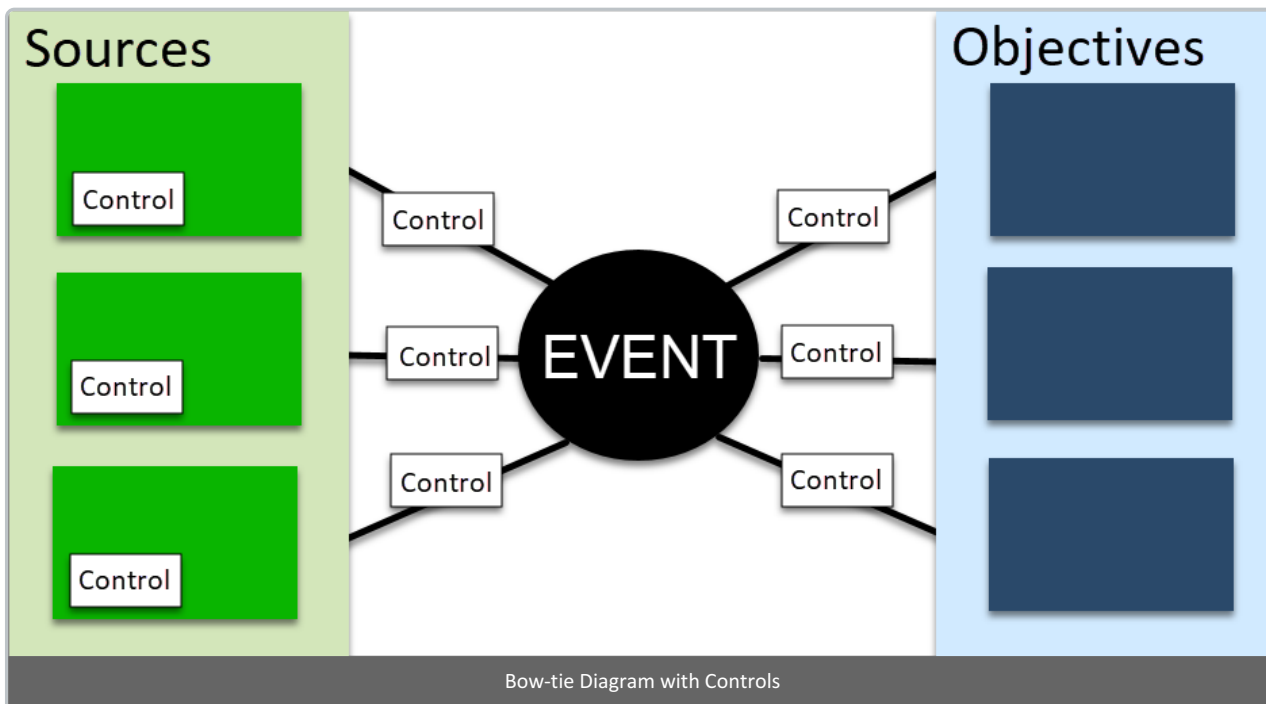


# Bow-Tie Diagram From Threats with Controls

## Overview

This page displays a similar diagram as with the [Bow-tie diagram from specific Threats](#) (without controls) -- but on this page the likelihoods, impacts, and risks are calculated with controls in effect. Controls can also be viewed, selected/deselected (to be in effect), and assigned from the diagram.

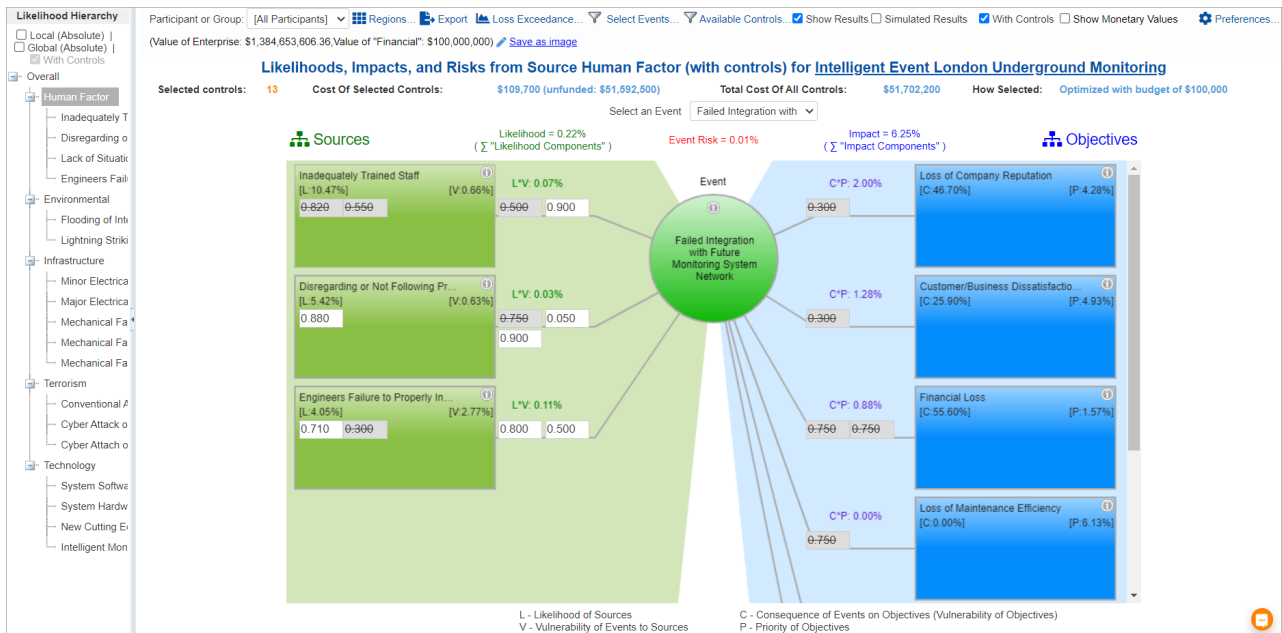


In Riskion, we refer to **threats**, **causes**, **hazards**, and **sources** interchangeably. While they may have slightly different nuances depending on the context in which they are used, they serve the same purpose -- they are all threats/sources of risk (for Risk Events) or sources of opportunity (for Opportunity Events). In our sample model, we are using the terminology "Source(s)".

Controls are defined to reduce or mitigate the:

- **Likelihood of Sources** (from the bow-tie, these are the controls on the sources boxes at the left)
- **Vulnerabilities of Events from Sources** (from the bow-tie, these are the controls on the lines connecting the event to the sources)
- **Consequences of Events to Objectives** (from the bow-tie, these are the controls on the lines connecting the event to the objectives)

The bow-tie diagram for the Event "**Failed Integration with Failure Monitoring System Network**" from source "**Public Relations**" with controls is displayed below.



The selected **Event** is displayed at the center of the diagram (circle). Its background color varies based on the event's %risk.

The **Sources** to which the selected event is vulnerable are displayed on the left side of the diagram (green boxes).

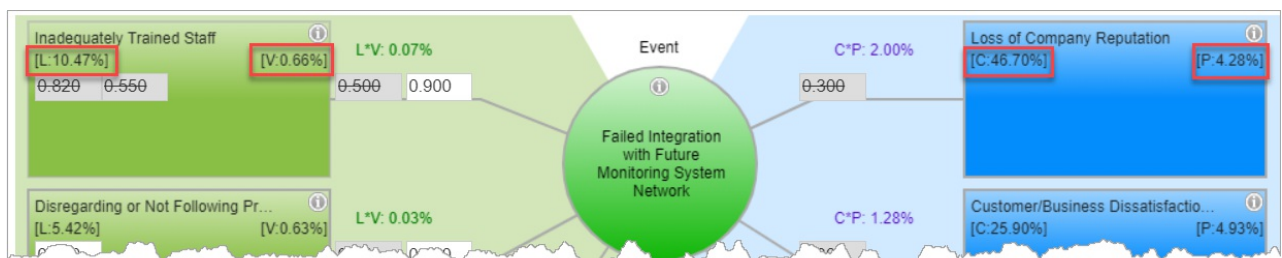
The **Objectives** of the selected Event are at the right (blue boxes).

The specific Source ("**Human Factor**") from which the event is being analyzed is selected from the **Likelihood Hierarchy** at the left.

You can view and analyze the following information:

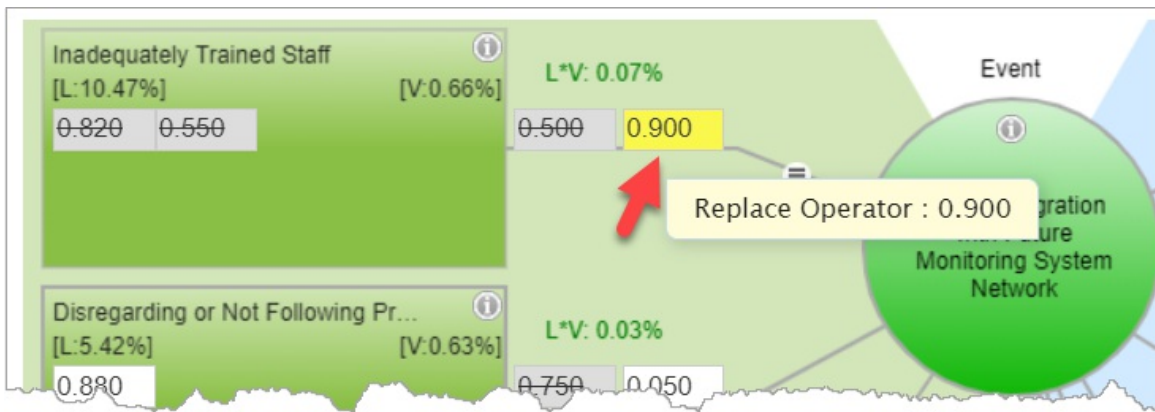
- L - Likelihood of Sources
- V - Vulnerabilities of events to sources
- C - Consequences of Events on Objectives
- P - Priority of Events on Objectives

Focusing on the first source and objective on the diagram:



1. The Likelihood (L) of the Source "Inadequate Trained Staff" given the source "Human Factor" is **10.47%**
2. The Vulnerability (V) of the Event "Failed Integration with Future Monitoring System Network" from source "Inadequately Trained Staff" is **0.66%**
3. The Consequence (C) of the Event "Failed Integration with Future Monitoring System Network" on the Objective "Loss of Company Reputation" is **46.70%**
4. The Priority (P) of Objective "Loss of Company Reputation" is **4.28%** (overall or global impact)

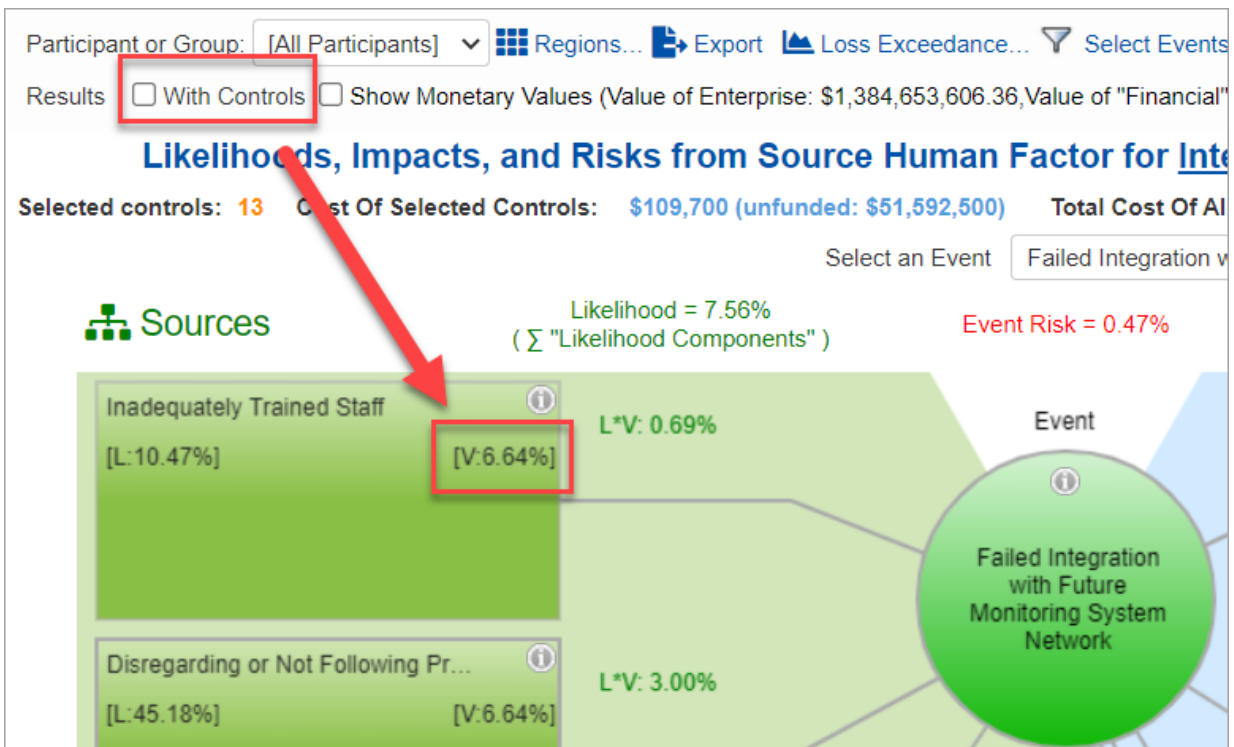
From the above diagram, we can see that there are 5 potential controls and only 1 is in effect as represented on the box with the value **0.900**.



Hovering on it will show the control name, "Replace Operator" as shown above.

The "Replace Operator" with the effectiveness of 0.9 is a control that mitigates the Vulnerability of the Event "Failed Integration with Future Monitoring System Network" From the source "Inadequately Trained Staff". With this, [V:0.66%] is a mitigated vulnerability.

You can uncheck the "With Controls" checkbox on the toolbar to see the results without controls.

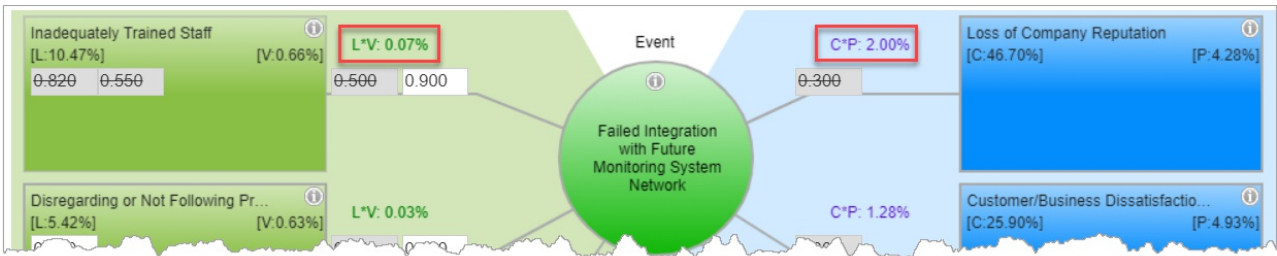


Here we see that the Vulnerability [V] of the event "Failed Integration..." to the source "Inadequately Trained Staff" given "Human Factor" without control is 6.64%. When the "Replace Operator" control is in effect, the Vulnerability is reduced by 5.976.

$$\begin{aligned}
 &= \text{Event Vulnerability without control} * \text{Control Effectiveness} \\
 &= 6.64 * 0.9 \\
 &= 5.976 \%
 \end{aligned}$$

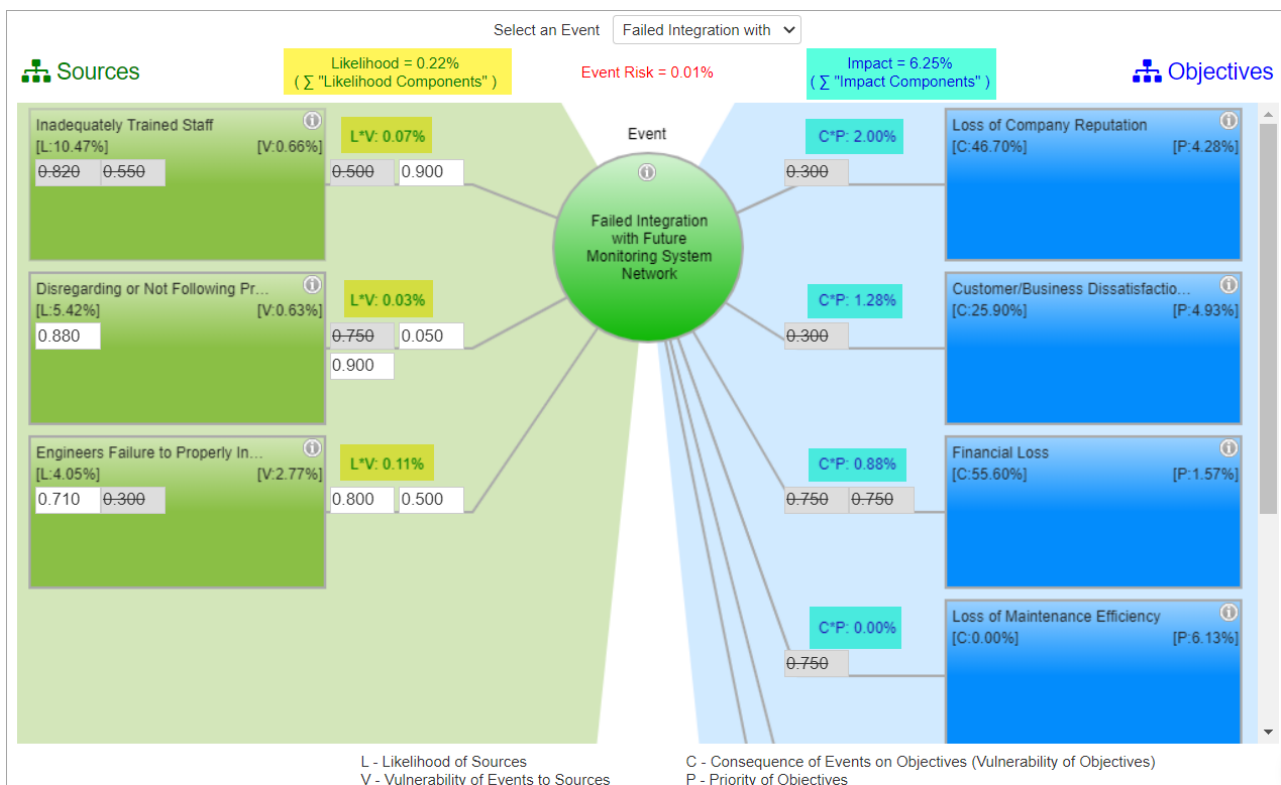
Finally, the resulting Event Vulnerability with control is  $6.64 \% - 5.976\% = 0.66\%$ .

The Likelihood of the event to a given source (L\*V), and the Impact of the event (C\*P) on a given objective are shown on the connecting lines to the source/objective boxes:



- The Likelihood of the Event "Failed Integration with Future Monitoring System Network" to the source "Inadequately Trained Staff" given "Human Factor" is **0.07%** (*this is 0.69% without control*).
- The Impact of the Event "Failed Integration with Future Monitoring System Network" on the Objective "Loss of Company Reputation" given "Human Factor" is **2.0%** (*since there is no control is in effect for this event given the objective, the impact remains 2.0%*)

The summation of ( $\sum "L*V"$ ) event's likelihoods from each event is the Likelihood of the Event, and the summation ( $\sum "C*P"$ ) event's impact on each objective is the Impact of the Event -- given the selected source.

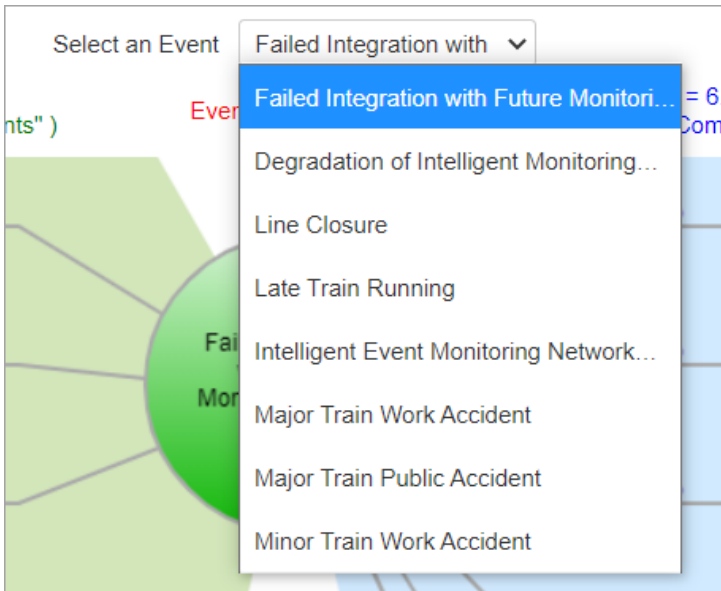


The event "Failed Integration with Future Monitoring System Network" has Likelihood and Impact due to source "Human Factor" **0.22%** and **6.25%** with controls respectively.

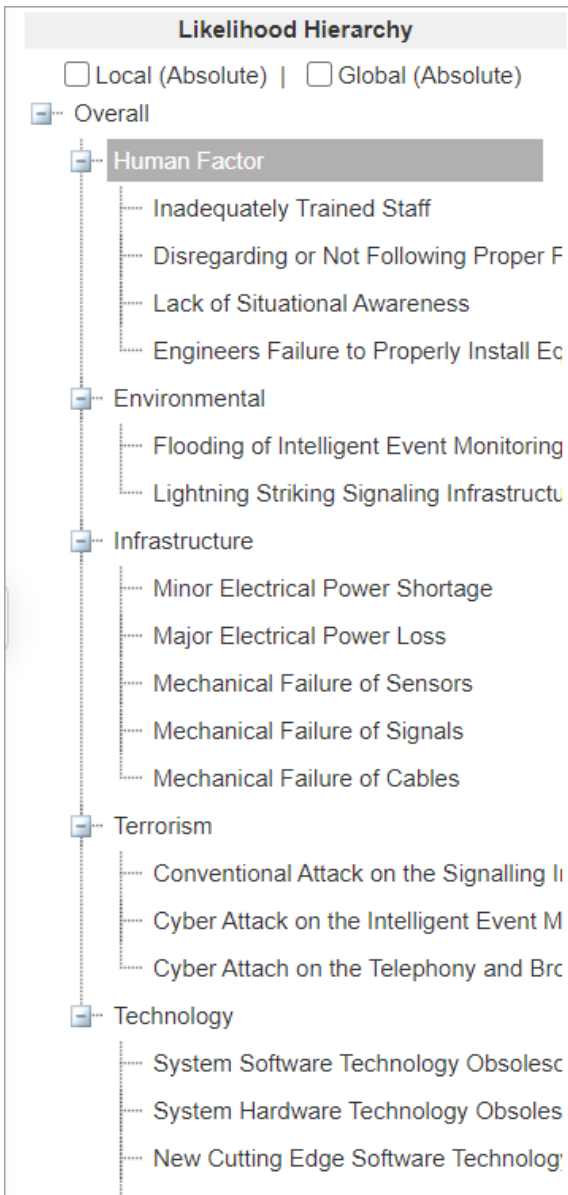
The Event's risk is then computed by Likelihood \* Impact:

$$0.22\% * 6.25\% = \mathbf{0.01\%} \text{ (as shown at the top of the Event)}$$

You can select another Event to analyze from the Events list pulldown at the top:



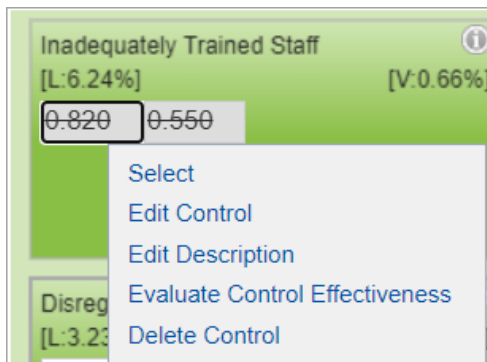
and you can select another source by clicking a node from the Likelihood Hierarchy at the left:



## Manage Controls from the Bow-tie Diagram

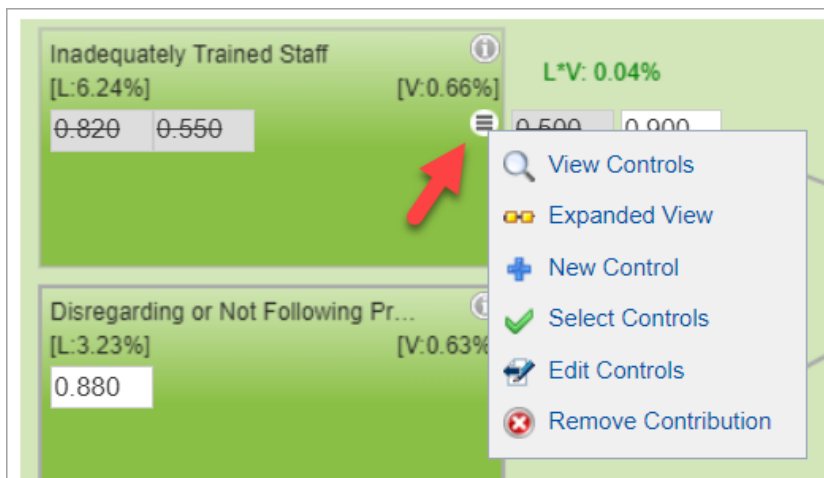
You can select/deselect a control to be in effect by double-clicking a control.

Alternatively, you can right-click on a control box to see the select/deselect options together with other functionality.



- Edit Control - open to update the control name, cost, and categories.
- Edit Description - open a rich text editor to edit the control description
- Evaluation Control Effectiveness - redirect to evaluation step specific to the control selected
- Delete control - delete the control

Hovering on the Source box, and the connecting line from Event to Source and Event to Objective will show a hamburger menu.

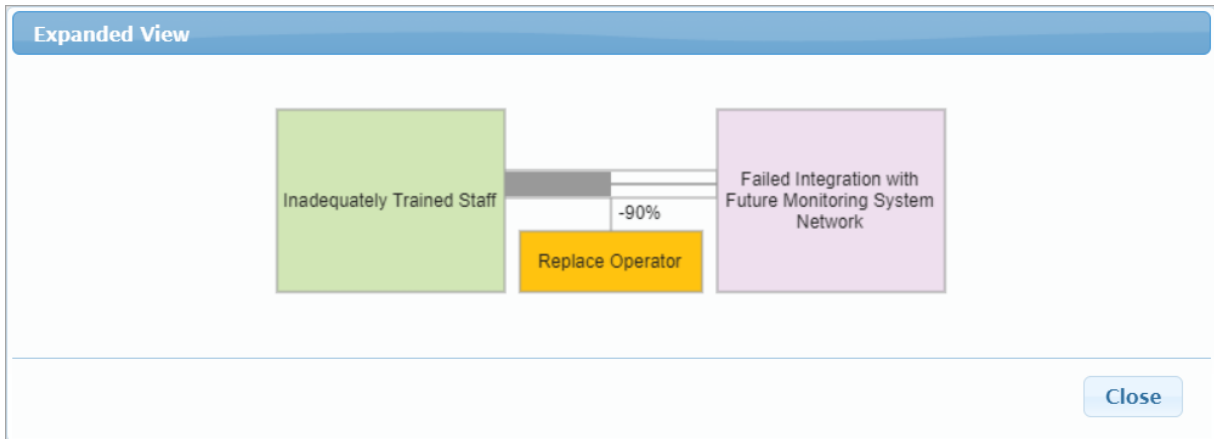


- View Controls - open a modal listing all the potential controls for the specific source, event from a source, or event to an objective. The effectiveness of the control and is active (YES if selected, NO if not) is also displayed.

| Controls Applications                        |               |           |
|--|---------------|-----------|
| Control                                      | Effectiveness | Is Active |
| Periodic Proficiency Training                | 0.820         |           |
| Identify Staff requiring additional training | 0.550         |           |

[Close](#)

- Expanded View - shows a diagram of the elements (source, event, objective, control)



- New Control - add a new control
- Select Controls - list all the available controls for the specific control type (for sources, events to source, or events to objectives). Here you can select potential control of given elements involved.
- Edit Controls - redirect to the Identify Controls page
- Remove Contribution

## Available Controls

Clicking Available Controls will open a modal listing all the identified potential controls.

The screenshot shows a software interface with a top navigation bar containing options like "Participant or Group: [All Participants]", "Regions...", "Export", "Loss Exceedance...", "Select Events...", and "Available Controls...". The "Available Controls" button is highlighted with a red box. Below this, a modal window titled "Available Controls" is open, displaying a list of 17 controls, each with a checked checkbox:

- Monthly Performance Review
- Schedule Proper Maintenance
- Upgrade Signals
- Mandatory Training for Engineers
- Periodic Proficiency Training
- Identify Staff requiring additional training
- Update Sensor
- Back-up Generator Power
- Periodic Inspection/Maintenance of Power Relay Station
- Predeployment Software Testing
- Quality Control of Cables
- Employ Higher Security
- Increase physical security
- Emplace flood prevention material
- Employ Water Pumps
- Periodic System Functional Checks
- Planned System Software Upgrades

Controls that are "checked" means that the control can be in effect or selected (manually or by optimization)

Controls that are "unchecked" mean that the control is **disabled** and can't be in effect or selected.

The "Available controls" option is just similar to the "Disabled" column on the **Identify controls** grid -- disabled controls are unavailable for selection for controls to be in effect.

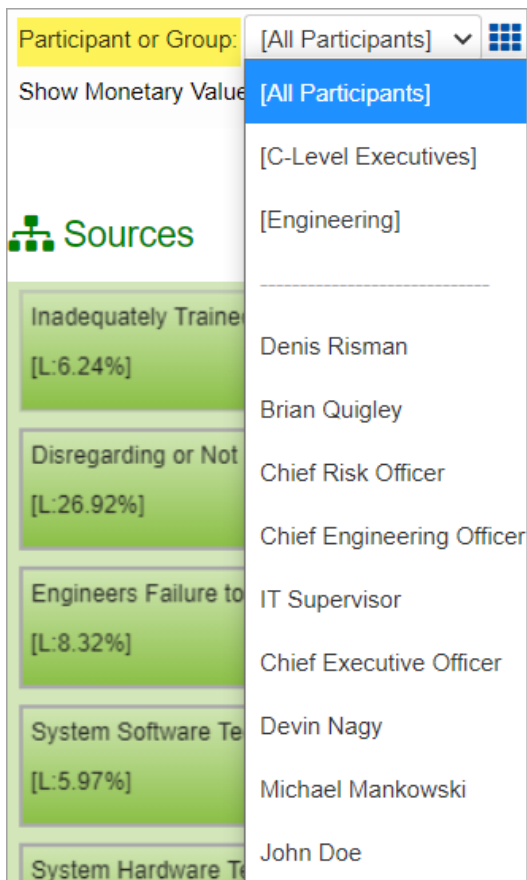
If control is un-available, the box of that control showing its effectiveness is hidden on the bow-tie diagram

When there are un-available controls, the button will have an exclamation mark



## Select Participant or Group

The bow-tie for the "All Participants" group is displayed by default. By selecting from the "Participants and Groups" dropdown, you can display the bow-tie analysis for another participants or group:



The screenshot shows a software interface with a dropdown menu open. The dropdown is titled "Participant or Group:" and currently shows "[All Participants]". The dropdown menu is open, showing a list of options: "[All Participants]", "[C-Level Executives]", "[Engineering]", and a list of individual names: "Denis Risman", "Brian Quigley", "Chief Risk Officer", "Chief Engineering Officer", "IT Supervisor", "Chief Executive Officer", "Devin Nagy", "Michael Mankowski", and "John Doe".

In the background, there is a "Sources" section with a tree icon. It lists several risk categories with their associated percentages:

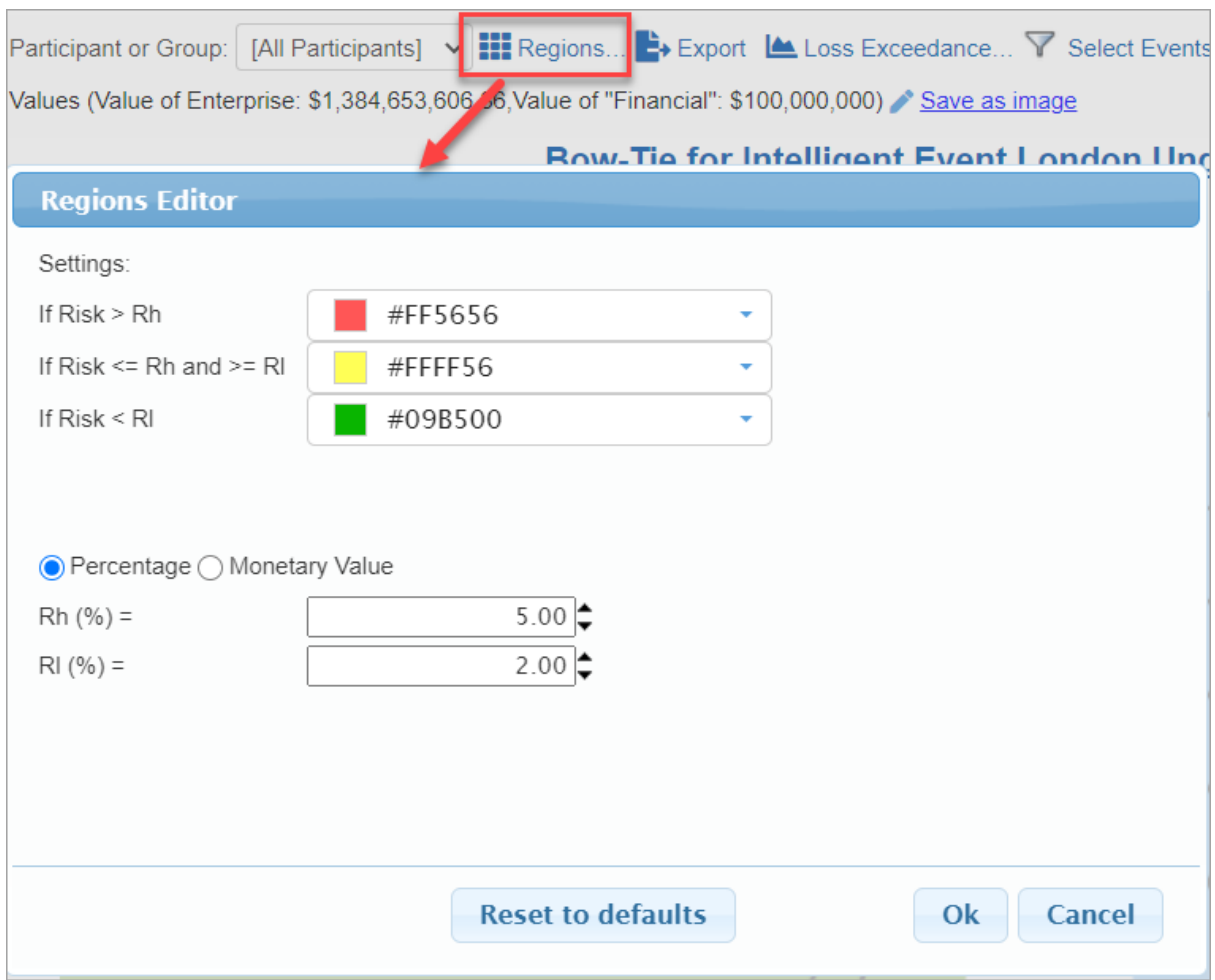
- Inadequately Trained [L:6.24%]
- Disregarding or Not [L:26.92%]
- Engineers Failure to [L:8.32%]
- System Software Te [L:5.97%]
- System Hardware Te

## Define Event Color (Region)

Default colors are already provided for the events on the diagram based on the event's %risk.

You can change this by clicking [Regions...](#)





Here you can specify the limits: Rh (risk high) and RI (risk low) both for percentage or monetary.

Given the limits, you can specify the 3 regions/colors:

- High Risk
- Mid (in-between) Risk
- Low Risk

## Export Bow-tie to Excel or Image Format

Click  [Export](#) to export the bowtie into a .xlsx file.

Click [Save as image](#) link to download the diagram as an image file (.jpeg)

## Show Monetary Values

## Simulated vs Computed Event Likelihoods, Impacts, and Risks (Flaw of Averages)

## Preferences