

## Introduction

The disaster in March 2011 of the Fukushima Daichi nuclear plant has forced many countries to rethink their nuclear policies. Shaken by the tsunami-induced nuclear disaster, Japan, a nuclear power since a decade after World War II, ordered a major review of its nuclear policy with economics and safety as primary concerns.

After Fukushima, Japan's political leaders were forced to edge through major balancing acts—at one end to prevent plunging into the dark, and at the other end to avoid a politically charged nuclear backlash from the people. Nuclear power provides 30 percent of Japan's energy needs. But after Fukushima, most of its nuclear reactors were ordered shut down while planning, safety and regulatory agencies were reorganized. Existing protocols were revised, and a long-term transition period was laid down to gradually phase out its nuclear capacity in favor of renewable energy.

Of other nuclear countries, Germany was quicker and more decisive in dealing with the Fukushima disaster. On May 29, 2011, in response to major anti-nuclear protests following Fukushima, Chancellor Angela Merkel announced that Germany's 17 nuclear plants would be shut down by 2022. Immediately, eight of the 17 reactors were ordered permanent shut down.

But it is good to note here that prior to Fukushima, Germany already had an elaborate energy transition framework called *energiewende*<sup>1</sup> that provides for a decisive shift towards renewable energy and energy efficiency. In other words, Fukushima did not drive the Germans towards this transition. Rather, it made them bolder, and wiser.

France meanwhile plans to cut by a third its nuclear energy output in 20 years. And French President François Hollande called a national

debate to start the process. This issue is truly a big deal for the country because unlike Japan that has other sources of power, 75 percent of France's electricity comes from a single source—its 58 nuclear reactors.<sup>2</sup> It is also unlikely that it can catch up quickly with Germany in developing green technology in place of a nuclear phaseout.

Yet France pursued developing its own transition framework called *la transition énergétique*. In October 2014 the National Assembly passed an energy transition bill, which aims to lower the generation share of nuclear power to 50 percent by 2025.<sup>3</sup>

Several other European states like Belgium and Switzerland have opted as well for a nuclear phaseout, while others (Italy, Bulgaria, Lithuania, Poland, and Slovakia) have prevented the re-entry of nuclear energy or have halted the construction of new reactors.<sup>4</sup>

Likewise after the Fukushima disaster, the European Commission (EC) imposed stricter safety rules and liability limits including mandatory stress tests for all EU power plants. As a result, nearly all the 132 nuclear power plants had to be upgraded with an estimated cost of 25 billion euros.<sup>5</sup>

Certainly, all over the world, the alert is up—aging nuclear plants are being shut down and nuclear policies are undergoing stringent review following the Fukushima disaster. In the Philippines, however, there has neither been a single reactor to close down nor a fleet of nuclear plants to subject to a phaseout plan. Accordingly, there is also no new nuclear policy to review.

What we have is a monument of fraud that lies idle in Morong<sup>6</sup> and behind it, the shadows of

<sup>2</sup> Rob Broomby, "France struggles to cut down on nuclear power," *BBC News Magazine*, Last modified January 11, 2014, <http://www.bbc.com/news/magazine-25674581>.

<sup>3</sup> "Nuclear Power in France," World Nuclear Association, Updated November 25, 2014, <http://www.world-nuclear.org/Info/Country-Profiles/Countries-A-F/France/>.

<sup>4</sup> Christian von Hirschhausen and Felix Reitz, *Nuclear energy: outdated model with no ultimate disposal place, Nuclear Phase Out*, DIW Wochenbericht No. 13/2014

<sup>5</sup> Hirschhausen and Reitz, *Nuclear energy: outdated model*.

<sup>6</sup> In Bataan province, Central Luzon region. It is within an 80.5-km radius from parts of Metro Manila. See <http://rverzola.wordpress.com/2011/04/02/bnpp-hypothetical-50-mile-80-5-km-radius-evacuation-zone-northern-metro-manila/>.

\*The authors are fellows of the Center for Power Issues and Initiatives (CPII).

<sup>1</sup> "The German Energiewende," Heinrich Böll Foundation, (Accessed Month Day Year), <http://energytransition.de/>.

fallacious promises of low-cost power and the folly of safety and reliability of the Bataan Nuclear Power Plant (BNPP). Thankfully, this plant has never been operated and has not provided any opportunity for a nuclear disaster. But there are forces within and without the government, as well as foreign interests, who would like to see the plant revived. Pro-nuclear power advocates are now pushing for the revival of the BNPP to close the projected power supply deficit of 2015.

In the last three decades, a great leap in power technology has made renewable energy a better choice than running an old and defective nuclear plant. But proponents of the BNPP refuse to concede. And tirelessly, they keep on reviving the nuclear option every time the country's power situation is in a sorry state.

What we have, therefore, is a bad idea that keeps coming back—an archaic proposition that refuses to die. So how do we finally and effectively shut down an idea as bad as the nuclear option?

The simplest way is to keep the idea out of our minds—by burying the BNPP option deep under the ground, similar to high-level wastes that need deep geological disposal. We need to push for an explicit non-nuclear policy of the State. At the same time, we build renewable energy options that are affordable and safe in terms of disposal of generation waste by-products.

## Power crisis, then and now

Unfortunately the country's gloomy power situation is keeping the lights on for the BNPP option. A power crisis similar to what the Philippines had suffered from during the time of President Corazon Aquino is haunting the present administration led by no less than her son, President Benigno S. Aquino III.

A deficit of not less than 700 megawatts (MW) is estimated to hit the country's three main grids as shown in the revised power outlook of the Department of Energy (DOE).<sup>7</sup> Broken down by grid, however, the figures are lower: The Luzon grid is facing a shortage of at least 184 MW next year; 81 MW for Visayas; and 173 MW for Mindanao.

These numbers however keep on changing every time the DOE attaches other factors to consider such as the amount of reserves to be maintained and the estimated amount of lost MW in a year due to forced outages (FO). In a hearing of the House of Representatives' Energy Committee, the DOE said the projected shortfall would be only 31 MW in the first two weeks of April 2015.<sup>8</sup> But adding on the reserve and FO factors would result in an estimated deficit of 900 MW to 1,000 MW.<sup>9</sup>

During her term, President Cory Aquino was widely blamed for her decision to mothball the 620-MW BNPP which led to the crippling power crisis in the late 80s up to the early 90s. Critiques of the first Aquino were unequivocal: the former President made the wrong decision in shelving the BNPP. Had she switched on the plant, "there would not have been a power crisis and her successor, President Fidel V.

Ramos, could have embarked on a higher phase of economic development for the nation."<sup>10</sup>

Today her son is being blamed for being too slow, if not completely clueless, in addressing a power crisis of similar magnitude. Last September, President Aquino finally asked Congress to grant him emergency powers to deal with the most pressing concern—the power deficiency expected to be felt in the summer of 2015. But Congress has yet to act on the President's request as lawmakers dispute the deficit in megawatts being projected by the energy department. In the meantime, the pro-nuke lobby is moving.

## History and Background of the Bataan Nuclear Power Plant

The BNPP is strongly associated with the Marcos dictatorship as a prime example of "crony capitalism" and rent seeking, resulting in a fraudulent debt that benefited a US multinational corporation,<sup>11</sup> a US bank<sup>12</sup> and a Marcos crony<sup>13</sup>—all at the expense of the Filipino people.

What is less known, however, is that the notion of using nuclear power for electricity in the Philippines began taking shape as early as the 1950s. Republic Act No. 2067<sup>14</sup> created the Philippine Atomic Energy Commission (now Philippine Nuclear Research Institute), which was responsible for promoting peaceful use of nuclear energy and regulating the use of radioactive materials. A series of preliminary feasibility studies of nuclear power was undertaken in the 1950s and the 1960s, together with the International Atomic Energy Agency. By 1965, the pre-feasibility study was completed. Two years later, the Luzon-based power utility Manila Electric Company (Meralco)

<sup>7</sup> Carlos Jericho L. Petilla, "Electric Power Demand Outlook for 2012–2030" (presentation at the Visayas Power Summit, Cebu City, Philippines, April 26, 2013), <http://www2.doe.gov.ph/Presentations/Visayas%20Power%20Summit%20-%20April%2026.pdf>.

<sup>8</sup> Angela Casauay, "House likely to drop Aquino emergency powers," *Rappler*, October 20, 2014, <http://www.rappler.com/business/industries/173-power-and-energy/72544-congress-aquino-emergency-powers>.

<sup>9</sup> Natasha Gutierrez, "Aquino seeks Congress help to address power shortage," *Rappler*, September 11, 2014, <http://www.rappler.com/business/industries/173-power-and-energy/68794-power-shortage-congress-aquino>.

<sup>10</sup> Gerardo P. Sicat, "The abandoned nuclear power plant, today's high electricity prices and unsteady supply," *The Philippine Star*, September 3, 2014, <http://www.philstar.com/business/2014/09/03/1364700/abandoned-nuclear-power-plant-todays-high-electricity-prices-and>.

<sup>11</sup> Westinghouse.

<sup>12</sup> US Export-Import Bank (US EXIMBANK).

<sup>13</sup> Herminio Disini.

<sup>14</sup> Republic Act No. 2067, As Amended By Republic Act No. 3589, "The Science Act of 1958: An Act to Integrate, Coordinate and Intensify Scientific and Technological Research and Development and to Foster Invention; to Provide Funds Therefor, and for Other Purposes. Approved June 13, 1958. RA No. 3589 took effect on June 22, 1963.

submitted a bid for a nuclear power plant to be operational by 1975.<sup>15</sup>

The bid of the latter did not materialize, apparently for a number of reasons. In September 1972 then President Ferdinand Marcos declared martial law and arrested, among others, Eugenio 'Geny' Lopez Jr., eldest son of the family that owned Meralco. Less than two months later, Marcos issued Presidential Decree No. 40,<sup>16</sup> giving the state-owned National Power Corporation (NPC; also Napocor) a monopoly over power generation and transmission. The following year, control over Meralco was transferred to Marcos and his cronies allegedly in exchange for the release of Mr. Lopez, Jr.<sup>17</sup>

Also in 1973, the NPC was instructed by Marcos to negotiate the acquisition and establishment of two 600-MW nuclear power plants. Negotiations with General Electric (GE), a US multinational, ensued for nine months without GE ever meeting with the President. On the same day on June 14 that GE submitted a 200-page prospectus for the 1.2 MW nuclear plant, the board of trustees of the NPC ratified the decision of President Marcos to award the contract to another US multinational, Westinghouse. A report in *Fortune* Magazine says that sometime in late May or early June of that year, the President had instructed both his Executive Secretary<sup>18</sup> and the general manager of the NPC<sup>19</sup> to favor Westinghouse. It was also reported that Westinghouse, through Herminio Disini—a golfing buddy of the President—made a sales pitch directly to Marcos and his cabinet

on May 7, 1973. GE executives were to learn only upon their return to the US that Westinghouse had won the contract for the nuclear plant.<sup>20</sup>

From an initial base price in June 1973 of US\$500 million for two 620-MW reactors, the Westinghouse price ballooned to US\$695 million in just four months. When the contract was finally signed in February 1976, the cost of the project had risen to \$1.1 billion (including interest and escalation charges); but instead of two reactors the Philippines was getting only one. Westinghouse began clearing the area where the plant now sits in Morong, Bataan, in March 1976, despite the PAEC not having issued a permit to proceed with construction. It was only in 1978 that the NPC asked the PAEC to issue a permit to construct the plant. Questions by Librado Ibe—then head of the Commission and a nuclear engineer—about the seismic tests conducted on the site prompted him to invite the IAEA to step in. A five-person team of the IAEA visited the BNPP site in 1978 and recommended that more tests be undertaken and in the meantime, that construction be halted. The Marcos government exerted pressure on Mr. Ibe to ignore the recommendations and issue a permit for the construction of the plant. Under severe pressure, he did so in April 1979, just a week after the notorious nuclear accident at Three Mile Island in Pennsylvania, United States.<sup>21</sup>

Perhaps because of growing opposition to the nuclear plant by the local community that was to host the plant as well as by national citizens' movements, President Marcos himself suspended construction of the plant and appointed a three-man commission to look into the plant. The commission, headed by Ricardo Puno, found the plant to be unsafe. This conclusion triggered a re-negotiation with Westinghouse for additional safeguards and some changes in the plant. The result was a further ballooning of the cost of the single-reactor plant to US\$1.8 billion. Westinghouse

<sup>15</sup> See the Philippines 2013 report to the International Atomic Energy Agency (IAEA) [http://www-pub.iaea.org/MTCD/Publications/PDF/CNPP2013\\_CD/countryprofiles/Philippines/Figure%20PHILIPPINES%202013.pdf](http://www-pub.iaea.org/MTCD/Publications/PDF/CNPP2013_CD/countryprofiles/Philippines/Figure%20PHILIPPINES%202013.pdf). Also, Arturo F. Salih and Gilzam Z. Beza, "Nuclear Power: Initiatives and Developments in the Philippines," Asian Nuclear Safety Network, October 2013, <https://ansn.iaea.org/Common/topics/OpenTopic.aspx?ID=13248https://ansn.iaea.org/Common/topics/OpenTopic.aspx?ID=13248>.

See also Economic Research Institute for ASEAN and East Asia (ERIA) Study on Nuclear Safety Management in East Asian Countries Working Group (2013), "Nuclear Energy Policy Trends in Member Countries," in Murakami, T. (ed.), Study on International Cooperation Concerning Nuclear Safety Management in East Asian Countries. ERIA Research Project Report 2012-28, 1–36. Available on: [http://www.eria.org/RPR\\_FY2012\\_No.28\\_Chapter\\_1.pdf](http://www.eria.org/RPR_FY2012_No.28_Chapter_1.pdf)

<sup>16</sup> Presidential Decree No. 40, "Establishing Basic Policies for the Electric Power Industry," November 7, 1972.

<sup>17</sup> Geny Lopez was not released and eventually escaped from prison.

<sup>18</sup> Alejandro Melchor.

<sup>19</sup> Ramon Ravanzo; as cited in Brian Dumaine, "The \$2.2 Billion Fiasco," *Fortune*, September 1, 1986, [http://money.cnn.com/magazines/fortune/fortune\\_archive/1986/09/01/67989/index.htm](http://money.cnn.com/magazines/fortune/fortune_archive/1986/09/01/67989/index.htm).

<sup>20</sup> Brian Dumaine, "The \$2.2 Billion Fiasco," *Fortune*, September 1, 1986, [http://money.cnn.com/magazines/fortune/fortune\\_archive/1986/09/01/67989/index.htm](http://money.cnn.com/magazines/fortune/fortune_archive/1986/09/01/67989/index.htm)

<sup>21</sup> Dumaine, "The \$2.2 Billion Fiasco."

resumed work on the plant in 1981. By the time construction of the plant was completed in 1984, the 600-MW reactor's cost had inflated to US\$2.3 billion.<sup>22</sup>

In 1984, tests on the functionality of the BNPP were completed, and the plant was synchronized with the Luzon grid. Nuclear fuel was delivered.<sup>23</sup>

But the Marcos regime's days were nearly over, especially after the assassination in August 1983 of his staunch political rival, Benigno S. Aquino. Geronimo Velasco, the Energy Secretary of the Marcos regime, recalls in his memoirs that then US ambassador to the Philippines Stephen Bosworth suddenly paid him a visit and requested that the US government be allowed to send a team to evaluate the BNPP's readiness for operation. The team's recommendation was not to operate the plant. Velasco interpreted this as a loss of faith of the US government in the Marcos regime.<sup>24</sup>

Then EDSA 1 happened, and the 20-year dictatorship ended. Corazon C. Aquino, widow of the slain senator Benigno S. Aquino, assumed the presidency in February 1986.

Two months later the Chernobyl nuclear plant exploded. A few days after the meltdown occurred, President Cory announced her decision to mothball the Bataan Nuclear Plant.<sup>25</sup> Her government pursued two cases, one in the US against Westinghouse, the other, also against Westinghouse, in an international court in Switzerland. The US court dismissed the charges against Westinghouse. In the end the Aquino government and the government of Fidel V. Ramos, who succeeded her, both agreed to what critics perceive as a grossly

unfair settlement with Westinghouse in 1992 and 1995, respectively. The settlement of 1992 under President Aquino was rejected by both houses of Congress.<sup>26</sup>

President Cory committed to pay the fraudulent debt to the US Export Import Bank. It was fully paid in 2007.<sup>27</sup>

### The plant mothballed, the dream lives on

The BNPP was shut down by the first Aquino government before it could commercially generate a single watt of electricity. Yet to this day the plant remains "under preservation" by a team of engineers from the NPC. Since it was mothballed in 1986 the government has been spending PhP40 million to PhP50 million a year to preserve the BNPP.<sup>28</sup>

Furthermore, the Philippine Atomic Energy Commission was reorganized and renamed the Philippine Nuclear Research Institute (PNRI) in 1987 through Executive Order 128.<sup>29</sup> The Aquino government also created a Presidential Committee on the Philippine Nuclear Power Plant. Senator Rene Saguisag headed this committee. The committee was tasked to undertake a technical audit of the BNPP and determine whether it could be safely operated as a nuclear plant; and if not, could the plant be operated as a combined cycle power plant. The audit team of the Presidential Committee had six major observations, as enumerated in a module prepared by the Nuclear-Free Bataan Movement-Network:

1. deficient fire protection systems,
2. unusually large number of field change notices or FCNs,
3. test programs that do not meet local and foreign standards of acceptability,
4. safety-related electrical components that do not meet physical separation requirements,

<sup>22</sup> Ibid.

<sup>23</sup> Salih and Beza, "Nuclear Power: Initiatives and Developments in the Philippines."

<sup>24</sup> Geronimo Z. Velasco, *Trailblazing: The Quest for Energy Self-Reliance* (Manila: Anvil Publishing 2006), as discussed in a review of the book by Mike Billington, *The Philippines' Fight for Nuclear Energy* in Executive Intelligence Review, Vol. 33, No. 19, May 12, 2006, 45-48, [http://www.larouchepub.com/eiw/public/2006/2006\\_10-19/2006\\_10-19/2006-19/pdf/eivr33n19.pdf](http://www.larouchepub.com/eiw/public/2006/2006_10-19/2006_10-19/2006-19/pdf/eivr33n19.pdf).

<sup>25</sup> Corazon Valdez Fabros, "The Continuing Struggle for a Nuclear-Free Philippines," World Information Service on Energy, October 16, 1998, <http://www.wiseinternational.org/node/2127>. See also ABS-CBN News Research, "Timeline: Nuclear Power in the Philippines," *ABS-CBN News*, December 21, 2009, <http://www.abs-cbnnews.com/research/12/21/09/timeline-nuclear-power-philippines>.

<sup>26</sup> Ibid.

<sup>27</sup> ABS-CBN News Research, "Timeline: Nuclear Power in the Philippines," *ABS-CBN News*, December 21, 2009, <http://www.abs-cbnnews.com/research/12/21/09/timeline-nuclear-power-philippines>.

<sup>28</sup> "Bataan Nuclear Power Plant," National Power Corporation, February 20, 2014, <http://www.napocor.gov.ph/index.php/bataan-nuclear-power-plant>.

<sup>29</sup> Executive Order No. 128, "Reorganizing the National Science and Technology Authority," January 30 1987.

5. anchor bolts and base plate installations that do not meet regulatory standards, and
6. potential seismic interaction problems endangering the safety of the plant."<sup>30</sup>

But the government's dream-keepers refused to let it go.

In May 1995 then President Fidel Ramos issued Executive Order No. 243 creating a Nuclear Power Steering Committee to develop a Nuclear Power Program for the Philippines. This committee was co-chaired by the Department of Energy, the Department of Science and Technology, and the Department of the Environment and Natural Resources. Also in this committee were the NPC and the PNRI. President Ramos's instructions included, among others, to identify possible sites of nuclear plants; to identify sites for final radioactive waste disposal; to prepare legislation needed to support a nuclear power program; and undertake a feasibility study for the operation of the first nuclear power plant under this program.<sup>31</sup>

By 1998 the Steering Committee had identified 13 "candidate" sites in Luzon, Visayas and Mindanao. (See infographic below.)<sup>32</sup>

The dream-keepers also say that a site has already been identified for burying radiation waste. But no one has dared to announce where this site will be located.<sup>33</sup>

In addition, the Ramos government included 2,400 MW of nuclear power capacity in its

power development plan for the Philippines covering the period 1998 to 2035.<sup>34</sup>

In August 2004, speaking before a business forum in Manila, Vincent Perez, Energy Secretary of then President Gloria Arroyo said that the nuclear option should be kept open in the Philippines, even though it is an unpopular option, because the Philippines is energy dependent.<sup>35</sup>

Four years later, at the request of the Arroyo government through Energy Secretary Angelo Reyes, the International Atomic Energy Agency conducted a review mission in early 2008 to assess the feasibility of rehabilitating the BNPP. The IAEA Mission identified 19 areas that formed the general requirements for a country to launch a nuclear power program.<sup>36</sup>

<sup>30</sup> "Modyul Hinggil sa Pagtalakay sa Bataan Nuclear Power Plant (BNPP) at Mga Batayan ng Atang Pagtutol (Unang Borador)," Nuclear-Free Bataan Movement-Network, June 6, 2009, <http://kpdnorth.weebly.com/global-issues/modyul-sa-pagtalakay-ng-bnpp>.

<sup>31</sup> Executive Order No. 243, "Creating a Nuclear Power Steering Committee," May 12, 1995.

<sup>32</sup> "Philippines: 2013," International Atomic Energy Agency, (Accessed Month Day Year), [http://www-pub.iaea.org/MTCD/Publications/PDF/CNPP2013\\_CD/countryprofiles/Philippines/Figure%20CNPP%20PHILIPPINES%202013.pdf](http://www-pub.iaea.org/MTCD/Publications/PDF/CNPP2013_CD/countryprofiles/Philippines/Figure%20CNPP%20PHILIPPINES%202013.pdf).

<sup>33</sup> "Philippines: 2013." See also Department of Tourism Bataan Nuclear Plant Briefer, <http://www.visitmyphilippines.com/index.php?title=BataanNuclearPlantBriefer&func=all&pid=8830>

<sup>34</sup> Department of Energy, *Philippine Energy Plan 2009-2030*, (Accessed Month Day Year), [https://www.doe.gov.ph/doe\\_files/pdf/01\\_Energy\\_Situationer/2009-2030-PEP.pdf](https://www.doe.gov.ph/doe_files/pdf/01_Energy_Situationer/2009-2030-PEP.pdf).

<sup>35</sup> Agence France-Presse, "Philippines should keep nuclear power option open: Arroyo aide," August 18, 2004, <http://www.spacewar.com/2004/040818081253.p6x3v5my.html>.

<sup>36</sup> "Nuclear Energy Policy Trends in Member Countries: Study on Nuclear Safety Management in East Asian Countries Working Group," in *Study on International Cooperation Concerning Nuclear Safety Management in East Asian Countries: ERIA Research Project Report 2012-28*, ed. T. Murakami, (Np: np, June 2013), 1-36, [http://www.eria.org/RPR\\_FY2012\\_No.28\\_Chapter\\_1.pdf](http://www.eria.org/RPR_FY2012_No.28_Chapter_1.pdf).

. See also <http://www.iaea.org/newscenter/news/iaea-advises-philippines-next-steps-mothballed-npp>.



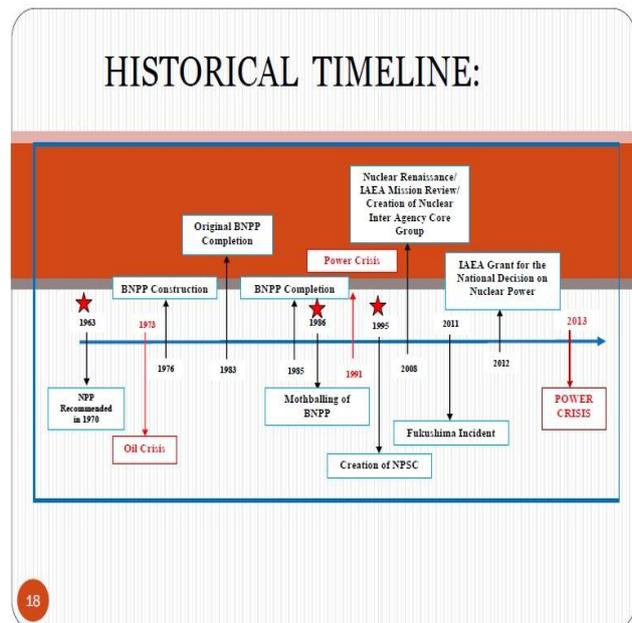
Figure 7. Other Candidate Sites for the Nuclear Power Plant

Source: Philippines 2013 report to the International Atomic Energy Agency (IAEA) [http://www-pub.iaea.org/MTCD/Publications/PDF/CNPP2013\\_CD/countryprofiles/Philippines/Figures/CNPP%20PHILIPPINES%202013.pdf](http://www-pub.iaea.org/MTCD/Publications/PDF/CNPP2013_CD/countryprofiles/Philippines/Figures/CNPP%20PHILIPPINES%202013.pdf)

The findings of the Mission centered on two major elements: the policy framework and infrastructure for nuclear energy in general, and the BNPP in particular. On the first major element the Mission found that there was no apparent nuclear energy policy, also that the legislative and regulatory framework was incomplete. It also found that there was no established joint mechanism among the industry, power utilities and the government.<sup>37</sup>

On the second major element—the condition of the BNPP—the Mission found a need for verified data of plant conditions, especially because budget limitations resulted in the scaling down over the years of the preservation of the plant. In particular, because the “Nuclear Steam Supply System” was not preserved, the Mission reckoned that the cost of rehabilitation

would be high. The Mission also noted the probability of degradation of the infrastructure as a result of the decision in 1986 to mothball the plant. It also found that there was no systematic evaluation system for the feasibility study of the plant’s rehabilitation.<sup>38</sup>



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Source: Arturo F. Salih and Gilzam Z. Beza, “Nuclear Power: Initiatives and Developments in the Philippines,” Asian Nuclear Safety Network, October 2013, <https://ansn.iaea.org/Common/topics/OpenTopic.aspx?ID=13248>.

The recommendations of the Mission thus focused on areas such as National Position/Policy, Nuclear Safety, and Regulatory Framework to Fuel Cycle and Waste Management. The Mission recommended the creation of a national nuclear energy policy, and the setting up of a “dedicated nuclear core group for the nuclear power program of the country.”<sup>39</sup> This gave rise to the creation in January 2009 of an Inter-Agency Committee on Nuclear Energy, headed by the Department of Energy with the Department of Science and Technology and the NPC as members.<sup>40</sup>

The IAEA Review Mission of 2008 also recommended a Feasibility Study to be conducted so as to verify the condition of the BNPP and prepare a plan for its rehabilitation. Enter the Korean-state owned power company, Korea Electric Power Corporation or KEPCO. On

<sup>37</sup> Victor M. Delgado Jr., “The Safety of the Bataan Nuclear Power Plant with focused [sic] on Seismic Safety,” (presentation at the First Kashiwazaki Symposium on Seismic Safety of Nuclear Installations, Kashiwazaki City, Japan, November 2010), [http://www.nsr.go.jp/archive/jnes/seismic-symposium10/presentationdata/2\\_sessionA/A-04.pdf](http://www.nsr.go.jp/archive/jnes/seismic-symposium10/presentationdata/2_sessionA/A-04.pdf).

<sup>38</sup> Delgado, “The Safety of the Bataan Nuclear Power Plant.”

<sup>39</sup> Ibid.

<sup>40</sup> “Nuclear Energy Policy Trends in Member Countries.”

December 23, 2008 the NPC signed a Memorandum of Understanding with the latter for the conduct of a feasibility study on the possible rehabilitation of the BNPP.<sup>41</sup> In 2010 KEPCO submitted its official report to the NPC. Not surprisingly, it found that for an estimated outlay of US\$1 billion, the BNPP could be rehabilitated and operated.<sup>42</sup>

While the KEPCO study was ongoing in 2009, Representative Mark Cojuangco (5<sup>th</sup> district, Pangasinan province) filed House Bill No. 4631<sup>43</sup> in the 14<sup>th</sup> Congress in 2008. Although it reached the Plenary, the bill did not pass. The following year, Representative Kimi Cojuangco—wife of Mark Cojuangco, who replaced her husband after he had served three consecutive terms—filed House Bill No. 1291.<sup>44</sup> But Representative Cojuangco declared a “moratorium” on her bill soon after the 3/11 earthquake, tsunami and nuclear fallout in Japan.<sup>45</sup>

President Benigno Aquino had publicly stated that he had no plans to revive the BNPP, despite earlier calls of his cousin, former Representative Mark Cojuangco, to do so.<sup>46</sup> In August 2012 it was reported that the Aquino administration refused to provide any funds in the 2013 budget to preserve the BNPP.<sup>47</sup> But just before President Aquino left for a state visit to Korea in mid-October 2013—during which visit he was to meet with Korean investors—he ordered the Budget Department to reinstate the allocation

for BNPP’s maintenance in the 2014 budget.<sup>48</sup> Rather than closing the door firmly on nuclear power, the government of Benigno S. Aquino III appears to be leaving it slightly ajar. When he was newly elected president of the Philippines in 2010, he was reported to have said that while he did not favor reviving the BNPP, he remained open to nuclear energy as a source of electricity.<sup>49</sup>

What is clear is that there is no categorical State policy against the use of nuclear energy in the Philippines. And in the absence of a categorical “no,” the implication is that nuclear energy is acceptable to the State. Energy Secretary Jericho Petilla admitted that the DOE is open to nuclear energy. “We’re looking at it on a long-term basis. We’re counting on [nuclear as an option].”<sup>50</sup> He added: “Nuclear is not in the energy mix today, but the major advantage of nuclear power generation is that it is cheap,” he said. “Another advantage of nuclear is that it’s clean, meaning, no emissions.”<sup>51</sup>

As discussed in a 2012 study on nuclear energy policy trends in East Asian countries, the Philippine government “is open to embarking on nuclear power generation plans in the future and looking at improvements in existing safety standards and technology advancement as necessary preconditions (notwithstanding opposition from various environmentalists and other interest groups).”<sup>52</sup>

The BNPP may be idle and deteriorating, but the dogged pursuit of the dream turned fantasy turned chimera continues.

<sup>41</sup> See [https://www.wikileaks.org/plusd/cables/09MANILA154\\_a.html](https://www.wikileaks.org/plusd/cables/09MANILA154_a.html). See also “Nuclear Energy Policy Trends in Member Countries” and <http://www.iaea.org/newscenter/news/iaea-advises-philippines-next-steps-mothballed-npp>.

<sup>42</sup> “Cost of Bataan nuke plant rehab set at \$1-B,” in *Business World*, cited in ABS-CBN News [www.abs-cbnnews.com/print/87329](http://www.abs-cbnnews.com/print/87329).

<sup>43</sup> Filed on July 3, 2008. This was later substituted by House Bill No. 6300, “An Act Mandating the Immediate Rehabilitation Commissioning and Commercial Operation of the Bataan Nuclear Power Plant, Appropriating Funds Therefor, and for Other Purposes,” 14<sup>th</sup> Congress of the House of Representatives.

<sup>44</sup> Filed on July 13, 2010, “An Act Mandating an Immediate Validation Process which satisfies Internationally Accepted Nuclear Power Industry Norms to Determine the Bataan Nuclear Power Plant’s Operability Culminating In Either The Immediate Rehabilitation, Certification And Commercial Operation Or, The Immediate Permanent Closure And Salvage Value Recovery, of the Bataan Nuclear Power Plant, Appropriating Funds Therefore, And For Other Purposes.”

<sup>45</sup> Kimi S. Cojuangco (privilege speech delivered at the Plenary Session of the House of Representatives, Quezon City, Philippines, March 14, 2011), <http://5thdistrictpangasinan.com/2011/03/14/>.

<sup>46</sup> “Palace won’t support Bataan Nuclear Power Plant opening,” (Accessed Month Day Year), <http://west.mabuhaynews.net/V19N12/fr05.html>.

<sup>47</sup> Leila B. Salaverria, “Bataan Nuclear Power Plant gets no funds in 2013,” *Philippine Daily Inquirer*, August 20, 2012, <http://newsinfo.inquirer.net/253426/bataan-nuclear-power-plant-gets-no-funds-in-2013>.

<sup>48</sup> Christine F. Herrera, “Aquino makes U-turn on nuke plant budget,” *Manila Standard Today*, October 19, 2013, <http://manilastandardtoday.com/2013/10/19/aquino-makes-u-turn-on-uke-plant-budget/>.

<sup>49</sup> “New Philippine President Welcomes Option of Nuclear Energy,” NucNet, July 13, 2010, <http://www.nucnet.org/allthenews/2010/07/13/newphilippinepresidentwelcomesoptionofnuclearenergy>.

<sup>50</sup> Amy R. Remo, “For gov’t, nuclear energy now a viable option,” *Philippine Daily Inquirer*, December 2012, <http://business.inquirer.net/99427/forgovtnuclearenergynowaviableoption/commentpage2>.

<sup>51</sup> “Nuclear Faces ‘Social Acceptability’ Problem in Philippines,” NucNet, December 24, 2012, <http://www.nucnet.org/allthenews/2012/12/24/nuclearfacesocialacceptabilityproblemphilippines>.

<sup>52</sup> “Nuclear Energy Policy Trends in Member Countries.”

## Main Protagonists and Antagonists

The main protagonists and antagonists since 2008 are a mixed group of politicians, activists, environmentalists, government officials, church and community leaders, progressive political organizations, engineers, scientists and professionals. Most of them have links with the past, whether for or against nuclear power.

From the history of the BNPP it is clear that the role of the Head of State—the President—is crucial in determining the pursuit of nuclear power—or in mothballing it. Because then President Gloria Arroyo did not categorically push for the commissioning of the BNPP, the 2008 effort to revive it then moved to the House of Representatives through Congressman Mark Cojuangco. The latter had the implicit support of the President through her son, Representative Mikey Arroyo, who headed the House Committee on Energy. The Cojuangco bill passed at the committee but was blocked at the Plenary and eventually died.

In 2010, with Mark's cousin now in office in Malacañang, and with Mr. Cojuangco himself out of office, the mantle fell on Mrs. Kimi Cojuangco (who succeeded her husband as representative of the 5<sup>th</sup> district of Pangasinan) to push for the revival of the BNPP. This time, however, PNoy said he would not push to rehabilitate and operate the BNPP. But he also said he welcomed the option of nuclear energy. This position made it possible for the DOE together with engineers of the NPC to continue to pursue the option of nuclear power, including reviving the BNPP, though less explicitly as then Secretary Angelo Reyes of the Arroyo administration. As in the past (Three Mile Island and Chernobyl), Fukushima put a halt to the efforts of a BNPP revival—at least on the national stage.

Despite the decision of President Cory to mothball the BNPP, neither she nor any other president of the republic—her son included—has taken an explicitly non-nuclear policy. This largely explains the absence of a clear-cut nuclear policy in the Philippines.

A fierce debate ensued in Congress and in multi-media forums when the Cojuangco house bill was filed in 2008. Key congressional opponents were Akbayan Representative Walden Bello<sup>53</sup> and Bayan Muna Representative Neri Colmenares.<sup>54</sup> Geologist Kelvin Rodolfo also emerged to place on record the IAEA standards on operating a nuclear plant in areas close to volcanoes, and to scientifically assess the clear and present danger posed by three volcanoes close to the BNPP.<sup>55</sup> Engineer and IT expert Roberto Verzola likewise came to the fore and challenged Mark Cojuangco's assertions and claims point by point, in public hearings, in print and broadcast media, and in the internet.<sup>56</sup> Professor Roland Simbulan re-emerged, too, to add an informed voice to the debate.<sup>57</sup>

Lending their support to the protagonists are some physicists and business groups. Speaking before NPC employees as well as on the occasion of the Centennial celebration of the University of the Philippines (UP), Dr. Jose Magpantay, a UP physics professor, argued for a clear industrial policy that would be supported by an energy policy that must include nuclear power.<sup>58</sup> Another group, the Philippine arm of the Larouche Society, has actively campaigned for the revival of the BNPP as part of a three-pronged strategy to "Save the Nation."<sup>59</sup>

<sup>53</sup> House Bill 6300, 14th Cong., 3rd sess., Congressional Record Vol. 1 No. 15, (September 9, 2009), 14–22, <http://congress.gov.ph/download/congrec/14th/3rd/3RS-15-090909.pdf>.

<sup>54</sup> T.J. Burgonio, "Gov't warned on reopening nuclear plant," *Philippine Daily Inquirer*, June 10, 2008, <http://newsinfo.inquirer.net/inquirerheadlines/nation/view/20080610-141787/Govt-warned-on-reopening-nuclear-plant>.

<sup>55</sup> *On the Safety of the Bataan Nuclear Power Plant: Hearing Before the Committee on Appropriations, House of Representatives, 14<sup>th</sup> Cong., 2 (February 2, 2009)* (Testimony given by Kelvin S. Rodolfo on behalf of the Philippine Climate Watch Alliance), <http://nautilus.org/projects/by-name/aus-indo/aust-ind-nuclear1/ind-np-old/asean-nuclear-power/philippines/>.

<sup>56</sup> See the blog site of Roberto Verzola on <https://rverzola.wordpress.com/nuclear-power/> for an extensive collection of documents and arguments surrounding the BNPP.

<sup>57</sup> Roland G. Simbulan, "Is the Bataan Nuclear Power Plant Safe?" *Yonip*, February 2009, <http://www.yonip.com/is-the-bataan-nuclear-power-plant-safe-by-professor-roland-g-simbulan/>.

<sup>58</sup> See full text of Dr. Magpantay's speech "A Call for an Energy Industrial Policy," on <http://weempower.wordpress.com/tag/jose-magpantay/> as well as his lecture "Is UP a Cause or Consequence of the Country's Weak Industry?" on <http://www.upd.edu.ph/~updinfo/octnovdec08/articles/uprole.html>.

<sup>59</sup> The Philippine Larouche Society calls for "three urgent steps for the survival of our nation." One of these steps is to "START THE OPERATION OF THE BATAAN NUCLEAR POWER PLANT as part of an energy development plan consisting of all alternative sources of energy, and immediately establish a Nuclear Energy Program, not merely to provide the cleanest, cost-efficient, reliable source of power for agro-industrial development, irrigation and water management systems, mass-transit systems, but also to explore its other beneficial uses, more specifically the production of potable water from nuclear-powered desalination plants, the production of isotopes used in

The effort of Mr. Cojuangco to revive the BNPP instead revived the nuclear-free movement in the Philippines, both at the national and local levels. As in the past they were joined by the Church, by broad civil society coalitions, and by environmental groups.<sup>60</sup> For many with ties to the movements of decades past, Mr. Cojuangco—son of Eduardo “Danding” Cojuangco, a key Marcos crony during the dictatorship—also represented a brand of politics and business that was perceived to be self-serving and harmful to the Filipino people.

Outside the glare of the national spotlight and Congress, the locus of the struggle is moving to Morong. Enter the congressman bearing gifts, throwing a party to celebrate the “birthday” of the BNPP, with media and bloggers in tow.<sup>61</sup> No doubt he has the cash to distribute; apparently he does not hesitate to use it, according to the Bataan nuclear-free activists, even at the expense of dividing the community.<sup>62</sup>

The march to Morong by the congressman includes engineers and representatives of the DOE. They are armed with false information tearing down renewable energy. They distribute a survey with questions so loaded that only one kind of answer—yes we are for nuclear power—can be provided by the respondents.<sup>63</sup> The fight against nuclear power is no doubt a national one, but the battleground is moving to the homes and villages of Morong.

The following table attempts to identify the prominent individuals and groups who have taken clear public positions for and against nuclear power in general, and reviving the BNPP in particular, based on newspaper accounts, published commentaries, memoirs and research papers.

	<b>Pro-BNPP</b>	<b>Anti-BNPP</b>
<i>Past Presidents</i>	Ferdinand E. Marcos Fidel V. Ramos Joseph Ejercito Estrada Gloria M. Arroyo	Corazon C. Aquino
<i>Legislators, present &amp; past</i>	Reps. Mark and Kimi Cojuangco Rep. Mikey Arroyo Rep. Antonio Cerilles Sen. JV Ejercito Sen. Juan Ponce Enrile	Sen. Lorenzo M. Tañada Sen. Jose W. Diokno Sen. Wigberto Tañada Sen. Rene Saguisag Rep. Edcel Lagman Rep. Roilo Golez Akbayan representatives Makabayan bloc representatives Partido Manggagawa representative Sanlakas representative
<i>Cabinet members, present and past</i>	Energy Sec. Jericho Petilla Energy Sec. Geronimo Velasco Energy Sec. Vincent Perez Energy Sec. Angelo Reyes	Heherson Alvarez
<i>Academics: physicists</i>	Jose A. Magpanta	Giovanni Tapang/AGHA

modern medical facilities, and the production of hydrogen as an alternative source of fuel.” See its website on <http://larouchephil.com/category/nuclear-energy/>.

<sup>60</sup> See list on pages 12–13 of this paper. Prominent among these groups are the Nuclear Free Philippines Movement, the Nuclear Free Bataan Movement-Network, the No to BNPP coalition, and the No to BNPP Revival.

<sup>61</sup> Kel Fabie, “8 Questions about the Bataan Nuclear Power Plant Answered,” June 10, 2013, <http://8list.ph/site/articles/8-questions-about-the-bataan-nuclear-power-plant-answered-254>.

<sup>62</sup> Anecdotal accounts shared by members of the Nuclear Free Bataan Movement at the FES-CPII Conference on the Future of Nuclear Power in the Philippines, Legend Villas, Mandaluyong City, Metro Manila, December 3, 2014.

<sup>63</sup> Also anecdotal accounts from abovementioned activity.

	Pro-BNPP	Anti-BNPP
	y	M
<i>Academics: geologists and engineers</i>	Carlo A. Arcilla	Alfredo Mahar F. Lagmay Kelvin Rodolfo Roberto Verzola Filemon Berba Jr.
<i>Academics: social scientists</i>		Roland Simbulan
<i>Business persons &amp; groups</i>	Philippine Larouche Society Arangkada Philippines David Celestra Tan	
<i>Power sector players</i>	NPC Engr. Mauro Marcelo KEPCO	
<i>Church based organizations</i>		Catholic Bishops Conference of the Philippines National Council of Churches in the Philippines Diocese of Balanga, Bataan Association of Major Religious Superiors of the Philippines Faith-Based Congress against Immoral Debts
<i>Community based organizations</i>		Nuclear Free Bataan Movement
<i>Environmental groups</i>		Greenpeace Philippine Greens Green

	Pro-BNPP	Anti-BNPP
		Convergence Ecological Waste Coalition Global Alliance for Incinerator Alternatives
<i>Other civil society groups and persons</i>		Nuclear Free Philippines Movement Cora V. Fabros No to BNPP No to BNPP Revival Youth for Nationalism and Democracy Freedom from Debt Coalition Philippine Rural Reconstruction Movement Center for People Empowerment in Governance Jubilee South Bisig Kalayaan Sanlakas
<i>Labor organizations</i>		Alliance of Progressive Labor Bukluran ng Manggagawang Pilipino Kilusang Mayo Uno
<i>Media/journalists</i>	Ben Kritz Domini M Torrevillas Solita Collas Monsod	Most progressive writers and journalists
<i>Political parties and organizations</i>		Kilusan para sa Pambansang Demokrasya Akbayan Ang Kapatiran Partido

	Pro-BNPP	Anti-BNPP
		Kalikasan Partido Manggagawa

### The Social and Economic Costs

A thorough and comprehensive accounting of all the costs involved thus far in contracting, building, and mothballing the BNPP must be undertaken by the government before any talk of reviving it is considered and pursued. In the absence of this full accounting, we will attempt to identify these social and economic costs.

As discussed in an earlier section of this paper, from an original amount of US\$500 million for two reactors, the final cost, for one reactor, was US\$2.3 billion. The corruption cost inherent in this overpricing is evident. The final cost is equivalent to US\$3.7 million per megawatt—a level far exorbitant in the 1980s when it would have cost less than one million US dollars to install one megawatt of power capacity with any other type of power generating plant. Should the pro-nuclear advocates succeed in reviving the BNPP, their conservative cost estimate of US\$1 billion to revive the plant will make the BNPP one of the smallest but most expensive nuclear plants in the world, at a cost of at least US\$5.3 million per megawatt.<sup>64</sup> The humongous 3.4 gigawatt (GW) nuclear plant currently being developed in the UK is estimated to cost US\$17 billion, or US\$5 million per megawatt.<sup>65</sup>

Even though the plant was mothballed, the Philippine government paid the debts in full. From 1986 to 2010, the total debt service on the BNPP alone is estimated to have been about PhP72 billion, according to data gathered by the Freedom from Debt Coalition (FDC) and the House of Representatives.<sup>66</sup>

Add to this the annual cost of “preserving” the plant for nearly three decades, estimated at PhP40 million to PhP50 million a year, or about PhP1.1 billion.<sup>67</sup>

The FDC also recognizes the social cost of servicing the BNPP debt.<sup>68</sup> Spending on health services, for example, from 1986 to 2009 was less than one percent of gross domestic product in each of these years that the government had pledged to honor all debts including the onerous among them. With government spending primarily allocated to debt servicing, the BNPP debt, being the single biggest debt of the Philippines thanks to the Marcos dictatorship, has no doubt contributed to the foregone social spending for the poor that characterized public spending in the past four decades.

Another cost that has to be factored in would be the lost energy sales because no additional capacity was planned by the government when the BNPP was mothballed. The World Bank estimates the blackouts of 1990 to 1991 to have been in the order of 251 gigawatt hours (GWh).<sup>69</sup>

At a conservative rate of PhP1.50 per kilowatt-hour (kWh) this amounts to about PhP380 million.<sup>70</sup> Add to this the lost production, which has been estimated at US\$1 billion a year during the years of critical power shortage.<sup>71</sup>

Another indirect impact of the BNPP is the onerous contracts of the state-owned NPC with independent power producers in response to the power crisis of the 1990s that have made the cost of electricity in the Philippines the highest in Asia today. The loss of productivity

<sup>64</sup> Calculated as follows: US\$2.3 billion plus US\$1 billion, divided by 620 megawatts (the installed capacity of the reactor).

<sup>65</sup> <http://www.powertechnology.com/projects/moorsidenuclearpowerprojectcumbria/>.

<sup>66</sup> Freedom from Debt Coalition research; debt statistics were obtained from the audited reports of the NPC from 1976 to 1986, and from the Department of Budget and Management’s report entitled “Budget of Expenditures and Sources of Financing” (BESF) for the years 1987 to 2005. See also Jess Diaz, “Pinoy’s paying PhP5.8 million a day for Bataan Nuclear Power Plant,” *The Philippine Star*, May 14, 2005.

<http://www.philstar.com/headlines/277496/pinoyspayingp58milliondaybataanuclearpowerplant>.

<sup>67</sup> As discussed in an earlier section on the history and background of the BNPP.

<sup>68</sup> See Maitet Diokno, “The Debt to the People,” PowerPoint presentation made on the occasion of the FDC National Congress, Quezon City, August 17, 2010.

<sup>69</sup> World Bank (2003), *Philippines: an opening for sustained growth*, Vol. 2 Country Economic Report No. 11061-PH; cited in Ma. Rowena M. Cham, “The Philippine power sector: issues and solutions,” in *The Philippine Review of Economics*, Vol. XLIV, No. 1, June 2007, 33–63; <http://pre.econ.upd.edu.ph/index.php/pre/article/view/218>.

<sup>70</sup> In 1995 the average electricity rates of the NPC were PhP1.77 per kilowatt hour (kWh) in the Philippines overall, and PhP1.85 per kWh in Luzon. See Rowaldo R. del Mundo, *Power Switch! Scenarios and Strategies for Clean Power Development in the Philippines* (Quezon City: WWF Philippines and UP Solar Laboratory, 2003), [http://d2ouvy59p0dg6k.cloudfront.net/downloads/wwf\\_powerswitch\\_scenario\\_philippines.pdf](http://d2ouvy59p0dg6k.cloudfront.net/downloads/wwf_powerswitch_scenario_philippines.pdf).

<sup>71</sup> del Mundo, *Power Switch! Scenarios and Strategies*.

and competitiveness as a result of the lengthy outages of the 1990s; the high cost of electricity that resulted from hastily built independent power plants with overpriced contracts; the further ballooning of the debt of the NPC as a result of its obligations under these onerous contracts are direct consequences of the decision and action of the government of Corazon Aquino to mothball the BNPP *without planning for additional capacity to replace the mothballed plant*. So even though the BNPP debt has been paid and mothballed, the Filipino people continue to suffer the folly of it to this day.

Some pro-nuclear advocates argue that should the plant have been operated then, these staggering costs could have been avoided.<sup>72</sup> They add, when Mt. Pinatubo erupted in 1991, there was no damage to the Monster of Morong (our words).<sup>73</sup> But this is a claim that cannot be accurately assessed precisely because the plant was not operating when Mt. Pinatubo erupted. The geological risks of locating the nuclear plant on top of a sleeping volcano are well documented and will be discussed in a later section of this paper.

### The Pro-BNPP Arguments

The arguments common among pro-BNPP advocates center on several themes. For one, the BNPP is safe, if not safer than Fukushima. If it will be revived as urged by the pro-nuclear advocates, it will conform to international safety standards. Moreover, nuclear energy is clean. And it is cheap.<sup>74</sup>

Unreliability and high cost characterize the Philippine power crisis. And for over a decade now, the power sector reforms made under the Electric Power Industry Reform Act (EPIRA) brought nothing but escalating rates and

diminishing supply. And as everyone scouts for solutions to address this lingering problem, the nuclear option sits well into the line of options being considered as far as cost, reliability and efficiency as base load power are concerned.

Former House Representative Mark Cojuangco, a staunch proponent of BNPP re-commissioning and author of House Bill 4631 in 2008, argued that the BNPP is the only technology with a “real chance” of lowering the price of electricity.<sup>75</sup> According to Cojuangco, nuclear power can be sold at around P2.50 per kilowatt hour (kWh)—below the NPC’s current rate of P4.50 to P5 per kWh.<sup>76</sup>

In May 2013, on the 29<sup>th</sup> anniversary of the BNPP, Mr. Cojuangco invited journalists and bloggers to a tour of the BNPP plant in order to celebrate the BNPP’s birthday. Complete with a cake and with the blowing of candles, he answered almost all possible queries about the nuclear plant’s operation and convinced his guests about the need to commission the plant.<sup>77</sup>

Cojuangco addressed the issues about the safety of the BNPP by claiming that “Chernobyl never followed international standards and BNPP is safer than Fukushima.” Cojuangco also stressed a point regarding the issue of radiation by saying that coal ash (from coal plant) is more radioactive than nuclear waste.<sup>78</sup> Another fallacious claim that Cojuangco has repeatedly made, despite being publicly corrected on this more than once, is that “In the 50-year history of the nuclear power industry in the West, including the Three Mile Island incident, not a single person has been killed or injured.”<sup>79</sup>

<sup>72</sup> Juan Ponce Enrile, “Costly Errors” (speech, Federation of Philippine Industries, Inc., in Greenhills, San Juan City, April 29, 2003), <http://www.juanponceenrile.com/view/212>.

<sup>73</sup> Leonardo V. Micua, “Mothballed BNPP More Modern and Sturdier than Fukushima Plants—Cojuangco,” *Balita*, April 1, 2011; <http://balita.ph/2011/04/01/mothballedbnppmoremodernandsturdierthanthefukushimaplantscojuangco/>

<sup>74</sup> Domini M. Torrevillas, “Nuclear Power as Best Option,” *Philippine Star*, June 12, 2012, <http://www.philstar.com/opinion/20120612/816175/nuclearpowerbestoption>. See also Katerina Francisco, “Nuclear power to lower electricity costs,” June 4, 2013, <http://www.rappler.com/business/industries/173powerandenergy/30308bnppnuclearoverdebate>.

<sup>75</sup> Katerina Francisco, “Nuclear power to lower electricity costs,” *Rappler*, June 4, 2013, <http://www.rappler.com/business/industries/173powerandenergy/30308bnppnuclearoverdebate>.

<sup>76</sup> “Ex-congressman urges passing bill allowing 20% private ownership of BNPP,” *GMA News Online*, December 12, 2010, <http://www.gmanetwork.com/news/story/208148/economy/ex-congressman-urges-passing-bill-allowing-20-private-ownership-of-bnpp>.

<sup>77</sup> Fabie, “8 Questions about the Bataan Nuclear Power Plant Answered.” See also videos posted on You Tube

<https://www.youtube.com/playlist?list=PLWRke6B11NKz8nCX5jfcFe-k074TNo7A>. <sup>78</sup> *Ibid*.

<sup>79</sup> Mr. Cojuangco excludes Chernobyl in this claim. His article “The Imperative of Nuke Power,” appeared in the *Philippine Daily Inquirer’s* Talk of the Town section on March 8, 2009. (see <http://opinion.inquirer.net/inquireropinion/talkofthetown/view/20090308-192919/The-imperative-of-nuke-power>). See also Roberto Verzola’s comment on

In fact, for Cojuangco, “eating a banana is more radioactive than standing in front of a nuclear power plant for an entire year, with the former containing 0.1 microsieverts (one banana!), while the latter exposes you to 0.09 microsieverts of radiation (one year!).”<sup>80</sup>

He also allayed fears of developing nuclear bombs from having nuclear power plants by elaborating that nuclear plants like BNPP will only utilize “slightly enriched uranium for power with a concentration of only two percent, while nuclear bombs would require a minimum of 80 percent.”<sup>81</sup>

Cojuangco likewise underscored that “we are shooting ourselves in the foot by letting one of the best national assets go to waste for nearly three decades.” One billion pesos is more or less the same price in setting up a new coal-fired power plant according to Cojuangco’s estimates. Not to mention that, for Cojuangco, if the main alternative for power generation is coal, then nuclear would be more appealing if the potential environmental impact were factored in. He further argues that nuclear power is “cleaner than others” as it does not produce greenhouse gases compared to coal and other fossil fuels. And in terms of reliability, nuclear power is considered a muscle since at 70 percent to 90 percent average capacity factor, it is a good source of baseload power.<sup>82</sup>

These arguments are strongly echoed by the individuals and groups identified in the table presented earlier. The following section tackles these assertions.

## Nuclear power is clean

Nuclear power advocates say that nuclear power has low emissions. Dr. Kelvin Rodolfo, a geologist and professor emeritus at University of Illinois at Chicago, counterposes that “the very well-funded global nuclear lobby is fond of claiming that nuclear power generates no carbon dioxide [CO<sub>2</sub>] to add to global warming. But much fossil fuel is spent to mine, mill and process Uranium before it reaches a reactor. Every watt of electricity generated by a nuclear plant thus indirectly makes about 30 percent as much CO<sub>2</sub> as a watt generated by burning fossil fuel.”<sup>83</sup>

Two other related points need to be raised here. The first is that while greenhouse gas emissions of nuclear power plants are low, the plants rely on fuel that must be extracted from the earth—in short, a *non*-renewable resource of which the Philippines has no indigenous supply. And this fuel must be buried somewhere safe (not that any operator of any nuclear plant in the world has found such a place).

The second point comes from the International Panel on Climate Change (IPCC). As quoted in the *World Nuclear Industry Status Report 2014*,<sup>84</sup> the IPCC finds that nuclear energy is not contributing to the lowering of CO<sub>2</sub> emissions even though it is “a mature low-GHG [greenhouse gas] emission source of baseload power.”<sup>85</sup> The IPCC notes that barriers and risks are preventing nuclear energy from contributing to the urgently needed rapid reduction in emissions coming from fossil-fueled energy plants. It names these risks and barriers as follows:

- Operational risks and associated concerns;
- Uranium mining risks;
- Financial and regulatory risks;
- Unresolved waste management issues;

<http://rverzola.wordpress.com/2009/03/08/cojuangcoperistsinlienonuclearplantdeathoutsidchernobyl/>

<sup>80</sup> Mark O. Cojuangco, “The imperative of nuke power,” *Philippine Daily Inquirer*, March 8, 2009, <http://opinion.inquirer.net/inquireropinion/talkofthetown/view/20090308-192919/The-imperative-of-nuke-power>.

<sup>81</sup> Cojuangco, “The imperative of nuke power.”

<sup>82</sup> *Ibid.*

<sup>83</sup> Rodolfo, *On the Safety of the Bataan Nuclear Power Plant*.

<sup>84</sup> Mycle Schneider and Antony Froggatt et al., *World Nuclear Industry Status Report 2014* (Paris, London, Washington, DC: n.p., July 2014), 73, <http://www.worldnuclearreport.org/IMG/pdf/201408msc-worldnuclearreport2014-hrv4.pdf>.

<sup>85</sup> Schneider and Froggatt et al., *World Nuclear Industry Status Report 2014*.

- Nuclear weapons proliferation concerns; and
- Adverse public opinion.<sup>86</sup>

### The BNPP is safe

Representatives Cojuangco take great pains to point out that the Fukushima Daiichi nuclear complex involves boiler water reactors, while the BNPP's unit is a pressurized water reactor. This difference, they explain, is what makes the BNPP safer than Fukushima. The same claim was told by NPC engineers to a group of activists and anti-nuclear advocates when they visited the BNPP in January 2012.<sup>87</sup>

Most of the operational nuclear power plants in the US are pressurized water reactors, and more than half of them were built by Westinghouse. According to the Nuclear Information and Resource Service (NIRS), the problem with nuclear plants, like any other industry, is that over time, their parts and equipment suffer from wear and tear. However, unlike other industries, adds the NIRS "the failure of safety related components at nuclear power plants can result in a catastrophic accident on a scale or larger than the radiological accident at Chernobyl. The industry is now plagued with age-related deterioration mechanisms unique to nuclear power operations. Chronic exposure to extreme radiation, heat, pressure, fatigue and corrosive chemistry are combining to cause embrittlement of metal, cracking and erosion of components integral to the protection of the public's health and safety. As nuclear reactors get older, the chance of this equipment failing only increases."<sup>88</sup>

In 2003 a leak was found at the bottom of a pressurized water reactor in South Texas in the

US.<sup>89</sup> The cause of the leak is boron, an acid that is used to soak excess neutrons and thereby cool the water in the reactor. What makes this discovery unusual is the location of the leak. Usually, these are found on the lids of reactor vessels throughout the world. But what is also different is that the discovered leak was found in a relatively young nuclear plant (15 years old) that was operating at relatively low temperatures. Because this discovery was not consistent with the equations and benchmarks set by the Nuclear Regulatory Commission of the US, this leak caught the attention of the entire industry.

The BNPP has never been used; there is hardly any wear and tear to speak of. But it was built more than 30 years ago and sits by the sea where the air is highly corrosive. Therefore it could also be exposed to similar risks as the aging US pressurized water reactors. Add to this, the fact conveniently overlooked by the pro-BNPP advocates that the BNPP was known to have been completed without all the required clearances.<sup>90</sup> Furthermore it was found to have over 4,000 construction defects that would render it unsafe to operate the plant, or very costly—running to the hundreds of millions of dollars—to correct.<sup>91</sup> As the IAEA Mission found in 2008, there is a "high uncertainty of functionality" of the plant because it was poorly preserved (due to budget limitations) and because it was mothballed and left idle for nearly 30 years. Furthermore, the IAEA mission also saw the need to verify the data regarding the BNPP's condition.<sup>92</sup>

### The BNPP faces no geological risks or hazards

A commonly heard argument from pro-BNPP technocrats, politicians, geologists, physicists and engineers is that when Mt. Pinatubo erupted in 1990, "nothing happened" to the plant.<sup>93</sup> Presumably this conclusion was reached

<sup>86</sup> Ibid.

<sup>87</sup> Authors Diokno and Ong were with a delegation organized by the Active Citizenship Foundation that visited the BNPP on 31 January 2012, and heard the NPC engineer make such a claim to the delegation. See also [http://www.asienhaus.de/public/archiv/Nuclear\\_Tourism\\_May31-longer.pdf](http://www.asienhaus.de/public/archiv/Nuclear_Tourism_May31-longer.pdf) and [http://www.nytimes.com/2012/02/14/world/asia/bataan-nuclear-plant-never-opened-now-a-tourism-site.html?pagewanted=all&\\_r=0](http://www.nytimes.com/2012/02/14/world/asia/bataan-nuclear-plant-never-opened-now-a-tourism-site.html?pagewanted=all&_r=0).

<sup>88</sup> Paul Gunter, "Safety Problems with Pressurized Water Reactors in the United States," Nuclear Information and Resource Service, March 1996, <http://www.nirs.org/factsheets/pwrfact.htm>.

<sup>89</sup> Matthew L. Wald, "Extraordinary Reactor Leak Gets the Industry's Attention," *New York Times*, May 1, 2003, <http://www.nytimes.com/2003/05/01/us/extraordinaryreactorleakgetstheindustrysattention.html?pagewanted=print>.

<sup>90</sup> Wald, "Extraordinary Reactor Leak Gets the Industry's Attention."

<sup>91</sup> Rodolfo, *On the Safety of the Bataan Nuclear Power Plant*. See also ABS-CBN News Research, "Timeline: Nuclear Power in the Philippines." See also *Business World*, February 2, 2010.

<sup>92</sup> Delgado, "The Safety of the Bataan Nuclear Power Plant."

<sup>93</sup> Ibid.

after a thorough post-Pinatubo inspection. Presumably, too, a nuclear power plant requires stringent standards for its structure, parts and bolts such that more than a mere ocular inspection would suffice after an eruption as strong as Pinatubo's. And such inspection must be meticulously documented.

Thirdly, a group of geologists<sup>95</sup> has initiated an assessment of the BNPP site following the IAEA guidelines and methodology. (See process flow in the diagram above.)

The geologists have scientific evidence to show the presence of lahar, pyroclastic flows, and lava flows and domes, among others. The table below summarizes their findings.

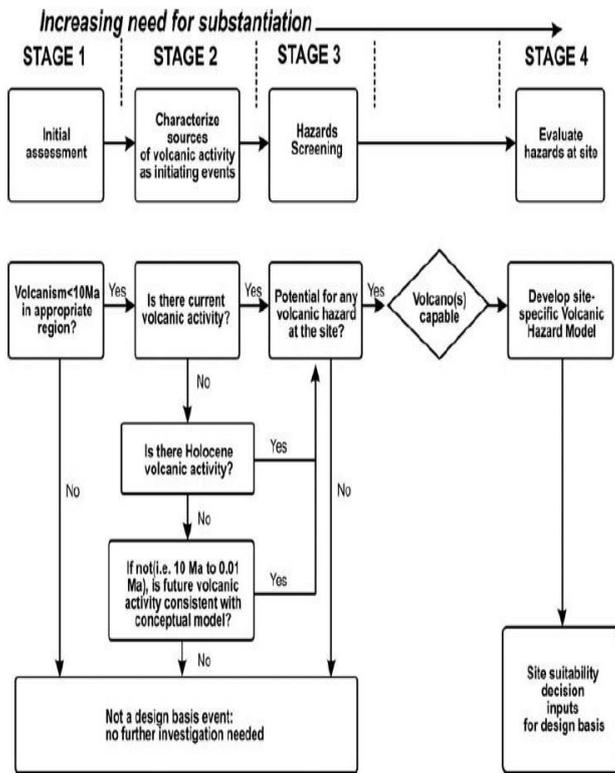


Fig. 14. Methodological approach in determining site suitability of a nuclear power plant site (IAEA 2009). This approach was followed in this study.

Source: AMF Lagmay et al., "Geological Hazards of SW Natib Volcano, site of the Bataan Nuclear Power Plant, Philippines," Geological Society, London, Special Publications, Vol. 361 (2012): 164, doi: 10.1144/SP361.13.

Even if we were to accept the conclusion that "nothing happened" to the BNPP when Pinatubo exploded, we also need to acknowledge three things. For one, while there were no IAEA guidelines in the 1970s for assessing volcanic and seismic risks, the guidelines exist today, having been established in the early 2000s.<sup>94</sup> Two, the guidelines of the IAEA must be closely used by the government in assessing whether the BNPP would be acceptable as a site for a nuclear power plant.

<sup>94</sup> International Atomic Energy Agency, *Volcanic Hazards in Site Evaluation for Nuclear Installations: Specific Safety Guide No. SSG-21*, (Vienna: IAEA, October 31, 2012), [http://www-pub.iaea.org/MTCD/publications/PDF/Pub1552\\_web.pdf](http://www-pub.iaea.org/MTCD/publications/PDF/Pub1552_web.pdf).

Table 1. Volcanic phenomena and associated characteristics that could affect nuclear installations, with implications for site selection and evaluation, and design (IAEA 2009)

Phenomena	Potentially adverse characteristics for nuclear installations	Site selection	Design/operation
Tephra fall	Static physical loads, abrasive and corrosive particles in air and water	No	Yes
Pyroclastic density currents: Pyroclastic flows, surges and blasts	Dynamic physical loads, atmospheric overpressures, projectile impacts, temperatures >300 °C, abrasive particles, toxic gases	Yes	No
Lava flows and lava domes	Dynamic physical loads, water impoundments and floods, temperatures >700 °C	Yes	No
Debris avalanches, landslides and slope failures	Dynamic physical loads, atmospheric overpressures, projectile impacts, water impoundments and floods	Yes	No
Debris flows and lahars, floods	Dynamic physical loads, water impoundments and floods, suspended particulates in water	Yes	Yes
Opening of new vents	Dynamic physical loads, ground deformation, volcanic earthquakes	Yes	No
Ballistic projectiles	Projectile impacts, static physical loads, abrasive particles in water	No	Yes
Volcanic gases and aerosols	Toxic and corrosive gases, water contamination, gas-charged lakes	No	Yes
Tsunamis, seiches, crater lake failure, glacial burst	Water inundation	Yes	Yes
Atmospheric phenomena	Dynamic overpressures, lightning strikes, downburst winds	No	Yes
Ground deformation	Ground displacements >1 m, landslides	Yes	No
Volcanic earthquakes and seismic events	Continuous tremor, multiple shocks usually <M 5	No	Yes
Hydrothermal systems and groundwater anomalies	Thermal water >50 °C, corrosive water, water contamination, water inundation or upwelling, alteration, landslides	Yes	No

Source: AMF Lagmay et al., "Geological Hazards of SW Natib Volcano, site of the Bataan Nuclear Power Plant, Philippines," in *Geological Society, London, Special Publications 2012*, Vol. 361, Table 1, p. 166; doi: 10.1144/SP361.13

The presence of lahar flows, evidence of water inundation, earthquake, ground deformation, landslides and the like, imply that additional measures must be taken to protect the BNPP plant and structures. These entail more costs.

But the presence of pyroclastic and lava flows point to only one conclusion: The BNPP site

<sup>95</sup> AMF Lagmay et al., "Geological Hazards of SW Natib Volcano, site of the Bataan Nuclear Power Plant, Philippines," Geological Society, London, Special Publications, Vol. 361 (2012): 164, doi: 10.1144/SP361.13.

*cannot* be used for a nuclear power plant, if we are to abide by IAEA standards and guidelines.

### Nuclear power is cheap

Like most proponents of nuclear technology, Representatives Mark and Kimi Cojuangco rely mainly on the conventional way of determining the cost of running a nuclear plant. That is, count only a narrow range of costs and pass on the heavier costs of decommissioning, radioactive waste disposal, and environmental and geological impacts to the government and consumers. This explains why, in a policy environment wherein privatization is king, the pro-BNPP advocates insist on government involvement in the revival and rehabilitation of the BNPP.<sup>96</sup>

In fact, no nuclear power plant in the world has been built as a private endeavor. To this day, no private bank will fund nuclear power, and no private company will insure it.<sup>97</sup>

Besides, as Greenpeace has found with nuclear power plant construction in countries such as the United States, Finland and India, actual costs far exceed their projected or planned costs. A figure of 300 percent<sup>98</sup> is commonly cited globally for cost overruns in nuclear power plant construction.

UP Professor Filemon Berba, on the other hand, explains that “cheaper power cost” from nuclear “might not be as cheap when we consider cost provisions that must be made for very strict safety regulatory requirements, for accident preparedness, for nuclear waste disposal, and ultimate cost of decommissioning when the time comes.”<sup>99</sup> These, he said, are

not direct operating costs—but have to be built into the power costing.

Berba added that while the cost of BNPP has been paid for and that the government will not pay for the billions of pesos needed to refurbish the mothballed plant, **“ultimately the consumers will have to pay for the power charge which may not be as cheap as initially estimated.”**<sup>100</sup>

To quote a German think tank, *Deutsches Institut für Wirtschaftsforschung* (DIW), in a recent report: “When discussing nuclear energy, often the risks during operation and the costs for research and development, as well as deconstruction and atomic waste disposal are neglected. Adding all factors up, it is clear that nuclear energy has *never been profitable.*”<sup>101</sup> The DIW explains further: “Constructing a nuclear power plant may be a profitable investment in a micro-economic context, when the State and consumers bear a large share of the macroeconomic costs. Operating a nuclear power plant may be profitable, if the State carried the non-priced safety risks and is responsible for deconstruction, final disposal, as well as research and infrastructure investments. A meaningful evaluation of nuclear energy can therefore only mean looking at the macroeconomic perspective.”<sup>102</sup>

The DIW insists that the claim of nuclear energy being cheap has no empirical basis.<sup>103</sup> A similar observation was made by a US energy specialist, Charles Komanoff, as early as 1986. Komanoff cited data showing that the cost of building a nuclear plant in the mid-1980s was, in real terms, six times more expensive than similar plants built in the seventies: from \$200 million to build a thousand MW reactor to \$3 billion.<sup>104</sup>

<sup>96</sup> Lean Santos, “Gov’t urged to act on \$1-B Bataan nuclear plant rehab,” *Rappler*, June 2, 2013, [http://www.rappler.com/business/industries/173-power-and-energy/30166-  
napocor-govt-bnpp-rehab-plan](http://www.rappler.com/business/industries/173-power-and-energy/30166-napocor-govt-bnpp-rehab-plan).

<sup>97</sup> Juergen Baetz, “As Fukushima bill looms, nations weigh dilemma: nuclear plants viable only when uninsured,” *The Associated Press*, April 21, 2011. [http://www.globalnews.ca/Nuclear+plants+viable+only+when+uninsured/4653983/  
story.html](http://www.globalnews.ca/Nuclear+plants+viable+only+when+uninsured/4653983/story.html).

<sup>98</sup> Jerry Taylor and Peter van Doren, “Nuclear Power in the Dock,” *Forbes*, May 4, 2011, [http://www.forbes.com/2011/04/04/nuclear-energy-economy-opinions-jerry-taylor-  
peter-van-doren.html?feed=rss\\_home](http://www.forbes.com/2011/04/04/nuclear-energy-economy-opinions-jerry-taylor-peter-van-doren.html?feed=rss_home).

<sup>99</sup> Filemon T. Berba Jr., “Looming Power Crisis (The BNPP Option?),” College of Engineering, University of the Philippines Diliman, October 29, 2013, <http://coe.upd.edu.ph/2013/10/29/looming-power-crisis-the-bnpp-option/>.

<sup>100</sup> Berba, “Looming Power Crisis.”

<sup>101</sup> Andreas Schröder, Friedrich Kunz, Jan Meiss, Roman Mendelevitch and Christian von Hirschhausen, *Current and Prospective Costs of Electricity Generation Until 2050* (Berlin: Deutsches Institut für Wirtschaftsforschung, 2013), [http://www.diw.de/documents/publikationen/73/diw\\_01.c.424566.de/diw\\_datadoc\\_2013-068.pdf](http://www.diw.de/documents/publikationen/73/diw_01.c.424566.de/diw_datadoc_2013-068.pdf); Emphasis ours.

<sup>102</sup> Andreas Schröder, *Current and Prospective Costs*.

<sup>103</sup> *Ibid.*

<sup>104</sup> Charles Komanoff, “Unmasking the Myth Brokers: The Real Cost of Nuclear Power,” *Multinational Monitor*, May 1986, Vol. 7–9, <http://www.multinationalmonitor.org/hyper/issues/1986/05/komanoff.html>.

A new nuclear plant currently in its development stage is a joint venture between Toshiba and GDF Suez. This is a 3,400-MW, triple reactor plant called “Moorside” to be located in northwest England. The estimated cost of building the plant is 17 billion US dollars—that is \$5 million per megawatt (excluding project overruns). To enable Toshiba and GDF Suez to obtain financing for this project, the UK has agreed to guarantee it.<sup>105</sup>

Komanoff quotes a Harvard business professor, LC Bupp, who in 1978 wrote: “Systematic confusion of expectation with fact, of hope with reality, has been the most characteristic feature of the entire 30-year effort to develop nuclear power. . . . The distinction between empirically supported fact and expectation was blurred from the beginning in the discussion of nuclear power economics. . . . What was missing . . . was independent analysis of actual cost experience.”<sup>106</sup>

The table below is a comparison, prepared by the DIW, of the levelized cost (2010) of electricity in the EU by type of power generating unit. As the chart shows, at 4,000 and 8,000 full load hours per year, the most expensive electricity is nuclear power.<sup>107</sup>

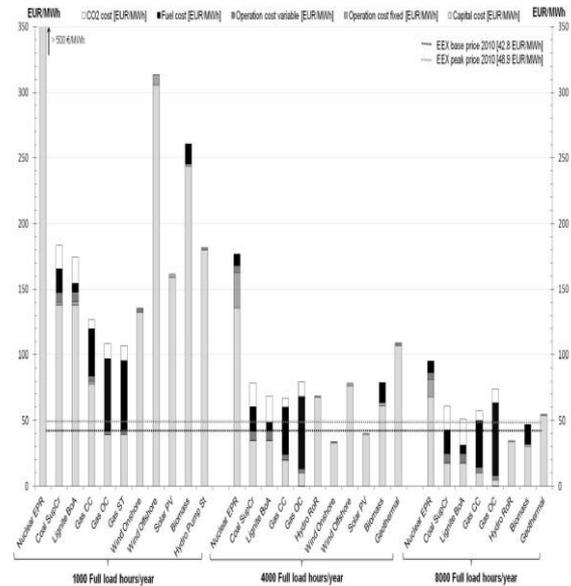


Figure 10: Levelized cost of electricity in dependence of full load hours at 2010 cost.

Source: Andreas Schröder, Friedrich Kunz, Jan Meiss, Roman Mendelevitch and Christian von Hirschhausen, *Current and Prospective Costs of Electricity Generation Until 2050* (Berlin: Deutsches Institut für Wirtschaftsforschung, 2013), 80, [http://www.diw.de/documents/publikationen/73/diw\\_01.c.424566.de/diw\\_datadoc\\_2013-068.pdf](http://www.diw.de/documents/publikationen/73/diw_01.c.424566.de/diw_datadoc_2013-068.pdf).

And what about the “unmentionable” costs associated with nuclear plants—the cost of a nuclear accident. Professors of environment policy at Osaka City University estimate the Fukushima tragedy to cost 11.08 trillion yen (\$105 billion),<sup>108</sup> twice as much as Japanese authorities predicted at the end of 2011. The expenses include radiation clean up and compensation to residents.

Globally, the costs of recorded nuclear disasters, non-utilization of equipment, failed repository projects and uranium mining operations were estimated to reach \$1,018 trillion.<sup>109</sup> Another study which listed some 69 nuclear accidents worldwide estimated the cost of such accidents to at least \$471 billion.<sup>110</sup>

<sup>105</sup> <http://www.powertechnology.com/projects/moorsidenuclearpowerprojectcumbria/>  
<sup>106</sup> Komanoff, “Unmasking the Myth Brokers.”  
<sup>107</sup> Andreas Schröder, *Current and Prospective Costs*.

<sup>108</sup> “Fukushima disaster bill more than \$105bn, double earlier estimate – study,” *RT*, August 27, 2014, <http://on.rt.com/hepemf>.  
<sup>109</sup> Jurgen Doschner, *Damages caused by Nuclear power: The Trillion-Dollar disaster*, WDR, March 11, 2014.  
<sup>110</sup> Tagesschau.de, March 11, 2014

## The cost of safety and reliability

Japan decided to stay nuclear even after the Fukushima tragedy. This is because for the moment it faces limited capacity for other sources outside of nuclear. For instance during the shutdown of all its nuclear facilities after Fukushima, Japan has to import 84 percent of its energy requirements, particularly gas and coal.<sup>111</sup>

But in deciding to restart its nuclear power, Japan has put massive premium on safety and reliability concerns that cost billions if not trillions of dollars. Prior to Fukushima, Japan has already invested billions of dollars to buyout or partner with local companies from very few uranium-producing countries to secure its supply. And after Fukushima, Japanese companies, particularly Mitsui and Mitsubishi, have invested billions of dollars in Australia for LNG production.<sup>112</sup>

The Philippines neither has that kind of vision nor resources to advance and protect its interest in the supply side of its energy program.

Moreover, a major step that Japan made in post-Fukushima energy policy was to internalize in its costs the potential compensation resulting from a nuclear disaster—up to ¥10 trillion (\$130 billion) for loss or damage from a nuclear accident. This translates to ¥0.5 per kWh. But the report said the amount of ¥0.5 per kWh for future nuclear risks is a low estimate: the cost would increase by ¥0.1 per kWh for each additional ¥1 trillion (\$13 billion) of damage.<sup>113</sup>

Japan's total estimated cost of ¥8.9 per kWh (PhP3.52/kWh) for nuclear power, which includes post-Fukushima measures, was calculated based on a model nuclear power plant using average figures since 2004 from four plants with an output of 1,200 MWe and construction costs of ¥420 billion (\$5.4

billion).<sup>114</sup> This price, the Japanese government contends, is still lower than the ¥9.5 per kWh for coal, ¥10.7 per kWh for liquid natural gas (LNG), and ¥36 per kWh for oil.<sup>115</sup>

But in addition, in terms of fuel recycling and waste disposal, Japan has poured in more money to develop high-end processing plants and safer disposal systems for both low- and high-level wastes. In 2004 Japan estimated the costs of reprocessing spent fuel, recycling its fissile material and management of all wastes over 80 years from 2005, *excluding decommissioning of power reactors*, to amount to some ¥19 trillion.<sup>116</sup> This is equivalent to US\$167.39 billion (or PhP 7.5 trillion) at current rates.

Again, this is just for recycling and waste disposal in the high-tech world of Japan. The Rokkasho-mura reprocessing and storage plant, for example, was built for ¥2.4 trillion (US\$20 billion) in 2004. A J-MOX plant built adjacent to it costs about a tenth of this—¥210 billion (US\$ 2.05 billion).<sup>117</sup>

In the US, a charge of ten cents per kWh (PhP 4.40/kWh) is being collected from consumers and lodged in the Nuclear Waste Fund.<sup>118</sup> France's EDF, which also manages nuclear plants in the UK, sets aside €0.14 cents per kWh (PhP7.84/kWh) for waste management costs.<sup>119</sup> In Finland, 10 percent of its electricity production cost goes to a State Nuclear Waste Management Fund, which at the end of 2012 stood at €2.16 billion or PhP121.59 billion.<sup>120</sup>

Other nuclear-powered countries have adopted similar levy-type schemes for funding waste management and disposal (internalized), or by direct government subsidy (external). In 2013, the Atomic Energy of Canada Limited advised

<sup>114</sup> Ibid.

<sup>115</sup> Ibid.

<sup>116</sup> Ibid.

<sup>117</sup> Ibid.

<sup>118</sup> "National Funding: Radioactive Waste Management - Appendix 4," World Nuclear Association (Accessed Month Day Year), <http://www.world-nuclear.org/info/Nuclear-Fuel-Cycle/Nuclear-Wastes/Appendices/Radioactive-Waste-Management-Appendix-4--National-Funding/>.

<sup>119</sup> "Nuclear Power in France," World Nuclear Association, Updated November 25, 2014, <http://www.world-nuclear.org/info/Country-Profiles/Countries-A-F/France/>.

<sup>120</sup> "Nuclear Power in Finland," World Nuclear Association, Updated December 2014, <http://www.world-nuclear.org/info/Country-Profiles/Countries-A-F/Finland/>.

<sup>111</sup> "Nuclear Power in Japan," Nuclear Works Association, Updated September 30, 2014, <http://www.world-nuclear.org/info/Country-Profiles/Countries-G-N/Japan/>.

<sup>112</sup> "Nuclear Power in Japan."

<sup>113</sup> Ibid.

the government that its liability costs for cleaning up its nuclear program would increase by \$2.4 billion from \$3.6 billion in March 2013.<sup>121</sup> The increase in the indirect costs of power is attributed to the decommissioning and waste management over the period of up to 70 years of the program. The cost is passed on directly to the federal government.

These respective amounts may seem “negligible” as far as the First World is concerned and since the per capita levy is spread over a 40- to 60-year period. But in the Philippines, building and managing this kind of nuclear program would surely require a big amount of money that the Cojuangcos would certainly not agree to shoulder. Instead, as in the past, this would be imposed upon the people. Again, as in the past, much needed social and anti-poverty spending would suffer.

There are also other forms of incentives like production tax credits and loan guarantees. External funding to these items amounts to billions of dollars. The Union of Concerned Scientists in the US said the amount of subsidies that can be availed by a generating company for a new reactor could reach US\$5 billion.<sup>122</sup>

Now the hard question: Is the Philippines, whose government can only approve a master plan for a rehabilitation program a year after a devastating tragedy (Typhoon Haiyan), ready to go nuclear? Is the government, which cannot even effectively address the problems of floods and traffic, willing to take and bear the risks of a nuclear holocaust?

But the more basic question is: With a country like ours so rich in renewable energy resources, why go nuclear?

## Renewables as best argument

We mentioned above that in shooting down a bad idea, a better idea should take its place.

This simple displacement theory, both in science and crime prevention, may not exactly do the work but may offer the best argument against the revival of the BNPP. Why take the BNPP risks and put new money into it when policymakers can actually change the game and plan a quick and better transition?

Other proposals to convert the BNPP into LNG or coal-fired power may save the plant from oblivion or redirect it back to its original purpose. Meanwhile the Bishop of Bataan and Greenpeace want it converted into a tourist spot,<sup>123</sup> while other groups wanted to see it as a museum and recreational park. Except for the proposal to convert the BNPP to coal or gas, these proposals do not run contrary to our position.

The shift to renewables displaces both the nuclear option and the carbon footprint produced by fossil-fueled power plants. Moreover, this is not only an affirmative action towards climate change but also a prudent move to build a system out of our vast natural and renewable energy advantage.

Compared to other countries, the Philippines is blessed with vast natural, renewable resources to address its present and future energy needs. Here, it is instructive to quote from a paper written for the FDC:<sup>124</sup>

“It’s more fun calculating the vast RE potential in the Philippines. Based on the DOE estimates, the country’s RE potential amounts to at least 250,000 MW<sup>125</sup>, with 1,200 MW coming from geothermal;

<sup>121</sup> Andy Johnson, “Nuclear waste cleanup liability cost up by \$2.4B, Ottawa told,” CTV News, Updated March 20, 2013, <http://www.ctvnews.ca/canada/nuclear-waste-cleanup-liability-cost-up-by-2-4b-ottawa-told-1.1203000>.

<sup>122</sup> “Billions of Dollars in Subsidies for the Nuclear Power Industry Will Shift Financial Risks to Taxpayers,” Nuclear-Free Planet, (Accessed Month Day Year), <http://nuclearfreeplanet.org/billions-of-dollars-in-subsidies-for-the-nuclear-power-industry-will-shift-financial-risks-to-taxpayers.html>.

<sup>123</sup> Joel Locsin, “Bishop: Turn Bataan Nuclear Power Plant into tourist spot instead,” *GMA News Online*, October 19, 2014, <http://www.gmanetwork.com/news/story/384240/economy/business/bishop-turn-bataan-nuclear-power-plant-into-tourist-spot-instead>.

<sup>124</sup> Wilson Fortaleza, *Power Shift: Building the Movement for Sustainable Energy and Democracy*, 2012

<sup>125</sup> DoE estimate on RE potential.

10,500 MW hydro; 76,000 MW wind; 235.7 MW biomass; 170,000 MW ocean current; and of course the vast potential of untapped solar power.

The country's current total installed capacity is only about 16,000 MW, with average peak demand reaching not more than 8,000 MW<sup>126</sup>. Our RE potential therefore is more than enough to power the country's march into a sustainable energy future. And even assuming that only 15 percent (37,500 MW) of that total RE potential is immediately harvestable, still the country is assured of enough supply until 2030, when total peak demand is estimated to reach 24,533 MW.<sup>127</sup>

One must be very happy to see these exciting numbers. Based on government projection, RE-based capacity will reach 9,147 MW by 2013 or a 100-percent increase from its current level of 4,449 MW.<sup>128</sup> This is remarkable, yet not enough given the vast potential that we have. If there is a plan to develop sustainable energy and provide 'Energy Access for More,' what prevents us from harnessing all these potentials?"

Going back to the impending 2015 power supply deficit, it appears that the Philippines can avoid this if it tapped even a sliver of the country's RE potential. In a new study, Roberto Verzola, an engineer and a leading green activist, tried to calculate our solar potential. He postulated that by utilizing a mere fraction (one percent) of its full potential, the country can

quickly cross over to a 100 percent renewable energy regime.<sup>129</sup>

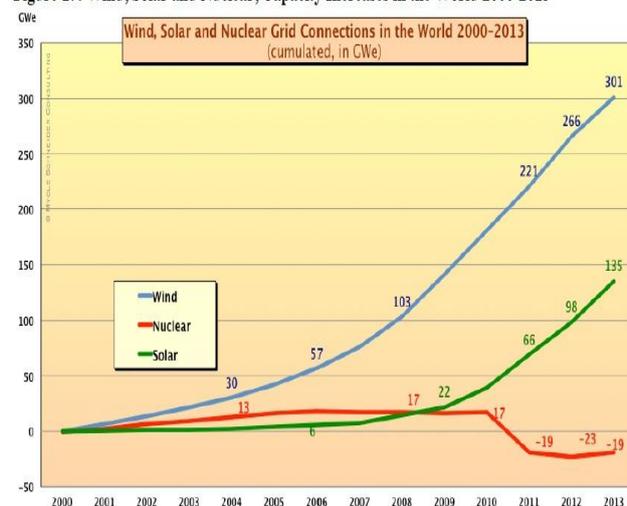
And that is from solar alone. Our geothermal, hydro, wind, ocean and biomass potentials are readily available to power this nation.

The passage of the Renewable Energy Act of 2008 and the introduction of new incentives such as the feed-in-tariff (FIT) should have created a good environment for investment in RE development. Yet development is so slow. Perhaps the new environment can neither grow under the highly possessive nature of private monopoly nor under a government that is at best passive when it comes to letting big business interests in the power sector rule over small consumers.

### Renewable versus Nuclear

Data from the World Nuclear Industry Status Report (WNIRS) 2014<sup>130</sup> very clearly point to the demise of the nuclear age as renewable energy ushers in a transformation of the energy sector in the countries where RE is becoming significant. This section extensively quotes this report.

Figure 17: Wind, Solar and Nuclear, Capacity Increases in the World 2000-2013



Source: IAEA-PRIS, EPIA, GWEC 2014

Source: Mycle Schneider and Antony Froggatt et al., World Nuclear Industry Status Report 2014 (Paris, London, Washington, DC: n.p., July 2014), 76, <http://www.worldnuclearreport.org/IMG/pdf/201408msc-worldnuclearreport2014-hr-v4.pdf>.

<sup>126</sup> <http://www.doe.gov.ph/EP/Powersituationer.htm>.

<sup>127</sup> Power Development Plan, 2009-2030, DoE.

<sup>128</sup> <http://www.doe.gov.ph/ER/Renenergy.htm>

<sup>129</sup> Roberto Verzola, *Crossing Over*, November 2014 (book has yet to be published).

<sup>130</sup> Schneider and Froggatt et al., *World Nuclear Industry Status Report 2014*.

The above graph shows that between 2000 and 2013, installed renewable energy capacities grew by 25 percent per year for wind, and 43 percent per year for solar photovoltaic installations. In contrast, nuclear energy capacities slightly declined by 0.4 percent over the same period.<sup>131</sup>

The same report says that as of July 2014, the number of nuclear plants in operation is down to 388, below the comparable figure of 427 units in July 2013. Net capacity of the operating plants is also lower in mid-2014: 333 GW, from 364 GW the year before.

As of July 2014, there are 45 nuclear plants that are in long-term outage. By this is meant that these plants did not generate electricity in the entire previous calendar year and in the six months of the current year. Furthermore, as of July 2014, 153 nuclear plants have been shut down.<sup>132</sup>

Not only are nuclear plant capacities falling, the operating plants are also aging. The average age in 2014 is 28.5 years. In fact only 70 of the 388 nuclear plants in operation in mid-2014 are 20 years old or younger.<sup>133</sup>

In contrast, wind power and solar photovoltaics are increasingly demonstrating that regardless of the variable nature of their output (depending on weather conditions) they are becoming significant across the globe. According to the WNIRS 2014, between 1997 and 2013, the annual increase in electricity generation of wind power, solar photovoltaics and nuclear are as follows:

- Wind: 616 terawatt-hours (TWh; one TWh equals a billion kilowatt-hours)
- Solar photovoltaic: 124 TWh
- Nuclear: 114 TWh<sup>134</sup>

In the US, China, Denmark, Spain and India, significant milestones are being registered by renewable energy in recent years.

An important development, seen in the German electricity spot market, is emerging as a result of the significant contribution of the renewable energy sector in meeting electricity demand. As keenly observed by the WNIRS 2014:

“In many countries, renewables enjoy priority access to the grid by regulation. However, even without such rules, variable renewable energies generally have priority simply for economic reasons: with operating costs close to zero, they win nearly all spot market auctions.”<sup>135</sup>

The rise of renewable energy in Germany is being felt in the German power market. The number of hours with negative prices rose to 64 in 2013 from 15 a year before. The number of hours in which electricity rates were less than €15 per MWh<sup>136</sup> likewise grew from 161 to 727. “While there are many factors influencing power prices, there is broad agreement that the growth of variable renewable was the main driver for the increasing frequency of very low prices in the German power market.”<sup>137</sup>

This development is posing a problem for nuclear plants in Germany. Even when the market price falls to below zero, the fleet of German nuclear power plants continues operating at “very close to its maximum available capacity.” In other words, the German nuclear plants are being forced to choose between very low revenues versus very costly—and closely regulated—stops and restarts in response to market price drops.

The authors of the WNIRS 2014 conclude:

“Some key features of power systems with high shares of renewable become evident. The conventional power plants

<sup>131</sup> Ibid.

<sup>132</sup> Ibid. This report introduces the notion of long-term outage because the authors have observed that the IAEA has been including as operating Japanese nuclear plants that have not generated electricity for at least a year and a half.

<sup>133</sup> Ibid.

<sup>134</sup> Ibid, 76.

<sup>135</sup> Ibid, 82–83.

<sup>136</sup> At today's peso-euro exchange rate, this would be 75 centavos per kilowatt hour.

<sup>137</sup> Ibid, 91.

serving the net load must cope with very frequent and rapid production ramps, both upwards and downwards. Predictability decreases, as the forecast errors concerning wind and solar generation add up to those concerning demand. Therefore, the conventional power plants must be able to adjust their schedules at short term. The analysis above suggests that the global nuclear power fleet does not have these capabilities."<sup>138</sup>

### Demand-side management

Utilizing energy-efficient lighting, heating, cooling and other household machine technologies are other ways of reducing demand for grid-sourced generated power. Greenpeace has posted in its website an interesting 12 practical household tips on how to save electricity, and money.<sup>139</sup>

Building green infrastructures (offices, buildings, hotels, housing projects, street lights, parks, etc.) based on most efficient designs can save a lot of megawatt-hours of power. The government should have devised a comprehensive, aggressive and continuing program of incentives to encourage broad demand-side management responses from all stakeholders.

Then environment Secretary Heherson Alvarez Alvarez opined that if the nation were to shift to CFL bulbs for light, about 500 MW of electricity would be saved each year, which is nearly equal to the BNPP capacity—minus the problems of site dangers, expensive fuel, waste disposal and decommissioning.<sup>140</sup>

### Conclusion

The Chernobyl accident made it easy for former Senator Rene Saguisag to convince President Corazon Aquino to mothball the BNPP. That was in 1986. Renewable energy then was a celestial concept. Renewable technology then was a dewdrop in the scientific field.

Today the world is very much different—environmentally different, technologically different. Meanwhile, the nuclear option for power generation is increasingly becoming untenable globally, on financial, ecological and social grounds. Sooner or later, its old wonders may be reserved for very restricted and limited use.

The 2011 Fukushima tragedy has pushed many countries to re-examine their nuclear programs and policies. Tighter safety regulations have been put in place and costs on waste disposal and nuclear accident have been embedded in rates. As a result, nuclear energy is far from being the cheapest form of electricity. Re-commissioning the BNPP at the current conjuncture would be the most expensive and most foolish mistake for a country that has not stopped paying the price of this monumental folly.

President Aquino has cast doubts on the viability of running the BNPP as a solution to the power crisis owing to its old design and unresolved safety concerns.<sup>141</sup> Yet the President stopped short of blocking the BNPP option, including its conversion into a different type of plant.

This only means that the RE alternative has yet to seize the guarded place occupied by defenders of the unsafe and dirty energy systems. An explicit declaration by the State of a non-nuclear energy policy would put clarity on the future of nuclear power in the Philippines. More nails in the coffin would be

<sup>138</sup> *Ibid.*, 92.

<sup>139</sup> "Efficiency how to: 12 clever ways to save lots of electricity and money," Greenpeace Philippines, (Accessed Month Day Year), <http://www.greenpeace.org/seasia/ph/Archives/campaigns/climate-change/clean-energy/12-steps/>.

<sup>140</sup> Belinda Olivares-Cunanan, "Shift to CFLs, avert 2nd BNPP disaster," *Philippine Daily Inquirer*, February 12, 2009, <http://opinion.inquirer.net/inquireropinion/columns/view/20090212-188811/Shift-to-CFLs-avert-2nd-BNPP-disaster>.

<sup>141</sup> Delon Porcalla, "BNPP not an option to deal with 2015 power crisis," *The Philippine Star*, October 23, 2014, <http://www.philstar.com/headlines/2014/10/23/1383421/bnpp-not-option-deal-2015-power-crisis>.

provided by a vigorous and coherent transition to renewable energy.

As for the BNPP, it must be deeply buried if not entirely removed from our national psyche.