OFFICE OF UTILITIES REGULATION – JAMAICA

REPORT

INVESTIGATION OF THE JAMAICA PUBLIC SERVICE COMPANY LTD (JPS) BILLING AND METERING SYSTEM FOR ELECTRICITY CONSUMPTION

October, 2011

Independent Investigator: **J Paul Morgan**

Table of Contents

Introduction

The OFFICE OF UTILITIES REGULATION (the Office/OUR) was established by an Act of Parliament, the Office of Utilities Regulation Act of 1995 (amended 2000) (the OUR Act) to regulate the provision of prescribed utility services in Jamaica. Those services are electricity, telecommunications, water supply, sewerage and public transportation by road, rail and ferry.

Section 4(1) of the OUR Act, inter alia, empowers the OUR to:

(i) Regulate the provision of prescribed utility services; and
(ii) Carry out, on its own initiative or at the request of any person, such investigations in relation to the provision of prescribed utility services as will enable it to determine whether the interests of the consumer are adequately protected.

The OUR has a statutory duty to protect and balance the interests of the utility consumers and those of the utility providers.

In the performance of its functions pursuant to Section 4(3) of the OUR Act, the OUR can undertake such measures as it considers necessary or desirable, inter alia:

i. To encourage competition in the provision of prescribed utility services;
ii. To protect the interests of consumers in relation to the supply of a prescribed utility service;
iii. To promote and encourage the development of modern and efficient utility services; and
iv. Enquire into the nature and extent of the prescribed utility services provided by a licensee or specified organization.

The Jamaica Public Service Company Limited (JPS/the Company) had been introducing new technology to its metering and billing platforms over a number of years along the following general lines:

- 1990's - introduction of hand held field meter reading capture devices and electronic upload of meter readings to billing platform
- 2007 - introduction of electronic digital meters at new accounts and phase out of the electromechanical meters
- 2009 - introduction of and change out to Advanced Metering Infrastructure (AMI) at large commercial and industrial accounts (about 1500)
- 2010- introduction of and change out to Residential Advanced Metering Infrastructure (RAMI) in marginal and at risk communities

- 2011 - large scale change to electronic digital meters as part of its loss reduction strategy with a decision to change out all meters that were installed prior to 1995.

The Office appointed an Independent Investigator at the end of August 2011 to investigate JPS' billing, meter replacement, meter inspections and audit, and meter testing practices and procedures. The investigation had its genesis in consumer concerns and reaction to the introduction of the electronic digital meters to replace the electromechanical meters that had been in use for decades.

The consumer concerns were directed at the high bills received by many which, perceivably, were linked to the new meters and the investigation was therefore to examine the various relevant aspects of JPS operations with a view of determining the extent to which it consistently provides reliable and accurate bills detailing customer consumption. Additionally, the extent to which JPS is in compliance with regulatory directives and prescribed standards that are related to billing, meter replacement, meter inspections and audit, and meter testing practices and procedures issued pursuant to the OUR Act 1995 (as amended 2000) and the All-Island Electricity Licence, 2001 ("the Licence") under which it operates was also to be assessed.

The Office appointed J Paul Morgan as the Independent Investigator. The investigation team comprised the following members of the OUR staff – Ms Marsha Minott, Chenee Riley and Cheryl Lewis and Messrs Leighton Hamilton, Wayne McGregor, Andrew Lewis, Winston Robotham, Garfield Bryan and Peter Johnson. The team at the Bureau of Standards Jamaica, led by Messrs Garfield Morgan and James Samuels were particularly supportive, not only in responding to the urgency of the Investigation's needs but also in the expert advice provided on the technology and principles of electricity metering as well the intricacies involved in the testing of meters to the applicable standards.

The investigation has relied on data provided by JPS which has been extracted from its current and historical business records and also reviewed established policies and processes documentation provided by the company. While as much cross referencing as possible has been done to test the quality of the data provided, this report relies on the completeness and legitimacy of all documents and data provided by JPS. The thrust of the investigation was forensic and fact based rather than qualitative, thus establishing an imperative to constrain the investigation to an assessment of facts rather than opinions proffered by interested parties.

The Investigation has been careful to use its best efforts to ensure impartial assessment of the facts and therefore the independence of this Report.

Data Requests made of and the responses made by JPS, reports from the Jamaica Bureau of Standards (BSJ) as well as a number of reports, prepared by the members of the

investigating team, that provide among other things analysis of the data received all form part of the working papers that have informed the outcome of the investigation.

This Report provides a summary of the supporting reports mentioned above and sets out the conclusions of the Investigations and the recommendations that arise there from.

The succeeding sections of the Report are organized as follows:

- Scope of the Investigation
- Key Findings and Recommendations
- Summary of Key Recommendations
- Annexure – Main Report
  - Background
  - Current Electricity Supply Environment in Jamaica
  - Findings, Conclusions and Recommendations – Objective 1
  - Findings, Conclusions and Recommendations – Objective 2
  - Findings, Conclusions and Recommendations – Objective 3
  - Findings, Conclusions and Recommendations – Objective 4
  - Findings, Conclusions and Recommendations – Objective 5
  - Findings, Conclusions and Recommendations – Objective 6
  - JPS' Compliance with OUR Directives
  - Constraints on the Office
  - Appendices
  - Terms of Reference
  - Article from The Western Mirror, Monday October 3, 2011

Scope of the Investigation

The Office identified a number of key issues about which it was particularly concerned and which would have influenced its initial considerations in launching the Investigation. These are outlined below.

Issues	Concerns
Significant changes in Billed consumption	• Meter change – electro mechanical to digital • Unexplained increase in billed consumption
Back billing (Policy)	• Retroactive charges resulting from meter change • Retroactive charges resulting from meter under/over registration • Failure of meter to register • Other
Meter Inspection/Audit and loss Reduction activities (Tampering allegations)	• Retroactive billing
Testing for meter accuracy	• Conformance to meter testing protocol • JPS Standard Terms and Conditions of Service

The Office provided some guidance as to the expected thrust of the investigation in providing some specific tasks, the outcome of which would assist in the formulation of conclusions related to each of the objectives set. These are reproduced below.

1. Assess the legitimacy of the high consumption billing complaints as a consequence of the replacement of old (electro-mechanical) meters with new "digital" meters using appropriate sampling techniques.
    a. Review JPS reports on its meter replacement programme/policy/ activities.
    b. Compile a list of customer accounts for which meter change has been effected since January 2008 (last 3 years).
    c. Establish baseline consumption data for all accounts where meters have been changed to digital meters identified in (b) above.
    d. Compare consumption data before and after meter change (digital vs. electro-mechanical).
    e. Determine the statistical significance in the difference of consumption before and after to inform further investigation and review.
    f. If necessary from (e) above, determine sample of old meters and digital meters required for testing and verification.
    g. Examine cases of every complaint received about excessive billing (greater than a 30% change in normal consumption) in cases not related to meter change since 2008.
    h. Review meter testing reports as available.
    i. Arrange for independent meter testing in the field as well as under laboratory condition as necessary.

2. Assess the legitimacy of the high consumption billing complaints against JPS by using appropriate sampling techniques:
    a. Establish the billed consumption trends at the aggregate level since January 2011;
    b. Compare consumption trends established since 2011 in (a) above to consumption trends for the five (5) years prior; and
    c. Examine billed consumption patterns on individual customer accounts as necessary (whether by Consumer and Public Affairs appeals data or otherwise) since January 2011 and for a period of 5 years prior.

3. Assess the appropriateness of JPS current Back Billing Policies and Procedures:
    a. Determine if the current policies are fair and reasonable and does not place undue burden on customers;
    b. Determine the compliance of JPS with provisions of existing policies; and
    c. Review the process by which retroactive charges are determined under existing policies.

4. Assess JPS current Meter Inspection and Audit activities:
    a. Review the current JPS policy in relation to Meter Inspection and Audit;
    b. Determine the extent to which JPS is in compliance with its internal Meter Inspection and audit policies;
    c. Determine the extent to which the current policy and practice is fair and reasonable to the customer; and
    d. Determine the basis upon which retroactive charges are calculated in relation to "flagged" accounts.

5. From a historical and current perspective, assess the extent to which the billing practices are in compliance with the existing quality control procedures (including meter reading and exceptions processing) and Directives.

6. From a historical and current perspective, assess the extent to which the design of the quality control measures (including meter reading and exceptions processing) reliably and consistently identifies and treat with legitimate/genuine billing anomalies.

7. Review the following documents:
    a. JPS Back Billing Policies and Procedures (July 2002)
    b. All-Island Electricity Licence, 2001;
    c. Office of Utilities Regulation Tariff Determination 2009 (OUR Document Ele 2009/04: Det/3); and
    d. JPS Terms and Conditions of Service;

e. JPS Guidelines for the conduct of Meter Inspections and Audits (dated September 16, 2010);
f. All documents and relevant material including JPS internal documentation, containing the policies and procedures related to the billing system.

Summary of Key Findings and Recommendations

Objective 1

Assess the legitimacy of the high consumption billing complaints as a consequence of the replacement of old (electro-mechanical) meters with new "digital" meters using appropriate sampling techniques

Based on the analysis done, it was found that approximately 23% of all customers who had an electro-mechanical meter replaced with an electronic one would have experienced some change in consumption attributable to meter replacement. Of this 23%, about 18.84% would have experienced a high increase in consumption (above 30%) likely to have been a consequence of meter replacement.

Simply based on consumption readings, the reason for this change cannot be established and could be due to reasons such as:

1. The old meter had begun to under-record and thus the customer was actually using more than was recorded.
2. The new meter is over-recording.
3. The customer previously had an illegitimate connection which was rectified upon meter replacement.

Whether or not the above may be drivers behind the numerical results obtained cannot be determined from the data provided but would require work being done in the field. Numbers 1 and 2, in particular, are addressed in another section of this report.

Furthermore, it was determined that only a very small percentage of high billing complaints made by customers who have had a meter change are actually related to the meter replacement itself. Of 80 accounts complaining of high consumption billing after meter change it was determined that only 2.5% were likely to be a direct a result of meter replacement.

It is of concern that the investigation turned up a sufficient number of incidences of suspected meter tampering where the meters under register. In these situations, a meter change to any type of technology would result in higher consumption readings post the change.

The analysis did not attempt to distill the possible impact of meter tampering on the numbers of complaints but a reasonable imputation would be that this would be a factor in the makeup of the 18.84% of accounts which were likely to see a major increase in consumption. This suggests that of the 17000 meters that are to be changed about 3000 will experience some issues of high billing associated with the metering which may range from meter tampering to the old meter under registering. In the light of this,

JPS could well consider establishing special customer service units dedicated to dealing with these issues.

It is noted that JPS has indicated that it does not retroactively adjust the accounts of customers that show changed consumption patterns (high or low) after the meter change. It is recommended that, for the avoidance of doubt, the Office issues a Directive to this effect. This Directive would address not just the circumstances of the current initiatives but would apply generally, where meters are being changed in the course of the company's normal replacement and business policy.

Objective 2

Assess the legitimacy of the high consumption billing complaints against JPS by using appropriate sampling techniques

Analysis of the data provided regarding the handling of high billing complaints suggest that the company is less than diligent in its handling and investigation in its response to the complaints and it begs the question of whether customers are being dealt with equitably. It is noted that the OUR is currently reviewing a Draft Code of Practice for customer complaints handling prepared by the Company pursuant to Condition 16 of the Licence. It is recommended that the OUR has due regard to and incorporates the findings of this Investigation in its review in order to procure a modern and customer centered Code of Practice.

Many of the high billing complaints expressed by customers are in the main tariff related where the instability of the fuel costs has led to significant increase in the price of electricity but are exacerbated by the issues which are the subject of this investigation. These are issues which are mentioned elsewhere in this report and while the tariff is outside of the scope of this investigation, the fact is that the customers are finding it increasingly difficult to meet their obligations to JPS and it would be remiss of this investigation not to, at least mention, the issue. The legitimacy or otherwise of the complaints about high billing, although critically important, are really cosmetic in today's circumstances. The Office has to take all the steps necessary within its power to secure an environment that will lead to lower tariffs. Until this happens, the JPS/Customer/OUR relationship will be hostile and unproductive. It is only then, that resolution of quality issues will prove to be of any real value and customer care standards fully appreciated.

In the cases reviewed, although the complaints were, in the strict context of this Objective of the Terms of Reference, not legitimate the worrying trend of JPS' selective breaches of the Directives issued by the Office is manifested. In one case this is evidenced by the non-compliance to the Hi/Low criteria and in the others breaches of the Guaranteed Standards and Directives relating to frequency of estimated billings. However, it begs the question as to whether JPS' should be entitled to recover from

customers when it has acted in clear breach of the Directives of the Office (this could be argued as analogous to the company benefitting, or the customer being disadvantaged, as a consequence of JPS breaking the law).

It is therefore **recommended** that the Office issues rules to prevent JPS from benefiting when it breaches Directives issued by the Office – these would prevent the company from back-billing customers when there is under recovery and commensurately to reimburse customers when there is over recovery.

Objective 3

Assess the appropriateness of JPS' current Back Billing Policies and Procedures

The company's back billing procedure seem to be working well except in instances where the it alleges that there is meter under-registering and/or meter tampering. These discrepancies are in fact associated with the meter itself and to which JPS tend to associate fraud for the purpose of taking action under its back billing policy

The issue that arises here is the interpretation JPS uses regarding Fraud and the "deliberate" and "willful" actions of customers who are deemed liable for such acts. The policy clearly states that JPS shall be entitled to recover for "deliberate acts of dishonesty or willful interference with JPS' equipment or device". JPS has however chosen to treat with customers who have allegedly committed some malfeasance regarding their power usage by stating that the customer has "benefitted" from the usage of the power supplied.

While it is indeed correct that JPS should be paid for the electricity it provides under contract, it is also correct that in the event that it discovers that it has provided service to a customer for which it has not been paid in a timely manner, then pursuant to its contract with that customer, JPS may disconnect its services for non-payment for the electricity used, and/or proceed to recover the monies outstanding. Such recovery, however, must take place under clear and unambiguous circumstances.

It appears that under the provisions of the Back Billing Policy JPS is allowed to benefit from its own errors. For example, in provision 3- *Errors Arising from Incorrect Rate*: the utility company is allowed to recover not more than 4 months charges in cases where the charges have been calculated using an incorrect rate for the class of service provided. The intention here is for JPS to recover (4 months back billing) only, if from its own error, the company was under-recovering. On the other hand, where JPS makes the error and was over-recovering for periods in excess of 4 months, JPS is now only paying back/refunding a maximum of 4 months to the consumer account.

This case in point raises the question of whether the remedies in circumstances such as these should be symmetrical. In the relationship between the company and the

customer, the company has significant advantage not only because of its absolute discretion to disconnect service but also because of the greater resources at its disposal when compared with that of the typical residential customer. As a matter of principle, the Investigation has concluded in support of the general principle enunciated by the Office, when the back billing policies were first being discussed, that JPS ought not to benefit from its own negligence or error (or put another way the customer should not be disadvantaged because of the company's errors).

JPS' Back-billing policies are at this time in need of review and amendment. As they presently exist, and with the benefit of the experience of their application over the last several years, one can conclude that they lend themselves to inconsistency of application in terms of the factors set out above and that they do not inure to the protection of customer rights, especially in light of JPS's treatment of alleged fraud cases and their application of the statutory limitation period.

The review of the back- billing codes and policies from jurisdictions in the US and the UK, suggest that JPS' policies and practices at present do not accord with "best practice".

It is **recommended** that -
The relevant policy documents are to provide that all new accounts (including those where a meter is already installed) should have the appurtenant meter checked and, if necessary, a new meter installed on the premises prior to activation of the said new account. This would serve to detect any meter registration problems and to have them eliminated at the time of the commencement of the account and the relevant service contract. It should also be stipulated that JPS will not be allowed to back-bill beyond this point of commencement of the new account. This may impact on the Guaranteed Standard (EGS 1), New Connections, in that the time for connection may have to be reviewed.

JPS be required to check meters more frequently than the company does at present, (this could be statistically derived but the appropriate time should be determined after consultation between the Office and JPS). In the event that JPS fails to do the inspection within the stipulated time or takes a business decision not to do so, it will be required to accept the risk of a given meter being faulty, i.e they should be prohibited from back billing beyond the material time when they should have discharged their responsibility and duty of care to check the meters.

JPS be required to revisit its back-billing policy and reformulate it to be in line with best practice, particularly with regard to back-billing on the grounds of fraud, alleged meter tampering and illicit abstraction. The period for which the company can back bill an account must reflect the principle that the customer ought not to be disadvantaged because of an error by or the inefficiency of JPS. The current minimum period where

stipulated as four (4) months should be changed to reflect the original intent – 2 billing periods or 2 months. In the case of the upper limits best practice suggest that these should be 1 year.

In the event that meter tampering is alleged, the company be restricted to a maximum back billing period of 2 years, subject to clear evidence that the customer has liability for a lesser period. Should this conclusion in any specific case be unsatisfactory to either party, either is free to refer the matter to the Office, in the first instance, or the courts, at any time, for adjudication.

If fraud is suspected, the company has to prove "deliberate" and "willful" actions of customers if it is to successfully apply the full period of retroactivity provided for in the statutes, or alternatively, routinely cause these matters to come before the courts

The company be required to issue its back billing policy and related issues as a Code of Practice to be made publicly available.

The Office issues Directives to give effect to these recommendations

Objective 4

Assess JPS' current Meter Inspection and Audit practices and procedures

The Investigation found that both the BSJ and JPS have been diligent in implementing the Protocol and complied with the provisions set out.

The investigation has formed the view that the method and systems for testing are sufficiently rigorous to secure public confidence in the electronic meters.

There are however four areas which require attention and for which the following **recommendations** are made:

The Protocol provides that it should be reviewed every two years – such a review is long overdue. The Office must embark on this review as a matter of urgency and in doing so consideration must be given, if it is necessary, to the aligning of the standards prescribed for the new technologies e.g. ANSI C12.20 which specifies more stringent accuracy tolerances for electronic meters should now be included. The outcome of this review may have financial implications in terms of investment in additional test equipment particularly equipment end to end system tests.

The Office must without any further delay conclude the review of, with a view to approving, JPS' proposal for the National Meter Sampling Map.

Concomitant with the review the Protocol, the Office should consider the introduction of "Independent meter testers" retained by the OUR who would be empowered to respond to customer requests for meter investigation/testing. The logistics and modality of such operations would have to be carefully considered and developed, but it would go a long way towards providing an independent means of verification of meter accuracy in the field and thus offer the customer an alternative to JPS in these matters.

In reviewing and updating the Protocol, the role of the Jamaica National Association for Accreditation (JANAAC) must now be formally recognised.

Objective 5

From a historical and current perspective, assess the extent to which the billing practices are in compliance with the existing quality control procedures (including meter reading and exceptions processing) and Directives;

The billing process reviewed follows the processes outlined in procedure manuals provided by the utility company and is in keeping for the most part with the observations made in PwC 2007 report and the OUR Directives.

The levels of the exceptions being generated seems high and while these average about 2% of accounts billed per month there are concerns as to whether there are systemic or embedded problems. JPS would be well advised to examine these issues more closely.

The OUR Directive that states that all bills which show consumptions with a +/- 30% variance should be investigated is only being adhered to in one aspect of the process; that is at the meter reading stage. However, at the bill generation stage the process is using +/- 99% variance in consumption which is contrary to the OUR Directive. Since the exception report produced after the bill creation stage is used to initiate investigation into customer accounts it will mask errors that can occur at the meter reading stage of the operation.

Although, JPS was found to be remiss in its compliance with the Office Directive on the +/- 30% exception processing, the opportunity was taken to review the presentations made by JPS to support its proposal to implement the +/- 99% variance mechanism. With the background to this investigation and with the real prospect that as the electronic meters become more widespread the numbers of exceptions may increase initially, the conclusion has been reached that the exception limits should remain at the originally Directed +/- 30%. It is felt that over time the numbers of exceptions generated will decrease but in the current environment the company should be minded to deal with the attendant customer issues proactively and directly.

The performance of the meter reading process and bill generation including the level of exceptions should be included as part of the routine reporting by JPS to the OUR

It is **recommended** that:
JPS is to adhere to the OUR Directive and synchronize the exception reporting to +/-30%.

JPS review its quality control measures at the meter reading stage at the district office level with a view to strengthening the quality controls at the meter reading stage of process. While this recommendation has been largely conditioned by the circumstances found regarding the exceptions processing at the meter reading stage – the company may well find it useful and more efficient to address the exceptions as an outcome of meter reading rather than billing. The quality control reporting and action would then take place at the District level rather than at the head office.

The Office issue a directive requiring that, for estimating bills, the variance in the meter reading be averaged over 12 months consumption rather than the three months that presently obtains. In the long run his may improve the quality of the billing when estimates have to be used.

The Office issue appropriate Directives to give effect to these recommendations.

Objective 6

From a historical and current perspective, assess the extent to which the design of the quality control measures (including meter reading and exceptions processing) reliably and consistently identifies and treat with legitimate/genuine billing anomalies.

From a design perspective, the quality control procedures as set out in the policy and procedures documentation ought to reliably and consistently identify and treat with legitimate/genuine billing anomalies whether in field or in house. This is consistent with the conclusion of PwC in 2007.

The number of accounts/customers identified by these quality control measures is totally dependent on the criteria/threshold which is designated as "normal". In other words, the level at which incremental consumption is considered as anomalous directly impacts what is deemed genuine. Hence having exception thresholds of +/-30% only at the meter reader level and +/-99% at the billing team level leaves room for significant number of customers to experience marked volatility in the billed consumption. This has effectively delegated much of the quality control to the meter reader level at the first instance which is in breach of the OUR regulatory directives which established that the exceptions processing criteria should be set at +/-30%.

In relation to billing adjustments, in its findings PwC states that the "*management reviews of billing corrections resulting from billing exceptions on a sample basis, may negatively affect the efficacy of those reviews*". While this review did not specifically examine that assertion, the Billing Adjustment policy indicates that there is some oversight of the billing adjustments with a graduated level of management responsibility dependent on the amounts in question.

Recommendations

The recommendations at Objective 5 apply.

JPS' Compliance with the Directives issued by the Office

Of the 20 Directives issued by the Office in 2005, JPS has yet to implement 6. While it appears that there has been some communication to the Office by JPS (responses to some of which by the Office appear to be outstanding), the following continue to be relevant and should be followed up by the Office:

- Implementation of effective mechanism to facilitate performance monitoring of meter readers regarding quality of their readings. Mechanism must hold meter readers accountable for accurate readings
- Accountability standard prescribed by JPS for meter readers must be communicated to OUR (30 June 2005)
- Notification of customers whose consumption is outside the high/low variance
- Rejection criterion to be lowered to +/-30% for rate 10 customers by 31 July 2005. Commencing with March 2005 billing and until further notice, JPS shall be required to submit reports detailing exceptions generated by the high/low criteria – this is addressed specifically at Objective 5
- Effective immediately, estimate of consumption should be based on the last 3 actual readings (new accounts excepted) – Objective 5 recommends that this be changed to 12 months.

As noted, of the twenty (20) Directives issued by the Office, six (6) have either not been implemented or are in process. Of these, the investigation is of the view that one (1) is non - negotiable, while the Office should examine the others to see if they remain relevant, given the passage of time. There are several references made to the action taken by JPS to move the exception criteria to ± 99% and a return to the ± 30% criteria has been recommended. Compliance with this Directive is considered to be non - negotiable.

General

The Investigation has found no evidence that would bring the accuracy and integrity of the electronic digital meters into question. The Pattern approval tests and other

acceptance test done by the BSJ are conducted in conformity with the "Electricity Meter Testing in Jamaica – Protocol on Administrative and Testing Procedures" (OUR Document No Ele 2005/07) which prescribes ANSI C12.10 and others for such tests.

While evidence of excessively high bills have been identified, these cannot be attributed to the new meters themselves but more so to a failure by JPS to recognize and intercept these anomalous bills and to address them proactively and sensitively with the customers affected. Contributory factors to the incidence of high billing which have been experienced after the meter change from electromechanical to electronic meters may have been (i) the electromechanical meters that are targeted for replacement are those which have been in service before 1995 (some 16 years) - statistically, meters of this age will under register (although there will be some incidences of over registration); (ii) in situations where meters have been tampered with (a number of these were either found or strongly suspected) - installation of the new meter will provide accurate readings and therefore the metered consumption, going forward, will be higher; (iii) because of their superior accuracy and lower registration threshold, the electronic meters will measure low energy consumption more accurately than the electromechanical type - low consumption users may therefore see some increase in kWh billing.

There was sufficient discovery of meter tampering and illegitimate connections so as to conclude that these activities are probably widespread and embedded across the JPS system. As a matter of principle the Investigation supports the position that consumers must pay and the company has a right to expect payment for electricity consumed. In this regard it would be in the best interest of consumers, the company and the country alike for illegal abstraction of electricity to be eradicated. The present drive by JPS to replace the electromechanical meters with the electronic equivalent will accelerate this outcome and therefore should be diligently pursued.

The company's customer service practices need major overhaul. In some of the cases reviewed, the attitudes of Customer Service Representatives (CSR) to customers who have been billed excessively have, reportedly been abysmal in many instances. It seems that the practice is to terrorise customers using the "big stick" of disconnection to secure submission to unreasonable, arbitrary or even unproven demands. It appears that the default position taken by the CSRs is that the customer is guilty or the billing is correct and this defines the relationship with the customer and how complaints are handled. The company has to be sensitive enough to recognise that when a customer receives a bill that is significantly higher than the norm, then there is a problem that has to be resolved in a manner where the customer feels that the matter has been fairly addressed. It is therefore recommended that, pursuant to its functions under S.4 (1)(a), 4(2)(a) and 4.(3)(b) of the OUR Act, (i) the Office directs the company to review and (ii) its complaints handling procedure, (ii) these procedures be subject to the Office's approval and (iii) the Company issues Codes of Practice reflecting the approved

Procedures. This should be completed as soon as possible but within six months is considered reasonable. It has been noted earlier that this review is underway.

With the introduction of the new metering systems, it is expected that efficiency gains and perhaps other factors will have a bearing on the tariff. These impacts must be examined and taken into account at the next tariff review in 2014.

Constraints on the Office

During the course of the Investigation, certain skepticism was detected amongst various stake holders as to the futility of an investigation of this type. This skepticism was not only manifested in interaction with the consuming public but also by way of a perceived frustration in the OUR itself. Of course, the need to understand the background to this was examined as it was felt that the translation of any recommendations arising from this Report into sustainable action and results would be dependent on the environment in which the Report itself is received.

A quick desk review of the current regulatory environment was undertaken, limited only to the circumstances dictated by the terms of Reference of this Investigation. A number of critical issues became evident.

1. Legal environment – the electricity sector is still operating without a modern Act. The Electric Lighting Act of 1890 (amended several times) is still the enabling legislation for the sector
2. The JPS Licence issued pursuant to that Act but having regard to the OUR Act is cumbersome because, in order to make it relevant to the current environment, the drafters, evidently, included provisions which really belong in the enabling legislation e.g. the establishment of the Appeals Tribunal' and the overarching regulatory framework
3. The OUR Act remains deficient in providing an appropriate framework of enforcement powers for the Office, so the OUR has powers to prescribe actions but no powers to enforce them.

These are all issues that have been recognized and the correction of which have been advocated for over the last decade or so. Until there is new legislation and OUR Act amended, the Licence will remain imperfect and this important sector will continue to languish with customer dissatisfaction arising out of the consequences of an unfettered monopoly service provider. These issues have to be attended to as a matter of urgency.

Recommendations

Objective	Recommendations
Objective 1 Assess the legitimacy of the high consumption billing complaints as a consequence of the replacement of old (electro-mechanical) meters with new "digital" meters using appropriate sampling techniques	The Office to issue a Directive that JPS is not to retroactively adjust accounts of customers that show changed consumption patterns (high or low) after a meter change.
Objective 2 Assess the legitimacy of the high consumption billing complaints against JPS by using appropriate sampling techniques	In its current review of the Company's Draft Code of Practice for customer complaints handling, the Office to have regard to the findings of this Investigation in order to procure a modern and customer centered Code of Practice. The Office to issue rules to prevent JPS from benefiting when it breaches Directives issued by the Office – these would prevent the company from back-billing customers when there is under recovery and commensurately to reimburse customers when there is over recovery
Objective 3 Assess the appropriateness of JPS' current Back Billing Policies and Procedures	The Company's policy documents are to provide that all new accounts (including those where a meter is already installed) should have the appurtenant meter checked and, if necessary, a new meter installed on the premises prior to activation of the said new account. JPS be required to check meters more frequently than the company does at present, (this could be statistically derived but the appropriate time should be determined after consultation between the Office and JPS). JPS be required to revisit its back-billing policy and reformulate it to be in line with best practice, particularly with regard to back-billing on the grounds of fraud, alleged meter tampering and illicit abstraction. The period for which the company can back bill an account must reflect the principle that the customer ought not to be disadvantaged because of an error by or the inefficiency of JPS. The current minimum period where stipulated as four (4) months should be changed to reflect the original intent – 2 billing periods or 2 months. In the case of the upper limits best practice suggest that these should be 1 year. In the event that meter tampering is alleged, the company be restricted to a maximum back billing period of 2 years, subject to clear evidence that the customer has liability for a lesser period. Should this conclusion in any specific case be unsatisfactory to either party, either is free to refer the matter to the Office, in the first instance, or the courts, at any time, for adjudication.

Objective	Recommendations
	If fraud is suspected, the company has to prove "deliberate" and "willful" actions of customers if it is to successfully apply the full period of retroactivity provided for in the statutes, or alternatively, routinely cause these matters to come before the courts The company be required to issue its back billing policy and related issues as a Code of Practice to be publicly available. The Office to issue Directives to give effect to these recommendations
Objective 4 Assess JPS' current Meter Inspection and Audit practices and procedures	The Protocol provides that it should be reviewed every two years – such a review is long overdue. The Office must embark on this review as a matter of urgency and in doing so consideration must be given to the aligning of the standards prescribed for the new technologies e.g. ANSI C12.20 which specifies more stringent accuracy tolerances for electronic meters should now be included. The Office must without any further delay conclude the review of, with a view to approving, JPS' proposal for the National Meter Sampling Map. Concomitant with the review the Protocol, the Office should consider the introduction of "Independent meter testers" employed by the OUR who would be empowered to respond to customer requests for meter investigation/testing. In reviewing and updating the Protocol, the role of the Jamaica National Association for Accreditation (JANAAC) to be formally recognised
Objective 5 From a historical and current perspective, assess the extent to which the billing practices are in compliance with the existing quality control procedures (including meter reading and exceptions processing) and Directives	JPS is to adhere to the OUR Directive and synchronize the exception reporting to +/- 30%. JPS to review its quality control measures at the meter reading stage at the district office level with a view to strengthening the quality controls at the meter reading stage of process. The Office issue a directive requiring that the variance in the meter reading be averaged over 12 months consumption rather than the three months that presently obtains. The Office issue appropriate Directives to give effect to these recommendations
Objective 6 From a historical and current perspective, assess the extent to which the design of the quality control measures (including meter reading and exceptions processing) reliably and consistently identifies and treat with legitimate/genuine billing anomalies.	See recommendations at Objective 5 above.
General	The company to revisit its complaints handling procedure, in the light of and having regard to the many

Objective	Recommendations
	complaints received, and issue Codes of Practice which will be subject to the Office's approval pursuant to its functions under S.4 (1)(a), 4(2)(a) and 4.(3)(b) of the OUR Act. This should be completed as soon as possible but within six months is considered reasonable (see objective 2) The expected efficiency gains and other benefits that will arise from the installation of electronic meters and Smart metering systems must be examined and taken into account at the next tariff review in 2014 The legislative and regulatory framework to be reviewed as matter of urgency and (i) a modern sector Act enacted (ii) the OUR Act amended so as to be aligned with the new Sector Act as well as providing the OUR with enforcement powers and (iii) the Licence be renegotiated and amended to be aligned with the sector Act.

Summary of Key Recommendations

Legal and Regulatory Frameworks	The legislative and regulatory framework to be reviewed as matter of urgency and (i) a modern sector Act enacted (ii) the OUR Act amended so as to be aligned with the new Sector Act as well as providing the OUR with enforcement powers and (iii) the Licence be renegotiated and amended to be aligned with the sector Act. The Office to issue rules to prevent JPS from benefiting when it breaches Directives issued by the Office – these would prevent the company from back-billing customers when there is under recovery and commensurately to reimburse customers when there is over recovery.
Tariff regime	The expected efficiency gains and other benefits that will arise from the installation of electronic meters and Smart metering systems must be examined and taken into account at the next tariff review in 2014
Customer Service	In its current review of the Company's Draft Code of Practice for customer complaints handling, the Office to have regard to the findings of this Investigation in order to procure a modern and customer centered Code of Practice. To be completed within 6 Months.
Billing	The Office to issue a Directive that JPS is not to retroactively adjust accounts of customers that show changed consumption patterns (high or low) after a meter change. JPS is to adhere to the OUR Directive and synchronize the exception reporting to +/- 30%. The Office to issue a Directive requiring that the variance in the meter reading be averaged over 12 months consumption rather than the three months that presently obtains. JPS be required to revisit its back-billing policy and reformulate it to be in line with best practice, particularly with regard to back-billing on the grounds of fraud, alleged meter

	tampering and illicit abstraction. The period for which the company can back bill an account must reflect the principle that the customer ought not to be disadvantaged because of an error by or the inefficiency of JPS. The current minimum period where stipulated as four (4) months should be changed to reflect the original intent – 2 billing periods or 2 months. In the case of the upper limits best practice suggest that these should be 1 year. In the event that meter tampering is alleged, the company be restricted to a maximum back billing period of 2 years, subject to clear evidence that the customer has liability for a lesser period. Should this conclusion in any specific case be unsatisfactory to either party, either is free to refer the matter to the Office, in the first instance, or the courts, at any time, for adjudication. If fraud is suspected, the company has to prove "deliberate" and "willful" actions of customers if it is to successfully apply the full period of retroactivity provided for in the statutes, or alternatively, routinely cause these matters to come before the courts The company be required to issue its back billing policy and related issues as a Code of Practice to be publicly available. The Office to issue rules to prevent JPS from benefiting when it breaches Directives issued by the Office – these would prevent the company from back-billing customers when there is under recovery and commensurately to reimburse customers when there is over recovery. JPS review its quality control measures at the meter reading stage at the district office level with a view to strengthening the quality controls at the meter reading stage of process.
Metering	The Company's policy documents are to provide that all new accounts (including those where a meter is already installed) should have the appurtenant meter checked and, if necessary, a new meter installed on the premises prior to activation of the said new

	account. JPS be required to check meters more frequently than the company does at present, (presently every 5 years) but the appropriate time should be determined after consultation between the Office and JPS). JPS review its quality control measures at the meter reading stage at the district office level with a view to strengthening the quality controls at the meter reading stage of process.
Metering Protocol	The Protocol provides that it should be reviewed every two years – such a review is long overdue. The Office must embark on this review as a matter of urgency and in doing so consideration must be given, to the aligning of the standards prescribed for the new technologies e.g. ANSI C12.20 which specifies more stringent accuracy tolerances for electronic meters should now be included. The Office must without any further delay conclude the review of, with a view to approving, JPS' proposal for the National Meter Sampling Map. Concomitant with the review the Protocol, the Office should consider the introduction of "Independent meter testers" employed by the OUR who would be empowered to respond to customer requests for meter investigation/testing. In reviewing and updating the Protocol, the role of the Jamaica National Association for Accreditation (JANAAC) to be formally recognised

Annexure – Main Report

Table of Contents

1 Background

JPS has a Licence – The All Island Electricity Licence, 2001 – originally issued March 31, 2001 to provide electricity services in Jamaica for 20 years. Under the terms of the Licence the company has the exclusive right "to transmit, distribute and supply electricity through Jamaica"[1] for the term.

The company is regulated by the Office of Utilities Regulation (OUR, the Office) pursuant to the Office of Utilities Regulation Act 1995 (the Act) and its subsequent amendments.

In 2004, following the passage of Hurricane Ivan, the OUR recorded a dramatic increase in complaints specifically related to high bills being rendered by the company. As a consequence, on 8th December 2004, the Office requested JPS to conduct its own investigation into these incidences of high bills being received by customers. Arising out of this investigation and its own Enquiry the Office issued a Decision (Document No Ele2005/01) dated 22nd February 2005 setting out its findings. The Directive to the Company codifying that Decision was issued on 24th February 2005 and amended 22nd March 2005.

Despite the measures taken arising out of the Directive, the OUR continued to receive high levels of complaints regarding billed consumption from customers of JPS and in September 2005, the Office decided to conduct an audit of the JPS billing system "*to assess its efficacy and arising from which to take such action as will be necessary to restore confidence in the company's billing system*". The Office retained Price Waterhouse Coopers (PwC) to carry out the audit which among other things was to examine the Company's compliance with the Directives of 22nd February 2005. PwC issued its report on 26 February 2007 and arising from which the Office issued a letter, dated 7th November 2007, to JPS raising a number of issues and bringing to attention the question of the Company's non compliance with a number of the Directives arising out of the report dated 26th February 2007.

Pursuant to its powers under Section 4(5) of the Act, the Office by Order (Document No Ele 2005/02) dated 29th July 2005 prescribed procedures for "The Testing of Meters used by Jamaica Public Service Company Ltd. This Order prescribed the applicable standards and test requirements for meters used in Jamaica to measure consumption of Electric Energy by Customers" and also, for the purposes of the OUR Act, designated the Bureau of Standards Jamaica (BSJ) as "the competent authority to test metering and associated equipment used for revenue purposes". This was followed by the issuance of "Electricity Meter Testing in Jamaica – Protocol on Administrative and Testing Procedures" (Document No Ele 2005/07) on 13th December 2005. This Protocol

[1] All Island Electric Licence, 2001, Condition 2.4(b)

prescribes the "administrative and testing procedures for electricity revenue meters installed by Jamaica Public Service Company Ltd at customer locations to measure the consumption of electrical energy".

Electromechanical meters with dial type registers have been the standard meter used by JPS for its revenue metering. These meters have had a long history of use in the electricity supply business worldwide. However, in 2007, JPS embarked on a programme to shift to electronic digital type meters which were gaining in use internationally. JPS reports that it initially introduced these new meters for new accounts or in those circumstances where a customer requested a meter change. In mid-2011, however, the company changed its strategy regarding the installation of the digital meters when it embarked on a specific exercise to change out the old electromechanical meters with the digital type and it reports that some 17,000 such accounts have been targeted. Simultaneously, the company has also embarked on a programme to install Residential Advanced Metering Infrastructure (RAMI) in some 12 major communities across the island.

There has been significant customer reaction and outcry about the level of JPS bills and seemingly these high billings have been linked to the installation of the digital meters. The level of protests reached a crescendo about May/June and continued unabated through August into September. As a result and being increasingly concerned about the complaints being voiced by consumers and customers, the Office commissioned this independent investigation into the JPS billing and metering practices with a view to establishing "*whether the complaints have merit and if this is found to be the case to recommend appropriate remedies for the Office to consider*". The objectives of the investigation are to:

1. Assess the legitimacy of the high consumption billing complaints as a consequence of the replacement of old (electro-mechanical) meters with new "digital" meters using appropriate sampling techniques;
2. Assess the legitimacy of the high consumption billing complaints against JPS by using appropriate sampling techniques;
3. Assess the appropriateness of JPS' current Back Billing Policies and Procedures;
4. Assess JPS' current Meter Inspection and Audit practices and procedures;
5. From a historical and current perspective, assess the extent to which the billing practices are in compliance with the existing quality control procedures (including meter reading and exceptions processing) and Directives;
6. From a historical and current perspective, assess the extent to which the design of the quality control measures (including meter reading and exceptions processing) reliably and consistently identifies and treat with legitimate/genuine billing anomalies.

1.1 Current Electricity Supply Environment in Jamaica

While a commentary on the state of the electricity supply environment is not an explicit consideration in the Terms of Reference, an investigation of this type must provide the background to which the issues under investigation arose as well as to provide the overarching context for any recommendations that are made.

Suffice it to say that JPS tariff comprises 4 factors that are billed monthly all of which are conditioned by the kilowatt hour (kWh) consumption viz;

The energy charge (Residential Rate)	1st 100 kWh - $6.280 Over 100 kWh - $14.36
The fuel charge	Variable dependent on fuel costs
The foreign exchange adjustment	Variable based on average exchange rate
General Consumption Tax	10% of energy charge over 200 kWh

A typical residential bill for August 2011 shows the following:

Total Energy Charge (329 kWh)	$ 3,916.44
Customer Charge	$ 300.00
F/E Adjustment @ -0.308%	$ - 12.99
Fuel & IPP Charges 329 kWh @ 20.718	$ 6,816.22
GCT	$ 451.93
Total	$ 11,471.60

It will be noted that the fuel and IPP charge on this bill is about 60% of the total bill and 74% higher than the "variable energy charge" component.

The Office fixes the JPS tariff (specifically the energy charge) at five year tariff reviews and, once fixed, it is subject to annual adjustments based on inflation less a productivity index; so the energy charge remains a fixed rate from month to month (usually July – June) for 12 months. The foreign exchange adjustment varies monthly based on the exchange rate of the Jamaican dollar to the US Dollar. This has remained relatively stable over the last several months. The fuel charge reflects the actual costs of fuel to JPS and the Independent Power Producers (IPPs) to generate electricity to meet demand during the month and is directly dependent on the costs of fuel charged by the fuel supplier to JPS and the IPPs. Table 1 below shows these relevant data for September 2010 to August 2011.

Table 1

Month	Total Fuel Costs (US$'000)	Billed Fuel and IPP Rate (USc/kWh)	System Losses (%)	Billing Exchange Rate (J$:1US$)
Sep-10	45,550	17.471	22.58	86.25
Oct-10	48,427	18.232	22.27	85.62
Nov-10	50,525	19.670	22.24	86.14

Dec-10	50,964	19.988	21.80	85.86
Jan-11	54,811	20.515	21.78	85.69
Feb-11	58,153	23.986	21.89	85.84
Mar-11	62,509	23.187	21.65	85.75
Apr-11	65,266	24.793	21.74	85.73
May-11	71,870	25.957	21.72	85.78
Jun-11	70,958	26.191	21.87	85.91
Jul-11	67,827	24.048	22.16	86.15
Aug-11	67,387	25.200	22.31	86.13

The billed fuel and IPP rate increased by 50% in May 2011 over the rate that prevailed in September 2010 while the related fuel costs increased by about 58%.

Customers, therefore, have been receiving electricity bills which have been far from stable and over the period would have varied in tandem with the movement in the fuel costs; a situation which makes it impossible for customers of all classes to plan or budget for electricity costs and consequently raises the level of dissatisfaction with the electricity service. To illustrate further, one large customer filed a complaint with the portfolio minister for energy, which eventually reached the investigating team. The substance of the complaint was:

"I would like to join the several thousands of Jamaicans who complain about the rapid increase in their electricity bills.

I attach herewith a schedule showing the kilowatt hours used each month by [Name Deleted] for the period January to July 2011 and the amount billed by Jamaica Public Service. You will observe that in January 2011, the consumption was 2,220,212 kilowatt hours at a cost of $50,777,314.35 against July 2011, where the kilowatt hours used was 2,157,720 and the amount billed was $60,564,076.08.

We are firmly of the opinion that either the new digital meters are not recording properly or the new method of billing is not properly regulated."

A close examination of data provided by the customer for this particular account revealed the following history for the period January – July 2011.

Table 2

	Jan 11	**Feb 11**	**Mar 11**	**Apr 11**	**May 11**	**Jun 11**	**Jul 11**
Energy kWh	2,220,212	1,580,877	1,809,092	1,810,755	1,996,570	2,086,775	2,157,720
Total Charge excluding GCT (Ja$)	50,777,314	38,339,243	48,400,313	47,313,688	54,359687	59,778,220	60,564,076

It is noteworthy that, in this case, the recorded kWh consumption for each subsequent month is less than that in the month of January and that the charge however is erratic due to the influence of the fuel charge (see Table 1). The customer, in this case, did not appreciate that the measured kWh (as per the new meter) had in fact declined.

The foregoing discussions serve to give emphasis to the tariff environment where neither the regulator nor the company has control over fuel costs which is a significant input to electricity rates. The measures to remedy this situation is outside the scope of this investigation but available literature confirms the experiences in other jurisdictions where customer perception and acceptance of the introduction of new technologies in the billing platforms tend to be negative where the tariffs are unstable.

The local electronic (radio) and print media have been replete with expressions of customer dissatisfaction over the bills rendered by JPS following the change to electronic meters. Much has been said and written which generally express concerns about (i) the accuracy of the new meters (ii) step increases in the bills received (high consumption) and (iii) the attitude (responsiveness) of JPS' customer service machinery to complaints/concerns raised by customers.

At the 2009 tariff review, the OUR increased the allowed losses in the tariff from 15.8% to 19.5% and at the same time provided for specific targets for loss reduction over the tariff period. Included in the tariff is a provision of US$0.004/kWh to be set aside from the tariff to fund investments in loss reduction initiatives, *"specifically to implement Advanced Metering Infrastructure and other loss reduction technology"*[2]

This Investigation, therefore, has been initiated at a time when the electricity supply environment is one where electricity prices are unstable due to the volatility in the fuel costs (billed fuel charge having peaked at Ja$22.50/kWh in June 2011); the company is on an intense programme of changing to electronic meters (with some limited introduction of AMI and RAMI) and also aggressively targeting the reduction of system losses to comply with the targets set by the for the reduction of system losses, the Regulator having provided, in the tariff, an income stream to fund investments in technology to secure such reductions.

1.2 Emerging considerations in JPS' revenue metering platforms

The meter is a critical part of the electric utility infrastructure. It doesn't provide a control function for the power system, but it is one of the most important elements from a monitoring and accounting point of view. Meters keep track of the amount of electricity transferred at a specific location in the power system, most often at the point of service to a customer. Like the cash-register in a store, these customer meters are the place where the transaction occurs, where

[2] OUR's Determination Notice – JPS Tariff 2009 – 2014, Document No. Ele 2009/04 : Det/03, September 18, 2009

the consumer takes possession of the commodity, and where the basis for the bill is determined. Unlike a cash-register, however, the meter sits unguarded at the consumer's home and must be trusted, by both the utility and the home owner, to accurately and reliably measure and record the energy transaction.

Electricity is not like other commodities because it is consumed in real-time. There is nothing to compare or measure later, nothing to return, nothing tangible to show what was purchased. This makes the meter all the more critical for both the utility and the homeowner. For this reason, meters and the sockets into which they are installed are designed to standards and codes that discourage tampering and provide means of detecting when it is attempted. Intentional abuses aside, the electricity meter itself must be both accurate and dependable, maintaining its performance in spite of environmental and electrical stresses.[3]

The electromechanical meter of the type used on the JPS system, as indeed on all systems worldwide, is of a basic design that was developed over 100 years ago. Over the years the design has evolved into a robust, mechanically simple mechanism that has enjoyed the trust and confidence of electric utility customers and utilities alike. With the increasing sophistication of the energy markets, responses of customers to increasing prices, theft and tampering with the meter and the capacity of new technology to deliver multi-functionality in measuring devices, the electronic meter with digital readout was developed in the early 80's but even as late as 2000 questions were being asked whether the electronic meter had application in the residential arena. The literature suggests that in the last ten years or so, there has been a major shift by utilities (with regulatory approval where required) to the electronic meter. The difference between the electromechanical meter and the electronic meter is that the former operates by counting the revolutions of an aluminium disc which is made to rotate at a speed proportional to the power. The aluminium disc through a series of gears turns a series registers (the least significant number being to the extreme left) which displays the meter reading. The number of revolutions of the disc is thus proportional to the energy usage. The latter displays the energy used on an LCD or LED display, and can also transmit readings to remote places. In addition to measuring energy used, electronic meters can also record other parameters of the load and supply such as maximum demand, power factor and reactive power used, etc.

The change from electromechanical to electronic meters has not been easy for the utilities and in many jurisdictions there has been customer reaction and protest to the extent where a number of regulatory commissions have carried out investigations into the accuracy and appropriateness of the electronic meters. In each jurisdiction, the general complaint has been the increase in bills that have occurred coincidently with the introduction of the electronic meter.

[3] Electric Power Research Institute (EPRI) White Paper – "Accuracy of Digital Electricity Meters, May 2010" - Extracted from the Background.

The change to electronic meters, however, is relentless manufacturers are increasingly discontinue the production of the electromechanical version and as the prices fall utilities shift to the new technologies because of the benefits that are claimed to accrue in terms of efficiency, accuracy, environmental gains, information and data capture opportunities for planning and operational decisions and the flexibility for offering multiple rate plans to customers. The consequence is that it is predicted that the electromechanical meter will soon not be available.

Figure 1 below shows the situation of vendors in the United States who manufacture meters since 1998 to 2010.

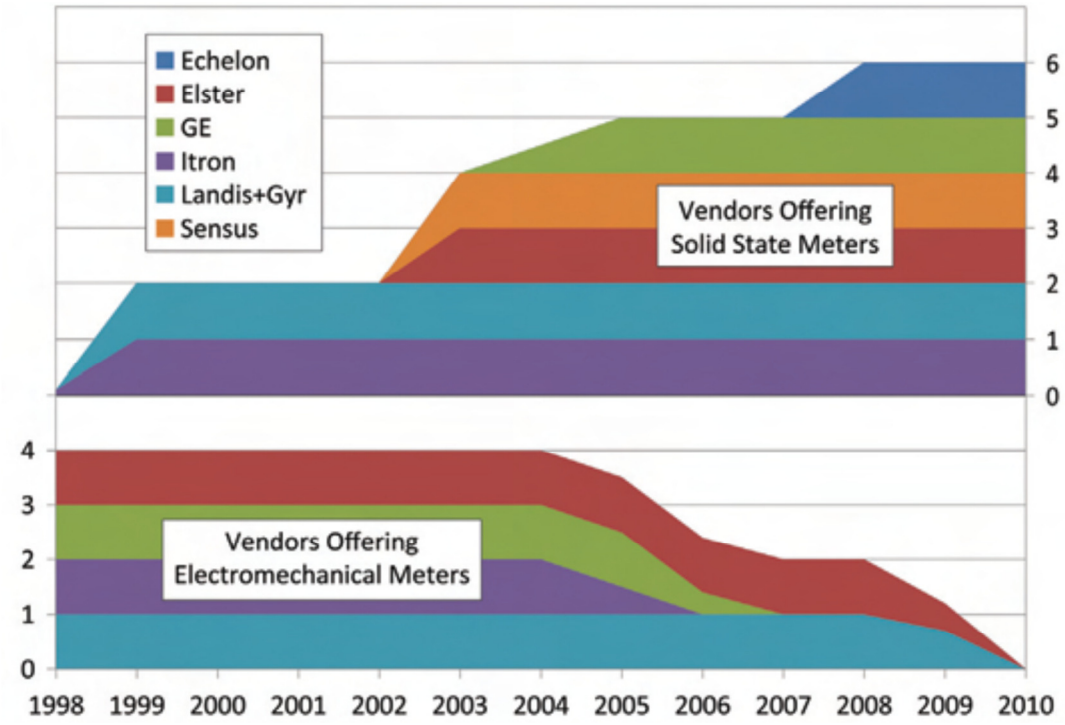

Figure 1: Status of Meter Manufacturers in the United States[4]

The accuracy of the electronic meter when compared to the electromechanical meter has been questioned. In the United States, meters are manufactured to and tested in accordance with American National Standards Institute (ANSI) Standards. In other jurisdictions Europe, Britain, Canada manufacture and testing are to the relevant national standards. The electronic meter meets those standards. In fact, keeping in-step with the technology improvements associated with solid state metering, the American National Standards Institute (ANSI) developed new standards with more stringent accuracy requirements during the late 1990s. ANSI C12.201 established Accuracy Classes 0.2 and 0.5, with the Class numbers representing the maximum percent metering error at normal loads.

[4] Electric Power Research Institute (EPRI) White Paper – "Accuracy of Digital Electricity Meters, May 2010"

Figure 2 below compares the accuracy prescribed for both types of meters as per ANSI.

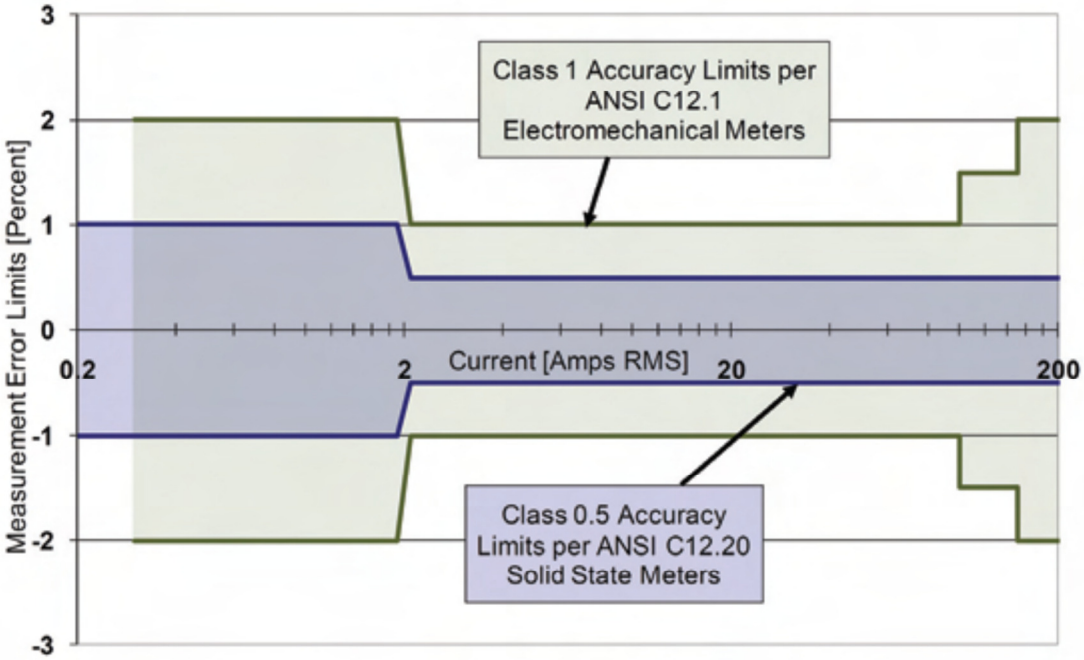

Figure 2: ANSI Accuracy limits for Electromechanical and Electronic Meters

Digital electronic meters were introduced by JPS in 2007. Digital electronic meters may be utilized in a variety of ways from the simple static one dimensional mode where meters readers read the meters periodically, as would be done for electromechanical meter to applications of various degrees of sophistication to operate at their full capability, when linked through communications channels to applications platforms at a central location. These applications are what are referred to Advanced Metering Infrastructure (AMI) and leverages the "smart capabilities" of the electronic meter and the expression "smart meters (metering)" usually refer to the application of electronic meters on AMI.

JPS last purchased residential 3 wire electro-mechanical meters in March 2007. The replacement 3 wire electronic meters were first purchased in April 2007 with first installation taking place during the third quarter of 2007. In the case of the electronic 2 wire meters, these were first purchased in November 2009 and installation commenced in first quarter of 2010.

The company introduced AMI when installation started in January. The AMI project was launched to target JPS' Commercial and Industrial customers. This category of customer approximates to 5,600 customers, or just less than 1% of the customer base, which contribute to approximately 50% of JPS total sales.

The first Residential Advanced Metering Infrastructure (RAMI) test pilot project was 35 customers in Clifton, where Radio Communication and Landis & Gyr meters were used. The second more extensive test was in 2009 in the form of pilot project in Old Harbor Bay using PLC Technology for communications. JPS' motivation to introduce RAMI has been to tackle the high levels of non technical losses (approximately 12%) that have been plaguing the company for decades and presumably in direct response to the OUR's Tariff Decision of 2009. The company has subsequently embarked on a programme to install some thirty Five Thousand (35,000) meters in specific areas were tampering and electricity theft is poses major problems.

JPS has reported the following statistics up to the period ending June 2011 –

> *Out of the total number of meters replaced so far, approximately 10% of the Old meters were found with some sort of irregularities. Out of the rest 49% of the replaced meters showed an increase in consumption while 48% of the replaced meters showed a decrease in consumption. 3% of the replaced meters did not show any variance.*

The inference being that approximately the same number of accounts experienced increases as did those that saw decreases in consumption under the new metering arrangement.

The Investigation has noted and is aware of a number of interventions in the local media that allude to JPS' installation of "Smart meters" and comparison of the local experience with those in other jurisdictions. It is important to note the difference between the electronic "digital" meter in its basic sense and Smart meters as there have been several comparisons drawn which are not comparing like situations or "apples with apples". The allusions to other jurisdictions have in the main been to the installation of Advance Metering Infrastructure (AMI) and or utilizing the digital meter in a smart mode to register consumption relating to multiple billing plans at a single location (e.g. for Time of Use Billing). This is the application generally referred to as smart metering and for which examples drawn from jurisdictions in the USA, Australia and others cite many difficulties and customer push back. In Jamaica, the comparative system in terms of our current experience would be the RAMI system which is being installed by JPS as a special project and the AMI as installed for large commercial and industrial accounts. The experiences of customers where these installations have been made are the only ones that can reasonably be compared with "Smart Meter" experiences in other jurisdictions.

1.3 International Experiences with "Smart" Meters

The experiences with the introduction of "smart meters" in various jurisdictions have been varied but by and large, customers have been skeptical about their introduction to the extent where some regulators have commissioned investigations and assessments of

these systems while a number of other independent analyses have been done. The following is a summary of some of the commentaries.

Table 3: International experiences with "smart meters"

Source	Summary conclusions
EPRI – White Paper discussing the accuracy of digital meters	"*Electromechanical meters are dependable products that have served society well. Over a hundred years, their design was optimized so that they provided an excellent combination of simplicity and reliability while providing a single measurement – cumulative energy consumption.*" During the transition to solid state meters "*there will likely be both real and perceived issues with solid-state designs that need addressing. Care must be taken to consider each case thoroughly and to use sound diagnostic practices to trace each issue to its root cause. Temptations to either blame or exonerate the solid state meter must be resisted. Ideally, each investigation should not only resolve any homeowner concerns, but also discover any product imperfections so that solid-state meter designs maybe continually improved.*"[5]
Structure Consulting Group – an investigation commissioned by the California PUC into PG&E's[6] Smart meter installations	"*Based upon Structure's review of requested PG&E documentation and Structure's associated testing, Structure determined that previously-identified issues brought to CPUC's attention were being appropriately addressed by PG&E. Structure's testing did not uncover issues that would challenge that PG&E's Smart Meters were accurately measuring and recording electric usage, or that PG&E's internal systems were accurately utilizing this data for billing purposes. Structure identified no relevant correlation between installed Smart Meters, impacts to billing on installed Smart Meters, and residential Customer Smart Meter high bill complaints. Structure did identify certain events and circumstances, including sub-optimal Customer service and variable implementations of industry best practices that contributed to the increase in Smart Meter high bill complaints. The concerns uncovered should be addressed, but did not appear to be related to the ability of PG&E's Smart Meter System to measure and bill electric usage correctly.*"[7]
Navigant Consulting on behalf of the Public Utility Commission of Texas "Evaluation of Advanced Metering System (AMS) deployment in Texas"	<u>On Accuracy of Advanced Meters in comparison with Electromechanical meters</u> *The results of the accuracy testing indicated that the advanced meters accurately measured and recorded electricity usage. 5,625 out of 5,627 meters (or 99.96 percent) tested were found to be accurate by the American National Standards Institute Standards of +/- 2 percent. Side by-side testing, as well as the review of historical accuracy testing results, indicated that the advanced meters were significantly more accurate than the electromechanical meters.* <u>On Analysis of Customer Complaints</u> *The higher electricity bills observed appeared to be due primarily to significant*

[5] Electric Power Research Institute (EPRI) paper – "Accuracy of Digital Electricity Meters, May 2010"
[6] Pacific Gas and Electric
[7] The Structure Consulting Group – "PG&E Advanced Metering Assessment Report Commissioned by the California Public Utilities Commission", September 2010

Source	Summary conclusions
	changes in the weather and electricity usage during the recent severe winter in Texas. The Navigant Consulting team also observed a combination of other factors that may have exacerbated the observed differences in certain customer bills including the length of customer billing cycles, and the use of "estimated" and "manual" meter reads that may not have been reflective of the customer's actual electric usage. On Electric Usage/Billing Analysis *The results of the analysis indicated that there was no statistically significant difference between customers with advanced meters and customers with electromechanical meters that was believed to be attributed to the installation and use of advanced meters.*[8]
Comments from Regulated Industries Commission – the Regulator in Trinidad and Tobago	In T&T penetration of AMI - greater than 98% since mid 2008. There were operational integration issues due to: • Installation difficulties which allegedly resulted in damaged appliances to customers. • Meter installation started at the time of a tariff adjustment therefore bill changes were not clear to customers. • Delays in the submission of readings from changed out meters further compounded billing issues. Project was not well received by customers due to: • Claims of higher bills due to new system. • Trespassing by contractors. • Issues arose with respect to meter accuracy The regulator in response to customers' complaints about the accuracy of the AMI meters called for the certification of these meters by the Trinidad and Tobago Bureau of Standards

Again, for the avoidance of doubt, while some general inferences can be made from these examples, a direct comparison with JPS' RAMI and AMI installations would be the only real comparisons of like situations. The EPRI report has direct relevance to the "electronic meter" as adopted by JPS and it has been used extensively as a reference during the course of this Investigation.

[8] All excerpts from Navigant Consulting Publication – "Smart Metering Deployment: Pitfalls and Perils", September 2010

2 Approach and Methodology

The concept of an independent investigation was first publicly expressed by the Office and, although not expressly stated as a condition of the Terms of Reference, a deliberate attempt has been made to establish "Chinese walls" between the Investigation and the Members of the Office, so as to minimize the opportunity for the Office to influence the investigation and to mitigate the possibility of any such perception.

Each objective received individual treatment and specific attention was paid to each by the investigating team. This has resulted in a number of individual reports, the findings from which have provided the basis for this Report and informed the conclusions of the Investigations. These individual reports will form part of the permanent record of the Investigation but are not appended to this Report because of individual privacy considerations.

The schedule set by the Office for completion of the investigation was aggressive. In order to complete the task within the timeframe it was decided to carry out a forensic process rather than to depend on written and/ or oral submissions from interested parties. The Jamaica Manufacturers' Association, Small Business Association and the Medium Small and Micro Enterprises were, nevertheless, invited to make representations on behalf of their respective memberships while two customers requested hearings. One day was set aside to hear these representations none of those who were specifically invited took up the invitation. One residential customer, however, attended and provided very valuable input and insight.

The initial data requests made of JPS were:

1. A compilation in an electronic spread sheet of all customer accounts for which the meters were changed from electromechanical to digital since 2008. For each such account, please provide monthly consumption one (1) year before and up to one (1) year after the meter has been changed. The information should also include account numbers and meter identification for the old and new meters. The consumption data should indicate estimated or actual.
2. The records of every billing complaint received since 2008 on accounts for which meters have been changed and details of the actions taken by JPS with respect to such complaints.
3. The records of every complaint received as well as actions taken with respect to high billing (greater than a 30% change in normal consumption) in cases not related to meter changes since 2008.
4. JPS internal written procedures – for billing (including back-billing) and meter reading.
5. JPS' case files for all customers who have been the subject of back billing procedures over the last eighteen (18) months.

These yielded (i) a population of some 60,163 accounts for which new digital meters were changed since 2008; (ii) 5,994 billing complaints since 2008; (iii) 20,534 records of high billings (± 30%); and (iv) 22,084 records of complaints that have been the subject of back billing adjustments since January 2010, analysis of which formed the core around which the subsequent investigations and analyses developed.

Details of how the samples were determined and the resulting analysis of the data are discussed in relevant sections of this Report.

2.1 Meter testing

The terms of reference pointed to concerns about meter accuracy and raised questions about JPS' conformance to the 2005 Meter Testing Protocol (Document No Ele 2005/07).

The investigation sought to establish a baseline position and to expressly form a view on the:

a. accuracy of the digital meters generally
b. accuracy of the metering installed under the RAMI generally; and specifically
c. integrity of the new meters when compared with the performance of the electromechanical meter.

The services of the Jamaica Bureau of Standards (BSJ), as the statutory body in Jamaica responsible for measurement, were utilized for all meter performance testing. These tests comprised:

i. Bench testing of a sample of digital meters taken from JPS stock
ii. Field tests (in situ) of a sample of electromechanical meters as they were removed from service. These were replaced by digital meters which were tested under (i).
iii. Field tests (in situ) of a sample of digital meters previously installed by JPS which were afterwards reinstalled
iv. Bench testing of a sample of the RAMI meters taken from JPS stock
v. Bench tests of a sample of RAMI meters that were removed from service. These were replaced by RAMI meters tested under (iv)

The results garnered from the meter testing activities were of particular interest in considering the issues under Objectives 1, 2 and 3.

3 Objective 1

Assess the legitimacy of the high consumption billing complaints as a consequence of the replacement of old (electro-mechanical) meters with new "digital" meters using appropriate sampling techniques

This aspect of the investigation utilised data provided by JPS and focused on two major issues. The first, which was the more extensive process, disregarded the issue of formal complaints being made and instead looked at the percentage of customers that were likely to experience a change in consumption as a result of meter replacement. Furthermore, it looked at the percentage of these customers that would have experienced a high increase in consumption, where a high increase was taken to mean an average monthly percentage increase between the twelve month period after the meter change compared to the twelve month period before the meter change being greater than thirty percent (%).

The second issue was an examination of actual billing complaints made to JPS that were made by customers who had their meter replaced. The list of complaints was examined to see those related to high consumption complaints occurring after meter replacement. These cases were examined to see how legitimate the high billing complaints were as well as to determine the likelihood of such high bills to be attributable to meter replacement.

Data provided by JPS consisted of information concerning 60,163 accounts, all of which had a meter replacement between 1999 and 2011. Information about 5,994 complaints made to JPS concerning customers who had a meter replacement was also provided. Appropriate sample sizes were taken to facilitate analysis.

3.1 Information Requests

In keeping with Objective 1 the OUR requested JPS to provide the following:

1. *A compilation in an electronic spread sheet of all customer accounts for which the meters were changed from electromechanical to digital since 2008. For each such account, please provide monthly consumption one (1) year before and up to one (1) year after the meter has been changed. The information should also include account numbers and meter identification for the old and new meters. The consumption data should indicate estimated or actual.*
2. *The records of every billing complaints received since 2008 on accounts for which meters have been changed and details of the actions taken by JPS with respect to such complaints.*

3.1.1 Request 1

In keeping with Request (1), data was received from the JPS giving consumption readings for customers subject to a change in their electricity meter from an

electromechanical meter to an electronic (digital) meter between January 2008 and July 2011. The data set received contained 60,163 cases and included the following information for each case:

- Customer Number
- Premises Number
- Old Meter Number
- New Meter Number
- Date of Meter Change
- An indication as to whether or not the meter change was a part of the Meter Replacement Project
- 12 months consumption data prior to the meter change
    - Shown as months 1 -12 in the data set
- All available consumption data up to 12 months after the meter change
    - Shown as months 13-24 in the data set

3.1.2 Request 2

In keeping with Request (2), data was received from JPS containing details on billing related customer complaints to JPS for the period January 2008 to July 2011 for accounts which had experienced a change from an electromagnetic to an electronic meter. The data set received contained 5,994 cases and indicated the following information for each case:

- Complaint Category
- Complaint Code (number)
- Complaint Code (words)
- Complaint Status
- Complaint Date (date)
- Complaint Date (time)
- Action date
- Customer Number
- Premises Number
- Type of Service
- Agent ID who took the complaint
- Service Order type (where one was generated)
- How the complaint was resolved
- Date Complaint Closed (Date)
- Date Complaint Closed (Time)

3.2 Data Review and Conditioning

Before analysis was done, both data sets were reviewed to determine how many cases were suitable for analysis.

3.2.1 Data Set 1

For the first data set, containing information for all accounts experiencing a meter change, checks were made for:

- Repeats
  - customer codes
  - premises codes
  - old meter numbers
  - new meter numbers
- instances where the old and new meter numbers were the same
- cases listed as part of the meter change project
- cases that are not listed as part of the meter change project
- cases without a meter change date
- cases with no consumption data
- cases with no consumption data prior to meter change
- cases with no consumption data after meter change

This screening and conditioning of the data received based on the above criteria resulted in the population being reduced to 41,693. This number could then be further divided into two categories: (i) those that were a part of the meter change project and (ii) those that were not.

General population information could then be determined from the reduced population of 41,693 cases. However, for detailed analysis of the population, an acceptable number of cases had to be chosen to both be large enough to represent an acceptable statistical representation of the population as well as small enough to be manageable in a very tight project schedule. A 95% confidence interval was chosen with a +/-5% margin of error. The representative sample size was then chosen as 381 based on Figure 23 in the Appendix.

The sample cases were then chosen in a quasi-random fashion. The procedure was as follows:

1. The population of 41,693 cases were divided into two:
   a. those that were a part of the Meter Change Project (11,552 cases) and
   b. those that were not (30,141 cases)
2. It was decided that of the 381 cases, 190 would be chosen from those that were a part of the Meter Change Project and the remaining 191 would be chosen from the remaining cases

Cases were chosen at random from both population sets, with the exception of one case that was intentionally included. A graphical representation of how the sample size was derived from the original population size is shown below in Figure 3.

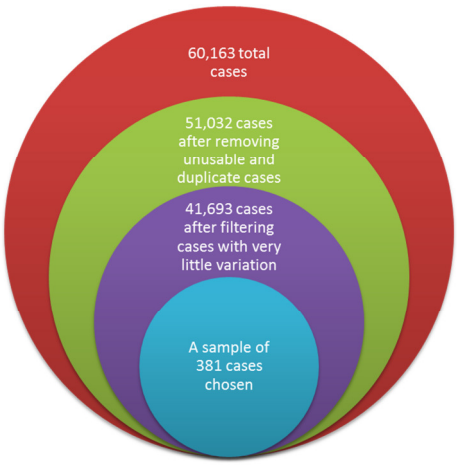

Figure 3

Detailed information was requested for these 381 accounts for further analysis. The following information was requested for all 381 accounts in the sample:

- Contact details
- Consumption data (kWh) for 60 months ending July 2011 and number of days billed
- Load data for each account, if available
- Meter brand (old and new)

The detailed information received for the 381 accounts was used for the secondary analysis, discussed later, however, while a number of errors were identified and corrected the following issues are noteworthy: (i) there were 149 cases occurring in the database that were simply duplicates of other cases; (ii) there were unexpected cases of repeat new meter numbers and repeat old meter numbers attached to different accounts that warrant further investigation. These cases are highlighted in Table 13 and Table 14 in the Appendix.

3.2.2 Data Set 2

For the second data set, containing complaints attached to accounts experiencing a meter change, checks were made to determine the nature of those complaints and then isolate complaints that:

1. were high consumption billing complaints
2. occurred after the meter change date

The total number of complaints given in the data set was 5,994 and these were divided into the following categories:

- Adjustment
- Bill not received
- Disconnection in Error
- High Bill
- Meter Not Working
- Meter Stolen
- Payment Not Credited
- Rate Change

- Incorrect Billing
- Incorrect meter reading
- Low Bill
- Transfer Credit/Debit
- Unable to understand bill

The number of complaints per category is shown in Figure 4 below.

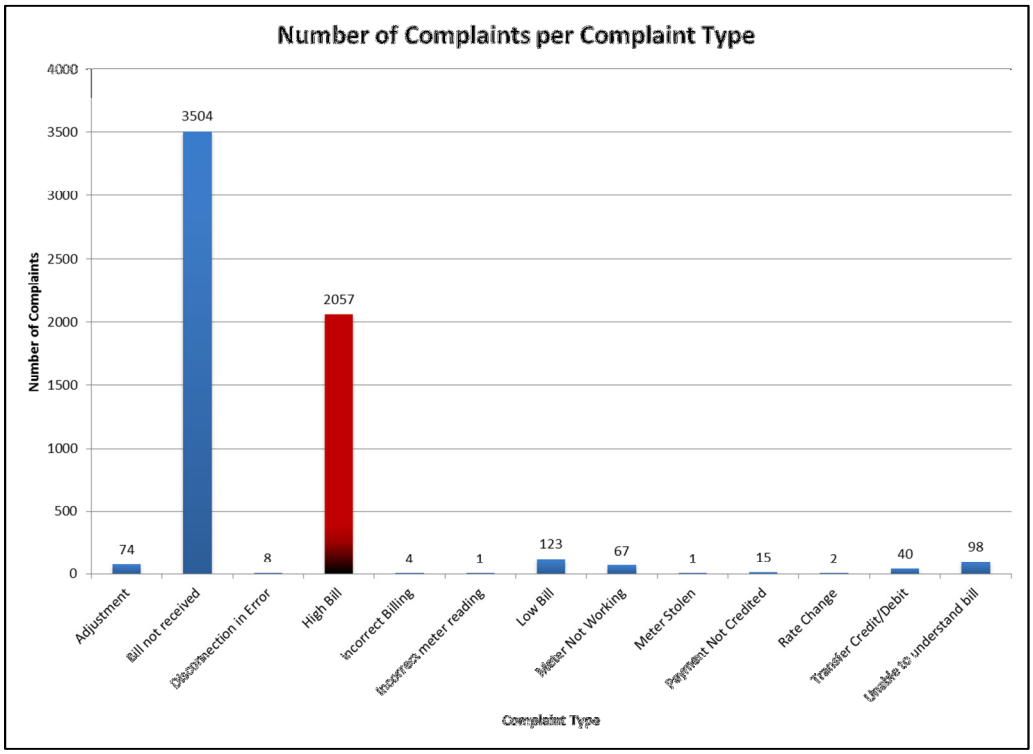

Figure 4

As is shown, the number of High Bill complaints was 2,057. These were then cross-referenced with the first data set to determine the number of complaining accounts and then the number of accounts filing complaints after the meter was changed. The results are displayed in Figure 5 below.

Figure 5

Detailed information was requested for these 80 accounts for further analysis.

3.3 Analysis

Analysis was done in two steps. The first step, preliminary analysis, involved looking at the initial data given for the sample of 381 cases, discussed earlier, to determine the extent of consumption change after the new meter installation. The second step involved re-doing the steps of the preliminary analysis with more detailed information provided by JPS. While the preliminary analysis used monthly consumption readings and disregarded billing days per month, secondary analysis took into account billing days per month to get a more accurate picture of consumption change. Additionally, secondary analysis looked at a five year consumption history for each case so as

a. to determine the user's consumption pattern over the period,
b. to determine the extent of consumption change and
c. to see if the greatest change in usage coincides with new meter installation

Finally, complaints made by customers who had a meter replacement were examined to see how many high billing complaints were legitimate and likely a result of meter replacement.

The outline of analysis conducted was as follows:

1. Establish baseline consumption data for all accounts where meters were changed from electromechanical to electronic.
2. Compare consumption data before and after meter change.
3. Determine the statistical significance in the difference of consumption before and after to inform further review.
4. Choose a suitable sample reflective of the population to conduct more detailed analysis.
5. From sample chosen determine usage pattern over an extended period.
6. Determine the extent to which usage pattern has changed.
7. Determine if the greatest change coincides with the meter change.

8. Evaluate legitimacy of high billing complaints related to meter change by re-doing steps 5 to 7.

3.3.1 Preliminary Analysis

In order to determine the legitimacy of high billing complaints due to meter change. The sample population was examined to see if there was an appreciable difference in billed consumption after a customer's new meter was installed compared to their consumption prior to meter replacement.

The approach taken looked at the average percent change in consumption on a month to month basis for 12 months before and after the meter change. That is, the average of the percent changes between months 1 and 13, months 2 and 14, months 3 and 15 etc. since these would be like months (see Figure 6 below). The idea behind this approach is that seasonal effects are discounted.

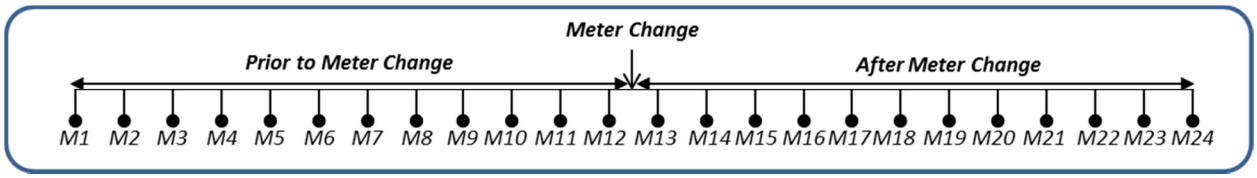

Figure 6

It was found that, in fact, the largest percentage of cases (59.83%) experienced a change in consumption within ±30% as is shown below.

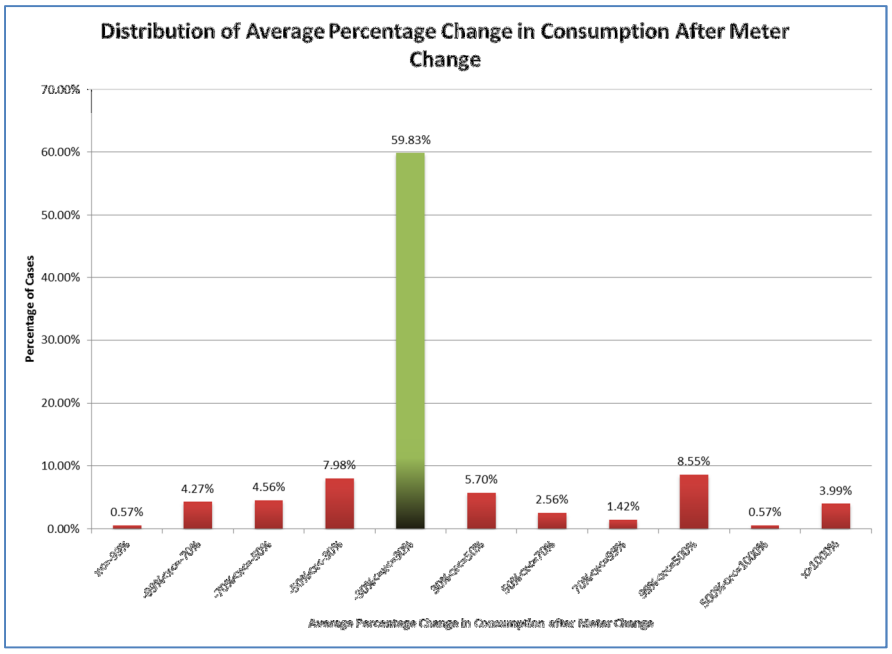

Figure 7

Furthermore, it can also be shown that, of these, the majority of cases experienced a reduction in consumption, after meter change, as is shown below.

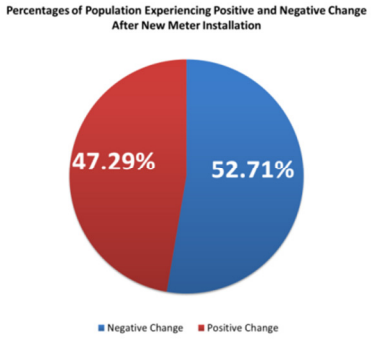

Figure 8

If the bounds were then changed to show cases experiencing an increase greater than 30% and those that didn't, the picture would change further to show that only 22.79% of cases experienced an increase greater than 30% in consumption readings.

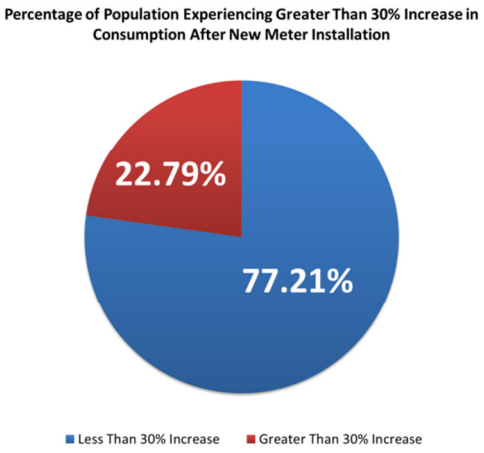

Figure 9

While the above indicates that 22.79% of customers experienced an increase in consumption greater than 30% it does not follow that the increase in consumption is solely due to the change from an electromechanical to an electronic meter but these results were still useful as they gave an idea of what to expect with more detailed analysis and informed the selection of candidate cases for meter testing.

3.3.2 Selection of Candidates for Meter Testing

Selection of candidates for meter testing was made based on the results of preliminary analysis. It was decided that 20 new meter installations were to be tested. This number was decided on based on economics and time required for testing, given the aggressive nature of the time for completing the investigation. The 20 meters to be tested were chosen based on Figure 7 where cases that experience a change in consumption less than or equal to 30% were excluded from possible selection. With the exception of one

case, all cases were selected at random and were distributed island-wide as shown in Table 4.

Table 4

Parish	Number of Cases
Kingston	7
St. Andrew	1
St. Catherine	1
Clarendon	1
Hanover	2
Portland	1
St. Ann	1
St. Elizabeth	1
St. James	1
St. Thomas	1
Trelawny	1
Westmoreland	2

Alternates were also provided in the event some premises were not accessible. The results of these tests are shown otherwise in this report.

3.3.3 Secondary Analysis

The secondary analysis began with re-doing what was done in primary analysis, however with more detailed information. This resulted in an outcome where the largest percentage of cases (39.61%) experienced a change in consumption within 30% as is shown below.

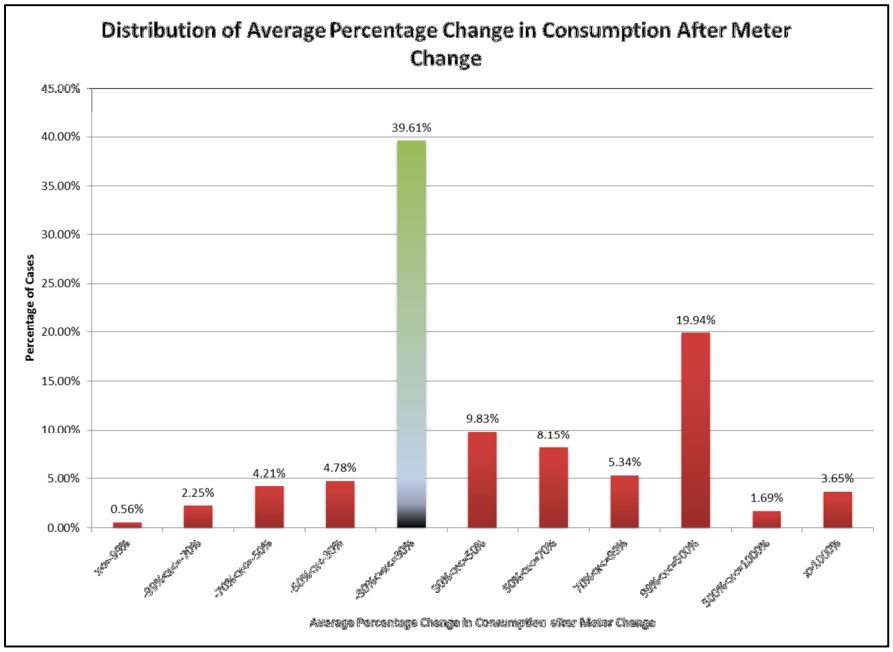

Figure 10

What is evident from Figure 10 is that, while it follows a similar pattern to Figure 4, it exhibits a larger percentage of cases showing increased consumption after meter replacement. This is confirmed by Figure 11 shown below.

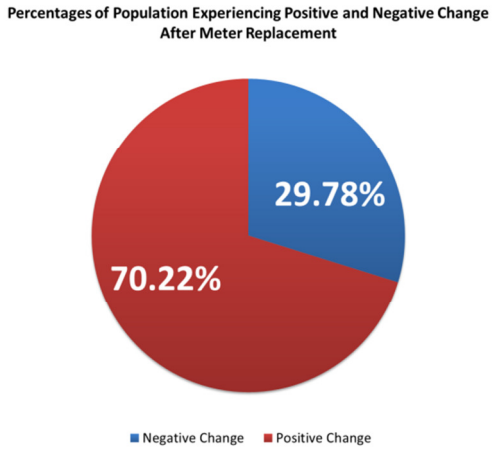

Figure 11

If the bounds were then changed to show cases experiencing an increase in consumption greater than 30% and those that didn't, the picture changes to show that 48.60% of cases experienced an increase greater than 30% in consumption readings. This is displayed in Figure 12 below.

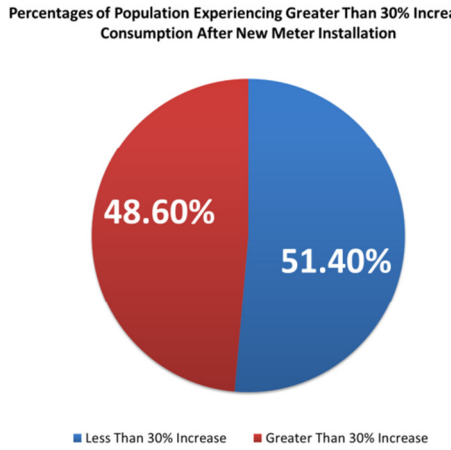

Figure 12

As with preliminary analysis, the above only allows an inference to be made. That is, it shows that 48.60% of customers who had a meter change experienced an increase of more than 30% after the installation of an electronic meter. It does not however attribute this increase to the meter replacement itself, as some of these customers could have simply changed their behavior or there are other legacy issues associated with the account.

In order to get a better idea if new meter installations caused an increase in consumption a next step was taken. The approach was to, first of all, look at the 60 months of consumption data per case, in 12 month periods, and establish the average change in daily consumption over each period. This is illustrated in Figure 13.

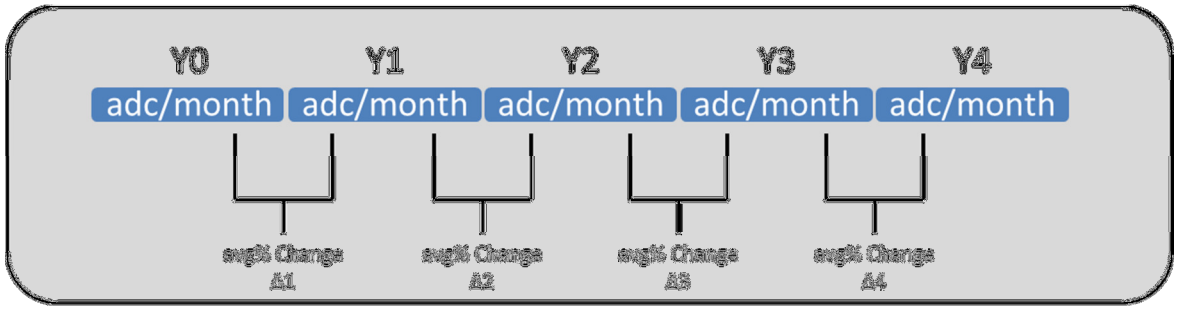

Figure 13

The period exhibiting the greatest change in consumption was then determined and this was cross-referenced with meter change dates to isolate cases where the meter change date occurred within the period of greatest increase in average consumption. This resulted in 35% of the cases being selected. These cases would more likely exhibit changes in consumption attributable to meter replacement as their greatest change in consumption coincides with their meter change date. The next step was to look at 6 month period immediately surrounding the meter change. The average consumption for the 3 months before and 3 months after were determined and the percentage change

in both ascertained. Cases with a greater than 30% change were isolated. This resulted in 23% of all cases being isolated as shown below.

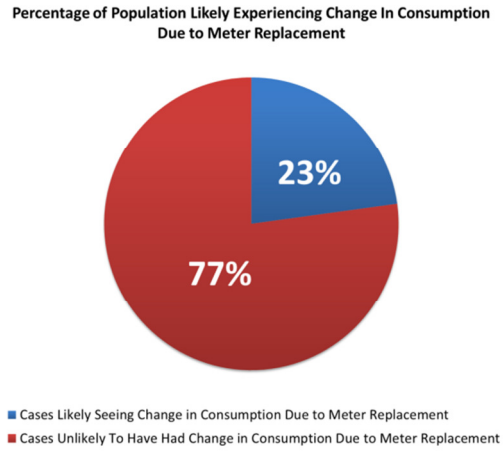

Figure 14

These cases were thought to be very likely to have seen a change in consumption as a result of a meter change. The procedure was repeated for these cases and first of all resulted in Figure 15 showing the percentage change in consumption for each case likely to have seen consumption change after new meter installation.

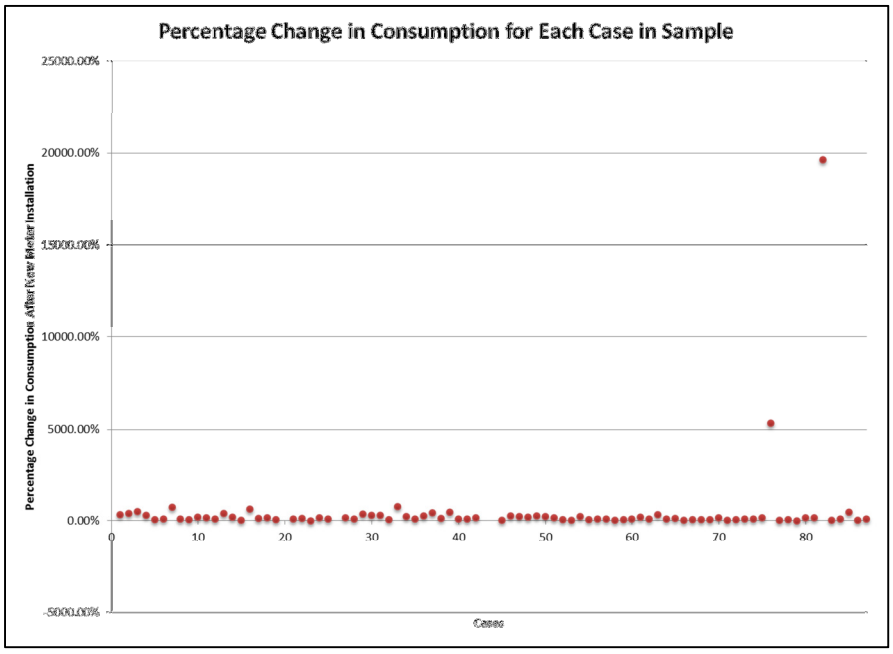

Figure 15

From the above it was determined that on average each account, likely to have seen a change in consumption after new meter installation, experienced a 439% increase in consumption. Again, this figure in isolation is misleading since it is affected significantly by outliers showing extraordinary increase. The actual distribution of

average percent increase in consumption, which gives a better representation of the data is shown in Figure 16.

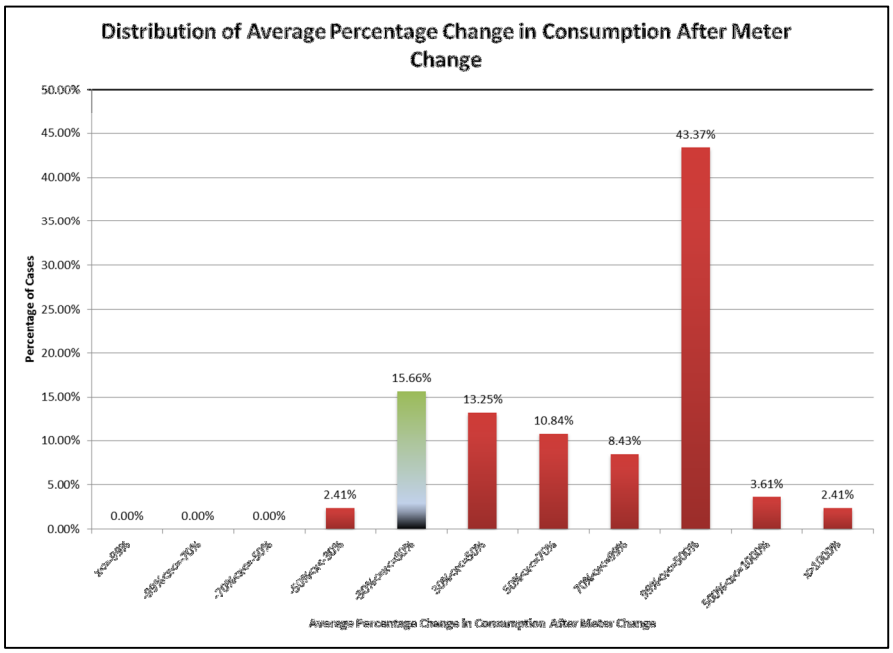

Figure 16

The above indicates that the majority of cases under consideration experienced an increase in consumption with 43.37% showing an increase between 99 and 500%. Figure 17 below confirms the fact that most cases experienced an increase in consumption.

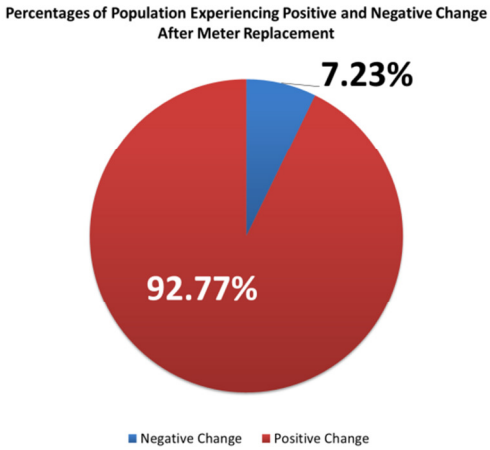

Figure 17

If the bounds were then changed to show cases experiencing an increase greater than 30%, representative of high consumption billing, the picture would change to show that 81.93% of all cases under consideration would experience this, as shown in Figure 18 below.

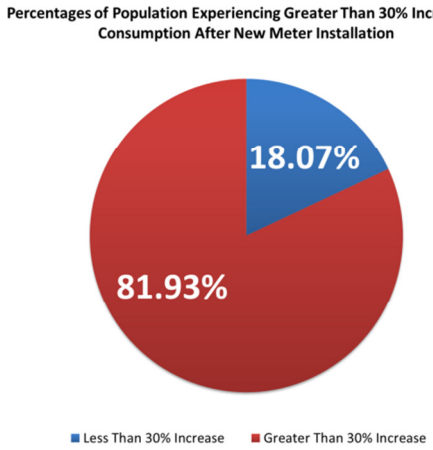

Figure 18

3.3.4 Assessing High Consumption Billing Complaints

As described earlier, of the 5,994 complaints made to JPS concerning accounts experiencing meter replacement, 80 accounts were found to have made high billing complaints after meter replacement. A five year consumption history for each of these accounts was requested from JPS for analysis.

A review was made to see if complaints made were likely to be legitimate. That is, based on consumption data given, and the calculated average daily consumption (ADC) per month, a check was made for each account to see if that account made a high billing complaint after experiencing a high consumption bill. Here, a high consumption bill is regarded as one where the ADC is at least 30% greater than the average ADC of the previous three months. This review revealed that 74 of 80 accounts, or 92.5%, were likely to have made legitimate high consumption billing complaints. These complaints however were not necessarily attributable to meter replacement.

To assess the likelihood of high consumption billing complaints being a result of meter replacement, the data conditioning procedure described earlier was done for the 74 accounts identified as likely to have made legitimate high consumption billing complaints. Upon filtering the data, using the same process as described earlier, only 2 accounts were found to have experienced high consumption billing which was likely due to meter replacement. This represents only 2.7% of the 74 accounts or 2.5% of the entire pool of 80. For reference, the average monthly change in consumption for these two accounts was found to be 202%.

3.3.5 Results of Meter Tests

The Electrical/Electronics Department, Bureau of Standards Jamaica (BSJ) was requested to conduct tests on eighty-two (82) electrical energy meters.

Forty (40) meters were tested in the Energy Metrology Laboratory (BSJ) and the results were provided under section TESR/21/2011/3575/A-AN of the formal report submitted by the BSJ. These meters were all electronic meters taken from JPS stock. With regard to these tests results the following statement is reproduced from the conclusions in the report submitted by the BSJ.

> *"The test results indicate that the meters have satisfied all the relevant requirements for compliance with the above-mentioned ANSI Standard. The meters are therefore considered* ***ACCEPTABLE****."*

Forty-two (42) meters were field-tested and the results provided under section TESR/21/2011/3575/AOCD of the formal report submitted by the BSJ. Eighteen (18) of the Forty Two (42) meters were of electromechanical type (these were tested and replaced with new electronic (digital) meters that were drawn from the forty as tested from the above mentioned lot). Twenty four (24) were recently installed electronic digital meters).

Meters were tested at several sites across the island chosen from two lists of addresses selected as a resulting of the sampling procedure described earlier. One list contained forty (40) preferred addresses and the other contained forty (40) alternate locations. At several preferred locations the meter could not be tested for various reasons such as:

- The premises was locked and the team was unable to gain access
- The customer requested that the meter not be tested in their absence
- The power was disconnected at the premises
- The premises were located but no occupant or representative could be contacted.
- The premises were no longer occupied.

In these cases an alternate location was chosen from the given list. In some instances similar difficulties were experienced with the first alternate location and successive alternate locations were selected until a test was successfully performed. Fourteen (14) locations were visited without a test being performed.

With regard to these tests results the following statement is reproduced from the conclusions in the report submitted by the BSJ.

> *"Eighteen (18) of the forty-two (42) meters were of the old electro-mechanical type and were tested and replaced with new electronic (digital) ones. Twenty-four (24) of the meters were recently installed electronic (digital) types. These were tested and left in place.*
>
> *All twenty-four (24) electronic (digital) meters were found to have accuracies within the acceptable limits specified in the relevant standard. Four (4) of the electromechanical meters were found to have accuracies that exceeded the acceptable limits specified in the*

relevant standard. The remaining fourteen (14) were found to have accuracies within the acceptable limits."

A summary of the test results is provided at Table 1Table 5. 15 of the meters had follow up readings taken and the ADC computed. Table 5 provides this data as well as the comparative historical data garnered from records provided by JPS.

Table 5: Results of Meter Tests on 20 meters - accounts with change in consumption greater than 30% after meter change

Meter # Before Test	Type	Meter Test Result	Meter # After Test	Meter Reading				kWh	Days	ADC
				Date	Reading	Date	Reading			
145258	EM	Pass	1357164	22-09	00002	04-10	62	60	12	5
1330935	Digital	Pass	1330935	22-09	00536					
1315036	Digital	Pass	1315036	22-09	02108					
1345059	Digital	Pass	1345059	22-09	00147					
225613	EM	Pass	1356277	22-09	00002	04-10	33	31	12	2.56
1476404	Digital	Pass	1476404	22-09	03722					
1331815	Digital	Pass	1331815	22-09	00152					
1345624	Digital	Pass	1345624	22-09	00155					
12401145	Digital	Pass	12401145	23-09	20483					
1209123	Digital	Pass	1209123	23-09	05628					
160892	EM	Pass	1338714	23-09	00002	04-10	00115	113	11	10.27
130076	EM	Fail	1359000	23-09	00002	05-10	00082	80	12	6.67
1297448	Digital	Pass	1297448	23-09	00537					
1477044	Digital	Pass	1477044	23-09	00567					
173678	EM	Pass	1355693	23-09	00002	04-10	00018	16	11	1.45
1346853	Digital	Pass	1346853	26-09	00206					
1202816	Digital	Pass	1202816	26-09	02998					
1325148	Digital	Pass	1325148	26-09	04658					
144583	EM	Pass	1358109	26-09	00002	06-10	00044	42	10	4.2
146804	EM	Pass	1359206	26-09	00002	05-10	00035	33	9	3.67
163265	EM	Fail	1349147	26-09	00002	05-10	00032	30	9	3.33
961582	EM	Pass	1340719	26-09	00002	05-10	00002	0	9	
1236993	Digital	Pass	1236993	26-09	00302					
1302046	Digital	Pass	1302046	27-09	00347					
1253108	Digital	Pass	1253108	27-09	00003					
223573	EM	Pass	1357591	27-09	00002	05-10	26	24	8	3.0
1335643	Digital	Pass	1335643	27-09	00534					
1195780	Digital	Pass	1195780	27-09	02795					
1283065	Digital	Pass	1283065	27-09	00424					
188695	EM	Pass	1339731	27-09	00002	05-10	00036	34	8	4.25
1329279	Digital	Pass	1329279	27-09	00101					
146326	EM	Pass	1342037	27-09	00002	05-10	00016	14	8	1.75
1315920	Digital	Pass	1315920	28-09	00576					
199626	EM	Pass	1342910	28-09	00002	04-10	00075	73	6	12.17
262742	EM	Fail	1342833	28-09	00002	04-10	00169	167	6	27.83
1313336	Digital	Pass	1313336	28-09	01543					
1333556	Digital	Pass	1333556	28-09	00930					
154403	EM	Pass	1349099	28-09	00002	05-10	00039	39	7	5.57
1331636	Digital	Pass	1331636	30-09	06166					
1489844	Digital	Pass	1489844	30-09	01978					
163010	EM	Fail	None	Illegal	N/A					
1345843	Digital	Pass	1345843	03-10	01157					

Notes: (1) EM – means electromechanical meter

(2) Only 15 follow up meter readings were taken
(3) Meter # 14899844 had other issues associated with the installation
(4) Meter # 163010 had other issues associated with the installation

For completeness 10 RAMI meters were taken from JPS' stock and tested by the BSJ. These were installed at locations that already had RAMI installations and the meters that were removed were taken to the BSJ's laboratories for testing. All passed the tests applied. It was not possible to conduct "end to end system testing" which involves a combination of laboratory and field tests, to determine the effectiveness of the SmartMeter and billing systems efficacy to capture meter data information. The facilities to conduct these tests are not presently available to the BSJ.

3.4 Conclusions and Recommendations

Assess the legitimacy of the high consumption billing complaints as a consequence of the replacement of old (electro-mechanical) meters with new "digital" meters using appropriate sampling techniques

The findings of the EPRI Report – reproduced below are instructive.

Replacing Defective Meters[9]
Although electromechanical meters are extremely reliable, they do fail. The most common "failure" mode is reduced registration. Anything that increases the drag on the rotating disk can cause a meter to run slow, resulting in reduced bills. Worn gears, corrosion, moisture, dust, and insects can all cause drag and result in an electromechanical meter that does not capture the full consumption of the premise. Failure modes also exist that could cause an electromechanical meter to run fast, but are less common. Figure 19 illustrates this effect, based on the average registration versus years-of-service for a sample of 400,000 electromechanical meters.

[9] Electric Power Research Institute (EPRI) White Paper – "Accuracy of Digital Electricity Meters, May 2010"

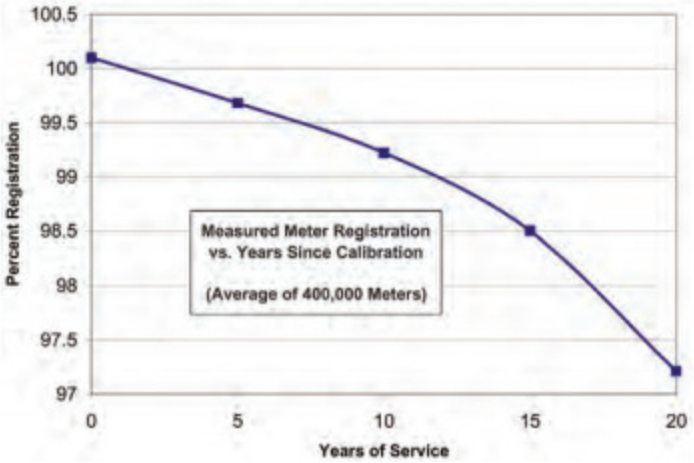

Figure 19: Electromechanical Meter Registration Loss vs. Time

When all the meters in a service area are replaced, it is reasonable to expect that some of those taken out of service were inaccurate and running slow. Some may have gradually slowed over many years so that the homeowner never noticed and became accustomed to lower electricity bills. The sudden correction to full accounting and billing could naturally surprise these homeowners and result in questioning of a new meter. While the average meter might be only slightly slow, a few could be significantly so. As indicated in the distribution shown in Figure 20, 0.3% of electromechanical meters tested registered less than 90% of actual consumption. Although 0.3% is small as a percentage, in a service area of a million meters, it represents 3,000 residences that might be under-billed by 10 to 20% prior to a new meter deployment.

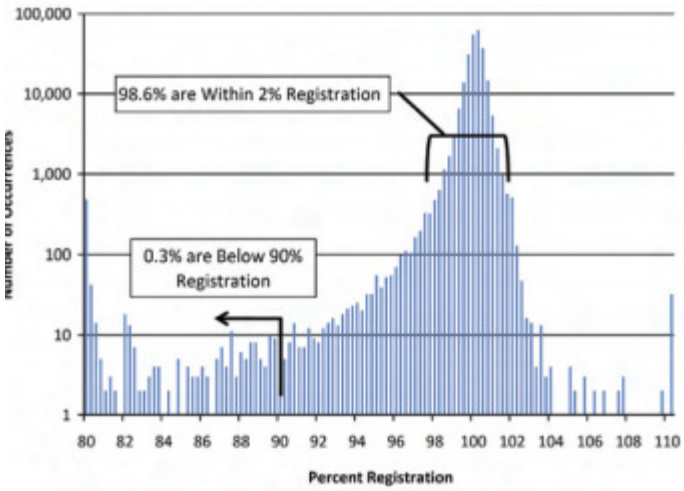

Figure 20: Electromagnetic Meter Registration Distribution

This suggests that one can expect about 0.3% of accounts, where electromechanical meters have been replaced, to register higher consumptions than before the change.

The analysis done was strictly based on consumption data provided by JPS. As such, only inferences could be made, as any change in a customer's consumption may be the

result of a wide variety of reasons. An attempt was made to, as best as possible, determine the effects meter replacement had on consumption, ruling out some effects not related to meter replacement such as seasonality. Based on the analysis done, it was found that approximately 23% of all customers who had an electro-mechanical meter replaced with an electronic one would have experienced some change in consumption attributable to the meter replacement. Of this 23%, about 18.84% would have experienced a high increase in consumption (above 30%) likely to have been a result of the meter replacement. This is summarized as shown in Figure 21 below.

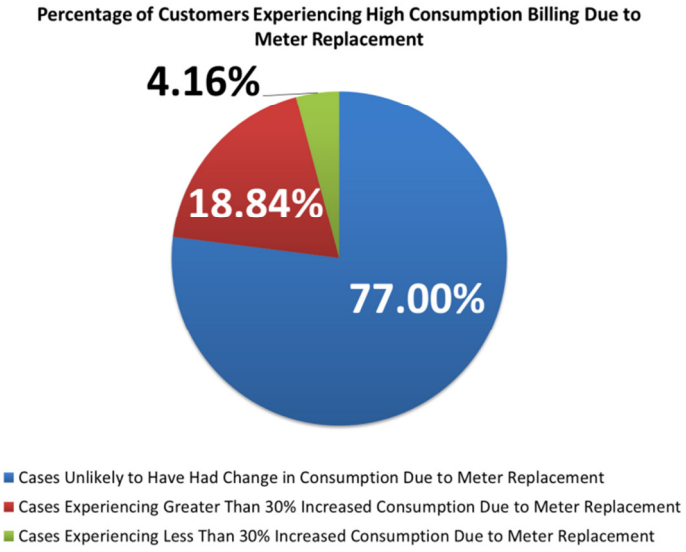

Figure 21

Simply based on consumption readings, the reason for this change cannot be established and could be due to reasons such as:

1. The old meter had begun to under-record and thus the customer was actually using more than was recorded.
2. The new meter is over-recording.
3. The customer previously had an illegitimate connection or the meter was tampered with which would have been rectified upon meter replacement.

Whether or not the above may be drivers behind the numerical results obtained cannot be determined from the data provided but would require work being done in the field. Numbers 1 and 2, in particular, are addressed in another section of this report.

Furthermore, it was determined that only a very small percentage of high billing complaints, made by customers who have had a meter change, are actually related to the meter replacement itself. Of 80 accounts complaining of high consumption billing, after meter change, it was determined that only 2.5% were likely to be directly a result of the meter replacement.

In summary, data analysis reveals that only a minority of customers who have had a meter replacement see any difference in consumption that is attributable to meter change. Additionally, what is also indicated is that an even smaller percentage of those who experience a change actually lodge a formal complaint about it.

It is noteworthy that the investigation turned up a sufficient number of incidences of suspected meter tampering where the meters under register. In these situations, a meter change to any type of technology would result in higher consumption readings post the change.

The analysis did not attempt to distill the possible impact of meter tampering on the numbers of complaints but a reasonable imputation would be that this would be a factor in the makeup of the 18.84% of accounts which were likely to see an increase as a consequence of the meter replacement. This suggests that of the 17000 meters that are to be changed about 3000 will experience some issues of high billing associated with the metering which may range from meter tampering to the old meter under registering. In the light of this, JPS could well consider establishing special customer service units dedicated to dealing with these issues.

While JPS has indicated that it does not retroactively adjust the accounts of customers that show changed consumption patterns (high or low) after the meter change, it is **recommended** that, for the avoidance of doubt, the Office issues a Directive to this effect. This Directive would address not just the circumstances of the current initiatives but would apply generally, where meters are being changed in the course of the company's normal replacement policy.

The facility for the BSJ to conduct "end to end system tests" is a matter that should be addressed in the near term as demands for this type of testing will increase as smart metering becomes more prevalent on the JPS system.

Recommendations regarding the treatment of accounts where some form of tampering or irregularity has been established is addressed elsewhere in this Report.

4 Objective 2

Assess the legitimacy of the high consumption billing complaints against JPS by using appropriate sampling techniques

Using sampling techniques similar to those described under Objective 1, 24 accounts were randomly selected for which the following information was requested of JPS:

1. Indicate whether any of the accounts were flagged by JPS' internal Exceptions process within the period January 2010 to September 2011.
2. For accounts flagged within the list, state the period flagged and how each was treated, i.e:
   - Whether the bill was prepared and dispatched without verification
   - Whether the account was estimated, pending verification
   - If estimated, how many estimated bills were sent
   - Whether the customer was notified
   - What was the eventual process of verification – was meter inspected/tested/ reading checked – and the outcome
   - Whether a high billing complaint was received by the company in relation to any of the listed accounts.

Table 6 below indicates JPS' treatment of the accounts that were flagged by this process. Based on the information provided, it is noteworthy that, despite being flagged by the exceptions process, the company in several instances assumed that the variance was seasonal and dispatched the bill. There is no indication that an investigation was undertaken for these accounts even after the customer's high billing complaint was received. It was also noted that in all but one case the company received high complaints in relation to these flagged accounts yet there is no evidence that the company investigated the customer's concern.

Table 6: Summary of HCB actions taken by JPS

TREATMENT OF EXCEPTION							
Customer	**Bill Prepared and dispatched without verification**	**Account estimated pending investigation**	**Account estimated and # of bills sent**	**Customer notified of exception /estimate**	**Action taken**	**Outcome**	**High Bill Complaint Received**
202425	N/A	N/A	N/A	N/A	N/A	N/A	YES
855081	N/A	N/A	N/A	N/A	N/A	N/A	YES
181470	No	No	No	In both cases the account was billed with actual readings	Accepted reading	There was no service order for investigation created, as the current consumption amount was in keeping with customer's previous usage	YES

483126	N/A	N/A	N/A	N/A	N/A	N/A	YES
620207	No	No	No	In this cases the account was billed with actual readings	Accepted reading	There was no service order for investigation created, as the current consumption amount was in keeping with customer's previous usuage	YES
250645	No	No	No	In this cases the account was billed with actual readings	Accepted reading	Customers usage considered seasonal. Customer informed JPS that the refrigerator was out of use for a while.	YES
237083	N/A	N/A	N/A	N/A	N/A	N/A	YES
976328	No	No	No	In all cases the account was billed with actual readings	Accepted reading	Customers usage considered seasonal. Based on the customers consumption pattern, no service order was deemed necessary to be created for an investigation	YES
875703							YES
238105	N/A	N/A	N/A	N/A	N/A	N/A	YES
987417	N/A	N/A	N/A	N/A	N/A	N/A	YES
957584	No	No	No	In both cases the account was billed with actual readings		Customers usage considered seasonal. Based on the customers consumption pattern, no service order was deemed necessary to be created for an investigation	YES
908589	N/A	N/A	N/A	N/A	N/A	N/A	YES
243598	"No	No	"No	"No			YES
522462	No"	Yes	No"	No"	N/A	N/A	YES
907056	N/A	N/A	N/A	N/A		Supply was disconnected	YES
597072	No	No	No	No	N/A	N/A	YES

804914	N/A	N/A	N/A	N/A	N/A	N/A	YES
780210	N/A	N/A	N/A	N/A	N/A	N/A	NO
324050	N/A	N/A	N/A	N/A			YES
324051							YES
193113							YES
604740							YES
876640							YES

A review of a selection of Appeals received by the OUR over the period 2008 to 2011 highlights a number of issues which (although the high bills turned out to be legitimate) raises concerns as to the reasonableness of JPS' interaction with its customers. Three issues are worthy of mention:

1. High Billing - Resulting from Estimated bills -Hi/Low Rejection Criterion
2. High Billing – Demand Charge
3. High Billing - Adjustment for low estimation due to in accessibility of the meter

4.1 High Billing - Resulting from Estimated bills -Hi/Low Rejection Criterion

The high/low rejection criterion was implemented as a quality control mechanism to manage the risk of large amounts of incorrect bills being sent to customers. The Office in its Decision of February 22, 2005 (Document No. Ele 2005/01) reduced the criterion from a consumption variance of +/-65% in the case of residential customers to +/-30%. The criterion for commercial customers was lowered to +/-60%. These levels were chosen as it was the considered view that, in Jamaica, residential customers have very small seasonal variations and that with diligent quality control, unexpected or unusual variations in usage would be quickly identified and managed by the customer and JPS.

The Decision further stipulated that bills reflecting consumption outside the rejection criterion should not be dispatched. Instead, these accounts should be estimated in keeping with the Guaranteed Standards provisions and the affected customers informed of the reason for the estimated bill in light of the significant variance in the consumption.

The company has adopted and is operating under criteria which does not conform with the OUR's Directive; this is discussed elsewhere in this Report but the circumstances of the case is instructive. In this case the customer received four (4) consecutive estimated bills (the Guaranteed Standards – EGS 7 - require that no more than two (2) are to be issued) following which a bill reflecting an adjustment $384,643.29 was rendered which also showed a current amount of $153,222.50. The upshot of this case is that the customer did have some problems with the electricity installation (which was reflected in the quantum of the current bill) but the point is that had JPS been diligent and followed the spirit of the Directive the problem would have been detected and resolved much earlier.

4.2 High Billing – Demand Charge

In this case, the customer received what was perceived as a high bill from JPS following reportedly significant reduction in business. The OUR however noted that while the consumption had in fact reduced, the Demand Charge that was applied to the account during the peak demand of the business remained payable. This was the primary reason the bill appeared high despite the reduction in energy usage. The business eventually closed, however the demand charge remained payable for several months.

This raises the question of whether JPS, as the monopoly provider of electricity service, has a duty to ensure that its customers are fully informed and empowered to take decisions regarding the management of their electricity costs. In this case, while the tariff rules regarding the ratchet for Demand Charges are well established, one could ask whether JPS – having noted that the energy usage was reduced, eventually to zero, should feel obliged to contact the customer and in the case of the closure advise that the account be closed. Here too diligent application to the quality control provide through the Hi/Low mechanism should have triggered action by a caring monopoly!

4.3 High Billing - Adjustment for low estimation due to in accessibility of the meter

JPS has clear and reasonable policies regarding "access to meters" designed to enable the company's agents easily and without hindrance to access its meters for meter reading, disconnection and other purposes. There are several cases however, where the company has been unable to access meters for meter reading purposes and has therefore had to resort to rendering bills based on estimated readings. Despite the requirement that no more than two consecutive estimated bills be issued to any account, the estimates continue until an actual reading is taken and the billing reconciled. This invariably results in a significant adjustment leading to issues with the customer.

4.4 Conclusions and Recommendations

Analysis of the data provided regarding the handling of high billing complaints suggest that the company is less than diligent in its handling and investigation in its response to the complaints and it begs the question of whether customers are being dealt with equitably. It is noted that the OUR is currently reviewing a Draft Code of Practice for customer complaints handling prepared by the Company pursuant to Condition 16 of the Licence. It is recommended that the OUR has due regard to and incorporates the findings of this Investigation in its review in order to procure a modern and customer centered Code of Practice

Many of the high billing complaints expressed by customers are in the main tariff related where the instability of the fuel costs has led to significant increase in the price of electricity but are exacerbated by the issues that are the subject of this investigation. These are issues which are mentioned elsewhere in this report and while the tariff is

outside of the scope of this investigation, the fact is that customers are finding it increasingly difficult to meet their obligations to JPS because of the high cost of electricity and it would be remiss of this investigation not to offer an opinion on the issue. The legitimacy or otherwise of the complaints about high billing, although critically important, are really cosmetic in today's circumstances. The Office has to take all the steps necessary within its power to secure an environment that will lead to lower tariffs. Until this happens, the JPS/Customer/OUR relationship will be hostile and unproductive. It is only then, that resolution of quality issues will prove to be of any real value and customer care standards fully appreciated.

In the cases reviewed, although the complaints were, in the strict context of this Objective of the Terms of Reference, not legitimate in that JPS' position was deemed correct, the worrying trend of JPS' selective breaches of the Directives issued by the Office is manifested. In one case this is evidenced by the non compliance to the Hi/Low criteria and in the others breaches of the Guaranteed Standards and Directives relating to frequency of estimated billings. However, it begs the question as to whether JPS' should be entitled to recover from customers when it has acted in clear breach of the Directives of the Office.

It is therefore **recommended** that the Office issues rules to prevent JPS from benefiting when it breaches Directives issued by the Office – these would prevent the company from back-billing customers when there is under recovery and commensurately to reimburse customers when there is over recovery.

5 Objective 3

Assess the appropriateness of JPS' current Back Billing Policies and Procedures

JPS' Back billing Policies and Procedures dated July 2002 were reviewed for appropriateness in the current context. These policies were introduced by JPS after protracted negotiations with the Office. At the time, the Office was of the view that the Company's existing practices were unfairly balanced against the customer and embarked on the negotiation with the intent of securing a more balanced relationship. The Office held the view that, while a customer has an obligation to pay JPS for services (electricity) received and consumed, the impact of the electricity costs on consumers is such that the accurate bills must be rendered as close as possible to the period that the service is received. There were two principles facing the Office at the time (1) what is a reasonable elapsed period for the company to recognize and correct an error in the billing process and rendering the corrected bill to the customer and (2) what is a reasonable period for back billing a customer in the event that such an error is discovered. Arising out of these considerations the Office agreed to the policies as currently applied by JPS.

5.1 Back Billing Policies & Procedures

JPS' back Billing Policies as presently applicable state as follows:

In any case where it is necessary for the Jamaica Public Service Company Limited to back bill an account of a customer, JPS shall be bound by the provisions set out at items 1 – 5 below and shall act in accordance with these provisions.

In all cases of fraud, deliberate acts of dishonesty or willful interference with JPS' equipment or device, JPS shall be entitled to recover the correct charges due and owing subject to any statutory limitation.

In any case where JPS is required to back bill as a result of any circumstance or condition not set out in items 1 – 5 below, JPS shall act in a manner reasonable to all concerned and reasonable to all circumstances of the case.

In any case where it is necessary to adjust an account or back bill an account because of an error or condition which results in an account being over billed or subject to excess charges, any adjustment or back billing of such an account shall be subject to the same terms and conditions and limitation as to the period of time for which any back billing or adjustment would have been permissible if such back billing or adjustment were for the under billing of a customer or the charging of a less amount than was actually due by a customer during the said period.

1. Application of Wrong Multiplier Constant

"In any case where the application of a wrong multiplier results in an account being incorrectly billed, the account shall be adjusted to allow for the payment of the actual charges for which the account should have been billed provided that, in respect of any single event, no such account shall be back billed or adjusted for a period exceeding four (4) months."

2. Under-Registration Arising as a Result of Incorrect Installation

"In any case where an account of a customer is found to have been under-billed because of an under-registration of the energy consumed in respect of that account arising from the incorrect installation of any metering device, the account shall be adjusted to allow for payment by the customer of the correct charges for which the account should have been billed provided that, in respect of any single event, no such account shall be back-billed or adjusted for a period exceeding four (4) months."

3. Errors Arising from Incorrect Rate

"In any case where the charges in respect of a customer's account have been calculated using an incorrect rate for the class of service provided, the account shall be adjusted to allow for the application of the correct rate and the payment by the customer of the correct charges in respect of the said account provided that, in respect of any single event, such an account shall not be back billed for a period exceeding four (4) months."

4. Errors Arising from the Failure to Bill an Account

"In any case where JPS fails to render to the customer the charges due for any billing period because of an error on the part of JPS, the account of the customer shall be adjusted to allow for the payment of these charges during any subsequent billing periods.

5. Roll-Over Meter

"In any case where the account of a customer has been incorrectly billed arising from the improper rolling-over of any metering device, the account shall be adjusted to allow for the payment by the customer of the correct charges for which the account should have been billed provided that, in respect of any single event of rolling-over, such an account shall not be adjusted for a period exceeding four (4) months".

6. Inaccurate Meter Registration

"In any case where the account of a customer has been incorrectly billed arising from the stoppage or failure of any meter' to register or any registration inaccurate in excess of 2%, the account shall be adjusted to allow for the payment by the customer of charges for the energy consumed based on the customers' use of electrical energy during a similar period of like use provided that in no case shall the account be adjusted for a period exceeding six months prior to the date of the adjustment"- July 2002

The above policies were reviewed and some issues arose that were found to be particularly relevant to the outcome of the analyses of specific accounts – discussed later in this section. These relate to the question of cases of alleged fraud.

> Paragraph 2 of the policy extract states:
> *"In all cases of fraud, deliberate acts of dishonesty or willful interference with JPS' equipment or device, JPS shall be entitled to recover the correct charges due and owing subject to any statutory limitation."*

In practice, when dealing with cases of alleged fraud or alleged "illegal abstraction" of electricity, alleged meter tampering and the like, JPS appears to adopt the statutory limitation of 6 years (as set out under the relevant legislation), meaning that JPS opts to back bill customers for up to 6 years of "estimated usage". Anecdotal evidence as well as commentary that has been discerned from complaints in the media and those received at the OUR suggest that there is customer disaffection at JPS' application of this policy in what is asserted as "arbitrary" assumption of the guilt of the account holder. The concern here is the interpretation JPS uses regarding fraud and the "deliberate" and "willful" actions of customers who are deemed liable for such acts. The policy clearly states that JPS shall be entitled to recover for "deliberate acts of dishonesty or willful interference with JPS' equipment or device". JPS has however chosen to treat with customers who have allegedly committed some malfeasance regarding their power usage by stating that the customer has "benefitted" from the usage of the power supplied.

These were also compared with similar policies from a number of other jurisdictions. A perusal of back-billing policies from other states show a tendency to set applicable back-billing periods at approximately between 3-12 months and 2-3 years, depending on the applicable rules/policies of the State in question. Relevant legislative and policy documents concerning back billing from various US state jurisdictions including California, Ohio, Illinois, Indiana and Rhode Island were reviewed. Of particular note are provisions from Illinois which may prove instructive to JPS in its further considerations:

> "If the meter is found to be slower than allowable, the entity providing metering service shall determine the correction to the metering data for that meter. In determining the correction, it shall be presumed, unless demonstrated otherwise, that the inaccuracy **has existed for a period of 1 year prior to the test for small commercial and residential customers and 2 years prior to the test for all other customers…"**
>
> " No corrections to metering data for meter error shall extend beyond the in-service date of the meter discovered to be in error**, nor shall any correction be required to extend beyond the date upon which the**

current customer first occupied the premises at which the error is discovered."

5.2 Back billing charges

In conducting this probe the legitimacy of the Back Billing charges applied by JPS to customers account in these circumstances was also tested. The issues in these cases are that cases of back billing could involve situations where JPS had over recovered or under recovered on an account and also, the question arises, how to deal with the specific issues of the treatment of "irregularities".

5.3 Methodology

The Investigating Team requested a record/listing of accounts affected by Back Billing for the last 18 months from JPS. (Data file: REVA/RPDA Adjustments in the last 18 months 04/03/2010 to 01/09/2011). Population size – 22084

With the use of the stratified sampling technique[10] a random sample of 320 accounts was selected for testing. Statements were requested on these 320 accounts. The population was stratified twice and the sample selected from two sets of data as follows:

1. Stratified set of accounts Back Billed (i) to the benefit of JPS; that is where the company had under recovered in its billing and (ii) those to the benefit of the customer; that is where the company had over recovered in its billing of the customer - Selection 200.
2. Stratified set of selected categories of accounts that were determined to be of most interest in the investigation; namely; Line Tap, Meter Burnt, Meter Under-registering, Meter Tampering, Incorrect Consumption and Account Over-Estimated - Selection 120.

The sample of 320 statements was examined from which 89 accounts were selected for further examination/probe. These accounts were considered to be worthy of closer scrutiny based on the consumption and payment history before and after the JPS adjustment for the alleged infraction. Customer files were requested for these accounts. The findings of the probe into customers files were categorized under three broad headings namely: Cleared, Disputed & Questionable.

Cleared – Action taken on the account by the utility company and subsequent transactions suggest acknowledgement/acceptance by the customer that the back billed amount was possibly justified.

[10] Stratification is the process of dividing members of the population into homogeneous subgroups before sampling.

Disputed – Action taken on the account by the utility company is disputed by the customer.

Questionable – Action taken by the utility company, which in the opinion of the investigator, is unclear/not justified as evidenced from the transaction history and or information/lack of information provided by JPS.

5.4 Findings

Of the 89 accounts for which statements were received 76 accounts or 85% were classified cleared, 9 accounts or 10% were disputed by customers and 10 accounts or 11% were questionable. Note that six (6) accounts that were classified as disputed were also classified as questionable and one (1) which was classified as cleared was also classified as disputed.

It is noteworthy that of the total sample of accounts that were back billed, for meter tampering and meter under-registering groups combined, as much as 30% were disputed by the customers. A similar 30% in this combined group were also classified as questionable. In the case of line taps, which are usually associated with tampering, 20% of the cases were disputed or questioned. The resolutions of the adjustments under the other categories were overwhelmingly cleared. For completeness, the categories of adjustments encountered in this review are as defined by JPS at Table 7 below.

Table 7: Some JPS Adjustment codes

Adjustment Code	Description
DCM	Direct Connection in Meter Socket
DM	Damaged Meter
DMND	Incorrect Demand
IC	Incorrect Consumption
IR	Incorrect Rate
KP	Key Punch Error
LT	Line Tap
MB	Meter Burnt
MD	Meter Defective
MT	Meter Tampering
MTNR	Meter Under-registering
MUIL	Meter Upgraded Illegally
OVR	Account Over-estimated
RADGJ	Readjustment
RAMI	RAMI Adjustment
RDG	Incorrect KWH Reading
UND	Account Under-estimated

Table 8 below provides a summary of the findings.

Table 8: Compliance and Back Billing (Retro Charging) of Customers Accounts

SAMPLE1 Statements & Correspondences Received Amounts due to Customers					FINDINGS		
Customer	**Parish**	**Reason**	**Adj Date**	**Adj Amount**	**Cleared**	**Disputed**	**Questionable**
		Group 1					
[redacted]	Mandeville	DM	5/16/2011	-1,750,253	•		
[redacted]	May Pen	KP	3/5/2011	-1,682,400	•		
[redacted]	Mandeville	KP	12/27/2010	-1,663,572	•		
[redacted]	Portmore	MD	5/2/2011	-1,662,913	•		
		Group 2					
[redacted]	Sav-la-Mar	RADJ	8/4/2011	-753,378	•		
[redacted]	KSA South	RDG	2/11/2011	-664,950	•		
[redacted]	KSA South	RADJ	7/18/2011	-656,296	•		
[redacted]	KSA North	KP	4/29/2010	-638,719	•		
		Group 3					
[redacted]	KSA South	RAMI	5/3/2011	-464,148	•		
[redacted]	KSA North	KP	5/10/2011	-392,178	•		
		Group 4					
[redacted]	KSA North	RADJ	5/28/2010	-92,491	•		
[redacted]	Spanish Town	KP	9/28/2010	-16,732	•		
		Group 5					
[redacted]	Port Maria	RDG	12/31/2010	-9,759	•		
[redacted]	Mandeville	RDG	8/4/2011	-3,754	•		
[redacted]	St. Ann's Bay	RDG	12/11/2010	-3,746	•		
[redacted]	Montego Bay	IR	6/1/2011	-3,745	•		•

SAMPLE2 Statements & Correspondences Received Amounts due to JPS					FINDINGS		
Customer	**Parish**	**Reason**	**Adj Date**	**Adj Amount**	**Cleared**	**Disputed**	**Questionable**
		Group 1					
[redacted]	Montego Bay	DMND	7/3/2011	2,783,085	•		
[redacted]	KSA South	MUIL	4/29/2011	1,194,573	•		
		Group 2					
[redacted]	Spanish Town	DCM	7/2/2010	512,350	•		
[redacted]	Montego Bay	MD	4/3/2011	512,271	•		
[redacted]	St. Ann's Bay	DCM	8/31/2011	510,012	•		
		Group 3					
[redacted]	KSA South	RDG	5/17/2011	343,673	•		
		Group 4					
		Group 5					
[redacted]	Lucea	UND	12/21/2010	9,288	•		
[redacted]	Mandeville	MD	7/21/2011	3,388	•		

SAMPLE3 Statements & Correspondences Received Amounts due to JPS					FINDINGS		
Customer	**Parish**	**Reason**	**Adj Date**	**Adj Amount**	**Cleared**	**Disputed**	**Questionable**
		Line Tap					
[redacted]	Sav-la-Mar	LT	5/27/2011	1,921,458		•	
[redacted]	Spanish Town	LT	5/24/2011	1,915,841	•		
[redacted]	KSA North	LT	5/10/2011	1,814,615	•		
[redacted]	Port Maria	LT	12/23/2010	1,785,677	•		
[redacted]	May Pen	LT	3/5/2011	1,715,223	•		
[redacted]	KSA North	LT	7/13/2011	1,590,057	•		
[redacted]	KSA North	LT	1/24/2011	1,582,002	•		

[redacted]	May Pen	LT	7/1/2011	577,782	•		
[redacted]	Portmore	LT	6/9/2010	576,356			•
[redacted]	Port Maria	LT	12/10/2010	566,310			•
[redacted]	KSA South	LT	9/30/2010	566,048	•		
[redacted]	Port Antonio	LT	8/24/2011	564,063	•		
[redacted]	KSA North	LT	2/26/2011	549,640	•		
[redacted]	May Pen	LT	7/13/2011	541,595	•		
[redacted]	KSA South	LT	12/20/2010	538,486	•		
Meter Burnt							
[redacted]	KSA North	MB	8/15/2011	430,528		•	
[redacted]	St. Ann's Bay	MB	7/11/2010	407,572	•		
[redacted]	St. Ann's Bay	MB	6/22/2011	281,000	•		
[redacted]	Portmore	MB	4/15/2011	224,521	•		
[redacted]	Mandeville	MB	5/27/2011	17,001	•		
[redacted]	Sav-la-Mar	MB	6/8/2011	16,157	•		
[redacted]	Mandeville	MB	8/29/2011	13,973	•		
Meter Under-Registering							
[redacted]	Montego Bay	MTNR	6/1/2011	443,569	•		
[redacted]	St. Ann's Bay	MTNR	6/27/2011	417,395		•	•
[redacted]	St. Ann's Bay	MTNR	6/27/2011	370,009		•	•
[redacted]	Portmore	MTNR	3/10/2011	366,262		•	•
[redacted]	Sav-la-Mar	MTNR	3/10/2011	358,433	•		
[redacted]	KSA North	MTNR	9/29/2010	358,115			•
[redacted]	KSA North	MTNR	8/12/2011	347,909	•		
[redacted]	KSA South	MTNR	8/10/2011	343,899	•		
[redacted]	KSA South	MTNR	5/13/2011	45,940	•		
[redacted]	Port Antonio	MTNR	6/24/2011	43,407	•		
[redacted]	Spanish Town	MTNR	6/30/2011	38,087	•		
[redacted]	Portmore	MTNR	7/18/2011	37,170		•	•
[redacted]	St. Ann's Bay	MTNR	6/28/2011	36,960	•		
Meter Tampering							
[redacted]	Spanish Town	MT	9/21/2010	1,648,241	•		
[redacted]	KSA North	MT	12/19/2010	1,632,019	•		
[redacted]	Port Maria	MT	7/29/2010	1,478,799		•	
[redacted]	KSA North	MT	11/2/2010	1,430,918		•	•
[redacted]	KSA North	MT	8/27/2011	1,411,486	•		
[redacted]	KSA North	MT	9/27/2010	1,410,254	•		
[redacted]	KSA North	MT	5/4/2010	1,370,057	•		
[redacted]	Port Maria	MT	9/7/2010	1,348,169	•		
[redacted]	St. Ann's Bay	MT	5/22/2010	1,285,524		•	•
[redacted]	Spanish Town	MT	8/3/2011	50,795	•		

SAMPLE4 **Statements & Correspondences Received** **Amounts due to Customers**					**FINDINGS**		
Customer	**Parish**	**Reason**	**Adj Date**	**Adj Amount**	**Cleared**	**Disputed**	**Questionable**
Incorrect Consumption							
[redacted]	KSA South	IC	12/20/2010	-33,497	•		
[redacted]	St. Ann's Bay	IC	8/2/2011	-30,443	•		
[redacted]	Portmore	IC	4/27/2011	-23,296	•		
[redacted]	KSA South	IC	4/7/2010	-22,373	•		
[redacted]	KSA South	IC	4/8/2010	-17,134	•		
[redacted]	KSA South	IC	4/6/2010	-1,512	•		
[redacted]	KSA South	IC	4/6/2010	-1,443	•		
[redacted]	KSA South	IC	4/7/2010	-1,397	•		
[redacted]	KSA South	IC	4/6/2010	-1,352	•		
[redacted]	KSA North	IC	7/11/2010	-1,301	•		
[redacted]	KSA South	IC	4/6/2010	-1,008	•		

Account Over-Estimated							
[redacted]	KSA North	OVR	11/23/2010	-110,313	•		
[redacted]	Falmouth	OVR	7/27/2010	-110,098	•		
[redacted]	Spanish Town	OVR	5/6/2010	-108,917	•		
[redacted]	KSA North	OVR	2/25/2011	-108,707	•		
[redacted]	KSA North	OVR	8/4/2011	-107,767	•		
[redacted]	Spanish Town	OVR	12/23/2010	-103,133	•		
[redacted]	KSA South	OVR	5/14/2011	-2,246	•		
[redacted]	Mandeville	OVR	2/17/2011	-2,241	•		
TOTAL					**76**	**9**	**10**
DISPUTED and QUESTIONABLE					**6**		
TOTAL REQUEST					**89**		

From the accounts sampled there were three cases where the utility company agreed to compromise on the original amount back-billed (originally a six year back-billed period). In some case the customer contends that he/she inherited a meter that JPS later claimed had been tampered with. JPS could not exactly pin the point of tampering to the period during which contracts were established with these customers. Customers also suggest that they had no basis to suspect that anything was awry as they had done nothing unusual or different with their consumption pattern/quantum and hence found it unreasonable to be back-billed for 6 years.

Customer	Premise	Name	Parish	Reason	Adj. Date	Adj. Amount (JA$)
			Port Maria	MT	9/7/2010	1,348,169
			KSA North	MT	5/4/2010	1,370,057
			KSA North	MT	11/2/2010	1,430,918
			KSA North	MTNR	8/10/2011	347,909

5.5 Conclusions and recommendations

The company's back billing procedures seem to be working well except in instances where the company alleges that there is meter under-registering and/or meter tampering. These discrepancies are in fact associated with the meter itself and to which JPS tend to associate fraud for the purpose of taking action under its back billing policy

The issue that arises here is the interpretation JPS uses regarding Fraud and the "deliberate" and "willful" actions of customers who are deemed liable for such acts. The policy clearly states that JPS shall be entitled to recover for "deliberate acts of dishonesty or willful interference with JPS' equipment or device". JPS has however chosen to treat with customers who have allegedly committed some malfeasance regarding their power usage by stating that the customer has "benefitted" from the usage of the power supplied rather than establishing that "*deliberate acts of dishonesty or willful interference with JPS' equipment or device*" has occurred.

The reason that this position of the Company may be logically untenable is that many of the "affected" customers have accounts that seem to be attached to meters that are

faulty or not reading correctly for a variety of reasons that may have had nothing to do with the "deliberate or willful" actions of said customers or to any malfeasance that may have flowed from the actions of said customers. The fact that a meter has registration/reading issues on a premises that leads to inaccurate registration/billing may not be as a result of a "deliberate or willful" act of the customer. It may have been the result of other factors unbeknownst to the customer, or may have been the result of malfeasance of a previous owner/resident/tenant. Unfortunately there is no infallible way to ascertain where the liability (if any) originally flowed from and all that is left are the bare facts: a meter has not registered correctly or has been misread, but power has been consumed under contract with JPS and should be appropriately paid for.

While it is indeed correct that JPS should be paid for the electricity it provides under contract, it is also correct that in the event that it discovers that it has provided service to a customer for which it has not been paid in a timely manner, then pursuant to its contract with that customer, JPS may disconnect its services for non-payment for the electricity used, and/or proceed to recover the monies outstanding. Such recovery, however, must take place under clear and unambiguous circumstances.

It appears that under the provisions of the Back Billing Policy JPS is allowed to benefit from its own errors. For example, in provision 3- *Errors Arising from Incorrect Rate*: the utility company is allowed to recover not more than 4 months charges in cases where the charges have been calculated using an incorrect rate for the class of service provided. The intention here is for JPS to recover (4 months back billing) only if from its own error the company was under-recovering. On the other hand, where JPS makes the error and was over-recovering for periods in excess of 4 months, JPS is now only paying back/refunding a maximum of 4 months to the consumer account (see the case involving Premises no. 604893, Meter Number 864226 - reason for adjustment Incorrect Rate (IR)).

This case in point raises the question of whether the remedies in circumstances such as these should be symmetrical. In the relationship between the company and the customer, the company has significant advantage not only because of its absolute discretion to disconnect service but also because of the greater resources at its disposal when compared with that of the typical residential customer. The Investigation has concluded that JPS ought not to benefit from its own negligence or error (or put another way the customer should not be disadvantaged because of the company's errors).

JPS' Back-billing policies are at this time (some ten years since last reviewed) are in need of review and amendment. As they presently exist, and with the benefit of the experience of their application over the last several years, one can conclude that they lend themselves to inconsistency of application in terms of the factors set out above and that they do not inure to the protection of customer rights, especially in light of JPS' treatment of alleged fraud cases and their application of the statutory limitation period.

The review of the back- billing codes and policies from jurisdictions in the US and the UK, suggest that JPS' policies at present do not accord with "best practice". Whilst it is indeed true that JPS is a commercial concern and as such, customers are obliged to pay for the services received, it is nevertheless evident that JPS' current back-billing policies (as exemplified by how they are presently being applied) are vague in areas such as fraud management and inaccurate meter registration. This "vagueness" in terms of possible interpretation and application may be said to account for many, if not the lion's share of customer complaints involving "back-billing" and alleged fraud and illicit power abstraction.

It is recommended that:

1. The relevant policy documents are to provide that all new accounts (including those where a meter is already installed) should have the appurtenant meter checked and, if necessary, a new meter installed on the premises prior to activation of the said new account. This would serve to detect any meter registration problems and to have them eliminated at the time of the commencement of the account and the relevant service contract. It should also be stipulated that JPS will not be allowed to back-bill beyond this point of commencement of the new account. This may impact on the Guaranteed Standard (EGS 1), New Connections, in that the time for connection may have to be reviewed.

2. JPS be required to check meters more frequently than the company does at present, (this could be statistically derived but the appropriate time should be determined after consultation between the Office and JPS). In the event that JPS fails to do the inspection within the stipulated time or takes a business decision not to do so, it will be required to accept the risk of a given meter being faulty, i.e they should be prohibited from back billing beyond the material time when they should have discharged their responsibility and duty of care to check the meters.

3. JPS be required to revisit its back-billing policy and reformulate it to be in line with "best practice", particularly with regard to back-billing on the grounds of "fraud", alleged meter tampering and illicit abstraction. The period for which the company can back bill an account must reflect the principle that the customer ought not to be disadvantaged because of an error by or the inefficiency of JPS. The current minimum period where stipulated as four (4) months should be changed to reflect the original intent – 2 billing periods or 2 months. In the case of the upper limits best practice suggest that these should be 1 year.

4. In the event that meter tampering is alleged, the company be restricted to a maximum back billing period of 2 years, subject to clear evidence that the customer has liability for a lesser period. Should this conclusion in any specific

case be unsatisfactory to either party, either is free to refer the matter to the Office, in the first instance, or the courts, at any time, for adjudication.

5. If fraud is suspected, the company has to prove "deliberate" and "willful" actions of customers if it is to successfully apply the full period of retroactivity provided for in the statutes, or alternatively, routinely cause these matters to come before the courts

6. The company be required to issue its back billing policy and related issues as a Code of Practice to be made publicly available.

The Office issues Directives to give effect to these recommendations

6 Objective 4

Assess JPS' current Meter Inspection and Audit practices and procedures

6.1 Compliance with Meter testing protocol

A critical aspect of the arrangements for engendering confidence in the metering system is the industry conformance with OUR Document No ELE 2005/07 "Electricity Meter Testing in Jamaica – Protocol on Administrative and Testing Procedures". This document prescribes the administrative and testing procedures for electricity revenue meters installed by JPS at customer locations to measure the consumption of electrical energy. It establishes the BSJ as the responsible agency for these matters and provides a framework of procedures to govern the various requirements set out. This Protocol was issued by the Office pursuant to its functions under Section 4 of the Act. It arose out of a crisis of confidence identified in the aftermath of the 2005 investigation and as indicated was designed to consolidate the formal arrangements necessary to secure public confidence in the metering equipment installed by JPS.

The stated aim of the Protocol is to establish a meter testing programme "*to create an environment in which measurement of electricity for revenue purposes meets the ± 2% tolerance on an ongoing basis and in so doing to develop confidence in the measurement process*." It requires that the following testing and services be carried out:

i. Pattern Approval of new models of electricity meters and associated accessories shall be carried out by the BSJ.
ii. Acceptance Testing of imported Type Approved meter shipments as well as JPS repaired meters shall be carried out by the BSJ.
iii. Pre-field Tolerance Adjustment on new meters above 12kVA shall be carried out by JPS but shall be subjected to audit under an accreditation programme.
iv. Compliance Testing of field installed meters shall be carried out by JPS but shall be subjected to audit under an accreditation programme.
v. Electricity Consumers Requests for Verifying Meter Accuracy shall begin with the JPS and follow the process hereinafter specified.
vi. Accreditation of JPS meter calibration/repair facilities and meter field testing programme shall be done by an Accreditation Body approved by the BSJ. Initially, the BSJ may be asked to be the Accreditor.

Both the BSJ and JPS were interrogated to ascertain and corroborate conformance with the Protocol. The findings are summarized in the following Table.

Table 9: Compliance with Meter Testing Protocol

Requirement	Objective	Key Finding
Pattern Approval of new models of electricity meters and associated accessories shall be carried out by	(i) No new models of electricity meter to be used in revenue determination, shall be introduced in service within Jamaica, without getting type approval from the	All new models of meters have been Pattern Approved and received certification from the BSJ. These are a total of 12 types as here listed: 1) Itron Sentinel CL 20, Fm 45S SS3A2L (SS3S2L) 2) Itron Sentinel CL 200, Fm 2S, SS1S2L 3) Itron Centron CL 100, Fm 1S, C1S

Requirement	Objective	Key Finding
the BSJ	BSJ (ii) JPS shall cause any new meter model intended for use in electrical measurements for revenue purposes to be pattern approved by BSJ before introduction in the field.	4) Itron Centron CL 100, Fm 2S, C1S 5) GE CL 200, Fm 2S, I-210 6) GE CL 100, Fm 2S, I-210 7) QL CL 100, Fm 1S 8) QL CL 100, Fm 2S 9) L&G CL 100 Fm 1S, SPGM11 10) Elster, class 20, 120 - 480V, Kh 1.8;* 11) Elster, class 200, 120 - 480V, Kh 7.2;* and 12) Elster, class 200, 120 - 480V, Kh 21.6* *Requested by a third party Sources – JPS and BSJ
Acceptance Testing of imported Type Approved meter shipments as well as JPS repaired meters shall be carried out by the BSJ.	(i) The BSJ shall conduct acceptance testing on all batches of imported meters to determine whether they conform to the standards that led to their type approval or for those batches pre-dating type approval to establish that they meet acceptable tolerance and safety standards. (ii) The BSJ shall conduct acceptance testing on all batches of repaired meters or on all repaired meters that cannot be batched to determine if their tolerance falls within acceptable limits. (iii) No new meter from a batch shall be installed in the field without an acceptance test certificate being issued for the batch.	(i) Of 48 batches that were submitted for acceptance tests – the BSJ records indicate that 3 failed. (ii) JPS ceased repairing meters since 2006. If a meter is removed from circuit the meter goes back to the stores to be crashed. All new customers or premises are provided with new meters (iii) Each new shipment of meters is segregated from other meters. When new meters are received the meters numbers are recorded and sent to the Bureau of Standards for selection of the sample size. Upon receipt of email notification from the BSJ of the test results, the meters numbers are verified to ensure that no other meters were added. The meters that passed the test are recorded in the inventory system and the meter application system (Banner). The meters are then sealed and moved to the meter warehouse. A system-generated requisition is needed for all meter removal from stock. Meters that are not recorded on the system cannot be issued. Additionally meter numbers of meter installed are verified against the meter information recorded in the meter application. These are written procedures
Pre-field Tolerance Adjustment on new meters above 12kVA shall be carried out by JPS but shall be subjected to audit under an accreditation programme.	(i) The JPS shall adjust the tolerance on every electricity meter, used for revenue determination and rated above 12kVA, so that it measures as close to zero tolerance as possible before it is dispatched for field installation. (ii) The quality of the electricity meter tolerance adjustment (calibration) shall be monitored by The Accreditor of JPS Meter Shop and Meter Testing Services and the level of auditing shall be such that will instill confidence and recognition by the OUR and BSJ.	(i) Electronic meters cannot be adjusted by JPS. (ii) JPS has a special test bench that is called "Standard" which is shipped every year to Radian Research Inc in USA who certifies the standard and puts a sticker on it writing who tested it, when tested it and when is the next test due. Then this Standard bench is shipped back to us. This Standard is used to calibrate all other test benches in the lab but not for any meter test. This test certificate is traceable with NIST the National Institute of Standards and Technology in USA. The standard test bench of BSJ is also tested every year by Radian Research Inc. and traceable at NIST JPS meter shop was formally accredited to the ISO/IEC 17025 standard by the Bureau of Standards.
Compliance Testing of field installed meters shall be carried out by JPS but shall be subjected to audit under an accreditation programme.	(i) To bring the full complement of JPS field-installed meters into compliance with a ± 2 % tolerance on electrical energy measurement for revenue purposes. (ii) To use random sampling together with a statistical sampling plan method developed specifically for electrical and gas meters to achieve the above	(i) In pursuance of Section 9.4.iii of the Protocol on Meter Testing in Jamaica, JPS submitted in February 2009 a proposal for the National Meter Sampling Map to the OUR for approval. As of the date of writing the approval had not yet been granted. Consequently this activity and those at (ii), (iii) and (iv) have not been formally activated. (v) Such meters are not returned to service as JPS does not operate a repair facility. Therefore, once the meter has been removed, the meter is stored as scrap, unless and otherwise advised by the OUR.

<table>
<tr><th>Requirement</th><th>Objective</th><th>Key Finding</th></tr>
<tr><td></td><td>objective.

(iii) If the first meter sample fails the batch (lot) from which it was taken, the JPS shall be given the option of withdrawing the meter batch from service or re-sample the batch through an increased sample size or double sample.

(iv) If the enlarged sample also fails the batch from which it was taken, then the JPS shall have the choice of withdrawing the meter batch from service or proceed to 100% sampling and testing in order to remove the meters with unacceptable tolerance.

(v) Meters (lots or individuals) that have been withdrawn from service can only be returned to service through the process of repairs (if needed), tolerance adjustment (recalibration), acceptance testing (by JPS), lot or individual meter clearance for field re-installation by the Accreditor.

(vi) To ensure that the quality of the JPS sampling, field testing programme and Meter Shop calibration & repairs are always meeting the standards of the OUR.</td><td></td></tr>
<tr><td>Electricity consumers Requests for Verifying Meter Accuracy shall begin with the JPS and follow the process hereinafter specified.</td><td>To assure every JPS customer that he/she has the right always to have his/her meter checked for measurement accuracy on request.

To make access to a meter verification check affordable to every JPS customer by offering one free per annum.

To prevent unjustified meter verification requests from flooding the JPS as well as incurring enormous uncontrollable expense, by charging for the second check unless the result shows the meter to be out of the ± 2% tolerance allowed.</td><td>JPS reports that There is no single process which can differentiate meter checks initiated by the customer versus those which are made by the company. It provided the following information from its records as to meter investigation requests and actual checks carried out.

<table><tr><th>YEAR</th><th>Meter Investigations Requested</th><th>Meter Investigations completed by JPS</th></tr><tr><td>2006</td><td>4,016</td><td>3,066</td></tr><tr><td>2007</td><td>18,343</td><td>16,723</td></tr><tr><td>2008</td><td>21,520</td><td>19,751</td></tr><tr><td>2009</td><td>20,384</td><td>18,315</td></tr><tr><td>2010</td><td>14,977</td><td>11,892</td></tr></table>
The BSJ reports that it received 19 requests for meter verifications during the period 2006 – 2010 of which 11 were found to be un satisfactory.</td></tr>
<tr><td>Accreditation of JPS meter calibration / repair facilities and meter field testing programme shall be done by an Accreditation Body</td><td>The JPS shall seek accreditation from a recognized and BSJ approved source for its Meter Shop and Meter Testing Services within 6 months of signing to this Protocol.</td><td>JPS meter shop was formally accredited to the ISO/IEC 17025 standard by the Bureau of Standards in August 2009.
The services accredited were:
▪ Testing/Calibration of watt-hour meters.
▪ Calibrations of portable meter field-test sets.
In July 2010 the BSJ had ceased being the local authority responsible for the granting of accreditation. JPS now has a pending application</td></tr>
</table>

Requirement	Objective	Key Finding
approved by the BSJ. Initially, the BSJ may be asked to be the Accreditor.	JPS shall use Accreditation as a tool for ensuring that its Meter Shop and Meter Calibration Services are of a standard that commands recognition and confidence by the most demanding evaluators.	for accreditation before the newly formed local authority, which is the Jamaica National Association For Accreditation (JANAAC).

6.2 Conclusions and recommendations

The Investigation found that both the BSJ and JPS have been diligent in implementing the Protocol and complied with the provisions set out. The BSJ, as expected, as the statutory body responsible for standards in metrology has been particularly diligent in the discharge of its responsibilities and no gaps or shortcomings were detected in the consistency of compliance with the Protocol.

The investigation has formed the view that the methods and systems for testing are sufficiently rigorous to secure public confidence in the electronic meters.

There are however four areas which require attention and for which the following recommendations are made:

1. The Protocol provides that it should be reviewed every two years – such a review is long overdue. The Office must embark on this review as a matter of urgency and in doing so consideration must be given, if it is necessary, to the aligning of the standards prescribed for the new technologies e.g. ANSI C12.20 which specifies more stringent accuracy tolerances for electronic meters should now be included. The outcome of this review may have financial implications in terms of investment in additional test equipment particularly equipment end to end system tests.

2. The Office must without any further delay conclude the review of, with a view to approving, JPS' proposal for the National Meter Sampling Map.

3. Concomitant with the review the Protocol, the Office should consider the introduction of "Independent meter testers" retained by the OUR who would be empowered to respond to customer requests for meter investigation/testing. The logistics and modality of such operations would have to be carefully considered and developed, but it would go a long way towards providing an independent means of verification of meter accuracy in the field and thus offer the customer an alternative to JPS in these matters.

4. In reviewing and updating the Protocol, the role of the Jamaica National Association for Accreditation (JANAAC) must now be formally recognised.

7 Objective 5

From a historical and current perspective, assess the extent to which the billing practices are in compliance with the existing quality control procedures (including meter reading and exceptions processing) and Directives;

The methodology adopted was to use the previous audit of the Billing System conducted by PriceWaterhouseCoopers (PwC) in 2007 along with the all Directives issued by the OUR as the point to initiate this review.

This was followed by the review all pertinent JPS documentation which included the Billing Adjustment, Exception Handling (Billing) and Meter Reading manuals along with the process flow maps. Interviews were held with the relevant JPS personnel in the departments involved in billing process.

The billing process is as follows:-

Billing Department/Operations

1. The Billing Department initiates the process by instructing Computer Operations to send the customer accounts for a cycle to the fourteen (14) district offices for readings to be taken. Any variation in the billing cycle schedule can only be authorised by the Billing Department but the district offices can request changes.

District Office

2. The meter readings are then taken based on the customer account and on the routes associated with the account. This is in keeping with PWC report and adheres to the meter reading documentation.

3. The meters are then read and during the process if a reading is +/- 30% of the average of the last three meter reading, the meter reader is prompted by the handheld reader device that there is an exception and is asked to either re-enter a new reading or accept the reading. This is in keeping with the OUR Directives.

4. The readings are collated by the district office in an automated process which requires the readings be downloaded to a computer in the district office for upload to the main office. Manual adjustments can be made to meter readings but these have to be approved by the meter reading supervisor at the district office. Seven (7) reports are generated for control of the quality and performance of the meter readers, copies of which were reviewed and retained.

5. The meter readings are then uploaded by the district office to the operations department by 6 pm of each day for the bill creation process.

Operations Department (Head Office)

6. The Billing Process is initiated at 5:30 pm with two batch runs, the first for late billing (unbilled customer accounts from a previous cycle) and current billing accepted reading for the cycle for that day.

7. The batches that contain information for the late billed accounts and accounts in the current cycle are subject to a verification check, and if there is less than 10% error the billing process continues. If there is more than a 10% error, the batches are then sent to the CIS Banner team for investigation and action to be taken to process the bills. The accounts with errors are not billed and an exception report is sent to the Billing team for investigation and further action.

8. The bills are then generated along with an exception report; this report is formulated based on rules setup in the billing system (CIS Banner). The rule that relates to consumption variances is set to +/- 99%. The investigation had sight of correspondence between JPS and the OUR which address a proposal by JPS to vary the exception strategy to that described. The correspondence reveals that the OUR had requested and was awaiting further information from the company so, at the time of writing, the OUR had not yet approved the change. The exception strategy being utilized by JPS was therefore found to be in violation of the OUR's Directive.

9. The bills for accounts that are not on the exception report are then dispatched to the customer. While the processing of the accounts that appear on the exception report is initiated.

Customer Care

10. The Exception team (15 exception agents) in Customer Care then reviews the accounts on the exception report by reviewing the history of the account and any other information that may be available. If the investigation is inconclusive then an estimated bill is generated and a service order is raised for further investigation to take place.

11. The customer accounts that require adjustments are then routed to the Adjustment team for review and approval. The authorisation of approval is based on the amount of the adjustment and is broken down as follows:-

    a) Supervisor approves amount < $10,000
    b) Managers approves amount < $250,000
    c) Vice President approves amount >= $250,000.

12. A letter is then prepared detailing the adjustment and sent to the customer along with the bill.

13. It was stated that all adjustments, links debit or credit adjustments in the customer balance with similar change in the consumption but the system does facilitate changes in the balance without a corresponding change in the consumption.

It should also be noted that adjustments to customer bills can only be done to items that appear on the exception reports.

7.1 Conclusions and Recommendations

The billing process reviewed follows the processes outlined in procedure manuals provided by the utility company and is in keeping for the most part with the observations made in PwC 2007 report and the OUR Directives.

The levels of the exceptions being generated seems high and while these average about 2% of accounts billed per month there are concerns as to whether there are systemic or embedded problems JPS would be well advised to examine these issues more closely.

The OUR Directive that states that all bills which show consumptions with a +/- 30% variance should be investigated is only being adhered to in one aspect of the process; that is at the meter reading stage. However, at the bill generation stage the process is using +/- 99% variance in consumption which is contrary to the OUR Directive. Since the exception report produced after the bill creation stage is used to initiate investigation into customer accounts it will mask errors that can occur at the meter reading stage of the operation. There is was no report presented during the review process that looked at exceptions between +/- 30% and +/- 90% variance in consumption. There was also no report presented that showed by district office and/or meter readers the incidences with +/-30% variance in kWh consumption at the meter reading stage.

Although, JPS was found to be remiss in its compliance with the Office Directive on the +/- 30% exception processing, the opportunity was taken to review the presentations made by JPS to support its proposal to implement the +/- 99% variance mechanism. With the background to this investigation and with the real prospect that as the electronic meters become more widespread the numbers of exceptions may increase initially, the conclusion has been reached that the exception limits should remain at the originally Directed +/- 30%. It is felt that over time the numbers of exceptions generated will decrease but in the current environment the company should be minded to deal with the attendant customer issues proactively and directly.

The performance of the meter reading process and bill generation including the level of exceptions should be included as part of the routine reporting by JPS to the OUR

It is **recommended** that:

1. JPS is to adhere to the OUR Directive and synchronize the exception reporting to +/- 30%.

2. JPS review its quality control measures at the meter reading stage at the district office level with a view to strengthening the quality controls at the meter reading stage of process. While this recommendation has been largely conditioned by the circumstances found regarding the exceptions processing at the meter reading stage – the company may well find it useful and more efficient to address the exceptions as an outcome of meter reading rather than billing. The quality control reporting and action would then take place at the District level rather than at the head office.

3. The Office issue a directive requiring that, for estimating bills, the variance in the meter reading be averaged over 12 months consumption rather than the three months that presently obtains. In the long run his may improve the quality of the billing when estimates have to be used.

4. The Office issue appropriate Directives to give effect to these recommendations.

8 Objective 6

From a historical and current perspective, assess the extent to which the design of the quality control measures (including meter reading and exceptions processing) reliably and consistently identifies and treat with legitimate/genuine billing anomalies.

There is some overlap in the issues to be addressed under this Objective and that of Objective 5 as the exceptions processing is essentially a billing issue rather than a metering issue.

PwC Findings

"Generally, the quality control procedures as designed should result in the consistent identification and treatment of legitimate billing anomalies. Weaknesses inherent in the design of the quality control procedures such as management reviews of billing corrections resulting from billing exceptions on a sample basis, may however negatively affect the efficacy of those reviews"

Using the findings from the PwC (2007) Report as the starting point, a review was conducted of the JPS policies and procedures relating to the meter reading and billing systems, including:

- Procedures Documentation: Exceptions Handling (July 21, 2011)
- Policy Documentation: Billing Adjustment (March 8, 2011)
- Procedures Documentation: Meter Reading (April 15, 2008)
- Policy and Procedure Documentation: Meter Replacement and Notification (November 1, 2010)
- Application Change Management – Policies and Procedures (last modified November 3, 2004)
- Process Flow Charts – Billing (Meter Reading Upload and Pre-Billing)
- Work In Progress (WIP) Rules/Documentation (Draft)
- Banner CIS Rules

Interviews were also conducted with staff members of various departments within JPS including Computer Operations team, Exceptions Processing, Billing and Banner/CIS.

8.1 Observations

Based on the documentation received and the interviews conducted, the quality control procedures are incorporated in the meter reading and billing processes at various levels including both in field and in-house processes. The processes are described in some detail below.

<u>Quality Control - Field Level Operations (Meter Reader)</u>

1. Meter reading routes are assigned by meter reading supervisor at the district offices that ensure a meter reader does not read the same route for two consecutive billing periods

2. Meter reading for residential customers are keyed into a handheld device upon which the meter reading route information is uploaded directly via a computer interface at District Office
3. Meter reading sheets are used if the automatic upload to the handhelds cannot be conducted (readings are then manually keyed in to the system directly)
4. Meter readers are required to key readings from the meters in their assigned routes directly into the handhelds
5. Meter readers are then alerted by the handhelds where the readings translate to a consumption that is +/-30% of the average consumption captured by the last three (3) actual readings
6. Where a meter reader is alerted by the handheld, they are required to confirm or reject the readings
7. Meter readers can also make notes/comments on the handhelds in relation to specific accounts/meters

Field Level Operations (Meter Reading Supervisor)

Meter Reading supervisor is required to perform an audit of the meter reading process on a routine basis. After the meter reading reports are generated and printed, the Meter reading supervisor use the reports to conduct audit checks and further investigations as below :

Comment Code Reports

Analyse the comment code reports daily and generate service orders as necessary.

Revenue billing Report

Meter reading/Field service supervisor is to required to revisit the meter reading routes that was read the previous day by the meter readers and re-read (on a sample basis) the customer's meter in order to ensure data integrity and accuracy.

Found Meter Reports

Used to generate service orders and initiate visits by Field Service Technicians as necessary.

Unread Meter Reports

Used to identify and assign unread meters to meter readers or ascertain the reasons why they were not read.

Inactive Meter Reports

Used to generate service orders and instigate visits by Field Service Technicians as necessary.

Quality Control In-House Operations

Computer Operations
The Computer Operations team has responsibility for the meter reading data uploads from the district offices into the billing and Banner/Customer Information systems (CIS). Within the computer operations remit, there are also some quality control functions especially as it relates to the integrity of the data and the generation of the exception reports.

Exceptions Processing
Once the exception reports are generated and submitted to the Customer Care Team/Center which includes a number of teams namely Banner CIS (ie Customer Service), Billing, Adjustments and Exceptions processing. Billing exceptions are assigned on a daily basis to individual officers by the supervisor and are processed via the guidelines as summarized below.

High/Low Consumption (+/-99%)
Readings are reviewed (rejected/accepted) based on criteria including:
Comparison of current readings to historical consumption pattern (ie 12 months for all accounts or 24 months for seasonal accounts)
Review of service history to identify issues such as changes in occupancy, load or other irregularity including a malfunctioning meter.
Where readings are rejected, estimates are prepared and used to bill the account and the relevant service orders generated. Accounts where the readings are deemed acceptable are then submitted to the billing department for processing.

Other Exceptions (Zero or Negative Consumption, Missing Readings, Idle Service, First/Final Bill, Days of Service)
These exceptions are processed by a review of the service history, customer meter reading information, outstanding or completed service orders and also any notations that may have been made in relation to any irregularity observed at the premises and a decision is made how to bill the account, either by applying the reading or using an estimated reading.

Preparation of estimates
Estimates are prepared using two methods depending on the availability of previous actual readings.
Previous Readings - Where actual readings are available the mass estimator routine within Banner/CIS determine estimated consumption based on the previous three (3) actual reading which is used to calculate an Average Daily Consumption (ADC) which is then applied to the current days of service.

No Previous Readings - Where actual readings are not available (for whatever reason), estimates are prepared on the basis of an assumed 30 day consumption of 100 kWh and 200 kWh for customers of Rates 10 and 20 respectively.

Billing Adjustments
Adjustments to customer account relating to billing are governed by "Policy Documentation: Billing Adjustment (dated March 8, 2011)". It sets out the basis upon which adjustments can be made as well as assigns responsibilities to the various agents whether at the clerical, supervisory and managerial levels. For instance, responsibility for approvals of adjustments has been set as the table below:

Table 10: Billing Adjustment Approval Responsibility

Responsibility	Range of Limit (J$)
Customer Care Officers	$0 - $9,999
Supervisors	$10,000 - $49,000
Customer Care Center Manager	$50,000 – $249,999
Vice President	$250,000 and above.

Additionally, the Billing Adjustment policy incorporates the JPS Back Billing Policy 2002 as approved by the OUR.

8.2 Findings and Conclusions

There is room for error when meter reading sheets are used if the automatic upload to the handhelds cannot be conducted (readings are then manually keyed in to the system directly).

As it relates to the meter reading and billing, the exceptions processing procedures of JPS operates initially at the level of the meter reader and completed within the billing/customer care center based at the head office. At the meter reader level, the system is designed to identify those reading which fall outside of a +/-30% criteria in relation to the historical consumption pattern established by the last three (3) actual readings. It therefore provides the meter reader with an opportunity to recheck/verify "exceptional readings" at the outset and acts as a quality control mechanism. Additionally, when the meter reader returns to the district office, the meter reading supervisor is charged with the upload of the meter read data and is also required to conduct quality checks based on reports generated. The meter reading supervisor is required to used these reports (including unread meters) to revisit meter reading routes (on a sample basis) to confirm readings and generate service orders as necessary.

It must be noted that this review did not include the observation of meter readers or meter reading supervisors as they obtained readings and as such cannot pronounce on the extent to which meter readers/supervisors are compliant with the policy of confirming readings that are deemed as exceptional.

The next level of quality control as it relates to meter readings (and subsequently billing) occurs with the processing and input to the centralized billing system from various district offices. Within the centralized billing and exceptions handling team, there is additional threshold which identifies exceptions where the current reading indicates consumption outside the boundaries of +/- 99% of the consumption pattern established by the last three actual readings. Once the readings are uploaded, those deemed to be within the tolerance levels are directly processed by the billing department and charged to the customers accounts accordingly. Accounts identified by this process as "exceptions" are then subject to review and action taken as deemed appropriate. These actions may include the confirmation of the reading as correct as established by a review of the historical consumption pattern for a period of between twelve (12) and twenty four (24) months. Where the "excepted" readings are not deemed acceptable, estimates are generated along with the relevant service orders which should lead to some action being taken to rectify same as necessary. Additionally, in some instances, the exception procedures may require the adjustment of a customer's account relating to billing (consumption), which is specified by the "Billing Adjustment Policy (March 8, 2011) outlined above.

Therefore, from a design perspective, the quality control procedures as set out in the policy and procedures documentation ought to reliably and consistently identify and treat with legitimate/genuine billing anomalies whether in field or in house.

However, the number of accounts/customers identified by these quality control measures is totally dependent on the criteria/threshold which is designated as "normal". In other words, the level at which incremental consumption is considered as anomalous directly impacts what is deemed genuine. Hence having exception thresholds of +/-30% only at the meter reader level and +/-99% at the billing team level leaves room for significant number of customers to experience marked volatility in the billed consumption. This has effectively delegated much of the quality control to the meter reader level at the first instance which is in breach of the OUR regulatory directives which established that the exceptions processing criteria should be set at +/-30%.

In relation to billing adjustments, in its findings (section 2 above), PwC states that the "*management reviews of billing corrections resulting from billing exceptions on a sample basis, may negatively affect the efficacy of those reviews*". While this review did not specifically examine that assertion, the Billing Adjustment policy indicate that there is some oversight of the billing adjustments with a graduated level of management responsibility dependent on the amounts in question (see Table 10 above).

8.3 Recommendations

As designed the quality control procedures require changes to the exceptions processing criteria for the in house billing and exceptions processing team. This should be reduced from +/-99% and brought in line with regulatory directives.

8.4 Limitations

This review did not include the observation of meter readers or meter reading supervisors as they obtain readings and as such cannot pronounce on the extent to which meter readers/supervisors are compliant with the policy of confirming readings that are deemed as exceptional. Additionally, the review did not include any interaction with the district offices or meter readers and as such cannot determine the extent to which the meter reading supervisors audit the readings taken by meter readers under their supervision.

9 JPS' compliance with OUR Directives

The Office has had occasions to review/investigate JPS' billing processes on a number of occasions since 2004. The first of these was in January 2003, when the Office directed JPS to conduct its own investigation into the extent and causes of the abnormally high level of complaints regarding unusually high bills. Arising out of the subsequent report submitted by the company, the Office issued a Memorandum dated March 11, 2003 setting out, among other things, a number of measures to be taken by the company. The second intervention was in the aftermath of the passage of Hurricane Ivan in September 2004 when the OUR recorded a significant increase in contacts[11] regarding JPS, especially relating to billing. The Office again requested that the company conduct its own investigation and provided specific data to inform the investigation. Arising out of the reports received from JPS and its own analyses the Office issued a number of Decisions (Doc Number Ele 2005/01) followed by a Directive dated February 24 2005. The 2007 PwC review sought to establish among other things the extent to which the Company had implemented the Directives issued by the OUR. At that time PwC concluded:

> *"Of the 20 directives which were decided upon, only ten (10) have been fully implemented, while four (4) have been partially implemented and the remainder have yet to be resolved. Therefore, overall, JPS has been inconsistent in its compliance with the Office's Directive of February 24, 2005 (amended March 22, 2005)."*

Rather than issue another set of Directives, the Office wrote to JPS on 7 November 2007 reaffirming its position on a number of issues but specifically relating to the matter of non compliance with the Directives the Office stated:

> *"It has been established that JPS has not fully complied with the Directive of February 24, 2005 (as amended March 22, 2005) which requires, among other things, the implementation of:*
>
> *i. an effective mechanism to facilitate performance monitoring of meter readers;*
> *ii. a programme for the routine maintenance of hand-held meters;*
> *iii. a system of notification to customers when their consumption is outside the established high/low variance criterion.*
>
> *Despite the passage of time the Office considers these issues to be as important as they were when the Directive was issued and the Office now reaffirms that these specific instructions be addressed and evidence and confirmation to this effect be provided by January 15, 2008. Notwithstanding the position expressed above, we would draw your attention to the Attachment section 14.0 which comments:*

[11] At that time Contacts were defined as those consumers who report problems against the service providers to the OUR and includes those instances where they OUR do not conduct an investigation, but refers the customer to a senior representative of the service provider to have the matter addressed.

"Of 20 directives issued by the Office, JPS has fully complied with 10; partially complied with 4; and has failed to comply with 6"

and to put you on notice that the Office views the company's non-compliance with its Directives as a serious offence. We are therefore requesting by November 30, 2007, a report on the actions (with confirmatory evidence of action) taken by the company in response to the Directive of February 24, 2005 referred to above, with explanations as to the reasons for non-compliance where this has occurred."

Against this background, the Investigation sought to establish the extent to which the company has complied with the various Directives (Decisions) of the Office, using the results from the PwC report as the base, and the consequential impact that these might have had on the customer billing experiences. The key findings are presented in the following tables.

Table 11 summarises the status of the company's compliance with Directives issued by the Office.

Table 11: Summary of JPS' compliance with Directive issued by the Office

	No of Directives	No Implemented 2005	Additional No implemented 2011	No outstanding
Meter Reading	11	5	2	4
High/Low criterion rejection	2	2	1	1
Estimation Routines	4	2	1	1
November 2004 Billing	2	2	-	0
Meter Maintenance & Testing	1	0	1	0

Table 12: JPS' Compliance with Directives issued by the Office

OUR Directive - 2005	Status– PwC Comments 2007	Findings - 2011
1. Meter Reading		
a. Re-training of all meter readers	Implemented	Not examined as this was confirmed previously.
b. Implementation of effective mechanism to facilitate performance monitoring of meter readers regarding quality of their readings. Mechanism must hold meter readers accountable for accurate readings	Not completed. It is our understanding that JPS is currently finalizing a report that will allow some assessment of meter reading accuracy. This is based on the number of high, low, missed or negative reads by meter reader. When finalized it can be used to evaluate meter reader accuracy	Not completed. JPS indicated to OUR via letter dated February 15, 2008 its commitment to the implementation of such a system on a phased basis. The first phase was to commence in April 2008. [Objective 6 of this Report refers]
c. Accountability standard prescribed by JPS for meter readers must be communicated to OUR (30 June 2005)	Has not been done.	Not completed. This has never been submitted to the OUR. [Objective 6 of this Report refers]
d. Routine inspection and maintenance of hand-held devices	JPS is currently finalising a procedural document regarding the maintenance of the handhelds	Implemented.
e. Notification of customers	Not implemented. PwC unable to confirm	Not implemented. Evidence suggests that this

OUR Directive - 2005	Status– PwC Comments 2007	Findings - 2011
whose consumption is outside the high/low variance criterion	implementation of the Directive	was implemented in April 2008 but has not been maintained. [This is an important customer service tool which should be re introduced]
f. Manual re-entry of readings flagged by hand-held device as exceptions	Implemented	Interviews with JPS personnel confirm this has been implemented.
g. Removal of access to previous readings by meter readers in the field	Implemented	Interviews with JPS personnel confirm this has been implemented.
h. Assessment of technology options and feasibility to introduce Automatic Meter Reading and Pre-paid Meters by the system (September 2005)	Partial implementation - consultant report on AMI shared with the OUR	Implemented. Technology changes to Electronic digital meters and AMI and RAMI introduced.
ii. JPS to submit monthly progress reports in relation to system overhaul	Covered under items a) through h) above	Not consistently implemented – ad hoc reports received
iii.JPS to put in place within 3 months of this Directive a customer education programme about meter reading procedures designed to restore confidence in the integrity of the billing system	Ongoing	Ongoing
iv. Wider and more frequent rotation of the assigned areas to meter readers	Implemented	Implemented. Confirmed by interview with JPS personnel that the meter reader supervisor ensure that meter readers are not assigned the same route consecutively.

OUR Directive - 2005	Status– PwC Comments 2007	Findings - 2011
2. High/Low criterion rejection		
i. Rejection criterion to be lowered to +/-30% for rate 10 customers by 31 July 2005. Commencing with March 2005 billing and until further notice, JPS shall be required to submit reports detailing exceptions generated by the high/low criteria	Implemented	Not implemented. Meter readers are prompted at +/-30% while the in office processing is governed by a rejection criterion of +/-99% [This is addressed at Objective 5]
ii) High/low criterion for commercial accounts to be lowered to +/-60% by 31 July 2005	Implemented	Implemented

OUR Directive - 2005	Status– PwC Comments 2007	Findings - 2011
3. Estimation Routines		
i) a. Effectively immediately, estimate of consumption should be based on the last 3 actual readings (new accounts excepted)	Implemented	Implemented except for cases where three (3) actual readings not available last. Where only last two (2) actual readings are available they are used and if not see finding in 3.1.c below. [This has been reviewed at Objective 5 and recommendation made to use 12 months of

OUR Directive - 2005	Status– PwC Comments 2007	Findings - 2011
		actual readings]
b. Effective immediately, there should be no difference in the algorithm used for the Mass and Base Estimators.	Implemented	Implemented
c. Effective immediately, adjust monthly consumption estimates used by the Manual Estimator to better reflect the class average consumption	Not implemented. JPS proposed to the OUR that there should be no changes as the change would replace one set of customer issues with another. Unless subsequently instructed to the contrary JPS would continue the current manual estimation rules. Feedback from the OUR was outstanding	Not implemented. JPS currently uses a class average of 100kWh per 30 days for Rate 10 customers and 200kWh per 30 days for Rate 20 customers prorated as necessary. [OUR has outstanding issues?]
ii) JPS to assess the merit of using even longer periods and advise OUR by 30 June 2005	Not implemented. JPS responded that there was no need to extend the length of history contained in the estimation routine, given by their nature estimators are imperfect and the Company is moving towards 100% monthly meter readings.	Company has introduced 100% monthly meter readings.

OUR Directive - 2005	Status– PwC Comments 2007	Findings - 2011
4. November 2004 Billing		
i) JPS to present proposal to OUR by 28 February 2005 for adjusting 21,000 accounts	Implemented	Not examined as this was confirmed previously.
ii) The 21,000 accounts only to be disconnected for non-payment of current billing	Implemented	Not examined as this was confirmed previously.

OUR Directive - 2005	Status– PwC Comments 2007	Findings - 2011
5. Meter Maintenance & Testing		
i. Develop a meter testing programme that will enhance credibility of JPS' metering programme	Ongoing with efforts by various entities	Implemented. The Document "Electricity Meter Testing in Jamaica – Protocol on Administrative and Testing Procedures", OUR Document No. Ele 2005/07 dated December 13, 2005 formalizes the arrangements for the BSJ to certify meters used by JPS for revenue purposes

9.1 Conclusion and recommendation

Of the 20 Directives issued by the Office, six (6) have either not been implemented or are in process. Of these, the investigation is of the view that one (1) is non - negotiable, while the Office should examine the others to see if they remain relevant, given the passage of time.

This Report makes several references to the action taken by JPS to move the exception criteria to ± 99% and it has advocated a return to the ± 30% criteria. Compliance with this Directive is considered to be non - negotiable.

With regard to the other outstanding Directives it is noted that one is seemingly awaiting action by the OUR while the others are in "process". All of these are important issues and while this Investigation is clear on the exceptions processing criteria the Office should take a position in the light of its assertion in its letter of 7 November 2007

"the Office views the company's non-compliance with its Directives as a serious offence" and bring these issues to conclusion.

10 Constraints on the Office

During the course of the Investigation, certain skepticism was detected amongst various stake holders as to the futility of an investigation of this type. This skepticism was not only manifested in interaction with the consuming public but also by way of a perceived frustration in the OUR itself. Of course, the need to understand the background to this was examined as it was felt that the translation of any recommendations arising from this Report into sustainable action and results would be dependent on the environment in which the Report itself is received.

A quick desk review of the current regulatory environment was undertaken, limited only to the circumstances dictated by the terms of Reference of this Investigation. A number of critical issues became evident

1. Legal environment – the electricity sector is still operating without a modern Act. The Electric Lighting Act of 1890 (amended several times) is still the enabling legislation for the sector
2. The JPS Licence issued pursuant to that Act but having regard to the OUR Act is cumbersome because, in order to make it relevant to the current environment, the drafters, evidently, included provisions which really belong in the enabling legislation e.g. the establishment of the Appeals Tribunal' and the overarching regulatory framework
3. The OUR Act remains deficient providing an appropriate framework of enforcement powers for the Office, so the OUR has powers to prescribe actions but no powers to enforce them.

These are all issues that have been recognized and the correction of which have been advocated for over the last decade or so. Until there is new legislation and OUR Act amended, the Licence will remain imperfect and this important sector will continue to languish with customer dissatisfaction due arising out of the consequences of an unfettered monopoly service provider. These issues have to be attended to as a matter of urgency.

Appendix 1

OFFICE OF UTILITIES REGULATION - JAMAICA

TERMS OF REFERENCE

INVESTIGATION OF THE JAMAICA PUBLIC SERVICE COMPANY LTD (JPS) BILLING AND METERING SYSTEM FOR ELECTRICITY CONSUMPTION

1.0 OBJECTIVE

The Office of Utilities Regulation (the Office/OUR) intends to conduct an investigation of the Jamaica Public Service Company Limited (JPS/the Company) billing, meter replacement, meter inspections and audit, and meter testing practices and procedures. The investigation will examine the various relevant aspects of JPS operations with a view of determining the extent to which it consistently provides reliable and accurate bills detailing customer consumption. Additionally, the extent to which JPS is in compliance with regulatory directives and prescribed standards that are related to billing, meter replacement, meter inspections and audit, and meter testing practices and procedures issued pursuant to the OUR Act 1995 (as amended 2000) and the All-Island Electricity Licence, 2001 ("the Licence") under which it operates will also be assessed.

The objective of this investigation is to:

1. Assess the legitimacy of the high consumption billing complaints as a consequence of the replacement of old (electro-mechanical) meters with new "digital" meters using appropriate sampling techniques;

2. Assess the legitimacy of the high consumption billing complaints against JPS by using appropriate sampling techniques;

3. Assess the appropriateness of JPS' current Back Billing Policies and Procedures;

4. Assess JPS' current Meter Inspection and Audit practices and procedures;

5. From a historical and current perspective, assess the extent to which the billing practices are in compliance with the existing quality control procedures (including meter reading and exceptions processing) and Directives;

6. From a historical and current perspective, assess the extent to which the design of the quality control measures (including meter reading and exceptions processing) reliably and consistently identifies and treat with legitimate/genuine billing anomalies.

2.0 BACKGROUND

2.1 The Office of Utilities Regulation

The OFFICE OF UTILITIES REGULATION was established by an Act of Parliament, the Office of Utilities Regulation Act of 1995 (amended 2000) (the OUR Act) to regulate the provision of prescribed utility services in Jamaica. Those services are electricity, telecommunications, water supply, sewerage and public transportation by road, rail and ferry.

Section 4(1) of the OUR Act, inter alia, empowers the OUR to:

(i) Regulate the provision of prescribed utility services; and
(ii) Carry out, on its own initiative or at the request of any person, such investigations in relation to the provision of prescribed utility services as will enable it to determine whether the interests of the consumer are adequately protected.

The OUR has a statutory duty to protect and balance the interests of the utility consumers and those of the utility providers.

In performance of its functions pursuant to Section 4(3) of the OUR Act, the OUR can undertake such measures as it considers necessary or desirable, inter alia:

(i) To encourage competition in the provision of prescribed utility services;
(ii) To protect the interests of consumers in relation to the supply of a prescribed utility service;
(iii) To promote and encourage the development of modern and efficient utility services; and
(iv) Enquire into the nature and extent of the prescribed utility services provided by a licensee or specified organization.

2.2 The JPS Billing Practices - Rationale for Review

In 2006, the Office commissioned an audit of JPS' billing system which was performed by PriceWaterhouseCoopers and completed with the submission of final reports in February 2007. The findings of the audit were published and the appropriate actions taken as recommended and deemed necessary to secure increased public confidence in the JPS billing system.

However, in recent months, the Office has become aware of increased concerns relating to the billing for electricity consumption, particularly relating to cases where the meter has been changed from an electro-mechanical to an electronic "digital" meter. Additionally, consumers complain that their billed consumption bear no relation to their lifestyle. In light of this, the Office deems it necessary to commission an investigation into these and other issues relating to JPS billing and metering. The investigation would seek to establish whether the complaints have merit and if this is found to be the case, to enable the Office to prescribe appropriate remedies and thus restore public confidence in the Company's billing system.

TERMS OF REFERENCE – REVIEW OF JPS BILLING AND METERING

ISSUES

Significant Changes in Billed Consumption

- Meter change (electro-mechanical to digital)
- Unexplained increase in billed consumption

Back billing (Policy)

- Retroactive charges resulting from meter change
- Retroactive charges resulting from meter under/over registration
- Failure of meter to register
- Other

Meter Inspection/Audit and Loss Reduction activities (Tampering allegations)

- Retroactive billing

Testing for meter accuracy

- Conformance to meter testing protocol
- JPS Standard Terms and Conditions of Service

SCOPE OF THE INVESTIGATION

This investigation shall engage in the following activities:

1. Assess the legitimacy of the high consumption billing complaints as a consequence of the replacement of old (electro-mechanical) meters with new "digital" meters using appropriate sampling techniques.

   The following tasks shall be undertaken:-

   a) Review JPS reports on its meter replacement programme/policy/activities.
   b) Compile a list of customer accounts for which meter change has been effected since January 2008 (last 3 years).
   c) Establish baseline consumption data for all accounts where meters have been changed to digital meters identified in (b) above.
   d) Compare consumption data before and after meter change (digital vs. electro-mechanical).
   e) Determine the statistical significance in the difference of consumption before and after to inform further investigation and review.
   f) If necessary from (e) above, determine sample of old meters and digital meters required for testing and verification.

g) Examine cases of every complaint received about excessive billing (greater than a 30% change in normal consumption) in cases not related to meter change since 2008.

h) Review meter testing reports as available.
i) Arrange for independent meter testing in the field as well as under laboratory condition as necessary.

2. Assess the legitimacy of the high consumption billing complaints against JPS by using appropriate sampling techniques:
    a) Establish the billed consumption trends at the aggregate level since January 2011;
    b) Compare consumption trends established since 2011 in (a) above to consumption trends for the five (5) years prior; and
    c) Examine billed consumption patterns on individual customer accounts as necessary (whether by Consumer and Public Affairs appeals data or otherwise) since January 2011 and for a period of 5 years prior.

3. Assess the appropriateness of JPS current Back Billing Policies and Procedures:
    a) Determine if the current policies are fair and reasonable and does not place undue burden on customers;
    b) Determine the compliance of JPS with provisions of existing policies; and
    c) Review the process by which retroactive charges are determined under existing policies.

4. Assess JPS current Meter Inspection and Audit activities:
    a) Review the current JPS policy in relation to Meter Inspection and Audit;
    b) Determine the extent to which JPS is in compliance with its internal Meter Inspection and audit policies;
    c) Determine the extent to which the current policy and practice is fair and reasonable to the customer; and
    d) Determine the basis upon which retroactive charges are calculated in relation to "flagged" accounts.

5. From a historical and current perspective, assess the extent to which the billing practices are in compliance with the existing quality control procedures (including meter reading and exceptions processing) and Directives.

6. From a historical and current perspective, assess the extent to which the design of the quality control measures (including meter reading and exceptions processing) reliably and consistently identifies and treat with legitimate/genuine billing anomalies.

7. Review the following documents:

    a) JPS Back Billing Policies and Procedures (July 2002)
    b) All-Island Electricity Licence, 2001;
    c) Office of Utilities Regulation Tariff Determination 2009 (OUR Document Ele 2009/04: Det/3); and
    d) JPS Terms and Conditions of Service;
    e) JPS Guidelines for the conduct of Meter Inspections and Audits (dated September 16, 2010);
    f) All documents and relevant material including JPS internal documentation, containing the policies and procedures related to the billing system.

TIME SCHEDULE
The investigation should be completed by **October 7, 2011**.

DELIVERABLES

A final report which should:

1. Describe the methodology used

2. Discuss Findings

3. Address each of the issues identified in the Objectives (Part 1) above

4. Provide recommendations for any improvements to JPS' metering, billing and meter reading practices

5. Provide advice on any further regulatory action that should be taken by the Office

TIME SCHEDULE
The investigation should be completed by **October 7, 2011.**

Appendix 2

Newspaper Clipping

'HOW COME, JPS?'

Transaction Date	Description	Kwh Consumption	Transaction Amount	Balance
	Beginning Balance			8,345.41
13-JAN-2011	Payment		8,000.00	345.41
28-JAN-2011	Electric Charge	335 A	10,005.61	10,351.02
28-JAN-2011	General Consumption Tax		424.29	10,775.31
16-FEB-2011	Payment		10,400.00	375.31
24-FEB-2011	Electric Charge	377 A	11,475.58	11,850.89
24-FEB-2011	General Consumption Tax		563.30	12,414.19
27-MAR-2011	Electric Charge	365 A	12,165.67	24,579.86
27-MAR-2011	General Consumption Tax		573.59	25,153.45
02-APR-2011	Payment		12,000.00	13,153.45
21-APR-2011	Payment		13,000.00	153.45
27-APR-2011	Electric Charge	323 A	10,503.08	10,656.53
27-APR-2011	General Consumption Tax		419.87	11,076.40
17-MAY-2011	Payment		23,000.00	-11,923.60
25-MAY-2011	General Consumption Tax		150.00	-11,773.60
25-MAY-2011	Reconnection Fee		1,500.00	-10,273.60
27-MAY-2011	Electric Charge	301 A	10,164.73	-108.87
27-MAY-2011	General Consumption Tax		358.62	249.75
17-MAY-2011	Payment		12,726.40	-12,476.65
02-JUN-2011	Payment		-23,000.00	10,523.35
15-JUN-2011	Payment		10,500.00	23.35
27-JUN-2011	Electric Charge	657 A	23,667.26	23,690.61
27-JUN-2011	General Consumption Tax		1,682.62	25,373.23
27-JUL-2011	Electric Charge	596 A	21,419.46	46,792.69
27-JUL-2011	General Consumption Tax		1,456.75	48,249.44
27-AUG-2011	Electric Charge	621 A	21,249.54	69,498.98
27-AUG-2011	General Consumption Tax		1,474.93	70,973.91
23-SEP-2011	Electric Charge	0 A	299.02	71,272.93
23-SEP-2011	General Consumption Tax		0.00	71,272.93
23-SEP-2011	Deposit Applied		-3,547.10	67,725.83

A print-out of Senior's payment schedule since January 2011.

Ending Balance
67,725.83

82-yr-old shocked by $70,000 electricity bill

By Volney Barrett

Byron Senior is barely able to stand without the aid of a walking stick. And when he received his last light bill he was shocked out of his wits.

The feeble 82-year-old retired auctioneer's light bill has him asking, "how come my light bill has soared from an average $10,000 to over $70,000 per month in just nine months?"

Senior, of Ramble Hill, St. James, is crying foul. The Jamaica Public Service (JPS) is demanding that he pays close to $70,000 to clear the balance on his electricity bill for September 2011 before his power is reconnected.

Senior's electricity was disconnected in early September and up to last weekend, he remained in the dark.

With the help of his walking stick and the support of a neighbour, a determined Senior made his way to the **Western Mirror's** offices in Montego Bay to highlight his plight as he searches for "some answers."

Senior owns a two-storey complex in which he has rented apartments to tenants. Now the senior citizen is distressed that despite desperate efforts, he has not been getting any redress from the light and power provider.

"Everything was fine" as Senior's bills were "quite manageable" when they averaged between $10,000 to $12,000 per month. But, earlier this year, the JPS installed digital meters at his premises in Ramble Hill, "Now the bills dem gone to $70,000 ... and I can't pay that," he lamented

A JPS printout of his payments confirmed that "at the start of the year, things were quite manageable." Now he is "very frustrated."

At the end of December last year, Senior's bill amounted to $8,345. It inched up to $10,351 in January.

That trend continued into March with slight increases but jumped to $13,153 in April.

Though a bit concerned, he paid, always making an effort to arrears. There were instances when the balances brought forward were just over $100.

NEW METERS

The new digital meters were installed on the premises on May 17, 2011 and almost immediately, with no additional electrical appliances installed or excessive use of energy, the bill shot up to $23,000 with a balance of $11,773. He was disconnected around that time, but was reconnected subsequently.

Things were about to get worse. The light bill skyrocketed even further for the remaining months of June and July, averaging in the region of $23,000 per month.

Due to challenges he experienced in paying this bill, the August balance jumped to $71,973 and, in September, the balance went up to $71,272. "I don't have a lot of things in my house, I don't understand this at all," Senior, who has hearing challenges, continued.

The neighbour, who asked not to be identified, said that nobody was at the house in the days, so the bills could not be correct. She too believes that the digital meters are at the heart of the problem.

To further add to Senior's plight, since this second disconnection, two tenants, who lived there for over six years, have since moved out.

A JPS representative said she "could not comment unless she had seen the account." The **Western Mirror** was referred to another representative, who was unavailable at the time we called.

The previous representative, however, said that she needed to ensure that the matter was reported to the company so that it could be addressed. Senior said he had made several reports to the JPS.

The **Western Mirror** also spoke with the Director of Consumer and Public Affairs at the Office of Utilities Regulations (OUR), Michael Bryce, who said there was nothing that they could do until "the complainant has fully exhausted all channels at the utility company."

A frail 82-year-old Byron Senior. - Volney Barrett Photo

Figure 22: The Western Mirror, Monday October 3, 2011

Appendix 3

Determining Sample Size Based on Population Size

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size.
S is sample size.

Figure 23: Table for Determining Sample Size from a Given Population
Source: "Determining Sample Size for Research Activities", Robert V. Krejcie, Daryle W. Morgan

Appendix 4

Repeat New Meter Numbers Attached to Separate Accounts

There was one case of the same new meter number attached to different accounts. This was not investigated for this report but investigation may be a necessary next step. The referenced accounts are shown below.

Table 13

Customer	Premises	Old Meter #	New Meter #	Date Meter Changed	Meter Change Project
[redacted]	[redacted]	38210	1324920	6/30/2010	NO
[redacted]	[redacted]	772849	1324920	6/30/2010	NO

Repeat Old Meter Numbers Attached to Separate Accounts

There were one hundred cases of old meter numbers attached to different accounts. This was not investigated for this report but investigation may be a necessary next step. The referenced accounts are shown below.

Table 14

Customer	Premises	Old Meter #	New Meter #	Date Meter Changed	Meter Change Project
[redacted]	[redacted]	186958	1300894	5/17/2011	YES
[redacted]	[redacted]	186958	1323330	6/22/2010	NO
[redacted]	[redacted]	203134	1227923	11/8/2009	NO
[redacted]	[redacted]	203134	1248765	2/12/2011	NO
[redacted]	[redacted]	209496	1209644	7/6/2009	NO
[redacted]	[redacted]	209496	1346692	7/25/2011	YES
[redacted]	[redacted]	227189	1310289	4/12/2010	NO
[redacted]	[redacted]	227189	1344073	6/2/2011	YES
[redacted]	[redacted]	231821	1311536	4/14/2010	NO
[redacted]	[redacted]	231821	1323581	8/12/2010	NO
[redacted]	[redacted]	358581	1237540	7/13/2011	NO
[redacted]	[redacted]	358581	1283560	1/20/2011	NO
[redacted]	[redacted]	369800	1228445	11/13/2009	NO
[redacted]	[redacted]	369800	1310075	3/12/2010	NO
[redacted]	[redacted]	563909	1478486	2/20/2011	NO
[redacted]	[redacted]	563909	1280907	2/4/2011	NO
[redacted]	[redacted]	625587	1200561	5/1/2009	NO
[redacted]	[redacted]	625587	1248181	10/28/2010	NO
[redacted]	[redacted]	854512	1333685	6/17/2011	NO
[redacted]	[redacted]	854512	1220736	9/21/2009	NO
[redacted]	[redacted]	876371	1274740	1/13/2010	NO
[redacted]	[redacted]	876371	1233112	10/15/2010	NO

[redacted]	[redacted]	964352	1171071	2/26/2008	NO
		964352	1230314	4/23/2010	NO
		964355	1170956	2/8/2008	NO
		964355	1230122	4/6/2010	NO
		964411	1170976	2/8/2008	NO
		964411	1230325	4/7/2010	NO
		964422	1171153	2/29/2008	NO
		964422	1230109	4/8/2010	NO
		968512	1171363	1/25/2008	NO
		968512	1229561	5/11/2011	NO
		968552	1285229	7/3/2011	NO
		968552	1170909	2/16/2008	NO
		968556	1229737	4/28/2010	NO
		968556	1171300	1/23/2008	NO
		968576	1171198	2/18/2008	NO
		968576	1230114	4/9/2010	NO
		968974	1230302	4/24/2010	NO
		968974	1170904	2/16/2008	NO
		969031	1229578	6/15/2010	NO
		969031	1171579	2/25/2008	NO
		993156	1286011	3/18/2011	NO
		993156	1169934	2/26/2008	NO
		993177	1230969	5/11/2010	NO
		993177	1169858	3/6/2008	NO
		993321	1169865	2/26/2008	NO
		993321	1231881	9/29/2009	NO
		1003572	1170933	2/9/2008	NO
		1003572	1230374	7/11/2011	NO
		1003582	1171028	2/18/2008	NO
		1003582	1229607	4/11/2010	NO
		1003623	1230482	4/11/2010	NO
		1003623	1171174	2/29/2008	NO
		1003934	1231071	3/25/2010	NO
		1003934	1169599	2/12/2008	NO
		1029598	1230298	3/30/2010	NO
		1029598	1171564	2/22/2008	NO
		1029816	1169932	2/4/2008	NO
		1029816	1231180	10/13/2010	NO
		1030154	1169875	2/5/2008	NO
		1030154	1231191	4/23/2010	NO
		1084376	1171211	2/19/2008	NO
		1084376	1229637	4/12/2010	NO
		1084398	1171049	2/26/2008	NO
		1084398	1230200	4/6/2010	NO
		1084534	1171503	2/19/2008	NO

[redacted]	[redacted]	1084534	1230169	3/29/2010	NO
[redacted]	[redacted]	1084679	1230659	2/11/2010	NO
[redacted]	[redacted]	1084679	1308042	5/25/2010	NO
[redacted]	[redacted]	1084888	1258400	3/4/2010	NO
[redacted]	[redacted]	1084888	1171070	2/26/2008	NO
[redacted]	[redacted]	1084940	1229615	6/7/2010	NO
[redacted]	[redacted]	1084940	1170903	2/16/2008	NO
[redacted]	[redacted]	1085003	1230175	4/6/2010	NO
[redacted]	[redacted]	1085003	1171735	4/12/2008	NO
[redacted]	[redacted]	1085046	1284327	5/18/2011	NO
[redacted]	[redacted]	1085046	1169895	2/12/2008	NO
[redacted]	[redacted]	1085302	1169964	2/8/2008	NO
[redacted]	[redacted]	1085302	1230748	4/28/2010	NO
[redacted]	[redacted]	1085308	1169838	2/8/2008	NO
[redacted]	[redacted]	1085308	1230955	2/24/2010	NO
[redacted]	[redacted]	1085524	1169718	2/23/2008	NO
[redacted]	[redacted]	1085524	1284948	7/14/2011	NO
[redacted]	[redacted]	1096571	1171485	2/22/2008	NO
[redacted]	[redacted]	1096571	1285621	5/6/2011	NO
[redacted]	[redacted]	1096629	1229881	5/30/2011	NO
[redacted]	[redacted]	1096629	1096569	7/8/2009	NO
[redacted]	[redacted]	1096630	1230181	3/23/2010	NO
[redacted]	[redacted]	1096630	1171790	4/11/2008	NO
[redacted]	[redacted]	1096697	1229726	6/7/2010	NO
[redacted]	[redacted]	1096697	1171679	4/9/2008	NO
[redacted]	[redacted]	1096739	1229999	6/8/2010	NO
[redacted]	[redacted]	1096739	1171635	4/13/2008	NO
[redacted]	[redacted]	1096742	1171448	2/28/2008	NO
[redacted]	[redacted]	1096742	1229642	5/20/2010	NO
[redacted]	[redacted]	1109401	1229533	10/27/2010	NO
[redacted]	[redacted]	1109401	1284945	6/2/2011	NO
[redacted]	[redacted]	1109462	1170028	2/11/2008	NO
[redacted]	[redacted]	1109462	1284392	6/16/2011	NO
[redacted]	[redacted]	1109525	1232032	3/29/2011	NO
[redacted]	[redacted]	1109525	1169973	2/7/2008	NO
[redacted]	[redacted]	1109533	1170015	2/14/2008	NO
[redacted]	[redacted]	1109533	1230872	2/2/2010	NO
[redacted]	[redacted]	1109566	1169781	3/5/2008	NO
[redacted]	[redacted]	1109566	1284339	5/20/2011	NO
[redacted]	[redacted]	1112855	1229566	5/21/2010	NO
[redacted]	[redacted]	1112855	1171007	2/19/2008	NO
[redacted]	[redacted]	1112857	1229813	4/28/2010	NO
[redacted]	[redacted]	1112857	1170885	2/20/2008	NO
[redacted]	[redacted]	1112858	1171008	2/19/2008	NO
[redacted]	[redacted]	1112858	1230354	3/31/2010	NO

[redacted]	[redacted]	1112923	1171411	2/21/2008	NO
[redacted]	[redacted]	1112923	1230116	4/22/2010	NO
[redacted]	[redacted]	1112964	1171018	2/23/2008	NO
[redacted]	[redacted]	1112964	1230139	4/22/2010	NO
[redacted]	[redacted]	1112967	1229994	5/21/2010	NO
[redacted]	[redacted]	1112967	1171531	2/22/2008	NO
[redacted]	[redacted]	1113018	1230409	4/7/2010	NO
[redacted]	[redacted]	1113018	1171031	2/26/2008	NO
[redacted]	[redacted]	1113034	1229719	5/13/2010	NO
[redacted]	[redacted]	1113034	1171541	2/25/2008	NO
[redacted]	[redacted]	1118092	1477089	2/8/2011	NO
[redacted]	[redacted]	1118092	1131851	4/11/2008	NO
[redacted]	[redacted]	1119481	1251043	10/29/2010	NO
[redacted]	[redacted]	1119481	1244265	9/7/2010	NO
[redacted]	[redacted]	1128940	1170950	2/7/2008	NO
[redacted]	[redacted]	1128940	1229840	5/3/2010	NO
[redacted]	[redacted]	1128942	1170942	2/8/2008	NO
[redacted]	[redacted]	1128942	1229567	6/1/2010	NO
[redacted]	[redacted]	1128971	1230522	6/23/2010	NO
[redacted]	[redacted]	1128971	1171132	2/11/2008	NO
[redacted]	[redacted]	1128985	1171692	4/24/2008	NO
[redacted]	[redacted]	1128985	1230425	3/30/2010	NO
[redacted]	[redacted]	1130772	1129288	3/19/2008	NO
[redacted]	[redacted]	1130772	1476690	1/27/2011	NO
[redacted]	[redacted]	1133818	1282622	6/22/2011	NO
[redacted]	[redacted]	1133818	1237878	5/7/2010	NO
[redacted]	[redacted]	1148801	1272877	12/23/2009	NO
[redacted]	[redacted]	1148801	1308223	3/11/2010	NO
[redacted]	[redacted]	1150724	1169723	2/29/2008	NO
[redacted]	[redacted]	1150724	1232031	6/8/2011	NO
[redacted]	[redacted]	1150999	1171255	2/26/2008	NO
[redacted]	[redacted]	1150999	1230268	4/13/2010	NO
[redacted]	[redacted]	1151034	1229995	6/15/2010	NO
[redacted]	[redacted]	1151034	1170075	3/26/2009	NO
[redacted]	[redacted]	1169420	1169422	4/10/2008	NO
[redacted]	[redacted]	1169420	1261077	1/7/2011	NO
[redacted]	[redacted]	1170629	1230618	2/2/2010	NO
[redacted]	[redacted]	1170629	1232118	4/8/2011	NO
[redacted]	[redacted]	1171880	1284630	5/27/2011	NO
[redacted]	[redacted]	1171880	1230873	2/1/2010	NO
[redacted]	[redacted]	1171887	1232391	4/10/2010	NO
[redacted]	[redacted]	1171887	1230940	2/2/2010	NO
[redacted]	[redacted]	1198189	1210650	9/21/2009	NO
[redacted]	[redacted]	1198189	1307225	2/18/2010	NO
[redacted]	[redacted]	1205206	1230898	2/2/2010	NO

[redacted]	[redacted]	1205206	1258531	6/1/2011	NO
[redacted]	[redacted]	1210491	1241588	11/30/2010	NO
[redacted]	[redacted]	1210491	1228202	12/17/2009	NO
[redacted]	[redacted]	1213933	1255605	11/28/2010	NO
[redacted]	[redacted]	1213933	1213932	10/18/2009	NO
[redacted]	[redacted]	1220874	1232353	4/28/2010	NO
[redacted]	[redacted]	1220874	1220879	9/24/2009	NO
[redacted]	[redacted]	1223716	1315772	6/2/2010	NO
[redacted]	[redacted]	1223716	1223776	12/8/2009	NO
[redacted]	[redacted]	1228739	1255527	12/22/2010	NO
[redacted]	[redacted]	1228739	1228738	8/27/2010	NO
[redacted]	[redacted]	1230486	1230023	7/12/2011	NO
[redacted]	[redacted]	1230486	1230846	4/29/2010	NO
[redacted]	[redacted]	1231545	1230596	2/11/2010	NO
[redacted]	[redacted]	1231545	1284614	7/19/2011	NO
[redacted]	[redacted]	1237025	1257499	12/17/2010	NO
[redacted]	[redacted]	1237025	1237022	3/9/2010	NO
[redacted]	[redacted]	1237254	1332903	4/14/2011	NO
[redacted]	[redacted]	1237254	1323425	6/11/2010	NO
[redacted]	[redacted]	1238384	1296354	6/7/2011	NO
[redacted]	[redacted]	1238384	1320393	4/30/2010	NO
[redacted]	[redacted]	1241853	1485683	7/18/2011	NO
[redacted]	[redacted]	1241853	1477721	3/7/2011	NO
[redacted]	[redacted]	1255000	1293176	5/18/2011	NO
[redacted]	[redacted]	1255000	1255186	4/13/2011	NO
[redacted]	[redacted]	1273651	1273561	12/21/2009	NO
[redacted]	[redacted]	1273651	1291579	3/25/2011	NO
[redacted]	[redacted]	1282676	1321814	7/28/2011	NO
[redacted]	[redacted]	1282676	1281676	3/7/2011	NO
[redacted]	[redacted]	1283158	1283159	4/29/2011	NO
[redacted]	[redacted]	1283158	1269585	6/2/2011	NO
[redacted]	[redacted]	1303967	1311930	4/26/2010	NO
[redacted]	[redacted]	1303967	1480989	3/29/2011	NO
[redacted]	[redacted]	1320046	1483151	3/25/2011	NO
[redacted]	[redacted]	1320046	1320042	5/6/2010	NO
[redacted]	[redacted]	1321277	1293658	5/30/2011	NO
[redacted]	[redacted]	1321277	1250566	11/17/2010	NO
[redacted]	[redacted]	1325586	1294021	4/8/2011	NO
[redacted]	[redacted]	1325586	1325582	9/6/2010	NO
[redacted]	[redacted]	1476768	1490969	7/23/2011	NO
[redacted]	[redacted]	1476768	1476468	2/26/2011	NO
[redacted]	[redacted]	1487743	1490791	7/1/2011	NO
[redacted]	[redacted]	1487743	1487742	6/30/2011	NO