International Cooperation Activities of ECCJ
Institutionalization of EC Guideline for Indian Industry

省エネルギーセンターの国際協力
インドに於ける判断基準策定支援

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History of International Cooperation of ECCJ

1978 ECCJ was established.

1979 Energy Conservation Act was enforced.

1981 International Cooperation Dept. was organized.

1984 JICA training on EE&C started.

From 1986 to 2004 received average 1 person per year from India.

2004 METI Intl. Capacity Building Program started.

2006 Japan-India cooperation thru METI pgm started

Intl cooperation record since 1981 to 2019.4

	Trainee received	Experts dispatched
Worldwide	4,292	1,855
India	486	130

Energy Conservation Policies– Japan and India

September 20,2016

Item	JAPAN	INDIA	Next Step for India
National Target	To reduce CO2 emissions by 26 % before 2030 baseline 2013	To reduce CO2 per GDP by 33-35% before 2030 baseline 2005	
Energy Saving Target for Industrial Sector	Obligatory Effort, 1% per annum Benchmark System	Mandatory under PAT, the target to be set by each DC. EC Cert Trade System	Measures for DCs to achieve PAT target
Energy Conservation Measures in Industrial Sector	Energy Conservation Law ・Designated per annual consumption ・All Sectors 12,500 Organizations ・Capture Rate（w/o Power Plt）: 90%	Energy Conservation Act 2001 & PAT ・Designated per annual consumption ・11 Sectors 621 DCs ・Capture Rate（w/o Power Plt）: 50-60%	Expand sectors and Lower the threshold, Increase Capture Rate.
Guideline for Promotion of Energy Conservation	EE&C GUIDELINE EM MANUAL		Introduction of GUIDELINE for PAT enhancement is advisable.
Certification System for Energy Management Personnel	Certified Energy Manager ＝99,000	Certified Energy Manager ＝4,000 Certified Energy Auditor ＝8,500	Foster human resources who can develop EM Manual per GUIDELINE
Energy Management Structure Implementer Regulator	Energy Manager of Energy Consumer METI	Energy Manager of DC BEE / SDA Accredited Energy Auditor	
Thermal Power Plant Heat Rate	Coal Crude Oil Gas Whole 41.5% 41.0% 43.1% 47.9% 44.3% EC Law Capture Rate : 100%	Coal Crude Oil Gas Whole 33.5% - 24.8% 40.5% 33.6% PAT Capture Rate : 70%	
S&L	31 (Top Runner Program) 21 (Labeling)	8 (Mandatory Labeling) 13 (Voluntary Labeling)	
EC Building Code	Yes	Yes	

In order to enhance PAT scheme implementation, we propose **Energy Management Methodology with EE&C GUIDELINE** that have been proved in Japan.

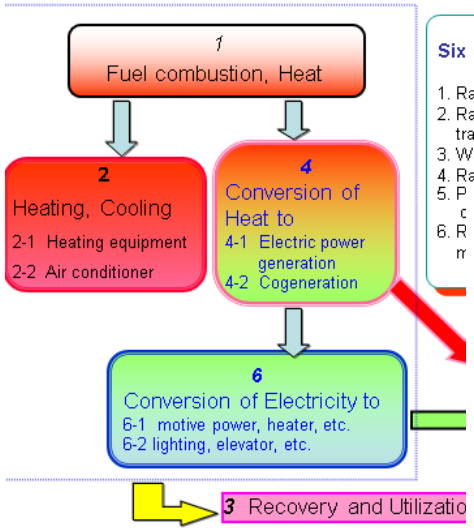
Three Years Project for EC Guideline

FY2016	*FY2017*	*FY2018 onward*
Introduction	**Development**	**Implementation**
Recognition of usefulness of Japanese system on EE&C Management **Study on Japan's EC Guideline**	**Development of EC Guideline customized to India** **Study on application of the Guideline to of India**	**Institutionalization of the EC Guideline of India** **Dissemination of EM Manual based on EC Guideline**

Sep. 2016 Japan proposed India to introduce ECG and EMM	**May. 2017** JPN-IND EC Working	**Feb. 2018** Round table discussion on draft ECG
	Sep. 2017 Steering Committee mtg.	**May. 2018** JPN–IND Energy Dialogue
Nov. 2016 Preliminary meeting called by BEE to reps. of DCs	**Nov. 2017** Interactive Session on Draft ECG in Delhi.	**Sep. 2018** ECG released by MOP
Jan. 2017 Study workshop in Japan, BEE and reps. From DCs invited	**Jan. 2018** Workshop in Japan to review Draft ECG.	**Jan. 2019** Workshop in Japan to familiarize creation of EMM based ECG.

Study workshop in Japan, Jan. 2017

Management Categories to be focused based on "EC Guideline"



Six categories of EC Guideline

1. Rationalization of fuel combustion.
2. Rationalization of heating, cooling and heat transfer.
3. Waste heat recovery and usage
4. Rationalization of converting heat to electric power
5. P
6. R

PDCA Action \ Functions of Equipment		Fuel Combustion	Heating, Cooling, and Heat Transfer	Waste Heat Recovery	Conversion of Heat to Motive Power	Prevention of Energy Loss	Conversion of Electricity to Motive Power
Standards Components	Management						
	Measurement & Recording						
	Maintenance & Inspection						
	Necessary Measures when Installing New Facilities						
Targets Components	Items to be considered for planning new installation or retrofitting of facilities						

In order to promote Energy Efficiency in Factory, it is important to manage facilities so as them kept in as good condition as that can be operated in most energy efficient state.

"EC Guideline" describes action standards to drive EE&C PDCA cycle and what should be considered in "EM Manual" for each particular facility, which enables steady advance in EE&C.

Tables of Standard Values : Tables (1) – (8)

Table (1) Air ratios for boilers

Classification		Air ratio				
Item	Load factor (%)	Solid fuel: Fixed bed	Solid fuel: Fluidized bed	Liquid fuel	Gas fuel	By-produced gas such as blast furnace gas
Standard for electric utility *	75–100	–	–	1.05–1.2	1.05–1.1	**1.2**
	50–100	1.3–1.45	1.2–1.45	1.1–1.25	1.1–1.2	1.2–1.3
30t/h	50–100	1.3–1.45	1.2–1.45	1.15–1.3	1.15–1.3	–
10/t	50–100	–	–	1.2–1.3	1.2–1.3	–
	50–100	–	–	1.2–1.3	1.2–1.3	–
	100	–	–	1.3–1.45	1.25–1.4	–
	75–100	–	–	1.05–1.1	1.05–1.1	1.15–1.2
	50–100	1.2–1.3	1.2–1.25	1.05–1.15	1.05–1.15	1.2–1.3
30t/h	50–100	1.2–1.3	1.2–1.25	1.15–1.25	1.15–1.25	–
10/t	50–100	–	–	1.15–1.3	1.15–1.25	–
	50–100	–	–	1.15–1.3	1.15–1.25	–
	100	–	–	1.25–1.4	1.2–1.35	–

above refers to boilers installed by electric power companies for power generation.

$$R = \frac{21}{21 - O_2}$$

O_2: Oxygen (%) in exhaust gas

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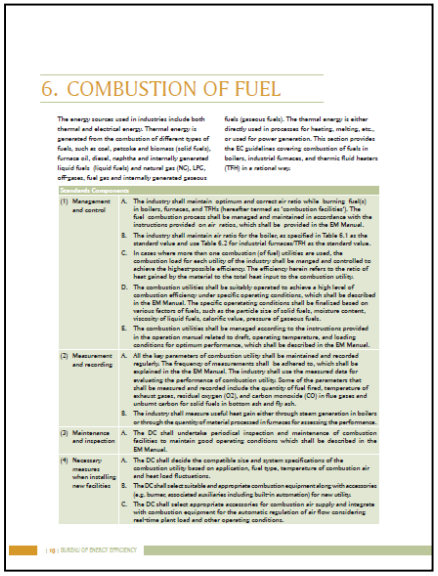
Release of Energy Conservation Guidelines, Sep. 2018

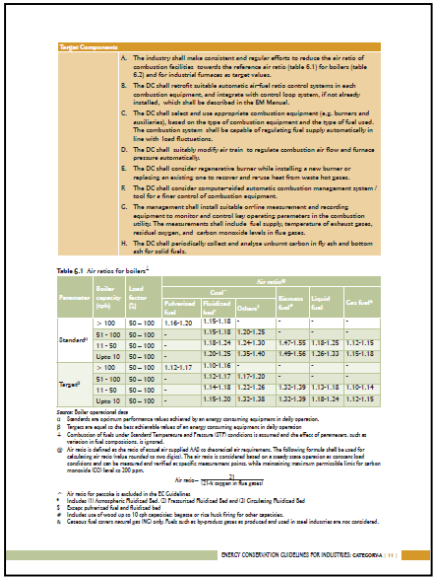


6. COMBUSTION OF FUEL

The energy sources used in industries include both thermal and electrical energy. Thermal energy is generated from the combustion of different types of fuels, such as coal, petcoke and biomass (solid fuels), furnace oil, diesel, naphtha and internally generated liquid fuels (liquid fuels) and natural gas (NG), LPG, off-gases, fuel gas and internally generated gaseous fuels (gaseous fuels). The thermal energy is either directly used in processes for heating, melting, etc., or used for power generation. This section provides the EC guidelines covering combustion of fuels in boilers, industrial furnaces, and thermic fluid heaters (TFH) in a rational way.

Mandatory Considerations

(1) Management and control	A.	The industry shall maintain optimum and correct air ratio while burning fuel(s) in boilers, furnaces, and TFHs (hereafter termed as 'combustion facilities'). The fuel combustion process shall be managed and maintained in accordance with the instructions provided on air ratios, which shall be provided in the EM Manual.
	B.	The industry shall maintain air ratio for the boiler, as specified in Table 6.1 as the standard value and use Table 6.2 for industrial furnaces/TFH as the standard value.
	C.	In cases where more than one combustion (of fuel) utilities are used, the combustion load for each utility of the industry shall be managed and controlled to achieve the highest possible efficiency. The efficiency herein refers to the ratio of heat gained by the material to the total heat input to the combustion utility.
	D.	The combustion utilities shall be suitably operated to achieve a high level of combustion efficiency under specific operating conditions, which shall be described in the EM Manual. The specific operating conditions shall be finalized based on various factors of fuels, such as the particle size of solid fuels, moisture content, viscosity of liquid fuels, calorific value, pressure of gaseous fuels.
	E.	The combustion utilities shall be managed according to the instructions provided in the operation manual related to draft, operating temperature, and loading conditions for optimum performance, which shall be described in the EM Manual.
(2) Measurement and recording	A.	All the key parameters of combustion utility shall be maintained and recorded regularly. The frequency of measurements shall be adhered to, which shall be explained in the the EM Manual. The industry shall use the measured data for evaluating the performance of combustion utility. Some of the parameters that shall be measured and recorded include the quantity of fuel fired, temperature of exhaust gases, residual oxygen (O2), and carbon monoxide (CO) in flue gases and unburnt carbon for solid fuels in bottom ash and fly ash.
	B.	The industry shall measure useful heat gain either through steam generation in boilers or through the quantity of material processed in furnaces for assessing the performance.
(3) Maintenance and inspection	A.	The DC shall undertake periodical inspection and maintenance of combustion facilities to maintain good operating conditions which shall be described in the EM Manual.
(4) Necessary measures when installing new facilities	A.	The DC shall decide the compatible size and system specifications of the combustion utility based on application, fuel type, temperature of combustion air and heat load fluctuations.
	B.	The DC shall select suitable and appropriate combustion equipment along with accessories (e.g. burner, associated auxiliaries including built-in automation) for new utility.
	C.	The DC shall select appropriate accessories for combustion air supply and integrate with combustion equipment for the automatic regulation of air flow considering real-time plant load and other operating conditions.



Target Components

	A.	The industry shall make consistent and regular efforts to reduce the air ratio of combustion facilities towards the reference air ratio (table 6.1) for boilers (table 6.2) and for industrial furnaces as target values.
	B.	The DC shall retrofit suitable automatic air-fuel ratio control systems in each combustion equipment, and integrate with control loop system, if not already installed, which shall be described in the EM Manual.
	C.	The DC shall select and use appropriate combustion equipment (e.g. burners and auxiliaries), based on the type of combustion equipment and the type of fuel used. The combustion system shall be capable of regulating fuel supply automatically in line with load fluctuations.
	D.	The DC shall suitably modify air train to regulate combustion air flow and furnace pressure automatically.
	E.	The DC shall consider regenerative burner while installing a new burner or replacing an existing one to recover and reruse heat from waste hot gases.
	F.	The DC shall consider computerized automatic combustion management system / tool for a finer control of combustion equipment.
	G.	The management shall install suitable on-line measurement and recording equipment to monitor and control key operating parameters in the combustion utility. The measurements shall include fuel supply, temperature of exhaust gases, residual oxygen, and carbon monoxide levels in flue gases.
	H.	The DC shall periodically collect and analyze unburnt carbon in fly ash and bottom ash for solid fuels.

Table 6.1 Air ratios for boilers[1]

Parameter	Boiler capacity (tph)	Load factor (%)	Air ratio[2]					
			Coal[3]			Biomass fuel[4]	Liquid fuel	Gas fuel[5]
			Pulverized fuel	Fluidized bed	Others[3]			
Standard[6]	> 100	50 – 100	1.16-1.20	1.15-1.18	-	-	-	-
	51 - 100	50 – 100	-	1.15-1.18	1.20-1.25	-	-	-
	11 - 50	50 – 100	-	1.18-1.24	1.24-1.30	1.47-1.55	1.18-1.25	1.13-1.15
	Upto 10	50 – 100	-	1.20-1.25	1.25-1.40	1.49-1.58	1.26-1.33	1.15-1.18
Target[6]	> 100	50 – 100	1.12-1.17	1.10-1.16	-	-	-	-
	51 - 100	50 – 100	-	1.12-1.17	1.17-1.20	-	-	-
	11 - 50	50 – 100	-	1.14-1.18	1.22-1.26	1.32-1.39	1.13-1.18	1.10-1.14
	Upto 10	50 – 100	-	1.18-1.20	1.30-1.38	1.32-1.39	1.18-1.24	1.13-1.15

Source: Boiler operational data

a Standards are optimum performance values achieved by an energy consuming equipment in daily operation.

b Targets are equal to the best achievable values of an energy consuming equipment in daily operation

c Combustion of fuels under Standard Temperature and Pressure (STP) conditions is assumed and the effect of permeaun. such as variation in fuel compositions, is ignored.

d Air ratio is defined as the ratio of actual air supplied AAS as theoretical air requirement. The following formula shall be used for calculating air ratio (value rounded to two digits). The air ratio is considered based on a steady state operation at constant load conditions and can be measured and verified at specific measurement points, while maintaining maximum permissible limits for carbon monoxide (CO) level as 200 ppm.

$$\text{Air ratio} = \frac{21}{21 - (\text{21\% oxygen in flue gases})}$$

^ Air ratio for pecolite is excluded in the EC Guidelines

* Includes (1) Atmospheric Fluidized Bed, (2) Pressurized Fluidized Bed and (3) Circulating Fluidized Bed

$ Except pulverized fuel and fluidized bed

Includes use of wood up to 10 tph capacities (bagasse or rice husk firing for other capacities).

§ Gaseous fuel covers natural gas (NG) only. Fuels such as by-product gases as produced and used in steel industries are not considered.

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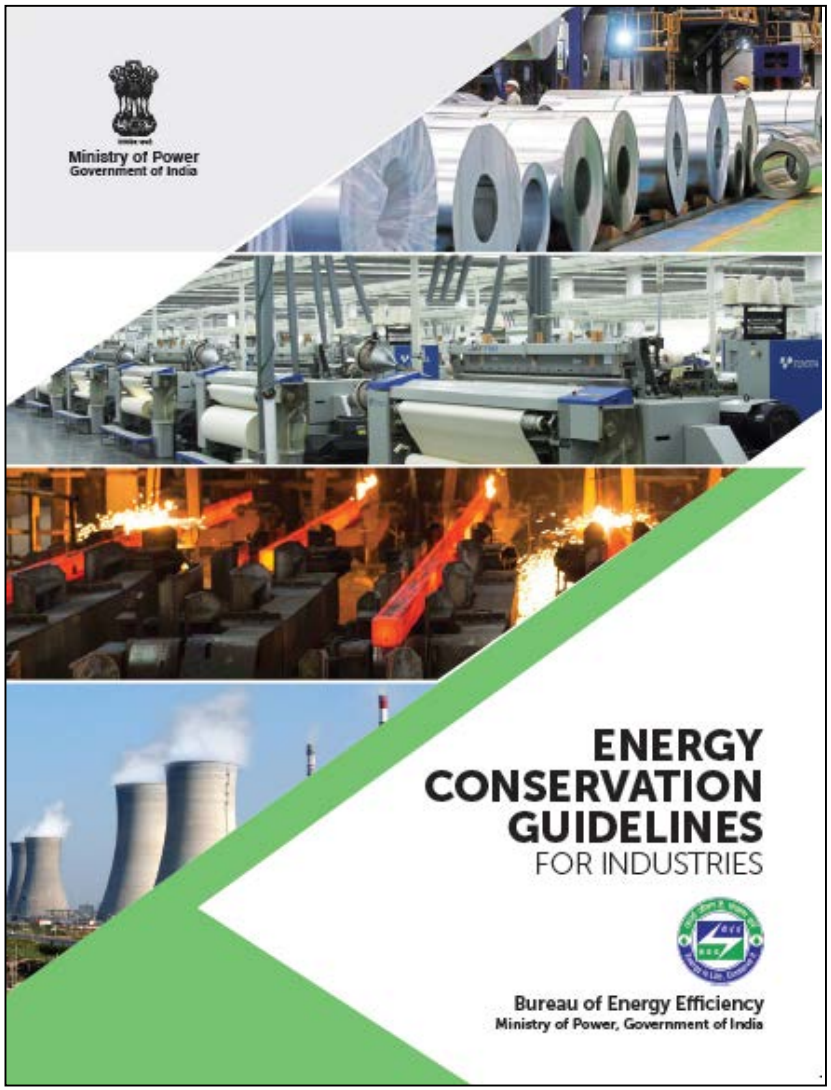


https://www.beeindia.gov.in/latest-news/energy-conservation-guidelines-industries

9 Model Factories as leading runner

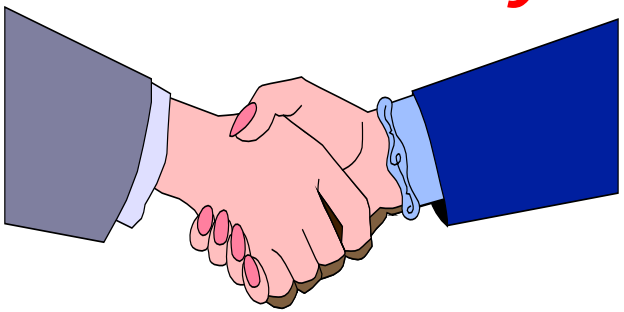
No.	Factory Name	Sector
1	Company A	Thermal Power Plant
2	Company B	Iron & Steel
3	Company C	Cement
4	Company D	Cement
5	Company E	Aluminium
6	Company F	Pulp & Paper
7	Company G	Chlor-Alkali
8	Company H	Textile
9	Company I	Petroleum Refinery

注） 工場名は、公表されていないので、敢えて伏せさせていただきました。

EC Guideline expansion to SMEs

Category	Details
Category-A	DCs covered under PAT scheme but limited to the following industries: (1) aluminium, (2) cement, (3) chlor-alkali, (4) fertilizers, (5) iron and steel, (6) petrochemicals, (7) petroleum refineries covering only cracker units, (8) pulp and paper, (9) textile, and (10) thermal power stations.
Category-B	Large industries with energy consumption of less than the existing minimum threshold limits for DCs.
Category-C	Small-scale enterprises with energy costs accounting for more than 30% of the total production cost but limited to the following SME sectors: (1) glass, (2) foundry, (3) forging, (4) ceramics, (5) dairy, and (6) textile industries.
Category-D	Medium enterprises with energy costs accounting for 10% to 30% of the total production costs but limited to the following sectors: (1) brick, (2) hand tools, (3) food, and (4) limestone industries.
Category-E	Micro industries with material costs more significant than energy costs.

Thank You Very Much



For More Information

The Energy Conservation Center, Japan

https://www.eccj.or.jp

Asia Energy Efficiency and Conservation Collaboration Center

(Established in 2007)

https://www.asiaeec-col.eccj.or.jp/index.html

Japanese Business Alliance for Smart Energy Worldwide (Established in 2008)

https://www.jase-w.eccj.or.jp/eng/index.html

The Energy Conservation Center, Japan