



OFFICE OF UTILITIES REGULATION

Investigation Report

**OUR'S INVESTIGATION INTO
CUSTOMER COMPLAINTS OF HIGH
BILLING BY THE JAMAICA PUBLIC
SERVICE COMPANY LIMITED**

2020 October 8

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This document provides details of the investigation and findings into complaints and public outcry about high bill/consumption by JPS, subsequent to the 2020 March - April billing cycle.

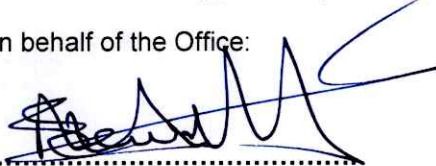
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On behalf of the Office:



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1 EXECUTIVE SUMMARY

1.1 OVERVIEW

The Office of Utilities Regulation (OUR/Office) recorded an increase in complaints of high consumption/bill from customers of the Jamaica Public Service Company Limited (JPS) following the 2020 March – April billing cycle and the introduction of measures to contain the spread of the Covid-19 pandemic. Note was also taken of an accompanying public outcry in the media (traditional and social) about high JPS bills. Consistent with its mandate to protect consumers' interest, the OUR took the decision to immediately commence an investigation into the customers' complaints and advised JPS by letter dated 2020 April 21.

The OUR was subsequently requested by then Minister of Science Energy and Technology (SET), Honourable Fayval Williams to conduct an "appropriate audit" into JPS' billing concerns. Having reviewed the request and in the context of its ongoing investigation, the OUR decided on a two-phased approach (with the implementation of the second phase conditioned on the outcome of the first), viz.:

Phase 1 – to be conducted entirely by OUR's personnel, and would include an examination of changes in the electricity bills across customer categories and of the various billing components, to assess, inter alia:

- (i) The extent of the increase in customers' consumption since 2020, compared to the corresponding billing periods in 2019;
- (ii) The impact of each billing component on total consumption charges; and
- (iii) Compliance level of JPS' billing practices with existing quality control procedures.

The outcome of the Phase 1 Investigation would inform any decision to proceed to Phase 2, for which the areas of focus envisaged would involve an independent audit/investigation of JPS' operations and/or systems. It was contemplated that in such an eventuality, a Consultant would be engaged and the scope of Phase 2 would include the specified areas identified from Phase 1, and any other areas that the OUR deems appropriate to assist with its findings.

This report presents the findings of Phase 1 of the Investigation and sets out additional steps to be taken. It comprises:

- Purpose, Background and Scope of Phase 1 of the Investigation;
- Summary of JPS' responses to queries; and
- OUR's Analysis of JPS' responses and the data provided from the company's Customer Information System (CIS)

1.2 SCOPE OF THE PHASE 1 INVESTIGATION

The scope of the Phase 1 Investigation spanned examination of:

- Consumption and bill computation for the period;
- Other possible attendant factors such as: the impact of the COVID-19 containment measures implemented by the Government of Jamaica (GOJ) including, Work from Home (WFH) stipulation; the temporary closure of our borders to international travel and other Government of Jamaica (GOJ) orders and protocols that directly affected economic activity and more specifically electricity demand and usage patterns; and
- The impact of various billing components on rates during the period in question.

In order to be able to make critical comparisons, it was also necessary to extend the collection and review of data well beyond the period to which the complaints related. The OUR therefore identified and requested that JPS provides monthly information from the company's billing system for the period 2019 January to 2020 May.

While the available data set covered a 17-month timeframe, and included information on all rate classes, the OUR's investigation focused on the Rate 10 (residential) and Rate 20 (small commercial) classes. It also examined potential billing and metering changes during the 2020 January to May timeframe, which included the period within which the complaints of increased JPS high bills occurred.

Phase 1 of the Investigation, which was conducted by the OUR personnel, sought to ascertain the magnitude and significance of changes in electricity bills experienced by Rate 10 and Rate 20 customers, across the identified period; identify the potential drivers of such changes, including changes in individual customer consumption and system wide issues, such as variations in the Fuel & IPP Rate, and Foreign Exchange Rate (US\$/J\$), among other factors.

1.3 SUMMARY OF INFORMATION FROM JPS' CORRESPONDENCE

OUR requested information from JPS by letters dated: 2020 April 21 and 2020 June 9 to which JPS responded by letters dated 2020 May 20 and 2020 June 23.

1.4 JPS CONFIRMS RECEIPT OF INCREASE IN HIGH BILLING COMPLAINTS

JPS confirmed, in its 2020 May 20 response, that it received more complaints from customers regarding high consumption and increase in their electricity bills in April, when compared with the previous 2020 billing periods and the corresponding billing periods in 2019.

JPS further advised that the high consumption/bill complaints were not limited to any specific billing cycle or geographical location. However, most of the complaints were from its residential (Rate 10) customers.

JPS' data also indicate that there was an overall 11% increase in consumption for residential (Rate 10) customers for the 2020 April billing cycle when compared to the 2020 March billing cycle, while all other rate classes realized a negative percentage change in their consumption levels over the same period.

1.5 JPS' PROPOSED REASONS FOR THE INCREASE IN CONSUMPTION/BILLS FOR THE PERIOD IN DISPUTE

JPS proffered the following general reasons for the high consumption/bill complaints:

1. The Impact of the COVID-19 Pandemic

JPS argued that with the impact of the COVID-19 Pandemic, more persons were at home due to school closures and the implementation of the WFH arrangement on the instruction of the GOJ.

2. Increased Days of Sales

Some customers were billed for up to thirty-three (33) days in instances. An analysis of the data showed that 39% of the bills generated in April exceeded the OUR stipulated thirty-one (31) days for a billing cycle. JPS contended that with the growth in its customer base over the last ten (10) years, it has been forced to use a range of days of service spanning twenty-eight to thirty-three (28 – 33) days for its meter reading schedule, in order to enable the majority of its customers to be billed within thirty-one (31) days.

JPS explained that the number of days for which a customer is billed is dependent on their billing cycle. Where a customer is billed for less or more than the number of days in a month, the necessary adjustment is made in the subsequent reading cycle, which would result in net billing days of sixty (60) or sixty-one (61) days over the two-month period.

JPS delineated several factors that can impact meter reading, notably: access to meters, scheduling around holidays and weekends, weather conditions, interruption in communication with smart meters and its Residential Advanced Metering Infrastructure (RAMI) system and more recently, GOJ protocols regarding the COVID-19 pandemic.

3. Estimations

JPS flagged estimations as another factor identified as part of the cause for the increase in high consumption/bill complaints, particularly in instances where the usage for the three previous actual readings, resulted in a higher estimated bill. JPS also advised that there was a 12% increase in estimated bills in April due to:

- (a) The lockdown of the parish of St. Catherine in 2020 April;
- (b) A community in Clarendon (Cornpiece) being placed under quarantine in 2020 March; and
- (c) The implementation of contact and social distancing measures to contain the spread of COVID-19.

JPS also provided details of accounts that were estimated and fell within the Exceptions Criteria for the 2020 April – June period, which are as follows:

- In April, of the 38,440 excepted accounts, 2,472 were also estimated, representing 6%;
- In May, of the 31,640 excepted accounts, 2,466 were also estimated, representing 8%; and
- In June, of the 31,202 excepted accounts, 2,032 were also estimated, representing 7%.

1.6 SUMMARY OF OUR'S ANALYSIS ON DATA OBTAINED FROM JPS' CUSTOMER INFORMATION SYSTEM

To assist with the in-depth analysis into JPS' account billing and metering data, system-wide metrics reported monthly by JPS, over the relevant period, were reviewed in order to establish a context for the investigation. The metrics included the system load curve, monthly net generation and sales by rate class. Additionally, an overview of the tariff structure and variation in billing determinants over time was also taken into consideration since they can be indicative of variations in electricity bills.

Major elements of the analysis involved comparisons between average electricity bills and electricity consumption before the implementation of COVID-19 mitigation strategies (Timeline 1), and after (Timeline 2). However, while the beginnings of large-scale implementation of the most impactful of COVID-19 mitigation strategies were considered to have occurred during the month of 2020 March, and not at the end of the month, based on the available dataset, the following timelines were selected for greater simplicity and ease of analysis:

- Timeline 1 (Before Large-scale COVID-19 Mitigation Strategies): 2020 January – March; and
- Timeline 2 (After Large-scale Implementation of COVID-19 Mitigation Strategies): 2020 April – May.

Bearing in mind the foregoing context and considerations, the OUR found that:

- Increases in average electricity bills and consumption were primarily attributed to residential (Rate 10) accounts, while small commercial (Rate 20) accounts, on average, experienced a reduction in electricity bills and consumption. This finding meets expectations given the nature of the COVID-19 mitigation measures.
- When disaggregated by Rate Class, it was confirmed that Rate 10 accounts were the primary contributors to the overall increases observed. In fact, Rate 20 accounts, on average, experienced a reduction in electricity bills and consumption. Upon disaggregation, it was found that Rate 10 accounts experienced an average increase of 24.23% in electricity bills, with Rate 20 accounts experiencing an average decrease of 2.69%.
- A major part of this analysis examined the change in electricity bills and consumption levels for JPS Rate 10 and Rate 20 customers over the period 2020 April to May vs 2020 January to March. Based on the results of the analysis, the selection of Rate 10 and Rate 20 customer accounts exhibited an increase in electricity bills of 21.87%, with a corresponding consumption increase of

14.43%. These figures, with the outliers removed, translate to a bill increase of approximately J\$1,038.20 and a consumption increase of 11.10 kWh.

- Rate 10 electricity bills and consumption changes were also investigated on a Parish/Region basis. This indicated that customers in Portmore, Kingston and St. Andrew (KSAN) and St. James experienced the largest average monthly bill increases of \$2,001.74, \$1,960.55 and \$1,493.97 respectively. Conversely, customers in Manchester and St. Ann experienced the lowest level of average monthly bill increases of \$655.63 and \$641.65 respectively. The Portmore findings appear to align with the expectation regarding the effect of a Stay at Home Order that was issued for the parish of St. Catherine.
- As expected, the increase in electricity bills was found to correlate with the increase in consumption levels exhibited. Upon analysis, consumption was found to be a significant explanatory factor for bill increases. This was expected, based on the very nature of the applicable rate classes, which are predominantly volumetric in nature. Nevertheless, other potential causal factors for bill increases were investigated.
- The r-squared value calculated for the entire dataset used in the analysis is 0.403, which indicates that about 40.3% of the change in electricity bills, can be directly explained by a change in consumption.
- The billing parameters Billed Fuel & IPP Rate and Foreign Exchange Adjustment, were higher on average during Timeline 2 vs Timeline 1. As such, these parameters would have contributed to increases in electricity bills experienced by some Rate 10 and Rate 20 customers.
- However, the billing parameter which accounted for the highest proportion of the change in average electricity bills, was the Fuel & IPP charge, which would have been driven by an increase in average electricity consumption and an increase in the Fuel & IPP Rate. This was followed by the increase in the Energy Charge for consumption greater than 100 kWh. This is reflective of the increased consumption at this energy charge tier, and the significantly higher rate, compared to the Energy Charge for ≤ 100 kWh.
- The cost of each incremental kWh of consumption becomes progressively more expensive, when consumption exceeds certain levels i.e. 100 kWh (above the Lifeline tier) and 150 kWh (which attracts GCT). For example, in 2020 May, the cost of each incremental kWh consumed between 100 to 150 kWh is more than 40% higher than that consumed in the 0 to 100 kWh range, with the cost of each incremental kWh consumed above 150 kWh being over 61% higher than that consumed in the 0 to 100 kWh range.
- Examination of JPS' billing accuracy revealed that the company's billing calculations were largely compliant with the terms of the 2018 – 2019 JPS Rate Schedule. With respect to Rate 10 accounts, 99.73% of accounts were found to have accurately calculated bills for the months of 2020 January to May. With respect to Rate 20 accounts, this figure was found to be 99.95%. However, as

implied, there were a number of deviations, some of which could not be explained from the information provided. Clarification on these will therefore be required from JPS.

1.7 OUR'S FINDINGS AND CONCLUSIONS

JPS' response indicates essentially three reasons for the identified increases in its bills:

- Substantial increases in residential bills arising from behavioural changes and consumption pattern occasioned by the COVID 19 measures;
- Increased days of sale; and
- The use of estimated consumption.

The OUR's analysis of the data from JPS' billing systems and the reasons for the increases proffered by JPS indicate varying degrees of plausibility.

Covid-19 Impact

It is noted that the complaints related to increased electricity consumption/bill started in 2020 April, following the recording of the first COVID-19 case and the designation of the island as a disaster area in March. This prompted the closure of schools and businesses and the implementation of the WFH order and arrangements in keeping with the GOJ stipulations, which resulted in persons spending more time at home. These circumstances align with the 11% increase seen in consumption for JPS' residential (Rate 10) customers and the negative percentage change for all other rate categories.

The data analysis supports the impact of the COVID-19 measures on consumption of electricity, particularly for residential (Rate 10) rate class, which experienced the largest increase. Within the scope and constraints of the analysis, it was found that JPS' residential (Rate 10) customers experienced significant increases in electricity bills from 2020 April to May, when compared to 2020 January to March. With respect to Rate 20 customers, it was found that these customers experienced a decrease in consumption, on average, over the same period.

Estimations and the Exceptions Criteria

With regard to JPS' indication that estimation of consumption contributed to high bills/consumption during the referenced period, the information submitted by the company failed to adduce evidence in support of this claim.

For the calculation of estimated consumption, JPS' Guaranteed Standard - EGS 8 stipulates that: *"an estimated bill should be based on an average of the last three (3) actual readings"*. Further, as a means of quality control to reduce the risk of incorrect bills being rendered to customers, the OUR in *"Decision: Enquiry into Billing System of the Jamaica Public Service Company Limited"* (Document No. Ele 2005/01) dated 2005 February 22, requires JPS to reject any reading that falls outside +/- 30% of average previous consumption for residential customers, and stipulates that this should not be applied to the accounts until the reading is confirmed to be accurate. JPS is also required to notify the affected customers of the significant variance in their consumption. This is known as the Exceptions Criteria.

For accounts that were estimated and fell within the Exceptions Criteria during the period 2020 April – June, the data shows that those were 6%, 8% and 7% respectively. It was also identified that for the period 2014 August to 2020 June, JPS had not complied with the requirement to notify customers of the significant variance in consumption, as stipulated by the Exceptions Criteria. The company has advised the OUR that it resumed notifying customer of excepted readings in 2020 July, by way of SMS messages. The OUR will signal to JPS its concern regarding the company's clear failure to comply with an Office Directive and request specific undertakings regarding future compliance.

Notably, a review of JPS' Guaranteed Standards quarterly performance reports submitted to the OUR for the relevant period indicates that the company, in April, committed two (2) breaches of EGS 8. The report further indicates that breaches of EGS 8 for May and June were five (5) and two (2) respectively.

Given the minimal number of breaches of EGS 8 being committed for the April – June period and the low percentage of accounts for which consumption was estimated and fell within the Exceptions Criteria, the OUR is satisfied that the impact of any deviation from these quality control billing measures during the April – June billing period, would not have affected a significant number of JPS customers or their billed consumption. The OUR therefore does not understand the basis on which estimation was cited by JPS as a factor which resulted in high bills/consumption, as its examination of the data presented did not confirm this assertion.

Days of Sales/Billing Days

The matter of JPS' response with respect to Days of Sales or billing days, is also another matter of great concern to the OUR. While the OUR has taken note of the reasons offered by JPS that may cause an increase in its billing days, as far back as 2008 October, the OUR had issued a Memorandum (Document No. Ele 2008/11:Mem/02) dated 2008 October 10 to JPS, which states:

"...JPS shall ensure that at least ninety-nine percent (99%) of bills be based on actual reading issued to customers reflect usage no greater than a billing period of thirty one (31) days."

The Memorandum was issued based on the OUR's findings of a similar investigation into high bill complaints by JPS. The findings of the 2008 investigation indicated a direct relationship between increased days of sales/billing days, increased consumption and associated charges for that billing period. As was seen in the data analysis, deviations from the stipulated thirty-one (31) billing days has implications for the applicable rates (such as Fuel and IPP and foreign Exchange) on billed consumption. Accordingly, the Memorandum was issued by the OUR in an effort to bring a level of consistency to JPS' billing days and to reduce the risk of bill shock on customers. JPS' response indicates that it has not been fully compliant with or has instituted clear measures to reduce and ultimately eliminate the need to exceed the stipulated thirty-one (31) days per billing cycle.

The OUR underscores its view that JPS' compliance with the aforementioned Directive related to exceptions and Memorandum stipulating the number of billing days, may have dampened the extent of

bill shock experienced by its customers. The OUR will therefore be seeking specific undertakings from JPS regarding its future compliance with these requirements.

Taking into consideration the findings of the data analysis, it appears that the causes of bill increases experienced by JPS' Rate 10 customers were multifaceted. While in a small number of cases, bill calculation errors may be an issue, for the most part bill increases were largely attributable to the following:

- Primary and secondary impacts of consumption increase for the Rate 10 class in particular;
- Significant increases in the Billed Fuel and IPP rates and Foreign Exchange Adjustment over the period; and
- Possibly, in some instances increases in billing days.

1.8 NEXT STEPS

- 1) A number of outlier accounts, with large consumption change were found. Further investigation is needed for some of these outliers. It is not envisaged, however, that this will necessitate an independent audit.
- 2) Additionally, a number of bill calculation deviations were discovered. Further information and clarification will be sought from JPS.
- 3) The impact of seasonality was not accounted for in this analysis. This may also have had an impact on the magnitude of consumption increase, and thus might be a useful exercise for future consideration.
- 4) JPS continues to bill customers in excess of thirty-one (31) days per billing cycle. This will be addressed with JPS in light of OUR's Memorandum and specifically the measure/s to be adopted to ensure compliance.
- 5) The OUR will examine further the significance of JPS exceeding the thirty-one (31) billing days per billing cycle on consumption charges.
- 6) The OUR will require JPS to, on a quarterly basis, submit an Exceptions Report which shall include data on the number of Exceptions and confirmation of the method/s used to notify customers about the significant variance in their consumption.

In light of the general findings and the abovementioned issues identified under Next Steps, the OUR is not of the view that an independent audit of JPS billing system is needed at this point. The OUR will, therefore, be proceeding to extend Phase 1 of the Investigation to: address some of the identified outlier issues, engage JPS about its failure to comply with the Office Directives and, in particular, pursue undertakings regarding future compliance and consequences for breaches.

A further progress report on the components of the extended Phase 1 Investigation will be provided by 2020 December 18.

ACRONYMS AND DEFINITIONS

GCT	General Consumption Tax
GOJ	Government of Jamaica
IPP	Independent Power Producers
JPS	Jamaica Public Service Company Limited
KDE	Kernel Density Estimator
KSAN	Kingston and St. Andrew North
KSAS	Kingston and St. Andrew South
MTAOP	Meter Testing Administrative and Operational Protocol for the Electricity and Water Sectors in Jamaica, 2017
OUR	Office of Utilities Regulation
RAMI	Residential Automated Metering Infrastructure
Rate 10	JPS' Residential customers
Rate 20	JPS' Small Commercial customers
WFH	Work From Home

2 INTRODUCTION

2.1 PURPOSE

Subsequent to the 2020 March – April billing cycle, the Office of Utilities Regulation (OUR/Office) recorded an increase in complaints of high consumption/bill from customers of the Jamaica Public Service Company Limited (JPS). The OUR also noted that there was an accompanying public outcry in the media (traditional and social) about JPS bills. Consistent with its mandate to protect consumers' interest, the OUR took the decision to immediately commence an investigation into the customers' complaints. JPS was provided notice of this by letter dated 2020 April 21, which sought pertinent information relating specifically to whether JPS had complied with requisite billing standards set by the Office and the existing Guaranteed Standards. JPS responded by letter dated 2020 May 20, however, based on their response, the OUR by letter dated 2020 June 9, sought additional information. By letter dated 2020 June 23, JPS responded and provided the requested information.

Subsequent to the commencement of its investigation in 2020 April, the OUR was requested by then Minister of Science Energy and Technology (SET), Honourable Fayval Williams to conduct an "appropriate audit" into JPS' billing concerns. Having reviewed the request and within the context of its ongoing investigation, the OUR took the view that a two-phased approach would be most prudent, viz.:

Phase 1 – which would be conducted entirely by OUR's personnel and would include an examination of changes in the electricity bills across customer categories and of the various billing components, to assess, inter alia:

- (i) The extent of the increase in customers' consumption since 2020, compared to the corresponding billing periods in 2019;
- (ii) The impact of each billing component on total consumption charges; and
- (iii) JPS's billing practices compliance level with existing quality control procedures.

The outcome of Phase 1 would inform any decision to proceed to Phase 2 and the areas of focus envisaged for an independent audit/investigation of JPS' operations and/or systems. It was contemplated that in this eventuality, a Consultant would be engaged to conduct the Phase 2 Audit/Investigation with a focus on the specified areas identified from the Phase 1 Investigation, and any other areas that the OUR deems appropriate to assist it with its findings. This report presents the findings of the OUR's Investigations and sets out additional steps to be taken.

2.2 BACKGROUND

Government of Jamaica (GOJ) interventions to mitigate the public health impacts of the COVID-19 pandemic, including the implementation of more impactful measures commencing in late 2020 March, has significantly altered the general functioning of the society. These measures include: Work from Home (WFH) stipulation; the temporary closure of our borders to international travel, etc., all of which affected economic activity. As would be expected, this also had an effect on such critical services as, electricity demand and usage patterns.

Specific to the Electricity System, this resulted in a downward trend in the daily load curve, with a resultant decrease in peak demand. Notably, the reduction in system peak demand, appears to have been largely driven by a concomitant reduction in commercial and industrial activities, with residential usage of electricity increasing significantly.

Against this backdrop, it is not unexpected that there would be increases in residential bills as a typical household would be spending a significantly greater time at home. Increased consumption is however, often not the only explanatory variable for bill increases as several other factors are involved in the calculation of a monthly electricity bill. These include: Fuel and IPP costs, the billing exchange rate (US\$/J\$), the tiered rate structure for residential customers and the application of GCT after a certain consumption level.

It was therefore, necessary to review information not just on consumption and bill computation, but also on all the other possible attendant factors. In order to be able to make critical comparison, it was also necessary to extend the collection and review of data well beyond the period to which complaints relate. The OUR consequently identified and stipulated that monthly information be provided for JPS's billing system for the period 2019 January to 2020 May, in order to investigate the extent of increases and to identify potential causes for these increases.

While the available data set covered a 17-month timeframe, and included information on all rate classes, the OUR's investigation focused on the Rate 10 and Rate 20 classes. It also examined potential billing and metering changes during the 2020 January to May timeframe. This covered the period within which the complaints of increased JPS high bills occurred.

The OUR's investigation sought to ascertain the magnitude and significance of changes in electricity bills experienced by Rate 10 and Rate 20 customers, across the identified period, the potential drivers for such changes, including changes in individual customer consumption, and system wide issues, such as variations in the Fuel & IPP Rate, and Foreign Exchange Rate (US\$/J\$) among other issues.

2.3 SCOPE AND STRUCTURE OF REPORT

This report provides information on the approach and outcomes of the OUR's investigation into reported electricity bill increases.

This report is divided into twelve (12) sections, including the Executive Summary.

- Section 2: Introduction
- Section 3: Overview of OUR's Assessment of Information from JPS' Correspondence
- Section 4: Overview of System Metrics and JPS Rate Schedule
- Section 5: Assessment of Methodology and Description of Datasets provided by JPS
- Section 6: Data Structure and Categorization
- Section 7: Assessment of Billing and Consumption Changes during Analysis Timeframe
- Section 8: Accuracy of JPS' Billing Calculations
- Section 9: Impact of Changes in Billing Parameters and Consumption Levels
- Section 10: Summary of Findings

- Section 11: Conclusion
- Section 12: Next Steps

3 OVERVIEW OF OUR'S ASSESSMENT OF INFORMATION FROM JPS' CORRESPONDENCE

The OUR requested information from JPS to assist in its investigation into the high billing complaints. The information requested sought to ascertain, inter alia, whether JPS' billing practices complied with existing quality control procedures established by the Office, such as the Guaranteed Standards and Exceptions Criteria. The following provides a summary of the initial information requested and received from JPS as well as the OUR's findings.

3.1 JPS CONFIRMS RECEIPT OF INCREASE IN HIGH BILLING COMPLAINTS

JPS confirmed, in its 2020 May 20 response, that the company received more complaints from customers regarding high consumption and increase in their electricity bills in April when compared with the previous 2020 billing periods and the corresponding billing periods in 2019, as shown in Table 3.1.

Table 3.1: High Bill/ Consumption Complaints Data
HIGH BILL / CONSUMPTION COMPLAINTS
2019 VS 2020

MONTHS	Y2019	Y2020	%CHANGE
Jan	1,446	1,217	-16%
Feb	1,227	990	-19%
Mar	900	1034	15%
Apr	942	1,623	72%
TOTAL	4,515	4,864	8%

*Source: JPS letter dated 2020 May 20

In that same letter, JPS further advised that the high consumption/bill complaints were not limited to any specific billing cycle or geographical location. However, most of the complaints were received from its residential (Rate 10) customers. JPS' data also indicate that there was an overall 11% increase in consumption for Rate 10 customers for the April billing cycle when compared to the March billing cycle, while all other rate classes realized a negative percentage change in their consumption levels over the same period.

3.2 JPS' PROPOSED REASONS FOR THE INCREASE IN CONSUMPTION/BILLS FOR THE PERIOD IN DISPUTE

Based on the findings of its investigation, JPS proffered the following general reasons for the high consumption/bill complaints:

- (i) The Impact of the COVID-19 Pandemic

JPS argued that with the impact of the COVID-19 pandemic, more persons were at home due to school closures and the implementation of the WFH arrangement on the instruction of the Government of Jamaica (GOJ).

(ii) Increased Days of Sales

Some customers were billed for up to thirty-three (33) days in instances. Indeed, an analysis of the data showed that 39% of the bills generated in April exceeded the OUR's stipulated thirty-one (31) days for a billing cycle.

JPS contended that with the growth in its customer base over the last ten (10) years, it has been forced to use a range of days of service spanning twenty-eight to thirty-three (28 – 33) days for its meter reading schedule, in order to enable the majority of its customers to be billed within thirty-one (31) days.

JPS delineated several factors that can impact meter reading, notably: access to meters, scheduling around holidays and weekends, weather conditions, interruption in communication with smart meters and its Residential Advanced Metering Infrastructure (RAMI) system and more recently, government protocols regarding the COVID-19 pandemic.

JPS explained that the number of days for which a customer is billed is dependent on their billing cycle. Where a customer is billed for less or more than the number of days in a month, the necessary adjustment is made in the subsequent reading cycle, which would result in net billing days of sixty (60) or sixty-one (61) days over the two-month period.

The data from JPS also indicated that the total consumption billed above thirty-one (31) days in April was 2.175 GWh, which had a sales impact of \$111,204,497.30 at the prevailing billing rates. However, the analysis done to reallocate the additional billing days for April to the May billing cycle indicate that the changes in the exchange rate that affected the fuel and other charges, would have adversely impacted the affected customers.

(iii) Estimations

JPS advised that the estimation of bills was another factor identified as the cause for the increase in high consumption/bill complaints, particularly in instances where the usage alignment based on actual readings, resulted in a higher bill. In this regard, JPS advised that there was a 12% increase in estimated bills in 2020 April when compared with 2019 April. JPS indicated that this was due to:

- (a) The lockdown of the parish of St. Catherine in 2020 April;
- (b) A community in Clarendon (Cornpiece) being placed under quarantine in 2020 March;
and
- (c) The implementation of contact and social distancing measures resulting from the spread of COVID-19.

JPS also provided details of accounts for which consumption was estimated and had an excepted reading during the 2020 April – June period, which are outlined in Table 3.2.

Table 3.2: Estimated and Excepted Accounts

Month	Exceptions	Estimates from Exceptions	% Estimates ending in Exceptions
April	38,440	2,472	6%
May	31,640	2,466	8%
June	31,202	2,032	7%

3.3 OUR’S ANALYSIS OF JPS’ RESPONSE

JPS’ response identifies essentially three reasons for the increases in its bills:

- Substantial increases in residential bills arising from behavioural changes and consumption patterns occasioned by the COVID 19 measures;
- Increased days of sale; and
- The use of estimated consumption.

The OUR’s analysis of the data from JPS’ billing systems and the reasons for the increases proffered by JPS indicate varying degrees of plausibility.

It is noted that the complaints relating to increased electricity consumption/bills started in 2020 April, following the announcement of the first COVID-19 case and the designation of the island as a disaster area in March. This prompted the closure of schools and businesses, and the implementation of the WFH order and arrangements, in keeping with the GOJ stipulations, which resulted in persons spending more time at home. Based on the data presented, these circumstances align with the 11% increase in consumption for JPS residential customers and the negative percentage change for all other rate categories. The detailed analysis of JPS’ billing for Rates 10 and 20 account for the period 2020 January – May is provided in subsequent sections of this report.

Estimations and the Exceptions Criteria

With regard to JPS’ indications that estimation of consumption contributed to high bills/consumption during the referenced period, the information submitted by the company failed to adduce evidence in support of this claim.

For the calculation of estimated consumption, JPS’ Guaranteed Standard - EGS 8 stipulates that: *“an estimated bill should be based on an average of the last three (3) actual readings”*. Further, as a means of quality control to reduce the risk of incorrect bills being rendered to customers, the OUR in *“Decision: Enquiry into Billing System of the Jamaica Public Service Company Limited”* (Document No. Ele 2005/01) dated 2005 February 22, requires JPS to reject any reading that falls outside +/- 30% of average previous consumption for residential customers, and stipulates that this should not be applied to

the accounts until the reading is confirmed to be accurate. JPS is also required to notify the affected customers of the significant variance in their consumption. This is known as the Exceptions Criteria.

The data which relates to the number of accounts that fell into the Exceptions Criteria and for which the consumption was estimated during the period 2020 April – June indicates that:

- In April, there were 38,440 excepted accounts of which 2,472 were also billed on estimates, representing 6%;
- In May, there were 31,640 excepted accounts of which 2,466 were also billed on estimates, representing 8%; and
- In June, there were 31,202 excepted accounts of which 2,032 were also billed on estimates, representing 7%.

It was also identified that for the period 2014 August to 2020 June, JPS had not complied with the requirement to notify customers of the significant variance in consumption, as stipulated by the Exceptions Criteria. The company has advised that it resumed notifying customer of excepted readings in 2020 July, by way of SMS messages. The OUR will signal to JPS its concern regarding the company's clear failure to comply with an Office Directive and request specific undertakings regarding future compliance.

A review of JPS' Guaranteed Standards quarterly performance reports submitted to the OUR for the relevant period indicate that the company, in April, committed two (2) breaches of EGS 8. The report further indicates that the number of breaches of EGS 8 for May and June were five (5) and two (2) respectively.

Given the minimal number of breaches of EGS 8 committed during the 2020 April – June period and the low percentage of accounts for which consumption was estimated and fell within the Exceptions Criteria, the OUR is satisfied that the impact of any deviation from these quality control billing measures during April – June billing period, would not have affected a significant number of JPS customers or their billed consumption. The OUR therefore does not understand the basis on which estimation was cited by JPS as a factor which resulted in high bills/ consumption, as its examination of the data presented did not confirm this assertion.

Days of Sale/Billings days

The matter of JPS' response with respect to, Days of Sales or billing days, is another matter of concern for the OUR. While the OUR has taken note of the reasons offered by JPS that may cause an increase in its billing days, as far back as 2008 October, the OUR had issued a Memorandum (Document No. Ele 2008/11:Mem/02) dated 2008 October 10) to JPS , which states :

"...JPS shall ensure that at least ninety nine percent (99%) of bills be based on actual reading issued to customers reflect usage no greater than a billing period of thirty one (31) days."

The Memorandum was issued based on the OUR's findings of a similar investigation into high bill complaints by JPS. The findings of the 2008 investigation indicated a direct relationship between increased

days of sales/billing days, increased consumption and associated charges for that billing period. Accordingly, the Memorandum was issued by the OUR in an effort to bring a level of consistency to JPS billing days and to reduce the risk of bill shock on customers. JPS response indicates that it has not been fully compliant with, nor has instituted clear measures to reduce and ultimately eliminate the need to exceed the stipulated thirty-one (31) days per billing cycle.

Although the reasons for the use of thirty-three (33) days for billing by JPS are credible, the OUR has a duty to weigh and balance the interest of the customers against that of the company. The OUR is therefore of the view that JPS has not, over the years, sufficiently implemented measures to reduce and ultimately eliminate the need to exceed the stipulated thirty-one (31) days per billing cycle. The OUR will therefore seek specific undertakings from JPS regarding its future compliance with this requirement.

4 OVERVIEW OF SYSTEM METRICS AND JPS RATE SCHEDULE

Prior to conducting detailed investigation into JPS' accounts billing and metering data, system-wide metrics reported monthly by JPS, over the relevant period, were reviewed in order to set the backdrop for more detailed analysis. Such metrics include the system load curve, monthly net generation and sales by rate class. Additionally, an overview of the tariff structure and variation in billing determinants over time, can be indicative of variations in electricity bills.

4.1 SYSTEM METRICS

4.1.1 SYSTEM LOAD PROFILE AND DAILY LOAD CURVE

As indicated, government interventions to mitigate the public health impacts of the COVID-19 pandemic, affected electricity demand and usage patterns. Consequently, there was a general downward trend in the electricity system load profile, with a resultant decrease in daily peak demand as shown in Figures 4.1 and 4.2 below.

Figure 4.1: Electricity System Load Profile: 2020 March 10 - 2020 April 18

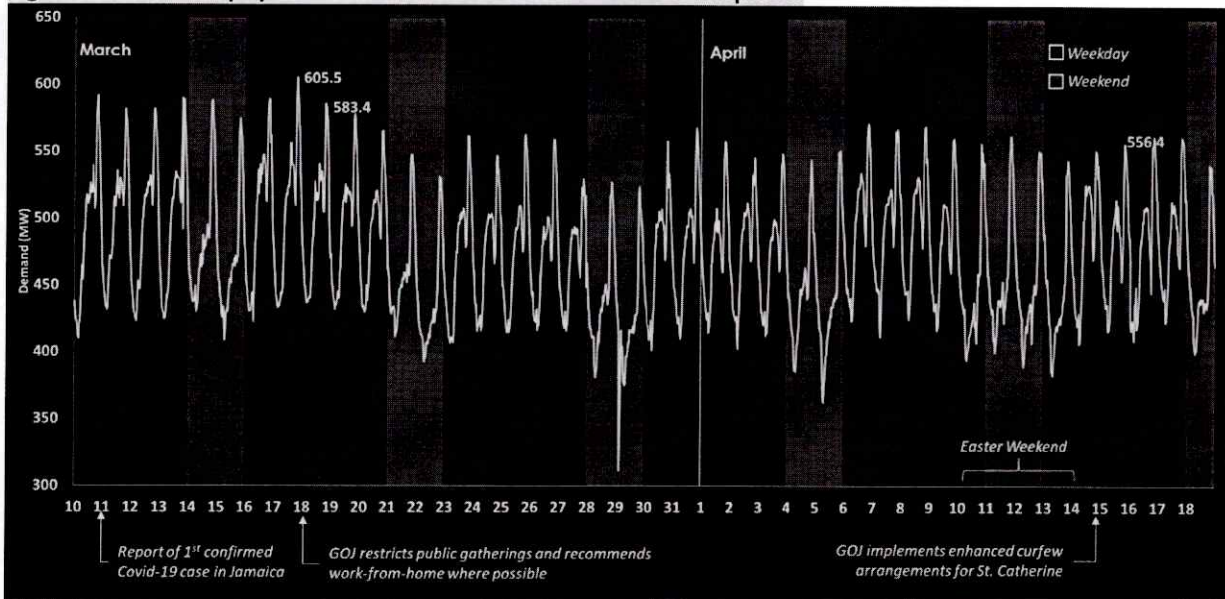
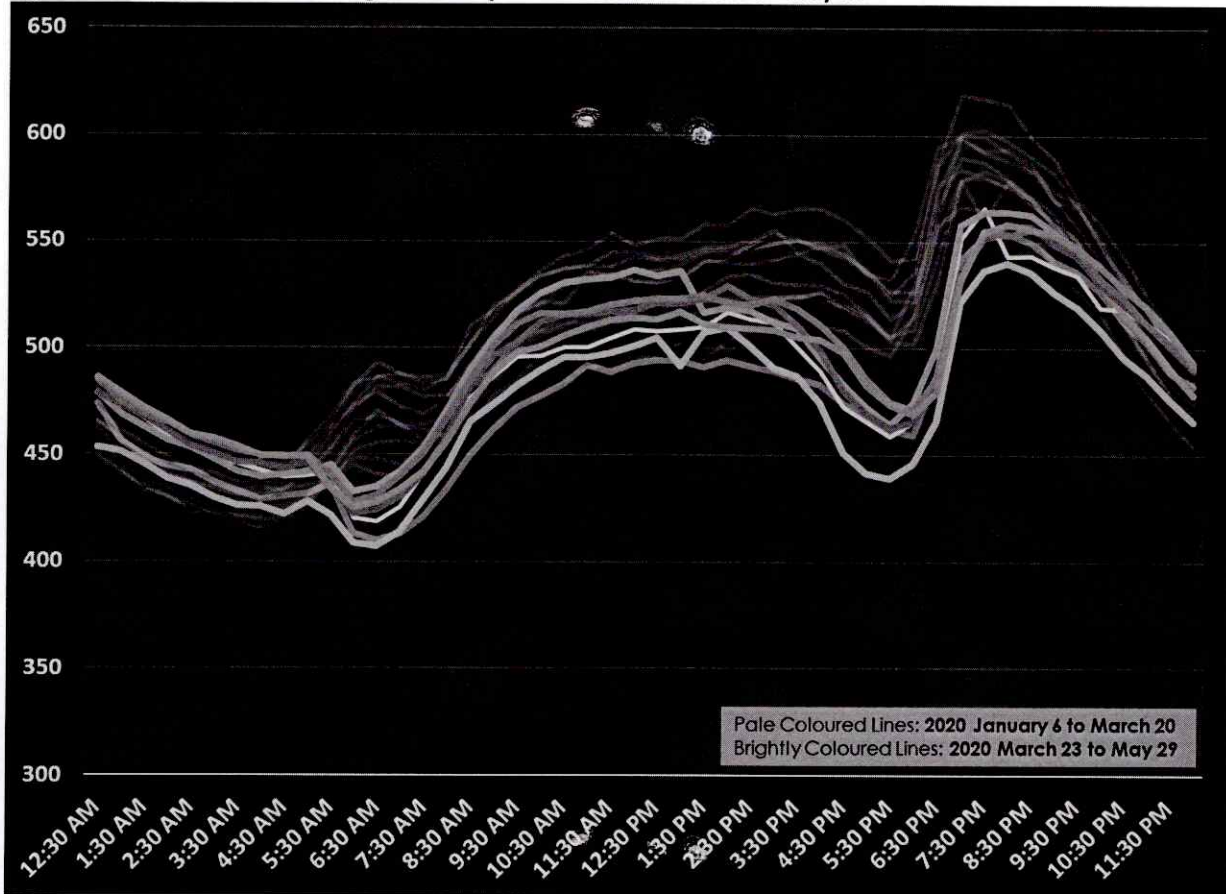


Figure 4.2: Comparison of Average Weekday Load Profile: 2020 Jan 6 - May 29



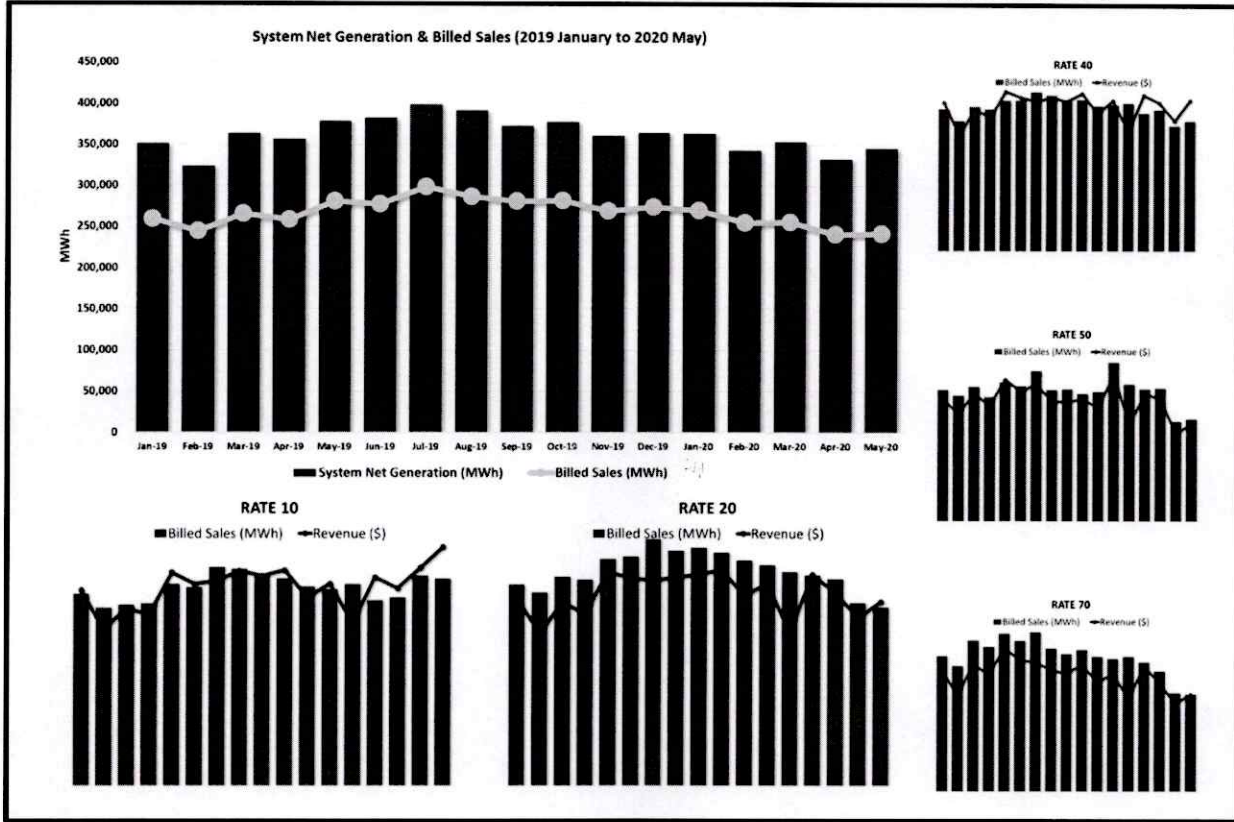
As observed in Figure 4.1 and Figure 4.2 above, there was a general downward shift in aggregate demand over the period. However, trends within the different customer classes may highlight the drivers for these observations.

4.1.2 NET GENERATION AND SALES 2019 JANUARY TO 2020 MAY

Figure 4.3 below shows trends in System Net Generation and Billed Sales, as well as Billed Sales and Revenue for the following five (5) rate classes:

- Rate 10;
- Rate 20;
- Rate 40;
- Rate 50; and
- Rate 70.

Figure 4.3: Trend in System Net Generation, Billed Sales with Rate Class Trends 2019 Jan – 2020 May



As seen in Figure 4.3, while Sales and Net Generation show some general decline towards the end of the period, a view of the separate rate classes shows noticeable differences. The residential (Rate 10) rate class, shows a marked increase in billed sales towards the end of the period. This is in contrast to some of the commercial and industrial rate classes, particularly Rate 50 and Rate 70, where sharp declines are observed towards the end of the period.

As such, the general reduction in overall demand appears to be largely attributed to a reduction in electricity demand for JPS' commercial and industrial rate classes. This is likely a direct result of measures implemented by the GOJ to alleviate public health impacts of COVID-19 such as WFH recommendations, and the significant reduction/shift in the level of activities in major sectors, such as tourism and education. Conversely, these measures have resulted in increased residential consumption, with large sections of the population spending significantly more of their time at home.

4.2 RATE SCHEDULE PARAMETERS AND BILLING DETERMINANTS

Electricity bills for all rate classes are calculated in accordance with the OUR's determined rate schedules in effect at the time. Due to delays with the JPS 2019-2024 Rate Review, the applicable rate schedule for the period 2020 January to May, is the 2018 – 2019 JPS Rate Schedule, which became effective on 2018 October 1.

With respect to Rate 10 and Rate 20, which are the rate classes under focus in this investigation, the components that make up the monthly billing calculations, as set out in the 2018 – 2019 JPS Rate Schedule, are described below. It should be noted that Pre-Paid Metering Service (allowed under both the Rate 10 and Rate 20 class) and the Community Renewal Rate (allowed under the Rate 10 class), both of which have variations from the standard rate structures, are not included in this investigation.

1. **Customer Charge** – Applicable whether or not there is any consumption and irrespective of the level of consumption and shall be a monthly contribution towards the cost of providing the service.
2. **Energy Charge** – Covers non-fuel costs that vary with consumption (kWh) such as the cost of wear and tear of the electricity plant in service and such additional fixed non-fuel costs not recovered through the Customer Charge.
3. **Fuel and Independent Power Producer (IPP) Charge** – A monthly amount per kWh, calculated in accordance with the additional terms and conditions of the 2018 – 2019 JPS Rate Schedule. The Fuel Charge represents the total cost of fuel (including the cost of fuel for energy purchased from Independent Power Producers) required for producing and delivering each kWh of electricity. The IPP Charge represents the difference between the IPP costs included in the base Customer and Energy Charges and the actual IPP non-fuel costs payable and/or paid by JPS. The Fuel and IPP Charge shall apply to all kWh billed in accordance with the 2018 – 2019 JPS Rate Schedule.
4. **Foreign Exchange Adjustment** – Applies to all charges except the Fuel and IPP Charge. The Foreign Exchange Adjustment is calculated in accordance with the additional terms and conditions of the 2018 – 2019 JPS Rate Schedule.

In addition to the billing components highlighted above, it should be noted that breaches of JPS' Standard Terms and Conditions or the Guaranteed Standards may also affect the final charge billed to customers. Also, General Consumption Tax (GCT) is collected on charges for consumption above 150kWh for Rate 10 customers, and on all charges for Rate 20 customers irrespective of consumption level. The application and impact of these bill components vary between customers, based on consumption level in the case of Rate 10 customers, and adherence to the JPS' Standard Terms and Conditions or the Guaranteed Standards.

4.2.1 CURRENT RATE SCHEDULE PARAMETERS

The 2018 – 2019 JPS Rate Schedule parameters currently utilized for calculating monthly bills for JPS' Rate 10 and Rate 20 customers are provided below.

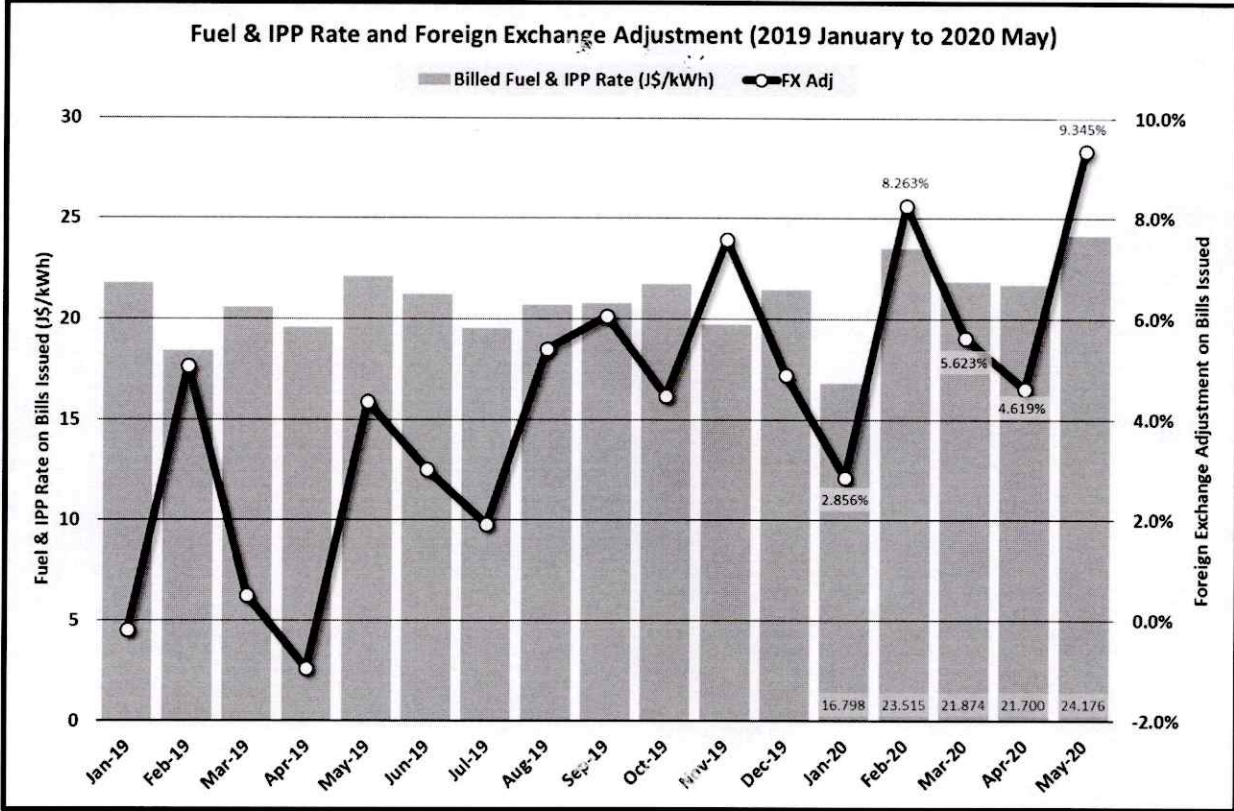
4.2.1.1 Rate 10

- Customer Charge: J\$445.39
- Energy Charge (<=100kWh): J\$9.66/kWh
- Energy Charge (>100kWh): J\$22.49/kWh
- Foreign Exchange Adjustment: See Figure 4.4 below.
- Fuel & IPP Rate: See Figure 4.4 below.

4.2.1.2 Rate 20

- Customer Charge: J\$992.24
- Energy Charge: J\$18.55/kWh
- Foreign Exchange Adjustment: See Figure 4.4 below.
- Fuel & IPP Rate: See Figure 4.4 below.

Figure 4.4: Billed Fuel & IPP Rate and Foreign Exchange Adjustment (2019 January to 2020 May)



5 ASSESSMENT METHODOLOGY AND DESCRIPTION OF DATA SETS PROVIDED BY JPS

5.1 APPROACH AND SCOPE OF ACTIVITIES

OUR's investigation included an examination of billing and metering data submitted by JPS for the Rate 10 and Rate 20 customer classes. The elements of the investigation are as follows:

- A. Investigation into the extent of changes in average electricity bills after the implementation of widespread COVID-19 mitigation strategies by the GOJ in late 2020 March. For simplicity, this involves comparing average electricity bills in the 2020 April to May period, to average electricity bills in the 2020 January to March period;
- B. Investigation of the relationship between changes in average consumption and changes in average electricity bills;
- C. Examination of the accuracy of JPS' billing calculation;
- D. Analysis of the billing impact on Rate 10 customers consuming increased energy above the Lifeline threshold of 100 kWh/month;
- E. Analysis of the billing impact of GCT on Rate 10 customers whose average consumption went from below the applicable threshold of 150kWh/month to above; and
- F. Analysis of the impact of movements in the monthly Billed Fuel and IPP Rate and the monthly Foreign Exchange Adjustment.

The investigation was largely driven by the analysis of monthly customer billing and metering data as well as other system data obtained from JPS as per OUR's stipulation. Notably, an OUR team, comprised of representatives from its Information Technology and Internal Audit Departments, attended JPS' offices on 2020 June 26 to obtain the relevant data. As part of the data extraction exercise, the OUR team observed and confirmed how the data capture was to be conducted. In light of the quantum of data needed, it was recognized that it would require a number of days to complete the transfer. However, the results are highly dependent on the accuracy, completeness and usability of the data obtained.

As the number of customers served by JPS is fairly large (>600,000), a statistical sample based analysis was initially considered. However, as the steps necessary to arrive at a representative sample of accounts would have required examination of the full datasets, it was decided that the full set of accounts would be examined (subject to a number of constraints), given that a statistical sample based approach was not expected to achieve any significant advantages in terms of expediency.

The primary activities performed in completing the investigation are detailed in the report and entails the following:

- A. Assessing Features and Constituents of the Data Sets Provided by JPS;
- B. Initial Screening of Accounts and Preparation of Data for Analysis;
- C. Data Evaluation and Analysis; and
- D. Presentation of Results and Findings.

5.1.1 ANALYSIS TIMEFRAME

Major elements of the analysis involved comparisons between average electricity bills and electricity consumption before the implementation of COVID-19 mitigation strategies (Timeline 1), and after (Timeline 2). As such, the two timelines to compare when conducting the analysis were as follows:

- Timeline 1 (Before Large-scale COVID-19 Mitigation Strategies): 2020 January – March; and
- Timeline 2 (After Large-scale Implementation of COVID-19 Mitigation Strategies): 2020 April – May.

While the beginnings of large-scale implementation of the most impactful of COVID-19 mitigation strategies was considered to have occurred during the month of 2020 March, and not exactly at the end of the month, based on the dataset available and for ease of analysis, the above timelines were selected for greater simplicity and ease of analysis.

5.2 DESCRIPTION OF DATASETS PROVIDED BY JPS

To facilitate the investigation, the OUR requested from JPS, by way of letter dated 2020 June 25, billing data from the company's Customer Information System (CIS) for all accounts for each month between 2019 January and 2020 May. Information requested for each account include:

- a) Account Identifiers (customer number, premises number, rate class, active/inactive, etc.);
- b) Consumption and Demand Data (kWh, kVA); and
- c) Bill Calculation Details (Fuel & IPP Charges, Foreign Exchange Adjustment, GCT, etc.).

The requested information was submitted by JPS, and in addition to the billing information requested above, JPS also provided metering information (monthly meter readings for each account, meter numbers, etc.); and meter reading exceptions information for the same period. A general description of the data sets provided by JPS is provided below.

5.2.1 DESCRIPTION OF DATASETS PROVIDED BY JPS

JPS generally categorized the customer account information that was submitted as follows:

- Billing Details (2019 January to 2020 May);
- Meter Reading (2019 January to 2020 May); and
- Meter Reading Exceptions (2019 January to 2020 May).

The datasets submitted under these categories, are summarized in [Table 5.1](#) below.

Table 5.1: Summary of Customer Account Datasets Submitted to the OUR by JPS

SUMMARY OF CUSTOMER ACCOUNT DATASETS SUBMITTED TO THE OUR BY JPS					
BILLING DETAILS (2019 JANUARY TO 2020 MAY)			METER READING (2019 JANUARY TO 2020 MAY)		
Item #	Period	# of Account Records	Item #	Period	# of Account Records
1	2019 – Jan	666,893	1	2019 – Jan	687,591
2	2019 – Feb	667,562	2	2019 – Feb	688,840
3	2019 – Mar	668,118	3	2019 – Mar	689,941
4	2019 – Apr	669,074	4	2019 – Apr	691,397
5	2019 – May	670,600	5	2019 – May	692,358
6	2019 – Jun	670,486	6	2019 – Jun	693,486
7	2019 – Jul	672,950	7	2019 – Jul	695,303
8	2019 – Aug	673,102	8	2019 – Aug	697,121
9	2019 – Sep	670,973	9	2019 – Sep	698,564
10	2019 – Oct	676,449	10	2019 – Oct	700,006
11	2019 – Nov	676,883	11	2019 – Nov	700,770
12	2019 – Dec	694,425	12	2019 – Dec	703,566
13	2020 – Jan	680,709	13	2020 – Jan	704,420
14	2020 – Feb	681,209	14	2020 – Feb	706,090
15	2020 – Mar	681,671	15	2020 – Mar	707,121
16	2020 – Apr	679,591	16	2020 – Apr	707,729
17	2020 – May	680,947	17	2020 – May	709,232
METER READING EXCEPTIONS (2019 JANUARY TO 2020 MAY)					
Item #	Period	# of Account Records			
1	2019 Jan – Jun	411,236			
2	2019 Jul – Dec	454,510			
3	2020 Jan – May	376,245			

As indicated in Table 5.1 above, the number of account records, particularly when examining Billing Details and Meter Reading datasets, fluctuated on a monthly basis. This is expected as new customers are added, and changes made to the status of existing customers on an ongoing basis. This situation created a challenge in the analysis, as in order to determine changes in billing, consumption, and other account parameters, the subset of accounts which were active in all months during the analysis timeframe (2020 January to May), had to be identified. This process is described further below. Information relevant to the analysis timeframe are highlighted in Table 5.1 above.

5.3 DATA REVIEW

Prior to performing the assessments, relevant datasets submitted by JPS were initially reviewed for consistency and completeness. As indicated, this process was necessary to ensure that the results and outcomes are reasonably representative.

This data review process involved the following steps:

1. Each dataset within the analysis timeframe, for both the Billing Details datasets, and the Meter Reading datasets were examined to determine account records, which were present in all relevant datasets. This was a necessary step to ensure congruence among all datasets to be used in assessments. Records that did not meet this qualification were not included in further aspects of the assessment.

2. Account numbers that appeared multiple times in a single dataset, as well as those that had negative or zero consumption for any single month during the Analysis Timeframe were identified, and excluded from the dataset to limit the effect of data biases in the analysis.
3. As meter numbers were provided for each account in monthly Meter Reading datasets, it was possible to identify accounts that experienced a meter change during the Analysis Timeframe. A meter change occurring on some accounts was considered to have some potential of introducing bias to the analysis. As such, accounts experiencing a meter change during the Analysis Timeframe were excluded from further analysis.

After initial data review, the refined datasets were then used to conduct the analysis.

A description of how the number of account records ultimately used in the assessments was arrived at, initial observations made and data preparation work performed are presented below.

5.3.1 INITIAL OBSERVATIONS

As indicated, OUR's initial review of the relevant JPS datasets focused on ensuring that a consistent set of account records were used in the analysis and that the records used contained sufficient information and did not introduce additional complexities in the analysis, given the exigencies involved. The number of account records used in the analysis after the different screening are summarized in Table 5.2 below.

Table 5.2: Number of Account Records Used in OUR's Assessment

Number of Account Records Used in OUR's Assessment	
# of monthly account records provided	See Table 2.1
# of RT 10 and RT 20 accounts included among all relevant Datasets in the Analysis Timeframe	645,053
# of accounts after performing steps 2 and 3 listed above	547,423

To reiterate, account records excluded from further analysis include those with limited information for comparison, such as records of zero consumption in some months; and accounts which appear to have been subject to a meter change during the Analysis Timeframe.

5.3.2 PREPARATION OF DATA FOR ASSESSMENT

Based on the identified data issues, it was not considered prudent to include accounts with unsuitable data records in the assessment. Therefore, with some level of data screening and alteration, usable records that allow for reasonable comparison were retained and used for the assessment.

The information pertaining to each record used for assessment includes:

1. Customer and Premises Number;
2. Rate Class;
3. Parish / Region;
4. Meter Number;
5. Meter Manufacturer;
6. Monthly Billing Calculation Parameters, Including Consumption (kWh); and
7. Average Percentage Change in Billing and Consumption (Timeline 2 vs. Timeline 1).

- Timeline 1 (“T1”): 2020 January to March
- Timeline 2 (“T2”): 2020 April to May

6 DATA STRUCTURE AND CATEGORIZATION

6.1 ACCOUNT RECORDS DATA ORIENTATION

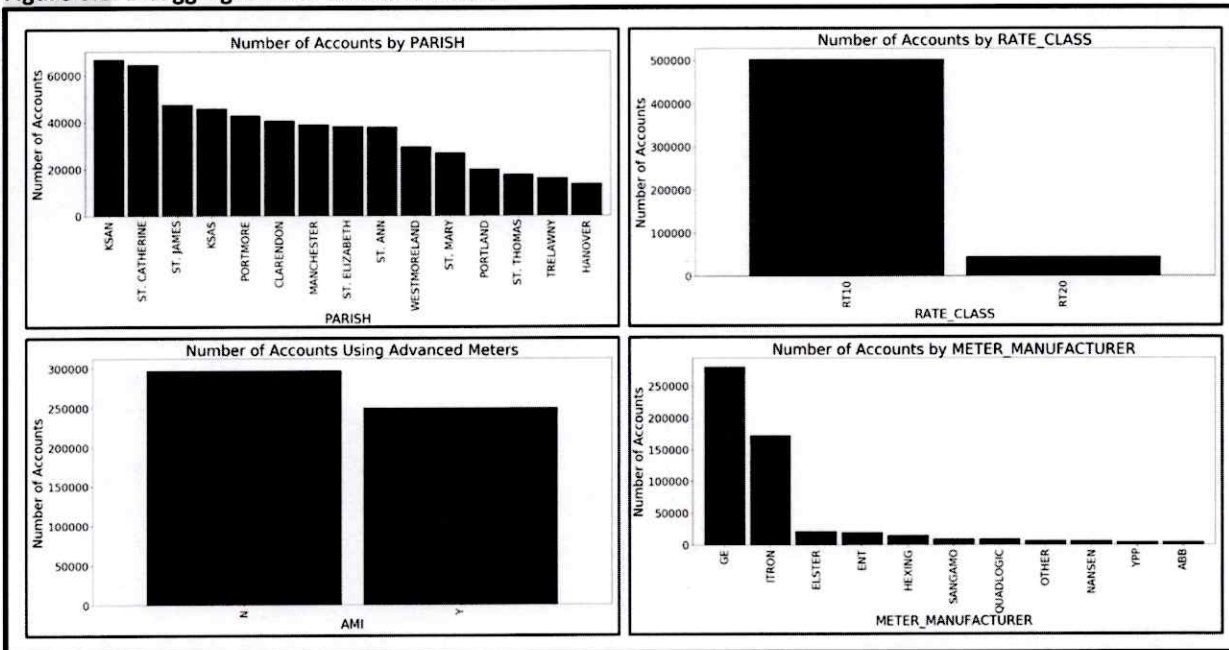
Following the data normalization process, the data in the selected account records was evaluated and categorized as shown in Table 6.1 below.

Table 6.1: Categorization of Selected Rate 10 and Rate 20 Account Records

CATEGORIZATION OF SELECTED RATE 10 AND RATE 20 ACCOUNTS			
NUMBER OF ACCOUNTS BY PARISH/REGION		NUMBER OF ACCOUNTS PER METER MANUFACTURER	
CLARENDON	40,692	GE	279,721
HANOVER	13,628	ITRON	172,619
KSAN	66,879	ELSTER	20,795
KSAS	45,975	ENT	19,820
MANCHESTER	39,029	HEXING	14,699
PORTLAND	19,884	SANGAMO	9,116
PORTMORE	42,866	QUADLOGIC	8,852
ST. ANN	38,019	NANSEN	6,019
ST. CATHERINE	64,566	YPP	4,565
ST. ELIZABETH	38,135	ABB	4,528
ST. JAMES	47,559	OTHER	6,689
ST. MARY	26,886	NUMBER OF ACCOUNTS BY RATE CLASS	
ST. THOMAS	17,640	ACCOUNTS ASSOCIATED WITH AN ADVANCED METER	
TRELAWNY	16,203	RATE 10	502,635
WESTMORELAND	29,462	RATE 20	44,788
		YES	250,141
		NO	297,282

Figure 6.1 below further illustrates the characteristics of the account records pertinent to the assessment:

Figure 6.1: Disaggregation of Account Records



Categorization of selected accounts was largely in line with expectations, with regards to Parish/Region account allocations and Rate Class allocations. As indicated, the figures represent numbers used for this analysis, based on the necessary constraints, and therefore would not match the present number of JPS customers in the respective rate classes. Of note, from Figure 6.1 above, while JPS has been aggressively rolling out advanced electricity meters over the last few years, they have still not achieved 50% coverage in their Rate 10 and Rate 20 customer classes.

7 ASSESSMENT OF BILLING AND CONSUMPTION CHANGES DURING ANALYSIS TIMEFRAME

7.1 INPUTS AND ASSUMPTIONS

This assessment focused primarily on changes in the average electricity bills and consumption for JPS' Rate 10 and Rate 20 customers during the 2020 January to May period. Specifically, changes in average electricity bills and consumption for the 2020 April to May timeframe ("Timeline 1") relative to the 2020 January to March timeframe ("Timeline 2") were examined. The following derived parameters were used in the assessment:

- Average Change in Customer Bills for Timeline 2 vs. Timeline 1 ["CHANGE_BILLS"]
- Average Change in Consumption for Timeline 2 vs. Timeline 1 ["CHANGE_CONS"]
- Average Percentage Change in Customer Bills for Timeline 2 vs. Timeline 1 ["PERCENT_CHANGE_BILLS"]
- Average Percentage Change in Consumption for Timeline 2 vs. Timeline 1 ["PERCENT_CHANGE_CONS"]

This data was then collated with the relevant information in the Selected Accounts dataset, such as account identifiers, to constitute the database used for the assessment. The resulting dataset was then subject to statistical analysis, which is described in the sections below.

7.2 STATISTICAL ANALYSIS

7.2.1 ASSESSMENT OF SELECTED ACCOUNTS

Based on statistical analyses carried out on the Selected Accounts (547,423 Rate 10 and Rate 20 accounts), the resulting summary statistics are presented in Table 7.1 below.

Table 7.1: Summary Statistics – All Selected Rate 10 and Rate 20 Accounts

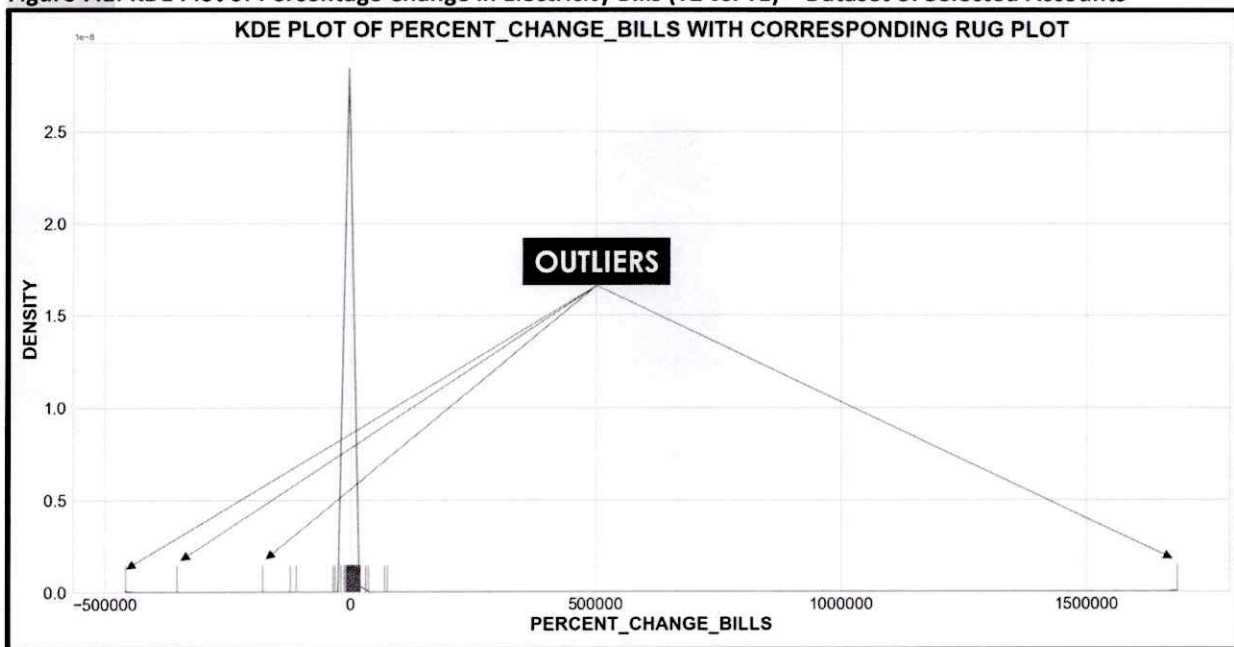
SUMMARY STATISTICS – SELECTED RATE 10 AND RATE 20 ACCOUNTS						
FEATURE	COUNT	MIN	MAX	MEAN	MEDIAN	STD DEV
Percentage Change in Total Electricity Bills (2020 Apr – May vs. 2020 Jan – Mar)	547,423	-457,850.68	1,684,387.62	24.18	17.25	2,439.75
Percentage Change in Consumption (2020 Apr – May vs. 2020 Jan – Mar)	547,423	-99.82	67,585.05	15.97	9.15	195.12
Absolute Change in Total Electricity Bills (2020 Apr – May vs. 2020 Jan – Mar) [\$]	547,423	-480,228.55	1,495,253.53	1,078.24	789.01	7,136.55
Absolute Change in Consumption (2020 Apr – May vs. 2020 Jan – Mar) [kWh]	547,423	-11,106.67	28,703.50	11.80	10.53	133.67

The mean and median statistic are measures of central tendency that can be used to formulate deductions and describe a specific dataset. As presented in Table 7.1 above, the mean absolute change in electricity for combined Rate 10 and Rate 20 classes was found to be an increase of **J\$1,078.24**, with a median increase of **J\$789.01**. These correspond to a mean percentage increase of **24.18%**, with a median increase of **17.25%**.

With respect to the change in consumption, the mean change was determined to be **11.80 kWh**, with a median value of **10.53 kWh**. These figures correspond to a mean percentage increase in consumption of **15.97%**, with a median increase of **9.15%**.

Deviations between the respective mean and median values, indicate some amount of skewness in the data. Based on the values shown, with mean values being greater than the medians, it can be deduced that there are a number of data points substantially larger than the respective median values. The other statistical features (i.e. min, max and standard deviation) clearly indicate that there is a very large spread for both features in the dataset, particularly with respect to the percentage change in total electricity bills. This is illustrated in **Figure 7.1** below, with a few of the large outliers identified.

Figure 7.1: KDE Plot of Percentage Change in Electricity Bills (T2 vs. T1) – Dataset of Selected Accounts



Based on the summary statistics presented, and in line with the nature of electricity rate structures for the Rate 10 and Rate 20 classes, it is clear that the increase in electricity bills can be partly explained by an increase in consumption. However, the relationship between the two metrics are not entirely linear, with other factors contributing to the observed average bill increase for the relevant rate classes.

7.2.2 OUTLIERS

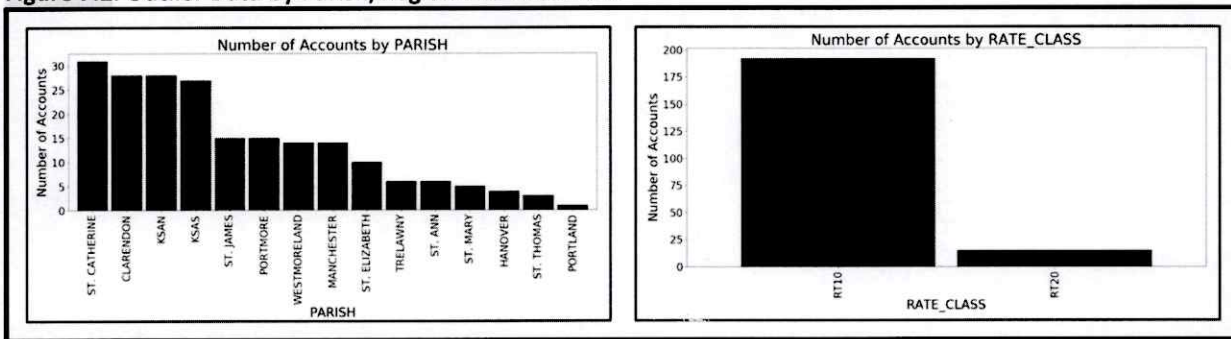
As shown in **Figure 7.1** above, there are a number of data points that can be considered outliers when examining the percentage change in electricity bills. Based on the results presented in **Table 7.1** above, a total of 207 accounts were identified as outliers, with the threshold selected for an outlier being data points one standard deviation away from the mean. These 207 outliers are categorized as shown in **Table 7.2** below.

Table 7.2: Categorization of Outlier Rate 10 and Rate 20 Accounts

CATEGORIZATION OF SELECTED RATE 10 AND RATE 20 ACCOUNTS			
NUMBER OF ACCOUNTS BY RATE CLASS		ACCOUNTS ASSOCIATED WITH AN ADVANCED METER	
RATE 10	192	YES	125
RATE 20	15	NO	82
NUMBER OF ACCOUNTS BY PARISH/REGION		NUMBER OF ACCOUNTS PER METER MANUFACTURER	
CLARENDON	28	GE	83
HANOVER	4	ITRON	41
KSAN	28	ELSTER	9
KSAS	27	ENT	16
MANCHESTER	14	HEXING	30
PORTLAND	1	SANGAMO	2
PORTMORE	15	QUADLOGIC	18
ST. ANN	6	NANSEN	1
ST. CATHERINE	31	YPP	4
ST. ELIZABETH	10	ABB	1
ST. JAMES	15	OTHER	2
ST. MARY	5		
ST. THOMAS	3		
TRELAWNY	6		
WESTMORELAND	14		

Some features of the outlier data provided in Table 7.2 are also represented graphically in Figure 7.2 below.

Figure 7.2: Outlier Data by Parish/Region and Rate Class



7.2.2.1 Observations

- 1) Consistent with expectations, the majority of outlier cases were associated with Rate 10 accounts, and were associated with Parishes/Regions with a higher number of JPS accounts.
- 2) Based on OUR information on JPS meter patterns, a number of the meter manufacturers that are features of outlier accounts, are primarily associated with electricity meters that form part of a Residential Automated Metering Infrastructure (RAMI). As represented in Table 7.2 above, these manufacturers are specifically: ENT, Hexing, Quadlogic and YPP. Accounts associated with these meter types represent 68 of the 207 outliers (32.9%). By comparison, the number of accounts associated with these meter manufacturers in the entire population of selected accounts is only 8.8%. This relatively high number of outlier accounts linked to RAMI systems, may require further investigation.

7.3 ASSESSMENT OF ADJUSTED DATASET – OUTLIERS REMOVED

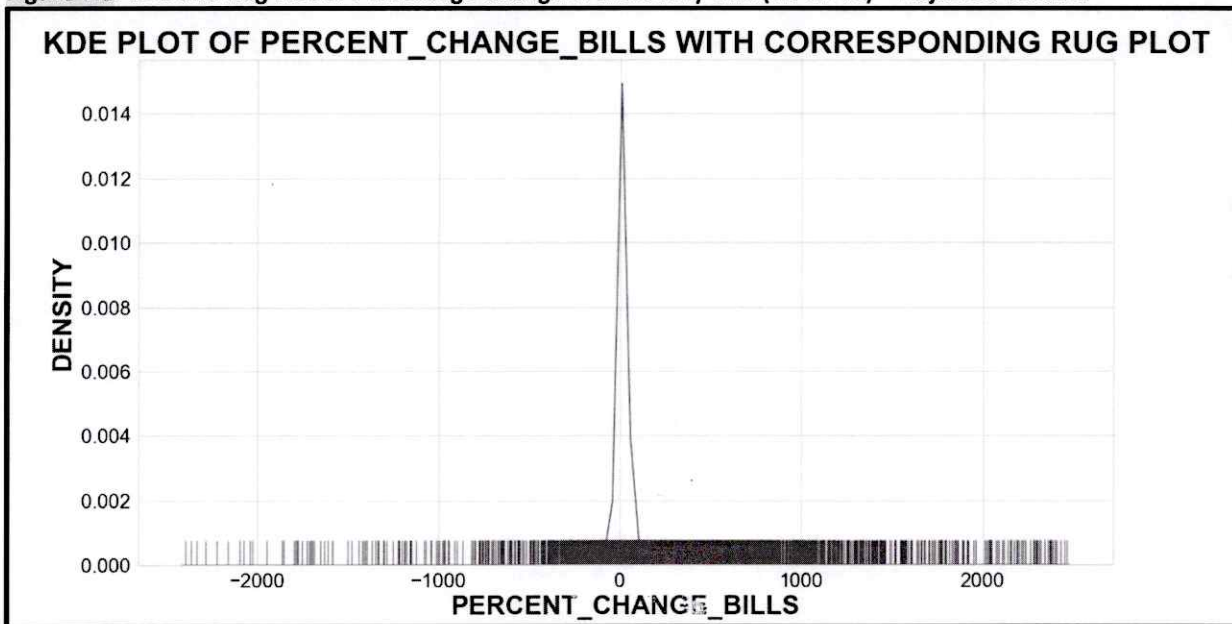
To limit the influence of the outliers, the 207 outliers were removed from the dataset of Selected Accounts (“Adjusted Dataset”). Statistical analyses on the Adjusted Dataset yielded the summary statistics presented in Table 7.3 below.

Table 7.3: Summary Statistics from Adjusted Dataset – Outliers Removed

SUMMARY STATISTICS – ADJUSTED DATASET (OUTLIERS REMOVED)						
FEATURE	COUNT	MIN	MAX	MEAN	MEDIAN	STD DEV
Percentage Change in Total Electricity Bills (2020 Apr – May vs. 2020 Jan – Mar)	547,216	-2,397.28	2,463.06	21.87	17.24	64.34
Percentage Change in Consumption (2020 Apr – May vs. 2020 Jan – Mar)	547,216	-99.82	15,550.00	14.43	9.15	90.56
Absolute Change in Total Electricity Bills (2020 Apr – May vs. 2020 Jan – Mar) [\$]	547,216	-480,228.55	698,043.94	1,038.20	788.47	5,429.67
Absolute Change in Consumption (2020 Apr – May vs. 2020 Jan – Mar) [kWh]	547,216	-11,106.67	8,578.75	11.10	10.52	104.12

As shown in Table 7.3 above, with the outliers removed, statistical analysis revealed a mean change in electricity bills of **J\$1,038.20**, with a mean consumption change of **11.10 kWh**. Additionally, the mean percentage change in electricity bills was found to be **21.87%**, with some level of convergence towards the median. This statistical representation is illustrated in Figure 7.3 below.

Figure 7.3: KDE and Rug Plot of Percentage Change in Electricity Bills (T2 vs. T1) – Adjusted Dataset



As seen in Table 7.3 and Figure 7.3 above, the range of values for the percentage change in electricity bills, is very wide, with values ranging from a minimum of -2,397.28% to 2,463.06 for the Adjusted Dataset. However, as shown in Figure 7.3 above, the majority of values densely surround the median value of 17.24%.

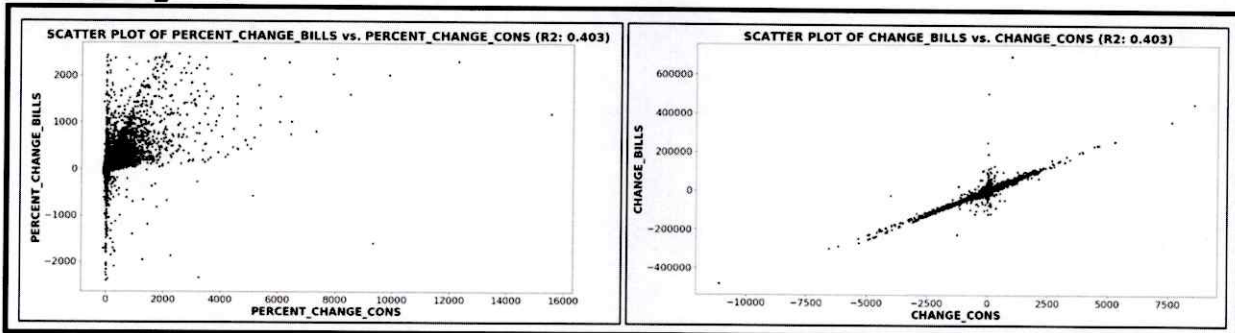
7.4 CORRELATION AND RELATIONSHIPS

While Table 7.3 and Figure 7.3 provide summary statistics for the Adjusted Dataset, further characteristics about the dataset can be investigated by examining correlations and relationships among features associated with each account in the Adjusted Dataset. Such correlations and relationships can be helpful in uncovering potential causal factors for the calculated average increase in electricity bills for JPS' Rate 10 and Rate 20 customers when comparing Timeline 2 to Timeline 1.

7.4.1 NUMERIC RELATIONSHIPS

The numeric features in the dataset are coded as *PERCENT_CHANGE_BILLS*, *PERCENT_CHANGE_CONS*, *CHANGE_BILLS* and *CHANGE_CONS*, which were described previously. Figure 7.4 below contains two scatter plot diagrams which compare the indicated features.

Figure 7.4: Scatter Plots Comparing *PERCENT_CHANGE_BILLS* with *PERCENT_CHANGE_CONS* and *CHANGE_BILLS* with *CHANGE_CONS*



While the two scatter plots may at first glance appear different, they tell similar stories. Two general patterns are apparent. The first is a cluster of data points projecting almost vertically at a *PERCENT_CHANGE_CONS* or *CHANGE_CONS* value of close to zero, across the range of bill increase values. The other pattern observed is a cluster of data points which suggest an increase in electricity bills with increasing consumption, which is expected, based on the rate structure for Rate 10 and Rate 20 customer classes. The r-squared value calculated for the entire Adjusted Dataset is 0.403, as shown in Figure 7.4. This indicates that about 40.3% of the change in electricity bills can be directly explained by a change in consumption. This suggests that other factors may also have had influence on changes in electricity bills, besides consumption change.

7.4.2 CATEGORICAL RELATIONSHIPS

Similar to the numeric features, possible relationships between some of the categorical features and *PERCENT_CHANGE_BILLS* were explored. The box plots shown in Figure 7.5 and 7.6 below show some of these relationships.

Figure 7.5: Box Plots of PERCENT_CHANGE_BILLS by Parish/Region

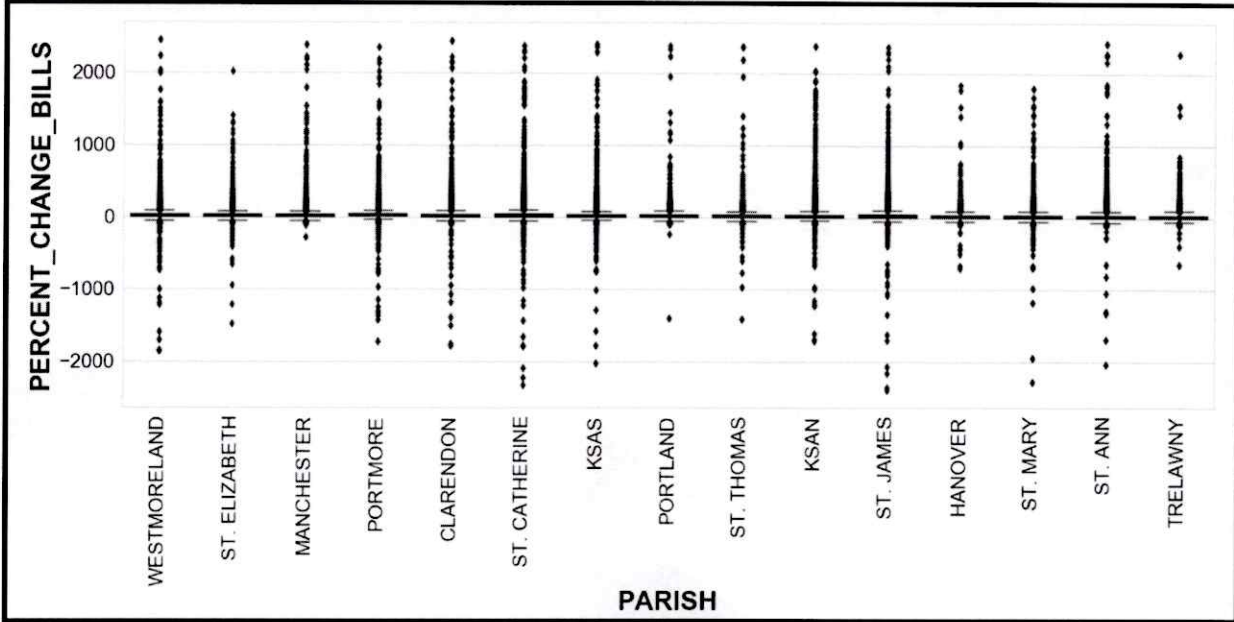
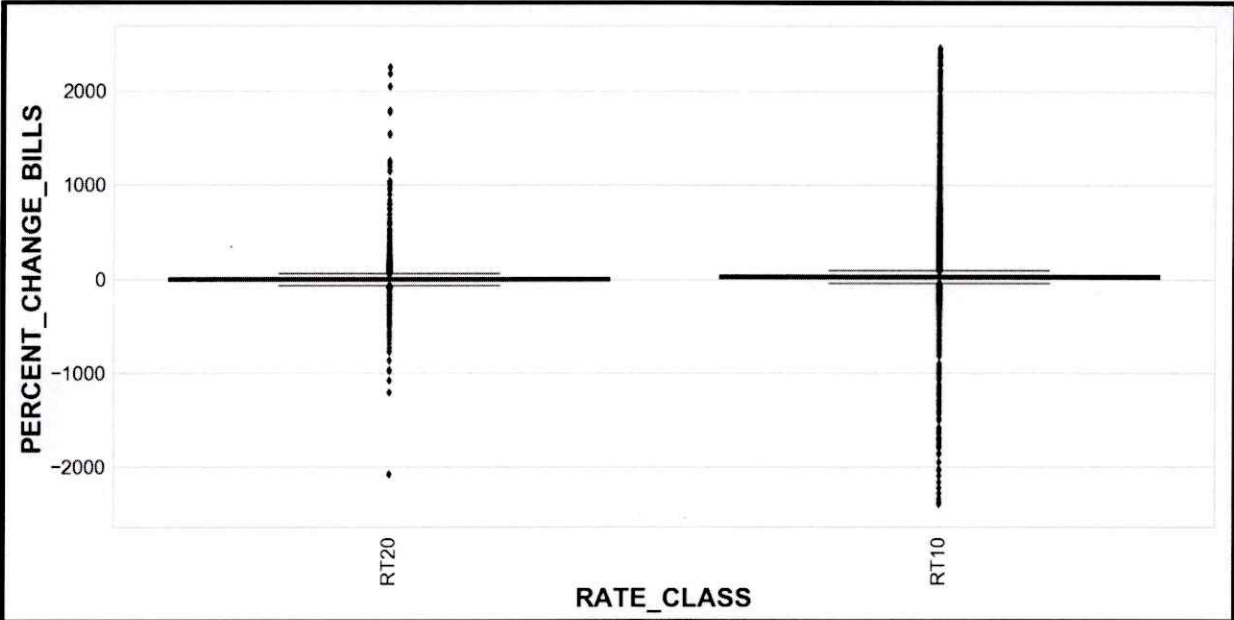


Figure 7.6: Box Plots of PERCENT_CHANGE_BILLS by Rate Class



The series of box plots presented by Parish/Region and Rate Class, in Figures 7.5 and 7.6 above, provide limited information, largely because of the wide range of values for PERCENT_CHANGE_BILLS, which results in compressed box plots. Nevertheless, the figures demonstrate that the range of values for PERCENT_CHANGE_BILLS is somewhat similar for most Parishes/Regions, except for Trelawny, Hanover and Manchester, which have significantly higher minimum values, with Hanover and St. Mary having significantly lower maximum values.

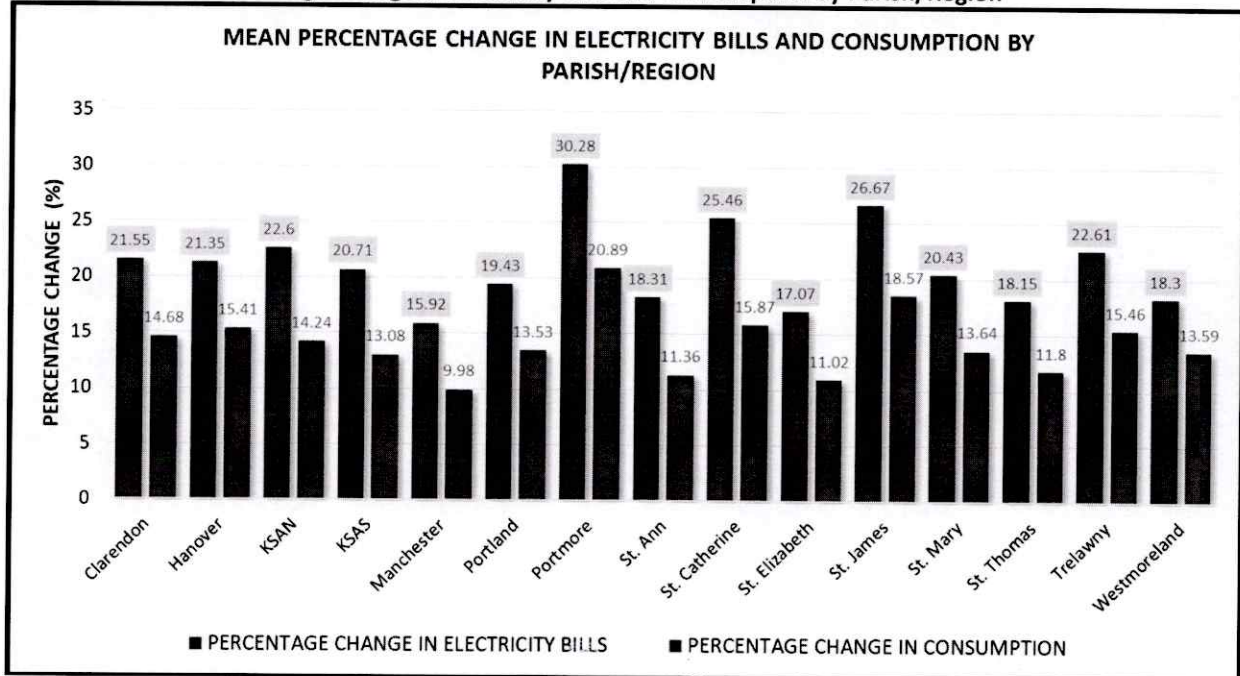
To gain more insight into the variations across Parishes/Regions and Rate Classes, summary statistics were calculated, as presented in Table 4.4 below.

Table 7.4: Summary Statistics by Parish/Region

SUMMARY STATISTICS FOR PERCENTAGE CHANGE IN BILLS & CONSUMPTION BY PARISH/REGION – SELECTED ACCOUNTS											
PARISH	COUNT	PERCENTAGE CHANGE IN BILLS					PERCENTAGE CHANGE IN CONSUMPTION				
		MIN	MAX	MEAN	MEDIAN	STD DEV	MIN	MAX	MEAN	MEDIAN	STD DEV
Clarendon	40,664	-1,779.72	2,450.84	21.55	16.70	66.24	-99.32	5,171.43	14.68	8.55	93.59
Hanover	13,624	-699.62	1,851.61	21.35	16.63	58.39	-99.30	2,975.00	15.41	9.05	82.87
KSAN	66,851	-1,711.35	2,377.06	22.60	18.18	64.10	-99.12	8,510.51	14.24	10.22	79.65
KSAS	45,948	-2,025.25	2,405.39	20.71	15.41	68.67	-99.82	8,031.58	13.08	7.28	97.62
Manchester	39,015	-273.27	2,396.86	15.92	12.25	57.02	-99.32	4,160.00	9.98	5.25	83.62
Portland	19,883	-1,405.68	2,386.56	19.43	15.86	59.52	-99.35	3,453.13	13.53	8.26	84.13
Portmore	42,851	-1,726.92	2,358.56	30.28	25.78	61.58	-99.59	4,353.49	20.89	16.22	64.20
St. Ann	38,013	-2,038.74	2,428.42	18.31	14.39	64.51	-99.24	6,368.75	11.36	7.14	76.37
St. Catherine	64,535	-2,331.66	2,377.06	25.46	20.10	67.57	-99.33	12,297.63	15.87	10.37	89.70
St. Elizabeth	38,125	-1,480.95	2,020.93	17.07	13.29	51.88	-98.93	9,888.24	11.02	5.91	95.36
St. James	47,544	-2,397.28	2,369.83	26.67	20.60	72.75	-99.77	15,550.00	18.57	12.02	113.83
St. Mary	26,881	-2,283.65	1,799.03	20.43	16.48	60.19	-99.21	5,367.50	13.64	8.15	88.91
St. Thomas	17,637	-1,415.08	2,375.16	18.15	14.65	61.32	-99.31	5,510.00	11.80	6.99	85.68
Trelawny	16,197	-643.37	2,284.62	22.61	17.52	60.68	-99.10	4,560.71	15.46	9.98	87.40
Westmoreland	29,448	-1,864.08	2,463.06	18.30	13.93	71.37	-99.77	9,348.72	13.59	6.60	118.33

For illustration, the mean percentage change in electricity bills and consumption by Parish/Region were plotted as shown in Figure 7.7 below.

Figure 7.7: Mean Percentage Change in Electricity Bills and Consumption by Parish/Region



Initial observations from Table 7.4 and Figure 7.7 reveal that Portmore, St. Catherine and St. James showed the largest average percentage increase in electricity bills and consumption with Manchester and

St. Elizabeth showing the lowest average percentage increases for both metrics. Generally, the relative change in electricity consumption when comparing one Parish/Region to the others followed the relative trend for consumption change.

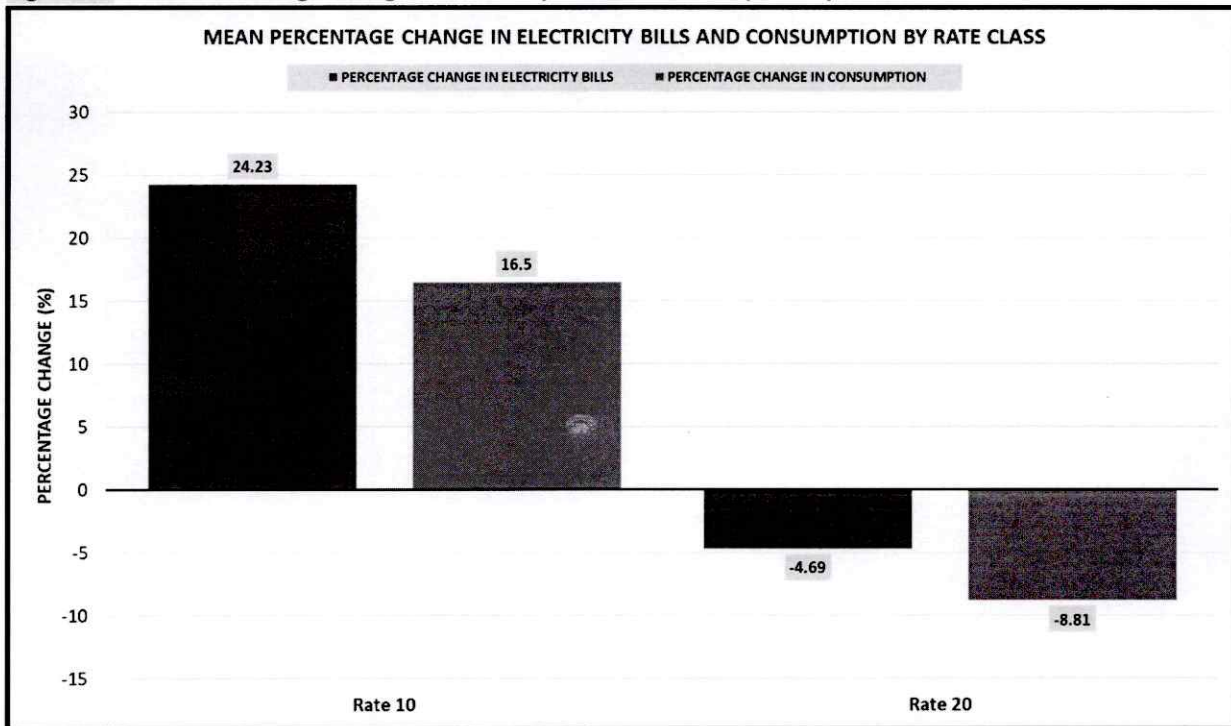
Similar to the summary statistics presented by Parish/Region, summary statistics can also be presented by Rate Class. This is presented in Table 7.5 below.

Table 7.5: Summary Statistics by Rate Class

SUMMARY STATISTICS FOR PERCENTAGE CHANGE IN BILLS & CONSUMPTION BY RATE CLASS – SELECTED ACCOUNTS											
RATE CLASS	COUNT	PERCENTAGE CHANGE IN BILLS					PERCENTAGE CHANGE IN CONSUMPTION				
		MIN	MAX	MEAN	MEDIAN	STD DEV	MIN	MAX	MEAN	MEDIAN	STD DEV
Rate 10	502,443	-2,397.28	2,463.06	24.23	19.14	64.79	-99.82	15,550.00	16.50	10.45	90.80
Rate 20	44,773	-2,075.78	2,262.31	-4.69	-2.69	52.08	-99.77	7,317.57	-8.81	-8.06	84.45

For illustration, the mean percentage change in electricity bills and consumption by Rate Class were plotted as shown in Figure 7.8 below.

Figure 7.8: Mean Percentage Change in Electricity Bills and Consumption by Rate Class



As seen, Rate 20 accounts on average, actually experienced a reduction in electricity bills and consumption, with the increase in average electricity bills and consumption therefore primarily attributed to Rate 10 accounts. Based on the nature of the COVID-19 mitigation measures, this finding meets expectations.

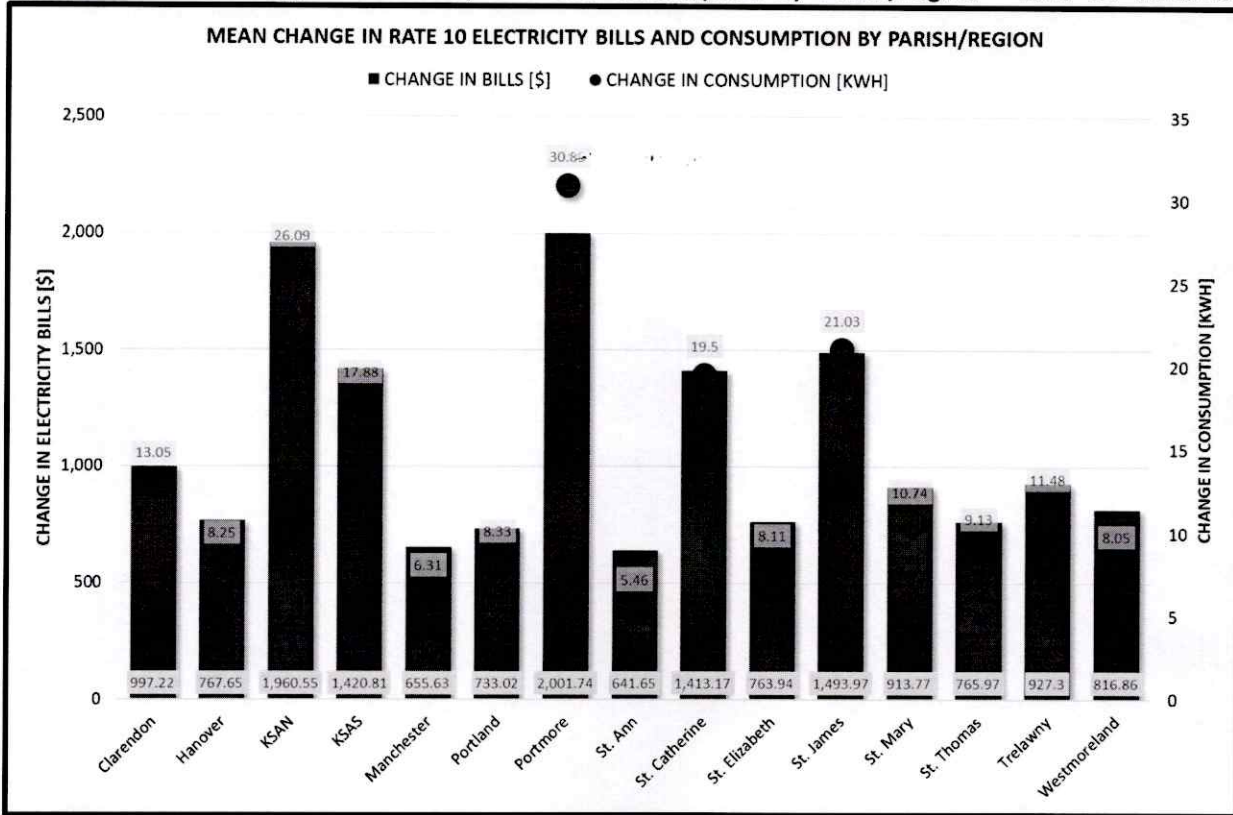
With this deviation in changes in electricity bills and consumption across the two rate classes, the absolute changes (J\$ and kWh) with respect to Rate 10 alone was investigated. Summary statistics in this regard, are presented in Table 7.6 below.

Table 7.6: Summary Statistics by Parish/Region – Rate 10 Only

SUMMARY STATISTICS FOR ABSOLUTE CHANGE IN BILLS & CONSUMPTION BY PARISH/REGION – SELECTED ACCOUNTS (RATE 10)											
PARISH	COUNT	CHANGE IN BILLS [J\$]					CHANGE IN CONSUMPTION [kWh]				
		MIN	MAX	MEAN	MEDIAN	STD DEV	MIN	MAX	MEAN	MEDIAN	STD DEV
Clarendon	37,491	-62,001.49	102,351.47	997.22	688.16	2,511.72	-1,306.33	2,123.00	13.05	9.50	50.03
Hanover	12,459	-249,305.94	57,333.63	767.65	739.94	7,080.09	-4,934.85	1,024.17	8.25	10.67	139.68
KSAN	61,924	-135,997.71	455,663.27	1,960.55	1,274.46	5,832.02	-2,647.67	8,578.75	26.09	18.00	103.60
KSAS	40,614	-150,588.15	239,164.47	1,420.81	987.52	4,474.29	-2,927.41	4,558.83	17.88	12.60	80.41
Manchester	35,449	-90,700.23	122,485.70	655.63	517.86	2,640.94	-1,793.00	2,409.00	6.31	6.00	52.11
Portland	18,065	-245,969.31	237,935.07	733.02	609.60	4,251.37	-4,859.83	4,585.50	8.33	8.67	83.94
Portmore	41,494	-63,247.50	506,002.42	2,001.74	1,549.80	4,300.36	-1,228.58	4,627.32	30.85	24.44	62.44
St. Ann	34,417	-237,828.91	99,685.01	641.65	621.26	4,797.21	-4,722.36	1,704.17	5.46	8.46	93.25
St. Catherine	60,429	-113,332.87	154,865.55	1,413.17	980.94	3,165.68	-2,239.37	2,952.22	19.50	13.56	58.65
St. Elizabeth	34,226	-136,386.70	63,643.89	763.94	569.42	2,810.11	-2,736.67	1,128.50	8.11	6.71	54.81
St. James	43,582	-240,014.25	180,619.22	1,493.97	1,081.72	5,119.98	-4,706.50	3,277.50	21.03	16.50	96.33
St. Mary	24,786	-233,407.01	235,760.16	913.77	680.14	3,955.45	-4,586.00	4,436.23	10.74	9.17	75.30
St. Thomas	16,180	-98,577.86	46,692.41	765.97	569.62	2,285.77	-1,949.83	994.98	9.13	7.33	45.43
Trelawny	14,950	-133,117.89	74,026.26	927.30	760.38	4,229.70	-2,632.93	1,830.33	11.48	11.50	82.97
Westmoreland	26,377	-268,583.82	87,351.23	816.86	624.32	4,795.82	-5,327.50	1,585.99	8.05	7.83	93.34

The mean change in electricity bills and consumption by Parish/Region for Rate 10 customers were plotted as shown in Figure 7.9 below.

Figure 7.9: Mean Change in Electricity Bills and Consumption by Parish/Region – Rate 10 Customers



Observations from Table 7.6 and Figure 7.9 reveal some level of deviation from results presented in Table 7.4 and Figure 7.7 which would be a result of isolating Rate 10 accounts. Table 7.6 and Figure 7.9 reveal that Portmore, KSAN and St. James showed the largest average increase in electricity bills and consumption with Manchester and St. Ann showing the lowest average increases for both metrics. Generally, the relative change in electricity consumption when comparing one Parish/Region to the others followed the relative trend for consumption change.

8 ACCURACY OF JPS BILLING CALCULATIONS

Another element of this investigation is to assess the accuracy of JPS' billing calculations. While it is generally expected that billing calculations across all rate classes are in line with the 2018 – 2019 JPS Rate Schedules, it is recognized that there may be instances of deviations from standard billing calculations. As such, billing calculations for 2020 January to May, for all accounts which form part of the Adjusted Dataset, were checked for calculation accuracy, based on the applicable rate schedule parameters, as described in Chapter 4, and the monthly account consumption data provided by JPS.

8.1 ASSESSMENT OF BILLING CALCULATIONS

Based on the applicable parameters for the applicable 2018 – 2019 JPS Rate Schedule and the monthly electricity consumption provided by JPS for each account, assessment of JPS' billing accuracy for accounts included in the Adjusted Dataset, resulted in the summarized findings presented in Table 8.2 below.

Table 8.2: Summary of Monthly JPS Bill Calculation Checks 2020 January – May

SUMMARY OF MONTHLY JPS BILL CALCULATION CHECKS				
Month	Rate Class	# of Accounts Checked	Bills Calculated In Accordance with Applicable Rate Schedule Terms	Bills Deviating From Applicable Rate Schedule Terms
JAN	RT10	502,443	501,270	1,173
	RT20	44,773	44,757	16
FEB	RT10	502,443	501,352	1,091
	RT20	44,773	44,766	7
MAR	RT10	502,443	501,353	1,090
	RT20	44,773	44,766	7
APR	RT10	502,443	501,364	1,079
	RT20	44,773	44,767	6
MAY	RT10	502,443	501,100	1,343
	RT20	44,773	44,751	22

As shown in Table 8.2, the large majority of bills associated with accounts included in the Adjusted Dataset, were in accordance with the calculation procedures and parameters outlined in the 2018 – 2019 JPS Rate Schedule, and the applicable monthly Fuel & IPP Rates and Foreign Exchange Adjustments. In the case of Rate 10 accounts, the assessment found that accurate calculations were done for greater than or equal to **99.73%** of accounts, for all applicable months, while Rate 20 accounts showed calculation accuracy for greater than or equal to **99.95%** of accounts.

8.1.1 BILL CALCULATION EXCEPTIONS

While the number of bills deviating from expectation, based on the 2018 – 2019 JPS Rate Schedule parameters, were found to be relatively low in number, further investigations were made to determine possible causes for these exceptions, as well as the magnitude of the deviations.

On initial review of billing deviations, it was found that the majority of billing exceptions showed a reduction of 50% compared to expectations when calculations are performed in accordance with the terms of the applicable rate schedule. Information included in the JPS billing datasets indicate that most accounts showing a 50% reduction in bills may be for JPS employees. There were, however, some accounts

which showed 50% reduction but appeared to be typical JPS Rate 10 customers. A monthly breakdown of these findings is provided in Table 8.3 below.

Table 8.3: Summary of Monthly JPS Bill Calculation Exceptions Found (2020 January – May)

SUMMARY OF BILL CALCULATION EXCEPTIONS					
Month	Rate Class	Bills Deviating From Rate Schedule Terms	Bills Calculated at 50% of Rate Schedule Linked to JPS Employees	Other Bills Calculated at 50% of Rate Schedule	Other Bill Exceptions
JAN	RT10	1,173	1,022	66	85
	RT20	16	0	0	16
FEB	RT10	1,091	1,029	19	43
	RT20	7	0	0	7
MAR	RT10	1,090	1,033	13	44
	RT20	7	0	0	7
APR	RT10	1,079	1,038	12	29
	RT20	6	0	0	6
MAY	RT10	1,343	1,040	3	300
	RT20	22	0	0	22

As indicated, for the majority of the billing exceptions found, deviations with respect to calculations done in accordance with the applicable rate schedule was a reduction of approximately 50%. While there are indications that these exceptions appeared to be associated with JPS employees, for the most part, verifications and explanations may be needed from JPS. Also, in instances where these accounts are not associated with JPS employees, further information may be necessary.

As shown in Table 8.3 (column titled “Other Bill Exceptions”), there were also a number of deviations, besides billing reductions of 50%, the reasons for which could not be explained based on the information provided. A further investigation was made, in order to characterize these deviations. Firstly, the number of deviations with respect to the different components of the billing calculations were investigated. These results are presented in Table 8.4 below.

Table 8.4: Monthly Exceptions per Bill Component (2020 January – May)

NUMBER OF EXCEPTIONS PER BILL COMPONENT – OTHER BILL EXCEPTIONS					
MONTH	RATE CLASS	BILL COMPONENTS			
		Customer Charge	Energy Charge	FX Adjustment	Fuel & IPP Charge
JAN	RT10	55	75	84	50
	RT20	11	11	16	5
FEB	RT10	29	34	43	18
	RT20	5	5	7	2
MAR	RT10	22	37	44	25
	RT20	3	3	7	4
APR	RT10	14	22	23	16
	RT20	4	3	5	2
MAY	RT10	26	188	298	273
	RT20	5	4	22	17

As shown, exceptions were found across both rate classes for all billing components. It should be highlighted that these include exceptions related to customer charges, a fixed monthly charge for each rate class; and per kWh energy charges, both of which should remain unchanged while the relevant rate

schedule is applicable. Clarification may therefore need to be required from JPS, with regards to these billing exceptions.

8.1.1.1 Magnitude of “Other Bill Exceptions”

In addition to identifying and characterizing the bill exceptions, as shown above, the magnitude (% and J\$), and direction (increase vs. decrease) of these deviations was also assessed. With respect to direction of deviation, this was assessed, with the results presented in Table 8.5 below.

Table 8.5: Bill Increases Vs Decreases by Month and Rate Class – Other Bill Exceptions

BILL INCREASES VS DECREASES BY MONTH AND RATE CLASS – OTHER BILL EXCEPTIONS				
MONTH	RATE CLASS	INCREASED BILLS	DECREASED BILLS	TOTAL
JAN	RT10	38	47	85
	RT20	5	11	16
FEB	RT10	29	14	43
	RT20	2	5	7
MAR	RT10	17	27	44
	RT20	0	7	7
APR	RT10	15	14	29
	RT20	2	4	6
MAY	RT10	22	278	300
	RT20	3	19	22
TOTALS	RT10	121 (24.2%)	380 (75.8%)	501
	RT20	12 (20.7%)	46 (79.3%)	58

As shown in Table 8.5, the majority of calculation deviations captured under “Other Bill Exceptions” resulted in decreased bills, when compared to bill calculations based on the applicable rate schedule parameters. This was the case when examining the relevant Rate 10 and Rate 20 accounts, with greater than 75% of the bills examined, in each case, showing a decrease.

To further characterise the deviations, summary statistics by month and rate class are provided in Table 8.6 and Table 8.7 below.

Table 8.6: Summary Statistics for Billing Deviations by Month and Rate Class (%) – Other Bill Exceptions

SUMMARY STATISTICS FOR BILLING DEVIATIONS BY MONTH AND RATE CLASS (%) – OTHER BILL EXCEPTIONS							
MONTH	RATE CLASS	COUNT	MIN	MAX	MEAN	MEDIAN	STD DEV
JAN	RT10	85	-2,274.75	412.87	-61.41	-1.85	324.87
	RT20	16	-52.12	10.46	-9.86	-2.29	19.85
FEB	RT10	43	-676.88	157.74	-11.54	8.76	121.77
	RT20	7	-43.61	5.55	-12.06	-4.19	18.01
MAR	RT10	44	-655.99	2,611.66	21.99	-11.56	423.61
	RT20	7	-42.29	-14.25	-23.45	-20.07	9.52
APR	RT10	29	-2,000.62	55.67	-93.19	4.29	392.19
	RT20	6	-45.37	6.97	-14.14	-12.37	20.06
MAY	RT10	300	-875.35	163.11	-15.39	-7.70	68.07
	RT20	22	-40.19	24.31	-5.94	-7.84	13.16

Table 8.7: Summary Statistics for Billing Deviations by Month and Rate Class (J\$) – Other Bill Exceptions

SUMMARY STATISTICS FOR BILLING DEVIATIONS BY MONTH AND RATE CLASS (J\$) – OTHER BILL EXCEPTIONS							
MONTH	RATE CLASS	COUNT	MIN	MAX	MEAN	MEDIAN	STD DEV
JAN	RT10	85	-162,553.14	8,629.79	-6,582.56	-541.89	26,616.01
	RT20	16	-1,464.70	25,091.50	2,412.60	-446.05	7,144.53
FEB	RT10	43	-39,542.53	11,255.90	-1,273.02	842.57	7,965.28
	RT20	7	-1,522.45	2,732.40	-164.02	-718.80	1,449.08
MAR	RT10	44	-81,597.03	281,960.38	3,073.05	-1,325.20	44,808.60
	RT20	7	-9,041.90	-732.45	-4,363.94	-4,199.69	3,327.56
APR	RT10	29	-186,061.72	2,045.97	-10,860.93	245.88	39,051.67
	RT20	6	-1,475.13	14,072.62	1,857.40	-631.10	6,048.94
MAY	RT10	300	-61,703.33	6,416.02	-7,214.14	-2,958.79	10,164.68
	RT20	22	-69,103.17	33,545.44	-6,827.71	-1,767.29	17,620.36

Information presented in Table 8.6 and Table 8.7 above was largely in line with that presented in Table 8.5 above, with deviations generally showing a mean (average) decrease in bills, both on a percentage and dollar value basis. The notable exceptions are 2020 January where an average dollar value increase was observed for Rate 20 accounts, and 2020 March, where an average increase was observed for Rate 10 accounts, both on a percentage and dollar value basis.

Additionally, when examining minimum, maximum and the standard deviation for each grouping, it is observed that the range of deviations are fairly wide, both on a percentage and dollar value basis. Further examination may be necessary to determine the causes for these deviations.

9 IMPACT OF CHANGES IN BILLING PARAMETERS AND CONSUMPTION LEVELS

As indicated in Chapter 4 and Chapter 7 above, bills issued to JPS customers are determined based on the applicable rate schedule for the respective customer class, the application of GCT and any associated adjustments in instances where there is a breach in the Terms and Conditions of Supply or Guaranteed Standards.

Although the billing parameters that comprise monthly bills remain constant for a specific tariff period, parameters that are applicable to a customer vary on a monthly basis. As such, Rate 10 and Rate 20 customers will tend to experience monthly variations in their average price of electricity due to variations in variables such as foreign exchange rate and monthly fuel cost. In the case of Rate 10 customers, additional variations may arise when transitioning to higher consumption bands due to the rate structure for the Rate 10 class and the threshold for the application of GCT.

9.1 BILLING PARAMETERS

The applicable billing parameters used in the assessment, inclusive of 2018 – 2019 JPS Rate Schedule parameters and GCT rate, for the Rate 10 and Rate 20 customer class over the period 2020 January to May are provided in Table 9.1 below.

Table 9.1: Rate 10 & Rate 20 Billing Parameters 2020 January to May

RATE 10 & RATE 20 BILLING PARAMETERS 2020 JANUARY TO MAY										
	RATE 10					RATE 20				
	JAN	FEB	MAR	APR	MAY	JAN	FEB	MAR	APR	MAY
Customer Charge [J\$]	445.39	445.39	445.39	445.39	445.39	992.24	992.24	992.24	992.24	992.24
Energy Charge (<=100kWh) [J\$/kWh] – RT10	9.66	9.66	9.66	9.66	9.66	N/A	N/A	N/A	N/A	N/A
Energy Charge (>100kWh) [J\$/kWh] – RT10	22.49	22.49	22.49	22.49	22.49	N/A	N/A	N/A	N/A	N/A
Energy Charge [J\$/kWh] – RT20	N/A	N/A	N/A	N/A	N/A	18.55	18.55	18.55	18.55	18.55
FX Adjustment [%]	2.856	8.263	5.623	4.619	9.345	2.856	8.263	5.623	4.619	9.345
Billed Fuel & IPP Rate [J\$/kWh]	16.798	23.515	21.874	21.700	24.176	16.798	23.515	21.874	21.700	24.176
GCT [%]	16.5	16.5	16.5	15.0	15.0	16.5	16.5	16.5	15.0	15.0

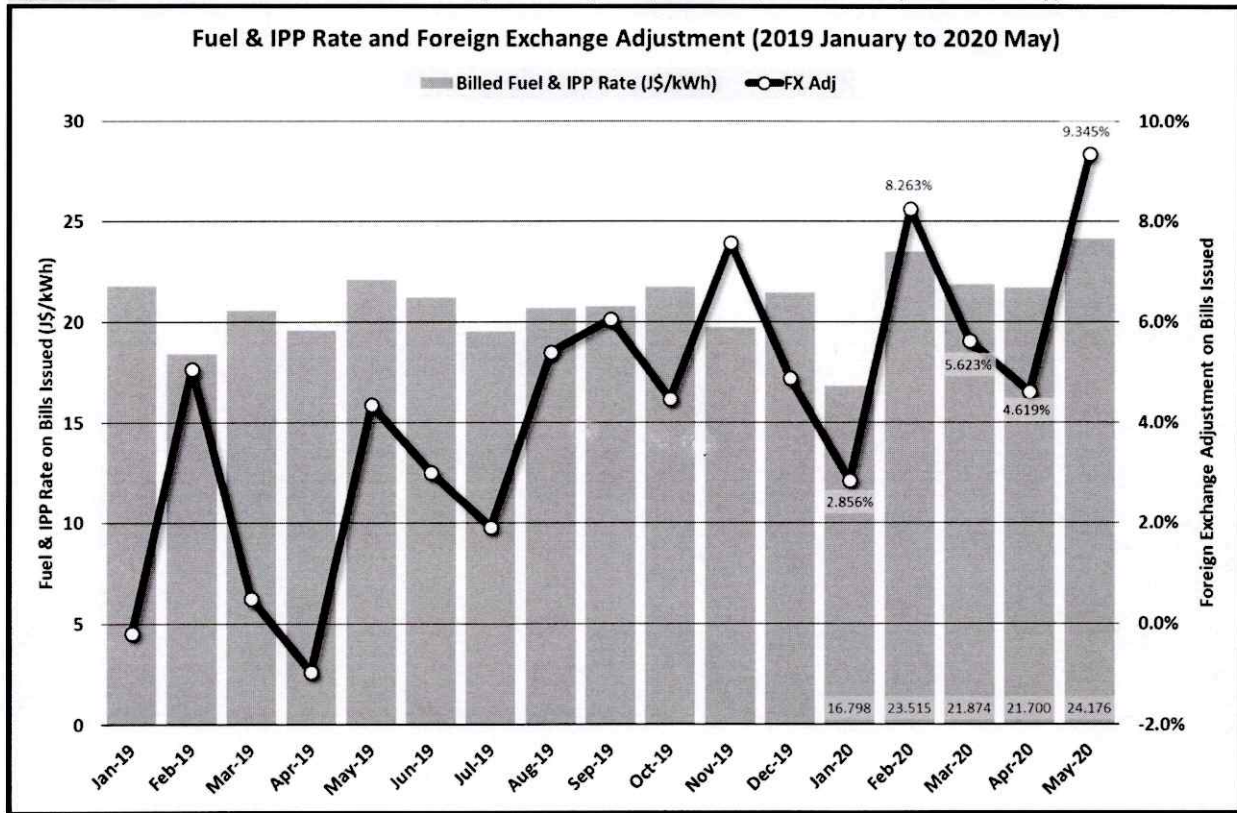
In the case of Rate 10 customers, GCT is only applied for consumption above 150 kWh per billing cycle/month. For Rate 20 customers, GCT is applied irrespective of consumption level.

As information provided by JPS, used in this assessment, did not clearly indicate breaches and associated billing adjustments, such as late payment charges, these were not considered in the assessment.

9.1.1 BILLED FUEL & IPP RATE AND FOREIGN EXCHANGE (FX) ADJUSTMENT

The variation in the monthly Billed Fuel & IPP Rate and the Foreign Exchange Adjustment are shown in Figure 9.1 below. An extended timeline (2019 January to 2020 May) is shown for context.

Figure 9.1: Billed Fuel & IPP Rate and Foreign Exchange Adjustment (2019 January to 2020 May)



As shown in Figure 9.1, the Billed Fuel & IPP Rate has been relatively steady over the period 2019 January to 2020 May, with a low of J\$16.798/kWh in 2020 January, and a high of J\$24.176/kWh in 2020 May. The Foreign Exchange Adjustment, however, has seen an overall increase (with fluctuations) over the same period, rising to a maximum of 9.345% in 2020 May. With respect to the timelines which are the focus of this report: Timeline 1 (2020 January to March) and Timeline 2 (2020 April to May), the average Billed Fuel & IPP Rate for Timeline 1 is J\$20.729/kWh, while that for Timeline 2 is J\$22.938/kWh. With respect to Foreign Exchange Adjustment, the comparative figures are: Timeline 1 – 5.581%; and Timeline 2 – 6.982%.

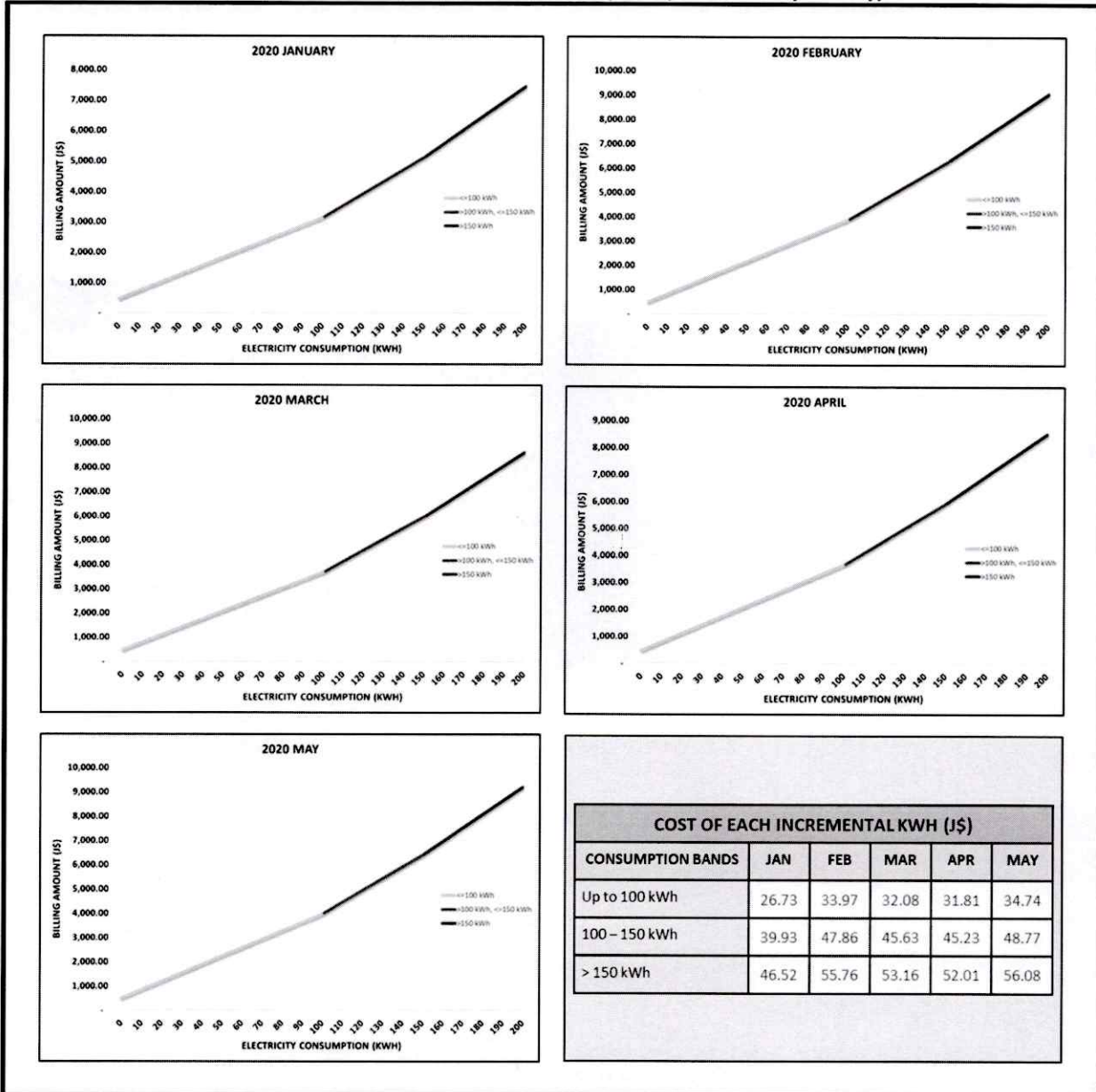
It is therefore apparent that the parameters: Billed Fuel & IPP Rate and Foreign Exchange Adjustment were indeed higher on average, during Timeline 2 vs Timeline 1, and as such these parameters would have contributed to increases in electricity bills experienced by some JPS Rate 10 and Rate 20 customers.

9.2 IMPACTS OF CONSUMPTION INCREASE

Figure 9.2 below uses the parameters stated in Table 9.1 above to graphically illustrate how billing amount in J\$ for Rate 10 customers, varies with consumption in kWh in each of the respective months: 2020 January to May. As seen, the relationship is linear within specified limits of consumption as indicated on the Figure 9.2, with a relationship of increasing gradient after each specified limit is reached. Therefore, as consumption increases above the 100kWh threshold (the maximum for the “Lifeline Rate”), up to 150kWh, and then to above 150kWh, the cost of each additional kWh increases in each case. The relationship between the two variables for the Rate 20 rate class, however, would have the same

relationship for all values of consumption, as that rate structure does not have tiers, and GCT is applicable at all levels of monthly consumption.

Figure 9.2: Relationship between Billing Amount and Consumption (2020 January to May)



As shown, the cost of each incremental kWh across all three bands, fluctuated throughout the period, with the lowest figures occurring in 2020 January, and the highest occurring in 2020 May. These fluctuations are due to changes in the Billed Fuel and IPP Rate, the Foreign Exchange Adjustment and a reduction in GCT from 16.5% to 15% in 2020 April.

As previously stated, the cost of each incremental kWh of consumption becomes progressively more expensive, when consumption exceeds certain levels i.e. 100 kWh and 150 kWh. In the case of 2020 May, for example, the cost of each incremental kWh consumed between 100 to 150 kWh is more than 40% higher than that consumed in the 0 to 100 kWh range, with the cost of each incremental kWh consumed above 150 kWh being over 61% higher than that consumed in the 0 to 100 kWh range.

In that regard a customer who typically has a consumption that lies within one of the two lower bands, but then has a consumption increase that results in some, or a greater portion of their consumption falling in a higher band, will experience a bill increase disproportionately higher than their consumption increase, all else being equal. Furthermore, with increases in Billed Fuel & IPP Rate and the Foreign Exchange Adjustment, this situation is exacerbated.

As demonstrated in Chapter 7 of this report, the average Rate 10 customer had a significant increase in their electricity bill, which, as expected, was moderately correlated with consumption increase. However, as shown, the relationship is not directly proportional, and factors such as those previously described in this section, are likely to have a significant impact on billing increases experienced by JPS customers. In order to have a clearer picture of how these factors impacted Rate 10 customers, in particular, information related to accounts that comprise the Adjusted Dataset was assessed to determine changes in billing parameters across all accounts.

9.2.1 VARIATIONS IN BILLING PARAMETERS TIMELINE 2 VS TIMELINE 1 FOR RATE 10 ACCOUNTS

The following billing parameters were examined for Rate 10 accounts contained within the Adjusted Dataset, less those accounts where bill calculation deviations were discovered:

- A. Customer Charge
- B. Energy Charge (≤ 100 kWh)
- C. Energy Charge (> 100 kWh)
- D. FX Adjustment
- E. Fuel & IPP Rate
- F. GCT

This specific assessment was done to identify and quantify variations in billing parameters when comparing Timeline 2 to Timeline 1. As such, the following was examined:

1. Average change in each parameter for the relevant customer accounts.
2. Movement of customer consumption across rate tiers:
 - a. Number of customers whose consumption remained less than or equal to 100 kWh (within the limits of the Lifeline Rate);
 - b. Number of customers whose consumption remained above 100 kWh;
 - c. Number of customers whose consumption increased from less than or equal to 100 kWh to above; and
 - d. Number of customers whose consumption decreased from greater than to less than or equal to 100 kWh.

3. Numbers of customers whose consumption increased above the tax free threshold, or vice versa.
4. Number of customers who experienced no change with regard to whether or not their electricity bill was taxed.

The results of these assessments are presented in Table 9.2 to Table 9.4 below.

Table 9.2: Mean (Average) Allocation of Billing Parameters for Rate 10 Accounts Assessed

MEAN (AVERAGE) CHANGE IN BILLING PARAMETERS FOR RATE 10 ACCOUNTS ASSESSED (J\$)			
BILLING PARAMETERS	TIMELINE 1 (2020 JAN – MAR)	TIMELINE 2 (2020 APR – MAY)	Δ
Customer Charge	445.39	445.39	-
Energy Charge (≤100kWh)	818.57	831.13	12.56
Energy Charge (>100kWh)	1,664.17	1,980.04	315.87
FX Adjustment	160.95	226.44	65.49
Fuel & IPP	3,274.46	3,990.54	716.08
GCT	354.67	420.95	66.28

As shown in Table 9.2, the billing parameter, which accounted for the highest proportion of the change in average electricity bills, was the Fuel & IPP charge, which would be driven by an increase in average electricity consumption as well as an increase in the Fuel & IPP Rate. This was followed by the increase in the Energy Charge for consumption greater than 100 kWh. This is reflective of the increased consumption at this energy charge tier, and the significantly higher rate, compared to the Energy Charge for ≤100 kWh, as presented in Table 9.1.

Aside from the Customer Charge, the parameter accounting for the lowest proportion of the change is the Energy Charge for ≤100 kWh. This seems to suggest that the majority of customers were either already consuming above 100 kWh or were fairly close to the limit of this tier. This is confirmed by Table 9.3 below, which illustrates the movement of customer consumption across energy charge tiers.

Table 9.3: Movement of Customer Consumption Across Rate 10 Energy Charge Tiers

MOVEMENT OF CUSTOMER CONSUMPTION ACROSS RATE 10 ENERGY CHARGE TIERS	
# of Customers with Consumption Remaining ≤100 kWh	119,123
# of Customers with Consumption Remaining >100 kWh	329,397
# of Customers with Consumption Increasing to Above 100 kWh	28,991
# of Customers with Consumption Decreasing to 100 kWh or Below	23,395

As stated, Table 9.3 above indicates that the majority of Rate 10 customers consumed above 100 kWh, on average, for the entirety of the assessment period (2020 January to May). Movement of customer consumption from one energy charge tier to the other occurred for about 10.5% of customers, with a little over half of these customers moving from an average monthly consumption of below 100 kWh to above.

Consumption changes also resulted in some customers moving across the threshold for the application of GCT: 150 kWh, as shown in Table 9.4 below. Approximately 7.6% of customers had consumption increases that resulted in them being charged GCT.

Table 9.4: Movement of Customer Consumption Across GCT Threshold

MOVEMENT OF CUSTOMER CONSUMPTION ACROSS GCT THRESHOLD	
# of Customers with Consumption Remaining Below GCT Threshold	227,883
# of Customers with Consumption Remaining Above GCT Threshold	210,630
# of Customers with Consumption Increasing to Above GCT Threshold	38,075
# of Customers with Consumption Decreasing to Below GCT Threshold	24,318

10 SUMMARY OF FINDINGS

1. JPS response indicates that it has not been fully compliant with, nor has instituted clear measures to reduce and ultimately eliminate the need to exceed the stipulated thirty-one (31) days per billing cycle established by the OUR.
2. A major part of this analysis examined the change in electricity bills and consumption levels for JPS Rate 10 and Rate customers over the period 2020 April to May vs 2020 January to March. Based on the results of the analysis, the selection of Rate 10 and Rate 20 customer accounts exhibited an increase in electricity bills of 21.87%, with a corresponding consumption increase of 14.43%. These figures, with the outliers removed, translate to a bill increase of approximately J\$1,038.20 and a consumption increase of 11.10 kWh.
3. When disaggregated by Rate Class, it was confirmed that Rate 10 accounts were the primary contributors to the overall increases observed. In fact, Rate 20 accounts, on average, experienced a reduction in electricity bills, and consumption. Upon disaggregation, it was found that Rate 10 accounts experienced an average increase of 24.23% in electricity bills, with Rate 20 accounts experiencing an average decrease of 2.69%.
4. Rate 10 electricity bills and consumption changes were also investigated on a Parish/Region basis. This indicated that customers in Portmore, KSAN and St. James experienced the largest average monthly bill increases of \$2,001.74, \$1,960.55 and \$1,493.97 respectively. Conversely, customers in Manchester and St. Ann experienced the lowest level of average monthly bill increases of \$655.63 and \$641.65 respectively. The findings with regard to Portmore appears to align with the expectation regarding the effect of a Stay at Home Order.
5. As expected, increase in electricity bills was found to be correlated to the increase in consumption levels exhibited. Upon analysis, consumption was found to be a significant explanatory factor for bill increases. This was expected, based on the very nature of the applicable rate classes, which are predominantly volumetric in nature. Nevertheless, other potential causal factors for bill increases were investigated.
6. Examination of JPS' billing accuracy revealed that the company's billing calculations were largely compliant with the terms of the 2018 – 2019 JPS Rate Schedule. With respect to Rate 10 accounts, 99.73% of accounts were found to have accurately calculated bills for the months of 2020 January to May. With respect to Rate 20 accounts, this figure was found to be 99.95%. However, as implied, there were a number of deviations, some of which could not be explained from the information provided. Clarification will therefore be required from JPS on these.
7. Factors that can also significantly impact electricity bills are the monthly Fuel & IPP rates and Foreign Exchange Adjustment. These factors exhibited significant average increase from Timeline 1 to Timeline 2, and were therefore found to be a significant contributory factor to bill increases, the increase in Fuel & IPP Rates in particular.

8. A secondary effect of a Rate 10 customer's overall consumption increase is the possibility of subjecting a larger portion of energy consumption to a higher energy charge. Based on the current 2018 – 2019 JPS Rate Schedule, the energy charge for consumption above 100 kWh is more than twice that for consumption at the Lifeline Rate (≤ 100 kWh). In some instances, customers who previously consumed all their energy within the bounds of the Lifeline Rate experienced increases which resulted in them consuming energy at the higher energy rate. Also, the majority of customers already consumed beyond 100 kWh per month, with bill increases subjecting even more of their electricity consumption to a higher energy charge. Additionally, above the threshold of 150 kWh, electricity charges are subject to GCT. As such, some customers experienced effects of additional GCT charges on their electricity bills. These factors were also found to play a role in electricity bill increases.

11 CONCLUSION

Within the scope and constraints of the analysis, it was found that JPS' Rate 10 customers experienced significant increases in electricity bills during the period 2020 April to May, when compared to 2020 January to March. With respect to Rate 20 customers, it was found that these customers experienced a decrease in consumption, on average, over the same period.

Taking into consideration the findings of the analysis, it appears that the causes of bill increases experienced by JPS' Rate 10 customers were multifaceted. While in a small number of cases, bill calculation errors may be an issue, for the most part bill increases were largely attributable to the following:

- Primary and secondary impacts of consumption increase for the Rate 10 class in particular;
- Significant increases in the Billed Fuel and IPP rates and Foreign Exchange Adjustment over the period; and
- Possibly, in some instances increases in billing days

12 NEXT STEPS

1. A number of outlier accounts, with large consumption change were found. Further investigation is needed for some of these outliers. It is not envisaged, however, that this necessitate an independent audit.
2. Additionally, a number of bill calculation deviations were discovered. Further information and clarification will be sought from JPS.
3. The impact of seasonality was not accounted for in this analysis. This may also have had an impact on the magnitude of consumption increase, and thus might be a useful exercise for future consideration.
4. JPS continues to bill customers in excess of thirty-one (31) days per billing cycle. This will be addressed with JPS in light of OUR's Memorandum and specifically the measure to be adopted to ensure compliance.
5. The OUR will examine the significance of JPS exceeding the thirty-one (31) billing days per billing cycle on consumption charges.
6. The OUR will require JPS to, on a quarterly basis, submit an Exceptions Report, which shall include data on the number of Exceptions and confirmation of the method/s used to notify customers about the significant variance in their consumption.

In light of the general findings and the abovementioned issues identified under Next Steps, the OUR is not of the view that an independent audit of JPS billing system is needed at this point. The OUR will, therefore, be proceeding to extend Phase 1 of the Investigation to: address some of the identified outlier issues, engage JPS about its failure to comply with the Office Directives and, in particular, to pursue undertakings regarding future compliance and consequences for breaches.

A further progress report on the components of the extended Phase 1 Investigation will be provided by 2020 December 18.