Session 7: Measuring networked standby power consumption*

Test procedures and protocols – standardisation and international harmonisation

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*Actually, network connectivity generally

Test procedures

Underpin all energy policies like
- Mandatory energy standards
- Voluntary energy standards
- Labelling programs (comparative, endorsement)
- Purchaser/consumer information
- Policy insight / monitoring

Objective

- Define test procedure elements that complement IEC62301 to allow the measurement of relevant modes of equipment where a network function present
- Aim to provide a platform for a globally relevant, uniform test methods for products with network functions
- Relevant modes should cover all levels of network functionality likely to occur during normal use

Benefits from a global approach

- Global alignment of testing approaches is good for government and good for industry
- Supports energy policies
- Allows comparisons and benchmarking
- Facilitates trade
- But some effort will be required to reach global agreement

"If you can not measure it, you can not improve it." (Lord Kelvin)

Problem

- Network connectivity adds significant complexity to testing products
- Complexity often independent of product type …
    - … but dependent on technology type
- Testing needs to evolve with technologies, usage
- Incorrect or inadequate testing will reduce actual energy savings achieved
- Complexity could be a significant burden
    - Policymakers, manufacturers, test labs, users

Components for test procedures

- Definitions and Network Technologies
- Product Configuration and Setup Requirements
- Network Connectivity
- Network States, Modes and Network Traffic
- Reporting Requirements
  - (need to ensure regulator/ program needs are met)

Issues covered by IEC62301

- Ambient conditions – Yes ✔
- Power supply and power quality – Yes ✔
  except for issues such as DC powering – No ✖
  (e.g. Power over Ethernet, USB; needs work)
- Power measurement equipment – Yes ✔
- Methodology to obtain a valid reading – Yes ✔

Network-related details for test procedures

- Cable type/length
- Radio conditions
- Capabilities of connected device(s)
- Functions provided by or to other devices
- Cloud / service provider context
- Data traffic details – quantity, timing, packet size, content, …
- Network service environment – addressing, discovery, …
- Typical usage (levels, not pattern of use)
- Etc. …

Solution

"Library" of network test procedure content

- Dropped into product test procedures as needed
- Drawn from as applicable to product
  - product types
  - product features
- Updated as technologies change
- Content may be
  - sentences, paragraphs, tables, data, ...
  - configuration, test setup, connected devices, network traffic, ...
- Principle
  - Be as horizontal as feasible / reasonable – **and no farther**

Examples of content from Energy Star *Small Network Equipment* draft spec (SNE)

- "All Ethernet cables used for testing shall meet ANSI/EIA/TIA-568 Category 5e (Cat5e) specifications and shall be no shorter than 2 meters in length."
- "If the UUT supports IEEE 802.3az protocol, all connected devices must support IEEE 802.3az".
- "Ethernet ports shall be connected at the maximum supported link rate unless otherwise specified in this test procedure."
- "Test traffic shall contain random data in a variety of datagram (or frame) sizes based on an Internet traffic mix (IMIX) sent at random intervals."
- "Tests are performed at two data rates, 1 kb/s (0.5 kb/s in each direction), and the highest rate supported by the link shown in Table 8."

Generating library content

- Adapt content from existing approaches where possible
  - Energy Star (SNE, PC, imaging), EU COC broadband, Japan Top Runner, ATIS, others
- Identify clear gaps in content
- Fill the gaps

Challenges for test procedures

- May not always be clear in advance what factors affect energy use
- Need to avoid possibility of "gaming" - circumvention
- Network connectivity may be present in any mode (On, Off, Sleep, Ready)
- Devices may have periodic higher-power activity
  - Internally or externally generated (cyclic)
- Different products of same type have different network capabilities, functions

Library challenges

- Who is librarian?
- What content applies as regulations and library content evolve over time?
- Who creates/reviews new content?
- Who updates and maintains content?
- Who does interpretation?

- What does this mean for IEC 62301?

Some bigger considerations

- IEC standards take many years to prepare
- IEC can not be changed for X years after publication
- Technology Standards frequently change – need dynamic link to current version
- Need to know standard version built into the EUT
- Need to understand energy management protocols present and how these are assessed and reported in the test procedure

Initial assessment of network library

- Product mode – leave to product experts to define
- Network physical connection – should be fairly straight forward in most cases (adapt content)
- Need to cover DC and cases like PoE
- Network protocol (technology standards for network link)– provide broad guidelines, external reference to relevant technical standards. Document technologies present and a process to assess legacy versions
- Network traffic – Guidelines can cover main traffic levels expected and guidance on assessing energy management or energy saving measures

Conclusions

- IEC62301 covers many basic requirements
- Much of the network test content exists
- Content needs to be compiled and harmomised
- Ensure content gaps are covered
- Product experts best to define modes and to some extent network traffic at product level
- Externally reference Technology Standards (assess energy management)
- Not clear where this could/should live

The end

- Thank you

Also useful

- Library of specification content
  - Power limits, other requirements
- Library of test results