

OpenSG Edge/Enterprise Conformance Task Group

Certification Process Reference Manual

V0.9 Draft D2

February 16, 2011

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Table of Contents

| | | |
|----|---|----|
| 8 | Change History | 5 |
| 9 | 1. Introduction | 6 |
| 10 | 1.1. Purpose | 6 |
| 11 | 1.2. Scope | 6 |
| 12 | 1.3. Acronyms and Abbreviations | 7 |
| 13 | 1.4. Terminology | 9 |
| 14 | 1.5. Other Considerations and References | 11 |
| 15 | 1.6. Overview | 12 |
| 16 | 2. Overall Description | 14 |
| 17 | 2.1. Guiding Principles | 14 |
| 18 | 2.1.1. Open standards based | 14 |
| 19 | 2.1.2. Robust and comprehensive certification process | 14 |
| 20 | 2.1.3. Clean, layered architecture | 14 |
| 21 | 2.1.4. Focus | 14 |
| 22 | 2.2. End to End System Interoperability | 14 |
| 23 | 2.3. Economic Viability | 16 |
| 24 | 2.4. Minimize Test Organization | 16 |
| 25 | 2.5. Coexistence | 16 |
| 26 | 2.6. Interoperability | 17 |
| 27 | 2.7. Standardization Efforts | 17 |
| 28 | 2.8. Architectural Considerations | 17 |
| 29 | 3. Organizational Requirements | 19 |
| 30 | 3.1. Governance | 19 |
| 31 | 3.1.1. Certification Program Manager (CPM) | 19 |
| 32 | 3.1.2. Approved Product Certification Body (APCB) | 20 |
| 33 | 3.1.3. Technical Advisory Board (TAB) | 22 |
| 34 | 3.1.4. Lead Laboratory (LL) | 24 |
| 35 | 3.1.5. Approved Product Certified Laboratory (APCL) | 24 |
| 36 | 3.1.6. Certificate Authority (CA) | 26 |
| 37 | 3.2. Qualification of Laboratories | 26 |
| 38 | 3.3. Design of ICP | 26 |
| 39 | 3.3.1. Process | 26 |
| 40 | 3.3.2. Program and Program Version | 29 |
| 41 | 3.3.3. Self Testing and Certification | 32 |
| 42 | 3.3.4. Device Compliant Portion Testing | 32 |
| 43 | 3.3.5. Software System Compliant Portion Testing | 35 |
| 44 | 3.3.6. Certification Requirements Status List (CRSL) | 35 |
| 45 | 3.3.7. Testing and Interoperability Principles | 38 |
| 46 | 3.3.8. Certified Product Listing | 39 |
| 47 | 3.3.9. Certified System Listing | 43 |
| 48 | 3.3.10. Validation of Test Harness for Device Testing | 45 |
| 49 | 3.3.11. Validation of Test Harness for System Testing | 46 |
| 50 | 3.4. Improvement and Corrective Action / Feedback | 47 |
| 51 | 3.4.1. Certification Process Exceptions | 47 |
| 52 | 3.4.2. Certification Requirement Waiver Process | 50 |
| 53 | 3.4.3. Surveillance of Certified Product Validity | 50 |
| 54 | 3.5. Security Considerations | 51 |
| 55 | 4. ANNEX | 52 |
| 56 | 4.1. Summary Matrix | 52 |
| 57 | | |

58 *List of Tables*
59

60

List of Figures

| | | |
|----|---|----|
| 61 | Figure 1: Context for OpenSG Conformance Program..... | 7 |
| 62 | Figure 2: System Component Overview | 13 |
| 63 | Figure 3: Context of individual test suites related to the total system | 15 |
| 64 | Figure 4: ZigBee SE2.0 Certification Scheme..... | 16 |
| 65 | Figure 5: GWAC Stack..... | 18 |

66

67

Disclaimer

68 This document should be considered as a living document. It is anticipated that there will be
 69 updates resulting from further work within OpenSG and the work of the NIST SGIP Test and
 70 Certification Committee (SGTCC).

71

Change History

73

| Date | Rev | Change | By |
|-------------------|-----------------------|--|--------------|
| August 25, 2010 | R9: work in progress | Added this Change History Table | Phil Beecher |
| | | Generalized references to "products" (previously devices and systems) | |
| | | Added Context for OpenSG Conformance Program | |
| | | Reorganized acronyms and definitions | |
| | | Inserted system component overview diagram | |
| | | Merged sections describing Approved Device Certification Lab and Approved System Certification Lab | |
| December 11, 2010 | V0.9 | Added line numbers, Revised version number ready for comment and voting | Phil Beecher |
| January 28, 2011 | V0.9 Draft pre-D2 wip | Applied changes as described in comment spreadsheet r02 | Phil Beecher |
| Feb 3, 2011 | V0.9 Draft preD2 | Applied changes as described in comment spreadsheet r03 | Phil Beecher |
| Feb 16, 2011 | V0.9 Draft D2 | Release for recirculation ballot | Phil Beecher |

74

75 **1. Introduction**

76 The electric energy utility industry has sponsored the work of the Open Smart Grid (OpenSG)
77 Conformity Working Group organization, Edge Conformance Task Group (OpenSG Edge TG),
78 under the auspices of the Utility Common Architecture Group (UCA Group). This OpenSG
79 Edge TG is tasked with the job of defining the necessary requirements for assuring
80 conformance and interoperability of various devices, systems and technologies in Enterprise
81 Systems, OpenHAN, OpenADR, and OpenADE specifications.

82
83 The GridWise Council, sponsored by NIST, also address issues of interoperability and testing.
84 This document aims to be inclusive of the GridWise Council work products, while maintaining a
85 clear focus on utility infrastructure and industry requirements.

86 **1.1. Purpose**

87 This document describes the Interoperability and Conformance Program (ICP) required by
88 OpenSG. The purpose of this document is to promote industry-centered robust product and
89 system certification programs to test for the stringent requirements from AMI-Enterprise,
90 OpenHAN, OpenADR, and OpenADE. It is the intent of this document to become the basic
91 foundation of standards organization testing and certification programs that would be deemed
92 acceptable to the utility industry and the smart grid industry community at large.

93 **1.2. Scope**

94 This document covers the entire framework description of the ICP. The ICP follows the
95 OpenSG Edge Conformity WG Guiding Principles. This document is issued by the OpenSG
96 Edge and Enterprise Conformance Task Groups, and implements the following key policy
97 factors:

- 98
99
- 100 • Testing and certification experiences of communication protocol stacks following
Best Practice for testing as described in the Guiding Principles document.
 - 101 • The importance of accumulated experience of testing institutions is recognized. Of
102 particular importance are: coexistence with interferers, interoperability at application
103 layers but with various physical layers and interconnections thereof, and
104 enforcement of standards based interoperability.
 - 105 • Systems represented in the OpenSG community are covered, including AMI-
106 Enterprise Systems, OpenHAN, OpenADE and OpenADR interoperability and
107 conformance.
- 108

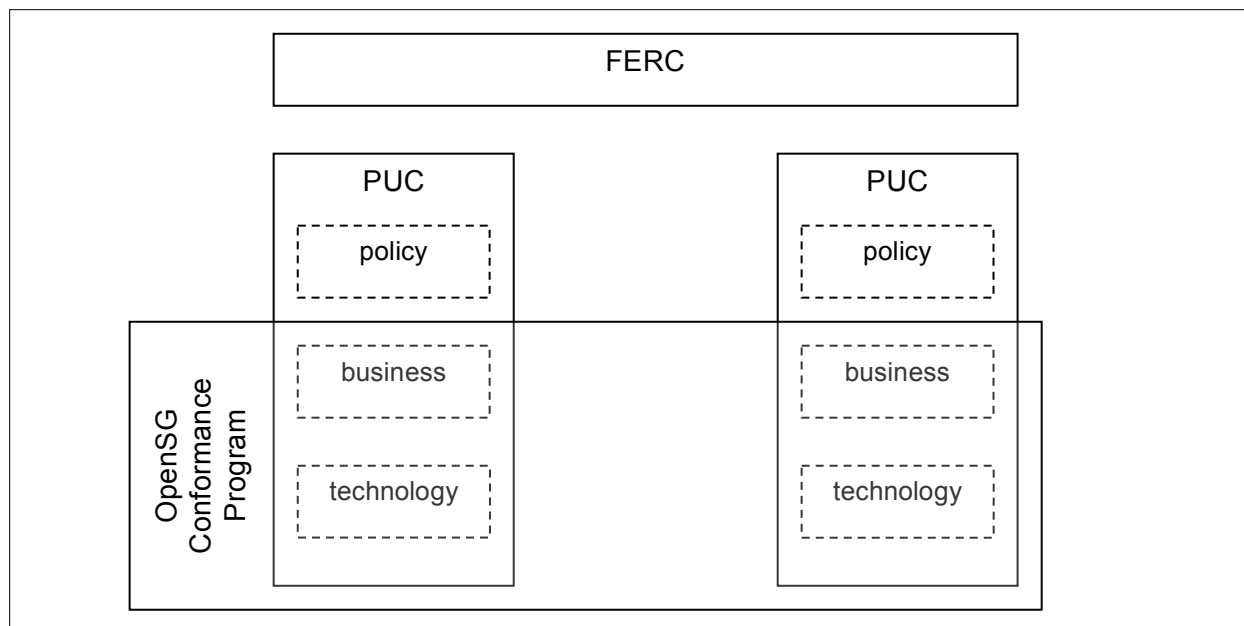


Figure 1: Context for OpenSG Conformance Program

Figure 1 shows the context for the OpenSG Conformance and Interoperability program. Each electric utility operates their smart grid within a technical, informational, and business environment different for every PUC and interested party jurisdiction. As such, the smart grid technologies will be installed in different regulatory and infrastructure environments. The CPRM shares a common purpose with NIST SGIP TCC Interoperability Process Reference Manual, which should be read as a companion document. However, this CPRM specifically describes the model implementation for informational and technical layers of the GWAC stack.

In general, the ICP framework shall consist of a basic two parts, with one part being the ICP Program Operations and Administration, while the other is the ICP Requirements & Policy. An Interoperability Testing and Certification Authority (ITCA) shall oversee the entire program and liaise with OpenSG on the suitability of the specific ICP Program.

1.3. Acronyms and Abbreviations

AMI: Advanced Metering Infrastructure refers to systems that measure, collect and analyze energy usage, and interact with advanced devices such as [electricity meters](#), [gas meters](#), [heat meters](#), and [water meters](#), through various communication media either on request (on-demand) or on pre-defined schedules.

APCB: Approved Product Certification Body - Qualified organisation responsible to manage a certification process for a particular product, and independent from test laboratory. The product may be either a device or module incorporating hardware and software, or a software only system / sub-system.

139
140 **APCL:** Approved Product Certification Laboratory - Testing organization tasked to evaluate
141 product for compliance and interoperability. The product may be either a device or module
142 incorporating hardware and software, or a software only system / sub-system
143
144 **API:** Application Program Interface
145
146 **CA:** Certificate Authority - Body responsible for digital certificate issuance of certified products
147 and systems. This includes embedded devices, as well as browsers conforming to ZigBee SE
148 Security (ECC) and X.509 security schemes.
149
150 **CCB:** Change Control Board - A Change Control Board is used to control identified system
151 changes, review impacts, and grant approvals as part of the change management function. The
152 CCB is typically comprised of members from the participating organizations shown in
153
154 **CIS:** Customer Information System
155
156 **CPM:** Certification Program Manager - Person tasked by the SSO/SDO to administer the test
157 and certification program
158
159 **CRSL:** Certification Reference Status List - List of test cases that are draft, active, deprecated,
160 and planned in the certification program.
161
162 **CVS:** Concurrent Versions System – a version control system often used for software
163 development
164
165 **DER:** Distributed Energy Resources
166
167 **EMS:** Energy Management System
168
169 **ESI:** Energy Services Interface
170
171 **Gauge R & R:** is a [Measurement Systems Analysis](#) technique which uses Analysis of Variance
172 ([ANOVA](#)) [random effects model](#) to assess a measurement system. There are two important
173 aspects of a Gauge R&R. First, **Repeatability:** the variation in measurements taken by a single
174 person or instrument on the same item and under the same conditions, and second,
175 **Reproducibility:** the variability induced by the operators. It is the variation induced when
176 different operators (or different laboratories) measure the same part.
177
178 **HAN:** Home Automation Network
179
180 **IUT:** Implementation Under Test
181
182 **ICP:** Interoperability and Conformance Program
183
184 **ITCA:** Interoperability Test and Certification Authority - An administrative organization vested with
185 the responsibility of operating and maintaining a testing and certification program for smart grid
186 technology, and responsible to maintain its efficacy per the OpenSG requirements.
187
188 **LL:** Lead Lab - Central technical authority for testing and testing technology

189
190 **MDMS:** Meter Data Management System
191
192 **OSI:** The Open System Interconnection Reference Model or OSI Reference Model is a
193 conceptual description for layered communications network protocol design.
194
195 **PICS:** Protocol Implementation Conformance Statement
196
197 **PIXIT:** Protocol Implementation Extra Information for Testing
198
199 **REST:** Representational State Transfer (REST) is a style of [software architecture](#) for [distributed](#)
200 [hypermedia](#) systems such as the [World Wide Web](#). REST-style architectures consist of [clients](#)
201 and [servers](#). Clients initiate requests to servers; servers process requests and return
202 appropriate responses. Requests and responses are built around the transfer of representations
203 of resources.
204
205 SOAP: originally defined as **Simple Object Access Protocol**, is a [protocol](#) specification for
206 exchanging structured information in the implementation of [Web Services](#) in [computer networks](#).
207
208 **SSO:** Standards Setting Organisation - An organisation which sets standards
209
210 **SRS:** System Requirements Specification
211
212 **SUT:** System Under Test
213
214 **SVN:** Subversion – a version control system often used for software development
215
216 **TAB:** Technical Advisory Board - a working group consisting of representatives of test labs,
217 certification bodies, and SSO/SDO administration; facilitates in the operation of the testing and
218 certification program, and discuss timely and critical issues facing the whole process.
219

220 **1.4. Terminology**

221 **AMI-Ent:** The AMI Enterprise Task Force defines requirements, policies, and services, based
222 on utility industry standards such as the Common Information Model (CIM), required for
223 information exchange and control between the AMI Head-Ends, MDMS or MDUS and enterprise
224 back office systems.
225
226 Certification Tool: A certification tool is a readily accessible and open online tool for industry to
227 submit evidence of products for certification
228
229 **Compliance:** A system is said to be “complying” when it is subjectively judged to be functioning
230 according to specifications. The judgement is subjective by nature, as it is not evaluated by a
231 third party. Hence compliance is a weaker adherence to specification when compared with
232 conformance
233
234 **Conformance:** A system “conforms” with a specification when it is objectively judged to be
235 functioning according to specifications. The judgment is both rigorous/objective, based on
236 technical and qualitative measures.
237

238 **Conformance Testing:** Determines whether an implementation conforms to the standard as
239 written, usually by exercising the implementation with a test environment. Conformance testing
240 is often also referred to as Verification testing. However, for consistency, the term
241 “Conformance” is used exclusively in this document.

242
243 **Compliant Portion:** is defined as the part of a specific hardware and firmware/software
244 configuration which behaves consistently according to the spec. The compliant portion may be
245 compromised of individual hardware or firmware/software components, which when combined,
246 become the compliant portion

247
248 **Device:** A device is a product which incorporates hardware, typically including communications
249 hardware which is included as part of the compliant portion. A device will usually be deployed at
250 the edge of the utility network.

251
252 **Enterprise System:** large-scale, integrated application-software package(s) that use the
253 computational, data storage, and data transmission power of modern [information technology](#) to
254 support [business processes](#), information flows, reporting, and data analytics within and between
255 complex organizations.

256
257 **Equivalence:** An evaluation of a system against another system instantiation, whereby
258 features/functions are compared and contrasted; when all such features/functions are identical,
259 the system is judged to be in “equivalence”.

260
261 **Instantiation:** An implementation of a system, either compliant or conforming. --- Example:
262 compiling, etc.

263
264 **OpenADE:** The OpenADE Task Force is a group of smart energy management vendors,
265 utilities, and consumer interests developing recommendations toward building interoperable
266 data exchanges that will allow customer authorization and sharing of utility consumption
267 information with 3rd party service providers.

268
269 **OpenADR:** Open Automated Demand Response

270
271 **OpenHAN:** OpenHAN Home Area Network Device Communication, Measurement, and Control
272 focuses on the consumer interface task defined by UtilityAMI.

273
274 **Prototype System:** A system created as a conforming instantiation.

275
276 **Reference System:** A system created as a complying instantiation.

277
278 **Primary Test Categories:** Canonical Baseline Test Types - tests categories that are deemed
279 to be minimum required for an acceptable and effective testing program.

280
281 **Signed Certification Mark License Agreement** – A licence agreement between the ITCA and
282 the applicant for a Certification Mark

283
284 **System:** Part or whole instance of product functionality, usually associated with software portion
285 of product

286
287 **Product:** Hardware and/or software implementation to be tested for compliance /
288 interoperability

289
290 **Module:** Hardware and software implementation that incorporates a compliant portion
291
292 **Component:** piece of software that together with another piece of software or hardware form a
293 Compliant Portion
294
295 **Interoperability:** Communication and functionality achieved by multiple conforming systems. A
296 correspondence of interfaces between two abstract functional units.
297
298 **Interoperability Testing:** connects two or more implementations together and determines
299 whether they can successfully communicate. Significantly different from conformance testing
300 because it is often possible for two systems that conform to the standard to be unable to
301 communicate. If they can communicate, it is possible that they cannot perform any useful
302 applications. These situations can arise because the implementations have conflicting
303 interpretations of the specification or because they have chosen conflicting options within the
304 standard. A particular form of interoperability testing is application testing in which there is a
305 specification for the particular use of a standard that can be tested
306
307 **Security Testing:** Analyzes whether the implementation correctly makes use of any security
308 features from the standard or other security features available in the device or computer system
309 housing the implementation. This is the most difficult type of testing program because it must
310 evaluate whether the system has vulnerabilities, which are not always obvious.
311
312 **Validation Testing:** Validation testing ensures that a system meets the needs of its users and
313 stakeholders. System end-to-end tests are examples of validation tests.
314

315 1.5. Other Considerations and References

316 It is the intention of this group to work with other organisations to reduce duplication of effort and
317 leverage other activities and expertise. The OpenSG Conformity Task Forces will interface with
318 the following organizations such as:

- 319
- 320 • NIST
 - 321 • SGIP TCC
 - 322 • ZigBee Alliance
 - 323 • HomePlug Alliance
 - 324 • Wi-Fi Alliance
 - 325 • CIMug
 - 326 • Others
- 327

328 Formal liaisons will be established as required. This will be dependent on level of accreditation.
329 It may also be dependent on the use of a logo.

330
331 Requirements and contributions from Utilities, Vendors and others will be captured through the
332 contributors' participation in OpenSG.
333

334 1.6. Overview

335 The scope of the design of the program described in this document is to certify products and
336 systems to

- 337
- 338 • relevant mandatory and optional conformance feature sets of the communication
339 stack physical layer
- 340 • relevant mandatory and optional conformance feature set of the communication
341 protocol stack
- 342 • interoperability of devices within the device class, and service level and application
343 interfaces relevant to the application profiles
- 344 • interoperability with applications and service level interfaces from other network
345 domains within the smart grid communication infrastructure
- 346 • conformance to metrics for product and system performance as specified by
347 business, regulatory, and user requirements per the GWAC stack framework
348

349 The relevant PICS documents are required to incorporate the SRS documents from AMI-
350 Enterprise System, OpenHAN, OpenADR, and OpenADE as appropriate. Product and System
351 Certification shall require applicants to sign a Declaration of Conformity (DoC) document prior to
352 a Certification by the relevant organization.

353

354 The product certification process applies to deployable end products and reference designs
355 such as, but not limited to, Smart Meters, Energy Service Interfaces and OpenHAN compliant
356 Smart Energy 2.x device implementations (PCT, IHD, LCD, etc.). The certification process also
357 addresses complete radio, PLC, wireline, and/or radio-PLC-wireline modules and reference
358 designs which may be integrated into other end products, typically without further modification,
359 and therefore without further certification (See section Inheritance). Re-certification of certified
360 device versions (evolving devices) and variants (adaptations) are also addressed (Section:
361 Revisions). The certification program does not certify incomplete implementations (SW/HW
362 components, subcomponents, subunits) of devices and applications, for example an
363 implementation of part of the protocol stack.

364

365 The certification process is also applied to application software and systems consuming
366 services at interfaces with AMI and smart grid communication infrastructure, to define the
367 system certification process. These may include OpenADR and OpenADE client / server
368 services, including Demand Response Automated Server (DRAS), Demand Response Client,
369 portal services and AMI-Enterprise services. Re-certification of certified application software
370 and system versions and variants are also addressed (Section: Revision). The certification
371 program does not certify incomplete implementations that do not implement a mandatory set of
372 features.


373

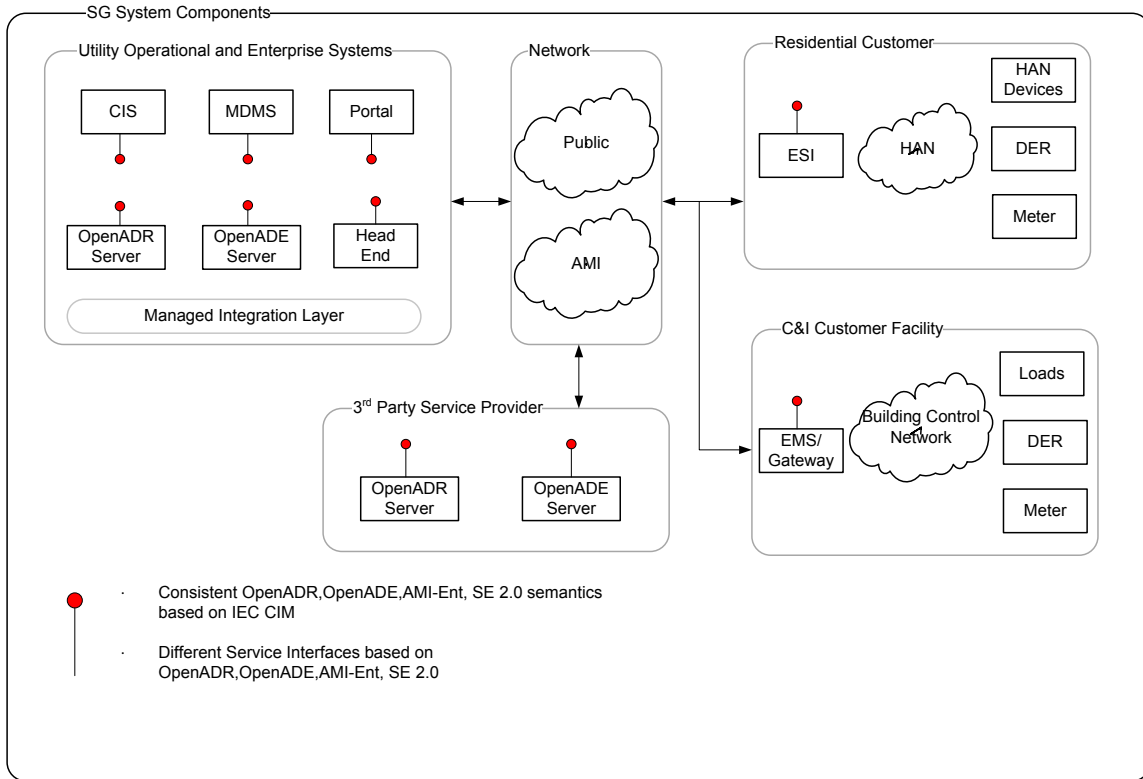
374 In the event of discrepancies or errors in the Requirements, Standard, Specifications or
375 Certification testing of products or systems, an industry Lead Laboratory (LL) will notify all
376 affected parties regarding needed remediation activities. In the event of an invalid test
377 specification or requirement, an industry WG shall review the test result and procedures
378 followed. If corrective action is needed the industry WG in cooperation with the LL will
379 determine the course of action and notify all affected companies of its determination.

380

381 If a product or system is certified and later the registered company is no longer a viable entity,
382 the certification remains active but use of relevant logo stops and the listing is removed.

383
384
385
386

Figure 2 shows an Overview of the System Components to be considered by OpenSG Edge /Enterprise Conformity Task Groups. The service interfaces are shown as .



387
388

Figure 2: System Component Overview

389 **2. Overall Description**

390 **2.1. Guiding Principles**

391 The SG Conformity Task Forces shall define Policy, Process and Procedures required to
392 implement testing and certification programs.

393
394 For both systems and devices that incorporate a hardware portion, existing Best Practice
395 Structure shall be utilized. The importance of accumulated experience of testing institutions is
396 also recognized. The following points must be considered in the ITCA when creating and
397 maintaining a testing and certification program.

398 **2.1.1. Open standards based**

399 A public specification that is maintained by an open, public consensus process to accommodate
400 new technology over time and that is consistent with standards. Open standards lower total
401 cost of ownership and provide an open platform that encourages innovation.

402 **2.1.2. Robust and comprehensive certification process**

403 Robust certification processes are needed to guarantee a seamless user experience that
404 minimizes support calls and builds confidence in the maturity of the smart grid technologies.

405 **2.1.3. Clean, layered architecture**

406 Adherence to industry best practices for software and systems development is a guiding
407 principle. Specifically, the system designs shall follow a clean, layered OSI architecture model.
408 This allows standardization of the higher levels of the stack to provide modularity and use of
409 multiple transport layers.

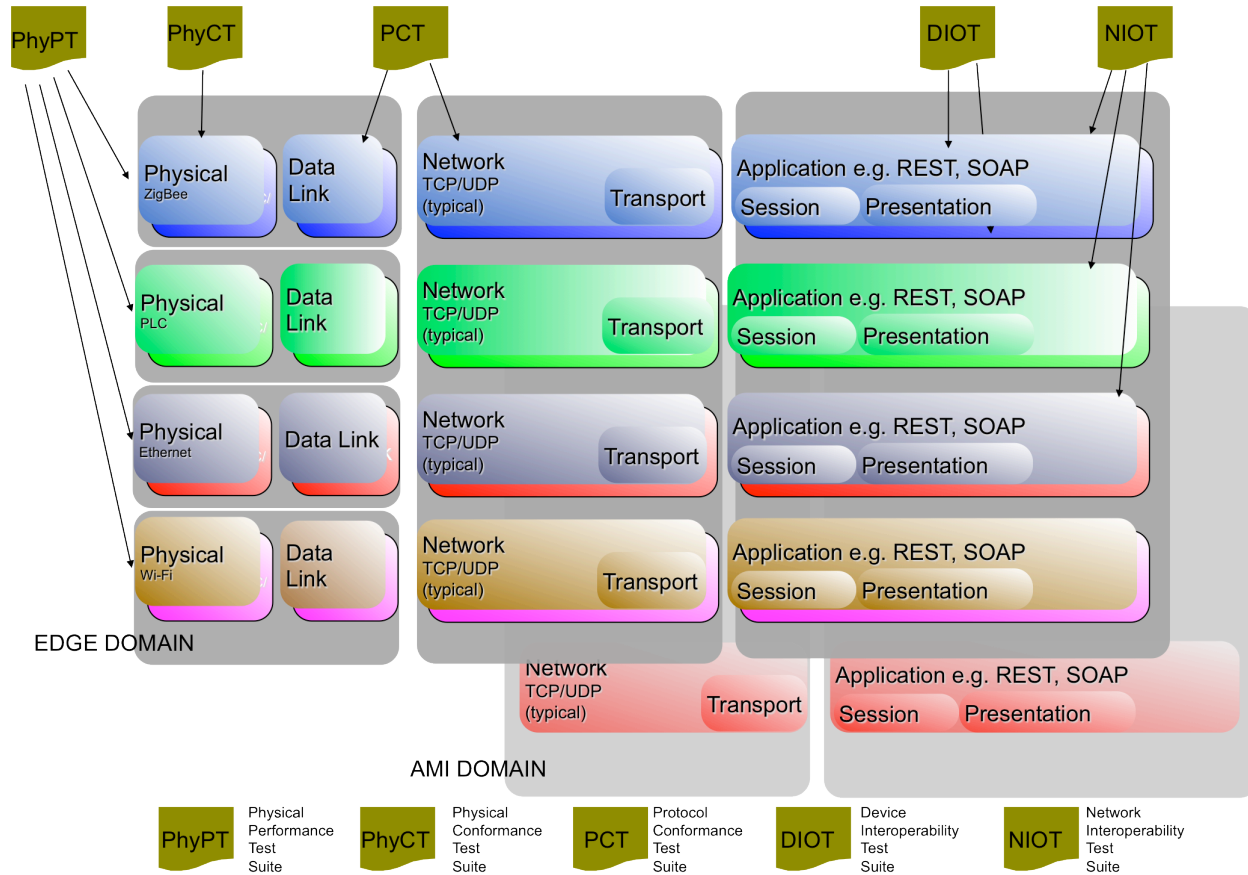
410 **2.1.4. Focus**

411 The focus for devices and systems should be on the application programming interfaces and not
412 specific applications. Identifying the interfaces between applications and the core information
413 sets available provides a minimum set of attributes to enable the required functionality. This
414 enables a platform for innovation upon which a wide range of applications can be designed and
415 built to suit users' requirements and preferences while maintaining adherence to the open
416 standard.

417 **2.2. End to End System Interoperability**

418 The Smart Grid communication infrastructure can be described by the OSI-7 layer model, but
419 with added description of multiple domains of network (Edge and AMI). Conformance tests
420 evaluate a unit or system under test for its adherence to a specification, whereas an
421 interoperability test verifies the ability of a device to intercommunicate within its domain with
422 peer layers of the OSI-stack. Further, the performance tests evaluate a unit or system under
423 test for its fitness of use in deployment scenarios under business requirements. Figure 3 shows
424 how individual test suites relate to the complete system. In the Edge Domain, products may
425 incorporate hardware portions, e.g. radio devices or PLC. Where a product incorporates one or

426 more hardware portions, e.g. a ZigBee Programmable Thermostat , Physical Performance and
 427 Physical Conformance Test Suites as well as Protocol Conformance Test suites for the Data
 428 Link Layers are required. However, where a product is a software system, e.g. a 3rd party
 429 OpenADE server, application layer testing only is required.
 430



431
 432
 433
 434
 435
 436
 437
 438

Figure 3: Context of individual test suites related to the total system

Figure 4: ZigBee SE2.0 Certification Scheme shows an example certification scheme as proposed for ZigBee Alliance Smart Energy Profile 2.0. The Certification Test Cases has been divided in 4 main sets: IEEE 802.15.4-2006, Stack, Platform and Device Type Certification. The coverage of each set of tests is shown in the figure.

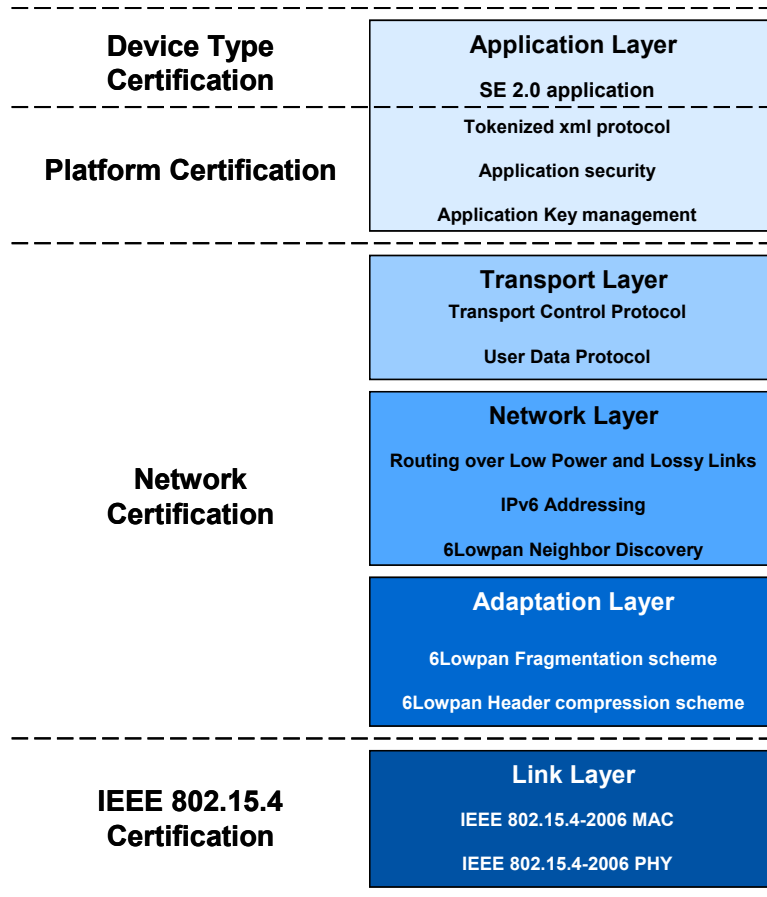


Figure 4: ZigBee SE2.0 Certification Scheme

439
440
441

442 **2.3. Economic Viability**

443 The ITCA shall design a testing and certification program that is economically viable for industry
444 participants, including utilities, device and software vendors, and test laboratories.

445 **2.4. Minimize Test Organization**

446 The following statements describes the foundation of the testing program to establish rapidly
447 maturing interoperable products and interfaces between products based on designated
448 specifications relevant to the Edge.

449 **2.5. Coexistence**

450 A mass, scalable deployment of communication technology requires “robustness”, and in
451 particular, coexistence with other technologies already in the field. These technologies may be
452 wireline, such as DSL, or non-standard PLC technologies, or wireless, such as Bluetooth and
453 Wi-Fi. Previously, the newer of installed technologies may or may not have impacted legacy
454 devices; however, with SE 2.0, wireline and wireless technologies may have mutual interference
455 effects that need to be mitigated for successful deployment.

456

457 **2.6. Interoperability**

458 Certified products should interoperate at all layers. For mature technologies with proven
459 certification programs, adoption should be straightforward. In recognition of various physical
460 communication and protocol layers (OSI layers 1-4) that may be deployed at any time by the
461 adopters of SEP, applications need to interoperate independent of the physical, MAC, link, and
462 transport layer selection.

463

464 **2.7. Standardization Efforts**

465 Industry, nation and worldwide efforts are underway to define specifications not only of
466 technology but also of interoperability itself. As such the Edge/Enterprise product testing and
467 certification program shall continually monitor these standard developments (such as IEEE-SA
468 P2030) and maintain compatibility with specified standards.

469

470 **2.8. Architectural Considerations**

471 The Gridwise Architecture Stack (GWAC) stack is shown below in Figure 5. The stack
472 adequately describes the scope of the interoperability topic at hand, and serves as a starting
473 point for the discussion on architectural considerations for the testing and certification program
474 required from ITCAs.

475

476 Briefly, the three domains of Technical, Informational, and Organization blocks of the GWAC
477 stack cover distinct but very relevant end-to-end system and cross business interoperability
478 requirements.

479

480 It is recognized here that ITCAs may scope activities that are subsets of the GWAC stack, and
481 may concentrate its efforts mostly on the *Technical block*. The OpenSG Edge Conformity
482 requires that the ITCA bring into consideration the interdependencies of the other GWAC stack
483 blocks that are not specifically addressed by the ITCA itself, and to maintain sufficient
484 mechanism to address characteristics and limitations of the ITCA's portion of the total end-to-
485 end system architectural issues.

486

487 As such, the ITCA shall take steps to establish needed formal liaison relationships with
488 customer and SSO, to assure that end-to-end system requirements are adequately included in
489 the ITCA established program.

490

491 As a general requirement for a qualified ITCA following this OpenSG document, that ITCA shall
492 implement a formalized market and technical requirements derivation process, and include end-
493 to-end system needs through utilization of SRS from OpenSG.

494

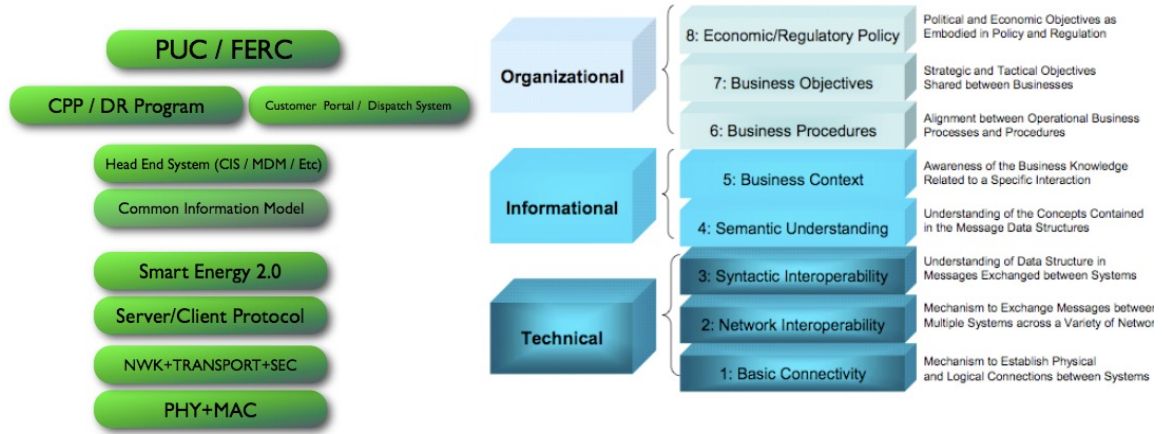


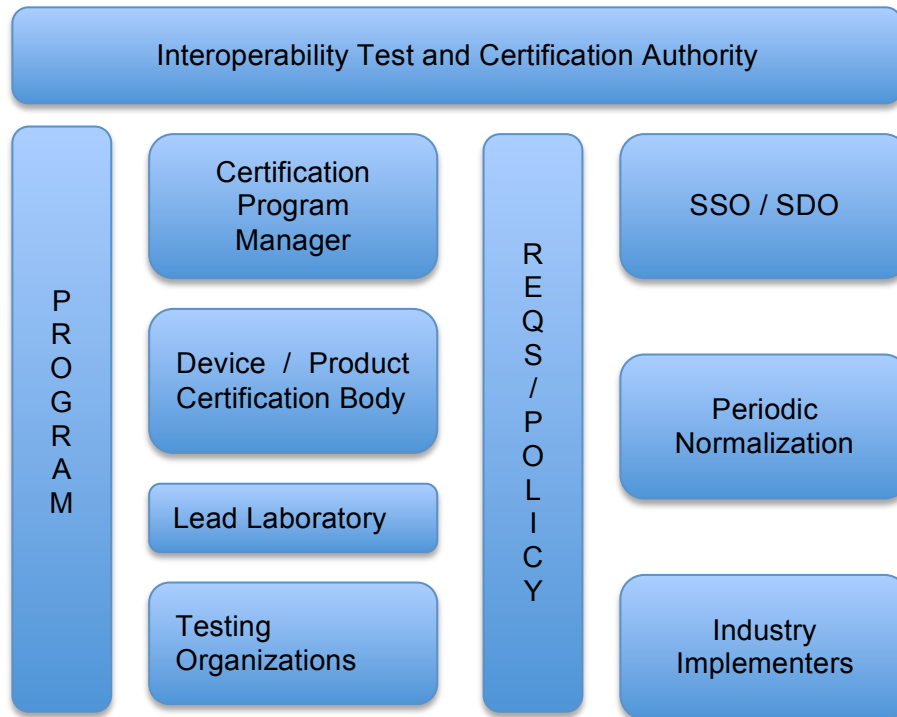
Figure 5: GWAC Stack

495
496
497

498 3. Organizational Requirements

499 3.1. Governance

500 Figure 6 shows a suitable organizational structure for the management of a certification
 501 program. The ITCA shall structure the testing and certification program with the specific
 502 elements described below to ensure that industry best practices are installed.



503
504

Figure 6: Organization

505 3.1.1. Certification Program Manager (CPM)

506 The CPM is an individual appointed by the industry program to act as the administrator of the
 507 Certification Program. His/her task is to oversee the day-to-day operations and needs of the
 508 certification program, and act as the interface between the industry and the program. His/her
 509 tasks involve:

510 3.1.1.1. Chairing the Technical Advisory Board (TAB)

511 Coordinating problem resolution in the Certification Program
 512 Communicating important items to the industry
 513 Signing off on the Certifications

514 3.1.1.2. Administering the Testing and Certification Program

515 t.b.d.

516 **3.1.1.3. Administering the Interoperability Test Events**

517 t.b.d.

518 **3.1.2. Approved Product Certification Body (APCB)**

519 The APCB is an organisation of qualified personnel installed by the Certification program, and
520 part of the Approved Product Certification Program. Each appointed APCB is entrusted with the
521 authority to submit products as Certified, without further review. This special trust depends
522 upon both the competence and the integrity of each APCB. The APCB appointment is renewed
523 yearly by the APCB contingent upon the following yearly recognition maintenance requirements
524 and any additional requirements the certification program deems necessary. The APCB may
525 seek monetary compensation to clients for services rendered to clients and organizations as
526 part of the sanctioned APCB function.

527 **3.1.2.1. Definition**

528 The APCB comprises individuals appointed by the certification program to certify that an End
529 Product or module satisfies all certification criteria to be a Certified Product. An APCB member
530 is an individual who is typically, but not necessarily, affiliated with an APCL(s). The APCB shall
531 not be both a) responsible for performing tests, generating and/or signing off on a test report for
532 a specific certification project, and b) responsible for assessing and certifying the results for
533 submittal as a Certified Product, for the same specific certification project. In other words, the
534 APCB may test for projects he/she is not responsible for certifying.
535

536 **3.1.2.2. Sanctioned Activities and Responsibilities**

537 The APCB submits product listings through the Certification Tool to the Certification Program
538 Manager for listing Certified Products, after a review of the Compliance Folder and other
539 documents by checking completeness, correctness, and consistency of the materials. The
540 APCB may assist the Member to determine tests required through the use of the Test Plan
541 Generator, preparing documentation, and completing all requirements for the listing. At the time
542 of completion of the certification assessment, the APCB shall deliver a Certified Product Notice
543 certifying that product has satisfied all Certification Criteria and is ready for listing. This
544 notification will be generated by the Cert system when the APCB updates the status of the
545 corresponding certification project.
546

547 The APCB is knowledgeable about the application profile and its certification criteria. The
548 APCB notifies the industry WG Program manager when all listing requirements are met, and
549 gives a certification date and a member defined listing date of the product with the express
550 permission of the Member. The APCB enters the product information on the Certified Products
551 List when authorized by the Member for a specific listing date.
552

553 Confidentiality is a key part of the APCB activity. For this reason, the APCB will operate under a
554 Non Disclosure Agreement (NDA). The APCB is responsible for verifying the authenticity of
555 documents submitted and used in Product Certification.
556

557 With respect to the Certification program, the APCB serves under privilege granted by the
558 certification program, and hence answers foremost to the Program Manager above any
559 immediate management authority the APCB may be operating under. Any deviation is grounds
560 for withdrawal of APCB status.
561

562 3.1.2.3. Qualifications: Recognition Process for APCB

563 The APCB holds a position of high trust. Recognition as APCB is therefore both subjective and
564 revocable. APCB recognition is based upon an applicant's compliance with criteria listed on this
565 CPRM as well as additional information gained by certification program throughout the applicant
566 evaluation process.

567
568 Applications for APCB recognition shall be submitted to the Certification Program Manager.
569 The applicants shall directly address each requirement listed below in a manner that allows the
570 responses to be easily compared with each requirement. The Certification Program Manager
571 will forward completed APCB applications to the certification program for consideration. The
572 certification program will determine whether additional evidence or interview(s) are needed and
573 will instruct the Certification Program Manager to so notify the applicant.
574

575 3.1.2.4. APCB Requirements

576 The APCB shall have the following minimum qualifications

- 577
- 578 • at least 3 years relevant professional work experience
 - 579 • at least 2 years of relevant engineering related work experience in at least one of the
580 following areas
 - 581 - product planning and project management
 - 582 - product design in physical, protocol, or application layers
 - 583 - product evaluation and testing
 - 584 - product regulatory testing
 - 585 - product regulatory certification
 - 586
 - 587
 - 588 • where the APCB is part of a larger organization, the organizational arrangements
589 should be such that departments having conflicting interests, such as production,
590 commercial marketing, or financing do not adversely influence APCB compliance
591 with the requirements of the Certification Program
 - 592 • The APCB shall have arrangements that ensure that APCB is free from any internal
593 or external commercial, financial, or other pressures and influences that may
594 adversely affect the quality of work
 - 595 • authority to reject test results based on non-conformance
 - 596 • capable of maintaining confidential information
 - 597 • at least 1 year of active participation in a related technical or qualification working
598 group
 - 599 • relevant degree in engineering or sciences, or equivalent
 - 600 • ability to speak, read, write English at college level
 - 601 • ability to compose a logical non-technical position and argument based on technical
602 issues
 - 603 • be available for participation in industry WG participation
 - 604 • complete a Certification Program / APCB introductory course session held by the
605 CPM
 - 606 • complete, with satisfactory results, the application and questionnaire for APCB
607 recognition
 - 608 • complete an interview with the CPM and certification program, or proxy thereof, for
609 APCB recognition

- 610 • participate in Technical Advisory Board (TAB) once recognized as APCB

611
612 Furthermore, each APCB applicant acknowledges that continued recognition is contingent upon
613 the applicant's maintaining both the complete trust of the program and the original APCB
614 requirements met by the applicant. The certification program reserves the right to suspend any
615 APCB recognition at any time, without warning. This includes, but is not limited to, changes in
616 employment status and failure to maintain competence in the applicable specifications, test
617 specifications, and certification policies. It is not necessary for the program to provide any
618 specific reason for withdrawal of APCB privileges.

619
620 The APCB shall annually declare in writing to the program:

- 621 • that no changes in the APCB's conformance with the recognition requirements have
622 occurred,
- 623 • how the APCB continues as an active participant in the certification program, and
- 624 • how the APCB maintains competence in the SE specifications, and SE certification
625 policies

626
627 Note that APCB appointment does not guarantee the validity of the APCB's action (certification
628 program cannot be held liable for any claims against an APCB).
629
630

631 **3.1.3. Technical Advisory Board (TAB)**

632 **3.1.3.1. Definition**

633 The TAB consists of Certification Program Manager, APCBs, APCL representatives, Lead
634 Laboratory representative, in addition to other relevant technical experts from manufacturers.
635 The TAB exists as an ongoing operations entity separate from the industry WG such as
636 OpenHAN, OpenADR, OpenADE, Enterprise System. The TAB provides specific informational
637 and operational recommendations to the program. Its function is advisory for feedback and
638 improvements of the process of Certification program through the Program Manager. The TAB
639 shall seek to enhance the expertise and technical competence of its members in matters
640 relating to edge product and system certification and testing.

641 **3.1.3.2. Activities**

642 The typical purposes of the TAB include:

- 643
- 644 • to address technical issues relating to conformance and interoperability testing of
645 End Products and modules; including issues relating to test specifications, test
646 requirements, test procedures, validated test equipment and validated test cases.
- 647 • to produce advisory notes for use by APCBs covering aspects related to test cases,
648 guidance on test configurations, applicability of test cases especially during
649 transitional periods, and new testing techniques in order to improve the practical
650 implementations of the certification process.
- 651 • to review and decide on Test Case Waiver submissions, subject to review by the
652 Lead Laboratory
- 653 • to provide a forum for free discussion of new ideas, developments, and advanced
654 testing techniques relating to test requirements, methods, and equipment

- 655 • to provide an environment that will improve the practical and theoretical knowledge
656 of members relating to the testing of End products and modules.

657
658 The primary function of the TAB is to advise and counsel the certification program in matters
659 relating to product certification requirements and testing, including problems relating to test
660 specifications, procedures, and equipment. A secondary function is the free exchange of
661 knowledge among members. To help these functions the TAB will act as the input and source
662 of knowledge on problems to the testing of End products and modules and on the certification
663 process for the benefit of the entire Certification Program and the Lead Laboratory.

664

665 **3.1.4. Lead Laboratory (LL)**

666 **3.1.4.1. Definition**

667 The Lead Laboratory is appointed by the ICP as the operational arm of technical development,
668 resolution, and ongoing repository of competence for the entire Certification Program. The LL is
669 a test laboratory charged with the investigation of test methods, test equipment, and inputs from
670 the TAB. The purpose of the LL is to maintain a center of core competence to uphold a robust
671 Certification Program, and to normalize the trustworthiness of test results from the various
672 APCLs.
673

674 **3.1.4.2. Activities**

675 The following activities are included in the LL scope of activities:

- 676
- 677 • Evaluation of test procedures, test cases, and test suites proposed by the industry
- 678 SSO/ WG before final approval
- 679 • Coordinating and managing interoperability events for development, and certification
- 680 readiness of upcoming specifications and products
- 681 • Evaluation and development of test systems (e.g. reference systems) used by the
- 682 APCL and industry at large
- 683 • Proxy as technical operations arm of the Certification Program manager and
- 684 program
- 685 • Evaluation of APCL for continued competence in testing for End Products and
- 686 modules
- 687 • Coordinating and facilitating the output of TAB and resulting requests and
- 688 requirements from the Certification Program Manager and/or program
- 689 • Serve as the operational arm of technical issues resolution, as necessary, for issues
- 690 forwarded by TAB, and WG.
- 691 • In general to function as a center of excellence in technical matters related to the
- 692 Certification Program, and to deploy that competence to the APCL
- 693 • The LL shall not commercially compete with an existing APCL for testing and
- 694 certification services.
- 695 • The LL shall be capable of performing all tests required of the ICP

696 **3.1.4.3. Selection**

697 The LL is selected and its appointment renewed or revoked at the discretion of the SSO/SDO.
698

699 **3.1.5. Approved Product Certified Laboratory (APCL)**

700 **3.1.5.1. Definition**

701 The Approved Product Certified Laboratory (APCL) is a commercial or non-commercial testing
702 laboratory focussed on delivering testing services as part of the Certification Program. The
703 APCL is charged with the responsibility of serving the program companies, to provide a clear
704 and concise pass / fail result for certification Testing based on the CRSL and the applicable test
705 and technical specifications. The APCL status is granted by the certification program based on
706 recommendation from the SSO/SDO. The APCL designation is a privilege which can be

707 revoked at any time by the certification program based on defined process of removal.
 708 Appointments are subject to evaluation and renewed biannually.
 709

710 **3.1.5.2. Activities**

711 The following activities are included in the APCL scope of activities:
 712

- 713 • timely implementation and maintenance of test procedures and test systems used in
 714 certification testing program
- 715 • participation and active contribution to industry WG and TAB
- 716 • provide testing services in accordance with the CRSL to the certification program
 717 member companies
- 718 • promptly address any issues identified by member companies, LL, TAB, WG, or
 719 certification program
- 720 • maintain competent personnel
- 721 • abide by the Service Level Agreement (SLA) defined with the certification program,
 722 and in force between the APCL, member companies, and the certification program
 723

724 **3.1.5.3. Selection**

725 It is the intent of the WG to make selection recommendations based on the following:
 726

- 727 • Overall result of both evaluation and audits of candidate APCL
- 728 • Geographic diversity of APCL locations in the Certification Program
- 729 • Fostering competition for service and technical excellence
- 730 • Basic organizational and technical strength
- 731 • Good management practices
- 732 • Recognized accreditations, including ISO Guide 17025 from an internationally
 733 recognized accreditation body under the ISO/IEC standardization structure
- 734 • Facilitating baseline business viability
- 735 • Commitment and ability to add value to the certification program organization
 736 through technical participation in working groups and advisory boards
- 737 • Experience in similar services
- 738 • Competent personnel
- 739 • Value brought to the certification program in general
- 740 • Work with the APCB and submit to the APCB the results for review
- 741 • Capability or readiness to implement the following, both technically and budgetarily
 - 742 - product physical layer conformance testing (if applicable)
 - 743 - product protocol layer conformance testing
 - 744 - product interoperability testing
 - 745 - product network testing
 - 746 - product physical layer performance testing (if applicable)
 - 747 - network interoperability testing (if applicable)
 - 748 - product functional testing (if applicable)

749
 750
 751 The industry SSO/SDO will develop a complete evaluation procedure and documentation to
 752 assist APCL selection according to the above set of criteria.
 753

754 3.1.6. Certificate Authority (CA)

755 3.1.6.1. Definition

756 The Certificate Authority (CA) is a commercial or non-commercial organization focussing on
757 issuing the digital certificates for the Certified Products. The CA is charged with the
758 responsibility of serving the program member companies, to provide digital certificates to be
759 embedded into “Edge” products. The CA status is granted by the certification program. The CA
760 designation is a privilege which can be revoked at any time by the certification program based
761 on defined process of removal. Appointments are subject to evaluation and renewed
762 biannually.

763 3.1.6.2. Activities

764 The following activities are included in the CA scope of activities:

- 765
- 766 • timely issuance of digital certificates to certified products
- 767 • management and control of digital certificate issuance system
- 768 • ensuring that the digital certificates issued are current and valid
- 769 • maintain competent personnel
- 770 • abide by the Service Level Agreement (SLA) defined with the ICP, and in force between
- 771 the CA, member companies, and ICP.
- 772

773 3.2. Qualification of Laboratories

774 Laboratory Qualification is expected to be compatible with SGIP TCC guidelines / requirements.

775 3.3. Design of ICP

776 3.3.1. Process

777 A device or system industry manufacturer seeking an OpenSG compliant test and certification,
778 such as ZigBee Smart Energy 2.x (ZEP2.x)/OpenADE/OpenADR, etc , of a new solution first
779 completes an application for Certification (see Annex for details; a new device may be an End
780 Product or a Module). This member selects an Approved Product Certification Laboratory
781 (APCL). The member seeking certification for a product, module or software system shall
782 contract with the APCL as appropriate and when required, an Appointed Product Certification
783 Body (APCB) for evaluation, testing, and certification services. The application process is the
784 first step in the booking process. **It shall not be possible to test and obtain a certification at
785 the LL.**

786
787 The instance of the OpenHAN technology, such as ZEP2.x, provides a PICS proforma including
788 all the features (Mandatory and Optional) that a certified product or module may support.

789 3.3.1.1. Devices and Products incorporating a hardware portion

790 The applicant supplies:

791

- 792 • Two product or module samples with supporting components (i.e. batteries, cables,
793 chargers, notebook computers and associate hardware/software, etc. as needed to
794 facilitate the evaluation)
- 795 • Signed and dated Laboratory Nondisclosure Agreement and Information Pack (soft
796 copies preferred)
- 797 • User documentation
- 798 • Completed PICS proforma.
- 799 • Completed PIXIT proforma. The PIXIT proforma will be provided by APCL at the
800 beginning of the testing project
- 801 • Completed Declaration of Conformity - this must be finalized prior to certification but
802 after testing is completed.
- 803 • Test reports for category C tests - supplied as available prior to certification
- 804 • A completed Signed Certification Mark License Agreement to permit use of a Logo or
805 similar mark upon successful completion of Certification - to be completed prior to
806 certification.

807
808 Where applicant seeks to certify more than one bill of material, product/module samples for
809 each bill of material shall be provided. Based on a review of the differences between bill of
810 materials, the APCL may waive this requirement.

811
812 The APCL with the APCB reviews the application, and determines test requirements based on
813 the supplied PICS according to the current Certification Requirements Status List (CRSL).

814
815 The Compliant Portion of the proposed Certified Device shall be described precisely so that
816 subsequent product change applications can determine whether a product/module change is
817 Class I (outside Compliant Portion) or Class II (within Compliant Portion). When feasible,
818 product model number, hardware version number and software version number shall be
819 associated with the Compliant Portion rather than a higher level assembly. If the Compliant
820 Portion is to be integrated into another end product, or if other Class I change is envisioned, the
821 application shall describe the applicable hardware and software environment of the Compliant
822 Portion sufficiently so that compliance can be ensured.

823
824 Certification Testing ensures that a IUT meets all Certification Criteria according to the vendors
825 submitted PICS which determines through a mapping table which specific test cases in the
826 currently applicable CRSL form the test plan that must be passed in accordance with the
827 categories defined in the Certification Requirements Status List (CRSL, 3.3.6). The whole
828 process shall be guided by a APCL. Tests include the following "Primary Test Categories" as
829 shown inFigure 3:

- 830
- 831 PhyCT- Physical Conformance Testing
- 832 PCT-Protocol Conformance Testing
- 833 DIOT-Device Interoperability Testing
- 834 NIOT-Network Interoperability Testing
- 835 PhyPT-Physical Device Performance Testing

836
837 Testing requirements for a particular device are determined by the PICS and the applicable
838 CRSL which identifies the current status of each applicable test and certification requirement. A
839 PIXIT proforma is used to configure the implementation under test (IUT) in the test bed properly
840 in order to run the test plan. Applicable tests shall be performed and results documented as
841 required by their category. Test categories are defined in section 3.3.6.3. During the testing

842 process each vendor has restricted access to the APCL's web site for tracking and monitoring
843 the progress of the testing of their equipment.

844
845 The APCL shall ensure that all testing requirements are satisfied by the particular hardware and
846 software version certified. In general, no product change is permitted during certification, except
847 as expressly required by a Test Procedure within an applicable test case. The APCL may
848 permit certain limited change if the APCL (a) has high confidence that such a change will not
849 compromise the integrity of prior test results, or (b) repeats all test cases which might be
850 impacted. Any product/module change introduced during certification shall be documented and
851 strictly managed by the APCL. See section 3.3.8.7 guidelines on determining required retesting
852 based on product changes.

853
854 When a product successfully completes all the required testing, test reports are assembled into
855 a Compliance Folder. See section 3.3.8.2 for Compliance Folder details.

856
857 The APCB shall review the application and relevant certification documentation, including PICS,
858 to determine that

- 859
- 860 • the vendor supplied product satisfies all current certification requirements;
 - 861 • all mandatory PICS items are supported;
 - 862 • the entire Compliant Portion is contained within the elements described;
 - 863 • the hardware and software environment containing the Compliant Portion is sufficiently
 - 864 described to ensure compliance is maintained in that environment; and
 - 865 • the Declaration of Conformity is complete and accurate.
- 866

867 After the APCB has determined that all necessary certification requirements are satisfied and
868 the certification listing fee is paid, the APCB shall submit the Compliant Portion to the Certified
869 Product/Module List along with necessary supporting information (section 4.1.2) and shall add
870 the product/module in which the Compliant Portion was evaluated to the End Product List.

871
872 Any deviation of the Compliant Portion thereof represents a Class I or Class II change. For
873 example, a Device Module may be a Compliant Portion, as well as a particular microcontroller
874 model with a specific firmware build.

875
876 Once the product or module is certified, the Certificate Authority (CA) issues a digital certificate
877 to be programmed into the devices, for use in joining a utility smart grid network.

878 **3.3.1.2. Software Products/Systems**

879
880 The Product Certification Program aims to achieve compliance and interoperability of all
881 instances of OpenADR and OpenADE systems. The Product Certification Program is
882 sponsored by a SSO, and accredited by the OpenSG.

883
884 An OpenADR and OpenADE instantiations seeking Certification from the Program sponsor shall
885 submit an application and an instance for evaluation by the Appointed Product Certification
886 Laboratory (APCL) for compliance and interoperability.

887
888 The Compliant Portion of the proposed software product / system shall be described precisely
889 so that system can state supported feature set. All changes shall undergo regression testing.

890

891 Certification Testing ensures that the System meets all Certification Criteria according to
892 submitted PICS, which determines through a mapping table the specific test cases in the
893 currently applicable CRSL that form the test plan the system must pass. The whole process
894 shall be done through an APCL. The Tests include the following Primary Test Categories:

895

896

897 A/E : Authentication and Encryption

898 PCT: Protocol Conformance

899 NIOT: Network Interoperability

900 FUNC: Functional Testing

901

902 Testing requirements for a particular system is determined by the PICS and the applicable
903 CRSL. A PIXIT is used to configure the test set-up in order to run the test plan. Applicable
904 tests shall be performed and results documented as required by their category. During the
905 testing process each vendor has restricted access to the APCL's web site for tracking and
906 monitoring the progress of the testing.

907

908 When a system successfully completes all the required testing, test reports are assembled into
909 a Compliance Folder.

910

911 The qualified person from the sponsoring SSO/SDO shall review the application and relevant
912 certification documentation, including PICS, to determine that the system supplier satisfies all
913 current certification requirements;

914

915 All mandatory PICS items are supported;

916 Compliant Portion is clearly defined;

917 the Declaration of Conformity is complete and accurate

918

919 **3.3.2. Program and Program Version**

920 The Testing and Certification Program set up by the SSO/SDO shall have a well defined release
921 version number, to designate the policy and procedures in effect at any time during the program
922 implementation.

923 **3.3.2.1. Product and Module**

924

925 **A. General**

926

927 A product or module shall have a certified Compliant Portion. The listing member company may
928 intend to apply the certified Compliant Portion to a family of similar end product models or
929 modules, either initially or subsequent to the initial listing.

930

931 Furthermore, the member company is allowed to sell the Compliant Portion for integration,
932 resulting in end products offered by another member company if the Compliant Portion is listed
933 as a Certified Module (See 3.3.8.9).

934

935 Performance may be impacted by integration of a Compliant Portion into a different end product,
936 and testing will typically be required when the end product differs or when the end product

937 manufacturer (integrator) is different from the Compliant Portion manufacturer according to
938 Class I, Class II, or Class III change rules by an APCB.

939
940 Every End Product shall be listed on the End Product List.

941
942 Integration of a Compliant Portion into an end product different from the end product in which it
943 was certified, may impact the performance, for example if the antenna placement or
944 environment changes, or if the host environment is otherwise different. Such integration shall
945 be considered within the Class I, Class II change rules by an APCB.

946
947 A member seeking to list a End Product shall complete an online application for Certification.
948 An End Product application shall reference the Module or Compliant Portion of a Certified
949 Product integrated into the End Product if the member wishes to claim abbreviated certification
950 process.

951
952 When integrating a Module, an application for End Product certification shall declare that the
953 hardware and firmware/software environment containing the module complies fully with that
954 required by the Module, and provide supporting documentation as needed. Such integration
955 shall be considered within the Class I, Class II change rules by an APCB.

956
957 When integrating a Compliant Portion that is not a Module, an application for End Product
958 certification shall describe any variation from the specific End Product in which the applicable
959 Compliant Portion was certified. Such integration shall be considered within the Class I, Class II,
960 and Class III change rules by an APCB.

961
962 An End Product application may cover a family of end product models, provided the compliant
963 portion is identical, and the application shall describe the end product family in a sufficient detail
964 to permit evaluation of potential impact of product family variations on performance including
965 radiated performance.

966
967 A End Product application is reviewed by APCB to determine testing requirements with
968 reference to CSRL and section 3.3.8.6. Indicated testing shall be performed and documented in
969 the End Product Compliance Folder. After the APCB has determined that all necessary
970 certification requirements have been met and any appropriate fee is paid, the APCB shall
971 submit the end product into the End Product List along with necessary supporting
972 documentation.

973
974 It is allowed to start certification testing for an end product before the initial product completes
975 its certification, on condition that the end product does not complete certification before the
976 initial product completes and obtains its certificate. In all cases the end product must follow the
977 rules and policies as defined in section 3.3.1.1

978
979 A certificate is issued for each End Product and Module Listing.

980 981 **B. Change to End Product or Module**

982
983 A change to an End Product or Module shall be reviewed by an APCB. When a listed product is
984 changed, the member responsible for the listing shall complete an application for Certification
985 Change online.

986

987 A Change application shall include the following:

988

- 989 • identify pertinent End Product or Module record,
- 990 • amended Compliant Portion or End Product / Module description as applicable
- 991 • amended PICS if applicable
- 992 • product change description, and
- 993 • executed revised Declaration of Conformity

994

995 The product/module change description shall be sufficient to determine the scope of testing
996 required to determine that the change device is compliant.

997

998 The APCB may request additional information as needed to complete the review. The APCB
999 shall determine additional testing as deemed required.

1000

1001 **C. Device Certification Requirements**

1002

1003 Product/module certification is associated with (a) a category (such as a device class as defined
1004 by the SSO/SDO), (b) a particular System Profile Release number and version and (c) one or
1005 more Certification Profile(s). To certify a product/module, a vendor completes the applicable
1006 PICS forms.

1007

1008 In the PICS, the vendor states the functions supported by the product/module to be certified.
1009 The completed PICS is used to generate a list of applicable Test Cases based on the test case
1010 mapping table (contact the APCB for a copy) within the online certification system.

1011

1012 The list of applicable test cases is used in conjunction with the current CRSL to determine which
1013 test cases shall be performed. See section 3.3.6 for detailed information on the CRSL.

1014

1015 **3.3.2.2. Software Systems**

1016

1017 A certified system for OpenADR or OpenADE consists of a Compliant Portion that implements
1018 features according to requirements for their server and/or client system.

1019

1020 A vendor system is evaluated and judged to be a Certified System when found to be in
1021 compliance by an APCL; evaluation is performed against Reference System for interoperability,
1022 when available, and test suites derived from abstract test suites from OpenADR and OpenADE
1023 as relevant. It is not necessary to attain an equivalence with the reference system, i.e. all
1024 feature sets are functionally identical, but that those features sets represented in the vendor
1025 system be evaluated to be equivalent to the reference system implementation.

1026

1027 An instantiation of the reference system itself is not considered to inherit any Compliant Portion;
1028 that instantiation must be evaluated and judged as any vendor system for equivalent portions.

1029

1030 **Reference Systems**

1031 Reference system(s) is(are) defined to be compliant implementation of the specification either
1032 by evaluation or by definition by the sponsoring SSO. The reference system, as a rule, need to
1033 be subject to direct implementation by instantiation by participants of the SSO. Therefore, an
1034 implementation cannot be a "reference system" if it is an "equivalent" system.

1035 Candidate Reference Systems

1036 Candidate reference system(s) is(are) defined to be a conforming implementation of the
1037 specification. Candidate reference systems are by definition not reference systems, though
1038 they may be evaluated for equivalence to reference systems, and compliance to requirements
1039 of OpenADR or OpenADE.
1040

1041 Changes to Certified System

1042 Any change to the System shall be reviewed by APCB. When a listed system is changed, the
1043 vendor responsible for the listing shall complete an application for Certification Change online.
1044

1045 A Change application shall include the following:

- 1046 • Identify pertinent System record
- 1047 • amended Compliant Portion description as applicable
- 1048 • system change description
- 1049 • amended PICS as applicable
- 1050 • executed revised Declaration of Conformity

1051
1052 Unless member is willing to perform code review with the APCL, changes to System shall
1053 require complete regression testing of the certification tests cases.
1054

1055 System Certification Requirements

1056 System certification is associated with a server or a client implementation of OpenADR or
1057 OpenADE or AMI-ENT requirement.
1058

1059 In the PICS, the vendor stipulates the functions supported by the system to be certified. The
1060 completed PICS is used to generate a list of applicable Test Cases based on the test case
1061 mapping table within the online Certification System. The list of applicable test cases is used in
1062 conjunction with the current CRSL to determine which test cases shall be performed.
1063

1064 3.3.3. Self Testing and Certification

1065 To be determined once the third party testing and certification system is sufficiently mature and
1066 products and systems objectively show an acceptable degree of interoperability throughout the
1067 program over extended periods of time.
1068

1069 3.3.4. Device Compliant Portion Testing

1070 The End Product or Module is subject to testing for its proposed compliant portion. The testing
1071 involves layers, from the physical all the way to the network interfaces.

1072 3.3.4.1. Physical Conformance (PhyCT): Radio, PLC, wireline

1073 Physical Conformance Testing assesses the compliance of the physical layers of an
1074 implementation seeking certification to the applicable base or core specification of the
1075 mandatory and optional features of the physical transport layer PHY (IEEE 802.15.4, IEEE
1076 802.11, etc), as applicable to the type of End Product or module.
1077

1078 Typically, Physical (RF, wireline, or PLC) Conformance Testing is not concerned with and does
1079 not cover assessment of performance, reliability or robustness of the entity under test, unless
1080 explicitly stated as a conformance requirement in the conformance testing specification.

1081
1082 Physical Conformance Testing does not add constraints to those stated in the core
1083 specifications and consists of a series of tests against the physical conformance requirements
1084 stated in the applicable radio/plc/wireline conformance testing specification.

1085
1086 A radio/plc conformance requirement is an elementary piece of the core specification stating
1087 what a SE implementation seeking certification is required to do or not to do.

1088
1089 An implementation is found as conformant with the physical layer core specifications when it
1090 satisfies all the selected physical layer conformance requirements contained in the CRSL based
1091 upon completing the required tests and executing the DoC.

1092
1093 For example, the radio physical layer conformance requirements of ZigBee devices are derived
1094 from the basic IEEE802.15.4 radio layer specification over the operational temperature and
1095 humidity range of the device as declared in the PIXIT, and include: power spectral mask and
1096 density, center frequency and tolerance, sensitivity/packet error rate, modulation/demodulation,
1097 error vector magnitude, adjacent and alternate channel rejection, turnaround time, clear channel
1098 assessment, energy detection, and link quality indication.

1099
1100 An implementation is found as conformant with the physical conformance related core
1101 specifications when it satisfies all the selected physical conformance requirements contained in
1102 the CRSL based upon completing the required tests and executing the DoC.

1103 **3.3.4.2. Protocol Conformance Testing (PCT)**

1104 Protocol Conformance Testing assesses the compliance of the protocols implementing the MAC
1105 layer and Network Layer of the implementation seeking certification to the applicable base and
1106 core specification (IEEE802.15.4:2006 and ZigBee IP for ZigBee, HomePlug SE Specification
1107 for HomePlug, IEEE802.11b/g for Wi-Fi).

1108
1109 Protocol Conformance Testing does not add constraints to those stated in the core
1110 specifications and consist of a series of tests against the protocol conformance requirements
1111 stated in the applicable protocol conformance testing specification.

1112
1113 A protocol conformance requirement defines the core specification stating what an
1114 implementation seeking certification is required or not to support.

1115
1116 For example, The ZigBee-related protocol conformance requirements are derived from the
1117 IEEE802.15.4 MAC layer and ZigBee IP specification along with the PICS and PIXIT documents
1118 relating to those MAC and NWK layers.

1119
1120 An implementation is found as conformant with the protocol-related core specifications when it
1121 satisfies all the selected protocol conformance requirements contained in the CRSL based upon
1122 completing the required tests and executing the DoC.

1123 **3.3.4.3. Interoperability Testing (IOT)**

1124 Interoperability is key to customer acceptance. Interoperability testing for Certification requires
1125 a minimum of three different golden unit vendor devices. The interoperability configuration

1126 scenario must include at least two different physical layer chipset vendors. Each end
1127 product/module must demonstrate interoperability with at least three different certified Energy
1128 Service Interface (ESI) if it is not an ESI; if an ESI, it shall demonstrate interoperability with at
1129 least three different PCT and IHD combination. This enables the basic network interoperability.

1130
1131 Additional to the above requirement, each product/module must demonstrate interoperability
1132 with at least two different certified end product/module (from at least two vendors) and at least
1133 one device should be the reference unit selected by industry WG. This enables general market
1134 device interoperability.

1135
1136 Interoperability testing is enhanced as more vendor equipment is made available from different
1137 vendors.

1138
1139 The interoperability certification test bed shall be available at each APCL for all currently
1140 required interoperability tests. The tests shall include all relevant profile device roles and
1141 application functionality declared in the PICS and PIXIT, and test for: trust center policy,
1142 network management policy, commissioning and installation, power failure/start-up, use cases,
1143 stress cases, over-the-physical media download.

1144
1145 A implementation is found as conformant with the interoperability core specifications when it
1146 satisfies all the selected interoperability requirements contained in the CRSL based upon
1147 completing the required tests and executing the DoC.

1148 **3.3.4.4. Physical Performance Testing (PhyPT)**

1149 Physical Performance Testing (PhyPT) requirements provide physical layer performance
1150 metrics intended to determine the limits of performance of End Products and modules, for
1151 example in an over-the-air (RF) environment. In such case, tests are intended to determine the
1152 transmitter and receiver performance and sensitivity in normal operation in the presence of far-
1153 field (for RF case) interferers causing transceiver desensitivity. PhyPT tests are critical in that
1154 they provide necessary information on the radiation pattern of the device as used, and the
1155 effect of interaction factors between the radiated field and the circuitry of the device.

1156
1157 The PhyPT shall include the following based on the PIXIT and PICS declarations: range and
1158 directionality (link budget and sensitivity verification), and immunity/desensitivity to known
1159 interferers.

1160
1161 PhyPT is required for the Certification of End Product/module. The test report will be included in
1162 the Compliance Folder and test results become part of the Compliant Portion of the end
1163 product/module. It is the intent of industry WG to conduct a regression analysis across the
1164 applicable Certification profiles on data collected during PhyPT. Industry WG will then request
1165 an approval of baseline criteria for example, Smart Energy 2.0 for future PhyPT testing.

1166

1167 **3.3.4.5. Network Conformance Testing (NCT)**

1168 Network Conformance Testing (NCT) complements PhyCT, PCT, IOT as a system level
1169 conformance testing for end-to-end from the utility head end to the HAN network.

1170
1171 NCT ensures that compatible state machines and protocols are employed at the product level,
1172 as with the utility head end. This includes frame compatibility with communication between the
1173 servers and client applications.

1174 Network Conformance Testing does not add constraints to those stated in the core
1175 specifications and consist of a series of tests against the network conformance requirements
1176 stated in the applicable network conformance testing specification.

1177
1178 A network conformance requirement defines the core specification stating what an
1179 implementation seeking certification is required or not to support.

1180
1181 For example, The ZigBee-related network conformance requirements are derived from the
1182 ZigBee IP and SE 2.0 application protocol specification along with the PICS and PIXIT
1183 documents.

1184
1185 An implementation is found as conformant with the network-related core specifications when it
1186 satisfies all the selected network conformance requirements contained in the CRSL based upon
1187 completing the required tests and executing the DoC.

1188

1189 **3.3.5. Software System Compliant Portion Testing**

1190 The system is subject to testing for its proposed compliant portion. The testing involves the
1191 entire set of use case tests as derived from relevant abstract test suites.

1192 **3.3.5.1. Authentication and Encryption**

1193 The system is subject to testing the mechanism for establishing secure sessions. Testing
1194 involves negotiating key, access level, and establishing a session for a specific account.

1195 **3.3.5.2. Protocol Conformance**

1196 Verify that the system implements methods, data frames, and interfaces of the prescribed in the
1197 communication method.

1198 **3.3.5.3. Network Interoperability**

1199 Communication between Server to Client reference systems. Network API shall be consistent
1200 with appropriate application layer implementations and shall comply with appropriate transport
1201 protocol e.g. RESTful or SOAP but not both.

1202 **3.3.5.4. System Functional Testing**

1203 Verification of state machine according to requirements of OpenADR, OpenADE or AMI-ENT.
1204 The testing shall be based on defined test cases derived from abstract test case scenarios of
1205 the System Requirements from OpenSG. Use cases shall be derived from the various
1206 functional requirements as stipulated by the abstract test cases, and such testing shall be
1207 performed using a Reference System or a validated Test Harness agreed by the SSO.

1208

1209 **3.3.6. Certification Requirements Status List (CRSL)**

1210 **3.3.6.1. Definition**

1211 The Certification Program currently certifies devices on 3 levels of conformance and
1212 interoperability test specifications. The corresponding PICS documents specify the mandatory
1213 and optional requirements for all the test specification documents. The Certification
1214 Requirements Status List (CRSL) specify the testing requirements at any given time, and gives

1215 guidance to the APCL and APCB on testing and recommendation for certifications. The CRSL
1216 is maintained by the LL.

1217
1218 CRSL versions include changes to the test requirements and test specifications. Requirements
1219 for certification are set by the CRSL version effective on the date that the device is certified.

1220
1221 A CRSL Interim Release includes the results of the CCB process, and introduces new
1222 requirements that will become active in future CRSL Major Releases. A (x.0.0) of the CRSL
1223 shall occur twice annually. A public interim release of the CRSL (x.y.0) shall occur no more
1224 frequently than once per month.

1225
1226 Requirements upgraded in Major Release (x.0.0) shall be available in an interim release of the
1227 Major Release (x-1.y.0) effective 45 days prior to Major Release (x.0.0). Vendors have 90 days
1228 to submit their equipment for certification to be tested against this major release.

1229
1230 An IUT undergoing certification testing when the next major release becomes effective have 45
1231 days to complete testing. Test requirements are defined by the major release under which the
1232 IUT is submitted. Test cases which become active after the next major release are not required.

1233 **3.3.6.2. CRSL Structure**

1234 The CRSL defines the current status of each test case in a list. The list contains the following
1235 information:

1236
1237 Designator - test case identifier
1238 Name - descriptive text from the test specification
1239 Current specification requirement – document, version and requirement
1240 Test specification number and version
1241 Test Case Category
1242 Available date: date at which the test case may be used as the indicated Test Case Category
1243 Active date: date at which the test case shall be used at the indicated Test Case Category
1244 Associated notes
1245 Previously published specification requirements¹
1246 -Test specification number and version
1247 -Test Case Category
1248 -Status
1249 -Active date
1250 -Associated notes
1251 Informative
1252 -Test Case Priority
1253 -Test Platform: Validated test platforms for both the current and previous test case

1254
1255
1256 The following applies for each test case requirement:
1257 • Prior to the Available date of the current specification requirement, the previously
1258 published specification requirement shall apply.
1259 • From the Available date until the active date of the current specification requirement, the
1260 vendor shall choose to apply either the previously published specification requirement or
1261 the current specification requirement.

¹ Included to ensure backward compatibility

- 1262 • From the Active date, the current specification requirement shall apply.
1263 • Products will support previous, current and future versions. Products that are not
1264 forwardly compatible will NOT be considered for testing under the CPRM program.
1265 Issue of an update to the CRSL is managed and approved by the industry WG. Updates to the
1266 CRSL include changes to test case categories to reflect the addition of new validated test
1267 cases, the downgrade of previous validated test cases, and the revalidation of downgraded test
1268 cases. The LL shall implement the CRSL updates.
1269

1270 **3.3.6.3. Test Case Categories**

1271 The Certification Program assigns each test case from the test specification a Test Case
1272 Category. A test case is validated when a validated test platform is available, and required for
1273 implementation.

1274 **Category A**

1275 The device shall pass each Category A test case at the APCL on a validated test platform.
1276 These are the validated test cases. A test report shall be generated according to ISO Guide
1277 17025.
1278

1279 **Category B**

1280 The device shall pass each Category B test case at the APCL. Pass/Fail verdict is assigned
1281 and the test reported generated according to ISO Guide 17025. These are typically test cases
1282 that have been verified and can be executed with unambiguous results, but for which test case
1283 validation is incomplete.
1284

1285 **Category C**

1286 The device shall pass each Category C test case either at the manufacturer or the APCL. In
1287 case the test is performed by the manufacturer, a test report shall be submitted to the APCL.
1288 Pass/Fail verdict shall be assigned.
1289

1290 **Category D**

1291 Test cases may be downgraded from A or B or C by the LL, but must be revalidated and
1292 reinstated to its prior status without delay, upon resolution of any issues.
1293

1294 **Category E**

1295 The device shall perform Category D tests at the APCL and a test report generated. However
1296 there is no Pass/Fail verdict assigned.
1297

1298 **Category I**

1299 Test cases planned for further development and listed for informational purpose.
1300

1301 **Category P**

1302 Test case planned for validation or awaiting approval but currently listed for informational
1303 purposes.

1304

1305 3.3.6.4. Test Case Category Transition

1306

1307 A Test Case Category for a test case may or may not change over time. Test Case Status is
1308 communicated using the CRSL Interim and Major release. The following list describes, in part,
1309 the typical assignment and re-assignment of test case categories:

1310

- 1311 • All test cases start as Category I.
- 1312 • Test cases selected from development are moved to Category P in the next major
1313 release.
- 1314 • If a test case upgrade proposal from Category B to Category A is accepted for inclusion
1315 in the next Interim Release of the CRSL, the following rule shall apply
- 1316 • The upgrade is effective immediately
- 1317 • Testing underway may (test start date prior to upgrade) may continue their certification
1318 testing without regression testing.
- 1319 • The initial Available Date shall not precede the CRSL publication date. Test cases may
1320 be immediately downgraded temporarily to Category D in specific circumstances under
1321 the authority of LL and reinstated without delay, maintaining the original active date if the
1322 reinstatement does not occur past the original active date. Test cases are not
1323 necessarily downgraded due to a single test platform losing validated status.
- 1324 • All other category transitions (upgrades) are effective at the next Major Release of the
1325 CRSL.

1326

1327 3.3.7. Testing and Interoperability Principles

1328 The ultimate goal of the ICP is an eco-system of *interoperable* devices and systems. For the
1329 purpose of this discussion, interoperability may be loosely defined as a correspondance of
1330 interfaces between two abstract functional units, of which communication is possible.

1331

1332 To this end, it is important for the certification program to assure a well-defined minimum
1333 interoperable set of features, whether it be functionality, user interface, or application interface.

1334 3.3.7.1. Non-overlapping Feature Set

1335 A simple set of best practice principles helps facilitate a robust interoperable interface. These
1336 are:

1337

1338 a) a specific set of functions shall be defined into “profiles”. A profile is a finite set, or grouping,
1339 of functionality.

1340

1341 b) any function belonging to a profile shall be reproduced by implementing the entire profile of
1342 mandatory functions by another device sharing that function. In other words, profiles are
1343 exclusionary of other like functions. For example, a mandatory function A, belonging to a profile
1344 X can be implemented in another device via the entire profile X, and never a partial
1345 implementation of X. A device adopting profile X must therefore implement the whole
1346 mandatory function set that includes function A.

1347

1348 c) A function in profile X shall not be duplicative of another function in profile Y, if that function is
1349 already existing in profile Y.

1350
1351 The above principles dictate that extreme care must be taken to design profiles; in other words,
1352 profiles need to be designed to coexist with other profiles; functions within profiles X and Y need
1353 to be exclusionary yet complimentary, but never overlapping.

1354
1355 Test suites shall evaluate individual profiles, with test cases addressing functions of said profile.
1356

1357 The non-overlapping feature set may be coupled with a branding or Logo program. However,
1358 there is no mandatory requirement for a Logo program.
1359

1360 **3.3.8. Certified Product Listing**

1361 When the Certification criteria are satisfied, and with the agreement of the vendor, the APCB
1362 shall post the product / module onto the Certified Product registry with the following information:
1363

1364 Product Name
1365 Certified Product Type
1366 Certification Number
1367 Date of Certification
1368 CRSL date
1369 CRSL associated version number
1370 Detailed product information in text form (not more than 200 words)
1371 Product image in jpg format no larger than 300 x 300 pixels
1372 Company logo in jpg format no larger than 300 x 300 pixels
1373

1374 The APCB shall ensure, prior to completing the product certification process, that the equipment
1375 vendor is still a member in good standing with the certification program, and that the certification
1376 testing fee and certification logo fee (if appropriate) are collected per certification. With the
1377 explicit agreement of the applicant, the APCB will enter the data into the Certified Product
1378 registry and create an electronic Certification Certificate from this data.
1379

1380 **3.3.8.1. Digital Certificates**

1381 Once a product enters the Certified Product registry, the CA shall generate a digital certificate
1382 for that product and issue it to the applicant.

1383 **3.3.8.2. Compliance Folder**

1384 The Compliance Folder shall provide the actual Record of Work for conformance to the
1385 certification process. The minimum required information is listed below. For additional
1386 information, see Annex.
1387

1388 Minimum contents in the Compliance Folder:
1389

1390 Member name
1391 Exact model number
1392 Exact kit number if applicable (i.e. variant number)
1393 Hardware version and change history
1394 Software version and change history
1395 CRSL version number
1396 PICS

1397 PIXIT
1398 Test Report
1399 Applicable waivers and their descriptions and reasons, and any change requests
1400 Declaration of Conformance
1401
1402 All vendors shall maintain a duplicate set of Compliance Folder for their certified product. The
1403 certification program, at its discretion, may order additional reviews of the Compliance Folder.
1404 Any such additional Compliance Folder reviews shall be at the expense of the certification
1405 program and be conducted by a mutually agreeable third party contractor that is not an
1406 employee of another manufacturer.
1407

1408 **3.3.8.3. Certificate**

1409 After the Certified product is listed in the Certified Product List, the Certification Program
1410 Manager shall issue a hard copy of the Certification to the vendor with special heavy stock
1411 paper.
1412

1413 **3.3.8.4. Removal of Products from Certified Product List**

1414 The primary contact for the particular product posted on the Certified Product List may request
1415 that the product be removed from public view anytime. The removal request should be sent to
1416 the Certification Program Manager. This action only affects the public view of the product on
1417 the List.
1418

1419 **3.3.8.5. Changes to Certified Products**

1420 Any change to a certified product falls under one of two classes: Class I or Class II.
1421

1422 **3.3.8.6. Determining Class of Change**

1423 All devices put on the market shall meet the requirements for which the product has been
1424 certified. The Certified Product List registers products/modules having a specific hardware and
1425 software version. The product manufacturer is responsible to ensure that the Compliant Portion
1426 of all production units are identical to the certified version in all material aspects.
1427

1428 Any change to the Compliant Portion of the Certified Product shall be documented in the
1429 Compliance Folder of the manufacturer, and the manufacturer shall notify the APCB of those
1430 changes. The manufacturer may initially classify the class of change; however the classification
1431 noted by the APCB shall be the class of record. The APCB shall determine what additional
1432 testing is required, according to the Annex guidelines and documentation provided.

1433 **Class I Changes**

1434 A Class I change is a product change that has no impact to the hardware or software within the
1435 Compliant Portion and no change to the declared functionality in the PICS.
1436

1437 For Class I change, no testing is required. For any change in the product name or product
1438 version, the Compliant Folder will be revised to reflect the change, and the APCB is responsible
1439 to effect the change in the Certified Product List.

1440 **Class II Changes**

1441 A Class II change is a software or hardware change to the Compliant Portion or to the
 1442 functionality declared in the PICS.

1443
 1444 The member shall supply the APCB with the detailed change description, and estimated impact
 1445 to the results of the tests implemented according to the CRSL in effect at the time of the
 1446 certification testing at the APCL. The member may add a proposal on the scope of required re-
 1447 testing.

1448
 1449 The recertification testing is done by the APCL using the current CRSL. Based on the technical
 1450 evaluation of the supplied change documentation, the APCB may determine that certain prior
 1451 test results may be reused.

1452
 1453 The test requirements shall be determined by the APCB based on the current CRSL. Test
 1454 reports from the former certification testing may be reused in portions or in its entirety
 1455 depending on the test requirements and judgement of the APCL.

1456
 1457 Based on the review of product change documentation, the APCB shall determine test cases to
 1458 be conducted on the product.

1459
 1460 The APCB may require additional information as necessary to determine test cases to be
 1461 conducted.

1462 **3.3.8.7. Re-certification versus Change to Certification**

1463 The change classification to a certified product is determined by the impact of that change on
 1464 the Compliant Portion as shown in the table below.
 1465

| Class Category | Definition | Re-certification | Responsibilities |
|----------------|---|------------------|--|
| I | Software and/or Hardware change outside the Compliant Portion | No | Manufacturer is responsible for any testing, and informational changes and any test results are recorded in the Compliance Folder. |
| II | Software and/or Hardware change affecting the Compliant Portion | Yes | Any and all tests are to be performed by the APCL. Changes and test results need to be recorded in the Compliance Folder |

1466
 1467
 1468 For Class I changes, any testing are responsibility of the member, and testing can be conducted
 1469 by the manufacturer, or by APCL. Test results shall be recorded in the Compliance Folder. For
 1470 Class II changes, any and all tests are to be performed by the APCL.

1471

1472 **3.3.8.8. Module Policy**

1473 A Certified Product may be designated as a Module at the option of the member responsible for
 1474 the listing. Designating the Certified Product as a Module facilitates the reuse of the Module in
 1475 a broader range of End Products. Certification requirements for the Module include all
 1476 requirements for the Certified Product, and additionally information described in this section.

1477
 1478 A Module is a hardware and software combination that constitutes a Compliant Portion when
 1479 installed within a specified hardware and software environment. Typically, a Module will include
 1480 a software driver, hardware module, and, for radio based products, an antenna. The Annex
 1481 gives an informative guideline on Modules.

1482
 1483 The description of the Module on the Certified Product List shall identify:

- 1484
 1485
 - hardware and software comprising the entire Compliant Portion,
 - 1486 • description essential to operation of the module,
 - 1487 • hardware and software versions certified.

1488
 1489 To certify a Module, the APCB shall determine that

- 1490
 1491
 - the vendor supplied product satisfies all current certification requirements,
 - 1492 • the entire Compliant Portion is contained within the Module,
 - 1493 • the hardware and software environment required for the Module is sufficiently specified
 1494 to ensure adherence of the Compliant Portion to the certified conditions.

1495
 1496 The same Product change rules apply to Modules.

1497

1498 **3.3.8.9. Inheritance of Compliant Portion of Modules**

1499 When a certified Module is incorporated into a product, the integrator may, for example, change
 1500 the antenna front end to the module. The integrated product may be certified as an End
 1501 Product when the APCB determines that an APCL RPT test yields results with acceptable
 1502 outcomes. An exception applies when there are no changes to the antenna front end, housing,
 1503 or any characteristics impacting the Compliant Portion.

1504
 1505 An example for a streamlined process for OEMs using a previously certified Module is shown in
 1506 the table below as a guide.

1507

| Vendor | Scenario | Required Testing | Approximate Cost | Documents |
|---------------|-----------------------|-----------------------------|--|--|
| Module Vendor | Initial Certification | PhyCT, RCT, IOT, PhyPT, NCT | Full certification testing cost and logo fee | All test reports and Compliance Folder |

| | | | | |
|--------------------|--|-------|------------------------------|--|
| End Product Vendor | Initial Certification using a certified Module | PhyPT | PhyPT test cost and logo fee | PhyPT test report and Compliance Folder, plus a reference to Compliance Folder of Module |
|--------------------|--|-------|------------------------------|--|

1508

1509 **3.3.8.10. Integrated Products and Re-Branded Products**

1510

1511 During its life cycle in the market, certified products may at times be integrated into larger
 1512 systems, or re-branded without the Compliant Portion undergoing any material change. In order
 1513 to maintain traceability of the certified product through the market place, and to ensure that
 1514 Compliant Portion certified status is indeed maintained, it is necessary to manage the
 1515 integration and re-branding processes.

1516

1517 Using a new brand name for a previously certified product is allowed without additional logo fee
 1518 if a new listing is not requested. However, in such cases, the product shall bare clearly the
 1519 original certification ID. If a new listing is requested, a listing fee shall be charged, and a replica
 1520 record created in the Certified Product list with the new brand information.

1521

1522 Additionally, original design manufacturers (ODM) may design, manufacture, and certify a
 1523 product or module for a second client company. In such cases, the client company is
 1524 responsible to create a new listing request for the product to be Certified Product under the
 1525 client company.

1526

1527 Any change in the Compliant Portion shall be processed under the change classifications
 1528 scheme.

1529

1530 **3.3.9. Certified System Listing**

1531 When the Certification criteria are satisfied, and with the agreement of the vendor, the APCL
 1532 shall post the system onto the Certified System registry with the following information:

1533

1534 System Name

1535 Name of each System Component

1536 Version, release and variant identifier for each System Component

1537 Certified Feature Set

1538 Date of Certification

1539 CRSL date

1540 CRSL associated version number

1541 Detailed system information in text form

1542 Company logo in jpg format

1543

1544 The APCB shall ensure, prior to completing the system certification process, that the system
 1545 vendor is still a member in good standing with the certification program, and that the certification

1546 testing fee and any appropriate certification logo fee are collected per certification. With the
1547 explicit agreement of the applicant, the APCB will enter the data into the Certified System
1548 registry and create an electronic Certification Certificate from this data.

1549 **3.3.9.1. Compliance Folder**

1550 The Compliance Folder shall provide the actual Record of Work for conformance to the
1551 certification process. The minimum required information is listed below.

1552
1553 Minimum contents in the Compliance Folder:

- 1554
- 1555 -Member name
- 1556 -System name
- 1557 Name of each System Component
- 1558 -Software execution environment
- 1559 -Software version and change history including MD5 Hash
- 1560 Version, release and variant identifier for each System Component
- 1561 -CRSL version
- 1562 -PICS
- 1563 -PIXIT
- 1564 -Test Report
- 1565 -Applicable waivers and their description and reasons, and any change requests
- 1566 -Declaration of Conformance

1567
1568 All vendors shall maintain a duplicate set of Compliance Folder for their certified system. The
1569 certification program, at its discretion, may order additional reviews of the Compliance Folder.
1570 Any such additional Compliance Folder reviews shall be at the expense of the certification
1571 program and be conducted by mutually agreeable third party contractor that is neither an
1572 employee of another vendor.

1573 **3.3.9.2. Certificate**

1574 After the Certified system is listed in the Certified System List, the Certification Program
1575 Manager shall issue a hard copy of the Certification to the vendor with special heavy stock
1576 paper.

1577 **3.3.9.3. Removal of Systems from Certified List**

1578 The primary contact for the particular system posted on the Certified System List may request
1579 the system be removed from public view any time. The removal request should be sent to the
1580 Certification Program Manager. This action only affects the public view of the system on the
1581 List.

1582 **3.3.9.4. Changes to Certified System**

1583 Any change to the system shall require regression testing as a rule, unless deemed
1584 unnecessary by the APCB.

1585 **3.3.9.5. Reference System Instantiations**

1586 Vendor systems derived from Reference System is considered an instantiation of the Reference
1587 System and not the Reference itself. As such, the practical status of instantiated reference
1588 system is the same as any system claiming conformance to specification.

1589 **3.3.9.6. Equivalent Clean Room Implementations**

1590 Vendor systems implementing a parallel Reference System is the same as any system claiming
1591 conformance to the specification.

1592 **3.3.9.7. Candidate Reference Implementations**

1593 Vendor systems implementing a Candidate Reference System is the same as any system
1594 claiming conformance to the specification.

1595 **3.3.10. Validation of Test Harness for Device Testing**

1596 **3.3.10.1. Submittal Process**

1597
1598 A test harness subject to consideration as part or whole of a validated test system for
1599 Certification shall satisfy the following submittal criteria:

- 1600
- 1601 a) Be available for commercial purchase by testing laboratories and Member
1602 companies or be available publically through free and open source agreements.
 - 1603 b) Support the Test Control Interface (TCI) for relevant Primary Test Categories and
1604 protocol layers
 - 1605 c) Include scripting capability for automated test runs
 - 1606 d) Supply test cases in accordance with the CRSL; implementation must be at least one
1607 complete test category out of five Primary Test Categories¹
 - 1608 e) as appropriate, subject to calibration cycles
- 1609

1610 The CPM shall review the test harness submittal for the above minimum submittal criteria (may
1611 be outsourced to LL), to be an eligible candidate system of detailed evaluation for
1612 validation as an official Certification Test Harness.

1613

1614 **3.3.10.2. Evaluation Process**

1615
1616 A test harness, accepted for consideration as part or whole of a validated test system for
1617 Certification, shall undergo technical evaluation by the LL, and the LL is responsible to sign-off
1618 on the technical viability of the system as a test harness for the industry.

1619
1620 The validation process shall at minimum involve the following steps:

- 1621
- 1622 1. Execution of the relevant CRSL scope, through a Test Control Interface (TCI), as
1623 implemented for the Primary Test Category of the test harness, and obtaining the
1624 expected results that include the use of the Golden Units designated by the CPM for
1625 the Product Certification Program.
 - 1626 2. Examination of the upper tester and lower tester logs, along with the over-the-
1627 air/physical media results, to determine the proper recording and evaluation of the
1628 test results.
 - 1629 3. Test harness shall exhibit a Gauge R&R of relevant reference Primary Test Category
1630 tests of less than 5%.

¹ The test harness shall provide a full implementation of any claimed supported protocol, as described in the corresponding test plan, which in turn has been derived from the PICS.

1631 4. Test harness shall exhibit a Gauge R&R of relevant reference Primary Test Category
1632 tests of less than 10% between homogenous and heterogenous test harness set-ups
1633 at different laboratory locations (i.e. in APCLs).

1634
1635 Note that the procedure to perform the Gauge R&R using the reference Primary Test Category
1636 tests are the responsibility of the LL.
1637

1638 3.3.11. Validation of Test Harness for System Testing

1639 In order to institute a stable Certification Program, a reliable testing program is essential. One
1640 basis of such a program is the use of well defined "test harness". Any such test harness shall
1641 be officially "validated" by the CPM as capable of performing the required testing. All APCLs
1642 are required to have access to and use a reference system or validated test harness to perform
1643 Certification testing for relevant test categories.

1644 System tests are required for the following:

1645
1646 A/E : Authentication and Encryption
1647 PCT : Protocol Conformance
1648 NIOT: Network Interoperability
1649 FUNC: Functional Testing
1650

1651
1652 All test harnesses tasked to perform the test need to be able to complete the entire set of tests
1653 as described in the applicable CRSL for at least one primary test category.
1654

1655 Once a test harness(es) is validated to perform the CRSL tests, all such instances of the test
1656 harness at or accessed by the APCL need to be monitored for continual validity of the entire
1657 Certification Program. Therefore, it is critical that tests be repeatable and reproducible, i.e.
1658 repeated measurement results are consistent, and that those measurements are reproducible
1659 by other laboratories that may be using different instances of the validated test harnesses. The
1660 Certification Program shall maintain a specific level of software version for all testing. The
1661 representative tests (reference primary category tests) shall be selected by the LL on an
1662 ongoing basis, and verification performed across the APCL at least once a year.
1663

1664 3.3.11.1. Submittal Process

1665
1666 A test harness subject to consideration as part or whole of a validated test system for
1667 Certification shall satisfy the following submittal criteria:

- 1668
1669 A. be available for commercial purchase by testing laboratories and Member
1670 companies
1671 B. support the Test Control Interface (TCI) for relevant Primary Test Categories
1672 and protocol layers
1673 C. supply test cases in accordance with the CRSL; implementation must be at least
1674 one complete test category out of Primary Test Categories
1675 D. maintain strict version control using a version control tool such as CVS or SVN
1676

1677 The CPM shall review the test harness submittal for the above minimum submittal criteria, to be
1678 an eligible candidate system of detailed evaluation for validation as an official Certification Test
1679 Harness.
1680

1681 **3.4. Improvement and Corrective Action / Feedback**

1682 **3.4.1. Certification Process Exceptions**

1683 While the present Certification Program Reference Manual attempts to cover all contingencies
1684 that may occur during the Certification Program, inevitably, new needs and issues continually
1685 arise, and the program shall install processes to enable a flexibility in the program for continual
1686 improvement.

1687
1688 In general contingencies will occur that interrupt the planned certification process. These
1689 contingencies may occur at various steps along the device testing and certification process, and
1690 can generally be categorized into two characters:

1691
1692 Problems arising in the course of executing the certification process: Process Problem
1693 Problems arising due to strong and quantifiable objection by members: Disputes
1694

1695 The following describes the nominal process to handle such contingencies.
1696

1697 **3.4.1.1. Process Problem Resolution**

1698 There can arise many potential problems within the Certification Process that can cause
1699 significant delays in certification of a vendor's product. These problems include, but are not
1700 limited to

- 1701
1702
- 1703 • Test Harness issues,
 - 1704 • Interoperability issues between optional or conditional features of vendor devices
and implementations
 - 1705 • Specification issues, etc.
- 1706

1707 The following creates a process framework to provide at a minimum, a predictable path to
1708 resolution for any potential problem that may arise.
1709

1710 **Change Request Process**

1711 In order to provide a solution to a problematic component of the certification process, the
1712 program provides its members the possibility to go through the Certification Change Request
1713 process (CCR). The CCR process is based on three steps: generation, evaluation, and
1714 resolution.
1715

- 1716 1. CCR generation: Vendor issues a CCR describing the problem and the test cases,
1717 PICS, specifications affected by this problem to the APCB. The APCB is responsible
1718 to review the CCR and consult with the LL.
- 1719 2. CCR evaluation: The LL, along with the APCB evaluates the CCR and endorses or
1720 rejects the CCR. In the case of endorsing the CCR, the LL shall recommend a

1721 resolution. The endorsement is forwarded to the TAB. The process shall take place
1722 within 5 business days from reception of the CCR.
1723 3. CCR resolution: The LL has further 5 business days to implement any technical
1724 resolution to the CCR under the LL's direct control and implement any necessary
1725 CRSL revisions. The TAB shall locate, as necessary a sponsor within the industry
1726 WG to affect any change in the technical specifications by the CCB process to
1727 institute a permanent fix to the problem.

1728 **CCR**

1729 The SSO and CPM must implement the submittal and template for the Certification Change
1730 Request (CCR).
1731

1732 **3.4.1.2. Process Dispute Resolution**

1733 All disputes relating to product certification shall be resolved by the following process:

1734 **Overview**

1735 Disputes not immediately affecting the certification process, but nonetheless are deemed
1736 serious enough for a vendor to raise, can be processed in a procedural way. The following is
1737 essentially a formalized dispute resolution, when other alternatives methods of are not available.

1738 **Binding Resolution**

1739 t.b.d.

1740 **3.4.1.3. Jurisdiction**

1741 A vendor may initiate a dispute resolution proceeding in accordance with this section for a
1742 dispute that relates to a certified feature or aspect of a Certified Product.
1743

1744 **Informal Dispute Resolution**

1745 Prior to initiating a formal dispute resolution the member shall seek in good faith to resolve
1746 disputes informally.
1747

1748 **A. Dispute Resolution Demand**

1749 If parties are unable to resolve the dispute within 30 days after the parties commenced informal
1750 efforts to resolve the dispute, either party may demand formal dispute resolution
1751 by delivering a demand in writing to the other party and to the Certification
1752 Program Manager.
1753

1754 **B. Hearing by Dispute Resolution Committee**

1755 Each dispute brought pursuant to this section shall be heard by a dispute resolution committee
1756 defined by these rules. The decision of the Dispute Resolution Committee shall
1757 be final and binding to both parties with respect to all certification matters. The
1758 Dispute Resolution Committee is formed by the Certification Program Manager at
1759 his/her discretion.
1760

1761 **C. Dispute Resolution Fee**

1762 Before the Dispute Resolution Committee considers the dispute, the party demanding
1763 adjudication of the dispute shall pay a non-refundable processing fee. The
1764 Certification Program Manager and the Dispute Resolution Committee shall not
1765 act unless the fee has been paid. Where the final decision is deemed favorable
1766 to the party demanding adjudication, the fee shall be reimbursed.
1767

1768 **D. Hearing Schedule**

1769 Upon receipt of the demand notice for the dispute resolution and payment of the processing fee,
1770 the Certification Program Manager shall promptly set up the Dispute Resolution
1771 Committee and send a copy of notice to parties involved via email with
1772 acknowledgement. This notice shall define a "Notice Date" for purpose of
1773 calculating all further actions in the dispute resolution process.
1774

1775 If the decision fo the Dispute Resolution Committee requires action by a product manufacturer
1776 in order to bring a Certified Product into conformity with applicable certification
1777 requirements, the manufacturer shall either implement those changes within
1778 ninety days of the Notice Date, or submit a schedule that is deemed acceptable
1779 by the Dispute Resolution Committee and commence diligent efforts to
1780 implement the change in accordance with the imposed or submitted timeline.
1781

1782 **E. Revocation of Certification**

1783 If the Dispute Resolution Committee deems that a manufacturer has failed to implement
1784 corrections as required by the binding resolution within the imposed or submitted
1785 timeline, and the Committee determines that no viable corrective action plan is in
1786 progress to resolve the dispute, the Dispute Resolution Committee can
1787 recommend to the Certification Program Manager that the product in question
1788 may be removed from the Certified Product List. The Certification Program
1789 Manager may then remove the product from the Certified Product List until the
1790 Dispute Resolution Committee deems that the manufacturer has rectified the
1791 problem.
1792

1793 **Dispute Resolution Committee**

1794 **A. Composition**

1795 The Dispute Resolution Committee shall have the following composition:

- 1796 - Lead Lab Representative
 - 1797 - APCL Representatives
 - 1798 - SSO/SDO Representative
- 1799

1800 **B. Committee Actions**

1801 In considering a dispute, the Dispute Resolution Committee shall consider the materials
1802 presented by each party involved to the dispute, and may in addition consider
1803 such other materials and information as it deems appropriate to settle the
1804 dispute.
1805

1806 A copy of all associated documents used in resolving the dispute shall be maintained by the
1807 vendor and APCB in the Compliance Folder.

1808 **(C) Committee Decisions**

1809 The Dispute Resolution Committee shall decide on matters by a majority vote.
1810

1811 **(D) Role of Certification Working Group**

1812 All decisions of the Dispute Resolution Committee shall be binding and final upon the parties,
1813 provided however that it becomes evident that the dispute may be related to a
1814 flaw in the certification test or the certification process. In that case, the Dispute
1815 Resolution Committee or either party in the dispute may request that the matter
1816 be transferred to the industry WG for consideration.

1817 **3.4.2. Certification Requirement Waiver Process**

1818 The waiver process allows a manufacturer to apply for a dispensation (exception) from a
1819 specific certification requirement that the manufacturer is unable to meet and that will prevent or
1820 delay certification. The waiver process is intended to be used in cases where a manufacturer
1821 believes it has a justifiable reason that a waiver should be granted. The waiver process is not
1822 intended to deal with test harness or test case problems that are preventing a device from
1823 achieving certification. Such issues are dealt with using the CCR process.
1824

1825 Waiver requests are reviewed by an independent body, the Waiver Review Board (WRB) which
1826 reviews and takes decisions on waiver requests. This body must be independent of the
1827 manufacturer submitting the waiver request, and have no conflict of interest with respect to the
1828 waiver request application for the device. Waiver requests are confidential and are not shared
1829 between manufacturers.
1830

1831 Waiver requests are submitted to the Certification Program Manager through the APCB, using a
1832 suitable Waiver Template. The Program Manager forwards the request to the Waiver Review
1833 Board for consideration. Waivers are reviewed on a case-by-case basis. Submission of a
1834 waiver request does not guarantee consideration or approval of the waiver request by the WRB.
1835 A waiver request can be submitted at any time in the certification testing process and the
1836 process can be applied for during both initial and re-certification of Certified Products.

1837 **3.4.3. Surveillance of Certified Product Validity**

1838 The ICP is responsible to ensure the continued validity of certified products, modules and
1839 software systems in the market.
1840

1841 The ICP is responsible to compile an ongoing verification record of certified products out in the
1842 market.
1843

1844 The CPM is responsible to take mitigative, corrective and preventive action to the non-compliant
1845 Member, the APCB, and the APCL involved using the following procedure outlined, upon
1846 discovery of a certified product that breaches the original certified condition of the product.
1847
1848

1849 **3.4.3.1. Corrective and Preventive Action**

1850 The CPM shall discuss with the involved APCB & APCL the issuance in writing of the Mitigation,
1851 Corrective, and Preventive Action Request (MCPAR), to the APCB & APCL, the non-compliant
1852 Member and the APCL. The MCPAR shall indicate the following:

- 1853
- 1854 • Detail on the observed breach of certification requirements
 - 1855 • Assigns APCB & APCL as party responsible to close the open action item identified
1856 on the MCPAR
 - 1857 • Orders Member to account for units already in the market
 - 1858 • Orders APCB, APCL Member to institute corrective action of this event and
1859 preventive action of similar events
 - 1860 • Order APCB, APCL to work with Member to mitigate the impact of released devices
 - 1861 • Order APCB, APCL to institute corrective action for this event, and preventive action
1862 to forestall future similar events
 - 1863 • After set date, obtain the report on the corrective and preventive action from
1864 Member, APCB, APCL
 - 1865 • The CPM shall evaluate validity and effectiveness of the response.
- 1866

1867 The APCB & APCL shall monitor the corrective and preventive action after a set time indicated
1868 by response on the MCPAR. When subsequent verification determines that corrective and
1869 preventive actions are effective, the APCB & APCL shall report to the CPM, and the case can
1870 be closed; if it is found to be insufficient, the CPM shall initiate a complete review of the APCB,
1871 APCL appointed status.

1872

1873 **3.5. Security Considerations**

1874 t.b.d.
1875

1876 **4. ANNEX**1877 **4.1. Summary Matrix**

| Requirement | OpenHAN | OpenADR | OpenADE |
|--------------------------|---------|---------|---------|
| Program Version | Yes | Yes | Yes |
| Lead Laboratory | Yes | Yes | Yes |
| Appointed Labs | Yes | Yes | Yes |
| Certification Body | Yes | No | No |
| Program Manager | Yes | Yes | Yes |
| Test Harness | Yes | Yes* | Yes* |
| Reference System | No | Yes* | Yes* |
| Technical Advisory Board | Yes | Yes | Yes |
| Test Case Reference List | Yes | Yes | Yes |
| Compliance Folder | Yes | Yes | Yes |

1878

1879 * Either Test Harness or Reference System may be used

1880