Fundamentals of Asset Management

Step 8. Optimize Capital Investment

A Hands-On Approach
Tom’s bad day...
Fourth of 5 core questions

4. What are my best O&M and CIP investment strategies?
   - What alternative management options exist?
   - Which are the most feasible for my organization?
AM plan 10-step process

1. Develop Asset Registry
2. Assess Performance, Failure Modes
3. Determine Residual Life
4. Determine Life Cycle & Replacement Costs
5. Set Target Levels of Service (LOS)
6. Determine Business Risk (“Criticality”)
7. Optimize O&M Investment
8. Optimize Capital Investment
9. Determine Funding Strategy
10. Build AM Plan

4. What are my best O&M and CIP investment strategies?
Recall view 4: Management framework

- Asset Management Business Processes
- Asset Management Plans
- Strategic Initiatives
- Annual Budgets

- Operating Budget
- Capital Budget
Balancing future demand with current capabilities

Current Demand Stream

Assets Available

Future Demand Stream

Assets Required

Gap

Supply-Production Stream

Focus of CIP

Asset Management Strategy (AMP)

Existing Assets
Maintainable

Existing Assets
Renewable

New Assets Augmentation

Reconfigurable or Disposable Assets

Non-asset Solutions
The CIP process *locks* in life cycle costs!

65-85% of all life-cycle costs are “locked-in” here!

Life-cycle O&M costs often are 5-10 (even 20) times initial construction costs

Life-cycle cost reduction opportunities diminish
Deriving the CIP investment program – a best practice model

1. The strategic CIP “Business Plan”
   - What are we going to do and why?
   - What will it cost?
   - How will it be funded?
   - Life-cycle impact on LOS, rates, and financial condition

2. On time and on budget
   - Managing costs
   - Managing schedules and deliverables
   -Managing contracts and changes

3. Integration into the portfolio of assets
   - Registry
   - Start-up, shake-down, burn-in, commissioning
   - Manuals, spares, and service
   - Initiating the maintenance regimen
Capital investment is made up of two major types of projects:

- **Renewal**
  - Repair
  - Refurbish/restore
  - Replace

- **Augmentation**
  - Functionality (LOS/efficiency)
  - Capacity
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Project

1. Identification
   2. Validation
      3. Prioritization
         4. Financing
        5. Execution
           6. Control
          7. Handover
Project identification: Moving to “best practice”

“Champion” model

- Plant “wish list”
- Collection “wish list”
- IT, etc., “wish list”
- Unknown requirements!

“Structured” model

AMP (whole portfolio)
- Inventory
- Condition
- Failure modes
- Residual life
- Replacement $
- LOS
- ODM

Project Development (optimal Investment)
The project development process

- **Project Identification**
  - “At risk” assets
  - Existing CIP
  - Strategic drivers

- Initial projects list
- Validation & prioritization
- CIP funding strategies
- CIP document
The “primary failure mode” gives insight into “strategic drivers” at work

<table>
<thead>
<tr>
<th>Failure Mode</th>
<th>Definition</th>
<th>Tactical Aspects</th>
<th>Management Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capacity</strong></td>
<td>Volume of demand exceeds design capacity</td>
<td>Growth, system expansion</td>
<td>(Re)design</td>
</tr>
<tr>
<td><strong>LOS</strong></td>
<td>Functional requirements exceed design capacity</td>
<td>Codes &amp; permits: NPDES, CSOs, OSHA, noise, odor, life safety; service, etc.</td>
<td>(Re)design</td>
</tr>
<tr>
<td><strong>Mortality</strong></td>
<td>Consumption of asset reduces performance below acceptable level</td>
<td>Physical deterioration due to age, usage (including operator error), acts of nature</td>
<td>O&amp;M optimization, renewal</td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
<td>Operations costs exceed that of feasible alternatives</td>
<td>Pay-back period</td>
<td>Replace</td>
</tr>
</tbody>
</table>

NPDES is National Pollutant Discharge Elimination System, CSOs are combined sewer overflows, and OSHA is Occupational Safety and Health Administration.
The project development process

Project Identification

- "At risk" assets
- Existing CIP
- Strategic drivers

Initial projects list

Validation & prioritization

CIP funding strategies

CIP document
“At risk” assets

- High business risk exposure scores
- Very low remaining useful lives
- Poor condition scores or scores approaching designated minimum acceptable levels
- Poor performance scores
- Poor reliability scores
- No redundancy
- Imminent major failure mode of “capacity” or “level of service”
- “Problem assets” (high work order frequency/maintenance time)
Each project should have a CIP project identification sheet that identifies...

- Problem statement
- Proposed scope
- Location
- Background & context
- Rationalization
- Fiscal requirements
- Design issues
- Permits required
- Comments
Deriving the CIP investment program – a best practice model

1. The strategic CIP “Business Plan”
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2. On time and on budget
   - Managing costs
   - Managing schedules and deliverables
   - Managing contracts and changes

3. Integration into the portfolio of assets
   - Registry
   - Start-up, shake-down, burn-in, commissioning
   - Manuals, spares, and service
   - Initiating the maintenance regimen

Project

Identification
Validation
Prioritization
Financing
Execution
Control
Handover
Validation: driving down the cost of CIP

Can we…

- Eliminate projects?
- Defer projects?
  - Change maintenance?
  - Change operations?
- Shift to more appropriate Optimized Renewal Decision Making (ORDM) solution (repair, refurbish, replace)?
- Find a non-asset solution?
CIP validation

How do we know that we have…

- The right projects?
- At the right time?
- At the right cost?
- For the right reasons?
CIP Validation

How do we “validate”? 

- We produce a rigorous *business case* for all projects that justifies the timing and project solution including:
  - Life cycle cost (capital and O&M)
  - “Triple bottom line” risks (financial, social, and environmental)

- We *sufficiently analyze* in a step-by-step approach to ensure that we have reached an *acceptable level of confidence* (confidence level rating—CLR)

- We set the sophistication of analytical process to match the *risks, value of the capital, and life cycle costs* to be invested
Validation as a “decision” filter

- **Existing CIP/“wish list”**
- **Project list**
- **AMP (whole portfolio)**

- **Valid?**
  - **Yes**: Proceed
  - **No**: Delete, Defer, Redo
Process steps

Project identification

CLR

BRE

LCC

Business case

CLR revision

Prioritization by CIP committee

Budget book

CLR is confidence level rating, BRE is business risk exposure, LCC is life cycle cost, CIP is capital improvements program

Fundamentals of Asset Management
Process steps

Project identification

CLR

CLR revision

Prioritization by CIP committee

Budget book

BRE

LCC

Business case

Project development and validation

CLR is confidence level rating, BRE is business risk exposure, LCC is life cycle cost, CIP is capital improvements program

Fundamentals of Asset Management
Measuring our confidence in our proposed projects and solutions

How confident are we that we are recommending the right solution at the right time at the right cost?

\[
\text{Quality of Analysis} \quad + \quad \text{Quality of Data Used} \quad = \quad \text{Confidence Level Rating (CLR)}
\]

\[
\frac{70\%}{2} \quad + \quad \frac{40\%}{2} \quad = \quad 55\%
\]
Confidence level rating process steps

Step 1: Project concept by project sponsor

Step 2: Build business case by assessor

Step 3: Comments on business case by peer reviewer

Step 4: Review and rank business case by CIP committee
Confidence Level Rating: 13 elements to be considered

1. Existing standard of service?
   What is the purpose of the asset? Why is it there?

2. Knowledge of existing asset or facility (renewal)
   - What condition is the asset in?
   - What is its performance? It’s reliability?

3. Current asset utilization (renewal)
   What is the asset actually delivering vs. what do I require the asset to do?
Confidence Level Rating: 13 elements to be considered

4. Future demands and reliability
   What change in the level of service is expected in the future?

5. Prediction of reliability and failure mode (renewal)
   Of the four failure modes (Capacity, Level of Service, Mortality and Efficiency), which one is most eminent?

6. Timing of reliability / renewal failure (renewal)
   How likely is this failure to occur?

7. Consequence of reliability and renewal failure (renewal)
   What is the impact of this failure?
Confidence Level Rating: 13 elements to be considered

8. Quality of proposed maintenance program
   How good are my estimates for maintenance costs for this project? Do I understand the most appropriate regimen across its life cycle?

9. Appropriateness of operating budgets
   How good are my estimates for operating costs for this project?

10. Appropriateness of renewal solution (renewal)
    Have we systematically considered all nine treatment options (do nothing, status quo, operate differently, maintain differently, repair, refurbish/rehabilitate, replace, decommission, and non-asset based)?
Confidence Level Rating: 13 elements to be considered

11. **Assessment of capital costs**
   How good are my estimates for capital costs?

12. **Assessment of benefits (risk reduction)**
   - What am I really getting for doing this project and have I adequately quantified it?
   - Will this provide real benefit to stakeholders?
   - Have I done the homework to understand the benefits?

13. **Appropriateness of evaluation process**
   Have I balanced business risk and all (life cycle) costs and benefits and documented them in a business case?
# Confidence Level Assessment & Rating

**LEVEL 2: Overall Confidence Levels LOS Capital Improvement Projects**

<table>
<thead>
<tr>
<th>No.</th>
<th>Quality Element</th>
<th>Project Value Chain</th>
<th>Process Effectiveness</th>
<th>Data &amp; Knowledge Quality</th>
<th>Effectiveness Score</th>
<th>Quality Score</th>
<th>Quality Rating</th>
<th>Confidence Level</th>
<th>Rating Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Existing Standard of Service</td>
<td>2%</td>
<td>Formal written standard adopted by legislative body</td>
<td>Large technical group - sound, accurate knowledge</td>
<td>100%</td>
<td>60%</td>
<td>80%</td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td>2</td>
<td>Knowledge of Existing Asset/Facility</td>
<td>4%</td>
<td>Informal specific knowledge based on informal records applied</td>
<td>Large technical group - sound, accurate knowledge</td>
<td>50%</td>
<td>60%</td>
<td>55%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>3</td>
<td>Current Demands for Service</td>
<td>0%</td>
<td>Current demand specifically analyzed and estimated</td>
<td>Full data and costs down to maintenance managed item level</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>4</td>
<td>Future Demands for Service</td>
<td>5%</td>
<td>Future demand specifically analyzed and projected</td>
<td>Full data and costs down to maintenance managed item level</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>5</td>
<td>Service failures Predicted Modes of Service Failure</td>
<td>0%</td>
<td>Major (strategic) failure modes analyzed</td>
<td>Large technical group - sound, accurate knowledge</td>
<td>75%</td>
<td>60%</td>
<td>66%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>6</td>
<td>Probability/Timing of Failure</td>
<td>0%</td>
<td>Formal analysis at facility/major process or higher level</td>
<td>Moderate data from asset management information system</td>
<td>75%</td>
<td>85%</td>
<td>80%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>7</td>
<td>Consequences of Failure</td>
<td>15%</td>
<td>Specific but informal consideration given</td>
<td>Medium technical group - moderate knowledge</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>0%</td>
<td>3%</td>
</tr>
<tr>
<td>8</td>
<td>Analysis approach Quality of Proposed Maintenance Programs</td>
<td>7%</td>
<td>Formal analysis at facility/major process or higher level</td>
<td>Large technical group - sound, accurate knowledge</td>
<td>75%</td>
<td>50%</td>
<td>66%</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>9</td>
<td>Appropriateness of Recurrent Budgets</td>
<td>16%</td>
<td>Formal analysis at facility/major process or higher level</td>
<td>Large technical group - sound, accurate knowledge</td>
<td>75%</td>
<td>50%</td>
<td>66%</td>
<td>7%</td>
<td>3%</td>
</tr>
<tr>
<td>10</td>
<td>Appropriateness of Renewal Solutions Considered</td>
<td>16%</td>
<td>Formal analysis at facility/major process or higher level</td>
<td>Key basic data from asset management information system</td>
<td>75%</td>
<td>75%</td>
<td>75%</td>
<td>8%</td>
<td>3%</td>
</tr>
<tr>
<td>11</td>
<td>Assessment of Capital Cost Estimates</td>
<td>12%</td>
<td>Formal analysis at asset or lower level</td>
<td>Large technical group - sound, accurate knowledge</td>
<td>100%</td>
<td>60%</td>
<td>90%</td>
<td>10%</td>
<td>2%</td>
</tr>
<tr>
<td>12</td>
<td>Assessment of Benefits (Risk Reduction)</td>
<td>15%</td>
<td>Formal analysis at facility/major process or higher level</td>
<td>Key basic data from asset management information system</td>
<td>75%</td>
<td>75%</td>
<td>75%</td>
<td>11%</td>
<td>4%</td>
</tr>
<tr>
<td>13</td>
<td>Appropriateness of Economic Evaluation Process</td>
<td>20%</td>
<td>Specific but informal consideration given</td>
<td>Medium technical group - moderate knowledge</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>10%</td>
<td>6%</td>
</tr>
</tbody>
</table>

**TOTALS** | 100% | | | | | | | | |

*“Gap” is difference between a “perfect” score of 100 and actual score*

Fundamentals of Asset Management
## Scoring “protocol”

### Table 3: Scoring the Processes & Practices

<table>
<thead>
<tr>
<th>Assessment Score</th>
<th>Processes &amp; Practice Followed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>No process applied to quality element</td>
</tr>
<tr>
<td>25%</td>
<td>Some consideration given to process</td>
</tr>
<tr>
<td>50%</td>
<td>Best Practice of ISO5167 - identification</td>
</tr>
<tr>
<td>70%</td>
<td>Real value of ISO5167 - identification</td>
</tr>
<tr>
<td>80%</td>
<td>Strong data collection &amp; analysis of cost effectiveness</td>
</tr>
<tr>
<td>90%</td>
<td>Significant data collection &amp; analysis of cost effectiveness</td>
</tr>
<tr>
<td>100%</td>
<td>Full tertiary data &amp; costs down to MMI</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment Score</th>
<th>Description of Data Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>No data available</td>
</tr>
<tr>
<td>25%</td>
<td>Some minor data available</td>
</tr>
<tr>
<td>40%</td>
<td>Small Delphi Group - poor knowledge</td>
</tr>
<tr>
<td>50%</td>
<td>Medium Delphi Group - reasonable knowledge</td>
</tr>
<tr>
<td>60%</td>
<td>Large Delphi Group - sound accurate knowledge</td>
</tr>
<tr>
<td>75%*</td>
<td>Key base principle data from AMIS</td>
</tr>
<tr>
<td>85%*</td>
<td>Secondary data from AMIS</td>
</tr>
<tr>
<td>100%*</td>
<td>Full tertiary data &amp; costs down to MMI</td>
</tr>
</tbody>
</table>
Weighted gap improvements

Renewal Weighted GAP

Quality Elements
- Existing Standards of Service
- Knowledge of Existing Asset / Facility / Resources Providing Service
- Current Demands
- Future Demands / Reliability
- Prediction of Reliability / Renewal Failure Mode
- Timing of Reliability / Renewal Failure
- Consequence of Failure to Make this Investment
- Quality of Proposed Maintenance Program (if applicable)
- Appropriateness of Recurrent Operations & Maintenance Budgets
- Appropriateness of Solutions Assessed & Adopted
- Assessment of Capital Cost Estimates
- Assessment of Benefits (Risk Reduction)
- Appropriateness of Economic Evaluation Process Undertaken

% GAP
0% 2% 4% 6% 8% 10% 12%
CIP “hurdle” stages

<table>
<thead>
<tr>
<th>Source</th>
<th>Period (years)</th>
<th>Minimum CLR rating</th>
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</thead>
<tbody>
<tr>
<td>AM plan</td>
<td>16-25</td>
<td>60%</td>
</tr>
<tr>
<td>AM plan</td>
<td>11-15</td>
<td>70%</td>
</tr>
<tr>
<td>10-year CIP 90%</td>
<td>6-10</td>
<td>80%</td>
</tr>
<tr>
<td>5-year CIP</td>
<td>2-5</td>
<td>85%</td>
</tr>
<tr>
<td>Design expenditure approved</td>
<td>1</td>
<td>90%</td>
</tr>
</tbody>
</table>
Process steps

CLR is confidence level rating, BRE is business risk exposure, LCC is life cycle cost, CIP is capital improvements program.
Elements of a “business case”

- Executive Summary
- Part 1, Demand and Supply
  - Objectives
  - Project background
  - Drivers & failure modes
- Part 2, Options Analysis
  - Feasible options defined
  - For each option:
    - Business risk exposure
    - Life cycle costing
    - Confidence level rating (CLR)
  - Summary tables
- Part 3, Recommendation
  Recommended option and description
## Options analysis - summarized

<table>
<thead>
<tr>
<th>Option</th>
<th>Business Risk</th>
<th>Capital ($)</th>
<th>Annual Operations</th>
<th>Annual Maintenance</th>
<th>PV of Benefits</th>
<th>NPV</th>
<th>Adjusted Annualized PV</th>
<th>Benefit Cost</th>
<th>Pay Back Period</th>
<th>Total PV/CLR</th>
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</thead>
<tbody>
<tr>
<td>Status Quo</td>
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<tr>
<td>Do Nothing / Run to Fail</td>
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<tr>
<td>Operate Differently</td>
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<tr>
<td>Maintain differently</td>
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<td>Repair</td>
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<tr>
<td>Refurbish / Rehabilitation</td>
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<tr>
<td>Replace</td>
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<td>Decommission</td>
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<tr>
<td>Non Asset Solutions</td>
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<tr>
<td>(Other options)</td>
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</table>
## Moving forward: Project validation decision matrix

<table>
<thead>
<tr>
<th>BRE Category</th>
<th>High CLR (&gt;84)</th>
<th>Medium CLR (56-84)</th>
<th>Low CLR (&lt;56)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High BRE (&gt;1M)</strong></td>
<td>Proceed with project, no changes</td>
<td>Consider proceeding with project if financial criteria are met and funding is available</td>
<td>Consider</td>
</tr>
<tr>
<td><strong>Medium BRE</strong></td>
<td>Consider</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Proceed with project</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Deferral or delay</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Increase CLR</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Low BRE (&lt;50K)</strong></td>
<td></td>
<td>Consider</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Deferral or delay</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Project breakup</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>- Cancellation</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>- Increase CLR</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Consider proceeding with project if financial criteria are met and funding is available
- Deferral or delay
- Project breakup
- Cancellation
- Increase CLR

- Consider |
- Deferral or delay |
- Project breakup |
- Cancellation |
- Increase CLR

- Consider |
- Mothball |
- Deferral or delay |
- Project breakup |
- Cancellation |
- Increase CLR
Deriving the CIP investment program – a best practice model

1. The strategic CIP “Business Plan”
   • What are we going to do and why?
   • What will it cost?
   • How will it be funded?
   • Life-cycle impact on LOS, rates, and financial condition

2. On time and on budget
   • Managing costs
   • Managing schedules and deliverables
   • Managing contracts and changes

3. Integration into the portfolio of assets
   • Registry
   • Start-up, shake-down, burn-in, commissioning
   • Manuals, spares, and service
   • Initiating the maintenance regimen
“Prioritization” rank-orders validated projects

A. Public Health/Safety, Mandated Program, BOC Irrevocable Commitment, Phase Completion

<table>
<thead>
<tr>
<th>Points</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Urgent to meet <em>emergency situations</em> to remedy or prevent a major health / safety hazard.</td>
</tr>
<tr>
<td>19</td>
<td>Essential to remedy or prevent a major health / safety hazard; Essential to comply with legally mandated programs and avoid penalty; Essential to comply with irrevocable commitment by the BOC.</td>
</tr>
<tr>
<td>15</td>
<td>Essential to complete a project phase, otherwise the system will not be operational.</td>
</tr>
<tr>
<td>6</td>
<td>Very positive economic impact; Ongoing support by BOC for <em>county grants match and outside agency grants</em>; Project identified as highest priority by BOC or County Manager; Potential hazard – deferral of project would increase significant level of hazard.</td>
</tr>
<tr>
<td>3</td>
<td>Potential hazard – deferral of project would not increase significant level of hazard.</td>
</tr>
<tr>
<td>0</td>
<td>Project does not apply to the aforementioned criteria.</td>
</tr>
</tbody>
</table>

B. Service Delivery, Fiscal Impact, Leverage

<table>
<thead>
<tr>
<th>Points</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>The project creates revenues or identifies savings <em>in excess of the project cost</em> and is justified by a cost benefit analysis; Implementation plans of the project are required prior to capital allocation and cost savings reduce the base operating budget.</td>
</tr>
<tr>
<td>6</td>
<td>Project significantly improves service delivery which will substantially reduce <em>subsequent operating or capital costs</em>; County funds are reimbursed by the federal or state government at a rate of 50% or greater.</td>
</tr>
<tr>
<td>5</td>
<td>Project significantly improves service delivery and will be utilized by multiple departments with <em>little or no impact</em> on future operating or capital costs (less than $20,000 per year); Essential operating capital to meet service growth and/or mandated programs.</td>
</tr>
<tr>
<td>4</td>
<td>Project significantly improves service delivery with <em>little or no impact</em> on future operating or capital costs (less than $10,000 per year); County funds are reimbursed by the federal or state government at a rate less than 50%.</td>
</tr>
<tr>
<td>3</td>
<td>Project improves service delivery with <em>no impact</em> on future operating or capital costs (less than $10,000 per year) Essential operating capital to meet service growth and/or mandated programs.</td>
</tr>
<tr>
<td>2</td>
<td>Project significantly improves service delivery with <em>moderate impact</em> on future operating or capital costs ($10,000 – $50,000 per year)</td>
</tr>
<tr>
<td>1</td>
<td>Project significantly improves service delivery with <em>high impact</em> on future operating or capital costs (more than $50,000 per year)</td>
</tr>
<tr>
<td>0</td>
<td>Project does not significantly improve service delivery; Project balance available for annual program; Project requires further study before consideration.</td>
</tr>
</tbody>
</table>
Example: Possible prioritization factors & weights

<table>
<thead>
<tr>
<th>Factor</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Health/Safety</td>
<td>15</td>
</tr>
<tr>
<td>Federal or State Mandated Program</td>
<td>15</td>
</tr>
<tr>
<td>Local Irrevocable Commitment</td>
<td>15</td>
</tr>
<tr>
<td>Business Risk Exposure</td>
<td>10</td>
</tr>
<tr>
<td>Service Delivery Impact</td>
<td>10</td>
</tr>
<tr>
<td>Fiscal Impact</td>
<td>10</td>
</tr>
<tr>
<td>Conformance with Plan / Policies; Phase Completion</td>
<td>8</td>
</tr>
<tr>
<td>Efficiency Improvement</td>
<td>7</td>
</tr>
<tr>
<td>Leverage</td>
<td>6</td>
</tr>
<tr>
<td>Project Interdependence</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total Maximum Score</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
Supplement to prioritization factor weighting

<table>
<thead>
<tr>
<th>No</th>
<th>Project description</th>
<th>Cost $M</th>
<th>B/C ratio</th>
<th>PBP yrs</th>
<th>CLR</th>
<th>BRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>256</td>
<td>South trunk renewal</td>
<td>4.2</td>
<td>2.42</td>
<td>2.5</td>
<td>83</td>
<td>610</td>
</tr>
<tr>
<td>102</td>
<td>Expand plant automation</td>
<td>6.5</td>
<td>2.35</td>
<td>3.5</td>
<td>63</td>
<td>411</td>
</tr>
<tr>
<td>16</td>
<td>Renew digester heaters</td>
<td>2.8</td>
<td>2.10</td>
<td>4.0</td>
<td>74</td>
<td>219</td>
</tr>
<tr>
<td>205</td>
<td>New CMMS</td>
<td>8.5</td>
<td>1.95</td>
<td>5.0</td>
<td>69</td>
<td>712</td>
</tr>
<tr>
<td>167</td>
<td>Office accommodation</td>
<td>4.7</td>
<td>1.35</td>
<td>6.2</td>
<td>72</td>
<td>813</td>
</tr>
<tr>
<td>150</td>
<td>Siphon renewals</td>
<td>2.6</td>
<td>1.30</td>
<td>7.2</td>
<td>73</td>
<td>471</td>
</tr>
</tbody>
</table>

Assume agency CIP limit of $25M
Deriving the CIP investment program – a best practice model

1. The strategic CIP “Business Plan”
   - What are we going to do and why?
   - What will it cost?
   - How will it be funded?
   - Life-cycle impact on LOS, rates, and financial condition

2. On time and on budget
   - Managing costs
   - Managing schedules and deliverables
   - Managing contracts and changes

3. Integration into the portfolio of assets
   - Registry
   - Start-up, shake-down, burn-in, commissioning
   - Manuals, spares, and service
   - Initiating the maintenance regimen

Project

1. Identification
2. Execution
3. Handover

Priority

Financing

Validation

Control
Project handover “best practices”

- Have contractor/vendor build asset registry at handover
  - Use retainage to assure
  - Give contractor/vendor asset registry protocol
- Collect baseline performance data after “burn-in” and store with asset ID
- Set up maintenance regimen (reactive, preventive, and predictive) at outset
- Incorporate manuals into Electronic Document Management System
- Set up spares re-supply protocol
Adapt the CIP business process!

"As Is"

"To Be"
Key points from this session

Given my system, what are my best capital investment strategies?

Key Points:

- A cost-effective CIP is about the right solutions at just the right time – a balancing of demand and risk/consequence
- Review your CIP to determine the ‘confidence level’ you have in it – good practices plus good data lead to high confidence decisions
- Decide to proceed with or defer a given project based on the risk it represents to your agency
- For those projects you defer, undertake the necessary analysis to lift the confidence level to where you feel good about proceeding
- The quality of the CIP development process and the quality of the data available determine the level of confidence that can be assigned to the CIP
- A good CIP requires a Strategic CIP Business Plan to fit funding to projects

Associated Techniques:

- Project development and authorization
- Project identification
- CIP validation
- Project business case
- Strategic CIP Business Plan
- Business risk exposure
- Confidence level metrics
Tom’s spreadsheet

Fundamentals of Asset Management