

Emissions from Electricity Generation

Ashim Choudhury

Central Institute of Mining & Fuel Research

Key Elements for estimations of GHG Emissions

a) Fuel consumption

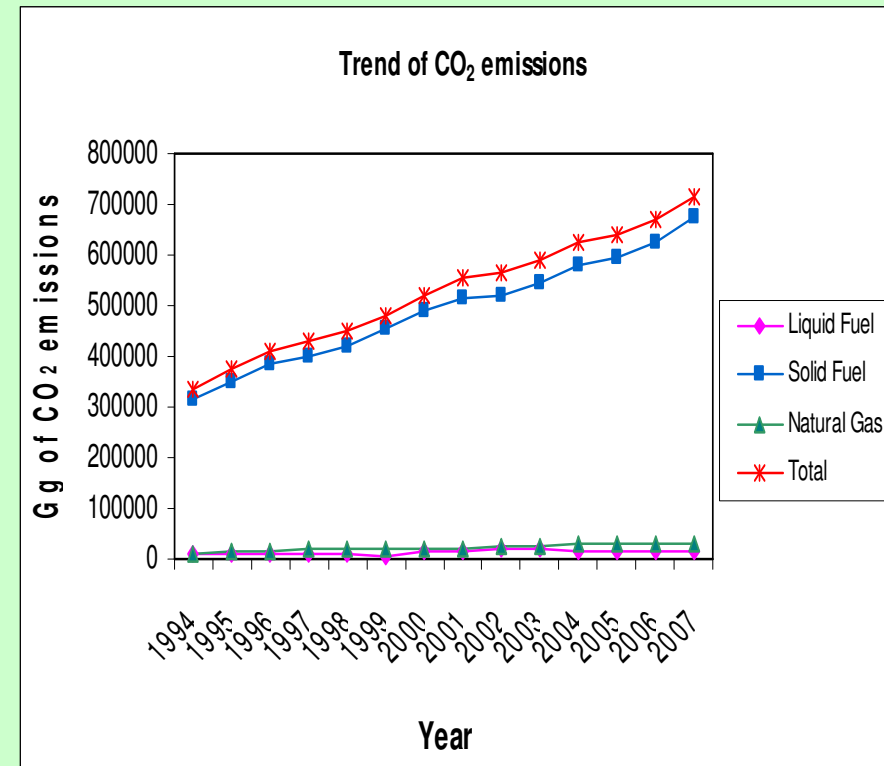
b) Conversion factor - Net Calorific Value

c) Emission Factor

d) Oxidation factor

NCV & CEF of Indian coals and Lignites

- Gradation of Indian coals
- Variation of NCV & CEF between grades



Grading of Indian coals

Coking

Grade	Ash %	Ash+moisture %
Semi coking Gr. I	-	<19
Semi Coking Gr. II	-	19 - <24
Steel Gr. I	<15	-
Steel Gr. II	15- <18	-
Washery Gr. I	18- <21	-
Washery Gr. II	21-<24	-
Washery Gr. III	24 - <28	-
Washery Gr. IV	28-<35	-

Non coking

Grade	UHV (kcal/kg)	Ash+Moist %
Grade A	>6200	<19.6
Grade B	6200 - <5600	19.6-22.5
Grade C	5600 - <4940	22.5-28.7
Grade D	4940 - <4200	28.7-34.1
Grade E	4200 - < 3360	34.1-40.0
Grade F	3360 - < 2400	40.0-47.1
Grade G	2400- <1300	47.1-55.1

Methodology adopted

- Collection of relevant coal characteristic data
 - Data Sources – i) CIMFR(3700- coking & non coking)
 - ii) Neyville Lignite Corporation(4400)
- Identification of outliers
- Categorisation of the coking & non coking coals into different existing grades
- Estimation of the NCV/CEF for each grade of different categories of coking & non coking coals .
- Use of grade wise production data for estimation of NCV & CEF of coking & non coking coals

NCV & CO₂ Emission factors of Indian coals

Indian Coals	Lower	Mean	Higher	Lower	Mean	Higher
	NCV(TJ/kt)			CO ₂ EF(t/TJ)		
Lignite	7.10	9.69	11.99	95.33	106.15	113.63
Non coking	12.03	19.63	27.20	81.33	95.81	108.06
Coking	21.77	24.18	29.72	91.59	93.61	95.55
IPCC default						
Lignite	5.50	11.90	21.60	90.90	101.00	115.00
Sub bitminous/ Other bituminous	11.50	18.9-25.8	30.50	89.50	96.10	100.00
Coking	24.00	28.20	31.00	87.30	94.60	101.00

**GHG emissions in Giga gram from the energy and manufacturing industry
in 2007**

	CO ₂	CH ₄	N ₂ O	CO ₂ equivalent
Energy Industries				
elect & heat	715829.80	8.14	10.66	719305.30
pet refinery	32893.07	1.71	0.055	32946.03
man solid fuels	894.43	0.01	0.015	899.29
Manufacturing Industries				
pulp and paper	5222.50	0.05	0.08	5248.83
food proc and beverages	27625.53	1.12	0.22	27718.41
non metallic minerals	58.74	0.00	0.00	58.94
mining and quarrying	1460.26	0.06	0.01	1465.17
textile and leather	1861.11	0.03	0.02	1869.47
non specific industries	87799.77	1.11	1.32	88231.04

Thank You