



Kenexis® Open-PHA®

PHA, HAZOP & LOPA Software

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1 Introduction

1.1 About Kenexis Open-PHA

Kenexis Open-PHA is the process hazard analysis module of the Kenexis Integrated Safety Suite (KISS). It is a browser-based, multi-user application for facilitating, documenting, and maintaining Process Hazard Analyses (PHA), Hazard and Operability studies (HAZOP), and Layer of Protection Analyses (LOPA). An Kenexis Open-PHA study organizes the analysis into nodes, deviations, and cause–consequence scenarios; ranks each scenario against a fully configurable risk matrix; and, where a scenario warrants it, carries the analysis into LOPA to quantify the required risk reduction and recommend a Safety Integrity Level (SIL).

Kenexis Open-PHA Cloud-Premium pairs the structured worksheets with a set of premium productivity tools: report generation from your own Word templates, study search, translation and spell-checking, revision management, previous-version recovery, reusable template libraries, bowtie diagram visualization, synchronization with Kenexis SIS Lifecycle Management studies, and facility-level dashboards that aggregate PHA results across studies.

1.2 Editions

Kenexis Open-PHA is available in two editions that work together:

- **Kenexis Open-PHA Cloud-Premium** — the KISS module documented in this manual. It runs in your browser, stores studies centrally, supports multi-user access, and includes the premium tools described in Chapter 13.
- **Kenexis Open-PHA Desktop** — a free standalone desktop application for Windows, macOS, and Linux, available from the Kenexis website. The two editions share one file format (“*.opha*”), so a study can move freely between the desktop and the cloud (sections 2.5 and 13.6).

1.3 Key Terms

Table 1-1. PHA and LOPA terminology.

Term	Definition
Process Hazard Analysis (PHA)	A qualitative study performed to identify process hazards that can adversely affect people, property, and the environment.
Layer of Protection Analysis (LOPA)	A semi-quantitative study used to identify required risk reduction and recommend layers of protection where needed.
Node	A section of the process with a defined design intention, analyzed as a unit. Each node carries its own deviations and worksheets.
Deviation	A departure from the design intention (guide word plus parameter, such as More Pressure) analyzed on the PHA worksheet.
Safeguard	A device, system, or action that prevents a scenario from occurring or reduces its impact. Safeguards are shared study-wide from a single master list.



Term	Definition
Independent Protection Layer (IPL)	A safeguard that is specifically designed to prevent the identified hazard, is independent of the initiating event and other IPLs, provides at least one order of magnitude of risk reduction, and is auditable.
Target Mitigated Event Likelihood (TMEL)	The maximum tolerable frequency for a consequence, set by the selected consequence severity. Also known as the target frequency.
Mitigated Event Likelihood (MEL)	The frequency of the harmful event considering the risk reduction provided by enabling events, conditional modifiers, and IPLs.
Risk Reduction Factor (RRF)	The amount of additional risk reduction required to mitigate risk to a tolerable level (the reciprocal of a probability of failure on demand).
Conditional Modifier (CM)	A probability factor for a condition necessary for the harmful outcome, such as occupancy or probability of ignition.
Enabling Event	A probability factor at the cause level that must be present for the initiating event to lead to the consequence.
Recommendation	A tracked improvement action arising from the study, with priority, responsible party, status, and due date.

1.4 About Kenexis

Kenexis is an independent engineering consulting and software development firm. We ensure the integrity of instrumented safeguards and industrial networks. Using skills in risk analysis, reliability engineering, and process engineering, we help establish the design and maintenance specifications of instrumented safeguards such as safety instrumented systems, alarm systems, and fire and gas systems.



2 Getting Started

2.1 Signing In and the KISS Manager

Kenexis Open-PHA Cloud-Premium runs inside KISS and requires a KISS account. Point your browser at the KISS sign-in page and log in with your account credentials. If you have misplaced your password, the Forgot Password link on the sign-in page restores it.

After signing in you land on the KISS Manager. Facilities are listed on the left; selecting a facility shows its studies on the right, with each study's type and last-modified date. Kenexis Open-PHA studies open with a click on the study name.

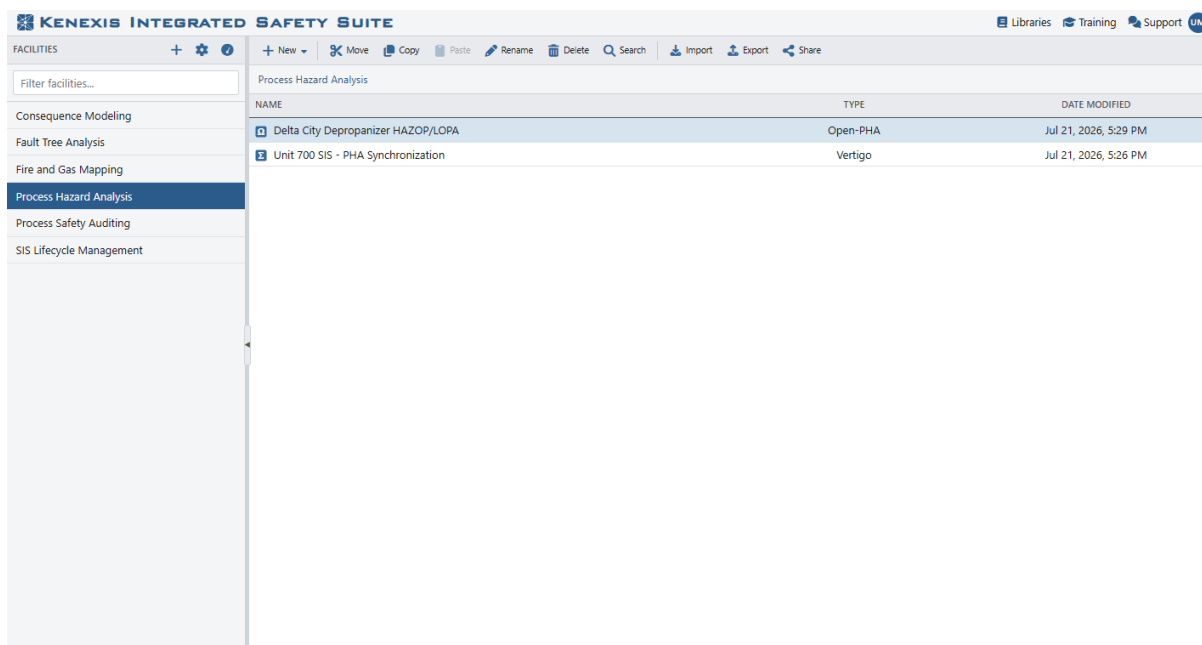


Figure 2-1. The KISS Manager: facilities on the left, the selected facility's studies on the right.

The KISS Manager toolbar acts on the selected study row (click any cell other than the name to select it). New creates a study, and Move, Copy, Rename, Delete, Import, Export, and Share perform the corresponding study-level operations. The Facility Dashboard button above the facility list opens the aggregated dashboard described in Chapter 14.

2.2 Creating a New Study

To create a study, select the facility that should hold it, click New in the toolbar, and choose Open-PHA. The new study opens immediately and a short series of dialogs configures its data structure.

The first dialog offers a choice between starting from a library template and creating an empty study. Starting from a template copies a complete study structure — including its risk criteria and worksheets — from a KISS library (section 13.7).



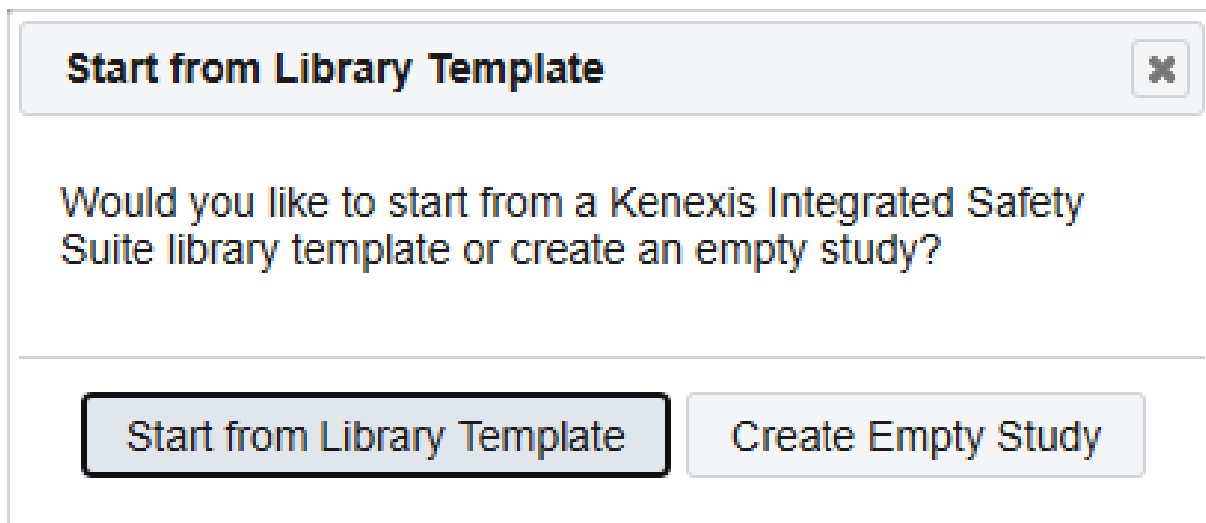


Figure 2-2. Start from a library template or create an empty study.

For an empty study, the next dialog selects the data structure. Kenexis Open-PHA supports numerous PHA methodologies, and the indexing choice tailors the worksheets to the methodology:

- **Option A — Standard (Cause-Indexed):** each cause has one or more consequences. Well suited to HAZOP, What-If, and checklist PHAs.
- **Option B — Consequence-Indexed:** each consequence has one or more causes. Best for SIL selection and LOPA because it aggregates the risk of all causes onto each consequence, allowing a single SIL requirement per safety function.

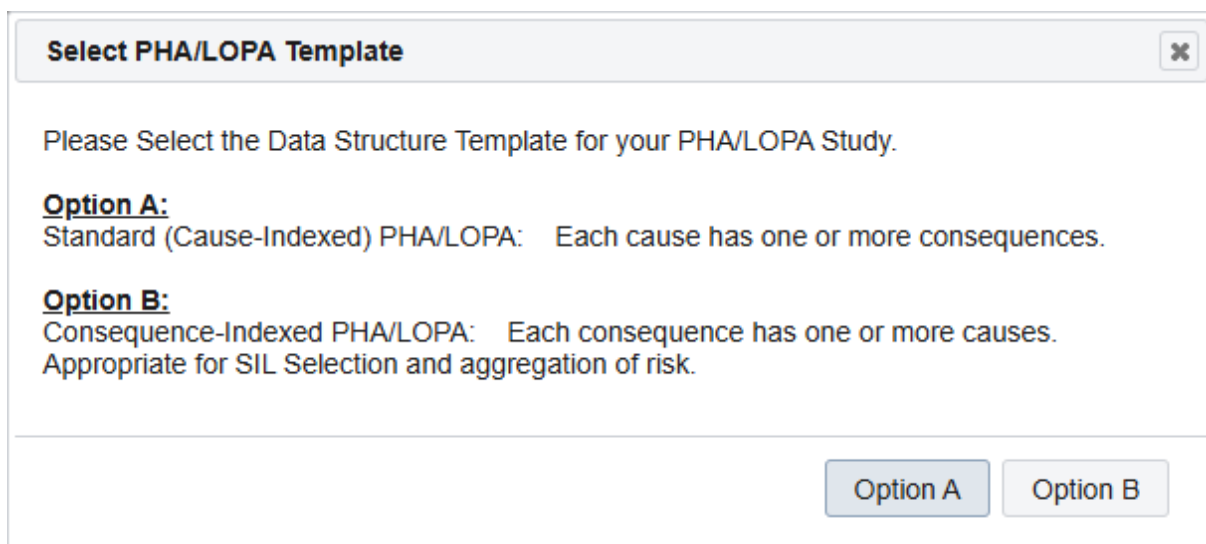


Figure 2-3. Selecting the study data structure.

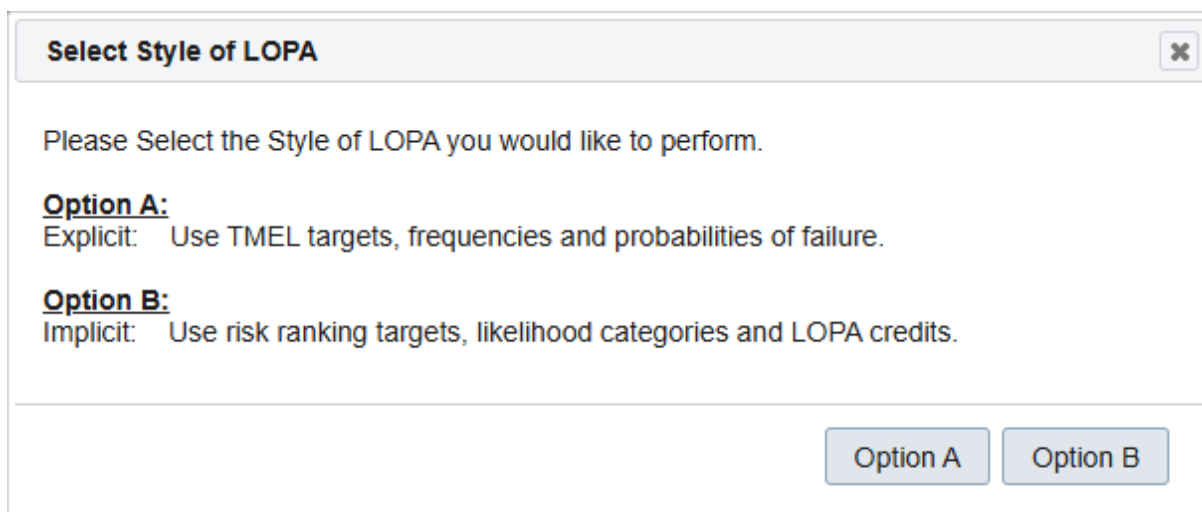
The data structure is a foundational property of the study, chosen once at creation.

The next dialog selects the LOPA style:

- **Option A — Explicit:** uses TMEL targets, initiating event frequencies, and probabilities of failure on demand. This is the most widely used LOPA methodology in industry.



- **Option B — Implicit:** uses risk ranking targets, likelihood categories, and LOPA credits (section 9.4).



Select Style of LOPA

Please Select the Style of LOPA you would like to perform.

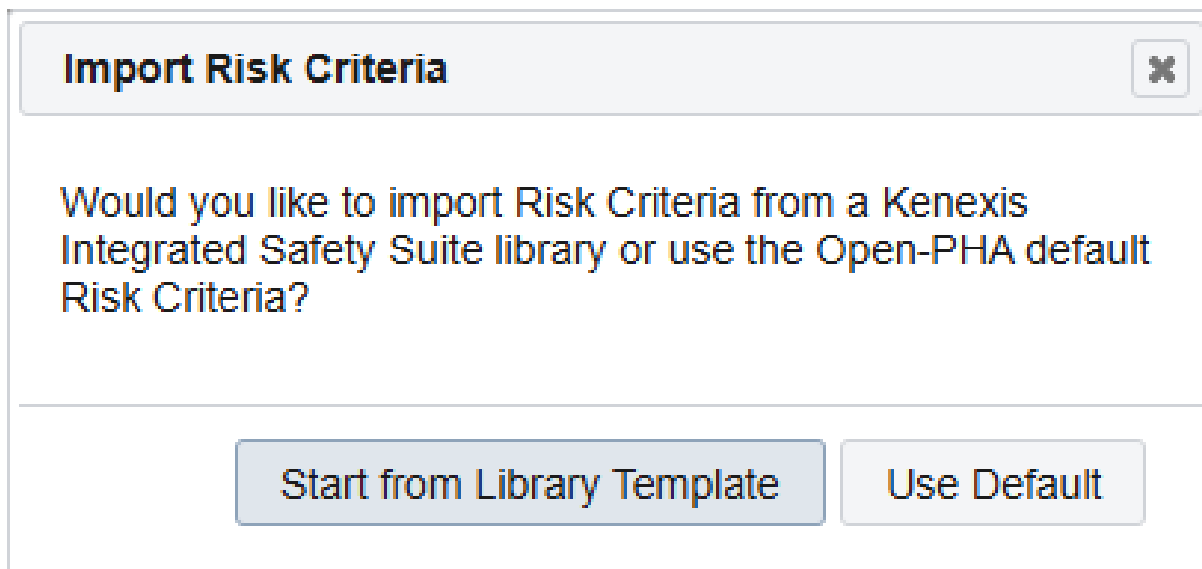
Option A:
Explicit: Use TMEL targets, frequencies and probabilities of failure.

Option B:
Implicit: Use risk ranking targets, likelihood categories and LOPA credits.

Option A Option B

Figure 2-4. Selecting the LOPA style.

Next, the study's risk criteria can be imported from a KISS library or initialized with the Kenexis Open-PHA defaults. The default criteria provide a complete five-by-five matrix with five likelihood categories, five severity categories per consequence type, and five risk rankings — all fully editable afterward (Chapter 5).



Import Risk Criteria

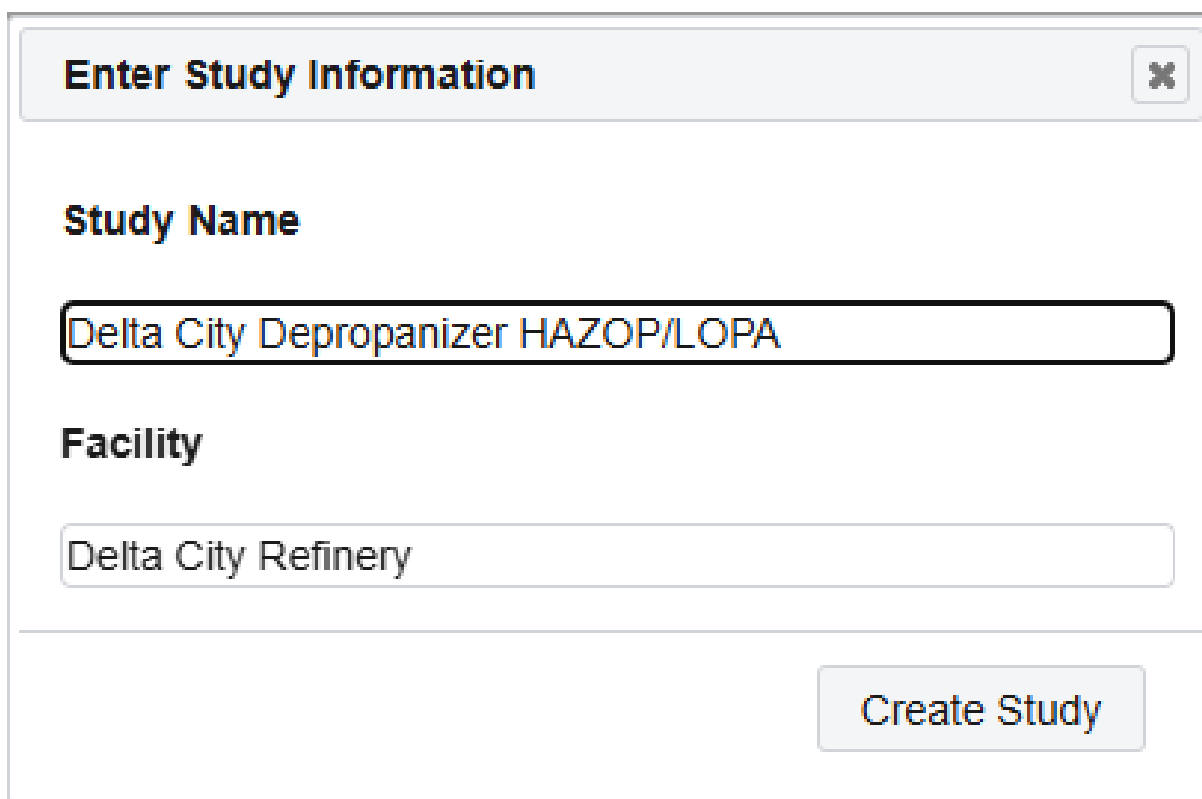
Would you like to import Risk Criteria from a Kenexis Integrated Safety Suite library or use the Open-PHA default Risk Criteria?

Start from Library Template Use Default

Figure 2-5. Choosing the study's starting risk criteria.

Finally, enter the study name and facility name. Clicking Create Study completes the setup and opens the Study Data tab, ready for work.





Enter Study Information [X]

Study Name

Delta City Depropanizer HAZOP/LOPA

Facility

Delta City Refinery

Create Study

Figure 2-6. Entering the study information.

2.3 Opening, Renaming, and Deleting Studies

Clicking a study name in the KISS Manager opens it. Rename updates the study name everywhere, and Delete moves the study to the organization's recycle bin, from which an administrator can restore it. Copy and Paste duplicate a study, and Move relocates it to another facility or folder.

2.4 Concurrent Access

Kenexis Open-PHA Cloud-Premium is multi-user. The first user editing a study holds the editing session; anyone else opening the same study views it read-only, with a Read-Only badge in the header, until the editor closes the study.

2.5 Importing and Exporting Studies

The Import and Export buttons in the KISS Manager move complete studies between KISS and “.opha” files on your computer. Export downloads the selected study as an .opha file — the same format the desktop edition reads and writes. Import creates a new study in the selected facility from an .opha file and opens it immediately. Together they let you facilitate offline with Kenexis Open-PHA Desktop and continue in the cloud, where the premium tools are available.



Import creates a new study

Importing a file always produces a new study alongside the existing ones. To bring desktop edits back into an existing cloud study — preserving its revisions and Kenexis SIS links — use Import As Working Revision (section 13.6) instead.



3 The Kenexis Open-PHA Workspace

3.1 Navigation

The workspace header carries the study name, the Save button, and the Premium Tools menu. Below it, the navigation tab strip is the primary means of moving through the study: Study Data, Nodes, Deviations, PHA Worksheets, LOPA Worksheets, Check Lists, Recommendations, Safeguards, Parking Lot, and Risk Criteria. Studies that enable the optional worksheets (Chapter 12) also show ALARP Analysis, SCAI, and MOCs / Incidents tabs. Several tabs carry a secondary rail of pages on the left edge of the workspace.

Save (or Ctrl+S) writes the study to the cloud. The Settings page can additionally enable timed auto-save (section 4.8). Function keys F1 through F10 jump between the main tabs, and Ctrl+F1 through Ctrl+F10 select rail pages — the full hotkey set is in Appendix A.

3.2 Worksheet Tables

The table is the staple of the Kenexis Open-PHA interface: every tab edits its data in place, in a consistent grid. Click a cell to select it (dark blue highlight); click again or start typing to make it active for editing. Ctrl+click and Shift+click extend the selection across rows, and the arrow keys move between cells. Dropdown cells — likelihoods, severities, statuses — open their pick list on click, and computed cells such as risk ranks display their value read-only.

3.3 The Workspace Toolbar

The toolbar above each worksheet provides, from left to right:

- Add New Row — inserts a row below the selection (also Ctrl+Enter).
- Copy, Cut, and Paste Row(s) — duplicate or move the selected rows (also Ctrl+C, Ctrl+X, Ctrl+V).
- Delete Row(s) — removes the selected rows (also the Delete key).
- Move Row Up / Move Row Down — reorders the selected row (also Ctrl+Up and Ctrl+Down).
- Zoom Out / Zoom In — scales the worksheet in ten-percent steps; the zoom level persists per browser.
- Export To Excel — downloads the current worksheet as a spreadsheet.
- Filter — applies typed column filters (contains, equals, and similar operators) to narrow large worksheets.
- Disable / Enable Row — strikes through a row and excludes it from the calculations while keeping it in the record.
- Search and Replace — finds text in the worksheet, steps through the hits, and optionally replaces all of them.

On the Nodes, Deviations, and PHA worksheets the copy functions perform a deep copy: copying a node brings its deviations and worksheet scenarios along, so similar process sections can be analyzed by copying a completed node and editing the differences.



3.4 Numbering and References

Rows carry hierarchical outline numbers (for example 1.2.3 for the third consequence of the second deviation of node one) that appear throughout the worksheets, the Recommendations and Safeguards registers, and the generated reports. Registers that reference worksheet rows — recommendations, safeguards, and comments — show the referencing locations as links that navigate straight to the scenario.



4 Study Data

The Study Data tab collects the study's bookkeeping: general information, the team, the sessions and attendance record, the drawing list, and the study's revision and revalidation history. Its rail also hosts the column settings and the study settings.

4.1 Overview

The Overview page documents high-level information about the study: the study name and coordinator, the PHA type (Preliminary, Project, MOC, Unit, or Decommissioning), the study status, the revalidation due date, the facility and owner, and free-text fields for the project description and general notes. Several additional identification fields (company, site, plant, and unit groupings) can be switched on from Column Settings when an organization tracks them.

The screenshot shows the 'Overview' page of the Kenexis Integrated Safety Suite. The page is titled 'Delta City Depropanizer HAZOP/LOPA'. The left sidebar contains a vertical menu with icons for Overview, Nodes, Deviations, PHA Worksheets, LOPA Worksheets, ALARP Analysis, Check Lists, Recommendations, Safeguards, and SCAI. The main content area displays the following fields:

Study Name	Delta City Depropanizer HAZOP/LOPA
Study Coordinator	A. Kowalski
Study Coordinator Contact Info	a.kowalski@dcep.example • +1 555 0173
PHA Type	Unit
Study Status	In Progress
Revalidation Due Date	2031-07-15
Facility	Delta City Refinery
Facility Owner	Delta City Energy Partners
Unit	Unit 700 - Gas Concentration
Report Number	RPT-2026-118
Project Number	P-7745
Description	Five-year revalidation HAZOP and LOPA of the Unit 700 depropanizer system, including column C-701, overhead condenser E-704, reflux drum D-702, reflux pumps P-703 A/B, and reboiler E-705.

General Notes | Consequence-indexed data structure with explicit LOPA. Risk criteria per the corporate risk matrix standard.

Figure 4-1. The Study Data Overview page.

4.2 Team Members

The Team Members page records the participants: name, company, title, department, expertise, experience, and contact details. Team members entered here populate the facilitator and scribe selections on the Sessions page and the attendance grid.



Name	Company	Title	Department	Expertise	
A. Kowalski	Delta City Energy Partners	PHA Facilitator	Process Safety	HAZOP/LOPA facilitation	18 years
R. Vasquez	Delta City Energy Partners	Scribe	Process Safety	PHA documentation	6 years
T. Nakamura	Delta City Energy Partners	Operations Representative	Operations	Unit 700 board operator	12 years
S. Boateng	Delta City Energy Partners	Process Engineer	Technical	Distillation and process design	9 years
L. Ferreira	Apex Controls	I&C Engineer	Instrumentation	SIS and alarm system design	11 years

Figure 4-2. The Team Members page.

4.3 Sessions

The Sessions page documents each meeting: date, duration, a description of the topics or nodes covered, and the facilitator and scribe chosen from the team member list.

Date	Duration	Session	Facilitator	Scribe	Comments
2026-06-08	8 hours	Session 1 - Node 1: column C-701 and reboiler circuit	A. Kowalski	R. Vasquez	
2026-06-09	8 hours	Session 2 - Node 2: overhead system and reflux circuit	A. Kowalski	R. Vasquez	
2026-06-10	4 hours	Session 3 - LOPA scenarios, checklist, and recommendation review	A. Kowalski	R. Vasquez	

Figure 4-3. The Sessions page.

4.4 Attendance

The Attendance page is a grid of team members against sessions. Each intersection records that member's participation in that session as Present, Partial, Virtual, or Absent.



KENEXIS INTEGRATED SAFETY SUITE				
Delta City Depropanizer HAZOP/LOPA				
Study Data	Nodes	Deviations	PHA Worksheets	LOPA Worksheets
ALARP Analysis	Check Lists	Recommendations	Safeguards	SCAI
MOCs / Incidents	Parking Lot	Risk Criteria		

Attendance				
Team Members	A. Kowalski	Present	Present	Present
	R. Vasquez	Present	Present	Present
	T. Nakamura	Present	Partial	Absent
	S. Boateng	Present	Present	Virtual
	L. Ferreira	Absent	Present	Present
		2026-06-08	2026-06-09	2026-06-10
		Sessions		

Figure 4-4. The Attendance grid.

4.5 Documents

The Documents page lists the drawings and documents available to the team: number, revision, document type, description, and an optional hyperlink. Documents recorded here populate the drawing links on the Nodes page. A CSV import on the toolbar appends document lists prepared outside Kenexis Open-PHA.

KENEXIS INTEGRATED SAFETY SUITE				
Delta City Depropanizer HAZOP/LOPA				
Study Data	Nodes	Deviations	PHA Worksheets	LOPA Worksheets
ALARP Analysis	Check Lists	Recommendations	Safeguards	SCAI
MOCs / Incidents	Parking Lot	Risk Criteria		

Documents				
Drawing	Revision	Document Type	Description	Link
D-700-PID-012	7	P&ID	Depropanizer C-701, reboiler E-705, and relief system	
D-700-PID-013	6	P&ID	Overhead condenser E-704, reflux drum D-702, and pumps P-703 A/B	
D-700-PFD-002	3	PFD	Unit 700 gas concentration process flow overview	
D-700-CSD-001	2	C&E Diagram	SIS cause and effect diagram for Unit 700	

Figure 4-5. The Documents page.



4.6 Revalidation History and Revision History

The Revalidation History page tracks the study's periodic revalidations with start and end dates and comments. The Revision History page is the study's formal revision record, managed by the Revision Manager described in section 13.5.

4.7 Column Settings

The Column Settings page controls which columns appear on every page and worksheet in the study, organized as a tree of toggles. A blue slider shows a visible column; clicking the slider or its label toggles it. The pencil icon beside a column renames its header study-wide, so worksheets can carry your organization's terminology. Core structural columns remain visible at all times.

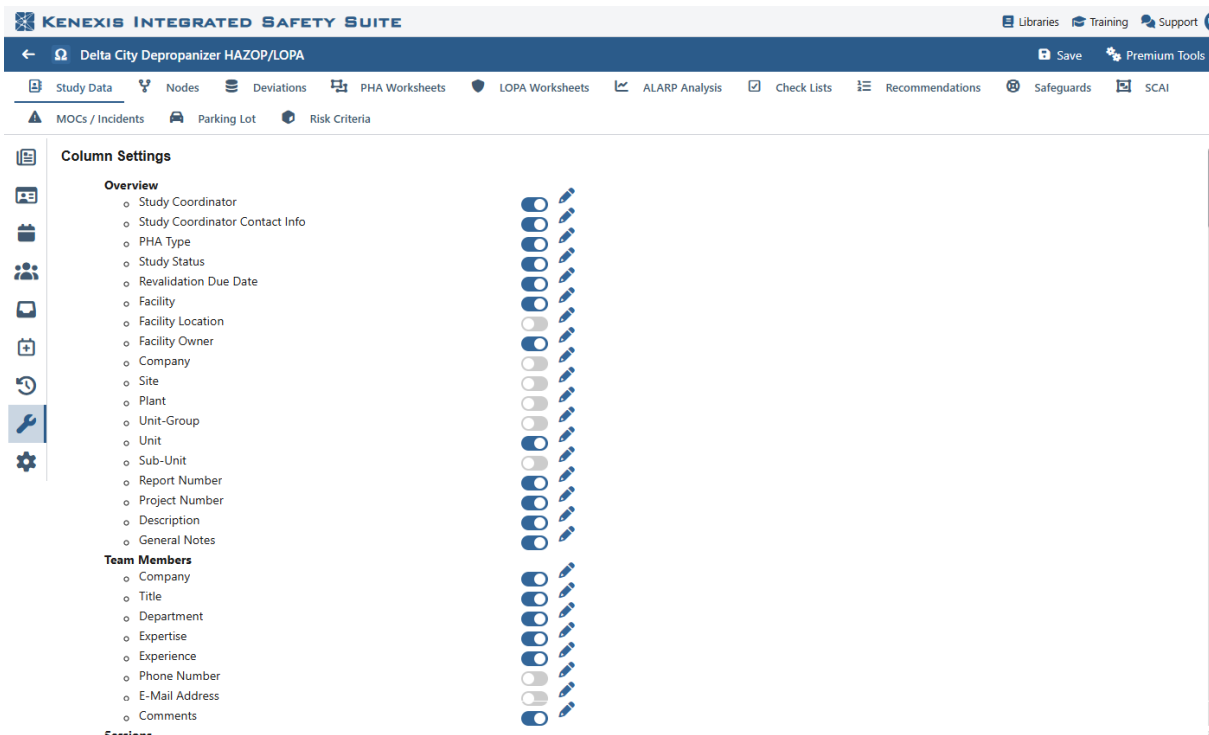


Figure 4-6. Column Settings: per-column visibility and renaming.

Column visibility participates in the calculations

The LOPA calculation includes the enabling event and conditional modifier columns when they are visible, and the risk ranking uses the visible severity and likelihood columns. Showing or hiding these columns updates the calculated results accordingly (Chapter 9).

4.8 Settings

The Settings page opens the Study Settings dialog. General Settings provides auto-save (with a selectable interval), Presenter Mode (larger, bolder worksheet text for meeting projection), the Scenario Context Bar switch (section 7.1), the Visible Tabs switches that enable the optional worksheets (Chapter



12), and item numbering controls per register. The Consequence Categories tab renames the five consequence categories, sets their single-letter codes, and assigns each a color used across the worksheets and reports.

Study Settings

General Settings

Consequence Categories

Auto-Save - Enable/Disable Auto-Save

Auto-Save

Auto-Save Interval

1 min

Presenter Mode - Enable/Disable Presenter Mode

Presenter Mode

Presenter mode makes text in worksheets larger, bolder and easier to read when projecting.

Scenario Context Bar - Show/Hide Scenario Context Bar

Scenario Context Bar

Shows the active cell's Deviation, Cause and Consequence in a bar above the worksheet, so you can tell which scenario you are editing when scrolled to the right.

Visible Tabs - Show/Hide Tabs

Nodes		Recommendations	
Deviations		Safeguards	
PHA Worksheets		SCAI	
LOPA Worksheets		ALARP Analysis	
Check Lists		MOCs / Incidents	
Parking Lot		Risk Criteria	

Item Numbering - Show/Hide Item Numbers

Nodes		PHA Recommendations	
Deviations		LOPA Recommendations	
Consequences		Check List Categories	
Causes		Check List Questions	
Safeguards		Check List Recommendations	
PHA Comments		LOPA Comments	

Close

Figure 4-7. The Study Settings dialog.

5 Risk Criteria

The Risk Criteria tab defines the study's risk model: the likelihood categories, the consequence severity categories, the risk rankings, and the risk matrix that maps severity and likelihood to a ranking. The criteria are per-study, and complete criteria sets can be exported to a library or file and imported into new studies (section 5.5).

5.1 Likelihood Categories

Each likelihood category has a code, a description, and a frequency. The codes populate the likelihood dropdowns on the PHA worksheet. In explicit LOPA studies the frequencies also bin the calculated mitigated event likelihood back onto the matrix (section 9.3); the default ladder spans five orders of magnitude.

Code	Description	Frequency
VL	Very Low	1E-4
L	Low	1E-3
M	Medium	1E-2
H	High	1E-1
VH	Very High	1E+0

Figure 5-1. The Likelihood Categories page.

5.2 Consequence Categories

The Consequence Categories page defines the severity levels used in the risk matrix. A severity table exists for each consequence category — Safety, Environment, Asset, Community, and Reputation by default — selected from the dropdown at the top of the page. Each severity has a code, a description, and, in explicit LOPA studies, the TMEL that becomes the LOPA target frequency whenever that severity is selected on a worksheet.

Code	Description	TMEL
VH	Very High	1E-5
H	High	1E-4
M	Medium	1E-3
L	Low	1E-2
VL	Very Low	1E-1

Figure 5-2. The Consequence Categories page.

5.3 Risk Rankings

The Risk Rankings page names the ranking levels, assigns each a code, a color, and a priority, and — in implicit LOPA studies — the number of LOPA credits required to mitigate risk of that rank to a tolerable level. Clicking a color cell opens the color picker; the chosen color paints the matrix cells and every computed rank cell in the study.

Code	Description	Color	Priority
5	Very High	Red	1
4	High	Orange	2
3	Medium	Yellow	3
2	Low	Light Green	4
1	Very Low	Dark Green	5

Figure 5-3. The Risk Rankings page.

5.4 The Risk Matrix

The Risk Matrix page builds the matrix automatically from the likelihood and severity categories, one matrix per consequence category. Clicking a cell assigns it a risk ranking from the dropdown; the cell takes the ranking's color. The toolbar swaps the axes, moves the header rows and columns to the opposite sides, exports the matrix to Excel, and imports or exports the complete risk criteria set.



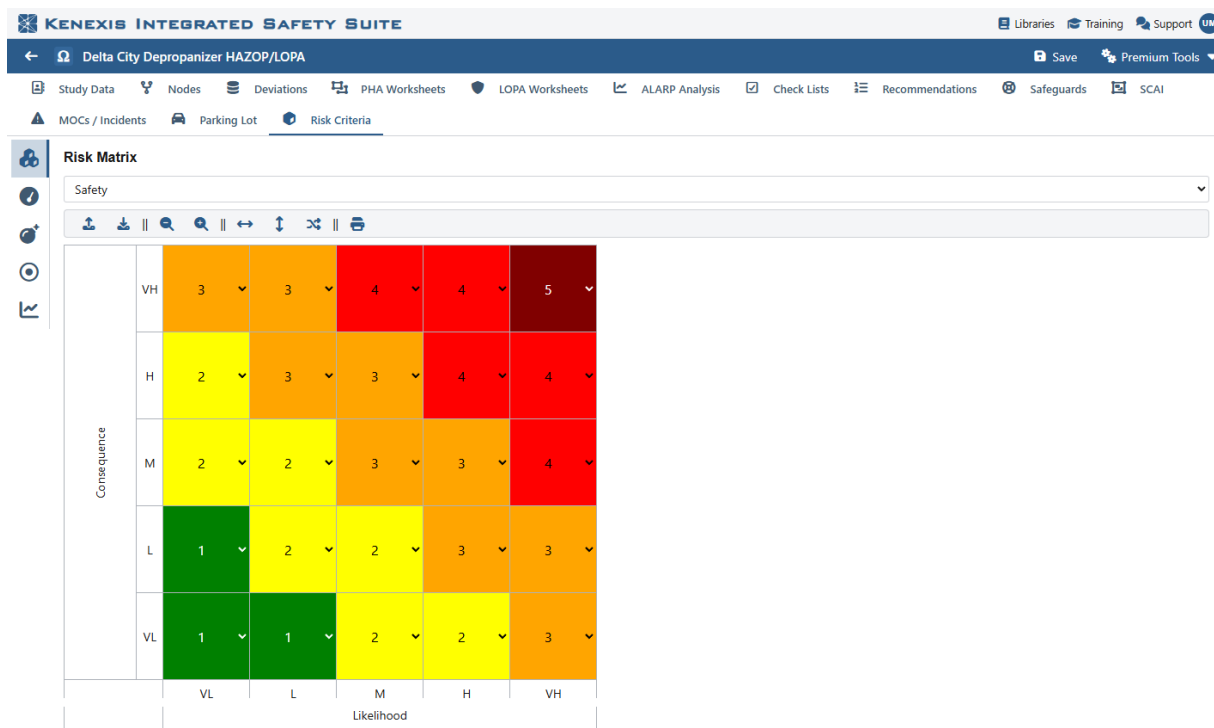


Figure 5-4. The Risk Matrix page.

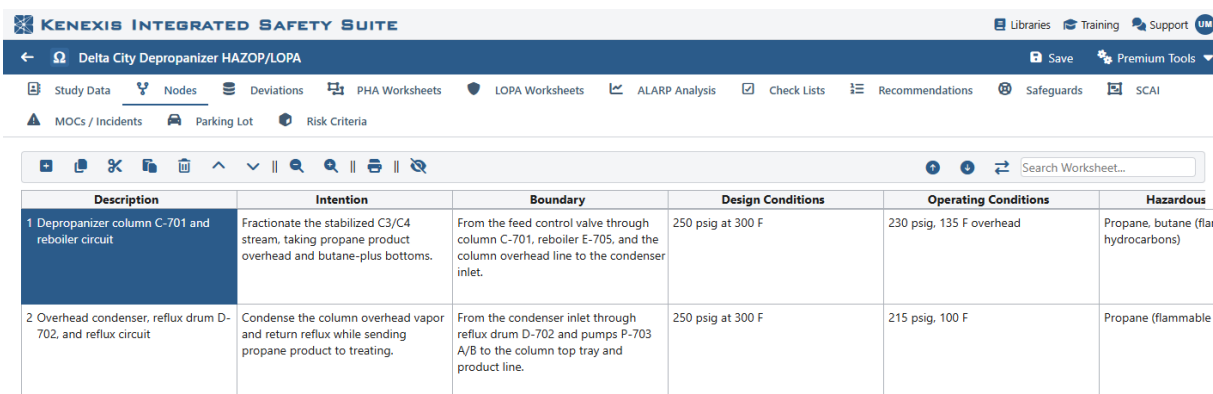
5.5 Sharing Risk Criteria

Complete risk criteria — categories, rankings, and the matrix — travel three ways: to and from KISS libraries (Export Risk Criteria under Premium Tools, and the library option offered when a study is created), and to and from a local file via the matrix toolbar's import and export buttons. Standardizing criteria in a library keeps every study in a program consistent.

6 Nodes and Deviations

6.1 Nodes

The Nodes table lays the foundation of the analysis: one row per process section, with its description, design intention, boundary, design and operating conditions, and a highlight color. Optional columns record hazardous materials, equipment tags, and location. Each node links to the sessions in which it was analyzed and the drawings that cover it, chosen from the Sessions and Documents pages. A PHA worksheet is created for every node in this table.



The screenshot shows the Kenexis Integrated Safety Suite interface. The top navigation bar includes 'Libraries', 'Training', and 'Support'. Below it, a breadcrumb trail shows 'Delta City Depropanizer HAZOP/LOPA'. The main menu includes 'Study Data', 'Nodes', 'Deviations', 'PHA Worksheets', 'LOPA Worksheets', 'ALARP Analysis', 'Check Lists', 'Recommendations', 'Safeguards', and 'SCAI'. The 'Nodes' tab is active, displaying a table with the following data:

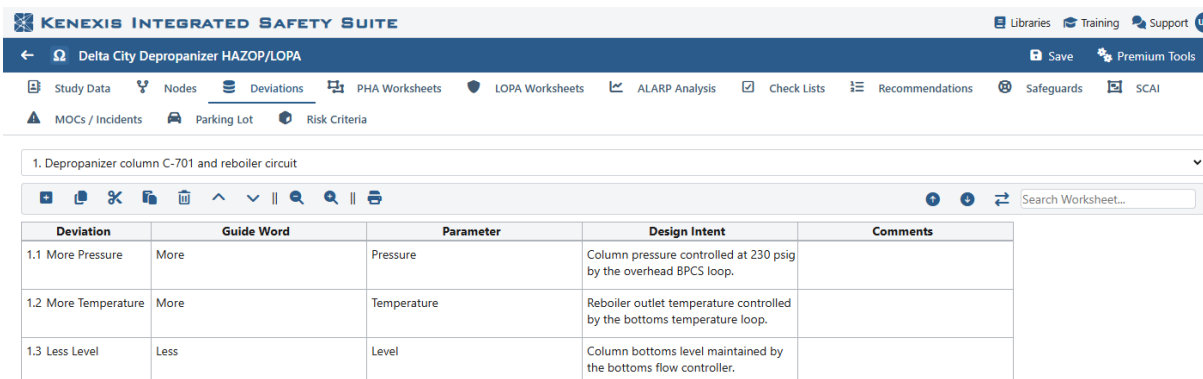
Description	Intention	Boundary	Design Conditions	Operating Conditions	Hazardous
1 Depropanizer column C-701 and reboiler circuit	Fractionate the stabilized C3/C4 stream, taking propane product overhead and butane-plus bottoms.	From the feed control valve through column C-701, reboiler E-705, and the column overhead line to the condenser inlet.	250 psig at 300 F	230 psig, 135 F overhead	Propane, butane (flam hydrocarbons)
2 Overhead condenser, reflux drum D-702, and reflux circuit	Condense the column overhead vapor and return reflux while sending propane product to treating.	From the condenser inlet through reflux drum D-702 and pumps P-703 A/B to the column top tray and product line.	250 psig at 300 F	215 psig, 100 F	Propane (flammable)

Figure 6-1. The Nodes table.

Copying a node performs a deep copy — the node's deviations and PHA worksheet come along — which makes quick work of processes with repeated equipment trains.

6.2 Deviations

The Deviations page records the deviations analyzed for the selected node (chosen from the dropdown above the table). The Deviation column carries over to the PHA worksheet, and each deviation can be broken down into its guide word and parameter, with a design intent statement for context. Deviations entered directly on the PHA worksheet appear here as well — the two views edit the same data.



The screenshot shows the Kenexis Integrated Safety Suite interface with the 'Deviations' tab selected. A dropdown menu at the top shows '1. Depropanizer column C-701 and reboiler circuit'. The table below lists the following deviations:

Deviation	Guide Word	Parameter	Design Intent	Comments
1.1 More Pressure	More	Pressure	Column pressure controlled at 230 psig by the overhead BPCS loop.	
1.2 More Temperature	More	Temperature	Reboiler outlet temperature controlled by the bottoms temperature loop.	
1.3 Less Level	Less	Level	Column bottoms level maintained by the bottoms flow controller.	

Figure 6-2. The Deviations page for the selected node.



7 PHA Worksheets

7.1 The Worksheet

The PHA Worksheets tab is the primary workspace for building scenarios. The dropdown above the worksheet selects the node, and the worksheet shows that node's deviations with their scenarios nested beneath: in a consequence-indexed study each consequence lists its causes, and in a cause-indexed study each cause lists its consequences. Safeguards attach to each scenario from the shared safeguard list (Chapter 11).

<

Figure 7-1. A consequence-indexed PHA worksheet: deviations, consequences, ranked risk, and causes with safeguards.

To build a scenario, click a cell and type. Text typed into the Safeguards column opens a filtered pick list of the study's existing safeguards — selecting one links it, and new text creates a new safeguard in the master list. Severity and likelihood cells are dropdowns fed by the risk criteria, and the risk rank cells compute and color themselves from the matrix as soon as a severity and likelihood are chosen.

The Scenario Context Bar keeps the current scenario's identity in view while you work in the right-hand columns. When enabled, a thin bar above the worksheet shows the deviation, cause, and consequence of the cell being edited and updates as the selection moves, so the scenario a safeguard or risk rank belongs to stays clear even when the cause and consequence columns have scrolled off to the left. It is switched on per study from the Study Settings dialog (section 4.8) and is off by default.



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Support
UM

Delta City Depropanizer HAZOP/LOPA
Save
Premium Tools

Study Data
Nodes
Deviations
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Check Lists

Recommendations
Safeguards
SCAI
MOCs / Incidents
Parking Lot
Risk Criteria

1. Depropanizer column C-701 and reboiler circuit

DEVIATION More Pressure

CAUSE Loss of cooling water to the overhead condenser

CONSEQUENCE Overpressure of the column with relief to flare and potential loss of containment at flanged joints

RR	LOPA Required	ALARP Required	PHA Recommendation	S After Recommendation	L After Recommendation	RR After Recommendation	PHA Comment
3	Yes	No	1 Verify that the relief valve sizing basis covers loss of the overhead condenser with continued reboiler heat input. 2 Update the unit operating procedure for response to loss of cooling water, including maximum allowable response time.	VH	VL	3	Team noted the relief system design basis is dated 2019 and predates the flare header modification.

Figure 7-2. The Scenario Context Bar shows the active cell's deviation, cause, and consequence above the worksheet.

7.2 Risk Ranking Phases

Each scenario ranks in up to three phases, reading left to right across the worksheet:

- **Before Safeguards** — the unmitigated ranking, with no credit for safeguards.
- **Mitigated** — the ranking considering the safeguards in place today. These are the columns titled with the bare category codes.
- **After Recommendations** — the projected ranking once the scenario's recommendations are implemented.

In a consequence-indexed study each phase ranks per consequence category — a column per visible category code — and the scenario's overall rank is the most severe of them (Chapter 9).



Libraries

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Delta City Depropanizer HAZOP/LOPA

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📋 Recommendations

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📊 SCAI

⚠️ MOCs / Incidents

🚗 Parking Lot

📊 Risk Criteria

1. Depropanizer column C-701 and reboiler circuit

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Search Worksheet...

S	E	A	C	L	RR	LOPA Required	ALARP Required	PHA Recommendation	S After Recommen	L After Recommen	RR After Recommen	PHA Comment
VH	M	H		L	3	Yes	No	1 Verify that the relief valve sizing basis covers loss of the overhead condenser with continued reboiler heat input. 2 Update the unit operating procedure for response to loss of cooling water, including maximum allowable response time.	VH	VL	3	Team noted the relief system design basis is dated 2019 and predates the flare header modification.
			M	M	3	No	No			M	3	
		L		L	2	No	No			L	2	
L		M		L	2	No	No	3 Evaluate a remote-operated isolation valve on the column feed line for emergency isolation.	L	L	2	

Figure 7-3. The right-hand worksheet columns: mitigated per-category severities, LOPA Required, recommendations, and the after-recommendations phase.

7.3 Flagging Scenarios for LOPA

Setting a scenario's LOPA Required field to Yes carries it onto the LOPA worksheet (Chapter 8), where the same cause and consequence data continue seamlessly into the quantitative analysis. Scenarios can also flag ALARP Required to appear on the ALARP worksheet when that optional tab is enabled (section 12.1).

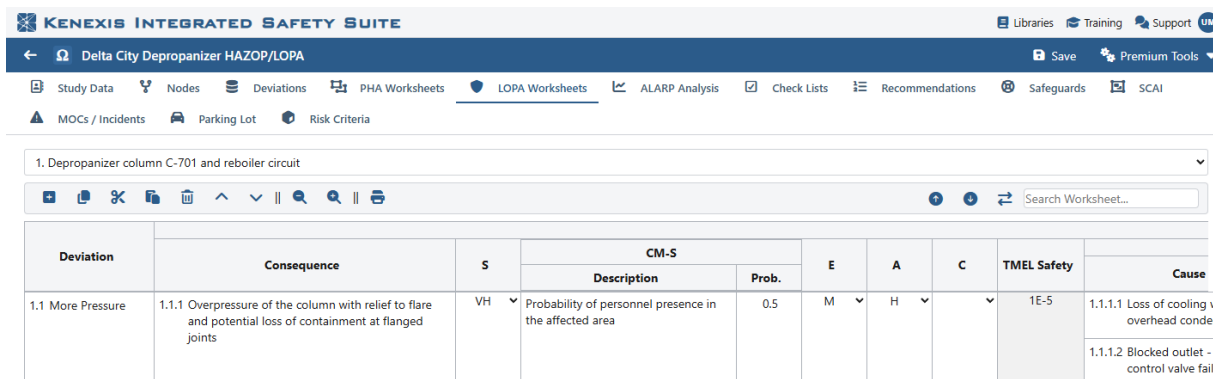
Comments and recommendations link to each scenario from their cells on the worksheet; the full registers are described in Chapter 11.



8 LOPA Worksheets

8.1 The Worksheet

The LOPA worksheet continues the PHA scenarios that were flagged LOPA Required. Where the data is shared — deviations, causes, consequences, severities — the PHA and LOPA worksheets edit the same records, and a scenario created directly on the LOPA worksheet creates its PHA counterpart with LOPA Required set to Yes.



Deviation	Consequence	S	CM-S		E	A	C	TMEL Safety	Cause
			Description	Prob.					
1.1 More Pressure	1.1.1 Overpressure of the column with relief to flare and potential loss of containment at flanged joints	VH	Probability of personnel presence in the affected area	0.5	M	H		1E-5	1.1.1.1 Loss of cooling w overhead conder 1.1.1.2 Blocked outlet - control valve fail

Figure 8-1. The LOPA worksheet: consequence, conditional modifiers, TMEL, causes with frequencies, enabling events, and IPLs.

The LOPA columns add the quantitative model. Each cause carries its initiating event frequency and any enabling events (probability factors that must be present for the cause to progress). Each consequence carries its conditional modifiers (probability factors on the outcome, such as occupancy) and its TMEL, populated automatically from the selected severity's TMEL. The IPLs column lists the attached safeguards; safeguards flagged as IPLs display their independence attributes and PFD, and they alone credit the calculation (section 11.2).

8.2 Results

The right-hand columns present the computed results — the LOPA risk rank, the mitigated event likelihood, the LOPA ratio, the required risk reduction factor, and the recommended SIL — with values that exceed their target shown in red. LOPA recommendations and comments link to each scenario from the final columns. Chapter 9 defines every calculation.



KENEXIS INTEGRATED SAFETY SUITE										
Delta City Depropanizer HAZOP/LOPA										
Study Data Nodes Deviations PHA Worksheets LOPA Worksheets ALARP Analysis Check Lists Recommendations Safeguards SCAI										
MOCs / Incidents Parking Lot Risk Criteria										
1. Depropanizer column C-701 and reboiler circuit										
			LOPA RR Safety	MEL Safety	LOPA Ratio Safety	RRF Safety	ALARP Required	Recommended SIL	LOPA Recommendations	LOPA Comment
Effective	PFD	Test Interval							LOPA Recommendation	
✓ Yes	0.01	60 months	3	1E-3	1E-2	100	No	SIL 2	1 Implement a safety instrumented function to close the feed and heat input on high column pressure.	Initiating event frequency for loss of cooling water taken from site utility reliability records.
✓ Yes	0.01	60 months								

Figure 8-2. LOPA results: risk rank, MEL, LOPA ratio, RRF, and the recommended SIL, with a linked recommendation.

9 Risk Ranking and LOPA Calculations

Every computed value in Kenexis Open-PHA updates live in the browser as the team works, and the results are stored with the study when it is saved. This chapter defines the calculations. The worked examples use round illustrative numbers.

9.1 PHA Risk Ranking

A scenario's risk rank in each phase comes from the risk matrix: the selected severity and likelihood identify a matrix cell, and the cell's risk ranking becomes the scenario's rank, painted with the ranking's color. In a consequence-indexed study the lookup runs once per visible consequence category, and the scenario's overall rank is the highest-priority (most severe) of the per-category ranks. The Before Safeguards and After Recommendations phases repeat the lookup with their own likelihood selections.

9.2 Explicit LOPA

In an explicit LOPA study each cause carries an initiating event frequency. The cause's contribution to the mitigated event likelihood is its frequency reduced by its enabling events and by the probability of failure on demand of each IPL credited on that cause:

$$MEL_{\text{cause}} = F_{IE} \cdot \prod_{EE} P_{EE} \cdot \prod_{IPL} PFD_{IPL}$$

The consequence's mitigated event likelihood sums the cause contributions and applies the conditional modifiers. In a consequence-indexed study the calculation runs per consequence category, using that category's conditional modifiers:

$$MEL = \left(\sum_{\text{causes}} MEL_{\text{cause}} \right) \cdot \prod_{CM} P_{CM}$$

The target is the TMEL of the selected consequence severity (section 5.2). Two ratios compare the result to the target:

$$\text{LOPA Ratio} = \frac{TMEL}{MEL}$$

$$\text{RRF} = \frac{MEL}{TMEL}$$

A LOPA ratio of one or greater — equivalently an RRF at or below one — indicates the scenario meets its target with the credited layers. An RRF above one is the additional risk reduction still required, and it drives the recommended SIL:

Table 9-1. Recommended SIL by required risk reduction factor.

Required RRF	Recommended SIL
Below 10	No SIL
10 to below 100	SIL 1



Required RRF	Recommended SIL
100 to below 1,000	SIL 2
1,000 to below 10,000	SIL 3
10,000 to 100,000	SIL 4
Above 100,000	Greater than SIL 4

In a consequence-indexed study the recommended SIL uses the largest RRF across the consequence categories, so one SIL requirement covers the scenario's worst case. Values that exceed their target — an MEL above the TMEL, or an RRF above one — display in red on the worksheet.

9.3 The LOPA Risk Rank

The explicit LOPA worksheet also expresses the computed MEL as a matrix rank: the MEL is matched to the smallest likelihood category whose frequency is at or above it, and that likelihood, with the selected severity, looks up the matrix exactly as in the PHA. This presents the quantitative result in the same language as the qualitative ranking.

9.4 Implicit LOPA

In an implicit LOPA study the team works in LOPA credits rather than frequencies. The risk rank at the intersection of the cause likelihood and the consequence severity sets the required credits (from the Risk Rankings page, section 5.3), and each enabling event, conditional modifier, and IPL contributes its credit value:

$$\text{LOPA Gap} = \max\left(0, C_{\text{required}} - \sum C_{\text{EE}} - \sum C_{\text{CM}} - \sum C_{\text{IPL}}\right)$$

Each full credit corresponds to one order of magnitude of risk reduction — a credit of 1 corresponds to a PFD of 0.1, and a credit of 2 to a PFD of 0.01. The goal of an implicit LOPA is a gap of zero, which implies tolerability of risk; a remaining gap drives the recommended SIL directly (a gap of one recommends SIL 1, and so on).

9.5 A Worked Explicit Example

Consider a scenario with one cause: an initiating event frequency of 0.5 per year, an enabling condition with probability 0.4, and one credited IPL with a PFD of 0.01. The cause contribution is:

$$\text{MEL}_{\text{cause}} = 0.5 \cdot 0.4 \cdot 0.01 = 2 \cdot 10^{-3}$$

With a single conditional modifier of 0.25 on the consequence, the mitigated event likelihood becomes:

$$\text{MEL} = 2 \cdot 10^{-3} \cdot 0.25 = 5 \cdot 10^{-4}$$

Against a selected severity whose TMEL is 1E-5, the required risk reduction is:

$$\text{RRF} = \frac{5 \cdot 10^{-4}}{1 \cdot 10^{-5}} = 50$$



An RRF of 50 falls in the 10-to-100 band, so the worksheet recommends SIL 1. Implementing a LOPA recommendation that carries a PFD (for example a new safety instrumented function) multiplies into the after-recommendations result, and the worksheet shows the scenario meeting its target once the credited PFD closes the gap.

9.6 Scope of the Calculated Values

The calculations use the worksheet as configured: visible enabling event, conditional modifier, and severity columns participate, disabled rows are excluded, and safeguards credit a PFD only when flagged as IPLs with a numeric PFD. Saved studies carry their computed values with them, so reports and dashboards present exactly what the worksheets showed when the study was saved.



10 Check Lists

10.1 Check List Categories

The Check Lists tab manages the checklists incorporated in the study. The Check List Categories page lists every checklist with its total question count, the number completed, and the percent complete — a live progress summary across the checklist portion of the PHA.

Description	Completed Questions	Total Questions	Percent Complete	Comments
1 Facility Siting Checklist	6	6	100%	Completed during Session 3 with the full team.

Figure 10-1. The Check List Categories page.

10.2 Check List Worksheets

The Check List Worksheets page hosts the questions of the checklist selected in the dropdown above the table. Each question takes an answer of Yes, No, or N/A, a justification, links to relevant safeguards, and — where the team acts on a question — a checklist recommendation, tracked in the Recommendations register like every other recommendation type. Checklist content can be typed directly, imported from a library template (section 13.7), or appended from a CSV file.

Question	Answer	Justification	Check List Recommendation
1.1 Are occupied buildings sited or protected in accordance with the current facility siting study?	Yes	Siting study revision 4 covers the control room and both field shelters.	2 Confirm occupied-building blast assessment reflects the current siting study revision.
1.2 Are evacuation routes marked and communicated for all normally occupied areas of the unit?	No	Route maps at the field shelters predate the 2025 unit expansion.	1 Provide updated unit evacuation route maps at the control room and both field shelters.
1.3 Is fixed gas detection provided at credible release locations near occupied areas?	Yes	Point detectors at the pump rows and compressor shelter alarm in the control room.	
1.4 Are temporary buildings controlled under the site portable building policy?	Yes	No temporary buildings currently inside the unit battery limits.	
1.5 Does the unit maintain safe access and egress during turnaround activities?	N/A	Assessed under the turnaround-specific review, outside this study scope.	
1.6 Are control room HVAC intakes protected against ingress of flammable or toxic vapors?	Yes	Intake gas detection trips HVAC to recirculation.	

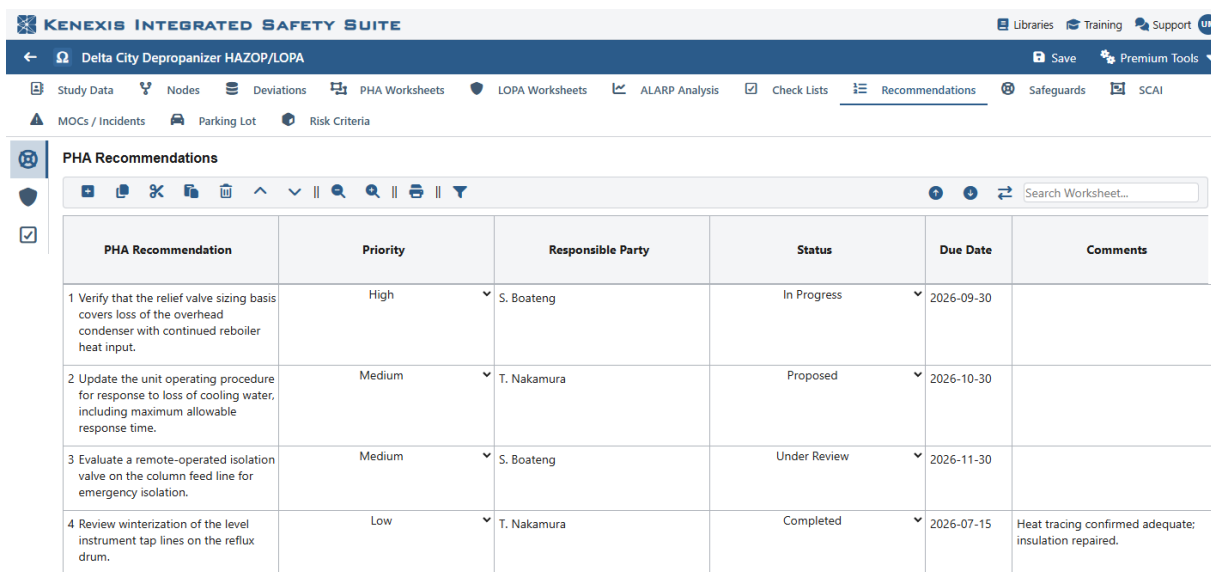
Figure 10-2. A checklist worksheet with answers, justifications, and a linked recommendation.



11 Recommendations, Safeguards, and the Parking Lot

11.1 Recommendations

The Recommendations tab consolidates every recommendation made during the study, grouped by origin on its rail: PHA Recommendations, LOPA Recommendations, and Check List Recommendations. Each record carries the recommendation text, a priority (High, Medium, or Low), the responsible party, a status spanning the recommendation lifecycle (Proposed through Implemented, Closed, and beyond), a due date, and comments. The Referenced Locations column links each recommendation back to every scenario that raised it. LOPA recommendations additionally carry the PFD (explicit studies) or IPL credit (implicit studies) that the after-recommendations calculation applies.



The screenshot shows the 'Kenexis Integrated Safety Suite' interface. The top navigation bar includes 'Libraries', 'Training', and 'Support'. The main menu has tabs for 'Study Data', 'Nodes', 'Deviations', 'PHA Worksheets', 'LOPA Worksheets', 'ALARP Analysis', 'Check Lists', 'Recommendations' (selected), 'Safeguards', and 'SCAI'. Below the menu, there are icons for 'MOCs / Incidents', 'Parking Lot', and 'Risk Criteria'. The 'PHA Recommendations' section is active, displaying a table with the following data:

PHA Recommendation	Priority	Responsible Party	Status	Due Date	Comments
1 Verify that the relief valve sizing basis covers loss of the overhead condenser with continued reboiler heat input.	High	S. Boateng	In Progress	2026-09-30	
2 Update the unit operating procedure for response to loss of cooling water, including maximum allowable response time.	Medium	T. Nakamura	Proposed	2026-10-30	
3 Evaluate a remote-operated isolation valve on the column feed line for emergency isolation.	Medium	S. Boateng	Under Review	2026-11-30	
4 Review winterization of the level instrument tap lines on the reflux drum.	Low	T. Nakamura	Completed	2026-07-15	Heat tracing confirmed adequate; insulation repaired.

Figure 11-1. The PHA Recommendations register.

11.2 Safeguards and IPLs

Safeguards live in one master list shared by the whole study: entering a safeguard on any worksheet creates it here, and linking an existing safeguard reuses the same record — so editing it once updates every scenario that references it. The Safeguards tab manages the list. Each safeguard carries its type, tag, and category; the Is Safeguard and Is IPL flags that control where it appears (PHA worksheet, LOPA worksheet, or both); the IPL qualification attributes — Independent, Auditable, Effective — and the PFD (or IPL credit) that the LOPA calculation credits; and maintenance data such as safety-critical designation, response time, and test interval. Referenced Locations links each safeguard to every scenario that uses it — the essential view for safeguard and IPL rationalization.



Safeguard	Type	Tag	Independent	Auditable	Effective	IPL	PFD	Test Interval
1 Relief valve on the column overhead sized for blocked outlet and fire	Relief Valve	PSV-706	Yes	Yes	Yes	Yes	0.01	60 months
2 High pressure alarm with operator response procedure	Alarm	PAH-701	No	Yes	Yes	No		
3 BPCS pressure control loop on the column overhead	BPCS					No		
4 Independent high level trip on the reflux drum closing the inlet	Interlock			Yes	Yes	Yes	0.01	12 months
5 High level alarm on the reflux drum with operator response	Alarm					No		
6 Flare system designed for the maximum credible relief load	Mitigation					No		
7 Operator field rounds each shift	Procedural		No			No		
8 Check valve on the reflux pump discharge	Check Valve					No		

Figure 11-2. The Safeguards register, with a Kenexis SIS link icon on a synchronized IPL.

The rail's second page, Synchronize IPLs with Kenexis SIS, opens the Kenexis SIS synchronization described in section 13.8.

11.3 Parking Lot and Comments

The Parking Lot tracks items that warrant follow-up without rising to the level of a recommendation — a drawing to verify, a document to update — each with a response, a responsible party, and start and end dates. Its rail also carries the PHA Comments and LOPA Comments pages: every comment made on the worksheets, with links back to the scenarios where it was made.

Parking Lot Issue	Response	Responsible Party	Start Date	End Date
1 Verify that drawing D-700-PID-012 reflects the bypass installed around the feed control valve.	Drafting to issue revision 8 incorporating the 2025 bypass modification.	S. Boateng	2026-06-08	
2 Confirm the winterization status of instrument tap lines on the reflux drum.		T. Nakamura	2026-06-09	
3 Update the relief system design basis file with the current flare header backpressure study.	Relief systems engineer to attach the 2024 study report.	S. Boateng	2026-06-10	2026-06-19

Figure 11-3. The Parking Lot.



12 Optional Worksheets

Three additional tabs switch on per study from Study Settings (section 4.8), extending the study record for organizations that manage these programs within the PHA.

12.1 ALARP Analysis

The ALARP Analysis worksheet demonstrates that risk is As Low As Reasonably Practicable for the scenarios flagged ALARP Required on the PHA worksheet. Each scenario lists the risk-reduction options the team considered — categorized using the ALARP categories defined on the Risk Criteria rail — with a description, whether the option is practicable, and the justification. Options judged practicable typically become recommendations; options rejected as grossly disproportionate document the ALARP case.

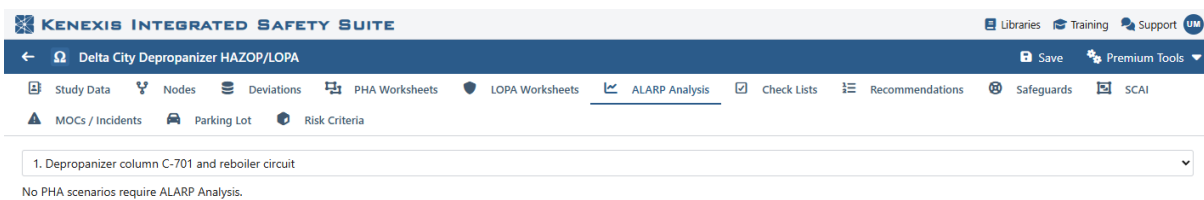


Figure 12-1. The ALARP Analysis worksheet.

12.2 SCAI

The SCAI tab registers Safety Controls, Alarms, and Interlocks: each record carries its type, tag, safety-critical designation, selected SIL, required response time, and test interval, and links to the safeguards it implements. The register gives operations a single handover list of the instrumented safeguards the PHA relies on.

SCAI	Type	Tag	Safeguard	Type	Tag
1 Reflux drum high level trip closing the drum inlet	Interlock	LSH-709	4 Independent high level trip on the reflux drum closing the inlet	Interlock	LSH-709
2 Column overhead relief valve	Relief Device	PSV-706	1 Relief valve on the column overhead sized for blocked outlet and fire	Relief Valve	PSV-706

Figure 12-2. The SCAI register.

12.3 MOCs and Incidents

The MOCs / Incidents tab records the change and incident history the team reviewed. Its rail carries three pages: MOCs (management of change records with number, description, status, and duration), Previous Incidents (the site's own incidents, with reference, date, level, status, and the team's



discussion), and Industry Incidents (relevant external events and how the study addresses them). Each page supports CSV append-import for lists prepared outside Kenexis Open-PHA.

MOC Number	Short Description	Long Description	Status	Duration
1 MOC-2025-041	Feed control valve bypass installation	Installed a manual bypass around the feed control valve to allow online maintenance.	Closed	Permanent
2 MOC-2026-007	Reflux pump impeller upsize	Upsized the reflux pump impellers to restore design reflux margin at summer conditions.	Open	Permanent

Figure 12-3. The MOCs / Incidents tab.

13 Premium Tools

13.1 The Premium Tools Menu

The Premium Tools menu in the workspace header gathers the productivity features of Kenexis Open-PHA Cloud-Premium: the report generator, study search, spell check and translation, the revision manager and previous versions, the import tools, the template libraries and library synchronization, Kenexis SIS synchronization, and the bowtie diagram visualizer.

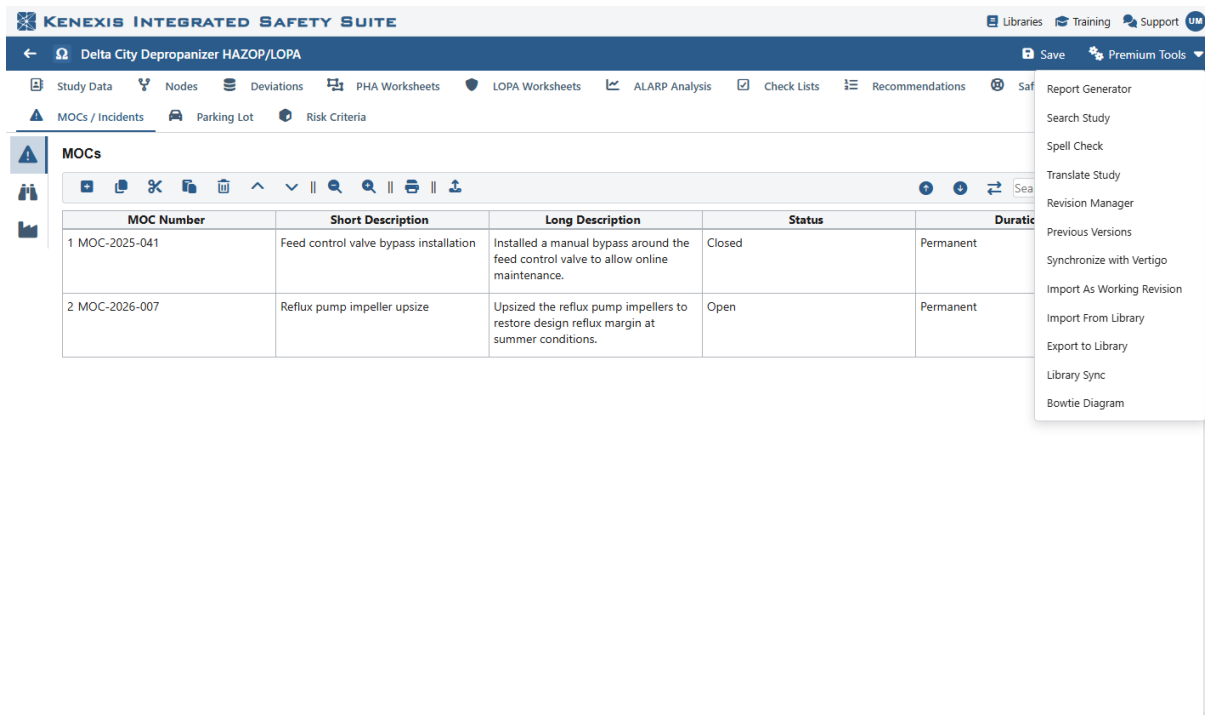


Figure 13-1. The Premium Tools menu.

13.2 Report Generation

Report Generator builds complete study reports server-side. Basic reporting selects any combination of study sections — the study data pages, risk criteria, nodes, the PHA and LOPA worksheets, recommendations, checklists, the optional worksheets, and more — and produces a Word document (with selectable page size and orientation) or an Excel workbook. Toggles include the referenced-locations columns and hide disabled items from the output.



Open-PHA Cloud Report Generator

Report Settings

☒ Include Referenced Locations
☐ Hide Disabled Items

Basic Reports - Select Items to Include

Study Data

☐ Drawings
☐ Team Members
☐ Sessions

☐ Attendance
☐ Risk Criteria
☐ Revalidation History

☐ Revisions

Worksheets & Recommendations

☐ Nodes
☐ Parking Lot
☐ Safeguards

☐ PHA Worksheets
☐ PHA Recommendations
☐ SCAI

☐ LOPA Worksheets
☐ LOPA Recommendations
☐ Check Lists

☐ Check List Worksheets
☐ Check List Recommendations
☐ MOC's

☐ ALARP Analysis
☐ Previous Incidents
☐ Industry Incidents

Report Format
Word

Page Size
8.5 x 11

Page Orientation
Portrait

Generate Basic Report

Custom Report - Upload Custom Report Template

Upload your *.docx Report Template

Choose File
No file chosen

Generate Custom Report

Close

Figure 13-2. The Report Generator.

Custom reporting populates your own Word template: upload a .docx containing text patterns of the form <%Pattern%>, and Kenexis Open-PHA replaces each pattern with the corresponding study data — single fields (for example <%Facility%>) or entire tables (for example <%Pha_Worksheets%>). Building the patterns into your organization's report template produces a finished, branded PHA report in one step. The recognized patterns are listed on the Kenexis support website.

Kenexis Open-PHA

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13.3 Search Study

Search Study finds text anywhere in the study. Find Next steps through the hits; Find All lists every match with its location, and clicking a result navigates to the scenario and selects the cell. Case-sensitive and whole-word options refine the search, and the worksheet toolbar's search box adds per-worksheet find and replace-all.

Search Study

Find:

reflux

☐ Case Sensitive ☐ Match Whole Word

22 matches found

- [Overview → Project Description — Project Description](#) "...verhead condenser E-704, reflux drum D-702, reflux pumps P-703 A/B, and reboiler ..."
- [Drawings — Drawing Description](#) "Overhead condenser E-704, reflux drum D-702, and pumps P-703 A/B"
- [Nodes — Node Description](#) "Overhead condenser, reflux drum D-702, and reflux circuit"
- [Nodes — Intention](#) "...verhead vapor and return reflux while sending propane product to treating."
- [Nodes — Boundary](#) "... condenser inlet through reflux drum D-702 and pumps P-703 A/B to the column top ..."
- [Deviations — Design Intent](#) "Reflux drum level maintained by the product draw controller."
- [Node 2.1.1 — Consequence](#) "High level in the reflux drum leads to liquid carryover to the fuel gas system"
- [Node 2.1.1.1 — EE Description](#) "Operation at high reflux during summer"

Find Next Find All Close

Figure 13-3. Search Study with results across the study.

13.4 Spell Check and Translation

Spell Check reviews the entire study — every worksheet, visible or not — against a dictionary in your language, offering Replace, Replace All, Ignore, Ignore All, and Add To Dictionary for each finding. Words added to the dictionary persist for future sessions.



Spell Check Study

Not in Dictionary:

Suggestions:

Replace

Replace All

Ignore

Ignore All

Add To Dictionary

Start

Pause

Close

Figure 13-4. Spell Check Study.

Translate Study translates the study's text content into a selected language using a cloud translation engine. Translation runs in the background on the server, and an email notifies you at the address on your KISS account when the translated study is ready.

13.5 Revision Management

The Revision Manager — reached from Premium Tools or the Study Data rail — maintains the study's formal revision history. Add Revision snapshots the current study under a revision name, with a description and remarks; the creator and creation date are recorded automatically.



Create New Revision

Revision Name

Revision Description

Revision Remarks

Create

Cancel

Figure 13-5. Creating a revision.

Edit Revision updates a revision's properties and carries the Approve Revision action: approval stamps the approver and approval date onto the revision record.

Update Revision

Revision Name

Rev A

Revision Description

Issued for internal review

Revision Remarks

Working revision at the close of Session 3.

Approve Revision

Update

Cancel

Figure 13-6. Updating and approving a revision.

Delta City Depropanizer HAZOP/LOPA

Save

Premium Tools

MOCs / Incidents

Parking Lot

Risk Criteria

Revision History

Revision	Description	Remarks	Revision Creator	Revision Date	Approver
Rev A	Issued for internal review	Working revision at the close of Session 3.	User Manual	21 Jul 2026	User Manual

Figure 13-7. The Revision History page with an approved revision.

View Revision loads the selected snapshot read-only, so the study can be seen exactly as it stood at that revision; the View Working Revision button returns to the editable working copy. Copy Revision creates a new study from the snapshot, and Delete removes a revision from the history.

When a study with approved revisions opens, Kenexis Open-PHA offers the choice of loading the latest approved revision (read-only) or the working revision:

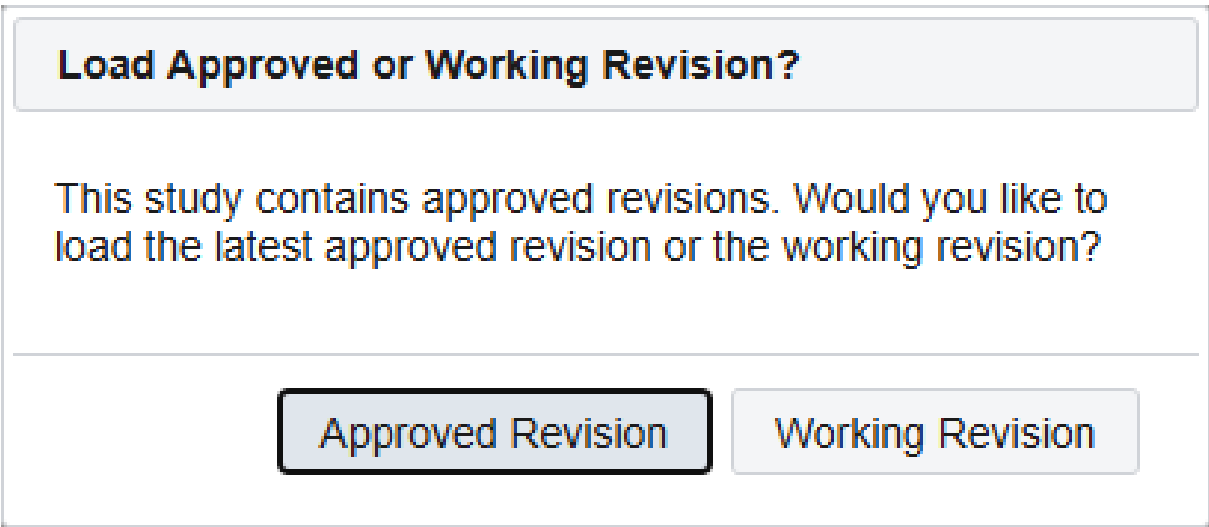


Figure 13-8. Opening a study that has approved revisions.

13.6 Previous Versions and Working-Revision Imports

Previous Versions lists the automatic save history of the study — each entry with its date, author, and size. Any version can be viewed read-only, downloaded as an .opha file, restored as the current study, or deleted.

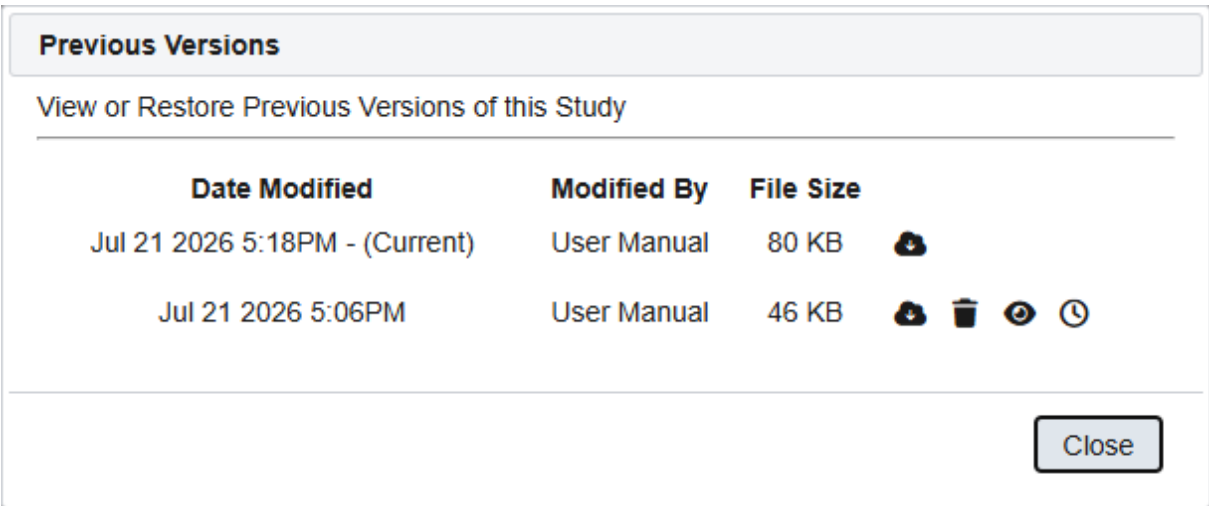


Figure 13-9. The Previous Versions dialog.

Import As Working Revision brings external data into the current study, replacing the working data after confirmation while preserving the study's identity — its revisions, links, and place in KISS:



- **From Kenexis Open-PHA Desktop** — re-uploads an .opha file edited offline. Together with Export, this supports a round trip: create a revision, export, facilitate offline, and import the result as the new working revision.
- **From PHAWorks** — imports a PHAWorks study exported in its Outline (entire project, hierarchical) format.
- **From CSV** — a mapping workspace that imports worksheet data from CSV files, with append and overwrite modes and reusable mapping configurations.

13.7 Template Libraries

KISS libraries hold reusable Kenexis Open-PHA content: whole study templates, node templates, checklist templates, risk criteria sets, and study settings. Export to Library publishes content from the open study — for example Export Node captures a complete node, with its deviations and scenarios, as a named template:



Export Node As Library Template

Create a template from a node in this study and store it to a Kenexis Integrated Safety Suite Library.

[Learn more about node templates](#)

Select PHA Node

1. Depropanizer column C-701 and reboiler circuit

Select Library

PHA Node Templates

Enter Node Template Name

Depropanizer Column and Reboiler Node

Export Node

Close

Figure 13-10. Exporting a node as a library template.

Import from Library brings templates into the study. Importing a node creates it with its full worksheet content, with merge options for the shared registers (safeguards and recommendations) to avoid duplicates:



Import Node from Library Template

Create a new node in this study from a node template in a Kenexis Integrated Safety Suite Library.

[Learn more about node templates](#)

Select Library

PHA Node Templates

Select PHA Node Template

Depropanizer Column and Reboiler Node

Merge List Items

Safeguards

PHA Recommendations

LOPA Recommendations

Import Node

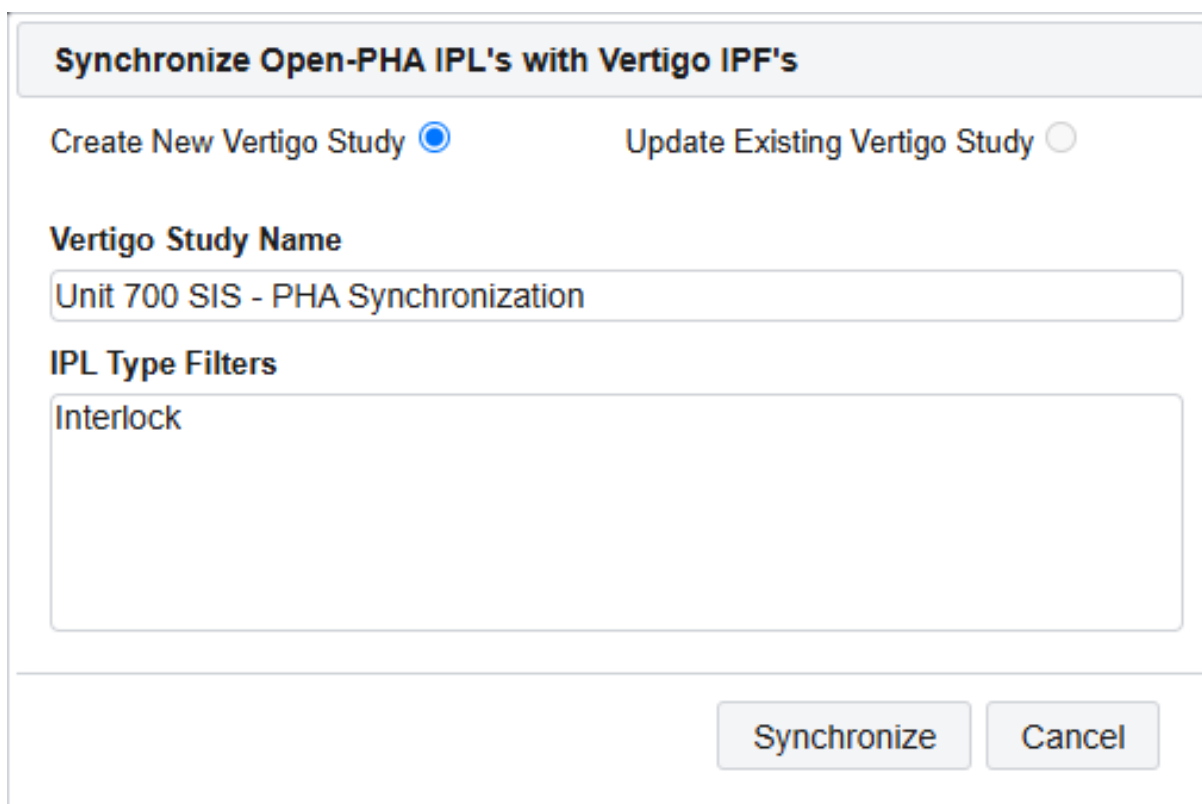
Close

Figure 13-11. Importing a node template from a library.

Library Sync connects individual study records — safeguards, causes, enabling events, and conditional modifiers — to their source library rows, compares them, and applies selected updates from the library to the study, keeping standardized data aligned across a program.

13.8 Synchronize with Kenexis SIS

Kenexis Open-PHA studies synchronize with Kenexis SIS Lifecycle Management studies, carrying the LOPA's IPL list into the SIS engineering workflow. Synchronize with Kenexis SIS creates a new Kenexis SIS study — in the same facility, with one Instrumented Protective Function per synchronized IPL — or updates a previously synchronized study, with checkboxes selecting which fields to update (tags, descriptions, types, and required RRFs, derived from each IPL's PFD) and whether to append newly added IPLs.



Synchronize Open-PHA IPL's with Vertigo IPF's

Create New Vertigo Study ☒ Update Existing Vertigo Study ☐

Vertigo Study Name
Unit 700 SIS - PHA Synchronization

IPL Type Filters
Interlock

Synchronize Cancel

Figure 13-12. The Kenexis SIS synchronization dialog.

The IPL Type Filters box limits synchronization to selected IPL types, entered semicolon-separated — filtering on the safeguard type field so that, for example, only instrumented interlocks become Kenexis SIS IPFs. Synchronization flows from Kenexis Open-PHA to Kenexis SIS; updating a synchronized study applies the current Kenexis Open-PHA data to it.

Individual safeguards also link directly to Kenexis SIS IPFs: select an IPL safeguard and use Link Safeguard to Kenexis SIS IPF on the toolbar, then pick the facility, Kenexis SIS study, and IPF:

Link Safeguard to Vertigo IPF

Select the Facility and Vertigo Study where your IPF is located, then select the IPF from the IPF list to Link it.

Select Facility

Process Hazard Analysis

Filter IPFs

Filter IPF List

Select Study

Unit 700 SIS - PHA Synchronization

Select IPF

LSH-709 - Independent high level trip on the reflux drum closing the inlet

Link to IPF

Close

Figure 13-13. Linking a safeguard to a Kenexis SIS IPF.

A linked safeguard shows a link icon in the Safeguards register; clicking it lists the linked IPFs with their selected and achieved SILs live from Kenexis SIS, and navigates into the Kenexis SIS study on demand.

View Linked Vertigo IPF's					
Vertigo Study	IPF Tag	IPF Description	Selected SIL	Achieved SIL	
Unit 700 SIS - PHA Synchronization	LSH-709	Independent high level trip on the reflux drum closing the inlet	SIL 2		

Close

Figure 13-14. Viewing a safeguard's linked Kenexis SIS IPFs.

13.9 Bowtie Diagrams

A completed LOPA scenario visualizes as a bowtie diagram: causes and their protection layers on the left, the event at the center, and the conditional modifiers and per-category consequences on the right. Select one or more scenarios on the LOPA worksheet and choose Bowtie Diagram from Premium Tools. The viewer zooms in and out and downloads the diagram as an image for reports and presentations.



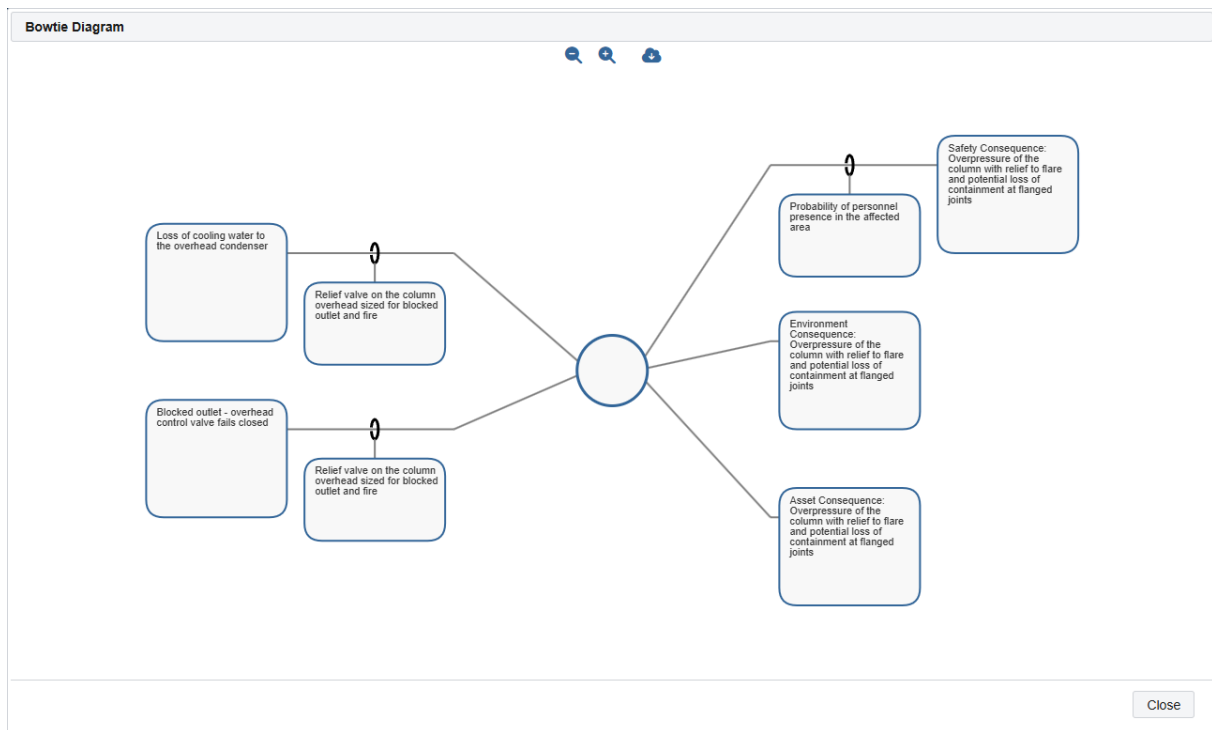


Figure 13-15. A LOPA scenario as a bowtie diagram.

14 The Facility Dashboard

The Facility Dashboard aggregates results across every study in a facility. Open it from the Facility Dashboard button above the facility list in the KISS Manager. The Kenexis Open-PHA section displays:

- PHA studies by the age of their current revision — a live view of revalidation currency.
- PHA and LOPA recommendations by implementation status.
- Risk-ranked scenarios by risk ranking.
- Scenario counts by consequence category and severity.

Facilities that also hold synchronized Kenexis SIS studies show the Kenexis SIS dashboard sections alongside — SIF counts by SIL, verification status, and testing history — a combined view of the path from PHA findings to implemented safety functions.

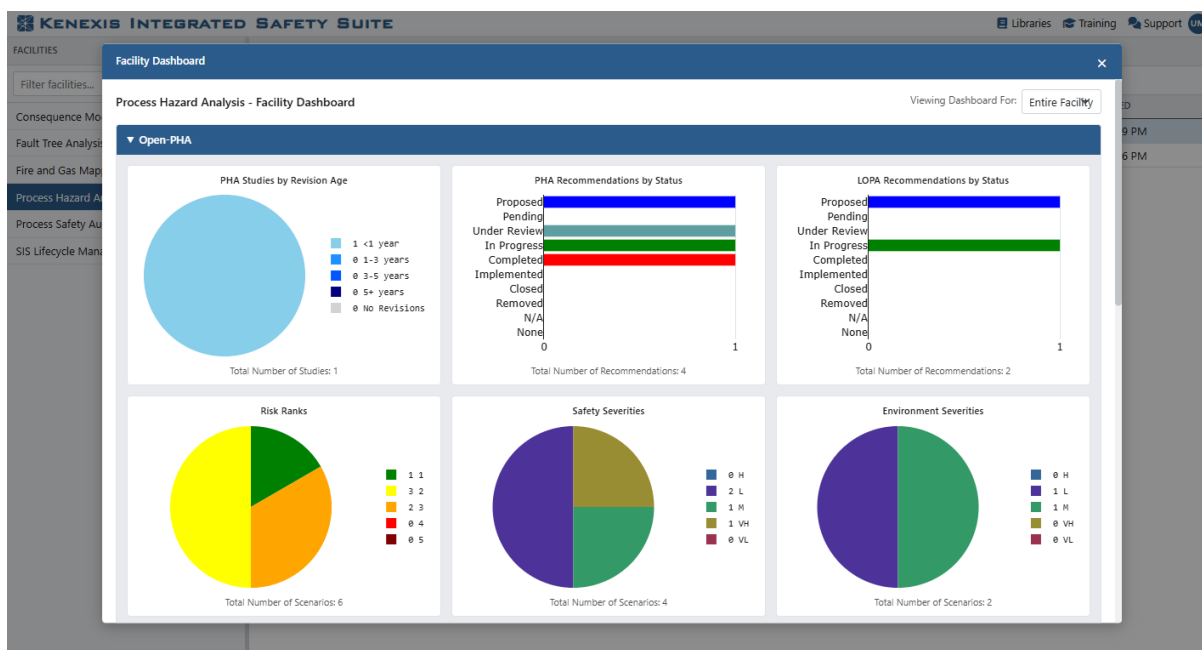


Figure 14-1. The facility dashboard for a facility holding PHA and Kenexis SIS studies.

Appendix A Hotkeys

Holding Ctrl+H displays the hotkey map at any time.

Hotkey Mapping					
General					
F1-F10	Navigate Primary (horizontal) toolbar	Ctrl + F1-F10	Navigate Secondary (vertical) toolbar	Ctrl + N	Create New Study
Ctrl + O	Open Existing Study	Ctrl + S	Save Study	Ctrl + H (hold)	Toggle Hotkey Map
Ctrl + number	Navigate Primary Dropdown Menu (above worksheet)				
With Cell(s) Selected - Dark Blue Highlight					
Ctrl + C	Copy Selected Cell(s)	Ctrl + X	Cut Selected Cell(s)	Ctrl + V	Paste Cut/Copied Cells
Delete	Delete Selected Cell(s)	Ctrl + Enter	Create New Row	Escape	Deselect Cell(s)
Arrow Keys	Select Neighboring Cells	Ctrl + Up Arrow	Move Row Up	Ctrl + Down Arrow	Move Row Down
Tab	Select Next Cell	Ctrl + Left Mouse	Select Additional Cells	Shift + Left Mouse	Select Many Additional Cells
With Cell(s) Active - Blue Border					
Ctrl + Enter	Create New Row	Ctrl + A	Select All Text in Active Cell	Alt + Arrow Keys	Make Neighbor Cell Active

Figure A-1. The hotkey map (Ctrl+H).

Table A-1. Navigation hotkeys.

Hotkey	Action
Ctrl + H (hold)	Display the hotkey map
F1 – F10	Navigate the main tab strip
Ctrl + F1 – F10	Navigate the rail pages of the current tab
Ctrl + S	Save the study
Ctrl + Number	Open the numbered entry of the worksheet dropdown

Working in a worksheet, with cells selected (dark blue highlight) or a cell active for editing (blue border):

Table A-2. Worksheet hotkeys by selection context.

Context	Hotkey	Action
Cells selected	Ctrl + C / X / V	Copy, cut, or paste the selected cells or rows
Cells selected	Delete	Delete the selected cells or rows
Cells selected	Ctrl + Enter	Create a new row
Cells selected	Escape	Deselect
Cells selected	Arrow keys	Move the selection
Cells selected	Ctrl + Up / Down	Move the selected row up or down
Cells selected	Tab	Select the next cell
Cells selected	Ctrl + Click	Add a cell to the selection
Cells selected	Shift + Click	Extend the selection
Cell active	Ctrl + Enter	Create a new row
Cell active	Ctrl + A	Select all text in the active cell
Cell active	Alt + Arrow key	Activate the neighboring cell



Appendix B Calculation Summary

The quantities computed by Kenexis Open-PHA, as defined in Chapter 9:

Table B-1. Calculated quantities and their definitions.

Quantity	Definition
PHA Risk Rank	Matrix lookup of the selected severity and likelihood, per phase; the most severe rank across the visible consequence categories.
Cause MEL (explicit)	Initiating event frequency multiplied by the enabling event probabilities and the PFDs of the IPLs credited on the cause.
MEL (explicit)	Sum of the cause MELs, multiplied by the conditional modifier probabilities of the consequence category.
TMEL	The target frequency of the selected consequence severity (Risk Criteria).
LOPA Ratio	TMEL divided by MEL; one or greater meets the target.
RRF	MEL divided by TMEL; the additional risk reduction required.
Recommended SIL (explicit)	From the largest per-category RRF: SIL 1 at RRF 10, SIL 2 at 100, SIL 3 at 1,000, SIL 4 at 10,000.
LOPA RR (explicit)	The matrix rank of the MEL, binned to the smallest likelihood category at or above it.
Required credits (implicit)	The Required LOPA Credits of the risk rank at the cause likelihood and consequence severity.
LOPA Gap (implicit)	Required credits minus the enabling event, conditional modifier, and IPL credits, floored at zero.
Recommended SIL (implicit)	From the remaining gap: a gap of one recommends SIL 1, two SIL 2, and so on.
After-recommendations values	The same calculations with the PFDs or credits of the scenario's LOPA recommendations applied.

