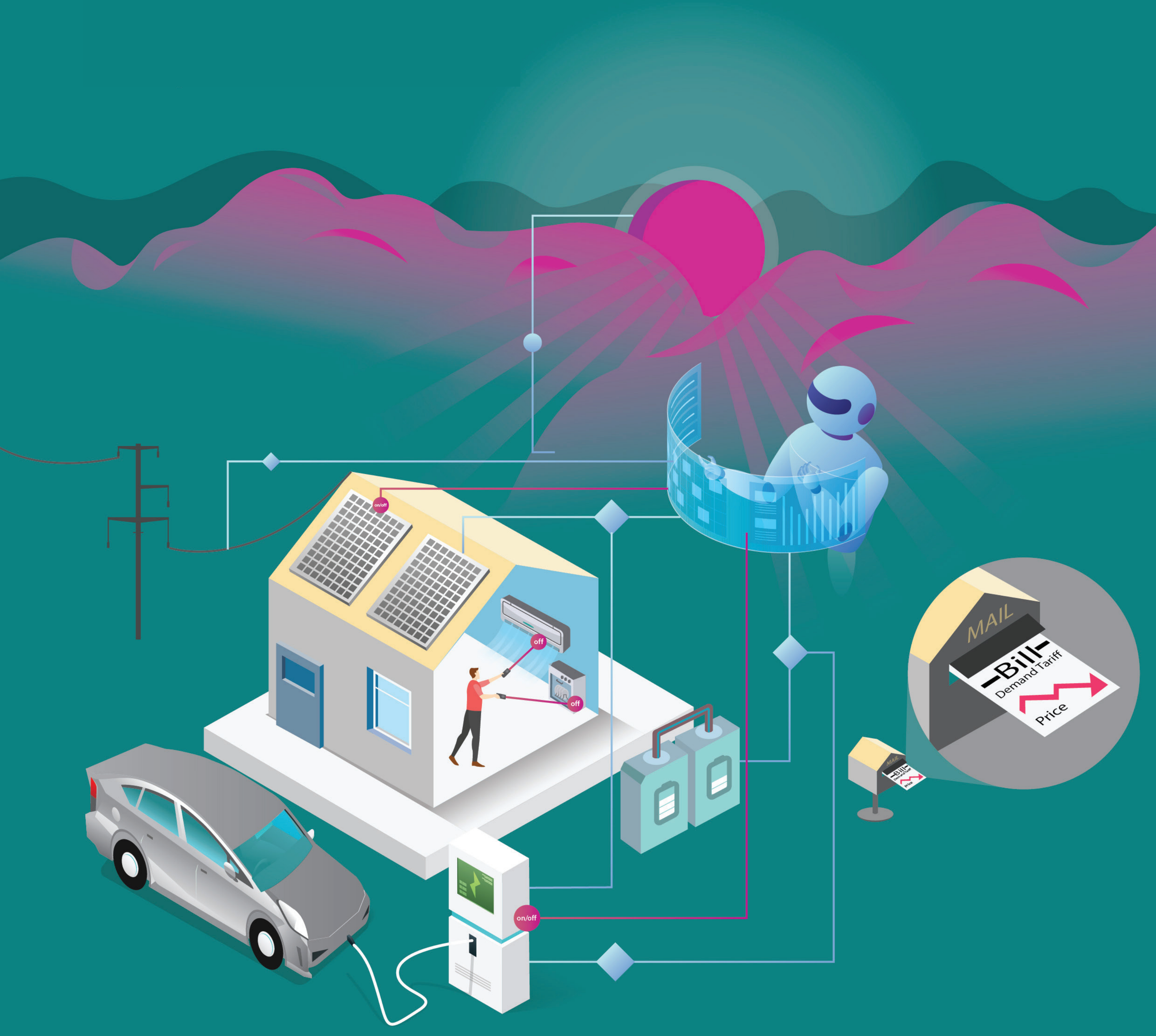
Network Tariffs and Dynamic Controls

Long term network bill impact to Energex and Ergon customers

January 2024



Dynamic Analysis

Contents

Executive Summary 4

1. Context 9

2. Approach 11

3. Key inputs and results 14

4. Bill impacts 21

Executive Summary

We were asked to assess the long-term customer impacts of efficient tariffs and dynamic controls. Our model found that Energex and Ergon would incur lower expenditure, allowing the networks to pass through lower network tariffs to customers. We also found that most customers would have lower network prices if they responded to price signals by moderately shifting when they use appliances.

In September 2023, we were engaged by Energy Queensland to model the long term impacts to customer network prices from efficient tariffs and dynamic controls for Energex and Ergon.

This was in response to the Network Pricing Working Group's (NPWG) request to understand the long term impact to customers from proposed tariff reform for the networks' upcoming 2025-30 regulatory period. This included increases in demand tariffs and the introduction of export tariffs. The NPWG recognised that tariff reforms are likely to have adverse impacts on some customers in the short term. The NPWG wanted to ensure that the proposed tariff direction would deliver material long term benefits to the customer base, and that the benefits would be broadly shared across customer segments. The NPWG sought to understand the impact to residential customers as the priority.

This report seeks to quantify the long term benefits to the customer base for Energex and Ergon from the proposed tariff reforms that the networks propose to implement in the 2025-30 period. To understand the impact to customer segments, we have analysed data of Energex customers only. We consider that undertaking a similar exercise for Ergon customers would be complex given the current arrangements that effectively subsidise the network charge levied on Ergon customers.

For both networks, our approach was to develop a revenue and tariff model that could project network prices for residential customers under different scenarios. We consulted with the NPWG and agreed to compare long term outcomes against three "bookend scenarios":

- Scenario 1 – From FY2026 to FY2050, all customers would not be subject to 'time-variable' import tariffs (ie: they would be on a fixed/energy volume tariff) and no export tariffs would apply. There would also be no application of controls on any appliances.
- Scenario 2 – From FY2026 to FY2050, all customers would be on tariff structures consistent with Energex and Ergon's proposed Tariff Structure Statement (TSS) for the 2025-30 regulatory period. However, there would be no dynamic controls of customers appliances or devices.
- Scenario 3 – This would be the same as Scenario 2 except that dynamic controls would complement tariff changes and be applied to customer energy resources and controllable appliances such as electric vehicles.

This report seeks to quantify the long term benefits to the customer base for Energex and Ergon from the proposed tariff reforms that the networks propose to implement in the 2025-30 period.

Tariff reform and dynamic controls reduce expenditure

For both networks, the modelling suggests that capital (capex) and operating expenditure (opex) would likely be significantly higher under Scenario 1 where no time-variable tariffs or dynamic controls are applied. Scenario 2 would result in significantly lower capex and opex than Scenario 1. Scenario 3 would result in even lower capex and opex than Scenario 2.

The key driver of the results is the relative difference in peak demand capex across the scenarios. The modelling suggests that under all scenarios Energex and Ergon will face a significant increase in energy consumed from the grid by 2050. This is largely due to the impact of electrification of vehicles and gas.

Higher peak demand growth (associated with higher energy growth) is likely to be higher if customers are not provided with tariff incentives to shift demand to off-peak periods.

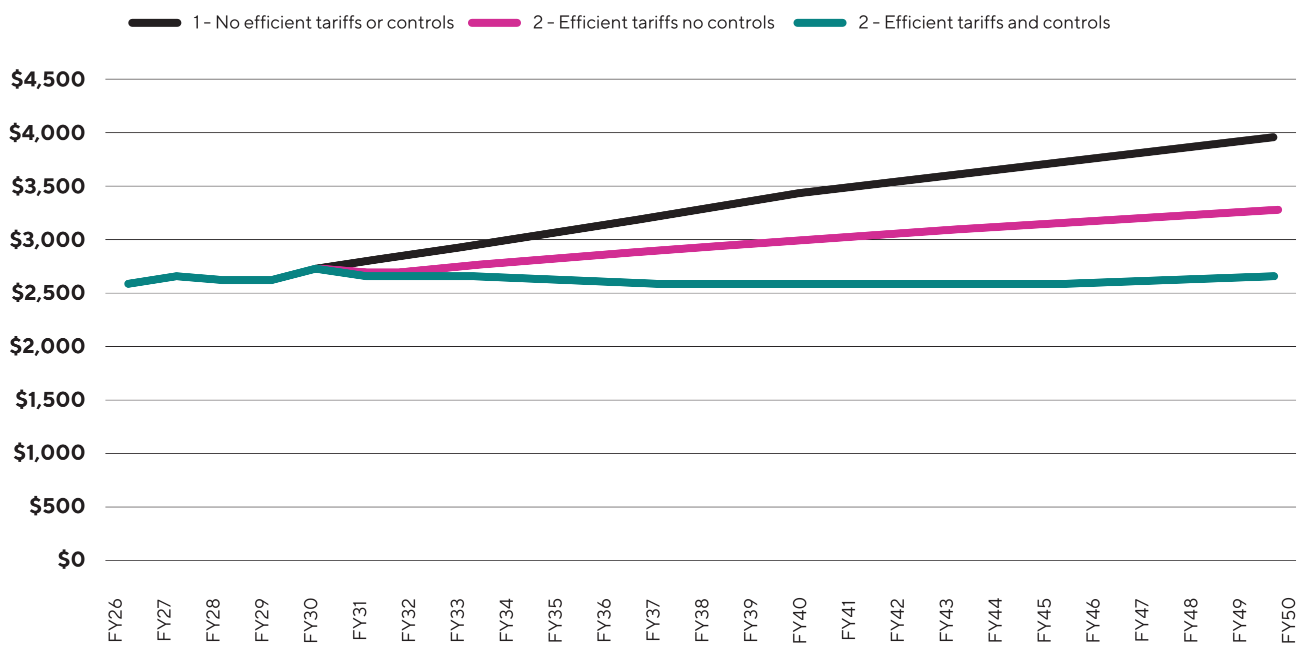
Higher peak demand is related to higher augmentation capex (new infrastructure) in Scenario 1. Under Scenario 2, a proportion of customers will look to avoid paying high prices in peak periods by shifting more energy into off-peak periods, lowering investment in new infrastructure. Scenario 3 has the lowest amount of new infrastructure investment because, in addition to price responsiveness, Energex and Ergon could dynamically control load and generation from some customer appliances (in return for lower prices) in order to respond to time and location specific constraints.

While less material, we note that export tariffs also reduce augmentation expenditure on low voltage assets. This is because customers are provided with price signals to curb exports when the network faces hosting capacity constraints. Dynamic controls provide more certainty that customers will not export when the network is congested, further reducing augmentation.

We also found that operating expenditure would be lower in Scenarios 2 and 3 due to less maintenance costs and overheads related to new infrastructure.

Figure 1 shows the total combined capital and operating expenditure for Ergon and Energex under each scenario between 2026 and 2050.

Figure 1 – Total capital and operating expenditure ($m, real 2024) between FY2026 and FY2050 under each scenario (real 2024)

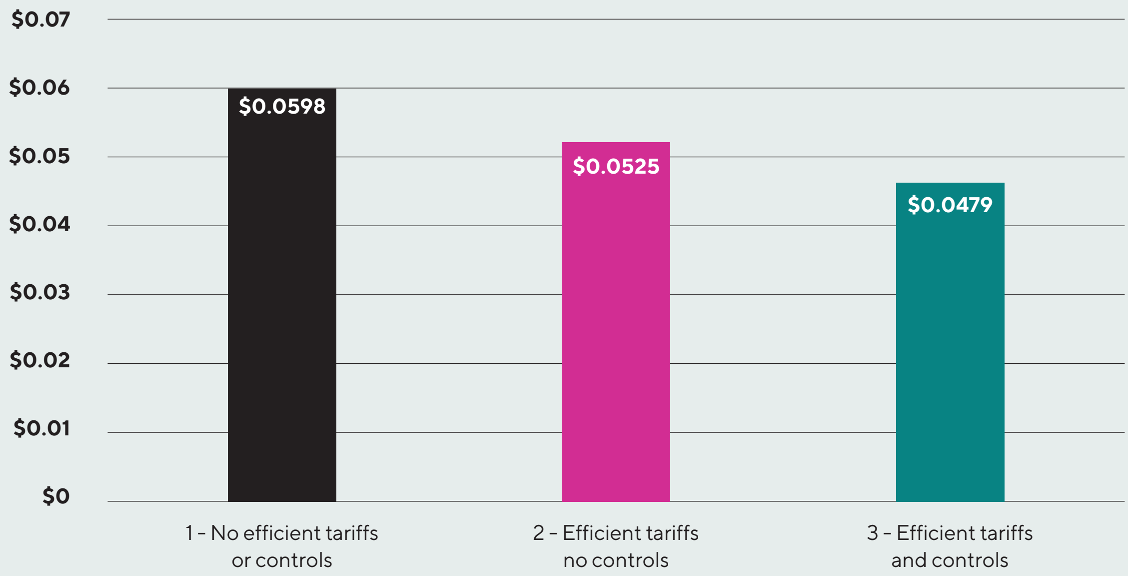


Cost of network electricity falls with tariff reform and dynamic controls

Our modelling shows that the costs that each residential customer pays for a unit of electricity would be 20 per cent lower for Energex customers by 2050 from pursuing tariff reform and dynamic controls relative to tariffs which are not time-variable. This can be seen in **Figure 2** below.

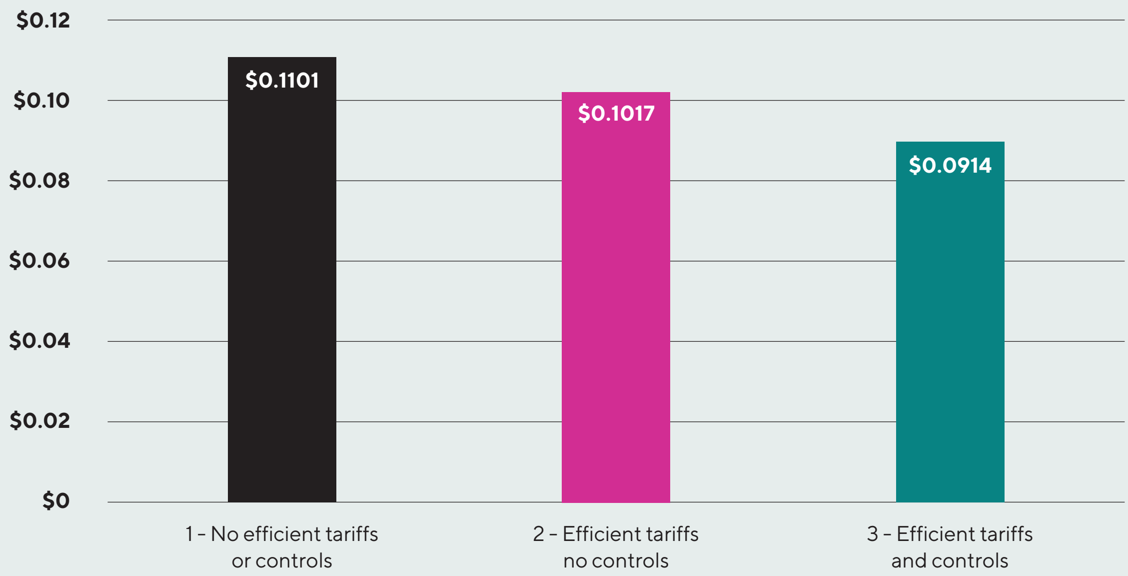
This is due to the lower revenue requirements in Scenarios 2 and 3 compared to Scenario 1, associated with lower capex and opex.

Figure 2 – Cents per kilowatt hour by 2050 for Energex customer base under each scenario (real 2024)



The modelling also showed that the customer base in Ergon's network would also yield similar benefits. This can be seen in **Figure 3.**

Figure 3 – Cents per kilowatt hour by 2050 for Ergon customer base under each scenario (real 2024)



Long term benefits likely to apply to most customers

We also modelled the long-term customer impacts under each scenario for different customer segments in Energex's network. The lower projected revenue from tariff reform and dynamic controls would be passed through as lower tariff rates.

We found that customers with certain characteristics such as access to energy efficiency, ability to reduce demand during peak periods, and access to electric cars are likely to benefit more than other customers in terms of network bill impacts. However, we found that customers without these characteristics are likely to benefit over the long term, particularly if they can shift energy consumption to off-peak periods.

Our analysis looked at four residential profiles used by Energy Queensland as part of stakeholder engagement on tariff reform. Our analysis has sought to model the projected tariff rates for each scenario on the customer segments based on the following characteristics.

- Azami - A customer with high energy consumption and demand from the grid, with limited access to energy efficiency or customer energy resources. We have assumed this customer does not purchase an electric vehicle in the 2026 to 2050 period.
- John - A customer with median energy consumption and demand from the grid, with moderate access to energy efficiency, but no customer energy resources. We have assumed this customer purchases two electric vehicles in the 2026 to 2050 period.
- Arush - A customer with low energy consumption and proportionately low demand from the grid. The customer has low access to energy efficiency, but has solar panels. The customer does not purchase an electric vehicle in the 2026 to 2050 period.
- Zahara – A customer with low energy consumption but disproportionately high demand from the grid. The customer has a relatively large system capacity panels, but does not purchase a battery. The customer purchases 2 electric vehicles in the 2026 to 2050 period.

Figure 4 identifies the network bill under Scenario 1 (fixed and flat tariffs) compared to Scenario 3 (time-variable tariffs and dynamic controls) in FY2050. We have also identified how the network bill would change for the customer based on achieving a 10 per cent, 30 per cent and 50 per cent shift in maximum demand each month.

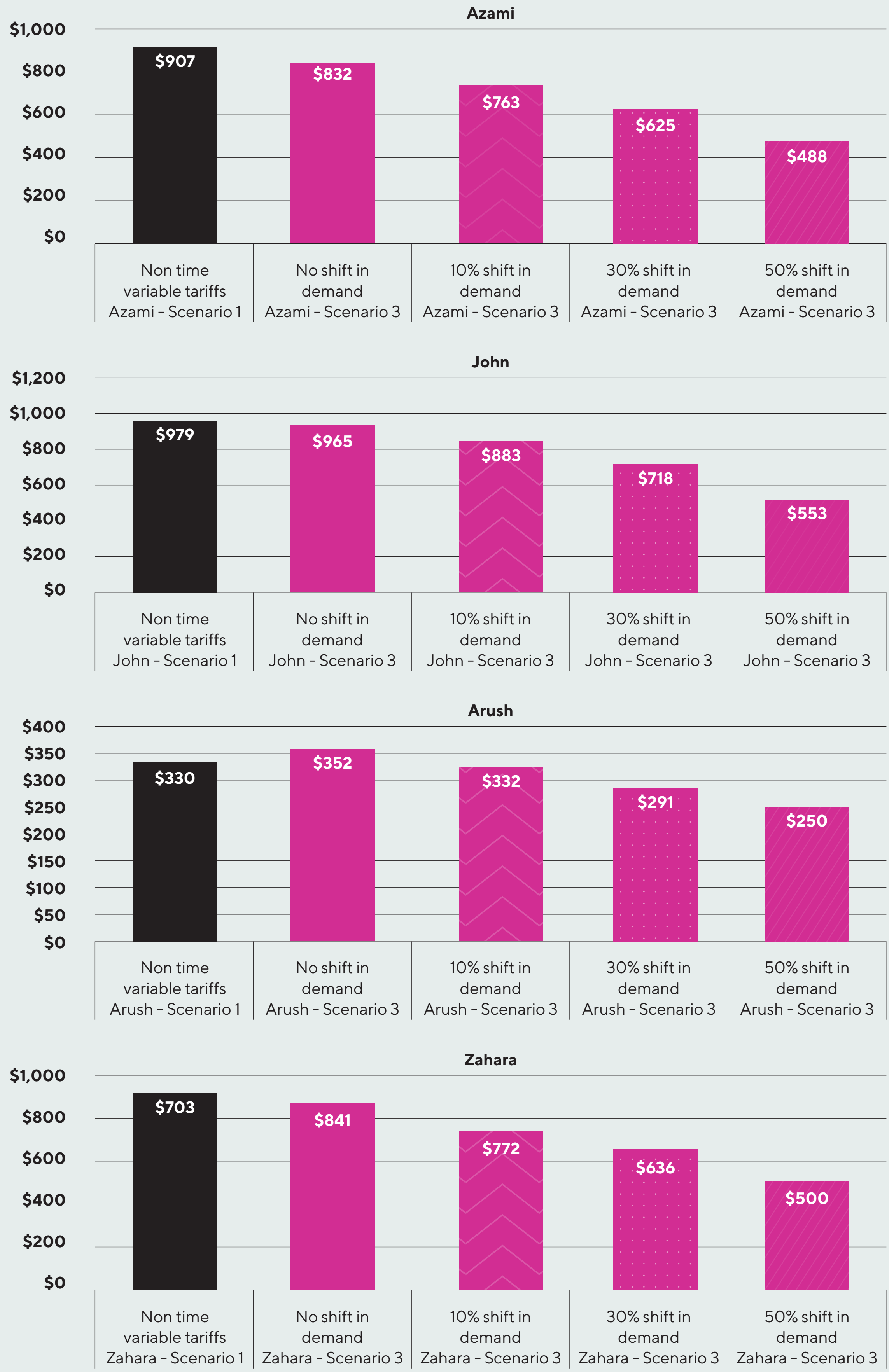
The key observation is that in the long term, some customers would achieve a marginal benefit in their network price from moving to demand tariffs and dynamic controls even if they do not shift demand to off-peak periods, with benefits increasing with demand reductions.

However, some customers would need to significantly reduce their demand at peak times, to achieve a lower network price under Scenario 3 relative to Scenario 1. With a 30 per cent decrease in monthly demand, these customers would also receive a benefit relative to flat tariffs.

We note that the only customer group which may struggle to achieve a 30 per cent demand reduction are low consumption customers without an electric vehicle such as Arush. These customers may not have the ability to shift appliance use to off peak periods.

We found that customers with certain characteristics such as access to energy efficiency, ability to reduce demand during peak periods, and access to electric cars are likely to benefit more than other customers in terms of network bill impacts

Figure 4 – Network bill in FY2050 for different customer segments under scenarios



1. Context

Network tariff designs influence a customer's decision on when to use and export electricity. In the short run, this may have limited impact on a network's cost structure. Over the longer term, efficient tariffs are likely to reduce investment and operating expenditure. Dynamic controls provide more opportunity for customers to reduce the network component of their energy bills while increasing downward pressure on future costs. Our long term revenue and tariff model provides a quantitative approach to project the impact on customers from different tariff structures.

1.1 Network tariffs and dynamic controls

In the National Electricity Market (NEM), networks are subject to price regulation by the Australian Energy Regulator. In its 5 year regulatory determinations, the AER sets a ceiling on the annual revenue that a network can collect from customers. This is based on returns on past and forecast capital expenditure, operating and tax expenditure, and incentive payments.

In the regulatory determination process, the AER also assesses a network's proposal on how it intends to recover revenue from customers through network tariffs levied on retailers. The Tariff Structure Statement sets out tariff classes and segments, allocation of revenue between segments, and the tariff structures.

We broadly group tariff structures into two categories:

- Tariffs which are anytime or not time-variable: Customers pay a network charge based on their connection characteristics such as a fixed rate per day, and on their total energy consumption or total exports from the network.
- Time-variable tariffs: Customers pay network charges based on the time and day when they use or export electricity from the network.

Time-variable structures are directed at sending a 'price signal' to customers on when it is cheaper or more expensive to use network services. This reflects that investment in new infrastructure is heavily dependent on the maximum demand for import or export services. For the Queensland networks, demand for electricity from the grid is generally highest in the evening when residential customers use electricity to power appliances in their homes, and when customers cannot rely on their rooftop solar to provide power. In contrast, maximum demand for export services is in the middle of the day when solar production is at its peak.

Time-variable structures have been far less common in residential and small business tariffs, due to the fact that meter technology for most of these customers did not allow for time-variable measurement. However, this is likely to change with an ambitious rollout of smart meters over the next seven years, meaning that by 2030 most customers will have meters capable of time-variable rates.

For the Queensland networks, demand for electricity from the grid is generally highest in the evening when residential customers use electricity to power appliances in their homes, and when customers cannot rely on their rooftop solar to provide power.

1.2 Tariff reform proposed by Energex and Ergon

Energex and Ergon have both proposed time-variable tariff structures for import and export of electricity, in line with energy rules which require these networks to promote better cost-reflectivity in their tariff designs.

In respect of import tariffs, the networks have proposed to signal the cost of future network investment at peak times through an import demand charge applied to customers for their maximum 30 minute usage of electricity in the evening peak period of each month. Demand charge rates are intended to signal the long run marginal cost of future investment.

In addition to a peak demand charge, Energex and Ergon have proposed to recover other revenues from a fixed daily charge, and an overnight energy consumption tariff.

In respect of export tariffs, Energex and Ergon will transition customers to tariffs applying to customers that export energy. These tariffs will impose charges on customers when they export during congested periods in the middle of the day. At the same time, the networks are proposing an export reward for customers who inject electricity into the grid in the evening peak.

In addition to tariff reforms, Energex and Ergon are proposing to offer dynamic connections that allow for more solar to be connected to the network, with solar export dynamically controlled during periods of congestion. While dynamic connections represent new technology for managing generation output, load control arrangements over appliances are utilised by networks in similar ways.

Dynamic connections, combined with load control of customer appliances, provide the opportunity for networks to manage constraints on the network by controlling both customer energy resources and appliances. In our report we have defined these technologies in general terms as ‘dynamic controls’.

1.3 Purpose of our study

The ultimate objective of transitioning to time-variable tariffs and dynamic controls is to reduce future costs of the network, with the benefits of lower costs passed onto customers through lower network prices. A key issue is that cost reductions are likely to occur over a longer period than the term of a regulatory period. While reductions in demand can resolve immediate local constraints, the key benefit of efficient tariffs and controls is that they slow the growth in import and export demand over time.

Stakeholders are naturally cautious about tariff reform given that the benefits are marginal in the short term. This is because tariff reform is likely to result in changes in each individual customer bill compared to traditional tariffs which are not time-variable. Significant changes should be justified by demonstration of benefits over the long term.

This provides context for why the NPWG considered that a long-term study on the potential benefits of tariff reform and dynamic controls was necessary. The NPWG wanted to understand the potential benefits over the long term and understand whether the benefits would accrue across the customer base or only to a sub-section.

Our model provides a quantitative framework for assessing the potential long-term benefits to Energex and Ergon’s customer base, and provides a means of assessing whether more financially vulnerable customers are likely to share in the benefits.

2. Approach

We have used a quantitative approach to assess the potential benefits of efficient tariffs and dynamic controls. Our model seeks to identify the changes in expenditure and revenue to 2050 under different tariff and control scenarios. We are then able to project the network bill impact on different customer types.

In this section, we set out the key questions, key elements of the modelling approach to test the hypotheses, scenarios, and key assumptions.

2.1 Key questions

We have sought to apply a quantitative approach to test two key questions. Firstly, what is the expected benefit to the customer base from time-variable tariffs and dynamic controls in the long term. We have defined the long term as 25 years over the FY2026-FY2050 period.

Secondly, we have sought to understand whether these benefits impact different segments of residential customers. This includes customers that do not have the ability to vary their energy usage for instance due to lack of energy efficiency in the homes that require the use of air conditioning. We have only sought to assess the impact on Energex customers given that Ergon customers currently receive the same network charge under the pricing arrangements applied in Queensland.

The analysis focuses on the impact of network charges which for most residential customers make up around a quarter to a third of their total electricity bill.

2.2 Model construction

The model draws on previous work undertaken by Dynamic Analysis to understand the drivers of network prices in the long term. We have undertaken analysis for Energy Consumers Australia, Energy Networks Australia and the Australian Energy Regulator on projections of network prices.

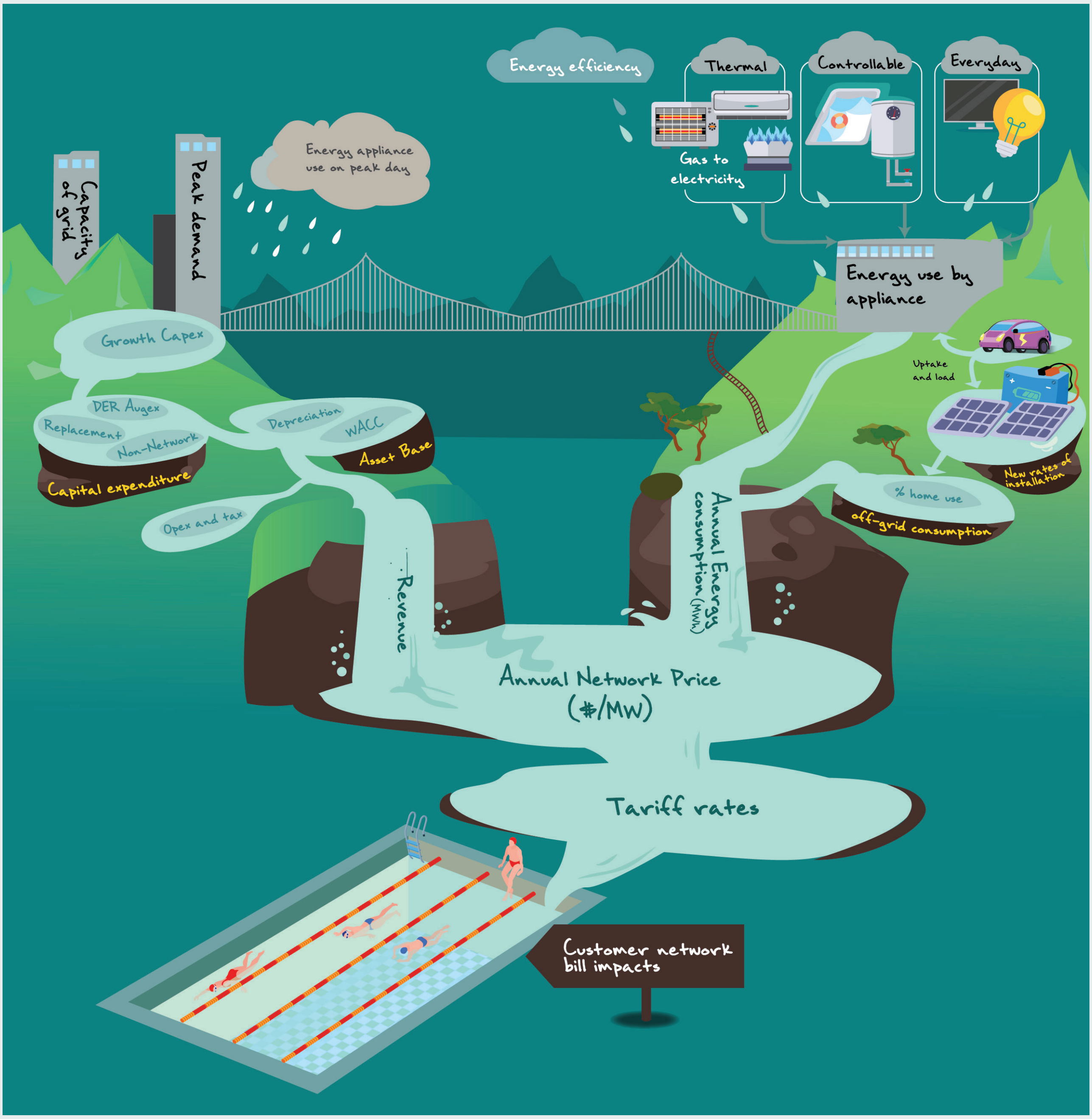
Figure 5 shows the logic of the original model which seeks to model energy consumption from the grid relative to annual network revenue requirements. This is used to calculate a projection of average unit prices (cents per kilowatt hour) for the standard control services provided by networks in the NEM based on key underlying assumptions. The two key components of the model are:

- Forecasts of energy consumption from the grid – This seeks to understand the trends in energy consumed from the grid by residential and business customers based on customer growth, energy efficiency, new appliances such as electric vehicles and substitution of gas, and self-consumption of electricity from solar and batteries.
- Annual revenue requirements – This considers the forecast expenditure from augmenting the network to meet higher peak demand and solar exports, replacement capital expenditure, capitalised overheads, non-network expenditure, and operating expenditure. We then develop a long-term prediction of revenue utilising expenditure and financial inputs that are based on the current formula used by the AER in its Post Tax Revenue Model.

The model then forecasts the change in cents per kilowatt hour by dividing the revenue projection by the energy consumed from the grid projection. This has provided us with a means of examining the potential long-term benefit of time-variable tariffs and dynamic controls.

To address the second key question, we have extended the model to provide a view on the bill impact of time-variable tariffs and dynamic controls to different customer segments on Energex's network. We have sought to model how the revenue would be collected through tariff rates over time. As a final step we have sought to identify the potential usage of electricity by customer type to assess the bill impact of customers. In developing this aspect of the model, we have sought to understand the bill impact based on the ability of the customer to shift load to off peak periods.

Figure 5 – Model construct



2.3 Scenarios

We developed three scenarios to assess the relative difference in benefits to customers as a whole, and individual customers from time-variable tariffs and dynamic controls.

- Scenario 1 – All customers are not subject to 'time-variable' import tariffs (ie: they would be on a fixed/energy volume tariff) and no export tariffs would apply. There is also no application of controls on any appliances.
- Scenario 2 – All customers are on tariff structures consistent with the demand and export tariffs outlined in this TSS. However, there are no dynamic controls of customer-owned energy resources (CER) or appliances.
- Scenario 3 – Dynamic controls complement tariff changes, and are applied to customer energy resources and controllable appliances such as electric vehicles.

2.4 Key Assumptions

The key assumptions in the model are energy and peak demand forecasts for each scenario, expenditure forecasts based on peak demand forecasts and exports for each scenario, and other factors such as replacement and capitalised overheads. We have also made assumptions on rate of return and inflation that remain consistent across scenarios.

Our key assumptions were discussed with the NPWG and Energy Queensland staff. We have also attempted to use publicly available reports as a basis for our analysis where possible. Nevertheless, our assumptions are based on our independent assessment, and may not reflect the actual circumstances of the Queensland distribution networks or more detailed assumptions underpinning their own forecasts.

In general, our assumptions rely on high level analysis rather than detailed analysis, due to the macro nature of the model. We have sought to apply sensitivity analysis to ensure the underlying rationale for the results remain consistent. For this reason, we advise that caution should be applied to the final results and that the underlying logic and drivers should be the focus in interpreting the results.

The key assumptions we have applied in seeking to address the key questions are as follows:

- Existing expenditure and revenue forecasts for the 2025-30 period – We have applied the expenditure, revenue and indicative price forecasts in Energex and Ergon's regulatory proposals using data provided to us in December 2023.
- Energy consumption forecasts – We have assumed that energy consumed by the grid remains relatively flat in the short term, but accelerates significantly between 2030 and 2050 primarily due to uptake of electric vehicles and substitution of gas with electricity. We have considered the impact of growing population, improving energy efficiency, and increased self-consumption from solar and batteries. We have also sought to reconcile with forecasts undertaken by the CSIRO on a joint project undertaken with Dynamic Analysis for Energy Consumers Australia.
- Peak demand forecasts – We have assumed that peak demand growth would exceed energy consumption forecasts if all customers were not on a time-variable tariff such as fixed energy consumption charges. This takes into account that about 20 per cent of customers are already on a time-variable tariff on the Energex network and that under our bookend scenario, these customers would no longer respond to price signals. We have also considered recent EV charging trials show that customers not subject to a time-variable tariff (Scenario 1) are likely to disproportionately charge their cars in the evening peak. In contrast, the model assumes that customers subject to time-variable tariffs (Scenario 2) would shift electric vehicle and other appliance charging to periods outside of the peak period. The model assumes that customers would further shift appliance use to off peak periods if they 'opted in' to dynamic controls (Scenario 3), further reducing peak demand growth.
- Capital expenditure – The critical assumption for the model is that augmentation capex is a function of peak demand growth. Peak demand growth and augmentation will therefore be lower when customers respond to time-variable tariffs and/or dynamic controls are applied. In applying this assumption, we considered that there is likely to be existing capacity to absorb peak demand growth on the network without significant augmentation. We have utilised existing data provided by Energy Queensland on the potential expenditure on augmenting the network to meet growing exports, relative to the costs of Dynamic Operating Envelopes that assist to manage solar exports. The model also assumes that replacement capex is likely to be marginally higher under strong peak demand growth due to wear and tear with operating assets at close to capacity. Finally the model assumes that capitalised overheads also grow with increases in network capital expenditure, but only the variable proportion.
- Operating expenditure – We have assumed that operating expenditure grows with an increase in the size of the network (ie: augmentation capex), customer numbers, and peak demand. We have applied the AER's existing approach to calculating forecast opex based on these output factors. The model assumes higher operating expenditure for Scenario 1 on the basis that the scenario has higher projected augmentation costs.
- Financial parameters – We have applied universal assumptions across the scenarios for rate of return and inflation.

3. Key inputs and results

The model projects that Energex and Ergon will incur significantly less expenditure and lower revenue by FY2050 if they implement time-variable tariffs and dynamic controls. This enables the networks to set lower tariff rates, reducing the cost per customer per electricity consumed.

The purpose of this chapter is to identify the key inputs for each scenario, and the outputs in terms of annual revenue requirement and average costs per customer per electricity consumed.

3.1 Energy consumption

Over the last decade, energy consumption has been relatively subdued on the Queensland distribution networks despite a significant increase in customers. This has largely been due to a marked increase in rooftop solar, which enables customers to utilise their own electricity ("self consumption") rather than rely on energy delivered from the network. This has also meant that solar exports make up a higher proportion of energy delivered from the grid.

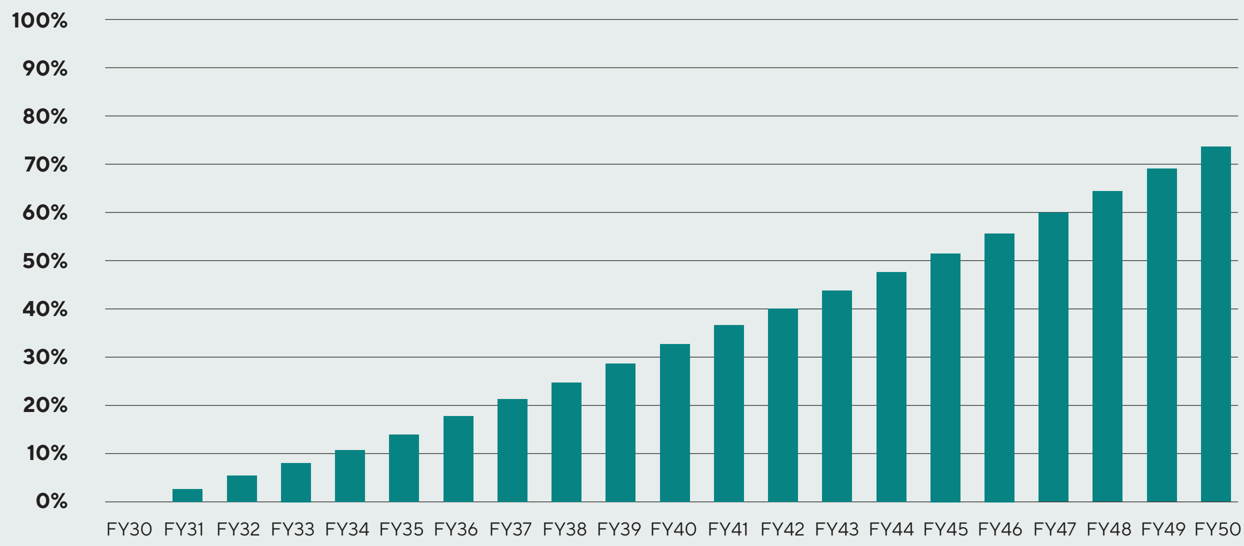
We expect that solar penetration growth is likely to increase significantly but at lower growth rates than the last decade. We also expect more residential customers to install home batteries, increasing self-consumption but also offering opportunities to export back into the grid.

Our analysis suggests that the demand for energy from the grid will markedly increase when electric vehicle purchases accelerate from 2030. Each residential electric vehicle in Queensland requires about 3000kWh of electricity annually, more than half of the average customers' current consumption from the grid. Given that the average Queensland household has about 1.4 cars, this indicates that electric vehicles would significantly increase energy consumption in the Energex and Ergon network, and far outweigh the trend towards self consumption.

In addition, we have considered the impact of electrification of natural and LPG gas in Queensland. This also adds a reasonable injection of energy consumption from the distribution electricity network by 2050.

Figure 6 sets out our assumptions for annual increase in energy consumed from the grid for the Queensland networks. For modelling simplicity, we have applied consistent growth rates to both Energex and Ergon.

Figure 6 – Cumulative energy consumption growth – FY2026 to FY2050 relative to FY2025



3.2 Peak demand growth

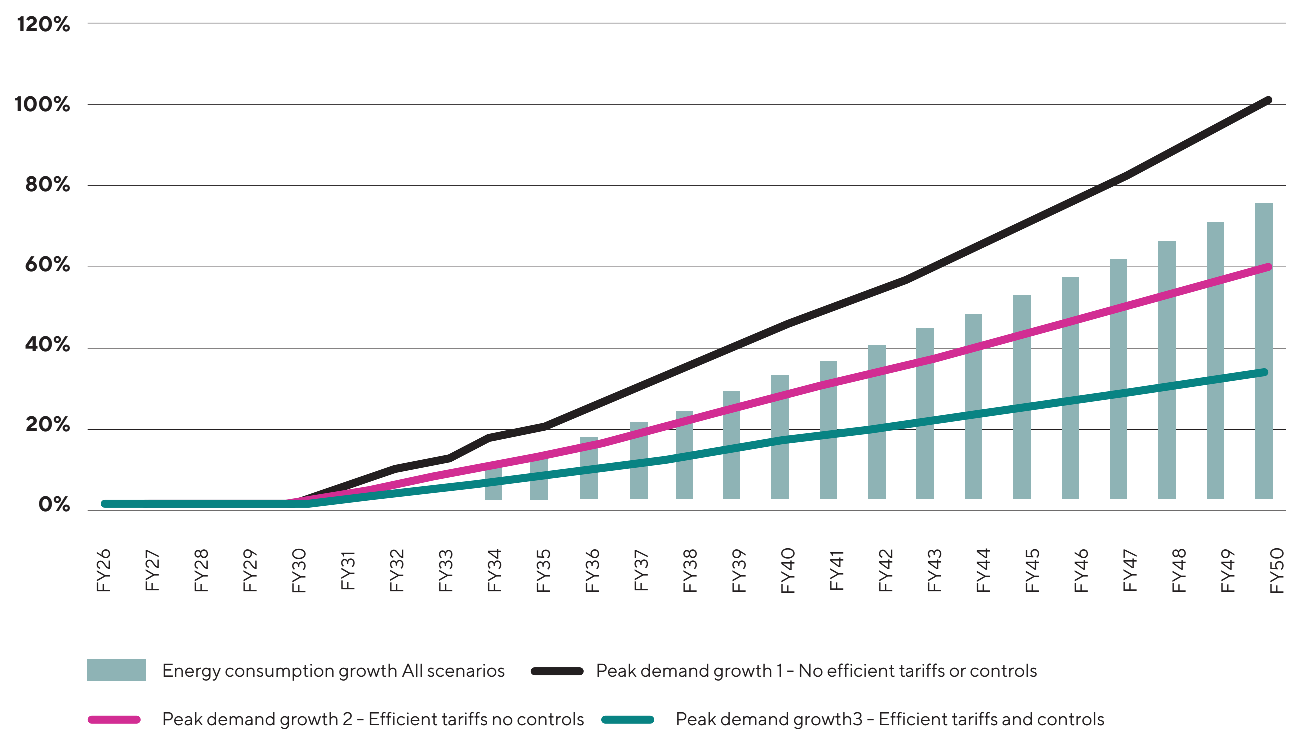
Our model assumes that peak demand growth is a function of energy consumption growth. However, peak demand growth will be less if customers use energy in off-peak periods. We have assumed that peak demand growth would outstrip the growth in energy consumption under tariffs which are not time-variable. This is because customers do not have a price signal to shift energy consumption to off-peak periods. We have also assumed that customers would charge EVs more in the evening period (convenience charging) as confirmed by recent empirical data in Australia on EV charging patterns.

In contrast, we have modelled that peak demand growth would be lower than energy consumption under time-variable tariffs imposed by the Queensland distribution networks (Scenario 2). In this respect, we note that demand tariffs send a direct price signal to customers to diversify appliance usage in the peak evening period, relative to time of use tariffs. We also note that the proposed tariff structures seek to recover a significant proportion of revenue from demand tariffs, emphasising the strong price signal on customers to not turn all appliances on at the same time during the peak period.

Our model has assumed that dynamic controls (Scenario 3) would amplify the impact of time-variable tariffs. The reasoning is that controls provide a 'convenience' factor to customers who otherwise would not respond to price signals. Further, our analysis suggests that dynamic controls also provide the tools to manage demand during times of less appliance elasticity (such as the holiday period when customers may want to charge their electric cars). We also note recent analysis we have undertaken that shows the increased probability of maximum demand occurring during prolonged cloudy periods, meaning that the network cannot rely on either home solar or batteries to meet demand. Finally, dynamic controls provide flexibility for more targeted management of time and location specific constraints. **Figure 7** shows the results of peak demand growth for each scenario for the Queensland networks compared to energy consumption.

We note that the relationship between peak demand and energy consumption has been undertaken at a high level, and that this could be improved in future modelling.

Figure 7 – Cumulative peak demand growth compared to consumption growth – FY2026 to FY2050 relative to FY2025



3.3 Capital Expenditure

Our model projects that Energex and Ergon's capital expenditure will almost double in the absence of time varying signals (Scenario 1). The primary driver of higher capital expenditure relates to augmentation of the network to meet very high growth in peak demand, while also augmenting the distribution network to cater for unmanaged solar exports. Higher augmentation would coincide with the need to replace ageing infrastructure, and this would also impact on capitalised overheads for project management and design.

Under time-variable tariffs (Scenario 2), augmentation capex would be significantly lower than Scenario 1. This is because the tariffs provide a sufficient price signal to customers on the cost of increasing the capacity of the network to meet peak demand growth and solar exports.

We projected that capital expenditure can largely be contained to current levels of capital expenditure if tariff reform is accompanied by dynamic controls for Energex and fall significantly for Ergon below today's levels.[1]

This is because dynamic controls provide a 'convenience factor' for customers to change their energy behaviour to respond to price signals. Networks also have the convenience of firm load and generation to call on when constraints occur. A further factor assumed in our analysis is that networks are better equipped at managing random events impacting local or time specific constraints such as holiday seasons and solar droughts. **Figure 8** and **Figure 9** identify the projected capital expenditure under each scenario for Energex and Ergon respectively.

[1] The difference between the networks relate largely to age-based replacement modelling undertaken by Dynamic Analysis which shows that Ergon will face lower replacement in the longer term than today's levels once ageing assets are removed. We note that the replacement modelling is high level and should not be relied on. In any case, this does not change the underlying differential between the scenarios as replacement levels are consistent across the scenarios.

Figure 8 – Energex's projected capital expenditure for each scenario ($m, real 2024)

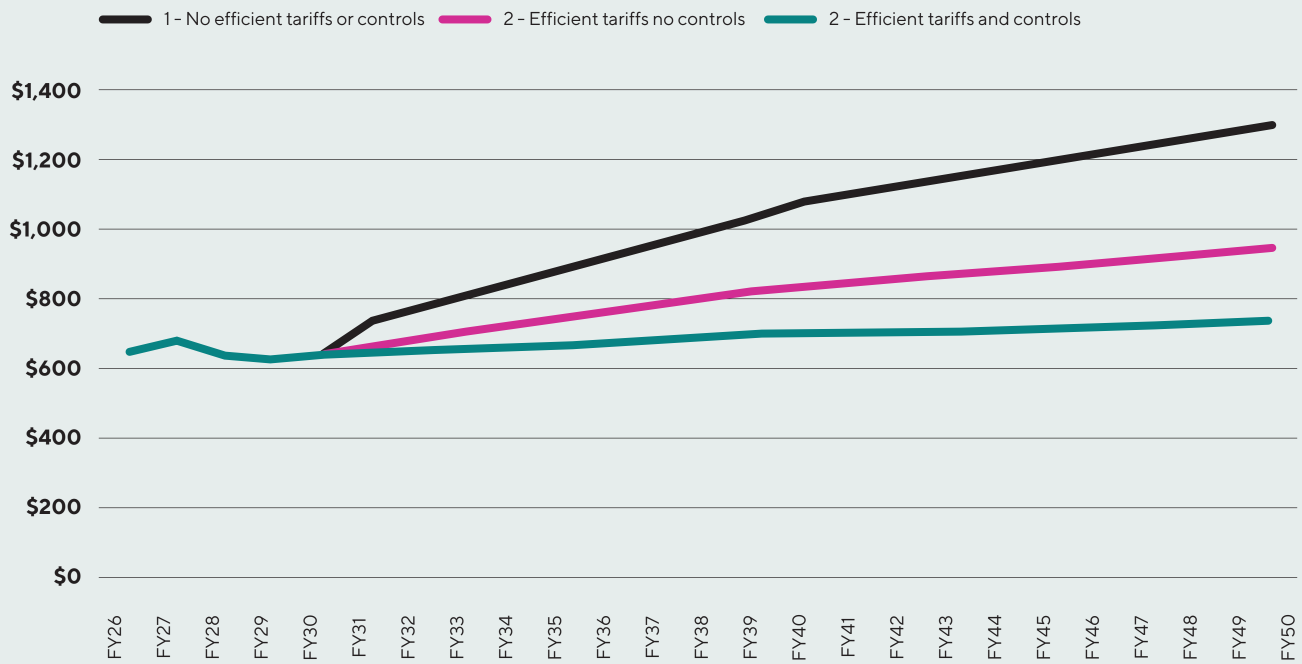
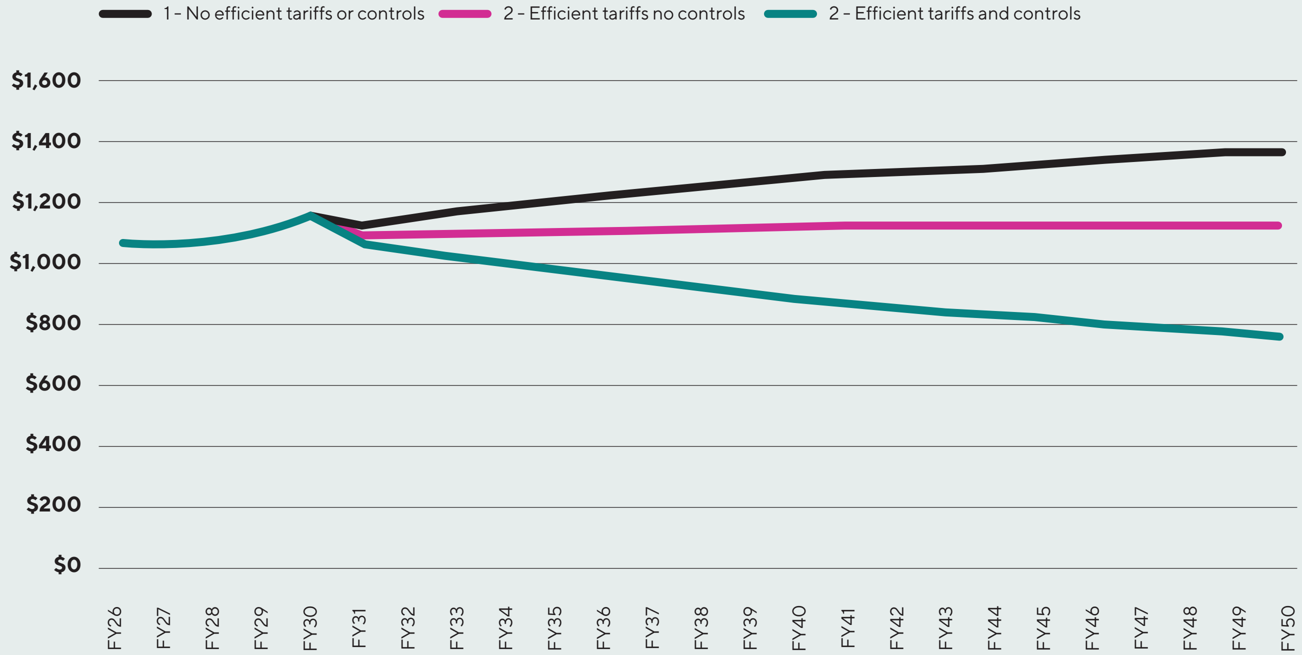


Figure 9 – Ergon's projected capital expenditure for each scenario ($m, real 2024)



3.4 Operating Expenditure

The model also projects that operating expenditure will be lower under tariff reforms and dynamic controls. The underlying rationale is that higher capital expenditure in Scenario 1 is associated with new infrastructure, requiring more maintenance. This adds to the expected increase in operating expenditure related to growing customer numbers. **Figure 10** and **11** show the projected operating expenditure under each scenario for Energex and Ergon respectively.

Figure 10 – Energex's projected operating expenditure for each scenario ($m, real 2024)

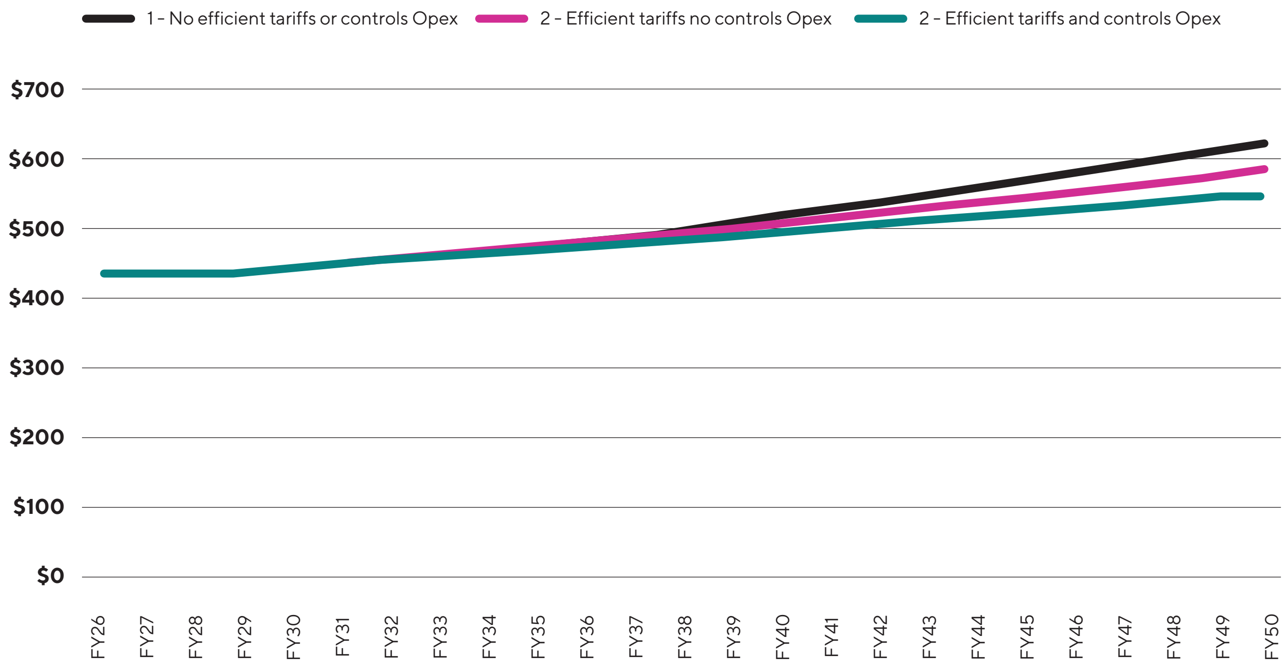
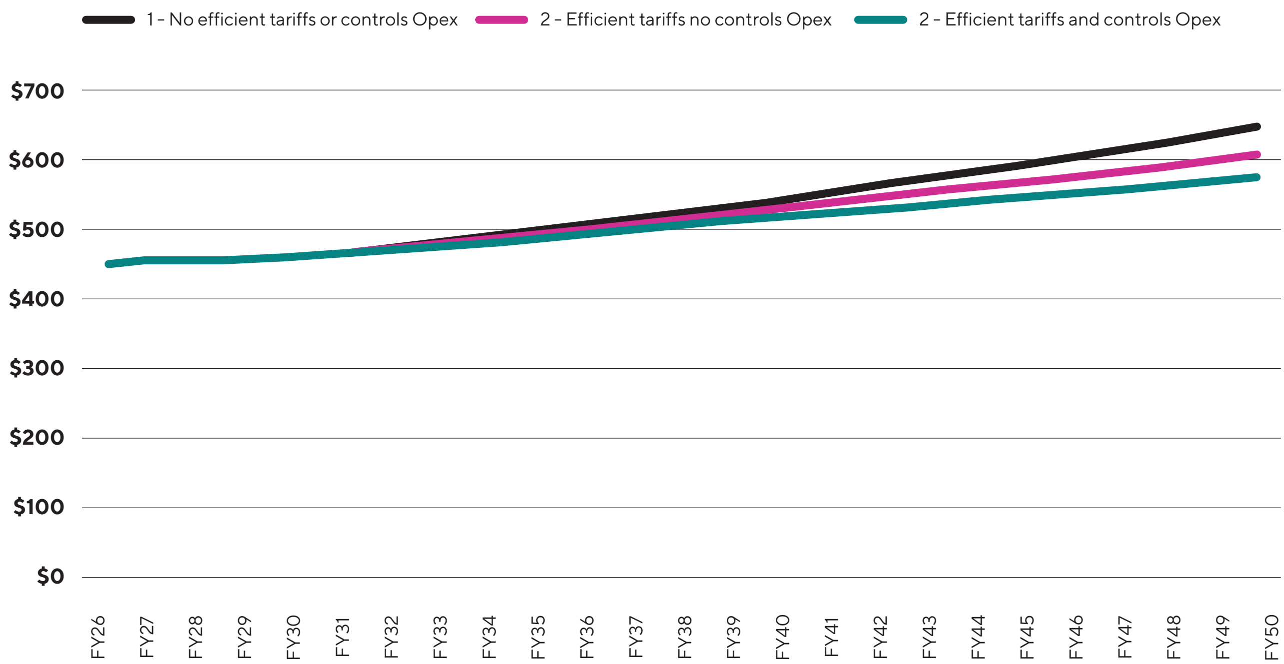


Figure 11 – Ergon's projected operating expenditure for each scenario ($m, real 2024)



3.5 Revenue

We have used the formulae in the current version of the AER's Post Tax Revenue Model to determine the projected revenue based on the expenditure forecast outputs identified in section 3.3.

Revenue is significantly lower in Scenario 3, followed by Scenario 2. This reflects the lower capital and operating expenditure projected under time-variable tariffs and dynamic controls as discussed in Section 3.3 and 3.4. **Figure 12** and **13** identify the projected annual revenue requirements for Energex and Ergon respectively. A key difference in the results is that Ergon's revenue is projected to be higher under all scenarios relative to Energex largely due to higher capital expenditure which increases the Regulatory Asset Base over time, and due to differences in depreciation schedules.

Figure 12 – Energex' projected annual revenue requirement for each scenario ($m, real 2024)

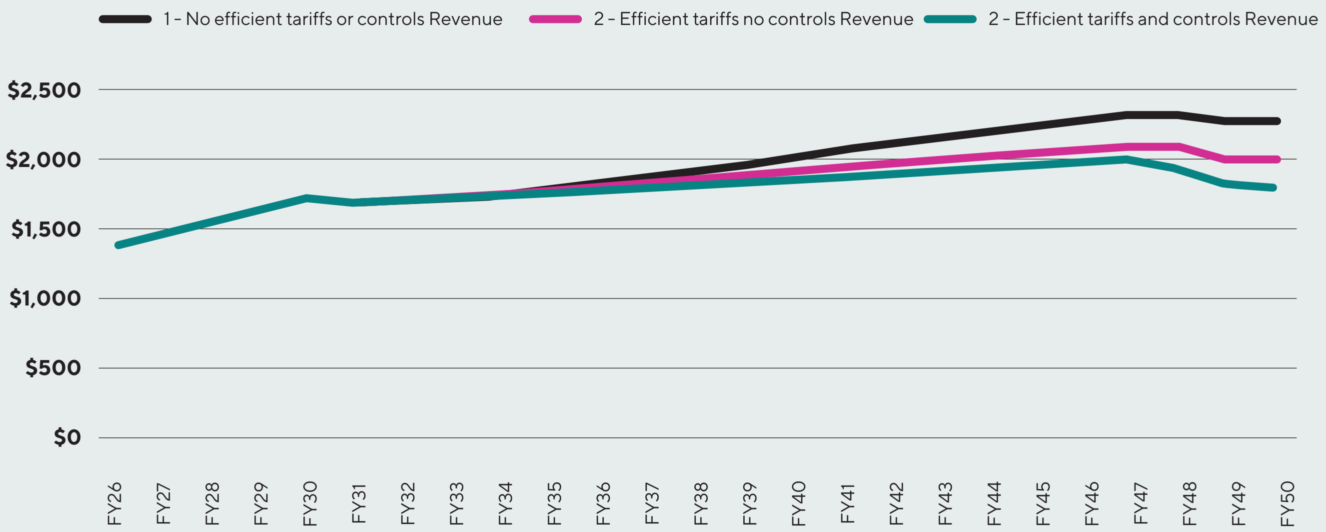
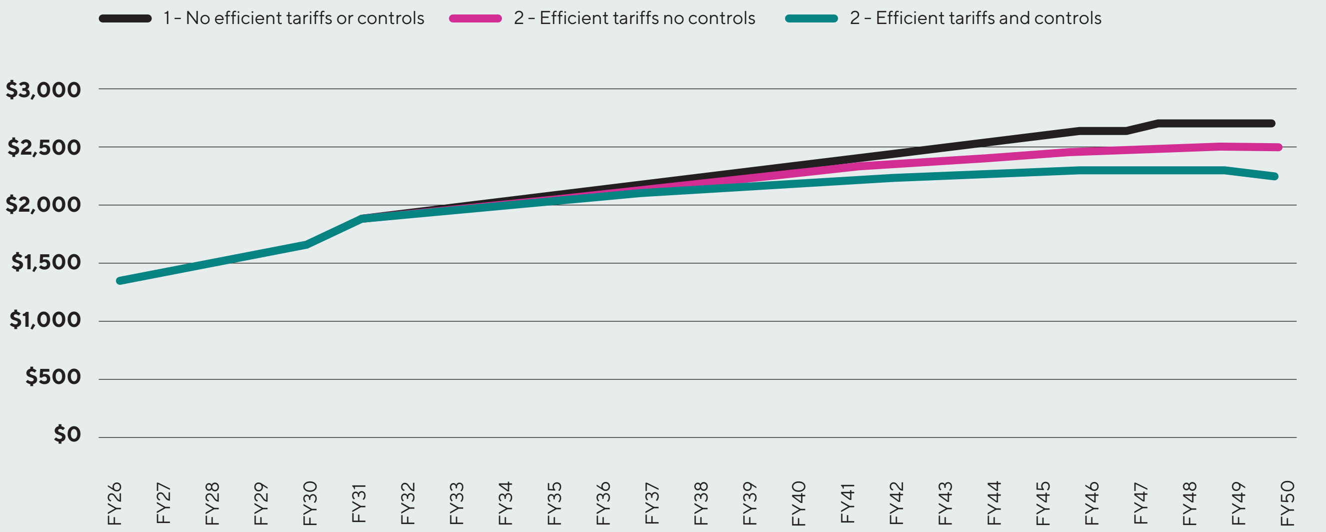


Figure 13 – Ergon's projected annual revenue requirement for each scenario ($m, real 2024)



3.6 Unit price for customer base (Cost per customer per electricity)

We have used cents per kilowatt hour as the basis for identifying the movement in network prices for 'customers as a whole'. This reflects the unit price of electricity and is based on the relative change in revenue requirement compared to the change in energy consumption.

The model finds that the unit price is significantly lower under time-variable tariffs and dynamic controls (scenario 3). Scenario 2 also reduces unit prices relative to tariffs which are not time-variable. **Figure 14** and **15** show the cents per kilowatt hour for Energex and Ergon respectively.

The results demonstrate that the customer base as a whole benefits under tariff reform and dynamic controls. This enables Energex and Ergon to set lower tariff rates for customers.

Figure 14 – Energex's projected unit price for network electricity (c/kWh, real 2024)

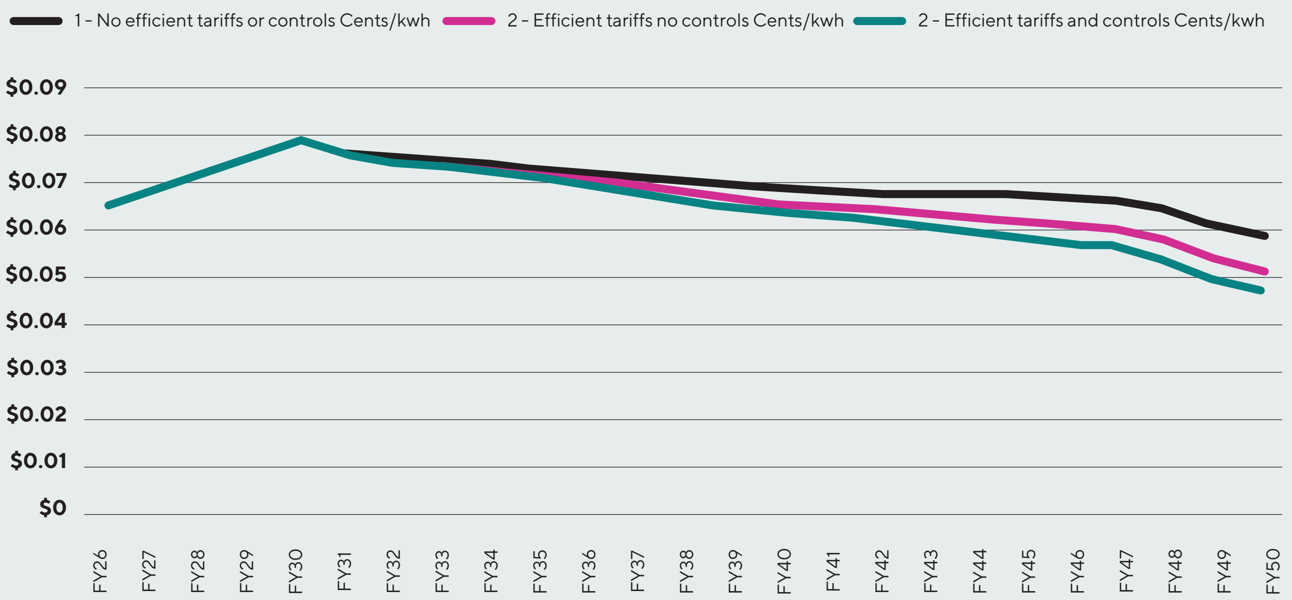
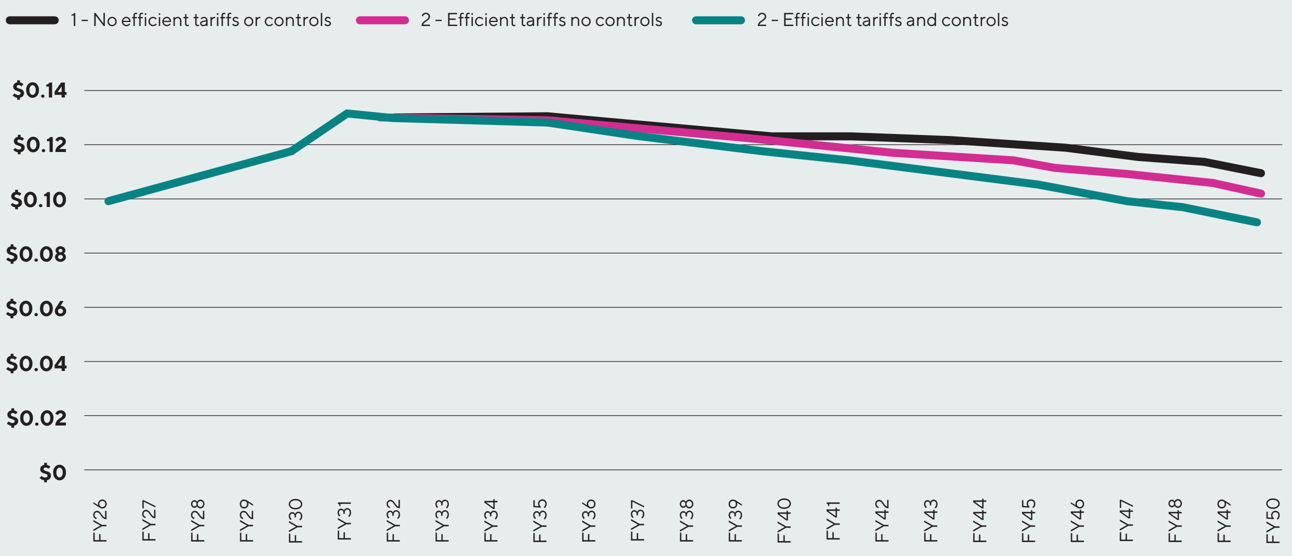


Figure 15 – Ergon's projected unit price for network electricity (c/kWh, real 2024)



4. Bill impacts

The lower revenue requirements projected in the model results indicate that Energex and Ergon can set lower tariff rates for residential customers. While our analysis found that some customers will benefit more than others, we found that most customers are likely to be 'better off' under tariff reform and dynamic controls. This includes customers that may not be able to reduce demand in peak times as much as other customers.

We have been provided with data on four 'residential personas' used in Energy Queensland's engagement with stakeholders on changes to tariffs. This includes:

- **Azami -** A customer with high energy consumption and demand from the grid, with limited access to energy efficiency or customer energy resources. We have assumed this customer does not purchase an electric vehicle in the 2025 to 2050 period.
- **John -** A customer with median energy consumption and demand from the grid, with moderate access to energy efficiency, but no customer energy resources. We have assumed this customer purchases two electric vehicles in the 2025 to 2050 period.
- **Arush -** A customer with low energy consumption and proportionately low demand from the grid. The customer has low access to energy efficiency, and has solar panels. The customer does not purchase an electric vehicle in the 2025 to 2050 period.
- **Zahara –** A customer with low energy consumption but disproportionately high demand from the grid. The customer has a relatively large solar panels, and does not purchase a battery. The customer purchases 1 electric vehicle in the 2025 to 2050 period.

The results for these customers with assumed future characteristics are presented in the next section.

4.1 Azami - Customer with high monthly demand and limited opportunities

We sought to test if a customer with high peak demand usage and less opportunity to reduce demand is likely to share in the benefits of tariff reform and dynamic controls. We considered a customer that may find it more difficult to shift and diversify appliance use outside of the peak period. Our modelling used the following assumptions:

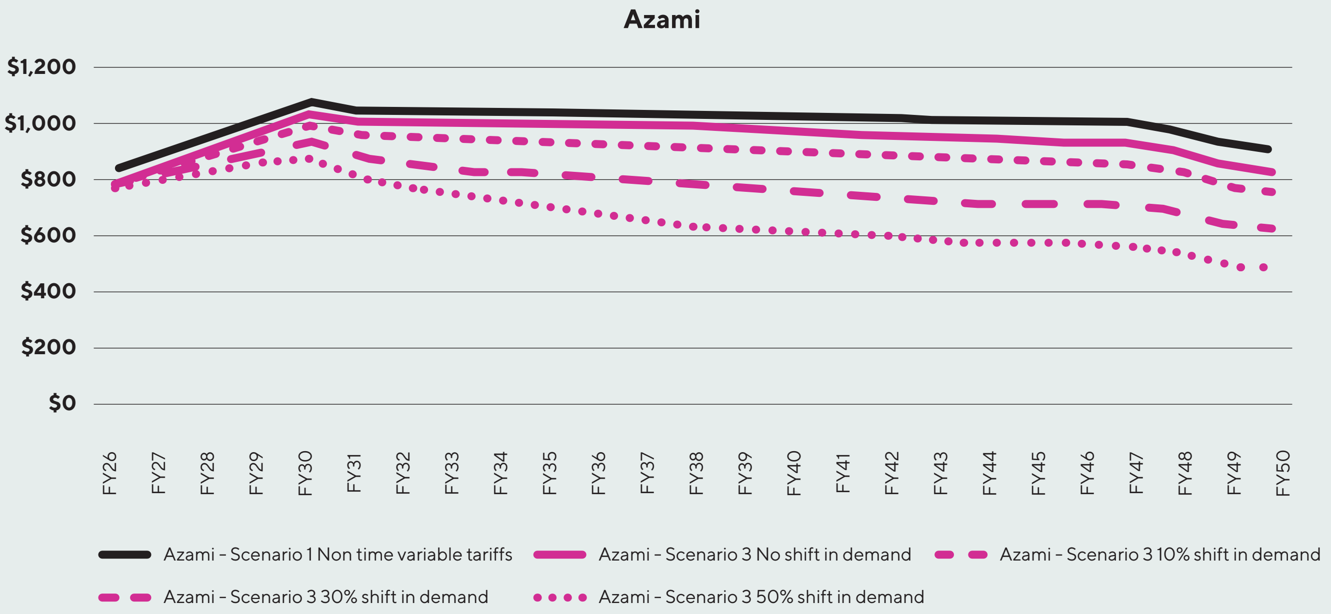
- Limited access to energy efficiency that limits the ability to reduce air conditioner usage.
- High annual energy consumption and high demand in peak periods
- Limited ability to purchase an electric vehicle, an appliance that is more amenable to charging outside of peak periods.
- No access to customer energy resources that provide flexibility in energy consumption and storage.

Based on this criteria, we considered a customer in 2025 with annual energy consumption of 8200kWh and relatively high monthly demand in the peak period of 5.75kw, no access to energy efficiency, and no electric vehicles, solar or batteries. We compared the annual bill the customer would face under Scenario 1 where the bill is not impacted by changes in energy usage at peak times, with the bill the customer would face under Scenario 3. We identified the bill impact depending on how much a customer could reduce their monthly demand by FY2050 relative to FY2025.

Figure 16 shows that under all scenarios, the customer is better off when demand tariffs are initially introduced in 2025. If the customer is unable to reduce their peak consumption, then by 2030 the customer still is no worse off but the benefit diminishes. However, if the customer is able to reduce peak demand, they will continue to face a material reduction in their network bill.

By the FY2050 period, the customer faces a much lower network bill than Scenario 3 than Scenario 1 assuming no difference in energy consumption or demand between the scenarios. If the customer responds to price signals or opportunities to participate in dynamic controls, they will have materially lower electricity bills compared to Scenario 1.

Figure 16 – Bill impact for customers with high monthly demand ($, real 2024)



4.2 John - Customer with median consumption and demand

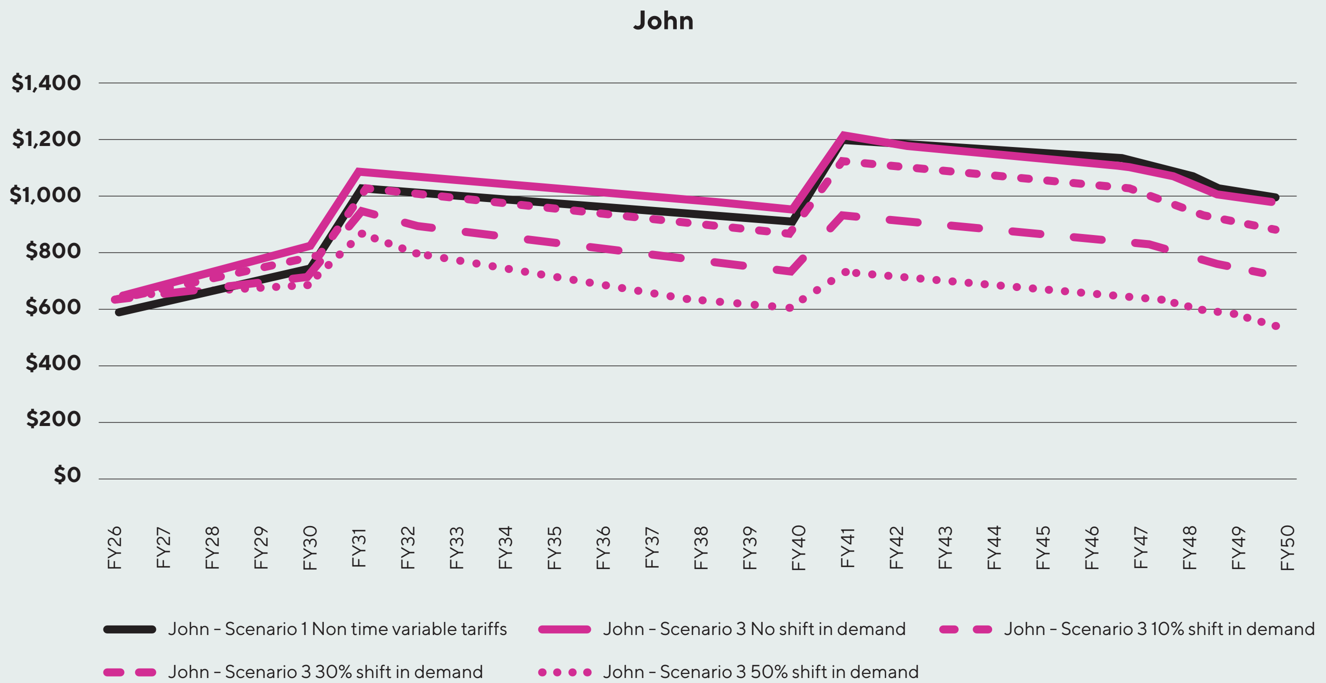
Our second residential persona could be seen as more of a typical customer with median energy consumption and demand from the grid, but without access to solar and batteries. Our modelling used the following assumptions:

- No access to energy efficiency that limits the ability to reduce air conditioner usage.
- Moderate annual energy consumption and high demand in peak periods
- Likely to purchase electric vehicles, an appliance that is more amenable to charging outside of peak periods.
- Limited access to customer energy resources that provide flexibility in energy consumption and storage.

Based on this criteria, we considered a customer in 2025 with annual energy consumption of 5300kWh and relatively high monthly demand in the peak period of 4.34kw, 1% energy efficiency each year including during demand periods, 2 electric vehicles (purchased in 2030 and 2040), and no solar or batteries. We compared the annual bill the customer would face under Scenario 1 where the bill is not impacted by changes in energy usage at peak times, with the bill the customer would face under Scenario 3. We identified the bill impact dependent on how much a customer could reduce their monthly demand by FY2050 relative to FY2025.

By the FY2050 period, the customer faces a similar network bill for Scenario 1 and 3 if the customer does not shift demand. If the customer responds to price signals or opportunities to participate in dynamic controls, they will have materially lower electricity bills compared to Scenario 1.

Figure 17 – Bill impact for customers with high monthly demand ($, real 2024)



4.3 Arush – Customer with low consumption and demand

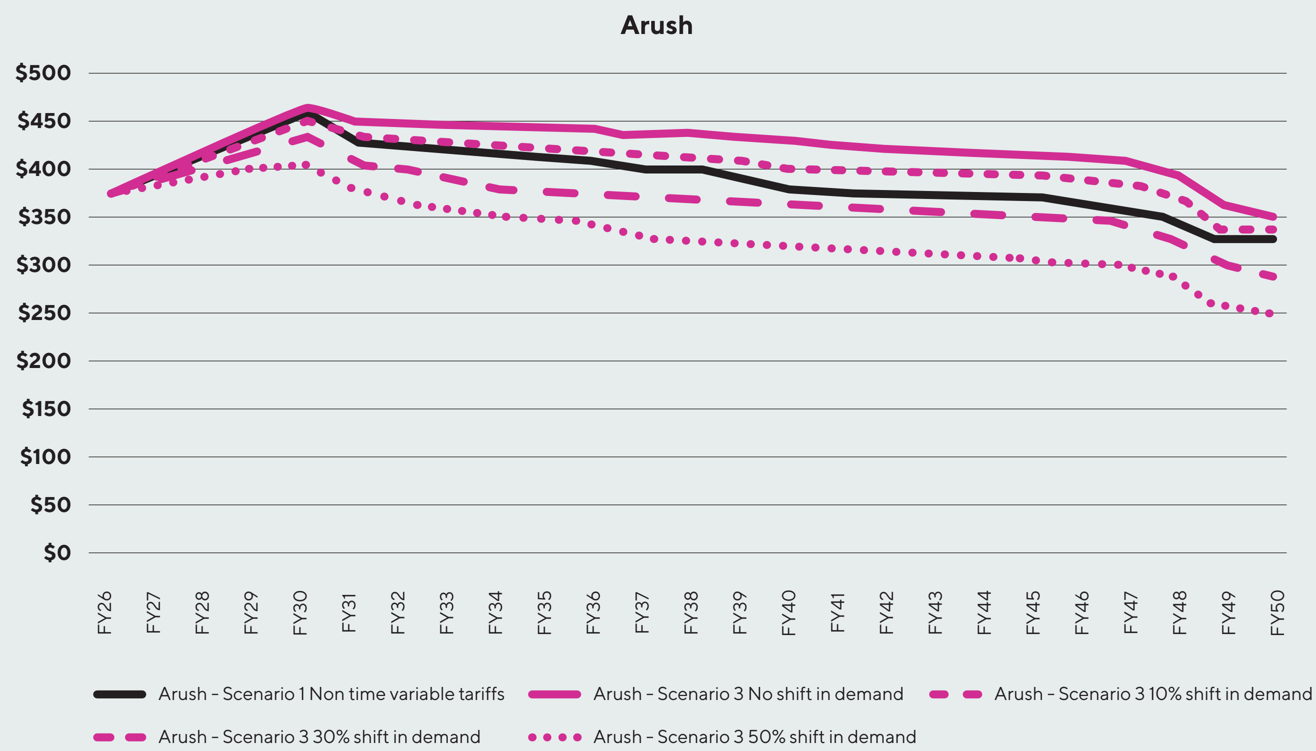
Our third residential persona has very low energy consumption and demand from the grid, and no access to customer energy resources. This type of customer would be expected to face a relatively higher fixed charge relative to other tariff charges, and limited means to reduce demand below current levels. Our modelling used the following assumptions:

- Limited access to energy efficiency that limits the ability to reduce air conditioner usage.
- Very low annual energy consumption and low demand in peak periods.
- Not likely to purchase electric vehicles, an appliance that is more amenable to charging outside of peak periods.
- No access to customer energy resources that provide flexibility in energy consumption and storage.

Based on this criteria, we considered a customer in 2025 with annual energy consumption of 2400kWh and relatively high monthly demand in the peak period of 1.82kw, 0.25% energy efficiency each year including during demand periods, no electric vehicles, and no solar or batteries. We compared the annual bill the customer would face under Scenario 1 where the bill is not impacted by changes in energy usage at peak times, with the bill the customer would face under Scenario 3. We identified the bill impact dependent on how much a customer could reduce their monthly demand by FY2050 relative to FY2025.

By the FY2050 period, the customer faces a higher network bill than Scenario 3 than Scenario 1 assuming no difference in energy consumption or demand between the scenarios. The customer would need to reduce demand by close to 20 per cent to achieve the same network price under flat/fixed tariffs in Scenario 1. This may be a customer segment that would struggle to achieve that level of reduction in their demand given they have low consumption and do not purchase electric vehicles which are more amenable to load shifting.

Figure 18 – Bill impact for customers with high monthly demand ($, real 2024)



4.4 Zahara - Customer with solar and high demand from grid

Our fourth residential persona has relatively low energy consumption, and disproportionately high demand from the grid. The underlying reason is that the customer uses solar in the daytime to power their homes, but uses the grid in the evening peak period. This customer also exports the solar in the middle of the day. Our modelling used the following assumptions:

- Moderate access to energy efficiency that limits the ability to reduce air conditioner usage.
- Low annual energy consumption, low demand but disproportionately higher than energy consumption.
- Likely to purchase one electric vehicle, an appliance that is amenable to charging outside of peak periods.
- Access to customer energy resources that provide flexibility in energy consumption and storage.

Based on this criteria, we considered a customer in 2025 with annual energy consumption of 3800kWh and relatively high monthly demand in the peak period of 4.34kw, 0.5% energy efficiency each year including during demand periods, 1 electric vehicle purchased in 2030 and 2040, solar already installed, and no battery. We compared the annual bill the customer would face under Scenario 1 where the bill is not impacted by changes in energy usage at peak times, with the bill the customer would face under Scenario 3. We identified the bill impact dependent on how much a customer could reduce their monthly demand by FY2050 relative to FY2025.

By the FY2050 period, the customer faces a much higher network bill than Scenario 3 than Scenario 1 assuming no difference in energy consumption or demand between the scenarios. If the customer responds to price signals or opportunities to participate in dynamic controls, they will have materially lower electricity bills compared to Scenario 1. Our view is that this type of customer could achieve a 30 per cent reduction or more in their monthly demand particularly their electric vehicle and access to energy efficiency.

Figure 19 – Bill impact for customers with high monthly demand ($, real 2024)