Grid Emission Factor (Uzbekistan)

v. 01.1

28/01/2013

Salient Features of the Uzbekistan national electricity grid - Gross Generation (GWh)[1]

	2007	2008	2009	2010	2011
Total for Uzbekistan (GWh)	**48 816,7**	**49 859,7**	**50 063,1**	**51 935,0**	**52 772,2**
Hydro (GWh)	6 457,1	4 385,9	6 483,3	8 192,1	5 721,3
CHP(GWh)	1 219,9	1 101,4	1 028,6	878,2	914,1
as % ratio from total generation	15,7%	11,0%	15,0%	17,5%	12,6%
5 Year Average			**14,35%**		

In accordance with Step 3: Selection a method to determine the operating margin (OM) [2] was selected simple operating margin as average of the five last years shows that low-cost/must-run resources (in Uzbekistan case are hydro power plants) constitute 14.35% < 50%

1. Information taken from report data of SJSC "Uzbekenrgo"; Annual Report; 2007, 2008, 2009, 2010, 2011

2. Tool to calculate the emission factor for an electricity system, ver. 03.0

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Sector and Station wise Generating Capacity in Uzbekistan and calculation of operating margin
Year: 2009

Province/Sector[1]	Date Comissioned[1]	Plant name[1]	Fuel Type[1]	Installed Capacity[1]	Generated Units[1]	Fuel consumption[1]	Net Calorific Value [2]	CO_2 emission factor of fossil fuel [3]	Emission	Emission factor	Total Unit Emissions
Thermal (Coal Fired)											
				MW	GWh/yr	kt or m^3/yr	TJ/kt or mln m^3	tCO_2/TJ	$ktCO_2$	tCO2/MWh	tCO2
Kashkadarya region	2004	Talimarjan TPP	Natural gas	800	[redacted]	[redacted]	34,16	54,30	2 367,39		
				Total					2 367,39	0,502	2 367 394
Tashkent region	1985	Novo-Angren TPP	Coal	2 100	[redacted]	[redacted]	10,04	92,80	1 819,91		
			Natural gas				34,16	54,30	2 701,46		
			RFO				40,07	75,50	7,26		
				Total					4 528,63	0,737	4 528 633
Syrdarya region	1972	Syrdarya TPP	Natural gas	3 000	[redacted]	[redacted]	34,16	54,30	7 850,63		
			RFO				40,07	75,50	150,05		
				Total					8 000,68	0,574	8 000 682
Tashkent region	1963	Tashkent TPP	Natural gas	1 860	[redacted]	[redacted]	34,16	54,30	3 931,81		
			RFO				40,07	75,50	440,78		
				Total					4 372,59	0,619	4 372 590
Navoi region	1961	Navoi TPP	Natural gas	1 250	[redacted]	[redacted]	34,16	54,30	3 763,94		
			RFO				40,07	75,50	3,33		
				Total					3 767,27	0,538	3 767 267
Republic Karakalpakistan	1961	Takhiatash TPP	Natural gas	730	[redacted]	[redacted]	34,16	54,30	1 845,06		
			RFO				40,07	75,50	0,61		
				Total					1 845,66	0,630	1 845 662
Tashkent region	1957	Angren TPP	Coal	484	[redacted]	[redacted]	10,04	92,80	364,28		
			RFO				40,07	75,50	31,74		
			Underground gas				3,65	94,36	67,68		
				Total					463,70	0,874	463 699
				Total (OM)	42 325,49					Total (OM)	25 345 926,49
Import of electricity from neighboring countries											
				Country[4]	Electricity generation[5]						
					GWh/yr						
				Tajikistan	[redacted]						
				Kyrgyzstan							
				Total	887,30						

$EF_{grid,OM,y}$ **0,5865 t CO_2/MWh**

1. Source: PJSC Uzbekenergo
2. NCV obtained from data presented by PJSC Uzbekenergo
3. UNFCCC revised guidelines 2006
4. TACIS CDM Capacity building project document
5. Central Asian Load Dispatch Center Report -2004

Sector and Station wise Generating Capacity in Uzbekistan and calculation of operating margin
Year: 2010

Thermal (Coal Fired)											
Province/Sector[1]	**Date Comissioned[1]**	**Plant name[1]**	**Fuel Type[1]**	**Installed Capacity[1]**	**Generated Units[1]**	**Fuel consumption[1]**	**Net Calorific Value [2]**	**CO_2 emission factor of fossil fuel [3]**	**Emission**	**Emission factor**	**Total Unit Emissions**
				MW	**GWh/yr**	**kt or m^3/yr**	**TJ/kt or mln m^3**	**tCO_2/TJ**	**$ktCO_2$**	**tCO2/MWh**	**tCO2**
Kashkadarya region	2004	Talimarjan TPP	Natural gas	800	[redacted]		34,16	54,30	2 804,41		
				Total					2 804,41	0,506	2 804 405
Tashkent region	1985	Novo-Angren TPP	Coal	2 100			10,04	92,80	1 333,65		
			Natural gas				34,16	54,30	2 561,41		
			RFO				40,07	75,50	7,87		
				Total					3 902,93	0,719	3 902 933
Syrdarya region	1972	Syrdarya TPP	Natural gas	3 000			34,16	54,30	8 076,37		
			RFO				40,07	75,50	150,05		
				Total					8 226,42	0,560	8 226 422
Tashkent region	1963	Tashkent TPP	Natural gas	1 860			34,16	54,30	3 381,46		
			RFO				40,07	75,50	365,15		
				Total					3 746,61	0,617	3 746 613
Navoi region	1961	Navoi TPP	Natural gas	1 250			34,16	54,30	3 929,12		
			RFO				40,07	75,50	0,45		
				Total					3 929,57	0,533	3 929 570
Republic Karakalpakistan	1961	Takhiatash TPP	Natural gas	730			34,16	54,30	1 978,24		
			RFO				40,07	75,50	0,00		
				Total					1 978,24	0,643	1 978 238
Tashkent region	1957	Angren TPP	Coal	484			10,04	92,80	325,95		
			RFO				40,07	75,50	27,86		
			Underground gas				3,65	94,36	54,45		
				Total					408,26	0,897	408 265
				Total (OM)	**42 637,20**					**Total (OM)**	**24 996 446**
Import of electricity from neighboring countries											
				Country[4]	**Electricity generation[5]**						
					GWh/yr						
				Tajikistan	0						
				Kyrgyzstan	0						
				Total	**0,00**						

$EF_{grid,OM,y}$ **0,5863 t CO_2/MWh**

1. Source: PJSC Uzbekenergo
2. NCV obtained from data presented by PJSC Uzbekenergo
3. Data obtained from UNFCCC guidelines 1996
4. UNFCCC revised guidelines 2006
5. TACIS CDM Capacity building project document
6. Central Asian Load Dispatch Center Report -2004

Sector and Station wise Generating Capacity in Uzbekistan and calculation of operating margin

Confidential

Year: 2011

Thermal (Coal Fired)											
Province/Sector[1]	**Date Comissioned[1]**	**Plant name[1]**	**Fuel Type[1]**	**Installed Capacity[1]**	**Generated Units[1]**	**Fuel consumption[1]**	**Net Calorific Value [2]**	**CO_2 emission factor of fossil fuel [3]**	**Emission**	**Emission factor**	**Total Unit Emissions**
				MW	**GWh/yr**	**kt or thousand m^3/yr**	**TJ/kt or mln m^3**	**tCO_2/TJ**	**$ktCO_2$**	**tCO2/MWh**	**tCO2**
Kashkadarya region	2004	Talimarjan TPP	Natural gas	800	[redacted]	[redacted]	34,16	54,30	2 911,62		
				Total					**2 911,62**	**0,498**	**2 911 618**
Tashkent region	1985	Novo-Angren TPP	Coal	2 100			10,04	92,80	1 266,94		
			Natural gas				34,16	54,30	2 751,17		
			RFO				40,07	75,50	8,47		
				Total					**4 026,58**	**0,685**	**4 026 583**
Syrdarya region	1972	Syrdarya TPP	Natural gas	3 000			34,16	54,30	8 432,88		
			RFO				40,07	75,50	142,19		
				Total					**8 575,07**	**0,570**	**8 575 066**
Tashkent region	1963	Tashkent TPP	Natural gas	1 860			34,16	54,30	2 515,78		
			RFO				40,07	75,50	438,06		
				Total					**2 953,85**	**0,380**	**2 953 846**
Navoi region	1961	Navoi TPP	Natural gas	1 250			34,16	54,30	4 008,60		
			RFO				40,07	75,50	16,34		
				Total					**4 024,93**	**0,525**	**4 024 935**
Republic Karakalpakistan	1961	Takhiatash TPP	Natural gas	730			34,16	54,30	2 152,60		
			RFO				40,07	75,50	0,00		
				Total					**2 152,60**	**0,657**	**2 152 598**
Tashkent region	1957	Angren TPP	Coal	484			10,04	92,80	252,68		
			RFO				40,07	75,50	19,36		
			Underground gas				3,65	94,36	47,56		
				Total					**319,60**	**0,761**	**319 601**
				Total (OM)	**45 923,90**					**Total (OM)**	**24 964 245**
Import of electricity from neighboring countries											
				Country[4]	**Electricity generation[5]**						
					GWh/yr						
				Kazakhstan	[redacted]						
				Kyrgyzstan							
				Total	**657,80**						

$EF_{grid,OM,y}$ **0,536 t CO_2/MWh**

1. Source: PJSC Uzbekenergo
2. NCV obtained from data presented by PJSC Uzbekenergo
3. UNFCCC revised guidelines 2006

Sector and Station wise Generating Capacity in Uzbekistan and calculation of build margin
Year: 2011

Thermal (Coal Fired)											
Province/Sector[1]	**Date Comissioned[1]**	**Plant name[1]**	**Fuel Type[1]**	**Installed Capacity[1]**	**Generated Units[1]**	**Fuel consumption[1]**	**Net Calorific Value [2]**	**CO_2 emission factor of fossil fuel [3]**	**Emission**	**Emission factor**	**Total Unit Emissions**
				MW	**GWh/yr**	**kt or thousand m^3/yr**	**TJ/kt or mln m^3**	**tCO_2/TJ**	**$ktCO_2$**	**tCO2/MWh**	**tCO2**
Kashkadarya region	2004	Talimarjan TPP	Natural gas	800	[redacted]		34,16	54,30	2 911,62		
				Total					**2 911,62**	**0,498**	**2 911 618**
Tashkent region	1985	Novo-Angren TPP	Coal	2 100			10,04	92,80			
			Natural gas				34,16	54,30			
			RFO				40,07	75,50			
				Total					**3 065,65**	**0,521**	**3 065 648**
Kashkadarya region	1985	Mubarek CHP	Natural gas	60			34,16	54,30	190,27		
				Total					**190,27**	**0,652**	**190 267**
Hydro											
Province/Sector[1]	**Date Comissioned[1]**	**Plant name[1]**	**Fuel Type[1]**	**Installed Capacity[1]**	**Electricity generation[1]**						
				MW	**GWh/yr**						
		SE Uzsuvenergo									
Kashkadarya region	2011	Gissarak HPP	Hydro	45,00	[redacted]						
Andijan region	2010	Andijan-2 HPP	Hydro	50,00							
Tashkent region	2010	Akhangaran HPP	Hydro	21,00							
Surkhandarya region	2006	Tupalang HPP	Hydro	30,00							
Samarqand region	2005	Urgut HPP	Hydro	1,50							
			Total	**1 857,20**	**5 721,30**						
				Sub-Total (BM)	**331,200**	**0,63%**					
				Total (BM)	**12 353,10**	**23,41%**				**Total (BM)**	**6 167 533**

$EF_{grid,BM,y}$ **0,499 t CO_2/MWh**

1. Source: PJSC Uzbekenergo
2. NCV obtained from data presented by PJSC Uzbekenergo
4. UNFCCC revised guidelines 2006

1. Operating Margin

Year	Emission, tons CO_2	Electricity generation, MWh/yr
2009	25 345 926	43 212 790
2010	24 996 446	42 637 205
2011	24 964 245	46 581 700

Operating Margin (ex-ante three years) **0,569 t CO_2/MWh**

Operating Margin (ex-post 2011) **0,536 t CO_2/MWh**

2. Build Margin

Year	Emission, tons CO_2	Electricity generation, MWh/yr
2011	6 167 533	12 353 100

Build Margin **0,499 t CO_2/MWh**

3. Calculation of combined margin emission factor EFgrid, CM, y

3.1. Using Ex-Annte OM EF

For Wind and Solar Projects (First Crediting Period)

w_{om}	$EF_{grid,OM,y}$	w_{bm}	$EF_{grid,BM,y}$	EF_y
0,75	0,569	0,25	0,499	**0,551**

Others

w_{om}	$EF_{grid,OM,y}$	w_{bm}	$EF_{grid,BM,y}$	EF_y
0,5	0,569	0,5	0,499	**0,534**

3.2. Using Ex-Post Emission Factor (updated annually)

For Wind and Solar Projects (First Crediting Period)

w_{om}	$EF_{grid,OM,y}$	w_{bm}	$EF_{grid,BM,y}$	EF_y
0,75	0,536	0,25	0,499	**0,527**

Others

w_{om}	$EF_{grid,OM,y}$	w_{bm}	$EF_{grid,BM,y}$	EF_y
0,5	0,536	0,5	0,499	**0,518**

NCV		
Coal	**10,04**	**TJ/kt**
Natural Gas	**34,16**	**TJ/mil. m3**
RFO	**40,07**	**TJ/kt**
Underground gas	**3,647**	**TJ/mil.m3**
CO_2 EF		
Coal	**92,8**	**tCO2/TJ**
Natural Gas	**54,3**	**tCO2/TJ**
RFO	**75,5**	**tCO2/TJ**
Underground coal gasification	**94,4**	**tCO2/TJ**

CO2_EF for Underground gas (National Inventory Report Uzbekistan 2000)

Apparent consumption	247	mil m3
Net Calorific Value	3,647	TJ/mil m3
Total Emissions	85 000	tCO2
CEF	94,36	tCO2/mil. m3