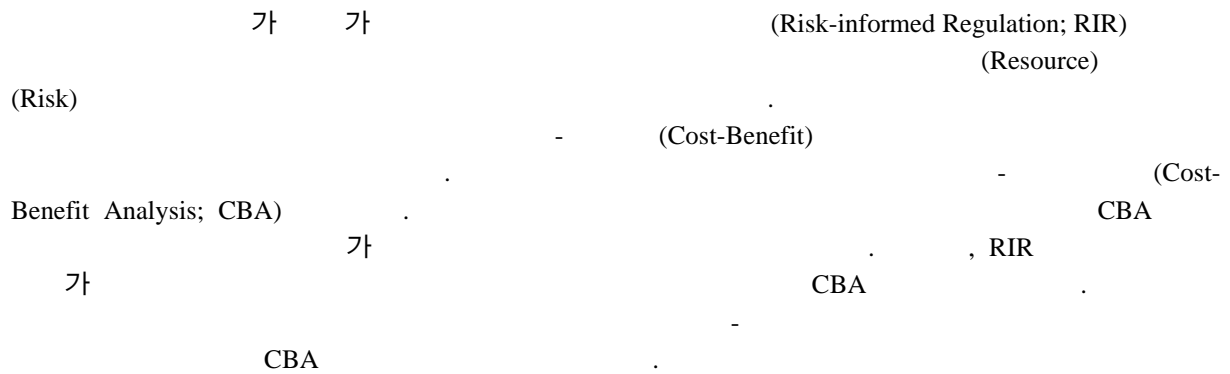


## The Development of the Risk-based Cost-Benefit Analysis Framework for Risk-informed Regulation

150



### Abstract

US NRC (Nuclear Regulatory Committee) introduces the Risk-informed Regulation (RIR) to allocate the resources of NRC effectively and to reduce the unnecessary burden of utilities. This approach inherently includes the cost-benefit analysis (CBA) concept. The CBA method has been widely used for many problems in order to support the decision making by analyzing the effectiveness of the proposed plan and/or activity in the aspect of cost and benefit. However, in general, the conventional CBA method does not use the information such as risk that is the essential element of RIR. So, we developed a revised CBA framework that incorporates the risk information in analyzing the cost and benefit of the regulatory and/or operational activities in nuclear industry.

### 1.

(Nuclear Regulatory Committee; NRC)가 (Risk-informed Regulation; RIR) 가 (Risk-

NRC , (Cost-Benefit Analysis; CBA) [1-2]. RIR - (Cost-Benefit Analysis; CBA) 가 - / . CBA 가 가 가 - (Socio-Economic Analysis, SEA) . - CBA (Cost-Effectiveness Analysis), - (Multi-criteria Analysis) 가 CBA 가 [3-7]. CBA 150 가 , 가 가 가 가 CBA 1980 CBA Value-Impact Analysis (VIA) CBA [8]. CBA 가, (Safety Issue) (Prioritization) 가 CBA가 [8-10]. , CBA 가 RIR , RIR 가 가 [1-2]. RIR / 가 CBA CBA . , (1) 가 , 가, (2) 가 RIR CBA .

**2. CBA**  
**2.1. CBA**

CBA 가 . / . CBA RIR / CBA가 가 1 .

가 / 가 . , / / 가 가 . / 가 (Alternatives) CBA 가 CBA 가 CBA 가 (Probabilistic Safety Assessment; PSA) 가가 CBA가 . CBA CBA 가 CBA CBA CBA 3 CBA , CBA CBA

**2.2.**

**CBA**

CBA가 , 가 CBA 가 , CBA RIR 가 [11-12].

(1)

, 가 , 가 가 가 가 가 가





$A_i$ :  $i$  ( / )  
 $Df_i$ :  $i$  ( / )  
 $C_t$ :  $t$  가 ( / )  
 $r$ :  
 $n$ : ( )  
 (1) 가 가 0

CBA

$$BC = \frac{A \frac{(1+r)^n - 1}{(1+r)^n r}}{I - F \frac{1}{(1+r)^n} + \sum_{t=1}^n \frac{C_t}{(1+r)^t}} \dots\dots\dots (2)$$

(2)

1

가

가

가

가

가

가

CBA

2.4.

가

가

가

가

(A B)

가

가

B

$$NPV_{B-A} = -(I_B - I_A) + (F_B - F_A) \frac{1}{(1+r)^n} + (A_B - A_A) \frac{(1+r)^n - 1}{(1+r)^n r} - \left( \sum_{t=1}^n \frac{C_{Bt}}{(1+r)^t} - \sum_{t=1}^n \frac{C_{At}}{(1+r)^t} \right) \dots\dots\dots (3)$$

$$BC_{B-A} = \frac{(A_B - A_A) \frac{(1+r)^n - 1}{(1+r)^n r}}{(I_B - I_A) - (F_B - F_A) \frac{1}{(1+r)^n} + \left( \sum_{t=1}^n \frac{C_{Bt}}{(1+r)^t} - \sum_{t=1}^n \frac{C_{At}}{(1+r)^t} \right)} \dots\dots\dots (4)$$

(3)  $NPV_{B-A}$  0 가 , (4)  $BC_{B-A}$  1 A가 B B가 A 가

가

(1) 가 .

(2) 가 “ ” .

(3) “ ” (A) “ ” (B) .

가

(B-A)  $NPV_{B-A}$  0

$BC_{B-A}$  1 (B)가 “ ”

(4) “ ” (A)가 . “

”

가 , 가

가

가

가

가

2.5.

CBA 가

가 ,

가 ,

가 .

가

- (1) CBA 가 가 , 가 가 가
- (2) 가 가 (Selective Sensitivity Analysis)
- (3) 가 가 가 가 가 가 (General Sensitivity Analysis)
- 가 가 가 가 가 가

3.

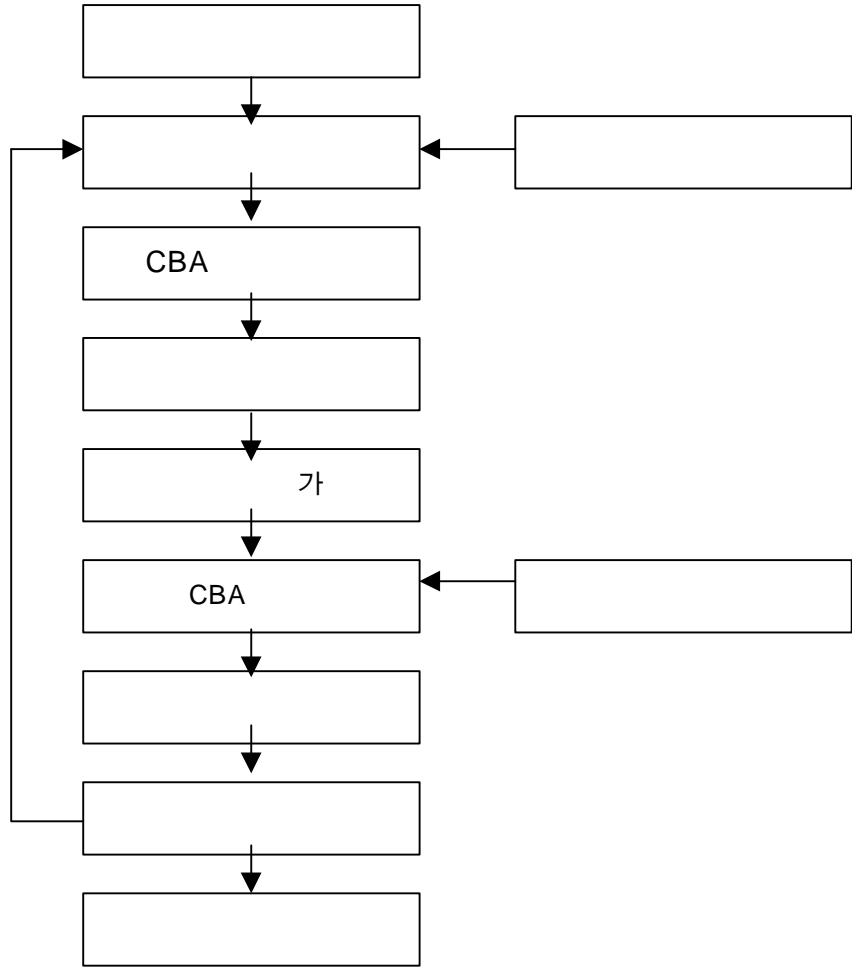
CBA RIR RIR 가 CBA 가 가 RIR CBA EPRI VIA CBA VIA 가 CBA [11-13]. 가 가 [14]. CBA 가 CBA가 가



4.

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1.

CBA