Japanese Energy Policy & Asian Energy Challenges

The British Institute of Energy Economics
London

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Executive Advisor to SOC Corporation
## Energy Indicators of Japan

(1945~2003)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GDP/capita</strong></td>
<td>1000 yen</td>
<td>240</td>
<td>709</td>
<td>1,926</td>
<td>3,658</td>
<td>4,124</td>
</tr>
<tr>
<td><strong>Energy use /capita</strong></td>
<td>1000 kcal</td>
<td>3,744</td>
<td>9,191</td>
<td>34,365</td>
<td>37,859</td>
<td>41,517</td>
</tr>
<tr>
<td><strong>Oil supply/year</strong></td>
<td>1000 kl</td>
<td>248</td>
<td>33,543</td>
<td>263,483</td>
<td>306,813</td>
<td>304,618</td>
</tr>
<tr>
<td><strong>Oil import/year</strong></td>
<td>1000 kl</td>
<td>-</td>
<td>32,919</td>
<td>262,785</td>
<td>286,128</td>
<td>286,511</td>
</tr>
<tr>
<td><strong>Coal supply/year</strong></td>
<td>1000 t</td>
<td>26,736</td>
<td>63,420</td>
<td>82,281</td>
<td>116,882</td>
<td>165,525</td>
</tr>
<tr>
<td><strong>Coal import/year</strong></td>
<td>1000 t</td>
<td>297</td>
<td>8,595</td>
<td>62,339</td>
<td>104,835</td>
<td>164,188</td>
</tr>
<tr>
<td><strong>Town gas supply/year</strong></td>
<td>billion kcal</td>
<td>-</td>
<td>19,593</td>
<td>78,599</td>
<td>152,560</td>
<td>261,510</td>
</tr>
<tr>
<td><strong>Electricity generation /year</strong></td>
<td>billion kwh</td>
<td>47 (1946)</td>
<td>115</td>
<td>476</td>
<td>857</td>
<td>1,094</td>
</tr>
</tbody>
</table>

Source: *Energy-Verification of 50 Years after WWII*, (in Japanese), Denryokushinpousha, 1995  
*The history of the Energy Industry after the War*, (in Japanese), Toyokeizaishinpousha 1986  
Mr. Chang Ping, EDMC, IEEJ (for 1990 & 2005 data)  
Note: The years in the above table are the Japanese Fiscal Years (April ~ March)
Six Phases of Japanese Energy Policy Development

- **Phase 1** (1945~1951): Economic recovery and readjustment of energy policies

- **Phase 2** (1952~1961): Economic development and modernization of energy industry

- **Phase 3** (1962~1972): High economic growth and comprehensive energy policies

- **Phase 4** (1973~1985): Oil shocks and the shift to energy efficient industrial structure

- **Phase 5** (1986~1996): Liberalization of energy market and the issue of global warming

- **Phase 6** (1997~): Globalization of energy market and the commitment to the Kyoto Protocol
Phase 1: Economic recovery and readjustment of energy policies (1945~1951)

Main features

- Complete devastation by the defeat in World War II
- Restructuring of political, economic and social system under the control by the GHQ (the occupation from 1945 till 1951)
- Limited energy resources: coal, hydro and wood/charcoal
- High level of state intervention in the energy industry
- By 1951 Japan recovered the pre-war level (1934~36 average) in real GDP, industry output, etc.,
Phase 2: Economic development and modernization of energy industry (1952~1961)

**Main Features**

- In April 1952, Japan recovered its independence (San Francisco Peace Treaty).

- GDP as well as energy demand grew very fast during this period:
  - [average GDP growth] 9.7% per annum
  - [average energy demand growth] 9.3% per annum

- The Shift from coal to oil was accelerated as called “liquid energy revolution”.

- Preparation for peaceful use of nuclear energy initiated.
Phase 3: High economic growth and comprehensive energy policies (1962~1972)

Main features

- In April 1964, Japan joined the OECD (Organization for Economic Co-operation and Development).

- Energy demand grew even faster than GDP growth during Phase 2:
  
  - [average GDP growth] 10.2% per annum
  - [average energy demand growth] 11.9% per annum

- Oil became the dominant primary energy source (75% by 1972).

- Diversification of energy sources started by the entry of nuclear power and LNG (liquefied natural gas)

- Environmental pollution, due mainly to rapid increase in energy use, became a major national agenda.
Phase 4: Oil Shocks and the shift to energy efficient industrial structure (1973~1985)

**Main Features**

- Oil shocks of the 1970s severely shook the Japanese economy built on the abundance of cheap oil.

- GDP growth suddenly slowed down to less than a half of the previous decade:

  \[ \text{FY 1973~78 average} \] \quad 3.7\% \ ( -0.2\% \text{ in FY 1974})

- A new set of energy policies from emergency response to technological development played an important role.

- The oil shocks forced and accelerated the self-renewal of the Japanese industrial structure (like an insect “casting off the skin”).
Phase 5: Liberalization of energy market and the issue of global warming (1986~1996)

Main features

- Strong yen following the Plaza Agreement in September 1985 increased the trade surplus of Japan ($100 billion in 1986).
  
  [Exchange rate of yen] $240/yen (prior to the Plaza Agreement)→$120/yen (end 1987)

- Trade friction with the USA intensified, which pressed Japan to deregulate the domestic market to absorb increased imports.

- In April 1986, “Maekawa Report” called for the stimulation of domestic consumption through the deregulation of various sectors including the energy sector.

- In October 1990, the cabinet decided “Action Plan to Arrest Global Warming” preceding to the adoption of the UNFCCC (United Nations Framework Convention on Climate Changes) in June 1992.

- GDP grew by 3.2% while energy consumption grew by 3.1%. 
Phase 6: Globalization of energy market and the commitment to the Kyoto Protocol (1997~)

Main Features

- Deregulation of the oil sector completed by 2002, and the remaining energy sectors accelerated the process.

- Domestic coal production finally ended in 2002 by closing its over 200 years’ history.

- Japan has been deeply involved with the prevention of global warming after the adoption of the Kyoto Protocol in December 1997 (Japan was the host of the COP 3).

- More recently, energy security came back to the driver’s seat as geopolitical tensions mounted along with the tightening of the oil markets.
3 Pillars of Energy Policy of Japan

-The Basic Law on Energy Policy Making (June 2002)-

Assurance of Stable Supply

Usage of Market Mechanism

Harmony with Environment
Total Primary Energy Supply of Japan
—Evolution from 1952 to 2000—

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TPES</strong></td>
<td>10000 billion kcal</td>
<td>52.6</td>
<td>125.3</td>
<td>387.4</td>
<td>459.7</td>
</tr>
<tr>
<td><strong>oil</strong></td>
<td>%</td>
<td>11</td>
<td>46.9</td>
<td>75.5</td>
<td>56.3</td>
</tr>
<tr>
<td><strong>coal</strong></td>
<td>%</td>
<td>49</td>
<td>37.2</td>
<td>17.0</td>
<td>19.4</td>
</tr>
<tr>
<td><strong>hydro</strong></td>
<td>%</td>
<td>32</td>
<td>12.2</td>
<td>5.6</td>
<td>4.7</td>
</tr>
<tr>
<td><strong>gas/wood</strong></td>
<td>%</td>
<td>8</td>
<td>3.7</td>
<td>1.0</td>
<td>9.4</td>
</tr>
<tr>
<td><strong>nuclear</strong></td>
<td>%</td>
<td>-</td>
<td>-</td>
<td>0.6</td>
<td>8.9</td>
</tr>
<tr>
<td><strong>geo/wind</strong></td>
<td>%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Source: Energy-Verification of 50 Years after WWII, Denryokushinpoousha, 1995
Energy Efficiency of Japan (1)

Energy efficiency of Japan (2)

-Comparison of energy consumption per GDP in 2001-

Source: Institute of Energy Economics, Japan
Note: copied from Energy in Japan, METI, 2005
Japanese international energy cooperation

Three Categories

(1) **International**
   Cooperation through an international organization or network

(2) **Regional**
   Cooperation through a regional forum or network

(3) **Bilateral**
   Cooperation with specific countries

<table>
<thead>
<tr>
<th>International</th>
<th>Regional</th>
<th>Bilateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEA</td>
<td>APEC (Asia Pacific Economic Cooperation)</td>
<td>China</td>
</tr>
<tr>
<td>IAEA</td>
<td>APERC (A-P Energy Research Center)</td>
<td>India</td>
</tr>
<tr>
<td>IEF (International Energy Forum)</td>
<td>ASEAN+3 (China, Japan &amp; Korea)</td>
<td>Russia</td>
</tr>
<tr>
<td>JODI (Joint Oil Data Initiative)</td>
<td>Asian IEF</td>
<td>Middle East countries</td>
</tr>
<tr>
<td>Others</td>
<td>Others</td>
<td>Others</td>
</tr>
</tbody>
</table>
## Energy Power Games involving Japan (Examples)

<table>
<thead>
<tr>
<th>Core Factor</th>
<th>Players</th>
<th>Main Developments</th>
<th>Expectation</th>
</tr>
</thead>
</table>
| **Asian Premium**           | Interaction between buyers’ power and sellers’ power                    | • Middle East exporters  
• Asian importers (Japan, India, China etc..)  
• The Asian Premium of Middle East crude oil (particularly Saudi) emerged around 1992.  
• Japan was by far the largest importer of ME oil, but took no action against this premium over years.  
• Indian Gov. publicly complained of the premium in 2002, then Japan joined by raising her voice. | When the buyers power may effectively prevail, the premium will narrow or disappear.                  |
| **East China Sea Gas**      | Confrontation or cooperation                                             | • Chinese Gov.  
• CNOOC  
• Japanese Gov.  
• Teikoku Oil  
• In 1969/1970, Japanese companies applied for test-drilling right of oil and gas, which was kept on the shelf by Japanese Gov. (Teikoku Oil was awarded the right in 2005).  
• In 2003, CNOOC started to drill in the gas field close to the Japan-China Median Line.  
• The Gov. talks started in Oct.2004 and the sixth round is expected to take place in March 2006. | The business-first-principle will prevail.                                                              |
| **Development**             |                                                                         |                                                                                                                                                                                                                 |                                                                                                        |
| **East Siberian Oil**       | Interaction between an energy giant and two big buyers                  | • Russian Gov.  
• Transneft  
• Chinese Gov.  
• CNPC  
• Japanese Gov.  
• In 1998, Yukos and CNPC planned to build an oil pipeline from Angarusk to Daging (North China).  
• In 2003, after talks with Japanese Gov., Russian Gov. decided on a pipeline from Angarusk to Nakhodka, with a spur to Daging.  
• In 2005, Russian Gov. decided on two-staged construction of this pipeline; ① Tayshet to Skovorodino (near Daging), then ② Scovorodino to Perevoznaya (near Nakhodka) | Russia will continue to play power games with China and Japan till the end.                           |
| **Pipeline**                |                                                                         |                                                                                                                                                                                                                 |                                                                                                        |
Pros and cons of Japanese energy policies

**Pros**
- Energy saving technology
- Energy saving society
- Alternative energy development
- Adjustment to oil shocks
- Emergency preparedness
- Closure of coal mines
- Multilateral cooperation
- Commitment to Kyoto Protocol
- Public persuasion

**Mixed**
- Nuclear energy policy
- Government interventions
- Bilateral energy diplomacy

**Cons**
- Upstream E&P of oil
- No major oil company
- Energy prices (electricity, gas)
Socio Economic Conditions of Asia

- Asia is the center of growth in the global economy.
- The growth of energy demand and CO2 emissions keeps pace with GDP growth.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>Billion USD</td>
<td>3,056</td>
<td>8,914</td>
<td>19%</td>
<td>25%</td>
<td></td>
<td>3.8%</td>
</tr>
<tr>
<td>Population</td>
<td>Million</td>
<td>1,309</td>
<td>1,947</td>
<td>34%</td>
<td>32%</td>
<td></td>
<td>1.4%</td>
</tr>
<tr>
<td>Energy Demand</td>
<td>Mtoe</td>
<td>675</td>
<td>2,152</td>
<td>12%</td>
<td>23%</td>
<td></td>
<td>4.1%</td>
</tr>
<tr>
<td>CO2 Emissions</td>
<td>Mt-C</td>
<td>582</td>
<td>1,712</td>
<td>14%</td>
<td>26%</td>
<td></td>
<td>3.8%</td>
</tr>
</tbody>
</table>

Note: South West Asia is not included in the table above.

Energy Demand in Asia

Income and Energy Demand (1971-2002)

GDP per capita (Real 2000 PPP$ per person)

Primary energy per capita (Toe per person)

Source: Asia Pacific Energy Research Centre (2005)
Oil Demand in Asia

Asia’s Share in World Oil Demand

Rising Share of Asia in the World

Rising vehicle ownership would give upward pressure on oil demand.

Source: Asia Pacific Energy Research Centre (2005)
Rising Energy Prices

Source: Asia Pacific Energy Research Centre (2005)

Source: U.S. DOE/EIA
# Local Air Quality: SOx and NOx

(In 1998; World Bank Data)

## Sulfur Dioxide

<table>
<thead>
<tr>
<th>Economy</th>
<th>City</th>
<th>micrograms per m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>China Guiyang</td>
<td>424</td>
</tr>
<tr>
<td>2</td>
<td>China Chongqing</td>
<td>340</td>
</tr>
<tr>
<td>3</td>
<td>China Taiyuan</td>
<td>211</td>
</tr>
<tr>
<td>4</td>
<td>Iran, Islamic Rep. Tehran</td>
<td>209</td>
</tr>
<tr>
<td>5</td>
<td>China Zibo</td>
<td>198</td>
</tr>
<tr>
<td>6</td>
<td>China Quingdao</td>
<td>190</td>
</tr>
<tr>
<td>7</td>
<td>China Jinan</td>
<td>132</td>
</tr>
<tr>
<td>8</td>
<td>Brazil Rio de Janeiro</td>
<td>129</td>
</tr>
<tr>
<td>9</td>
<td>Turkey Istanbul</td>
<td>120</td>
</tr>
<tr>
<td>10</td>
<td>China Anshan</td>
<td>115</td>
</tr>
<tr>
<td>11</td>
<td>Russia Moscow</td>
<td>109</td>
</tr>
<tr>
<td>12</td>
<td>China Lanzhou</td>
<td>102</td>
</tr>
<tr>
<td>13</td>
<td>China Liupanshui</td>
<td>102</td>
</tr>
<tr>
<td>14</td>
<td>Japan Yokohama</td>
<td>100</td>
</tr>
<tr>
<td>15</td>
<td>China Shenyang</td>
<td>99</td>
</tr>
<tr>
<td>16</td>
<td>China Beijing</td>
<td>90</td>
</tr>
<tr>
<td>17</td>
<td>Poland Katowice</td>
<td>83</td>
</tr>
<tr>
<td>18</td>
<td>China Tianjin</td>
<td>82</td>
</tr>
<tr>
<td>19</td>
<td>Korea Taegu</td>
<td>81</td>
</tr>
<tr>
<td>20</td>
<td>China Chengdu</td>
<td>77</td>
</tr>
</tbody>
</table>

## Nitrogen Dioxide

<table>
<thead>
<tr>
<th>Economy</th>
<th>City</th>
<th>micrograms per m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Italy Milan</td>
<td>248</td>
</tr>
<tr>
<td>2</td>
<td>China Guangzhu</td>
<td>136</td>
</tr>
<tr>
<td>3</td>
<td>Mexico Mexico City</td>
<td>130</td>
</tr>
<tr>
<td>4</td>
<td>Bulgaria Sofia</td>
<td>122</td>
</tr>
<tr>
<td>5</td>
<td>China Beijing</td>
<td>122</td>
</tr>
<tr>
<td>6</td>
<td>China Lanzhou</td>
<td>104</td>
</tr>
<tr>
<td>7</td>
<td>China Dalian</td>
<td>100</td>
</tr>
<tr>
<td>8</td>
<td>Argentina Cordoba City</td>
<td>97</td>
</tr>
<tr>
<td>9</td>
<td>China Zhengzhou</td>
<td>95</td>
</tr>
<tr>
<td>10</td>
<td>China Anshan</td>
<td>88</td>
</tr>
<tr>
<td>11</td>
<td>Brazil Sao Paulo</td>
<td>83</td>
</tr>
<tr>
<td>12</td>
<td>Australia Sydney</td>
<td>81</td>
</tr>
<tr>
<td>13</td>
<td>Chile Santiago</td>
<td>81</td>
</tr>
<tr>
<td>14</td>
<td>Poland Katowice</td>
<td>79</td>
</tr>
<tr>
<td>15</td>
<td>United States New York</td>
<td>79</td>
</tr>
<tr>
<td>16</td>
<td>United Kingdom London</td>
<td>77</td>
</tr>
<tr>
<td>17</td>
<td>China Chengdu</td>
<td>74</td>
</tr>
<tr>
<td>18</td>
<td>United States Los Angeles</td>
<td>74</td>
</tr>
<tr>
<td>19</td>
<td>China Shanghai</td>
<td>73</td>
</tr>
<tr>
<td>20</td>
<td>China Shenyang</td>
<td>73</td>
</tr>
</tbody>
</table>

Source: Asia Pacific Energy Research Centre (2005)
APEC Total Primary Energy Demand Outlook

(Source) APERC (2002), “APEC Energy Demand and Supply Outlook”
APEC Energy Demand Growth (1999-2020)
(Regional Shares of Increment)

(Source) APERC (2002), “Energy Demand and Supply Outlook 2002
APEC Electricity Demand Growth

(Source) APERC (2002), “APEC Energy Demand and Supply Outlook”
APEC Energy Investment Requirements

(Total $3.4 – 4.4 trillion: 2000 to 2020)

(Source) APERC (2003), “APEC Energy Investment Outlook for the APEC Region”
APEC CO2 Emissions (1999-2020)

- Increment from 1999 to 2020 (pie chart)
- Annual Emissions (bar chart)

(Source) APERC (2002), “APEC Energy Demand and Supply Outlook 2002”
Regional Outlook for Oil Import Dependency

(Source) APERC (2002) “APEC Energy Demand and Supply Outlook”
Sea Lane Chokepoints in Asia

- Malacca Straits: 900km long with over 12mb/d oil flow
- Shallow with the narrowest part just 500m wide near Singapore
- Very congested with more than 170 ships per day (over 300 DWT)
- Lombok & Sunda: Diversion routes with 4~5 extra days (round trip)
Topography of the Straits of Malacca
Oil Stockpiling in Asia

<table>
<thead>
<tr>
<th>Country</th>
<th>Days of net imports or consumption</th>
<th>Actual or Target</th>
<th>Time</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>JAPAN (IEA member)</td>
<td>91 (Government) 82 (Industry)</td>
<td>actual</td>
<td>Nov. 2005</td>
<td>Government stocks held by JOGMEC</td>
</tr>
<tr>
<td></td>
<td>(days of net imports)</td>
<td>actual</td>
<td>Nov. 2005</td>
<td></td>
</tr>
<tr>
<td>Korea (IEA member)</td>
<td>55 (Gov.) 54 (Ind.)</td>
<td>actual</td>
<td>Nov. 2005</td>
<td>Government stocks held by KNOC</td>
</tr>
<tr>
<td></td>
<td>(days of net imports)</td>
<td>actual</td>
<td>Nov. 2005</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>20 (Gov.) = 16mm³</td>
<td>target</td>
<td>by 2010</td>
<td>Four facilities to be constructed by 2008~2009</td>
</tr>
<tr>
<td></td>
<td>(days of consumption)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>45 (Gov.) = 15mt</td>
<td>Target 5mt as 1st phase</td>
<td>by 2015</td>
<td>Three facilities to be constructed by 2007</td>
</tr>
<tr>
<td></td>
<td>(days of consumption)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese Taipei</td>
<td>22 (Gov.) 60 (Ind.)</td>
<td>actual</td>
<td>Sept. 2005</td>
<td>Government stocks held by CPC</td>
</tr>
<tr>
<td></td>
<td>(days of consumption)</td>
<td>actual</td>
<td>Sept. 2005</td>
<td></td>
</tr>
</tbody>
</table>
| ASEAN             | (1) Virtually none as emergency stocks.  
|                   | (3) APSA (ASEAN Petroleum Security Agreement; 1986) as a conceptual base. |                  |         |                                                 |
APEC Energy Security Initiatives (1)

APEC=Asia Pacific Economic Cooperation (21 economies)

- **September 2000**: APEC Senior Officials’ Meeting discussed the measures to respond to oil price volatility.
- **October 2001**: APEC Leaders endorsed APEC Energy Security Initiative (ESI), a policy package developed by the APEC Energy Working Group (EWG).
- **July 2002**: APEC Energy Ministers directed the APEC EWG to work on enhancement of energy security through short-term and long-term measures.
APEC Energy Security Initiatives (2)

- **Joint Oil Data Initiative**: Joint Initiative to improve oil data transparency - APEC, IEA, EU, OLADE, OPEC and UN.

- **Sea-Lane Security**: EWG to review the activities implemented by APEC Transportation Working Group and the International Maritime Organization, and identify additional actions.

- **Real-Time Emergency Information Sharing**: EWG to work together to identify contacts to share information in case of an emergency, and establish a system for sharing information.

- **Oil Supply Emergency Response**: EWG to implement a feasibility study of joint stockpiling by net oil importing economies of APEC and other interested APEC economies.

- **Non-Petroleum and Longer-Term Concerns**: EWG to consider broader issues to enhance energy security.
ASEAN+3 Common Energy Goal

ASEAN (Association of South East Asian Nations: 10 Members) +3 (China, Japan, Korea)

- **June 2004**: ASEAN+3 Energy Ministers Meeting in Makati City, The Philippines
- **Common Energy Goal**
  “Recognizing Asia’s growing demand for energy and depletion of fossil fuels, we resolve to achieve, through ASEAN+3 Energy Partnership, our common goal of greater energy security and sustainability in our region which will become the largest energy consuming region in the world”
- Note: “Common Goal” is a sign of maturity of cooperation in Asia
World population growth: What would this be telling us?

<table>
<thead>
<tr>
<th>Year</th>
<th>Total (billion)</th>
<th>Growth Rate(%)</th>
<th>Developing Countries(%)</th>
<th>Developed Countries(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td>0.25</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1600</td>
<td>0.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1830</td>
<td>1.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1930</td>
<td>2.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1950</td>
<td>2.5</td>
<td>-</td>
<td>67.7</td>
<td>32.3</td>
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<tr>
<td>1975</td>
<td>4.1</td>
<td>2.0</td>
<td>74.3</td>
<td>25.7</td>
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<tr>
<td>2000</td>
<td>6.1</td>
<td>1.6</td>
<td>80.3</td>
<td>19.7</td>
</tr>
<tr>
<td>2005*</td>
<td>6.5</td>
<td>1.2</td>
<td>81.3</td>
<td>18.7</td>
</tr>
<tr>
<td>2030*</td>
<td>8.1</td>
<td>0.7</td>
<td>84.7</td>
<td>15.3</td>
</tr>
<tr>
<td>2050*</td>
<td>8.9</td>
<td>0.3</td>
<td>86.3</td>
<td>13.7</td>
</tr>
</tbody>
</table>

Source: Mr. Saishu (before 1950), United Nations (after 1950: * prospects)
The Era of "HEAT"

- Human activities have imposed accumulating environmental burdens on the mother earth ever since the Industrial Revolution.

- The level of environmental burdens is believed to have exceeded the self-cleaning or self-recovering capacity of the nature since around the turn of the century.

- In the 21st century, for the first time, the tension between human beings and the earth has become palpable.

- I call this century the era of "HEAT", HUMAN-EARTH-TENSION.

- This new tension will affect geopolitical developments leading to the creation of derivative tension among nations and regions.
Energy use and its environmental Implications

- The growth of the world population is unstoppable, although it will slow down. The world population will double in only 55 years between 1975 and 2030.

- The world energy demand will increase by 1.7% per year (2002-2030: IEA projection) much faster than the population growth.

- Accordingly, the global energy related CO2 emissions will also increase by 1.7% per year (2002-2030).

- More than two-thirds of the energy-related CO2 emission increase will come from the developing countries.

- Some 80 to 85% of the global CO2 emissions comes from energy use.
The Japanese Energy Model: a solution?

- Energy saving and energy efficiency will hold the key to arrest the CO$_2$ emissions.

- Japan has developed itself as the world most energy-saving and energy-efficient society in industrial, commercial, transport and residential sectors through technological innovation, regulations, policy incentives and public persuasion.

- In the era of HEAT, the application of the Japanese energy model will be of great value to the developing countries, Asia in particular.

- As the Japanese energy model is not a “one-size-fits-all” type, it should be tailor-made for specific countries of application.
Footnotes to the Japanese Energy Model

- Policy measures should be **understandable**.
- Policy measures should be **cost effective**.
- Reasonable **lead-time** is needed for any measures to take effect.
- Energy technologies should **not be too expensive**.
- Policy incentives such as tax incentives should be **carefully designed**.
- Energy saving efforts should **not be too painful**.
- **Energy education** should be given to the younger generation.
- Every effort should be **sustainable**.
Asian Energy Challenges at a Glance

Energy Vulnerability
- High oil import dependency
- Security of Malacca Straits
- Persistent power shortage
- Poor emergency preparedness

Energy Poverty & Environment
- Inter & Intra-state gap
- Rising energy prices
- Worsening air/water quality
- Pressures to curb CO₂ emissions

Energy Strength
- Dynamic economy
- Large population
- High energy demand
- Increasing vehicle ownership

Need
- Energy investment
- Energy technology
- Energy efficiency/saving
- Emergency preparedness
- Energy education
  “Japanese Energy Model”