



# **Engineering Risk Benefit Analysis**

**1.155, 2.943, 3.577, 6.938, 10.816, 13.621, 16.862, 22.82, ESD.72**

## **CBA 1. Background and Fundamental Premises**

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# Basic Premise of Cost-Benefit Analysis

- **Express all costs and benefits of a project in terms of dollars.**
- **This may be a challenge for non-monetary costs and benefits in public projects.**
- **Since many of these are in the future, find the present value (worth).**
- **Use a figure of merit, such as the Present Worth, to make decisions.**
- **A widely used method by private and public entities.**



# **The Time Value of Money (CBA 2): Cash Flows (1)**

- **Compare alternative courses of action by considering the money consequences of each and its timing.**
- **$A_1$ : Initial Investment: \$32,000  
Net Annual Benefit: \$9,000**
- **$A_2$ : Initial Investment: \$25,000  
Net Annual Benefit: \$6,000**
- **Planning Horizon: 10 years**



## Cash Flows (2)

- We need a decision criterion that allows for the different value of money at different times.
- Possible Criterion: Maximize the *Net Present Worth* (the present worth of benefits minus the present worth of costs).
- Other criteria have also been proposed.
- We need methods for calculating the worth of money at different times.
- CBA 3 will present decision criteria.



## Evaluation Under Uncertainty (CBA 4)

- **What if costs and benefits are uncertain?**
- **Lectures RPRA 2 & 3 will be useful here.**
- **We'll discuss simple criteria for decision-making under uncertainty**
  - *Maximize expected net present value*
  - *Minimize probability of loss*



## Evaluating Public Activities (CBA 5)

- ***National:*** Interstate highway system; Major water-resource projects.
- ***State:*** Educational programs
- ***Municipality:*** Parks; Fire protection
  
- **The selection is not made on the basis of profit, but, rather, on the basis of maximization of the general (or, social) welfare of the citizens.**



## **Regulatory Analysis (10 CFR 50.109)**

- **A backfit in nuclear plants is justified only if there is substantial increase in the overall protection of the public health and safety.**
- **The analysis should include:**
  - **The potential change in the risk to the public.**
  - **The potential impact on facility employees.**
  - **Installation and continuing costs associated with the backfit.**
  - **The estimated resource burden on the Nuclear Regulatory Commission.**