

**‘Civil’ nuclear program –a unique model that serves the dual objectives of retaining state’s hegemony on citizens’ basic energy needs and assuring supply of weapon grade ingredients : a case study on India<sup>1</sup>**

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*In contrast with North America and most of Western Europe, where growth of nuclear power have leveled out for many years, the ‘greatest growth in nuclear generation’ in near future is expected in China, Japan, South Korea and India.*

*It would be naïve to believe that the political establishments are not aware of the negative consequences of nuclear power. Question may be raised then why have the emerging economies of India, China, Brazil, et al aligned themselves with the nuclear establishment without fully exploiting other alternative energy sources? This paper explores to find an answer to this question.*

*The Indian experience suggests that in addition to energy, the nuclear reactors can also produce the necessary ingredients for atomic bombs. Citing the loopholes of the nuclear non-proliferation treaty (NPT) and the inability of the regulators to perform their expected role, the paper suggests a complete phase out of nuclear energy programs to make this world free of nuclear weapons.*

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In July, 2008, the Lower House of the Indian Parliament, for the first time in its long history, had debated on an issue which, among others, was also linked to energy supplies. Though there is no dearth of experts in the country on ‘poverty’ alleviation strategies, Indians usually don’t show much enthusiasm in any debate on ‘energy’. Politicians in general and development economists in particular have failed miserably to high light the links between ‘poverty and lack of energy supply’. However, an analysis of the last few weeks’ political events would indicate to a growing sense of urgency among the leaders of the ruling coalition to ensure supply of nuclear energy, for the development of the country.<sup>3</sup> A section of the mainstream media –both electronic and print, have praised very highly of the Prime Minister of India for taking the ‘risk’ of seeking a ‘confidence vote’ in the Parliament, which he owned on July 22, 2008 amid allegation of resorting to all unfair means to ‘buy votes’.

It is an irony that during the debate on ‘confidence vote’, most of the Members preferred to discuss various issues (from bribery to poetry) except energy. No one has spoken of the need for a comprehensive long term energy policy which the country has failed to develop even after six decades of independence<sup>4</sup>. This lack of proper energy policy has prompted the government to take short term initiatives at different periods to address the energy needs of the elite groups- mainly the upper and middle class citizens. This recent euphoria about nuclear energy is a case in point.

The World Watch Institute, in one of their latest reports has informed that the future prospect of nuclear power is ‘uncertain’<sup>5</sup>. According to the figures released (in June

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<sup>1</sup> This is an updated and slightly modified version of the working paper titled ‘Nuclear Energy - Most Suitable Energy Source for Retaining State's Hegemony on Citizens' Basic Needs: A Case Study on India’, uploaded in SSRN in July 2008. I am grateful to Helene CONNOR for her comments and suggestions on my first draft.

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<sup>3</sup> As per 2001 Census, only 55.8% of Indian household had access to electricity.

<sup>4</sup> The Integrated Energy Policy, 2006 has already been made a toothless document.

<sup>5</sup> The Hindu Business Line, July 13, 2008

2008) by the World Nuclear Association<sup>6</sup>, in 2007 the global production of nuclear energy declined to 2608 TWh from 2658 TWh in 2006. (The actual figure after summing up the country-wise figure adds up to 2661.3 TWh in 2006. Please refer to Annexure I for details). Compared to this, in this period, the growth of wind and other renewable form of energy across the globe was much higher. But defying all economic logic, the government of India has preferred to patronize the former. The figures in Table 1, below highlight the priority the government has accorded to different forms of energy during last one and half decades. Between 1990 and 2005, the share of nuclear energy in the total primary energy supply (tpes) has gone up while the shares of the renewable energy sources have declined. In contrast, the global trends in the growth of renewable and nuclear energy were just the opposite.

The ‘Renewables 2007: Global Status Report’ as released by REN21<sup>7</sup> has claimed that multilateral agencies and private investors “have been ‘mainstreaming’ renewable energy in their portfolios and many renewable technologies have captured the interest of the largest global companies”. In 2006, the share of renewable energy in the global final energy consumption amounted to 18%. The share of nuclear energy was 3% and rest 79% was the share of fossil fuels (including coal). The corresponding shares of renewable sources, nuclear and fossil fuel in the generation of global electricity were: 18.4%; 14% and 67% respectively.

Table 1: Energy Sources (India)

Total primary energy supply (Mt. of oil equiv.)		Share of TPES											
		Fossil Fuels				Renewable Energy				Other			
		Coal (%)		Oil (%)		Natural Gas (%)		Hydro, solar, wind & geo-thermal (%)		Biomass and waste (%)		Nuclear (%)	
1990	2005	1990	2005	1990	2005	1990	2005	1990	2005	1990	2005	1990	2005
319.9	537.3	33.2	38.7	19.6	23.9	3.1	5.4	1.9	1.7	41.7	29.4	0.5	0.8

Source: Human Development Report (HDR) 2007

On March 2, 2006, India and USA had entered into a civilian nuclear deal (commonly known as ‘123 nuclear agreement’) where India promised to separate its civilian and military installations in return for uninterrupted supply of uranium and access to advanced nuclear technology. Though US law prohibits any nuclear co-operation between USA and India as the latter has not signed the Non-Proliferation Treaty (NPT), the present agreement grants a ‘waiver’ from that law to enable the American firms to participate in the massive nuclear program of India.<sup>8</sup> It is claimed that in the long run, the said agreement would help the country to fuel its growing energy needs.<sup>9</sup>

#### *Shift of the epicenter:*

The epicenter of nuclear power has shifted in recent past to East and South-east Asia. In January 2006, USA along with Australia and Japan has formed the Asia Pacific Partnership on Clean Development and Climate (APPCDC). APPCDC is an agreement between six Asia – Pacific nations namely Australia; Japan; China; India; South Korea

<sup>6</sup> See the website of the World Nuclear Association, <http://www.world-nuclear.org/info/nshare.html>

<sup>7</sup> Visit <http://www.ren21.net>

<sup>8</sup> Iyenger, P.K, ‘Ten Misconceptions about the nuclear deal’, The Hindu Business Line, July 22, 2008

<sup>9</sup>The Businesses Standard,3.3.2006

and USA. The spoke person of APPCDC, after its first meeting at Sidney in January 2006, commented: “You have to accept that nuclear power plants, civil nuclear power plants are greenhouse friendly”<sup>10</sup>. And after attending the meeting, the Indian Environment Minister suggested that “nuclear power should be used in India to promote our emission reduction.”<sup>11</sup> It has been reported that in contrast with North America and most of Western Europe, where growth of nuclear power have leveled out for many years, the ‘greatest growth in nuclear generation’ in near future is expected in China, Japan, South Korea and India<sup>12</sup>.

Resistance against nuclear power in the developed western countries, especially after the Chernobyl nuclear disaster in 1986, did not allow nuclear lobby to regain its lost position. Research findings released by different competent authorities like UK’s Sustainable Development Commission (SDC) have established that nuclear power was a problem, not a solution. The SDC gave a unanimous ‘No’ to the question, ‘is nuclear the answer to tackling climate change or energy security?’ Their reasons, among others, included ‘long-term waste, cost, inflexibility, undermining energy efficiency and international security issues, including accidents, terrorism and nuclear proliferation.’<sup>13</sup> Figures in annexure I on the declining importance of nuclear power in most of the developed countries including France, which is often cited as an example of the most successful country in achieving energy security through nuclear energy, would strengthen SDC’s observations.

It would be naïve to believe that the political establishments are not aware of these negative consequences of nuclear power. Question may be raised then why have the emerging economies of India, China, Brazil, et al aligned itself with the nuclear establishment without fully exploiting other alternative energy sources?

*Petroleum a dominant energy source: emergence of a symbiotic relationship between the state and trans national energy utilities*

Conventional energy sources namely coal; petroleum, natural gas and electricity from large hydro electric projects have dominated the world economy during the last century. Technology was one of the strategic tools through which energy utilities maintained their dominance over the production and distribution of different energy sources. Major oil companies could retain control on world petroleum market over a fairly long period mainly due to their technical edge over others. However, constant support from their ‘home’ state was also essential to maintain their dominance. Though coal was found abundantly throughout the world, after the World War II, most of the countries shifted to oil, By then, the technique of coal production became known to almost all the countries but the technique of oil production remained unknown to most of them. Since 1950s, thanks to Marshall Plan<sup>14</sup>, the ‘US oil majors’ who had established their dominance in the global petroleum market by then, played the crucial role in this shift from coal to oil, especially in Europe<sup>15</sup>. Subsequently, India, with a huge coal reserve capable to meet her

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<sup>10</sup> CAN-Talk,2006, Reuters: INTERVIEW-India says will not agree to emissions caps, can-talk@listi.jpberlin.de (12.1.2006)

<sup>11</sup> ibid

<sup>12</sup> World Nuclear Association, 2007,Asia’s Nuclear Energy Growth, February, <http://www.world-nuclear.org>

<sup>13</sup> Greenpeace, 2006, May, Nuclear Power: Unsustainable, Uneconomic, Dirty and Dangerous, presentation at the Commission on Sustainable Development CSD-14, May 4,

<sup>14</sup> Tanzer, 1974, The Energy Crisis: World Struggle for Power and Wealth by,,: Monthly Review Press, New York

<sup>15</sup> Europe is planning to reverse the trend by regaining their dominance on coal through ‘sustainable coal technology’

energy demands for few hundred years, has also followed the global trend of switching over to petroleum, though till date, as the Table 1 indicates, coal has remained as a major source of energy in India.<sup>16</sup>

### *State and large energy utilities- a symbiotic relationship*

The 'green revolution' of 1950s had opened an opportunity before the nation states to exercise control on the basic necessities (food and energy) of its citizens. A symbiotic relationship between the states and major transnational firms supplying new agricultural inputs (say fertilizer, Seeds, pesticides, water pumps, diesel, electricity et al) was established. Usually, in such arrangements, the state provided with the financial assistance –subsidies, tax rebate etc and the corporate supplied the required technology.

A World Bank study in 1992 estimated that globally, around US\$230 billion per year was provided by the states towards consumption subsidy of fossil fuel. In a subsequent study in 1997, they estimated the annual fossil fuel subsidy in the OECD countries and twenty largest countries outside the OECD, at US\$10 billion and US\$ 48 billion respectively. The International Energy Agency (IEA) in 1999 had estimated the total value of energy subsidies in eight of the largest developing countries at around US\$95 billion. It also revealed that the annual energy consumption subsidies in non-OECD countries were as high as \$250 billion.<sup>17</sup> And in 2006, the Indian government provided a yearly subsidy of Rs 26,604 crores (nearly \$6 billion) to the consumers of LPG and kerosene. While the subsidies ensured political loyalty of the beneficiaries to the state, the energy utilities enjoyed higher market share, earned more profit and remained competitive vis-à-vis other alternative forms of energy. Thus during last century, a win-win relationship had existed between the states and the major energy utilities, dominated mainly by petroleum firms.

The major exception to this trend was France which is cited repeatedly by the nuclear lobby and ambitious emerging states, as an example to emulate. After the oil shock of 1973, to retain its control on energy supplies, the French government made a conscious decision to establish massive nuclear plants. Now the state run France Electricité de France (EdF) operates 59 nuclear reactors with total capacity of over 63 GWe. Around 75% of electricity in France is generated from nuclear sources.

In 2003, 70% of the French citizens had identified themselves as being poorly informed on energy questions.<sup>18</sup> Lack of information to the citizens ( may be due to different barriers imposed by the state on accessing information) on energy options and their socio economic consequences definitely helped the ambitious French government (which always wanted to be at par with its hefty neighbors) to pursue with its massive nuclear program.

### *Alternative options:*

Against the backdrop of soaring crude oil price and climate change debate, the relative importance of different energy sources in the energy mix of a nation are changing. In

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<sup>16</sup> Dey, 1999, The State and Foreign Involvement in the Development of Indian Petroleum Industry between 1970 and 1989' PhD Dissertation, University of Calcutta

<sup>17</sup> As mentioned in Chakraborty and Govind (2008): Should Energy be Subsidized? Icfai Journal of Environmental economics, February

<sup>18</sup> France's first national energy debate was announced in 2003, in response to a "strong demand from the French people", 70% of whom had identified themselves as being poorly informed on energy questions. <http://www.world-nuclear.org/info/inf40.html>

addition to the renewable energy sources like solar and wind energy, two conventional sources of energy namely coal and nuclear are all set to regain their relative market position in the energy mix. Interestingly, two groups of nations<sup>19</sup> are patronizing these different forms of conventional energy. While the US led group are trying to push nuclear energy to the fast growing economies of India; China; Brazil et al, the European Union (EU) is seriously aiming towards a low CO<sub>2</sub> fossil fuel future through the development of 'clean coal technologies' so that after 2020 "near zero emission" power generation could be systematically used in the EU and in the world.<sup>20</sup>

Traditionally, coal has remained as the key fossil fuel in power generation. Carbon-di-oxide emitted from coal fired power generation represents 76% of emission from power generation and around 30% of total global emission of carbon di-oxide. But it can also contribute to the energy security of the EU and the world. It is estimated that compared to the reserves for oil and gas which are expected to last for another 40 and 60 years respectively, at current rate of production, hard coal and lignite would last for another 200 and 130 years respectively. Improved technology with a capacity to reduce coal's harmful environmental effects would change the total energy equation of the globe. The owners of those new generations 'clean coal technologies' would dominate the global energy market in future. Keeping this in mind, the EU has envisaged an integrated technological solution combining efficiency improvement of the conversion cycle with the mechanism of 'carbon-di-oxide capture and storage (CCS). This 'Sustainable Coal Technologies' will enable European firms to become the 'global leaders in this energy form.'<sup>21</sup>

### *Why nuclear?*

In this new century when the sovereign power of the nation states are being increasingly challenged due to proliferation of multilateral agreements, the nation states, specially the ambitious states of emerging economies which have not yet reached the maturity level of Western European States, are trying desperately to retain their hegemony over the basic needs of their subjects. The symbiotic relationship between the state and energy utilities suits effectively with energy sources like petroleum and nuclear power which need large scale operation with huge initial capital investments.

Transnational energy utilities have always preferred mega exploration projects; large refineries and power plants with modern technology. For producing electricity, micro or mini turbines with decentralized power production facilities have been consciously discarded paving way to mega thermal/hydro/nuclear complex with centralized control on production and distribution. Since the 1950s, the size of reactor units has grown from 60 MW to more than 1300 MW, with corresponding economies of scale in operation.<sup>22</sup> To

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<sup>19</sup> Though the share of renewable energy sources are growing across the globe and many countries including USA, have set ambitious targets to meet their future energy needs from renewable sources, here the example of 'clean coal' has been cited to make a comparative assessment of the types of technology that would determine in near future the supply of two conventional energy sources namely coal and nuclear power.

<sup>20</sup> In February 2008, The Polish Platform for Clean Coal Technologies was initiated by the Vattenfall Polska Company and the National Contact Point for EU Research Programs. Poland which is dependent on coal for 96% of its energy, considers the EU's Flagship Program for producing clean energy from coal as 'the future' of their economy. See, Warsaw Voice Supplement, 'Clean Coal Technology A Way to Offset Global Warming', 4 June 2008

<sup>21</sup> Commission of the European Communities (CEC), Commission Communication on sustainable power generation from fossil fuels: aiming for near zero emissions from Coal after 2020. Brussels, 10.1.2007

<sup>22</sup> See Froggatt, 2005, Nuclear Reactor Hazards, Nuclear Issues Paper No.2, Heinrich Böll Foundation, December,

run such a large nuclear plant, the utilities will require the support of the state in a wide range of functional areas starting from the procurement of raw materials; safe disposal of wastes and arranging subsidy for marketing the electricity it produces, to the protection of the plant against disruptive forces.

Compared to this, any breakthrough in 'clean coal' technology will give an edge to the proprietors of the new technology who will disseminate it to thousands of coal producers and coal based power generators to earn royalty. Unlike firms dealing in nuclear energy, these firms will not depend on the 'states' for financial and other assistance. Though huge untapped potential in renewable sources exists,<sup>23</sup> ambitious states like India would prefer nuclear power over other better options.

In the absence of organized public opinion against such blatant exercise of power, these states will construct new nuclear power plants knowing fully well that the safety<sup>24</sup> and economic cost<sup>25</sup> of nuclear energy are much more than the cheaper options already available in other energy sources. This hunger for 'absolute power' is pushing the ambitious states like India, China, Brazil and South Korea towards nuclear power projects.

#### *Importance of India to the global nuclear industry*

In addition to the vast market, India will act as a facilitator to the major players in expanding the market to smaller developing nations with the limited capacity of installing smaller nuclear reactors. Globally, major developers of nuclear reactors in France and North America have moved into large reactor sizes of 1000 MWe and above. India is still using 220 MWe reactors in running its nuclear program. 12 such reactors are in operation now. The Indo-US Nuclear Agreement will allow India to enter into global nuclear trade. It is reported that India is exploring the possibility of exporting indigenous 220 MWe reactors to the developing countries which are constrained by small sized electricity grids to support large reactors of say 1000 MWe. To enhance their global competitiveness, the French and US firms<sup>26</sup> have already expressed interest for long term cooperation with Indian nuclear establishment. While the French firms are keen establishing their production base in the manufacture of Pressurized Water Reactor (PWR) equipment, the US firm Thorium Power is interested in generating license-driven revenue through deployment of thorium technology.<sup>27</sup>

India has acquired global leadership in research involving Pressurized Heavy Water Reactors (PHWR); Fast Breeder Reactors and Thorium Cycle. In case of thorium research, India stands at the top, ahead of Japan, France, Germany and the US. By entering into different collaborative agreements with existing major manufactures of the

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<sup>23</sup> For details see Dey, Dipankar, Global Warming, Nuclear Power and Resurgence of Renewable Energy: A Political Economic Analysis of the Major Issues in the Choice of Energy Supplies with Special Reference to India(July 8, 2008). Available at SSRN: <http://ssrn.com/abstract=1156834>

<sup>24</sup> The cost becomes prohibitive if we include the safety cost of managing the nuclear waste. It has been reported that since the inception of the Nuclear Waste Policy Act in 1983, the US nuclear establishment had to spend around \$9 billion to store the waste. But this amount would reach to \$ 58.5 billion, if the 'total system life-cycle cost' method were used for the cost estimates See FORTUNE, America's Nuclear Revival, August 6, 2007, p 63-64

<sup>25</sup> For a detailed discussion on how 'the prohibitive cost of reactors is making nuclear energy unviable across the world' see Latha Jishnu: Chasing the nuclear power chimera, The Business Standard, July 30, 2008, [www.business-standard.com](http://www.business-standard.com)

<sup>26</sup> Between 1996 and 2007, the share of nuclear in the generation of electricity has decreased both in France and USA. See annexure I

<sup>27</sup> The Hindu Business Line , July 28, 2008

industry, India plans to leverage its edge in these areas to tap the export potential of the global market. Countries like Vietnam, The Philippines, Thailand and Indonesia which have announced their intention to go nuclear are the possible targets.<sup>28</sup>

### *New initiatives to make the world nuclear free*

The Nuclear Non –Proliferation Treaty (NPT), in its present form, which allows some countries to retain their nuclear weapons while others are to make commitment of non-proliferation of nuclear weapon has lost its relevance. The Indo-US nuclear deal has further exposed the basic flaws of the NPT. Though India, a declared nuclear weapon state, is not a signatory to the nuclear non-proliferation treaty, it has received all the necessary support and encouragement from International Atomic Energy Agency (IAEA) and other regulators in its endeavor for massive nuclear program. The preferred treatment which India has received in recent past from IAEA and other nuclear states was reserved, for those who signed the NTP and vowed to abide by the non-proliferation regulations.

It is heartening to know that for the first time, the issue of the complete elimination of nuclear weapons was being addressed, in the United States, by politicians like George Schultz, Henry Kissinger, Bill Perry and Sam Nunn, who represent the mainstream of American strategic policy. Recently, these four American statesmen have proposed a total elimination of nuclear weapons. They argued that unless the nuclear-weapon States (now there are eight of them) – and especially the two main ones, United States and Russia, take the lead in launching a process aimed at their total elimination, it will become increasingly difficult to prevent other countries from acquiring them, with the risk that sooner or later these weapons may be used, and that would have catastrophic consequences for the world.<sup>29</sup>

It may be recalled that the first atomic bomb made by India in 1974 was made from the plutonium produced in a nuclear reactor received from Canada in 1960s. Sheer ban on nuclear weapons would not be effective unless supply of weapon grade materials, produced in such civilian programs, could be stopped. As an extreme measure, this could be made possible only by putting a world wide ban<sup>30</sup> on nuclear energy generation programs.

Even after six decades of Hiroshima and Nagasaki massacre, political leaders have failed to find a suitable mechanism to make this world free of nuclear weapons. Now it is high time that the civil society organizations (CSOs), across the globe, raise a united demand for a total moratorium on nuclear energy programs and phased decommissioning of all existing reactors. This is the only approach through which further proliferation of nuclear weapons could be stopped. Pressure should also be built simultaneously on nuclear weapon states for complete elimination of their atomic weapons.

The politicians have failed to keep their promise of making this world free of nuclear weapons. Now the onus is on the civil society to achieve that objective, for its own survival.

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<sup>28</sup> *ibid*

<sup>29</sup> I am grateful to Gordon Edwards and Helene Connor for sending the English version (by Ms. Lisa Clark) of the *Italian text available at*  
[http://www.corriere.it/cronache/08\\_luglio\\_24/mondo\\_senza\\_armi\\_nucleari\\_ba381db8-594a-11dd-94cb-00144f02aabc.shtml](http://www.corriere.it/cronache/08_luglio_24/mondo_senza_armi_nucleari_ba381db8-594a-11dd-94cb-00144f02aabc.shtml)

<sup>30</sup> may be in a phased manner allowing sufficient time to switch to alternative energy sources

**Annexure –I: Nuclear share (%) in electricity generation (1996-2007)**

<b>A. Countries Exhibiting Increasing Trend (share)</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>Nuclear electricity production (TWh)</b>	<b>Nuclear electricity production (TWh)</b>
<i>Country or area</i>	1996	2002	2007	2006	2007
Armenia	36.7	40.5	43.5	2.4	2.4
Brazil	0.7	4	2.8	13.8	11.7
China:- Mainland	1.3	1.4	1.9	54.8	59.3
Czech Rep	20	24.5	30.3	24.5	24.6
Finland	28.1	29.8	28.9	22	22.5
India	2.2	3.7	2.5	15.6	15.8
Pakistan	0.6	2.5	2.3	2.5	2.3
Romania	1.8	10.3	13	5.2	7.1
Russia	13.1	16	16	144.3	148
Slovakia	44.5	65.4	54.3	16.6	14.2
Slovenia	37.9	40.7	41.6	5.3	5.4
Ukraine	43.8	45.7	48.1	84.8	87.2
<b>Total (A)</b>				<b>391.8</b>	<b>400.5</b>
<b>B. Countries Exhibiting Decreasing Trend (share)</b>					
Argentina	11.4	7.2	6.2	7.1	6.2
Belgium	57.2	57.3	54.1	44.3	45.9
Bulgaria	42.2	47.3	32.1	18.1	13.7
Canada	16	12.3	14.7	92.4	88.2
China:- Taiwan	29	22.9	19.3	38.3	39
France	77.4	78	76.9	428.7	420.1
Germany	30.3	29.9	25.9	158.7	133.2
Hungary	40.8	36.1	36.8	12.5	13.9
Japan	33.4	34.5	27.5	291.5	267.3
Korea, S	36.3	38.6	35.3	141.2	136.6
Lithuania	83.4	80.1	64.4	7.9	9.1
Mexico	5.1	4.1	4.6	10.4	10
Netherlands	4.8	4	4.1	3.3	4
South Africa	6.3	5.9	5.5	10.1	12.6
Spain	32	25.8	17.4	57.4	52.7
Sweden	52.4	45.7	46.1	65	64.3
Switzerland	44.5	39.5	40	26.4	26.5
UK	26	23.7	15.1	69.2	57.5
USA	21.9	20.3	19.4	787.2	807
<b>Total (B)</b>				<b>2269.7</b>	<b>2207.8</b>
<b>Grand total (A) + (B)</b>				<b>2661.5</b>	<b>2608.3</b>

Source: World Nuclear Association <http://www.world-nuclear.org/info/nshare.html>, visited on 31.07.2008