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**Cable Operator Energy Audit Framework and
Establishment of Energy Baseline**

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1. Scope

Defines how cable operators should audit power consumption and accurately establish an energy baseline for inside and outside plant excluding any customer powered equipment.

2. Normative References

The following documents contain provisions, which, through reference in this text, constitute provisions of the standard. At the time of Subcommittee approval, the editions indicated were valid. All standards are subject to revision; and while parties to any agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents listed below, they are reminded that newer editions of those documents may not be compatible with the referenced version.

- None are applicable

3. Informative References

The following documents may provide valuable information to the reader but are not required when complying with this standard.

- SCTE EMS 023, “Energy Metrics for Cable Operator Edge and Core Facilities”

4. Compliance Notation

<i>shall</i>	This word or the adjective “ required ” means that the item is an absolute requirement of this specification.
<i>shall not</i>	This phrase means that the item is an absolute prohibition of this specification.
<i>should</i>	This word or the adjective “ <i>recommended</i> ” means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighted before choosing a different course.
<i>should not</i>	This phrase means that there may exist valid reasons in particular circumstances when the listed behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
<i>may</i>	This word or the adjective “ <i>optional</i> ” means that this item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.

5. Abbreviations and Definitions

5.1. Abbreviations and Acronymns

EDI	Electronic Data Interchange
EMS	element management systems
GIS	geographic information sytem
HFC	hybrid fiber coax
kW	kilowatt
kWh	kilowatt-hour
OCR	optical character recognition
SCTE	Society of Cable Telecommunications Engineers

5.2. Definitions

Access network	Utilized to transport information between a service provider and a plurality of users. Includes all active and passive equipment between the headend or hub and the demarcation point at the user premises.
Audit	Comparison/validation of what energy is consumed vs. what energy is billed
Energy benchmark	Establishment of how much energy is consumed at a specific point in time to allow for measurement of change after the establishment of the benchmark
Geographic information system	Computer system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data
kilowatt	Unit for measurement of power
kilowatt-hour	Unit for measurement of energy
Legacy	Equipment having prior history greater than 3 years in relation to the audit framework
Outside plant	See Access network
Power supply transponder	Interfaces with hybrid fiber coax (HFC) power supplies to provide communications to centralized element management systems (EMS)
Tariff	Collection of rules that defines the relationship between a utility and its customers, that largely address rates, costs and responsibilities from the utility provider point of view
Critical facility	Cable operator premise responsible for transmission of information to/from the customer with the desire of maximum availability
Utility grade meter	Device used to measure the power consumed over time in kWh and is reliable enough to generate invoice/billing information
Grid-connected:	Energy derived from connection to the electric utility

6. Framework

Statistical techniques can be leveraged to calculate and/or extrapolate a comprehensive approach to establish the energy benchmark based on the following audit techniques listed below. Statistical selection should be made to ensure a sample size indicative of a 95% confidence level at a 5% margin of error.

Dedicated resources to manage the process are recommended to help facilitate the process of performing the baseline establishment via this audit framework.

6.1. Access Network Power Supplies

- 1) Leveraging the cable operator system of record for outside plant power supply monitoring compile a list of all power supplies for the market or region where the audit is being performed. Monitoring devices and software can expedite the audit process, however for a full reconciliation design data bases should be consulted.
- 2) Contact the utility providers for the same market and ask them to provide their accounting of all power supplies that they are billing the cable operator for, along with the rate they are being billed at (commercial, residential, etc...).

- 3) Identify any delta's between the cable operator and utility provider lists, as well as identifying any power supplies (including if the supply is 60 or 90 volts) the cable operator may NOT be actively monitoring (if known). Take appropriate billing actions where necessary to make necessary change.

Where reconciliation is not as straightforward; GIS tools should be leveraged to identify uncertain addresses as cross streets are typically used as reference points for plant power.

For metered power supplies, the utility billing information should provide power supply input power (kWh and days in bill).

Legacy status monitoring devices can be used to capture output voltage and output current. Be aware, status monitoring data is not accurate enough across the board to serve as more than an indicator for power supply output. Thus, for unmetered power supplies with legacy transponders, there is no utility grade measurement available. In systems with a mixed population (metered and unmetered), the metered accounts can be used to statistically estimate unmetered usage. This will provide an indication if the unmetered power supply population as a whole is billed correctly and can be used as a decision point for follow up work.

Metered power supplies are generally billed as stand alone accounts, i.e. one bill per power supply. Unmetered power supplies are often billed on summary bills (many sub accounts under one primary account number). Many unmetered accounts are legacy accounts, often carried across multiple acquisitions without account maintenance. In many cases, utility addresses are missing completely. In these cases, in depth negotiations with the utility are required to resolve billing issues.

Overbillings are normally related to unmetered power supplies. Not only is the number of supplies billed often inflated, but kWh numbers charged are in excess of actual usage. In some cases, utilities charge based on nameplate rating of the unmetered power supplies.

- 4) Reconcile the delta's between the lists and "certify" the audit list is accurate.
- 5) Outline strategy based on the rate and utilization information provided by the Utility provider, to do several things:
 - a. Optimize power consumed in the network that can aid in utility tariff identification for power supply loads.
 - b. Re-negotiate rates with utility providers where utility providers are charging cable operator's unfavorable utilization rates.

6.2. Critical Facilities

For Critical Facilities compile lists of utility power bills for the market or region where the audit is being performed. A single meter reading is not sufficient where mixed use facilities are being examined. Estimates of critical usage can be obtained based on the analysis of the entire population of facilities. However, for accurate results, sub metering is required to exclude any administrative components in mixed-use facilities. In order to be useful in energy analysis and benchmark development, facility detail is required for the correlation.

For complete detail on how determine and calculate the total see SCTE EMS 023, "Energy Metrics for Cable Operator Edge and Core Facilities."

7. Data Collection Definition and Frequency

7.1. Overview

Monthly data should be obtained from the utility provider or cable operator for at least one year retroactively to optimally allow outlining trends. The monthly tracking should be in synch with monthly accounts payable process.

Large utilities have the capability of billing electronically using electronic data interchange (EDI). In these cases, extraction is simple. Many of the smaller utilities offer web access to accounts and monthly data extraction can be automated. There are still utilities (mainly smaller cooperatives or municipal systems) which rely on paper billing. For these, data entry or an optical character recognition (OCR) process is indicated.

7.2. Grid-connected

The following data *shall* be collected on a monthly basis:

- 1) How many days included in the utility bill (to calculate power from kWh)
- 2) If applicable bill demand power for peak power (kW), to determine load factor
- 3) kWh (sub metering should be performed by the cable operator not utility provider)
- 4) Billing rates.
- 5) Meter number
- 6) Utility service address and utility account number
- 7) Tariff charged
- 8) Total amount charged

7.3. Non-grid-connected

The following data *shall* be collected on a monthly basis:

- 1) How many days included in the measurement (to calculate power from kWh)
- 2) kWh
- 3) Energy source identification number (including service address and account number if applicable)

7.4. Collection on an Annual Basis

The following data *shall* be captured on an annual basis:

- 1) Number of power supply units purchased
- 2) Number of power supply units purchased for plant growth.

Note: This value can be determined by examining the budget for new builds and correlated with utility billing data.

- 3) Number of replacement power supply units.

Note: This can be calculated by subtracting growth power supply units from total power supply units purchased.

8. Summary

Given the importance of power and competition for operational expense optimization, cable Operators should audit power consumption to accurately establish an energy baseline for inside and outside plant excluding any customer premise equipment. This reference framework provides an industry go to operational practice to help ensure uniform practices when managing the tracking of consumption of power.