Adequate Radioactive Waste Management Fund Fee[1]

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1. Introduction

Last year our government established a regulation for the Radioactive Waste Management ("RWM") Fund. This regulation had two principal items - establishment of the RWM Fund and organization of a public corporation. This regulation will promote transparency, fairness, and safety of the RWM Project.

There is strong interest between current generations and future descendants for the RWM Project. That is why the project will continue for a long period of time whereas, the public is currently benefiting from the nuclear electricity. Radioactive waste is a by-product that is inevitably produced as long as the nuclear power plant generates the electricity.

This article focuses on calculating a reasonable fee for the RWM Fund in order to minimize conflicts between generations and to fairly share the burden.

2. Details of other countries' RWM Funds

Most countries operating Nuclear Power Plants ("NPPs") have prepared a RWM Fund to raise money to invest in the RWM Project. The details of other countries' RWM Funds are given in the following table.

Table 1 : Details on other countries' RWM Funds

Country	*Manage-ment*	*Administ-rator*	*Methodolo-gy for calculation*	*Fund Fee (amount)*	*Others*
South Korea	*Gover-nment (Gov.)*	*public corpor-ation*	*LILW : unit cost SF : estimated recovery cost (p. v.)*	*LILW:4.55mil. won/200Ldrum SF : PWR;410 mil. won/bundle CANDU;5.8mil. won/bundle*	*Establish-ment in 2009*
USA	*Gov.*	*OCRWM*	*Fixed Fee (equalized escalation method)*	*0.1 cent/KWh*	*Establish-ment in 1982 disposal for HLW*
Sweden	*Gov.*	*SKB(IC) AB*	*Constant Real Fee (real value of money method)*	*0.014~0.016 SEK /KWh*	*Establish-ment in 1981 Disposal SF/Dec.*
Fin-land [1]	*Gov.*	*Posiva Oy Co.*	*unit cost*	*0.014 FIM/kWh*	*Establish-ment in 1988*
Japan	*Gov.*	*RWMC*		*0.13 yen/kWh (as of 2006) annually adjust*	*Establish-ment in 2006 HLW*

3. Methodology for calculation of RWM Fund Fee

According to the present law, the Fund Fee can be determined from the past method in which KHNP calculated an allowance for managing the RW after operation of NPPs. The Fund Fee for LILW management should be levied on the basis of unit cost – i.e., the cost for disposing LILW divided by LILW quantities. The Fund Fee for SF management should be charged according to the estimated recovery cost method of Business Accounting Standard #5.

However, these methods entail some problems stemming from charging fee transfers from the present generations who enjoy the benefits of electricity to the next generations who will be handling the RW.

The present paper therefore proposes another method using the electricity quantities, as applied in most other countries, including the US. In this method the purchase value of money is considered.

From this general rule, the basic equation is given as follows:

Fee=(RWM cost/(1+r))/(electricity quantities)/(1+N))

r ; real rate, N ; nominal rate

In the USA this formula is referred to FFM (Fixed Fee Method).

4. Estimated quantities of Fund components

4.1 Estimated quantities of electricity

This article supposes that 28 NPPs will be in operation by 2020 based on the decision of the 3rd basic plan for supply and demand of electricity (December 2006, the Ministry of Knowledge Economy). It is also supposed that the CANDU NPPs will be operated for 30 years, the PWR 1000 NPPs for 40 years, and the PWR 1400 plants for 60 years. On this assumption, the period of operating 28 NPPs will extend until 2077 and the total electricity quantity will be 7.41 mil. GWh.

1 The principal ideas/data have been presented in Seoul National University for completing the Advanced Management Program for Public Corporations (KEPCO) in 2008.

4.2 Estimated quantities of LILW

We hypothesize that the LILW quantities are 150 drums/NPP per year in the case of CANDU reactors and 210 drums/NPP per year for PWR. The LILW quantities produced from decommission are assumed to be 14,500 drums/NPP. On this hypothesis, we can estimate that LILW quantities produced by 2077 will reach 610,000 drums.

4.3 Estimated quantities of SF

The SF quantities of CANDU NPPs are expected to be 95 Ton.U/NPP. The SF quantities of PWR NPPs are variously estimated to be from 13 Ton.U/NPP to 26 Ton.U/NPP. CANDU NPPs will be operated until 2029, and on the above assumption the total quantities of CANDU will come to 12,000 Ton.U. PWR NPPs will be operated until 2077, and the total quantities of PWR will reach 21,000 Ton.U. From this estimation, the intermediated storage facilities of CANDU will be extended to 4 buildings and PWR will be enlarged to 11 buildings.

5. Adequate Fund Fee

5.1 Principal assumptions

For deriving a reasonable Fund Fee the following six principal assumptions are made:

① Full cost recovery principle: The accumulated funds should be spent only for RWM. The Fund must not exceed the RWM cost. This means that the final fund balance should always be 0(zero).

② The benefit principle; The cost used for RWM should be charged by beneficiaries receiving benefit from the production of electricity.

③ We should reinvest by the real rate(r) when the Fund exceeds the cost during the project period.

④ We should borrow money by the real rate(r) when the Fund falls short of RWM cost. When the Fund is restored to positive levels then the borrowed money should be paid back immediately.

⑤ Loans should be kept at minimal levels.

⑥ The annual fund balance should be kept as low as possible.

5.2 Estimated RWM cost

The first step of building LILW facilities started in the area of Kyeong-ju in 2008. They will be completed in December 2009. Therefore this cost is excluded from the present estimation. Judging from the estimated quantities of LILW, we concluded that a capacity of 800,000 drums is needed in this facility. From these conditions, we suggest that trillion won will be needed for LILW disposal cost until 2090.

The cost of SF disposal is more difficult to calculate. There is no country utilizing SF disposal facilities up to now. Therefore, we borrowed cost data derived by KOPEC, the leading engineering company in this field, through analyses conducted for the KHNP proposal in 2004. From this analysis it is estimated that trillion won will be needed disposing SF from 2040 to 2090.

5.3 Adequate Fund Fee

The additional article #5 of the RWM Law prescribes that KHNP should pay all expenses for disposing SF which already produced for the last 30 years. That cost should be scheduled to pay from 2014 to 2028. Therefore, in the present work, we apply this money as fund revenue.

From this data we calculated the adequate Fund Fee with FFM, as described below:

Fee (won/kWh) = PV(RWM cost) / PV(electricity)

subject to N(nominal rate)=4.36 %, **i**(inflation rate)=2.3 %, r(real rate)=2.0 %

6. Conclusions

To calculate the RWM Fee this article has used the FFM, which has been accepted as a general rule in the USA. However, numerous interested parties will inevitably debate this amount. As such, this estimation should be reviewed periodically.

In addition to this fee calculation a few proposals for controlling the newly RWM law smoothly are given below.

First, it is expected that the Fee amount will be readily accepted and anticipated. The current law is extremely complicated, to the extent that it is not widely understood. Hence, we will propose a method of expressing the explicit amount per kWh, as in the present work and the case of the USA.

Second, the point of time to charge the fee should be changed from the delivery point to a public corporation (LILW) and withdrawal point from the NPP (SF) to the point of producing electricity. The reason for this is that the beneficiaries must pay all expenses for this benefit.

Third, Fund Fee should be calculated in considering only future cash flow. The accrued cost is a sunk cost. Therefore that cost need not to be considered in making a decision.

Fourth, the RW Fund account must be converged. In the current law, the Fund account is divided into LILW and SF Fund accounts, which can lead to considerable confusion.

REFERENCES

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