ARRIS Comments and Recommendations for SNE Power Consumption Procedure

ARRIS Group manufactures voice modems, data modems, home gateway products and other products used by the cable television industry. We have millions of modems in the field and extensive experience regarding their use and applications. ARRIS has been active for many years in energy conservation methods in our products which enhances our battery backup capabilities. We minimize the energy requirements and maximize the power supply efficiency to reduce wasted power and generated heat within our products. We are active in meeting the European Union's Code of Conduct on Energy Consumption of Broadband Equipment requirements and are in compliance on the majority of our products. ARRIS is a leader in this product market and utilizes the latest technologies and products available in the industry.

Our initial comment on the ENERGY STAR SNE Framework document reflected our support of the EU Code of Conduct and we continue that same support and recommend it as model for the ENERGY STAR SNE. The EU Code of Conduct on Energy Consumption of Broadband Equipment requirement is a mature standard which is widely accepted within the industry. The base power plus adder approach provides a logical method for integrating features into a base product and calculating the allowed power for the complete assembly for all features. The EU Code of Conduct is currently in its third version which improved with each new release. We are not in complete agreement with the Code of Conduct in all the methods of measuring power or the power allocations provided, but support the general theme and requirements. The measurement procedures stated in the EU Code of conduct represent a reasonable approach to determine the overall unit idle and active power requirements. Power management is required to keep the power as low as possible during the various idle and active periods. In support of the approach used by EU in the Code of Conduct for Broadband we are willing to share with the ENERGY STAR SNE committee, our spreadsheet for calculating the power based on the EU Code of Conduct which allows capturing the calculated allowances and comparison of the results.

In review of the first draft of the ENERGY STAR SNE Test Procedure, we notice a strong divergence from the EU Code of Conduct for Broadband Equipment approach.

- EU uses a simplistic approach to characterize only the idle power and the total active power.
- ENERGY STAR SNE Test Procedure is an extremely complex and excessively detailed procedure.

The objective stated in the introduction of the SNE Framework document and discussed during the opening remarks of the previous web conference emphasized saving Kilowatts-hours of energy from the Home consumption. The incremental loading and details have lost focus on the bigger scope of power consumption to now measure milliwatts of power variations. This approach may be justified for single function devices, such as routers, but not for multi function units where the router represents a small percentage of the total. This test procedure is the first draft and perhaps it is only for the purpose of collecting initial data, but our concern is both immediate and long term. Assuming the details are only for the initial data collection, the gathering of details is far too excessive. The collected data will be overwhelming and difficult to evaluate. The fact that the activity in the network is dynamic as reflected by overall low utilization for homes means the need for the incremental power numbers at various loads is not necessary to define the SNE power consumption. The details are better suited for a research into the utilization factors of the home network environment, which are outside of the ENERGY STAR SNE objectives. Established network traffic patterns reflect the majority of the time the SNE is in an idle state, therefore this is the number one priority in power consumption. Second, the total active power is an indication of the peak power consumed. If these two limits are used to define the limits, then incremental variations are of limited value. It is recognized that the equipment will likely be used at a level below the maximum active power level, but the maximum load will vary with each user and each unique application. The established traffic patterns can be used to calculate the annual power consumption as used in other studies. Over time, all traffic statistics are expected to change and will modify the annualized consumption, but that can be addressed as required in future updates along with changes through technology in new products.

For example, in the area of the Broadband DOCSIS products, there are dynamic variations in the required bandwidth for DOCSIS products. Today, the current DOCSIS 3.0 channel deployments are likely to be a 4x4 (4 downstream and 4 upstream) channels configuration or less. IC developers are working on new generation products which will serve greater bandwidths of 8x4 to 24x8 channel configurations. Each generation of products will offer more channels of bandwidth and will increase power requirements. New developments must be allowed for in the requirements to encourage new product development through technology. The EU Code of Conduct for Broadband is lacking in this at the current time, but newer releases of the specification are expected to address the emerging products. The concern is not to allow the ENERGY STAR SNE requirements to limit the power so tightly as to suffocate innovation and product development.

The test procedure for the Ethernet interface contains far too many steps in data traffic. ARRIS has evaluated the impact of data traffic on our modem products and find a very small variation in the power consumption as a function of data traffic. ARRIS recommends the data collection be simplified and limited to one data rate and one idle condition.

The SNE Test Procedure contains limited details in the testing of the DOCSIS interface and the POTS Telephony interface. ARRIS recommends the following test procedures which are patterned around typical configurations as opposed to various configurations. The “typical configuration” is expected to show what the large majority of the applications will use and we encourage this “typical” approach be used in the SNE measurements of all interfaces. The beauty of the existing network is the flexibility provided to adapt to multiple uses, however, very few home users exploit these capabilities or features beyond the default settings and configurations. This reduces the testing overhead and time for compliance measurements and keeps the focus on recognizing the power consumption of the low power and active states of the equipment.

RECOMMENDED TEST PROCEDURE FOR DOCSIS 2.0

Record the power requirements for the following low-power and active states. The following configuration is recommended:

System Configuration:

- Configured with the modem ranged and registered with a CMTS using a discrete downstream frequency and 256QAM coding in the downstream path.
- Modem receive level to be 0dBmV +/- 5dBmV
- Upstream to use 2560 KSym/sec QPSK coding using an upstream center frequency.
- Modem transmit level to be 30dBmV +/- 5dBmV

Low-power State:

- All data and voice features to be in an idle or in a low-power state without data traffic
- Voice circuits provisioned and on hook (Measurement of Voice circuits is defined below).

Active State:

- Voice to be provisioned with data and voice traffic established during this test.
- Send data via the RF port at 50% of maximum throughput data rate using multiple Ethernet and Wireless ports as applicable. Data traffic to be in both direction at 50% of maximum rate as defined by the product or limited by the internal processing.

RECOMMENDED TEST PROCEDURE FOR DOCSIS 3.0

Record the power requirements for the following low-power and active states. The following configuration is recommended:

System Configuration:

- Configured in a 4x4 configuration with the modem ranged and registered with a CMTS using 4 discrete downstream frequencies and 256QAM coding in the downstream path.
- Modem receive level to be 0dBmV +/- 5dBmV
- Upstream to use 2560 Ksym/sec 64QAM coding at 4 upstream center frequencies.
- Modem transmit level to be 30dBmV +/- 5dBmV

Low-power State:

- All data and voice features to be in an idle or in a low-power state without data traffic
- Voice circuits provisioned and on hook (Measurement of Voice circuits is defined below).

Active State:

- Voice to be provisioned with data and voice traffic established during this test.

- Send data via the RF port at 50% of maximum throughput data rate using multiple Ethernet and Wireless ports as applicable. Data traffic to be in both direction at 50% of maximum rate as defined by the product or limited by the internal processing.

RECOMMENDED TEST PROCEDURE FOR POTS/FXS Power Consumption

Record the power for each of the following Low-power and active conditions:

Idle or Lower Power State:

- All Lines provisioned and all phones on hook.
- The loop current configured as shipped.
    - A variety of loop currents are used in the industry and ranges for 18 to 45 mA depending on the operating companies. The majority of our customers prefer the higher 40mA loop current as this provides better service and compatibility with various phones. The EU Code of Conduct does not specify the loop current. Additional power allowances for the higher loop current should be provided in the specifications. The higher loop current is not a factor in the low power state with the lines on hook.

Active Power State:

- One line off hook for units providing 1 to 4 lines.
- Beyond 4, this is not a typical home application. These would be more for an apartment or business application. Traffic studies will show usage at 3 to 6 CCS, for an average of $1/6^{th}$ of the phones off-hook during active periods .
- For systems greater than 5 lines, use $1/6^{th}$ of the lines off-hook, rounded to the next integer.
- The off-hook resistance should be 200 ohms, which is an average resistance of a telephone.
- Lines which are active (off hook), a call should be established to another phone in the network, not to another line of the UUT.
- The loop current configured as shipped.
    - A variety of loop currents are used in the industry and ranges for 18 to 45 mA depending on the operating companies. The majority of our customers prefer the higher 40mA loop current as this provides better service and compatibility with various phones. The EU Code of Conduct does not specify the loop current. Additional power allowances for the higher loop current should be provided in the specifications.

Off-mode State:

- **ARRIS recommends** not turning off the voice or data (Off-state) when used for phone service but recommends the service be in a standby mode. This is based on the past requirements to provide "Life-Line" service and potentially may be a required offering in the future. The use of power switches make the ability to turn off the modem too easy or accidental, resulting in loss of services preventing access to emergency services.

- The need to provide "Life-line" services in the cable market (entertainment provider) is currently excluded from the FCC requirements to provide such service to users. There have been cases where cable companies have offered this service and there may be needed in the future.

GLOSSARY:

- DOCSIS – Data Over Cable Service Interface Specification
- CMTS - A cable modem termination system is equipment typically found in a cable company's headend, or at cable company hub site, and is used to provide high speed data services, such as cable internet or Voice over IP, to cable subscribers
- POTS - Plain old telephone service (POTS) is the voice-grade telephone service that remains the basic form of residential and small business service connection to the telephone network in most parts of the world
- CCS – Stands for Connect Call Seconds a measure of traffic in the telephone network, where 36CCS is 100% off-hook.

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December 9, 2009