JAPAN AND THE ISSUE OF NUCLEAR ENERGY

By Dr Michael Vaughan

PROLOGUE

"Cheap and reliable electricity are essential for supporting prosperous and decent livelihoods. Japanese society cannot function if we stop or try to do without nuclear power generation, which has supplied 30 per cent of our electricity."

PRIME MINISTER YOSHIHIKO NODA
Statement made on 8 June 2012
Source: International Herald Tribune

Japan can expect a shortage of 8,500 MW this summer (2012).[1] Japan's electricity consumption was estimated in 2011 as being 859.7 billion kWh.[2] As a resource poor country, however, Japan needs to import 84% of its energy requirements. In 2010, Japan generated 1,080 billion kWh gross, 27% from coal, 27% from gas, 27% from nuclear, 9% from oil and 7% from hydro. Final consumption was 965 billion kWh, or about 7,500 kWh per capita.[3]

Energy experts in Japan have proposed three nuclear-generated energy options to the Noda Government:

- Zero nuclear power as soon as possible
- A 15% share of electricity by 2030
- A 20% to 25% share by 2030, compared to almost 30% before the Fukushima disaster

Under pressure from business interests that are worried about stable electricity supply, Prime Minister Noda has been thought to be leaning toward the 15% option, which would require all of Japan's 50 reactors to resume operation before gradually closing older units.[4]

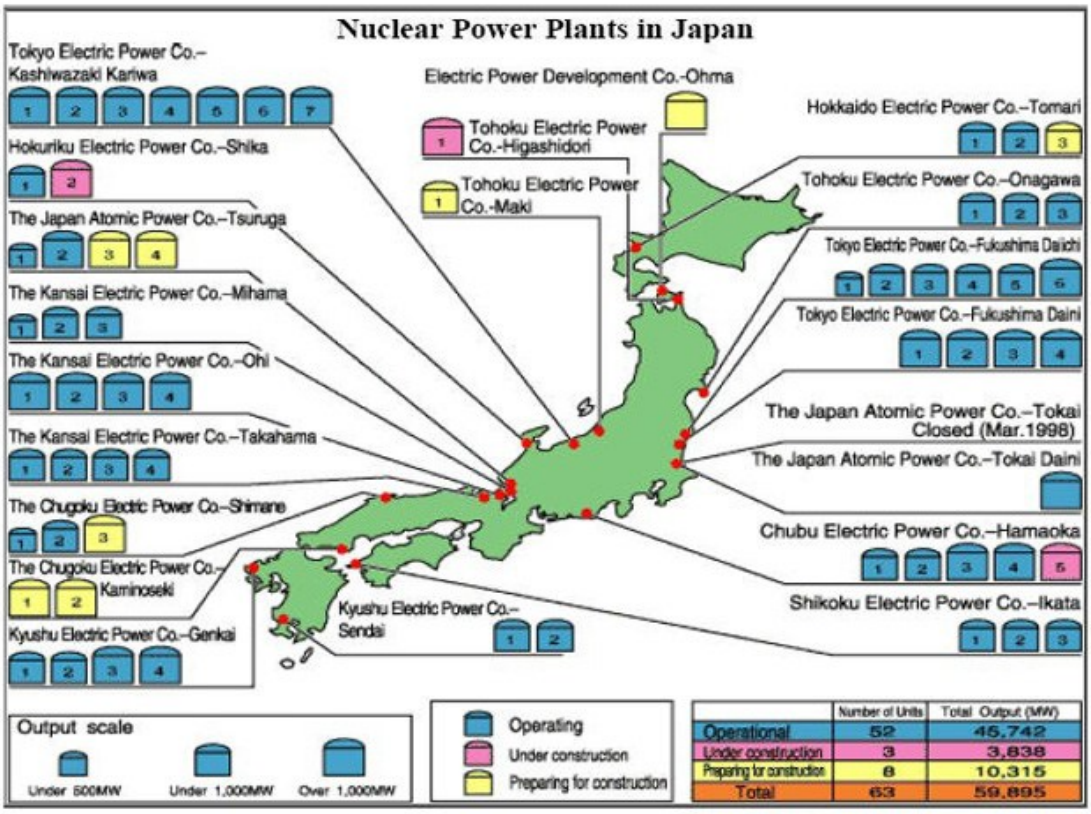
In terms of criticism of Japan's nuclear energy policies over the years are the views of the highly respected Japanese Nobel Literature Laureate, Kenzaburo Oe. He says that

20,000 Japanese Protestors in Anti-Nuclear Power Demonstration Of 23 June 2012 held near Prime Minister's Official Residence

1994 Nobel Laureate For Literature, Kenzaburo Oe, Descendant From A Prominent Samurai Family

following World War Two, the nation's government and media worked together to promote a pro-nuclear agenda. He says that Matsutaro Shoriki, the media tycoon who owned one of Japan's largest circulating newspapers, the *Yomiuri Shimbun*, worked with one time Prime Minister Yasuhiro Nakasone to publicize the benefits of nuclear power.[5]

The above map provides details of Japan's network of nuclear reactors and their generating capacity.[6]



The following four statistical Tables illustrate

- Japan's level of electricity consumption compared to other leading nations;
- its electric energy per capita of population;
- its electricity consumption in terms of Gross Domestic Product and consumption per capita in comparison to the world's largest consumer the United States;
- its energy consumption in terms of population and type of fuel used to generate electricity.[7]

On the basis of the data in Table Two, it is clear that, of the countries selected for analysis, the highest users of fossil fuels are the UK (79.3% of capacity); USA (71.2% of capacity); Japan (66.6% of capacity); Germany (60.2% of capacity); and France (9.5% of capacity.) The highest users of nuclear power generation are France (76.5% of capacity); Japan (23.6% of capacity); Germany (23.4% of capacity); USA (19.2% of capacity); and UK (13.5% of capacity.) The highest users of renewable energy are France (13.0% of capacity); Germany (11.3% of capacity);

Table 1: Electricity Consumption 2008

Country	Population (Millions)	GDP (US$ Billions)	Rank	Electricity Consumption GWh/yr	Rank
China	1,339	$7,992	2	3,444,108	2
India	1,166	$3,304	4	860,723	5
USA	307	$14,440	1	4,401,698	1
Indonesia	240	$917	15	149,437	20
Russia	140	$2,271	6	1,022,726	4
Japan	127	$4,340	3	1,083,142	3
Germany	82	$2,925	5	617,132	7

Table 2: Electric Energy per Capita 2008 (kWh/Person) & form of Generation

Country	Total Population	Fossil	Nuclear	RE-Bio
USA	14,270	10,162	2,746	224
Japan	8,507	5,669	2,010	682
France	8,984	853	6,872	1,168
Germany	7,693	4,635	1,804	873
UK	6,392	5,069	860	266

Notes: RE-Bio includes hydro power, wind power, solar electricity and geothermal energy.
Source: Electricity Information 2009 IEA/OECD.

Japan (8.0% of capacity); UK (4.2% of capacity); and USA (1.6% of capacity.)

As can be seen from this Table, Japan ,Germany and Russia have the highest electricity consumption levels of those countries selected for analysis – all of which are at least half, or somewhat higher than half, of the United States' consumption per head of population of 14,338 GWh per year (based on data from 2008.)

Since the devastating melt-down at Fukushima (where caesium -137 is being measured in terms of 40% of the levels escaping from Chernobyl[8] 25 years earlier in April 1986), the matter of electricity generation by nuclear reactors in Japan is no longer just a commercial/ technological question.

It is probably the most worrisome and angering matter on the minds of Japanese citizens. They see the government as having substantially failed in its duty to protect the public interest. A recent Nikkei poll found that, far from regaining support, the Cabinet of Prime Minister Noda has reached a frightening disapproval level of 63%.

Apart from decisions made by the Noda government on the matter of nuclear energy generation in Japan, much will depend on the principal Opposition party, the Liberal Democratic Party (LDP). During the 2011 nationwide local elections, LDP candidates said very little about the 54 nuclear reactors that were built during their 53 years in office. Such pointed silence could have been related

Table 3: Electricity Consumption 2008 (In terms of Gross Domestic Product & Population)

Country	Population (Millions)	GDP (US$ Billions)	Electricity Consumption GWh/yr
USA	307	$14,440	4,401,698
China	1,339	$7,992	3,444,108
Japan	127	$4,340	1,083,142
India	1,166	$3,304	860,723
Germany	82	$2,925	617,132

Table 4: Sizes of Electricity Consumption Levels (As Compared to USA)

COUNTRY	GDP PER HEAD OF POPULATION	ELECTRICITY CONSUMPTION PER HEAD OF POPULATION GWh PER YEAR	PERCENTAGE COMPARISON WITH USA LEVELS
China	$5,968	2.57	0.02%
Japan	$34,173	8,528.7	59.48%
India	$2,834	738.2	5.15%
Germany	$35,677	7,526.0	52.49%
Russia	$16,221	7,305.2	50.95%

Japanese Question Reliance on Nuclear Power, Handling of Fukushima Crisis

Should use of nuclear power in Japan be...	2011 %	2012 %	*Change*
Reduced	44	70	*+26*
Maintained	46	25	*-21*
Increased	8	4	*-4*
Don't know	2	1	*-1*
Approval of government's handling of Fukushima crisis			
Approve	25	17	*-8*
Disapprove	69	80	*+11*
Don't know	6	3	*-3*

PEW RESEARCH CENTER Q108 & Q109.

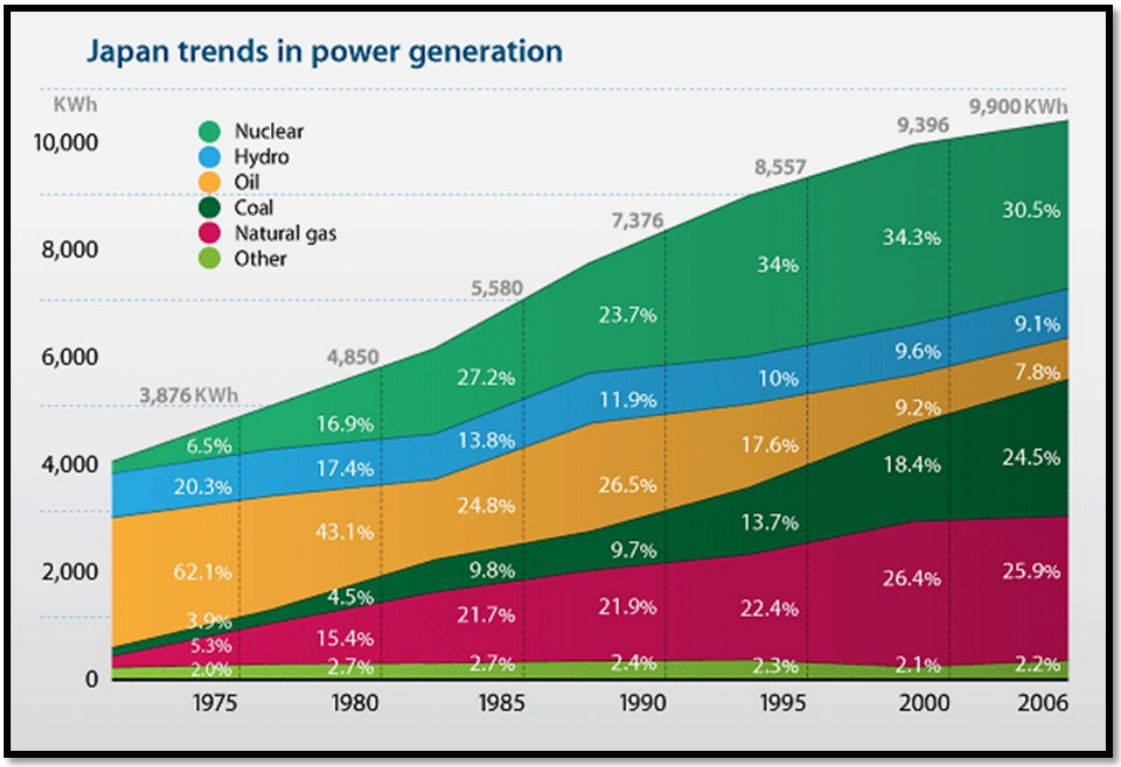
to the fact that the LDP has received sizeable donations from Japan's major nuclear plant makers – Toshiba, Hitachi and Mitsubishi Heavy Industries.[9]

For the time being, the matter of which forms of energy to retain and which forms to put aside will be determined by the unit cost of electricity production.

In 2010, the cost of one kWh by **nuclear generation** was 8.9 Yen; for **coal**, the cost was 9.5 Yen; for **LNG** is was 10.7 Yen; whilst for **oil,** it was 36.0 Yen. Applying those figures broadly to the 859.7 billion kWh of electricity consumed in Japan in 2010, nuclear generated electricity was **1.06 times cheaper than coal** (costing 816.7 billion Yen or US$ 10.4 billion); **12 times cheaper than LNG** (costing 9,198.8 billion Yen or US$ 117.3 billion); and **40 times cheaper than oil** (30,949.2 billion Yen or US$394.6 billion.)[10]

The irony is that, whilst nuclear generated electricity is the cheapest to produce, in the wake of the Fukushima disaster, it also carries the greatest dangers.

Political feeling in Japan is running high over the nuclear energy issue. At eight



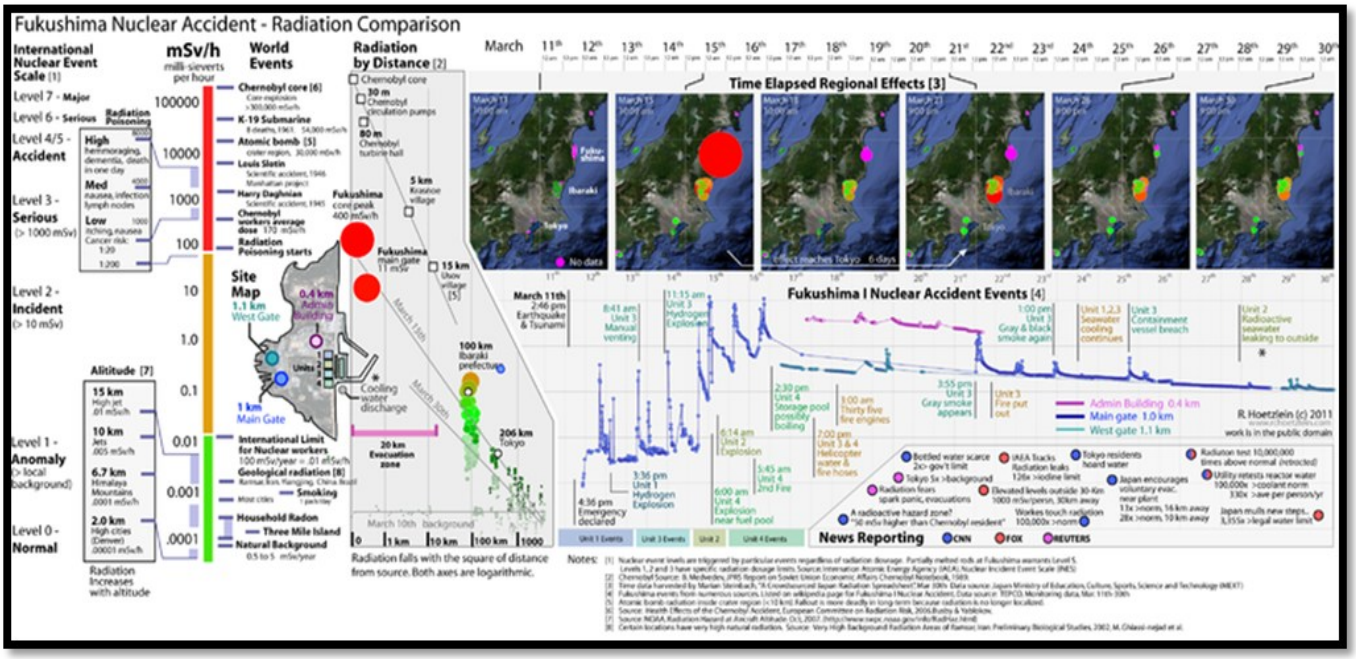
Nuclear Plant Disaster In Japan

public meetings held to solicit people's views on the three policy options [See above p. 2], 70% of speakers supported the zero per cent option by 2030. The eight hearings were held between 14 July and 29 July.[11] Public dissatisfaction with proposed government actions spilled over on Sunday 29 July 2012 with some 20,000 protestors assembling outside the Diet. The protestors broke through the police barriers, causing law enforcers to bring in reinforcements and to dispatch armoured buses to guard the main gate. NHK, the national broadcasting company, described the protests as an *"uncharacteristic show of political activism among the Japanese."* A series of demonstrations has not led, as yet, to any major policy changes.[12]

Still, there have been some movements towards alternative energy sources, even though these, on closer inspection, are somewhat at the margins. Japan is set to build its largest solar power plant costing 27 billion Yen (US$344 million). The plant in Kagoshima City in southern Japan is expected to supply 78,000 MWh of energy every year.[13] Japan currently has 5 GW of installed solar capacity and is aiming for 28GW of renewable solar energy by 2020 and 53GW by 2030. The Kagoshima City project is expected to be completed by Autumn 2013.[14] Such levels of renewable, clean energy are not, however, of sufficiently high levels as to make drastic inroads into Japan's current energy generation and consumption.

Levels of 5 million kW (5 GW), 28 million kW (28 GW) and 53 million kW (53 GW)-

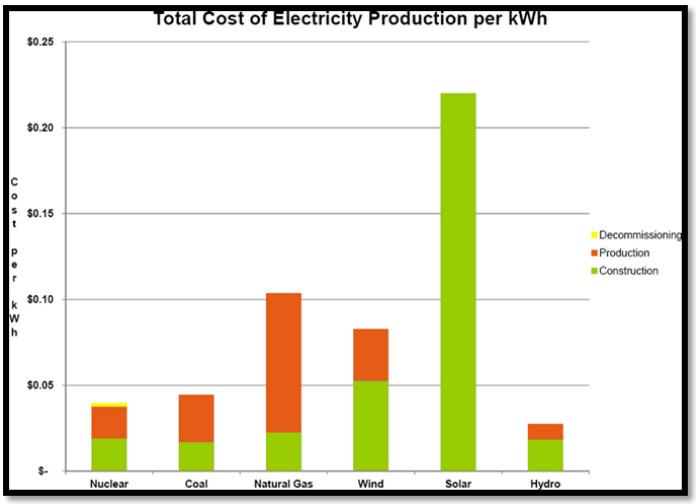
Fukushima Nuclear Disaster - Radiation Comparisons



"Uncharacteristic" Protest By Demonstrators In Japan Who Want An End To Nuclear Reactors For Electricity Generation

given that Japan's total electricity consumption in 2011 was estimated to be 859.7 billion kW – when placed in perspective, amount to 5.8 millionths of 1 percent; 3.25 ten thousandths of 1 percent; and 6.16 ten thousandths of 1 per cent – in terms of estimated electrical consumption for the whole of Japan in 2011. Still, 5 million kW will supply **278 average homes** a year; 28 million kW will supply **1,556 average homes** a year; and 53 million kW will supply **2,944 average homes** a year – a not inconsiderable outcome.

Such figures pale into insignificance, though, when weighed up against Japan's potential capacity for large-scale electricity generation from renewable energy sources, *given the necessary political will and policy application.* Japan is capable of generating 222 GW from wind turbines; 70 GW from geothermal plants; 26.5 GW from additional hydro capacity; and 4.8 GW from solar energy – a total amounting to 323.3 GW of power, or 115% of Japan's 2010 level of 282 GW of total installed electricity, the third largest in the world, ranking behind only the United States and China. The potential is there. It requires, however, a bold change of policy and planning – change which would be greatly welcomed by the Japanese public but would be more difficult to get adopted by conservative, change-resistant lawmakers and their well-entrenched policy advisors within their parties and within officialdom.



Nonetheless, in April 2012, the Noda Government approved feed-in-tariffs (FIT) that are expected to spur investment by guaranteeing higher returns for renewable than for conventional energy. From July 2012, utilities were required to buy electricity from renewable energy providers at a rate of 42 yen (US$0.52) per kilowatt hour (kWh) for solar energy; 23 yen (US$0.29)/kWh for wind power; and 30 to 35 yen (US$0.37 to US$0.43)/kWh for small scale hydro power. These preferential rates will apply for 10 to 20 years, depending on the energy source. Many of Japan's largest corporations, from steel mills and car makers to ceramics and electronics makers, are developing renewable technologies, often incorporating solar and wind power features into their offices and factories.[15]

Germany raised the proportion of renewable energy generation from 5% in

1990 to 20% by 2010. *"If Japan has the motivation, it can do this, too,"* said Sei Kato, Deputy Director of the Environment Ministry's Low Carbon Society Promotion Office. *"We have the technological know-how. Japan can do anything that Germany can."* Real change in Japan is slow. Giant solar arrays and wind farms cannot be built quickly and powerful utilities that spent billions on nuclear energy are lobbying to protect their interests.[16]

Nevertheless, probability studies into establishing 100% renewable energy provision in Japan have been carried out and their findings, if accurate, are immensely important. GENI, the Global Energy Network Institute, in August 2012, noted that renewable energy could be as high as 1,581 GW to 1,612 GW a year in Japan by 2020, adopting a Feed-In-Tariff+Technological Innovation+Subsidy Scenario – this figure being 1.8 to 1.9 times greater than the 858.5 GW consumed by Japan in 2011. The four sources for such electricity generation were listed as wind power, solar power, geothermal power and hydropower. [17]

The following Table illustrates the projected possible levels of renewable energy generation as estimated by GENI in August 2012.

On the basis of these estimates and given the designated scenario, it is possible for Japan, using four clean, safe, renewable energy sources, to generate almost double its 2011 electricity needs in just eight years following 2012.

The central issue, though, remains more political, than technological. The Noda Government has taken some tentative steps by introducing its Feed-In-Tariffs. The outcome will hinge upon what occurs in the Diet. DPJ effectiveness as a government was badly damaged by the Ozawa break-away group ("People's Livelihoods First")[18] of July 2012. Former Party leader and funds dispenser, Ichiro Ozawa, failed to prevent passage of the consumption tax legislation in the Lower House and took 49 defectors with him when he walked out of the Party for which he helped to secure victory in 2009.

Having opposed the much-disliked consumption tax increase, Ozawa will take up the popular anti-nuclear cause as well. His new group does not yet seem to have sufficient numbers to remove the DPJ's parliamentary majority in the Lower House or yet to bring on a vote of no-confidence. If joined by the principal opposition parties the LDP and New Komeito and by more DPJ defectors

Yearly Electricity Generation Using Renewable Sources Estimates By 2020

Installed Capacity (million kW)	Scenario - FIT+Technological Innovation+Subsidy
Wind Power	1,500
Solar Power	69-100
Geothermal	4.6
Hydropower	7.4
TOTAL	1,581 – 1,612

Estimation Source: Ministry of Environment Research

(hostile to the Noda Government's decision to re-start two nuclear reactors), such a vote could succeed, precipitating a dissolution of the House and a General Election. While Ozawa is open to Coalitions with others, no Party with any serious electoral prospects wants to join him. Public expectations of Ozawa's new Party are very low, with an *Asahi Shimbun* poll showing that 78% of voters expect very little from *"The Destroyer",* as Ozawa is ruefully known. He himself has much impeding electoral baggage to carry, having been discredited in the public eye through his recent trial for DPJ funds misappropriation. Although initially acquitted for "lack of evidence", this short-lived victory for Ozawa is presently under a cloud, a successful appeal having been lodged by the prosecution. He must therefore face a Court of Law once again, with all of the attendant bad publicity. There is also the ominous possibility of a conviction and a humiliating jail sentence, spelling complete ruination of a once very powerful political figure, no longer able to shape affairs to suit himself. [19]

Angry Demonstrators Demanding An End To Nuclear Energy And The Adoption Of Clean, Safe Renewable Energy Sources

Notes:

* **Dr Michael Vaughan** is a sessional teacher for classes in Australian politics and Asian Politics. He sits on the King's College Council. Dr Vaughan has pronounced research interests in China and her regional cognates.

1. Manta Badkar & Gregory White, "If History Proves Correct, Japan May Be Ready To Stomach Its Imminent Power Shortage" *Business Insider* 4 April 2011.
2. 1 kilowatt (kWh) is a unit of energy equal to 1,000 watt hours or 3.6 mega joules. 1 Megawatt (MW) is equal to 1 million watts or, 1,000 kilowatt hours every hour
3. See "Nuclear Power In Japan", *World Nuclear Association* July 2012 http://www.world-nuclear.org/imfo/inf79.html Accessed 1 August 2012.
4. Linda Sieg, "Noda's Nuclear Energy Policy Will Be Tested In Yamaguchi Election", *Japan Today* , 26 July 2012
5. Adam Westlake, "Nobel–Winning Kenzaburo Oe Alleges Government, Media Collusion Promoted Nuclear Power", *The Japan Daily Press*, 31 July 2012.
6. Anthony Hall, "Fukushima Daiichi: From Nuclear Power Plant To Nuclear Weapon", *Global Research*, 13 June 2012.

EPILOGUE

"We are here to oppose nuclear power, which is simply too dangerous ... [Noda] isn't listening to us. He only listens to companies and Yonekura. "

STATEMENT BY **HIROKO YAMADA** A PARTICIPANT IN THE 19 JULY 2012 DEMONSTRATION OUTSIDE JAPAN'S PARLIAMENT BY 20,000 ANGRY CITIZENS

7. All these Statistics relate to the year 2008 and are based on data published in *The CIA Fact Book 2009*
8. The Chernobyl Disaster released into the surrounding environment 30 to 40 times the radiation caused by the atomic bombing of Hiroshima and Nagasaki. At 40% of such radiation, the Fukushima meltdowns released 12 to 16 times the radiation caused by the bombings. The worst radioactive element is caesium-137 which has a half-life of fully 30 years.
9. "LDP Must Reflect On Nuclear Power Generation" *Japan Press Weekly* 13-19 April 2011 [Translated from the Japanese.]
10. For unit costs per kWh in 2010, see "Nuclear Power In Japan", *World Nuclear Association,* July 2012 www.world-nuclear.org/info/imf79.html Accessed 2 August 2012.
11. "Majority At Public Hearings Want Nuclear-Free Japan", *The Asahi Shimbun,* 30 July 2012.
12. See *Market Watch*, 31 July 2012.
13. An average household uses 18,000 kW a year, meaning that the Kagoshima City project, when completed, will fuel 4,333 households every year, given an output of 78,000,000 kW (78,000 MWh).
14. Priyanka Shrestha, "Japan Set To Build Its Largest Solar Plant", *Energy Live News*, 1 August 2012.
15. Elaine Kurtenbach and Mari Yamaguchi, "Crisis-Hit Japan Mulls Shift To Renewable Energy", *The Seattle Times,* 3 May 2012.
16. Ibid.
17. Takatoshi Kojima, "How Is 100% Renewable Energy In Japan Possible By 2020?", *Global Energy Network Institute*, August 2012 – URL www.scribd.com/.../How-is-100-renewable-energy-possible-in-Japan Accessed 15 August 2012. See also *CIA Fact Book July 2012*, for 2011 Japan Electricity Consumption.
18. Political rivals and opponents have cuttingly said a more appropriate name for Ozawa's new party might be "Put Elections First." DPJ Foreign Minister Gemba has said that Ozawa must have badly miscalculated if he thought he could win an election simply by opposing tax increases and nuclear power generation. The Japanese people, the Foreign Minister went on to say, were not fools and suggested that voters would not be beguiled by Ozawa's pursuit of popularity whilst masking his own self-interest.
19. Aurelia George Mulgan, "Can Ichiro Ozawa Repeat History In Japan?", *East Asia Forum*, 3 July 2012.
20. This reference is to **Hiromasa Yonekura**, currently Chairman of the Board of **Sumitomo Chemicals** (which he joined 52 years ago in 1960) a massive corporation employing 27,828 workers which had a net income in 2009 of 14.7 billion Yen or US$188 million. Since May 2010, Mr Yonekura has also been **Chairman of the Japan Business Federation (the Nippon Keidanren)** which is the most powerful business lobby group in Japan. Keidanren, which cites the development of the Japanese economy as its principal objective, represents 1,281 companies and other business organizations, which include such corporate giants as **All Nippon Airways**, **Toyota, Toshiba, Marubeni** and **Da-Ichi Life**. It used to make substantial political donations to the Liberal Democratic Party but has ceased such donations since the election of the Democratic Party of Japan government. Following the March 2011 Tsunami and shut-down of nuclear reactors, the Keidanren **called for the re-start of the reactors**, though a small number of business leaders dissociated themselves from this call.