CER uptake forecasting

2025-2030 Regulatory Proposal

Supporting document 5.7.12

20 December 2023 – Version 1

[redacted]

SA Power Networks

Empowering South Australia

DER uptake forecasts
Final methodology report

Prepared for SA Power Networks

March 2023

Contents

A

Introduction

This section provides an overview of the:
- Market context
- Project context and objectives
- General approach for DER forecasts

A.1 Market context

Electricity systems around the world are evolving as we transition to an increasingly renewable and decarbonised future. Customers are leading a big part of this transformation, by increasingly embracing distributed energy resources (DER). This includes technologies such as rooftop solar photovoltaics (PV), behind-the-meter battery energy storage systems (ESS) and electric vehicles (EVs).

Australia's uptake of rooftop solar is amongst the highest in the world. South Australia is at the forefront of this transition, with one of the highest rates of rooftop solar per capita in Australia. Rooftop solar is now South Australia's largest generator[1]. The use of solar and other DER within the state is expected to continue rising.

An increasing share of renewables will need to be integrated into South Australia's generation mix, in order to meet the state's goal of 100 per cent net renewable energy by 2030 and zero emissions by 2050. Renewables, including DER alongside large-scale renewable energy projects like solar and wind, already account for over 60 per cent of South Australia's electricity generation mix. As a result, South Australia has one of the highest rates of renewable energy generation globally[2].

SA Power Networks is a key enabler of this transition and has set its own target to double the amount of solar on the distribution network between 2020 and 2025[3]. To meet this goal, SA Power Networks is helping to connect more solar and enable new technologies like battery energy storage and virtual power plants, or VPPs.

SA Power Networks

SA Power Networks is the sole electricity distributor in South Australia (SA). In this role, SA Power Networks builds, operates and maintains the electricity distribution network across South Australia, delivering power to around 900,000 homes and businesses.

SA Power Networks' role is changing, as the electricity system continues to evolve into an increasingly decentralised, two-way energy system.

Sources: [1] SA Power Networks, *Distributed Energy Transition Roadmap 2020-2025.* N.d., https://www.sapowernetworks.com.au/public/download.jsp?id=319084. [2] Government of South Australia, *Renewable Energy.* September 2022, https://www.safa.sa.gov.au/environmental-s-governance/energy. [3] SA Power Networks, *Future energy.* September 2022, https://www.sapowernetworks.com.au/future-energy/.

A.2 Project context and objectives

Context

As the sole electricity distribution network in South Australia, SA Power Networks is responsible for a range of forecasting activities. Forecasting demand, customer numbers and generation capacity is a critical exercise for any distribution network service provider (DNSP). Forecasting underpins the determination of the business' revenues, the design of its tariffs as well as its network planning activities.

Within this context, planning for the uptake of DER is increasingly important. Distributed energy resources are changing the way customers use electricity, with the rise in DER having a significant influence on demand and energy growth.

SA Power Networks engaged Enea Consulting (Enea) to develop postcode level DER forecasts that align with the input assumptions and top-down forecasts in the Australian Energy Market Operator (AEMO)'s growth scenarios and forecasts for rooftop solar, ESS, VPPs and EVs. DER forecasts are an important input for SA Power Networks' network investment plans and expenditure forecasts, in preparation for its 2025-2030 regulatory proposal. The uptake of other emerging, new technologies of particular interest, such as electric hot water systems and smart meters, is also explored as part of this engagement.

Objectives

SA Power Networks engaged Enea to deliver a postcode level DER forecast for the financial years ending 2023 through to 2050 period in South Australia. The forecasts will support SA Power Networks' planning and regulatory process.

Specifically, Enea delivered forecasts of annual rooftop solar PV (for 0-100 kW systems) and behind-the-meter battery energy storage capacity, electric vehicle numbers, VPP enrolment, smart metering, electric hot water penetration and AS/NZS 4777.2:2020 compliant inverter numbers[1]. Where available, the analysis used state level forecasts from the AEMO's 2022 Integrated System Plan (ISP)[2] as an input, to deliver forecasts:

- At the state level and at the postcode level,
- For residential and commercial customers, and
- Aligned to three AEMO scenarios – Slow Change, Step Change and Strong Electrification Sensitivity.

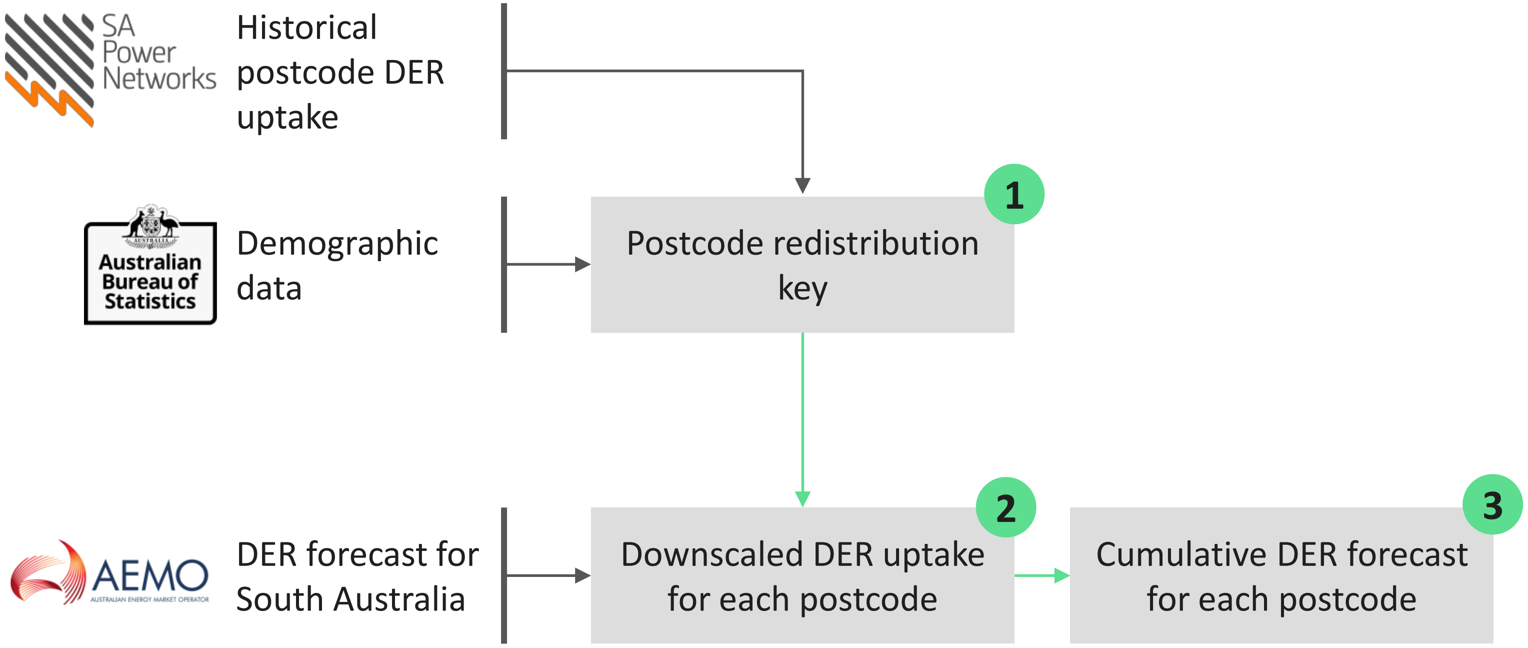
This report details the inputs, assumptions and methodologies for forecasting and is intended to accompany the results. Section B of the document covers the DER uptake forecasts and assessment of AEMO's approach, while Section C focuses on the other technologies of interest to SA Power Networks.

Notes and sources: [1] The AS/NZS 4777.2:2020 standard was first introduced in 2020. As such, there is limited historical data available with which to develop a qualitative model. [2] Australian Energy Market Operator, *2022 Integrated System Plan.* June 2022, https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp.

Disclaimer: As part of this engagement, Enea Consulting has developed a customised tool that downscales AEMO's state level DER forecasts to the postcode (spatial) level, on behalf of SA Power Networks. The outputs of this tool are most relevant in the current year (2022), based on the inputs, assumptions, scenarios and approach that AEMO uses in the ISP published during this same year. Should AEMO make any changes to the inputs, assumptions, scenarios or approach used in future years, in a way that materially changes the process, that is outside the remit of the tool that has been developed.

A.3 General approach for DER forecasts[1]

Enea's forecasts use demographic and historical data to inform the postcode redistribution of AEMO's state level forecasts



Notes: [1] This diagram is intended to provide a high-level overview of the general approach taken to downscale AEMO's state level forecasts for South Australia to the postcode level. A detailed approach is outlined for each technology (solar PV, energy storage systems, virtual power plants and electric vehicles) and component (capacity, energy (ESS only) and approvals for solar PV and ESS, the number of electric vehicles, and the number of aggregated ESS participating in VPPs) within this document. Note that historical DER uptake data is not available for electric vehicles. As a result, the postcode redistribution key is computed using demographic data only. [2] A sigmoid function is a mathematical function with a characteristic *S* shaped curve, or sigmoid curve. The sigmoid function is defined by three parameters – saturation, steepness and inflexion. Sigmoid curves are commonly used to model processes that exhibit an initially slow process that accelerates in the medium term and then plateaus towards an upper bound, such as the penetration of technology on the market. In the context of this project, the sigmoid curve is used to represent the penetration of DER on the SA Power Networks network.

Overview

A consumer technology adoption approach underpins the postcode level forecasts for DER uptake. This approach uses a sigmoid function[2] and considers historical data, where available, to predict postcode level installs and compute the redistribution key. The redistribution key is used to downscale each of AEMO's DER forecasts for South Australia.

Where sufficient historical data is available, at the required granularity (number of data points, timeseries), a sigmoid curve can be optimised for each customer category – residential and commercial. In the absence of sufficient historical data (for example, in the case of EVs), technology adoption is modelled using publicly available demographic data sourced from the Australian Bureau of Statistics (ABS).

Due to the varied nature of the other technologies considered as part of this project and limited availability of AEMO forecasts, a tailored approach is taken for each individual technology.

Contents

B.1

Scenario settings

Scenarios are used in forecasting exercises to capture a range of possible futures. This section presents the set of AEMO scenarios selected for consideration and the underlying scenario settings.

1.1 AEMO scenarios selected for forecasting

Three AEMO scenarios were selected for the DER forecasts, in consultation with SA Power Networks

DER uptake scenario[1]	Slow Change	Step Change	Strong Electrification
Economic growth & population outlook	Low	Moderate	High
Distributed PV	Moderate, but elevated in the short term	High	High
Battery storage installed capacity	Low	High	High
Battery storage aggregation	Low	High	High
Battery EV uptake	Low	High	High
Decarbonisation target	26-28% reduction by 2030 No explicit target beyond 2030	Net zero before 2050, exceeding 26-28% reduction by 2030 Pace of decarbonisation consistent with limiting temperature rise to 2 degrees, in line with global activities	Net zero by early 2040s, exceeding 26-28% reduction by 2030 Pace of decarbonisation consistent with limiting temperature rise to 1.5 degrees, in line with global activities

Sources: [1] Australian Energy Market Operator, *2021 Inputs, Assumptions and Scenarios Report.* July 2021, https://aemo.com.au/-/media/files/major-publications/isp/2021/2021-inputs-assumptions-and-scenarios-report.pdf?la=en. [2] Australian Energy Market Operator, *2022 Integrated System Plan.* June 2022, https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp.

Five AEMO scenarios are presented in the 2022 ISP[2], of which three are considered in this report:

- **Slow Change** challenging economic environment
- **Step Change** rapid consumer-led transformation of the energy sector and coordinated economy-wide action
- **Strong Electrification sensitivity** assumes the same emission reduction objectives as Hydrogen Superpower, but with limited hydrogen uptake, and stronger and faster electrification of transport

Other AEMO scenarios (not considered):

- **Progressive Change** pursuing an economy-wide net zero emissions 2050 target progressively, ratcheting up emissions reduction goals over time
- **Hydrogen Superpower** strong global action and technology breakthroughs

B.2

Data inputs

This section outlines the key data inputs and assumptions used by Enea, to downscale AEMO's DER forecasts. Enea sought to use publicly available inputs to ensure that the model could be continuously maintained.

2.1 AEMO scenarios at the state level

The Slow Change, Step Change, and Strong Electrification Sensitivity scenario forecasts are used for solar PV, ESS and electric vehicles

Rooftop solar PV, 0-100 kW

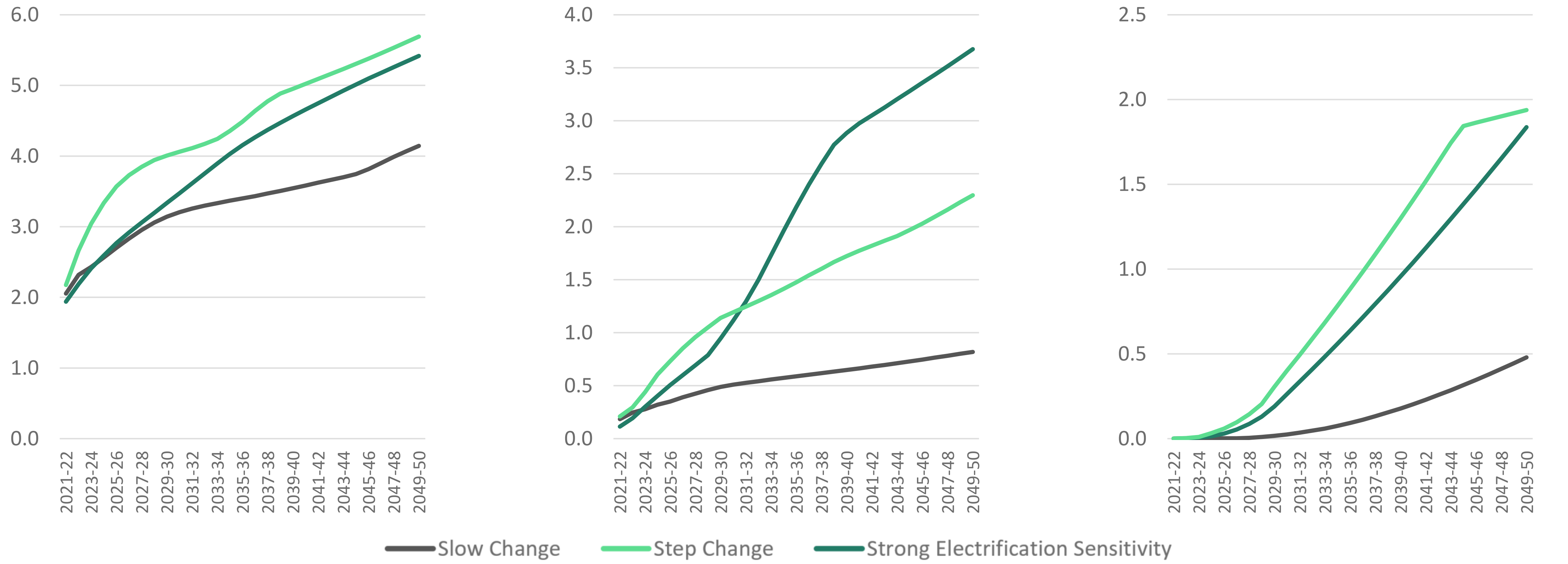
Cumulative capacity (GW)

Energy storage systems[1]

Cumulative capacity (GW)

Battery and plug-in electric vehicles[2]

Number of vehicles (millions)



Notes: [1] In the context of this report, energy storage systems refer to small-scale, behind-the-meter battery systems. [2] EVs refers to battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) collectively.

2.2 External data inputs

Technology	Source	Dataset used
Rooftop solar PV	Australian Energy Market Operator (AEMO)[1]	• Rooftop PV, systems between 0-100 kW (Capacity, MW)
Rooftop solar PV Energy storage systems	Australian Bureau of Statistics (ABS)[2]	• Tenure Type (home ownership) • Dwelling Structure (dwelling type)
Energy storage systems	AEMO[1]	• Battery power (MW) of Embedded battery installations by NEM region • Storage capacity (MWh) of Embedded battery installations by NEM region
Virtual power plants (VPPs)	AEMO[1]	• Aggregated embedded energy storages (small-scale batteries, MW)
Electric vehicles	AEMO[1]	• Aggregated BEV and PHEV (Uptake, Number of vehicles)
	ABS[2]	• Tenure Type (home ownership) • Dwelling Structure (dwelling type) • Number of Persons Usually Resident in Dwelling • Number of Motor Vehicles (car ownership) • Total Household Income (weekly) • Age • Education

Sources: [1] Australian Energy Market Operator, *2022 Inputs and Assumptions Workbook*, June 2022. [2] Australian Bureau of Statistics, *Census 2016*, 2016. Data is downloaded using the TableBuilder tool provided by the Australian Bureau of Statistics (ABS), https://tablebuilder.abs.gov.au/webapi/jsf/tableView/tableView.xhtml. ABS data from the 2016 Census is used as the 2021 Census postcode level datasets were not yet publicly available at the time of developing the forecasts presented in this report.

B.3

Methodology and assumptions

This section provides an overview of the approach for downscaling AEMO's DER uptake forecasts and the specific steps taken for each technology – rooftop solar PV, battery energy storage, VPPs and electric vehicles.

[redacted]

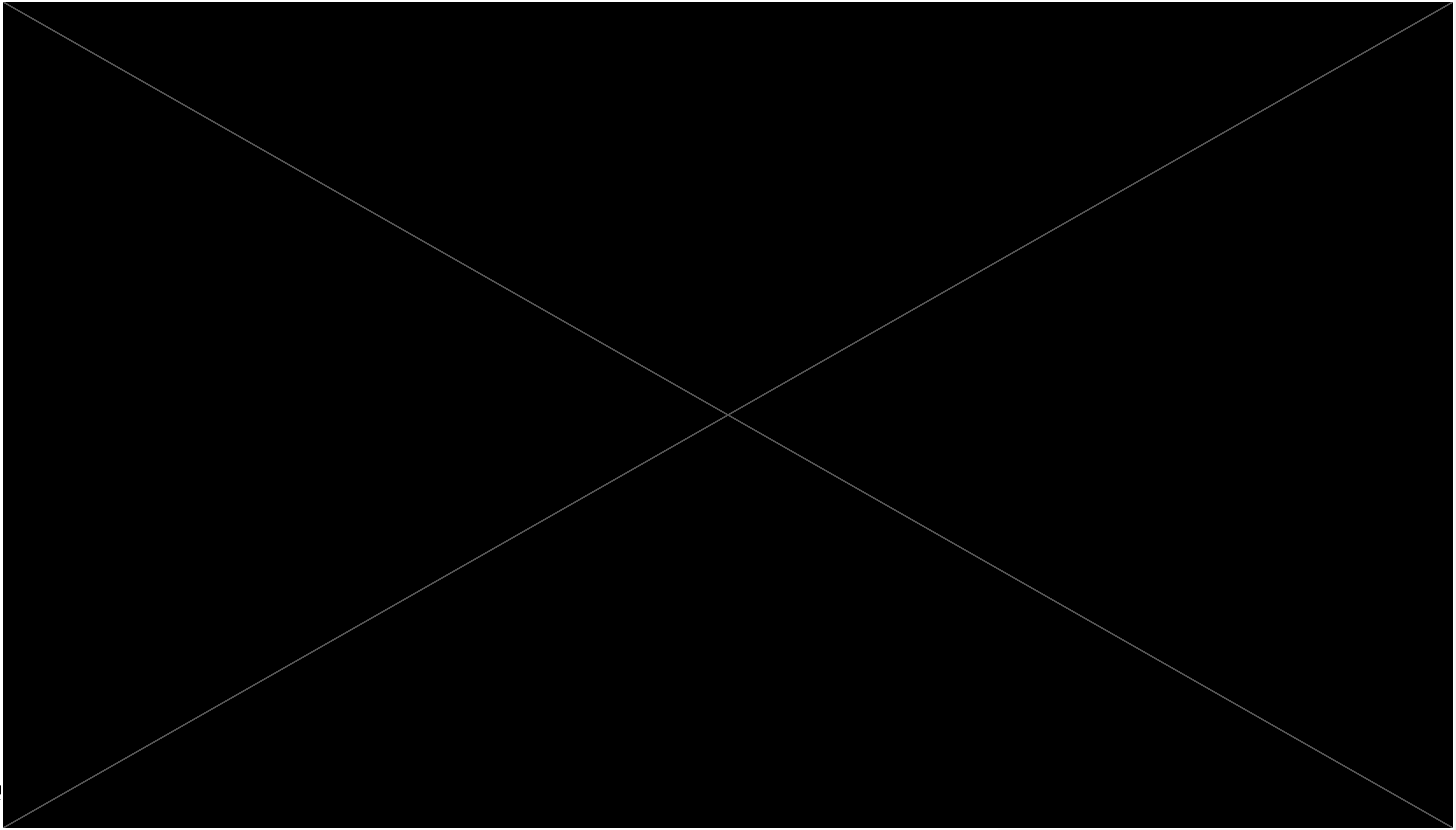
Methodology and assumptions

Methodology and assumptions

[redacted]

[redacted]

Methodology and assumptions



Methodology and assumptions

[redacted]

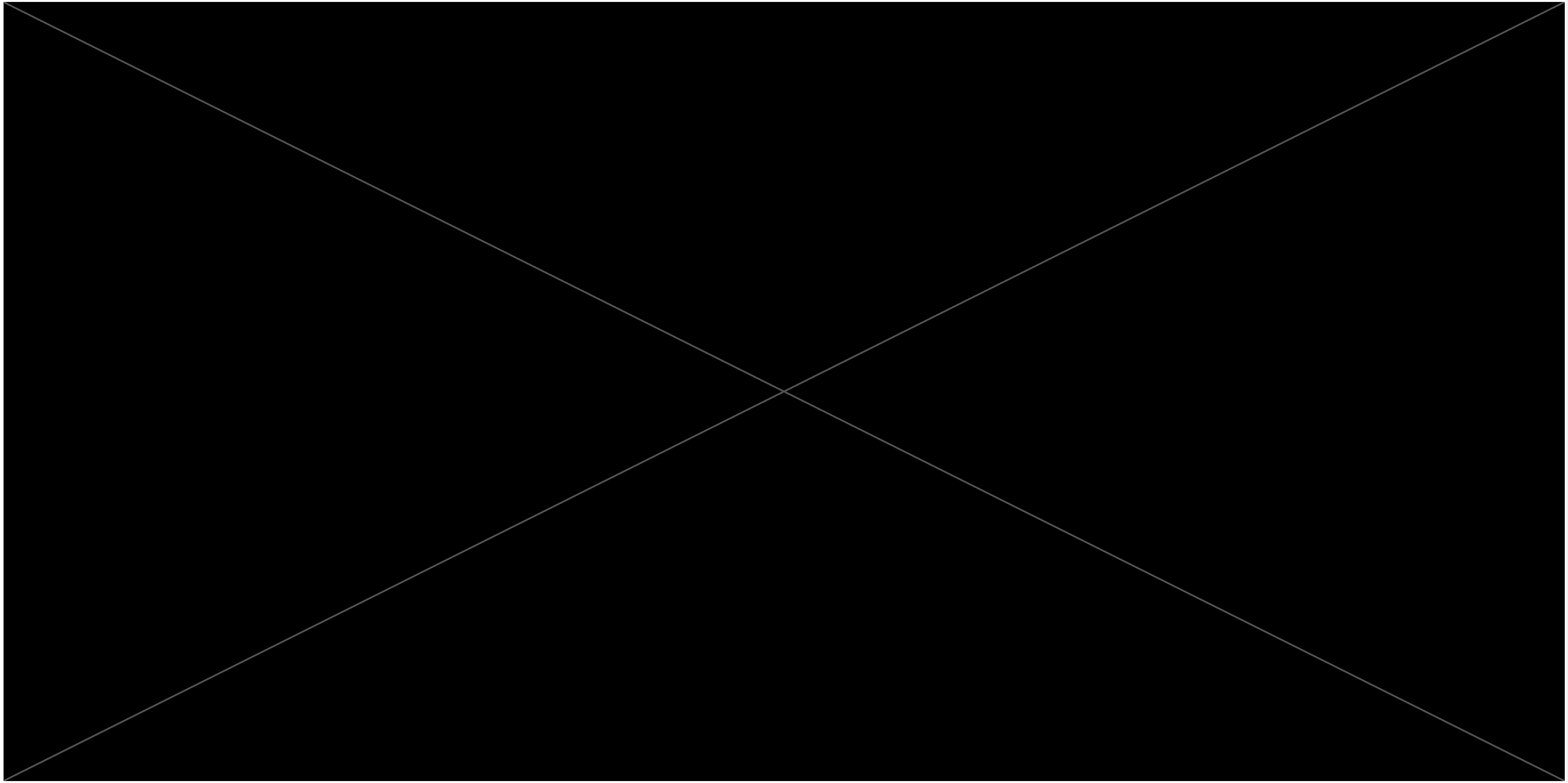
Methodology and assumptions

[redacted]

Methodology and assumptions

[redacted]

Methodology and assumptions



Methodology and assumptions

B.4

Results

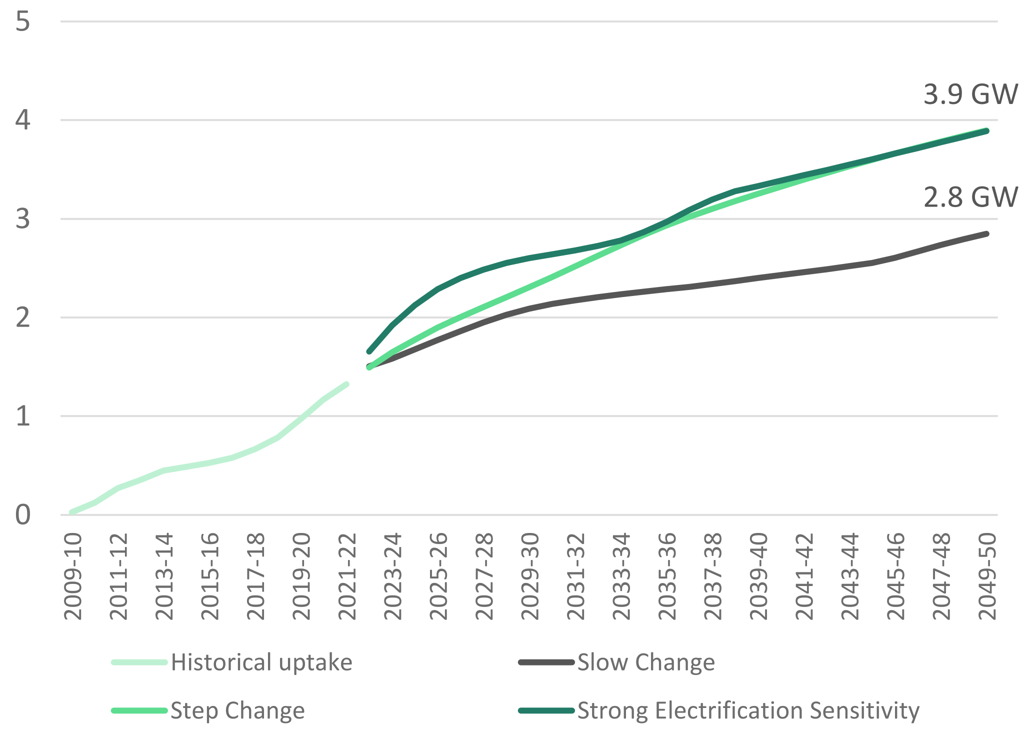
This section presents a selection of the downscaled network level results, by customer type, for DER uptake. Results for individual postcodes are not presented within this document.

4.1 Rooftop solar PV

Cumulative capacity of rooftop solar PV (systems between 0-100 kW) in the SA Power Networks distribution network, by customer type

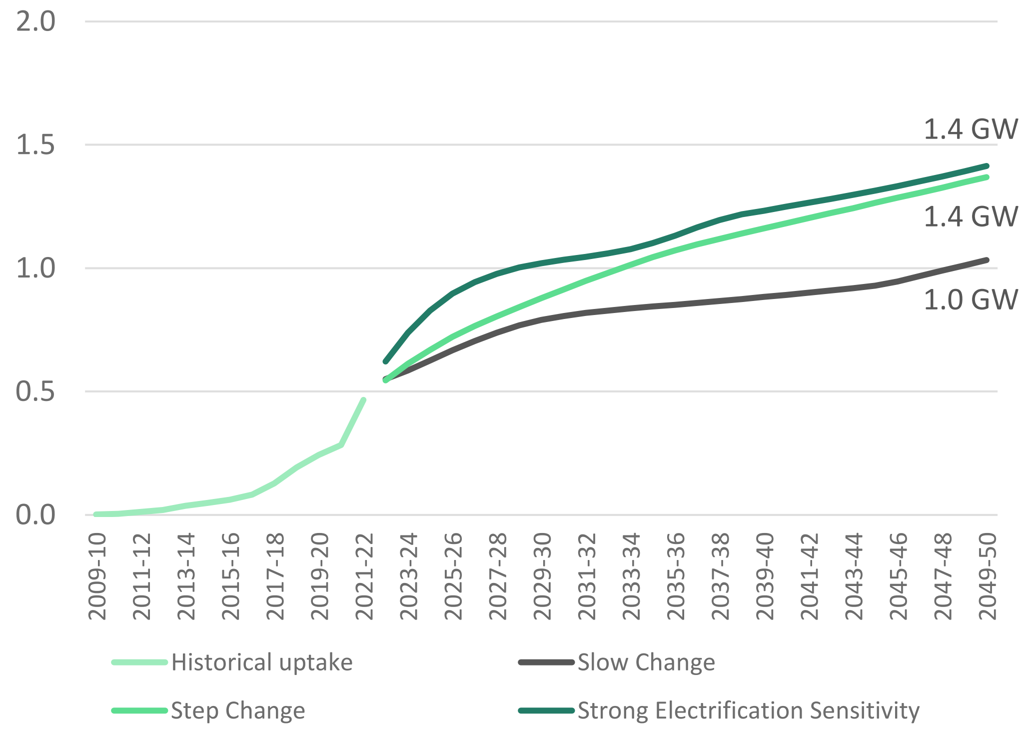
Residential

Cumulative capacity (GW)



Commercial

Cumulative capacity (GW)

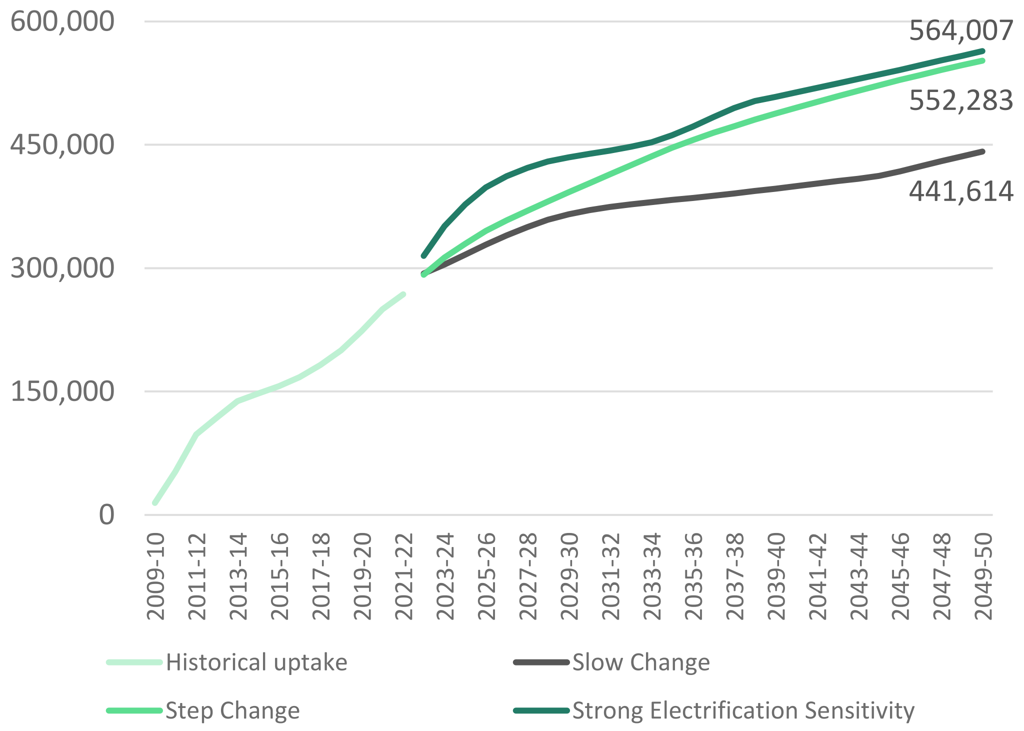


4.1 Rooftop solar PV

Cumulative rooftop solar PV (systems between 0-100 kW) approvals in the SA Power Networks distribution network, by customer type

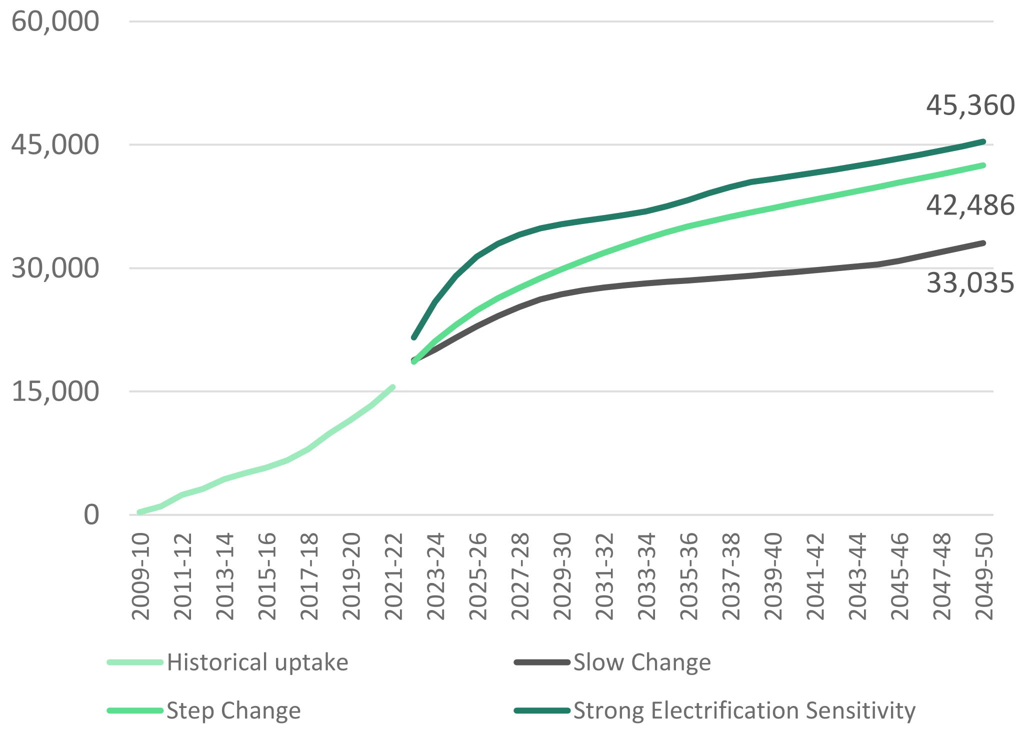
Residential

Approvals, number of systems



Commercial

Approvals, number of systems

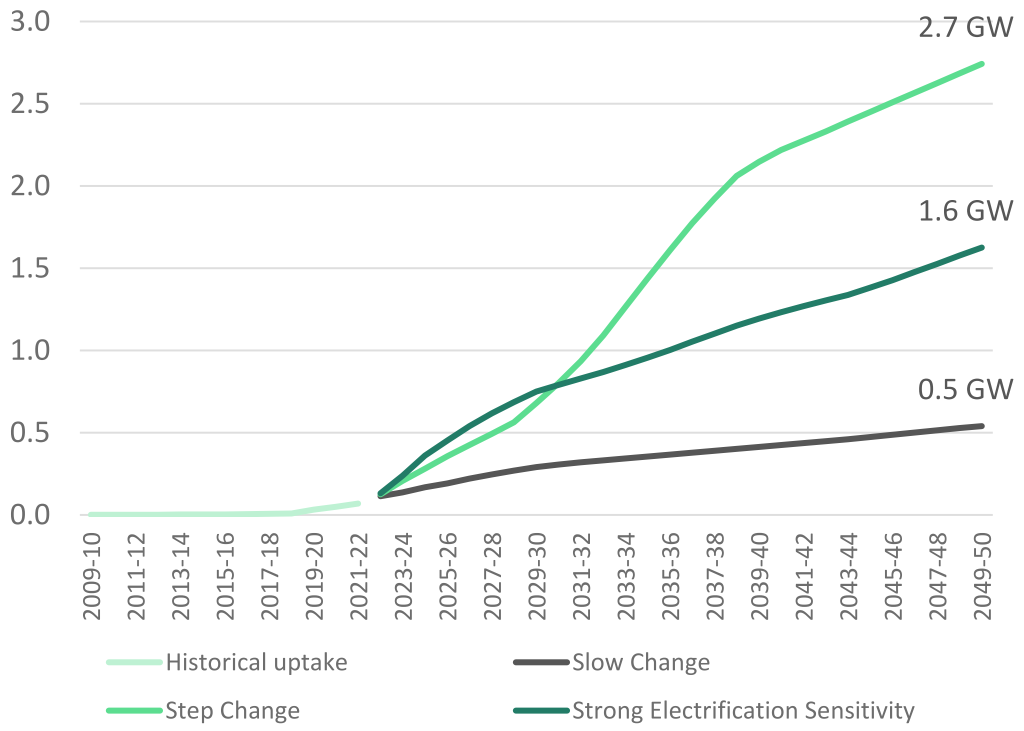


4.2 Energy storage systems

Cumulative capacity of ESS in the SA Power Networks distribution network, by customer type

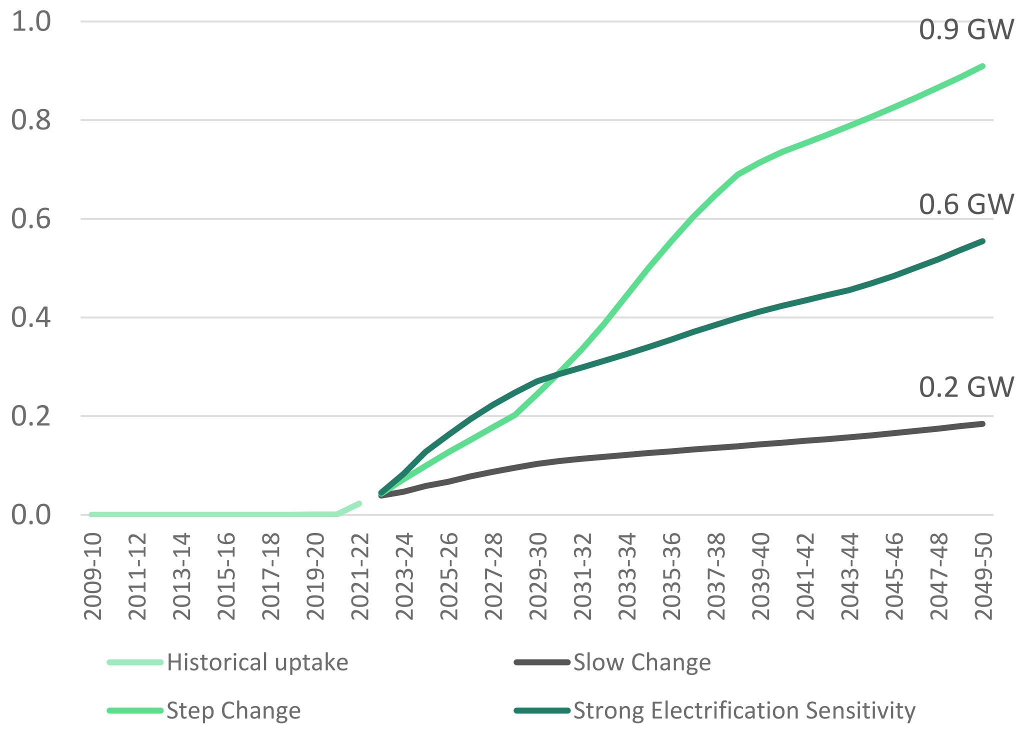
Residential

Cumulative capacity (GW)



Commercial

Cumulative capacity (GW)

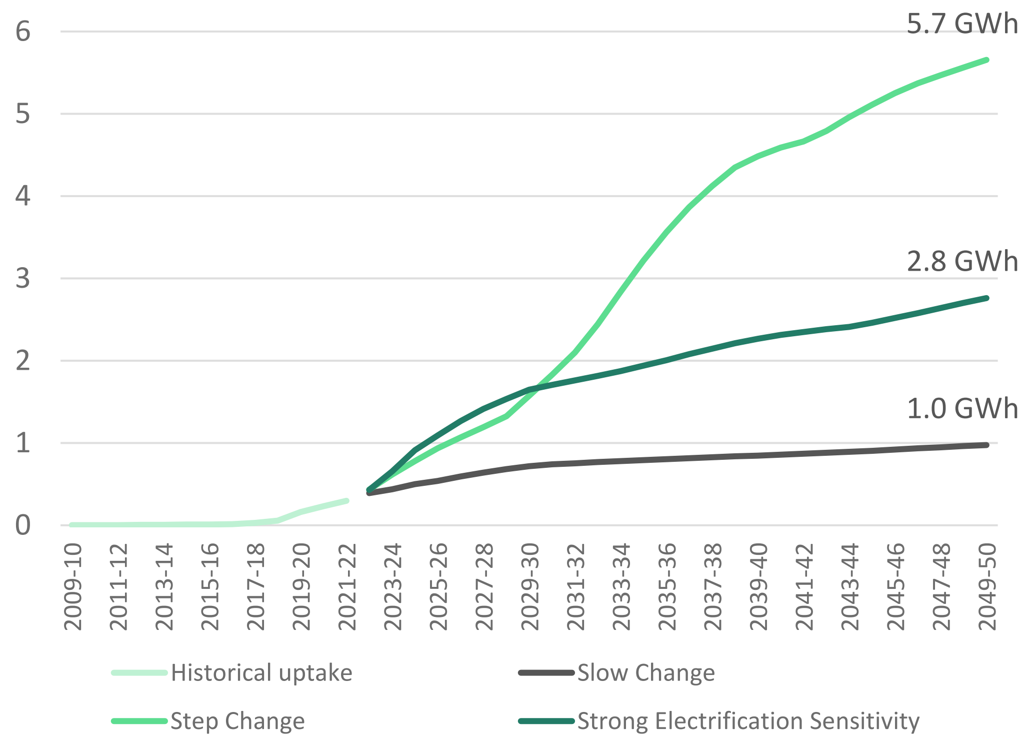


4.2 Energy storage systems

Cumulative ESS energy in the SA Power Networks distribution network, by customer type

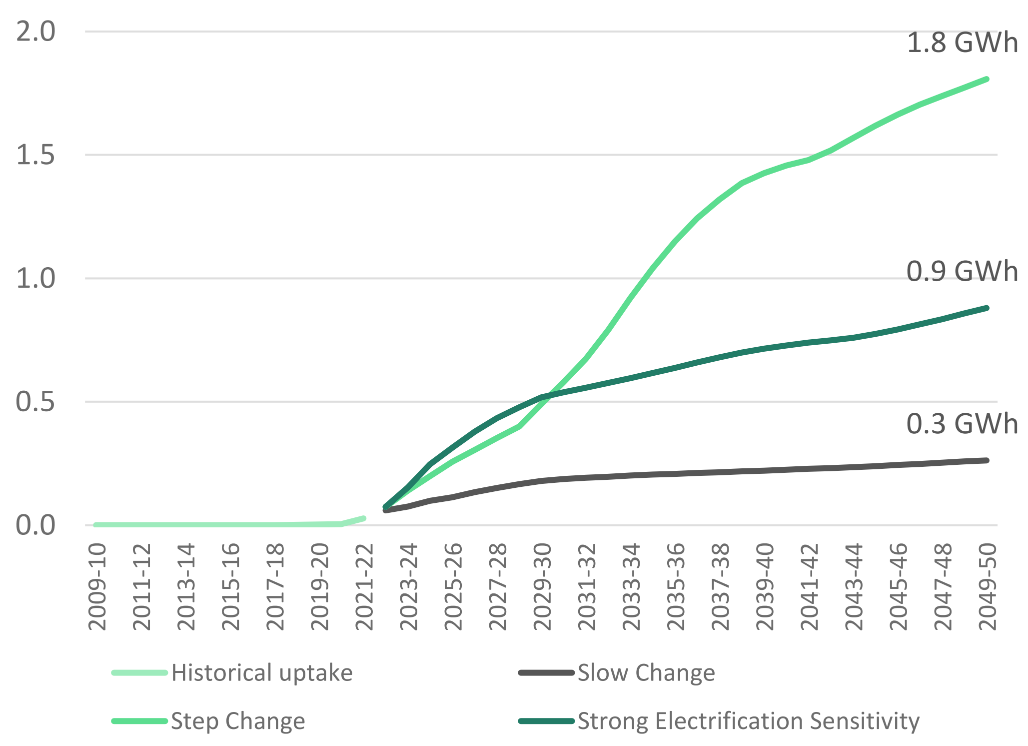
Residential

Cumulative energy (GWh)



Commercial

Cumulative energy (GWh)

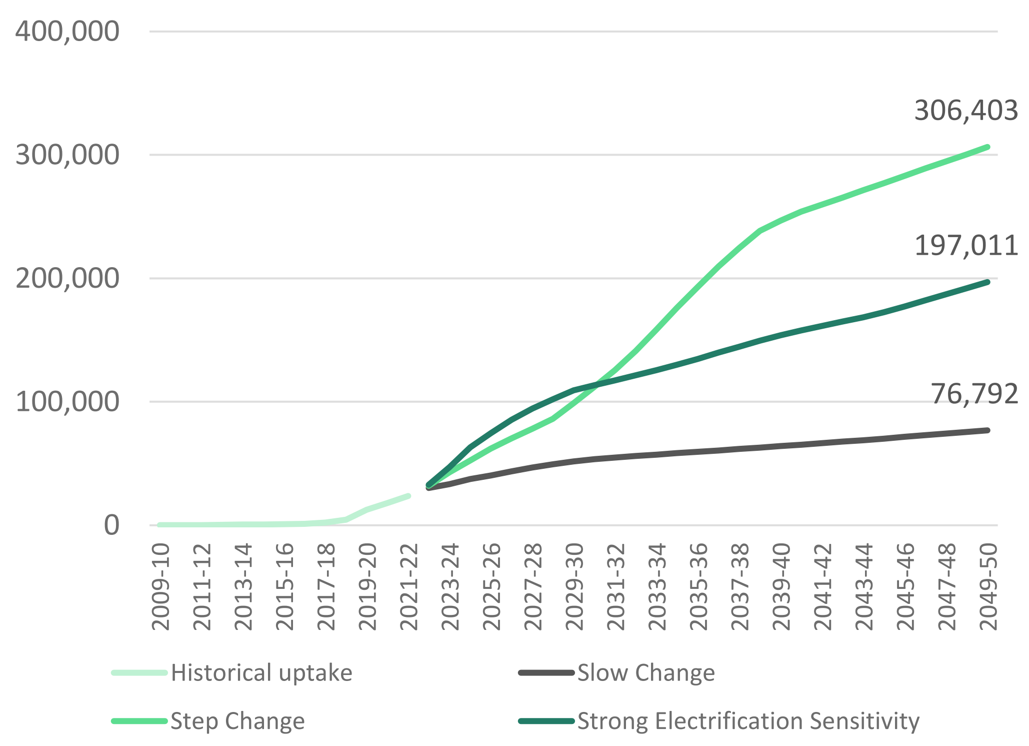


4.2 Energy storage systems

Cumulative ESS approvals in the SA Power Networks distribution network, by customer type

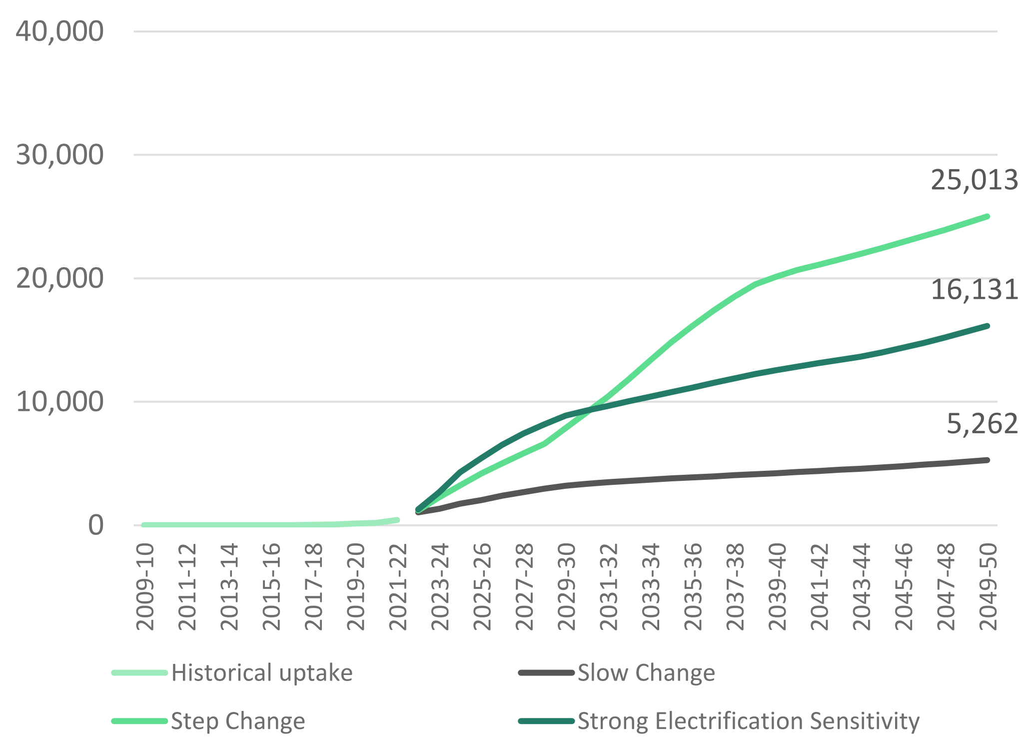
Residential

Approvals, number of systems



Commercial

Approvals, number of systems

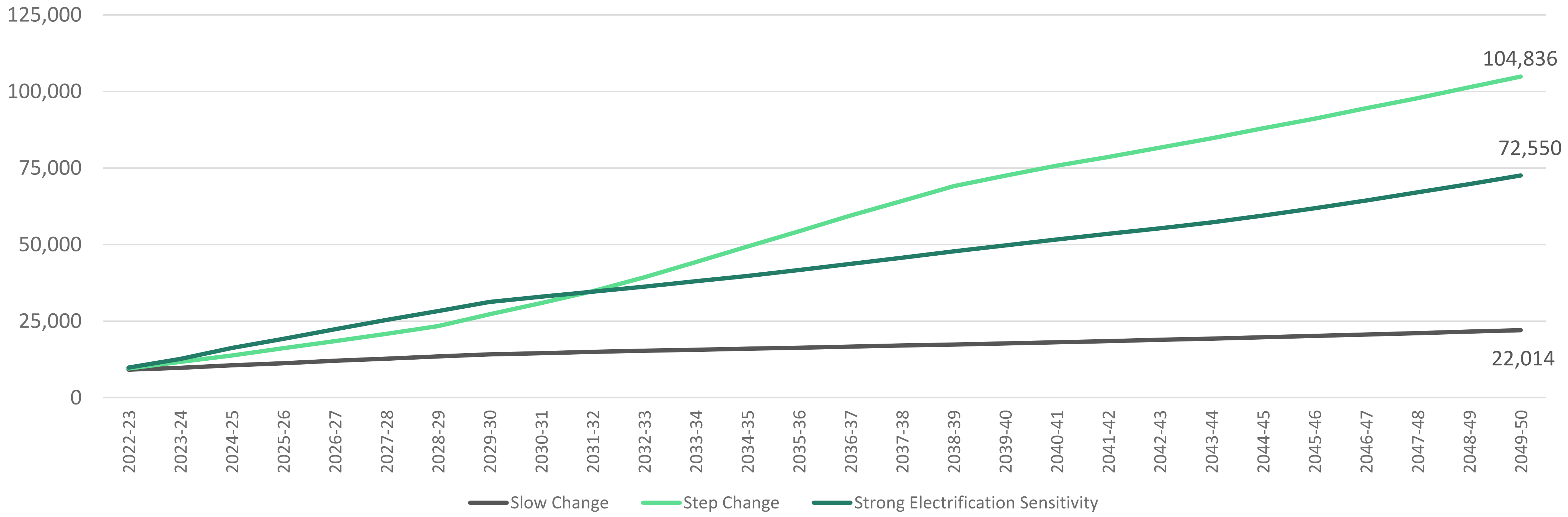


4.3 Virtual power plants (VPPs)

Cumulative number of aggregated ESS participating in VPPs in the SA Power Networks distribution network

All customers

Number of systems

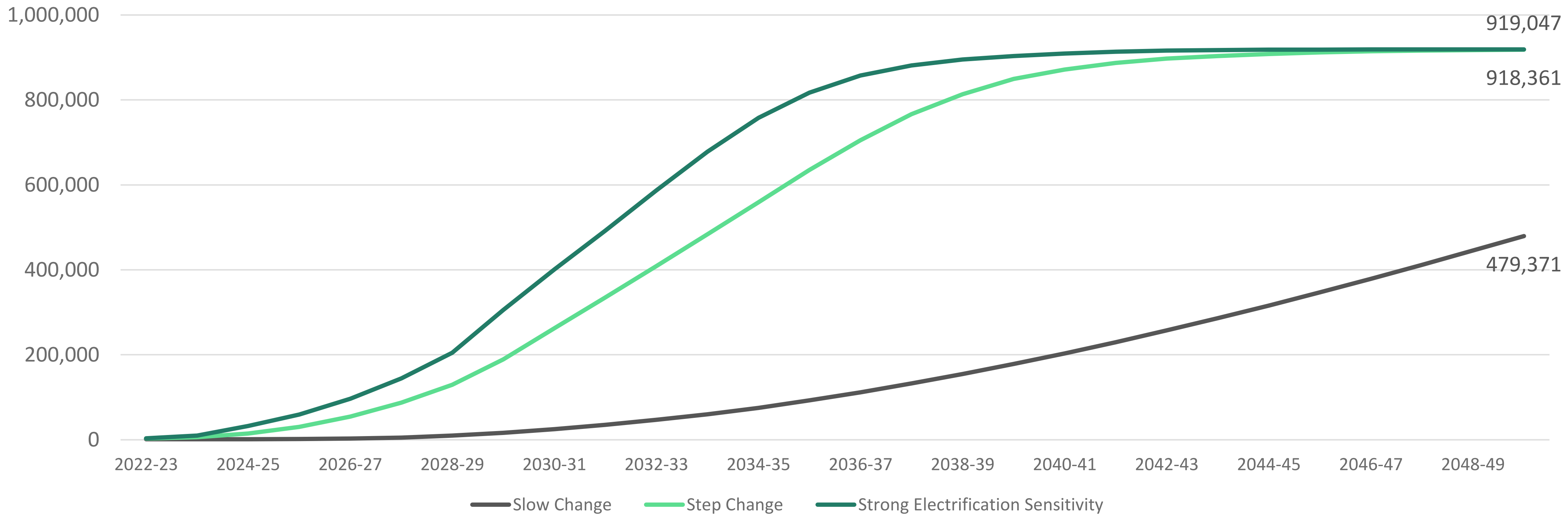


4.4 Electric vehicles

Cumulative number of electric vehicles in the SA Power Networks distribution network[1]

All customers

Number of vehicles



Notes: [1] Sufficient historical data is not available for the number of electric vehicles in South Australia. In the absence of historical data, the predicted number of EVs cannot be computed and the distribution of EVs across each customer type cannot be determined. Furthermore, AEMO's forecast cannot be downscaled. This means that Enea's forecast is equivaled to AEMO's when aggregated at the state level.

B.5

Assessment of AEMO approach

This section provides an overview of AEMO's broad consultation process, DER forecasting methodology and the associated forecasting outcomes.

5.1 Strengths and weaknesses of AEMO's methodology development and consultation processes

AEMO develops scenarios for forecasting supply-demand balance for Summer Readiness, Medium-Term Projected Assessment of System Adequacy (MTPASA), Electricity Statement of Opportunities (ESOO) and the Integrated System Plan (ISP). Due to the relatively broad purpose of these materials, the scenarios used can be very generic.

AEMO's scenarios are developed in consultation with industry, consumer groups and government to capture a wide range of stakeholder views. The scenarios are used to test and inform government environmental and energy sector policy, by consumer groups, and by generators and network operators to plan energy assets.

Strengths

- Heavily consulted on by industry, consumer groups and government with broad support across all these stakeholder groups.
- Driven by policy announcements as well as used to inform policy, but independent enough to not assume the policy targets will always be achieved.
- Highly granular and component based, allowing flexibility in substituting in and out other components.
- Considers all aspects of demand, supply and network drivers.

Weaknesses

- Limited scenarios that must meet broad range of stakeholder needs and achieve consensus (consumer groups, networks, retail, government)
- Stakeholders are heavily involved in the development of the forecast inputs and methods without the expert knowledge to support these views.
- Inertia in the forecasting methods due to best practice guidelines leads to slow evolution of methods.
- Significant year-on-year changes in the 'current' view of the future for solar PV, battery and EV.
- Scenarios must be 'internally consistent' which creates situations where negative drivers cancel out positive drivers and provides narrow bounds of uncertainty in outcomes.
- Long-term focus at the expense of short-term accuracy. For example, solar PV capacity has been under forecast every year that AEMO has been forecasting (up to the current date).
- Inconsistent scenario narratives across publications, for example step change was the highest DER scenario until 2021, now it's the middle of the road scenario.

5.1 An overview of AEMO's DER methodology development process for short-term and long-term modelling

Short-term trend model[1]

Solar PV only

- Trend analysis is applied to produce projections based on historical solar data, for the first ~18 months of the forecast horizon[2].
- The short-term projection is estimated as a linear regression against 2 years of monthly data and dummy variables to account for trends in monthly sales.
- Historical data used in the linear projection has been shortened, to ensure the projection is tracking the most recent trends.

$$X_m = f(month\ in\ sequence, month\ of\ year\ dummy)$$

where X is the monthly (m) activity of solar PV installations and capacity by customer segment.

!

- Technology adoption is not typically linear, even in the short term.
- The linear trend model approach doesn't perform well in the short-term (discussed later).
- The linear model designed to capture the trend and seasonality although better models exist to do this, for instance Seasonal-Trend using LOESS[3].
- An alternative approach would be to fit a data-driven technology adoption curve.

Long-term adoption model[1]

All technologies

- General projection approach that calibrates the adoption curve based on payback period (price factor) and non-price factors.
- Non-price factors considered include age, educational attainment and discretional income.
- Inputs are altered according to scenario assumptions, to evolve the rate of adoption over time for each scenario.

!

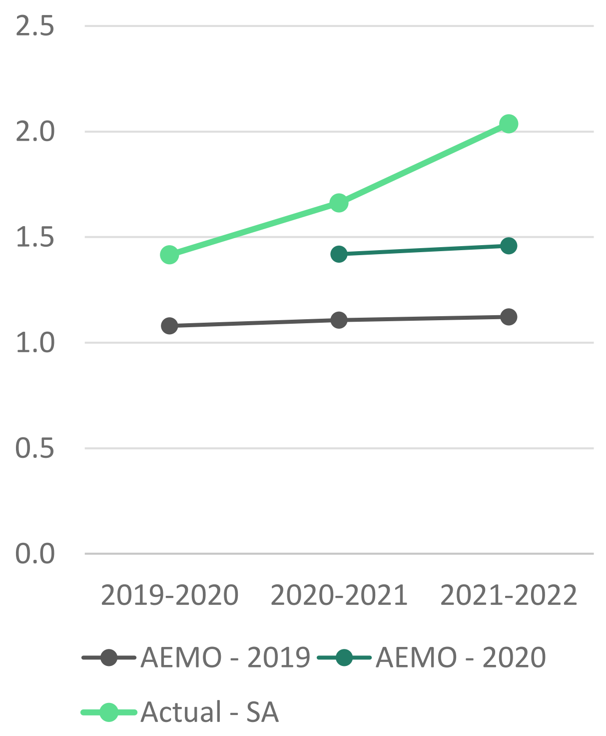
- A technology adoption curve approach typically provides a robust method for projection, especially in markets for new technologies.
- Structural models are assumptions-based and are therefore highly sensitive to changes in assumptions. As a result, if assumptions remain unchanged between scenarios, there will be limited variation.
- Similarly, keeping assumptions the same overtime, to ensure a consistent scenario narrative, restricts the bounds of uncertainty such that there is limited uncertainty taken into consideration in the long-term.

Sources and notes: [1] CSIRO, *Small-scale solar and battery projections 2021.* May 2021, https://aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/Inputs-Assumptions-Methodologies/2021/CSIRO-DER-Forecast-Report. [2] It is assumed that the trends project to 2021-2022 (short-term trend model) are historical, from the perspective of the long-term projection model. The two models are joined by calibrating the adoption curve from the ed of the short-term trend model onwards. [3] LOESS = Locally Estimated Scatterplot Smoothing.

5.2 Comparing AEMO's past solar PV capacity forecasts against historical uptake in SA[1]

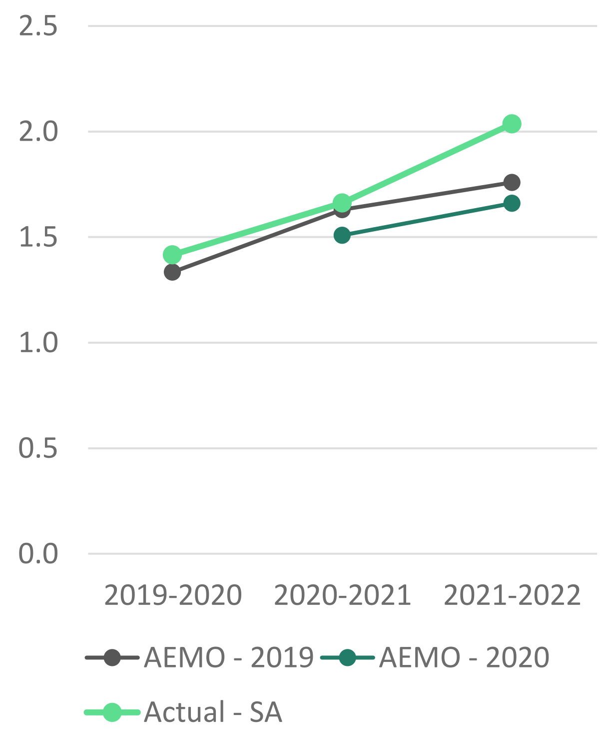
Slow Change[2]

Cumulative capacity, GW



Step Change[2]

Cumulative capacity, GW



Notes: [1] The **Actual – SA** values presented are at the South Australia level (not the SA Power Networks' network level), to align with AEMO's forecasts. However, the 2021-2022 Actual-SA value is estimated, based on the historical relationship between the state level and SA Power Networks level actuals.
[2] The 2021 forecast is excluded as the 2022 *Inputs assumptions and scenarios workbook* uses the trajectories developed for AEMO in 2021.

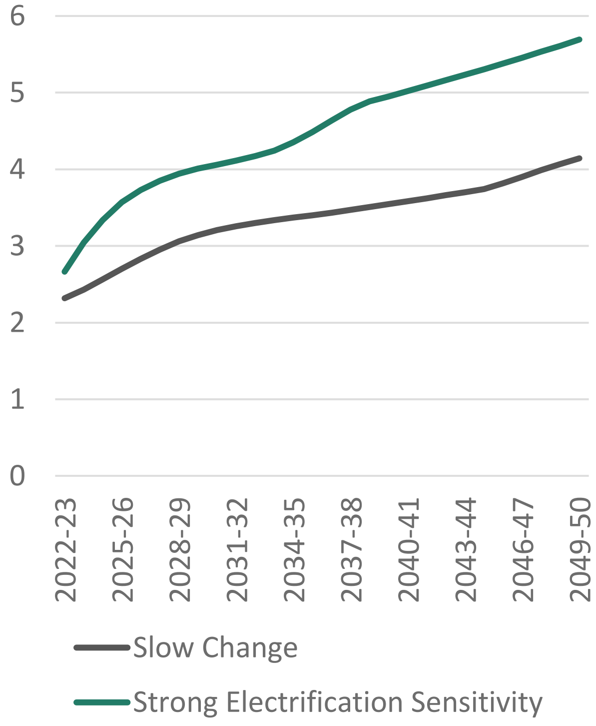
Key points

- The alignment of AEMO's forecasts to actual solar PV uptake varies across scenarios and forecasting years.
- The Slow Change scenario is below the actual uptake for both the 2019 and 2020 forecast years. This is expected, as the Slow Change scenario represents the lower bound of the forecast scenarios.
- The Step Change scenario is AEMO's highest PV uptake scenario, in the 2019 and 2020 forecast years. However, the forecasts consistently underestimated growth in solar PV, indicating poor alignment in the short-term trend.
- It is too early to estimate AEMO's forecast accuracy for ESS and EV, given that there is limited historical data available and visibility of uptake is difficult prior to the introduction of the DER Register (DER-R).

5.2 AEMO presents greater uncertainty across publications than within publications

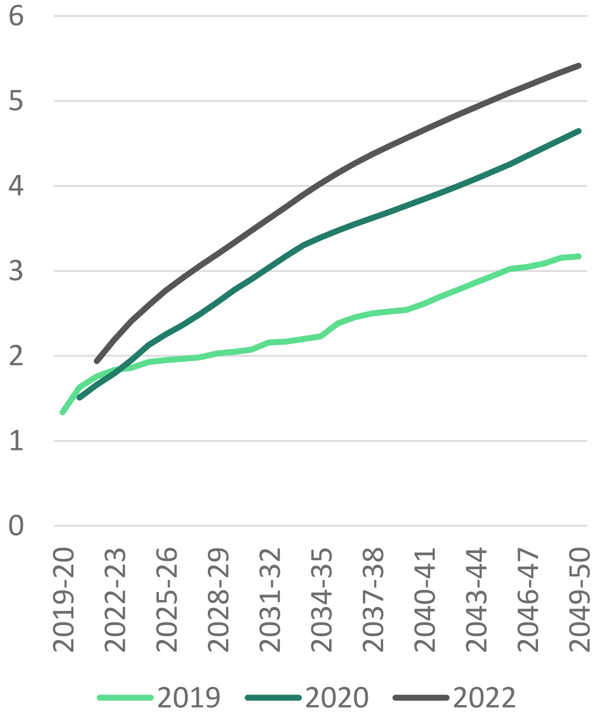
Within publication spread – 2022 ISP[1]

Cumulative PV capacity, GW



Across publication spread – Step Change[2]

Cumulative PV capacity, GW



Key points

- Each year, AEMO forecasts relatively narrow forecast bands. This implies certainty on forecast outcomes. The 2022 ISP forecast a 37% spread between rooftop solar PV scenarios in 2049-2050.
- However, across years and across publications AEMO scenarios vary greatly, implying less certainty on forecast outcomes. The relative variation in the 2049-2050 capacity between the 2019 forecast and the 2022 forecast is around 75%. Each year AEMO revises up the forecast as AEMO reacts to increasing solar PV uptake.
- Only solar PV is shown, however this is illustrative of all AEMO forecasts (ESS and EV). This is consistent with a narrative driven, rather than uncertainty driven, forecasting approach.

Notes: [1] Note that there is inconsistency in AEMO's scenario narratives, for the given (2022) forecast year (and potentially other years, however these have not been as closely examined). For example, the 2022 ISP estimates for Slow Change are higher than the Step Change scenario in the short-term.
[2] The 2021 forecast is excluded as the 2022 *Inputs assumptions and scenarios workbook* uses the trajectories developed for AEMO in 2021.

5.3 Possible enhancements to the DER forecasts presented within this report

The scope of this project, as defined by SA Power Networks, is to downscale AEMO's state level forecasts for South Australia to the postcode (spatial) level[1]. This approach has the advantage of ensuring that the DER forecasts are consistent with AEMO's state level results. Ensuring consistency with AEMO may remove complexity from SA Power Networks' engagement with the Australian Energy Regulator (AER).

A considerable drawback of this downscaling approach is that any limitations in AEMO's methodology and forecasts are also inherently captured in the DER forecasts delivered within this scope of work. Of particular concern are the narrow bounds of uncertainty in outcomes and short-term under-estimation / accuracy, as outlined in Section B.5.1 and B.5.2 of this report. As such, there may be instances where deviating from AEMO's forecasts could be to SA Power Networks' benefit – for example, for network planning purposes.

Other limitations in the DER forecasts, beyond the scope of AEMO's methodology and forecasts, arise from the data used. These limitations are caused mostly by data availability and quality.

Enea recommends that SA Power Networks considers the following enhancements, for future DER forecasting exercises:

Better align the short-term model with recent historical DER uptake trends, to avoid under-estimation in the short-term. Taking a data driven approach could help to ensure that forecasts are better aligned to history and more accurate in the short-term as well as the long-term.

Broaden the scenario bounds to better capture DER uncertainty. Taking a broader view on the bounds of uncertainty within a reporting year will also facilitate a more consistent view to scenario planning across years.

Include customer specific drivers for DER saturation.

- **Incorporate the business maximum demand forecast, to capture DER saturation drivers for business customers.** As business customer's electricity demand increase, it is expected that the saturation limit for DER will also increase
- **Develop spatial population growth, as a driver for postcode level residential DER uptake.** The current method does not capture underlying spatial population growth, given the limited availability of forecasts at the required granularity. The expected population growth is therefore assumed to be equal across all postcodes.

Notes: [1] The downscaling approach used by Enea is outlined in Section B.3 of this report.

Contents

C.1

Scenario settings

Scenarios are used in forecasting exercises to capture a range of possible futures. This section presents the settings and policy assumptions underlying each scenario.

1.1 Scenario settings

The other technology forecasts were designed to align with the AEMO scenarios, based on a range of underlying assumptions

Uptake scenario[1]		Slow Change	Step Change	Strong Electrification
AS4777.2 2020 compliant inverters	AEMO rooftop PV approvals[2]	Slow Change	Step Change	Strong Electrification
	AEMO battery storage approvals[2]	Slow Change	Step Change	Strong Electrification
	Year of mandate	2050	2035	2030
	Target rate	27%	75%	100%
Smart meters	AEMO rooftop PV approvals[2]	Slow Change	Step Change	Strong Electrification
Electric hot water systems	Turning point (year)[3]	2050	2035	2027
	AEMO electrification[2]	Slow Change	Step Change	Strong Electrification

Sources: [1] Australian Energy Market Operator, *2021 Inputs, Assumptions and Scenarios Report.* July 2021, https://aemo.com.au/-/media/files/major-publications/isp/2021/2021-inputs-assumptions-and-scenarios-report.pdf?la=en. [2] Based on forecasts from Australian Energy Market Operator, 2022 Forecasting Assumptions Workbook, June 2022. The forecasts used as inputs have been downscaled by Enea, as part of this project. [3] The year in which the forecast switches from the historical linear trend to AEMO's electrification forecast (user-input parameter that can be adjusted directly in the model).

Key points

- The scenario settings previously outlined for the DER uptake forecasts still apply, where outputs from these forecasts have been used as an input in the other technology models.
- AEMO's scenario nomenclature has been preserved, to ensure consistency across all forecasts presented within this report. However, the forecasts presented in this section have been independently developed by Enea.
- The scenario settings used for the other technology forecasts are intended to capture a range of future policy outcomes.

C.2

Data inputs

This section outlines the key data inputs used by Enea to produce independent forecasts for the other technologies, where no directly comparable AEMO forecast is available.

2.1 External data inputs

Technology	Source	Dataset used
AS4777.2 2020 compliant inverters	*Not applicable*	
Smart meters	*Not applicable*	
Electric hot water systems	Energy Efficient Strategies (prepared for the Department for Energy and Mining, South Australia)[1]	Updated share of water heater types for South Australia from 1990 to 2020
	Australian Energy Market Operator (AEMO)	Residential electrification[2] and connections[3]

Sources: [1] Energy Efficient Strategies, *Review of Residential Sector Hot Water Requirements for South Australia*. October 2020, https://www.energymining.sa.gov.au/__data/assets/pdf_file/0007/673756/EES_Report.pdf [2] Australian Energy Market Operator, *2022 Forecast (version 17/12/2021, Electrification, South Australia)* [3] Australian Energy Market Operator, *2022 Forecast (version 17/12/2021, Operational (Sent-Out), South Australia, Inputs)*

C.3

Methodology and assumptions

This section provides an overview of the approach for forecasting uptake for each technology – AS4777.2:2020 compliant inverters, smart meters, and electric hot water systems.

[redacted]

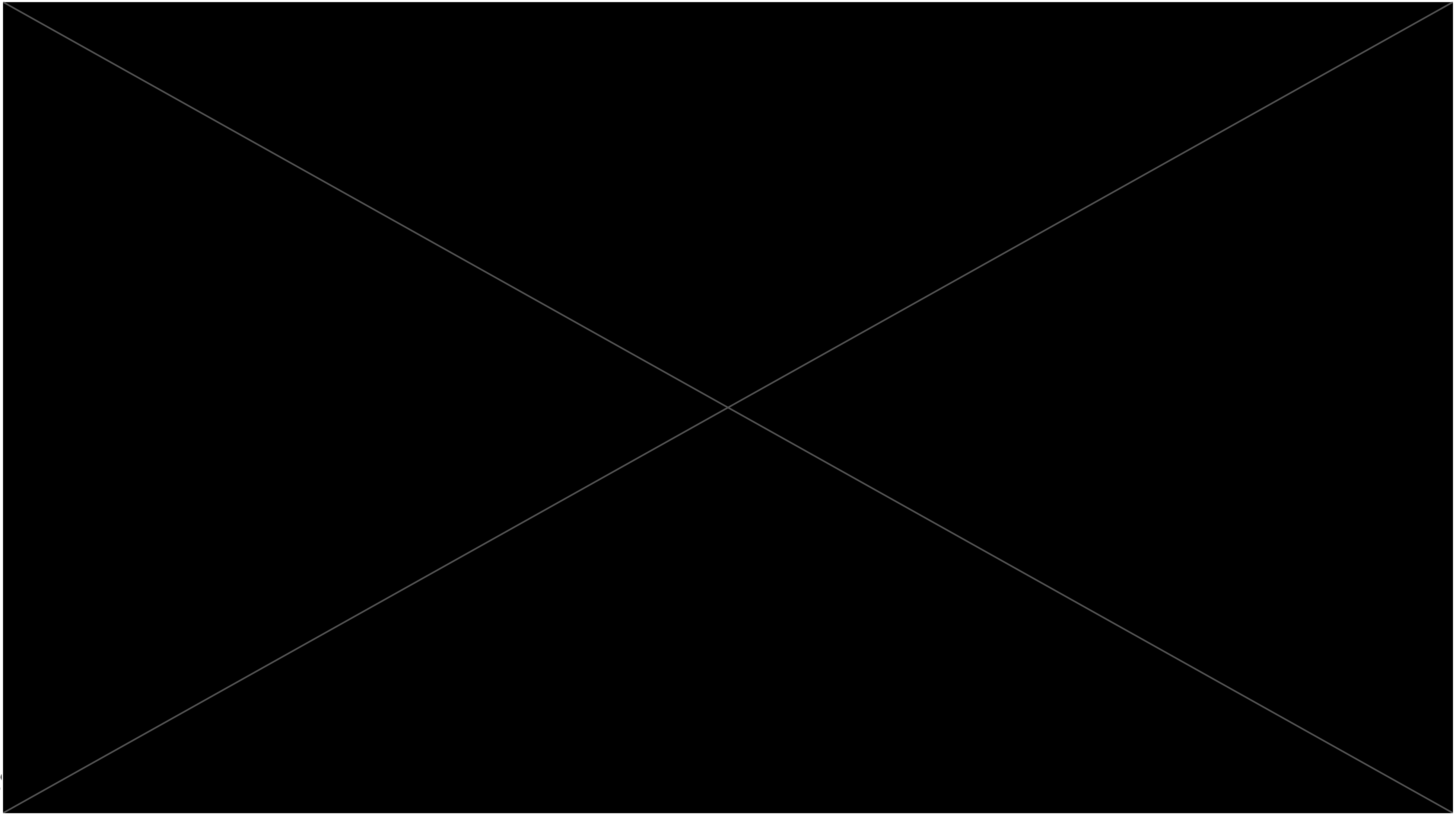
[redacted]

[redacted]

[redacted]

[redacted]

Methodology and assumptions



[redacted]

[redacted]

[redacted]

[redacted]

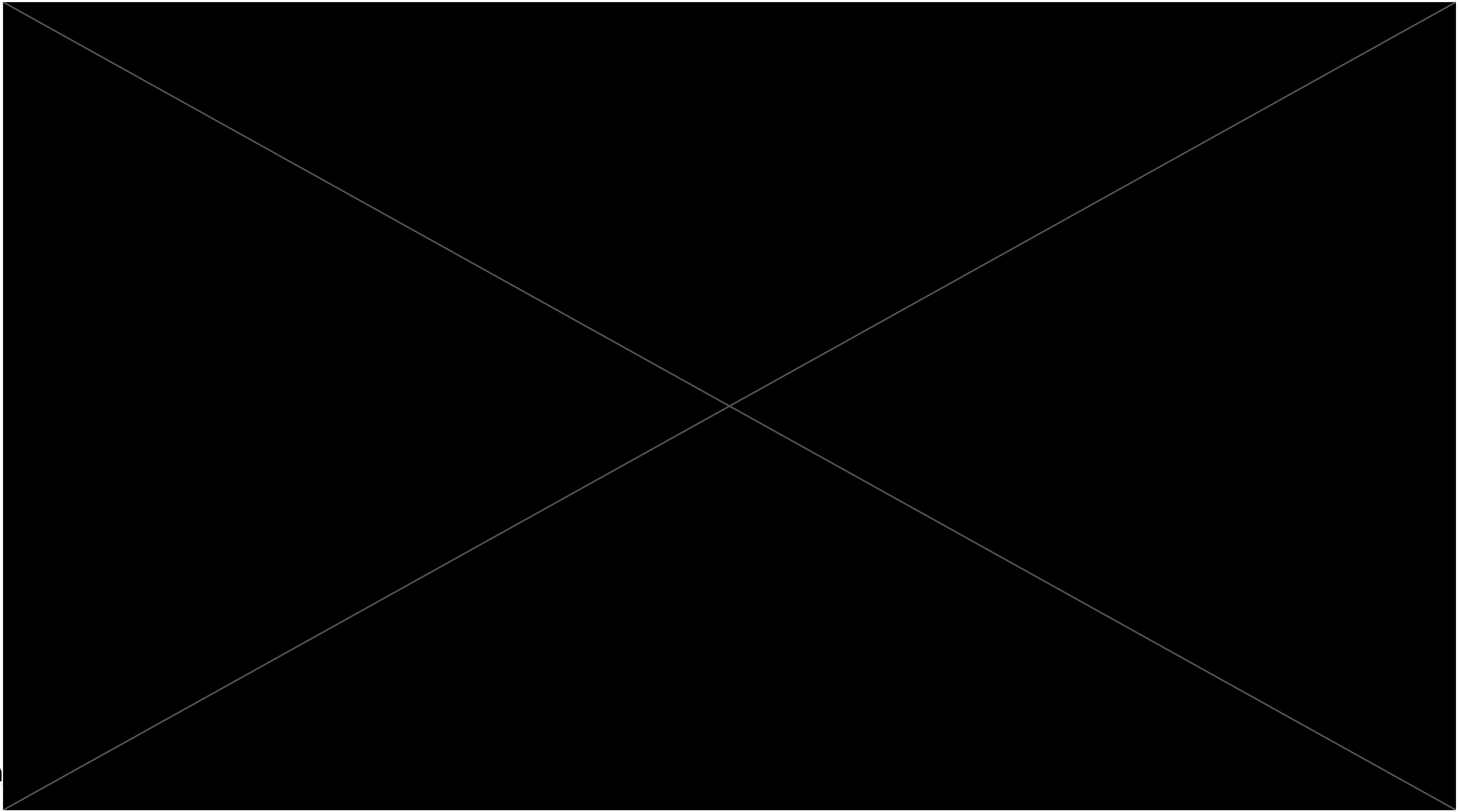
[redacted]

[redacted]

[redacted]

[redacted]

Methodology and assumptions



[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Methodology and assumptions

C.4

Results

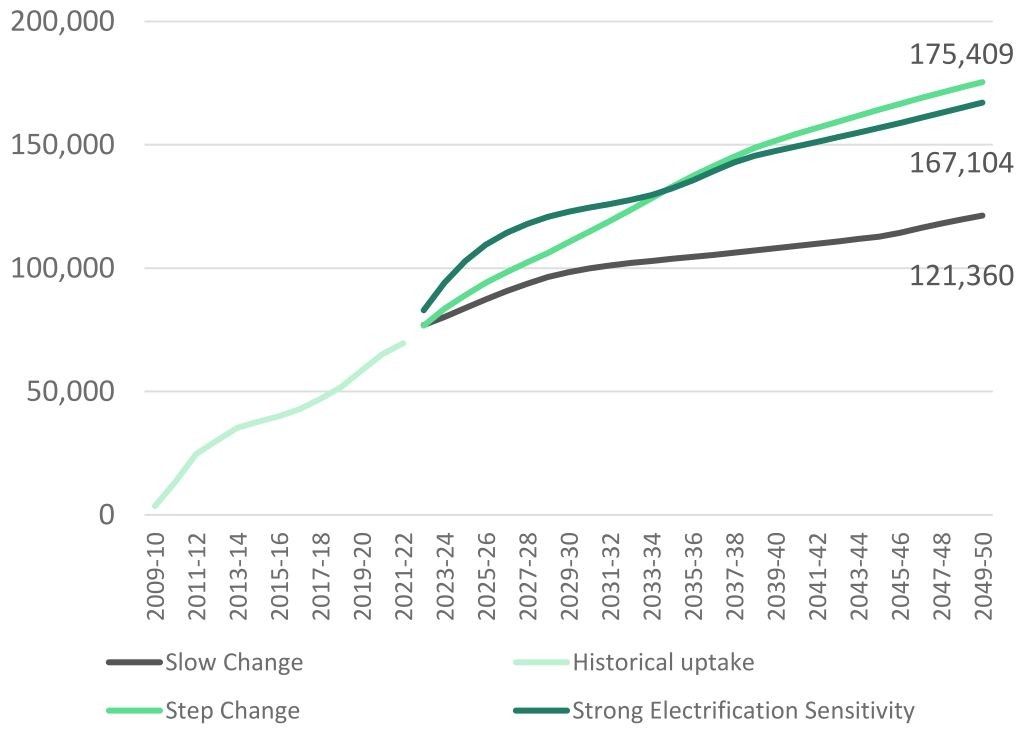
This section presents a selection of the downscaled network level results, by customer type, for the other technologies modelled. Results for individual postcodes are not presented within this document.

4.1 AS4777.2:2020 compliant inverters

Cumulative number of compliant inverters in the SA Power Networks distribution network

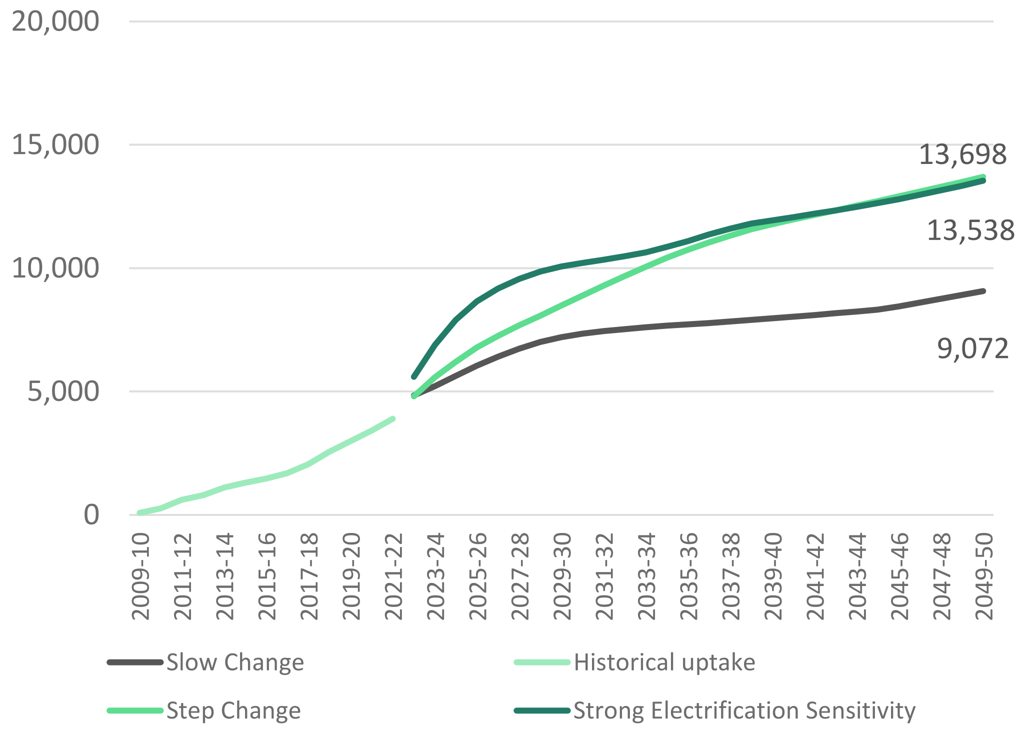
Residential

Number of inverters



Commercial

Number of inverters

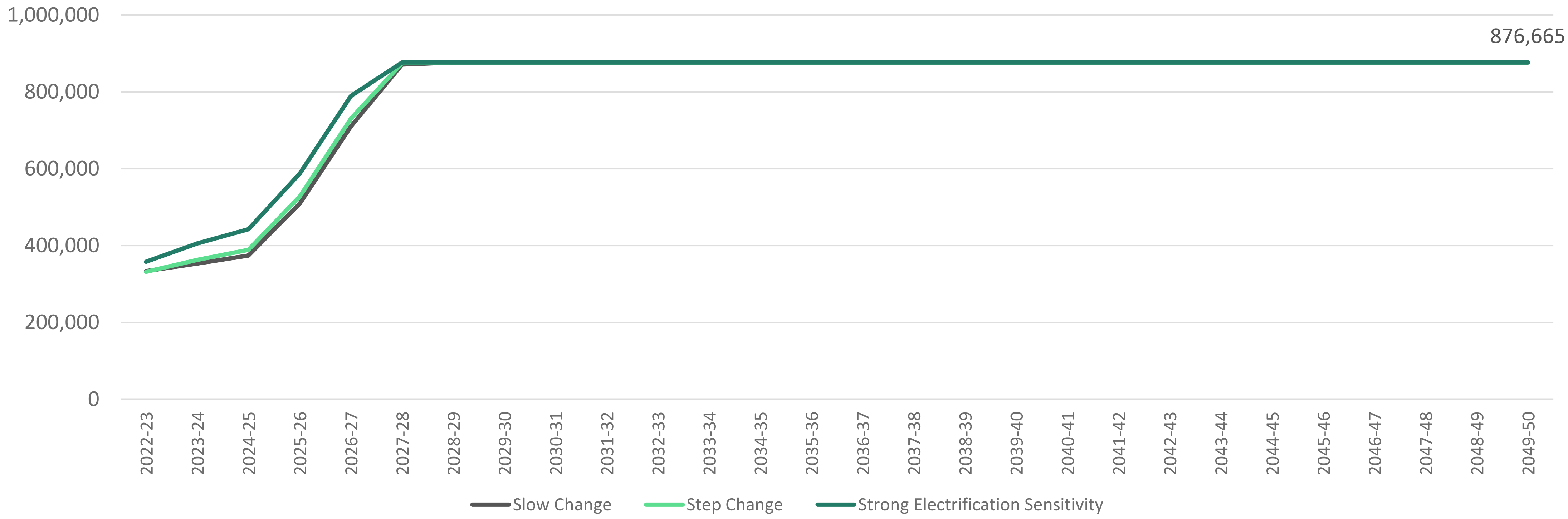


4.2 Smart meters

Cumulative number of smart meters (advanced metering infrastructure) in the SA Power Networks distribution network

All customers

Number of smart meters

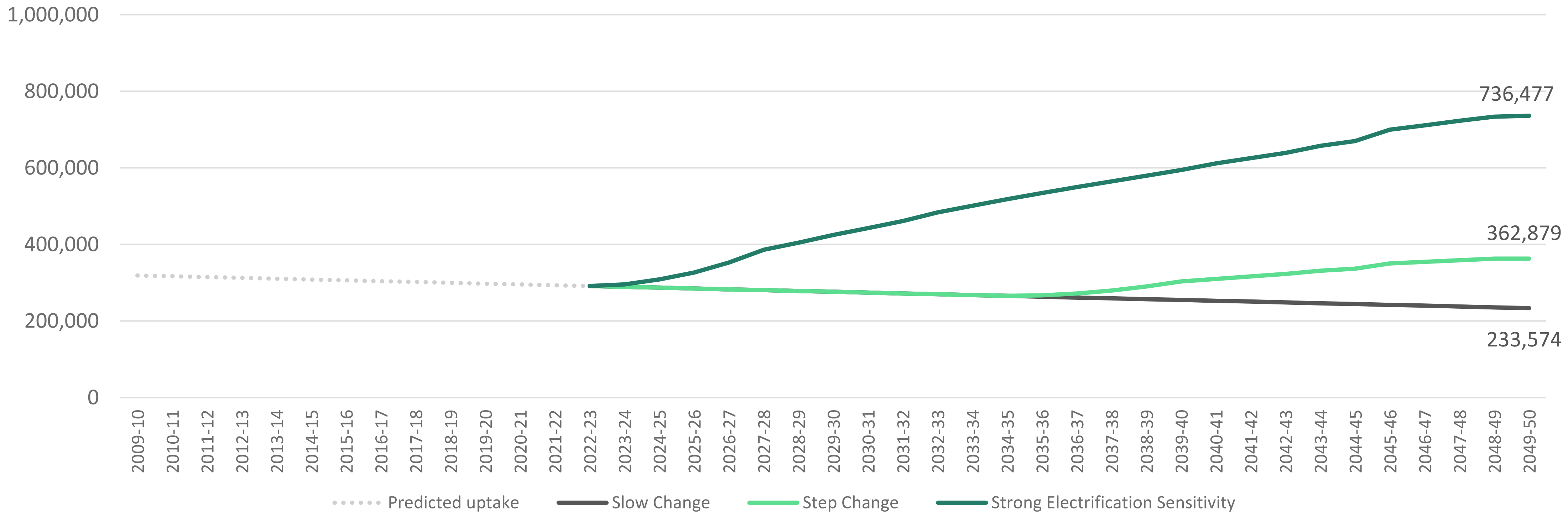


4.3 Electric hot water systems

Cumulative number of electric hot water systems in the SA Power Networks distribution network

All customers

Number of systems



Paris
Melbourne
Hong Kong
Singapore
Sydney
London

enea
CONSULTING