IBM TRIRIGA
Version 10 Release 5

Real Estate Environmental Sustainability User Guide

Note
Before using this information and the product it supports, read the information in "Notices" on page 91.

This edition applies to version 10, release 5, modification 0 of IBM TRIRIGA and to all subsequent releases and modifications until otherwise indicated in new editions.

Contents

Chapter 1. Managing real estate environmental sustainability

You use IBM® TRIRIGA® Real Estate Environmental Sustainability Manager and IBM TRIRIGA Real Estate Environmental Sustainability Impact Manager to measure, manage, and reduce the environmental impact of the real estate portfolio.

Before you begin

TRIRIGA Real Estate Environmental Sustainability Manager is a prerequisite to TRIRIGA Real Estate Environmental Sustainability Impact Manager. TRIRIGA Real Estate Environmental Sustainability Manager provides functionality to operational or transactional users and is licensed by concurrent user. TRIRIGA Real Estate Environmental Sustainability Impact Manager provides enterprise-wide analytics, with reporting access available to the entire enterprise.

TRIRIGA Real Estate Environmental Sustainability Impact Manager helps organizations achieve additional benefits of an environmental sustainability strategy in two primary ways:

- By supporting the use of analytics to examine performance data of energy consuming systems in the facility and automatically creating corrective work orders to repair equipment that is not operating correctly. This capability requires a service engagement to load data into TRIRIGA from either a building management system or an energy sensor data collection system, such as Tridium Niagara or OSIsoft PI.
- By providing additional capabilities in IBM TRIRIGA Capital Projects Manager, IBM TRIRIGA Workplace Operations Manager, IBM TRIRIGA Facilities Manager, and IBM TRIRIGA Real Estate Manager. TRIRIGA Capital Projects Manager ensures that improvement projects are implemented within the planned scope, schedule, and budget. Once projects have been implemented, the TRIRIGA Workplace Operations Manager is the operations and maintenance system to perform critical preventative maintenance and commissioning tasks. TRIRIGA Real Estate Environmental Sustainability Manager is also extended to report performance metrics, read-only transactional reports, and participation in the approval process for TRIRIGA Real Estate Environmental Sustainability Manager business processes to the enterprise.

In this documentation, features that require TRIRIGA Real Estate Environmental Sustainability Impact Manager will include the full product name.

Overview of environmental sustainability management

To implement an environmental sustainability management strategy, you must first accurately measure and assess the overall environmental footprint of the portfolio. Next, you must manage the environmental impact by identifying and evaluating opportunities for improvement. Finally, you must implement changes to reduce costs and environmental impact.

Measure

After product setup, the first step in implementing an environmental sustainability strategy is to collect the environmental data that is needed to measure the environmental impact of the organization.

Manage

After you collect and measure environmental data, you must manage environmental impact. You can identify and evaluate opportunities to improve sustainability across the real estate portfolio.

Reduce

After you identify opportunities, you can use IBM TRIRIGA to request approval. When an opportunity is approved, you can use TRIRIGA Real Estate Environmental Sustainability to interface with other TRIRIGA products, which include predefined processes to drive and track the implementation of the change.

Environmental data

Environmental data includes information about the workplace assets of an organization, including energy or water consumption, waste production, travel, carbon, and other emissions. Environmental data can be used for calculating, reporting, and metric analysis of environmental impact.

Environmental scope

Environmental data is classified as scope one, two, or three based on the source. When you enter information from a utility invoice or a travel record, TRIRIGA determines the scope and reports the data based on scope.

Scope one includes all direct greenhouse gas emissions such as:

- Company-owned vehicles
- Fuel combustion

Scope two includes indirect greenhouse gas emissions from consumption of purchased electricity, heat, or steam.

Scope three includes indirect greenhouse gas emissions such as:

- The extraction and production of purchased materials and fuels
- Transport-related activities in vehicles that are not owned or controlled by the organization
- Electricity-related activities that are not included in scope two
- Outsourced activities
- Waste disposal
- Employee business travel

Environmental data logs

Enter environmental data by using the following logs on the **Environmental** tab of the location record:

Carbon credits and sinks logs
: Used to record information about the carbon credits that are purchased or sold for a building, land, a retail location, or a structure. Carbon credits and sinks do not affect the carbon footprint calculation for a location but can be included on reports. Carbon credits and carbon sinks can be purchased or sold to offset carbon emissions. Carbon credits are tracked at the company or portfolio level. Carbon credits can be associated with a

building, retail location, or a structure. Typically carbon credits are purchased to offset the overall carbon emissions of the portfolio.

Carbon logs
Created by the system for each building, land, retail location, and structure. Carbon logs are based on the data from the energy, travel, and waste logs. The preferred method of creating carbon logs is for an administrator to set up a job schedule that determines how often the system creates carbon logs for locations. You can create carbon logs manually, but there should be no reason.

Climate logs
Used to record information about the climate of the location of a building, land, a retail location, or a structure. This data can be used to accurately compare the efficiency of buildings in different climates.

Emissions logs
Used to record information about the emissions of a building, land, a retail location, or a structure.

Energy logs
Used to record information about the energy consumption of a building, land, a retail location, or a structure. The data can be used in carbon calculations and to identify opportunities to reduce environmental impact.

Travel logs
Used to record information about travel that is associated with a building, land, a retail location, or a structure. The data can be used in carbon calculations and to identify opportunities to reduce environmental impact.

Waste logs
Used to record information about the waste management of a building, land, a retail location, or a structure. Calculating and voluntarily reporting greenhouse gas emissions from waste help solid waste planners to implement a plan to reduce emissions and save energy.

Water logs
Used to record information about the water consumption of a building, land, a retail location, or a structure. The data can be used to identify opportunities to decrease water usage.

Chapter 2. Prerequisite setup for managing environmental sustainability

Before using TRIRIGA Real Estate Environmental Sustainability, an administrator or the environmental manager must configure the applications settings and classifications that are used for environmental data and perform sustainability setup activities such as emission factors, weather stations, and environmental checklists.

Application settings and classifications

An administrator configures the application settings and classifications. The environmental manager may need to request changes or administrator access to change the settings and classifications that affect environmental sustainability.

Application settings

An administrator configures applications settings that contain constants that are used in environmental sustainability opportunity and facility assessment management. To ensure that environmental sustainability information is correctly calculated, the environmental manager should ensure that the application settings are correct for the organization.

Classifications

An administrator configures classifications that affect environmental sustainability functions while setting up IBM TRIRIGA Facility Assessment. If changes are needed, they must be made by an administrator.

Classifications affect environmental sustainability functions including:

- How facility and system condition indexes are calculated
- How report results are grouped
- How tasks and projects from submitted planned work requests are created
- How building system item condition or risk is described
- How opportunities or deficiencies are classified

Energy rating classifications for ENERGY STAR ratings

The ENERGY STAR energy rating type classification identifies the rating system that measures the energy performance of a building, structure, and retail location.

You use the ENERGY STAR energy rating type classification to connect with the ENERGY STAR Portfolio Manager.

Energy space type classification

The energy space type classification describes the specific use of a building. Energy space types are associated with ENERGY STAR energy rating types. Each energy space type contains the energy rating data attributes and default values for that type of building. Data attributes describe the characteristics of the energy space type. For example, a hospital energy space type contains data attributes such as gross floor area, laboratory, number of staffed beds, and number of MRI scanners.

The data attributes must correspond to the data attributes that are used in ENERGY STAR Portfolio Manager.

Location primary use classification

The location primary use classification describes the primary use of a building and includes one or more energy rating type and energy space type values. For example, when the location primary use of a building is healthcare, the associated energy space type is a medical office for the ENERGY STAR energy rating type.

Configuring sustainability settings

To accurately assess the energy efficiency of your building portfolio, you configure meters and their allocations, emission factors, templates, weather stations and data, and data utilities. To obtain ENERGY STAR ratings, you configure settings for ENERGY STAR.

Configuring general sustainability settings

Before you can measure and analyze the energy performance of your building portfolio, you configure utility meters, setup carbon calculation requests, and define energy regions.

Configuring utility meters

Utility meters are associated with buildings in your portfolio to measure the consumption of electricity, gas, or water. Energy use that is measured by utility meters is included in the calculations of the carbon footprint of the building. You configure utility meters to ensure that the energy usage is associated with the correct building.

About this task

Meters are defined as building equipment assets with the specification type set to Utility Meter. Confirm that all information about the utility meters is accurate, including the appropriate allocations of energy use per building when one utility meter is associated with more than one building. This information must be accurate at the building level to result in accurate carbon calculations.

Procedure

1. Click **Sustainability** > **Set Up** > **General** > **Meters** and select a utility meter.
2. On the **Maintenance** tab, click the **Meter Service Allocations** tab and associate a building with the meter.
3. If the utility meter is associated with more than one building, specify the percentage of the allocation of the meter.
4. Save the record.

Configuring carbon calculation requests

You can schedule the carbon calculator to calculate carbon emissions of locations within your organization at regular intervals. If you want additional carbon calculations for selected time periods and locations, you can request an additional calculation by using a carbon calculation request.

Procedure

1. Click **Home** > **Sustainability** > **Set Up** > **General** > **Carbon Calculation Request** > **Add**.

2. Specify the type of requestor.
3. Specify the recalculation period.

Type of recalculation period	Action
If you select single as the recalculation period	Specify the calendar period.
If you select multiple as the recalculation period	Specify the start date and end date.

4. Enter an explanation about why you are requesting additional carbon calculations.
5. Specify the locations to be included in the calculation request. If you select **Get Carbon Calculation Locations**, all locations that have updated information since the last carbon calculation are included in the request.
6. Submit the carbon calculation request. You can also create a draft request to submit at a later date

Configuring energy regions

The geographical location of a building determines the conversion factor that is used in the carbon calculation of each building. Before you can associate energy regions with locations, you must configure a list of all of the energy regions that are included in the organization.

About this task

Conversion factors are used to convert the use of energy data, such as water, electricity, or travel, into grams or pounds of CO_2.

Procedure

1. Select **Sustainability** > **Set Up** > **General** > **Energy Regions**.
2. In the hierarchy panel, click **New** and select **Carbon Calculation Region**.
3. Specify the classification details of the carbon calculation region.
4. Create the record.

Configuring emission factors

Emission factors are used by the carbon calculator to covert measured emissions into CO_2 for greenhouse gas calculations. They should be reviewed yearly by either an application administrator or the environmental manager.

Configuring energy emission factors

Energy emission factors are used in the carbon calculations. For your results to be accurate, you must first set up the energy emission factors.

Procedure

1. **Home** > **Sustainability** > **Set Up** > **Emission Factors** > **Energy** to view the current energy emission factor records.
2. Click an existing record to view and edit the current data. Save changes and close the record.
3. Click **Add** to create a new energy emission factor.

Configuring travel emission factors for distance

Travel emission factors for distance are used to determine the conversion factors in the carbon calculations. For your results to be accurate for travel logs that use distance, you must first set up the travel emission factors for distance.

Procedure

1. Click **Home** > **Sustainability** > **Set Up** > **Emission Factors** > **Travel (Distance)** to view all current travel distance emission factors.
2. Click an existing record to view and edit the current data. Save changes and close the record.
3. Click **Add** to create a new travel distance emission factor.

Configuring travel emission factors for usage

Travel emission factors for usage are used to determine the conversion factors in the carbon calculations. For your results to be accurate for travel logs that are based on usage, you must first set up the travel emission factors for usage.

Procedure

1. Click **Home** > **Sustainability** > **Set Up** > **Emission Factors** > **Travel (Usage)** to view all current travel usage emission factors.
2. Click an existing record to view and edit the current data. Save changes and close the record.
3. Click **Add** to create a new travel usage emission factor.

Configuring waste emission factors

Waste emission factors are used to determine the conversion factors in the carbon calculations. For your results to be accurate for waste logs, you must first set up the waste emission factors.

Procedure

1. Click **Home** > **Sustainability** > **Set Up** > **Emission Factors** > **Waste** to view all current waste emission factors.
2. Click an existing record to view and edit the current data. Save changes and close the record.
3. Click **Add** to create a new waste emission factor.

Configuring global warming potential emission factors

Global warming potential emission factors are used to determine the conversion factors in the carbon calculations. For your results to be accurate for emission logs that record emissions such as methane or fluorinated ethers, you must first set up the global warming potential emission factors.

Procedure

1. Click **Home** > **Sustainability** > **Set Up** > **Emission Factors** > **Global Warming Potential** to view all current global warming potential emission factors.
2. Click an existing record to view and edit the current data. Save changes and close the record.
3. Click **Add** to create a new global warming potential emission factor.

Configuring templates for environmental sustainability

Before you can use the checklist or integration functions for a location record, you must create the templates that will be used by the system.

Configuring survey templates

Before you can use the survey function, you must create the survey templates.

Procedure

1. Click **Home** > **Sustainability** > **Set Up** > **Templates** > **Survey - General Evaluation** to view all current survey templates.
2. Click to view the existing templates.
3. If you need to add a new template, an administrator can create the template at **Home** > **Tools** > **Application Setup** > **Survey Templates** > **General Evaluation**.

Configuring checklist templates for environmental sustainability

Checklists must be set up as templates before you can use them to assess locations. The environmental manager should keep them updated each time there is an updated version of the checklists.

About this task

If you want to load complicated checklists such as those for Leadership in Energy and Environmental Design (LEED) certification, IBM Global Business Services can help you to import the templates into the system instead of using this manual method.

Procedure

1. Click **Home** > **Sustainability** > **Set Up** > **Templates** > **Checklist** to view all current checklist templates.
2. Click to view the existing templates. Make updates as needed and click **Save and Close**.
3. If you need to add a new template, click **Add**.

Configuring checklist categories for environmental sustainability

Checklist categories must be set up as templates before you can use them to assess locations. The environmental manager should keep them updated as needed. For example, each time LEED releases a new version of their rating system, the checklist category templates for LEED must be updated.

About this task

If you want to load complicated checklists and categories, such as those for LEED certification, IBM Global Business Services can help you to import the templates into the system instead of using this manual method.

Procedure

1. Click **Home** > **Sustainability** > **Set Up** > **Templates** > **Checklist Category** to view all current checklist category templates.
2. Click to view the existing templates. Make updates as needed and click **Save and Close**.
3. If you need to add a new template, click **Add**.

Configuring checklist items for environmental sustainability

Checklist items must be set up as templates before you can use them to assess locations. The environmental manager should keep them updated as needed. For example, each time LEED releases a new version of their rating system, the checklist item templates for LEED must be updated.

About this task

If you want to load complicated checklists, categories, and items such as those for LEED certification, IBM Global Business Services can help you to import the templates into the system instead of using this manual method.

Procedure

1. Click **Home** > **Sustainability** > **Set Up** > **Templates** > **Checklist Item** to view all current checklist item templates.
2. Click to view the existing templates. Make updates as needed and click **Save and Close**.
3. If you need to add a new template, click **Add**.

Configuring integration templates for environmental sustainability

Integration templates are used to set up the notifications for integration with ENERGY STAR.

Procedure

1. Click **Home** > **Sustainability** > **Set Up** > **Templates** > **Integration** to view the current integration templates.
2. Click **Add** to open a new integration template form.
3. Edit the form and click **Create**.

Configuring weather stations and data for environmental sustainability

Weather stations and data allow you to account for the weather where a building is located when you assess the energy efficiency of the building. Before locations can have a weather station associated with them, the administrator or environmental manager must configure a list of all of the weather stations that will be used by the organization.

Configuring weather stations

Weather stations, or climate zones, are classifications that provide a source for weather-related data for each facility. Before locations can have a weather station associated with them, the administrator or environmental manager must configure a list of all of the weather stations that are included in the organization.

Procedure

1. Click **Home** > **Sustainability** > **Set Up** > **Weather** > **Stations** to view the current list of available weather stations.
2. If changes are required, an administrator can make changes at **Home** > **Tools** > **Administration** > **Classifications**.

Entering weather data

You can enter weather data that is associated with a selected weather station as a climate log that will help you to analyze the energy efficiency of your buildings by allowing you to take weather into account.

About this task

Although you can enter data for each weather station each quarter, IBM Global Business Services can help you to set up an integration that will automatically

create climate logs each quarter. Additionally, there is an offline form for creating multiple climate logs at one time or for emailing the information to TRIRIGA while you are offline.

Procedure

1. Click **Home** > **Sustainability** > **Set Up** > **Weather** > **Data** to view the current list of climate logs.
2. Click **Add** to open the Climate Log form.
3. Enter information from a valid weather station source and click **Create**.

Integrating TRIRIGA with the ENERGY STAR Portfolio Manager

Direct integration with ENERGY STAR Portfolio Manager from the US Environmental Protection Agency (EPA) automates the process of receiving current ENERGY STAR ratings for buildings at regular intervals. You configure TRIRIGA to connect to the ENERGY STAR Portfolio Manager. The ENERGY STAR rating system provides the industry standard for the energy performance of buildings.

ENERGY STAR ratings

TRIRIGA can receive ENERGY STAR ratings for buildings by integrating with the ENERGY STAR Portfolio Manager from the US Environmental Protection Agency (EPA). ENERGY STAR ratings help you to assess energy and water consumption across the portfolio of buildings.

You configure TRIRIGA to connect to the ENERGY STAR Portfolio Manager. TRIRIGA then automatically sends current environmental data on a scheduled basis to receive updated ENERGY STAR ratings.

With the ENERGY STAR rating system, you can evaluate the energy performance of your building portfolio by comparing the rating of buildings within the portfolio. You can also compare the energy performance rating of your building portfolio with the average ratings of similar buildings. You then can set targets to improve the ratings of the buildings and evaluate the potential savings if these targets are achieved. By comparing the current ratings with the targets, you can prioritize buildings that maximize return on investment by comparing potential savings to costs of efficiency opportunities.

The ENERGY STAR 1 - 100 scale provides a simple way to review and understand the energy performance of buildings. The rating system evaluates attributes of each building by space type, energy usage, and monthly weather data for each building region. Buildings that rate 75 or greater qualify for the ENERGY STAR label.

The ENERGY STAR Portfolio Manager requires information such as the gross floor area, property use, the in-service date, and geographical location of the building. At least 12 consecutive months of meter energy logs are also required. You can establish a baseline rating for a building and then set a target date and rating to achieve an ENERGY STAR rating.

When you submit the energy log for an energy rating, the cost of the meter, that is displayed in the **Total Cost (Energy Rating Currency)** field, is also submitted. The default currency is US dollars. You can change the default currency in Application Settings.

If you update information about a building, property use, meter, or energy logs, the corresponding ENERGY STAR record on ENERGY STAR Portfolio Manager is also updated on the next energy rating submission.

Integrating TRIRIGA with ENERGY STAR Portfolio Manager

To integrate with the ENERGY STAR Portfolio Manager and receive ENERGY STAR ratings for your building portfolio, you must perform the following tasks.

Procedure

1. Configure the energy rating type classifications.
2. To test your energy rating information in the ENERGY STAR testing environment, you can create an ENERGY STAR test server account.
3. Configure meters for ENERGY STAR ratings.
4. Add the energy consumption of buildings to energy logs.
5. Establish a baseline rating and a target rating for buildings.
6. For existing users, migrate energy space types.
7. Connect to the ENERGY STAR live server.
8. Create building portfolios for ENERGY STAR submissions.
9. To prevent any issues before you request an ENERGY STAR rating, you can validate the energy rating information.
10. Request ENERGY STAR ratings.

Configuring ENERGY STAR settings

Before you can submit buildings, property use, meters, and energy logs for an ENERGY STAR rating, you configure settings for ENERGY STAR. You configure meters for successful energy rating submissions, set baseline and target values to measure energy performance, and create ENERGY STAR server accounts to connect to ENERGY STAR.

Configuring meters for ENERGY STAR ratings:

To receive ENERGY STAR ratings, you must provide meter information for the meter type and the meter asset. This information is required by the ENERGY STAR Portfolio Manager to generate ENERGY STAR ratings.

Configuring meter type classifications for ENERGY STAR ratings:

The environmental meter type record defines the energy type and unit of measure for energy logs and meter assets. When you create the classification for the meter type, you must provide the energy rating details that ENERGY STAR requires to generate ENERGY STAR ratings.

About this task

You must provide the following energy rating details in the associated environmental meter type record:

- The corresponding meter type definition for ENERGY STAR
- The default unit of measure (UOM) for the energy rating
- The unit of measure that is used by ENERGY STAR

When a meter is retired, the associated meter in the ENERGY STAR portfolio is automatically set to inactive when the next energy rating request is submitted.

For more information about meters values, see the ENERGY STAR website (www.energystar.gov/).

Procedure

1. Open the environmental meter type record by selecting **Tools** > **Administration** > **Classifications** and select the **Environmental Meter Type** classification from the hierarchy list.
2. In the ENERGY STAR Details section, specify the energy rating details.
3. Save and close the record.

What to do next

Specify the energy rating information for the meter asset.

Creating utility meters for ENERGY STAR ratings:

When you create utility meters for an energy rating submission, you must provide the energy type of the utility meter and the date the meter is active. The energy type and service date of the utility meter is required to request ENERGY STAR ratings.

About this task

Meters are defined as building equipment assets with the specification type of Utility Meter.

Procedure

1. Open the meter by selecting **Portfolio** > **Assets** > **Building Equipment**.
2. In the Environmental Details section, specify the energy type of the utility meter.
3. In the Asset Status section, specify the in-service date of the utility meter.
4. Save and close the record.

Configuring baseline and target setup:

Baseline data provides a set of initial energy rating values for locations. You set a baseline for locations to compare the energy rating performance of buildings within a building portfolio and also the performance average of similar buildings. You can also use this information to set targets for improvement and predict potential savings.

About this task

You can establish baseline and target energy rating values for a collection of building, structure, or retail locations.

Procedure

1. Create the Baseline and Target Setup form by clicking **Home** > **Sustainability** > **Set Up** > **General** > **Baseline and Target Setup**.
2. Select the process type.

Option	Description
If process type is Baseline	Enter the baseline date. The energy rating value from or nearest to the baseline date is used as the baseline rating.
If process type is Target	Enter the target date and target rating.

3. Select the buildings, structures, and retail locations.
4. Apply the changes to update the baseline or target values to the locations you selected.

Creating accounts for the ENERGY STAR test server:

You can use the testing environment on the ENERGY STAR Portfolio Manager to test the energy rating information before you connect to the live server. To access the ENERGY STAR testing environment, you must create an account for the ENERGY STAR test server.

Procedure

1. Open the ENERGY STAR Settings form by clicking **Sustainability** > **Set Up** > **General** > **ENERGY STAR Settings**.
2. On the **Test Server** tab, specify the account information for the test server and create the account.

Results

After the account is created on the ENERGY STAR test server, the account number is displayed on the test server form.

Connecting to the ENERGY STAR live server:

To submit energy rating information and receive ENERGY STAR ratings for your building portfolio, you connect to the EPA Portfolio Manager live server environment.

About this task

When you create a meter, you can exclude energy logs that do not have an associated cost from the energy rating submission.

Procedure

1. Open the ENERGY STAR Settings form, by clicking **Sustainability** > **Set Up** > **General** > **ENERGY STAR Settings**.
2. On the **Live Server** tab, specify the account information for the live server.
3. Select the **Active Server** check box to connect to the ENERGY STAR live server. The test server is automatically inactivated.
4. On the **General** tab, upload the ENERGY STAR XML schemas.
5. To exclude energy logs that do not have an associated cost from the energy rating submission, select the **Default Exclude Energy Logs with Zero Cost** check box. All meters with energy logs that do not have an associated cost are excluded from the energy rating submission by default.
6. Save the form.

Working with data utilities for environmental sustainability

You can use the data utilities section of **Sustainability** > **Setup** to manage meter log and ENERGY STAR integration. These utilities will allow you to view and process records that failed to upload and validate building information that is necessary for ENERGY STAR integration.

ENERGY STAR XML schema

ENERGY STAR XML schema defines the data that is required from buildings, meters, property uses, and consumption data to successfully rate a building. You can use the ENERGY STAR XML schema to validate the energy rating information before you request an ENERGY STAR rating.

XML requests are created during the validation of the energy rating process. The XML requests are validated against the ENERGY STAR XML schema to confirm that all data types and required values are populated. If any required data is missing, the generated XML requests are attached to the Energy Star Validation Item form.

You can download the ENERGY STAR XML schema files from the ENERGY STAR website (www.energystar.gov/). You can upload the latest ENERGY STAR XML schema to the ENERGY STAR Settings form on the **Live Server** tab.

Validating energy rating information

If any required energy rating information is missing when information is sent to the ENERGY STAR Portfolio Manager to request ENERGY STAR ratings, the request is rejected. To prevent issues, you can validate the energy rating information before you send the information.

About this task

To prevent errors when you send ENERGY STAR information, use the Energy Star Validation form to identify issues with your building data.

Procedure

1. Click **Home** > **Sustainability** > **Set Up** > **Data Utilities** > **ENERGY STAR Validation**.
2. Click a record to open an existing validation form or click **Add** to open a new validation form.
3. In the Send Notifications to section, add the people who are to be notified when the validation completes.
4. In the Buildings section, use the **Find** and **Remove** actions to add or remove buildings. Use the **Associate All Energy Star Buildings** action to add all buildings with ENERGY STAR information.
5. Click **Validate**.

Results

Records are created for all buildings where there are problems with the data. You can view the records in the Validation Results section.

Migration of ENERGY STAR for existing users

For existing users, a sequence of patch helper workflows are included in the Object Migration package. These workflows import the ENERGY STAR IDs and add them to TRIRIGA.

Migrating energy spaces:

The ENERGY STAR Portfolio Manager updates the types of energy spaces that are used in the energy rating process. You use the ENERGY STAR Migration utility to update the energy spaces to the new energy spaces for the selected locations.

Procedure

1. Open an ENERGY STAR Migration form by selecting **Sustainability** > **Setup** > **Data Utilities** > **ENERGY STAR Migration**, and click **Add**.
2. Select the old energy space type and the corresponding new energy space type.
3. Select the locations that are associated with the energy spaces.
   - Click **Find** to add specific locations.
   - To add all locations, click **Associate All Energy Star Buildings**.
4. Click **Create** and **Migrate** to complete the migration.

Results

The energy spaces with the corresponding percentage used and the exact matching data attribute values are updated. You can use the energy rating section to find any missing data attribute values.

Validating integration for environmental meter logs

You can use the data utility for environmental logs to view and process records that have been uploaded through integration.

Procedure

1. Click **Home** > **Sustainability** > **Set Up** > **Data Utilities** > **Environmental Meter Log** to view the current list of environmental meter logs.
2. Click on a log to view information about the records received from integration.

Prerequisite setup for using TRIRIGA Real Estate Environmental Sustainability Impact Manager

To use the features of TRIRIGA Real Estate Environmental Sustainability Impact Manager, a TRIRIGA administrator must set up the application settings, building equipment specifications, calendars, external companies, building equipment assets, and job schedules.

Application settings

Configure the application settings parameters on the **Environmental Settings** tab of the Application Settings record.

Specify values for the following fields under the Assembly Line Settings section:

Data Retention Hourly Fact (days)
The number of days of data that is retained in hourly fact table. This field is referenced by the "Asset Hourly Fact – Clear" ETL Job Item.

Data Retention Daily Fact (days)
The number of days of data that is retained in daily fact table. This field is referenced by the "Asset Daily Fact – Clear" ETL Job Item.

Data Retention Monthly Fact (days)
The number of days of data that is retained in monthly fact table. This field is referenced by the "Asset Monthly Fact – Clear" ETL Job Item.

Energy Log Lag Time (days)
The number of days to continue processing data after the last day of previous month. This field is referenced by the "Load Meter Item Staging Table" ETL job item.

The following fields are optional and can be used by an ETL created to populate the TRIRIGA Real Estate Environmental Sustainability Impact Manager fact tables.

Debug Mode
The flag can be set to specify that the ETL is running in debug mode.

Sample Threshold
The percentage of hourly energy use samples that are collected for a valid monthly record.

Connector URL
TRIRIGA URL and port with the format http://hostname:port/

Connector User Name
TRIRIGA user name

Connector Password
TRIRIGA password

Connector Timeout
The number of seconds to attempt HTTP connection before timeout

Specify values for the following fields in the Asset Event Settings section:

Evaluation Period used in determining Repeat Requests and Tasks created from Asset Events
The value that is entered for this field is used to check if the Request and Work Task created for Asset Analytic Event is a Repeat Request and Repeat Work Task that has Analytic Event with same Rule and Asset within this period.

Default SNMP Triggered Event Type
The event type that is triggered when an analytic event is created

Default SNMP Priority
The priority for the request generated

Default SNMP Duplicates Evaluation Period
The value that is entered for this field is used to check whether the asset analytic event created for SNMP trap is a duplicate event with same event name and asset within this period. A similar field is available in the rule definition for events that are generated by rules.

Default SNMP Request Class
If the **Default SNMP Triggered Event Type** field has a value that is specified as **Asset Event Request**, then specify a value for this field. The request class determines the business rules that are to be applied by the request.

Default SNMP Contact
This email contact receives analytic eEvent notifications

Configure the following data source records available under Assembly Line Connections section. These fields are used by the TRIRIGA Real Estate Environmental Sustainability Impact Manager ETL job items to establish a database connection.

TRIRIGA data source

- Connection String – TRIRIGA database URL and port. A sample format for oracle jdbc:oracle:thin:@hostname:port:dbname
- DB Driver Name – Driver name
- UserName – Database user name

- Password – Database password
- Test Table Name – Fact table name

Other data source

- Connection String – OTHER/TDW database URL and port. A sample format for DB2 jdbc:db2://hostname:port/dbname
- DB Driver Name – Driver name
- UserName – Database user name
- Password – Database password
- Test Table Name – Fact table name

Building equipment specification

Create Building Equipment Specification records with Spec Class selected as "Air Handlers", "Chilled Water", or "Utility Meter". These specification records are added under Spec Information section of Building Equipment Assets.

Calendar

Create reservation calendar records. These records are used under Operating Schedule tab of Building Equipment Asset to determine the operating hours of an asset.

External company

Create an External Company record with Organization Type selected as "Utility Supplier". This makes the Utility Rates tab visible. This record is referenced by a Building Equipment Asset and used by the "Load Meter Item Staging Table" ETL job item.

On the **Utility Rates** tab, create a Utility Rate Plan record by selecting the following values:

- Name – Name of rate plan
- Rate Type – The type of rate specified
- Plan Type – The type of environmental data log that is created
- Energy Type – The energy type for rate plan
- Currency – Currency for the rate plan
- Base UOM – The unit of measure for Energy
- Start Date – Start date when rate plan is effective
- End Date – End date when the rate plan is expired
- Start Time – Time within the Start Date when rate plan is effective
- End Time – Time within the End Date when the rate plan is expired
- Rate – The value that is specified for this field determines the rates
- Has Weekend Rate? – When this is checked, it makes the "Has Weekend Rate" field visible
- Weekend Rate – The value that is specified for this field determines the rates for weekend. "0" is a valid value for this field and it means that no cost is applied on weekends.

Building equipment assets

Configure the following fields on Building Equipment Asset records that are associated with records in the fact tables.

On the **General** tab:

- Nameplate – The value must match the nameplate value in fact table.
- Primary Location – Location of asset which is a space.
- Main Meter? – This should be checked when the asset is considered as a main meter of a particular location.
- Specification Name – The specification record with Spec Class selected as "Air Handlers", "Chilled Water" or "Utility Meter".

On the **Operating Schedule** tab, on the Operating Calendar field, select a reservation calendar to determine the operating hours of an asset. This field is required when the asset has a nameplate value added in **General** tab.

On the **Environmental** tab:

- Purchased From Organization – If the **Main Meter?** field is checked, select an organization that provides the energy. The organization should include a utility rate plan. This field is used by the "Load Meter Item Staging Table" ETL job item.
- Environmental Energy Type – If the **Main Meter?** field is checked, this value should be specified and match the "Energy Type" on the "Purchased From Organization" Utility Rate Plan. This field is used by the "Load Meter Item Staging Table" ETL job item.

On the **Maintenance** tab, on the **Meter Service Allocations** section, if the **Main Meter?** field is checked, records should be added specifying the buildings for which the energy usage is applied. This field is used by the "Load Meter Item Staging Table" ETL job item.

Job scheduler

The following job schedules must be configured:

- DEFAULT - Clear Asset Daily Fact Table
- DEFAULT - Clear Asset Hourly Fact Table
- DEFAULT - Clear Asset Monthly Fact Table
- DEFAULT - Load Meter Item Staging Table

For each job schedule, set the following fields on the **General** tab and click **Activate**:

- Schedule Type – Schedule type for the job item
- Start Date – The first date when the job item starts processing
- End Date – The last date when the job item ends processing

Business objects used by TRIRIGA Real Estate Environmental Sustainability Impact Manager

TRIRIGA Real Estate Environmental Sustainability Impact Manager uses four business objects to generate hourly, daily, and monthly energy usage reports.

The energy usage reports require the following business objects:

- Monthly Fact Table – Used to store monthly asset energy use data
- Daily Fact Table – Used to store daily asset energy use data
- Hourly Fact Table – Used to store hourly asset energy use data
- Classification for Energy Type – A branch of the classification hierarchy that is used to represent the various energy types that are supported by TRIRIGA Real Estate Environmental Sustainability Impact Manager

Devices and TRIRIGA assets

In TRIRIGA, a device is represented as a building equipment asset and is uniquely identified by its nameplate.

When TRIRIGA loads fact records, the device must already exist as a building equipment record in TRIRIGA with unique nameplate.

Use the TRIRIGA building equipment record with the matching nameplate as a reference to find the information that is needed in the fact table, such as organization or location.

Monthly Fact Table - T_TRIASSETENERGYUSEMFACT

You must have data loaded into the monthly fact table T_TRIASSETENERGYUSEMFACT in order to use the monthly energy use reports.

Module
triMetricFact

Business object
triAssetEnergyUseMFact

Display name
Asset Energy Use Monthly

Table 1. Monthly Fact Table - T_TRIASSETENERGYUSEMFACT

Column name	Data type	Description	Example value
TRIAGENTHOSTNAMETX	VARCHAR2(400)	The hostname on which the code that interfaces to the BMS is running. The field can be helpful if you need to debug the data flow.	walleperf03
TRIAGENTINSTANCETX	VARCHAR2(400)	If there are multiple programs interfacing to different BMSs on the same host then this field allows additional identifying information to be specified. The field can be helpful if you need to debug the data flow.	oBIXTest201
TRIASSEMBLYLINETX	VARCHAR2(150)	Identifies what created the row and is used to help you debug the data flow.	triAssetHourlyFactLoad
TRICAPTUREDDT	NUMBER (32,0)	Captured Date and Time. Required. Date and Time associated from the external database for this record. The number of seconds that has elapsed since January 1, 1970. Need to be in a uniform time zone (GMT).	1391479200000
TRICONTROLNUMBERCN	VARCHAR2(1000)	Control Number. System generated field. The field is automatically generated but a value is not required.	100000001
TRICREATEDDT	NUMBER (32,0)	Created Date and Time. Date and Time when this record was inserted in TRIRIGA. The number of seconds that have elapsed since January 1, 1970. TRIRIGA's time zone use for debug.	1391520579359
TRIDIMASSETTX	VARCHAR2(150)	Asset. Required. Asset associated with Energy Use data (T_TRIBUILDINGEQUIPMENT.TRINAMETX)	ITEO Test CH Asset 3-2-15
TRIDIMASSETTXOBJID	NUMBER (20,0)	ref Asset. Required. (T_TRIBUILDINGEQUIPMENT.SYS_OBJECTID)	54323333

Table 1. Monthly Fact Table - T_TRIASSETENERGYUSEMFACT (continued)

Column name	Data type	Description	Example value
TRIDIMENERGYTYPETX	VARCHAR2(150)	Energy Type. Required. Reference to Energy Type from triEnergyType object (T_TRIENERGYTYPE.TRINAMETX). The Energy Type can be found in TRIRIGA under Classification in TRIRIGA.	Electric
TRIDIMENERGYTYPETXOBJID	NUMBER (20,0)	ref Energy Type Required. (T_TRIENERGYTYPE.SPEC_ID)	54247649
TRIDIMGEOGRAPHYTX	VARCHAR2(150)	Geography. Required. Reference to City specified on asset record (T_TRIBUILDING.TRIGEOGRAPHYLOOKUPTX where T_TRIBUILDING.SYS_OBJECTID = XXXXXX T_TRISPACE. TRIPARENTBUILDINGTXOBJID)	CH
TRIDIMGEOGRAPHYTXOBJID	NUMBER (20,0)	ref Geography. Required. (T_TRIBUILDING.TRIGEOGRAPHYLOOKUPTXOBJID where T_TRIBUILDING.SYS_OBJECTID = XXXXXX T_TRISPACE. TRIPARENTBUILDINGTXOBJID)	54320390
TRIDIMLOCATIONTX	VARCHAR2(150)	Location. Required. Reference to Building specified on asset record (T_TRISPACE.TRIPARENTBUILDINGTX where T_TRISPACE.SYS_OBJECTID = XXXXXX T_TRIBUILDINGEQUIPMENT.LOCATIONNAMEOBJID)	ITEO Test CH Bldg 3
TRIDIMLOCATIONTXOBJID	NUMBER (20,0)	ref Location. Required. (T_TRISPACE. TRIPARENTBUILDINGTXOBJID where T_TRISPACE.SYS_OBJECTID = XXXXXX T_TRIBUILDINGEQUIPMENT.LOCATIONNAMEOBJID)	54320849
TRIDIMSPECIFICATIONCLA	VARCHAR2(150)	Specification Class. Reference to Specification Class specified on asset record (T_TRIBUILDINGEQUIPMENT.TRISPECCLASSCL)	Air Handlers
TRIDIMSPECIFICATIONCLAOBJID	NUMBER (20,0)	ref Specification Class (T_TRIBUILDINGEQUIPMENT.TRISPECCLASSCLOBJID)	3055758
TRIFACTENERGYUSENU	NUMBER (32,12)	Energy Use. Required. Result from energy use calculation. The field represents the monthly energy use for the device in kWH.	11999
TRIENERGYUSEREPORTEDNU	NUMBER (32,12)	Energy Use Reported by a meter device.	11999
TRIFACTPEAKELECTRICALD	NUMBER (32,12)	Peak Electrical Demand. Required for Peak Electric Energy Demand Report Result from peak demand calculation. The field represents the maximum monthly energy use for the device in kWH.	500
TRINAMEPLATEIDTX	VARCHAR2(150)	Nameplate ID. Required. Uniquely identify on asset record in TRIRIGA. (Nameplate should uniquely exist in T_TRIBUILDINGEQUIPMENT.TRINAMEPLATEIDTX)	oBIX-0255
TRINODETX	VARCHAR2(150)	Node. Identifier from BMS that represents unique asset. The field can be helpful if you need to debug the data flow.	79:AHU255:BMS
TRISAMPLESACTUALNU	NUMBER (32,12)	Samples - Actual. The number of samples that were collected in the current interval (Month). Customer determines what percent of the maximum samples is enough for the reports and analytics.	1393
TRISAMPLESMAXIMUMNU	NUMBER (32,12)	Samples - Maximum. The maximum number of samples that could be collected in the current interval (Month). For example sample is taken every 15 minute * 24 hours a day * 31 days a month = 2976	2976
TRIWRITETIMETX	VARCHAR2(16)	Write Time. Required. This is the starting time for the interval which this data represents. The format is 1YYMMDD000000000. For example 1140101000000000 represents January 1 2014 00:00:000 so this row represents January 1 2014 00:00:000 thru Jan 31 2014 23:59:59:999.	1140101000000000

Daily Fact Table - T_TRIASSETENERGYUSEDFACT

You must have data loaded into the daily fact table T_TRIASSETENERGYUSEDFACT in order to use the daily energy use reports.

Module
triMetricFact

Business object
triAssetEnergyUseDFact

Display name
Asset Energy Use Daily

Table 2. Daily Fact Table - T_TRIASSETENERGYUSEDFACT

Column name	Data type	Description	Example value
TRIAGENTHOSTNAMETX	VARCHAR2(400)	Agent Hostname. Hostname where agent is running	walleperf03
TRIAGENTINSTANCETX	VARCHAR2(400)	Agent Instance. Instance name for the agent	oBIXTest201
TRIASSEMBLYLINETX	VARCHAR2(150)	AssemblyLine. Name of the Tivoli® Directory Integrator AssemblyLine that created this row	triAssetHourlyFactLoad
TRICAPTUREDDT	NUMBER (32,0)	Captured Date and Time. Required. Date and Time associated from the external database for this record. The number of seconds that has elapsed since January 1, 1970. Need to be in a uniform time zone (GMT).	1391479200000
TRICONTROLNUMBERCN	VARCHAR2(1000)	Control Number. System generated field. The field is automatically generated, but a value is not required.	100000001
TRICREATEDDT	NUMBER (32,0)	Created Date and Time. Date and Time when this record was inserted in TRIRIGA. The number of seconds that have elapsed since January 1, 1970. TRIRIGA's time zone use for debug.	1391520579359
TRIDIMASSETTX	VARCHAR2(150)	Asset. Required. Asset associated with Energy Use data (T_TRIBUILDINGEQUIPMENT.TRINAMETX)	ITEO Test CH Asset 3-2-15
TRIDIMASSETTXOBJID	NUMBER (20,0)	ref Asset. Required. (T_TRIBUILDINGEQUIPMENT.SYS_OBJECTID)	54323333
TRIDIMENERGYTYPETX	VARCHAR2(150)	Energy Type. Required. Reference to Energy Type from triEnergyType object (T_TRIENERGYTYPE.TRINAMETX). The Energy Type can be found in TRIRIGA, under Classification in TRIRIGA.	Electric
TRIDIMENERGYTYPETXOBJID	NUMBER (20,0)	ref Energy Type. Required. (T_TRIENERGYTYPE.SPEC_ID)	54247649
TRIDIMGEOGRAPHYTX	VARCHAR2(150)	Geography. Required. Reference to City specified on asset record (T_TRIBUILDING.TRIGEOGRAPHYLOOKUPTX where T_TRIBUILDING.SYS_OBJECTID = T_TRISPACE. TRIPARENTBUILDINGTXOBJID)	CH
TRIDIMGEOGRAPHYTXOBJID	NUMBER (20,0)	ref Geography. Required. (T_TRIBUILDING.TRIGEOGRAPHYLOOKUPTXOBJID where T_TRIBUILDING.SYS_OBJECTID = T_TRISPACE. TRIPARENTBUILDINGTXOBJID)	54320390
TRIDIMLOCATIONTX	VARCHAR2(150)	Location. Required. Reference to Building specified on asset record (T_TRISPACE.TRIPARENTBUILDINGTX where T_TRISPACE.SYS_OBJECTID = T_TRIBUILDINGEQUIPMENT.LOCATIONNAMEOBJID)	ITEO Test CH Bldg 3
TRIDIMLOCATIONTXOBJID	NUMBER (20,0)	ref Location. Required. (T_TRISPACE. TRIPARENTBUILDINGTXOBJID where T_TRISPACE.SYS_OBJECTID = T_TRIBUILDINGEQUIPMENT.LOCATIONNAMEOBJID)	54320849
TRIDIMSPECIFICATIONCLA	VARCHAR2(150)	Specification Class. Required. Reference to Specification Class specified on asset record (T_TRIBUILDINGEQUIPMENT.TRISPECCLASSCL)	Air Handlers
TRIDIMSPECIFICATIONCLAOBJID	NUMBER (20,0)	ref Specification Class. Required. (T_TRIBUILDINGEQUIPMENT.TRISPECCLASSCLOBJID)	3055758
TRIFACTENERGYUSENU	NUMBER (32,12)	Energy Use. Required. Result from energy use calculation. The field represents the daily energy use for the device in kWH.	0.8368

Table 2. Daily Fact Table - T_TRIASSETENERGYUSEDFACT (continued)

Column name	Data type	Description	Example value
TRIENERGYUSEREPORTEDNU	NUMBER (32,12)	Energy Use Reported by a meter device.	11999
TRINAMEPLATEIDTX	VARCHAR2(150)	Nameplate ID. Required. Uniquely identify on asset record in TRIRIGA (Nameplate should uniquely exist in T_TRIBUILDINGEQUIPMENT.TRINAMEPLATEIDTX)	oBIX-0255
TRINODETX	VARCHAR2(150)	Node. Identifier from BMS that represents unique asset	79:AHU255:BMS
TRISAMPLESACTUALNU	NUMBER (32,12)	Samples – Actual. The number of samples that were collected in the current interval (Day). Use to determine if we have enough samples for a complete interval.	96
TRISAMPLESMAXIMUMNU	NUMBER (32,12)	Samples – Maximum. The maximum number of samples that could be collected in the current interval (Day). For example sample is taken every 15 minute * 24 hours a day = 96	96
TRIWRITETIMETX	VARCHAR2(16)	Write Time. Required. This is the starting time for the interval which this data represents. The format is 1YYMMDD000000000. For example 1140101000000000 represents January 1, 2014 00:00:000, so this row represents January 1, 2014 00:00:000 thru Jan 1, 2014 23:59:59:999.	1140204000000000

Hourly Fact Table - T_TRIASSETENERGYUSEHFACT

You must have data loaded into the hourly fact table T_TRIASSETENERGYUSEHFACT in order to use the hourly energy use reports.

Module

triMetricFact

Business object

triAssetEnergyUseHFact

Display name

Asset Energy Use Hourly

Table 3. Hourly Fact Table - T_TRIASSETENERGYUSEHFACT

Column name	Data type	Description	Example value
TRIAGENTHOSTNAMETX	VARCHAR2(400)	Agent Hostname. Hostname where agent is running	walleperf03
TRIAGENTINSTANCETX	VARCHAR2(400)	Agent Instance. Instance name for the agent	oBIXTest201
TRIASSEMBLYLINETX	VARCHAR2(150)	AssemblyLine. Name of the Tivoli Directory Integrator AssemblyLine that created this row	triAssetHourlyFactLoad
TRICAPTUREDDT	NUMBER (32,0)	Captured Date and Time. Required. Date and Time associated from the external database for this record. The number of seconds that has elapsed since January 1, 1970. Need to be in a uniform time zone (GMT).	1391479200000
TRICONTROLNUMBERCN	VARCHAR2(1000)	Control Number. System generated field. The field is automatically generated, but a value is not required.	100000001
TRICOSTNU	NUMBER (32,12)	Cost of energy use reported. The field is required to run the 'Load Meter Item Staging Table' ETL Job Item when the associated asset is a main meter. The value for triCostNU is calculated by multiplying the rate times the energy use reported for this record (triRateNU * triFactEnergyUseReportedNU). If there is no Utility Rate that matches the time interval for the Energy Use record, the value should be set to 0.	18.01

Table 3. Hourly Fact Table - T_TRIASSETENERGYUSEHFACT (continued)

Column name	Data type	Description	Example value
TRICOSTNU_UOM	VARCHAR2(100)	Unit of measure associated with the TRICOSTNU field. The value is obtained from the Utility Rate table (T_TRIUTILITYRATEPLAN). This field is required to run the 'Load Meter Item Staging Table' ETL job item when the associated assets is a main meter. The asset associated with this record should contain a reference to an external company (Purchased From Organization). The external company should specify a Utility Rate Plan (T_TRIUTILITYRATEPLAN) . The value should be set from the TRIBASEUOM field of the record associated with this meter \ time interval.	US Dollars
TRICREATEDDT	NUMBER (32,0)	Created Date and Time. Required. Date and Time when this record was inserted in TRIRIGA. The number of seconds that have elapsed since January 1, 1970. TRIRIGA's time zone use for debug.	1391520579359
TRIDIMASSETTX	VARCHAR2(150)	Asset. Required. Asset associated with Energy Use data (T_TRIBUILDINGEQUIPMENT.TRINAMETX)	ITEO Test CH Asset 3-2-15
TRIDIMASSETTXOBJID	NUMBER (20,0)	ref Asset. Required. (T_TRIBUILDINGEQUIPMENT.SYS_OBJECTID)	54323333
TRIDIMENERGYTYPETX	VARCHAR2(150)	Energy Type. Required. Reference to Energy Type from triEnergyType object (T_TRIENERGYTYPE.TRINAMETX) . The Energy Type can be found in TRIRIGA, under Classification in TRIRIGA.	Electric
TRIDIMENERGYTYPETXOBJID	NUMBER (20,0)	ref Energy Type Required. (T_TRIENERGYTYPE.SPEC_ID)	54247649
TRIDIMGEOGRAPHYTX	VARCHAR2(150)	Geography. Required. Reference to City specified on asset record (T_TRIBUILDING.TRIGEOGRAPHYLOOKUPTX where T_TRIBUILDING.SYS_OBJECTID = T_TRISPACE. TRIPARENTBUILDINGTXOBJID)	CH
TRIDIMGEOGRAPHYTXOBJID	NUMBER (20,0)	ref Geography. Required. (T_TRIBUILDING.TRIGEOGRAPHYLOOKUPTXOBJID where T_TRIBUILDING.SYS_OBJECTID = T_TRISPACE. TRIPARENTBUILDINGTXOBJID)	54320390
TRIDIMLOCATIONTX	VARCHAR2(150)	Location. Required. Reference to Building specified on asset record (T_TRISPACE.TRIPARENTBUILDINGTX where T_TRISPACE.SYS_OBJECTID = T_TRIBUILDINGEQUIPMENT.LOCATIONNAMEOBJID)	ITEO Test CH Bldg 3
TRIDIMLOCATIONTXOBJID	NUMBER (20,0)	ref Location. Required. (T_TRISPACE. TRIPARENTBUILDINGTXOBJID where T_TRISPACE.SYS_OBJECTID = T_TRIBUILDINGEQUIPMENT.LOCATIONNAMEOBJID)	54320849
TRIDIMSPECIFICATIONCLA	VARCHAR2(150)	Specification Class. Reference to Specification Class specified on asset record (T_TRIBUILDINGEQUIPMENT.TRISPECCLASSCL)	Air Handlers
TRIDIMSPECIFICATIONCLAOBJID	NUMBER (20,0)	ref Specification Class (T_TRIBUILDINGEQUIPMENT.TRISPECCLASSCLOBJID)	3055758
TRIENERGYTYPECL	VARCHAR2(1000)	Required. Identifies Energy Type associated with the Utility Rate for a main meter: Chilled Water, Electric, Fuel Oil, Natural Gas, Propane Gas, or Steam Water (T_TRIENERGYTYPE.TRINAMETX)	Electric
TRIENERGYTYPECLOBJID	NUMBER (20,0)	ref Energy Type. Required. (T_TRIENERGYTYPE.SPEC_ID)	54247649
TRIFACTENERGYUSENU	NUMBER (32,12)	Energy Use. Required. Result from energy use calculation This field represents the hourly energy use for the device in kWH.	0.3008
TRIENERGYUSEREPORTEDNU	NUMBER (32,12)	Energy Use Reported by a meter device. This field is required to run the 'Load Meter Item Staging Table' ETL job item when the associated asset is a main meter.	11999

Table 3. Hourly Fact Table - T_TRIASSETENERGYUSEHFACT (continued)

Column name	Data type	Description	Example value
TRIMAINMETERBL	VARCHAR2(5)	Main meter? If the Main Meter field on the asset is enabled, this value should be set to TRUE, otherwise FALSE (T_TRIBUILDINGEQUIPMENT.TRIMAINMETERBL) Required to run the 'Load Meter Item Staging Table' ETL Job Item when the associated asset is a main meter.	TRUE
TRIMAINMETERPROCESSEDN	VARCHAR2(5)	Has this meter record been processed by the 'Load Meter Item Staging Table' ETL Job Item? Default value is 0. Updated by the ETL when this is a main meter. This field is required by the ETL when the associated assets is a main meter. This default value for this field should be: 0 = Not Processed When the ETL runs, it will be set as follows: 1 = Processed 2 = Manual Processing Required	1
TRIMETERIDTX	VARCHAR2(150)	Unique Identifier for meter. This field is required to run the 'Load Meter Item Staging Table' ETL Job Item when the associated assets is a main meter. This field should be populated with the value for the TRIMETERIDTX field on the asset associated with this record.	EQ-1000300
TRINAMEPLATEIDTX	VARCHAR2(150)	Nameplate ID. Required. Uniquely identify on asset record (Nameplate should uniquely exist in T_TRIBUILDINGEQUIPMENT.TRINAMEPLATEIDTX)	oBIX-0255
TRINODETX	VARCHAR2(150)	Node. Identifier from BMS that represents unique asset	79:AHU255:BMS
TRIRATENU	NUMBER (32,12)	Rate associated with this meter and time interval. The value is obtained from the Utility Rate table (T_TRIUTILITYRATEPLAN). This field is required to run the 'Load Meter Item Staging Table' ETL Job Item when the associated assets is a main meter. The asset associated with this record should contain a reference to an external company (Purchased From Organization). The external company should specify a Utility Rate Plan (T_TRIUTILITYRATEPLAN) . The value should be set from the TRIRATENU field of the record associated with this meter and time interval.	59.86
TRIRATENU_UOM	VARCHAR2(100)	Unit of Measure associated with the value in the TRIRATENU field. The value is obtained from the Utility Rate table (T_TRIUTILITYRATEPLAN). This field is required to run the 'Load Meter Item Staging Table' ETL Job Item when the associated assets is a main meter. The asset associated with this record should contain a reference to an external company (Purchased From Organization). The external company should specify a Utility Rate Plan (T_TRIUTILITYRATEPLAN). The value should be set from the TRICURRENCYUOM field of the record associated with this meter \ time interval.	kilowatt-hours
TRISAMPLESACTUALNU	NUMBER (32,12)	Samples – Actual. The number of samples that were collected in the current interval (Hourly). Use to determine if we have enough samples for a complete interval.	4
TRISAMPLESMAXIMUMNU	NUMBER (32,12)	Samples – Maximum. The maximum number of samples that could be collected in the current interval (Hourly), for example sample every 15 minutes.	4

Table 3. Hourly Fact Table - T_TRIASSETENERGYUSEHFACT (continued)

Column name	Data type	Description	Example value
TRIWRITETIMETX	VARCHAR2(16)	Write Time. Required. This is the starting time for the interval which this data represents. The format is 1YYMMDDHH0000000. For example 1140101020000000 represents January 1, 2014 02:00:000, so this row represents January 1, 2014 02:00:000 thru January 1, 2014 02:59:999.	1140204020000000

Hourly Fact Table - T_TRIASSETANALYTICHFACT

You must have data loaded into the hourly fact table T_TRIASSETANALYTICHFACT in order to use the analytic rules.

Module

triMetricFact

Business object

triAssetAnalyticHFact

Display name

Asset Analytic Hourly

Table 4. Hourly Fact Table - T_TRIASSETANALYTICHFACT

Column Name	Data Type	Description	Example Value
TRIAGENTHOSTNAMETX	VARCHAR2(400)	Agent Hostname. Hostname where agent is running	walleperf03
TRIAGENTINSTANCETX	VARCHAR2(400)	Agent Instance. Instance name for the agent	oBIXTest201
TRIASSEMBLYLINETX	VARCHAR2(150)	AssemblyLine. Name of the Tivoli Directory Integrator AssemblyLine that created this row	triAssetHourlyFactLoad
TRICAPTUREDDT	NUMBER (32,0)	Captured Date and Time. Required. Date and Time associated from the external database for this record. The number of seconds that has elapsed since January 1, 1970. Need to be in a uniform time zone (GMT).	1391479200000
TRICONTROLNUMBERCN	VARCHAR2(1000)	Control Number. System generated field. This field is automatically generated, but a value is not required.	100000001
TRICREATEDDT	NUMBER (32,0)	Created Date and Time. Date and Time when this record was inserted in TRIRIGA. The number of seconds that have elapsed since January 1, 1970. TRIRIGA's time zone use for debug.	1391520579359
TRIDIMASSETTX	VARCHAR2(150)	Asset. Required. Asset associated with Energy Use data (T_TRIBUILDINGEQUIPMENT.TRINAMETX)	ITEO Test CH Asset 3-2-15
TRIDIMASSETTXOBJID	NUMBER (20,0)	ref Asset Required. (T_TRIBUILDINGEQUIPMENT.SYS_OBJECTID)	54323333
TRIDIMENERGYTYPETX	VARCHAR2(150)	Energy Type. Reference to Energy Type from triEnergyType object (T_TRIENERGYTYPE.TRINAMETX) . The Energy Type can be found in TRIRIGA, under Classification in TRIRIGA.	Electric
TRIDIMENERGYTYPETXOBJID	NUMBER (20,0)	ref Energy Type (T_TRIENERGYTYPE.SPEC_ID)	54247649
TRIDIMGEOGRAPHYTX	VARCHAR2(150)	Geography. Required. Reference to City specified on asset record (T_TRIBUILDING. TRICITYTX where T_TRIBUILDING.SYS_OBJECTID = T_TRISPACE. TRIPARENTBUILDINGTXOBJID)	CH
TRIDIMGEOGRAPHYTXOBJID	NUMBER (20,0)	ref Geography. Required. (T_TRIBUILDING.TRIGEOGRAPHYLOOKUPTXOBJID where T_TRIBUILDING.SYS_OBJECTID = T_TRISPACE. TRIPARENTBUILDINGTXOBJID)	54320390

Table 4. Hourly Fact Table - T_TRIASSETANALYTICHFACT (continued)

Column Name	Data Type	Description	Example Value
TRIDIMLOCATIONTX	VARCHAR2(150)	Location. Required. Reference to Building specified on asset record (T_TRISPACE.TRIPARENTBUILDINGTX where T_TRISPACE.SYS_OBJECTID = T_TRIBUILDINGEQUIPMENT.LOCATIONNAMEOBJID)	ITEO Test CH Bldg 3
TRIDIMLOCATIONTXOBJID	NUMBER (20,0)	ref Location. Required. (T_TRISPACE.TRIPARENTBUILDINGTXOBJID where T_TRISPACE.SYS_OBJECTID = T_TRIBUILDINGEQUIPMENT.LOCATIONNAMEOBJID)	54320849
TRIDIMSPECIFICATIONCLA	VARCHAR2(150)	Specification Class. Reference to Specification Class specified on asset record (T_TRIBUILDINGEQUIPMENT.TRISPECCLASSCL)	Air Handlers
TRIDIMSPECIFICATIONCLAOBJID	NUMBER (20,0)	ref Specification Class (T_TRIBUILDINGEQUIPMENT.TRISPECCLASSCLOBJID)	3055758
TRIFACTCOOLANTFLOWLMNU	NUMBER (32,12)	Cooling Liquid Flow In Liters Per Minute	10.4
TRIFACTCOOLINGVALVEPCT	NUMBER (32,12)	Cooling Valve Percentage. The percentage open of the cooling valve, where 100% represents completely open and 0% represents completely closed	9.3
TRIFACTECONOMIZERMODEN	NUMBER (32,12)	0 or 1. Economizer Mode Economizer Mode setting for this device. 0 represents it's not currently running in economizer more, 1 represents it is currently running in economizer.	1
TRIFACTENERGYUSENU	NUMBER (32,12)	This is energy use, in kWh of this device for this hour. This should match the value in triAssetEnergyUseHFact.	10
TRIFACTENEGYUSEREPORTEDNU	NUMBER (32,12)	Energy Use Reported by a meter device.	1014
TRIFACTEXHAUSTFANCURRE	NUMBER (32,12)	Exhaust Fan Current In Amperes	79.8
TRIFACTEXHAUSTFANOUTPU	NUMBER (32,12)	Exhaust Fan Output Percentage	80
TRIFACTEXHAUSTFANSTATU	NUMBER (32,12)	Exhaust Fan Status 0 represents OFF and 1 represents ON	0
TRIFACTHEATINGVALVEPCT	NUMBER (32,12)	Heating Valve Percentage. This is the percentage open of the valve, where 100% represents completely open and 0% represents completely closed	76.3
TRIFACTHUMIDIFIERVALVE	NUMBER (32,12)	Humidifier Valve Percentage This is the percentage open of the valve, where 100% represents completely open and 0% represents completely closed	53
TRIFACTINSCHEDULENU	NUMBER (32,12)	0 or 1. This value should be set to the results of querying the Scheduler for the Asset, set to 1 if the Asset on schedule, and 0 if off schedule	1
TRIFACTISAVAILABLENU	NUMBER (32,12)	0 or 1. This value should be set to the results of querying the Asset Status in TRIRIGA, set to 1 if status is 'Available'	1
TRIFACTISCALCULATEDRUN	NUMBER (32,12)	0 or 1. This value should be set to 0 if the asset is not intended to be running and 1 if it is intended to be running. Example algorithm per Specification of a device. Air Handling (TRIFACTSUPPLYFANSTATUS = 1) OR (TRIFACTSUPPLYFANSTATUS = null AND TRIFACTSUPPLYFANCURREN >= 1) OR (TRIFACTSUPPLYFANSTATUS = null AND TRIFACTSUPPLYFANCURREN = null AND TRIFACTSUPPLYFANOUTPUT >= 1) Chill Water (TRIFACTPOWERUSAGEWNU > 25000) OR (TRIFACTPOWERUSAGEWNU = null AND TRIFACTISAVAILABLENU = 1)	1
TRIFACTISMAINTENANCEMO	NUMBER (32,12)	0 or 1. This value should be set to the results of querying the Asset Status in TRIRIGA, set to 1 if status is 'Offline for Maintenance' else 0	0
TRIFACTMIXAIRTEMPCNU	NUMBER (32,12)	Mixed Air Temperature In Celsius	19.2

Table 4. Hourly Fact Table - T_TRIASSETANALYTICHFACT (continued)

Column Name	Data Type	Description	Example Value
TRIFACTOCCUPIEDCOMMAND	NUMBER (32,12)	0 or 1. Occupied Command. 0 means the space serviced by this device is unoccupied, and 1 means the space is occupied	1
TRIFACTOUTSIDEAIRDAMPE	NUMBER (32,12)	Outside Air Damper Minimum Percentage	31.9
TRIFACTOUTSIDEAIRDAMPE1	NUMBER (32,12)	Outside Air Damper Percentage	79.5
TRIFACTOUTSIDEAIRTEMPC	NUMBER (32,12)	Outside Air Temperature In Celsius	23.2
TRIFACTOUTSIDEENTHALPY	NUMBER (32,12)	Outside Enthalpy In Joules Per Kilogram	71.7
TRIFACTOUTSIDEHUMIDITY	NUMBER (32,12)	Outside Humidity Percentage	81.7
TRIFACTPOWERUSAGEWNU	NUMBER (32,12)	Power Usage In Watts	836.8
TRIFACTPREHEATVALVEPCT	NUMBER (32,12)	Preheat Valve Percentage This is the percentage open of the valve, where 100% represents completely open and 0% represents completely closed.	48.1
TRIFACTREHEATVALVEPCTN	NUMBER (32,12)	Reheat Valve Percentage This is the percentage open of the valve, where 100% represents completely open and 0% represents completely closed.	48.1
TRIFACTRETURNAIRCOPPM	NUMBER (32,12)	Return Air CO2 In Parts Per Million	81.8
TRIFACTRETURNAIRTEMPCN	NUMBER (32,12)	Return Air Temperature In Celsius	25.8
TRIFACTRETURNCOOLANTTE	NUMBER (32,12)	Return Cooling Temperature In Celsius	18.8
TRIFACTRETURNFANOUTPUT	NUMBER (32,12)	Return Fan Output Percentage	81.9
TRIFACTSTEAMVALVEPCTNU	NUMBER (32,12)	Steam Valve Percentage This is the percentage open of the valve, where 100% represents completely open and 0% represents completely closed.	15.9
TRIFACTSUPPLYAIRTEMPCN	NUMBER (32,12)	Supply Air Temperature In Celsius	17.2
TRIFACTSUPPLYAIRTEMPSP	NUMBER (32,12)	Supply Air Temperature Setpoint In Celsius	13.5
TRIFACTSUPPLYCOOLANTTE	NUMBER (32,12)	Supply Cooling Temperature In Celsius	10.2
TRIFACTSUPPLYCOOLANTTE1	NUMBER (32,12)	Supply Cooling Temperature Setpoint In Celsius	10.9
TRIFACTSUPPLYFANCURREN	NUMBER (32,12)	Supply Fan Current In Amperes	79.6
TRIFACTSUPPLYFANOUTPUT	NUMBER (32,12)	Supply Fan Output Percentage	81.9
TRIFACTSUPPLYFANSTATUS	NUMBER (32,12)	Supply Fan Status	0
TRIFACTSUPPLYRELHUMIDI	NUMBER (32,12)	Supply Relative Humidity Percentage	35.9
TRIFACTSUPPLYRELHUMIDI1	NUMBER (32,12)	Supply Relative Humidity Setpoint Percentage	66.6
TRIFACTZONERELHUMIDITY	NUMBER (32,12)	Zone Relative Humidity Percentage	34
TRIFACTZONETEMPCNU	NUMBER (32,12)	Zone Air Temperature In Celsius	19.2
TRINAMEPLATEIDTX	VARCHAR2(150)	Nameplate ID. Required. Uniquely identify on asset record in TRIRIGA (Nameplate should uniquely exist in T_TRIBUILDINGEQUIPMENT.TRINAMEPLATEIDTX)	oBIX-0255
TRINODETX	VARCHAR2(150)	Node. Identifier from BMS that represents unique asset	79:AHU255:BMS
TRISPECIFICATIONSUBTYP	VARCHAR2(150)	Sub Type Specification Class. Reference to Specification Class specified on asset record (T_TRIBUILDINGEQUIPMENT.TRISPECCLASSCL)	VAV
TRIWRITETIMETX	VARCHAR2(16)	Write Time. Required. This is the starting time for the interval which this data represents. The format is 1YYMMDDHH0000000. For example 1140101020000000 represents January 1, 2014 02:00:000, so this row represents January 1, 2014 02:00:000 thru January 1, 2014 02:59:999.	1140204020000000

Chapter 3. Measuring environmental impact

To implement an environmental sustainability strategy, you must measure the environmental impact of your organization. The first step is to collect environmental data about critical workplace assets, including energy consumption and emissions data.

Examples for measuring environmental impact

Carbon footprint calculation is the standard way of measuring and reporting the environmental impact that a building, land, structure, or retail location has on the environment. One strategy to lessen the carbon footprint while also reducing expenses is to lower the use of energy.

Example: Calculating the carbon footprint of the real estate portfolio

Executives at Company XYZ are interested in determining the current carbon footprint of the real estate portfolio. The goal is to use this information to identify cost-effective environmental opportunities to reduce the impact and cost of workplace assets on the environment.

To calculate the carbon footprint of the real estate portfolio, Gary Green, environmental manager for Company XYZ, plans to use TRIRIGA Real Estate Environmental Sustainability. Gary uses TRIRIGA to collect and analyze the environmental data.

Step 1: Collecting real estate portfolio information

To get started, Gary must collect the following basic information about the real estate portfolio:

- The measurements of the area of each building in the real estate portfolio, including details about the floors and spaces, such as offices and meeting rooms
- The percent of occupancy of each building
- The geographical region of each building

The geographical regions in which the spaces are located are important to determine the correct emissions factors to use in the carbon calculations. Because Company XYZ is in the US, the emissions factors are based on the North American Electric Reliability Corporation (NERC) regions and the Emissions & Generation Resource Integrated Database (eGRID) subregions. To accurately compare the efficiency of buildings that are in different climates, you must consider the geographic location.

Gary uses the TRIRIGA application to create location records for the real estate portfolio. Gary creates location records for buildings, floors, and spaces. To gather the information, Gary meets with a facilities manager, a financial officer, and the real estate department.

The greatest challenge in calculating the carbon footprint is to collect the environmental data. Gary spends months collecting and entering information in order to have enough data to accurately benchmark the carbon footprint.

Step 2: Creating climate logs

Gary creates climate logs for each facility to normalize data from month to month and year to year. Normalized data shows whether the carbon footprint is affected by global warming or daily temperatures. The data shows whether the HVAC equipment or any of the assets in a facility are inefficient. If the data points to inefficient equipment, Gary can request an inspection.

To find information about the heating and cooling degree days for a location, Gary searches for a nearby weather station. To save time, Gary configures a list of weather stations in TRIRIGA and associates the stations with the location records. Gary contacts IBM Global Business Services to help set up an integration between a weather data source and TRIRIGA. After the integration is complete, TRIRIGA automatically creates the climate logs for all of the locations at the chosen interval.

Step 3: Populating energy logs

Gary uses two of the available methods to enter energy log information into TRIRIGA:

- Some utility companies allow customers to connect to their billing systems. For locations that use these utility companies, Gary uses the IBM TRIRIGA Connector for Business Applications tool to integrate TRIRIGA directly with the utility company. The TRIRIGA system receives the data about energy use and automatically creates the energy logs.
- For locations that cannot be integrated with a data source, Gary enters the information from the paper utility bills into TRIRIGA. Rather than entering the data directly into energy logs, Gary enters the data into a utility invoice form. When the utility invoices are approved, TRIRIGA creates the energy logs.

Step 4: Populating waste logs

Waste information comes from the utility company and is based on consumption, including landfill, composite, combusted, and recycled waste. Gary enters this data into TRIRIGA waste logs.

Step 5: Populating travel logs

Travel data that is used in carbon calculations for scope three emissions includes the daily commute of your employees and the business travel of the employees. Gary creates monthly travel logs for the total number of employees in each facility who traveled during that month. Gary gets this information from the travel agency that is used by Company XYZ, which does not have a separate travel department.

Step 6: Generating carbon logs and carbon footprint reports

Gary is ready to use the energy, waste, and travel information to calculate carbon logs for each location. Gary configures the system to run the calculations and create a carbon footprint report on a regular job schedule. Gary continues to enter new data and views the updated carbon footprint reports each month.

Example: Lowering energy consumption

Executives at Company XYZ want to understand the total monthly electricity use for each of their facilities to consider actions that can reduce energy expenses.

Environmental manager Gary Green plans to use TRIRIGA Real Estate Environmental Sustainability to examine the energy consumption of each facility in the real estate portfolio.

Step 1: Analyzing the data

Gary uses the energy log data that is in TRIRIGA to view information about the energy use of each facility. The climate logs help to better understand the expenses for heating or cooling in each location.

Step 2: Analyzing options

Gary considers options, such as upgrading energy-consuming assets or changing the working schedule of employees.

Step 3: Proposing solutions

Gary proposes a shortened workweek and a shutdown of the facilities during the three non-working days of each week.

Result: Changing the workweek to lower energy costs

The CFO approves the proposal to change the workweek from eight hours on five days of each week to ten hours on four days each week. Energy expenses from heating, cooling, lighting, and other uses of electricity are nearly eliminated during the three days that employees are not at work. Gary uses TRIRIGA to track the results and reports the success to the CFO.

Carbon footprint calculations

The calculation of carbon footprint is the standard way of measuring and reporting the environmental impact that a building, land, a structure, or a retail location has on the environment.

The carbon footprint of a company, a building, land, a structure, or a retail location is measured in tons of CO_2 per year.

The carbon footprint calculator function bases calculations on the three environmental scopes, including the following components:

- On-site energy production and other industrial activities
- Area of facilities and percent of occupancy
- Facility energy use such as electricity, gas, coal, oil, and solar
- Corporate travel such as plane, rail, vehicle
- Corporate waste

The carbon footprint calculator converts each of these energy, travel, and waste sources from their original unit of measure, for example, kWh or miles, to tons CO_2 per year by applying emission conversion factors. The calculator uses the most current energy, travel, and waste data from the energy log, the travel log, and the waste log. These logs are saved until you delete them.

On a recurring basis, which is daily by default, TRIRIGA searches for any records or locations with changes to the factors that affect the carbon calculation. For example, new energy or travel data is entered. For changed records, the emissions

are calculated for each designated location and organization and stores the calculation data in the carbon log. This process can also be triggered manually.

The calculator uses the following emission lookup tables, which are in the **Application Setup** menu, for the calculations:

Energy Conversion Factors
The conversion factors for converting energy data into grams or pounds of CO_2. Conversion factors can be tailored to be based on the policy of the company. Examples include the following factors:

- US Region Electricity Emission Factors (NERC Region and eGRID Subregion Emission Factors). This table contains electricity emission factors for the US regions only.
- World Region Electricity Emission Factors (Electricity Emission Factors - All Fuels)
- World Region Electricity Emission Factors - Coal (Electricity Emission Factors – Coal)
- World Region Electricity Emission Factors - Oil (Electricity Emission Factors – Oil)
- World Region Electricity Emission Factors - Gas (Electricity Emission Factors – Gas)
- Other user-defined emission factors such as factors that are negotiated with an energy provider.

Travel Conversion Factors
The conversion factors for converting travel data into grams or pounds of CO_2.

Waste Conversion Factors
The conversion factors for converting waste data.

Each carbon footprint calculation creates a carbon log on the record for the building, land, the structure, or the retail location. The carbon logs provide a historical view of carbon emissions over the life of the location.

Carbon calculations process

The carbon calculator function runs in a circular process each time that it is triggered after changes are made that impact the calculation.

The carbon calculator function uses the following circular process:

1. Trigger the carbon footprint calculator process.
2. Retrieve the locations and organizations with changes.
3. Retrieve all inputs.
4. Perform the calculations.
5. Create the carbon log with all of the input and output data.
6. Update the current period carbon footprint.
7. Reset the **Carbon Calculation Needed** flag.

Carbon footprint calculation formulas

Carbon footprint calculation formulas vary depending on what you are measuring.

Carbon footprint calculations for energy

Energy carbon calculations use the selected base unit of measure.

The following calculations are used for scope 1 (direct) energy emissions:

CO_2 = (Total Amount * (CO_2 Emission Factor * Heating Value) * Density)

CH_4 = ((Total Amount * (CH_4 Emission Factor * Heating Value) * Density) * GWP CH_4 Conversion)

N_2O = ((Total Amount * (N_2O Emission Factor * Heating Value) * Density) * GWP N_2O Conversion)

The following calculations are used for scope 2 (indirect) energy emissions:

CO_2 = ((Total Amount Used Based on Occupancy * Emission Factor))

CH_4 = ((Total Amount Used Based on Occupancy * CH_4 Emission Factor) * GWP CH_4 Conversion)

N_2O = ((Total Amount Used Based on Occupancy * N_2O Emission Factor) * GWP N_2O Conversion)

Carbon footprint calculations for travel

If the company owns the vehicle, emissions are calculated by the distance that is traveled. If the company does not own the vehicle, emissions are calculated by usage.

The following calculations are used for scope 1 (direct) travel emissions for vehicles that are owned by the company:

CO_2 = ((Distance Traveled + Fuel Usage) * Emission Factor)

CH_4 = (((Distance Traveled + Fuel Usage) * CH_4 Emission Factor) * GWP CH_4 Conversion)

N_2O = (((Distance Traveled + Fuel Usage) * N_2O Emission Factor) * GWP N_2O Conversion)

The following calculations are used for scope 1 (direct) travel emissions for vehicles that are not owned by the company:

CO_2 = ((Distance Traveled + Fuel Usage) * (Emission Factor * Heating Value) * Density)

CH_4 = (((Distance Traveled + Fuel Usage) * (CH_4 Emission Factor * Heating Value) * Density) * GWP CH_4 Conversion)

N_2O = (((Distance Traveled + Fuel Usage) * (N_2O Emission Factor * Heating Value)*Density)*GWP N_2O Conversion)

The following calculations are used for scope 3 (indirect) travel emissions for vehicles that are owned by the company:

```
Travel Carbon Footprint = (Emission Factor * Distance Traveled)
```

The following calculations are used for scope 3 (indirect) travel emissions for vehicles that are not owned by the company:

```
Travel Carbon Footprint = ((Distance Traveled + Fuel Usage) * Emission
Factor * Heating Value * Density)
```

Carbon footprint calculations for other emissions

The following calculations are used for other emissions:

```
Other Emissions = Total Quantity * 0.001102 * GWP Emission Factor
```

Sustainability checklists

Sustainability checklists can be configured based on common rating systems to prepare for an assessment.

Checklists

Checklists enable evaluating the current environmental and energy performance of facilities. Checklists monitor the impact of planned and completed improvements. Checklists help you to rate environmental and energy performance to help determine what improvements can be made to reach a higher level of certification. Checklists are also used to verify that defined actions are complete.

A checklist consists of checklist categories that group checklist items and scores. Checklist categories contain checklist items. Checklists and checklist items can include specific projects and tasks to be implemented to achieve the score for the checklist item.

Templates

Templates facilitate the standardization and creation of checklists, checklist categories, and checklist items. If a checklist template is revised or retired, you can choose to apply the action to any checklists that were based on the template. If you update a template, you can choose to update the associated checklists that were based on the template.

Collecting environmental data into TRIRIGA

To measure environmental impact of the organization, you must collect all relevant environmental data. You enter data into the environmental logs by using several methods, from manual entry to integration with other sources of data.

Manually entering environmental data

If you have records that are related to environmental data from sources other than utility invoices that cannot be imported through integration, you can create environmental logs that are associated with a building, land, a retail location, or a structure record.

Procedure

1. Open the record for which you want to create an environmental log and go to the **Environmental** tab.

2. On the tab for the type of environmental log that you want to create, click **Add**.
3. Complete the environmental log form, click **Create**, and then click **Activate**.

Creating environmental logs by using utility invoices

When a utility bill invoice is approved, energy, water, and waste logs are created for the corresponding business objects.

Before you begin

When you process utility bills and create the corresponding energy, water, and waste log records at the building level, you must know which business objects that a meter services. You must also know the proportionate allocation that each business object is of the overall utility bill line item. Several meters can service a single business object, so you must know which meters belong to a business object. You can allocate meters by selecting **Portfolio** > **Assets** > **Building Equipment**.

Procedure

1. Go to **Contracts** > **Payables** > **Invoices** > **Utilities** and click **Add**.
2. Complete the Utility Invoice form. Energy logs are not be created when the utility invoice is approved, unless you select the **Include in Energy Use** check box in the Details section of the **General** tab.
3. Optional: To add line items for the utility invoice in the Line Items section, click **Add** and complete the Utility Invoice Line Items form.
4. Click **Create Draft**.
5. Click **Issue** to send the invoice for approval.

Results

When the invoice is approved, the corresponding energy, water, and waste logs are created.

Creating environmental logs by sending offline content records

Offline content records are Microsoft Excel spreadsheets that are used to enter the data to create multiple environmental logs at one time or to send information to TRIRIGA when you are not logged in.

Before you begin

You must be signed in as an application administrator.

Enter the incoming email account information for offline forms in the Incoming Mail Config record by selecting **Tools** > **System Setup** > **Incoming Mail Config**.

About this task

Offline content forms are available for climate, emission, energy, travel, waste, and water logs. TRIRIGA parses the data that is entered into the system through offline content forms. TRIRIGA creates environmental logs based on the meter type for water, energy, emission, travel, or waste logs or for the weather station for climate logs.

Tip: Use the offline content records that are provided with TRIRIGA. To change a standard record, copy it, rename the copy, and edit the copy.

Procedure

1. Go to **Tools** > **System Setup** > **Integration** > **Offline Content**, select an offline content record, and save the `.xls` file to your computer.
2. Open the offline content record `.xls` file and specify the data to send to the TRIRIGA system.
3. Send the populated record as an attachment to a configured email address.

Automated collection of environmental data

TRIRIGA supports various techniques to integrate data from external sources, whether for monthly, daily, or hourly data.

Integrating monthly data for TRIRIGA Real Estate Environmental Sustainability Manager

The focus of TRIRIGA Real Estate Environmental Sustainability Manager is on monthly data. In addition to manual methods of entering this data, some utility companies and energy monitoring systems allow data integration. By integrating TRIRIGA with other sources of data you can automatically import monthly environmental data into TRIRIGA environmental logs.

Integrating daily or hourly data for TRIRIGA Real Estate Environmental Sustainability Impact Manager

TRIRIGA Real Estate Environmental Sustainability Impact Manager extends the abilities of TRIRIGA Real Estate Environmental Sustainability Manager to allow reports and analytics to be run on daily or hourly data from meters or sensors.

You can find additional information and sample ETLs to help you set up data integration with building management systems and other external data sources in the TRIRIGA Real Estate Environmental Sustainability Impact Manager Toolkit on the IBM Integrated Service Management Library at http://www.ibm.com/software/ismlibrary?NavCode=1TW10IB09.

Additional support for data integration with TRIRIGA

Whether you are using TRIRIGA Real Estate Environmental Sustainability Manager or TRIRIGA Real Estate Environmental Sustainability Impact Manager, IBM Global Business Services can help you to set up custom integrations with your utility companies or with another system, such as IBM Tivoli Monitoring for Energy Management.

Creating energy logs from data in the T_TRIASSETENERGYUSEHFACT hourly fact table

In TRIRIGA Real Estate Environmental Sustainability Impact Manager, you can create energy logs from meter data that is contained in the T_TRIASSETENERGYUSEHFACT hourly fact table by scheduling the ETL job item that creates the energy logs.

Before you begin

The T_TRIASSETENERGYUSEHFACT hourly fact table must already contain energy consumption data from meters. The meter data in the fact table already includes energy cost information from the utility rate plans that you configure for utility suppliers. For more information about the types of data that are included in the fact table and the requirements for using the Load Meter Item Staging Table ETL, see the reference information for "Hourly Fact Table - T_TRIASSETENERGYUSEHFACT" on page 23.

Configuring utility rate plans

Create utility rate plans to be associated with energy consumption data so that the energy logs that you create from the TRIRIGA Real Estate Environmental Sustainability Impact Manager T_TRIASSETENERGYUSEHFACT fact tables will include cost information that is specific to the utility supplier that is used at the time of energy consumption.

About this task

Utility rate plans can be associated with external organizations that have the organization type set to Utility Supplier. For TRIRIGA Real Estate Environmental Sustainability Impact Manager to be able to use the rate plan information when creating energy logs from the T_TRIASSETENERGYUSEHFACT fact tables, the consumption data must come from meters that are associated with an external organization that has a utility rate plan configured.

Procedure

1. To configure a utility rate plan, click **Portfolio** > **Organizations** > **External Companies** and open the organization record for the utility supplier.
2. Click the **Utility Rates** tab.

   Restriction: The **Utility Rates** tab is only available on an Organization record that is defined as an External Organization with the organization type set to Utility Supplier.
3. On the Utility Rate Plans section menu bar, click **Add** to open a new Utility Rate Plan form or click an existing rate plan record.
4. Specify the information for the rate plan. The start and end dates define the date range for which the rate plan is in effect. The start and end times define the period each day that the rate is in effect. The time period for a rate plan for a utility supplier cannot overlap the time period of another rate plan for the same utility supplier for the same day.
5. Click **Save and Close**.

Scheduling the creation of energy logs from hourly fact table data

After you have populated the hourly fact table with energy consumption data and utility rate plan information, you must schedule the Load Meter Item Staging Table ETL to run and create energy logs. Configure and activate the default job scheduler for the Load Meter Item Staging Table ETL that is included in TRIRIGA Real Estate Environmental Sustainability Impact Manager.

Procedure

1. To access the default job scheduler, click **Tools** > **System Setup** > **Job Scheduling** > **Job Scheduler** and click to open the **DEFAULT - Load Meter Item Staging Table** job scheduler.

2. Modify the details of the job scheduler and click **Activate**.

Results

The Load Meter Item Staging Table ETL will run as scheduled to create energy logs based on the energy consumption data in the T_TRIASSETENERGYUSEHFACT fact table.

Creating building portfolios for ENERGY STAR submissions

The ENERGY STAR Portfolio Manager requires specific information to provide ENERGY STAR ratings for buildings. This information includes the gross floor area, property use, the in-service date of the building, geographical location of the building, and how the building is used. At least 12 consecutive months of meter energy logs are also required.

Creating location data for ENERGY STAR ratings

You can submit building, structure, and retail locations to the ENERGY STAR Portfolio Manager to receive ENERGY STAR ratings.

About this task

You can modify the details of the location after you submit the record for an ENERGY STAR rating. These changes are automatically updated in the ENERGY STAR Portfolio Manager on the next energy rating submission.

ENERGY STAR accepts the area unit of measure only as square feet or square meters. If the unit of measure on the location record is specified as square meters, the gross area is submitted as square meters. Otherwise, the unit of measure is automatically submitted as square feet.

Procedure

1. Create a building, structure, or retail location record.
   a. Select **Portfolio** > **Locations**.
   b. In the Hierarchy pane, click **Locations** > **New**.
2. Enter the area measurements of the location.

Option	Description
If the location includes floors	Add a floor to the location by selecting **New** > **Floor** and enter the gross area floor measurements.
If the location does not include floors in the record	Enter the area measurements in the **Total Area Occupied (manual)** field on the **General** tab.

3. Specify the primary use for the location.
4. In the Energy Rating Setup section, specify the energy rating type.
5. Optional: Set the baseline and target dates and ratings.
6. Specify the in-service date that the location is active.
7. Enter the address of the location. The address format must include a two-letter abbreviation for the state and country, for example, NV for Nevada and US for United States.
8. Click **Create Draft** and save the location.

What to do next

Create an energy rating record to list the energy space types and associated data attributes for the location.

Creating energy rating records

Energy rating records list the energy spaces and data attribute values, associated meters, and energy logs for building, structure, retail location records. This information is required for an ENERGY STAR rating.

Before you begin

Associate the applicable meters with the energy log records.

Specify the primary use on the location record.

About this task

The primary energy space describes how the space in a building is predominantly used, for example as a hospital, elementary school, office, or medical office. Buildings can have multiple functional uses, but one space type must be selected as the primary energy space.

For more information about property use, see the ENERGY STAR website (www.energystar.gov/).

Procedure

1. Open the Energy Rating form by clicking **Update** on the Energy Rating results section of the location record.
2. In the Log Collection Parameter section, associate logs and meters from 12 consecutive months.
3. Click **Create** to add energy spaces.
4. In the Energy Space section, add the energy spaces for the location and enter the percentage of total space for each.
5. Specify one of the energy spaces as the primary energy space.
6. Select the energy space and enter the associated data attribute values.
7. Save the energy rating form.

Results

The energy rating record for the location is ready to be submitted for an ENERGY STAR rating. You can submit records manually or automatically. You can view the energy rating record from the **Environmental** tab on the **Energy ratings** tab.

You can also update or remove energy spaces, data attribute values, meters, and energy logs for the location after you request an ENERGY STAR rating. These changes are automatically updated in the ENERGY STAR Portfolio Manager on the next energy rating submission.

Integrating TRIRIGA with the ENERGY STAR Portfolio Manager

Direct integration with ENERGY STAR Portfolio Manager from the US Environmental Protection Agency (EPA) automates the process of receiving current ENERGY STAR ratings for buildings at regular intervals. You configure TRIRIGA to connect to the ENERGY STAR Portfolio Manager. The ENERGY STAR rating system provides the industry standard for the energy performance of buildings.

ENERGY STAR ratings

TRIRIGA can receive ENERGY STAR ratings for buildings by integrating with the ENERGY STAR Portfolio Manager from the US Environmental Protection Agency (EPA). ENERGY STAR ratings help you to assess energy and water consumption across the portfolio of buildings.

You configure TRIRIGA to connect to the ENERGY STAR Portfolio Manager. TRIRIGA then automatically sends current environmental data on a scheduled basis to receive updated ENERGY STAR ratings.

With the ENERGY STAR rating system, you can evaluate the energy performance of your building portfolio by comparing the rating of buildings within the portfolio. You can also compare the energy performance rating of your building portfolio with the average ratings of similar buildings. You then can set targets to improve the ratings of the buildings and evaluate the potential savings if these targets are achieved. By comparing the current ratings with the targets, you can prioritize buildings that maximize return on investment by comparing potential savings to costs of efficiency opportunities.

The ENERGY STAR 1 - 100 scale provides a simple way to review and understand the energy performance of buildings. The rating system evaluates attributes of each building by space type, energy usage, and monthly weather data for each building region. Buildings that rate 75 or greater qualify for the ENERGY STAR label.

The ENERGY STAR Portfolio Manager requires information such as the gross floor area, property use, the in-service date, and geographical location of the building. At least 12 consecutive months of meter energy logs are also required. You can establish a baseline rating for a building and then set a target date and rating to achieve an ENERGY STAR rating.

When you submit the energy log for an energy rating, the cost of the meter, that is displayed in the **Total Cost (Energy Rating Currency)** field, is also submitted. The default currency is US dollars. You can change the default currency in Application Settings.

If you update information about a building, property use, meter, or energy logs, the corresponding ENERGY STAR record on ENERGY STAR Portfolio Manager is also updated on the next energy rating submission.

Integrating TRIRIGA with ENERGY STAR Portfolio Manager

To integrate with the ENERGY STAR Portfolio Manager and receive ENERGY STAR ratings for your building portfolio, you must perform the following tasks.

Procedure

1. Configure the energy rating type classifications.

2. To test your energy rating information in the ENERGY STAR testing environment, you can create an ENERGY STAR test server account.
3. Configure meters for ENERGY STAR ratings.
4. Add the energy consumption of buildings to energy logs.
5. Establish a baseline rating and a target rating for buildings.
6. For existing users, migrate energy space types.
7. Connect to the ENERGY STAR live server.
8. Create building portfolios for ENERGY STAR submissions.
9. To prevent any issues before you request an ENERGY STAR rating, you can validate the energy rating information.
10. Request ENERGY STAR ratings.

Configuring ENERGY STAR settings

Before you can submit buildings, property use, meters, and energy logs for an ENERGY STAR rating, you configure settings for ENERGY STAR. You configure meters for successful energy rating submissions, set baseline and target values to measure energy performance, and create ENERGY STAR server accounts to connect to ENERGY STAR.

Configuring meters for ENERGY STAR ratings

To receive ENERGY STAR ratings, you must provide meter information for the meter type and the meter asset. This information is required by the ENERGY STAR Portfolio Manager to generate ENERGY STAR ratings.

Configuring meter type classifications for ENERGY STAR ratings:

The environmental meter type record defines the energy type and unit of measure for energy logs and meter assets. When you create the classification for the meter type, you must provide the energy rating details that ENERGY STAR requires to generate ENERGY STAR ratings.

About this task

You must provide the following energy rating details in the associated environmental meter type record:

- The corresponding meter type definition for ENERGY STAR
- The default unit of measure (UOM) for the energy rating
- The unit of measure that is used by ENERGY STAR

When a meter is retired, the associated meter in the ENERGY STAR portfolio is automatically set to inactive when the next energy rating request is submitted.

For more information about meters values, see the ENERGY STAR website (www.energystar.gov/).

Procedure

1. Open the environmental meter type record by selecting **Tools** > **Administration** > **Classifications** and select the **Environmental Meter Type** classification from the hierarchy list.
2. In the ENERGY STAR Details section, specify the energy rating details.
3. Save and close the record.

What to do next

Specify the energy rating information for the meter asset.

Creating utility meters for ENERGY STAR ratings:

When you create utility meters for an energy rating submission, you must provide the energy type of the utility meter and the date the meter is active. The energy type and service date of the utility meter is required to request ENERGY STAR ratings.

About this task

Meters are defined as building equipment assets with the specification type of Utility Meter.

Procedure

1. Open the meter by selecting **Portfolio** > **Assets** > **Building Equipment**.
2. In the Environmental Details section, specify the energy type of the utility meter.
3. In the Asset Status section, specify the in-service date of the utility meter.
4. Save and close the record.

Configuring baseline and target setup

Baseline data provides a set of initial energy rating values for locations. You set a baseline for locations to compare the energy rating performance of buildings within a building portfolio and also the performance average of similar buildings. You can also use this information to set targets for improvement and predict potential savings.

About this task

You can establish baseline and target energy rating values for a collection of building, structure, or retail locations.

Procedure

1. Create the Baseline and Target Setup form by clicking **Home** > **Sustainability** > **Set Up** > **General** > **Baseline and Target Setup**.
2. Select the process type.

Option	Description
If process type is Baseline	Enter the baseline date. The energy rating value from or nearest to the baseline date is used as the baseline rating.
If process type is Target	Enter the target date and target rating.

3. Select the buildings, structures, and retail locations.
4. Apply the changes to update the baseline or target values to the locations you selected.

Creating accounts for the ENERGY STAR test server

You can use the testing environment on the ENERGY STAR Portfolio Manager to test the energy rating information before you connect to the live server. To access the ENERGY STAR testing environment, you must create an account for the ENERGY STAR test server.

Procedure

1. Open the ENERGY STAR Settings form by clicking **Sustainability** > **Set Up** > **General** > **ENERGY STAR Settings**.
2. On the **Test Server** tab, specify the account information for the test server and create the account.

Results

After the account is created on the ENERGY STAR test server, the account number is displayed on the test server form.

Connecting to the ENERGY STAR live server

To submit energy rating information and receive ENERGY STAR ratings for your building portfolio, you connect to the EPA Portfolio Manager live server environment.

About this task

When you create a meter, you can exclude energy logs that do not have an associated cost from the energy rating submission.

Procedure

1. Open the ENERGY STAR Settings form, by clicking **Sustainability** > **Set Up** > **General** > **ENERGY STAR Settings**.
2. On the **Live Server** tab, specify the account information for the live server.
3. Select the **Active Server** check box to connect to the ENERGY STAR live server. The test server is automatically inactivated.
4. On the **General** tab, upload the ENERGY STAR XML schemas.
5. To exclude energy logs that do not have an associated cost from the energy rating submission, select the **Default Exclude Energy Logs with Zero Cost** check box. All meters with energy logs that do not have an associated cost are excluded from the energy rating submission by default.
6. Save the form.

Requesting ENERGY STAR ratings

To provide an environmental score for your building portfolio, you can request ENERGY STAR ratings from the ENERGY STAR Portfolio Manager. You can schedule requests automatically for multiple locations or send a request manually for an individual building.

Requesting ENERGY STAR ratings manually

To request an ENERGY STAR rating for an individual building in your building portfolio, you can submit a request manually.

Before you begin

You must have at least 12 months of energy logs for each location to be rated.

You must associate the appropriate meters with the energy log records.

Procedure

1. Open a building, structure, or retail location record.
2. In the Energy Rating Result section, click **Update**.
3. In the Energy Rating form, enter the number of months of energy logs to use, specify the end date, and click **Create**.
4. Submit the ENERGY STAR rating request for the location.

Results

ENERGY STAR rating results are displayed on the Energy Rating record and on the **General** tab of the location record.

Configuring the energy rating schedule

The energy rating schedule determines how often ENERGY STAR ratings will be requested and for which locations.

Before you begin

Before you can request ENERGY STAR ratings, you must have at least 12 months of data for each location to be rated.

Procedure

1. Click **Home** > **Sustainability** > **Set Up** > **General** > **Energy Rating Schedule** to view current energy rating schedules.
2. You can open an existing schedule to modify it or click **Add** to create a new schedule.

Troubleshooting information for ENERGY STAR integration

To prevent errors in receiving ENERGY STAR ratings, TRIRIGA Real Estate Environmental Sustainability includes the option to validate ENERGY STAR data before it is sent to the Environmental Protection Agency (EPA) and provides log data to help you troubleshoot errors after they occur.

ENERGY STAR error messages

For any errors that are generated by ENERGY STAR during the submission process, an ENERGY STAR processing log is created to describe the failure point of the process.

These error messages include ENERGY STAR error codes and descriptions about the problem. For information about ENERGY STAR errors codes, see the ENERGY STAR website (www.energystar.gov/).

Locating ENERGY STAR submission errors

ENERGY STAR processing log records are created for errors that are generated in response to a request for an ENERGY STAR rating. These processing logs provide information that explains where the errors occurred.

About this task

The log records are associated with the building, structure, or retail location for which the submission is being processed.

For information about ENERGY STAR errors codes, see the ENERGY STAR website (www.energystar.gov/).

Procedure

1. To view errors, go to the **Environmental** tab of the building record and click **Energy Ratings**.
2. In the **Related Reports** list, select **Energy Rating Error Log** to view the Energy Star Processing Log records.
3. Select a record to open and view information about the error.

Environmental data analysis

Metrics, reports, carbon footprint calculations, ENERGY STAR ratings, and checklists help you to analyze environmental data.

Environmental performance metrics

Metrics for the use of energy, greenhouse gas emissions, production of waste, and the use of other resources are used to measure environmental performance and to help you to assess environmental impact and opportunities for improvements.

Environmental performance reports

Reports are included with TRIRIGA to help you report on environmental sustainability.

Calculating the carbon footprint

You can trigger the carbon calculator function in TRIRIGA Real Estate Environmental Sustainability to run manually or automatically on a regular job schedule.

Scheduling carbon calculations

Schedule a carbon calculation job to run at a regular interval to maintain records of the carbon footprint of each location over time.

Before you begin

You must sign in as an application administrator.

Procedure

1. Go to **Home** > **Tools** > **System Setup** > **Job Scheduling** > **System Job Scheduler** and click **Add**.
2. In the General section, enter a name and description.
3. In the Schedule section, select values for the schedule type and the start and end dates. If environmental logs exist for past calendar periods, check the **Run Historic Captures** box.
4. In the Job Items section, select the job item for Carbon Footprint Calculator.
5. Click **Create Draft** and then **Activate**.

Results

Scheduled jobs are created for all calendar periods in the selected range of dates. Calendar periods in the past are processed immediately. Future calendar periods are in Active status until the last day of the calendar period. When processing completes, carbon logs are created for the included locations that are based on the data in the environmental logs.

Calculating the carbon footprint

Request new carbon footprint calculations when environmental data is changed and want to see the updated results before the next carbon calculations job run is scheduled to occur.

About this task

You can request carbon calculations for you or for someone else and for one or more calendar periods. You can use **Find** to select the locations to calculate from the list of all location records or you can click **Get Carbon Calculation Locations** to select from a list of locations where data that affects the carbon calculations has been changed.

Procedure

1. Go to **Home** > **Sustainability** > **Carbon Calculation Request** and click **Add** to create a new request.
2. Complete the Carbon Calculation Request form and click **Submit**.

Troubleshooting carbon calculations

Use carbon processing logs to view information about problems that occurred during carbon calculations.

Procedure

1. To view errors, go to the **Environmental** tab of the building record and click **Carbon Log**.
2. In the **Related Reports** list, select **Carbon Processing Logs** to view the Carbon Processing Log records.
3. Select a record to open and view information about the error. On the **General** tab in the Details section of the Carbon Processing Log record, boxes are checked to identify the issues that occurred in the carbon calculation for that building.

ENERGY STAR rating results

IBM TRIRIGA provides several ways to check the results of an ENERGY STAR rating from the Environmental Protection Agency (EPA) and to evaluate the rating for your building portfolio.

Energy rating results

ENERGY STAR rating results are displayed on location records and Energy Rating records.

The Energy Rating Result section on the **General** tab of a building, structure, or retail location record shows the result of the most current ENERGY STAR rating.

For the records that are rated, a color code indicates the result of the ENERGY STAR rating. The color coding is based on the following criteria:

Color	Description
Green	If the rating is greater than or equal to the target rating * (1 – (days until target date) / (days between target date and baseline date))
Yellow	If the rating is less than the target rating * (1 – (days until target date) / (days between target date and baseline date)) and greater than or equal to the baseline rating.
Red	If the rating is less than the baseline rating.

The projected yearly savings uses current annual energy costs as follows:

- If the target rating is greater than the rating, the projected yearly savings = ((target - rating) / maximum rating * effect factor * annual energy costs)
- If the target rating is less than or equal to the rating, the projected yearly savings = $0

In addition to the actual ENERGY STAR rating that is received, the ENERGY STAR Portfolio Manager also provides metric rating information. This metric information helps you to assess environmental impact and opportunities for improvements. These metric rating details are displayed on the Energy Rating record.

The table describes the additional energy rating calculations that are provided by the ENERGY STAR Portfolio Manager.

Table 5. Energy rating

Category	Rating details	Unit of measure
Site Energy	Current Site Energy Intensity	Thousand BTUs-per-square-foot (kBtu/Sq. Ft.)
	Current Site Total Energy Use	Thousand BTUs (kBtu)
	Current Weather Normalized Site EUI	Thousand BTUs-per-square-foot (kBtu/Sq. Ft.)
Source Energy	Current Source Energy Intensity	Thousand BTUs-per-square-foot (kBtu/Sq. Ft.)
	Current Source Total Energy Use	Thousand BTUs (kBtu)
	Current Weather Normalized Source Energy Intensity	Thousand BTUs-per-square-foot (kBtu/Sq. Ft.)
Greenhouse Gas (GHG) Emissions	Current Direct GHG Emissions	Metric Ton CO2 (MtCO2e)
	Current Indirect GHG Emissions	Metric Ton CO2 (MtCO2e)
	Current Total GHG Emissions	Metric Ton CO2 (MtCO2e)

ENERGY STAR metrics

With the ENERGY STAR rating system, you can evaluate the energy performance of your building portfolio. The ENERGY STAR metrics provide you with information about the energy performance and improvement progress of your building portfolio.

You can evaluate the following ENERGY STAR rating metrics by using the Performance Metrics portal.

Energy rating certification:

The energy rating certification metric identifies the buildings, structures, and retail locations that are eligible for ENERGY STAR recognition.

Item	Description
Metric Category	Portfolio: Measures the utilization, condition, and return on workplace assets.
Analysis objective for exception conditions	Identify buildings, structures, retail locations with ENERGY STAR rating equal to or greater than 50.
Source (of metric recommendation or industry benchmark reference)	Customer Focus Group Environmental Protection Agency (EPA)
Measurement	ENERGY STAR ratings
Fact Details	• Module: triMetricFact • Business object: triLocationFact • Metric query: triLocationFact - Metric - Energy Rating Certification

Energy rating comparison average:

The energy rating comparison average metric identifies the energy efficiency of the building portfolio that is compared with EPA ENERGY STAR averages.

Item	Description
Metric Category	Portfolio: Measures the utilization, condition, and return on workplace assets.
Analysis objective for exception conditions	Determine what buildings, structures, retail locations have good or poor energy used compared with EPA ENERGY STAR average (always 50).
Source (of metric recommendation or industry benchmark reference)	Customer Focus Group Environmental Protection Agency (EPA)
Measurement	(rating - average/maximum rating)
Fact Details	• Module: triMetricFact • Business object: triLocationFact • Metric query: triLocationFact - Metric - Energy Rating Comparison to Average

Energy rating improvement:

The energy rating improvement metric identifies the buildings, structures, and retail locations that have improved ENERGY STAR ratings.

Item	Description
Metric Category	Portfolio: Measures the utilization, condition, and return on workplace assets.
Analysis objective for exception conditions	Determine what buildings, structures, and retail locations that have improved EPA ENERGY STAR ratings.
Source (of metric recommendation or industry benchmark reference)	Customer Focus Group Environmental Protection Agency (EPA)
Measurement	Compare the current rating to the baseline rating and derive the improvement percentage from baseline: • If baseline is greater than zero, ((rating - baseline)/ maximum rating) • If baseline is zero, N/A
Fact Details	• Module: triMetricFact • Business object: triLocationFact • Metric query: triLocationFact - Metric - Energy Rating Improvement

Projected yearly savings:

The projected yearly savings metric identifies the energy cost efficiency that is based on comparing projected yearly savings from the energy rating records.

Item	Description
Metric Category	Financial: Measures the cost of operations, total occupancy costs, revenue weeks, and profitability of workplace operations and resources. The external corporate financial system used is hierarchical and aggregates costs at the building or structure level. The cost code structure and roll-up align with common industry definitions of Capital, Cost of Operations (IFMA definition), Operating Costs (IFMA definition), Capital or Expense.
Analysis objective for exception conditions	Summarize potential savings by geography, location, building type
Source (of metric recommendation or industry benchmark reference)	Customer Focus Group

Item	Description
Measurement	Evaluate the current rating to the target rating. • If target > rating: ((target - rating) / maximum rating * effect factor * annual energy costs) • If target is less than or equal to rating, the projected yearly savings = 0
Fact Details	• Module: triMetricFact • Business object: triLocationFact • Metric query: triLocationFact - Metric - Projected Yearly Savings

Ranking by quartile:

The ranking by quartile metric ranks the energy rating performance of each building, structure, and retail location.

Item	Description
Metric Category	Environmental: Measures the cost, intensity, and recovery for energy, emissions, water, and waste.
Analysis Objective for Exception Conditions	Determine what facilities have good or poor ENERGY STAR ratings.
Source (of metric recommendation or industry benchmark reference)	Customer Focus Group Environmental Protection Agency (EPA)
Measurement	Rank each building, structure, and retail location rating per quartile (0 - <25, 25 - <50, 50 - <75, 75 – 100)
Fact Details	• Module: triMetricFact • Business object: triLocationFact • Metric query: triLocationFact – Metric – Ranking by Quartile

Entering data into a checklist

To track the preparation for a rating assessment, you can add a checklist to the location record and then enter data that helps you to determine the current status of checklist items.

Before you begin

Click **Home** > **Sustainability** > **Set Up** > **Templates** to set up checklist templates before an administrator can add a checklist to a location record from the **Maintenance** tab.

Procedure

1. On the record for the building that you want to edit, go to the **Maintenance** tab and then select **Checklists**.
2. Click the checklist that you want to work with, edit the checklist, and then click **Save**.

Chapter 4. Managing environmental impact

Use TRIRIGA Real Estate Environmental Sustainability to identify and evaluate opportunities to reduce energy use and the overall carbon footprint of the real estate portfolio. By analyzing and comparing energy efficiency measures, you can optimize the financial and environmental return on investment of improvements.

TRIRIGA Real Estate Environmental Sustainability Impact Manager includes analytic event functionality that can send a notification or create a service request when an event is triggered. Events can be triggered by analytic rules, which you define in TRIRIGA Real Estate Environmental Sustainability Impact Manager, or through SNMP traps that bring the data in from external sources.

Examples for managing environmental sustainability

TRIRIGA Real Estate Environmental Sustainability provides a system to identify and analyze opportunities to improve energy efficiency and savings across the real estate portfolio. TRIRIGA Real Estate Environmental Sustainability also includes checklist templates that can be used to prepare for green building certifications such as LEED.

Example: Creating and analyzing a group of opportunities

Company XYZ has new goals for improving environmental sustainability and wants to identify opportunities to improve their energy, water, and waste consumption.

Environmental manager Gary Green plans to use TRIRIGA Real Estate Environmental Sustainability as the interface for collaborating with building inspectors. The inspectors identify opportunities for improvements of assets that affect environmental sustainability and create the opportunity records in TRIRIGA.

Step 1: Identifying facilities to inspect

Gary starts by looking at the monthly energy bills for each facility. Gary sets up a rule so that if a building reaches a peak capacity of over 500 kilowatts during the month, that building is flagged. For each building that is flagged, TRIRIGA sends an inspection form to a third-party company that does energy inspections.

Step 2: Inspecting facilities

The third-party inspectors check the conditions of assets at the facility. The inspectors return reports that include the following information:

- The condition of the HVAC systems
- The age of the building
- The type of material that is used in the foundation and construction of the building
- The status of preventive and demand maintenance
- The types of energy that are used in the building

Step 3: Creating opportunities

Gary receives information about all of the opportunities that the third-party inspectors identified during inspection and uses the Bulk Create Opportunities function to enter the details into TRIRIGA.

Step 4: Analyzing opportunities

At the end of each month, Gary uses the Opportunity Analysis function to view all of the opportunities that were created. He compares the potential return on investment of each opportunity in terms of cost and reduction in emissions. Based on the available environmental project budgets, Gary selects the opportunities to implement.

Example: Preparing for LEED certification

The CFO of Company XYZ approves the construction of a new facility. The project team plans to use TRIRIGA Real Estate Environmental Sustainability to prepare for LEED certification.

The design must meet the requirements for Platinum certification in Leadership in Energy and Environmental Design (LEED) for new construction by the US Green Building Council (USGBC).

Company XYZ plans to use TRIRIGA Real Estate Environmental Sustainability to track the points on the LEED rating system scale that they earn.

Prerequisite setup: Configuring the LEED checklist template

Environmental manager Gary Green ensures that the most current version of the LEED rating system for new construction is configured as a checklist template in TRIRIGA.

Step 1: Designing the building

As the new building is designed and constructed, a project manager and building inspector help Gary to monitor the checklist. To ensure that the building meets the goal of 80 points or more to be eligible for LEED Platinum certification, the team updates the checklist items that are complete in TRIRIGA. The checklist compiles the number of points that are earned. When the score exceeds 80 points, Gary can register and apply for LEED certification.

Step 2: Applying for LEED certification

To apply for certification, Gary uses the information that is collected in the checklist template in TRIRIGA to submit a certification application to the USGBC.

Results: Certification

After an application review, the USGBC notifies Gary that the building is now LEED Platinum certified.

Company XYZ is able to participate in local incentive programs for LEED buildings. Incentives include tax credits, tax breaks, density bonuses, reduced fees, priority or expedited permits, free or reduced-cost technical assistance, grants, and low-interest loans.

Example: Testing the efficiency of new motion sensors by using an analytic rule

Emily, the energy manager at Supermarket XYZ, uses IBM TRIRIGA Real Estate Environmental Sustainability Impact Manager to monitor and improve energy efficiency. To test the efficacy of new motion sensors on an aisle of refrigerator units, Emily creates an analytic rule.

Background

To reduce energy use, Supermarket XYZ installed motion sensors to control the lights inside an aisle of refrigeration units. The refrigeration unit lights are off by default to conserve energy and are automatically turned on when the motion sensor detects movement.

Emily wants to use an analytic rule to test that the new motion sensors are actually leading to lower energy use during periods of low traffic in the aisle. Her logic is that the power usage of the unit should not be high when the light device energy use is low. In other words, if there is low traffic in the refrigerator unit, the doors should remain closed, and it should require less power to keep the refrigerator cool.

Emily plans to create the analytic rule and then monitor the events that are triggered for a two week evaluation period before determining if the motion sensors are effective enough to invest in for more aisles.

Step One: Create a plan for an analytic rule that captures the correct information

Emily's first step is to answer some questions that will help her to determine what is needed to created an analytic rule that will test the motion sensors' efficacy.

Table 6. Emily's plan

Question	Answer
What is the goal?	To test that energy use is low when there is low traffic. Emily wants an analytic rule to alert her each time the refrigeration units' power usage is higher than she expects during low traffic. To determine what periods qualify as low traffic, Emily uses the amount of power that is used by the lights. Based on historical data, she determines that energy use below 35 watts indicates few people in the aisle.
What is the device type or classification? Does the device type already exist at **Classifications** > **Specification Class** > **Operations (Specification Class)**?	The device type is Refrigeration Units. No Refrigeration Units classification exists at **Classifications** > **Specification Class** > **Operations (Specification Class)**.

Table 6. Emily's plan (continued)

Question	Answer
What are the data points that are needed? Do the data points already exist in the hourly fact table?	The data points needed are: • Power usage in watts • Motion light sensor in watts The Asset Analytic Hourly fact table (triAssetAnalyticHFact) includes a data point for Power Usage In Watts (triFactPowerUsageWNU). But there is no data point for motion light sensor usage.
What is the asset analytic rule logic?	Based on these answers, Emily determines that the analytic rule logic should be: Refrigeration Unit is running, Power Usage In Watts > 1500W AND Motion Sensor Light In Watts < 35W, Met for 2 hours

Step Two: Create the analytic rule and associated workflows

To create the analytic rule as well as the needed device type and data point, she must complete the following tasks:

1. Create the device type "Refrigeration Units" by creating a specification class.
2. Create a data point for the motion sensor light, which is measured in watts, in the Asset Analytic Hourly BO (triAssetAnalyticHFact).
   a. Based on the naming guideline, Emily names the data point `cstFactMotionSensorLightWNU`. The `cst` indicates customer field, `Fact` indicates that it is a fact data point, `MotionSensorLight` is the field, `W` indicates the unit of measure is watts, and `NU` indicates that the field type is number.
   b. For the label, Emily enters `Motion Sensor Light in Watts`. Emily does not select the **Do Not Auto Populate** check box.
3. Create a new analytic rule. Emily creates a rule named cstRU00001 with a priority set to High.
   a. For the description, Emily enters `Refrigeration Unit is running, Power Usage In Watts > 1500W AND Motion Sensor Light In Watts < 35W, Met for 2 hours`.
   b. She decides on the name of the rule engine workflow that she will create for the rule and enters it into the rule as `triAnalyticRule - Synchronous - RU - cstRU00001 - High Power Usage in Low Traffic`.
   c. For the event summary workflow, Emily enters `triAssetEventSummary - SubFlow - cstRU00001 - RU - High Power Usage in Low Traffic`.
   d. She chooses to have the rule trigger a notification rather than an asset event request. As a possible resolution, she enters `Refrigeration Unit is not sealed, door is not closed, or unit required maintenance`.
   e. Finally, she adds the parameters: `"Power Usage In Watts" with value "1500" "Motion Sensor Light In Watts" with value "35"`.
4. Create the rule engine workflow `triAnalyticRule - Synchronous - RU - cstRU00001 - High Power Usage in Low Traffic`.
   a. In the first branch, for the **Retrieve Properties Task**, Emily enters into the **Label** field `Get Power Usage in Watts Param`.

b. In the **Filter Using** section, Emily clicks **General::triNameTX** and sets the value for the **Right Data** field to **Power Usage In Watts**.

c. The, for the **Define Variable Task**, Emily enters `Power Usage in Watts Param` into the **Label** field.

d. Emily confirms that the **For Task** field is already updated with the renamed task `Get Power Usage In Watts Param`.

e. Emily sets up the second branch to include the **`Motion Sensor Light In Watts`** parameter.

f. Emily checks that both the **`Power Usage In Watts`** parameter and the **`Motion Sensor Light In Watts`** parameter have a Results Count value of 1.

g. Emily sets the conditions to be `Power Usage In Watts > Power Usage In Watts Param && Motion Sensor Light In Watts < Motion Sensor Light In Watts Param`.

5. Create the event summary workflow `triAssetEventSummary - SubFlow - cstRU00001 - RU - High Power Usage in Low Traffic`.

a. The workflow that Emily copies has four branches to capture four rules data points, but Emily only has three data points defined. Therefore, Emily removes the extra branch and its tasks.

b. In the first branch, in the **Query Task**, on the **Filter Using** section, Emily clicks **General::triNameTX** and sets the value to **Power Usage In Watts**.

c. For the description, Emily enters `Create Asset Event Summary Intermediate Record for "Power Usage In Watts"`.

d. On the Edit Map, Emily enters `Power Usage In Watts` as the value for **triNameTX** and `General::triFactPowerUsageWNU` as the value for **triParameterValueNU**.

e. Emily verifies that the value is `Power Usage In Watts (triAssetEventSummaryIntermediate)`.

f. Emily sets up `Motion Sensor Light In Watts` in the second branch.

g. Emily sets the value on the third branch to **Is Running**.

Step Three: Create associated reports

Emily creates a system report query to filter the hourly fact table for the new device.

1. Emily names the report `Cst - triAssetAnalyticHFact - RUs` and enters `Asset Analytic Hourly - Refrigeration Units` for the **Header (Title)**.
2. In the System Filter Columns section, Emily modifies the **Specification Class (triDimSpecificationClassTX)** row. Emily enters `Specification Class` in the **Report Label** field, sets the Filter Operator to **Equals**, sets Conditional to **No**, and enters `Refrigeration Units` into the **Value** field.

Step Four: Create and run the analytic process

Emily creates an asset analytic process with the new filter and the new analytic rule and periods. She uses the ID `Cst - RU - 2 Hours Rules Process" (RU for Refrigeration Units)` and the name `Cst - Refrigeration Units - 2 Hours Rules Process`. For the description, Emily enters `Analytic Process to execute Refrigeration Units rules that evaluates 2 hours periods of Asset Analytic Hourly reading`. Emily chooses `Cst - triAssetAnalyticHFact – RUs` as the system report query in the **Criteria Query Name** field. Emily adds the rule she created, **cstRU00001**, as the only rule to be included in the process. Finally, Emily schedules the analytic process to run on a regular basis for the two week evaluation period.

Step Five: Monitor the results and evaluate the strategy

If events are created when the process runs, Emily receives a notification. She monitors the events and looks for possible causes. At the end of the two weeks, she finds that with the sensors installed, energy use is lower when there is low traffic in the aisles. She uses the data she has collected to make a case for installing additional sensors.

Analyzing energy data by using analytic rules

TRIRIGA Real Estate Environmental Sustainability Impact Manager includes analytic rules to alert you of possible issues with energy efficiency in your portfolio. To customize the analytic rules to alert you as appropriate for your objectives, you can modify the existing rules or write new analytic rules.

Analytic rules in TRIRIGA Real Estate Environmental Sustainability Manager are managed and run by using TRIRIGA workflows. The user defines the rules, schedules, and conditions for generating analytic events. Analytic events can be set to automatically trigger alerts and service requests.

When an event is triggered by an analytic rule, TRIRIGA checks whether there is an existing event created by the same analytic rule against the same asset within a period of time that the user defines. If there is a duplicate event that is already in process, the event is marked as a possible duplicate and is not processed.

Rule definitions

You can define rules and their configuration so that TRIRIGA creates alerts that notify you of abnormal or inefficient energy use.

Use the rules definitions to define a new rule or edit an existing rule, which includes the following components:

- The general information about the rule, such as ID, name, and priority
- A description of the rule conditions
- The parameters and values that are used to analyze the data
- A list of contacts who are notified of events
- A list of events that are associated to the rule
- A list of the associated processes

Analytic rules definitions are at **Sustainability** > **Set Up** > **Analytics** > **Rule Definitions**.

Tip: Each rule definition can be used in multiple analytic processes. For example, you might want to run the same rule on all of your locations but with different thresholds defined for each location based on the specific characteristics. Therefore, it is a good practice to separate threshold values from the rule's logic and use parameter values instead of hardcoded values in the workflow. Then in each analytic process, you can define a different threshold for each parameter. You can use the **Sync Processes Parameters** action to update the parameters and values of the analytic processes to the parameters and values that are currently defined in the analytic rule.

Rules engine workflow

When a rule runs, the rules engine uses the rules engine workflow to control the logic and conditions that evaluate the fact data to determine whether an analytic event should be created. The rules engine workflow is set as part of the rule definition.

All rule engine workflows have the same structure. First, the workflow evaluates pre-rule conditions. For example, the workflow checks that the device is running and that the specified data points in the fact table are reporting values. Second, the workflow accesses the rule's parameter values for thresholds. Third, the workflow evaluates the rule conditions against the threshold values. The periods that are evaluated in the rule conditions must not exceed the periods that the analytic process retrieves.

All predefined analytic rules that are included with TRIRIGA Real Estate Environmental Sustainability Impact Manager are for hourly analytic fact records that are not in maintenance mode.

In the fact table, a data point field is considered not reporting if its value is null. In workflow conditions, you can use the function `HasValue(field)=0` or `1` to determine whether a field has value.

You can edit the rules engine workflow at **Tools** > **Builder Tools** > **Workflow Builder** > **triAnalyticRule** > **triAssetRule**.

Event summary workflow

The event summary workflow defines the data points columns to be displayed in the Event Summary report that is created for the analytic rule.

You can edit the event summary workflow at **Tools** > **Builder Tools** > **Workflow Builder** > **triAnalyticEvent** > **triAssetEventSummary**.

Predefined analytic rules

TRIRIGA Real Estate Environmental Sustainability Impact Manager includes predefined analytic rules. You can select from these rules or copy and modify them to create new rules that are appropriate to your organization.

The following table summarizes the predefined analytic rules. The rules, along with detailed descriptions, are at **Sustainability** > **Set Up** > **Analytics** > **Rule Definitions**. By default, all predefined analytic rules are set to event type Asset Event Request, priority Medium, and status Active.

Table 7. Predefined analytic rules

Rule ID	Rule name	Rule description	Alert summary
AH00001	AHU - Simultaneously Heating and Cooling	AHU Running, Cooling Valve % >= 5% AND (Heating Valve % >= 5% OR Preheat Valve % >= 5%), Met for 2 Hours	Both heating valves and cooling valves are open at the same time.

Table 7. Predefined analytic rules (continued)

Rule ID	Rule name	Rule description	Alert summary
AH00002	AHU - Heating Valve Open when Warm Outside	AHU Running, ((Outside Air Temperature - Supply Air Temperature Setpoint > 5°F AND Supply Air Temperature Setpoint Is Reporting) OR (Outside Air Temperature - Supply Air Temperature > 5°F AND Supply Air Temperature Setpoint Not Reporting)) AND (Heating Valve % > 10% OR Preheat Valve % > 10%), Met for 2 Hours	Excessive heating when it is warm outside.
AH00003	AHU - High Building Zone Temperature (Hot Call)	AHU Running, (Zone Air Temperature >= 79°F OR Return Air Temperature >= 79°F IF Zone Air Temperature Not Reporting), Met for 2 Hours	Automated alert for a hot call.
AH00004	AHU - Low Building Zone Temperature (Cold Call)	AHU Running, (Zone Air Temperature <= 65°F OR Return Air Temperature <= 65°F IF Zone Air Temperature Not Reporting), Met for 2 Hours	Automatic alert for a cold call.
AH00006	AHU - Detected Operating in Override Mode	AHU Running, Occupied = 0, Met for 2 Hours	The building control commands indicate that an AHU should be off, but other sensors determine it to be on.
AH00007	AHU - Detected Operating Outside of Office Hour Schedule	AHU Running, Schedule = 0 AND Outside Air Temperature > 35°F, Met for 2, 3, 4 or 5 Hours	An AHU is running outside of its weekday resource schedule.
AH00009	AHU - Excessive Loading of Supply Variable Frequency Drive	AHU Running, Supply Fan Output % > 97% AND Outside Air Temperature < 95°F, Met for 2 Hours	A motor is using more energy than expected, which indicates that the unit is probably not meeting its static pressure setpoint.
AH00010	AHU - Excessive Loading of Return Variable Frequency Drive	AHU Running, Return Fan Output % > 97% AND Outside Air Temperature < 95°F, Met for 2 Hours	A motor is using more energy than expected, which indicates that the unit is probably not meeting its static pressure setpoint.
AH00011	AHU - Cooling Valve Open when Cold Outside	AHU Running, Outside Air Damper % Is Reporting AND 37°F < Outside Air Temperature < 50°F AND Cooling Valve % > 5%, Met for 2 Hours	Excessive cooling when it is cold outside.
AH00013	AHU - Mixed air greater than Supply when AHU is Commanded OFF (Valve Leaking By or Damper Issue)	AHU NOT Running, Mixed Air Temperature - Supply Air Temperature > 10 °F, Met for 3 Hours	An air handler that is not operating has cooled off below the ambient temperature, which indicates that the cooling valve may be leaking into the coil.

Table 7. Predefined analytic rules (continued)

Rule ID	Rule name	Rule description	Alert summary
AH00014	AHU - Mixed air less than Supply when AHU is Commanded OFF (Valve Leaking By or Damper Issue)	AHU NOT Running, Supply Air Temperature - Mixed Air Temperature > 20°F AND Outside Air Temperature > 35°F, Met for 3 Hours	An air handler that is not operating has warmed up above the ambient temperature, which indicates that the heating valve may be leaking into the coil.
AH00015	AHU - Economizer Mode Alert - Not in Free Cooling Mode	AHU Running, (Economizer Mode = 1 OR Supply Air Temp < Outside Air Temperature < (Return Air Temperature - 3°F) IF Economizer Mode Not Reporting) AND Cooling Valve % > 10% AND Outside Air Damper % < 95%, Met for 2 Hours	The economizer mode is not correct. For example, while in economizer mode, the system is mechanically cooling or the damper is wide open. The damper should be at 100% before the chilled water valve opens.
AH00016	AHU - Hot Outside and Outside Air Damper Open Greater than Minimum	AHU Running, (Economizer Mode = 0 OR Outside Air Temperature > Return Air Temp IF Economizer Mode Not Reporting) AND (Return Air CO2 < 800 OR Return Air CO2 Not Reporting) AND (Outside Air Damper % > Outside Air Damper Min % OR Outside Air Damper % > 15% IF Outside Air Damper Min % Not Reporting), Met for 2 Hours	The system is in mechanical cooling mode but the outside air damper is open past the minimum, which suggests a damper problem. It will filter if you have a CO2 sensor and the CO2 level is high.
AH00017	AHU - Supply Air Temperature Warning While Mechanically Cooling with 100% Outdoor Air	AHU Running, (Outside Air Temperature > Supply Air Temperature Setpoint OR Outside Air Temperature > Supply Air Temperature IF Supply Air Temperature Setpoint Not Reporting) AND (Outside Air Temperature < Return Air Temperature OR Outside Air Temperature < 75°F IF Return Air Temperature Not Reporting) AND Cooling Valve % > 5% AND Outside Air Damper % > 95% AND Supply Air Temperature - Mixed Air Temperature > 5°F, Met for 2 Hours	The supply air temperature is higher than the mixed air temperature when the system is mechanically cooling with 100% outdoor air.

Table 7. Predefined analytic rules (continued)

Rule ID	Rule name	Rule description	Alert summary
AH00018	AHU - Return Air Damper Leakage when 100% Outside Air	AHU Running, (Outside Air Temperature > Supply Air Temperature Setpoint OR Outside Air Temperature > Supply Air Temperature IF Supply Air Temperature Setpoint Not Reporting) AND (Outside Air Temperature < Return Air Temperature OR Outside Air Temperature < 75 °F IF Return Air Temperature Not Reporting) AND Outside Air Damper % = 100% AND Mixed Air Temperature - OAT > 5°F, Met for 2 Hours	Possible return air damper malfunctions when the system should be cooling with 100% outside air that is supplemented with mechanical cooling.
AH00019	AHU - Supply Air Temperature Warning while Mechanically Cooling with Minimum Outdoor Air	AHU Running, (Outside Air Temperature > Return Air Temperature OR Outside Air Temperature > 75 °F IF Return Air Temperature Not Reporting) AND (Outside Air Damper % <= Outside Air Damper Min % OR Outside Air Damper % <= 15% IF Outside Air Damper Min % Not Reporting) AND Cooling Valve % > 5% AND Supply Air Temperature - Mixed Air Temperature > 5°F, Met for 2 Hours	The supply air temperature is higher than the mixed air temperature when the system is mechanically cooling with a minimum of outdoor air.
AH00020	AHU - Cooling Valve Off - Discharge is less than mixed air temperature (Valve Leaking By)	AHU Running, (10°F < Outside Air Temperature < Supply Air Temperature Setpoint OR 10°F < Outside Air Temperature < Supply Air Temperature IF Supply Air Temperature Setpoint Not Reporting) AND ((Heating AND Preheat) Valve % < 5% OR Preheat Valve % < 5% IF Heating Valve % Not Reporting OR Heating Valve % < 5% IF Preheat Valve % Not Reporting OR (Heating AND Preheat) Valve % Not Reporting) AND Cooling Valve % < 5% AND Mixed Air Temperature - Supply Air Temperature > 5°F, Met for 2 Hours	Possible leaking chilled water valve when the system is cooling with only outside air, as indicated by the valve being commanded off but the coil still cooling.

Table 7. Predefined analytic rules (continued)

Rule ID	Rule name	Rule description	Alert summary
AH00021	AHU - Economizer Command Error - Incorrect Command Sent to Outside Air Damper when Cold Outside	AHU Running, Outside Air Temperature > 37°F AND (Outside Air Temperature < Supply Air Temperature Setpoint OR Outside Air Temperature < Supply Air Temperature IF Supply Air Temperature Setpoint Not Reporting) AND (Outside Air Damper % < Outside Air Damper Min % OR Outside Air Damper % < 15% IF Outside Air Damper Min % Not Reporting), Met for 2 Hours	The economizer is not working correctly. When outside air temperature is cold, less than the setpoint, the rule checks that the BCS sends the correct command to the damper.
AH00022	AHU - Economizer Command Error - Outside Air Damper not fully Open to take advantage of free cooling	AHU Running, (Economizer Mode = 1 OR Enthalpy < 26 BTU IF Economizer Mode Not Reporting) AND (Outside Air Temperature > Supply Air Temperature Setpoint OR Outside Air Temperature > Supply Air Temperature IF Supply Air Temperature Setpoint Not Reporting) AND (Outside Air Temperature < (Return Air Temperature - 3°F) OR Outside Air Temperature < 75°F IF Return Air Temperature Not Reporting) AND Outside Air Damper % < 90%, Met for 2 Hours	The BMS command to the damper is not fully using free cooling. The rule identifies that the economizer is working correctly when the OAT is between return air temperature and the discharge air temperature.
AH00024	AHU - Cooling Control Alert - Supply Air Temperature Setpoint Attainment	AHU Running for 4 hours, |Supply Air Temp Setpoint - Supply Air Temp| > 7°F IF Sub Type NOT VAV |Supply Air Temp Setpoint - Zone Air Temp| > 7°F IF Sub Type is VAV, Met for 2 Hours	The system is not achieving its programmed setpoint after 2 hours.
AH00025	AHU - Heating Valve Leaking by when Commanded Closed	AHU NOT Running, AND (35 °F < Outside Air Temperature < 70 °F) AND (Heating Valve % = 0% OR Preheat Valve % = 0% OR (Heating AND Preheat Valve %) = 0% IF Both Are Reporting) AND (Supply Air Temperature > 90°F OR Mixed Air Temperature > 90°F), Met for 3 Hours	The heating valve is passing by indicating when the system is off and heating continues due to a leaking heating valve.
AH00026	AHU - Cooling Control Alert - Heating Valve Full Open for an Excessive Amount of Time	AHU Running for 6 hours, Outside Air Temperature > 35 °F AND Heating Valve % > 97%, Met for 4 Hours	The RCU or AHU has a heating coil, and the heating coil valve command is full open for an excessive time.

Table 7. Predefined analytic rules (continued)

Rule ID	Rule name	Rule description	Alert summary
AH00027	AHU - Preheat Valve Full Open for an Excessive Amount of Time	AHU Running, Outside Air Temperature > 35°F AND Preheat Valve % > 97%, Met for 4 Hours	The AHU has a preheat coil, and the preheat coil valve command is open for excessive time.
AH00028	AHU - Reheat Valve Full Open for an Excessive Amount of Time	AHU Running, Outside Air Temperature > 35°F AND Reheat Valve % > 97%, Met for 4 Hours	The AHU has a reheat coil, and the reheat coil valve command is full open for excessive time.
AH00029	AHU - Cooling Valve Full Open for an Excessive Amount of Time	AHU Running, Outside Air Temperature < 80°F AND Cooling Valve % > 97%, Met for 4 Hours	The RCU or AHU has a cooling coil, and the cooling coil valve command is full open for excessive time.
AH00031	AHU - Humidification Open for an Excessive Amount of Time	AHU Running, Humidifier Valve % > 97%, Met for 2 Hours	The AHU has humidification, and the humidification valve command is at 100% for excessive time.
AH00032	AHU - System Cooling When in Heating Mode	AHU Running, Heating Valve % > 5% AND Cooling Valve % = 0% AND (Mixed Air Temperature - Supply Air Temperature) > 5°F, Met for 2 Hours	While in heating mode, the supply air temperature is lower than the mixed air temperature.
AH00033	AHU - Economizer Mode Alert - Preheating With Damper Open	AHU Running, (Outside Air Damper % > Outside Air Damper Min % OR Outside Air Damper % > 15% AND Outside Air Damper Min % Not Reporting) AND Preheat Valve % > 5%, Met for 2 Hours	The preheat valve is commanded open when the damper is providing free cooling. The AHU is preheating with the fresh air damper greater than minimum open position.
AH00035	AHU - System Heating while in Cooling Mode	AHU Running, Heating Valve % = 0% AND Supply Air Temperature - Mixed Air Temperature > 5°F, Met for 2 Hours	The supply air temperature is warmer than the mixed air temperature, which indicates that the heating valve might be leaking.
AH00036	AHU - Humidifying on a Humid Day	AHU Running, Enthalpy > 29 BTU OR Calculated Enthalpy > 29 BTU IF Enthalpy Not Reporting AND Humidifier Valve % > 2%, Met for 1 Hour	The humidifier is on when it is humid outside.
AH00037	AHU - Dehumidifying on a Dry Day	AHU Running, Enthalpy < 15 BTU OR Calculated Enthalpy < 15 BTU IF Enthalpy Not Reporting AND Low Temperature Chilled Water Valve % > 2%, Met for 1 Hour	The dehumidifier is on when it is dry outside.

Table 7. Predefined analytic rules (continued)

Rule ID	Rule name	Rule description	Alert summary
AH00038	AHU - Verify Dehumidification is commanded Properly when humid	AHU Running, Enthalpy > 29 BTU OR Calculated Enthalpy > 29 BTU IF Enthalpy Not Reporting AND Low Temperature Chilled Water Valve % < 5%, Met for 1 Hour	The dehumidifier is not on when it is humid outside.
AH00039	AHU - Verify humidification is commanded Properly when arid	AHU Running, Enthalpy < 15 BTU OR Calculated Enthalpy < 15 BTU IF Enthalpy Not Reporting AND Humidifier Valve % < 5%, Met for 2 Hours	The humidifier is not on when it is dry outside.
AH00040	AHU - Excess Humidification Into Zone	AHU Running, Enthalpy < 15 BTU OR Calculated Enthalpy < 15 BTU IF Enthalpy Not Reporting AND (Zone Relative Humidity % - Supply Relative Humidity Setpoint % > 10% OR Supply Relative Humidity % - Supply Relative Humidity Setpoint % > 10%), Met for 2 Hours	There is excess humidification.
AH00041	AHU - Excessive Low Temperature Water Cooling for Dehumidification	AHU Running, Enthalpy < 29 BTU OR Calculated Enthalpy < 29 BTU IF Enthalpy Not Reporting AND Outside Air Temperature < 80°F AND Low Temp Chilled Water Valve % > 97%, Met for 4 Hours	The dehumidification valve position is at 100% for 4 hours, which indicates that the unit is in dehumidification mode for an excessive amount of time.
AH00042	AHU - Simultaneous Humidification and Dehumidification	AHU Running, Humidification Valve % > 5% AND Low Temp Chilled Water Valve % > 5%, Met for 2 Hours	The humidification valve command and the dehumidification valve command are both open.
AH00043	AHU - Exhaust fan Detected Operating Outside of Office Hour Schedule	Exhaust Fan Running, Schedule = 0, Met for 2 Hours	The exhaust is operating outside of its normal schedule.
CR00002	Chiller - Cooling Substance Temperature Setpoint Attainment	Chiller Running, (Supply Cooling Substance Temperature - Supply Cooling Substance Temperature Setpoint) > 5°F, Met for 2 Hours	The chilled water temperature is above its setpoint temperature.
CR00003	Chiller - Low Supply Temperature	Chiller Running, (Supply Cooling Substance Temperature Setpoint - Supply Cooling Substance Temperature) > 3°F, Met for 2 Hours	The chilled water temperature is below its setpoint temperature.

Table 7. Predefined analytic rules (continued)

Rule ID	Rule name	Rule description	Alert summary
CR00004	Chiller - Cooling Substance Delta Temperature Low	Chiller Running, (Return Cooling Substance Temperature - Supply Cooling Substance Temperature) < 7°F, Met for 4 Hours	The chilled water system has a low delta temperature.

Planning new analytic rules

Before creating an analytic rule, gather the information you will need and create a plan.

About this task

To gather the necessary information, determine the answers to the following questions:

Procedure

1. What is the goal of the analytic rule? Use this information to determine what data points and rule logic you need.
2. What is the device type? Does the device type already exist as a classification at **Classifications** > **Specification Class** > **Operations (Specification Class)**? If the classification does not exist, create a new classification.
3. What are the data points? Do the data points already exist in the hourly fact table at **Tools** > **Builder Tools** > **Data Modeler** > **triMetricFact** > **triAssetAnalyticHFact**? If the data points do not exist, create the needed data points in the hourly fact table.
4. What is the asset analytic rule logic?

Creating classifications

To add a device type that is not currently defined in TRIRIGA, you must create a classification for the device type, create an asset specification record for the new classification, and then assign the specification to the appropriate assets.

Procedure

1. Create a new classification for the device type.
   a. Click **Tools** > **Administration** > **Classifications** > **Operations**. In the Hierarchy section, expand **Specification Class (Specification Class)** and then click **Operations (Specification Class)**.
   b. Click **New** and then click on **Specification Class** in the bar that appears. A new Specification Class form displays.
   c. Complete the form and click **Create**.
2. Create an asset specification record for the classification at **Portfolio** > **Assets** > **Specifications** > **Building Equipment**.
3. Assign the specification to the appropriate assets at **Portfolio** > **Assets**.

Creating data points in the hourly fact table

Create data points as fields in the hourly fact table when there is new data for the analytic rules to analyze.

Procedure

1. Click **Tools** > **Builder Tools** > **Data Modeler** and then choose **triMetricFact** > **triAssetAnalyticHFact**.
2. Click **Revise BO**.
3. In the Field List section, click **Add** and specify the details for the new field.
4. Click **Save** and then **Tools** > **Publish BO**.

Creating and modifying analytic rules

In addition to using the analytic rules that are predefined in IBM TRIRIGA Real Estate Environmental Sustainability Impact Manager, you can create analytic rules to gather information specific to your facilities. To create or modify an analytic rule, you must either create or modify the rule definition and parameters threshold, the rule engine workflow with conditions that compare the data point to the parameter thresholds, and the event summary workflow with the data point.

Creating or modifying an analytic rule definition

The first step in creating an analytic rule is to create the new rule definition. You can also modify the properties of an existing rule definition.

Procedure

1. Click **Sustainability** > **Set Up** > **Analytics** > **Rule Definitions** and click **Add** or open an existing rule.
2. In the **ID** field, enter the ID for the rule in the suggested format of `cst`*Device Type Sequence Number*. For example, if the rule is for air handlers, you might enter `cstAH10001`.
3. Select the priority.
4. In the **Description** field, enter the conditions for the rule in the suggested format of *Device Type* Running, *Conditions*, Met for # *Periods* Hours. For example: `AHU Running, Humidity Valve % > 80% AND Outside Air Temperature < 10°C, Met for 2 Hours`.
5. Enter the name of the rule engine workflow that handles rule conditions for the new rule in the suggested format of triAnalyticRule - Synchronous - *Device Type - Rule ID - Rule Name*. For example: `triAnalyticRule - Synchronous - AHU – cstAH10001 - High Humidity when Cold Outside`.
6. Enter the name of the event summary workflow that handles the report for the rule in the suggested format of triAssetEventSummary - SubFlow - *Rule ID - Device Type - Rule Name*. For example: `triAssetEventSummary - SubFlow – cstAH10001 - AHU - High Humidity when Cold Outside`.
7. Select the event type that is triggered for the new rule, either **Asset Event Request** or **Notification**.
8. If the event type that is triggered is Asset Event Request, select the request class for the new rule.
9. Select the period for which you want duplicates to be evaluated. The default is one week.
10. Optional: Enter a possible resolution.
11. Click **Create Draft**.
12. Click **Quick Add** to enter parameters for the rule. Match the parameter name to the rule description conditions and the data points. Include the unit of measure in the parameter.
13. Click **Save** and then click **Activate**.

Creating a rule engine workflow

To create a rule engine workflow, you can copy an existing workflow and then modify the properties.

Procedure

1. Click **Tools** > **Builder Tools** > **Workflow Builder**. Expand **triAnalyticRule** and click **triAssetRule**
2. Select an existing workflow and click **Copy**.
3. Open the new workflow.
4. Click **Start** to open the Workflow Properties form.
5. Specify the name of the rule engine workflow that you specified in the Rule Definitions record.
6. Click the **Pre Rule Conditions** task and set the pre conditions for the new rule. This task checks whether the device is running or is in maintenance mode and that the required data points are reporting for length of time set as the periods.
7. Check that the workflow has the correct number of branches that are needed for the parameters. Add or delete branches as needed.
8. Click **Retrieve Task Properties** for each branch and modify the properties.
9. Click **Define Variable Task Properties** for each branch and modify the properties.

   Remember: Confirm that the **For Task** field is already updated with the renamed task.
10. Click **Switch Condition** for the rule parameters, clear the current conditions, and set the conditions.
11. Click the **Rule** task, clear the current conditions, and set the conditions.
12. Click **Publish**.

Creating an event summary workflow

To create an event summary workflow, you can copy an existing workflow and then modify it to retrieve the appropriate data points.

Procedure

1. Click **Tools** > **Builder Tools** > **Workflow Builder** > **triAnalyticEvent**.
2. Select an existing workflow that begins with "triAnalyticEventSummary - SubFlow" and click **Copy**.
3. Open the new workflow.
4. Click **Start** to open the Workflow Properties form.
5. Specify the name of the event summary workflow that you specified in the Rule Definitions record.
6. Check that the workflow has the correct number of branches and add or remove branches based on the number of data points that you need.
7. For each branch, modify the following properties:
   a. In the Query Task Properties section, modify the name filter.
   b. In the Create Task Properties section, modify the label and description.
   c. In the Object Mapping section, modify the values for **triNameTX** and **triParameterValueNU**, and click **OK**.
   d. In the Assign Variable Task Properties section, verify that the **From Task** value is correct and the **Append Results** checkbox is selected.

8. Click **Publish**.

Running analytic rules

To run the analytic rules to analyze data, you define asset analytic processes and then schedule them to run on a regular basis.

Asset analytic process

An asset analytic process defines the data to be retrieved from the database and the analytic rules to be evaluated.

You define asset analytic processes in the Rules Engine. Each asset analytic process includes the following components:

- The general process information, such as the ID, name, description, and status
- The target fact table that is to be analyzed, as identified by the module, business object, grouping, and timestamp
- The control that will be used to determine the data set that will be retrieved from the fact table to be analyzed, such as the period end, period duration in minutes, periods, criteria, and if it is to run synchronously or asynchronously when run manually
- The analytic rules that will be processed
- The parameters and values of the selected rules, which can be modified
- Information about the performance of the process from the last time it ran
- The associated analytic events that were created by the process execution
- The associated requests
- The associated tasks
- Error logs

TRIRIGA Real Estate Environmental Sustainability Impact Manager includes five asset analytic processes by default. Each analytic process is based on a different number of one hour periods for data analysis. For example, the DEFAULT - AHU - 2 Hours Rules Process asset analytic process is, by default, used for all analytic rules for AHUs that are set to evaluate data every two hours.

You can edit the asset analytic process records at **Tools** > **Sustainability** > **Setup** > **Analytics** > **Rules Engine**.

Creating an asset analytic process

To run a new analytic rule, you must create an asset analytic process to include a new filter and create the new analytic rule.

Procedure

1. Click **Sustainability** > **Set Up** > **Analytics** > **Rules Engine** and click **Add**.
2. In the **Asset Analytic Process** form, specify the details for the new asset analytic process.
   a. In the **ID** field, enter an ID for the process in the recommended format of `cst - device type - number hours descriptive text`.
   b. In the **Name** field, enter a name for the process.
   c. In the **Decription** field, write a summary of the conditions that the process is seeking, including the device type, number of periods, and any criteria queries that are applied.
   d. In the **Module** field, select **triMetricFact**.

e. In the **BO** field, select **Asset Analytic Hourly (triAssetAnalyticHFact)**.
f. In the **Group By Field** field, enter `triDimAssetTX`.
g. In the **Timestamp Field** field, enter `triCapturedDT`.
h. Select a period end. This period end is used to retrieve data when you click **Run**. When the asset analytic process runs from the Job Scheduler, this **Period End** field is automatically updated to the last period that was entered into the fact table, which you can view at **Tools** > **System Setup** > **General** > **Application Settings** in the ETL section in the **Last Captured Date** field.
i. Enter the number of periods that should be retrieved for the rules that are included in the asset analytic process. The number of periods that are defined should match the number of periods defined in each of the included rules. If the number of periods in the asset analytic process is less than the number of periods in the rules, insufficient data is retrieved and the engine workflow fails.
j. To set the period length to one hour, enter `60` in the **Period Duration Mins** field.
k. In the **Criteria Query Name** field, enter the system report query name that defines the set of records to retrieve for analysis, such as the filter specification, organization, and location.
l. Optional: Create a new system report.

3. Click **Create**.
4. In the Rules section, click **Add**.
5. From the list, select the rule to include in the asset analytic process and click **OK**.
6. Click **Activate**.

Filtering hourly fact data

Create a system report to filter the hourly fact data for a new device. You can use the system report in the asset analytic processes to include or exclude device types, locations, and assets.

Procedure

1. From the menu, click **My Reports** and click the **System Reports** tab.
2. Filter the **Business Object** column by entering `Asset Analytic Hourly`.
3. Select the check box for the **triAssetAnalyticHFact - AHUs** row and click **Copy** to create a new system report.
4. Open the new system report, named **Copy Of triAssetAnalyticHFact - AHUs**.
   a. Enter the name in the recommended format of `cst -`BO*device type*.
   b. Enter the **Header (Title)**.
5. Click on the **Filters** tab. In the System Filter Columns section, modify the **Specification Class (triDimSpecificationClassTX)** row.
6. Click **Save & Close**.

Running an asset analytic process

Asset analytic processes can be grouped together and scheduled to run automatically from a Job Scheduler. You can also run a single asset analytic process manually from the asset analytic process itself.

Procedure

1. Click **Sustainability** > **Set Up** > **Analytics** > **Rules Engine** and then click on the asset analytic process to run.
2. Click **Run**. If the rule conditions are matched in the database for the fact configuration that is specified in the Asset Analytic Process record, an analytic event is created. The state of the analytic process shows as Completed and the Performance section shows the results of the last run. You can also view all created records on the **Events** tab, **Requests** tab, and the **Tasks** tab of the Asset Analytic Process record.

What to do next

If you are satisfied with the results, you can schedule the asset analytic process to run on a regular basis.

Scheduling asset analytic processes

Asset analytic processes can be scheduled to run automatically from a Job Scheduler.

About this task

For efficiency, run asset analytic processes in the same job schedule ETL that loads the energy data into the fact tables.

The asset analytic processes run only if the ETL inserts new energy records and the log of the job schedule completes without error, which is indicated by a status other than Failed.

There is no value of running the rules more often than the fact tables refresh because that would be running the rules against the same data.

Procedure

1. Go To **Tools** > **System Setup** > **Job Scheduling** > **Job Scheduler** and find the Job Scheduler that loads the energy data you want to analyze into the fact tables.
2. To run the analytic process as part of the Job Scheduler, select **Run Analytic Processes** in the Schedule section. The Analytic Processes sub tab is displayed.
3. In the Analytic Processes sub tab, click **Find** and add all the analytic processes that you want to run. All analytic processes with status of 'Active' or 'Completed' can be associated to the Job Scheduler.

Results

Once the Job Scheduler is activated, the asset analytic processes run automatically after the Job Schedule's ETL completes successfully and inserts records. You can view all Job Schedulers that are configured to include Analytic Processes at **Sustainability** > **Set Up** > **Analytics** > **Process Job Schedules**.

Reviewing analytic events

You can use Event Summary reports to view trends in the data points that were analyzed for an event.

About this task

The Event Summary form displays a set of Event records. When you click on an Event record from the list, TRIRIGA generates an Event Summary report based on the Event selected. The generated Event summary report displays the trending of analytic rule evaluated data points over a period of 17 hours, which includes the 12 hours before the event occurred and 4 hours after the event occurred, based on the Event that was selected.

Procedure

To view the Event Summary reports, click **Sustainability** > **Set Up** > **Analytics** > **Event Summary**.

Analytic performance

Use the following information to understand and improve performance when using analytics in TRIRIGA Real Estate Environmental Sustainability Impact Manager.

Take into account the following performance considerations:

- Analytic processes are executed from TRIRIGA's Job Scheduler, which use the TRIRIGA Application Platform's multi-threading capabilities to run multiple analytic processes in parallel.
- The rules that are included in an asset analytic process run in sequence.
- The number of threads that are enabled to the TRIRIGA Process Server determines the number of analytic processes that will be executed at the same time in parallel execution.
- Grouping rules under an asset analytic process reduces the number of SQL statements that are required to retrieve the fact data to be evaluated by the rule's analysis logic; however, because the rules run in sequence, rather than using multi-threading, the total run time of the asset analytic process might increase.
- The total execution time of the Job Scheduler is correlated to the size of data been analyzed, number of analytic rules, number of analytic processes, analytic processes configuration, hardware configuration, and TRIRIGA configuration.

Use the following tips to improving performance:

- Limit the number of rules under each analytic process to take advantage of TRIRIGA multi-threading capabilities.
- Analytic processes can be separated to handle smaller data sets by using query filters. For example, you can choose to filter the data by a characteristic such as location or classification.
- Fine tune the number of analytic processes and rules based on the size of the data to analyze.

Troubleshooting analytic rules

If an analytic event is not generated when an asset analytic process is run, you can check the error logs for the asset analytic process or the asset analytic event. You can also check for common issues with the configuration, workflows, or database.

About this task

You can find error logs in the Error Log section of an Asset Analytic Process record or an Asset Analytic Event record. An error log is created when an asset analytic

process does not create an asset analytic event or when an asset analytic event does not create an asset event request.

Verifying the Asset Analytic Process configuration

Use the following steps to locate errors in the Asset Analytic Process configuration.

Procedure

1. Check what fact data is retrieved for processing.
   a. Click **Sustainability** > **Set Up** > **Analytics** > **Rule Engine** and then open the Asset Analytic record.
   b. Verify the following values in the Fact section:

      Module
      triMetricFact

      BO Asset Analytic Hourly(triAssetAnalyticHFact)

      Group By Field
      triDimAssetTX

      Timestamp Field
      triCapturedDT

      The workflow constructs a query to retrieve the data that will be analyzed. The fields in the Fact section define the target table, how data is grouped, and what field defines the timestamp. If these fields are not specified or are specified incorrectly, the workflow fails to retrieve the fact data and a warning is created in the **Work Flow Instance** tab.

      For example, if you enter an invalid field name in the **Timestamp** field and run the asset analytic process, no data is retrieved. Click the **Work Flow Instance** tab to view the workflow and find the failure, which in this case is on the Retrieve Hourly Devices task. Click **View Error** to show that the invalid field name does not exist.
   c. In the Control section, verify that the values in the **Period End**, **Periods**, and **Period Duration Mins** fields are defined to match the rule. For example, an Asset Analytic Process that includes a rule that analyzes 2 hour periods should have the value in the **Periods** field set to 2.

      Remember: The Analytic Process Periods cannot be smaller then the value in the number of periods set in the rule conditions. For example, if the period value for the Asset Analytic Process is set to 1 and the rule condition is set to expect two periods of data, a warning will be listed in the **Workflow Instance** tab. Click on the workflow to view the error in the **Call Workflow Task**, which states that not enough results were found.
   d. If there is a value in the Criteria Query Name field, verify that the value is valid by checking for a warning listed in the **Workflow Instance** tab. You can verify the value by checking that the system report query name exists at **My Reports** > **System Reports**.
2. Check if the rules that are listed are active. Asset Analytic Processes do not call Engine Rule Workflows for rules that are not active. There are no warnings for rules that are not active.
3. Check the number of rows and objects that are retrieved.
   a. To activate the Retrieved Custom task log, log in to the TRIRIGA Admin Console, in **Managed Object** select **Platform Category**, in **Add Manual Category** enter `com.tririga.platform.fact.FactDataQueryServiceImpl`, and click **OK**.

b. Run the Asset Analytic Process.
c. Find the `server.log` file in the TRIRIGA Admin Console under **Error Logs**.
d. Review the log information, which includes the executing SQL and the number of rows and objects that were retrieved.
e. Find "com.tririga.platform.fact.FactDataQueryServiceImpl" in the `server.log` file. The Custom Task uses the query to retrieve the fact data but it will only include data for objects that have the specified number of periods.
f. Run the executing SQL statement against the database and verify that the Asset Analytic Process retrieves the data that you want to analyze. For example, the `server.log` below shows that two rows (periods) for one object (asset) were retrieved from the fact table.

```
executing SQL: Sql[SQL=select * from T_TRIASSETANALYTICHFACT T1 where
triCapturedDT > 1375254000000 and triCapturedDT <= 1375261200000 and
( T1.triDimSpecificationCla = 'Refrigeration Units' ) order by
triDimAssetTXObjId, triCapturedDT desc ,DB transaction ID=(None)]

2013-12-02 12:55:41,042 DEBUG
[com.tririga.platform.fact.FactDataQueryServiceImpl]
(http-0.0.0.0-14001-2) com.tririga.platform.fact.FactDataQueryServiceImpl
processed 2 rows for 1 objects in 32 milliseconds.
```

Verifying the rule definition configuration

Use the following steps to locate errors in the rule definition configuration.

Procedure

1. To view the Rule Engine Workflow and Event Summary Workflows that are set in the Rule Definitions record, go to **Sustainability** > **Set Up** > **Analytics** > **Rule Definitions**.
2. Go to **Tools** > **Builder Tools** > **Workflow Builder** and then expand **triAnalyticRule** and **triAssetRule**. Check that the Rule Engine Workflow exists and is published.
3. Go to **Tools** > **Builder Tools** > **Workflow Builder** and then expand **triAnalyticEvent** and **triAssetEventSummary**. Check that the Event Summary Workflow exists and is published.

Debugging the rule engine workflow

Use the following steps to locate errors in the rule engine workflow.

Before you begin

Before you follow these steps to debug the Rule Engine Workflow, verify that the Asset Analytic Process and the rules configuration are correct, which means that the correct fact data is retrieved and the correct Rule Engine Workflow is run, but the analytic event is not generated as expected.

About this task

Although workflow recording is automatically created when there is an error in the workflow, you can also choose to activate workflow debug mode and trace the execution path of the workflow.

To simplify debugging a workflow, narrow down the retrieved records to retrieve one device or asset.

For more information on TRIRIGA workflows, see the *IBM TRIRIGA Application Platform Application Building for the IBM TRIRIGA Application Platform* user guide.

Tip: Because workflow debug uses a lot of memory, disable workflow debugging as soon as possible.

Procedure

1. Activate workflow debug.
   a. Log in to the TRIRIGA Admin Console.
   b. In the **Managed Object**, select **Workflow Agent Manager**.
   c. In the **Workflow Instance Recording**, select **Always** and click **Save**. Now, a Workflow Instance record is created when workflows are run.
2. Run the Asset Analytic Process and then click the **Workflow Instance** tab to view the recording and find the part of the workflow that is not running as expected.
   a. Track the execution path of the workflow.
   b. Check whether the workflow Pre conditions are as designed.
   c. Check whether the Retrieve Rule Parameters tasks are accurate.
   d. Check whether the rule conditions are as designed.
3. To view a list of the Engine Workflow Instance records that are created when the engine workflow of a rule is called dynamically, click **Tools** > **Builder Tools** > **Workflow Builder** and then expand **triAnalyticRule** and click **triAssetRule**. Select the radio button for the workflow you want to check and click **List All Instances** and click an instance to open.

Verifying the data in the fact table

Use the following steps to locate errors in the fact table data.

Procedure

1. To verify that the hourly fact table records have data points that match the rule conditions and periods, build a query that displays the data points that are related to this rule for the periods and the asset or node in question. The data point should match the Period End of the Asset Analytic Process.
2. Verify that the hourly fact table does not have corrupted reference Ids by checking the **Workflow View Error**.
3. Verify that the devices in the hourly fact table have unique assets. The analytic process will not retrieve data for an asset that is assigned to more then one device.

Analyzing energy data from external tools

External tools that are capable of analyzing fact data, such as building management systems, can send information to TRIRIGA via SNMP traps in order to create an analytic event, such as a service request.

SNMP traps

The Simple Network Management Protocol (SNMP) is a TCP/IP-based network-management protocol that, among other things, enables distributed systems to interchange asynchronous notifications. In event creation and processing, SNMP traps enable the notification of events between the system that is creating the event and the system that is processing the event.

TRIRIGA Real Estate Environmental Sustainability Impact Manager includes an SNMP agent that supports the use of data analysis from an external system, such as building management systems, energy management systems, or data analysis systems, to cause analytic events to be created in TRIRIGA.

The analytic events that are created in TRIRIGA are based on the data content that is specified in the TRIRIGA Real Estate Environmental Sustainability Impact Manager SNMP trap keys. The SNMP trap keys, such as triName or triDescription, are included in the payload of the SNMP traps.

When an event is triggered by an SNMP trap, TRIRIGA checks whether there is an existing event created with the same event name against the same asset within a period of time that the user defines. If there is a duplicate event that is already in process, the event is marked as a possible duplicate and is not processed.

After the SNMP-based analytic events are successfully created, you can use TRIRIGA Real Estate Environmental Sustainability Impact Manager to address the equipment operating deviations that originated these external events by automatically creating service requests and work tasks that specifically target remediation actions.

You can view the SNMP properties from the Admin Console.

SNMP trap keys

When an SNMP trap is received in TRIRIGA, it creates an Asset SNMP Trap record only if the SNMP Trap record includes the key string “triTREESExternalRule”.

SNMP traps include variables which have values. The names of the variables are not controlled by TRIRIGA. TRIRIGA stores all of the required information from an SNMP trap in one variable or string as pairs where key = value.

For example, one of the variables may have the following string value: triTREESExternalRule, triName = Simultaneous Heating and Cooling, triNameplate =abc123, triPriority =High, triDescription =AHU is Heating and Cooling at the same time”, triResolution=Check AHU setting

Without the key string "triTREESExternalRule", TRIRIGA will not create an Asset SNMP Trap record.

The following table contains more information about each of the keys.

Table 8. SNMP trap keys

Key	Value	Comments
triTREESExternalRule	Required.	Since SNMP traps can be used by other objects in TRIRIGA, the triTREESExternalRule key indicates that this message should be processed for analytics.
triName	Required. The name of the event.	

Table 8. SNMP trap keys (continued)

Key	Value	Comments
triNameplate	Required. The nameplate of the device.	The Nameplate value must exist in TRIRIGA as an Asset (Building Equipment). TRIRIGA workflow will use the Nameplate to identify the asset that triggered this analytic event and requires attention.
triDescription	Required. Description of the analytic rule conditions that trigger this event.	
triPriority	Optional. The priority of this event.	Used when creating a service request. You can set a default SNMP priority in the Application Settings.
triResolution	Optional.	

SNMP trap application settings

A TRIRIGA administrator defines the default settings for how TRIRIGA handles SNMP traps that are received from external data sources.

Set the default parameters for SNMP trap handling on the Environmental tab in the Asset Event Settings section of the application settings at **Tools** > **System Setup** > **General** > **Application Settings**.

Table 9. Application settings for SNMP traps

Field name	Description
Default SNMP Trigger Event Type	Sets the event type that should be triggered when analytic event is created. The options include: • Asset Event Request • Notification
Default SNMP Request Class	Defines the TRIRIGA request class that is used for new requests. If the Default SNMP Trigger Event Type is set to Asset Event Request, this field is required. The default request class is HVAC Services.
Default SNMP Priority	Sets the default priority from the Priority classification for new events.
Default Contact	Sets the contacts who will receive new notifications.
Default SNMP Duplicates Evaluation Period	Sets the period that will be used for duplicate event checking. An event is marked as a duplicate event, if it has the same Event Name and Asset as another event during the evaluation period set in this field.

Debugging asset analytic events from SNMP traps

If an asset analytic event is not created from an SNMP trap, first check the Application Settings. Then, you can check whether an Asset SNMP Trap was created, whether the Asset SNMP Trap created has the required information, and whether the Asset SNMP Trap that was created has valid information.

Procedure

1. To check whether an Asset SNMP Trap was created, select **Sustainability** > **Set Up** > **Analytics** > **Asset SNMP Trap**. Verify that a new Asset SNMP Trap record was created.

Option	Description
If an Asset SNMP Trap record was not created, verify that the SNMP trap includes the key string "triTREESExternalRule".	To view the SNMP traps, run the SNMP Traps report from **My Reports** > **System Reports**.
If an Asset SNMP Trap record was created, verify that the Asset SNMP Trap variable includes all of the required keys.	Key values from the variable are parsed and populated in the Matched section of the Asset SNMP Trap record. An Error Log record is created if the Analytic Event was not created due to missing information. For example, without a valid Nameplate value the Asset for which the Event should be created cannot be found in TRIRIGA. The Asset column in the Error Log indicates whether the Asset was found. For more information about the required keys, see “SNMP trap keys” on page 74.

2. If an Asset Analytic Event was created but not the Asset Request, verify that the Asset Analytic Event includes the required information, which includes valid values for the **Asset**, **Location**, **Organization**, and **Request Class** fields.

Pruning events

Event pruning deletes duplicate analytic events so that only events that have service requests or work tasks associated with them are saved. You can set options and schedule event pruning or you can view the results of previous event pruning jobs.

Procedure

1. To access the event pruning function, click **Sustainability** > **Set Up** > **Analytics** > **Event Pruning**.
2. Optional: You can click an existing event pruning schedule to view or edit the settings or to set the status to Scheduled or UnScheduled. You can view the results of the last scheduled event pruning process in the Purge History section.
3. To create a new event pruning schedule, click **Add**.
4. In the General section, enter a name and description for the schedule.
5. In the Purge Schedule section, click the calendar icon to set the amount of time that the schedule will purge events older than.
6. To purge only events with a status of Possible Duplicate, select **Purge Only Duplicate Events?**.

7. Set the frequency for event pruning as the **Recurrence Pattern Type**.
8. Set the start date for the schedule.
9. Click **Create**.
10. Open the event pruning schedule and click **Schedule** to activate the event pruning schedule.

Results

The event pruning job will now run as scheduled. If you want to cancel future runs, open the event pruning schedule and click **UnSchedule**.

Chapter 5. Reducing environmental impact

Implement programs and projects identified to meet environmental sustainability objectives and maintain the improvements.

A project management system ensures that improvement projects are implemented within the planned scope, schedule, and budget. After implementing projects, an operations and management system is needed for critical preventive maintenance and commissioning tasks.

Examples for reducing environmental impact

Environmental managers use TRIRIGA Real Estate Environmental Sustainability along with other TRIRIGA products to implement opportunities to reduce the overall carbon footprint, energy consumption, and costs.

Example: Improving the occupancy rate of facilities

The CFO of Company XYZ issued a directive to improve the occupancy rate of their facilities. Environmental manager Gary Green leads the initiative.

Gary meets with the facilities management team to identify solutions for improving the occupancy rate of buildings. The goal is to lower energy use and other costs that affect the carbon footprint of the real estate portfolio.

Step 1: Researching occupancy and space utilization

Gary works with the facilities management department to understand the occupancy rates, space utilization records, square feet per person, and cost per square foot for each building. The team uses data about the occupancy and use of space from TRIRIGA.

Step 2: Analyzing solutions

Using the scenario analysis features of IBM TRIRIGA Strategic Facility Planning, the team considers options for moving together organizations. By consolidating floors, the occupancy rate can be maximized through reducing the amount of office or cubicle space that is allotted to each employee. One facility has two low-occupancy floors and it is feasible to consolidate the employees onto one floor.

Step 3: Implementing a move project

The facilities management team completes planning for the move and uses the move management features in TRIRIGA to create the related project and tasks.

Result: Reporting on improvements

Data is updated in TRIRIGA, and new reports demonstrate the improvements. The consolidation of the two floors leads to vacant space, which can be eliminated. By releasing the vacant space, Company XYZ can further reduce expenses and the carbon footprint of the real estate portfolio.

Example: Releasing vacant facilities

The CFO of Company XYZ wants to reduce the carbon footprint of the real estate portfolio by terminating the lease of a vacant facility.

Company XYZ is renting a floor of a building that is no longer being used. To reduce the carbon footprint of the portfolio, environmental manager Gary Green works with the real estate department to consider options for disposing of the floor.

Step 1: Researching the lease

The real estate department uses IBM TRIRIGA Real Estate Manager to determine that the lease for the floor does not expire for two more years. They find that the early termination fee is less than the cost of continuing to rent the floor through the end of the lease.

Step 2: Terminating the lease for the vacant floor

The real estate department completes the process of terminating the lease for the vacant floor and updates the records in TRIRIGA.

Step 3: Tracking the results of the real estate disposition project

Gary tracks the changes in energy consumption and overall carbon footprint after the disposition to report on the results. The project results in a reduction of the overall rental expense, the energy cost, and the carbon footprint.

Chapter 6. Reference information

The following topics provide reference information about TRIRIGA Real Estate Environmental Sustainability forms and records.

Application Settings record

The Application Settings record contains constants that are used for environmental calculations by TRIRIGA Real Estate Environmental Sustainability Manager and TRIRIGA Real Estate Environmental Sustainability Impact Manager.

Locating the applications settings

You can find the applications settings on the General tab by selecting **Tools** > **System Setup**.

Environmental Settings section

Field	Description
Energy Reporting UOM	The default unit of measure for energy reporting.
Travel Reporting UOM	The default unit of measure for travel reporting.
Emissions Reporting UOM	The default unit of measure for emissions reporting.
Water Reporting UOM	The default unit of measure for reporting water usage in water logs.
Waste Reporting UOM	The default unit of measure for reporting waste levels in waste logs.
Carbon Reporting UOM	The default unit of measure for reporting carbon levels.
Carbon Credit UOM	The default unit of measure for carbon credits.
Energy (Scope 1) Carbon Calculation UOM	The default unit of measure for calculating Scope-1 carbon footprint for energy logs such as electricity, and gas.
Energy (Scope 2) Carbon Calculation UOM	The default unit of measure for calculating Scope-2 carbon footprint for energy logs such as electricity, and gas.
Travel Carbon Calculation UOM	The default unit of measure for carbon footprint calculations for all travel logs.
Waste Carbon Calculation UOM	The default unit of measure for carbon footprint calculations for all waste logs.
N2O GWP Conversion	The global warming potential (GWP) conversion factor for nitrous oxide (N_2O).
CH4 GWP Conversion	The global warming potential (GWP) conversion factor for methane (CH_4).

Opportunity Analysis section

Field	Description
Analysis Term (Years)	The default term for opportunity analysis. Used to calculate the Net Present Value and Internal Rate of Return for opportunities included in the opportunity analysis.

Field	Description
Discount Rate	The default discount rate for opportunity analysis. Used to calculate the Net Present Value of opportunities included in the opportunity analysis.
Capitalization Rate	The default capitalization rate for opportunity analysis.
Blended Energy Cost per kWh	The global blended energy cost per kWh. Used in opportunity analysis to estimate the carbon footprint reduction amount. Represents a firm's estimate of the cost per kWh to operate all energy sources.
Blended Energy Emissions Conversion Factor (grams/kWh)	The global blended energy conversion factor used in opportunity analysis to estimate carbon footprint reduction amount. Represents a firm's estimate for converting kWh to carbon default UOM (for instance, US Tons CO_2).

Reporting Base Period Settings section

Field	Description
Reporting Base Year	The environmental reporting defaults for base year reporting.
Reporting Base Month	The environmental reporting defaults for base year reporting.

Facility Assessment Analysis Defaults section

Field	Description
Current Scenario Year	The start year of the analysis.
Construction Cost Inflation Rate	The inflation rate for facility analysis.
Target FCI	The target facility condition index (FCI) percent reduction used for Option 3 of the Facility Assessment Analysis Crystal Report.
Backlog Deterioration Rate	The rate at which defined projects degrade.
Target Reduction Period (years)	The target number of years associated with the target FCI.
Funding Percent Increase	The estimated funding percent annual increase.
Facility Growth Rate	The estimate of the facility growth rate during the term of the analysis.
Number of Years in Analysis	The number of years included in the facility assessment analysis.

Energy Log form

The Energy Log form contains information about the energy use for a building, land, a retail location, or a structure record.

Locating the Energy Log form

You can find the Energy Log form by clicking on **Energy Log** below the **Environmental** tab of the business object record.

Linked Records section

Field	Description
Linked Record	ID for the business object record that is linked to the energy log data.
Linked Business Object	The type of business object for the linked record, such as a building, land, a retail location, or a structure.

General section

Field	Description
Energy Type	The type of energy the data represents. Click **Search** for a list of options.
Recorded By	Auto-populated with the user's name. To change the name, click the link.

Units section

Field	Description
Currency	The currency that is used for the data in the Details section. If you change the currency, click **Apply** to update the record.
Base UOM	The base unit of measure that is used for the data in the Details section. Choose from the drop-down lists. If you change this value, click **Apply** to update the record.

Energy Star Validation Item form

The Energy Star Validation Item form contains information about errors that occurred when you request ENERGY STAR ratings from the EPA Portfolio Manager.

Locating the Energy Star Validation Item form

You can find the Energy Star Validation Item form by selecting **Home** > **Sustainability** > **Set Up** > **ENERGY STAR Validation** and opening an Energy Star Validation record. The Energy Star Validation Item records are in the Validation Results section.

Building Details

Field	Description
Building Name Blank	The box is checked if the Building Name is blank.
Geography Information Blank	The box is checked if the Address, the City, the State, the postal code, or the Country of the building is not specified.
Location Primary Use Blank	The box is checked if the building record does not contain location primary use information or energy space attributes.
Primary Use Do Not Have Associated Energy Space	The box is checked if the building record does not have an energy space that is associated to the location primary use but does include information about the location primary use.
Gross Floor Area Zero	The box is checked if the gross floor area of the location is not specified.

Field	Description
Federal Agency Details (Energy Star ID, Real Property Unique Identifier)	The box is checked if the federal agency details are not specified. When the building class is Federal, specify the Energy Star ID on the agency organization and the real property unique ID on the Federal tab of the Location record.
Failed Building XML Source record	The box is checked if the building request XML is not generated because some ENERGY STAR required data is missing. Confirm that Primary Energy Space is checked on the latest Energy Rating record.

Meters

The Meters section on the **General** tab of the Energy Star Validation Item form contains all of the building equipment assets that is missing required data.

Field	Description
In Service Date	The box is checked if the in-service date of the meter is not specified.
Meter XML Source	The box is checked if the meter request xml is not generated because some ENERGY STAR required data is missing.
Energy Type not selected	The box is checked if the energy type of the meter is not specified.
Energy Star UOM Type not selected	The box is checked if the unit of measure for the associated environmental meter type classification is not specified.
Energy Star Meter Type not selected	The box is checked if the ENERGY STAR meter type is not specified on the associated environmental meter type classification.
Property Meter Type not selected	The box is checked if the property meter type is not specified. The property meter type identifies how the meter is used, for example, for the whole property or for a tenant area only.
Tenant Common Area Energy Type not selected	The box is checked if the tenant common area energy type is not specified. Specify the tenant common area energy type when the **Property Meter Type** value is **Combination of Tenant and Common Area Consumption**.

Energy Logs

The Energy Logs section of the Energy Star Validation Item form identifies the energy log records that have missing or invalid information. It also gives the total number of energy logs with issues.

Energy Space Attributes

The Energy Space Attribute section of the Energy Star Validation Item form identifies the data attributes values that are not specified for the energy space. The total number of energy space attributes with issues does not include XML schema validation errors.

XML Schema Validation

XML requests are created during the validation that is based on the energy rating record. The XML requests are validated against the ENERGY STAR XML schema to confirm that all data types and required values are populated. The generated XML

requests are attached in the XML Schema Validation section if any required data is missing

Utility Invoice form

The Utility Invoice form is a record that contains information from an invoice that is received from a utility company.

Locating the Utility Invoice form

You can find the Utility Invoice form by clicking **Contracts** > **Payables** > **Invoices** > **Utilities**.

General section

Field	Description
ID	A unique number identifying the utility invoice record. This number is generated automatically and displayed by the system when the utility invoice record is created.
Revision	The revision number indicating the number of times the current record is revised. You can revise or modify the record by clicking **Revise**, which is displayed on the Action bar. Each time you revise or modify the record, the value displayed in this field increases by one.

Field	Description
Status	The current status of the utility invoice record being created. The utility invoice record can have the following statuses: **Draft** The utility bill invoice record is in the draft state and can be modified. The system displays this status when you click **Create Draft** in the Action bar. **Review In Progress** The record has been sent for approval and is yet to be approved by all the members in the distribution list. The system displays this status when you click the **Issue** action in the Action bar. **Issued** The record changed from Review In Progress state to Issued state when all the members in the distribution list have approved the record. The system creates environmental logs when a record is changed to Issued state. **Revision In Progress** The record is being modified or edited for further changes. The system displays this status when you click the **Revise** action in the Action bar. **Completed** All the processes associated with the record are complete. The system displays this status when you click **Complete** in the Action bar. **Retired** The record is removed temporarily from the active management list. The system generates this status when you click the **Retire** action in the Action bar. **History** When the utility bill invoice record is revised, a copy of the record is saved in the History state for each revision. If you select the History option in the Related Reports drop-down status list, which is displayed in the results page, the system retrieves and displays all the records that are revised at different stages.
Name	A unique name to identify the utility invoice record that is being created. You enter the unique name.
Invoice Date	The date on which the utility invoice record is created.
Description	A brief description about the invoice. You enter the description.

Units section

Field	Description
Currency	The currency type that is used for all the cost-related fields. Use the List icon to select the currency type. You see all options defined for Currency in the **Tools** > **Administration** > **Lists** page. By default, the system displays the currency set by your administrator.

Details section

Field	Description
Response Required	An option to request a response. Select this check box to specify that a response is required from the person selected in the To section of the current record.
Conversion Group	The conversion group that is used for all the cost-related fields in the record. Use the List icon to select the group. The system displays all options defined for Conversion Group in the **Tools** > **Administration** > **Lists** page.
Currency Exchange Date	The date and time on which the currency was traded. Use the Calendar icon to select the date.

Invoice Summary section

Field	Description
Total Invoice Amount	The sum of the invoice line items.
Total Previous Invoices	The sum of the **Previous Invoiced Total** fields on the invoice line items.
New Invoice Total	The sum of the **New Invoiced Total** fields on the invoice line items.

Contract section

The Contract section is used to associate the utility invoice record to a contract.

1. Click **Find** on the section bar to associate a contract record. The system displays the list of records retrieved from the Service Agreement and the Blanket Purchase Order business objects in the Contract menu. The list is sorted by contract type and contract number.
2. Select a record and click **OK**. The system autopopulates the fields in this section, as well as the To, Service Provider Company, Service Provider Contact, and Payment Terms sections, with values from the selected contract.

Field	Description
ID	The unique ID number of the associated contract record.
Status	The current status of the associated contract record.
Name	The name of the associated contract record.
Revision	The number of times the associated contract record was revised.
Contract Type	The contract type of the associated contract record.

To section

The To section is used to add contact information about the person who sends the invoice. The system automatically populates the details about the contact person. These details are from the associated contract record selected in the Contract section of the current record.

Field	Description
To Lookup	The **To Lookup** field is used to find an employee that the company assigns as the person responsible for the contract. 1. Use the Search icon to select the contact person in the company. In the search list, you can see a list of the employee records in the People page. 2. Use the **Related Reports** drop-down list to select records of other business objects in the People page (such as an External Contact or a Consultant). The details about the contact are autopopulated by the system after you select a record (if data exists in the selected record). Otherwise, you can populate the fields manually.
Conversion Group	The organization for which the payment is made. Use the Search icon to select the organization. In the search list, the system displays a list of the records retrieved from the associated business object in the Organization Hierarchy.

Service Provider Company section

The Service Provider Company section is used to identify the service provider company.

The system autopopulates the details about the service provider company from the associated contract record selected in the Contract section of the current record. To change the information, you click **Find** on the section bar, choose from among the companies displayed, and click **OK**.

Service Provider Contact section

The Service Provider Contact section is used to identify the service provider contact.

The system autopopulates the details about the service provider company from the associated contract record selected in the Contract section of the current record and any changes you make in the Service Provider Company section. To change the information, you click **Find** on the section bar, choose from among the contacts displayed, and click **OK**.

Utility Invoice Line Item form

Use this form to enter the details of the new line item.

Locating the Utility Invoice Line Item form

When you click **Add** on the Line Item section bar on the Line Items tab of the Utility Invoice form, the Utility Invoice Line Item form opens in a new window.

General section

Field	Description
Name	A unique name to identify the utility invoice line item record that is being created. Enter a unique name.

Field	Description
Status	The current status of the utility invoice line item record being created. Click **Create** to add this utility invoice line item to the utility invoice.

Units section

Field	Description
Currency	The options to select the type and unit of measure. All options defined for the UOM type are displayed on the **Tools** > **Administration** > **Lists** page.
Currency Exchange Date	The currency exchange date from the utility invoice.

Details section

The fields that are displayed in this section depend on the utility bill type that is selected. Enter the details from the utility bill. Only utility invoice line items whose **Include in Energy Use** check box is selected have a corresponding log created.

Meter Service Allocations section

The service allocation percent and service location are displayed in this section. If the service locations displayed are not correct, click **Add** or **Remove** or click a hyperlinked Service Location entry to modify it. Clicking **Add** opens the Meter Service Allocations window. Use this window to define the service allocation percent and the service location. Clicking **Create** adds the Meter Service Allocation to the list of service locations.

Budget Code section

The budget code from the utility invoice is displayed in this section. To change the value for this utility invoice line item, use **Find** and **Clear** on the section bar.

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