

Comparison of the pollution control technology between coal-fired power plants in Japan and ones overseas supported (to be supported) by JBIC

Name of Power Plant	JBIC Under Consideration										JBIC Supported					Existing coal-fired power plant in Japan				
	Nga Yoke Kaung	Ann Din	Indoramayu II	Cirebon II	JEPARA III	Batang	Safi	Meja	Vinh Tan IV	Kudji	Hai Phong II	Cirebon	Paiton III	JEPARA II	Mindanao	Isoqo New 2	Isoqo New 1	Hekinan 5	Niichi 2	Hekinan 1
Proponent	Mitsubishi, J-Power	TTCL	PLN	CEPR	BJP	BPI (J-Power)	Safi Energy	MUNPL	EVN	NTPC	HPTP/JSC	CEP	PE	CJP	SPI	J-Power	J-Power	Chubu	Souma Kyodo	Chubu
Location	Myanmar	Myanmar	Indonesia	Indonesia	Indonesia	Indonesia	Morocco	India	Vietnam	India	Vietnam	Indonesia	Indonesia	Indonesia	Philippines	Kanagawa	Kanagawa	Aichi	Fukushima	Aichi
Capacity (MW)	300*2 (600)	640*2 (1280)	1000*1	1000*1	1070*2 (2140)	1000*2 (2000)	625*2 (1250)	660*2 (1320)	600*2 (1200)	800*3 (2400)	300*2 (600)	660	815	660*2 (1320)	116*2 (232)	600	600	1000	1000	700
Operation year	2019 (proposed)	2019 (proposed)	2019 (proposed)	2020 (proposed)	2020 (proposed)	2018 (proposed)	2018 (proposed)	2017 (proposed)	2017 (proposed)	2016 (proposed)	August 2013	July 2012	June 2012	Feb 2012	Nov 2006	July 2009	April 2002	November 2002	July 1995	October 1991
Type of Power Generation	SUBCR	ULTRSC	ULTRSC	ULTRSC	ULTRSC	ULTRSC	ULTRSC	SUPERC	SUPERC	SUPERC	SUBCR	SUPERC	SUPERC	SUBCR	SUBCR	ULTRSC	ULTRSC	SUPERC	SUPERC	SUPERC
Height of stack (m)	Unknown	Unknown	220	200	240	240	200	275	210	275	200	215	220	240	150	200	200	200	200	200
Mitigation measure against SOx	SWFGD	Unknown	SWFGD	WLST	SWFGD	SWFGD	FGD	The space to be provided for FGD	SWFGD	The space to be provided for FGD	FGD ("See Note 1")	CF	SWFGD	WLST	WL	DFGD	DFGD	FGD (Type of FGD is unknown)	FGD etc. (Type of FGD is unknown)	FGD etc. (Type of FGD is unknown)
Emission concentration (ppm)	SO2 = 35 (SO2 = 100 mg/Nm3)	250-300	SO2 = 235-257 (SO2 = 665 mg/Nm3)	SO2 = 221 (SO2 = 625 mg/Nm3)	SO2 = 106 (SO2 = 300 mg/Nm3)	SO2 = 106 (SO2 = 300 mg/Nm3)	SO2 = 70 (SO2 = 200 mg/Nm3)	Unknown	SO2 = 123 (SOx = 350 mg/Nm3)	SO2 = 321 (SO2 = 917mg /Nm3)	SO2 = 63 (SO2 = 180 mg/Nm3)	SO2 = 227 (SO2 = 649 mg/Nm3)	SO2 = 30 (SO2 = 84 mg/Nm3)	SO2 = 106 (SO2 = 300 mg/Nm3)	SO2=245 (SO2 = 700mg/m3)	10	20	25	100	50 (28) (0 = after improvement in 2002)
Mitigation measure against NOx	LNB	Unknown	LNB	LNB	LNB	LNB	SCR/LNB	LNB	LNB	Unknown	LNB	LNB	LNB	LNB	LNB	SCR / LNB / TSC	SCR / LNB / TSC	SCR / LNB / TSC	SCR etc.	SCR etc.
Emission concentration (ppm)	NO2 = 197 (NOx = 400 mg/Nm3)	200	NO2 = 212-231 (NOx = 430 mg/Nm3)	NO2 = 251 (NOx = 510 mg/Nm3)	NO2 = 197 (NO2 = 400 mg/Nm3)	NO2 = 127 (NO2 = 260 mg/Nm3)	NO2 = 107 (NOx = 200mg /Nm3)	Unknown	NO2 = 111 (NO2 = 228 mg/Nm3)	NO2 = 316 (NOx = 648mg /Nm3)	NO2 = 438 (NO2 = 900 mg/Nm3)	NO2 = 404 (NOx = 829 mg/Nm3)	NO2 = 267 (NOx = 542 mg/Nm3)	NO2 = 229 (NOx = 465 mg/Nm3)	NO2 = 365 (NOx = 750mg/m3)	13	20	15	60	45 (30)
Mitigation measure against PM	ESP	Unknown	ESP	ESP	ESP	BH	ESP	ESP	ESP	ESP	ESP	ESP	ESP	ESP	BH	ESP	ESP	ESP	ESP	ESP
Emission concentration (mg/Nm3)	30	50	42	50	40	50	≤50	≤100	150	≤100	200	29	150	50	50	5	10	5	30	10 (5)

Note 1: The sources of the data on each power plant are the followings.

- * Nga Yoke Kaung = Power Point Presentation Report on "Project Development Survey on High-efficient and Eco-friendly Coal-fired Power Plant Project in Myanmar" by Mitsubishi and J-POWER (July 2015)
- * Ann Din = Documents provided by TTCL to the local community, 2014
- * Indoramayu II = Feasibility Studies, 2010 (JICA) and EIA (ANDAL), May 2015
- * Cirebon II = EIA (ANDAL), March 2016
- * JEPARA III = EIA (ANDAL), March 2016
- * Batang = EIA (ANDAL), August 2013
- * Safi = EIA, October 2013. The conversion from NOx to NO2 was done on the assumption that the concentration of NO2 is 75%, according to the description of EIA.
- * Meja = EIA, March 2013
- * Vinh Tan IV = EIA, September 2013
- * Kudji = EIA, September 2011. The unit of the concentration is assumed as mg/Nm3.
- * Hai Phong II = EIA, November 2006. According to the database of Platts WEPP (January 2015), SOx control measure used for Hai Phong II is only "Compliance fuel (CF)".
- * Cirebon = EIA (ANDAL), April 2006. The unit of the concentration is assumed as mg/Nm3.
- * Paiton III = EIA (ANDAL), 2008. The unit of the concentration is assumed as mg/Nm3.
- * JEPARA (Tanjung Jati B) II (Unit 3 and 4)= EIA (ANDAL)
- * Mindanao = EIS, January 2002. The unit of the concentration is assumed as mg/Nm3.
- * Isoqo New 2 and 1 = J-Power, Annual Report 2009
- * Hekinan 5 and 1 = CCT Journal No. 1, Center for Coal Utilization, Japan (currently JCOAL), May 2002
- * Niichi 2 and Hekinan 1 = "Is ODA fine like this", San-ichi Publishing Co., Ltd., 1996

Note 2: Conversion from mg/Nm3 to ppm in emission concentration was made with the following calculation.

(When we need to convert the concentration of SOx or NOx from mg/Nm3 into ppm, each molecular weight of SO2 and NO2 are applied here: M of SO2 = (32+16*2), M of NO2 = (14+16*2)

To convert X mg/Nm3 into Y ppm,

$$Y = X * 10(-3) / M * 22.4 * 10(3) * 10(6) = X * M * 22.4 \quad (M = \text{Molecular Weight})$$

As both are in the condition of the standard temperature and pressure (0°C or 273K in absolute temperature, and 0.1MPa), there is no need to correct in each temperature and pressure.

SOx Control	NOx Control	Particulate Control
DFGD	SCR	BH
SWFGD	LNB	ESP
FGD	TSC	Unspecified type of electrostatic precipitator (elektrofilter)
CF		
WLST		
WL		