

**NORTHEAST ASIA**  
**ENERGY BALANCE TABLES**

<b>2002</b>									Mtoe
	Coal	Oil	Gas	Hydro	Nuclear	NRE	Electricity	Heat	Total
Production			3.1	9.6	108.6	12.7			134.1
Net Imports	166.9	411.4	103.5				0.5		682.2
<b>TPED</b>	<b>167.1</b>	<b>407.0</b>	<b>106.8</b>	<b>9.6</b>	<b>108.6</b>	<b>12.7</b>	<b>0.5</b>		<b>812.4</b>
Electricity and Heat Generation	-100.4	-35.9	-70.8	-9.6	-108.6	-9.3	130.2	3.8	-200.5
Petroleum Refineries		-32.1	-0.9				-1.0		-34.1
Others	-32.8	-5.0	3.3			-0.2	-0.1		-34.8
<b>TFED</b>	<b>36.7</b>	<b>335.5</b>	<b>39.4</b>			<b>3.4</b>	<b>126.9</b>	<b>3.8</b>	<b>545.7</b>
Industry	36.2	128.4	14.7			2.4	58.8	2.0	242.5
Transport		145.7	0.1				1.9		147.7
Residential	0.6	22.5	17.5			0.8	30.5	1.2	73.1
Commercial		38.8	7.1			0.1	35.7	0.7	82.4

  

<b>2010</b>									Mtoe
	Coal	Oil	Gas	Hydro	Nuclear	NRE	Electricity	Heat	Total
Production			2.6	10.4	130.3	21.5			164.8
Net Imports	190.8	427.3	137.2				0.5		755.7
<b>TPED</b>	<b>190.8</b>	<b>427.3</b>	<b>139.8</b>	<b>10.4</b>	<b>130.3</b>	<b>21.5</b>	<b>0.5</b>		<b>920.6</b>
Electricity and Heat Generation	-125.6	-21.4	-87.1	-10.4	-130.3	-18.1	153.8	6.2	-232.9
Petroleum Refineries		-21.2	-1.1				-1.1		-23.3
Others	-24.3	-4.3	3.0				-0.1		-25.7
<b>TFED</b>	<b>40.9</b>	<b>380.4</b>	<b>54.6</b>			<b>3.4</b>	<b>153.1</b>	<b>6.2</b>	<b>638.5</b>
Industry	40.8	142.5	22.1			2.4	69.3	3.5	280.6
Transport		174.0	0.1				2.0		176.1
Residential	0.1	22.3	22.3			0.9	36.2	1.9	83.8
Commercial		41.5	10.0			0.1	45.7	0.8	98.0

  

<b>2020</b>									Mtoe
	Coal	Oil	Gas	Hydro	Nuclear	NRE	Electricity	Heat	Total
Production			0.7	10.2	155.4	31.7			198.0
Net Imports	223.0	457.8	177.3				0.5		858.6
<b>TPED</b>	<b>223.0</b>	<b>457.8</b>	<b>178.0</b>	<b>10.2</b>	<b>155.4</b>	<b>31.7</b>	<b>0.5</b>		<b>1 056.6</b>
Electricity and Heat Generation	-153.0	-17.8	-110.9	-10.2	-155.4	-28.0	187.2	8.1	-280.1
Petroleum Refineries		-20.4	-1.1				-1.0		-22.5
Others	-24.2	-4.0	3.1				-0.1		-25.2
<b>TFED</b>	<b>45.8</b>	<b>415.7</b>	<b>69.0</b>			<b>3.6</b>	<b>186.7</b>	<b>8.1</b>	<b>728.8</b>
Industry	45.8	154.5	28.9			2.5	87.4	4.8	323.9
Transport		193.8	0.3				2.1		196.2
Residential		22.2	26.8			1.0	40.2	2.4	92.6
Commercial		45.1	13.0			0.1	57.0	0.9	116.2

  

<b>2030</b>									Mtoe
	Coal	Oil	Gas	Hydro	Nuclear	NRE	Electricity	Heat	Total
Production			0.7	10.6	176.9	41.2			229.5
Net Imports	243.1	472.5	206.3				0.6		922.5
<b>TPED</b>	<b>243.1</b>	<b>472.5</b>	<b>207.1</b>	<b>10.6</b>	<b>176.9</b>	<b>41.2</b>	<b>0.6</b>		<b>1 151.9</b>
Electricity and Heat Generation	-170.3	-16.8	-128.3	-10.6	-176.9	-37.4	214.7	9.6	-316.0
Petroleum Refineries		-19.6	-1.1				-0.9		-21.6
Others	-23.9	-4.0	3.2				-0.1		-24.8
<b>TFED</b>	<b>48.9</b>	<b>432.2</b>	<b>80.8</b>			<b>3.8</b>	<b>214.3</b>	<b>9.6</b>	<b>789.5</b>
Industry	48.9	160.9	34.7			2.6	102.0	5.9	355.0
Transport		206.7	0.4				2.2		209.3
Residential		21.6	30.7			1.0	42.5	2.7	98.6
Commercial		43.0	15.0			0.2	67.5	1.0	126.6

## NORTHEAST ASIA

## MACRO ASSUMPTIONS

	1980	2002	2010	2020	2030	Growth Rate (% per annum)				
						80-02	02-10	10-20	20-30	02-30
<b>GDP</b> (2000 PPP US\$ billion)	2 236	4 576	5 700	7 140	8 498	3.3	2.8	2.3	1.8	2.2
<b>Population</b> (million)	178	204	208	207	203	0.6	0.2	-0.04	-0.2	-0.03
<b>GDP per capita</b> (2000 PPP US\$)	12 561	22 396	27 419	34 476	41 925	2.7	2.6	2.3	2.0	2.3
<b>GDP in Services</b> (2000 PPP US\$ billion)	1 403	3 257	3 974	4 964	6 005	3.9	2.5	2.2	1.9	2.2
<b>GDP in Industry</b> (2000 PPP US\$ billion)	726	1 416	1 759	2 235	2 725	3.1	2.7	2.4	2.0	2.4
<b>Urbanisation level</b> (%)	54	71	73	75	78	1.3	0.2	0.3	0.4	0.3

## ENERGY PROJECTIONS

	1980	2002	Mtoe			2030	Growth rate (% per annum)				
			2010	2020	2030		80-02	02-10	10-20	20-30	02-30
<b>Production</b>	<b>58.4</b>	<b>134.1</b>	<b>164.8</b>	<b>198.0</b>	<b>229.5</b>	<b>3.9</b>	<b>2.6</b>	<b>1.8</b>	<b>1.5</b>	<b>1.9</b>	
Coal	20.7 (35%)										
Oil	0.7 (1%)	0.05	0.04	0.05	0.05	-11.6	-1.4	0.7	0.4		
Gas	3.5 (6%)	3.1 (2%)	2.6 (2%)	0.7 (0%)	0.7 (0%)	-0.5	-2.3	-12.3	0.3	-5.1	
Hydro	8.0 (14%)	9.6 (7%)	10.4 (6%)	10.2 (5%)	10.6 (5%)	0.8	1.0	-0.2	0.4	0.3	
NRE	0.8 (1%)	12.7 (9%)	21.5 (13%)	31.7 (16%)	41.2 (18%)	13.1	6.8	3.9	2.7	4.3	
Nuclear	24.6 (42%)	108.6 (81%)	130.3 (79%)	155.4 (78%)	176.9 (77%)	7.0	2.3	1.8	1.3	1.8	
<b>Net Imports</b>	<b>380.4</b>	<b>682.2</b>	<b>755.7</b>	<b>858.6</b>	<b>922.5</b>	<b>2.7</b>	<b>1.3</b>	<b>1.3</b>	<b>0.7</b>	<b>1.1</b>	
Coal	54.1	166.9	190.8	223.0	243.1	5.3	1.7	1.6	0.9	1.4	
Oil	306.8	411.4	427.3	457.8	472.5	1.3	0.5	0.7	0.3	0.5	
Gas	19.5	103.5	137.2	177.3	206.3	7.9	3.6	2.6	1.5	2.5	
Electricity		0.5	0.5	0.5	0.6		-0.9	1.0	1.0	0.5	
<b>Total Primary Energy Demand</b>	<b>421.8</b>	<b>812.4</b>	<b>920.6</b>	<b>1 056.6</b>	<b>1 151.9</b>	<b>3.0</b>	<b>1.6</b>	<b>1.4</b>	<b>0.9</b>	<b>1.3</b>	
Coal	76.9 (18%)	167.1 (21%)	190.8 (21%)	223.0 (21%)	243.1 (21%)	3.6	1.7	1.6	0.9	1.3	
Oil	288.4 (68%)	407.0 (50%)	427.3 (46%)	457.8 (43%)	472.5 (41%)	1.6	0.6	0.7	0.3	0.5	
Gas	23.0 (5%)	106.8 (13%)	139.8 (15%)	178.0 (17%)	207.1 (18%)	7.2	3.4	2.4	1.5	2.4	
Hydro	8.0 (2%)	9.6 (1%)	10.4 (1%)	10.2 (1%)	10.6 (1%)	0.8	1.0	-0.2	0.4	0.3	
NRE	0.9 (0%)	12.7 (2%)	21.5 (2%)	31.7 (3%)	41.2 (4%)	13.0	6.8	3.9	2.7	4.3	
Nuclear	24.6 (6%)	108.6 (13%)	130.3 (14%)	155.4 (15%)	176.9 (15%)	7.0	2.3	1.8	1.3	1.8	
<b>Input for Electricity and Heat Generation</b>	<b>-136.8</b>	<b>-334.6</b>	<b>-392.9</b>	<b>-475.4</b>	<b>-540.3</b>	<b>4.1</b>	<b>2.0</b>	<b>1.9</b>	<b>1.3</b>	<b>1.7</b>	
Coal	-12.9 (9%)	-100.4 (30%)	-125.6 (32%)	-153.0 (32%)	-170.3 (32%)	9.8	2.8	2.0	1.1	1.9	
Oil	-75.0 (55%)	-35.9 (11%)	-21.4 (5%)	-17.8 (4%)	-16.8 (3%)	-3.3	-6.3	-1.8	-0.6	-2.7	
Gas	-15.6 (11%)	-70.8 (21%)	-87.1 (22%)	-110.9 (23%)	-128.3 (24%)	7.1	2.6	2.4	1.5	2.1	
Hydro	-8.0 (6%)	-9.6 (3%)	-10.4 (3%)	-10.2 (2%)	-10.6 (2%)	0.8	1.0	-0.2	0.4	0.3	
NRE	-0.8 (1%)	-9.3 (3%)	-18.1 (5%)	-28.0 (6%)	-37.4 (7%)	11.9	8.7	4.5	2.9	5.1	
Nuclear	-24.6 (18%)	-108.6 (32%)	-130.3 (33%)	-155.4 (33%)	-176.9 (33%)	7.0	2.3	1.8	1.3	1.8	
<b>Other Transformation</b>	<b>-22.2</b>	<b>-68.8</b>	<b>-49.1</b>	<b>-47.7</b>	<b>-46.4</b>	<b>5.3</b>	<b>-4.1</b>	<b>-0.3</b>	<b>-0.3</b>	<b>-1.4</b>	
Coal	-3.4 (15%)	-32.8 (48%)	-24.3 (50%)	-24.2 (51%)	-23.9 (52%)	10.8	-3.7		-0.1	-1.1	
Oil	-17.3 (78%)	-37.1 (54%)	-25.5 (52%)	-24.4 (51%)	-23.5 (51%)	3.5	-4.6	-0.5	-0.3	-1.6	
Gas	-0.6 (3%)	2.3 (-3%)	1.9 (-4%)	2.0 (-4%)	2.1 (-4%)		-2.5	0.4	0.5	-0.4	
NRE		-0.2 (0%)					-18.7			-5.7	
Electricity	-0.9 (4%)	-1.1 (2%)	-1.1 (2%)	-1.1 (2%)	-1.0 (2%)	0.9	0.4	-0.4	-0.7	-0.3	
Heat											

## NORTHEAST ASIA

	Mtoe					Growth rate (% per annum)				
	1980	2002	2010	2020	2030	80-02	02-10	10-20	20-30	02-30
<b>Total Final Energy Demand</b>	<b>264.9</b>	<b>545.7</b>	<b>638.5</b>	<b>728.8</b>	<b>789.5</b>	<b>3.3</b>	<b>2.0</b>	<b>1.3</b>	<b>0.8</b>	<b>1.3</b>
Coal	33.2 (13%)	36.7 (7%)	40.9 (6%)	45.8 (6%)	48.9 (6%)	0.5	1.3	1.1	0.7	1.0
Oil	169.6 (64%)	335.5 (61%)	380.4 (60%)	415.7 (57%)	432.2 (55%)	3.2	1.6	0.9	0.4	0.9
Gas	11.1 (4%)	39.4 (7%)	54.6 (9%)	69.0 (9%)	80.8 (10%)	5.9	4.1	2.4	1.6	2.6
NRE		3.4 (1%)	3.4 (1%)	3.6 (0%)	3.8 (0%)	22.6	0.2	0.5	0.5	0.4
Electricity	50.9 (19%)	126.9 (23%)	153.1 (24%)	186.7 (26%)	214.3 (27%)	4.2	2.4	2.0	1.4	1.9
Heat	0.1 (0%)	3.8 (1%)	6.2 (1%)	8.1 (1%)	9.6 (1%)	17.9	6.3	2.7	1.8	3.4
<b>Industry</b>	<b>141.0</b>	<b>242.5</b>	<b>280.6</b>	<b>323.9</b>	<b>355.0</b>	<b>2.5</b>	<b>1.8</b>	<b>1.4</b>	<b>0.9</b>	<b>1.4</b>
Coal	24.2 (17%)	36.2 (15%)	40.8 (15%)	45.8 (14%)	48.9 (14%)	1.8	1.5	1.2	0.7	1.1
Oil	80.2 (57%)	128.4 (53%)	142.5 (51%)	154.5 (48%)	160.9 (45%)	2.2	1.3	0.8	0.4	0.8
Gas	3.8 (3%)	14.7 (6%)	22.1 (8%)	28.9 (9%)	34.7 (10%)	6.3	5.2	2.7	1.9	3.1
NRE		2.4 (1%)	2.4 (1%)	2.5 (1%)	2.6 (1%)		-0.1	0.3	0.3	0.2
Electricity	32.7 (23%)	58.8 (24%)	69.3 (25%)	87.4 (27%)	102.0 (29%)	2.7	2.1	2.3	1.6	2.0
Heat		2.0 (1%)	3.5 (1%)	4.8 (1%)	5.9 (2%)		7.5	3.2	2.0	4.0
<b>Transport</b>	<b>62.6</b>	<b>147.7</b>	<b>176.1</b>	<b>196.2</b>	<b>209.3</b>	<b>4.0</b>	<b>2.2</b>	<b>1.1</b>	<b>0.7</b>	<b>1.3</b>
Coal										
Oil	61.2 (98%)	145.7 (99%)	174.0 (99%)	193.8 (99%)	206.7 (99%)	4.0	2.2	1.1	0.6	1.3
Gas		0.1 (0%)	0.1 (0%)	0.3 (0%)	0.4 (0%)		9.1	5.7	5.0	6.4
NRE										
Electricity	1.4 (2%)	1.9 (1%)	2.0 (1%)	2.1 (1%)	2.2 (1%)	1.5	0.7	0.5	0.7	0.6
<b>Residential</b>	<b>37.1</b>	<b>73.1</b>	<b>83.7</b>	<b>92.6</b>	<b>98.6</b>	<b>3.1</b>	<b>1.7</b>	<b>1.0</b>	<b>0.6</b>	<b>1.1</b>
Coal	8.9 (24%)	0.6 (1%)	0.1 (0%)	0.02 (0%)	0.002 (0%)	-11.8	-17.0	-18.1	-19.3	-18.2
Oil	11.2 (30%)	22.5 (31%)	22.3 (27%)	22.2 (24%)	21.6 (22%)	3.2	-0.1	-0.04	-0.3	-0.1
Gas	5.8 (16%)	17.5 (24%)	22.3 (27%)	26.8 (29%)	30.7 (31%)	5.2	3.1	1.9	1.4	2.0
NRE		0.8 (1%)	0.9 (1%)	1.0 (1%)	1.0 (1%)	15.0	0.9	0.7	0.6	0.7
Electricity	11.3 (30%)	30.5 (42%)	36.2 (43%)	40.2 (43%)	42.5 (43%)	4.6	2.1	1.1	0.6	1.2
Heat		1.2 (2%)	1.9 (2%)	2.4 (3%)	2.7 (3%)		6.4	2.1	1.5	3.1
<b>Commercial</b>	<b>24.3</b>	<b>82.4</b>	<b>98.0</b>	<b>116.2</b>	<b>126.6</b>	<b>5.7</b>	<b>2.2</b>	<b>1.7</b>	<b>0.9</b>	<b>1.5</b>
Coal	0.1 (0%)									
Oil	17.0 (70%)	38.8 (47%)	41.5 (42%)	45.1 (39%)	43.0 (34%)	3.8	0.8	0.8	-0.5	0.4
Gas	1.5 (6%)	7.1 (9%)	10.0 (10%)	13.0 (11%)	15.0 (12%)	7.3	4.3	2.7	1.4	2.7
NRE		0.1 (0%)	0.1 (0%)	0.1 (0%)	0.2 (0%)		2.3	2.4	1.9	2.2
Electricity	5.5 (23%)	35.7 (43%)	45.7 (47%)	57.0 (49%)	67.5 (53%)	8.9	3.1	2.2	1.7	2.3
Heat	0.1 (0%)	0.7 (1%)	0.8 (1%)	0.9 (1%)	1.0 (1%)	8.8	1.8	1.7	1.5	1.7

Note: Net imports include intraregional trade

## ENERGY SECURITY

	1980	2002	2010	2020	2030
Diversity of Primary Energy Demand (Rated between 1 and 100)	52	77	81	85	87
Net Energy Import Ratio (%)	87	84	82	81	80
Net Oil Import Dependency (%)	100	100	100	100	100

**NORTHEAST ASIA**  
**ELECTRICITY GENERATION**

	1980	2002	2010	2020	2030	Growth rate (% per annum)				
						80-02	02-10	10-20	20-30	02-30
<b>Total Electricity Generation (TWh)</b>	<b>665</b>	<b>1 587</b>	<b>1 854</b>	<b>2 249</b>	<b>2 562</b>	<b>4.0</b>	<b>2.0</b>	<b>2.0</b>	<b>1.3</b>	<b>1.7</b>
Coal	63 ( 10%)	496 ( 31%)	631 ( 34%)	783 ( 35%)	893 ( 35%)	9.8	3.1	2.2	1.3	2.1
Oil	332 ( 50%)	183 ( 12%)	101 ( 5%)	81 ( 4%)	75 ( 3%)	-2.7	-7.1	-2.2	-0.8	-3.1
Gas	81 ( 12%)	342 ( 22%)	412 ( 22%)	538 ( 24%)	637 ( 25%)	6.8	2.4	2.7	1.7	2.3
Hydro	93 ( 14%)	101 ( 6%)	120 ( 6%)	115 ( 5%)	114 ( 4%)	0.4	2.1	-0.4		0.4
NRE	1	11 ( 1%)	48 ( 3%)	78 ( 3%)	95 ( 4%)	11.9	20.7	5.0	2.0	8.1
Nuclear	94 ( 14%)	454 ( 29%)	542 ( 29%)	655 ( 29%)	747 ( 29%)	7.4	2.2	1.9	1.3	1.8
<b>Total Installed Generation Capacity (GW)</b>	<b>166</b>	<b>344</b>	<b>416</b>	<b>488</b>	<b>549</b>	<b>3.4</b>	<b>2.4</b>	<b>1.6</b>	<b>1.2</b>	<b>1.7</b>
Thermal	115 ( 70%)	221 ( 64%)	261 ( 63%)	311 ( 64%)	355 ( 65%)	3.0	2.1	1.8	1.3	1.7
Coal		72 ( 21%)	97 ( 23%)	124 ( 25%)	148 ( 27%)		3.7	2.5	1.7	2.6
Oil		63 ( 18%)	60 ( 14%)	54 ( 11%)	52 ( 9%)		-0.6	-1.1	-0.5	-0.7
Gas		86 ( 25%)	104 ( 25%)	133 ( 27%)	155 ( 28%)		2.5	2.5	1.6	2.1
Hydro	32 ( 20%)	53 ( 15%)	60 ( 14%)	61 ( 13%)	64 ( 12%)	2.3	1.5	0.2	0.4	0.7
NRE		3 ( 1%)	16 ( 4%)	25 ( 5%)	29 ( 5%)	17.4	21.1	4.9	1.5	8.0
Nuclear	18 ( 11%)	67 ( 19%)	79 ( 19%)	90 ( 18%)	101 ( 18%)	6.2	2.1	1.3	1.2	1.5

**ENERGY INTENSITY & CO<sub>2</sub> EMISSIONS**

	1980	2002	2010	2020	2030	Growth Rates (% per annum)				
						80-02	02-10	10-20	20-30	02-30
<b>Energy Intensity (toe per US\$ million GDP)</b>	<b>189</b>	<b>178</b>	<b>161</b>	<b>148</b>	<b>136</b>	<b>-0.3</b>	<b>-1.2</b>	<b>-0.9</b>	<b>-0.9</b>	<b>-1.0</b>
Industry (toe per US\$ million GDP in Industry)	194	171	160	145	130	-0.6	-0.9	-1.0	-1.1	-1.0
Commercial (toe per US\$ million GDP in Services)	17	25	25	23	21	1.7	-0.3	-0.5	-1.0	-0.6
<b>Energy Intensity (kgoe per capita)</b>	<b>2 370</b>	<b>3 976</b>	<b>4 428</b>	<b>5 101</b>	<b>5 683</b>	<b>2.4</b>	<b>1.4</b>	<b>1.4</b>	<b>1.1</b>	<b>1.3</b>
Industry	792	1 187	1 350	1 564	1 751	1.9	1.6	1.5	1.1	1.4
Transport	352	723	847	947	1 033	3.3	2.0	1.1	0.9	1.3
Residential	209	358	403	447	486	2.5	1.5	1.0	0.8	1.1
Commercial	136	403	472	561	625	5.1	2.0	1.8	1.1	1.6
<b>CO<sub>2</sub> Emissions (million tonnes)</b>	<b>987</b>	<b>1 982</b>	<b>2 244</b>	<b>2 539</b>	<b>2 727</b>	<b>3.2</b>	<b>1.6</b>	<b>1.2</b>	<b>0.7</b>	<b>1.1</b>
Electricity Generation	293	686	761	899	1 004	3.9	1.3	1.7	1.1	1.4
Transformation other than Electricity Generation	60	53	53	51	48	-0.5	0.1	-0.4	-0.7	-0.4
Industry	318	565	643	715	760	2.6	1.6	1.1	0.6	1.1
Transport	182	432	516	576	613	4.0	2.3	1.1	0.6	1.3
Residential	80	112	121	130	137	1.5	1.0	0.8	0.5	0.7
Commercial	54	135	150	168	166	4.2	1.3	1.1	-0.1	0.7
<b>CO<sub>2</sub> Emissions Intensity</b>										
CO <sub>2</sub> emissions per GDP (tonnes per US\$ million)	441	433	394	356	321	-0.1	-1.2	-1.0	-1.0	-1.1
CO <sub>2</sub> emissions per capita (tonnes per capita)	5.5	9.7	10.8	12.3	13.5	2.6	1.3	1.3	0.9	1.2

**ENERGY INVESTMENT REQUIREMENTS**

(Cumulative from 2003 - )	2010	2020	2030
<b>Total (2000 US\$ billion)</b>	<b>157 - 188</b>	<b>320 - 389</b>	<b>460 - 560</b>
Coal Production & Transportation			
Oil & Gas Production & Processing	14 - 19	26 - 35	34 - 46
Oil & Gas International Trade	17 - 19	32 - 37	41 - 49
Oil & Gas Domestic Pipeline	3 - 4	6 - 8	8 - 11
Electricity Generation & Transmission	123 - 146	257 - 309	377 - 453