

## Current Status of Development of Proliferation Resistance Criteria in Future Nuclear Systems

150

Gen IV 가 TOPS 가 INPRO , INPRO  
GIF 4 가 가

### Abstract

Proliferation resistance is one of the main issues of the present nuclear power systems and is essential to the increase of public acceptance and deployment of future nuclear systems. The present status of studies on proliferation resistance as a characteristic of nuclear system was surveyed. TOPS proposed a assessment framework referred to attribute methodology and identified barriers agianst proliferation from civil nuclear power systems. In INPRO of IAEA, principles and guidelines of proliferation resistance for future innovative systems are now developing and GIF established the proliferation resistance criteria as metrics for selection of the concepts on Generation IV nuclear energy systems. Achievement of proliferation resistance as a characteristic of nuclear systems will be a basis of potential future of nuclear energy.

1.

1995 5 (NPT) 가 NPT  
NPT

가 .1)  
. IAEA INPRO(International Project on  
Innovative Nuclear Reactors and Fuel Cycles) (DOE :  
Department of Energy) GIF(Generation IV International Forum)  
4 (Gen IV) 가  
가 6 .2) IAEA INPRO  
2002  
가  
INPRO Gen IV

2.

1999 11 (NERAC ; Nuclear Energy  
Research Advisory Committee) TOPS(Technology Opportunities for Increasing  
the Proliferation Resistance of Global Civilian Nuclear Power System) Task  
Force 가  
.3)  
가 (framework)  
(attribute) , 가  
(Barrier)

(2) , ; (3) (1) ;  
가

(fast critical mass) 가

(intrinsic) , (extrinsic) .

가 TOPS

2.1

(desirability)

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가  
, , , 가  
(HEU) 가 가 가 , 가  
가

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가 가

가 가 , 가  
(MOX) , 가

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) . 가 가 ( ), 가 ( , , .

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( ), stimulation , , .

## 2.2

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가 , , 가 , .

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가 , , , .

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가 가 가

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\_\_\_\_\_  
/ \_\_\_\_\_

가

\_\_\_\_\_  
,

가

2.3

Accounting),

, MPC&A(Materials Protection, Control, and

\_\_\_\_\_

가

3

\_\_\_\_\_

가

가

가

2.4

가

가  
 가 , 가 가 가

3.

3.1 IAEA INPRO

IAEA ,  
 2000 9 IAEA IAEA  
 INPRO 21  
 가 , 가  
 12  
 IINPRO 4  
 cross-cutting 5 1) , 2) ,  
 , 3) , 4) (cross-cutting)  
 가 .  
 가 가

1)  
 가 , 2)  
 , , 3) , 가,  
 . IAEA

IAEA

가  
 가 ,  
 , ,  
 , ,

· Pu U-233 가

· Pu-239 가

가

IAEA

가

, 가

.4)

가

(1)

가 , (2)

가 , (3)

( )

(4)

IAEA

가

INPRO

2002

### 3.2 GEN IV International Forum

Gen IV

가

가

2000 1

8

Gen IV

, GIF

9

2001 10 가

10

2002 7

Gen IV

(roadmap)가

GEN IV

가

(Goal)

(Economy) 가 (sustainability), (Safety & Reliability),  
(Protection) . 가 (Proliferation Resistance/Physical  
가 가  
(Goal Statement) .5)

· GEN IV 가 ( )

GEN IV 가  
가  
가 가 가  
( ) 가 . 가

가  
가 / (MC&A),  
가 가  
가 IAEA

· 가  
·  
· IAEA 가  
가

· 가  
·  
· /  
가 가



가  
가

가 MC&A  
가

가 가 가  
가 가

Gen IV  
Gen IV  
Gen IV  
Gen IV

가  
(1) : 가

5%  
(2) 가 :  
가

가 50,000MWd/tU  
(3) : , ,  
가

(ALWR)

Gen IV 가  
VCR(Vapor Core Reactor) MSR(Molten Salt Reactor), 가  
PMR(Prismatic Modular Reactor), PBR(Pebble Bed Modular Reactor), HTGR(High  
Temperature Gas Reactor) GFR(Gas Fast Reactor), Pb Alloy  
Na  
GFR, MSR, Pb Alloy .6)

4.

가

TOPS

가

INPRO

GIF

가

가

가

가

가

- 1). NUCLEAR POWER IN THE OECD, OECD/IEA, 2001
- 2). 가 , 2002
- 3). DOE, "Attributes of Proliferation Resistance for Civilian Nuclear Power Systems", October 2000
- 4). Thomas E. Shea, et al. PROLIFERATION RESISTANCE IN INNOVATIVE NUCLEAR REACTORS AND FUEL CYCLES, ICONE 10-22501
- 5). Evaluation of Generation IV Systems: FINAL SCREENING METHODOLOGY, 21 May 2002, GIF
- 6). , GIF 가 , KAERI/OT-967/2002