

---

*Zhuoxiang Yang*

## **A COST-BENEFIT ANALYSIS OF RESTARTING JAPAN'S NUCLEAR**

Zhuoxiang Yang: The University of Tokyo, Ph.D. Candidate, Graduate Program on Environmental Sciences, 208 KIBER, Komaba Campus, Meguro-ku, Tokyo, 153-8902, Japan  
Phone: +81-80-4674-3344, Fax: +81-3-5454-6014, e-mail: yangzhuoxiang@gmail.com

### **Overview**

Nuclear energy had been Japan's national strategic priority since 1973 and contributed to nearly a third of its electricity generation. However, after the earthquake and Fukushima Daiichi nuclear disaster on March 2011, all of the nuclear reactors have been gradually shut down for safety concerns. The shutdown not only raised CO<sub>2</sub> intensity of power generation, but also increased Japan's vulnerability in energy security.

### **Method**

This paper provides a cost-benefit analysis (CBA) for the issue of restarting the nuclear power plants in Japan. The analysis compares "With" and "Without" restarting the 42 nuclear power plants scenarios, and the net present value (NPV) and benefit-cost ratio (BCR) are calculated based on the discounted value of benefit and cost components for the time horizon of 19 years in the "With" scenario.

Main benefits under "With" scenario include increase in energy security and reduction in CO<sub>2</sub> emission. And main costs consist of upgrading and safety regulations compliance cost, operational and maintenance cost, decommissioning cost and risk of reactors' accident.

To deal with uncertainty, sensitivity analysis is carried out. A range of scenarios are considered as regards discount rate, social cost of carbon and risk of reactor's accident cost.

### **Results**

The result for the net present value of "With" scenario is positive 2.90.E+13 Yen and the benefit cost ratio is 3.72, which makes this alternative feasible to be executed.

---

And under sensitivity analysis, even with high social discount rate, low social cost of carbon and high risk of nuclear accidents, BCR is still as big as 1.90. Therefore, restarting nuclear is feasible under all scenarios because benefits outweigh costs a lot.

## **Conclusions**

Based on the NPV, BCR, and sensitivity analysis result, it is clear that with restarting nuclear in Japan, the benefits from increase in energy security and CO<sub>2</sub> reduction outweigh costs a lot. Therefore, the government should continue to implement the restarting of nuclear power plants. In the long term, the increase in energy security will lead to the fall back of electricity price and promote economy.

## **References**

- Boardman, A. E., Greenberg, D. H., Vining, A. R., & Weimer, D. L. (2010). "Cost-Benefit Analysis: Concepts and Practice". Upper Saddle River, New Jersey, USA: Prentice-Hall.
- Central Research Institute of Electric Power Industry (CRIEPI). (2012). "Impact of Supply Reliability and Blackout on Residential and Business Customers of Electric Power Companies in Japan".
- Kennedy, D. (2007). "New nuclear power generation in the UK: Cost benefit analysis". Department of Trade and Industry, Her Majesty's Government, London. Energy Policy 35: 3701-3716.
- Matsuo, Y., Yamaguchi, Y., & Murakami, T. (2013). "Historical Trends in Japan's Long Term Power Generation Cost by Source: Assessed by Using Corporate Financial Statements". IEEJ.
- METI. (2013). "FY 2013 Annual Report on Energy".
- World Health Organization (WHA) Report. (2013). "Health risk assessment from the nuclear accident after the 2011 Great East Japan Earthquake and Tsunami based on a preliminary dose estimation".
- World Nuclear Association Report. (2011). "Comparison of Lifecycle Greenhouse Gas Emissions of Various Electricity Generation Sources".