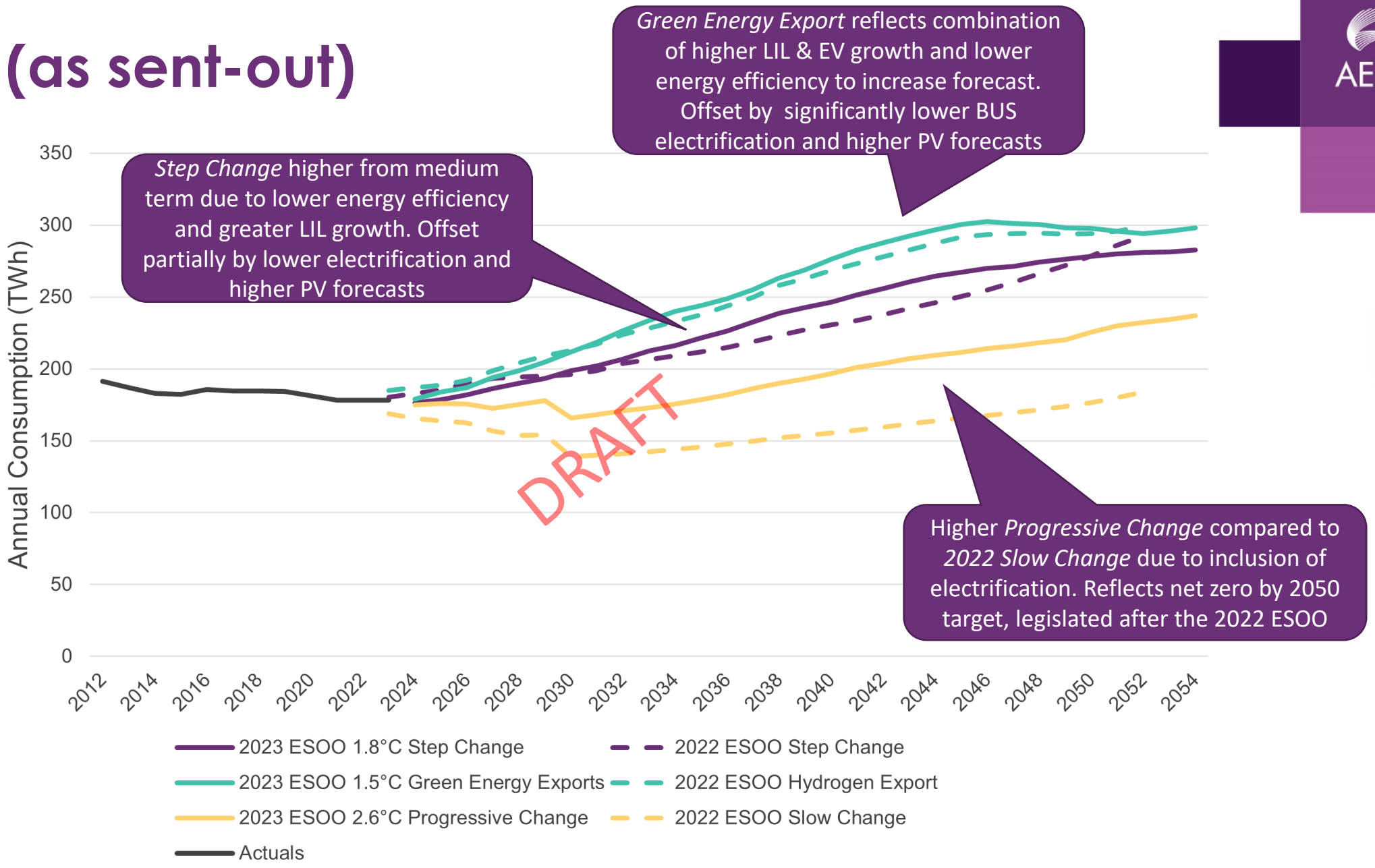
* Refer to Appendix, 'Model Inputs' for detail on the short-term capacity forecast

Total Electric Vehicle (EV) consumption (rebased)*

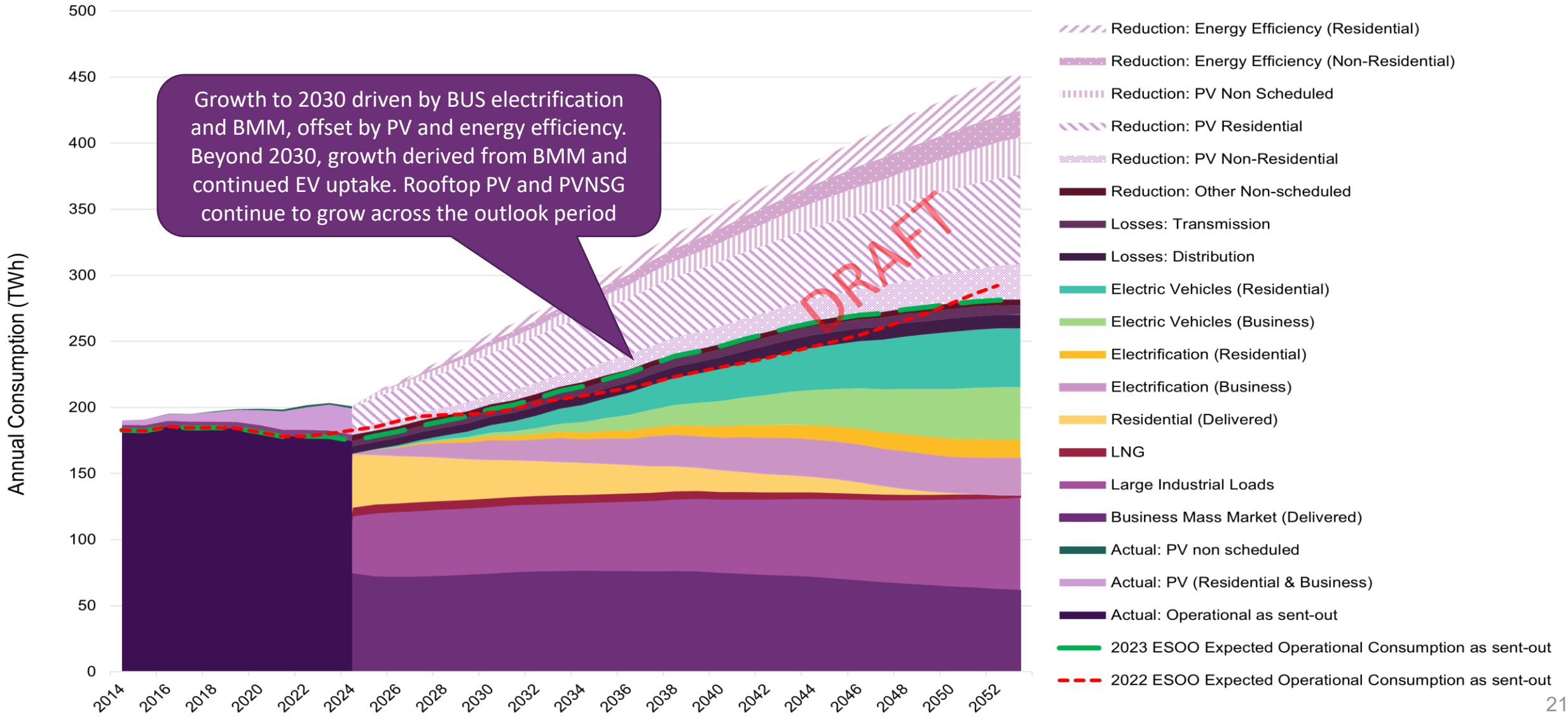


* Refer to Appendix, 'Model Inputs' for more detail

OPSO (as sent-out)



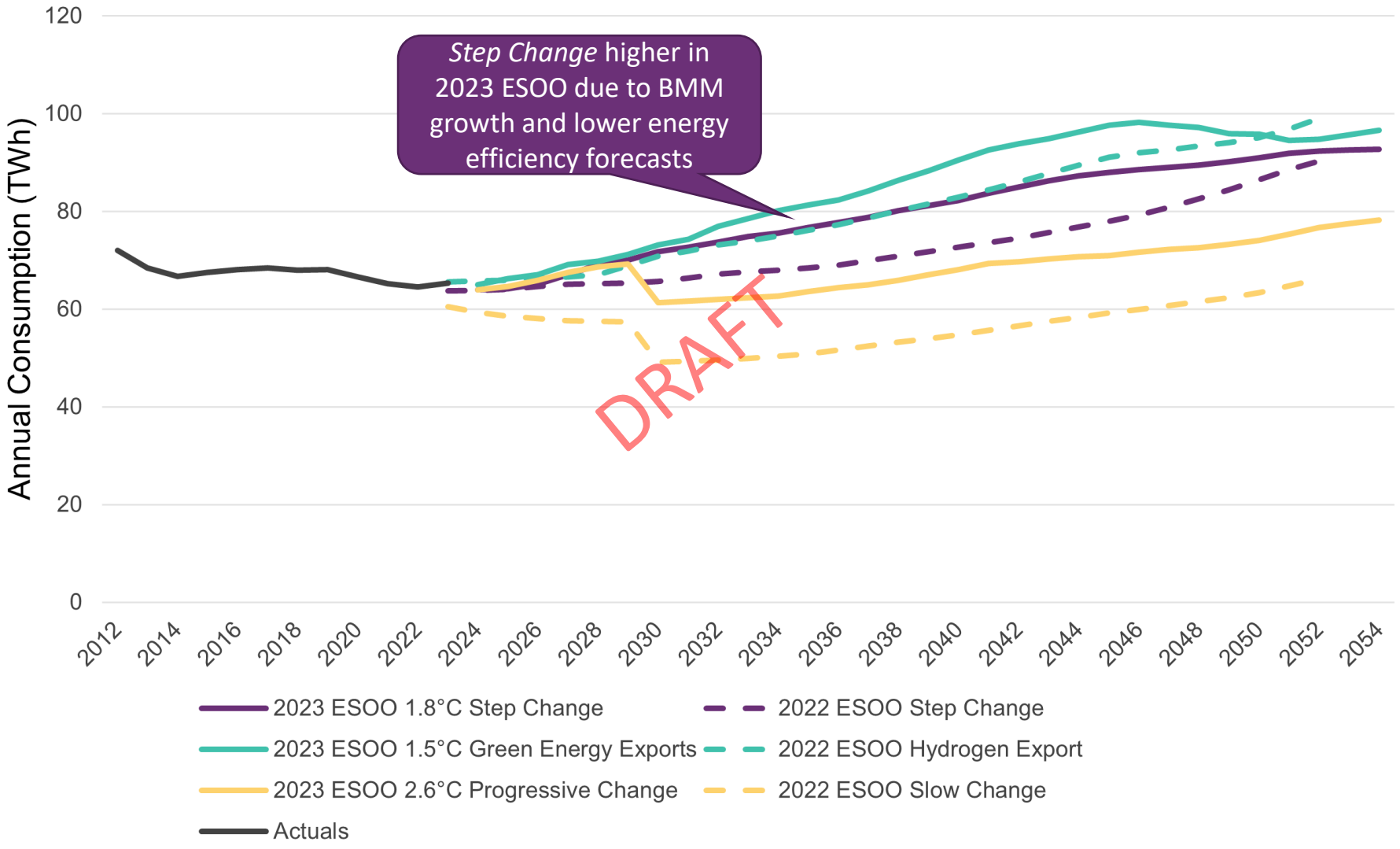
NEM forecast by component (Step Change)



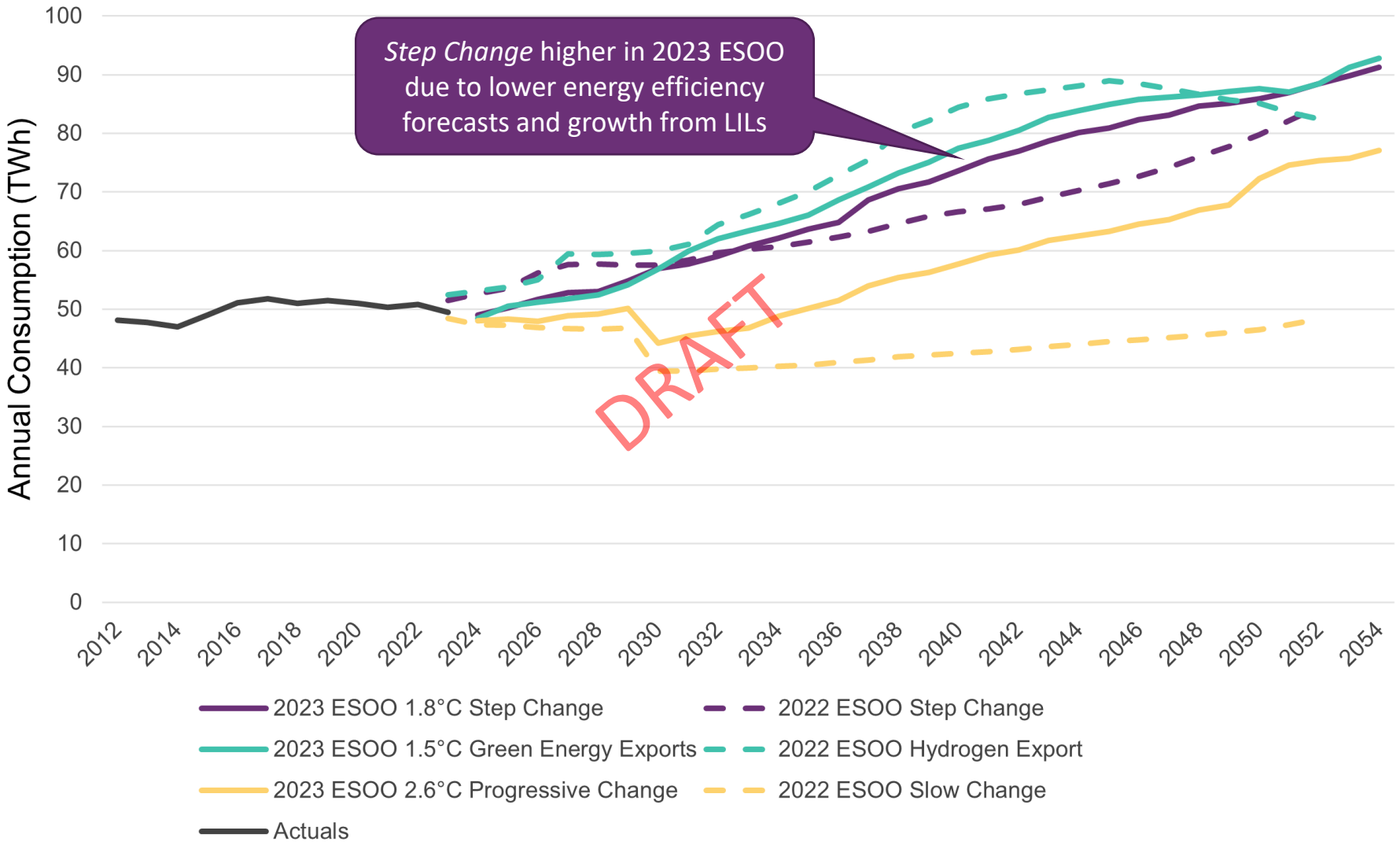
Appendix

Regional Operational consumption as sent-out (OPSO) forecasts

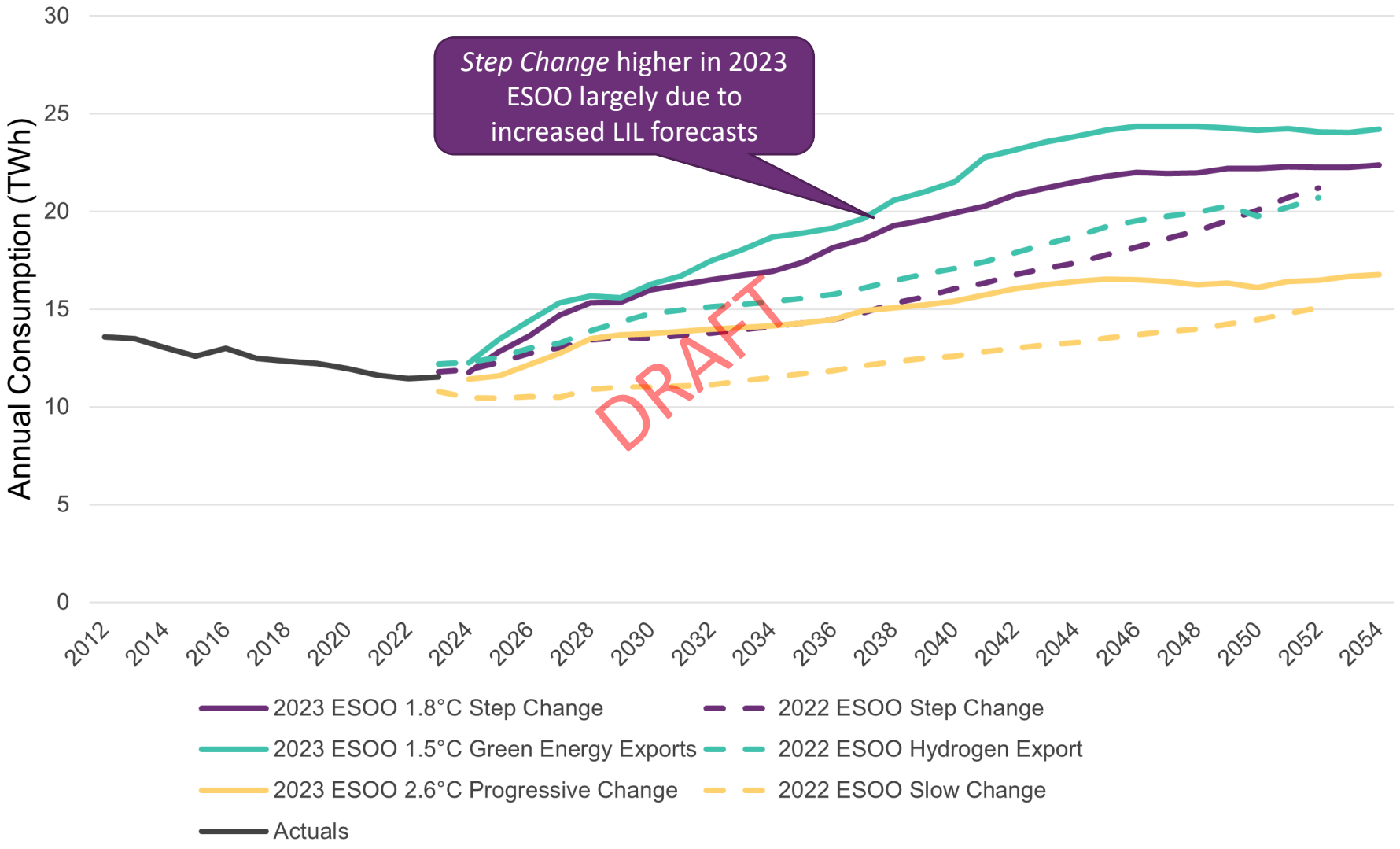
NSW OPSO


Step Change higher in 2023 ESOO due to BMM growth and lower energy efficiency forecasts
DRAFT
Annual Consumption (TWh)
120
100
80
60
40
20
0
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
2052
2054
2023 ESOO 1.8°C Step Change
2022 ESOO Step Change
2023 ESOO 1.5°C Green Energy Exports
2022 ESOO Hydrogen Export
2023 ESOO 2.6°C Progressive Change
2022 ESOO Slow Change
Actuals

QLD OPSO


Step Change higher in 2023 ESOO due to lower energy efficiency forecasts and growth from LILs
DRAFT
Annual Consumption (TWh)
100
90
80
70
60
50
40
30
20
10
0
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
2052
2054
2023 ESOO 1.8°C Step Change
2023 ESOO 1.5°C Green Energy Exports
2023 ESOO 2.6°C Progressive Change
Actuals
2022 ESOO Step Change
2022 ESOO Hydrogen Export
2022 ESOO Slow Change

SA OPSO


Step Change higher in 2023 ESOO largely due to increased LIL forecasts
DRAFT
Annual Consumption (TWh)
30
25
20
15
10
5
0
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
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2042
2044
2046
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2023 ESOO 1.8°C Step Change
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Actuals
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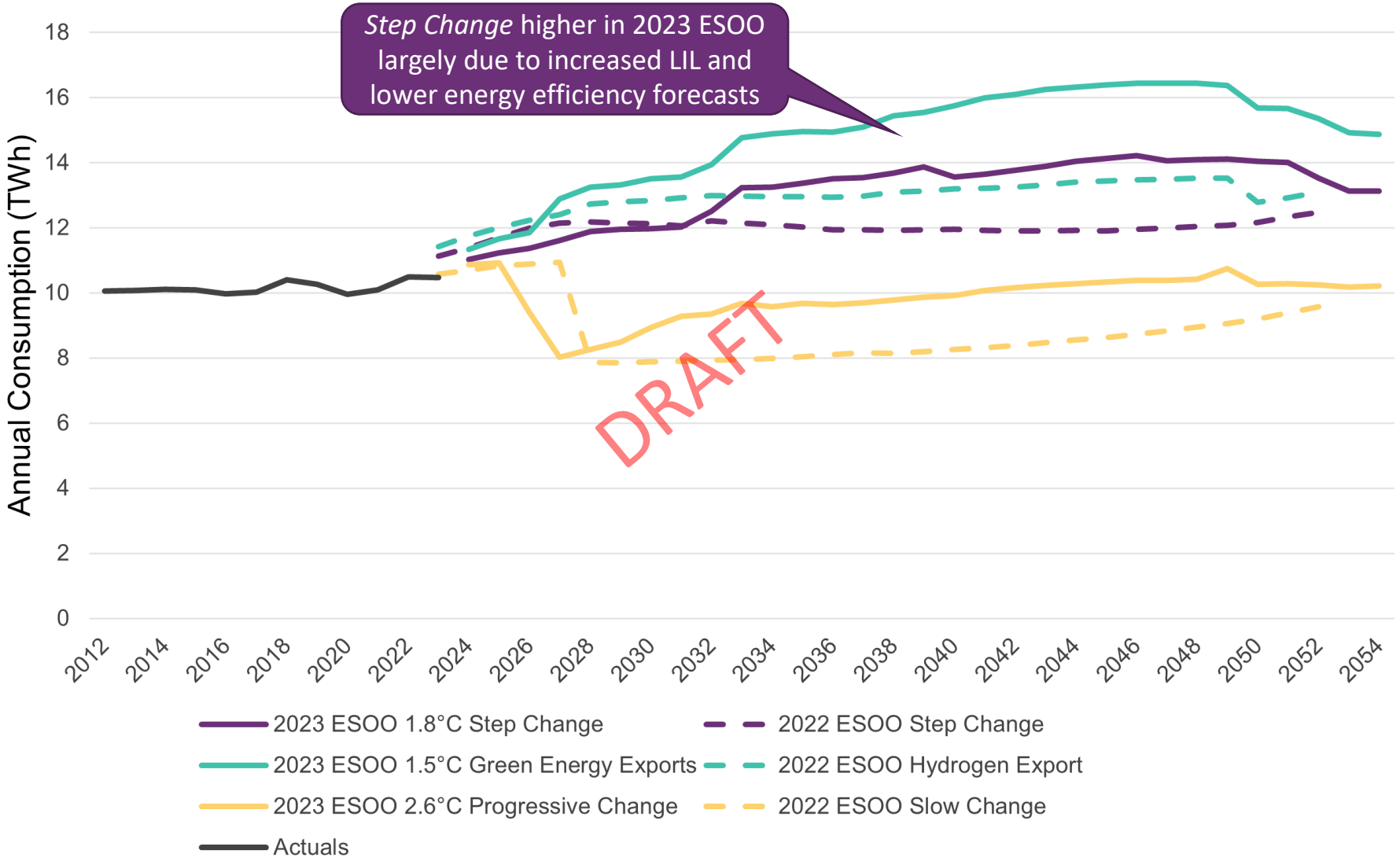
2022 ESOO Hydrogen Export
2022 ESOO Slow Change

TAS OPSO


Step Change higher in 2023 ESOO largely due to increased LIL and lower energy efficiency forecasts
DRAFT
Annual Consumption (TWh)
0
2
4
6
8
10
12
14
16
18
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
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2052
2054
2023 ESOO 1.8°C Step Change
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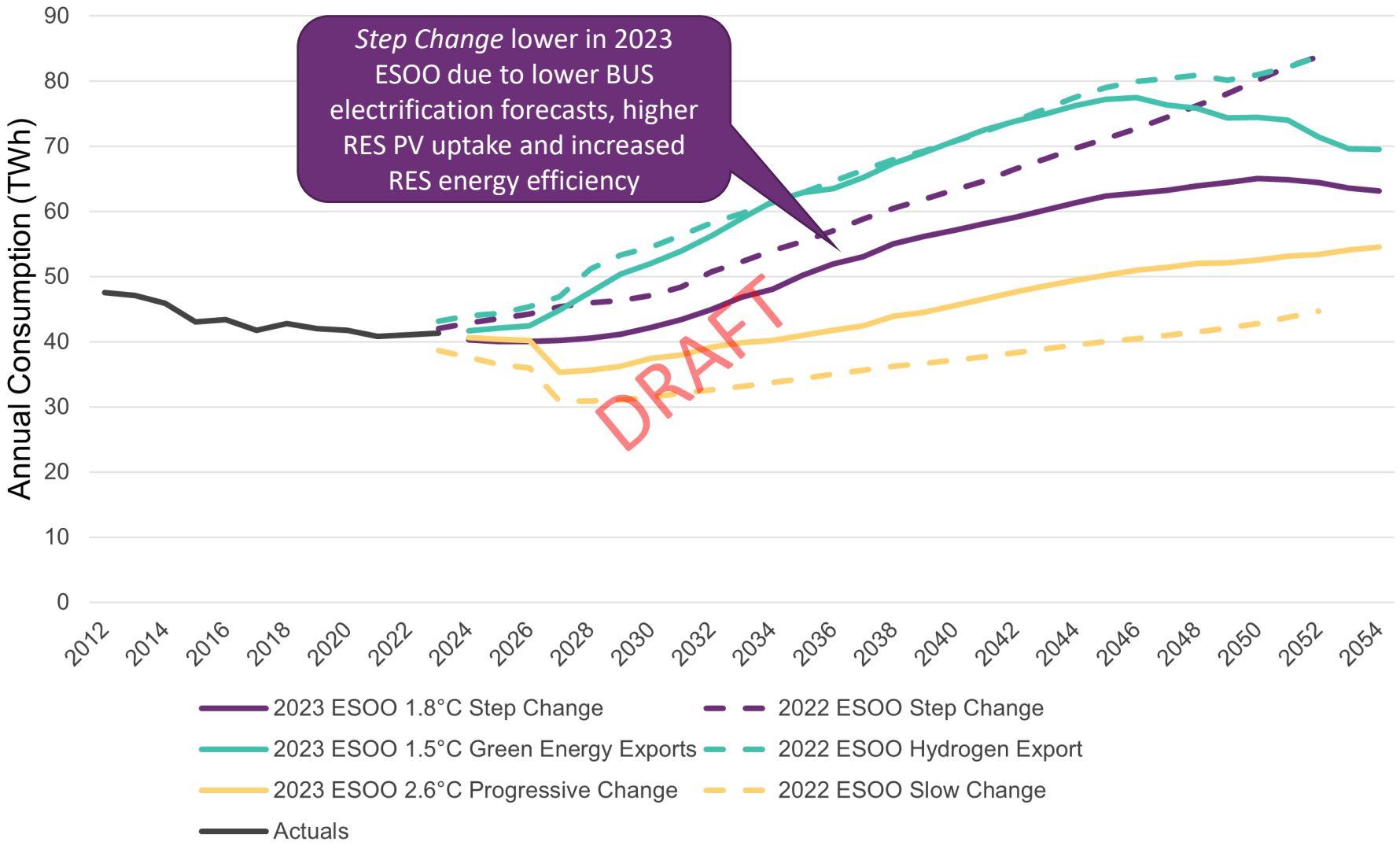
Actuals
2022 ESOO Step Change
2022 ESOO Hydrogen Export
2022 ESOO Slow Change

VIC OPSO


Step Change lower in 2023 ESOO due to lower BUS electrification forecasts, higher RES PV uptake and increased RES energy efficiency
DRAFT
Annual Consumption (TWh)
90
80
70
60
50
40
30
20
10
0
2012
2014
2016
2018
2020
2022
2024
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2023 ESOO 1.8°C Step Change
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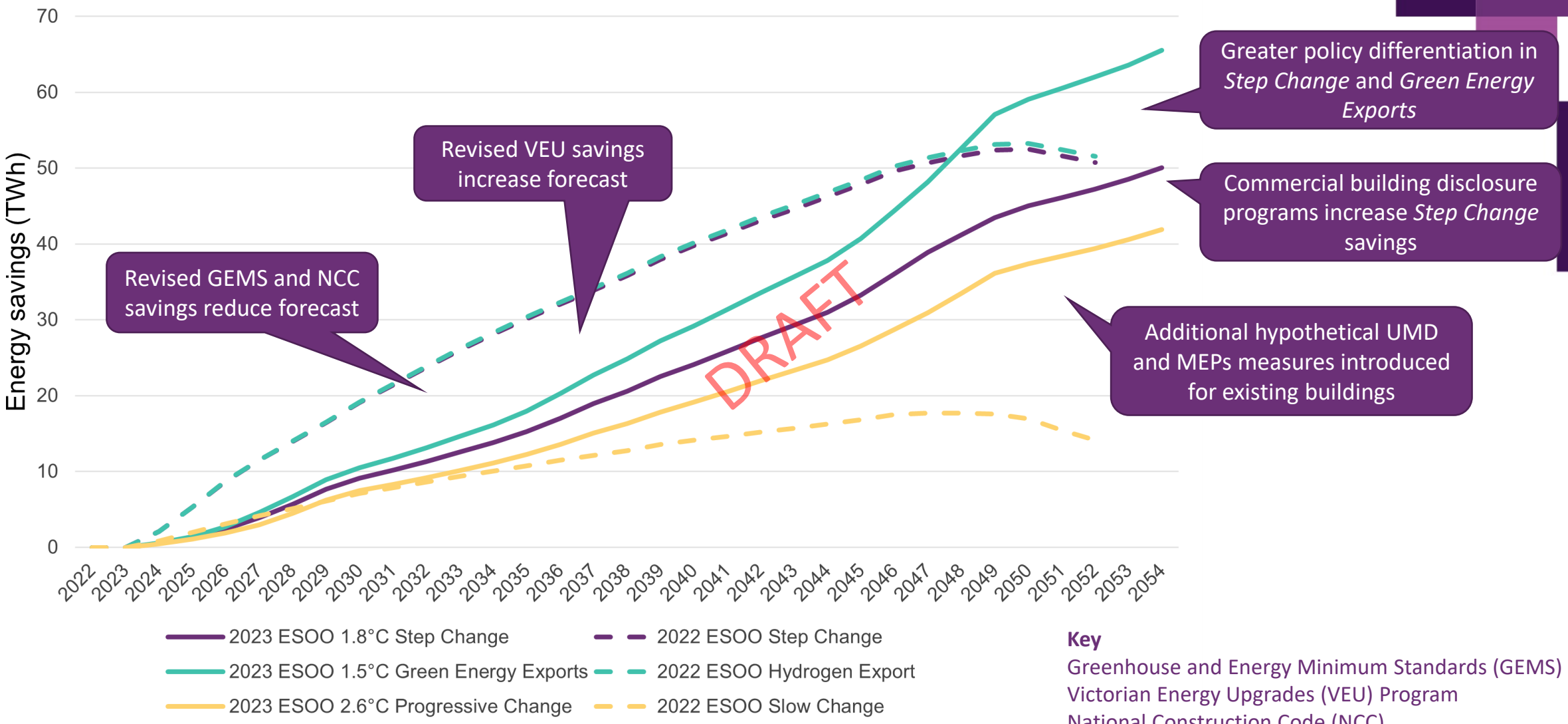
Actuals
2022 ESOO Step Change
2022 ESOO Hydrogen Export
2022 ESOO Slow Change

Appendix

Model Inputs

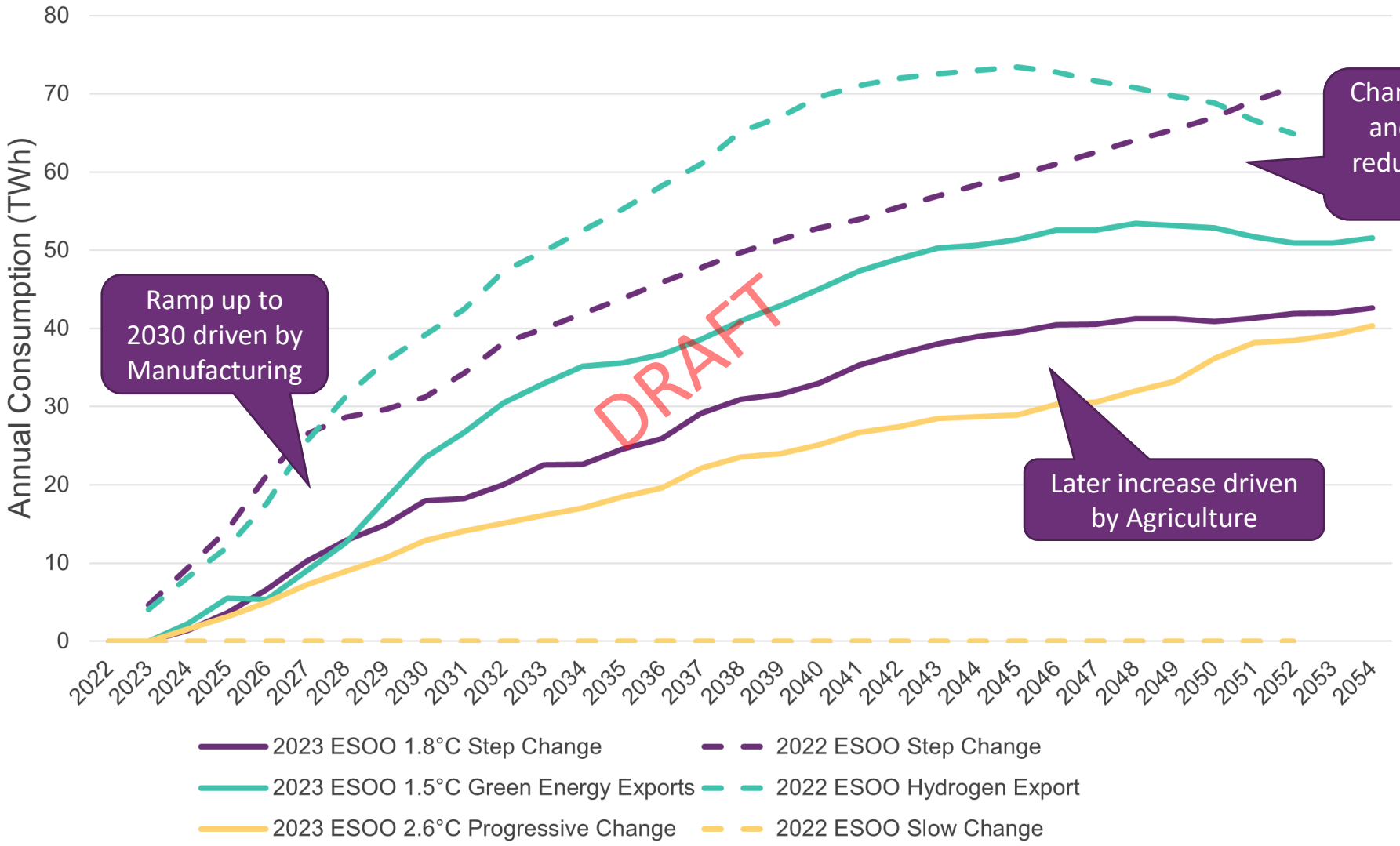
Total energy efficiency (EE) forecasts



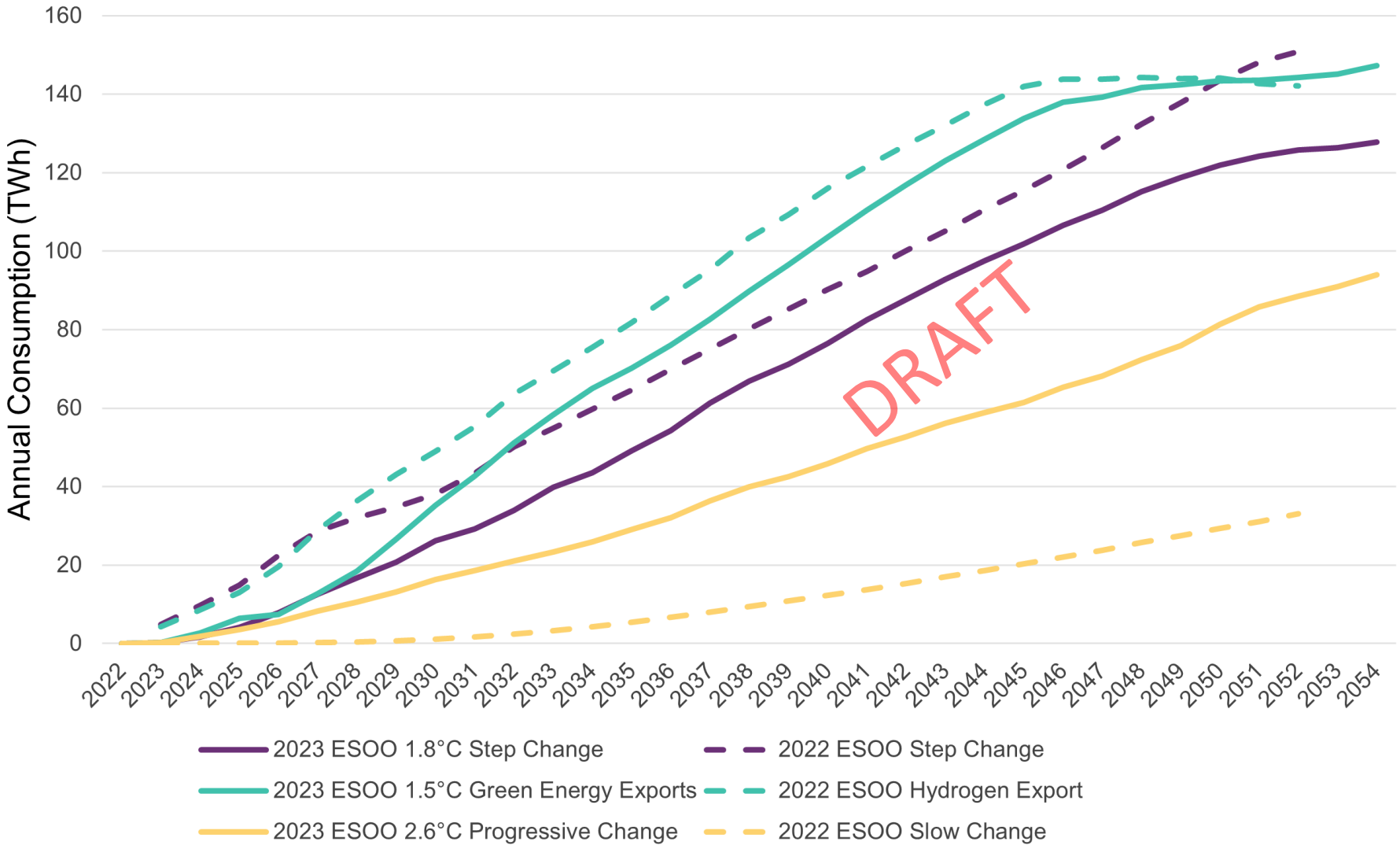
Key

Greenhouse and Energy Minimum Standards (GEMS)
Victorian Energy Upgrades (VEU) Program
National Construction Code (NCC)
Universal Mandatory Disclosure (UMD)
Minimum Energy Performance (MEPs)

Total electrification impact (exc. EV)

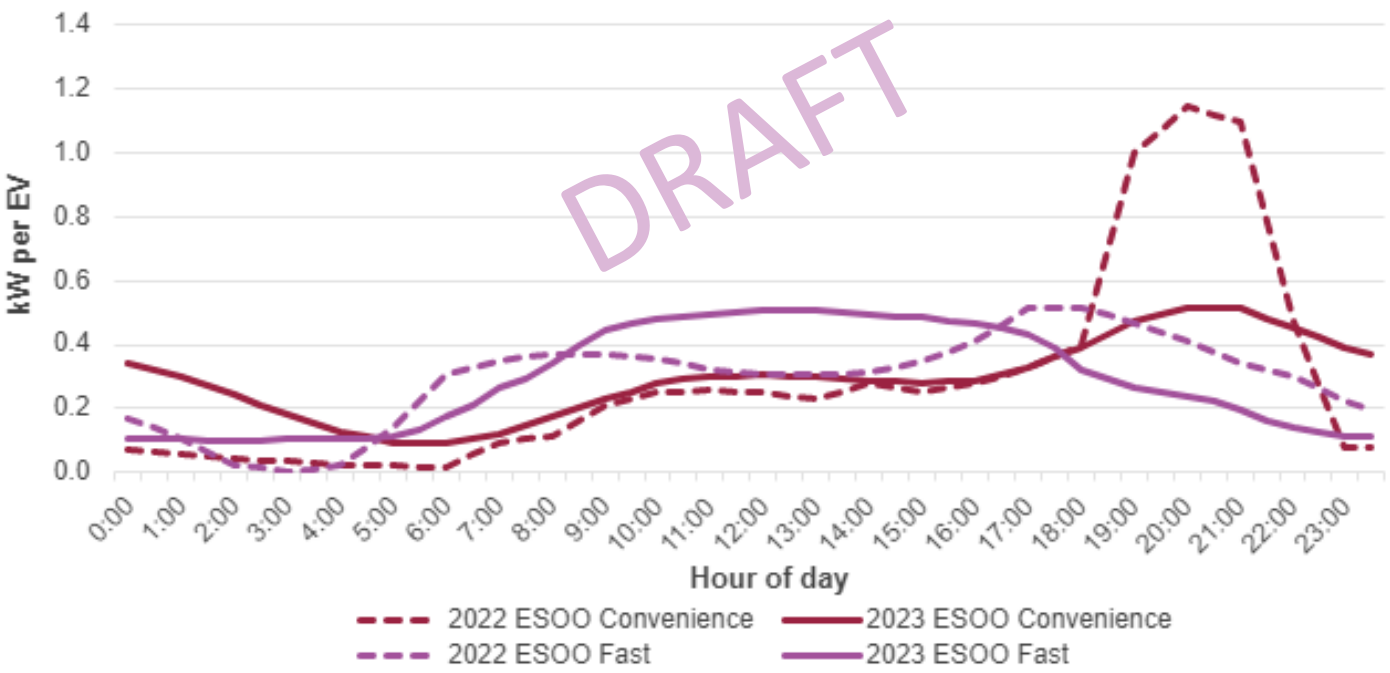


Total electrification impact (incl. EV)



EV charging profiles consistent with Draft 2023 IASR, updated from new data since 2022 ESOO

Example: Medium-sized residential EVs move to flatter charging profiles



Normalized after diversity EV charging profiles (medium-sized residential EVs in Victoria based on a typical January weekday, 2030, 1.8°C Step Change scenario)

Data sourced from publicly available reports: Energex and Ergon Energy Network's EV SmartCharge (Queensland) program, Origin Energy, ARENA, EA Technology (UK).

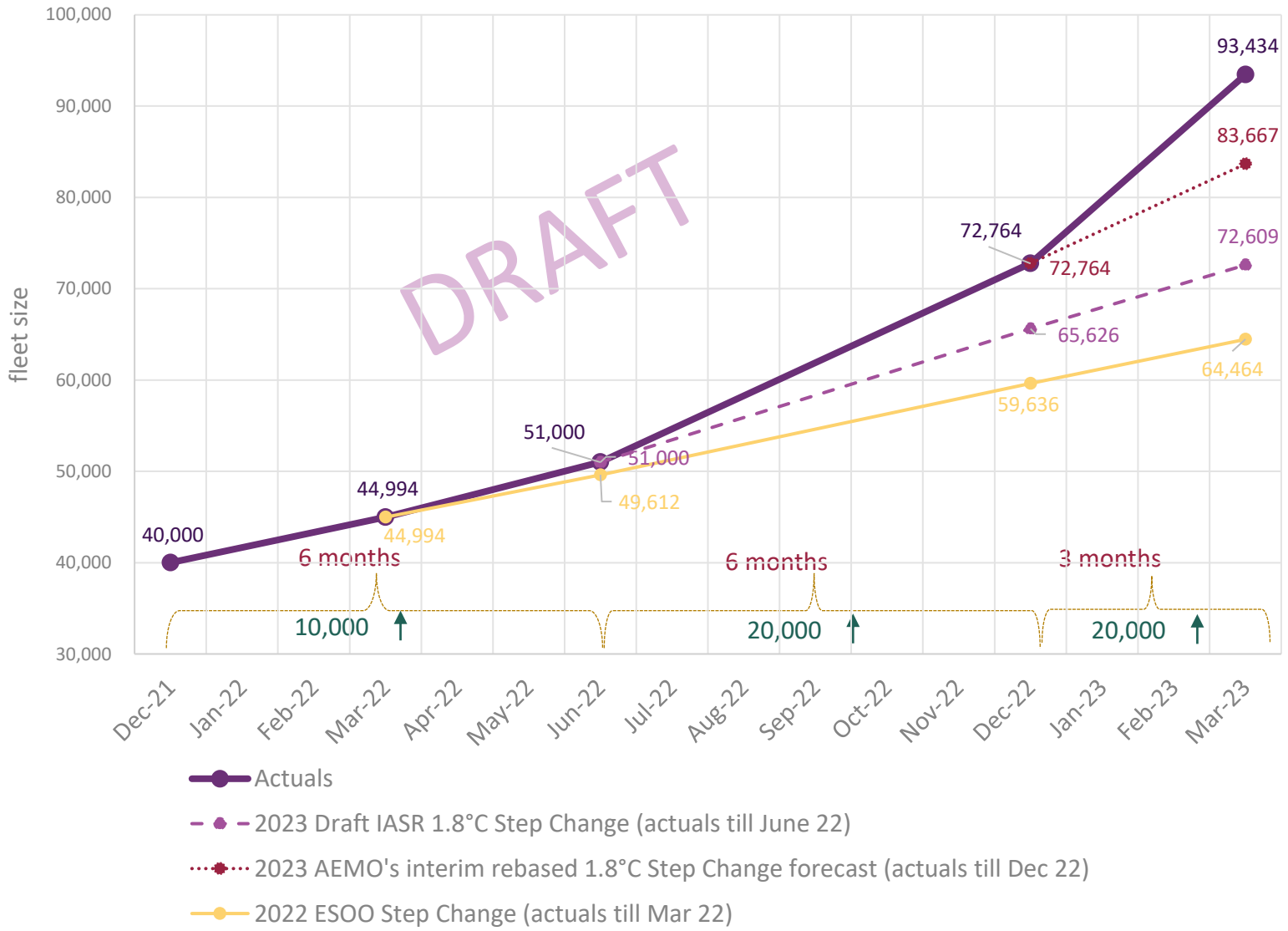
*** No change from 2023 Draft IASR**

Fast-charging: Traffic movements, which served as a proxy for public charging behavior, showed two peaks in 2021. In 2023, public charging behavior is based on a study of public fast charger meter data, which revealed a flatter peak over the day.

Convenience charging: A lower charging peak is assumed for 2023 as new trial data indicates dedicated high-power chargers are less common than previously believed.

*The above two changes affect all residential charging profiles

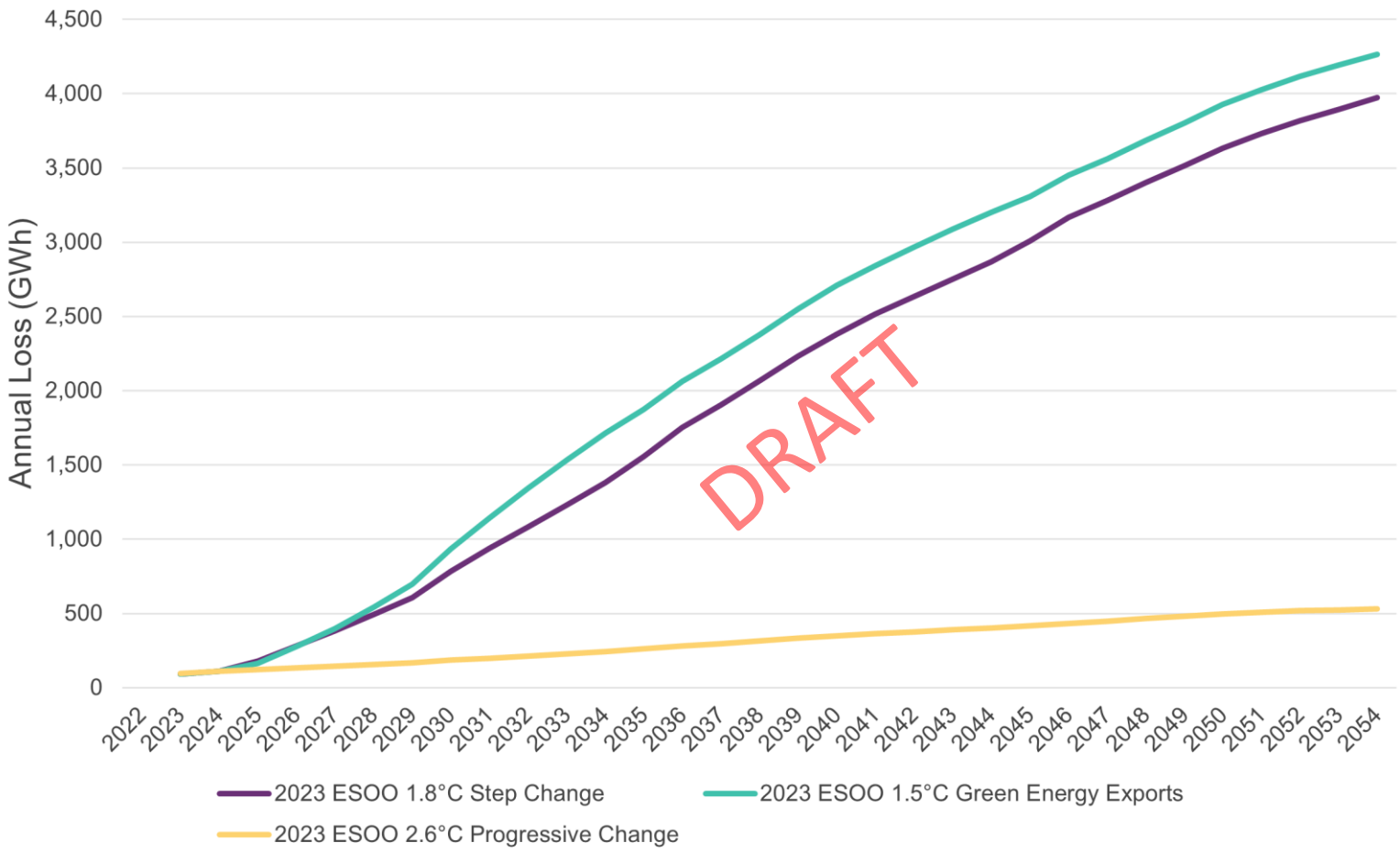
VFACTS actual sales versus ESOO 2022 & Draft IASR 2023 forecasts



EV fleet category	EV fleet size	Source
Dec 2021 actuals	40,000	CSIRO (EVC+Tesla estimated)
Jun 2022 actuals	51,000	CSIRO (VFACTS)
2023 Draft IASR 1.8°C Step Change	72,609	CSIRO
Dec 2022 actuals	72,764	EVC (from VFACTS)
2023 AEMO's interim rebased 1.8°C Step Change forecast	83,667	AEMO: rebased CSIRO forecast based on Dec 2022 actuals
Mar 2023 actuals	93,434	VFACTS

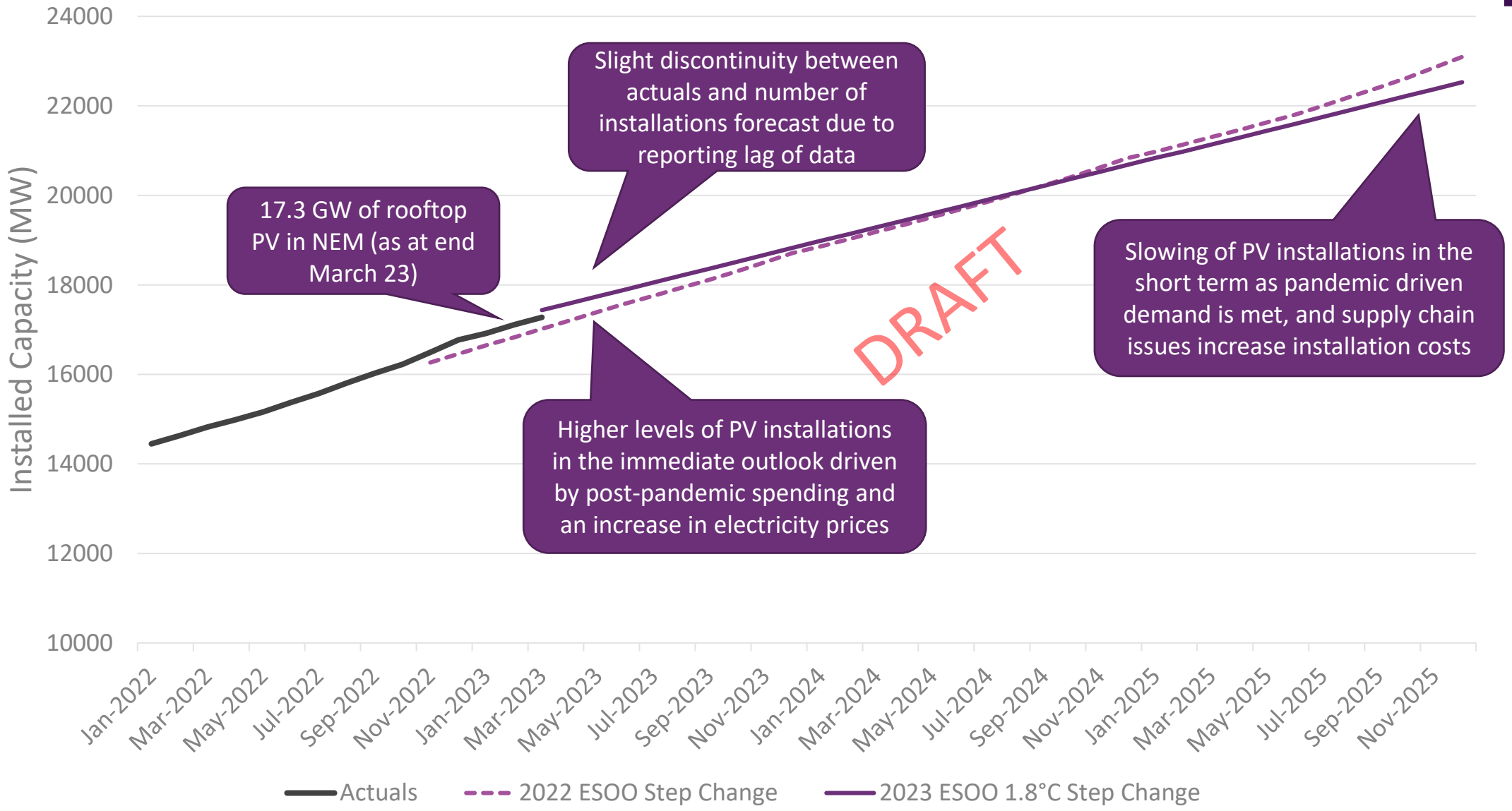
Accelerated EV uptake: Actual EV uptake increased by 10,000 in the first 6 months (Dec 21 – Jun 22), 20,000 in the next 6 months (Jun 22 – Dec 22) and then 20,000 in the next 3 months (Jan 23 – Mar 23)

Total battery losses

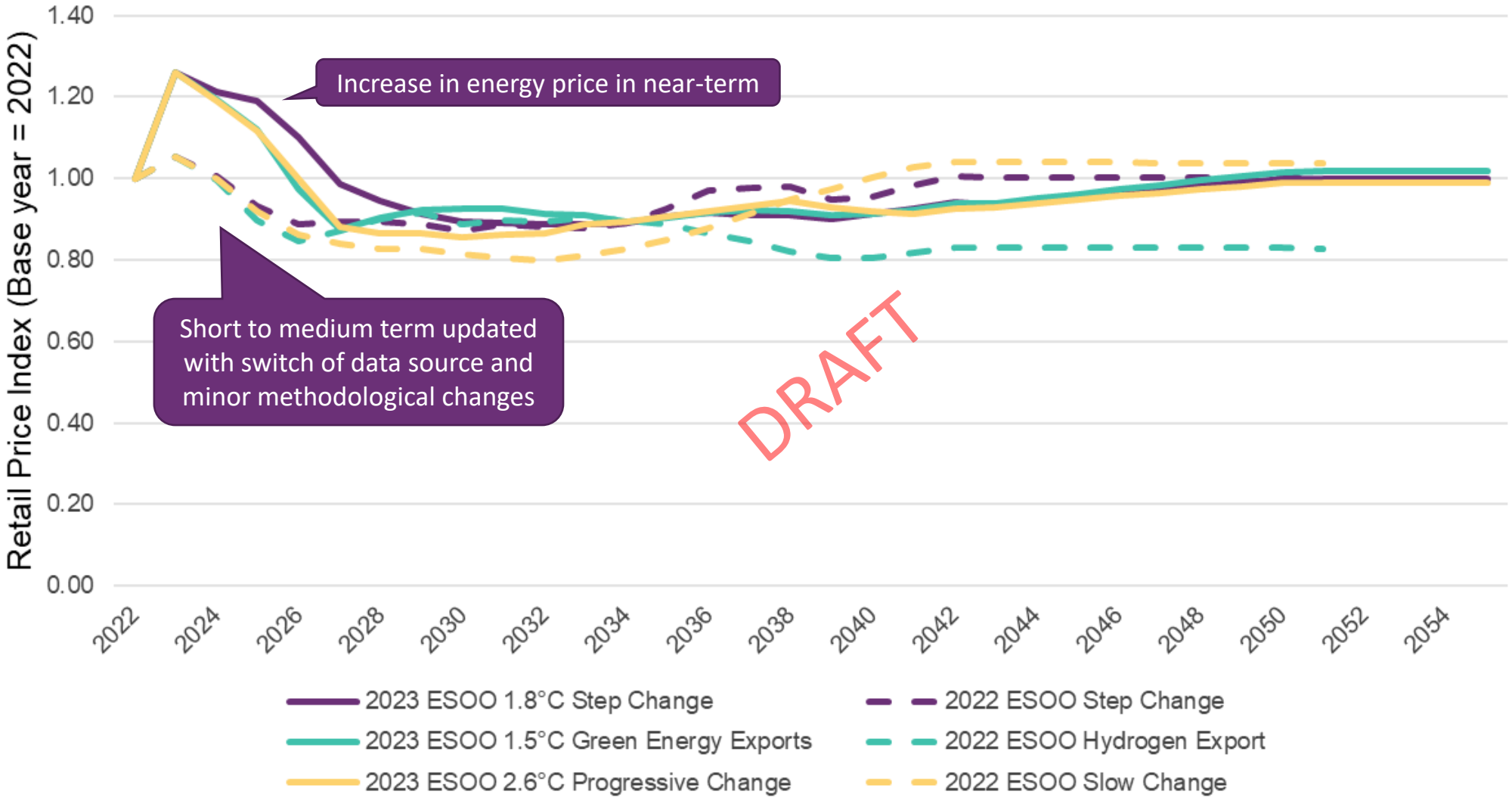


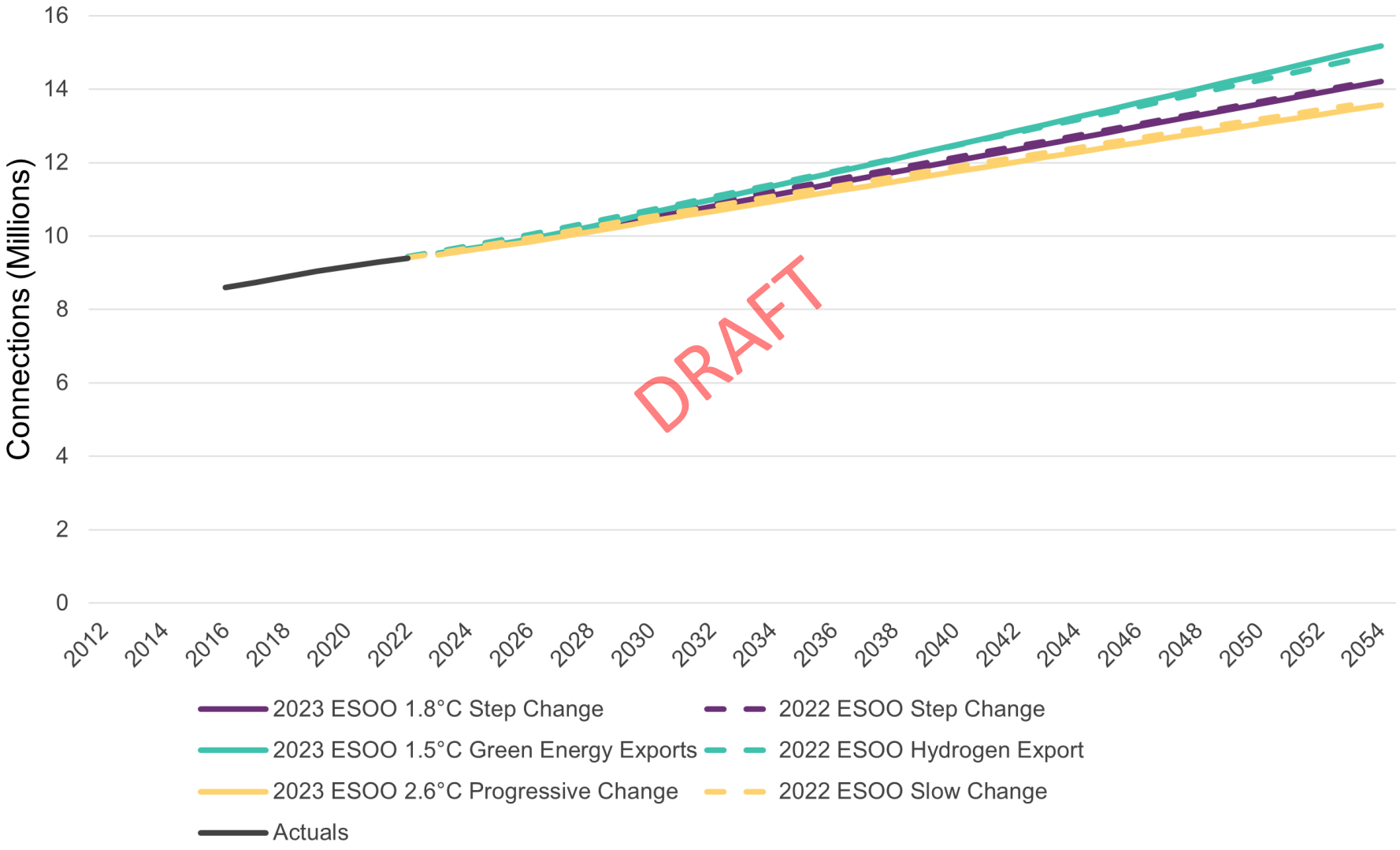
Battery losses were modelled independently of Residential and Business forecasts in the 2023 NEM ESOO. Losses are based on the assumption of 85% round-trip efficiency and a single full battery cycle per day.

NEM rooftop PV installed capacity (short term)



Retail Price Index - Residential



Draft price forecasts are being reviewed in light of the final decisions on the Default Market Offer and Victorian Default Offer

Connections - Residential