Framework for Inspection, Testing and Verification of Utility Revenue Metering Systems in Jamaica

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Introduction and Background

The presented outline is for the Framework for Inspection, Testing and Verification of Utility Revenue Metering Systems in Jamaica. The outline includes:

- Introduction and Background
- Development of a Meter Testing Framework
- Implementation Process and Overview of the Meter Testing Protocol, 2017
- Key Lessons Learned
- Conclusions
Introduction and Background

REGULATORY SYSTEM IN JAMAICA

REGULATED UTILITY SECTORS
- Electricity
- Water & Sewerage
- Information & Communications Technologies

FUNCTIONS OF THE OUR
- Encourage competition
- Protect the interests of consumers
- Encourage the development and use of indigenous resources
- Promote modern and efficient utility services

STRUCTURE OF UTILITY SECTORS

OUR AUTHORITY FOR MEASUREMENT
- Section 4(5) of the OUR Act empowers the OUR to:
  - prescribe measurement standards - quantity, quality, accuracy, and
  - provide for the inspection and testing of any equipment used for measurement of utility services.
Introduction and Background

ELECTRICITY AND WATER SECTOR STATISTICS

Market structure - Single Buyer (SB) model, JPS - SB/ SO.

- RESIDENTIAL: 572,337 (~7% AMI)
- SMALL – MEDIUM C&I: 65,799 (~2% AMI)
- LARGE C&I: 1,978 (100% AMI)
- STREETLIGHT/STOPLIGHT: 475

- Customer Base: 640,589 (2017 data) (All services metered except for streetlights)

- Advanced transformer meters being installed - energy reconciliation.
- Proposal to install 100,000 advanced meters in the next 12 months.
- Other intelligent metering infrastructure being installed.

WATER SECTOR

- WSPs - NWC and 12 small private licenced suppliers. Small private WSPs customer counts range between 10 to just over 2,600 customers, some of which are metered.
- NWC: active customer base of ~368,600 most of which are metered.
- Limited visibility exists within the water sector networks.
- Improvement being pursued with advanced water meter systems.
CONFERENCE THEME

Regulating for Sustainability in a Disruptive Environment
How does a meter testing framework align with sustainability of utility services?

The strategy for addressing sustainability starts with accurate measurement and quantification, taking into consideration economics, efficiency and environmental attributes. For example:

- High system losses driving the need for greater measurement accuracy and deployment of smart meters.
- Fixed cost recovery issues influenced by declining sales volumes due to increased EE programmes and DG.

What is this disruptive environment all about?

This can be conceptualized from the perspective of emerging market forces impacting the traditional utility operations and business models. Obvious disrupters include DERs, EVs, Demand Response, Micro-Grids etc.
Introduction and Background

ELEMENTS OF THE DISRUPTIVE ENVIRONMENT

DISTRIBUTED ENERGY RESOURCES

- Wheeling
- Net Billing (behind the meter)
- Auxiliary Connections

NET-BILLING PARTICIPATION IN JAMAICA, 2012-17

ELECTRIC VEHICLES

EVOLUTION OF THE GLOBAL ELECTRIC CAR STOCK, 2013-17

- JPS has licence requirements for it to implement smart LED technology.
- Implementation already underway, with 36,440 (out of 105,000) street lights replaced at the end of 2017.
- Expectation for increased efficiency and billing accuracy, through metering.

SMART STREET LIGHTING

- JPS has licence requirements for it to implement smart LED technology.
- Implementation already underway, with 36,440 (out of 105,000) street lights replaced at the end of 2017.
- Expectation for increased efficiency and billing accuracy, through metering.
Development of a Meter Testing Framework

- Measurement of electricity and water quantities for revenue purposes were being conducted without any independent meter accuracy verification checks.
- This may have prevailed due to a lack of coordination and a coherent operating framework.
- Applicable regulations were in place but were not being implemented in any systematic way.

This document was issued pursuant to a previously issue Directive to JPS to govern the testing and verification of electrical meters to be used for revenue billing purposes in Jamaica.

The aim was to ensure that electricity revenue meters meets accuracy requirements of $\pm 2\%$ on an on-going basis.

Assure public confidence in the measurement process.
### Development of a Meter Testing Framework

|--------------|------|------|-----------|------|

- During 2011, JPS replaced a large number of legacy electromechanical meters with electronic digital meters. There were a significant number of complaints about high bills, which were perceived to be linked to the new meters.
- In response, the OUR conducted an investigation to examine JPS’ billing, meter replacement, meter inspections and audit, and meter testing practices and procedures.
- **Recommendations to the OUR included:**
  - A review of the Electricity Meter Testing Protocol, 2005 should be urgently pursued, as it was long overdue.
  - Consideration should be given to incorporating standards related to new technologies (eg. ANSI C12.20)
  - Formally recognizing the role of the local accreditation body - JANAAC, in a revised Protocol.
BSJ indicated in 2013 October that the Electricity Meter Testing Protocol was due for review since specified timelines and conditions had expired.

Review triggered by BSJ’s indicating OUR is the process owner by law. This was confirmed by legal review.

TOR for review of the 2005 Protocol were developed and a Review Team, comprising BSJ and OUR personnel was established. The review was premised on several considerations, including:

- Restructuring of the BSJ, with implications for the testing process.
- Proposed changes in the arrangements for meter testing activities.
- Expiration of some standards & regulations associated with the 2005 Protocol.
- Need to establish minimum standards and guidelines for testing of water meter systems.
- Increased utilization of advanced metering technology by electric and water utilities.
Despite process delays requiring rescheduling of major activities, the Meter Testing Administrative and Operational Protocol for the Electricity and Water Sectors in Jamaica (MTAOP) became effective on 2017 October 17.

**Office of Utilities Regulation**

**Electricity Meter Testing in Jamaica**

Protocol on Administrative and Testing Procedures

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**Office of Utilities Regulation**

**Meter Testing Administrative and Operational Protocol for the Electricity and Water Sectors in Jamaica**

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**The Jamaica Gazette**

Supplement

Programmations, Rules and Regulations

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**The Office of Utilities Regulation Act**

The Office of Utilities Regulation is an independent statutory body established under the Utilities Act, 2017. The Act provides for the regulation of utilities, including meter testing and verification of utility revenue metering systems in Jamaica.
Implementation Process and Overview of the MTAOP

**The MTAOP covers aspects of meter accuracy and verification testing, including:**

- Pattern Testing and Approval.
- Acceptance Testing and Approval.
- Compliance Testing.
- Customer Requested Meter Accuracy Verification Checks.
- Accreditation of Meter Testing, Calibration & Repair Facilities and Services.
- Amended or new provisions upon which the review was premised.

**The MTAOP is organized into 5 Parts, with a total of 16 sections and 5 schedules.**

- **PART 1**: Introduction and General Conditions
- **PART 2**: Electricity Meter Testing
- **PART 3**: Water Meter Testing
- **PART 4**: General Requirements
- **PART 5**: Schedules
Implementation of the MTAOP involved extensive consultations with major stakeholders prior to its promulgation. Since the effective date of the MTAOP there has also been a number of further consultation activities to address issues with compliance to its requirements.

Roles and responsibilities in the operation of the MTAOP are:

- The BSJ is responsible for processing applications for testing submitted by the relevant utility service providers, conducting the required testing, and providing test reports to the OUR;
- The relevant utility providers are responsible for providing the required number of samples and information to facilitate testing by the BSJ or other meter testing entities; and
- The OUR is responsible for issuing the relevant approvals, conducting necessary sampling for Acceptance and Compliance Testing, and ensuring the requirements of the Protocol are adhered to.
Implementation Process and Overview of the MTAOP

REFERENCE STANDARDS SUPPORTING THE MTAOP

Standards Applicable to Electricity Meters

- ANSI C12.1 – 2014
  American National Standard for Electric Meters – Code for Electricity Metering

- IEEE C57.13 – 2008
  IEEE Standard Requirements for Instrument Transformers

- SUPPLEMENTARY STANDARDS
  - ANSI C12.18
  - ANSI C12.19
  - ANSI C12.21
  - ANSI C12.22

Standards Applicable to Water Meters

- ISO 4064 – 1 2014
  Water Meters for Cold Potable Water and Hot Water Part 1: Metrological and Technical Requirements

- ISO 4064 – 2 2014
  Water Meters for Cold Potable Water and Hot Water Part 2: Test Methods

- ISO 4064 – 3 2014
  Water Meters for Cold Potable Water and Hot Water Part 3: Test Report Format

Sampling Standard

- ISO 2859/2 – 1985
  Sampling Procedures for Inspection by Attributes – Part 2: Sampling Plans Indexed by Limiting Quality (LQ) for Isolated Lot Inspection
In order to introduce any new pattern of electricity meter, or related metering device into Jamaica, the relevant utility shall complete and submit a Pattern Approval Application Form, along with the relevant supporting documentation, for review by the BSJ.

Pattern Approval Application Form is available on the OUR's website, and also at its office.
Utility submits completed application form to BSJ, with supporting documents for processing.

BSJ acknowledges receipt of application and notifies OUR (2 days).

BSJ reviews application within 5 days of receipt and notifies utility if additional information is required.

If information is satisfactory, BSJ notifies utility of the number of sample devices required (normally 3), and the associated fees.


- Utility then submits the samples and pay fees.
- BSJ acknowledges receipt of devices and payment.
- If samples are satisfactory, BSJ proceeds with testing in accordance with testing procedures and time schedule (typically within 6 weeks).
- Upon completion of Pattern Testing, BSJ submits the Pattern Testing Report to the OUR, who then grants or declines Pattern Approval to utility.
## SUMMARY OF CASES SINCE PROMULGATION OF MTAOP

<table>
<thead>
<tr>
<th>APPLICANT</th>
<th>APPLICATION DATE</th>
<th>DEVICE TYPE</th>
<th>TESTING DURATION</th>
<th>DECISION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ELECTRICITY METERS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JPS</td>
<td>2018 Jul 13</td>
<td>Itron Centron II C2SLD</td>
<td>40 days</td>
<td>GRANTED</td>
</tr>
<tr>
<td>JPS</td>
<td>2018 Jul 26</td>
<td>Hexing HXS100-A</td>
<td>19 days</td>
<td>GRANTED</td>
</tr>
<tr>
<td>JPS</td>
<td>2018 Jul 26</td>
<td>Aclara kV2c</td>
<td>23 days</td>
<td>GRANTED</td>
</tr>
<tr>
<td><strong>WATER METERS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NWC</td>
<td>2018 Apr 24</td>
<td>Elster Amco V110</td>
<td>15 days</td>
<td>GRANTED</td>
</tr>
</tbody>
</table>

- Meters granted Pattern Approval include meters capable of being used for Prepaid Electricity Service, and meters that have two-way communication capability.
All new or repaired Lots of utility meters to be deployed in Jamaica shall be subject to Acceptance Testing to determine conformity to standards under which Pattern Approval was granted.

Acceptance Testing is typically carried out by the BSJ.
### OUR SELECTS SAMPLE DEVICES FOR TESTING

#### SELECTION CRITERIA

<table>
<thead>
<tr>
<th>Lot Size</th>
<th>LQ = 8.0%</th>
<th>LQ = 12.5%</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 25*</td>
<td>n</td>
<td>Ac</td>
<td>n</td>
</tr>
<tr>
<td>26 to 50</td>
<td>17**</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>51 to 90</td>
<td>24</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>91 to 150</td>
<td>26</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>151 to 280</td>
<td>28</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>281 to 500</td>
<td>32</td>
<td>0</td>
<td>32</td>
</tr>
<tr>
<td>501 to 1,200</td>
<td>50</td>
<td>1</td>
<td>32</td>
</tr>
<tr>
<td>1,201 to 3,200</td>
<td>80</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>3,201 to 10,000</td>
<td>125</td>
<td>5</td>
<td>80</td>
</tr>
<tr>
<td>10,001 to 35,000</td>
<td>200</td>
<td>10</td>
<td>125</td>
</tr>
<tr>
<td>35,001 to 150,000</td>
<td>315</td>
<td>18</td>
<td>200</td>
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<tr>
<td>150,001 to 500,000</td>
<td>315</td>
<td>18</td>
<td>200</td>
</tr>
<tr>
<td>&gt; 500,000</td>
<td>315</td>
<td>18</td>
<td>200</td>
</tr>
</tbody>
</table>

* - Lot size modified from “16 to 25” to “Up to 25”

** - When n exceeds the Lot size, use 100% inspection with an Acceptance Number of zero

#### SAMPLING METHODOLGY

- **Lot Size**
- **LQ = 8.0%**
- **LQ = 12.5%**
- **Remarks**

### OUR SELECTS SAMPLE DEVICES FOR TESTING

- **Lot Size**
- **LQ = 8.0%**
- **LQ = 12.5%**
- **Remarks**

#### OUR SELECTS SAMPLE DEVICES FOR TESTING
SAMPLE DEVICES DELIVERED TO BSJ FOR TESTING

Hexing HXS100-A   Elster Amco   Aclara kV2c   Diehl Hydrus   Itron Centron

- Largest Sample Delivered to Date: 200

TESTING OF SAMPLES BY BSJ

TEST REPORT & DECISION BY OUR

- BSJ issues Test Report to OUR
- OUR reviews Test Report and issues decision to utility

Reference is made to all previous communications regarding Acceptance Testing for a Lot of Utility metering devices with the following description:

Device Type: Electricity Meter
Manufacturer Name: Aclara (GE)
Model Number: kV2C+ Form 16S
Number of Devices in Lot: 2,400
Range of Manufacturer Serial Numbers: 78538951 – 78541350
Range of JPS Co. Serial Numbers: 2162684 – 2165083
Pattern Approval Number: TESR/21/2012/1498
Pattern Approval Date: 2013 October 09

The OUR has received the Test Report (TESR/21/2018/3504) from the Bureau of Standards Jamaica (BSJ) dated 2018 June 4, providing the results and details of testing done on the eighty (80) sample devices submitted by JPS to the BSJ on 2018 May 22, based on OUR's selection. The OUR has examined the Test Report, and in accordance with sub-sections 4.8 and 4.9 of the Meter Testing Protocol, 2017, has determined that the Lot of devices described above is ACCEPTABLE. JPS is therefore authorized to install these devices on the electricity network, subject to the conditions identified below. For reference, a copy of the BSJ Test Report, is attached to this letter.
## Implementation Process and Overview of the MTAOP

### ACCEPTANCE TESTING

<table>
<thead>
<tr>
<th>Applicant</th>
<th>Application Date</th>
<th>Device Type</th>
<th>Lot Size</th>
<th>Sample Size</th>
<th>Timeline for Sampling &amp; Testing</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ELECTRICITY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JPS</td>
<td>11-Jan-18</td>
<td>Itron C1S</td>
<td>5,000</td>
<td>125</td>
<td>29 days</td>
<td>Granted</td>
</tr>
<tr>
<td>JPS</td>
<td>18-Feb-18</td>
<td>Aclara I-210+C FM2S</td>
<td>20,160</td>
<td>200</td>
<td>27 days</td>
<td>Granted</td>
</tr>
<tr>
<td>JPS</td>
<td>29-Mar-18</td>
<td>Aclara I-210+C FM1S</td>
<td>10,000</td>
<td>125</td>
<td>19 days</td>
<td>Granted</td>
</tr>
<tr>
<td>JPS</td>
<td>20-Apr-18</td>
<td>Aclara I-210+C FM2S</td>
<td>9,840</td>
<td>125</td>
<td>26 days</td>
<td>Granted</td>
</tr>
<tr>
<td>JPS</td>
<td>17-May-18</td>
<td>Aclara kV2c+FM16S</td>
<td>2,400</td>
<td>80</td>
<td>36 days</td>
<td>Granted</td>
</tr>
<tr>
<td>JPS</td>
<td>08-Jun-18</td>
<td>Itron C1S</td>
<td>5,000</td>
<td>125</td>
<td>21 days</td>
<td>Granted</td>
</tr>
<tr>
<td>JPS</td>
<td>27-Aug-18</td>
<td>Hexing HXS100-A</td>
<td>2,500</td>
<td>80</td>
<td>Incomplete</td>
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<tr>
<td>JPS</td>
<td>05-Sep-18</td>
<td>Aclara I-210+C FM1S</td>
<td>3,280</td>
<td>125</td>
<td>Incomplete</td>
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<tr>
<td>JPS</td>
<td>06-Sep-18</td>
<td>Aclara kV2c FM9S</td>
<td>2,892</td>
<td>80</td>
<td>Incomplete</td>
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</tr>
<tr>
<td>JPS</td>
<td>26-Sep-18</td>
<td>Aclara I-210+C FM2S</td>
<td>2,720</td>
<td>80</td>
<td>Incomplete</td>
<td></td>
</tr>
<tr>
<td><strong>WATER</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NWC</td>
<td>23-Jul-18</td>
<td>Diehl Hydrus 171</td>
<td>9,600</td>
<td>80</td>
<td>Incomplete</td>
<td></td>
</tr>
<tr>
<td>NWC</td>
<td>23-Jul-18</td>
<td>Elster Amco V110</td>
<td>10,000</td>
<td>80</td>
<td>Incomplete</td>
<td></td>
</tr>
<tr>
<td>NWC</td>
<td>12-Sep-18</td>
<td>Diehl Hydrus 171</td>
<td>9,600</td>
<td></td>
<td>Incomplete</td>
<td></td>
</tr>
</tbody>
</table>

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**SUMMARY OF CASES SINCE PROMULGATION OF MTAOP**

- **Applications**
  - Electricity - 10
  - Water meters - 3

- **Number of Meters Included in Applications**
  - Electricity Meters: 63,792
  - Water Meters: 29,200

- Average Time from Application to Decision: 27 days
Implementation Process and Overview of the MTAOP

APPLICABILITY:

- Currently applicable only to JPS and NWC revenue meters. Testing to be performed by relevant utilities.
- Compliance Testing depicts a monitoring function influenced by Pattern Approval, Acceptance Approval and relevant licences and legislation.

PURPOSE:

- To ensure that the full complement of JPS’ and NWC’s field-installed revenue meters are in compliance with the required tolerances (±2% for electricity meters, ±5% for water meters).

PROCESS:

- Statistical sampling plan, supported by random sampling methodologies to ensuring accurate quantification of volumes and associated revenue, at specified intervals, on an ongoing basis.
The MTAOP provides for meter accuracy verification checks to JPS and NWC customers. Currently not applicable to customers of small private WSPs.

- Serves as a means of validating meter accuracy within specified tolerances: ±2% for electricity meters, ±5% for water meters.
- Customers are entitled to one free meter accuracy verification check per 12 month period. Not currently applicable to customers of private WSPs.
- Despite the allowed free check, JPS and NWC customers are entitled to request a meter accuracy verification under circumstances where:

1. The customer becomes aware that the utility inspected or tested its meter during the course of its operation and the results are not satisfactory to the customer.
2. There is reasonable indication to the customer that the meter is malfunctioning.
3. Where an Appeal or investigation related to the settlement of a service/billing matter is being addressed by the OUR.

A customer shall pay the cost of a requested meter accuracy verification check if test results show that the meter is within the prescribed tolerance. Otherwise, the utility is responsible for the costs.
Accreditation of Meter Testing, Calibration & Repair Facilities and Services is necessary to engender public confidence in utility service delivery in Jamaica and to give credibility to the respective meter testing processes.

JPS and NWC are required by the MTAOP to have their own Meter Testing, Calibration & Repair Facilities and Services in order to facilitate ongoing Compliance Testing and Customer Requests for Meter Accuracy Verification. Small private WSPs are currently exempt for reasons of practicality.


Accreditation documents must be submitted to the OUR.
ROLE OF OUR

- OUR required to promulgate, apply, monitor and enforce provisions of the MTAOP.

REVIEW PANEL

- Establishment of a Review Panel comprising representatives of the BSJ, JPS, NWC, small WSPs and the OUR to:
  - Ensure administrative & operational provisions of the MTAOP stay up to date.
  - Assess technical requirements, taking into consideration changes in metering technology, applications and deployment.
  - Review proposals for amendments to the MTAOP.
  - Present recommendations for amendments to the MTAOP to the OUR.

DISPUTE RESOLUTION

- OUR responsible for settling any disputes between stakeholders within the scope of the MTAOP.
LESSONS LEARNED

- The MTAOP, since implementation is recognized as a reasonable and transparent framework for utility meter testing in Jamaica, and is consistent with international best practices and prudent utility practice.
- The revision and implementation of the MTAOP was achieved through collective contribution and coordination between major sector participants: BSJ, JPS, NWC, OUR and JANAAC.
- Collaboration, cooperation and consultation, on a fair and transparent basis, is recognized as crucial elements resulting in the success of this regulatory initiative.
- Notwithstanding such a robust process, there is always scope for improvement to the existing provisions through further revisions.
- The process allowed greater visibility to the OUR in terms of utility metering procurement, metering & instrumentation assets, and testing & calibration procedures and processes.
Conclusions

IMPORTANCE OF MEASUREMENT TO SUSTAINABILITY

1. IF YOU DON’T **MEASURE**, YOU CAN’T MONITOR.

2. IF YOU CAN’T MONITOR, YOU WON’T UNDERSTAND.

3. IF YOU DON’T UNDERSTAND, YOU CAN’T MANAGE.

4. IF YOU CAN’T MANAGE YOU CAN’T INFLUENCE.

5. IF YOU CAN’T INFLUENCE YOU WON’T IMPROVE.

6. IF YOU DON’T IMPROVE YOU WON’T SUSTAIN!

The MTAOP and related documentation can be accessed on the OUR’s website at: http://www.our.org.jm/ourweb/sectors/mtaop-electricity-and-water-sectors-jamaica-0
Framework for Inspection, Testing and Verification of Utility Revenue Metering Systems in Jamaica

QUESTIONS