ATTACHMENT 10.104A

ACCELERATED DEPRECIATION – MODELLING GUIDELINE, ASSUMPTIONS & SENSITIVITIES

DRAFT DECISION RESPONSE 2025-29

PUBLIC

EIM # 114124021

ISSUE DATE

10/06/2024

ATCO

ACCELERATED DEPRECIATION - MODELLING GUIDELINE, ASSUMPTIONS AND SENSITIVITIES

AA6 DRAFT DECISION

GAS DIVISION

Information to utilise the *Acceleration Depreciation - Model*

10/06/2024

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ABBREVIATIONS

Term	Definition
AA6	Sixth Access Arrangement (ATCO)
ACIL	ACIL Allen Economics Consultants
AD	Accelerated Depreciation
ATCO	ATCO Gas Australia
ERA	Economic Regulatory Authority
FOGM.	Future of Gas Model
model	Accelerated Depreciation – Model (also known as the FOGM)
PTRM	Post Tax Revenue Model
WACC	Weighted Average Cost of Capital

OVERVIEW

ATCO has updated its modelling approach in response to the Draft Decision. The modelling approach from the ATCO 2025 to 2029 Plan to Draft Decision Response has changed. The updated model is similar to the previous version of the model, with a change in the method to calculate the proposed accelerated depreciation. Various assumptions and inputs to the scenarios are updated resulting in the scenarios behaving differently in some cases. This guideline outlines those changes, the operation of the model and the sensitivities that are generated by changes in inputs and assumptions.

The model is based around a customer choice modelling framework. Customer classes were developed using tariff classes and in the case of residential customers, historical usage data. Existing residential users were assigned to different appliance classes based on observed usage data. Potential new connections were also incorporated, with the number of potential new customers each year extrapolated based on historical new connections and forecasted disconnections.

To calculate Accelerated Depreciation consumer demand is taken from the customer choice model as an input and generates new customer pricing, which in turn iterates the customer choice model and so on. The scenario inputs have been updated for the most current information with respect to:

- Appliance costs and usage
- Connection and disconnection costs
- Projected electricity and gas prices.
- Rebates used in some of the scenarios are updated based on the underlying scenario characteristics.

To calculate accelerated depreciation, the revised approach combines a tilt function with a price cap on retail prices that is applied to bring forward some depreciation into earlier years while limiting retail prices in all years to the price cap. The tilt function brings forward some recovery of capital into the early years where there is room between the underlying gas price and the consumer's price of indifference, such that the gas supplier's customer base is not unduly cannibalised.

These components are explained in detail within this guideline. This guideline also relies on information from two external reports:

- Accelerated Depreciation – ACIL Allen report
- Accelerated Depreciation - Incenta report

1. MODEL AND DOCUMENT STRUCTURE

The accelerated depreciation is a Microsoft Excel model named the *Accelerated Depreciation – Model* (**model**), consistent with external consultant reports) that has two (2) components:

1. A consumer choice model developed by ACIL Allen Economics Consultants (**ACIL**).
2. A Post Tax Revenue Model (**PTRM**) in a form used by the Economic Regulatory Authority (**ERA**) but with the additional capability to modify the calculation of depreciation. This section of the model was developed by ATCO Gas Australia (**ATCO**)

This document describes:

- Relevance of the accelerated depreciation modelling to tariff modelling
- How the model works
- The purpose of each tab in the excel file for the sections of the model developed by ATCO
- Sensitivities of model outputs to model inputs
- Assumptions made relating to the PTRM section of the model including capex and opex.
- How to operate the model

ACIL Allen have separately prepared a document to describe in detail how the consumer choice model prepared by them works. That document is attached as Appendix A.

- For reference - ACIL Allen refer to the model as the Future of Gas Model **FOGM**.

1.1 Relevance to AA6 tariff modelling

Having calculated an accelerated depreciation amount it needs to be incorporated into AA6 tariffs through the tariff model.

For simplicity given time constraints, and transparency the amount has been allocated to HP steel mains in the initial capital base in the year 2000. This also ensures the accelerated depreciation is allocated to those assets with the longest lives of 80 years as at 2025.

ATCO is available to work with the ERA if required to integrate the accelerated depreciation results by asset type into the ERA's tariff model. Applying the accelerated depreciation by asset type in AA6 or applying it to one long life asset class in the tariff model does not affect the AA6 tariff outcome.

The inclusion of accelerated depreciation as recommended by ACIL Allen increases the average B3 tariff class distribution charge per year over AA6 in nominal dollars by $22.

ATCO's cost allocation modelling to ensure tariff revenue for a tariff class falls between avoidable cost and stand alone cost for the tariff class incorporates accelerated depreciation into stand-alone costs on present value terms as shown in Table 1.1. The allocation was made proportionate to the allocation of total AA6 depreciation to tariff classes in the total cost allocation analysis.

Table 1.1: Present value accelerated depreciation ($ ($ millions real as at 31 December 2023)

	A1	A2	B1	B2	B3
PV accelerated depreciation	1.965	1.391	4.134	3.194	66.416

No allocation was made to avoidable costs.

ATCO's cost allocation *Table 14.23 (Expected revenue and cost allocation)* in the revised plan[1] includes an allocation of accelerated depreciation to total costs to tariff classes consistent with the above allocation. The allocation did not indicate any adjustment was required to the tariffs set for AA6 to rebalance costs and revenue by tariff class.

1.2 How the model works

1.2.1 Confidentiality

The model is secure in terms of password protection for the macros and some information on particular sheets (and the sheets themselves).

[redacted]

1.2.2 Overview

An overview of the model is shown in Figure 1.1.

The model works in an iterative way as follows.

- Initial prices are set for ATCO's sixth Access Arrangement (**AA6**) period based on the data for ATCO's response to the ERA's draft decision[2].
- The consumer choice model runs to determine demand in each year. The demand forecast for 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 model.

1.2.3 Modelling architecture

Calculating the accelerated depreciation schedule includes the following:

- Develop the projected annual gas demands from 2025 to 2074 for the four separate scenarios
- Extract 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.
- Calculate 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.
- Apply an appropriate tilt factor to the straight line depreciation schedule to bring forward some depreciation into AA6.
- Apply a price cap to retail prices to limit prices to plausible levels.

1 ATCO Gas Australia Draft Decision Repsonse information document for the ERA.

2 Notes some data for opex and capex may have minor differences to ATCO 's final response due to the timing of finalising the response and the need to have data input to the model at a prior date (22 May)

1.2.4 Running the model

The model is run from the "Dashboard" tab.

The user can:

- Select a "tilt" value to bring forward depreciation from future periods. The "tilt" can be applied to the RAB at 31 December 2024 and capex separately.
- Set a final year for asset lives.
- Set a start and end year for accelerated depreciation to observe the effect on tariffs of deferring accelerated depreciation.

The model uses a "tilt" function to bring forward depreciator from future periods. The advantage of this function is that it allows the amount of accelerated depreciation across years to be varied using a single variable. The form of the function is not critical to the analysis as long as:

- Total depreciation equals the asset value. i.e., it is not over depreciated
- There is some movement of depreciation from future periods to earlier periods. In this case to AA6.

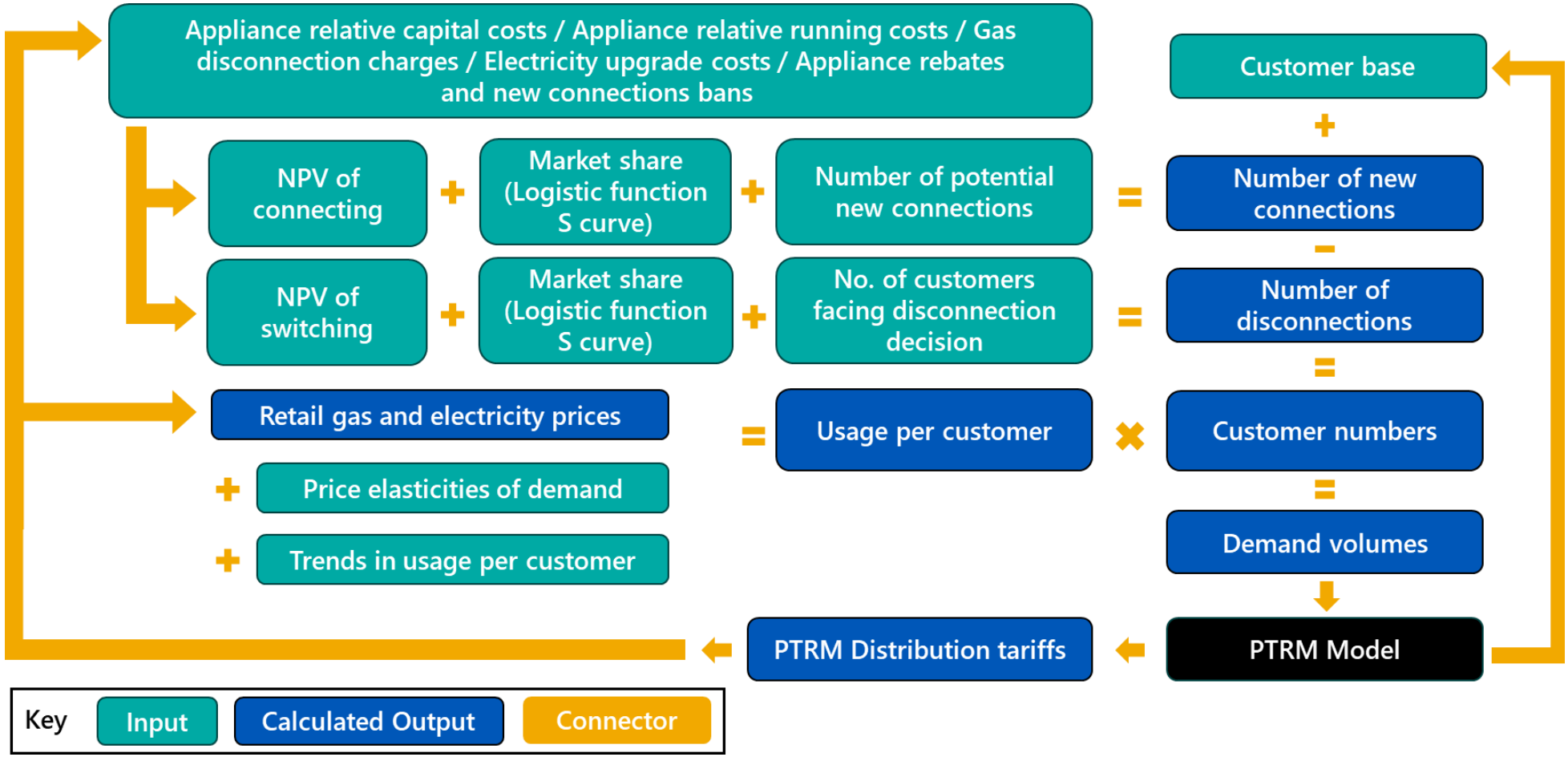
The user can also set a price cap on the retail price of gas based on a multiple of the 2029 price.

After running the model with accelerated depreciation and with or without a price cap the user can observe for different amounts of accelerated depreciation:

- Values of the RAB over time
- Unrecovered costs of service
- The amount of accelerated depreciation by comparing depreciation with and without accelerated depreciation.

All calculations are in real December 2023 dollars ($real December 2023).

Figure 1.1: Accelerated depreciation model overview



2. MODEL COMPONENTS

2.1 Overview

The model is explained below by explain what each "tab" or worksheet does within the model. A list of worksheets is provided on the "Information" tab within the model and copied to appendix A.1. The tabs "Dashboard", "User Output" and "Depn Summary" are the main tabs for the user.

Tabs from "ACIL Output" through to "COM S curve Disconnect" which together form the ACIL Allen Consumer choice model. These tabs are described separately by ACIL Allen, copied into Appendix B for easier reference.

The remaining tabs relate to the PTRM tariff calculation model.

- 'Capex scenario inputs" to "2019 Capex NGR 77(2)(a)" are inputs to the PTRM
- "CoS" to "Tax Core" are PTRM calculations copied from the ERA's draft decision PTRM model and modified to:
    - Accept the PTRM inputs in this model including the ACIL Allen demand forecasts
    - Work only on a real $2023 basis
    - Modify the cost of service according to the depreciation method selected
- "Tax RAB total" to "Tax Asset close 2024" summarise the tax asst base (TAB)
- "RAB total" to "2074" contain elements of the RAB in real December 2023 dollars.

2.2 General User Tabs

2.2.1 Information

The information tab contains general information about the model and allows users to unhide sheets with a password. It also provides details outlined in appendix A.1.

2.2.2 Range names (Hidden)

This tab contains range names used in the model formulas and should not be accessed by users.

2.2.3 Dashboard

The first tab in the model is the "Dashboard". This tab is used to set up the parameters to ascertain the effect of accelerated depreciation.

The dashboard has a drop down box to select either accelerated or straight line depreciation. The model always calculates straight line depreciation even if accelerated depreciation is selected to allow comparison to accelerated depreciation and thus calculate the difference being accelerated depreciation. There. is a drop down box to select the scenario to be evaluated.

The dashboard tab has two switches to allow accelerated depreciation (**AD**) to be turned on for either or both of the RAB at 31 December 2024 and capex for 2025 to 2074. It also possible to specify the years to which the tilt applies by selecting the start year and end year.

Tilt refers to a depreciation function which increases depreciation in the early years of an asset's life and reduces it in the later years of an asset's life. It applies to the opening written down value

at the start of the first year in which accelerated depreciation applies. The tilt function is described in section 3.1.

Their also switches to:

- Apply an asset life cap to accelerate depreciation for comparison rather than using the tilt function. Use the tick box to apply the asset life reduction.
- Trigger a reduction in both opex and capex. A fall in the number of customers in a year is specified which then triggers opex and capex reduction when the tick box is ticked. Opex is reduced proportionately with the size of the customer base. Capex is reduced using a function based on the remaining years to 2074
- Specify capex programmes to be discontinued. By specifying the years and ticking the tick boxes it is possible to switch off capex programmes specified. This option has little effect once a reduction in capex has been triggered due to the already large capex reductions.
- Specify the reduction in opex due to reductions in the customer base. The user can specify an amount of opex to reduce or increase for every 1,000 customers lost or gained. This adjustment happens automatically regardless of other expenditure adjustments.
- Specify a price cap based on a multiple of the 2029 retail gas price by entering a number in the input box. The price cap function is effectively turned off by selecting a very large number, for example, 5000.

2.2.4 User Output and Depn Summary

The 'User Output' tab contains output data for the user to view. The data is pasted to this tab is if the user uses the macro the Dashboard tab to run the model.

The 'Depn Summary' tab contains output data for the user to view. The data is pasted to this tab is if the user uses the macro the Dashboard tab to run the model.

2.3 Customer Choice Modelling Tabs

Customer Choice modelling tabs consist of:

- ACIL inputs [these sheets contain inputs that users may want to alter]
  - Control
  - Scenarios
  - DNSP data
  - Census
- ACIL Calcs [these sheets are visible but protected from changes]
  - Prices
  - Appliance costs
  - CustomersRes
  - CustomersCOM
  - RES S curve-connect
  - RES S curve-disconnect
  - COM S curve-connect

- COM S curve-disconnect

Explanations of inputs and assumptions are in ACIL Allen's report and provided in Appendix B.

2.4 ATCO Gas Australia Input Tabs

The rest of the tabs in the model are visible (unless noted otherwise) but protected from any changes.

2.4.1 Prices to ACIL

This sheet contains price outputs output from the PTRM model for input to the ACIL Allen consumer choice model with a one year lag. This sheet should not be accessed by the user.

2.4.2 Capex scenarios [CONFIDENTIAL] - Hidden

This sheet shows the rate at which capex is assumed to change relative to:

- The size of the customer base
- New connections
- It also removes gas injection points from forecast capex to avoid double counting under the hydrogen future scenario and energy hybrid scenario.

The sheet cannot be edited and is hidden due to confidentiality of unit rates and programs.

2.4.3 Capex_on_off

This sheet calculates the capex to be deducted from the capex forecast to exclude capex programmes selected to be switched off in the Dashboard. This sheet cannot be edited.

2.4.4 HF, ED, GR and EH from ACIL

These sheets contain the outputs from the ACIL Allen consumer choice model.

- Gross new connections
- Disconnections
- Customer base
- Gas volumes
- The data is organised by tariff class. The data is reformatted to input to the PTRM model.
- The amount of capex to adjust for the number of connections and the size of the customer base is also calculated.
- The user should not access these sheets.

2.5 PTRM Input and Calculation Tabs

2.5.1 Active Scenario

This tab contains data for each scenario used to input to the PTRM model to calculate tariffs. There is also data in "Base no change" based on ATCO's response to the draft decision used as a baseline against which expenditure is adjusted depending on the number of connections and the size of the customer base.

The expenditure reduction "Trigger" at cell B16 in the dashboard is linked to this tab at row 271. If the trigger is activated, then:

- Opex is reduced proportionately to the reduction in the customer base.
- Capex is reduced over the years to 2074 using a log function such that capex is reduced firstly at a rapid rate which then declines as the value of capex reduces.

The data for each scenario is

- Demand:
  - Volume of GJ by tariff class and A1 tariff class charging units
  - Connections and disconnections
  - Customer base
- Opex adjusted for changes to the customer base
- UAFG price
- Capex adjusted for changes it the customer base, new connections and capex excluded by the dashboard.

2.5.2 CoS (Cost of Service)

This tab is a copy from the ERA's draft decision tariff model. It summarises the building blocks of the cost of service. It also has outputs in rows 41 and 42 of the straight line and accelerated depreciation. The depreciation line of the tab at row 23 selects either straight lien or accelerated depreciation depending on the scenario selected in the dashboard.

RAB values for accelerated and straight line depreciation are recorded in rows 45 and 46. If a straight line depreciation scenario is run then the values of straight line and accelerated depreciation and RAB's will be the same.

This is an output tab and should not be altered.

2.5.3 WACC

This tab is a copy of the ERA draft decision tariff model tab. It calculates the real weighted average cost of capital (**WACC**) used in PTRM NPV calculations.

This tab should not be accessed by users.

2.5.4 PTRM expenditure

This tab is a simplified version of the "input" tab of the ERA's PTRM model "Input" tab.

It includes:

- Asset lives as in the ERA's draft decision.
- Historical depreciation to 2024 as in the ERA's draft decision
- Historical capex to 2018 as in the ERA's draft decision
- Capex.
- Asset disposals
- Modelled opex including UAFG
- Working capital parameters

Inflation and WACC Data at the top of the tab is for refence only and does not affect calculations. All calculations are in real December 2023 dollars.

Data is input to this tab from the scenario tab based on the scenario selected.

2.5.5 2019 Capex NGR 77(2) (a)

This tab is a copy from the ERA's draft decision tariff model to adjust the asset base for any underspend in capex in 2019 compared to the AA5 final decision.

This tab should not be accessed the user.

2.5.6 Price_path_AA6

This tab summarises the price path over time including AA6. AA6 prices are set to equate cost of service and tariff revenue over the AA6 period in NPV terms.

- Row 7 is the X factor or price increase each year. The convention is that a negative value is a price increase.
- Row 8 contains a price index which can be used to check the operation of the price cap.
- Rows 11 to 26 summarise the building block and tariff revenue calculations.
- Rows 31 to 55 contain the projected real dollar tariffs.
- Rows 58 to 85 contain calculations to check the price cap. First a maximum price is forecast based on prior period tariffs and current period movements in prices. A check is then made at row 8 if the price cap will be exceeded. Due to circularity with the current period distribution price the cap will never be 100% precise when implemented but is materially correct.

2.5.7 Load demand

The Load demand tab is a simplified version of the ERA's "load Tariffs" tab and contains demand information in the same format.

2.5.8 Revenue

This tab contains the calculation of tariff revenue by tariff class and tariff band.

2.5.9 Working Capital and Tax Core

These tabs are versions of the tabs in the ERA's tariff model but in a similar layout. The calculations are done in real dollars consistent with other calculations in the model.

2.5.10 RAB total

The RAB total tab summarises the RAB under both a straight line depreciation regime and an accelerated depreciation regime. The model operates to calculate both straight lien and accelerated depreciation contemporaneously. The "CoS" tab selects depreciation to incorporate into the cost of service calculations based on the method selected in the dashboard.

The opening RAB on 1 January 2025 is the same under both scenarios. Capex will vary according to the depreciation method selected due to variances in the size of the customer base between the two scenarios. Therefore, to see straight line depreciation as it would be without accelerated depreciation it is necessary to run the model with "Straight Line Depreciation" selected in the dashboard.

Rows 7 to 35 show the straight line depreciation RAB summary.

Rows 37 to 67 show the accelerated depreciation RAB summary. Rows 45, 52 and 65 show the straight line depreciation for the years in which accelerated depreciation does not apply when an accelerated depreciation scenario is selected but not all years out to 2074 have accelerated depreciation. This allows for example to see the effect of deferring accelerated depreciation.

2.5.11 RAB close 2024 straight

This tab calculates straight line depreciation on assets as at 31 December 2024.

This tab is a copy of the ERA asset base tab with formulas for straight line depreciation as set by the ERA. The only change is to allow for an asset life cap.

The tab retains the form in the ERA AA5 final decision tariff model having separate sections for:

- Assets as at 1 Janaury2000 when the network was privatised.
- Vines and Westnet assets rolled into the asset base around 2010
- Capex from the years 2000 to 2024. Calculations are made separately for each year of capex.

For simplicity data prior to 2019 is deleted and the data for 2019 hard coded.

References in this tab to capex are to capex up to and including 2024.

2.5.12 RAB close 2024 AD

This tab calculates accelerated depreciation on assets as at 31 December 2024 using straight line depreciation to that date. (the RAB at close December 2024)

For simplicity data prior to 2019 is deleted and the data for 2019 hard coded.

References in this tab to capex are to capex up to and including 2024.

Assets from the Vines and Westnet rolled into the asst base around 2010 contribute less than $20 thousand dollars depreciation per year and have been left as straight line depreciation.

The tab retains the form in the ERA AA5 final decision tariff model having separate sections for:

- Assets as at 1 jJanaury2000 when the network was privatised.
- Vines and Westnet assets rolled into the asset base around 2010
- Capex from the years 2000 to 2024. Calculations are made separately for each year of capex.
- The asset base summary rows combining these three categories in detail are not used.

Data at the top left of the tab contains inputs to determine the depreciation including the asst life cap.

Apply tilt	**TRUE**	**Apply Network asset final year**		**FALSE**
Tilt value	**0.02**	**Network asset final year**		**2074**
1-tilt	0.98			
Start year	**End Year**			
2025	**2074**			

Row 7 contains a flag to apply straight line depreciation instead of accelerated depreciation if the end year of accelerated depreciation is less than 2074 or the start year is greater than 2025.

Rows 8 and 9 contain parameters used in the tilt function used to accelerated depreciation.

Cell M1 contains a flag to cap asset lives at the date in cell M2. These values are selected in the dashboard.

3. SENSITIVITY ANALYSIS

Sensitivity analysis can be split into three (3) areas:

1. The model input parameters such as the tilt to bring forward depreciation and price cap (if any) which restricts revenues in later years where there is a declining customer base
2. Customer choice model parameters such as appliance costs and rebates
3. The original assumptions regarding opex and capex which will to some extent determine starting prices and how the consequent movements in the customer base.
4. Sensitivity analysis is quantified as movement from the base case considered by ACIL Allen using the parameters described in section 5.1 of their report.
5. When deciding on what sensitivity analysis is relevant the following principles must accounted for:

- How likely is the event (sensitivity) to occur and in which direction(s)
- Does the likely sensitivity make the case for accelerated depreciation weaker or stronger
- Is the magnitude of the sensitivity material noting the uncertain outcomes modelled

Sensitivity analysis results should be interpreted with caution. Changing a single assumption is not necessarily informative as to the reasonableness of model output. Assumptions in the model have been calibrated as a group such that they match the underlying scenario to which they relate. Therefore, moving one variable in isolation may indicate the sensitivity of outputs to that variable but does not necessarily provide information about the reasonableness of the results as changing one variable may be a departure from the underlying scenario.

When doing sensitivity analysis apart from the tilt value or capex to 2028 changing input or parameter values has no impact on AA6 accelerated depreciation. This is because in response to previous criticism of the accelerated depreciation modelling that inputs for all scenarios did not coincide with the amounts in the ATCO's AA6 forecast the inputs have now been fixed for AA6 at values corresponding to ATCO's response to the ERA's draft decision. Therefore, the amount of accelerated depreciation calculated for AA6 is solely a function of the tilt value applied. and capex to 2028. Prices and RAB values which effect the potential value of asset stranding will however alter after AA6 as input values change.

We are available to assist the ERA with further sensitivity analysis if required.

3.1 The tilt function

The aim of the tilt function is to bring forward depreciation so that the residual RAB at a date where the asset base is at risk of stranding is reduced. This must be balanced against the price impact of bringing forward depreciation in earlier periods. The measures or outputs in any evaluation of a tilt are:

- The effect on the value of a future RAB value which may become stranded
- The amount of accelerated depreciation in AA6
- The effect on prices in AA6 and future periods.

The form of the calculation is shown in the table below. "G" is the factor applied to the asset written down value to calculate the amount of depreciation using "tilted" or accelerated depreciation.

- $A = 1 - tilt\ value$
- $B\ (prior\ years\ of\ depreciation) = period = period\ of\ capex - 1$
- $C\ (tilt\ compounded) = A^B$
- $D = C \times tilt\ value$
- $E = A^{Asset\ Life}$
- $F = 1 - E$
- $G = D/F$
- $H = G\ \times\ Written\ Down\ Value$
    - Where *H* = Amount of depreciation using the accelerated depreciation method.

3.1.1 RAB values

ACIL Allen in their report section 5.3.2 at table 5.1 copied below evaluated the effect of the tile on the RAB value in 2074 as an estimate of asset stranding risk.

Table 3.1: Residual RAB values in 2074 for straight line and accelerated depreciation (tilt-values of 0.01 to 0.05) ($M real as at 31 December 2023)

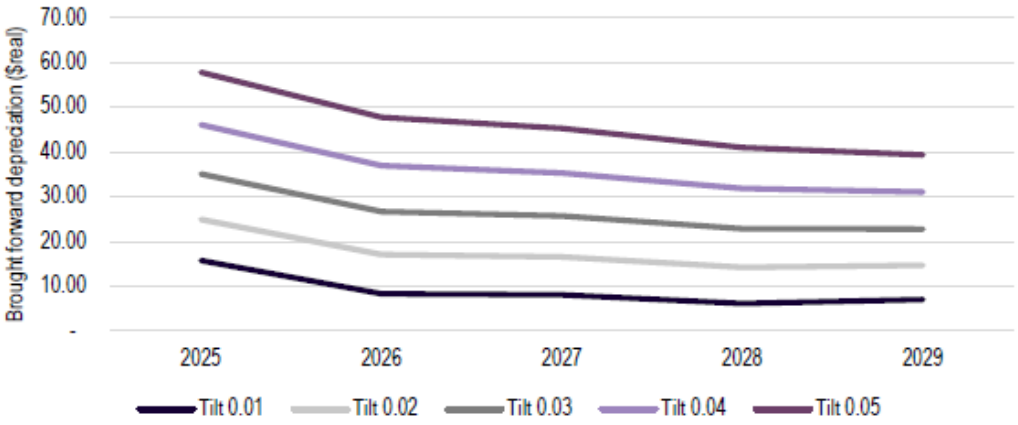
DEPRECIATION	NATURAL GAS RETAINED	HYDROGEN FUTURE	ENERGY HYBRID	ELECTRICITY DOMINATES
Straight line	2,360.54	2,323.10	1,199.64	500.92
Accelerated – tilt-value of 0.01	2,191.08	2,027.64	1,079.60	396.50
Accelerated – tilt-value of 0.02	2,018.34	1,790.55	1,067.56	310.90
Accelerated – tilt-value of 0.03	1,837.86	1,589.66	1,040.43	238.02
Accelerated – tilt-value of 0.04	1,661.24	1,415.61	934.30	178.99
Accelerated – tilt-value of 0.05	1,481.76	1,266.39	846.91	132.93

Increasing the tilt reduces the value of the RAB in 2074 and therefore reduces asset stranding risk but not totally. Note the lower value for electricity dominates is a function of the model assumption regarding aggressive capex reductions triggered by a 40,00 fall in customers in a year. Therefore, these values should be considered conservative.

3.1.2 Tilt and accelerated depreciation

ACIL Allen evaluated the effect of the tilt on accelerated depreciation in AA6. The effect is shown in Figure 3.1 (copy from report) below.

Figure 3.1: Brought forward depreciation by Tilt Value 2025 to 2029



Source: ACIL Allen

Note: the values do not change over AA6 according to scenario as the capex is fixed to align with ATCO's response to the ERA's draft decision. This fixing of the AA6 capex value is in response to previous criticism of accelerated depreciation modelling that the scenarios did not align with AA6 data.

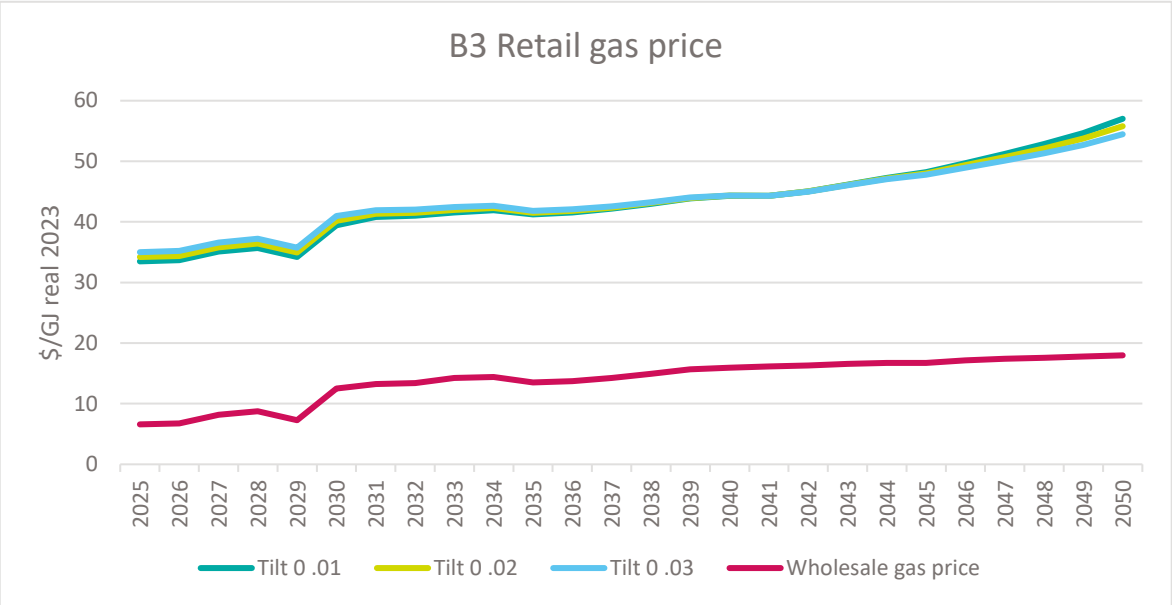
Evaluation of the tilt function effect on AA6 depreciation must be considered in concert with the effect on prices over time and asset stranding risk; the RAB value at a date of potential stranding as the accelerated depreciation is only a means to reduce asset stranding risk. It is not an end in itself.

3.1.3 Tilt and prices

Analysing movements in the B3 retail gas price has shown movements in prices due to the tilt factor are less important than other factors such as movement in the wholesale price of gas. For example, each tilt increment of 0.01 adds about $8 to $9 million to required revenue per year. If the B3 approximately 80% of the cost is spread over say B3 10 petajoules that equates to about $0.64 to $0.72 per gigajoule. This effect is often outweighed by movements in other factors such as the wholesale price of gas. Figure 3.2 plots the forecast retail gas price for residential customers in the electricity dominance scenario out to 20[3]50 compared to forecast wholesale gas prices.

[3] The comparison was stopped at 2050 due to increase in the forecast retail price driven by a reduced customer base that made it difficult to see any effects due to the scale on the graph required.

Figure 3.2: Effect of tilt on B3 retail as price compared to the wholesale gas price ($ real per GJ as at 31 December 2023)



3.2 Capex

The value of capex post AA6 has no impact on the AA6 accelerated depreciation. This is because depreciation in AA6 is determined by the opening value of assets in AA6 and any capex in AA6.

Similarly, this means accelerated depreciation does not vary by scenario over AA6 although it will vary in the long term. This is consistent with the notion that we have no information about what the actual outcome will be by the end of AA6. It is simply a risk mitigation measure in the face of uncertainty.

We have modelled the impact of a 10% reduction in capex across all al asset classes on AA6 accelerated depreciation. The amounts shown are a decrease in accelerated depreciation.

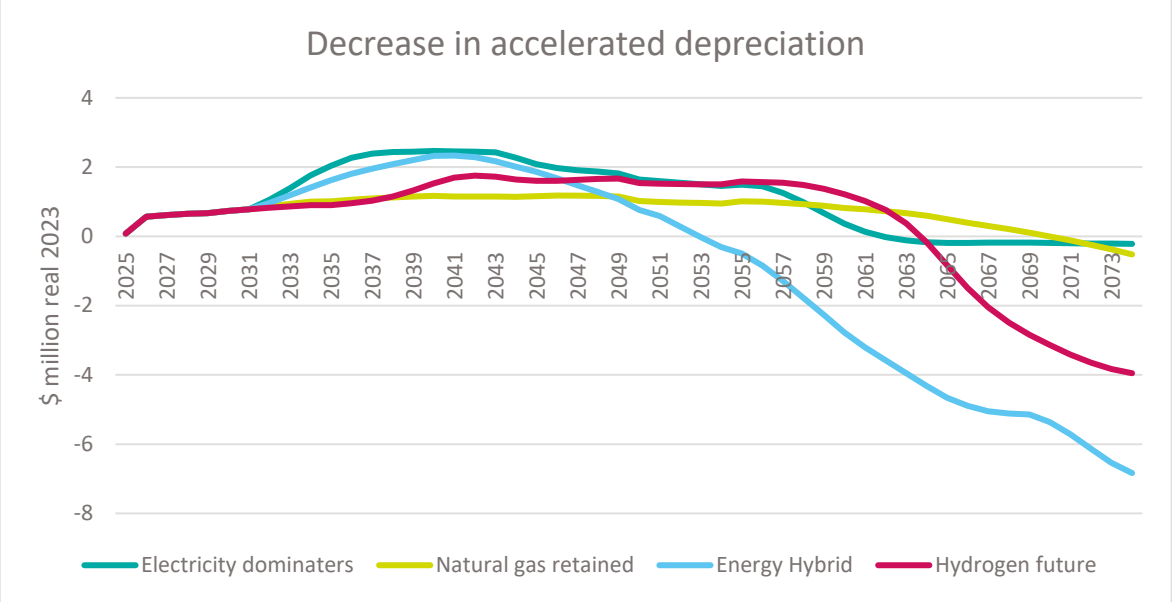
Table 3.2 shows the effect of a 10% reduction in capex from 2019 to 2029 on AA6 accelerated depreciation. The amounts shown are a decrease in accelerated depreciation.

Table 3.2: Accelerated depreciation reduction ($ million real as at 31 December 2023)

	2025	2026	2027	2028	2029
Accelerated depreciation reduction	0.1	0.6	0.6	0.6	0.7

Figure 3.3 shows the decrease in accelerated depreciation over time due to a 10% decrease in capex from 2019 to 2029. Note a positive number in the graph represents a decrease in accelerated depreciation.

Figure 3.3:Decrease in accelerated depreciation ($ real as at 31 December 2023)



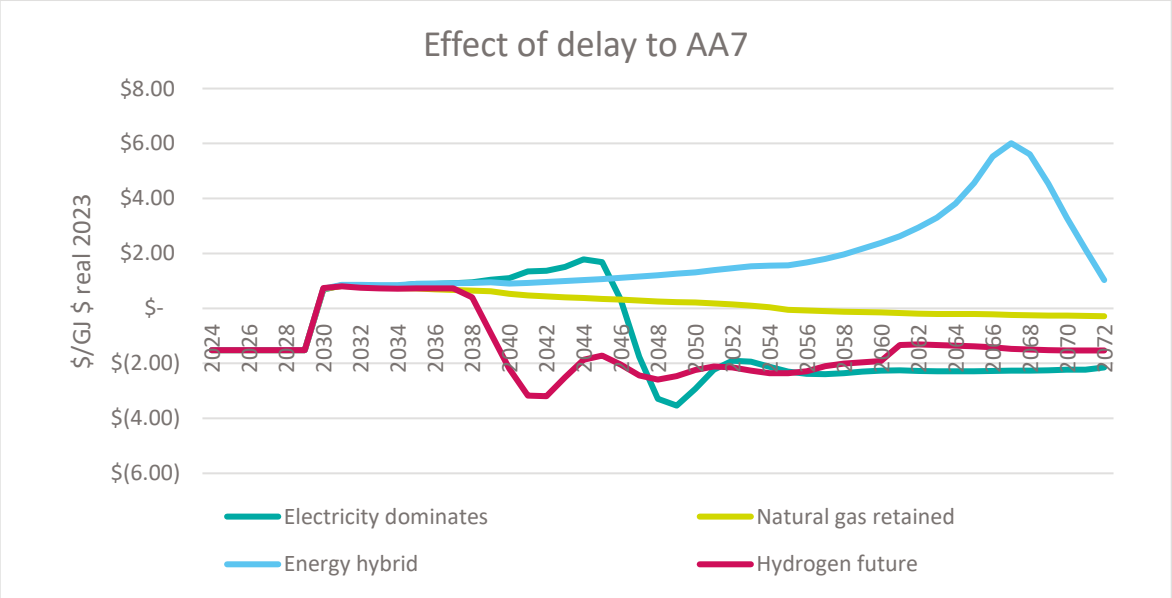
Over time the effect of a short term decrease in capex is outweighed by other factors in the model such as capex reductions made in response to decreases in the customer base

On the basis of remaining conservative the effect of an increase in capex has not been modelled as an increase in capex will generate an increase in accelerated depreciation.

3.3 Deferral of accelerated depreciation

This matter has been commented on by Incenta and who point out the risks of delaying implementing accelerated depreciation. Although we have conducted numerical analysis to estimate the effect on retail gas prices its numerical effect is outweighed by the risk of delaying in an uncertain future. Figure 3.4 shows the effect on retail gas prices over time of delaying accelerated depreciation

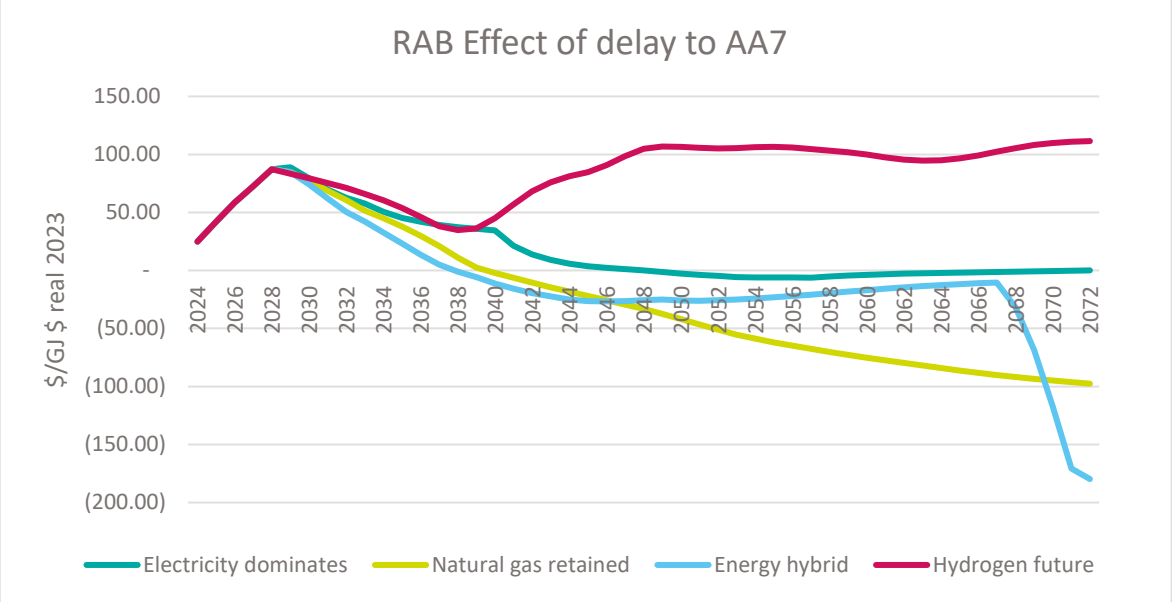
Figure 3.4: Effect of delaying accelerated depreciation ($/GJ real as at 31 December 2023)



B3 Customers benefit about $1.50 per GJ over AA6 and pay about 60 to 80 cents per GJ more over AA7 with greater increases in future periods. If prices rise it triggers customer defections to electricity which in turn triggers drastic cost reductions to bring prices back down.

Figure 3.5 shows similar effects on the RAB. There is an extended period of exposure to an increased RAB value out to around 2040. After that higher prices start to bite forcing expenditure reductions to bring the RAB value down. The exception is the hydrogen future scenario whereas the hydrogen future is implemented and the customer base increases so does the RAB.

Figure 3.5: Effect of delay on RAB ($ real as at 31 December 2023)



3.4 Effect of a common WACC of 7.33%

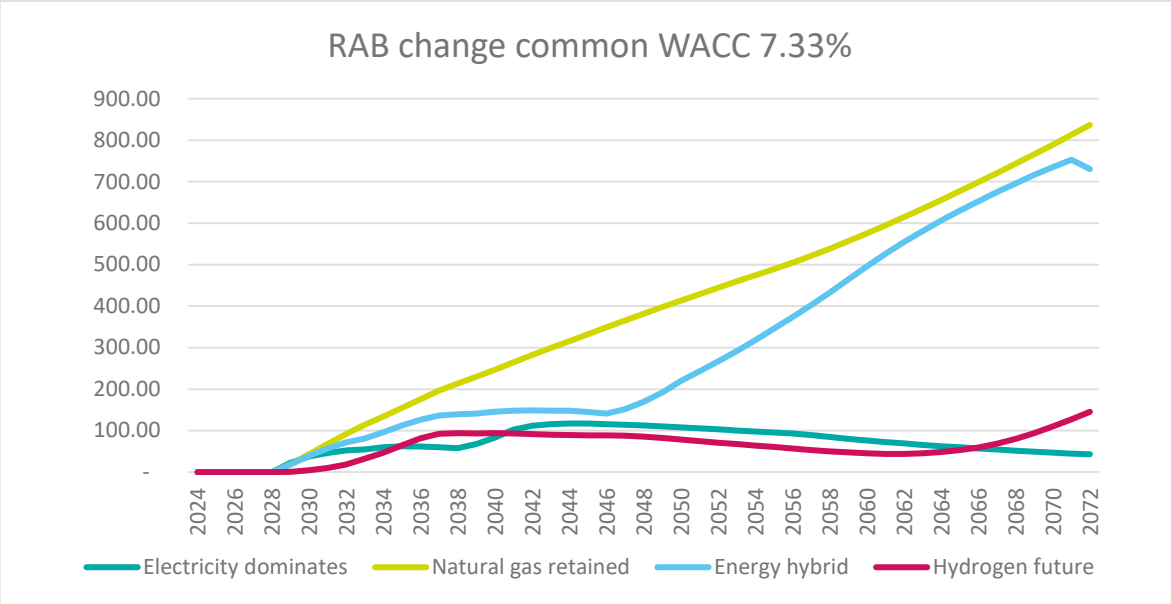
The effect of adopting a common WACC of 7.33% is directionally as expected. Lowering the WACC lowers the NPV of switching and customers are retained longer. There is a marked increase in retention in Natural gas retained and Energy Hybrid scenarios possibly reflecting the lower rates of switching at the margin in these scenarios. There is a much lower effect on the hydrogen future and gas retained scenarios. In the case of hydrogen future there is already low switching so there is less effect. In the electricity dominates scenario there is also less effect because the scenario already favours switching to electricity and it take a larger change in variables to generate a reduction in switching and an increase in the RAB

The results indicate sensitivity to the WACC used. A lower WACC increases the risk of stranding due to the higher RAB values as shown in Figure 3.6. The WACC's used by ACIL Allen are more likely to be too high than too low at 10% and 15% when compared to, for example, mortgage rates. The higher WACC rates apply to the low and medium income groups which have the highest weighting as shown in Table 3.3.

Table 3.3: WACC by income class

Customer discount rates	WACC	Weight
High income	5%	17%
Medium income	10%	62%
Low income	15%	21%

Figure 3.6: RAB change WACC at 7.33% ($ million real as at 31 December 2023)



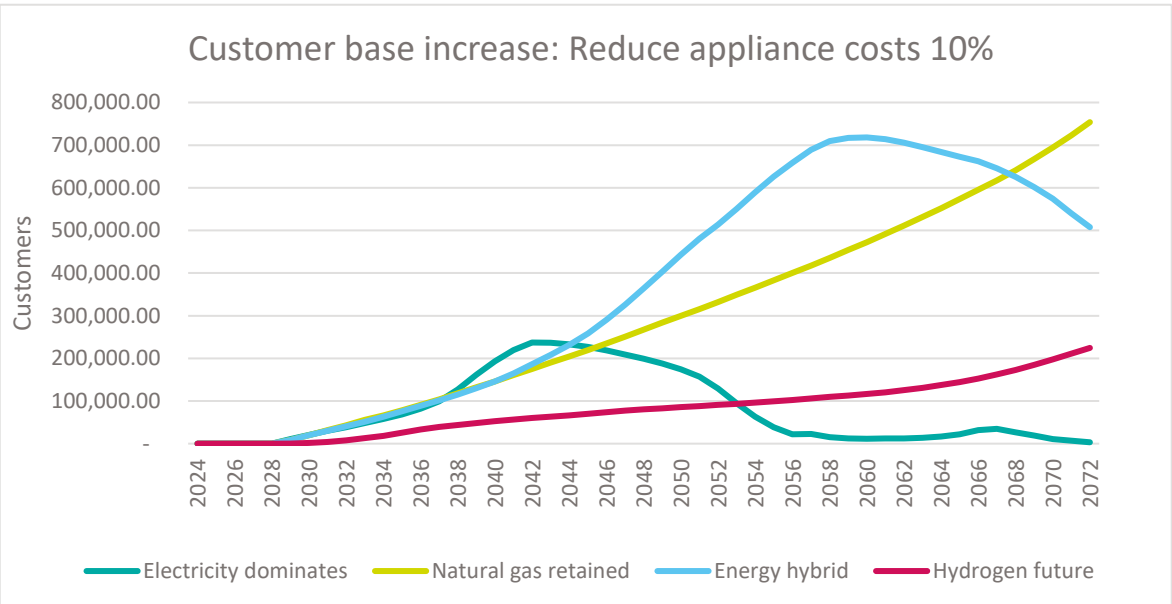
Overall, it appears the WACC rates used by ACIL Allen result in a conservative outcome.

3.5 Sensitivities

3.5.1 Reduce appliance costs 10%

Reducing appliance costs 10% has a marked effect on the RAB and customer numbers of the Energy hybrid and natural gas retained scenarios shown in Figure 3.8 and Figure 3.8. Although the increase looks large it is not beyond the realms of possibility if gas in some form is retained as it represents approximately a doubling of the customer base over 50 years. That magnitude of growth is not out of line with past growth in the context of a network that remains viable.

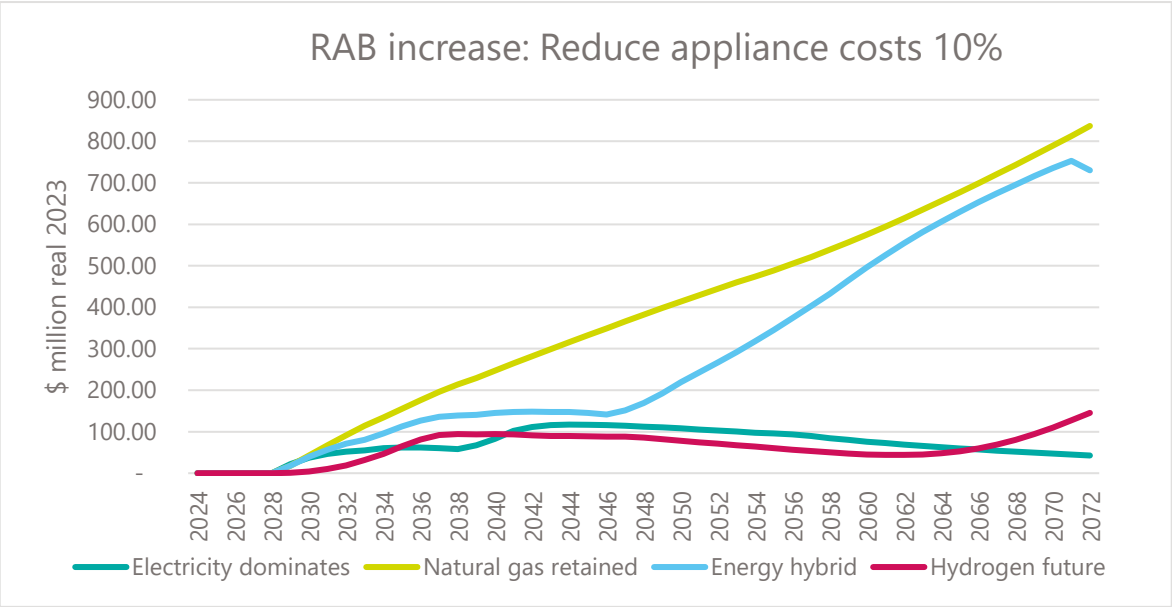
Figure 3.7:Customer base increase



The risk is that if this result is seen as a plausible outcome and investment made accordingly the risk of stranded assets increases should this outcome not be realised.

To the extent the base case appliance costs may be overstated, if any, that represents a reduction in future RAB's and therefore the perceived asset stranding risk which in turn results in a more conservative view of accelerated depreciation required over time.

Figure 3.8: RAB increase ($ million real as at 31 December 2023)



3.5.2 Increase appliance costs 10%

The increase in appliance costs has the expected effect of reducing the projected customer base and RAB but to different degrees, as shown in Figure 3.10 and Figure 3.10. For a decrease in the customer base it appears the energy hybrid scenario is particularly sensitive to changes in appliance costs.

The unusual shape of the movement in Electricity Dominates customer base represents decline in response to the higher appliance costs but moves back closer to the original scenario because the customer base is so reduced it shows smaller annual reductions compared to the base case.

Figure 3.9: RAB change ($ million real as at 31 December 2023)

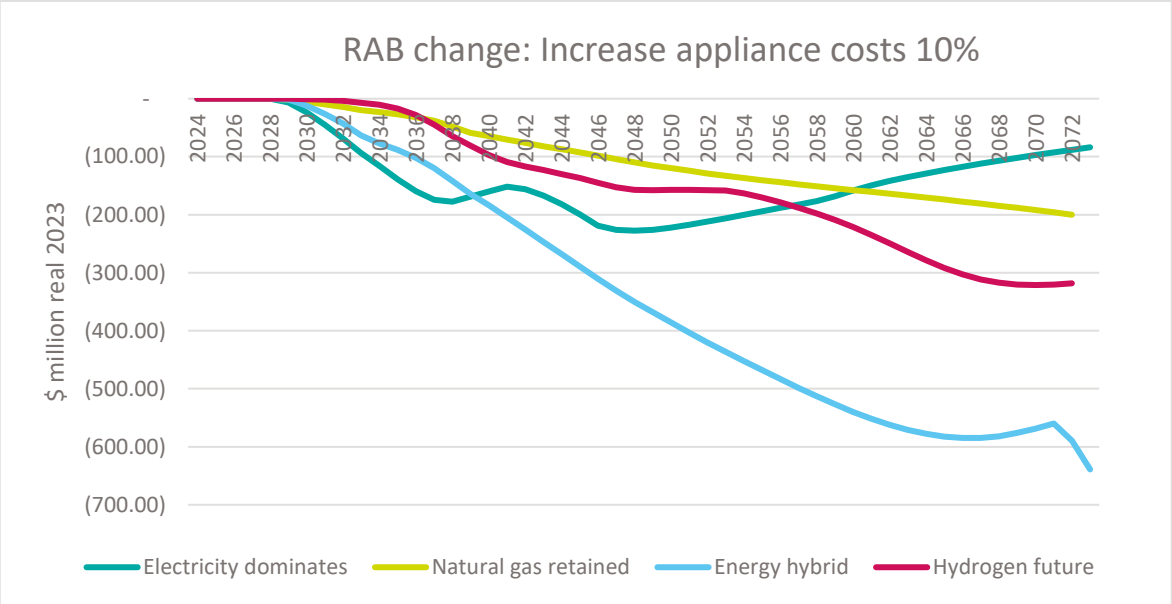
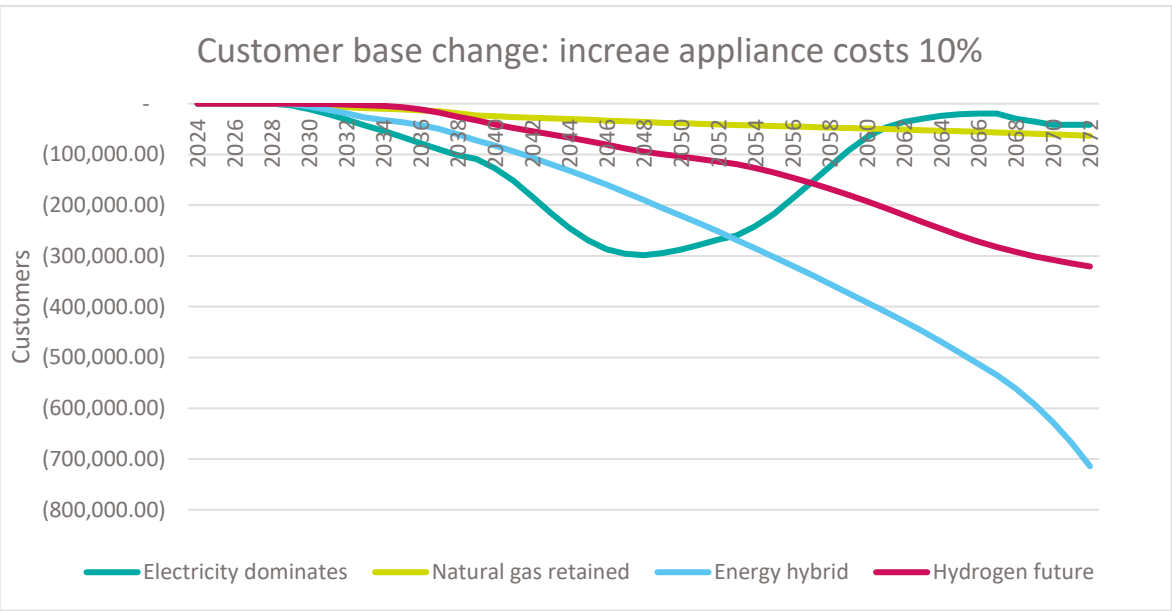


Figure 3.10: Customer base change



3.5.3 Appliance rebates

In *section 4.2.16* of their report ACIL Allen state the application of appliance rebates in the Energy hybrid an Electricity Dominates scenarios which reflect these scenarios movement to alternative energy sources. As a sensitivity the rebates have been halved. The effect on retail B3 prices, the customer base and the RAB is shown in the figures below.

Figure 3.11: Price effect halve appliance rebates ($real as at 31 December 2023)

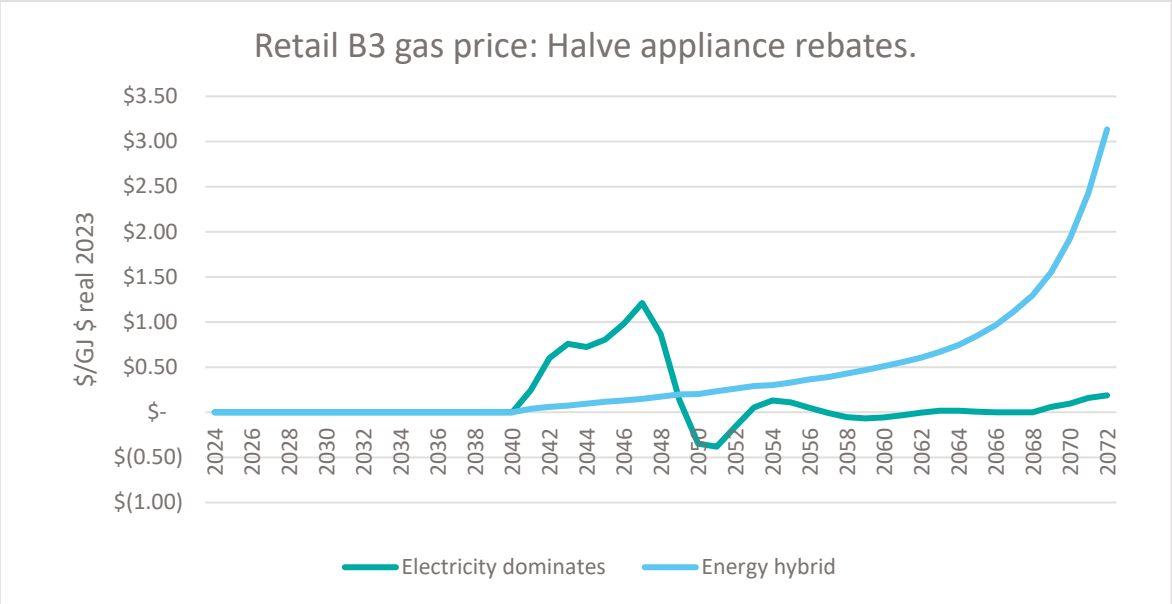


Figure 3.12: Customer base change: effect of halving appliance rebates

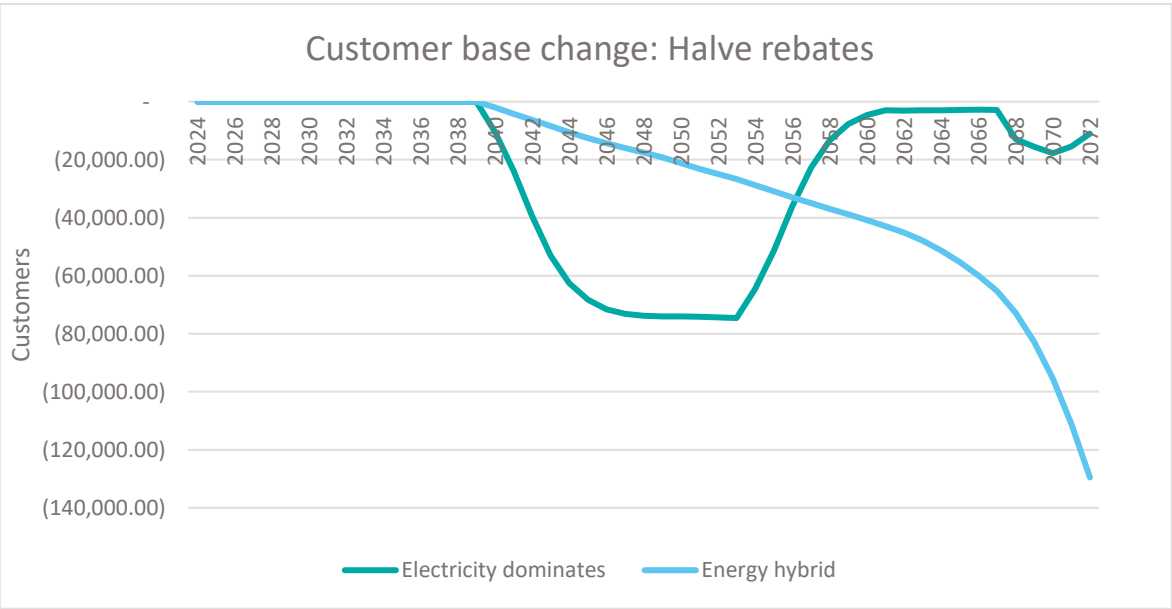
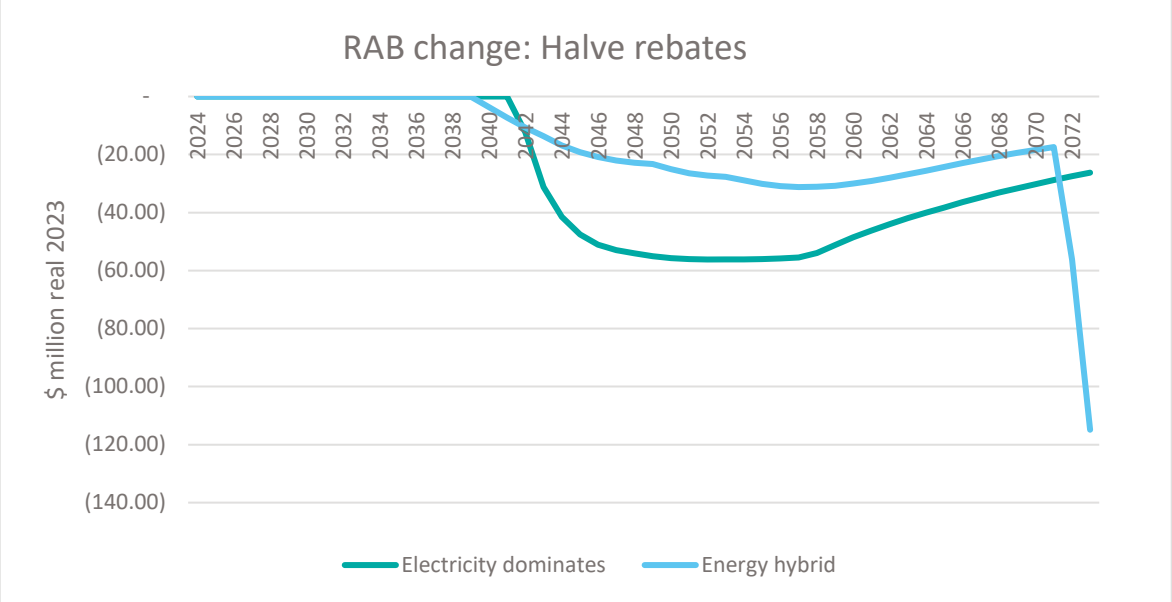


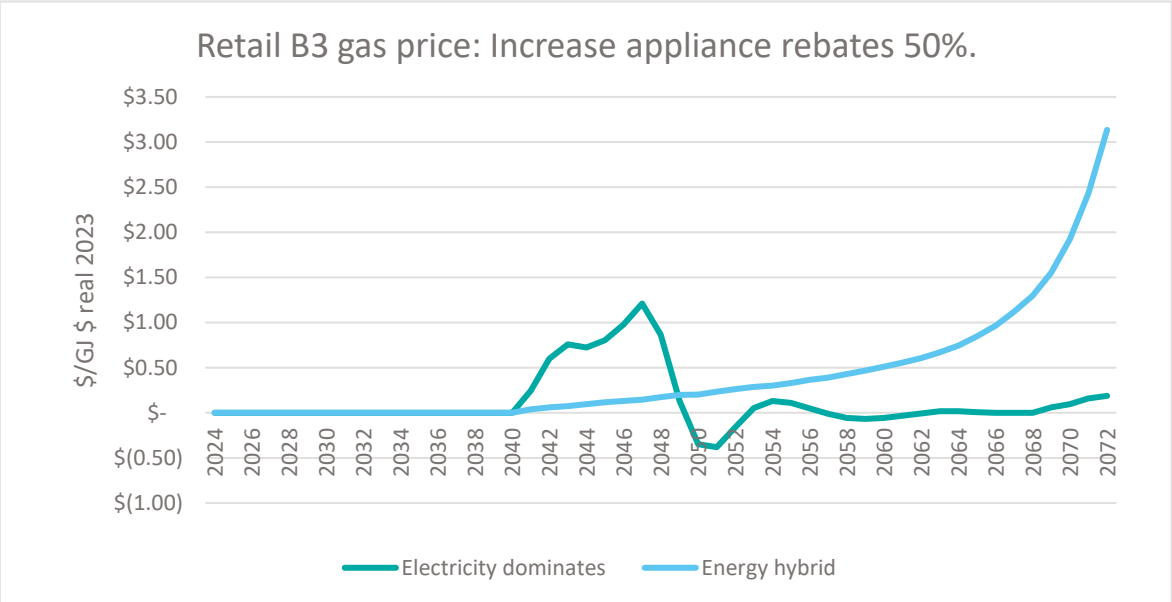
Figure 3.13: RAB change effect of halving appliance rebates ($ million real as at 31 December 2023)



The effect of halving the appliance rebates is directionally as expected reducing customer numbers in these 2 scenarios. The unusual shape of the Electricity dominates scenario curves is again driven by the banning of new connections from 2040[4] and the declining movements in the customer base as the size of the customer base reduces.

As a sensitivity the rebates have been increased 50%. The effect on retail B3 prices, the customer base and the RAB is shown in the figures below.

Figure 3.14: Retail gas price effect of increasing appliance rebates ($ real as at 31 December 2023)



[4] ATCO has run the Electricity dominates scenario without the cap and found new connections fall to les that 10 by 2040 and so has no material effect on model outcomes. The ban on new connections can be removed by changing all values in row 23 of the "scenarios" sheet in the model to zero.

Figure 3.15: Increase appliance rebates customer base change

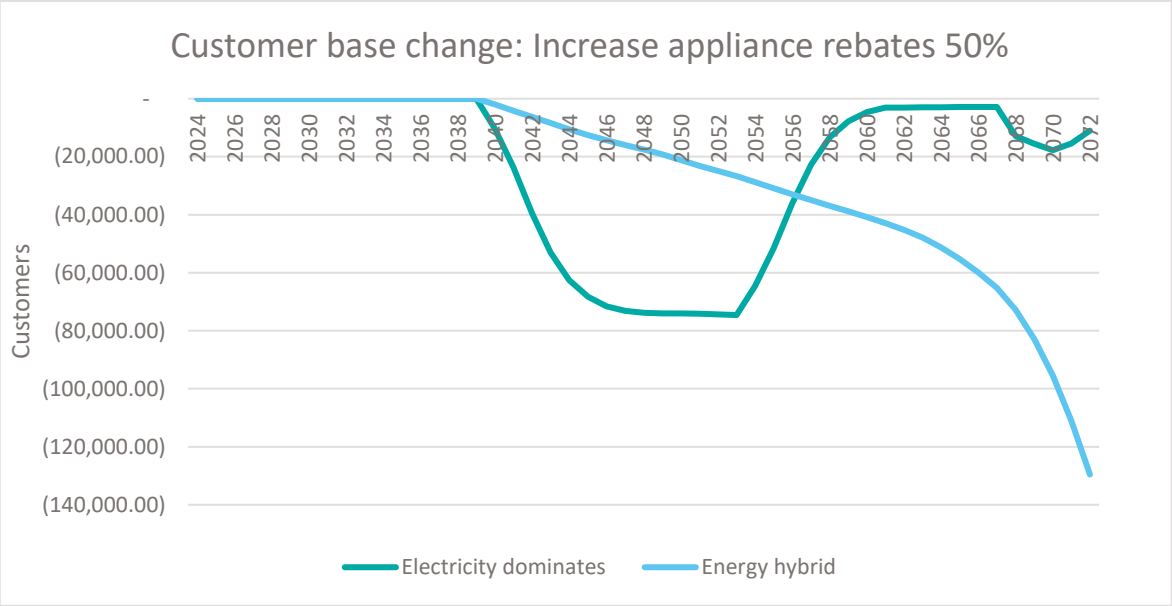
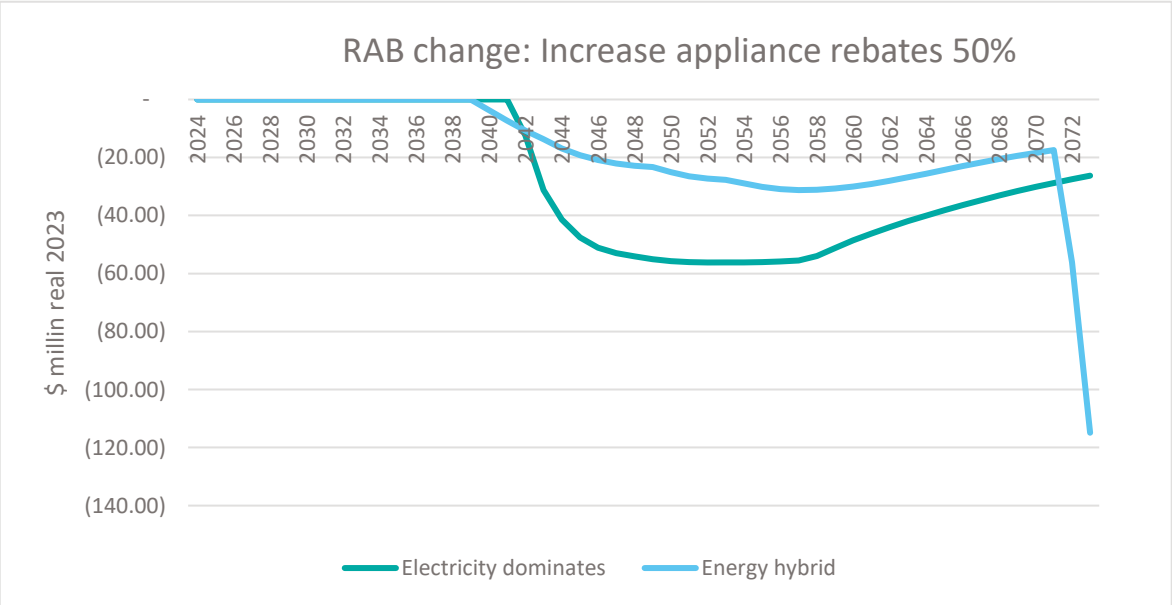


Figure 3.16: RAB change due to increasing appliance rebates ($ million real as at 31 December 2023)



3.5.4 Change retail gas and electricity prices

When interpreting the effect of price movements, what is relevant is the gap between the cost of running electric or gas appliances and the cost of switching to electricity form gas. It is also the retail price which is relevant not the gas distribution price on its own. The graphs below show changes compared to the base case.

3.5.5 Increase retail gas price 10%

Figure 3.17 shows the retail gas price increased 10%

Figure 3.17:Retail B3 gas price ($/GJ real as at 31 December 2023)

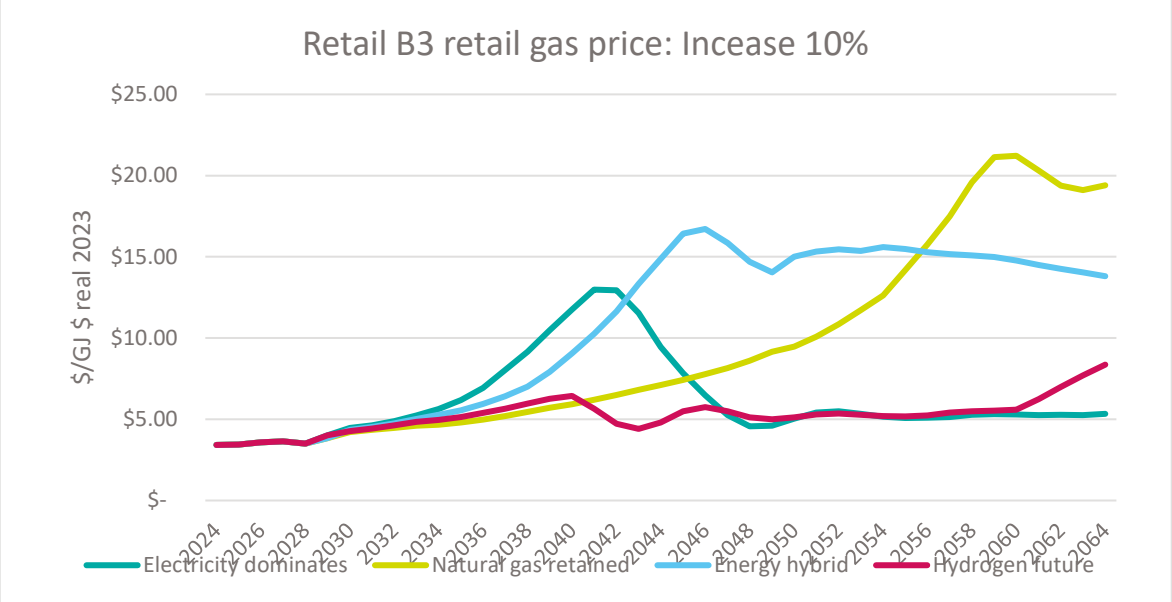


Figure 3.18 shows the effect on the customer base of increasing he retail gas price. The result is directionally as expected. The scenarios most effected are those that are most dependent on the gas price as users in those scenarios are expected to continue using gas. The electricity dominates curve is similarly affected as in previous analysis where variables are changed to disadvantage gas It is less affected than other scenarios as it already has a steep decline in the customer base.

Figure 3.18: Customer base: retail gas price increase 10%

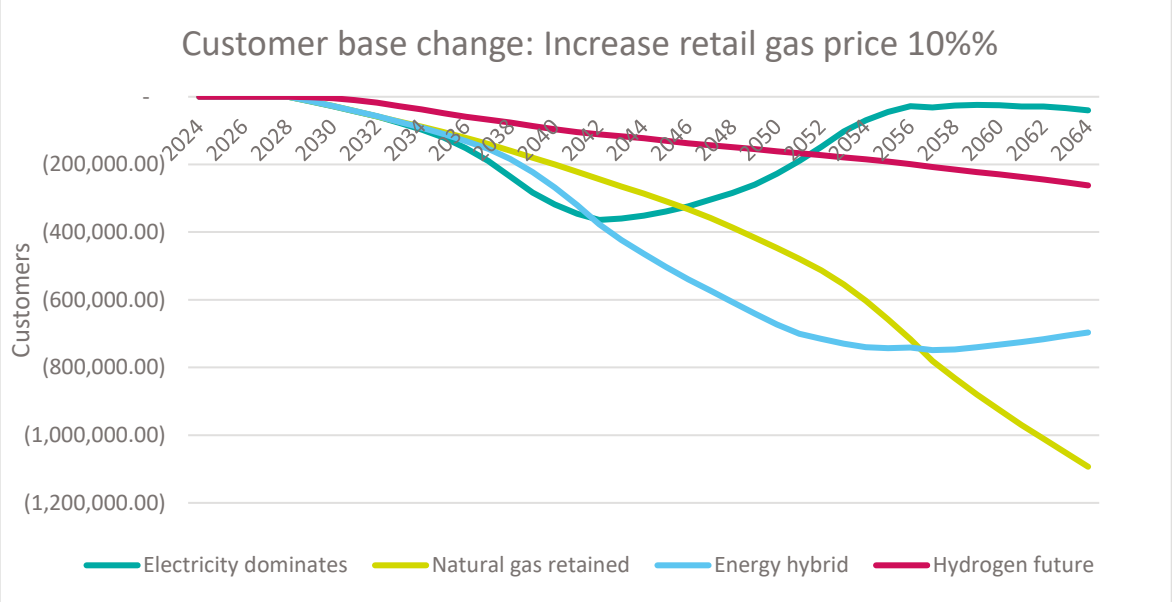
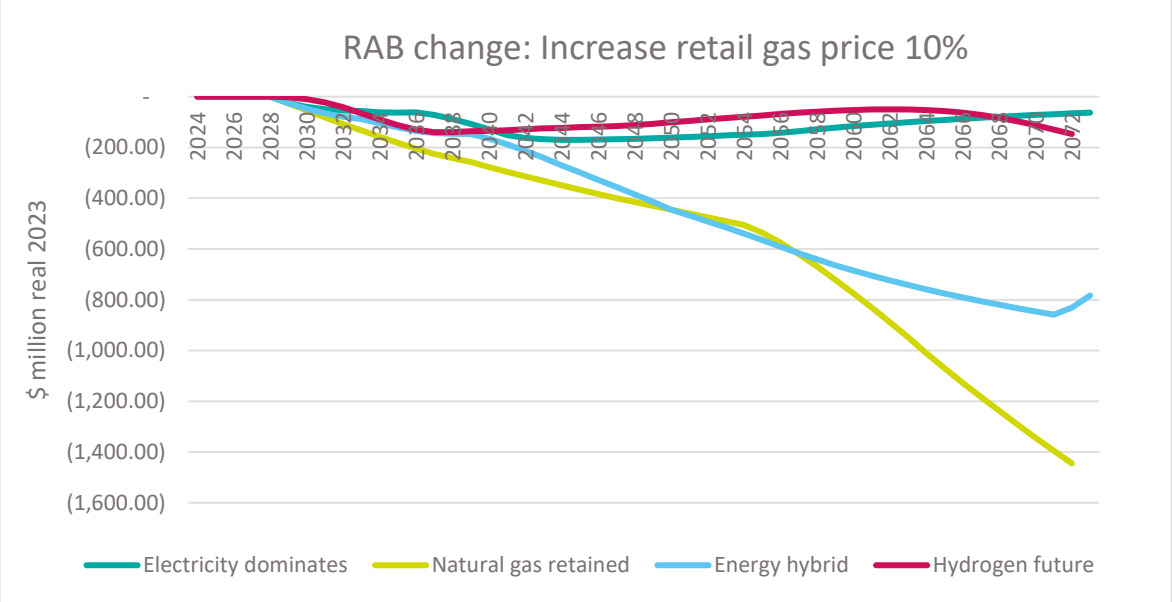


Figure 3.19 shows the decline in the RAB consistent with the decline in the customer base.

Figure 3.19: RAB change retail gas price increase 10% ($ million real as at 31 December 2023)



3.5.6 Electricity price decrease 10%

Figure 3.20 shows the change in the retail gas price given a 10% decrease in the retail electricity price. As expected, prices increase as additional customers are lost due to the increased competitiveness of electricity.

Figure 3.20: Change in retail gas price ($/GJ %$ real 31 December 2023)

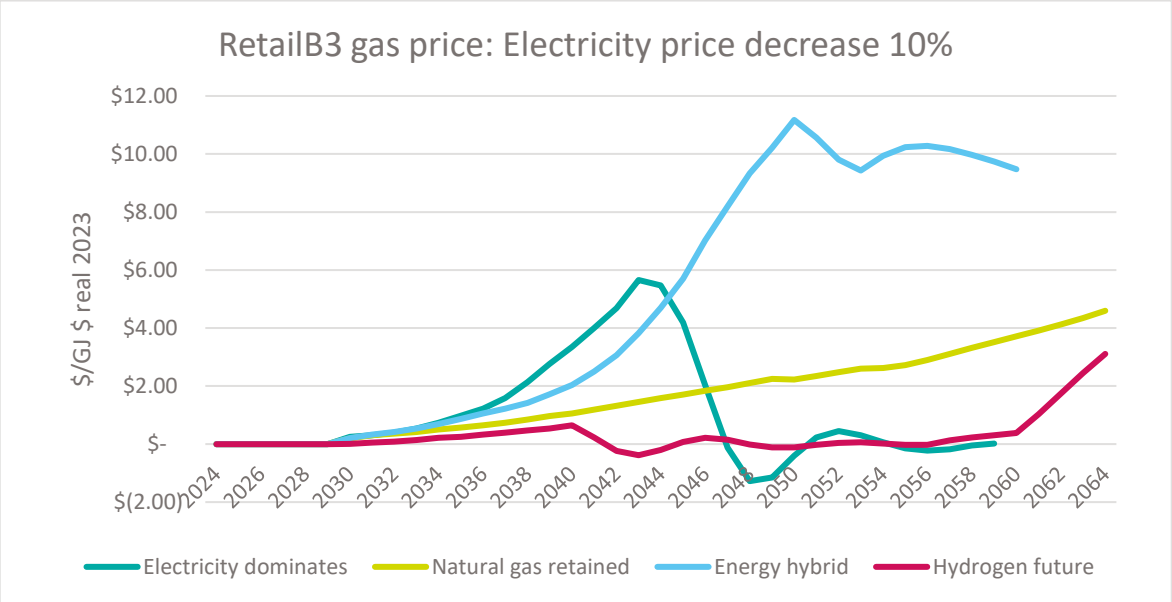


Figure 3.22 and Figure 3.22 show the consequent drop in customers and the RAB consequent on an electricity price decrease. The results are as expected given the reduced competitiveness of gas.

Figure 3.21: Change in customer base

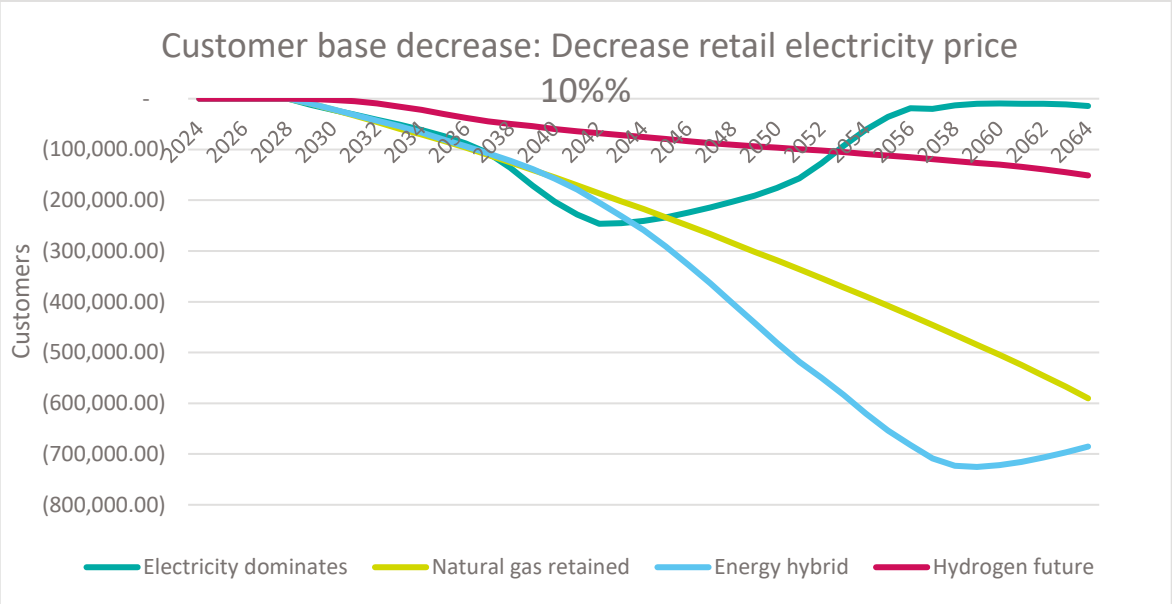
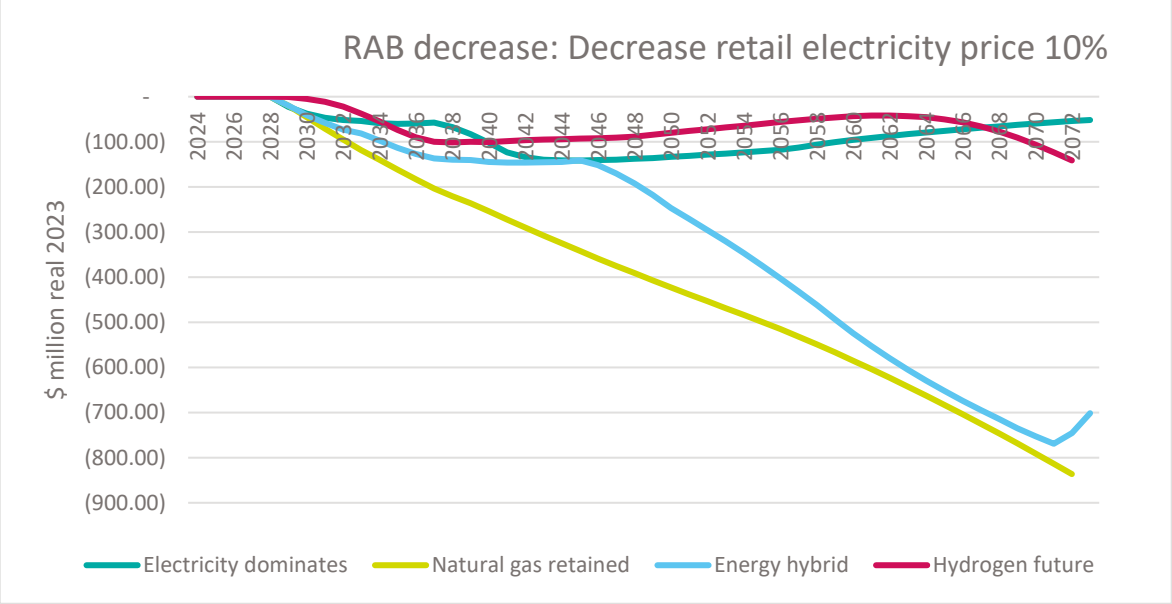


Figure 3.22: Change in RAB ($ million real as at 31 December 2023)



3.5.7 Decrease gas price 10%

The results are directionally as expected. The larger drop in the middle years for Electricity Dominates reflects higher customer retention than in the base case.

Figure 3.23: Decrease in the retail gas price ($/GJ real as at 31 December 2023)

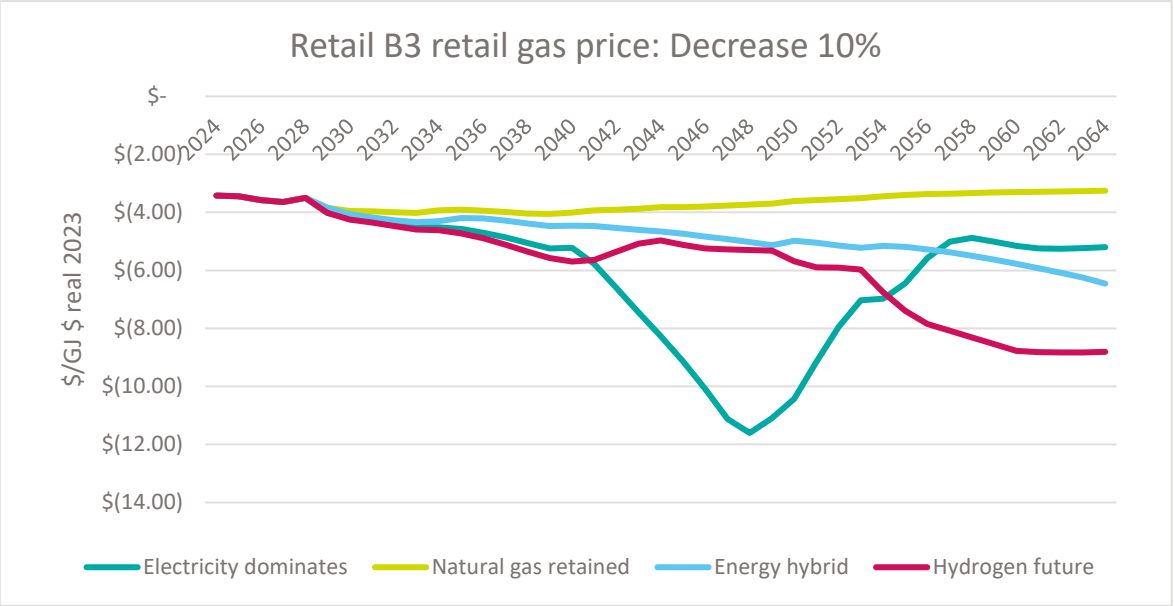


Figure 3.25 and Figure 3.25 show the consequent changes in the customer base and RAB due to the retail gas price decrease. Customers and consequently the RAB increase relative to the base case due to higher customer retention and new connections.

Figure 3.24: Customer base change

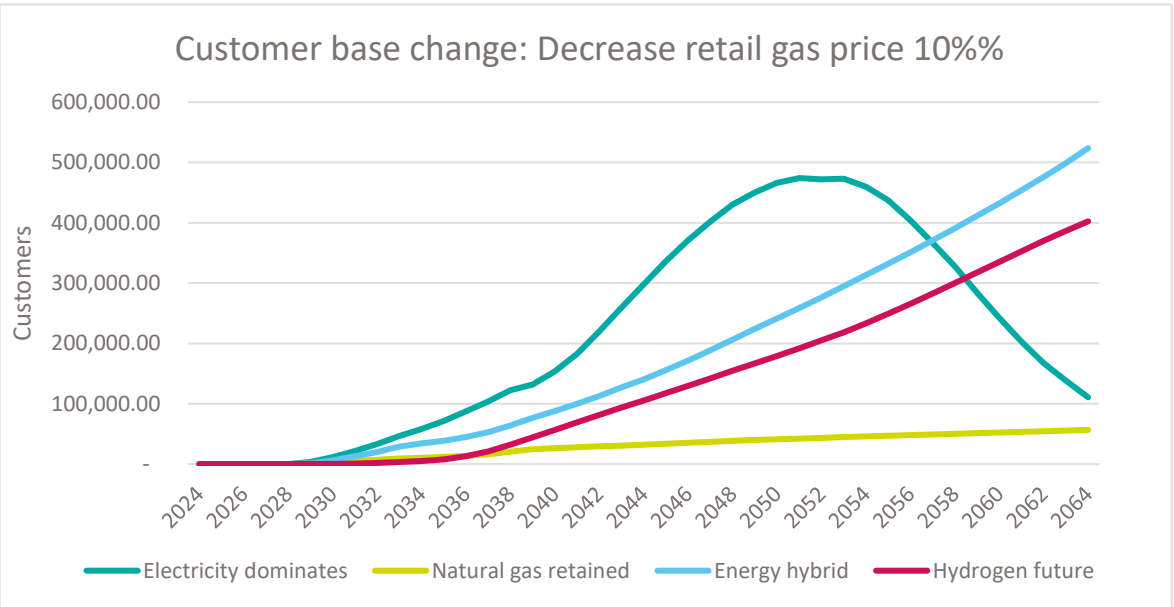
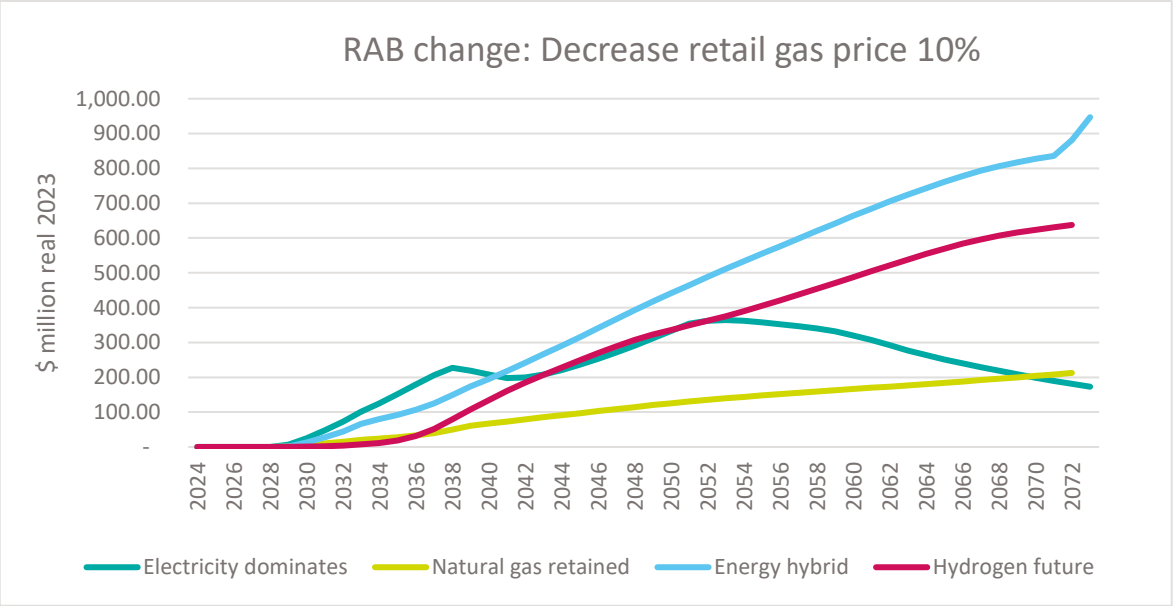


Figure 3.25: RAB ($ million real as at 31 December 2023)



3.5.8 Increase retail electricity price 10%

Increasing the electricity price has very similar effects to decreasing the retail gas price 10%. This can be seen by comparing the graphs in this section to the previous section.

Figure 3.26: Retail gas price change ($real as at 31 December 2023)

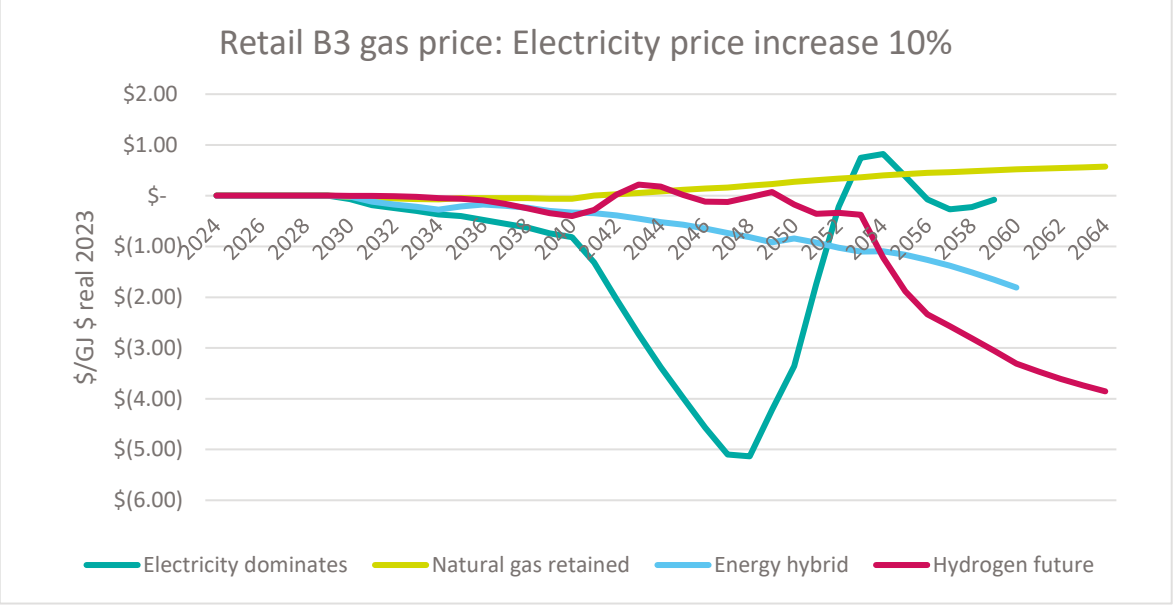


Figure 3.27: Customer base change

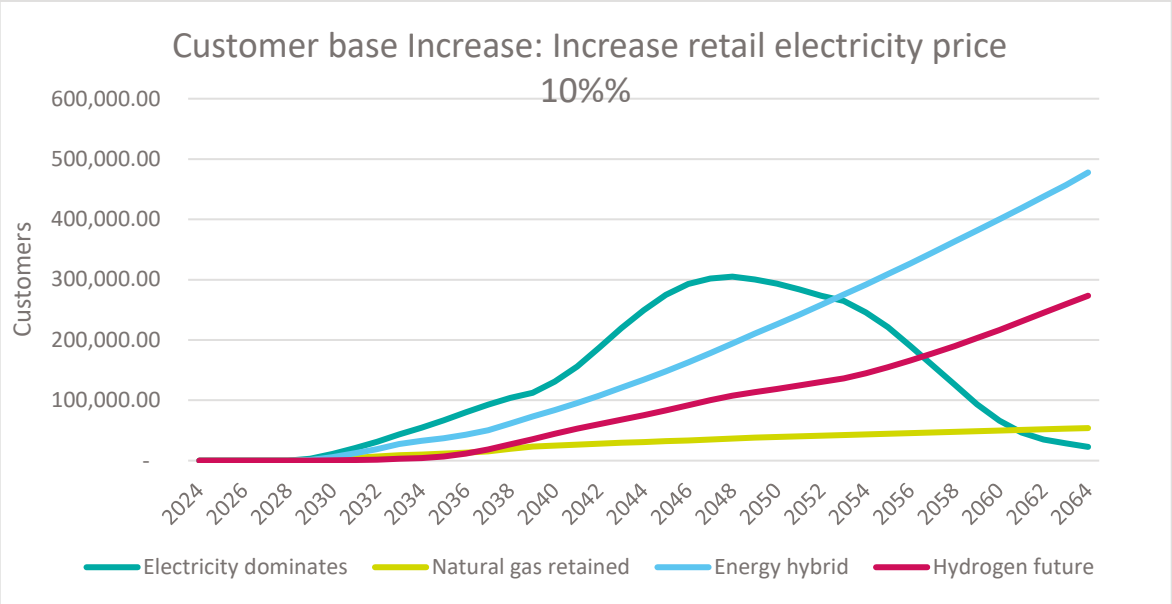
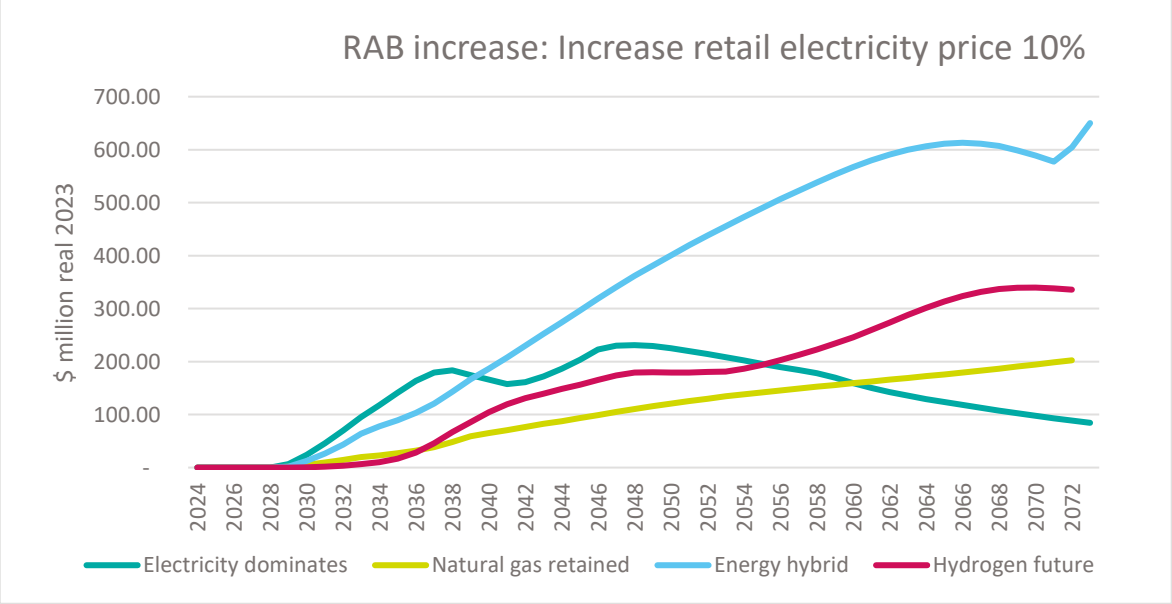


Figure 3.28: RAB change ($ real as at 31 December 2023)



3.6 Comparative measures

Accepting there is some risk of asset stranding then a comparison can be made to simple measures.

Table 3.4 summarise some measures from the modelling based on straight line depreciation which indicate the dollars at risk given a price cap of 1.5 in comparison to the accelerated depreciation.

Table 3.4: Value at risk ($ million real as at 31 December 2023)

	Gas retained		Hydrogen future		Energy Hybrid		Electricity dominates	
	2023	NPV	2023	NPV	2023	NPV	2023	NPV
Accelerated depreciation AA6	87	77	87	77	87	77	87	77
RAB 2074 (straight line)	2,361	66	2323	233	1200	120	501	50
RAB 2050 (straight line)	1,975	528	3,056	925	1,740	526	1,323	400
Unrecovered costs (straight line)	0		0		188	21	1,528	298
Unrecovered costs (straight line) start year					2069		2046	

The value a risk (NPV 2023) can be converted to an annual payment over 50 or 25 years depending on the view when provision of gas distribution services will be banned or made uneconomic.

Table 3.5: Payments to eliminate risk ($ million real as at 31 December 2023)

	Energy Hybrid	Electricity Dominates
RAB 2074 (straight line)	6	3
RAB 2050 (straight line) 25 year payment	36	28
Unrecovered costs (straight line)	1	16

Converting the value at risk to an annual payment over 50 years indicates an annual payment in the range of $7 to $19 million per year. If the payment period were reduced to 25 years consistent with a government policy to phase out gas by 2050 then the payments to recover the forecast RAB at 2050 are in the range $28 to $36 million per year

3.6.1.1 Reducing asset lives

We have conducted analysis using the tariff model which shows:

- If asset lives are capped to 2074 depreciation increases about $3 to $ 4 million per year over AA6.
- If asset lives are capped to 2050 depreciation increases about $20 million per year over AA6.

3.6.1.2 Inflation on the asset base

The PTRM tariff modelling framework adds inflation to the RAB each access arrangement period. That amount is effectively a deferral of the inflation portion of the nominal rate of return on the asset base to future periods. That amount is recovered over the life of assets in future periods. This makes sense to assist stabilising prices in a growing market. In a flat or declining market, it may not have the desired effect of stabilising prices over time.

We have estimated inflation on the RAB transferred to future periods from AA6 at approximately $220 million.

Accelerated depreciation could be viewed as one way to reduce this burden transferred to future customers. If the amount carried forward is not reduced the effect is to increase prices in future

periods where there may be other forces at play, such as a declining customer base also forcing price rises.

4. MODELLING ASSUMPTIONS

This section provides a description of the assumptions behind the model operation, opex and capex used in the accelerated depreciation modelling. Assumptions regarding the consumer choice section of the model have been documented by ACIL Allen. There are two (2) assumptions made by ACIL in setting up the base model which are noted however in section 4.2.

All data for AA6 is aligned to ATCO's response to the ERA's draft decision in accordance with the ERA's review of the previous modelling approach.

4.1 Overall approach

The overall approach is to first set up a scenario based on business as usual into the future. The expenditures are consistent with the growth and customer base. The scenario is called "Base no change" and can be viewed in the scenario tab.

When a scenario is run the capex and opex for the scenario are amended based on:

1. Connections and the size of the customer base for the active scenario using known unit rates of expenditure.
2. Adjustments specific to the scenario such as gas injection points if relevant.
3. Cost reduction measures, after taking account of the precious 2 adjustments, in response to a reduction in customer numbers greater than or equal to 40,000 customers.

- The details of adjustments 1 and 2 made for each scenario are in the tabs GR_ACIL to ED_ACIL where the first two letters of the tab name refer to the initials of the scenario name.
- Adjustments made for item 3 are in the "Actie scenario" tab.

4.2 ACIL Allen assumptions: Tilt and price Cap

ACIL Allen has recommended a tilt value of 0.02. As noted in section 4.1.1 ATCO believes this is a conservative value given the capex reductions assumed in response to a drop in customer numbers which reduce RAB values. This also appears to be a reasonable number when considered in light of the comparisons made in section 4.3.

The second assumption is the price cap. ATCO's understanding is that the price cap was selected by reviewing at what point in each scenario no new connections occurred and the retail gas price at that time. That price can then be compared to the 2029 price and expressed as a ratio or price cap multiple. We have run the model in both straight line and accelerated depreciation mode for each scenario and found price ratios in the range of approximately 1.3 to 1.8. The ratios will vary by scenario dependent on the assumptions made for the scenario about gas versus other energy sources preferences. Therefore, we believe the price cap of 1.5 is a good estimate to use in the base case model.

This price cap assumption is also conservative in terms of setting an accelerated depreciation amount as apart from the Electricity dominates scenario which has unrecovered costs beginning in 2046 unrecovered costs are relatively minor or zero for other scenarios.

4.3 Price and demand relationship

Price and demand are interdependent and so a method must be devised to remove the circularity between two variables. ATCO has done this by assuming that the price in period t determines the demand in period t+1. This can be considered a reasonable assumption.

- Over time although there is a one year lag the results will reflect changes in prices.
- When customers make decisions to change energy supply the change is not instantaneous. It will take time, although perhaps not a full year, to install appliances and make the necessary infrastructure changes if any.

4.4 OPEX

Opex projections are adjusted based on the three steps stated in section 4.1. The Energy hybrid and Hydrogen future scenarios have specific adjustments to account for the costs of injecting hydrogen or other gases into the network. Row references below unless stated otherwise refer to the relevant scenario tab GR_ACIL to ED_ACIL. To view the adjustment the relevant scenario must be selected to populate the demand section of the tab.

4.4.1 Size of the customer Base

At row 137 is an amount adjusted according to the size of the customer base. The amount is the product of the change in the size of the customer base relative to the "Base no Change" scenario and the assumed variable cost per customer. At the time of setting up the model this was believed to be around $35 per customer. Subsequent analysis in response to the ERA's draft decision indicates this amount should be around $40 per customer. The amount can be varied in the "dashboard" tab.

4.4.2 Reaction to customer base decline

At the "Active Scenario" tab rows 267 to 271 there is a calculation to reduce opex in response to a decline in the customer base. The base model assumes a "trigger" of a 40,000 drop in customers in one year. Once the trigger is activated it stays in place and opex continues to reduce. Opex is reduced proportionate to the reduction in the customer base. In any one year this is an aggressive cost reduction assumption as it assumes all costs are variable. However, in a longer term context this is a reasonable assumption as costs are reduced in response to an underutilised network and a potential not to be able to recover costs.

Opex compared to the customer base for the Electricity dominates and Energy Hybrid scenarios are shown in Figure 4.1 and Figure 4.2.

Figure 4.1 Electricity dominates opex and customer base

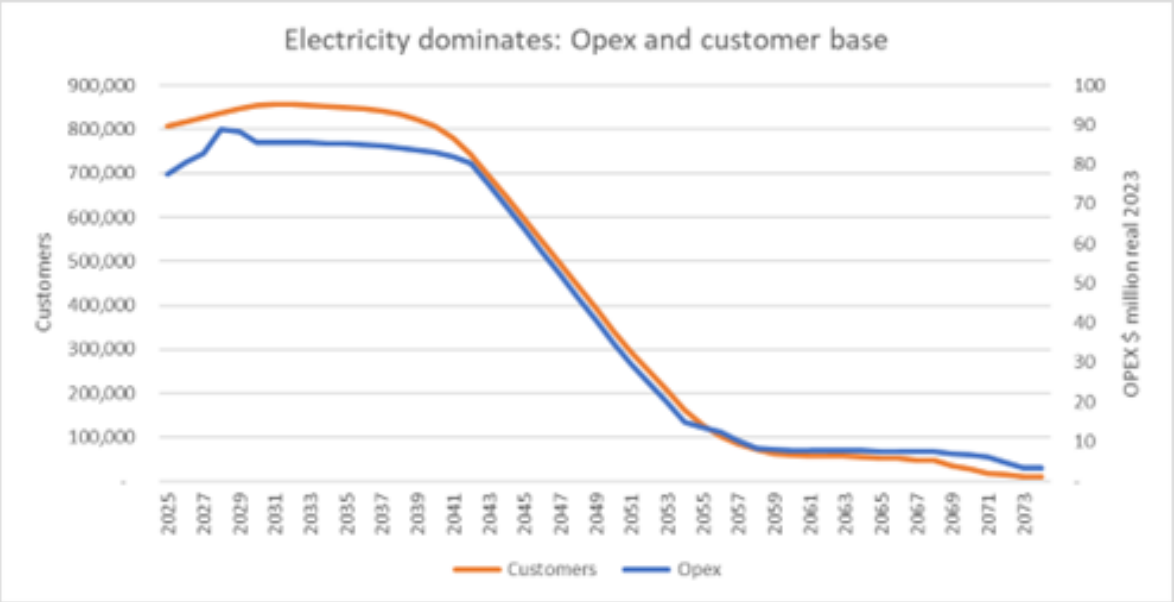
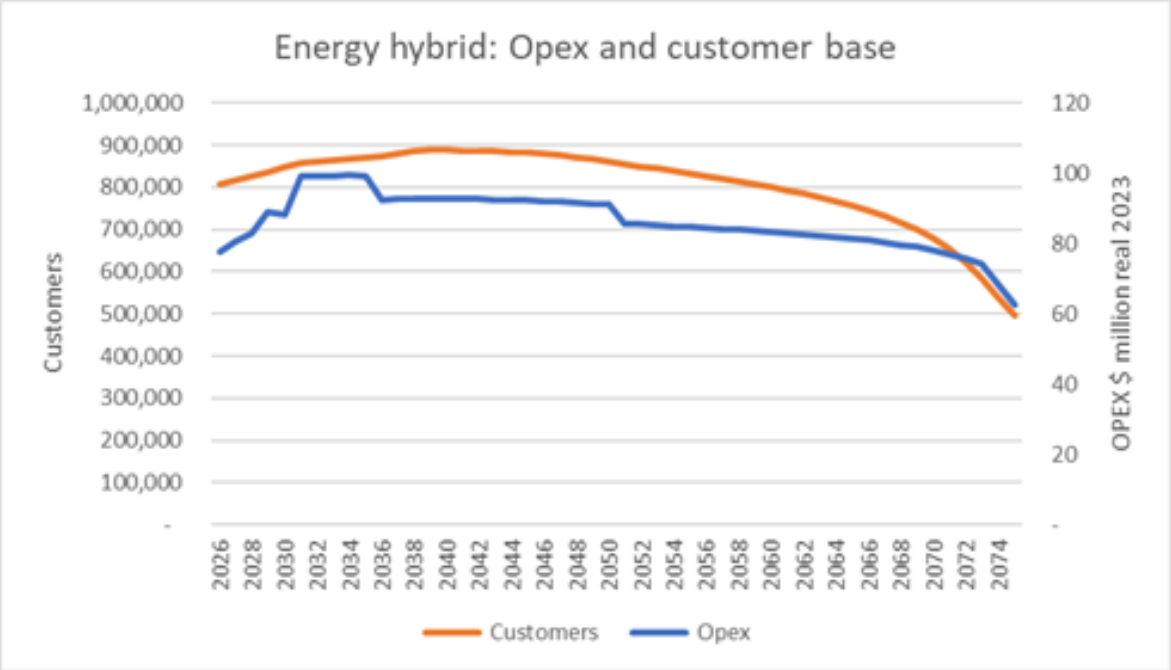


Figure 4.2:Energy hybrid opex and customer base



4.4.3 Energy Hybrid and Hydrogen Future.

Thes scenarios have specific opex adjustments made due to the requirements to inject gases other than natural gas into the network. As previously advised to the ERA in response to question FE01 the costs are based on work done by Sustech Engineering. Sustech calculated the incremental opex of operating a 10% blend versus BAU. An incremental amount of $12 million per annum is required from 2027 to 2034 and $5 million per annum thereafter. Due to delays the model implements this expenditure from 20230. It is shown at row 155 of the EH_ACIL tab.

Sustech conducted a detailed analysis working with ATCO to identify specific items of expenditure required. Sustech used an iterative approach to reach their results preparing initial estimates

which were reviewed by ATCO and modified in response to ATCO feedback using knowledge of operating the network.

The degree of detail is indicated in the screenshots below of the expenditure line items considered.

Operating Expenses (AGA Group) ($'000s)
Salaries and Wages
Salaries and wages for Retrofit for 10% hydrogen blend
Operating Fee
Contract Expenses
Contract expenses for Retrofit 10% hydrogen blend
Consulting Fees
Consulting Fees for Retrofit for 10% hydrogen blend
Motor Vehicle Expenses
Motor Vehicle Expenses for Retrofit for 10% hydrogen blend
Insurance
Insurance for Retrofit for 10% hydrogen blend
Property Expenses
Employee Expenses
Employee Expenses for Retrofit for 10% hydrogen blend
Materials Expenses
Materials Expenses for Retrofit for 10% hydrogen blend
Admin Expenses
Overhead Absorption
Overhead Absorption for Retrofit for 10% hydrogen blend
Repairs & Maintenance
Repairs & Maintenance (Including inspection) for Retrofit for 10% hydrogen blend
Advertising, Marketing and Promotions
Advertising, Marketing and Promotions for 10% hydrogen blend

IT Expenses
IT Expenses for Retrofit for 10% hydrogen blend
ESG (labour)
ESG (labour) for Retrofit for 10% hydrogen blend
ESG (non labour)
ESG (non labour) for Retrofit for 10% hydrogen blend
Other Company Expenses
Other additional expenses (Including inspection) for 10% hydrogen blend not included in other company expenses
Total Operating Expenses
Total Operating Expenses - 10% Hydrogen Blend

Opex has been retained at BAU levels plus incremental opex for the H2 blend. It is assumed no additional incremental opex on the basis new pipes and fittings will (if anything) reduce maintenance opex. Incremental opex can be seen at row 155 of the HF_ACIL tab.

4.5 Capex

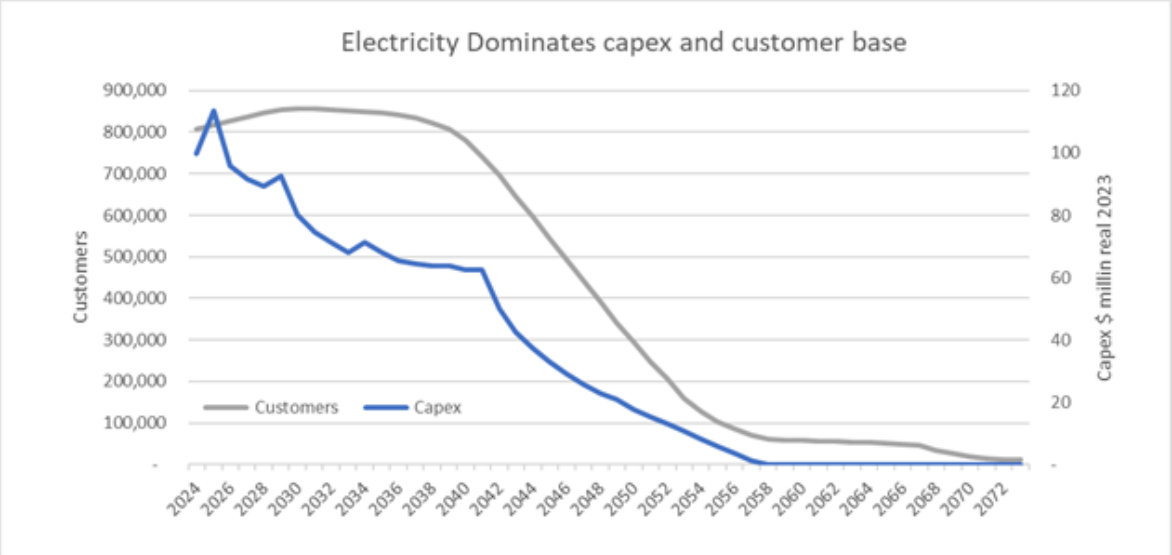
Capex projections are adjusted based on the three steps stated in section 4.1. The Energy hybrid and Hydrogen future scenarios have specific adjustments to account for the costs of injecting hydrogen or other gases into the network. Row references below unless stated otherwise refer to the relevant scenario tab GR_ACIL to ED_ACIL. To view the correct amount of adjustment the relevant scenario must be selected to populate the demand section of the tab.

4.5.1 Reaction to customer base decline

At row 97 is an amount adjusted according to the size of the customer base. The amount is the product of the change in the size of the customer base relative to the "Base no Change" scenario and the forecast unit rate for the routine meter change program of works which replaces out of date residential meters.

Should the customer base decline by more than 40,00 customers in a year a capex reduction programme is triggered and continues each year. Figure 4.3 shows the effect in the Electricity dominates scenario. The capex reduction is aggressive and reduces capex to nil by 2056 which is very conservative and contributes to the low RAB value in 2074 lowering the perceived asset stranding risk. The rate at which capex is reduced is at rows 363 to 377 of the active scenario tab.

Figure 4.3: Electricity dominates capex and customer numbers



4.5.2 Customer growth

Customer growth capex is adjusted based on new connections in the scenario compared to the "Base no change" scenario. Adjustments are made for the B2 and B3 tariff classes. Adjustment is at the forecast unit rate for mains and meters relevant to the B2 or B3 connection.

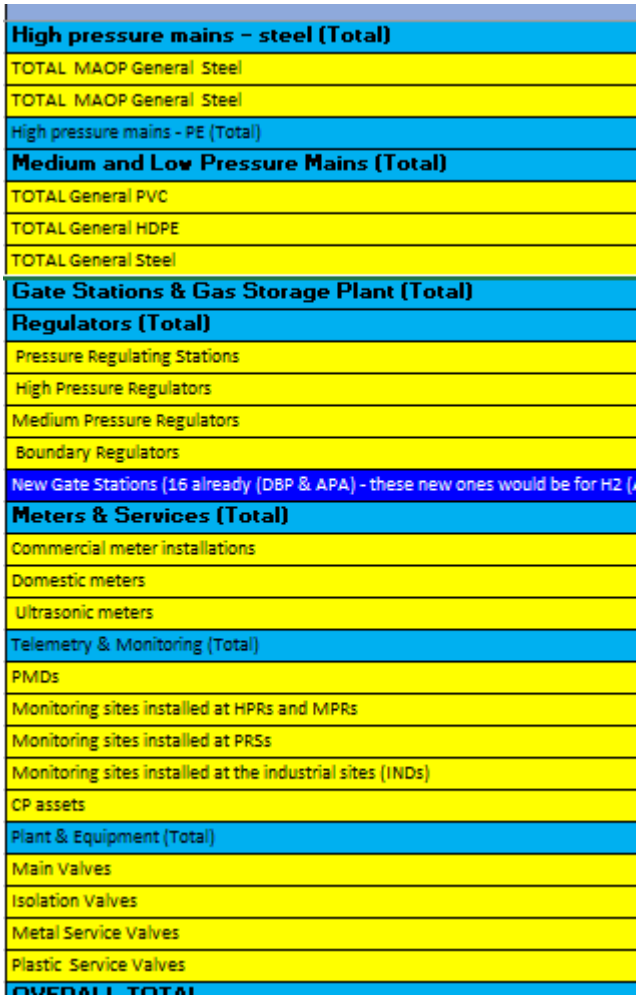
4.5.3 Energy Hybrid and Hydrogen Future.

Thes scenarios have specific capex adjustments made due to the requirements to inject gases other than natural gas into the network. As previously advised to the ERA in response to question

FE01 the costs are based on work done by Sustech Engineering. The amount of expenditure is shown in rows 115 to 1331 of the tabs EH_ACIL and HF_ACIL. Due to delays, the model implements this expenditure from 2030.

Sustech conducted a detailed analysis working with ATCO to identify specific items of expenditure required. Sustech used an iterative approach to reach their final results preparing initial estimates which were reviewed by ATCO and modified in response to ATCO feedback using knowledge of operating the network.

Sustech developed a detailed bill of quantities required and the prices for the items listed. The degree of detail is indicated in the screenshots below of the expenditure line items considered.



High pressure mains – steel (Total)
TOTAL MAOP General Steel
TOTAL MAOP General Steel
High pressure mains - PE (Total)
Medium and Low Pressure Mains (Total)
TOTAL General PVC
TOTAL General HDPE
TOTAL General Steel
Gate Stations & Gas Storage Plant (Total)
Regulators (Total)
Pressure Regulating Stations
High Pressure Regulators
Medium Pressure Regulators
Boundary Regulators
New Gate Stations (16 already (DBP & APA) - these new ones would be for H2 (
Meters & Services (Total)
Commercial meter installations
Domestic meters
Ultrasonic meters
Telemetry & Monitoring (Total)
PMDs
Monitoring sites installed at HPRs and MPRs
Monitoring sites installed at PRSs
Monitoring sites installed at the industrial sites (INDs)
CP assets
Plant & Equipment (Total)
Main Valves
Isolation Valves
Metal Service Valves
Plastic Service Valves
OVERALL TOTAL

5. RUNNING THE MODEL

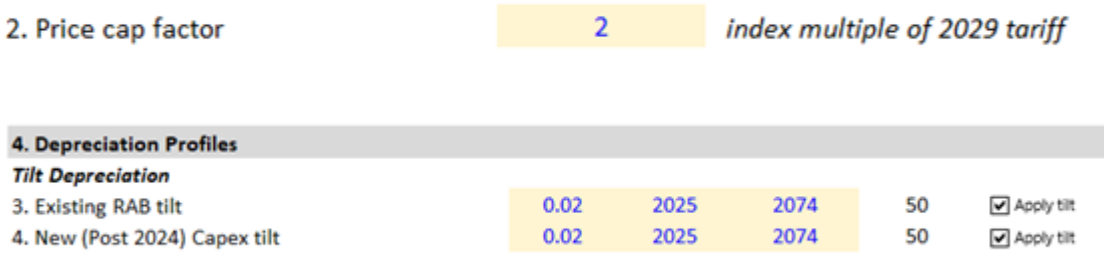
The model is run from the dashboard tab either manually or using a macro.

5.1 Using the macro to generate outputs

The macro calculates both the straight line and accelerated depreciation and outputs summary data to the “user Output” and “Depn Summary tabs”. The Output tab compares movement between applying straight line depreciation and accelerated deprecation for the following variables.

- Depreciation
- RAB
- Capex
- Opex
- Cost of service
- Tariff revenue
- Gas consumption
- Customers
- Residential retail gas price.
- The macro is run by completing the following steps:
- Select the scenario form the drop down box.

Input the price cap and tilt values. If no price cap is required input a high value say 500 so it does not apply. Input the start and end years for the tilt. Usually, the start year is 2025 and end year 2074. Years outside this range are not valid. If using the macro, it is not necessary to tick the apply tilt boxes.



If required tick the boxes to turn off selected capex programmes and specify the start and end years.

Capex to turn off (End year must be less than 2074)				
EOL Replacement - PVC mains	2030	2074	45	☐ switch off
Small Asset Replacement - SPY Transfers	2030	2074	45	☐ switch off
Network Reinforcement - Secret Harbour	2030	2074	45	☐ switch off
Network Reinforcement - Inglewood	2030	2074	45	☐ switch off
Network Reinforcement - Pearsall	2030	2074	45	☐ switch off
Pressure Monitoring Device Installation	2030	2074	45	☐ switch off
Reconnection after Disconnection (SNB)	2030	2074	45	☐ switch off
Re-lay Service / SNB (SNR)	2030	2074	45	☐ switch off

An asset life end year can also be specified but this is normally run separately to the accelerated depreciation scenario as they are different methods to achieve bringing forward depreciation.

APPENDIX A. SPECIFIC MODEL INFORMATION

A.1 Model Worksheets

Sheets in Workbook	Status	Description
Information	Visible	
Range_Names	Hidden	Contains named ranges for workbook
Dashboard	Visible (Protected)	Main sheet to run different scenarios, uses macros to generate information
Outputs>>		
User Output	Visible	Sheet for generating macro outputs, contains output data for the user to view
Depn Summary	Visible	Sheet for generating macro outputs, contains output data for the user to view
ACIL Output>>		
Summary	Visible	Collated forecast information for pricing and demand
Forecasts	Visible	Provide forecast customer choice information post 2025
ACIL inputs>>		
Control	Visible	Appliance and customer preference inputs
Scenarios	Visible	Gas and electricity pricing information and forecasts
DNSP data	Visible	Distribution network provider historical information
Census	Visible	Census data, including income distribution
ACIL Calcs>>		
Prices	Visible	Calculation of electricity and gas forecast prices
Appliance costs	Visible	Calculation of forecast appliance costs and switching decision
CustomersRes	Visible	Residential forecast customers and appliance distribution
CustomersCOM	Visible	Commercial forecast customers and appliance distribution
RES S curve-connect	Visible	Residential forecast connection NPV analysis
RES S curve-disconnect	Visible	Residential forecast disconnection NPV analysis
COM S curve-connect	Visible	Commercial forecast connection NPV analysis
COM S curve-disconnect	Visible	Commercial forecast disconnection NPV analysis
ATCO Inputs>>		
Price to ACIL	Visible	Price outputs output from the PTRM model for input to the ACIL Allen consumer choice model with a one year lag
Capex Scenarios	Hidden	Shows the rate at which capex is assumed to change relative to scenarios
Capex_On_off	Visible	Calculates the capex to be deducted from the capex forecast to exclude capex programmes selected
GR_ACIL	Visible	Contain the outputs from the ACIL Allen consumer choice model for Gas Retained

Sheets in Workbook	Status	Description
EH_ACIL	Visible	Contain the outputs from the ACIL Allen consumer choice model for Energy Hybrid
HF_ACIL	Visible	Contain the outputs from the ACIL Allen consumer choice model for Hydrogen Future
ED_ACIL	Visible	Contain the outputs from the ACIL Allen consumer choice model for Electricity Dominates
PTRM>>		
Active_Scenario	Visible	
WACC	Visible	Contains the relevant parameters related to computing the WACC
PTRM expenditure	Visible	
2019 Capex NGR 77(2)(a)	Visible	Calculation of the benefit or loss due to the difference between AA5 forecast capex and actual 2019 capex
CoS	Visible	Computations of total revenue building block (cost of service), inflationary gain and Credit Foncier Check
Price_path_AA6	Visible	Contains the macro to calculate the price path necessary to equate in NPV terms the cost of service and expected tariff revenue
Load_Demand	Visible	Uses the customer choice demand to upload into the PTRM calculation
Revenue	Visible	Contains calculation of tariffs and revenue
Working_Capital	Visible	Contains calculation of working capital
Tax_CoRE	Visible	Contains calculation of tax, imputation credit and cost of raising equity
RAB total	Visible	Contains regulatory asset base. Includes initial capital base, capital expenditure account, Vines and Westnet. Computations in Real 31-Dec-2019 $m
RAB close 2024 SL	Visible	Updates the RAB for Straight-line depreciation
RAB close 2024 AD	Visible	Updates the RAB for Accelerated depreciation
RAB Post 2024	Visible	RAB outcomes
Tax RAB total	Hidden	Tax imputations
Tax_Asset close 2024	Hidden	Tax imputations
Years>>		
2025 to 2074	Hidden	2025 to 2074 handle year specific information and are hidden for navigation

APPENDIX B. ACIL ALLEN MODEL INFORMATION

B.1 Model Inputs

B.1.1 Control

2.1 'Control' worksheet

The Control worksheet contains the main model settings used in the NPV calculations.

These include:

- Appliance capital costs for cooking, hot water and space heating
- Real percentage annual change in appliance costs over time
- Assumed annual appliance consumption for cooking, hot water and space heating
- Changes in appliance efficiency over time
- Appliance maintenance costs per annum and real percentage changes in maintenance costs
- Assumed asset lives and the decision point for each existing customer

The model user can adjust each of the above settings in the worksheet and observe the impact on gas volumes and customer numbers over time.

Figure 2.1 shows a snapshot from this worksheet.

Figure 2.1 Snapshot of the 'Control' worksheet

	A	B	C	D	E	F	G	H	I
1	**Customer discount rates**	%							
2	High income	5%		Recoonections as share of gross conne	25%		**Asset lives**	**Years**	
3	Medium income	10%					**Cooking**	15	
4	Low income	15%		**Appliance capital costs**			**Hot water**	12	
5	Commercial	3%		**Cooking**	**$ real 2021**		**Room heating**	15	
6				Electric cooktop (induction)	2900		**Ducted heating**	15	
7	**Appliance costs**			Gas stove	2100		**Service charge**	15	
8	**Cooking**	**real % change (p.a.)**							
9	Electric cooktop (induction)	0%		**Hot water**			**Decision point**	15	
10	Gas stove	0%		Heat pump hot water	3700				
11				Gas instant hot water	1400		**Elasticities**	**Residential B3**	**Commercial B2**
12	**Hot water**						**Weather**	0.200	
13	Heat pump hot water	0%		**Room heating**			**Gas price**	-0.250	
14	Gas instant hot water	0%		RCAC split system	2199		**Elecricity price**	0.100	
15				Gas wall furnace	1747		**GSP**	0.000	
16	**Room heating**						**B1 Trend**	0.000	
17	RCAC split system	0%		**Ducted heating**					
18	Gas wall furnace	0%		Ducted RCAC	4542				
19				Ducted gas heating	2244				
20	**Ducted heating**								
21	Ducted RCAC	0%		**Gas disconnection charge**	100		Distribution share of retail fixed ch	%	
22	Ducted gas heating	0%		**Electricity connection upgrade**	1500		Residential	40%	
23							Commercial	40%	
24	**Gas disconnection charge**	0%							
25	**Electricity connection upgra**	0%							
26									

Source: ACIL Allen

B.1.2 Scenarios

2.2 'Scenarios' worksheet

The Scenarios worksheet presents two blocks of indicator variables (0 or 1) representing whether an LGA is turned on or off for each year in the projection period.

The first two blocks in the worksheet allow the model user to turn the network entirely on or off for each LGA within the distribution network for residential and commercial customers, respectively. The indicator variable is set to 1 when the network is permitted to operate for a given LGA in a given year (see Figure 2.2). To turn the network off in a particular LGA, the indicator variable needs to be set to zero for each year the distribution network is switched off. Once the network is turned off it cannot be turned on again. It is also possible for the indicator variable to take a value between zero and 1 reflecting a transitionary period between operating and switching off.

Two additional blocks of data in the worksheet allow the model user to prevent new connections from being added to the network in specific LGAs. This allows the model user to explore scenarios around new government policies that prevent new greenfield developments in specific areas within the distribution network. Separate switches exist for both residential and commercial customers. These indicator variables are set to a default value of zero (indicating that new connections are still permitted).

Residential Network ON/OFF

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Natural Gas Retained	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Energy Hybrid	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Hydrogen Future	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Electricity Dominates	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
INPUT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Commercial Network ON/OFF

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Natural Gas Retained	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Energy Hybrid	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Hydrogen Future	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Electricity Dominates	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
INPUT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Residential Network No new connections

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Natural Gas Retained	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy Hybrid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Future	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricity Dominates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Commercial Network No new connections

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Natural Gas Retained	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy Hybrid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Future	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricity Dominates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Electricity appliance rebates-Cooktops

Appliance	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Natural Gas Retained	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy Hybrid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Future	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricity Dominates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Electricity appliance rebates- Hot water

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Natural Gas Retained	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy Hybrid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Future	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricity Dominates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Electricity appliance rebates- Room heater

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Natural Gas Retained	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy Hybrid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Future	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricity Dominates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Electricity appliance rebates- Ducted heating

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Natural Gas Retained	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy Hybrid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Future	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricity Dominates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Selected Scenario																Scenario number			
	Natural Gas Retained			Energy Hybrid			Hydrogen Future			Electricity Dominates			Selected scenario: Electricity Dominates			4.000			
Electricity Dominates	Wholesale gas price	Retail electricity price- residential	Retail electricity price- commercial	Wholesale gas price	Retail electricity price- residential	Retail electricity price- commercial	Wholesale gas price	Retail electricity price- residential	Retail electricity price- commercial	Wholesale gas price	Retail electricity price- residential	Retail electricity price- commercial				wholesale gas price $/GJ	Retail electricity price- residential $/kwh	Retail electricity price- commercial	
2021	3.80	0.338	0.336	3.80	0.338	0.336	3.80	0.338	0.336	3.80	0.338	0.336				3.800	0.338	0.336	
2022	5.36	0.333	0.332	5.36	0.333	0.332	5.36	0.333	0.332	5.36	0.333	0.332				5.364	0.333	0.332	
2023	5.46	0.317	0.315	5.46	0.317	0.315	5.46	0.317	0.315	5.46	0.317	0.315				5.465	0.317	0.315	
2024	6.60	0.308	0.307	6.60	0.308	0.307	6.60	0.308	0.307	6.60	0.308	0.307				6.603	0.308	0.307	

B.1.3 DNSP Data

Provides for the historical information for the ATCO network:

Distribution Network Service Provider	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Volumes																		
Residential volume GJ (CY) B3	9,915,732	9,986,998	9,850,157	10,024,743	10,428,114	10,028,686	10,126,791	9,984,526	10,329,927	10,453,622	10,204,752	10,325,306	9,952,599	9,693,821	9,489,882	9,314,348	9,159,842	9,021,354
Commercial volume GJ (CY) B1	1,601,263	1,618,005	1,642,693	1,714,544	1,919,597	1,865,589	1,997,992	1,935,207	1,847,302	2,077,214	2,140,840	2,199,445	2,164,480	2,153,962	2,143,169	2,132,430	2,121,746	2,111,115
Commercial volume GJ (CY) B2	1,213,946	1,233,255	1,275,755	1,302,729	1,318,310	1,339,836	1,343,696	1,328,717	1,251,356	1,318,289	1,296,905	1,329,339	1,310,198	1,300,823	1,291,538	1,282,340	1,276,486	1,273,806
Industrial volume GJ (CY) A1	12,180,681	11,141,986	11,561,704	11,398,216	10,777,961	10,338,179	11,178,043	10,889,197	11,717,847	12,321,872	11,853,736	12,497,535	12,150,331	13,178,431	13,378,659	13,876,851	13,854,511	13,821,128
Industrial volume GJ (CY) A2	2,110,137	1,965,168	1,880,703	1,854,029	1,819,924	1,814,453	1,834,569	1,848,741	1,735,996	1,841,568	1,879,069	1,879,403	1,897,993	1,899,848	1,886,418	1,882,250	1,877,351	1,872,523
Customers																		
Residential customers B3	642,286	657,322	675,990	697,831	713,194	724,627	732,627	741,437	746,639	756,154	767,161	778,476	784,780	791,959	800,769	810,484	820,622	831,004
Commercial customers B1	1,338	1,363	1,414	1,476	1,563	1,637	1,704	1,774	1,841	1,912	1,968	2,021	2,070	2,120	2,170	2,222	2,275	2,330
Commercial customers B2	9,247	9,839	10,364	10,885	11,344	11,649	11,828	12,120	12,139	12,318	12,540	12,725	12,913	13,104	13,299	13,496	13,766	14,040
Industrial customers A1	76	73	72	75	77	74	75	74	74	73	73	69	69	70	70	70	70	70
Industrial customers A2	108	108	108	105	99	99	105	108	103	105	103	105	104	104	104	104	104	104
Customers-Connections																		
Residential customers B3	14,237	17,008	21,577	24,378	19,456	14,342	12,490	11,218	10,082	10,992	12,127	14,010	9,885	10,789	12,453	13,398	13,867	14,157
Commercial customers B1	50	44	65	65	68	72	51	64	57	59	49	45	43	42	42	43	43	44
Commercial customers B2	528	552	520	534	517	373	335	277	220	197	212	240	244	248	252	256	260	264
Customers-Disconnections																		
Residential customers B3	1,618	1,972	2,909	2,537	4,093	2,909	4,490	2,408	4,880	1,477	1,120	2,695	3,581	3,610	3,643	3,684	3,728	3,775
Commercial customers B1	11	19	14	3	(19)	(2)	(16)	(6)	(10)	(12)	(7)	(8)	(6)	(8)	(9)	(9)	(10)	(10)
Commercial customers B2	(21)	(40)	(5)	13	58	68	156	(15)	201	18	(10)	35	56	57	58	59	(10)	(10)
Volume per connection																		
Residential customers B3	15	15	15	14	15	14	14	13	14	14	13	13	13	12	12	11	11	11
Commercial customers B1	1,197	1,187	1,162	1,162	1,228	1,140	1,173	1,091	1,003	1,086	1,088	1,088	1,046	1,016	988	960	932	906
Commercial customers B2	131	125	123	120	116	115	114	110	103	107	103	104	101	99	97	95	93	91
Industrial customers A1	160,272	152,630	160,579	151,976	139,974	139,705	149,041	147,151	158,349	168,793	162,380	181,124	176,092	188,263	191,124	198,241	197,922	197,445
Industrial customers A2	19,538	18,196	17,414	17,657	18,383	18,328	17,472	17,118	16,854	17,539	18,243	17,899	18,250	18,268	18,139	18,099	18,051	18,005

B.1.4 Census

2.7 'Census' worksheet

The 'Census' worksheet contains information from the 2016 Census that is used to classify each LGA (see Figure 2.6). The methodology uses three discount rates, which can be assigned to each LGA depending on the characteristics of each LGA. The classification is assigned in the 'Control' worksheet of the model, and each LGA is assigned either a low, medium or high discount rate in the LGA calculations. LGAs with lower socio-economic characteristics are assigned a higher discount rate because consumers are constrained by the upfront capital costs of new appliance purchases and are, therefore, less forward-looking in their decision-making. The values of the low, medium and high discount rates are assigned in the 'Control' worksheet.

2021 census data				
ATCO	Count (Persons)	Median_tot_fam_inc_w	Median_tot_hhd_inc_w	Socioeconomic class
ARMADALE	94184	2061	1774	M
BASSENDEAN	15932	2278	1738	M
BAYSWATER	69283	2228	1739	M
BELMONT	42257	2086	1641	L
BUNBURY	32987	1760	1326	L
BUSSELTON	40640	1866	1459	L
CAMBRIDGE	28876	3898	2964	H
CANNING	95860	2130	1838	M
CAPEL	18175	2206	1949	M
CHITTERING	5930	2258	2044	H
COCKBURN	118091	2344	1995	M
COTTESLOE	7970	4597	3303	H
DARDANUP	14686	2089	1746	M
EAST FREMANTLE	7819	3178	2288	H
FREMANTLE	31930	2591	1887	M
GOSNELLS	126376	1930	1656	L
GREATER GERALDTON	39489	2003	1536	L
HARVEY	28567	2067	1788	M
JOONDALUP	160003	2528	2165	H
KALAMUNDA	58762	2215	1866	M
KWINANA	45867	1996	1716	M
MANDURAH	90306	1651	1273	L
MELVILLE	103523	2654	2096	H
MOSMAN PARK	9169	3456	2132	H
MUNDARING	39166	2270	1907	M
MURRAY	18068	1742	1368	L
NEDLANDS	22132	4244	3226	H
PEPPERMINT GROVE	1597	5012	4565	H
PERTH	28463	2480	1931	M
ROCKINGHAM	135678	2077	1724	M
SERPENTINE-JARRAHDALE	32173	2242	2097	H
SOUTH PERTH	43405	2761	2004	H
STIRLING	226369	2332	1786	M
SUBIACO	17267	3242	2140	H
SWAN	152974	2109	1843	M
VICTORIA PARK	36889	2473	1844	M
VINCENT	36537	3050	2209	H
WANNEROO	209111	2148	1894	M

	Count	Proportion
Low	390,123	17.1%
Medium	1,419,987	62.1%
High	476,401	20.8%

B.1.5 Prices

2.10 'Prices' worksheet

The 'Prices' worksheet is a crucial input sheet in the model where gas and electricity price projections are entered.

ACIL Allen developed retail electricity price forecasts for commercial and domestic users to input into the Future of Gas Model. We provided electricity prices under four scenarios: Gas Retained, Electricity Dominates, Energy Hybrid and Hydrogen Future.

ACIL Allen maintains a national retail price model that estimates electricity tariffs for typical retail customers in each NEM region, the WA WEM, and the NT DKIS. The retail prices used were developed using this model. The retail prices were developed using a building block approach with the building blocks consisting of network, wholesale energy, LRET, SRES, other state-based green schemes, losses and retailing costs.

Wholesale costs were developed using ACIL Allen's simulator, PowerMark. The results were based on our most recent reference case. We update these cases quarterly, and these prices can change depending on assumed inputs.

The retail gas price is split into a daily fixed charge and a volumetric charge.

The volumetric charge ($/GJ) is built up from the following components:

- Distribution charge
- Wholesale price
- Transmission charge
- AEMO costs
- Environmental charges
- Retail margin

Figure 2.8 Snapshot from 'Prices' worksheet

Residential	Real $2021								
Year	Distribution fixed charge $/day	Distribution $/GJ	Retail fixed charge $/day	Wholesale $/GJ	Transmission $/GJ	AEMO costs $/GJ	Environmental $/GJ	Retail margin $/GJ	Retail gas price $/GJ
2021	0.227667006	$ 3.53	0.83	8.59	$ 2.32	$ 0.23	$ 0.47	$ 1.02	$ 16.15
2022	0.228	$ 3.53	0.83	9.60	$ 2.32	$ 0.23	$ 0.47	$ 0.93	$ 17.08
2023	0.230	$ 3.53	0.83	10.36	$ 2.24	$ 0.23	$ 0.50	$ 0.97	$ 17.82
2024	0.233	$ 3.54	0.83	10.56	$ 2.22	$ 0.23	$ 0.55	$ 0.98	$ 18.08
2025	0.239	$ 3.54	0.84	11.06	$ 2.19	$ 0.23	$ 0.62	$ 1.01	$ 18.66
2026	0.246	$ 3.55	0.85	11.57	$ 2.16	$ 0.23	$ 0.72	$ 1.05	$ 19.27
2027	0.257	$ 3.55	0.86	11.56	$ 2.14	$ 0.23	$ 0.86	$ 1.05	$ 19.39
2028	0.270	$ 3.55	0.87	11.77	$ 2.14	$ 0.23	$ 1.05	$ 1.08	$ 19.81
2029	0.291	$ 3.55	0.89	12.06	$ 2.15	$ 0.23	$ 1.32	$ 1.11	$ 20.41
2030	0.319	$ 3.55	0.92	12.43	$ 2.16	$ 0.23	$ 1.69	$ 1.15	$ 21.21
2031	0.193	$ 3.54	0.79	12.51	$ 2.17	$ 0.23	$ -	$ 1.06	$ 19.51
2032	0.192	$ 3.54	0.79	12.83	$ 2.18	$ 0.23	$ -	$ 1.08	$ 19.86
2033	0.193	$ 3.53	0.79	12.97	$ 2.19	$ 0.23	$ -	$ 1.09	$ 20.00
2034	0.193	$ 3.52	0.79	13.13	$ 2.19	$ 0.23	$ -	$ 1.10	$ 20.18
2035	0.193	$ 3.54	0.79	13.14	$ 2.20	$ 0.23	$ -	$ 1.10	$ 20.21
2036	0.192	$ 3.54	0.79	13.39	$ 2.21	$ 0.23	$ -	$ 1.11	$ 20.48
2037	0.193	$ 3.54	0.79	13.47	$ 2.22	$ 0.23	$ -	$ 1.12	$ 20.58
2038	0.193	$ 3.54	0.79	13.98	$ 2.23	$ 0.23	$ -	$ 1.15	$ 21.13
2039	0.193	$ 3.54	0.79	14.21	$ 2.24	$ 0.23	$ -	$ 1.16	$ 21.37
2040	0.192	$ 3.53	0.79	13.80	$ 2.24	$ 0.23	$ -	$ 1.14	$ 20.94

Source:ACIL Allen

B.2 Modelling Calculations

The main objective of the calculations worksheets in the model is to obtain a projection of new connections and disconnections from the gas distribution network for residential and commercial customers. The overall number of customers in the network is, therefore, equal to the previous period's number of customers plus the difference between new connections and disconnections to the network. The number of customers can then be multiplied by the average consumption in a given year to obtain total consumption.

The decision to disconnect or connect to the network is based on the economic payoff from choosing gas against electricity. The appliance costs of the appliances and the relative running costs of the appliances predominantly drive this. A relative NPV measure is calculated assuming a given specified appliance life. The NPV variable is then used as an input into a logistic function, which calculates the probability that a potential new connection will connect to the network or the probability that a potential disconnection will disconnect from the network. The model then keeps a running tally of total gas customers, given the number of new connections and disconnections occurring every year.

The model calculations are conducted in the following worksheets:

- Appliance costs
- Res-Appliance class
- CustomersRes
- RES S curve-disconnect
- Res S curve-connect
- COM-Appliance class
- CustomersCOM
- COM S curve disconnect
- COM S curve-connect

The calculations conducted in the worksheets are described in more detail in the following sections.

B.2.1 Appliance costs

The appliance costs worksheet calculates the upfront appliance and annual running costs annually. Appliance capital costs can be set to decline by a certain percentage each year in real terms. This rate of change can be set in the ‘Control’ worksheet. Appliance capital costs and appliance consumption inputs were sourced from the Grattan Institute report “Flame Out: The Future of Natural Gas”.

The first block of calculations in the worksheet shows the projected capital costs of electric and gas appliances for cooking, hot water, room heating and space heating appliances (see Figure 3.1).

Figure 3.1 Appliance costs worksheet- Capital and installation costs

	A	B	C	D	E	F	G	H	I	J	K
1	**Appliance and installation costs**										
2	**Cooking**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
3	Electric cooktop (induction)	2900	2871	2842.29	2813.867	2785.7284	2757.871	2730.292	2702.99	2675.96	2649.2
4	Gas stove	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
5	Diference	-800	-771	-742.29	-713.8671	-685.72843	-657.8711	-630.2924	-602.9895	-575.9596	-549.2
6	**Hot water**										
7	Heat pump hot water	3100	3069	3038.31	3007.927	2977.8476	2948.069	2918.588	2889.403	2860.509	2831.903
8	Gas instant hot water	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
9	Difference	-1700	-1669	-1638.31	-1607.927	-1577.8476	-1548.069	-1518.588	-1489.403	-1460.509	-1431.903
10	**Room heating**										
11	RCAC split system	2200	2178	2156.22	2134.658	2113.3112	2092.178	2071.256	2050.544	2030.038	2009.738
12	Gas wall furnace	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
13	Diference	-800	-778	-756.22	-734.6578	-713.31122	-692.1781	-671.2563	-650.5438	-630.0383	-609.7379
14	**Ducted heating**										
15	Ducted RCAC	10750	10642.5	10536.08	10430.71	10326.407	10223.14	10120.91	10019.7	9919.505	9820.31
16	Ducted gas heating	7600	7600	7600	7600	7600	7600	7600	7600	7600	7600
17	Diference	-3150	-3042.5	-2936.075	-2830.714	-2726.4071	-2623.143	-2520.912	-2419.702	-2319.505	-2220.31
18	Gas disconnection charge	100	100	100	100	100	100	100	100	100	100
19	Electricity connection upgrade	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
20											

Source:ACIL Allen

The next block of calculations shows residential and commercial customers' running costs per appliance over time (see Figure 3.2).

These are calculated as the average consumption per appliance (in GJs for gas and kWhs for electricity) multiplied by the fuel price (gas or electricity, depending on the appliance). The formula also allows for annual appliance consumption to decline as appliance efficiency improves over time. The model can also be adjusted to turn off the annual decline in appliance consumption after some point in time.

Figure 3.2 Appliance costs work sheet- Running costs

	A	B	C	D	E	F	G	H	I	J	K
21	**Residential**	**Running costs**									
22	**Cooking**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
23	Electric cooktop (induction)	27.14	29.52	29.90	34.29	35.46	36.25	38.22	43.84	40.57	35.56
24	Gas stove	19.38	20.49	21.39	21.69	22.39	23.12	23.26	23.78	24.50	25.46
25	Difference	- 7.76	- 9.03	- 8.51	- 12.60	- 13.07	- 13.13	- 14.96	- 20.07	- 16.07	- 10.11
26	**Hot water**										
27	Heat pump hot water	466.09	506.99	513.45	588.85	608.95	622.48	656.34	752.88	696.62	610.71
28	Gas instant hot water	332.76	351.78	367.16	372.39	384.34	396.93	399.35	408.15	420.52	437.01
29	Difference	- 133.33	- 155.21	- 146.28	- 216.46	- 224.61	- 225.55	- 257.00	- 344.73	- 276.09	- 173.70
30	**Room heating**										
31	RCAC split system	339.37	369.16	373.86	428.76	443.40	453.25	477.91	548.20	507.23	444.68
32	Gas wall furnace	242.30	256.15	267.35	271.16	279.86	289.03	290.79	297.19	306.21	318.21
33	Difference	- 97.07	- 113.00	- 106.51	- 157.61	- 163.54	- 164.22	- 187.12	- 251.00	- 201.02	- 126.47
34	**Ducted heating**										
35	Ducted RCAC	791.86	861.35	872.32	1,000.43	1,034.57	1,057.56	1,115.09	1,279.10	1,183.52	1,037.56
36	Ducted gas heating	565.36	597.69	623.82	632.70	653.01	674.40	678.50	693.45	714.48	742.49
37	Difference	- 226.49	- 263.66	- 248.50	- 367.73	- 381.56	- 383.16	- 436.59	- 585.65	- 469.03	- 295.08
38	Gas service charge $	302.08	302.08	302.91	303.40	306.17	308.89	312.67	317.04	325.22	335.49
39	Electricity service charge $	-	-	-	-	-	-	-	-	-	-
40											
41	**Commercial**	**Running costs**									
42	**Cooking**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
43	Electric cooktop (induction)	26.78	29.13	29.54	33.71	34.84	35.59	37.51	42.88	39.95	34.76
44	Gas stove	17.44	18.65	19.53	19.82	20.49	21.21	21.33	21.83	22.53	23.47
45	Difference	- 9.33	- 10.48	- 10.01	- 13.90	- 14.35	- 14.38	- 16.18	- 21.05	- 17.42	- 11.29
46	**Hot water**										
47	Heat pump hot water	459.81	500.16	507.26	578.89	598.26	611.17	644.18	736.34	686.03	596.83
48	Gas instant hot water	299.44	320.16	335.24	340.16	351.81	364.07	366.25	374.71	386.78	402.93
49	Difference	- 160.37	- 180.01	- 172.02	- 238.73	- 246.45	- 247.10	- 277.93	- 361.63	- 299.25	- 193.90
50	**Room heating**										
51	RCAC split system	334.80	364.19	369.35	421.51	435.61	445.02	469.05	536.16	499.52	434.57
52	Gas wall furnace	218.04	233.12	244.11	247.69	256.17	265.10	266.68	272.85	281.64	293.39
53	Difference	- 116.76	- 131.06	- 125.25	- 173.82	- 179.44	- 179.91	- 202.36	- 263.31	- 217.88	- 141.18
54	**Ducted heating**										
55	Ducted RCAC	781.20	849.75	861.81	983.51	1,016.41	1,038.35	1,094.42	1,251.00	1,165.53	1,013.99

Source: ACIL Allen

The worksheet also contains a block of calculations showing the annual maintenance costs by appliance type and customer type. The inputs for these formulas come from the 'Control' worksheet. Maintenance costs were obtained from the Consumer Advocacy Panel report, "Are we still cooking with gas?" from November 2014.

The separate capital, operating and maintenance costs are then aggregated for each appliance type and customer type to present the relative difference in capital and running costs between gas and electric appliances (see Figure 3.3).

Relative capital and running costs are defined as gas costs minus electric costs. Therefore, A negative value means that purchasing and running gas appliances is cheaper than electric ones.

Figure 3.3 Appliance costs worksheet- Relative capital and running costs

79	**Capital costs**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
80	Cooking	-800	-771	-742.29	-713.8671	-685.72843	-657.8711	-630.2924	-602.9895	-575.9596	-549.2
81	Hot water	-1700	-1669	-1638.31	-1607.927	-1577.8476	-1548.069	-1518.588	-1489.403	-1460.509	-1431.903
82	Room heating	-800	-778	-756.22	-734.6578	-713.31122	-692.1781	-671.2563	-650.5438	-630.0383	-609.7379
83	Space heating	-3150	-3042.5	-2936.075	-2830.714	-2726.4071	-2623.143	-2520.912	-2419.702	-2319.505	-2220.31
84	Gas disconnection charge	-100	-100	-100	-100	-100	-100	-100	-100	-100	-100
85	Electricity connection upgrade	-1500	-1500	-1500	-1500	-1500	-1500	-1500	-1500	-1500	-1500
86											
87	**Realtive running costs-Residential**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
88	Cooking	- 5.60	- 6.87	- 6.35	- 10.44	- 10.91	- 10.97	- 12.80	- 17.91	- 13.91	- 7.95
89	Hot water	- 144.13	- 166.01	- 157.09	- 227.27	- 235.41	- 236.35	- 267.80	- 355.54	- 286.90	- 184.51
90	Room heating	- 100.32	- 116.25	- 109.75	- 160.85	- 166.78	- 167.46	- 190.36	- 254.24	- 204.27	- 129.71
91	Space heating	- 226.49	- 263.66	- 248.50	- 367.73	- 381.56	- 383.16	- 436.59	- 585.65	- 469.03	- 295.08
92	Service charge	302.08	302.08	302.91	303.40	306.17	308.89	312.67	317.04	325.22	335.49
93											
94	**Relative running costs-Commercial**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
95	Cooking	- 7.17	- 8.32	- 7.85	- 11.74	- 12.19	- 12.22	- 14.02	- 18.89	- 15.26	- 9.12
96	Hot water	- 171.17	- 190.81	- 182.82	- 249.53	- 257.25	- 257.90	- 288.73	- 372.43	- 310.05	- 204.71
97	Room heating	- 120.00	- 134.31	- 128.49	- 177.06	- 182.68	- 183.15	- 205.60	- 266.55	- 221.13	- 144.42
98	Space heating	- 272.43	- 305.80	- 292.23	- 405.56	- 418.68	- 419.78	- 472.16	- 614.36	- 508.38	- 329.40
99	Service charge	422.04	422.04	421.29	421.64	422.04	422.04	421.29	421.64	422.04	422.04

Source: ACIL Allen

The last block of calculations in the worksheet is the most important and represents the NPV of the different appliances by customer type and income class. The NPV is defined as the upfront capital relative costs plus the NPV of the relative running costs.

Figure 3.4 Appliance costs work sheet- Relative NPV of switching from gas to electric

101	**Residential**										
102	**NPV (High income)**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
103	**Cooking**	-$858	-$842	-$808	-$822	-$799	-$772	-$763	-$789	-$720	-$632
104	**Hot water**	-$3,196	-$3,392	-$3,269	-$3,967	-$4,021	-$4,001	-$4,298	-$5,180	-$4,438	-$3,347
105	**Room heating**	-$1,841	-$1,985	-$1,895	-$2,404	-$2,444	-$2,430	-$2,647	-$3,290	-$2,750	-$1,956
106	**Ducted heating**	-$5,501	-$5,779	-$5,515	-$6,648	-$6,687	-$6,600	-$7,053	-$8,499	-$7,188	-$5,283
107	**Service charge**	$3,135	$3,135	$3,144	$3,149	$3,178	$3,206	$3,245	$3,291	$3,376	$3,482
108											
109	**NPV (Mid income)**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
110	**Cooking**	-$843	-$823	-$791	-$793	-$769	-$741	-$728	-$739	-$682	-$610
111	**Hot water**	-$2,796	-$2,932	-$2,833	-$3,337	-$3,368	-$3,346	-$3,556	-$4,194	-$3,643	-$2,835
112	**Room heating**	-$1,563	-$1,662	-$1,591	-$1,958	-$1,982	-$1,966	-$2,119	-$2,584	-$2,184	-$1,596
113	**Ducted heating**	-$4,873	-$5,048	-$4,826	-$5,628	-$5,629	-$5,537	-$5,842	-$6,874	-$5,887	-$4,465
114	**Service charge**	$2,298	$2,298	$2,304	$2,308	$2,329	$2,349	$2,378	$2,411	$2,474	$2,552
115											
116	**NPV (Low income)**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
117	**Cooking**	-$833	-$811	-$779	-$775	-$750	-$722	-$705	-$708	-$657	-$596
118	**Hot water**	-$2,543	-$2,640	-$2,557	-$2,937	-$2,954	-$2,930	-$3,085	-$3,568	-$3,138	-$2,511
119	**Room heating**	-$1,387	-$1,458	-$1,398	-$1,675	-$1,689	-$1,671	-$1,784	-$2,137	-$1,824	-$1,368
120	**Ducted heating**	-$4,474	-$4,584	-$4,389	-$4,981	-$4,958	-$4,864	-$5,074	-$5,844	-$5,062	-$3,946
121	**Service charge**	$1,766	$1,766	$1,771	$1,774	$1,790	$1,806	$1,828	$1,854	$1,902	$1,962
122											
123	**NPV Commercial running costs**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
124	**Cooking**	-$86	-$99	-$94	-$140	-$145	-$146	-$167	-$226	-$182	-$109
125	**Hot water**	-$2,043	-$2,278	-$2,183	-$2,979	-$3,071	-$3,079	-$3,447	-$4,446	-$3,701	-$2,444
126	**Space heating**	-$3,252	-$3,651	-$3,489	-$4,842	-$4,998	-$5,011	-$5,637	-$7,334	-$6,069	-$3,932
127	**Service charge**	$5,038	$5,038	$5,029	$5,034	$5,038	$5,038	$5,029	$5,034	$5,038	$5,038

Source: ACIL Allen

B.2.2 Res-Appliance class

Appliance and installation costs								
Cooking	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Electric cooktop (induction)	3254.61	3254.61	3254.61	3254.61	3254.61	3254.61	3254.61	3254.61
Gas stove	2356.78	2356.78	2356.78	2356.78	2356.78	2356.78	2356.78	2356.78
Difference	-897.82	-897.82	-897.82	-897.82	-897.82	-897.82	-897.82	-897.82
Hot water								
Heat pump hot water	3479.06	3479.06	3479.06	3479.06	3479.06	3479.06	3479.06	3479.06
Gas instant hot water	1571.19	1571.19	1571.19	1571.19	1571.19	1571.19	1571.19	1571.19
Difference	-1907.87	-1907.87	-1907.87	-1907.87	-1907.87	-1907.87	-1907.87	-1907.87
Room heating								
RCAC split system	2469.01	2469.01	2469.01	2469.01	2469.01	2469.01	2469.01	2469.01
Gas wall furnace	1960.84	1960.84	1960.84	1960.84	1960.84	1960.84	1960.84	1960.84
Difference	-508.17	-508.17	-508.17	-508.17	-508.17	-508.17	-508.17	-508.17
Ducted heating								
Ducted RCAC	12064.49	12064.49	12064.49	12064.49	12064.49	12064.49	12064.49	12064.49
Ducted gas heating	5097.39	5097.39	5097.39	5097.39	5097.39	5097.39	5097.39	5097.39
Difference	-6967.10	-6967.10	-6967.10	-6967.10	-6967.10	-6967.10	-6967.10	-6967.10
Gas disconnection charge	897.82	897.82	897.82	897.82	897.82	897.82	897.82	897.82
Electricity connection upgrade	3366.83	3366.83	3366.83	3366.83	3366.83	3366.83	3366.83	3366.83
Residential	**Running costs**							
Cooking	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Electric cooktop (induction)	45.11	44.51	42.31	41.16	40.00	38.43	37.87	37.81
Gas stove	30.14	30.04	29.55	28.45	34.54	34.74	36.16	36.77
Difference	- 14.97	- 14.47	- 12.76	- 12.71	- 5.46	- 3.70	- 1.71	- 1.05
Hot water								
Heat pump hot water	434.03	428.28	407.11	396.08	384.93	369.80	364.38	363.85
Gas instant hot water	406.19	404.78	398.17	383.47	465.53	468.13	487.31	495.51
Difference	- 27.84	- 23.50	- 8.94	- 12.62	80.60	98.33	122.92	131.66
Room heating								
RCAC split system	121.97	120.36	114.41	111.31	108.17	103.92	102.40	102.25
Gas wall furnace	114.15	113.75	111.89	107.76	130.82	131.55	136.94	139.25
Difference	- 7.82	- 6.60	- 2.51	- 3.55	22.65	27.63	34.54	37.00
Ducted heating								
Ducted RCAC	321.43	317.18	301.49	293.33	285.07	273.87	269.85	269.46
Ducted gas heating	300.82	299.77	294.88	283.99	344.76	346.69	360.89	366.97
Difference	- 20.61	- 17.40	- 6.62	- 9.34	59.69	72.82	91.03	97.50
Gas service charge $	116.99	116.99	116.99	116.99	116.99	116.99	116.99	116.99
Electricity service charge $	-	-	-	-	-	-	-	-

Commercial	Running costs							
Cooking	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Electric cooktop (induction)	44.93	44.33	42.14	41.00	39.84	38.28	37.72	37.66
Gas stove	27.46	27.42	27.00	26.03	28.43	28.62	30.03	30.63
Difference	- 17.46	- 16.91	- 15.14	- 14.97	- 11.41	- 9.66	- 7.69	- 7.04
Hot water								
Heat pump hot water	432.28	426.55	405.46	394.48	383.37	368.31	362.91	362.38
Gas instant hot water	370.09	369.56	363.85	350.73	383.18	385.64	404.67	412.72
Difference	- 62.19	- 56.99	- 41.61	- 43.75	- 0.19	17.34	41.75	50.34
Room heating								
RCAC split system	121.48	119.87	113.94	110.86	107.74	103.50	101.99	101.84
Gas wall furnace	104.00	103.85	102.25	98.56	107.68	108.37	113.72	115.98
Difference	- 17.48	- 16.02	- 11.69	- 12.30	- 0.05	4.87	11.73	14.15
Ducted heating								
Ducted RCAC	320.13	315.90	300.28	292.15	283.92	272.76	268.76	268.37
Ducted gas heating	274.08	273.69	269.46	259.74	283.78	285.60	299.69	305.65
Difference	- 46.06	- 42.21	- 30.82	- 32.40	- 0.14	12.84	30.92	37.28
Gas service charge $	109.58	109.58	109.58	109.58	109.58	109.58	109.58	109.58
Electricity service charge $	-	-	-	-	-	-	-	-

Residential	Maintenance costs (p/a)							
Cooking	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Electric cooktop (induction)	-	-	-	-	-	-	-	-
Gas stove	3.09	3.09	3.09	3.09	3.09	3.09	3.09	3.09
Difference	3.09	3.09	3.09	3.09	3.09	3.09	3.09	3.09
Hot water								
Heat pump hot water	61.71	61.71	61.71	61.71	61.71	61.71	61.71	61.71
Gas instant hot water	45.55	45.55	45.55	45.55	45.55	45.55	45.55	45.55
Difference	- 16.17	- 16.17	- 16.17	- 16.17	- 16.17	- 16.17	- 16.17	- 16.17
Room heating								
RCAC split system	41.66	41.66	41.66	41.66	41.66	41.66	41.66	41.66
Gas wall furnace	37.03	37.03	37.03	37.03	37.03	37.03	37.03	37.03
Difference	- 4.62	- 4.62	- 4.62	- 4.62	- 4.62	- 4.62	- 4.62	- 4.62
Ducted heating								
Ducted RCAC	40.99	40.99	40.99	40.99	40.99	40.99	40.99	40.99
Ducted gas heating	97.20	97.20	97.20	97.20	97.20	97.20	97.20	97.20
Difference	56.21	56.21	56.21	56.21	56.21	56.21	56.21	56.21

Capital costs	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Cooking	-897.8224456	-897.8224456	-897.822446	-897.8224	-897.8224	-897.8224	-897.8224	-897.8224
Hot water	-1907.872697	-1907.872697	-1907.8727	-1907.873	-1907.873	-1907.873	-1907.873	-1907.873
Room heating	-508.1675042	-508.1675042	-508.167504	-508.1675	-508.1675	-508.1675	-508.1675	-508.1675
Space heating	-6967.102178	-6967.102178	-6967.10218	-6967.102	-6967.102	-6967.102	-6967.102	-6967.102
Gas disconnection charge	-897.8224456	-897.8224456	-897.822446	-897.8224	-897.8224	-897.8224	-897.8224	-897.8224
Electricity connection upgrade	-3366.834171	-3366.834171	-3366.83417	-3366.834	-3366.834	-3366.834	-3366.834	-3366.834

Realtive running costs-Residenti	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cooking	- 11.87	- 11.38	- 9.67	- 9.62	- 2.37	- 0.60	1.38	2.05	1.00	2.60
Hot water	- 44.00	- 39.67	- 25.10	- 28.78	64.43	82.16	106.76	115.49	99.73	135.44
Room heating	- 12.45	- 11.23	- 7.14	- 8.17	18.03	23.01	29.92	32.38	27.94	37.98
Space heating	35.59	38.80	49.59	46.86	115.90	129.03	147.24	153.71	142.04	168.48
Service charge	116.99	116.99	116.99	116.99	116.99	116.99	116.99	116.99	116.99	116.99

Relative running costs-Commerci	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cooking	- 14.37	- 13.82	- 12.05	- 11.88	- 8.32	- 6.57	- 4.60	- 3.94	- 5.00	- 3.39
Hot water	- 78.35	- 73.16	- 57.78	- 59.92	- 16.36	1.17	25.59	34.17	18.22	54.08
Room heating	- 22.10	- 20.64	- 16.32	- 16.92	- 4.68	0.25	7.11	9.52	5.04	15.12
Space heating	10.15	14.00	25.39	23.81	56.07	69.05	87.13	93.49	81.68	108.23
Service charge	109.58	109.58	109.58	109.58	109.58	109.58	109.58	109.58	109.58	109.58

Residential

NPV (High income)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cooking	-$1,021	-$1,016	-$998	-$998	-$922	-$904	-$883	-$877	-$887	-$871
Hot water	-$2,365	-$2,320	-$2,168	-$2,207	-$1,239	-$1,055	-$800	-$709	-$873	-$502
Room heating	-$637	-$625	-$582	-$593	-$321	-$269	-$198	-$172	-$218	-$114
Ducted heating	-$6,598	-$6,564	-$6,452	-$6,481	-$5,764	-$5,628	-$5,439	-$5,372	-$5,493	-$5,218
Service charge	$1,214	$1,214	$1,214	$1,214	$1,214	$1,214	$1,214	$1,214	$1,214	$1,214

NPV (Mid income)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cooking	-$988	-$984	-$971	-$971	-$916	-$902	-$887	-$882	-$890	-$878
Hot water	-$2,243	-$2,210	-$2,099	-$2,127	-$1,418	-$1,283	-$1,096	-$1,029	-$1,149	-$878
Room heating	-$603	-$594	-$562	-$570	-$371	-$333	-$281	-$262	-$296	-$219
Ducted heating	-$6,696	-$6,672	-$6,590	-$6,611	-$6,086	-$5,986	-$5,847	-$5,798	-$5,887	-$5,686
Service charge	$890	$890	$890	$890	$890	$890	$890	$890	$890	$890

NPV (Low income)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cooking	-$967	-$964	-$954	-$954	-$912	-$901	-$890	-$886	-$892	-$883
Hot water	-$2,165	-$2,140	-$2,055	-$2,076	-$1,531	-$1,427	-$1,284	-$1,233	-$1,325	-$1,116
Room heating	-$581	-$574	-$550	-$556	-$403	-$374	-$333	-$319	-$345	-$286
Ducted heating	-$6,759	-$6,740	-$6,677	-$6,693	-$6,289	-$6,213	-$6,106	-$6,068	-$6,137	-$5,982
Service charge	$684	$684	$684	$684	$684	$684	$684	$684	$684	$684

NPV Commercial	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cooking	-$1,069	-$1,063	-$1,042	-$1,040	-$997	-$976	-$953	-$945	-$958	-$938
Hot water	-$2,843	-$2,781	-$2,598	-$2,623	-$2,103	-$1,894	-$1,602	-$1,500	-$1,690	-$1,262
Space heating	-$6,846	-$6,800	-$6,664	-$6,683	-$6,298	-$6,143	-$5,927	-$5,851	-$5,992	-$5,675
Service charge	$1,308	$1,308	$1,308	$1,308	$1,308	$1,308	$1,308	$1,308	$1,308	$1,308

Appliance breakdown	Cooktops	Cooktops plus hot w	C+HW+Room	C+HW+Spa	TOTAL
Number	178,413	418,884	131,167	29,642	758,106

Residential Weights				
	Cooktops	Cooktops plus hot w	C+HW+Room	C+HW+Space heating
	0.235	0.553	0.173	0.039

Commercial weights			
	Cooktops	Cooktops plus hot w	C+HW+Space heating
	0.333	0.333	0.333

B.2.3 CustomersRes

Residential Customers	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ATCO	642,286	657,322	675,990	697,831	713,194	724,627	732,627	741,437	746,639	756,154	767,161	778,476	784,780	791,959
New Residential Customers	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ATCO	14237	17008	21577	24378	19456	14342	12490	11218	10082	10992	12127	14010	9885	10789
New Residential Disconnections	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ATCO	1618	1972	2909	2537	4093	2909	4490	2408	4880	1477	1120	2695	3581	3610
Residential Customers decision po	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ATCO		42819	43821	45066	46522	47546	48308	48841	49429	49775	50410	51144	52319	52319
	2.22%	2.59%	3.19%	3.49%	2.73%	1.98%	1.70%	1.51%	1.35%	1.45%	1.58%	1.80%		
	0.25%	0.30%	0.43%	0.36%	0.57%	0.40%	0.61%	0.32%	0.65%	0.20%	0.15%	0.35%		
	1.96%	2.29%	2.76%	3.13%	2.15%	1.58%	1.09%	1.19%	0.70%	1.26%	1.43%	1.45%		

Appliance age	2024	2025
14	52,319	52,319
13	52,319	52,319
12	52,319	52,319
11	52,319	52,319
10	52,319	52,319
9	52,319	52,319
8	52,319	52,319
7	52,319	52,319
6	52,319	52,319
5	52,319	52,319
4	52,319	52,319
3	52,319	52,319
2	52,319	52,319
1	52,319	52,319
0	52,319	59,498
	784,780	791,959
	784,780	791,959
	52,319	60,920

Commercial B2 Customers	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ATCO	9,247	9,839	10,364	10,885	11,344	11,649	11,828	12,120	12,139	12,318	12,540	12,725	12,913	13,104
New Commercial B2 Customers	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ATCO	528	552	520	534	517	373	335	277	220	197	212	240	244	248
New Commercial Disconnections	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ATCO	-21	-40	-5	13	58	68	156	-15	201	18	-10	55	56	57
Commercial customers decision po	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ATCO										809	821	836	0	0

B.2.4 Res S curve-connect

By customer class	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Cooking																		
High income		$193	$198	$216	$217	$292	$310	$331	$338	$327	$343	$356	$361	$363	$370	$365	$372	$381
Medium income		-$98	-$95	-$82	-$81	-$26	-$13	$3	$8	-$0	$12	$21	$24	$26	$31	$27	$33	$39
Low income		-$283	-$280	-$270	-$270	-$228	-$217	-$206	-$202	-$208	-$199	-$192	-$189	-$188	-$184	-$187	-$182	-$177
Cooking plus hot water																		
High income		-$2,171	-$2,121	-$1,952	-$1,990	-$947	-$745	-$469	-$371	-$546	-$159	$18	$77	$123	$207	$122	$211	$328
Medium income		-$2,341	-$2,304	-$2,180	-$2,208	-$1,444	-$1,296	-$1,093	-$1,022	-$1,150	-$866	-$737	-$693	-$660	-$598	-$660	-$595	-$510
Low income		-$2,448	-$2,420	-$2,325	-$2,346	-$1,759	-$1,645	-$1,489	-$1,434	-$1,533	-$1,314	-$1,215	-$1,182	-$1,156	-$1,109	-$1,156	-$1,106	-$1,040
Cooking plus hot water and room heating																		
High income		-$2,809	-$2,746	-$2,535	-$2,583	-$1,268	-$1,014	-$667	-$543	-$764	-$273	-$50	$25	$82	$188	$81	$193	$340
Medium income		-$2,944	-$2,898	-$2,743	-$2,778	-$1,815	-$1,629	-$1,374	-$1,284	-$1,445	-$1,085	-$922	-$867	-$825	-$748	-$826	-$744	-$636
Low income		-$3,029	-$2,994	-$2,875	-$2,902	-$2,161	-$2,018	-$1,822	-$1,753	-$1,877	-$1,601	-$1,475	-$1,433	-$1,401	-$1,341	-$1,401	-$1,338	-$1,255
Cooking plus hot water and space heating																		
High income		-$8,769	-$8,686	-$8,405	-$8,471	-$6,711	-$6,373	-$5,908	-$5,743	-$6,039	-$5,377	-$5,079	-$4,979	-$4,902	-$4,760	-$4,904	-$4,754	-$4,558
Medium income		-$9,037	-$8,976	-$8,770	-$8,819	-$7,529	-$7,281	-$6,940	-$6,820	-$7,036	-$6,552	-$6,334	-$6,260	-$6,203	-$6,100	-$6,205	-$6,095	-$5,951
Low income		-$9,207	-$9,160	-$9,002	-$9,039	-$8,048	-$7,857	-$7,595	-$7,503	-$7,669	-$7,296	-$7,129	-$7,072	-$7,029	-$6,949	-$7,030	-$6,945	-$6,835

Weighted NPV	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		-$2,160	-$2,127	-$2,017	-$2,041	-$1,365	-$1,233	-$1,054	-$991	-$1,104	-$854	-$740	-$701	-$672	-$617	-$672	-$614	-$538

S curve	Constant	NPV coefficient
ATCO	9.47	0.01263

		Relative U	P(connec	Average	Economic C	Economic Stay	Estimate
Against Gas	-	9.473	0.01%	13,000	1	12,999	
For Gas (status quo)	1,500	9.473	99.99%	13,000	12,999	1.00	
			P(Connec	Decision points		Less than one	Solve for 0
Relative U where less than 1 person doesn't connect on eco		9.473	99.99%	13,000	#########	1.000	0
Current Economics (where households don'	1,500	- 0.0063					
Difference in NPV to reach almost 100% disc	1,500						
Difference in RU to reach almost 100% disco	19						
Implied NPV Coefficient	0.01263						
Intercept	9.47						
NPV per year of appliance life	-						

S curves (Relative utility)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		17.8033	17.3907	15.9990	16.3022	7.7630	6.1002	3.8396	3.0409	4.4671	1.3135	- 0.1280	- 0.6170	- 0.9887	- 1.6802	- 0.9871	- 1.7196	- 2.6735

S curves	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO	0.50	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.95	0.99	0.79	0.47	0.35	0.27	0.16	0.27	0.15	0.06

S curves (number of new connections)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		11,722	11,871	12,044	12,222	12,315	12,405	12,307	12,144	12,737	10,282	6,152	4,616	3,571	2,064	3,553	1,985	839

New Connections absent Appliance Econom	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		11722	11872	12044	12222	12321	12434	12572	12725	12884	13047	13146	13172	13169	13145	13090	13067	13010

High	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		-$1,983	-$1,940	-$1,795	-$1,827	-$937	-$763	-$528	-$444	-$593	-$264	-$114	-$63	-$24	$48	-$24	$52	$151

Medium	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		-$2,179	-$2,148	-$2,041	-$2,065	-$1,412	-$1,285	-$1,113	-$1,052	-$1,161	-$920	-$810	-$772	-$744	-$691	-$744	-$688	-$615

Low	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		-$2,304	-$2,279	-$2,198	-$2,215	-$1,714	-$1,616	-$1,484	-$1,437	-$1,520	-$1,335	-$1,251	-$1,222	-$1,200	-$1,159	-$1,200	-$1,157	-$1,101

Commercial	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		-$2,304	-$2,279	-$2,198	-$2,215	-$1,714	-$1,616	-$1,484	-$1,437	-$1,520	-$1,335	-$1,251	-$1,222	-$1,200	-$1,159	-$1,200	-$1,157	-$1,101

B.2.5 RES S curve-disconnect

By customer class	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Cooking																		
High income		-$4,071	-$4,066	-$4,049	-$4,048	-$3,973	-$3,954	-$3,934	-$3,927	-$3,938	-$3,921	-$3,909	-$3,904	-$3,902	-$3,895	-$3,900	-$3,893	-$3,884
Medium income		-$4,363	-$4,359	-$4,346	-$4,346	-$4,291	-$4,277	-$4,262	-$4,257	-$4,265	-$4,253	-$4,244	-$4,240	-$4,239	-$4,234	-$4,237	-$4,232	-$4,225
Low income		-$4,548	-$4,545	-$4,535	-$4,535	-$4,492	-$4,482	-$4,470	-$4,466	-$4,473	-$4,463	-$4,456	-$4,454	-$4,452	-$4,448	-$4,451	-$4,447	-$4,442
Cooking plus hot water																		
High income		-$6,436	-$6,386	-$6,217	-$6,255	-$5,212	-$5,009	-$4,734	-$4,636	-$4,810	-$4,423	-$4,247	-$4,188	-$4,142	-$4,058	-$4,143	-$4,053	-$3,937
Medium income		-$6,606	-$6,569	-$6,445	-$6,473	-$5,708	-$5,560	-$5,358	-$5,286	-$5,414	-$5,131	-$5,002	-$4,958	-$4,925	-$4,863	-$4,925	-$4,859	-$4,774
Low income		-$6,713	-$6,685	-$6,590	-$6,611	-$6,023	-$5,909	-$5,754	-$5,699	-$5,797	-$5,579	-$5,480	-$5,446	-$5,421	-$5,373	-$5,421	-$5,371	-$5,305
Cooking plus hot water and room heating																		
High income		-$7,073	-$7,011	-$6,799	-$6,848	-$5,533	-$5,279	-$4,931	-$4,808	-$5,029	-$4,537	-$4,315	-$4,240	-$4,182	-$4,076	-$4,184	-$4,071	-$3,925
Medium income		-$7,208	-$7,162	-$7,007	-$7,043	-$6,080	-$5,893	-$5,639	-$5,548	-$5,710	-$5,350	-$5,187	-$5,132	-$5,090	-$5,012	-$5,091	-$5,008	-$4,901
Low income		-$7,294	-$7,259	-$7,139	-$7,167	-$6,426	-$6,283	-$6,087	-$6,018	-$6,142	-$5,865	-$5,740	-$5,698	-$5,665	-$5,606	-$5,666	-$5,603	-$5,520
Cooking plus hot water and space heating																		
High income		-$13,034	-$12,950	-$12,669	-$12,735	-$10,976	-$10,637	-$10,172	-$10,008	-$10,303	-$9,642	-$9,344	-$9,244	-$9,167	-$9,025	-$9,169	-$9,019	-$8,823
Medium income		-$13,302	-$13,241	-$13,035	-$13,083	-$11,794	-$11,546	-$11,205	-$11,084	-$11,301	-$10,816	-$10,598	-$10,525	-$10,468	-$10,364	-$10,470	-$10,360	-$10,216
Low income		-$13,472	-$13,425	-$13,267	-$13,304	-$12,313	-$12,122	-$11,860	-$11,767	-$11,934	-$11,561	-$11,393	-$11,337	-$11,293	-$11,214	-$11,295	-$11,210	-$11,100

Weighted average NPV	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		-$6,424	-$6,392	-$6,281	-$6,305	-$5,629	-$5,498	-$5,319	-$5,255	-$5,368	-$5,119	-$5,005	-$4,966	-$4,936	-$4,882	-$4,937	-$4,879	-$4,803

Number of decision points	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
ATCO	49,775	50,410	51,144	52,319	52,319	52,319	52,319	52,319	52,319	52,319	52,319	52,319	52,319	52,319	52,319	52,319	52,319	52,319

S curves	Constant	NPV coefficient
ATCO	20.44	0.004809

		Relative U	P(Disconne	Average	Economic Disconn	Economic Sta	Natural Attrition
Against Gas	-2000	10.820	100%	50,000	49,999	1	3,800	0%
For Gas (status quo)	-6500	10.820	0%	50,000	1	49,999	3,800	1316%
					Estimate of numbe	Less than one	Solve for 0
Relative U where less than 1 person disconnects		10.820	0.00200%	50,000	0.99999970	0.99999999	- 0.000000
Current Economics (where house	6,500						
Difference in NPV to reach almos	4,500						
Difference in RU to reach almost 1	22						
Implied NPV Coefficient	0.00481						
Intercept	20.44						
NPV per year of appliance life	133						

S curves (Relative utility)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		10.4555	10.2983	9.7685	9.8839	6.6327	5.9996	5.1390	4.8348	5.3779	4.1772	3.6283	3.4421	3.3006	3.0374	3.3013	3.0223	2.6592

S curves	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		0.000	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.02	0.03	0.03	0.04	0.05	0.04	0.05	0.07

S curves (number of disconnections)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		2,838	2,874	2,917	2,960	3,050	3,138	3,347	3,492	3,358	3,948	4,535	4,810	5,046	5,576	5,026	5,592	6,572

High	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		-$6,248	-$6,205	-$6,060	-$6,091	-$5,201	-$5,028	-$4,792	-$4,709	-$4,858	-$4,529	-$4,379	-$4,328	-$4,289	-$4,217	-$4,289	-$4,213	-$4,113

Medium	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		-$6,444	-$6,412	-$6,306	-$6,329	-$5,677	-$5,550	-$5,377	-$5,316	-$5,425	-$5,184	-$5,074	-$5,037	-$5,008	-$4,956	-$5,009	-$4,953	-$4,880

Low	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		-$6,568	-$6,544	-$6,462	-$6,480	-$5,979	-$5,881	-$5,748	-$5,701	-$5,785	-$5,600	-$5,515	-$5,487	-$5,465	-$5,424	-$5,465	-$5,422	-$5,366

B.2.6 CustomersCOM

Commercial Customers	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ATCO	9,247	9,839	10,364	10,885	11,344	11,649	11,828	12,120	12,139	12,318	12,540	12,725	12,913	13,104
New Commercial Customers	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ATCO	528	552	520	534	517	373	335	277	220	197	212	240	244	248
New Commercial Disconnections	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ATCO	-21	-40	-5	13	58	68	156	-15	201	18	-10	55	56	57
Commercial Customers decision pc	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ATCO		616	655	690	725	756	776	788	808	809	821	836	861	861
	5.71%	5.61%	5.02%	4.91%	4.56%	3.20%	2.83%	2.29%	1.81%	1.60%	1.69%	1.89%	1.89%	1.89%
	-0.23%	-0.41%	-0.05%	0.12%	0.51%	0.58%	1.32%	-0.12%	1.66%	0.15%	-0.08%	0.43%	0.43%	0.43%
	5.94%	6.02%	5.07%	4.79%	4.05%	2.62%	1.51%	2.41%	0.16%	1.45%	1.77%	1.45%	1.46%	1.46%

Appliance age	2024	2025
14	861	861
13	861	861
12	861	861
11	861	861
10	861	861
9	861	861
8	861	861
7	861	861
6	861	861
5	861	861
4	861	861
3	861	861
2	861	861
1	861	861
0	861	1,052
	12,913	13,104
	12,915	13,106
	861	1,008

B.2.7 COM S curve-connect

By customer class	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Cooking																		
Commercial		$239	$245	$266	$268	$311	$332	$355	$363	$351	$370	$381	$386	$392	$399	$392	$400	$410
Cooking plus hot water																		
Commercial		-$2,605	-$2,536	-$2,331	-$2,355	-$1,792	-$1,562	-$1,247	-$1,137	-$1,340	-$893	-$731	-$664	-$578	-$490	-$607	-$509	-$379
Cooking plus hot water and space heating																		
Commercial		-$9,450	-$9,336	-$8,995	-$9,038	-$8,090	-$7,705	-$7,174	-$6,988	-$7,332	-$6,568	-$6,294	-$6,183	-$6,037	-$5,889	-$6,086	-$5,922	-$5,703

Weighted NPV	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		-$3,935	-$3,872	-$3,683	-$3,704	-$3,187	-$2,975	-$2,686	-$2,584	-$2,771	-$2,361	-$2,212	-$2,152	-$2,072	-$1,992	-$2,098	-$2,008	-$1,889

S curve	Constant	NPV coefficient
ATCO	- 5.70	- 0.00380

		Relative	P(connec	Average	Economic C	Economic Stay	Estimate
Against Gas	-	- 5.700	0.33%	300	1	299	
For Gas (status quo)	3,000	5.700	99.67%	300	299	1.00	
			P(Connec	Decision points		Less than one	Solve for 0
Relative U where less than 1 person doesn't connect on eco		5.700	99.67%	300	#########	1.000	0
Current Economics (where households don'	- 3,000	- 0.0019					
Difference in NPV to reach almost 100% disc	- 3,000						
Difference in RU to reach almost 100% disco	11						
Implied NPV Coefficient	- 0.00380						
Intercept	- 5.70						
NPV per year of appliance life	-						

S curves (Relative utility)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		9.2530	9.0128	8.2957	8.3768	6.4118	5.6069	4.5065	4.1214	4.8298	3.2724	2.7071	2.4760	2.1752	1.8683	2.2735	1.9313	1.4781
S curves	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO	0.50	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.98	0.99	0.96	0.94	0.92	0.90	0.87	0.91	0.87	0.81
S curves (number of new connections)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		230	234	238	241	244	248	249	252	259	257	253	253	249	243	258	252	238
New Connections absent Appliance Econom	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		231	234	238	242	245	249	253	256	262	267	271	274	278	282	285	289	293
Commercial	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		-$3,935	-$3,872	-$3,683	-$3,704	-$3,187	-$2,975	-$2,686	-$2,584	-$2,771	-$2,361	-$2,212	-$2,152	-$2,072	-$1,992	-$2,098	-$2,008	-$1,889

B.2.8 COM S curve disconnect

By customer class	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Cooking																		
Commercial		-$4,026	-$4,019	-$3,998	-$3,996	-$3,954	-$3,933	-$3,909	-$3,901	-$3,914	-$3,895	-$3,884	-$3,878	-$3,873	-$3,866	-$3,873	-$3,865	-$3,855
Cooking plus hot water																		
Commercial		-$6,869	-$6,801	-$6,596	-$6,619	-$6,057	-$5,827	-$5,512	-$5,401	-$5,604	-$5,157	-$4,995	-$4,929	-$4,843	-$4,755	-$4,871	-$4,773	-$4,644
Cooking plus hot water and space heating																		
Commercial		-$13,715	-$13,601	-$13,260	-$13,302	-$12,355	-$11,970	-$11,439	-$11,252	-$11,596	-$10,832	-$10,559	-$10,448	-$10,301	-$10,154	-$10,351	-$10,186	-$9,968

Weighted average NPV	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		-$8,195	-$8,132	-$7,943	-$7,965	-$7,448	-$7,236	-$6,946	-$6,845	-$7,031	-$6,621	-$6,473	-$6,412	-$6,333	-$6,252	-$6,359	-$6,269	-$6,149

Number of decision points	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
ATCO		809	821	836	861	861	861	861	861	861	861	861	861	861	861	861	861	861

S curves	Constant	NPV coefficient
ATCO	-10.82	-0.003091

		Relative U	P(Disconne	Average	Economic Disconn	Economic Sta	Natural Attrition	
Against Gas	0	10.820	100%	50,000	49,999	1	3,800	0%
For Gas (status quo)	-7000	10.820	0%	50,000	1	49,999	3,800	1316%
					Estimate of numbe	Less than one	Solve for 0	
Relative U where less than 1 person disconnects		10.820	0.00200%	50,000	0.99999970	0.99999999	-0.000000	

Current Economics (where housel	-7,000
Difference in NPV to reach almost	7,000
Difference in RU to reach almost	-22
Implied NPV Coefficient	-0.00309
Intercept	-10.82
NPV per year of appliance life	-

S curves (Relative utility)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		14.5146	14.3192	13.7359	13.8018	12.2034	11.5486	10.6535	10.3402	10.9165	9.6496	9.1898	9.0018	8.7571	8.5075	8.8371	8.5587	8.1900

S curves	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

S curves (number of disconnections)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		49	49	50	51	52	52	53	54	55	56	57	58	59	59	60	61	62

Commercial	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
ATCO		-$8,195	-$8,132	-$7,943	-$7,965	-$7,448	-$7,236	-$6,946	-$6,845	-$7,031	-$6,621	-$6,473	-$6,412	-$6,333	-$6,252	-$6,359	-$6,269	-$6,149