ATCO MWSW GDS Model Review – Accelerated Depreciation, Stage 2

A report for the Economic Regulation Authority, Western Australia | 18 September 2024

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1 Introduction

ATCO Gas Australia Pty Ltd (ATCO) operates the Mid-West and South-West Gas Distribution System (MWSW GDS). The MWSW GDS is a regulated distribution network and requires an approved access arrangement.

The Economic Regulation Authority (ERA) uses a building block framework to determine the efficient revenues that ATCO is allowed to earn over the regulatory period. A key component of the allowed revenues is the return of capital allowance, also referred to as regulatory depreciation. Rule 89(1)(b) of the *National Gas Rules – Western Australia* requires that the depreciation schedule used to set the regulatory depreciation allowance should be designed[1]:

> *… so that each asset or group of assets is depreciated over the economic life of that asset or group of assets …*

Traditionally, economic regulators in Australia utilise straight-line depreciation methods to set regulatory depreciation. That is, the same real depreciation amount is recovered each year. This contrasts with depreciation schedules that recover more (or less) depreciation in the earlier years of an asset's life and less (or more) depreciation in the later years2. Accelerated depreciation (AD) broadly refers to any depreciation method that shifts depreciation along the depreciation schedule such that more depreciation is recovered in the earlier years of an asset's life (or remaining life), with less depreciation recovered in the later years.

1.1 Our engagement

We have been engaged by the ERA to review the approach and implementation of the AD models prepared by ATCO's consultants for ATCO's AA6 proposal, in order to assist the ERA in its decision relating to AD allowances. Specifically, we have been engaged to:

- Review the reasonableness of ACIL Allen's modelling approach to uncertainty of future long-term demand.
- Review the reasonableness of ACIL Allen's model, advising of any errors or issues in the model.
- Conduct sensitivity analysis to determine which assumptions are the most material. Including reviewing and reporting on the reasonableness of these material assumptions.
- Comment on the reasonableness of proposed AD amounts for AA6.
- Advise on possible alternative methods of determining an amount of AD for AA6.

[1] Australian Energy Market Commission 2024, *National Gas Rules – Western Australia: Rule 89 Depreciation Criteria*. Available at: https://energy-rules.aemc.gov.au/wangr/587/459354#89

[2] Economic Regulation Authority, *Draft decision on revisions to the access arrangement for the Mid-West and South-West Gas Distribution Systems Attachment 6: Depreciation*, 24 April 2024. Available at: https://www.erawa.com.au/cproot/23986/2/GDS---ATCO---AA6---Draft-Decision---Attachment-6.PDF

Section 1.2 and 1.3 provide an overview of the scope, approach and outcomes of ATCO's initial accelerated depreciation proposal and our review[3] of ATCO's initial accelerated depreciation proposal. As part of our ongoing engagement with the ERA on this matter, we have now reviewed the approach and implementation of the updated models prepared by ATCO's consultants as part of their revised accelerated depreciation proposal.

Our approach to this review was to focus on the most material components of the models, informed by our review and knowledge of the previous models. A full audit and review of the integrated ACIL Allen and ATCO model was not undertaken.

1.2 ATCO's access arrangement proposal – accelerated depreciation

On 1 September 2023, ATCO submitted its access arrangement proposal for 1 January 2025 to 31 December 2029 (the sixth access arrangement period (AA6)).

ATCO's AA6 initial proposal included $80 million ($real 2023) for accelerated depreciation (AD) due to the uncertainty of the future of gas and the use of the gas distribution network.[4] This represented 23% of the increase in proposed AA6 revenue.

In support of this proposal ATCO submitted to the ERA modelling undertaken by ACIL Allen. Within this modelling, ACIL Allen forecast demand for ATCO's gas distribution services for four different scenarios. ACIL Allen applied expenditure forecasts supplied by ATCO that were relevant for each scenario and projected regulated revenue given the demand forecasts for each of the four scenarios. ACIL Allen then combined the projections of demand with the projections of revenue requirements to derive the regulated distribution prices that would be implied and, from this, backed out the necessary AD required to deliver constant real prices.

ATCO submitted a report by ACIL Allen on the development of the scenarios and the calculation of AD,[5] as well as a report by Incenta Economic Consulting which included a review of the ACIL Allen report.[6]

1.3 Frontier review of ATCO's accelerated depreciation proposal

Frontier Economics was engaged by the ERA to review the approach and implementation of the AD models prepared by ATCO's consultants for ATCO's AA6 proposal, in order to assist the ERA in its decision relating to AD allowances. Following this review, we made a number of recommendations relating to the modelling methodology and assumptions used by ATCO's consultants. Our report[7] was published by the ERA, alongside the ERA's draft decision.

Our report included 4 recommendations:

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3 Frontier Economics, *ATCO MWSW GDS Accelerated Depreciation Modelling Review*, A report for the Economic Regulation Authority, 26 March 2024. Available at: https://www.erawa.com.au/cproot/23996/2/GDS---ATCO---AA6---Frontier-Economics-Accelerated-depreciation-report.PDF

4 ATCO 2023, *ATCO Gas 2025-29 Plan: ATCO Mid-West and South-West Gas Distribution System*. Available at: https://www.erawa.com.au/cproot/23598/2/-6-Access-Arrangement-Information.pdf

5 ACIL Allen 2023, *Future of Gas: Scenario development and modelling for the ATCO gas distribution system*. Available at: https://www.erawa.com.au/cproot/23603/2/03.002---Future-of-Gas-Report.pdf

6 Incenta Economic Consulting 2023, *Regulatory depreciation for AA6*, ATCO Gas Australia. Available at: https://www.erawa.com.au/cproot/23615/2/11.001---Regulatory-depreciation-for-AA6.pdf

7 Frontier Economics, *ATCO MWSW GDS Accelerated Depreciation Modelling Review*, A report for the Economic Regulation Authority, 26 March 2024.

- Recommendation 1: *In order to determine whether there is a high degree of confidence that costs will be recovered, for all four modelling scenarios, analysis should be undertaken to establish:*
  - *The extent to which ATCO would be unable to recover its costs in the absence of AD, and*
  - *If ATCO is unable to recover its costs in the absence of AD, the extent to which ATCO's cost recovery is improved as a result of the proposal AD.*
- Recommendation 2: *For all four modelling scenarios, analysis should be undertaken to establish:*
  - *The extent to which inefficient utilisation of ATCO's assets would occur in the absence of AD, and*
  - *If inefficient utilisation of ATCO's assets would occur in the absence of AD, the extent to which efficiency of utilisation is improved as a result of the proposal AD.*

  In our view this would require forecasting demand using the network prices modelled by ACIL Allen as inputs into the retail prices faced by customers.
- Recommendation 3: *Analysis should be undertaken to determine the effect of deferring action on AD in all scenarios. This analysis should not only compare outcomes from deferring action under a single scenario – such as the Electricity Dominates scenario. Rather, the analysis should recognise that there is risk to taking action on AD on the expectation of the Electricity Dominates scenario occurring, if in future it turns out that another scenario occurs.*
- Recommendation 4: *Our comments on inputs and assumptions should be considered, with changes to inputs and assumptions or justification of existing inputs and assumptions as appropriate. As a priority the following issues should be considered:*
  - *Varying the inputs assumptions for distribution, transmission and retail components of retail gas prices across all scenarios.*
  - *Varying wholesale gas price forecasts across all four scenarios.*
  - *Varying the inputs and assumptions for retail electricity prices across all scenarios.*
  - *Ensuring consistency in the inclusion of carbon costs between gas and electricity retail tariffs.*
  - *Varying income assumptions for LGAs based on census data.*
  - *Incorporating iteration between network tariff assumptions and demand forecasts in order to account for the relationship between forecast demand and out-turn network tariffs.*
  - *Incorporating behind the meter PV in the analysis of NPV.*
  - *Considering other representative appliance types in the analysis of NPV.*
  - *Considering the extent to which customers with gas heating already have RCAC installed.*
  - *Considering how existing data on rates of electrification can be used to inform and test assumptions relating to the specification of the S-curve, and the modelling approach generally, provides reasonable results.*

1.4 ATCO's revised access arrangement proposal – accelerated depreciation

On 10 June 2024 ATCO submitted its revised access arrangement proposal for AA6. This revised proposal included:

- An updated AD model – '*10.101 – Accelerated Depreciation – Model*' (**ACIL Allen and ATCO Updated AD Model**).

- An updated *Future of Gas* report from ACIL Allen – '*10.102 Future of Gas Report – ACIL Allen*' (**ACIL Allen Updated Report**).[8]
- An updated report from Incenta Economic Consulting – '*10.103 Accelerated Depreciation – Incenta Report*' (**Incenta Updated Report**).[9]
- A modelling handbook from ATCO – '*10.104 – Accelerated Depreciation – Modelling Handbook*' (**ATCO Draft Decision Response**).[10]

We were also subsequently provided with another updated version of the Updated AD Model in which Incenta Economic Consulting had undertaken a number of additional calculations used in the Incenta Updated Report (**Incenta Updated AD Model**).

Following issues identified with respect to the retail gas price calculations in the Updated AD Model (and by extension, the Incenta Updated AD Model), we were provided with an additional two versions of the models (**ACIL Allen and ATCO Second Update AD Model** and **Incenta Second Update AD Model**).

1.5 Report structure

This report is structured as follows:

- Section 2 provides an overview of the ACIL Allen and Incenta model updates, a brief recap of the scenarios and an overview of the updated approach to estimating AD within the respective models.
- Section 3 discusses some key methodological issues identified within the ACIL Allen and ATCO Updated model.
- Section 4 details our assessment and conclusions of the model review.

8 ACIL Allen, *Future of Gas: Scenario development and modelling for the ATCO gas distribution system*, Report to ATCO Gas Australian Pty Ltd, 7 June 2024. Available at: https://www.erawa.com.au/cproot/24106/2/10.102-Future-of-Gas-Report-ACIL-Allen.pdf

9 Incenta Economic Consulting, *ATCO depreciation for AA6 – Response to the ERA Draft Decision*, Report for ATCO, June 2024. Available at: https://www.erawa.com.au/cproot/24107/2/10.103-Accelerated-Depreciation-Incenta-Report.pdf

10 ATCO, *Accelerated Depreciation – Modelling Guidelines, Assumptions & Sensitivities: Draft Decision Response 2025-29*, 10 June 2024. Available at: https://www.erawa.com.au/cproot/24108/2/10.104A-Accelerated-Depreciation-Modelling-Handbook.pdf

2 Model updates, scenarios and updated AD estimation

The following section includes:

- A brief recap of the four scenarios modelled.
- A brief overview of the ACIL Allen and Incenta model updates.
- An overview of the updated approach to estimating AD within the ACIL Allen and ATCO model and Incenta models respectively.

2.1 Scenarios

In concert with ATCO and a group of ATCO's stakeholders, four scenarios were developed for which demand forecasts were produced. The four scenarios and their defining characteristics have not changed from the initial model and proposal. Table 1 below provides a brief overview of the four scenarios.

Table 1: ACIL Allen *Future of Gas* scenarios

Scenario	Characteristics
Hydrogen Future	"*Under the Hydrogen Future scenario, rapid learning rates relating to green hydrogen and renewable gas production enable these gases to displace natural gas domestically and internationally. The resulting green hydrogen industry mirrors the current natural gas and LNG industries with a broader high-volume export focus enabling the economic servicing of a smaller domestic market*" [11]
Electricity Dominates	"*Under the Electricity Dominates scenario, renewable electricity generation and storage experience a rapid reduction in cost through fast technological learning … the relative cost of electricity against natural gas and renewable gases falls to such an extent that a broad-based electrification of industry and households occurs*" [12]
Energy Hybrid	"*Under the Energy Hybrid scenario, technical learning rates for renewable gases and electrification develop similarly, resulting in some customers electing to electrify and some remaining on the gas network. From an economic and environmental point of view, electricity and zero emissions gases become viable alternatives for natural gas. This results in a mixed response from residential/commercial and industrial consumers, with an even split electing to follow electrification or to stick with a gas-based energy supply chain*" [13]

[11] ACIL Allen 2024, *Future of Gas*, p.10.

[12] ACIL Allen 2024, *Future of Gas*, p.12.

[13] ACIL Allen 2024, *Future of Gas*, p.14.

Natural Gas Retained	*"Under the Natural Gas Retained scenario, global and local factors result in natural gas being retained in the ATCO network, broadly in line with medium-term expectations … Zero-emissions gases such as green hydrogen or renewable methane experience slow technological learning rates … remaining uneconomic at scale … natural gas continues to be embraced as a 'transition fuel' used in large volumes … carbon emissions intensity … reduce significantly through rapid technological learning relating to carbon capture and storage CCS/CCUS and improved access to adequate and affordable carbon offset options"* [14]

Source: ACIL Allen 2024, Future of Gas.

At a high-level, these four scenarios are reasonable, and all represent plausible future states-of-the-world that are appropriate for estimating potential asset stranding risk.

A critique of these scenarios outlined in our initial model review[15] was that a range of inputs – most notably retail electricity and gas prices – did not reasonably reflect the scenarios and the range of potential gas demand outcomes over the modelling period. A number of our concerns from the initial model review were addressed in the ACIL Allen and ATCO Updated AD Model. However, after issues relating to the calculation of the retail gas price in the ACIL Allen and ATCO Updated AD Model were identified and rectified in the ACIL Allen and ATCO Second Update AD Model, the demand forecasts for Electricity Dominates, Energy Hybrid and Hydrogen Future converged significantly.

Consequently, this raises issues as to the alignment of the demand forecasts and the scenario definitions. These issues are further detailed and discussed in Sections 4.1 and 4.2.

Scenario probabilities

As noted in our initial model review[16], ACIL Allen concluded that each scenario represents a plausible future, but the relative probability of each scenario occurring is unknown. For this reason, ACIL Allen concluded that deriving an AD allowance based on a weighted average of results or based on an identified central case is not feasible. We still consider this a reasonable conclusion.

Instead, in the initial modelling and proposal ACIL Allen recommended AD that was halfway between the Electricity Dominates scenario and the Natural Gas Retained scenario, on the basis that these scenarios represent the bounds of those three scenarios that cluster closely together. We concluded in the *Modelling Review*[17] that recommending an amount for AD that is based on outcomes for those scenarios that are most closely clustered was a reasonable approach. However, as detailed in Section 2.4 below, ACIL Allen and ATCO have updated how they estimate AD, including now attempting to estimate stranded asset risk under each of these scenarios as opposed to shifting depreciation to maintain constant annual average tariffs.

Our assessment of ACIL Allen and ATCO's (and Incenta's) approach to estimating stranded asset risk and AD is discussed in Section 3.5 and assessed in Section 4.3. The implications of this approach and our assessment for the scenarios are respectively detailed in Sections 3.4 and 4.2.

14 ACIL Allen 2024, *Future of Gas*, p.15.

15 Frontier Economics 2024, *ATCO Accelerated Depreciation Modelling Review*.

16 Frontier Economics 2024, *ATCO Accelerated Depreciation Modelling Review*.

17 Frontier Economics 2024, *ATCO Accelerated Depreciation Modelling Review*.

2.2 The ACIL Allen and ATCO Updated AD Model

The initial ACIL Allen model, including the overall approach to estimating accelerated depreciation (AD), has been updated for ATCO's revised access arrangement proposal. While the ACIL Allen Updated Report does not directly respond to any of the recommendations made in our previous report[18], some of the updates in the overall approach are consistent with recommendations that we made.

The ACIL Allen and ATCO Updated Model now consists of two integrated components:

1. A consumer choice (switching) model, developed by ACIL Allen.
2. A Post Tax Revenue Model (PTRM), developed by ATCO Gas Australia.

The ACIL Allen and ATCO Updated Model is similar to the initial ACIL Allen model in many ways. It consists of an Excel-based consumer choice (switching) model. The purpose of the model remains to assess the impact of each scenario on the gas distribution system. The model does this by forecasting demand for ATCO's gas distribution services over the long term in each scenario.

At a high-level, the ACIL Allen and ATCO Updated Model maintains the same approach as the initial model. That is, demand forecasts are derived for a given scenario by separately estimating customer numbers (split into new connections and disconnections) and average consumption per connection on an annual basis, and calculating total demand from these figures.

Forecasts for both customer numbers and average consumption are split between residential customers (one tariff class), commercial customers (two tariff classes), and industrial customers (two tariff classes). The modelling approach still estimates a net present value (NPV) of switching from gas to electricity based on the differences in appliance costs and energy prices between gas and electricity for residential customers (B3) and smaller commercial customers (B2). An S-curve logistic function is then utilised to estimate disconnections and new connections in each year, accounting for a '*non-appliance cost-related rate of connection and disconnection*'[19]. Customer numbers for larger commercial customers (B1) and industrial customers (A1 and A2) are still assumed to move in line with movements in the total number of residential customers.

Average consumption per customer (measured in gigajoules per connection) is still driven by changes in the price of gas and an estimated price elasticity of gas (estimated in a separate model). However, it is also driven now by the product of an assumed projected trend in consumption per capita and an assumed decay rate of the projected trend that was not included in the initial model. Average consumption is also now fixed until 2029 (inclusive) to ensure that consumption forecasts are consistent with those estimated and published by Core Energy as part of the broader AA6 pricing submission[20]. Additionally, average consumption per customer estimates are no longer weather-corrected in the ACIL Allen model as the Core Energy forecasts are already weather-normalised.

While the ACIL Allen and ATCO Updated Model is similar to the initial model in many ways, there are also significant updates to the approach within the ACIL Allen and ATCO Updated Model. The ACIL Allen and ATCO Updated Model now works in an iterative way. That is, there is a feedback loop between the retail prices being produced by the ACIL Allen and ATCO Updated Model and

18 Frontier Economics, *ATCO MWSW GDS Accelerated Depreciation Modelling Review*, A report for the Economic Regulation Authority, 26 March 2024.

19 ACIL Allen 2024, *Future of Gas*, p.32.

20 Core Energy, Gas Demand Forecast, 10 June 2024, https://www.erawa.com.au/cproot/24099/2/05.101-Gas-Demand-Forecast-Report-CORE-Energy.pdf

the customer number and consumption forecasts produced by the ACIL Allen and ATCO Updated Model. This change is consistent with Recommendation 1 from our previous report.[21]

The ATCO Draft Decision Response details how this feedback loop operates within the modelling[22]. At a high-level, the model is now constructed such that:

- Initial prices are set for ATCO's AA6 period based on the data for ATCO's response to the ERA's draft decision.
- The consumer choice (switching) model runs to determine demand in each year. The demand forecast for each year is based on the price determined in the PTRM model for the prior year, to avoid circularity in the model.
- Capex and opex forecasts are amended according to the number of connections and the customer base.
- A new price for each year is calculated using the PTRM framework based on the demand forecast from the consumer choice (switching) model.

The ACIL Allen and ATCO Updated Model also includes the functionality of an assumed retail price cap for residential (B3) customers. In the ACIL Allen and ATCO Updated Model, the price cap is set at 1.5 times the 2029 retail price, as defined by the AA6 draft decision. The rationale for the inclusion of the price cap is stated in the ACIL Allen Updated Report which notes, "*in scenarios where customer numbers and demand decline significantly, gas distribution tariffs and retail prices rise to unreasonable levels. Applying a gas retail price cap overcomes this; the gas retail price cap constrains the gas distribution tariffs*" [23]. In the Incenta Updated AD Model, the price cap is set at 2 times the 2029 retail price. The price cap is discussed further in Section 3.2.

Another feature of the ACIL Allen and ATCO Updated Model is significantly revised parametrisation of the S-curves, including different parametrisations of S-curves across the scenarios. The S-curve approach and the update to the application of the S-curve is further discussed in Section 3.3.

Importantly, the forecasts for both customer numbers and average consumption produced in the ACIL Allen model now feed into a PTRM model developed by ATCO – which includes a whole new approach to estimating stranded asset risk and AD allowances (detailed in Section 2.4 below). This is in contrast to the previous building block PTRM approach included in the initial ACIL Allen model which was set up to calculate AD to ensure a constant annual average tariff in real terms that in-turn provided the same present value of revenue as the average annual tariff. The ACIL Allen and ATCO Updated Model does not seek to solve for a specific AD amount.

In addition to the significant changes already noted, a number of other changes were made to the ACIL Allen and ATCO Updated Model. Some of these changes include:

- New appliance capital cost estimates.
- New average appliance consumption estimates.
- Revised local government area socioeconomic class designations.
- Updated capex profiles.

[21] Frontier Economics, *ATCO MWSW GDS Accelerated Depreciation Modelling Review*, A report for the Economic Regulation Authority, 26 March 2024, p. 55.

[22] ATCO 2024, *Accelerated Depreciation – Modelling Guidelines, Assumptions & Sensitivities*, p.2,

[23] ACIL Allen 2024, *Future of Gas*, p.23.

- A new (additional) opex reduction factor (applied where the annual customer base reduction exceeds 40,000).
- Rebates under the Electricity Dominates and Energy Hybrid scenario that reduce the appliance and installation cost of electric appliances (to reflect general policy factors).

Finally, it should be noted that in response to several comments in our previous report – notably with respect to the methodology applied to industrial customers and the consideration of the impacts of residential rooftop solar photovoltaic (and other distributed energy resources) – ATCO responded that "*incorporating complexity into the model was not reasonable given particular data [was] not available to build into the model but [sic] making the conscious choice of keeping the modelling outcomes simplified ...To address the matters raised by Frontier and the ERA, the model utilises sensitivities as proxies to account for items such as how 'rooftop solar systems may affect customer gas demand*".

2.3 The Incenta Updated AD Model

The Incenta Updated AD Model is built upon the ACIL Allen and ATCO Updated Model.

Utilising key outputs of the PTRM developed by ATCO, and therefore by extension the outputs of the ACIL Allen consumer choice (switching) model, Incenta develops its own macros and calculations with the requisite functionality to estimate potential stranding loss [asset stranding risk] and AD [preliminary] results[24] for different tilt factors, price caps and scenarios – both discounted and undiscounted.

Incenta's approach to estimating asset stranding risk and AD is different to that utilised in the ACIL Allen and ATCO Updated Model. The Incenta approach is discussed in Section 2.5 below.

2.4 Updated approaches to AD estimation – ACIL Allen and ATCO

The ACIL Allen and ATCO Updated Model includes a new approach to estimating AD.

The initial model was underpinned by an approach to estimating AD based on maintaining a constant annual average tariff in real terms, that in-turn provided the same present value of revenue as the average annual tariff. Under this approach, a proposed amount of AD was a direct output of the model (i.e., that amount of AD that delivered constant annual average tariffs in real terms).

The new approach to determining an AD amount is now separate from the ACIL Allen and ATCO Updated Model. Rather than an output of the model being an amount of AD, the amount of AD is an input into the model and the model determines the consequences of that amount of AD for key model outputs (such as retail prices, forecast demand and asset stranding risk). The amount of AD input into the model is specified using a tilt factor, which is addressed in Section 4.3).

As detailed in the ATCO Draft Decision Response[25], ATCO's revised approach to estimating AD schedules involves:

- Developing the projected annual gas demands from 2025 to 2074 for the four separate scenarios (this is the output from the ACIL Allen consumer choice (switching) model).

[24] It should be noted that Incenta state their results are preliminary results, noting that "*We [Incenta] have not in the time that has been available been able to subject these results to a robust series of checks as we ordinarily would, and hence we describe the results as preliminary results*".

[25] ATCO 2024, *Accelerated Depreciation – Modelling Guidelines, Assumptions & Sensitivities*, p.2,

- Determining the current asset base, the remaining asset lives, and the proposed new assets expenditure and lives and opex associated with each of the four scenarios.
- Calculating the revenue and depreciation schedules associated with the underlying demand and expenditures under the four separate scenarios via an integrated model that links ACIL Allen modelling to the ATCO PTRM model.
- Applying a price cap to retail prices to limit prices to plausible levels.
- Calculating asset stranding risk.
- Applying a tilt factor to the straight line depreciation schedule to bring forward some depreciation into AA6 (with the tilt factor continuing to apply in the model beyond AA6).

That is, the updated approach is no longer one related to an implied price path that is constant in real terms but is instead calculated via the application of a depreciation schedule that can be altered (advanced or deferred relative to straight line depreciation) based on one factor (i.e. the tilt factor).

A fundamental and notable characteristic of the ACIL Allen approach to AD estimation is their definition and measurement of the asset stranding risk. As borne out in Section 5.3 of the ACIL Allen Updated Report, asset stranding risk is measured as the residual regulated asset base (RAB) in 2074[26] (the last year of the modelling period).

Table 5.1 of the ACIL Allen Updated Report details the residual RAB in 2074 under the four scenarios. For each of the four scenarios, the residual RAB in 2074 is reported under standard straight-line depreciation and with AD with tilt factors of 1%, 2%, 3%, 4% and 5%.

Based on these figures, and using its discretion, ACIL Allen subsequently considers using a tilt-value of 2% as a reasonable trade-off in reducing asset stranding risk (in the two scenarios they identify as having stranded asset risk) while resulting in only relatively modest cost increases for consumers.[27]

2.5 Incenta updated AD estimation approach

Incenta's approach to calculating stranded asset risk differs from ACIL Allen and ATCO's. Incenta measures asset stranding risk as the sum of the:

- Under-recovery of the *Cost of Service* whilst operating; and
- Unrecovered RAB in the year the network is closed ('stranded').

2.5.1 Incenta's calculation of under-recovery of *Cost of Service*

Incenta calculates the amount of under-recovery of the *Cost of Service* whilst operating as:

- The sum of *Cost of Service* over the period from 2025 (the beginning of AA6) until the end of the modelling period (which is 2074); less
- The sum of *Total Tariff Revenue* over the period from 2025 until the end of the modelling period (which is 2074).

Both of these amounts relate to ATCO: the *Cost of Service* is ATCO's cost of service, and the *Total Tariff Revenue* is ATCO's tariff revenues from all customers.

26 ACIL Allen 2024, *Future of Gas*, pp.38-43.

27 ACIL Allen 2024, *Future of Gas*, p.43.

Total Tariff Revenue falls below the *Cost of Service* in years where the uncapped retail gas price is in excess of the assumed cap on the retail price of gas (i.e. where the retail gas price cap binds). The implication is that where the retail gas price cap binds, the revenue shortfall is borne entirely by ATCO, as operating costs in the value chain need to be covered first.

Cost of Service

Cost of Service for each year is calculated as the sum of allowances for opex, depreciation, return on asset, return on working capital, tax and imputation credits in that year. The *Cost of Service* amount includes an amount for depreciation. The amount for depreciation depends on the depreciation approach specified in the model:

- The model can be run with straight-line depreciation, which is the setting used by Incenta to determine the under-recovery amount with no AD.
- The model can also be used with accelerated depreciation with a specific tilt factor, which is the setting used by Incenta to determine the under-recovery amount with a 2% and 5% tilt factor respectively.

Total Tariff Revenue

Total Tariff Revenue is calculated for each year as:

- The sum of revenue for each tariff class (tariff classes A1, A2, B1, B2, and B3) in that year. For each tariff class, revenues are calculated by multiplying chargeable quantities by the appropriate charge. For instance, for B3 customers, total annual revenue for each year is calculated as:
  - The Fixed Charge for the year multiplied by the total number of customers in that year.
  - Usage Rate 1 for the year multiplied by the total quantities for that usage band (being the first 9.855 GJ per annum for each customer) in that year.
  - Usage Rate 2 for the year multiplied by the total quantities for that usage band (being usage in excess of 9.855 GJ per annum for each customer) in that year.

The rates for this revenue calculation are based on the previous year's reference tariff, adjusted by the absolute value of the x-factor.

- The rule used to calculate which x-factor is to apply is as follows:
  - Calculate a percentage difference by dividing *Cost of Service* by lagged *Total Tariff Revenue*, and subtracting one:
    - *Cost of Service* is the sum of the building block components, as discussed above. If the model is used with AD, then the depreciation building block component is depreciation with AD.
    - Lagged *Total Tariff Revenue* is based on the product of the **prior year's** tariffs and the current year's chargeable quantities. The prior year's tariffs are tariffs that have been capped (if the cap binds). The current year's chargeable quantities are based on the results of ACIL Allen's customer modelling for the current year.
  - If that percentage increase is less than the x-factor implied by capped retail prices, then that percentage increase is the relevant x-factor for the year.
  - If that percentage increase is greater than the x-factor implied by capped retail prices, then the x-factor implied by capped retail prices is the relevant x-factor for the year.

The x-factor for each year depends on the *Maximum allowed B3 distribution price increase to keep within price cap (%)* [for B3 customers], which is measured in $/GJ, and the *Average B3 Distribution Gas Charge* for the **prior year**, which is also measured in $/GJ.

The effect of this rule is to ensure that network tariffs increase to ensure that *Total Tariff Revenue* matches *Cost of Service*, unless this would cause retail prices to increase above the assumed retail price cap, in which case network tariffs can only increase by an amount that would keep retail prices no higher than the retail price cap.

The chargeable quantities used to calculate total annual revenue for each year are based on the following:

- The total number of customers in each year, which is based on the results of ACIL Allen's customer modelling for that year. The price input into this customer modelling is the price having regard to the operation of the price cap.
- Total usage in each year, which is calculated by multiplying the total number of customers for that year by consumption per customer for that year. Consumption per customer is based on the results of ACIL Allen's customer modelling for that year.
- The split between usage bands, which is hard pasted into the model.

2.5.2 Incenta's calculation of unrecovered RAB

Incenta's calculation of the unrecovered RAB is straightforward. Unrecovered RAB is simply reported as the closing RAB in the year in which the network is 'closed' (stranded). That is, where a scenario with a given set of inputs (e.g. tilt factors, opex reduction factors etc.) does not result in the closure of the network, the unrecovered RAB is zero. This is in contrast to the ACIL Allen and ATCO residual RAB approach, which proxies stranded asset risk as the residual RAB in 2074 (the last year of the modelling period), regardless of whether the network is still operating.

3 Updated Model Review – Methodology

This section discusses some key methodological issues identified during our review of the ACIL Allen and ATCO Updated Model. As detailed in Section 2.3, this is also the model that underpins Incenta's stranded asset risk and AD allowance modelling and calculations.

As noted in Section 0, our approach to this review was to focus on the most material components of the models, informed by our review and knowledge of the previous models. A full audit and review of the integrated ACIL Allen and ATCO Updated Model was not undertaken, and consequently a full review of inputs and assumptions was also not undertaken. This is largely due to time constraints, a factor exacerbated by the increased size and complexity of the updated model.

3.1 Methodological issue – retail gas prices

Our review of the ACIL Allen and ATCO Updated Model identified an issue with the way that retail gas prices were calculated in the model.

As discussed, the ACIL Allen and ATCO Updated Model includes a retail price cap for B3 customers (which is set at 1.5 times the 2029 retail price). We observed the issue with retail gas prices when reviewing the implementation of the retail price cap. When the price cap binds the annual increase in distribution tariffs is calculated with reference to both the *Average B3 distribution gas charge* (row 63 in *Price_path_AA6* sheet) and the *Residential Retail gas price* (row 64 in *Price_path_AA6* sheet). This is necessary to ensure distribution tariffs do not increase to such an extent that the retail price cap is breached.

In reviewing this part of the ACIL Allen and ATCO Updated Model, we observed that in the long-term (after 2053) the calculated distribution gas charge is larger than the calculated retail gas price. This was occurring because the distribution gas charge and the calculated retail price cap are calculated in different ways:

- The distribution gas charge is an average charge that is calculated based on an annual gas consumption that declines over time. This decline over time in annual gas consumption is due to the assumptions included within the model.
- In contrast, the residential retail gas price is an average price that is calculated by converting fixed retail costs into a variable gas price on the basis of an assumption of constant annual gas consumption of 13.4 GJ/annum.

Over time, the difference in the annual gas consumption used to calculate the distribution gas charge and the residential retail gas price increases, with the effect that the residential retail gas price is significantly understated, with respect to the distribution gas charge. In turn, this means that the extent to which the retail gas price cap binds is also significantly understated, with respect to the way that the distribution gas charge is calculated.

We submitted a question to ATCO about this aspect of the ACIL Allen and ATCO Updated Model. In response we received a revised version of the model (ACIL Allen and ATCO Second Update AD Model) and subsequently also received a revised version of the Incenta model (Incenta Second Update AD Model). These amended models included changes to ensure that the residential retail gas price is calculated on a consistent basis, using the same annual gas consumption that is used to calculate the distribution gas charge.

This change resulted in material changes to the results of the models. This means that the results presented in the ACIL Allen Updated Report, the Incenta Updated Report and the ATCO Draft Decision Response do not reflect the results in the ACIL Allen and ATCO Second Update AD Model and the Incenta Second Update AD Model.

We have not been provided with updated versions of the reports to accompany the ACIL Allen and ATCO Second Update AD Model and the Incenta Second Update AD Model, but have ourselves used the secondary versions of the updated models to update some of the key results presented in the updated reports, as discussed in more detail in Section 4.

3.2 Methodological issue – gas price cap

As discussed, the ACIL Allen and ATCO Updated Model includes an assumed retail price cap for residential (B3) customers. In the ACIL Allen and ATCO Updated Model, the price cap is set at 1.5 times the 2029 retail price, as defined by the AA6 draft decision. In the Updated Incenta version of the model, the price cap is set at 2 times the 2029 retail price.

We note that tying the price cap to the 2029 retail price does mean that the price cap can change with the level of AD – since AD can increase network tariffs – and therefore retail tariffs – during AA6, it can also lead to an increase in the price cap. This is acknowledged in the ACIL Allen Updated Report.[28] We are not sure why the price cap – which is intended to prevent retail prices rising to "unreasonable levels" – would be expected to vary depending on the level of AD. Our view is that it would be more sensible for the price cap to be fixed, regardless of the level of AD. Nevertheless, tying the price cap to the 2029 retail price has a relatively small effect on the level of the price cap: the ACIL Allen Updated Report notes that the price cap is $50.12 with straight line depreciation and $52.40 with AD with a 2% tilt.[29] We observed a similar sized impact using the ACIL Allen and ATCO Second Update AD Model when using a 2% tilt in the Electricity Dominates scenario.

We also note that the price cap does not vary over time and does not vary by scenario. While there are good reasons to think that willingness to pay will vary over time or vary by scenario, it is important to recognise that the assumptions that drive switching decisions do vary over time and vary with scenario, and that this is the reason that the model delivers different forecasts of gas demand in each scenario. It is not clear that there is a need to also vary the price cap between scenarios or over time to meaningfully give effect to the scenarios.

3.3 Methodological issue – S-curve calibration

One of the critical methodological components of the ACIL Allen 'switching' model, is the use of an S-curve logistic function to determine the probability of switching from gas appliances to electrical appliances. This methodological decision and feature of the model is of central importance. The shape of the S-curve function – in particular, it's location relative to relative costs and its steepness – is one of the most important factors in determining the number of customers connecting and disconnecting to the gas distribution network over time and across scenarios. The use of an S-curve logistic function for this purpose is the same approach as used in the initial modelling by ACIL Allen.

To recap, the ACIL Allen model assumes that customers have switching decisions every 15 years (at the end of the gas appliances' life). The switching decision is modelled as an absolute decision – if a customer switches from gas appliances to electricity appliances, the household fully

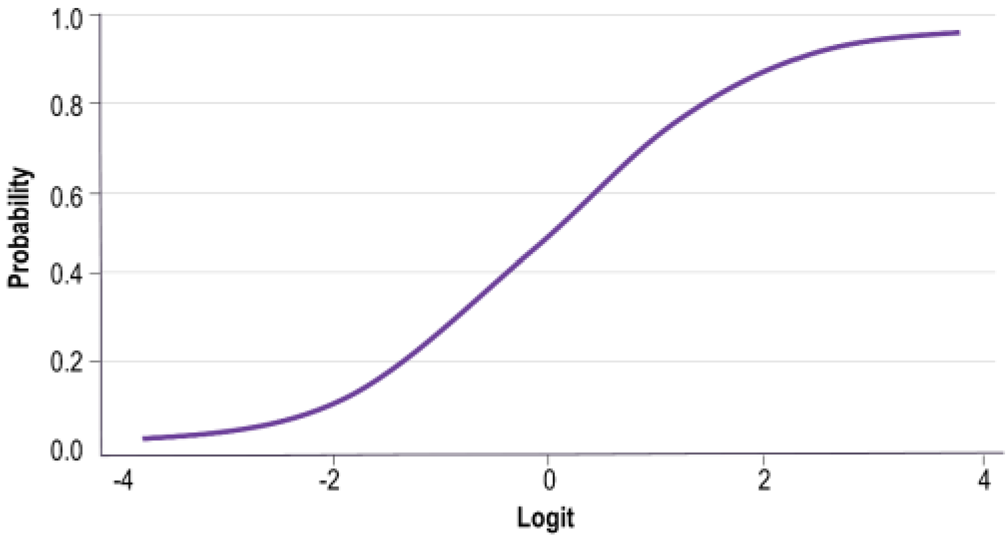
28 ACIL Allen 2024, *Future of Gas*, p.24.

29 The impact of AD on the price cap is the same in each scenario, since the retail gas price in 2029 is also the same in each scenario.

electrifies, gas network disconnection occurs, and gas consumption ceases. Separate S-curve logistic functions are used for residential and commercial customers and separate calculations are made regarding customer connection decisions and customer disconnection decisions.

Essentially, what the ACIL Allen model does is convert the NPV of switching from gas to electricity into a relative measure of utility in each year (for connecting to the gas network or disconnecting from the network) which is transformed in turn into a probability of connecting or disconnecting using this logistic function, as illustrated in Figure 1. This probability then determines the number of those customers that *are able to* disconnect or connect in any year that actually *do* disconnect or connect.

Figure 1: ACIL Allen S-curve logistic function



Source: ACIL Allen, Future of Gas Updated, p.20.

Our understanding is that the S-curve function designed by ACIL Allen is calibrated by:[30]

- Selecting the NPV corresponding to 100% of users connecting to gas and the NPV corresponding to 100% of users connecting to electricity;
- Solving for the relative utility where there is less than one disconnection (for disconnection S-curve parametrisation) and where there is less than one connection (connection S-curve parametrisation);
- Dividing the relative utility value by the range between the bottom and upper bound of the NPV to calculate the NPV coefficient; and
- Calculating the intercept term by subtracting the relative utility calculated by the product of the NPV where households do not switch and the implied NPV coefficient.

As noted in our previous report, in our view adopting an S-curve approach is a reasonable method for modelling gas network connections and disconnections. Fundamentally, S-curves are intended to represent the diffusion of a given technology or innovation. However, S-curve modelling requires several critical assumptions and ‘judgement calls’. One of the most important ‘judgement calls’, both in the ACIL Allen model and S-curve modelling more generally, is the S-curve parametrisation. That is, the ‘end-points’ of the S-curves (which can also be thought of as the NPV at which 100% of users connect/disconnect to/from the network).

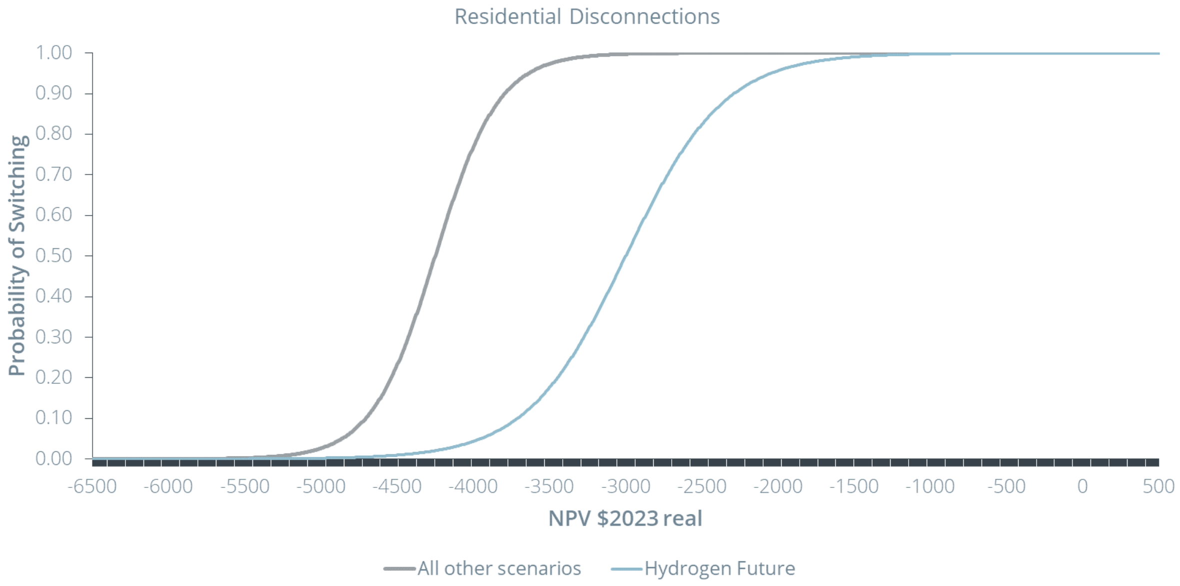
30 ACIL Allen 2024, *Future of Gas*, pp.18-19.

Figure 2 and Figure 3 provide a visual representation of the S curve logistic functions utilised in the ACIL Allen and ATCO Updated AD Model for residential customers.

Figure 2 shows the S-curves that calculate the probability of residential customers disconnecting from the gas network across the four scenarios. Focusing on the Hydrogen Future S-curve, our understanding – informed by discussions with ACIL Allen and ATCO – is that this S-curve implies a probability of disconnecting from the gas network of about 50% for customers that would be $3,000 in NPV terms *worse off* by disconnecting, and a probability of disconnecting of about 100% for customers that would be $1,000 in NPV terms *worse off* by disconnecting.

For the other three scenarios, each of which have the same S-curve, the S-curve logistic function suggests an even higher probability of disconnecting – about 50% for customers that would be well over $4,000 in NPV terms *worse off* by disconnecting. The S-curves for the Electricity Dominates, Natural Gas Retained and Energy Hybrid scenarios also imply a probability of disconnecting of about 100% for customers that would be $3,000 in NPV terms *worse off* by disconnecting.

Figure 2: S-curve for residential gas disconnection – ACIL Allen and ATCO Updated AD Model



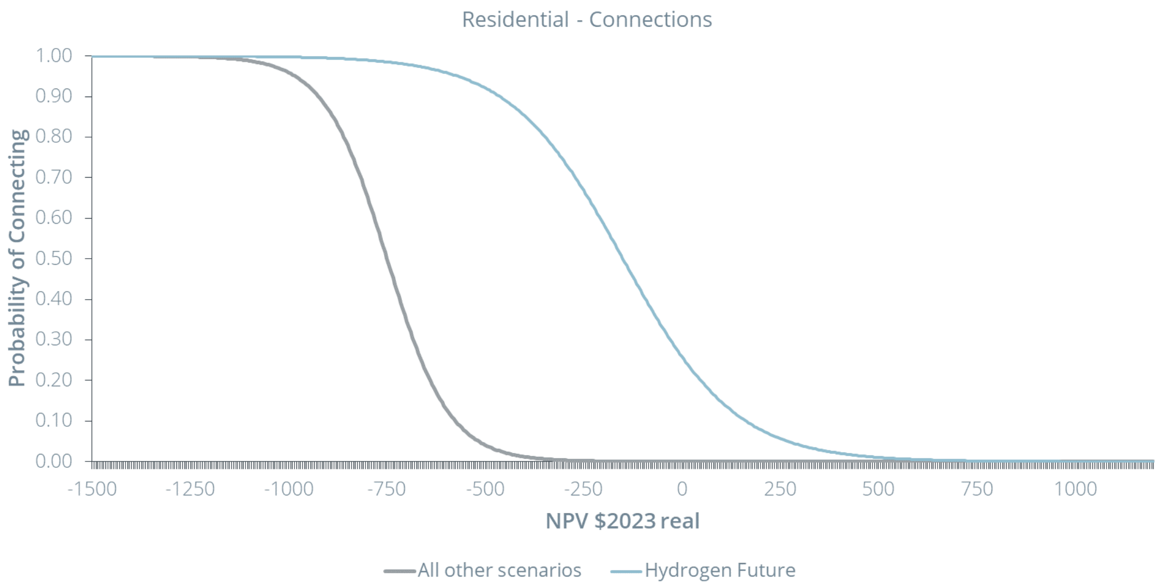
Source: Frontier Economics analysis of ACIL Allen and ATCO Updated AD Model

Figure 3 shows the S-curves that calculate the probability of new residential customers connecting to the gas network across the four scenarios.

Again focusing on the Hydrogen Future S-curve, our understanding – informed by discussions with ACIL Allen and ATCO – is that the Hydrogen Future S-curve implies a probability of connection to the gas network of about 100% for customers that would be $1,000 in NPV terms better off with gas, and a probability of connection to the gas network of about 30% for customers that would face the same NPV on gas or electricity (i.e. an NPV of switching of $0).

For the other three scenarios, the S-curve logistic function suggests a lower probability of connecting to gas, such that almost no customers facing the same NPV on gas or electricity would choose to connect to gas (seen in Figure 3 by the fact the S-curve has a probability of near-zero when the NPV is equal to $0).

Figure 3: S-curve for residential gas connection – ACIL Allen and ATCO Updated AD Model



Source: Frontier Economics analysis of ACIL Allen and ATCO Updated AD Model

We have significant concerns with the parameterisation of the S-curve. First, the way that the S-curve for residential gas disconnections has been parameterised suggests that there is a very high probability that customers would disconnect from the gas network even if doing so would make those customers worse off in financial terms. As discussed, in all scenarios other than Hydrogen Future the S-curve implies that 50% of customers would disconnect even if doing so made them over $4,000 worse off in NPV terms. It may be that there would be reasons that customers would be prepared to incur higher costs in order to disconnect from the natural gas network, but no reasons have been provided for this assumption by ACIL Allen.

Second, the model suggests quite different behaviour for existing customers and potential new customers. The way that the S-curve for residential customers is parameterised for the Hydrogen Future scenario suggests that *existing* customers that would be $1,000 better off in NPV terms on the gas network will be almost certain to disconnect from the gas network anyway, but *new* customers that would be $1,000 better off in NPV terms on the gas network will be almost certain to connect to the gas network. It is not clear why customers would make such different decisions when faced with the same NPV; indeed, if anything it might be expected that existing customers would be more likely to use gas in future than potential new customers (since existing customers have already expressed a willingness to use gas, and a potential preference for using gas).

Finally, we note that the parameterisation of the S-curve was significantly revised between the initial AD model and the ACIL Allen and ATCO Updated Model, as seen in Table 2. Because the S-curve is intended to capture the rate of adoption (in this case, the rate of disconnection of existing customers or connection of new customers) it is not clear why the parameterisation of the S-curve should need to change as a result of changes to other inputs in the model. Nevertheless, ACIL Allen did update these parameters between the initial AD model and the ACIL Allen and ATCO Updated Model. This may have been to ensure that the demand forecasts in each of the modelled scenarios aligned with the scenario descriptions provided to ACIL Allen. Nevertheless, we note that the S-curve parameters have not been revised as part of the ACIL Allen Second Update AD Model. As we discuss below, this has implications for the forecasts of demand in the scenarios for the ACIL Allen and ATCO Updated Model.

Table 2: ACIL Allen S-curve end-point parametrisation – Initial model and ACIL Allen and ATCO Updated Model ($NPV)

	Initial Model ($NPV of additional cost of using gas)		Updated Model ($NPV of additional cost of using gas)	
	Against Gas - 100% choosing electricity	For Gas - 100% choosing gas	Against Gas - 100% choosing electricity	For Gas - 100% choosing gas
Residential Connections				
Natural Gas Retained	$10,000	-$5,000	$0	-$1,500
Energy Hybrid	$10,000	-$5,000	$0	-$1,500
Hydrogen Future	$10,000	-$5,000	$1,200	-$1,500
Electricity Dominates	$10,000	-$5,000	$0	-$1,500
Residential Disconnections				
Natural Gas Retained	$6,000	-$2,000	-$2,000	-$6,500
Energy Hybrid	$6,000	-$2,000	-$2,000	-$6,500
Hydrogen Future	$6,000	-$2,000	$500	-$6,500
Electricity Dominates	$6,000	-$2,000	-$2,000	-$6,500
Commercial Connections				
Natural Gas Retained	$400,000	-$50,000	$0	-$3,000
Energy Hybrid	$400,000	-$50,000	$0	-$3,000
Hydrogen Future	$400,000	-$50,000	$0	-$3,000
Electricity Dominates	$400,000	-$50,000	$0	-$3,000
Commercial Disconnections				
Natural Gas Retained	$400,000	-$40,000	$0	-$7,000
Energy Hybrid	$400,000	-$40,000	$0	-$7,000
Hydrogen Future	$400,000	-$40,000	$0	-$7,000
Electricity Dominates	$400,000	-$40,000	$0	-$7,000

Source: Frontier Economics analysis of ACIL Allen Initial Model and ACIL Allen and ATCO Updated Model

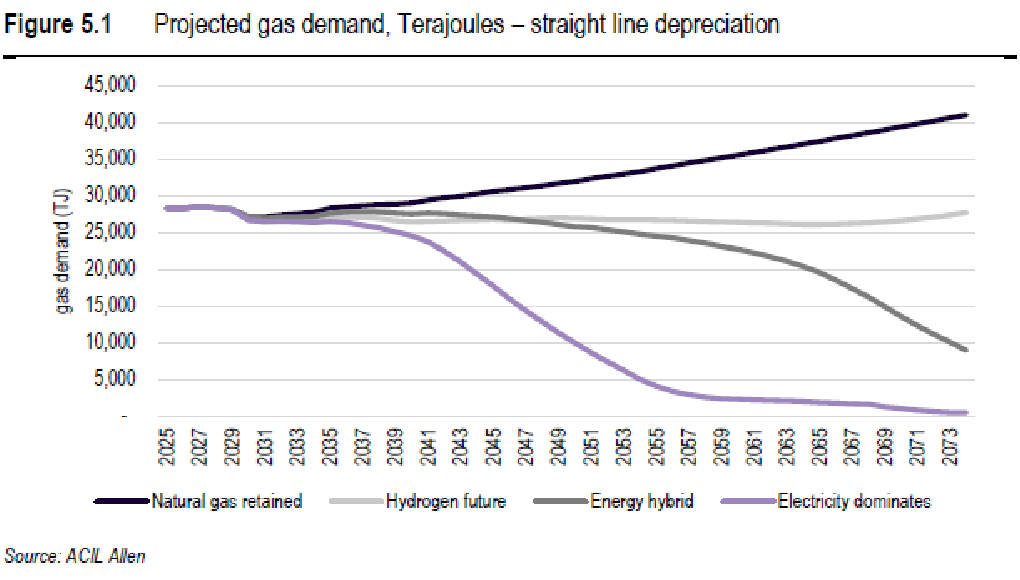
3.4 Methodological issue – relevance of scenarios

As a result of the change in the calculation of the retail gas price in the ACIL Allen Second Update AD Model, while the S-curve parameters were held constant, the ACIL Allen Second Update AD Model provides a very different set of demand forecasts for each scenario than the ACIL Allen and ATCO Updated Model.

The demand forecasts in the ACIL Allen and ATCO Updated Model, as reported in the ACIL Allen Updated Report, are shown in Figure 4. These demand forecasts are for a case with straight line depreciation (with no AD). These demand forecasts reflect the scenarios adopted by ACIL Allen:

- Natural gas retained has continued growth in natural gas demand, reflecting this scenario being one in which natural gas is "*retained in the ATCO network, broadly in line with medium-term expectations as of the previous Access Arrangement process*".[31]
- Hydrogen future has "*rapid learning rates relating to green hydrogen and renewable gas production*" which "*will result in continued strong domestic demand [for] gas, leading to modest growth in the volume of gas sold …*".[32]
- Energy hybrid has "*some customers electing to electrify and some remaining on the gas network*", resulting in ATCO "*retaining much of its existing customer base*".[33]
- Electricity dominates has "*broad-based electrification of industry and households*" which sees "*a substantial and sustained reduction in the volume of gas sold and the number of customers*"[34] connected to ATCO's network.

Figure 4: Projected gas demand from ACIL Allen and ATCO Updated Model – straight line depreciation



Source: ACIL Allen Updated Report, page 36.

31 ACIL Allen Updated Report, page 15.

32 ACIL Allen Updated Report, page 10.

33 ACIL Allen Updated Report, page 14.

34 ACIL Allen Updated Report, page 12.

With the revised retail gas prices in the ACIL Allen and ATCO Second Update AD Model, these demand forecasts change substantially. The demand forecasts from the ACIL Allen and ATCO Updated Model and the ACIL Allen and ATCO Second Update AD Model are compared in Figure 5. As seen in Figure 5, the higher retail gas prices in the ACIL Allen and ATCO Second Update AD Model have resulted in lower demand for all scenarios:

- The Natural Gas Retained scenario from the ACIL Allen and ATCO Second Update AD Model no longer has growth in natural gas demand, and is in fact much nearer to the previous Hydrogen Future scenario.
- Both the Hydrogen Future and Energy Hybrid scenarios now see significant declines in natural gas demand, almost to zero. These scenarios are now much nearer to the previous Electricity Dominates scenario.
- The Electricity Dominates scenario is the scenario that is most similar to its previous version. Demand in the Electricity Dominates scenario follows a very similar trajectory to the previous version of the Electricity Dominates scenario, with the principal difference between the decline occurring around 3 years earlier than the previous version.

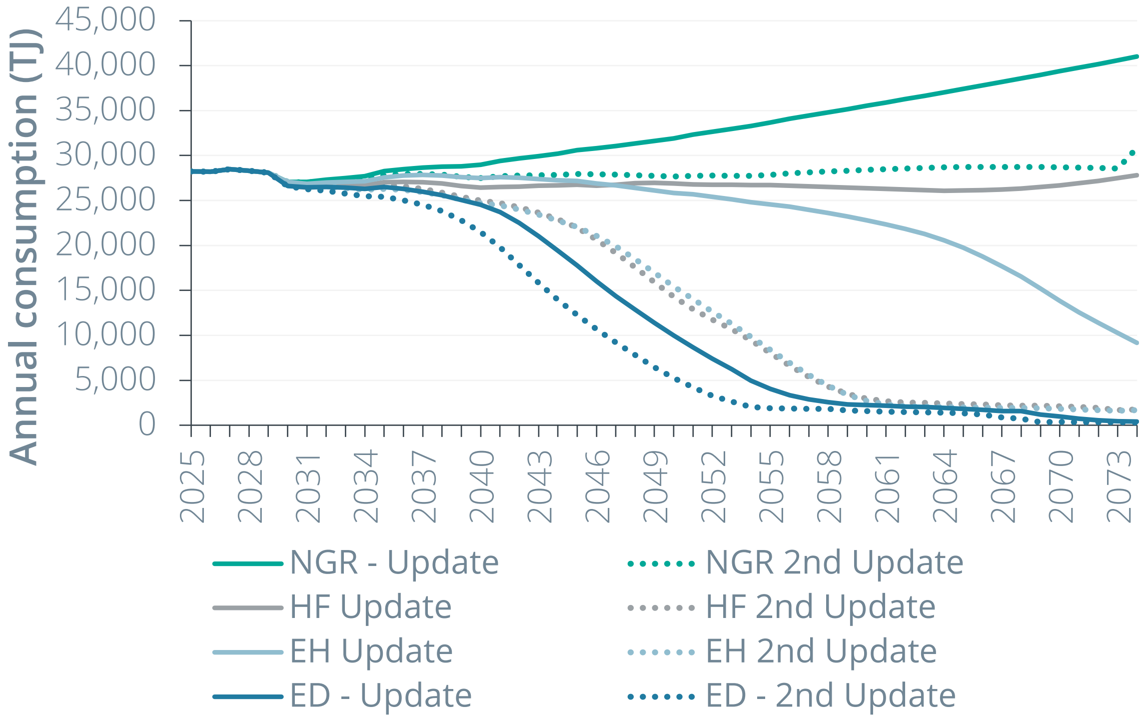
As noted in Section 2.1, there is significant uncertainty as to what future may eventuate and there are many different scenarios that could materialise in the future.

In our view, the forecasts from the ACIL Allen and ATCO Second Update AD Model for some of these scenarios can still be thought to align with the scenario definitions. For instance, demand forecasts for both the Electricity Dominates and Natural Gas Retained scenarios are changed only moderately, and can still be seen to be consistent with the general definition of these scenarios (gas demand trends to zero for Electricity Dominates and remains relatively steady for Natural Gas Retained).

Similarly, the general expectation is that the Energy Hybrid scenario would fall somewhere between Electricity Dominates and Natural Gas Retained. This remains the case in these forecasts from the ACIL Allen and ATCO Second Update AD Model, notwithstanding that there is a material change for this scenario.

However, in our view the demand forecasts from the ACIL Allen and ATCO Second Update AD Model for the Hydrogen Future scenario are more difficult to align with the scenario definition. In particular, it is not obvious that it would make sense to undertake significant capital investment in converting the network to operate on hydrogen if demand is declining to near zero, as it is forecast to do in this scenario.

Figure 5: Projected gas demand from ACIL Allen and ATCO Updated Model and ACIL Allen and ATCO Second Update AD Model – straight line depreciation



Source: Frontier Economics analysis of Updated AD Model and Second Updated AD Model

Note: While this figure compares equivalent scenarios under the same straight line depreciation approach, the forecasts from the ACIL Allen and ATCO Updated Model include a price cap of 1.5 times (which is adopted in the ACIL Allen Updated) while the forecasts from the ACIL Allen and ATCO Second Update AD Model include a price cap of 2 times (which is adopted in the Incenta Updated Report and which we adopt in Section 4).

Note: NGR – Natural Gas Retained; HF – Hydrogen Future; EH – Energy Hybrid; ED – Electricity Dominates

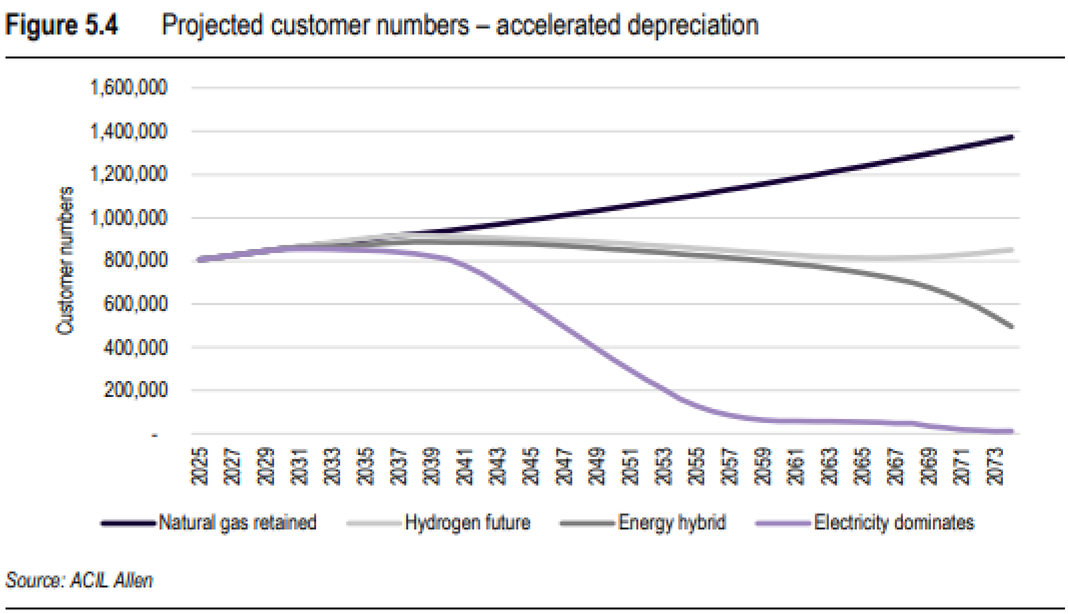
3.5 Methodological issue – ACIL Allen and ATCO AD estimation approach

As discussed in Sections 2.4 and 2.5 of this report, there is a difference in approach between the way that stranded asset risk is calculated in the ACIL Allen Updated Report and the ATCO Draft Decision Response, on one hand, and in the Incenta Updated Report, on the other hand.

Our view is that the approach to measuring stranded asset risk in the ACIL Allen Updated Report and the ATCO Draft Decision Response is problematic. In particular, the ACIL Allen Updated Report and the ATCO Draft Decision Response do not actually measure stranded asset risk. Rather, they report the residual RAB at the conclusion of the modelling period (2074) and treat that as an estimate of stranded asset risk.

Firstly, the residual RAB at 2074 does not necessarily equal the terminal RAB. For example, under the Energy Hybrid scenario, with an AD tilt of 2%, there is still a relatively substantial customer base across all five tariff categories (see Figure 6), and the network is continuing to operate (subject to the price cap). Therefore, the residual RAB may not be equal to the terminal RAB (depending on how much of this RAB can be recovered from customers post 2074 without exceeding the price cap). Despite this, the ACIL Allen Updated Report (Table 5.1) lists the residual RAB's in 2074 for each of the four scenarios modelled under standard straight-line depreciation and 5 AD scenarios[35]. ACIL Allen then goes on to conclude that "*applying accelerated depreciation with a low tilt-value of 0.01 reduces the stranded asset risk by $122 million ... for the Energy Hybrid [scenario]*"[36].

Figure 6: ACIL Allen projected customer numbers with AD tilt 0.02 – Updated Model



Source: ACIL Allen, Future of Gas Updated, p.38.

The ACIL Allen and ATCO Updated Model also does not account for the unrecovered *Costs of Service*. Our view is that the unrecovered *Cost of Service* is an important component of the stranding risk for ATCO. As detailed in Sections 2.2 and 3.1, the purpose of the retail price cap as stated by ACIL Allen is to prevent gas distribution tariffs from rising to unreasonable levels in scenarios where customers numbers and demand decline significantly. However, when estimating the asset stranding risk, the unrecovered *Costs of Service*[37] (where *Total Tariff Revenue* falls below the *Cost of Service* in years where the uncapped retail gas price is in excess of the assumed cap on the retail price of gas) are not accounted for in the estimates of stranded asset risk.

Incenta's approach to calculating stranded asset risk differs from ACIL Allen and ATCO's. Incenta measures asset stranding risk as the sum of:

- The under-recovery of the *Cost of Service* whilst operating; and
- Unrecovered RAB in the year the network is closed ('stranded').

That is, Incenta's calculation of stranded asset risk accounts for the unrecovered *Costs of Service* while still operating, as well as the RAB that is actually stranded when the network is closed (rather than the remaining RAB at the end of the modelling period). Our view is that this approach provides a better understanding of the stranded asset risk to which ATCO is exposed.

The approach adopted by Incenta leads to quite different estimates of stranding risk. Table 3 below summarises the differing results from the ACIL Allen and ATCO Updated Report and the

[35] The 5 AD scenarios consisted of tilt factors of 0.01, 0.02, 0.03, 0.04 and 0.05 respectively.

[36] ACIL Allen 2024, *Future of Gas*, p.42.

[37] Incenta calculates the amount of under-recovery of *Cost of Service* whilst operating as the sum of *Cost of Service* over the period from 2025 the beginning of AA6 until the end of the modelling period (which is 2074); less the sum of *Total Tariff Revenue* over the period from 2025 until the end of the modelling period (which is 2074).

Incenta Updated Report. (That is, the results shown below do not reflect the ACIL Allen and ATCO Second Update model changes to retail gas price calculations).

Table 3: Difference in estimated asset stranding risk – ACIL Allen and ATCO Updated Model, Incenta Updated AD Model

	Stranding risk – Straight line depreciation ($million, real 2023)	Stranding risk – Accelerated depreciation – 2% tilt ($million, real 2023)	Reduction
Energy Hybrid			
ACIL Allen	$1,200	$1,080	10%
Incenta	-	-	NA
Electricity Dominates			
ACIL Allen	$501	$397	21%
Incenta	$1,642	$1,056	36%

Source: ACIL Allen 2024, Future of Gas, p.43; Incenta 2024, ATCO depreciation for AA6 – Response to the ERA Draft Decision, p.12.

For instance, based on the ACIL Allen Updated Report, with straight line depreciation in the Energy Hybrid scenario, ACIL Allen calculates asset stranding risk of $1,200 million[38], while Incenta concludes that there is no asset stranding risk. In the Electricity Dominates scenario, ACIL Allen calculates asset stranding risk of $501 million, while Incenta calculates that there is asset stranding risk of $1,642 million.

With AD using a 2% tilt, in the Energy Hybrid scenario ACIL Allen calculates asset stranding risk of $1,080 million[39] (representing a reduction of asset stranding risk of 10%), while Incenta concludes that there is no asset stranding risk. In the Electricity Dominates scenario, ACIL Allen calculates asset stranding risk of $397 million (representing a reduction of asset stranding risk of 21%), while Incenta calculates that there is asset stranding risk of $1,056 million (representing a reduction of asset stranding risk of 36%).

3.6 Consumer surplus and producer surplus

Incenta's Updated Report included calculations of consumer surplus and producer surplus resulting from the modelling for each scenario, with and without AD.

These calculations of consumer surplus and producer surplus were not included in the Incenta Second Update AD Model, and so we have not assessed these values.

38 Although ACIL Allen does recognise that a small portion of that amount may be recovered after 2074 before the customer base disappears

39 Although ACIL Allen does recognise that a small portion of that amount may be recovered after 2074 before the customer base disappears

4 Model Review – Assessment and conclusions

Despite the issues with the ACIL Allen and ATCO Updated Model and ACIL Allen and ATCO Second Update AD Model discussed in Section 3, we consider that there are still important insights into stranded asset risk and AD that are provided by the modelling. We discuss these insights in this section.

These insights cannot be drawn directly from the ACIL Allen Updated Report, the ATCO Draft Decision Response and the Updated Incenta Report because the results from each of these reports are based on the ACIL Allen and ATCO Updated Model rather than the ACIL Allen and ATCO Second Update AD Model. As discussed, we identified issues with the calculation of the retail gas price in the ACIL Allen and ATCO Updated Model, which have been resolved in the ACIL Allen and ATCO Second Update AD Model (and the Incenta Second Update AD Model).

For this reason, in this Section we recreate what we consider to be the key results related to stranding asset risk and AD, making use of the ACIL Allen and ATCO Second Update AD Model (and the Incenta Second Update AD Model).

4.1 Scenario analysis is reasonable when considering uncertainty

An important consideration in assessing the case for AD is that there is uncertainty about future outcomes for natural gas networks. There are plausible future states of the world in which all customers leave natural gas networks, and the assets are no longer used, as well as plausible future states of the world in which customers remain on the natural gas networks (perhaps transitioning over time to using biomethane and/or hydrogen) and the assets continue to be used.

In the face of this uncertainty, our view is that scenario analysis is a useful approach for assessing the case for AD. In particular, by forecasting price outcomes, demand outcomes and stranded asset risk outcomes for four different scenarios, the ACIL Allen and ATCO Second Update AD Model provides a useful tool for understanding the implications for AD decisions in different future states of the world. While the demand forecasts for the scenarios have changed materially in the ACIL Allen and ATCO Second Update AD Model, relative to earlier versions of the model, we consider that the Electricity Dominates, Natural Gas Retained and Energy Hybrid scenarios remain useful for considering the implications of AD for customers and for ATCO.

4.2 Forecast demand in the Electricity Dominates scenario is relevant for considering asset stranding risk

As discussed in Section 3 we have significant concerns with the parameterisation of the S-curve in ACIL Allen's model. It is this S-curve that is at the heart of the customer switching model that ACIL Allen uses to forecast demand in each scenario. While we have concerns with the way that demand is forecast, we nevertheless consider that the demand forecast in the Electricity Dominates scenario (which is the scenario in which the risk of asset stranding is most relevant) represents a reasonable scenario and is a scenario that is important to consider in the context of assessing asset stranding risk.

For instance, we note that the demand forecast from the Electricity Dominates scenario (from the ACIL Allen and ATCO Second Update AD Model with straight line depreciation) is broadly in line with demand forecasts for Western Australia published in AEMO's Western Australia Gas Statement of Opportunities (WAGSOO)[40] for the *Expected scenario* and with demand forecasts for Eastern Australia published in AEMO's Gas Statement of Opportunities (GSOO)[41] for the *Step Change* scenario (the most likely scenario) as seen in Figure 7.

In the WAGSOO, AEMO identifies that the forecast decline in residential and small business gas demand (as represented in Figure 7) is driven by the assumed rate of electrification. AEMO notes that residential and small business gas demand is forecast to increase at an average annual rate of 1.2% (excluding electrification) but when the impact of electrification is accounted for this leads to an average annual rate of -1.5%.

In the GSOO, AEMO similarly identifies that electrification is a key driver of forecasts for residential and small commercial consumption (as represented in Figure 7). AEMO points to recent policy changes as contributing to the pace of electrification in its GSOO forecasts, including the Victorian Gas Substitution Roadmap and the ACT Government introducing legislation preventing new gas connections.

Therefore, it is fair to conclude that the Electricity Dominates scenario is representative of one of a number of future paths that could result in achieving net-zero (or near net-zero) emissions in 2050, featuring a shift to electrification similar to *Step Change* albeit at a slower initial rate.[42] This points to one possible explanation for Electricity Dominates representing a reasonable scenario despite our concerns about the way that the S-curve is parameterised: it may be that scenarios that result in electrification in Western Australia will be driven by policy decisions more than by the financial payoffs to individual households.

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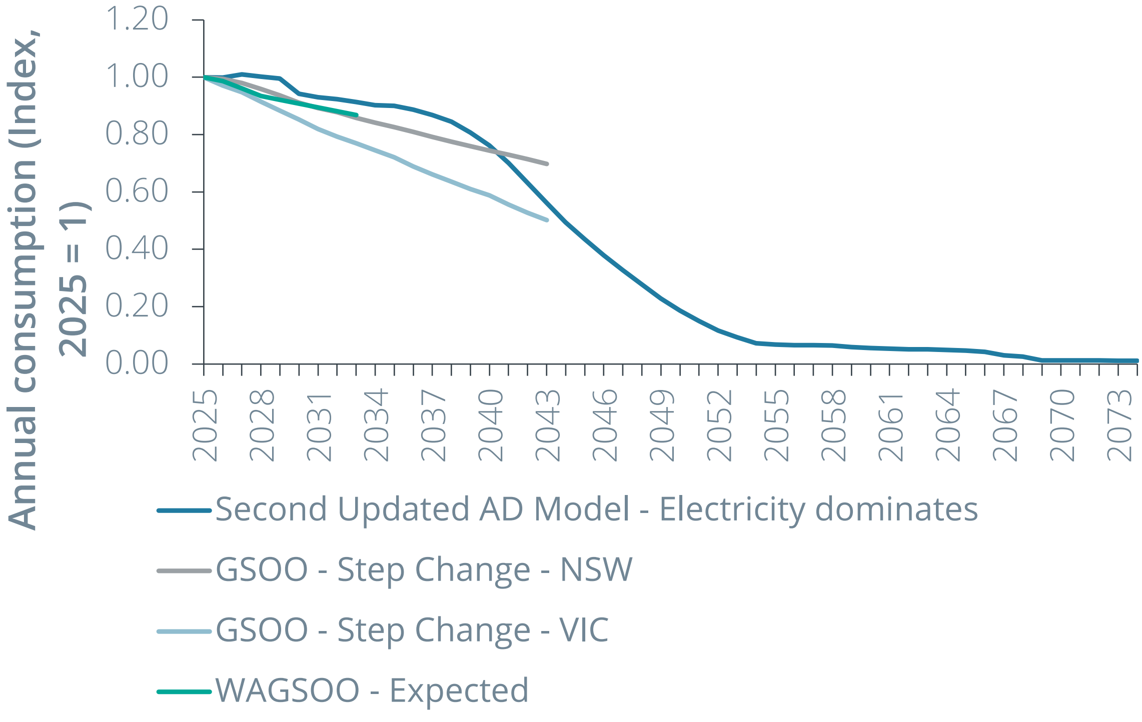
40 Australian Energy Market Operator (AEMO), *2024 Western Australia Gas Statement of Opportunities: Markey outlook to 2033*, December 2023. Available at: https://aemo.com.au/-/media/files/gas/national_planning_and_forecasting/wa_gsoo/2023/2023-wa-gas-statement-of-opportunities-wa-gsoo.pdf?la=en&hash=71B9040F2097FF4552429FF8F61C62A4

41 AEMO, *Gas Statement of Opportunities: For Australia's East Coast Gas Market*, March 2024. Available at: https://aemo.com.au/-/media/files/gas/national_planning_and_forecasting/gsoo/2024/aemo-2024-gas-statement-of-opportunities-gsoo-report.pdf?la=en

42 Noting that Step Change itself is defined as centring around limiting Australia's contribution to global temperature rises to below 2 degrees Celsius, not 1.5 – See: AEMO, *2023 Inputs, Assumptions and Scenarios Report: Final report, July 2023*. Available at: https://aemo.com.au/-/media/files/major-publications/isp/2023/2023-inputs-assumptions-and-scenarios-report.pdf?la=en

Figure 7: Comparison of demand in Electricity Dominates with WAGSOO and GSOO



Source: Frontier Economics analysis

4.3 Use of tilt approach for AD

As discussed previously, under the ACIL Allen and ATCO Updated Model (and the ACIL Allen and ATCO Second Update AD Model) an amount of AD is no longer an output of the model, but is used as an input into the model. The model determines the consequences of that amount of AD for key model outputs (such as retail prices, forecast demand and asset stranding risk). The amount of AD input into the model is specified using a tilt factor.

The tilt factor is an approach that enables an amount of depreciation to be advanced or deferred (compared to straight line depreciation) by changing a single factor (the tilt factor). As observed in the Incenta Updated Report, and confirmed in our model review, this tilted depreciation approach "meets the normal requirements for a depreciation method, specifically that the sum of the depreciation amounts over the life of the assets will equate precisely to the original cost".[43]

Our view is that the tilted depreciation approach is a pragmatic approach, which enables the use of the model to assess the impact of different amounts of accelerated depreciation in each scenario.

4.4 Updated estimates of stranding risk

The key results that we produce using the ACIL Allen and ATCO Second Update AD Model (and the Incenta Second Update AD Model) are the results originally presented in Table 1 of the Incenta Updated Report. These results present asset stranding risk – as measured using

43 Incenta Economic Consulting, *ATCO depreciation for AA6 – Response to the ERA Draft Decision*, Report for ATCO, June 2024, page 6.

Incenta's approach, which we consider a reasonable approach – for each scenario, for various AD tilt factors and for cases in which AD is applied from 2025 or delayed and applied from 2030.

Impact of taking action in AA6

The results from Incenta's Updated Report are presented in Table 4. These results show that asset stranding risk is only a material risk in the Electricity Dominates scenario. These results also show that AD with a tilt factor of 2% reduces this asset stranding risk: as noted in the Incenta Updated Report, AD with a tilt factor of 2% reduces asset stranding risk by "approximately one-third"[44]. This one third reduction in asset stranding risk is apparent whether asset stranding risk is measured on an undiscounted basis or on an NPV basis.

The equivalent results using the ACIL Allen and ATCO Second Update AD Model and Incenta Second Update AD Model are presented in Table 5. Before discussing these results, we note that a tilt factor of 2% brings about the same acceleration of deprecation into AA6, in dollar terms, in the Incenta Second Update AD Model as in the Incenta Update AD Model.

The results seen in Table 5 for the Electricity Dominates scenario are quite similar to the results presented in Incenta's Updated Report. The updated estimates of stranding risk are higher, when using the Second Update AD Models, but the impacts of AD are comparable. In particular, we continue to see that AD with a tilt factor of 2% applied from the start of AA6 reduces asset stranding risk by approximately one-third.

The results using the Second Update AD Model also show substantial risk of asset stranding in both the Energy Hybrid and Hydrogen Future scenarios, which was not evident in Incenta's Updated Report. This is because the demand forecasts for these scenarios are now much closer to the demand forecasts for the Electricity Dominates scenario than was the case using the ACIL Allen and ATCO Updated Model, as discussed in Section 3.4. Our view is that the results from these scenarios are confirming the stranding risk that occurs in scenarios with significant reductions in demand. However, it is evident from the results that a delayed reduction in gas demand (as occurs in the Energy Hybrid scenario, compared with the Electricity Dominates scenario) does result in a material reduction in stranded asset risk.

Impact of deferring action on AD

The results seen in Table 4 and Table 5 for AD deferred until the start of AA7 are also similar.

The results from Incenta's Updated Report show that deferring action on AD until AA7 reduces the amount that risk is mitigated with a tilt factor of 2% (the Incenta Updated Report notes that a tilt factor of 3% would be required from 2030 to deliver a similar level of stranding risk as a tilt factor of 2% from 2025).

The results using the Second Update AD Models also show that deferring action on AD until AA7 reduces the amount of risk that is mitigated. However, in the Second Update AD Models the impact of deferring action is greater:

- The results from Incenta's Updated Report show that applying a 2% tilt from AA7 reduces stranding risk by around 25% (compared with around 35% from applying a 2% tilt from AA6).
- The results using the Second Update AD Models show that applying a 2% tilt from AA7 reduces stranding risk by around 20%.

The reason that deferring action has greater consequences for the reduction in stranding risk using the Second Update AD Models is due to the higher retail prices produced by the Second

[44] Incenta Economic Consulting, *ATCO depreciation for AA6 – Response to the ERA Draft Decision*, Report for ATCO, June 2024, p.12.

Update Models. The higher retail prices in the Second Update Models are a function of the rectification of the issue in the ACIL Allen and ATCO Updated AD Model where the average distribution charge and the average residential retail price were calculated with reference to different average annual gas consumption figures, which resulted in understated retail gas prices (see Section 3.1). The higher retail prices, which increase over time as a result of declining average consumption in the Second Update AD Models make it more likely that the price cap will bind. This means that deferring action until AA7 increases the likelihood that the price increased caused by AD (from AA7 onward) result in the price cap binding.

Deferring action on AD also has an effect on prices for customers. Focusing on distribution prices, and using the Incenta Second Update AD Model to compare distribution prices for in the Electricity Dominates scenario using a 2% tilt, we see that deferring action on AD from AA6 to AA7:

- Initially results in *lower distribution prices* during AA6 by around 7.4% (because there is no increase in depreciation during AA6).
- Results in *higher distribution prices* during AA7 by around 3.8% (because deferral means that during AA7 a greater amount of depreciation is accelerated with a 2% tilt).

Table 4: Estimated stranded asset risk from Incenta Updated Report ($million, real 2023)

		Undiscounted			NPV		
Tilt factor	Applied from	Unrecovered COS	Unrecovered RAB at closure	Total	Unrecovered COS	Unrecovered RAB at closure	Total
Natural gas retained							
Base case	n/a	0.0	0.0	0.0	0.0	0.0	0.0
2%	2025	0.0	0.0	0.0	0.0	0.0	0.0
5%	2025	0.0	0.0	0.0	0.0	0.0	0.0
2%	2030	0.0	0.0	0.0	0.0	0.0	0.0
5%	2030	0.0	0.0	0.0	0.0	0.0	0.0
Energy hybrid							
Base case	n/a	0.0	0.0	0.0	0.0	0.0	0.0
2%	2025	0.0	0.0	0.0	0.0	0.0	0.0
5%	2025	0.0	0.0	0.0	0.0	0.0	0.0
2%	2030	0.0	0.0	0.0	0.0	0.0	0.0
5%	2030	149.3	0.0	149.3	16.2	0.0	16.2
Hydrogen future							
Base case	n/a	0.0	0.0	0.0	0.0	0.0	0.0
2%	2025	0.0	0.0	0.0	0.0	0.0	0.0
5%	2025	0.0	0.0	0.0	0.0	0.0	0.0
2%	2030	0.0	0.0	0.0	0.0	0.0	0.0
5%	2030	0.0	0.0	0.0	0.0	0.0	0.0
Electricity dominates							
Base case	n/a	1,086.4	555.5	1,641.9	166.0	58.4	224.4
2%	2025	703.9	351.9	1,055.8	104.3	37.0	141.2
5%	2025	259.2	155.7	414.9	32.6	16.4	48.9
2%	2030	833.3	373.2	1,206.5	126.9	41.1	168.0
5%	2030	593.0	210.1	803.2	90.6	26.5	117.1

Source: Incenta Updated Report, page 12.

Table 5: Estimated stranded asset risk using Incenta's approach but with Second Updated AD Models ($million, real 2023)

		Undiscounted			NPV		
Tilt factor	Applied from	Unrecovered COS	Unrecovered RAB at closure	Total	Unrecovered COS	Unrecovered RAB at closure	Total
Natural gas retained							
Base case	n/a	0.0	0.0	0.0	0.0	0.0	0.0
2%	2025	0.0	0.0	0.0	0.0	0.0	0.0
5%	2025	0.0	0.0	0.0	0.0	0.0	0.0
2%	2030	0.0	0.0	0.0	0.0	0.0	0.0
5%	2030	334.3	193.5	527.7	59.9	22.3	82.2
Energy hybrid							
Base case	n/a	773.0	0.0	773.0	118.6	0.0	118.6
2%	2025	463.6	0.0	463.6	71.4	0.0	71.4
5%	2025	147.8	0.0	147.8	20.9	0.0	20.9
2%	2030	596.6	0.0	596.6	99.7	0.0	99.7
5%	2030	497.6	289.8	787.4	149.3	52.9	202.2
Hydrogen future							
Base case	n/a	2,256.7	0.0	2,256.7	397.9	0.0	397.9
2%	2025	1,717.3	0.0	1,717.3	305.3	0.0	305.3
5%	2025	847.1	0.0	847.1	149.0	0.0	149.0
2%	2030	2,095.4	0.0	2,095.4	406.8	0.0	406.8
5%	2030	1,612.0	0.0	1,612.0	384.5	0.0	384.5
Electricity dominates							
Base case	n/a	1,154.8	619.7	1,774.5	244.6	82.0	326.6
2%	2025	760.9	391.2	1,152.2	158.5	51.7	210.2
5%	2025	354.5	181.3	535.8	72.9	24.0	96.9
2%	2030	927.1	441.2	1,368.2	216.1	64.0	280.1
5%	2030	652.0	277.5	929.6	196.3	53.0	249.3

Source: Incenta Updated Report, page 12; Frontier Economics analysis of the ACIL Allen and ATCO Second Update AD Model and the Incenta Second Update AD Model.

4.5 Conclusion

In conclusion, we consider that the ACIL Allen and ATCO Second Update AD Model and Incenta Second Update AD Model provide a more reasonable basis for assessing the impact of AD on ATCO and gas customers than the previous models provided. In particular, these models respond to the primary concern we raised in our initial view, which was that the model did not account for the impact that higher network tariffs would have on retail prices and, therefore, on customers incentives to continue to use gas.

As we have discussed in this report, we continue to have concerns about aspects of the ACIL Allen and ATCO Second Update AD Model and Incenta Second Update AD Model. In particular, our view is that the way that the S-curve is parameterised does not accord with expectations: the assumptions made imply that customers will overwhelmingly choose to switch from gas to electricity even if to do so would be to their significant financial detriment. Unfortunately, these assumptions are at the heart of the models, which means that the resulting demand forecasts and price forecasts are driven by these assumptions and, for this reason, should not be relied upon without further assessment.

We have compared the demand forecasts with other long-term forecasts of gas demand from AEMO. We found that the forecast for the Electricity Dominates scenario is comparable to scenarios forecast by AEMO and is representative of one of a number of future paths that could result in achieving net-zero (or near net-zero) emissions in 2050. For this reason, we consider that assessing the risk of asset stranding, and the impact of AD on this risk, for the Electricity Dominates scenario is appropriate. The fact that the ACIL Allen and ATCO Second Update AD Model and Incenta Second Update AD Model provide this forecast based on what we consider to be unrealistic assumptions about customers financial decisions remains unresolved. As discussed, it may be that declining demand will be driven in practice by policy decisions rather than by customers' financial decisions, or it may be that other inputs into the model mean that drivers of financial outcomes for customers are not being appropriately captured in this scenario. In either case, in our view, this highlights the importance of careful consideration of the alignment between scenarios and modelled outcomes, and careful consideration of the relevant drivers of behaviour when modelling.

We also consider that the Natural Gas Retained scenario remains a useful counterpoint to Electricity Dominates, a counterpoint that highlights the fact that stranding risk is driven by uncertainty about what the future for the gas network looks like, and that asset stranding may not occur in a future in which the gas network continues to be used. The Energy Hybrid scenario is now significantly closer to Electricity Dominates than in previous versions of the modelling, but does point to the impact on asset stranding that the timing of reduced demand can have (the decline in gas demand is delayed by around 10 years relative to Electricity Dominates).

We have used the Incenta Second Update AD Model to re-estimate asset stranding using the approach to calculating asset stranding that Incenta has proposed. We consider this to be the relevant measure of asset stranding, rather than the estimate of remaining RAB at the end of the modelling period that is used by ACIL Allen. We also consider the use of a tilt to investigate different amounts of AD is a pragmatic approach to using the model to understand the implications of AD on customers and on ATCO.

Using this measure of asset stranding, we can see that estimated asset stranding has increased as a result of the changes made in the ACIL Allen and ATCO Second Update AD Model and Incenta Second Update AD Model. Of the three scenarios we consider – Electricity Dominates, Natural Gas Retained and Energy Hybrid – the biggest change in estimated asset stranding occurs for the Energy Hybrid scenario. This is because there has been a substantial reduction in demand in this scenario, bringing the demand forecast closer to that in the Electricity Dominates scenario. The Electricity Dominates scenario has also seen an increase in asset stranding, but the difference is smaller because the change in demand in this scenario was smaller. Finally, we do see some asset stranding in the Natural Gas Retained scenario, where there is a 5% tilt delayed until AA7. The reason is that the initial increase in retail gas prices caused by the AD in this case results in switching from gas to electricity. This, in turn, drives further increases in retail gas prices in the model (due to lower demand) until the price cap is hit. Because the price cap is hit, there is an amount of under-recovery of Cost of Service.

Based on the estimates of asset stranding from the Incenta Second Update AD Model, our view is that the key results are as follows:

- Adopting a 2% tilt from AA6 brings about a reduction in asset stranding in the Electricity Dominates scenario (by about one-third) and in the Energy Hybrid scenario (by a similar amount).
- Delaying the adoption of a 2% tilt until AA7 would mean that the same 2% tilt would reduce asset stranding risk by a smaller amount (by about 20% in both scenarios). This increases the risk that there will not be sufficient opportunity to fully address asset stranding risk.
- Adopting a higher 5% tilt would bring about a more significant reduction in asset stranding than a 2% tilt. However, a higher tilt runs the risk of inducing asset stranding because of the price increase caused by AD. For instance, a 5% tilt starting in AA7 leads to asset stranding in the Natural Gas Retained scenario that does not occur in that scenario with straight line depreciation.

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