Targeted Performance Incentives:

Recommendations to the Hawaiian Electric Companies

PREPARED FOR

The Hawaiian Electric Companies

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THE Brattle GROUP

This report was prepared for the Hawaiian Electric Companies. All results and any errors are the responsibility of the authors and do not represent the opinion of The Brattle Group, Inc. or its clients.

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Executive Summary

In its *Inclinations* document,[1] the Hawai'i Public Utilities Commission (Commission) emphasized the importance of reliable and high quality electric service for Hawai'i, and in the current proceeding (Docket No. 2013-0141) has taken steps to ensure that it, consumers and interest groups have access to specific measures concerning the ongoing performance of the Hawaiian Electric Companies.[2] The Commission is currently in the process of determining if it should implement targeted performance incentives (TPIs), which are essentially the attachment of financial penalties and rewards to select performance measures. The Companies have requested that The Brattle Group assist them in analyzing the application of performance incentives to electric utilities and to recommend incentives that may be appropriate to implement in Hawai'i.

Our primary focus was on determining potential performance incentives that would ensure that key elements of electric service, mainly reliability and customer service, were not impaired because of cost pressures, or cost reduction incentives, facing the Companies. Accordingly, we applied our understanding of incentive based regulation (IBR) and performance incentive frameworks to the circumstances in Hawai'i and identified specific measures that should be included in a TPI plan. We also developed recommendations concerning: the targets for TPI performance; the parameters for a deadband (around the target levels); the maximum levels of penalties/rewards; the degree of incentive symmetry; and, incentive formulas (concerning the slope and shape of the curves governing the incurrence of penalties/rewards).

The principles and guidelines for designing and implementing TPIs follow from those associated with IBR. We have observed that most parties to regulatory proceedings concerning performance incentives tend to agree with these general guidelines, however opinions frequently diverge when it comes to the specific design and implementation of performance incentives, notably concerning the scope and number of performance measures targeted and the form of penalties and/or rewards. In our view, this is because aspects of the economics underlying utility

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1 Commission's Inclinations on the Future of Hawai'i's Electric Utilities, Aligning the Utility Business Model with Customer Interests and Public Policy Goals, Exhibit A to Decision and Order No. 32052, issued April 28, 2014, in Docket No. 2012-0036.

2 The Hawaiian Electric Companies include Hawaiian Electric Company, Inc., Maui Electric Company, Limited, and Hawai'i Electric Light Company, Inc.

service levels are not fully observable, and analysts are required to make assumptions about economically optimal levels of utility service.

We also added guidelines that are specific to the implementation of TPI plans. Notably, TPIs do not represent an “end state” in the regulation of service quality. That is, all of the performance measures that the Commission and other parties are interested in monitoring should not be converted into TPIs. Some areas of performance should be monitored without the attachment of financial incentives; ongoing performance monitoring and TPIs should be considered to be complements in the regulation of utility service levels.

Overview of Targeted Incentive Plans

As part of this and other assignments, we have reviewed TPIs that have been applied to utilities in various jurisdictions across the U.S as well as in other parts of the world. Our review indicates that there are consistencies and similarities across plans, as well as notable differences. It also confirms a conclusion provided in the May 2014 Brattle report: it is unrealistic to expect that review of IBR plans—and in this case, plans covering TPIs—will yield an identifiable “optimal” approach, because the design of a “good” plan will depend on the specific circumstances facing an individual utility, as well as upon the views and preferences of regulators and customers. All of the plans reviewed share a common general structure, composed of a target, a deadband and provisions for penalties/rewards. However, there are differences across plans in terms of the number of measures to which an incentive mechanism is attached, how targets are set, and the extent that incentives are symmetrical (*i.e.*, the inclusion of both rewards and penalties).

A summary of our findings concerning the key components of a TPI plan follow.

- **Performance Measures**. There are numerous performance measures that have been applied to TPIs. Generally, for the scope that we examined, TPIs can be grouped into two primary categories, system reliability and customer service which, in turn, are composed of multiple specifically defined TPIs. Each TPI tends to address a specific area of potential concern, but there is a balancing that needs to be considered to ensure that the number of TPIs is not overly burdensome. Also, finding the right mix of TPIs is an ongoing exercise; the specific measures included in a performance incentive plan may change over time to reflect technological shifts, data availability and/or priorities. In our view, it is sensible for regulators to adopt fewer, rather than many, TPIs when initiating a performance incentive plan.

- **Performance Targets** are the quantified level of service (for a particular performance measure) that the utility is expected to provide on an ongoing basis. Ideally, this level should be set to balance relevant benefits and costs, and should be set to a level which the utility can realistically achieve. The historic performance of the subject utility is usually used to determine target levels in TPIs. In some cases, levels of service quality may have shifted due to advances in technologies, enhanced investments and/or specific improvements in business processes; in such cases, targets should be adjusted accordingly.
- **Deadbands** allow for the difficulty associated with precisely estimating performance targets. TPI plans typically include a neutral zone or a deadband, i.e., a range around the target level of performance in which the utility's financial position does not vary with the realized level of service quality. The extent of this range should reflect the variability of factors associated with achieving target levels of service quality. An overly restrictive (*i.e.*, tight) deadband can mean that a utility may be penalized (or rewarded) for slight variations in factors that are beyond its control or capability to foresee. Deadbands can be set based on statistics (i.e., standard deviations) or using percentages.
- **Incentive Structure** involves: the symmetry of incentives (i.e., the degree to which incentives allow for both penalties and rewards); the cap of the incentive (or maximum revenue exposure) and allocation of penalties/rewards to individual TPIs; and the shape and slope of the incentive formula, which reflects how quickly penalties are assessed and/or rewards are earned.

A key point component of a TPI's incentive structure concerns the incentive formula. Graphically, these formulas are depicted as curves in which penalties/rewards vary as performance falls further from the ends of the deadband. The slope and shape of incentive curves concerns how quickly the incentive curves reach the point of maximum penalty or reward. Steeper curves result in the maximum level of penalty/reward being reached when TPI performance falls only modestly out of the deadband. In contrast, a flatter slope allows the utility considerably more "leeway" before it reaches the maximum penalty (or reward) level.

The symmetry component is also worthy of additional comment because it is sometimes an area of disagreement. The Brattle May 2014 report stressed the importance of symmetry in IBR plans because asymmetry would mean that financially unfavorable outcomes would be more likely than favorable outcomes, making it statistically more difficult for the utility to earn its authorized rate of return. The level of symmetry in an incentive mechanism is also an important dimension in the design of TPI plans. When implemented together, both TPIs and IBRs are complements in an overall incentive regulatory framework and, in our view, will each require symmetrical incentive mechanisms. In cases where TPIs are implemented on a stand-alone basis, asymmetrical incentives do not change the rate of return that the utility can expect to earn. However, this does not mean that TPIs that are not associated with IBR plans should not have symmetric incentives. A reward component should be included when regulators want to motivate utilities to improve upon service levels (i.e., bring marginal benefits in line with marginal costs)

Applying the TPI Framework in Hawai'i

Hawai'i faces its own set of unique circumstances concerning the current and desired end state of it electric system, which become important factors in designing a performance incentive plan. In addition, a system of performance incentives will be a new addition for the Commission and the Companies. Ideally, this system should not require them to dedicate unreasonable levels of resources to implementing a TPI plan, or to its ongoing maintenance.

We address our recommendations for the design and implementation of a TPI plan applicable to the Companies following the structure used to describe the key plan components above:

- **Reliability TPI Measures**. Our primary focus concerned developing TPIs for reliability and customer service because it is possible that these areas could be compromised by cost reduction initiatives. Selecting TPIs to address concerns about electric system reliability was a relatively straight forward exercise. We recommend starting a reliability TPI plan by applying widely accepted measures of reliability; i.e., the System Average Interruption Duration Index (SAIDI) and the System Average Interruption Frequency Index (SAIFI). In addition, the reliability measures included in TPI plans tend to be oriented around performance in the distribution system, and incentives are designed accordingly. Thus, we recommend that the SAIDI and SAIFI TPIs be further specified so that they reflect normalized transmission and distribution (T&D) data for each of the three operating companies.

- **Customer Service TPI Measures**. Selecting customer service TPIs for the Companies presented a slightly more challenging case, because, to our knowledge, there are no overall indicators of customer service performance. We reviewed a range of specific measures concerning a variety of areas of customer service performance, such as measures involving customer complaints, orders and appointments, meter reading, billing accuracy, customer satisfaction and call center performance. We excluded meter reads and billing accuracy as candidates for customer service TPIs because data provided by the Companies indicated that they routinely performed at the 99%+ level in these areas. From the remaining group, we selected Transaction Satisfaction and Service Level because they are representative of customer experiences with the Companies. Transaction Satisfaction comes closest to providing an encompassing indicator of customer service scores because it reflects customer opinions concerning a range of more specific customer service measures. Service Level is a more specific measure, but reflects an important and highly visible point of interaction between customers and the utilities. The Commission can continue to require the Companies to report additional statistics and measures concerning reliability and customer service on a reporting basis (i.e., not a TPI), and can also expand the scope of reliability TPIs in the future.
- **Reliability TPI Targets**. Historic data (i.e., averages over a sufficiently robust time period) provides a sound basis for setting TPI performance targets for the Companies. However the Companies face several unique circumstances that should also be taken into account. Normalized outages attributable to T&D issues are available from the Companies for seven years (2007 through 2013). This is less than the ten years of data that we have seen used as a rule of thumb in calculating averages that are used as TPI targets. However, we conclude that it is worth using seven years of normalized T&D SAIDI and SAIFI data in the reliability TPIs than using ten years of other reliability data.
- **Transaction Satisfaction Target**. The Companies have experienced what appears to be a set-back with respect to their scores in recent years, which they attribute to the impact of a number of factors that are unrelated to customer transaction experiences. Specifically, the results of Transaction Satisfaction surveys should reflect customer opinions of a specific experience (*i.e.*, a specific transaction), but, in practice, many other factors can influence the score that a customer gives the Companies. The Companies have also represented that they do not expect this shift to rebound to prior levels immediately. If this is true, the Companies will

likely not be able to reach a target set using the average of ten years of historic data. Thus, to make the target achievable, but not guaranteeing that the Companies will reach the target level, we recommend setting the target for Transaction Satisfaction equal to the average of the most recent five years of data.

- **Service Level Target**. On a comparative basis, the Companies' performance with respect to Service Level has been relatively low. However, the Companies are actively addressing this problem by upgrading their information systems and customer interfaces. The Companies represent that they have set an internal goal of answering 70% of all calls received within 30 seconds. This is notably higher than the average of the Companies' last two years of Service Level performance, so a TPI target set at this level represents a stretch target. We recommend setting the target for the Service Level TPI to this 70% level, instead of to historic averages. Tracking of this TPI should also exclude the impacts of major events, as is the case for the reliability TPIs.
- **Deadbands**. We recommend that the deadbands for SAIDI and SAIFI be based on standard deviations using the same data set used to calculate targets; that is, the most recent seven years of normalized T&D data. We recommend that the deadbands for Transaction Satisfaction measure be calculated as the standard deviation of the last ten years of available data, even though we recommended setting the target for this performance measure based on the most recent five years of data. This is in accommodation to the statistical nature of standard deviations. Finally, we conclude that the deadband for Service Level should not be based on standard deviations because its target was not based on historic data. Instead, we recommend that the deadband for Service Level be set equal to two to three percentage points, which is a narrow enough range for the Companies to be incentivized to meet their goal while also allowing for random variation beyond the control of the Companies.
- **Incentive Structure – Maximum Revenue Exposure**. Maximum revenue exposure can be expressed as a percentage of revenues or in terms of basis points. These incentives can be compared across plans because the measure for penalties and rewards under one method (*e.g.*, basis points) can usually be converted into other terms (*e.g.*, percentage of revenue requirements). We recommend that a maximum revenue exposure for the Companies under a TPI plan could be set at roughly 1.5% or 2.0% of estimated T&D cost of service revenue requirements, and that these estimates be used to set specific dollar incentive amounts. We also recommend that the Commission consider setting the maximum penalty/reward

for reliability at 70% of the total revenue exposure, evenly split with 35% assigned to SAIDI and 35% to SAIFI. The remaining 30% of the maximum penalty/reward should be allocated to the TPIs associated with customer service.

- **Incentive Structure – Symmetry**. We recommend that a symmetric incentive structure be applied to the TPIs applied to the Companies. We understand that the TPIs are being considered as an adjunct to a broader reaching IBR plan. In such a case, symmetry is necessary (in both the IBR and TPI plans) in order to provide the utility with a reasonable opportunity to earn a fair rate of return. On the other hand, we also noted that symmetry is not a requirement for a TPI plan implemented on a stand-alone basis (i.e., that is associated with traditional cost of service). Even in this case, it may be appropriate to apply a symmetric incentive structure to a TPI when customers are dissatisfied with service levels and/or when regulators want to motivate utilities to improve upon them. This appears to be the case with the Companies' Transaction Satisfaction scores and Service Level performance
- **Incentive Structure – Formula**. We reviewed the formulas that governed incentives applied to TPIs in other jurisdictions and also specified formulas that could be applied to the Companies. We considered two general categories of incentives formulas; linear and quadratic, with the latter applied in modified form in Massachusetts and, we understand, also recommended for use in Hawai'i by the Consumer Advocate. The maximum revenue exposure is reached more gradually in the formula reflected in a parabolic shaped curve (reflecting a quadratic function) than is the case under linear functions. However, the quadratic formula used in Massachusetts is modified by a coefficient. This results in significant levels of penalties/rewards being incurred as soon as performance leaves the deadband via a step function. Thus, the quadratic incentive formula used in Massachusetts is more punitive than the incentive curve under a standard quadratic formula or a linear incentive function. We recommend using a linear incentive function to TPIs in Hawai'i, that reaches the maximum level of penalty/reward at two standard deviations from the target (one standard deviation from the end of the deadband). This curve reaches maximum revenue exposure at the same point as in the case of the modified quadratic used in Massachusetts, but in a proportional fashion.

The approach that we recommend for a TPI plan applicable to the Companies in Hawai'i can be implemented using data that the Companies currently track. It also should be viewed as a complement to ongoing monitoring and reporting of a variety of performance measures. Finally, regulation of utility performance is an ongoing exercise; the Commission can refine and/or expand the scope of TPIs in the future, as experience is gained.

I. Introduction

The Hawaiian Electric Companies[3] requested that The Brattle Group recommend performance incentives that may be appropriate for the Hawai'i Public Utilities Commission (Commission) to consider in the Schedule B portion of Docket No. 2013-0141.[4] The Commission solicited comments in Order No. 31289 on matters pertaining to: incentives for the Hawaiian Electric Companies to control costs; whether additional performance incentives relating to, for example, customer service should be adopted; and whether incentives for the Companies to change their strategic and action plans should be considered. The Commission also clarified the difference between performance metrics and performance incentives in Decision and Order No. 31908. Per the Commission, performance metrics are measures that are informative and "regularly reported by the utilities without further direct linkage to financial or other incentives."[5] On the other hand, performance incentives likely involve financial rewards and/or penalties.

The Commission had outlined its vision for the electricity industry in Hawai'i in its *Inclinations* document.[6] Specifically, it highlighted the goals and general path of reducing the State's dependence on fossil fuel based electric generation and meeting more of the State's electricity needs through utility scale renewables based generation and distributed energy resources (DER).[7] The Commission found that Hawai'i is in a unique position compared to states on the mainland, in that switching from central station fossil-fuel based power to a portfolio with a greater

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3 The Hawaiian Electric Companies include Hawaiian Electric Company, Inc., Maui Electric Company, Limited, and Hawai'i Electric Light Company, Inc.

4 The Commission bifurcated Docket No. 2013-0141 (*In the Matter of Instituting an Investigation to Reexamine the Existing Decoupling Mechanisms for Hawaiian Electric Company, Inc., Hawai'i Electric Light Company, Inc., and Maui Electric Company, Limited*) in Schedules A and B. As part of Schedule A, in Order No. 31908, the Commission directed the Companies to track and report on performance metrics. Performance incentives are being considered as part of Schedule B.

5 Decision and Order No. 31908, Section IV, Issue No. 4 – Should Certain Metrics Be Adopted In The Schedule A Order?

6 Commission's Inclinations on the Future of Hawai'i's Electric Utilities, Aligning the Utility Business Model with Customer Interests and Public Policy Goals, Exhibit A to Decision and Order No. 32052, issued April 28, 2014, in Docket No. 2012-0036.

7 Distributed energy resources (DER) include distributed generation (DG), such as rooftop photovoltaics, demand response (DR), and energy efficiency (EE). The aggregation of DER into controllable and dispatchable resources permits them to be treated as approximate "virtual power plants."

proportion of renewable generation and DER could lower the cost of power and, ultimately, reduce customers' electricity bills, which are among the highest in the U.S. At the same time, the Commission recognized the importance of upgrading and/or maintaining the Companies' transmission and distribution (T&D) system to ensure that electricity is delivered in a highly reliable fashion and that renewable generation and DER resources can be readily integrated into the system.

Electric utilities are typically presented with the dual motivations of providing reliable service and keeping costs (and rates) down. Such conflicting objectives are compounded for the utilities in Hawai'i because the current very high electric rates place management under considerable pressure to reduce costs at the same time that the path to lower power prices requires investment in T&D infrastructure. Thus, it is not surprising that the Commission raised the issues of possibly incorporating into the regulatory regime in Hawai'i: 1) a broad-based incentive mechanism (coordinated with the decoupling mechanisms already in place in Hawai'i, albeit subject to modification) aimed primarily at containing the Companies' costs; and/or 2) specific performance incentive mechanisms targeted mainly at motivating the Companies to maintain reliability and customer service at acceptable levels.

An earlier report by The Brattle Group (dated May 20, 2014) provided a conceptual example concerning the application of a broad-based incentive mechanism, referred to as incentive-based ratemaking, or IBR, to the regulation of the Hawaiian Electric Companies.[8] In that report, Brattle concluded that broad-based IBR may be inappropriate to apply to the Companies at this time because IBR, as a mechanism, is mainly oriented towards incentivizing cost reduction. As discussed above, while the Companies are clearly motivated to contain and even reduce costs, applying such a financial incentive would be at odds with the T&D investment requirements needed to integrate renewable generation and DER, which is critical to accomplishing the vision articulated by the Commission in its *Inclinations* document. Instead, Brattle recommended

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8 Hawaiian Electric Companies Initial Statement of Position With Respect To Schedule B Specific Issues, Exhibit D, *Incentive-based Ratemaking: Recommendations to the Hawaiian Electric Companies*, Toby Brown, Michael J. Vilbert and Joseph B. Wharton (referred to as the "Brattle May 2014 report"). As noted in the Brattle report, incentive based ratemaking is sometimes also referred to as: performance-based ratemaking (PBR); formula-based ratemaking (FBR): "RPI–X"; and alternative regulation. All of these terms broadly refer to the same concept of extending the period between rate cases and allowing the authorized revenue requirement to change between rate cases according to a pre-determined formula.

working with the current decoupling mechanisms to incorporate the appropriate incentives for containing costs.

The May 2014 Brattle report also discussed the possibility of implementing targeted performance incentives into the overall regulation of the Companies. Most regulatory commissions routinely monitor various areas of electric utility reliability and customer service. In some case, regulators also attach financial incentives to achievement of specified performance targets for a subset of the monitored measures. Attaching such financial incentives to performance targets converts monitoring into a system of performance incentives which, for purposes of this proceeding, we refer to as targeted performance incentives (TPIs).[9]

Further analysis and recommendations concerning these TPIs are the focus of this report, specifically with respect to those associated with electric system reliability and customer service. In the sections that follow, we provide an overview of the principles and economics that underlie the application of TPIs; the scope of measures frequently used to gauge performance in reliability and customer service; an overview of the structure and components of TPI plans; and, our conclusions and recommendations concerning the possible application of TPIs in Hawai‘i.

II. Principles and Economics

In general, the principles and guidelines for designing and implementing targeted performance incentives are the same as those that guide the design and implementation of broad-based incentive regulation. These guiding principles, together with attributes of well-designed IBR plans, were summarized in the May 2014 Brattle report. We restate these, specified for the application of TPIs, as follows:

- The definition of the specific TPI measure, as well as the associated formulas for its calculation and use in a system of financial incentives, should be clear, transparent and easily understood.
- TPI targets and incentives should provide the utility with appropriate motivation. That is, the plan should be designed so that the company, through diligent

[9] The regulatory mechanism involving TPIs may also be referred to as service quality regulation or service quality plans.

investments and operational decisions, can reasonably expect to influence its performance.[10]

- Financial incentives should be designed to reflect acceptable levels of risk and reward. Specifically, inappropriate penalty or reward thresholds that ensure the utility will either always exceed or never achieve specified targets can discourage the company and ultimately harm customers.
- The structural elements of individual TPIs are all interrelated and need to be determined in an integrated manner. The overall structure of a TPI plan may be very similar to that of IBR (*i.e.*, performance targets, deadbands and penalty/reward provision).

We add three additional guiding principles that are more specific to the design and implementation of TPIs than they are to broad-based incentive plans:

- TPIs should concern quantifiable results that can be objectively measured.
- Specification of TPIs should take into account the type of data that utilities have historically collected and the costs and issues associated with tracking new forms of data.
- TPIs do not represent an "end state" in the regulation of service quality. That is, all of the performance measures that the Commission and other parties are interested in monitoring should not be converted into TPIs. Some areas of performance should be monitored without the attachment of financial incentives; ongoing performance monitoring and TPIs should be considered to be complements in the regulation of utility service levels.

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10 Electric utilities are large, complex and inter-dependent systems; numerous assets are added, replaced, maintained and upgraded on an ongoing basis. Therefore, performance levels for many areas of operations (e.g., system reliability) cannot be finely calibrated in the short term. However, the link between investment, operating practices and utility performance is well known by utility managers, and the ability for managers to influence utility performance by adjusting investment and operating practices is also well known, although such adjustments may not immediately have an impact on performance levels. Some areas of utility performance (e.g., call answering times) may be adjusted more quickly than other (e.g., system reliability) but, even here, improvements in performance levels may involve hardware and software upgrades or contracting for additional services (e.g., additional telephone trunk lines) that require lead times.

We have observed that most parties to regulatory proceedings concerning performance incentives tend to agree with the general guidelines summarized above.[11] However, opinions may diverge when it comes to the specific design and implementation of performance incentives, notably concerning the scope and number of performance measures targeted and the form of penalties and/or rewards. In our view, this is because aspects of the economics underlying utility service levels are not fully observable, and analysts are required to make assumptions about economically optimal levels of utility service.

Basic microeconomics indicates that optimal performance targets should be set at the level where the marginal benefit that consumers derive from increased performance is equal to the marginal cost of providing such a service level.[12] For utilities, this means that systems are built to provide the level of service that is appropriately valued by customers. In practice, however, utilities (as well as other interested parties) cannot observe and thus do not really know this value. In some cases, utilities have conducted studies to estimate the value that customers currently place on service levels;[13] however, this is a time consuming exercise and, because it involves the surveying of individual customer preferences, may be subject to estimation error. Understanding marginal benefits is complicated further when trying to anticipate future customer needs. For example, demand for electric service at very stable voltage levels is much higher today than it was a decade ago, prior to widespread adoption of digital devices by many customers.

In practice, utilities have developed their current target levels for services based on history and experience, modifying investment levels and operational practices to adjust for feedback from

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11 We are not aware of the positions of all of the parties involved in the subject proceeding, so do not extend our generalization to this proceeding.

12 Accordingly, regulators would want to encourage utilities to provide service at this balanced level and not provide incentives which may result in over- or under- building of utility systems. Over-building would result in customers receiving a higher level of service than they value and are willing to pay for; under-building would result in customers being dissatisfied with the service levels that they are receiving.

13 Studies of customer perception of the appropriate level of service reliability involve estimating customer "willingness to pay" (WTP) and the "value of lost load" (VOLL). A study of VOLL of note is: Sullivan, M., Mercurio, M., and Schellenberg, J. (2009) Estimated Value of Service Reliability for Electric Utility Customers in the United States, Lawrence Berkeley National Laboratory. The Berkeley study used research and results from 28 customer value of service reliability studies conducted by 10 major US electric utilities over the 16 year period from 1989 to 2005.

customers and regulators and to reflect industry developments.[14] The appropriateness of service levels has also been implicitly acknowledged in rate case proceedings, when regulators authorize capital and operating spending put in place by the utility to maintain or improve the quality of its services. However, differing views, especially regarding future levels of marginal benefits to customers, can have a significant impact on positions taken concerning the structure of performance incentives, particularly with regard to the symmetry of incentives.

III. Measures of Reliability and Customer Service

Regulatory commissions have paid attention to electric utility reliability and the quality of their customer service since the inception of utility regulation. Typically, regulators have reviewed utility performances with respect to the reliability of their electric service, specifically in terms of the extent and degree of power outages (*i.e.*, outage duration and frequency). Regulators have also reviewed the experiences that customers have had when dealing with the utility through measures such as call center responsiveness (when customers call with inquiries and/or concerns) and the accuracy of meter reading and billing.

A. Electric Reliability

Electric system reliability refers to the degree to which the utility provides continuous service at specified voltage levels. Service interruptions, or outages, are measured in terms of duration and frequency, using specific measures known as the System Average Interruption Duration Index (SAIDI) and the System Average Interruption Frequency Index (SAIFI),[15] described below, which can be reported for the company as a whole or by geographic or other sub-divisions.

- SAIDI is a measure of the average duration of outage, defined as the sum of all customer interruption durations (in minutes) divided by the total customers served.
- SAIFI is a measure of the average frequency of outages, defined as the total number of customer interruptions divided by the total number of customers served.

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14 Some may refer to this practice as "trial and error" over the course of many years.

15 An additional measure of reliability is CAIDI, which reflects the average outage for each customer actually affected by outages. Since CAIDI is derived from SAIDI and SAIFI, only two of the three measures are required to be reported.

Interruptions in customer service can result from a variety of causes, many of which are beyond the control of the utility delivering electric service. For example, inadequate generating capacity and/or congestion in the transmission of the electric system do not reflect failures within the electric delivery system, but are nonetheless included in reliability statistics. Historically, however, most outages have been attributed to distribution system related causes and, thus, SAIDI and SAIFI have come to be viewed as indicators of electric delivery system performance. With this understanding, utilities and regulators have sought to further specify reliability metrics that reflect circumstances over which the utility has some degree of control.

Major weather events are not considered to be in the control of an electric utility. Thus, reliability indicators are frequently tracked both including and excluding such events. "SAIDI-x" refers to the duration statistic excluding interruptions that are caused by major weather events. SAIDI-x (as well as SAIFI-x) provide indicators of utility performance under normal (or close to normal) conditions. Routine utility investment decisions and operations and maintenance decisions and practices tend to be guided by reaching performance levels associated with these statistics.[16]

Utilities and state regulators do not have completely consistent definitions of the interruptions that should be excluded from "normal" SAIDI and SAIFI statistics but generally attempt to distinguish controllable outages from uncontrollable outages. This inconsistency makes comparisons (or benchmarking) across utilities difficult. The IEEE has developed a statistical technique to standardize the way utilities normalize reliability statistics (*i.e.*, standardizing what constitutes a major event through statistical technique) but it is not uniformly used by utilities and/or regulators. This approach has been referred to as the IEEE's "beta method" or IEEE standard 1366.[17]

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16 Utilities also make investments and develop plans for "non-normal" circumstances (e.g., outages resulting from the impacts of severe weather events) and track their performance there with additional measures e.g., storm response). Many utilities are also in the process of determining the types and costs of investments and operating practices that should be put in place to make their systems "harder" and more "resilient" to severe weather events. See: Edison Electric Institute, Before and After the Storm -Update, A compilation of recent studies, programs, and policies related to storm hardening and resiliency, March 2014; and, Utility Investments in Resiliency: Balancing Benefits with Cost in an Uncertain Environment, William P. Zarakas, Sanem Sergici, Heidi Bishop, Jake Zahniser-Word, and Peter S. Fox-Penner, The Electricity Journal, Volume 27, Issue 5, June 2014.

17 IEEE Standard 1366-2012, *IEEE Guide for Electric Power Distribution Reliability Indices*.

Electric utilities also examine reliability information in more detailed and discrete ways. For example, they frequently review the above reliability statistics by region or subsystems of their total system. They also may examine the data and trends, for example, associated with poorly performing specific circuits in order to discern areas of particular weakness within their systems.

B. Customer Service

Utilities often track a range of information concerning how customers view their experiences with the utility, some reflecting long-standing practices while others have been developed at the direction of regulators. Representative measures of customer service performance include:

- Telephone Answering involves the performance of the utility in responding to a call from a customer within a specified period of time (*e.g.*, within 30 seconds). The Hawaiian Electric Companies refer to this metric as "Service Level."
- On-Cycle Meter Reads involves the percentage of bills sent out that are based on actual (as opposed to estimated) metered information.
- Service Appointments Kept involves percentage of appointments for service calls set in advance that the utility has met (on the day/time window agreed upon).
- Billing Accuracy reflects the percentage of bills for which the utility needed to rebill or reprint a bill.[18]
- Customer Satisfaction typically involves survey-based scoring by customers on their level of satisfaction with the utility, usually with respect to specific transactions. (The Companies refer to this metric as "Transaction Satisfaction.") Measures of customer satisfaction may be expanded from an indicator of satisfaction with regards to a specific transaction to a broader measure, reflecting satisfaction with the utility overall. We are unable to point to an example of

[18] At the Hawaiian Electric Companies, rebilling or reprinting of customer bills can occur when: 1) a customer requests termination of service at a date prior to the last billing; 2) it is necessary to correct an inaccurate meter reading; 3) adjusting an estimated bill after receipt of an actual meter reading; 4) revising a bill for a meter that has stopped working or is running slow or when Company records reflect an incorrect location of the start service request and meter installation; and, 5) a bill needs to be adjusted in response to a bankruptcy filing.

where this broader type of customer satisfaction measure is currently being used in a TPI plan.[19]

Measures of customer service are important because they provide information as to how customers perceive the utility, which can influence utility effectiveness in implementing new products and services, and the investment community's perceptions of the utility. Utilities must maintain accurate records and systems in order to report these data. However, to our knowledge, metrics concerning utility customer service are less universally accepted and tracked than metrics associated with electric system reliability. Also, to our knowledge, fewer industry studies are focused on customer service metrics than are upon indicators of reliability.[20]

C. Data Tracked By The Companies

The Hawaiian Electric Companies track a range of data and performance measures concerning electric system reliability and customer service.

1. Reliability

The Companies track outage durations and frequencies at three levels:

- Unadjusted, or non-normalized, System Reliability, reflecting SAIDI and SAIFI for each operating company system (and/or sub-system), irrespective of the cause of sustained (*i.e.*, non-momentary) outages.
- Normalized Reliability Statistics. The Companies' normalized reliability statistics are generally equivalent to the "–x" outage statistics compiled by utilities that exclude the effects of major weather events (*e.g.*, SAIDI-x and SAIFI-x). The Companies normalize their reliability statistics following the methodology that they provided to the Commission in 1990.[21]

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19 Customer satisfaction surveys are undertaken annually by J.D. Power and Associates, which surveys customers in a variety of industries and develops scores for the participating companies.

20 We can identify a variety of studies that benchmark electric system reliability across panels of utilities, including an annual survey of reliability conducted by the Edison Electric Institute (EEI). Surveys and studies of reliability are also conducted by private companies. We are also aware of subscription-based surveys of customer service, through which utilities pay to participate in a benchmarking study.

21 *Methodology for Determining Reliability Indices for [HECO, HELCO and MECO] Utilities*, December 1990. The normalization guidelines exclude "abnormal" situations such as hurricanes, tsunamis,

Continued on next page

- Normalized T&D Reliability, which excludes sustained outages caused by circumstances other than that associated with transmission and distribution functions and operations, notably outages caused by failures by generating units.

The Companies file annual reports regarding electric system reliability to the Commission, which includes a break-down of the causes of outages.

A summary of historic reliability statistics for Hawaiian Electric, Hawai'i Electric Light and Maui Electric are provided in **Attachment I**.[22] As shown, with some exceptions, reliability statistics are available from 1994 to 2013 for each system on both non-normalized and normalized bases. However, normalized outages attributable to T&D issues are currently available only from 2007 through 2013. For most utilities, outages emanating from problems with generating units affect as significant number of customers (e.g., more than 10%) and are therefore excluded from normalized statistics. The Companies represent that this is not the case in Hawai'i. Problems with company-owned and/or independent power producer-owned generating units can affect a narrow group of customers, making the normalized T&D outage statistics particularly important in understanding T&D performance.

2. Customer Service

Overall, customer service measures assess the Companies' performance with respect to its interactions with customers. The Companies track a range of customer service measures, including the accuracy of bills that are sent to customers, the percentage of meters that are read on cycle, and the level of responsiveness when customers contact the Companies (via call centers) with inquires.

The Companies track six measures concerning performance at their Customer Contact Center:

- "Service Level," which measures the percentage of incoming calls that are answered within 30 seconds of being placed in the representative queue;

Continued from previous page
earthquakes, floods, catastrophic equipment failures, and single outages that cascade into a loss of load greater than 10% of the system peak load.

22 Attachment I is composed of three panels: Panel A provides historic reliability statistics on a system-wide un-adjusted basis; Panel B provides normalized system-wide outage statistics; and, Panel C provides normalized system-wide outage statistics that are attributed to T&D only.

- Abandoned Percentage Rate, or the percentage of total calls in which a caller hangs up in the representative queue before being connected to a representative;
- Average Call Handle Time, or the average time that a representative spends on the phone with a customer (plus the work time after a call to complete the transaction in the system);
- Force Busy, or the number and percentage of calls that receive a busy signal due to insufficient telephone circuits and/or insufficient customer service resources;
- "Call Count Offered," or the calls that are placed into a queue that will be distributed to representatives for handling.[23]

Of these, Service Level is the single measure that is most representative of the performance of the Companies' Customer Contact Center.

The Companies have upgraded their customer information systems (notably, with a new SAP system) in 2012. This improvement has changed the quality of reported customer service data (i.e., data under the new system is more detailed and accurate than under the previous system). The Companies represent that consistent customer service data upon which to base averages and perform meaningful trend analysis is, thus, only available for the last few years. Also, they point out that, in some cases, lower levels of performance reported under the new system is the result of improved record keeping, rather than due to deteriorated performance.

The Companies' performance with respect to meters read and billing accuracy has been relatively high (i.e., 99%), based on data covering 2011 through the first quarter of 2014. However, Service Level performance has been at a lower level, and was particularly low during the third quarter of 2012, when the Companies were switching over to their new customer information system. At that time, Service Level performance was between 10% and 26% across the three Companies. Since then, the Companies have completed the implementation of their new systems and are adjusting staffing levels to support their Service Level performance objective of 70% of incoming calls being answered within 30 seconds. Service Levels have improved significantly in 2013.

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23 This measure does not include calls that are handed by interactive voice response (IVR), and also excludes the calls that received a forced busy signal.

The Companies also survey customers that have had recent interactions (i.e., transactions) with the Companies concerning: requests to change their services; trouble reports (e.g. power outages); and/or inquiries about their bills. The Companies' Transaction Satisfaction survey asks customers to rate their interaction with Companies' using a point scale from 0 to 100. The Transaction Satisfaction survey is conducted by a third party and is reported quarterly.[24] Over the last ten years (2004-2013), the Companies overall Transaction Satisfaction scores have declined from at or near 90% in the 2004-2010 timeframe to less than 88% for the period 2011-2013. The Companies represent that the drop in these scores are the result of several factors which influenced scoring by customers, some of which are completely unrelated to the specific transactions that were being assessed (e.g., rate increases).

IV. Overview of Targeted Incentive Plans

We have reviewed TPIs that have been applied to utilities in various jurisdictions across the U.S as well as in other parts of the world.[25] Our review of performance incentive plans indicates that there are consistencies and similarities across plans and jurisdictions, as well as notable differences. It also confirms a conclusion provided in the May 2014 Brattle report: it is unrealistic to expect that review of IBR plans—and in this case, plan covering TPIs—will yield an identifiable "optimal" approach, because the design of a "good" plan will depend on the specific circumstances facing an individual utility, as well as upon the views preferences of regulators and customers.

Typically, TPIs are a subset of the performance measures reported to regulators. Regulators usually require utilities to report on a variety of performance measures, sometimes at a detailed

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[24] The Transaction Satisfaction survey is conducted by Market Trends Pacific. Separate surveys are conducted for Hawaiian Electric Company, Maui Electric Company and the Hawai'i Electric Light Company. The survey for Quarter 1 2014 included 298 customers who called to start, stop, or change the location of service, 63 customers who called to ask about their bill, and 75 who called to report trouble with their service, for a total of 436 interviews. Transaction Satisfaction scores are presented in four areas: customers who requested new or changed service; customers who requesting billing field investigations; customers having trouble with their service; and, an overall score.

[25] For example, see *Approaches to Setting Electric Distribution Reliability Standards and Outcomes*, Serena Hesmondhalgh, William P. Zarakas, and Toby Brown, prepared for the Australian Energy Markets Commission, January 2012. For this engagement, we also reviewed TPI plans in New York, California and Massachusetts.

level, but only a sub-set of these usually have the financial incentives attached that make them TPIs. Also, TPIs may be an adjunct to IBR plans, although this is not always the case. For example, in New York, Con Edison and National Grid each have earnings sharing plans in addition to their TPIs, while National Grid in Massachusetts does not have any form of IBR plan applied to it.[26] The California Public Utilities Commission (CPUC, or California PUC) applied both IBRs and TPI plans to SCE and SDG&E. It later opted not to renew the IBR plans, but chose to continue to apply TPIs.

All of the plans reviewed share a common general structure, composed of: a target or benchmark; a deadband; and, a provision for penalties, as well as rewards in some cases, when performance falls outside of the deadband. There are also differences across plans, frequently in terms of the number of measures to which an incentive mechanism is attached, how targets are set, and the extent that incentives are symmetrical (*i.e.*, the inclusion of both rewards and penalties).

A. Performance Measures

Regulators frequently require that electric utilities report performance measures at defined intervals, typically on an annual basis. Such reporting may be strictly informational. In most cases, regulators expect utilities to achieve certain levels of performance and may begin a proceeding to investigate the causes for consistently poor performance; they may also develop recommendations for improving the situation. Performance incentives may be developed for a subset of the overall performance measures tracked by the utility. For these, the utility is expected to achieve a specifically defined level of performance and is penalized and/or rewarded when performance strays too far from the targeted levels.

Generally, TPIs can be grouped into two primary categories, system reliability and customer service, which are, in turn, composed of multiple specifically defined TPIs.[27] (In addition, some jurisdictions have also adopted measures that address employee safety.) The New York Public Service Commission (NYPSC) adopted a relatively high number of TPIs for Con Edison, covering

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26 To an extent, all regulation provides some level of incentive to the regulated companies.

27 That is, in the context of service quality incentive plans. It is possible to design performance incentives with regard to any number of goals. For example, we are aware that targets have been set (possibly with associated penalties and rewards) for increasing penetration of clean energy resources. However, these types of performance incentives are not related to IBR or to concerns that utility service levels could be compromised as utilities try to control costs.

detailed aspects of system reliability and customer service on a geographically disaggregate level. In contrast, the Massachusetts Department of Public Utilities has fewer measures included in its TPI plan for National Grid.

Each TPI tends to address a specific area of potential concern, but there is a balancing that needs to be considered to ensure that the number of TPIs is not overly burdensome. At the same time, areas of concern should not be sacrificed in the name of simplicity. A good example of this balancing is found in the California PUC's decision for SDG&E's 2008 General Rate Case. During the rate case process, a proposal was made to expand the field service order appointment TPI into multiple separate TPIs, each reflecting a specific aspect of the broader field services.[28] However, in response, the CPUC found that the TPI did not need to be further segmented and concluded that using a single TPI served to "simplify the mechanism."[29]

Also, finding the right mix of TPIs is an ongoing exercise; the specific measures included in a performance incentive plan may change over time to reflect technological shifts, data availability and/or priorities. For example, in 2008, the California PUC deleted one reliability TPI and added two other to address more specific concerns, and the New York PSC recently dropped the meter reading performance incentive from the National Grid TPI plan.

In our view, it is sensible for regulators to adopt fewer, rather than many, TPIs when initiating a performance incentive plan. It may be tempting to adopt a large scale system of TPIs in order to address the concerns of the many parties to a regulatory proceeding. However, it should be remembered that reporting as well as reviewing TPI results involves time and resources on the parts of utilities and regulators, respectively, and that TPIs can be refined and/or expanded in the future, as experience is gained.

B. PERFORMANCE TARGETS

A performance target is the quantified level of service (for a particular performance measure) that the utility is expected to provide on an ongoing basis. As we discussed, ideally, this level should be set to balance relevant benefits and costs. Extremely high levels of service quality may be feasible for a utility to achieve, but it may represent a level that is far above recent

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[28] This proposal was made by the Division of Ratepayer Advocate (DRA).

[29] CPUC Decision 08-07-046 July 31, 2008, p. 54.

performance and may come at a very high cost. Its cost may also exceed the value that customers place upon such a high level of service quality. In addition, as referenced in our discussion concerning the principles that guide the design of TPIs, the performance target should be set at a level which the utility can realistically achieve. Setting a performance target at a level that is unreasonably demanding (or, conversely, is too easily achieved) removes the motivation (or incentive) that is a key principle underlying TPI plans.

Historic utility performance data, either for an individual utility or for the industry overall, is frequently used as a proxy for the ideal levels of service quality are typically sought.[30] National benchmarking data (*i.e.*, indicators of average or best-in-class performance) provides a large data set of utility performances which can be used to infer the balance between marginal costs and marginal benefits on average. However, they may not be fully relevant in specifying a goal for an individual utility, as there are a wide range of differences in characteristics (e.g., size or density) across the utilities making up the benchmark panel.[31] In addition, some areas of utility operations (e.g., areas of customer service) are less amenable to quantification in benchmarking studies.

The historic performance of a single utility is more commonly employed to determine target levels in TPIs. This approach eliminates the need to control for relevant differences among utilities (in a benchmarking panel), but it also assumes that, over time, the utility appropriately estimated the service level that balances marginal benefits (to customers) and its own marginal costs. In practice, historical data for utilities are perhaps the only data set that regulatory commissions can reasonably expect to be available at a detailed and consistent level. Averaging historic performance (frequently over ten or so years) should provide a reasonable basis for establishing TPI performance targets. Less common is the use of a rolling average to set performance targets; that approach could distort incentives for improvement. Constantly raising the bar (assuming utility performance is improving over time) makes it increasingly more difficult to meet performance targets going forward.

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[30] This assumes that past interactions of utility management, customers, and regulators have managed to produce levels of service quality that reasonably approximate ideal levels.

[31] Electric utilities frequently undertake benchmarking studies which compare company performance over a range of metrics with the corresponding performance of a "peer panel" of utilities. These studies are typically based on publicly available data (notably FERC Form 1 data and reports filed by utilities with state regulatory commissions) and on proprietary data sources.

In some cases, realized levels of service quality may have increased due to advances in technologies, enhanced investments and/or specific improvements in business processes. In these cases, the Commission might consider using more recent performance data in setting a benchmark, provided the evidence is clear and the causes of the observed trend in realized service quality are well understood.

Finally, we are aware of one instance in which performance targets are set through a comprehensive review process, through which historic performance, other considerations and input and comments from the utilities and other parties are all taken into account in setting perform targets for TPIs. This is the case for Con Edison in New York and appears to involve considerable effort in compiling and analyzing all of the input to arrive at an acceptable target level.

C. Deadbands or Neutral Zones

In practice, it is difficult to precisely estimate the ideal level of service quality because there is considerable uncertainty about the relevant benefits and costs of service quality. Furthermore, the relationship between utility actions to enhance service quality and realized service quality typically cannot be described with perfect accuracy because of the influence of variety of uncontrollable and unpredictable factors. Consequently, TPI plans typically include a deadband, or a neutral zone; i.e., a range around the target level of performance in which the utility's financial position does not vary with the realized level of service quality. The extent of this range should reflect the variability of factors associated with achieving target levels of service quality. An overly restrictive (*i.e.*, tight) deadband can mean that a utility may be penalized (or rewarded) for slight variations in factors that are beyond its control or capability to foresee.

Deadbands can be set based on percentages, e.g., the deadband surrounding SDG&E's customer service targets is +/- 1%. However, they are more frequently set on a statistical basis involving standard deviations, a widely used and well accepted statistical measure which indicates the range and variability of a series of observations. A deadband equal to +/- one standard deviation should account for roughly 68% of random events that affect utility performance.[32] Performance

[32] The use of the standard deviation as a deadband mechanism presumes a "normal" distribution of performance outcomes. Graphically, normal distributions resemble a bell curve. Under a normal distribution, observed performance will ultimately fall within one standard deviation of the average

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that falls outside of +/- one standard deviation can then be attributed to non-random events; that is, actions that were under the utility's control.[33] Deadbands defined in terms of standard deviations are used in several TPI plans, e.g., by the Massachusetts DPU in the performance incentive plan applied to National Grid.

D. Incentive Structure

The incentive provision of a TPI refers to the structure through which the utility is penalized (or rewarded) for performing at service levels outside of the deadband. The components of a TPI incentive structure include:

- *Symmetry*, or the degree to which incentives allow for both penalties and rewards.
- *Incentive Cap and Allocation*, refers to 1) the maximum dollar amount of penalties and/or rewards (also referred to as the TPI's maximum "revenue exposure"); and 2) the levels of penalties (or rewards) assigned to individual TPIs.
- *Shape and Slope* of the incentive formula, which reflects how quickly penalties are assessed and/or rewards are earned. For example, a steep incentive curve means that the maximum penalty may be incurred faster (*i.e.*, with less leeway after utility performance falls out of the deadband) than would be the case under a flatter incentive curve.

1. Symmetry

The Brattle May 2014 report stressed the importance of symmetry in IBR plans because asymmetry (i.e., an incentive mechanism providing for penalties only, and not for rewards) would mean that financially unfavorable outcomes would be more likely than favorable outcomes, making it statistically more difficult for the utility to earn its authorized rate of return. Alternatively stated, with an asymmetrical IBR, the expected value of the utility's rate of return would be less than its authorized rate of return, thereby conflicting with the fair return standard.

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about two-thirds of the time. Furthermore, the service quality metric averages will converge to the normal distribution in the long run, even if they exhibit a non-normal distribution in the shorter term.

33 +/- one standard deviation is commonly used as zone to capture random events in TPI plans and in other statistical analyses because it is a reasonable indicator of randomness. It is also used because it is a round number, as opposed to, say, 0.80 standard deviations or 1.1 standard deviations.

Thus, symmetry is very important within an IBR framework in order to provide the utility with a reasonable opportunity to earn a fair rate of return.

The level of symmetry in an incentive mechanism is also an important dimension in the design of TPI plans. We distinguish between two conditions under which TPIs may be implemented. First, TPI plans may be implemented in conjunction with an IBR plan. As discussed earlier, we understand that this may be the case in Hawai'i, where TPIs may be put into place specifically to counter the incentives to reduce costs that are motivated by an IBR. In such a case, TPIs and IBRs are complements in an overall incentive regulatory framework and, in our view, the arguments cited in the Brattle May 2014 report should apply to both IBR and TPI plans.

The second case concerns the condition in which TPIs are implemented when an IBR is not applied to the utility; i.e., under traditional cost of service. In this case, we assume that the revenue requirements established in rate cases are aligned with investment needed to meet the target service levels under the TPIs. In such a case, asymmetrical incentives would not change the rate of return that the utility can expect to earn. Therefore symmetry is not a requirement for a TPI that is associated with traditional cost of service regulation. However, TPIs that are not associated with IBR plans may also meit symmetric incentive structures when regulators want to motivate utilities to improve upon service levels (i.e., bring marginal benefits more in line with marginal costs).

The application of incentive symmetry in TPIs has not been consistent across jurisdictions. The TPIs applied by the NYPSC to Con Edison and National Grid in New York include incentive provisions for penalties alone. The Massachusetts DPU has adopted a plan under which National Grid (in Massachusetts) cannot earn a reward but can use rewards credits to offset penalties. In contrast, the California PUC strongly supports symmetrical incentives, stating that they reject "unbalanced incentives or limiting the mechanisms only to penalties: without rewards for marked improvement there is a lesser likelihood that the company will strive to exceed the target and only minimize the risk of penalty."[34]

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[34] California PUC Decision 08-07-046, July 31, 2008, p. 56.

2. Incentive Cap and Allocation

To our knowledge, all TPI plans include a maximum revenue exposure in order to provide a bound on the financial impacts associated with its performance in reliability and/or customer service. Maximum levels of exposure have been set in terms of annual revenues or in terms of basis points of authorized rates of return (subtracted from or added to the authorized rate of return)[35] or as a percentage of revenue requirements. These incentives can be compared across plans because the measure for penalties and rewards under one method (*e.g.*, basis points) can usually be converted into other terms (*e.g.*, percentage of revenue requirements). We find it easier to compare maximum revenue exposures across TPI plans by examining percentages of revenues than other forms of penalty (such as basis points); however, it is reasonable to express incentives in either terms.

The maximum penalty for Massachusetts Electric was initially set by the Massachusetts DPU at 2.0% of the company's annual transmission and distribution (T&D) revenue requirements and subsequently raised to 2.5% of annual T&D revenues. We provide a rough estimate of maximum penalties/rewards in terms of percentage of T&D revenues for Con Edison and National Grid in New York and SDG&E and SCE in California in **Attachment II**.[36] These estimates are necessarily "rough" because few utilities report T&D revenues; we developed these estimates in order to facilitate comparisons. We estimated T&D revenue requirements for these utilities using data from FERC Form 1 reports. A more thorough analysis would need to be completed to more accurately estimate T&D revenue requirements for these utilities.[37]

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35 As part of the rate making process, regulators authorize utilities to earn a specified return on rate base. The rate of return is defined in percentage terms which can be translated into dollars. A basis point is a financial convention equal to 1/100th of one percent. Specifying a TPI incentive in terms of basis points can thus be translated into dollars.

36 Attachment II is composed of three panels: Panel A provides the TPIs and estimates of associated revenue exposure for each for Con Edison and National Grid in New York; Panel B provides similar information for SDG&E and SCE in California; and Panel C provides this information for National Grid in Massachusetts.

37 Revenue requirements were calculated by summing non-production expenses (O&M expenses and annual depreciation) and the carrying costs on non-production net plant in service. All data was from FERC Form-1s as filed by the utilities. Carrying costs were assumed to be 8%, recognizing that a more complete analysis of the weighted average cost of capital (WACC) for each utility is required to provide an accurate estimate.

Our estimate of the maximum revenue exposure associated with TPIs as a percent of T&D revenue requirements is highest for the utilities in New York (roughly from 2.0% to 3.0% for National Grid and from 3.5% to 5.0% for Con Edison). The maximum revenue exposure associated with TPIs as a percent of T&D revenue requirements appears lower for utilities in California (ranging from less than 1.0% to about 2.0%).

Also included in the attachment are our estimates of the allocation of the maximum incentive among the individual TPIs. The weighting of incentives for reliability TPIs was notably higher than customer service TPIs in both New York and California. The maximum revenue exposure for reliability TPIs were 74% for Con Edison and 57% for National Grid in New York, and were 62% for SDG&E and 71% for SCE in California.[38] The weightings were at the same level for National Grid in Massachusetts.

3. Shape and Slope

A final element of specification for a TPI incentive structure involves how rapidly (or gradually) incentives are realized when performance is outside of the deadband. The shape and slopes of the functions that govern imposition of penalties (or rewards) varies across the jurisdictions that we reviewed, and appear to reflect specific views and issues. For example, the shape and slope of the incentive function is linear in California, a step function in New York, and follows a combination step and quadratic function in Massachusetts.

To illustrate (below in **Figure 1**), we calculated the penalties and rewards that would be realized for Hawaiian Electric under three SAIDI TPI functions:

- SAIDI TPI applied by the California PUC for SDG&E, labeled "SDG&E" in the figure;
- SAIDI TPI used in Massachusetts at National Grid, labeled "Mass.-Quadratic" in the figure; and,
- A modified (non-quadratic) version of the SAIDI TPI used in Massachusetts, labeled "Mass.-Linear" in the figure.

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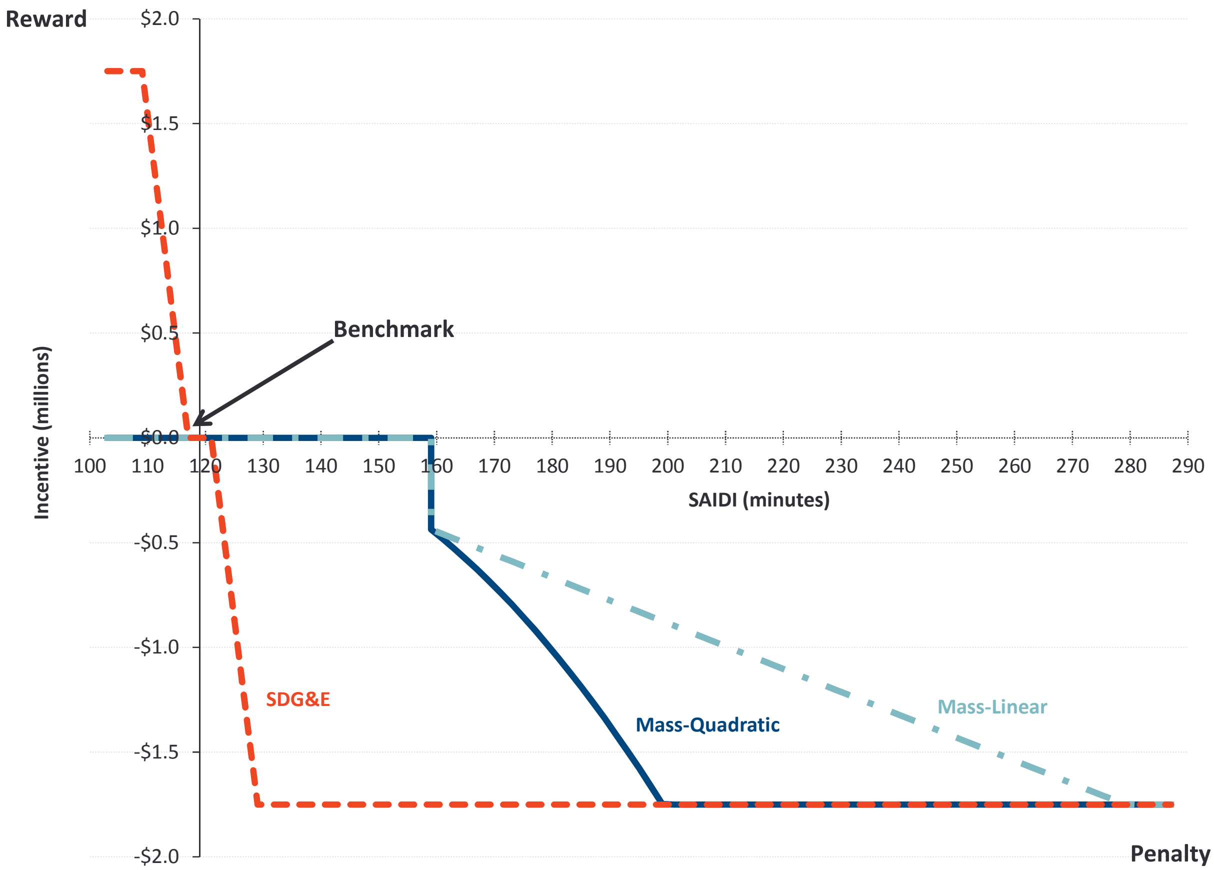
38 The California TPI plans also include an Employee Safety TPI which was set at 18% of the total revenue exposure for SDG&E and 10% for SCE. The weighting between reliability and customer service would therefore be higher than the percentages included in the body of this report if examining the relative weighting of reliability and customer service only.

Figure 1
Comparison of Incentive Structures



As can be seen in the figure, the incentive structure for SAIDI at SDG&E is quite steep and has a very narrow deadband. This may be because the California PUC does not expect that SDG&E's SAIDI performance will vary significantly from targeted levels. However, if performance fell outside of the deadband, the utility would be penalized, or rewarded, $250,000 for each one minute up to the maximum revenue exposure for that TPI. The incentive function for the SAIDI TPI in California is, thus, steep but fully symmetrical.

The incentive function that the Massachusetts DPU applies to National Grid (labeled Mass-Quadratic) imposes an immediate step function penalty when performance falls out of the deadband (on the penalty side), followed by a slope function that, for the most part, is more gradual than the slope applied to SDG&E in California. We also included an additional curve (labeled Mass-Linear) to illustrate an incentive curve with a flatter slope.

A key point to note concerning the slope and shape of incentive curves concerns how quickly the incentive curves reach the point of maximum penalty or reward. The steepness of the curve labeled SDG&E indicates that it reaches the maximum penalty/reward for the TPI after it falls only modestly out of the deadband. In contrast, the flatter slope for Mass-Linear provides the utility considerably more “leeway” before it reaches the maximum penalty (or reward) level. The Mass-Quadratic curve intercepts with the maximum penalty level somewhere in between, at two standard deviations from the target performance level (or one standard deviation from the end of the deadband).

VI. Applying the TPI Framework in Hawai‘i

As introduced at the outset of this report, Hawai‘i faces its own set of unique circumstances concerning the current and desired end state of it electric system, which become important factors in designing a performance incentive plan. Specifically, the Companies are under pressure to reduce costs while, at the same time, they need to maintain the reliability of their electric systems, at least, and in short order make their systems capable of integrating potentially sizable quantities of distributed energy resources. Implementation considerations should also be taken into account. A system of performance incentives will be a new addition for the Commission and the Companies. Ideally, this system should not require the Companies (and the Commission) to dedicate unreasonable levels of resources to implementing a TPI plan, or to its ongoing maintenance.

A. TPI Measures

We have reviewed the comments concerning and recommendations for performance incentives included in the Initial Statements of Positions (ISOPs) from parties to Docket No. 2013-0141.[39] These recommended TPIs can be categorized as follows: 1) reliability (e.g., SAIDI and SAIFI); 2) customer service (e.g., customer satisfaction surveys, speed of call answering); 3) overall cost to consumers; 4) planning processes (e.g., quality and direction of strategic planning); and, 5) renewable and clean energy (e.g., clean energy percentage of sales).

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[39] These include ISOPs from the Division of Consumer Advocacy, the Blue Planet Foundation, the County of Hawai‘i, the Hawai‘i Solar Energy Association and the Hawai‘i Renewable Energy Alliance (in a joinder to Blue Planet’s ISOP).

As indicated at the outset of our report, our primary area of investigation concerns the impacts on utility operations and interfaces with customers that may result from financial incentives adopted by the Commission for the Companies to reduce costs. Thus, TPIs concerning overall costs to consumers may be important but lie outside of the scope of TPIs that we are examining. Similarly, integrating more renewable and/or clean energy is an important goal pointed out by the Commission in the *Inclinations* document, but this also falls outside of the focus on our analysis. Excluding them from our consideration as TPIs does not suggest that they should not be monitored or considered in the context of incentives elsewhere.

The Division of Consumer Advocacy proposed a qualitative TPI in its ISOP, specifically addressing the effectiveness of the Companies' strategic planning.[40] Planning at utilities represents an important area that has long lasting consequences, and the Companies will need to think proactively to address the evolving energy environment. However, measures that address process, such as an assessment of the Companies' strategic planning process, instead of results are inherently subjective, even if such an assessment was conducted by an independent expert. Such concerns are more appropriately addressed outside of the TPI framework which, in our opinion, should focus on objectively quantifiable results.

1. Reliability TPIs

Selecting TPIs to address concerns about electric system reliability was a relatively straight forward exercise. We recommend starting a reliability TPI plan by applying widely accepted measures of reliability; i.e., SAIDI and SAIFI. Some jurisdictions have adopted additional and more detailed reliability TPIs, notably New York with respect to the TPIs applied to Con Edison. We expect that adopting a more detailed scope of reliability TPIs at the initiation of a plan in Hawai'i would be burdensome and could potentially be counter-productive by distracting from review of the key measures. The Commission can continue to require the Companies to report additional statistics and measures concerning reliability on a reporting basis (i.e., not a TPI),[41] and can also expand the scope of reliability TPIs in the future.

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40 Division of Consumer Advocacy's Initial Statement of Position Schedule B Issues in Docket No. 2013-014, pp. 9-12.

41 We understand that performance measures concerning reliability and customer service will also be provided on the Companies' web site, following the Commissions' directive in Decision and Order No. 31908.

The reliability measures included in TPI plans tend to be oriented around performance in the distribution system, and incentives are designed accordingly. For example, for Con Edison, which has the most detailed reliability TPI components among the plans that we have reviewed, reliability TPIs include separate measures for the company's radial and networked distribution systems; program standards for damaged poles; program standards for replacement of over-duty circuit breakers; and a restoration performance metric.[42] We also note that the SAIDI and SAIFI statistics used in TPIs generally exclude major events, including the impacts from failures of generating units and transmission lines.[43] That is, TPI incentives are primarily aligned with reliability in the distribution system.

We recommend that measures of reliability that exclude major weather events and also exclude the impacts of failures in generating units be used in a reliability TPI in Hawai'i, even though the Companies are responsible for many of the State's centralized generating units. Therefore, we recommend that normalized T&D SAIDI and SAIFI for each of the operating companies be used as reliability TPIs.

2. Customer Service TPIs

Selecting customer service TPIs for the Companies presented a slightly more challenging case because, to our knowledge, there are no overall indicators of customer service performance which are similar to the way that SAIDI or SAIFI are indicative of overall reliability performance. We reviewed a range of specific measures concerning a variety of areas of customer service performance, such as measures involving customer complaints, orders and appointments, meter reading, billing accuracy, customer satisfaction and call center performance. Many of these overlap with customer service TPIs that were proposed by other parties to the proceeding.[44]

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42 The New York PSC applies eight reliability TPIs to Con Edison.

43 Sometimes such events are specifically excluded from reliability statistics. More typically, outages which affect a sizable portion of a utility's customer base or geographic segment (e.g., 10%) are deemed to be major or excluding events. In most cases, failures of a generating unit or transmission line will affect this threshold, and thus be excluded from reliability statistics. Excluding generating unit failures from reliability statistics is particularly important in "restructured" states, where the distribution utilities have no control over the performance of generating assets.

44 In its ISOP, the Division of Consumer Advocacy proposed TPIs covering customer complaints, call center performance and orders and appointments. The

We excluded meter reads and billing accuracy as candidates for customer service TPIs because data provided by the Companies indicated that they routinely performed at the 99%+ level in these areas.[45] Such high levels of performance do not require additional financial incentives. From the remaining group, we selected Transaction Satisfaction and Service Level because they are representative of customer experiences with the Companies. Transaction Satisfaction comes closest to providing an encompassing indicator of customer service scores because it reflects customer opinions concerning a range of more specific customer service measures. Service Level is a more specific measure, but reflects an important and highly visible point of interaction between customers and the utilities. Service Level is currently tracked by the Companies at a company-wide level.

Adopting a limited number of customer service TPIs also helps to ensure that the initiation of a customer service TPI plan is relatively simple and manageable. However, there is not a clearly defined "bright line" that makes more than two customer service measures unmanageable. As was the case concerning our proposed reliability TPIs, the Companies can continue to provide other measures of customer service on a reporting basis, and customer service TPIs can be expanded in the future if needed.

The Transaction Satisfaction TPI deserves additional attention in light of the proposal made by the Division of Consumer Advocacy for a broader based survey of customer satisfaction, irrespective if customers have recently interacted with the Companies. We suspect that the Companies are interested in this type of information. However, such a broad-based opinion survey is not appropriate to apply as a TPI. Surveys of customer opinions of utilities are influenced by a variety of exogenous factors, many of which are not within the control of the utility. These factors led the Massachusetts DPU to discontinue its use of general customer satisfaction survey as a TPI.

In summary, the TPIs that we recommend should be considered by Commission are

- SAIDI and SAIFI normalized for T&D events, separately reported on an annual basis for Hawaiian Electric, Hawai‘i Electric Light and Maui Electric;

[45] That is, recent performance data indicated that roughly 99% (or more) of meters have been read on cycle and roughly 99% (or more) of bills were accurate.

- Transaction Satisfaction as expressed in the results of surveys of customers who had recent transactions with the Companies, separately reported on an annual basis for Hawaiian Electric, Hawai‘i Electric Light and Maui Electric; and,
- Service Level (i.e., percentage of calls answered within 30 seconds), reported annually but which the Companies track on a consolidated basis.

These measures are all feasible to determine objectively, can be accurately measured and are immune from gaming, subject, of course, to the Companies not deliberately falsifying data or reports.[46] Furthermore, the Companies currently track the data needed to calculate performances to be used in TPI calculations, and can provide the Commission with trend or explanatory analysis going forward.

B. TPI Targets

Historic data (i.e., averages over a sufficiently robust time period) provides a sound basis for setting TPI performance targets for the Companies. However the Companies face several unique circumstances that should also be taken into account.

As indicated earlier, normalized outages attributable to T&D issues are available from the Companies for seven years (2007 through 2013). This is less than the ten years of data that we have seen used as a rule of thumb in calculating averages that are used as TPI targets. However, there is not a bright line that separates a sample encompassing ten years of data from a slightly smaller data set. We conclude that it is worth using seven years of normalized T&D SAIDI and SAIFI data in the reliability TPIs, rather than using ten years of other reliability data (e.g., normalized system data including generation related outages).

Data concerning Transaction Satisfaction scores are available for over ten years, while data concerning Service Levels are available, on a consistent basis, for only recent years. However, in both cases, circumstances warrant that adjustment should be made to historic averages. First, with respect to Transaction Satisfaction, the Companies have experienced what appears to be a set-back with respect to their scores in recent years, which they attribute to the impact of a number of factors that are unrelated to customer transaction experiences. Specifically, the results of Transaction Satisfaction surveys should reflect customer opinions of a specific experience (i.e.,

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[46] Criteria from Hawaii PUC Order No. 31635, p. 14.

a specific transaction), but, in practice, many other factors can influence the score that a customer gives the Companies. The Companies represent that increases in utility rates over the last few years along with other unfavorable news about them has shifted their Transaction Satisfaction scores downward, even though the way that they handled transactions with customers may have been very good. Thus, the Companies experienced the opposite of a "halo effect."[47] The Companies have also represented that they do not expect this shift to rebound to prior levels immediately. If this is true, the Companies will likely not be able to reach a target set using ten years of historic data. Thus, to make the target achievable, but not guaranteeing that the Companies can reach a target level, we recommend setting the target for Transaction Satisfaction equal to the average of the most recent using five years of data.

The second issue involving customer service targets concerns the Service Level measure. On a comparative basis, the Companies' performance with respect to Service Level has been relatively low.[48] However, the Companies are actively addressing this problem by upgrading their information systems and customer interfaces. The Companies represent that they have set an internal goal of answering 70% of all calls received within 30 seconds. This is notably higher than the average of the Companies' recent history of Service Level performance, so a TPI target set at this level represents a "stretch" target. We recommend setting the target for the Service Level TPI to this 70% level, instead of to historic averages. Tracking of this TPI should also exclude the impacts of major events, as is the case for the reliability TPIs.

C. DEADBANDS

Specifying the deadbands included in the TPI applied to the Companies necessarily needs to follow the approach taken in setting targets.

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47 Such an impact (*i.e.*, when one trait carries over to influence a person's opinion concerning another trait) is sometimes called a "halo" or, more relevant to this case, a "reverse halo" effect. We explored the impact that various factors, including utility rates, have upon customer satisfaction scores in: *Rates, Reliability, and Region*, William P. Zarakas, Philip Q. Hanser, and Kent Diep, Public Utilities Fortnightly, January 2013.

48 This is based on our general understanding of acceptable levels of call answering, as well as representations by the Companies. We did not conduct a benchmarking study of call answering performances across a panel of utilities.

- Deadbands for SAIDI and SAIFI should be based on standard deviations using the same data set used to calculate targets; that is, the most recent seven years of normalized T&D data.
- Deadbands for Transaction Satisfaction should be calculated as the standard deviation of the last ten years of available data, even though we recommended setting the target for this performance measure based on the most recent five years of data. This is in accommodation to the statistical nature of standard deviations. Specifically, the variability of the standard deviation is proportional to the square root of the number of observations. Thus, a stable standard deviation (and one that is usable for purposes of inclusion as a deadband) requires more than three observations, and five observations is acceptable but only barely so.
- Deadbands for Service Level should not be based on standard deviations because its target was not based on historic data. In this case, because Service Level is a stretch target with the Companies employing new resources to meet the target, historical data does not appear to be indicative of future performance. Instead, judgment should be applied to estimate a deadband that absorbs random events. We recommend that the deadband for Service Level be set equal to two to three percentage points, which is a narrow enough range for the Companies to be incentivized to meet their goal while also allowing for random variation beyond the control of the Companies.

D. INCENTIVE STRUCTURE

We identified the key areas associated with the structure of incentives earlier in this report. Below, we provide our analysis and recommendations for these components of a TPI plan that may be applied to the Companies. Specifically, we discuss:

- The maximum level of rewards and penalties, and the allocation of rewards/penalties among individual TPIs;
- The degree of symmetry incorporated into the TPI plan; i.e., whether or not there are provisions for both rewards and penalties; and
- The "slopes" for payments, and whether or not such slopes are set the same for both penalties and rewards, if applicable.

1. Maximum Penalty/Reward

We find that setting the maximum level of penalties/rewards roughly equal to annual T&D revenues provides a direct gauge of revenue exposure, and recommend that the Commission use this measure to guide it in setting a maximum level of penalties/rewards stated in dollar terms. T&D revenues are not reported in Hawaiʻi, but T&D revenue requirements can be estimated from the Companies' "Functional Class Sales Revenues at Proposed Rates" included in the cost of service studies that support current approved base rates. A summary of the functionalization of the revenue requirements from the cost of service studies for Hawaiian Electric, Hawaiʻi Electric Light and Maui Electric is provided in **Attachment II**. Applying a percentage to the estimate of T&D revenue requirements can then be used to set maximum levels of revenue requirements in dollar terms.

Determining the percentage that should be applied to T&D revenue requirements (to form maximum revenue exposure) involves some judgment. The information that we provided earlier, concerning our estimates of maximum revenue exposures in terms of T&D revenue requirements in other jurisdictions, provides some relevant points of comparison. We recommend that a maximum penalty for the Companies under a TPI plan could be set at roughly 1.5% or 2.0% of estimated T&D cost of service revenue requirements. For example, setting maximum revenue exposure equal to roughly 1.7% of estimated T&D cost of service revenue requirements would translate into roughly $5 million per year for Hawaiian Electric, $1.4 million per year for Hawaiʻi Electric Light and $1 million for Maui Electric, for a total of, say, $7.4 million per year for the Companies.

This level of maximum revenue exposure to the Companies under a TPI plan is notably lower than that proposed by the Division of Consumer Advocacy; they proposed a maximum penalty level of about $18.6 million per year, which is about 4.3% of estimated annual T&D revenues.[49]

We also recommend that the Commission consider setting the maximum penalty/reward for reliability at 70% of the total revenue exposure, evenly split with 35% assigned to SAIDI and

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49 Division of Consumer Advocacy ISOP, Exhibit B. The Division of Consumer Advocacy's proposal provides for maximum rewards of roughly $11.2 million and maximum penalties of roughly $18.6 million. The proposal provides for symmetric treatment of penalties and rewards for the Customer Costs and Customer Services TPIs, but allows for penalties only for reliability (SAIDI and SAIFI).

35% to SAIFI. The remaining 30% of the maximum penalty/reward should be allocated to the TPIs associated with customer service. The higher percentage allocated to the reliability TPIs follows from our understanding of the important role that the distribution system will play going forward, in meeting customer needs and in integrating distributed energy resources.

2. Incentive Symmetry

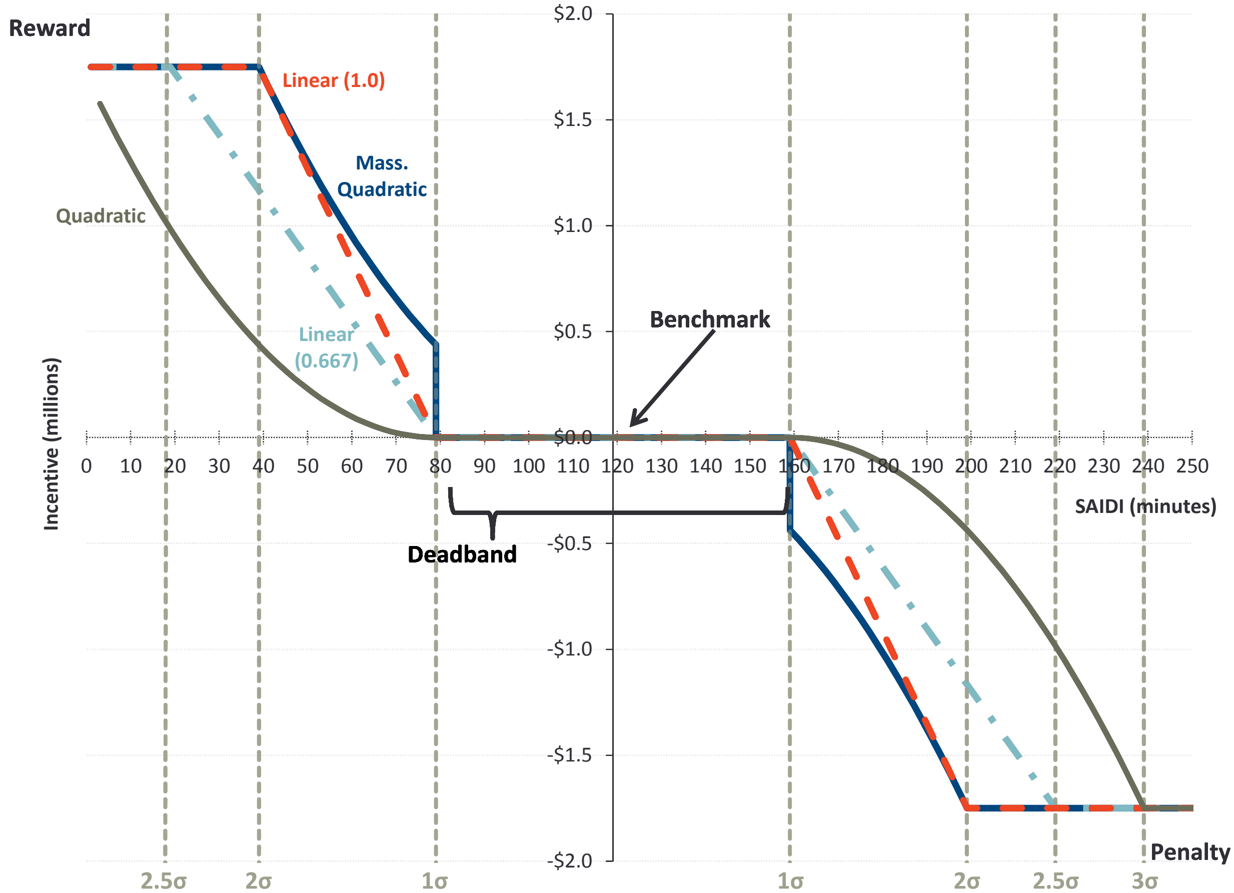
We recommend that a symmetric incentive structure be applied to the TPIs applied to the Companies. We understand that the TPIs are being considered as an adjunct to a broader reaching IBR plan. As we discussed earlier, in such a case, symmetry is necessary (in both the IBR and TPI plans) in order to provide the utility with a reasonable opportunity to earn a fair rate of return. On the other hand, we also noted that symmetry is not a requirement for a TPI plan implemented on a stand-alone basis (i.e., that is associated with traditional cost of service). However, even in that case, it may be appropriate to apply a symmetric incentive structure to a TPI when customers are dissatisfied with service levels and/or when regulators want to motivate utilities to improve upon them. This appears to be the case with the Companies' Transaction Satisfaction scores and Service Level performance.

3. Incentive Formula

As discussed earlier, a key attribute of incentive formulas concerns how quickly (or gradually) a penalty or reward is realized by the utility. We refined the scope of incentive formulas presented earlier and provide four formulas that may be applicable to a TPI plan in Hawai'i. In **Figure 2**, we illustrate four incentive symmetric formulas using Hawaiian Electric's SAIDI performance: two with linear forms and two with quadratic forms.[50]

[50] Hawaiian Electric (as one of the Hawaiian Electric Companies) and SAIDI (as a TPI) were selected for illustrative purposes only. The same graphic could be provided using Hawai'i Electric Light and/or Maui Electric data for SAIFI, Transaction Satisfaction and/or Service Level.

Figure 2
Comparison of Incentive Formulas



We summarize the key points associated with these curves below, and provide an explanation of the underlying formulas in Attachment IV.

- The curve labeled "Linear 1.0" is designed for the Companies to realize penalties/rewards proportionally within one standard deviation from the end of the deadband. Hence, it is a straight line that, on the penalty side, extends from point (159.07, $0) through point (199.04, $1.75), where 159.07 minutes is the end of the SAIDI deadband, 199.04 minutes is the point two standard deviations from the target (equal to 119.04) and $1.75 million is the maximum penalty assigned to the SAIDI TPI (i.e., $5 million x 35%)
- The curve labeled "Linear 0.667" is a variation on Linear 1.0, designed to demonstrate the effect that changing the line's slope has upon the incurrence of incentives. This curve has a flatter slope which causes the maximum penalty to be reached at 2.5 standard deviations from the target, or at point (219.1, $1.75).

- The curve labeled "Quadratic" is based on standard quadratic function and has a parabolic shape that reaches the maximum level of penalty/reward in two standard deviations from its origin. The origin of the Quadratic curve is at the end of the deadband (which is one standard deviation from the target). Following this curve, the maximum penalty/reward is reached at three standard deviations (i.e., at three standard deviations from the target) at point (239.1, $1.75).
- The curve labeled "Mass. Quadratic" is a variation on the Quadratic curve and is based upon an incentive formula that was used by the Massachusetts BPU in the performance incentive plan applied to National Grid.[51] We understand that this is the quadratic form that is being proposed by the Consumer Advocate in this proceeding.[52] A major component of this curve is the step function that begins at the end of the deadband and jumps from 0 to $0.44 on the y axis. As explained in Attachment IV, this is because the incentive formula set the coefficient, k, equal to 0.25, which results in 25% of the penalty/reward being realized immediately upon performance leaving the deadband. That is, the Mass. Quadratic curve is designed to mimic a curve based on a quadratic formula that originated at the TPI target, in this case at point (119.04, 0). However, such a formula would result in penalties/rewards being incurred as soon as performance strayed from the target level. Thus, it was adjusted to keep penalties/rewards equal to zero and then jumps to the level it would have been on the incentive curve if the curve had originated at the TPI target.

We recommend that the maximum level of penalty/reward be reached at two standard deviations from the target (one standard deviation from the end of the deadband). As indicated in our discussion concerning setting deadbands, +/- one standard deviation around the average (i.e., target) includes roughly 68% of all observations in a normal distribution. Adding a standard deviation on either side of the deadband brings this level up to find roughly 95%. Thus, statistically, the majority of observations (i.e., performances) in the future will fall within the deadband, and about 27% of performances will fall between one and two standard deviations from the target.

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51 For this illustration, we used a symmetric version of the quadratic incentive formula. The formula that the Massachusetts DPU applies to National Grid includes a penalty provision and a revenue offset, but not a monetary reward.

52 Division of Consumer Advocacy's Responses To Information Requests On Initial Statement of Position, Attachment 2.

We also recommend using a linear incentive formula, specifically the formula underlying Linear 1.0. The notion of a parabolic curve is appealing but the step function included in the Mass. Quadratic takes away the smoothness of the function and makes it punitive (or overly-generous) for performance that is only modestly outside of the deadband.

We provide the formulas for applying our recommended linear incentive formula in **Attachment V**.

E. Sensitivities

We provide a structure for a TPI plan that may be applied to the Companies in **Attachment VI**.

We also applied data to the TPI specifications shown in the attachment in order to depict the circumstances under which the Companies would pay a penalty or receive a reward. Sensitivity analysis for the SAIDI TPI is provided in **Attachment VII**, in a table entitled *Sensitivity Analysis: SAIDI TPI*. The table summarizes whether or not each of the Hawaiian Electric Companies would pay a penalty or receive a reward if historic 2007 through 2013 normalized T&D SAIDI performances were used to set the target and deadband for the SAIDI TPI. The results of this sensitivity indicate that, for most of the time, the Companies operated within one standard deviation of the SAIDI target. Thus there are few occasions when penalties or rewards would be triggered. Each operating company's SAIDI performance triggered one penalty incident, and Hawaiian Electric's and Hawai'i Electric Light's SAIDI performance also triggered one reward incident.

Sensitivity analysis for the SAIFI TPI is provided in **Attachment VIII**, in a table entitled *Sensitivity Analysis: SAIFI TPI*. This table provides a similar sensitivity analysis that was applied to the SAIDI TPI above. In this case, using the Companies historic data in psecifying the SAIFI TPI would have resulted in two penalty instances for Hawaiian Electric and Hawai'i Electric Light and one for Maui Electric. Each operating company would also have realized one incident of reward. Thus, the Companies' SAIFI performance falls out of the deadband more frequently than is the case with SAIDI. This is largely due the nature of the distribution of SAIFI data. Addressing this reliability data distribution issue is at the heart of the beta methodology that was developed by the IEEE in standard 1366. The Companies and Commission should follow development with data normalization going forward. However, we recommend that the

Commission use the normalized T&D data provided by the Companies in calculating targets and deadbands for the reliability TPIs.

We also conducted a sensitivity analysis on the Transaction Satisfaction TPI. As introduced earlier, customer scoring of satisfaction with their transactions with the Companies has declined in the last several years, more so for Hawaiian Electric and Hawai'i Electric Light than for Maui Electric. The Companies represent that the most recent Transaction Satisfaction scores will most likely persist for the next few years because it will take time for their reputation to improve. Thus, they represent that it would be unlikely for the Companies to reach the scores achieved from 2004 through 2010. We conducted two analyses of sensitivities. First, in **Attachment IX Panel A** (entitled *Sensitivity Analysis: Transaction Satisfaction TPI – Panel A*), we estimated the target value and deadband based on ten years of historic data (2004-2013). Not surprisingly, the Companies performance fell short of the low end of the deadband in each of the last three years. Second, in **Attachment IX Panel B** (entitled *Sensitivity Analysis: Transaction Satisfaction TPI – Panel B*), we estimated the target value based on the last five years of data, which the Companies represent is the "new normal," at least for the next few years. We set the deadband equal to +/- one standard deviation which was estimated using the full ten years of data. In this case, each operating company would have incurred a penalty in one of the most recent three years, but not for the other two. Calculating a target based on the most recent five years appears to address the Companies' concerns about the recent declines in their Transaction Satisfaction scores, without being overly accommodating.

We did not conduct a sensitivity analysis on the final TPI, Service Response, because the Companies have proposed a target of 70% telephone answering within 30 seconds and a deadband range of +/- 2.5%. The available historic data tended to fall below this level, which would suggest that the Companies would have incurred penalties in most years. However, as discussed earlier, the Companies believe that improvements in underlying systems will allow them to reach the 70% target going forward, absent unforeseen circumstances. The Commission should consider excluding extraordinary events from the Service Response statistic, similar to the way SAIDI and SAIFI are normalized for extraordinary events.

We summarized the key parameters of the four TPIs, calculated using the most recent data from the Companies in **Attachment X**.

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