Ecology Guideline (Draft)

For the
ICT Industry
(Version 1)

December 18, 2009
ICT Ecology Guideline Council

Ecology Guideline Contents

1. Background and Purpose

1.1 Background

In the face of global warming, Japan must take responsible action to reduce CO_2 emissions and the info-communications technology (ICT) industry needs to further strengthen its own voluntary efforts currently in effect.

As mentioned in the April 2008 Report Released by the "Study Group on ICT Policy for Addressing Global Warming (Ministry of Internal Affairs and Communications: MIC)," the use of ICT can dramatically increase efficiency in production, consumption and industrial activities and greatly contribute to the reduction of carbon emissions by replacing physical travel and easing traffic congestion. However, the growth in the scale of ICT services which are realized through configuring network equipment, servers, and other devices, and the resulting traffic volume have led to increased consumption of energy (electricity), translating into escalating CO_2 emissions.

To address this increase in CO_2 emissions, the MIC report released in June 2009 by its "Study Group on Ecological Measures in the Info-communications Industry" listed (i) the procurement of energy-efficient equipment by telecommunications services providers and (ii) making reductions in CO_2 emissions by telecommunications services providers more visible as two of the numerous effective measures in decreasing CO_2 emissions. It also sought the creation of a guideline by ICT associations with the cooperation of equipment vendors and other relevant entities, covering such topics as "assessment of CO_2 emissions by equipment," "labeling" and "Eco ICT Logo."

With the release of this MIC report, the five industry organizations: Telecommunications Carriers Association (TCA), Telecom Services Association (TELESA), Japan Internet Providers Association (JAIPA), Communications and Information network Association of Japan (CIAJ) and ASP・SaaS Industry Consortium (ASPIC) created the "ICT Ecology Guideline Council," (hereafter referred to as "Council") on June 26, 2009. The mission of the Council is to (1) determine an "assessment standard" for use in energy-efficient "procurement standards" of equipment and data center services by telecommunications services providers and (2) create a guideline for "establishing procurement standards" and a "self-assessment of actions" to indicate appropriate CO_2 reduction references for measures taken by individual telecommunications services providers.

1.2 Purpose

Curbing power consumption by the equipment used to provide services is an effective way for telecommunications services providers to reduce CO_2 emissions. To that end, it is appropriate for individual telecommunications services providers to establish "procurement standards" for buying telecommunications equipment and

services that emit lower amounts of CO_2.

Furthermore, telecommunications services providers need to endeavor to increase energy efficiency across the entire business spectrum. To further promote ecology-conscious actions by telecommunications services providers, individual companies need clear normative actions, and there needs to be a framework that simplifies assessment by a third-party.

In consideration of these factors, this Guideline sets forth points 1) and 2) below and by doing so, seeks to enhance ecology-conscious actions, such as efforts to reduce CO_2 emissions by telecommunications services providers.

(1) Guideline to establish procurement standards of energy-saving equipment

Indicate an "assessment standard" to assist the formulation of "procurement standards" by telecommunications services providers for equipment and services with a focus on the reduction of CO_2 emissions.

(2) Guideline for disclosing self-assessment of ecology-conscious actions

Prepare a framework for public disclosure that facilitates an understanding of the status of efforts to reduce CO_2 emissions, in order to show that telecommunications services providers are appropriately making such efforts. To that end, the Council will provide a Self-Assessment Checklist and "Logo for acting for ecology."

Furthermore, this guideline is a reference for telecommunications services providers in establishing voluntary procurement standards. It is possible that equipment deemed necessary by telecommunications services providers due to performance and functional requirements do not meet the energy-saving standards of this guideline.

2. Definitions

(1) Telecommunications services providers

Under this Guideline, an entity providing telecommunication services based on the Telecommunications Business Act is referred to as a telecommunications services provider. Moreover, the term is not limited to entities belonging to an industry organization.

(2) Vendor

Under this Guideline, "vendors" refer to all equipment manufacturers (including OEM businesses) but does not include businesses dealing solely in sales and distribution.

(3) Eco ICT Logo

A symbol for broadly disseminating to the public that self-assessment of CO_2 emission reducing and other ecologically conscious activities are being performed.

(4) Figure of merit

An index used to calculate the energy-saving effects of a device.

(5) Assessment result

A result of assessment.

(6) Normative reference

An assessment value that is the normative reference for determining the energy-saving effect. In this Guideline, it is a value determined by a rank of ★★ (two stars) on an assessment scale of five.

(7) Assessment scale

An assessment scale of five ranks used to facilitate the understanding of assessment regarding energy efficiency of equipment. Indicates rank by the number of stars (★). The greater the number of stars, the greater the energy efficiency.

(8) Self assessment checklist

A table of assessment items established by the Council to be used for self-assessment and public disclosure of ecology-conscious actions.

(9) Assessment standard based on the top runner method

Target reference values for energy conservation set forth under the Act on the Rational Use of Energy (hereinafter referred as the Energy Conservation Law).

3 Relative Positioning and Expected Impact

3.1 Scope

This guideline basically applies to telecommunications services providers but also considers serving as a reference for companies outside the scope of telecommunications services providers that are planning "procurement standards" or are engaged in broader efforts to reduce CO_2 emissions.

3.2 Policy

As stated in 1.2 Purpose, the policy of this Guideline is to (1) lay down guidelines for establishing a procurement standard of energy-saving equipment among telecommunications services providers and (2) lay down guidelines for self-assessment and disclosing ecology-conscious actions.

As for (1), laying down guidelines for establishing procurement standards of energy-saving equipment among telecommunication carriers, this Guideline sets forth:

- categories, relevant equipment and assessment standards that can be shared amongst the vendors and companies making the procurement; and
- directions for easy-to-understand notations to be used by those involved in procurement.

As for (2), laying guidelines for self-assessment and disclosing ecology-conscious actions, this Guideline proposes a:

- method of public disclosure using self-assessment checklists and "Eco ICT Logo."

3.3 Expectations for Respective Parties

By creating this Guideline, we expect the respective parties to take the following actions:

(1) Telecommunications services providers

[1] Establishment of Procurement Standards

Referring to the figure of merit and assessment standards provided in this Guideline for equipment and data centers, telecommunications services providers shall formulate their own procurement standards incorporating market trends and their respective business circumstances while allowing for safety and reliability considerations.

<*Image for use as reference*>

Company ABC's Procurement Standard (executed in FYxx)

In procuring materials, we at our company have clearly defined our stance to contribute to the creation of a sound material-cycle society and have established a procurement standard to further promote this effort.

1. Scope of equipment covered: ICT equipment and services
2. Procurement standard

For equipment listed in the "Ecology Guideline for ICT Industry," procurement decisions shall basically be made from among equipment with energy-saving ranking of [ ]stars or above.

For equipment not listed in the Guideline, the equipment with the lowest possible electric power consumption shall be procured.

[2] Indication of the "Eco ICT Logo"

Check the status of efforts and achievements in reducing CO_2 emissions and disclose those results using a "Eco ICT Logo," to show that telecommunications services providers are appropriately engaged in efforts to reduce CO_2 emissions.

(2) Vendors

[1] Indication of equipment assessment results

Vendors wishing to register energy-saving equipment covered by the scope of this Guideline with the Council must measure and evaluate the device in accordance to section 5.2 of this Guideline and notify the Council of the assessment results (assessment results and assessment scale ranking) so that the information can be publicly disclosed on the Council homepage.

(3) Data center operators

[1] Public disclosure of data

In relation to data center services, data center operators shall publicly disclose data relevant to energy-saving (such as PUE values, with measurement conditions) which would serve as a reference for procurement by telecommunications services providers.

3.4 Expected Impact

The relevant equipment and assessment standards indicated in this Guideline allow for the establishment of categories and assessment standards that can be shared by both vendors and the companies making the procurement, which benefits both sides to the extent it can eliminate inconsistencies in manufacturing and procurement. Furthermore, it is expected that as telecommunications services providers add energy-saving items to their procurement standards and actively install energy efficient equipment, which in turn will promote the development of energy efficient ICT equipment.

By formulating an assessment standard with the objective of saving energy, it is hoped that standardization bodies will conduct deliberations of low power-consuming technologies (such as technologies to control stand-by power of access equipment) at a faster pace.

3.5 Revisions

This guideline will require appropriate response to: changes in policy relating to global warming measures; the status of ICT service provision; penetration of equipment and the like; and technological advances. To that end, even after its establishment, this Guideline shall continue to be studied by the Council and:

- the scope of equipment covered shall be broadened, and
- review of the criteria, such as figure of merit and normative reference shall be made.

3.6 Notice of Disclaimer

(1) The Council shall not be liable for any damages resulting from the use of this Guideline incurred by any user of this Guideline.

(2) The Council shall not be held liable for any conflicts resulting from the use of this Guideline between the user of this Guideline and a third party (or third parties), in which case, it shall be the responsibility of the user of this Guideline and the third party (or third parties) to appropriately deal with the conflict.

4. Outline of the Guideline

4.1 "Assessment standards" for equipment covered (for details, see 5.2)

(1) Equipment covered in this Guideline and relevant values

* An assessment scale is designated for each equipment category based on normative references (refer to the following table and/or section 5.2).

Equipment category	Class	Equipment name	Figure of merit	Normative reference	Approximate date for realization of normative reference	Remarks
Broadband router[1] (without VPN function)	A	Wire-line router	Power consumption (W)[8]	4.0	End of FY2010	X2: 2.4 GHz wireless output (mW/MHz) X5: 5 GHz wireless output (mW/MHz) *Figure of merit and normative reference shall be compliant with top runner assessment standards.
	B	VoIP router		5.5		
	C	Wireless router (2.4 GHz)		0.10×X2+3.9		
		Wireless router (5 GHz)		0.15×X5+3.9		
		Wireless router (2.4 GHz + 5 GHz)		0.10×X2+0.15×X5+5.1		
	D	ADSL router		7.4		
	E	ADSL router w VoIP		7.4		
	F	wireless ADSL router		8.8		
L2 switch[2] (box type)	A	L2 switch (with SNMP management function and IP filtering function)	Power consumption (W)/ maximum effective transmission rate (Gbps) [9]	$(\alpha_n+P_n)/T$	End of FY2011	α_n : sum of power consumption of port and fixed power consumption P_n : additional power consumption of PoE T: maximum effective transmission rate n: sub-category (A, B, C, D) *Figure of merit and normative reference shall be compliant with top runner assessment standards.
	B	L2 switch (with SNMP management function, w/o IP filtering function)				
	C	L2 switch (with Web management function)				
	D	L2 switch (w/o administration function)				
Transport	WDM	DWDM device	Maximum	0.32	End of	Average power

equipment[3]		CWDM device	throughput (Gbps)/avg power consumption (W) [10]	0.48	FY2012	consumption = (power consumption at full wavelength + power consumption at one wavelength) / 2 *Figure of merit shall be compliant with ATIS references
PON equipment[4] (OLT)	GE-PON	OLT(AC power source)	Average power consumption(W)/ total number of lines[11]	0.46	End of FY2012	Average power consumption = (P100 + P50 + P0) / 3 Total number of lines = total number of IF ports X no. of PON branches
		OLT(DC power source)		0.42		
PON equipment[4] (ONU)	GE-PON	ONU(100Mbps)	Average power consumption (W) [12]	3.68	End of FY2012	Average power consumption = (P100 + P50 + P0) / 3
		ONU(1Gbps)		4.45		
Broadband base station equipment[5]	WiMAX	WiMAX base station (integrated 10W device (1 system))	∑Pn/{ Pidle×(1-α)+Pmax×α}[13]	12.60	End of FY2012	Pn: power transmission by aerial line terminal n (W) Pidle: supply-side power when there is no load (W) Pmax: supply-side power at maximum transmission (W) α: average daily down link transmission traffic rate.
		WiMAX base station (integrated 10W device (2 systems))		9.63		
		WiMAX base station (integrated 5W device (1 system))		5.84		
External power source[6]	AC adapter	AC adapter	Average conversion efficiency[14]	62.2+6.26ln(P_{no})	End of FY2011	Average conversion efficiency＝(η_{25}＋η_{50}＋η_{75}＋η_{100})／4 η_n: efficiency at n%load P_{no} : nameplate output (W) * Figure of merit shall be compliant with global efficiency agreements
Server[7]	Server	Server	<<For active state>> ∑ssj_ops/∑power consumption (W)/10[15]	100	End of FY2010	ssj_ops: processing capacity *Figure of merit shall be compliant with ATIS

			<<For idle state>> Average power consumption(W) in idle state and in low power mode/theoretical operation (MTOPS)	TBD	TBD	

[1] Broadband router
Routers which relay data using International Organization for Standardization (ISO) OSI (Open System Interconnection) layer 3 (network layer) using IP addresses included in the destination information of packets, and with an effective transmission rate of no more than 200 Mbps (no more than 100 Mbps for wireless routers).

[2] Layer 2 (L2) switch
Equipment which relays data on the network using International Organization for Standardization (ISO) OSI (Open System Interconnection) layer 2 (data link layer).

[3] Transport equipment
Equipment whose main task is to relay data on the network using International Organization for Standardization (ISO) OSI (Open System Interconnection) layer 1 (physical layer). This category includes WDM equipment, electric multiplexers and FC switches.

[4] PON equipment
A name for a category of optical access devices for building PON (Passive Optical Network) systems, including GE-PON, G-PON and 10GE-PON equipment

[5] Broadband base station equipment
A generic term for a category of radio base station equipment such as WiMAX base station or LET base station equipment.

[6] External power source
A device which provides electric power to the equipment and is physically separate and independent of the equipment.

[7] Server
A computer device comprising of a central processing unit (CPU), a main memory, an input/output control and a power source. It exists as part of a network to provide information and services to other computer devices. It is designed to use an operating system (OS) so that it can be installed with and run user applications.

[8] The power consumed at maximum effective transmission rate. The smaller the number, the greater the energy efficiency.

[9] The power consumed at maximum effective transmission rate. The smaller the number, the greater the energy efficiency.

[10] Maximum throughput at average power consumption (average power consumption of full wave length and 1 wave length). The greater the number, the greater the energy efficiency.

[11] Average power consumption (average power consumption at loads of 100%, 50% and 0%) per line. The smaller the number, the greater the energy efficiency.

[12] Average power consumption (average power consumption at loads of 100%, 50% and 0%). The smaller the number, the greater the energy efficiency.

[13] Transmission power (total per antenna) at average input power (average input power at loads of 100% and 0% when applying daily traffic rates). The greater the number, the greater the energy efficiency.

[14] Average conversion rate at loads of 100%, 75%, 50% and 25%. The greater the number, the greater the energy efficiency.

[15] Total power consumption at CPU loads of 0 through 100% vs. total processing capacity. The greater

the number, the greater the energy efficiency.

(2) Assessment scale for relevant equipment

[1] Broadband router (without VPN function)

Figure of merit: En=power consumption (W)

NR=normative reference

Assessment scale	Rate of reduction vs. power consumption at NR	Energy efficiency ratio by sub-category En（W）						Notes
		A	B	C	D	E	F	
★★★★★	n≧30%	E×0.7≧En						Normative reference E (W) per table under 5.2.1-1 (3) Normative References
★★★★	20%≦n＜30%	E×0.8≧En＞E×0.7						
★★★	10%≦n＜20%	E×0.9≧En＞E×0.8						
★★（NR）	0%≦n＜10%	E＝En＞E×0.9						
★	(NR not achieved)	E＜En						

[2] L2 switch (box type)

Figure of merit: En=energy consumption (W)/ maximum effective transmission rate (Gbps)

NR=normative reference

Assessment scale	Rate of reduction vs. power consumption at NR	Energy efficiency ratio per sub-category En（W）				Remarks
		A	B	C	D	
★★★★★	n≧30%	En≦E×0.7				Normative Reference E (W/Gbps) per table under 5.2.2-1 (3) Normative References
★★★★	20%≦n＜30%	Ex0.7<En≦E×0.8				
★★★	10%≦n＜20%	Ex0.8<En≦E×0.9				
★★（NR）	0%≦n＜10%	E×0.9<En≦E				
★	(NR not achieved)	En>E				

Note: Rate of reduction of power consumption vs. NR shall be comparable for equipment with similar maximum effective transmission rates.

[3] WDM

Figure of merit: TEER= maximum throughput (Gbps)/ average power consumption (W)

NR=normative reference

Assessment scale	Rate of reduction vs. power consumption at NR	Average power consumption for 800GbpsDWDM	Average power consumption for 40GbpsCWDM
★★★★★	n≧30%	P≦1,750	P≦58.4
★★★★	20%≦n＜30%	1,750＜P≦2,000	58.4＜P≦66.7
★★★	10%≦n＜20%	2,000＜P≦2,250	66.7＜P≦75.0
★★（NR）	0%≦n＜10%	2,250＜P≦2,500	75.0＜P≦83.3
★	(NR not achieved)	P＞2500	P＞83.3

[4] GE-PON

OLT figure of merit: E= average energy consumption (W)/ total no. of lines

ONU figure of merit: P= average energy consumption (W)

NR=normative reference

Assessment scale	Rate of reduction vs. power consumption at NR	Average power consumption for OLT (AC power source) (W)	Average power consumption for OLT (DC power source) (W)
★★★★★	n≧30%	E≦0.322	E≦0.294
★★★★	20%≦n＜30%	0.322＜E≦0.368	0.294＜E≦0.336
★★★	10%≦n＜20%	0.368＜E≦0.414	0.336＜E≦0.378
★★(NR)	0%≦n＜10%	0.414＜E≦0.46	0.378＜E≦0.42
★	(NR not achieved)	E＞0.46	E＞0.42

Assessment scale	Rate of reduction vs. power consumption at NR	Average power consumption for ONU (100 Mbps)	Average power consumption for ONU (1 Gbps)
★★★★★	n≧30%	P≦2.576	P≦3.115
★★★★	20%≦n＜30%	2.576＜P≦2.944	3.115＜P≦3.56
★★★	10%≦n＜20%	2.944＜P≦3.312	3.56＜P≦4.005
★★(NR)	0%≦n＜10%	3.312＜P≦3.68	4.005＜P≦4.45
★	(NR not achieved)	P＞3.68	P＞4.45

[5] WiMax base station equipment

Figure of merit: E= total transmission power (W)/average primary input power (W)

Assessment scale	Rate of reduction vs. power consumption at NR	Reference average power consumption (W) for integrated 10W equipment (single) (Note 1)	Reference average power consumption (W) for integrated 10W equipment (dual) (Note 1)
★★★★★	n≧30%	P≦111.09	P≦145.39
★★★★	20%≦n＜30%	111.09＜P≦126.96	145.39＜P≦166.16
★★★	10%≦n＜20%	126.96＜P≦142.83	166.16＜P≦186.93
★★(NR)	0%≦n＜10%	142.83＜P≦158.7	186.93＜P≦207.7
★	(NR not achieved)	P＞157.8	P＞207.7

Assessment scale	Rate of reduction vs. power consumption at NR	Reference average power consumption (W) for integrated 5W equipment (single) (W) (Note 2)	
★★★★★	n≧30%	P≦119.86	
★★★★	20%≦n＜30%	119.86＜P≦136.99	

★★★	10%≦n＜20%	136.99＜P≦154.11	
★★(NR)	0%≦n＜10%	154.11＜P≦171.2	
★	(NR not achieved)	P＞171.2	

Notes
1: When transmission output is 10.0 W X 2
2: When transmission output is 5.0 W X 2

[6] External Power Sources

Figure of merit: Average conversion efficiency $\eta=(\eta_{25}+\eta_{50}+\eta_{75}+\eta_{100})/4$

P_{no} : nameplate output (W)

Assessment scale	Rate of reduction vs. power consumption at NR	Average conversion efficiency η (See formula (＊))
★★★★★	n≧30%	$\eta \geqq 70.7+5.00\ln(P_{no})$
★★★★	20%≦n＜30%	$67.7+5.46\ln(P_{no}) \leqq \eta < 70.7+5.00\ln(P_{no})$
★★★	10%≦n＜20%	$64.8+5.88\ln(P_{no}) \leqq \eta < 67.7+5.46\ln(P_{no})$
★★(NR)	0%≦n＜10%	$62.2+6.26\ln(P_{no}) \leqq \eta < 64.8+5.88\ln(P_{no})$
★	(NR not achieved)	$\eta < 62.2+6.26\ln(P_{no})$

[7] Servers

<< Assessment standard for active state>>

Figure of merit: TEER = SPECpower_ssj2008value/10

= ∑ssj_ops/∑power consumption (W)/10

Assessment scale	Rate of reduction vs. power consumption at NR	TEER
★★★★★	n≧30%	TEER≧250
★★★★	20%≦n＜30%	166≦TEER＜250
★★★	10%≦n＜20%	125≦TEER＜166
★★(NR)	0%≦n＜10%	100≦TEER＜125
★	(NR not achieved)	TEER＜100

(Note): TEER (Telecommunications Energy Efficiency Ratio)

(Note): Comparison of the rate of reduction against power consumption at normative reference is possible among equipment with similar processing capacity (ssj_ops).

<< Assessment standard for idle state>>

Normative reference and assessment scale are to be determined.

4.2 Effort and Assessment Criteria for the "Eco ICT Logo"

(for details see 7.2)

<Mandatory items>

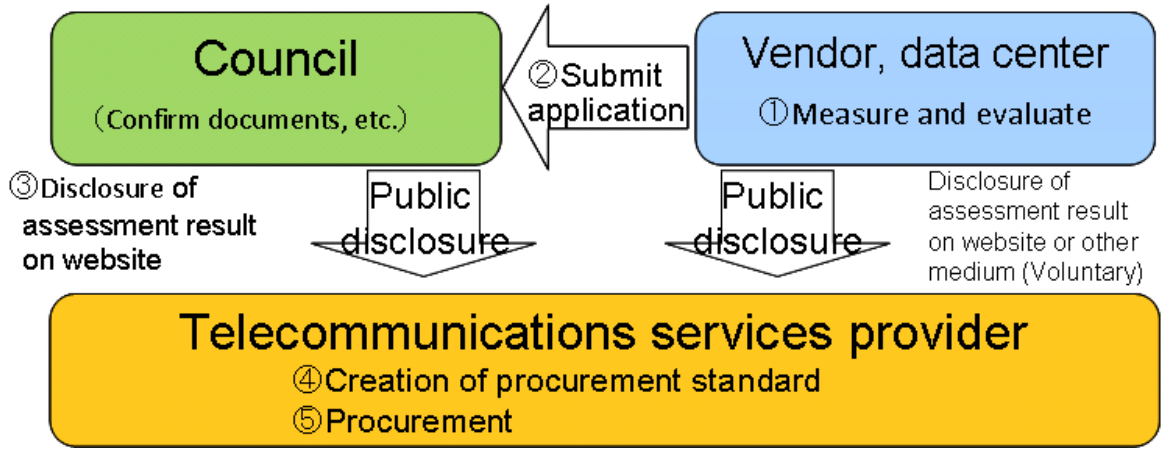
Type of effort		Assessment criteria
Preparation of a voluntary ecological action plan	1	Has a voluntary ecological action plan stipulating various efforts directed at reducing CO_2 emissions been created and is it being executed?
	2	Does the ecological policy include specific efforts stipulating numerical targets for the reduction of CO_2 emissions?
	3	Is the ecological policy documented and disseminated inside and outside of the company? Does the company carry out activities to inform and enlighten its employees? Is the company working to raise ecological awareness?
	4	Does the company disclose the individual activities listed in its voluntary ecological action plan along with implementation and achievement status to the general public?
Efforts relating to procurement	5	In regard to ICT equipment and data center services, has the company prepared a procurement standard that takes energy conservation into consideration? Is procurement carried out in accordance to the standard?
	6	Is the company cognizant of energy conservation in procuring office equipment, supplies and logistics (e.g., green purchasing)?
Promotion regime	7	In relation to efforts to reduce CO_2 emissions, has the company assigned a person or department responsible for such matters?
	8	Is there a regime in place using internal audits or other means to keep appropriate track of the implementation of measures and achievement of targets set forth in the voluntary ecological action plan?

<Recommended items>

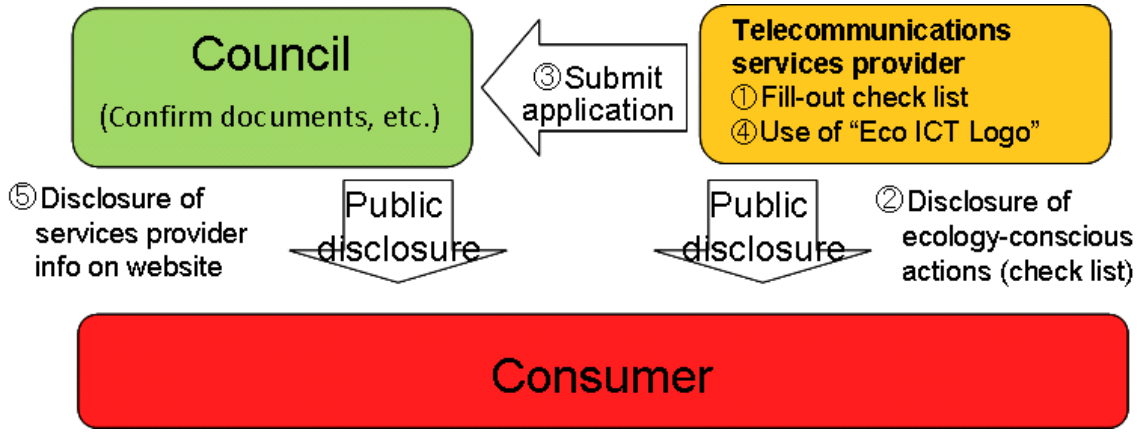
Other ecological activities	9	Are ecologically-friendly efforts being made other than activities to save energy?
	10	Is the company involved in ecological preservation activities in collaboration with local communities?

4.3 Image of Guideline Implementation

(1) Flow leading to public disclosure of assessment results by vendors and data centers as well as how procurement by telecommunications services providers would proceed.



(2) Flow of public disclosure of checklist and use of the "Eco ICT Logo" by telecommunications services providers.



5. Assessment Standards

5.1 Assessment standards

5.1.1 Scope

The scope of ICT equipment covered in this Guideline shall be equipment used mainly by telecommunications services providers to provide their services, covering network equipment, power equipment, server equipment and storage equipment. The addition and/or elimination of the equipment categorization and more detailed sub-categorizations shall be reviewed as deemed appropriate.

【Network equipment】

Equipment categorization	Sub-category	Equipment covered	Notes
Upper-layer equipment	TBD	TBD	
Large-sized routers	TBD	TBD	
Broadband routers（with VNP functions）	TBD	TBD	
Broadband routers （without VNP functions）	A（WAN：Ether、LAN：Ether）	Wire-line router	Equipment classifications and sub-categories shall be aligned with top runner assessment standard
	B（WAN：Ether、LAN：VoIP）	VoIP routers	
	C（WAN：Ether、LAN：wireless）	Wireless routers	
	D（WAN：ADSL、LAN：Ether）	ADSL routers	
	E（WAN：ADSL、LAN：VoIP）	ADSL routers with VoIP	
	F（WAN：ADSL、LAN：wireless）	Wireless compatibel ADSL routers	
L2 switch（chassis-type）	TBD	TBD	
L2 switch（box-type）	A（with SNMP management and IP filtering functions）	L2 switch	Equipment classifications and sub-categories shall be aligned with top runner assessment standard
	B（with SNMP management, w/o IP filtering functions）	L2 switch	
	C（With web or other management functions）	L2 switch	
	D（without web management functions）	L2 switch	
Transport equipment	WDM equipment	DWDM equipment	Equipment categorizations shall be aligned with ATIS
		CWDM equipment	Equipment categorizations shall be aligned with

			ATIS
PON equipment	GE-PON	OLT	
		ONU	
Broadband base station equipment	WiMAX	WiMAX base stations	
External power source	AC adaptors	AC adaptors	Excludes re-chargers

【Power equipment】

Equipment categorization	Sub-category	Equipment covered	Notes
UPS	TBD	TBD	
Rectifier equipment	TBD	TBD	

【Server equipment】

Equipment categorization	Sub-category	Equipment covered	Notes
Server equipment	Server equipment	Server equipment	Equipment categorizations of assessment standard for active state and idle state shall be aligned with ATIS and top runner method respectively

【Storage equipment】

Equipment categorization	Sub-category	Equipment covered	Notes
Storage equipment	TBD	TBD	

TBD：To be determined

5.1.2 Stance on other assessment standards

In regard to specific assessment standards for the equipment subject to this Guideline, in cases where appropriate standards covering practices by telecommunications services providers already existed, those existing standards were adopted. For equipment with no existing assessment standards, assessment standards for similar equipment were used as reference.

5.1.3 Considerations for error

Acceptable margins due to diversity among equipment covered will be addressed in the future.

5.2 Equipment Definitions, Figures of Merit, Normative References and Measurement Methods

5.2.1 Routers

5.2.1.1. Broadband router

(1) Equipment Definition

Among routers which relay data on ISO's OSI (Open System Interconnection) layer 3 (network layer) using IP addresses included in the destination information of packets, routers with an effective transmission rate of no more than 200 Mbps (no more than 100 Mbps for wireless routers) and:

- having no VPN (Virtual Private Network) functions; and
- having no more than two phone lines if equipped with VoIP (Voice over Internet Protocol) functions.

The following is the definition of effective transmission rate.

Non-wireless: the sum of down link and up link maximum transmission rates (bps) including overhead (control information)

Wireless: down link transmission rate (bps) including overhead (control information)

Broadband routers as defined by the Energy Conservation Law

Equipment Definition of Energy Conservation Law

Equipment for sending and receiving electronic telecommunication signals having the function of transmitting electronic telecommunication signals to a path determined to be the most appropriate depending on the state of each path etc. from among available paths to reach the destination equipment (limited to those used almost exclusively for the Internet; when having a communication terminal equipment connect to the Internet through a phone line, excluding those used to connect to the Internet by calling an Internet service provider to have the said communication terminal equipment connect to the Internet, and others set forth under Ministerial Ordinance Number 39 from the Ministry of Economy, Trade and Industry[*1]).

*1: Exclusions provided under Ministerial Ordinance Number 39 from the Ministry of Economy, Trade and Industry are as follows.

[1] Those that do not transmit/exchange Internet protocol packets

[2] In transmitting Internet protocol packets, those with the maximum value of the sum of the number of signal bits of the said packets exceeding 200Mbps/s (excluding those specified in 6))
(Those having an effective transmission rate exceeding 200Mbit/s)

[3] Those that do not allow asynchronous transfer mode equipment to be easily removed.

[4] Those having the function of impressing high-frequency current of 10kHz or higher.

[5] Those having at least three of those used for sending and receiving sound among connection ports for sending and receiving electric telecommunications signals (excluding those using Internet protocol)

[6] In transmitting Internet protocol packets wirelessly, those with the maximum value of the sum of the number of signal bits of the said packets exceeding 100Mbit/s

[7] Those having the function to use satellites

[8] Those having the function of transmitting 53 or more subcarrier frequencies by using orthogonal frequency division multiplexing method.

[9] Those having the function of setting a Virtual Private Network.

[10] Those designed to be built into an electronic computer or other item.

(2) Figure of Merit

Adopt the assessment standard based on the top runner method (Ministerial Notification No. 226 from the Ministry of Economy, Trade and Industry) for routing equipment specified in the Energy Conservation Law. Specific figures of merit are as follows.

Energy Efficiency ratio E: Power consumption P (W)

(3) Normative References

[1] Method for setting normative references

Adopt the assessment standard based on the top runner method for routing equipment specified in the Energy Conservation Law.

[Normative References]

Specific normative references are as follows.

Category			Energy efficiency ratio E(W)
Type of interface on WAN side	Type of interface on LAN side	Category name	
Ethernet only	Ethernet only	A	4.0
	Ethernet with VoIP	B	5.5
	Ethernet with wireless function	C	When transmitting wirelessly on 2.4GHz band only: E = 0.10×X2+3.9 When transmitting wirelessly on 5 GHz band only: E=0.15×X5+3.9 When transmitting the two frequencies mentioned above simultaneously: E=0.10×X2+0.15×X5+5.1
ADSL only	Ethernet only	D	7.4
	Ethernet with VoIP	E	7.4
	Ethernet with wireless function	F	8.8

Remarks

1: "WAN side" refers to the side of the port connected to a network such as the Internet. "LAN side" refers to the side of the port connected to other equipment.

2: E, X2 and X5 represent the following values:
E: Reference energy efficiency ratio (unit: W)
X2: 2.4 GHz wireless output (unit: mW/MHz)
X5: 5 GHz wireless output (unit: mW/MHz)

3: In subcategory C, for equipment capable of transmission after selecting wireless 2.4 GHz band or 5 GHz band, use the calculation formula for the frequency band with a higher effective transmission rate in (4) Measurement Methodology to calculate the value for the reference energy efficiency ratio.

[Approximate Timeline for Realizing the Normative References]

The end of Fiscal Year 2010 (adopted the target fiscal year per the standard on routing equipment (Ministerial Notification No. 226 from the Ministry of Economy, Trade and Industry), specified in the Energy Conservation Law),

[2] Assessment scale references

The rate of reduction versus the normative reference shall determine the threshold. In the assessment scale, the rank covering the normative reference shall be ★★.

Assessment scale	Rate of reduction vs. power	Energy efficiency ratio by category En (W)	Remarks

	consumption at NR	A	B	C	D	E	F	NR E (W) per table under (3) 1) Normative References
★★★★★	n≧30%	En≦E×0.7						
★★★★	20%≦n＜30%	E×0.7<En≦E×0.8						
★★★	10%≦n＜20%	E×0.8<En≦E×0.9						
★★ (NR)	0%≦n＜10%	E×0.9<En≦E						
★	(NR not achieved)	En>E						

(Note) In calculating energy efficiency ratio, calculate values to the first decimal place.

(4) Measurement Methodology

Measurement methods are as follows and coincide with those set forth under Ministerial Notification Number 226 from the Ministry of Economy, Trade and Industry, which sets forth, among other things, assessment standards for vendors in relation to the stipulations of the Energy Conservation Law for routing equipment.

[1] To measure energy efficiency, measure power consumption at maximum effective transmission rate. Conditions for measuring power consumption and maximum effective transmission rate are as follows.

(a) The maximum value of the sum of the number of packets per second output to the WAN side and the number of packets per second output to the LAN side.

(b) A 1,500 byte packet shall be transmitted for measurement. However, if the transmission of a 1,500 byte packet is not possible, use the maximum packet length.

(c) Use IP packets for unicast transmission.

(d) The data pattern of the header section is arbitrary. Use 0 for all data patterns of the packet to be measured.

(e) When measuring power consumption, it shall be acceptable to transmit the minimum packet suited to the maximum effective transmission rate of the router.

(f) Enable routing of packets received by the router. Routing is the relay of data to a destination determined by the IP address on a network using the third layer (network layer) of a model indicated in the Basic Reference Model 6 of Open Systems Interconnection stipulated in Japan Industrial Standard X5003. Upon performing the relay, the TTL value, which is the header information associated with an IP address, shall be decremented and relayed to a different data link.

(g) Removable components and functions that can be disabled without sacrificing the basic performance and functioning of the router shall be removed or disabled, respectively, for the measurement.

(h) Ports not involved in the measurement can be linked down.

(i) The peripheral temperature shall fall within the range of 16 to 32°C. However, for wireless routers the range shall be 0 to 40°C.

(j) Power voltage shall be within the range of +/-10% of rated input voltage (100V or 200V).
(k) Use rated frequency for AC power source frequency.
(l) Conduct measurements with the router in a stationary state.
(m) For products using an AC power source, measure power consumption at the power plug.
(n) In the case of AC power, use effective power as power consumption.

[2] Use the following conditions for routers with wireless functions
(a) Wireless transmission direction shall be from the WAN side to the LAN side.
(b) If there are multiple wireless LAN interfaces capable of operating simultaneously, operate them simultaneously.
(c) Use a configuration that disables functions such as data compression and output power adjustment.
(d) Use maximum link speed of the router.
(e) Use packet generators as measurement equipment to measure wireless LAN routers.

5.2.2 Switching Equipment

5.2.2.1. Layer 2 (L2) Switches (box type)

(1) Equipment Definition

Among equipment which relays data on the network using ISO's OSI (Open System Interconnection) layer 2 (data link layer) using the MAC address included in the destination information of the packet and is a box type having three or more communication ports.

Equipment Definition in Energy Conservation Law

Equipment for sending and receiving electronic telecommunication signals having the function of transmitting electronic telecommunication signals to a path determined separately for each destination from among two or more paths capable of transmission (limited to those used almost exclusively for the Internet; however excluding those capable of wireless telecommunication and others set forth under Ministerial Ordinance Number 39 from the Ministry of Economy, Trade and Industry[*1]).

*1: Exclusions provided under Article 48(21) of Ministerial Ordinance Number 39 from the Ministry of Economy, Trade and Industry (exclusions from specified equipment) are as follows.

[1] Those that do not transmit and switch Ethernet frames
[2] Those that transmit and switch Internet protocol packets
[3] Those with connection ports for sending and receiving electric telecommunications signals having at least half of the connection ports utilize a two line connection
[4] Those designed to be built into a housing, electronic computer or other item.
[5] Those for controlling equipment that relay electrical telecommunications signal wirelessly
[6] Those set forth by the Minister of Economy Trade and Industry that are primarily for supplying power.

(2) Figure of merit

Adopt the assessment standard based on the top runner method for switching equipment (Ministerial Notification No. 227 from the Ministry of Economy, Trade and Industry), which are identified as specified equipment in the Energy Conservation Law.

Energy efficiency E = power consumption/maximum effective transmission rate (W /Gbps)

(3) Normative References

[1] Method for deciding Normative References

Adopt the assessment standard based on the top runner method for switching equipment, which are identified as specified equipment in the Energy Conservation Law.

[Normative References]

Specific normative references are as follows.

However, the normative references do not apply to models with P_d/P_{SA}, P_d/P_{SB}, P_d/P_{SC} or P_d/P_{SD} in excess of 16, per the following.

Category				Normative Reference: Standard energy efficiency ratio (W/Gbps)
Management functions	Type of management functions	IP filtering functions	Category name	
With management functions	With SNMP functions	With IP filtering functions	A	$E=(\alpha_A+P_A)/T$
		No IP filtering functions	B	$E=(\alpha_B+P_B)/T$
	With Web management and other management functions		C	$E=(\alpha_C+P_C)/T$
No management functions			D	$E=(\alpha_D+P_D)/T$

Remarks

1: "Management functions" refers to functions for a network manager to acquire such information as network components and telecommunications status for the purpose of operating the network efficiently.

2: Values for α_A, α_B, α_C and α_D shall be calculated using the following formula.

$\alpha_A=0.578 \times X1 + 1.88 \times X2 + 15.9 \times X3+\beta_A$

$\alpha_B=0.375 \times X1 + 1.88 \times X2 + \beta_B$

$\alpha_C=0.375 \times X1 + 1.133 \times X2 + \beta_C$

$\alpha_D=0.272 \times X1 + 1.133 \times X2 + \beta_D$

The value for α_A, α_B, α_C or α_D shall be 3 in cases where the equipment has only a 100 Mbps port, or where the equipment has a 100 Mbps port and a 1 Gbps port and the value for α_A, α_B, α_C and α_D is less than 3. Furthermore, the value for α_A, α_B, α_C or α_D shall be 4.5 in the event the equipment has only a 1Gbps port and the value for α_A, α_B, α_C or α_D is less than 4.5.

3: The value for X1 is the number of ports (unit: number of ports) with a line speed of

100 Mbps. The value for X2 is the number of ports (unit: number of ports) with a line speed of 1 Gbps. The value for X3 is the number of ports (unit: number of ports) with a line speed of 10 Gbps.

4: Use the values provided in the following table for β_A, β_B, β_C and β_D based on the appropriate categorization.

	β_A	β_B	β_C	β_D
Has only a 100Mbps port	3.976	3.4	3.4	0.824
Has only a 1Gbps port	9.94	−5.07	−2.074	−2.074
Has only a 10Gbps port	0	0	0	0
Has a 100Mbps port and one 1 Gbps port	2.276	1.7	2.447	1.494
Has a 100Mbps port and two 1 Gbps ports	0.576	0	1.494	1.494
Has a 1Gbps port and a 10Gbps port	-10.24	0	0	0

5: The values for P_A, P_B, P_C and P_D shall be calculated using the following formula.

$P_A = (0.0347 \times P_d / P_{SA}) / (1 - 0.0347 \times P_d / P_{SA}) \times \alpha_A$

$P_B = (0.0347 \times P_d / P_{SB}) / (1 - 0.0347 \times P_d / P_{SB}) \times \alpha_B$

$P_C = (0.0347 \times P_d / P_{SC}) / (1 - 0.0347 \times P_d / P_{SC}) \times \alpha_C$

$P_D = (0.0347 \times P_d / P_{SD}) / (1 - 0.0347 \times P_d / P_{SD}) \times \alpha_D$

6: The values for P_{SA}, P_{SB}, P_{SC} and P_{SD} shall be calculated using the following formula.

$P_{SA} = \alpha_A \times 0.85 + 1$

$P_{SB} = \alpha_B \times 0.85 + 1$

$P_{SC} = \alpha_C \times 0.85 + 1$

$P_{SD} = \alpha_D \times 0.85 + 1$

7: P_d represents the value for maximum power supply (unit: W) for power over Ethernet. If the equipment has no power over Ethernet function, use 0.

8: T represents the value for maximum effective transmission rate (unit: Gbps) when the frame length is 1,518 bytes.

[Approximate Timeline for Realizing the Normative References]

End of Fiscal Year 2011 (adopted the target fiscal year per the standard on switching equipment (Ministerial Notification No. 227 from the Ministry of Economy, Trade and Industry), specified in the Energy Conservation Law)

[2] Assessment scale references

Set a threshold for the improvement rate versus the energy efficiency of normative reference. In assessment scale, the rank including normative reference shall be ★★.

Assessment scale	Rate of reduction vs. power consumption at NR	Energy efficiency ratio by category En (W/Gbps)				Remarks
		A	B	C	D	
★★★★★	n≧30%	En≦E×0.7				Normative Reference E (W/Gbps) per table under (3) Normative References
★★★★	20%≦n＜30%	Ex0.7<En≦E×0.8				
★★★	10%≦n＜20%	Ex0.8<En≦E×0.9				
★★(NR)	0%≦n＜10%	E×0.9<En≦E				
★	(NR not achieved)	En>E				

(Note) In calculating energy efficiency, drop digits beyond the first decimal point.

(Note) Rate of reduction of power consumption vs. NR shall be comparable for equipment with similar maximum effective transmission rates.

(4) Measurement Methodology

Measurement conditions are as follows in consideration of the contents of Ministerial Notification Number 227 from the Ministry of Economy, Trade and Industry, which sets forth judgment standards, among other things, for manufacturers of switching equipment based on the stipulations of the Energy Conservation Law.

[1] For energy efficiency, use the value resulting from dividing the value expressed in W, representing power consumption during maximum effective transmission rate when the frame length to be measured is 1,518 bytes, by a value expressed in Gbps, representing the aforementioned effective transmission rate.

[2] Conditions for measuring power consumption and maximum effective transmission rate are as follows.

(a) The value for maximum effective transmission rate is calculated using the following formula.

$$T = R \times (L+20) \times 8$$

In this formula, T, R and L represent the following values.

T: Maximum effective transmission rate when the frame length is 1,518 bytes

R: The total number of frames output per second from all ports

L: Frame length (unit: bytes)

(b) Set switch so as to perform switching of received frames. Switching is the relay of data on a network using the second layer (data link layer) of a reference model indicated in Basic Reference Model 6 of Open Systems Interconnection stipulated in Japan Industrial Standard X5003. Specifically relay is performed referring to the MAC address.

(c) Use a frame for unicast transmission.

(d) The data pattern of the header section is arbitrary. Use 0 for all data patterns of the frame to be measured.

(e) Measurement dependent on type of cascade connection at the ports are permissible. In such cases, calculate maximum effective transmission rate considering the number of cascade-connected ports.

(f) When measuring energy efficiency ratio, it is acceptable to transmit the minimum frames required according to the maximum effective transmission rate of the switch.

(g) Components that can be removed and functions that can be disabled without sacrificing the basic performance and functioning of the switch shall be removed or disabled, respectively, for the measurement.

(h) Ports not used in the measurement can be linked down.

(i) The peripheral temperature shall fall within the range of 16 to 32°C.
(j) Power voltage shall be within the range of +/-10% of rated input voltage (100V or 200V) if the power source is AC and within the range of DC-57V to DC-40.5V if the power source is DC.
(k) Use rated frequency for AC power source frequency.
(l) Conduct measurements with the switch in a stationary state.
(m) For products using an AC power source, measure power consumption at the power plug terminal.
(n) In the case of AC power, use effective power as power consumption.

5.2.3 Transport Equipment

5.2.3.1. WDM Equipment

(1) Equipment Definition

- WDM equipment is a product that performs info-communication functions over a single fiber-optic cable by multiplexing multiple optic signals of different wavelengths.
- WDM equipment from recent years may include devices that integrate OSI reference models from the second (data link) layer to the third (network) layer. Due to the difficulty of defining a standard device configuration, here WDM equipment refers to devices having only the OSI first (physical) layer mounted.
- This guideline applies to WDM equipment used in terrestrial systems. Submarine systems are exempt. Furthermore, relay equipment is exempt because relay equipment consumes less power compared to terminal equipment.

[Functional Configuration Subject to This Guideline]

WDM equipment is categorized as follows based on WDM multiplexing method, OADM function and OADM method.

WDM multiplexing method	OADM function (Note 1)	OADM method	Classification	
DWDM (Note 2)	Yes	Fixed	①	DWDM with Fixed OADM
		Reconfigurable	②	DWDM with ROADM
	No	−	③	DWDM (Point-Point)
CWDM (Note 3)	Yes	Fixed	④	CWDM with Fixed OADM
		Reconfigurable	⑤	CWDM with ROADM
	No	−	⑥	CWDM (Point-Point)

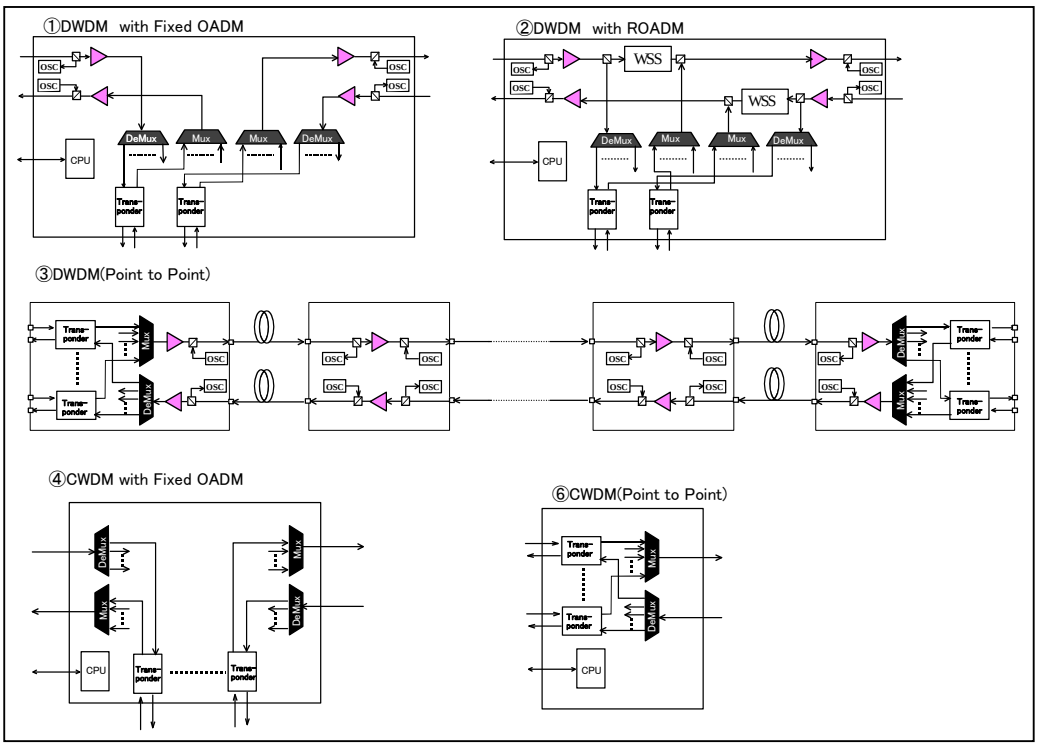
Notes

1: Point-Point optical multiplexing/demultiplexing is considered to be included within OADM functions, but categories are expressed in terms of with or without OADM.
2: DWDM (Dense Wavelength Division Multiplexing): the number of wavelength

multiplexing is mainly no less than 32ch. Primarily used in backbone and metro core networks.

3: CWDM (Coarse Wavelength Division Multiplexing): the number of wavelength multiplexing is mainly no more than 16ch. Primarily used in metro access and parts of metro core.

Among the above categories, 2) DWDM with ROADM and 6) CWDM (Point-Point) are subject to this Guideline, both of which are expected to exhibit energy-saving impact and for which future demand is forecast.



(2) Figures of merit

Use the figure of merit TEER (Telecommunications Energy Efficiency Ratio) (Note 1) for transport equipment stipulated by ATIS (Alliance for Telecommunications Industry Solutions), as follows.

$$TEER_{CERT} = D_{TEER} / P_{TEER\text{-}CERT}$$
$$= \Sigma Di / (P_{CERT\text{-}0} + P_{CERT\text{-}50} + P_{CERT\text{-}100})/3$$

$TEER_{CERT}$: Certified TEER measured at a specific configuration (Note 2)
D_{TEER}: Total data rate (bps)
$P_{TEER\text{-}CERT}$: Measured power consumption (W)
Di: Data rate (bps) at a given interface i
$P_{CERT\text{-}0}$: Measured power consumption (W) at a 0% data usage rate
$P_{CERT\text{-}50}$: Measured power consumption (W) at a 50% data usage rate
$P_{CERT\text{-}100}$: Measured power consumption (W) at a 100% data usage rate
(Note 1): ATIS-0600015.2009: General TEER base standard

(Note 2): ATIS-0600015.02.2009: Transport product category TEER

This figure of merit applies not only to WDM equipment but also to "transport equipment" including SONET/SDH equipment and the like.

<For WDM Equipment>

DWDM figure of merit: TEER = maximum throughput (Gbps) / average power consumption (W)
CWDM figure of merit: TEER = maximum throughput (Gbps) / average power consumption (W)

Note: Calculate average power consumption = (power consumption at full wavelength + power consumption at one wavelength) / 2.
Peak throughput is total throughput at full wavelength.

In WDM equipment, unlike packet interface cards, it is common for operations to guarantee 100% transport constantly; therefore,

$P_{CERT-0} = P_{CERT-50} = P_{CERT-100.}$

Thus, $TEER_{CERT}$ in WDM equipment under ATIS is substantially as follows.

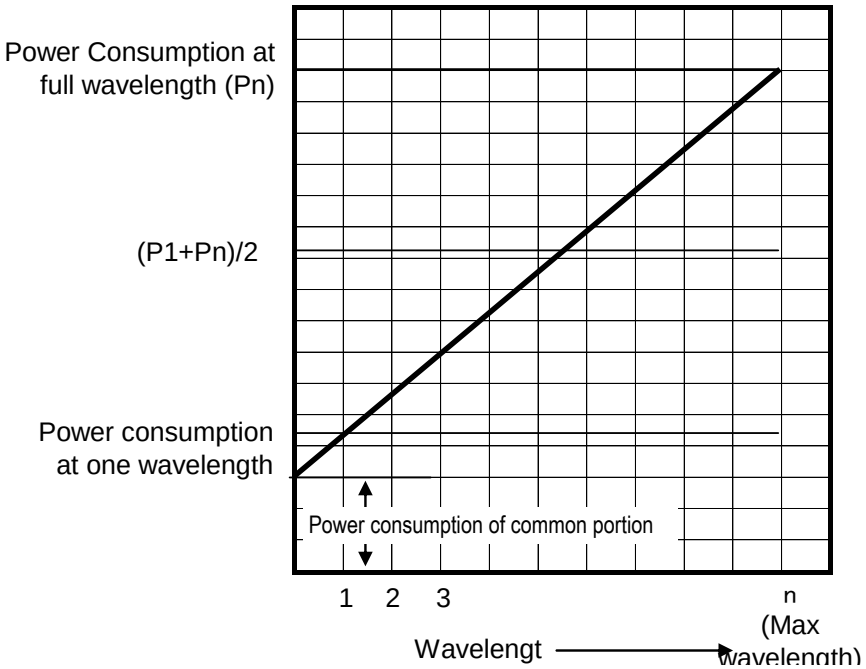
$TEER_{CERT} = D_{TEER} / P_{TEER-CERT}$

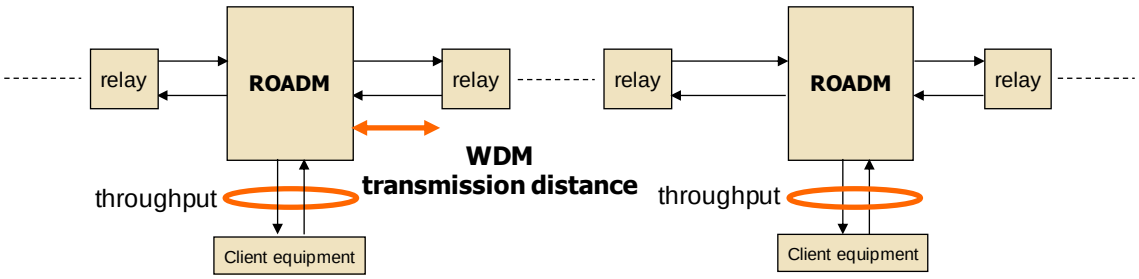
= maximum transmission capacity / power consumption when configured for maximum transmission capacity

(This is provided as a ROADM system example for ATIS-0600015.02.2009.)

In evaluating the power consumption of equipment, measure power consumption at one wavelength and at full wavelength, so as to provide visibility into low power consumption in common portions such as the optical amplifier and the optical multiplexer/demultiplexer, and use the following for average power consumption.

Average power consumption = (power consumption at full wavelength + power consumption at one wavelength) / 2





Given that equipment configuration differs by vender, it is preferable to use the following parameters, which rely largely on power consumption and enable stipulation through external interface.

Total throughput on client side.

Transmission distance of a section (Use 0.25dB/km)

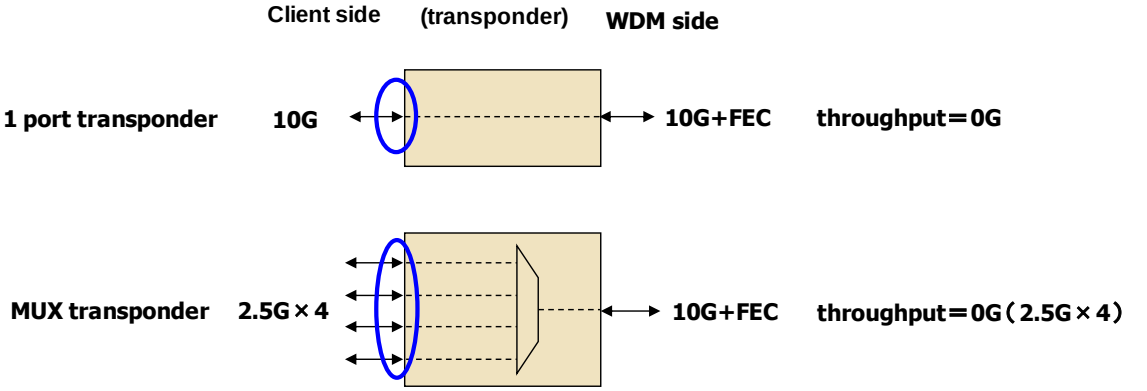
Generally, it is believed power consumption rises with an increase in these parameters. However, in the case of DWDM, the increase in power consumption in relation to transmission distance of a section is believed to be small in light of the overall proportion.

For that reason, use as a metric value that results from dividing maximum throughput value by average power consumption and do not consider transmission distance of a section.

[Definition of Throughput]

Throughput is defined as the total effective client signal rate (converted to a single direction) passing through the device (does not include FEC closed and added within WDM).

Example of throughput by transponder type



(3)

(3) Normative References

[1] Method for determining normative references

Normative references for DWDM and CWDM equipment shall be values derived by adding enhancements accounting for technological trends to average metric values based on products shipped in Fiscal Year 2008 (CIAJ survey).

[Normative References]

DWDM equipment: 0.32 Gbps/W

CWDM equipment: 0.48 Gbps/W

[Approximate Timeline for Realizing the Normative References]

End of Fiscal Year 2012

[2] Assessment scale references

The reduction rate versus the normative reference shall determine the threshold. In the assessment scale, the rank covering the normative reference shall be ★★.

Reference example 1) Average power consumption for normative reference for 800 Gbps DWDM equipment is 2,500 W.

Reference example 2) Average power consumption for normative reference for 40 Gbps CWDM equipment is 83.3 W.

Assessment scale	Rate of reduction vs. power consumption at NR	Average power consumption for 800GbpsDWDM	Average power consumption for 40GbpsCWDM
★★★★★	n≧30%	P≦1,750	P≦58.4
★★★★	20%≦n<30%	1,750W<P≦2,000	58.4W<P≦66.7

★★★	10%≦n<20%	2,000W<P≦2,250	66.7W<P≦75.0W
★★(NR)	0%≦n<10%	2,250W<P≦2,500	75.0W<P≦83.3
★	Did not achieve NR	P>2500	P>83.3

(Note) In calculating power consumption, drop digits beyond the first decimal point.

(4) Measurement Methodology

[1] Measurement configuration

(a) Subject: 1 piece of equipment (not in units of frames or shelves)

(b) Mounting: Configure and equip with function blocks to maximize throughput

(c) Power source: Redundant configuration (DC)

(d) Optic cable connection:

> All mounted within device

> Corresponds to measuring equipment on client side

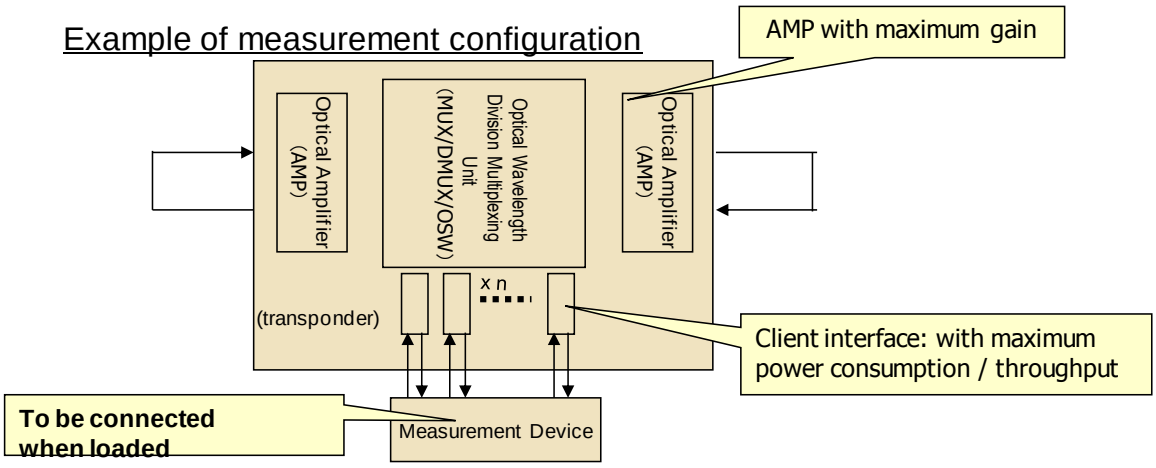
> Corresponds to return path of transmission

(e) Basic configuration

> Use Ring for DWDM with ROADM

>Use point to point for CWDM

Example of measurement configuration



[2] Measurement conditions

(a) Ecological conditions: Temperature of 25°C +/-5°C (no stipulations for humidity or air pressure)

(b) Measurement precision: +/- 1%

(c) Test voltage: -48V +/- 1V in DC

(d) Slot mounting: Full mounting (use maximum mounting regardless of redundancy)

- Maximum mounting refers to the state that maximizes equipment throughput.
- Where different types of optical amps exist, equip with that which provides maximum distance of a span.
- Mount all cables

(e) Load conditions:
> 1 wave (minimum wavelength count but maximum bandwidth)
> Full wavelength (maximum bandwidth)

(f) Points to note in testing: Run for 15 continuous minutes under stipulated conditions to stabilize before beginning measurement.

5.2.4 PON Equipment

5.2.4.1. GE-PON Equipment

(1) Equipment Definition

[Common Items]

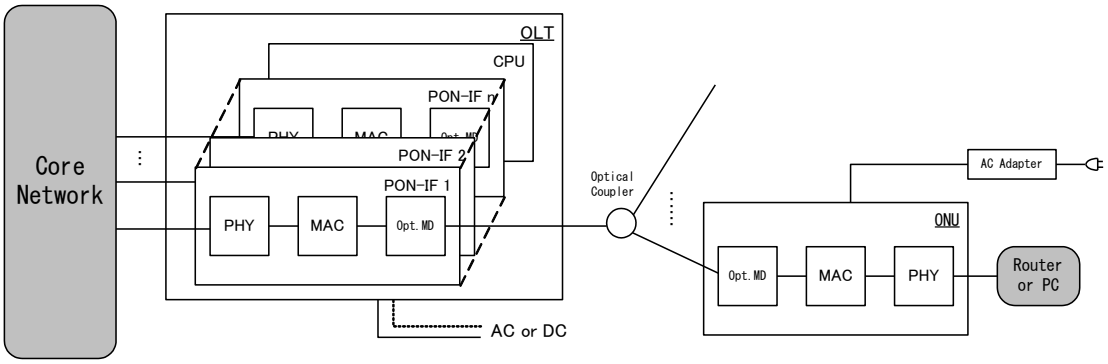
Ethernet PON equipment in compliance with or an extension of IEEE802.3ah, providing a maximum transmission rate of 1 Gbps.

OLT (Note 1)

- Power source specifications (AC or DC)
- No line concentrator functions (Note 2)

ONU (Note 3)

- Power source specifications (AC) (Note 4)
- Standalone functions only. Compound functions not included. (Note 5)
- UNI type (100 Mbps or 1 Gbps)



Notes

1: NNI I/F and the number of ports not stipulated. QoS and functions such as priority control not stipulated. Number of branches also not stipulated.

2: OLT applies for the domestic carrier market. If the OLT has functions other than PON (such as line concentrator functions), disable those functions before taking measurements.

3: UNI I/F and the number of ports not stipulated. QoS and functions such as priority control not stipulated.

4: ONU applies to the domestic consumer market. AC adapter power supply is standard for ONU domestic consumer market.

5: If the ONU has multiple functions, disable those functions before taking measurements.

(2) Figures of merit

- For OLT, use a value that divides average power consumption for the OLT (at full mounting), measured using DC input if the product power source is DC and AC input if the power source is AC, by the total number of lines (Total number of IF ports x number of PON branches).

  OLT figure of merit: E = average power consumption (W)/total number of lines

- For ONU, use ONU average power consumption measured on the supply side of the AC adapter.

  ONU figure of merit: P = average power consumption (W)

  Note:
  Average power consumption = (power consumption at 100% load + power consumption at 50% load + power consumption at 0% load) / 3
  Total number of lines = total number of IF ports x 32

The above metrics shall be used as figure of merit not only for GE-PON, but also for "PON Equipment" including G-PON and 10G-PON.

(3) Normative References

[1] Method for deciding Normative References

Normative references for OLT and ONU shall be values derived by adding enhancements based on technological trends to average metric values based on products shipped in Fiscal Year 2008 (CIAJ survey).

[Normative References]
OLT: 0.46 W (AC) or 0.42 W (DC)
ONU: 3.68 W (100Mbps) or 4.45 W (1Gbps)

[Approximate Timeline for Realizing the Normative References]
End of Fiscal Year 2012

[2] Assessment scale references

The reduction rate versus the normative reference shall determine the threshold. In the assessment scale, the rank covering the normative reference shall be ★★.

Average power consumption for OLT normative references: 0.46 W (AC power supply) or 0.42 W (DC power supply)

Average power consumption for ONU normative references: 3.68 W (100 Mbps) or 4.45 W (1 Gbps).

OLT Power Consumption Values

Assessment scale	Rate of reduction vs. power consumption at NR	Average power consumption for OLT (AC power source) (W)	Average power consumption for OLT (DC power source) (W)
★★★★★	n≧30%	E≦0.322	E≦0.294
★★★★	20%≦n＜30%	0.322W＜E≦0.368	0.294W＜E≦0.336
★★★	10%≦n＜20%	0.368W＜E≦0.414	0.336W＜E≦0.378
★★(NR)	0%≦n＜10%	0.414W＜E≦0.46	0.378W＜E≦0.42
★	Did not achieve NR	E＞0.46	E＞0.42

(Note) In calculating power consumption, drop digits beyond the third decimal point.

ONU Power Consumption Values

Assessment scale	Rate of reduction vs. power consumption at NR	Average power consumption for ONU (100 Mbps)	Average power consumption for ONU (1 Gbps)
★★★★★	n≧30%	P≦2.576	P≦3.115
★★★★	20%≦n＜30%	2.576＜P≦2.944	3.115＜P≦3.56
★★★	10%≦n＜20%	2.944＜P≦3.312	3.56＜P≦4.005
★★(NR)	0%≦n＜10%	3.312＜P≦3.68	4.005＜P≦4.45
★	Did not achieve NR	P＞3.68	P＞4.45

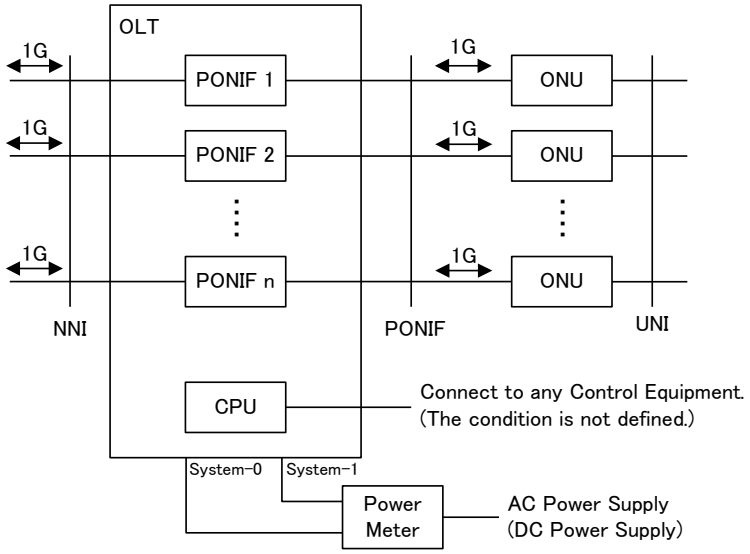
(Note) In calculating power consumption, drop digits beyond the third decimal point.

(4) Measurement Methodology

[1] Measurement configuration

[OLT]

For OLT, use 1 Gbps for both the NNI side and the PON side and use the following three settings for load factor. Furthermore, in stipulating load factor, the load factor specified by data entry side shall be used (NNI or UNI).



100% load factor: a state where 64 byte frames flow continuously (without interruption).
50% load factor: the state where 512 byte frames flow 50%.
0% load factor: the state where frames are not flowing.

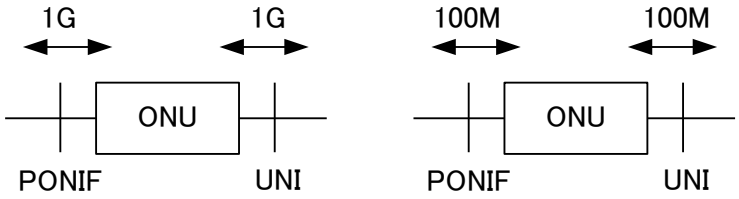
[ONU]

For ONU, carry out measurements using configurations (a) and (b). As in the case of OLT, apply three load factor settings.

(a) 1 Gbps on PON side, 1 Gbps on UNI side

(b) 100 Mbps on PON side, 100 Mbps on UNI side

Furthermore, in stipulating load factor, as in the case of OLT, it shall be acceptable to use the load factor specified by data entry sites (NNI or UNI).



[2] Measurement conditions

(a) Temperature: room temperature (around 25°C +/- 5°C)

(b) Humidity: no stipulation

(c) Air pressure: no stipulation

(d) Power supply conditions:

Using AC voltage: AC 100 V +/- 10%

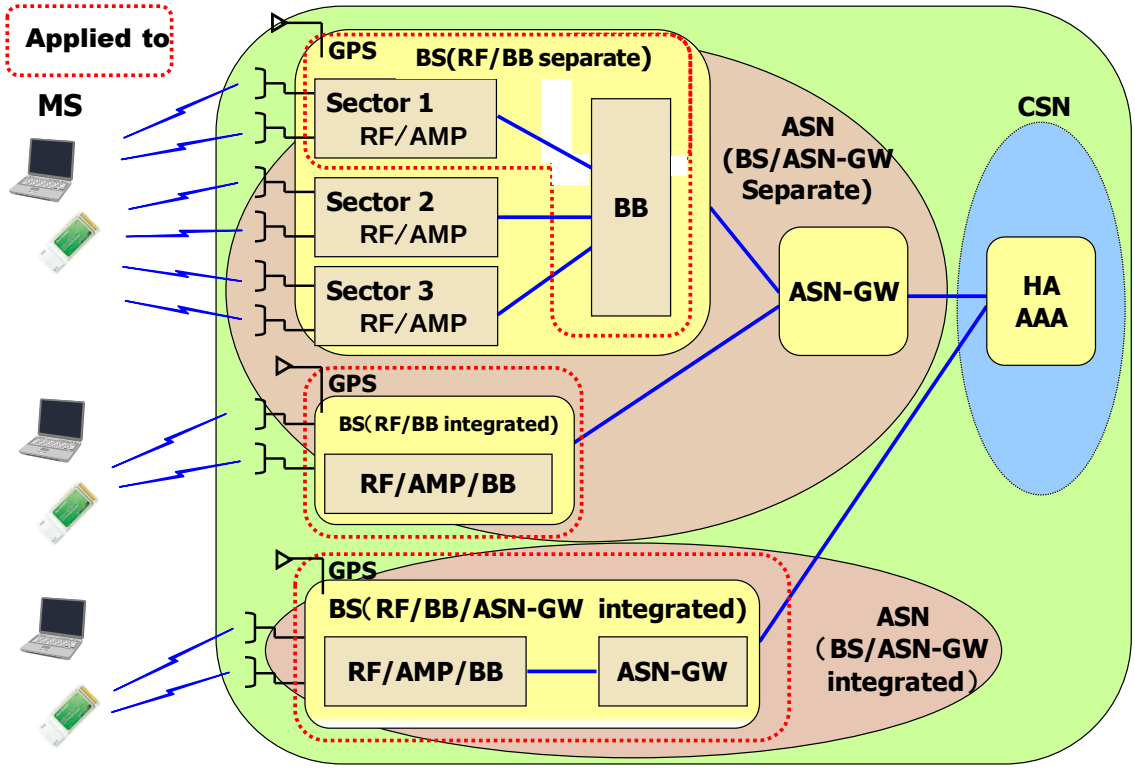
Using DC voltage: DC -48 +/- 1 V

5.2.5 Broadband Base Station Equipment

5.2.5.1. WiMAX™ Base Station Equipment

(1) Equipment Definition

- Mobile WiMAX base station equipment in compliance with IEEE802.16e.
- Applies to BS (Base Station, WiMAX base station) only and does not include MS (Mobile Station, WiMAX subscriber device) and higher ranked core network equipment.
- BS equipment takes the following three configurations.
  [1] RF (radio frequency) and BB (baseband) separate.
  [2] RF and BB integrated.
  [3] RF and BB integrated with ASN-GW (Access Service Network Gateway).



Notes
AAA: Authentication, Authorization, and Accounting; AMP: Amplifier; ANT: Antenna;
ASN: Access Service Network; ASN-GW: Access Service Network Gateway;
BB: Base Band; BS: Base Station、WiMAX base station;
CSN: Connectivity Service Network;
GPS: Global Positioning System
HA: Home Agent;
MS: Mobile Station、WiMAX subscriber device ;
RF: Radio Frequency

[Common Equipment Specifications and Equipment Configurations]

Equipment specifications/ configuration	Item name	Specifications
Equipment specifications	Frequency band	2,595MHz - 2,625MHz or 2,582MHz - 2,592MHz
	Signal bandwidth	10MHz
	Duplex operation	TDD
	Wireless access system / modulation system	SOFDMA／QPSK, 16QAM, 64QAM (※) ※64QAM is down link only
	FFT size	1024
	UL/DL frame ratio	DL/UL ： (29:18)
	Segmentation	N/A
	Inter-base station synchronization system	GPS
Equipment configuration	Antenna configuration	MIMO Matrix-A or Matrix-B(2TX+2RX)

Notes:

SOFDMA: Scalable Orthogonal Frequency Division Multiple Access;
DL: Down Link; UL: Up Link;
QAM: Quadrature Amplitude Modulation;
QPSK: Quadrature Phase Shift Keying;
FFT: Fast Fourier Transform;
MIMO: Multiple Input Multiple Output;
FFT: Fast Fourier Transform

[Categorized Equipment Specifications and Equipment Configurations]

Equipment specifications / configuration	Item name	Classification specification
Equipment specifications	RF output power	① 10W+10W ② 5W+5W
	Primary power supply	① AC ② DC
	Network interface	① Number of optical ports: N ② Number of electrical ports: M
	Transmission carrier count	① 1 ② 2 ③ 3
	Baseband processor	① single (1) ② dual (2)
Equipment configuration	RF/BB configuration	① Integrated ② Separate

The above items may be combined independent of each other.
Of those combinations, the following three types, which are currently commercialized and thus able to be measured, are subject to this guideline.

Name	Integrated 10W equipment (1 BB system)	Integrated 10W equipment (2 BB systems)	Integrated 5W equipment (1 BB system)
Output power	10W+10W	10W+10W	5W+5W

Baseband processor	1 system	2 systems	1 system
RF/BB configuration	Integrated	Integrated	Integrated
Supply side power source input	AC	AC	AC

(2) Figures of merit

- Figure of merit for broadband base station equipment shall be defined following formula..

  Figure of merit $E = \Sigma P_n / 「P_{idle} \times (1-\alpha) + P_{max} \times \alpha」$

  P_n: RF output power at antenna connecter n (W)
  P_{idle}: primary power supply-side power when transmitting only the Preamble and MAP.
  P_{max}: primary power supply-side power at maximum transmission (W). The state where all down link symbols are being transmitted based on an MS connection or the test settings.
  α: average of daily down link transmission traffic rate. Average daily traffic rate using down link Data Symbol, excluding Preambles and MAP.
- The above metrics shall be used as figures of merit not only for WiMAX base station, but for "broadband base station equipment" including 3.5 G., 3.9 G., and XGP.

<For WiMAX Two Antenna Base Station Equipment>

Till when the daily average down link traffic is available, calculate using average primary power supply-side input power with $\alpha = 0.5$.

Figure of merit = $(P_{out1} + P_{out2}) / \{(P_{idle} + P_{max})/2\}$

P_{out1}: RF output power at antenna connecter # 1 (W)
P_{out2}: RF output power at antenna connecter # 2 (W)
P_{idle}: primary power supply-side input power under idle mode (W)
P_{max}: primary power supply-side input power during maximum transmission (W)

(3) Normative References

[1] Method for deciding Normative References

Normative references for the three types of WiMAX base station equipment stipulated above, namely, an integrated 10 W equipment (one system), integrated 10 W equipment (two systems), and integrated 5W equipment (one system) shall be the enhanced figure based on technological

trends incorporated with average metric values from current products (CIAJ survey).

[Normative References]
Integrated 10 W equipment (one system): 12.60
Integrated 10 W equipment (two systems): 9.63
Integrated 5W equipment (one system): 5.84

[Approximate Timeline for Realizing the Normative References]
End of Fiscal Year 2012

[2] Assessment scale references

The reduction rate versus the normative reference shall determine the threshold. In the assessment scale, the rank covering the normative reference shall be ★★.

Average power consumption for normative reference for integrated 10 W equipment (one system): 158.7 W

Average power consumption for normative reference for integrated 10 W equipment (two systems): 207.7 W

Average power consumption for normative reference for integrated 5 W equipment (one system): 171.2 W

Assessment scale	Rate of reduction vs. power consumption at NR	Average power consumption normative reference for integrated 10W equipment (1BB) (W) (Note 1)	Average power consumption normative reference for integrated 10W equipment (2BB) (W) (Note 1)
★★★★★	n≧30%	P≦111.09	P≦145.39
★★★★	20%≦n＜30%	111.09＜P≦126.96	145.39＜P≦166.16
★★★	10%≦n＜20%	126.96＜P≦142.83	166.16＜P≦186.93
★★(NR)	0%≦n＜10%	142.83＜P≦158.7	186.93＜P≦207.7
★	Did not achieve NR	P＞157.8	P＞207.7

(Note) In calculating power consumption, drop digits beyond the first decimal point.

Assessment scale	Rate of reduction vs. power consumption at NR	Average power consumption normative reference for integrated 5W equipment (1BB) (W) (Note 2)	
★★★★★	n≧30%	P≦119.86	
★★★★	20%≦n＜30%	119.86＜P≦136.99	
★★★	10%≦n＜20%	136.99＜P≦154.11	
★★(NR)	0%≦n＜10%	154.11＜P≦171.2	
★	Did not achieve NR	P＞171.2	

(Note) In calculating power consumption, discard digits beyond the first decimal point.

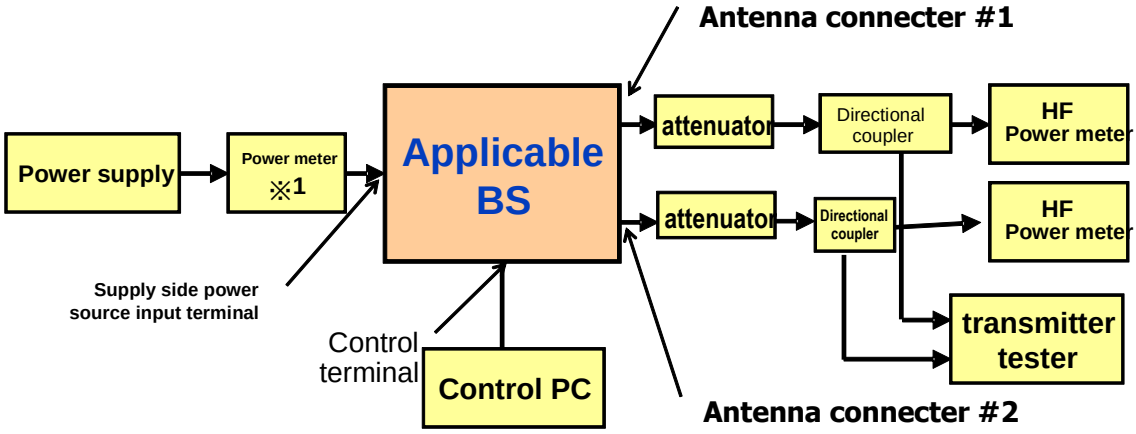
Notes

1: When RF output power at antenna connecters are 10.0 W X 2

2: When RF output power at antenna connecters are 5.0 W X 2

(4) Measurement Methodology

[1] Measurement configuration



※1 Under DC input, acceptable to use ammeter/voltmeter instead of wattmeter.

[2] Measurement conditions

[Environment and Electrical Conditions]

Item		Conditions	Remarks
Environment conditions	Room temperature	+25℃±5℃	
Primary power supply voltage	AC	Designated voltage ± 1%	50Hz or 60Hz
	DC	Designated voltage ± 0.5%	
Operating conditions	10W×2ANT	・Designated power ＋12.2% No more than（＋0.5dB） ・Measure up to one decimal point	Measure RF output power at antenna connecter by measurement method TELEC-T137.
	5W ×2ANT		

[Conditions Other than Environment and Electrical]

(a) The number of units of BS equipment or AMP to be measured shall be more than one and stipulated separately.
Report the average from measuring multiple units to the Council Secretariat.

(b) This guideline does not stipulate the number of times measurements shall be taken for each measurement item in relation to a BS or AMP. However, use an average value when measuring multiple times.

(c) Measure the following functions after having provided continuous power supply to the equipment.

- Upstream receiving circuit, line interface, GPS circuit

(d) Begin measurements after the equipment has been exposed to room temperature for one or more hours with power plugged in.

[Measurement methodology]

Item		Measurement method	
Primary power supply side power at maximum RF output	P_{max}	Use an MS connection or test settings to set so that all down link symbols are transmitted.	• Measure using a power meter. • Use effective power consumption of the equipment when input is AC. • Acceptable to use Ampere meter/voltmeter when input is DC.
Primary power supply-side input power under idle mode	P_{idle}	Put in a state where only down link preamble and MAP are being transmitted. (Data is PUSC)	

5.2.6. External Power Sources

5.2.6.1. AC Adapters

(1) Equipment Definition

Among external power sources, refers to an AC-DC converter that takes AC commercial power supply and provides DC power to the equipment.

This assessment applies to external power sources for customer-premises equipment having a name plate output (rated output) P_{no} (P_{no}: Nameplate Output Power) of $1W<Pno\leqq 49W$.

This assessment applies to AC adapters procured separately or those that are included within the procurement of a piece of equipment which is not set forth in 5.1.1 Scope of this Guideline. Those included with equipment for which scope has been set forth in 5.1.1 Scope shall be assessed as part of the equipment itself and shall be excluded from the assessment of this section.

Chargers for cellular phones and the like that are used for the purpose of recharging batteries are exempt from this assessment.

(2) Figure of merit

The figures of merit are established in reference to the figures of merit set forth under the International Efficiency Marking Protocol. Evaluate average conversion efficiency η at nameplate output P_{no} (W) based on conversion efficiency at 25% load η_{25}, conversion efficiency at 50% load η_{50}, conversion efficiency at 75% load η_{75} and conversion efficiency at 100% load η_{100}.

$$\eta=(\eta_{25}+\eta_{50}+\eta_{75}+\eta_{100})/4$$

(3) Normative References

[1] Method for deciding normative references

- Normative references are established in reference to International Efficiency Marking Protocol.
- Decide individual normative references for each nameplate output.

[Normative References]

As a normative reference for external power sources, average conversion efficiency value at nameplate output P_{no} (W) shall be equivalent to Mark V of the International Efficiency Marking Protocol

[Approximate Timeline for Realizing the Normative References]

April 2011 (as required by the EuP Directive (Directive on Eco-Design of Energy Using Products).

[2] Assessment scale

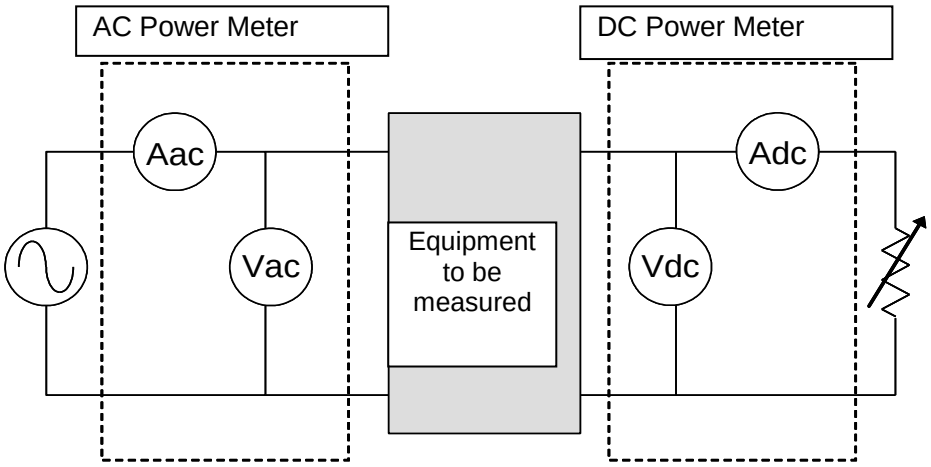
The reduction rate versus the normative reference shall determine the threshold. In the assessment scale, the rank covering the normative reference shall be ★★.

Assessment scale	Rate of reduction vs. power consumption at NR	Average conversion efficiency η (See formula (＊))
★★★★★	n≧30%	$\eta \geqq 70.7+5.00\ln(P_{no})$
★★★★	20%≦n＜30%	$67.7+5.46\ln(P_{no}) \leqq \eta < 70.7+5.00\ln(P_{no})$
★★★	10%≦n＜20%	$64.8+5.88\ln(P_{no}) \leqq \eta < 67.7+5.46\ln(P_{no})$
★★(NR)	0%≦n＜10%	$62.2+6.26\ln(P_{no}) \leqq \eta < 64.8+5.88\ln(P_{no})$
★	Did not achieve NR	$\eta < 62.2+6.26\ln(P_{no})$

(Note) P_{no}: Nameplate Output Power (W)

(4) Measurement Methodology

[1] Measurement system



Example of a measurement system using variable resistance

Using variable resistance, measure conversion efficiencies η_{100}, η_{75}, η_{50} and η_{25} at nameplate currents of 100%, 75%, 50%, and 25%, respectively, and seek the average value η.

[2] Measurement conditions

- Room temperature: 23°C +/- 5°C
- Error tolerance of measurement equipment: use a calibrated voltmeter/ammeter or power meter.
  Error tolerance: No more than 2% error for the ammeter/voltmeter. Precision of no less than 0.01 W for the power meter.
- Voltage applied: Measure upon applying voltage of 100 V (+/- 1 V) at frequencies of 50 Hz (+/- Hz) and 60 Hz (+/- 0.6 Hz).
- Preparations prior to measurement: Begin measurements after running 100% nameplate current through the external power source to be tested for no less than 30 minutes.

5.2.7 Servers

<<Assessment standard for Active state>>

5.2.7.1. Servers

(1) Definition

In this Guideline, a server is a computer device comprising of a central processing unit (CPU), a main memory, an input/output control and a power source. It is designed to exist as part of a network to provide information and services to other computer devices 24/7. It must be able to use an operating system (OS) so that it can be installed with and run user applications. Examples of servers include but are not limited to the following:

> file servers
> mail servers
> database server
> authentication server
> web server
> media server
> game server

* Devices sold as a single unit which are actually a combination of hardware and software (such as appliances) shall be included under servers in this section if all that is needed to change the device to a particular use is the installation of (a) user application(s).

(2) Figure of merit

The TEER[*1] determined by ATIS shall serve as an index, and will be calculated as follows:

TEER=SPECpower_ssj2008value/10

Furthermore, SPECpower_ssj2008 figure is defined by SPEC (Standard Performance Evaluation Corporation: http://www.spec.org/power_ssj2008) and is calculated with the following equation.

Overall ssj_ops/watt=∑ssj_ops/∑power consumption (W)

ssj_ops is a metric for server processing capacity and is attained by implementing SPECpower_ssj2008 v. 1.10 server power consumption performance benchmark test program to the servers included in the scope of the assessment. The performance (ssj_ops) at CPU load rates (0 – 100%) and average power consumption are measured, then the capacity (ssj_ops) at the respective target loads are totaled and divided by the total average power consumption (W) (∑ssj_ops/∑power), and that figure is considered to be the capacity metric (overall ssj_ops/watt) per electric power.

[*1] ATIS-0600015.01.2009: Energy Efficiency for Telecommunication

Equipment: Methodology for Measurement and Reporting – Server Requirements.

(3) Normative reference

[1] Methodology for establishing normative reference

Publicly disclosed SPEC data is converted to TEER and a trend analysis of the product shall be conducted.

[Normative reference]

TEER=100

[Approximate timeline for realizing normative reference]

The end of Fiscal Year 2010

[2] Assessment scale

The reduction rate versus the normative reference shall determine the threshold. In the assessment scale, the rank covering the normative reference shall be ★★.

Assessment scale	Reduction rate vs. power consumption of NR	Figure of merit（TEER）
★★★★★	n≧30%	TEER≧250
★★★★	20%≦n＜30%	166≦TEER＜250
★★★	10%≦n＜20%	125≦TEER＜166
★★(NR)	0%≦n＜10%	100≦TEER＜125
★	Did not achieve NR	TEER＜100

(Note) It shall be possible to compare the rate of reduction of power consumption against normative reference among equipment which have similar ssj_ops at CPU load rates (0 – 100%). However, in case of equipment with different ssj_ops at CPU load rates (0 – 100%), the rate of reduction shall be analyzed in conjunction with the performance of the equipment (i.e. power consumption shall increase x% if performance increases x%).

[Formula for calibrating the threshold]

20% reduction: TEER/0.8=125

40% reduction: TEER/0.6=166

60% reduction: TEER/0.4=250

(4) Measurement methodology

[1] Measurement methodology

A testing program for power measurements of servers at benchmark points is provided by SPEC. Equipment shall be measured using

SPECpower_ssj2008 v1.10. For details please refer to the following sites (*2, *3).

*2: ATIS-0600015.2009: Energy Efficiency for Telecommunication Equipment: Methodology for Measurement and Reporting – General Requirements

*3: SPEC User Guide
http://www.spec.org/power_ssj2008/docs/SPECpower_ssj2008-User_Guide.pdf

[2] Measurement conditions

Measurements shall be taken in compliance to the ATIS measurement conditions (*1, *2). For areas not covered by ATIS, measurements shall be in compliance to the SPEC User Guide (*3). Furthermore, among the ATIS measurement conditions, the following criteria shall be applied, taking into consideration the equipment's use in Japan.

Temperature: 25℃±3℃
Humidity: 30% - 75%
Voltage: -53VDC±1V, 100V±1% (50/60Hz±1%)

<< Assessment standard for idle state>>

Adopt the assessment standard based on the top runner method for computers (Ministerial Notification No. 50 from the Ministry of Economy, Trade and Industry), which are identified as specified equipment in the Energy Conservation Law. Normative reference and assessment scale are to be determined.

Figure of merit E = {(W1+W2)/2}/Q (W /MTOPS)

E: energy efficiency
W1: energy consumption in idle state
W2: energy consumption in low-power mode
Q: theoretical operation (MTOPS)

5.3 Implementation

5.3.1 Public disclosure of assessment results of energy-saving equipment and target timeline for disclosure

Vendors wishing to register their energy-saving equipment with the Council shall measure and assess the equipment in compliance to criteria outlined in 5.2 of this Guideline, submit the assessment results and other pertinent information (normative reference and assessment scale ranking) to the Council, and publicly disclose information via such medium as the Council website. Indication of the assessment results in the vendor's website or other medium, such as the vendor catalog is left to the discretion of the vendor.

Furthermore, the target timeline for public disclosure of the assessment results shall be July 1, 2010 or later.

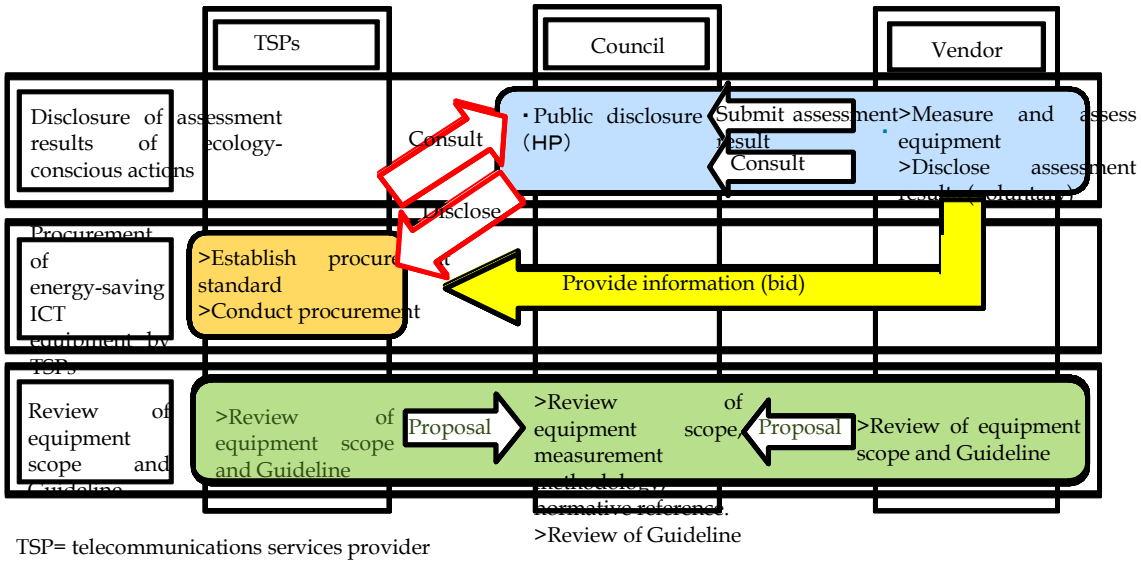
5.3.2 Procurement of energy-saving equipment by telecommunications services providers

Telecommunications services providers planning to procure energy-saving equipment shall establish a procurement standard based on this Guideline and the assessment results of energy-saving equipment publicly disclosed on the Council's website and other medium.

5.3.3 Addition of new equipment and review of the existing Guideline

Telecommunications services providers and vendors shall propose the addition of new equipment to be covered in the scope of the Guideline or a review of existing standards based on product trends, such as the emergence of new functions. Upon receipt of a proposal, the Council shall decide on the addition of the indicated equipment, the measurement methodology, normative reference, and the timing of the new criteria implementation. In addition, the Council shall review the Guideline as deemed appropriate.

For example, a review of the figure of merit will be necessary with the addition of a new function (optical XC or packet switching for WDM equipment), or when a new format is announced (10G-PON for GE-PON equipment), or a new equipment which is not covered by existing definitions is announced.



TSP= telecommunications services provider

Image of implementation of assessment standard for equipment

6. Normative Reference for Data Centers

6.1 Basic Approach to Normative Reference

A data center is a complex facility combining ICT equipment such as servers, storage equipment, and network equipment with other hardware including air conditioning systems and power converters. Additionally, the various modes of use and contractual agreements that exist contribute to a multifaceted situation. Furthermore, in terms of software, data centers perform a variety of work and individual data centers differ greatly in how and for what processes software is used.

For this reason, establishing a figure of merit on energy-saving as a normative reference for data centers is no easy task. Currently studies on this issue are underway inside and outside of Japan. Therefore this guideline uses PUE as one figure of merit (details to follow) currently adopted broadly in relative terms, which serves as a useful reference for data centers to perform CO_2 emission reduction activities and for Telecommunications services providers to procure data center services. Even in the case of PUE, which has been adopted broadly in relative terms, there is insufficient data from actual measurements and little data has been publicly disclosed. Therefore, to promote telecommunications service providers' CO_2 emission reduction activities, it is hoped that data center operators measure energy conservation related data (e.g. PUE with clear measurement conditions) and make further efforts in public disclosure.

Unresolved challenges have been identified, such as the need for further consideration of data center processing performance; for this reason, this Guideline will continue to revisit figures of merit in consideration of future trends in studies on the issues inside and outside of Japan.

6.2 Definition

A data center is a space or facility (including air conditioning, power converters, etc.) used exclusively to store the ICT equipment (network equipment, servers, storage equipment, etc.) it operates.

A data center may be a stand-alone building but also could occupy only a portion of space in a shared facility (office, etc.) within a building used for other purposes.

However, this guideline assumes data centers primarily providing services to external clients. Thus, this guideline does not assume application of a reference to a small-scale server room equipped with only a few pieces of ICT equipment.

6.3 Figure of Merit on Energy-Saving As a Normative Reference

(1) The Current Situation of Figure of Merit on Energy-saving

As described above, figures of merit on energy-saving as normative reference for data centers are currently under study inside and outside of Japan. Defining energy efficiency of data centers is quite difficult and nothing that may be used as a figure of merit having been adopted on a global scale exists at the present time.

Figure of merit on energy-saving may be categorized into the following two types: using one figure of merit to represent the data center as a whole or using multiple metrics as a set to represent the multifaceted aspects of data centers. For example, in the case of the former, an energy productivity figure of merit (a ratio of the amount of energy introduced to the data center versus the work processed by the data center) is currently under study. No clear definition has been established, however, as details are still under study inside and outside of Japan.

(2) Figure of Merit on Energy-saving That May Be Used so far

One figure of merit on energy-saving for data centers that may be used so far is the Power Usage Effectiveness (PUE) figure of merit, which compares the power consumption of the ICT equipment that should be in operation to the power consumption of the facility portion (air-conditioning, power source, lighting, etc.) used to operate the ICT equipment. PUE is a figure of merit proposed by The Green Grid (US) and its definition is as follows.

PUE = power consumption of entire facility (ICT equipment + facilities) / power consumption of ICT equipment

Based on this definition, one could say that a small PUE value could mean that the facilities portion of a data center has good energy efficiency.

The inverse of PUE is the Data Center Infrastructure Efficiency (DCiE). Presumably, these two metrics could be used in parallel depending on their application, such as the method of managing the figures.

PUE and DCiE are the figures of merit on energy-saving for data centers most widely adopted so far.

At the same time, there are those who point to issues with PUE and DCiE. One is that the measurement methods are not always clearly defined. Another is that the metrics do not consider differences in energy efficiency derived from efficiency of the ICT equipment and operational proficiency.

(3) The Status of Studies at Related Organizations

In light of the current issues with PUE, The Green Grid and many other organizations are studying the development of better figures of merit on energy-saving.

The Green Grid is studying measurement guidelines, numerical reporting and a certification system for PUE. Additionally, The Green Grid is involved in developing the Data Center energy Productivity (DCeP) metric for representing the energy productivity of the entire data center, including not only facilities but also ICT equipment, and an applicable alternative figure of merit (proxy).

Also, Japan's Green IT Promotion Council has entered into an MOU with The Green Grid to pursue the development of an independent figure of merit on energy-saving covering the entire data center including ICT equipment.

Moreover, under the EU's Code of Conduct on Data Centers, a guideline compiled for data centers, PUE is adopted as a figure of merit on energy-saving for facilities, while a productivity figure of merit is to be decided in consideration of future trends. Furthermore, the US Environmental Protection Agency (USEPA) uses Energy Usage Effectiveness (EUE: a ratio similar to PUE, but calculated using a supply-side energy conversion) and, has also begun activities so as to rate the energy efficiency of facilities.

(4) Data Center Figure of Merit on Energy-Saving under this Guideline

In light of current studies on figures of merit on energy-saving and the situation of global adoption, this Guideline preliminarily uses PUE, already gained adoption as a figure of merit on energy-saving for the facilities portion, which serves as a useful reference for data centers to perform CO_2 emission reduction activities and for telecommunications service providers to procure data center services. It is preferred that data center operators measure energy conservation related data (e.g. PUE with clear measurement conditions) and advance public disclosure. This guideline will continue to revisit figures of merit in consideration of future trends in studies on the issues inside and outside of Japan.

6.4 Outline of Figure of Merit on Energy-Saving

(1) PUE and DCiE

PUE, currently an important figure of merit on energy-saving for data centers, is as described in 6.3(2), and its inverse is DCiE (DCiE = 1/PUE).

Here, ICT equipment includes computers, network equipment, ICT support systems (printers, etc.), storage, and telecommunications equipment. Facilities are equipment not included under ICT equipment, namely, electrical power (converters, UPS, lighting, etc.), air conditioning (including cooling tower, cooling water pump, humidifier, etc.), security equipment, building management systems and the like. DCiE is simply the inverse of PUE; thus, articles subject to measurement are the same in both cases.

In the case that a data center uses other energy sources in parallel to electrical power, use an energy conversion value to calculate PUE or DCiE. Specifically, use a crude oil equivalent value for the amount of energy consumed as defined by the Energy Conservation Law.

(2) Measurement Methods for PUE and DCiE

A guideline set forth by The Green Grid exists for PUE and DCiE measurement methods (measurement frequency, selecting measurement points, etc.). The guideline indicates three levels (1 to 3). (For details see The Green Grid White Paper Number 14 The Green Grid metrics: A detailed analysis of DCiE (Data Center Infrastructure Efficiency).)

http://members.thegreengrid.org/japanese/gg_content/White_Paper_14_-_DCiE_Detailed_Analysis_11.06.08_JP.pdf)

(3) Disclosure of PUE and DCiE Measurement Results

The energy efficiency of data centers is believed to differ depending on the characteristics of the data center. Thus, in disclosing figures of merit on energy-saving such as PUE or DCiE, the basic characteristics of a data center that would significantly impact energy efficiency need also be disclosed. As an attempt at tentative uniformity in consideration of user convenience, specific disclosure items should include, in addition to the actual PUE measurement values, measurement methodology, data center location, room temperature and humidity settings, duration of measurement, and redundancy configurations.

This guideline will not stipulate uniform measurement methods, but the measurement methods (measurement frequency, measurement sites, etc.) used by the data center should be disclosed.

Disclosure items are currently under study at related organizations. This guideline will consider additions or amendments as appropriate in light of the results of those studies.

Disclosure item		Example of Disclosure
Actual PUE measurement values (average/highest/lowest)		1.86／2.08／1.69
Measurement methodology	Measurement frequency	once weekly
	Measurement points	ICT equipment power consumption: UPS Power consumption of entire facility: data center power supply input
	Duration of measurement	October 2007 to September 2008
Basic Characteristics	Data center location	Country, area (Kanto, etc.))
	Room temperature and humidity settings	22℃／50-60%
	Redundancy configuration	N+1

PUE disclosure items

6.5 Implementation (See 4.3 (1) diagram)

6.5.1 Disclosure Method of Energy Conservation Related Data of Data Center

Data center operators shall report energy conservation related data (e.g. PUE with clear measurement conditions etc.) to the Council and disclose that information via such medium as the Council's website.(PUE measurement results to be disclosed in accordance with the disclosure items set forth in 6.4(3))

6.5.2 Procurement by Telecommunications Service Providers of Data Center Services

Telecommunications services providers seeking to procure data center services shall refer to energy conservation related data of the data center disclosed in this

guideline, on the Council's website and the like to formulate their procurement standards, and procure the services by selecting a data center based on a comprehensive assessment together with required functions and processing performance.

7. Assessment Standard Eco ICT Logo

7.1 Purpose

7.1.1 Purpose of Self-Assessment of Efforts

The status of efforts and achievements in reducing CO_2 emissions made by telecommunications service providers needs to be publicly disclosed (made visible) appropriately and in a timely fashion so that external parties including users and other related parties may appropriately assess such efforts.

In light of such needs, the purpose is for telecommunications services providers to checking the status of those efforts under their own initiative in and to enhance their efforts to be ecologically conscious and to reduce their ecological burden.

7.1.2 Indication of Eco ICT Logo

Telecommunications services providers shall display the "Eco ICT Logo" as a medium for broad public disclosure depending on the result of appropriate self-assessment of their actions to reduce CO_2 emissions etc. and to indicate the status of such implemented actions.

Because efforts to reduce CO_2 emissions need to become broader in scope, telecommunications services providers not belonging to an industry group can refer to this guideline to confirm efforts on their own initiative and display the "Eco ICT Logo."

7.2 Checklist

7.2.1 Purpose of the Checklist

The Council has prepared the Self Assessment Checklist for CO_2 Emission Reduction Efforts by Telecommunications Services Providers (hereinafter, the Checklist) (see separate sheet) for telecommunications services providers to set targets for reducing CO_2 emissions and to use the checklist for self-confirmation and make visible to others the efforts being taken.

The purpose is for telecommunications services providers to use this checklist to perform self-assessments of the results of actions taken under autonomous action plans prepared by individual companies and as a medium for public disclosure.

7.2.2 Checklist Assessment Items and Assessment Standards

<Preparation of a Voluntary Ecological Action Plan>

[1] Has a voluntary ecological action plan stipulating various efforts directed at reducing CO_2 emissions been created and is it being executed?

- Is there a voluntary ecological action plan in place, which is aimed at promoting ecological preservation activities such as the prevention of global warming, reduction of waste and the promotion of reduce, reuse and recycling activities?

[2] Does the ecological policy include specific efforts stipulating numerical targets for the reduction of CO_2 emissions?
- Does the voluntary ecological action plan include specific activities and numerical targets?

Examples
- Reduce by the end of 2020 the amount of electricity used by ICT equipment by 25%, compared to 1990 levels.
- Switch to power generation of green power, purchase green power certificates and the like, so that green power accounts for 10% of electricity used.
- 10% reduction on a year-to-year base employees' use of private vehicles for commuting by promoting the use of public transportation, bicycles and car-sharing.

[3] Is the ecological policy documented and disseminated inside and outside of the company? Does the company carry out activities to inform and enlighten its employees? Is the company working to raise ecological awareness?
- Are employees informed of such plans through internal training events and the like?
- Is information disclosed outside the company or is information disclosed to interested parties and other members of the general public when needed?

[4] Does the company disclose to the general public its activities and data such as CO_2 emission reduction?
- Is such information as the status, accomplishments and track record of specific activities under the voluntary ecological action plan disclosed to the public?
- Does that information continue to be publicly disclosed based on annual reviews?

*May be substituted with the creation and disclosure of an ecological report, CSR report, sustainability report, and the like.

Examples
- URL of the company's website where the status of specific actions taken in accordance with the voluntary ecological action plan is disclosed
- URL of the company's blog where information on ecological activities is disseminated on a continual basis

<Efforts Related to Procurement>

[5] In regard to ICT equipment and data center services, has the company prepared a procurement standard that takes energy conservation into consideration? Is procurement carried out in accordance with the standard?

- Is there a procurement standard prepared in reference to this Guideline that relates to ICT equipment and data centers the company plans to procure?
- Are ICT equipment and data centers with advanced energy conservation features being procured in accordance with an established procurement standard?

[6] Is the company cognizant of energy conservation in procuring office equipment, supplies and logistics (e.g., green purchasing)?
- Is the company implementing green purchasing?
- Are specific procurement measures taken in consideration of energy conservation?

Examples
- Introducing fluorescent lamps and office equipment low power consumption.
- Procuring products manufactured with processes that generate less CO_2.

<Promotion Regime>

[7] In relation to efforts to reduce CO_2 emissions, has the company assigned a person or department responsible for such matters?
- Has the company assigned a person or department responsible for promoting these efforts, regardless of whether those resources are dedicated or hold other concurrent responsibilities?

[8] Is there a regime in place using internal audits or other means to keep appropriate track of the implementation of measures and achievement of targets set forth in the voluntary ecological action plan? Is the internal audit performed by a department other than the department that set targets?
- Are member companies of industry groups auditing each other?
- Or does the company receive external audits or comments from third parties?

Examples
- Member companies of industry groups audit each other.

<Other Ecological Activities>

[9] Are ecologically-friendly efforts being made other than activities to save energy?
- Is the company involved in resource conservation in the office by conducting double-sided printing or printing on the flip side of printed paper and trying to reduce waste? If so, specific activities shall be indicated.

Examples

- Working to use double-sided printing and copying, reduce the amount of paper and ink used, and reduce the amount of power used for printing.

[10] Is the company involved in ecological preservation activities in collaboration with local communities?

- Does the company work on a continual basis with society on activities related to ecological preservation?

Examples

- Work jointly with regional organizations every month to pick up garbage and increase plant coverage in local areas.
- Participate in community recycling activities to actively recycle.
- Participate in eco-cap activities and make contributions to society beyond recycling efforts.

7.2.3 Review of the Checklist

The Council shall review this checklist and its items as appropriate in response to: reviews of this Guideline; changes in policy relating to global warming measures; revisions to laws and ordinances; the status of ICT service provision; penetration of equipment and the like; and technological advances.

7.3. Eco ICT Logo

7.3.1 Method of Indication

In accordance with 7.3.2, telecommunications services providers may use on their website and printed matter the name of the logo and the "Eco ICT Logo" set forth in the reference section of the Guideline.

7.3.2 Usage Stipulations

(1) Usage Standard

In using the name and "Eco ICT Logo," disclosure by the means set forth in 7.4.2 must be followed.

(2) How to Obtain

The "Eco ICT Logo" may be downloaded in electronic format from the Council's website.

[1] The URL (Internet address) for downloading is indicated on the Council's homepage.

[2] The URL for downloading may change. Therefore, when setting a link from an external website, link to the Council's homepage.

(3) The permissible scope of use of the name and "Eco ICT Logo" by a telecommunications services provider

- The company's website

- The company's advertisements requested to be posted on a third party's website
- E-mails sent by the company or by a third party at the request of the company
- Business cards
- Materials distributed in an electronic format
- Printed pamphlets, distribution materials, leaflets, mailings, etc.
- Projection data used in presentations

(4) Reminders in Use of Logo

When using the name and "Eco ICT Logo," telecommunications services providers shall do so under the following conditions.

[1] Expenses shall be borne by the telecommunications service provider.

[2] The name and "Eco ICT Logo" must be used in their entirety, without changing the aspect ratio or the color of the "Eco ICT Logo."

[3] When use of the name or the "Eco ICT Logo" by a telecommunications services provider might possibly conflict with the intent of self-assessment efforts to reduce CO_2 emissions or conflict with public order or standards of decency, or otherwise, the Council may advise the telecommunications services provider of correction based on a judgment by the Council.

(5) Discontinuing Use of the Logo

[1] In the event a telecommunications services provider using the name or "Eco ICT Logo" fails to perform self-assessment of efforts to reduce CO2 emissions, the telecommunications services provider must promptly discontinue use of the name and "Eco ICT Logo."

[2] In the event a telecommunications services provider does not comply with the stipulations under 7.3.2 and rules regarding usage separately set forth by the Council, the Council may remove the company from the Council's website and notify of the discontinuation of use of the name and "Eco ICT Logo."

7.4. Implementation

7.4.1 Assessment Methods

[1] The telecommunications services provider shall perform self-assessment based on the checklist as to whether the company is actively implementing efforts to reduce CO_2 emissions.

[2] If the telecommunications services provider is judged to be appropriately implementing efforts indicated in the checklist, the telecommunications services provider shall be responsible for describing an overview of specific efforts being implemented in the checklist.

[3] Items 1 to 8 on the checklist are mandatory entries (must describe the company's efforts) and items 9 and 10 are recommended (free to list

information in checklist or not).

[4] In the event certification of an international standard (ISO 14001) relating to environmental management systems has been acquired, companies may substitute check list entries as appropriate with an indication that certification has been acquired under the applicable assessment items and a description of where that information is made be publicly available.

7.4.2 Public Disclosure Methods by Telecommunications Services Providers Conducting the Efforts

The following information of telecommunications services providers involved in efforts complying with the checklist shall be publicly available through the Council's website.

- Company name (personal name or trade name if an individual)
- URL and link to where the checklist is posted

Telecommunications services providers need to disclose the completed checklist and provide sufficient information for a user or viewer to understand what sort of efforts was made that apply to or comply with the checklist per the self-assessment.

(1) Submitting Necessary Forms & Information

[1] Telecommunications services providers shall post the checklist prepared per 7.4.1(2) on their website and report by submitting the "Application for Requesting Public Disclosure of CO2 Emission Reduction Efforts by Telecommunication Services Providers" in attachment 2 (hereinafter Application) to the Council.

[2] The Council shall confirm the contents of the Application and the items disclosed on the checklist on the company's website, and the information will be disclosed to the public on the Council's website.

[3] If a telecommunications services provider having information disclosed on the Council's website needs to revise targets aimed at reducing CO_2 emissions or change specific effort within the effective period of disclosure, the telecommunications services provider shall follow the procedures similar to those for the original Application as deemed appropriate.

(2) Effective Period of Disclosure by the Council

[1] Regarding results of telecommunications services providers' specific efforts toward targets aimed at appropriately reducing CO_2 emissions, such targets need to be reviewed at least once a year since continuity and improvement contributes greatly to reducing CO_2 emissions. Thus, the effective period of disclosure by the Council shall be no longer than one year and continue to the last day of December of each year.

[2] When self-assessment of efforts to reduce CO_2emissions is performed, a checklist is completed and submitted at some point between January 1 and the last day of December, the effective period of disclosure by the Council

shall continue until the last day of December of the year disclosure began and shall not be calculated as one full year from the date of disclosure.

(3) Method of Renewing Public Disclosure by the Council

[1] Telecommunications services providers shall submit necessary information to the Council between October 1 and the last day of November of each year, receive confirmation for renewal and have disclosure by the Council renewed.

[2] For renewal, a telecommunications services provider submits procedures similar to those for the original report to the Council.

[3] If a telecommunications services provider does not report for renewal by the last day of November each year, the Council may remove that company from the list and cancel the company's usage of the name and "Eco ICT Logo."

[4] Telecommunications services providers removed from the list disclosed by the Council must promptly discontinue use of the name and "Eco ICT Logo" on their own websites and printed mattes.

(4) Others

[1] If a third party inquires about the disclosed contents regarding a telecommunications services provider on the Council's website, the inquiry may be routed to the relevant telecommunications services provider.

[2] The telecommunications services provider subject to the inquiry must answer and respond in good faith.

Attachment 1

Self-Assessment Checklist for CO_2 Emission Reduction Efforts by Telecommunications Services Provider

Telecommunications services provider: _____

<Mandatory items>

		Assessment items	Implementation, measures taken
Preparation of a voluntary ecological action plan	1	Has a voluntary ecological action plan stipulating various efforts directed at reducing CO_2 emissions been created and is it being executed?	
	2	Does the ecological policy include specific efforts stipulating numerical targets for the reduction of CO_2 emissions?	
	3	Is the ecological policy documented and disseminated inside and outside of the company? Does the company carry out activities to inform and enlighten its employees? Is the company working to raise ecological awareness?	
	4	Does the company disclose to the general public its activities and data such as CO_2 emission reduction?	
Efforts relating to procurement	5	In regard to ICT equipment and data center services, has the company prepared a procurement standard that takes energy conservation into consideration? Is procurement carried out in accordance with the standard?	
	6	Is the company cognizant of energy conservation in procuring office equipment, supplies and logistics (e.g., green purchasing)?	
Promotion regime	7	In relation to efforts to reduce CO_2 emissions, has the company assigned a person or department responsible for such matters?	
	8	Is there a regime in place using internal audits or other means to keep appropriate track of the implementation of measures and achievement of targets set forth in the voluntary ecological action plan?	

<Recommended items>

Other ecological activities	9	Are ecologically-friendly efforts being made other than activities to save energy?	
	10	Is the company involved in ecological preservation activities in collaboration with local communities?	

Attachment 2

Application for Requesting Public Disclosure of CO2 Emission Reduction Efforts by Telecommunications Services Providers

Application type	New ・ Renewal/Change			
Type of telecom carrier	Registered	Notified	Registration no./ Notification no.	
Affiliated association	Telecommunications Carriers Association ・ Telecom Services Association Japan Internet Providers Association ・ Non-affiliated			
Company name				
Company representative				
Address	〒(If applicable, Japanese postal code)			
URL	http://			
Contact tel. no.			Fax no.	
Name of person submitting application				
Dept. (section)				
Title				
Tel. no.			Fax no.	
e-mail address				
URL outlining ecological policy	http://			
URL of checklist	http://			

(For Council use only)

団体受付日	環境方針確認	チェックリスト	協議会受付日	公表日	結果通知日

Diagram of Logo for Reference

[1] Eco ITC Logo design (tentative)

Logo

[2] Assessment scale symbol design

Logo

8. Reference Material

Omitted.

9. Contacts

Telecommunications Carriers Association
e-mail: enq@tca.or.jp

Telecom Services Association
e-mail: jimukyoku@telesa.or.jp

Japan Internet Providers Association
e-mail: info@jaipa.or.jp

Communications and Information network Association
e-mail: ecoc@ciaj.or.jp

ASP・SaaS Industry Consortium
e-mail: office@aspicjapan.org