R&D Efforts to Reduce the Burden of ICT Services on the Environment

Nobuyuki Watanabe, Yoshiharu Akiyama, and Akira Sugiyama

Abstract

Providing telecommunications services requires a telecom infrastructure that comprises network equipment, air-conditioning systems, power supply equipment, access system equipment, and various other facilities. As a telecom provider, NTT manages the full range of such facilities. This article describes research and development efforts to reduce the burden placed on the natural environment by ICT (information and communication technology) services, focusing on what is being done by the NTT research laboratories and NTT Group companies as members of the Green and Sustainable Infrastructure Committee.

Keywords: energy and environment, sustainable, energy management

1. Introduction

In the face of global environmental issues such as global warming and depletion of natural resources, the NTT Group has for some time been working to achieve three goals in the use and application of information and communication technology (ICT) services: creating a low carbon society, implementing closed loop recycling, and conserving biodiversity. The use of ICT services involves massive consumption of power and resources including the operation of network equipment such as routers and servers and the air-conditioning systems needed to cool them, and access facilities such as utility poles and telecom lines. Network power consumption has been increasing along with network traffic, and the overall cost of power has been increasing because of the rising cost per unit of electricity. However, even when concerns about protecting the global environment are set aside, energy use is a growing problem for business operations in the NTT Group, which used nearly 8.6 billion kilowatt-hours of electricity in fiscal year 2013 (**Fig. 1**). Power consumption on this scale accounts for about 1% of all commercial power used in Japan. The carbon dioxide emissions associated with power consumption on that scale make up about 95% of all emissions attributable to the NTT Group, and that must be reduced as a step towards achieving a low-carbon society. Furthermore, we rely almost entirely on the commercial power supply. Japan currently depends on imported fossil fuels for power generation, and fuel costs are rising year by year. The effect of that situation on short-term revenue cannot be ignored by the NTT Group. What is more, traffic volume is increasing yearly with the increasing popularity of services that transmit large amounts of data such as video, and new services for smartphones and other such devices. The investment in facilities needed to cope with the increase in traffic is expected to also increase the power consumed to provide those services.

To solve the problem of rising energy costs and future problems related to the global environment, NTT Energy and Environment Systems Laboratories has been collaborating with NTT Network Service Systems Laboratories, NTT Access Service Systems Laboratories, NTT FACILITIES, INC. and other organizations in the research and development (R&D) of technology to reduce power consumption and technology to conserve resources and in drafting R&D strategies.

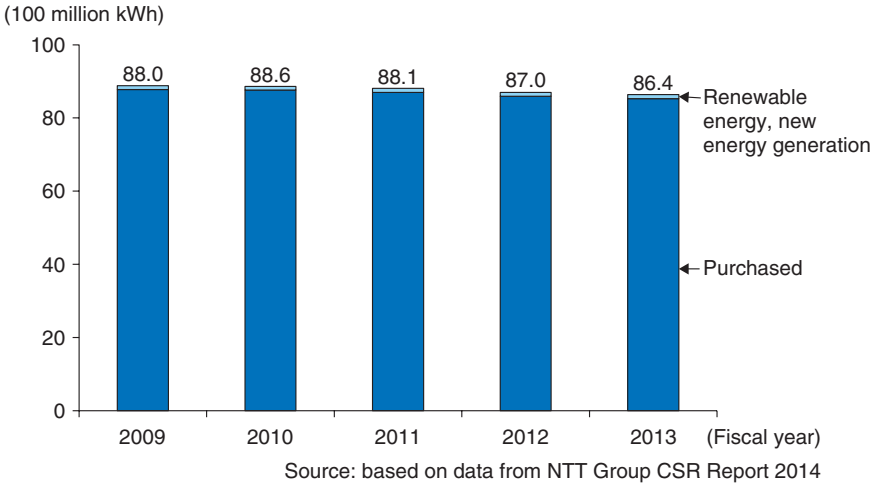

Fig. 1. Trend in power use by the NTT Group.

2. Six areas of technology related to environment and energy

The provision of ICT services requires a telecom infrastructure that comprises network equipment, air-conditioning systems, power supply equipment, access system equipment, and various other kinds of facilities. To reduce the environmental burden created by the telecom infrastructure, the Environment and Energy Technologies Committee was established in April 2013. (The name was changed to the Green and Sustainable Infrastructure Committee in November 2014.) The Committee serves as a strategic organization for cooperation among all facility-managing entities within the NTT Group, including the research laboratories and member companies, in the R&D of elemental technology in the six areas (**Fig. 2**) listed below.

(1) Power source related technology for raising the level of self-sufficiency and supplying power to network equipment
(2) Air-conditioning related technology for raising the energy efficiency of air conditioning systems for telecom buildings
(3) Technology for integrated operation of network equipment, power supply systems, and air-conditioning systems
(4) Technology for reducing power consumption, with network architecture and network equipment designed to contribute to overall network energy efficiency
(5) Green telecom infrastructure technology for resource conservation
(6) Technology for dealing with electromagnetic radiation, lightning, and other disturbances from the external environment.

These Feature Articles introduce R&D work on materials for energy production and storage [1] and high-voltage direct current (HVDC) power supplies [2, 3], which concern the first three items above. Other articles feature work on reducing power use of network equipment [4] and of optical access systems [5] (item 4), and work on conserving resources for the materials used in the telecom infrastructure [6] (item 5). We are also working on technology for quantitatively measuring the effects of ICT services on the environment [7].

3. Future development

NTT Energy and Environment Systems Laboratories has been collaborating with other NTT research laboratories and NTT Group companies through the Green and Sustainable Infrastructure Committee to develop technology for reducing the load placed on the environment by ICT services. We are continuously moving forward with R&D to improve energy efficiency and resource efficiency in the overall business activities of the NTT Group by responding rapidly to the needs of businesses and external trends.

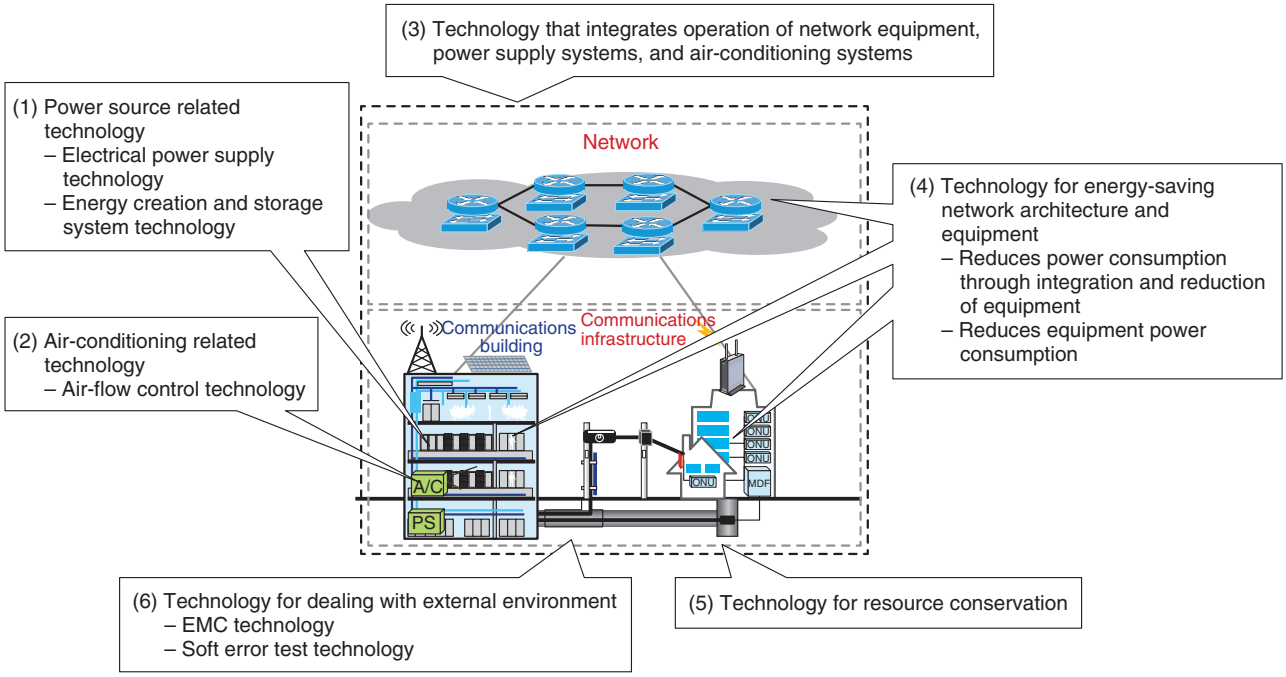

Fig. 2. Six areas of technology concerning energy and the environment.

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