Chapter 5 Local Emission Standards of Thermal Power Plants

5.1 Preface

The JICA Team proposed the methodology to establish local emission standards of new or extended thermal power plants and applied it to the 3 model areas: the City of Buenos Aires, San Nicolas and Lujan de Cuyo. Based on the results, summarized here are several political matters that required attention in applying the methodology in line with the present laws and regulations for air pollution control in Argentina.

5.2 Methodology for Establishing Local Emission Standards of Thermal Power Plants

1) Basic Conditions

A proposed method for establishment of local emission standards by the agency in the National Organization has been developed under the following conditions.

- Local emission standards are the average allowable emission levels based on the local average pollution levels and meteorological conditions.
- The method should be applicable to any local area in the whole country.
- The national emission standards must be observed primarily in the local areas.
- The national emission standards are based on generally available technologies, and the local standards are equal to or more stringent than the national ones because the local ones are based on preservation of local environmental conditions.
- The national and local air quality standards are the basis for the establishment of local emission standards.
- Emissions from sources other than power plants have to be recognized in the establishment of the power plant emission standards.
- In the course of the establishment, political judgments by national or local officials must be reserved.
- A safety factor has to be introduced for the establishment to give margins of uncertainty.
- The ENRE Manual must be regarded for the establishment of the standards.
- Existing statistics on air quality, meteorology, socio-economy are available for the establishment of the standards.
- The target pollutants are SOx, NOx and PM.

2) Methodology for Establishment of Local Emission Standards

From the above backgrounds and conditions, the methodology for establishment of local emission standards was developed as follows. Fig.5.1 shows the procedure.

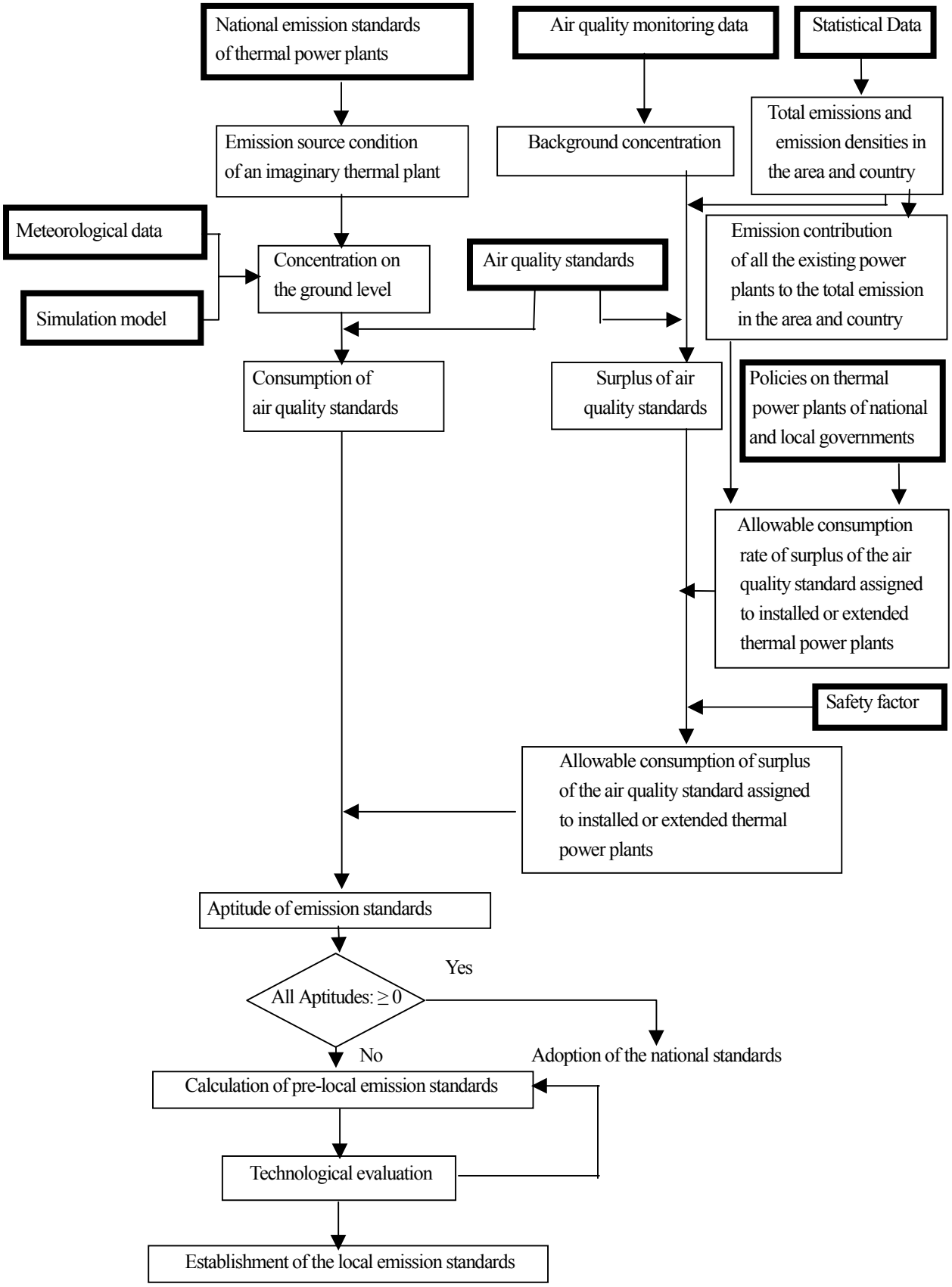

Figure 5.1 Flowchart of Local Emission Standards of Thermal Power Plants

5.3 Investigation of Local Emission Standards in Model Area

5.3.1 Outline of Local Emission Standard Investigation

According to the method of the local emission standard establishment in **section 5.2**, the investigation of the standards are conducted in three model areas.

The outline of the local emission standard investigation is explained below, using an example of local emission standard investigation shown in **Table 5.1.**

Table 5.1 An Example of Local Emission Standard Investigation

NO_x Emission Standard	Natural Gas	100	mg/m^3_N
	Gas Oil	100	mg/m^3_N
	Mixture	100	mg/m^3_N
Power Plant Share in NO_x Emission		0.272	(Fraction)
Annual Air Quality Standard of NO_x		100	$\mu g/m^3$

Stations	Present Conc. ug/m^3	Present P.P. ug/m^3	Surplus Conc. ug/m^3	P.P. Share ug/m^3	Phased Out P.P. ug/m^3	P.P. Total ug/m^3	P.P. Expansion ug/m^3	Judge	Recommended Emission Standard mg/m^3_N
(1)	19.2	0.1	80.8	22.0	0.0	22.0	13.5	○	
(2)	18.4	0.1	81.6	22.2	0.0	22.2	6.9	○	
(3)	18.7	1.3	81.3	22.1	0.3	22.4	20.2	○	
(4)	8.1	1.3	91.9	25.0	0.3	25.3	17.5	○	
(5)	19.1	1.2	80.9	22.0	0.2	22.2	12.3	○	
(6)	15.4	0.6	84.6	23.0	0.2	23.2	9.6	○	
(7)	16.6	0.5	83.4	22.7	0.1	22.8	6.6	○	
(8)	39.9	0.1	60.1	16.4	0.0	16.4	18.8	×	87.2
(9)	40.9	0.1	59.1	16.1	0.0	16.1	15.4	○	
(10)	36.2	0.5	63.8	17.4	0.1	17.5	9.0	○	
	Area Avg.	Same Location	Surplus	P.P.	Same Location		Area Max.		
Area Location	23.3	3.4 (16km,10km)	76.7	20.9	0.8 (16km,10km)	21.7	36.7 (16km,10km)	×	59.1

Conc.: Concentration, P.P.: Power Plant

a. Present emission standard for combined cycle with natural gas and gas oil mixture is $100mg/m^3_N$, and the annual air quality standard in Buenos Aires is $100ug/m^3$.

b. The manual sampling measurement results are regarded as the present annual average concentrations, and the averages of the stations as the local annual concentration. The present concentration shown here includes present power plant contribution. For example, the present concentration of the station (1) is $19.2ug/m^3$ and $0.1ug/m^3$ is the contribution from the power plants. Therefore, the surplus to the annual air quality standard, $100ug/m^3$, is $80.8ug/m^3$.

c. 27.2% of the total NO_x emission amount in the Buenos Aires model area comes from the power plants. Accordingly, 27.2% of the total surplus to the air quality standard, 22.0 ug/m^3, is assigned to the surplus of the power plants.

d. In the Buenos Aires model area, 1239MW units of the power plants will be scrapped and 3200MW units expanded until the year of 2020. Then, the surplus by the scrapped units will be added to the surplus of the present power plants to obtain the total surplus for the power plants.

e. Finally, if the contribution by the expansion does not exceed this total surplus, the present

emission standard is adequate (Judgement: O). For an example at the station (8), the contribution by the expansion, 16.4ug/m^3, exceeds the surplus, 18.8 μ g/m^3(Judgement: X). In this case, the present emission standard, 100ug/m^3, have to be changed as, 100ug/m^3 X 16.4(ug/m^3)/18.8(ug/m^3)=87.2ug/m^3.

5.3.2 Future Electricity Supply Plan

The electricity supply plan in the model areas by the year 2020 are predicted as in **Table 5.2**.

Table 5.2 Future Electricity Supply Plan

Year	Unit[1)]	Buenos Aires City		Buenos Aires Province		Mendoza Province	
		Capacity	Increase/ Decrease	Capacity	Increase/ Decrease	Capacity	Increase/ Decrease
2001	TV	2149		650		164	
	CC	1976		830		364	
	Total	4125		1480		528	
2020	TV	910	-1239	350	-300	164	0
	CC	5176	3200	2430	1600	1564	1200
	Total	6086	1961	2780	1300	1728	1200

1)TV : Steam Turbine, CC : Combined Cycle Unit : MW

Negative values in the table mean scrapping of old power generation units. For example, 1239MW of steam turbines will be scrapped and 3200MW of combined cycles will be newly constructed.

5.3.3 Result of Emission Standard Investigation

The results of emission standard investigations of NO_x, SO_2, and PM in the three model areas using the method described in **section 5.3.1** are shown in **Table 5.3** to **Table 5.11.**

The results show that the present NO_x and PM emission standards in Buenos Aires are adequate. Present SO_2 concentrations have already exceeded the air quality standards and the standards could not be satisfied even if the concentration improvement by scrapped units would be considered. The main causes of the high concentrations are not the power plants. Installation or extension of the power plant is not allowable even if the strictest emission standard is set. The example of the investigation in **Table 5.1** assumes three times greater expansion than the actual plan in order to explain a correctional method of emission standard.

In San Nicolas, the current emission standards of NO_x and SO_2 are adequate. For the PM emission standards, the emission standard is adequate for the stations with the lower present concentrations than the air quality standard. However, the present concentrations at most of the stations exceed the air quality standards. This is not necessary to make the present standard

stricter. The situation suggests that the expansion of power plant is not allowable because of local characteristics such as other emission sources, etc.

In Lujan de Cuyo, the emission standards of NO_x and SO_2 are adequate, and the present PM concentrations at most of the stations exceed the air quality standards, and the emission standards are adequate for the stations with present concentrations below the air quality standard, like in San Nicolas. The expansion of power plant causing the increase of SPM concentrations in Lujan de Cuyo is not acceptable.

The shares of pollutant emissions used in the tables should not be taken as directly proportional to the apportionment of the power plants to air quality deterioration in the model areas. As flue gases are emitted under conditions that favor pollutants to disperse (important emission release height, and relatively high values of temperatures and volume rates), the contribution of the power plants in the ambient air concentrations of NO_x, SO_2 and PM is much lower than their shares in emissions. This can be also appreciated from the tables.

Adding to the features of the figures above, more precise estimations of the shares of pollutant emission are highly recommended with more precise and time-matched data of emission sources.

Table 5.3 Result of Emission Standard Investigation (Buenos Aires/NO_x)

NO_x Emission Standard	Natural Gas	100	mg/m^3_N	
	Gas Oil	100	mg/m^3_N	
	Mixture	100	mg/m^3_N	
Power Plant Share in NO_x Emission		0.272	(Fraction)*	*More Precise Estimation is Highly Recommended
Annual Air Quality Standard of NO_x		100	$\mu g/m^3$	

Stations	Present Conc. ug/m^3	Present P.P. ug/m^3	Surplus Conc. ug/m^3	P.P. Share ug/m^3	Phased Out P.P. ug/m^3	P.P. Total ug/m^3	P.P. Expansion ug/m^3	Judge
(1)	19.2	2.8	80.8	22.0	1.9	23.9	4.5	○
(2)	18.4	1.5	81.6	22.2	0.9	23.1	2.3	○
(3)	18.7	4.1	81.3	22.1	1.4	23.5	6.7	○
(4)	8.1	3.7	91.9	25.0	1.0	26.0	5.8	○
(5)	19.1	2.7	80.9	22.0	0.5	22.5	4.1	○
(6)	15.4	1.8	84.6	23.0	0.6	23.6	3.2	○
(7)	16.6	1.6	83.4	22.7	0.4	23.1	2.2	○
(8)	39.9	3.8	60.1	16.4	2.7	19.1	6.3	○
(9)	40.9	3.0	59.1	16.1	2.3	18.4	5.1	○
(10)	36.2	1.8	63.8	17.4	0.7	18.1	3.0	○
	Area Avg.	Same Location	Surplus	P.P.	Same Location		Area Max.	
Area Location	23.3	7.5 (16km,10km)	76.7	20.9	1.6 (16km,10km)	22.5	12.2 (16km,10km)	○

Table 5.4 Result of Emission Standard Investigation (Buenos Aires/SO_2)

SO_2 Emission Standard	Natural Gas	0	mg/m^3_N	
	Gas Oil	380.2	mg/m^3_N	
	Mixture	3.8	mg/m^3_N	
Power Plant Share in SO_2 Emission		0.567	(Fraction)*	*More Precise Estimation is Highly Recommended
Annual Air Quality Standard of SO_2		80	$\mu g/m^3$	

Stations	Present Conc. ug/m^3	Present P.P. ug/m^3	Surplus Conc. ug/m^3	P.P. Share ug/m^3	Phased Out P.P. ug/m^3	P.P. Total ug/m^3	P.P. Expansion ug/m^3	Judge
(1)	112.5	4.209	-32.5	-18.4	3.600	-14.8	0.171	—
(2)	95.6	2.097	-15.6	-8.8	1.765	-7.1	0.087	—
(3)	105.9	2.550	-25.9	-14.7	2.366	-12.3	0.256	—
(4)	89.6	2.047	-9.6	-5.4	1.773	-3.7	0.221	—
(5)	101.9	0.819	-21.9	-12.4	0.724	-11.7	0.156	—
(6)	87.2	1.130	-7.2	-4.1	0.982	-3.1	0.121	—
(7)	92.9	0.728	-12.9	-7.3	0.632	-6.7	0.083	—
(8)	98.0	5.729	-18.0	-10.2	4.978	-5.2	0.237	—
(9)	147.5	4.650	-67.5	-38.3	4.260	-34.0	0.195	—
(10)	124.1	1.534	-44.1	-25.0	1.373	-23.6	0.113	—
	Area Avg.	Same Location	Surplus	P.P.	Same Location		Area Max.	
Area Location	105.5	2.615 (16km,10km)	-25.5	-14.5	2.417 (16km,10km)	-12.1	0.464 (16km,10km)	—

Table 5.5 Result of Emission Standard Investigation (Buenos Aires/PM)

PM Emission Standard	Natural Gas	6	mg/m^3_N	
	Gas Oil	20	mg/m^3_N	
	Mixture	6.14	mg/m^3_N	
Power Plant Share in PM Emission		0.567	(Fraction)*	*More Precise Estimation is Highly Recommended
Annual Air Quality Standard of SPM		50	$\mu g/m^3$	

Stations	Present Conc. ug/m^3	Present P.P. ug/m^3	Surplus Conc. ug/m^3	P.P. Share ug/m^3	Phased Out P.P. ug/m^3	P.P. Total ug/m^3	P.P. Expansion ug/m^3	Judge
(1)	46.9	0.09	3.1	1.8	0.07	1.8	0.28	○
(2)	31.7	0.05	18.3	10.4	0.03	10.4	0.14	○
(3)	30.1	0.07	19.9	11.3	0.06	11.3	0.41	○
(4)	35.6	0.06	14.4	8.2	0.05	8.2	0.36	○
(5)	37.6	0.03	12.4	7.0	0.02	7.0	0.25	○
(6)	35.6	0.03	14.4	8.1	0.03	8.2	0.20	○
(7)	36.2	0.02	13.8	7.9	0.02	7.9	0.13	○
(8)	48.9	0.12	1.1	0.6	0.09	0.7	0.38	○
(9)	29.5	0.09	20.5	11.6	0.08	11.7	0.32	○
(10)	31.8	0.03	18.2	10.3	0.03	10.3	0.18	○
	Area Avg.	Same Location	Surplus	P.P.	Same Location		Area Max.	
Area Location	36.4	0.10 (16km,10km)	13.6	7.7	0.08 (16km,10km)	7.8	0.75 (16km,10km)	○

Table 5.6 Result of Emission Standard Investigation (San Nicolas/NO_x)

NO_x Emission Standard	Natural Gas	100	mg/m^3_N	
	Gas Oil	100	mg/m^3_N	
	Mixture	100	mg/m^3_N	
Power Plant Share in NO_x Emission		0.048	(Fraction)*	*More Precise Estimation is Highly Recommended
Annual Air Quality Standard of NO_x		100	$\mu g/m^3$	

Stations	Present Conc. ug/m^3	Present P.P. ug/m^3	Surplus Conc. ug/m^3	P.P. Share ug/m^3	Phased Out P.P. ug/m^3	P.P. Total ug/m^3	P.P. Expansion ug/m^3	Judge
(1)	8.7	0.24	91.3	4.4	0.07	4.5	0.79	○
(2)	9.3	0.31	90.7	4.4	0.07	4.5	1.10	○
(3)	9.3	0.30	90.7	4.4	0.08	4.5	1.02	○
(4)	8.7	0.55	91.3	4.4	0.14	4.5	1.82	○
(5)	7.6	0.47	92.4	4.5	0.12	4.6	1.25	○
(6)	8.2	0.50	91.8	4.4	0.11	4.5	1.67	○
(7)	9.5	0.47	90.5	4.4	0.13	4.5	1.31	○
(8)	8.7	0.20	91.3	4.4	0.05	4.5	0.45	○
(9)	5.7	-	-	-	-	-	-	-
(10)	12.3	0.09	87.7	4.2	0.02	4.3	0.26	○
	Area Avg.	Same Location	Surplus	P.P.	Same Location		Area Max.	
Area Location	8.8	0.51 (21km,35km)	91.2	4.4	0.11 (21km,35km)	4.5	1.85 (21km,35km)	○

Table 5.7 Result of Emission Standard Investigation (San Nicolas/SO_2)

SO_2 Emission Standard	Natural Gas	0	mg/m^3_N	
	Gas Oil	380.2	mg/m^3_N	
	Mixture	3.8	mg/m^3_N	
Power Plant Share in SO_2 Emission		0.220	(Fraction)*	*More Precise Estimation is Highly Recommended
Annual Air Quality Standard of SO_2		80	$\mu g/m^3$	

Stations	Present Conc. ug/m^3	Present P.P. ug/m^3	Surplus Conc. ug/m^3	P.P. Share ug/m^3	Phased Out P.P. ug/m^3	P.P. Total ug/m^3	P.P. Expansion ug/m^3	Judge
(1)	38.5	0.3	41.5	9.1	0.01	9.1	0.03	○
(2)	49.2	0.5	30.8	6.8	0.01	6.8	0.04	○
(3)	38.0	0.5	42.0	9.2	0.01	9.2	0.04	○
(4)	48.0	0.8	32.0	7.0	0.03	7.1	0.07	○
(5)	43.0	0.7	37.0	8.1	0.03	8.2	0.05	○
(6)	35.4	0.8	44.6	9.8	0.04	9.8	0.06	○
(7)	36.7	0.7	43.3	9.5	0.05	9.6	0.05	○
(8)	46.6	0.7	33.4	7.3	0.02	7.4	0.02	○
(9)	32.4	-	-	-	-	-		
(10)	41.4	0.1	38.6	8.5	0.01	8.5	0.01	○
	Area Avg.	Same Location	Surplus	P.P.	Same Location		Area Max.	
Area Location	40.9	0.8 (21km,35km)	39.1	8.6	0.02 (21km,35km)	8.6	0.07 (21km,35km)	○

Table 5.8 Result of Emission Standard Investigation (San Nicolas/PM)

PM Emission Standard	Natural Gas	6	mg/m^3_N	
	Gas Oil	20	mg/m^3_N	
	Mixture	6.14	mg/m^3_N	
Power Plant Share in PM Emission		0.220	(Fraction)*	*More Precise Estimation is Highly Recommended
Annual Air Quality Standard of SPM		50	$\mu g/m^3$	

Stations	Present Conc. ug/m^3	Present P.P. ug/m^3	Surplus Conc. ug/m^3	P.P. Share ug/m^3	Phased Out P.P. ug/m^3	P.P. Total ug/m^3	P.P. Expansion ug/m^3	Judge
(1)	40.2	0.046	9.8	2.1	0.014	2.2	0.05	○
(2)	53.1	0.068	-3.1	-0.7	0.013	-0.7	0.07	—
(3)	50.4	0.067	-0.4	-0.1	0.014	-0.1	0.06	—
(4)	42.5	0.108	7.5	1.6	0.025	1.7	0.11	○
(5)	87.2	0.097	-37.2	-8.2	0.025	-8.1	0.08	—
(6)	61.2	0.103	-11.2	-2.5	0.026	-2.4	0.10	—
(7)	49.6	0.091	0.4	0.1	0.034	0.1	0.08	○
(8)	63.6	0.036	-13.6	-3.0	0.012	-3.0	0.03	—
(9)	46.8	-	-	-	-	-	-	
(10)	44.7	0.019	5.3	1.2	0.004	1.2	0.02	○
	Area Avg.	Same Location	Surplus	P.P.	Same Location		Area Max.	
Area Location	53.9	0.103 (21km,35km)	-3.9	-0.9	0.021 (21km,35km)	-0.8	0.11 (21km,35km)	—

Table 5.9 Result of Emission Standard Investigation (Lujan de Cuyo/NO_x)

NO_x Emission Standard	Natural Gas	100	mg/m^3_N
	Gas Oil	100	mg/m^3_N
	Mixture	100	mg/m^3_N
Power Plant Share in NO_x Emission		0.133	(Fraction)*
Annual Air Quality Standard of NO_x		74	$\mu g/m^3$

*More Precise Estimation is Highly Recommended

Stations	Present Conc. ug/m^3	Present P.P. ug/m^3	Surplus Conc. ug/m^3	P.P. Share ug/m^3	Phased Out P.P. ug/m^3	P.P. Total ug/m^3	P.P. Expansion ug/m^3	Judge
(1)	13.3	1.33	60.7	8.1	0.00	8.1	1.21	○
(2)	13.1	0.43	60.9	8.1	0.00	8.1	0.06	○
(3)	13.4	-	-	-	-	-	-	
(4)	14.6	1.26	59.4	7.9	0.00	7.9	1.87	○
(5)	13.8	0.10	60.2	8.0	0.00	8.0	0.14	○
(6)	13.3	0.07	60.7	8.1	0.00	8.1	0.07	○
(7)	13.9	0.52	60.1	8.0	0.00	8.0	0.24	○
(8)	13.7	0.16	60.3	8.0	0.00	8.0	0.16	○
(9)	12.2	2.77	61.8	8.2	0.00	8.2	1.02	○
	Area Avg.	Same Location	Surplus	P.P.	Same Location		Area Max.	
Area Location	13.5	1.93 (13km,43km)	60.5	8.0	0.00	8.0	2.99 (13km,43km)	○

Table 5.10 Result of Emission Standard Investigation (Lujan de Cuyo/SO_2)

SO_2 Emission Standard	Natural Gas	0	mg/m^3_N
	Gas Oil	380.2	mg/m^3_N
	Mixture	3.8	mg/m^3_N
Power Plant Share in SO_2 Emission		0.181	(Fraction)*
Annual Air Quality Standard of SO_2		229	$\mu g/m^3$

*More Precise Estimation is Highly Recommended

Stations	Present Conc. ug/m^3	Present P.P. ug/m^3	Surplus Conc. ug/m^3	P.P. Share ug/m^3	Phased Out P.P. ug/m^3	P.P. Total ug/m^3	P.P. Expansion ug/m^3	Judge
(1)	65.3	0.05	163.7	29.6	0.00	29.6	0.05	○
(2)	65.6	0.01	163.4	29.6	0.00	29.6	0.00	○
(3)	50.8	-	-	-	-	-	-	
(4)	49.4	0.05	179.6	32.5	0.00	32.5	0.07	○
(5)	59.1	0.00	169.9	30.8	0.00	30.8	0.01	○
(6)	45.3	0.00	183.7	33.2	0.00	33.2	0.00	○
(7)	48.5	0.02	180.5	32.7	0.00	32.7	0.01	○
(8)	54.2	0.00	174.8	31.6	0.00	31.6	0.01	○
(9)	47.2	0.08	181.8	32.9	0.00	32.9	0.04	○
	Area Avg.	Same Location	Surplus	P.P.	Same Location		Area Max.	
Area Location	53.9	0.05 (13km,43km)	175.1	31.7	0.00	31.7	0.11 (13km,43km)	○

Table 5.11 Result of Emission Standard Investigation (Lujan de Cuyo/PM)

PM Emission Standard		Natural Gas	6	mg/m^3_N				
		Gas Oil	20	mg/m^3_N				
		Mixture	6.14	mg/m^3_N				
Power Plant Share in PM Emission			0.181	(Fraction)*	*More Precise Estimation is Highly Recommended			
Annual Air Quality Standard of SPM			72	$\mu g/m^3$				
Stations	Present Conc. ug/m^3	Present P.P. ug/m^3	Surplus Conc. ug/m^3	P.P. Share ug/m^3	Phased Out P.P. ug/m^3	P.P. Total ug/m^3	P.P. Expansion ug/m^3	Judge
(1)	58.7	0.0022	13.3	2.4	0.0	2.4	0.07	○
(2)	119.3	0.0002	-47.3	-8.6	0.0	-8.6	0.00	－
(3)	87.4	-	-	-	-	-	-	
(4)	73.4	0.0020	-1.4	-0.3	0.0	-0.3	0.11	－
(5)	78.3	0.0002	-6.3	-1.1	0.0	-1.1	0.01	－
(6)	70.1	0.0001	1.9	0.3	0.0	0.3	0.00	○
(7)	79.0	0.0005	-7.0	-1.3	0.0	-1.3	0.01	－
(8)	70.6	0.0001	1.4	0.3	0.0	0.3	0.01	○
(9)	86.1	0.0029	-14.1	-2.5	0.0	-2.5	0.06	－
	Area Avg.	Same Location	Surplus	P.P.	Same Location		Area Max.	
Area Location	80.3	0.0015 (13km,43km)	-8.3	-1.5	0.0	-1.5	0.18 (13km,43km)	－

5.4 Application Plan of Emission Standards for Thermal Power Plants

1) Applied Fields

There are 3 fields for which the methodology can be applied.

- Nationwide allocation of thermal power plants in the future in consideration of air quality.
- Environmental evaluation of plans of installation and extension of thermal power plants.
- The establishment of local emission standards of new or extended thermal power plants.

2) Differences between National and Local Emission Standards

There are 2 kinds of emission standards: national and local ones. Their main difference is that national emission standards are based on technology, while the local ones are based on the environment.

3) Judgment of Necessity of Local Emission Standards

As mentioned earlier, Argentina has national emission standards on thermal power plants. There is no local standard in the 3 areas of the JICA Study, except for the general ones in Department of Lujan de Cuyo. It should be judged whether the national government has to establish local emission standards or not, prior to examining the framework of emission

standards of thermal power plants in the country, namely national standards only or a combination of national and local standards. There are 3 items to be considered for the judgment as shown below.

- Existence of environmental impact assessment system (EIA system).
- Lack of Ambient air monitored data and source inventory data
- Movements of local governments

The first item is the existence of environmental impact assessment system (EIA system). As is widely known, EIA provides materials to decide whether to approve the implementation of the project or not from its impacts on the environment.

The Secretariat of Energy and Mines (Secretary Energy), and 15 provinces and the City of Buenos Aires impose EIA on thermal power plants. The EIA system is a powerful tool to prevent environmental deterioration before it happens. In such a situation where a entrepreneur of a thermal power plant has a legal obligation to conduct a EIA study, it is a crucial issue whether the national government should establish the local emission standards or not.

Beside, if local emission standards have to be established, the existence of monitored air quality data and source inventory data in the area concerned is a prerequisite. In Argentina where air quality monitoring has rarely been conducted, development of air quality monitoring (to give reliable background concentration) and the source inventories (to estimate reasonable emissions from other sources) are indispensable in order to establish reasonable local emission standards of thermal power plants. The establishment of local emission standards requests substantial efforts and costs.

Moreover, the major air pollutant emitted from combined cycles, the prevailing power generation system now in Argentina, is NOx, although it does not emit much NOx in comparison with other generation systems. As a result, NOx is the target pollutant for further emission regulation. The area with a high concentration of NOx is the Buenos Aires metropolitan area, where the Argentina Pollution Management Project has been conducted with the assistance of the World Bank. Although the project is reportedly suspended now, an air quality monitoring network is planned in the metropolitan area. The City of Buenos Aires has a plan of establishing local emission standards on stationary sources.

The national policy on local emission standards of thermal power plants should be decided with due consideration to the issues mentioned above.

The JICA Team recommends that the Secretary of Energy and Mines and ENRE apply the methodology of EIA in the planning stage of installation and extension of thermal power

plants.

5.5 Governmental Environmental Management

Prior to establishing local emission standards of thermal power plants, the following items should be executed by national or local governments.

- Establishment of comprehensive emission standards
- Execution of ambient air monitoring
- Development of source inventory

1) Establishment of Comprehensive Emission Standards

There is no national comprehensive emission standards covering various stationary sources in Argentina. The Secretary of Energy has revised the emission standards of thermal power plants three times in 1993, 1995 and 2001.

As long as the national economy continues to expand, total national air pollution loads will increase, which will lead to higher background concentrations everywhere, including around power plants, and subsequently to further revision of emission standards of power plants.

In spite of the fact above, the establishment of comprehensive emission standards covering various combustion and industrial facilities is a prerequisite to further revision of the emission standards of thermal power plants or new establishment of their local emission standards.

The polluter-pays-principle is a principle stipulated in the National Constitution of Argentina. Air polluters must share their fair burdens for protection of atmospheric environment. It is questionable to impose the burden only on the power generators. The Secretary of Energy and ENRE are in a position to control and supervise thermal power plants, and at the same time in a position to protect them. Comprehensive national emission standards on stationary sources are necessary to make polluters share burdens for environmental protection. Such standards are indispensable for reasonable allocation of resources in the country.

The JICA Team visited large-scale industries in the 3 model areas, most of which conducted environmental management voluntarily. Several industries have measured their flue gases. They pay much attention to the environment. They seem to shift to accept emission regulations such as emission standards.

The Secretary of Energy and ENRE should propose that the Secretary of Social Development and Environment establish emission standards on air polluting facilities over a given scale. The targeted industries are obliged to observe the standards, and to conduct flue gas measurement and report the results.

Flue gases should be measured based on the national uniform rule. The Secretary of Energy and ENRE should propose that the Secretary of Social Development and Environment prepare guidelines and manuals for flue gas measurement, maintenance of the analyzers, and data processing and analysis.

The Secretary of Energy and ENRE have much experience and knowledge on establishment of emission standards and flue gas measurement respectively. They can contribute much to developing the above standards, guidelines and manuals.

2) Ambient Air Monitoring

Establishment of local emission standards requires monitoring of air quality to know the level of concentrations, its compliance with the air quality standards and change over several years. Therefore, automatic and continuous air quality monitoring should be encouraged. As well, meteorological data are required to know local air pollution mechanism and hence, meteorology (wind direction and speed, temperature, etc.) should be observed at least at one of the air quality monitoring stations.

Air pollution is a result of dispersion of air pollutants from various kinds of stationary and mobile sources. Consequently there are many polluters. Though several industries are monitoring ambient air voluntarily, it is questionable to impose the monitoring on specific polluters.

It is local governments (provinces or municipalities) who are responsible for the monitoring and management of their atmosphere. The Secretary of Energy and ENRE should propose to local governments, through the national cabinet, that they carry out automatic continuous monitoring in their jurisdictions.

It is a duty of local governments to monitor their atmosphere. However, it should be conducted based on the national uniform rule. The Secretary of Social Development and Environment should prepare guidelines and manuals for selection of monitoring sites for air quality and meteorology, measuring methods, maintenance of the equipment, data processing and analysis.

3) Development of Source Inventory

To monitor and manage local atmosphere, development of source inventories as well as continuation of air quality monitoring is necessary to know the state of the local air pollution and its pollution mechanism. Although development of source inventories is assigned to local governments, they should be made based on the national uniform rule. The Secretary of Social Development and Environment should prepare uniform guidelines and manuals to develop source inventories.