



Switching off the gas distribution network: Consumer, network, and emissions impacts

Final Report to Gas Industry Company

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Definitions

BAU	Business-as-usual
CCC	Climate Change Commission
CO₂e	Carbon Dioxide Equivalent
EDB	Electricity Distribution Business
EECA	Energy Efficiency and Conservation Authority
EMI	Electricity Market Information
EY	Ernst & Young
GDC	Gas Distribution Consumer
GHG	Greenhouse Gas
GIC	Gas Industry Company
GJ	Gigajoule
GWh	Gigawatt-hour
kWh	Kilowatt-hour
LDC	Load Duration Curve
LPG	Liquefied Petroleum Gas
LRMC	Long-Run Marginal Cost
MW	Megawatt
MWh	Megawatt-hour
NPV	Net Present Value
PJ	Petajoule
RETA	Regional Energy Transition Accelerator
T&D	Transmission and Distribution

Executive summary

New Zealand's transition to a low-emissions economy requires careful evaluation of how existing energy systems, particularly reticulated natural gas, fit into future pathways. As natural gas supply declines and policymakers and consumers consider options for decarbonising energy use, it is critical to understand the full implications of replacing gas with electricity.

Gas Industry Company (GIC) engaged Castalia to analyse the costs and benefits of switching off the gas distribution network. This study addresses the central question: **What are the economic and emissions impacts of ending gas supply through distribution networks to consumers?**

To answer the question, we examined three discrete networks in Hamilton, Gisborne and Wellington, analysing:

- **Consumer costs:** The costs consumers incur when switching away from gas appliances, including appliance replacements, gas-to-electricity rectification, and ongoing energy use
- **Network upgrade costs:** Costs of upgrading the electricity distribution network to accommodate increased load resulting from more electrification
- **Greenhouse gas (GHG) emissions impact:** We compared on-site gas use with electricity generation and extrapolated results from Hamilton, Gisborne, and Wellington to estimate North Island-wide emissions from switching off the gas network. We consider the GHG emissions impact separately from the cost impacts, as the gas and electricity prices already include a carbon cost.

To assess the costs and benefits of switching off gas supply to residential, commercial and industrial gas distribution network customers (GDCs), we compare two scenarios over a 25-year forecast period:

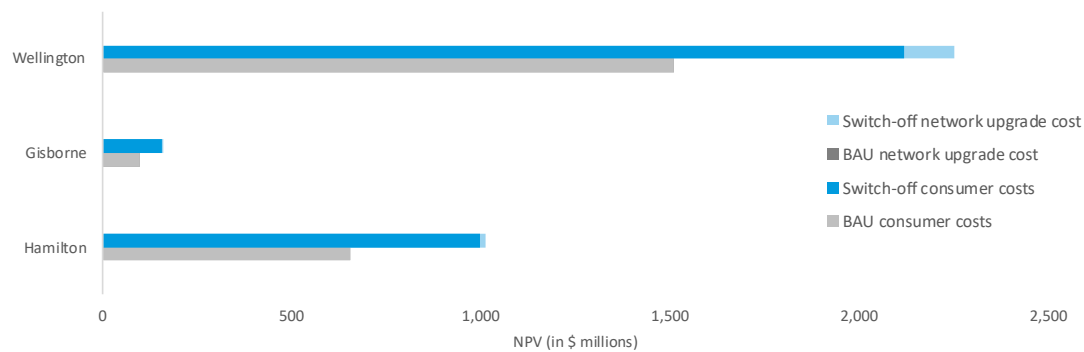
- **Business-as-Usual (BAU) Scenario:** This is the counterfactual. It assumes energy use continues as it does today, with GDCs continuing to use natural gas with existing appliances
- **Switch-off Scenario:** This factual scenario assumes a full switch-off of the gas distribution networks in the three study areas by 2029. All GDCs must transition away from natural gas. Most users electrify their appliances, but a portion switch to liquefied petroleum gas (LPG) instead.

Key findings

Our analysis shows that the Switch-off scenario is more expensive than continuing with BAU, assuming energy prices remain at recent historical levels. This also holds under different energy price assumptions with different (higher and lower) electricity and gas price trajectories. We discuss the implications of different energy price paths below.

Consumer costs account for the bulk of the additional costs, while the costs of upgrading the electricity distribution networks are relatively modest, as shown in Figure 0.1.

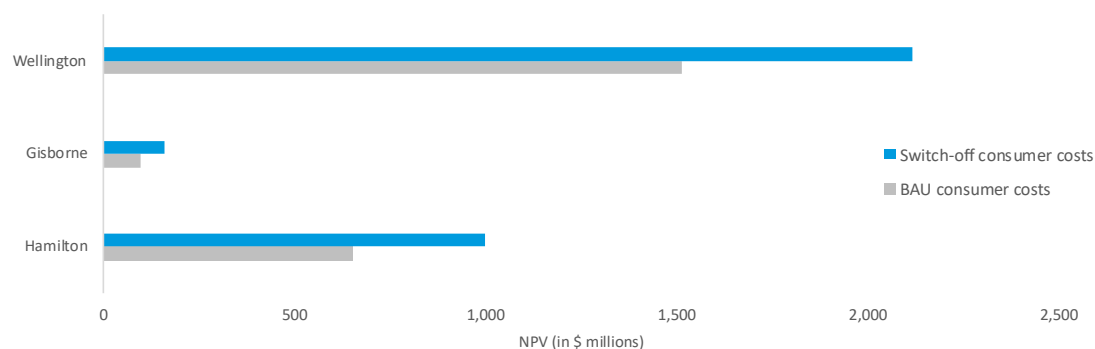
Figure 0.1: Consumer and network upgrade costs by region under BAU and Switch-off scenarios – Historical energy prices



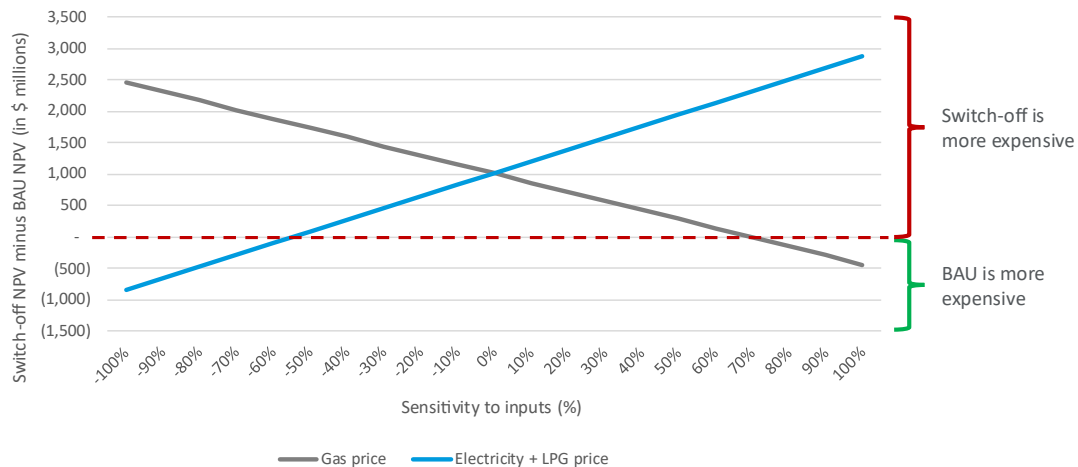
Consumer cost impacts

Consumers face higher direct cash costs from switching off the gas network than the BAU. Holding historical energy prices constant, switching off the gas network increases consumer costs by \$1 billion over the 25-year forecast period, a 45 percent rise compared to the BAU scenario, as shown in Figure 0.2.

Figure 0.2: Consumer costs by region under BAU and Switch-off scenarios—Historical energy prices



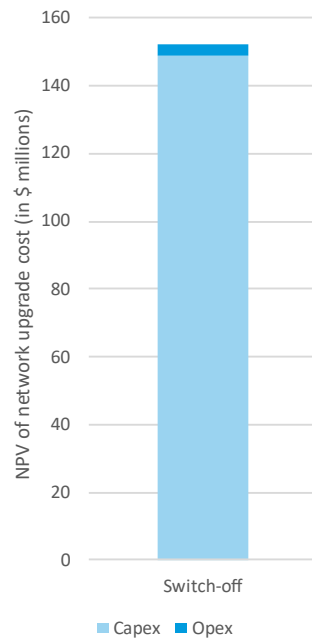
Among all cost components, energy consumption is the largest cost driver for consumers, accounting for 85 and 71 percent of the total consumer costs in BAU and Switch-off scenarios. As a result, the outcomes are highly sensitive to assumptions about future energy prices. In Figure 0.3, we test the tipping points where energy price changes could make Switch-off consumer costs less costly than BAU.

Figure 0.3: Sensitivity analysis of energy prices on consumer costs

The analysis shows that if gas prices remain constant, both electricity and LPG prices would need to fall by about 60 percent (from recent historical levels at the start of the forecast period and then held constant in real terms) for Switch-off to become the lower-cost option for consumers. Conversely, if electricity and LPG prices stay the same, gas prices would need to rise by around 70 percent (again from recent historical levels at the start of the forecast period and then held constant in real terms) for Switch-off to be less expensive than BAU for consumers.

Network upgrade cost impact

The network impact is small compared to the consumer cost. Switching off gas increases peak electricity demand by around 9 percent in Hamilton, Gisborne, and Wellington. The higher peak load requires upgrades in electricity distribution assets to cope, and some additional operational costs. The upgrades are estimated to add \$152 million in costs for electricity distribution businesses in the three study regions. Costs comprise both capital expenditure (Capex) for infrastructure upgrades and operating expenditure (Opex) for ongoing maintenance and operation of the upgraded network, as shown in Figure 0.4.

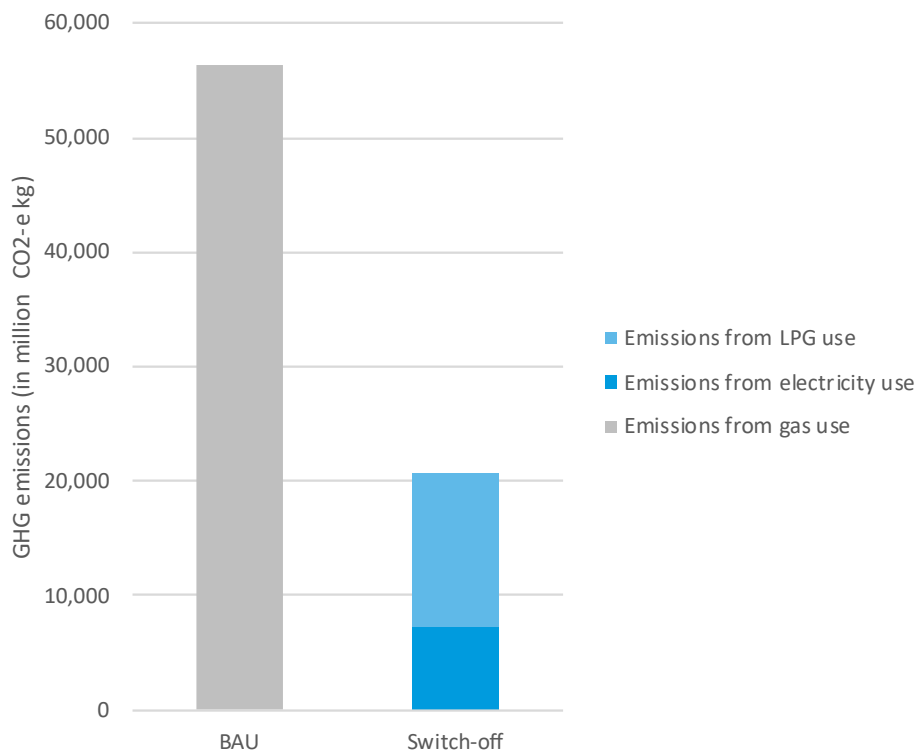
Figure 0.4: NPV of network upgrade costs in three regions

Capex costs dominate the network upgrade costs, on average accounting for 98 percent of total NPVs.

GHG emissions impact

Switching off the gas distribution network is estimated to reduce GHG emissions significantly. Under the Switch-off scenario, New Zealand will need to generate additional electricity to meet the higher demand from replacing gas appliances with electric alternatives. The GHG emissions impact of this additional electricity depends on the generation mix that supplies it. Using a generation expansion model that predicts the generation mix needed to meet additional demand above the demand in existing forecasts, we modelled the likely generation mix. The generation expansion model screens across a load duration curve using cost of generation, fuel costs, plant capacity and availability factors. We estimated that onshore wind will meet most of the increased electricity demand (93 percent) with gas peakers accounting for the remainder.

Over the 2029–2050 period, switching off the entire North Island gas network is projected to cut GHG emissions by about 36 million tonnes of CO₂e. Overall, the Switch-off scenario reduces emissions by roughly 63 percent compared with continuing the use of reticulated gas, as shown in Figure 0.5.

Figure 0.5: Comparison between GHG emissions-North Island

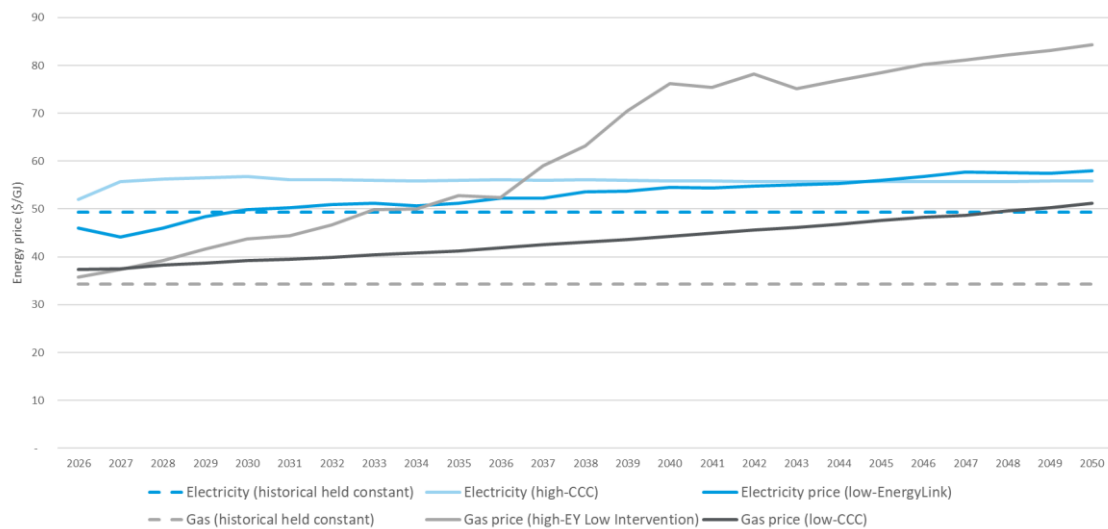
At a regional level, switching off the gas network is projected to reduce emissions by 1.2, 0.2, and 2.1 million tonnes CO₂e (NPV of 0.4, 0.07, and 0.8 million tonnes) in Hamilton, Gisborne, and Wellington, respectively. Under the historical energy price scenario, this produces an abatement cost per tonne of CO₂e of \$821, \$871, \$911, and \$879 in Hamilton, Gisborne, Wellington, and overall, respectively.

Switch-off is closer to BAU under some energy price scenarios

Relative energy prices can significantly affect the results. Energy prices are difficult to predict with certainty, but it is certain that gas and electricity prices will change over the forecast period. Several credible sources project different trajectories for gas¹ and electricity prices, as shown in Figure 0.6.

¹ EY forecasts declining gas demand. Under the high gas price scenario (EY's low intervention scenario), we increase the T&D costs in line with EY's declining demand forecast (as similar costs must be recovered from a declining customer base).

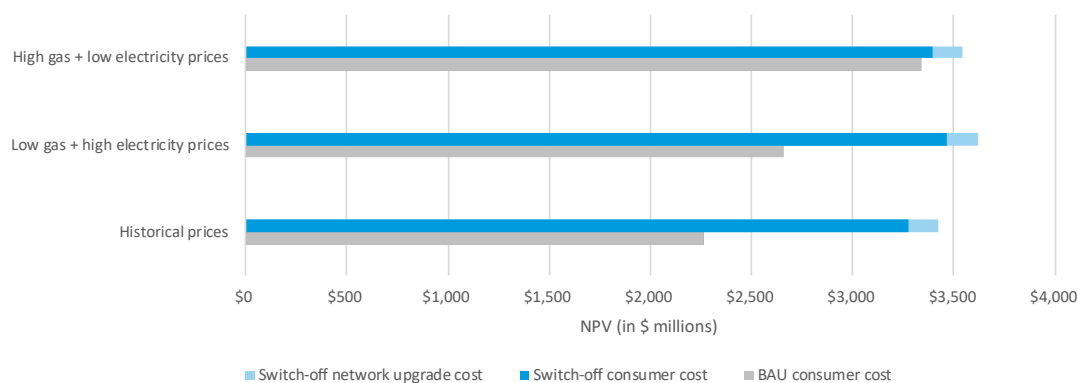
Figure 0.6: Electricity and gas price forecasts



**Prices are calculated as weighted averages of residential, commercial, and industrial prices and weighted by region*

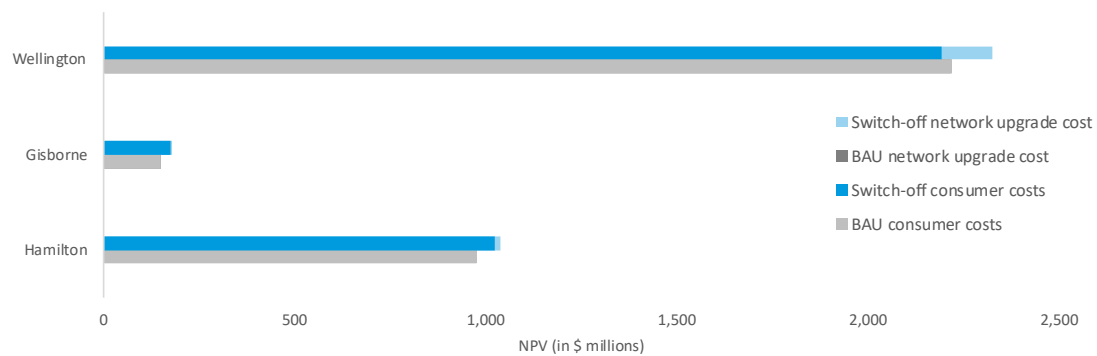
To test the robustness of the model results that used historical prices, we also modelled the forecasts of a relatively high gas price trajectory with a relatively low electricity price trajectory (and vice versa). In reality, gas price increases would also mean electricity price increases since gas-fired generation will remain important for firming over the modelling period. Our analysis shows that the Switch-off scenario is still costlier than the BAU scenario under different price scenarios, as shown in Figure 0.7. However, the difference is much smaller under the favourable conditions for electrification.

Figure 0.7: Consumer and network costs under different energy price forecasts



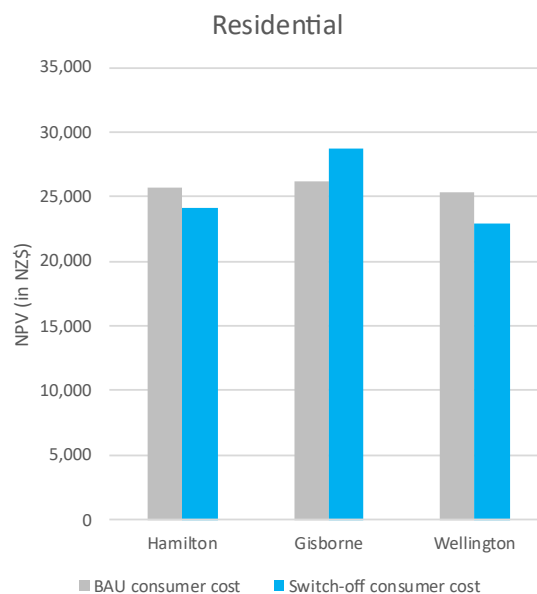
At a regional level, the Switch-off scenario is lower cost in Wellington under the high gas and low electricity prices scenario, as shown in Figure 0.8. This is driven by the higher proportion of residential demand in Wellington.

Figure 0.8: Consumer and network costs under the BAU and Switch-off Scenario—High gas and low electricity prices



Commercial and industrial consumer costs are always higher under the Switch-off scenario across all regions and energy price scenarios. However, Switch-off residential consumer costs in Hamilton and Wellington are lower under the high gas and low electricity price scenario, as shown below in Figure 0.9. Gisborne’s Switch-off scenario remains more expensive due to a relatively higher electricity price compared to the other two regions.

Figure 0.9: Residential consumer costs per user by region – High gas and low electricity prices scenario



Broader considerations

There are important qualitative considerations that fall outside of the purely economic analysis. For example, many consumers value the convenience of instant hot water from gas and may be reluctant to switch to alternative technologies, regardless of long-term cost implications. These consumer preferences, along with broader social and environmental

objectives, will also influence decision-making about the future of the gas distribution network.

1 Introduction

New Zealand's transition to a low-emissions economy requires careful evaluation of how existing energy systems, particularly reticulated natural gas, fit into future pathways. As natural gas supply declines and policymakers and consumers consider options for decarbonising energy use, it is critical to understand the full implications of replacing gas with electricity.

Gas Industry Company (GIC) engaged Castalia to support in analysing the costs and benefits of switching off the gas distribution network. This assignment seeks to answer this central question: **What are the economic and emissions impacts of ending gas supply through distribution networks to consumers?**

We analyse impacts on consumers, network upgrades and emissions across three centres

To answer the question, we examined three discrete networks in Hamilton, Gisborne and Wellington,² and wider implications for the North Island, analysing:

- **Consumer costs:** The costs consumers incur when switching away from gas appliances, including appliance replacement, gas-to-electricity rectification, and ongoing energy use
- **Network upgrade costs:** Costs of upgrading the electricity distribution network to accommodate increased load resulting from greater electrification
- **GHG emissions impact:** Emissions from using gas directly on premises versus using gas to generate electricity. In this case, we extrapolated the results beyond the three networks of Hamilton, Gisborne and Wellington to consider the North Island-wide emissions implications of gas distribution network switch-off. We consider the GHG emissions component separately from the consumer and network upgrade costs, as the gas and electricity prices already include a carbon cost.

Residential, commercial and industrial gas users connected to distribution networks use gas for a wide range of purposes

The study focuses on gas distribution network customers (GDCs)—that is, residential, commercial, and industrial users connected to local gas distribution networks in the three study areas. These users rely on gas for a variety of purposes:

- **Residential consumers** use gas primarily for water heating, space heating, and cooking
- **Commercial consumers** use gas for similar applications at higher volumes—especially in hospitality and service industries, where high thermal outputs are needed
- **Industrial consumers** typically use gas for high-temperature process heat, boilers, and other specialised applications where consistent and high-volume heat is required.

The study excludes large gas consumers directly connected to the transmission network, such as those in the electricity generation, chemicals, and large-scale manufacturing sectors.

² The three study areas are identified by GIC for this study.

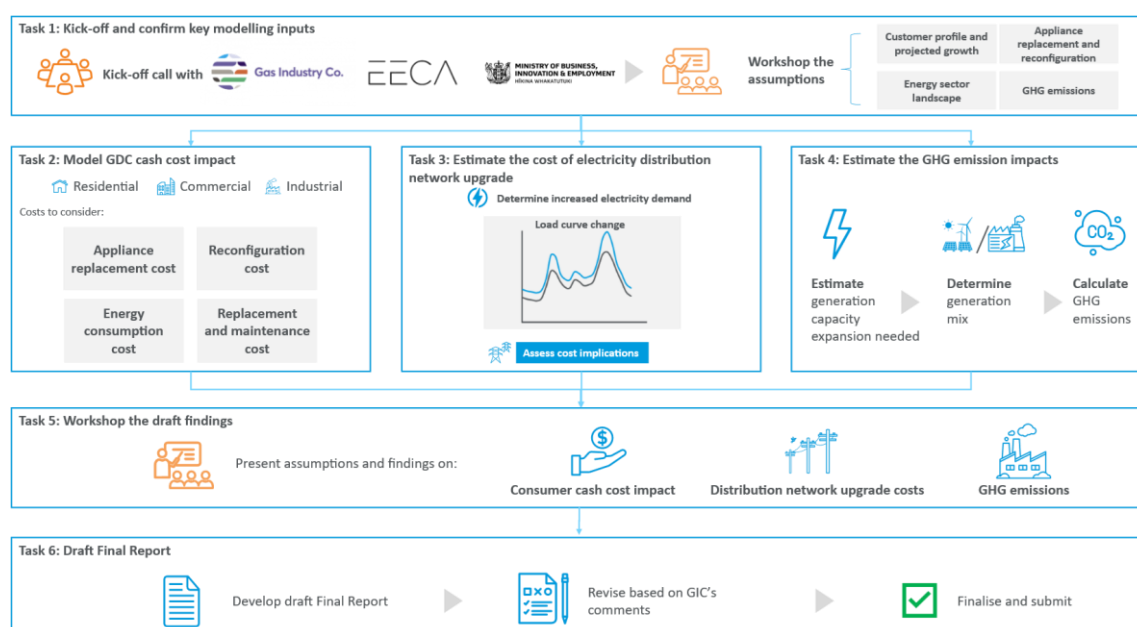
BAU Scenario is compared to Switch-off Scenario to estimate costs and benefits

To assess the costs and benefits of switching off gas supply to GDCs, we compare two scenarios over a 25-year forecast period:

- **Business-as-Usual (BAU) Scenario:** This is the counterfactual. It assumes energy use continues as it does today, with GDCs continuing to use natural gas with existing appliances. Gas distribution continues to serve customers with gradual attrition as users voluntarily disconnect over time
- **Switch-off Scenario:** This factual scenario assumes a full switch-off of the gas distribution networks in the three study areas by 2029. All GDCs must transition away from natural gas. Most users electrify their appliances, but a portion—particularly commercial users and some households—switch to liquefied petroleum gas (LPG) instead.

Figure 1.1 presents the methodology we used in this study.

Figure 1.1: Methodology diagram



Future energy prices are a significant factor in the costs and benefits

The costs to consumers from a Switch-off of gas distribution networks compared to the BAU are dominated by the ongoing energy costs. Consumers obviously require gas to run appliances in the BAU, and electricity and LPG (or other energy sources) in the Switch-off scenario. The relative prices for gas, electricity and LPG change the outcome of the analysis significantly. If electricity prices fall in the future and gas prices rise, the Switch-off Scenario becomes more favourable. If electricity prices rise, and gas prices fall, the BAU Scenario is more favourable.

We have used a range of energy price forecasts to test the impacts of the Switch-off Scenario compared to BAU, because New Zealand energy prices have been volatile in recent years.³ We use the following price forecasts:

- Gas price forecasts:

Forecast	Description
Historical price baseline	Gas prices held constant at recent historical levels
Low price path	Gas prices increase slowly in line with CCC projections
High price path	Gas prices rise more quickly as wholesale price and Transmission and Distribution (T&D) charges increase, following Ernest & Young (EY)'s assessment of supply and demand

- Electricity price forecasts:

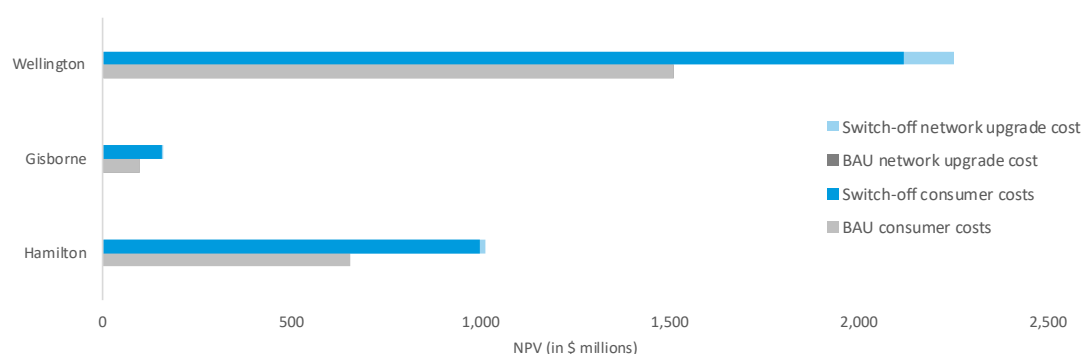
Forecast	Description
Historical price baseline	Electricity prices held constant at recent historical levels
Low price path	Electricity prices rise slowly, based on Energy Link forecasts for wholesale prices and assumptions of higher T&D charges.
High price path	Electricity prices rise more sharply in line with Climate Change Commission (CCC) projections

We present outcomes assuming historical prices remain constant in Section 2 and then apply different forecast trajectories to show the range of potential outcomes in Section 5.

Switch-off scenario is likely to be costlier than BAU

Our analysis shows that switching off the gas network is consistently more expensive than continuing with BAU. The bulk of these additional costs are borne by consumers, while a smaller share attributable to network upgrades, as shown in Figure 1.2. At the same time, the Switch-off scenario delivers substantial reductions in GHG emissions.

³ Electricity prices have spiked, particularly in winter, with wholesale electricity prices higher than the long-term average. Gas prices have also increased sharply in recent years as gas production and reserves has been lower than expected. Future gas prices are uncertain due to uncertain demand forecasts for large users of gas and apparently dwindling supply.

Figure 1.2: Consumer and network upgrade costs by region under BAU and Switch-off scenarios

The report is structured as follows:

- Section 2 presents the consumer cost impact of the distribution network switch-off
- Section 3 presents the electricity distribution network cost impact
- Section 4 presents the GHG emissions impact
- Section 5 presents the results of scenario analysis on consumer and network upgrade costs under alternative energy price trajectories
- Section 6 concludes the study.

2 Consumer cost impacts of the distribution network switch-off

If gas networks are decommissioned, consumers relying on gas appliances will need to transition to alternative fuel sources and will therefore incur the associated costs. The consumer cost impacts of switching off the gas distribution network include capital costs of replacing appliances/equipment, periodic maintenance costs and operating costs for the energy source used.

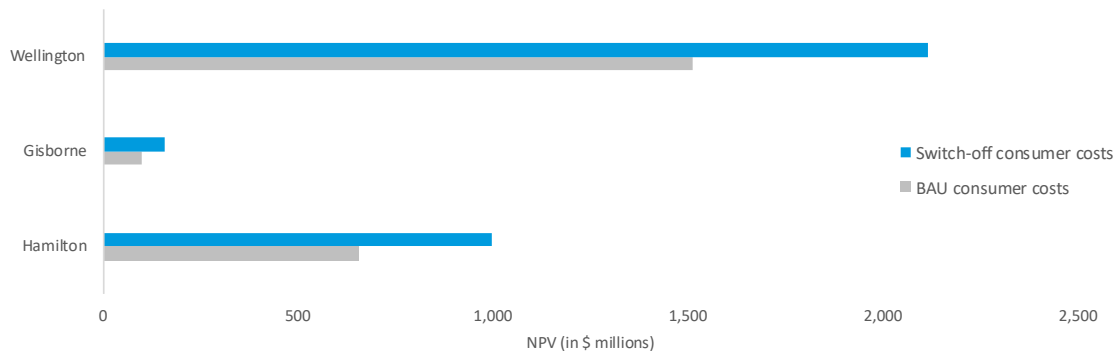
In our analysis, we calculate consumer costs separately for the BAU and Switch-off scenarios, then compare the results to assess the net impact of switching off the gas network.

The analysis is sensitive to forecast energy prices: the price of gas, LPG and electricity. New Zealand gas prices are currently high, as gas production and reserves are turning out to be lower than expected. New Zealand electricity prices have increased due to wholesale price spikes in recent years and higher T&D costs. LPG prices are driven by global oil prices.

To fairly compare scenarios without results being dominated by price uncertainty, this section presents outcomes using historical energy prices held constant. In Section 5, we test two alternative energy price scenarios—low gas/high electricity and high gas/low electricity—to assess the impact on consumer costs.

Under historical price assumptions, the Switch-off scenario is more expensive than BAU in every study region (Figure 2.1). Overall, switching off the gas network would increase consumer costs by \$1,011 million.

Figure 2.1: Comparison of the consumer costs under the BAU and Switch-off Scenario



**To calculate the NPV, we used a real social discount rate of 8 percent, published by the New Zealand Treasury. Source: NZ Treasury (2024) "Updated Public Sector Discount Rates for Cost Benefit Analysis"*

We analysed current gas use, cost and technologies, and modelled the costs under BAU and Switch-off, and carried out sensitivity analysis:

- Section 2.1 explains the profiles of gas users, their usage patterns, and the technologies and associated costs of gas and alternative energy use, by region
- Section 2.2 shows modelling results of consumer costs under BAU and Switch-off and the net impact
- Section 2.3 highlights the key sensitivities for the results.

2.1 Comparing the consumer costs between BAU scenario and Switch-off scenario

Consumer costs refer to the total costs borne by end users—households, businesses, and industries—for owning and using appliances. These include energy bills, appliance purchase and installation, and replacement and maintenance costs.

The key information required to estimate the consumer costs of the Switch-off scenario includes profiles of gas users, usage patterns, and cost and technology assumptions. We disaggregate the analysis into three sectors: residential, commercial, and industrial.

The analysis is sensitive to relative energy prices over the 25-year forecast period. Therefore, we first model outcomes assuming historical prices remain constant, and then apply different forecast trajectories to show the range of potential outcomes (presented in Section 5). Box 2.1 below explains the forecast prices we have used.

Box 2.1: Gas, electricity and LPG prices for residential, commercial and industrial customers

Gas and electricity prices in New Zealand have been volatile in recent years. Predicting future prices is challenging, and will depend on wholesale energy costs, transmission and distribution costs and retail margin. LPG prices are driven by global oil market trends.

Gas prices are rising due to falling supply, but future demand is uncertain

In the gas sector, policy changes and declining production have resulted in higher prices. Future prices will depend on the availability of gas supply and competing uses for gas. There is significant uncertainty about the future of major users of gas connected to the transmission network. Some of those major users may exit the market completely—for example, in the past 12 months, Methanex, a major methanol producer, fertiliser manufacturers and some manufacturers using process heat have significantly reduced demand).

Electricity prices have recently risen, but long-term prices should tend to underlying costs

In the electricity sector, wholesale prices have been volatile, and T&D costs have risen as the Commerce Commission has allowed Transpower and electricity distribution businesses to earn higher revenues to cover higher costs. The energy system relies on new generation investment to be built to meet new demand, at the levelised cost of energy for the generation type. The Government is currently reviewing the electricity market settings to determine whether these underlying assumptions about generation being built to meet demand still hold.

Gas price forecasts used in Castalia's analysis

We have used the following gas price forecasts to model the consumer cost impacts of Switch-off and BAU scenarios:

- **Historical price baseline**—gas prices held constant at recent historical levels
- **Low gas price path**—prices increase slowly, in line with CCC projections
- **High gas price path**—prices rise more quickly as wholesale price and T&D charges increase, following EY's assessment of supply and demand.

Electricity price forecasts used in Castalia's analysis

We have used the following electricity price forecasts to model the consumer cost impacts of Switch-off and BAU scenarios:

- **Historical price baseline**—electricity prices held constant at recent historical levels
- **Low electricity price path**—prices rise slowly, based on Energy Link forecasts for wholesale prices and assumptions of higher T&D charges
- **High electricity price path**—prices rise more sharply in line with CCC projections.

LPG price forecasts used in Castalia's analysis

For LPG, we held prices constant over the forecast period

2.1.1 Residential sector

The key factors for estimating residential consumer costs of switching off the gas distribution network are:

- Trends in residential gas demand
- Gas end use
- Household gas use patterns
- Electric technologies for replacing gas appliances
- Cost components in changing from gas to electric appliances
- Energy efficiency of gas versus electric appliances.

Residential gas demand is declining but we model a stable number of customers to ensure the modelling is fair

As of 2024, there are approximately 291,320 residential natural gas users in New Zealand (all located on the North Island). The average consumption per residential user is 24.7 GJ per year.⁴ We examine a subset of these users to closely examine the cost impact in three study areas:

- Hamilton has 29,886 residential users
- Gisborne has 2,579 residential users
- Wellington has 63,108 residential users.⁵

EY predicts that residential gas demand will decline rapidly between 2025 and 2050, falling from 5.5 PJ/year to 1.6 PJ/year.⁶ This is driven by the reduced demand in low-temperature space heating and water heating.⁷ To sensibly compare the BAU and Switch-off scenarios, we hold the number of gas customers constant over the 25-year modelling period. If we reduce customer numbers in line with EY's demand forecast, then for some customers, we would capture the cost of appliances but not the full cost of energy over the appliances' life.

Gas is used for water heating, space heating, and cooking

In the residential sector, gas is primarily used for three purposes:

- **Water heating:** households typically rely on gas appliances such as continuous flow systems (commonly known as califonts) or storage tank units
- **Space heating:** gas is commonly used through a variety of appliances, including flued and unflued wall heaters, ducted central heating systems, or decorative gas fireplaces
- **Cooking:** households use gas to produce an open flame for direct heat.

Household gas use patterns vary

Not all households use gas for all three purposes. According to Energy Efficiency and Conservation Authority (EECA) and census data, usage patterns vary significantly. To reflect this diversity, we created three representative archetypes of residential households:

- **Archetype A:** Gas used for water heating, space heating, and cooking
- **Archetype B:** Gas used for water heating and cooking
- **Archetype C:** Gas used for water heating only.

While this typology does not capture every possible combination (for example, gas for space and water heating only), it represents the most common use patterns. Applying these archetypes allows for a more granular estimation of consumer cost impacts.⁸

Figure 2.2 illustrates how archetypes are distributed in each study region.

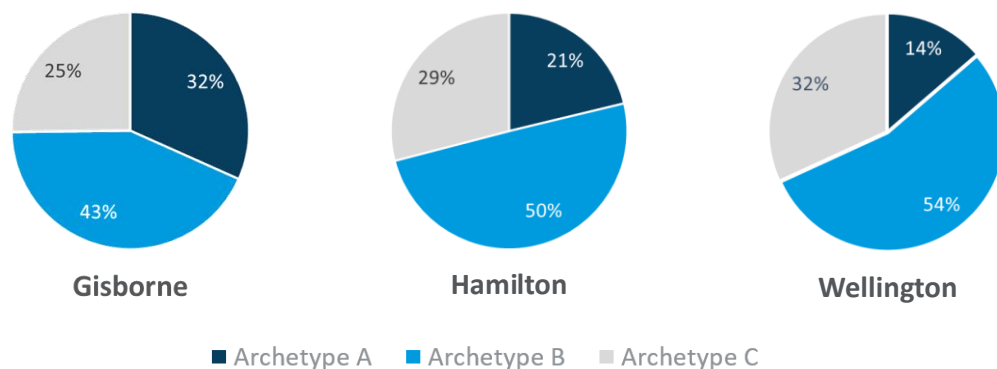
⁴ Source: GIC Registry and MBIE Energy statistics

⁵ Source: GIC allocation data

⁶ Source: EY (2024) "Gas Supply and Demand Study"- Low Intervention scenario

⁷ Source: EY (2024) "Gas Supply and Demand Study"

⁸ We used Rewiring Aotearoa (2024)'s report for household consumption per appliance type, which estimates that gas water heaters use 6.88 kWh/day, gas space heaters 11.6 kWh/day, and gas cooktops 2.08 kWh/day. We then adjusted to reflect regional differences in gas consumption.

Figure 2.2: Share of archetypes by region

Source: EECA (2024) "Electrifying Aotearoa: The Consumer Perspective"; NZ 2023 Census

Households could adopt various technologies to replace their gas appliances

For households that switch from gas to electricity, we assume a range of replacement technologies could be adopted depending on the end use: water heating, space heating, and cooking. These assumptions are important for estimating the cost and emissions impacts of electrification, and are reflected in the appliance cost and energy efficiency estimates presented later in this section.

For water heating, electric alternatives include resistive storage cylinders and high-efficiency heat pump systems. Resistive cylinders heat water using an electric element, while water heat pumps extract heat from the surrounding air, offering significantly greater energy efficiency. Based on current adoption patterns in New Zealand, we assume that 4 percent of households will install heat pump water heaters, while the remaining 96 percent will adopt standard resistive systems. Water heat pumps have significantly higher upfront capital costs, but lower ongoing energy costs. We present the results of a 100 percent water heat pump sensitivity in Section 2.3, to test whether behavioural reasons such as hyperbolic discounting might be influencing the observed current 4 percent uptake rate.

For space heating, electric options include basic resistive heaters and heat pumps. Resistive heaters generate heat directly using electric coils or panels and are commonly used for heating individual rooms. Heat pumps, by contrast, are more energy-efficient and can provide whole-home heating (for example, ducted systems), particularly in newer or better-insulated homes. Following current usage trends, we assume heat pumps will meet 60 percent of household heating needs, and resistive heating solutions will meet the remaining 40 percent.

For cooking, we assume households currently using gas cooktops will transition to either resistive or induction electric cooktops. Resistive cooktops use heated coils or ceramic surfaces to transfer heat to pots and pans, while induction cooktops rely on electromagnetic fields to heat cookware directly. Drawing from the experience in Esperance, Western Australia, which undertook a large-scale residential gas phase-out, we assume that 85 percent of households will switch to induction cooktops, while 15 percent will adopt resistive options.

Residential consumer costs include five components

To estimate the costs borne by residential consumers following the gas distribution network switch-off, we categorised expenses into five cost components: rectification, appliance purchase and installation, maintenance, energy price, and, for some, transition to LPG.

Table 2.1 describes the cost components and our assumptions.

Table 2.1: Cost types and assumptions for residential users

Cost component	Description	BAU	Switch-off
Gas-to-electricity rectification⁹	One-off cost to safely disconnect from the gas network. This includes appliance removal, pipe capping, and safety checks. For Archetype A, household power supply upgrade cost is also included.	Not applicable	- Water heating: \$973 - Space heating: \$2,008 - Cooking: \$482 - Household power supply upgrade: \$1,333 (Archetype A only)
Appliance product and installation cost, including replacement¹⁰	The cost of purchasing and installing appliances. For BAU, this includes replacing gas appliances at end-of-life For Switch-off, this includes purchasing electric appliances when the gas network is switched off, as well as future replacements.	- Water heating: \$3,593 - Space heating: \$4,483 - Cooking: \$1,651	- Water heating: \$3,756 - Space heating: \$7,687¹¹ - Cooking: \$2,453
Maintenance cost¹²	Servicing and repair costs to keep electric and gas appliances in working order.	10% of the product price; One maintenance event after 8 years of appliance use	
Energy price¹³	The cost of ongoing energy use. - For BAU, it is the cost of consuming gas - For Switch-off, it is the cost of consuming electricity We used 2024 energy prices and assumed they remain constant over the forecast period.	Current gas prices (2024): \$49/GJ (delivered price which includes fixed and variable charges)	Current variable charges for electricity prices (2025): - Hamilton: 24.4 c/kWh - Gisborne: 29.0 c/kWh - Wellington: 23.1 c/kWh We only apply the variable portion of the electricity

⁹ Source: Frontier Economics (2022) "Cost of switching from gas to electric appliances", adjusted to NZD and 2025 prices. We also cross checked these numbers with our desk research to ensure they are robust.

¹⁰ The average appliance costs are weighted averages of different appliance costs and their adoption rates in the sub-section above. Source: Rewiring Aotearoa (2024) "Electric Homes Technical Report". We have cross checked the numbers with our own desk research.

¹¹ For households with gas space heating, we do not assume a direct one-to-one replacement of the gas appliance. Instead, we estimate the number of heat pumps or resistive electric heaters required to match the typical heat output of a ducted gas heater, which we estimate at 15 kW. We then apply unit cost estimates (per kW of heating capacity) to determine the total replacement cost: heat pump: \$527 per kW; resistive electric heater: \$57 per kW. Source: EECA (2024). "Space Heating Comparison Methodology: Public Consultation"; own market research.

¹² Source: Online product manuals and supplier websites

¹³ Source: Gas price: published statistics from Ministry of Business, Innovation, and Employment. Electricity prices: Electricity Authority Regional Power Prices dashboard.

	Variations in energy prices are tested in Section 5.		bill to avoid double-counting the fixed electricity charges that gas users pay, regardless of how much electricity they consume.
Cost for LPG users¹⁴	This includes one-off switch cost, including disconnection from the piped gas network, installing LPG bottles, and fittings. It also includes LPG consumption cost, and gas appliance replacement and maintenance costs We assume 15% of residential users will switch to LPG, an assumption we elaborate on in Box 2.2.	Not applicable	▪ One-off switch cost: \$1,500 ▪ LPG prices: \$63/GJ (constant in real terms) ▪ Appliance replacement and maintenance costs: Same as natural gas equipment in BAU

Gas and electric appliances differ in energy efficiency

When switching from gas to electricity, residential users may benefit from improved energy efficiency. Depending on the specific technology, electric appliances can be two to four times more efficient than their gas counterparts.

Table 2.2 presents the weighted average energy efficiency of gas relative to electricity, where weights reflect the assumed adoption rates of different technologies discussed above.

¹⁴ Source: One-off switch cost: Castalia desk research; LPG price: Climate Change Commission (2024) "Commission's Advice on Aotearoa New Zealand's fourth emissions budget and Review of the 2050"

Table 2.2: Energy efficiency of gas relative to electricity by usage

Type	Energy efficiency of gas relative to electricity
Water heating	1.02
Space heating	0.46
Cooking	0.40

Source: Rewiring Aotearoa (2024) "Electric Homes Technical Report"; we have cross-checked these numbers with the International Energy Agency and our own desk research

The values in Table 2.2 present the ratio of energy use between gas and electric appliances (weighted by assumed adoption rates). For example, a gas space heater using 1 kWh of energy delivers the same amount of heat as electric heaters (60 percent heat pumps and 40 percent resistive heaters) using only 0.46 kWh of energy (on average). This reflects the higher efficiency of electricity-based technologies, particularly heat pumps and induction cooktops. Gas water heating is assumed to be more efficient than electric resistive systems because it heats water on demand, avoiding heat losses associated with storage tanks. The water heating efficiency reflects the water heat pump adoption rate of 4 percent.

2.1.2 Commercial sector

The key factors for estimating commercial consumer costs include:

- Trends in commercial gas demand
- Gas end use
- Cost components in changing from gas to electric appliances
- Energy efficiency of gas versus electric appliances.

Commercial gas consumption is declining

As of 2024, there are approximately 15,741 commercial gas users in New Zealand. Within our three study areas:

- Hamilton has 1,303 commercial users, with an average consumption of 381 GJ/year
- Gisborne has 255 commercial users, with an average consumption of 246 GJ/year
- Wellington has 2,632 commercial users, with an average consumption of 512 GJ/year.¹⁵

Commercial gas demand is projected to decline between 2025 and 2050, falling from 6.5 PJ/year to 1.6 PJ/year.¹⁶ This is in response to the gas supply shortfall. However, to sensibly compare the BAU and Switch-off scenarios, we hold the number of gas customers constant over the 25-year modelling period.

¹⁵ Source: GIC allocation data

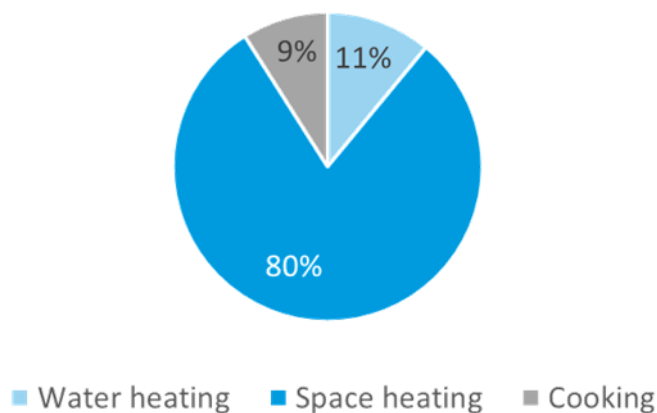
¹⁶ Source: EY (2024) "Gas Supply and Demand Study"- Low Intervention scenario

80 percent of commercial gas is used for space heating

In the commercial sector, gas is primarily used for water heating, space heating, and cooking in New Zealand. These uses vary across different types of businesses, depending on their operational needs. Water heating is common in facilities with high hot water demand, such as hotels, gyms, leisure centres, and commercial laundries. Space heating uses the most gas in the commercial sector in office buildings, schools, healthcare facilities, and again in hotels—particularly in colder months when large indoor spaces require consistent heating. Cooking with gas is most common in the hospitality industry, especially among restaurants and cafés that rely on open flame for quick, high-heat food preparation or for particular cooking styles.

Figure 2.3 presents the breakdown of commercial gas use by end-use application.

Figure 2.3: Breakdown of commercial gas use by end use



Source: EECA (2017-2023) Energy End Use Database

As shown, space heating accounts for the largest share of commercial gas demand, followed by water heating and cooking.

Commercial consumer costs include three components

To estimate the costs borne by commercial consumers following the gas distribution network switch-off, we categorised expenses into three key cost components: energy price, rectification, and costs borne by LPG users.

Table 2.3 describe the cost components and our assumptions.

Table 2.3: Cost types and assumptions for commercial users

Cost component	Description	BAU	Switch-off
Energy price ¹⁷	The cost of ongoing energy use. ▪ For BAU, it is the cost of consuming gas	Gas prices: \$28/GJ (delivered price, which	Current variable charges for electricity prices (2025):

¹⁷ Source: Gas price: published statistics from Ministry of Business, Innovation, and Employment. Electricity prices: Electricity Authority Regional Power Prices dashboard.

	For Switch-off, it is the cost of consuming electricity We used 2024 energy prices and assumed they remain constant over the forecast period. Variations in energy prices are tested in Section 5.	includes fixed and variable charges)	- Hamilton: 16.1 c/kWh - Gisborne: 19.1 c/kWh - Wellington: 15.2 c/kWh
Gas-to-electricity rectification (including electric appliance purchase and installation)¹⁸	One-off cost to safely disconnect from the gas network. This includes purchasing new electric appliances, removing existing gas appliances, capping gas pipes, and carrying out any required electrification work, such as switchboard, cabling, or transformer upgrades.	Not applicable	\$325 for each GJ of annual gas consumption displaced
Cost for LPG users¹⁹	This includes one-off switch cost, including disconnection from the piped gas network, installing LPG bottles, and fittings. It also includes the LPG consumption cost. We assume 60% of commercial users will switch to LPG, an assumption we discuss in Box 2.2.	Not applicable	- One-off switch cost: \$5,000 - LPG prices: \$48/GJ (constant in real terms)

We did not include ongoing maintenance and replacement costs in our analysis of commercial users due to the high degree of variability between users. These users operate a wide range of appliance types with significantly different energy loads and typically have bespoke solutions for the premises. Their building layouts and electrical systems also vary widely, which influences the cost and technical feasibility of switching from gas to electricity. Given this diversity, the associated costs are highly case-specific and difficult to generalise across the sector.

Since we exclude these costs from both the BAU and Switch-off scenarios, their omission should not affect the overall cost–benefit results, as they would effectively cancel each other out.

Commercial electric appliances are typically more energy efficient than gas appliances

When switching from gas to electricity, commercial users may benefit from improved energy efficiency. We estimate the relative efficiency of gas compared to electricity at 0.39 for the commercial sector.²⁰

¹⁸ Source: EECA Regional Energy Transition Accelerator

¹⁹ Source: One-off switch cost: Castalia desk research; LPG price: Climate Change Commission (2024) “Commission's Advice on Aotearoa New Zealand's fourth emissions budget and Review of the 2050”

²⁰ Source: EECA Regional Energy Transition Accelerator

2.1.3 Industrial sector

To estimate industrial consumer costs, we analysed:

- Trends in industrial gas demand
- Costs of changing from gas to electric appliances
- Energy efficiency of gas versus electric appliances.

Industrial gas consumption is declining

As of 2024, within our three study areas:

- Hamilton has 19 industrial users, with an average consumption of 35,300 GJ/year
- Gisborne has 3 industrial users, with an average consumption of 48,400 GJ/year
- Wellington has 21 industrial users, with an average consumption of 35,200 GJ/year.²¹

Industrial gas demand is projected to decline rapidly between 2025 and 2050, according to EY, falling from 23.1 PJ/year to 4.2 PJ/year.²² This is in response to the gas supply shortfall.

However, to sensibly compare the BAU and Switch-off scenarios, we hold the number of gas customers constant over the 25-year modelling period.

Industrial consumer costs include three components

To estimate the costs borne by industrial consumers following the gas distribution network switch-off, we categorised expenses into three key cost components: energy price, rectification, and costs borne by LPG users. Our assumptions and approach to estimating the role of LPG in the Switch-off scenario are set out in Box 2.2.

Table 2.4 describe the cost components and our assumptions.

Table 2.4: Cost types and assumptions for industrial users

Cost component	Description	BAU	Switch-off
Energy price²³	The cost of ongoing energy use. ▪ For BAU, it is the cost of consuming gas ▪ For Switch-off, it is the cost of consuming electricity We used 2024 energy prices and assumed they remain constant over the forecast period. Variations in energy prices are tested in Section 5.	Gas prices: \$20/GJ (delivered price, which includes fixed and variable charges)	Current variable charges for electricity prices (2025): ▪ Hamilton: 13.4 c/kWh ▪ Gisborne: 15.9 c/kWh ▪ Wellington: 12.7 c/kWh
Gas-to-electricity rectification (including electric appliance)	One-off cost to safely disconnect from the gas network. This includes purchasing new electric appliances, removing existing gas appliances, capping gas pipes, and carrying out any required electrification work such		\$240 for each GJ of annual gas consumption displaced

²¹ Source: GIC allocation data

²² Source: EY (2024) "Gas Supply and Demand Study"-Low Intervention scenario

²³ Source: Current gas price: published statistics from Ministry of Business, Innovation, and Employment. Current electricity prices: Electricity Authority Regional Power Prices dashboard.

purchase and installation)²⁴	as switchboard, cabling, or transformer upgrades.	
Cost for LPG users²⁵	This includes one-off switch cost, including disconnection from the piped gas network, installing LPG bottles, and fittings. It also includes the LPG consumption cost. We assume 9-16% of industrial users will switch to LPG across the three study areas, an assumption we discuss in Box 2.2.	- One-off switch cost: \$10,000 - LPG prices: \$39/GJ (constant in real terms)

For the same reasons illustrated for the commercial sector, we did not include appliance maintenance and replacement costs in our analysis of commercial users due to the high degree of variability across users.

Industrial electric appliances are typically more energy efficient than gas appliances

When switching from gas to electricity, industrial users may benefit from improved energy efficiency to the extent that there are electrical appliances that meet the use-case needs. We estimate the relative efficiency of gas compared to electricity at 0.78 for the industrial sector.²⁶

Box 2.2: LPG Switching Assumptions

Not all gas users will be willing to switch to electric appliances. Electrical appliances do not provide the same quality of output as gas appliances in many cases (for example, achieving almost instant hot water available with a gas califont is costly to replicate with electrical appliances). In some commercial and industrial use cases, electrical, biomass or other non-gas alternatives are not currently viable. LPG is supplied in tanks, either directly to the site or to a hub, and appliances can be relatively easily converted from natural gas to LPG use.

We assumed some gas users would switch to LPG in the Switch-off scenario. We use LPG as a proxy for alternative energy sources, which include a range of options such as cylinder-supplied biomethane. Our assumptions vary by residential, commercial, and industrial sectors:

In the **residential sector**, some households may choose LPG over electricity for several reasons:

- Older homes may lack sufficient electrical capacity for full electrification without costly upgrades
- Some households may prefer to avoid the upfront cost of replacing and installing new electric appliances
- A preference for cooking with an open flame or for instant hot water may lead some to retain gas through LPG.

In the **commercial and industrial** sectors, users are more likely to require high thermal output that electric appliances may struggle to deliver cost-effectively. Factors contributing to a preference for LPG include:

²⁴ Source: EECA Regional Energy Transition Accelerator

²⁵ Source: One-off switch cost: Castalia desk research; LPG price: Climate Change Commission (2024) "Commission's Advice on Aotearoa New Zealand's fourth emissions budget and Review of the 2050"

²⁶ Source: EECA Regional Energy Transition Accelerator

- Many commercial or industrial gas appliances (for example, ovens, boilers, fryers) have high energy demands that exceed existing electrical infrastructure
- Electrification often requires major upgrades to switchboards, cabling, or transformers—adding cost and complexity
- Converting kitchens or facilities to electric systems can result in operational downtime, which many businesses cannot afford
- For restaurants in particular, precise flame control is critical for fast-paced, high-volume cooking operations.

Based on case studies and published data, we assume the following LPG switching rates:

- Residential: 16 percent of gas users switch to LPG
- Commercial: 60 percent of gas users switch to LPG
- Industrial:
 - Hamilton: 9 percent of industrial gas demand switches to LPG
 - Gisborne: 15 percent of industrial gas demand switches to LPG
 - Wellington: 16 percent of industrial gas demand switches to LPG.

We include a sensitivity test on our LPG switch rate assumptions, which we present in Section 2.3.

Source: Residential and commercial assumptions are based on the Esperance gas transition case study. Industrial estimates are based on regional data from EECA's Regional Energy Transition Accelerator (RETA).

2.2 Results: Consumers face lower costs under BAU

The cost impacts for consumers under the BAU and Switch-off scenarios across residential, commercial, and industrial sectors fall into non-energy costs (appliance capital cost and maintenance and replacement) and energy costs (the relative price of gas, electricity or LPG). We have separated the analysis given the wide range of energy price forecasts.

2.2.1 Switch-off is costlier for residential sector

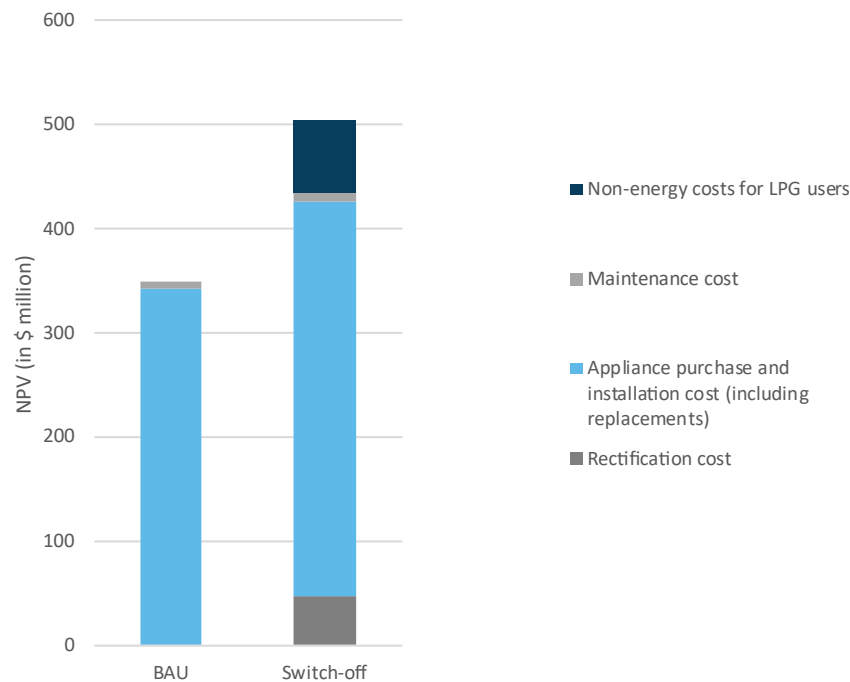
Residential gas customers are estimated to face higher non-energy costs in the Switch-off scenario over the BAU. Energy costs are highly sensitive to assumptions about future prices.

Non-energy costs of Switch-off and BAU for residential users

For residential consumers, switching off the gas network results in \$155 million in modelled non-energy costs compared with BAU. The total net present value (NPV) of non-energy costs under the Switch-off scenario is \$504 million, which is 44 percent higher than under BAU (\$349 million).

Figure 2.4 presents the total NPVs for the two scenarios, broken down by different non-energy costs. Costs for LPG users are the same as BAU except for a one-off switch cost of \$1,500 in 2029. We present them as a separate category to distinguish between costs from gas appliances and electric appliances.

Figure 2.4: Comparison between NPVs in BAU scenario and Switch-off scenario by cost type (excluding energy consumption costs)—Residential sector



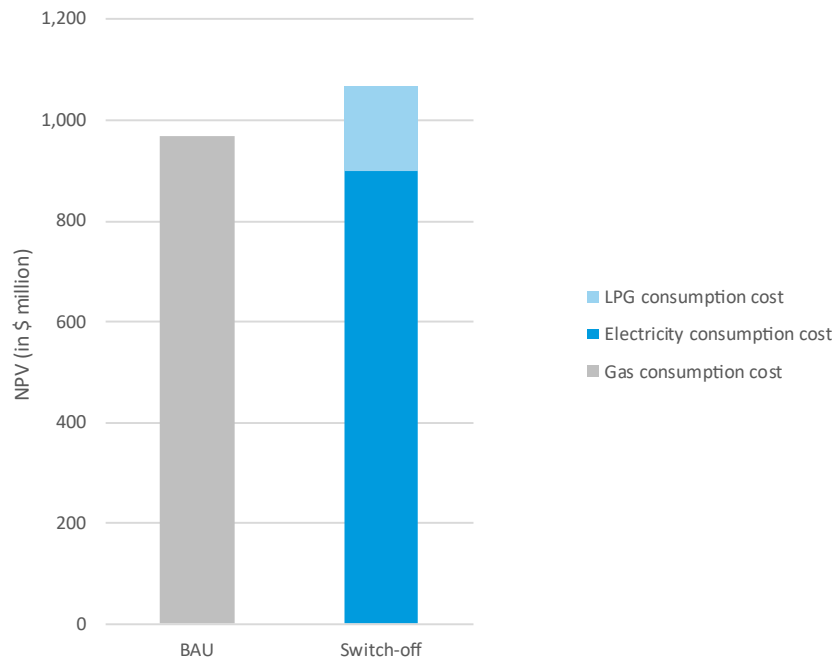
The Switch-off scenario is estimated to be costlier than the BAU scenario for two main reasons. First, electrical appliances are more expensive than gas appliances: as the results show, even with only 84 percent of households electrifying, their appliance purchase and installation costs exceed those of the entire population using gas appliances under the BAU scenario. Second, the upfront rectification costs further increase the total consumer cost of the switch-off.

Energy costs of Switch-off and BAU scenarios for residential users

We model the energy costs of Switch-off and BAU scenarios using historical energy prices held constant over the forecast period (we consider different energy price scenarios in Section 5). The Switch-off scenario results in \$101 million more in energy costs than the BAU scenario. The total NPV of energy costs under the Switch-off scenario is \$1,069 million, which is 10 percent higher than under BAU (\$969 million).

Figure 2.5 presents the total NPVs of the energy consumption cost for the two scenarios.

Figure 2.5: NPVs of energy consumption costs in BAU scenario and Switch-off scenario (historical energy prices)—Residential sector

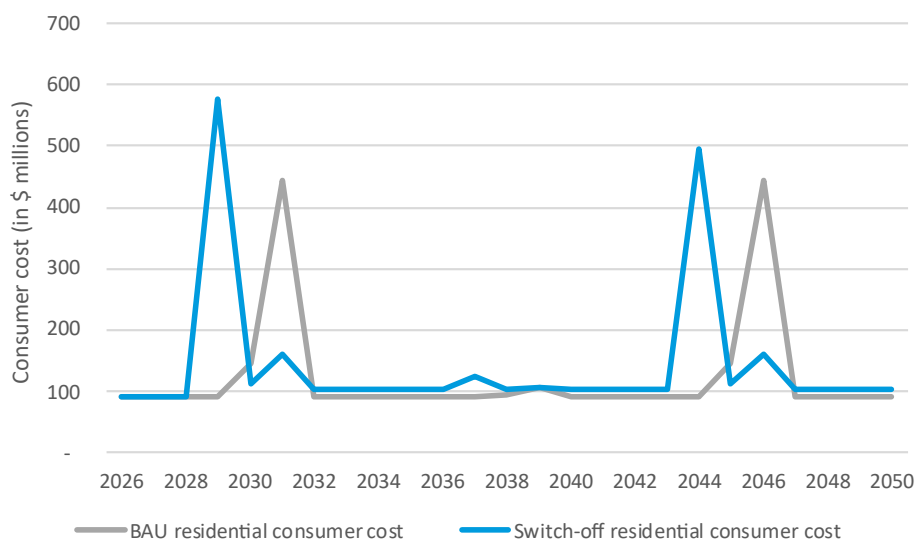


Despite the higher energy efficiency of electric appliances, the energy consumption costs under Switch-off are higher than BAU. This is because of higher electricity and LPG prices.

Time-profiled and regional consumer cost impacts

Figure 2.6 shows the cost impacts for the three regions over the forecast period, combining energy costs and non-energy costs.

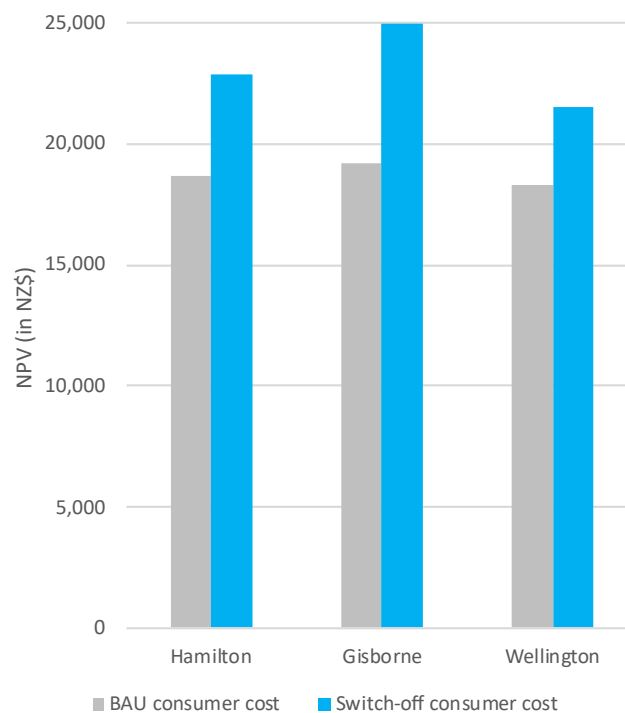
Figure 2.6: Cost impact under BAU and Switch-off, 2026-2050—Residential sector



Under BAU, two noticeable spikes occur when gas appliances are replaced. Under Switch-off, costs rise sharply in 2029 when the gas network is switched off, as households pay for rectification and new electric appliances. A second spike occurs in 2044 when electric appliances reach the end of their 15-year lifespan and are replaced. The two smaller spikes in Switch-off occur when LPG appliances are replaced. We assume nameplate appliance life-spans, so the replacement costs are incurred within a short period, whereas in reality these costs would probably be spaced over a longer period (which would not affect the net present value significantly).

Figure 2.7 presents the NPVs per residential user for each study region. The Switch-off scenario is costlier than the BAU scenario across all regions for residential users. On average, a residential user spends \$18,433 between 2026 and 2050 under BAU, compared with \$22,010 under Switch-off, a 19 percent increase.

Figure 2.7: Comparison between NPVs in BAU scenario and Switch-off scenario per user by region—Residential sector



Costs are broadly similar across regions, with minor variations driven by differences in the share of households in each usage archetype and, in the Switch-off scenario, regional differences in electricity prices.

2.2.2 Switch-off is costlier for commercial sector

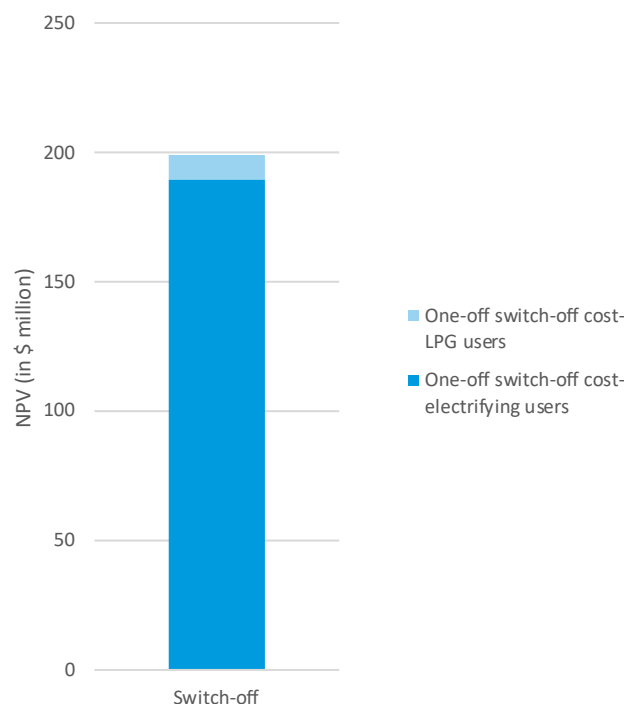
Commercial gas customers are estimated to face higher non-energy costs in the Switch-off scenario over the BAU. Energy costs are highly sensitive to assumptions about future prices.

Non-energy costs of Switch-off and BAU for commercial users

Switching off the gas network results in \$199 million in non-energy costs for commercial users compared with BAU. We do not include ongoing appliance purchase and replacement costs for commercial customers as they are highly case-specific and difficult to generalise across the sector. Since we exclude these costs from both the BAU and Switch-off scenarios, their omission should not affect the overall cost–benefit results, as they would effectively cancel each other out. Due to this, non-energy costs in the BAU scenario are zero. Therefore, the total net non-energy cost for commercial users equals the non-energy cost under the Switch-off scenario, which is \$199 million.

Figure 2.8 presents the total NPVs for the Switch-off scenario, broken down by alternative fuel sources.

Figure 2.8: NPVs for the Switch-off scenario (excluding energy consumption costs)—Commercial sector



In the commercial sector under the Switch-off scenario, 40 percent of users switch to electricity and 60 percent switch to LPG. One-off switch-off costs incurred by electrifying users total \$190 million, accounting for 95 percent of consumer costs. LPG users incur \$9 million of one-off switch-off costs, 5 percent of the consumer costs.

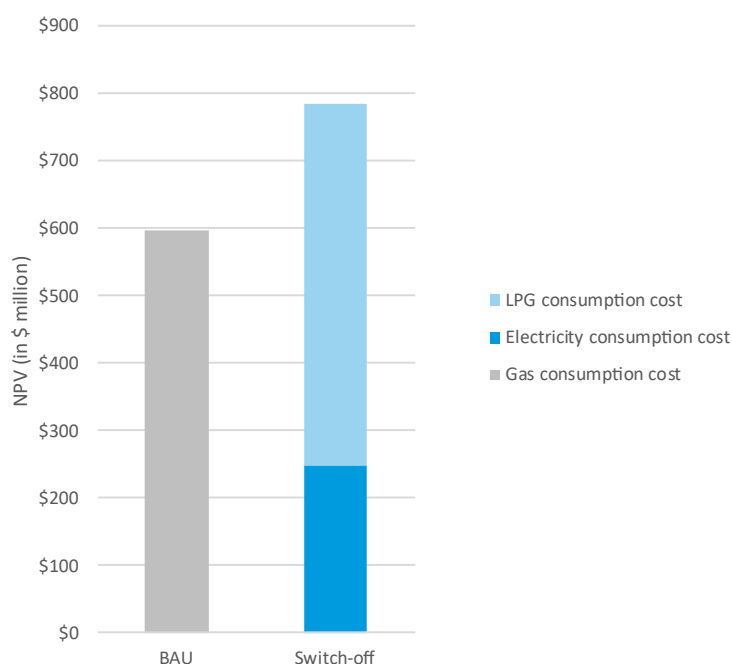
Energy costs of Switch-off and BAU scenarios for commercial users

We model the energy costs of Switch-off and BAU scenarios using historical energy prices held constant over the forecast period. We consider different energy price scenarios in Section 5.

Switching off the gas network results in \$186 million in energy costs compared with BAU. The total NPV of energy costs under the Switch-off scenario is \$783 million, which is 31 percent higher than under BAU (\$596 million).

Figure 2.9 presents the total NPVs of the energy consumption cost for the two scenarios.

Figure 2.9: NPVs of energy consumption costs in BAU scenario and Switch-off scenario (historical energy prices)—Commercial sector

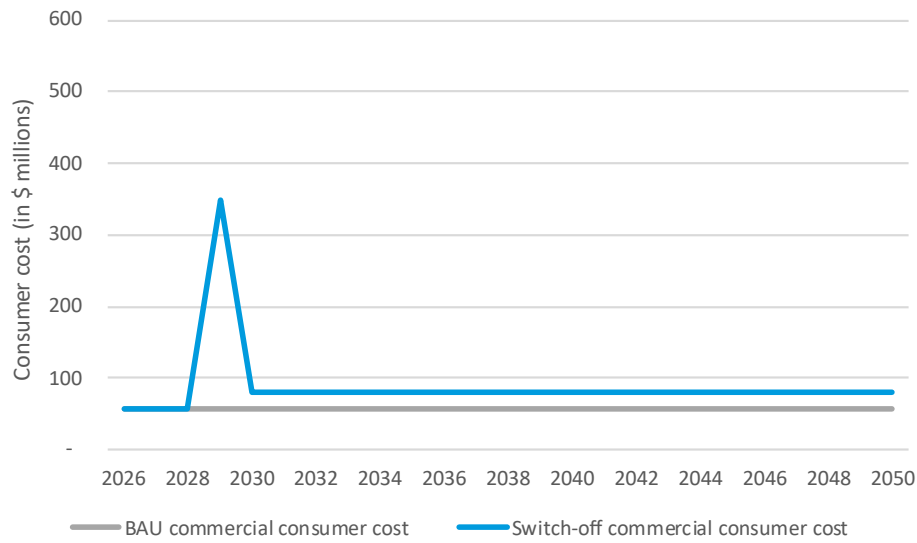


Under the Switch-off scenario, 40 percent of users switch to electricity, with electricity costs (\$247 million) making up 32 percent of total energy consumption costs. The remaining 60 percent use LPG, which accounts for 68 percent of the total energy costs. LPG switching assumptions about commercial users are in Box 2.2.

Time-profiled and regional consumer cost impacts

Figure 2.10 shows the cost impacts for the three regions over the forecast period, combining energy costs and non-energy costs.

Figure 2.10: Cost impact under BAU and Switch-off, 2026-2050—Commercial sector

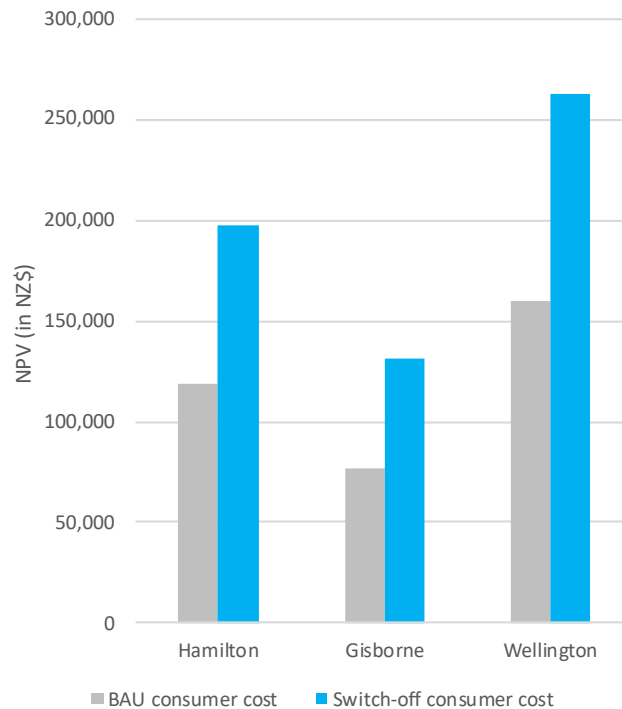


Under the BAU scenario, consumer costs are entirely driven by energy consumption and remain stable over time, averaging \$56 million a year.

Under the Switch-off scenario, costs spike sharply in 2029 when the gas network is switched off and commercial users switch to electricity or LPG. In that year, total costs reach \$349 million before falling again. Energy consumption cost is higher than the BAU scenario, averaging \$79 million per year.

Figure 2.11 presents the NPVs per commercial user for each study region.

Figure 2.11: Comparison between NPVs in BAU scenario and Switch-off scenario per user by region—Commercial sector



Per-user costs are consistently higher under the Switch-off scenario across all regions. On average, a commercial user spends \$142,400 between 2026 and 2050 under BAU, compared with \$234,400 under Switch-off.

Regional differences in per-user cost reflect variations in gas consumption per user.

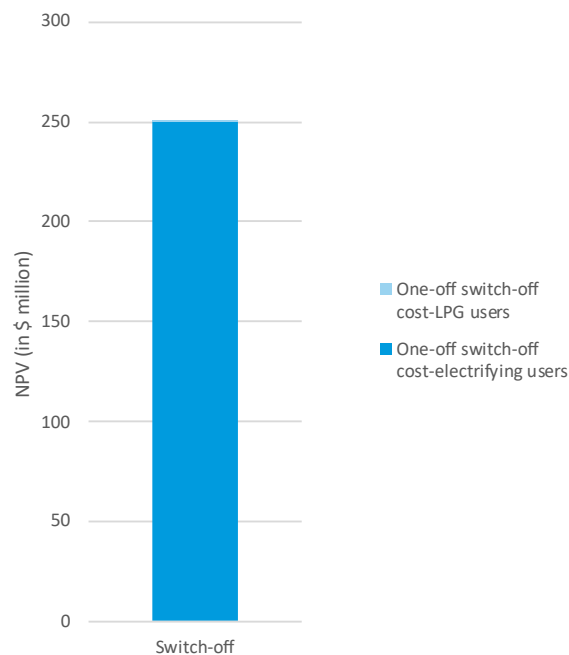
2.2.3 Switch-off is costlier for industrial sector

Industrial gas customers are estimated to face higher non-energy costs in the Switch-off scenario over the BAU.

Non-energy costs of Switch-off and BAU for industrial users

For industrial consumers, the non-energy cost for the Switch-off scenario is \$250 million. We do not include ongoing appliance purchase and replacement costs for industrial customers as they are highly case-specific and difficult to generalise across the sector. Since we exclude these costs from both the BAU and Switch-off scenarios, their omission should not affect the overall cost–benefit results, as they would effectively cancel each other out. Due to this, non-energy costs for the BAU scenario are zero. Therefore, the net non-energy cost of the Switch-off equals the non-energy cost under the Switch-off scenario, which is \$250 million.

Figure 2.12 presents the total NPVs for the Switch-off scenario, broken down by alternative fuel sources.

Figure 2.12: NPVs for the Switch-off scenario (excluding energy consumption costs)—Industrial sector

In the industrial sector, 87 percent of users switch to electricity and 13 percent switch to LPG. One-off switch-off costs incurred by electrifying users total \$250 million, accounting for 99.98 percent of consumer costs. LPG users incur \$40,600 of one-off switch-off costs, 0.02 percent of the consumer costs. Assumptions about industrial users switching to LPG are derived from ECCA's RETA study and are discussed in detail in Box 2.2.

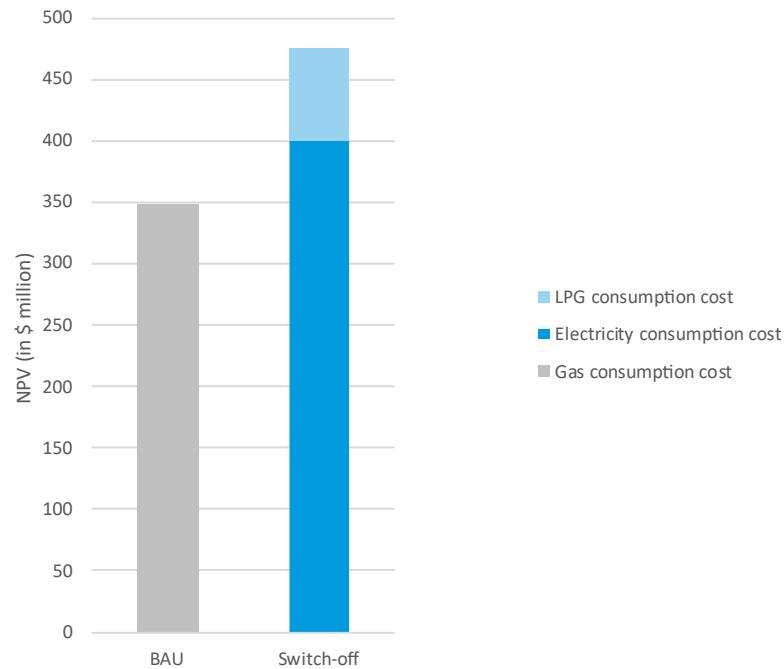
Energy costs of Switch-off and BAU scenarios for industrial users

We model the energy costs of Switch-off and BAU scenarios using historical energy prices held constant over the forecast period. We consider different energy price scenarios in Section 5.

Switching off the gas network results in \$128 million in energy costs compared with BAU. The total NPV of energy costs under the Switch-off scenario is \$476, which is 37 percent higher than under BAU (\$348 million).

Figure 2.13 presents the total NPVs of the energy consumption cost for the two scenarios.

Figure 2.13: NPVs of energy consumption costs in BAU scenario and Switch-off scenario (historical energy prices)—Industrial sector

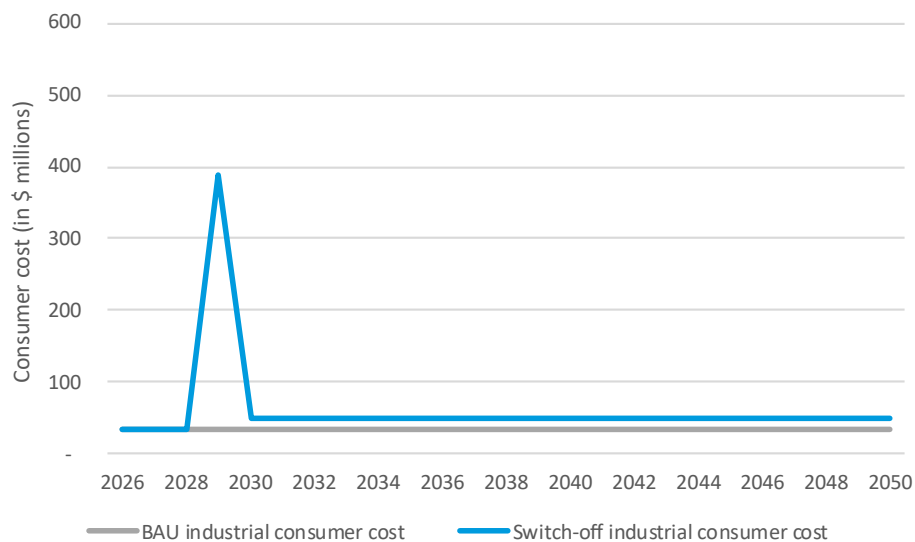


Under the Switch-off scenario, the 87 percent of users who switch to electricity incur an electricity consumption cost of \$400 million, making up 84 percent of total energy consumption costs. The remaining 13 percent use LPG, which accounts for 16 percent of the total energy costs.

Time-profiled and regional consumer cost impacts

Figure 2.14 shows the cost impacts for the three regions over the forecast period, combining energy costs and non-energy costs.

Figure 2.14: Cost impact under BAU and Switch-off, 2026-2050—Industrial sector

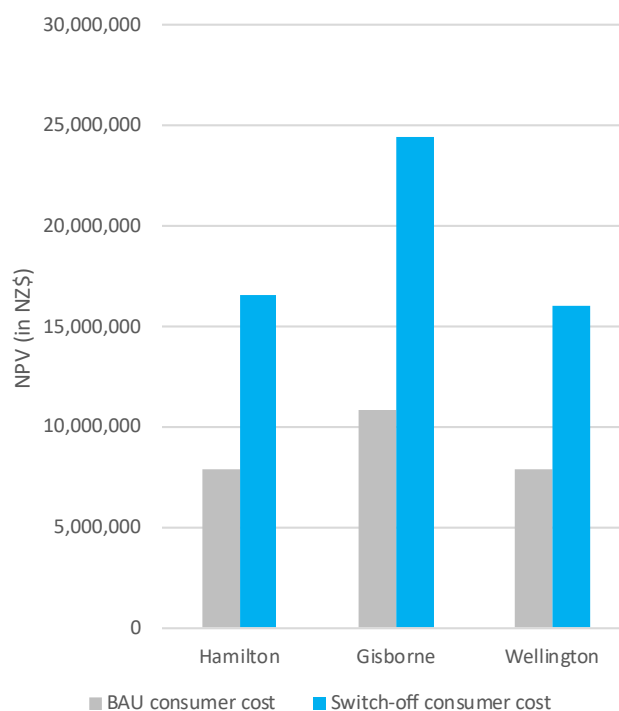


Under the BAU scenario, consumer costs are entirely driven by energy consumption and remain stable over time, averaging \$33 million a year.

Under the Switch-off scenario, costs spike sharply in 2029 when the gas network is switched off and industrial users switch to electricity or LPG. In that year, total costs reach \$389 million before falling again. Energy consumption cost is higher than the BAU scenario, averaging \$48 per year.

Figure 2.15 presents the NPVs per industrial user for each study region.

Figure 2.15: Comparison between NPVs in BAU scenario and Switch-off scenario per user by region—Industrial sector



Per-user costs are consistently higher under the Switch-off scenario across all regions. On average, an industrial user spends \$8 million between 2026 and 2050 under BAU, compared with \$17 million under Switch-off.

Regional differences in per-user cost reflect variations in gas consumption per user.

2.3 Sensitivity analysis of consumer costs

In this section, we carried out sensitivity analysis on:

- Gas prices and electricity prices
- Appliance prices and installation costs
- LPG switching rate

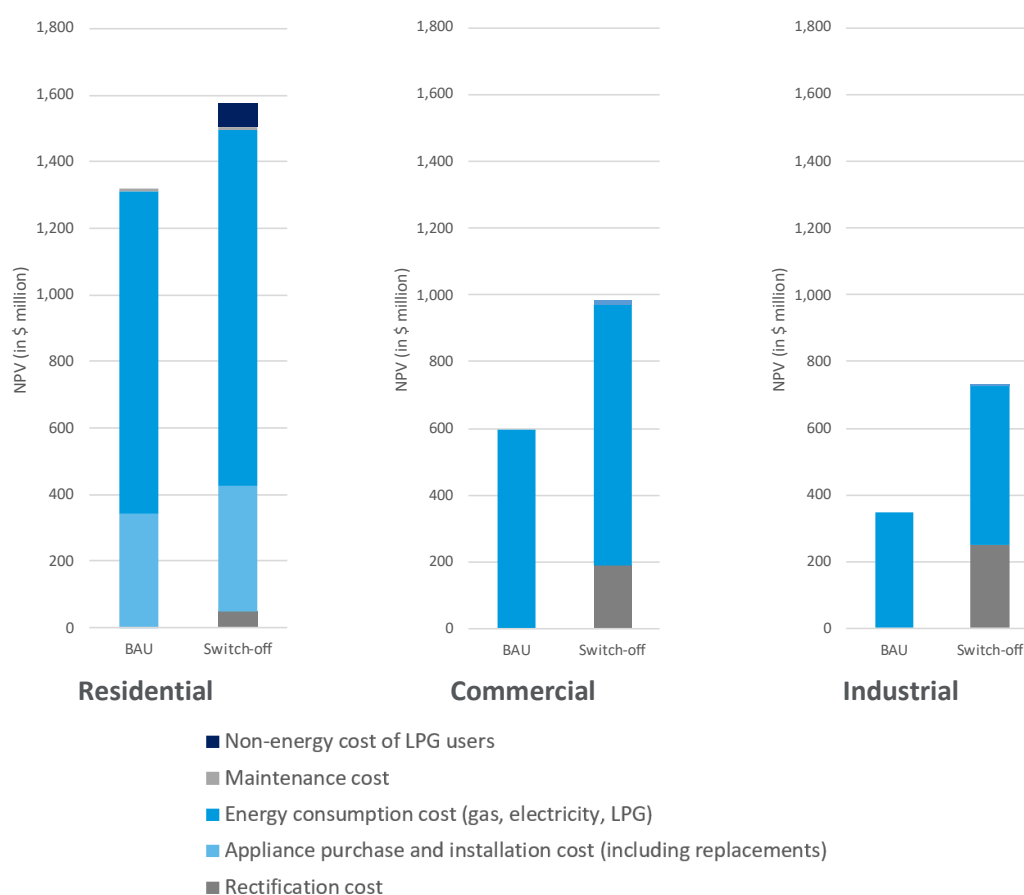
- Water heat pump adoption rate.

In addition to the sensitivity analysis here, we also analysed different energy price scenarios for both gas and electricity using a range of forecasts. This more in-depth analysis of the effect of energy prices on the results is set out in Section 5 below.

Gas prices need to be 70 percent more expensive than historical levels for the Switch-off to be cost-benefit justified

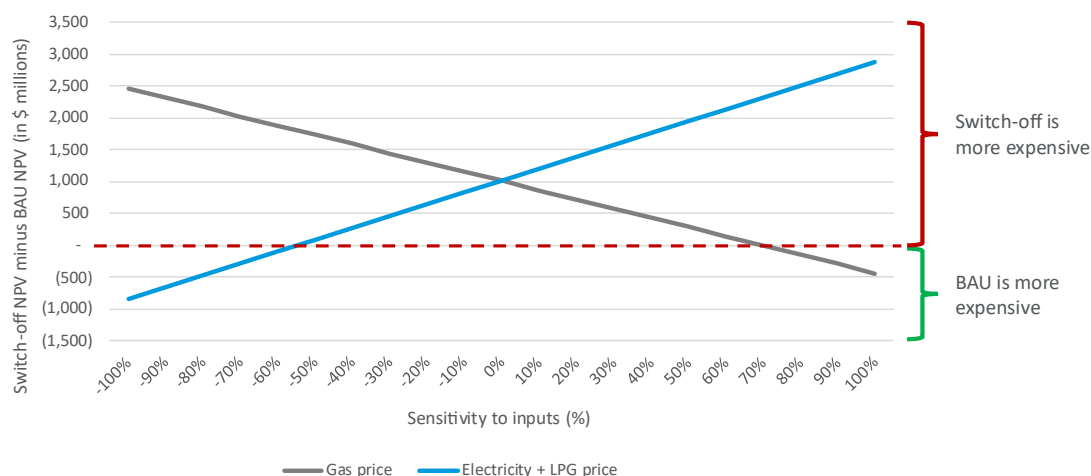
Energy consumption cost is a major driver of the NPV, as shown in Figure 2.16.

Figure 2.16: Consumer cost breakdown by consumer type



In total, energy consumption cost (including consumption of gas, electricity, and LPG) makes up 85 percent of total consumer cost in the BAU scenario, and 71 percent of total consumer cost in the Switch-off scenario.

Therefore, the cost-benefit analysis results for switching off the gas network are highly sensitive to changes in gas, electricity, and LPG prices. Figure 2.17 shows the results of the sensitivity analysis of energy prices on consumer costs.

Figure 2.17: Sensitivity analysis of energy prices on consumer costs

Each line shows, holding all else equal, the consumer cost impact of switching off the gas network as average energy prices vary by ± 100 percent from the baseline.

If gas prices stay in line with recent historical prices, electricity prices²⁷ and LPG prices would both need to fall 60 percent (from recent historical levels at the start of the forecast period and then held constant in real terms) for New Zealand to be better off under the Switch-off scenario.

If electricity and LPG prices stay in line with recent historical prices, gas prices would need to increase 70 percent (from recent historical levels at the start of the forecast period and then held constant in real terms) for New Zealand to be better off under the Switch-off scenario.

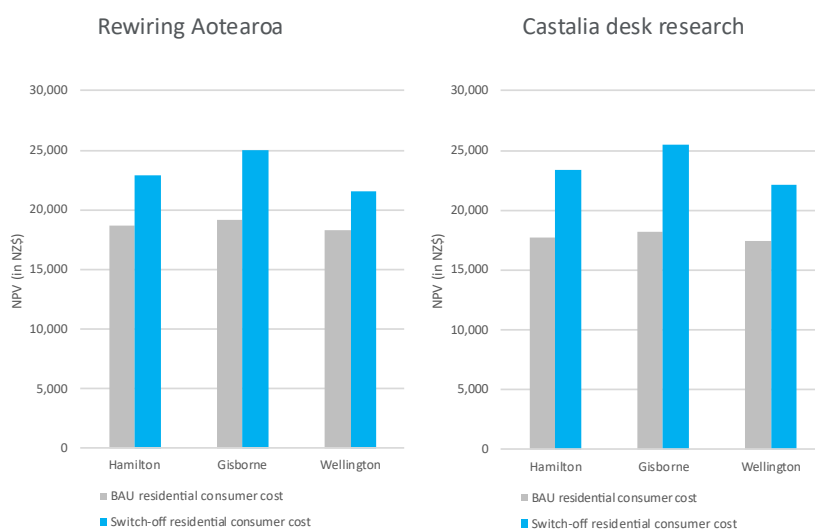
Consumer costs are not sensitive to appliance purchase and installation costs

We tested the sensitivity of residential consumer costs to the assumed purchase and installation costs of residential gas and electric appliances. This test is relevant because appliance prices can vary significantly in the market.

The results show that the residential consumer costs of the gas network switch-off are not materially affected by the appliance purchase and installation costs used in our analysis (Figure 2.18). In other words, the relative price differences in appliances play only a small role in whether consumers are better off under the BAU or Switch-off scenario.

Figure 2.18: Sensitivity analysis on gas and electric appliance purchase and installation costs – Residential consumer costs per user

²⁷ We use on-grid electricity prices in our analysis



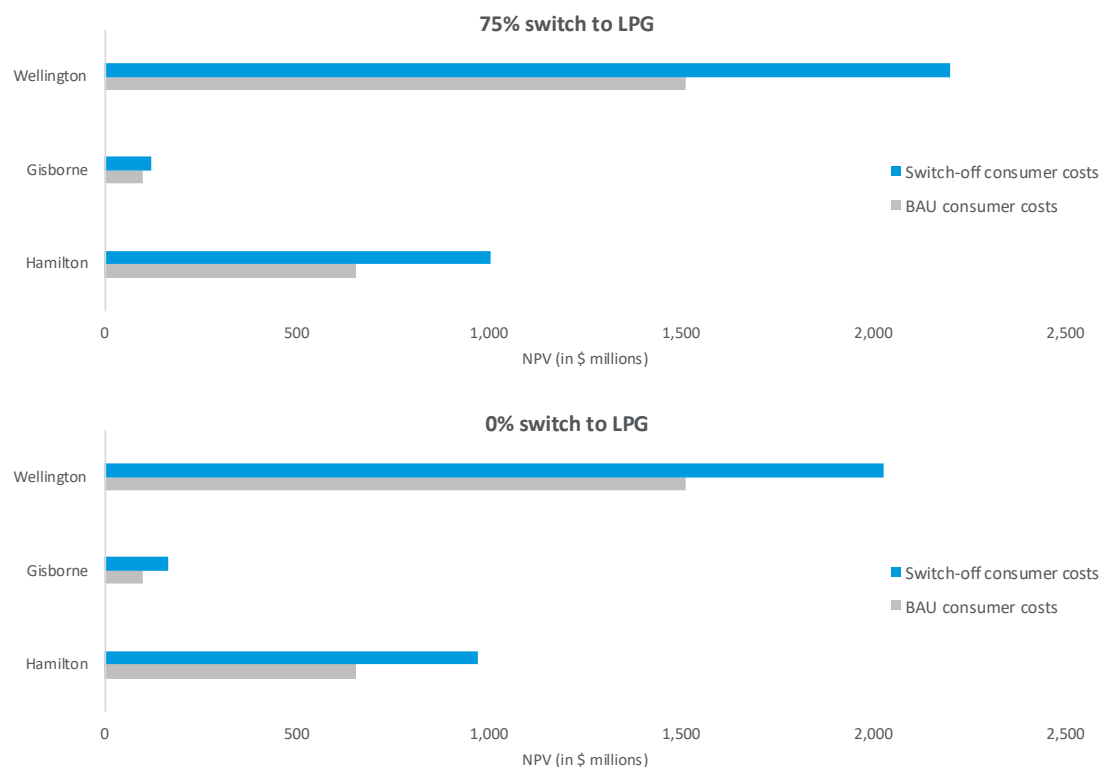
Appliance type	Cost (NZ\$)
Gas water heating	3,593
Gas space heating	4,483
Gas cooktop	1,651
Electric water heating	3,756
Electric space heating*	7,687
Electric cooktop	2,453

Appliance type	Cost (NZ\$)
Gas water heating	2,601
Gas space heating	3,832
Gas cooktop	1,859
Electric water heating	4,417
Electric space heating*	7,687
Electric cooktop	2,913

*We used general market research under both approaches.

Switch-off scenario is costlier regardless of whether more or fewer users switch to LPG

We tested the sensitivity of consumer costs to the proportion of gas users switching to LPG (Figure 2.19), modelling a scenario where more users switch to LPG rather than electricity (75 percent) and a scenario where no users switch to LPG (0 percent).

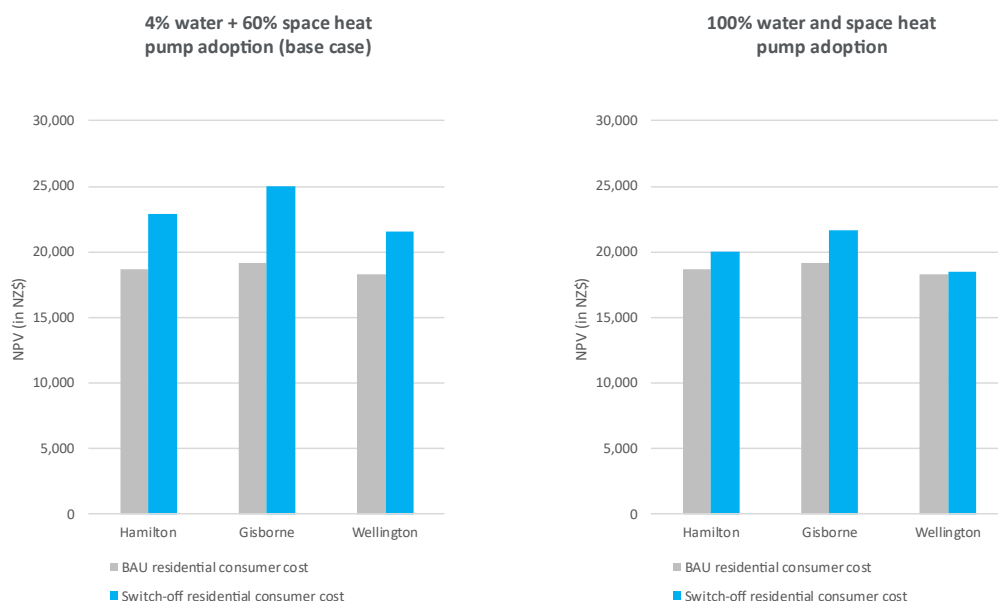
Figure 2.19: Sensitivity analysis on LPG switching assumptions – Total consumer costs

BAU consumer costs are lower than Switch-off costs under both scenarios. Switch-off consumer costs increase as more customers are assumed to switch to electricity because more customers incur the gas-to-electricity rectification costs.

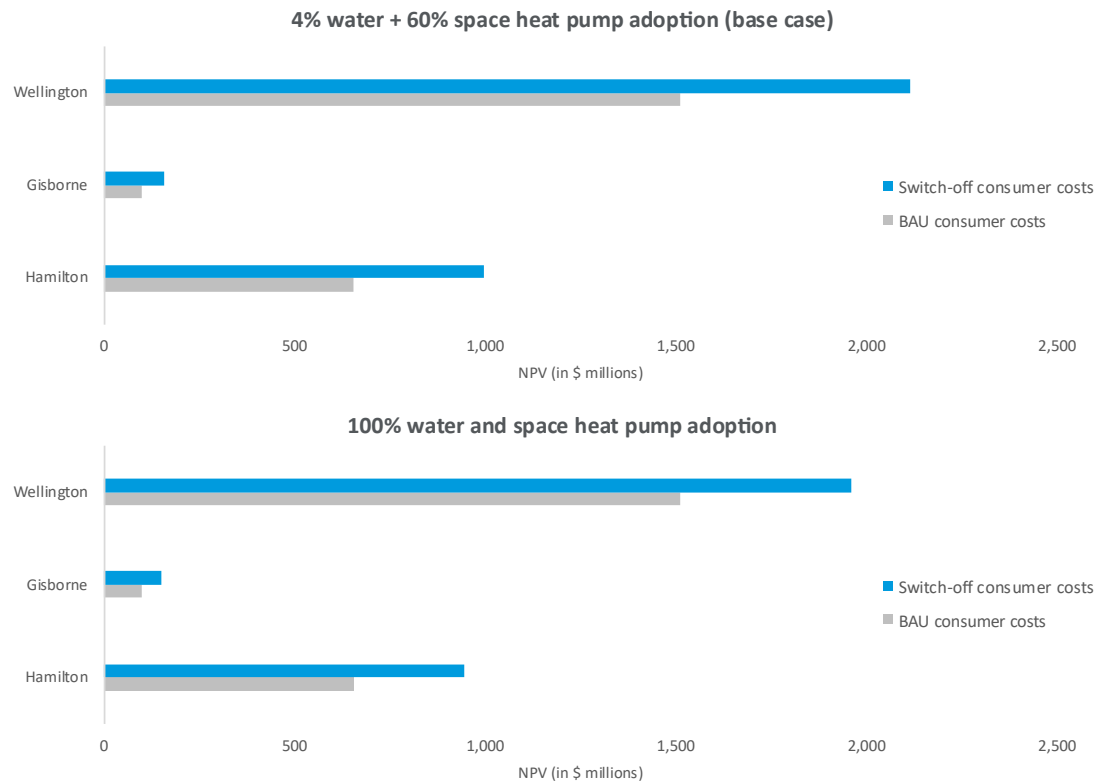
Higher water and space heat pump adoption reduces Switch-off costs

We tested the sensitivity of consumer costs to the residential adoption rate of water and space heat pumps (Figure 2.20) in response to a request by EECA. Water heat pumps and space heat pumps have higher upfront capital costs than common resistive water and space heaters, but lower ongoing energy costs. We compared the original estimate (where 4 percent of households purchase water heat pumps and 60 percent of households purchase space heat pumps when electrifying) to a scenario where all households adopt water and space heat pumps. Residential consumer costs are still more expensive under the Switch-off scenario, but the difference is smaller.

Figure 2.20: Sensitivity analysis on water and space heat pump adoption rates – Residential consumer costs per user



Overall, if 100 percent of residential consumers switched to water and space heat pumps, the total Switch-off consumer costs would decrease by 6.6 percent, from \$3.3 billion to \$3.1 billion. In net terms, the net Switch-off consumer costs decrease by 21.4 percent, from \$1,011 million to \$795 million. This indicates that while water and space heat pumps are overall more economical due to lower operating costs, all residential consumers switching to water and space heat pumps does not materially change the difference between the Switch-off and BAU scenario overall results, as shown in Figure 2.21.

Figure 2.21: Sensitivity analysis on water and space heat pump adoption rates – Total consumer costs

3 Electricity distribution network upgrade impacts

Replacing gas appliances with electric alternatives will increase electricity consumption. The increased electricity demand will intensify peak demand beyond current infrastructure capacity. Therefore, transformers, lines, and substations must be upgraded to manage these new peaks and maintain system reliability. The following sets out our analysis of the cost of upgrading and operating the electricity distribution network to meet the increased electricity demand if the gas network is switched off.

3.1 Switching off gas network will increase peak load on electricity networks

We focus specifically on the increase in peak demand on the electricity distribution network. While the switch-off leads to higher electricity use across all hours, it is the peak demand that drives the need for infrastructure upgrades. This is because distribution networks are sized to meet maximum demand, not average load, so any increase in peak load may trigger capital investment in transformers, feeders, and substations to maintain reliability and avoid overloading.

In contrast, higher electricity demand during non-peak hours does not typically incur additional network costs, as the existing infrastructure is generally sufficient to accommodate off-peak loads.

A review of historical load curves shows that annual peak demand typically occurs in winter, between 6 PM and 7 PM.²⁸

To estimate the impact of the switch-off on peak demand:

- **Residential sector:** We use appliance-level electricity demand (water heating, space heating, and cooking) during the 2023 system peak (6:00–6:30 PM on 2 August 2023)
- **Commercial and industrial sectors:** We apply a stepwise method using annual energy demand, load factors, and coincidence factors to estimate peak demand.

The following sub-sections outline how we estimate the peak demand increase for the three sectors.

Estimating peak demand increase for the residential sector

We estimate residential peak demand by identifying the electrical demand of each appliance during the 2023 peak demand period (6:00–6:30 PM on 2 August 2023). During this half-hour window:

- Water heating accounted for 7 percent of its daily electricity use
- Space heating accounted for 22 percent
- Cooking accounts for 20 percent.²⁹

We then apply these shares to the average daily energy use per end use³⁰ and the number of households switching from gas to electricity, to estimate additional peak demand.

The gas network switch-off is projected to increase peak demand from the residential sector by:

- Hamilton: 13 MW
- Gisborne: 2 MW
- Wellington: 32 MW.

Estimating peak demand increase for the commercial and industrial sectors

To estimate the additional peak demand in the commercial and industrial sectors, we follow a multi-step approach:

1. Estimate total annual electricity demand increase

Using outputs from Section 2 (Consumer Costs Analysis), we calculate the additional electricity demand in 2029 from the gas switch-off:

- Commercial sector: 81,800 MWh

²⁸ In 2023, the peak demand happens on 02 August 2023 between 18:00 and 18:30. Source: Electricity Authority Dashboard-Electricity Demand Trends

²⁹ Source: Rewiring Aotearoa (2024) "Electric Homes Technical Report"

³⁰ Water heating: 7 kWh per day; space heating: 5.3 kWh per day; cooking: 0.82 kWh per day. Source: Rewiring Aotearoa (2024) "Electric Homes Technical Report"

- Industrial sector: 293,300 MWh.

2. Convert annual demand to average hourly load

We divide the annual electricity demand increase by 8,760 (the number of hours in a year) to obtain an average load. Then we apply load factors to convert the average load into peak load. The load factors for the three study areas are 36 to 41 percent for the commercial sector,³¹ and 93 percent for the industrial sector.³²

3. Apply coincidence factors

The coincidence factor adjusts total commercial peak demand to reflect that not all commercial customers will be operating at peak load simultaneously (same for industrial). The coincidence factor we use for the commercial sector is 56 percent, and 95 percent for the industrial sector.³³

4. Adjust for peak period

To calculate the commercial and industrial sectors' contribution to system peak demand, we apply the share of commercial and industrial peak demand occurring during the winter 6–7 PM peak hour. For the commercial sector, the adjustment factor is 72 percent.³⁴ For the industrial sector, the adjustment factor is 80 percent.³⁵

Based on this approach, we estimate the increase in peak demand during the winter 6–7 PM window for the three regions to be:

- Commercial: 10 MW
- Industrial: 27 MW.

On average, peak demand increases by about 9 percent in each region

Figure 3.1 shows the peak demand by sector and by region.

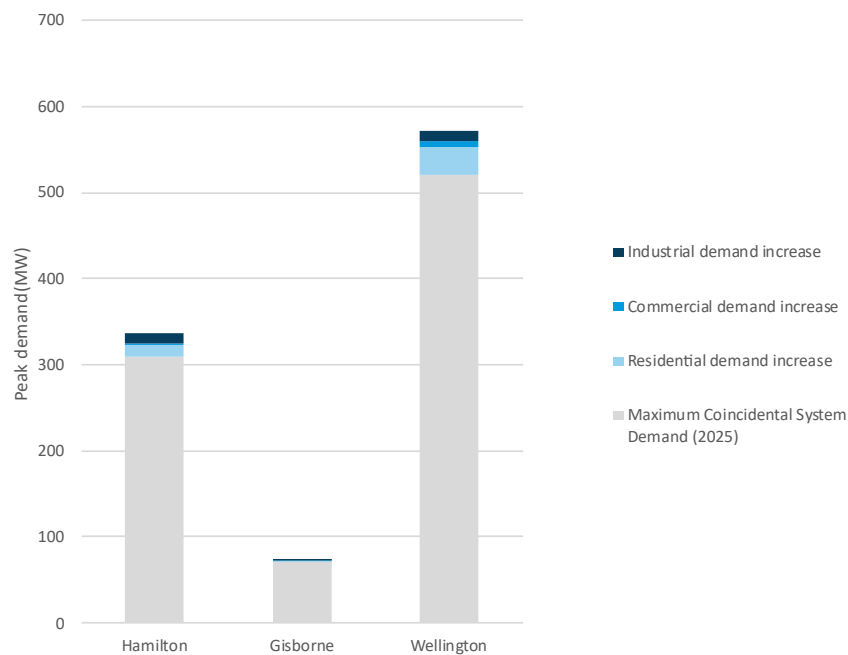
³¹ Hamilton: 41%, Gisborne: 41%, and Wellington: 36%. EECA (2021) "Commercial-scale Solar in New Zealand"

³² Source: Electricity Authority (EA) (2025) "Rewarding Industrial Demand Flexibility"

³³ Source: OtagoNet (2025) "Line Pricing Methodology"

³⁴ Source: Wellington Electricity AMP (2025)

³⁵ Source: Electricity Authority (EA) (2025) "Rewarding Industrial Demand Flexibility"

Figure 3.1: Increase in peak demand by sector and by region

Compared to the 2025 maximum coincidental system demand, switching off the gas network increases peak electricity demand by 28 MW (9 percent) in Hamilton, 5 MW (7 percent) in Gisborne, and 52 MW (10 percent) in Wellington.

3.2 Change in peak demand will incur marginal costs

This section explains how we estimate the additional costs of upgrading and operating the electricity distribution network if the gas network is switched off. The analysis separates network upgrade costs into two components: capital expenditure (Capex) and operating expenditure (Opex).

Estimating the increase in Capex

Capex covers the infrastructure investments required to accommodate higher peak loads. These upgrades typically include:

- **Transformer upgrades:** replacing or adding pole-mounted or ground-mounted distribution transformers to handle increased peak capacity
- **Feeder and cable reinforcements:** upgrading overhead lines or underground cables to prevent overheating and voltage drops under higher peak current
- **Substation upgrades:** enhancing zone or distribution substations to accommodate larger transformers, upgraded switching equipment, or improved control systems.

To estimate the increase in Capex, we calculated the long-run marginal cost (LRMC) of distribution network upgrades per additional MW of peak demand. LRMC represents the average annualised cost of expanding network capacity over time to meet incremental peak

demand. It incorporates the cost of network reinforcements such as new transformers, substations, and lines.

We derived LRMC using the Average Incremental Cost method, drawing on data from each Electricity Distribution Business's (EDB) 2025 Asset Management Plan. The LRMC is calculated using the following formula:³⁶

$$LRMC = \frac{PV \text{ (annualised expenditure relating to new network capacity)}}{PV \text{ (additional demand service)}}$$

The resulting region-specific LRMC estimates are:

- Hamilton: \$60,605/MW
- Gisborne: \$71,142/MW
- Wellington: \$308,835/MW.³⁷

We understand that Wellington's substantially higher LRMC reflects its challenging topography and urban density. Hilly terrain, constrained road access, and undergrounding requirements probably make installing and upgrading distribution infrastructure significantly more expensive compared to more accessible, flatter areas like Hamilton and Gisborne.

It is important to note that LRMC reflects the economic cost, not the upfront cash cost incurred by EDBs. In practice, the actual capital outlay will occur before or in 2029, when EDBs undertake the physical upgrades in response to higher peak demand. These upfront costs are then recovered over the assets' useful life through depreciation in network pricing models. From a regulatory and pricing perspective, LRMC represents the efficient cost signal that should be passed through to consumers via tariffs, and it provides a more accurate picture of the societal cost of additional peak demand than short-term expenditure measures.

Estimating the increase in Opex

Opex refers to ongoing operational and maintenance costs associated with running the upgraded network under higher load conditions. These costs are incurred because:

- Higher peak demand leads to more frequent maintenance and asset inspections
- Line losses and voltage control costs rise due to heavier loading
- Utilities must invest in monitoring, fault management, and reliability systems to operate the network under more stressed conditions.

We estimate the Opex increase using Opex elasticity relative to peak demand, published by the Commerce Commission³⁸

- Network Opex increases by 0.36 percent for every one percent increase in peak demand
- Non-network Opex increases by 0.51 percent per one percent increase in peak demand.

³⁶ Source: HoustonKemp (2015) "Estimation of Long Run Marginal Cost and Other Concepts Related to the Distribution Pricing Principles"

³⁷ Our estimate falls within the LRMC range calculated by Wellington Electricity in its 2025/26 Pricing Methodology

³⁸ Commerce Commission (2024) "Electricity Distribution Services Default Price-Quality Path Determination 2025"

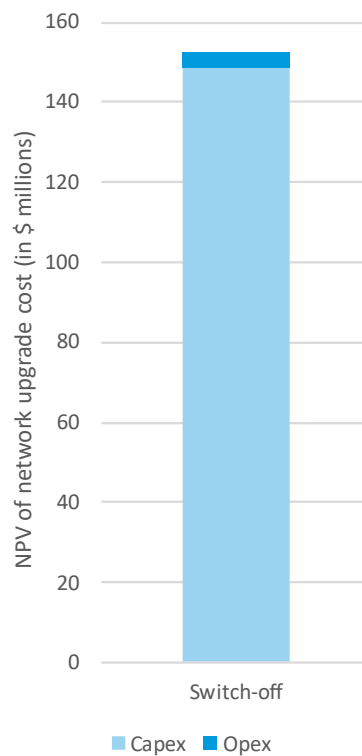
These elasticities allow us to estimate the additional Opex EDBs would incur if the gas network is switched off, based on the projected increase in peak demand for each region.

3.3 Results: Significant Capex and modest Opex increases for EDBs to meet higher electricity demand

Upgrading and operating the electricity distribution network to meet higher electricity demand if the gas network is switched off will incur higher costs.

Under the Switch-off scenario, the switch-off of the gas network adds an estimated \$152 million in network costs for EDBs in the three regions (Figure 3.2). These costs comprise both Capex for infrastructure upgrades and Opex for ongoing maintenance and operation of the upgraded network.

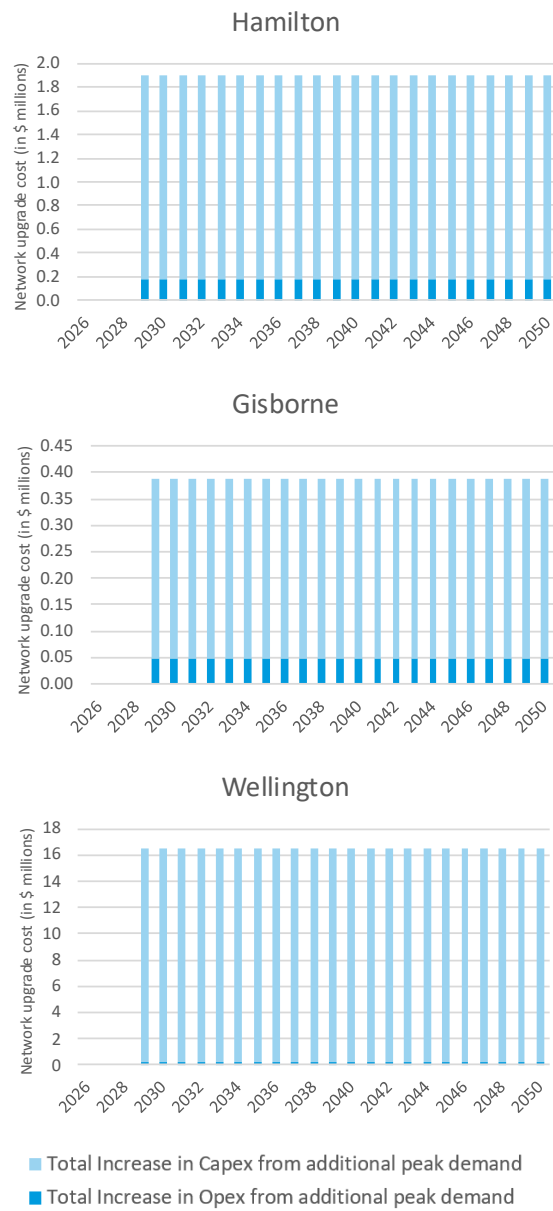
Figure 3.2: NPV of network upgrade costs in three regions



Capex costs dominate the network upgrade costs, on average accounting for 98 percent of total NPVs.

Figure 3.3 presents the annual distribution network upgrade costs by region under the Switch-off scenario between 2026 and 2050.

Figure 3.3: Network upgrade costs by region-Switch-off scenario



The NPVs of distribution network upgrade costs under BAU are:

- Hamilton: \$15 million (91 percent Capex, 9 percent Opex)
- Gisborne: \$3 million (88 percent Capex, 12 percent Opex)
- Wellington: \$134 million (99 percent Capex, 1 percent Opex).

4 Change in GHG emissions in Switch-Off Scenario

Under BAU, residential, commercial, and industrial GDCs burn natural gas on site, generating GHG emissions. In the Switch-off scenario, these customers would replace gas appliances with alternatives—some switching to electricity, and others to LPG or other fuels. The GHG emissions implications of this shift are relevant for policy considerations.

Under the Switch-off scenario, New Zealand will need to generate additional electricity to meet the increased demand resulting from the replacement of gas appliances with electric alternatives. The GHG emissions impact of this additional electricity depends on the generation mix that supplies it, as well as the amount of LPG consumed in on-site appliances.

We used the following approach to estimate GHG emissions:

1. **Estimate the projected increase in electricity demand** resulting from the gas network switch-off.
2. **Model the additional generation mix** using a least-cost generation expansion model, which simulates how the electricity system would evolve to meet increased demand while minimising cost.
3. **Estimate the marginal emission factor** associated with the new generation mix.
4. **Calculate total GHG emissions from electricity use** by newly electrified consumers under the Switch-off scenario.
5. **Account for LPG-related emissions** from households and businesses that switch to LPG instead of electricity.
6. **Compare total emissions** under the BAU and Switch-off scenarios:
 - In the BAU scenario, emissions come exclusively from on-premise gas combustion
 - In the Switch-off scenario, emissions arise from electricity generation and LPG use.

In the following sub-sections, we present:

- Our approach for modelling the required generation expansion to meet this increased demand
- The resulting GHG emissions under both the BAU and Switch-off scenarios.

4.1 Modelling approach for estimating generation capacity increase

Electricity demand will increase if the gas network is switched off, requiring additional generation in the North Island. Switching off the gas distribution network in Hamilton, Gisborne, or Wellington separately will not materially increase total North Island generation requirements. Therefore, for this component, we analyse the additional demand from switching off gas distribution networks across the whole North Island.

We estimate that a full North Island gas network switch-off would increase electricity demand by an average of 7,700 GWh per year, based on outputs from Section 2 (Consumer Cost Analysis) extrapolated to the entire North Island. Specifically,

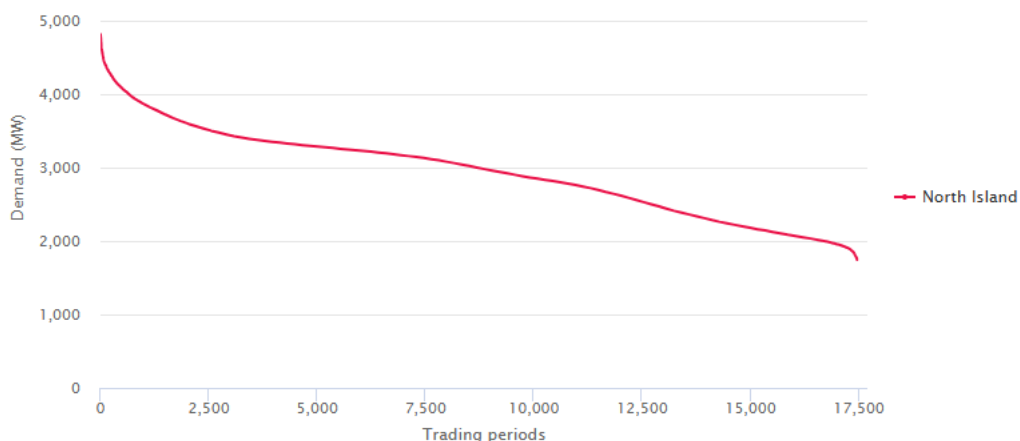
- **Residential:** an increase of 1,300 GWh in 2029, and 28,400 GWh cumulatively between 2029–2050
- **Commercial:** an increase of 300 GWh in 2029, and 7,300 GWh cumulatively between 2029–2050
- **Industrial:** an increase of 6,000 GWh in 2029, and 133,000 GWh cumulatively between 2029–2050.

This step change in demand requires a corresponding increase in generation. Below, we describe our high-level approach, starting with the construction of a new Load Duration Curve (LDC) and then using it to model a least-cost generation expansion scenario.

Approach for constructing the new LDC

A LDC arranges hourly electricity demand data from highest to lowest, showing how often different demand levels occur throughout the year. Constructing a new LDC allows us to analyse how additional electricity demand affects the system's hourly load profile and, in turn, the types and capacity of generation required. The LDC for the North Island for the last 12 months is illustrated in Figure 4.1 below. It shows the load in MW that the system must provide for each 30-minute electricity market trading period, for example, that relatively few periods require over 4,000 MW load:

Figure 4.1: North Island LDC: 1 August 2024 to 31 July 2025



Source: Electricity Authority, Electricity Market Information website

We began with the existing LDC for the New Zealand electricity system. We then overlaid the projected additional demand from our modelled estimates, which results in a shift upwards of the LDC:

- For **residential** users, we converted the annual increase in electricity use from electrified water heating, space heating, and cooking into average daily demand increases. EECA provides an annual hourly load profile for each residential use case.

We applied these profiles to the estimated increase to determine the impact on the LDC by end use

- For **commercial** users, we applied Electricity Market Information (EMI) demand statistics from Hamilton Central, a representative commercial area accounting for 25 percent of Hamilton's Gross Domestic Product and the Waikato's commercial hub. The profile was used to distribute annual demand increases across the year
- For **industrial** users, we applied EMI data from Penrose, one of New Zealand's largest industrial areas, to allocate annual increases.

For all sectors, we applied a T&D loss factor of 7 percent.³⁹

Approach for estimating the least-cost generation expansion scenario

With the new LDC, we estimated the mix and quantity of generation investment given the costs of different types of generation that would occur from 2029 in a perfectly competitive market. We assume a competitive market would result in the optimal mix of generation types to deliver the required energy at the least cost.

We modelled three types of new generation technologies: onshore wind, utility solar, and gas peakers.⁴⁰ We applied a two-stage process to determine the least-cost generation mix to meet the additional load for each year between 2029 and 2050:

1. We first identify which generation technology is most cost-effective at different levels of capacity utilisation

Technologies with low fixed and high variable costs (for example, gas peakers) are better suited for peaking use, while those with high fixed and low variable costs (for example, wind and solar) are more cost-effective for baseload or frequent use.

2. We then overlay the generation technologies onto the LDC

We allocate baseload demand to the cheapest baseload technologies (such as wind) and peak demand to mid-cost or peaking technologies (such as gas peakers)

In this process, we considered availability factors, which indicate how reliably each technology can generate electricity when required. Technologies with low availability need to be overbuilt or complemented with firm generation.⁴¹

We also factored in a "peaking factor" penalty for variable renewables to account for their reduced marginal value at high penetration levels. At high wind or solar penetration, market prices are increasingly shaped by their availability. While these generators are inexpensive to operate, they may be unable to produce power during high-price periods (for example, calm or

³⁹ We calculated the T&D loss factor by dividing transmission and distribution losses by total electricity consumption in 2024. Source: MBIE Energy Statistics

⁴⁰ Technology cost and performance parameters (for example, capital cost, fixed and variable O&M, fuel cost) are primarily drawn from the Climate Change Commission's ENZ model.

⁴¹ For wind and solar, the availability factor depends on their operational role. When used to meet peak demand, we applied lower availability factors to reflect their limited predictability during peaks. When used for baseload, we applied higher availability factors to reflect their greater average contribution during periods when supply exceeds demand. We used the availability factors from Transpower's Security of Supply Assessments if wind and solar are used to meet peak demand. We used the availability factors from Climate Change Commission if wind and solar are used to meet peak demand. Source: Transpower (2025) "Security of Supply Assessment"; Climate Change Commission (2021) Energy and Emissions in New Zealand Model

dark winter evenings), reducing their economic return. The peaking factor penalty captures this effect by reducing the relative attractiveness of wind and solar in high-penetration scenarios.

Lastly, we considered battery energy storage as an alternative or complement to the new generation. We compared the cost of meeting demand with batteries against the annual cost of the least-cost generation option identified above. If batteries are cheaper, we assume they are deployed instead of generation expansion.⁴²

Wind will serve most of the additional demand from the gas network switching off

Our modelling estimates that the new additional demand will be met by 93 percent wind and 7 percent gas peakers (for example, open-cycle gas turbine plants).

Wind is estimated to provide the lowest cost of renewable generation by 2029, which is consistent with current market estimates.^{43,44} Accordingly, the model predicts that wind will meet most of the increase in energy demand due to the gas switch-off.

However, since wind is variable, gas peakers are needed to fill gaps and meet peak demand. Therefore, gas peakers account for seven percent of annual generation, ensuring a reliable and stable power supply as wind capacity grows.⁴⁵

Based on the new generation mix, we estimated the marginal emission factor of electricity is 0.04 kg CO_{2e} /kWh.⁴⁶

4.2 Results: Emissions are 63 percent higher under BAU

This sub-section presents the estimated GHG emissions in the BAU and Switch-off scenarios.

Switching off the gas network is estimated to reduce GHG emissions by 34 million tonnes CO_{2e} over the 2029–2050 period for the whole North Island, as shown in Figure 4.2.

⁴² The annual cost of batteries is equal to the annual capital cost of the battery itself plus the cost of the energy to fill it. The latter is assumed to be the long-run marginal cost of wind at a 40 percent capacity factor, assuming no significant wind overbuild. The battery's capacity is determined by analysing the 2021 energy load and determining how many hours of duration a battery would need to be available to meet the relevant percentile of demand in that year. This calculation embeds a requirement for a recharging period as long as the relevant discharging period to fully recharge the battery.

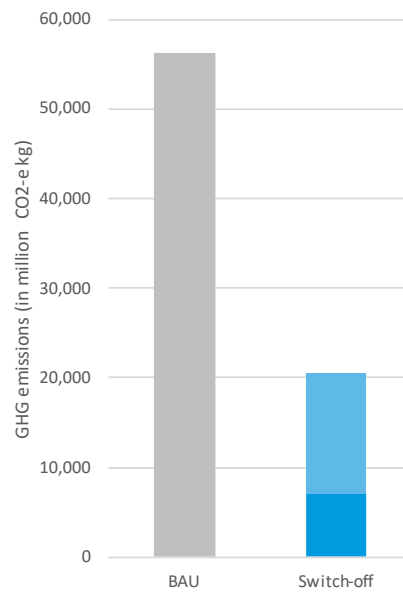
⁴³ New Zealand Wind Energy Association (2024). "Wind Energy in New Zealand: Presentation to the Energy Economics Summer School"

⁴⁴ NZ News (July 23, 2025). "UN says booming solar, wind and other green energy hits global tipping point for even lower costs".

⁴⁵ We assume any remaining gas not used in electricity generation under the switch-off scenario stays in the ground.

⁴⁶ The marginal emission factor is the weighted average of emission factor of wind and gas. Wind: 0.007 kg CO_{2e} /kWh. Gas: 0.455 kg CO_{2e} /kWh. Source: Ecotricity. (2025). "The Truth Behind New Zealand's Electricity Emissions"

Figure 4.2: Comparison between GHG emissions-North Island



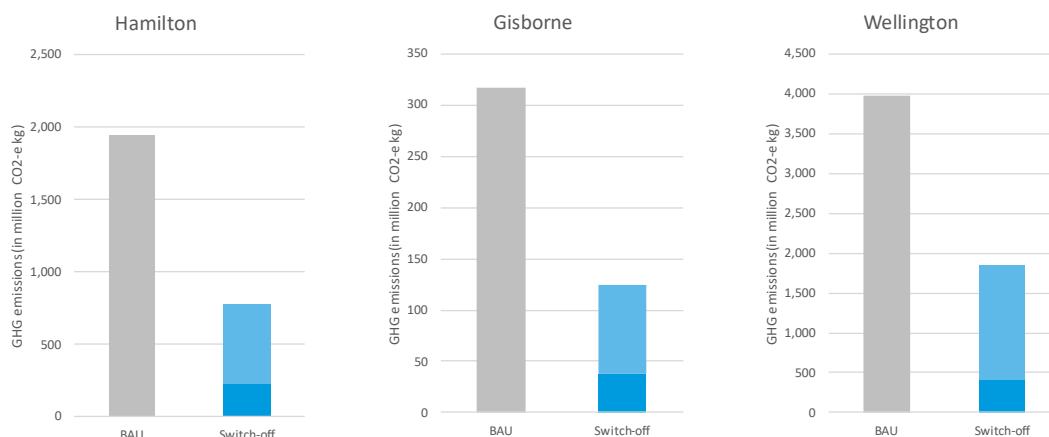
**In the BAU scenario, the GHG emissions are from on-premise gas combustion, using an emission factor of 0.20 kg CO₂e /kWh. In the Switch-off scenario, emissions from LPG use are estimated with an LPG emission factor of 0.22 kg CO₂e /kWh. Source: Ministry for the Environment. (2025). "Measuring emissions guide"*

In the BAU scenario, on-premise gas combustion generates a total of 56 million tonnes CO₂e between 2029 and 2050.

In the Switch-off scenario, emissions come from two sources: electricity generation and LPG use. Electricity use generates 7 million tonnes CO₂e, while LPG use generates 13 million tonnes CO₂e, resulting in a combined total of 20 million tonnes CO₂e. Overall, switching off the gas network is estimated to reduce GHG emissions by 63 percent over the 2029–2050 period.

We also estimated the regional emissions impact for Hamilton, Gisborne, and Wellington, as shown in Figure 4.3.

Figure 4.3: GHG emissions across Switch-off scenario and BAU scenario by region



- Emissions from LPG use
- Emissions from electricity use
- Emissions from gas use

- For Hamilton, switching off the gas network is projected to reduce emissions by 1.2 million tonnes CO₂e (NPV of 0.4 million tonnes), representing a 60 percent reduction
- For Gisborne, switching off the gas network is projected to reduce emissions by 0.2 million tonnes CO₂e (NPV of 0.07 million tonnes), representing a 61 percent reduction
- For Wellington, switching off the gas network is projected to reduce emissions by 2.1 million tonnes CO₂e (NPV of 0.8 million tonnes), representing a 54 percent reduction

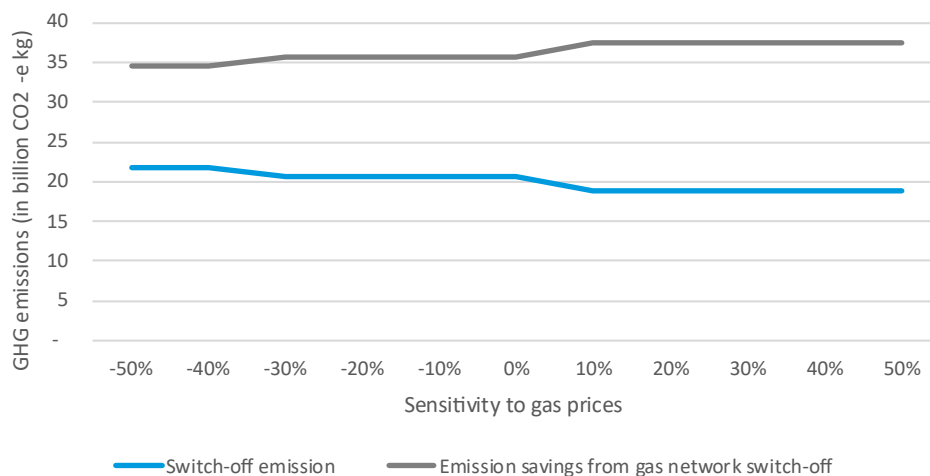
Under the historical energy price scenario, this produces an abatement cost per tonne of CO₂e of \$821, \$871, \$911, and \$879 in Hamilton, Gisborne, Wellington, and overall, respectively.

4.3 GHG emissions result is not sensitive to changes in gas prices

In theory, as gas prices rise, gas-fired generation becomes less attractive and will therefore make up a smaller share of the generation mix. This analysis considers how changes in gas prices affect the generation mix needed to meet additional demand, and in turn, the level of GHG emissions under the Switch-off scenario.

Figure 4.4 presents the results of this sensitivity analysis.

Figure 4.4: Sensitivity of gas prices on GHG emissions

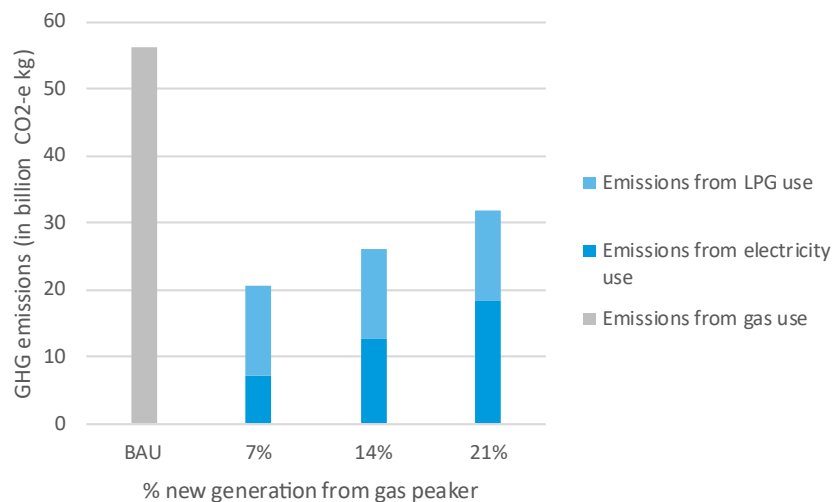


Overall, GHG emissions under the Switch-off scenario are not sensitive to changes in gas prices. As gas prices vary from 50 percent below to 50 percent above the baseline, total GHG emissions in the Switch-off scenario decrease from 22 million tonnes CO₂e to 19 million tonnes CO₂e, representing a 14 percent reduction. This change results in 3 million tonnes CO₂e of

additional emission savings, equivalent to a 15 percent increase in reductions compared to the baseline case.

Our modelling indicates that the additional electricity demand from the gas network switch-off will be met by 93 percent onshore wind and seven percent gas peakers. We also conducted a sensitivity test on new gas generation, as shown in Figure 4.5.

Figure 4.5: Sensitivity test on new gas generation assumption



The results show that even if gas generation triples, GHG emissions under the Switch-off scenario remain just over half of those in the BAU scenario, indicating a substantial reduction in emissions from switching off the gas distribution network.

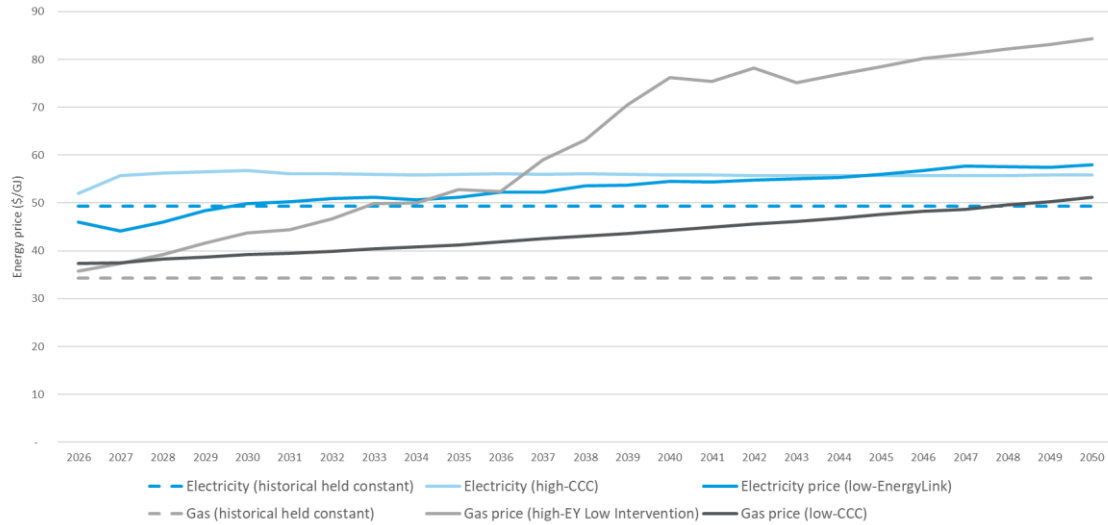
5 Scenario analysis on energy prices

Energy consumption costs are a significant component of the costs to consumers under the BAU and Switch-off scenarios. New Zealand electricity prices have been volatile in recent years. There is significant uncertainty around gas production (which appears to be falling) and large gas users are reducing demand. This means gas prices are also uncertain.

When gas prices are high, switching to electricity could become more economical for consumers (although high gas prices tend to be correlated with high electricity prices), making the Switch-off scenario more attractive. Conversely, when electricity prices are high, switching is more costly, making the BAU scenario relatively more attractive.

Gas and electricity prices are expected to change over the forecast period, and several credible sources project different trajectories for both, as shown in Figure 5.1.

Figure 5.1: Gas and electricity price forecasts



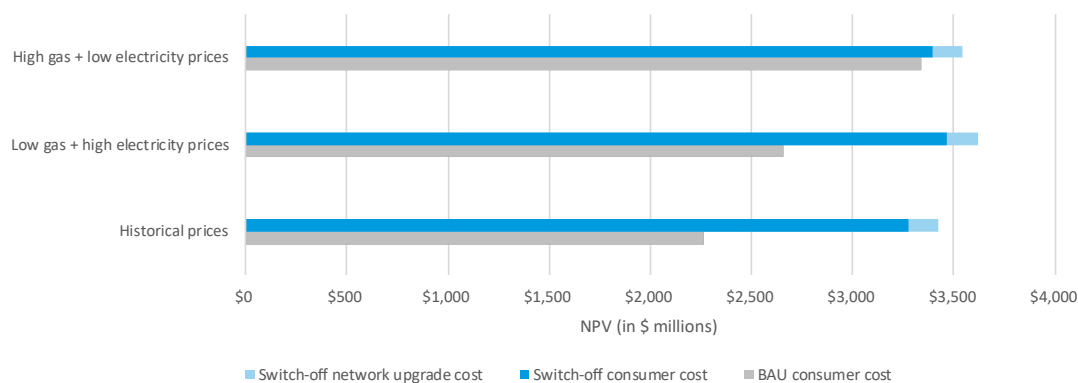
*Prices shown are calculated as weighted averages of residential, commercial, and industrial prices and weighted by region

To test the robustness of our findings, we model two alternative scenarios:

- **Optimistic BAU Energy Price Scenario:** Low gas price and high electricity price
- **Optimistic Switch-off Energy Price Scenario:** High gas price and low electricity price.

We analyse the impact of these two scenarios on the combined consumer and network costs under BAU and Switch-off. We exclude the GHG emissions component as the gas and electricity prices already include a carbon cost. We find that in both scenarios, the Switch-off scenario is more expensive than BAU overall, as shown in Figure 5.2. However, the difference is much smaller under favourable conditions for electrification.

Figure 5.2: Consumer and network costs under different energy price forecasts



5.1 Low gas price / high electricity price

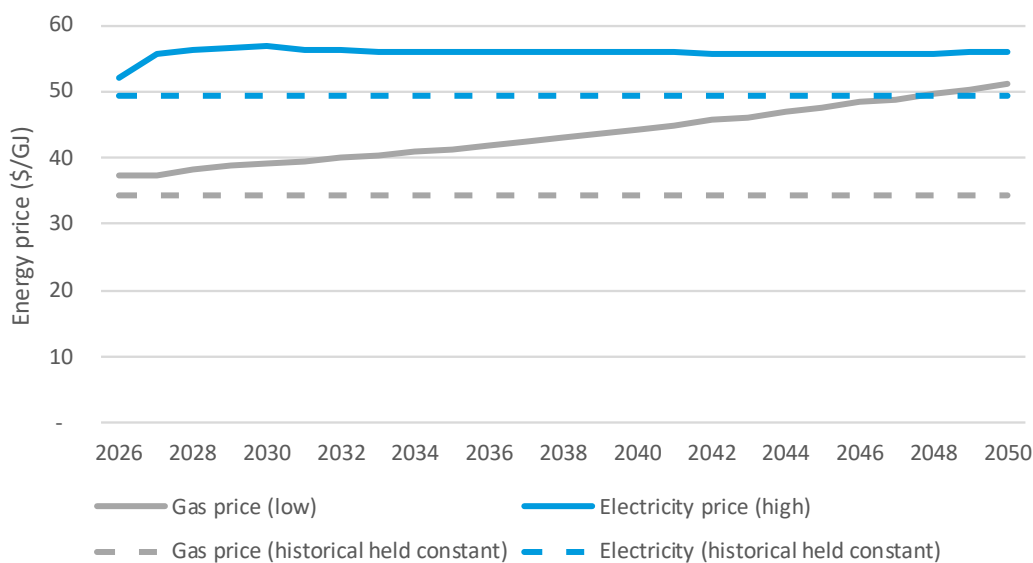
In this scenario, we test the impact of low gas prices combined with high electricity prices.

For gas, we rely on the CCC's forecasts. Household gas prices are assumed to increase by only 0.8 percent annually, while commercial and industrial gas prices follow CCC's wholesale gas forecast, rising at two percent per year.⁴⁷

For electricity, we adopt the CCC's household electricity price forecast (assumes consumers buy from the grid), which suggests prices grow by only 0.5 percent per year on a compounded basis.⁴⁸

Figure 5.3 presents the modelled energy price paths.

Figure 5.3: Gas and electricity prices forecast—Low gas and high electricity



*Gas prices are calculated as weighted averages of residential, commercial, and industrial prices, using gas consumption in each sector. Electricity prices are calculated as weighted averages across residential, commercial, and industrial users in Hamilton, Gisborne, and Wellington, weighted by their electricity consumption.

Under the CCC's more conservative estimates, gas prices still rise above historical levels, averaging 26 percent higher. Electricity prices also increase from historical levels before stabilising, averaging 13 percent higher.

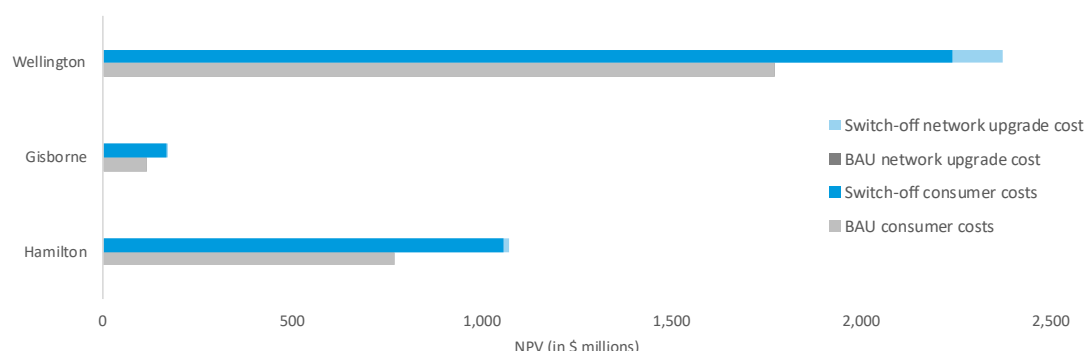
Switch-off is more expensive than BAU

Under the low gas/high electricity assumption, the Switch-off scenario is more expensive than BAU in every study region (Figure 5.4). Overall, switching off the gas network would increase consumer and network costs by \$959 million.

⁴⁷ Source: Climate Change Commission (2024) "Commission's Advice on Aotearoa New Zealand's fourth emissions budget and Review of the 2050"

⁴⁸ Climate Change Commission (2024) "Commission's Advice on Aotearoa New Zealand's fourth emissions budget and Review of the 2050"

Figure 5.4: Consumer and network costs under the BAU and Switch-off Scenario—Low gas and high electricity



Even under the low gas/high electricity assumptions, gas prices still increase on average by more than electricity prices. This explains why the relative cost of the Switch-off scenario decreased by 18 percent compared with the historical-price estimate (\$1.2 billion).

5.2 High gas price / low electricity price

In this scenario, we consider the opposite conditions: high gas prices alongside relatively low electricity prices.

To model gas prices, we use EY's Gas Demand and Supply Assessment Low Intervention scenario, which indicates that wholesale gas prices increase by around three percent per year (in real terms) over the forecast period.⁴⁹ We assume T&D charges increase progressively at 6 percent per year (in real terms) as consumers exit the gas networks, following EY's projections of declining customer numbers. We keep retail costs per GJ constant in real terms.

For electricity, we construct the forecast by separately modelling wholesale prices and T&D charges. For the wholesale component, we use Energy Link's forecast, which shows average increases of around 1.5 percent per year across Hamilton, Gisborne, and Wellington. For T&D charges, we split the horizon into two periods: between 2026 and 2030, we base our assumptions on EDBs' published pricing methodology disclosures and the Commerce Commission's default price-quality paths, which suggest increases of around eight percent annually.⁵⁰ From 2031 onward, we revert to long-term historical trends, with T&D charges rising by around 0.7 percent per year.⁵¹ We keep retail costs per kWh constant in real terms. We applied the increases to the variable portion of the electricity bill to avoid double-counting the fixed charges that gas users pay, regardless of how much electricity they consume.

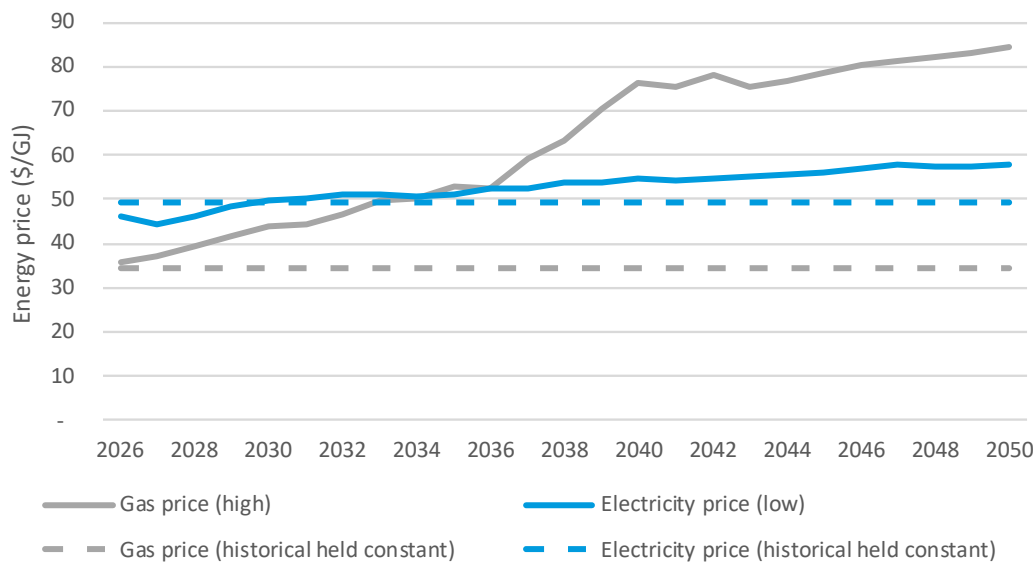
Figure 5.5 presents the modelled energy price paths.

⁴⁹ EY (2024) "Gas Supply and Demand Study" - Low Intervention scenario

⁵⁰ Source: WEL Networks (2025) "Pricing Methodology Disclosure 2024/25"; Firstlight (2025) "Pricing Methodology For the Year Commencing 1 April 2025"; Wellington Electricity (2025) "Pricing Methodology Prepared March 1 2025"; Commerce Commission (2025) "Default price-quality paths for electricity distribution businesses from 1 April 2025"

⁵¹ Source: Sales-based electricity cost data published by MBIE

Figure 5.5: Gas and electricity prices forecast—High gas and low electricity



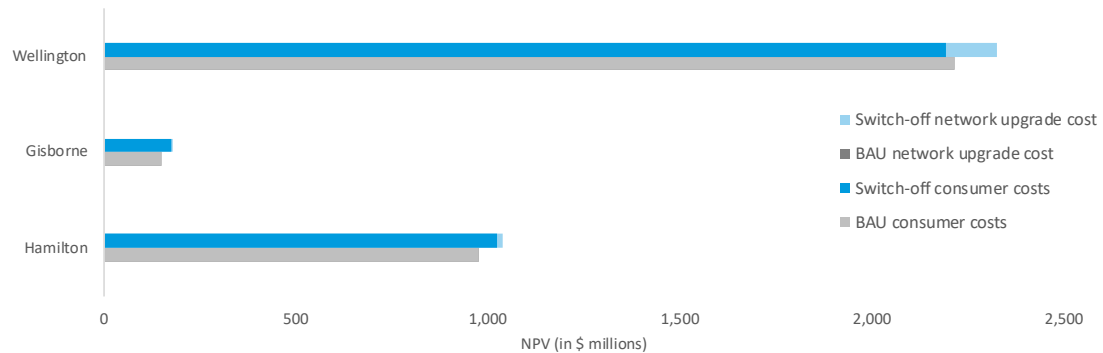
*Gas prices are calculated as weighted averages of residential, commercial, and industrial prices, using gas consumption in each sector. Electricity prices are calculated as weighted averages across residential, commercial, and industrial users in Hamilton, Gisborne, and Wellington, weighted by their electricity consumption.

The resulting trajectory shows gas prices rising above historical levels, while electricity prices remain close to the historical level. On average, gas prices are 79 percent higher than historical, while electricity prices are seven percent higher.

Switch-off remains more expensive overall, but cheaper for residential consumers

Under the high gas / low electricity price assumptions, the Switch-off scenario is more expensive than BAU in every study region (Figure 5.6). However, the switch-off generates consumer savings in Wellington, driven by a higher proportion of residential demand. Overall, switching off the gas network would increase consumer and network costs by \$203 million.

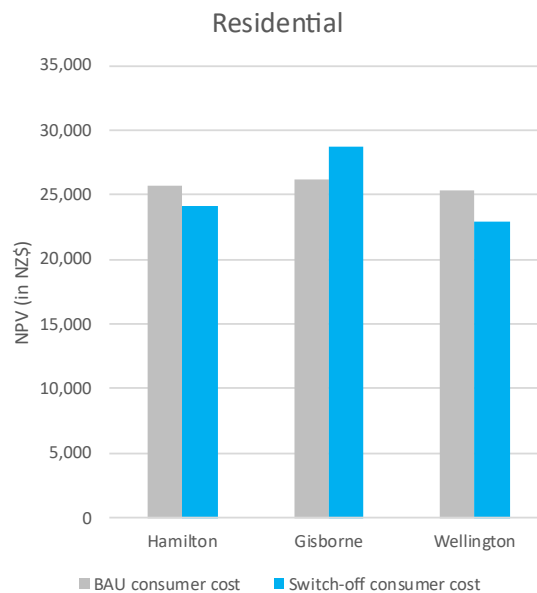
Figure 5.6: Consumer and network costs under the BAU and Switch-off Scenario—High gas and low electricity



Compared with results under the historical-price baseline (\$1.2 billion), the relative cost of the Switch-off scenario is reduced by 83 percent. This occurs because the BAU scenario becomes more expensive under sharply rising gas prices.

For residential consumers, switching off the gas network delivers net savings of \$144 million compared with BAU. By region, Hamilton and Wellington record net savings of \$28 million and \$122 million, respectively, while Gisborne faces an additional cost burden of \$6 million. Figure 5.7 shows the NPVs per residential consumer by region.

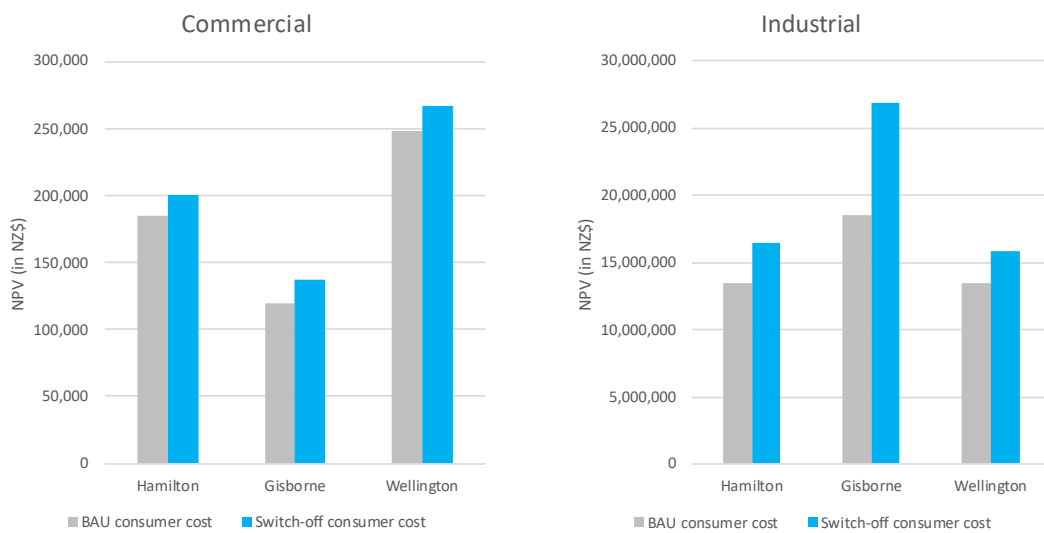
Figure 5.7: Comparison between residential consumer costs per user by region



With high gas prices, residential energy consumption costs rise substantially under the BAU scenario. In Hamilton and Wellington, lower electricity prices and greater energy efficiency result in lower consumer costs under the Switch-off scenario compared to BAU. However, Switch-off remains more expensive in Gisborne because electricity prices are higher compared to Hamilton and Wellington.

For commercial and industrial users, BAU remains cheaper than Switch-off (as shown in Figure 5.8). This is because the price gap between gas and electricity is smaller for commercial and industrial customers than for residential customers. On a per-kWh basis, residential, commercial, and industrial natural gas are 18 percent, 16 percent, and 14 percent more expensive than electricity.

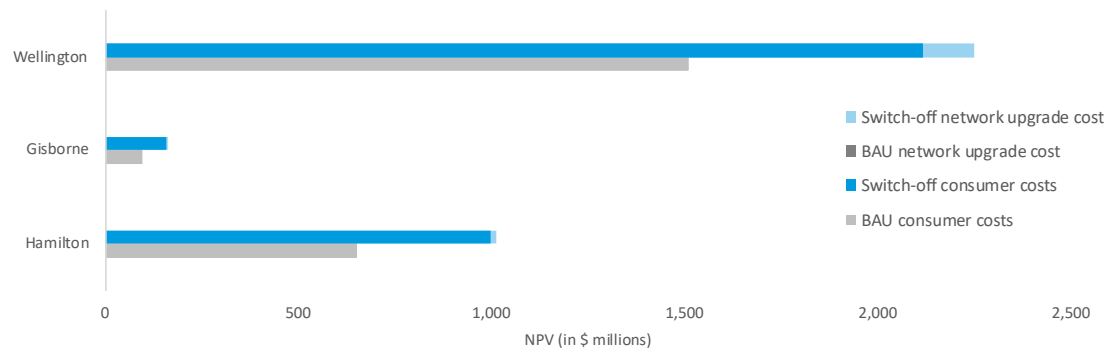
Figure 5.8: Comparison between commercial and industrial consumer costs per user by region



6 Conclusion

The analysis shows that the Switch-off scenario is more costly than the BAU scenario across all regions under historical energy prices. Consumer costs account for the bulk of the additional costs, while the cost of upgrading the electricity distribution networks is relatively modest. Figure 6.1 illustrates this, showing that consumer costs dominate the overall net present value of total costs in every study region.

Figure 6.1: NPVs of consumer and network upgrade costs by region—Historical energy prices



While the results are sensitive to assumptions about future energy prices, the overall conclusion holds. Even under favourable conditions for the Switch-off scenario—low electricity prices combined with high gas prices—the Switch-off remains slightly costlier than BAU.

Other cost components, such as appliance capital expenditure and the costs of remodelling or reconfiguring households for new electric appliances, are relatively small in the overall cost structure. This means that even if there are substantial reductions in appliance prices or innovations in household retrofitting, the overall results are unlikely to change materially. The decisive factor will continue to be the trajectory of gas and electricity prices.

In addition to the cost impacts, switching off the gas network would have energy and climate implications. Replacing gas appliances with electric alternatives will require more electricity generation. This electricity demand increase is primarily met by wind. Therefore, switching off the gas network is expected to significantly reduce GHG emissions across the North Island.

Finally, there are important qualitative considerations that fall outside of the purely economic analysis. For example, many consumers value the convenience of instant hot water from gas and may be reluctant to switch to alternative technologies, regardless of long-term cost implications. These consumer preferences, along with broader social and environmental objectives, will also influence decision-making about the future of the gas distribution network.



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