

Green Energy Metrics for Network Operations

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Motivation

- **The Growing Importance of Energy Efficiency**
 - Rising energy costs
 - Environmental concerns
- **Impact of Network Operations on Energy Consumption**
 - Data centers and network infrastructure energy use
- **Need for Standardized Metrics**
 - Facilitating benchmarking and improvements

Objectives of the Green Energy Metrics Draft

- Define Clear Energy Consumption Metrics
- Provide Guidelines for Measurement and Reporting
- Promote Energy Efficiency in Network Design and Operation

Key Energy Consumption Metrics

- **Power Consumption per Data Rate (PCDR)**
 - Measures the power consumed relative to the data rate of network equipment.
 - Evaluates the energy efficiency of data transmission.
- **Power Usage Effectiveness (PUE)**
 - Assesses the overall energy efficiency of a data center or facility.
 - A PUE value closer to 1 indicates higher efficiency.

Key Energy Consumption Metrics cont'd

- **Network Equipment Energy Efficiency (NEEE)**
 - Evaluates the energy efficiency of network equipment based on work output per energy input.
 - Benchmarks devices to compare energy performance under specific workloads.
- **Energy Proportionality Coefficient (EPC)**
 - Measures how closely a system's energy consumption scales with its workload.
 - An EPC close to 1 indicates power consumption is highly proportional to workload.

Standard Testing Conditions

- Standardized testing conditions are crucial for achieving reliable and consistent results.
- **STC are essential for:**
 - Ensuring Fairness and Objectivity
 - Enabling Valid Comparisons
 - Supporting Test Validity and Reliability
 - Minimizing Confounding Variables
- **Benefits:**
 - While it's impossible to eliminate all external influences, adhering to STC helps reduce their impact on test results.
 - Companies can ensure accurate measurements, fair comparisons, reliable results, consistent quality, and compliance with industry standards.

Measurement Methodologies

- **Data Collection Techniques**
 - Direct measurement vs. estimation
- **Monitoring Tools and Sensors**
 - Smart meters, network monitoring software
- **Standardization of Processes**
 - Ensuring consistency across different networks

Reporting Guidelines

- **Frequency of Reporting**
 - Real-time, daily, monthly reports
- **Data Formats and Protocols**
 - Use of common data models and APIs
- **Transparency and Verification**
 - Third-party audits, certifications

Impact on Network Design and Operations

- **Energy-Efficient Hardware Selection**
- **Optimizing Network Configurations**
 - Load balancing, virtualization
- **Adoption of Renewable Energy Sources**
 - Solar panels, wind turbines on-site

Challenges and Considerations

- **Balancing Performance and Energy Efficiency**
- **Cost of Implementation**
 - ROI considerations
- **Regulatory Compliance**
 - Meeting regional and international standards