Cost-Benefit Analysis

- Why is it Used?
  - Required for analysis of navigation projects by Flood Control Act of 1939.
  - Accounts for time value of benefits and of costs (50 year).

- What is it?
  - Technique to evaluate in monetary terms what is achieved (benefits) in comparison to what is invested (costs).
  - Systematic process for comparing costs and benefits over time between no investment (Without-Project Condition) and investment (With-Project Condition).

- What are the Metrics?
  - Net Benefits = Benefits minus Costs
  - Benefits Cost Ratio (BCR) = Benefits divided by Costs
Costs

- **Without-Project Condition**
  - Normal operation & maintenance costs
  - Cyclical maintenance & unexpected repair / replacement costs
  - Non-structural (i.e. helper-boats, mooring cells)

- **With-Project Condition**
  - Normal operation & maintenance costs
  - Cyclical maintenance & unexpected repair / replacement costs
  - Construction/Major Rehabilitation costs
Benefits

- Without Project Condition
  - National Economic Development (NED) benefits
  - Regional Economic Development (RED) benefits
  - Other Social Effects (OSE) benefits
  - Environmental Quality (EQ) benefits

- With Project Condition
  - NED benefits – e.g. Transportation Rate Savings
  - RED benefits – e.g. Jobs, Income
  - OSE benefits – e.g. Cultural considerations
  - EQ benefits – e.g. Environmental impacts
### Cost Benefit – Incremental Analysis

**NED plan maximizes net benefits – Alternative C is NED plan.**

<table>
<thead>
<tr>
<th>METRIC</th>
<th>WITHOUT PROJECT CONDITION</th>
<th>WITH PROJECT CONDITION</th>
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<tbody>
<tr>
<td></td>
<td>Alt A</td>
<td>Alt B</td>
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<tr>
<td>Costs</td>
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<tr>
<td>Benefits</td>
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<td>Incremental Costs</td>
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<td>Incremental Benefits</td>
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<tr>
<td>BCR</td>
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</table>
With-Project Costs - NED

- Investment First Cost (Construction Costs)
  - Walla Walla certified estimate (risk-based contingency)
- Interest During Construction (Construction Duration)
- Maintenance Costs (Scheduled)
- Costs from Risk Exposure (Repair & Replacement Costs)
With-Project Benefits – NED

- Inland Navigation Transportation
  - Cost Reduction → Project transit time reduction (Processing + Queuing Delay)
  - Others (Shift-in-mode, shift-in-market)

- Without-Project Repair & Replacement Costs Avoided

- Other Benefits*
  - Recreation
  - Water supply
  - Hydropower
  - Highway Impacts ($)

* Other benefits are only considered when selecting between projects if (NED) BCR >1.0.
Benefits – NED Drivers

- Inland Navigation Transportation
  - Capacity (LPMS)
  - Forecasts (WCSC, Industry reports, etc.)
  - Transportation Rate Savings (Surveys, STB Waybill, Informa Vessel Operating Costs)
  - Engineering Reliability Industry Impacts

- Repair & Replacement Costs Avoided
  - Engineering Reliability (OCA/ORA, RMC, OPs, ED)
Questions?

Extra Slides follow…
Cost-Benefit Analysis

- Conceptually – the IMTS accommodates Q traffic at cost P. Benefit is represented by red triangle as consumer surplus for Q that is willing to pay more for water transportation but doesn’t in the current market.
- A navigation improvement/investment increases waterway transportation supply to Q’ and reduces cost to P’. Existing Q traffic moves at lower cost and additional traffic (Q → Q’) is induced or shifts to the waterway.
- BCR is calculated by dividing total economic benefits by total economic costs.
## Inland Navigation Economics

### BCR Updates

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Last Approved Report</th>
<th>Last Economic Update</th>
<th>BCR - App Rate</th>
<th>BCR - 7%</th>
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<tbody>
<tr>
<td>Olmsted</td>
<td>2012 PACR 4 - PACR</td>
<td>2012 2.8</td>
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<td>Kentucky Lock Addition</td>
<td>1994 LRR 3- LRR</td>
<td>2011 1.7</td>
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<td>2001 Feasibility 3-LRR</td>
<td>2015 n.a.</td>
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<td>Lower Monongahela 2, 3 &amp; 4</td>
<td>1992 Feasibility 1.5 - Update</td>
<td>2014 1.3</td>
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