



Options for the Japanese electricity mix by 2050

Master of Science Thesis – Application to the Vattenfall Energy Award

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October 2012

Presentation of author and project supervisors

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Description of the report - Analysing short term and long term policy decisions on the Japanese electricity system

- ◆ **This thesis aims at analysing how Japan should be addressing both short and long-term policy decision-making for the country's future energy system, following the Fukushima disaster and raising concerns over safety of nuclear power.**
- ◆ **For the short term, the report analyses how the country dealt with the power crisis during summer 2011, following the Great East Japan Earthquake and the resulting Fukushima accident.**
 - The Japanese government undertook unsustainable emergency measures to offset the expected 20% capacity shortage in Tokyo and Tohoku areas
 - Capacity was recovered by restarting and restoring fossil-fuelled power generation, and importing power from neighboring areas;
 - Stringent demand restriction measures led to a summer peak demand 10 GW lower in the Tokyo area and 3.1 GW lower in the Tohoku area, compared to 2010.
- ◆ **For the long term, the report presents and analyses the results of a model I realized - an assessment of the economic and environmental impacts of various electricity mix options for Japan by 2050.**
 - Scenarios evaluated for nuclear power: (1) expansion, (2) upholding and (3) phase-out;
 - The results show that a nuclear phase-out would induce additional costs in the order of €850bn to the power system over the period 2010-50, compared to the nuclear expansion scenario, while also preventing Japan to reach its CO₂ emissions' reduction targets by 2050.

Supporting policy makers in their decision process with quantitative tools and data

- ◆ **Beyond the immeasurable human tragedy induced by the terrible Great East Japan Earthquake and tsunami, and the resulting Fukushima events, the impact on Japan's future energy development plan was considerable**
 - On the short term, the country is still threatened by power shortages and the safety on its existing nuclear facilities;
 - On the long term, the country has to decide on its future electricity mix, with the main question on whether to keep nuclear power in the mix or not – and if yes, what would be the acceptable level.

- ◆ **I believe that the thesis work that was carried out could provide a significant help to the decision making process in Japan on two levels**
 - By partly assessing the consequences of the disaster on the energy system, and evaluating the decisions that were made on the short term. It offers Japanese policy makers an opportunity to validate or not these choices, and assess their reliability and sustainability for the long term;
 - By evaluating the various options for the Japanese electricity mix by 2050 on economic and environmental aspects. The model is aimed at providing quantitative tools to Japanese policy makers in order to take a direction with long term consequences and answer an inevitable question: How much would cost a nuclear phase-out to the Japanese energy system?