



HES/OTV AMI Interface Guide

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HES/OTV AMI Interface Guide

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Revision History

Revision	Release Date	Change Description
A	July 2, 2014	Initial release.
B	November 19, 2014	Updated: <ul style="list-style-type: none">■ IEC CIM HTTP interface■ Meter Identification Handles■ Record Definitions■ Additional minor cleanup for OTV 1.1■ Information for HES IEC CIM Messaging Call Flows Added: <ul style="list-style-type: none">■ Metadata fields in exported files■ Power Quality Reports
C	April 14, 2015	Updated: <ul style="list-style-type: none">■ Multispeak HES config properties settings■ IEC CIM HTTP interface with version 2 option■ Appendix A with more detailed explanation of values■ CIM code information in Appendix C Moved: <ul style="list-style-type: none">■ CIM code to new Appendix D
D	October 2, 2015	Updated with IEC CIM changes required for GE SaaS.

1 Introduction

This document describes the OTV features that are an integral part of AMI back office system integrations as well as manufacturer and customer meter work flows. The OTV product roadmap must maintain the functionality described in the following sections.

The interfaces addressed are:

- **MultiSpeak**
CIS and OMS interfaces based on the MultiSpeak standard protocol, built for NISC
- **IEC CIM**
XML HTTP interface for other third party MDMS/other integrations
- **TWACS Export**
Manual billing export compliant with the legacy TWACS AMR systems.
- **CMEP Export**
Scheduled MDMS export interface to NISC MDMS
- **Device Plots**
Plotting and charting features
- **Marriage Import**
Meter marriage process.

2 MultiSpeak Interface

The interface is a web service that supports a set of MultiSpeak methods encapsulated in the SOAP message framework transported over HTTP. The MultiSpeak version supported is 3.0. The MultiSpeak interface is currently known to operate with the NISC iVue Billing system and the NISC OMS system.

Table 1. MultiSpeak Methods Supported

Multi-Speak Methods	Description	Details
MeterAddNotification	CIS notifies AMI system of newly deployed (added) AMI meters.	If configured to do so enables data delivery to CIS when message is received by the AMI system.
MeterRemoveNotification	CIS notifies AMI System of removed AMI meters.	If configured to do so disables data delivery to CIS when message is received by the AMI system.
ServiceLocationChangedNotification	CIS notifies AMI System of changed customer/service location information.	Only GPS and billing cycle are displayed in OTV. All other fields are persisted in OTV database but not used.
InitiateUsageMonitoring	CIS notifies AMI System of locations where Usage should be monitored.	Message contents stored in database but no other actions taken.
CancelUsageMonitoring	CIS notifies AMI System of locations where Usage Monitoring is no longer required.	Message contents stored in database but no other actions taken.
InitiateDisconnectedStatus	CIS notifies AMI System of locations where no AMI reading is expected.	Message contents stored in database but no other actions taken.
CancelDisconnectedStatus	CIS notifies AMI System of locations where AMI readings are once again expected.	Message contents stored in database but no other actions taken.
InitiateMeterReadbyMeterNumber	CIS initiates a new reading request by meter number from AMI System.	Triggers an OTA meter read which if times out results in the CIS following up with a GetLatestReadbyMeterNumber request.
GetLatestReadbyMeterNumber	CIS requests latest meter readings by meter number from AMI System.	Retrieves the most recent meter read from the AM system DB.
ReadingChangedNotification	AMI System delivers meter reads to CIS.	All meter reads both scheduled and on demand from the AMI system are delivered using this message.
GetAMRSupportedMeters	CIS request all AMI supported meters and associated information from AMI System.	Used during initial CIS/AMI System message exchange.
InitiateReconnectDisconnect	CIS initiates a disconnect or reconnect request by meter number to the AMI System	Used during on demand connect and disconnect operation.

Multi-Speak Methods	Description	Details
GetCDState	CIS retrieves connect/disconnect state by meter from the AMI System	Can be used by the CIS operator to validate connect state but not necessary because AMI system pushes state via CDStateChangedNotification.
CDStateChangedNotification	AMI System provides the CIS the connect/disconnect status of one or more meters.	Automatically sends this in response to connect/disconnect operations.
InitiateOutageDetectionEventRequest	OMS requests AMI System to provide the outage status of one or more meters	Can be used by the CIS operator to validate outage state but not necessary because AMI system automatically pushes state using InitiateOutageDetectionEventRequest.
ODEventNotification	AMI System sends unsolicited outage detection event to the OMS.	Automatically sent by AMI system when a state change is detected at the meter.

2.1 HES Configuration

Several configuration settings need to exist in the `hes_config.properties` file for the MultiSpeak interface to operate.

2.2 Application IDs

```
mdms.multispeak.subscribe_to_app_type_id=10,30
```

- 10 is required for AMI 1.0 meters
- 30 is required for AMI 1.1 meters (only supported in OTV 1.1)

2.3 URL Declarations

The MultiSpeak interface uses unique URLs for CIS and OMS. The default URL refers to CIS while the OMS is specified explicitly. At least one URL must be defined for MultiSpeak to work properly. OMS configuration is not enabled by default in the `hes_config.properties` file.

- `mdms.multispeak.http.subscriber.default.url` = XML format specified below
- `mdms.multispeak.http.subscriber.oms.url` = XML format specified below

NOTE: The HES code does not explicitly look for “oms.” It looks like you can put what you want there. However all related subscriber settings for this URL need to have the same prefix.

2.4 CIS XML

The CIS configuration XML is shown below. This is the default checked into OTV 1.1.

```
<URLConfig><Auth><User></User><Pwd></Pwd></Auth><Url>${installer:multispeak.url}
</Url><Routing><MessageConfig><Includes><Value>ReadingChangedNotification</Val
```

```
ue></Includes><Generate>daily</Generate></MessageConfig><MessageConfig><Includes><Value>*</Value></Includes></MessageConfig></Routing></URLConfig>
```

Sample configuration

```
<?xml version="1.0" encoding="utf-8"?>
<URLConfig>
  <Url>https://www.orgx.com/multispeak/CB_ServerSoap</Url>
  <Auth>
    <User>OPERATOR</User>
    <Pwd>PASSWORDX</Pwd>
  </Auth>
  <Routing>
    <MessageConfig>
      <Includes>
        <Value>ReadingChangedNotification</Value>
      </Includes>
      <Generate>daily</Generate>
    </MessageConfig>
    <MessageConfig>
      <Includes>
        <Value>CDStateChangedNotification</Value>
      </Includes>
      <Auth>
        <User> OPERATOR </User>
        <Pwd> PASSWORD </Pwd>
      </Auth>
    </MessageConfig>
    <MessageConfig>
      <Includes>
        <Value>*</Value>
      </Includes>
      <Excludes>
        <Value>ODEventNotification</Value>
      </Excludes>
    </MessageConfig>
  </Routing>
  <meterIDSubstitute>METERID</meterIDSubstitute>
```

2.5 OMS XML

The OMS configuration XML is shown below. The following configuration is checked into OTV 1.1:

```
#mdms.multispeak.http.subscriber.example.url=<URLConfig><meterIDSubstitute>METER
SERIAL</meterIDSubstitute><Url>http://example:23791</Url><Auth><User>user1</Us
er><Pwd>pwd1</Pwd></Auth><Routing><MessageConfig><Includes><Value>ODEventNotifi
cation</Value></Includes></MessageConfig></Routing></URLConfig>
```

Sample Configuration

```
<URLConfig>
  <Url>https://www.orgx.com/omsservices/OA_ServerSoap</Url>
  <Auth>
```

```

        <User>OPERATOR</User>
        <Pwd>PASSWORDZ</Pwd>
    </Auth>
    <Routing>
        <MessageConfig>
            <Includes>
                <Value>ODEventNotification</Value>
            </Includes>
        </MessageConfig>
    </Routing>
    <meterIDSubstitute>METERSERIAL</meterIDSubstitute>
</URLConfig>

```

2.6 Meter Identification Handles

Message traffic between the HES and the CIS and the HES and the OMS rely on a meter handle to map the message to meter mapping at each end. The default is for both CIS and OMS to use the HES Meter ID as the message handle. Message handle configuration properties reside in `hes_config.properties`.

- By default, all messages use the HES Meter ID, **METERID**, as the meter handle.
- HES also supports the following meter handle:
 - METERSERIAL - specified on marriage file import

Supporting different OMS meter handles allows interfacing to CIS and OMS systems that don't share a common meter handle.

Both the HES METERSERIAL and the HES METERID are set during the meter marriage ingest. See Marriage File Ingest section below for details.

To change a MultiSpeak URL meter handle, do the following:

- For outgoing messages, add the `<meterIDSubstitute>METERSERIAL</meterIDSubstitute>` element under the `<URLConfig>` specified in the `mdms.multispeak.http.subscriber.<xxx>.url` property.
- For incoming messages, add
`mdms.multispeak.incoming_request.<MultispeakXmlMessageRequestName?>.meterid_`
`attrib=METERSERIAL`

Example:

```
mdms.multispeak.incoming_request.InitiateOutageDetectionEventRequest.meterid_
_attrib=METERSERIAL
```

2.7 Data Push

Meter reads are pushed to the CIS URL using the `ReadingChangedNotification` method. The operation can be configured to push:

- Every received meter read,

- Only a 24-hour midnight read, or
- Drop every meter read.

Configuration properties reside in the MultiSpeak URL declaration XML in `hes_config.properties`.

- Use `<Generate>daily</Generate>` within the `mdms.multispeak.http.subscriber.default.url` property value to specify the following:
 - `per_uplink`
 - `daily`
 - `off`
- If `daily` is specified, the following two settings are required:
 - `mdms.multispeak.midnight_reads.backoff.minutes=xx` to specify the delay in minutes after midnight local time to run the data push. If “xx” is set to 0, then the midnight read push is disabled.
 - `mdms.multispeak.midnight_reads.timezone=time-zone` where **time-zone** is defined in the standard time zone data base at <http://www.iana.org/time-zones> to specify the local time zone.

Example: `mdms.multispeak.midnight_reads.timezone=America/Los Angeles`

■ MDMS_SERVICE_STATE

Readings are only pushed for meters that have their MDMS_SERVICE_STATE set to IN_SERVICE. This is done when a MeterAddNotification is received via MultiSpeak. See Activation section below.

- NOTES:**
- There is also a way to do this via the eMCM diagnostic port.
 - If NOT_IN_SERVICE, the reads are dropped and are not saved to OTV.

2.8 CIM Codes

The following CIM code masks for readings are used in the MultiSpeak adapter for OTV 1.0:

- `String cimForwardActiveTOU = "0.0.9.1.0.12.3.X.0.X.72";`
- `String cimDemandTOU = "0.0.9.1.0.8.3.X.0.X.38";`
- `String cimForwardActive = "0.0.1.1.0.12.0.0.0.X.72";`
- `String cimReverseActive = "0.0.1.19.0.12.0.0.0.X.72";`
- `String cimDemand = "0.0.6.1.0.8.0.0.0.X.38";`
- `String cimReactiveDemand = "9.2.0.5.0.8.0.0.0.X.38"; //Block Average Forward Reactive Demand VAR`

In OTV 1.1, IEC-CIM event codes can be mapped to MultiSpeak MeterEventNotifications via the `multispeak.properties` file. This file is located in the HES root directory after the MultiSpeak adapter has been installed. Each IEC-CIM event will require a key value pair where the key must

be prefixed by “event,” and followed by the IEC-CIM event code. The value is set by the customer/partner as required. Examples are shown below for voltage swell and sag.

- event.6.38.17.248=SWELL
- event.6.38.17.223=SAG

2.9 Activation

ReadingChangedNotification messages are disabled until the MeterAddNotification is received. To disable this behavior, hes_config.properties must contain:

```
mdms.multispeak.uplink.requires.meter.activation=false
```

Consequently, the MeterRemoveNotification sets the meter’s MDMS_SERVICE_STATE to OUT_OF_SERVICE, and readings are dropped.

2.10 Midnight Push Details

A delay relative to midnight local time is specified for the “24-hour midnight push” to compensate for the AMI system delivery latency. The “24-hour midnight push” sends the most recent read found in the 24-hour interval ending at midnight local time. If **no read** is found in the database, then **no read** is pushed. The recommended delay is the maximum allowable AMI delivery time in minutes.

When enabling midnight reads, you must have the OTV AMI adapter on the HES side installed as it provides the database storage. This means that both the OTV web adapter and the OTV web AMI adapter must be installed as they provide the SQL scripts to define the AMI tables in the database.

OTV 1.0 midnight push configuration:

```
# if backoff is more than 0 then periodic meter readings are not sent to mdms,
# instead midnight read is sent once a day at backoff time

mdms.multispeak.midnight_reads.backoff.minutes=0

# should be a time zone name specified in the standard tz database -
# http://www.iana.org/time-zones

mdms.multispeak.midnight_reads.timezone=America/Los Angeles
```

OTV 1.1 midnight push configuration:

```
mdms.multispeak.billing.export.enabled=true

mdms.multispeak.billing.export.time.hour=00:00

# should be a time zone name specified in the standard tz database -
# http://www.iana.org/time-zones

mdms.multispeak.billing.export.time.zone=America/Los Angeles

mdms.multispeak.billing.export.trigger.delay=300
```

```
mdms.multispeak.billing.export.energy.regex=0\\. [02]\\\\.1\\.1\\.0\\.12\\.0\\. [01]\\.0\\. [0369]\\\\.72  
mdms.multispeak.billing.export.peak.demand.regex=0\\.8\\. [167]\\\\.1\\.0\\.8\\.0\\. [01]\\\\.0\\. [0369]\\\\.38  
mdms.multispeak.billing.export.virtual.min.interval=14  
mdms.multispeak.billing.export.virtual.peak.demand=0.8.6.1.0.8.0.0.0.0.38
```

2.11 Peak Demand

The Midnight Push also includes a peak demand for the 24-hour interval ending at midnight local time. The peak demand is assigned to the largest demand CIM code or the largest calculated demand present in the 24-hour interval.

Calculated demands are the difference between consecutive usage-reads divided by the time difference between the reads. Only consecutive reads separated by more than the minimum Time Interval Configuration property are used for calculating demands. For meters that report demand reads, only UOM to CIM mappings that match the following regular expression will be pushed: 0.0.6.1.0.8.0.0.0.(0|1|2|3|4|5|6).38.

3 IEC CIM HTTP Interface

The IEC CIM interface is a SOAP service over HTTP. The standard used is IEC CIM 61968-9 XML. The IEC CIM HTTP adapter needs to be installed for this to function. See Appendix D for more detailed information about CIM codes.

3.1 Configuration

The following properties are available to be configured in the `hes_config.properties` file.

3.1.1 WSDL Version

OTV 1.1.12.7 and later supports version 2 of the WSDL file for this interface. HES can be configured to use the old version if necessary. The following lines are new in the `hes_config.properties` file as of OTV 1.1.12.7:

```
# Specifies which wsdl version to use
# 1 = legacy support for OTV 1.1.12.4 and earlier
# 2 - added in OTV 1.1.12.5, should be default
mdms.iec-cim-http.wsdl.version=2
```

The appropriate version of the WSDL is available at this URL:

`https://<onramp_hes_host:XXXX>/cim/iec-cim-httpWsdService.wsdl`

3.1.2 Application IDs

The application IDs should be set by the installer. No modification should be necessary.

```
mdms.iec-cim-http.subscribe_to_app_type_id=10,30
```

- 10 is required for AMI 1.0 meters
- 30 is required for AMI 1.1 meters (only supported in OTV 1.1)

3.1.3 HTTP URL

Responses from the HTTP URL should follow SOAP messaging standards and an HTTP status code should always be set (anything other than 2XX is treated as an error). The response body should contain either an empty response or valid SOAP XML, otherwise the response is treated as an error. The initial send is flagged as an error and later retried according to the redelivery settings configured.

The following HTTP properties are requested and set by the installer:

- `mdms.iec-cim-http.http.url=${installer:iec-cim-http.url}`
- `mdms.iec-cim-http.http.proxy_host=${installer:iec-cim-http.proxyHost}`

- `mdms.iec-cim-http.http.proxy_port=${installer:iec-cim-http.proxyPort}`
- `mdms.iec-cim-http.http.proxy_user=${installer:iec-cim-http.proxyUser}`
- `mdms.iec-cim-http.http.proxy_pwd=${installer:iec-cim-http.proxyPwd}`

3.1.4 Additional HTTP Headers

Additional HTTP headers may be appended to outgoing messages. These should be separated by '<::>'.

Example:

```
mdms.iec-cim-
http.http.headers=header1<::>header1value<::>header2name<::>header2value
```

3.1.5 Other HTTP Settings

- `mdms.iec-cim-http.http.username=`
- `mdms.iec-cim-http.http.password=`
- `mdms.iec-cim-http.http.connect_timeout_ms=30000`
- `mdms.iec-cim-http.http.read_timeout_ms=30000`
- `mdms.iec-cim-http.http.max_connections=16`
- `mdms.iec-cim-http.http.ssl.validate=false`
- `mdms.iec-cim-http.http.client_cert=`
- `mdms.iec-cim-http.http.ssl.keyStore=/opt/sample/sample.jks`
- `mdms.iec-cim-http.http.ssl.keyStorePassword=sample`
- `mdms.iec-cim-http.http.soapheader.correlationid=CORRELATION_ID`
- `mdms.iec-cim-http.http.soapaction.baseurl=http://onrampwireless.com/Cim/`

3.1.6 XML Settings

- `mdms.iec-cim-http.xml.header.source=ORW_HES`
This setting represents this AMI/HES name as defined in IEC-CIM-HTTP
- `mdms.iec-cim-http.xml.encoding=UTF-8`
This setting defines what encoding XML data(strings) are converted to byte arrays.

Note: The HTTP header Content-Type must match what is specified here.

Example: Content-Type: text/xml;charset=utf-8

- `mdms.iec-cim-http.xml.schema_validate=true`
This setting turns on/off XML schema validation for incoming/outgoing XML with IEC-CIM-HTTP. The default setting is ON for schema validation.

3.1.7 Midnight Reads

- Midnight Reads are currently not supported on this interface. Any billing export configurations should be disabled:


```
mdms.iec-cim-http.billing.export.enabled=false
```

3.1.8 Downlink Settings

- `adapter.iec-cim-http.max_downlink_no_response_time_seconds=`
 - Downlink maximum amount of time allowed for no correlated uplink response. A sweep is periodically performed for all downlinks that exceed the time period and an error response is generated for expired downlink messages.
 - Empty value or 0, means that no timeout sweeping is done on this adapter request.
- `adapter.iec-cim-http.reject_incoming_request_if_gw_unreachable=false`
 - If this setting is true for each JMS message received, HES wraps in a transaction. If HES cannot send a message to the GW/AMQP, it rolls back the JMS transaction which keeps the message on the remote JMS broker.
 - If this setting is false and the GW/AMQP is unreachable, a failure response is sent to the MDMS.

3.1.9 Uplink Redelivery Settings

OTV 1.1.12.5 and later support a different redelivery mechanism.

The following are the `hes_config.properties` for redelivery:

- `mdms.iec-cim-http.retry-count=5`
- `mdms.iec-cim-http.retry-delay=60000`
- `mdms.iec-cim-http.queue-size=1000`

The following redelivery settings are applicable to OTV 1.1.12.4 and prior:

- `adapter.iec-cim-http.max_uplink_redelivery_attempts=5`
- `adapter.iec-cim-http.min_uplink_redelivery_delay=3000`

This is the HES container configuration for redelivery of the GW uplink specific to this adapter. If `redelivery_attempts = -1`, then no requeueing occurs and the uplink message is dropped from the adapter after the first adapter connection error.

3.2 UOM → CIM Mappings

The `iec-cim-http.properties` file contains UOM-to-CIM code mappings that are used by this adapter to transform eMCM messages to IEC CIM XML. A UOM-to-CIM mapping must exist in this file for that specific measurement to be passed on to an external MDMS and/or to the OTV HES AMI adapter.

OTV 1.0 and OTV 1.1 formats for this file differ. Also, in OTV 1.0, meter events are hard-coded and not configurable. In OTV 1.1, meter events have been added to the `iec-cim-http.properties` file.

NOTE: This file must be replaced manually when upgrading OTV.

3.3 Sample Call Flows

Sample call flows using the IEC CIM HTTP interface are available in Appendix A: HES IEC CIM Messaging Call Flows.

4 TWACS Export

The TWACS export generates a CSV file containing a single energy usage (KWh) and a peak demand (kW) for all meters with a particular billing cycle attribute over a specified date range. This is a manual export done through the OTV user interface.

NOTE: The reading dates/times in the exported file are local to the user's OTV time zone.

Table 2. Fields within CSV Format

Field Name	Description
RECORD-CODE	Record Code fixed at "M".
METER-NBR	Meter Number set to the meter serial number.
TOU (Register)	TOU Label fixed at "1"
READING	Reading set to most recent kWh value (integer only) from the Energy Date Range window.
TIME	kWh reading time (hh:mm).
RDNG-DATE	kWh reading date (mm/dd/yyyy).
KW	Peak demand set to maximum power (decimal 3 places) either calculated or measured from the Peak Demand Range.
PEAK-TIME	kW reading time (hh:mm).
PEAK-RDNG-DATE	kW reading date (mm/dd/yyyy).
KVAR	Not support nor populated

Example TWACS record:

M,583384321,1487,00:00,10/31/2013,8.392,08:45,10/19/2013

In the example above, the meter with serial number 5833843 reported a reading value of 1487 kWh at 00:00 midnight local time on October 31 2013 and a peak demand of 8.392 kW at 08:45 on October 19 2013.

4.1 Export Options

Table 3. Export Options

Option	Description
Billing Cycle	Sets the scope of the export to only those meters with a matching bill cycle attribute.
Energy Date Range	Time window to search over for the most recent usage read.
Peak Demand Date Range	Time window to search/compute over for the peak demand.
Derive Peak Demand from Intervals	If there are no peak demand values and this option is selected, OTV attempts to estimate a peak demand from interval readings.
Minimum Interval	The minimum interval duration used for calculating Peak Demand. This option is only valid when Derive Peak Demand is selected.
Export File Name	Optional field to specify a custom file name for the exported file.

4.2 Peak Demand

The peak demand is assigned to a demand CIM code if one is present. If a CIM code is not present **and** “Derive Peak Demand from Intervals” is selected, peak demand is assigned to the calculated demand. The time interval over which the demand is searched/estimated is specified by the “Peak Demand Date Range.” Readings spaced less than the minimum interval are not used for demand estimation.

4.3 CIM Code

OTV uses the regular expressions below for energy and demand CIM code:

- Energy: 0.[02].1.1.0.12.0.[01].0.[0369].72
- Demand: 0.8.[167].1.0.8.0.[01].0.[0369].38

To support the TWACS export, an energy CIM code that meets the above with an appropriate read frequency must be part of the metering program. A demand CIM code that meets the above with an appropriate read frequency must be part of the metering program if the calculated peak demand is not sufficient.

TWACS exports only report correctly if a single energy and demand CIM code matches the above regular expressions. CIM code mappings can be modified in the HES configuration if the default mapping does not align with the TWACS export format or other MDMS formats.

4.4 Export Status Indicator

The TWACS export status is indicated by the web browser download progress mechanics. In most cases the indication only shows the size of the download so having knowledge of the final size of the TWACS file provides an indication of the download progress.

Windows IE

Windows IE opens a dialog box at the bottom of the browser window. The export is complete when the dialog box options change to:

- Open folder
- View downloads

Firefox

Firefox requires clicking on the green download arrow in the upper right corner of the browser to get the status pop-up box. The export is complete under the following circumstances:

- If the status pop-up has closed, the arrow shows green.
- or
- If the pop-up box has not been closed, the pop-up changes to indicate that the download is complete.

4.5 Implementation Detail

Implementation specifics on the TWACS export can be found in Appendix B: TWACS Implementation Detail.

5 CMEP Export

The CMEP export feature transfers data to the NISC MDMS parser using a CMEP record format specific to the GE/ORW AMI system. The CMEP record format is structured to use IEC CIM codes to indicate key data attributes like units of measure, interval frequency, direction of flow, phase, TOU tier, etc. The CMEP export feature utilizes the record formats shown in the following table.

Table 4. CMEP Export Record Formats

Record Format	Description
MEPMD01	Encapsulates interval data
MEPMD02	Encapsulates register data
MLA01	Encapsulates meter event codes

The CMEP export runs as a background task initiated by the OTV Task Manager. The files are compressed using GZIP and delivered using HTTP file transfer. Each of the file types are described in the following sections.

NOTE: CMEP exports can only be scheduled for meters configured in Device Groups in OTV. These OTV device groups should only contains meters of the same model type (i.e., all i210+ or all kV2c).

5.1 Performance Requirements

The CMEP export feature must support and meet or surpass the following requirements:

- An AMI system of 128k meter end points.
- A database capable of maintaining two calendar months of meter data.
- Flexible export schedules that match the customer specific requirements.
- Efficient record generation that minimizes export processing latency.
- Deployments consisting of multiple meter types both residential and C&I.
- Meter programs that include total register, TOU register and demand register reads.
- Meter programs that include multiple channels of interval data.
- Virtual metering by providing the MDMS a scheme to identify the appropriate data.
- Flexible mapping scheme to filter which CIM codes are exported.
- Flexible mapping scheme to translate event codes to NISC approved event codes.

5.2 Export Scheduling

Typical data frequencies are 24 hour register reads (MEPMD02) and 15-minute interval reads (MEPMD01). The rate the AMI system delivers data to the HES is configurable and can be as fast

as every 5 minutes or as slow as once per 24 hours. A typical metering program may deliver hourly messages containing four sets of 15-minute interval reads (MEPMD01) and/or daily messages containing a single set of register reads (MEPMD02).

5.2.1 Export Schedules

CMEP exports are scheduled to generate and transfer the appropriate records at rates that meet the needs of the MDMS with minimum processing latencies. Each record type export schedule is defined by:

- Read-time window which specifies range of read times to export
- Export time delay which specifies the amount of time to delay from midnight local time for the meter time

Each record can be scheduled to use a unique window and delay as shown in the following table.

Table 5. Record Type Export Schedules

Record Type	Export Rate/Read-time Window	Export Limitations
MEPMD01 records	The rate of export can vary from once per 24 hours to every 2 hours and is limited by the rate the interval data sets are delivered to the HES.	Export latency is limited to the data set delivery rate or the MDMS latency requirement.
MEPMD02 records	The rate of export is fixed to once per 24 hours with a delay from midnight local time to when the next export occurs. This amount of time cannot be more than what is required to ensure the midnight reads are available in the MDMS by the start of business the following day.	Limited by the need to have midnight register reads available at the MDMS at the start of business the next day.
MLA01 records	Records are exported along with the MEPMD01 records and follow the same scheduling. The MDMS uses certain MLA01 events as inputs into the data estimation function.	

5.2.2 Export Control

The CMEP export references a table of CIM Codes to determine which readings are populated in the MEPMD01 and MEPMD02 records. The table resides in the HES properties file and consists of a list of CIM Codes for inclusion in each record type.

The CMEP export references a table of IEC Event Codes to determine which events are populated in the MLA01 records. The table resides in the HES properties file and consists of a list of IEC Event Codes for inclusion in each record type. The table also contains alternative mappings that are used to ensure the IEC Event Code usage aligns with the MDMS.

See Appendix C: CMEP Details for more information about CIM codes and CMEP definitions.

5.3 MEPMD01

Interval and high frequency reads are examples of reads contained in the MEPMD01 file. Reads are encapsulated in records identified by an IEC CIM codes; see **iec61968-9 Annex C**. Each record contains a series of time-stamped values that fall in the time period the export spans.

Regularly scheduled MEPMD01 exports are handled by the Task Manager. Both the read start time and the export start time are configurable. The read start time determines which reads are export and the export start time determines how long to wait for reads to be received. The later the export start time relative to the read start time, the more latency introduced. This export can be scheduled every 2, 4, 8, 12, or 24 hours.

This export also has a Virtual Metering option which must be selected for energy-only meters such as the i210+. Manually-initiated MEPMD01 exports are supported. These exports can be used to gap-fill reads that were not present during scheduled exports.

5.4 MEPMD02

Total TOU and demand reads are examples of reads contained in the MEPMD02 file. Reads are encapsulated in records identified by an IEC CIM Code; see **iec61968-9 Annex C**. Each record contains a single time-stamped value delivered by the AMI system during the time period the CMEP export spans.

Regularly scheduled MEPMD02 exports are handled by the Task Manager. This report can only be scheduled to run once a day. The export delay time and local time zone are configurable. The export delay time determines how long to wait for reads to be received. The later the export start time relative to the read start time, the more latency introduced. For billing purposes, the export start time needs to be after the appropriate date is available but before data must be delivered to the MDMS.

Manually-initiated MEPMD02 exports are supported. These exports can be used to gap fill reads that were not present during scheduled exports.

5.5 MLA01

IEC Event Codes are contained in the MLA01 file. A CIM code mapping is used to translate Event Codes used by the On-Ramp Wireless AMI system to those inserted in the MLA01 Event Code field. This mapping addresses any differences that may arise between Event Code mappings. The mapping is configured in the `electricami.properties` file used by the OTV AMI adapter.

The scheduling of this export is similar to the scheduling of MEPMD01 files.

5.6 HTTP File Upload

All exports are uploaded automatically after the file creation task completes and all files are compressed using **gnuzip**. Each scheduled task has the following configurations that are specified in the OTV task scheduler dialog:

- HTTP URL
- HTTP username
- HTTP password
- Max file size: This is the maximum size of a single file to create. If the report happens to be larger than the size specified here, it is broken down into multiple files.
- The filename created is a timestamp of when the export runs.

5.7 Virtual Metering

Virtual metering consists of taking frequent register reads from energy-only meters, like the GE i210+, and generating interval data. The generation of the interval data is done in the MDMS. The CMEP export process encapsulates the non-interval CIM codes from these meters in MEPMD01 records.

The MDMS generates interval data by identifying the records with energy, non-interval CIM codes (i.e., attribute #5 is "0.12" and attribute #1 is "0") and calculating the difference between consecutive date/time-stamped triplets. Non-energy, non-interval CIM code records are not used to generate interval data but are used by the MDMS for profiling.

Triplets are not necessarily in chronological order so the MDMS must make sure that the proper date/time-stamp triplets are used and that missing triplets are handled appropriately.

The CMEP export also generates a single MEPMD02 record for register reads corresponding to the most recent register reads before or at midnight local time.

Energy-only meters that support virtual metering are exported using a separate MEPMD01 export with a preconfigured group containing only those meters. The export also uses a separate MEPMD01 list that contains only the CIM codes generated by energy-only meters but follows the same format as the normal MEPMD01 export list.

5.8 CIM Code Configuration

CIM code configuration is done through the `electricami.properties` file. There are four sets of CIM codes that can be used. Only the CIM codes specified for each set are included in the generated CMEP report.

5.8.1 MEPMD01 Interval Codes

```
cmepegmd01.interval.codes=2.0.4.1.0.12.0.1.0.0.72,2.0.4.20.0.12.0.1.0.0.73,2.9.0.0.0.54.0.0.40.0.29,2.9.0.0.0.54.0.0.66.0.29,2.9.0.0.0.54.0.0.132.0.29,2.8.0.0.0.4.0.0.128.0.5,2.8.0.0.0.4.0.0.64.0.5,2.8.0.0.0.4.0.0.32.0.5
```

5.8.2 Interval Report Virtual Metering Codes

```
cmepegmd01.virtual.codes=0.0.1.20.0.12.0.0.0.0.72,0.0.1.19.0.12.0.0.0.0.72,0.0.1.4.0.12.0.0.0.0.72,0.0.1.1.0.12.0.0.0.0.72,0.0.6.0.0.54.0.0.0.0.29
```


5.8.3 MEPMD02 Billing Codes

```
cmeq.mepmd02.register.codes=0.0.1.19.0.12.0.1.0.0.73,0.0.1.20.0.12.0.1.0.0.73,0.0.1.1.0.12.0.1.0.0.73,0.0.1.19.0.12.0.1.0.0.72,0.0.1.1.0.12.0.1.0.0.72,0.8.0.1.0.8.0.1.0.0.38,0.8.0.1.0.8.0.1.0.0.63,0.8.9.1.0.8.3.1.0.0.38,0.8.0.20.0.8.0.0.0.0.61,0.0.9.1.0.12.3.1.0.0.72,0.0.9.19.0.12.3.1.0.0.72,0.0.9.1.0.12.3.1.0.0.73,0.0.9.19.0.12.3.1.0.0.73,0.0.9.20.0.12.3.1.0.0.73,0.8.9.1.0.8.3.1.0.0.63,0.8.9.20.0.8.3.1.0.0.61,0.0.9.1.0.12.3.2.0.0.72,0.0.9.19.0.12.3.2.0.0.72,0.0.9.1.0.12.3.2.0.0.73,0.0.9.19.0.12.3.2.0.0.73,0.0.9.20.0.12.3.2.0.0.73,0.8.9.1.0.8.3.2.0.0.63,0.8.9.20.0.8.3.2.0.0.61,0.0.1.20.0.12.0.0.0.0.72,0.0.1.19.0.12.0.0.0.0.72,0.0.1.4.0.12.0.0.0.0.72,0.0.1.1.0.12.0.0.0.0.72,0.0.1.20.0.12.0.0.0.0.72,0.0.1.19.0.12.0.0.0.0.72,0.0.1.4.0.12.0.0.0.0.72,0.0.1.1.0.12.0.0.0.0.72
```

5.8.4 MLA01 Event Codes

```
cmeq.mla01.mapping={6.20.1.185=6.20.1.185, 6.20.9.185=6.20.9.185, 3.12.1.243=3.12.1.243, 3.12.9.243=3.12.9.243, 3.12.19.243=3.12.19.243}
```

NISC may want to use different codes than we have in our system, so the event codes are mapped from the OTV CIM code to theirs. The generated file should use the code to the right side of the equal sign. The left side of the equal sign is the actual CIM code stored in the OTV database.

5.9 Additional Metadata Fields in Exported Files

In OTV 1.1.12.2, the CMEP export files can be configured to have additional metadata fields populated in the exported files. In order to include other metadata, the OTV electricami.properties configuration file must be updated with the following line:

```
cmeq.additional.metadata.columns=<metadata key name>
```

where:

<metadata key name> is equal to the node_list_col_name value of the metadata attribute in the USER_DATA_TYPE2UI_META database table.

Example 1:

```
cmeq.additional.metadata.columns=Description
```

If more than one metadata field is desired, it should be separated by a comma.

Example 2:

```
cmeq.additional.metadata.columns=Description,UtilityID
```

The additional metadata fields specified are added to the exported files, after the MeterID value.

6 Device Plots

Device plots include the Device Detail Plot displayed in the upper right corner of the Device Detail window and the Device Charts displayed in the Charts window.

6.1 Plot Attributes

An OTV administrator can specify which CIM codes are displayed by using the plot attributes in the OTV UI by editing the `electricami.properties` file. OTV must be restarted after saving the file.

6.2 Plot List

The plot list attributes specify all the plot types available for display in the Device Detail Plot and the Chart window. Plots are added to the plot list attributes in a CSV format as follows:

```
electricami.plot.list=Usage, Power Factor, Temperature  
Interval_Data_(Delivered_Energy)Voltage
```

6.3 CIM Code Mask

Each plot list entry must include one or more CIM code masks. Masks use UNIX regular expression syntax as follows:

```
electricami.plot.Interval_Data_(Delivered_Energy).cim.code.mask.1=[0-  
9].0.4.1.0.12.0.0.0.3.72  
electricami.plot.Interval_Data_(Delivered_Energy).cim.code.mask.2=[0-  
9].0.4.1.0.12.0.1.0.3.72
```

In the above example, the integer immediately following the mask attribute specifies the order in which to search for CIM codes to plot.

i210+ Energy-only Meter

The i210+ energy-only meter represents an exception to the above CIM code mask. For this meter interval data is generated by taking the difference of consecutive energy reads. The following attributes are specific to the i210+:

```
electricami.plot.gei210plus.usage.cim.code.mask=0.0.1.([14]|19|20).0.12.0.0.0.3.72  
electricami.plot.gei210plus.usage.delivered.type=0.0.1.1.0.12.0.0.0.3.72  
electricami.plot.gei210plus.interval.delivered.type=X.0.4.1.0.12.0.0.0.3.72
```

In the above example, the mask attribute maps multiple CIM codes to the single usage plot using a regex string.

NOTE: Both type attributes are not configurable and *should not be altered*.

6.4 Y-Axis

The following right Y-axis attribute specifies a second Y-axis on the right of the plot:

```
electricami.plot.Usage.cim.code.mask.1.right.yaxis=0.0.1.19.0.12.0.0.0.3.72
```

7 Timestamps

OTV stores all timestamps in GMT format and displays data using the account time zone setting.

NOTE: *During changes between Daylight Savings Time and Daylight Standard Time, care must be taken to interpret the impact of moving the local time zone forward or backward by an hour. Additionally, only the current time zone is applied to all data both before and after the time zone change so reading timestamps must be adjusted accordingly.*

Appendix A HES IEC CIM Messaging Call Flows

The WSDL for the SOAP service is available at:

https://<onramp_hes_host:XXXX>/cim/iec-cim-httpWsdIService.wsdl

Important Notes:

- Timestamps are in GMT.
- Header.CorrelationID may be used by the external system to keep track of requests and responses.
- EndDeviceAsset.mRID should equal the value of the “HES/MDMS Meter ID” in OTV.

Reply Codes in synchronous responses:

- 0.0 – Normal reply code
- 4.0 – Default error code
- 4.1 – Downlink error

A.1 On-demand Meter Reading Request for Default Readings

The response data is determined by the meter’s profile which could be on a 15-minute kWh recording, 1-hour kWh recording, etc. The following example returns all of the latest bulk readings (not just energy) for the meter.

HTTP post to https://<onramp_hes_host:XXXX>/cim/

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345_6789</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:RequestMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
  <p:Header>
    <p:Verb>get</p:Verb>
    <p:Noun>MeterReadings</p:Noun>
    <p:Revision>1.4</p:Revision>
    <p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
    <p:Source>MDMS</p:Source>
    <p:MessageID>3453466</p:MessageID>
    <p:CorrelationID>12345_6789</p:CorrelationID>
  </p:Header>
  <p:Request>
    <m:GetMeterReadings xmlns:m="http://iec.ch/TC57/2009/GetMeterReadings#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
      <m:EndDeviceAsset>
        <m:mRID>fake-meter-id</m:mRID>
      </m:EndDeviceAsset>
    </m:GetMeterReadings>
  </p:Request>
</p:RequestMessage>
```

```
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

The client receives a synchronous HTTP response of:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/request
 HTTP Content:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345_6789</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>MeterReadings</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>32452222</p:MessageID>
<p:CorrelationID>12345_6789</p:CorrelationID>
  <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
</p:ResponseMessage></SOAP-ENV:Body></SOAP-ENV:Envelope>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

At some point later, an asynchronous meter reading response with correlated data is HTTP Posted from the On-Ramp Wireless HES to a URL that the client provides to On-Ramp Wireless. The client can optionally specify the asynchronous return URL by adding the following CIM header to the original request message:

```
<p:ReplyAddress>http://your_cim_http_receiver</p:ReplyAddress>
```

The response looks like:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncResponse
 HTTP Content:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345_6789</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>MeterReadings</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
```

```

<p:Source>test</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345_6789</p:CorrelationID>
  <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
<p:Payload>
  <m:MeterReadings xmlns:m="http://iec.ch/TC57/2009/MeterReadings#"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

    <m:MeterReading>
      <m:Readings>
        <m:timeStamp>2009-12-15T12:45:00Z</m:timeStamp>
        <m:value>10.0</m:value>
        <m:ReadingQualities>
          <m:quality>3.0.0</m:quality>
        </m:ReadingQualities>
        <m:ReadingType ref="0.0.1.1.0.12.0.0.0.0.72" />
      </m:Readings>
      <m:Readings>
        <m:timeStamp>2009-12-15T12:45:00Z</m:timeStamp>
        <m:value>11.0</m:value>
        <m:ReadingQualities>
          <m:quality>3.0.0</m:quality>
        </m:ReadingQualities>
        <m:ReadingType ref="0.0.1.1.0.12.0.0.0.0.73" />
      </m:Readings>
      <m:Readings>
        <m:timeStamp>2009-12-15T12:46:00Z</m:timeStamp>
        <m:value>150</m:value>
        <m:ReadingQualities>
          <m:quality>3.0.0</m:quality>
        </m:ReadingQualities>
        <m:ReadingType ref="0.0.6.1.0.8.0.0.0.0.38" />
      </m:Readings>
      <m:Readings>
        <m:timeStamp>2009-12-15T12:46:00Z</m:timeStamp>
        <m:value>0.65</m:value>
        <m:ReadingQualities>
          <m:quality>3.0.0</m:quality>
        </m:ReadingQualities>
        <m:ReadingType ref="32.0.6.1.0.38.0.0.0.2.65" />
      </m:Readings>
      <m:MeterAsset>
        <m:mRID>fake-meter-id</m:mRID>
      </m:MeterAsset>
    </m:MeterReading>
  </m:MeterReadings>
</p:Payload>
</p:ResponseMessage>

```

A.2 On-demand Meter Reading Request for Limited Readings

AMI 1.2 supports the ability to request a limited set of billing data for a meter. The limited set can be specified by a CIM code mask, added as an additional element in the reading request.

A single CIM code can be specified for an exact match, or a wildcard (*) may be used to match multiple CIM codes.

The response data is determined by the meter's profile which could be on a 15-minute kWh recording, 1-hour kWh recording, etc. The following example returns all of the latest bulk readings that match the CIM code mask specified.

HTTP post to https://<onramp_hes_host:XXXX>/cim/

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345_6789</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:RequestMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
  <p:Header>
    <p:Verb>get</p:Verb>
    <p:Noun>MeterReadings</p:Noun>
    <p:Revision>1.4</p:Revision>
    <p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
    <p:Source>MDMS</p:Source>
    <p:MessageID>3453466</p:MessageID>
    <p:CorrelationID>12345_6789</p:CorrelationID>
  </p:Header>
  <p:Request>
    <m:GetMeterReadings xmlns:m="http://iec.ch/TC57/2009/GetMeterReadings#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
      <m:EndDeviceAsset>
        <m:mRID>fake-meter-id</m:mRID>
      </m:EndDeviceAsset>

      <m:ReadingType>
        <m:mRID>0.0.1.*.0.12.0.0.0.*.72</m:mRID>
      </m:ReadingType>

    </m:GetMeterReadings>
  </p:Request>
</p:RequestMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

The client receives a synchronous HTTP response of:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/request
HTTP Content:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345_6789</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
```

```

<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>MeterReadings</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>32452222</p:MessageID>
<p:CorrelationID>12345_6789</p:CorrelationID>
  <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
</p:ResponseMessage></SOAP-ENV:Body></SOAP-ENV:Envelope>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

At some point later, an asynchronous meter reading response with correlated data is HTTP Posted from the On-Ramp Wireless HES to a URL that the client provides to On-Ramp Wireless. The client can optionally specify the asynchronous return URL by adding the following CIM header to the original request message:

```
<p:ReplyAddress>http://your_cim_http_receiver</p:ReplyAddress>
```

The response looks like:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncResponse
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345_6789</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>MeterReadings</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>test</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345_6789</p:CorrelationID>
  <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
<p:Payload>
  <m:MeterReadings xmlns:m="http://iec.ch/TC57/2009/MeterReadings#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <m:MeterReading>

```



```

        <m:Readings>
            <m:timeStamp>2009-12-15T12:45:00Z</m:timeStamp>
            <m:value>10.0</m:value>
            <m:ReadingQualities>
                <m:quality>3.0.0</m:quality>
            </m:ReadingQualities>
            <m:ReadingType ref="0.0.1.1.0.12.0.0.0.0.72" />
        </m:Readings>
        <m:Readings>
            <m:timeStamp>2009-12-15T12:45:00Z</m:timeStamp>
            <m:value>11.0</m:value>
            <m:ReadingQualities>
                <m:quality>3.0.0</m:quality>
            </m:ReadingQualities>
            <m:ReadingType ref="0.0.1.4.0.12.0.0.0.0.73" />
        </m:Readings>

        <m:MeterAsset>
            <m:mRID>fake-meter-id</m:mRID>
        </m:MeterAsset>

    </m:MeterReading>
</m:MeterReadings>
</p:Payload>
</p:ResponseMessage>

```

A.3 On-demand Load Profile

Specifies a date range. Only the readings that the meter is programmed to record, that exist within the date range specified, are sent back:

HTTP Post to https://<onramp_hes_host:XXXX>/cim/

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
    <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345_678</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:RequestMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
    <p:Header>
        <p:Verb>get</p:Verb>
        <p:Noun>MeterReadings</p:Noun>
        <p:Revision>1.4</p:Revision>
        <p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
        <p:Source>MDMS</p:Source>
        <p:ReplyAddress>http://localhost:23789</p:ReplyAddress>
        <p:MessageID>3453466</p:MessageID>
        <p:CorrelationID>12345_678</p:CorrelationID>
    </p:Header>
    <p:Request>
        <m:GetMeterReadings xmlns:m="http://iec.ch/TC57/2009/GetMeterReadings#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
            <m:EndDeviceAsset>

```

```

    <m:mRID>fake-meter-id</m:mRID>
  </m:EndDeviceAsset>

  <m:TimeSchedule>
    <m:scheduleInterval>

      <m:end>2008-12-15T13:00:00Z</m:end>

      <m:start>2008-12-15T12:00:00Z</m:start>
    </m:scheduleInterval>
  </m:TimeSchedule>
</m:GetMeterReadings>
</p:Request>
</p:RequestMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

The client receives a synchronous http response of:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/request
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345_6789</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>MeterReadings</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>32452222</p:MessageID>
<p:CorrelationID>12345_678</p:CorrelationID>
  <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
</p:ResponseMessage></SOAP-ENV:Body></SOAP-ENV:Envelope>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

At some point later, an asynchronous meter reading response with correlated data is HTTP Posted from the On-Ramp Wireless HES to a URL that the client provides to On-Ramp Wireless. The client can optionally specify the asynchronous return URL by adding the following CIM header to the original request message:

```
<p:ReplyAddress>http://your_cim_http_receiver</p:ReplyAddress>
```

The content of the response looks like:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncResponse
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
    <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345_678</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>MeterReadings</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345_678</p:CorrelationID>
    <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
<p:Payload>
<m:MeterReadings xmlns:m="http://iec.ch/TC57/2009/MeterReadings#"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <m:MeterReading>
        <m:IntervalBlocks>
            <m:IntervalReadings>
                <m:timeStamp>2008-01-01T00:15:00Z</m:timeStamp>
                <m:value>10.0</m:value>
                <m:ReadingQualities>
                    <m:quality>3.0.0</m:quality>
                </m:ReadingQualities>
            </m:IntervalReadings>
            <m:IntervalReadings>
                <m:timeStamp>2008-01-01T00:30:00Z</m:timeStamp>
                <m:value>30.0</m:value>
                <m:ReadingQualities>
                    <m:quality>3.0.0</m:quality>
                </m:ReadingQualities>
            </m:IntervalReadings>
            <m:IntervalReadings>
                <m:timeStamp>2008-01-01T00:45:00Z</m:timeStamp>
                <m:value>11.0</m:value>
                <m:ReadingQualities>
                    <m:quality>3.0.0</m:quality>
                </m:ReadingQualities>
            </m:IntervalReadings>
            <m:IntervalReadings>
                <m:timeStamp>2008-01-01T01:00:00Z</m:timeStamp>
                <m:value>31.0</m:value>
                <m:ReadingQualities>

```

```

        <m:quality>3.0.0</m:quality>
      </m:ReadingQualities>
    </m:IntervalReadings>
    <m:ReadingType ref="2.0.4.1.0.12.0.0.0.0.72" />
  </m:IntervalBlocks>
  <m:IntervalBlocks>
    <m:IntervalReadings>
      <m:timeStamp>2008-01-01T00:15:00Z</m:timeStamp>
      <m:value>20.0</m:value>
      <m:ReadingQualities>
        <m:quality>3.0.0</m:quality>
      </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>
      <m:timeStamp>2008-01-01T00:30:00Z</m:timeStamp>
      <m:value>40.0</m:value>
      <m:ReadingQualities>
        <m:quality>3.0.0</m:quality>
      </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>
      <m:timeStamp>2008-01-01T00:45:00Z</m:timeStamp>
      <m:value>21.0</m:value>
      <m:ReadingQualities>
        <m:quality>3.0.0</m:quality>
      </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>
      <m:timeStamp>2008-01-01T01:00:00Z</m:timeStamp>
      <m:value>41.0</m:value>
      <m:ReadingQualities>
        <m:quality>3.0.0</m:quality>
      </m:ReadingQualities>
    </m:IntervalReadings>
    <m:ReadingType ref="2.0.4.1.0.12.0.0.0.0.73" />
  </m:IntervalBlocks>
  <m:MeterAsset>
    <m:mRID>fake-meter-id</m:mRID>
  </m:MeterAsset>

</m:MeterReading>
</m:MeterReadings>
</p:Payload>
</p:ResponseMessage>
</SOAP-ENV:Body>

</SOAP-ENV:Envelope>

```

A.4 On-demand Load Profile with Set

AMI 1.2 supports multiple load profile sets, up to a maximum of 4. Only the readings that the meter is programmed to record, that exist within the date range specified, are sent back.

Load profile set is specified in the ReadingType of the request: **0.0.4.0.0.0.2.[LP_SET].0.0.0**, where [LP_SET] is replaced with the set number desired. Valid set numbers are 0, 1, 2, or 3.

This request specifies a date range and load profile set 1.

HTTP Post to https://<onramp_hes_host:XXXX>/cim/

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345_678</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:RequestMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
  <p:Header>
    <p:Verb>get</p:Verb>
    <p:Noun>MeterReadings</p:Noun>
    <p:Revision>1.4</p:Revision>
    <p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
    <p:Source>MDMS</p:Source>
    <p:ReplyAddress>http://localhost:23789</p:ReplyAddress>
    <p:MessageID>3453466</p:MessageID>
    <p:CorrelationID>12345_678</p:CorrelationID>
  </p:Header>
  <p:Request>
    <m:GetMeterReadings xmlns:m="http://iec.ch/TC57/2009/GetMeterReadings#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
      <m:EndDeviceAsset>
        <m:mRID>fake-meter-id</m:mRID>
      </m:EndDeviceAsset>

      <m:ReadingType>
        <m:mRID>0.0.4.0.0.0.2.1.0.0.0</m:mRID>
      </m:ReadingType>

      <m:TimeSchedule>
        <m:scheduleInterval>

          <m:end>2008-12-15T13:00:00Z</m:end>

          <m:start>2008-12-15T12:00:00Z</m:start>
        </m:scheduleInterval>
      </m:TimeSchedule>
    </m:GetMeterReadings>
  </p:Request>
</p:RequestMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

The client receives a synchronous http response of:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/request
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345_6789</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>

```

```
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>MeterReadings</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>32452222</p:MessageID>
<p:CorrelationID>12345_678</p:CorrelationID>
  <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
</p:ResponseMessage></SOAP-ENV:Body></SOAP-ENV:Envelope>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

At some point later, an asynchronous meter reading response with correlated data is HTTP Posted from the On-Ramp Wireless HES to a URL that the client provides to On-Ramp Wireless. The client can optionally specify the asynchronous return URL by adding the following CIM header to the original request message:

```
<p:ReplyAddress>http://your_cim_http_receiver</p:ReplyAddress>
```

The content of the response looks like:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncResponse
 HTTP Content:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345_678</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>MeterReadings</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345_678</p:CorrelationID>
  <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
<p:Payload>
<m:MeterReadings xmlns:m="http://iec.ch/TC57/2009/MeterReadings#"
```

```

xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

<m:MeterReading>

  <m:IntervalBlocks>
    <m:IntervalReadings>
      <m:timeStamp>2008-01-01T00:15:00Z</m:timeStamp>
      <m:value>10.0</m:value>
      <m:ReadingQualities>
        <m:quality>3.0.0</m:quality>
      </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>
      <m:timeStamp>2008-01-01T00:30:00Z</m:timeStamp>
      <m:value>30.0</m:value>
      <m:ReadingQualities>
        <m:quality>3.0.0</m:quality>
      </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>
      <m:timeStamp>2008-01-01T00:45:00Z</m:timeStamp>
      <m:value>11.0</m:value>
      <m:ReadingQualities>
        <m:quality>3.0.0</m:quality>
      </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>
      <m:timeStamp>2008-01-01T01:00:00Z</m:timeStamp>
      <m:value>31.0</m:value>
      <m:ReadingQualities>
        <m:quality>3.0.0</m:quality>
      </m:ReadingQualities>
    </m:IntervalReadings>
    <m:ReadingType ref="2.0.4.1.0.12.0.0.0.0.72" />
  </m:IntervalBlocks>
  <m:IntervalBlocks>
    <m:IntervalReadings>
      <m:timeStamp>2008-01-01T00:15:00Z</m:timeStamp>
      <m:value>20.0</m:value>
      <m:ReadingQualities>
        <m:quality>3.0.0</m:quality>
      </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>
      <m:timeStamp>2008-01-01T00:30:00Z</m:timeStamp>
      <m:value>40.0</m:value>
      <m:ReadingQualities>
        <m:quality>3.0.0</m:quality>
      </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>
      <m:timeStamp>2008-01-01T00:45:00Z</m:timeStamp>
      <m:value>21.0</m:value>
      <m:ReadingQualities>
        <m:quality>3.0.0</m:quality>
      </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>

```

```

        <m:timeStamp>2008-01-01T01:00:00Z</m:timeStamp>
        <m:value>41.0</m:value>
        <m:ReadingQualities>
            <m:quality>3.0.0</m:quality>
        </m:ReadingQualities>
    </m:IntervalReadings>
    <m:ReadingType ref="2.0.4.1.0.12.0.0.0.0.73" />
</m:IntervalBlocks>
<m:MeterAsset>
    <m:mRID>fake-meter-id</m:mRID>
</m:MeterAsset>

</m:MeterReading>
</m:MeterReadings>
</p:Payload>
</p:ResponseMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

A.5 On-demand Meter Disconnect

HTTP post to https://<onramp_hes_host:XXXX>/cim/

This command can be used to disconnect the main relay or an auxiliary relay. A single request can be used to disconnect only a single relay. EndDeviceControl.type is used to distinguish between relays as specified:

- Disconnect main relay: 3.31.6.68 OR 3.31.6.68.0
- Disconnect auxiliary relay <relay>: 3.31.6.68.<relay>

The content of the post to disconnect the main relay is:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
    <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:RequestMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>create</p:Verb>
<p:Noun>EndDeviceControls</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
<p:Source>MDMS</p:Source>
<p:MessageID>235782345</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
</p:Header>
<p:Request>
<m:EndDeviceControls xmlns:m="http://iec.ch/TC57/2009/EndDeviceControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<m:EndDeviceControl>
<m:type>3.31.6.68</m:type>
<m:EndDeviceAsset>
<m:mRID>fake-meter-id</m:mRID>
</m:EndDeviceAsset>
</m:EndDeviceControl>

```



```

</m:EndDeviceControls>
</p:Request>
</p:RequestMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

The client receives a synchronous HTTP response of:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/request
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>EndDeviceControls</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>2008-12-31T12:00:00Z </p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>3460922</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
<p:AckRequired>>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
</p:ResponseMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

At some point later, an asynchronous response indicating whether the meter has been successfully disconnected is HTTP-Posted from the On-Ramp Wireless HES to a URL that the client provides to On-Ramp Wireless. The client can optionally specify the asynchronous return URL by adding the following CIM header to original request message:

```
<p:ReplyAddress>http://your_cim_http_receiver</p:ReplyAddress>
```

Response to a disconnect request may result in following category codes:

- Smart Meter 1.1 and 1.2:
 - 2.5.16.35 = Executed successfully with one of the following strings:
 - RELAY_STATE_DISCONNECTED
 - RELAY_STATE_UNKNOWN
 - 2.5.16.36 = Unsuccessful operation with failure message
 - 2.5.16.271 = METER_UNSUPPORTED
 - 2.5.16.125 = APP_TTL_EXPIRED
- Smart Meter 1.0:

- ❑ 3.31.17.66 = RELAY_NOT_SUPPORTED
- ❑ 3.31.17.68 = DISCONNECTED
- ❑ 3.31.17.85 = Failed with failure reason
- ❑ 3.31.17.67 = Disconnect failure with failure reason

NOTE: Version 1 of the WSDL interface uses EventMessage as the top level XML element in the SOAP body. Version 2 of the WSDL interface uses ResponseMessage as the top level XML element in the SOAP body.

Example of Version 1 POST with successfully executed category code:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncResponse
HTTP Content:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:EventMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>created</p:Verb>
<p:Noun>EndDeviceEvents</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
  <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Payload>
<m:EndDeviceEvents xmlns:m="http://iec.ch/TC57/2009/EndDeviceEvents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<m:EndDeviceEvent>
<m:category>2.5.16.35</m:category>
<m:createdDateTime>SKIP</m:createdDateTime>
<m:Assets>
<m:mRID>fake-meter-id</m:mRID>
</m:Assets>
<m:status>
<m:dateTime>SKIP</m:dateTime>
<m:value>Disconnected</m:value>
</m:status>
</m:EndDeviceEvent>
</m:EndDeviceEvents>
</p:Payload>
</p:EventMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

Example of Version 2 POST with successfully executed category code:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncResponse
HTTP Content:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
```

```

    <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>EndDeviceEvents</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
  <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
<p:Payload>
<m:EndDeviceEvents xmlns:m="http://iec.ch/TC57/2009/EndDeviceEvents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<m:EndDeviceEvent>
<m:category>2.5.16.35</m:category>
<m:createdDateTime>SKIP</m:createdDateTime>
<m:Assets>
<m:mRID>fake-meter-id</m:mRID>
</m:Assets>
<m:status>
<m:dateTime>SKIP</m:dateTime>
<m:value>Disconnected</m:value>
</m:status>
</m:EndDeviceEvent>
</m:EndDeviceEvents>
</p:Payload>
</p:ResponseMessage >
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

A.6 On-demand Meter Connect

HTTP post to `https://<onramp_hes_host:XXXX>/cim/`

The connect command can be used to connect the main relay or an auxiliary relay. A single request can be used to connect only a single relay. EndDeviceControl.type is used to distinguish between relays as specified:

- Connect main relay: 3.31.6.42 OR 3.31.6.42.0
- Connect auxiliary relay <relay>: 3.31.6.42.<relay>

The content of the post to connect the main relay is:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:RequestMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >

```

```

<p:Header>
<p:Verb>create</p:Verb>
<p:Noun>EndDeviceControls</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
<p:Source>MDMS</p:Source>
<p:MessageID>235782345</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
</p:Header>
<p:Request>
<m:EndDeviceControls xmlns:m="http://iec.ch/TC57/2009/EndDeviceControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<m:EndDeviceControl>
<m:type>3.31.6.42</m:type>
<m:EndDeviceAsset>
<m:mRID>fake-meter-id</m:mRID>
</m:EndDeviceAsset>
</m:EndDeviceControl>
</m:EndDeviceControls>
</p:Request>
</p:RequestMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

The client receives a synchronous HTTP response of:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/request
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>EndDeviceControls</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
<p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
</p:ResponseMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

At some point later, an asynchronous response indicating whether the meter has been successfully connected is HTTP-Posted from the On-Ramp Wireless HES to a URL that the client provides to On-Ramp Wireless. The client can optionally specify the asynchronous return URL by adding the following CIM header to the original request message:

```
<p:ReplyAddress>http://your_cim_http_receiver</p:ReplyAddress>
```

Response to a connect request may result in posts with one of the following category codes:

- Smart Meter 1.1 and 1.2:
 - 2.5.16.35 = Executed successfully with one of the following strings:
 - RELAY_STATE_CONNECTED
 - RELAY_STATE_UNKNOWN
 - 2.5.16.36 = Unsuccessful operation with failure message
 - 2.5.16.271 = METER_UNSUPPORTED
 - 2.5.16.125 = APP_TTL_EXPIRED
- Smart Meter 1.0:
 - 3.31.17.66 = RELAY_NOT_SUPPORTED
 - 3.31.17.42 = CONNECTED
 - 3.31.17.85 = Failed with failure reason
 - 3.31.17.41 = Connect failure with failure reason

NOTE: Version 1 of the WSDL interface uses EventMessage as the top level XML element in the SOAP body. Version 2 of the WSDL interface uses ResponseMessage as the top level XML element in the SOAP body.

Example of Version 1 POST with successfully executed category code is:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncResponse
 HTTP Content:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:EventMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>created</p:Verb>
<p:Noun>EndDeviceEvents</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
  <p:AckRequired>>false</p:AckRequired>
</p:Header>
<p:Payload>
<m:EndDeviceEvents xmlns:m="http://iec.ch/TC57/2009/EndDeviceEvents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<m:EndDeviceEvent>
<m:category>2.5.16.35</m:category>
<m:createdDateTime>SKIP</m:createdDateTime>
<m:Assets>
<m:mRID>fake-meter-id</m:mRID>
</m:Assets>
<m:status>
<m:dateTime>SKIP</m:dateTime>
```

```

<m:value>Connected</m:value>
</m:status>
</m:EndDeviceEvent>
</m:EndDeviceEvents>
</p:Payload>
</p:EventMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

Example of Version 2 POST with successfully executed category code is:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncResponse
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:pl="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>EndDeviceEvents</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
  <p:AckRequired>>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
<p:Payload>
<m:EndDeviceEvents xmlns:m="http://iec.ch/TC57/2009/EndDeviceEvents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<m:EndDeviceEvent>
<m:category>2.5.16.35</m:category>
<m:createdDateTime>SKIP</m:createdDateTime>
<m:Assets>
<m:mRID>fake-meter-id</m:mRID>
</m:Assets>
<m:status>
<m:dateTime>SKIP</m:dateTime>
<m:value>Connected</m:value>
</m:status>
</m:EndDeviceEvent>
</m:EndDeviceEvents>
</p:Payload>
</p:ResponseMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

A.7 On-demand Disable Override (SGM Only)

For AMI 1.2 SGM meters, it may be required to send a Disable Override operation after a Connect or Disconnect.

HTTP post to `https://<onramp_hes_host:XXXX>/cim/`

The Disable Override command can be used for the main relay or an auxiliary relay. A single request can be used to connect only a single relay. EndDeviceControl.type is used to distinguish between relays as specified:

- Disable Override main relay: 3.31.6.237 OR 3.31.6.237.0
- Disable Override auxiliary relay <relay>: 3.31.6.237.<relay>

The content of the post to connect the main relay is:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:RequestMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>create</p:Verb>
<p:Noun>EndDeviceControls</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
<p:Source>MDMS</p:Source>
<p:MessageID>235782345</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
</p:Header>
<p:Request>
<m:EndDeviceControls xmlns:m="http://iec.ch/TC57/2009/EndDeviceControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<m:EndDeviceControl>
<m:type>3.31.6.237</m:type>
<m:EndDeviceAsset>
<m:mRID>fake-meter-id</m:mRID>
</m:EndDeviceAsset>
</m:EndDeviceControl>
</m:EndDeviceControls>
</p:Request>
</p:RequestMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

The client receives a synchronous HTTP response of:

HTTP Header: SOAPAction: `http://onrampwireless.com/Cim/request`
 HTTP Content:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
```

```
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>EndDeviceControls</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
<p:AckRequired>>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
</p:ResponseMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

At some point later, an asynchronous response indicating whether the operation has been successfully executed is HTTP-Posted from the On-Ramp Wireless HES to a URL that the client provides to On-Ramp Wireless. The client can optionally specify the asynchronous return URL by adding the following CIM header to the original request message:

```
<p:ReplyAddress>http://your_cim_http_receiver</p:ReplyAddress>
```

Response to a disable override request may result in posts with one of the following category codes:

- Smart Meter 1.2:
 - 2.5.16.35 = Disable Override (successful operation)
 - 2.5.16.36 = Unsuccessful operation with failure message
 - 2.5.16.271 = METER_UNSUPPORTED
 - 2.5.16.125 = APP_TTL_EXPIRED

NOTE: Version 1 of the WSDL interface uses EventMessage as the top level XML element in the SOAP body. Version 2 of the WSDL interface uses ResponseMessage as the top level XML element in the SOAP body.

Example of Version 1 POST with successfully executed category code is:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncResponse
HTTP Content:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:EventMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>created</p:Verb>
<p:Noun>EndDeviceEvents</p:Noun>
```



```

<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
  <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Payload>
<m:EndDeviceEvents xmlns:m="http://iec.ch/TC57/2009/EndDeviceEvents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
  <m:EndDeviceEvent>
    <m:category>2.5.16.35</m:category>
    <m:createdDateTime>SKIP</m:createdDateTime>
    <m:Assets>
      <m:mRID>fake-meter-id</m:mRID>
    </m:Assets>
    <m:status>
      <m:dateTime>SKIP</m:dateTime>
      <m:value>Disable Override</m:value>
    </m:status>
  </m:EndDeviceEvent>
</m:EndDeviceEvents>
</p:Payload>
</p:EventMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

Example of Version 2 POST with successfully executed category code is:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncResponse
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
  <p:Header>
    <p:Verb>reply</p:Verb>
    <p:Noun>EndDeviceEvents</p:Noun>
    <p:Revision>1.4</p:Revision>
    <p:Timestamp>SKIP</p:Timestamp>
    <p:Source>ORW_HES</p:Source>
    <p:MessageID>SKIP</p:MessageID>
    <p:CorrelationID>12345</p:CorrelationID>
    <p:AckRequired>false</p:AckRequired>
  </p:Header>
  <p:Reply>
    <p:ReplyCode>0.0</p:ReplyCode>
  </p:Reply>
  <p:Payload>
    <m:EndDeviceEvents xmlns:m="http://iec.ch/TC57/2009/EndDeviceEvents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
      <m:EndDeviceEvent>
        <m:category>2.5.16.35</m:category>
        <m:createdDateTime>SKIP</m:createdDateTime>
        <m:Assets>
          <m:mRID>fake-meter-id</m:mRID>
        </m:Assets>
        <m:status>
          <m:dateTime>SKIP</m:dateTime>
          <m:value>Disable Override</m:value>
        </m:status>
      </m:EndDeviceEvent>
    </m:EndDeviceEvents>
  </p:Payload>
</p:ResponseMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

```

</m:EndDeviceEvent>
</m:EndDeviceEvents>
</p:Payload>
</p:ResponseMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

A.8 On-demand Arm to Connect (SGM Only)

For SGM meters, arm to connect is a new feature in AMI 1.2.

HTTP post to `https://<onramp_hes_host:XXXX>/cim/`

The arm to connect command can be used for the main relay or an auxiliary relay. A single request can be used to connect only a single relay. `EndDeviceControl.type` is used to distinguish between relays as specified:

- Arm to Connect main relay: 3.31.6.11 OR 3.31.6.11.0
- Arm to Connect auxiliary relay <relay>: 3.31.6.11.<relay>

The content of the post to connect the main relay is:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:RequestMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>create</p:Verb>
<p:Noun>EndDeviceControls</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
<p:Source>MDMS</p:Source>
<p:MessageID>235782345</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
</p:Header>
<p:Request>
<m:EndDeviceControls xmlns:m="http://iec.ch/TC57/2009/EndDeviceControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<m:EndDeviceControl>
<m:type>3.31.6.11</m:type>
<m:EndDeviceAsset>
<m:mRID>fake-meter-id</m:mRID>
</m:EndDeviceAsset>
</m:EndDeviceControl>
</m:EndDeviceControls>
</p:Request>
</p:RequestMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

The client receives a synchronous HTTP response of:

HTTP Header: SOAPAction: `http://onrampwireless.com/Cim/request`
HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">

```

```

<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
  <p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
    <p:Header>
      <p:Verb>reply</p:Verb>
      <p:Noun>EndDeviceControls</p:Noun>
      <p:Revision>1.4</p:Revision>
      <p:Timestamp>SKIP</p:Timestamp>
      <p:Source>ORW_HES</p:Source>
      <p:MessageID>SKIP</p:MessageID>
      <p:CorrelationID>12345</p:CorrelationID>
      <p:AckRequired>>false</p:AckRequired>
    </p:Header>
    <p:Reply>
      <p:ReplyCode>0.0</p:ReplyCode>
    </p:Reply>
  </p:ResponseMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

At some point later, an asynchronous response indicating whether the operation has been successfully executed is HTTP-Posted from the On-Ramp Wireless HES to a URL that the client provides to On-Ramp Wireless. The client can optionally specify the asynchronous return URL by adding the following CIM header to the original request message:

```
<p:ReplyAddress>http://your_cim_http_receiver</p:ReplyAddress>
```

Response to an arm to connect request may result in posts with one of the following category codes:

- Smart Meter 1.2:
 - ❑ 2.5.16.35 = Arm To Connect (successful operation)
 - ❑ 2.5.16.36 = Unsuccessful operation with failure message
 - ❑ 2.5.16.271 = METER_UNSUPPORTED
 - ❑ 2.5.16.125 = APP_TTL_EXPIRED

NOTE: Version 1 of the WSDL interface uses EventMessage as the top level XML element in the SOAP body. Version 2 of the WSDL interface uses ResponseMessage as the top level XML element in the SOAP body.

Example of Version 1 POST with successfully executed category code is:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncResponse
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>

```

```

<p:EventMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>created</p:Verb>
<p:Noun>EndDeviceEvents</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
  <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Payload>
<m:EndDeviceEvents xmlns:m="http://iec.ch/TC57/2009/EndDeviceEvents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<m:EndDeviceEvent>
<m:category>2.5.16.35</m:category>
<m:createdDateTime>SKIP</m:createdDateTime>
<m:Assets>
<m:mRID>fake-meter-id</m:mRID>
</m:Assets>
<m:status>
<m:dateTime>SKIP</m:dateTime>
<m:value>Arm To Connect</m:value>
</m:status>
</m:EndDeviceEvent>
</m:EndDeviceEvents>
</p:Payload>
</p:EventMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

Example of Version 2 POST with successfully executed category code is:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncResponse
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>EndDeviceEvents</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
  <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
<p:Payload>
<m:EndDeviceEvents xmlns:m="http://iec.ch/TC57/2009/EndDeviceEvents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<m:EndDeviceEvent>
<m:category>2.5.16.35</m:category>
<m:createdDateTime>SKIP</m:createdDateTime>

```

```

<m:Assets>
<m:mRID>fake-meter-id</m:mRID>
</m:Assets>
<m:status>
<m:dateTime>SKIP</m:dateTime>
<m:value>Arm To Connect</m:value>
</m:status>
</m:EndDeviceEvent>
</m:EndDeviceEvents>
</p:Payload>
</p:ResponseMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

A.9 Asynchronous Meter Readings

The On-Ramp Wireless meter communications module obtains readings from the meter on various intervals and transmits data back to the HES system periodically.

NOTE: Version 1 of the WSDL interface uses EventMessage as the top level XML element in the SOAP body. Version 2 of the WSDL interface uses ReceiveAsyncMeterReadings as the top level XML element in the SOAP body.

A.9.1 Interval Readings

The following is an example of an asynchronous report of 15-minute interval reads for kWh and kVARh and it has collected four reads per type. The On-Ramp Wireless HES will HTTP-Post the message to the URL provided by the client.

Example of Version 1 HTTP POST:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncMeterReads
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header/>
<SOAP-ENV:Body>
<p:EventMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
  xmlns:pl="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-
  1.0.xsd"
  xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-
  1.0.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p:Header>
    <p:Verb>created</p:Verb>
    <p:Noun>MeterReadings</p:Noun>
    <p:Revision>1.4</p:Revision>
    <p:Timestamp>SKIP</p:Timestamp>
    <p:Source>ORW_HES</p:Source>
    <p:MessageID>SKIP</p:MessageID>
    <p:AckRequired>false</p:AckRequired>
  </p:Header>
  <p:Payload>
    <m:MeterReadings xmlns:m="http://iec.ch/TC57/2009/MeterReadings#"
      xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
      <m:MeterReading>
        <m:IntervalBlocks>
          <m:IntervalReadings>
            <m:timeStamp>2008-01-01T00:15:00Z</m:timeStamp>
            <m:value>2.83</m:value>
            <m:ReadingQualities>
              <m:quality>3.0.0</m:quality>
            </m:ReadingQualities>
          </m:IntervalReadings>
        </m:IntervalBlocks>
      </m:MeterReading>
    </m:MeterReadings>
  </p:Payload>
</p:EventMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

```

        </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>
        <m:timeStamp>2008-01-01T00:30:00Z</m:timeStamp>
        <m:value>3.13</m:value>
        <m:ReadingQualities>
            <m:quality>3.0.0</m:quality>
        </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>
        <m:timeStamp>2008-01-01T00:45:00Z</m:timeStamp>
        <m:value>3.43</m:value>
        <m:ReadingQualities>
            <m:quality>3.0.0</m:quality>
        </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>
        <m:timeStamp>2008-01-01T01:00:00Z</m:timeStamp>
        <m:value>3.73</m:value>
        <m:ReadingQualities>
            <m:quality>3.0.0</m:quality>
        </m:ReadingQualities>
    </m:IntervalReadings>
    <m:ReadingType ref="2.0.4.1.0.12.0.0.0.3.72" />
</m:IntervalBlocks>
<m:IntervalBlocks>
    <m:IntervalReadings>
        <m:timeStamp>2008-01-01T00:15:00Z</m:timeStamp>
        <m:value>2.805</m:value>
        <m:ReadingQualities>
            <m:quality>3.0.0</m:quality>
        </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>
        <m:timeStamp>2008-01-01T00:30:00Z</m:timeStamp>
        <m:value>3.105</m:value>
        <m:ReadingQualities>
            <m:quality>3.0.0</m:quality>
        </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>
        <m:timeStamp>2008-01-01T00:45:00Z</m:timeStamp>
        <m:value>3.405</m:value>
        <m:ReadingQualities>
            <m:quality>3.0.0</m:quality>
        </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>
        <m:timeStamp>2008-01-01T01:00:00Z</m:timeStamp>
        <m:value>3.705</m:value>
        <m:ReadingQualities>
            <m:quality>3.0.0</m:quality>
        </m:ReadingQualities>
    </m:IntervalReadings>
    <m:ReadingType ref="2.0.4.1.0.12.0.0.0.3.73" />
</m:IntervalBlocks>
    <m:MeterAsset>
        <m:mRID>fake-meter-id</m:mRID>
    </m:MeterAsset>
</m:MeterReading>
</m:MeterReadings>
</p:Payload>
</p:EventMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

Example of Version 2 HTTP POST:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncMeterReads
 HTTP Content:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header/>
<SOAP-ENV:Body>
<p:ReceiveAsyncMeterReadEventMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
  xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-
1.0.xsd"
  xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-
1.0.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p:Header>
    <p:Verb>created</p:Verb>
    <p:Noun>MeterReadings</p:Noun>
    <p:Revision>1.4</p:Revision>
    <p:Timestamp>SKIP</p:Timestamp>
    <p:Source>ORW_HES</p:Source>
    <p:MessageID>SKIP</p:MessageID>
    <p:AckRequired>>false</p:AckRequired>
  </p:Header>
  <p:Payload>
    <m:MeterReadings xmlns:m="http://iec.ch/TC57/2009/MeterReadings#"
      xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
      <m:MeterReading>
        <m:IntervalBlocks>
          <m:IntervalReadings>
            <m:timeStamp>2008-01-01T00:15:00Z</m:timeStamp>
            <m:value>2.83</m:value>
            <m:ReadingQualities>
              <m:quality>3.0.0</m:quality>
            </m:ReadingQualities>
          </m:IntervalReadings>
          <m:IntervalReadings>
            <m:timeStamp>2008-01-01T00:30:00Z</m:timeStamp>
            <m:value>3.13</m:value>
            <m:ReadingQualities>
              <m:quality>3.0.0</m:quality>
            </m:ReadingQualities>
          </m:IntervalReadings>
          <m:IntervalReadings>
            <m:timeStamp>2008-01-01T00:45:00Z</m:timeStamp>
            <m:value>3.43</m:value>
            <m:ReadingQualities>
              <m:quality>3.0.0</m:quality>
            </m:ReadingQualities>
          </m:IntervalReadings>
          <m:IntervalReadings>
            <m:timeStamp>2008-01-01T01:00:00Z</m:timeStamp>
            <m:value>3.73</m:value>
            <m:ReadingQualities>
              <m:quality>3.0.0</m:quality>
            </m:ReadingQualities>
          </m:IntervalReadings>
          <m:ReadingType ref="2.0.4.1.0.12.0.0.0.3.72" />
        </m:IntervalBlocks>
        <m:IntervalBlocks>
          <m:IntervalReadings>
            <m:timeStamp>2008-01-01T00:15:00Z</m:timeStamp>
            <m:value>2.805</m:value>
            <m:ReadingQualities>
              <m:quality>3.0.0</m:quality>
            </m:ReadingQualities>
          </m:IntervalReadings>
          <m:IntervalReadings>
            <m:timeStamp>2008-01-01T00:30:00Z</m:timeStamp>
            <m:value>3.105</m:value>
          </m:IntervalReadings>
        </m:IntervalBlocks>
      </m:MeterReading>
    </m:MeterReadings>
  </p:Payload>
</p:ReceiveAsyncMeterReadEventMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

```

        <m:ReadingQualities>
          <m:quality>3.0.0</m:quality>
        </m:ReadingQualities>
      </m:IntervalReadings>
    <m:IntervalReadings>
      <m:timeStamp>2008-01-01T00:45:00Z</m:timeStamp>
      <m:value>3.405</m:value>
      <m:ReadingQualities>
        <m:quality>3.0.0</m:quality>
      </m:ReadingQualities>
    </m:IntervalReadings>
    <m:IntervalReadings>
      <m:timeStamp>2008-01-01T01:00:00Z</m:timeStamp>
      <m:value>3.705</m:value>
      <m:ReadingQualities>
        <m:quality>3.0.0</m:quality>
      </m:ReadingQualities>
    </m:IntervalReadings>
    <m:ReadingType ref="2.0.4.1.0.12.0.0.0.3.73" />
  </m:IntervalBlocks>
  <m:MeterAsset>
    <m:mRID>fake-meter-id</m:mRID>
  </m:MeterAsset>
</m:MeterReading>
</m:MeterReadings>
</p:Payload>
</p:ReceiveAsyncMeterReadEventMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

The HTTP response to this POST should be an HTTP 200 with an empty SOAP envelope:

```

<SOAP-ENV:Envelope xmlns:ns1="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header/><SOAP-ENV:Body/>
</SOAP-ENV:Envelope>

```

Or, alternatively an HTTP 202 with no response data.

A.9.2 Bulk Readings

The following is an example of an asynchronous, once daily, bulk quantity (i.e., midnight reads) for kWh and kVARh. The On-Ramp Wireless HES will HTTP-Post the message to the URL provided by the client.

Example of Version 1 HTTP POST:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncMeterReads
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header/>
  <SOAP-ENV:Body>
    <p:EventMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
      xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-
1.0.xsd"
      xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-
1.0.xsd"
      xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
      <p:Header>
        <p:Verb>created</p:Verb>
        <p:Noun>MeterReadings</p:Noun>
        <p:Revision>1.4</p:Revision>
        <p:Timestamp>SKIP</p:Timestamp>

```



```

    <p:Source>ORW_HES</p:Source>
    <p:MessageID>SKIP</p:MessageID>
    <p:AckRequired>>false</p:AckRequired>
  </p:Header>
  <p:Payload>
    <m:MeterReadings xmlns:m="http://iec.ch/TC57/2009/MeterReadings#"
      xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
      <m:MeterReading>
        <m:Readings>
          <m:timeStamp>2009-12-15T12:45:00Z</m:timeStamp>
          <m:value>120.4</m:value>
          <m:ReadingQualities>
            <m:quality>3.0.0</m:quality>
          </m:ReadingQualities>
          <m:ReadingType ref="0.0.1.1.0.12.0.0.0.3.72" />
        </m:Readings>
      </m:MeterReading>
      <m:MeterReading>
        <m:timeStamp>2009-12-15T12:45:00Z</m:timeStamp>
        <m:value>130.5</m:value>
        <m:ReadingQualities>
          <m:quality>3.0.0</m:quality>
        </m:ReadingQualities>
        <m:ReadingType ref="0.0.1.1.0.12.0.0.0.3.73" />
      </m:MeterReading>
    </m:MeterReadings>
  </p:Payload>
</p:EventMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

Example of Version 2 HTTP POST:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncMeterReads
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header/>
<SOAP-ENV:Body>
<p:ReceiveAsyncMeterReadEventMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
  xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-
1.0.xsd"
  xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-
1.0.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p:Header>
    <p:Verb>created</p:Verb>
    <p:Noun>MeterReadings</p:Noun>
    <p:Revision>1.4</p:Revision>
    <p:Timestamp>SKIP</p:Timestamp>
    <p:Source>ORW_HES</p:Source>
    <p:MessageID>SKIP</p:MessageID>
    <p:AckRequired>>false</p:AckRequired>
  </p:Header>
  <p:Payload>
    <m:MeterReadings xmlns:m="http://iec.ch/TC57/2009/MeterReadings#"
      xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
      <m:MeterReading>
        <m:Readings>
          <m:timeStamp>2009-12-15T12:45:00Z</m:timeStamp>
          <m:value>120.4</m:value>
          <m:ReadingQualities>
            <m:quality>3.0.0</m:quality>
          </m:ReadingQualities>
          <m:ReadingType ref="0.0.1.1.0.12.0.0.0.3.72" />
        </m:Readings>
      </m:MeterReading>
    </m:MeterReadings>
  </p:Payload>
</p:ReceiveAsyncMeterReadEventMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

```

    </m:Readings>
    <m:Readings>
      <m:timeStamp>2009-12-15T12:45:00Z</m:timeStamp>
      <m:value>130.5</m:value>
      <m:ReadingQualities>
        <m:quality>3.0.0</m:quality>
      </m:ReadingQualities>
      <m:ReadingType ref="0.0.1.1.0.12.0.0.0.3.73" />
    </m:Readings>
  <m:MeterAsset>
    <m:mRID>fake-meter-id</m:mRID>
  </m:MeterAsset>
</m:MeterReading>
</m:MeterReadings>
</p:Payload>
</p:ReceiveAsyncMeterReadEventMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

The HTTP response to this POST should be an HTTP 200 with an empty SOAP envelope:

```

<SOAP-ENV:Envelope xmlns:ns1="http://schemas.xmlsoap.org/soap/envelope/">

<SOAP-ENV:Header /><SOAP-ENV:Body/>

</SOAP-ENV:Envelope>

```

Or, alternatively an HTTP 202 with no response data.

A.10 Meter Connected State

This command obtains the current status of the relay states for a meter. A meter may have one or more relays. A single request is used to get the state of all relays.

OTV 1.0 uses the following CIM code in the mRID element of the request:

```
0.0.0.0.0.43.0.0.0.0.109
```

OTV 1.1 and later uses the following CIM code in the mRID element of the request:

```
0.0.0.0.0.43.2.0.0.0.109
```

Example OTV 1.0 HTTP post to https://<onramp_hes_host>XXXX/cim/

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header/>
<SOAP-ENV:Body>
<p:RequestMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:pl="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.iec.ch/TC57/2008/schema/message Message1.4.xsd">
<p:Header>
  <p:Verb>get</p:Verb>
  <p:Noun>MeterReadings</p:Noun>
  <p:Revision>1.4</p:Revision>
  <p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
  <p:Source>MDMS</p:Source>
  <p:MessageID>235782345</p:MessageID>
  <p:CorrelationID>12345_6789</p:CorrelationID>
</p:Header>
<p:Request>

```

```

    <m:GetMeterReadings xmlns:m="http://iec.ch/TC57/2009/GetMeterReadings#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <m:EndDeviceAsset>
    <m:mRID>fake-meter-id</m:mRID>
    </m:EndDeviceAsset>
    <m:ReadingType>
    <m:mRID>0.0.0.0.43.0.0.0.109</m:mRID>
    </m:ReadingType>
    </m:GetMeterReadings>
  </p:Request>
</p:RequestMessage>

```

The client receives a synchronous HTTP response of:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/request
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345_6789</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>MeterReadings</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>32452222</p:MessageID>
<p:CorrelationID>12345_6789</p:CorrelationID>
  <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
</p:ResponseMessage></SOAP-ENV:Body></SOAP-ENV:Envelope>

```

At some point later, an asynchronous response with correlated data is HTTP-Posted from the On-Ramp Wireless HES to a URL that the client provides to On-Ramp Wireless. The client can optionally specify the asynchronous return URL by adding the following CIM header to original request message.

```
<p:ReplyAddress>http://your_cim_http_receiver</p:ReplyAddress>
```

Response may result in posts with following ReadingTypes:

- Main: 0 0.0.0.0.43.0.0.0.109 (legacy) OR 0.0.0.0.43.2.0.0.109 (OTV 1.1 and later)
- Auxiliary relay <relay> disconnected: 0.0.0.0.43.2.<relay>0.0.109

ReadingType may have the following values:

- 0 => Disconnected
- 1 => Connected
- 2 => Relay is not present
- 3 => Error when checking relay state
- 4 => Relay not supported

The content of the post is:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncResponse
 HTTP Content:

```
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>MeterReadings</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
<p:Source>test</p:Source>
<p:MessageID>1234556864</p:MessageID>
<p:CorrelationID>12345_6789</p:CorrelationID>
<p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
<p:Payload>
<m:MeterReadings xmlns:m="http://iec.ch/TC57/2009/MeterReadings#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
<m:MeterReading>
<m:MeterAsset>
<m:mRID>fake-meter-id</m:mRID>
</m:MeterAsset>
<m:Readings>
<m:timeStamp>2008-12-31T12:00:00Z</m:timeStamp>
<m:value>1.0</m:value>
<m:ReadingQualities>
<m:quality>3.0.0</m:quality>
</m:ReadingQualities>
<m:ReadingType ref="0.0.0.0.0.43.0.0.0.0.109" />
</m:Readings>
</m:MeterReading>
</m:MeterReadings>
</p:Payload>
</p:ResponseMessage>
```

A.11 Alarm Events

The On-Ramp Wireless meter communications module can report some events that have been detected on the meter after they happen. The following is an example of some conditions that could be reported as either occurring or clearing. The On-Ramp Wireless HES will asynchronously, HTTP-Post the message to the URL provided by the client.

NOTE: Version 1 of the WSDL interface uses EventMessage as the top level XML element in the SOAP body. Version 2 of the WSDL interface uses ReceiveAsyncEventMessage as the top level XML element in the SOAP body.

Example of Version 1 HTTP POST:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncEvent
 HTTP Content:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
```

```

<SOAP-ENV:Header />
<SOAP-ENV:Body>
<p:EventMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
<p:Header>
<p:Verb>created</p:Verb>
<p:Noun>EndDeviceEvents</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:AckRequired>>false</p:AckRequired>
<p:MessageID>SKIP</p:MessageID>
</p:Header>
<p:Payload>
<m:EndDeviceEvents xmlns:m="http://iec.ch/TC57/2009/EndDeviceEvents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
<m:EndDeviceEvent>
<m:Assets>
<m:mRID>fake-meter-id</m:mRID>
</m:Assets>
<m:category>6.20.1.185</m:category>
<m:createdDateTime>SKIP</m:createdDateTime>
<m:status>
<m:dateTime>SKIP</m:dateTime>
<m:value>GRID_EVENT_POWER_FAIL</m:value>
</m:status>
</m:EndDeviceEvent>
<m:EndDeviceEvent>
<m:Assets>
<m:mRID>fake-meter-id</m:mRID>
</m:Assets>
<m:category>6.38.17.248</m:category>
<m:createdDateTime>SKIP</m:createdDateTime>
<m:status>
<m:dateTime>SKIP</m:dateTime>
<m:value>METER_EVENT_VOLTAGE_SWELL</m:value>
</m:status>
</m:EndDeviceEvent>
</m:EndDeviceEvents>
</p:Payload>
</p:EventMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

Example of Version 2 HTTP POST:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncEvent
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header />
<SOAP-ENV:Body>
<p:ReceiveAsyncEventMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
<p:Header>
<p:Verb>created</p:Verb>
<p:Noun>EndDeviceEvents</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:AckRequired>>false</p:AckRequired>
<p:MessageID>SKIP</p:MessageID>
</p:Header>
<p:Payload>

```

```

<m:EndDeviceEvents xmlns:m="http://iec.ch/TC57/2009/EndDeviceEvents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <m:EndDeviceEvent>
    <m:Assets>
      <m:mRID>fake-meter-id</m:mRID>
    </m:Assets>
    <m:category>6.20.1.185</m:category>
    <m:createdDateTime>SKIP</m:createdDateTime>
    <m:status>
      <m:dateTime>SKIP</m:dateTime>
      <m:value>GRID_EVENT_POWER_FAIL</m:value>
    </m:status>
    </m:EndDeviceEvent>
  <m:EndDeviceEvent>
    <m:Assets>
      <m:mRID>fake-meter-id</m:mRID>
    </m:Assets>
    <m:category>6.38.17.248</m:category>
    <m:createdDateTime>SKIP</m:createdDateTime>
    <m:status>
      <m:dateTime>SKIP</m:dateTime>
      <m:value>METER_EVENT_VOLTAGE_SWELL</m:value>
    </m:status>
    </m:EndDeviceEvent>
  </m:EndDeviceEvents>
</p:Payload>
</p:ReceiveAsyncEventMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

The HTTP response to this POST should be an HTTP 200 with an empty SOAP envelope:

```

<SOAP-ENV:Envelope xmlns:ns1="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header/><SOAP-ENV:Body/>
</SOAP-ENV:Envelope>

```

Or, alternatively an HTTP 202 with no response data.

A.12 Ping Request

OTV 1.1 supports an additional Ping request message to check the status of a meter.

HTTP post to `https://<onramp_hes_host:XXXX>/cim/`

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header>
    <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
  </SOAP-ENV:Header>
  <SOAP-ENV:Body>
    <p:RequestMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
      <p:Header>
        <p:Verb>create</p:Verb>
        <p:Noun>EndDeviceControls</p:Noun>
      </p:RequestMessage>
    </SOAP-ENV:Body>
  </SOAP-ENV:Envelope>

```

```

<p:Revision>1.4</p:Revision>
<p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
<p:Source>MDMS</p:Source>
<p:MessageID>235782345</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
</p:Header>
<p:Request>
<m:EndDeviceControls xmlns:m="http://iec.ch/TC57/2009/EndDeviceControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<m:EndDeviceControl>
<m:type>1.23.5.18</m:type>
<m:EndDeviceAsset>
<m:mRID>fake-meter-id</m:mRID>
</m:EndDeviceAsset>
</m:EndDeviceControl>
</m:EndDeviceControls>
</p:Request>
</p:RequestMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

The client receives a synchronous HTTP response of:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>EndDeviceControls</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
<p:AckRequired>>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
</p:ResponseMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

At some point later, an asynchronous response with correlated data is HTTP-Posted from the On-Ramp Wireless HES to a URL that the client provides to On-Ramp Wireless. The client can optionally specify the asynchronous return URL by adding the following CIM header to original request message.

```
<p:ReplyAddress>http://your_cim_http_receiver</p:ReplyAddress>
```

NOTE: Version 1 of the WSDL interface uses EventMessage as the top level XML element in the SOAP body. Version 2 of the WSDL interface uses ResponseMessage as the top level XML element in the SOAP body.

Example of Version 1 POST with successfully executed category code:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:EventMessage xmlns:p=http://www.iec.ch/TC57/2008/schema/message
xmlns:p1=http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd
xmlns:p2=http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
<p:Header>
    <p:Verb>created</p:Verb>
    <p:Noun>EndDeviceEvents</p:Noun>
    <p:Revision>1.4</p:Revision>
    <p:Timestamp>SKIP</p:Timestamp>
    <p:Source>ORW_HES</p:Source>
    <p:MessageID>SKIP</p:MessageID>
    <p:AckRequired>>false</p:AckRequired>
</p:Header>
<p:Payload>
    <m:EndDeviceEvents xmlns:m=http://iec.ch/TC57/2009/EndDeviceEvents#
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
        <m:EndDeviceEvent>
            <m:category>1.23.5.42</m:category>
            <m:createdDateTime>SKIP</m:createdDateTime>
            <m:Assets>
                <m:mRID>fake-meter-id</m:mRID>
            </m:Assets>
            <m:status>
                <m:dateTime>SKIP</m:dateTime>
                <m:value>OTR_PING_RESPONSE</m:value>
            </m:status>
        </m:EndDeviceEvent>
    </m:EndDeviceEvents>
</p:Payload>
</p:EventMessage>

</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```


Example of Version 2 POST with successfully executed category code:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p=http://www.iec.ch/TC57/2008/schema/message
xmlns:p1=http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd
xmlns:p2=http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
<p:Header>
    <p:Verb>reply</p:Verb>
    <p:Noun>EndDeviceEvents</p:Noun>
    <p:Revision>1.4</p:Revision>
    <p:Timestamp>SKIP</p:Timestamp>
    <p:Source>ORW_HES</p:Source>
    <p:MessageID>SKIP</p:MessageID>
    <p:AckRequired>>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
<p:Payload>
    <m:EndDeviceEvents xmlns:m=http://iec.ch/TC57/2009/EndDeviceEvents#
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
        <m:EndDeviceEvent>
            <m:category>1.23.5.42</m:category>
            <m:createdDateTime>SKIP</m:createdDateTime>
            <m:Assets>
                <m:mRID>fake-meter-id</m:mRID>
            </m:Assets>
            <m:status>
                <m:dateTime>SKIP</m:dateTime>
                <m:value>OTR_PING_RESPONSE</m:value>
            </m:status>
        </m:EndDeviceEvent>
    </m:EndDeviceEvents>
</p:Payload>
</p:ResponseMessage>

</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

A.13 Demand Reset Request

OTV 1.1 supports an additional Demand Reset request message. **NOTE:** Demand Reset is an immediate reset, not scheduled.

HTTP post to `https://<onramp_hes_host:XXXX>/cim/`

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345_abc</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:RequestMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>create</p:Verb>
<p:Noun>EndDeviceControls</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
<p:Source>MDMS</p:Source>
<p:MessageID>235782345</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
</p:Header>
<p:Request>
<m:EndDeviceControls xmlns:m="http://iec.ch/TC57/2009/EndDeviceControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<m:EndDeviceControl>
<m:type>3.8.6.61</m:type>
<m:EndDeviceAsset>
<m:mRID>fake-meter-id </m:mRID>
</m:EndDeviceAsset>
</m:EndDeviceControl>
</m:EndDeviceControls>
</p:Request>
</p:RequestMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

The client receives a synchronous HTTP response of:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
```

```

<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>EndDeviceControls</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
<p:AckRequired>>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
</p:ResponseMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

At some point later, an asynchronous response with correlated data is HTTP-Posted from the On-Ramp Wireless HES to a URL that the client provides to On-Ramp Wireless. The client can optionally specify the asynchronous return URL by adding the following CIM header to original request message.

```
<p:ReplyAddress>http://your_cim_http_receiver</p:ReplyAddress>
```

Response to a demand reset request may result in following category codes:

- Executed successfully: 2.5.16.35
- Unsuccessful: 2.5.16.36
- Unsupported: 2.5.16.271
- TTL Expired: 2.5.16.125

NOTE: Version 1 of the WSDL interface uses EventMessage as the top level XML element in the SOAP body. Version 2 of the WSDL interface uses ResponseMessage as the top level XML element in the SOAP body.

Example of Version 1 POST with successfully executed category code:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:EventMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"

```

```

xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>created</p:Verb>
<p:Noun>EndDeviceEvents</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>
<p:Source>ORW_HES</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
  <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Payload>
<m:EndDeviceEvents xmlns:m="http://iec.ch/TC57/2009/EndDeviceEvents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<m:EndDeviceEvent>
<m:category>2.5.16.35</m:category>
<m:createdDateTime>SKIP</m:createdDateTime>
<m:Assets>
<m:mRID>fake-meter-id</m:mRID>
</m:Assets>
<m:status>
<m:dateTime>SKIP</m:dateTime>
<m:value>DemandReset</m:value>
</m:status>
</m:EndDeviceEvent>
</m:EndDeviceEvents>
</p:Payload>
</p:EventMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

Example of Version 2 POST with successfully executed category code:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<p:Header>
<p:Verb>reply</p:Verb>
<p:Noun>EndDeviceEvents</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>SKIP</p:Timestamp>

```

```

<p:Source>ORW_HES</p:Source>
<p:MessageID>SKIP</p:MessageID>
<p:CorrelationID>12345</p:CorrelationID>
  <p:AckRequired>false</p:AckRequired>
</p:Header>
<p:Reply>
<p:ReplyCode>0.0</p:ReplyCode>
</p:Reply>
<p:Payload>
<m:EndDeviceEvents xmlns:m="http://iec.ch/TC57/2009/EndDeviceEvents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
  <m:EndDeviceEvent>
    <m:category>2.5.16.35</m:category>
    <m:createdDateTime>SKIP</m:createdDateTime>
    <m:Assets>
      <m:mRID>fake-meter-id</m:mRID>
    </m:Assets>
    <m:status>
      <m:dateTime>SKIP</m:dateTime>
      <m:value>DemandReset</m:value>
    </m:status>
  </m:EndDeviceEvent>
</m:EndDeviceEvents>
</p:Payload>
</p:ResponseMessage>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

A.14 Power Quality Reports

OTV 1.1 supports power quality reports via the IEC CIM HTTP interface. Different power quality reports can be requested using the following CIM codes:

- All: 12.0.0.0.2.19.0.0.0.0
- Line Side Diagnostic: 12.0.0.0.2.5.0.0.0.0
- Instantaneous Demand: 12.0.0.0.8.0.0.0.0
- Instantaneous Distortion: 12.0.0.0.47.0.0.0.0

An example request follows:

HTTP post to `https://<onramp_hes_host:XXXX>/cim/`

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header/>
<SOAP-ENV:Body>
<p:RequestMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.iec.ch/TC57/2008/schema/message Message1.4.xsd">
<p:Header>

```

```

<p:Verb>get</p:Verb>
<p:Noun>MeterReadings</p:Noun>
<p:Revision>1.4</p:Revision>
<p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
<p:Source>MDMS</p:Source>
<p:MessageID>235782345</p:MessageID>
<p:CorrelationID>12345_6789</p:CorrelationID>
</p:Header>
<p:Request>
<m:GetMeterReadings xmlns:m="http://iec.ch/TC57/2009/GetMeterReadings#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <m:EndDeviceAsset>
    <m:mRID>fake-meter-id</m:mRID>
  </m:EndDeviceAsset>
  <m:ReadingType>
    <m:mRID>12.0.0.0.2.19.0.0.0.0</m:mRID>
  </m:ReadingType>
</m:GetMeterReadings>
</p:Request>
</p:RequestMessage>

```

The client receives a synchronous HTTP response of:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/request
 HTTP Content:

```

<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
<SOAP-ENV:Header>
  <orwcim:CORRELATION_ID
xmlns:orwcim="http://onrampwireless.com/cim">12345_6789</orwcim:CORRELATION_ID>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
<p:ResponseMessage xmlns:p="http://www.iec.ch/TC57/2008/schema/message"
xmlns:p1="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:p2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
  <p:Header>
    <p:Verb>reply</p:Verb>
    <p:Noun>MeterReadings</p:Noun>
    <p:Revision>1.4</p:Revision>
    <p:Timestamp>2008-12-31T12:00:00Z</p:Timestamp>
    <p:Source>ORW_HES</p:Source>
    <p:MessageID>235782345</p:MessageID>
    <p:CorrelationID>12345_6789</p:CorrelationID>
    <p:AckRequired>false</p:AckRequired>
  </p:Header>
  <p:Reply>
    <p:ReplyCode>0.0</p:ReplyCode>
  </p:Reply>
</p:ResponseMessage></SOAP-ENV:Body></SOAP-ENV:Envelope>

```

At some point later, an asynchronous response with correlated data is HTTP-Posted from the On-Ramp Wireless HES to a URL that the client provides to On-Ramp Wireless. The client can optionally specify the asynchronous return URL by adding the following CIM header to original request message.

```
<p:ReplyAddress>http://your_cim_http_receiver</p:ReplyAddress>
```

The content of the post is:

HTTP Header: SOAPAction: http://onrampwireless.com/Cim/asyncResponse
 HTTP Content:

```
<ResponseMessage xmlns:ns2="http://www.docs.oasis-open.org/wss/2004/01/oasis-200401-wss-
wssecurity-utility-1.0.xsd" xmlns="http://www.iec.ch/TC57/2008/schema/message"
```

```

xmlns:ns4="http://iec.ch/TC57/2009/EndDeviceAssets#"
xmlns:ns3="http://iec.ch/TC57/2009/EndDeviceEvents#"
xmlns:ns5="http://iec.ch/TC57/2009/EndDeviceControls#"
xmlns:ns6="http://iec.ch/TC57/2009/GetMeterReadings#"
xmlns:ns7="http://iec.ch/TC57/2009/MeterReadings#"
  <Header>
    <Verb>reply</Verb>
    <Noun>MeterReadings</Noun>
    <Revision>1.4</Revision>
    <Timestamp>2014-10-24T18:31:37Z</Timestamp>
    <Source>ORW_HES</Source>
    <AckRequired>false</AckRequired>
    <MessageID>fd4e7470-5bab-11e4-a105-5cd9980be1fb</MessageID>
    <CorrelationID>15</CorrelationID>
  </Header>
  <Reply>
    <ReplyCode>0.0</ReplyCode>
  </Reply>
  <Payload>
    <ns7:MeterReadings>
      <ns7:MeterReading>
        <ns7:MeterAsset>
          <ns7:mRID>14810</ns7:mRID>
        </ns7:MeterAsset>
        <ns7:Readings>
          <ns7:timeStamp>2014-10-24T18:31:20Z</ns7:timeStamp>
          <ns7:value>245.3</ns7:value>
          <ns7:ReadingQualities>
            <ns7:quality>3.0.0</ns7:quality>
          </ns7:ReadingQualities>
          <ns7:ReadingType ref="0.15.6.0.0.54.0.0.128.0.29"/>
        </ns7:Readings>
        <ns7:Readings>
          <ns7:timeStamp>2014-10-24T18:31:20Z</ns7:timeStamp>
          <ns7:value>0.3</ns7:value>
          <ns7:ReadingQualities>
            <ns7:quality>3.0.0</ns7:quality>
          </ns7:ReadingQualities>
          <ns7:ReadingType ref="0.15.6.0.0.54.0.0.32.0.29"/>
        </ns7:Readings>
        <ns7:Readings>
          <ns7:timeStamp>2014-10-24T18:31:20Z</ns7:timeStamp>
          <ns7:value>0.0</ns7:value>
          <ns7:ReadingQualities>
            <ns7:quality>3.0.0</ns7:quality>
          </ns7:ReadingQualities>
          <ns7:ReadingType ref="0.0.6.0.0.38.0.0.128.0.65"/>
        </ns7:Readings>
        <ns7:Readings>
          <ns7:timeStamp>2014-10-24T18:31:20Z</ns7:timeStamp>
          <ns7:value>34.0</ns7:value>
          <ns7:ReadingQualities>
            <ns7:quality>3.0.0</ns7:quality>
          </ns7:ReadingQualities>
          <ns7:ReadingType ref="0.0.6.0.0.46.0.0.0.0.23"/>
        </ns7:Readings>
      </ns7:MeterReading>
    </ns7:MeterReadings>
  </Payload>
</ResponseMessage>

```

A.15 Season Change

OTV 1.2 supports a Season Change Request via the IEC CIM HTTP interface.

A.16 Real-time Pricing Change

OTV 1.2 supports Real-time Pricing changes via the IEC CIM HTTP interface.

Appendix B TWACS Implementation Detail

For TWACS export, the reading dates/times in the exported file are local to the user's OTV time zone.

1. Find all nodes that match:
 - a. Billing Cycle
Node Attributes table must have a key equal to "Bill Cycle" or "Billing Cycle" and a string value equal to the actual billing cycle value.
 - b. Search Text
Search text is split on comma. A "%like%" query is performed on all values for the node in the Node Attributes Table.
2. The resulting nodes are paged and processed 1000 at a time.
3. For each node:
 - a. Look up all unique reading type IDs (CIM codes) in the "ElectricAMIReadingsSdu" table that are:
 1. Greater than or equal to start date (user input)
 2. Less than or equal to end date (user input)
 - b. For each distinct CIM code, classify as:
 1. Energy register data – regex that matches "0.[02].1.1.0.12.0.[01].0.[0369].72"
 2. Peak demand data – regex that matches "0.8.[167].1.0.8.0.[01].0.[0369].38"
 - c. If there is no energy register data for this node, it is skipped.
 - d. If there is Peak Demand data, find the most recent Peak Demand reading with a reading date as follows:
 1. Greater than or equal to peak start time (user input)
 2. Less than or equal to peak end time (user input)
 3. Set the peak value = computedValue:
 - a. If the cim code has >= 11 parts, find the multiplier in C10.
 - b. If the multiplier is equal to 0,1,3,6, or 9, return the value * 10ⁿ where n = 0,1,3,6, or 9
 - c. Otherwise return the value "as is."
 4. Set the peak timestamp to the reading date.
 5. If there is no peak demand reading found, then no peak value is exported.
 - e. If there is no Peak Demand data found AND estimate Peak Demand is selected and there is a minimum interval set (user input):
 1. Find all Energy register readings that are:
 - a. Greater than or equal to peak start time (user input)
 - b. Less than or equal to peak end time (user input)

2. For each reading found, scroll through the result:
 - a. Calculate the average value from the previous reading and the current reading:
 - Calculate the time difference between current reading date and previous reading date
 - If interval between previous reading and current reading is less than the minimum interval, value = 0
 - Else, value = (current reading computedValue – previous reading computedValue) / (time difference in ms / # ms in 1 hour)
 - b. If the average value is greater than the last calculated average value, set peak to the new average value and peak date to current reading.
 - f. Get the most recent energy register read (from 3.b.) for the node:
 1. Greater than or equal to start date (user input)
 2. Less than or equal to end date (user input)
 - g. Finally, write the TWACS line:
 1. If there is no energy register, read from (3.f.), then no line is written.
 2. Otherwise the line consists of:
 - a. “M” is hardcoded as first character
 - b. MeterId (= “HES/MDMS Meter ID” value in Node Attributes table)
 - c. “1” is hardcoded
 - d. Energy read computedValue (see 3.d.3.) / 1000 as Integer value only
 - e. Time of energy read as HH:mm
 - f. Date of energy read as MM/dd/yyyy
- If Peak Demand value and Peak Demand date exist (else g, h, i, shown below, are empty):
- g. Peak demand value / 1000 scaled to 3 decimal places, rounded up if last digit is > 5
 - h. Time of peak demand value as HH:mm
 - i. Date of peak demand value as MM/dd/yyyy
 - j. Empty value (kvar placeholder?)
 - k. New line

Appendix C CMEP Details

C.1 CIM Codes

The CMEP record format uses IEC CIM Codes to identify data types in each exported record. See Appendix D for more details about CIM Codes.

C.2 MEPMD01: Sample CIM Codes

The following table provides a list of sample CIM Code configurations used to generate a MEPMD01 record for each code entry. All but the last five CIM codes are interval reads. The MDMS generates interval data from the four non-interval energy CIM codes and uses the remaining voltage code only for profiling purposes. See section 5.7 Virtual Metering. The CIM Code entries are configured in the HES.

Table 6. Sample CIM Codes Used to Generate a MEPMD01 Record

CIM Code	Reading Description
2.0.4.1.0.12.0.1.0.0.72	Delivered Active Energy Fund (15-minute Interval) Wh
2.0.4.20.0.12.0.1.0.0.73	Total Reactive Energy Fund (15-minute Interval) VARh
2.9.0.0.0.54.0.0.40.0.29	Min Voltage Line A to Line C (15-minute Interval) V
2.9.0.0.0.54.0.0.66.0.29	Min Voltage Line C to Line B (15-minute Interval) V
2.9.0.0.0.54.0.0.132.0.29	Min Voltage Line B to Line A (15-minute Interval) V
2.8.0.0.0.4.0.0.128.0.5	Max Current Phase A (15-minute Interval) A
2.8.0.0.0.4.0.0.64.0.5	Max Current Phase B (15-minute Interval) A
2.8.0.0.0.4.0.0.32.0.5	Max Current Phase C (15-minute Interval) A
0.0.1.20.0.12.0.0.0.0.72	Total Energy Wh
0.0.1.19.0.12.0.0.0.0.72	Received Energy Wh
0.0.1.4.0.12.0.0.0.0.72	Net Energy Wh
0.0.1.1.0.12.0.0.0.0.72	Delivered Energy Wh
0.0.6.0.0.54.0.0.0.0.29	Indicating Voltage

C.3 MEPMD02: Sample CIM Codes

The following table provides a list of sample CIM Code configurations used to generate a MEPMD02 record for each code entry. In addition to the Total, two TOU tiers, A and B, and associated demands, the last five codes used in the MEPMD01 records for virtual metering. Only the billing read, usually the read before or at midnight local time, is included in a record. See section 5.7 Virtual Metering. The CIM Code entries are configured in the HES.

Table 7. Sample CIM Codes Used to Generate a MEPMD02 Record

CIM Code	Reading Description
0.0.1.19.0.12.0.1.0.0.73	Received Reactive Energy Fund VARh
0.0.1.20.0.12.0.1.0.0.73	Total Reactive Energy Fund VARh
0.0.1.1.0.12.0.1.0.0.73	Delivered Reactive Energy Fund VARh
0.0.1.19.0.12.0.1.0.0.72	Received Active Energy Fund Wh
0.0.1.1.0.12.0.1.0.0.72	Delivered Active Energy Fund Wh
0.8.0.1.0.8.0.1.0.0.38	Demand Max Active Power Delivered Fund W
0.8.0.1.0.8.0.1.0.0.63	Demand Max Reactive Power Delivered Fund VAR
0.8.9.1.0.8.3.1.0.0.38	Demand Max Real Power Delivered W
0.8.0.20.0.8.0.0.0.0.61	Demand Max Total Apparent VA
0.0.9.1.0.12.3.1.0.0.72	Delivered Energy(TOU Rate A) Wh
0.0.9.19.0.12.3.1.0.0.72	Received Energy(TOU Rate A) Wh
0.0.9.1.0.12.3.1.0.0.73	Delivered Reactive Energy (TOU Rate A) VARh
0.0.9.19.0.12.3.1.0.0.73	Received Reactive Energy (TOU Rate A) VARh
0.0.9.20.0.12.3.1.0.0.73	Total Reactive Energy (TOU Rate A) VARh
0.8.9.1.0.8.3.1.0.0.63	Demand Max Reactive Power Delivered (TOU Rate A) VAR
0.8.9.20.0.8.3.1.0.0.61	Demand Max Total Apparent (TOU Rate A) VA
0.0.9.1.0.12.3.2.0.0.72	Delivered Energy(TOU Rate B) Wh
0.0.9.19.0.12.3.2.0.0.72	Received Energy(TOU Rate B) Wh
0.0.9.1.0.12.3.2.0.0.73	Delivered Reactive Energy (TOU Rate B) VARh
0.0.9.19.0.12.3.2.0.0.73	Received Reactive Energy (TOU Rate B) VARh
0.0.9.20.0.12.3.2.0.0.73	Total Reactive Energy (TOU Rate B) VARh
0.8.9.1.0.8.3.2.0.0.63	Demand Max Reactive Power Delivered (TOU Rate B) VAR
0.8.9.20.0.8.3.2.0.0.61	Demand Max Total Apparent (TOU Rate B) VA
0.0.1.20.0.12.0.0.0.0.72	Total Energy Wh
0.0.1.19.0.12.0.0.0.0.72	Received Energy Wh
0.0.1.4.0.12.0.0.0.0.72	Net Energy Wh
0.0.1.1.0.12.0.0.0.0.72	Delivered Energy Wh

C.4 MLA01 Event Codes

The CMEP export references a table of Event Codes to determine which events are populated in the MLA01 record and the required translation between the AMI event code mapping and the MDMS event code mapping. Only event codes in the table are populated in the MLA01 record. Multiple AMI event codes can map to the same MDMS event code. The inclusion or exclusion and mapping of event codes can be changed as part of the meter program integration process. The Event Code entries are configured in the HES.

The following table provides a list of sample Event Codes used to generate MLA01 records. The first column shows the AMI system code mapping and the second the MDMS mapping, i.e., the required MLA01 record mapping.

Table 8. Sample Event Codes Used to Generate MLA01 Records

AMI System	MDMS	Description
3.2.17.149	2.2.1.149	Meter Low Battery
2.36.14.139	2.36.1.29	Meter sense of time Error
3.11.1.40	3.11.7.40	Configuration Error
6.20.1.185	3.26.1.185	Power Failure Detection
6.20.9.185	3.26.9.216	Power Failure Clear
3.26.1.219	3.33.1.219	Reverse Energy Flow Detection
3.33.1.257	3.33.1.257	Tamper Detection
6.38.14.276	6.38.1.276	Low Loss Potential

C.5 Record Formats

C.5.1 Timestamps

Timestamp requirements below must be followed to be compatible with the MDMS:

- All timestamps must be at the “End of the Frequency.”
“End of the Frequency” implies the timestamp aligns to a multiple of the read frequency. For a 15-minute read frequency the allowable timestamps fall at 0, 15, 30 and 45 minutes after the hour.
- Timestamps start at the previous midnight local time and repeat at the metering frequency until the last timestamp that corresponds to midnight local time.
- The first interval is from midnight local time to midnight local time plus the read interval, i.e., if midnight local time is UTC+5 and the read frequency is every 15 minutes, the first interval starts at 05:00 and ends at 5:15.
- The end of the interval is always used as the timestamp.

C.5.2 MEPMD01 Details

The MEPMD01 record encapsulates interval data.

- Interval data is identified by a CIM Code Time attribute enumeration of 1 to 7 which also indicates the read frequency.

- NOTES:**
1. i210+ data is identified by a CIM Code Time attribute enumeration outside the 1 to 7 range. See section 5.7 Virtual Metering.
 2. The MDMS converts the i210+ energy data to interval data by computing delta values from consecutive energy reads. See section 5.7 Virtual Metering.

- The number of triplets in a record is typically equal to the time interval the record spans divided by the read frequency.

NOTE: The record triplet count must equal the number of triplets. The MDMS validates the record by comparing the number of triplets against the count.

- CIM code attributes are used by the MDMS to determine the correct units, direction of flow, phase, etc., for the interval data.
- All MEPMD01 records must be aligned to the first interval.

- NOTES:**
1. If the export spans 24 hours of a 15-minute meter, the records contain 96 triplets (assuming that there is no missing data starting at the first interval).
 2. If the export spans 2 hours of a 15-minute meter, the records contain 8 triplets assuming the following:
 - There is no missing data starting at first interval
or
 - The first interval plus integer multiples of 2 hours as follows:
 - Export #2 starts at first interval plus 2 hours
 - Export #3 starts at first interval plus 4 hours
 -
 -
 -
 - Export #12 starts at first interval plus 22 hours

C.5.3 MEPMD02 Details

The AMI system uses the MEPMD02 record to encapsulate register data.

- All MEPMD02 reads must be at midnight local time using UTC, i.e., UTC + (time zone).

NOTE: If there is no reading for midnight local time, the next “End of the Frequency” read before midnight local time within the last 24 hours is reported, i.e., the CMEP export searches backward in time until a read is encountered or the previous midnight local time is reached.

- CIM code attributes are used by the MDMS to determine the correct attributes for the interval data.

NOTE: Units, Direction of Flow, Phase and TOUs are all attributes included in the CIM code used by the MDMS to qualify the data.

- The start and end timestamps in the record indicate the time window the record spans and is typically set to the entire 24 hours from the first interval timestamp to the last interval timestamp at midnight local time.

C.6 Record Definitions

C.6.1 MEPMD01: Metering Data Type 1 – Interval

Table 9. MEPMD01: Metering Data Type 1 – Interval

Field Name	Data Type/Length	Format	Required	Description
Record Type	Varchar (7)	General: AAAAAAA Specific Usage: "MEPMD01"	Y	This field always contains the record type "MEPMD01"
Record Version	Date	General: yyyyMMdd Specific Usage: 20131015	Y	This field contains the CMEP version date. The current version being supported is "20080130"
Sender ID	Varchar (10)	General: AAAAAAA Specific Usage: "ONRAMP"	N	This field is fixed to ONRAMP
Sender Customer ID	Char (11)	<empty>	Y	This field is left blank
Receiver ID	Char (8)	<empty>	N	This field is left blank
Receiver Customer ID	Hexadecimal Number (8)	General: NNNNNNNN Example: "0003A48F"	Y	This field contains the ORW NodeID
Timestamp	Date/Time	yyyyMMddHHmm Example: 201001310855	Y	UTC Date and Time this record was created.
Meter ID	Varchar (50)	Meter number	Y	This is the ID that is used as a key for the integration between the MDMS and ORWAMI Head End System. This is the meter number or meter ID based on a configuration.
Custom Metadata Field(s)	Varchar(30)	General: AAAAAAA	N	This is where any custom metadata fields specified will appear
Purpose	Varchar (8)	General: AAAAAAA Specific Usage: "OK"	Y	Indicated the reason for this data transmission. Defined value are: "OK" – Normal transmission
Commodity	Char (1)	General: A Specific Usage: "E"	Y	Describes what commodity type is being delivered. "E" – Electricity
CIM Code	VarChar(43)	mRID Example: "0.0.1.1.0.12.0.0.0.3.72"	Y	IEC 61968-9 ReadTypeID see Annex C.

Field Name	Data Type/Length	Format	Required	Description
Calculation Constant	Number (1,0)	General: N Specific Usage: "1"		Fixed to "1". Refer to CIM Code Attribute #8, metric multiplier.
Interval	Time Interval (Number (4))	General: NN Example: "15"	Y	Indicates the meter program interval duration in minutes. Use CIM Code Attribute #1, time for interval data. Use user-supplied time for non-interval data.
Count	Number (2,0)	General: NN Example: "96"	Y	Indicate the number triples (date/time, quality code and value) to follow.
Data Triplet: The following fields repeat for each interval/register read provided in the file.				
Date/Time	Date/Time	yyyyMMddHHmm	Y	Indicates the end time of the interval. The Date/Time field is supplied in UTC format.
Protocol Text	Char (7)	General: AAAAAAA Specific Usage: R0	Y	This field is populated with the data quality information. Always R0
Numeric Floating Point	Number (12,2)	General:NNNNNNNNNNNN.NN Specific: 123456789012.34	Y	This field is populated with the interval data value. Use CIM Code Attribute #3, accumulation behavior, to determine if this field contains bulk data (C.3=1) needing conversion into an interval time series. Non-Interval data is converted into interval data by computing the difference between consecutive values spaced at uniform intervals of time.

C.6.2 MEPMD02: Metering Data Type 2 – Register (Total, TOU, Demand)

Table 10. MEPMD02: Metering Data Type 2 – Register (Total, TOU, Demand)

Field Name	Data Type/Length	Format	Required	Description
Record Type	Varchar (7)	General: AAAAAAA Specific Usage: "MEPMD02"	Y	This field always contains the record type "MEPMD02"

Field Name	Data Type/Length	Format	Required	Description
Record Version	Date	General: yyyyMMdd Specific Usage: 20131015	Y	This field contains the CMEP version date. The current version being supported is "20080130"
Sender ID	Varchar (10)	General: AAAAAAA Specific Usage: "ONRAMP"	N	This field is fixed to ONRAMP.
Sender Customer ID	Char (11)	<empty>	Y	This field is left blank
Receiver ID	Char (8)	<empty>	N	This field is left blank
Receiver Customer ID	Hexadecimal Number (8)	General: NNNNNNNN Example: "0003A48F"	Y	This field contains the ORW NodeID
Timestamp	Date/Time	yyyyMMddHHmm Example:201001310855	Y	UTC Date and Time this record was created.
Meter ID	Varchar (50)	Meter number	Y	This is the ID that is used as a key for the integration between the MDMS and ORWAMI Head End System. This is the meter number or meter ID based on a configuration.
Custom Metadata Field(s)	Varchar(30)	General: AAAAAAAA	N	This is where any custom metadata fields specified will appear
Purpose	Varchar (8)	General: AAAAAAAA Specific Usage: "OK"	Y	Indicated the reason for this data transmission. Defined value are: "OK" – Normal transmission
Commodity	Char (1)	General: A Specific Usage: "E"	Y	Describes what commodity type is being delivered. "E" – Electricity
CIM Code	VarChar(43)	mRID Example: "0.0.1.1.0.12.0.0.0.3.72"	Y	IEC 61968-9 ReadTypeID see Annex C.
Season Identifier	Char	<empty>		This field is left blank.
Calculation Constant	Number (1,0)	General: N Specific Usage: "1"		Fixed to "1". Refer to CIM Code Attribute #8, metric multiplier.
Data Start Time	Date/Time	yyyyMMddHHmm Example:201001300005		Start time of the reporting interval
Data End Time	Date/Time	yyyyMMddHHmm Example:201001310005		End time of the reporting interval.

Field Name	Data Type/Length	Format	Required	Description
Count	Number (2,0)	General: NN Specific Usage: "1"		Always "1" to indicate a single triple (label, quality code and value) to follow.
Data Triplet: The following three fields are not repeated.				
Date/Time	Date/Time	yyyyMMddHHmm	Y	For Demand values this field contains the peak time of the demand. The Date/Time field is supplied in UTC format. For all other values, TOU and Total, indicates the read time. The Date/Time field is supplied in UTC format. For TOU values, the CIM Code Attribute C.6.2 is used as the TOU label, i.e., 3.x where "x" is the TOU label.
Protocol Text	Char (7)	General: AAAAAAA Specific Usage: R0	Y	This field is populated with the data quality information. Always R0
Numeric Floating Point	Number (12,2)	General:NNNNNNNNNNNN.NN Specific: 123456789012.34	Y	This field is populated with the Demand, Total or TOU data value.

C.6.3 MLA01: Meter Level Alarm Type 1

Meter-level alarms are distinct from data quality flags in that they are not associated with a particular interval or register read.

Table 11. MLA01: Meter Level Alarm Type 1

Field Name	Data Type/Length	Format	Required	Description
Record Type	Varchar (7)	General: AAAAAAA Specific Usage: "MLA01"	Y	This field always contains the record type "MLA01"
Record Version	Date	General: yyyyMMdd Specific Usage: 20080501	Y	This field contains the CMEP version date. The current version being supported is "20080501"
Sender ID	Varchar (10)	General: AAAAAAA Specific Usage: "ONRAMP"	N	This field is fixed to ONRAMP.
Sender Customer ID	Char (11)	<empty>	Y	This field is left blank
Receiver ID	Char (8)	<empty>	N	This field is left blank

Field Name	Data Type/Length	Format	Required	Description
Receiver Customer ID	Hexadecimal Number (8)	General: NNNNNNNN Example: "0003A48F"	Y	This field contains the ORW NodeID
Timestamp	Date/Time	yyyyMMddHHmm Example: 201001310855	Y	UTC Date and Time this record was created.
Meter ID	Varchar (50)	Meter number	Y	This is the ID that is used as a key for the integration between the MDMS and Sensus AMI Head End System. This is the meter number stored in CIS.
Custom Metadata Field(s)	Varchar(30)	General: AAAAAAAA	N	This is where any custom metadata fields specified will appear
Purpose	Varchar (8)	General: AAAAAAAA Specific Usage: "OK"	Y	Indicated the reason for this data transmission. Defined value are: "OK" – Normal transmission
Commodity	Char (1)	General: A Specific Usage: "E"	Y	Describes what commodity type is being delivered. "E" – Electricity
Units	Char (6)	General: AAAAAA Specific Usage: METERDQ	Y	Always METERDQ
Calculation Constant	Number (1,0)	<empty>		
Interval	Time Interval	<empty>		
Count	Number (2,0)	General: NN Specific Usage: 1		Number of alarms (triples) reported in the row. Always 1
Data Triplet: The following three fields are not repeated.				
Date/Time	Date/Time	yyyyMMddHHmm	Y	Indicates when the alarm event was transmitted. The Date/Time field is supplied in UTC format.
Protocol Text	Char (7)	General: AAAAAAAA Specific Usage: R0	Y	This field is populated with the data quality information. Always R0
IEC Event Code	Number (12)	General:NNNNNNNNNNNN Example: "3.26.14.185"	Y	IEC 61968-9 Event Code see Annex E.

C.7 MDMS Requirements

The MDMS is expected to support the requirements listed below.

NOTE: Several of these requirements have been cited and detailed in previous sections of this document.

- MDMS uses the CMEP record formats defined in this document and the corresponding use of the MEPMD01 record type for interval data, the MEPMD02 record type for register data and the MLA01 record type for meter event codes.
- MDMS uses IEC CIM code attribute fields embedded in the CMEP records to determine data attributes like units of measure, interval frequency, direction of flow, phase, TOU tier, etc.
- MDMS accepts data from metering programs with different read intervals, i.e., meters programmed with different interval read rates or register read rates.
- MDMS accepts data from metering programs with unique CIM codes assigned to billing and/or load profile data. The MDMS must accommodate meter program changes that result in the use of different CIM codes for billing and/or load profile purposes, i.e., hardcoded CIM codes will not provide the needed flexibility and some level of filtering based on CIM code attributes is needed.
- MDMS provides Virtual Metering support for the conversion of high frequency, energy-only meter reads into interval data. This consists of identifying the MEPMD01 records for energy register reads and taking the difference of consecutive time-stamped values to use as interval data. Also a subset of the energy register reads included in the MEPMD02 records are still used as register reads.

NOTE: Virtual TOU support is also possible but outside the scope of this document.

- MDMS supports unique file transfer schedules for each record type, i.e., the AMI system may deliver MEPMD01 records every two hours, MEPMD02 records every 24 hours and MLA01 records every hour.

Appendix D CIM Codes

D.1 CIM Codes

Many of the OTV interfaces use CIM codes. The mapping of meter data to CIM codes can be changed as part of the meter program integration process. For most purposes only a subset of the nine CIM code attributes should be used for data processing/filtering. In the following sections, mapping examples illustrate how attributes are used to identify data types.

The following table lists the CIM code attribute enumerations used by the AMI system to identify meter data. The MDMS usage notes identify specific use cases associated with an attribute.

Table 12. CIM Code Attribute Enumerations and Use Cases

Description	Attribute #	Supported Enumerations	MDMS Usage Notes
Time	1	0 = Bulk 1-7 = Interval (2 = 15 minutes) 32 = Coincident (non-standard)	MDMS uses C.1=0 in MEPMD01 record CIM codes to identify energy only register reads for Virtual Metering support.
Data Qualifier	2	0 = Not applicable 2 = Average 8 = Maximum 9 = Minimum	
Accumulation	3	All = Not applicable	MDMS ignores C.3.
Direction of Flow	4	0 = Not applicable 1 = Delivered/Forward 4 = Net 6 = All Quadrants 19 = Received/Reverse 20 = Total	
Measure	5	0.4 = Current 0.8 = Demand 0.12 = Energy 0.37 = Power 0.38 = PowerFactor 0.54 = Voltage	MDMS uses C.5=12 for MEPMD01 records with C.1=0 to signal interval generation for Virtual Metering support.
TOU Tier	6	3.1 = Tier 1 (typically On Peak) 3.2 = Tier 2 (typically Off Peak) 3.3-7 = Tier 3 through 7	MDMS uses C.6.2 to indicate TOU tier when C.6.1=3 (TOU) and ignores C.6 otherwise.
Phase	7	0 = Not Applicable 128 = Phase A 64 = Phase B 32 = Phase C 40 = Line A to Line C 66 = Line C to Line B 132 = Line B to Line A	

Description	Attribute #	Supported Enumerations	MDMS Usage Notes
Multiplier	8	0 = Not applicable 2 = % (percentage) 3 = k (Kilo)	
Units	9	5 = Amps (Current) 29 = Volts (Potential) 38 = W (Real Power) 61 = VA (Apparent Power) 63 = VAr (Reactive Power) 65 = Degrees (Power Factor) 72 = Wh (Real Energy) 73 = Arh (Reactive Energy)	

D.2 Load Profile

Per the IEC 61968-9 edition 1.0 standard, the first attribute in a meter reading CIM code is the time attribute (see table C.1 on page 107 of the standard). However, the time attributes defined and enumerated in the IEC standard only supports a limited number of load profile interval durations. Most modern meters can support load profile interval durations that are not listed in the standard. In order to address this issue, On-Ramp Wireless has implemented the following set of time attribute enumerations in OTV 1.1 and later.

Table 13. Load Profile CIM Codes Times

Load Profile Interval Duration (Minutes)	C1 Time Attribute Enumeration
1	3
2	10
3	14
4	34*
5	6
6	36*
10	1
12	42*
15	2
20	50*
30	5
60	7

*** NOTE:** The C1 Time Attribute Enumerations above denoted with an asterisk (*) are values that are not defined by the IEC 61968-9 standard. The formula used to generate these non-standard time enumerations is:

$$\text{<time>} = 30 + (\text{LP Interval Duration in Minutes})$$

This formula can be used to generate new C1 Time Attribute Enumerations that are not listed above.