

## **Economic Contributions of Radioisotope Production Reactor in Korea**

Ji-hee Nam\*, Seung-su Kim, Kee-Whan Moon  
*Korea Atomic Energy Research Institute*

*1045, Daedeok dae ro, Yu-seong gu, Dae-jeon city, The Republic of Korea, 305-353*

*\*Corresponding author: jhnam1@kaeri.re.kr*

### **1. Introduction**

Radioisotopes (RIs) have been used extensively in the fields of industrial, the agricultural, and the medical applications. Especially the deficiency of radioisotopes such as Mo-99 and I-131 in the medical applications recently is becoming the main issue in our society.

Radioisotope with the characteristics of public goods in some aspects is mainly playing as the intermediate inputs or goods in the process of the industrial production, with being expected to produce the economic benefits by creating the new demand in the market or enlarging the value added for the related goods and services.

In this study, the contribution effects for Korean economy by the construction and operation of the reactor for radioisotope production would be evaluated the effects produced by the activities such as a RI supplies into domestic industry, the RI exports, the neutron transmutation doping services called NTD, and the exports of RI production reactors.

### **2. Methodologies**

The economic effects from radioisotopes supplied directly into domestic industry can be evaluated by applying the multiplier ratio of outputs to inputs, which resultantly give rise to the increases in the domestic outputs and the value added. Inputs here mean the components or items put into for the industries' final goods production, while outputs do the final products of the related production process, with both of them being expressed usually in monetary amounts.

The multiplier of outputs to inputs of RI in the industries can be drawn by investigating the flows of RI usages in the industrial productions. Two kinds of multipliers are applied for the economic evaluations by the construction & operation of a RI production dedicated reactor in this study. One is for the manufacturing industry field and the other is for medical industry. For example a multiplier for the manufacture industry can be obtained by dividing the output increment in outputs due to the industrial deployments of RIs by the input amounts of RIs into the manufacture industry. A multiplier for medical industry can be calculated through the same process as the case of manufacture industry.

As for the export effects by the introduction of RI production reactor, there are three fields such as the

direct RIs' export, the NTD services to foreign customers in Korea, and the export of RI production reactors to foreign countries in the future. These kinds of three activities are assumed to result in the increase in domestic industries' outputs just as much as the amounts exported. Therefore the total effects over the whole evaluation period can be obtained by summing up each year's outputs or value added.

### **3. Results**

The basic assumptions for the analysis are as follows. In the first place we assumed that the main products from RI reactor operation would be the RIs such as Mo-99 & I-131 and the NTD services. In addition we are also expecting that the export of RI production reactors to the foreign countries would be possible by learning and establishing the technologies related to the plate type of RI production reactor's construction and its operation. The operation lifetime of RI production reactor is assumed to be 50 years. The base year of cost or technical data used is set up to be the year 2009.

Meanwhile, it is assumed that the contribution effects of RIs to the industries are being confined to happen only in the manufacture and medical industries.

The detailed results for the economic effects by RIs supply into industries and the overseas export of RI production reactor can be summarized as follows. Firstly the effects by RI supply into the industries, which include those by the direct export of RIs themselves and the economic effects by the role of intermediate input in the industrial production, amount to about 10.2 trillion won in outputs base and about 3.3 trillion won in value added when summing up the effects in the manufacture and medical industries, with the output multipliers being 18.11 and 4.53 in each industry.

As for the NTD services field, 0.68 trillion won in the output growth and 0.37 trillion in the value added are evaluated as the total effects

Lastly the export of RI production reactors is expected to increase the outputs by 27.3 trillion won and by 12.1 trillion won in value added.

The below table 1 is showing the summary of the outputs and value added effects to be induced from RI production reactor.

### **4. Conclusions**

The construction and operation of RI production reactor is expected to give a vast economic effects to Korean economy compared to its cost expenditure. In addition to the direct economic effects the stable supply of RI is thought to be very helpful in securing people's health and making the level of life be elevated further.

**REFERENCES**

- [1] Survey on the status of radiation/RI Utilization in 2006, Ministry Of Science and Technology, 2006.
- [2] Study on the contribution of nuclear and RI technology to the national economy, KAERI, 2004

**Table 1. Summary of the outputs and value added effects**

			supply (0.1 billion won/year)	output multiplier	Yearly Output effect (0.1 billion won/year)	Total output effect (Trl. won)	Value Added Ratio (2006)	<b>Total Value added effect (Tri. won)</b>
RI supplies	Manufacture	Domestic	65	18.11	1,179.3	5.8966	25.4%	1,498
		export	359	1	359.0	1.795		0.456
	Medical	Domestic	111	4.53	502.3	2.5114	53.7%	1,349
	subtotal			176	-	2,040.6	<b>10.203</b>	-
NTD Services	Export	60/ 1st to 5th year		1	60	0.03	54.5%	0.0164
		100/ 6th to 10th year		1	100	0.05		0.0273
		150/ 11th to 50th year		1	150	0.6		0.327
	subtotal			-	-	-	<b>0.68</b>	-
RI reactor Const.	export		3,000	1.82	5,460	<b>27.3</b>	44.3%	<b>12.09</b>
Total			-	-	-	<b>38.183</b>		<b>15.763</b>