Overview of the Standardisation Landscape

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Energy Efficient Strategies

Networked Standby Policy Framework Workshop

7-8 March 2013, Toronto, Canada

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Overview

- What is a “standard” in this context
- Exploration of the different types of “standards”
- Areas where there is activity
- Areas where there should be some activity
- Taking a step back – what are we trying to achieve?
- More information

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What do we mean by "standards"?

In simplistic terms, there are 3 main categories of what people commonly call "standards"

1. Energy standards or specifications that set performance requirements
2. Measurement methods (test standards)
3. Technology standards

1. Energy Standards

- Typically these are where a regulation, endorsement or other program sets specific energy requirements for compliance.
- These are typically in form of power limits while meeting certain product design or performance criteria
- Example 1: 0.5W limit in standby and off mode in European regulation
- Example 2: Meeting requirements for small network equipment under Energy Star

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2. Test Procedures

- These are the method that defines how we measure the energy and performance of a product
- Sometimes these are combined with (to varying extents) efficiency requirements
- These are critical as energy standards rely on a test method to determine eligibility
- Example 1: IEC62301 Edition 2
- Example 2: EU Code of conduct for broadband equipment (has requirements too)

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3. Technology Standards

- These are the operating protocols that make things work
- In the world of networks, technology standards define how data is transported through the network and ultimately how things talk to each other i.e. function correctly
- Example 1: IEEE 802.3 Ethernet
- Example 2: HDMI Version 1.4

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Technology Standards

- Technology standards are about making things work smoothly and efficiently
- Often they do not cover any energy matters
- Where there is no facility for energy management, energy cannot be saved in normal operation
- Some network technology standards need to address energy issues

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Technology Standards

- IEEE 802.3az EE Ethernet allows the network link to be asleep with almost zero power consumption where there are no data packets
- Link can be re-established in <<1ms
- It is a subset of IEEE 802.3 that deals with energy issues – without this technology at both ends of the link, energy cannot be saved
- Requiring products to comply with IEEE 802.3az will save energy

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Technology Standards

- IEEE 802.11 (Wi-Fi) has some features that allow energy saving in the edge device (have to be active at both ends):
  - Power Save (PS-Poll)
  - Automatic Power Save delivery (APSD)
  - Fast BSS Transition – IEEE 802.11r/mb
  - IBSS Mode Power Save
- Here are some things in the pipeline for access points:
  - Proxy ARP – IEEE 802.11v
  - TIM Broadcast – IEEE 802.11v
  - WNM Sleep Mode

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Technology Standards

- DOCSIS Data Over Cable Service Interface Specification does not allow any management by the data transport network - the only way to reduce energy is to manually disconnect (no function)
- HDMI Version 1.4 (High-Definition Multimedia Interface) “Consumer Electronics Control” (CEC) allows coordinated power management across connected devices, but is not standardised for all brands/models

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Technology Standards

- Technology standards are important to allow energy saving in networks
- So existing energy features need to be improved and technology standards that do not have such features need to have them developed (sometimes easier said than done)
- But is there a bigger picture we need to consider?

Energy and Networks

- Networks are a collection of equipment (called edge devices) that are connected together by network links
- It is important, in a conceptual and policy sense, to separate edge devices (things that provide us services) from network equipment (things that provide the network links)
- The main difference is that the MAIN function of network equipment is the network itself – this is normally ALWAYS ON

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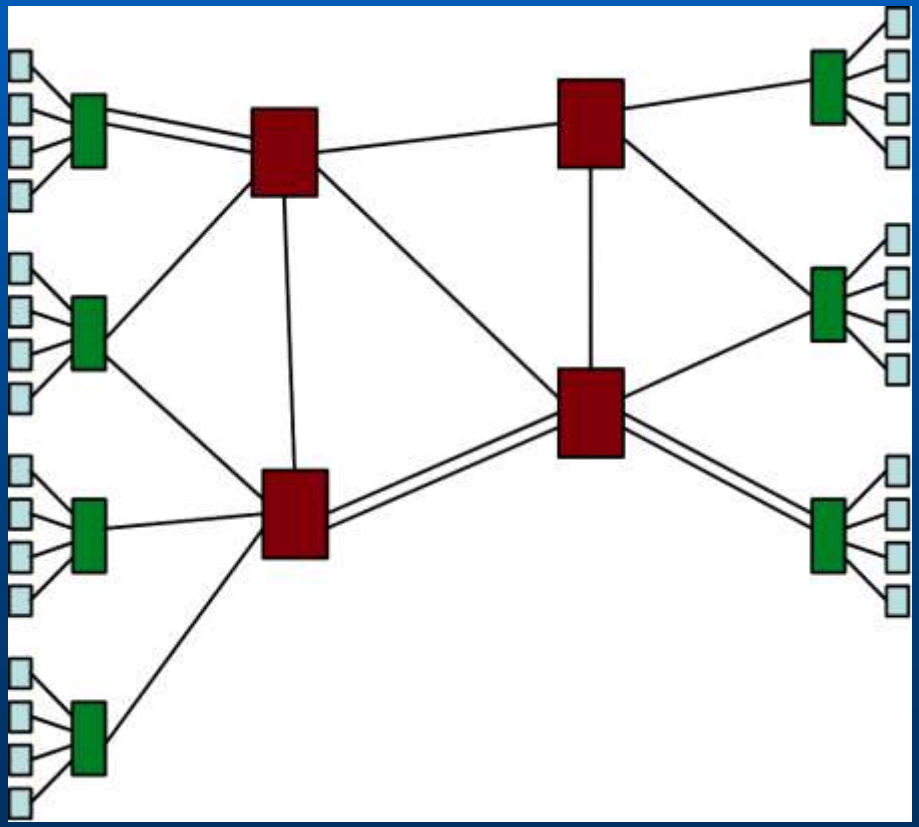
Energy and Networks

- Edge devices (blue) versus
- Network equipment (red and green)



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Low energy network objective

The right policy question in the context of networks is:

- How much extra energy in all modes does the presence of a network function induce?
- What can we do to minimise that additional energy while maintaining usability and quality of service?

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Low energy network objective

All elements in a network should use the minimum possible energy while still providing the services that users (or other equipment) require

(that also applies to equipment not on a network!)

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Low energy network objective

- What does this mean?
- Link power should be as low as possible (technology standards)
- Devices should power manage themselves into the lowest power mode whenever possible (go to sleep when not in use)
- Devices should internally power down internal services that are not being used (power scaling)

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Low energy network objective

- Only edge devices can change into lower power modes when the demand for main function is not present (power management)
- All devices can implement power scaling, including network equipment, when some main functions are not required
- Power scaling can provide LARGE energy savings in all equipment where INFORMATION and DATA is the MAIN function

Some important considerations

- User experience has to be good (energy management that is annoying will be disabled)
- Some products may need to be able to wake up in response to network demands (link should remain available for reactivation)
- Need to be careful that useless network chatter does not keep everything awake all the time – what services are needed?

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Some important considerations

- Power management and power scaling cannot be defined by technology standards (but technology standards can facilitate coordinated power management)
- The product designer needs to configure PM and PS in a way that it works properly – every product is unique
- But these can be “encouraged” or “required” through energy standard requirements (we don’t care how you make the power < 1W)

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How do we test products?

- IEC62301 defines test methods for “simple” standby (stand alone products) widely used
- Many network elements exist in some energy standards – eg Energy Star, EU Code of Conduct (many bits are different)
- Providing a functional network for test is often necessary
- Network test elements need development – see 4E work by Nordman - *Testing Products with Network Connectivity*

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How do we test products?

- Here are some things to be settled in a test procedure for networks:
- Definitions and Network Categories - definition of terms integral to testing of network functions
- Product Configuration and Setup Requirements - configuration and setup requirements
- Network Connectivity - Define relevant network connection modes for testing
- Network States and Modes and Network Traffic
- Energy Reporting Requirements - energy by mode and network connection

Standby Power and Low Energy Networks – issues and directions

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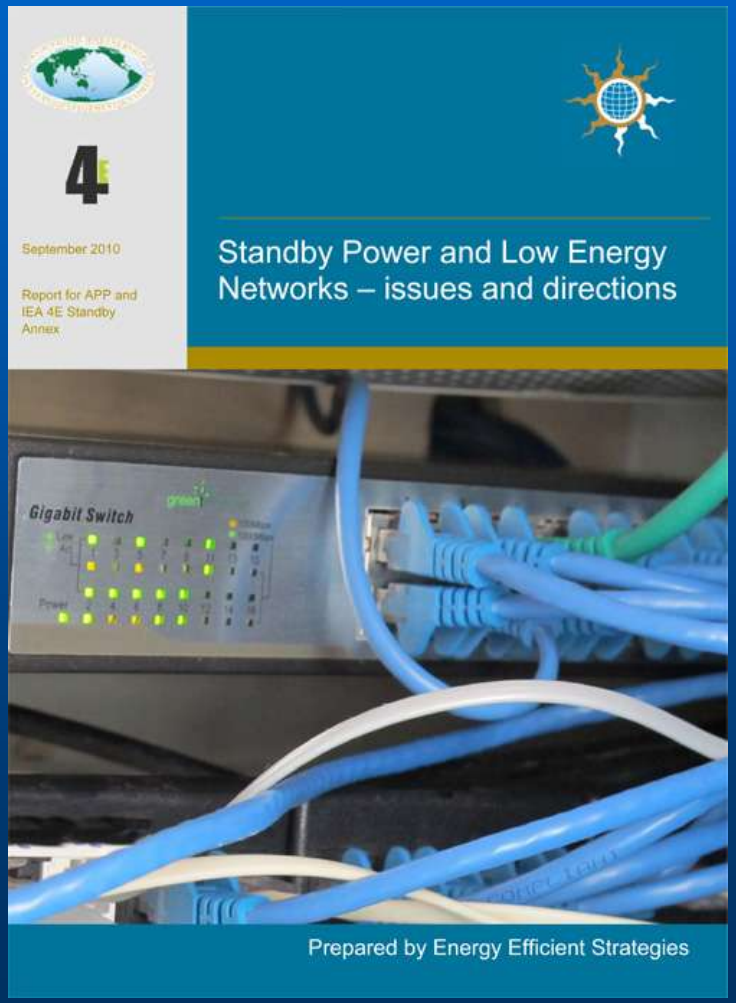
- APP and 4E Report
- Prepared by Harrington and Nordman
- Sets out many of these issues and a road map for future work



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List of Technical Standards for Equipment Connected to Energy-Using Networks

- Aust Dept Climate Change and EE
- Prepared by BIO IS
- A list of efficiency standards, test methods and technology standards in the field of networks

Staying Connected: Unravelling energy waste issues in network standby

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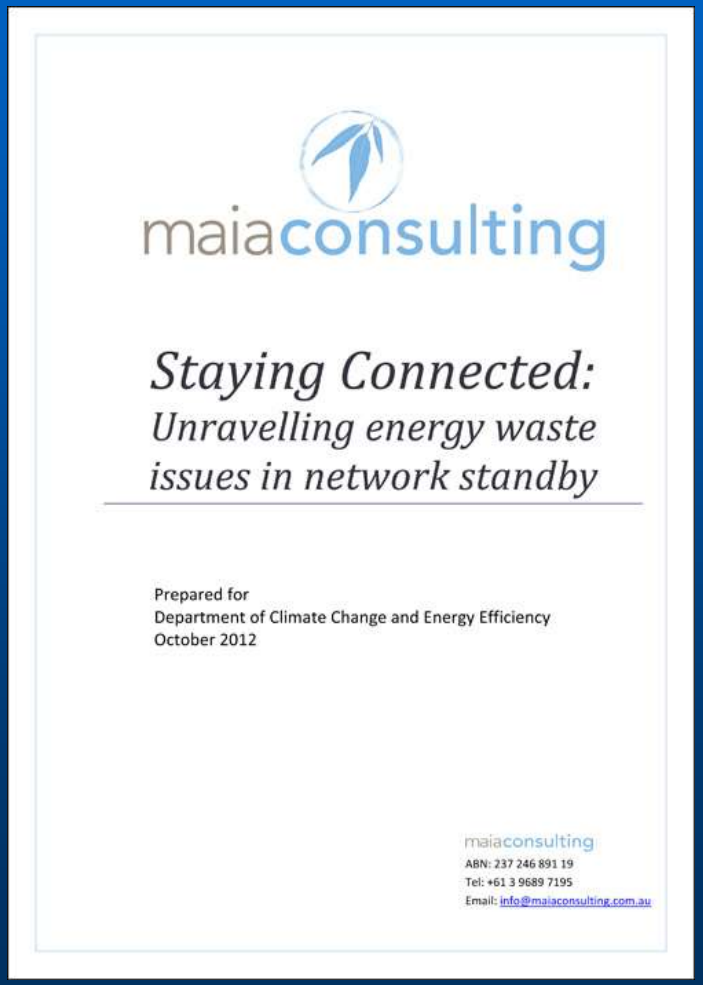
- Aust Dept Climate Change and EE
- Prepared by Maia Consulting
- Provides a summary of the key issues and recent activities in the field



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Network standby workshop

- IEA/4E event, Stockholm, May 2012
- *Prioritising energy management protocols in standards for networked products* – Nordman – Harrington – Harrison
- Explores energy management issues in networks in some detail
- *Test procedures and protocols – standardisation and international harmonisation* – Nordman – Harrington
- Explores elements required for a test procedure for networked products

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Conclusion

- Energy in networks is a complex thing because there are many interdependencies
- Some technology standards need improved energy features
- Power management needs to be a universal paradigm
- Power scaling can be encouraged through efficiency standards
- Testing elements need more work

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Where to now?

- How are we going to make progress on technology standards where there are gaps in energy saving features?
- How can we track progress in the diffusion energy saving technology standards?
- How do we track their effectiveness in the real world? (confounding factor)
- How will the testing elements for networks be developed?

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The End

All reports available from
http://standby.iea-4e.org

- thank you