NERA
ECONOMIC CONSULTING

Review of Jersey Electricity's Proposed Standby Charge for Commercial Embedded Generators

Prepared for Jersey Department of the Environment

15 August 2018

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Our Assignment

NERA Economic Consulting (NERA) has been commissioned by the States of Jersey (SoJ) Department of the Environment (DE) to assess whether a proposal from Jersey Electricity Plc (JE) to apply a "standby charge" of £3.25/kW per month to all new commercial customers choosing to install embedded generation of up to 50kW of installed capacity is "fair and reasonable".[1] The charge would be levied per kW of installed embedded generation capacity.[2]

Our terms of reference require that we assess whether the proposed standby charge is "cost reflective" and consistent with the form of charge that would emerge in a competitive market. Consistent with best practice in the regulation of electricity network utilities, we meet this objective by assessing whether the proposed charge will promote the economically efficient development of embedded generation in Jersey. In other words, we consider whether the proposed charge sends accurate signals to customers regarding the value of embedded generation to the electricity system in Jersey.

In addition, we also consider whether the proposed charge is proportionate to the penetration of embedded generation in Jersey. And finally, we note other advantages and disadvantages of electricity tariff reform options in Jersey, such as related to the costs or complexity of implementation.

It is important to note that assessing the economic rationale for JE or SoJ providing financial support to renewable generation technologies, such as reflecting actual or perceived environmental benefits they create, is outside of the scope of this assignment.

In performing this review, we held discussions with JE as well as a range of stakeholders in the energy sector in Jersey to obtain evidence on the case for or against the proposed standby charge.

JE's Proposed Standby Charge

JE's proposed standby charge aims to address a problem with its current charging methodology that exaggerates the economic value of embedded generation to the wider power system. Specifically, the standby charge addresses the problem that JE's current retail prices, which like many utilities are specified in pence/kWh, are set to cover both JE's fixed and variable costs. Hence, if customers reduce their purchases from JE by installing embedded generation, they also reduce their contributions to the fixed costs of the electricity system in Jersey. These costs would therefore need to be recovered from other residential and commercial customers.

This problem is widely known internationally as "inefficient grid bypass", and is becoming more common due to reductions in the cost of some embedded generation technologies

1 Jersey Electricity website,, URL: https://www.jec.co.uk/your-business/standby-charge/qa-standby-charge/

2 Source: NERA discussions with JE.

(notably solar panels). Utilities and energy regulators around the world are considering changes to end-user prices to address this, which typically involve recovering a larger proportion of utilities' costs through fixed charges that do not vary with the amount of electricity customers produce themselves using embedded generation.

While the penetration of embedded generation in Jersey is low at present, we understand that JE's proposal is intended to send a more accurate signal to embedded generation developers regarding the value of their electricity production to the power system in Jersey. JE's proposed standby charge therefore bears some similarity to reforms in other jurisdictions to address the challenge of inefficient grid bypass.

The proposed standby charge does not seek to recover any incremental costs JE may incur to manage the "intermittent" nature of output from solar PV facilities. JE may incur costs to integrate solar PV facilities in the future, at which point it would become necessary for JE to adjust its tariffs to recover these costs.

Assessment of JE's Proposed Standby Charge

Following our review of the standby charge, we consider that there is a commercial justification for some charging reform to address the potential for inefficient grid bypass, ie. customers installing embedded generation to avoid contributing to the fixed costs of the system. And, while there is a sound rationale for the approach JE has proposed, we have identified features of its detailed proposals that mean it will not fully address the potential for inefficient grid bypass and create other problems.

We have identified some limitations related to the design of the standby charge:

- It assumes all embedded generators have the same load factor, based on the expected output from solar PV facilities. This will cause the standby charge to be too low for embedded generators using other technologies that produce more energy per kW. However, if potential variation in solar PV load factors on Jersey is small, then the effect of this limitation on the standby charge paid by solar PV facilities would also be limited;
- It assumes all commercial customers consume the same proportion (50%) of the electricity they generate at their own premises. This will result in commercial customers with larger generators (relative to their demand) paying too much, and customers with smaller generators paying too little. In practice, we understand that commercial customers that already have solar PV installed consume more than JE assumed in its calculation, between 69% and 100%, suggesting JE's calculation understates the appropriate standby charge;[3] and
- The standby charge is not well-suited to thermal generators. As noted above, they will tend to produce more energy than solar PV, but they may also provide some cost savings to the system if they reliably reduce customers' peak demand or provide relatively firm export capacity, which the standby charge does not recognise. JE's tariff structure will

[3] Information provided to NERA by JE via email on 8 May 2018.

also encourage them to generate more often than is efficient, which imposes a cost on the system.

We have also identified some minor problems with the details of JE's calculation, rather than with the design of the charge, such as the method used to allocate costs between fixed costs and variable costs for the purpose of the standby charge calculation. However, their effect is small. Addressing these minor problems and updating JE's calculations to reflect its current costs would result in a slightly lower standby charge of £3.22/kW/month.

However, making these changes and applying a higher self-consumption ratio based on the mid-point of those observed currently (85%) results in a higher standby charge of £5.48/kW/month, suggesting JE's calculation is conservative overall.

Alternative Solutions to Inefficient Grid Bypass

In this report we discuss a number of possible solutions to address these limitations with JE's proposed tariff, which we understand JE is also considering as possible alternatives to its initial proposal:

1. The most comprehensive solution to the problem of inefficient grid bypass would be to restructure the prices all customers (ie. residential and commercial customers) pay for electricity, setting tariffs that are more reflective of the balance between fixed and variable costs. For example, this might involve levying a fixed £/month charge and a variable pence/kWh charge:
   - This approach would send more efficient signals to all customers and about the value of embedded generation, and would also be fairer in the sense that electricity tariffs would better reflect the costs JE incurs to serve different customers. Utilities in some US States are restructuring tariffs in this way to mitigate potential inefficient grid bypass (though not all are restructuring tariffs for all customer classes – see option 2). In Great Britain, the energy regulator Ofgem is also considering restructuring network charges to avoid recovering fixed costs through pence/kWh charges that encourage inefficient grid bypass.
   - However, it would also involve a relatively significant adjustment to current tariffs and would cause some customers to face higher or lower bills than at present. It may therefore take longer to implement. For instance, in some US states increases in fixed charges for electricity have been phased in over time. Restructuring tariffs might also require SoJ to consider the distributional effects of customers with relatively low energy consumption tending to face higher bills (and vice versa).
2. Without restructuring all customers' tariffs, JE could also consider a more limited application of cost reflective charging structure (ie. including a fixed £/month element to the charge) for commercial customers only, or only those customers (including commercial and residential) opting to install embedded generation. This approach would be combined with a lower tariff per unit of energy they consume and leave other customers' tariffs unchanged. Rather than restructure all tariffs as in option 1, many US states have adopted this more limited approach to addressing inefficient grid bypass.

- The advantage of this more limited change is that it might be faster to implement, but it would not improve the efficiency of signals sent to customers which do not face restructured tariffs.
- Also, it would have fewer distributional effects than restructuring all customers' tariffs. This limits the possible need for SoJ or JE to introduce new measures to protect any vulnerable customers facing higher bills, but would also not address the potential unfairness built into the current charging methodology arising from customers consuming less energy making smaller contributions to the fixed costs of the system.

3. Alternatively, JE could measure production from embedded generation facilities separately from customers' on-site consumption by installing (or requiring developers to install) an additional meter. Embedded generation could then be paid a price reflecting JE's wholesale procurement costs (eg. similar to JE's established buy-back rate), and customers' would pay for their consumption in the same way as now. This option is essentially the same as setting a standby charge for each customer that reflects that customer's own capacity, self-consumption rate and load factor.
   - The advantage of this approach is that it would be relatively simple to implement, but at the cost of installing additional meters with new embedded generation, which could constitute a material cost for smaller commercial and residential installations. It largely removes any distributional effects. Like options 1 and 2, this option has also been adopted in some US states as a means of addressing inefficient grid bypass and is being discussed as a reform option in Great Britain.
4. In discussions with JE, it also asked us to consider the option of technology-specific standby charges, effectively separating out solar from other technologies. This approach could address the minor limitation we identified with JE's proposal, that it assumes all embedded generators have the same load factor. However, it would not address the more serious limitation that JE's proposed approach assumes a common self-consumption ratio for all customers with embedded generation. We therefore do not consider that this option would adequately address the limitations we identified.

The Proportionality of the Standby Charge

The amount of embedded generation in Jersey is currently extremely small, and we cannot conclude objectively whether there is any amount of embedded generation that would necessitate the proposed standby charge, because (under JE's current tariff methodology) any growth in embedded generation increases the costs that would have to be paid by other customers.

We have quantified the impact of a decision *not to* impose the standby charge on new embedded generators on the bills that would be faced by other customers.

- Specifically, we estimate that without the standby charge (or one of the similar changes proposed above), every 10MW of solar PV installed in Jersey[4] would require other

[4] Note, the unit of 10MW is not intended to represent the total potential for solar PV deployment in Jersey, which we have not sought to estimate and could be higher or lower than this amount. We present it solely for the purpose of illustrating the rate at which solar PV deployment in Jersey increases the costs faced by customers who do not install it.

customers choosing not to install solar PV to pay higher electricity tariffs, by around £390,000 per annum. This amounts to an average household customer facing an increase in their annual electricity costs of around £4.56 for every 10MW of solar PV installed on the island.

- However, these calculations are based on the same assumptions as JE built into its calculation of the £3.25/kW/month standby charge, which as noted above would be lower (£3.22/kW/month) if we correct some minor problems with the calculation and use updated cost data for 2016/17. This decreases the effect to £386,845 per annum for all customers, or £4.53 per household. This effect on customers' bills arises due to the reduced contribution that customers with embedded generation make to the fixed costs of the system. However, the effect on customers' bills from growth in embedded generation could be higher if JE starts to incur additional costs to accommodate the intermittent output from solar plants as penetration rates rise.
- Also, we understand from JE that the self-consumption ratio observed for solar PV installations in Jersey at present is higher than assumed in its standby charge calculation. The mid-point of the self-consumption ranges reported by JE is 85%, as compared to the 50% assumed by JE in its calculation of the £3.25/kW/year standby charge. If we use this higher self-generation rate and correct the minor problems identified with JE's calculation, the standby charge increases to £5.48/kW/month, and the impact of not applying it increases to £657,636 per annum for all customers, or £7.75 for a typical household.

Despite this relatively small apparent impact on household customers' bills, we agree with an argument put forward by JE during our discussions, that some charging reform has value in signalling to potential investors in embedded generation that the long-term value of some types of embedded generation investments are less than JE's current retail energy prices suggest.

1. Introduction

NERA Economic Consulting (NERA) has been commissioned by the States of Jersey (SoJ) Department of the Environment (DE) to assess whether a proposal from Jersey Electricity Plc (JE) to apply a "standby charge" of £3.25/kW per month to all new commercial customers choosing to install embedded generation of up to 50kW peak of installed capacity is "fair and reasonable".[5] The charge would be levied per kW of installed embedded generation capacity.[6]

Specifically, our scope requires that we assess "whether the charge of £3.25 is fair and reasonable and a true reflection of the real costs to JE of providing 'standby' for embedded renewable energy generation".[7] In doing so, our scope requires that we consider whether the level of the charge is appropriate, and whether the charge accounts for an appropriate range of "factors".[8] Hence, we have reviewed and appraised both the detailed calculations underpinning the £3.25/kW charge, and assessed whether the structure of this charge is appropriate as a means of reflecting the costs associated with changes in embedded generation in Jersey.

Our scope also asks that we consider whether the standby charge is justifiable on a commercial basis, and whether it is consistent with the outcomes that would emerge in a competitive market. We have also been asked to consider whether there is a level of penetration of embedded generation below which the proposed charge would not be merited.[9]

The remainder of the report is structured as follows:

- Chapter 2 provides background on JE's operating context, including a brief review of the electricity supply mix in Jersey, the regulatory environment and energy policy framework, and JE's current charging methodology;
- Chapter 3 explains how we interpret the questions posed to us in our terms of reference (listed above). The purpose of this chapter is to establish the criteria against which we perform our assessment;
- Chapter 4 provides our review of JE's proposed standby charge, applying the criteria established in Chapter 3; and
- Chapter 5 concludes.

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5 Jersey Electricity website,, URL: https://www.jec.co.uk/your-business/standby-charge/qa-standby-charge/

6 Source: NERA discussions with JE.

7 States of Jersey, Department of the Environment (7 March 2018), Stakeholder call for evidence: Embedded Generators (EmG) 'Standby' Charge review, Section 3.1.

8 States of Jersey, Department of the Environment (7 March 2018), Stakeholder call for evidence: Embedded Generators (EmG) 'Standby' Charge review, Section 3.1.

9 States of Jersey, Department of the Environment (7 March 2018), Stakeholder call for evidence: Embedded Generators (EmG) 'Standby' Charge review, Section 3.1.

2. Understanding JE's Operating Context

2.1. The Electricity Market in Jersey

JE is the sole supplier of electricity in Jersey. It procures the energy required to serve electricity demand on the island through a mix of the following supply sources:

- **Imports:** JE serves the majority[10] of electricity demand on the island through a contract with EDF, which supplies power to JE via three interconnectors from France. These interconnectors, Normandie 1, Normandie 2 and Normandie 3, have a combined capacity of 290 MW,[11] though this is limited in practice to 245MW due to capacity constraints on the French grid.[12] The interconnectors are jointly owned with Guernsey Electricity Limited (GEL).[13] JE has firm capacity rights on the interconnectors totalling 190MW, with GEL holding the remaining capacity.[14] JE has a 10-year supply agreement with EDF which lasts until 2027;[15]
- **JE's own generation:** JE also owns on-island generation capacity at two power stations, La Collette and Queens Road, which are in place primarily to ensure security of supply. La Collette's main functions are to provide back-up in case imports from France are unavailable. Queens Road also acts as a substation for the interconnector supplying Guernsey (GJ1);[16] and
- **Energy-from-Waste (EfW) plant:** JE has a contract to purchase power from the EfW plant owned by the SoJ,[17] which has a capacity of 10 MW.[18] We understand that under this contract JE purchases all energy exported to the grid by the EfW plant.

Figure 2.1 below shows the evolution of JE's electricity supply mix and unit sales in Jersey between 2009/10 to 2016/17. Imports from France make up around 90% of electricity supply on average over this period, whereas JE's own generation and the EfW plant make up around 6% and 4% respectively. The annual electricity demand (measured in the volume of energy sales) has remained stable at around 650 GWh over per annum this period.

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[10] In 2016/2017 financial year Jersey imported 93% of its electricity supply from France. Source: Jersey Electricity's annual Report and Accounts 2017, page 4

[11] Normandie 1 is the 100 MW replacement for EDF 1, which came to the end of its useful life in 2012. Normandie 2 and Normandie 3 have a capacity of 90 MW and 100 MW respectively. Source: Jersey Electricity website. Link: https://www.jec.co.uk/about-us/our-business/energy-business/grid-connections/

[12] Information provided to NERA by JE via email on 8 May 2018.

[13] Guernsey Electricity website, visited on 16 May 2018. URL: https://www.electricity.gg/about/the-cieg/

[14] Information provided to NERA by JE via email on 8 May 2018.

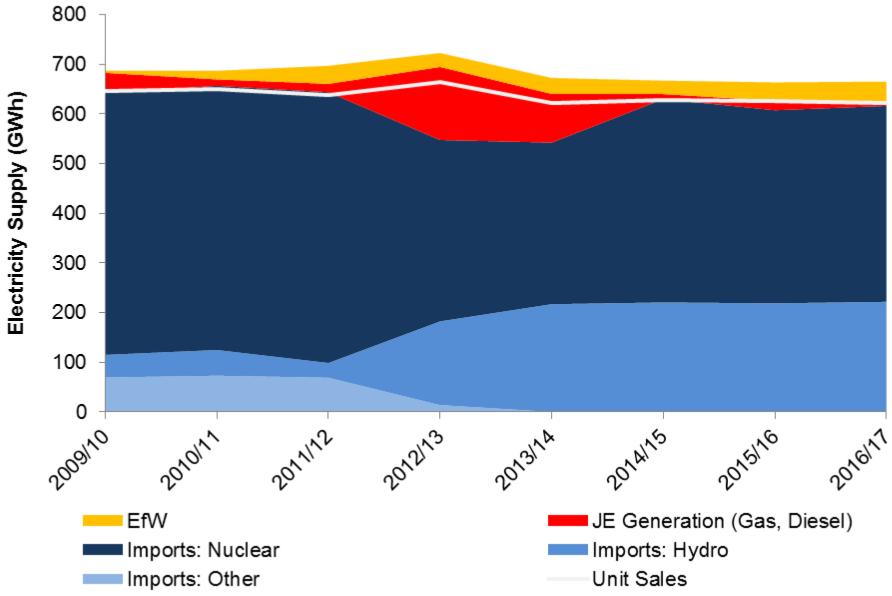
[15] Jersey Electricity's annual Report and Accounts 2017, page 10.

[16] Jersey Electricity website. Link: https://www.jec.co.uk/about-us/our-business/energy-business/90kv-network/

[17] Jersey Electricity's annual Report and Accounts 2017, page 23.

[18] Jersey Electricity, "Standby Charge Review: Initial Submission", 22nd February 2018, page 6.

Figure 2.1
Evolution of JE's Electricity Supply Mix and Unit Sales



Source: NERA analysis of JE data[19]

As shown in Figure 2.2 below, peak demand has varied between 140-160 MW over the same period. However, we understand peak demand for the 2017/18 winter was the highest on record, reaching 178MW.[20]

JE also owns and operates the distribution network that transports electricity from these generators and interconnectors to customers' premises in Jersey. In essence, therefore, JE is a vertically integrated monopolist, serving the entire electricity value chain on the island.

JE is listed on the London Stock Exchange. The SoJ owns 62% of the Ordinary Share capital, which is unlisted. The remaining listed equity is owned by various private and institutional investors.[21]

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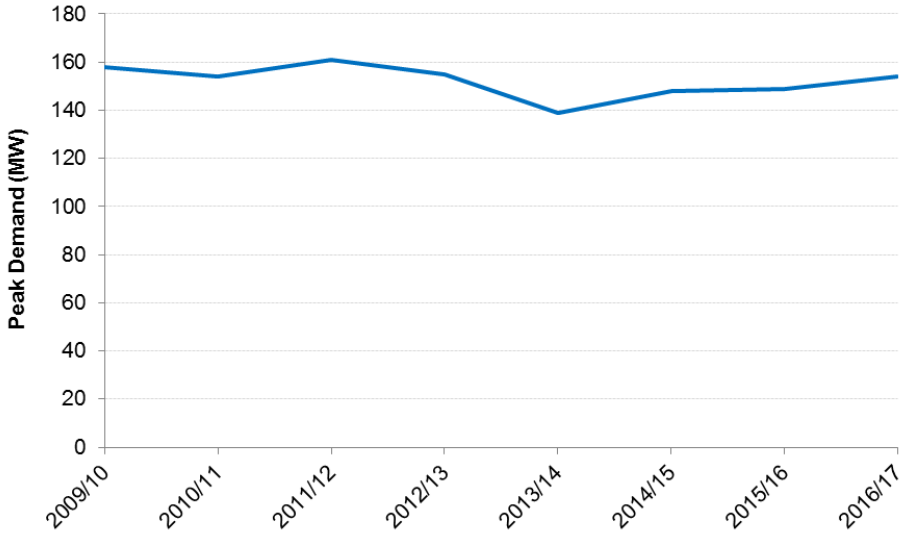
19 Jersey Electricity annual Report and Accounts 2010-2017.

20 Source: Email from JE to NERA, dated 15 June 2018.

21 Jersey Electricity website. Link: https://www.jec.co.uk/about-us/investor-relations/

Figure 2.2
Evolution of Peak Electricity Demand in Jersey



Source: NERA analysis of JE data[22]

2.2. The Current Role of Embedded Generation in Jersey

In addition to relying on electricity generated or procured by JE, a small number of customers (both domestic and commercial) have chosen to generate their own electricity using embedded generation. Embedded generators are small-scale generation facilities not owned or operated by JE, but installed on customers' own sites or premises. We understand from JE that, at present, there are only a very small number of embedded generators in Jersey, including some embedded solar photovoltaic (solar PV) capacity and Combined Heat and Power (CHP) facilities. We also understand from JE that the number of solar PV installations has been rising recently.

Customers use embedded generators to "self-supply", reducing the amount of electricity they buy from JE. However, JE may also buy power from them to offset the wider energy needs of the island (known as "buy-back"). Customers which install embedded generation would also typically still buy a proportion of the energy they require from JE, either when their on-site generation is not available, which for solar PV would be much of the time, or because their total energy needs exceed the capacity of their on-site generators. In essence, customers with embedded generation still rely to some degree on the grid for "standby" power to meet any shortfalls in demand.

[22] Jersey Electricity annual Report and Accounts 2010-2017.

While the penetration of embedded generation is currently minimal, the number and scale of embedded generators in Jersey could increase in the coming years, for reasons such as the declining cost of solar PV installations.[23]

2.3. Economic Regulation in the Jersey Electricity Industry[24]

The Jersey Competition Regulatory Authority (JCRA) is an independent body, accountable to the Minister for Economic Development, with responsibility for promoting competition and consumer interests through economic regulation and competition law.[25] Among its main functions, the JCRA is responsible for:

- The economic regulation of telecommunications under the sector-specific Telecommunications (Jersey) Law 2002, and postal services under the Postal Services (Jersey) Law 2004;
- Administering and enforcing competition law in Jersey under the Competition (Jersey) Law 2005;[26] and
- Advising the Minister and other States Departments on matters relating to competition and economic regulation.

Unlike the telecommunication and postal sectors, the electricity sector in Jersey is not currently subject to any form of sector-specific economic regulation by the JCRA. The two pieces of legislation which govern the electricity market, namely the Electricity (Jersey) Law 1937 and the Competition (Jersey) Law 2005, do not provide for sector-specific tariff regulation. JE is therefore not subject to any explicit regulation of its revenues or the charges it sets for its services.

However, like all businesses operating in Jersey, JE is subject to the Competition (Jersey) Law 2005. This law aims to promote competition in the supply of goods and services in Jersey, and in particular, prohibits any anti-competitive arrangements or abuses of a dominant market position. Moreover, the JCRA has the power to conduct market investigations if it considers that a party in a market is behaving anti-competitively, and on the back of the investigation recommend possible changes in legislation or other remedies to the SoJ.

Therefore, while JE's pricing and conduct are not explicitly regulated by sectoral legislation, the ability of the SoJ to apply competition law to the electricity market, or possibly introduce new legislation that does apply sector-specific regulation, imposes some constraints on JE's

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23 As an illustration of this trend, according to a recent Green Business Watch article, the median cost of a 4kW solar PV installation in the UK has fallen from £20,000 in 2010 to £6,668 in 2017, representing a 67% decrease. Source: Green Business Week, UK Domestic Solar Panel Costs and Returns 2014 – 2017, URL: https://greenbusinesswatch.co.uk/uk-domestic-solar-panel-costs-and-returns-2010-2017#section4

24 It is beyond the scope of this report to comment on the appropriateness of these arrangements governing the economic regulation of the electricity sector in Jersey. We explain these arrangements here solely to provide the factual background required for our review of the proposed standby charge.

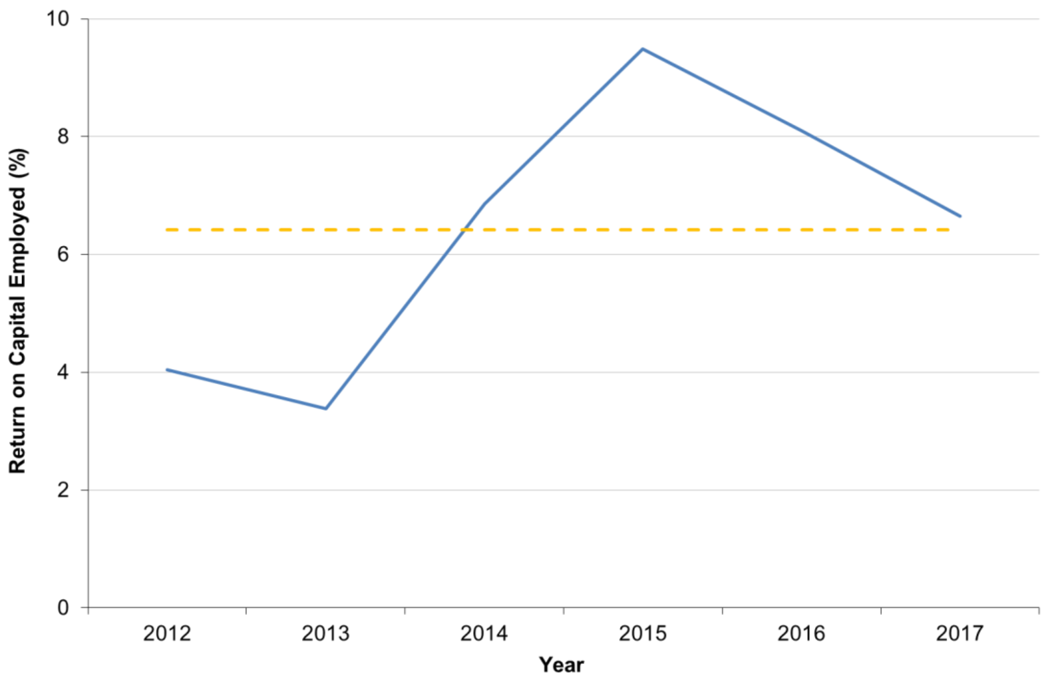
25 CICRA, "Memorandum of Understanding between the Jersey Competition Regulatory Authority and the Office of Utility Regulation".

26 The Competition (Jersey) Law 2005. Link: https://www.jerseylaw.je/laws/revised/Pages/05.070.aspx

behaviour. Hence, while JE is a vertically integrated monopolist, and as such may have considerable market power allowing it to profitably raise its prices, these institutional constraints in practice limit the extent to which it exercises this market power.

For instance, in its 2012 Annual Report JE states that its Energy Business has a "target return of between 6-7%, [...] as it is generally viewed in our industry as the minimum necessary to support continued infrastructure investment".[27] While we have not formed a view on the appropriateness of this level of return, this statement is consistent with our discussions with JE, during which it explained that it sets prices to ensure it can recover its costs, including a target rate of return on invested capital in this range. Figure 2.3 below shows the evolution of JE's return on capital employed (ROCE) for its Energy Business between 2012 and 2017. The ROCE averaged around 6.4% over this period, although it has varied from year-to-year.

Figure 2.3
Evolution of JE's ROCE for the Energy Business[28]



Source: NERA analysis of data from Jersey Electricity Report and Accounts 2012-2017.

2.4. Energy Policy Framework in Jersey

The energy policy framework for Jersey is guided by the "Pathway 2050" plan. The overarching target of Pathway 2050 is to "by 2050, reduce emissions by 80% compared to 1990 levels, by using secure, affordable and sustainable energy".[29] To deliver this target, Jersey's Minister for Environment, in cooperation with other concerned Ministers and the

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27 Jersey Electricity's annual Report and Accounts 2012, page 5.

28 Return on Capital Employed (%) is calculated as operating profit divided by net assets of the Energy Business.

29 States of Jersey, "Pathway 2050: An Energy Plan for Jersey", March 2014, page 5.

"Energy Partnership", will oversee action being taken in three interlinked policy areas designed to reduce energy demand while ensuring affordability and sufficiency:

- 'Demand management', comprising actions aimed at reducing energy demand through a series of interventions aimed at reducing all types of emissions;
- 'Energy security and resilience', involving evaluation of the best options for the utility-scale generation of renewable energy. The criteria for this evaluation are the establishment of a diverse, safe and resilient supply of energy to meet the population's needs; and
- 'Fuel poverty and affordability of energy', covering the affordability of energy for all users.

The "Energy Partnership" is able to review the three policy areas as necessary and develop further interventions where required. The actions for each of the three policy areas have been chosen from "good practices" identified by the Jersey government, drawing on experience of policies in comparable jurisdictions.

2.5. JE's Current Charging Methodology

JE sets its tariffs to ensure it recovers the costs of its Energy Division, including operating costs, the costs of depreciating historical investment costs, plus a return on undepreciated historical investment costs. It recovers these costs through the charges that it levies on end-users for the supply of energy. We understand that JE refers to the practice of recovering its total costs from users as a "user pays" model.

In practice, JE currently levies a range of tariffs on domestic and commercial customers:

- **Per unit charges:** Users pay a charge per unit (kWh) of energy they consume, levied on both domestic and commercial customers. The JE website says that the unit charge aims to recover JE's wholesale cost of electricity (imported from France or generated by the SoJ's EfW plant), the cost of generating electricity at JE's own on-island plants, and the cost of maintaining and operating the grid.[30] The charge varies between 7.80 pence per kWh and 15.50 pence per kWh[31] depending on time of day and whether the customer has approved electrical space and water heating. The standard rate for both domestic and commercial customers is 14.80 pence per kWh.[32]
- **Daily service charge:** This is a fixed charge per customer per day, and is levied on both domestic and commercial customers. The JE website says that this charge is intended to recover costs of energy support services, such as metering, billing, customer care and

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30 Jersey Electricity, "Commercial Standby Charge", available at: https://www.jec.co.uk/your-business/standby-charge/commercial-standby-charge/ (accessed 4 June 2018).

31 These correspond to the Economy 7 Night and Day rates (respectively) for both domestic and commercial customers. See: Jersey Electricity, "Economy 7 (E7) Tariffs", available at: https://www.jec.co.uk/your-home/our-tariffs-and-rates/economy-7-(e7)/ (accessed 4 June 2018).

32 Jersey Electricity, "General Domestic Tariffs", available at: https://www.jec.co.uk/your-home/our-tariffs-and-rates/general-domestic/ (accessed 4 June 2018).

other energy support services.[33] Like the per unit energy charge, this charge varies across customers. For both domestic and commercial customers on the standard rate, the daily service charge is 16.10 pence per day for a single phase meter and 35.30 pence per day for a three phase meter.[34] For those customers on any other per unit tariffs, the charge is 19.10 pence per day and 42.50 pence per day, respectively.[35]

- **Buy-back rate:** This is a payment made by JE to both domestic and commercial customers with approved embedded generators up to 50kW of installed capacity (three phase meters) and 20kW installed capacity (single phase meters)[36] for all units exported back to the JE network at any time of the day. Currently, the buy-back rate is 6.40 pence per kWh.[37]
- **Maximum demand kVA tariffs:** These are the set of tariffs for each kVA of customers' maximum demand. These tariffs vary depending on the time of year, time of day and the voltage level at which customers connect to JE's grid. The standard set of maximum demand kVA tariffs for low voltage (230/400 Volts) that applies to domestic and commercial customers are: a charge of 850.00 pence per kVA for November to April, a charge of 649.00 pence per kVA for May to October, a unit charge of 11.00 pence per kVA, and a daily service charge of 93.60p per kVA.[38]

Through discussions with JE, we understand that these tariffs were originally set a number of years ago, and the structure has remained largely unchanged. Over time, JE explained to us that it has adjusted tariffs in line with changes in its costs, to ensure it achieves its target rate of return on invested capital (see Section 2.3). JE also explained that, if any tariff rises are required due to changes in cost, they are generally applied across all tariff components and customer classes. In effect, we understand that if JE needs to increase or reduce revenues to achieve its target rate of return, a single percentage change would generally be applied across all its tariffs.

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33 Jersey Electricity, "Q&A: Standby Charge", available at: https://www.jec.co.uk/your-business/standby-charge/qa-standby-charge/ (accessed 4 June 2018).

34 Jersey Electricity, "General Domestic Tariffs", available at: https://www.jec.co.uk/your-home/our-tariffs-and-rates/general-domestic/ (accessed 4 June 2018).

35 Jersey Electricity, "Our Tariffs and Rates", available at: https://www.jec.co.uk/your-home/our-tariffs-and-rates/ (accessed 4 June 2018).

36 Installations above 50kW peak will be reviewed on a case-by-case basis.

37 Jersey Electric, "Buy Back Commercial", available at: https://www.jec.co.uk/your-business/commercial-tariffs/buy-back/ (accessed 30 May 2018).

38 Jersey Electricity, "Standard Maximum Demand kVA", available at: https://www.jec.co.uk/your-business/commercial-tariffs/standard-maximum-demand-kva/ (accessed 4 June 2018).

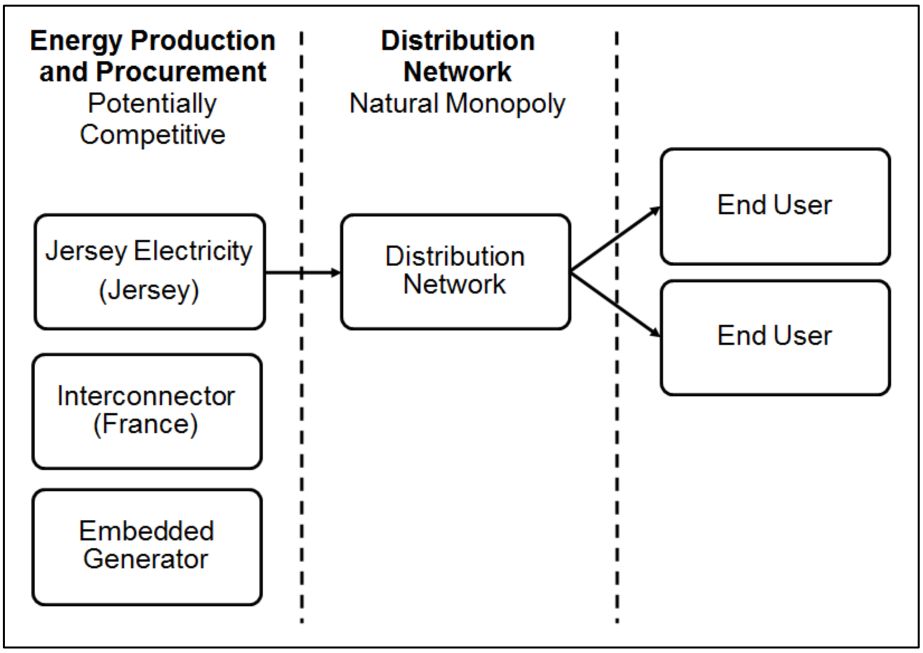
3. Criteria and Process for Reviewing the Proposed Standby Charge

As set out in Chapter 1, our terms of reference require that we assess whether the proposed standby charge is "cost reflective" and consistent with the form of charge that would emerge in a competitive market. We also need to consider whether the proposed charge is proportionate to the penetration of embedded generation in Jersey. The purpose of this chapter is to set out how we interpret these criteria and apply them in reviewing JE's proposed standby charge for embedded generation.

3.1. The Value Chain in the Electricity Market in Jersey

The electricity sector in Jersey, as illustrated in Figure 3.1 below, has some unique characteristics that we need to consider when evaluating the standby charge proposed by JE.

Figure 3.1
Value Chain in the Electricity Market in Jersey



Source: NERA illustration

As explained in the previous chapter, JE is responsible for the procurement of electrical energy at the "wholesale" level of the value chain. In practice, JE procures energy through cables from France under a contract with EDF.[39] It also uses its own generation facilities on the island to ensure wholesale supplies are reliably available, in periods when there is insufficient capacity on the cables to France to supply total demand in Jersey, or when some operational problems limit the import capacity available to Jersey.

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39 We understand from JE that the procurement of energy from France also requires a contract with the French electricity transmission system operator, RTE. Source: Information provided by email to NERA from JE on 8 May 2018.

Once energy is imported from France or generated on the island, power is transported using a distribution network to end-users. JE sells this power to end-users, and also provides retail services, such as customer service and billing. However, in some cases, end-users also have the option to generate power at their own sites. Such customers would not typically detach themselves entirely from the JE grid, but use on-site generation facilities to reduce the volume of energy they purchase from JE. In essence, while JE supplies the vast majority of energy consumed on the island, small scale embedded generators can compete with JE in the production of electricity.[40]

The extent to which embedded generators can compete with JE is limited. Even relatively large commercial customers in Jersey are unlikely to have sufficient scale to install embedded generation that enables them to be completely self-reliant. Customers still need to purchase power from JE when their on-site generators are not available ("standby" power), with JE effectively providing back-up supply via its distribution system. Furthermore, electricity distribution in Jersey (as in all jurisdictions) represents a "natural monopoly" activity. Natural monopoly industries are typically infrastructure industries requiring an essential facility (here, an electricity network) that it would be uneconomic to duplicate to create competition between providers.

3.2. Promoting Economically Efficient Provision of Embedded Generation

As explained above, JE provides a mix of services in which it is the natural monopoly provider (ie. the distribution network and supplier of peaking/back-up generation), and services for which it can potentially be subjected to competition by new entrants into the market (eg. generation of energy). A challenge for setting the prices JE levies on end-users is therefore to encourage entry in conditions where generation by new entrants is more *economically efficient* than the energy they displace that could otherwise be supplied by JE.

To explain what we mean by this, consider the following example of the impact on JE's costs from increases in small-scale solar PV in Jersey. If a customer decides to install solar panels at its facilities, JE will supply that customer with less energy (ie. fewer kWh), by the amount that they generate and consume themselves. As a result, JE's costs will change, as follows.[41]

Some of JE's costs will fall:

- JE procures electricity from France and pays a variable fee to EDF per kWh of energy supplied to Jersey. More production from embedded generation on the island will reduce energy imports from France, and will therefore reduce the costs of procuring energy from France. Similarly, JE's foreign exchange hedging costs may fall, as they are linked to the need to procure power in Euro while selling in Sterling; and
- Depending on the operating conditions on the power system (see above), the fuel and operating costs JE incurs to run its own generation facilities may also fall due to more

40 Indeed, in larger electricity markets throughout Europe the wholesale procurement function is deemed a fully competitive activity, with many different generators competing to generate electrical energy.

41 Note, this is not intended to be an exhaustive list of JE's costs. It is intended solely as an illustration.

production coming from other sources, although the extent to which they will do so is limited, as these run very rarely and remain in place primarily for emergency back-up.

Some costs will remain the same, or possibly increase:

- Most of the costs JE incurs to provide, operate and maintain its distribution infrastructure will not change. We understand the electricity distribution network in Jersey is built and specified primarily to accommodate demand in peak winter conditions, which are unaffected by the installation and use of solar PV;
- The costs of procuring power from the EfW plant would not change, as this plant tends to run all year, irrespective of how much energy is produced from embedded generation in Jersey; and
- Some costs may increase, particularly if renewables penetration grows and JE faces increases in operating costs to manage the "variability" of production from solar or wind production facilities. However, given the penetration of these technologies is currently very low (see above), we assume these costs would be zero or negligible in the near future.

The net effect on JE's costs from growth in solar generation is therefore limited to the saving JE makes on the costs of procuring electricity from France. From the perspective of Jersey as a whole, the development of new embedded generation is beneficial if the costs of installing and operating it are less than this saving realised by JE, on the basis that JE's costs are ultimately recovered from end-users in Jersey (see Section 2.5).

If total costs fall in this way, the installation of solar PV would be *economically efficient*. As a whole, customers in Jersey would also benefit, as the aggregate cost of the power system for which they pay through tariffs would fall.[42]

3.3. Charging Arrangements to Encourage Efficient Provision of Embedded Generation

The design of electricity charging arrangements, ie. the system of tariffs JE charges for its services to end-users, is influential in determining whether customers have an incentive to install and use embedded generation to the extent that it is economically efficient. Consider a simple numerical example. Suppose:

- JE's fixed costs are £10 million per annum, which *do not* vary with the amount of energy produced by embedded generators on the island;
- JE's variable costs are £5 million per annum, which *do* vary with the amount of energy produced by embedded generators on the island; and

[42] Of course, how these benefits are distributed amongst consumers depends on the prevailing methods for setting tariffs. If JE achieves a cost saving through the installation of embedded generation, it would be possible in principle to adjust tariffs such that all customers gain (or at least remain no worse off than they were before the installation of the embedded generation). However, under JE's current approach to charging that we discuss further in Section 2.5, even if embedded generation does result in a cost saving for the overall power system, it would not necessarily reduce tariffs for all customers; some would win and some would lose. This feature of the current charging methodology can be addressed through the options for reform we discuss in Section 4.6.

- JE supplies 5 million units of electricity per annum to 100,000 customers.

In this case, a simple retail price per unit of electricity that recovers JE's total cost would be £3/unit [= (£5m + £10m) / 5m units]. If JE levies this charge on end-users as a retail price, then by opting to install embedded generation capacity, customers can reduce their electricity bill by £3 for every unit they self-generate. Hence, as long the average cost of embedded generation is less than £3/unit, customers have an incentive to install and use embedded generation.

However, embedded generation will only be economically efficient, in the sense of reducing the total costs of the power system, if the costs of embedded generation are less than £1/unit [=£5m / 5m units]. Hence, a simple retail price that recovers both variable and fixed costs through a per unit charge (ie. of £3/unit) can encourage the deployment of embedded generation, even when it is not economically efficient. In other words, it creates the ability and incentive for customers to use embedded generation to avoid paying a contribution towards the fixed costs of the power system.

This phenomenon, of customers using embedded generation to reduce their contributions towards the fixed costs of the power system resulting from the tariffs, is known as "inefficient grid bypass".[43] This practice results in excessive deployment of embedded generation, which increases overall costs, and results in the fixed costs of the power system being recovered from a narrower group of customers who cannot or do not use embedded generation to reduce their electricity bills.

One solution to this problem is to create a system of charges that give customers the option of avoiding only the variable costs of the power system if they choose to self-generate. There may be a number of ways of achieving this in practice, but it essentially involves recovering fixed costs through a charge that does not vary with the number of units consumed (such as a fixed fee per customer per day), and recovering variable costs only through a variable charge per unit.[44]

In this example, this would involve each customer paying a fixed fee of £100 per annum [= £10m / 100,000 customers] and a fee per unit consumed of £1/unit [=£5m / 5m units]. This means customers have an efficient incentive to deploy embedded generation to reduce the volume of electricity consumed: they only profit from deploying embedded generation when it costs less than the cost JE avoids through its use.

Another solution would be to charge different prices to different users, such that those customers who have the option or ability to deploy embedded generation pay a price per unit that reflects the variable costs of production, with a higher mark-up levied on those users who cannot deploy embedded generation. This approach can also encourage efficiency, but may increase the costs incurred by some types of customers.

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43 As we discuss further below, this is a widely discussed problem in the course of regulatory reviews of electricity tariffs.

44 As we discuss further below, JE's proposed standby charge represents a particular form of charge that recovers some fixed costs through a fee that does not vary with the number of units of electricity commercial customers

We discuss the practical application of these concepts further in Chapter 4 with reference to JE's proposed standby charge and our suggested alternatives.

3.4. Implications for the Scope of this Review

3.4.1. Assessing the economic efficiency of the proposed standby charge

Our terms of reference require that we assess whether the proposed standby charge is "cost reflective" and consistent with the form of charge that would emerge in a competitive market.

For the reasons set out above, we interpret these criteria as requiring that we assess whether JE's calculation of the proposed standby charge and the methodology behind it represent a pricing rule that promotes the "economically efficient" deployment of embedded generation in the electricity market in Jersey. In other words, we consider whether it promotes economically efficient competition between JE and potential embedded generators. To achieve this, we need to assess whether the proposed standby charge provides incentives for investment in embedded generation, only when deployment of embedded generators can reduce whole system costs (including both the costs of the embedded generator and the impact on JE's own costs from its deployment).

In making this assessment, we also need to recognise that JE needs to have a reasonable prospect of recovering the costs of the range of services over which it serves as a "natural monopolist": the provision of network services, system operation and the provision of back-up generation electricity network. Affording JE a reasonable prospect of recovering its costs for these natural monopoly services (including a return on capital) is necessary to ensure that JE has an incentive and the ability to continue to invest to meet the needs of electricity customers in Jersey.

Therefore, one particular issue we need to consider is whether the current charging methodology allows JE's customers to deploy embedded generators profitably because it allows them to avoid paying a contribution towards the wider costs of operating and developing the electricity system in Jersey, and whether the proposed charge provides a solution to this problem.

3.4.2. Proportionality of the proposed charge

Our terms of reference also require that we consider the proportionality of the proposed charge, in the sense that we consider whether there is some level below which the proposed standby charge would not be required. Some stakeholders suggested to us that they understood the rationale for the proposed standby charge to be related to the cost of integrating renewable generation onto the grid, suggesting it would be reasonable to consider whether the direct costs of renewables integration is low today and likely to rise to a level in the future that requires a new charge to recover this cost.

However, we understand from discussions from JE that the rationale for the proposed charge is not to cover the costs of accommodating renewables onto the system. Rather, as we discuss in Section 4.2.1, its purpose is to maintain the proportion of fixed costs paid by the affected category of commercial customers and to prevent the current tariff structure from exaggerating the economic benefit to the system that comes from installing embedded generation. This prevents JE from increasing tariffs to other customers to ensure it recovers its total costs.

Small changes in embedded generation will have a small effect on JE's recovery of fixed costs from particular user groups and the resulting increase in other customers' bills. And, at the current low rates of penetration, an increase in embedded generation on commercial customers' contribution to fixed costs would be modest. However, any reduction in the share of fixed costs recovered from commercial customers increases the share to be recovered from other classes of user, and there is no objective basis on which we can assess whether this shifting of the burden for paying the fixed costs of the system onto smaller users becomes too great within our current scope. Hence, our approach is to quantify the financial impact of the charge on the wider customer base, and show how this increases with the penetration of embedded generation (see Section 4.7).

3.4.3. Environmental externalities

As set out above, in meeting our terms of reference we assess whether JE's proposed standby charge will promote the "economically efficient" development of the electricity market in Jersey. Moreover, we apply this test by assessing whether it will encourage the deployment of embedded generation in cases when these generators can reduce whole system costs.

This interpretation of our terms of reference means that a number of topics are excluded from the scope of this report, some of which may be important features of the commercial arrangements that exist between embedded generators and utilities/government, and to other facets of energy policy.

Through our discussions with stakeholders, some parties stated that they consider the development of renewable generation (principally solar panels) provides a wider environmental and/or economic benefit to the island as compared to the purchase of electricity from France, which they also consider is consistent with the Pathway 2050 energy policy in Jersey (see Section 2.4). On the other hand, JE also noted in discussions with us that its contract with EDF entitles it to cite low carbon nuclear and renewable hydroelectric stations as the origin of the power it imports from France.[45]

While there may be environmental benefits associated with some embedded generation technologies, notably the environmental benefits associated with renewables, it is beyond the scope of this report to consider whether these benefits justify any form of support from either JE or the SoJ.[46] Hence, we consider whether the proposed standby charge promotes

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[45] JE has explained to us that the hydroelectric supply is backed by Guarantees of Origin issued in accordance with European legislation (Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources) as well as French Law. EDF provides quarterly letters to JE regarding the volumes of hydroelectricity supplied. The nuclear supply is provided to Channel Islands Electricity Grid (CIEG), as per the long-term supply contract as nuclear certificates. EDF provides quarterly letters of the volumes of nuclear electricity supplied. The CIEG Nuclear Certificates and Guarantees of Origin are both reserved exclusively for sale to CIEG and are not reserved, sold or otherwise allocated to any party.

Source: Information provided by email from JE to NERA on 8 May 2018.

[46] States of Jersey, Department of the Environment (7 March 2018), Stakeholder call for evidence: Embedded Generators (EmG) 'Standby' Charge review, Section 3.2.

economic efficiency, without considering the environmental externalities associated with any particular generation technology.

3.4.4. Estimating the costs of accommodating embedded generation onto the Jersey power system

We have not conducted a detailed "bottom-up" estimate of the costs of accommodating embedded generation onto the Jersey power system. This would require detailed engineering analysis and would not have been possible within the time available for this review. However, as we explain in Section 4.2.1, JE's justification for the proposed standby charge does not hinge on any estimate of the costs of accommodating embedded generation onto the system, so such an estimate is not required for this review.

3.4.5. Protection for vulnerable customers and potential re-allocation of fixed costs between customers

As noted above, this review considers whether the proposed standby charge promotes *efficient* outcomes in the Jersey electricity industry. The proposed charge will tend to improve economic efficiency if it increases the extent to which users pay charges (or receive revenues) reflecting the cost directly caused by their consumption (and cost saved from their production) of electricity. In the language of economists, efficiency will tend to improve if charges better reflect the "marginal costs" that users impose on the power system.

While more efficient charges can result from better reflecting the "marginal costs" that users impose on the power system, not all costs can be attributed to the actions of particular users; some costs are "shared" or "common" costs that are incurred by JE to the benefit of all users. As discussed further below, JE's design of the proposed standby charge entails choices as to which categories of consumers should bear these shared costs of the system that are not directly associated with any one user's actions.

Decisions as to which users should pay these common costs do affect efficiency, as we discuss in Section 4.6. However, it is not within our scope to advise on the mechanisms for protecting lower income or vulnerable customers from the relatively high electricity bills that could result from certain changes in JE's charges.

Essentially, while we focus on assessing the economic efficiency of the proposed charge, it is outside of our scope to form conclusions as to the "equity" considerations that govern the design of electricity tariffs in Jersey. However, as we discuss further in Section 4.8.1, if SoJ is concerned about the impact of tariff reform on vulnerable customers, departing from efficient charging methods is very unlikely to be an effective remedy for this problem. In essence, cost savings from improved efficiency could be used to support vulnerable customers and mitigate the effect of tariff increases.

4. Appraising the Proposed Standby Charge

4.1. Process for Delivering this Review

In order to appraise JE's proposed standby charge and apply the criteria set out in the previous chapter, we have gathered and reviewed a range of information, following the process set out below:

- **Project inception meeting:** We began the assignment with a project inception meeting with the DE in Jersey to help us understand its requirements for this review.
- **Discussions with JE:** We held a meeting with JE to discuss the rationale for the standby charge, the methodology used to derive it and the wider set of tariffs that the charge sits alongside. Following this initial meeting, JE provided us with further data and information regarding the calculation of the proposed charge. After reviewing this information, we also submitted to JE and received responses to a number of clarification questions.
- **Engagement with other stakeholders:** In addition, we also held telephone discussions with other key stakeholders to ensure we considered any concerns they have with the proposed standby charge and to gather evidence that they have regarding the reasonableness of the proposed charge.
- **Assessment of the proposed standby charge:** We then conducted our review of the reasonableness of the proposed standby charge. At a high-level, our approach was to first review the data, documents and calculations provided by JE, including both those directly relevant to the proposed standby charge, and also the wider set of charges that JE uses to recover its costs. We then conducted a detailed assessment of JE's methods against the economic principles set out above in order to draw conclusions on the reasonableness of JE's proposal. Where we consider it appropriate, we also draw on practical experience of electricity charging practices in other jurisdictions.
- **Reporting and presenting findings:** The main output of the assignment is this final report, which sets out our findings.

We explain the results of our review that emerge from this process in the remainder of this chapter, against the criteria established in Chapter 3.

4.2. The Proposed Standby Charge for Embedded Generation

4.2.1. JE's rationale for the proposed standby charge

As discussed in Chapter 3, growth in small scale embedded generators may impose some costs on JE, such as to accommodate fluctuations in the output from variable solar generation, and it also reduces the contribution that customers make to paying the fixed costs of the power system that are currently recovered through JE's tariffs.

The proposed standby charge aims to address the second of these impacts, ie. the revenue it raises replaces the loss of revenue that comes from customers deploying embedded generation and purchasing fewer units from JE, after accounting for the saving in costs JE achieves from customers generating some of their energy on-site.[47] In essence, therefore, the charge aims to recover the contribution to JE's fixed costs (including a return on capital) that commercial customers would have made through purchasing power at JE's commercial tariffs, had they not chosen to install embedded generation. This prevents JE from increasing the tariffs paid by the generality of customers to recover its fixed costs.

JE is not currently seeking to recover any incremental costs it may incur to accommodate the variable output of embedded generators.[48] Given the current small penetration of embedded generators in Jersey, JE has indicated to us that it expects this impact to be negligible in the near-term,[49] though it may become more material if/when penetration rises.

We understand that the proposed standby charge is to be applied to all new commercial customers with embedded generation installations of up to 50kW of installed generation capacity. Any standby charge for commercial installations of more than 50kW of installed generation capacity will be determined by JE on a case-by-case basis. Also, it does not apply to pure export generators, which solely export electricity to JE, or pure standby generators, which solely provide back-up generation in case of a failure in the JE grid.

The level of the charge currently proposed by JE is £3.25/kW of installed embedded generation capacity per month.[50] However, this figure was calculated by JE on the basis of budgeted cost data for the year 2015/16. When we use 2016/17 data we estimate the standby charge to be £3.65/kW using JE's methods and assumptions.[51]

4.2.2. Methodology underlying the proposed standby charge

As explained above, the proposed standby charge seeks to levy a fee on commercial customers which install embedded generation capacity that seeks to ensure they make the same contribution to JE's fixed costs (including a return on capital) as they would have had they chosen not to install embedded generation. Hence, the £3.25/kW per month charge is calculated by estimating the reduction in energy purchased by a customer that chooses to install a solar PV facility at their premises.

JE applies the following methodology to calculate the standby charge of £3.25/kW per month for commercial customers with embedded generation for the financial year 2015/16:

1. **Reduction in unit sales by JE per kW of solar PV capacity:** As a first step, JE calculates the amount of unit sales it loses for every kW of embedded generation capacity installed at a customer's premises. JE does so by taking an assumed load factor of 13.3% (based on production data from existing solar PV installations in Jersey) to estimate the annual output of an embedded generator. Next, JE applies an assumed self-consumption

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47 Jersey Electricity. "Standby Charge review: Initial submission", 22nd February 2018, page 27.

48 Jersey Electricity. "Standby Charge review: Initial submission", 22nd February 2018, page 28.

49 Jersey Electricity. "Standby Charge review: Initial submission", 22nd February 2018, page 28.

50 Jersey Electricity website. Link: https://www.jec.co.uk/your-business/standby-charge/qa-standby-charge/

51 Information received from JE.

rate of 50% (based on the lower end of the figures cited for commercial customers in a European Commission study[52] on renewable self-consumption) to estimate the proportion of this production that causes unit sales by JE to fall. This adjustment reflects the fact that, units of production that are exported to the wider grid and not consumed on-site do not reduce JE's total volume of sales. Multiplying the 13.3% load factor by the 50% self-consumption rate and the number of hours in the year (8,760) gives the number of kWh in sales that JE estimates it would lose from a customer installing 1kW of solar PV (583kWh).

2. **Fixed cost and profit per unit:** As a second step, JE calculates the amount of fixed cost (including a rate of return on capital employed) that JE seeks to recover through its charge. JE does so by summing all the cost items in its accounts that it categorises as "fixed", plus its target level of profit (as measured by operating profit). JE then divides the sum of fixed cost and profit by unit sales (in kWh) to obtain fixed cost and profit per unit. The fixed cost plus profit figure underlying the £3.25/kW per month charge is 6.4 pence/kWh.
3. **Standby charge per kW per month:** As the final step, JE multiplies the results of steps (1) and (2) and divides by 12 to calculate the reduced contribution to fixed costs per month that comes from a commercial customer installing 1kW of solar PV capacity. JE then adds 5% GST to arrive at the proposed standby charge of £3.25/kW of installed embedded generation capacity per month.

We understand that the proposed standby charge has been calculated in a similar way to an existing standby charge levied on customers with embedded CHP facilities. However, going forward, we understand from JE that it intends to apply this new charge of £3.25/kW/month to all new embedded generation of any technology with an installed capacity of up to 50kW.

JE has indicated to us that during the process of this review that it would consider applying different standby charges for each technology (eg. one for solar and one for thermal), if we concluded that this would improve the efficiency of the proposed standby charge.

4.3. The Economic Principles Behind JE's Methodology

The economic principle that JE has applied in formulating the proposed standby charge is known as the Efficient Component Pricing Rule (ECPR). The ECPR can be applied in situations where an incumbent company (here, JE) is potentially subject to competition from other new entrant companies (here, commercial customers choosing to install embedded generation) in the provision of some services (here, the production of energy), but new entrants also require access to an "essential facility" owned by the incumbent (here, the power grid and JE's provision of "standby" power).

As we discuss further below, the ECPR is used to ensure that new entrants can only enter the market when it is economically efficient for them to do so, ie. when they can produce more cheaply than the incumbent.

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52 European Commission "Best practices on Renewable Energy Self-consumption", 15th July 2015, page 3.

4.3.1. The rationale for the ECPR is to encourage efficient entry by potential competitors to the incumbent

In order to compete with JE in the production of energy, embedded generators require access to certain essential services that only JE can provide, notably access to the electricity network in Jersey that JE owns and operates, and access to back-up energy supply when their on-site generators are not available. The role of the ECPR is to determine a price for these monopoly-supplied inputs that are required by new entrants that can potentially compete with JE. It sets these prices in a way that seeks to ensure new entrants can compete for the other (potentially competitive) part of the value chain on an equal basis to JE.

In essence, therefore, JE's standby charge (calculated using the ECPR method) puts a price on JE's network and standby services. Under the ECPR, this price is set at an estimate of JE's "opportunity cost" of providing these services to commercial customers with embedded generation, derived from the change in JE's costs and revenue that results from embedded generators entering the market.[53] In other words, the standby charge seeks to ensure that JE does not have to materially adjust tariffs charged to the generality of customers to recover its total costs due to embedded generators connecting to the system.[54]

Another property of the ECPR is that it promotes economically efficient entry by new embedded generators, as we illustrate with an extension of numerical example as in Section 3.3:

- In this example, as explained above, JE can serve energy demand at a "variable cost" of £1/unit of energy, and has fixed costs (including a return on capital) of £2/unit on average, but these do not vary with the amount of energy JE produces. Hence, the final price that JE charges to recover total costs is £3/unit.
- When a commercial customer installs embedded generation, JE loses sales of £3/unit, but avoids costs of £1/unit. Hence, JE's "opportunity cost" of the new embedded generation facility entering the market is £2/unit, ie. the reduction in this commercial customer's contribution to covering its fixed costs.
- The ECPR would therefore imply that the commercial customer has to pay JE a standby charge of £2/unit (albeit converted into a monthly fee per unit of capacity under the calculation method described above).
- This rule means that commercial customers will only have an incentive to deploy embedded generation when they can produce energy for less than £1/unit [= £3/unit – £2/unit]. As explained in Section 3.3, this promotes efficient decisions over whether to deploy embedded generation: commercial customers will only do so if they can produce energy for less than the costs JE incurs to generate electricity itself.

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53 Economides, N. and White, L. "Access and Interconnection Pricing: How Efficient is the "Efficient Component Pricing Rule"?", Antitrust Bulletin, vol. XL, no. 3, (Fall 1995), pages 557-579.

54 Kao, T., Menezes, F. and Quiggin, J. "Optimal access regulation with downstream competition", J Regul Econ (2014) 45:75-93 DOI 10.1007/s11149-013-9231-x, page76.

4.3.2. The ECPR only promotes efficient entry under specific circumstances

The theoretical economics literature shows that the ECPR only promotes economically efficient entry if certain assumptions about the market hold.[55]

- The first requirement is that the incumbent and the entrant's products are the same in the eyes of consumers, which given that electricity is the same product irrespective of where or how it was generated, probably holds in this case. However, if customers preferred on site generation for some reason, then the ECPR's method of forcing the entrant to be as cost-efficient as the incumbent would not deter entry by generators with a higher production cost. If this is the case, and more expensive embedded generators entered the market, this might still be economically efficient in this case if it reflects a genuine customer preference.
- The second requirement is that the new entrants have no market power, so that the monopolist is free to set the price (ie. the ECPR-price) that consumers will pay. This condition probably applies in this case, as potential embedded generators are small relative to JE and there are a relatively large number of commercial customers on the island which could install some form of embedded generation.
- The third requirement is that a regulatory body overseeing the market is able to observe the incumbent's costs. Otherwise, the firm could understate its variable costs of generation (and hence overstate the ECPR-based price levied on entrants) to prevent a more cost-efficient rival from entering the market. As set out below, if anything we consider that JE has arguably overstated the variable production costs that feed into its calculation and therefore understated the standby charge, so this concern does not apply.
- The fourth requirement is that there are "constant returns to scale". That is, the additional cost of producing one more unit of the good or service is the same as that for all previous units.[56] Given the cost of changes in JE's procurement costs are primarily driven by changes in the volume of energy imported from France, which has a defined price per MWh stipulated in a contract with EDF, it seems reasonable to assume that this assumption holds in this case.

Therefore, as set out in Section 4.3.1, the ECPR that JE has adopted should (in theory) encourage efficient entry into the market by potential embedded generators. And as set out above, the conditions identified in the economics literature under which this theoretical result holds also seem to apply in this case. However, as we discuss below, there are some practical challenges with applying the ECPR in the way JE has proposed that affect its ability to promote the economically efficient deployment of embedded generation in Jersey.

4.4. Assessment of JE's Calculation

As a starting point for assessing the reasonableness of JE's proposed standby charge, the extent to which it promotes economic efficiency based on the criteria set out in Chapter 3,

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55 Economides, N. and White, L. "Access and Interconnection Pricing: How Efficient is the "Efficient Component Pricing Rule"?", Antitrust Bulletin, vol. XL, no. 3, (Fall 1995), pages 557-579.

56 Valletti, T. and Estache, A. "The theory of access pricing: an overview for infrastructure regulators", (March 1998) World Bank Institute, World Bank, Washington DC

this section summarises our review of the *calculations* JE performed to derive the proposed charge of £3.25/kW per month. Then, in Section 4.5, we also assess the reasonableness of the *method* it applied against the same criterion.

4.4.1. JE's calculation entails an allocation of costs between fixed and variable costs

We concluded in the previous section that, according to economic theory, the ECPR has the potential to incentivise efficient entry by embedded generators. However, applying the ECPR in practice requires a number of methodological choices.

In particular, to derive the standby charge, JE has allocated its costs between those it considers "fixed" and those it considers "variable". As part of our review, JE provided us with the full list of cost items in its General Ledger (GL) accounts, the cost associated with each cost item from both its 2015/16 budget and 2016/17 actual accounts, and a classification of each cost item as either "fixed" or "variable".

As set out in Section 4.2.2, JE calculates the total amount of fixed cost of the business by summing all the costs that it classifies as "fixed" in its GL accounts. Under its current methodology, this equates to JE allocating 41% of total costs to fixed and 59% to variable in its 2015/16 accounts. In the 2016/17 accounts these proportions change slightly, to 48% fixed costs and 52% variable costs.

We understand from our discussions with JE that the methodology it followed when allocating its costs between fixed and variable was to apply its own judgment. Moreover, we understand from JE that the allocation of costs between fixed and variable was conducted prior to calculating the standby charge, and for another internal management purpose.

4.4.2. JE may have overstated the share of its costs that are variable when calculating the proposed standby charge

To calculate a standby charge using the ECPR methodology described above, JE should have defined as variable only those costs that would vary as a result of increases in embedded generation. Because the standby charge is calculated on the basis that the competing embedded generation technology is solar PV, we assume that the only costs that should be considered as "variable" within the calculation JE conducted are those that would vary with growth in solar PV on the island.

Given the way in which energy sources are despatched on the island, an increase in production from small scale PV would result in a lower volume of electricity being procured from France via the interconnector. Solar does not reduce the costs JE incurs to procure energy from the energy-from-waste plant, as this is a "must-run" plant, or the oil-fired units on the island, which only provide back-up and (we understand from JE) run only occasionally for testing.

Also, solar PV tends not to be available at peak times (ie. in cold winter conditions), so variation in PV production does not offset any of JE's network infrastructure costs, as infrastructure is provided to meet peak demand conditions.

Hence, in reviewing JE's current cost allocation, we consider that it should have classified a number of categories of expenditure as fixed costs that it has classified as variable. For instance, JE has allocated expenses such as "training", "telephone" and "consultancy" to variable, when they do not vary with the amount of electricity generated by solar generators.

With this change in the allocation of costs between fixed and variable, we consider JE should have allocated 47% of total cost to fixed (49% in 2016/17) and 53% to variable (51% in 2016/17). Adjusting the standby charge calculation, so it values the reductions in JE's sales due to embedded generation at the average cost of procurement under the EDF contract, changes the standby charge from £3.65/kW per month to £3.52/kW per month.[57]

4.4.3. JE has not taken into account the portion of fixed cost recovered from the daily service charge when calculating the standby charge

In addition to the proposed standby charge that JE proposes it should levy on customers with embedded generation, all classes of customers are also subject to a fixed daily service charge of 16.10 pence per day for those with a single phase meter and 35.30 pence per day for those with a three phase meter.[58]

As discussed in Section 2.5, this charge recovers some elements of JE's fixed costs. The logic for JE's calculation of the standby charge assumes that its total fixed costs (including a return on capital) are recovered evenly across all kWh it supplies. It does not consider the fact that some of these are recovered from the daily service charge.

To avoid double-counting the fixed costs recovered through the daily service charge, the revenue it earns for JE should be "netted-off" from total fixed costs before calculating the standby charge. We understand from JE that in financial year 2016/17 the fixed daily service charge recovered around 4% of the total sales for its energy business, or £3.5 million. By netting this revenue off from JE's total fixed costs, the standby charge falls from £3.25/kW per month to £2.96/kW per month, or from £3.65/kW per month to £3.36/kW per month using the new 2016/17 cost data.

When combined with the change in cost allocation between fixed and variable we suggest in Section 4.4.2, we find that the standby charge of £3.25/kW per month should be £3.00/kW per month, or £3.22/kW per month using the new 2016/17 cost data.

However, as we discuss further below, making these changes and applying a higher self-consumption ratio based on the mid-point of those observed currently (85%) results in a

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57 Note, in practice this required that we adjust very slightly the approach to calculating the standby charge. In particular, had we simply allocated all costs apart from procurement from France to variable costs and maintained JE's method, we would have understated the value of energy produced by embedded generation. This is because the denominator in JE's calculation was the total number of units supplied, including those generated on the island. Instead, we adjusted the calculation to take average total costs per unit supplied (including the target return on capital) and subtracted the average cost of procurement from France. The difference represents the reduced contribution to fixed costs from customers installing embedded generation.

58 Jersey Electricity, "General Domestic Tariffs", available at: https://www.jec.co.uk/your-home/our-tariffs-and-rates/general-domestic/ (accessed 4 June 2018).

higher standby charge of £5.48/kW/month, suggesting JE's calculation is conservative overall.

4.5. Assessment of JE's Methodology

4.5.1. By assuming embedded generators run at a particular load factor, the proposed charge may send inefficient signals

As explained in Section 4.2.2, JE's methodology for calculating the standby charge assumes that the new entrant embedded generator is a solar PV installation achieving a specific load factor of 13.3%. However, the standby charge itself would apply to all embedded generation technologies.

The reliance of JE's calculation on an assumption of any single load factor overlooks the fact that different types of embedded generation technologies operate with different load factors. For example, thermal embedded generators have the capability to run at much higher load factors than solar PV installations, given availability of solar PV is limited to relatively sunny weather. And even amongst solar PV embedded generators, we would expect there to be some limited variation in the achievable load factor. For example, PV installations may exhibit a range of load factors depending on the direction of the panels.

Solar PV installations tend to achieve a relatively low load factor compared to other generation technologies, suggesting JE has been conservative in the calculation of the standby charge as a higher load factor assumption would increase the charge. Nonetheless, the need to use a particular load factor assumption in JE's methodology could promote economically inefficient deployment of new embedded generators. We illustrate this following on from the numerical example in Section 4.3.1:

- In this example, we concluded that the ECPR rule would imply that the commercial customer has to pay JE a standby charge equivalent to £2/unit of reduced sales made by JE as a result of the embedded generator, resulting in an incentive to deploy embedded generation only if it costs the customer less than £1/unit to self-generate. This promotes efficient deployment of embedded generation because it ensures the customer will only have an incentive to generate electricity itself when it can do so more cheaply than JE.
- However, suppose JE assumes a lower load factor when it calculates that customer's liability to pay the standby charge than the customer's embedded generator actually achieves. This means the customer will displace more units of JE's sales than JE assumed when calculating the standby charge, and thus the customer will avoid paying a larger share of JE's fixed costs than it pays through the standby charge. Consequently, the customer's incentive to deploy embedded generation will be exaggerated compared to the level that would be economically efficient.
- The reverse problem applies to customers whose embedded generators can achieve a lower load factor than JE assumed when calculating the standby charge. In this case, customers would have less incentive to install embedded generation than is economically efficient. However, given that fewer technologies will have load factors materially below a solar PV facility, this problem would only arise to a very limited extent.

This problem means that customers with embedded solar PV, say, in a more advantageous site may have an exaggerated incentive to deploy embedded generation to avoid paying a contribution towards the fixed costs of the power system. And customers with the potential to install PV in a less advantageous site have an inefficiently low incentive to do so. However, the effect of this distortion would probably be small, if the range of variation in load factors achieved by solar PV sites in Jersey is small.

For other technologies that can achieve higher load factors than solar PV, like thermal technologies, this particular feature of JE's methodology for calculating the standby charge means customers tend to have a stronger incentive to install embedded generation than is economically efficient. However, as discussed below, there are a range of other problems that come from applying this proposed standby charge to thermal embedded generation technologies.

4.5.2. The assumption of a fixed self-consumption rate distorts incentives

As explained in Section 4.2.2, in calculating the standby charge JE has also assumed that commercial customers installing embedded generation would achieve a specific self-consumption rate of 50%. We note that JE has taken a conservative view by taking the lower end of the range (50-80%) quoted by the European Commission study on which it relied, leading to a lower standby charge than JE would have obtained by taking a higher self-consumption rate from this range.

Moreover, JE has also provided us with information suggesting that the self-consumption rate for existing solar PV installations in Jersey is currently between 69% and 100%.[59] Although JE calculated these self-consumption rates based on the small number of existing solar PV sites in Jersey, these data and the decision to use a number towards the bottom end of the range cited by the European Commission study suggest JE's proposed standby charge may have been understated.

However, regardless of the precise figure JE has taken, its assumption of a fixed self-consumption rate for all customers overlooks potential variation in the proportion of customers' embedded generation they would self-consume. In particular, the self-consumption rate of a particular customer would depend on the size of a customer's electricity demand relative to the capacity of its embedded generation facility:

- Take, for instance, the extreme case in which a customer's electricity demand is materially higher than the capacity of the embedded generator it installs. In this case, the customer's self-consumption rate would probably be close to 100%, ie. the customer would consume most of the power it generates and meet the shortfall in demand through purchases from JE. However, JE assumes a self-consumption rate of 50%, so that the customer's standby charge covers much less than the contribution to fixed costs avoided by installing the embedded generator. As a result, the customer's incentive to deploy a small embedded generation facility will be exaggerated compared to the level that would be economically efficient.

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59 Information provided by JE to NERA by email on 8 May 2018.

  - Suppose the customer had a self-consumption rate of 90% and installed a 20kW solar PV generator. In this case, its liability to pay the standby charge would understate the share of JE's fixed costs this customer's self-generation avoids by £624 per year [= £3.25 x 12 x (50% - 90%) / 50% x 20kW]

- At the other extreme, suppose a customer's generating capacity is much larger than its on-site demand. In this case, the customer's self-consumption rate would be lower, as much of the electricity generated would be exported back to the grid rather than being used to meet the customer's demand. By assuming a self-consumption rate of 50%, JE's standby charge would levy a much higher charge than justified by the reduction in the customer's contribution to fixed costs. Hence, the incentive to install embedded generation is weaker than would be economically efficient.

  - Suppose the customer had a self-consumption rate of 10% and installed a 20kW solar PV generator. In this case, its liability to pay the standby charge would overstate the share of JE's fixed costs this customer's self-generation avoids by £624 per year [= £3.25 x 12 x (50% - 10%) / 50% x 20kW]

4.5.3. Illustrating the effects of a fixed self-consumption rate or load factor

As explained above, the effect of assuming a single self-consumption rate and a single load factor are similar. They mean that, for customers with embedded generators running at the assumed load factor (13.3%) and with the assumed self-consumption rate (50%), the proposed charge of £3.25/kW/month would send an efficient signal to new entrants regarding the value of embedded generation in Jersey, but for all other customers the standby charge would be either too high or too low.

The blue lines in Figure 4.1 below show how the efficient standby charge would vary depending on a customer's self-consumption rate and load factor, and has been calculated using the same 2015/16 budget figures and cost allocation as JE used to derive the £3.25/kW/month charge.

Figure 4.1
Impact of Load Factor or Self-Consumption Rate on the Efficient Standby Charge Using 2015/16 Budget Numbers and the Same Assumptions as JE's Original Proposal

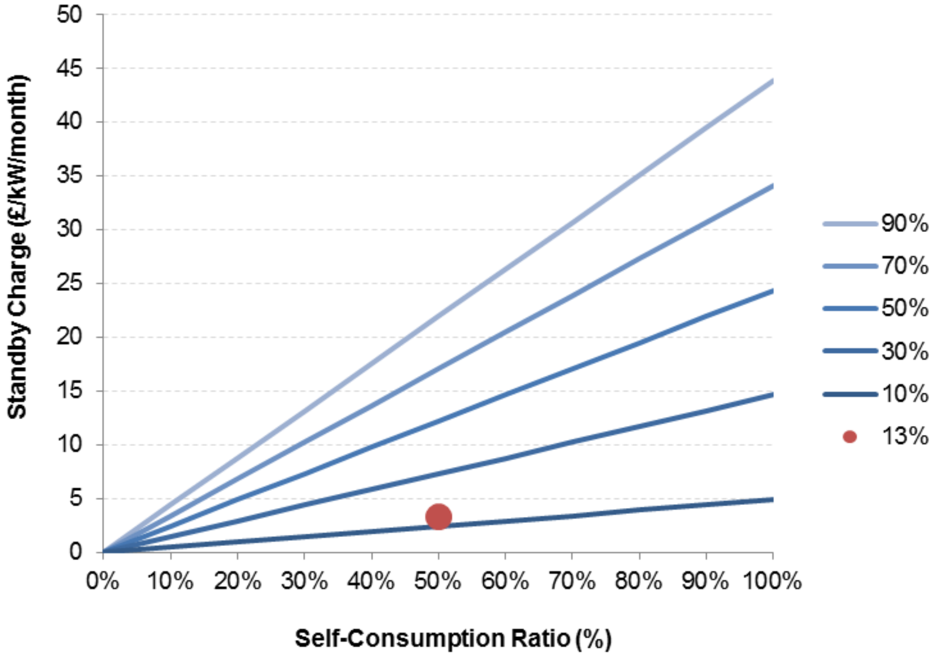
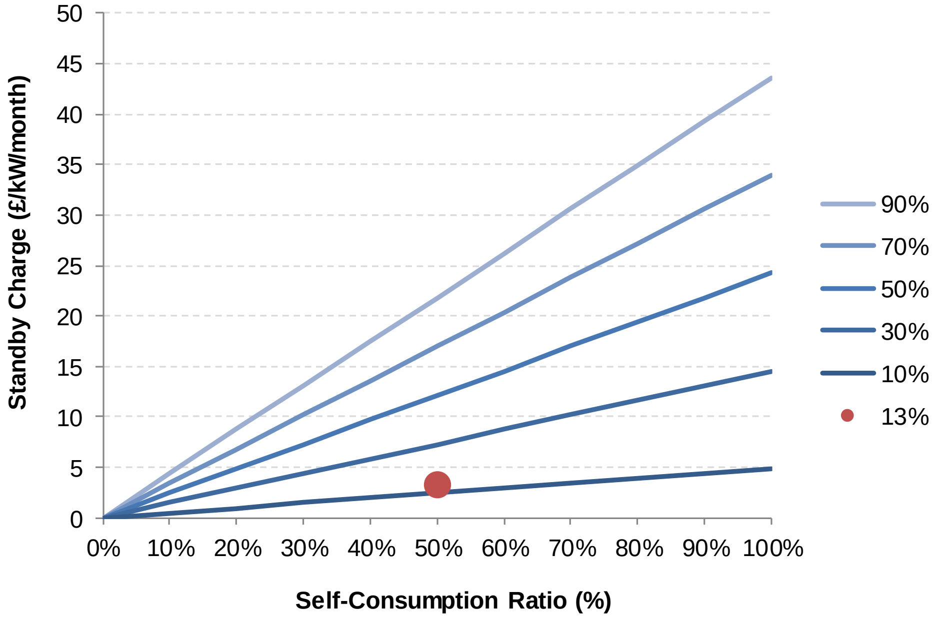


Figure 4.2 shows the same information, but using updated 2016/17 budget cost and unit sales data. Both figures show that these assumptions have a material impact on the appropriate standby charge. And, moreover, because no single assumption on load factor or the self-consumption rate would be appropriate for all customers, any single point estimate is likely to lead to the vast majority of customers with embedded generators either paying too much or too little. Note, Figure 4.1 and Figure 4.2 are very similar due to the small difference between JE's 2015/16 budget and 2016/17 actual cost data.

Figure 4.2
Impact of Load Factor or Self-Consumption Rate on the Efficient Standby Charge Using 2016/17 Actuals and Assumptions Reflecting Recommendations in Section 4.4



In discussions with JE, it also asked us to consider the option of technology-specific standby charges, effectively separating out solar from other technologies. This approach could address one limitation we identified with JE's proposal, that it assumes all embedded generators have the same load factor (see Section 4.5.1). However, it would not address the limitation of assuming a common self-consumption rate for all customers. As the figures above illustrate, even if all embedded generators with a particular technology have the same load factor (ie. they are on the same line in the figures above), different customers may have very different self-consumption rates (see the slope of the lines) depending on the capacity of their generators relative to onsite demand. Hence, we recommend that JE does not follow this approach as it would not address the concerns we have raised.

4.5.4. The proposed charge is not suitable as a means of encouraging efficient entry by thermal embedded generators

As explained above, JE's methodology for calculating the standby charge assumes that the new entrant embedded generator is a solar PV installation operating at a specific load factor of 13.3%. However, the standby charge itself would apply to all forms of embedded generation technologies up to 50kW of installed capacity, including thermal plants.[60] This feature of JE's methodology can also affect potential investments in embedded thermal plants (up to 50kW capacity) in a number of ways.

Firstly, as we explain above in Section 4.5.1, thermal technologies can run at higher load factors than solar PV. By running at higher load factors than the one assumed in JE's standby

[60] Note, JE intends to set standby charges for embedded generators with capacities larger than 50kW on a case-by-case basis.

charge calculation (13.3%), commercial customers would reduce their purchases from JE and their contributions to the fixed costs of the system to a greater extent than the proposed standby charge assumes. For this reason, the standby charge may be too low for thermal plant and the commercial customers' incentive to install thermal embedded generation is greater than is economically efficient.

Second, JE's calculation assumes that new entrant embedded generators provide no capacity value, that is, the ability to reliably meet demand. This may be a reasonable assumption for solar PV installations, from which the output is not controllable or available at times of peak demand in cold winter conditions. However, this logic does not necessarily apply to thermal embedded generators, which may be available most of the year to meet demand. By adding thermal capacity to the system that is reliably available, embedded generators can reduce the fixed costs JE faces to ensure peak security, or at least defer the point in time at which new capacity to serve peak requirements will be needed. Under JE's current methodology, this means that customers with embedded thermal plants end up contributing to a larger share of JE's fixed costs than JE may actually incur to serve the needs of commercial customers that install them. This problem causes customers to have less incentive to install embedded thermal generation than is economically efficient.

In the US, where standby charges are used extensively in respect of Combined Heat and Power (CHP) facilities, utilities are required to consider this factor when setting standby charges. The federal Public Utility Regulatory Policies Act (PURPA) of 1978 established the fundamental cost of service and legal principles that govern the design of standby rates. Under PURPA regulations, some utilities are required to provide supplementary, backup, maintenance, and interruptible power to a "qualifying cogeneration facility or… small power facility" ("QF"). PURPA Section 305 states, in part, that rates for sales of backup and maintenance power:

- Shall not be based upon an assumption (unless supported by factual data) that forced outages or other reductions in electric output by all qualifying facilities on an electric utility's system will occur simultaneously, or during the system peak, or both; and
- Shall take into account the extent to which scheduled outages of the qualifying facilities can be usefully coordinated with scheduled outages of the utility's facilities.

Of course, generators' forced outages may coincide with system peak to some degree, but this precedent illustrates the need to consider this effect when calculating charges for thermal embedded generation facilities. We recommend that JE considers this factor when setting the charges that apply to embedded generators, and considers the extent to which the thermal embedded generators allow it to reduce or defer the need to infrastructure investment. If it can demonstrate that the installation of thermal embedded generators does not reduce the infrastructure costs it incurs in the short or long-term, then this effect would not need to be accounted for in setting charges.

Lastly, thermal embedded generators, unlike solar PVs, need to make an economic decision over whether to despatch their plant once it is installed. By contrast, solar PV installations tend to simply despatch when the sun is shining.

Under JE's proposed methodology, in hours when they are not exporting power back to the grid, thermal embedded generators will face a marginal energy price equal to JE's commercial tariff, irrespective of whether they are required to pay a standby charge. Hence, they will have an incentive to despatch whenever their own marginal cost of generation is below JE's per unit energy price. This is not efficient. A more efficient solution would be for JE to set tariffs that incentivise thermal generators to despatch when their own marginal costs of production are below JE's marginal cost of procuring energy from France.

More efficient tariff structures could involve a two-part tariff, in which a fixed charge is levied to recover JE's fixed costs (less any saving in infrastructure or operating costs caused by adding thermal capacity to the JE system), combined with a variable charge per MWh to reflect JE's marginal cost of production, as we discuss further below. With this approach, it would only profitable to despatch embedded generation when its running costs are less than JE's energy procurement costs. Alternatively, metering and billing of commercial customers' embedded generation facilities separately from their underlying consumption could also achieve a similar outcome, as we also discuss below in Section 4.6.5.

4.6. The Alternative Models JE Considered

4.6.1. JE considered introducing more cost reflective charges, and alternative means of ensuring they recover its total costs

As discussed above, in formulating the proposed standby charge, JE has applied the ECPR. Under this approach, the standby charge recovers the revenue JE loses due to customers installing embedded generation, through a charge equal to the expected reduction in customers' contribution to fixed costs.

We understand that the ECPR was not the only approach that JE considered when setting the standby charge. JE also considered and rejected three other economic principles which could have been used to address the same challenges as the standby charge.[61]

One option JE considered was introducing more cost-reflective tariffs, which typically means that the tariff design makes some attempt to reflect the cost users imposes on the system. This principle would require that JE levies a variable charge per kWh to reflect JE's marginal cost of production, ie. the additional cost (saving) the end-user imposes on JE by consuming (saving) an additional unit of electricity. It may also be combined with charges to reflect the impact users' maximum demands have (ie. in kW of peak load) on the longer-term fixed costs of the system, and fixed charges (eg. per customer per day) to reflect the costs that do not vary with usage at all.

Economic efficiency can be achieved through cost reflective charges, because it allows end-users to make optimal consumption and production decisions that trade-off their own costs against the costs they impose on the wider power system. However, they may yield revenues higher or lower than those required by JE to recover total costs, and as such some mark-ups are typically required to recover total power system costs.

To address this, JE considered two alternative charging approaches: Ramsey pricing and eqip-proportional mark-ups. These are not mutually exclusive alternatives to cost-reflective

61 Jersey Electricity plc (22 February 2018), Standby Charge review: Initial submission, page 35.

charging and the ECRP approach, as they are not comprehensive charging methodologies in their own right. Rather, cost-reflective tariffs are typically combined with either Ramsey pricing or equi-proportional mark-ups as means of recovering total costs:

1. **Ramsey pricing** involves charging higher mark-ups above marginal cost to customers who are less price-sensitive relative to those with more price-sensitive demand. This ensures that JE will recover its total costs at the same time as minimising the distortion to demand compared to the economically efficient solution that emerges from users paying marginal cost. JE suggests this approach would be inequitable, presumably because the Ramsey pricing model may result in higher mark-ups on domestic customers' tariffs which tend to be least price-sensitive, and lower mark-ups on commercial customers' tariffs, which may be more likely to install embedded generation.
2. **Equi-proportionate mark-ups** provide another method of marking-up tariffs above marginal cost to recover total costs. Under this approach, the mark-up is set proportional to the marginal cost customers are deemed to impose on the system. JE suggested this approach would be more equitable than Ramsey pricing, but may be less efficient.

Having considered these options, JE selected the ECPR approach for the reasons noted above in Section 4.3. JE considered that cost-reflective tariffs would be more complex, both in analytical terms (see Section 4.6.2) and due to its assessment of the challenges of implementing alternative charging structures (see Section 4.6.3).

4.6.2. Calculating more cost-reflective tariffs would not be prohibitively complex from an analytical perspective

In respect of the analytical complexity of computing more cost reflective charges, it may be complex to comprehensively model the effects that different types of user in different locations have on the power system, and in some jurisdictions the calculation of cost reflective charges certainly are extremely complex. However, in this context some moves towards more cost-reflective charging would not be prohibitively complex. For instance, some simple rebalancing of cost recovery towards higher fixed charges (per day or per kW) and lower variable charges (per kWh) could address the challenges around inefficient grid bypass with which JE expresses concern.

This suggestion, of recovering a greater share of costs through fixed charges per kW or through standing charges, is being considered in other jurisdictions to which JE could look as examples of "good practice" in electricity pricing. Such changes are being considered to address potential inefficient grid bypass caused by growth in embedded generation and other Distributed Energy Resources (DERs). For instance:

- As part of its ongoing Targeted Charging Review (TCR), Ofgem is currently considering a range of alternative charging bases for recovering the residual costs of British networks not associated with the costs deemed to be caused by particular users.[62]
- In the US, as we discuss in Appendix A, utilities in many states have made proposals, which in some cases have been approved and implemented, to address growth in DERs

[62] Ofgem (2017). "Targeted Charging Review: update on approach to reviewing residual charging arrangements".

through restructuring of rates for either customers with embedded generators, or in some cases all customers. This rebalancing of tariffs involves shifting from simple volumetric rates per kWh to a blend of charges per kW, per month and per kWh. In some cases, most notably Massachusetts, utilities are implementing these charges for all customer classes, including residential customers. In fact, from our review of US regulatory changes aimed at addressing grid bypass by solar PV, the use of standby charges seems to be extremely unusual, with a rebalancing of tariffs towards higher fixed components far more commonplace.

4.6.3. The complexity of introducing more cost reflective charges could be addressed through phased implementation

JE has also explained to us that its conclusion that introducing more cost reflective tariffs would be too complex also referred to the resulting distributional effects, as some customers would face higher and some would face others lower bills. We agree that introducing more cost reflective charges would take longer to implement than the proposed standby charge, and may be complex in the sense that it may face resistance from customers likely to face higher bills. However, rather than dismissing this reform option on the basis of the challenges of implementing it, as JE seems to have done, we consider it could have considered other options, such as a phased introduction of more cost reflective charging to comprehensively address the problems of inefficient grid bypass while reducing the complexity of its introduction.

For instance, the Public Utilities Commission in Nevada has decided that NV Energy's tariffs should be restructured to include an increased basic service charge for fixed costs, combined with a separate volumetric rate for the energy customers consume. The basic service charge and the volumetric charge were not initially set at the full, cost-based charges. Instead, prices have been transitioning from 2015 rates, which recovered a much larger share of total costs through volumetric rates, over a five-year period.[63]

We therefore disagree that more cost reflective tariffs would have been prohibitively complex to implement. We consider JE could have considered other options such as a phased introduction of more cost reflective charging to comprehensively address the complexity of its introduction. A phased introduction would also comprehensively address the problem of inefficient grid bypass, if combined with a clear trajectory for the future evolution of tariffs.

If cost reflective tariffs were also extended to residential (not just commercial) customers, a phased introduction would also allow SoJ time to consider whether different tariff structures require additional protections for vulnerable customers. We discuss this topic further in Section 4.8.

[63] Nevada Power Company, 2015. Compliance Filing, Docket No. 15-07041, Document ID No. 8544.

4.6.4. More cost reflective tariffs would address the limitations we identified associated with JE's proposed standby charge

Restructuring the tariffs faced by all commercial customers, not just those opting to install embedded generators, would also address the limitations of JE's proposed standby charge that we outline above.

As explained in Section 4.6.3, more cost reflective tariffs involves replacing the current practice of recovering the vast majority of JE's costs through a per unit energy charge, and instead setting a charge per kWh that reflects JE's marginal costs of energy procurement and a charge per kW of deemed peak consumption, per kW of connection size, or per day to recover JE's remaining costs. Hence, customers that can reduce their energy requirement using embedded generators would reduce their liability to pay the per kWh tariff, and customers that can reduce their peak requirement (eg. using reliable thermal embedded generation) would reduce their liability to pay the per kW charge.

Setting more cost reflective tariffs for electricity in Jersey could draw on JE's existing work to allocate costs between variable and fixed to calculate the proposed standby charge based on the ECPR approach. After implementing our recommendations on the appropriate cost categories to be treated as variable and fixed (see Section 4.4), we estimate that JE could levy a variable charge of 6.02 pence per kWh (by dividing its total cost of energy procurement from EDF by unit sales for 2016/17) and a fixed charge that recovers the share of fixed costs JE deems should be paid by the customer in question:

- At the moment, the share of fixed costs JE recovers from an individual customer is equal to JE's daily service charge, plus the customer's consumption in kWh multiplied by the difference between JE's variable costs (approximately 6.02 pence per kWh) and the per unit retail price (14.80 pence per kWh at the standard commercial rate).[64]
- A relatively simple approach to setting fixed charges that avoids changing the proportion of JE's fixed costs paid by any individual customer could be to estimate the contribution a particular customer has been making to fixed costs in recent years (eg. based on their metered consumption) and convert this contribution into a fixed annual payment that would apply alongside a lower per kWh energy price of around 6.02 pence per kWh after they install an embedded generation facility. For instance, under this approach, a commercial customer which had been consuming 20,000kWh per annum before installing an embedded generator would face a fixed charge of £151 per month.

This alternative approach to charging for electricity in Jersey would have a number of advantages:

Applying a simple cost-reflective tariff structure of this sort would obviate the need for a standby charge based on the ECPR, as commercial customers considering the installation of embedded generation would be able to trade-off their own costs of self-supply against JE's energy procurement costs. Moreover, customers would pay the same contribution to JE's fixed costs with or without embedded generation in place. This approach also avoids the

64 Jersey Electricity, "General Domestic Tariffs", available at: https://www.jec.co.uk/your-home/our-tariffs-and-rates/general-domestic/ (accessed 4 June 2018).

distortions embedded in JE's proposed approach related to the use of a single assumed load factor and self-consumption rate for all customers.

It would also ensure thermal embedded generators have efficient despatch incentives (as the marginal energy price they face would reflect JE's wholesale procurement cost). However, it would not reflect the potential value that thermal embedded generators bring to the system by providing capacity that is reasonably reliably available. This could be dealt with through a separate rebate or payment to thermal embedded generators, reflecting the benefit that thermal embedded generators provide. However, this would need to be calculated separately and is beyond the scope of this study, and in any event would not apply if JE could demonstrate that they do not contribute to it avoiding or deferring fixed infrastructure costs.

In a sense, this example of applying cost-reflective tariffs is a simple application of Ramsey pricing,[65] on the basis that it involves setting tariffs per kWh of energy consumption using the marginal cost of procuring energy from France. It also recovers fixed costs per kW of peak demand or per customer, and these charges are harder to avoid (certainly with solar PV) than charges per kWh of consumption. This approach also reflects the fact that the fixed infrastructure and operating costs of power networks tend to be driven more by customer numbers and peak requirements than by the volume of energy transported over the power system. It is also arguably fairer, as the tariffs paid by each customer will more closely reflect the costs they impose on the system.

Nonetheless, because this approach would reallocate the burden for paying the fixed costs of the system amongst different customers, SoJ may wish to consider further the implications of this change (see also Section 3.4.5). This reform may also require a longer lead time to provide customers with notice of the change.

4.6.5. Introducing gross metering

Another solution would be for JE to use gross metering of embedded generation facilities. This would involve metering the output from embedded generation facilities separately from customers' demand. Embedded generation output could then be remunerated at a price reflecting JE's wholesale procurement costs (eg. at the established buy-back rate of 6.40 pence/kWh),[66] and customers' on-site demand would be billed in the same way as now at the retail price. This approach is equivalent to setting a bespoke standby charge to every customer, taking account of their own self-consumption rates and load factors. It therefore addresses the problem illustrated in Figure 4.1 and Figure 4.2, that any single standby charge using an assumption on load factor or self-consumption rates would probably set incorrect charges for the majority of customers.

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65 JE criticises Ramsey pricing (which imposes a higher mark-up on customers with less elastic demand) on the basis that it would not be in the interest of smaller customers. We agree that this approach would result in customers with below average consumption paying more and those with above average consumption paying less. While this implies a redistribution of the burden for paying for JE's fixed costs amongst commercial customers, it does so in a way that is more likely to promote efficient energy use for the reasons explained in this section.

66 Jersey Electric, "Buy Back Commercial", available at: https://www.jec.co.uk/your-business/commercial-tariffs/buy-back/ (accessed 30 May 2018).

A potential advantage of this approach is that it would continue to allocate JE's fixed costs to those customers consuming the most energy, as at present. While this may not represent the most efficient or fair way of allocating the fixed costs of the system, as customers consuming large amounts of energy would tend to pay more than the costs they impose on the system and vice versa, it may facilitate implementation to maintain the current approach to allocating the fixed costs of the system amongst users.

Another advantage of this approach is that it would ensure embedded generators receive a payment for the energy they produce that reflects its value to the wider system. The main downsides are that it requires embedded generators' output to be metered, so imposes additional costs of supplying and reading the meter. This cost may be insignificant as a share of total project costs for larger solar PV installations, but could be more material for smaller PV arrays. It also does nothing to address other forms of grid bypass, such as demand reduction investments.

This type of reform is being considered by Ofgem's ongoing TCR in Great Britain, and has been adopted in some US states to prevent inefficient grid bypass. For instance, as we discuss in Appendix A, Maine is moving from "net metering", in which all embedded generation output is remunerated at the retail price, to a "buy-all, sell-all" framework in which embedded generation is metered and credited for all generation at a buy-back rate. In effect, Maine is skipping over the approach currently followed in a number of US states and in Jersey, described in the US as "net billing", where exported generation is credited at a buy-back rate while self-consumed generation is remunerated at the retail price.[67]

One way to mitigate the additional metering cost imposed by gross metering could be for JE to give customers a choice between a standby charge (calculated in a similar way to the current JE proposal, albeit possibly with the adjustments discussed above) and a charge based on the gross metering approach described here. However, the downside of this approach is that commercial customers with PV will tend to choose the most advantageous of these options for their particular circumstances:

- It will tend to encourage customers with the lowest self-consumption rates to purchase meters to avoid an excessive standby charge.
- Conversely, customers with higher self-consumption rates will select the generic standby charge (eg. as calculated based on an average self-consumption rate), as this will allow them to avoid paying some of the contribution they would make to JE's fixed costs if they purchased their full energy requirement at the full retail price.

We therefore consider this alternative approach to mitigating the cost of metering would probably not address the concerns with JE's current approach that we raise in this report.

4.7. The Proportionality of the Reform

As discussed in Section 3.4.2, our terms of reference requires us to consider whether the proposed standby charge is proportionate to the situation facing JE, ie. whether there exists a

[67] Maine Public Utilities Commission, "Order Adopting Rule and Statement of Factual and Policy Basis," Docket No. 2016-00222, March 1, 2017.

threshold level of embedded generation penetration below which it would not have a material impact on JE's costs, and hence the charge would not be required.

As explained above, we understand from JE that the proposed charge is not aimed at recovering the costs of accommodating renewables onto the system, but rather to recover the reduction in customers' contributions to fixed costs resulting from decisions to install embedded generation. Given this, we do not consider the question of proportionality to be relevant, as according to this rationale, any growth in embedded generation would erode the contribution towards fixed costs of customers choosing to install it, and hence the standby charge (or a similar intervention to restructure tariffs to make them more cost reflective discussed in this report) would have merit at all levels of penetration of embedded generation.

Nonetheless, Figure 4.3 below illustrates the financial impact of the standby charge on the wider customer base, and shows how this increases with the penetration of embedded generation. Specifically, we plot the following function in the "JE Proposal" line in the figure:

$$\text{Impact per Household from EmG (£/yr)} = \frac{\text{£3.25/kW/month x Installed kW of EmG x 12 months x 7200kWh consumption per year}}{\text{636 million kWh/yr supplied by JE - Installed kW of EmG x Solar Load Factor x Self-Consumption Rate x 8760hrs/yr}}$$

This function approximates the financial impact due to the rising penetration of solar PV, which reduces the share of fixed costs recovered from commercial customers and therefore increases the share to be recovered from the wider customer base. This calculation takes the £3.25/kW impact estimated by JE as given, and assumes an illustrative household consumption of 7,200kWh per year.[68]

For instance, if the penetration of embedded generation rises to around 10MW and the standby charge is not implemented, it would impose an additional annual cost on a "typical" domestic customer consuming 7,200kWh per year of around £4.56/year.

As the figure shows, the monetary impact on the wider customer base increases (approximately) linearly with the level of penetration of embedded generation in Jersey. In essence, more embedded generation on the island reduces the share of JE's fixed costs recovered from embedded generators, and increases the amount that has to be recovered from other classes of users. This quantification may provide SoJ with the information required to assess whether the impact of embedded generation is significant enough to justify changes to JE's charging methodology.

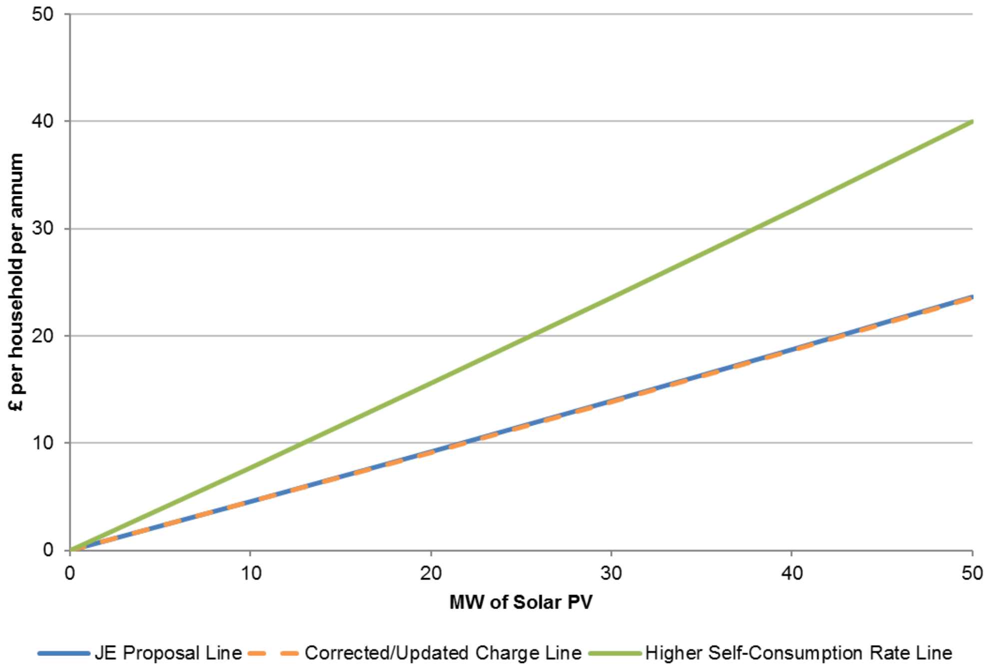
Using updated cost and sales data for 2016/17 and correcting several aspects of the calculation increases the standby charge from £3.25/kW/month to £3.22/kW/month. We have shown the effect of this in Figure 4.3 using the "Corrected / Updated Charge" line (albeit the red and blue lines in the figure, based on the £3.25 and £3.22 charges are almost identical). After these corrections, the chart suggests that every 10MW of solar PV would

[68] We understand from JE that an average household customer in Jersey consumes around 7,200kWh per annum.

impose an additional annual cost on a customer consuming 7,200kWh of around £4.53 per year, without the standby charge or some alternative.

JE has also suggested to us that the actual self-consumption rate for solar PV in Jersey, albeit based on a very small sample of sites, is currently between 69% and 100%.[69] Taking the mid-point of 85% and applying the same adjustments as in the "Corrected / Updated Charge" line, the "Higher Self Consumption Rate" line suggests that every 10MW of solar PV would impose an additional annual cost on a customer consuming 7,200kWh of around £7.75 per year without the standby charge or some alternative.

Figure 4.3
Financial Impact per Household per Annum from Increasing Embedded Generation Penetration (£/year Impact on Average Household Bill) Without the Standby Charge



Source: NERA analysis using JE's assumptions in calculating the standby charge

This result can also be presented in terms of the total contribution to the fixed costs of the power system that commercial customers with embedded generation would avoid by installing solar PV, in the absence of the standby charge. As Figure 4.4 shows, for every 10MW of solar PV installed in Jersey, the costs paid by other customers increases by around £390,000 per annum, calculated as follows:

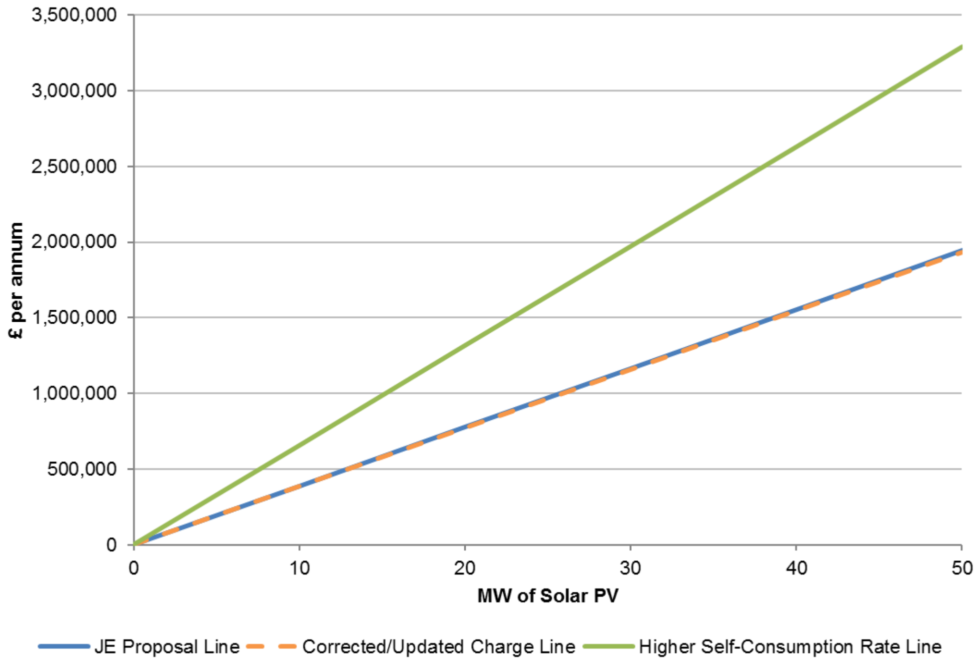
Total Impact from EmG (£/yr) = £3.25/kW/month x Installed kW of EmG x 12 months

This calculation assumes the same £3.25/kW/month charge as the "JE Proposal" line in Figure 4.3. Figure 4.4 also shows the alternative calculations described above using the updated/corrected standby charge of £3.22/kW/month, and the updated/corrected standby charge using the higher self-consumption rate of 85%. As the figure shows, these alternatives

69 Information provided to NERA by JE via email on 8 May 2018.

suggest a higher total impact of between £386,845 per year and £657,636 per year, respectively.

Figure 4.4
Total Impact per Annum from Increasing Embedded Generation Penetration (£/year)



Source: NERA analysis using JE's assumptions in calculating the standby charge

However, irrespective of the level of impact on household customers' bills, we agree with an argument put forward by JE during our discussions, that some charging reform has value in signalling to potential investors in embedded generation that the long-term value of some types of embedded generation investments are less than JE's current retail energy prices suggest.

4.8. Wider Comments Outside of Our Main Scope

4.8.1. The proposed standby charge does not address other types of inefficiency, in particular grid bypass by residential customers

As discussed above, JE's proposed standby charge is designed to address a very particular problem of lost revenues due to increased penetration of commercial customers with embedded generation with capacity of less than 50kW.[70] While the previous sections discuss some of the weaknesses in JE's approach to calculating and applying the standby charge applicable to this particular type of customers choosing to install embedded generation with a

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[70] As discussed in Section 3.3, this problem arises as a result of the relatively simple tariff structure JE currently applies, which sets a retail price per unit of electricity to recover the majority of total costs, which is therefore relatively high compared to the marginal cost of supplying energy, and potentially higher than the levelised unit cost of production from embedded generators.

capacity of up to 50kW, there are a number of limitations with the overarching approach JE has adopted to establishing a standby charge of this form.

First, the application of this standby charge to a narrow group of commercial customers means it does nothing to prevent the potential for inefficient grid bypass by other types of customers, notably domestic customers, who choose to install embedded generation. We understand from JE that the commercial sector was the largest segment of the market at the time the standby charge was proposed. However, embedded generation in the domestic sector may rise in the future, particularly if the proposed standby charge or similar reforms reduce the incentive to install solar PV at commercial customers' premises, in which case domestic customers with embedded generation may also need to be charged differently to prevent inefficient grid bypass.

JE has told us that it intends to extend a standby charge to residential customers choosing to install embedded generation. If this standby charge were calculated in the same way as JE's proposed £3.25/kW/month charge, the same criticisms of it would apply as those set out above in relation to commercial customers. As for the standby charge for commercial customers, gross metering or more cost reflective charges could address these problems. However, the extra metering cost associated with gross metering may become more onerous (ie. as a percentage of total project costs for solar PV) for smaller residential installations.

Second, by only applying the new charge to commercial customers with embedded generation of less than 50kW installed capacity, the standby charge also does nothing to prevent the deployment of inefficient embedded generation investments (made economic by relatively high energy prices) on a larger scale (ie. above 50kW). We understand that JE will consider applications to connect embedded generation installations over 50kW on a case-by-case basis, potentially making bespoke connection and tariff offers. However, the need for such bespoke arrangements illustrates the extent to which the proposed standby charge provides a partial solution to the potential challenge of inefficient grid bypass. It also provides no signal to the market regarding the likely value of larger embedded generation facilities. By contrast, a more cost reflective charging structure, with a greater share of fixed costs recovered through a fixed tariff levied on all customers would address this problem.

Lastly, by targeting the narrowly defined group of commercial customers which install embedded generation of up to 50kW, the standby charge does nothing to address other potential sources of inefficiency resulting from JE's current charging structure. For instance:

- Various forms of demand-side reduction like energy efficiency investments (eg. building insulation, heat pumps), may have an exaggerated value because JE's per kWh tariff exceeds the marginal cost of generation or imports. A more cost reflective charging structure would address this problem.
- On the other hand, other types of investment that involve customers consuming more electricity, such as electric vehicles, may appear less economic than they really are because JE's per kWh tariffs exceed the marginal cost of generation or imports. A more cost reflective charging structure would address this problem.

Hence, JE's proposed standby charge potentially provides only a partial solution to the problem of potential inefficient grid bypass. Addressing these problems more thoroughly, and in a way that will not require further reform in the very near future even if the standby charge is implemented, would require further changes to JE's charging methodology, as we discuss in the Section 4.6.4.

Altering the structure of tariffs to better reflect the balance of JE's fixed and variable costs would result in those with below average consumption tending to pay more, and those with above average consumption tending to pay less. Therefore, if residential end user tariffs were restructured as part of this process to address potential for grid bypass by this class of customer, SoJ may wish to consider whether more cost reflective tariff structures necessitate additional protections for lower-income or vulnerable domestic customers. As we discuss above, a phased implementation of new tariff structures may also help address the complexity of implementation.

However, if the SoJ is concerned about the "equity" implications of electricity tariff reform, departures from cost-reflective pricing are unlikely to be an efficient solution; other welfare measures may be more appropriate, such as asking JE to target discounts on customers identified as vulnerable (with the costs of such discounts recovered from the generality of customers). In any case, it is not clear whether this particular change in the distribution of energy costs across the customer base would necessarily be adverse to vulnerable customers, as some may have relatively large energy requirements (eg. those with large families, households using electric heating or with poor thermal insulation). Further examining the impact of tariff reform on vulnerable customer groups is beyond the scope of this review.

4.8.2. The process for implementing the new charge

As discussed above in Section 2.3, JE is not subject to economic regulation, except through the competition laws applying to the economy as a whole in Jersey. It is beyond our scope to consider whether sector-specific regulation is required to ensure that the conduct of JE promotes the economically efficient development of the energy system on the island (including, where appropriate, subjecting JE to competition from new entrants). However, the regulatory mechanisms in place in the electricity sectors of other jurisdictions may offer lessons to JE and SoJ in relation to the process for setting tariff structures.

In other jurisdictions, one aspect of the regulatory arrangements governing the conduct of natural monopoly electricity network owners (and/or the incumbent suppliers of energy) relates to the process through which the structure of tariffs is determined.[71] Typically, this regulation involves specific requirements on utilities to publish tariffs and seek regulatory approval for them, as well as a defined methodology through which tariffs must be calculated.

While many of these requirements may be excessively onerous for a utility serving a relatively small market like Jersey, some aspects of them could improve the future customer acceptance of tariff changes and avoid the need for independent reviews following proposed changes to the tariff structure. In particular, we understand from various stakeholders that they feel the process JE followed when proposing the standby charge was not (at least initially) transparent. We have not formed a view on whether JE's communication strategy

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[71] This is a separate element of regulation from the process through which the overall level of revenue.

was sufficiently transparent when implementing the proposed new charge, but the following changes could address these concerns in the future.

Without sector-specific regulation of the tariffs JE is allowed to charge, JE could improve transparency by publishing a statement that explains how it derives its charges. This could cover, for instance, the rationale for the structure of charges, the methods used to allocate particular costs amongst customer classes, and so on. This would allow stakeholders to understand any proposed changes to tariffs better in the future and reduce the need for independent expert reviews of proposed tariff changes.

It ought to be possible, in our view, to create such a tariff methodology report without publishing the detailed cost data which JE considers to be commercially confidential. Indeed, regulated utilities in other jurisdictions, even when they are privately owned and/or listed like JE, can be subject to extremely extensive obligations to publish their cost data. While it may be unnecessary for JE to publish detailed cost data, we see no reason why it could not publish aggregated summaries of its total costs allocated to a fixed and variable charge, alongside an explanation of how the cost allocation had been performed.

As part of this, depending on whether the SoJ considers more comprehensive charging reform is worthwhile, it may be appropriate for JE's tariff methodology to seek to set and update tariffs to ensure the "fixed" elements of the tariff (eg. per customer or per kW of connection) recover broadly the fixed costs associated with its operations, and that "variable" elements of the tariff (per kWh) reflect the variable costs of providing energy to end users. For the reasons explained in this report, this approach will tend to promote economic efficiency by allowing electricity consumers to balance the costs and benefits of their own consumption and production decisions against the costs those decisions impose on the wider power system in Jersey.

5. Conclusion

5.1. Justification for JE's Proposed Standby Charge

Following our review of the standby charge proposed by JE, we consider that some charging reform to address the impact of customers installing embedded generation to reduce their contribution to JE's fixed costs is "justifiable on a commercial basis." And, moreover, economic theory suggests that the ECPR approach proposed by JE would promote the efficient deployment of embedded generation in Jersey.

However, despite the prediction from the economics literature that the standby charge should promote efficiency, we have identified problems with the proposals put forward by JE that mean it will not promote efficiency in practice.

We have identified some significant limitations related to the design of the standby charge:

- It assumes all embedded generators have the same load factor, based on the expected output from solar PV facilities. This will cause the standby charge to be too low for embedded generators using other technologies that produce more energy per kW. However, if potential variation in solar PV load factors on Jersey is small, then the effect of this problem would also be limited;
- It assumes all commercial customers consume the same proportion of the electricity they generate at their own premises. This will result in commercial customers with larger generators (relative to their demand) paying too much, and customers with smaller generators paying too little; and
- The standby charge is not well-suited to thermal generators. As noted above, they will tend to produce more energy than solar PV, but they may also provide some cost savings to the system if they reliably reduce customers' peak demand or provide relatively firm export capacity, which the standby charge does not recognise. JE's tariff structure will also encourage them to generate more often than is efficient, which imposes a cost on the system.

We have also identified some minor problems with the details of JE's calculation, rather than with the design of the charge, such as the method used to allocate costs between fixed costs and variable costs for the purpose of the standby charge calculation. However, their effect is small. Addressing these minor problems and updating JE's calculations to reflect its current costs would result in a slightly lower standby charge of £3.22/kW/month.

However, making these changes and applying a higher self-consumption ratio based on the mid-point of those observed currently (85%) results in a higher standby charge of £5.48/kW/month, suggesting JE's calculation is conservative overall.

5.2. Potential Alternative Solutions

A number of solutions may be possible to address these problems with JE's proposed tariff:

1. The most comprehensive solution to the problem of inefficient grid bypass would be to restructure the prices all customers pay for electricity, setting tariffs that are more

reflective of the balance between fixed and variable costs. For example, this might involve levying a fixed £/month charge and a variable £/MWh charge:

- This approach would send more efficient signals to customers and about the value of embedded generation, and would also be fairer in the sense that electricity tariffs would better reflect the costs JE incurs to serve different customers. Utilities in some US States are restructuring tariffs in this way to mitigate potential inefficient grid bypass (though often not for all customer classes – see option 2). In Great Britain, the energy regulator Ofgem is also considering restructuring all network charges to avoid recovering fixed costs through £/kWh charges that encourage inefficient grid bypass.
- However, it would also involve a relatively significant adjustment to current tariffs and would cause some customers to face higher or lower bills than at present. It may therefore take longer to implement. For instance, in some US states, increases in fixed charges for electricity have been phased in over time. Restructuring tariffs might also require SoJ to consider the distributional effects of customers with relatively low energy consumption tending to face higher bills (and vice versa).

2. Without restructuring all customers' tariffs, JE could also consider implementing a more cost reflective charging structure (ie. including a fixed £/month element to the charge) for commercial customers only, or only those commercial customers opting to install embedded generation. This approach would be combined with a lower tariff per unit of energy they consume and leave other customers' tariffs unchanged. Rather than restructure all tariffs, some US states have adopted this more limited approach to addressing inefficient grid bypass.
   - The advantage of this more limited change is that it might be faster to implement, but it would not improve the efficiency of signals sent to customers which do not face restructured tariffs.
   - Also, it would have fewer distributional effects than restructuring all customers' tariffs. This limits the possible need for SoJ or JE to introduce new measures to protect any vulnerable customers facing higher bills, but would also not address the potential unfairness built into the current charging methodology arising from customers consuming less energy making smaller contributions to the fixed costs of the system.
3. Alternatively, JE could measure production from embedded generation facilities separately from customers' on-site consumption by installing (or requiring developers to install) an additional meter. Embedded generation could then be paid a price reflecting JE's wholesale procurement costs (eg. at JE's established buy-back rate), and customers' they would pay for their consumption in the same way as now. This option is essentially the same as setting a standby charge for each customer that reflects that customer's own installed generation capacity, self-consumption rate and load factor.
   - The advantage of this approach is that it would be relatively simple to implement, but at the cost of installing additional meters to measure output from new embedded generators. It largely removes any distributional effects. Like options 1 and 2, this option has also been adopted in some US states as a means of addressing inefficient grid bypass.
4. In discussions with JE, it also asked us to consider the option of technology-specific standby charges, effectively separating out solar from other technologies. This approach

could address (to some extent) the limitation of JE’s proposal that assumes all embedded generators have the same load factor. However, it would not address the other limitation that JE’s proposed approach, that it assumes a common self-consumption rate for all customers with embedded generation. We therefore do not consider that this option would adequately address the limitations we identified.

5.3. The Proportionality of the Standby Charge

The amount of embedded generation in Jersey is currently extremely small, and we cannot conclude objectively whether there is any amount of embedded generation that would necessitate the proposed standby charge, because (under JE’s current tariff methodology) any growth in embedded generation increases the costs that would have to be paid by other customers.

We have quantified the impact of a decision *not to* impose the standby charge on new embedded generators on the bills that would be faced by other customers. Specifically, we estimate that without the standby charge (or one of the similar changes proposed above), every 10MW of solar PV installed in Jersey[72] would require other customers choosing not to install solar PV to pay higher electricity tariffs, in total by around £390,000 per annum. This amounts to an average household customer facing an increase in their annual electricity costs of around £4.56 for every 10MW of solar PV installed on the island. These annual effects rise to £7.75 per customer per year and £657,636 per annum in aggregate if we update the standby charge calculations based on the recommendations in this report, update the cost data, and use the current average self-consumption rate observed in Jersey.

However, despite this relatively small apparent impact on household customers’ bills, we agree with an argument put forward by JE during our discussions, that some charging reform has value in signalling to potential investors in embedded generation that the long-term value of some types of embedded generation investments are less than JE’s current retail energy prices suggest.

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72 Note, the unit of 10MW is not intended to represent the total potential for solar PV deployment in Jersey, which we have not sought to estimate and could be higher or lower than this amount. We present it solely for the purpose of illustrating the rate at which solar PV deployment in Jersey increases the costs faced by customers who do not install it.

Appendix A. Reform of Charging Arrangements Due to Solar PV in the US Market

A.1. The Evolving Tariff Landscape in the United States

In the last decade, the growth of smaller-scale embedded generation technologies—principally rooftop solar photovoltaics (PV)—has been driven by state "net metering" policies that compensate exported generation at a volumetric ($/kWh) retail rate of electricity, which are similar to JE's charging methodology described in the body of this report. Under net metering policies, utilities are unable to recover certain fixed costs associated with the delivery of electricity.[73] These non-recovered costs typically end up being transferred from net metering customers to non-net metering customers. By way of example, Figure A.1[74] highlights the growth and extent of cost shifting due to net metering for customers served by Eversource Energy, a New England utility, from 2010 to 2015.

Recognising this growing mismatch between utility costs and revenues, many states are in the process of developing net metering alternatives or successors that would enable utilities to recover the appropriate levels of fixed costs from customers with embedded generation. Such alternatives include new compensation policies for embedded generation ("net billing" and "buy-all, sell-all" policies); increased residential fixed charges (including subscription service charges, grid access charges, and "minimum bills"); residential demand charges and standby rates; and time-varying rates.

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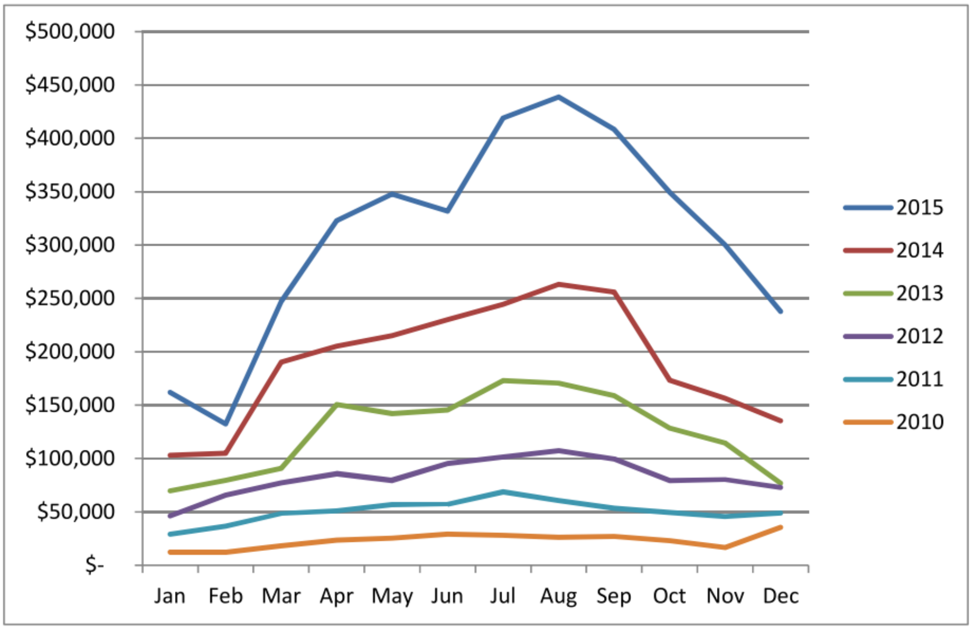
73 Utility costs are comprised of customer related costs (meter, service line, transformer, customer care, etc.), grid related costs (distribution and transmission), and supply related costs (fuel costs and power plant capacity). Current residential delivery rates typically have two components to recover a multitude of utility service costs: fixed charges and volumetric rates. Net metered customers are paid the retail volumetric rate that includes within it supply related costs but also certain grid related costs. The energy exported by embedded generation offsets or avoids fuel costs but often does not offset power plant capacity and grid related costs. Therefore, in many cases net metering overcompensates exported generation.

74 Eversource Energy, "Direct Testimony of Rate Design Panel (Exhibit ES-RDP-1): Rate Design, Consolidation, and Alignment," D.P.U. 17-05, January 17, 2018, pg. 96.

Figure A.1
Monthly Displaced Rate Revenue for Eversource Energy



Many states issuing net metering successor tariff decisions have opted to move toward new compensation policies for embedded generation. "Net billing" policies allow unmetered behind-the-meter consumption but credit all exported energy at a rate other than the retail rate.[75] This is similar to JE's approach of paying for exported power at a buy back rate, which is lower than the retail price.

For instance, in 2017, Jacksonville Electric Authority, Indiana, New York, and Utah approved transitions from net metering to net billing. Net billing models are under consideration in several additional states, including Arkansas, Louisiana, and Michigan. While there is growing convergence toward the net billing framework, states are taking diverse approaches to credit rates for excess generation. The most common of these have been avoided cost and value-based crediting, although there are is a wide variety of methodologies in use or under consideration for calculating avoided cost and the value of distributed generation.

One state, Maine, is moving from net metering to a "buy-all, sell-all" framework in which embedded generation is metered and credited for all generation (as opposed to only exported generation).[76] This reflects the option set out in Section 4.6.5, though we refer to it as a "gross metering" option, reflecting the terminology more widely used in the charging reform debate in the UK.

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[75] Proudlove, A., Lips, B., Sarkisian, D., and A. Shrestha, "50 States of Solar: Q4 2017 Quarterly Report & 2017 Annual Review," NC Clean Energy Technology Center, January 2018.

[76] Maine Public Utilities Commission, "Order Adopting Rule and Statement of Factual and Policy Basis," Docket No. 2016-00222, March 1, 2017.

Moves to introduce residential fixed charges have also increased steadily over the past three years, with 61 requests from utilities to increase charges pending or decided in 2015, 71 in 2016, and 84 in 2017. A total of 44 decisions were made on these requests during 2017, with regulators approving 57 percent of utilities' requested increases. Of the partial increases granted, regulators approved, on average, 26 percent of the utility's original request. Only six utilities were granted their full requested increases.[77]

Currently 50 utilities in 21 states offer residential demand charges (Figure A.2[78]), ie. fixed charges per kW of residential customers' peak requirement, which we discuss in Section 4.6.4 and Section 4.8.1 of this report. For instance, the Massachusetts Department of Public Utilities has recently approved mandatory demand charges for all new net metering facilities for residential and small commercial customers.

Other utilities have set or proposed demand charges per kW of peak demand specifically for customers with embedded generation (an option discussed in Section 4.6). These include Eversource, Arizona Public Service, Salt River Project, NV Energy, and Westar Energy. Salt River Project in Arizona, a municipally owned system, has also instituted a mandatory tariff for embedded generation customers. The Kansas Corporation Commission has ordered that embedded generation customers be considered a separate class and be offered three-part rates (ie. with charges per kWh, per kW and per day), among other options.

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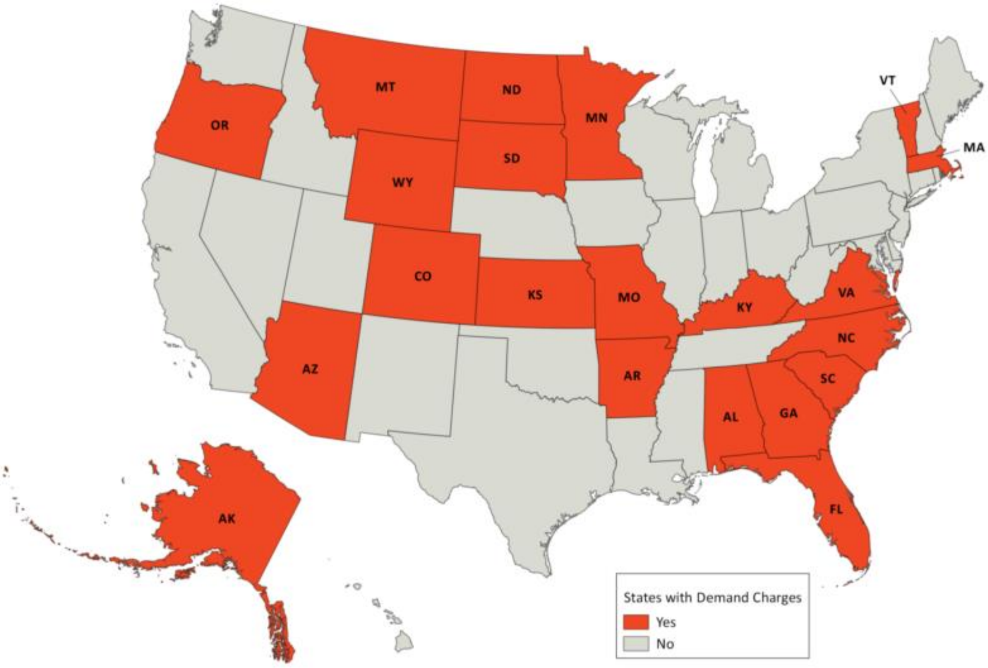
77 Proudlove et al., 2018.

78 Faruqui, A. and S. Sergici, "Rate Design for DER Customers in New York: A Way Forward," The Brattle Group, March 6, 2018 (Presentation to the New York VDER Rate Design Working Group).

Figure A.2:
States Offering Residential Demand Charges



Finally, time-varying rates are gaining attention as states and utilities examine net metering successor tariffs and rate design changes for embedded generation customers.[79] In New Hampshire, regulators initiated a time-varying rates pilot program, while a pilot is also being designed in Maryland. The Vermont Public Service Department recommended exploring time-varying rates for net metering customers. Time varying rates include seasonal/tiered pricing, time-of-use (ToU) rates, and "critical peak pricing" (CPP).

Table A.1 describes some of the main features and design considerations of common net metering alternatives being considered in the United States.

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[79] Proudlove et al., 2018.

Table A.1
Summary of Net Metering Alternatives

Rate Design	Main Features	Other Considerations
Net billing	• Exported generation compensated at a rate other than retail (typically market price or "avoided cost")	• Need to determine compensation regime for exported generation
Buy-all, sell-all	• All generation compensated at a rate other than retail	• Requires dual meters • Need to determine compensation regime for exported generation
Increased fixed charge	• Reflects fixed costs of serving customers • Most fixed charges do not include all customer costs; some utilities increase fixed costs to cover all customer related costs and some demand related costs	• May have a larger negative impact on low usage customers • May temper conservation incentives • Easier to manage from customer experience perspective
Subscription service charge	• Fixed delivery charge based on kW usage subscription level • Single charge for all delivery costs • Additional charge for excess demand	• Customers may choose subscription levels or they are defaulted based on historic consumption levels • Variations around demand measurement
Grid access charge	• Charge per kW of solar generating capacity • Ensure that solar customers contribute to the recovery of delivery costs regardless of their net consumption	• Need to determine the basis of grid access charge (inverter rating, max net demand) • Need a technology specific access charge
Minimum bill	• Ensures that each customer makes a minimum level of contribution to cost recovery regardless of their consumption • May negatively impact low usage customers	• Minimum level of consumption needs to be determined
Demand charge	• Ideally would have two components: coincident peak (CP) and non-coincident peak (NCP) demand • Reflects delivery related cost-causation • Typically require interval meters	• Several options are available for measuring demand (NCP is most common) • In some cases, billing demand is measured during the peak window
Standby rate	• No volumetric charges included • Customer charge, contract demand charge, daily as-used demand charge	• Which costs to include in contract demand vs. as-used demand? • Measurement of as-used demand • Additional charge for actual demand that exceed the contract demand
Seasonal/tiered pricing	• Seasonal rates to reflect higher commodity or delivery rates in high demand seasons • First tier typically determined to cover essential uses	• Tiered rates typically have weak cost causation • Declining or inclining
Time-of-use rate	• TOU periods are determined based on system or local load conditions • May have seasonal definitions	• As the peak shifts towards later in the day, it becomes more effective in recovering demand related costs
Critical peak pricing	• Typically declared based on wholesale system conditions, although there are variations based on local conditions	• CPP can be defined as a demand charge or a kWh charge • Event day charge may vary across events, known as variable peak pricing (VPP)

A.2. Net Billing and Demand Charges

Two alternatives to net metering are net billing (similar to JE's current approach, before introducing the standby charge or one of the alternatives discussed in this report) and demand charges (ie. fixed charges per kW of peak demand, see Section 4.6).

When compared to net metering, net billing more accurately compensates exported generation for its value to the electricity system (in Jersey, at the buy-back rate), thereby reducing unrecovered utility fixed costs. Moreover, net billing has the potential to signal to customers when exported generation is most economically valuable.

However, customers with net billing may still incur unrecovered utility fixed costs because they will be avoiding the retail rate for self-consumed generation. This has created the rationale for the JE standby charge as we discuss in Section 4.2.

Unrecovered costs could be lessened or eliminated if net billing were combined with a more granular tariff for residential electricity consumption, such as a three-part tariff consisting of a customer charge ($/month), demand charge ($/kW-month), and energy charge ($/kWh). We suggest and discuss this option in Section 4.6.4.

Demand charges target peak consumption rather than generation. They enable utilities to recover fixed costs associated with net metering customers. Moreover, they can provide signals to customers to reduce demand when distribution system conditions are most stressed (and therefore when electricity is most expensive). Fixed charges (in $/month), on the other hand, do not provide any kind of signal to customers concerning the economic value of their demand reduction.

There are several design considerations for demand charges, including the duration of the demand interval (15, 30, or 60 minutes), the measurement of demand (maximum day, top three days, average of all days), coincident peak (CP) vs. non-coincident peak (NCP), nature of coincidence (with system peak, transmission peak, or local distribution peak), and others. Table A.2 lists some of the pros and cons associated with CP and NCP demand charges. However, as we discuss in Section 4.6.2, the calculation of a fixed or demand charge in Jersey need not necessarily involve such a wide range of choices. Rather, it could be set simply by seeking to recover its fixed costs on a per customer basis.

The next two sub-sections consider the cases of two jurisdictions that have recently implemented net metering alternatives: New York and Massachusetts. New York has recently adopted a net billing policy—the "Value of Distributed Energy Resources" (VDER) rate structure— that compensates exported generation according to its estimated value or avoided utility cost. Massachusetts has recently adopted a mandatory three-part tariff for net metering customers—the "Monthly Minimum Reliability Contribution" (MMRC) rate structure— that includes a demand charge.

Table A.2:
Pros & Cons of Coincident Peak (CP) & Non-Coincident Peak (NCP) Demand Charges

	Coincident Peak	Non-Coincident Peak
Pros	• Is effective in addressing delivery capacity costs further away from the customer • It directly addresses local capacity constraints if coincident with local distribution peak • It can be measured during a defined peak window	• Is effective in addressing delivery capacity costs close to the customer (grid access charge) • Customers may develop rules of thumb to manage their max demand
Cons	• Difficult to manage as the time of CP is not known until the end of the month • If coincident with system peak, may not address local distribution peak constraints	• Management of NCP does not necessarily address delivery capacity costs further away from the customer

A.2.1. New York "Value of DER" tariff

New York is moving away from net metering under its ongoing "Value of Distributed Energy Resources" (VDER) proceeding. Last year the New York Public Service Commission (PSC) issued an order[80] replacing the existing net metering compensation with a new compensation regime that more accurately reflects the location- and time-specific values provided by DERs.

As with net metering, customers with distributed generation will be credited for net exports to the grid. However, unlike net metering, they will be compensated under a so-called "value stack" methodology. There are four main components of the value stack, some of which vary in time and location, and some of which do not:

1. Energy value, based on a day-ahead hourly zonal locational-based marginal price, inclusive of losses;
2. Capacity value, based on retail capacity rates for intermittent technologies and based on performance during the peak hour in the previous year for dispatchable technologies;
3. Environmental value, based on the higher of the latest auction-clearing price for New York renewable energy credits; and
4. Distribution system value, based on a "de-averaging" of utility marginal cost of service (MCOS) studies, and based on performance during the 10 peak hours.

With respect to "distribution system value," utilities were required to use existing "marginal cost of service" (MCOS) studies to develop a value for distribution cost savings ($/kW-year) associated with energy exports that are coincident with peak system demand. This "Demand Reduction Value" (DRV) is distributed across the 10 highest usage hours in a utility's area and generators are compensated based on their performance during those hours. Moreover,

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[80] New York Public Service Commission, "Order on Net Energy Metering Transition, Phase One of Value of Distributed Energy Resources, and Related Matters," Case 15-E-0751, March 9, 2018.

utilities were required to identify high-value locations within their service areas, and to identify a value for these areas ($/kW-year) that is higher than that of the system-wide DRV. This "Locational System Relief Value" (LSRV) is distributed across the 10 highest usage hours in those areas.

The table below summarises utilities' DRV and LSRV proposals. Utilities' proposals for DRV and LSRV values were recently approved by the PSC.[81]

Table A.3:
Distribution System Values for New York "Value of DER" Net Billing Policy

	Utility				
Item	ORU	Con Edison	Central Hudson	National Grid	NYSEG and RGE
DRV after removal of LSRV if applicable ($/kW-yr)	$65	$199	Approx. $13	$61.44	RGE: $31.92; NYSEG = $29.67
LSRV estimation methodology	Assumed 50% higher than original DRV.	Assumed 50% higher than original DRV.	None. All identified areas had marginal cost lower than DRV	Assumed 50% higher than residual DRV.	Estimated individually (not system average).
Net LSRV is the incremental value above the modified DRV.	Net LSRV = $39.61/kW-yr	Net LSRV = $141/kW-yr	N/A	Net LSRV = $30.72/kW-yr.	Net LSRV = $9.47/kW-yr to $47.96/kW-yr for RGE; $21.82/kW-yr to $56.25/kW-yr for NYSEG
% of system load with LSRV	12%	19%	0%	16.4%	?
LSRV Areas	Five areas, Caps from 2.5MW to 10.5MW.	13 projects in four CSRP zones. Caps range from 0.3 MW to 30.1 MW	None identified	53 areas. Caps total 103MW, and range from 0.1 MW to 13.1 MW	2 areas for RGE; 4 for NYSEG. RGE caps are 1.3MW and 3.3MW. NYSEG caps range from 1.3 MW to 56.3 MW.

While this case provides an interesting (and prominent international) example of rate design to address the challenges created by growing penetration of DERs, it probably represents an example which is disproportionately complex for the Jersey context.

81 New York Public Service Commission, "Order on the Phase One Value of Distributed Energy Resources Implementation Proposals, Cost Mitigation Issues, and Related Matters," Case 15-E-0751, September 14, 2018.

A.2.2. Massachusetts' "Monthly Minimum Reliability Contribution"

Earlier this year, the Massachusetts Department of Public Utilities (DPU) adopted the proposal of Massachusetts' electricity distribution company Eversource Energy ("Eversource") for a new rate structure for net metering customers.[82] The new rate structure, known as a "Monthly Minimum Reliability Contribution (MMRC)," includes a demand charge.

Eversource will apply the MMRC to new residential and commercial and industrial (C&I) net metering customers with an in-service date on or after 31 December 2018. MMRC rates will consist of charges per customer, per kW of peak demand and, where applicable, per kWh of energy demand.

Eversource designed the MMRC and corresponding distribution rates for each class of user on a revenue neutral basis, such that tariffs recover a target level of revenue from each customer class. A three-part rate was designed for each rate class, based on the allocated cost of providing service (reflected in an "allocated cost of service" [ACOS] study) and target rate revenues. However, in the Jersey context, this could be done more simply, such as by maintaining the levels of revenue recovered from each customer class under the current methodology to avoid material redistribution of cost between customer classes.

For each rate class, the customer charge (the charge for collecting fixed customer costs such as for meters, monthly billing, etc.) has been set equal to the full unit customer cost provided in these studies. This has been done to separate customer costs from distribution system costs, and to assure that each customer is responsible for their share of customer costs that would, due to net metering, otherwise be shifted to other customers if included in a volumetric charge.

The demand charge was developed using the allocated minimum distribution system costs from the ACOS study and the individual customer monthly peak demands of all customers within each class (ie. it reflects an estimate of the fixed cost of serving each user). To complete the rate design for residential rate classes, a volumetric rate was calculated to achieve revenue neutrality with the total rate revenue for each class. For small C&I customers, the MMRC is included as part of the total demand charge for each class. The demand charge is specific to each customer and is based on their actual use of the system.

Eversource considered an MMRC based on a fixed, monthly charge. The method for determining that cost was to apply a ratio of minimum to peak load, thus representing a load share of total demand-related cost responsibility. Such a design may increase the amount of distribution revenue a net metering customer contributes, albeit the rate would be fixed and the same for each customer within a given class. A demand based rate, on the other hand, varies on the basis of each customer's actual demand and better aligns with the types of costs incurred.

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[82] Massachusetts Department of Public Utilities, "Order Establishing Eversource's Rate Structure," D.P.U. 17-05-B, January 5, 2018.

The figure below[83] illustrates how costs are allocated to residential bill components under the conventional two-part rate (top rectangle) and under the new MMRC rate (bottom rectangle). The illustration is based on usage of an average residential customer. As the illustration shows, the MMRC provides a contribution toward the fixed cost of providing service, and is based upon the distribution costs of the distribution system. The MMRC rates for each rate class are summarised in Table A.4.[84]

Figure A.3:
Comparison of Residential Bill Cost Allocation Under a Conventional Rate (Top Rectangle) and New MMRC Rate (Bottom Rectangle)

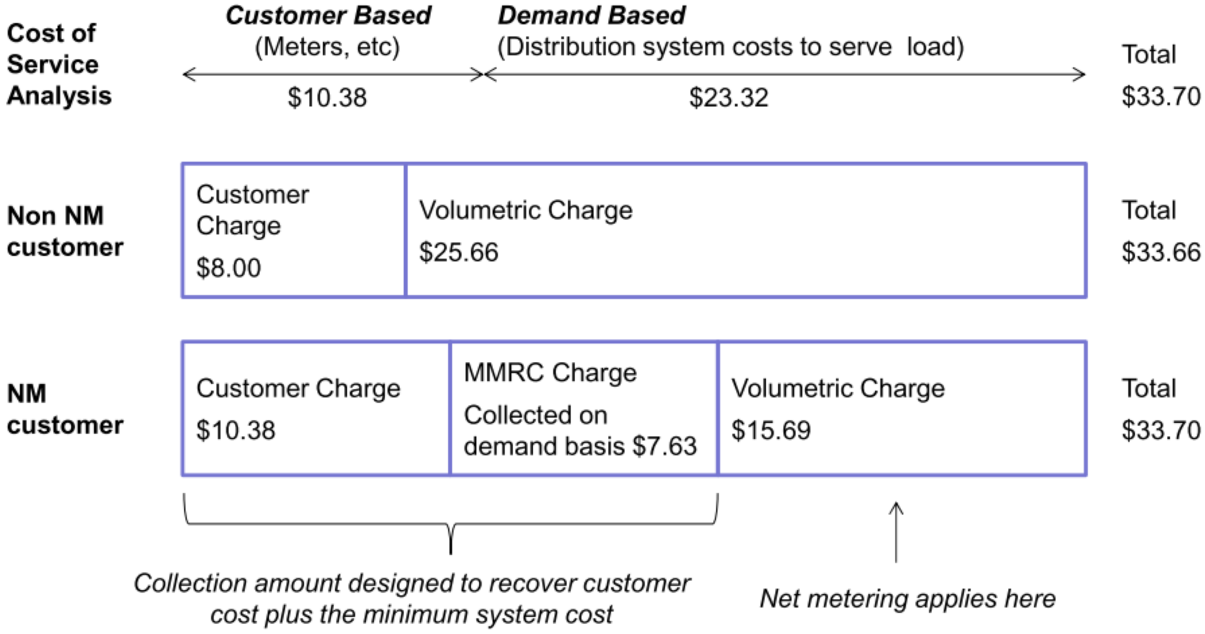

Table A.4:
"Monthly Minimum Reliability Contribution" (MMRC) Rates for Eversource Net Metering Customers

MMRC Rate Component	R-1/R-2	R-3/R-4	G-1 EMA	G-1 WMA	G-2 EMA	G-2 WMA
Customer Charge ($/month)	10.88	13.89	19.44	23.04	120.89	52.87
Demand Charge ($/kW)	2.21	2.71	5.16	7.75	6.02	7.58
Distribution Energy Charge ($/kWh)	0.03056	0.02085	0.01837	0.00658	0.01940	0.00827

To implement the MMRC, Eversource will:

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[83] Eversource Energy, 2018, pg. 98.

[84] Massachusetts Department of Public Utilities, 2018, pg. 105.

1. Install demand meters that measure maximum billing cycle demand (in kWs and meters that measure energy delivered and received (in kWh) for customers subject to the MMRC; and
2. Update its billing system to incorporate the monthly demand charge.

Several valid criticisms have been made of the MMRC. For instance, the MMRC imposes a demand charge on residential customers without providing a way for customers to track their electricity consumption, thereby weakening the economic incentive for customers to reduce their peak demands. Moreover, the demand charge is non-coincident with system-wide peak demand and thus it is unclear that charges will reflect each customers' contribution to costs.

Appendix B. Applications of the ECPR in Other Sectors

In addition to reviewing the economic theory surrounding the ECPR, to inform this review we have also examined some selected case studies from other jurisdictions that have applied the ECPR in regulated infrastructure industries.

B.1. England and Wales Water

Since privatisation in 1989, the water industry in England and Wales has consisted of several regional regulated monopolies. The reforms of the Water Act 2014 aimed to increase competition, one of the areas in which being upstream competition. Upstream activities include the "storage and treatment of raw or treated water and the disposal of sewage or waste water".[85]

Specifically, the reforms allow entrants to provide upstream services without "being obliged to also provide retail services". Once the changes relating to these reforms are implemented, access to the water distribution network would be priced as a natural monopoly input (similar to the prices paid by embedded generators in Jersey to JE through the standby charge). Implementing the ECPR to price access to the water network would involve subtracting the incumbent water company's marginal cost of upstream production from the retail price it charges end users.

This calculation is particularly challenging in this case, as water companies' marginal costs are extremely low in the short term due to the long-lived nature of their investments. Hence, the ECPR should ideally be applied by subtracting the *long-run* marginal cost of production, including a contribution to levelised fixed costs, from the retail price.

However, even if the estimate of the marginal cost of production includes some contribution to long-run fixed costs, the experience from the English and Welsh water sector suggests that new entry may be challenging in practice, and does not necessarily increase economic efficiency. First, assets used in the water sector have very long economic lives, so the incumbent is likely to face lower additional long-term costs than a new entrant starting the same operations. And even if the entrant finds it economical to set up operations, should it not perfectly supplant the incumbent's activity, it would inefficiently introduce costs into the overall water system that would take a long time to disappear.

The circumstances of the water sector's privatisation 25 years ago present an additional challenge to potential entrants. At the time, capital assets were subject to a high discount rate meaning that their value today as estimated for regulatory purposes is lower than their true replacement cost,[86] and current retail tariffs reflect this approach to valuing assets. Hence,

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[85] Priestly, S. and Hough, D. "Increasing competition in the water industry", (21 November 2016), Briefing Paper Number CBP 7259

[86] Oxera, "The future of water upstream", (2015). Link: https://www.oxera.com/Latest-Thinking/Agenda/2015/The-future-of-water-upstream.aspx

the ECPR, which takes the retail price as its starting point, leaves little "headroom" for new entrants to cover their costs.

B.2. New Zealand Telecommunications

In 1992, Clear Communications sued the monopoly provider for public telephone services, New Zealand Telecom.[87] The former challenged the latter's use of the ECPR in pricing access to the network in order to provide a competing long-distance call service. Specifically, Clear Communications argued that one of the rule's key advantages, that it covers the incumbent's opportunity costs, should not apply in this particular market.

At the time, the telecommunications market in New Zealand was expanding; if new entrants contributed to this increase in demand in some way (eg. through advertising campaigns) then even if an increase in competition caused the monopolist to lose market share, they could well increase profit overall. The same could be true if the monopolist were induced to lower prices due to competitive pressure and increased revenue as a result (through the growth in demand compensating for the discount). In short, the argument put forward by the entrant was that it is hypothetical to say that an incumbent loses profit by granting an entrant access to its input.

This case identifies a similar problem to that experienced in the water industry, that the marginal cost of providing service is low once the infrastructure is provided, so subtracting the marginal cost of the potentially competitive activity from the retail price leaves little "headroom" for new entry. However, this does not apply to the JE case, as the marginal cost of the potentially competitive activity is relatively easy to identify from the cost of energy procurement from France.

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[87] Schechter, P. "Telecommunication in New Zealand: Competition, Contestability and Interconnection"

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