**Comments of Alcatel-Lucent
in Response to
Energy Star - Large Network Equipment Discussion Document**

November 21, 2012

Alcatel-Lucent is the trusted transformation partner of service providers, enterprises, and strategic industries worldwide, providing solutions to deliver voice, data and video communications services to end-users. A leader in fixed, mobile and converged broadband networking, IP and optics technologies, applications and services, Alcatel-Lucent leverages the unrivaled technical and scientific expertise of Bell Labs, a leading innovator in the communications industry.

With operations in more than 130 countries and the most experienced global services organization in the industry, Alcatel-Lucent is a local partner with a global reach. Alcatel-Lucent's presence in the United States is central to its position as a world leader in emerging telecommunications technologies.

<u>Efforts and achievements regarding telecom infrastructure network energy efficiency</u>

Alcatel-Lucent considers the improvement of its products' energy efficiency as an environmental gain as well as an economic benefit for its customers. Assessments of the environmental impacts of its network telecommunications infrastructure products over their entire life cycle demonstrate that a product's greatest impact occurs during its "usage stage", or in simple terms, its power consumption while in operation. Alcatel-Lucent places great emphasis on a product's energy efficiency in the early phases of design, as that can then significantly reduce its total impact on the environment. This is the principle of the company's *Environment-Conscious Design* guidelines and requirements that have been implemented and consistently improved for more than 10 years within the company.

Alcatel-Lucent's most recent commitments and achievements in the domain of energy efficiency are the following:

- In 2008, Alcatel-Lucent committed to improving the functional energy efficiency of its key products by at least 20% by 2010 compared with 2008. In addition to all key products reaching this target, many products significantly exceeded this target value (*see* 2010 Corporate Responsibility Report at: http://www.alcatel-lucent.com/sustainability/reports/Corporate_Responsibility_Report_2010_Alcatel-Lucent_BD.pdf).

- In 2010, Alcatel-Lucent renewed its commitment to improving the functional energy efficiency of its key products, now by at least 25% by 2012 compared with 2010 (*see* 2011 Corporate Responsibility Report at: http://www.alcatel-lucent.com/sustainability/reports/Alcatel-Lucent-CR-Report-2011-EN.pdf). Current measurements indicate that this target will be fully met with many products largely exceeding it. We also committed to increasing the functional energy efficiency of our lightRadio^{TM} product family by at least 75% by 2015 compared with 2008.

In addition to these short term, individual commitments and achievements to improve product energy efficiency, Alcatel-Lucent - Bell Labs has taken an end-to-end network perspective and initiated the founding of the GreenTouch consortium. Set up as a pre-

competitive research consortium of leading global experts and organizations in industry, academia and research institutes, GreenTouch was founded in May 2010 with the mission to deliver, by 2015, the architectures, solutions, technologies, and to demonstrate key components, to improve network energy efficiency by a factor of 1000 compared to 2010 levels. The vision of GreenTouch is to fundamentally transform communications and data networks, including the Internet, and to significantly improve the energy efficiency and reduce the carbon footprint of ICT devices, platforms and networks, thereby enabling a sustainable and economically viable future and growth for our industry and society for the benefit of all. Given the enabling effect of ICT to significantly improve the greenhouse gas emissions of other industries, it is of paramount importance that the ICT networks are as efficient as possible and that we can develop and deploy networks that are able to provide the services and applications needed to realize this enabling effect.

GreenTouch has brought together a team of researchers and scientific experts from 60 organizations from 23 countries who are working together in ways they may not have thought possible. The symbiotic collaboration created by GreenTouch with the common goal of improving the end-to-end network energy efficiency is making a lasting and measurable impact on next-generation ICT networks to a greater degree than any individual organization can accomplish alone.

Since its launch in 2010, GreenTouch has already identified several strategic research directions and built an impressive research portfolio around five major themes, including mobile communications, wireline access, routing and switching, optical network and services, applications and trends. Over 25 research projects and activities are actively involving over 350 individual participants. Among these projects, the Large Scale Antenna System (LSAS) and the Bit-Interleaved Passive Optical Network (Bi-PON) projects have already yielded very concrete technology innovations and showcased their initial results in public demonstrations, including at major industry events, tradeshows and conferences. GreenTouch has also created a services, policies and standards group to interface and connect with all the relevant standardization organizations and policy groups. This effort is intended to drive the requirements and definition of future next-generation networks into the next generation of standards and policies being set today, and to ensure that the technologies being researched today are implemented tomorrow.

QuEST sustainability initiative (jointly with ATIS)

Alcatel-Lucent is a member of the QuEST (Quality Excellence for Suppliers of Telecommunications) Forum, and contributes to the regular reporting on key indicators essentially focused on the supply chain and network operation issues. At the end of 2011, QuEST launched the *Sustainability Initiative* led by AT&T. The overall objective for QuEST is to develop and incorporate industry-accepted sustainability metrics based first, on energy efficiency and also possibly on other criteria.

QuEST wants to initiate a benchmark study focusing on energy efficiency. The goal is to engage companies (equipment manufacturers) in using the ATIS TEER metric and measurement methodology for their products, and provide QuEST with two years of historical data for existing products and at least one year of data for current and developing products. The data exchange between companies and QuEST on the topic of energy efficiency would be anonymous. Alcatel-Lucent has committed to providing information on a number of its products.

For more information, see the attached document from QuEST.

Ongoing Industry-Led Efforts Are the Most Effective Way to Drive Efficiency in LNE

ICT encompasses a very broad and complex aggregation of equipment and networks that provide a myriad array of services and applications to many different types of end-users. The resulting networks are evolving at a fast pace in order to keep up with the exponential demand in services and number of connected devices and end-users. In addressing energy efficiency improvement of telecommunications network equipment, which includes LNE, Alcatel-Lucent believes that current industry-led research and development activities are progressing at a pace that will exceed the EPA's Energy Star program capabilities and intentions. Efforts within Alcatel-Lucent and also consortia activities as described above are intended to address the exponential traffic growth in a sustainable and economically viable way. The early results of these efforts are substantial – demonstrating the company's and the ICT industry's commitment to delivering radical improvements in ICT energy efficiency, end-to-end across the network.

Alcatel-Lucent respectfully submits that the speed of these industry-led innovations in energy efficiency improvement, along with the complexities of testing highly configurable, customized ICT equipment, do not make LNE a good fit for the Energy Star program or the best use of limited governmental personnel/contractor and funding resources. For example, rapid development of new network protocols and equipment power saving features will outpace any probable development of test methods to fully assess these features in the operating conditions and various configurations that business-to-business (B2B) service providers will be incorporating in their networks. The individuality of their networks coupled with the complex needs of their services, applications and end-customers will not be capable of being fully modeled by test methods and specifications, which will fail to yield meaningful criteria for Energy Star labeling of LNE.

Rather, Alcatel-Lucent recommends that EPA provide only general guidance on LNE. This guidance should be limited to referencing the most up to date standards for energy efficiency measurement and reporting metrics such as those developed and maintained by ATIS and the International Telecommunications Union (ITU).

We further implore that the EPA should not set any energy efficiency threshold for equipment categories under the LNE category. For reasons mentioned above, the complexity and highly configurable nature of telecommunications network infrastructure equipment make it inherently difficult to define criteria and specifications that can be then linked to discrete energy utilization thresholds. Not only would testing methods become complex and subject to testing variations that could possibly be manipulated to provide suspect results with an eye toward competitive advantage, but the uniqueness and expertise of the microcosm of service providers that specify and select network infrastructure equipment is not conducive to an LNE Energy Star label. Even governmental institutions that may purchase telecom infrastructure equipment for their specialized networks would do so through the expertise of telecom contractors and consultants who have in-depth knowledge of the network and applications needs regarding energy efficiency, and would be unlikely to rely on Energy Star labeled products for their purchase. In Alcatel-Lucent's experience those tasked with LNE procurements rely on the standards and guidance from such development bodies as ATIS, ETSI and ITU, along with existing regulation based on the EU Directive 2005/32/EC, or the EU Joint research center Broadband Communication Code of Conduct (EU BB CoC), to define the test methods and reporting metrics for purchasing energy efficient network equipment.

<u>Specific comments on US EPA's proposal for Energy Star to address LNE</u>

- **Reduce the scope of LNE and lessen its specification to general guidance only:** As part of EPA's effort to address network equipment efficiency, an initiative was launched in late 2009 to define the scope and test method for Small Network Equipment (SNE). According to EPA this was to address approximately 30% of the national network equipment energy consumption, with LNE addressing much of the remaining 70%. As SNE is more consumer (end-user) based, these products tend to be better defined in product type and end-use service or application specification. In other words, the product type within SNE should have made it easier to develop the initial Energy Star specification, test method and energy efficiency threshold. Yet, this effort is still ongoing after nearly 3 years of work efforts by the EPA, its contractors and the ICT industry / stakeholders. With a potential LNE scope that could cover a much broader and complex group of products under a much more variable set of configurations, Alcatel-Lucent is deeply concerned that the LNE undertaking by EPA is daunting - requiring prohibitive amounts of personnel resources and costs to EPA and the ICT industry.

  Alcatel-Lucent therefore requests that EPA provide, at most, *general guidance* on LNE. This guidance should be limited to referencing the most up to date standards for energy efficiency measurement and reporting metrics such as those developed and maintained by the Alliance for Telecommunications Industry Solutions (ATIS) and the International Telecommunications Union (ITU). We further implore that the EPA should not set any energy efficiency threshold for equipment categories under the LNE category. Due to the complexity and highly configurable nature of most types of ICT network equipment it would be inherently difficult to define criteria and specifications that can be then linked to discrete energy utilization thresholds.

  In developing this *general guidance* for LNE, or any LNE initiative that EPA determines to undertake, we recommend that the EPA limit their initial undertaking for Version 1.0 by addressing the network equipment that consumes the most significant portion of the ICT network energy use. For example, based on the network equipment energy consumption chart presented by EPA at the LNE kick-off meeting, the largest portion of energy use is in switching products.

  We concur with the EPA that the network equipment domains of **Wireless Access** and **Wireline Access** including **Optical Transport** be <u>excluded</u> from the LNE scope. We strongly believe for reasons mentioned above that these equipment domains and their use by ICT network operators and service providers will not be practically served by the Energy Star specification and labeling program. We ask that EPA explicitly state these exclusions in the LNE scope definition.

  We also recommend excluding **Security Appliances** in the LNE scope because this equipment category performs an *administrative overhead function*, i.e. overseeing service provider and end-user data/information security in a supervisory role, and is thus a level of overhead that is voluntarily added depending on the security needs of the network users.

  Provide a clearer definition of LNE: Alcatel-Lucent proposes that EPA develop a diagram indicating the ICT network and its delineation for SNE and LNE as well as the current scope of equipment within each of these two domains.

- **Limited resources and high costs for LNE Energy Star testing and labeling certification:** Alcatel-Lucent believes that the cost for testing LNE equipment to the

established test method will be excessive. Coupled with the high degree of complexity and configurability in the equipment, the cost for testing a particular product could be in the range of $10k to $100k, depending on the system size, acquisition and integration costs. Fixed equipment would be less costly to test than modular equipment due to the higher configurability of the latter. In addition, the EPA would also undertake significant resources and costs to perform equipment certification to the designated LNE Energy Star specification and test method. Because of the speed at which technological innovations are anticipated to progress in the way of energy efficiency improvements in ICT networks, the EPA would also need to devote extensive resources to updating and reissuing LNE specifications and test methods. The costs and lack of efficacy of LNE testing indicates against implementing labeling certification for LNE.

- **Difficulty in performing LNE test method for telecom network equipment:** Alcatel-Lucent believes that the test method for assessing and measuring the energy efficiency of telecom network infrastructure equipment (NIE) will be difficult to administer based on the EPA's initial suggestion that such equipment be tested with energy efficiency / power saving features <u>turned off</u>. Rather we request that EPA supports and references the ATIS standards for TEER calculation and reporting, and that any energy efficiency / power saving features be in the "<u>test as shipped</u>" mode, i.e. the typical configuration that is intended for the customer, e.g. the network operator or service provider.

- Additionally, test specifications will need to address latency issues whereby equipment that is normally operating, and in low traffic usage states may power off, but will need to address latency when re-powering due to increased traffic detection. In these latter cases, excessive latency may negate an initial need to power off, with these operating features set by the needs of the network operator or service provider in which the equipment will be placed.

  Additional test method issues:

  o A major concern with telecom network infrastructure equipment (NIE) is that EPA may treat such equipment under the LNE umbrella as single function devices. But in fact most NIE, such as switches, are integrating more functionality and duties into their specifications. For example, Dynamic Host Configuration Protocol (DHCP) servers are taking on security / monitoring and network management duties. As such, the EPA test methods will not adequately address these additional features integrated into the product (and which may not be easily or feasibly switched off for testing purposes).

  o There should be distinctions within the switching equipment category such as for example layer-2 and layer-3 switches, and for 1 Gigabit and 100 Gigabit switches. We request that EPA reference the ATIS standards for TEER measurements and their specific categorical treatment of network equipment.

  o The proposed test method will need to address scaling, for example, the number of MACs, IP routes, ACLs, etc. This is important because the onboard memory and processing that such scaling requires are very power intensive, and will therefore need to be included in the test procedure.

  o The proposed test method will need to account for the network infrastructure equipment's redundancy that is built into the individual equipment unit's chassis. The degree of redundancy will depend on the network operator / service provider's needs for system reliability and resiliency. This will be less of an issue if the EPA

addresses only fixed equipment in their LNE Version 1.0. (Note: there is a tendency to have more redundancy included in modular equipment than in fixed equipment.)

o Technological innovations such as software defined networks (SDN) will need to be considered in any LNE specifications. SDN moves the intelligence out of the switch and into an integrated virtual (e.g. cloud-based) switch management system that promotes lower switching equipment energy use. It is recommended that EPA reference the latest ATIS and also European Telecommunications Standards Institute (ETSI) standards – who are addressing these innovative changes with the ICT industry.

o Alcatel-Lucent requests that EPA reference ATIS in their LNE development for Version 1.0. ATIS is a standards developing organization (SDO) that is globally recognized. However, we do not recommend referencing ECR as they are not an SDO, and do not publish standards.