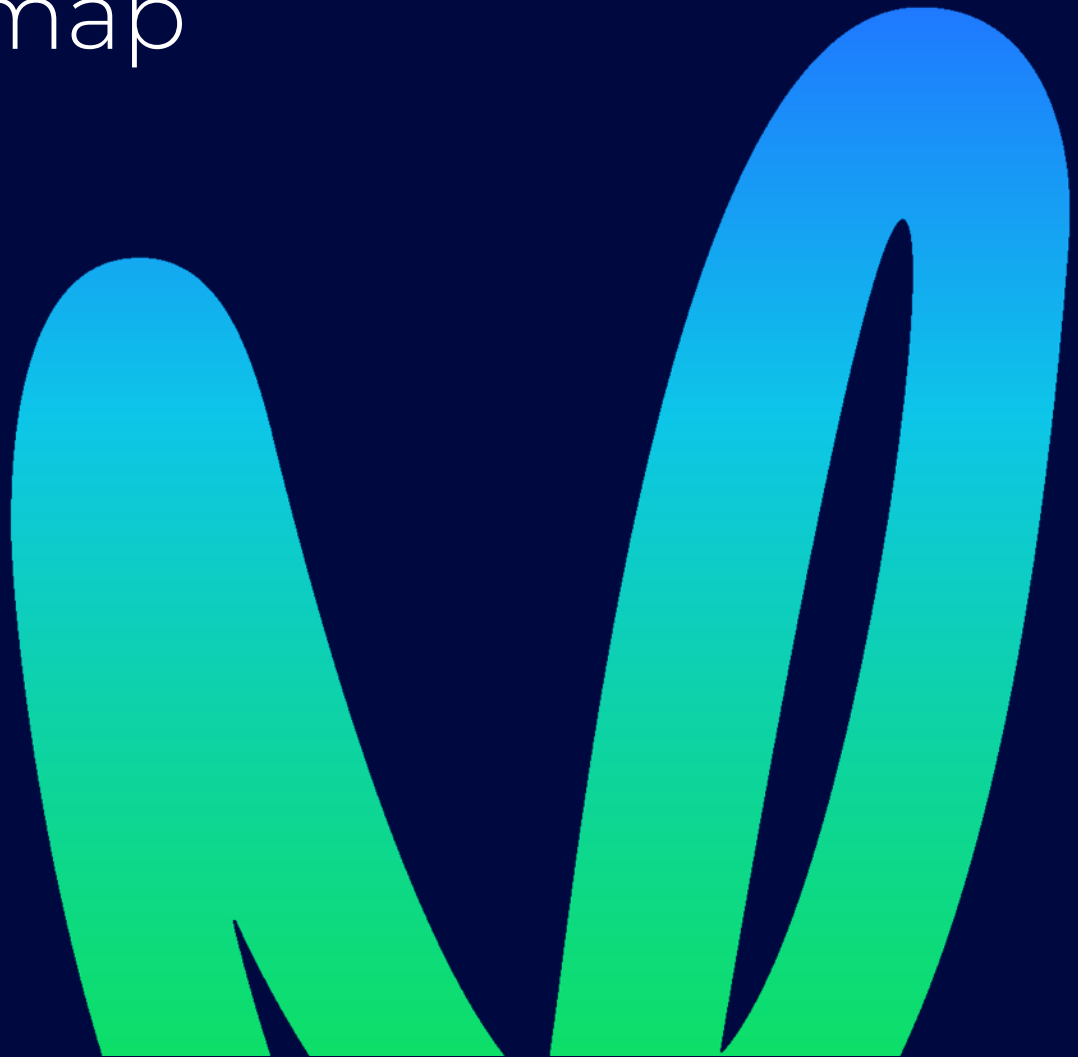
Distribution Pricing Roadmap

April 2023



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INTRODUCTION

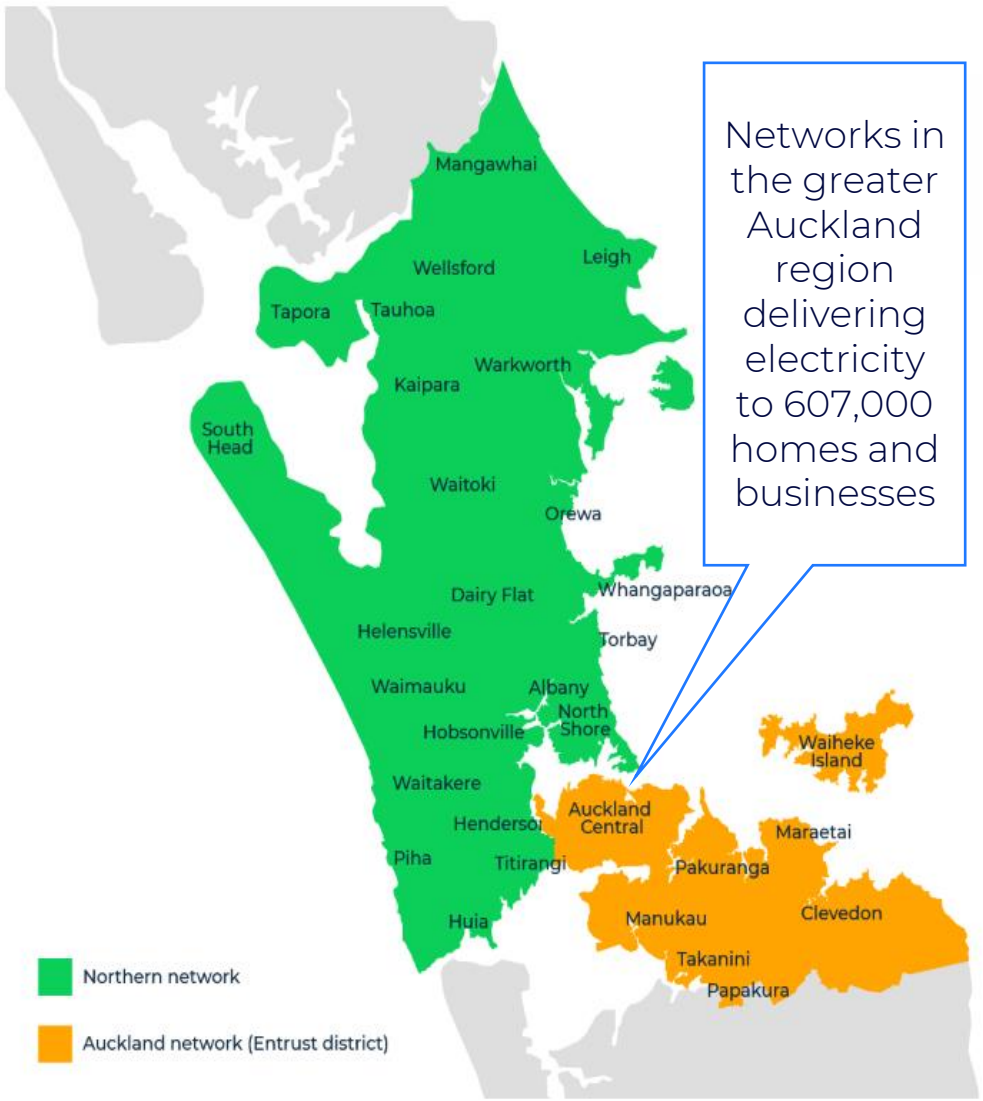
Vector provides electricity lines services to consumers via its electricity distribution network covering the Auckland region. Vector recovers the cost of providing electricity lines services to:

- existing connections through electricity distribution prices (lines charges), including published standard prices[1] and (in a limited number of circumstances) non-standard prices; and
- new or enhanced connections through capital contributions[2] (upfront one-off payment) as well as line charges.

Our electricity pricing roadmap sets out how we are evolving our prices to enable and deliver better outcomes for consumers, though recognising for most connections we price/ bill the end user's retailer not the end user themselves. The roadmap is an evolving document and is updated periodically, but at least once a year.

Please note that this document does not contain our Pricing Methodology[3] which is published every year alongside our pricing schedules.

This roadmap sets out, as at the month of publication, our view of the reform we believe will deliver the best outcomes, however we note that, we are not bound to follow the initiatives described here as we update our views on how to best deliver for our customers.



[1] Pricing schedule available at https://www.vector.co.nz/personal/electricity/about-our-network/pricing
[2] Capital contribution policy available at https://www.vector.co.nz/about-us/regulatory/disclosures-electricity/capital-contributions
[3] Pricing methodology available at https://www.vector.co.nz/about-us/regulatory/disclosures-electricity/pricing-methodology

POLICY & REGULATORY CONTEXT

Electricity Authority's (EA) Pricing Principles (2019)

Government's final Emissions Reduction Plan

EA's decision on new Transmission Pricing Methodology (TPM)

EA's Open letter to EDBs on pricing reform (Sep 2022)

Low-Fixed Charges (LFC) revoked by Cabinet

NZCC's Input Methodology review

EA release Distribution Pricing Practice Note v2.2 (Oct 2022)

EA's Letter on distribution pricing scorecards (Dec 2022)

- There is uncertainty around the existing regulatory framework. Additionally, new business models are evolving in response to new consumer demands, new technologies and decarbonisation. We see this new environment as an opportunity to revise our pricing pro-actively in an evolving market.
- Distribution pricing is facing many drivers of change both from within the industry but also externally. Decarbonisation of the sector is key to achieve the government's net zero target by 2050. Electricity Distribution Businesses (EDBs) will be critical enablers. Vector is seeking to be at the forefront of these changes.
- Boston Consulting Group's (BCG) recent report, *The Future is Electric*[4], concluded that a "smart system" scenario, in which flexible resources and cost-reflective pricing are operated in such a way as to avoid opex and capex in generation and distribution/transmission infrastructure, can save $10bn in costs to consumers out to 2050.
- In the regulatory space the EA has been actively seeking views on the regulatory settings for distributors, reached a final decision for Transpower's TPM and in October 2022 released a new version of its pricing Practice Note.
- Meanwhile the Commerce Commission is in the thick of its review of the Input Methodologies to ensure their framework is fit for purpose in light of the decarbonisation and digitalisation of New Zealand's energy networks.

[4] Available online at https://www.bcg.com/publications/2022/climate-change-in-new-zealand

WHO THIS ROADMAP IS FOR?

- Our pricing roadmap is intended for a wide audience but we want to ensure you know who you are when reading this document.
- To that end we have provided some useful definitions of terms we use throughout the roadmap.
- Please note that you could fall into more than one of the categories listed.

Consumer: end of user of our electricity network, someone who purchases and uses or consumers the electricity but does not resell it (for e.g. mum and dad, local business, commercial factory)

Customer: The EA has determined the retailer as the customer when it comes to distribution pricing. They purchase electricity from the wholesale market to sell to residential and business users (consumers) and purchase the transportation/delivery service of this electricity from distributors

Installation Control Point (ICP): physical point of connection on a local network or an embedded network that the distributor nominates as the point at which a retailer will be deemed to supply electricity to a consumer

Stakeholder: a party or individual that (in this context) has an interest in Vector's pricing reform and can either affect or be affected by the changes. They can be internal or external to the company (for e.g. regulators, flexibility traders)

Direct bill end user: the end consumer who pays the retailer's electricity invoice

APPROACH TO OUR ANNUAL PRICE REVIEW

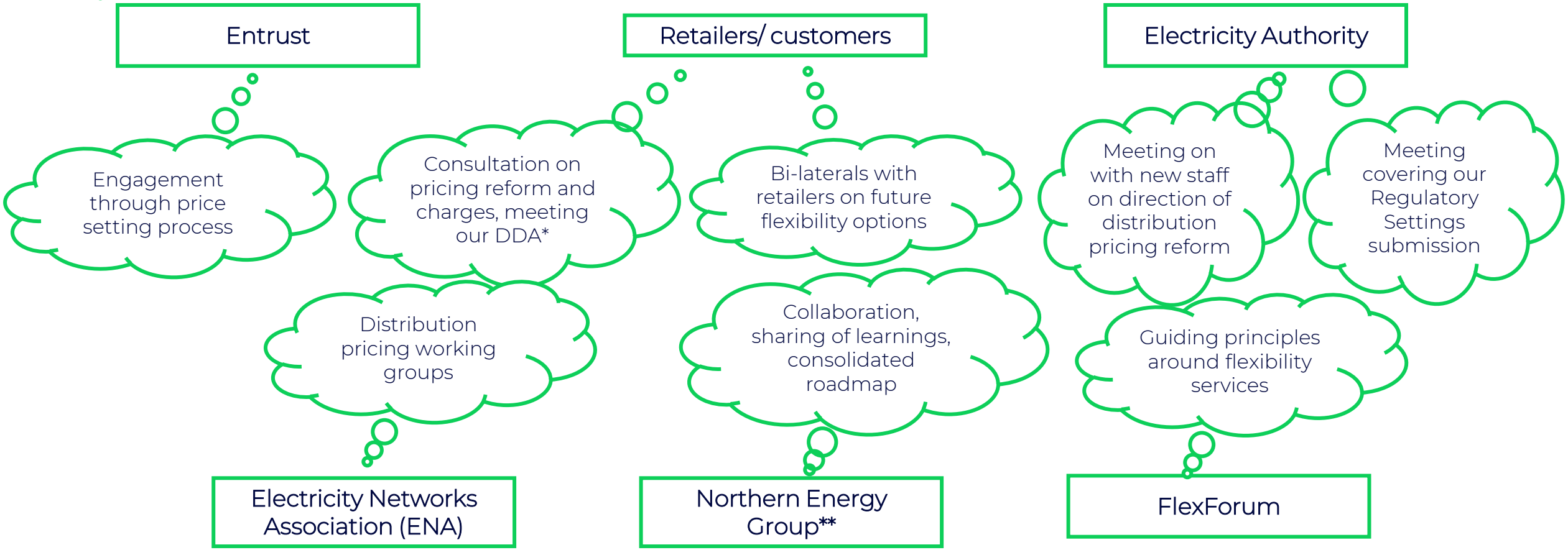
- Data driven analysis
- Meet regulatory requirements including Electricity Authority's Pricing Principles
- Ensure prices appropriately reflect costs to the system
- Assessment of evolving technologies (i.e. distributed energy resources (DERs))

ANNUAL PRICE REVIEW

- Consumer insights
- Leverage international best practice and expert advice
- Industry engagement (e.g. customers and direct bill end users)
- Stakeholder consultation

For further details of our approach to pricing reform please see Appendix 2

EXTERNAL ENGAGEMENT



* Our Default Distributor Agreement (DDA) with retailers sets out the terms by which we need to consult when setting prices. Vector ensures reasonable time is given to ensure retailers can updates systems and processes.

** The Northern Energy Group (NEG) was formed in 2019 and consists of Counties Energy, Northpower, The Lines Company, Top Energy, Waipa Networks and Vector. One if its key workstreams is distribution pricing.

Vector will be ramping up its engagement with consumers and stakeholders throughout 2023.

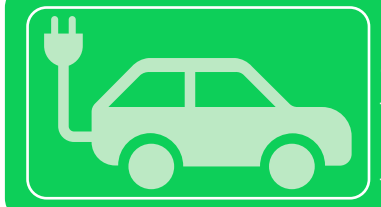
INTERNAL ENGAGEMENT

Executive + Board

Our Board of Directors is involved in the price setting process and is instrumental in shaping the vision for our pricing reform

AMP Steering Committee

Our Asset Management Plan (AMP) Steering Committee looks actively at how changes to forecasts and network configuration could impact our pricing reform including for example our capital contributions policy



EV Steering Committee

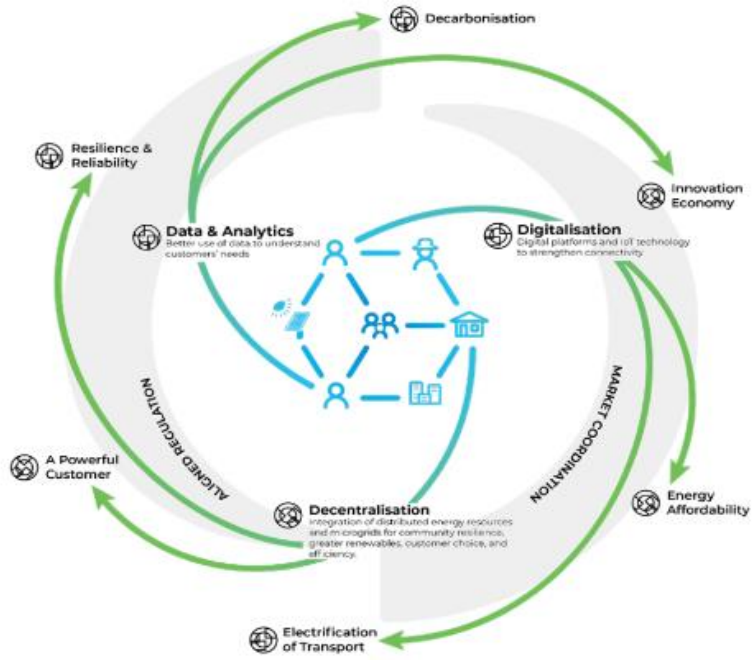
Our EV Steering Committee looks actively at our consumers' transition away from petrol and diesel cars (and the general increase in DERs) and how that affects the network including the role that pricing plays in this transformation

IM Review Steering Committee

Our Input Methodology (IM) Steering Committee reviews the Commerce Commission's regulatory framework including how decarbonisation sits within the settings which has a direct link to the EA's work on both regulatory settings and pricing

VECTOR'S SYMPHONY STRATEGY

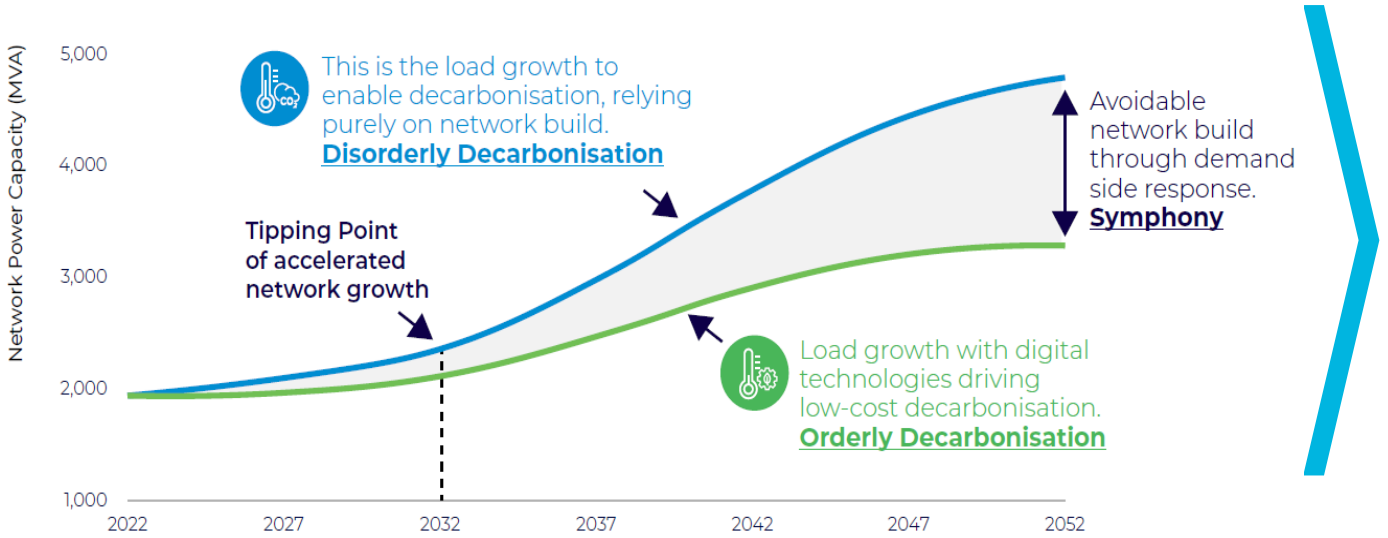
Vector's Symphony Strategy is about creating a system for our consumers that fits the future, delivering safe, cleaner, more reliable and affordable energy solutions that are developed with consumers at the centre, and which helps us navigate future uncertainty.



Symphony is how we intend to transform the traditional poles and wires of the electricity networks serving the Auckland region into an intelligent energy system where consumers have more choice and control.

EMBEDDING SYMPHONY THROUGH PRICING

- If large, flexible loads such as EV charging are unmanaged, we expect peak congestion to increase accordingly and Vector's network capacity would need to more than double to accommodate that increase in peak load.

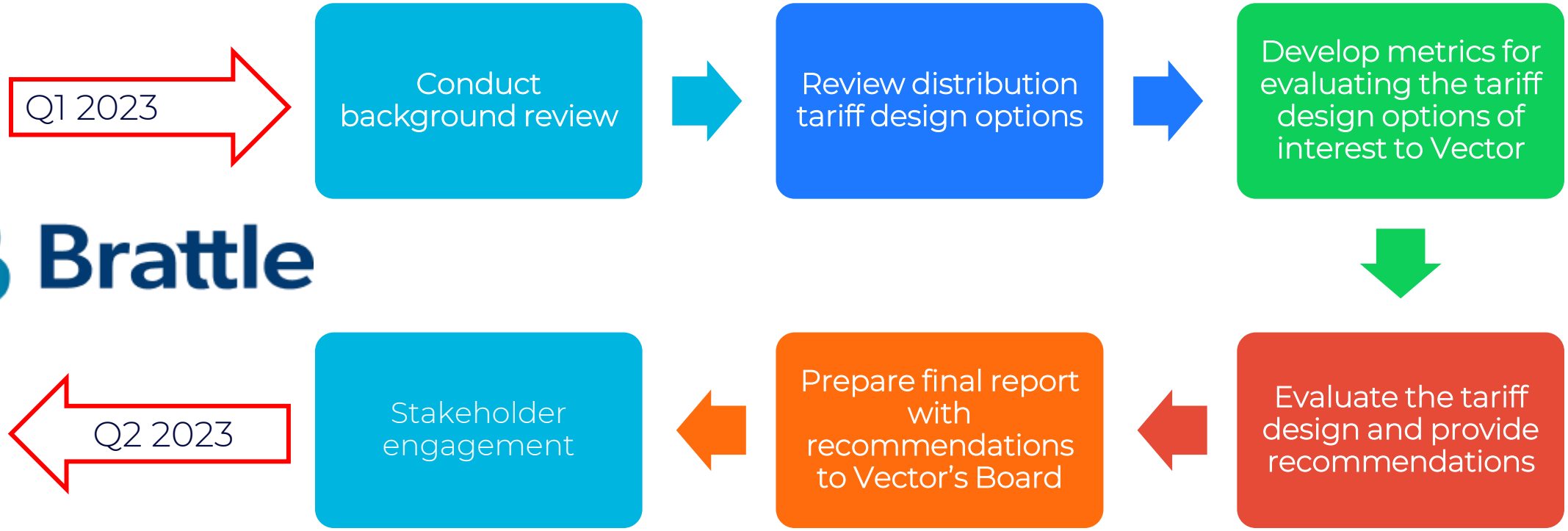


Source: Vector's 2022 TCFD Report

Distribution pricing reform will have a key role supporting Vector achieving its Symphony ambitions, for instance by being an incentive to encourage compliance with dynamic operating envelopes (DOEs). Making the most of the flexibility in DER, shifting loads out of peak congestion periods, this will avoid the need for significant network reinforcement. Managed EV charging is forecasted to be the most abundant resource for shifting demand away from peak congestion periods. Hot water load shifting will also play a significant role in managing demand.

PRICING VISION

- Vector has engaged the Brattle Group to develop a "pricing vision document" that presents unconstrained recommendations for designing Vector's distribution tariff to support its Symphony strategy.



Brattle

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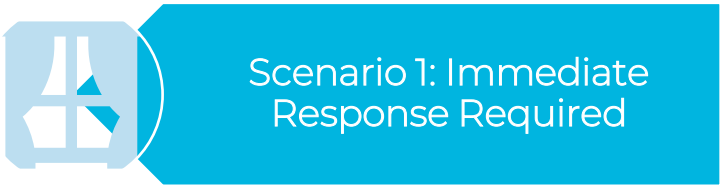
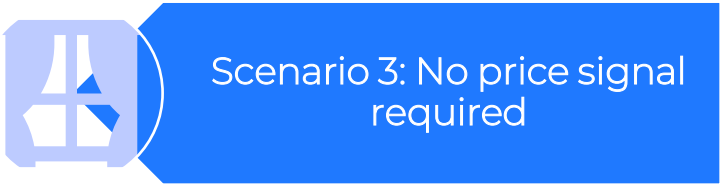
WINDOW OF OPPORTUNITY

The Authority defines the 'window of opportunity' as a time dimension of anticipated congestion that is created by the interplay of increasing demand, cost reflective pricing and price signalling, and investments by distributors, customers and flexibility traders.



Scenario 1: Immediate Response Required

Scenario 2: Cost-reflective price signal required



Scenario 3: No price signal required

See our case studies in Appendix 1 to see how the window of opportunity plays out in reality

At Vector our thinking around pricing reform is primarily focussed on Scenario 2 as it links well with our Symphony roadmap and the work we are doing on our pricing vision

Some of the challenges we have put forward to Brattle include:

- How much of the price signal should reflect future costs?
- How sharp does the TOU signal need to be to balance network constraints and customer/ consumer responsiveness?
- To what extent do distribution prices need to consider the connection fees paid by the customer?
- With more and more distributed generation coming on to the network what role should injection tariffs play in distribution pricing design?

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SYMPHONY ALIGNS WITH THE EA'S FOCUS AREAS

- The Authority has sent an open letter to distributors setting out its expectations for pricing reform. The letter sets out five areas for distributors to focus on:

    1. Planning for future congestion
    2. Avoiding first mover disadvantage for new/expanded connections
    3. Transmission pricing pass-through
    4. Increased use of fixed charges
    5. Not applying use-based charges (e.g., AMD) to recover fixed costs

- The direction of our Symphony strategy on pricing reform is consistent with the areas the EA is looking for EDBs to focus on when it comes to distribution pricing. For that reason Vector was already underway with addressing these areas.

- The next couple of pages will demonstrate Vector's progress against each of the five focus areas.

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1. PLANNING FOR FUTURE CONGESTION

- Vector has made considerable progress in this focus area with the implementation of three changes to our PY24 prices which are detailed below.

- The changes demonstrate how Vector is thinking about our network's congestion in terms of:

  - Addressing congestion arising from New Zealand's key initial emissions reduction activities
  - Peak vs off peak time bands
  - The impacts of the TPM Regional Coincident Peak Demand (RCPD) change

Changes implemented from 1st April 2023	Rationale
Have a separate distributed energy resource (DER) tariff for customers with load that can either be directly connected to or respond to our distributed energy resource management system	To prepare for future load management consistently with the pricing principles, and avoid future investment
Only have a peak signal in winter for time of use tariffs as there is at present no peak signal required in the summer	Peak price signal only targeting actual peaks periods where network congestion may occur. This unlocks more potential for this flexibility to be directed towards other uses, outside of peak periods
Reduce the price differential between controlled and uncontrolled hot water prices on the Auckland network as the benefit of hot water control is significantly reduced now the new TPM is in place	Ripple control no longer used to manage transmission peaks as no financial benefit to consumers under new TPM
Setting our ToU prices on the basis of a long-term, network-wide long-run marginal cost (LRMC).	Enables customers (and consumers) to make informed choices between growing demand in peak periods, and saving future costs.

2. TRANSMISSION PRICING PASS-THROUGH

- The key considerations in respect of the new TPM as outlined in the EA's transmission charge pass-through guidance are:
  - Transmission charges should not influence grid usage;
  - The prospect of future charges should influence investment; and
  - Locational variations in historical costs may influence investment.
- Following a detailed review by an independent expert and legal advice, a GXP allocation pricing approach was adopted to:
  - minimise the revenue risk; and
  - be consistent with the pricing principles and guidance, which meant transmission cost recover pricing was not tied to individual ICPs.

Change implemented from 1st April 2023	Rationale
Move to grid exit point (GXP) based pricing for the recovery of transmission pass-through costs from retailers (bulk wholesale charge to retailers)	Transmission cost recovery is more consistent with how we are charged by Transpower under the new TPM. Transmission costs are more directly borne by those that benefit from them (i.e. no subsidisation between GXPs)

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3. INCREASED USE OF FIXED CHARGES

- A large portion of network costs are fixed in order to recover the costs of the equipment delivering electricity to consumers.
- Given network costs are largely fixed we are typically applying any price increases to fixed components and price decreases to variable components. This means not all consumers will see the weighted average price change when prices change.
- With the phase-out path for the low fixed charge tariff regulations now clear, Vector is transitioning to fixed charges for greater cost reflectivity.
- We started this transition in our 1st April 2022 prices and will continue it over the Default Price-Quality Path (DPP) regulatory period and beyond. The transition will be complete when our variable components are only signalling variable costs, and our fixed charges are recovering all residual revenues.

Change implemented from 1st April 2023	Rationale
Adjust the low residential user fixed daily line charge (from $0.30 to $0.45 per day)	To reflect the amended low user fixed charge regulations
Residential standard and General TOU have pass-through prices moved to the fixed daily price component from volume component	To ensure share of revenue occurs at the fixed charge level

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4. TRANSITION AWAY FROM USE-BASED CHARGES

- For residential and general time of use tariffs our Peak price signal only targets actual peaks periods where network congestion may occur, because these consumers currently contribute to our winter-peaking low voltage network. The time of use differential is based on an estimate of the long-run investment cost on an electricity network. Sapere, in a report commissioned by the EA, estimated the value of DERs to distribution networks at $98 per kW per annum.

- For commercial tariffs, whilst we decreasing variable charges we are concentrating on aligning our regional tariffs between Auckland and Northern

5. AVOIDING FIRST MOVER DISADVANTAGE (FMD)

- Vector's capital contribution policy is a means to address first mover disadvantage issues. We review our policy and the prices within it on an annual basis. Please see the next slide for further details.

- Vector notes the issue regarding the incremental cost pricing principle applied to distributed generation under Part 6 of the Code, and the implications of that principle for the recovery of the costs of building anticipatory capacity into these connections.

- We are please that the Authority is actively considering this issue.

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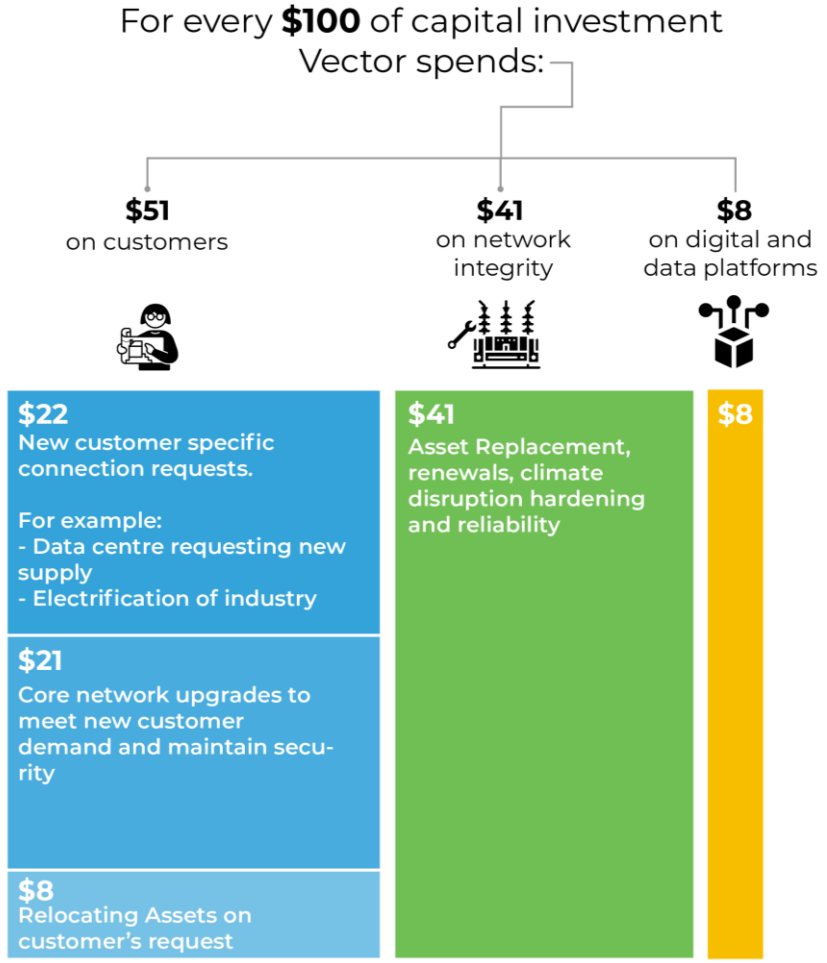
VECTOR'S CAPITAL CONTRIBUTIONS POLICY

- Vector capital contributions policy[5] was last reviewed in 2021 and describes:
  - Objectives of the policy (Section 2)
  - Methodology and determination of costs (Sections 4 & 5)
  - Types and treatments of new connections (Section 7)
  - Adherence to the EA's pricing principles (Section 11)
- We will be reviewing our capital contributions policy in parallel with the Input Methodology (IM) review – the Commerce Commission's determinations could have a real impact on EDBs' cashflows
- Vector will ensure that the IM draft and final decisions (in June and December 2023) align with our current thinking
- Our capital contributions policy reviews focus on alignment with pricing principles, the impact on consumer behaviour and satisfaction, as well as is ensuring the policy is equitable

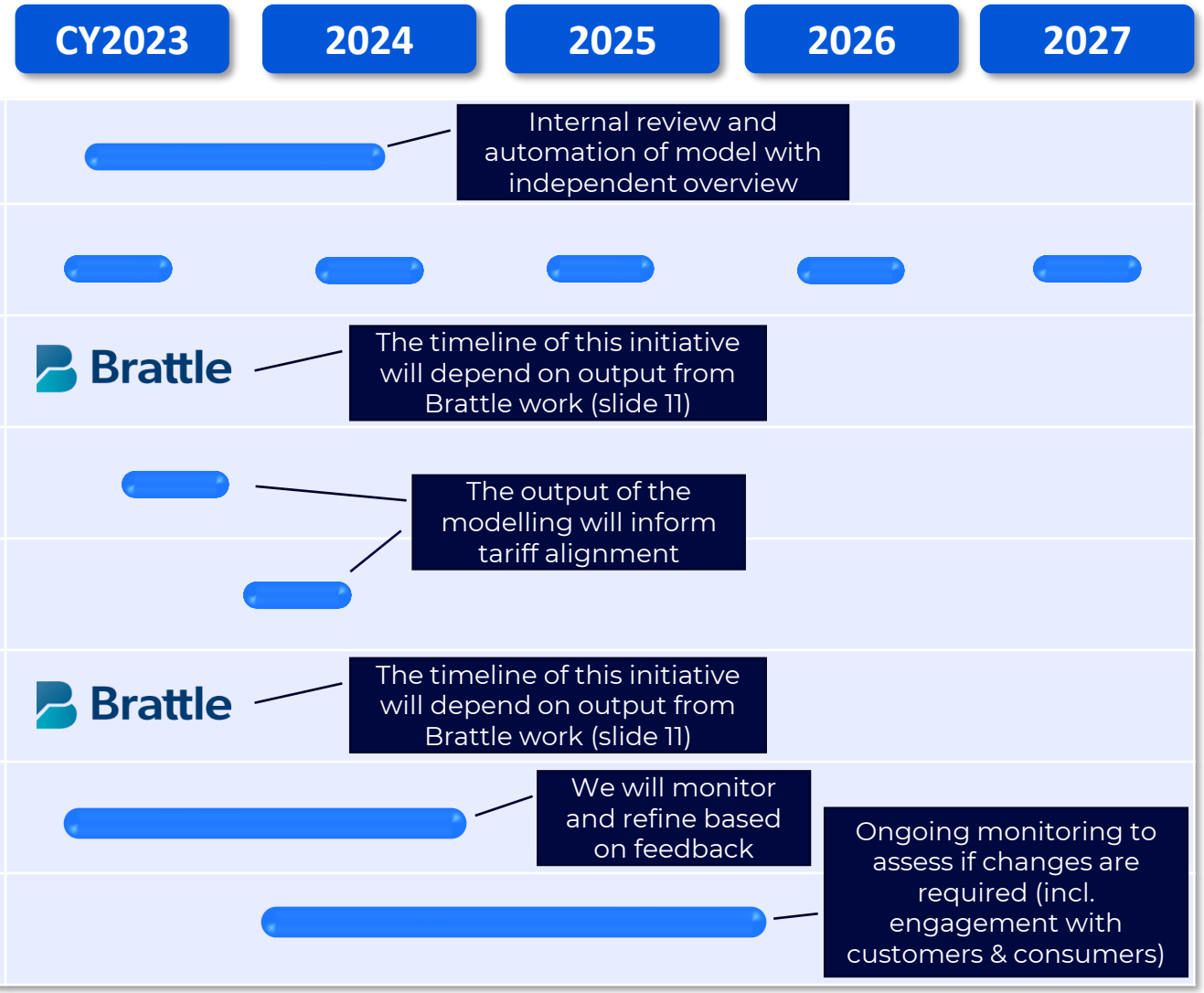
For next 10 years, 51% of forecast spend is customer driven and 41% is to maintain network integrity



[5] Capital contribution policy available at https://www.vector.co.nz/about-us/regulatory/disclosures-electricity/capital-contributions

PRICING TIMELINE - REFORM and ALLOCATIONS

Reform ongoing Completed Cancelled



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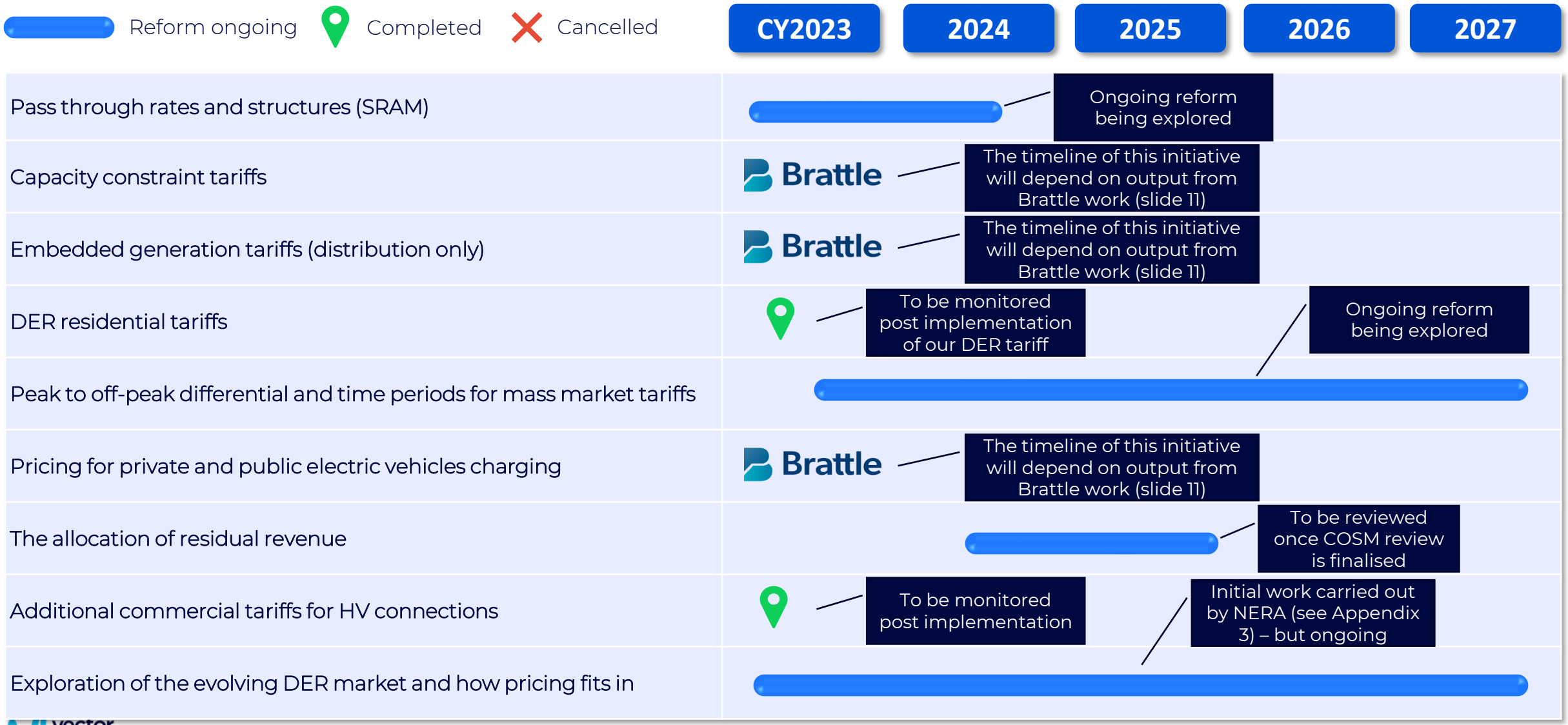
PRICING TIMELINE - TARIFFS

Reform ongoing | Completed | Cancelled



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PROGRESS AGAINST 2022 ROADMAP

The table below picks up all the activities due for action in the calendar year 2022 from our last published Roadmap in April 2022*.

Reform and allocations	We said...	We did...
Capital contributions policy	Manage	We refreshed the prices within our policy in CY2022
Interaction between connection charges and line charges	Initiate and develop	Initial discussions held with Brattle in particular around public charging for EVs
Cost of service model	Initiate and develop	Scoping exercise carried out to review: - whether the model is fit for purpose - automating the model and refinement
Transmission pricing options	Initiate and develop	We have implemented GXP pricing for PY2024 We will monitor and develop further with - new 'benefits based charges' - how to treat quantities wash-ups and ICP switching
Interaction between power factor & injection	Initiate and develop	We are monitoring this and working with customers and consumers to see if changes are required
Pass through tariffs and structures	Initiate and develop	Pass-through components have been moved to fixed where possible (least distortionary)
Capacity constraint tariffs	Develop	We developed a non standard contract with a major consumer (subject to a dynamic operating envelope to potentially limit usage during peak) – see Case Study 3 and the development of our non-standard tariff We are looking at whether this could be rolled our to other infrastructure projects

*Please see Appendix 4 for our 2022 disclosed timelines

PROGRESS AGAINST 2022 ROADMAP (cont.)

Tariffs	We said...	We did...
Controlled residential tariffs (eligibility criteria)	Initiate, develop, manage	Ripple control no longer used to manage transmission peaks as no financial benefit to consumers under new TPM We removed gas eligibility for a load control price benefit as this is achieved through TOU pricing We introduced our new DER tariff
Peak to off-peak differential and time periods for mass market tariffs	Develop	The time of use differential is based on an estimate of the long-run investment cost on an electricity network developed by Sapere We are actively looking at time bands through modelling of consumption patterns using smart meter data We now only have a peak signal in winter for time of use tariffs as there is at present no peak signal required in the summer and this frees up flexibility for other uses in a greater proportion of the year
Pricing for private and public electric vehicles charging	Initiate and develop	We developed our new DER tariff for private EV charging For public charging we have a non-standard contract with a major consumer Our capital contributions policy seeks to address EV charging pricing matters Brattle is focussing on developing recommendations for EV charging pricing
Legacy pricing differences for commercial customers	Initiate, develop, manage	A transition towards an alignment of daily and volume is underway across Vector's networks
Additional commercial tariffs for HV connections	Initiate, develop, manage	Introduction of a new sub-transmission commercial consumer group Considering a GXP tariff for large customers who do not use Vector's assets
Embedded generation tariffs (distribution only)	Initiate and develop	No longer considered, as no benefit under new TPM Still considering distribution network benefits

KEY LEARNINGS FROM OUR PRICING REFORM

1 Retailer feedback

There are differing capabilities and attitudes towards responding to sophisticated cost-reflective pricing - among different retailers.

There is also increasing cognitive dissonance between retailers' advocates / innovation / flexibility staff and their pricing implementation teams. We will continue to engage with retailers on the topic of distribution pricing reform on a regular basis and outside of the annual pricing cycle.

2 Evolving market

With the emergence of managed services / load control tariffs, there is a huge unknown about how they are going to feature going forward. Please see Appendix 3 which covers some of the work we have been doing with NERA to uncover the evolving electricity market and the role of demand management.

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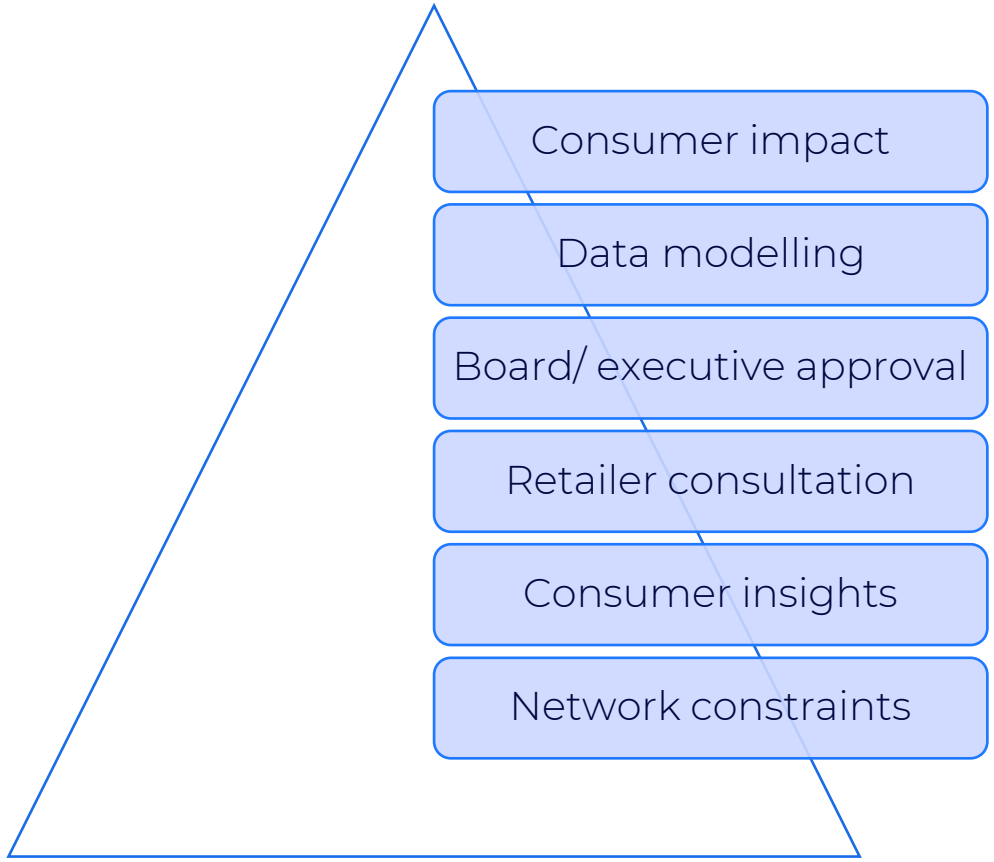
RISK MANAGEMENT

We are conscious that price changes can affect our customers (retailers) and end consumers especially in a period where affordability needs to be at the forefront of decision-making. We try to manage this risk each time price reform is considered.



Examples of risk	
Time of use	May require re-tuning as usage patterns adapt or economic costs change. High risk of deterring usage at times when economic costs are low. Also risk of high prices when consumers need to use the network the most.
Pass-through of price signals	To what extent should distribution prices be designed for retailers as opposed to end users noting in NZ there is no requirement for distribution prices to be passed through by retailers? Does this change as more retailers access flexible resources in consumers'' homes?
TOU that is not well targeted	Can be detrimental to customers' acceptance and "lock out" flexibility from other uses
Congestion and price signals	Without a link between congestion and price signals an EDB risks distorting behaviour with unintended consequences. For e.g. assigning a time of use price signal to time periods when no congestion is present, could send the wrong signal and create a worse outcome than a flat charge

APPENDIX 1: CASE STUDIES

CASE STUDY 1: WARKWORTH ROI

In January 2022, Vector sought Registrations of Interest (ROI) from suitably qualified suppliers who were interested in delivering non-wires alternatives (NWAs) in the wider Warkworth region. We determined a need for a total of 3-5 MW to alleviate the network constraint for periods of 2-5 years and were seeking to purchase this in 1 MW blocks.

Of the 12 completed applications, there were none that would utilise existing DER in the Warkworth region – all required investment in new DER, in some shape or form. Of the 12 only 6 were selected for in-depth discussions to further understand their offerings. Only one application was considered further for deployment.

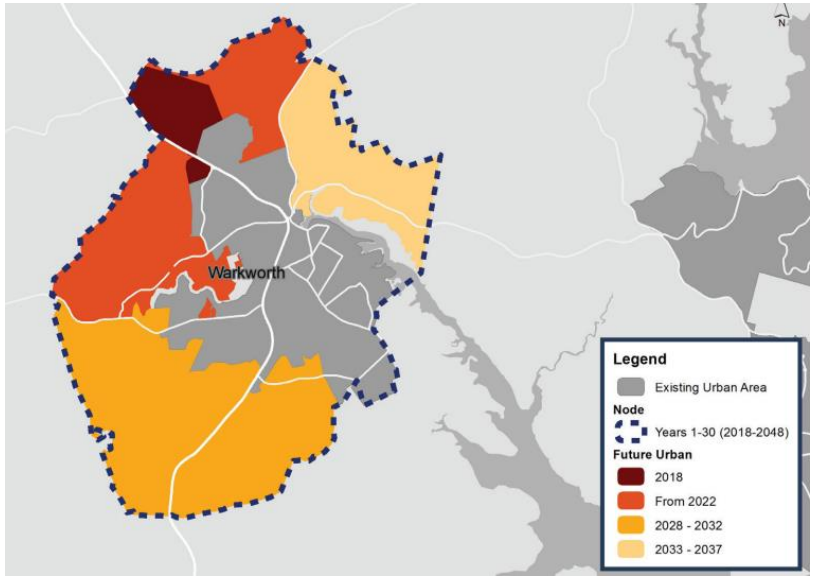
Our key learnings from this experience have been as follows:

1. NWAs absolutely offer viable alternatives for certain applications, but the economics are challenging – especially if a technology roll-out is required.

2. The flexibility service market needs building, as today most NWAs on offer are technology solutions, which require innovation funding from distributors.

3. Regulated distributors need more funding for flexibility as the current fixed five-year regulatory periods offer little room to change course by swapping a capex solution for an opex solution.

Auckland Plan 2050: Development Strategy Warkworth Node



Source: Auckland council

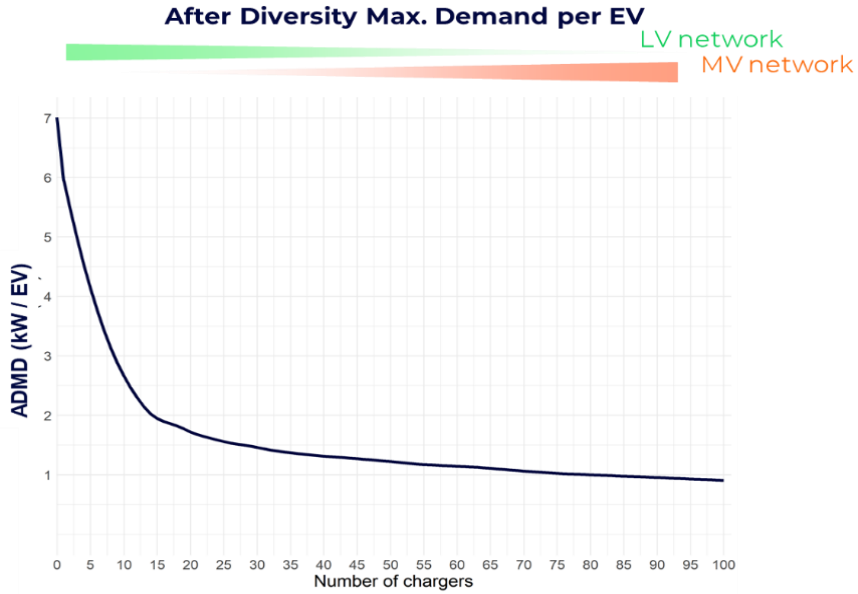
Deployment and operation of solutions can be incentivised by cost-reflective distribution pricing (instead of dedicated opex funding), but, depending on the locational granularity of the constraint being managed, may not deliver the performance guarantees distributors will need to defer investment with confidence. This scenario demonstrates how narrow the window of opportunity can be.

CASE STUDY 2: EV SMART CHARGING TRIAL

Our partnership with EVnex showed the value of remotely managed EV charging by a third party, with little direct consumer interaction or impact on experience. The key learnings are outlined below:

- Access to data on network conditions and locations of EV adoption will be valuable during early stages of the transition to transport electrification (sensitivity of ADMD[28])
- Customers were highly satisfied with all network managed EV charging options
- Smart charging effectively reduced demand during traditional network peak times
- The charging data collected is being used to explore other network impacts such as thermal and voltage impacts on LV networks from EV clustering and to update the assumptions used for our customer model.

[28] After Diversity Maximum Demand (ADMD) is used in the design of electricity distribution networks where demand is aggregated over a large number of customers. ADMD accounts for the coincident peak load a network is likely to experience over its lifetime and as such is an overestimation of typical demand



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CASE STUDY 3: NZ'S FIRST ELECTRIC BUS DEPOT

In February 2023 we saw the opening of New Zealand's first fully electric bus depot, in Panmure, Auckland. Our team worked with Auckland Transport (AT), NZ Bus and Kinetic to complete the project

The Panmure bus depot formerly housed 44 diesel buses (and diesel tanks), but now it's home to 35 electric buses – each one able to be charged up to 502kWh each night, via fast DC chargers. This is the equivalent load of an apartment building with 40 units!

If all of them plugged in at peak time, it would require a significant investment in the network. Along with AT we conducted a Grid Impact Study , we assessed the requirements of a high-voltage connection to the depot and the charging infrastructure needed to supply it.

Together with NZ Bus we adopted a smart-charging system, which will be connected to our Distributed Energy Resource Management System (DERMS). This will manage e-bus charging dynamically to avoid increasing peak demand, while guaranteeing full charging overnight and during many times of the year when the network is unconstrained.

This was achieved through the development of a non-standard DERMS tariff which helped inform our new DER tariff.

The system also future proofs the depot for potential development of additional Bus to Grid (B2G) systems (which are being assessed overseas) to transfer surplus energy from bus batteries back to the network.

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APPENDIX 2: APPROACH TO PRICING REFORM

CONSUMER IMPACT

In line with one of the Pricing Principles, “Development of prices should be transparent and have regard to transaction costs, consumer impacts, and uptake incentives”, Vector takes consumer impact of prices with utmost importance.

We must consider consumer impact in relation to the dynamic with retailers and the pass-through (or not) of distribution price signals

EVOLVING CONSUMER NEEDS

Evolving consumer needs and expectations, centred around the use of new technology and digitalisation, is resulting in massive shifts in service industries across the world. Energy is no different, and we need to be flexible to accommodate significant changes in behaviour at scale. As more adopt new technology to enhance and support their lives, they are becoming stakeholders and participants in the energy system.

DATA-DRIVEN INSIGHTS

In addition to our relationships with our consumers, and regular engagement, we use a data-driven approach to gather insights beyond what is available from other means. We have long recognised the need for a sophisticated understanding of the impact of our investment decisions on the diverse households and businesses that make up Auckland. To achieve this, we complement the knowledge we gain from the relationships we have with our customers with data and insights generated from analytics, regular structured engagements, daily feedback from consumers, and often qualitative techniques.

DEPRIVATION INDEX

Our pricing decisions are made with analyses on consumer impact front and centre. We are able to link ICP level bill changes to the ICP or consumer’s deprivation index or NZDep[6]. The NZDep is an area-based measure of socioeconomic deprivation in Aotearoa New Zealand. It measures the level of deprivation for people in each small area. It is based on nine Census variables and is displayed as deciles from 1 to 10. We want to ensure that our price changes are not affecting our least deprived consumers with equity and affordability being central to our pricing roadmap.

AVOIDING PRICE SHOCKS

Energy hardship is a growing concern and cost reflective pricing and good price signalling will assist with keeping prices as low as they can be. At Vector we are also engaging actively with the Commerce Commission through the Input Methodology review to ensure that prudent and efficient investments are made to decarbonise our networks so that consumers face an equitable transition.

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[6] https://www.ehinz.ac.nz/indicators/population-vulnerability/socioeconomic-deprivation-profile/

FINANCIAL IMPACT ANALYSIS

Utilising our data analytics team

Our data analytics team is developing a tool that automates the detailing the financial impact of the change in pricing structure on residential electricity consumers. The impacts are explored on total revenue, as well as on the annual and monthly bills of various consumer groups.

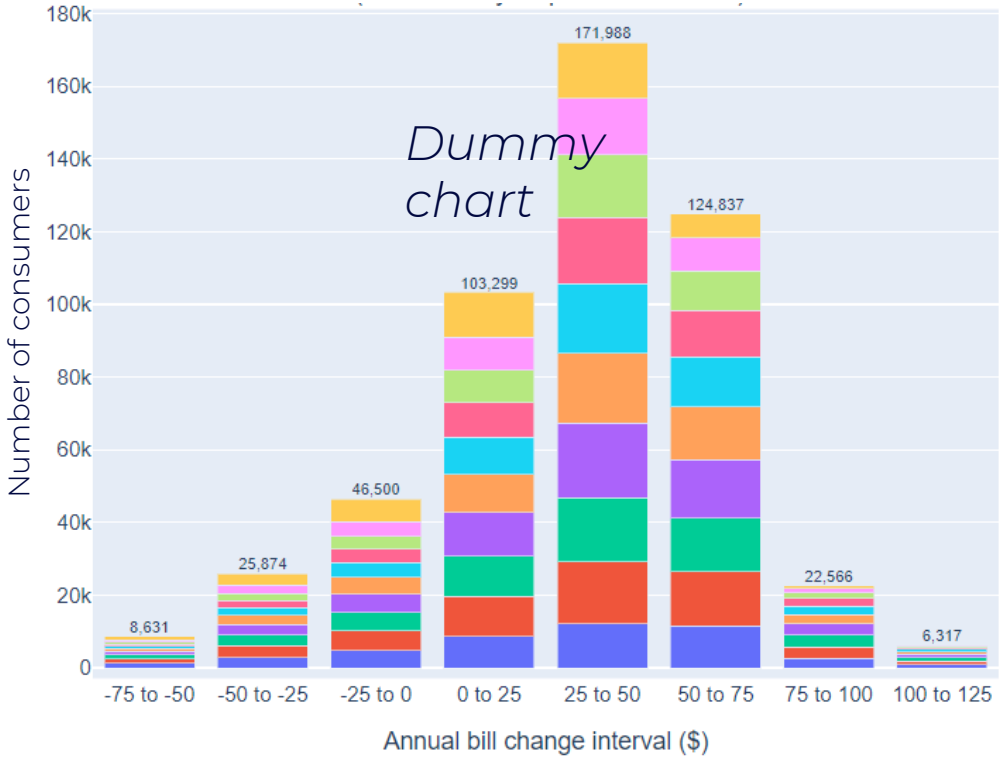
The figure on the right hand side is a dummy example of an automated graph that can be produced by the tool by inputting tariff proposals.

Having this automated reporting at the pricing team's disposal ensures that we the right tools to assess the consumer impact of our price change proposals, on the assumption our prices are passed through by retailers.

It also highlights another area where the importance of accessing smart meter data for the sector is apparent.

This year we will be extending the analysis to commercial consumers.

Number of consumers per bill change interval (coloured by deprivation decile)



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Data sources: The revenue from each consumer is calculated using the aggregated and anonymised half hourly and monthly billing data depending on:

- whether the customer is on a TOU or non-TOU plan, and
- whether the DDA data has been received from the retailer yet.

COST-REFLECTIVE PRICING

Efficient pricing involves a process to develop cost-reflective allocations and using price as a signalling mechanism (where needed), and then (given the target revenue to recover) allocating residual costs in a least distortionary manner. While our pricing reform develops, we consider the following items.

Cost-reflectivity	• How does our network design interplay with our prices? • Where is demand changing and congestion occurring, or expected? • Who's using the network and how: do our assets support all or a subset of customers?
Affordability	• Are we leaving customers behind in the energy transition and is the transition equitable? • We are working with the ENA to respond to Te Kore, Te Po, Te Ao Marama - Energy hardship: the challenges and a way forward (mbie.govt.nz) noting the specific actions: Strategy AF6: Investigate and address the implications of network pricing methodologies for energy hardship and AF3 relates to fees and charges being cost-reflective.
Cost of service	• How do we ensure we are able to regularly update our cost of service model (COSM) to reflect changing network usage? • We will be reviewing our COSM internally to automate the model and ensure it is fit for purpose. We will seek independent review so this is likely to be completed on 2024.
Allocating residual revenue	• How do we make our pricing a least distortionary cost recovery exercise? How do we embed allocating residual revenue in our COSM? This will form part of our review mentioned above. • Currently COSM is set (deliberately calibrated) to recovery the revenue that Vector is allowed to earn according to the DPP. The total revenue includes both the revenue from the price signalling part (for e.g., the peak volumetric prices) and the residual revenue (for e.g., the daily fixed charge).

EFFICIENCY & BENCHMARKING

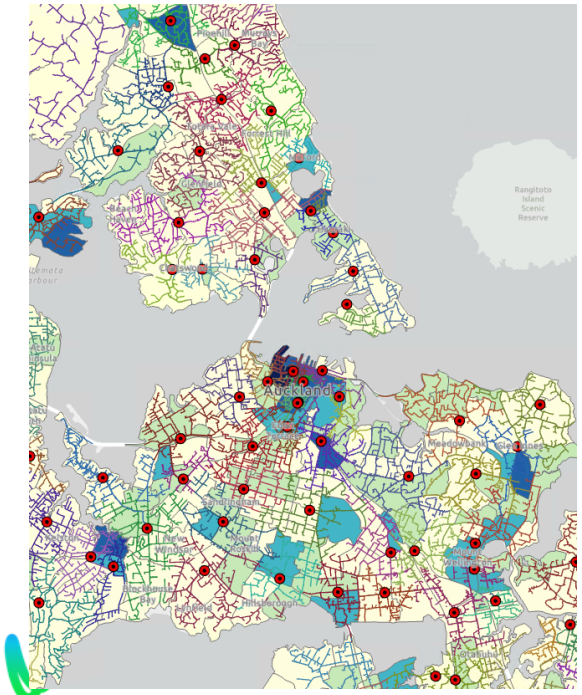
Price vs Quality

Non-exempt EDBs[7] in New Zealand are regulated through price-quality paths meaning that while price is integral to the good performing electricity networks, the reliability and resilience of those networks is equally as important.

Investing efficiently

Investing in assets to meet demand peaks, which are underutilised during other times, could result in overbuilding of infrastructure and a significant cost associated with the electrification of the economy. To minimise this, we need to actively manage demand and unlock new value at the demand side of the electricity supply chain to minimise costs to consumers. For Vector, this includes data analytics, distributed energy solutions, and the digitalisation of the network. Through making these investments now, we believe we can better manage peak demand and avoid unnecessary investments in traditional pole and wire solutions which will burden future generations with long-term cost recoveries.

Location of our assets in relation to suburbs



Red dots = zone substations
Lines = feeders

Whole Energy System Cost (WESC)

We encourage regulators to consider the WESC when assessing investments and designing regulation. The WESC was initially commissioned by the UK Department of Business, Energy and Industrial Strategy to capture the wider costs and benefits associated with different generation technologies. It was extended by the ReCosting Energy project to also assess demand-side technologies within this whole system framework.

Vector commissioned Frontier to apply this to the NZ energy market[8]. The WESC makes the true consumer value of digital and demand response technologies visible – revealing that the potential value of these technologies is accrued across multiple parts of the energy system. In our view the current market does not send signals which incentivise the most efficient investments for consumers as decisions and investments in our electricity system are assessed in strict market silos – i.e., by generators, the transmission network, distributors, and consumers separately. Decisions within these silos do not reflect the impact of investments on the whole electricity system.

[7] Non-exempt EDBs are subject to price-quality and information disclosure requirements – they are outlined here

[8] https://blob-static.vector.co.nz/blob/vector/media/vector-regulatory-disclosures/annex-3-whole-system-costs-in-nz.pdf

NETWORK CHARACTERISTICS

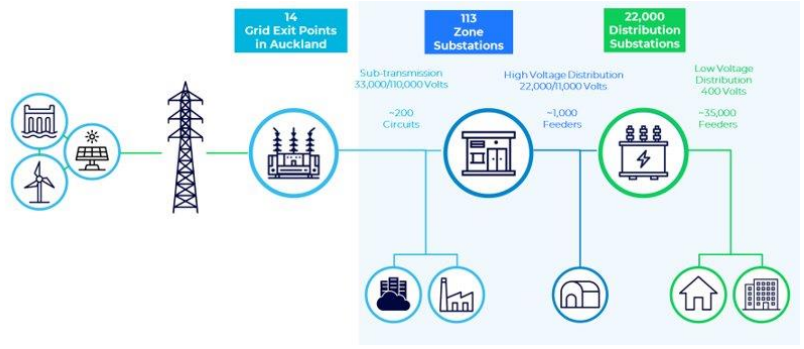
Our pricing reform program will consider (amongst others) the following key characteristics reported in our annual Asset Management Plan (AMP). Consultation on network developments and choices for alternative investments (network and non-network) have a clear pricing component and form part of discussions both internally and externally for efficiently and prudently managing investments.

DER uptake

We are actively enabling the new energy future through our use of demand management and our DERMS (DER Management System) to control and manage DERs. The DERMS is an integrated platform that enables Vector to manage a large fleet of DERs as a single system and connect to third party systems such as aggregators. Demand management enables Vector to remotely control when specific loads are turned on to manage the demand on the network. Together, our demand management systems and DERMS enable reduction of peak demand that needs to be supplied through our network, therefore allowing us to defer investment, maintain reliability and minimise costs to our customers.

Vector's network planning areas:

Vector's electricity network:



Regional variations

Explain how we assess the differences between our planning areas in the pricing models

Utilisation

Our AMP disclosure reports demand at a transformer level within our 14 planning areas (see figure to the left). As much as we pay attention to keeping costs to a minimum and therefore impacting our prices at a macro level, the large number of transformers within our region makes it extremely complex to link our pricing at such a granular level. However we believe access to smart meter data will assist us in combining utilisation metrics directly into our pricing models

Zone Substations

There are 110 zone substations on our network which makes it challenging to price at that level of locational granularity

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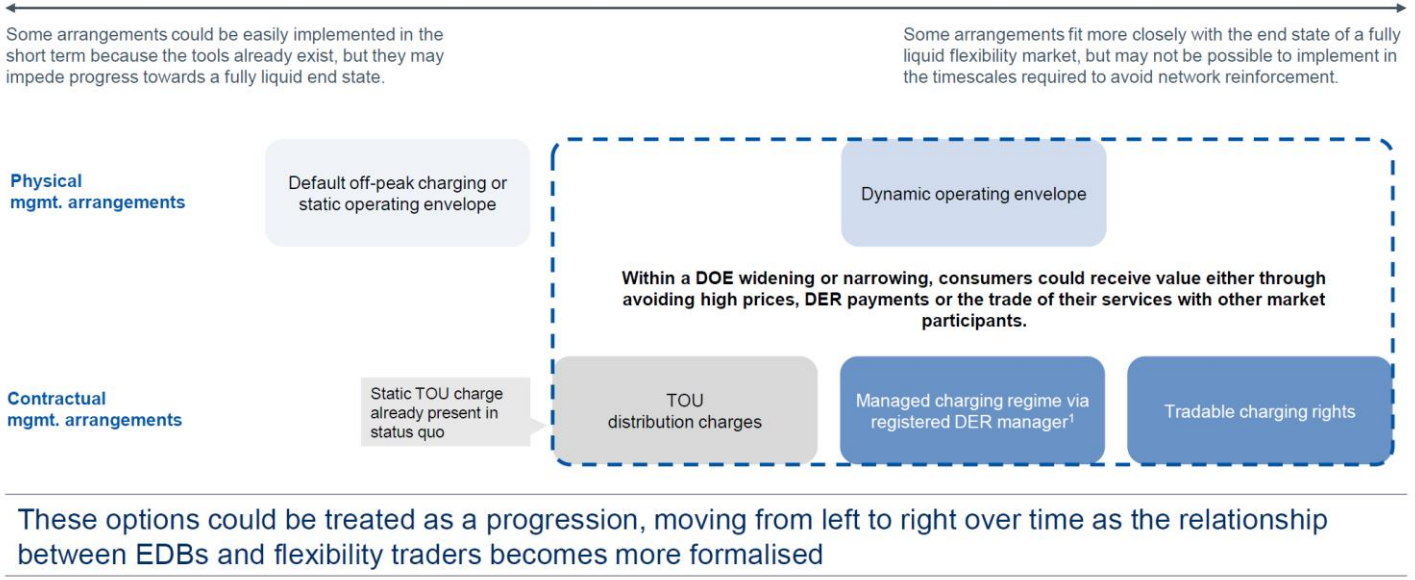
APPENDIX 3: EVOLVING MARKET

AN EVOLVING DER MARKET

In a future in which the management of consumers' DER would be contestable service, we tasked NERA with developing a suite of options[9] that would enable the overall network cost minimisation objective, and a multi-criteria framework for evaluating them.

In our submission to the EA on 'Updating the Regulatory Settings for Distribution Networks,'[10] we explained that, while the appropriate mechanisms for procuring flexibility (e.g. contracted flexibility, price-response or another method) will take time to develop, implementing dynamic operating envelopes and emergency orchestration powers will be essential to enabling safe and secure value stacking by DER, regardless of how the future plays out.

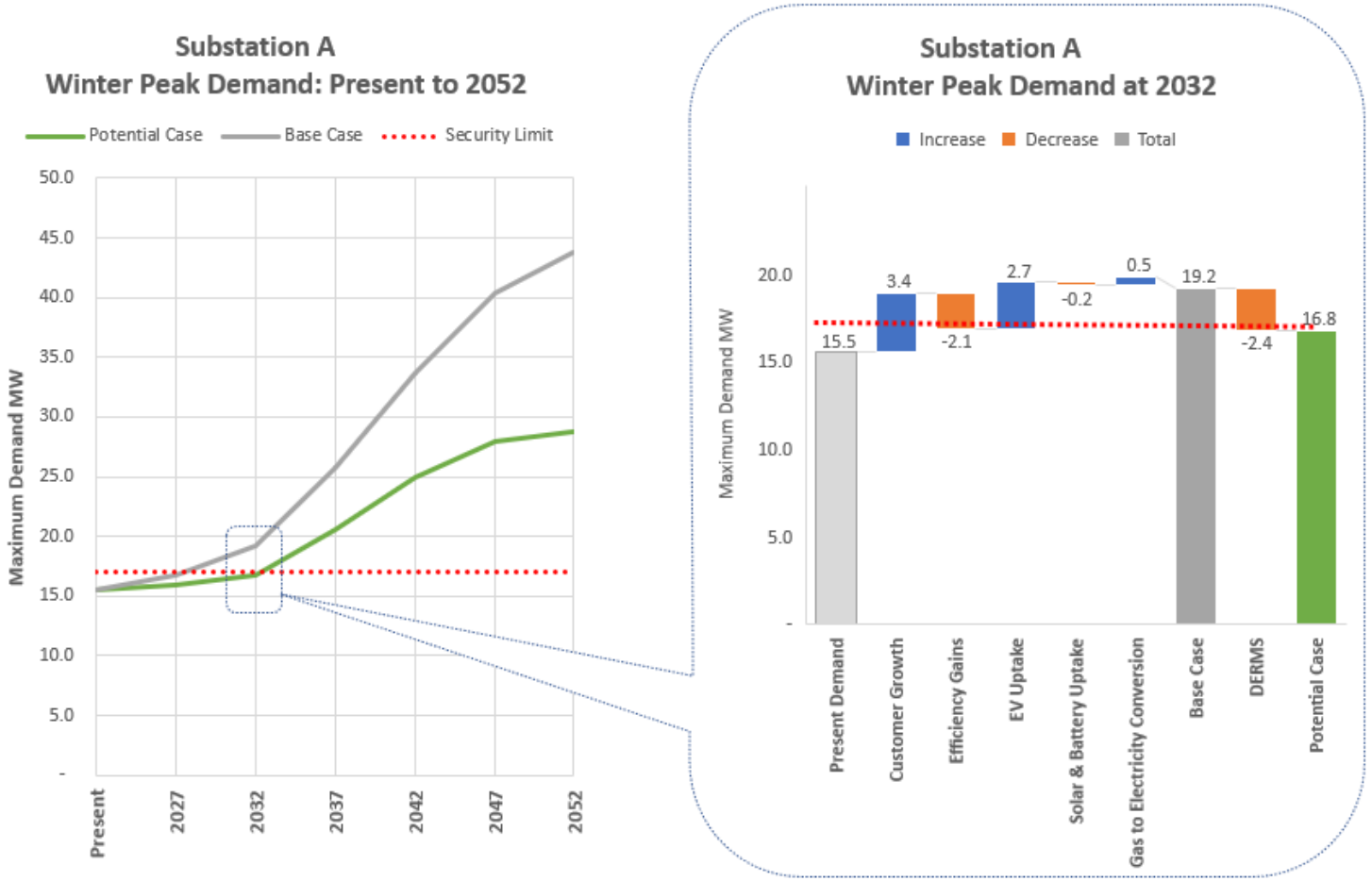


Source: NERA [9]

[9] NERA Report, https://blob-static.vector.co.nz/blob/vector/media/vector-2023/nera-report-for-vector-20230228-v1-0.pdf
[10] Vector submission to the EA, https://blob-static.vector.co.nz/blob/vector/media/vector-2023/vector-submission-issues-paper-updating-the-regulatory-settings-for-distribution-networks_1.pdf

THE FUTURE OF DEMAND MANAGEMENT

Estimated Vector “Substation A” winter peak to 2050 broken down by drivers



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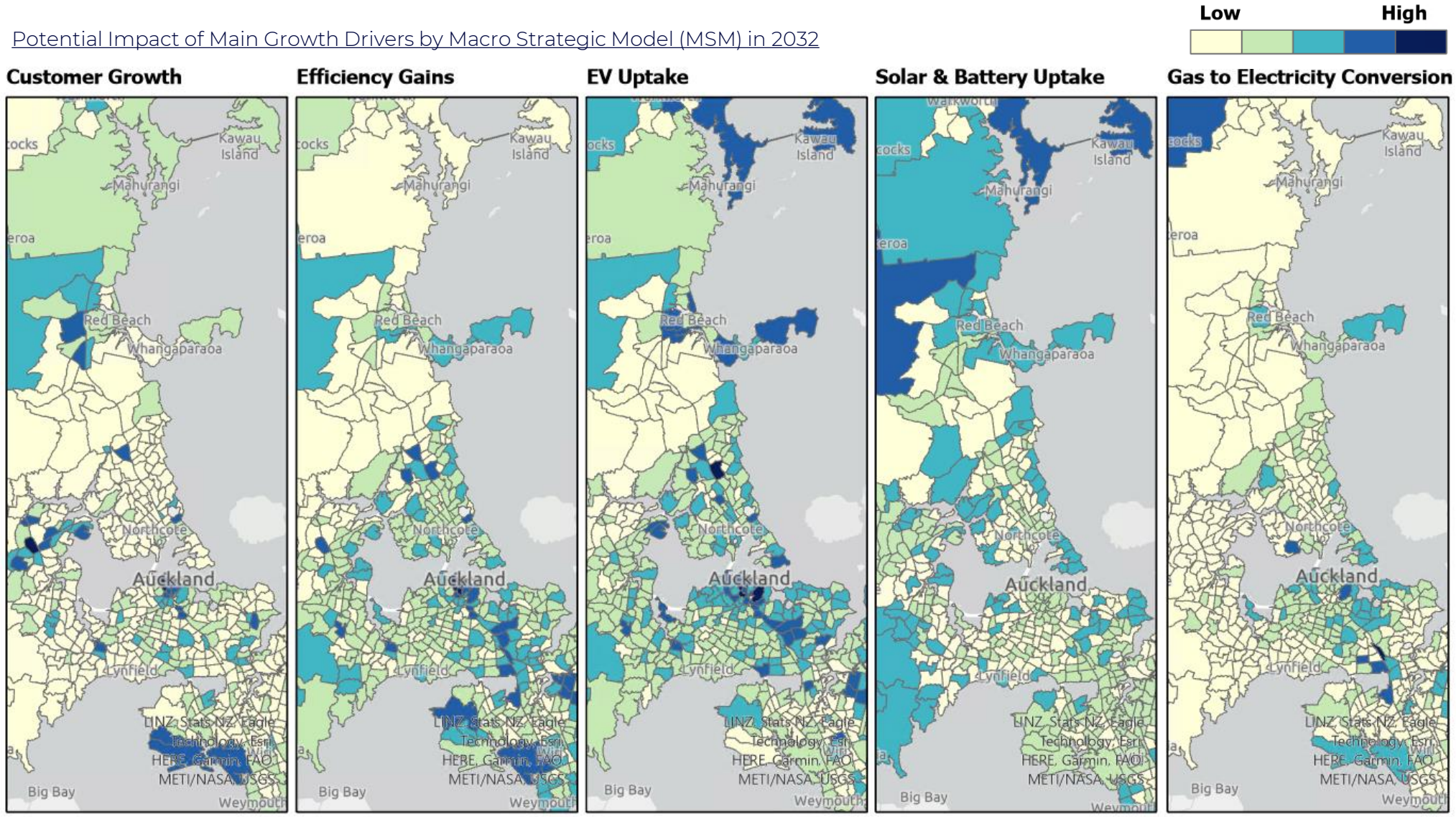
DEMAND LOCATION BY MAIN DRIVERS

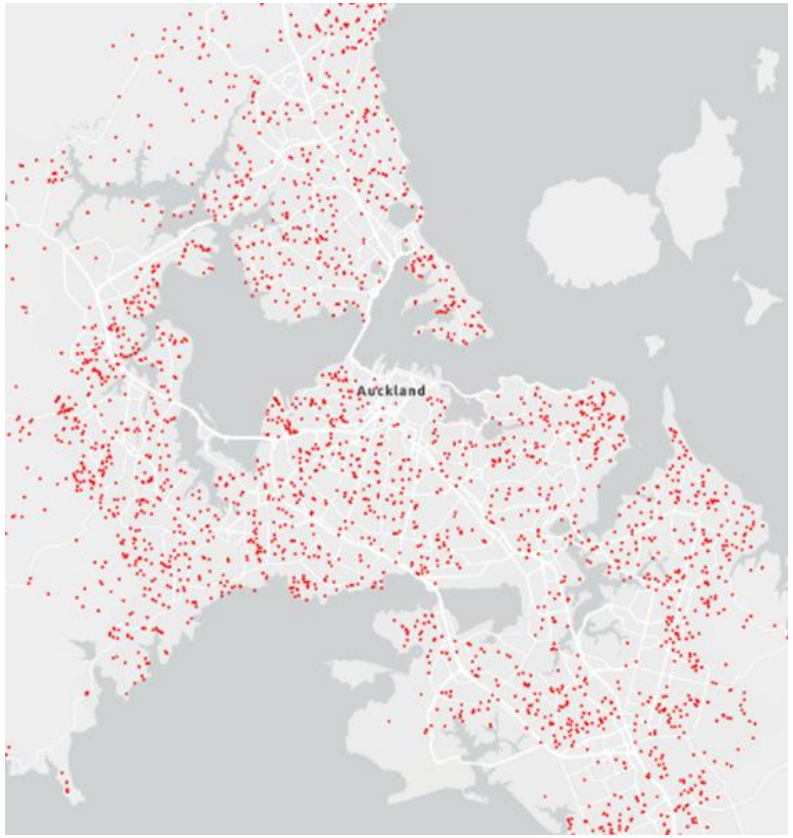
Potential Impact of Main Growth Drivers by Macro Strategic Model (MSM) in 2032



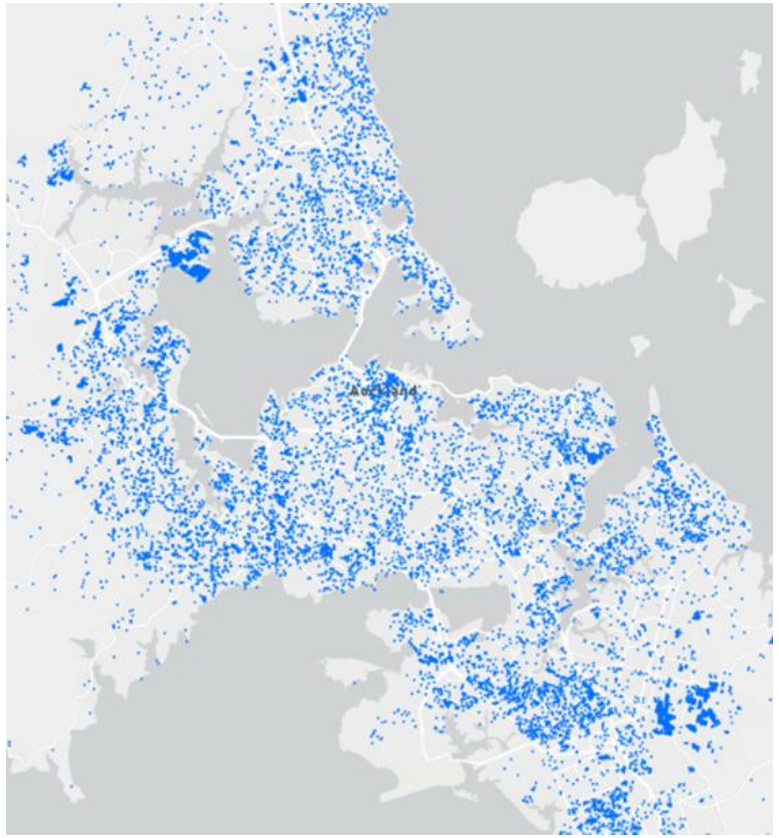
Source: Vector scenario model

GROWTH ON OUR NETWORK

Solar installations over last 4 years (~3,300)

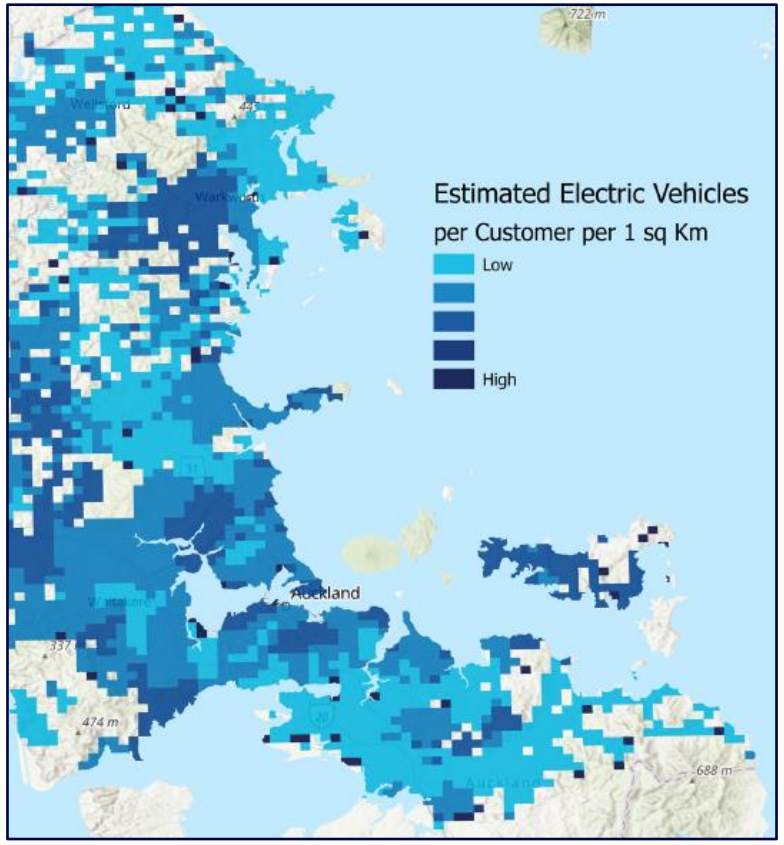


New "Standard" ICPs over last 4 years (~52,000)



Modelled EV Concentration

(2020) 1sq km estimates based on best available data (EV Reg by Suburb)



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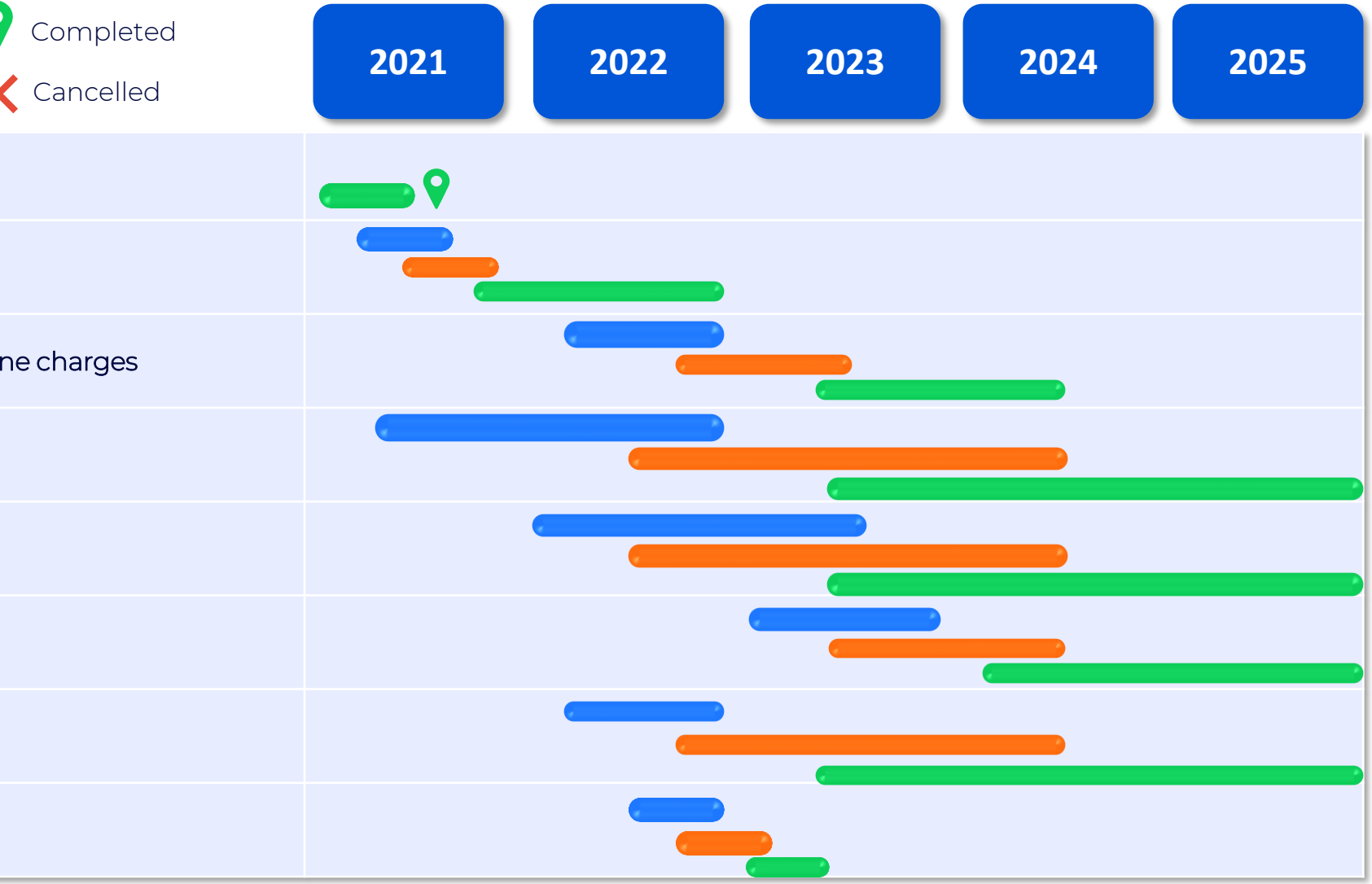
Visibility of EVs is very limited. We are currently involved in a trial with NZTA to improve EV data quality as the impacts from EVs will become increasingly important at all network levels

APPENDIX 4: 2022 DISCLOSED ROADMAP TIMELINE

2022 PRICING TIMELINE - REFORM and ALLOCATIONS

Initiate (identify and review)
Develop (test, analyse, consult)
Manage (rollout, implement)
Completed
Cancelled



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2022 PRICING TIMELINE - TARIFFS

Initiate (identify and review)
Develop (test, analyse, consult)
Manage (rollout, implement)
Completed
Cancelled