# Life Cycle Cost Analysis

# Contents

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# Chapter

# 1

# Overview

**Topics:**

# Overview of the Life Cycle Cost Analysis (LCC) Module

The Life Cycle Cost Analysis (LCC) module provides the ability to balance costs, plan budgets, collect performance data and build contingency plans for your organization.

By using LCC, your organization can:

• Develop Process Models
• Acquire Data
• Run Models
• Perform Analyses
• Report Results
• Track Costs

# Access the LCC Overview Page

**Procedure**

In the **Applications** menu, navigate to the **STRATEGY** section, and then select **Life Cycle Cost Analysis**. The **LCC Overview** page appears.
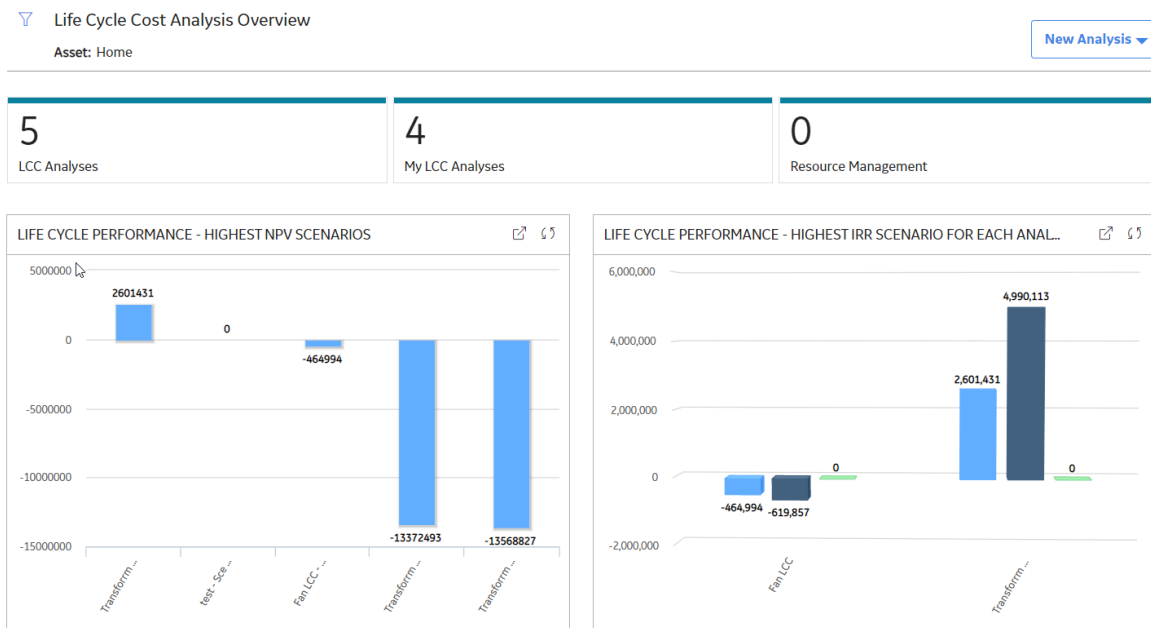


The **LCC Overview** page displays the following sections with information related to Life Cycle Cost Analysis:

• **LCC Analyses** : Contains a list of Life Cycle Analyses associated with assets at or below the selected Asset Hierarchy level.
• **My LCC Analyses** : Contains a list of the LCC Analyses to which you are assigned as a team member.
• **Resource Management** : Contains a list of Resources available to be applied to Life Cycle costs available in the database.

- **Life Cycle Performance - Highest IRR Scenario For Each Analysis** : Displays a summary of Life Cycle Performance of the greatest Internal Rate of Return (IRR) of all the scenarios per analysis.

   **Note:** LCC assumes that all LCC Analyses being compared share the same currency.
- **Life Cycle Performance - Top NPV Scenarios** : Displays a summary of Life Cycle Performance of the greatest Net Present Value (NPV) scenarios.

   **Note:** LCC assumes that all LCC Analyses being compared share the same currency.

By default, the hierarchy level is set to Home, displaying all of the analyses with and without assets. You can filter the hierarchy level by selecting ▽ on the upper-left corner of the page. When setting the filter to an asset or functional location in the hierarchy, only those analyses linked to the selected functional location and its children or to the selected asset will appear.

# LCC Workflow

This workflow provides the basic, high-level steps for using this module. The steps and links in this workflow do not necessarily reference every possible procedure.

1. Define an Analysis to create a Life Cycle Cost Analysis.
2. Create Scenarios to reflect the best forecast of life cycle costs for the defined period, using cost data to populate the Operating and Capital costs. Within the scenario, you will also develop and define an Operating Profile, Primary Element and Secondary Elements. Primary and Secondary elements can be defined and associated with asset hierarchy elements.
3. Define cost elements.
4. Import Cost Data or Manually Add Cost Data to associated scenario elements. After the costs are entered, they will be saved in the Cost Data grid where you can review them.
5. Create resources applicable to your analysis, such as people, replacement parts, consumable parts, oils and lubricants, maintenance equipment, and tools.
6. Analyze results of your Analysis.

# Chapter

# 2

# Workflow

**Topics:**

# Life Cycle Cost Analysis Workflow

This workflow describes the process for developing a Life Cycle Cost Analysis to compare costs through various scenarios.

In the following workflow diagram, the blue text in a shape indicates that the corresponding description has been provided in the sections that follow the diagram. For more information, refer to the Interpreting the Workflow Diagrams topic in the APM Product Workflows documentation.

**Note:** For information on the personas associated with a APM module, refer to the APM Product Workflows documentation.
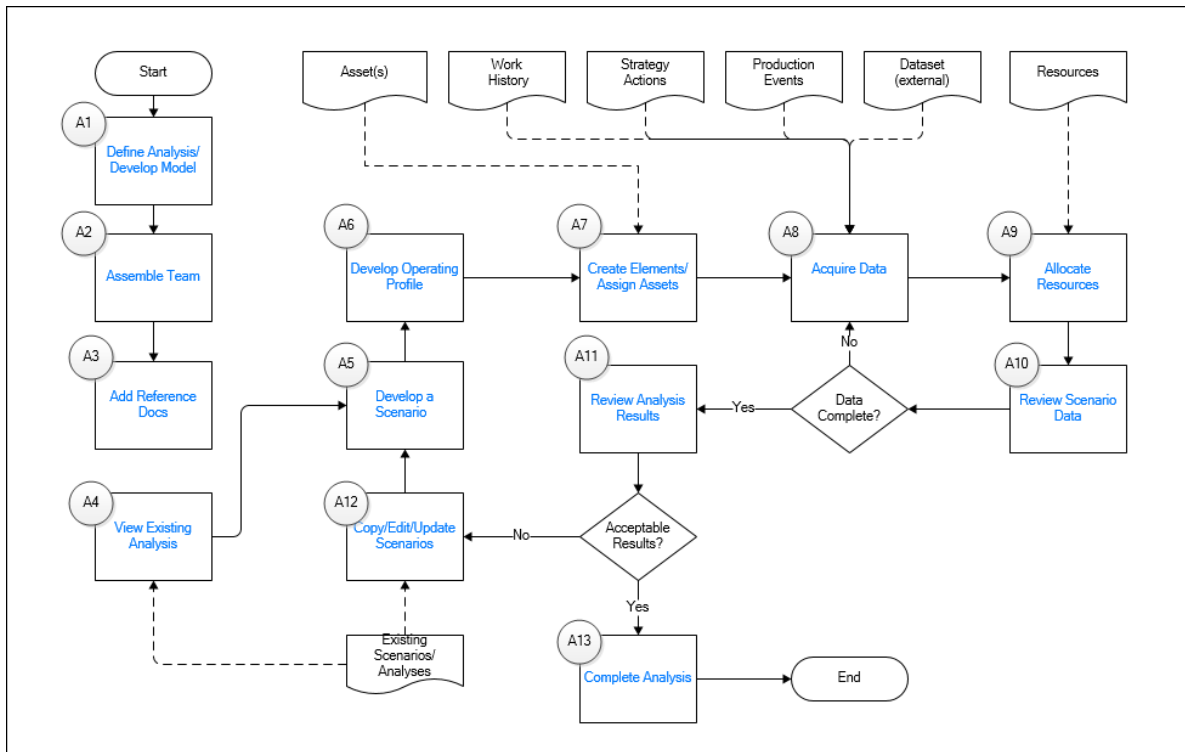


## Define Analysis/Develop Model

Persona: Analyst

Define the LCC Analysis, duration, and financial model to be applied to the analysis.

## Assemble Team

Persona: Analyst

Assemble team members to perform an LCC.

## Add Reference Documents

Persona: Analyst

Create reference documents to associate files or websites with a record in the APM database.

## View Existing Analysis

Persona: Analyst

Find, select, and open a previously created analysis via the **LCC Module Overview** page. For a baseline test, this will be the analysis created in step A1.

## Develop a Scenario

Persona: Analyst

Develop a new scenario for the first scenario. A new scenario will form the best current projection of future asset usage over the defined period of the analysis.

## Develop Operating Profile

Persona: Analyst

Develop the operating profile for the analysis by defining operating usage through each defined period.

## Create Elements/Assign Assets

Persona: Analyst

Create Primary and Secondary Elements for the Scenario. Elements can be linked to assets or locations taken from the hierarchy, but this is not mandatory as required elements may not always exist in the hierarchy. Secondary Elements may also be added from previously created Asset Groups.

## Acquire Data

Persona: Analyst

Categorize each element of cost data within the scenario. Basic categories are provided by default, but others may need to be added. Operating Costs may then be added manually or imported for each element.

## Allocate Resources

Persona: Analyst

Allocated resources used in operating and maintaining an asset in the scenario. This may include humans, tools, facilities, insurance, etc.

## Review Scenario Data

Persona: Analyst

Review all added or imported data in the scenario for accuracy and completeness. Amend and update the data as needed.

## Copy/Modify/Update Scenarios

Persona: Analyst

Alternative scenarios will usually be variations of a previously created scenario. Time can be saved by copying a scenario, and then modifying the copied scenario needed.

## Review Analysis Results

Persona: Analyst

Using the various charts provided, analyze the results of the analysis. Compare costs for each scenario according to the displayed categories. Create additional scenarios as needed until an optimum scenario for minimizing life cycle costs for the analysis has been determined.

## Complete Analysis

Persona: Analyst

Change the state of the LCC to Completed, making the analysis read-only.

# Chapter
# 3

## LCC Analyses

**Topics:**

# About LCC Analyses

LCC Analyses are economic analyses used to evaluate the total cost of ownership of an asset, including cost of installation, operation, maintenance, conversion, and decommission, through applying different operating scenarios to a model.

Managers are able to use analyses to understand the cost of ownership of Assets or fleets of Assets over defined accounting periods or planned asset life. By comparing scenarios, LCC Analyses provide information to inform choices to optimize costs over the period defined in the Analysis. Cost information is presented in a range of categories to help managers determine which assets to buy, what maintenance strategies are most cost effective, and when replacement is necessary. Informed decisions can be based on a range of financial criteria for all scenarios in the analysis, presented in a chart format. Examples include Capital Costs, Operating Costs and Cashflow.

For Example, as a transportation manager, I would like to evaluate the costs of owning a fleet of trucks. Using an LCC Analysis, the company will keep a log of the use and maintenance of each truck in the fleet in order to determine the exact cost of each truck in the fleet and to know when replacement or decommission should occur.

# About Fleet Management

Using LCC Analyses, you can now manage a fleet of vehicles in one central location. Analyses are used to collect performance data, balance costs of ownership, and plan action items over the lifespan of each vehicle, and the fleet.

# Access an LCC Analysis

**Before You Begin**

- Create an Analysis

**Procedure**

1. Access the **LCC Overview** page.
2. Select the **LCC Analyses** tab.

   The **LCC Analyses** section appears, displaying a list of available LCC Analyses.
3. In the list, in the **Analysis Name** column, select an analysis.

   In a new page, the **Analysis Summary** workspace for the selected analysis appears, displaying the **Summary** section. The following charts related to LCC Analyses can be accessed from the drop-down list box:

   - **Capital Cost**: Displays a summary trend for each scenario, which is based on the sum of all capital costs per period for each scenario.
   - **Operating Cost**: Displays a summary trend for each scenario, which is based on the sum of all operating costs per period for each scenario.
   - **Cash Flow Trend**: Displays a summary trend for each scenario, which is based on the cash flow per period for each scenario.
   - **Capital Cost Break Down**: Displays stacked bars for each scenario, which breaks down the capital costs for the capital cost type.

- **Operating Cost Break Down**: Displays stacked bars for each scenario, which breakdown the operating costs by elements.
- **Depreciated Values**: Displays a summary trend of depreciated values per period for each scenario.
- **Present Values**: Displays a summary trend of present values per period for each scenario.
- **Total Cost**: Displays a cumulative summary trend of the associated capital costs and operating costs for each scenario.

## About Analysis Charts and Graphs

### Capital Cost Chart

The Capital Cost Summary Chart displays the trend for each scenario, as well as the sum of all capital costs per period for each scenario.
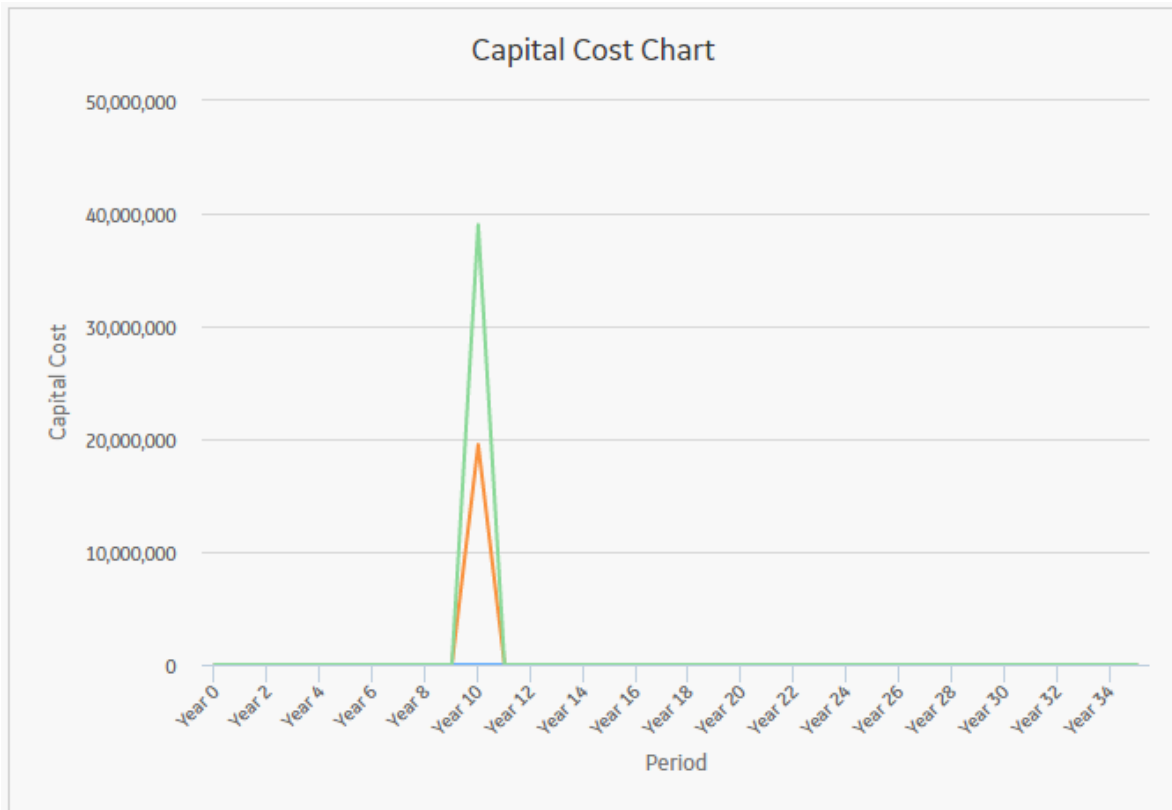


### Capital Cost Break Down Chart

The Capital Cost Break Down Chart displays all the values that comprise the capital cost totals for each scenario in the analysis. Within the chart, you will see a complete breakdown of the costs contained in a scenario. If you hover over the individual capital costs, the title and details of the costs appear.

**Capital Cost Break Down Chart**
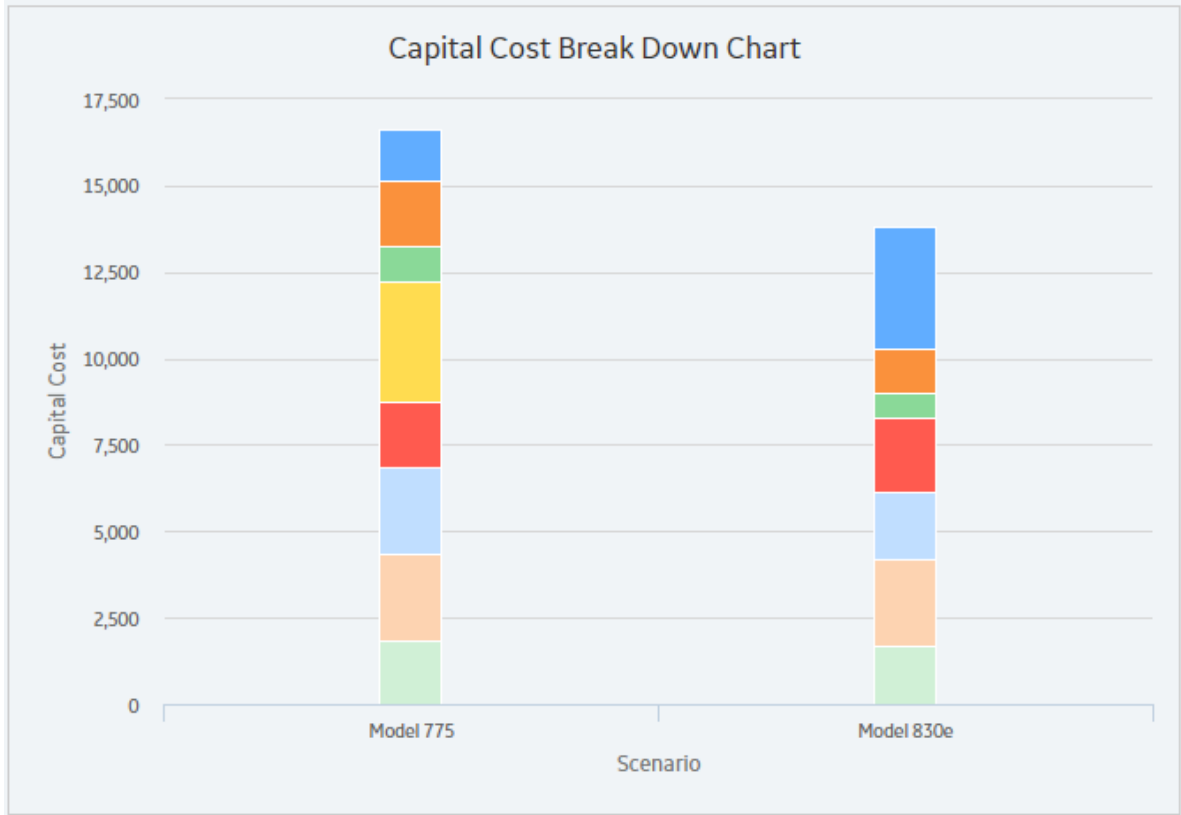
**Cash Flow Chart**

The Cash Flow Chart displays Cash Flow per period. All of the values from the Cost Data grid are factored into the output shown in the chart, making it easier for you to monitor the movement of money throughout the span of the Analysis and easily view and determine which scenario has the optimal cash flow as compared with other scenarios.

**Cash Flow Chart**
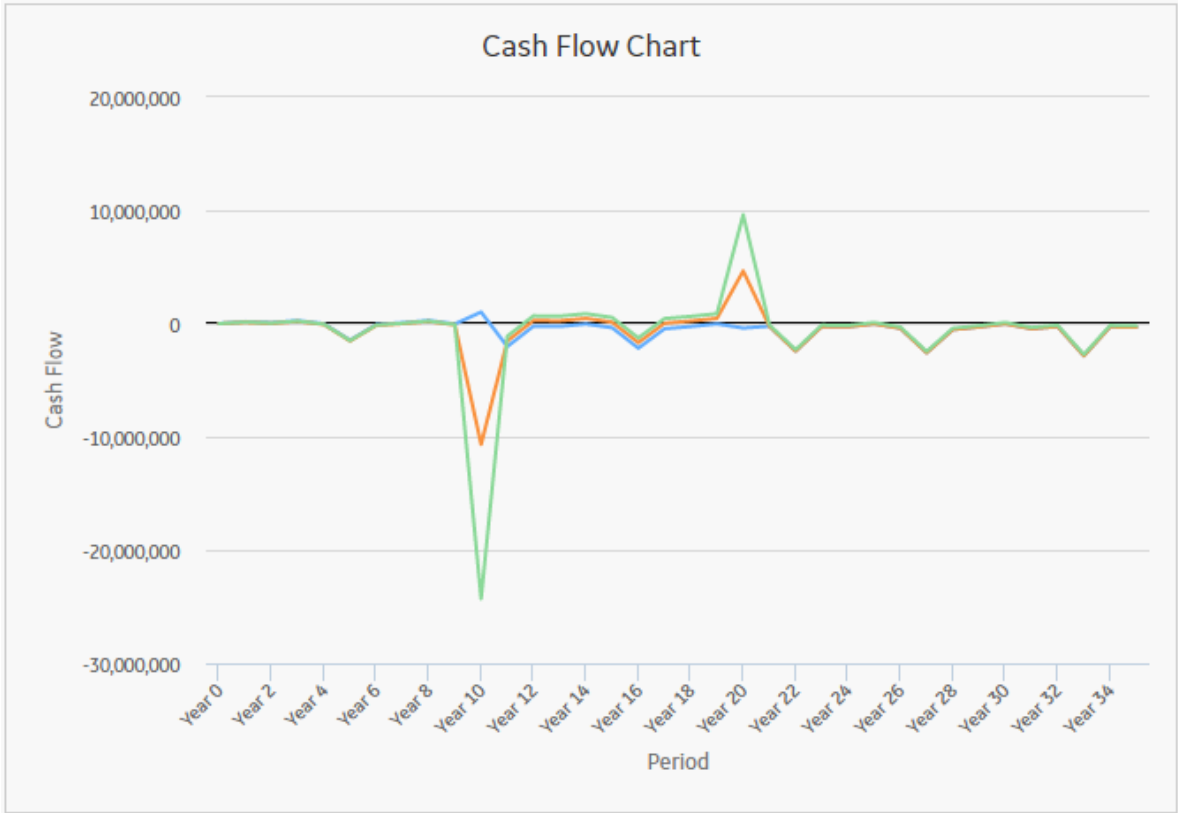
**Depreciated Value Chart**

The Depreciated Value Chart displays Depreciated Values per period for each scenario, detailing how the value of the asset has been depreciated throughout the analysis. The chart allows you to assess the overall depreciation so that a corrective course of action can be determined.
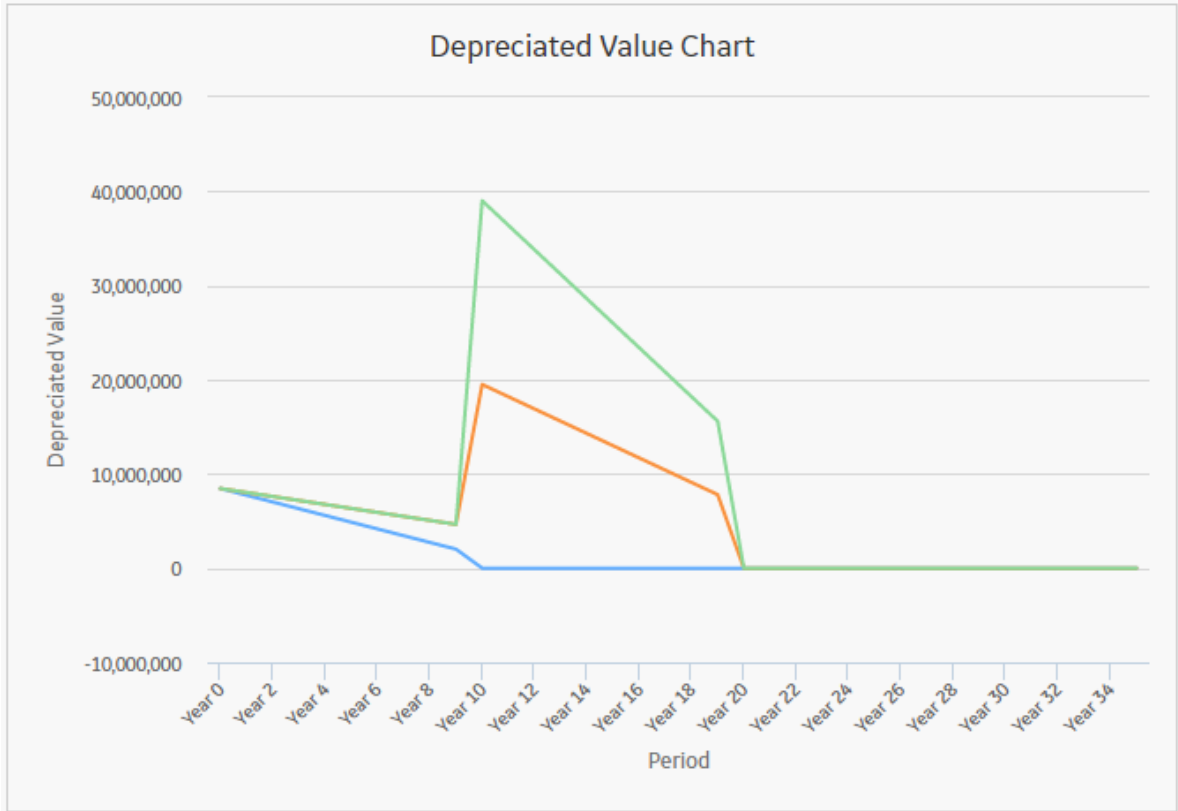
**Equivalent Unit Cost Chart**

The Equivalent Unit Cost Chart displays the average cost per operating unit as it has changed across the analysis lifespan.

**Operating Cost Chart**

The Operating Cost Chart displays the trend, as well as the sum of all operating costs per period for each scenario. The chart allows you to review the overall operating costs of an Analysis and make decisions regarding future courses of action.
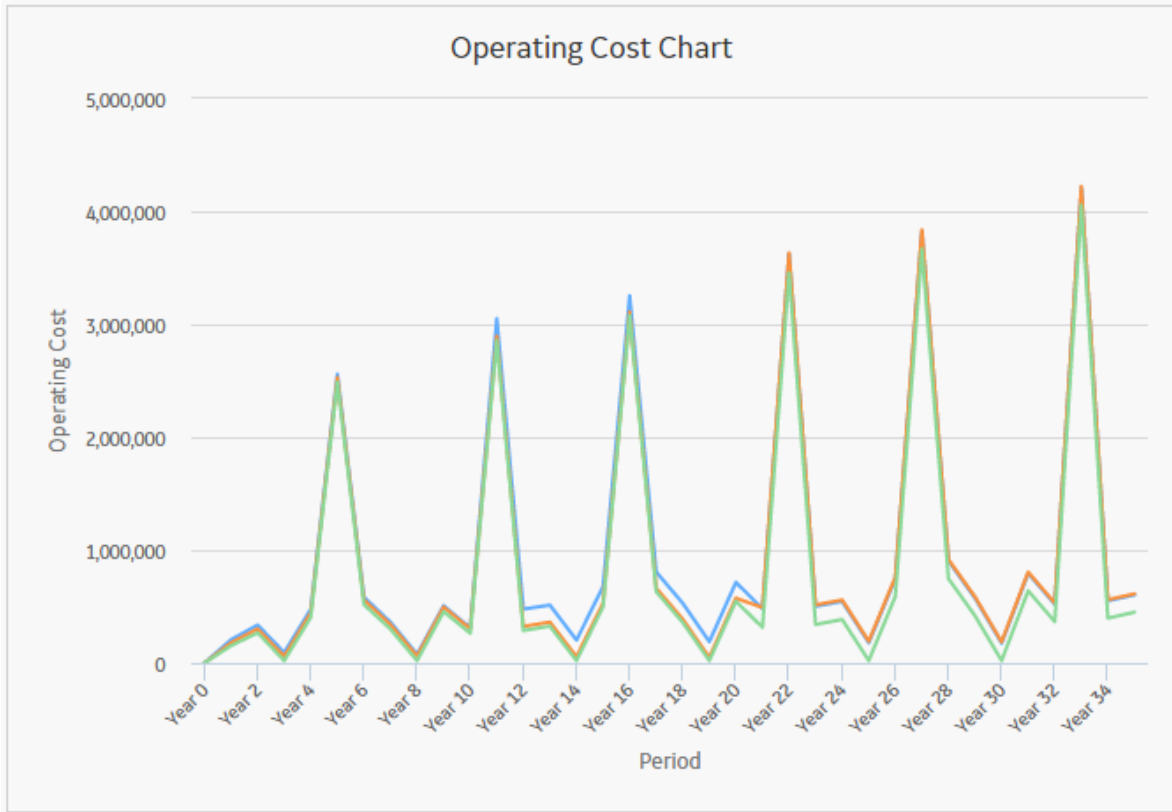


**Operating Cost Break Down Chart**

The Operating Cost Break Down Chart displays stacked bars for each scenario that are broken down by element; these break down the operating costs by elements. The Break Down chart enables you to see where money is being spent within each scenario, identifying major cost drivers and target areas for cost reduction. If you hover over the individual operating costs, the title and details of the costs appear.

**Operating Cost Break Down Chart**

(Chart axis — Operating Cost, Scenario)

X-axis categories:
- As is (10 years of remaining life)
- Overhaul (add 10 years of remaining life. 20 yrs total)
- Replace after 10 years (45 years remaining life)
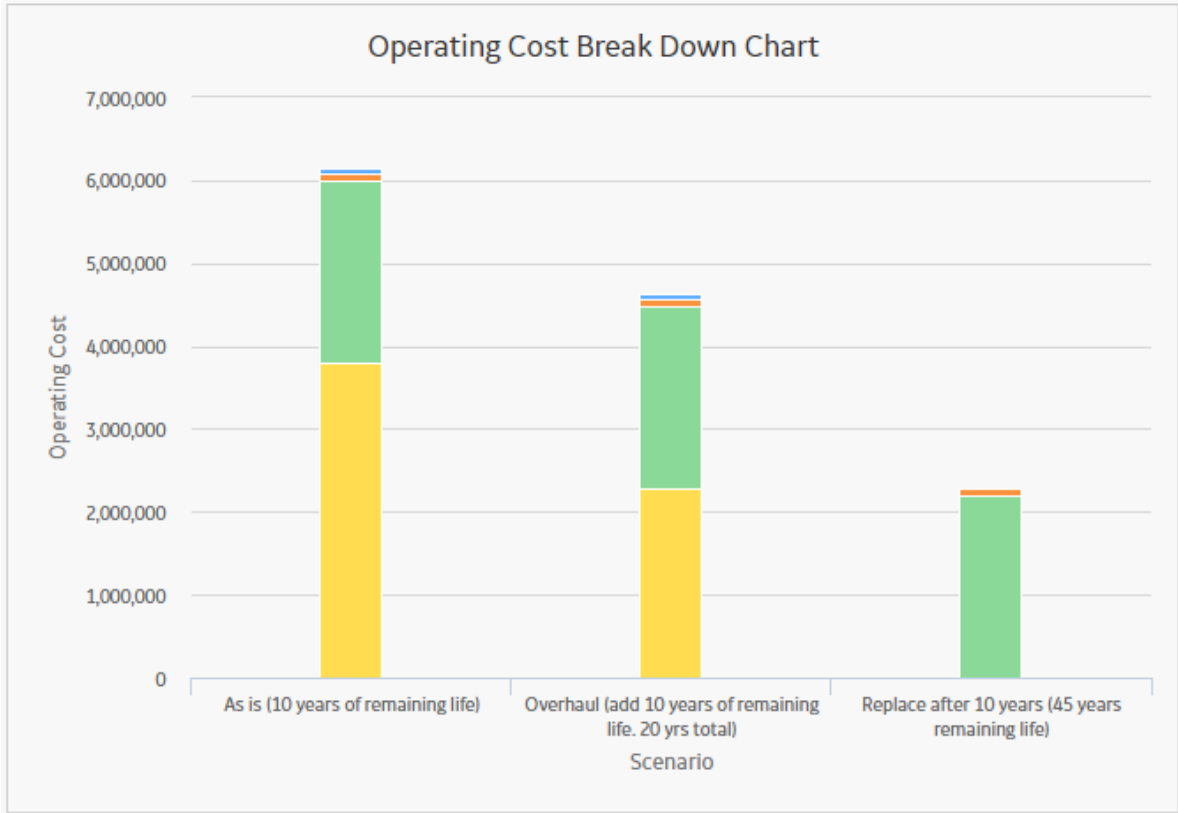
**Present Value Chart**

The Present Value Chart displays Present Values per period for each scenario. Present values are determined based on the Interest Rate.

The chart provides information to allow you to accurately view the expected worth of your Analysis based on the current Interest Rate.

Present Value Chart
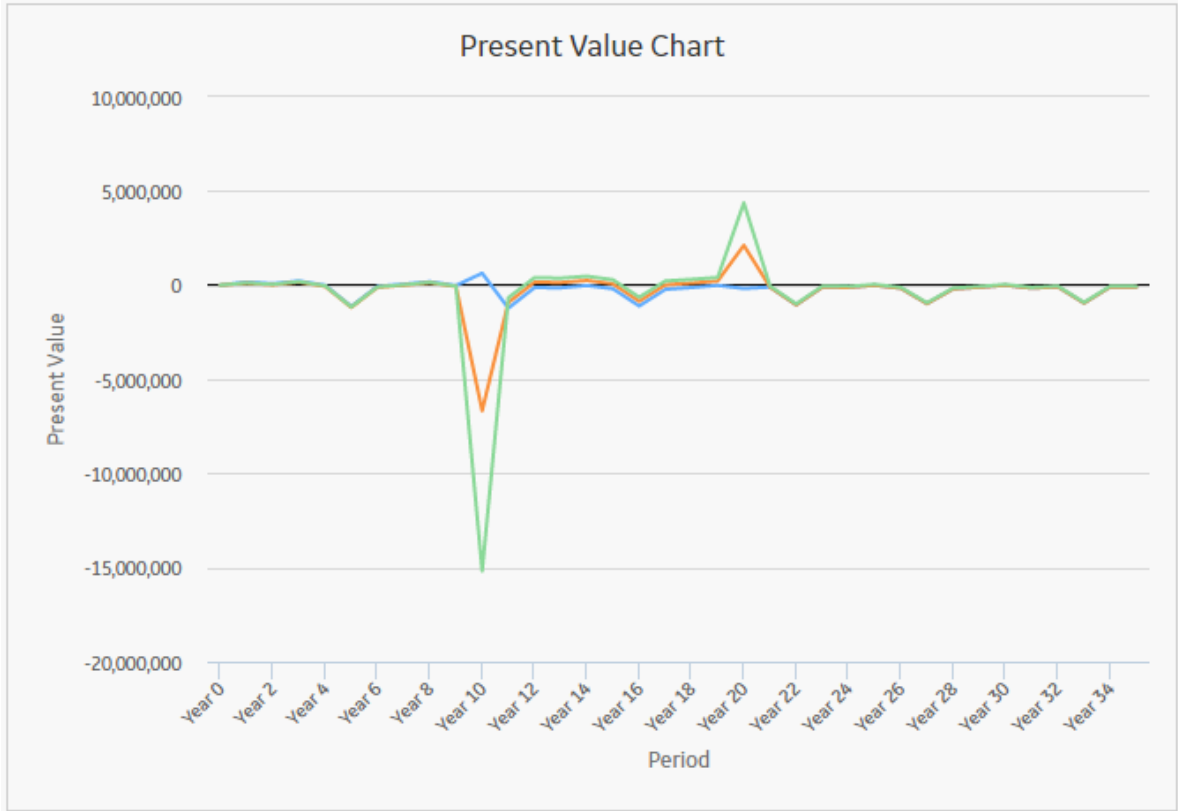
**Remaining Planned Life**

The Remaining Planned Life graph displays the amount of life that remains after consumption throughout a scenario, or all scenarios, in an analysis.



Remaining Planned Life - Fleet B
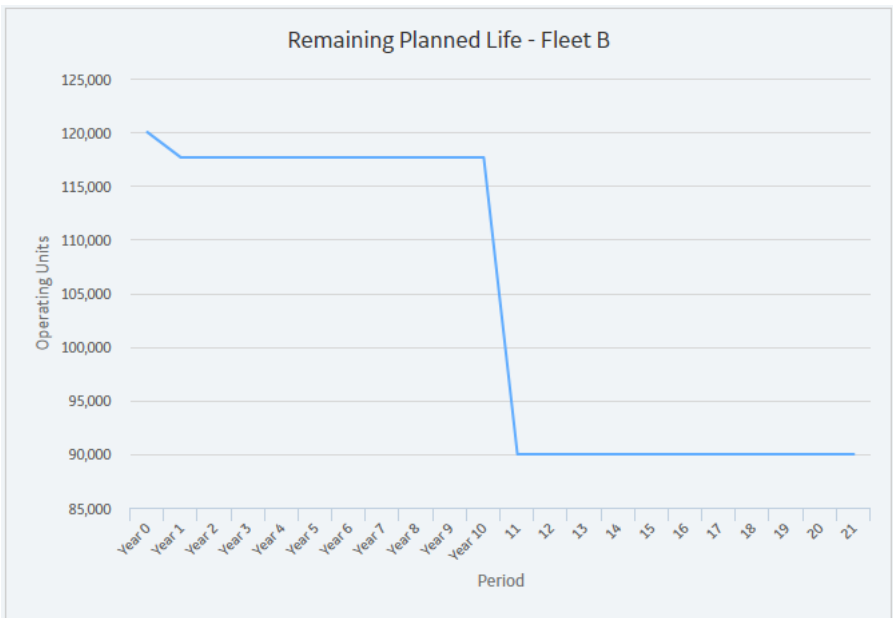
**Total Cost Chart**

The Total Cost Chart displays the cumulative summary trend of the associated capital costs and operating costs for each scenario. The chart allows you to review the overall capital costs and operating costs of an Analysis and make decisions regarding future courses of action.
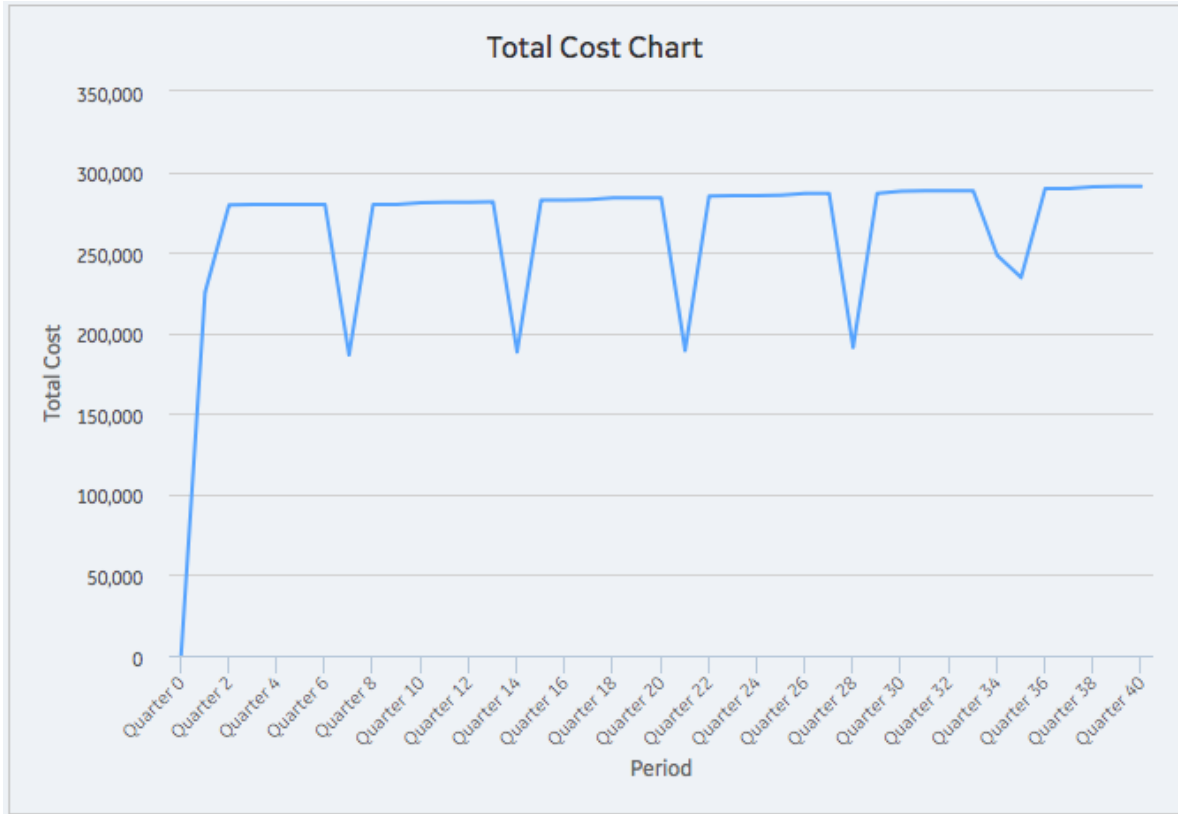


# Create an LCC Analysis

**Procedure**

1. Access the **LCC Overview** page.
2. In the upper-right corner of the page, select **New Analysis**, and then select one of the following options:

| Option | Description |
|---|---|
| **Basic Analysis** | Select this option if you want to create a standard Life Cycle Cost Analysis. |
| **Fleet Management** | Select this option if you want to create an analysis to manage a fleet. This option provides a profile for each secondary element, start and end lives, additional calculated values for EUC and Remaining Life, and additional charts. |

In a new page, the **Analysis Summary** workspace for the new analysis appears, displaying the **Definition** section.

3. As needed, enter values in the available fields, and then select 🖫.

The LCC Analysis is saved.

# Modify an LCC Analysis

**Procedure**

1. Access the LCC Analysis that you want to modify.
2. Select the **Definition** tab.
   The **Definition** section appears.
3. Select ✏.
4. As needed, modify the values in the available fields.

   **Note:** When modifying the value in the **Analysis Period Unit** box and Analysis length, the following occurs:

   - When the Number of Periods field is modified to shorten the Analysis, columns are removed from the end of the Cost Data grid.
   - When the Number of Periods field is modified to lengthen the Analysis, empty columns are added to the end of the Cost Data grid.
   - When only the Start Date field is modified, the columns in the Cost Data grid will remain the same and only the dates in the **Definition** and **Summary** section will reflect the change.
   - When you modify the value in the **Analysis Period Unit** box, the data in the Cost Data grid is divided or aggregated based on the new unit of time that you specify. For example, if a unit was previously measured in years and is now measured in quarters, then the data in each row will be one fourth of what it was previously. For the Salvage Value row, the whole value will appear in the last quarter within the same year.

5. Select 💾.
   The analysis is saved.

# Delete an LCC Analysis

**Procedure**

1. Access the **LCC Overview** page.
2. In the workspace heading, select the **LCC Analyses** tab.
   The **LCC Analysis** section appears, displaying a list of available LCC Analyses.
3. Select the row for the analysis that you want to delete.
4. At the top of the workspace, select 🗑.
   A confirmation message appears.
5. Select **Yes**.
   The LCC Analysis is deleted from the APM database.

# Access Reference Documents in LCC

**Procedure**

1. Access the LCC Analysis whose Reference Documents you want to access.
2. In the workspace, select the **Reference Documents** tab.
   A list of Reference Documents linked to the selected LCC Analysis appears.

# Access the LCC Team Members Section

**Procedure**

1. Access the LCC Analysis whose list of team members you want to access.
2. In the workspace, select the **Team Members** tab.
   The **Team Members** section appears, displaying a list of team members assigned to the analysis.

   **Tip:** For details about working with teams and the **Team Members** section, refer to the Teams section of the documentation.

# Access Recommendations in LCC

**Procedure**

1. Access the LCC Analysis whose list of team members you want to access.
2. Select the **LCC Analyses** tab.
   The **LCC Analyses** section appears, displaying a list of available LCC Analyses.
3. Select the analysis for which you want to access Recommendations.
   The **Analysis Summary** workspace for the selected analysis appears, displaying the **Summary** section.
4. Select .
   The **Recommended Actions** pane expands.

   **Tip:** For information about additional options available when working with recommendation records, refer to the Recommended Actions section of the documentation.

# Chapter
# 4

## Resource Management

**Topics:**

# About Resource Management

Resource Management organizes all of the resources that have been applied to existing analyses in a central location within LCC to ensure easy access. Resource types include people, replacement parts, consumable parts, oils and lubricants, maintenance equipment, and tools.

# Create a Resource

**Procedure**

1. Access the **LCC Overview** page.
2. Select **Resource Management**.
   The **Resource Management** section appears, displaying a list of available resources.
3. Select ╋ .
   The **Add Resource** window appears.
4. As needed, enter values in the available fields.
5. Select **Done**.
   The resource is created.

# Delete a Resource

**About This Task**

**Note:** If you are deleting a resource that has been applied to an LCC cost, then the cost will not be affected.

**Procedure**

1. Access the **LCC Overview** page.
2. Select **Resource Management**.
   The **Resource Management** section appears, displaying a list of available resources.
3. Select the row containing the resource you want to delete, and then select 🗑.
   A confirmation message appears.
4. Select **Yes**.
   The resource is deleted.

# Chapter

# 5

# Scenarios

**Topics:**

# About Scenarios

Scenarios are based on one or more assets or groups of assets that help evaluate the cost of ownership over defined accounting periods or planned asset life. An analysis can have one or many scenarios to cover all of the costs over the lifespan of an asset. On the LCC Overview page, scenario performance can be compared when an analysis has more than one scenario.

Scenarios are made up of an Operating Profile and a Cost Data grid.

For example, a construction company owns a fleet of trucks and would like to assess the cost of trucks over a lifespan. A scenario will include different trucks based on their life expectancy. Within the scenario, the company will keep track of maintenance, repairs, and fuel usage to determine the exact cost of the truck in that scenario.

# About Operating Profiles

Multiple Operating Profiles can be used within a scenario, enabling you to establish different revenue rates for different periods within the analysis. Profiles within scenarios define the production operating rate for a prescribed operating condition by allowing production output values to be added to an analysis. The analysis will then have a value to analyze asset ownership costs.

For example, assume that you have been tasked with determining the lifecycle costs of an air compressor. Your compressor will operate at one operating profile during the summer months and a second operating profile during the winter months, due to the greater density of air in winter. The two profiles allow the performance between two different time spans with different production rates to be captured.

# About LCC Elements

Life Cycle Cost Analysis uses two different types of elements: primary and secondary. Elements are organized in a two-level hierarchy with the primary level as the top level. One or many secondary elements can be added below the primary element, and all element costs are distributed up to the primary element and shown under the scenario calculated costs.

### Primary Elements

Primary elements are assets that apply directly to the scenario and can be supplemented with an infinite number of secondary elements.

### Secondary Elements

Secondary elements are used to add other assets or groups of assets from the hierarchy to scenarios that will contribute to the operating cost. Secondary elements are subcomponents that contribute to the costs of a primary element.

> For example, Hydraulics would be secondary elements to a haul truck, contributing to the overall cost of the primary element.
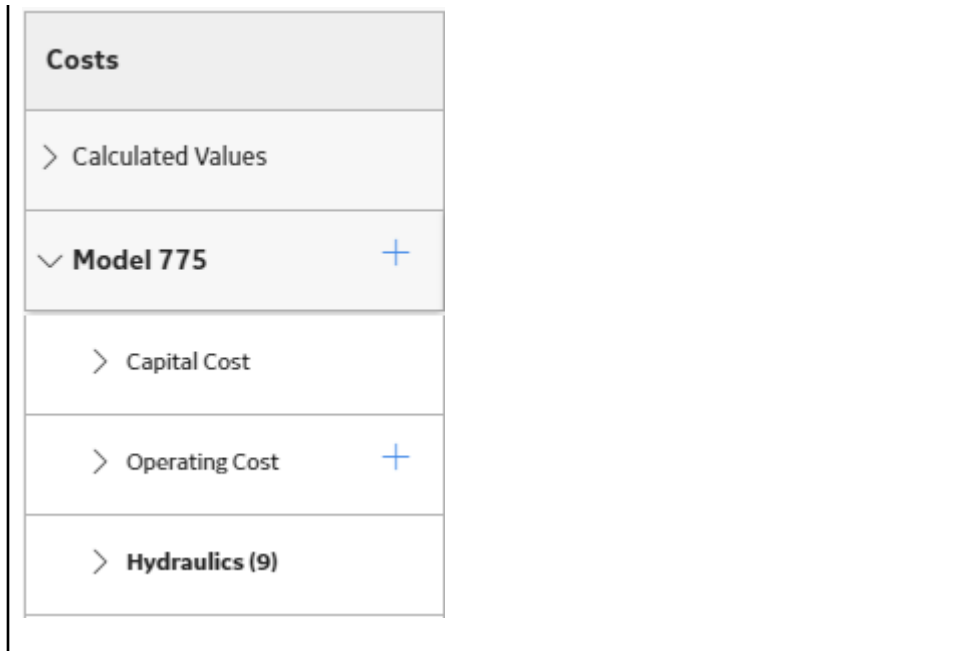
## About Asset Groups in LCC

When you create secondary elements in LCC, you can associate them with a single asset or a previously defined Asset Group. Multiple assets can be added and related by selecting an Asset Group.

For more information about the different Asset Group functions, refer to the Asset section of the documentation. Functions include, but are not limited to, creating and modifying an Asset Group.

## Access a Scenario

**Before You Begin**

- Create a Scenario

**Procedure**

1. Access the Analysis containing the scenario that you want to access.
2. In the left pane, select a scenario.
   The workspace for the selected scenario appears, displaying the **Scenario Definition** section.

## Create a Scenario for an LCC Analysis

**Procedure**

1. Access an LCC Analysis.

2. In the left pane, select ╋.
   The workspace for the new scenario appears, displaying the **Scenario Definition** section.

3. In the **Details** subsection, enter values in the **Scenario ID**, **Primary Element Name** boxes.

4. In the **Link to Hierarchy** box, select ⛃.
   The **Asset Finder** window appears.

5. Navigate to and select an item in the hierarchy, and then select **Done**.

   **Note:** The asset that you choose to link from the hierarchy is used to determine the relevant costs to be imported to the elements in the Cost Data grid.

6. In the **Operating Profile** subsection, complete the **Measurement Unit**, **Value of Unit**, **Measurement Frequency**, and **Rate Capacity** fields.

   **Tip:** Once the Measurement Unit is entered, it is saved in a drop-down list box for future use.

7. In the **Operating Profile** subsection, in the grid, select ＋.
   A new row appears in the grid.

8. In the new row, enter values in the **Profile Name**, **Operating %**, **From**, and **To** boxes.

   **Note:** Profiles are used as the revenue model for the scenario; therefore, a warning message will appear if Profiles overlap or there is a gap where there is no associated profile. One or many Profiles can be created to cover the span of the analysis.

9. In the new row, if you want the profile to repeat annually, then select the **Repeat Annually** check box.

10. Select 🖫.
    The scenario is saved.

## Create a Scenario for a Fleet Analysis

**Procedure**

1. Access an LCC Analysis.

2. In the left pane, select ＋.
   The workspace for the new scenario appears, displaying the **Scenario Definition** section.

3. In the **Details** subsection, enter values in the **Scenario ID**, **Primary Element Name** boxes.

4. In the **Link to Hierarchy** box, select ⛃.
   The **Asset Finder** window appears.

5. Navigate to and select an item in the hierarchy, and then select **Done**.

   **Note:** The asset that you choose to link from the hierarchy is used to determine the relevant costs to be imported to the elements in the Cost Data grid.

6. In the grid, select ＋.
   A new row appears.

7. Enter a **Secondary Element Name**.

8. To associate the secondary element with either an Asset or an Asset Group, in the Asset Hierarchy ID cell, select ⛃.
   The **Asset Finder** window appears.

9. Navigate to an Asset or Asset Group in the hierarchy, and then select the asset or asset group from the list.

   **Note:** The asset that you choose to link from the hierarchy is used to determine the relevant costs to be imported to the elements in the Cost Data grid.

10. Select **Done**.
    The Asset Hierarchy ID field is populated with a link, and the Quantity field is populated with a value of 1 automatically.

**Note:** The hyperlink for an Asset or Asset Group displays the asset or asset group's datasheet in the record explorer. The Quantity can be manually modified by entering a new number in the field. Every cost, entered or imported, is multiplied by the Quantity in the element's cost summary row.

11. In the **Operating Profile** subsection, complete the **Measurement Unit**, **Value of Unit**, **Measurement Frequency**, and **Rate Capacity** fields.

    **Tip:** Once the Measurement Unit is entered, it is saved in a drop-down list box for future use.

12. Select the row of the secondary element for which you want to enter the operating rate.

    **Note:** The **Operating Rate For** subsection is enabled once a secondary element is selected.

13. In the **Operating Profile** subsection, in the grid, select ╋.
    A new row appears.

14. In the new row, enter values in the **Profile Name**, **Operating %**, **From**, and **To** boxes.

    **Note:** Profiles are used as the revenue model for the scenario; therefore, a warning message will appear if Profiles overlap or there is a gap where there is no associated profile. One or many Profiles can be created to cover the span of the analysis.

15. In the new row, if you want the profile to repeat annually, then select the **Repeat Annually** check box.

16. Select 💾.
    The scenario is saved.

# Create a Profile

**Procedure**

1. Access the Scenario for which you want to create a profile.

2. In the **Operating Profile** subsection of the **Scenario Definition** section, select ╋.
   A new row appears in the grid.

3. In the new row, enter values in the **Profile Name**, **Operating %**, **From**, and **To** boxes.

   **Note:** Profiles are used as the revenue model for the scenario; therefore, a warning message will appear if Profiles overlap or there is a gap where there is no associated profile. One or many Profiles can be created to cover the span of the analysis.

4. In the new row, if you want the profile to repeat annually, then select the **Repeat Annually** check box.

5. Select 💾.
   The profile is created.

# Create a Secondary Element

**Procedure**

1. Access the Scenario to which you want to create a secondary element.

2. In the **Details** subsection, in the upper-left corner of the grid, select ╋.
   A new row appears in the grid.

3. Enter a **Secondary Element Name**.

4. To associate the secondary element with either an Asset or an Asset Group, in the **Asset Hierarchy ID** cell, select ▲.
   The **Asset Finder** window appears.

# Delete a Secondary Element

**Procedure**

1. Access the Scenario from which you want to delete a secondary element.
2. In the row for the secondary element that you want to delete, select the check box, and then select
   🗑.
   A confirmation message appears.
3. Select **OK**.
   The selected secondary element and all links to assets or groups created when the element was added are deleted.

# Import Scenario Elements Into an Analysis

**About This Task**

You can use the import feature within the **Scenario Definition** section to create a new, comprehensive analysis by adding primary and secondary elements from previously created analyses. These will appear as secondary elements in the target scenario.

**Procedure**

1. Access the scenario into which you want to import a previously created scenario's elements.

2. In the **Details** subsection, select ⤵.
   The **Import Secondary Elements** window appears, displaying a list of scenarios. The list is comprised of scenarios with the same site, start date, period type, and number of periods as the target analysis.
3. Select the scenario that contains elements you want to import into the analysis, and then select **Import**.
   The primary and secondary elements from the selected scenario appear in the **Details** subsection. In addition, all associated capital and operating costs for the imported elements are imported.

# Copy a Scenario Within an Analysis

**Procedure**

1. Access a Scenario.

2. In the left pane, select ⧉.
   A confirmation message appears.
3. Select **Yes**.
   The workspace for the copied scenario appears, displaying all the copied information from the original scenario. The scenario is saved, with its name based on the following format: <Name of the original scenario> Copy

   If you want to change the name of the scenario, you can enter the new name in the Scenario ID field, and then select 💾.

# Delete a Profile

**Procedure**

1. Access the Scenario containing the profile that you want to delete.
2. In the **Profile** section grid, select the check box beside the profile that you want to delete.
3. Select 🗑.
   A confirmation message appears.
4. Select **Yes**.
   The profile is deleted and its associated revenues are removed from the cost data grid.

# Delete a Scenario

**Procedure**

1. Access the LCC Analysis containing the scenario that you want to delete.
2. In the left pane, select the scenario that you want to delete, and then select 🗑.
   A confirmation message appears.
3. Select **Yes**.
   The scenario is deleted.

# Chapter

# 6

## Cost Data

**Topics:**

# About Cost Data

Cost Data includes all of the costs that an Asset or Group of Assets will incur throughout the life span of an asset. It is essential that all Cost Data is collected before and throughout the LCC Analyses to maximize reliability and accuracy.

> **Example**
>
> For example, if the asset is a fleet of service vehicles, you would want to collect the following types of Cost Data:
>
> - Maintenance Costs
> - Replacement Parts
> - Energy Costs
> - Driver Costs
>
> By collecting all of the above Cost Data, you can create an analysis to maintain, track, and predict costs throughout the lifespan of the fleet of service vehicles.

# About Operating Costs

### Blank Rows

Blank rows provide the option to add costs to the grid and apply them the applicable period(s).

### Known Interval/Cost

Known interval cost data provides the ability for you to track the ongoing costs that occur on a regular basis.

For example, a fleet of trucks have their air filters changed every 6 months. Air filter maintenance can be logged in the cost data grid by adding a Known Interval/cost and continued every 6 months for the life of the truck.

### Distributed Costs

Distributed costs can be added where the user has the option to specify the distribution type and distribution parameters. The application of these costs will distribute the mean cost over all periods within the scenario based upon the shape of the distribution that was specified.

> In a scenario with 10 yearly periods, where the user elects to apply a distributed cost with the following parameters:
>
> - Mean Cost: 50000
> - Distribution Type Weibull
> - Beta: 1.25
> - Eta: 72 (months)
> - Gamma: 0
>
> The costs would be applied as follows:

| Period | Cost |
|---|---|
| Period 1 | 5051 |
| Period 2 | 6137 |
| Period 3 | 5975 |
| Period 4 | 5463 |
| Period 5 | 4823 |
| Period 6 | 4158 |
| Period 7 | 3521 |
| Period 8 | 2940 |
| Period 9 | 2425 |
| Period 10 | 1981 |

**Distributed Cost Application**
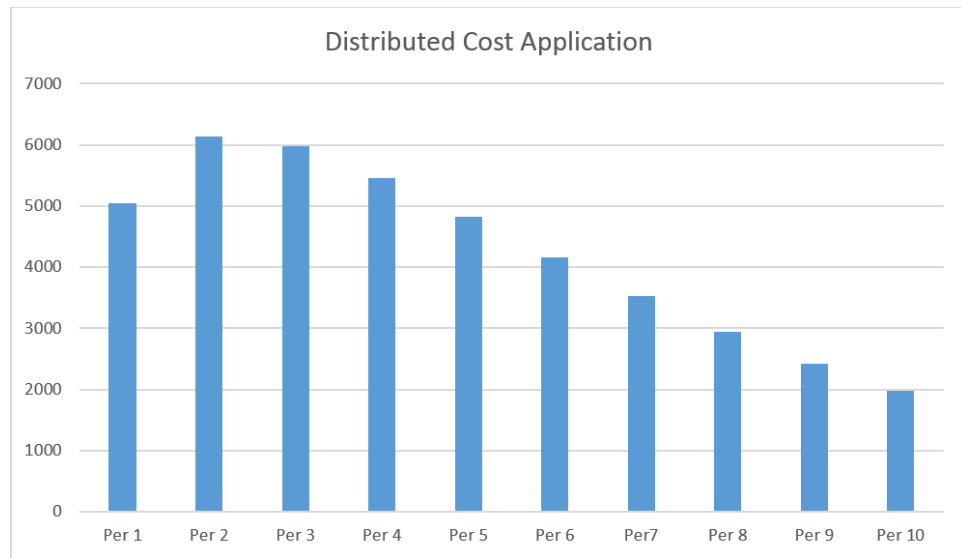
## About Import Cost Data

In LCC, you are able to import cost data from sources including Work Histories, Strategy Actions, Production Events, and Datasets. Importing cost data in various forms allows you to evaluate the Total Cost of Ownership for an asset with all of the information in the Cost Data grid.

Possible Cost Data you may want to import:

- Equipment Failures.
- Shutdowns and Slowdowns + Maintenance actions.
- Insurance costs.
- Fuel/Energy usage.

# About Calculated Values

Calculated Values are located at the top of the Cost Data grid and are automatically factored or calculated from data from the Primary Element and Secondary Elements. Calculated values provide a mathematical summation of the costs associated with each of the elements within the analysis.

Calculated Values Include:

- Capital Costs
- Operational Costs
- Total Depreciated Values
- Revenue
- Cash Flow
- Present Value
- Planned Unit Consumption
- Equivalent Unit Cost

# Access a Cost Data Grid

**Before You Begin**

- Create a Scenario

**Procedure**

1. Access a Scenario.
2. Select **Cost Data**.
   The **Cost Data** section appears, displaying the **Cost Data** grid.

   **Note:** The unit displayed in grid heading (i.e., quarters, months, or years) is based on the Analysis Period Unit that you selected when you created the analysis.

# Create a Resource

**Procedure**

1. Access a Cost Data grid.
2. In the cell for the Cost Element to which you want to add a resource, select ┼, and then select **Add a New Resource**.

   The **Create a New Resource** window appears.
3. As needed, enter values in the available fields, and then select **Next**.
   The **Apply Resource** section appears.
4. Enter values in the **Quantity**, **Consumption Unit**, **Period Usage**, and **Periods** boxes, and then select **Finish**.
   The new resource is added.

# Add an Existing Resource

**Procedure**

1. Access a Cost Data grid.

2. In the cell for the Cost Element to which you want to add a resource, select ＋, and then select **Add Existing Resource**.
   The **Select Resources** section appears.

3. Beside each resource that you want to add, select the check box, and then select **Next**.
   The selected resources appear in the **Apply Resource** section.

4. Enter values in the **Quantity**, **Consumption Unit**, **Period Usage**, and **Periods** boxes.

   If you want to add another resource, select ＋.

5. Select **Finish**.
   The selected resources are added.

# Create a Secondary Element in the Cost Data Grid

**Procedure**

1. Access a Cost Data grid.

2. In the primary element cell, select ＋.

   The **Add Secondary Element** window appears.

3. If you want to add an element that is listed in the hierarchy:

   a. Beside the **Asset Hierarchy ID** box, select ⛰.
      The **Hierarchy** window appears.

   b. Navigate to and select an Asset, and then select **Done**.

   c. Enter values in the **Secondary Element** and **Quantity** boxes.

      **Note: Quantity**, which has a default of 1, is used as a multiplier. For example, if the quantity is equal to 10, all of the operating and capital costs are multiplied by 10.

   d. On the **Add Secondary Element** window, select **OK**.

   -or-

   If you want to add an element that is not listed in the hierarchy:

   a. Enter values in the **Secondary Element** and **Quantity** boxes, and then select **OK**.

      **Important:** When adding an asset not listed in the hierarchy, the import features may not have the context needed to function and will return null results.

   The secondary element appears in the Cost Data grid.

# Copy a Secondary Element

**Procedure**

1. Access a Cost Data grid that contains at least one secondary element.
2. Select the row that contains the secondary element that you want to copy.

   The selected row is highlighted.

3. In the upper-right corner of the **Cost Data** section, select .

   The **Copy selected item?** dialog box appears, asking you to confirm that you want to copy the selected secondary element.

4. Select **Yes**.

   The copied secondary element appears in the Cost Data grid and in the **Details** subsection of the **Scenario Definition** section.

   **Note:** The quantity of the new secondary element will be set to 1, regardless of the quantity of the secondary element you copied. The asset associated with the original secondary element will be removed.

# Create Operating Costs Manually

**Procedure**

- Create a Blank Row

  1. Access a Cost Data grid.

  2. In the **Operating Cost** cell, select ╀, and then select **Blank Row**.
     A new row appears.

  3. In the new row, enter values in the cells.

- Create a Known Interval/Cost

  1. Access a Cost Data grid.

  2. In the **Operating Cost** cell, select ╀, and then select **Known Interval/Cost**.
     The **Add Known Interval Cost** window appears.

  3. Enter values in the **Cost Name**, **Cost**, **Interval**, **Interval Unit**, **Start Date** boxes.

  4. Select **OK**.
     The Known Interval Cost is added in a new row in the Cost Data grid according to the interval within the analysis period row or column.

- Create a Distributed Cost

  1. Access a Cost Data grid.

  2. In the **Operating Cost** cell, select ╀, and then select **Distributed Cost**.
     The **Add Distributed Cost** window appears.

  3. As needed, modify the **Cost Name**, **Mean Cost**, **Interval Unit**, **Interval Distribution Type**, **Beta**, **Eta**, and **Gamma** boxes, and then select **OK**.
     Based on the Interval Distribution Type selection, the Distributed Cost is added in a new row to the Cost Data grid.

# Import Cost Data

**About This Task**

**Important:** To execute this procedure, membership in Security Groups additional to those normally associated with this module is required. For more information, please see the Security Groups topic.

**Procedure**

- Import Work History

  1. Access a Cost Data grid.

  2. In the element section to which you want to add cost data, in the **Operating Cost** cell, select ╋, and then select **Import Data**.

     The **Import Operating Cost Data** window appears.

  3. Depending on the type of source that you want to import, select the **Work History**, **Strategy Action**, **Production Event**, or **Dataset** check box.

  4. Select **Next**.
     Based on the assets associated with the element, a list of work history events and their associated event types and costs appears.

  5. Select the work history events that you want to import, and then select **Next**.
     The **Data Mapping** section appears.

  6. In the **Start Date** and **End Date** boxes, select dates to set the Review Period for the events you are importing, then select **Next**.
     A list of the costs that you are importing appears.

  7. Depending on how you want the data to be displayed in the grid, select **Individual Costs** or **Group costs and sum total**.

     If **Individual Costs** is selected, then each selected event will add a new row to the Cost Data grid. If **Group costs and sum total** is selected, then all selected action costs are summed by year number and inserted into grid as one row.

  8. Select **Finish**.
     The selected cost data is imported to the Cost Data grid and repeated every review period until the end of the analysis with cost inflation applied.

- Import Strategy Action Costs

  1. Access a Cost Data grid.

  2. In the element section to which you want to add cost data, in the **Operating Cost** cell, select ╋, and then select **Import Data**.

     The **Import Operating Cost Data** window appears.

  3. Depending on the type of source that you want to import, select the **Work History**, **Strategy Action**, **Production Event**, or **Dataset** check box.

  4. Select **Next**.
     A list of Strategy Actions related to the asset or asset group selected in the primary or secondary element appears.

  5. Beside each Strategy Action that you want to import, select the check box, and then select **Next**

     The Strategy Actions associated with the asset will only appear in the list if the strategy is currently active.

     The **Confirmation** screen appears displaying the list of Strategy Actions that you selected and their associated costs.

6. Select **Individual Costs** or **Group costs and sum total**, depending on how you want the data to be displayed in the grid.

   If **Individual Costs** is selected, each selected action will add a new row to the cost grid. If **Group costs and sum total** is selected, all selected action costs are summed by year number and inserted into grid as one row.

7. Select **Finish**.
   The selected cost data is imported to the Cost Data grid.

• Import Production Event Costs

   1. Access a Cost Data grid.

   2. In the element section to which you want to add cost data, in the **Operating Cost** cell, select $+$, and then select **Import Data**.

      The **Import Operating Cost Data** window appears.

   3. Depending on the type of source that you want to import, select the **Work History**, **Strategy Action**, **Production Event**, or **Dataset** check box.

   4. Select **Next**.
      A list of Production Events appears based on the event, where the causing asset has been associated with either primary or secondary elements.

   5. Beside each Production Event that you want to import, select the check box, and then select **Next**.
      The **Data Mapping** section appears.

   6. Enter values in the **Cost ID**, **Cost**, **Date**, **Start Date**, and **End Date** boxes, and then select **Next**.

      The Date selection in the Data Mapping subsection determines whether repeat events are based on the Start Date or End Date of the source event. The Start Date and End Date fields in the Review Period subsection define the frequency of the repeat events.

   7. Select **Individual Costs** or **Group costs and sum total**, depending on how you want the data to be displayed in the grid, and then select **Finish**.

      If **Individual Costs** is selected, each selected action will add a new row to the cost grid. If **Group costs and sum total** is selected, all selected action costs are summed by year number and inserted into grid as one row.

      The selected cost data is imported to the Cost Data grid and repeated every review period until the end of the analysis with cost inflation applied.

• Import a Dataset

   1. Access a Cost Data grid.

   2. In the element section to which you want to add cost data, in the **Operating Cost** cell, select $+$, and then select **Import Data**.

      The **Import Operating Cost Data** window appears.

   3. Depending on the type of source that you want to import, select the **Work History**, **Strategy Action**, **Production Event**, or **Dataset** check box.

   4. Select **Browse**.
      The **Select a Dataset from the catalog** window appears.

   5. Navigate to and select the data that you want to import.

   6. Select **Open**.
      The dataset link is automatically populated in the Dataset box.

   7. Select **Next**.
      Data from the selected dataset is displayed.

   8. Select the data that you want to insert into the Cost Data grid.

   9. Select **Next**.
      The **Data Mapping** section appears.

10. Enter the Cost ID, Cost, Date, Start Date, and End Date values.

    The difference between the Date value in each row and the Start Date entered in step 10 will determine the period number of each row. For example, if year number is 5, then the current cost will be populated in the Year 5 column. The Review Period Start Date must precede the date of the first imported cost. The Review Period End Date must follow the date of the most recent imported cost.

11. Select **Next**.
    A list of costs that you are importing appears.

12. Depending on how you want the data to be displayed in the grid, select **Individual Costs** or **Group costs and sum total**.

    If **Individual Costs** is selected, each cost will be inserted into the grid as a new row. If **Group costs and sum total** is selected, all costs will be combined and only one new row will be inserted into the grid.

13. Select **Finish**.
    The selected cost data is imported to the Cost Data grid and repeated every review period until the end of the analysis with cost inflation applied.

# Access Calculated Values

**About This Task**

Calculated Values are available in the Cost Data grid for each scenario and for each period within each scenario. For information on the formulas used to calculate the values, refer to the Rates and Calculations section.

**Note:** The values appear a whole numbers in the grid. However, the actual value appears when the cell is selected and is what is stored in the database. If a number is too long to fit in the cell, then scientific notation is used.

**Procedure**

1. Access a Cost Data grid.
   The **Calculated Values** row appears at the top of the Cost Data grid with values listed in columns including:

   • **Total Cost of Ownership** (**TCO**)
   • **Net Present Value** (**NPV**)
   • **Internal Return Rate** (**IRR**)
   • **Planned Unit Consumption** (**PUC**)
   • **Equivalent Unit Cost** (**EUC**)

2. Expand the **Calculated Values** row.
   The grid and various sub rows containing calculated values appear.

   Sub rows include:

   • **Capital Costs**

     Note: **Capital Costs** sums the capital costs of all elements in the scenario.
   • **Operational Costs**

     Note: **Operational Costs** sums the operating costs of all elements in the scenario.
   • **Total Depreciated Value**

**Note: Total Depreciated Value** sums the depreciated values for both primary and secondary elements

- **Revenue**
- **Cash Flow**
- **Present Value** (**PV**)

# Add Capital Costs to the Cost Data Grid

**About This Task**

In LCC, you have the ability to add the value or cost of an asset into the calculation using the **Capital Cost** section of the Cost Data grid. The added capital costs are depreciated according to the method and rate determined in the analysis model. Capital Costs can be added at the Primary and Secondary Element levels.

Initial Values are entered at Year 0 and are not treated as costs or revenue, as they are the value of the element at T0 before the analysis. The total capital cost for an element is the sum of rows underneath it, excluding the initial value row, salvage value row, and depreciated value row.

Capital Costs are added to the depreciated value of the element and the Depreciated Value sum shown in the calculated values for the period. Capital costs and Initial Value are depreciated to the Salvage Value in the period in which the salvage is taken.

**Procedure**

1. Access a Cost Data grid.
2. Expand the **Primary Element Name** or **Secondary Element** section.
3. Expand the **Capital Cost** section.
4. Select the cell beside the value that you want to add in the corresponding column.
5. Enter the value.
6. Select any other cell.
   Your changes have been saved.

   **Note:** Sums are displayed in the **Sum of Capital Costs** row at the top of the **Capital Cost** section.

# Delete Cost Data

**Procedure**

1. Access a Cost Data grid.
2. Select the row containing the data that you want to delete, and then, in the upper-right corner of the section, select **Delete**.
   A confirmation message appears.
3. Select **Yes**.
   The Cost Data has been deleted.

# Chapter

# 7

**Deployment and Upgrade**

**Topics:**

- Deployment
- Upgrade

# Deployment

## Deployment

Refer to the deployment information here Deploy LCC for the First Time.

# Upgrade

## Upgrade

Refer to the upgrade information here: Upgrade Life Cycle Cost Analysis.

# Chapter

# 8

# Reference

**Topics:**

# General Reference

## LCC Site Filtering

A Life Cycle Cost Analysis is assigned a site and spread to all the related records, such as Analysis records and Cost records. In LCC, users will see only LCC Analyses that are assigned to their site(s) or that are global records.

**Tip:** For more information, refer to the Site Filtering section of the documentation.

When a user with multiple sites creates an LCC Analysis, the user will have the option of selecting one of the sites or selecting Global.

When a user makes an asset selection, the list of assets is limited to assets that have the same site as the analysis.

Resources are all viewable by any user and can be used in any analysis.

---

**Example**

Consider an organization that has three sites, Site X, Site Y, and Site Z. The following LCC Analysis records exist:

- LCC Analysis A: Assigned to Site X
- LCC Analysis B: Assigned to Site Y
- LCC Analysis C: Assigned to Site Z
- LCC Analysis D: No site assigned (global record)

**Scenario 1: User assigned to only Site X**

This user will see LCC Analyses A and D.

**Scenario 2: User assigned to both Site X and Site Y**

This user will see LCC Analyses A, B, and D.

**Scenario 3: Super User**

This user will see LCC Analyses A, B, C, and D.

**Important:** If a multi-site user or a Super User links child records from multiple sites to a parent record designated as a global record, then another user who does not have access to all sites may only see a portion of the data associated with that record. In the example above, if a child record assigned to Site X and a child record assigned to Site Y are linked to LCC Analysis D, the Site X user will not be able to see all the records associated with LCC Analysis D.

---

## LCC Data Model

The following diagram shows how the families used in LCC are related to one another.
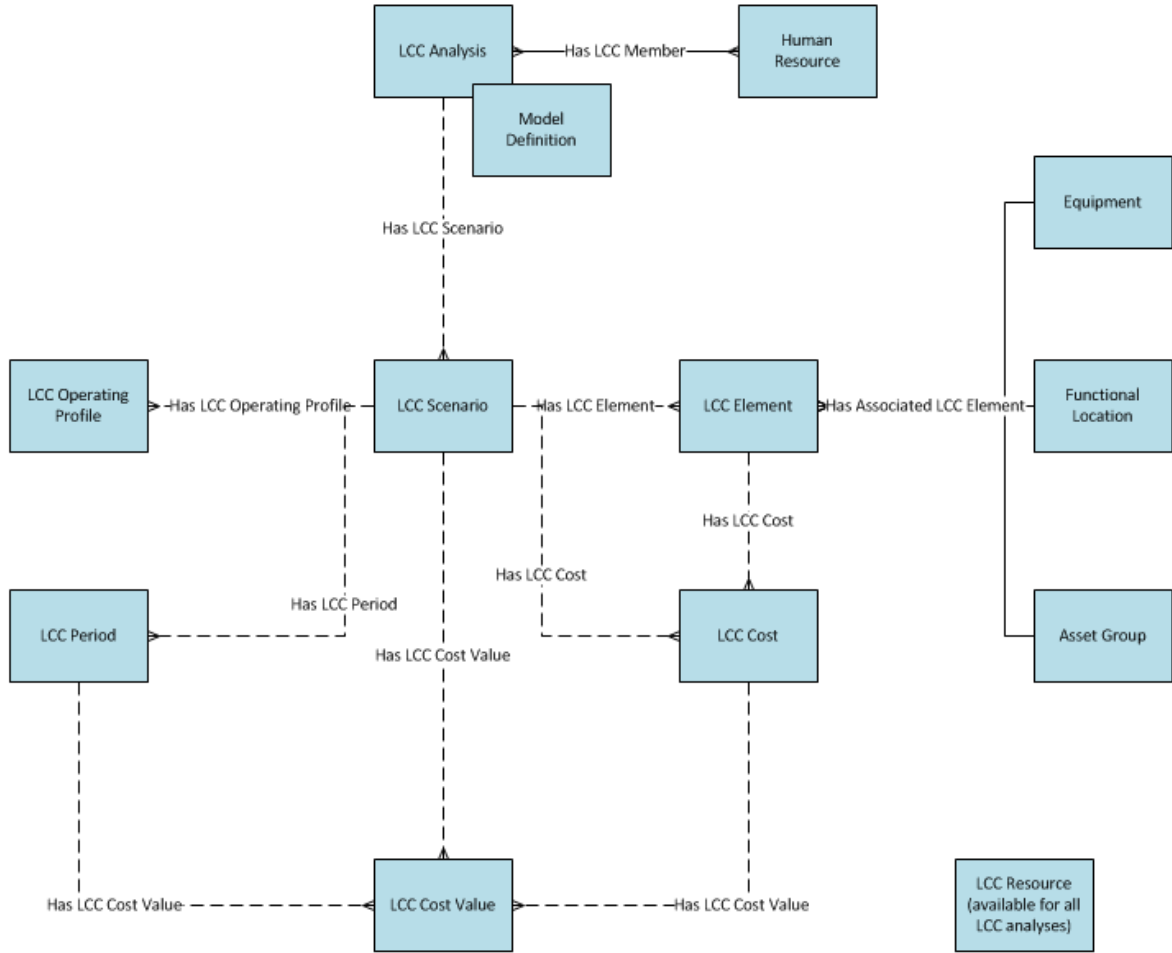
**Note:** In the diagram, boxes represent entity families and lines represent relationship families that are configured in the baseline database. You can determine the direction of each relationship definition from the direction of the arrowhead: the box from which the arrow originates is the predecessor, and the box to which the arrow head points is the successor.

## LCC URLs

There is one URL route associated with Life Cycle Cost Analysis: LCC. The following table describes the various paths that build on the route, and the elements that you can specify for each.

**Tip:** For more information, refer to the URLs section of the documentation.

| Element | Description | Accepted Value(s) | Notes |
|---|---|---|---|
| lcc/dashboard/0: Displays the LCC Dashboard (no asset context). | | | |
| lcc/dashboard/0/<AssetKey>: Displays the LCC Dashboard with an asset context. | | | |
| AssetKey | Entity key of the selected asset | None | N/A |
| lcc/shell/0/summary: Displays the Definition of a new LCC Analysis. Used to create a new LCC Analysis. | | | |

| Element | Description | Accepted Value(s) | Notes |
|---|---|---|---|
| lcc/shell/<AnalysisKey>/summary: Displays the Overview and Definition of an existing LCC Analysis. Used to open an existing LCC Analysis. | | | |
| AnalysisKey | Entity key of a LCC Analysis record | None | N/A |
| lcc/shell/<AnalysisKey>/scenario/0/definition: Displays the Scenario Definition for a new scenario in an existing LCC Analysis. Used to add a new scenario to an existing LCC Analysis | | | |
| AnalysisKey | Entity key of a LCC Analysis record | None | N/A |
| lcc/shell/<AnalysisKey>/scenario/<ScenarioKey>/definition: Displays the Scenario Definition for an existing scenario in an existing LCC Analysis. Used to open an existing scenario in an existing LCC Analysis and show Scenario Definition. | | | |
| AnalysisKey | Entity key of a LCC Analysis record | None | N/A |
| ScenarioKey | Entity key of a LCC Scenario record | None | N/A |
| lcc/shell/<AnalysisKey>/scenario/<ScenarioKey>/grid: Displays the Cost Data for an existing scenario in an existing LCC Analysis. Used to open an existing scenario in an existing LCC Analysis and show Cost Data. | | | |
| AnalysisKey | Entity key of a LCC Analysis record | None | N/A |
| ScenarioKey | Entity key of a LCC Scenario record | None | N/A |

**Example URLs**

| Example URL | Destination |
|---|---|
| lcc/dashboard/0 | **LCC Overview** page |
| lcc/dashboard/0/1234567 | **LCC Overview** page in the context of an asset with the Entity Key 1234567 |
| lcc/shell/0/summary | **LCC Analysis Definition** page to create a new LCC Analysis |
| lcc/shell/1234567/summary | **LCC Analysis Overview** page and **LCC Definition** page of an existing LCC Analysis with the Entity Key 1234567 |
| lcc/shell/1234567/scenario/0/definition | **Scenario Definition** page to add a new scenario to an existing LCC Analysis with the Entity Key 1234567 |
| lcc/shell/1234567/scenario/7654321/definition | **Scenario Definition** page of an existing scenario with the Entity Key 7654321 in an existing LCC Analysis with the Entity Key 1234567 |
| lcc/shell/1234567/scenario/7654321/grid | **Cost Data** page of an existing scenario with Entity Key 7654321 in an existing LCC Analysis with the Entity Key 1234567 |

# LCC System Code Tables

The following table lists the System Code Tables that are used by LCC:

| Table ID | Table Description | Function |
|---|---|---|
| MI_LCC_CAL_VAL_TYPE | Calculated Value Type | Populates the cost name for costs that are a subcategory of Calculated Values. |
| MI_LCC_COST_TYPE | Cost Type | Populates the cost name for costs that are a subcategory of the primary or secondary element. |
| MI_LCC_DEPRECIATION_METHOD | Depreciation Method | Populates the Depreciation Method field in LCC Analysis records. |
| MI_LCC_FIXED_COST_TYPE | Capital Cost Type | Populates the name for costs in the Capital Cost subcategory. |
| MI_LCC_INTEREST_RATE_TYPE | Interest Rate Type | Populates the Interest Rate Type field in LCC Analysis records. |
| MI_LCC_PERIOD_UNITS | Period Units | Populates the Period Unit field in LCC Analysis records. |
| MI_LCC_PROFILE_UNITS | Profile Rate Units | Populates the Measurement Frequency field in LCC Scenario records. |
| MI_LCC_RESOURCE_CATEGORY | Resource Category | Populates the Type field in LCC Resource records. |
| MI_LCC_TEAM_MEMBER_TYPE | LCC Team Member Type | Populates the Type field for LCC Team Members. |

# Family Field Descriptions

## Analysis Records

Analysis records store information about the fields in the Analysis family that are used to populate the fields for the Analysis Definition. This topic provides an alphabetical list and description of the fields that exist for the Analysis family and appear on the LCC Analysis datasheet. The information in the table reflects the baseline state and behavior of these fields.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site and will only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

| Field | Data Type | Description | Behavior and Usage |
|---|---|---|---|
| Analysis Period Unit | Character | The time for unit period. | The default value for this field is years. This field is required. |
| Annual Effective Interest Rate | Numeric | The annualized compounding interest rate. | This value must be a positive number. This field is required. |

| Field | Data Type | Description | Behavior and Usage |
|---|---|---|---|
| Annual Escalation Rate | Numeric | The current price or value minus the initial cost or value in a one-year period, divided by the initial price. | This value must be a positive number.<br>This field is required. |
| Annual Nominal Interest Rate | Numeric | The stated interest rate of a given loan. | This value must be a positive number.<br>This field is required. |
| Assumptions | Text | User entered field describing any/all relevant Assumptions. | Text is entered in the Assumptions field. |
| Constraints | Text | User entered field describing any/all Constraints. | Text is entered in the Constraints field. |
| Currency | Character | The currency used by your organization. | The default value for this field is US Dollars. |
| Declining Balance Factor | Numeric | The factor that determines accelerated depreciation in which the amount of depreciation that is charged to an asset declines over time. | The default value for this field is 2, which represents double declining balance depreciation.<br>The value in this field must be a positive number. |
| Dependencies | Text | User entered field that described any/all dependencies. | Text is entered in the Dependencies field. |
| Depreciation Method | Character | The method used to determine depreciation of the asset over time. | The value in this field can be:<br>• Straight Line<br>• Declining Balance<br>• Sum of Year's digits<br>This field is required. |
| Description | Text | User entered field that described any/all descriptions. | Text is entered in the Description field. |
| End Date | Date | The date on which the analysis ended. | This field is calculated by adding the analysis period to the start date.<br>This field is required. |
| Interest Rate Type | Character | The type of interest rate, either Simple or Compound, used for the analysis. | This field is required. |
| Is Fleet Management | Boolean | Identifies whether or not the analysis is used for fleet management. | This field is calculated by your selection when creating a new analysis. |
| Name | Character | The name of the analysis. | This field is required. |
| Number of Periods | Numeric | The number of periods (for example, years) which the analysis covers. | This field is required. |

| Field | Data Type | Description | Behavior and Usage |
|---|---|---|---|
| Objectives | Text | The objectives for the analysis as defined by your organization. | Text is entered in the Objectives field. |
| Start Date | Date | The date on which the analysis began. | You can use the Calendar feature to select the date on which the analysis began.<br><br>This field is required. |
| Tax Rate | Numeric | The tax rate associated with the analysis. | This value must be a positive number.<br><br>This field is required. |

## Cost Records

Cost records store information about the cost data used in LCC. This topic provides an alphabetical list and description of the fields that exist for the Cost family and appear on the LCC Cost datasheet. The information in the table reflects the baseline state and behavior of these fields.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site and will only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

| Field | Data Type | Description | Behavior and Usage |
|---|---|---|---|
| Cost Name | Character | The name of the cost. | Text is entered in the Cost Name field. |
| Cost Type | Character | Determines the type of cost for the record. | The value in this field can be:<br>• Capital<br>• Operating<br>• Calculated |
| Element Key | Numeric | The Entity Key of the element record. | System Generated field that is hidden by default. |
| Is Primary | Logical | Indicates whether or not the cost is for the primary element. | This field is required. |
| Resource Name | Character | The name of the resource. | Text is entered in the Resource Name field to describe the resource. |
| Scenario Key | Numeric | The Entity Key of the scenario record. | System Generated field that is hidden by default. |
| Total | Numeric | The total of costs of the cost record. | This field is the sum of the costs of all periods associated with this cost. |

## Cost Value Records

Cost Value records store information about costs. This topic provides an alphabetical list and description of the fields that exist for the Cost Value family. The information in the table reflects the baseline state and behavior of these fields.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site and will only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

| Field | Data Type | Description | Behavior and Usage |
|---|---|---|---|
| Cost | Numeric | The cost associated with the record. | A numeric value is entered in the Cost field. |
| Cost Key | Numeric | The Entity Key of the cost record. | System Generated field that is hidden by default. |
| Period Key | Numeric | The Entity Key of the period record. | System Generated field that is hidden by default. |
| Scenario Key | Numeric | The Entity Key of the scenario record. | System Generated field that is hidden by default. |

## Element Records

Element records store information about the elements used in scenarios. This topic provides an alphabetical list and description of the fields that exist for the Element family. The information in the table reflects the baseline state and behavior of these fields.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site and will only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

| Field | Data Type | Description | Behavior and Usage |
|---|---|---|---|
| Is Primary? | Logical | Indicates whether or not the associated record is the "Primary" Scenario element. | This field is required. |
| Name | Character | The name of the element record. | This field is required. |
| Planned Life End | Numeric | The number of units at the end of operation. This field is only available for Fleet Management analyses. | This field is required. |
| Planned Life Start | Numeric | The number of units at the beginning of operation. This field is only available for Fleet Management analyses. | This field is required. |

| Field | Data Type | Description | Behavior and Usage |
|---|---|---|---|
| Quantity | Numeric | The quantity of the element record. | This field is required. |
| Scenario Key | Numeric | The Entity Key associated with the scenario record. | System Generated field that is hidden by default. |

## Operating Profile Records

Operating Profile records store information about the fields in the Operating Profile. This topic provides an alphabetical list and description of the fields that exist for the Operating Profile family. The information in the table reflects the baseline state and behavior of these fields.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site and will only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

| Field | Data Type | Description | Behavior and Usage |
|---|---|---|---|
| From | Date | The start date for which the profile is applicable. | This field is required. |
| Name | Character | The name of the profile. | This field is required. |
| Operating Rate in Percentage | Numeric | The rate of the profile. | This field is required. |
| Repeat Annually | Logical | Indicates whether or not the operating profile repeats annually. | This field is required. |
| Scenario Key | Numeric | The Entity Key of the scenario record. | System Generated field that is hidden by default. |
| To | Date | The end date for which the profile is applicable. | This field is required. |

## Period Records

Period records store information about the periods in scenarios. This topic provides an alphabetical list and description of the fields that exist for the Period family. The information in the table reflects the baseline state and behavior of these fields.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site and will only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

| Field | Data Type | Description | Behavior and Usage |
|---|---|---|---|
| Name | Character | The value used to identify the period. | This field is required. |
| Scenario Key | Numeric | The Entity Key of the scenario record. | System Generated field that is hidden by default. |
| Sequence | Numeric | A number indicating the order of the period. | This value begins with 0. This field is required. |

## Resource Records

Resource records store information about the resources used in scenarios. This topic provides an alphabetical list and description of the fields that exist for the Resource family. The information in the table reflects the baseline state and behavior of these fields.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site and will only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

| Field | Data Type | Description | Behavior and Usage |
|---|---|---|---|
| Description | Text | The details of the resource. | Text entered in the Description field to describe the resource. |
| Name | Character | The value used to identify the resource. | This field is required. |
| Type | Character | The selection of the type of resource. | The Type must be one of the following values:<br>• Labor<br>• Part<br>This field is required. |
| Unit | Character | The selection of the resource unit. | The Unit field is entered. This field is required. |
| Unit Cost | Numeric | The cost of the unit resource. | This field is required. |

## Scenario Records

Scenario records are used to determine values in a scenario and store information about the fields in a scenario. This topic provides an alphabetical list and description of the fields that exist for the Scenario family. The information in the table reflects the baseline state and behavior of these fields.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site and will only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

| Field | Data Type | Description | Behavior and Usage |
|---|---|---|---|
| Analysis Key | Numeric | The numeric key associated with the Analysis. | System Generated field that is hidden by default. |
| Description | Text | The details of the scenario. | Text entered in the Description field to describe a scenario. |
| Internal Rate of Return (IRR) | Numeric | The discount rate used to make the net present value equal 0. | This field is automatically populated. |
| Is Template | Logical | Identifies whether or not a scenario has been saved as a template. | This field is required. |
| Measurement Frequency | Character | A value describing the unit of rate capacity. This value is used in conjunction with Monetary Value and Unit of Measure. | The Rate of Measure must be one of the following:<br>• Per Year<br>• Per Quarter<br>• Per Month<br>• Per Week<br>• Per Day<br>• Per Hour<br>This field is required. |
| Measurement Unit | Character | A value that defines the unit of measure (e.g. gallons, miles, pounds) that is applicable in the Operating Profile. | This value is used in conjunction with Monetary Value and Rate of Measure<br>This field is required. |
| Name | Character | The value used to identify the scenario. | This field is required. |
| Net Present Value(NPV) | Numeric | The sum of the present values of incoming and outgoing cash flows over an analysis period. | This field is not required. |
| Rate Capacity | Numeric | A value describing the maximum rate of measurement (e.g. 5000 gallons/Year). | This field is required. |
| Total Capital Cost | Numeric | The sum of all Capital Costs in a scenario. | This field is automatically populated.<br>This field is required. |
| Total Cost of Ownership | Numeric | The sum of all costs required for the ownership of an asset in a scenario. | This field is automatically populated.<br>This field is not required. |

| Field | Data Type | Description | Behavior and Usage |
|---|---|---|---|
| Total Operational Cost | Numeric | The sum of all costs needed for asset operations in a scenario. | This field is automatically populated.<br><br>This field is required. |
| Value of Unit | Numeric | A monetary value per unit measurement (e.g. $1000/gallon). | This value is used in conjunction with Rate of Measure and Unit of Measure.<br><br>This field is required. |

# Catalog Items

## Analyses Folder

The Catalog folder `\\Public\Meridium\Modules\LCC\Analyses` contains individual cost data queries for each analysis created in a database.

## Dashboards Folder

The Catalog folder `\\Public\Meridium\Modules\LCC\Dashboards` contains the following items.

| Item Name | Behavior and Usage |
|---|---|
| LCC Dashboard | A dashboard featuring information related to Life Cycle Cost Analysis. |

## Graphs Folder

The Catalog folder `\\Public\Meridium\Modules\LCC\Graphs` contains the following items.

| Graph Name | Behavior and Usage |
|---|---|
| Life Cycle Performance - Highest IRR Scenario for Each Analysis | Graph for the LCC Overview dashboard.<br><br>This graph shows the Total Cost of Ownership, Net Present Value, and Internal Rate of Return of the top 10 LCC Scenarios with the highest NPV of all LCC Scenarios with the highest IRR within a LCC Analysis. |
| Life Cycle Performance - Highest NPV Scenarios | Graph for the LCC Overview dashboard.<br><br>This graph shows the NPV of the top 10 LCC Scenarios with the highest NPV of all LCC Scenarios. |

## Queries Folder

The Catalog folder `\\Public\Meridium\Modules\LCC\Queries` contains the following items.

| Query Name | Behavior and Usage |
|---|---|
| AnalysisTileQuery | Returns a list of LCC Analyses.<br><br>This query is used to generate the list of LCC Analyses that is displayed on the **LCC Overview** page. |
| Capital Cost Breakdown vs Sequence Name | Used to generate the Capital Cost Breakdown chart on the **LCC Overview** page. |
| Capital Cost vs Sequence name | Used to generate the Capital Cost chart on the **LCC Overview** page. |
| Cash Flow vs Sequence name | Used to generate the Cash Flow chart on the **LCC Overview** page. |
| Cost Data Query | Used to collect all of the data in the cost data grid. |
| Depreciated Values vs Sequence Name | Used to generate the Depreciated Value chart on the **LCC Overview** page. |
| Example - Labor Cost by Year and Name | Sample query that returns the labor cost by year and resource name for a selected analysis and scenario. |
| Example - Resource Cost by Year and Name | Sample query that returns the resource cost by year and resource name for the selected analysis and scenario. |
| Example - Total Costs by Year | Sample query that returns the total cost by year and resource name for the selected analysis and scenario. |
| Get Cost Details for Scenario | Returns all LCC Cost records in a LCC Scenario. The APM system uses this query when copying an LCC Scenario. |
| Get Cost Value Details from Scenario | Returns all LCC Cost Value records in a LCC Scenario. The APM system uses this query when copying LCC Scenario. |
| Get Element Details for Scenario | Returns all LCC Element records in a LCC Scenario. The APM system uses this query when copying an LCC Scenario. |
| Get Period Details for Scenario | Returns all LCC Period records in a LCC Scenario. The APM system uses this query when copying an LCC Scenario. |
| IRR Query | Returns the Total Cost of Ownership, NPV, and IRR of the top 10 LCC Scenarios with highest NPV of all LCC Scenarios with highest IRR within an LCC Analysis. This query is used to generate data for the **Life Cycle Performance - Highest IRR Scenario for Each Analysis** section on the LCC Dashboard. |
| IRR Query dependency | Returns the Total Cost of Ownership, NPV, and IRR of all LCC Scenarios with highest IRR among those within an LCC Analysis. This query is used as a sub-query of the IRR Query query. |
| LCC Dashboard Graph Query - NPV with ACC and NA | Returns the NPV of the top 10 LCC Scenarios with highest NPV of all LCC Scenarios. |
| LCC Page Filter | This query is used to generate the page filter on the **LCC Overview** page. |

| Query Name | Behavior and Usage |
|---|---|
| LCC Resource List Query | Returns a list of LCC Resources.<br><br>This query is used to generate the list of LCC Resources on the **LCC Overview** page. |
| Operating Cost Breakdown vs Sequence Name stacked | Operating Cost Breakdown chart in **LCC Overview** page. |
| Operating Cost vs Sequence Name | Used to generate the Operating Cost chart on the **LCC Overview** page. |
| Present Value Vs Sequence Name | Used to generate the Present Value chart on the **LCC Overview** page. |

# Rates and Calculations

## Interest Rate Definitions

There are several types of interest rates used in LCC Analyses.

The differences among the various types of rates are based on several key economic factors.

### Annual Nominal Interest Rates

The annual nominal interest rate is the stated interest rate of a given loan. It is the actual monetary price that borrowers pay to lenders to use their money. If the nominal rate on a loan is 5%, then borrowers can expect to pay $5 of interest for every $100 loaned to them for one year.

### Simple Interest Rates

Simple interest rate is the easiest to calculate as there is no compounding taking place over each year. So, a 5% simple annual interest rate adds 5 percent to the capital sum owed for each year.

> **Simple Interest Rates**
>
> If you put a sum of money in the bank and spend the interest earned each year (i.e., the capital stays constant), the amount of money that you will have earned some time in the future is given by the formula:
>
> $A = P(1+r)*t$
>
> where P is the initial investment (Principal), r is the interest rate per period expressed as a decimal fraction, t is the number of periods, and A is the amount of money in the bank plus the interest you spend at the end of the calculated period.

### Compounded Interest Rates

In compounded interest rates, the rate of annual interest is applied to the principal sum borrowed, plus the additional amount owed in the previous year due to the interest already applied.

> **Compounded Interest Rates**
>
> If you put a sum of money in the bank and let the interest accumulate, the amount of money that you will have some time in the future is given by the formula:
>
> $A = P(1+r)^t$

where P is the initial investment, r is the interest rate per period, t is the number of periods, and A is the amount of money in the bank after the periods.

**Real Interest Rates**

The real interest rate states the "real" rate that the lender receives after inflation is factored in; that is, the interest rate that exceeds the inflation rate. If a bond that compounds annually has a 6% nominal yield and the inflation rate is 4%, then the real rate of interest is only 2%.

The real rate of interest could be said to be the actual mathematical rate at which investors and lenders are profiting from their loans. It is actually possible for real interest rates to be negative if the inflation rate exceeds the nominal rate of an investment. For example, a bond with a 3% nominal rate will have a real interest rate of -1% if the inflation rate is 4%. A comparison of real and nominal interest rates can therefore be summed up in this equation:

**Real interest rate = Nominal interest rate – Inflation**

Several economic stipulations can be derived from this formula that lenders, borrowers and investors can use to make more informed financial decisions.

Real interest rates can not only be positive or negative, but can also be higher or lower than nominal rates. Nominal interest rates will exceed real rates when the inflation rate is a positive number (as it usually is). But, real rates can also exceed nominal rates during deflation periods.

**Annual Effective Interest Rates**

The effective rate takes the power of compounding into account for Nominal Interest Rate. For example, if a bond pays 6% on an annual basis and compounds semiannually, then an investor who invests $1,000 in this bond will receive $30 of interest after the first 6 months ($1,000 x .03), and $30.90 of interest after the next 6 months ($1,030 x .03). The investor received a total of $60.90 for the year, which means that while the nominal rate was 6%, the effective rate was 6.09%.

Mathematically speaking, the difference between the nominal and effective rates increases with the number of compounding periods within a specific time period.

# Depreciation Methods

Depreciation Methods include:

**Declining Balance**

Declining balance method of depreciation is a technique of accelerated depreciation in which the amount of depreciation that is charged to an asset declines over time. In other words, more depreciation is charged during the beginning of the lifetime and less is charged during the end.

The reason for a declining amount of depreciation charged is that assets are usually more productive when they are new and their productivity declines gradually. Thus, in the early years of their operation, assets generate more revenue as compared to the revenue generated in later years of their life.

**Formula and Calculation Procedure**

Declining balance depreciation is calculated using the following formula:

Depreciation = Depreciation Rate × Book Value of Asset

Depreciation rate is given by the following formula:

Depreciation Rate = Accelerator × Straight Line Rate

In the above formula, accelerator is a multiplication factor, which accelerates depreciation. Book value is the difference between cost of an asset and its accumulated depreciation. During the first accounting period, accumulated depreciation is zero, so book value is equal to cost. Since the book value decreases after each depreciation charge, depreciation expense declines in successive charges.

Depreciation is charged according to the above method as long as book value is greater than the salvage value of the asset. No more depreciation is provided when book value equals salvage value.

### Single Line

Single line (or Straight line) depreciation is the default method used to gradually reduce the carrying amount of a fixed asset over its useful life. The method is designed to reflect the consumption pattern of the underlying asset, and is used when there is no particular pattern to the manner in which the asset is to be used over time.

1.  Under the straight-line method of depreciation, depreciation occurs evenly over the estimated useful life of an asset. The straight-line calculation steps are:
2.  Determine the initial cost of the asset that has been recognized as a fixed asset.
3.  Subtract the estimated salvage value of the asset from the amount at which it is recorded on the books.
4.  Determine the estimated useful life of the asset. It is easiest to use a standard useful life for each class of assets.
5.  Divide the estimated useful life (in years) into 1 to arrive at the straight-line depreciation rate.
6.  Multiply the depreciation rate by the asset cost (less salvage value).

> **Single Line**
>
> Pensive Corporation purchases the Procrastinator Deluxe machine for $60,000. It has an estimated salvage value of $10,000 and a useful life of five years. Pensive calculates the annual straight-line depreciation for the machine as:
>
> - Purchase cost of $60,000 – estimated salvage value of $10,000 = Depreciable asset cost of $50,000
> - 1 / 5-year useful life = 20% depreciation rate per year
> - 20% depreciation rate x $50,000 depreciable asset cost = $10,000 annual depreciation

### Sum of Years

The sum-of-years digits depreciation method is an accelerated method of depreciation that calculates depreciation using the following equation:

$$SYD = \frac{(cost - salvage) * (life - per + 1) * 2}{life * (life + 1)}$$

where,

cost = initial cost of the asset (at start of period 1)

salvage = final value of the asset at the end of its lifetime

life = number of periods over which the depreciation occurs

per = the period for which the depreciation is being calculated

**Straight Line**

Straight line is the sum of capital costs and number of periods.

Annual (Straight Line) Depreciation Rate DSL = (V-S)/(V*L)

# Annual Discount Rate

The annual discount rate is the rate of return used in a discounted cash flow analysis to determine the present value of future cash flows.

**Details**

In an annual discounted cash flow analysis, the sum of all future cash flows (C) over some holding period (N), is discounted back to the present using a rate of return (r). This rate of return (r) in the below formula is the discount rate.

$$NPV = \sum_{n=0}^{N} \frac{C_n}{(1+r)^n}$$

# Net Present Value

The net present value (NPV) or net present worth (NPW)[1] is defined as the sum of the present values (PVs) of incoming and outgoing cash flows over a period of time. Incoming and outgoing cash flows can also be described as benefit and cost cash flows, respectively.

$$NPV = \sum_{n=0}^{N} \frac{C_n}{(1+r)^n}$$

# Present Value

Present value is the current value of future cash flows base on the Discount Rate. For LCC, the Discount Rate is calculated from Nominal Interest Rate to give the time value of money being applied.

(Cash Flow / (1+Discount Rate))

# Costs

Costs include:

**Capital Costs**

Capital costs are costs, typically recurring, which are set in advance and do not vary. Examples include storage overheads amortized over the total number of assets, documentation, etc.

**Cash Flow**

Cash flow represents the after tax influx of money, which can be positive if savings are considered.

(Revenue - (All Costs + Depreciation)) * (1-Tax Rate) + Depreciation

### Operational Costs

Operational costs are the sum of operation costs for a period and includes all variable costs related to operating the equipment (e.g., fuel and maintenance).

### Revenue

Revenue is calculated from the Profile.

### Total Cost of Ownership

Total Cost of Ownership represents the sum of all cash flows after tax cost over the life cycle of the asset.

# Annual Escalation Rate

Annual Escalation Rate = current cost or value minus the initial price or value and divide by the initial price in a one year period.

ER = (C2 – C1) / C1, where C1 is initial cost and C2 is the end value after 1 year

# Internal Rate of Return

Internal Rate of Return (IRR) is the annual rate of growth that an investment is expected to generate. IRR represents the interest rate required to bring the Net Present Value (NPV) to zero, and gives the anticipated return rate from investment in the asset (Total Cost of Ownership). You must have the initial costs as well as the costs per year in order to calculate.

$$0 = NPV = \sum_{n=1}^{N} \frac{c_n}{(1+r)^n} - C_0$$

Example:

Initial Cost: $5000

Year 1: $1700

Year 2: $1900

Year 3: $1600

Year 4: $1500

Year 5: $700

$$0 = NPV = \frac{\$1700}{(1+r)^1} + \frac{\$1900}{(1+r)^2} + \frac{\$1600}{(1+r)^3} + \frac{\$1500}{(1+r)^4} + \frac{\$700}{(1+r)^5} - \$5000$$

$$r = 16.61\%$$

**Note:** The IRR calculation is an iterative process and the system performs 1000 iterations to calculate IRR. If IRR can't be calculated in 1000 iterations then N/A is displayed as IRR value.

## Planned Unit Consumption

Planned Unit Consumption is the sum of all operating units accumulated over each period in an analysis.

> For example, a Planned Unit Consumption value may be calculated as [Rate x duration Period 1] + [Rate x duration Period 2]. Periods can be whole periods defined for the analysis, or partial periods defined by date in the Operating Profile for a specific element.

## Equivalent Unit Cost

Equivalent Unit Cost is the present value of the average cost per operating unit.

> For Example, an Equivalent Unit Cost value may be calculated as NPV / Planned Unit Consumption.