RECOMMENDATION TO NAESB EXECUTIVE COMMITTEE

For Quadrant:	**Retail Electric and Wholesale Electric Quadrants**
Requesters:	**Smart Grid PAP 10 Subcommittee**
Request No.:	**WEQ AP Item 6(d), REQ AP Item 9(d)**
Request Title:	**Business Practices and Information Models to Support Priority Action Plan 10 − Standardized Energy Usage Information**

1
2

1. RECOMMENDED ACTION:

X	Accept as requested
	Accept as modified below
	Decline

EFFECT OF EC VOTE TO ACCEPT RECOMMENDED ACTION:

X	Change to Existing Practice
	Status Quo

3
2. TYPE OF DEVELOPMENT/MAINTENANCE

Per Request:

X	Initiation
	Modification
	Interpretation
	Withdrawal
X	Principle
X	Definition
X	Business Practice Standard
X	Document
X	Data Element
X	Code Value
	X12 Implementation Guide
X	Business Process Documentation

Per Recommendation:

X	Initiation
	Modification
	Interpretation
	Withdrawal
X	Principle
X	Definition
X	Business Practice Standard
X	Document
X	Data Element
X	Code Value
	X12 Implementation Guide
X	Business Process Documentation

4

5 **3. RECOMMENDATION**

6   **SUMMARY:**

7 The Joint Retail Electric (REQ) and Wholesale Electric (WEQ) Quadrants' PAP 10 Smart Grid Subcommittee
8 submit this Recommendation for 2010 Retail Annual Plan Item No. 9d and WEQ Annual Plan Item No. 6d –
9 Business Practices and Information Models to support Priority Action Plan 10, "Standardized Energy Usage
10 Information," based on the Tiger Team Report issued on June 22, 2010 by the NIST SGIP PAP10 Committee.

11 In initiating this standards development, NAESB agreed to by year-end 2010 develop an energy use information
12 model standard defining information to be communicated between utilities, third parties and energy use customers,
13 via customer devices and/or 3rd Party energy services providers. The basic energy usage information model standard
14 will let energy services providers exchange detailed energy use and cost information in a consistent format on behalf
15 of customers. Doing so will let Customers track their power use and help them manage energy consumption and
16 cost. Without a standardized format for representing energy use data, a variety of approaches could emerge, leading
17 to incompatibilities among energy management products and services. It is planned that the American Society of
18 Heating, Refrigerating and AC Engineers (ASHRAE) will extend the NAESB standard to create a facilities data
19 model providing additional energy use data elements for facility energy management including buildings.

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20   **RECOMMENDED STANDARDS:**

21

22   **REQ.18**   **CUSTOMER ENERGY USAGE INFORMATION COMMUNICATION**

23

24   **EXECUTIVE SUMMARY**

25   This section presents a summary of the Model Business Practices for Retail Customer Energy
26   Usage Information communication. Specifically, these Model Business Practices establish a
27   model for Energy Usage Information to be communicated in a consistent format among a variety
28   of Entities, potentially including Distribution Companies, Energy Service Providers, meter-
29   reading entities, and Retail Customers, via devices owned by Retail Customers and/or Energy
30   Services Providers. Establishment of this model will let Retail Customers track their energy use
31   and help them manage energy consumption and costs.

32   This document contains Model Business Practices establishing a model for communication of
33   Retail Customer Energy Usage Information. The Model Business Practices do not require that
34   wholesale electricity markets administered by System to adopt this model since System Operators
35   generally are not the system of record for individual Retail Customer Energy Usage Information
36   and load data or individual Retail Customer forecasted usage and load data. These Model
37   Business Practices are not intended to replace applicable Governing Documents, and in the event
38   of a conflict, the latter documents shall have precedence over these standards. Without limiting the
39   foregoing, these Model Business Practices are only applicable to the extent the information
40   covered by this model is collected, managed or communicated pursuant to the applicable
41   Governing Documents.

42   Retail Customer Energy Usage Information communication encompasses a variety of interactions
43   between Distribution Companies, Retail Customers and Energy Services Providers. In a business
44   environment where best practices are voluntary, Model Business Practices such as those in this
45   document may be applied within the context of regulatory or other market requirements and
46   agreements.

47   **INTRODUCTION**

48   The North American Energy Standards Board (NAESB) is a voluntary, non-profit organization
49   comprised of members from all aspects of the natural gas and electric industries. Within NAESB,
50   the Retail Electric Quadrant (REQ) and the Retail Gas Quadrant (RGQ) focus on issues impacting
51   the retail sale of energy to end-use Retail Customers. REQ / RGQ Model Business Practices are
52   intended to provide guidance to Distribution Companies, Suppliers, and other Market Participants
53   involved in providing competitive energy service to end-use Retail Customers. The focus of these
54   Model Business Practices is the representation of Retail Customer Energy Usage Information.
55   System Operators do not generally communicate with Retail Customers and are not the system of
56   record for individual Retail Customer Energy Usage Information or individual Retail Customer
57   load forecast.

58   These Model Business Practices are voluntary and do not address policy issues that are the subject
59   of state legislation or regulatory decisions. These Model Business Practices have been adopted
60   with the realization that as the industry evolves, additional and amended Model Business Practices

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61		may be necessary. Any industry participant seeking additional or amended Model Business

61   may be necessary. Any industry participant seeking additional or amended Model Business
62   Practices (including principles, definitions, data elements, process descriptions, and technical
63   implementation instructions) should submit a request to the NAESB office, detailing the change,
64   so that the appropriate process may take place to amend the Model Business Practice.

65   **BUSINESS PROCESSES AND PRACTICES**

66   **Overview**

67   The business processes and practices described below are not presently applicable to Wholesale
68   Markets because Wholesale Markets do not generally communicate directly with Retail Customers
69   and are not the system of record for individual Retail Customer Energy Usage Information or
70   individual Retail Customer load forecast. The model and these business processes and practices
71   are not required of System Operators. As the model and these business processes and practices
72   evolve, System Operators may determine that use of the model or these business processes can be
73   applied to other information. However, such use is not intended to replace or supplant applicable
74   Governing Documents. Without limiting the foregoing, these Model Business Practices are only
75   applicable to the extent the information covered by this model is collected, managed or
76   communicated pursuant to the applicable tariff, market rules, operating procedures, protocols or
77   manuals.

78   **REQ.18.1**   **Principles**

79   **REQ.18.1.1**   **Overall Principles**

80   **REQ.18.1.1.1**   These Model Business Practices provide a Retail Customer Energy Usage Information
81   model, defining a collection of structured Energy Usage Information elements needed by
82   Retail Customers, to allow management of their energy efficiency and costs, including
83   environmental impacts.

84   **REQ.18.1.1.2**   The Energy Usage Information model is specified in UML, which is syntax neutral, so
85   that it may be used within exchange protocols using a variety of specific representation
86   syntax and exchange mechanisms, specified separately.

87   **REQ.18.1.1.3**   The recommended use of the Energy Usage Information model is in implementation
88   specifications exposing Customer Energy Usage Information. Specifications that
89   conform to the model shall contain semantically equivalent representations of all
90   required and included model elements, resulting in straightforward, lossless
91   transformations between conformant specifications.

92   **REQ.18.1.2**   **General Principles**

93   This section describes the requirements for the Energy Usage Information model defined
94   in these Model Business Practices. It is specifically not intended to represent
95   requirements for use of the Model Business Practices. Rather, it describes the potential

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96   overlapping needs of a robust model that can satisfy the many current and anticipated
97   future needs for exchange of Energy Usage Information.

98   The following list of objectives represents a series of intended outcomes from the
99   implementation of Model Business Practices defining Energy Usage Information. The
100   goals and objectives herein do not require the regulated wholesale or retail Entity, in
101   control of such information, to provide in the defined format or release such information,
102   except where required under their Governing Documents and only to the Parties that are
103   identified in the Governing Documents to receive such information. The Wholesale
104   Market does not communicate with the individual Retail Customer, nor does the
105   Wholesale Market forecast energy consumption for individual Retail Customers. The
106   Wholesale Market does not use individual Retail Customer Energy Usage Information in
107   their settlement unless specified in or supported by their Governing Documents.
108   Statements idealizing intended outcomes do not hold the regulated Entity responsible for
109   any actions taken or results of the actions of the receiving party.

110   For each requirement stated, there is an explanatory verification paragraph describing
111   how the model in Appendix A satisfies the requirement.

112   **REQ.18.1.2.1**   **General**

113   *REQ.18.1.2.1.1*   *Facilities shall include residences, buildings, and industrial installations*

114   *REQ.18.1.2.1.2*   *Usage and load information shall be readily available*

115   *REQ.18.1.2.1.3*   *PAP 10 is an information model concept which is transport agnostic.*

116   **REQ.18.1.2.2**   **Timeliness of Delivery**

117   *REQ.18.1.2.2.1*   *Customers shall be able to use the information defined in these standards for real-time*
118   *feedback on present and projected performance*

119   *REQ.18.1.2.2.2*   *Premises based systems (e.g. EMS/ESI) shall be able to use the information defined in*
120   *these standards for real-time feedback on present and projected performance*

121   *REQ.18.1.2.2.3*   *Information exchanged shall be delivered in sufficient time to affect usage ["and this is*
122   *the definition of real-time and near real-time "]*

123   *REQ.18.1.2.2.4*   *Operations, Distribution, and Service Providers shall be able to use the information*
124   *defined in these standards with the facility in near-real-time*

125   *REQ.18.1.2.2.5*   *Customers and premises-based systems shall be able to use the information defined in*
126   *these standards to provide real-time feedback on present and projected performance*

127   **REQ.18.1.2.3**   **Benefits to Facilities**

128   *REQ.18.1.2.3.1*   *Standard load and usage information shall enable improved energy efficiency by defining*
129   *a consistent way to communicate usage information.*

130   *REQ.18.1.2.3.2*   *Standard load and usage information shall enable helping [all] Customers and*
131   *operations manage their energy usage [and load]*

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132 133	*REQ.18.1.2.3.3*	*Standard load and usage information shall enable improved [facility] energy usage by availability of fine grained and timely information*
134 135	*REQ.18.1.2.3.4*	*Availability of fine grained and timely information will enable better decisions about energy usage and conservation*
136 137	*REQ.18.1.2.3.5*	*Facilities will benefit from consistent usage information exchange inside the facility, including meeting the energy efficiency goals of EISA 2007 and DOE initiatives*
138 139 140	*REQ.18.1.2.3.6*	*Standard model shall support aggregated projections that can be passed on to operations make forecasting and management better and increase the value of a facility to the Smart Grid*
141 142	*REQ.18.1.2.3.7*	*Sharing usage and load information inside a facility makes that facility more valuable to the Smart Grid*
143 144	*REQ.18.1.2.3.8*	*The information exchanged shall allow integration of usage information throughout facility decision processes*
145	**REQ.18.1.2.4**	**Benefits to Grid and Service Provider Operations**
146 147	*REQ.18.1.2.4.1*	*Standard load and usage information will improve forecasting and grid management by delivering aggregated projections to operations.*
148 149	*REQ.18.1.2.4.2*	*Standard load and usage information will improve forecasting and grid management by delivering aggregated projections to service providers.*
150	*REQ.18.1.2.4.3*	*Standard load and usage information will enable more responsive facilities.*
151 152	*REQ.18.1.2.4.4*	*Standard load and usage information will enable early deployment of devices that deliver and understand usage information.*
153	**REQ.18.1.2.5**	**Internet-Like Future**
154 155	*REQ.18.1.2.5.1*	*Standard usage and load information enables innovation in novel ways to help customers manage energy usage.*
156 157	*REQ.18.1.2.5.2*	*Standard usage and load information enables innovation by third party service and software providers.*
158	**REQ.18.1.2.6**	**Improved Collaboration**
159	*REQ.18.1.2.6.1*	*The Information model shall not restrict two way flows of information.*
160 161 162	*REQ.18.1.2.6.2*	*By standardizing usage and load information exchange, devices that deliver and understand usage and load can be deployed more quickly, contributing to achieving the energy efficiency goals of EISA 2007 and DOE.*
163	**REQ.18.1.2.7**	**Information Sources and Accessibility**
164 165	*REQ.18.1.2.7.1*	*Usage and load information shall be provided by utilities and aggregating service providers and may be provided by others.*
166	*REQ.18.1.2.7.2*	*Usage and load information shall be provided by devices and EMS/ESI implementations.*

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167	*REQ.18.1.2.7.3*	*Usage and load information can be accessed from the meter.*
168	*REQ.18.1.2.7.4*	*Usage and load information can be accessed from the Smart Grid.*
169	**REQ.18.1.2.8**	**Interactions and Information Exchanges Supported**
170 171	*REQ.18.1.2.8.1*	*Interactions supported shall include those between Distribution [and Operations] and the industrial, commercial, and residential premises.*
172 173 174	*REQ.18.1.2.8.2*	*Standard information models and understanding of usage and load are essential to cross domain interactions between Distribution [and Operations]: and Industrial, Commercial, Residential, and PEVs.*
175 176	*REQ.18.1.2.8.3*	*Interactions supported shall include those between Distribution [and Operations] and the industrial, commercial, residential premises, and plug-in electric vehicles.*
177 178 179	*REQ.18.1.2.8.4*	*Standard information models and understanding of usage and load are essential to cross domain interactions between Service Providers: and Industrial, Commercial, Residential, and PEVs.*
180 181	*REQ.18.1.2.8.5*	*Interactions supported shall include those between Service Providers and the industrial, commercial, residential premises, and plug-in electric vehicles.*
182 183 184	*REQ.18.1.2.8.6*	*This effort shall support information standards for load curtailment, load shaping, and energy market operations, hence load and usage must be supported (see PAP09, PAP03, and PAP04).*
185	*REQ.18.1.2.8.7*	*Information exchanges shall include to, from, and within facilities.*
186	**REQ.18.1.2.9**	**Information Characteristics**
187 188	*REQ.18.1.2.9.1*	*Information model shall support exchange of both Fine Grained and summary information.*
189 190	*REQ.18.1.2.9.2*	*Fine grained means that there is disaggregated information. Disaggregated information can include for example load, subsystem, premise, and variable time interval.*
191 192	*REQ.18.1.2.9.3*	*Support for exchanging standard historical, present, and projected load information is required.*
193 194	*REQ.18.1.2.9.4*	*Energy Usage Information shall include usage, usage profile, and some component of cost (consistent with PAP03, PAP04).*
195 196	*REQ.18.1.2.9.5*	*The PAP 10 Energy Usage Information model shall allow for exchange of greater or lesser detail.*
197	**REQ.18.1.2.10**	**Timing and Goals**
198 199	*REQ.18.1.2.10.1*	*Initial steps include making usage information more readily available by defining and standardizing usage information [delivered] through existing SG infrastructure.*
200	*REQ.18.1.2.10.2*	*Information on device and facility usage is a primary goal in the initial focus.*
201 202	*REQ.18.1.2.10.3*	*Standard load and usage information will enable early deployment of devices that deliver and understand usage information.*

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203	**REQ.18.1.2.11**	**Requirements on Quality of Consensus Standard**
204		*The information model shall support:*
205	*REQ.18.1.2.11.1*	*Consistent data representation for REST & Web Services*
206 207	*REQ.18.1.2.11.2*	*Specification of transactional exchange, syntax, and required population of the information model are beyond the scope of these requirements*
208	*REQ.18.1.2.11.3*	*an extensible information model – e.g. ability to add custom extensions as needed*
209 210	*REQ.18.1.2.11.4*	*have an evolvable information model – e.g. the standards process supports future revisions*
211	*REQ.18.1.2.11.5*	*Forward compatible as we evolve*
212	*REQ.18.1.2.11.6*	*Supportive of versioning*
213	*REQ.18.1.2.11.7*	*Usable without "knowing all the details"*
214		*More flexibility for independent innovation shall be achieved through:*
215	*REQ.18.1.2.11.8*	*Focus on information exchanged*
216	*REQ.18.1.2.11.9*	*Agreed upon interfaces are maintained over time*
217	*REQ.18.1.2.11.10*	*Minimal details = maximum interoperation*
218	*REQ.18.1.2.11.11*	*Intellectual Property Rights shall be clear & clean*
219		*Results of PAP 10 shall produce:*
220	*REQ.18.1.2.11.12*	*Information model and XML schema*
221	*REQ.18.1.2.11.13*	*At information exchange level*
222		*The information model shall be:*
223	*REQ.18.1.2.11.14*	*Readable without charge*
224	*REQ.18.1.2.11.15*	*Reusable without restriction or charge*
225	*REQ.18.1.2.11.16*	*Adaptable without restriction or charge*
226	*REQ.18.1.2.11.17*	*Usable for open source*
227	**REQ.18.1.2.12**	**Additional Considerations**
228 229	*REQ.18.1.2.12.1*	*In communicating energy usage information, the Energy Usage Information Model should be used and the information outlined within the model should be available.*
230 231	*REQ.18.1.2.12.2*	*The Energy Usage Information Model data set has three unique identifiers, which serve the purpose of allowing various aggregations of data sets.*
232 233	*REQ.18.1.2.12.3*	*The Tariff Profile component should be included in the Energy Information Usage Model.*

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234	*REQ.18.1.2.12.4*	*UsageSummary should include an optional cost attribute to interval and reading class.*
235 236 237	*REQ.18.1.2.12.5*	*A known base currency should be included in the top level class associated with the MeterAsset for the Energy Usage Information Model, which would be applicable to all instances.*
238	*REQ.18.1.2.12.6*	*The Energy Usage Information Model should be compliant with ISO8601.*
239 240 241	*REQ.18.1.2.12.7*	*Optionally, both start and end of interval can be defined in order to support non-uniform interval information, which is accomplished in the Energy Information Usage Model through endTimestamp to IntervalReading.*
242 243	*REQ.18.1.2.12.8*	*Demand based elements are maintained in the TariffProfile including common demand and demand ratchets.*
244 245 246 247 248	*REQ.18.1.2.12.9*	*The Energy Information Usage Model status structure includes a named pair of QualityOfReading and values of raw, forecast, validated, estimated, mixed, and other for qualifying the associated data set, as an explicit representation of these name value pairs can be processed in implementations by sending and receiving actors. The UsageSummary class also includes such summary information.*
249	*REQ.18.1.2.12.10*	*MeterEvent should be associated with meterAsset, not MeterReading.*
250 251	*REQ.18.1.2.12.11*	*PQSummary as events of enumerated type are provided in the Energy Information Usage Model to represent a simple exposure of summary information.*
252 253	*REQ.18.1.2.12.12*	*The Energy Usage Information Model should represent and take into account pollutant energy emissions such as O2, SO2, and NOX.*
254 255 256	*REQ.18.1.2.12.13*	*Energy Usage Information Model should include a top level cost summary – billStart, billEnd, billToDate, lastPeriod, and costAdditional, so that the bill to date and bill as of the last billing period could be conveyed through a formula:*
257 258 259 260	*REQ.18.1.2.12.14*	*The model shall use the work being produced by OASIS on common schedule information pursuant to the SGIP PAP04 Requirements. As this work is not complete as of this draft, the abstract definition of time intervals is the most appropriate way to ensure consistency.*
261 262 263 264	*REQ.18.1.2.12.15*	*The model shall use the work being produced by OASIS on common price and product definition information pursuant to the SGIP PAP03 Requirements. As this work is not complete as of this draft, should information related to price be included in the Seed Specification it must be at an appropriate level of abstraction.*
265	**REQ.18.2**	**Energy Usage Abbreviations, Acronyms and Definition of Terms**
266	**REQ.18.2.1**	**Business Definitions**
267	**REQ.18.2.1.1**	**Applicable Regulatory Authority**
268 269 270		The state regulatory agency or other governing body that provides oversight, policy guidance, and direction to any parties involved in the process of providing energy to Retail Customers through regulations and orders.

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271 **REQ.18.2.1.2**   **(Retail) Customer**

272   Any Entity that takes gas and/or electric service for its own consumption.

273 **REQ.18.2.1.3**   **Distribution Company**

274 A regulated Entity which provides distribution services and may provide energy and/or
275 transmission/transportation services in a given area.

276 **REQ.18.2.1.4**   **Entity**

277 A person or organization with sufficient legal standing to enter into a contract or
278 arrangement with another such person or organization (as such legal standing may be
279 determined by those parties) for the purpose of conducting and/or coordinating energy
280 transactions.

281 **REQ.18.2.1.5**   **Governing Documents**

282 Documents that govern the interactions among parties, including but not limited to:
283 regulatory documents (e.g. tariffs, rules, regulations), contractual agreements, and
284 Distribution Company Operational Manuals.

285 **REQ.18.2.1.6**   **Market Participant**

286 A party engaged in the process of providing competitive retail energy to end-use
287 Customers including but not limited to the Distribution Company, the Supplier, the
288 Registration Agent, the settlement agent, and the meter reading Entity.

289 **REQ.18.2.1.7**   **Model Business Practices**

290   TBD

291 **REQ.18.2.1.8**   **Supplier**

292   Persons engaged in the competitive sale of energy to end-users.

293 **REQ.18.2.2**   **Technical Definitions**

294   This section contains technical terms and abbreviations used in this recommendation.

295 **REQ.18.2.2.1**   **Energy Management System (EMS)**

296 An application used for controlling multiple energy-controllable devices (e.g., pool
297 pump, Programmable Communicating Thermostat, light switches, PEV charging, etc.).
298 This application may reside within a HAN Device (e.g. Programmable Communicating
299 Thermostat, In-Home Display, computer, cable set-top box, other computing device,

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300 301		etc.). This application may also control other devices or systems in the home providing integrated automated services for the Consumer.
302	**REQ.18.2.2.2**	**Energy Services Interface (ESI)**
303 304 305 306 307 308 309 310		A secure interface to a premises communications network (i.e. HAN) which facilitates relevant energy applications (e.g. remote load control, demand response, monitoring and control of DER, in-premises display of energy usage, reading of energy and non-energy meters, PEV charging and roaming coordination, and integration with energy management systems, etc.), provides auditing / logging functions that record transactions to and from HAN Devices, and, often, coordination functions that enable secure transactions between the HAN Devices Commissioned and Registered on its network and Enrolled in a Service Provider program.
311	**REQ.18.2.2.3**	**Energy Services Provider**
312 313		An entity (e.g. Utility, retail electric provider, demand response aggregator, etc.) which provides energy services to Customers.
314	**REQ.18.2.2.4**	**Energy Usage Information**
315		TBD
316	**REQ.18.2.2.5**	**Facility**
317		TBD
318	**REQ.18.2.2.6**	**Fine Grained**
319		Characterized by abundant use of detail or thoroughness of treatment.
320	**REQ.18.2.2.7**	**Operations**
321 322 323		One of the seven domains identified in the NIST Framework and Roadmap, defined there as "The managers of the movement of electricity". This could apply to operators of equipment within any of the other domains.
324	**REQ.18.2.2.8**	**Real-time**
325		Refers to the ability of a component to process input at the rate it is received.
326	**REQ.18.2.2.9**	**Regional Transmission Organization**
327		TBD

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328	**REQ.18.2.2.10**	**Seed Specification**
329		TBD
330	**REQ.18.2.2.11**	**Smart Grid**
331		TBD
332	**REQ.18.2.2.12**	**System Operator**
333		TBD
334	**REQ.18.2.2.13**	**Wholesale Market**
335		TBD
336	**REQ.18.2.3**	**Abbreviations and Acronyms**

Abbreviation / Acronym	Meaning
EUI	Energy Usage Information
UML	Unified Modeling Language
EMS	Energy Management System
ESI	Energy Services Interface
PEV	Plug-in Electric Vehicle

337

338	**REQ.18.3**	**Energy Usage Information Model Business Practices**
339	**REQ.18.3.1**	**Introduction**

340 341 342 343   The focus of these Model Business Practices is the representation of Energy Usage Information. As defined in [PAP10 Requirements] the Energy Usage Information includes historic, present, and future projected usage and load together with the time period(s) for that information.

344 345   These Model Business Practices draw on actors and use cases defined by the following groups:

346   • Energy Information Standards Alliance (the EIS Alliance) [EIS]
347   • NAESB Survey and Consolidation of PAP10 Use Cases [NAESB PAP10]
348   • UCAIug OpenADE [ADE]
349   • ZigBee/Home Plug Smart Energy Profile 2.0 Market Requirements [SEP MRD]

350   The relevant use cases are summarized as follows:

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351 352	**REQ.18.4.1**	The ESP and/or Distribution Company communicates historic and present Energy Usage Information and load information to the Retail Customer or Facility.[1]
353 354	**REQ.18.4.2**	The Retail Customer or Facility communicates future projected usage and load information to the ESP, Distribution Company, or Grid Operations.[2]
355 356	**REQ.18.4.3**	The ESP and/or Utility communicates their projection of usage and load to the Retail Customer or Facility.[3]
357 358 359	**REQ.18.4.4**	Devices within a Facility communicate their present and future projected usage and load to Controllers or Facility EMS for aggregation and to be a component of Facility aggregated future projected usage and load.[4]
360 361	**REQ.18.4.5**	Devices, business processes, EMS, ESI, and other functional units within the Facility communicate usage and load information among themselves.[5]
362 363 364 365 366	**REQ.18.4.6**	These Model Business Practices are limited to the Seed Specification which shall be usable by others to build standards and/or specification for exchange of Energy Usage Information and load information appropriate to their needs without overly constraining those uses or including information that is not required in all implementations of specifications for exchanging load and usage.
367	**REQ.18.4**	**Energy Usage Information Model**

368 The model proposed is based on the IEC TC57 Common Information Model, WG13 and WG14.
369 New elements identified in this recommendation will be proposed to these working groups, after
370 ratification within NAESB, as extensions to be considered for inclusion in a future release of the
371 CIM.

372

---

[1] See e.g. EIS Alliance Use Cases v2 including UC-9, UC-11, UC-12, UC-14, UC-15, and OpenADE use case "Publication".
[2] See e.g. EIS Alliance Use Cases v2 including UC-3, UC-11, UC-14, UC-15
[3] Needs refs. This is an addition to EIS and OpenADE.
[4] See e.g. EIS Alliance Use Cases v2 including UC-1, UC-2, UC-3, UC-8, UC-9.
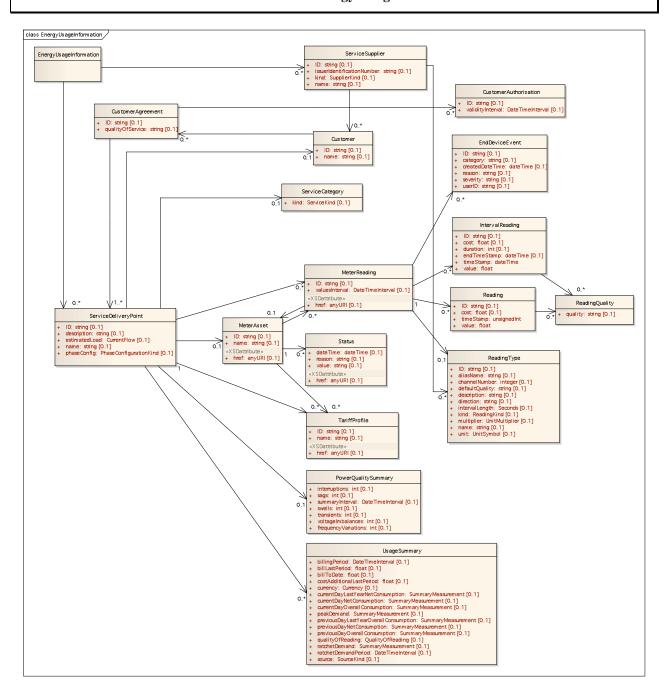[5] See e.g. EIS Alliance Use Cases v2 including UC-1, UC-2, UC-3

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class EnergyUsageInformation

373

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

375   The following sections contain the classes and attributes defined in the model, along with
376   their descriptions. Elements tagged with <<enumeration>> define the valid values for an
377   enumerated data type.

378   **REQ.18.4.1.1**   **Currency** *«enumeration»*

379   Monetary currencies. Apologies for this list not being exhaustive.

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

380   **REQ.18.4.1.2**   **CurrentFlow**

381   Electrical current (positive flow is out of the ConductingEquipment into the
382   ConnectivityNode)

Name	Type	Description
multiplier	*UnitMultiplier*	Multiplier for 'unit'.
unit	*UnitSymbol*	Unit in symbol
value	*float*	Value in type of float

383   **REQ.18.4.1.3**   **Customer**

384   Organisation receiving services from ServiceSupplier.

Name	Type	Description
ID	*string*	Object identifier

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name	*string*	Name of an attribute.

385 **REQ.18.4.1.4** CustomerAgreement

386 Agreement between the Customer and the ServiceSupplier to pay for service at a specific
387 ServiceLocation. It records certain billing information about the type of service provided
388 at the ServiceLocation and is used during charge creation to determine the type of
389 service.

Name	Type	Description
ID	*string*	A Model Authority issues mRIDs. Given that each Model Authority has a unique id and this id is part of the mRID, then the mRID is globally unique.
qualityOfService	*string*	Quality of service provided to customer related to contracted level of power quality events

390 **REQ.18.4.1.5** DateTimeInterval

391 Interval of date and time.

Name	Type	Description
end	*unsignedInt*	Date and time that this interval ended.
start	*unsignedInt*	Date and time that this interval started.

392 **REQ.18.4.1.6** EndDeviceEvent

393 Event detected by a DeviceFunction associated with EndDeviceAsset.

Name	Type	Description
ID	*string*	A Model Authority issues mRIDs. Given that each Model Authority has a unique id and this id is part of the mRID, then the mRID is globally unique.
category	*string*	Category of event resulting in this activity record.
createdDateTime	*dateTime*	Date and time this activity record has been created (different from the 'status.dateTime', which is the time of a status change of the associated object, if applicable).
reason	*string*	Reason for event resulting in this activity record, typically supplied when user initiated.
severity	*string*	Severity level of event resulting in this activity record.
userID	*string*	(if user initiated) ID of user who initiated

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		this end device event.

394 **REQ.18.4.1.7**   **EnergyUsageInformation**

395

396 **REQ.18.4.1.8**   **IntervalReading**

397 Data captured at regular intervals of time. Interval data could be captured as incremental
398 data, absolute data, or relative data. The source for the data is usually a tariff quantity or
399 an engineering quantity. Data is typically captured in time-tagged, uniform, fixed-length
400 intervals of 5, 10, 15, 30, or 60 minutes.
401 Note: Interval Data is sometimes also called "Interval Data Readings" (IDR).

Name	Type	Description
ID	*string*	Object identifier
cost	*float*	
duration	*int*	The duration of the interval, in seconds.
endTimeStamp	*dateTime*	End interval timestamp
timeStamp	*dateTime*	The start date and time of an interval reading
value	*float*	Value in type of float

402 **REQ.18.4.1.9**   **MeterAsset**

403 Physical asset that performs the metering role of the ServiceDeliveryPoint. Used for
404 measuring consumption and detection of events.

Name	Type	Description
ID	*string*	Object identifier
name	*string*	Meter name
href	*anyURI*	Hypertext reference pointing to a URI

405 **REQ.18.4.1.10**   **MeterReading**

406 Set of values obtained from the meter.

Name	Type	Description
href	*anyURI*	Hypertext reference pointing to a URI
ID	*string*	Object identifier
valuesInterval	*DateTimeInterval*	Interval in date time (start & end)

407 **REQ.18.4.1.11**   **PhaseConfigurationKind** *«enumeration»*

408 Kind of phase configuration.

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409	Note that there is an enum Wires::WindingConnection with values {D, Y, Z, Yn, Zn}.
410	However, there are many more phase configurations than delta (threePhaseThreeWire)
411	and wye (threePhaseFourWire), which are defined here.

Name	Type	Description
onePhaseThreeWire		
onePhaseTwoWire		
other		
threePhaseFourWire		
threePhaseThreeWire		
threePhaseTwoWire		
twoPhaseThreeWire		
twoPhaseTwoWire		

412   **REQ.18.4.1.12**   **PowerQualitySummary**

413

Name	Type	Description
interruptions	*int*	Number of interruptions
sags	*int*	Number of sags
summaryInterval	*DateTimeInterval*	Interval of summary period
swells	*int*	Number of swells
transients	*int*	Number of transients
voltageImbalances	*int*	Number of voltage imbalances
frequencyVariations	*int*	Number of frequency variations

414   **REQ.18.4.1.13**   **QualityOfReading** *«enumeration»*

415

Name	Type	Description
estimated		
forecast		
mixed		

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raw		
validated		
normalizedForWeather		
other		

416   **REQ.18.4.1.14**   **Reading**

417
418

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

Name	Type	Description
ID	*string*	Object identifier
cost	*float*	Cost in a currency
timeStamp	*unsignedInt*	The date and time of a reading
value	*float*	Value in type of float

419   **REQ.18.4.1.15**   **ReadingKind** *«enumeration»*

420

Kind of reading.

Name	Type	Description
current		
currentAngle		
date		
demand		
energy		
other		
phaseAngle		
power		
powerFactor		
pressure		
time		
voltage		
voltageAngle		
volume		
carbonDioxide		
NOx		
carbon		
SOx		

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methane		
HCH		
perfluorocarbons		
sulfurHexafluoride		

421 **REQ.18.4.1.16** ReadingQuality

422 Quality of a specific reading value or interval reading value. Note that more than one
423 Quality may be applicable to a given Reading. Typically not unsed unless problems or
424 unusual conditions occur (i.e., quality for each Reading is assumed to be 'Good' unless
425 stated otherwise in associated ReadingQuality).

Name	Type	Description
quality	*string*	Quality, to be specified if different than 'Good'.

426 **REQ.18.4.1.17** ReadingType

427 Type of data conveyed by a specific Reading.

Name	Type	Description
ID	*string*	A Model Authority issues mRIDs. Given that each Model Authority has a unique id and this id is part of the mRID, then the mRID is globally unique.
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.
channelNumber	*integer*	Logical positioning of this measurement data.
defaultQuality	*string*	Characteristics of a data value conveyed by a specific Reading, which allow an application to understand how a specific Reading is to be interpreted.
description	*string*	The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.
direction	*string*	Specifies the direction of flow of the measurement.
intervalLength	*Seconds*	(if incremental reading value) Length of increment interval. Interval duration specified at the IntervalReading overrides

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		this default.
kind	*ReadingKind*	Kind of reading.
multiplier	*UnitMultiplier*	Multiplier for 'unit'.
name	*string*	Name of an attribute.
unit	*UnitSymbol*	Unit in symbol

428 **REQ.18.4.1.18**   **Seconds**

429   Time, in seconds

Name	Type	Description
multiplier	*UnitMultiplier*	Multiplier for 'unit'.
unit	*UnitSymbol*	Unit in symbol
value	*float*	Value in type of float

430 **REQ.18.4.1.19**   **ServiceDeliveryPoint**

431   Logical point on the network where the ownership of the service changes hands. It is one
432   of potentially many service points within a ServiceLocation, delivering service in
433   accordance with a CustomerAgreement. Used at the place where a meter may be
434   installed.

Name	Type	Description
ID	*string*	A Model Authority issues mRIDs. Given that each Model Authority has a unique id and this id is part of the mRID, then the mRID is globally unique.
description	*string*	The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.
estimatedLoad	*CurrentFlow*	Estimated load.
name	*string*	Name of an attribute.
phaseConfig	*PhaseConfiguratio nKind*	Phase configuration kind.

435 **REQ.18.4.1.20**   **SourceKind** *«enumeration»*

436

Name	Type	Description
consumer		
provider		
other		

437 **REQ.18.4.1.21**   **Status**

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438   Current status information relevant to an entity.

Name	Type	Description
dateTime	*dateTime*	Date and time for which status 'value' applies.
href	*anyURI*	Hypertext reference pointing to a URI
reason	*string*	Reason code or explanation for why an object went to the current status 'value'.
value	*string*	Value in string

439 **REQ.18.4.1.22**   **SummaryMeasurement**

440

Name	Type	Description
multiplier	*UnitMultiplier*	
timeStamp	*dateTime*	
unit	*UnitSymbol*	
value	*float*	

441 **REQ.18.4.1.23**   **TariffProfile**

442   A schedule of charges; structure associated with Tariff that allows the definition of
443   complex tarif structures such as step and time of use when used in conjunction with
444   TimeTariffInterval and Charge. Inherited 'status.value' is defined in the context of the
445   utility's business rules, for example: active, inactive, etc.

Name	Type	Description
ID	*string*	Object identifier
name	*string*	Name of an attribute.
href	*anyURI*	Hypertext reference pointing to a URI

446 **REQ.18.4.1.24**   **UnitMultiplier** *«enumeration»*

447   The unit multipliers defined for the CIM

Name	Type	Description
c		Centi 10**-2
d		Deci 10**-1
G		Giga 10**9
k		Kilo 10**3
m		Milli 10**-3
M		Mega 10**6
micro		Micro 10**-6

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n		Nano 10**-9
none		
p		Pico 10**-12
T		Tera 10**12

448   **REQ.18.4.1.25**   **UnitSymbol** *«enumeration»*

449   The units defiend for usage in the CIM

Name	Type	Description
A		Current in ampere
deg		Plane angle in degrees
F		Capacitance in farad
g		Mass in gram
h		Time in hours
H		Inductance in henry
Hz		Frequency in hertz
Hz-1		per Hertz
J		Energy in joule
J/s		Joule per second
kg/J		Mass per energy
m		Length in meter
m2		Area in square meters
m3		Volume in cubic meters
min		Time in minutes
N		Force in newton
none		Dimension less quantity, e.g. count, per unit, etc.
C		Relative temperature in degrees Celsius
ohm		Resistance in ohm
Pa		Pressure in pascal (n/m2)
rad		Plane angle in radians
S		Conductance in siemens
s		Time in seconds
s-1		per second
V		Voltage in volt

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V/VAr		Volt per volt ampere reactive
VA		Apparent power in volt ampere
VAh		Apparent energy in volt ampere hours
VAr		Reactive power in volt ampere reactive
VArh		Reactive energy in volt ampere reactive hours
W		Active power in watt
W/Hz		Watt per hertz
W/s		Watt per second
Wh		Real energy in what hours

450   **REQ.18.4.1.26**   **UsageSummary**

451

Name	Type	Description
billingPeriod	*DateTimeInterval*	
billLastPeriod	*float*	
billToDate	*float*	
costAdditionalLastPeriod	*float*	
currency	*Currency*	
currentDayLastYearNetConsumption	*SummaryMeasurement*	
currentDayNetConsumption	*SummaryMeasurement*	
currentDayOverallConsumption	*SummaryMeasurement*	
peakDemand	*SummaryMeasurement*	
previousDayLastYearOverallConsumption	*SummaryMeasurement*	
previousDayNetConsumption	*SummaryMeasurement*	
previousDayOverallConsumption	*SummaryMeasurement*	
qualityOfReading	*QualityOfReading*	
ratchetDemand	*SummaryMeasure*	

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	ment	
ratchetDemandPeriod	*DateTimeInterval*	
source	*SourceKind*	

452 **REQ.18.4.1.27**   **ServiceKind** *«enumeration»*

453   Kind of service.

Name	Type	Description
electricity		
gas		
water		
time		
heat		
refuse		
sewerage		
rates		
tvLicence		
internet		
other		

454 **REQ.18.4.1.28**   **CustomerAuthorisation**

455   Holds an authorisation for access to specific user-private data granted to a 3rd Party
456   service provider. [OpenADE Extension - Specialization of "Agreement"]

Name	Type	Description
ID	*string*	Unique identifier for this authorisation
validityInterval	*DateTimeInterval*	Date and time interval this agreement is valid (from going into effect to termination).

457 **REQ.18.4.1.29**   **ServiceCategory**

458   Category of service provided to the customer.

Name	Type	Description
kind	*ServiceKind*	Kind of service.

459 **REQ.18.4.1.30**   **SupplierKind** *«enumeration»*

460   Kind of supplier.

Name	Type	Description

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utility		
retailer		
other		

461   **REQ.18.4.1.31**   ServiceSupplier

462   Organisation that provides services to Customers.

Name	Type	Description
ID	*string*	Unique identifier of this service supplier.
issuerIdentificationNumber	*string*	Unique transaction reference prefix number issued to an entity by the International Standards Organisation for the purpose of tagging onto electronic financial transactions, as defined in ISO/IEC 7812-1 and ISO/IEC 7812-2.
kind	*SupplierKind*	Kind of supplier.
name	*string*	The human-readable name for the service supplier.

463

464   **REQ.18.4.2**   **Energy Usage Information and Format and Use**

465   **REQ.18.4.2.1**   The Energy Usage Information Model is developed using a UML modeling tool. The
466   Model classes, attributes, types and descriptions are included in REQ 18.4. The Model is
467   made available as XMI, which is the standard XML import/export format for UML. The
468   Model is exported as HTML, and made available as a downloadable archive viewable
469   with a web browser.

470   **REQ.18.4.3**   **Energy Usage Information Model Technical Consideration**

471   *REQ.18.4.3.1*   *The Energy Usage Information Model will used as the basis for Smart Grid interfaces*
472   *exchanging customer usage information between energy services providers.*

473   *REQ.18.4.3.2*   *The Energy Usage Information Model will be configured to allow schemas to be*
474   *generated from it, using XML Schema Definition Language (XSD). This format defines*
475   *the valid structures and types for XML documents that may carry the model information.*

476   *REQ.18 4.3.3*   *Implementations may decide to include only a subset of the elements defined in the*
477   *model.*

478   *REQ.18 4.3.4*   *The example XSD shall conform to Naming and Design Rules best practices as described*
479   *by IEC 62361-100, Naming and Design Rules for CIM Profiles to XML Schema*
480   *Mapping.*

481   *REQ.18.4.3.5*   *The model and schema shall support multiple information exchange standards, including*
482   *WS-I Basic Profile Web Services, RESTful Web Services, or other conventions. These*
483   *specifics are left to implementers to define.*

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484 485 486 487	*REQ.18.4.3.6*	*Though there may be elements useful for transfer of security-related information elements in the model, the specific details related to how to protect sensitive information, and how to authorize specific roles or identities to have access are not defined in this recommendation.*
488 489 490 491	*REQ.18.4.3.7*	*A conformant specification that refines or extends this standard shall produce information for exchange that can be transformed algorithmically (that is based on the standard alone) into a form that can be validated through the method described in REQ.18.4.3.7.*
492 493 494 495 496 497 498 499 500 501		This requirements means that various formats for representation and exchange and various subsets and potentially supersets of information content are envisioned based on this standard. The use of the schema is not to impose its direct use in message validation. Rather its use is intended to facilitate verification of conformance to the information model with respect to message content and semantics without imposing constraints on specific message payload schemas and data element representations. Some representations are anticipated to be entirely binary in nature. Others will trade off strings for integer representations of information contents. Regardless of the means, the information should be convertible to be testable as described herein.
502 503 504	*REQ.18.4.3.8*	*A specification that claims conformance to this standard shall describe and define an automatable transformation from that specification's model to and from this UML Model, including indicating listing of attributes used and not used.*
505 506 507 508 509 510 511 512 513 514 515 516 517	*REQ.18.4.3.9*	*Conformant specifications shall include the following required core model elements exchanged between data provider and data consumer in their defined messages:* • *One or more measurement or summary containers: IntervalReading, Reading, PowerQualitySummary, UsageSummary* • *Two of the following attributes, for each IntervalReading: timeStamp, endTimeStamp, duration* • *value (the value of the measurement, from IntervalReading or Reading)* • *ReadingType – ID, defaultQuality, direction, kind, multiplier, name, unit* • *ReadingType ID for each measurement (IntervalReading or Reading) (exists in model through MeterReading)* • *Measurement source / location – ServiceDeliveryPoint.ID or MeterAsset.ID and association to measurements or summary*

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517   APPENDIX A   Principle Verifications Against The Energy Information
518   Usage Model

519

520   **REQ.18.4.4**   **Requirements validation method**

521   A complete requirements process involves a sequential breakdown of a problem starting with the collection of high
522   level functional user requirements. The high level requirements are broken down into ever more specific derived
523   requirements. Eventually you get to design requirements. At the bottom of the requirements tree are simple, testable,
524   atomic requirements. When the atomic requirements are met, the tracing to the higher level requirements allows
525   them to be met by definition.

526   The PAP10 charter – the text of the abstract, description, and objectives from the NIST Framework – are high level
527   user requirements {insert reference to NIST Framework Rev 1.0}. The requirements presented in REQ.18.6.1.1 can
528   be considered the first level requirements breakdown of derived requirements.

529   This standard does not go to the final level of detailed design requirements. Instead, we performed a parallel
530   assessment of the "derived requirements" against the evolving model, which itself was initially derived from
531   detailed requirements identified in activities external to this standard.

532   Here is a sample requirement and how it is verified:

533   *<<requirement reference>>*   *Standard load and usage information shall enable improved energy*
534   *efficiency by defining a consistent way to communicate usage*
535   *information.*

536   In the Model, There is at least one Schema, see
537   {reference} produced as a part of this standard. With a
538   schema at least one specific consistent way to
539   communicate usage information is thereby specified. Thus,
540   the presence of the agreed upon schema or equivalent
541   satisfies this requirement.

542   **REQ.18.4.4.1**   **General**

543   *REQ.18.4.4.1.1*   *Facilities shall include residences, buildings, and industrial installations*

544   No specific limit as to the nature of the facility appears in the EUI model.
545   Identifiers are for user, location, and device only.

546   *REQ.18.4.4.1.2*   *Usage and load information shall be readily available*

547   While the availability of information is the realm of the utility and its customer,
548   this model facilitates availability by providing a single simple information
549   model for client applications

550   *REQ.18.4.4.1.3*   *PAP 10 is an information model concept which is transport agnostic.*

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551		Because it is defined within a UML model as a series of classes and no services are specifically defined in the standard for those classes, it is by this definition transport agnostic.
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| 554 | **REQ.18.4.4.2** | **Timeliness of Delivery** |

| 555 | *REQ.18.4.4.2.1* | *Customers shall be able to use the information defined in these standards for real-time feedback on present and projected performance* |
| 556 | | |

| 557 | | There are no constraints on time stamps, latency or performance imposed by the model, so it is possible to represent past, present, or future usage. |
| 558 | | |

| 559 | *REQ.18.4.4.2.2* | *Premises based systems (e.g. EMS/ESI) shall be able to use the information defined in these standards for real-time feedback on present and projected performance* |
| 560 | | |

| 561 | | There are no constraints on time stamps, latency or performance imposed by the model, so it is possible to represent past, present, or future usage. |
| 562 | | |

| 563 | *REQ.18.4.4.2.3* | *Information exchanged shall be delivered in sufficient time to affect usage ["and this is the definition of real-time and near real-time "]* |
| 564 | | |

| 565 | | There are no constraints on time stamps, latency or performance imposed by the model, so it is possible to represent past, present, or future usage. |
| 566 | | |

| 567 | *REQ.18.4.4.2.4* | *Operations, Distribution, and Service Providers shall be able to use the information defined in these standards with the facility in near-real-time* |
| 568 | | |

| 569 | | There are no constraints on time stamps, latency or performance imposed by the model, so it is possible to represent past, present, or future usage. |
| 570 | | |

| 571 | *REQ.18.4.4.2.4.1* | *Customers and premises-based systems shall be able to use the information defined in these standards to provide real-time feedback on present and projected performance* |
| 572 | | |

| 573 | | There are no constraints on time stamps, latency or performance imposed by the model, so it is possible to represent past, present, or future usage. |
| 574 | | |

| 575 | **REQ.18.4.4.3** | **Benefits to Facilities** |

| 576 | *REQ.18.4.4.3.1* | *Standard load and usage information shall enable improved energy efficiency by defining a consistent way to communicate usage information.* |
| 577 | | |

578		By minimizing the number of different physical representations of usage information, and aligning the logical elements included in the definition of this information, it will allow for the development of applications that require this information to provide energy efficiency services and functionality.
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| 582 | *REQ.18.4.4.3.2* | *Standard load and usage information shall enable helping [all] Customers and operations manage their energy usage [and load]* |
| 583 | | |

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584 585 586		The data model standardizes load and usage information so customer usage data provider services may be developed to interface with systems that help customers and operations with energy management.
587 588	*REQ.18.4.4.3.3*	*Standard load and usage information shall enable improved [facility] energy usage by availability of fine grained and timely information*
589 590		The data model standard provides for measurement intervals enabling the availability of fine grained and timely load and usage information.
591 592	*REQ.18.4.4.3.4*	*Availability of fine grained and timely information will enable better decisions about energy usage and conservation*
593 594 595		The data model enables a standard approach for fine grained and timely load and usage information so customer usage data provider services can interface to systems that help customers and/or operations with energy conservation.
596 597	*REQ.18.4.4.3.5*	*Facilities will benefit from consistent usage information exchange inside the facility, including meeting the energy efficiency goals of EISA 2007 and DOE initiatives*
598 599 600 601		The data model provides consistent energy usage data representation so information exchanges are uniformly understood. This ensures facility energy efficiency systems using this data are acting on correct and consistent information.
602 603 604	*REQ.18.4.4.3.6*	*Standard model shall support aggregated projections that can be passed on to operations [the System Operator's] or [building management] [?] make forecasting and management better and increase the value of a facility to the Smart Grid*
605 606		Aggregated projections are supported via future timestamps in interval and other data.
607 608	*REQ.18.4.4.3.7*	*Sharing usage and load information inside a facility makes that facility more valuable to the Smart Grid*
609 610		The data model provides usage, load, and pricing information from which a facility manager or system may take optimization actions.
611 612	*REQ.18.4.4.3.8*	*The information exchanged shall allow integration of usage information throughout facility decision processes*
613 614 615		The data model standardizes usage information so customer usage data provider services may be developed to integrate with systems handling facility decision processes.
616	**REQ.18.4.4.4**	**RBenefits to Grid and Service Provider Operations**
617 618	*REQ.18.4.4.4.1*	*Standard load and usage information will improve forecasting and grid management by delivering aggregated projections to operations.*

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| 619 620 | | By specifying future intervals, which could be larger than measured intervals, it is possible to represent aggregated projections. |

621 622 *REQ.18.4.4.4.2* *Standard load and usage information will improve forecasting and grid management by delivering aggregated projections to service providers.*

623 624 By specifying future intervals, which could be larger than measured intervals, it is possible to represent aggregated projections.

625 *REQ.18.4.4.4.3* *Standard load and usage information will enable more responsive facilities.*

626 627 Interoperable models of load and usage information allow coordination of response capability, allowing those capabilities to be utilized more efficiently.

628 629 *REQ.18.4.4.4.4* *Standard load and usage information will enable early deployment of devices that deliver and understand usage information.*

630 631 By standardizing the information to be made available, devices and applications will be able to get access to that information.

632 **REQ.18.4.4.5** **Internet-Like Future**

633 634 *REQ.18.4.4.5.1* *Standard usage and load information enables innovation in novel ways to help customers manage energy usage.*

635 636 637 By standardizing on simple data sets that many providers and consumers can utilize, this information can be combined with additional information to find the specific way that will help customers the most.

638 639 *REQ.18.4.4.5.2* *Standard usage and load information enables innovation by third party service and software providers.*

640 641 642 By standardizing on simple data sets that many providers and consumers can utilize, this information can be combined with additional information to find the specific way that will help customers the most.

643 **REQ.18.4.4.6** **Improved Collaboration**

644 *REQ.18.4.4.6.1* *The Information model shall not restrict two way flows of information.*

645 646 Customers, utilities and third parties will have access to the model in real time with the appropriate usage information and customer permissions/allowances.

647 648 649 *REQ.18.4.4.6.2* *By standardizing usage and load information exchange, devices that deliver and understand usage and load can be deployed more quickly, contributing to achieving the energy efficiency goals of EISA 2007 and DOE.*

650 651 Uniformity among signals as required by the model standards will lead to greater acceptance and adoption.

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652	**REQ.18.4.4.7**	**Information Sources and Accessibility**
653 654	*REQ.18.4.4.7.1*	*Usage and load information shall be provided by utilities and aggregating service providers and may be provided by others.*
655 656		With consent from the customer, utilities and aggregators will provide access to usage and load information in the provided format for model integration.
657	*REQ.18.4.4.7.2*	*Usage and load information shall be provided by devices and EMS/ESI implementations.*
658 659 660		With consent from the customer, devices and EMS/ESI implementations will provide usage and load information in the provided format for model integration.
661	*REQ.18.4.4.7.3*	*Usage and load information can be accessed from the meter.*
662 663 664		With consent from the customer and the utility, usage and load information will be provided by the meter to accredited sources for purposes of running the model.
665	*REQ.18.4.4.7.4*	*Usage and load information can be accessed from the Smart Grid.*
666 667		With consent from the customer and the utility, usage and load information will be made available by any Smart Grid services provider via the public Internet.
668	**REQ.18.4.4.8**	**Interactions and Information Exchanges Supported**
669 670	*REQ.18.4.4.8.1*	*Interactions supported shall include those between Distribution [and Operations] and the industrial, commercial, and residential premises.*
671 672		The model does not exclude/include specific actors or potential exchange points, it merely describes data and format of information.
673 674 675	*REQ.18.4.4.8.2*	*Standard information models and understanding of usage and load are essential to cross domain interactions between Distribution [and Operations]: and Industrial, Commercial, Residential, and PEVs.*
676 677 678		The standard information format does not exclude potential actors or exchange points including potential cross domain interaction including those between Distribution companies and other actors.
679 680	*REQ.18.4.4.8.3*	*Interactions supported shall include those between Distribution [and Operations] and the industrial, commercial, residential premises, and plug-in electric vehicles.*
681 682		The model does not exclude/include specific actors or potential exchange points, it merely describes data and format of information.
683 684 685	*REQ.18.4.4.8.4*	*Standard information models and understanding of usage and load are essential to cross domain interactions between Service Providers: and Industrial, Commercial, Residential, and PEVs.*

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686		The standard information format does not exclude potential actors or exchange points including potential cross domain interaction including those between Service Providers and other actors.
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| 689 | *REQ.18.4.4.8.5* | *Interactions supported shall include those between Service Providers and the industrial, commercial, residential premises, and plug-in electric vehicles.* |
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691		The model does not exclude/include specific actors or potential exchange points, it merely describes data and format of information therefore by not excluding these actors.
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694	*REQ.18.4.4.8.6*	*This effort shall support information standards for load curtailment, load shaping, and energy market operations, hence load and usage must be supported (see PAP09, PAP03, and PAP04).*
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| 697 | | Load and usage information are part of the model. |

| 698 | *REQ.18.4.4.8.7* | *Information exchanges shall include to, from, and within facilities.* |

| 699 | | The model does not preclude any potential exchange points therefore the requirement is met. |
| 700 | | |

| 701 | **REQ.18.4.4.9** | **Information Characteristics** |

| 702 | *REQ.18.4.4.9.1* | *Information model shall support exchange of both Fine Grained and summary information.* |
| 703 | | |

704		Summary information is available at the top level through PowerQualitySummary and UsageSummary components. Fine-grained information is available through the list of MeterReading measurement structures which in turn have both summary, Reading, and interval level detail, IntervalReading components. Additionally, the EUI data structures can be associated by device, location, and owner facilitating variable aggregations.
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| 710 | *REQ.18.4.4.9.2* | *Fine grained means that there is disaggregated information. Disaggregated information can include for example load, subsystem, premise, and variable time interval.* |
| 711 | | |

712		Fine grained (disaggregated) information is described throughout the information model. From CustomerAccount, EventType, MeterAsset, ReadingKind, etc. there seems to be enough detailed data elements to support "Fine grained" information.
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| 716 | *REQ.18.4.4.9.3* | *Support for exchanging standard historical, present, and projected load information is required.* |
| 717 | | |

718		Historical information seems to be supported by the UsageSummary attributes for billing items only. Present (meter reading) information has fine grained as well as billing attributes defined. Projected usage is supported in the QualityOfReading <<enumeration>> attribute, which delineates the "estimated" and "forecast" attribute names.
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723 724	*REQ.18.4.4.9.4*	*Energy Usage Information shall include usage, usage profile, and some component of cost (consistent with PAP03, PAP04)*
725 726		Energy usage information, including costs is contained in the data model. Interval data is supportive of usage profiles and PAP04.
727 728	*REQ.18.4.4.9.5*	*The PAP 10 Energy Usage Information model shall allow for exchange of greater or lesser detail.*
729 730 731 732 733 734		Summary information is available at the top level through PowerQualitySummary and UsageSummary components. Fine-grained information is available through the list of MeterReading measurement structures which in turn have both summary, Reading, and interval level detail, IntervalReading components. Additionally, the EUI data structures can be associated by device, location, and owner facilitating variable aggregations.
735	**REQ.18.4.4.10**	**Timing and Goals**
736 737	*REQ.18.4.4.10.1*	*Initial steps include making usage information more readily available by defining and standardizing usage information [delivered] through existing SG infrastructure.*
738 739 740		The EUI data structures enable a diverse range of technologies to deliver usage information in a timely and protocol agnostic manner. Examples of this might be a premise ESI or through services provided by a utility or facility.
741	*REQ.18.4.4.10.2*	*Information on device and facility usage is a primary goal in the initial focus.*
742 743		As the EUI data structures cover summary and device level information, device and facility (aggregated) information can be delivered.
744 745	*REQ.18.4.4.10.3*	*Standard load and usage information will enable early deployment of devices that deliver and understand usage information.*
746 747		As the EUI data models are standardized, producers may deliver usage based devices with confidence in interoperability.
748	**REQ.18.4.4.11**	**Requirements on Quality of Consensus Standard**
749		*The information model shall support:*
750	*REQ.18.4.4.11.1*	*Consistent data representation for REST & Web Services.*
751 752 753		The Schema in section REQ.18.4.3 ensures that a consistent data representation can be achieved when a Schema is developed in a supporting standard carrying EUI in REST and Web Services.
754 755	*REQ.18.4.4.11.2*	*Specification of transactional exchange, syntax, and required population of the information model are beyond the scope of these requirements.*
756		No transactional syntaxes or message services are defined in this standard.

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757	*REQ.18.4.4.11.3*	*an extensible information model – e.g. ability to add custom extensions as needed*
758 759 760 761		This model may be extended by adding new elements (classes, attributes, and associations). Implementations must utilize conventions to ignore any elements not understood by components, to allow them to continue to operate when future extensions are added.
762 763	*REQ.18.4.4.11.4*	*have an evolvable information model – e.g. the standards process supports future revisions*
764 765		**Error! Reference source not found.** identifies how the model is evolvable. Section 0 defines how the standard version can be revised.
766	*REQ.18.4.4.11.5*	*Forward compatible as we evolve*
767 768 769 770		To maintain forward and backward compatibility, no model elements may be removed or restricted in future versions. Only additions and expansions are allowed, so that previous version representations maintain validity against future versions, and vice-versa.
771	*REQ.18.4.4.11.6*	*Supportive of versioning*
772 773 774		Versioning in the UML Model is addressed by a tagged value. The tagged value "version" is used additionally in the XML Schema export (see REQ.18.4.3) as the schema version value.
775	*REQ.18.4.4.11.7*	*Usable without "knowing all the details"*
776 777 778 779 780		Information in the model is arranged hierarchically. Greater detail can be understood the deeper into this hierarchy the reader goes. Summary information is exposed near the top of the hierarchy. These arrangements make it straightforward to accessing applications to ignore the level of detail they do not plan to use or comprehend, while getting value out of higher level information.
781		*More flexibility for independent innovation shall be achieved through:*
782	*REQ.18.4.4.11.8*	*Focus on information exchanged*
783 784		The specification of an information-only model allows the standard to focus on the information exchanged.
785	*REQ.18.4.4.11.9*	*Agreed upon interfaces are maintained over time*
786		See section 0 which describes
787	*REQ.18.4.4.11.10*	*Minimal details = maximum interoperation*
788 789 790		The model provides a hierarchy of summary and detailed information. A balance is achieved by the definition of minimal set of details necessary to satisfy the cumulative set of use cases of the EUI and allocated to this model.

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791	*REQ.18.4.4.11.11*	*Intellectual Property Rights shall be clear & clean*
792		[Need section on IPR and access to model and schema]
793		*Results of PAP 10 shall produce:*
794	*REQ.18.4.4.11.12*	*Information model and XML schema*
795 796		See sections REQ.18.4.2 and REQ.18.4.3 which describe the delivery of an information model and XML schema respectively.
797	*REQ.18.4.4.11.13*	*At information exchange level*
798 799 800		The information model is designed to be exchanged between participants. The information model and XML Schema provide the specificity to define an information exchange, but stops short of mandating one (see 0).
801		*The information model shall be:*
802	*REQ.18.4.4.11.14*	*Readable without charge*
803 804		NAESB has agreed to make the Energy Usage Information Model included in REQ.18.4 and REQ.18.4.1 available to the public without charge.
805	*REQ.18.4.4.11.15*	*Reusable without restriction or charge*
806 807		The use of the Energy Usage Information Model included in REQ.18.4 and REQ.18.4.1 for the production of derivative work products is not prohibited.
808	*REQ.18.4.4.11.16*	*Adaptable without restriction or charge*
809 810		All NAESB standards maybe modified through the NAESB process. . (Please see: http://www.naesb.org//misc/naesb_process_for_standards_dev.doc)
811	*REQ.18.4.4.11.17*	*REQ.18.1.2.13.17Usable for open source*
812 813 814		The use of the Energy Usage Information Model included in REQ.18.4 and REQ.18.4.1.maybe distributed in any manner, however, must be made available without charge.
815	**REQ.18.4.4.12**	**Additional Considerations**
816 817	*REQ.18.4.4.12.1*	*In communicating energy usage information, the Energy Usage Information Model should be used and the information outlined within the model should be available.*
818 819 820		The model provides a common, consensus-based, vendor-neutral model to represent usage information, to be used in exchange scenarios where it is applicable and desired by usage information providers and Customers.

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821 822	*REQ.18.4.4.12.2*	*The Energy Usage Information Model data set has three unique identifiers, which serve the purpose of allowing various aggregations of data sets.*
823 824 825		Owner (customer): This is represented by the Customer class, provided the use of the term "owner" or similar verbiage is not indicative or dispositive of any ownership or other rights under applicable law in the Model or any data.
826		Location: This is represented by ServiceDeliveryPoint.
827		Device: This is represented by MeterAsset.
828 829	*REQ.18.4.4.12.3*	*The Tariff Profile component should be included in the Energy Information Usage Model.*
830 831 832		Recommend marking as a "Future" – TariffProfile provides the representation of the rate elements, and would expand the scope beyond our initial target schedule.
833	*REQ.18.4.4.12.4*	*UsageSummary should include an optional cost attribute to interval and reading class.*
834		Recommend marking as "Future".
835 836 837	*REQ.18.4.4.12.5*	*REQ.18.1.2.14.5 A known base currency should be included in the top level class associated with the MeterAsset for the Energy Usage Information Model, which would be applicable to all instances*
838 839 840		Recommend marking as "Future" – If performance considerations require optimization, global defaults for this and other repetitious elements should be considered.
841	*REQ.18.4.4.12.6*	*The Energy Usage Information Model should be compliant with ISO8601.*
842 843		The current model does not define the primitive to be used to represent the dateTime, however the default xs:dateTime is ISO8601 compliant.
844 845 846	*REQ.18.4.4.12.7*	*Optionally, both start and end of interval can be defined in order to support non-uniform interval information, which is accomplished in the Energy Information Usage Model through endTimestamp to IntervalReading.*
847 848		The endTimeStamp element is included as an optional component of IntervalReading.
849 850	*REQ.18.4.4.12.8*	*Demand based elements are maintained in the TariffProfile including common demand and demand ratchets.*
851 852		The model does not currently contain the full definition of TariffProfile, but this is the CIM element where thresholds associated with the rate are specified.
853 854	*REQ.18.4.4.12.9*	*The Energy Information Usage Model status structure includes a named pair of QualityOfReading and values of raw, forecast, validated, estimated, mixed, and other for*

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855 856 857		*qualifying the associated data set, as an explicit representation of these name value pairs can be processed in implementations by sending and receiving actors. The UsageSummary class also includes such summary information.*
858		Model is specified as described.
859	*REQ.18.4.4.12.10*	*MeterEvent should be associated with meterAsset, not MeterReading.*
860 861 862		The events are currently associated to the MeterAsset <u>through</u> MeterReading, but could be represented in other ways if the group decides this should be changed.
863 864	*REQ.18.4.4.12.11*	*PQSummary as events of enumerated type are provided in the Energy Information Usage Model to represent a simple exposure of summary information.*
865		The model exposes these events in summary form as described.
866 867	*REQ.18.4.4.12.12*	*The Energy Usage Information Model should represent and take into account pollutant energy emissions such as O2, SO2, and NOX.*
868 869 870		Detailed information about these emissions is possible through definition of a ReadingType specifying the appropriate kindReading values as enumerated in ReadingKind.
871 872 873	*REQ.18.4.4.12.13*	*Energy Usage Information Model should include a top level cost summary – billStart, billEnd, billToDate, lastPeriod, and costAdditional, so that the bill to date and bill as of the last billing period could be conveyed through a formula:*
874 875		billLastPeriod = costAdditionalLastPeriod + ∑MeterReading[i].Reading.cost (constrained by datetime)
876		The model represents these elements in the UsageSummary class.
877 878 879 880	*REQ.18.4.4.12.14*	*The model shall use the work being produced by OASIS on common schedule information pursuant to the SGIP PAP04 Requirements. As this work is not complete as of this draft, the abstract definition of time intervals is the most appropriate way to ensure consistency.*
881		TBD – Group to discuss alignment with PAP04
882 883 884 885	*REQ.18.4.4.12.15*	*The model shall use the work being produced by OASIS on common price and product definition information pursuant to the SGIP PAP03 Requirements. As this work is not complete as of this draft, should information related to price be included in the Seed Specification it must be at an appropriate level of abstraction.*
886		TBD – Group to discuss alignment with PAP03

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887   **4. SUPPORTING DOCUMENTATION**

888   a.   Description of Request:

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890   b.   Description of Recommendation:

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892   c.   Business Purpose:

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

895   NAESB Process for Standards Development -
896   http://www.naesb.org//misc/naesb_process_for_standards_dev.doc

897