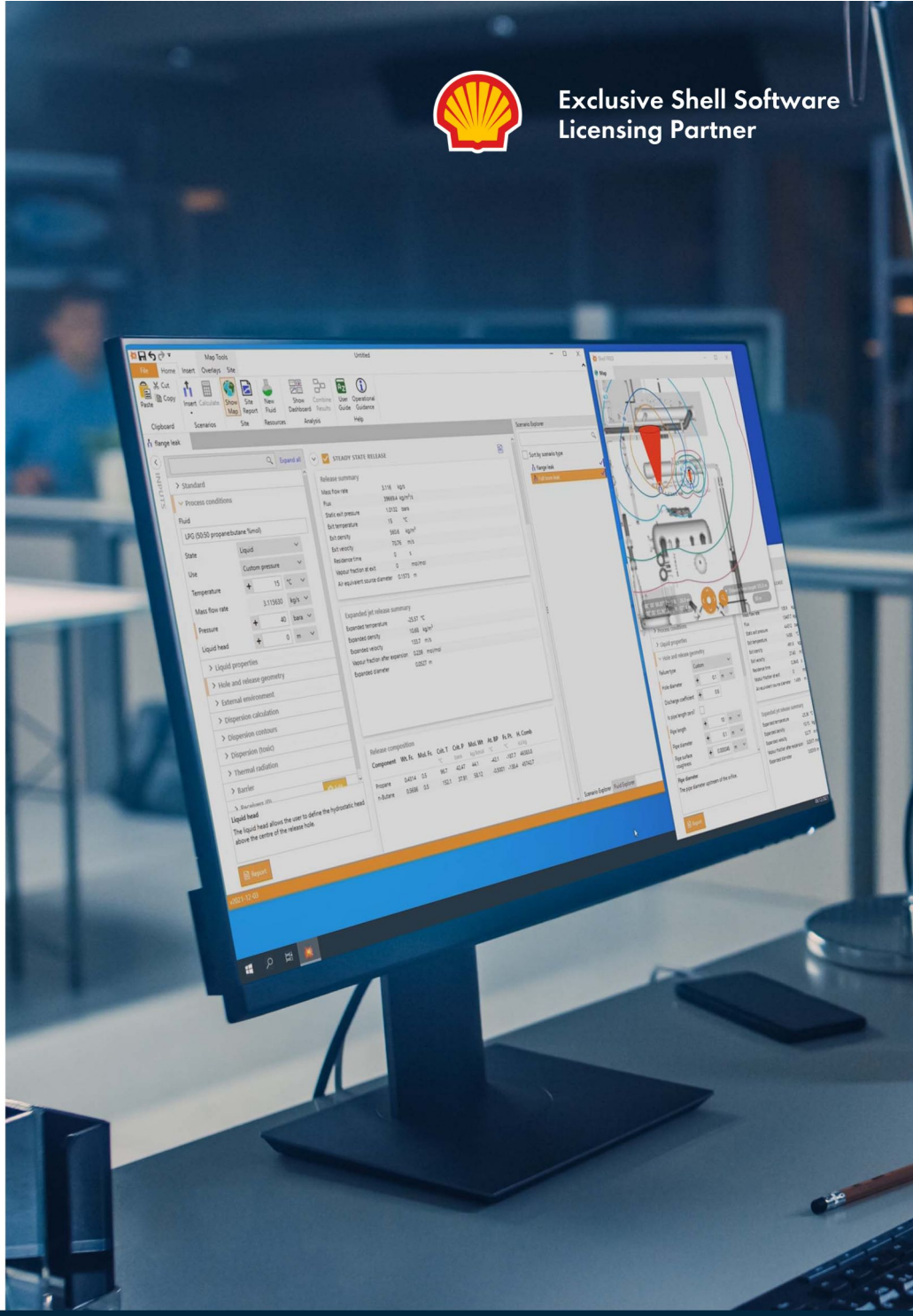
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A summary of the changes to FRED for version 2025

Shell Global Solutions (UK) (a division of Shell Research Ltd.)

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FRED 2025 Release Notes

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Document History

Date	Issue	Reason for Change	Author	Approved by / content owner
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21-Feb-2025	1	Updated after review	Steven Betteridge	Peter Barker

FRED 2025 Release Notes

Betteridge, Steven GSUK-PTS/SP

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Executive Summary

These release notes cover updates to FRED, since the last release of FRED 2023 (in July 2023). This version of FRED is labelled FRED 2025.

In this release there are no significant changes to the models. However, there are several enhancements to areas of the user interface improving functionality, as well as some modifications to the science and a number of minor bug fixes that were identified during the last year.

Along with the changes described in this document, there has been a significant change to the underlying code base to make FRED 64 bit compliant.

Table of Contents

Document History 1
Executive Summary 3
1. Introduction 5
2. Science Updates 6
3. Changes to User Interface 7
3.1 Group Scenarios in Scenario Explorer 7
3.2 Fluid Properties in Custom Fluid Editor 8
3.3 Replace Bing Maps with Azure Maps 9
3.4 Visualisation of Dispersion Hazard Extent 9
3.5 Improvements to Result Panels 9
3.6 Minor Enhancements 11
4. Bug Fixes 13
4.1 Science 13
4.2 User Interface 13
5. Bibliographic Information 16

1. Introduction

These release notes cover updates to FRED, since the last release of FRED 2023 (in July 2023). In this release there are no significant changes to the models However, there are several enhancements to areas of the user interface improving functionality, as well as some modifications to the science and a number of minor bug fixes that were identified during the last year.

Along with the changes outlined below, there has been a significant update to the underlying code base to make FRED 64 bit, which does give a small performance boost to the calculation speed. The user may also notice some minor changes to some of the calculated results as a result of 64-bit operation, since many of the calculations are using iterative numerical solvers. However, these differences are usually well within the uncertainty of the models themselves < 1% and testing has demonstrated that > 99% of the results remain unchanged.

2. Science Updates

The following changes have been made to the scientific models and scenarios within the FRED user interface.

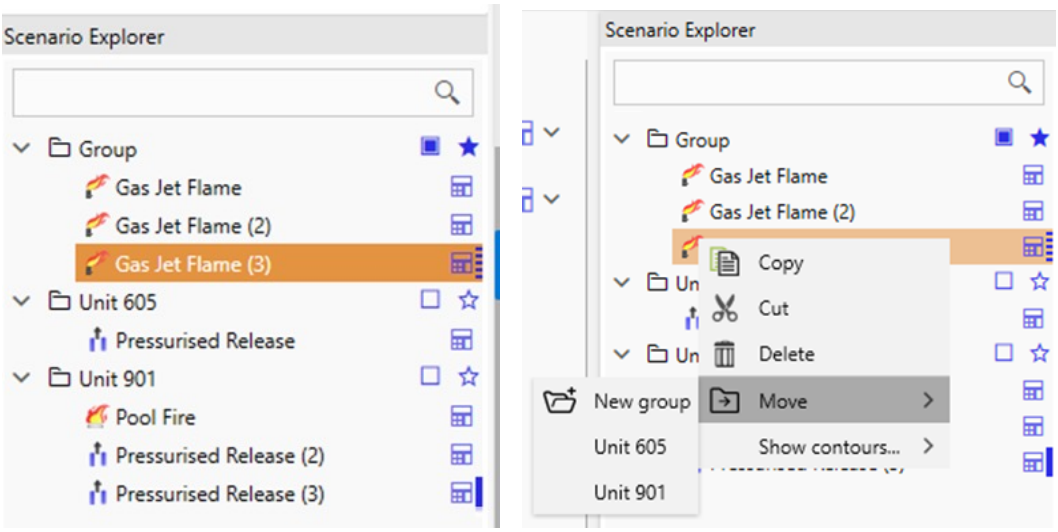
- The inert limit used present in the generalised jet fire model have been reviewed and updated when hydrogen is one of the fluid components. This change affects the jet fire model that is used in Pressurised release, PRV and Unified Scenarios.
- In FRED 2023, the correlation for H2 jet fires was improved, however this correlation was only used when modelling a fluid containing > 99.99% H2. The jet fire correlations in FRED 2025 have been modified to adjust the jet fire results when the fraction of hydrogen is less than 100% and hence to improve the predictions of hydrogen mixtures, for instance H2/methane or syngas compositions.
- The jet fire correlations for standard hydrocarbons fuels were also reviewed following the changes for hydrogen. A small amendment was made for fluids that contain inert components, which consequently reduces the f-factor and hence the predicted radiation at a distance. The change affects the jet fire model in the Pressurised Release, PRV and Unified scenarios, but will only have a limited impact for inert concentrations up to 5%, where f-factor changes by < 1%.
- The Two-Phase Blowdown scenario has been modified to allow pipes up to 100 km (The previous limit was 10 km). This required some modification to the internal calculation nodes used in the numerical iterative process and hence results for 1 km – 10 km may be slightly different to previously.
- The calculation time for the Two-phase Blowdown scenario has been significantly improved. For short pipe lengths < 1000 m, the calculation time is now 10 x quicker. Note that following this change, the operation of the shutdown time input has been changed. It now reflects the time shown in the results and not the timeout period that the user must wait for the calculation to finish.

3. Changes to User Interface

3.1 Group Scenarios in Scenario Explorer

The Scenario Explorer window has been modified to allow scenarios to be grouped. This means that scenarios can now be logically grouped, e.g. by unit name or specific conditions and consequently it should make it easier to search and find specific scenarios.

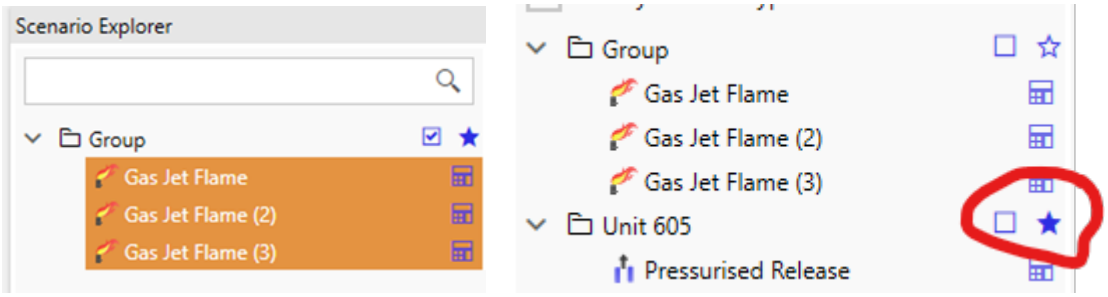
This functionality can be accessed via "Right Click" options on a scenario. The resultant menu allows the scenario to be moved to a new group or to a pre-existing group.



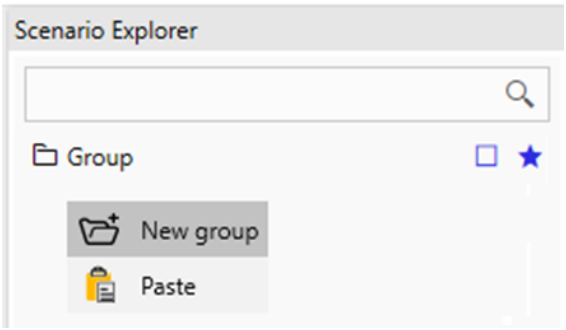
The functionality includes options to

(1) quickly select all scenarios in a group and

(2) make the group a favourite, which means that new scenarios are automatically added to this group.

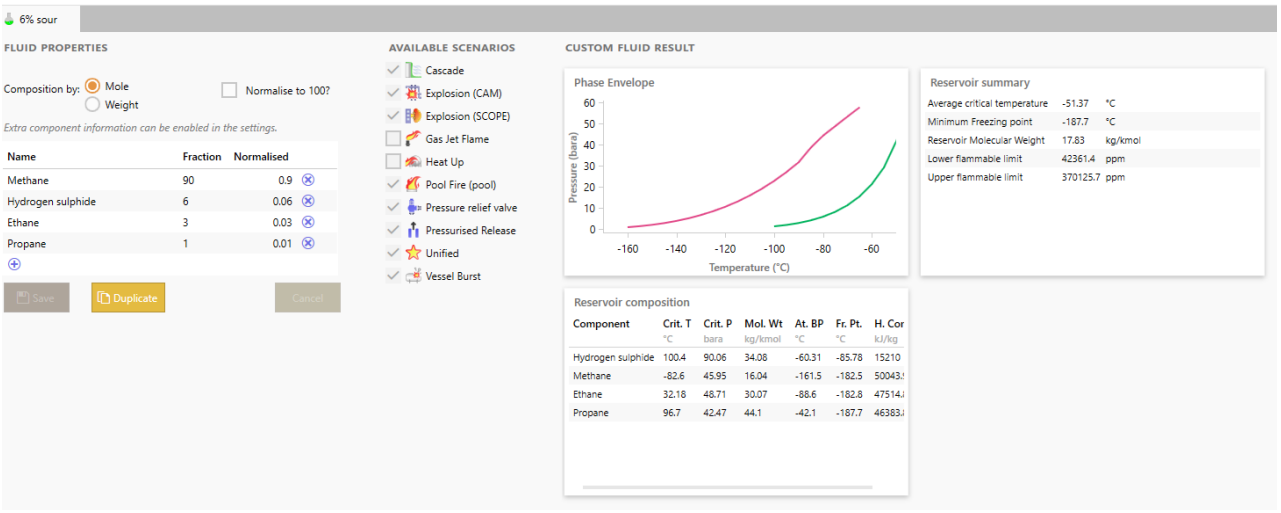


New groups can be created via the Insert menu or right click the background in the Scenario Explorer.



3.2 Fluid Properties in Custom Fluid Editor

New functionality has been added to the Custom Fluid editor to show certain fluid properties, such as the bubble/dew point graph and reservoir properties. These properties are updated as a custom fluid is being created and modified to ensure that the Custom Fluid matches process information and for future reference.



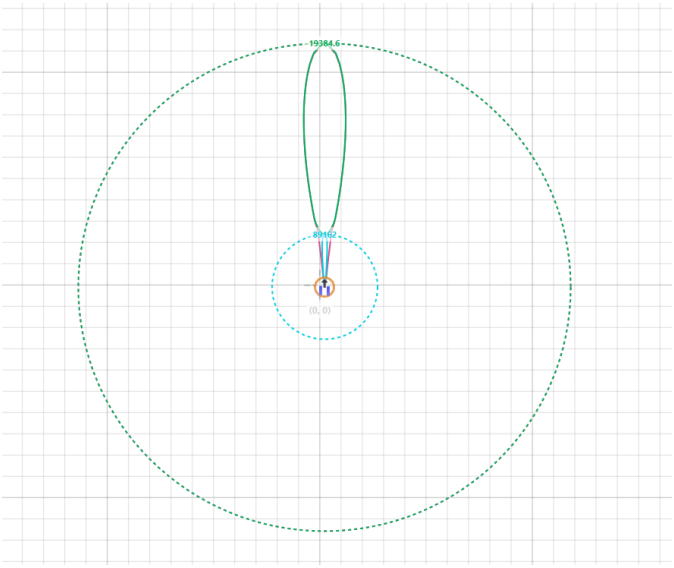
The result panels are updated on the fly as new components are added/removed or the fraction is adjusted. Note that the LFL/UFL values are calculated based upon the reservoir conditions and not the release conditions, which is the default option in the Pressurised Release scenario.

3.3 Replace Bing Maps with Azure Maps

The use of Bing maps for the site map background has been replaced with Azure maps. This change was necessary to mitigate future changes by Microsoft who will be withdrawing support for Bing maps APIs soon. The functionality in Azure maps to display a satellite image is very similar, although the search function may generate slightly different results. Also, unfortunately, Azure maps does not currently display labels for the locations. If you need to check the location, then switch to OpenStreetMap to check and revert to Azure maps once the location has been confirmed.

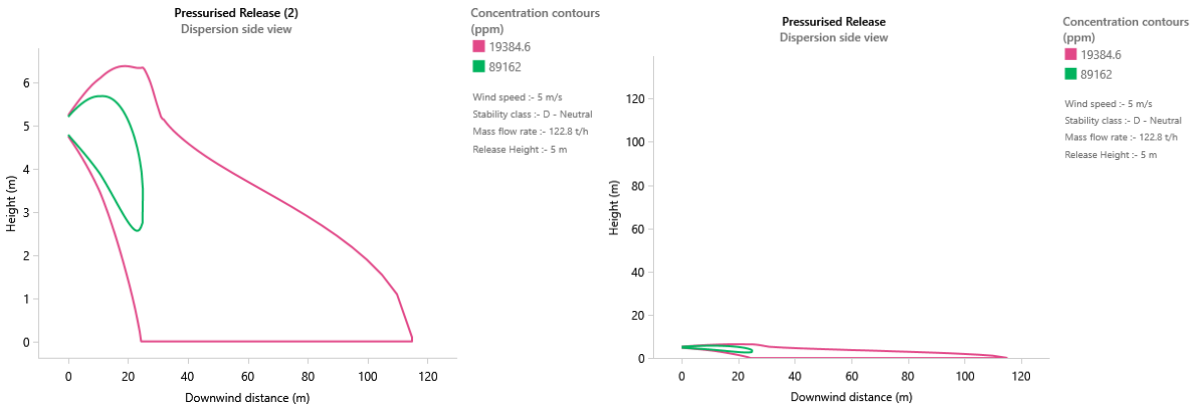
3.4 Visualisation of Dispersion Hazard Extent

A new overlay option has been added that allows users to visualise the maximum extent of the dispersion hazard irrespective of the wind direction. This option is enabled via Overlays - Hazard Extent and draws a dotted circle with a diameter corresponding to the distance for each calculated dispersion contours.

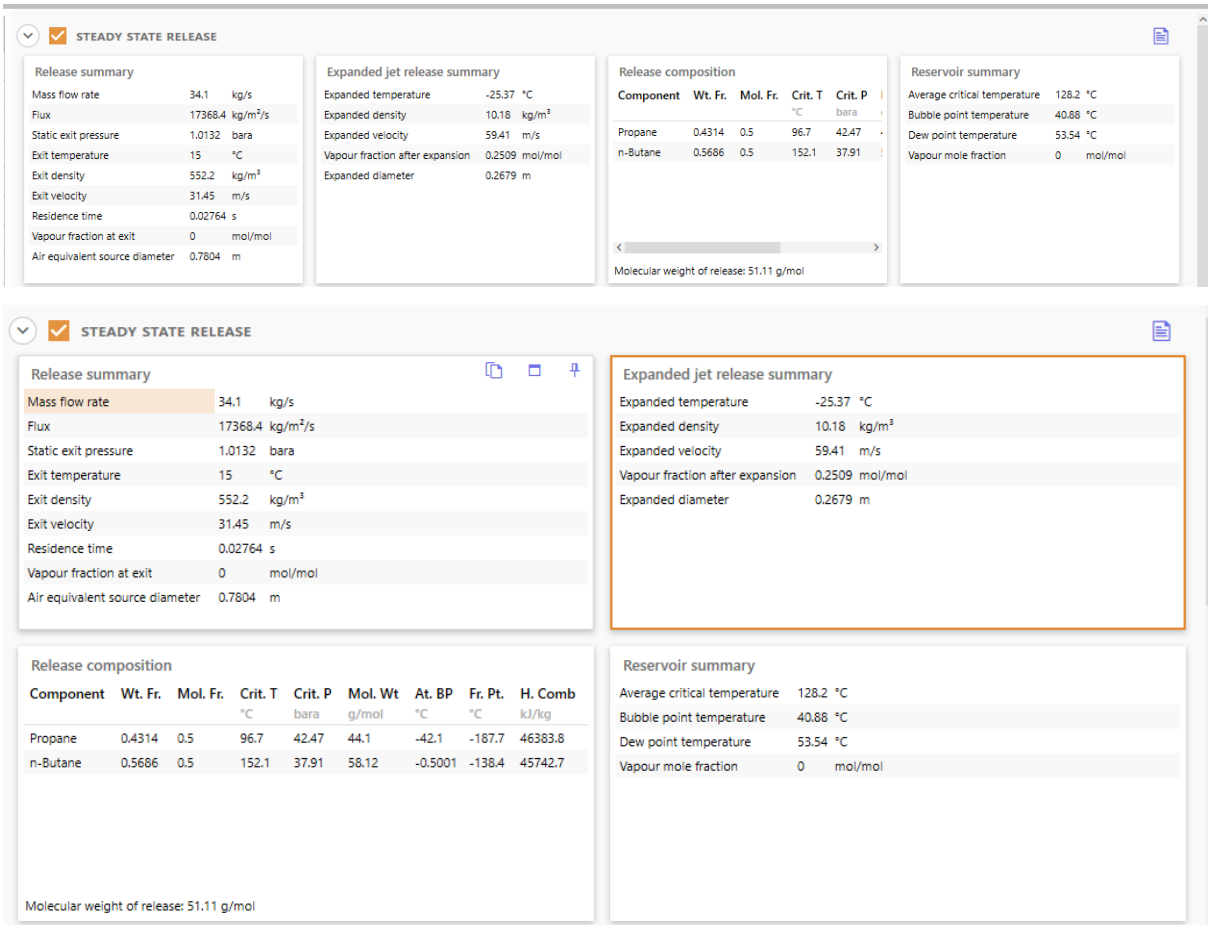


3.5 Improvements to Result Panels

- An option has been added to the Chart menu to allow charts to be defined as isometric. This ensures that the maximum range (either in the x or y direction) is determined and used to modify both x- and y- axes to have the same range. Note this was the default option in FRED 7.1. In the example below, the image on the left shows the standard approach currently used in FRED 2022/2023, whilst the image on the right shows the chart after selecting isometric, where the y-axis now extends to 120 m to match the x-axis in this example.



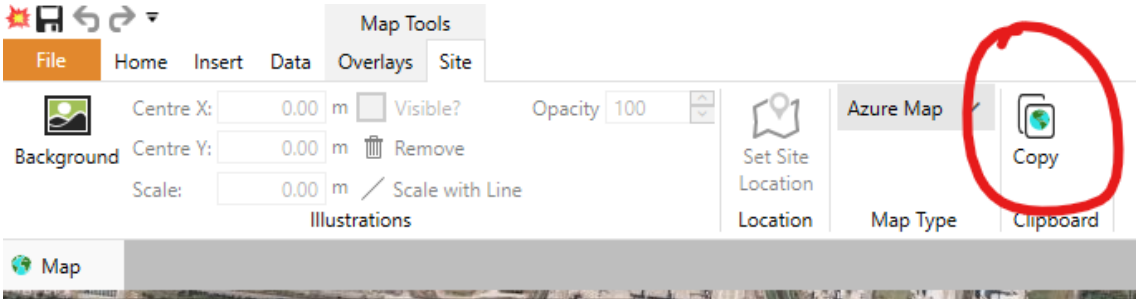
- An option to adjust the minimum width of the results panels has been added. This enables the number of panels that can be shown in one row to be adjusted to accommodate different screen sizes or for a user's preference to show more information, for instance, on the reservoir composition result panel. A choice of narrow (first image below), standard or wide (second image below) can be selected in File | Settings.



3.6 Minor Enhancements

- The Undo / Redo functionality has been improved, and the following updates have been made:
  - The Undo / Redo functionality is no longer reset after calculation is pressed.
  - Changes to the input fields on a scenario can now be reverted to a previous value.
  - Changes to the input fields for a custom fluid can now be reverted to a previous value.
  - The action of selecting a scenario is no longer added to the Undo queue.

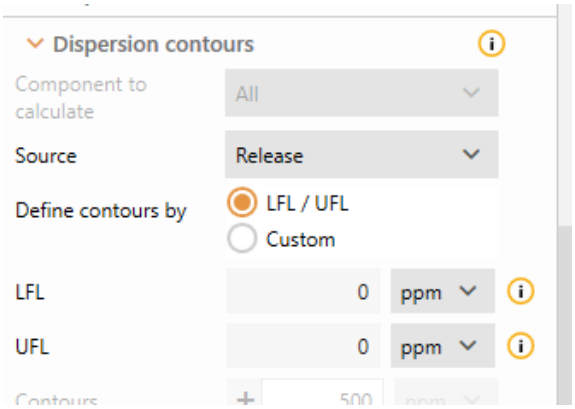
- It is now possible to take a screenshot of the current map view using the following icon on the Site menu. The screenshot can then be pasted into email or documents.



- A legend has been added to the Temperature Profile chart in the Temperature Rise scenario.
- When associating Receivers with a scenario, the right click functionality in the Scenario Explorer and the map has been removed to make the functionality of the Add Receiver interface less ambiguous.



- A warning and tooltip are now displayed adjacent to the "calculated" input values within a parent scenario when the value of that input is different in its child variant scenarios. This can affect the calculation of LFL/UFL and mass flow rate.



- If the user accidentally deletes a scenario (either by using the icon in the Scenario Explorer or pressing delete), then no confirmation dialog is shown. This was intended because the change could be reverted via the undo option. However, following requests from some users, it is now possible to enable a confirmation dialog to check if the scenario should be deleted. This is enabled in the File | Settings menu.

4. Bug Fixes

4.1 Science

- The calculation of expanded exit conditions in Pressurised Release scenario has now been fixed. The bug, which was introduced in FRED 2023, occurred when handling a custom fluid with one or more components that had a fraction smaller than 1E-6. In these specific cases, FRED 2023 displayed values of 0 for all expanded exit conditions and stopped jet fire and dispersion calculations.
- The source term for dispersion in Cascade scenario has now been corrected. The Cascade scenario will now only calculate dispersion when the model predicts the concentration at the base of the tank is above LFL.
- An issue using the standard fluid crude oil in the Cascade scenario has been fixed. In FRED 2023 this was causing FRED to become unstable.

4.2 User Interface

- An unexpected crash when importing Pressurised Release scenario data from Excel has been fixed. This could occur in FRED 2023 if the user modified either release height or release angle to create a variant for these two input parameters.
- An issue with the calculation of variants after the local units were updated has been resolved. In previous versions of FRED, the internal values were not correctly stored in the variant scenarios when the units were altered in between modifying variants. The unit change is now correctly implemented for all variant scenarios belonging to a parent scenario.
- Fixed issue with the display of contours for scenarios with a single contour and where variants had been defined (Dense Gas and CAM scenarios). In FRED 2023, the contours for the parent scenario could not be displayed after showing a contour for a variant.
- The display of values in the chart legend has now been fixed if using a "," as a decimal separator. For instance, in FRED 2023, an LFL value of 19384,6 was represented as 193846 ppm.
- The Chart Format menu is now updated when a different chart is selected within the same sub-model.
- Fixed issue where the contour labels drawn onto the site overlay did not move correctly with the contour when the scenario was moved.
- Corrected the display of contours on the site map when the scenario is moved to an extreme latitude. At locations near the artic circle, the contours in FRED 2023 were stretched along the North – South axes.

- DXF files with measurements defined in mm can now be loaded. Previously the mm scale was interpreted as a distance in metres and FRED tried to scale the elements in the DXF file by ×1000.
- Modified default CAM inputs to ensure that the modified input flag is not triggered following a calculation of the default scenario. Note that these parameters are calculated internally using the simplified methodology and will not change the generated results for the default scenario.
- A problem loading .fr7 files that had Heatup Scenario in which a PRV was defined has been fixed and can now be loaded.
- The display of the interface layer text on the Temperature Rise chart has been improved. This has been rotated through 90° to ensure that the label information that denotes each interface layer can be seen more easily and without the text overlapping.
- Fixed issue with the conversion of units for a few graphs. This includes the concentration units on the toxic dose top view and the user of pressure rather than overpressure on the BLEVE overpressure result panels.
- Resolve issue with the display of the pool fire outline in charts. In previous versions of FRED, this was found to disappear in some circumstance when zooming into and out of chart.
- An issue has been fixed whereby modifying the chart extent (min / max values) reset the currently displayed variant to the first variant.
- Extend maximum extent of chart axis to allow dose charts to display dose contours with a maximum value of 1E20.
- Pressing delete while editing a scenario name no longer cause another scenario to be deleted (this can be another scenario and not the scenario whose name is being modified).
- The Export Scenario Inputs option on the Data Menu was disabled for some workflows. This did not allow users to export the data following specific selections in the Scenario Explorer window. This has now been resolved.
- Added restriction to reset the Undo functionality when importing scenario data from an Excel file. In FRED 2023, this operation could corrupt the Undo list and create unexpected changes, including forcing FRED to close down.
- Fixed crash when create Dense Gas Dispersion button was selected in the Unified Scenario (pool model). This occurred when the Dense Gas Dispersion model had weather variants defined as default values for new scenarios. The pool model was creating a single weather scenario and this caused the crash.

- FRED would crash if a Smoke scenario was connected to a Fire source that has variants defined. In the latest version, FRED will no longer allow users to select scenarios as a fire source if they have variants defined.
- The display of the bubble / dew point graph has been improved to ensure that the crosshair defining current temperature/pressure is always shown.
- The coordinates of the current map view are now saved correctly if the current location is outside Europe / North Africa. In FRED 2023, the view of the site map was shifted when the file was reloaded when working at locations in the Americas and Asia. Note that this did not affect the scenario positions relative to the background location.
- The naming convention for variants that use the character "|" has been improved. This occurred in previous versions of FRED when the name of the parent scenario included the "|" character.
- Fixed issue where the calculation error message that receiver is located within a Jet Fire was not properly displayed. It was shown as just a general error if only one receiver was defined or hidden if two or more receivers were connected to a jet fire model.
- A calculation message has been added to dispersion calculation. The message "Dispersion Top view chart cannot be displayed at contour height XXX" is shown if the user has selected a contour height above the selected concentration.

5. Bibliographic Information

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