



Meter Reading

Web Services Data Exchange Specification

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ISO New England Inc.

Change Summary

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Version 1.0	June 2016	Initial release

About this document

The Meter Reading Web Services Data Exchange Specification document describes the REST messages and the Authentication and Authorization process used to exchange meter reading data between a Meter Reader and the Meter Reading application through web services. It also describes the upload and download files used to exchange meter reading data through a Meter Reader's web browser and the "Submit Meter Reading" user interface provided by the SMD Site for ISO Applications. The user interface upload/download files and the web service REST messages share the same data format. This document explains how to access the Meter Reading web services, lays out the format and construction of REST messages used to exchange data, and briefly describes the Authentication and Authorization methods used to ensure security.

This guide is designed to assist Meter Readers develop personal interfaces that interact and exchange meter reading data with the Meter Reading web services. It will help Meter Readers comprehend and construct the meter reading data messages essential for data exchange with the Meter Reading application. It can also help Meter Readers develop software that generates upload files for use with the Meter Reading user interface, or software that parses download files obtained from the Meter Reading user interface.

Scope and prerequisite knowledge

This document is offered to ISO New England Meter Readers as an aid in developing new interfaces as well as assisting in the upgrade/re-design of existing interfaces. Users should be familiar with Extensible Markup Language (XML), Web Services, HTTP/HTTPS protocols, and ISO New England's governing documents, business rules and operating procedures. Refer to [References and Additional Information](#) for helpful links.

Structure of this document

- Section 1 gives an overview of the Meter Reading web services including Meter Reading web service design and access, Meter Reading roles, and authentication and authorization.
- Section 2 describes REST operations and their construction.
- Section 3 explains the functionality of the REST operations available for exchanging meter reading data between a Meter Reader and the Meter Reading application.
- Section 4 describes upload/download files and their format.

References and Additional Information

All of the data exchanges using the Meter Reading web services support XML data described by types defined in the Meter Reading XSD files:

- **vnd.iso-ne.error.xsd**
- **vnd.iso-ne.metering.readers.v1.xsd**
- **vnd.iso-ne.metering.reading_blocks.v1.xsd**
- **vnd.iso-ne.metering.submissions.v1.xsd**

Additional information about Extensible Markup Language (XML), Web Services, and other helpful information can be found at the following web locations:

- XML –
 - **<http://www.w3.org>** > XML Technology
 - **<http://www.w3schools.com>** > Learn XML
- Web Services –
 - **<http://www.w3.org>** > Web Service Technology
 - **<http://www.w3schools.com>** > Learn Web Services
- REST –
 - **<http://www.packetizer.com/ws/rest.html>**

ISO New England governing documents include the Transmission, Markets & Services Tariff, ISO New England Manuals and Operating Procedures. They can be found at the following location:

- **<http://www.iso-ne.com/participate/rules-procedures>**

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1. Web Service Overview

This section gives an overview of web service concepts associated with the Meter Reading web services, how to access the Meter Reading web services, and the appropriate Meter Reading roles.

1.1 Web Service Design

The Meter Reading web services (the Meter Reading application's programmatic interface) are organized as a tree of HTTP resources with different URL patterns for different types of resources. Each type of HTTP resource is considered a separate "web service" in section 3 below. The different resource types support specific operations from the standard HTTP methods (GET, POST, etc.) and have their own message structures for transferring meter reading data between a Meter Reader and the Meter Reading application through the interaction of the Meter Reader's client interface and the Meter Reading application's web services. The web service messages all may use XML format for data transmission, in addition to CSV format for modifying bulk data, which is discussed in more detail in chapter 2 entitled REST Messages.

All web service requests follow the request/response pattern supported by HTTP(S) communication. A request may contain a message that modifies (or submits) data identified in the URL or it may query for data identified in the URL. The response is a message that is either: 1) the new state of the data following a modification, 2) an error, or 3) the current state of the data for a query.

Any resource that allows data to be modified will support a GET operation that allows for that data to be queried. These resources have a modifying operation (POST e.g.) and a GET operation that return the same data. Some resources simply have GET operations, and they are used for the sole purpose of requesting specific data from the Meter Reading application.

1.2 Accessing the Meter Reading web services

The Meter Reading web services are based on REST over HTTPS (version 1.1). A client application that accesses the Meter Reading application can be written in nearly any modern enterprise technology and language, such as Java, .NET, C++, Ruby, etc. The web service is accessible to authorized Meter Readers through an ISO New England published URL, and all posts/puts of data and queries are serviced via the same URL.

Access to Meter Reading web services is managed through the Customer and Asset Management System (CAMS).

Your company's Security Administrator (SA) is responsible for assigning roles per your company's internal procedures and controls.

The SA is also responsible for issuing digital certificates to users, as required (e.g., a customer may already have a digital certificate if they already have access to another ISO SMD application).

For details on managing access, SAs can refer to the "CAMS User Guide for Digital Certificates" which is available by contacting ISO-NE Customer Support.

1.3 Meter Reading Roles

Roles restrict the web service operations/messages available to a given user to submit or query data. Currently there is a single role for all Meter Reader users of the Meter Reading application, and all Meter Reader users of the Meter Reading application have uniform access to the Meter Reading web services. All operations defined for every type of resource below are accessible to any Meter Reader user of the Meter Reading application. Use of a web service operation by a user without the role allowing access to the Meter Reading application will result in an error (see error handling in Section 2.1).

2. REST Messages

This section describes constructing REST messages, restrictions on data submitted, and REST format/documentation.

REST is an architecture style for exchanging information involving Web Services such as those provided by the Meter Reading application. Meter Reading REST messages are constructed using Extensible Markup Language (XML) as a structure to store data. REST messages used to modify bulk data may also structure data as Comma-Separated Values (CSV). This XML or CSV message body carries descriptions of the data for interpretation by an interface or Web Service.

Each HTTP message body used by the Meter Reading application has one of these *media types*, including ISO New England-defined XML media types, ISO New England-defined CSV media type alternatives for modifying bulk data, and plain text media type as an alternative for querying Submission information:

- application/vnd.iso-ne.error+xml;charset=UTF-8
- application/vnd.iso-ne.metering.readers.v1+xml;charset=UTF-8
- application/vnd.iso-ne.metering.reading_blocks.v1+xml;charset=UTF-8
- application/vnd.iso-ne.metering.submissions.v1+xml;charset=UTF-8
- text/vnd.iso-ne.metering.reading_blocks.v1+csv;charset=UTF-8
- text/vnd.iso-ne.metering.reading_blocks.v2+csv;charset=UTF-8
- text/plain

The XML data in each XML-type HTTP message body has one of these ISO New England-defined *XML Schemas*:

- *Namespace* <http://xmlns.iso-ne.com/error> in *Schema XSD file* vnd.iso-ne.error.xsd
- *Namespace* <http://xmlns.iso-ne.com/metering/readers> in *Schema XSD file* vnd.iso-ne.metering.readers.v1.xsd
- *Namespace* http://xmlns.iso-ne.com/metering/reading_blocks in *Schema XSD file* vnd.iso-ne.metering.reading_blocks.v1.xsd
- *Namespace* <http://xmlns.iso-ne.com/metering/submissions> in *Schema XSD file* vnd.iso-ne.metering.submissions.v1.xsd

2.1 REST Operations Responses

The Meter Reading application allows clients to modify meter reading data via the web services for All Assets' Reading Blocks and Asset's Reading Block for Operating Day. These resources support POST requests. When a client POSTs to one of these resources, the Meter Reading application allows the client to track the POST request and see details about its progress and outcome via the web services for Submission and Submission Attachment.

The POST can either result in critical errors (unable to parse request message, e.g.) or succeed with possible non-critical errors (reading value out of range, e.g.). For a POST resulting in a critical error, an error response will be sent to the client with the appropriate HTTP response status code. For a POST avoiding any critical errors, a successful response (201 Created or 202 Accepted) will be sent to the client with the response message body containing the Submission resource. 201 Created means the process is already complete, and the response contains a Submission with the final outcome of the request. 202 Accepted means the Meter Reading

application is continuing to process the request, and the client can query the Submission resource for further status updates.

It may be that some or all of the individual Reading Blocks are rejected due to a non-critical error and therefore not submitted. The non-critical errors and not-submitted status will be reflected in the Submission resource's details. When a client modifies data in bulk by a POST to All Assets' Reading Blocks, multiple Reading Blocks may be involved, in which case there may be some Reading Blocks submitted (accepted) and other Reading Blocks not submitted (rejected). The Submission resource's details will indicate which Reading Blocks are submitted and which are not. The web service will use a database transaction to commit only if all the submitted Reading Blocks are modified entirely successfully. If an exception occurs, the transaction will be rolled back, which the Submission resource's details also indicate.

The client error 4XX response status codes are used to indicate critical errors requiring correction on the client side, e.g.:

- 404 Not Found for requests whose URLs do not name a supported resource.
- 405 Method Not Allowed for requests using an operation unsupported for the resource, e.g. a POST for a GET-only resource.
- 415 Unsupported Media Type for requests (e.g. POSTs) specifying a media type besides the ones listed above for the Meter Reading application.
- 400 Bad Request for requests whose message body is not valid data of the expected XML type (or CSV format).

Many client error 4XX responses will result from generic error conditions and will include a generic text/plain HTTP response body. Some requests check for specific error conditions and have client error 4XX responses with an XML HTTP response body that provides more details in a structure the client can process meaningfully. For instance, a POST to All Assets' Reading Blocks uses an:

- application/vnd.iso-ne.error+xml; charset=UTF-8 response body to report series of data validation errors in a 400 Bad Request response.
- application/vnd.iso-ne.metering.submissions.v1+xml; charset=UTF-8 response body to report conflicting Submission in a 409 Conflict response.

2.2 Format and Construction

Each REST HTTP request supported by the Meter Reading application has a common base URL:

- https://smd.iso-ne.com/sms_oper_metering/api

Different types of resources (the web services listed below) are named by URL patterns, where an individual resource has a specific URL that applies specific values to the pattern, e.g.:

`https://smd.iso-ne.com/sms_oper_metering/api/readers/1/assetRegistrations`
`https://smd.iso-ne.com/sms_oper_metering/api/readingBlocks/assets/1/dates/20151015`

Clients are encouraged to use **Accept** request headers with a version-specific media type to support future API versioning (e.g., `Accept: application/vnd.iso-ne.metering.readers.v1+xml; charset=UTF-8`).

2.3 Date/time Format

Date/time values in each XML-type HTTP message body (and, except where noted, in each CSV-type HTTP message body) are in Internet date/time format with a time zone, following ISO New England web services standards. Internet date/time format is described in <https://tools.ietf.org/html/rfc3339>, RFC 3339 - Date and Time on the Internet: Timestamps.

Date/time values in responses from the Meter Reading web services use the UTC time zone designation (“Z”), for instance, for midnight beginning the October 20 2015 operating day at ISO New England:

2015-10-20T04:00:00Z

Meter Reading web services accept date/time values in client request message bodies:

- With the UTC time zone designation (“Z”), as used in responses to the client.
- With local-offset time zone designation, as in the web services of other SMD ISO Applications like eMarket.

Meter Reading web services reject client request message bodies with unqualified local date/time values (those without any time zone designation).

3. Web Services

This section explains the functionality of the REST operations available for exchanging meter reading data between a Meter Reader and the Meter Reading application.

3.1 Reader’s Asset Registrations

3.1.1 Purpose of Message

Returns a collection of Asset Registrations belonging to the Meter Reader indicated by the *readerCustomerId* parameter.

3.1.2 REST Endpoint

URL https://smd.iso-ne.com/sms_oper_metering/api/readers/{readerCustomerId}/assetRegistrations

Media Type application/vnd.iso-ne.metering.readers.v1+xml;charset=UTF-8

3.1.3 Request Method

GET returns a collection of Asset Registrations belonging to the Meter Reader indicated by the *readerCustomerId* parameter. Collection contains one Asset Registration for each asset and operating day where *readerCustomerId* is the asset’s meter reader (and the asset is active and has hourly metering submittal). Each Asset Registration includes the asset’s registration parameter values effective as of the operating day.

3.1.4 Mandatory and Optional Fields

Parameters - mandatory parameters:

- *readerCustomerId* – Meter Reader’s unique numeric ID at ISO New England.

Parameters - optional query parameters:

Parameter name	Data Type; Format	Comments
<i>page, start, and limit</i>	Number	Subset of Meter Reader’s records (Asset Registrations) to retrieve, based on total matching other query parameters. limit must be >=1 and <=1000 and defaults to 25 records. start must be >=0 and defaults to 0 (first page of records).
<i>sort and dir</i>	String	Sort registrations according to a specific field <i>sort</i> and direction <i>dir</i> . <i>dir</i> may be “ASC” or “DESC”. Valid <i>sort</i> values: <ul style="list-style-type: none"> • asset_id • begin • asset_type_desc • asset_sub_type • asset_name Defaults to asset_id, ascending.
<i>begin_date</i> and <i>end_date</i>	Date ; yyyymmdd	Return registrations for the range of operating days between these two Eastern Time yyyymmdd dates, inclusive. E.g. <i>begin_date</i> 20151020 and <i>end_date</i> 20151020 returns registrations for a single day, October 20 2015. Ranges with two or more days are only allowed if <i>reading_exception</i> is also specified. Defaults to a single day, the day prior to the current time.
<i>asset_search_type</i>	String	Return registrations for assets with a related type: <ul style="list-style-type: none"> • ALL_ENERGY_ASSETS • GENERATING_UNITS • LOAD_ASSETS • TIE_LINES • ALL_FCM_DEMAND_ASSETS • ON_PEAK • REAL_TIME • REAL_TIME_EG • SEASONAL_PEAK Defaults to ALL_ENERGY_ASSETS.
<i>reading_exception</i>	String	Return registrations for assets with current readings meeting a certain condition as of an operating day: <ul style="list-style-type: none"> • MISSING_READINGS • EXCEEDS_THRESHOLD By default (when parameter is omitted), registrations will be returned regardless of current readings.

3.1.5 Sample Request

To return a collection of Asset Registrations belonging to the Meter Reader:

- as of October 20 2015,
- for Generating Unit assets,
- and up to the first 25 Asset Registrations when sorted by asset ID,

the Meter Reader with numeric ID 1 may request:

GET https://smd.iso-ne.com/sms_oper_metering/api/readers/1/assetRegistrations?begin_date=20151020&end_date=20151020&asset_search_type=GENERATING_UNITS

3.1.6 Data Returned

```
<?xml version="1.0" encoding="UTF-8"?>
<asset_registrations xmlns="http://xmlns.iso-ne.com/metering/readers">
  <query_info>
    <total_record_count>2</total_record_count>
  </query_info>
  <asset_registration>
    <asset_id>2000</asset_id>
    <begin>2015-10-20T04:00:00Z</begin>
    <asset_type_desc>Unit</asset_type_desc>
    <asset_sub_type>SOLAR</asset_sub_type>
    <asset_name>COMPANY PV 01</asset_name>
    <summer_cap_mw>1.67</summer_cap_mw>
    <winter_cap_mw>1.67</winter_cap_mw>
    <low_limit_mw>0</low_limit_mw>
  </asset_registration>
  <asset_registration>
    <asset_id>2001</asset_id>
    <begin>2015-10-20T04:00:00Z</begin>
    <asset_type_desc>Unit</asset_type_desc>
    <asset_sub_type>SOLAR</asset_sub_type>
    <asset_name>COMPANY PV 02</asset_name>
    <summer_cap_mw>2.5</summer_cap_mw>
    <winter_cap_mw>2.5</winter_cap_mw>
    <low_limit_mw>0</low_limit_mw>
  </asset_registration>
</asset_registrations>
```

3.2 All Assets' Reading Blocks

3.2.1 Purpose of Message

Returns or updates a collection of Reading Blocks.

3.2.2 REST Endpoint

URL https://smd.iso-ne.com/sms_oper_metering/api/readingBlocks

Media Types

- application/vnd.iso-ne.metering.reading_blocks.v1+xml;charset=UTF-8
- application/vnd.iso-ne.metering.reading_blocks.v1.xml.gzip;charset=UTF-8 (for GET only)
- text/vnd.iso-ne.metering.reading_blocks.v1+csv;charset=UTF-8 (for POST only)
- text/vnd.iso-ne.metering.reading_blocks.v2+csv;charset=UTF-8 (for POST only)
- application/vnd.iso-ne.metering.submissions.v1+xml;charset=UTF-8 (for 202 Accepted and 409 Conflict responses)
- application/vnd.iso-ne.error+xml;charset=UTF-8 (for 400 Bad Request responses)

Message Body Content Encoding

- GET request may optionally allow a compressed response body for responses with a large number of readings. GET will return a response body in GZIP file format if more than 100,000 readings are returned, otherwise the response body will be normal UTF-8 character data, without compression. The response's Content-Type: header will indicate whether the response body is XML (media type application/vnd.iso-ne.metering.reading_blocks.v1+xml;charset=UTF-8) or compressed XML (media type application/vnd.iso-ne.metering.reading_blocks.v1.xml.gzip;charset=UTF-8). Clients may control this with the Accept: header, by listing both media types if the client can process both XML and compressed XML. Note that the response will not distinguish XML from compressed XML using the Content-Encoding: header, since Content-Encoding: would interfere with some specific uses, e.g. saving via a web browser user interface.
- POST request may use "Content-Encoding: gzip" header and a compressed request body in GZIP file format. POST will decompress the request body before parsing it according to the XML or CSV media type.

Message Body Data Limits

- GET response is restricted to:
 - 100,000 or fewer readings with XML media type,
 - Or 2,000,000 or fewer readings with compressed XML media type,
 - And 10 MB or smaller response body.
- POST request is restricted to 10 MB or smaller request body.

3.2.3 Request Method

GET queries hourly and five-minute Energy asset meter reading data in bulk, returning data as a collection of Reading Blocks. Collection contains one Reading Block for each asset and operating day where the asset has readings previously submitted. Each Reading Block includes the current version of the reading for each meter interval.

POST modifies hourly and five-minute Energy and FCM Demand asset meter reading data in bulk, updating the readings for each Reading Block in the request that will allow the update, so that these Reading Blocks' current reading versions match the requested readings, while

Reading Blocks that won't allow the update are left unchanged. A client may choose one of 3 media types for the POST request body, either XML, old CSV, or Sub-Hourly Settlements (SHS) CSV. The two CSV types differ in the date/time format, with old CSV only supporting hourly metering submittal assets, and SHS CSV updated to the same date/time format as the XML type to support both hourly and five minute assets.

3.2.4 Mandatory and Optional Fields

3.2.4.1 Parameters – GET optional query parameters

Parameter name	Data Type; Format	Comments
<i>meter_reader_id</i>	Number	Return blocks for assets and operating days where the asset's meter reader is a specific customer ID number. Redundant with Meter Reader's unique numeric ID at ISO New England. For a Meter Reader, this is the only value this parameter is allowed to have, and by default (the parameter is omitted) only reading blocks for Meter Reader will be returned.
<i>begin_date</i> and <i>end_date</i>	Date ; yyyymmdd	Return blocks for the range of operating days between these two Eastern Time yyyymmdd dates, inclusive. E.g. <i>begin_date</i> 20151020 and <i>end_date</i> 20151020 returns registrations for a single day, October 20 2015. Defaults to a single day, the day prior to the current time.
<i>asset_search_type</i>	String	Return blocks for assets with a related type: <ul style="list-style-type: none"> • ALL_ENERGY_ASSETS • GENERATING_UNITS • LOAD_ASSETS • TIE_LINES Defaults to ALL_ENERGY_ASSETS.
<i>asset_id</i>	Number	Return blocks for the asset with a specific asset ID number. By default (when parameter is omitted), blocks will be returned regardless of asset ID.

3.2.4.2 Data – POST XML-type request body XML elements:

Optional	Element	Data Type; Format	Comments
No	<i>asset_id</i>	xs:nonNegativeInteger	ISO New England-specified unique numeric asset ID for an individual Reading Block.
No	<i>reading_block_begin</i>	xs:dateTime; Internet date/time format with a time zone	Operating day begin date/time for an individual Reading Block.
No	<i>asset_type_desc</i>	xs:string	Meter Reading application description of asset's type: <ul style="list-style-type: none"> • Unit • Load (for Load Facility and Asset Related Demand)

			<ul style="list-style-type: none"> assets) • Tie Line • FCM Demand <p>Each Reading Block must specify this element for message consistency checking, and its value must match the asset's real value in the Meter Reading application.</p>
Yes	fcm_demand_asset_sub_type	xs:string	<p>FCM Demand asset's sub-type as of the operating day:</p> <ul style="list-style-type: none"> • ON_PEAK • REAL_TIME • REAL_TIME_EG • SEASONAL_PEAK <p>Reading Block for an FCM Demand asset must specify this element for message consistency checking, and its value must match the asset's real value in the Meter Reading application as of the operating day.</p> <p>Reading Block for an Energy asset must not specify this element.</p>
No	meter_interval_type	xs:string	<p>Asset's meter interval type (metering submittal indicator) as of the operating day:</p> <ul style="list-style-type: none"> • Hourly • Five Minute <p>Each Reading Block must specify this element for message consistency checking, and its value must match the asset's real value in the Meter Reading application as of the operating day.</p>
No	meter_reader_id	xs:nonNegativeInteger	Must be Meter Reader's unique numeric ID at ISO New England.
No	begin	xs:dateTime; Internet date/time format with a time zone	Date/time beginning the meter interval for an individual reading and its MW value(s). For a Reading Block with Hourly meter_interval_type, this is the date/time beginning a specific hour. For a Reading Block with Five Minute meter_interval_type, this is the date/time beginning a specific five minute interval.
No (for Energy)	mw	xs:decimal; 9999999.999	Reading Block for an Energy asset must specify this element

asset)			for each reading, containing the MW value. Reading Block for an FCM Demand asset must not specify this element.
Yes	tfl_mw	xs:decimal; 9999999.999	Reading Block for an FCM Demand asset <i>may</i> specify this element for each reading, containing the Hourly Total Facility Load MW value. An hour without tfl_mw is considered to be a reading with Hourly Total Facility Load undefined. Reading Block for an Energy asset must not specify this element.
Yes	dgo_mw	xs:decimal; 9999999.999	Reading Block for an FCM Demand asset with ON_PEAK / SEASONAL_PEAK fcm_demand_asset_sub_type <i>may</i> specify this element for each reading, containing the Hourly DG Output MW value. An hour without dgo_mw is considered to be a reading with Hourly DG Output undefined. Reading Block for an FCM Demand asset with other fcm_demand_asset_sub_type must not specify this element. Reading Block for an Energy asset must not specify this element.

3.2.4.3 Data – POST old-CSV-type request body CSV fields

Old CSV (media type text/vnd.iso-ne.metering.reading_blocks.v1+csv;charset=UTF-8) formats its CSV fields as follows.

Message body CSV has 1 or more multi-line Reading Blocks, with “***” separator line:

```
Meter
Daily
(
***
Reading Block
)+
***
```

Reading Block has header line and 0 or more reading lines:

```
Meter Reader ID,Asset ID,Asset Type Desc,Reading Block Date[,FCM Demand Asset Sub Type]
(
Reading
)*
```

Reading has MW value(s) for a specific meter interval:

```
Hour Ending,MW|[TFL MW]],[DGO MW]
```

CSV fields are defined in the following table.

Optional	Field	Data Type; Format	Comments
No	Asset ID	Number; 999999999	ISO New England-specified unique numeric asset ID for an individual Reading Block.
No	Reading Block Date	Date; MM/DD/YYYY	Operating day date for an individual Reading Block.
No	Asset Type Desc	String; not case-sensitive	Meter Reading application description of asset's type: <ul style="list-style-type: none"> • Unit • Load (for Load Facility and Asset Related Demand assets) • Tie Line • FCM Demand Each Reading Block must specify this field for message consistency checking, and its value must match the asset's real value in the Meter Reading application.
Yes	FCM Demand Asset Sub Type	String; not case-sensitive	FCM Demand asset's sub-type as of the operating day: <ul style="list-style-type: none"> • ON_PEAK • REAL_TIME • REAL_TIME_EG • SEASONAL_PEAK Reading Block for an FCM Demand asset must specify this field for message consistency checking, and its value must match the asset's real value in the Meter Reading application as of the operating day. Reading Block for an Energy asset must not specify this field.
No	Meter Reader ID	Number; 999999999	Must be Meter Reader's unique numeric ID at ISO New England.
No	Hour Ending	Number; 1-2 digits and optional * character	Contains the given ending hour that the meter reading was taken. Normal days have values 1-24. 2* indicates DST 25-hour day repeat hour. 2 is not valid for DST 23-hour day.

No	MW	Number; 9999999.999	Reading Block for an Energy asset must specify this field for each reading, containing the MW value.
Yes	TFL MW	Number/blank/"null"; 9999999.999	Reading Block for an FCM Demand asset <i>may</i> specify this field for each reading, containing the Hourly Total Facility Load MW value. An hour without this field is considered to be a reading with Hourly Total Facility Load undefined. A field with blank "" or the word "null", or a reading line with only the Hour Ending field, represents a reading with no value for this field.
Yes	DGO MW	Number/blank/"null"; 9999999.999	Reading Block for an FCM Demand asset with ON_PEAK / SEASONAL_PEAK fcm_demand_asset_sub_type <i>may</i> specify this field for each reading, containing the Hourly DG Output MW value. An hour without this field is considered to be a reading with Hourly DG Output undefined. A field with blank "" or the word "null", or a reading line with only the Hour Ending and TFL MW fields, represents a reading with no value for this field. Reading Block for an FCM Demand asset with other FCM Demand Asset Sub Type must not specify this field. Reading Block for an Energy asset must not specify this field.

3.2.4.4 Data – POST SHS-CSV-type request body CSV fields

SHS CSV (media type text/vnd.iso-ne.metering.reading_blocks.v2+csv;charset=UTF-8) formats its fields as follows.

Message body CSV has 1 or more multi-line Reading Blocks, with "***" separator line:

```
Meter
Daily
(
***
Reading Block
)+
***
```

Reading Block has header line and 0 or more reading lines:

```
Meter Reader ID,Asset ID,Asset Type Desc,Meter Interval Type,Reading Block Begin[,FCM Demand Asset Sub Type]
(
Reading
)*
```

Reading has MW value(s) for a specific meter interval:

CSV fields are defined in the following table.

Optional	Field	Data Type; Format	Comments
No	Asset ID	Number; 999999999	ISO New England-specified unique numeric asset ID for an individual Reading Block.
No	Reading Block Begin	Date/time; Internet date/time format with a time zone	Operating day begin date/time for an individual Reading Block.
No	Asset Type Desc	String; not case-sensitive	Meter Reading application description of asset's type: <ul style="list-style-type: none"> • Unit • Load (for Load Facility and Asset Related Demand assets) • Tie Line • FCM Demand Each Reading Block must specify this field for message consistency checking, and its value must match the asset's real value in the Meter Reading application.
No	Meter Interval Type	String	Asset's meter interval type (metering submittal indicator) as of the operating day: <ul style="list-style-type: none"> • Hourly • Five Minute Each Reading Block must specify this field for message consistency checking, and its value must match the asset's real value in the Meter Reading application as of the operating day.
Yes	FCM Demand Asset Sub Type	String; not case-sensitive	FCM Demand asset's sub-type as of the operating day: <ul style="list-style-type: none"> • ON_PEAK • REAL_TIME • REAL_TIME_EG • SEASONAL_PEAK Reading Block for an FCM Demand asset must specify this field for message consistency checking, and its value must match the asset's real value in the Meter Reading application as of the operating day. <p>Reading Block for an Energy asset must not specify this field.</p>
No	Meter Reader ID	Number; 999999999	Must be Meter Reader's unique numeric ID at ISO New England.
No	Begin	Date/time; Internet date/time format with a time zone	Date/time beginning the meter interval for an individual reading and its MW value(s). For a Reading Block with Hourly Meter Interval Type, this is the date/time beginning a specific hour. For a Reading Block with Five Minute Meter Interval Type, this is the date/time beginning a specific five minute interval.

No	MW	Number; 9999999.999	Reading Block for an Energy asset must specify this field for each reading, containing the MW value.
Yes	TFL MW	Number/blank/"null"; 9999999.999	Reading Block for an FCM Demand asset <i>may</i> specify this field for each reading, containing the Hourly Total Facility Load MW value. An hour without this field is considered to be a reading with Hourly Total Facility Load undefined. A field with blank "" or the word "null", or a reading line with only the Begin field, represents a reading with no value for this field.
Yes	DGO MW	Number/blank/"null"; 9999999.999	<p>Reading Block for an FCM Demand asset with ON_PEAK / SEASONAL_PEAK fcm_demand_asset_sub_type <i>may</i> specify this field for each reading, containing the Hourly DG Output MW value. An hour without this field is considered to be a reading with Hourly DG Output undefined. A field with blank "" or the word "null", or a reading line with only the Begin and TFL MW fields, represents a reading with no value for this field.</p> <p>Reading Block for an FCM Demand asset with other FCM Demand Asset Sub Type must not specify this field.</p> <p>Reading Block for an Energy asset must not specify this field.</p>

3.2.5 Additional Value Restrictions

XML Element Field	CSV field	Rules
asset_id and reading_block_begin	SHS CSV fields Asset ID and Reading Block Begin	<p>Each Reading Block within the request message body must have a unique asset_id and reading_block_begin.</p> <p>reading_block_begin date/time must be the beginning of an ISO New England operating day, e.g. date/time 2015-10-20T04:00:00Z for October 20 2015.</p> <p>asset_id must be the ID number of some asset that is active as of the operating day and has the Meter Reader as its asset meter reader as of the operating day.</p>

begin	SHS CSV field Begin	<p>Each reading within a Reading Block must have a unique begin date/time.</p> <p>Energy asset Reading Blocks with Hourly meter_interval_type must have one begin date/time for every hour in the operating day identified by reading_block_begin, e.g. date/time 2015-10-20T05:00:00Z for the second hour of October 20 2015.</p> <p>Energy asset Reading Blocks with Five Minute meter_interval_type must have one begin date/time for every five-minute interval in the operating day identified by reading_block_begin, e.g. date/time 2015-10-20T04:10:00Z for the third interval of October 20 2015.</p> <p>FCM Demand asset Reading Blocks must only have begin date/time values matching the beginning of an hour in the operating day identified by reading_block_begin, e.g. date/time 2015-10-20T05:00:00Z for the second hour of October 20 2015.</p>
	Old CSV fields Asset ID and Reading Block Date	<p>Each Reading Block within the request message body must have a unique Asset ID and Reading Block Date.</p> <p>Reading Block Date must be an ISO New England operating day, e.g. 10/20/2015 for October 20 2015.</p> <p>Asset ID must be the ID number of some asset that is active as of the operating day and has the Meter Reader as its asset meter reader as of the operating day.</p>
	Old CSV field Hour Ending	<p>Each reading within a Reading Block must have a unique Hour Ending.</p> <p>Energy asset Reading Blocks must have one Hour Ending value for every hour in the operating day identified by Reading Block Date, e.g. 02 for the second hour of October 20 2015.</p> <p>FCM Demand asset Reading Blocks must only have Hour Ending values matching the beginning of an hour in the operating day identified by Reading Block Date, e.g. 02 for the second hour of October 20 2015.</p>

3.2.6 Sample Request – GET request

To return a collection of Reading Blocks belonging to the Meter Reader:

- as of October 20 2015,
- for Generating Unit assets,

the Meter Reader may request:

GET [https://smd.iso-ne.com/sms_oper_metering/api/readingBlocks?
begin_date=20151020&end_date=20151020&asset_search_type=GENERATING_UNITS](https://smd.iso-ne.com/sms_oper_metering/api/readingBlocks?begin_date=20151020&end_date=20151020&asset_search_type=GENERATING_UNITS)

3.2.7 Sample Request – GET response

```
<?xml version="1.0" encoding="UTF-8"?>
<reading_blocks xmlns="http://xmlns.iso-ne.com/metering/reading_blocks">
  <reading_block>
    <asset_id>2000</asset_id>
    <reading_block_begin>2015-10-20T04:00:00Z</reading_block_begin>
    <energy_reading><begin>2015-10-20T04:00:00Z</begin><mw>0.1</mw></energy_reading>
    <energy_reading><begin>2015-10-20T05:00:00Z</begin><mw>0.2</mw></energy_reading>
    ...17 more lines...
    <energy_reading><begin>2015-10-20T23:00:00Z</begin><mw>0</mw></energy_reading>
    <energy_reading><begin>2015-10-21T00:00:00Z</begin><mw>0</mw></energy_reading>
    <energy_reading><begin>2015-10-21T01:00:00Z</begin><mw>0</mw></energy_reading>
    <energy_reading><begin>2015-10-21T02:00:00Z</begin><mw>0</mw></energy_reading>
    <energy_reading><begin>2015-10-21T03:00:00Z</begin><mw>0</mw></energy_reading>
  </reading_block>
  <reading_block>
    <asset_id>2002</asset_id>
    <reading_block_begin>2015-10-20T04:00:00Z</reading_block_begin>
    <energy_reading><begin>2015-10-20T04:00:00Z</begin><mw>0.01</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:05:00Z</begin><mw>0.02</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:10:00Z</begin><mw>0.02</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:15:00Z</begin><mw>0.02</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:20:00Z</begin><mw>0.03</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:25:00Z</begin><mw>0.03</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:30:00Z</begin><mw>0.03</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:35:00Z</begin><mw>0.03</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:40:00Z</begin><mw>0.02</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:45:00Z</begin><mw>0.02</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:50:00Z</begin><mw>0.02</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:55:00Z</begin><mw>0.02</mw></energy_reading>
    <energy_reading><begin>2015-10-20T05:00:00Z</begin><mw>0.02</mw></energy_reading>
    <energy_reading><begin>2015-10-20T05:05:00Z</begin><mw>0.02</mw></energy_reading>
    ...273 more lines...
    <energy_reading><begin>2015-10-21T03:55:00Z</begin><mw>0</mw></energy_reading>
  </reading_block>
</reading_blocks>
```

3.2.8 Sample Request – POST request

To update the above collection of Reading Blocks so that the MW for specific intervals is replaced, the Meter Reader with numeric ID 1 may request a POST to URL:

https://smd.iso-ne.com/sms_oper_metering/api/readingBlocks

with request header:

Content-Type: application/vnd.iso-ne.metering.reading_blocks.v1+xml;charset=UTF-8

and request message body:

```
<?xml version="1.0" encoding="UTF-8"?>
<reading_blocks xmlns="http://xmlns.iso-ne.com/metering/reading_blocks">
  <reading_block>
    <asset_id>2000</asset_id>
    <reading_block_begin>2015-10-20T04:00:00Z</reading_block_begin>
    <asset_type_desc>Unit</asset_type_desc>
    <meter_interval_type>Hourly</meter_interval_type>
    <meter_reader_id>1</meter_reader_id>
    <energy_reading><begin>2015-10-20T04:00:00Z</begin><mw>0.13</mw></energy_reading>
    <energy_reading><begin>2015-10-20T05:00:00Z</begin><mw>0.2</mw></energy_reading>
    ...17 more lines...
    <energy_reading><begin>2015-10-20T23:00:00Z</begin><mw>0</mw></energy_reading>
    <energy_reading><begin>2015-10-21T00:00:00Z</begin><mw>0</mw></energy_reading>
    <energy_reading><begin>2015-10-21T01:00:00Z</begin><mw>0</mw></energy_reading>
    <energy_reading><begin>2015-10-21T02:00:00Z</begin><mw>0</mw></energy_reading>
    <energy_reading><begin>2015-10-21T03:00:00Z</begin><mw>0</mw></energy_reading>
  </reading_block>
  <reading_block>
    <asset_id>2002</asset_id>
    <reading_block_begin>2015-10-20T04:00:00Z</reading_block_begin>
    <asset_type_desc>Unit</asset_type_desc>
    <meter_interval_type>Five Minute</meter_interval_type>
    <meter_reader_id>1</meter_reader_id>
    <energy_reading><begin>2015-10-20T04:00:00Z</begin><mw>0.013</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:05:00Z</begin><mw>0.02</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:10:00Z</begin><mw>0.02</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:15:00Z</begin><mw>0.02</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:20:00Z</begin><mw>0.03</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:25:00Z</begin><mw>0.03</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:30:00Z</begin><mw>0.03</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:35:00Z</begin><mw>0.03</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:40:00Z</begin><mw>0.021</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:45:00Z</begin><mw>0.021</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:50:00Z</begin><mw>0.021</mw></energy_reading>
    <energy_reading><begin>2015-10-20T04:55:00Z</begin><mw>0.021</mw></energy_reading>
    <energy_reading><begin>2015-10-20T05:00:00Z</begin><mw>0.021</mw></energy_reading>
    <energy_reading><begin>2015-10-20T05:05:00Z</begin><mw>0.021</mw></energy_reading>
    ...273 more lines...
    <energy_reading><begin>2015-10-21T03:55:00Z</begin><mw>0</mw></energy_reading>
  </reading_block>
</reading_blocks>
```


Similarly the Meter Reader may POST Reading Blocks for FCM Demand assets, with a request message body:

```
<?xml version="1.0" encoding="UTF-8"?>
<reading_blocks xmlns="http://xmlns.iso-ne.com/metering/reading_blocks">
  <reading_block>
    <asset_id>3000</asset_id>
    <reading_block_begin>2015-10-20T04:00:00Z</reading_block_begin>
    <asset_type_desc>FCM Demand</asset_type_desc>
    <fcm_demand_asset_sub_type>ON_PEAK</fcm_demand_asset_sub_type>
    <meter_interval_type>Hourly</meter_interval_type>
    <meter_reader_id>1</meter_reader_id>
    <fcm_demand_reading><begin>2015-10-20T13:00:00Z</begin>
      <tfl_mw>1.2</tfl_mw><dgo_mw>0.84</dgo_mw></fcm_demand_reading>
    <fcm_demand_reading><begin>2015-10-20T14:00:00Z</begin>
      <tfl_mw>1.2</tfl_mw><dgo_mw>0.84</dgo_mw></fcm_demand_reading>
    <fcm_demand_reading><begin>2015-10-20T15:00:00Z</begin>
      <tfl_mw>1.2</tfl_mw><dgo_mw>0.84</dgo_mw></fcm_demand_reading>
    <fcm_demand_reading><begin>2015-10-20T16:00:00Z</begin>
      <tfl_mw>1.2</tfl_mw><dgo_mw>0.84</dgo_mw></fcm_demand_reading>
    <fcm_demand_reading><begin>2015-10-20T17:00:00Z</begin>
      <tfl_mw>1.2</tfl_mw><dgo_mw>0.84</dgo_mw></fcm_demand_reading>
    <fcm_demand_reading><begin>2015-10-20T18:00:00Z</begin>
      <tfl_mw>1.2</tfl_mw><dgo_mw>0.84</dgo_mw></fcm_demand_reading>
    <fcm_demand_reading><begin>2015-10-20T19:00:00Z</begin>
      <tfl_mw>1.2</tfl_mw><dgo_mw>0.84</dgo_mw></fcm_demand_reading>
    <fcm_demand_reading><begin>2015-10-20T20:00:00Z</begin>
      <tfl_mw>1.1</tfl_mw><dgo_mw>0.84</dgo_mw></fcm_demand_reading>
    </reading_block>
  <reading_block>
    <asset_id>3001</asset_id>
    <reading_block_begin>2015-10-20T04:00:00Z</reading_block_begin>
    <asset_type_desc>FCM Demand</asset_type_desc>
    <fcm_demand_asset_sub_type>REAL_TIME</fcm_demand_asset_sub_type>
    <meter_interval_type>Hourly</meter_interval_type>
    <meter_reader_id>1</meter_reader_id>
    <fcm_demand_reading><begin>2015-10-20T13:00:00Z</begin><tfl_mw>1.02</tfl_mw></fcm_demand_reading>
    <fcm_demand_reading><begin>2015-10-20T14:00:00Z</begin><tfl_mw>1.02</tfl_mw></fcm_demand_reading>
    <fcm_demand_reading><begin>2015-10-20T15:00:00Z</begin><tfl_mw>1.02</tfl_mw></fcm_demand_reading>
    <fcm_demand_reading><begin>2015-10-20T16:00:00Z</begin><tfl_mw>1.02</tfl_mw></fcm_demand_reading>
    <fcm_demand_reading><begin>2015-10-20T17:00:00Z</begin><tfl_mw>1.02</tfl_mw></fcm_demand_reading>
    <fcm_demand_reading><begin>2015-10-20T18:00:00Z</begin><tfl_mw>1.02</tfl_mw></fcm_demand_reading>
    <fcm_demand_reading><begin>2015-10-20T19:00:00Z</begin><tfl_mw>1.02</tfl_mw></fcm_demand_reading>
    <fcm_demand_reading><begin>2015-10-20T20:00:00Z</begin><tfl_mw>1.01</tfl_mw></fcm_demand_reading>
    </reading_block>
</reading_blocks>
```

3.2.9 Sample Request – POST Accepted response

If the POST request body data was parsed successfully, it will continue to be processed after the POST response is sent. The POST response will have status 202 Accepted, its Content-Type will be application/vnd.iso-ne.metering.submissions.v1+xml;charset=UTF-8, and its response body will contain a Submission that can be used for tracking the status of the processing. See the Submission web service below for more details.

```
<?xml version="1.0" encoding="UTF-8"?>
<submission xmlns="http://xmlns.iso-ne.com/metering/submissions">
  <submission_id>12345</submission_id>
  <submission_status>STARTED</submission_status>
  <transaction_commit_flag>false</transaction_commit_flag>
  <start_time>2015-10-22T14:22:13Z</start_time>
</submission>
```

3.2.10 Sample Request – POST Bad Request response

If the POST request body data had a critical error and could not be parsed and further processed, no processing will occur after the POST response is sent. The POST response will have client-error status 400 Bad Request, its Content-Type will be application/vnd.iso-ne.error+xml;charset=UTF-8, and its response body will contain an Error that provides meaningful details on the request body data's issue.

```
<?xml version="1.0" encoding="UTF-8"?>
<error xmlns="http://xmlns.iso-ne.com/error">
  <status>400</status>
  <error_code>request_xml_parse_error</error_code>
  <error_message>Request body could not be parsed and validated against XML Schema.</error_message>
  <error_detail>
    <error_code>xml_error</error_code>
    <error_message>lineNumber: 7; columnNumber: 35; cvc-datatype-valid.1.2.1: 'XYZ' is not a valid value for
'integer'.</error_message>
  </error_detail>
</error>
```

3.2.11 Sample Request – POST Conflict response

If the Meter Reader user has an ongoing submission (Reading Blocks POST that has not yet produced a response, or that produced a 202 Accepted response for a Submission that is still status STARTED), and issues a new Reading Blocks POST request, the Meter Reading web services will prevent the concurrent submission. The POST response will have client-error status 409 Conflict, its Content-Type will be application/vnd.iso-ne.metering.submissions.v1+xml;charset=UTF-8, and its response body will contain a Submission showing the earlier ongoing submission details.

```
<?xml version="1.0" encoding="UTF-8"?>
<submission xmlns="http://xmlns.iso-ne.com/metering/submissions">
  <submission_id>12345</submission_id>
```

```
<submission_status>STARTED</submission_status>
<transaction_commit_flag>>false</transaction_commit_flag>
<start_time>2015-10-22T14:22:13Z</start_time>
</submission>
```

3.2.12 Sample Request – POST request with Old CSV

To update the same collections of Reading Blocks as above using the Old CSV format, the Meter Reader with numeric ID 1 may request a POST to URL:

https://smd.iso-ne.com/sms_oper_metering/api/readingBlocks

with request header:

Content-Type: text/vnd.iso-ne. metering.reading_blocks.v1+csv;charset=UTF-8

and this request message body for hourly metering submittal Energy asset 2000 (five minute metering submittal Energy assets cannot be supported in Old CSV format):

```
Meter
Daily
***
1,2000,Unit,10/20/2015
01,0.13
02, 0.2
...17 more lines...
20,0
21,0
22,0
23,0
24,0
***
```

Or this request message body for FCM Demand assets 3000 and 3001:

```
Meter
Daily
***
1,3000,FCM Demand,10/20/2015,ON_PEAK
10,1.2,0.84
11,1.2,0.84
12,1.2, 0.84
13,1.2,0.84
14,1.2,0.84
15,1.2,0.84
16,1.2,0.84
17,1.1,0.84
***
```

```
1,3001,FCM Demand,10/20/2015,REAL_TIME
10,1.02
11,1.02
12,1.02
13,1.02
14,1.02
15,1.02
16,1.02
17,1.01
***
```

3.2.13 Sample Request – POST request with SHS CSV

To update the same collections of Reading Blocks as above using the SHS CSV format, the Meter Reader with numeric ID 1 may request a POST to URL:

https://smd.iso-ne.com/sms_oper_metering/api/readingBlocks

with request header:

Content-Type: text/vnd.iso-ne. metering.reading_blocks.v2+csv;charset=UTF-8

and this request message body for Energy assets 2000 and 2002 (hourly and five minute metering submittal Energy assets can be supported in SHS CSV format):

```
Meter
Daily
***
1,2000,Unit,Hourly,2015-10-20T04:00:00Z
2015-10-20T04:00:00Z,0.13
2015-10-20T05:00:00Z, 0.2
...17 more lines...
2015-10-20T23:00:00Z,0
2015-10-21T00:00:00Z,0
2015-10-21T01:00:00Z,0
2015-10-21T02:00:00Z,0
2015-10-21T03:00:00Z,0
***
1,2002,Unit,Five Minute,2015-10-21T03:00:00Z
2015-10-20T04:00:00Z,0.013
2015-10-20T04:05:00Z,0.02
2015-10-20T04:10:00Z,0.02
2015-10-20T04:15:00Z,0.02
2015-10-20T04:20:00Z,0.03
2015-10-20T04:25:00Z,0.03
2015-10-20T04:30:00Z,0.03
2015-10-20T04:35:00Z,0.03
2015-10-20T04:40:00Z,0.021
2015-10-20T04:45:00Z,0.021
```

```
2015-10-20T04:50:00Z,0.021
2015-10-20T04:55:00Z,0.021
2015-10-20T05:00:00Z,0.021
2015-10-20T05:05:00Z,0.021
...273 more lines...
2015-10-21T03:55:00Z,0
***
```

Or this request message body for FCM Demand assets 3000 and 3001:

```
Meter
Daily
***
1,3000,FCM Demand,Hourly,2015-10-20T04:00:00Z,ON_PEAK
2015-10-20T13:00:00Z,1.2,0.84
2015-10-20T14:00:00Z,1.2,0.84
2015-10-20T15:00:00Z,1.2, 0.84
2015-10-20T16:00:00Z,1.2,0.84
2015-10-20T17:00:00Z,1.2,0.84
2015-10-20T18:00:00Z,1.2,0.84
2015-10-20T19:00:00Z,1.2,0.84
2015-10-20T20:00:00Z,1.1,0.84
***
1,3001,FCM Demand,Hourly,2015-10-20T04:00:00Z,REAL_TIME
2015-10-20T13:00:00Z,1.02
2015-10-20T14:00:00Z,1.02
2015-10-20T15:00:00Z,1.02
2015-10-20T16:00:00Z,1.02
2015-10-20T17:00:00Z,1.02
2015-10-20T18:00:00Z,1.02
2015-10-20T19:00:00Z,1.02
2015-10-20T20:00:00Z,1.01
***
```

3.3 Asset's Reading Block for Operating Day

3.3.1 Purpose of Message

Returns or updates a single Reading Block for the asset indicated by the *assetId* parameter and the operating day indicated by the *date* parameter. The asset may be an Energy or FCM Demand asset with hourly metering submittal.

3.3.2 REST Endpoint

URL `https://smd.iso-ne.com/sms_oper_metering/api/readingBlocks/assets/{assetId}/dates/{date}`

Media Types

- `application/vnd.iso-ne.metering.reading_blocks.v1+xml; charset=UTF-8`
- `application/vnd.iso-ne.metering.submissions.v1+xml; charset=UTF-8` (for 201 Created and 409 Conflict responses)

3.3.3 Request Method

GET queries the meter reading data for the asset and operating day, returning a single Reading Block, which either contains readings previously submitted (the current version of the reading for each meter interval) or no readings (data was not POSTed yet). The reading block contains additional information regarding the status of the reading block and the status and version timestamp of individual readings, which may aid the client in understanding whether readings may be submitted or re-submitted.

POST modifies the meter reading data for the asset and operating day, updating the readings for every meter interval so they match the request message body data.

3.3.4 Mandatory and Optional Fields

Parameters – all methods:

- *assetId* – ISO New England-specified unique numeric asset ID.
- *date* – ISO New England operating day date, in YYYYMMDD.

Data – POST XML-type request body XML elements:

Optional	Element	Data Type; Format	Comments
No	<code>asset_id</code>	<code>xs:nonNegativeInteger</code>	ISO New England-specified unique numeric asset ID for an individual Reading Block.
No	<code>reading_block_begin</code>	<code>xs:dateTime</code> ; Internet date/time format with a time zone	Operating day begin date/time for an individual Reading Block.
Yes	<code>reading_block_end</code>	<code>xs:dateTime</code> ; Internet date/time format with a time zone	Operating day end date/time for an individual Reading Block. Returned by GET. Ignored by POST.

No	begin	xs:dateTime; Internet date/time format with a time zone	Date/time beginning the meter interval for an individual reading and its MW value(s). This is the date/time beginning a specific hour.
No (for Energy asset)	mw	xs:decimal; 9999999.999	Reading Block for an Energy asset must specify this element for each reading, containing the MW value. Reading Block for an FCM Demand asset must not specify this element.
Yes	tfl_mw	xs:decimal; 9999999.999	Reading Block for an FCM Demand asset <i>may</i> specify this element for each reading, containing the Hourly Total Facility Load MW value. An hour without tfl_mw is considered to be a reading with Hourly Total Facility Load undefined. Reading Block for an Energy asset must not specify this element.
Yes	dgo_mw	xs:decimal; 9999999.999	Reading Block for an FCM Demand asset with ON_PEAK / SEASONAL_PEAK sub-type <i>may</i> specify this element for each reading, containing the Hourly DG Output MW value. An hour without dgo_mw is considered to be a reading with Hourly DG Output undefined. Reading Block for an FCM Demand asset with other sub-type must not specify this element. Reading Block for an Energy asset must not specify this element.
No (for FCM Demand asset)	version	xs:dateTime; Internet date/time format with a time zone	Reading Block for an FCM Demand asset must specify this element for each reading, containing the version timestamp received in the previous GET response. This timestamp is required for a concurrency check preventing concurrent updates by other users or sessions. Reading Block for an Energy asset must not specify this element.

3.3.5 Sample Request – GET request

The Meter Reader with numeric ID 1 and an asset with numeric ID 2000 may request:

GET https://smd.iso-ne.com/sms_oper_metering/api/readingBlocks/assets/2000/dates/20151020

3.3.6 Sample Request – GET response

The response body for an Energy asset might look like:

```
<?xml version="1.0" encoding="UTF-8"?>
<reading_block xmlns="http://xmlns.iso-ne.com/metering/reading_blocks">
  <asset_id>2000</asset_id>
  <reading_block_begin>2015-10-20T04:00:00Z</reading_block_begin>
  <reading_block_end>2015-10-21T04:00:00Z</reading_block_end>
  <energy_reading_block_status>
    <day_type>Tue</day_type>
    <status>WITHINEIGHTYDAYS</status>
    <status_deadline>2015-12-30T04:00:00Z</status_deadline>
  </energy_reading_block_status>
  <energy_reading><begin>2015-10-20T04:00:00Z</begin><mw>0.1</mw>
    <reading_status>NORMAL</reading_status></energy_reading>
  <energy_reading><begin>2015-10-20T05:00:00Z</begin><mw>0.2</mw>
    <reading_status>NORMAL</reading_status></energy_reading>
  <energy_reading><begin>2015-10-20T06:00:00Z</begin><mw>0.2</mw>
    <reading_status>NORMAL</reading_status></energy_reading>
  <energy_reading><begin>2015-10-20T07:00:00Z</begin><mw>0.2</mw>
    <reading_status>NORMAL</reading_status></energy_reading>
  <energy_reading><begin>2015-10-20T08:00:00Z</begin><mw>0.3</mw>
    <reading_status>OVERLIMIT</reading_status></energy_reading>
  ...18 more lines...
  <energy_reading><begin>2015-10-21T03:00:00Z</begin><mw>0</mw>
    <reading_status>NORMAL</reading_status></energy_reading>
</reading_block>
```

Or for an FCM Demand asset:

```
<?xml version="1.0" encoding="UTF-8"?>
<reading_block xmlns="http://xmlns.iso-ne.com/metering/reading_blocks">
  <asset_id>3001</asset_id>
  <reading_block_begin>2015-10-20T04:00:00Z</reading_block_begin>
  <reading_block_end>2015-10-21T04:00:00Z</reading_block_end>
  <fcm_demand_reading_block_status>
    <day_type>Tue</day_type>
    <status>LR_WINDOW_METERING_TO_XTH_BUSINESS_DAY</status>
    <status_days>2</status_days>
    <status_hours>17</status_hours>
  </fcm_demand_reading_block_status>
  <fcm_demand_reading><begin>2015-10-20T13:00:00Z</begin><tfl_mw>1.02</tfl_mw>
    <version>2015-10-21T15:11:36Z</version><reading_status>OVERLIMIT</reading_status></fcm_demand_reading>
  <fcm_demand_reading><begin>2015-10-20T14:00:00Z</begin><tfl_mw>1.02</tfl_mw>
    <version>2015-10-21T15:11:36Z</version><reading_status>OVERLIMIT</reading_status></fcm_demand_reading>
  <fcm_demand_reading><begin>2015-10-20T15:00:00Z</begin><tfl_mw>1.02</tfl_mw>
    <version>2015-10-21T15:11:36Z</version><reading_status>OVERLIMIT</reading_status></fcm_demand_reading>
  <fcm_demand_reading><begin>2015-10-20T16:00:00Z</begin><tfl_mw>1.02</tfl_mw>
```



```

<version>2015-10-21T15:11:36Z</version><reading_status>OVERLIMIT</reading_status></fcm_demand_reading>
<fcm_demand_reading><begin>2015-10-20T17:00:00Z</begin><tfl_mw>1.02</tfl_mw>
  <version>2015-10-21T15:11:36Z</version><reading_status>OVERLIMIT</reading_status></fcm_demand_reading>
<fcm_demand_reading><begin>2015-10-20T18:00:00Z</begin><tfl_mw>1.02</tfl_mw>
  <version>2015-10-21T15:11:36Z</version><reading_status>OVERLIMIT</reading_status></fcm_demand_reading>
<fcm_demand_reading><begin>2015-10-20T19:00:00Z</begin><tfl_mw>1.02</tfl_mw>
  <version>2015-10-21T15:11:36Z</version><reading_status>OVERLIMIT</reading_status></fcm_demand_reading>
<fcm_demand_reading><begin>2015-10-20T20:00:00Z</begin><tfl_mw>1.01</tfl_mw>
  <version>2015-10-21T15:11:36Z</version><reading_status>NORMAL</reading_status></fcm_demand_reading>
</reading_block>

```

The GET response will have a client error status (404 Not Found) if the asset is not an active asset with Meter Reader as its asset meter reader as of the operating day.

3.3.7 Sample Request – POST request

To update the above Reading Block so that the MW for specific intervals is replaced, the Meter Reader with numeric ID 1 may request a POST to URL:

https://smd.iso-ne.com/sms_oper_metering/api/readingBlocks/assets/2000/dates/20151020

with request header:

Content-Type: application/vnd.iso-ne.metering.reading_blocks.v1+xml;charset=UTF-8

and request message body:

```

<?xml version="1.0" encoding="UTF-8"?>
<reading_block xmlns="http://xmlns.iso-ne.com/metering/reading_blocks">
  <asset_id>2000</asset_id>
  <reading_block_begin>2015-10-20T04:00:00Z</reading_block_begin>
  <energy_reading><begin>2015-10-20T04:00:00Z</begin><mw>0.13</mw>
    </energy_reading>
  <energy_reading><begin>2015-10-20T05:00:00Z</begin><mw>0.2</mw>
    </energy_reading>
  <energy_reading><begin>2015-10-20T06:00:00Z</begin><mw>0.2</mw>
    </energy_reading>
  <energy_reading><begin>2015-10-20T07:00:00Z</begin><mw>0.2</mw>
    </energy_reading>
  <energy_reading><begin>2015-10-20T08:00:00Z</begin><mw>0.3</mw>
    </energy_reading>
  ...18 more lines...
  <energy_reading><begin>2015-10-21T03:00:00Z</begin><mw>0</mw>
    </energy_reading>
</reading_block>

```

Or for the FCM Demand asset:

```

<?xml version="1.0" encoding="UTF-8"?>
<reading_block xmlns="http://xmlns.iso-ne.com/metering/reading_blocks">
  <asset_id>3001</asset_id>
  <reading_block_begin>2015-10-20T04:00:00Z</reading_block_begin>
  <fcm_demand_reading><begin>2015-10-20T13:00:00Z</begin><tfl_mw>1.023</tfl_mw>
    <version>2015-10-21T15:11:36Z</version></fcm_demand_reading>
  <fcm_demand_reading><begin>2015-10-20T14:00:00Z</begin><tfl_mw>1.022</tfl_mw>
    <version>2015-10-21T15:11:36Z</version></fcm_demand_reading>
  <fcm_demand_reading><begin>2015-10-20T15:00:00Z</begin><tfl_mw>1.022</tfl_mw>
    <version>2015-10-21T15:11:36Z</version></fcm_demand_reading>
  <fcm_demand_reading><begin>2015-10-20T16:00:00Z</begin><tfl_mw>1.02</tfl_mw>
    <version>2015-10-21T15:11:36Z</version></fcm_demand_reading>
  <fcm_demand_reading><begin>2015-10-20T17:00:00Z</begin><tfl_mw>1.02</tfl_mw>
    <version>2015-10-21T15:11:36Z</version></fcm_demand_reading>
  <fcm_demand_reading><begin>2015-10-20T18:00:00Z</begin><tfl_mw>1.02</tfl_mw>
    <version>2015-10-21T15:11:36Z</version></fcm_demand_reading>
  <fcm_demand_reading><begin>2015-10-20T19:00:00Z</begin><tfl_mw>1.02</tfl_mw>
    <version>2015-10-21T15:11:36Z</version></fcm_demand_reading>
  <fcm_demand_reading><begin>2015-10-20T20:00:00Z</begin><tfl_mw>1.01</tfl_mw>
    <version>2015-10-21T15:11:36Z</version></fcm_demand_reading>
</reading_block>

```

3.3.8 Sample Request – POST Created response

If the POST request body data was parsed and processed successfully, it will complete processing before the POST response is sent. The POST response will have status 201 Created, its Content-Type will be application/vnd.iso-ne.metering.submissions.v1+xml;charset=UTF-8, and its response body will contain a Submission showing the outcome of the processing, including whether the Reading Block was not submitted due to non-critical errors. See the Submission web service below for more details.

```

<?xml version="1.0" encoding="UTF-8"?>
<submission xmlns="http://xmlns.iso-ne.com/metering/submissions">
  <submission_id>12345</submission_id>
  <submission_status>ENDED</submission_status>
  <transaction_commit_flag>true</transaction_commit_flag>
  <start_time>2015-10-22T14:22:13Z</start_time>
  <daily_asset_block>
    <asset_id>2000</asset_id>
    <begin>2015-10-20T04:00:00Z</begin>
    <block_status>Submitted</block_status>
    <message>Customer Identifier = 1</message>
    <message>AssetID = 2000</message>
    <message>AssetType = Unit</message>
    <message>Date = 10/20/2015</message>
    <message>24 readings submitted</message>
    <message>Meter Readings Processed Successfully</message>
  </daily_asset_block>
</submission>

```

3.4 Submission

3.4.1 Purpose of Message

Returns the Submission indicated by the *submissionId* parameter.

3.4.2 REST Endpoint

URL https://smd.iso-ne.com/sms_oper_metering/api/submissions/{submissionId}

Media Types

- application/vnd.iso-ne.metering.submissions.v1+xml;charset=UTF-8
- text/plain

3.4.3 Request Method

GET queries the current status of the Submission, including its overall status (whether it's complete) and detailed per-block statuses (whether each block was submitted or not). Submissions are created by POST requests to Reading Block resources and returned in these requests' responses, including the unique Submission ID number that can be used as a parameter to this GET. Clients have a choice of media type (using the Accept: header), either XML for automated processing of the status, or text/plain for content more readable by an end user (also appropriate for printing or saving via a web browser user interface e.g.).

3.4.4 Mandatory and Optional Fields

Parameters:

- *submissionId* – Unique Submission ID number tracking one of the Meter Reader user's POST requests.

3.4.5 Sample Request - XML

The Meter Reader user with a POST that created Submission ID 12345 may request:

GET https://smd.iso-ne.com/sms_oper_metering/api/submissions/12345

with header:

Accept: application/vnd.iso-ne.metering.submissions.v1+xml;charset=UTF-8

The response body might look like:

```
<?xml version="1.0" encoding="UTF-8"?>
<submission xmlns="http://xmlns.iso-ne.com/metering/submissions">
  <submission_id>12345</submission_id>
  <submission_status>ENDED</submission_status>
  <transaction_commit_flag>true</transaction_commit_flag>
```

```
<start_time>2015-10-22T14:22:13Z</start_time>
<end_time>2015-10-22T14:22:18Z</end_time>
<daily_asset_block>
  <asset_id>2000</asset_id>
  <begin>2015-10-20T04:00:00Z</begin>
  <block_status>Submitted</block_status>
  <message>Customer Identifier = 1</message>
  <message>AssetID = 2000</message>
  <message>AssetType = Unit</message>
  <message>Date = 10/20/2015</message>
  <message>24 readings submitted</message>
  <message>Meter Readings Processed Successfully</message>
</daily_asset_block>
</submission>
```

The GET response will have a client error status (404 Not Found) if no Submission with this ID number belongs to the Meter Reader user.

3.4.6 Sample Request - Text

The Meter Reader user with a POST that created Submission ID 12345 may request:

GET https://smd.iso-ne.com/sms_oper_metering/api/submissions/12345

with header:

Accept: text/plain

The response body might look like:

```
Submission ID 12345 ended at 10/22/2015 10:22:18 EDT.
```

```
Customer Identifier = 1
AssetID = 2000
AssetType = Unit
Date = 10/20/2015
24 readings submitted
Meter Readings Processed Successfully
```

3.5 Submission Attachment

3.5.1 Purpose of Message

Returns the Submission indicated by the *submissionId* parameter, with headers directing a web browser or other end-user HTTP client to open/save the file as an attachment.

3.5.2 REST Endpoint

URL https://smd.iso-ne.com/sms_oper_metering/api/submissions/{submissionId}/attachment

Media Type text/plain

3.5.3 Request Method

GET queries the current status of the Submission, exactly the same as the Submission web service above.

3.5.4 Mandatory and Optional Fields

Parameters:

- *submissionId* – Unique Submission ID number tracking one of the Meter Reader user’s POST requests.

3.5.5 Sample Request - XML

The Meter Reader user with a POST that created Submission ID 12345 may request:

GET https://smd.iso-ne.com/sms_oper_metering/api/submissions/12345/attachment

The response will have a message body exactly like the Submission GET text/plain request above, but will also have the response header:

Content-Disposition: attachment

4. User Interface Upload/Download Files

Besides web services, the Meter Reader may exchange meter reading data with the Meter Reading application through the Meter Reader’s web browser and the “Submit Meter Reading” user interface (UI) provided by the SMD Site for ISO Applications. To exchange data in bulk, the Submit Meter Reading UI user may prepare files to be selected and uploaded in the UI, and may download data from the UI so that it is opened as a file in another application or saved as a file on the user’s computer.

The UI upload/download files and the web service REST messages share the same data format. In particular, the upload and download files mimic the POST request message body and the GET response message body for the web service All Assets’ Reading Blocks.

4.1 UI File Upload Formats

The UI file upload supports the same 3 data formats as the POST request message body.

- XML (see XML Schema file [vnd.iso-ne.metering.reading_blocks.v1.xsd](#) available at

<http://www.iso-ne.com/participate/support/upload-download>, Upload and Download File Format Protocols)

- XML elements: [POST XML-type request body XML elements](#)
- XML samples: [Sample Request - POST request](#)
- Old CSV (Hourly Metering Submittal only)
 - Old CSV elements: [POST old-CSV-type request body CSV fields](#)
 - Old CSV samples: [Sample Request - POST request with Old CSV](#)
- Sub-Hourly Settlements (SHS) CSV (Hourly and Five Minute Metering Submittal)
 - SHS CSV fields: [POST SHS-CSV-type request body CSV fields](#)
 - SHS CSV samples: [Sample Request - POST request with SHS CSV](#)

4.2 UI File Download Format

The UI file download supports the same data format as the GET response message body.

- XML (see XML Schema file vnd.iso-ne.metering.reading_blocks.v1.xsd available at <http://www.iso-ne.com/participate/support/upload-download>, Upload and Download File Format Protocols)
 - XML elements: [POST XML-type request body XML elements](#)
 - XML samples: [Sample Request - GET response](#)

5. Customer Support

5.1 By Internet



<http://www.iso-ne.com/participate/support>

5.2 By Telephone



Days of Operation

During Regular Business Hours, Monday through Friday: 8:00 A.M. to 5:00 P.M. ET:
(413) 540-4220

The Customer Support Hotline is **NOT** staffed on the following days:

New Year's Day	Labor Day
Martin Luther King Day	Columbus Day
Presidents Day	Veterans Day
Good Friday	Thanksgiving Day
Patriots Day	Day After Thanksgiving
Memorial Day	Christmas Eve Afternoon (12:00 to 17:00)
Independence Day	Christmas Day

For after-hours business emergencies, contact Customer Support at **(877) 226-4814** (pager).

5.3 By Email



custserv@iso-ne.com

5.4 Ask ISO



Ask ISO is available to users who have a valid digital certificate and who have been assigned the role of "Ask ISO / External User" by their Security Administrator. Ask ISO is located at:

<http://www.iso-ne.com/about/contact/customer-support>

6. Links

6.1 ISO New England Home Page

<http://www.iso-ne.com>

6.2 ISO New England Training Page

<http://www.iso-ne.com/participate/training>

6.3 ISO New England FAQ Page

<http://www.iso-ne.com/participate/support/faq>

6.4 SMD Site for ISO Applications

<https://smd.iso-ne.com/>

6.5 SMD Site for ISO Sandbox Applications

<https://sandboxsmd.iso-ne.com/>

6.6 ISO New England Glossary and Acronyms

<http://www.iso-ne.com/participate/support/glossary-acronyms>