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Innovation under the DPP: potential barriers and solutions

‘Big Six’ EDBs: Aurora, Orion, Powerco, Unison, Vector, and Wellington Electricity

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1. Introduction and Summary

1. In May 2022, the New Zealand Commerce Commission (**"NZCC"**) released its process and issues paper on the Part 4 Input Methodologies Review 2023 (**"PIP"**).[1] The purpose of the PIP is to initiate the review of the input methodologies (**"IMs"**), which are the rules, requirements, and processes that the NZCC sets for services – electricity networks, gas networks, and airports – which are regulated under Part 4 of the Commerce Act. As the NZCC notes: [2]

   The focus of this phase of the IM Review is on identifying the key topics, and issues relating to those topics, that the IM Review should address, and identifying whether and how potential changes to the IMs might address them. Your input is vital to shaping the issues and, ultimately, the IM Review.

2. In the PIP, the NZCC formed initial views on the extent of innovation by electricity distribution business (**"EDBs"**). By way of summary, the NZCC's initial view is that innovation is not improving outcomes for consumers, where the NZCC defines outcomes in two ways:[3]

   a. Productivity meaning that EDBs are spending more than is efficient, which increases the prices paid by consumers; and

   b. Quality of service meaning that EDBs are not improving the service experienced by its customers.

3. These initial views were followed by a series of NZCC workshops to present staff views and seek stakeholder feedback on various topics. While these workshops did not directly address productivity or quality of service, they covered innovation in broad terms and specifically the potential issue of capex bias.[4]

4. Given these initial views and questions asked following the workshops, the 'Big Six' electricity distributors (Aurora, Orion, Powerco, Unison, Vector, Wellington Electricity) have asked NERA to prepare a report which:

   a. Defines innovation, sets out the potential barriers to innovation, and explains how overseas regulators have incentivised innovation;

   b. Considers what barriers to innovation might exist under the current regulatory framework applying to EDBs; and

   c. Reviews the possible mechanisms to incentivise innovation given the potential barriers in the New Zealand context, including a review of the Innovation Project Allowance (**"IPA"**).

5. Our review of the regulatory framework (ignoring for the moment the existence of the IPA) suggests that the following material barriers to innovation may exist in New Zealand:

   a. **Asymmetric rewards (AR):** as the benefit that EDBs can earn from innovation is capped while, by definition, innovation is risky. For example, the revenue cap can effectively limit any benefits from providing a new service;

[1] NZCC, *Part 4 Input Methodologies Review 2023 Process and Issues paper*, May 2022 ("NZCC PIP").

[2] NZCC PIP, p. 3.

[3] NZCC PIP, para 10.11 on p. 150.

[4] NZCC, *IM review 2023 – Incentivising efficient expenditure – Workshop follow-up questions*, November 2022.

b. **Uncompensated outputs (UO):** meaning that EDBs are not incentivised to innovate in order to improve uncompensated outputs i.e., any output that is distinct from the number of customers, line length, or the specific quality targets;[5]

c. **Capex bias (CB)**: as EDBs are likely incentivised to inefficiently prefer capex over opex solutions. This primarily occurs in the NZ framework as capex is easier to obtain due to the rigid nature of the opex allowance setting process; and

d. **Regulatory timeframe (RT):** which means that there is a lack of incentives for innovation with an upfront cost when the payback occurs in future regulatory periods in the form of avoided investments.

6. In Table 1, we summarise the potential solutions which can address these barriers. By removing barriers to innovation, these potential solutions are consistent with the Part 4 purpose. In particular, removing barriers to innovation promotes the long-term benefit of consumers by increasing incentives for EDBs to innovate, which ultimately benefits consumers in terms of lower prices or higher quality.[6,7]

[5] To be specific, EDBs receive additional opex allowance if these compensated outputs increase (to reflect an increase in maintenance and supporting overhead cost). The incentive to innovate arises as an IRIS cost saving reward if the EDB can provide these outputs at lower cost than the allowance.

[6] Absent a definition of quality, we take quality to imply improved outcomes for customers. This ranges from new services/offerings to better resilience and sustainability.

[7] For completeness, we note changes to the IMs may have offsetting costs and that we have not carried out a cost benefit analysis of any particular change to the IMs to enable innovation.

Table 1: Summary of potential solutions and barriers addressed

Potential solution	Barrier addressed			
	AR Asymmetric rewards	UO Uncompensated outputs	CB Capex bias	RT Regulatory timeframe
Allowance: Explicit funding for innovation focused on smaller projects or pilots. Can be general or targeted.	Yes	Yes		Yes
Innovation fund (or competition): similar to allowance but typically larger and for bigger projects.	Yes			
Cost multiplier: an EDB receives a greater allowance than the actual expenditure (i.e., a % uplift)	Yes			Yes
Address deficiencies in opex allowance: either by including more terms in NZCC model or by carve-out and bespoke forecast of specific categories		Yes		
Customer centric allowance: Incentives for an EDB to do more customer engagement		Yes		
Output/outcome incentive: incentives for generating outcomes e.g., customer satisfaction.		Yes		
Business plan incentives: incentive for submitting high quality business plans			Yes	Yes
Totex: Assess opex and capex together and provide combined cost incentive			Yes	
Longer regulatory period: Extend regulatory periods past 5 years				Yes
IRIS accounts for avoided capex *across* periods: Incentives for efficiently reducing future capex				Yes

7. Given we identify that an allowance can address multiple barriers to innovation, there appears to be a role for the existing IPA. However, we understand the IPA has not been used yet. This raises the question of whether it is fit for purpose. Based on first principles and a comparison to similar mechanisms in Australia and the UK, we identify two broad reasons why the NZCC's IPA has not incentivised any innovative activity yet:

    a. **The IPA's criteria is conservative**: As acknowledged by the NZCC, its low budget, ex-ante nature, and high contribution rate skews the applications towards safer (i.e., not particularly innovative) projects. Furthermore, the potentially narrow definition of what constitutes electricity lines services may mean that there is socially valuable innovation that is not occurring; and

    b. **EDBs still face the other barriers to innovation:** meaning that there is no clear pathway to advance an innovation in New Zealand. To be specific, while in the first instance, the allowance reduces the *initial* cost to innovating, the next step of developing any project further would face the other three barriers. Overcoming these barriers would require:

        i. Combining the innovation allowance with another mechanism. For example, the AER combines an allowance with a cost multiplier for implementing projects; and/or

        ii. Removing these barriers. For instance, Ofgem applies outcome incentives (and other mechanisms) so that the payoff from innovating is greater than in New Zealand.

8. In the rest of this report we:
    a. Provide context by summarising the NZCC's initial views on EDB innovation (Section 2);
    b. Explain how EDBs may be innovating to generate outputs that are not currently measured by the NZCC (Section 3);
    c. Define three types of innovation and set a list of potential barriers to these different types of innovation. Using this list, we then assess which barriers are likely to be the most important given New Zealand's current regulatory settings (section 4);
    d. Summarise how innovation is incentivised by overseas regulators (Section 5);
    e. Explore the potential solutions for addressing the most important barriers to innovation in New Zealand (Section 6); and
    f. Assess the extent that the Innovation Project allowances addresses these barriers with a focus on how changes to the IPA might lead to improved outcomes (Section 7).

2. NZCC's initial views on EDB innovation

9. In this section, we summarise the NZCC's initial views on innovation by EBDs. For context, given the likely impending electrification of the economy (e.g., to accommodate EVs); the NZCC noted at the DPP3 reset that there was likely to be greater scope for innovative activity by EDBs:[8]

> *We expect there to be more scope for innovation and its potential benefits now than in the recent past. Changes in technology have increased opportunities for electricity distributors to innovate as well as creating challenges that distributors may address through new practices. Innovation is an important consideration for us as it is one of the performance areas referred to in the purpose of Part 4.*

10. In its 2020 reasons paper for DPP3, the NZCC defines innovation as follows:[9]

> *We consider innovation to be the practice of distributors putting technologies, processes, or approaches, which have not been used in similar circumstances in New Zealand by distributors before, into practice for the benefit of the electricity distribution service.*

11. This definition of innovation can be connected to the concept of dynamic efficiency, which the NZCC defines as follows:[10]

> *Dynamic efficiency refers to decisions made over time and includes decisions relating to investment and/or innovation that can improve productivity as well as the range and quality of services.*

12. Taken collectively, these two definitions imply that the NZCC considers that an EDB is innovating if it improves productivity and/or the range and quality of service, by applying a new technology, process, or approach.

13. Despite the NZCC identifying greater scope for innovative activity by EBDs, in the 2022 PIP the NZCC formed the initial view that innovation by EDBs had not improved outcomes for consumers:[11]

> *…innovation—to the extent that it has occurred—has not (or not yet) evidently contributed to improving dynamic efficiency, and therefore, has not evidently promoted the section 52A purpose of Part 4.*

14. In this context, the NZCC specifically identified falling productivity and no improvement in measured quality of service as indicators of a lack of innovation:[12]

> *dynamic efficiency may have worsened, given that productivity and the measured quality of service have worsened and remained stable since 2002 and 2008 respectively*.

15. When considering productivity and quality of service, however, the NZCC acknowledges that its current measurements may not fully capture all the relevant outputs (which affect productivity) and customer service (which affect quality of service). As the NZCC itself notes:[13]

> *The quality that consumers receive could have improved (eg, customer service) and/or the outputs that suppliers deliver could have increased (eg, allowing more DER to be connected, greater security of supply, EDBs taking greater responsibility for consumer connection lines), but this has not been captured in the existing quality or output metrics.*

[8] NZCC, *Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision Reasons paper*, November 2019, para 4.52 on p. 80.

[9] NZCC, *Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision Reasons paper*, November 2019, para 4.53 on p. 80.

[10] NZCC PIP, para 10.39.3 on p. 158.

[11] NZCC PIP, para 10.70 on p. 169.

[12] NZCC PIP, para 10.57 on p. 165.

[13] NZCC PIP, para 10.53.3 on p. 165.

16. By way of summary: while the NZCC believes there is now more scope for innovative activities; it has yet to see evidence that innovation is improving the outputs that it measures. Although, equally, the NZCC acknowledges that it might not be measuring all relevant outputs.

3. Innovation could be generating uncompensated outputs

17. As the NZCC considers that falling productivity indicates that EDBs are not innovating, in this section we explain how measured productivity is only a reliable measure of actual productivity to the extent that it captures *all* of the outputs EDBs are producing. *Measured productivity* refers to the quantitative relationship between the outputs produced by an EDB and the inputs used to produce those outputs. More specifically, the NZCC considers the partial productivity factor for operating expenditure (**"opex PPF"**), which refers to a ratio of an index of multiple outputs to the opex required to produce those outputs.[14] At a high level, the NZCC defines the opex PPF as:[15]

> *The operating expenditure partial productivity measures changes in the ratio of operational expenditure to associated outputs*

18. In practice, the NZCC has considered three different specifications for measuring productivity. Each specification consists of a selection of multiple outputs and estimates a different weighting for the outputs. In total, the NZCC considers the following five different outputs:
    a. **Connections (#)**: the number of installation control points (ICPs) or customers, which should proxy spending that scales with connections e.g., customer service activities;
    b. **Circuit length (km)**: The sum of overhead and underground circuit kilometres;
    c. **Energy Throughput (GWh)**: The quantity of electricity distribution throughput is measured by the number of kilowatt hours of electricity supplied;
    d. **Overall system capacity (kVA*kms)**: transformer capacity multiplied by circuit length; and
    e. **Ratcheted maximum demand (GW)**: The highest maximum demand observed in the sample period up to that point.
19. Therefore, if EDBs are innovating to produce *any* outputs that are not included in the productivity measure, and these outputs (and their associated opex) are growing over time, then *measured* productivity will be negative even if the expenditure is efficient and EBDs are achieving productivity gains. The NZCC acknowledges this possibility, and provides examples of EDBs improving quality (e.g., customer service) and providing more uncompensated outputs such as connecting more Distributed Energy Resources (DER) to the gird and ensuring a greater security of supply.[16] To illustrate, the NZCC could measure that the productivity of EDBs is *negative* 1%. This measurement could, for example, be the result of:
    a. a 1% opex increase to generate the same line length and ICPs, with no increase in other uncompensated outputs (i.e., a productivity decrease related to measured outputs);
    b. a 1% opex increase to generate the same line length and ICPs, but with an increase in other uncompensated outputs (i.e., no productivity change relating to measured outputs, but an increase in expenditure on uncompensated outputs); or
    c. 1% opex reduction to generate the same line length and ICPs combined with 2% opex increase for growth in uncompensated outputs such as DER installations. That 2% increase in opex could also incorporate productivity gains with respect to those uncompensated outputs

[14] By comparison, Total factor productivity (TFP) refers to the ratio of an index of all outputs produced by a business to an index of all inputs (i.e., opex + capex) consumed in producing those outputs.

[15] NZCC, *Default price-quality paths for electricity distributors from 1 April 2015 to 31 March 2020: Low cost forecasting approaches*, 28 November 2014, footnote 14.

[16] NZCC PIP, Para 10.53 on p. 165.

(i.e., a productivity increase on measured outputs combined with an increase in expenditure on uncompensated outputs).

20. In Table 2, we list and explain the uncompensated outputs that we understand EDBs are increasingly generating. The leftmost column categorises the different outputs. We then list specific outputs, provide an explanation, and lastly indicate if the uncompensated output is primarily historical/recent/or forwards looking.

Table 2: Summary of uncompensated outputs

Category	Output	Period
Consents, regulation, and compliance *EDBs now face regulations (or other pressures) to deliver additional uncompensated "outputs". These additional (uncompensated) outputs add cost*	**Traffic Management Compliance:** Increasingly stringent safety regulations require crews to set up and manage traffic at any project. Traffic management add costs by extending the time taken and cost to complete a job.	Historical
	Safety for the Public and EDB staff (distinct from traffic management compliance): For example, *Electricity (Hazard from Trees) Regulations 2003* require EDBs to remove trees sufficiently near to electricity lines. Tree removal can only occur via negotiation with tree owners which can deliver an uncertain outcome of indeterminate cost. Another example is the *Health and Safety and Work Act 2015*, which may increase costs to work on electrified (live) lines.	Historical
	Regulatory/ financial compliance: In general, more complex disclosures (IDs & AMP), more complex Accounting Standards (e.g., IAS 16) and share market disclosures (e.g. ESG).	Historical
	Resource Consents: Examples include council sign-offs such as approval of works impacting parking and footpaths, district plan reviews (including submission, hearings, mediations etc.).	Historical
New product/service *EDBs are increasingly providing a new product or service which wasn't provided historically (or was provided less)*	**Non-network solutions/flex services:** EBDs are increasingly (or will in the future) be finding opex solutions to what were traditionally capex problems. An example is non-network solutions, which reduce the size of the grid.	Forward
	ESG and carbon footprint: expenses that reduce an EDBs ESG impact. For example, by reducing carbon emissions.	Forward
	Stakeholder engagement: Increasing expectations of "stakeholder journey" from council to network planning, which requires EDBs to allocate more FTEs.	Recent/Forward
	Connecting/Integrating DER: This includes connecting solar panels to the grid; batteries, and network planning for large new loads.	Forward
Digitisation & IT *EDBs are providing new digital products and services*	**Smart meters:** greater opex required to access smart meter data to monitor the network. Also, costs involved in turning this data into insights.	Historical/Forward
	General digitisation (including cybersecurity): For instance, maintaining a website (or app) to provide information to customers on the grid including data on repair times and planned outages. Cybersecurity likely to become increasingly important as household defer more to smart technologies such as time of day charging for EVs.	Historical/Forward
	LV visibility/ monitoring /Data acquisition: Understanding the impact on the grid of emerging technologies such as batteries and solar panels requires increased information and understanding about the LV networks. Collecting and using this data, however, is costly.	Historical/Forward
Network resilience *EDBs are incurring costs to make their networks more resilient to climate change, weather, and natural disasters (e.g., earthquakes)*	**Climate and natural disaster resilience:** Greater spending to increase the resilience of the network e.g., because of flood mitigation, black start resilience (biofuels for generators), earthquake measures etc.,	Historical/Forward
	Insurance: Protects customers from paying more after a major event (e.g., Earthquake).	Historical/Forward

4. Defining innovation and identifying barriers to innovation

21. In this section we:

    a. Provide a definition of innovation, focused around the different types of innovation that can occur (section 4.1);

    b. list the potential conceptual barriers to innovation (section 4.2); and

    c. identify the most important barriers that are likely to apply in New Zealand (section 4.3).

4.1. Defining innovation

22. As noted in section 2, innovation can be broadly thought of as improving dynamic efficiency by applying new technologies, processes, or approaches. We can operationalise this by focusing on how these new technologies, processes, or approaches improve total welfare:

    a. **Innovation to reduce total costs**: Innovation to reduce total costs or improve cost efficiency. This type of innovation includes any solution that allows a EDB to reduce overall costs either immediately or prospectively (potentially subject to a learning curve);

    b. **Innovation to deliver measurable outputs:** Includes any solution that allows an EDB to achieve a given output which can be quantified and measured (e.g., reducing the number of interruptions or the quantity of losses); and

    c. **Innovation to deliver long-term and wider societal benefits**: Includes any solution that delivers benefits in the long-term, which go beyond the direct net benefits to the EDB (e.g., environmental benefits).

4.2. Conceptual barriers to innovation

23. Having set out the types of innovation, we consider what *might* stop these types of innovation happening in a regulated context, i.e., this is a long list which will be refined in the next section. At a conceptual level, the key potential regulatory barriers to innovation include:

    a. **Unclear definition of innovation:** which causes challenges when codifying 'innovation' in a set of regulatory obligations that clearly delineate what effort sits within a company's regulatory obligations and what should be funded separately;

    b. **Unclear scope of services:** A tension/unclear delineation over the scope of services EDBs are allowed to supply can deter EDBs from engaging in certain types of innovation;

    c. **Capex (or opex) bias:** The different treatment of operating and capital expenditure when assessing costs and/or setting revenue allowances, means that EDBs may have an incentive to prefer capex-based solution instead of solutions that minimise total costs to the firm/society;

    d. **Short time horizon of regulation:** The regulatory period may not allow EDBs sufficient time to realise the benefits from innovative projects (e.g., 5 years for capex). This concern is particularly important for projects that deliver benefits in the longer-term;

    e. **Uncompensated outputs:** Compensation for EDBs is provided through both allowance setting and output/quality incentives. Therefore, the use of mechanistic models or cost benchmarking to define efficient costs and set allowances may not capture all outputs (i.e., drivers of costs) for EDBs and therefore leave EDBs underfunded. This, coupled with the inherent uncertainty of the outputs associated with innovative and disruptive solutions, suggests that cost benchmarking alone as a means of setting efficient costs may be ill-suited to capture companies' future cost pressures and deter companies from innovating;

f. **Asymmetric rewards:** Innovation is risky yet regulation caps potential returns. Firms may not capture the wider upside (e.g., to other firms) or broader social investments of innovations; and

g. **Instability of regulation:** Instability in the rules for cost assessment if networks suspect regulatory confiscation of cost reductions due to changes in the regulatory rules.

4.3. Assessing the relative importance of the barriers to innovation in New Zealand

24. We now assess which barriers to innovation are likely to be the most important in the New Zealand context. Because we discuss the Innovation Project Allowance (IPA) separately in Section 7.1, our assessment in this section essentially ignores the existence of the IPA. Which is to say our assessment in this section will establish whether there are potential barriers for an IPA like mechanism to address, and then our assessment in Section 7 will consider whether the IPA is an effective mechanism for addressing those barriers.

25. Our assessment identifies that the primary barriers to innovation in New Zealand reflect:

    a. **Asymmetric rewards:** as the benefit that EDBs can earn from innovation is capped while, by definition, innovation is risky. For example, the revenue cap can effectively limit any benefits from providing a new service (Section 4.3.1);

    b. **Uncompensated outputs**: meaning that EDBs are not incentivised to innovate in order to improve uncompensated outputs i.e., any output that is distinct from the number of customers, line length, or the specific quality targets (Section 4.3.2);

    c. **Capex bias**: as EDBs are likely incentivised to inefficiently prefer capex over opex solutions. This primarily occurs in the NZ framework as capex is easier to obtain due to the rigid nature of the opex allowance setting process (Section 4.3.3); and

    d. **Short regulatory timeframe**: which means that there is a lack of incentives for innovation with an upfront cost when the payback occurs in future regulatory periods in the form of avoided investments (Section 4.3.4).

26. Barriers that are less likely to be important in the New Zealand context are: the definition of innovation, the scope of innovation, and regulatory instability.[17] A summary of our assessment can be found in Table 3.

4.3.1. Asymmetric rewards

27. As a starting point, we identify asymmetric rewards as a potential material barrier to innovation in New Zealand. Regarding this barrier, it is useful to consider how the regulatory framework – in particular a revenue cap – means for the share of benefits from any innovation captured by EDBs. If EDBs do not capture a sufficiently large share of the benefits of an innovation yet bear the costs, they will be unlikely to innovate. Below we set out how two types of innovation interact with a revenue cap:

    a. **Cost saving innovation (i.e., provide the current service at a lower cost):** For example, an innovation, which reduces the maintenance cost of poles and wires. This type of innovation benefits consumers by lowering prices since the IRIS mechanism passes these cost savings

[17] More specifically, these barriers are likely to be much less material than the primary barriers. For instance, while the scope of services could be more broadly defined, we imagine that the primary barriers mean that there are many innovative projects within the narrow definition on ELS that are not being undertaken. Likewise, despite there being some ambiguity around the definition of 'sufficiently innovative', we believe this is a relatively minor barrier. Last, there appears to be little risk that the regulatory regime will change in a major way, and that this risk is significantly disincentivising innovation.

onto consumers after five years. For cost saving innovations, EDBs have a clear incentive to innovate if they expect the cost saving to be profitable. Noting that the level of the sharing rate (and the specific risk profile of the investment) changes the calculus of whether an EDB considers it worthwhile to fund risky investments in innovation. That is, some welfare improving projects may not occur if the EDB doesn't receive sufficient upside; and

b. **Service innovation (i.e., increase the value of the network):** For instance, a new service such as connecting DERs. This type of innovation benefits consumers by increasing the value of the network. A revenue cap means that EDBs have weak incentives to innovate in order to provide new and better services. This arises because the EDB bears all of the risk, yet because revenue is capped (and not all outputs/outcomes consumers desire are explicitly compensated – see section 4.3.2), the EDB doesn't earn any upside from increasing demand.[18] We should note that one of the NZCC's motivations for introducing a revenue cap was to promote innovation in the case that innovation would reduce revenue (i.e., demand management).[19] While this reasoning is sound, the same logic effectively implies there are limited incentives to providing new services that expand demand.

28. An additional input into the barrier of asymmetric rewards is the externality nature of innovation, which typically means there is less innovation than would be socially optimal. The mechanism is that the benefit of a given innovation can accrue to all firms. For example, by directly copying, using the first innovation as a first step to another innovation, or seeing a proof of concept. At the same time, innovating imposes a private cost to an EDB. The mismatch of private costs and wider benefits means that there is typically too little innovation unless it is explicitly incentivised. Going forward, the wider benefits of innovation are likely to be greater, as innovation is increasingly applying new ways to use data, intellectual property, and provide services. This is because these innovations can be more easily applied by other firms.

29. A final consideration into the asymmetric rewards barrier is that innovation by EDBs may reduce the Whole Electricity System Cost (**WESC**) but increase distribution costs. The NZCC has acknowledged this possibility in the PIP:[20]

> *it may be that EDB costs are increasing, but they are facilitating a reduction in other costs, potentially resulting in a net cost reduction for consumers (eg reduced gas use, lower energy costs using solar PV, lower transport costs through enabling EVs?).*

30. To understand this barrier, while the regulatory regime compensates an EDB for cost savings *specific* to distribution (e.g., as set out above in para 27a); it does not compensate an EDB for more *general* cost savings that occur in other parts of the electricity system, or in markets that rely on electricity as an input. In this regard, suppose an EDB could undertake innovative activity to reduce *total* costs across the energy system, for example by investing in platforms and running trials with DERs.[21] At the level of WESC, this type of innovation might be clearly beneficial by reducing *total* energy costs if it reduces the need for generation and transmission. At the narrow level of distribution, however, innovation of this type might show up as falling productivity e.g., because distribution specific costs increase by more than distribution specific outputs. Therefore, there is a barrier to innovation since EDBs will innovate too little to reduce WESC.

[18] Our focus being on the case in which the EDB expects to hit their revenue cap. This means they have little incentive to incur expenditure to innovate, as they will not financially benefit from doing so. By contrast, if a firm does not expect to hit their revenue cap, they can have the incentive to expand demand. Also, if the expenditure that results in the demand expansion is included in expenditure allowances, this provides some incentive to expand demand.

[19] NZCC, *Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision Reasons paper*, November 2019, para 4.70 on p. 84.

[20] NZCC, PIP, para 10.54 on p. 165.

[21] Noting this channel is similar to a service innovation (see para 27,1.b, above) but the focus is instead on cost reductions accruing elsewhere in the supply chain e.g., generation or transmission.

4.3.2. Uncompensated outputs

31. As explained in section 3, the allowance setting process is mechanistic. In particular, an EDB's opex allowance only varies with line length and customer numbers, so that other outputs are not directly compensated (i.e., the customer numbers serve as a proxy for customer related expenses). Additionally, there is a reliability incentive mechanism based on the System Average Interruption Duration Index (SAIDI). This mechanism means an EDB is liable for a payment if it exceeds the SAIDI target set for the EDB by the NZCC (and receives a reward if it beats the target).

32. Therefore, while EDBs have strong incentives to innovate to reduce the cost of providing these two outputs (and additionally maintaining reliability to avoid penalty payments); they have little incentive to innovate to produce other outputs or provide higher quality on uncompensated dimensions. As a result, there is likely to be too little innovation to deliver uncompensated outputs such as improved customer satisfaction, climate adaption, digitisation, and improved environmental outputs (as set out in Table 2). This is an important barrier because the nature of services provided by EDBs is changing, so that these uncompensated services are becoming more important. The implication is that this barrier to innovation is likely to become more costly going forward.

4.3.3. Capex bias

33. Capex bias – meaning that an EDB prefers using capex over opex – is an additional aspect of the regulatory regime that is likely to be a material barrier to innovation. The NZCC acknowledges that a capex bias may still exist even though it has now equalised the IRIS rate between opex and capex. More specifically, the NZCC provides some reasons underlying a possible capex bias:[22]

    a. **Easier to justify capex vs. opex solutions**: The most obvious reason is that opex allowances are mechanistic (e.g., see Section 3) while capex allowances are more bespoke, which may provide an EDB more ability to justify capex. As an example, consider two possible solutions to address a growth in peak load. First a capex-based network solution e.g., building more system capacity. Second, an opex solution that develops demand management services. Under the current regulatory regime, an EDB is likely to prefer the capex solution since it can be well evidenced in its capex forecast. By contrary, the EDB would not receive any additional opex allowance to cover the expense of the demand management services, as an increase in peak load may not be associated with ICP or line length growth;[23]

    b. **Earn a return on capex**: A second reason is that capex earns a return (while opex does not) so that EDBs may prefer capex spending which grows their RAB. Additionally, if the regulated WACC exceeds the required rate of return, then this can further bias spending towards capex (this is known as the Averch-Johnson effect);[24] and

    c. **Cultural preferences and risk aversion**: These two factors may lead EDBs to prefer less efficient capex solutions because they are already well understood so that institutional conservatism may lead towards capex. The driver is that opex and capex are substitutes, so that an EDB effectively makes a build-or-buy decision. If EDBs are risk averse or have cultural preferences for building (e.g., engineering mindset) then EDBs may prefer capex solutions to maintain control over the assets.

[22] NZCC, *Electricity distributors' expenditure incentives under the current Part 4 approach and under a totex approach Staff working paper to inform 7 November 2022 workshop 'Forecasting and incentivising efficient expenditure for EDBs'*, November 2022 section on Sources of Capex bias on p. 6.

[23] Note that under the IRIS after 5 years the costs of this solution would be passed through to consumers. But prior to that the cost would be borne by the EDB.

[24] Averch, Harvey; Johnson, Leland L. (1962). "Behavior of the Firm Under Regulatory Constraint". American Economic Review. 52 (5): 1052–1069.

34. Connecting a capex bias to innovation, the implication is that EDBs may prefer to focus on capex solutions rather than finding innovative opex solution (which may for example help to avoid capex). Therefore, in the New Zealand context, this bias likely leads to over investment in the distribution network relative to non-wire solutions such as flexibility services.

4.3.4. Short regulatory period

35. The short regulatory period is a final regulatory parameter that may result in a material barrier to innovation. New Zealand's current regime is a regulatory period of five years, which means that an EDB is only compensated for generating efficient savings *within* a five-year period. Accordingly, any efficient action that generates a saving *between* regulatory periods is not compensated. To be clear, the problem is not the length of the regulatory period in absolute terms *per se*, but rather the potential mismatch between the regulatory period and the time horizon that innovation delivers benefits. This barrier is important because innovation is increasingly taking the form of non-wire solutions that by their nature are designed to optimise the use of the network, and so defer investment.

36. To explain this point further, suppose an EDB is considering whether to innovate by procuring a flexibility service, which would allow the EDB to efficiently defer capex (i.e., reduce the cost of providing electricity).[25] Now consider the following two possible scenarios depending on when the capex in question would be deferred:

    a. **Defer capex *within* regulatory period:** The EDB finds this investment attractive as it makes a saving from deferring capex that is rewarded under the IRIS; and

    b. **Defer capex that will occur in the *following* regulatory period**: this change in timing means that the EDB no longer finds this (otherwise equivalent) investment attractive. In response, the EDB may inefficiently choose to avoid a more efficient opex solution, such as flexibility solutions. This outcome arises because the flexibility service costs opex today, which would lead to an IRIS penalty. Then in the following regulatory period, the capex saving made possible by the flex services enters the capex forecast, so that the EDB does not benefit from the reduction in capex.

37. For context, we note that both the NZCC and the AER have identified this barrier to innovation exists:

    a. NZCC:[26] *"given incentives to avoid expenditure, and the risk that innovation* ***will not deliver immediate efficiency or quality benefits****, we consider that additional funding outside of the opex and capex allowances is in the long-term benefit of consumers."*

    b. AER:[27] "*While incentive regulation is important for giving effect to the NEO, we also recognise that* ***R&D can deliver value to consumers in the long term, but produce higher costs in the short term****."*

[25] For example, procuring demand response/flexibility services from EV owners, or an aggregator who has contracted with EV owners.

[26] NZCC 2020 Reasons Paper, p 99.

[27] AER, *Explanatory statement Demand management innovation allowance mechanism,* December 2017 ("AER DMIA paper") p. 9.

4.3.5. Summary of barriers to innovation faced by New Zealand EDBs

Table 3: Summary table of primary and secondary barriers to innovation faced by New Zealand EDBs

Barrier	Explanation
Primary barriers	
Asymmetric rewards	▪ Innovation is risky yet the IRIS caps the benefit that EDBs can earn from innovation. ▪ Particularly important for riskier innovation (higher benefit but also risk of failure) ▪ An EDB does not benefit from any innovation that increases the value of the network if a) it expects the revenue cap to bind, b) the cost of innovation does not increase the MAR, and c) there are no additional incentives. ▪ Innovation by one EDB can be applied by other EDBs, so the total value of innovation is the value to all EDBs. However, this reward does not accrue to the innovating EDB. ▪ Future innovations (e.g., surrounding flexibility services) are increasingly information based, so likely that the wider benefits are increasing.
Uncompensated outputs	▪ Opex allowance based on mechanistic process. ▪ Therefore, the opex allowances only incentivises innovation that improves the cost of generating two outputs (customers and network length) or improves the cost of meeting certain quality standards related to reliability. ▪ This means there are weak incentives to innovate to generate any outputs that are not line length and customer numbers (e.g., providing better services through better information etc.)
Capex (or opex) bias	▪ Easier to justify capex as the capex process is through a bespoke proposal and opex is provided via a mechanistic model ▪ Incentive to capitalise if regulatory WACC exceeds required rate of return ▪ Capex may be preferred because of risk aversion and cultural preferences i.e., safer but less efficient.
Short regulatory period	▪ No incentive to innovate if expenditure occurs in current period but the benefits only arise in the following regulatory period ▪ Will become a larger barrier if the innovation is increasingly non-network solutions that defer future capex.
Secondary barriers	
Definition of innovation	▪ NZCC definition of innovation is not precise. ▪ Not clear if business as usual R&D is innovation or whether innovation needs to be a discrete activity. ▪ Additionally, some uncertainty whether innovation needs to reflect new solutions or whether adoption is also innovation.
Scope of service	▪ The definition of ELS is clear. ▪ There is uncertainty as technology is changing, so it is not fully clear how or if future technologies (e.g., flex solutions) will be considered ELS.
Instability	▪ Unlikely for the regulatory system to change so that EDBs benefit less from innovation than they currently do.

5. How innovation is incentivised elsewhere

38. In this section we provide a high-level overview of the different ways that innovation is incentivised globally. The intention is to initially list out the potential solutions to different barriers before focusing more specifically on applying solutions to the New Zealand context (see, Section 6). For the purpose of this section, we focus on describing the specific incentives and then provide examples of where it is applied. We therefore refer to Appendix A for specific references. A high-level taxonomy of the different types of mechanism that exist is set out in Table 5 below.

Table 4: Taxonomy of innovation mechanisms observed globally

Incentives for	Incentive type
Cost incentives	Expose firms to cost risk, so they are incentivised to innovate and find lower cost solutions.
Outcome/quality incentives	Provide financial incentives for beating quality targets, so firms are incentivised to innovate and find efficient ways of improving quality.
Targeted and direct funding for innovation	Provide direct financial support for engaging in innovative activities.
Incentives to submit innovative business plans	Provide financial rewards or have less stringent proposal assessment, for demonstrably innovative business plans.

39. In this section we will briefly work though, at a high level, the different types of mechanisms that exist within each category. Starting with cost mechanisms, Table 5 identifies examples of incentive mechanisms used for innovation to reduce costs.

Table 5: Incentives for innovation to reduce total costs

Incentive	Description	Examples
Ex ante allowance (within period)	Network Service Providers (NSPs) are rewarded for beating/exceeding targets relative to the allowance set for capex and opex within the regulatory period, generally by allowing NSPs to retain all or part of cost reductions. Incentivises innovation to reduce costs as NSPs can retain efficiency gains. However, incentive declines near the end of the pricing period.	Australia, Germany, Great Britain, Italy, New Zealand, Spain, Sweden, etc.
Ex ante allowance (with rolling incentive)	As with the within period allowances, but also provides a constant incentive across time.	New Zealand - IRIS, Australia – EBSS & CESS.
Ex ante allowance (with very long time period)	Setting a long price control period increases the time until efficiencies are passed through and thus allows for greater retention of any efficiencies from innovation.	In the UK Ofgem implemented an 8-year period as part of the RIIO-1 price controls.
Totex	Regulator does not distinguish between capex and opex when assessing efficient cost levels.	Great Britain, Germany, Netherlands.

40. Turning to quality and outcome incentives Table 6 identifies examples of incentive mechanisms used for innovation to deliver measurable outputs.

Table 6 Quality and outcome incentive mechanisms

Incentive	Description	Examples
Target based incentive mechanism	Most regulatory frameworks incentivise quality through technology neutral mechanisms of penalty and rewards based on performance against pre-set targets (e.g., unplanned outages, quality of customer service, network losses, etc.). Network operators are incentivised to find better solutions to gain rewards / avoid penalties.	Australia, Germany, Great Britain, Italy, New Zealand, Spain, Sweden, etc.
Reputation incentives	Reputation incentives, setting targets and requiring performance reporting relative to targets (but with no direct financial incentive).	Great Britain: ODI-Rs
Bonus payment for quality metric	Bonus payments for reaching predetermined (environmental) quality metrics (essentially a one-side target based mechanism).	Belgium: Gas TSO environmental (and others) incentive scheme. Great Britain: Water has many environmental ODIs
Price control deliverables	Price control deliverables, where firms have explicit targets to meet and are provided expenditure to do so.	Great Britain: PCDs

41. A more recent trend is rewards for innovative proposals or business plans which provide financial rewards or have less stringent proposal assessment for innovative business plans. Table 7 identifies examples of these types of mechanisms.

Table 7: Incentive mechanisms to submit innovative business plans

Incentives	Incentive type	Examples
Incentives to submit innovative business plans	Financial rewards for innovative business plans.	Great Britain, New South Wales.
	Less stringent assessment of innovative business plans.	Australia, Great Britain.

42. Finally, there has also been a recent trend to provide direct funding or financial incentives of innovation. Table 8 identifies examples of these direct funding mechanisms.

Table 8: Incentive mechanisms for innovation to deliver long-term and wider social benefits

Incentive type	Description	Examples
Allowance	Funding for innovation, usually focused on smaller projects or pilots. Generally allocated as a specific amount for each NSP to be used towards projects that fit specific criteria. Upfront funding allows investment that may not have occurred otherwise.	▪ New Zealand: Innovation project allowance ▪ Australia: Demand Management Innovation Allowance (DMIA) ▪ Germany: §25a AregV Allowances for R&D costs ▪ Great Britain: Network Innovation Allowance (NIA) ▪ Spain: Pilot programmes ▪ Austria: Gas TSOs capex and opex allowance ▪ Great Britain: Net Zero use-it-or-lose-it allowance
Innovation fund	Funding for innovation, usually focussed on larger projects. Generally allocated through an application process from a pool of funds held by the government or a regulator. Upfront funding allows investment that may not have occurred otherwise.	▪ Great Britain: Strategic Innovation Fund (SIF) ▪ California: Electric Program Investment Charge (EPIC) ▪ Ontario: Grid Innovation Fund ▪ Canada: Smart Grid Program
Reimbursement	Reimbursed for the additional costs of innovative solutions. Reduces cost risk as disadvantages incurred (i.e., costs) of innovative solutions are reimbursed.	▪ Germany: SINTEG-V
Cost multiplier	Multiplier applied to the cost of a project. Provides a clear opportunity to earn a return for undertaking efficient investment.	▪ Australia: Demand Management Incentive Scheme (DMIS)
WACC multiplier	A higher WACC is allowed for new investment or specific types of investment. Addresses issues of capped upside by providing higher return.	

6. Potential solutions to identified barriers in NZ

43. In this section, we identify potential solutions to the primary barriers to innovation identified in section 4.3. Where possible, we identify instances in which there is precedent of a regulator applying these solutions. This section covers the following barriers to innovation:

    a. **Asymmetric rewards:** as the benefit that EDBs can earn from innovation is capped while, by definition, innovation is risky (section 6.1);

    b. **Uncompensated outputs:** meaning that any innovation that improves cost efficiencies is not incentivised if these cost efficiencies do not relate to the number of customers; line length; or to meeting specific quality targets (section 6.2);

    c. **Capex bias**: as EDBs are incentivised to inefficiently substitute opex for capex as capex is easier justify due to its more bespoke nature (section 6.3); and

    d. **Regulatory timeframe** means that there is a lack of incentives for innovation with upfront cost and payback in future regulatory periods in the form of avoided or deferred investments (section 6.4).

6.1. Asymmetric rewards

44. Asymmetric rewards can cause an EDB to forego valuable innovation in situations where an EDB bears the cost of risky innovative activity but does not capture a sufficiently large share of the upside. In general, this barrier arises because there is a misalignment between the benefits and costs to society as compared to the EDB. Therefore, overcoming this barrier requires a solution that increases the EDB's private return (either by reducing the private cost EDBs incur or by increasing the benefit they capture) so that it is in the EDB's interests to innovate.

45. In this regard, we identify the following solutions:

    a. **Allowance (or reimbursement)**: Explicit funding for innovation, which reduces the costs to innovation. This is typically focused on smaller projects or pilots. Upfront funding means there is a separate allowance for the EDB to invest in innovative projects, which are likely to not make financial sense if the EDB had to use money from its existing allowances, particularly if those allowances already do not provide sufficient funding for the outputs EDBs want to deliver (we return to this in section 6.2). Examples include NZCC's own IPA, Ofgem's National Innovation Allowance, and the AER's Demand Management Innovation Allowance;

    b. **Innovation fund or competition:** Funding for innovation that is typically focused on larger projects, which again reduces the costs to innovation. Generally allocated through an application process from a pool of funds held by the government or a regulator. Similar to an allowance, the upfront funding means there is ringfenced funding for the EDB to invest in innovative projects, which do not make financial sense if it had to use money from its allowances. Relevant examples include Ofgem's Strategic Innovation Fund (SIF); Electric Program Investment Charge (EPIC) in California; Grid Innovation Fund in Ontario; and the Smart Grid Program in Canada; and

    c. **Cost multiplier:**[28] A cost multiplier means that the EDB receives a greater expenditure allowance than the actual expenditure. Applying a multiplier increases the returns to a project and thus make these projects more attractive. For example, the AER's Demand Management Incentive Scheme (DMIS), applies a 50% uplift factor. This means that an EDB receives $150 of allowance for each $100 spent on approved opex.

[28] In principle, one could also apply the multiplier to WACC

6.2. Uncompensated outputs

46. Uncompensated outputs (or outcomes) are problematic because the EDB will innovate too little to improve these outputs/outcomes. Recall that by uncompensated outputs we mean outputs or outcomes that are desired by customers but EDBs are either not funded to deliver (through their allowances) or provided rewards for good performance (through revenue linked outcome/quality incentives). In other words, there is a conflict between minimising costs compared to improving quality or delivering these outputs/outcomes. Therefore, one type of solution is to reward the EDB for delivering these outputs that are currently not measured. Possible ways to implement this solution include:

    a. Address deficiencies in opex setting:

        i. **Incorporating the uncompensated outputs into the allowance process:** if the allowance process accounted for all outputs then, by definition, an EDB would not be disincentivised to innovate to generate certain outputs. Therefore, adding these outputs into the allowance setting process would incentivise innovation.

        ii. **Carve-out allowances for uncompensated outputs:** Alternatively, if it is fundamentally too difficult to measure some outputs then it may make sense to carve-out expenditure into two categories. First, apply the mechanistic allowance process to opex required for generating measured outputs. Second, use a more tailored mechanism for opex that is used to generate uncompensated outputs e.g., more similar to capex proposals.

    b. **Customer centric allowances:** provide incentives to an EDB that engages with customers when proposing an allowance. If the EDB can prove that an allowance request is responding to customer requests, then it may be reasonable for them to receive a higher allowance to fund these programs. For example, the AER's Better Resets handbook, specifies how the AER will apply less scrutiny to proposals that can demonstrate genuine consultation with customers and agreement on expenditure plans.[29] Alternatively, there can be explicit rewards for firms that can demonstrate good customer consultation/innovative proposals. In this regard, Ofgem's business plan incentive provides rewards for firms that demonstrate a customer value proposition, in which a firm "goes beyond the functions typically undertaken by an energy network company as business as usual and how this will lead to benefits for consumers".[30] For example, by providing improved services to vulnerable customers;

    c. **Output/outcome incentives:** Provide incentives for certain outputs/outcomes that are difficult to include in an allowance setting process. As opposed to the allowance process (which focuses on inputs), this is a payment for beating certain output/outcome targets and thus incentivises innovation to beat targets (and so focuses on outputs/outcomes). Ofgem provides a wide ranging array of Outcome Delivery Incentives (ODIs).[31] The ODIs range from "Customer Satisfaction" and "Time to Connect" through to an ODI for EDBs that "*efficiently develop and use their network, considering flexible and smart alternatives to network reinforcement*".[32] In the New Zealand context, we could imagine incentives payments based on the quality of information provided to consumers by EDBs (e.g., through an app or website) or the customer experience in connecting to the grid. Applying output/outcome incentives to NZ would effectively extend quality incentives beyond the single reliability measure related to outages; and

[29] AER, *Better Resets Handbook Towards Consumer Centric Network Proposals,* December 2021.

[30] Ofgem, *RIIO-ED2 Business Plan Guidance*, February 2021, p. 61.

[31] Ofgem, *RIIO-ED2 Draft Determinations – Overview Document*, June 2022, Table 1 on p. 21.

[32] Ofgem, *RIIO-ED2 Draft Determinations – Overview Document*, June 2022, Table 1 on p. 21. See DSO ODI.

d. **Targeted allowance or fund:** which is an allowance that can only be spent on a specific category that is difficult to measure in the allowance setting process. The purpose is to incentivise innovation in the direction of generating the uncompensated outputs/outcomes. For precedent, Ofgem has several use-it-or-lose-it allowances for specific purposes. Regarding examples, there is a visual amenities allowance (to address environmental impacts e.g., pollution) and the worst served customer allowance (to mitigate the number of interruptions experienced by customers who experience unusually poor service).[33]

6.3. Capex bias

47. A capex bias may cause EDBs to focus too little innovation on opex solutions (as EDBs may favour using capex rather than opex). Correcting this bias therefore requires a solution that removes this preference. We list the solutions in order of how much change is required (from least to most):

    a. **Business plan incentive:** A regulator provides an EDB with a higher incentive rate if the regulator has higher confidence in the capex forecast. This can address a capex bias because an EDB would receive a lower incentive rate if it attempts to substitute capex for opex and this substitution is difficult to justify. In response, firms have a greater incentive to provide high-quality information which reduces the capex bias. The regulatory precedence is Ofgem's Confidence Dependent Incentive Rate (CDIR) and Business Plan Incentive (BPI).[34] In high-level terms, Ofgem rewards business plans that provide value to customers; penalises firms for poorly justified costs; and rewards ambitious proposals for high-confidence costs. In theory, this set up can mitigate concerns about a capex bias by disincentivising capex inflation/substitution;

    b. **Totex:** Under a totex regime, capex and opex are combined, which theoretically eliminates any bias towards capex. This can reduce capex biases and ensure EDBs optimally trade-off between capex and opex, therefore promoting innovation to lower total costs. It is important to note that there are different conceptual components of a totex regime:

        i. Totex *assessment/forecasting*: the regulator does not distinguish between capex and opex when assessing efficient levels. Instead, the regulator reviews *total* costs (or expenditure). This would address the more procedural aspect of any potential bias whereby it is easier to ask for capex – if a joint allowance is being asked for and assessed, the issue should fall away.

        ii. Totex *incentives*: requires companies to have equal incentives to reduce costs, irrespective if the savings are in capex or opex. This would address any potential *within* period bias towards capex as there is no issue around equivalent retention rates if there is a single allowance for the purpose of calculating incentives payments.

        iii. Totex *revenue recovery*: revenue allowances comprise two sources: fast money (does not enter RAB) and slow money (enters RAB). A totex approach to the split between fast and slow money divorces the capitalisation rate from the actual shares of capex and opex. A totex revenue profile therefore removes companies' incentives to over-capitalise to take advantage of a cost of capital allowance that may exceed the true cost of capital.

48. The NZCC's discussion of totex focuses on the UK implementation, which uses all three of these components. However, a "totex regime" can mean different things in practice, and other countries have totex regimes which only use some of these components. For example:

[33] Ofgem, *RIIO-ED2 Draft Determinations – Core Methodology Document*, June 2022, p. 62 and p. 188.

[34] Ofgem, *RIIO-ED2 Sector Methodology Decision: Annex 2 Keeping bills low for consumers*, 17 December 2020, pg. 90 – 103.

a. **Germany** (totex assessment only)**:** only adopted a totex approach to assessing costs, which it does by assessing the revenue requirement (depreciation, return and opex) during a snapshot year. The identified totex efficiency is then used to scale up/down each company's opex and capex allowances.

b. **Netherlands** (totex assessment + totex incentive)**:** the ACM benchmarks companies to one another using a totex cost assessment process. Companies are incentivised to outperform totex allowances through totex incentives scheme. However, unlike in the UK, the revenue allowance separates opex from capex.

49. Therefore, if the NZCC is considering "totex" as a solution to a capex bias, consideration should be given to the source of any capex bias and therefore the aspects of totex that address the identified problem(s). In addition, there may be solutions to problems that do not involve a move to a totex approach. For example:

    a. If the key issue in New Zealand is the procedural issue around it being easier to obtain capex vs opex, this could be dealt with by having a totex cost assessment/forecast but not changing the IRIS or revenue recovery. Equally, if the opex forecast process is changed to be less mechanistic and more like the capex forecasting process, this would address the procedural issue without needing to move to a totex assessment/forecast.

    b. If the issue is more about the theoretical equivalence of the IRIS incentives not holding in practice, a totex incentive mechanism could be implemented without implementing totex assessment or revenue recovery.

6.4. Regulatory timeframe

50. EDBs may face a reduced incentive to innovate if the benefits arise in future regulatory periods (i.e., after 5 years), but the costs occur in the current period. This is similar to the potential asymmetric reward issue already discussed but is specifically related to the timing aspect of it. Therefore, solving this problem requires a solution that alters the balance of risks, costs, and rewards for scenarios when benefits occur in the future. Possible solutions are:

    a. **Cost multipliers:** A cost multiplier means that the EDB receives a greater expenditure allowance than the raw cost for certain types of expenditure that are likely to reduce future allowances. For example, a regulator could apply a cost multiplier to increase the returns to a project that is likely to reduce the need for future capex. The multiplier makes these projects more attractive, and so EDBs are more willing to undertake innovation that (efficiently) reduces future capex. As an example, the AER's Demand Management Incentive Scheme (DMIS) in Australia, applies a 50% uplift factor. This means that an EDB receives $150 of allowance for each $100 spent on approved opex. In principle, this uplift should compensate the EDB for the fact that the regulatory system otherwise would not compensate the EDB for avoiding or deferring capex;

    b. **Longer regulatory period:** Setting a longer price control period increases the time until efficiencies are passed through, and therefore allows for greater retention of any efficiencies from innovation. This reduces the likelihood or the significance of a mismatch between when the costs and benefits of innovative projects occur. For example, in Great Britain, Ofgem implemented an 8-year period as part of the RIIO-1 price controls;

    c. **Alter the IRIS to account for estimates of avoided capex *across* periods:** The IRIS is designed to provide a time consistent incentive to reduce expenditure relative to the allowance *within* regulatory period. It does not however address the issue that efficiencies that happen *between* regulatory periods are not retained. A possible solution would therefore be to design an incentive mechanism that rewards efficiencies that happen between periods. This would require estimating the future capex (or opex) savings that have resulted from an innovation and passing a proportion of these savings back to the EDBs. For example, a flex trial might

lead to flex services, which reduce or defer future capex. If it is possible to estimate the present value of these capex savings in future periods, then in concept the firm can be rewarded for this avoided future capex through the IRIS. While conceptually this approach works, we imagine it would face practical challenges;

d. **Rewards for innovative business plans**: financial rewards for business plans with a focus on innovation. For example, the Business Plan Incentive in Great Britain as part of RIIO-2, business plans must "evidence a strong strategic focus on innovation" at minimum, and EDBs are rewarded for business plans that provide additional value to customers.[35] Such an approach could act as a method to operationalise estimates of avoided capex, as outlined above. Specifically, a business plan could proxy for a mechanical cross period IRIS mechanism. For example, one possibility would be to provide rewards (e.g. as a % of totex) at the proposal stage, which EDBs can access if they can provide evidence that lower costs in the proposal are the result of innovations. More generally, rewarding good business plans means that EDBs have less incentive to hold back their best ideas during the development of the proposal stage; and

e. **Allowance or innovation fund/competition**: As already described, this barrier is essentially the temporal version for the asymmetric rewards point. Therefore, all the mechanism described in section 6.1 would also help address this barrier.

[35] Ofgem, 2021, *RIIO-ED2 Business Plan Guidance*, February 2021, para.4.31.

7. Review of the Innovation Project Allowance

51. As described in section 6.1 above, an allowance for innovation is a strong solution to addressing the asymmetric rewards barrier. It can also be used to address the barriers of uncompensated outputs and regulatory timeframe. The DPP regime already has a mechanism like this, the Innovation Project Allowance ("**IPA**"). In this section we therefore review the mechanics of the IPA and its outcomes to date, with a view to determining whether it is fit for purpose for addressing the potential innovation barriers we have identified.

7.1. Summary of the IPA

52. Introduced in 2020 for DPP3, the NZCC's innovation project allowance provides EDBs an ability to claim for costs incurred in developing an "innovative project", which is a project that improves the provision of electricity lines services (ELS).[36] Schedule 5.3 of the NZCC EDB DPP3 determination provides the relevant details for making an IPA application.[37] We summarise the criteria as follows:

    a. **Sufficiently innovative:** While the NZCC does not provide any precise definition of innovation; it notes that an innovative project is "focused on the creation, development or application of a new or improved technology, process, or approach."

    b. **Scope:** The innovation projects must deliver ELS at a lower cost to consumers or at a higher quality (or both). That is, an innovation project cannot be for any other purpose other than to improve the provision of ELS (e.g., decarbonisation is not within the scope). [38]

    c. **Budget***:* The total recoverable cost (i.e., the amount drawn down from the innovation project allowance) is limited to the greater of the 0.1% of each EDB's MAR or $150k.[39]

    d. **Ex-post:** meaning that the EDB has already incurred costs.

    e. **Contribution:** Requires a contribution from the EDB of greater or equal to the recoverable cost. Because of the ex-post nature of the IPA, the already incurred costs will be at least 200% of the proposed drawdown amount.

    f. **General application:** The benefits should be of general application to EDBs e.g. scalable.

    g. **Suitable Specialist:** An independent engineer or other suitable specialist must state that, in their opinion, the planned project meets the NZCC's criteria.

[36] Specifically, the NZCC defines an innovative project as "…the creation, development or application of a new or improved technology, process, or approach in respect of the provision of electricity lines services in New Zealand" see NZCC, *Electricity Distribution Services Input Methodologies Determination 2012 (amendments as of May 2020),* 2020 p. 31.

[37] NZCC, Electricity Distribution Services Default Price-Quality Path Determination 2020, [2019] NZCC 21, 27 November 2019.

[38] The NZCC explanation on the reasoning for this is: "The requirement for the projects to be solely focused on the cost and quality of the electricity distribution services is to reduce any risk of distorting investment in adjacent markets. This requirement may be able to be altered in future regulatory periods if this risk is found to be minimal or is otherwise reduced." NZCC, *Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision Reasons paper,* November 2019, para.F24.

[39] For the budget available for each EDB, see table 5.1 on p. 75-76 of NZCC, *Electricity Distribution Services Default Price-Quality Path Determination* 2020, [2019] NZCC 21, 27 November 2019.

7.2. IPA applications

53. As of October 2021, only a single EDB – Orion – has made an IPA application.[40] Orion's application was for a project to offset carbon emissions. In the first instance, the NZCC rejected Orion's application because it failed to satisfy the ex-post criteria given that "As most of the expenditure on the offsets project is yet to occur, we cannot approve a drawdown amount from the innovation project allowance at this time".[41]

54. Additional to the ex-post criteria, the NZCC provided a "non-binding" view on the other criteria, which communicated the likely outcome if Orion were to apply to the NZCC after incurring the expenditure (and therefore satisfying the ex-post criteria). To be specific, the NZCC deemed that Orion's proposed project was:[42]

    a. Outside the scope of ELS *"we [NZCC] consider that voluntary carbon offsetting falls outside the regulated electricity lines service (ELS) defined under s 54C of the Commerce Act 1986 (Act)."*; and

    b. Not sufficiently innovative *"unlikely to be sufficiently innovative to meet the definition of 'innovation project'"* because *"it is a widespread practice across many sectors and does not require specific adaptation to the electricity distribution sector."*

7.3. Possible applications of the IPA

55. Beyond Orion's unsuccessful IPA application, we understand that EDBs are currently considering innovative projects that would benefit from the right type of funding. To be specific:

    a. **Wellington Electric's EV connect project:** which is to advance flexibility services for EV charging;[43] and

    b. **Vector plans to process smart meter data from external service providers**: to analyse this data to enhance its understanding of its LV network. This will result in improved reliability and lower costs through improved asset management decisions.[44]

56. Beyond these two applications, our understanding is that EDBs are broadly interested in:

    a. Flexibility services trials;

    b. Increased visibility of LV network through processing of smart meter data;

    c. Improving efficiency of networks by exploring new use cases for technologies such as automation, AI and machine learning;

    d. Drawing insights from consumers and market research;

    e. Developing and testing solutions that could reduce outages / network costs e.g., LV switching;

    f. Developing and testing solutions that could reduce environmental impacts e.g., biodiesel generators;

[40] Orion, *Application for innovation allowance to offset carbon emissions related to electricity lines services in a manner that will lower costs to customers*, June 2021.

[41] NZCC, *response to Orion's IPA,* November 2021.

[42] NZCC, *response to Orion's IPA,* November 2021.

[43] "EV Connect - Stakeholder Consultation," Wellington Electric, accessed October 10, 2022, https://www.welectricity.co.nz/about-us/major-projects/ev-connect/

[44] Correspondence with Vector.

g. Empowering communities and customers to decarbonise by providing insight and guidance through novel processes or services; and

h. Exploring and assessing solutions that reduce energy hardship and provide whole-systems or social benefits e.g., energy efficiency as demand reduction service.

7.4. Comparison of IPA to other innovation allowances

57. This section compares the IPA to two similar allowance mechanisms applied by other regulators: Ofgem's Network Innovation Allowance (**NIA**) and the AER's Demand Management Innovation Allowance (**DMIA**).[45] Table 9 below compares the criteria and mechanics between the different allowances before commenting on the number of applications received by the different allowances.

58. To begin with we compare the criteria of the IPA to Ofgem's NIA. We make three observations on the NIA in comparison to the IPA:

    a. **The NIA is financially more generous than the IPA on multiple criteria**. For comparison the NIA's budget is 5x-7x as large as the IPA and only requires EDBs to contribute 1/5th as much;

    b. **The allowance is ex-ante:** This means it is a use-it-or-lose it arrangement and EDBs in the UK do not need to spend the money first and seek compensation after the fact. This difference removes the risk that the regulator may not provide compensation; and

    c. **The scope of the NIA is much broader than the IPA**. While the IPA is focused on delivering ELS, the NIA allows a broad scope of projects which includes decarbonisation; energy system transition; and projects that benefit consumers in vulnerable situations. These broad criteria might suggest that the NIA could have covered Orion's IPA application (which the NZCC provided a non-binding view as being outside of ELS). This difference arises because the NIA explicitly requests innovative projects that address decarbonisation, while the IPA is focused on ELS.

59. Next, we compare the IPA to the AER's Demand Management Innovation Allowance. Both the IPA and DMIA are *ex-post* in nature. However, the acceptance rate of the DMIA is very high (for example 100% in 2018-2019), which might provide greater confidence to Australian EDBs that their project would be funded. The budget is similar in magnitude but distributed differently. Compared to the IPA, the $200k base is designed to give smaller EDBs a larger budget given that innovative projects often have substantial fixed costs (e.g., salaries). The AER writes:[46]

    > *Therefore, having a reasonable fixed (in real terms) base for the allowance cap serves to achieve the Allowance Objective and gives smaller distributors certainty that they can proceed with innovative projects*

60. At the same time, applying the DMIA budget to NZ would imply that larger EDBs in NZ such as Vector would receive a lower allowance (as the DMIA has a lower % allowance). In terms of differences, the DMIA does not require a contribution by the EDB. This means the EDBs do not need to bear any downside risk from the innovative projects. The second and largest difference concerns the scope. On the one hand, the DMIA is specific to demand management projects, so rather narrow. On the other hand, within the demand management scope, the DMIA allows for a broad array of projects which may fall outside the scope of ELS. As way of example, in 2018-2019, Endeavour Energy successfully applied for a project to control households' air

[45] We note that both the UK and Australia both have other, larger scale funding mechanisms (the Strategic Innovation Fund in the UK and the Demand Management Innovation Scheme in Australia). We focus on the NIA and the DMIA as they are more directly comparable in their purpose and scale.

[46] AER DMIA, p. 21.

conditioning.[47] Under the IPA, it is not clear, whether controlling people's appliances would come under the scope of ELS.

61. Table 9 compares the IPA to both the NIA and DMIA, using the final two rows to describe outcomes and explain the next steps available to an EDB that uses the allowance for a project. Both Ofgem and the AER provide other schemes to further the development of innovative projects. Ofgem offers the Strategic Innovation Fund (SIF), which has double the budget of the NIA and is devoted to larger-scale transformational research and development projects. The AER offers the Demand Management Innovative Scheme, which allows EDBs to receive a 50% uplift of expenditure, and so allows EDBs to put any successful project into practice.

62. In terms of outcomes, both the NIA and DMIA have had many more applications than the IPA. For the DMIA, in 2018-2019 all 46 DMIA applications were accepted, and total spending was $4.7mil. At a high level, the top five categories funded by the DMIA have been battery storage solutions, general research, managing load of air conditioning, micro grid, and voltage management.[48] For the NIA, since 2009, there have been 370 accepted projects at a total cost of £271 mil.

[47] See AER, *Decision Approval of Demand Management Innovation Allowance (DMIA) expenditures by non-Victorian electricity distributors in 2019*, November 2020. Section Air Conditioner Control Trial using 3G Demand Response Enabling Device on p. 26.

[48] For information of funded projects, see: *Decision Approval of Demand Management Innovation Allowance (DMIA) expenditures by non-Victorian electricity distributors in 2019*, November 2020.

Table 9: Comparing the IPA to similar allowance mechanisms

Criteria	NZCC: Innovative Project Allowance (IPA)[49]	Ofgem: Network Innovation Allowance (NIA)[50]	AER: Demand management innovation allowance (DMIA)[51]
Sufficiently innovative	Not precisely defined *"the creation, development or application of a new or improved technology, process, or approach".* Precedent of an application being rejected for not being sufficiently innovative.	Must involve R&D or Demonstration. Must also be innovative e.g., unproven, effectiveness not yet demonstrated, untested at scale, risks preventing widespread deployment, etc.,	New or original ways of building/developing capability and capacity to undertake, facilitate or utilise. Explicitly acknowledges that R&D has multiple stages, so allows for iterative technology innovations.
Budget	Greater of ($150k or 0.1% of EDB's MAR)	Varies between 0.5% and 0.7% of allowable revenues	$200k + 0.075% EDB MAR (indexed to CPI)
Scope	**Only ELS:** meaning deliver ELS at a lower cost to consumers or at a higher quality (or both).	**Broader than ELS:** to include ▪ Decarbonisation; ▪ Energy system transition; ▪ Benefit consumers in vulnerable situations	**Broader and narrower:** On the one hand, specific to demand management, so narrower. On the other hand, broader than ELS as could explore solutions such as paying consumers to not use the grid (which we imagine would not be permissible in the IPA)
Ex-post	**Ex-post**: EDB need to pay upfront and then ask for funds ex-post. NZCC will, however, provide a non-binding view.	**Ex-ante:** Use it or lose it or ex-ante	**Ex-post** but AER will provide "up-front consideration", which is similar to NZCC non-binding view.
Contribution	> 50%	> 10%	None
General application	Yes: The benefits should be of general application to EDBs.	No but required to "develop new learning" and provide information to all EDBs via a portal. Additionally, projects should not lead to unnecessary duplication.	No specific mention about general application. Requirement to publish results.
Next steps	**No** – The IPA is the only mechanism to incentivise innovation	**Yes** – can then use the Strategic Innovation Fund (SIF), which has double the budget of the NIA and is devoted to larger-scale transformational projects.	**Yes** – Insights from the DMIA can then be applied using the Demand Management Innovative Scheme, to receive a 50% uplift to expenditure.
Outcomes	One unsuccessful application	Over RIIO-1, 370 projects were funded at a total cost of £271 mil.[52]	2018–19: all 46 project applications were accepted, and total spending was $4.7mil.[53] Most projects addressed batteries and smoothing load from air conditioning.

[49] NZCC, *Default price-quality paths for electricity distribution businesses from 1 April 2020 Reasons paper*, November 2019, "Attachment F Incentives for innovation" on p. 290.

[50] Ofgem, *RIIO-2 NIA Governance Document*, January 2021 and Ofgem, *RIIO-2 Final Determinations - Core Document*, December 2020.

[51] AER, *Explanatory statement Demand management innovation allowance mechanism,* December 2017.

[52] Energy Networks Association, *Energy Networks Innovation Strategy*, March 2022, Slide 5.

[53] AER, *Decision Approval of Demand Management Innovation Allowance (DMIA) expenditures by Victorian electricity distributors in 2019* and *Decision Approval of Demand Management Innovation Allowance (DMIA) expenditures by non-Victorian electricity distributors in 2019*, November 2020.

7.5. Assessment of IPA

63. In terms of conclusions, we find that the IPA has been much less successful in funding innovative projects compared to both the AER's DMIA and Ofgem's NIA. The first reason is that the IPA's conservative criteria – it's low budget, ex-ante nature, and high contribution rate – will skew the applications towards safer (i.e., not particularly innovative projects). This point has already been recognised by the NZCC in the DPP3 reasons paper. For instance, on the contribution criteria the NZCC writes:[54]

> *We recognise that the contribution requirement may incentivise distributors to select projects that are more likely to be successful and benefit them financially, for example, projects where the full extent of potential benefits are uncertain but most likely to result in efficiency or quality improvements in future regulatory periods. However, on balance, we consider that maintaining an incentive to minimise costs is more important than this risk.*

64. Further the NZCC acknowledges that the budget is conservative:[55]

> *Although we recognise that this limit is lower than some of the mechanisms in other countries and that there may be significant benefits from a larger scheme, we consider that this level is an appropriate starting point because it recognises that there are several risks and downsides of the new mechanism …, and so balances the benefits and risks.*

65. An additional cause for the lack of applications is that there is no clear pathway for an EDB to advance any innovation in New Zealand. That is, given IPA is intentionally small scale in nature, it may only be useful for pilots. But moving beyond a pilot, an EDB may find it hard to action an innovative project given the barriers we have already described are likely to still exist. For example, a pilot study may identify a potential service that allows households to sell energy back into the grid. If the EDB bears costs and cannot earn any revenue from providing this service, then it will have no incentive to provide the service.

66. For a comparison, the AER's DMIA feeds directly into the DMIS. Under the DMIS, projects receive a cost multiplier, which is designed to address concerns caused by demand management innovations deferring capex *between* periods. Therefore, an Australian EDB can use the DMIA to run a pilot and then apply to the DMIS to action this pilot. In the words of the AER:[56]

> *The Scheme [DMIS] and Mechanism [DMIA] are designed to work together to provide incentives for innovation. The Scheme exposes distributors to 'up-side risk' by rewarding demand management when it is used in efficient non-network projects. The Mechanism provides innovation incentives by reducing distributors' 'down-side risk' via an allowance for R&D costs.*

67. Similarly, the British experience differs in two important ways. First, the NIA acts as a steppingstone to the Strategic Innovation Fund (SIF), which then allows EDBs to apply for much greater funding.[57] Second, the vast array of output incentives imply that UK EDBs (as compared to NZ EDBs) have much stronger incentives to action any new services.

[54] NZCC, *Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision Reasons paper*, November 2019. See para F7 on p. 291.

[55] NZCC, *Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision Reasons paper*, November 2019. See para F7 on p. 293.

[56] AER DMIA paper, p. 9.

[57] Ofgem, *SIF Governance Document*, September 2022, See paras 1.5 & 1.6 on p. 7.

Appendix A. Further detail and references for overseas incentive mechanisms

Table 10: Incentives to submit innovative business plans

Financial and process-based rewards		Providing financial or process-based rewards can encourage firms to submit innovative business plans to counteract firms not benefitting from innovation if it is incorporated in forecasts.	
UK Electricity	**Financial rewards** Business plan incentive (BPI)	**How it works:** Four steps: 1) financial penalty if minimum requirements for quality of proposal aren't met, 2) financial reward for business plans that provide additional value to customers, 3) penalty for poorly justified costs and 4) reward for ambitious cost proposals. **How it promotes innovation:** Step 2 rewards proposals that demonstrate added value for consumers and step 4 rewards ambitious costs forecasts.	**References**: Ofgem, *RIIO-ED2 Sector Methodology Decision: Annex 2 Keeping bills low for consumers*, 17 December 2020, p. 95.
UK Electricity	**Less stringent assessment** Fast tracking during RIIO1	**How it works:** Under RIIO1 Ofgem applied proportionate scrutiny of companies' business plans where the regulatory scrutiny varied according to the quality of the plans. Companies that submit very high-quality business plans could have the price control agreed early, which was termed "fast tracking". **How it promotes innovation:** The ability to be fast tracked and face less scrutiny was considered to incentivise firms to submit their best view up front.	**References**: Ofgem, *Assessment of RIIO-ED1 business plans and fast-tracking*, 22 November 2013, p.2.
Australia (IPART - NSW) Water	**Financial and process rewards** Self-assessment rewards	**How it works:** Businesses that self-assess that their proposal is "Advanced" or "leading" and IPART agrees, can receive a financial reward of up to 2.5% of allowed revenue. A business can expect a more streamlined price review if it submits a proposal that demonstrate a) improved performance and b) a program that efficiently delivers the services that its customers prefer. **How it promotes innovation:** Financial and process rewards will incentivise firms to submit innovative proposals upfront.	**References**: IPART, *Our water regulatory framework*, November 2022, p.22.
Australia (AER) Energy	**Process reward** Better resets handbook	**How it works:** Proposals that reflect consumer preferences, and meet the regulator's expectations, are more likely to be largely or wholly accepted at the draft decision stage. **How it promotes innovation:** While not focused on innovation per se, meeting expectations regarding customer engagement may result in more innovative business plans being submitted**.**	**References**: AER, *Better Resets Handbook: Towards Consumer Centric Network Proposals*, December 2021.

Table 11: Quality and outcome incentive mechanisms

Target based incentive mechanism		Most regulatory frameworks incentivise quality through technology neutral mechanisms of penalty and rewards based on performance against pre-set targets (e.g., unplanned outages, quality of customer service, network losses, etc.). Network operators are incentivised to find better solutions to gain rewards / avoid penalties.	
Germany Electricity	**Quality** Q-Element, §18 ARegV	**How it works:** Incentive regulation, the Q-Element for each DSO is determined by the regulatory authority based on five different aspects (network reliability, product quality, security of supply, quality of customer services and network performance). The performance of a single DSO is measured against a benchmark which is calculated as a weighted average of the performance of all DSOs. Depending on its performance, a DSO receives an increase or a reduction of its revenue cap. **How it promotes innovation:** Provides an incentive to ensure security of supply and to offer high-quality services to customers (for DSOs).	**References**: Bundesnetzagentur (German Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway), ARegV section18 [58]
Australia DNSPs	**Quality** Service Target Performance Incentive Scheme (STPIS)	**How it works:** Penalty/rewards for over/underperformance in relation to quality targets. The STPIS is applied to unplanned outages, including those caused by short-lived weather events. Furthermore, it incentivises networks to reduce the impact of planned outages on the market. STPIS targets are based on the network's average historical performance and are tailored to each specific network to account for their intrinsic differences. 30% of performance improvement is retained by the network, assuming a 6% real discount rate. **How it promotes innovation:** Incentivises networks to achieve predetermined quality targets. An incentive to adopt solutions that reduce the impact and duration of planned and unplanned outages.	**References**: Australian Energy Markets Commission, *National Electricity Amendment (Access, Pricing, and Incentive Arrangements for Distributed Energy Resources) Rule 2021,* 12 August 2021.
Australia DNSPs	**Quality** Reliability incentive scheme	**How it works:** Revenue-linked incentive scheme based on the duration of outages. DNSPs receive a penalty or reward based on over or underperformance in relation to the duration of outages. The actual durations of planned and unplanned outages are weighted against forecasts and multiplied by a firm-specific incentive rate. Firm-specific incentive rates, where the incentive rate relating to planned outages makes up 50% of the unplanned outage rate due to less inconvenience to customers. **How it promotes innovation:** Incentivises DNSPs to maintain and surpass reliability standards/forecasts. Incentive to adopt solutions that reduce the duration of service outages.	**References**: NZCC, *Default price-quality paths for electricity distribution businesses from 1 April 2020 – Reasons paper*, November 2019, Chapter 7.

[58] For description in English see:
www.bundesnetzagentur.de/EN/RulingChambers/Chamber8/RC8_05_Revenue%20caps_revenue%20regulation/57_Quality%20regulation%20and%20the%20quality%20element/Quality%20regulation%20and%20the%20quality%20element.html

For an overview of incentive regulation in Germany see: https://www.bundesnetzagentur.de/EN/Areas/Energy/Companies/GeneralInformationRegulation/IncentiveRegulation/Tools/start.html

Reputation incentives		Reputation incentives, setting targets and requiring performance reporting relative to targets (but with no direct financial incentive). Setting targets and requiring performance reporting relative to targets, but with no direct financial incentive. Effectively a form of peer pressure as firm management faces reputational incentive to beat targets.	
Great Britain Energy networks & Water	ODI-Rs	**How it works:** Ofgem and Ofwat have introduced Outcome Delivery Incentives (ODIs) which set targets and require performance reporting relative to targets, but with no direct financial incentive. **How it promotes innovation:** Effectively a form of peer pressure as firm management faces reputational incentive to beat targets.	**References**: Ofgem, *RIIO2 Outputs and Incentives: Next steps on framework*, September 2018, Slide 10.
Price control deliverables		Firms can have explicit targets they need to meet and are provided expenditure to do so. Costs of sustainability/decarb activities are explicitly included in allowances.	
Great Britain Energy networks	Price control deliverables	**How it works:** Firms can have explicit targets they need to meet and are provided expenditure to do so. **How it promotes innovation:** Costs of sustainability/decarbonisation activities are explicitly included in allowances.	**References**: Ofgem, *RIIO-2 Sector Specific Methodology – Core document,* 24 May 2019, Chapter 4.

Table 12: Incentive mechanisms for innovation to deliver long-term and wider social benefits

Allowance		Funding for innovation, usually focused on smaller projects or pilots. Generally allocated as a specific amount for each NSP to be used towards projects that fit specific criteria. Upfront funding allows investment that may not have occurred otherwise.	
New Zealand DNSPs	Innovation project allowance	**How it works:** Recoverable cost allowance for innovation projects focused on the creation, development, or application of new or improved technology, process, or approach in the provision of electricity distribution. Allowance can be recovered as capex or opex, where at least 50% of the project's cost is borne by the distributor and limited to a higher of 0.1% of the forecast of allowable revenue (excluding pass-through and recoverable costs) or $150,000. **How it promotes innovation:** Allows cost recovery towards innovative projects to incentivise investment in projects that are in the long-term interest of customers.	**References**: NZCC, *Default price-quality paths for electricity distribution businesses from 1 April 2020 – Reasons paper*, November 2019, Attachment F.
Australia EDBs	Demand Management Innovation Allowance (DMIA)	**How it works:** Allowance awarded to R&D projects on demand management on an individual basis and subject to a cap (AU$200k + 0.075% of allowed revenues). The projects need to have the potential to reduce long-term network costs. **How it promotes innovation:** Upfront funding for R&D for demand management projects that have the potential to reduce long-term network costs.	**References:** Australian Energy Regulator, *Demand management innovation allowance mechanism,* December 2017, p. 6.
Germany Energy Networks	Allowances for R&D costs (§25a ARegV)	**How it works:** Partial pass-through of R&D costs to network charges for some projects. DNSPs can recover 50% of their R&D costs that have not already been considered in the revenue cap through the photo-year and that arise as part of governmental energy research initiatives. Electricity grid operators can recover 50% of their R&D costs that fulfil the criteria above through a yearly adjustment of the revenue cap. **How it promotes innovation:** Provides additional incentives for R&D.	**References**: Bundesnetzagentur (German Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway), ARegV section 25.[59]
Great Britain Energy Networks	Network innovation allowance (NIA)	**How it works:** Allowance to fund smaller innovation projects that deliver learning potential or customer benefit. NIA is a set annual allowance (awarded as a percentage of totex, e.g., between 0.5%-0.7% at RIIO-ED1). This mechanism will be in place also at RIIO-2. **How it promotes innovation:** Provides a consistent level of funding to encourage investment in innovative projects.	**References**: Ofgem, *Electricity Network Innovation Allowance Governance Document,* 2 April 2015, Chapter 1.

[59] See: https://www.gesetze-im-internet.de/aregv/ARegV.pdf

Great Britain Energy networks	Net Zero use-it-or-lose-it allowance	**How it works:** An allowance that EDBs can spend on early development work for projects facilitating Net Zero. Any unused funding from the baseline allowance is automatically handed back at the end of the regulatory period. **How it promotes innovation:** Supports investment in projects facilitating Net Zero.	**References**: Ofgem, *Net Zero and Re-opener Development Fund Governance Document,* 30 March 2021, p. 5 & 6.
Spain	Pilot programmes	**How it works:** Allowance to incentivise innovation, usually reserved for small demonstration projects. Operators apply to the pilot programme by presenting investments with quantifiable expected benefits in terms of safety, quality, efficiency, objectivity, and transparency. They receive an allowance which covers depreciation, return on capital, and possibly operating expenses. **How it promotes innovation:** Allowance to incentivise innovation.	**References**: V2 Market, *Conclusions of the market study,* June 2022, p. 13.[60]
Austria Gas TSOs	Lump-sum (capex and opex) allowance	**How it works:** An allowed lump sum covering capex and opex for qualified projects determined ex-ante (i.e., in the cost decision ahead of the implementation of the project) to incentivise gas TSOs to carry out certain R&D and pilot projects. Ex-post deviations are adjusted for in the next regulatory period (outstanding balance earns interest). E-Control incentivises gas TSOs to carry out R&D projects, feasibility studies, and pilot projects relating to some areas (e.g., feeding-in of low carbon gasses and sector coupling) and subject to some criteria (e.g., CO_2 emissions reduction, demonstration of commitment to sustainability and others). **How it promotes innovation:** Incentivises investments in innovative approaches that aim at promoting the decarbonisation of the energy system.	**References**: E-Control (Austrian Energy Regulator), *Electricity Distribution System Operators 1 January 2019 - 31 December 2023 Regulatory Regime for the Fourth Regulatory Period*, December 2018, p. 49.
Innovation fund		Funding for innovation, usually focussed on larger projects. Generally allocated through an application process from a pool of funds held by the government or a regulator. Upfront funding allows investment that may not have occurred otherwise.	
Great Britain Energy networks	Strategic Innovation Fund (SIF) and Network Innovation Competition (NIC)	**How it works:** SIF: Funding mechanism focusing on high-value innovation projects (>$5m) that operators would not otherwise pursue as business-as-usual activities or via the NIA funding. The application process to obtain funding is much quicker than the previous NIC (which it will replace at RIIO-2), and the default level of companies' compulsory contribution is equal to 10% of project costs. Expected to invest £450 million in energy network innovation over 2021-26 for projects targeted at specific 'challenges'. NIC: Annual competition to fund selected flagship innovative projects to deliver customers low carbon and environmental benefits. Allowance for larger scale projects at RIIO-1. To obtain it, DNSPs compete for a pre-set allowance presenting projects each year (£40m in 2022, discontinued at RIIO-2). **How it promotes innovation:** Supports investment in innovative projects that contribute to the achievement of net zero and that would not occur otherwise.	**References** **SIF:** Ofgem, *RIIO-ED2 Draft Determinations – Core Methodology Document,* 29 June 2022, p. 48. **NIC:** Ofgem, *Gas Network Innovation Competition Governance Document,* 30 June 2017

[60] See: https://v2market-project.eu/wp-content/uploads/2022/07/D3.3-Conclusions-of-study_M9_v1.0_OMIE.pdf

USA – California Electricity	Electric Program Investment Charge (EPIC)	**How it works:** Innovation fund to provide funding for public investments that benefit electricity ratepayers of the three large investor-owned utilities. The utilities charge the Electric Program Charge to customers (US$162m yearly). Of this total, 80% is pooled and redistributed to the utilities for projects in applied R&D, technology demonstration and deployment (TD&D), and facilitation of clean energy technology and approaches. The remaining 20% is retained by utilities but can only be used for TD&D. **How it promotes innovation:** Innovation fund for investment in R&D and innovation. Significant focus on "grid modernisation and optimisation" projects, i.e., grid monitoring, data analytics and predictive maintenance.	**References** The Electric Program Investment Charge (EPIC), PG&E, accessed 14 December, 2022.[61]
Canada – Ontario Electricity	Grid Innovation Fund	**How it works:** Financial support for innovation with the potential to achieve significant electricity bill savings for Ontario ratepayers (either by enabling greater competition or helping customers manage energy consumption). The Independent Electricity System Operator issues general or targeted calls for proposals, and awards funding for a share of the costs of the projects it accepts. **How it promotes innovation:** Innovation fund for projects to achieve electricity bill savings. Prioritisation of distributed energy resources projects at present.	**References:** Grid Innovation Fund, IESO, accessed 14 December, 2022.[62]
Canada Electricity	Smart Grid Program	**How it works:** Innovation fund to accelerate the development of smart grids to reduce GHG emissions and generate economic and social benefits. Up to CA$100 million over five years available to fund projects to demonstrate or deploy smart grid technologies. Strong emphasis on non-network solutions. For example, Hydro Quebec received CA$11 million to deploy a microgrid control system and battery storage system throughout 11 remote indigenous communities. **How it promotes innovation:** Innovation fund for investment in smart grid technology projects.	**References**: Natural Resources Canada, *Smart Grid: Program Overview,* October 2021.
Reimbursement		Reimbursed for the additional costs of innovative solutions. Reduces cost risk as disadvantages incurred (i.e. costs) of innovative solutions are reimbursed.	
Germany Electricity	SINTEG-V	**How it works:** SINTEG-V is a mechanism by which network operators are reimbursed for the disadvantages incurred as a result of taking actions on networks due to the implementation of innovative, decentralised, smaller-scale solutions. It is only awarded for projects under the SINTEG government research programme. **How it promotes innovation:** Reimbursement for disadvantages incurred (i.e., costs) of innovative solutions.	**References**: Bundesnetzagentur (German Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway), SINTEG-V.[63]

[61] See: https://www.pge.com/en_US/about-pge/environment/what-we-are-doing/electric-program-investment-charge/regulatory-filings.page

[62] See: https://www.ieso.ca/en/Get-Involved/Funding-Programs/Grid-Innovation-Fund/Overview

[63] See: https://www.bundesnetzagentur.de/DE/Beschlusskammern/BK04/BK4_71_NetzE/BK4_74_SINTEG/BK4_SINTEG_node.html

Cost multiplier		Multiplier applied to the cost of a project. Provides a clear opportunity to earn a return for undertaking efficient investment.	
Australia EDBs	Demand Management Incentive Scheme (DMIS)	**How it works:** Cost multiplier incentive to encourage NSPs to consider demand-side management solutions. The cost multiplier is set to be 50% of demand management costs but is capped by the net benefit provided to consumers. Provides the NSP with a clear opportunity to earn a return for undertaking efficient demand management projects. **How it promotes innovation:** Promotes NSPs to consider demand-side management solutions when managing and planning networks.	**References:** AER, *Explanatory statement Demand management incentive scheme*, December 2017, p. 25.
Exposure to volume and cost risk		System operators bear cost/volume risk around electricity usage, carbon costs and losses. Exposure to more risk for disincentivised outputs (e.g., power loss, CO2 emissions) incentivises networks to minimise.	
Germany Power TSOs	TSO power loss incentive.	**How it works:** German TSOs are incentivised to keep power losses low by exposing them to i) the full fluctuation in losses volumes and ii) some of the fluctuations in losses prices. German TSOs are allowed to charge for an imputed level of cost losses that is calculated as the reference year volume of losses multiplied by an annually calculated reference price. The TSO bears any deviation from this imputed cost level. **How it promotes innovation:** By exposing power TSOs to the full volume of losses higher than the reference year (upside and downside), the regulator provides an incentive to minimise losses and thus to reduce power consumption overall.	**References**: "System Service", Bundesnetzagentur, accessed 19 December 2022.[64]
Re-opener		Allows allowances to be adjusted *within* period in response to changing expenditure needs for specific types of activities. If needs arise within period and firms would take a penalty for exceeding their capex allowances, they may defer investment.	
Great Britain Energy networks	Net Zero re-opener	**How it works:** Network companies can trigger the re-opener when there is a need to undertake work beyond the baseline allowance (subject to Ofgem's approval). There is a materiality threshold of 0.5% (at ET, GD, GT and 1% proposed for ED) of annual average ex-ante base revenues. Can be triggered due to changes in policy, the introduction of new obligations, or technological or market developments. **How it promotes innovation:** EDBs can adjust allowances *within* the period in response to changing expenditure needs for specific activities. If needs arise within the period and firms would take a penalty for exceeding their capex allowances, they may defer investment.	**References**: Ofgem, *Net Zero and Re-opener Development Fund Governance Document,* March 2021, p. 5.

[64] See: https://www.bundesnetzagentur.de/EN/RulingChambers/Chamber8/RC8_05_Revenue%20caps_revenue%20regulation/59_TSO%20specific%20features/591_System%20service/System%20service_%20basepage.html

Volume drivers		Indexing allowances based a volume driver related to a known category of environmental/sustainability expenditure. If firms bear within period volume risk related to environmental/sustainability-based expenditure, they may defer investment.	
Great Britain Energy networks	Volume Drivers	**How it works:** Indexing allowances based on a volume driver (VD) related to a known environmental/sustainability expenditure category. VD enable allowances to flex in a timely and agile manner in response to changes in demand and supply. VD is bespoke to each sector (e.g. Generation and Demand connections VD and Opex Escalator in electricity transmission and Reinforcement VD and LV Services VD in electricity distribution). **How it promotes innovation:** If firms bear within period volume risk related to environmental/sustainability-based expenditure, they may defer investment.	**References**: Ofgem, *RIIO-2 Final Determinations - Core Document*, December 2020, p. 56.
Reduction in asset lives		Reduction in asset lives. Shortening asset lives while ensuring cost recovery enables more rapid asset replacement.	
Italy Gas	Reduction in asset lives for the gas sector	**How it works:** In an ongoing consultation document, the Italian regulator states that it plans to consider shortening regulatory assets' lives to facilitate the decarbonisation of the energy system. The regulatory change would allow assets to be replaced more rapidly whilst ensuring cost recovery for operators, thus facilitating the energy transition. **How it promotes innovation:** Shortening asset lives while ensuring cost recovery allows networks to replace assets more rapidly facilitating the energy transition.	**References**: ARERA, *Consultation Document 512/2018/R/Gas,* p. 2.

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