**1. RECOMMENDED ACTION: EFFECT OF EC VOTE TO ACCEPT RECOMMENDED ACTION:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Accept as requested | X | Change to Existing Practice |
| X | Accept as modified below |  | Status Quo |
|  | Decline |  |  |

**2. TYPE OF DEVELOPMENT/MAINTENANCE**

|  |  |
| --- | --- |
| **Per Request:** | **Per Recommendation:** |
|  | Initiation |  | Initiation |
| X | Modification | X | Modification |
|  | Interpretation |  | Interpretation |
|  | Withdrawal |  | Withdrawal |
|  |  |  |  |
|  | Principle |  | Principle |
|  | Definition |  | Definition |
| X | Business Practice Standard | X | Business Practice Standard |
|  | Document |  | Document |
|  | Data Element |  | Data Element |
|  | Code Value |  | Code Value |
|  | X12 Implementation Guide |  | X12 Implementation Guide |
|  | Business Process Documentation |  | Business Process Documentation |

**3. RECOMMENDATION**

**SUMMARY:**

The following modifications to the Priority Action Plan 10 - Energy Usage Information Model are offered to harmonize the model with other smart grid standards including Smart Energy 2.0, the IEC Common Information Model, the NAESB REQ Energy Service Providers Interface and the ASHRAE standards under development in response to Priority Action Plan 17.

**RECOMMENDED STANDARDS:**

**EXECUTIVE SUMMARY**

This document establishes the Model Business Practices for Retail Customer energy usage information communication. Specifically, these Model Business Practices establish an information model for energy usage information. These Model Business Practices do not limit the form or function of the information model and is exemplary, but not exclusive, of the information that may be communicated in a consistent format among a variety of Entities, including, but not limited to, Distribution Companies, energy service providers, meter-reading entities, and Retail Customers. Such communication may occur via multiple systems and devices. Establishment of this energy usage information model will standardize a common data format which may be used when information is communicated between Distribution Companies, third parties and Retail Customers which may aid Retail Customers in tracking and managing their energy use.

These Model Business Practices do not require that wholesale electricity markets administered by system operators adopt this energy usage information model since system operators generally do not maintain or have access to the system of record for individual Retail Customer energy usage information and load data or individual Retail Customer forecasted usage and load data. These Model Business Practices are not intended to replace applicable Governing Documents, and, in the event of a conflict, the latter documents shall have precedence over these Model Business Practices. Without limiting the foregoing, these Model Business Practices are only applicable to the extent the information covered by this energy usage information model is collected, managed or communicated pursuant to the applicable Governing Documents. Retail Customer energy usage information communication encompasses a variety of interactions between Distribution Companies, Retail Customers and energy services providers. In a business environment where best practices are voluntary, these Model Business Practices may be applied within the context of regulatory or other market requirements and agreements.

**REQ.18.4 Energy Usage Information Model**

The energy usage information model herein is organized consistent with several related models, including the IEC TC57 Common Information Model [IEC 61968 Part 9], and ZigBee Smart Energy Profile 2.0 [SEP2.0], that are defined by the Energy Information Standards Alliance [EIS Alliance] and Open Automated Data Exchange [OpenADE]. The energy usage information model, where possible, uses classes, information elements and attribute names drawn from the CIM and the cited references.

The starting point for the energy usage information model is the UsagePoint. UsagePoints identify key references for the information set optionally including identification of the Retail Customer, the location, and the physical asset. UsagePoint is associated in turn with zero or more MeterReadings. A MeterReading composes information about a particular measurement such as kWh or kW. A MeterReading has a ReadingType which describes the nature of the measurement including its units of measure, and zero or more IntervalReadings or Readings and associated quality information. UsagePoint may also be associated with summary information on load and usage, and optionally, power quality. For applications requiring third party access to this information, additional classes are identified to facilitate associating Retail Customer and Retail Customer agreement information with the measurements available at a UsagePoint.

To find the usage or load in a particular interval, identify the appropriate UsagePoint, select the MeterReading of interest (measurement) and then select the IntervalReading or Reading associated with the given interval.

The energy usage information model includes many optional components. The complete set of information expressible using the energy usage information model satisfies a wide range of applicability requirements identified by the industry. Users of these Model Business Practices may optionally take advantage of these extended definitions based on need without requiring them. Applications built on the energy usage information model may elect which optional components to present.

However, clients of this information can be expected to recognize all components provided in the application.

REQ.18.3.4.3 identifies the set of core model elements that shall be supported by specifications claiming conformance to these Model Business Practices. The following class diagram illustrates a view[[1]](#footnote-1) of this core of the energy usage information model:

Figure 1: Energy Usage Information Model – Minimal View

The full energy usage information model, illustrated in Figure 2, forms the basis of the recommended Model Business Practices. Note, some minor classes detailed in REQ.18.4.1 are omitted from the diagram to aid in readability (e.g. DateTimeInterval).

Figure 2: Full Energy Usage Information Model

**REQ.18.4.1** **Energy Usage Information Model Details**

The following sections contain the classes and attributes defined in the energy usage information model, along with their descriptions. Elements tagged with <<enumeration>> define the valid values for an enumerated data type and so do not have their own data type, and should be self explanatory, not requiring a definition.

Terms in this section may be based upon IEC 61968 classes and their descriptions. Some of the descriptions refer to other components of the IEC model (recognized as camel case terms) and these are not part of the energy usage information model or needed by the components in the energy usage information model. To preserve accurate presentation of unaltered IEC classes, certain terms have been retained.

REQ.18.4.1.1 AbsoluteDateTime *«Datatype»*

*Date and time as specified in International Organization for Standardization standard ISO 8601.*

REQ.18.4.1.2 BaseCIM\_CombinedVersion

*The combined version denotes the versions of the subpackages that have been combined into the total CIM model. This is a convenience instead of having to look at each subpackage.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **date** | *AbsoluteDate* | *Form is YYYY-MM-DD for example for January 5, 2009 it is 2009-01-05.* |
| **version** | *String* | Form is IEC61970CIMXXvYY\_IEC61968CIMXXvYY\_combined where XX is the major CIM package version and the YY is the minor version, and different packages could have different major and minor versions. For example IEC61970CIM13v18\_IEC61968CIM10v16\_combined. Additional packages might be added in the future. |

REQ.18.4.1.3 Boolean *«Primitive»*

*A type with the value space "true" and "false".*

REQ.18.4.1.4 Customer

*Organization receiving services from ServiceSupplier.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **name** | *String* | *The name is any free human readable and possibly non unique text naming the object.* |

REQ.18.4.1.5 CustomerAgreement

*Agreement between the customer and the ServiceSupplier to pay for service at a specific service location. It provides for the recording of certain billing information about the type of service provided at the service location and is used during charge creation to determine the type of service.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **name** | *String* | *The name is any free human readable and possibly non unique text naming the object.* |

REQ.18.4.1.6 CustomerAuthorisation

*Holds an authorization for access to specific user-private data granted to a third party service provider.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **authorizationServer** | *anyURI* | *Contains the URI link to the authorization endpoint associated with this authorization.*  |
| **authorizedPeriod** | *DateTimeInterval* | *Restricts access to requests or subscriptions within this date time interval.*  |
| **name** | *String* | *The name is any free human readable and possibly non unique text naming the object.* |
| **validityInterval** | *DateTimeInterval* | *Date and time interval this agreement is valid (from going into effect to termination).* |
| **accessToken** | *String32* | *Contains the access token associated with this authorization.*  |
| **publishedPeriod** | *DateTimeInterval* | *Restricts access to the objects within the associated resource that were published within this date time interval.*  |
| **resource** | *anyURI* | *Contains the identifier of the resource, same as was specified in OAuth "scope".*  |
| **status** | *UInt8* | The status of this authorization. 0 - Revoked1 - Active |

REQ.18.4.1.7 DateTimeInterval *«Compound»*

*Interval of date and time.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **start** | *AbsoluteDateTime* | *Date and time that this interval started.* |
| **end** | *AbsoluteDateTime* | *Date and time that this interval ended.* |
| **duration** | *Duration* | *The duration of this interval, in seconds* |

REQ.18.4.1.8 Duration *«CIMDatatype»*

*An interval of time, specified in International Organization for Standardization standard ISO 8601 compatible format.*

REQ.18.4.1.9 ElectricPowerQualitySummary

A summary of power quality events. This information represents a summary of power quality information typically required by customer facility energy management systems. It is not intended to satisfy the detailed requirements of power quality monitoring. All values are as defined by measurementProtocol during the period. The standards typically also give ranges of allowed values; the information attributes are the raw measurements, not the "yes/no" determination by the various standards. See referenced standards for definition, measurement protocol and period.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **flickerPlt** | *Float* | *A measurement of long term Rapid Voltage Change*  |
| **flickerPst** | *Float* | flickerPst is a value measured over 10 minutes that characterizes the likelihood that the voltage fluctuations would result in perceptible light flicker. A value of 1.0 is designed to represent the level that 50% of people would perceive flicker in a 60 watt incandescent bulb. |
| **harmonicVoltage** | *Float* | *A measurement of the Harmonic Voltage during the period. For DC, distortion is with respect to a signal of zero Hz.* |
| **longInterruptions** | *Integer* | *A count of Long Interruption events (as defined by measurementProtocol) during the summary interval period.* |
| **mainsVoltage** | *Float* | *A measurement of the Mains [Signaling] Voltage during the summary interval period.* |
| **measurementProtocol** | *String* | *A reference to the source used as the measurement protocol definition. e.g. "IEEE1519-2009", "EN50160"* |
| **powerFrequency** | *Float* | *A measurement of the power frequency during the summary interval period.* |
| **rapidVoltageChanges** | *Integer* | *A count of Rapid Voltage Change events during the summary interval period* |
| **shortInterruptions** | *Integer* | *A count of Short Interruption events during the summary interval period*  |
| **summaryInterval** | *DateTimeInterval* | *Interval of summary period* |
| **supplyVoltageDips** | *Integer* | *A count of Supply Voltage Dip events during the summary interval period*  |
| **supplyVoltageImbalance** | *Integer* | *A count of Supply Voltage Imbalance events during the summary interval period*  |
| **supplyVoltageVariations** | *Integer* | *A count of Supply Voltage Variations during the summary interval period*  |
| **tempOvervoltage** | *Integer* | *A count of Temporary Overvoltage events (as defined by measurementProtocol) during the summary interval period*  |

REQ.18.4.1.10 EndDeviceAsset

EndDeviceAsset that performs one or more end device functions. One type of EndDeviceAsset is a MeterAsset which can perform metering, load management, connect/disconnect, accounting functions, etc. Some EndDeviceAssets, such as ones monitoring and controlling air conditioner, refrigerator, pool pumps may be connected to a MeterAsset. All EndDeviceAssets may have communication capability defined by the associated ComFunction(s). An EndDeviceAsset may be owned by a consumer, a service provider, utility or otherwise.

There may be a related end device function that identifies a sensor or control point within a metering application or communications systems (e.g., water, gas, electricity).

Some devices may use an optical port that conforms to the ANSI C12.18 standard for communications.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **name** | *String* | *The name is any free human readable and possibly non unique text naming the object.* |

REQ.18.4.1.11 EnergyUsageInformation

A collection of customer energy usage information. This class is a container, and has no attributes.

REQ.18.4.1.12 Float *«Primitive»*

*A floating point number. The range is unspecified and not limited.*

REQ.18.4.1.13 IdentifiedObject

*This is a root class to provide common identification for all classes needing identification and naming attributes*.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **aliasName** | String | The aliasName is free text human readable name of the object alternative to IdentifiedObject.name. It may be non unique and may not correlate to a naming hierarchy. |
| **mRID** | String | Master resource identifier issued by a model authority. The mRID is globally unique within an exchange context. The specific type and encoding of mRID is dependent on the context in which it is found by the adopting profiles. |
| **name** | String | The name is any free human readable and possibly non unique text naming the object. |

REQ.18.4.1.14 Integer *«Primitive»*

*An integer number. The range is unspecified and not limited.*

REQ.18.4.1.15 IntervalBlock

*Time sequence of Readings of the same ReadingType.*

REQ.18.4.1.16 IntervalReading

*Data captured over a specific interval of time. If not specified, the duration is the intervalLength of the associated ReadingType, where the full definition of the units of measure is located.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **cost** | *Float* | *The cost associated with this reading for this interval.* |
| **interval** | *DateTimeInterval* | *The time interval associated with the reading.*  |
| **value** | *Float* | *Value of this interval reading.* |

REQ.18.4.1.17 MeterReading

*Set of values obtained from the meter.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **name** | *String* | *The name is any free human readable and possibly non unique text naming the object.* |
| **valuesInterval** | *DateTimeInterval* | *Date and time interval of the data items contained within this meter reading.* |

REQ.18.4.1.18 NAESB\_EUI\_Version

*This class contains the version of the NAESB model.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **date** | *AbsoluteDate* | *Form is YYYY-MM-DD for example for January 5, 2009 it is 2009-01-05*. |
| **version** | *String* | *Form is naesb\_eui\_vXX.YY where XX is the major version and YY is the minor version.* |

REQ.18.4.1.19 Name

*The Name class provides the means to define any number of human readable names for an object.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **name** | *String* | *Any free text that name the object.* |

REQ.18.4.1.20 NameType

*Type of name. Possible values for attribute 'name' are implementation dependent but standard profiles may specify types. An enterprise may have multiple information technology systems each having its own local name for the same object, e.g. a planning system may have different names from an energy management system. An object may also have different names within the same system.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **name** | *String* | *Name of the name type.* |

REQ.18.4.1.21 NameTypeAuthority

Authority responsible for creation and management of names of a given type; typically an organization or an enterprise system.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **name** | *String* | *Name of the name type authority.* |

REQ.18.4.1.22 PositionPoint

*Set of spatial coordinates that determine a point, defined in coordinate system specified in 'Location.CoordinateSystem', or "WGS 84" if not specified otherwise. Use a single position point instance to describe a point-oriented location. Use a sequence of position points to describe a line-oriented object (physical location of non-point oriented objects like cables or lines), or area of an object (like a substation or a geographical zone - in this case, have first and last position point with the same values).*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **xPosition** | *String* | *X axis position.* |
| **yPosition** | *String* | *Y axis position.* |
| **zPosition** | *String* | *(if applicable) Z axis position.* |

REQ.18.4.1.23 QualityOfReading *«enumeration»*

List of codes indicating the quality of the reading

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **estimated** |  |  |
| **forecast** |  |  |
| **mixed** |  |  |
| **raw** |  |  |
| **validated** |  |  |
| **normalizedForWeather** |  |  |
| **other** |  |  |

REQ.18.4.1.24 Reading

Specific value measured by a meter or other asset. Each Reading is associated with a specific ReadingType.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **cost** | *Float* | *Cost in a currency* |
| **timeStamp** | *AbsoluteDateTime* | *The time when the value was last updated* |
| **value** | *Float* | *Value of this reading.* |

REQ.18.4.1.25 FlowDirectionKind *«enumeration»*

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

 *This value identifies the direction of flow of what is being measured. Specific indications are supported especially for electrical measurements that can have complex values.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **none** |  | Not Applicable (N/A) |
| **forward** |  | "Delivered," or "Imported" as defined 61968-2.Forward Active Energy is a positive kWh value as one would naturally expect to find as energy is supplied by the utility and consumed at the service.Forward Reactive Energy is a positive VArh value as one would naturally expect to find in the presence of inductive loading.In polyphase metering, the forward energy register is incremented when the sum of the phase energies is greater than zero:*EnergyA + EnergyB + EnergyC > 0* |
| **lagging** |  | Typically used to describe that a power factor is lagging the reference value. Note 1: When used to describe VA, “lagging” describes a form of measurement where reactive power is considered in all four quadrants, but real power is considered only in quadrants I and IV.Note 2: When used to describe power factor, the term “lagging” implies that the PF is negative. The term “lagging” in this case takes the place of the negative sign. If a signed PF value is to be passed by the data producer, then the direction of flow enumeration zero (none) should be used in order to avoid the possibility of creating an expression that employs a double negative. The data consumer should be able to tell from the sign of the data if the PF is leading or lagging. This principle is analogous to the concept that “Reverse” energy is an implied negative value, and to publish a negative reverse value would be ambiguous.Note 3: Lagging power factors typically indicate inductive loading. |
| **leading** |  | Typically used to describe that a power factor is leading the reference value.Note: Leading power factors typically indicate capacitive loading. |
| **net** |  | |Forward| - |Reverse|, See 61968-2.Note: In some systems, the value passed as a “net” value could become negative. In other systems the value passed as a “net” value is always a positive number, and rolls-over and rolls-under as needed.  |
| **q1plusQ2** |  | Reactive positive quadrants. (The term “lagging” is preferred.) |
| **q1plusQ3** |  | Quadrants 1 and 3 |
| **q1plusQ4** |  | Quadrants 1 and 4 usually represent forward active energy |
| **q1minusQ4** |  | Quadrant1 minus Quadrant4 |
| **q2plusQ3** |  | Quadrants 2 and 3 usually represent reverse active energy |
| **q2plusQ4** |  | Quadrants 2 and 4 |
| **q2minusQ3** |  | Quadrant2 minus Quadrant3 |
| **q3plusQ4** |  | Reactive negative quadrants. (The term “leading” is preferred.) |
| **q3minusQ2** |  | Quadrant3 minus Quadrant2 |
| **quadrant1** |  | Quadrant1 only |
| **quadrant2** |  | Quadrant2 only |
| **quadrant3** |  | Quadrant3 only |
| **quadrant4** |  | Quadrant4 only |
| **reverse** |  | Reverse Active Energy is equivalent to "Received," or "Exported" as defined in 61968-2.Reverse Active Energy is a positive kWh value as one would expect to find when energy is backfed by the service onto the utility network.Reverse Reactive Energy is a positive VArh value as one would expect to find in the presence of capacitive loading and a leading Power Factor.In polyphase metering, the reverse energy register is incremented when the sum of the phase energies is less than zero:*EnergyA +EnergyB +EnergyC < 0*Note: The value passed as a reverse value is always a positive value. It is understood by the label “reverse” that it represents negative flow. |
| **total** |  | |Forward| + |Reverse|, See 61968-2.The sum of the commodity in all quadrants Q1+Q2+Q3+Q4.In polyphase metering, the total energy register is incremented when the absolute value of the sum of the phase energies is greater than zero:*| EnergyA +EnergyB +EnergyC | > 0* |
| **totalByPhase** |  | In polyphase metering, the total by phase energy register is incremented when the sum of the absolute values of the phase energies is greater than zero:*| EnergyA | +| EnergyB | +| EnergyC | > 0*In single phase metering, the formulas for “Total” and “Total by phase” collapse to the same expression. For communication purposes however, the “Total” enumeration should be used with single phase meter data. |

REQ.18.4.1.26 MeasurementKind *«enumeration»*

*Identifies "what" is being measured, as refinement of 'commodity'. When combined with 'unit', it provides detail to the unit of measure. For example, 'energy' with a unit of measure of 'kWh' indicates to the user that active energy is being measured, while with 'kVAh' or 'kVArh', it indicates apparent energy and reactive energy, respectively. 'power' can be combined in a similar way with various power units of measure: Distortion power ('distortionVoltAmperes') with 'kVA' is different from 'power' with 'kVA'.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **none** |  | Not Applicable |
| **apparentPowerFactor** |  |  |
| **currency** |  | funds |
| **current** |  |  |
| **currentAngle** |  | Identifies what is being measured. |
| **currentImbalance** |  |  |
| **date** |  |  |
| **demand** |  |  |
| **distance** |  |  |
| **distortionVoltAmperes** |  |  |
| **energization** |  |  |
| **energy** |  |  |
| **energizationLoadSide** |  |  |
| **fan** |  |  |
| **frequency** |  |  |
| **ieee1366ASAI** |  |  |
| **ieee1366ASIDI** |  |  |
| **ieee1366ASIFI** |  |  |
| **ieee1366CAIDI** |  |  |
| **ieee1366CAIFI** |  |  |
| **ieee1366CEMIn** |  |  |
| **ieee1366CEMSMIn** |  |  |
| **ieee1366CTAIDI** |  |  |
| **ieee1366MAIFI** |  |  |
| **ieee1366MAIFIe** |  |  |
| **ieee1366SAIDI** |  |  |
| **ieee1366SAIFI** |  |  |
| **lineLosses** |  |  |
| **losses** |  |  |
| **negativeSequence** |  |  |
| **phasorPowerFactor** |  |  |
| **phasorReactivePower** |  |  |
| **positiveSequence** |  |  |
| **power** |  |  |
| **powerFactor** |  |  |
| **quantityPower** |  |  |
| **sag** |  | or Voltage Dip |
| **swell** |  |  |
| **switchPosition** |  |  |
| **tapPosition** |  |  |
| **tariffRate** |  |  |
| **temperature** |  |  |
| **totalHarmonicDistortion** |  |  |
| **transformerLosses** |  |  |
| **unipedeVoltageDip10to15** |  |  |
| **unipedeVoltageDip15to30** |  |  |
| **unipedeVoltageDip30to60** |  |  |
| **unipedeVoltageDip60to90** |  |  |
| **unipedeVoltageDip90to100** |  |  |
| **voltage** |  |  |
| **voltageAngle** |  |  |
| **voltageExcursion** |  |  |
| **voltageImbalance** |  |  |
| **volume** |  | Indicates fluid volume |
| **zeroFlowDuration** |  |  |
| **zeroSequence** |  |  |
| **distortionPowerFactor** |  |  |
| **frequencyExcursion** |  | Usually expressed as a “count” |
| **applicationContext** |  |  |
| **apTitle** |  |  |
| **assetNumber** |  |  |
| **bandwidth** |  |  |
| **batteryVoltage** |  |  |
| **broadcastAddress** |  |  |
| **deviceAddressType1** |  |  |
| **deviceAddressType2** |  |  |
| **deviceAddressType3** |  |  |
| **deviceAddressType4** |  |  |
| **deviceClass** |  |  |
| **electronicSerialNumber** |  |  |
| **endDeviceID** |  |  |
| **groupAddressType1** |  |  |
| **groupAddressType2** |  |  |
| **groupAddressType3** |  |  |
| **groupAddressType4** |  |  |
| **ipAddress** |  |  |
| **macAddress** |  |  |
| **mfgAssignedConfigurationID** |  |  |
| **mfgAssignedPhysicalSerialNumber** |  |  |
| **mfgAssignedProductNumber** |  |  |
| **mfgAssignedUniqueCommunicationAddress** |  |  |
| **multiCastAddress** |  |  |
| **oneWayAddress** |  |  |
| **signalStrength** |  |  |
| **twoWayAddress** |  |  |
| **signaltoNoiseRatio** |  |  |
| **alarm** |  |  |
| **batteryCarryover** |  |  |
| **dataOverflowAlarm** |  |  |
| **demandLimit** |  |  |
| **demandReset** |  | Usually expressed as a count as part of a billing cycle |
| **diagnostic** |  |  |
| **emergencyLimit** |  |  |
| **encoderTamper** |  |  |
| **ieee1366MomentaryInterruption** |  |  |
| **ieee1366MomentaryInterruptionEvent** |  |  |
| **ieee1366SustainedInterruption** |  |  |
| **interruptionBehaviour** |  |  |
| **inversionTamper** |  |  |
| **loadInterrupt** |  |  |
| **loadShed** |  |  |
| **maintenance** |  |  |
| **physicalTamper** |  |  |
| **powerLossTamper** |  |  |
| **powerOutage** |  |  |
| **powerQuality** |  |  |
| **powerRestoration** |  |  |
| **programmed** |  |  |
| **pushbutton** |  |  |
| **relayActivation** |  |  |
| **relayCycle** |  | Usually expressed as a count |
| **removalTamper** |  |  |
| **reprogrammingTamper** |  |  |
| **reverseRotationTamper** |  |  |
| **switchArmed** |  |  |
| **switchDisabled** |  |  |
| **tamper** |  |  |
| **watchdogTimeout** |  |  |
| **billLastPeriod** |  | Customer’s bill for the previous billing period |
| **billToDate** |  | Customer’s bill, as known thus far within the present billing period |
| **billCarryover** |  | part of a previous obligation carried over from a previous billing period |
| **connectionFee** |  | Monthly fee for connection to commodity |
| **audibleVolume** |  | Sound |
| **volumetricFlow** |  |  |
|  |  |  |
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REQ.18.4.1.27 ReadingQuality

*Quality of a specific reading value or interval reading value. Note that more than one quality may be applicable to a given reading. Typically not used unless problems or unusual conditions occur (i.e., quality for each reading is assumed to be 'good' unless stated otherwise in associated reading quality).*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **quality** | *QualityOfReading* | *Quality, to be specified if different than ReadingType.defaultQuality.* |

REQ.18.4.1.28 ReadingType

*Detailed description for a type of a reading value. Values in attributes allow for the description of metadata about a measurement or measurements.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **accumulation** | *AccumulationKind* | *Accumulation behavior of a reading over time, usually 'measuringPeriod', to be used with individual endpoints (as opposed to 'macroPeriod' and 'aggregate' that are used to describe aggregations of data from individual endpoints).* |
| **aggregate** | *DataQualifierKind* | *Salient attribute of the reading data aggregated from individual endpoints. This is mainly used to define a mathematical operation carried out over 'macroPeriod', but may also be used to describe an attribute of the data when the 'macroPeriod' is not defined.* |
| **argument** | *RationalNumber* | Argument used to introduce numbers into the unit of measure description where they are needed (e.g., 4 where the measure needs an argument such as CEMI(n=4)). Most arguments used in practice however will be integers (i.e., 'denominator'=1).Value 0 in 'numerator' and 'denominator' means not applicable. |
| **commodity** | *CommodityKind* | *Commodity being measured.* |
| **consumptionTier** | *Integer* | In case of common flat-rate pricing for power, in which all purchases are at a given rate, 'consumptionTier'=0. Otherwise, the value indicates the consumption tier, which can be used in conjunction with TOU or CPP pricing.Consumption tier pricing refers to the method of billing in which a certain "block" of energy is purchased/sold at one price, after which the next block of energy is purchased at another price, and so on, all throughout a defined period. At the start of the defined period, consumption is initially zero, and any usage is measured against the first consumption tier ('consumptionTier'=1). If this block of energy is consumed before the end of the period, energy consumption moves to be reconed against the second consumption tier ('consumptionTier'=2), and so on. At the end of the defined period, the consumption accumulator is reset, and usage within the 'consumptionTier'=1 restarts. |
| **cpp** | *Integer* | *Critical peak period (CPP) bucket the reading value is attributed to. Value 0 means not applicable. Even though CPP is usually considered a specialized form of time of use 'tou', this attribute is defined explicitly for flexibility.* |
| **currency** | *Currency* | *Metering-specific currency.* |
| **flowDirection** | *FlowDirectionKind* | *Flow direction for a reading where the direction of flow of the commodity is important (for electricity measurements this includes current, energy, power, and demand).* |
| **interharmonic** | *ReadingInterharmonic* | *Indication of a "harmonic" or "interharmonic" basis for the measurement. Value 0 in 'numerator' and 'denominator' means not applicable.* |
| **macroPeriod** | *MacroPeriodKind* | *Time period of interest that reflects how the reading is viewed or captured over a long period of time.* |
| **measurementKind** | *MeasurementKind* | *Identifies "what" is being measured, as refinement of 'commodity'. When combined with 'unit', it provides detail to the unit of measure. For example, 'energy' with a unit of measure of 'kWh' indicates to the user that active energy is being measured, while with 'kVAh' or 'kVArh', it indicates apparent energy and reactive energy, respectively. 'power' can be combined in a similar way with various power units of measure: Distortion power ('distortionVoltAmperes') with 'kVA' is different from 'power' with 'kVA'.* |
| **measuringPeriod** | *TimeAttributeKind* | Time attribute inherent or fundamental to the reading value (as opposed to 'macroPeriod' that supplies an "adjective" to describe aspects of a time period with regard to the measurement). It refers to the way the value was originally measured and not to the frequency at which it is reported or presented. For example, an hourly interval of consumption data would have the value 'hourly' as an attribute. However in the case of an hourly sampled voltage value, the meterReadings schema would carry the 'hourly' interval size information.It is common for meters to report demand in a form that is measured over the course of a portion of an hour, while enterprise applications however commonly assume the demand (in kW or kVAr) normalized to 1 hour. The system that receives readings directly from the meter therefore must perform this transformation before publishing readings for use by the other enterprise systems. The scalar used is chosen based on the block size (not any sub-interval size). |
| **multiplier** | *UnitMultiplierKind* | *Metering-specific multiplier.* |
| **phases** | *PhaseCodeKind* | *Meteric-specific phase code.* |
| **tou** | *Integer* | *Time of use (TOU) bucket the reading value is attributed to. Value 0 means not applicable.* |
| **unit** | *UnitSymbolKind* | *Metering-specific unit.* |
| **intervalLength** | *Duration* | *(if incremental reading value) Length of increment interval.* |
| **defaultQuality** | *QualityOfReading* | *The default quality of readings. May be overridden for specific measurements in Reading or IntervalReading classes.* |
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REQ.18.4.1.29 Seconds *«Datatype»*

*Time, in seconds*.

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| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **value** | *Float* | *Time, in seconds* |
| **unit** | *UnitSymbolKind* |  |
| **multiplier** | *UnitMultiplierKind* |  |

REQ.18.4.1.30 ServiceCategory

*Category of service provided to the customer.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **kind** | *ServiceKind* | *Kind of service.* |

REQ.18.4.1.31 ServiceDeliveryPoint

*Logical point on the network where the ownership of the service changes hands. It is one of potentially many service points within a service location, delivering service in accordance with a customer agreement. Used at the place where a meter may be installed.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **name** | *String* | *The name is any free human readable and possibly non unique text naming the object.* |

REQ.18.4.1.32 ServiceKind *«enumeration»*

*Kind of service.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **electricity** |  |  |
| **gas** |  |  |
| **water** |  |  |
| **time** |  |  |
| **heat** |  |  |
| **refuse** |  |  |
| **sewerage** |  |  |
| **rates** |  |  |
| **tvLicence** |  |  |
| **internet** |  |  |
| **other** |  |  |
| **cold** |  | *Includes chilled water and ice* |

REQ.18.4.1.33 ServiceSupplier

*Organization that provides services to customers.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **kind** | *SupplierKind* | *Kind of supplier.* |
| **name** | *String* | *The name is any free human readable and possibly non unique text naming the object.* |

REQ.18.4.1.34 String *«Primitive»*

*A string consisting of a sequence of 8 bit characters. The character encoding is UTF-8. The string length is unspecified and unlimited.*

REQ.18.4.1.35 SummaryMeasurement

*An aggregated summary measurement reading.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **multiplier** | *UnitMultiplierKind* | *The multiplier part of the unit of measure, e.g. "kilo" (k)* |
| **timeStamp** | *AbsoluteDateTime* | *The date and time (if needed) of the summary measurement.* |
| **unit** | *UnitSymbolKind* | *The units of the reading, e.g. "Wh"* |
| **value** | *Float* | *The value of the summary measurement.* |

REQ.18.4.1.36 SummaryQuality *«enumeration»*

*List of codes indicating the quality of the summary.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **estimated** |  |  |
| **forecast** |  |  |
| **mixed** |  |  |
| **validated** |  |  |
| **raw** |  |  |
| **normalizedForWeather** |  |  |
| **other** |  |  |

REQ.18.4.1.37 SupplierKind *«enumeration»*

*Kind of supplier.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **utility** |  |  |
| **retailer** |  |  |
| **other** |  |  |
| **district** |  |  |
| **intermediary** |  |  |
| **local** |  |  |
| **microgrid** |  |  |

REQ.18.4.1.38 TariffProfile

*A schedule of charges; structure associated with Tariff that allows the definition of complex tariff structures such as step and time of use.*

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| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **name** | *String* | *The name is any free human readable and possibly non unique text naming the object.* |

REQ.18.4.1.39 UnitMultiplierKind *«enumeration»*

*The unit multiplier is the power of ten multipliers such as kilo, micro, deci, etc...*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **y** |  | *yocto = x10-24* |
| **z** |  | *zepto = x10-21* |
| **a** |  | *atto = x10-18* |
| **f** |  | *femto = x10-15* |
| **m** |  | *Milli 10\*\*-3* |
| **c** |  | *Centi 10\*\*-2* |
| **p** |  | *Pico 10\*\*-12* |
| **n** |  | *Nano 10\*\*-9* |
| **micro** |  | *Micro 10\*\*-6* |
| **d** |  | *Deci 10\*\*-1* |
| **none** |  | *Not Applicable or "x1"* |
| **da** |  | *deca 10\*\*1* |
| **h** |  | *hecto 10\*\*2* |
| **k** |  | *Kilo 10\*\*3* |
| **M** |  | *Mega 10\*\*6* |
| **G** |  | *Giga 10\*\*9* |
| **T** |  | *Tera 10\*\*12* |
| **P** |  | *Peta = x1015* |
| **E** |  | *Exa = x1018* |
| **Z** |  | *Zetta = x1021* |
| **Y** |  | *Yotta = x1024* |

REQ.18.4.1.40 UnitSymbolKind *«enumeration»*

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This identifies the units of measure based on the NIST Special Publication 330 2008 edition -- The International System of Units. Note that this reference document supports SI units as well as common units of measurements in practice including CGS units.

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| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **m** |  | *Length,meter* |
| **g** |  | *Mass,gram* |
| **a** |  | *Current,ampere* |
| **degK** |  | Temperature,Kelvin (Note: the unit “degrees” is implied) |
| **mol** |  | *Amount of substance,mole* |
| **cd** |  | *Luminous intensity,candela* |
| **s** |  | *Time,second* |
| **rad** |  | *Plane angle,Radian (m/m)* |
| **sr** |  | *Solid angle,Steradian (m2/m2)* |
| **gy** |  | *Absorbed dose,Gray (J/kg)* |
| **bq** |  | *Radioactivity,Becquerel (1/s)* |
| **degC** |  | *Relative temperature,degrees Celsius* |
| **sv** |  | *Dose equivalent,Sievert (J/kg)* |
| **f** |  | *Electric capacitance,Farad (C/V)* |
| **c** |  | *Electric charge,Coulomb (Amp second)* |
| **h** |  | *Electric inductance,Henry (Wb/A)* |
| **v** |  | *Electric potential,Volt (W/A)* |
| **ohm** |  | *Electric resistance,Ohm (V/A)* |
| **j** |  | *Energy joule,(N·m = C·V = W·s)* |
| **n** |  | *Force newton,(kg m/s²)* |
| **hz** |  | *Frequency,Cycles per second or (1/s)* |
| **lx** |  | *Illuminance lux,(lm/m²)* |
| **lm** |  | *Luminous flux,lumen (cd sr)* |
| **wb** |  | *Magnetic flux,Weber (V s)* |
| **t** |  | *Magnetic flux density,Tesla (Wb/m2)* |
| **w** |  | *Real power,Watt. By definition, one Watt equals one Joule per second. Electrical power may have real and reactive components. The real portion of electrical power (I²R), is expressed in Watts. (See also apparent power and reactive power.)* |
| **pa** |  | *Pressure,Pascal (N/m²) (Note: the absolute or relative measurement of pressure is implied with this entry. See below for more explicit forms.)* |
| **siemens** |  | *Electric Conductance,Siemens (A / V = 1 / O)* |
| **paA** |  | *Pressure,Pascal, absolute pressure* |
| **paG** |  | *Pressure,Pascal, gauge pressure* |
| **kat** |  | *Catalytic activity,katal = mol / s* |
| **revPerS** |  | *Rotational speed,rotations per second (Note: compare to cycles per second, Hz)* |
| **m2** |  | *Area,square meter* |
| **m3** |  | *Volume,cubic meter* |
| **mPerS** |  | *Velocity,meter per second (m/s)* |
| **mPerS2** |  | *Acceleration,meter per second squared* |
| **m3PerS** |  | *Volumetric flow rate,cubic meters per second* |
| **mPerM3** |  | *Fuel efficiency,meter / cubic meter* |
| **gM** |  | Moment of mass,kilogram meter (kg·m) (first moment of mass) (Note: users must supply the “k” prefix to obtain “kg m”.) |
| **gPerM3** |  | Density,gram/cubic meter (Note: users must supply the prefix multiplier “k” to form kg/ m³) |
| **m2PerS** |  | *Viscosity,meter squared / second* |
| **wPerMK** |  | *Thermal conductivity,Watt/meter Kelvin* |
| **jPerK** |  | *Heat capacity,Joule/Kelvin* |
| **radPerS** |  | *Angular velocity,radians per second* |
| **vA** |  | *Apparent power,Volt Ampere (See also real power and reactive power.)* |
| **vAr** |  | Reactive power, Volt Ampere reactive. The “reactive” or “imaginary” component of electrical power. (See also real power and apparent power). |
| **vS** |  | *Volt seconds,Volt seconds (Ws/A)* |
| **v2** |  | *Volts squared,Volt squared (W2/A2)* |
| **aS** |  | *Amp seconds,Amp seconds* |
| **a2** |  | *Amps squared,Amp squared* |
| **a2S** |  | *Amps squared time,square Amp second* |
| **vAH** |  | *Apparent energy,Volt Ampere hours* |
| **wH** |  | *Real energy,Watt hours* |
| **vArH** |  | *Reactive energy,Volt Ampere reactive hours* |
| **vPerHz** |  | *Magnetic flux,Volt per Hertz* |
| **hzPerS** |  | *Rate of change of frequency,Hertz per second* |
| **gM2** |  | Moment of mass,kg m2 (Second moment of mass, commonly called the moment of inertia) (Note: users must supply the “k” prefix to obtain “kg m2”.) |
| **wPerS** |  | *Ramp rate,Watt per second* |
| **lPerS** |  | *Volumetric flow rate,liters per second* |
| **q** |  | *Quantity power,Q* |
| **qh** |  | *Quantity energy,Qh* |
| **ohmM** |  | *resistivity,Ohm meter* |
| **aPerM** |  | *A/m,magnetic field strength, Ampere per meter* |
| **v2H** |  | *volt-squared hour,Volt-squared-hours* |
| **a2H** |  | *ampere-squared hour,Ampere-squared hour* |
| **aH** |  | *Ampere-hours,Ampere-hours* |
| **wHPerM3** |  | *Wh/m3,energy per volume* |
| **timeStamp** |  | *Timestamp,time and date per International Organization for Standardization standard ISO 8601 format* |
| **wHPerRev** |  | *Kh-Wh,active energy metering constant* |
| **vArHPerRev** |  | *Kh-VArh,reactive energy metering constant* |
| **vAHPerRev** |  | *Kh-Vah,apparent energy metering constant* |
| **m3PerH** |  | *Volumetric flow rate,cubic meter per hour* |
| **m3CompensatedPerH** |  | *Volumetric flow rate,compensated cubic meter per hour* |
| **m3UncompensatedPerH** |  | *Volumetric flow rate,uncompensated cubic meter per hour* |
| **lPerH** |  | *Volumetric flow rate,liter per hour* |
| **lUncompensatedPerH** |  | *Volumetric flow rate,liter (uncompensated) per hour* |
| **lCompensatedPerH** |  | *Volumetric flow rate,liter (compensated) per hour* |
| **q45** |  | *Quantity power,Q measured at 45º* |
| **q60** |  | *Quantity power,Q measured at 60º* |
| **q45H** |  | *Quantity energy,Qh measured at 45º* |
| **q60H** |  | *Quantity energy,Qh measured at 60º* |
| **jPerKg** |  | *Specific energy,Joule / kg* |
| **m3Uncompensated** |  | *Volume,cubic meter, with the value uncompensated for weather effects.* |
| **m3Compensated** |  | *Volume,cubic meter, with the value compensated for weather effects.* |
| **m1** |  | *Wavenumber,reciprocal meter, (1/m)* |
| **m3PerKg** |  | *Specific volume,cubic meter per kilogram, v* |
| **paS** |  | *Dynamic viscosity,Pascal second* |
| **nM** |  | *Moment of force,Newton meter* |
| **nPerM** |  | *Surface tension,Newton per meter* |
| **radPerS2** |  | *Angular acceleration,radian per second squared* |
| **wPerM2** |  | *Heat flux density, irradiance,Watt per square meter* |
| **jPerKgK** |  | *Specific heat capacity, specific entropy,Joule per kilogram kelvin* |
| **jPerM3** |  | *energy density,Joule per cubic meter* |
| **vPerM** |  | *electric field strength,Volt per meter* |
| **cPerM3** |  | *electric charge density,Coulomb per cubic meter* |
| **cPerM2** |  | *surface charge density,Coulomb per square meter* |
| **fPerM** |  | *permittivity,Farad per meter* |
| **hPerM** |  | *permeability,Henry per meter* |
| **jPerMol** |  | *molar energy,Joule per mole* |
| **jPerMolK** |  | *molar entropy, molar heat capacity,Joule per mole kelvin* |
| **cPerKg** |  | *exposure (x rays),Coulomb per kilogram* |
| **gyPerS** |  | *absorbed dose rate,Gray per second* |
| **wPerSr** |  | *radiant intensity,Watt per steradian* |
| **wPerM2Sr** |  | *radiance,Watt per square meter steradian* |
| **katPerM3** |  | *catalytic activity concentration,katal per cubic meter* |
| **min** |  | *Time,minute = 60 s* |
| **hr** |  | *Time,hour = 60 min = 3600 s* |
| **d** |  | *Time,day = 24 h = 86400 s* |
| **deg** |  | *Plane angle,degree* |
| **angleMin** |  | *Plane angle,minute* |
| **angleSec** |  | *Plane angle,second* |
| **ha** |  | *Area,hectare* |
| **l** |  | *Volume,liter= dm3 = m3/1000.* |
| **tonne** |  | mass,“tonne” or “metric ton” (1000 kg = 1 Mg) |
| **none** |  | *N/A,none (not applicable)* |
| **cosTheta** |  | *Power factor,dimensionless* |
| **bel** |  | Logarithmic ratio,Bel, Note: users must combine this unit with the multiplier prefix “d” to form decibels (dB) |
| **status** |  | *State,status, where:"1" = "true", "live", "on", "high", "set";"0" = "false", "dead", "off", "low", "cleared"Note: A Boolean value is preferred but other values may be supported* |
| **count** |  | *Amount of substance,Counter value* |
| **bm** |  | Logarithmic ratio of signal strength,Bel-mW, normalized to 1mW. Note: to form “dBm” combine “Bm” with multiplier “d”. |
| **code** |  | *Application Value,Encoded value* |
| **meCode** |  | *EndDeviceEvent,Value to be interpreted as a EndDeviceEventCode* |
| **lPerL** |  | Concentration,The ratio of the volume of a solute divided by the volume of the solution. (Note: Users may need use a prefix such a ‘µ’ to express a quantity such as ‘µL/L’) |
| **gPerG** |  | Concentration,The ratio of the mass of a solute divided by the mass of the solution. (Note: Users may need use a prefix such a ‘µ’ to express a quantity such as ‘µg/g’) |
| **molPerM3** |  | *Concentration,The amount of substance concentration, (c), the amount of solvent in moles divided by the volume of solution in m³.* |
| **molPerMol** |  | *Concentration,Molar fraction, the ratio of the molar amount of a solute divided by the molar amount of the solution.* |
| **molPerKg** |  | *Concentration,Molality, the amount of solute in moles and the amount of solvent in kilograms.* |
| **mPerM** |  | *Length,Ratio of length* |
| **sPerS** |  | Time,Ratio of time (Note: Users may need to supply a prefix such as ‘µ’ to show rates such as ‘µs/s’) |
| **hzPerHz** |  | Frequency,Rate of frequency change (Note: Users may need to supply a prefix such as ‘m’ to show rates such as ‘mHz/Hz’) |
| **vPerV** |  | Voltage,Ratio of voltages (Note: Users may need to supply a prefix such as ‘m’ to show rates such as ‘mV/V’) |
| **aPerA** |  | Current,Ratio of Amperages (Note: Users may need to supply a prefix such as ‘m’ to show rates such as ‘mA/A’) |
| **wPerVA** |  | *Power factor,PF* |
| **rev** |  | *Amount of rotation,Revolutions* |
| **wPerW** |  | Signal Strength,Ratio of power (Note: Users may need to supply a prefix such as ‘m’ to show rates such as ‘mW/W’) |
| **refractiveIndexN** |  | *Refractive Index,n* |
| **relativePermeabilityMur** |  | *Relative Permeability,µr* |
| **np** |  | *Logarithmic ratio,neper* |
| **eV** |  | *energy,electronvolt (1 eV = 1.602 176 x 10-19J)* |
| **da** |  | *mass,dalton (1 Da = 1.660 538 x 10-27kg)* |
| **u** |  | *mass,unified atomic mass unit (1u = 1 Da)* |
| **ua** |  | *length,astronomical unit (1ua = 1.495 978 x1011m)* |
| **c0** |  | *speed,natural unit of speed (speed of light in a vacuum) 299 792 458 m/s* |
| **nuH** |  | *action,natural unit of action (reduced planck constant) 1.054 571 X 10-34J s* |
| **nuMe** |  | *mass,natural unit of mass (electron mass) 9.109 382 x 10-31 kg* |
| **nuHPerNuMeC02** |  | *time,natural unit of time* |
| **auE** |  | *charge,atomic units of charge (elementary charge) 1.602 176 x 10-19 C* |
| **auMe** |  | *mass,atomic units of mass (electron mass) 9.109 382 x 10-31 kg* |
| **auH** |  | *action,atomic unit of action (reduced planck constant) 1.054 571 X 10-34J s* |
| **auA0** |  | *length,atomic unit of length, bohr ( Bohr radius) 0.529 177 x 10-10 m* |
| **auEh** |  | *energy,atomic unit of energy, hartree 4.359 744* |
| **auHPerAuEh** |  | *time,atomic unit of time* |
| **char** |  | *Number of characters,characters* |
| **charPerSec** |  | *Data rate,characters per second* |
| **money** |  | *Monetary unit,Generic money (Note: Specific monetary units are identified the currency class).* |
| **ft3** |  | *Volume,cubic foot* |
| **ft3Compensated** |  | *Volume,cubic foot compensated for weather* |
| **ft3Uncompensated** |  | *Volume,cubic foot uncompensated for weather* |
| **ft3PerH** |  | *Volumetric flow rate,cubic foot per hour* |
| **ft3CompensatedPerH** |  | *Volumetric flow rate,compensated cubic feet per hour* |
| **ft3UncompensatedPerH** |  | *Volumetric flow rate,uncompensated cubic feet per hour* |
| **uSGal** |  | *Volume,US gallon (1 gal = 231 in3 = 128 fl oz.)* |
| **uSGalPerH** |  | *Volumetric flow rate,US gallon per hour* |
| **impGal** |  | *Volume,Imperial gallon* |
| **impGalPerH** |  | *Volumetric flow rate,Imperial gallon per hour* |
| **btu** |  | *Energy,British Thermal Unit* |
| **btuPerH** |  | *Power,BTU per hour* |
| **psiA** |  | *Pressure,Pound per square inch, absolute* |
| **psiG** |  | *Pressure,Pound per square inch, gauge* |
| **lUncompensated** |  | *Volume,Liter, with the value uncompensated for weather effects.* |
| **lCompensated** |  | *Volume,Liter, with the value compensated for weather effects.* |
| **therm** |  | *Energy,Therm* |
| **bar** |  | *Pressure,bar (1 bar = 100 kPa)* |
| **mmHg** |  | *Pressure,millimeter of mercury (1 mmHg ˜ 133.3 Pa)* |
| **angstrom** |  | *Length,ångström (1Å = 10-10m)* |
| **nmi** |  | *Length,nautical mile (1 M = 1852 m)* |
| **barn** |  | *Area,barn (1 b = 100 fm2 = 10-28 m2)* |
| **kn** |  | *Speed,knot (1 kn = 1852/3600) m/s* |
| **ci** |  | *Activity,curie (1 Ci = 3.7 x 1010Bq)* |
| **r** |  | *exposure,roentgen (1 R = 2.58 x 10-4 C/kg)* |
| **doseRad** |  | *absorbed dose,rad (1 rd = 1 cGy)* |
| **rem** |  | *dose equivalent,rem (1 rem = 10-2 Sv)* |
| **in** |  | *length,inch* |
| **ft** |  | *length,foot (1 ft = 12 in)* |
| **rod** |  | *length,rod (1 rod = 16.5 ft)* |
| **fur** |  | *length,furlong (1 fur = 660 ft)* |
| **mi** |  | *length,mile (1 statute mile = 8 fur = 80 chains = 320 rods = 5280 feet)* |
| **ft2** |  | *area,square foot (1 ft2 = 144 in2)* |
| **yd2** |  | *area,square yard (1 yd2 = 9 ft2)* |
| **rod2** |  | *area,square rod (1 rod2 = 272.25 ft2)* |
| **acre** |  | *area,acre (1 acre = 160 rd2 = 43 560 ft2)* |
| **mi2** |  | *area,square mile (1 mi2 = 640 acres)* |
| **sectionOfLand** |  | *area,section of land (1 mi2 = 1 section of land)* |
| **township** |  | *area,township (1 township = 6 miles square)* |
| **yd3** |  | *Volume,cubic yard (1 yd3 = 27 ft3)* |
| **li** |  | *length,link (1 li = 0.66 ft)* |
| **ch** |  | *length,chain (1 ch = 100 links = 4 rods = 66 ft)* |
| **uSLiqPt** |  | *Volume,US liquid pint (1 pt = 28.875 in3 = 128 fl dr)* |
| **uSLiqQt** |  | *Volume,US liquid quart (1 qt = 2 pt)* |
| **flDrAp** |  | *Volume,Apothecaries fluid dram* |
| **flOzAp** |  | *Volume,Apothecaries fluid ounce (1 fl oz ap = 8 fl dr ap)* |
| **usDryPt** |  | *Volume,US dry pint (1 pt = 67.2 in3)* |
| **usDryQt** |  | *Volume,US dry quart (1 qt = 2 pints)* |
| **usPk** |  | *Volume,US peck (1 pk = 8 qt)* |
| **usBu** |  | *Volume,US bushel (1 bu = 4 pk)* |
| **gr** |  | Mass,grain (1 grain = 1/7000 avdp lb) Note: The “grain” is the same in the avoirdupois, troy, and apothecaries units of mass. |
| **avdpDr** |  | Mass,Avoirdupois dram (1 Avdp dr = 27-11/32 gr) Note: The abbreviation “dr” may be used if there is no chance of confusing the avoirdupois dram with the troy or apothecaries dram. |
| **avdpOz** |  | Mass,Avoirdupois ounce (1 Avdp oz = 16 Avdp dr) Note: The abbreviation “oz” may be used if there is no chance of confusing the avoirdupois ounce with the troy or apothecaries ounce. |
| **avdpLb** |  | Mass,Avoirdupois pound (1 lb = 16 oz) Note: Although the term “pound” is commonly used in many countries simply as “pound (lb)”, the historical term “avoirdupois” is added to provide context and distinguish it in this setting from the troy and apothecaries systems of measure which use the same names. The abbreviation “lb” may be used instead of “avdp lb” if no confusion is possible with the pound named in these other systems. |
| **shortCwt** |  | *Mass,Avoirdupois hundredweight (1 cwt = 100 lbs)* |
| **shortTon** |  | *Mass,Avoirdupois ton (1 short ton = 2000 lbs)* |
| **longCwt** |  | *Mass,Avoirdupois gross or long hundredweight (1 long cwt = 112 lbs)* |
| **longTon** |  | *Mass,Avoirdupois gross or long ton (1 long ton = 20 long cwt)* |
| **dwt** |  | *Mass,Troy pennyweight (1 dwt = 24 grains)* |
| **ozT** |  | *Mass,Troy ounce (1 oz t = 20 dwt)* |
| **lbT** |  | *Mass,Troy pound (1 lb t = 12 oz t)* |
| **sAp** |  | *Mass,Apothecaries scruple (1 s ap = 20 grains)* |
| **drAp** |  | *Mass,Apothecaries dram (1 dr ap = 3 s ap)* |
| **ozAp** |  | *Mass,Apothecaries ounce (1 oz ap = 8 dr ap)* |
| **lbAp** |  | *Mass,Apothecaries pound (1 lp ap = 12 oz ap)* |
| **mpgImp** |  | *Fuel economy,mile per imperial gallon* |
| **mpgUS** |  | *Fuel economy,mile per US gallon* |
| **mPGeUS** |  | *Fuel economy,mile per US gallon equivalent* |
| **lPer100km** |  | *Fuel economy,liter per 100 km* |
| **wHPerMi** |  | Fuel economy,watt-hour per mile (Note: users must supply the “k” prefix to create “kWh/mi”) |
| **wHPer100Mi** |  | Fuel economy,watt-hour per 100 mile (Note: users must supply the “k” prefix to create “kWh/(100 mi)”) |
| **degF** |  | *Temperature,degrees Fahrenheit* |
| **erg** |  | *Energy,erg (1 erg = 10-7 J)* |
| **dyn** |  | *Force,dyne (1 dyn = 10-5 N)* |
| **p** |  | *Dynamic viscosity,poise (1 P = 0.1 Pa s)* |
| **st** |  | *Kinematic viscosity,stokes (1 St = 1 cm2/s)* |
| **sb** |  | *Luminance,stilb (1 sb = 104 cd/m2)* |
| **ph** |  | *Illuminance,phot (1 ph = 104 lx)* |
| **gal** |  | Acceleration,gal (1 Gal = 10-2 m s-2) Note: This “Gal” is an abbreviation for “Galileo” not “gallon” |
| **mx** |  | *Magnetic flux,Maxwell (1 Mx = 10-8 Wb)* |
| **gauss** |  | *Magnetic flux density,Gauss (1 G = 10-4 T)* |
| **oe** |  | Magnetic field,Œrsted (1 Oe = (103/4p) A/m) |

REQ.18.4.1.41 UsagePoint

*Logical point on a network at which consumption or production is either physically measured (e.g. metered) or estimated (e.g. unmetered street lights).*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **name** | *String* | *The name is any free human readable and possibly non unique text naming the object.* |
| **description** | *String* | *A human readable description of the object.*  |
| **status** | *Integer* | Status of this UsagePoint:0 - Off1 - On |
| **roleFlags** | *RoleFlags* | *The set of roles pertinant to this UsagePoint* |

REQ.18.4.1.42 UsageSummary

Summary of usage for a billing period

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **billingPeriod** | *DateTimeInterval* | *The billing period to which the included measurements apply* |
| **billLastPeriod** | *Float* | *The amount of the bill for the previous period* |
| **billToDate** | *Float* | *The bill amount related to the billing period as of the date received* |
| **costAdditionalLastPeriod** | *Float* | *Additional charges from the last billing period* |
| **costAdditionalLastPeriodDetail** | *LineDetail* | *Additional charges from the last billing period* |
| **currency** | Currency | *The International Organization for Standardization standard ISO 4217 code indicating the currency applicable to the bill amounts in the summary. See list at http://www.unece.org/cefact/recommendations/rec09/rec09\_ecetrd203.pdf* |
| **currentBillingPeriodOverallConsumption** | *SummaryMeasurement* | *The total consumption for the billing period* |
| **currentDayLastYearNetConsumption** | *SummaryMeasurement* | *The amount of energy consumed one year ago*  |
| **currentDayNetConsumption** | *SummaryMeasurement* | *Net consumption for the current day (delivered - received)* |
| **currentDayOverallConsumption** | *SummaryMeasurement* | *Overall energy consumption for the current day* |
| **peakDemand** | *SummaryMeasurement* | *Peak demand recorded for the current period* |
| **previousDayLastYearOverallConsumption** | *SummaryMeasurement* | *The amount of energy consumed on the previous day one year ago*  |
| **previousDayNetConsumption** | *SummaryMeasurement* | *Net consumption for the previous day* |
| **previousDayOverallConsumption** | *SummaryMeasurement* | *The total consumption for the previous day* |
| **qualityOfReading** | *SummaryQuality* | *Indication of the quality of the summary readings* |
| **ratchetDemand** | *SummaryMeasurement* | *The current ratchet demand value for the ratchet demand period* |
| **ratchetDemandPeriod** | *DateTimeInterval* | *The period over which the ratchet demand applies* |

REQ.18.4.1.43 RoleFlags

*Describe a set of specific communication or physical attributes that the associated UsagePoint may have. The term RoleFlags in this specific case pertains to the application-specific nature of the UsagePoint. More than one of these flags can be true for any UsagePoint.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **isDC** | *boolean* | *Is direct current (DC) rather than alternating current (AC)* |
| **isDER** | *boolean* | *Is a distributed energy resource point* |
| **isMirror** | *boolean* | *Represents a copy or mirror of an original UsagePoint* |
| **isOneway** | *boolean* | *Device is a one-way communications device that can only transmit its information and cannot receive.* |
| **isPEV** | *boolean* | *Is a PEV Usage Point* |
| **isPremiseAggregationPoint** | *boolean* | *This UsagePoint aggregates the contributions of other UsagePoints in the premise* |
| **isRevenueQuality** | *boolean* | *Is revenue quality.* |

REQ.18.4.1.44 LineDetail

*Details on an amount line, with rounding, date and note.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **amount** | float | *Amount for this line item.* |
| **rounding** | float | *Totalized monetary value of all errors due to process rounding or truncating that is not reflected in 'amount'.* |
| **dateTime** | *DateTime* | *Date and time when this line was created in the application process.* |
| **note** | *String* | *Free format note relevant to this line.* |

REQ.18.4.1.45 ReadingInterharmonic *«Compound»*

*Interharmonics are represented as a rational number 'numerator' / 'denominator', and harmonics are represented using the same mechanism and identified by 'denominator'=1.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **numerator** | *Integer* | *Interharmonic numerator. Value 0 means not applicable. Value 1 is used in combination with 'denominator'=2 to represent interharmonic 1/2, and with 'denominator'=1 it represents fundamental frequency. Finally, values greater than 1 indicate the harmonic of that order (e.g., 'numerator'=5 is the fifth harmonic).* |
| **denominator** | *Integer* | *Interharmonic denominator. Value 0 means not applicable. Value 2 is used in combination with 'numerator'=1 to represent interharmonic 1/2. Finally, value 1 indicates the harmonic of the order specified with 'numerator'.* |

REQ.18.4.1.46 RationalNumber *«Compound»*

*Rational number = 'numerator' / 'denominator'.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **numerator** | *Integer* | *Numerator.* |
| **denominator** | *Integer* | *Denominator. Value 1 indicates the number is a simple integer.* |

REQ.18.4.1.47 AccumulationKind *«enumeration»*

*Accumulation behavior of a reading over time, usually 'measuringPeriod', to be used with individual endpoints (as opposed to 'macroPeriod' and 'aggregate' that are used to describe aggregations of data from individual endpoints).*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **none** |  | *Not Applicable, or implied by the unit of measure.* |
| **bulkQuantity** |  | A value from a register which represents the bulk quantity of a commodity. This quantity is computed as the integral of the commodity usage rate. This value is typically used as the basis for the dial reading at the meter, and as a result, will roll over upon reaching a maximum dial value. Note 1: With the metering system, the roll-over behavior typically implies a roll-under behavior so that the value presented is always a positive value (e.g. unsigned integer or positive decimal.) However, when communicating data between enterprise applications a negative value might occur in a case such as net metering.Note 2: A BulkQuantity refers primarily to the dial reading and not the consumption over a specific period of time. |
| **continuousCumulative** |  | The sum of the previous billing period values and the present period value. Note: “ContinuousCumulative” is commonly used in conjunction with “demand.” The “ContinuousCumulative Demand” would be the cumulative sum of the previous billing period maximum demand values (as occurring with each demand reset) summed with the present period maximum demand value (which has yet to be reset.) |
| **cumulative** |  | The sum of the previous billing period values. Note: “Cumulative” is commonly used in conjunction with “demand.” Each demand reset causes the maximum demand value for the present billing period (since the last demand reset) to accumulate as an accumulative total of all maximum demands. So instead of “zeroing” the demand register, a demand reset has the affect of adding the present maximum demand to this accumulating total.  |
| **deltaData** |  | The difference between the value at the end of the prescribed interval and the beginning of the interval. This is used for incremental interval data. Note: One common application would be for load profile data, another use might be to report the number of events within an interval (such as the number of equipment energizations within the specified period of time.) |
| **indicating** |  | As if a needle is swung out on the meter face to a value to indicate the current value. (Note: An “indicating” value is typically measured over hundreds of milliseconds or greater, or may imply a “pusher” mechanism to capture a value. Compare this to “instantaneous” which is measured over a shorter period of time.)  |
| **summation** |  | A form of accumulation which is selective with respect to time. Note : “Summation” could be considered a specialization of “Bulk Quantity” according to the rules of inheritance where “Summation” selectively accumulates pulses over a timing pattern, and “BulkQuantity” accumulates pulses all of the time. |
| **timeDelay** |  | *A form of computation which introduces a time delay characteristic to the data value* |
| **instantaneous** |  | Typically measured over the fastest period of time allowed by the definition of the metric (usually milliseconds or tens of milliseconds.) (Note: “Instantaneous” was moved to attribute #3 in 61968-9Ed2 from attribute #1 in 61968-9Ed1.) |
| **latchingQuantity** |  | When this description is applied to a metered value, it implies that the value is a time-independent cumulative quantity much a BulkQuantity, except that it latches upon the maximum value upon reaching that value. Any additional accumulation (positive or negative) is discarded until a reset occurs. Note: A LatchingQuantity may also occur in the downward direction – upon reaching a minimum value. The terms “maximum” or “minimum” will usually be included as an attribute when this type of accumulation behaviour is present.When this description is applied to an encoded value (UOM= “Code”), it implies that the value has one or more bits which are latching. The condition that caused the bit to be set may have long since evaporated.In either case, the timestamp that accompanies the value may not coincide with the moment the value was initially set.In both cases a system will need to perform an operation to clear the latched value. |
| **boundedQuantity** |  | *A time-independent cumulative quantity such as BulkQuantity or a LatchingQuantity, except that the accumulation stops at the maximum or minimum values. When the maximum is reached, any additional positive accumulation is discarded, but negative accumulation may be accepted (thus lowering the counter.) Likewise, when the negative bound is reached, any additional negative accumulation is discarded, but positive accumulation is accepted (thus increasing the counter.)*  |

REQ.18.4.1.48 CommodityKind *«enumeration»*

*Identifies the commodity being measured.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **none** |  | *Not Applicable* |
| **electricity SecondaryMetered** |  | All types of metered quantities. This type of reading comes from the meter and represents a “secondary” metered value. |
| **electricity PrimaryMetere**d |  | It is possible for a meter to be outfitted with an external VT and/or CT. The meter might not be aware of these devices, and the display not compensate for their presence. Ultimately, when these scalars are applied, the value that represents the service value is called the “primary metered” value. The “index” in sub-category 3 mirrors those of sub-category 0. |
| **communication** |  | *A measurement of the communication infrastructure itself.* |
| **air** |  |  |
| **insulativeGas** |  | (SF6 is found separately below.) |
| **insulativeOil** |  |  |
| **naturalGas** |  |  |
| **propane** |  |  |
| **potableWater** |  | *Drinkable water* |
| **steam** |  | *Water in steam form, usually used for heating.* |
| **wasteWater** |  | *(Sewerage)* |
| **heatingFluid** |  | *This fluid is likely in liquid form. It is not necessarily water or water based. The warm fluid returns cooler than when it was sent. The heat conveyed may be metered.* |
| **coolingFluid** |  | *The cool fluid returns warmer than when it was sent. The heat conveyed may be metered.* |
| **nonpotableWater** |  | *Reclaimed water – possibly used for irrigation but not sufficiently treated to be considered safe for drinking.* |
| **nox** |  | Nitrous Oxides NOX |
| **so2** |  | Sulfur Dioxide SO2 |
| **ch4** |  | Methane CH4 |
| **co2** |  | Carbon Dioxide CO2 |
| **carbon** |  |  |
| **pfc** |  | *Perfluorocarbons PFC* |
| **sf6** |  | Sulfur hexafluoride SF6 |
| **tvLicence** |  | *Television* |
| **internet** |  | *Internet service* |
| **refuse** |  | *trash* |
| **h2** |  | *Hydrogen, H2* |
| **c2h2** |  | *Acetylene, C2H2* |
| **c2h4** |  | *Ethylene, C2H4* |
| **c2h6** |  | *Ethane, C2H6* |
| **co** |  | *Carbon monoxide, CO* |
| **o2** |  | *Oxygen, O2* |
| **dissolvedCombustibleGas** |  | *Dissolved Combustible Gas (A combination of combustible gasses such as H2, CH4, C2H2, C2H4, C2H6, and/or CO in some mixture.)* |
| **co2e** |  | *Carbon Dioxide CO2 Equivalent* |
| **lead** |  | *Lead, Pb* |
| **mercury** |  | *Mercury, Hg* |
| **ozone** |  | *Ozone, O3* |
| **pm10** |  | *Particulate matter whose maximum size is 10 µm.* |
| **pm25** |  | *Particulate matter whose maximum size is 2.5 µm.* |
| **sox** |  | *Sulfur Oxides, SOX* |

REQ.18.4.1.49 Currency *«enumeration»*

*Monetary currencies. Apologies for this list not being exhaustive. The complete set of enumerated values can be found in International Organization for Standardization standard ISO 4217 currency and funds name and code elements.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **USD** |  | *US dollar* |
| **EUR** |  | *European euro* |
| **AUD** |  | *Australian dollar* |
| **CAD** |  | *Canadian dollar* |
| **CHF** |  | *Swiss francs* |
| **CNY** |  | *Chinese yuan renminbi* |
| **DKK** |  | *Danish crown* |
| **GBP** |  | *British pound* |
| **JPY** |  | *Japanese yen* |
| **NOK** |  | *Norwegian crown* |
| **RUB** |  | *Russian ruble* |
| **SEK** |  | *Swedish crown* |
| **INR** |  | *India rupees* |
| **other** |  | *Another type of currency.* |

REQ.18.4.1.50 DataQualifierKind *«enumeration»*

*This value qualifies the measurement as to what it represents -- for example a minimum or maximum value or a nominal or nameplate value.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **high** |  | *Typically used to identify the high volume flow port of a compound water meter.* |
| **low** |  | *Typically used to identify the low volume flow port of a compound water meter.* |
| **none** |  | *Not Applicable* |
| **average** |  | *The value represents an average* |
| **excess** |  | *The value represents an amount over which a threshold was exceeded.* |
| **highThreshold** |  | *The value represents a programmed threshold.* |
| **lowThreshold** |  | *The value represents a programmed threshold.* |
| **maximum** |  | *The highest value observed* |
| **minimum** |  | *The smallest value observed* |
| **nominal** |  | *The value represents nominal or nameplate values* |
| **normal** |  | *The value represents typical operating values* |
| **secondMaximum** |  | *The second highest value observed* |
| **secondMinimum** |  | *The second smallest value observed* |
| **thirdMaximum** |  | *The third highest value observed* |
| **fourthMaximum** |  | *The fourth highest value observed* |
| **fifthMaximum** |  | *The fifth highest value observed* |
| **sum** |  | *The accumulated sum* |

REQ.18.4.1.51 MacroPeriodKind *«enumeration»*

*Time period of interest that reflects how the reading is viewed or captured over a long period of time.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **none** |  | *Not Applicable* |
| **billingPeriod** |  | *Captured during the billing period starting at midnight of the first day of the billing period (as defined by the billing cycle day). If during the current billing period, it specifies a period from the start of the current billing period until "now".* |
| **daily** |  | *Daily Period starting at midnight. If for the current day, this specifies the time from midnight to "now".* |
| **monthly** |  | *Monthly period starting at midnight on the first day of the month. If within the current month, this specifies the period from the start of the month until "now."* |
| **seasonal** |  | *A season of time spanning multiple months. E.g. "Summer," "Spring," "Fall," and "Winter" based cycle. If within the current season, it specifies the period from the start of the current season until "now."* |
| **weekly** |  | *Weekly period starting at midnight on the first day of the week and ending the instant before midnight the last day of the week. If within the current week, it specifies the period from the start of the week until "now."* |
| **specifiedPeriod** |  | *For the period defined by the start and end of the TimePeriod element in the message.* |

REQ.18.4.1.52 MeasuringPeriodKind *«enumeration»*

Time attribute inherent or fundamental to the reading value (as opposed to 'macroPeriod' that supplies an "adjective" to describe aspects of a time period with regard to the measurement). It refers to the way the value was originally measured and not to the frequency at which it is reported or presented. For example, an hourly interval of consumption data would have the value 'hourly' as an attribute. However in the case of an hourly sampled voltage value, the meterReadings schema would carry the 'hourly' interval size information.

It is common for meters to report demand in a form that is measured over the course of a portion of an hour, while enterprise applications however commonly assume the demand (in kW or kVAr) normalized to 1 hour. The system that receives readings directly from the meter therefore performs this transformation before publishing readings for use by the other enterprise systems. The scalar used is chosen based on the block size (not any sub-interval size).

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **none** |  | *Not Applicable* |
| **tenMinute** |  | *10-minute* |
| **fifteenMinute** |  | *15-minute* |
| **oneMinute** |  | *1-minute* |
| **twentyfourHour** |  | *24-hour* |
| **thirtyMinute** |  | *30-minute* |
| **fiveMinute** |  | *5-minute* |
| **sixtyMinute** |  | *60-minute* |
| **twoMinute** |  | *2-minute* |
| **threeMinute** |  | *3-minute* |
| **present** |  | *Within the present period of time* |
| **previous** |  | *Shifted within the previous monthly cycle and data set* |
| **twentyMinute** |  | *20-minute interval* |
| **fixedBlock60Min** |  | *60-minute Fixed Block* |
| **fixedBlock30Min** |  | *30-minute Fixed Block* |
| **fixedBlock20Min** |  | *20-minute Fixed Block* |
| **fixedBlock15Min** |  | *15-minute Fixed Block* |
| **fixedBlock10Min** |  | *10-minute Fixed Block* |
| **fixedBlock5Min** |  | *5-minute Fixed Block* |
| **fixedBlock1Min** |  | *1-minute Fixed Block* |
| **rollingBlock60MinIntvl30MinSubIntvl** |  | *60-minute Rolling Block with 30-minute sub-intervals* |
| **rollingBlock60MinIntvl20MinSubIntvl** |  | *60-minute Rolling Block with 20-minute sub-intervals* |
| **rollingBlock60MinIntvl15MinSubIntvl** |  | *60-minute Rolling Block with 15-minute sub-intervals* |
| **rollingBlock60MinIntvl12MinSubIntvl** |  | *60-minute Rolling Block with 12-minute sub-intervals* |
| **rollingBlock60MinIntvl10MinSubIntvl** |  | *60-minute Rolling Block with 10-minute sub-intervals* |
| **rollingBlock60MinIntvl6MinSubIntvl** |  | *60-minute Rolling Block with 6-minute sub-intervals* |
| **rollingBlock60MinIntvl5MinSubIntvl** |  | *60-minute Rolling Block with 5-minute sub-intervals* |
| **rollingBlock60MinIntvl4MinSubIntvl** |  | *60-minute Rolling Block with 4-minute sub-intervals* |
| **rollingBlock30MinIntvl15MinSubIntvl** |  | *30-minute Rolling Block with 15-minute sub-intervals* |
| **rollingBlock30MinIntvl10MinSubIntvl** |  | *30-minute Rolling Block with 10-minute sub-intervals* |
| **rollingBlock30MinIntvl6MinSubIntvl** |  | *30-minute Rolling Block with 6-minute sub-intervals* |
| **rollingBlock30MinIntvl5MinSubIntvl** |  | *30-minute Rolling Block with 5-minute sub-intervals* |
| **rollingBlock30MinIntvl3MinSubIntvl** |  | *30-minute Rolling Block with 3-minute sub-intervals* |
| **rollingBlock30MinIntvl2MinSubIntvl** |  | *30-minute Rolling Block with 2-minute sub-intervals* |
| **rollingBlock15MinIntvl5MinSubIntvl** |  | *15-minute Rolling Block with 5-minute sub-intervals* |
| **rollingBlock15MinIntvl3MinSubIntvl** |  | *15-minute Rolling Block with 3-minute sub-intervals* |
| **rollingBlock15MinIntvl1MinSubIntvl** |  | *15-minute Rolling Block with 1-minute sub-intervals* |
| **rollingBlock10MinIntvl5MinSubIntvl** |  | *10-minute Rolling Block with 5-minute sub-intervals* |
| **rollingBlock10MinIntvl2MinSubIntvl** |  | *10-minute Rolling Block with 2-minute sub-intervals* |
| **rollingBlock10MinIntvl1MinSubIntvl** |  | *10-minute Rolling Block with 1-minute sub-intervals* |
| **rollingBlock5MinIntvl1MinSubIntvl** |  | *5-minute Rolling Block with 1-minute sub-intervals* |

REQ.18.4.1.53 PhaseCodeKind *«enumeration»*

Enumeration of phase identifiers. Allows designation of phases for both transmission and distribution equipment, circuits and loads.

Residential and small commercial loads are often served from single-phase, or split-phase, secondary circuits. Phases 1 and 2 refer to hot wires that are 180 degrees out of phase, while N refers to the neutral wire. Through single-phase transformer connections, these secondary circuits may be served from one or two of the primary phases A, B, and C. For three-phase loads, use the A, B, C phase codes instead of s12N.

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **none** |  | *Not applicable to any phase* |
| **phaseN** |  | *Neutral* |
| **phaseNtoGnd** |  | *Neutral to ground* |
| **phaseC** |  | *Phase C* |
| **phaseCtoN** |  | *Phase C to Neutral* |
| **phaseCtoAv** |  | *Phase C current or voltage relative to Phase A voltage* |
| **phaseCAtoN** |  | *CA to Neutral* |
| **phaseB** |  | *Phase B* |
| **phaseBtoN** |  | *Phase B to Neutral* |
| **phaseBtoC** |  | *Phase B to C* |
| **phaseBtoAv** |  | *Phase B current or voltage relative to Phase A voltage* |
| **phaseBCtoN** |  | *BC to Neutral* |
| **phaseA** |  | *Phase A* |
| **phaseAtoN** |  | *Phase A to Neutral* |
| **phaseAtoB** |  | *Phase A to B* |
| **phaseAtoAv** |  | *Phase A current relative to Phase A voltage* |
| **phaseABtoN** |  | *AB to Neutral* |
| **phasesABC** |  | *Involving all phases* |
| **phaseABCtoN** |  | *ABC to Neutral* |
| **s2** |  | *Phase S2* |
| **s2N** |  | *Phase S2 to Neutral* |
| **s1** |  | *Phase S1* |
| **s1N** |  | *Phase S1 to Neutral* |
| **s12** |  | *Phase S1 to S2* |
| **s12N** |  | *Phase S1, S2 to Neutral* |
| **threeWireWye** |  | *Three wire Wye* |
| **fourWireWye** |  | *Four wire Wye* |
| **threeWireDelta** |  | *Three wire Delta* |
| **fourWireDelta** |  | *Four wire Delta* |
| **fourWireHLDelta** |  | *Four wire High-leg Delta* |
| **fourWireOpenDelta** |  | *Four wire Open Delta* |
| **networked** |  | *Networked meter* |

REQ.18.4.1.54 TimeAttributeKind *«enumeration»*

*This value identifies the time period during which this measurement was performed. For example if averaged (see DataQualifierKind) what period is averaged. Other complex time periods for how a measurement is computed are identified.*

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| **twelveMinute** |  | *12-minute* |
| **twoHour** |  | *2-hour* |
| **fourHour** |  | *4-hour* |
| **sixHour** |  | *6-hour* |
| **twelveHour** |  | *12-hour* |
| **specifiedInterval** |  | The interval length is described in RationalNumber.numerator in seconds. Attribute RationalNumber.denominator should be ‘1’ for whole seconds. |
| **specifiedFixedBlock** |  | The fixed block duration is described in RationalNumber.numerator in seconds. RationalNumber.denominator should be ‘1’ for whole seconds. |
| **specifiedRollingBlock** |  | *The rolling block size is described by RationalNumber.numerator in seconds, and the sub-interval size by RationalNumber.denominator in seconds.* |
| **none** |  | *Not Applicable* |
| **tenMinute** |  | *10-minute* |
| **fifteenMinute** |  | *15-minute* |
| **oneMinute** |  | *1-minute* |
| **twentyfourHour** |  | *24-hour* |
| **thirtyMinute** |  | *30-minute* |
| **fiveMinute** |  | *5-minute* |
| **sixtyMinute** |  | *60-minute* |
| **twoMinute** |  | *2-minute* |
| **threeMinute** |  | *3-minute* |
| **present** |  | *Within the present period of time* |
| **previous** |  | *Shifted within the previous monthly cycle and data set* |
| **twentyMinute** |  | *20-minute interval* |
| **fixedBlock60Min** |  | *60-minute Fixed Block* |
| **fixedBlock30Min** |  | *30-minute Fixed Block* |
| **fixedBlock20Min** |  | *20-minute Fixed Block* |
| **fixedBlock15Min** |  | *15-minute Fixed Block* |
| **fixedBlock10Min** |  | *10-minute Fixed Block* |
| **fixedBlock5Min** |  | *5-minute Fixed Block* |
| **fixedBlock1Min** |  | *1-minute Fixed Block* |
| **rollingBlock60MinIntvl30MinSubIntvl** |  | *60-minute Rolling Block with 30-minute sub-intervals* |
| **rollingBlock60MinIntvl20MinSubIntvl** |  | *60-minute Rolling Block with 20-minute sub-intervals* |
| **rollingBlock60MinIntvl15MinSubIntvl** |  | *60-minute Rolling Block with 15-minute sub-intervals* |
| **rollingBlock60MinIntvl12MinSubIntvl** |  | *60-minute Rolling Block with 12-minute sub-intervals* |
| **rollingBlock60MinIntvl10MinSubIntvl** |  | *60-minute Rolling Block with 10-minute sub-intervals* |
| **rollingBlock60MinIntvl6MinSubIntvl** |  | *60-minute Rolling Block with 6-minute sub-intervals* |
| **rollingBlock60MinIntvl5MinSubIntvl** |  | *60-minute Rolling Block with 5-minute sub-intervals* |
| **rollingBlock60MinIntvl4MinSubIntvl** |  | *60-minute Rolling Block with 4-minute sub-intervals* |
| **rollingBlock30MinIntvl15MinSubIntvl** |  | *30-minute Rolling Block with 15-minute sub-intervals* |
| **rollingBlock30MinIntvl10MinSubIntvl** |  | *30-minute Rolling Block with 10-minute sub-intervals* |
| **rollingBlock30MinIntvl6MinSubIntvl** |  | *30-minute Rolling Block with 6-minute sub-intervals* |
| **rollingBlock30MinIntvl5MinSubIntvl** |  | *30-minute Rolling Block with 5-minute sub-intervals* |
| **rollingBlock30MinIntvl3MinSubIntvl** |  | *30-minute Rolling Block with 3-minute sub-intervals* |
| **rollingBlock30MinIntvl2MinSubIntvl** |  | *30-minute Rolling Block with 2-minute sub-intervals* |
| **rollingBlock15MinIntvl5MinSubIntvl** |  | *15-minute Rolling Block with 5-minute sub-intervals* |
| **rollingBlock15MinIntvl3MinSubIntvl** |  | *15-minute Rolling Block with 3-minute sub-intervals* |
| **rollingBlock15MinIntvl1MinSubIntvl** |  | *15-minute Rolling Block with 1-minute sub-intervals* |
| **rollingBlock10MinIntvl5MinSubIntvl** |  | *10-minute Rolling Block with 5-minute sub-intervals* |
| **rollingBlock10MinIntvl2MinSubIntvl** |  | *10-minute Rolling Block with 2-minute sub-intervals* |
| **rollingBlock10MinIntvl1MinSubIntvl** |  | *10-minute Rolling Block with 1-minute sub-intervals* |
| **rollingBlock5MinIntvl1MinSubIntvl** |  | *5-minute Rolling Block with 1-minute sub-intervals* |

**4. SUPPORTING DOCUMENTATION**

**a. Description of Request:**

**b. Description of Recommendation:**

**c. Business Purpose:**

**d. Commentary/Rationale of Subcommittee(s)/Task Force(s):**

1. This is but one of several views that might result from choices permitted in the context of the conformance paragraph. [↑](#footnote-ref-1)