Plan of New Research Reactor Construction in Korea

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In-Cheol LIM

KAERI Korea Atomic Energy Research Institute

Contents

Part I

Background

Background - Global Shortage of Mo-99

- Insecurity of Mo-99 Supply in Korea
  - Dependent mainly on import
- Raise in Mo-99 Price
  - Imbalance with health care expenses
- Losing big profit due to raised dollar value
  - Worsening the situation
- Failures in medical diagnosis
  -Delayed medical treatment
- An issue at the Korean National Assembly in 2008

Background – National Strategy for Mo-99

Short Term	**(n, γ) Mo using HANARO** **- 5% of domestic supply**
Mid Term	(n, γ) Mo using HANARO & Success in R&D on new generator of higher efficiency - 30% of domestic supply
Long term	Construction of a new reactor having fission Mo production capability

Background – Silicon Doping

- Capacity of NTD Service in HANARO
  - 5, 6 and 8” silicon ingot doping
  - 10~15% of world doping demand
  - High quality service
- Prediction of Future NTD Market
  - HEV
  - Windmill
  - Solar

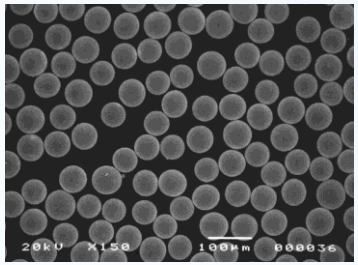
Background – Silicon Doping

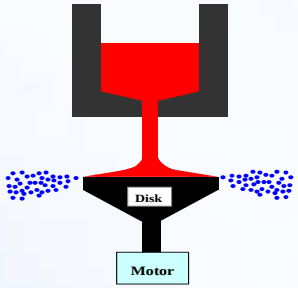
- For HEV
  - Estimation of the amount of NTD-Si per an HEV
  - Estimation of HEV Market Growth
  - KIM et al, 13th European Power Electronics Conf., 2009
  - The belief on stable service and capacity building will create larger market.

Year	2010	2015	2020	2030
HEV production [in million vehicles]	1	3	10	50
Need for 6 inch NTD-Si ingot [tons]	16-51	47-153	157-510	786-2550

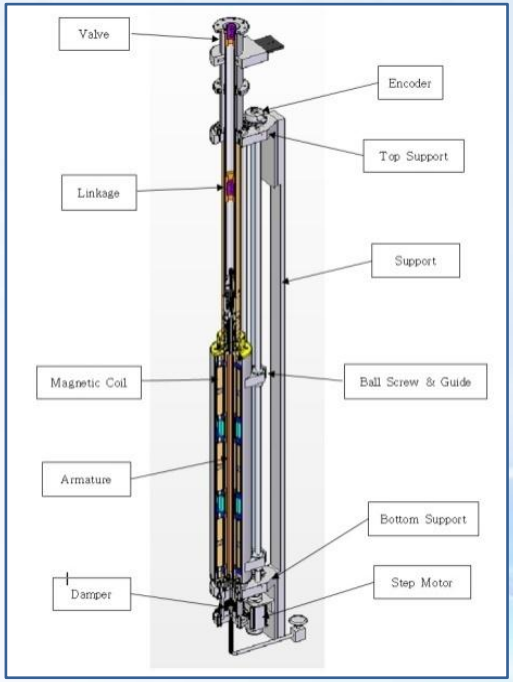
Background – RR Technology Development

- U-Mo Plate Type Fuel Development
  - ❖ Unique technology : Atomization Technique
- Bottom Mounted CRDM Development
  - ❖ Necessary for easy-access design





Atomization Process



Bottom Mounted CRDM

Part II

Progress

Progress

- Proposal by MEST(Ministry of Education, Science & Technology) in Dec. 2009
- Pre-evaluation by MOSF(Ministry Of Strategy and Finance) in Mar. 2010
- Site Selection in July 2010
- Feasibility Study by an Independent Government Institute from Sept. 2010 to June 2011
- Submission of Budget Proposal in Oct. 2011
- At present, under the Review of National Assembly

Site Selection in 2010

- Prerequisite for Feasibility Study
- Reply from 9 local counties to the Government Proposal of Host
- Evaluation of Proposals
  - Safety
  - Public acceptance of the residence
  - Support from the local government
  - Consideration of emergency preparedness plan execution
  - Meteorological conditions
  - Possibility of external events
  - Local infra for utilization
  - Accessibility
  - Conditions of inhabitancy
- Preliminary Site Evaluation
  - Geologic, seismic and hydrologic conditions

Feasibility Study

- Period : 2010.9~2011.6
- Conducted by KDI(Korea Development Institute)
  - A national research institute supporting the Ministry of Strategy and Finance
- Evaluation Items
  - Maturity of technologies required for the project to see the possibility of success
  - Economic study to investigate the cost and benefit of the proposed project and facilities for the life time
  - Strategic review

Part III

Project Plan

Facilities to be built

- Reactor
- RI Production and Research Facility
- LEU Target Manufacturing Facility
  - Attachment to the existing fuel manufacturing facility in KAERI
- Irradiation Service Facility
- Rad-waste Treatment Facility
- Consideration of Future Demand for Research and Service

Reactor Characteristics

Item	Value
Reactor power(MW)	~20
Reactor type	Pool type
Max. thermal neutron flux (n/cm^2s)	> $3.0x10^{14}$ n/cm^2s
Operation day per year	~300
Reactor life(year)	50
Fuel	LEU U-Mo plate type fuel (U loading : 4.8 g/cm^3)
Reflector	Beryllium
Coolant and flow direction in operation	H_2O, downward forced convection
Reactor building	Confinement

- PAMS and Emergency Control Room
- Diesel generator in appropriate size

Proposed Project Schedule

Key activity	Year						
	2011	2012	2013	2014	2015	2016	2017
Design and engineering							
Long need item procurement							
Site preparation							
Procurement and construction							
Commissioning							
Licensing							

Utilization

Radioisotope Production

- Mo-99
- I-131 and I-125
- Ir-192
- P-33, Co-60(medical), Re-186, Sm-153
- Schedule
  - Mo-99 : To fulfill national demand in 2017 and increase year by year
  - Others : To reach full capacities in 2017

Silicon Doping

- 6”(2 holes), 8”(3) from 2017
- 12”(2) : dependent on technology development

Concluding Remarks

- Roles
  - HANARO-Research, New RR-Service
- National Contribution of Korean New RR
  - Self sufficiency in RI supply
  - Contribution to the strengthening of power device industry and to the competitive power of car making industries
  - Validation of element RR technologies
- Regional and International Contribution
  - Contribution to the RI supply capacity
  - Contribution to green economy
  - Use and validation of U-Mo fuel


Thank You!
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