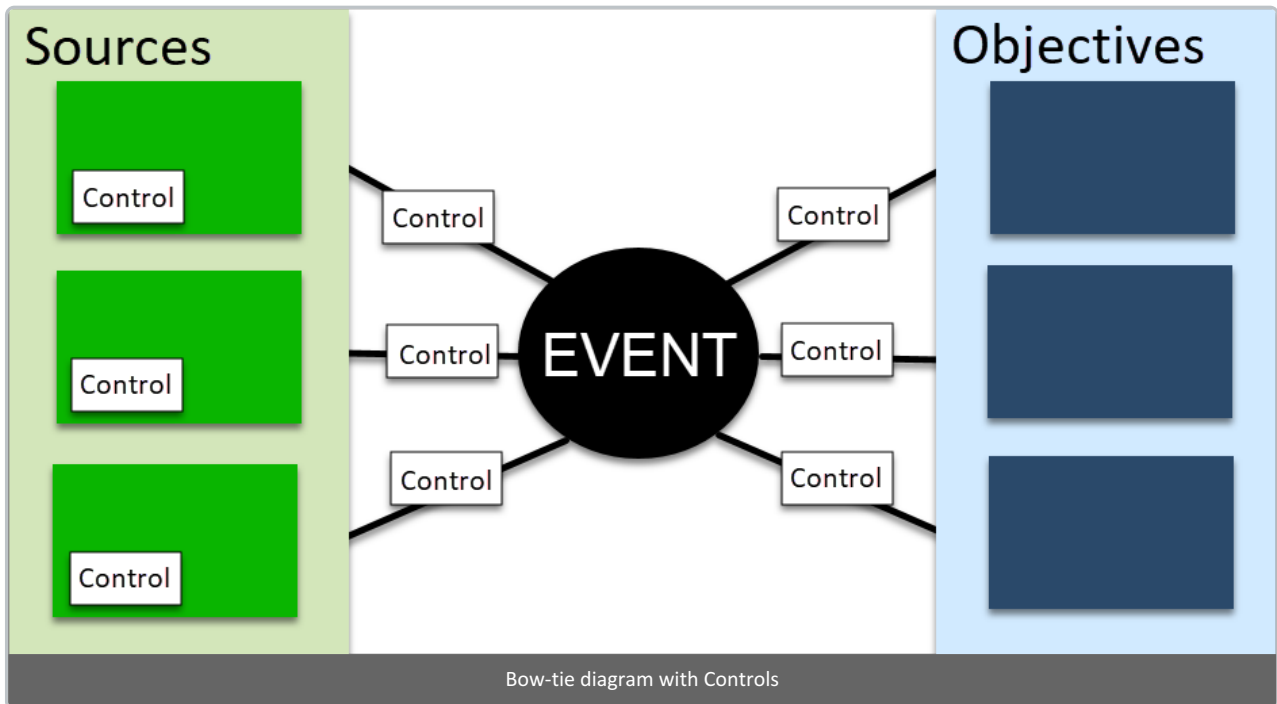


# Bow-Tie Diagram To Objectives with Controls

## Overview

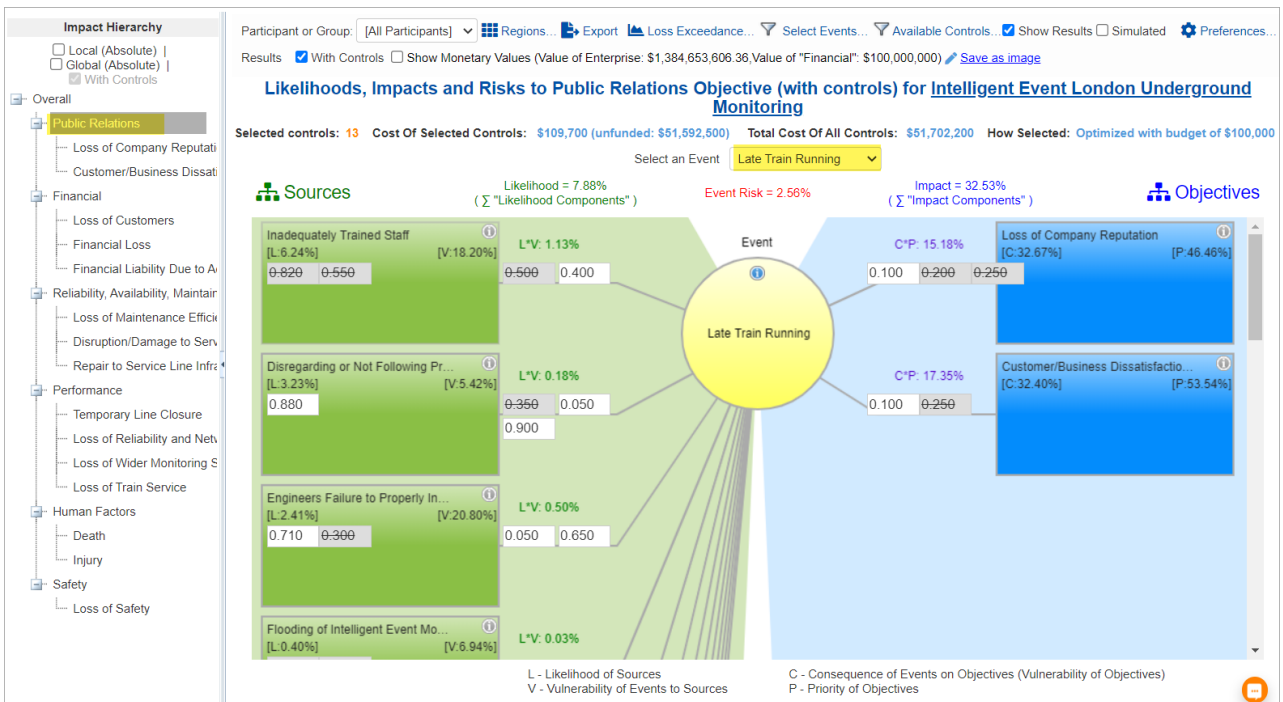
This page displays a similar diagram as with the [Bow-tie diagram To specific Objectives](#) (without controls) -- but on this page, the likelihoods, impacts, and risks are calculated with controls in effect. Controls can also be viewed, selected/deselected (to be in effect), and assigned from the diagram.



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 analysis of the Event "**Late Train Running**" To the objective "**Public Relations**" 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** of the selected event are on the left side of the diagram (green boxes).

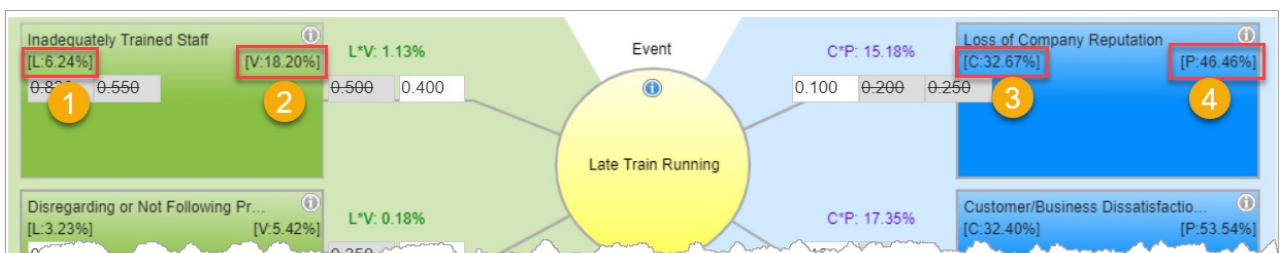
The **Objectives** of the selected Event are on the right (blue boxes).

The Objective ("**Public Relations**") to which the event is being analyzed is selected from the **Impact 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

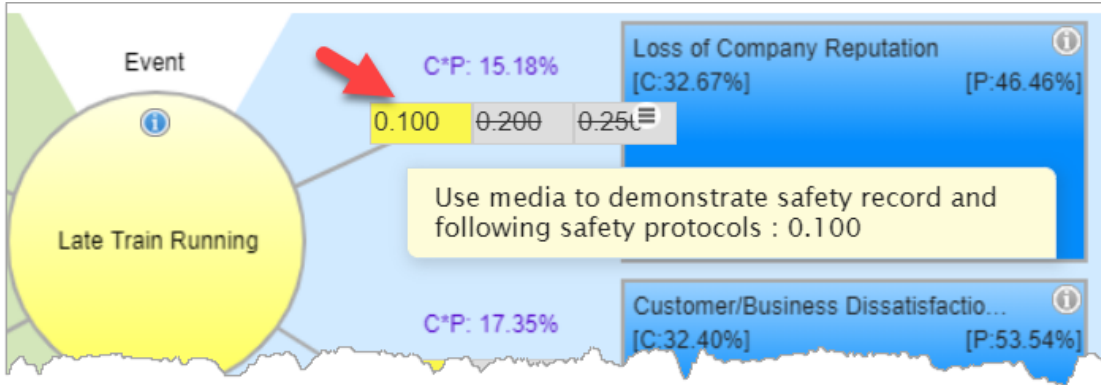
Focusing on the first source and objective on the diagram:



1. The Likelihood (L) of the Source "Inadequate Trained Staff" is is **6.24%**
2. The Vulnerability (V) of the Event "Late Train Running" from the Source "Inadequately Trained Staff" is **18.20%**
3. The Consequence (C) of the Event "Late Train Running" on the Objective "Loss of Company Reputation" is **32.67%**
4. The Priority (P) of Objective "Loss of Company Reputation" wrt the objective "Public Relations" is **46.46%**

From the above diagram, we can see that there are 7 potential controls and there 2 that are in effect as represented on the box with the values **0.400** and **0.100**.

Focusing on the right side, hovering on 0.100 will show the control name, "Replace Operator" as shown above.



The "Use media to demonstrate safety record and following safety protocols" with the effectiveness of 0.1 is a control that mitigates the Consequence of the Event "Late Train Running" on the objective "Loss of Company Reputation" with respect to "Public Relations". With this, V:32.67% is a mitigated consequence.

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

Above we see that the Consequence [C] of the event "Late Train Running" on the objective "Loss of Company Reputation" with respect to "Public Relations" without control is 36.30%. When the "Use media to demonstrate safety record and following safety protocols" control is in effect, the Vulnerability is reduced by 3.63%.

$$\begin{aligned}
 &= \text{Event Consequence without control} * \text{Control Effectiveness} \\
 &= 36.30 * 0.1 \\
 &= \mathbf{3.63\%}
 \end{aligned}$$

The resulting Event Consequence with control is 36.30% - 3.63% = **32.67%** as shown on the bow-tie with control.

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:

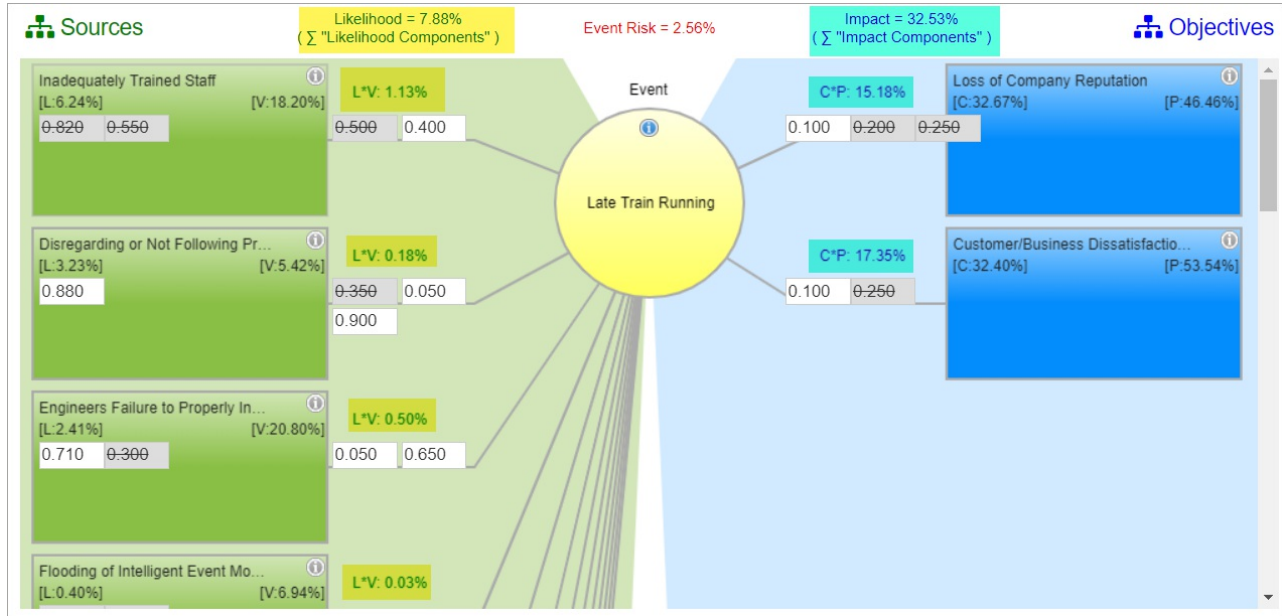


- The Likelihood of the Event "Late Train Running" to the source "Inadequately Trained Staff" wrt "Public Relations"

is **1.13%** (this is 1.89% without control).

- The Impact of the Event "Late Train Running" on the Objective "Loss of Company Reputation" wrt "Public Relations" is **15.18%** (this is 16.87% without control).

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.



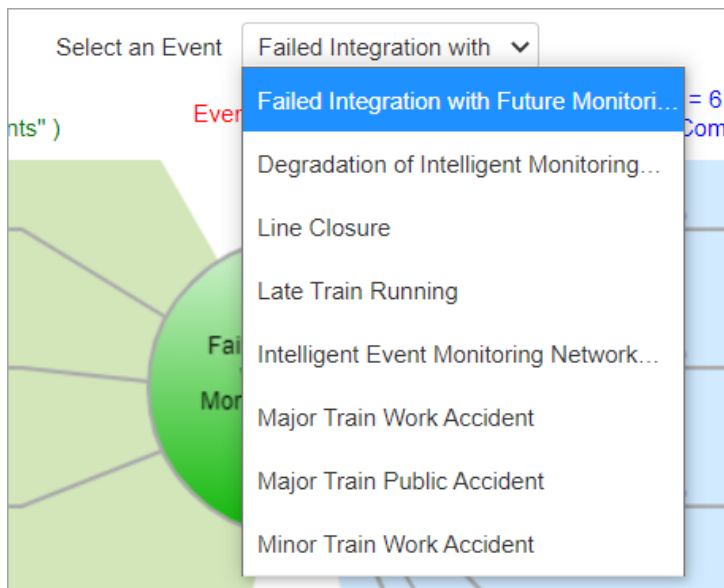
The event "Late Train Running" has Likelihood and Impact wrt to objective "Public Relations" **7.88%** and **32.53%** with controls respectively.

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

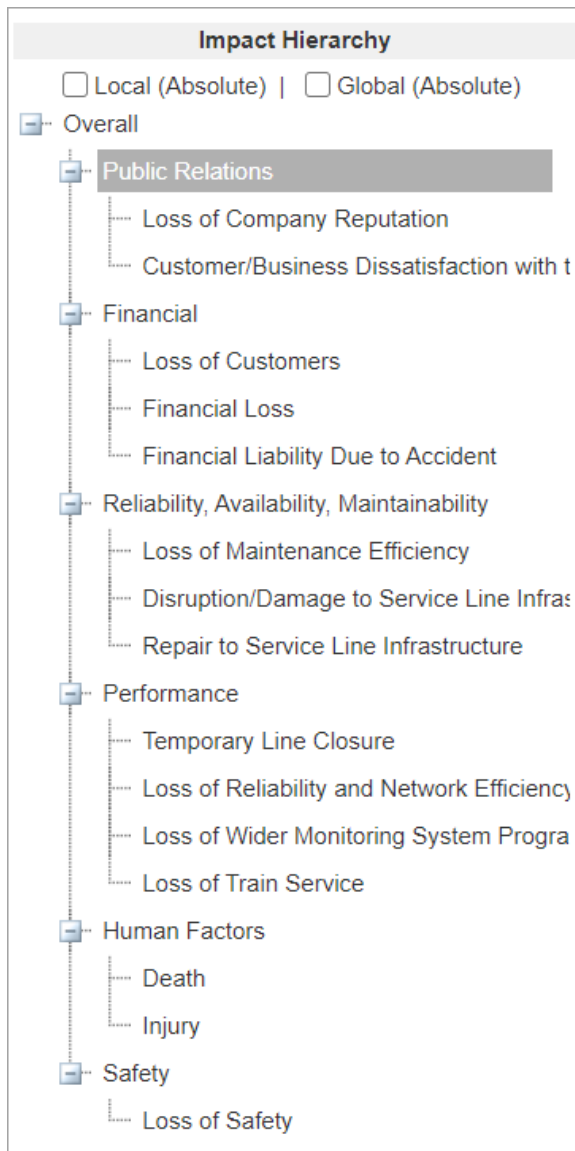
$$7.88\% * 32.53\% = 2.56\% \text{ (as shown at the top of the Event)}$$

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

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



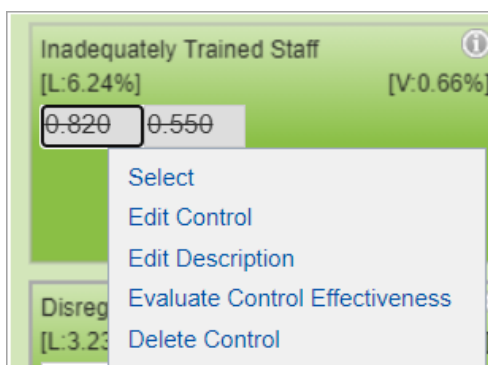
and you can select the wrt objective by clicking a node from the Impact Hierarchy at the left:



## Manage Controls from the Bow-tie Diagram

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

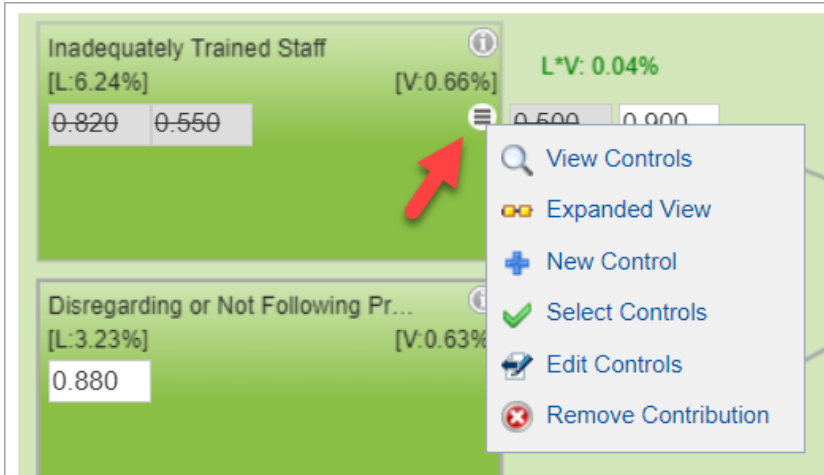
Alternatively, you can right-click on a control box to see the select/deselect options together with other functionality.



- 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.

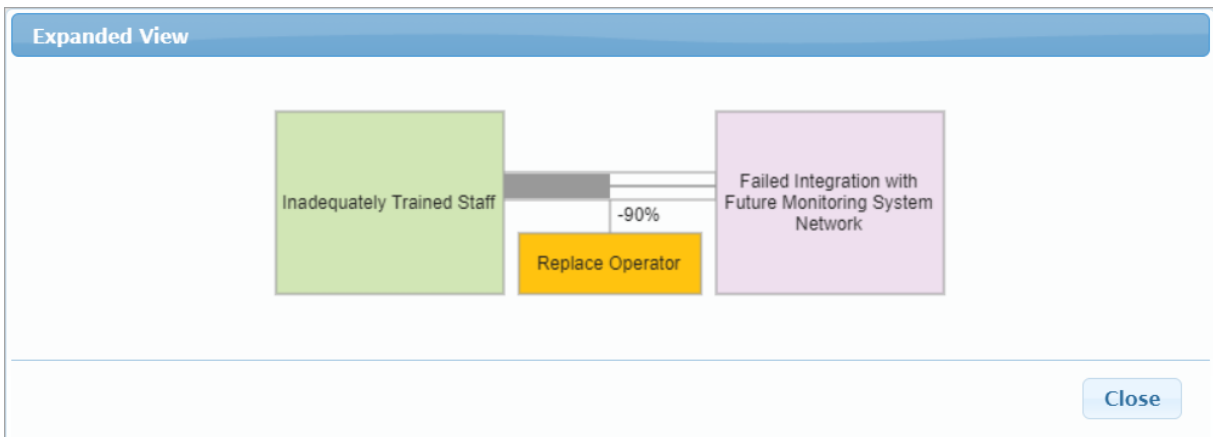


- View Controls - open a modal listing all the potential controls for the specific source, event from a source, or event to an objective. The effectiveness of the control and is active (YES if selected, NO if not) is also displayed.

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

[Close](#)

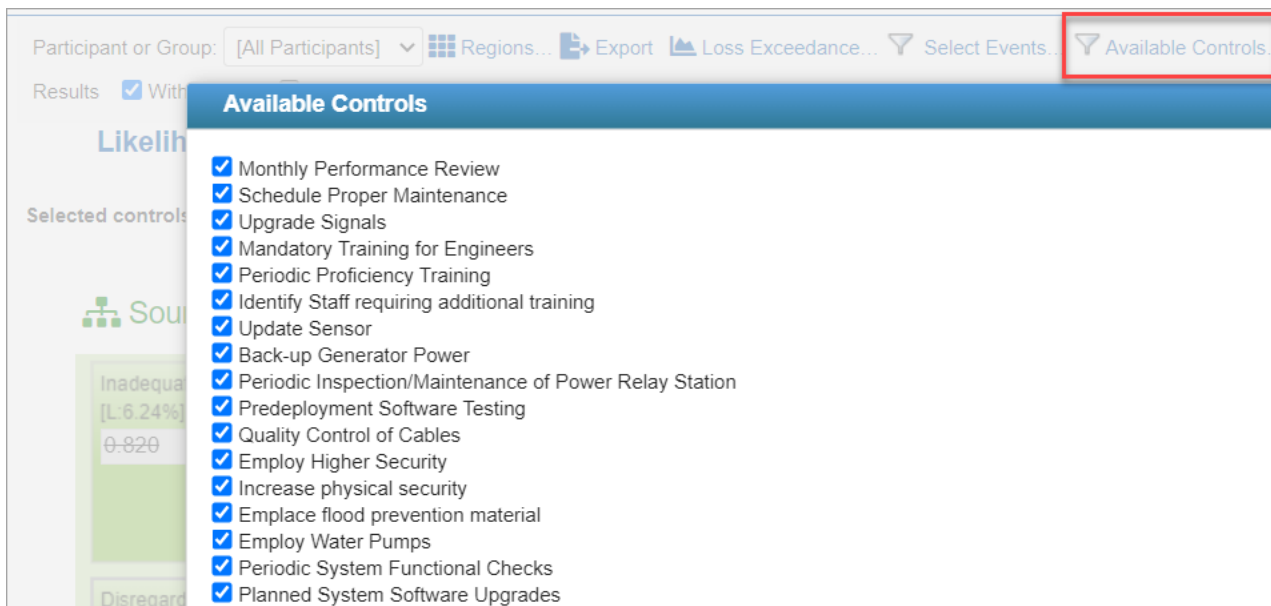
- Expanded View - shows a diagram of the elements (source, event, objective, control)



- 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.




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:

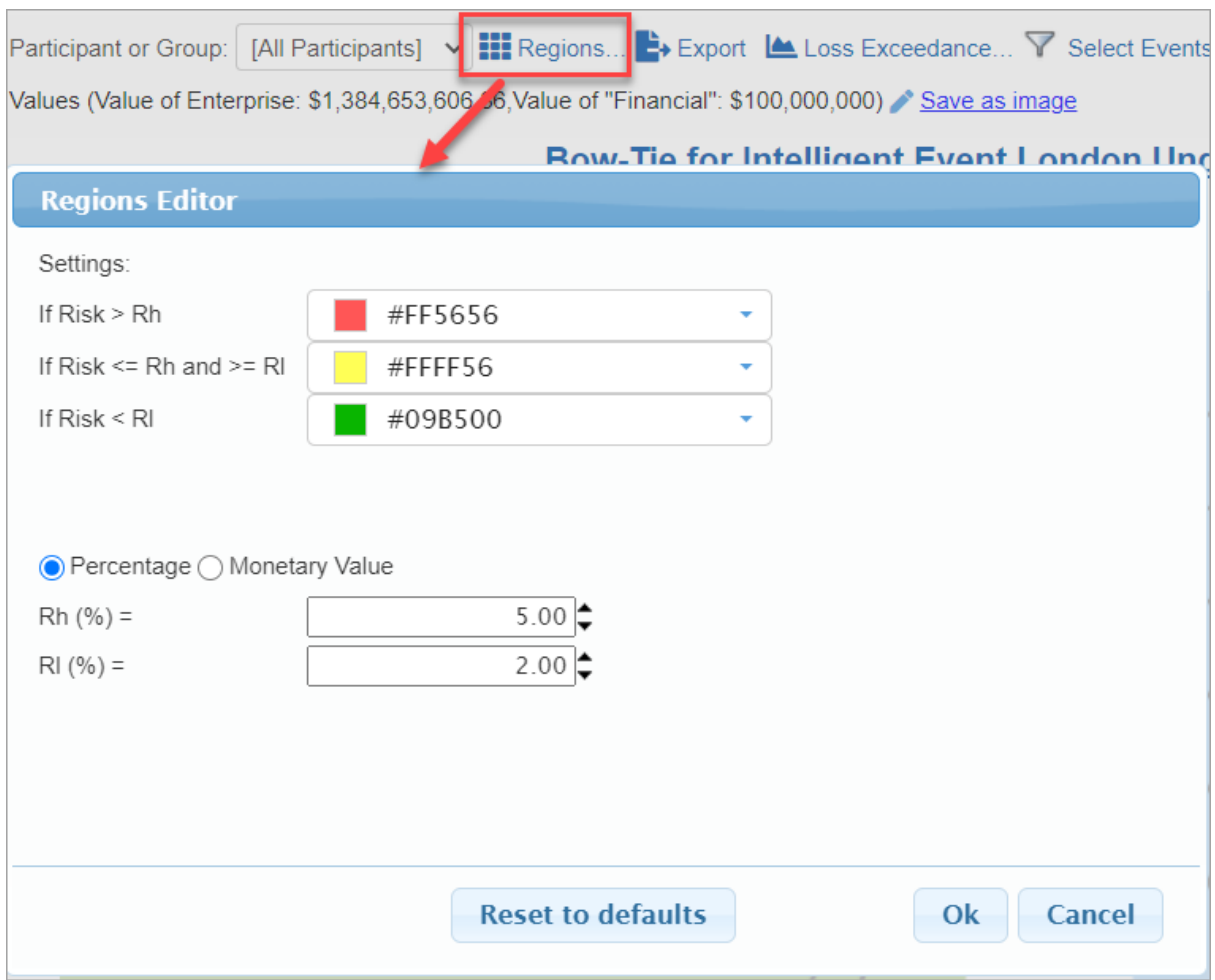
Participant or Group:	[All Participants] 
Show Monetary Value	[All Participants]
	[C-Level Executives]
	[Engineering]
-----	
 Sources	
Inadequately Trained [L:6.24%]	Denis Risman
	Brian Quigley
Disregarding or Not [L:26.92%]	Chief Risk Officer
	Chief Engineering Officer
Engineers Failure to [L:8.32%]	IT Supervisor
	Chief Executive Officer
System Software Te [L:5.97%]	Devin Nagy
	Michael Mankowski
System Hardware Te	John Doe

## 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 





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

