

JAPAN  
ENERGY BALANCE TABLES

<b>2002</b>										Mtoe
	Coal	Oil	Gas	Hydro	Nuclear	NRE	Electricity	Heat	Total	
Production			2.4	7.9	72.6	7.4				90.3
Net Imports	95.4	254.4	66.6							416.4
<b>TPED</b>	<b>95.4</b>	<b>251.6</b>	<b>69.5</b>	<b>7.9</b>	<b>72.6</b>	<b>7.4</b>				<b>504.4</b>
Electricity and Heat Generation	- 48.8	- 25.2	- 48.8	- 7.9	- 72.6	- 4.2	86.1	0.5		- 120.9
Petroleum Refineries		- 12.2	- 0.1				- 0.7			- 13.0
Others	- 26.9	- 3.9	2.8				- 0.1			- 28.1
<b>TFED</b>	<b>21.4</b>	<b>210.8</b>	<b>24.1</b>			<b>3.2</b>	<b>84.7</b>	<b>0.5</b>		<b>344.8</b>
Industry	21.4	70.7	10.4			2.4	36.7			141.6
Transport		92.9					1.6			94.4
Residential		16.8	8.7			0.8	22.9			49.2
Commercial		30.5	5.0				23.5	0.5		59.6

  

<b>2010</b>										Mtoe
	Coal	Oil	Gas	Hydro	Nuclear	NRE	Electricity	Heat	Total	
Production			1.5	8.2	85.0	10.2				104.9
Net Imports	105.2	253.0	75.4							433.5
<b>TPED</b>	<b>105.2</b>	<b>253.0</b>	<b>76.9</b>	<b>8.2</b>	<b>85.0</b>	<b>10.2</b>				<b>538.4</b>
Electricity and Heat Generation	- 59.8	- 12.5	- 49.1	- 8.2	- 85.0	- 6.9	91.9	0.6		- 129.1
Petroleum Refineries		- 11.7	- 0.1				- 0.7			- 12.5
Others	- 24.3	- 3.5	2.8				- 0.1			- 25.1
<b>TFED</b>	<b>21.1</b>	<b>225.2</b>	<b>30.5</b>			<b>3.2</b>	<b>91.1</b>	<b>0.6</b>		<b>371.7</b>
Industry	21.1	73.1	14.3			2.4	36.5			147.4
Transport		101.2					1.6			102.8
Residential		17.4	9.7			0.8	25.5			53.5
Commercial		33.5	6.5				27.5	0.6		68.1

  

<b>2020</b>										Mtoe
	Coal	Oil	Gas	Hydro	Nuclear	NRE	Electricity	Heat	Total	
Production				8.0	94.5	11.9				114.5
Net Imports	107.4	255.2	92.1							454.6
<b>TPED</b>	<b>107.4</b>	<b>255.2</b>	<b>92.1</b>	<b>8.0</b>	<b>94.5</b>	<b>11.9</b>				<b>569.1</b>
Electricity and Heat Generation	- 62.4	- 11.4	- 59.2	- 8.0	- 94.5	- 8.6	102.2	0.6		- 141.3
Petroleum Refineries		- 11.3	- 0.1				- 0.7			- 12.1
Others	- 24.2	- 3.5	2.9				- 0.1			- 24.9
<b>TFED</b>	<b>20.8</b>	<b>229.0</b>	<b>35.6</b>			<b>3.3</b>	<b>101.4</b>	<b>0.6</b>		<b>390.7</b>
Industry	20.8	70.9	16.6			2.5	41.7			152.4
Transport		103.5					1.5			104.9
Residential		17.4	11.1			0.8	26.9			56.2
Commercial		37.2	8.0				31.3	0.6		77.2

  

<b>2030</b>										Mtoe
	Coal	Oil	Gas	Hydro	Nuclear	NRE	Electricity	Heat	Total	
Production				8.2	108.1	13.3				129.5
Net Imports	107.6	247.7	100.9							456.2
<b>TPED</b>	<b>107.6</b>	<b>247.7</b>	<b>100.9</b>	<b>8.2</b>	<b>108.1</b>	<b>13.3</b>				<b>585.8</b>
Electricity and Heat Generation	- 63.2	- 10.6	- 64.2	- 8.2	- 108.1	- 9.9	110.9	0.7		- 152.6
Petroleum Refineries		- 10.4	- 0.1				- 0.6			- 11.1
Others	- 23.9	- 3.5	2.9				- 0.1			- 24.6
<b>TFED</b>	<b>20.5</b>	<b>223.2</b>	<b>39.5</b>			<b>3.3</b>	<b>110.2</b>	<b>0.7</b>		<b>397.5</b>
Industry	20.5	68.2	18.7			2.6	46.5			156.6
Transport		102.9					1.5			104.4
Residential		17.0	12.3			0.8	26.8			56.9
Commercial		35.2	8.4				35.4	0.7		79.6

## JAPAN

## 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)	1 912	3 275	3 806	4 424	4 975	2.5	1.9	1.5	1.2	1.5
<b>Population</b> (million)	117	127	128	125	120	0.4	0.1	-0.3	-0.4	-0.2
<b>GDP per capita</b> (2000 PPP US\$)	16 377	25 717	29 736	35 457	41 487	2.1	1.8	1.8	1.6	1.7
<b>GDP in Services</b> (2000 PPP US\$ billion)	1 231	2 428	2 840	3 340	3 892	3.1	2.0	1.6	1.5	1.7
<b>GDP in Industry</b> (2000 PPP US\$ billion)	620	1 010	1 131	1 317	1 538	2.2	1.4	1.5	1.6	1.5
<b>Urbanisation level</b> (%)	60	65	67	69	73	0.4	0.2	0.4	0.5	0.4

## 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>43.2</b>	<b>90.3</b>	<b>104.9</b>	<b>114.5</b>	<b>129.5</b>	<b>3.4</b>	<b>1.9</b>	<b>0.9</b>	<b>1.2</b>	<b>1.3</b>	
Coal	10.9	(25%)									
Oil											
Gas	1.9	2.4	1.5			1.0	-5.8				
	(4%)	(3%)	(1%)								
Hydro	7.6	7.9	8.2	8.0	8.2	0.2	0.4	-0.2	0.1	0.1	
	(18%)	(9%)	(8%)	(7%)	(6%)						
NRE	0.8	7.4	10.2	11.9	13.3	10.7	4.0	1.6	1.1	2.1	
	(2%)	(8%)	(10%)	(10%)	(10%)						
Nuclear	21.5	72.6	85.0	94.5	108.1	5.7	2.0	1.1	1.4	1.4	
	(50%)	(80%)	(81%)	(83%)	(83%)						
<b>Net Imports</b>	<b>318.8</b>	<b>416.4</b>	<b>433.5</b>	<b>454.6</b>	<b>456.2</b>	<b>1.2</b>	<b>0.5</b>	<b>0.5</b>	<b>0.04</b>	<b>0.3</b>	
Coal	47.5	95.4	105.2	107.4	107.6	3.2	1.2	0.2	0.02	0.4	
Oil	251.7	254.4	253.0	255.2	247.7		-0.1	0.1	-0.3	-0.1	
Gas	19.5	66.6	75.4	92.1	100.9	5.7	1.6	2.0	0.9	1.5	
Electricity											
<b>Total Primary Energy Demand</b>	<b>346.5</b>	<b>504.4</b>	<b>538.4</b>	<b>569.1</b>	<b>585.8</b>	<b>1.7</b>	<b>0.8</b>	<b>0.6</b>	<b>0.3</b>	<b>0.5</b>	
Coal	59.6	95.4	105.2	107.4	107.6	2.2	1.2	0.2	0.02	0.4	
	(17%)	(19%)	(20%)	(19%)	(18%)						
Oil	235.6	251.6	253.0	255.2	247.7	0.3	0.1	0.1	-0.3	-0.1	
	(68%)	(50%)	(47%)	(45%)	(42%)						
Gas	21.4	69.5	76.9	92.1	100.9	5.5	1.3	1.8	0.9	1.3	
	(6%)	(14%)	(14%)	(16%)	(17%)						
Hydro	7.6	7.9	8.2	8.0	8.2	0.2	0.4	-0.2	0.1	0.1	
	(2%)	(2%)	(2%)	(1%)	(1%)						
NRE	0.8	7.4	10.2	11.9	13.3	10.7	4.0	1.6	1.1	2.1	
	(0%)	(1%)	(2%)	(2%)	(2%)						
Nuclear	21.5	72.6	85.0	94.5	108.1	5.7	2.0	1.1	1.4	1.4	
	(6%)	(14%)	(16%)	(17%)	(18%)						
<b>Input for Electricity and Heat Generation</b>	<b>-116.3</b>	<b>-207.6</b>	<b>-221.5</b>	<b>-244.1</b>	<b>-264.2</b>	<b>2.7</b>	<b>0.8</b>	<b>1.0</b>	<b>0.8</b>	<b>0.9</b>	
Coal	-10.5	-48.8	-59.8	-62.4	-63.2	7.2	2.6	0.4	0.1	0.9	
	(9%)	(23%)	(27%)	(26%)	(24%)						
Oil	-60.3	-25.2	-12.5	-11.4	-10.6	-3.9	-8.4	-1.0	-0.7	-3.1	
	(52%)	(12%)	(6%)	(5%)	(4%)						
Gas	-15.6	-48.8	-49.1	-59.2	-64.2	5.3	0.1	1.9	0.8	1.0	
	(13%)	(24%)	(22%)	(24%)	(24%)						
Hydro	-7.6	-7.9	-8.2	-8.0	-8.2	0.2	0.4	-0.2	0.1	0.1	
	(7%)	(4%)	(4%)	(3%)	(3%)						
NRE	-0.8	-4.2	-6.9	-8.6	-9.9	8.0	6.4	2.2	1.4	3.1	
	(1%)	(2%)	(3%)	(4%)	(4%)						
Nuclear	-21.5	-72.6	-85.0	-94.5	-108.1	5.7	2.0	1.1	1.4	1.4	
	(19%)	(35%)	(38%)	(39%)	(41%)						
<b>Other Transformation</b>	<b>-17.8</b>	<b>-41.1</b>	<b>-37.6</b>	<b>-37.0</b>	<b>-35.7</b>	<b>3.9</b>	<b>-1.1</b>	<b>-0.2</b>	<b>-0.4</b>	<b>-0.5</b>	
Coal	-2.4	-26.9	-24.3	-24.2	-23.9	11.6	-1.3	-0.04	-0.1	-0.4	
	(14%)	(65%)	(65%)	(65%)	(67%)						
Oil	-14.1	-16.1	-15.2	-14.8	-13.9	0.6	-0.7	-0.3	-0.6	-0.5	
	(79%)	(39%)	(41%)	(40%)	(39%)						
Gas	-0.5	2.7	2.7	2.8	2.8		0.1	0.1	0.1	0.1	
	(3%)	(-7%)	(-7%)	(-7%)	(-8%)						
NRE											
Electricity	-0.8	-0.8	-0.8	-0.7	-0.7	0.04	-0.5	-0.4	-0.9	-0.6	
	(5%)	(2%)	(2%)	(2%)	(2%)						
Heat											

## JAPAN

	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>215.8</b>	<b>344.8</b>	<b>371.7</b>	<b>390.7</b>	<b>397.5</b>	<b>2.2</b>	<b>0.9</b>	<b>0.5</b>	<b>0.2</b>	<b>0.5</b>
Coal	21.4 (10%)	21.4 (6%)	21.1 (6%)	20.8 (5%)	20.5 (5%)		-0.2	-0.2	-0.1	-0.1
Oil	140.5 (65%)	210.8 (61%)	225.2 (61%)	229.0 (59%)	223.2 (56%)	1.9	0.8	0.2	-0.3	0.2
Gas	9.7 (4%)	24.1 (7%)	30.5 (8%)	35.6 (9%)	39.5 (10%)	4.2	3.0	1.6	1.0	1.8
NRE		3.2 (1%)	3.2 (1%)	3.3 (1%)	3.3 (1%)		-0.1	0.2	0.2	0.1
Electricity	44.1 (20%)	84.7 (25%)	91.1 (25%)	101.4 (26%)	110.2 (28%)	3.0	0.9	1.1	0.8	0.9
Heat	0.1 (0%)	0.5 (0%)	0.6 (0%)	0.6 (0%)	0.7 (0%)	7.9	1.1	0.9	0.9	1.0
<b>Industry</b>	<b>114.2</b>	<b>141.6</b>	<b>147.4</b>	<b>152.4</b>	<b>156.6</b>	<b>1.0</b>	<b>0.5</b>	<b>0.3</b>	<b>0.3</b>	<b>0.4</b>
Coal	20.8 (18%)	21.4 (15%)	21.1 (14%)	20.8 (14%)	20.5 (13%)	0.1	-0.2	-0.2	-0.1	-0.1
Oil	62.3 (55%)	70.7 (50%)	73.1 (50%)	70.9 (46%)	68.2 (44%)	0.6	0.4	-0.3	-0.4	-0.1
Gas	2.7 (2%)	10.4 (7%)	14.3 (10%)	16.6 (11%)	18.7 (12%)	6.3	4.1	1.5	1.2	2.1
NRE		2.4 (2%)	2.4 (2%)	2.5 (2%)	2.6 (2%)		-0.1	0.3	0.3	0.2
Electricity	28.3 (25%)	36.7 (26%)	36.5 (25%)	41.7 (27%)	46.5 (30%)	1.2	-0.1	1.4	1.1	0.9
Heat										
<b>Transport</b>	<b>55.4</b>	<b>94.4</b>	<b>102.8</b>	<b>104.9</b>	<b>104.4</b>	<b>2.5</b>	<b>1.1</b>	<b>0.2</b>	<b>-0.1</b>	<b>0.4</b>
Coal										
Oil	54.1 (98%)	92.9 (98%)	101.2 (98%)	103.5 (99%)	102.9 (99%)	2.5	1.1	0.2	-0.1	0.4
Gas										
NRE										
Electricity	1.3 (2%)	1.6 (2%)	1.6 (2%)	1.5 (1%)	1.5 (1%)	0.9	-0.3	-0.5	-0.02	-0.3
<b>Residential</b>	<b>25.9</b>	<b>49.2</b>	<b>53.5</b>	<b>56.2</b>	<b>56.9</b>	<b>3.0</b>	<b>1.0</b>	<b>0.5</b>	<b>0.1</b>	<b>0.5</b>
Coal	0.6 (2%)									
Oil	9.8 (38%)	16.8 (34%)	17.4 (33%)	17.4 (31%)	17.0 (30%)	2.5	0.4	0.02	-0.3	0.03
Gas	5.5 (21%)	8.7 (18%)	9.7 (18%)	11.1 (20%)	12.3 (22%)	2.1	1.4	1.3	1.1	1.3
NRE		0.8 (2%)	0.8 (1%)	0.8 (1%)	0.8 (1%)					
Electricity	10.0 (39%)	22.9 (46%)	25.5 (48%)	26.9 (48%)	26.8 (47%)	3.8	1.4	0.5	-0.02	0.6
Heat										
<b>Commercial</b>	<b>20.4</b>	<b>59.6</b>	<b>68.1</b>	<b>77.2</b>	<b>79.6</b>	<b>5.0</b>	<b>1.7</b>	<b>1.3</b>	<b>0.3</b>	<b>1.0</b>
Coal										
Oil	14.3 (70%)	30.5 (51%)	33.5 (49%)	37.2 (48%)	35.2 (44%)	3.5	1.2	1.1	-0.6	0.5
Gas	1.4 (7%)	5.0 (8%)	6.5 (10%)	8.0 (10%)	8.4 (11%)	5.9	3.3	2.1	0.5	1.8
NRE										
Electricity	4.6 (22%)	23.5 (39%)	27.5 (40%)	31.3 (41%)	35.4 (44%)	7.8	2.0	1.3	1.2	1.5
Heat	0.1 (1%)	0.5 (1%)	0.6 (1%)	0.6 (1%)	0.7 (1%)	7.6	1.2	1.0	0.9	1.0

## ENERGY SECURITY

	1980	2002	2010	2020	2030
Diversity of Primary Energy Demand (Rated between 1 and 100)	53	78	81	83	86
Net Energy Import Ratio (%)	88	82	81	80	78
Net Oil Import Dependency (%)	100	100	100	100	100

**JAPAN**  
**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>573</b>	<b>1 024</b>	<b>1 090</b>	<b>1 210</b>	<b>1 312</b>	<b>2.7</b>	<b>0.8</b>	<b>1.0</b>	<b>0.8</b>	<b>0.9</b>
Coal	55 ( 10%)	233 ( 23%)	289 ( 26%)	306 ( 25%)	314 ( 24%)	6.8	2.7	0.6	0.3	1.1
Oil	265 ( 46%)	132 ( 13%)	66 ( 6%)	61 ( 5%)	58 ( 4%)	-3.1	-8.2	-0.8	-0.5	-2.9
Gas	81 ( 14%)	262 ( 26%)	267 ( 25%)	329 ( 27%)	363 ( 28%)	5.5	0.3	2.1	1.0	1.2
Hydro	88 ( 15%)	92 ( 9%)	95 ( 9%)	94 ( 8%)	95 ( 7%)	0.2	0.4	-0.2	0.1	0.1
NRE	1	10 ( 1%)	27 ( 2%)	36 ( 3%)	41 ( 3%)	11.5	13.2	3.0	1.3	5.2
Nuclear	83 ( 14%)	296 ( 29%)	346 ( 32%)	385 ( 32%)	440 ( 34%)	6.0	2.0	1.1	1.4	1.4
<b>Total Installed Generation Capacity (GW)</b>	<b>144</b>	<b>243</b>	<b>259</b>	<b>283</b>	<b>297</b>	<b>2.4</b>	<b>0.8</b>	<b>0.9</b>	<b>0.5</b>	<b>0.7</b>
Thermal	98 ( 68%)	147 ( 61%)	153 ( 59%)	171 ( 60%)	179 ( 60%)	1.9	0.4	1.1	0.5	0.7
Coal	5 ( 4%)	36 ( 15%)	39 ( 15%)	44 ( 16%)	48 ( 16%)	9.1	1.2	1.2	0.8	1.1
Oil	60 ( 42%)	54 ( 22%)	51 ( 20%)	48 ( 17%)	45 ( 15%)	-0.5	-0.6	-0.6	-0.7	-0.6
Gas	20 ( 14%)	58 ( 24%)	62 ( 24%)	78 ( 28%)	86 ( 29%)	5.0	0.8	2.4	1.0	1.4
Hydro	30 ( 21%)	47 ( 19%)	48 ( 19%)	48 ( 17%)	48 ( 16%)	2.0	0.4			0.1
NRE		3 ( 1%)	8 ( 3%)	11 ( 4%)	12 ( 4%)	16.5	13.7	3.0	1.0	5.2
Nuclear	16 ( 11%)	46 ( 19%)	50 ( 19%)	54 ( 19%)	58 ( 20%)	5.0	1.1	0.7	0.7	0.8

**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>181</b>	<b>154</b>	<b>141</b>	<b>129</b>	<b>118</b>	<b>-0.7</b>	<b>-1.1</b>	<b>-0.9</b>	<b>-0.9</b>	<b>-1.0</b>
Industry (toe per US\$ million GDP in Industry)	184	140	130	116	102	-1.2	-0.9	-1.2	-1.3	-1.1
Commercial (toe per US\$ million GDP in Services)	17	25	24	23	20	1.8	-0.3	-0.4	-1.2	-0.6
<b>Energy Intensity (kgoe per capita)</b>	<b>2 967</b>	<b>3 961</b>	<b>4 206</b>	<b>4 561</b>	<b>4 885</b>	<b>1.3</b>	<b>0.8</b>	<b>0.8</b>	<b>0.7</b>	<b>0.8</b>
Industry	978	1 112	1 151	1 222	1 306	0.6	0.4	0.6	0.7	0.6
Transport	475	742	803	841	870	2.0	1.0	0.5	0.3	0.6
Residential	221	386	418	450	475	2.6	1.0	0.8	0.5	0.7
Commercial	174	468	532	619	664	4.6	1.6	1.5	0.7	1.3
<b>CO<sub>2</sub> Emissions (million tonnes)</b>	<b>786</b>	<b>1 186</b>	<b>1 245</b>	<b>1 296</b>	<b>1 294</b>	<b>1.9</b>	<b>0.6</b>	<b>0.4</b>	<b>-0.02</b>	<b>0.3</b>
Electricity Generation	237	380	385	415	427	2.2	0.2	0.8	0.3	0.4
Transformation other than Electricity Generation	44	33	31	30	27	-1.4	-0.6	-0.5	-1.0	-0.7
Industry	255	322	337	335	331	1.1	0.6	-0.1	-0.1	0.1
Transport	160	275	299	306	302	2.5	1.1	0.2	-0.1	0.3
Residential	43	72	76	79	80	2.3	0.7	0.4	0.2	0.4
Commercial	45	104	117	132	127	3.9	1.4	1.2	-0.4	0.7
<b>CO<sub>2</sub> Emissions Intensity</b>										
CO <sub>2</sub> emissions per GDP (tonnes per US\$ million)	411	362	327	293	260	-0.6	-1.3	-1.1	-1.2	-1.2
CO <sub>2</sub> emissions per capita (tonnes per capita)	6.7	9.3	9.7	10.4	10.8	1.5	0.6	0.7	0.4	0.5

**ENERGY INVESTMENT REQUIREMENTS**

(Cumulative from 2003 - )	2010	2020	2030
<b>Total (2000 US\$ billion)</b>	<b>38.6 - 45.9</b>	<b>82.5 - 100.0</b>	<b>116.5 - 141.8</b>
Coal Production & Transportation			
Oil & Gas Production & Processing	0.67 - 0.96	1.29 - 1.85	1.29 - 1.85
Oil & Gas International Trade	4.00 - 4.28	6.04 - 7.04	7.02 - 8.26
Oil & Gas Domestic Pipeline	0.20 - 0.28	0.60 - 0.85	0.83 - 1.18
Electricity Generation & Transmission	33.7 - 40.4	74.6 - 90.3	107.3 - 130.5