



SIL Solver® Enterprise

V1.3.0

User Instructions

SIS-TECH Solutions, LP

We're Proven-in-Use®

Welcome

- Welcome to SIL Solver® Enterprise.
- If you need assistance or would like to provide us with feedback, contact:
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 - asummers@sis-tech.com 713-909-2114

SIL Solver®

We are Proven in Use

- More than 100 companies have chosen SIL Solver® for their functional safety verification since 2002

We Build upon Field Experience

- The built-in SIL Solver® database uses field failure data as a basis, reflecting real-world device performance

We are Internationally Recognized

- SIL Solver® uses internationally recognized methods for PFD and STR calculation
- SIL Solver® is used by companies worldwide

User Instructions

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8. Check in/Check out
9. Troubleshooting

1. ACCESSING THE APPLICATION

- Licensing
- Assigning username and password for new user
- Hierarchy
- Security Profiles
- List of Rights
- Login

Licensing

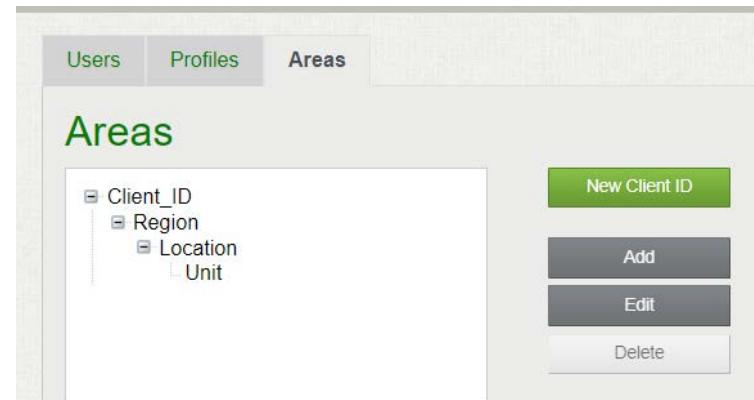
- SIL Solver® is licensed software
 - Each enterprise license includes one administrator account and two read-write licenses
 - Additional user (read-write) licenses can be purchased
 - Fixed number of Read-Only seats with software at no additional cost
- To request a quote for a new license, contact SIS-TECH at:
<http://sis-tech.com/applications/sil-solver>

Assigning username and password to new user

- Assignment of usernames is performed through the *administrator account*.
 - With SSO enable
 - Company email id credentials are used to login
 - Non-SSO version
 - Administrator or user can change password
- The administrator account also creates hierarchy and security access levels within the server
 - These are addressed in the “*SIL Solver® Enterprise Admin How To Guide V1-3-0*”

Hierarchy

- Project hierarchy has 4 levels:
 - Company/Client Name
 - Region
 - Location
 - Unit
 - Project1
 - Project2...



- Project lies under unit. A Client ID can have multiple Regions, Locations and Units.
- For a user to be able to create new projects or import, minimum unit level access be given
- Note: 30 is the max. character length for client, region, location & unit.

Security Profiles

- 3 Default Profiles
 - Admin: Assigned to Admin, rights can not be edited
 - User: rights can be edited
 - Read Only: View only option (Read-Only license)
- Additional Profile
 - Manager: Defined for supervisor to handle project assignment for users



Profile name	Description	Edit Profiles	View Areas	Edit Areas	View Users	Edit Users	Import/Export	Edit Projects	Print Project Reports	Customize DataSheet	Actions
Admin	Full Access	✓	✓	✓	✓	✓	✓	✓	✓	✓	<button>Edit</button> <button>Delete</button>
User	Engineer Level Access	✗	✓	✗	✓	✗	✓	✓	✓	✓	<button>Edit</button> <button>Delete</button>
Project Manager	Manages user assignments within the areas	✗	✓	✓	✓	✗	✓	✓	✓	✓	<button>Edit</button> <button>Delete</button>
Read Only	Profile to be assigned to those with Read-Only license	✗	✗	✗	✗	✗	✗	✗	✓	✗	<button>Edit</button> <button>Delete</button>

List of Rights

- Edit Profiles
 - Can edit profiles under “Profiles” tab
- View Areas
 - View only access to “Areas” tab
- Edit Areas
 - Can edit hierarchy under “Areas” tab
- View Users
 - View only access to “Users” tab
- Edit Users
 - Can edit users under “Users” tab
- Import/Export
 - Right to Import & Export Project and functions
- Edit Projects
 - Can add or edit projects
- Print Project Reports
 - Right to print reports
- Customize Datasheet
 - Can create, delete, promote datasheets, paired with ‘Edit Projects’

Users Profiles Areas

Profiles

Profile name	Description	Edit Profiles	View Areas	Edit Areas	View Users	Edit Users	Import/Export	Edit Projects	Print Project Reports	Customize DataSheet	Actions
Admin	Full Access	✓	✓	✓	✓	✓	✓	✓	✓	✓	<button>Edit</button> <button>Delete</button>
User	Engineer Level Access	✗	✓	✗	✓	✗	✓	✓	✓	✓	<button>Edit</button> <button>Delete</button>
Project Manager	Manages user assignments within the areas	✗	✓	✓	✓	✗	✓	✓	✓	✓	<button>Edit</button> <button>Delete</button>
Read Only	Profile to be assigned to those with Read-Only license	✗	✗	✗	✗	✗	✗	✗	✓	✗	<button>Edit</button> <button>Delete</button>

Login: Username and Password

- Companies purchasing a license to a SIL Solver® application will typically have their own server locations.
- For training classes provided by SIS-TECH, a link to a training server location will be provided.
- Non-SSO version: Login with your assigned Username and Password
- SSO version: Allows login using company credentials without re-entering authentication factors into SIL Solver®

SSO: Single Sign-On



Non-SSO version

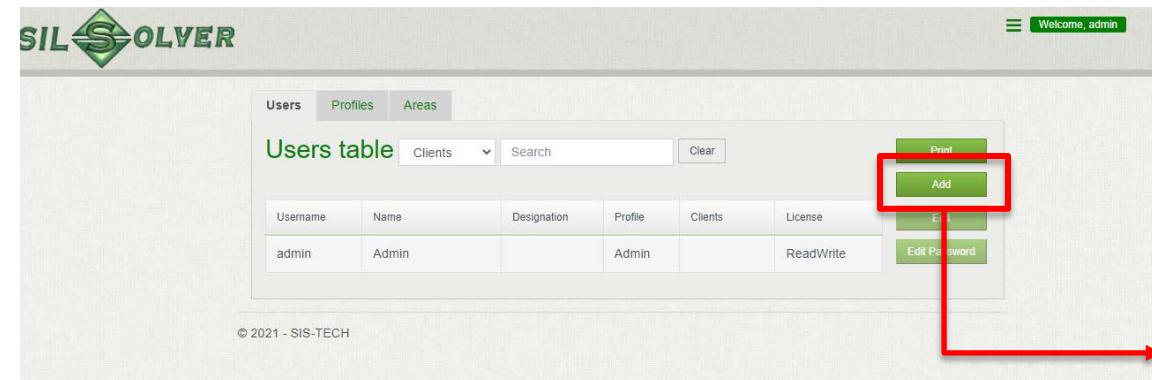
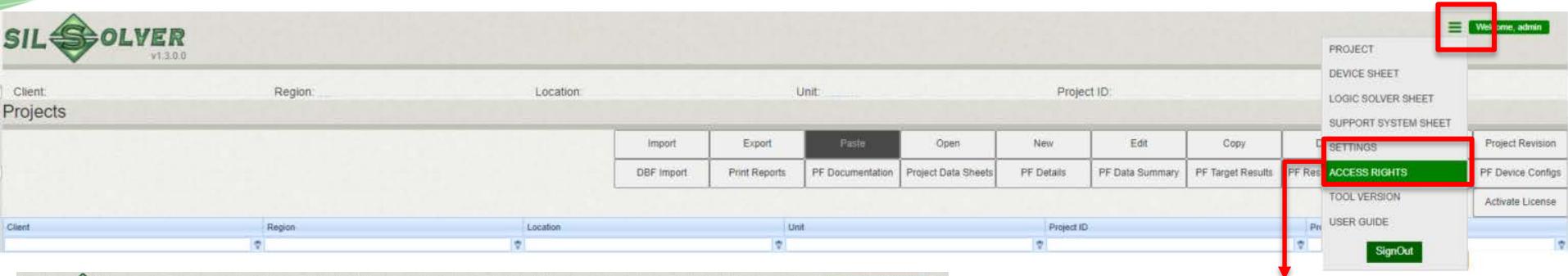


SSO version

2. PROJECT MANAGEMENT

- Setting up a New user
- Editing a User account
- User page: Client Column
- Setting up user with license
- Assigning a security profile
- Adding a New security profile
- Creating Hierarchy: Add Client ID
- Creating Hierarchy: Add Region
- Creating Hierarchy: Add Location
- Creating Hierarchy: Add Unit
- Assigning User to a Hierarchy

Setting up a New User



Select Access rights
to access User tab

The screenshot shows the 'New User' dialog box. It includes fields for 'User name', 'Name', 'Designation', 'Mobile', 'Email', 'License' (set to 'Read and Write'), 'Password', 'Profile' (set to 'Admin'), and a 'Rights' section with checkboxes for various permissions. The 'Rights' section includes checkboxes for: Edit Profiles, View Areas, Edit Areas, View Users, Edit Users, Edit Projects, Import / Export, Print All Project Reports, and Custom Datasheets. At the bottom right are 'Cancel' and 'Save user' buttons.

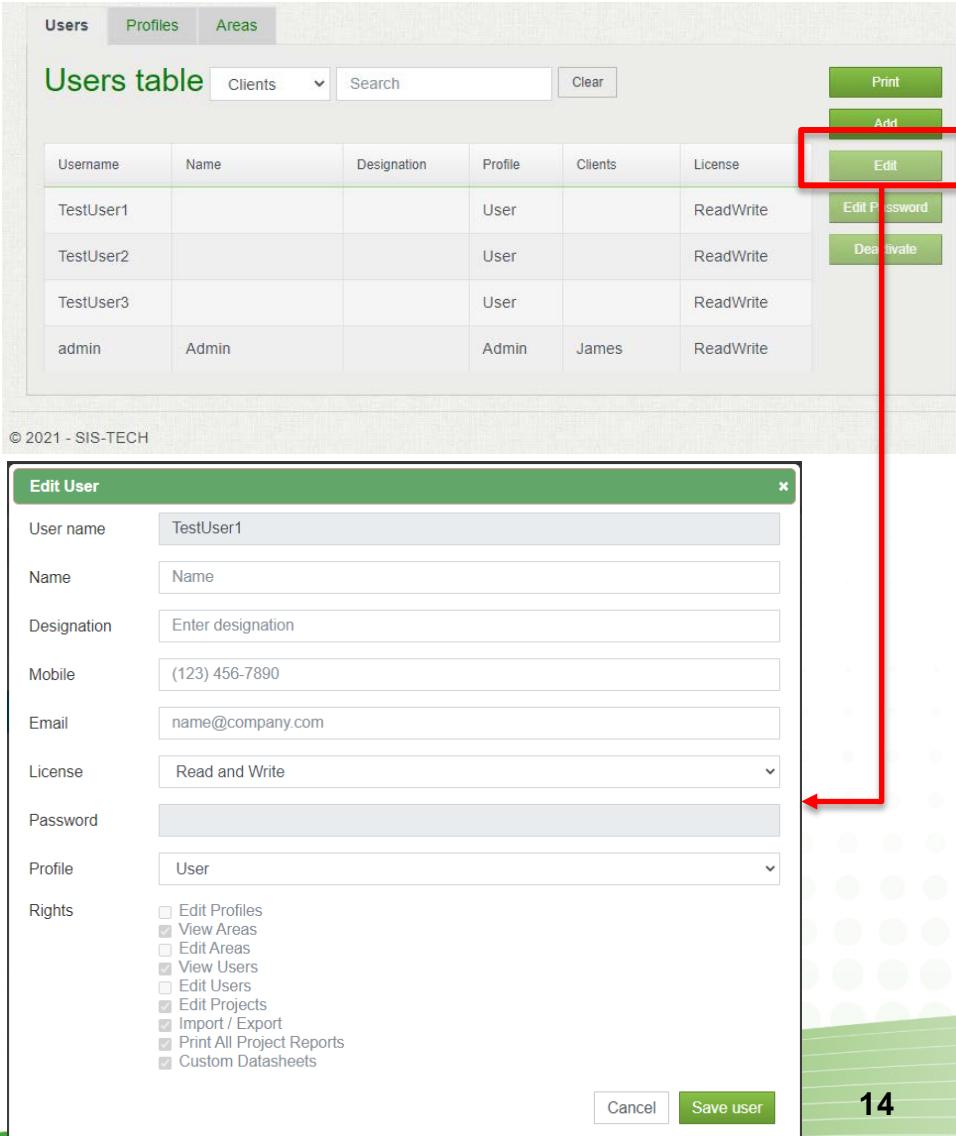
New User	
User name	<input type="text"/>
Name	<input type="text"/>
Designation	<input type="text"/>
Mobile	<input type="text"/>
Email	<input type="text"/>
License	Read and Write
Password	<input type="password"/>
Profile	Admin
Rights	<input type="checkbox"/> Edit Profiles <input type="checkbox"/> View Areas <input type="checkbox"/> Edit Areas <input type="checkbox"/> View Users <input type="checkbox"/> Edit Users <input type="checkbox"/> Edit Projects <input type="checkbox"/> Import / Export <input type="checkbox"/> Print All Project Reports <input type="checkbox"/> Custom Datasheets
<input type="button" value="Cancel"/> <input type="button" value="Save user"/>	

- Login with Admin account to create new user accounts
- User page can be accessed from menu under Access Rights to create new users
- Assign License, Password and Profile.

Note: Once username is created, it can not be renamed or deleted.

Editing a User account

- Edit the user account properties
- Deactivate the unused user account, it will remove the user login rights.
- Deactivating the account will release the used license
- User list can be printed from Print button
- Non-SSO version: Password can be set or changed in SIL Solver®
- SSO-version: Passwords are managed outside software



The screenshot shows the SIS-TECH software interface. At the top, there are three tabs: 'Users', 'Profiles', and 'Areas'. The 'Users' tab is selected. Below the tabs is a search bar with 'Clients' and 'Search' buttons, and a 'Clear' button. To the right of the search bar are several green buttons: 'Print', 'Add', 'Edit' (which is highlighted with a red box), 'Edit Password', and 'Deactivate'. The main area is a table titled 'Users table' with columns: Username, Name, Designation, Profile, Clients, and License. The table contains four rows: 'TestUser1' (User, Admin, ReadWrite), 'TestUser2' (User, Admin, ReadWrite), 'TestUser3' (User, Admin, ReadWrite), and 'admin' (Admin, James, ReadWrite). At the bottom of the table is a copyright notice: '© 2021 - SIS-TECH'. Below the table is an 'Edit User' dialog box. The dialog box has fields for 'User name' (TestUser1), 'Name' (Name), 'Designation' (Enter designation), 'Mobile' ((123) 456-7890), 'Email' (name@company.com), 'License' (Read and Write), 'Password' (empty), and 'Profile' (User). The 'Rights' section contains a list of checkboxes, many of which are checked: Edit Profiles, View Areas, Edit Areas, View Users, Edit Users, Edit Projects, Import / Export, Print All Project Reports, and Custom Datasheets. At the bottom of the dialog box are 'Cancel' and 'Save user' buttons. A red box and an arrow point to the 'Edit' button in the top right of the main interface and the 'Edit' button in the 'Edit User' dialog box, respectively.

Username	Name	Designation	Profile	Clients	License
TestUser1		User			ReadWrite
TestUser2		User			ReadWrite
TestUser3		User			ReadWrite
admin	Admin	Admin	James		ReadWrite

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Edit User

User name	TestUser1
Name	Name
Designation	Enter designation
Mobile	(123) 456-7890
Email	name@company.com
License	Read and Write
Password	
Profile	User
Rights	<input type="checkbox"/> Edit Profiles <input checked="" type="checkbox"/> View Areas <input type="checkbox"/> Edit Areas <input checked="" type="checkbox"/> View Users <input type="checkbox"/> Edit Users <input checked="" type="checkbox"/> Edit Projects <input checked="" type="checkbox"/> Import / Export <input checked="" type="checkbox"/> Print All Project Reports <input checked="" type="checkbox"/> Custom Datasheets

Cancel Save user

User Page: Client Column

- Drop down option to change the column view from Clients to Projects
- Gives an overall view of area assignment to a user, from top client level to project level.

The screenshot shows a user interface for managing user profiles. At the top, there are three tabs: 'Users', 'Profiles', and 'Areas'. The 'Users' tab is selected. Below the tabs, the title 'Users table' is displayed. A dropdown menu is open, showing options: 'Clients' (which is selected and highlighted with a red box), 'Regions', 'Locations', 'Units', and 'Projects'. To the right of the dropdown is a search bar with a 'Clear' button. The main area contains a table with four columns: 'Username', 'Name', 'Designation', and 'Profile'. The 'Profile' column is currently set to 'Clients' (highlighted with a red box). The table data is as follows:

Username	Name	Designation	Profile	License
TestUser1		User	Clients	ReadWrite
TestUser2		User	Clients	ReadWrite
TestUser3		User	Clients	ReadWrite
admin	Admin	Admin	Clients	ReadWrite

On the right side of the table, there is a vertical column of buttons: 'Print', 'Add', 'Edit', 'Edit Password', and 'Deactivate'. At the bottom left of the table area, the text '© 2021 - SIS-TECH' is visible.

Setting up User with License

- Select the License type for the user.
 - Read and Write:
 - Can work on projects
 - Read Only
 - Can only print reports, project editing is not allowed(Read only license gets Read only Profile automatically)
 - Inactive
 - No login to SIL Solver®

Edit User

User name	User1
Name	Name
Designation	Enter designation
Mobile	(123) 456-7890
Email	name@company.com
License	Read and Write
Authentication	Read and Write
Profile	User
Rights	<input type="checkbox"/> Edit Profiles <input checked="" type="checkbox"/> View Areas <input type="checkbox"/> Edit Areas <input checked="" type="checkbox"/> View Users <input type="checkbox"/> Edit Users <input checked="" type="checkbox"/> Edit Projects <input checked="" type="checkbox"/> Import / Export <input checked="" type="checkbox"/> Print All Project Reports <input checked="" type="checkbox"/> Custom Datasheets

Assigning a Security Profile

The screenshot shows the SIS-TECH application interface for managing users. At the top, there are tabs for 'Users', 'Profiles', and 'Areas'. Below the tabs is a search bar with 'Clients' and 'Search' buttons, and a 'Clear' button. On the right side of the table are buttons for 'Print', 'Add', 'Edit', 'Edit Password', and 'Deactivate'. The 'Edit Password' button is highlighted with a red box and a red arrow pointing to the text 'Edit Password unavailable in SSO version'. The 'Edit' button is also highlighted with a red box and a red arrow pointing to the text 'Select User and click on "Edit"'. The 'Edit User' dialog is open, showing fields for 'User name' (TestUser1), 'Name' (Name), 'Designation' (Enter designation), 'Mobile' ((123) 456-7890), 'Email' (name@company.com), 'License' (Read and Write), and 'Password' (a placeholder field). The 'Profile' field is set to 'User', and the 'Rights' field is a dropdown menu with options: Admin, User (selected), Manager, Read Only, Unique, and Edit User. The 'Edit User' dialog has 'Cancel' and 'Save user' buttons at the bottom. The 'Edit Password' button in the dialog is also highlighted with a red box and a red arrow pointing to the text 'Edit Password unavailable in SSO version'.

Assign Security Profile

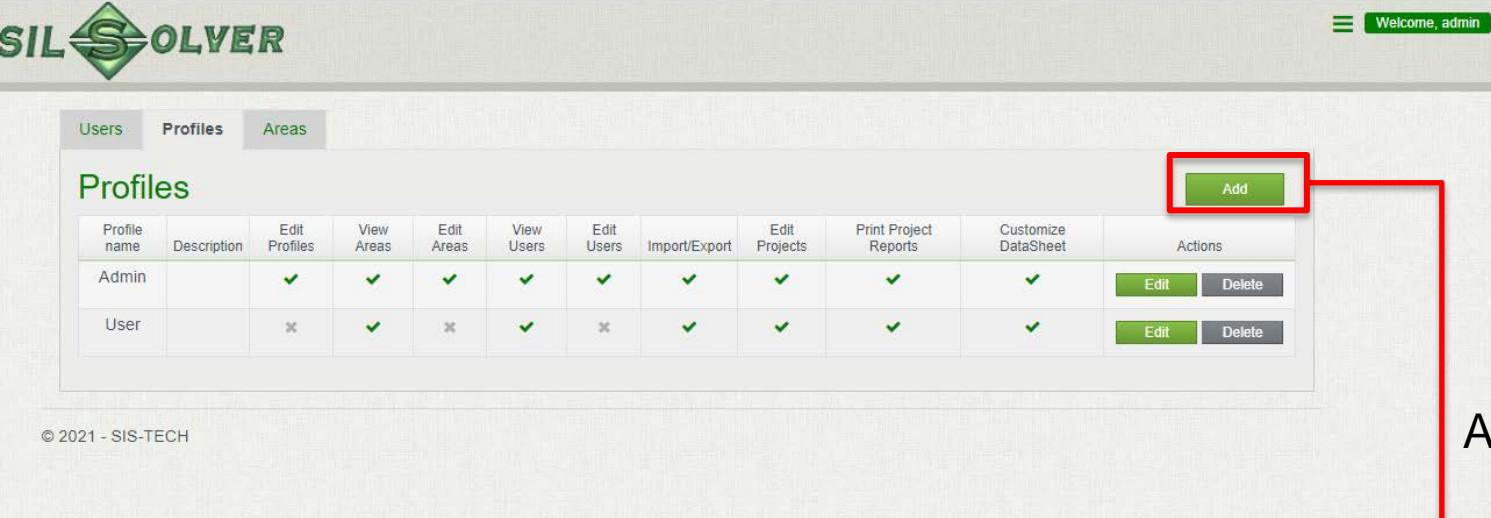
Select User and click on "Edit"

Edit Password unavailable in SSO version

Tool use is affected by combination of license and security profile

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Adding New Security Profile



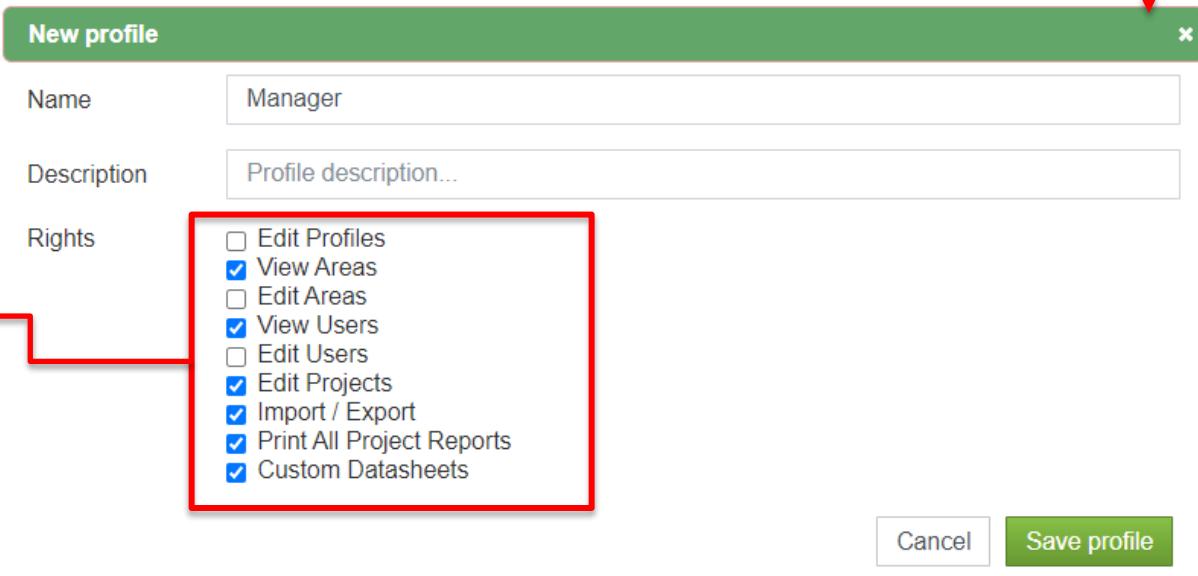
Welcome, admin

Profiles

Profile name	Description	Edit Profiles	View Areas	Edit Areas	View Users	Edit Users	Import/Export	Edit Projects	Print Project Reports	Customize DataSheet	Actions
Admin		✓	✓	✓	✓	✓	✓	✓	✓	✓	<button>Edit</button> <button>Delete</button>
User		✗	✓	✗	✓	✗	✓	✓	✓	✓	<button>Edit</button> <button>Delete</button>

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Add profile



New profile

Name: Manager

Description: Profile description...

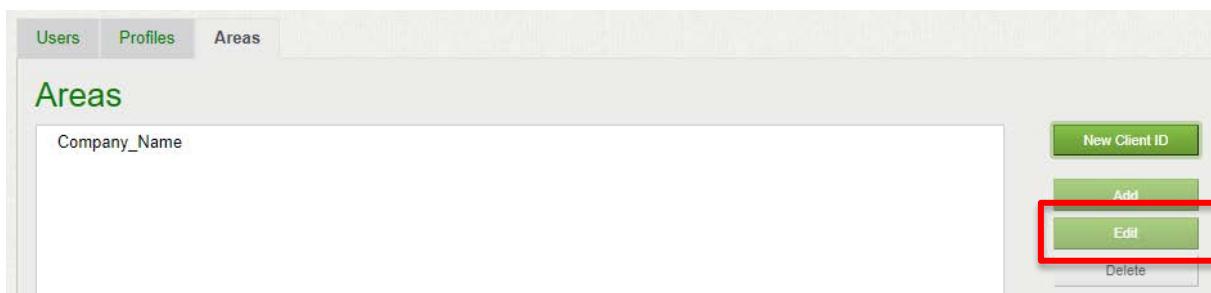
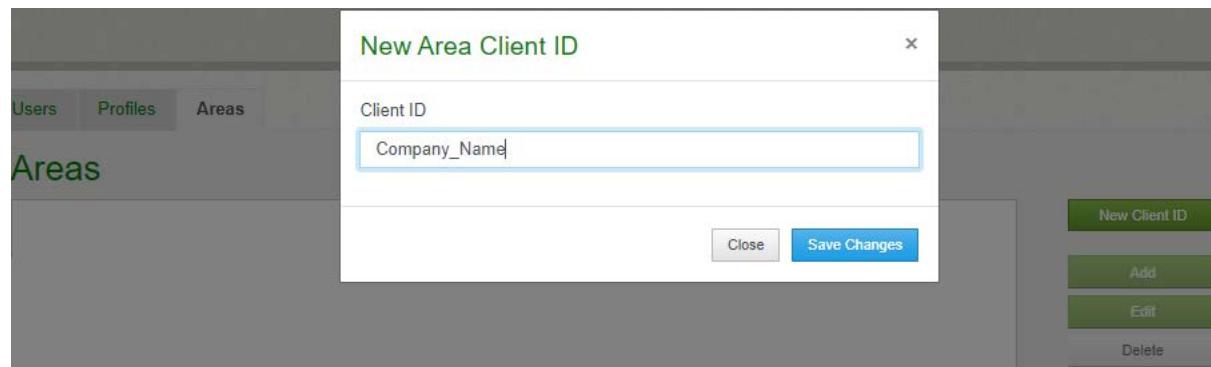
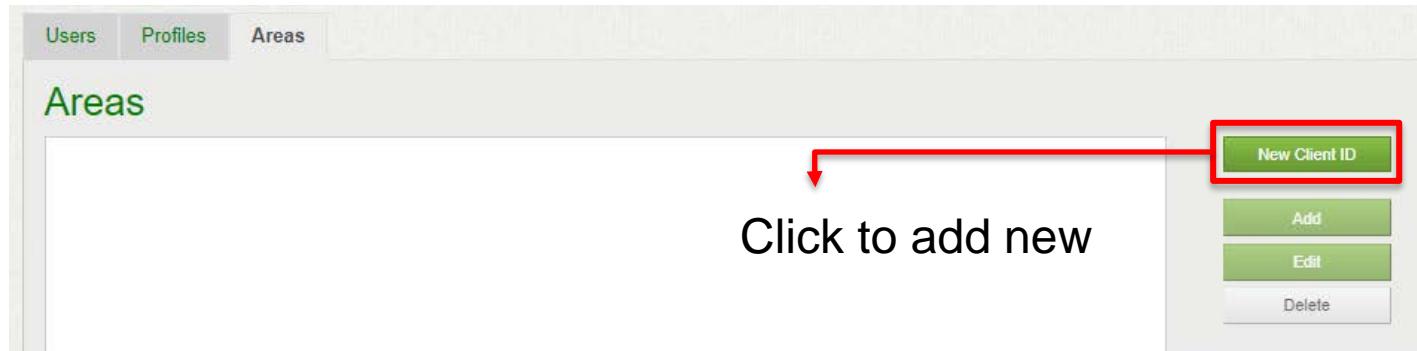
Rights

- Edit Profiles
- View Areas
- Edit Areas
- View Users
- Edit Users
- Edit Projects
- Import / Export
- Print All Project Reports
- Custom Datasheets

Cancel Save profile

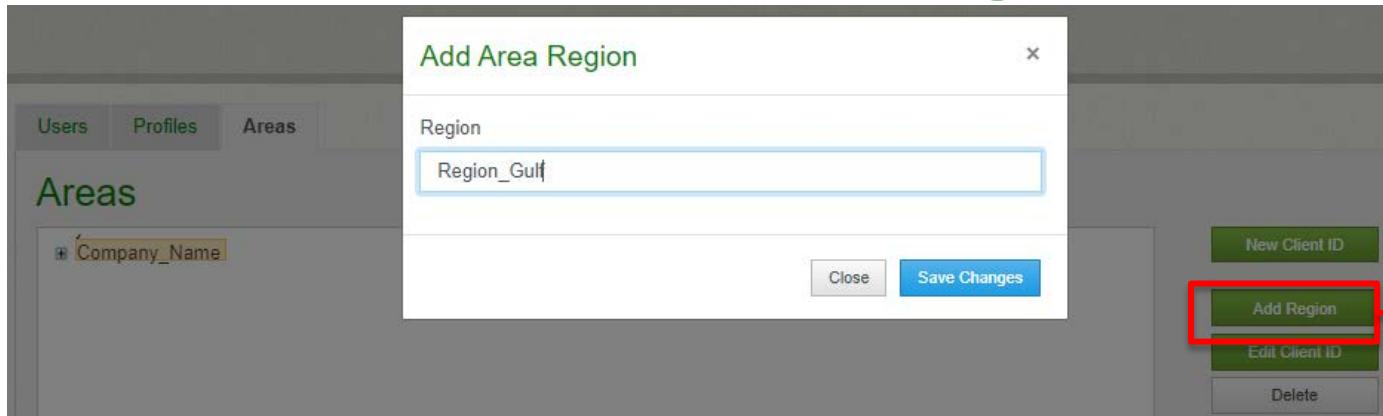
Define profile rights

Creating Hierarchy: Add Client ID

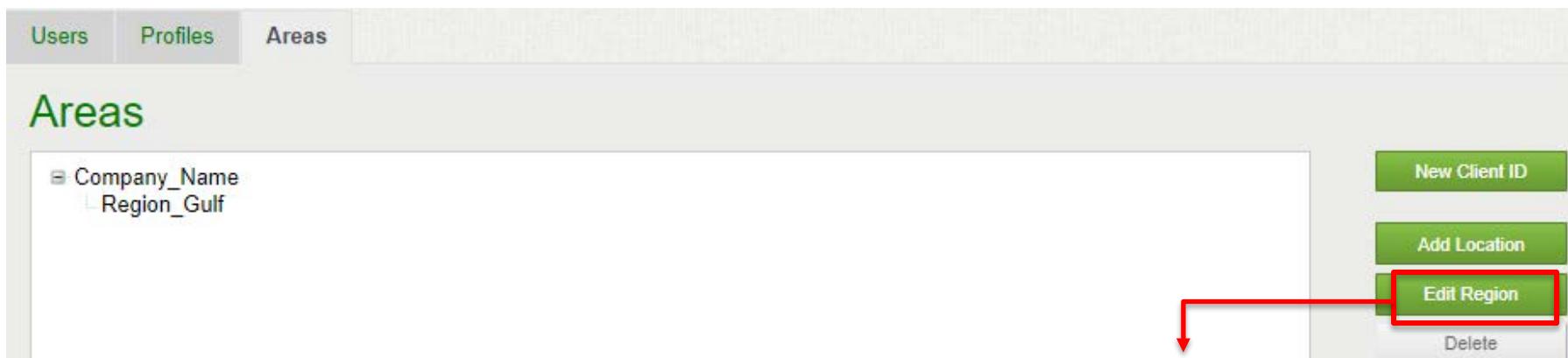


Edit Button: A Client ID can be renamed later

Creating Hierarchy: Add Region

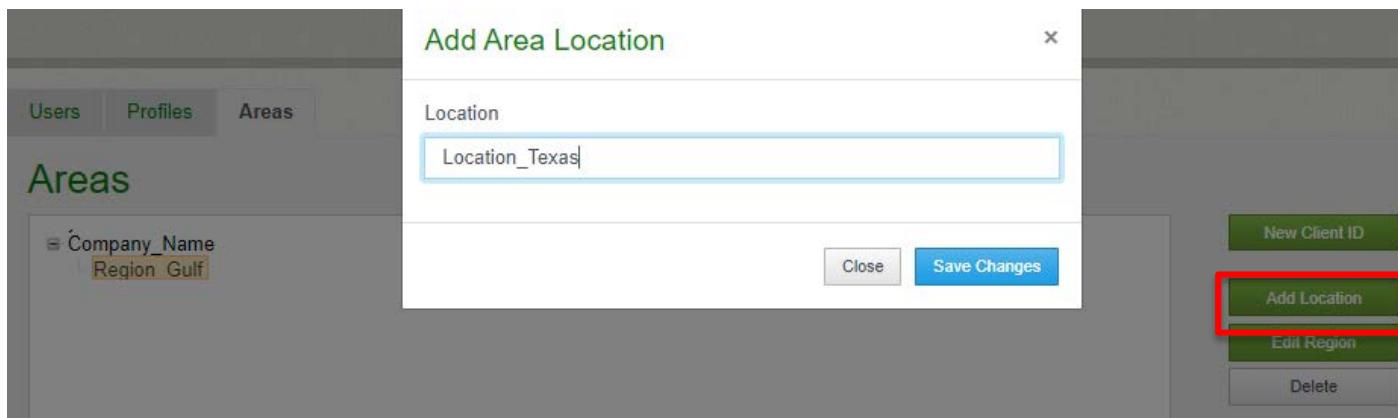


Select added client ID & click "Add region"

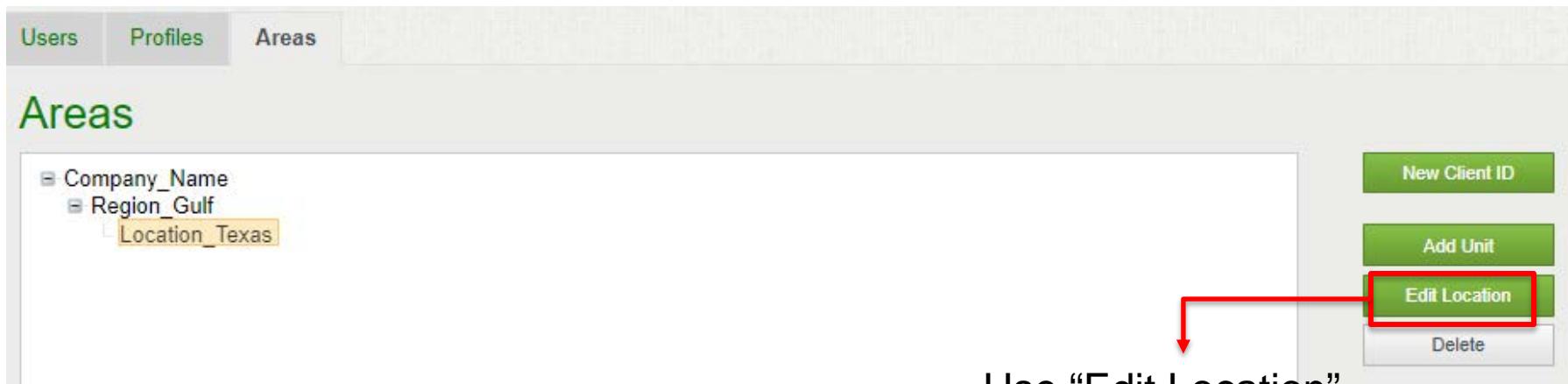


Use "Edit Region" to rename later

Creating Hierarchy: Add Location

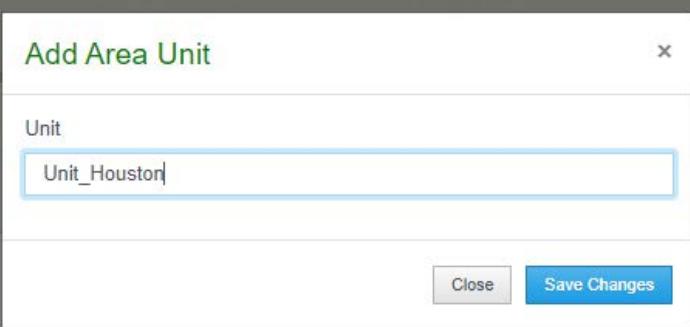


Select added region & click “Add Location”



Use “Edit Location” to rename later

Creating Hierarchy: Add Unit



Users Profiles Areas

Areas

- Company_Name
- Region_Gulf
- Location_Texas

Add Area Unit

Unit: Unit_Houston

Close Save Changes

New Client ID

Add Unit (boxed)

Edit Location

Delete

Add Unit under Location



Users Profiles Areas

Areas

- Company_Name
- Region_Gulf
- Location_Texas
 - Unit_Houston

New Client ID

Add Project

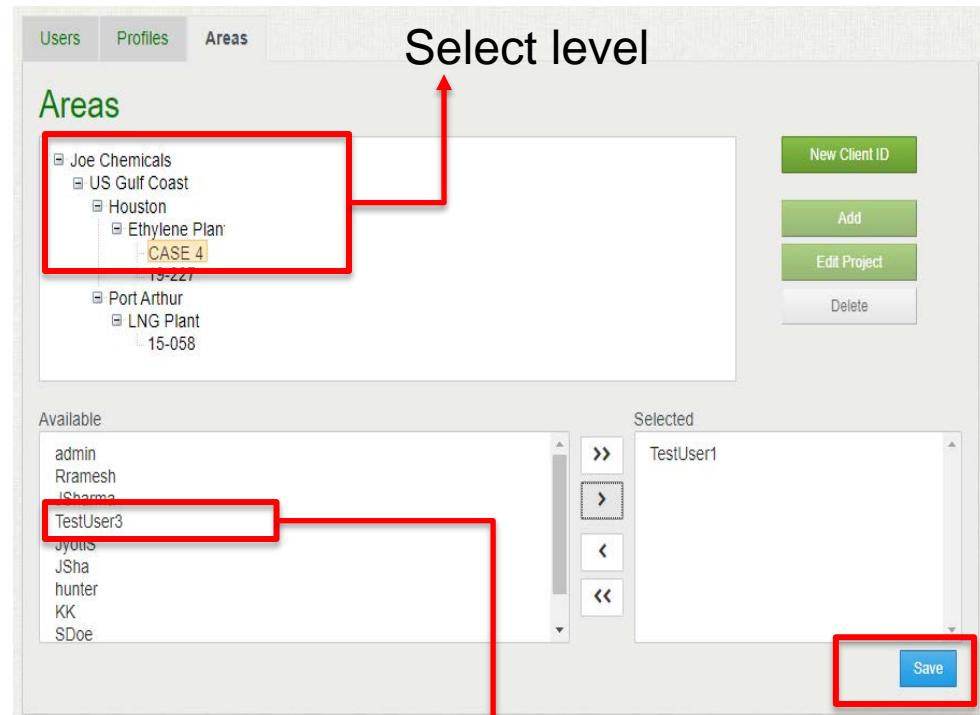
Edit Unit (boxed)

Delete

Use "Edit Unit" to rename later

Manage User Access

- Access to a Hierarchy Level
 - Select the level (unit or higher)
 - Select the username and move it from “Available” to “Selected” section
 - Save
 - All the projects under that level will be accessible by user
 - User need
- Access to a Project
 - Select the Project
 - Select the username and move it from “Available” to “Selected” section
 - Save
 - User can edit assigned project but can add new projects



Select level
Move selected user to the right and save

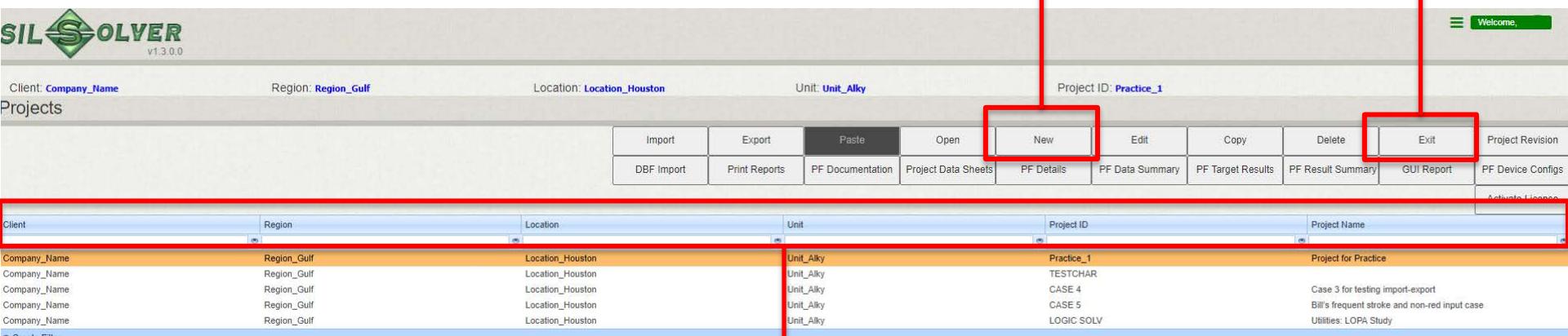
3. CREATING A NEW PROJECT

- Create New Project
- Setting up the project information
- Creating a safety function
- Copying a safety function
- Editing a safety function

Create New Project

Starting a new project

Exit the software



SIL SOLVER v1.3.0.0

Welcome

Client: Company_Name Region: Region_Gulf Location: Location_Houston Unit: Unit_Alky Project ID: Practice_1

Projects

Import Export Paste Open New Edit Copy Delete Exit Project Revision

DBF Import Print Reports PF Documentation Project Data Sheets PF Details PF Data Summary PF Target Results PF Result Summary GUI Report PF Device Configs

Client	Region	Location	Unit	Project ID	Project Name
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	Practice_1	Project for Practice
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	TESTCHAR	Case 3 for testing import-export
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	CASE 4	Bill's frequent stroke and non-red input case
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	CASE 5	Utilities: LOPA Study
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	LOGIC SOLV	

Create Filter

Project List
Filters may be useful to users with long project lists

Create New Project

SIL SOLVER v13.0.0

Client: Company_Name Region: Region_Gulf Location: Location_Houston Unit: Unit_Alky Project ID: Practice

Projects

		Import	Export	Paste	Open	New	Edit	Copy	Delete	Exit	Project Revision
		DBF Import	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary	GUI Report	PF Device Configs
Client	Region	Location	Unit	Project ID		Project Name					
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	Practice		Practice Setting up					

Create Filter

Add New Project

Client Id:	Company_Name
Region:	Region_Gulf
Location:	Location_Texas
Unit:	Unit_Houston
Project ID:	<input type="text"/>
Name:	<input type="text"/>

Save Close

Add New Project

Client Id:	Company_Name
Region:	Region_Gulf
Location:	Location_Houston
Unit:	Unit_Alky
Project ID:	Practice
Name:	Practice Setting up

Save Close

• Click on “New” to create a project
 • A project name within the client ID should be unique

The window (shown on left) pops up, type in relevant information and click “Save”

Note: Project ID is limited to 10 characters. Avoid using an underscore “_” in project name

Project Revision Data

SIL SOLVER v1.3.0.0

Client: Company_Name Region: Region_Gulf Location: Location_Houston Unit: Unit_Alky Project ID: Practice

Projects

		Import	Export	Paste	Open	New	Edit	Copy	Delete	Exit	Project Revision
		DBF Import	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary	GUI Report	PF Device Configs
Client	Region	Location	Unit	Project ID		Project Name					
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	Practice		Practice Setting up					

SIL SOLVER v1.3.0.0

Site : Project ID: Practice

Project Version	Performed By	Date	Approved By	Date	New	Open	Delete	Report	Exit
No data to display									

Project Revision

Version: A

Performed By: Jill Hill Date: 19-Jun-2021

Approved By: John Doe Date: 28-Jun-2021

Description of Modification:
Initial Draft

Create initial project revision information

Click “New” to open dialog box, enter data, and Save

Steps for adding a safety function

1. Obtain functional description from Hazard and Risk Analysis (H&RA) documentation
2. Open Project
3. Select new function and enter function identification fields
4. Enter performance targets
5. Enter function architecture through GUI interface and populating the architecture with devices
6. Perform calculation
7. Re-iterate with design modifications, if necessary, to get successful design

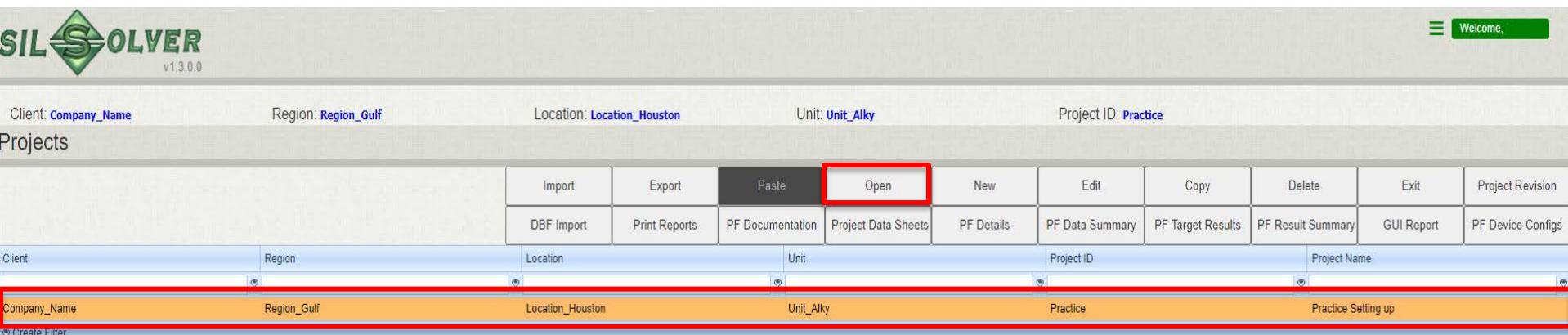
Example SIF

Information from H&RA and related process requirement specification (PRS) information

- SIF 01
- SIL-1 (20% design margin)
- Low Demand mode
- Spurious trip target = 20 yrs
- Desired test interval = 5 yrs
- V-101 High DP (2oo3,DP-101A/B/C) trip closes XV-101A and XV-101B (1oo2) ball valves spring loaded to the closed position, each with a single ETT solenoid (XY-101A and XY-101B)
- Power supply is monitored and is tested at 5 yr interval
- Existing logic solver (SIS-A) is safety configured system with 1oo2D CPU and simplex I/O
- Assume no sensor diagnostic response will be implemented, so no DC credit should be taken

Opening the project

- Start from Project home page
- Select the Project you want to open by left-click (first project in list is selected by default)
- Click Open



SIL SOLVER v1.3.0.0

Welcome

Client: Company_Name Region: Region_Gulf Location: Location_Houston Unit: Unit_Alky Project ID: Practice

Projects

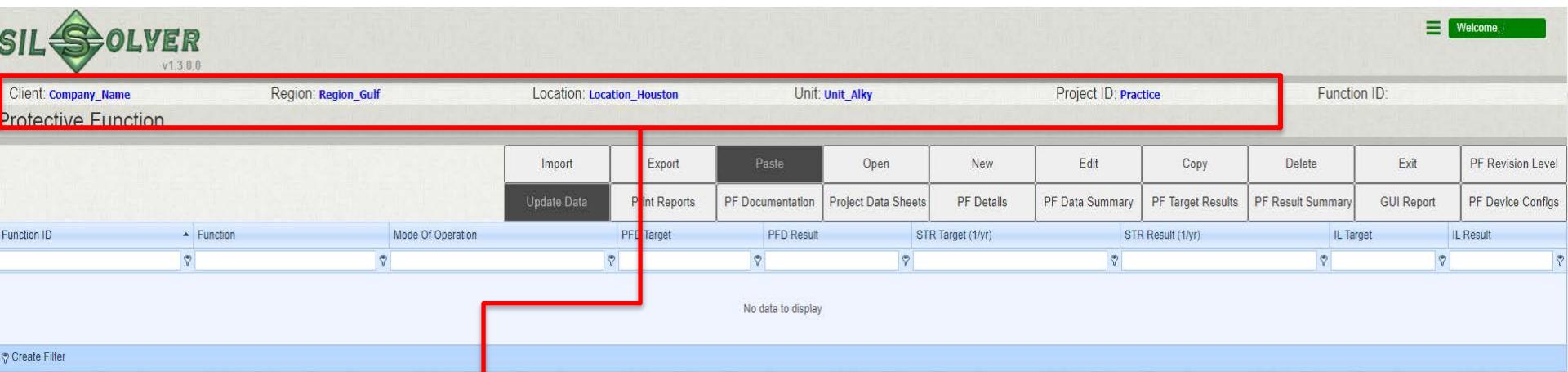
Import	Export	Paste	Open	New	Edit	Copy	Delete	Exit	Project Revision
DBF Import	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary	GUI Report	PF Device Configs

Client	Region	Location	Unit	Project ID	Project Name
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	Practice	Practice Setting up

Create Filter

Protective Function Level

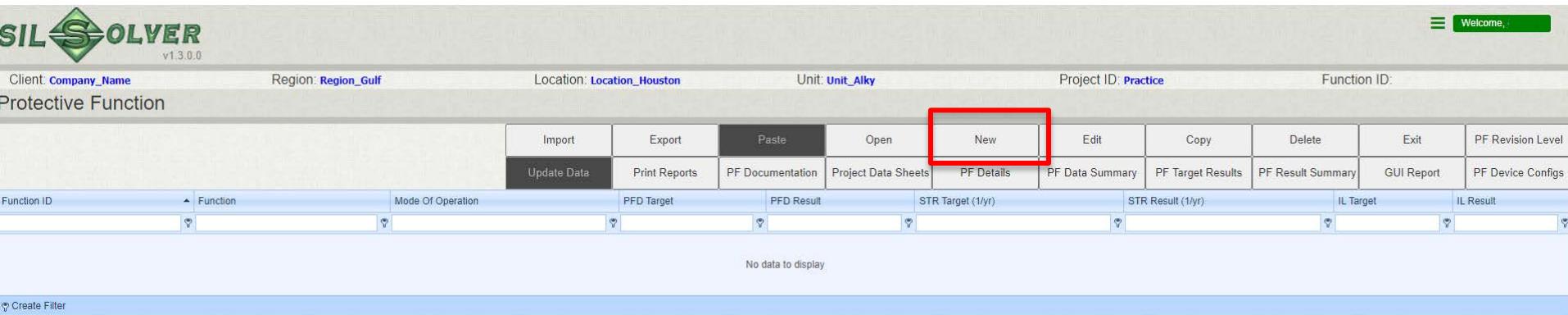
- The general layout is the same as the main page with list of projects



The screenshot shows the SIL SOLVER v1.3.0.0 software interface. At the top, there is a navigation bar with the following items: Client: Company_Name, Region: Region_Gulf, Location: Location_Houston, Unit: Unit_Alky, Project ID: Practice, and Function ID: Protective Function. On the far right of the top bar is a 'Welcome' button. Below the top bar, there is a toolbar with various buttons: Import, Export, Paste, Open, New, Edit, Copy, Delete, Exit, and PF Revision Level. The 'Update Data' button is highlighted with a red box. Below the toolbar, there is a table with columns: Function ID, Function, Mode Of Operation, PFD Target, PFD Result, STR Target (1/yr), STR Result (1/yr), IL Target, and IL Result. Each column has a dropdown arrow icon. A red arrow points from the 'Project ID: Practice' text in the top bar down to the 'Project information.' text in the bottom left. The bottom left also contains a 'Create Filter' button and the text 'No data to display'.

Project information.

Start a new safety function



SIL SOLVER v1.3.0.0

Client: Company_Name Region: Region_Gulf Location: Location_Houston Unit: Unit_Alky Project ID: Practice Function ID:

Protective Function

Import Export Paste Open New Edit Copy Delete Exit PF Revision Level

Update Data Print Reports PF Documentation Project Data Sheets PF Details PF Data Summary PF Target Results PF Result Summary GUI Report PF Device Configs

Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result

No data to display

Create Filter

- Enter Function ID, brief version of function description (e.g., from H&RA), Mode of Operation, and Save

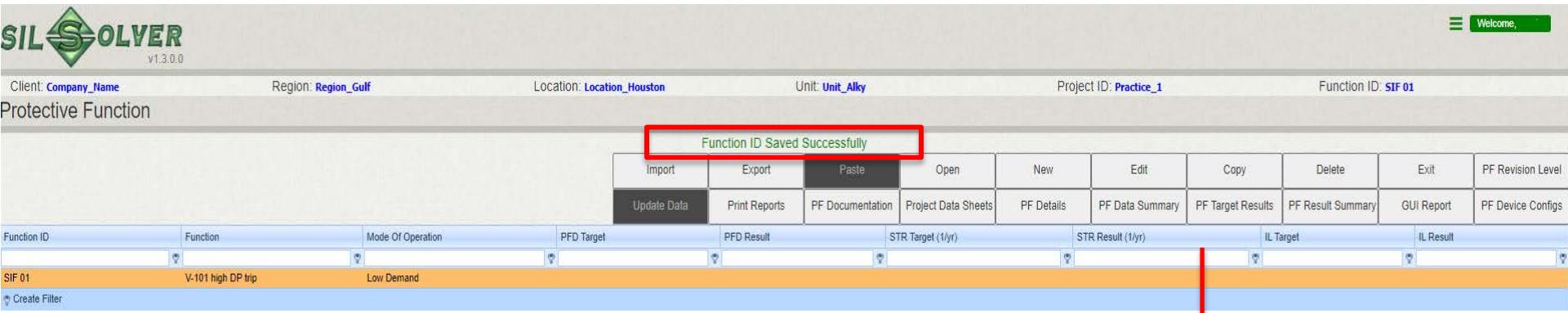
Protective Function

Function ID:	SIF 01
Function :	V-101 High DP trip
Mode of Operation:	Low Demand

Save Close

Note: Function ID is limited to 15 characters.

Select and Open Function



The screenshot shows the SIL SOLVER software interface. At the top, there are navigation links: 'Welcome' (with a gear icon), 'File', 'Edit', 'View', 'Tools', 'Help', and 'About'. Below the header, there are project details: Client: Company_Name, Region: Region_Gulf, Location: Location_Houston, Unit: Unit_Alky, Project ID: Practice_1, and Function ID: SIF 01. The main area is titled 'Protective Function' and displays a table of functions. A message 'Function ID Saved Successfully' is displayed in a red-bordered box above the toolbar. The toolbar includes buttons for Import, Export, Paste, Open, New, Edit, Copy, Delete, Exit, and PF Revision Level. Below the toolbar is a sub-toolbar with buttons for Update Data, Print Reports, PF Documentation, Project Data Sheets, PF Details, PF Data Summary, PF Target Results, PF Result Summary, GUI Report, and PF Device Configs. The table has columns for Function ID, Function, Mode of Operation, PFD Target, PFD Result, STR Target (1/yr), STR Result (1/yr), IL Target, and IL Result. A single row is selected: SIF 01, V-101 high DP trip, Low Demand. A red arrow points from the text 'Fields for filtering can be useful for projects with long lists of protective functions' to the filter dropdowns in the table header.

- Select function and click Open to begin configuring SIF

Fields for filtering can be useful for projects with long lists of protective functions

Function GUI Interface

SIF project information

SIF calculation results both numerical and graphical

HFT for Logic Solver

HFT for Action(s)

HFT for Inputs(s)

HFT for Support System 1

HFT for Support System 2

HFT for Manual Input

HFT for Manual Action

The Backward and Forward buttons only have meaning when you have multiple functions in the project

Modelling panel, where you select system configuration and component.

Client: **Company_Name**
Project ID: **Practice**

Function: **V-101 High DP trip**
Function ID: **SIF 01**

PFDavg **IL** **STR (1/Yr)** **MTTFs (Yr)** **HFT**

PFD/STR Breakdown

HFTIN **HFTLS** **HFTACT**

HFTSPT1 **HFTSPT2** **HFTMIN** **HFTMACT**

SRS
LOGIC SOLVER
INPUT CONFIGURATION
INPUT DEVICE
ACTION CONFIGURATION
ACTION DEVICE
SUPPORT CONFIGURATION
SUPPORT SYSTEM
CUSTOMER DEVICE
MANUAL DEVICE

Calculate and Save

Reset

NoON **NoOFF**

Zooming

Use the + and – buttons to zoom in and out on the figure

You cannot interact with certain features in a zoomed state

Client: **Company_Name** Function: **V-101 High DP trip**
Project ID: **Practice** Function ID: **SIF 01**

Welcome, User Guide **SIL SOLVER**

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT	PFD/STR Breakdown		HFT _{IN}	HFT _{LS}	HFT _{ACT}
TARGETS						PFDavg	STR			
RESULTS						No data	No data			
TARGETS MET?								HFT_{SPT1}	HFT_{SPT2}	HFT_{MIN}
										HFT_{MACT}

Calculate and Save **Reset**

SRS
LOGIC SOLVER
INPUT CONFIGURATION
INPUT DEVICE
ACTION CONFIGURATION
ACTION DEVICE
SUPPORT CONFIGURATION
SUPPORT SYSTEM
CUSTOMER DEVICE
MANUAL DEVICE

Use the Reset to return to the base view required for editing

Entering Performance Targets

Click any cell in Targets row of table to open dialog box

The screenshot shows the SIL SOLVER software interface. At the top, it displays the client information: Company Name (Practice), Function (V-101 High DP trip), and Function ID (SIF 01). The main area features a table titled 'PFD/STR Breakdown' with columns for PFDavg, IL, STR (1/Yr), MTTFs (Yr), and HFT. The 'TARGETS' row is highlighted with a red box. A 'Target Specification' dialog box is open over the table, showing fields for PFDavg (0.08) and MTTFs (Yr) (20). The dialog has an 'Update' button. On the left, a sidebar lists various configuration options: SRS, LOGIC SOLVER, INPUT CONFIGURATION, INPUT DEVICE, ACTION CONFIGURATION, ACTION DEVICE, SUPPORT CONFIGURATION, SUPPORT SYSTEM, CUSTOMER DEVICE, and MANUAL DEVICE.

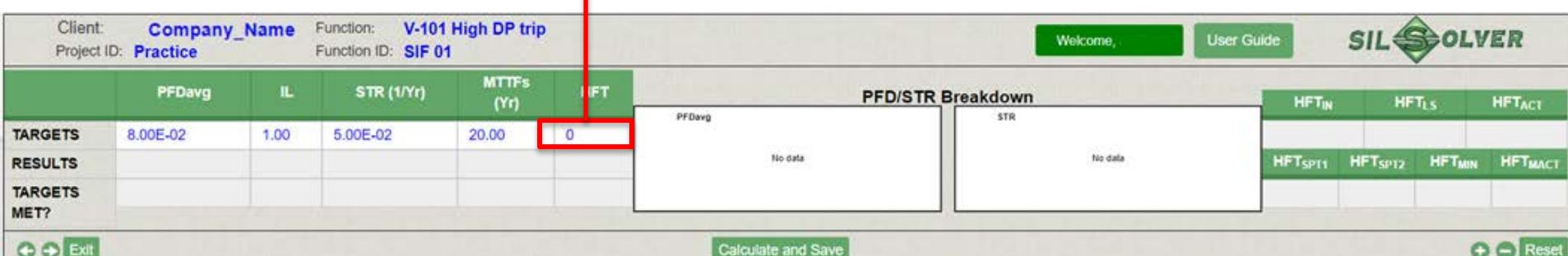
Enter performance targets and update

HFT Target

HFT target is based on the SIL Target and SIS Mode of Operation, following ANSI/ISA61511-1:2018 requirements. If no PFDavg target has been entered (which would result in no SIL target), HFT target will be set to null.

SIL Target	Mode of Operation	HFT target for each subsystem
1	Low Demand	0
1	High Demand	0
2	Low Demand	0
2	High Demand	1
3	Low Demand	1
3	High Demand	1

HFT Target



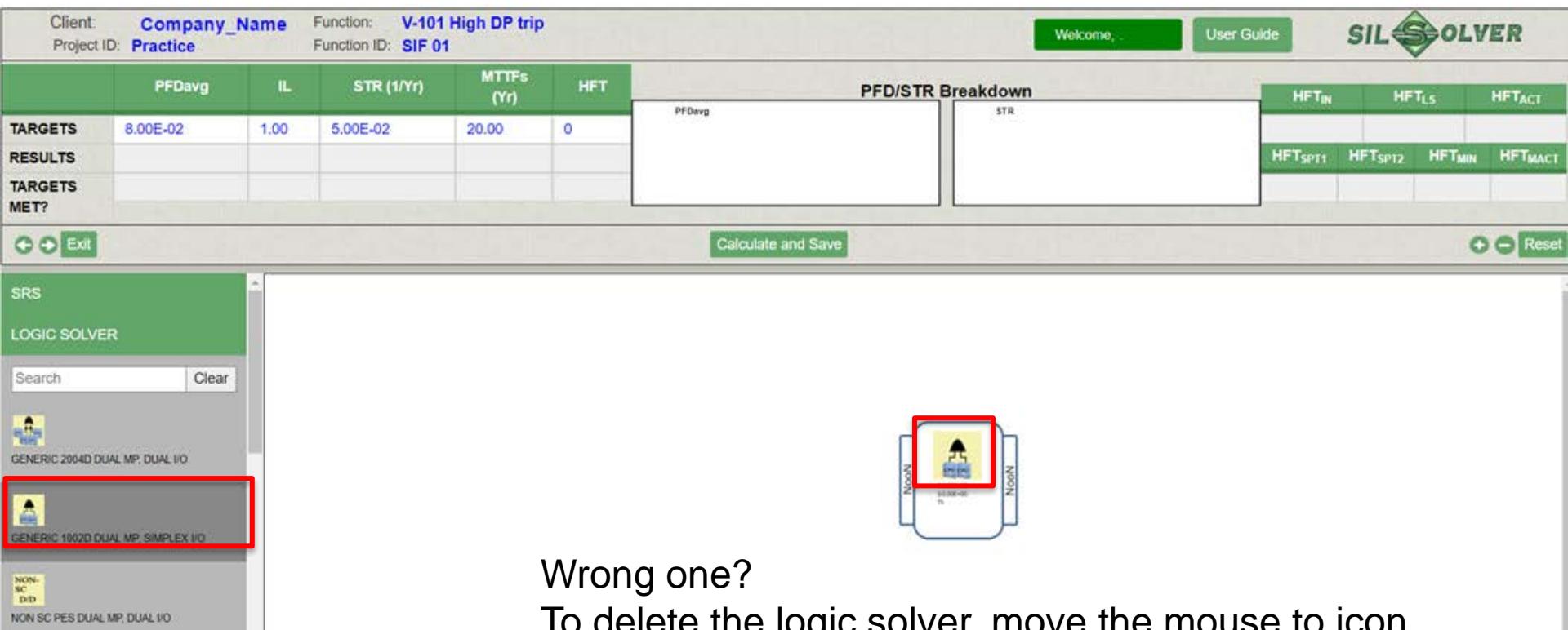
The screenshot shows the SIL SOLVER software interface. At the top, it displays the function as "V-101 High DP trip" and the target as "SIF 01". The main area shows a table for PFDavg and STR breakdowns. A red arrow points to the "HFT" column in the "TARGETS" row, which contains the value "0".

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS	8.00E-02	1.00	5.00E-02	20.00	0
RESULTS					
TARGETS MET?					

Below the table, there is a "PFD/STR Breakdown" section with two empty boxes labeled "PFDavg" and "STR", both with "No data" written inside. To the right, there is a section for "HFT" with columns for HFT_{IN} , HFT_{LS} , and HFT_{ACT} , and sub-sections for HFT_{SPT1} , HFT_{SPT2} , HFT_{MIN} , and HFT_{MAX} .

Picking Logic Solver (LS)

- Select Logic Solver header on left to begin configuration
- Left click desired logic solver to copy and then click in middle box to paste.



The screenshot shows the SIL SOLVER software interface. At the top, there are fields for Client (Company Name: Practice), Function (V-101 High DP trip), and Function ID (SIF 01). To the right are buttons for Welcome, User Guide, and the SIL SOLVER logo. Below this is a table with columns for PFDavg, IL, STR (1/Yr), MTTFs (Yr), and HFT. The table rows include TARGETS, RESULTS, and TARGETS MET?. To the right is a 'PFD/STR Breakdown' section with two empty boxes for PFDavg and STR. Further right is a table for HFT calculations with columns for HFT_{IN}, HFT_{LS}, and HFT_{ACT}, and sub-columns for HFT_{SPT1}, HFT_{SPT2}, HFT_{MIN}, and HFT_{MAX}. At the bottom left is a 'LOGIC SOLVER' panel with a search bar and a list of logic solvers. The 'GENERIC 1002D DUAL MP, SIMPLEX I/O' item is highlighted with a red box. To the right is a 'PICK LOGIC SOLVER' dialog box with a red box around the icon of the selected logic solver. The text 'Wrong one?' is displayed below the dialog.

Wrong one?

To delete the logic solver, move the mouse to icon, right click to make the delete option appear, left click on the delete option

Adding LS details

Left click the logic solver icon on in the center box. Enter a logic solver tag name, select the voting (may be only one option), and enter the test interval (TI)

Note: the voting needs to be selected before test interval.

Caution: Logic Solver test interval may be prescribed in vendor safety manual or prior use justification documentation

Tool will automatically calculate LS contributions to PFDavg and STR

Logic Solver

Logic Solver ID: DMSIO

Logic Solver Type: GENERIC 1002D DUAL MP; SIMPLEX I/O

Configurations:

Logic Solver Tag: SIS-A

Voting: 1oo2D

Proof Testing Interval (yr): 5

PFDavg: 4.92E-04 STR: 4.50E-02

Note:

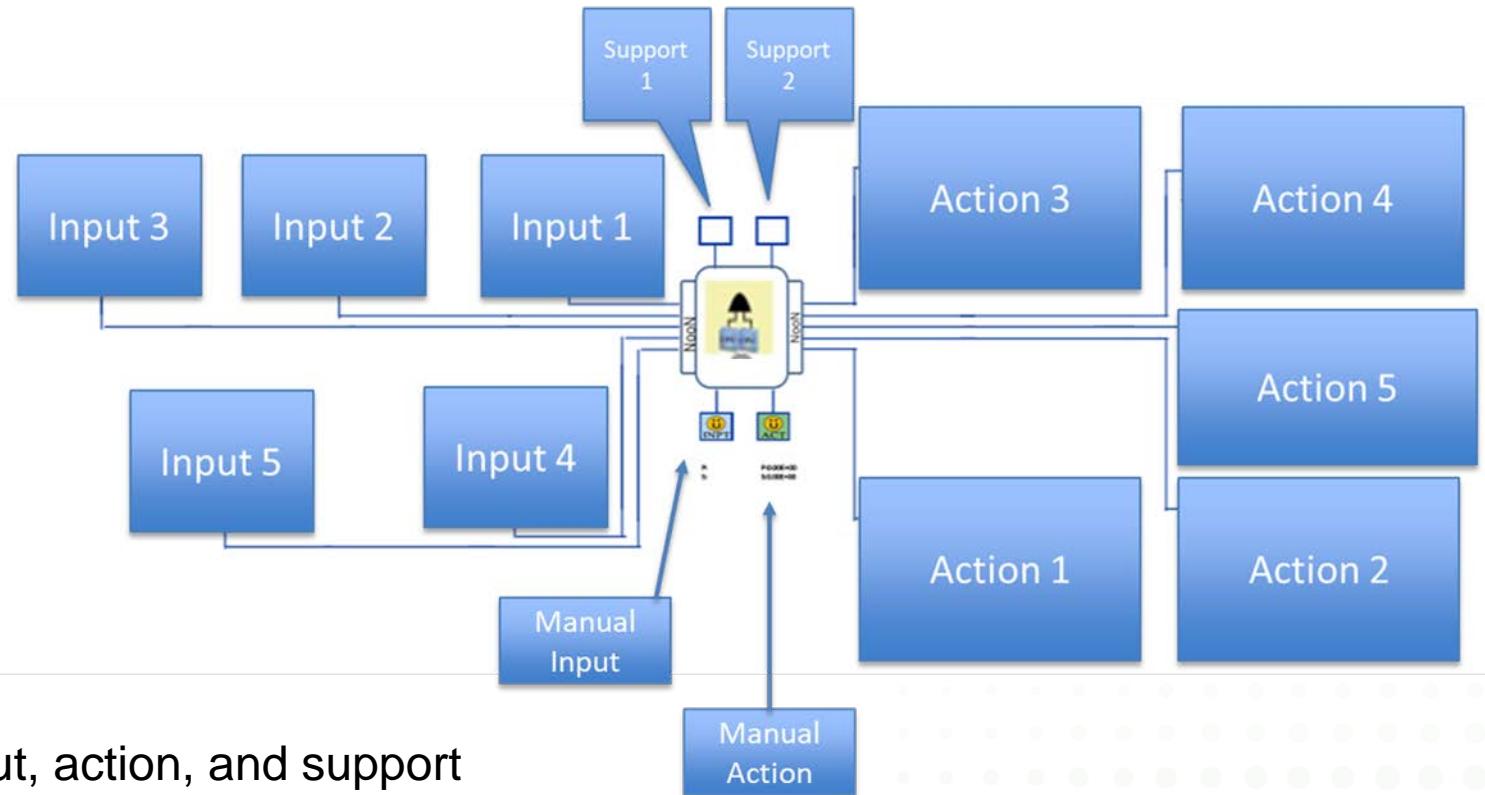
Boundary Description: Boundary includes 1oo2D logic solver with dual main processors, 1 simplex digital input module, 1 simplex analog input module, and 1 simplex digital output module.

Implementation Limitations and Exclusions: Refer to the SIL Solver manual for a discussion of "1oo2D" and "2oo2D" architectures. The logic solver is certified to IEC 61508 SIL 3 or TUV AK 5-6.

Data Source: SIL HFT: 1 **Update**

Click Update to return to GUI page

Screen locations of the other subsystems



Input, action, and support system locations are filled in the order entered

Adding Inputs (aka Sensors)

Adding an input is divided into two steps

1. add the input configuration
2. add each device.

Input Configuration

Click “Input Configuration” to open selection list

Select the desired voting grouping.

Left-click the selected configuration to add to the GUI.

Client: **Company_Name** Function: **V-101 High DP trip**
 Project ID: **Practice** Function ID: **SIF 01**

Welcome, User Guide **SIL SOLVER**

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS	8.00E-02	1.00	5.00E-02	20.00	0
RESULTS					
TARGETS MET?					

PFD/STR Breakdown

HFT_{IN} **HFT_{LS}** **HFT_{ACT}**

HFT_{SPT1} **HFT_{SPT2}** **HFT_{MIN}** **HFT_{MACT}**

Calculate and Save **Reset**

SRS

LOGIC SOLVER

INPUT CONFIGURATION

ONE DEVICE

TWO DEVICES

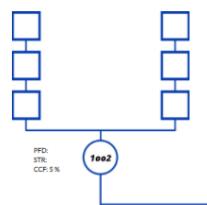
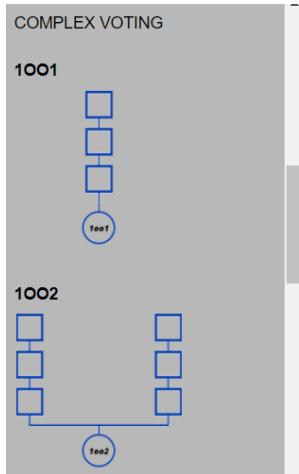
THREE DEVICES

1003

2003

Wrong choice? Hover over that portion of the architecture until grey location field appears, right-click to get option to copy or delete, left-click delete.

Complex Voting Architectures



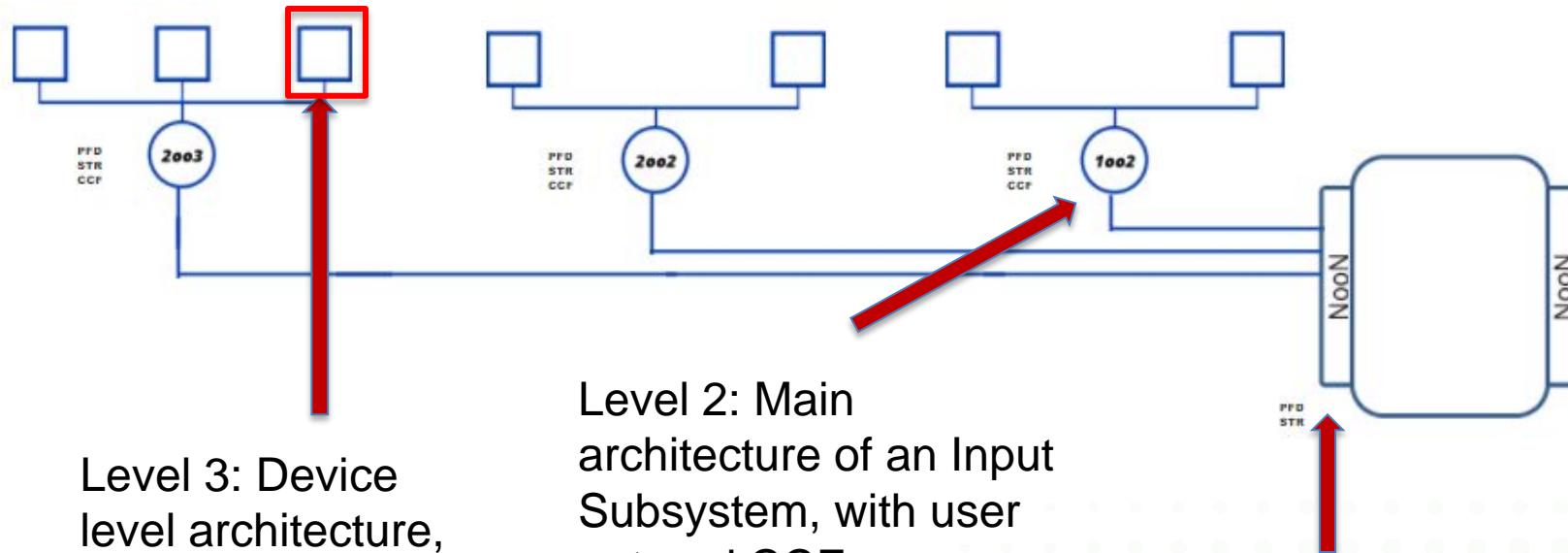
Common examples:

- Sensor Transmitter with a Signal Splitter, Trip Amp, or a Relay
- Pressure/Temperature compensated flow

- If a single variable value is made up of multiple devices, use a **Complex Voting Architecture**
- All the devices for each separate value go in a single vertical channel

Three levels of Input Architecture

Best Practice: Only use Level 3 if you must for the complexity of the function (some details will not show on the GUI)



Level 3: Device level architecture, with fixed CCF from datasheet

Level 2: Main architecture of an Input Subsystem, with user entered CCF

Level 1: 1ooN or NooN **VOTING** between Input Subsystems, with no CCF

Picking Sensor Technology

Click “input device” to access to the list of device categories
Left-click the relevant category to access the list of devices technology

Client: **Company_Name** Function: **V-101 High DP trip**
Project ID: **Practice** Function ID: **SIF 01**

Welcome, User Guide **SIL SOLVER**

	PFDAvg	IL	STR (1/Yr)	MTTFs (Yr)	HFT		HFT _{IN}	HFT _{LS}	HFT _{ACT}
TARGETS	8.00E-02	1.00	5.00E-02	20.00	0				
RESULTS									
TARGETS MET?									

PFD/STR Breakdown

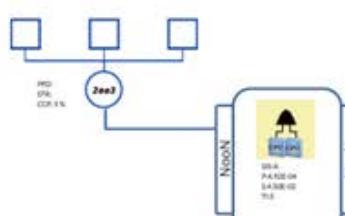
PFDAvg: 100% Logic
STR: 100% Logic

INPUT DEVICE

Search Clear

TRIP AMPLIFIER
ANALYZER
PRESSURE

DIFFERENTIAL PRESSURE TRANSMITTER
 PNEUMATIC PRESSURE SWITCH
 PNEUMATIC PRESSURE TRANSMITTER



Calculate and Save **Reset**

Selecting the Device

Scroll to the desired device

Left click device in list to copy (right-click to open datasheet – more later)

Left click in device box on diagram to add device to the input subsystem

Client: **Company_Name** Function: **V-101 High DP trip**
 Project ID: **Practice** Function ID: **SIF 01**

Welcome, User Guide **SIL SOLVER**

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT		HFT _{IN}	HFT _{LS}	HFT _{ACT}
TARGETS	8.00E-02	1.00	5.00E-02	20.00	0	PFDavg	100%	Logic	
RESULTS						STR	100%	Logic	
TARGETS MET?									

INPUT DEVICE

Search Clear

TRIP AMPLIFIER

ANALYZER

PRESSURE

DP
DIFFERENTIAL PRESSURE TRANSMITTER

P
PNEUMATIC PRESSURE SWITCH

PT
DIN-CHAMBER PRESSURE TRANSMITTER

PFDAvg **STR** **Logic**

Calculate and Save **Reset**

Copy Delete

To delete or copy the device, move the mouse to device icon in function diagram and right click the desired option.

Adding Device Details

White boxes are editable fields. Some are pre-populated

Device

Device ID:	DPTR	Device Type:	DIFFERENTIAL PRESSURE TRANSMITTER
Configurations: Display Tag for Device(s): <input type="text" value="Individual Tags"/> Proof Testing Interval (yr): <input type="text" value="1"/> Voting: <input type="text" value="1oo1"/> Subsystem Diagnostic Level: <input type="text" value="NO DC"/>		Properties: Failure Dangerous Failure Rate (1/yr): <input type="text" value="8.00E-03"/> Failure Spurious Failure Rate (1/yr): <input type="text" value="1.67E-02"/> Common Cause Factor CCF Dual (%): <input type="text" value="2"/> Common Cause Factor CCF Triple (%): <input type="text" value="2"/> Diagnostic Coverage Simplex DC1 (1/yr): <input type="text" value="60"/> Diagnostic Coverage Dual DC2 (1/yr): <input type="text" value="80"/> Diagnostic Coverage Triple DC3 (1/yr): <input type="text" value="90"/> PFDavg: <input type="text" value="0.00E+00"/> STR: <input type="text" value="0.00E+000"/>	
Maintenance: Mean Time to Repair (hr): <input type="text" value="72"/> Diagnostic Interval (hr): <input type="text" value="0.5"/> Overhaul Interval (yr): <input type="text" value="20"/> Proof Testing Coverage (%): <input type="text" value="100"/> User Specified <input type="checkbox"/>			
Note: Boundary Conditions: Boundary includes the electronic transmitter, sensing diaphragm and process connection. Process Severity Assumption: Clean			
<small>Implementation Limitations and Evaluations: No limitations beyond standard assumptions. (See SIL Solver Enterprise User Guide)</small>			
Data Source:	<input type="text" value="SIL"/> <input type="button" value="Update"/>		

Filled In

Test Interval is in years

Define Voting of one device. Use 1oo1 most of the time

Define Diagnostic Level that will be implemented

Default OI is 20Year

Default PTC is 100 %

Device

Device ID: DPTR	Device Type: DIFFERENTIAL PRESSURE TRANSMITTER
Configurations: Display Tag for Device(s): Individual Tags Proof Testing Interval (yr): 5 Voting: 1oo1 Subsystem Diagnostic Level: ? NO DC	
Maintenance: Mean Time to Repair (hr): 72 Diagnostic Interval (hr): 0.5 Overhaul Interval (yr): 20 Proof Testing Coverage (%): ? 100 User Specified: <input type="checkbox"/>	
Note: Boundary Conditions: Boundary includes the electronic transmitter, sensing diaphragm and process connection. Process Severity Assumption: Clean	
Data Source: SIS <input type="button" value="Update"/>	

Properties:

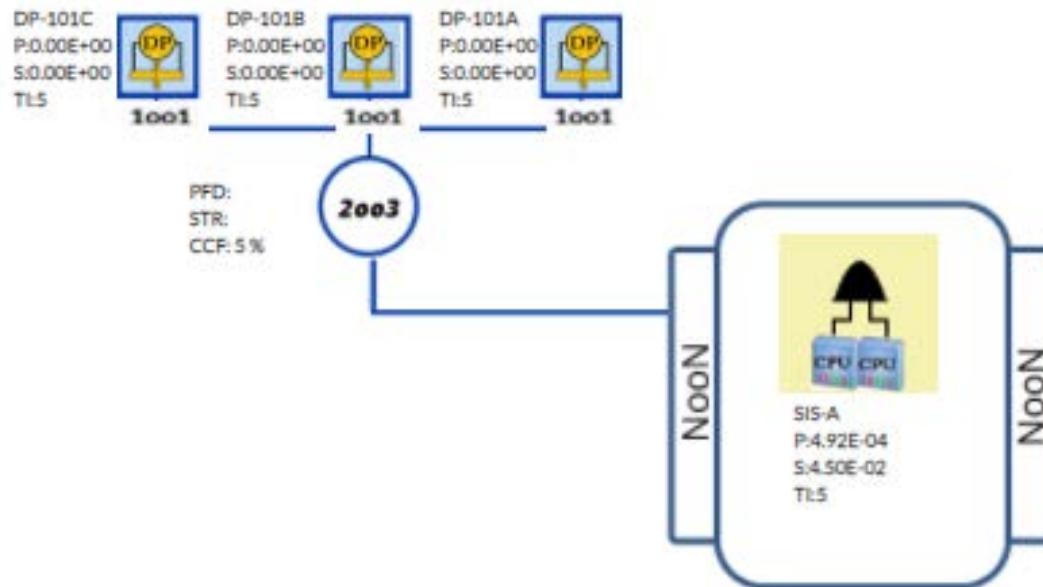
Failure Dangerous Failure Rate (1/yr):	8.00E-03
Failure Spurious Failure Rate (1/yr):	1.67E-02
Common Cause Factor CCF Dual (%):	2
Common Cause Factor CCF Triple (%):	2
Diagnostic Coverage Simplex DC1 (1/yr):	60
Diagnostic Coverage Dual DC2 (1/yr):	80
Diagnostic Coverage Triple DC3 (1/yr):	90

Will updated once SIF is calculated

Update button will activate once minimum data is entered.

Completing the subsystem

1. Copy DP-101A Pressure transmitter
2. Paste DP pressure transmitter to each of box in the 2oo3 input configuration
3. Update the tags for DP-101B and DP-101C and any other parameters that were modified for DP-101A.

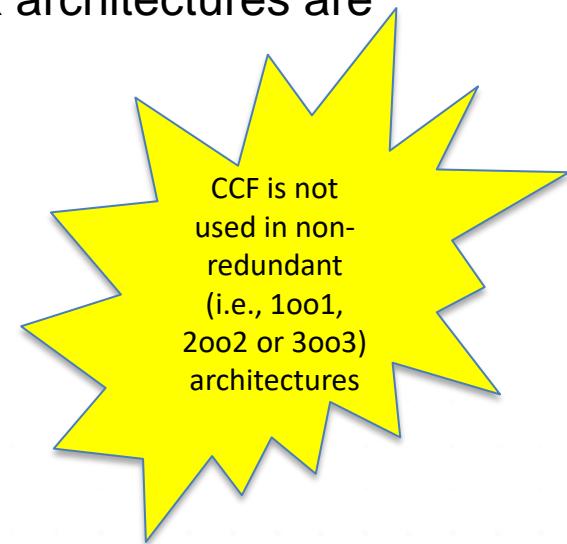
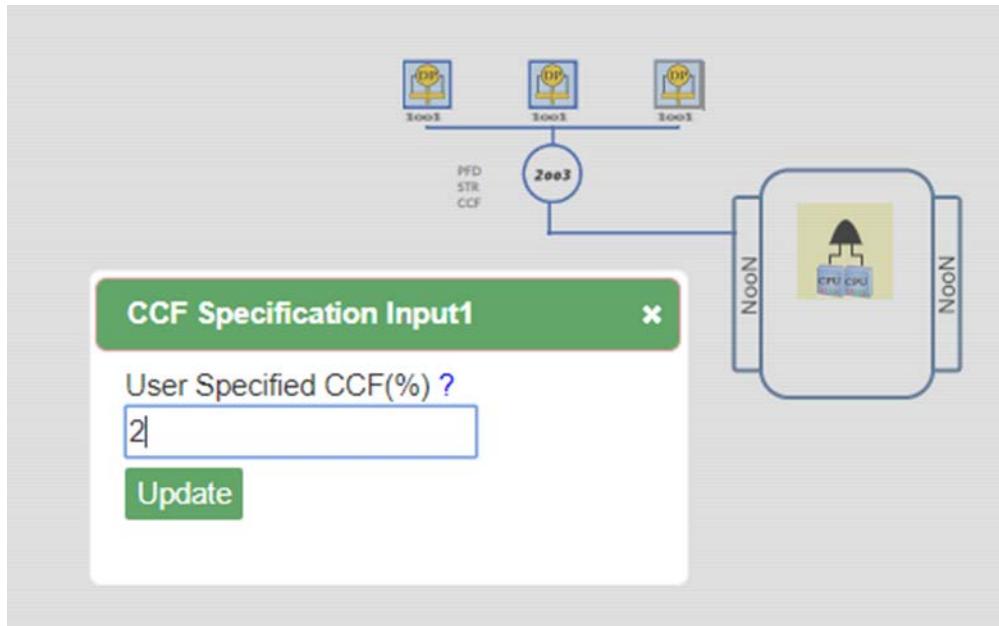


Adding Common Cause

- Left-click on the voting 2oo3 circle
- Update the default CCF value as needed (for example, 2%)

Note: Recommended values for duplex and triplex architectures are shown in the device datasheet under “Properties”

- Click Update to close the dialog box



Note: When using diverse instrumentation in a redundant architecture, there might still be some CCF. A judgement based on the technology and installation details should be made.

2003D vs. 2003

- What if automated diagnostics is going to be used to take safe action on diagnosed failure?
- Enter each device and change the Diagnostic level to DC3 (diagnostic level for inter-comparison of 3 transmitters)
- Click Update to close dialog box

Define Diagnostic DC3 is used since 3 PTs are used for comparison. The DC used in 90%

The triplex DC for this device is 90%

Device	
Device ID:	DPTR
Device Type:	DIFFERENTIAL PRESSURE TRANSMITTER
Configurations:	
Device Tag:	DP-101A
Proof Testing Interval (yr):	5
Voting:	1001
Subsystem Diagnostic Level:	DC3
Properties:	
Failure Dangerous Failure Rate (1/yr):	8.00E-03
Failure Spurious Failure Rate (1/yr):	1.67E-02
Common Cause Factor CCF Dual (%):	2
Common Cause Factor CCF Triple (%):	2
Diagnostic Coverage Simplex DC1 (1/yr):	60.00
Diagnostic Coverage Dual DC2 (1/yr):	80.00
Diagnostic Coverage Triple DC3 (1/yr):	90.00
Maintenance:	
Mean Time to Repair (hr):	72
Diagnostic Interval (hr):	0.500
Overhaul Interval (yr):	20
Proof Testing Coverage (%):	100
User Specified	<input type="checkbox"/>
Note:	
Boundary Conditions: Boundary includes the electronic transmitter, sensing diaphragm and process connection.	
Process Severity Assumption: Clean	
Implementation Limitations and Exclusions: No limitations beyond standard assumptions (see SII_Solver Enterprise User	
Data Source:	SIL
Update	

FYI: DC for other architectures

For all other input configurations with safe action on diagnosed failure, the general rule for the selection of Diagnostic level is as below:

1oo1D → DC1 (Diagnostic Coverage Simplex)

1oo2D and 2oo2D → DC2 (Diagnostic Coverage Dual)

1oo3D, 2oo3D and 3oo3D → DC3(Diagnostic Coverage Triplicated)

May need to select a lower DC when diverse devices are used in the same voting.

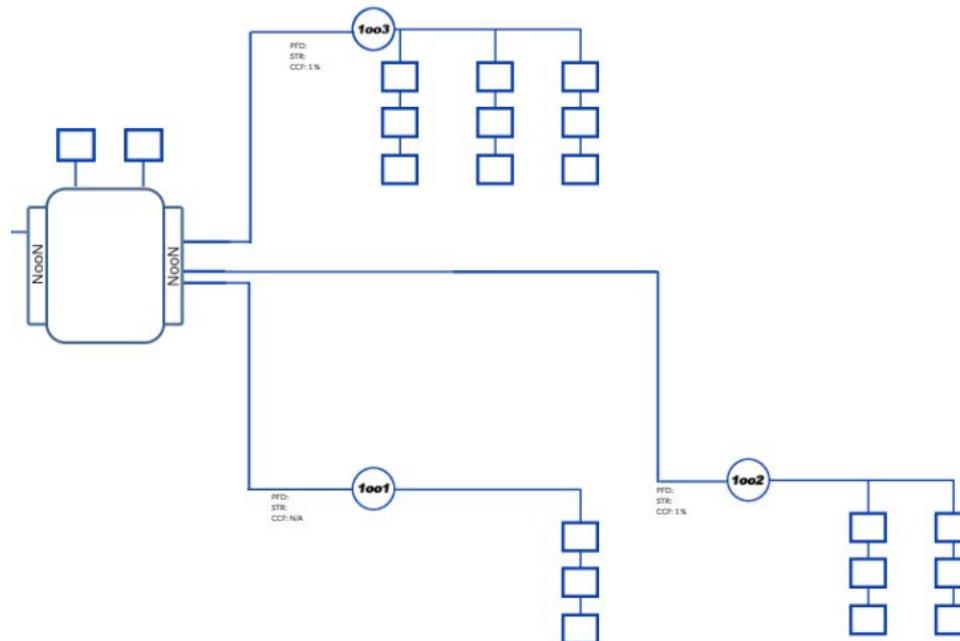
May select a higher DC when an external independent reading can be used for inter-comparison with the SIF sensor.

Reminder: Credit for diagnostics shouldn't be taken if the diagnostic result isn't going to be used to take prompt safe action, either automatically or manually, to address any risk gap caused by the failure.

Adding the rest of the system

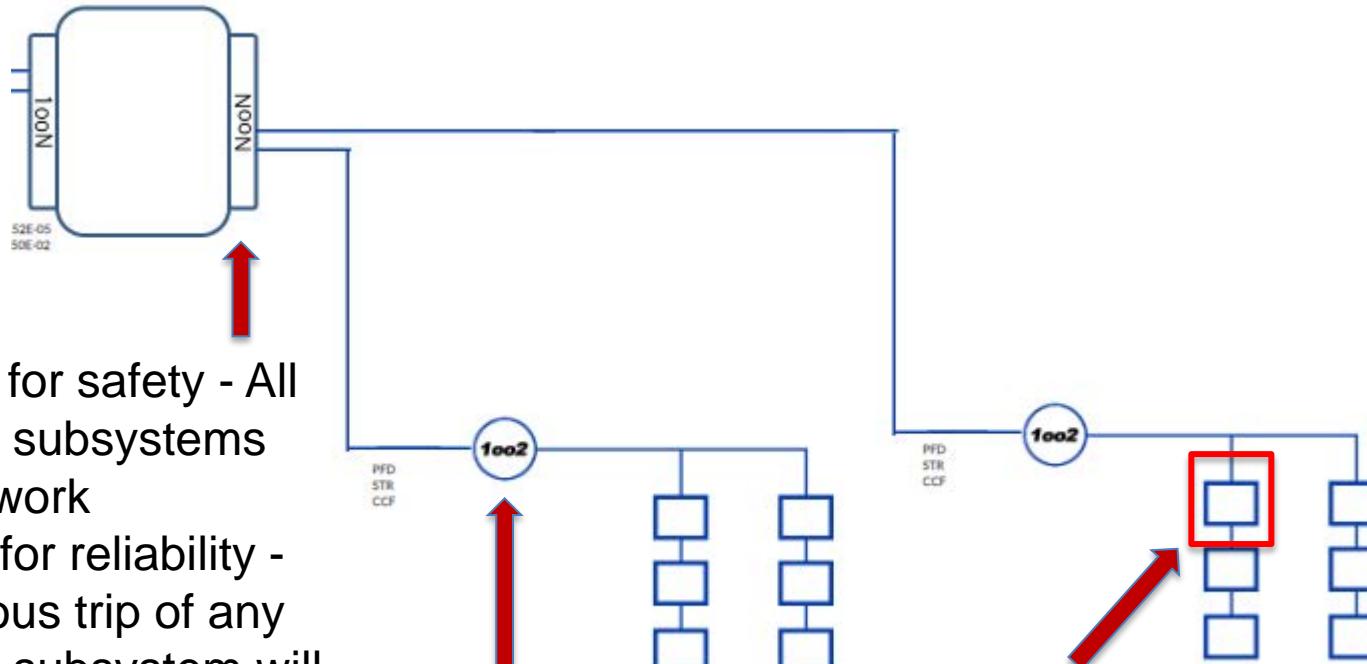
The support system and final actions are modelled in a similar way as the input.

1. Select the action configuration
2. Select the action device(s)
3. Specify relevant parameters



Two configurable levels of Action Architecture

Best Practice: To show the most information on the GUI, only use Level 2 if you must for the complexity of the function.



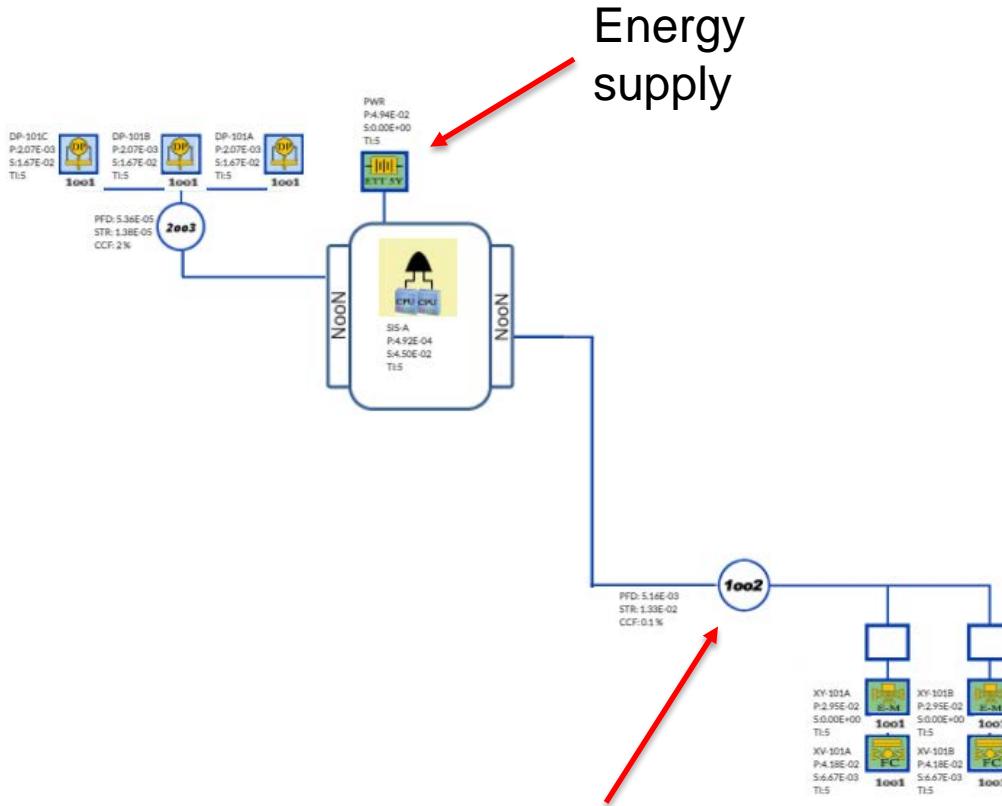
FIXED:

- NooN for safety - All action subsystems must work
- 1ooN for reliability - Spurious trip of any action subsystem will cause an operational problem

Level 1: Main architecture of an Action Subsystem, with user entered CCF

Level 2: Device level architecture, with fixed CCF from datasheet

Adding valves, solenoids, and support system

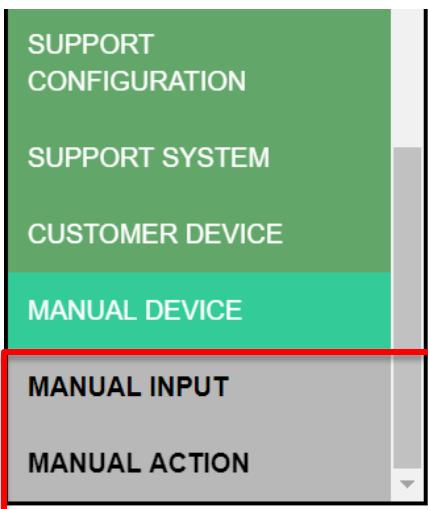


Don't forget to update CCF

Device	
Device ID:	SVETM
Device Type:	SOLENOID VALVE - ETT - MONITORED
Configurations:	
Device Tag:	XY-101A
Proof Testing Interval (yr):	5
Voting:	1oo1
Subsystem Diagnostic Level:	NO DC
Properties:	
Failure Dangerous Failure Rate (1/yr):	1.18E-02
Failure Spurious Failure Rate (1/yr):	0
CCF Dual(%):	1
CCF Triple(%):	1
Diagnostic Coverage Simplex(1/yr):	0.00
Diagnostic Coverage Dual(1/yr):	0.00
Diagnostic Coverage Triple(1/yr):	0.00
Maintenance:	
Mean Time to Repair (hr):	72
Diagnostic Interval (hr):	0.000
Overhaul Interval (yr):	20
Proof Testing Coverage (%):	100
User Specified	<input type="checkbox"/>
Note:	
Boundary Conditions: Boundary includes solenoid and solenoid wiring up to monitoring device.	
Process Severity Assumption: N/A	
Implementation Limitations and Exclusions: Vent port for redundant configurations is unobstructed and protected from debris.	
Data Source:	SIL
Update	

Device	
Device ID:	BVFC
Device Type:	BLOCK VALVE-BALL-FTC-CLEAN
Configurations:	
Device Tag:	XV-101A
Proof Testing Interval (yr):	5
Voting:	1oo1
Subsystem Diagnostic Level:	NO DC
Properties:	
Failure Dangerous Failure Rate (1/yr):	1.67E-02
Failure Spurious Failure Rate (1/yr):	6.67E-03
CCF Dual(%):	0.1
CCF Triple(%):	0.1
Diagnostic Coverage Simplex(1/yr):	85.00
Diagnostic Coverage Dual(1/yr):	85.00
Diagnostic Coverage Triple(1/yr):	85.00
Maintenance:	
Mean Time to Repair (hr):	72
Diagnostic Interval (hr):	0.000
Overhaul Interval (yr):	20
Proof Testing Coverage (%):	100
User Specified	<input type="checkbox"/>
Note:	
Boundary Conditions: Boundary includes spring return, pneumatically-operated ball valve, operating in a standby (dormant) mode of operation. The solenoid is NOT INCLUDED. Safe-state specified is fail closed.	
Process Severity Assumption: Clean	
Data Source:	SIL
Update	

What if the design has a complicated “black box” subsystem?



Click to add field to GUI

Most commonly used for complex designs where there is a complicated subsystem in the design that is evaluated using an advanced method such as FTA

SIL Solver® allows for a MANUAL ACTION subsystem and a MANUAL INPUT subsystem

THESE ARE NOT POPULATED LIKE NORMAL DEVICES

The PFDavg and STR contributions for these subsystems are entered directly into the tool

The performance of these subsystems are additive to the overall PFD and STR analysis

Manual Inputs

The user can enter two parts of a Manual Input analysis:

If two are used, the user must define whether they are redundant to each other (i.e., EITHER subsystem working will allow the overall Manual Input to work) or non-redundant (i.e., BOTH parts must work for the overall Manual Input to work)

DeviceID, Tag, voting architecture and TI are entered for completeness of reporting. The PFDavg and STR are entered directly for each portion of the Manual Input

Check to allow entry of the second Manual Input

Manual Inputs

Redundancy: Non-Redundant

Enable second manual input device

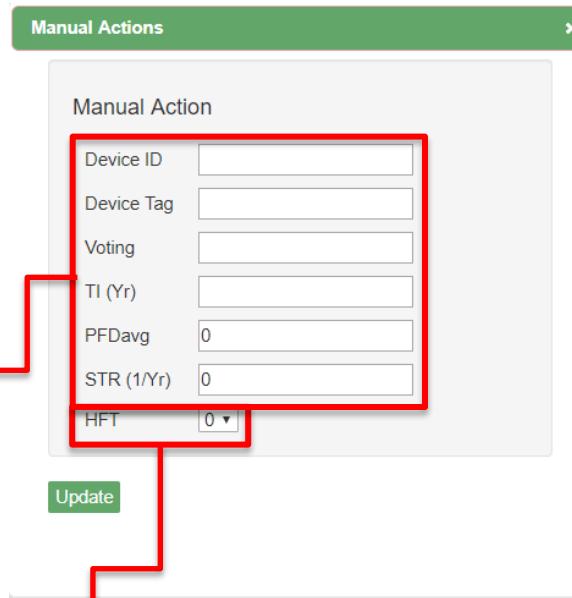
Manual Input Device 1		Manual Input Device 2	
Device ID		Device ID	
Device Tag		Device Tag	
Voting		Voting	
TI (Yr)		TI (Yr)	
PFDavg	0	PFDavg	
STR (1/Yr)	0	STR (1/Yr)	
HFT	0	HFT	0

Update

The user selects the Hardware Fault Tolerance value appropriate for each part of the Manual Input

Manual Action

DeviceID, Tag, voting architecture and TI are entered for completeness of reporting. The PFDavg and STR are entered directly for each portion of the Manual Input



Manual Actions

Manual Action

Device ID	<input type="text"/>
Device Tag	<input type="text"/>
Voting	<input type="text"/>
TI (Yr)	<input type="text"/>
PFDavg	0
STR (1/Yr)	0
HFT	0 ▾

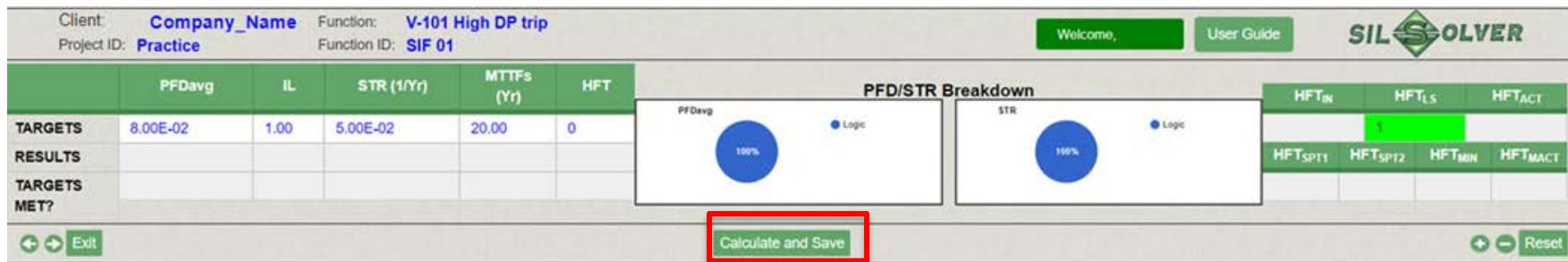
Update

User enters Manual Action HFT Value

Ready to Calculate?

All devices entered, filled out, and CCF added?

Click the “Calculate and Save” button

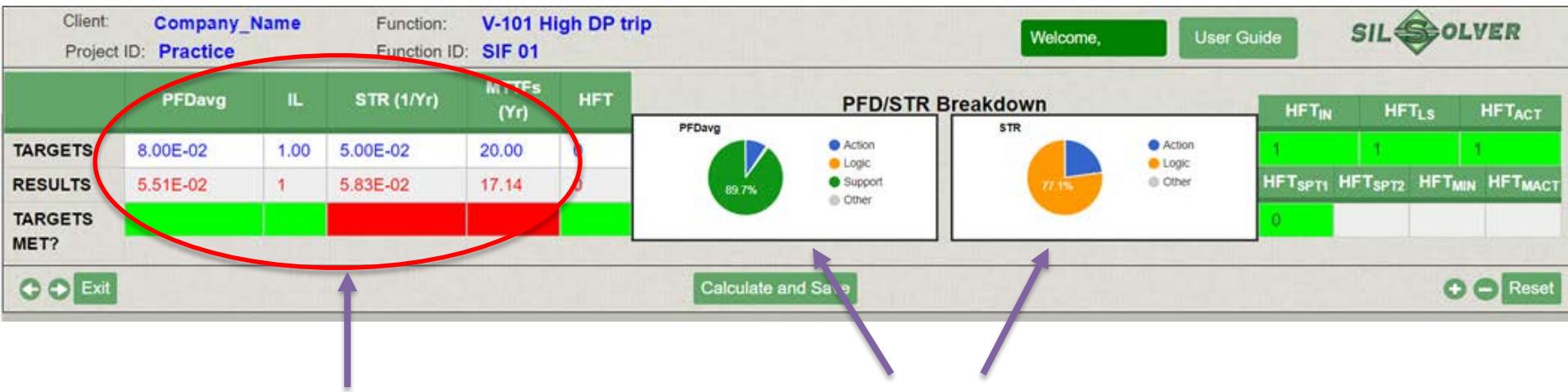


Note any **ERRORS** or **Warnings** that are generated during the calculation:

ERRORS: A problem exists in GUI or devie configuration that will make the calculated results **INCORRECT**

Warning: A value is missing from the configuration that may or may not be a technical issue, depending on the overall design

Are PFDAvg and STR good enough?



Numerical results and red-green pass-fail indicator on top left of GUI and most SIF reports

Graphical Charts provide information on which components are dominating PFDAvg and STR

If necessary, modify design until performance targets are achieved.

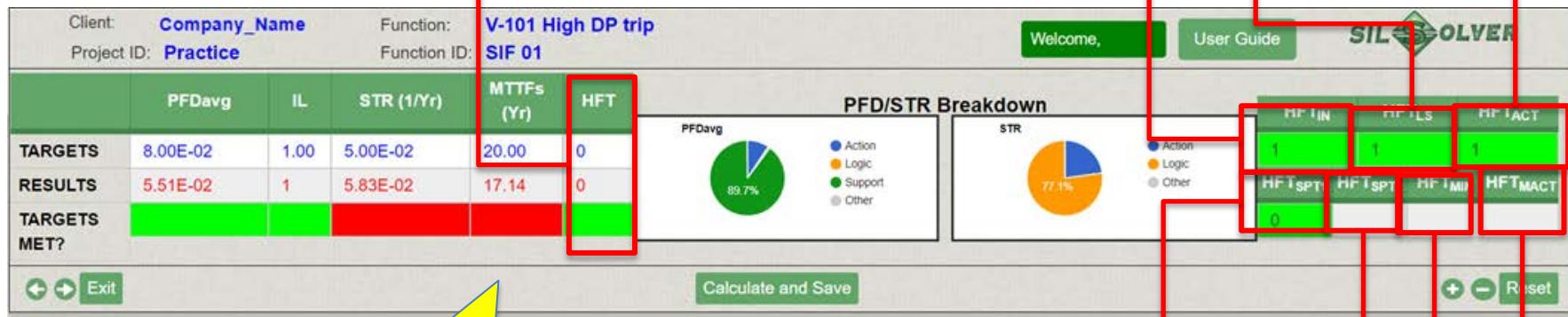
Don't forget Hardware Fault Tolerance (HFT)

HFT Target and
Overall HFT
Result

HFT for Input(s)

HFT for
Logic
Solver

HFT for
Action(s)



Overall HFT result is the minimum HFT out of the seven main subsystems (see far right side of GUI) for those subsystems that are configured for use in that architecture

HFT for Support
System 1

HFT for Support
System 2

HFT for Manual
Input

HFT for Manual
Action

HFT for Input and Action Subsystems

The HFT for each field device box (MooN) is determined by the selected architecture within that box as below.

Architecture(s)	HFT = N - M
1oo1, 1oo1D	0
1oo2, 1oo2D	1
2oo2, 2oo2D	0
1oo3, 1oo3D	2
2oo3, 2oo3D	1
3oo3, 3oo3D	0
2oo4, 2oo4D	2
HFAT/HPATD (unused for LS, but used for some action devices)	1

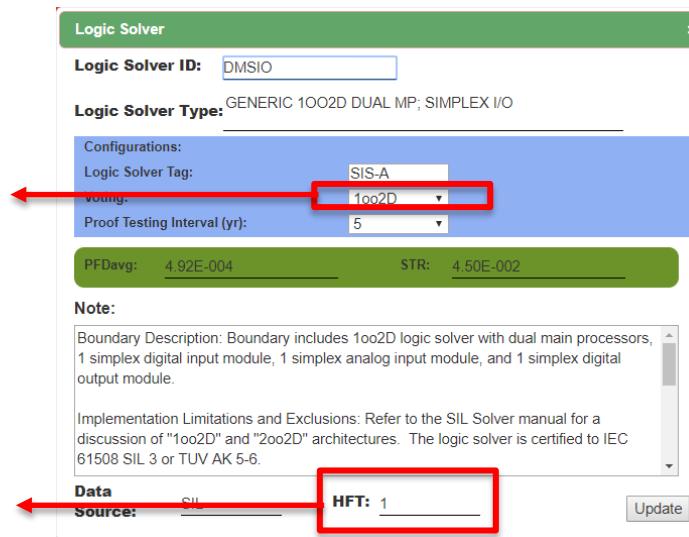
The results of the individual device boxes are combined based on the mid-level architecture.

HFT for Logic Solver

The HFT value for the logic solver is based on the technology and the selected architecture. The resulting HFT value for the logic solver is shown on the logic solver data sheet and on the GUI as below.

In this case,
architecture is
1oo2D

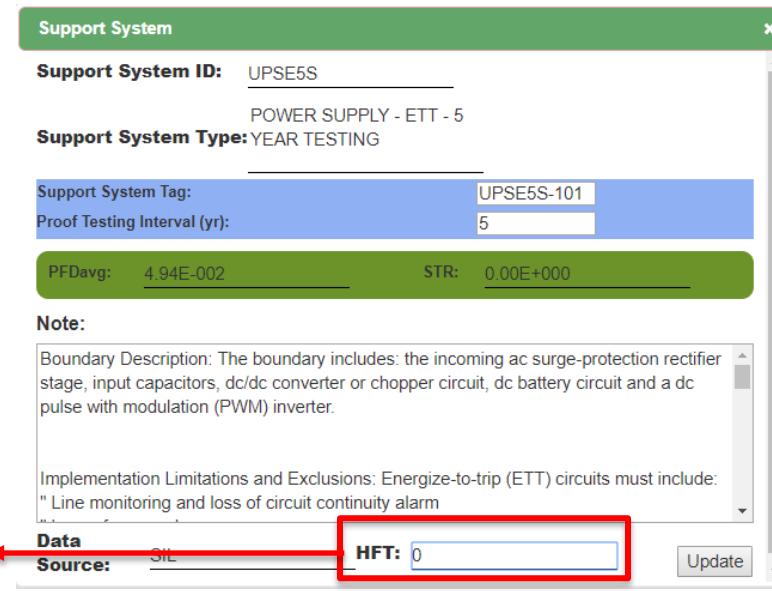
Logic Solver
HFT Value



Default value is 0 when importing a logic solver that is not in the current SIL Solver® logic solver datasheet.

HFT for Support System

The HFT value for the support system is fixed and shown on the support system data sheet and on the GUI as below.

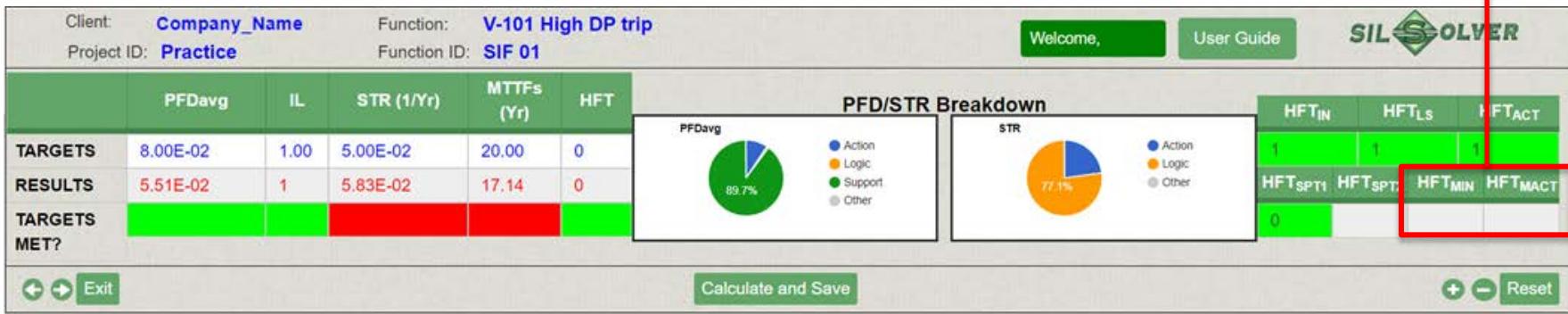


The screenshot shows a software interface for managing support systems. The window title is "Support System". The "Support System ID" is listed as "UPSE5S" and the "Support System Type" is "POWER SUPPLY - ETT - 5". The "Support System Tag" is "UPSE5S-101" and the "Proof Testing Interval (yr)" is "5". The "PFDavg" value is "4.94E-002" and the "STR" value is "0.00E+000". A "Note" section contains a boundary description and implementation limitations. At the bottom, there is a "Data" section with "Source: SIL" and a red box highlighting the "HFT: 0" input field, which is being pointed to by a red arrow from the label "Support System HFT Value".

Default value is 0 when importing support systems that are not in the current SIL Solver® support system datasheet.

HFT Results for Manual Input and Manual Action

HFT Results from Manual Input and Manual Action entries



Is that all?

- The SIL Calculation is performed within a context of standard SIL evaluation assumptions, such as
 - Sufficient independence exists between the SIF and other functions used in the hazard case the SIF is designed for
 - Functional safety management program meets ISA61511-1 requirements
- The documentation of the SIL calculation should include sufficient SRS information to provide this context

SRS Info

Client: **Company_Name** Function: **V-101 High DP trip**
 Project ID: **Practice** Function ID: **SIF 01**

PFDavg **IL** **STR (1/Yr)** **MTTFs (Yr)** **HFT**

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS	8.00E-02	1.00	5.00E-02	20.00	0
RESULTS	5.51E-02	1	5.83E-02	17.14	0
TARGETS MET?	Met Not Met				

PFD/STR Breakdown



PFDavg

- Action
- Logic
- Support
- Other



STR

- Action
- Logic
- Other

HFT

	HFT _{IN}	HFT _{LS}	HFT _{ACT}
HFT_{SPT1}	1	1	1
HFT_{SPT2}	0		
HFT_{MNN}			
HFT_{MACT}			

Calculate and Save **Exit** **+** **Reset**

SRS

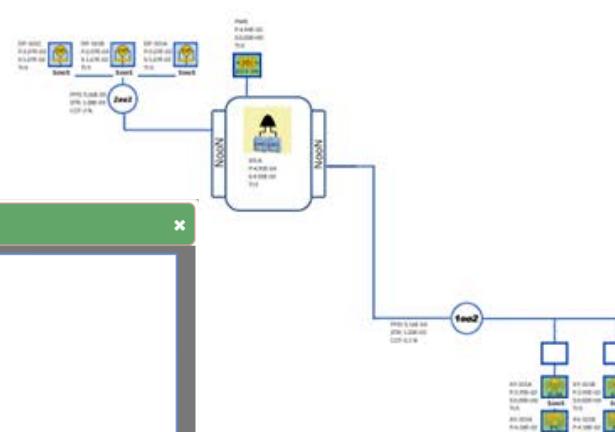
- PROCESS HAZARD**
- DESCRIPTION**
- DIAGNOSTICS**
- RESET**
- SHUTDOWN**
- REFERENCE**
- COMMENTS**

LOGIC SOLVER

- INPUT CONFIGURATION**
- INPUT DEVICE**
- ACTION CONFIGURATION**
- ACTION DEVICE**
- SUPPORT CONFIGURATION**
- SUPPORT SYSTEM**
- CUSTOMER DEVICE**
- MANUAL DEVICE**

Process Hazard

Save



Done with SIF 01

Client: Company Name
Project ID: Practice Function: V-101 High DP trip
Function ID: SIF 01

Welcome, User Guide

SIL SOLVER

PFDavg

STR (1/Yr)

MTTFs (Yr)

HFT

PFDavg

STR

HFT_{IN}

HFT_{LS}

HFT_{ACT}

Targets

Results

Targets Met?

Calculate and Save

Exit

Reset

SRS

PROCESS HAZARD

DESCRIPTION

DIAGNOSTICS

RESET

SHUTDOWN

REFERENCE

COMMENTS

LOGIC SOLVER

INPUT CONFIGURATION

INPUT DEVICE

ACTION CONFIGURATION

ACTION DEVICE

SUPPORT CONFIGURATION

SUPPORT SYSTEM

CUSTOMER DEVICE

MANUAL DEVICE

Exit to return to main Protective Function screen for this project

Second Function

- This project includes V-102 as well
- V-102 has an analogous protective function, SIF 02
- Key difference, SIF 02 uses a single pressure transmitter as the third device, instead of a DP
- Tags: DP-102A/B, PT-102, XV/XY-102A/B

Copy SIF 01

Client: Company_Nam Region: Region_Gulf Location: Location_Houston Unit: Unit_Alky Project ID: Practice Function ID: SIF 01

Protective Function

Import	Export	Paste	Open	New	Edit	Copy	Delete	Exit	PF Revision Level
Update Data	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary	GUI Report	PF Device Configs
Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result	
SIF 01	V-101 High DP trip	Low Demand	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1	

From the main Protective Function page, selecting the function to be copied and clicking the Copy button...

Client: Company_Name Region: Region_Gulf Location: Location_Houston Unit: Unit_Alky Project ID: Practice Function ID: SIF 01

Protective Function

Import	Export	Paste	Open	New	Edit	Copy	Delete	Exit	PF Revision Level
Update Data	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary	GUI Report	PF Device Configs
Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result	
SIF 01	V-101 High DP trip	Low Demand	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1	

Causes the Paste button to activate...

Create SIF 02

Clicking the Paste button opens the dialog box to enter the new function ID and description

The screenshot shows the SIL SOLVER software interface. At the top, there is a navigation bar with the 'SIL SOLVER' logo, a 'Welcome' button, and other menu options. Below the navigation bar, the client information is displayed: Client: Company_Name, Region: Region_Gulf, Location: Location_Houston, Unit: Unit_Alky, Project ID: Practice, and Function ID: SIF 01. The main window is titled 'Protective Function' and shows a table of existing protective functions. One row is selected, showing 'SIF 01' with the function description 'V-101 High DP/P trip' and 'Low Demand'. A 'Paste' button is visible in the top right of this table row. A modal dialog box titled 'Protective Function' is open in the center, containing fields for 'Function ID' (set to 'SIF 02') and 'Function' (set to 'V-102 High DP/P trip'). At the bottom of the dialog are 'Save' and 'Close' buttons. The background table has columns for 'Function ID', 'Function', 'Mode Of Operation', 'Results', 'PF Result Summary', 'GUI Report', and 'PF Device Configs'.

Success!



Welcome.

Client: **Company_Name** Region: **Region_Gulf** Location: **Location_Houston** Unit: **Unit_Alky** Project ID: **Practice** Function ID: **SIF 02**

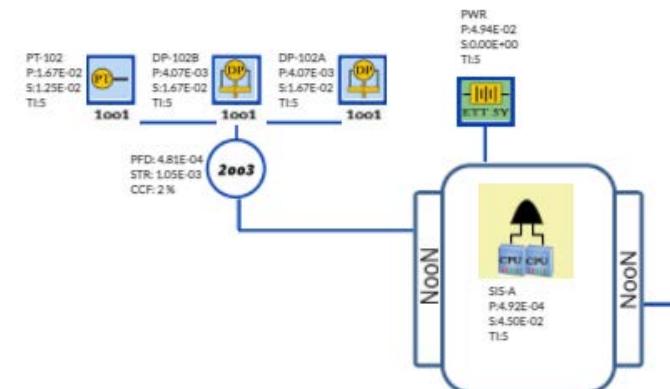
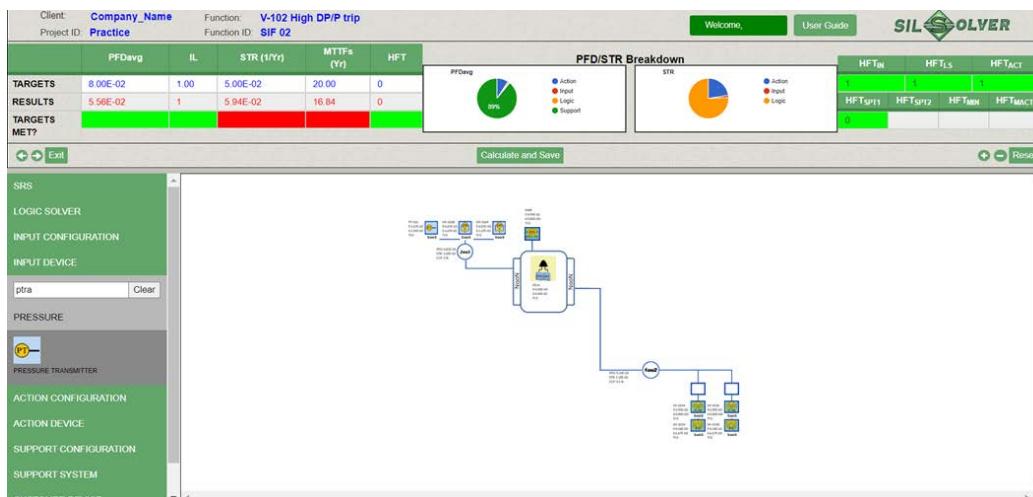
Protective Function

Import	Export	Paste	Open	New	Edit	Copy	Delete	Exit	PF Revision Level
Update Data	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary	GUI Report	PF Device Configs
Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result	
SIF 01	V-101 High DP trip	Low Demand	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1	
SIF 02	V-102 High DP/P trip	Low Demand	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1	

- Select and Open the new function
- Update tag ID fields for all devices that are the same

Modeling diverse sensors

1. Delete the third DP sensor
2. Copy General Pressure transmitter
3. Paste General pressure transmitter to the last box in the 2oo3 input configuration
4. Change Diagnostic level to DC2 for the two DP pressure transmitters and keep the General PT Diagnostic level as NO DC (no device to compare with).



Partial Stroke Testing of Valves

- For valves, the DC selection can be used to model partial stroke testing

1. Set the diagnostic level to DC1

2. Set the diagnostic interval to partial stroke testing interval

Both fields must be configured for correct use of equation

Properties:	
Failure Dangerous Failure Rate (1/yr):	1.67E-02
Failure Spurious Failure Rate (1/yr):	6.67E-03
Common Cause Factor CCF Dual (%):	0.1
Common Cause Factor CCF Triple (%):	0.1
Diagnostic Coverage Simplex DC1 (1/yr):	85.00
Diagnostic Coverage Dual DC2 (1/yr):	85.00
Diagnostic Coverage Triple DC3 (1/yr):	85.00

Partial Interim Testing of Sensors

- Sometimes an imperfect test is performed on a sensor at a shorter interval, with a 100% proof test (or complete replacement) performed at a longer interval
- Use the Proof Test coverage and Overhaul interval to model this

Example:
Sensor installation
with an 85% test
performed
annually with
100% test or full
replacement done
every 10 years

Device

Device ID:	THMLS	Device Type:	THERMOCOUPLE - LOW STRESS ENVIRONMENT
Configurations: Device Tag: TT1 Proof Testing Interval (yr): 1 Voting: 1oo1 Subsystem Diagnostic Level: NO DC		Properties: Failure Dangerous Failure Rate (1/yr): 5.00E-03 Failure Spurious Failure Rate (1/yr): 4.00E-02 Common Cause Factor CCF Dual (%): 2 Common Cause Factor CCF Triple (%): 2 Diagnostic Coverage Simplex DC1 (1/yr): 60.00 Diagnostic Coverage Dual DC2 (1/yr): 80.00 Diagnostic Coverage Triple DC3 (1/yr): 90.00	
Maintenance: Mean Time to Repair (hr): 72 Diagnostic Interval (hr): 0.500 Overhaul Interval (yr): 10 Proof Testing Coverage (%): 85 User Specified <input checked="" type="checkbox"/>			
Note: Boundary Conditions: Boundary includes thermocouple element and insulators, terminal head and protecting tube or thermowell. Process Severity Assumption: Clean Implementation Limitations and Exclusions: A low stress environment does not include the following: high vibration application			
Data Source: SIL		<input type="button" value="Update"/>	

Both fields must be
configured for correct use
of equation

4. EDITING, COPYING OR DELETING AN EXISTING PROJECT

Function Revision Info

To create/edit function revision information, select the function and click “function Revision level” to get to the editing page, where you can create a new function revision entry, open to edit it, or delete an entry.

SIL SOLVER

Client: **Company_Name** Region: **Region_Gulf** Location: **Location_Houston** Unit: **Unit_Alky** Project ID: **Practice** Function ID: **SIF 02**

Protective Function

Import	Export	Paste	Open	New	Edit	Copy	Delete	Exit	PF Revision Level
Update Data	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary	GUI Report	PF Device Configs
Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result	
SIF 01	V-101 High DP trip	Low Demand	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1	
SIF 02	V-102 High DP/P trip	Low Demand	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1	

SIL SOLVER

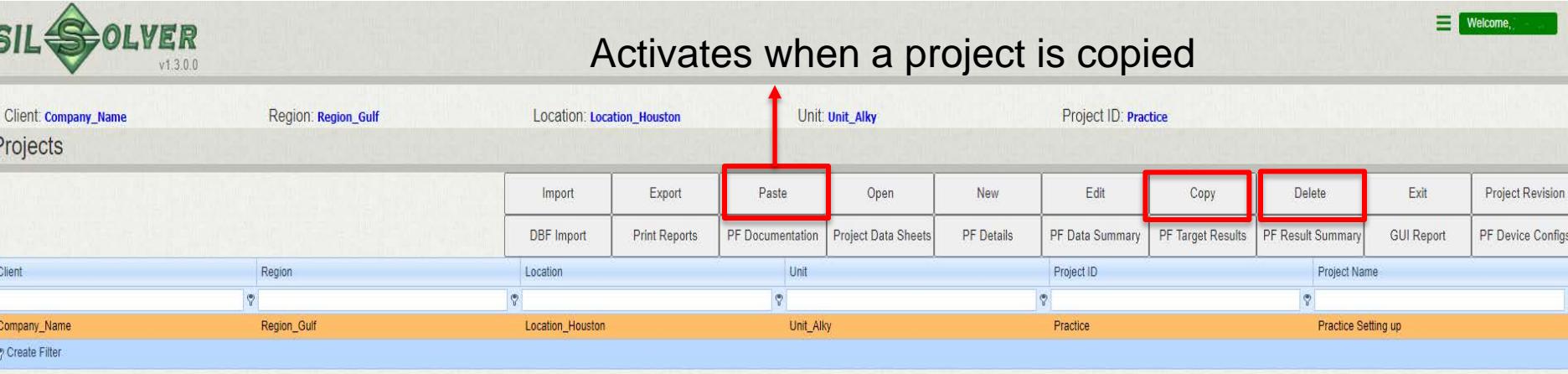
Client: **Company_Name** Region: **Region_Gulf** Location: **Location_Houston** Unit: **Unit_Alky** Project ID: **Practice** Function ID: **SIF 02**

Function Version	Performed By	Date	Approved By	Date	New	Open	Delete	Report	Exit

No data to display

[Create Filter](#)

Copying or deleting a project works like copying or deleting a function



Activates when a project is copied

Client: Company_Name Region: Region_Gulf Location: Location_Houston Unit: Unit_Alky Project ID: Practice

Projects

Import	Export	Paste	Open	New	Edit	Copy	Delete	Exit	Project Revision
DBF Import	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary	GUI Report	PF Device Configs

Client Region Location Unit Project ID Project Name

Company_Name	Region_Gulf	Location_Houston	Unit_Alky	Practice	Practice Setting up
--------------	-------------	------------------	-----------	----------	---------------------

Select the project

Copy → Make a copy of the selected project and after that a paste button will appear, when “paste” is click a window will pop up for you to enter new project designation.

Delete → Delete the selected project

5. GENERATING REPORTS

Project Report generation

Print a single report for a whole project by selecting project and click relevant report tab...

or use “Print Reports” and select multiple reports at once

When the project reports are printed, the report will include project revision information

The screenshot shows the SIL SOLVER software interface. At the top, there is a header with the company logo and a 'Welcome' button. Below the header, a toolbar contains various buttons: Import, Export, Paste, Open, New, Edit, Copy, Delete, Exit, and Project Revision. The 'Print Reports' button is highlighted with a red box. A sub-menu titled 'Select Reports to Print' is displayed, listing several report options: PF Documentation, Project DataSheets, PF Details, PF Data Summary, PF Target Results, and PF Results Summary. The 'Print' and 'Close' buttons at the bottom of this sub-menu are also highlighted with a red box. In the background, there is a table with columns for Site, Location, Project, and Project ID, showing data for various projects like SIS-TECH, TEST, SISTC, and BACK. The Project ID for the selected project is BIG FUNCS1.

Function Report generation

Print a report for an individual function by going to the function list for that project, select a function and click relevant report tab ...

or use “Print Reports” and select multiple reports at once

When the function level reports are printed, the report will include function revision information



Welcome, [Logout](#)

Client: [Company_Name](#) Region: [Region_Gulf](#) Location: [Location_Houston](#) Unit: [Unit_Alky](#) Project ID: [Practice](#) Function ID: [SIF 02](#)

Protective Function

Import	Export	Paste	Open	New	Edit	Copy	Delete	Exit	PF Revision Level
Update Data	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary	GUI Report	PF Device Configs
Function ID			PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result	
SIF 01	V-10		8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1	
SIF 02	V-10		8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1	

Select Reports to Print

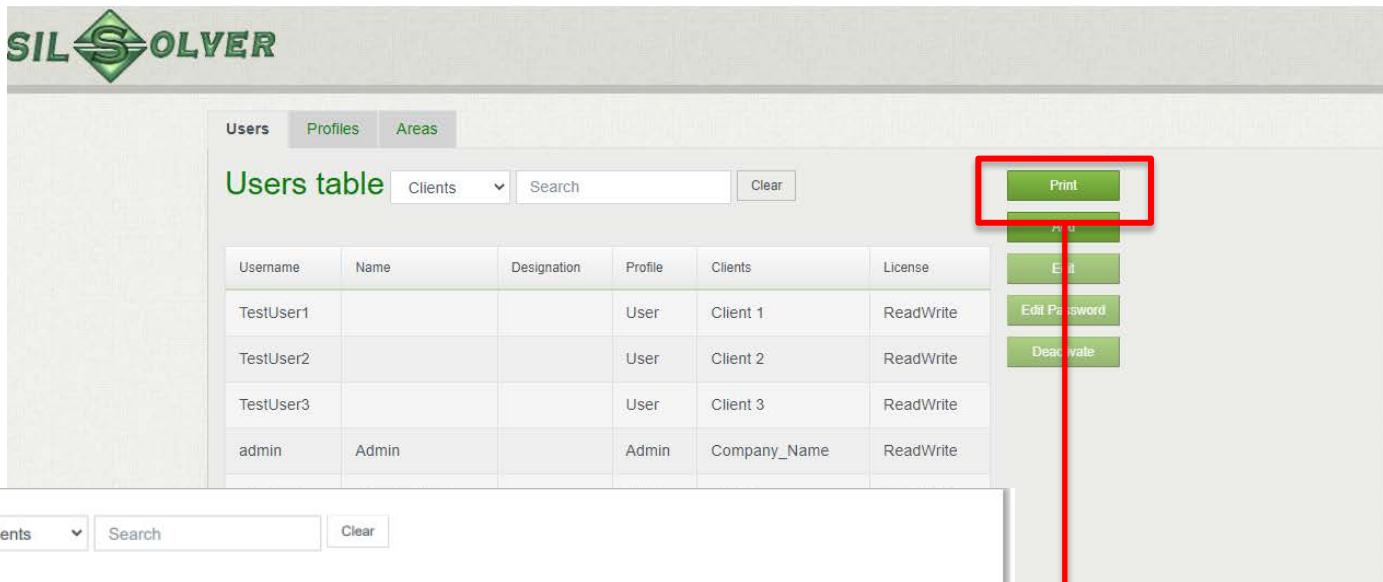
CTRL-Click to select multiple reports. Note: The GUI Report will open in a separate tab for printing.

- [PF Details](#)
- [PF Data Summary](#)
- [PF Target Results](#)
- [PF Results Summary](#)
- [PF Device Configs](#)
- [GUI Report](#)

[Print](#) [Close](#)

User Report for Admin

- Click on Print on Users tab to print the list of all users



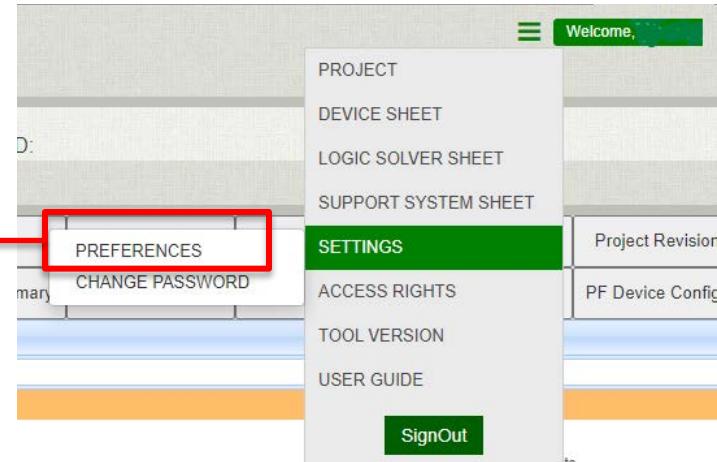
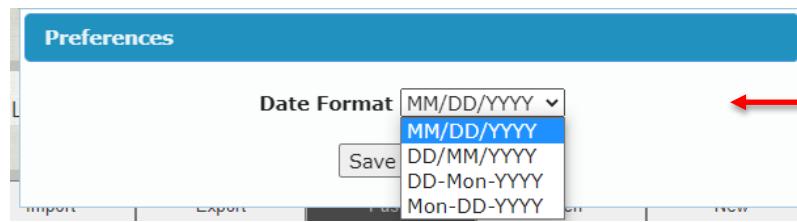
The screenshot shows the SIL SOLVER software interface. At the top, there is a navigation bar with tabs: 'Users' (which is selected and highlighted in green), 'Profiles', and 'Areas'. Below the navigation bar is a sub-navigation bar for the 'Users' tab, showing 'Clients' (with a dropdown arrow), a 'Search' input field, and a 'Clear' button. To the right of the sub-navigation bar is a context menu with several options: 'Print' (highlighted with a red box and a red arrow pointing to it), 'Add', 'Edit', 'Edit Password', and 'Deactivate'. Below the sub-navigation bar is a table titled 'Users table' with the following data:

Username	Name	Designation	Profile	Clients	License
TestUser1			User	Client 1	ReadWrite
TestUser2			User	Client 2	ReadWrite
TestUser3			User	Client 3	ReadWrite
admin	Admin		Admin	Company_Name	ReadWrite

Below this table is a smaller, separate window titled 'Users table' with the same data structure and content, also showing the 'Clients' dropdown, 'Search' input, and 'Clear' button.

Report: Date format

- Each user can set preferred date format. Format is user account specific



- Selected format will be shown in footer for all related reports

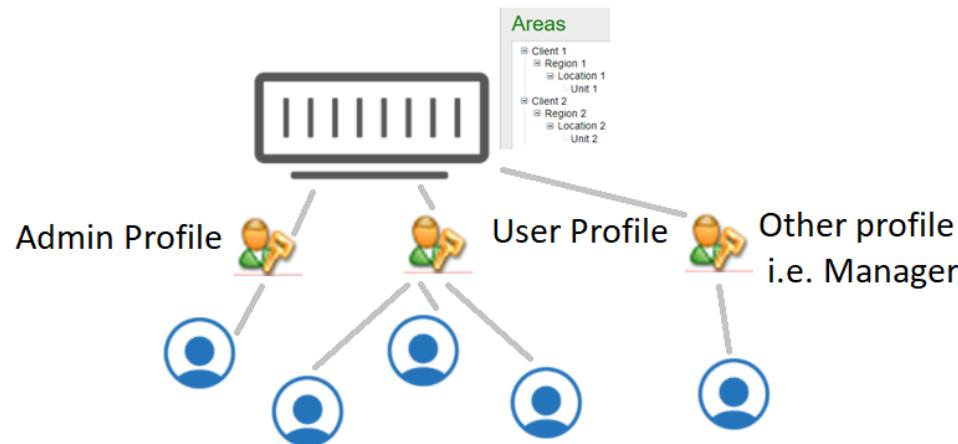


6. IMPORTING/EXPORTING

- Project export from SIL Solver® Enterprise
- SIL Solver® Enterprise project import
- Function Export/Import
- Importing SIL Solver® desktop application files into SIL Solver® Enterprise (DBF Import)

Sharing a Project

- The way to share a project between **SIL Solver® Enterprise users** on a central platform



- Role based users are given access to the project hierarchy. Only one user can edit a function at a time.

Project Export

To export an Enterprise project:

1. Go to the project page
2. Select the project
3. Click “Export” – confirm the ProjectID and click Export in the dialog
4. A *.sifprj file of the project will be created in the download folder

Client: Company_Name Region: Region_Gulf Location: Location_Houston Unit: Unit_Alky Project ID: BIG FUNC51

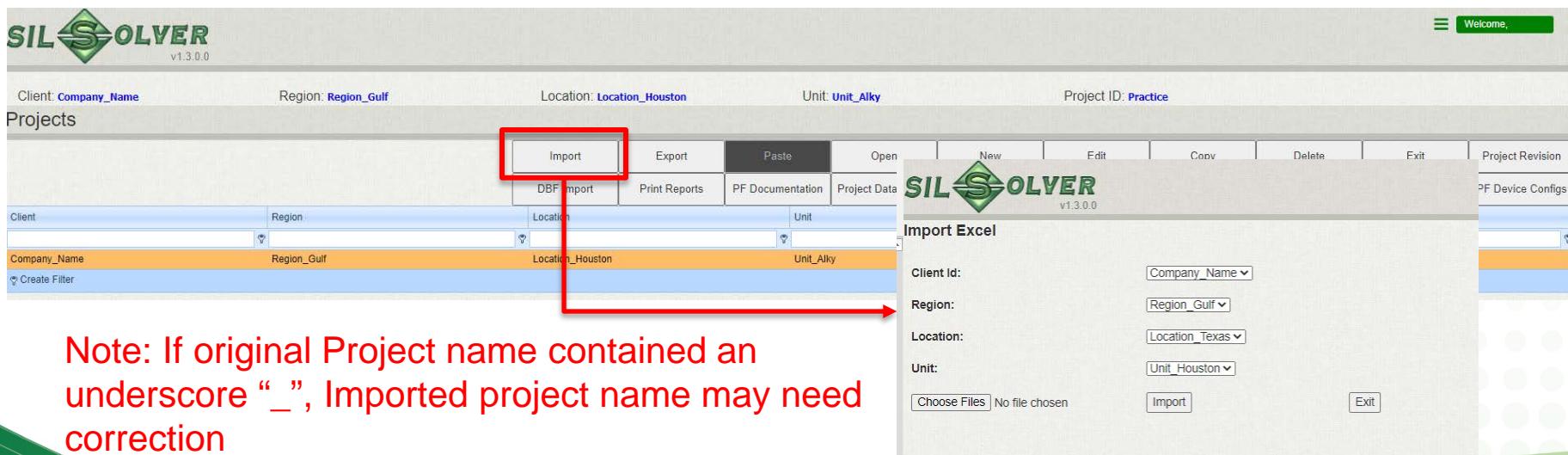
Projects

Client	Region	Location	Unit	Project ID	Project Name
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	BIG FUNC51	Fully populated
Company_Name	Region_Gulf	Location_Houston		CASE_4	Case 3 for testing import-export
Company_Name	Region_Gulf	Location_Houston		CASE_5	Bill's frequent stroke and non-red input case
Company_Name	Region_Gulf	Location_Houston		LOGIC_SOLV	Utilities: LOPA Study
Company_Name	Region_Gulf	Location_Houston		Practice_1	Project for Practice
Company_Name	Region_Gulf	Location_Houston		TESTCHAR	

Project import

To import a previously exported SIL Solver® Enterprise project:

1. Go to the project page
2. Click “Import”, which will open the import page
3. Choose the Client ID, region, location and unit for this project
4. Click “choose files”, then browse the project (*.silprj) file to be imported
5. Click Import and the tool will attempt to import the file



Note: If original Project name contained an underscore “_”, Imported project name may need correction

DBF import to Enterprise

- The way to transfer a project from a SIL Solver® desktop program into SIL Solver® Enterprise
- BEFORE you import the DBF file:
 1. Make sure the project folder name is correct, the files in the folder have not been modified, and no additional files have been added to the folder
 2. Ensure the project folder contains the subfolder for each SIF and the four control files

Name	Type	Size	Dat
PF-1	File folder	7/2,	
PF-2	File folder	11/	
TEST_01_dpjver.DBF	DBF File	1 KB	3/6
TEST_01_dpjver.FPT	FPT File	1 KB	12/
TEST_01_pj	CDX File	3 KB	7/2
TEST_01_pj.DBF	DBF File	1 KB	7/2

3. Ensure the tag names in PFs do not have any comma or trailing space
4. Ensure that all edited/approved by dates within the project are in an acceptable format
5. Ensure no files other than the desktop tool generated ones have been added to the main project folder or SIF subfolders

DBF import to Enterprise

- To import a **project** from SIL Solver® **desktop** versions into SIL Solver® Enterprise
 - 1. Go to the folder where you saved the desktop software project
 - For example, the default directory: C:\SILSolver_Projects
 - 2. Zip the project folder that you want to import to SIL Solver® Enterprise
 - 3. Go to the SIL Solver® Enterprise project page
 - 4. Click “DBF import” button to open the DBF import page
 - 5. Choose the client, region, location and unit for this project
 - 6. Click Choose Files to browse to the Zipped project folder
 - 7. Click “Upload_ZipFile”
 - 8. When the upload is ready, click import
 - 9. A message will pop up when the import is done, including any warnings



SIL Solver® Enterprise

Function export/import

To export/import an Enterprise function is the same as for a project, the only difference is that the operations are on the function level page and the exported file extension is *.silsif

The screenshot displays the SIL Solver Enterprise software interface. At the top, the title bar shows 'SIL SOLVER v1.3.0.0'. The main menu bar includes 'File', 'Edit', 'View', 'Tools', 'Help', and 'Welcome'. Below the menu, various project parameters are set: Client: Company_Name, Region: Region_Gulf, Location: Location_Houston, Unit: Unit_Alky, Project ID: Practice, and Function ID: SIF 01. The main workspace is titled 'Protective Function' and shows a table of data. The 'Import' and 'Export' buttons in the toolbar are highlighted with red boxes and arrows pointing to them. A detailed data table is shown below:

Function ID	Mode of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result
SIF 01	Low Demand	8.00E-02	1.03E-01	2.00E-01	2.03E-01	1	0
		8.00E-02	5.23E-02	2.00E-01	5.07E-02	1	1

Below the main window, a smaller window titled 'Import Excel Protective' is open, showing an 'Import' button and a 'Choose Files' field with 'No file chosen'. A modal dialog box titled 'Export Protective' is also visible, containing a 'Function ID' field set to 'SIF 01', an 'Export' button, and a 'Close' button.

CAUTION: Know the version the work needs to be performed in!

- Projects/functions from older versions **can** be imported into a newer version of SIL Solver® Enterprise.
- However, projects and functions from a newer version **cannot** be imported back into an older version of SIL Solver® Enterprise or into the desktop application.

What if Data Changed from Version the Imported Project was created in?

- i Indicates the data has been updated for one or more devices in this function

Client: Company_Name Region: Region_Gulf Location: Location_Houston Unit: Unit_Alky Project ID: BIG FUNCS1 Function ID: 3003 Complex

Protective Function

Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)
1002 complex	Duplex Complex Inputs with incomplete entries	Low Demand		1.21E-02	
1002new		Low Demand		1.21E-02	
3003 Complex	Full set of 3003 Complex Inputs with 1003 Actions	Low Demand	8.00E-02	3.24E-02	1.00E-01

Create Filter Some devices in this protective function don't match the 'master pool' device sheets. Click the Update Data button to correct.

Update Data

This action will update all fixed datasheet values within this project to match the Master Pool Datasheet. This action cannot be undone. Please review the report below and confirm this action or cancel. Note: To make updates on a device-by-device basis, enter the individual functions and use the individual device dialog box to update.

Function Name	GUI Position	Device ID	Parameter	Current Value	Master Datasheet Value
3003 Complex	6502	UPSDMS	STR1year	0.019100000000	0.019140000000

Update Data **Cancel**

The window lists the devices with different failure rates.

“Update Data” button updates all the device in the project with new failure rates

What if Data Changed from Version the Imported Project was created in?



Indicates the data has been updated for the device

The screenshot shows a software interface for process hazard analysis. At the top, there is a 'PFD/STR Breakdown' chart with two pie charts: one for PFDavg (98.0%) and one for STR (9.33%). Below this is a table comparing 'TARGETS' and 'RESULTS' for PFDavg, IL, STR (1/yr), MTTFs (Yr), and HFT. The 'RESULTS' row shows updated values in red, and a green bar indicates 'TARGETS MET?'. A 'Calculate and Save' button is at the bottom of this section.

The main area contains a 'SRS' (System Requirements Specification) tree on the left and a 'Device' configuration sheet on the right. The 'Device' sheet for 'HNSW' (Hand Switch) includes fields for 'Device ID', 'Device Type', 'Configurations' (Display Tag, Proof Testing Interval, Voting, Subsystem Diagnostic Level), 'Properties' (Failure Dangerous Failure Rate, Failure Spurious Failure Rate, etc.), 'Maintenance' (Mean Time to Repair, Diagnostic Interval, Overhaul Interval, Proof Testing Coverage), and 'PFDAvg' and 'STR' values. A 'Note' section at the bottom states: 'Calculations assume that provisions are made to maintain safe operation during any on-line testing; on-line maintenance; or fault response activities.'

At the bottom of the device sheet, there are 'Data Sources' and 'Data Source' buttons. A red arrow points from the text 'This function is like "Update Data"' to the 'Restore device sheet' button, which is highlighted with a red box.

“Restore device sheet” button updates that device with new failure rate.

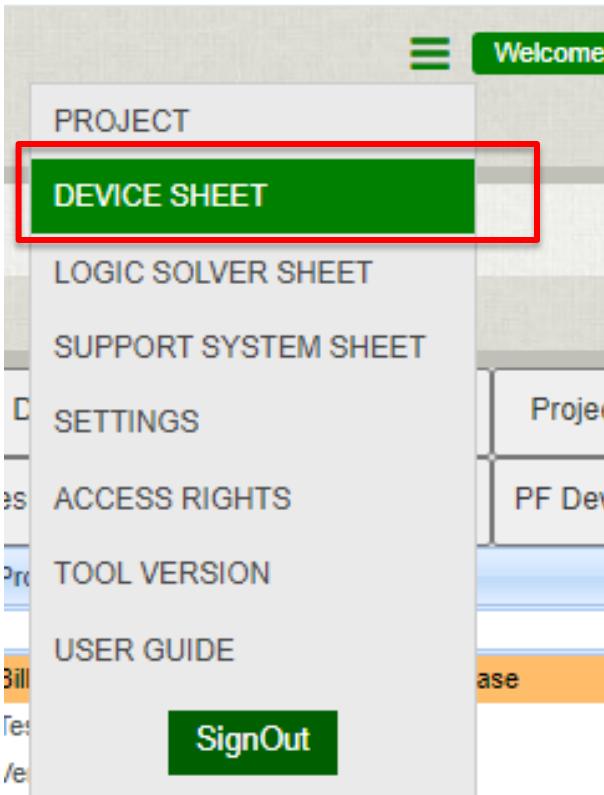
This function is like “Update Data”

7. DATASHEETS

- Device (Input and Action devices)
- Logic Solver
- Support System
- Creating a custom datasheet
- Importing a project or function with custom device sheet

Accessing Datasheets

- Access from main page dropdown menu, or
- For individual devices right-click when in device list on GUI



Client: Company_Name		Function: SIF 01		Modified by:	
Project ID: Practice		Function ID: SIF 01			
	PFDAvg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS	8.00E-02	1.00	2.00E-01	5.00	0
RESULTS	1.03E-01	0	2.03E-01	4.92	0
TARGETS MET?					
<input type="button" value="←"/> <input type="button" value="→"/> <input type="button" value="Exit"/>					

SRS
LOGIC SOLVER
INPUT CONFIGURATION
INPUT DEVICE
Search

TRIP AMPLIFIER
ANALYZER
PRESSURE

DPTR **Device Type:** DIFFERENTIAL PRESSURE TRANSMITTER

Configurations:
Display Tag for Device(s):
Proof Testing Interval (yr):
Voting:
Subsystem Diagnostic Level:

Maintenance:
Mean Time to Repair (hr):
Diagnostic Interval (hr):
Overhaul Interval (yr):
Proof Testing Coverage (%):
User Specified

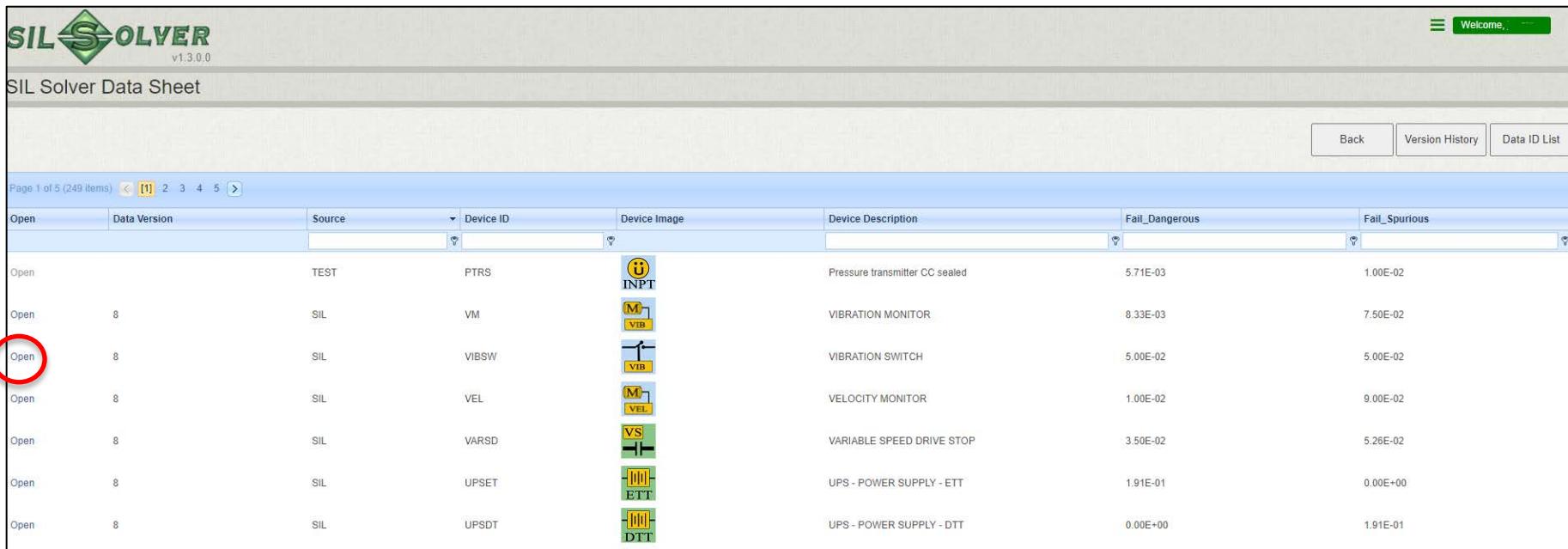
Properties:
Failure Dangerous Failure Rate (1/yr):
Failure Spurious Failure Rate (1/yr):
Common Cause Factor CCF Dual (%):
Common Cause Factor CCF Triple (%):
Diagnostic Coverage Simplex DC1 (1/yr):
Diagnostic Coverage Dual DC2 (1/yr):
Diagnostic Coverage Triple DC3 (1/yr):

Note:
Boundary Conditions: Boundary includes the electronic transmitter, sensing diaphragm and process connection.
Process Severity Assumption: Clean

Data Source: SIL

DP

Device datasheet list



The screenshot shows a table of device datasheets. The columns are: Open, Data Version, Source, Device ID, Device Image, Device Description, Fail_Dangerous, and Fail_Spurious. The 'Open' column is circled in red to indicate the action to be taken.

Open	Data Version	Source	Device ID	Device Image	Device Description	Fail_Dangerous	Fail_Spurious
Open		TEST	PTRS	 INPT	Pressure transmitter CC sealed	5.71E-03	1.00E-02
Open	8	SIL	VM	 VM	VIBRATION MONITOR	8.33E-03	7.50E-02
Open	8	SIL	VIBSW	 VIBSW	VIBRATION SWITCH	5.00E-02	5.00E-02
Open	8	SIL	VEL	 VEL	VELOCITY MONITOR	1.00E-02	9.00E-02
Open	8	SIL	VARSD	 VARSD	VARIABLE SPEED DRIVE STOP	3.50E-02	5.26E-02
Open	8	SIL	UPSET	 UPSET	UPS - POWER SUPPLY - ETT	1.91E-01	0.00E+00
Open	8	SIL	UPSDT	 UPSDT	UPS - POWER SUPPLY - DTT	0.00E+00	1.91E-01

- Click open (far left) to look at the datasheet for that device. Device list contains datasheets for input and action devices
- Device list show SIL and client promoted NON SIL datasheets

Device Datasheet

SIL SOLVER

Welcome

SIL Solver Data Sheet

DataSource: SIL Device Id: ACC Device Type: ACCELERATION MONITOR

Fail Dangerous Failure Rate(1/yr): 1.25E-02
 Fail Spurious Failure Rate(1/yr): 1.13E-01
 Mean Time to Repair(hrs): 72
 Common Cause Factor Dual Mode(%): 2.00
 Common Cause Factor Triple Mode(%): 2.00

Diagnostic Interval(hrs): 0.00

Current DataSheet
 SIL DataSheet
 NON SIL DataSheet

Get Report Close

Notes

Boundary Conditions: Boundary includes probe/cable assembly and monitor with alarm relay or analog output.

Process Severity Assumption: N/A

Implementation Limitations and Exclusions: For redundant configurations, separate probes and mounting brackets must be selected from the table.

"D" configuration assumes that each monitor circuit is provided with a means to detect spurious activation of a circuit, providing signal deviation alarming, OR when the relay output from the monitor is used to generate a fault alarm to the analysis.

appropriate output voting should be
 e monitor are connected to the SIS, diagnostic coverage credit is taken in the

SIL or Custom (NON SIL) device sheets can be printed via “Get Report” option. User hierarchy access will limit the NON SIL datasheets available to print.

Same for Logic Solvers and Support Systems

SIL and Non-SIL datasheets

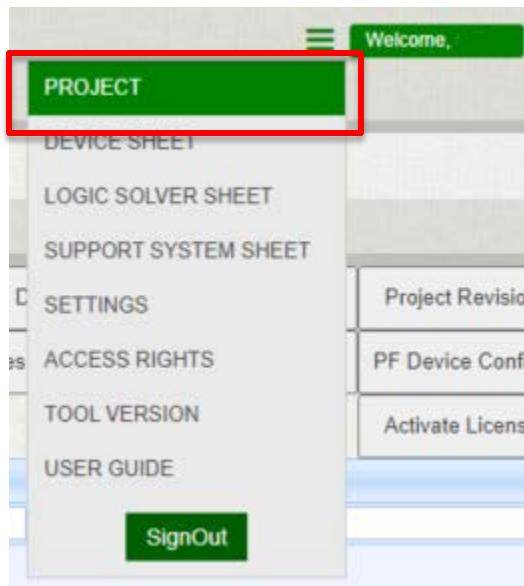
SIL Solver Data Sheet

Open	Data Version	Source	Device ID	Device Image	Device Description	Fail_Dangerous	Fail_Spurious
Open		TEST	PTRS		Pressure transmitter CC sealed	5.71E-03	1.00E-02
Open	8	SIL.	VM		VIBRATION MONITOR	8.33E-03	7.50E-02
Open	8	SIL	VIBSW		VIBRATION SWITCH	5.00E-02	5.00E-02
Open	8	SIL	VEL		VELOCITY MONITOR	1.00E-02	9.00E-02
Open	8	SIL	VARSD		VARIABLE SPEED DRIVE STOP	3.50E-02	5.26E-02

SIL Solver Support System Data Sheet

Open	Data Version	Source	Support System ID	Support System Image	Support System Description
Open		TEMP	CSS1		pretend SS
Open	8	SIL	IADRMS		INSTRUMENT AIR-DIVERSITY/MONITORED RECEIVER
Open	8	SIL	IADRS		INSTRUMENT AIR-DIVERSITY/RECEIVER
Open	8	SIL	IADS		INSTRUMENT AIR-COMPRESSOR DIVERSITY
Open	8	SIL	IANDVS		INSTRUMENT AIR-NO DIVERSITY

Returning to Project View



Click Project on the dropdown menu or use Back buttons on the datasheet pages to return to project page

The screenshot shows the 'SIL SOLVER' software interface. The top left corner displays the 'SIL SOLVER' logo and version 'v1.2.5.0'. The top right corner shows a 'Welcome' message. The main title is 'SIL Solver Support System Data Sheet'. In the bottom right corner, there are three buttons: 'Back', 'Version History', and 'Support ID List'. The 'Back' button is highlighted with a red box.

Creating a Custom Datasheet

- From GUI page, go to bottom of lists to the Customer Device section
- Left-click the header (Device, Logic Solver, Support System)** for the type of sheet to be created
- Enter the data for the new custom device and Submit
 - Do not use special characters or spaces in the Data Source or Device ID fields
 - If desired, browse to a new image for this device to replace the default

The screenshot shows a software interface for creating a custom device. The main window displays a table of reliability data (PFDavg, IL, STR, MTTFs, HFT) and a pie chart for a 'SIF 01' function. On the left, a sidebar lists various device types: GRS, LOGIC SOLVER, INPUT CONFIGURATION, INPUT DEVICE, ACTION CONFIGURATION, ACTION DEVICE, SUPPORT CONFIGURATION, SUPPORT SYSTEM, and CUSTOMER DEVICE. The 'INPUT DEVICE' item is highlighted with a red arrow. Below the sidebar is a 'DEVICE' button, which is also highlighted with a red box. A modal window titled 'Customer Device' is open, containing fields for Data Source, Device Id, Device Type, Failure Dangerous Failure Rate, Diagnostic Interval, Failure Spurious Failure Rate, Diagnostic Coverage Simplex, Mean Time to repair, Diagnostic Coverage Dual, CCF Dual, Diagnostic Coverage Triplex, CCF Triple, and Notes. At the bottom of the modal, there is a 'Select Alternate User Image File (optional)' section with a 'Choose Files' button and a note that no file has been chosen. A message 'Data Source is required.' is displayed in red. The 'Submit' button at the bottom of the modal is also highlighted with a red box. The text 'Click Submit' is overlaid on the bottom right of the modal window.

Device Custom Datasheet Fields

Data Source: Lim 5 charac.
Can be Project ID, or any unique code
For LS & support Sys, charact lim. is 10

Put notes on origin of datasheet, time, date or other significant details for easy tracking

e.g. PTTRAN

Description: e.g. Pressure Transmitter

Customer Device

Data Source	Device Id	Device Type	
Failure Dangerous Failure Rate(1/ yr)		Diagnostic Interval(hr)	
Failure Spurious Failure Rate (1/yr)		Diagnostic Coverage Simplex(%)	
Mean Time to repair(hrs)		Diagnostic Coverage Dual(%)	
CCF Dual(%)		Diagnostic Coverage	
CCF Triple(%)		Tripled(%)	
		Notes	

Select Alternate User Image File (optional):

No file chosen

Select the image file to represent this custom device.

Data Source is required.

Fill all the fields for submit button to enable

Custom Datasheet - Sample

Customer Device

Data Source	<input type="text" value="MANF"/>	Device Id	<input type="text" value="PTTRAN"/>	Device Type	<input type="text" value="Pressure Transmitter"/>
Failure Dangerous Failure Rate(1/ yr)	<input type="text" value=".0003"/>	Diagnostic Interval(hr)		<input type="text" value=".5"/>	
Failure Spurious Failure Rate (1/yr)	<input type="text" value=".0001"/>	Diagnostic Coverage Simplex(%)		<input type="text" value="65"/>	
Mean Time to repair(hrs)	<input type="text" value="2"/>	Diagnostic Coverage Dual(%)		<input type="text" value="80"/>	
CCF Dual(%)	<input type="text" value="2"/>	Diagnostic Coverage		<input type="text" value="90"/>	
CCF Triple(%)	<input type="text" value="3"/>	Triplicated(%)		<input type="text" value="Notes"/>	
Dummy Description: This is a site data. Its from the company's database. Created on date XX/YY/2021 for practice project by XX					
Select Alternate User Image File (optional):					
<input type="button" value="Choose Files"/> No file chosen					
Select the image file to represent this custom device.					
<input type="button" value="Submit"/>					

Logic Solver and Support System Datasheets

LOGIC SOLVER

 LS

TYPE

Customer Logic

Data Source

Logic Solver ID

Logic Solver Type

Logic Solver Description

Voting

TI (Yr)

PFDavg

STR (1/Yr)

HFT

Note

Select Alternate User Image File (optional):
 No file chosen
 Select the image file to represent this custom logic solver.

Data Source is required.

Submit

SUPPORT SYSTEM

 SUP

POWER SUPPLY

Customer Support

Data Source

Support System Id

Support System Type

Support System Description

PFDavg

STR (1/Yr)

HFT

Note

Select Alternate User Image File (optional):
 No file chosen
 Select the image file to represent this custom support system.

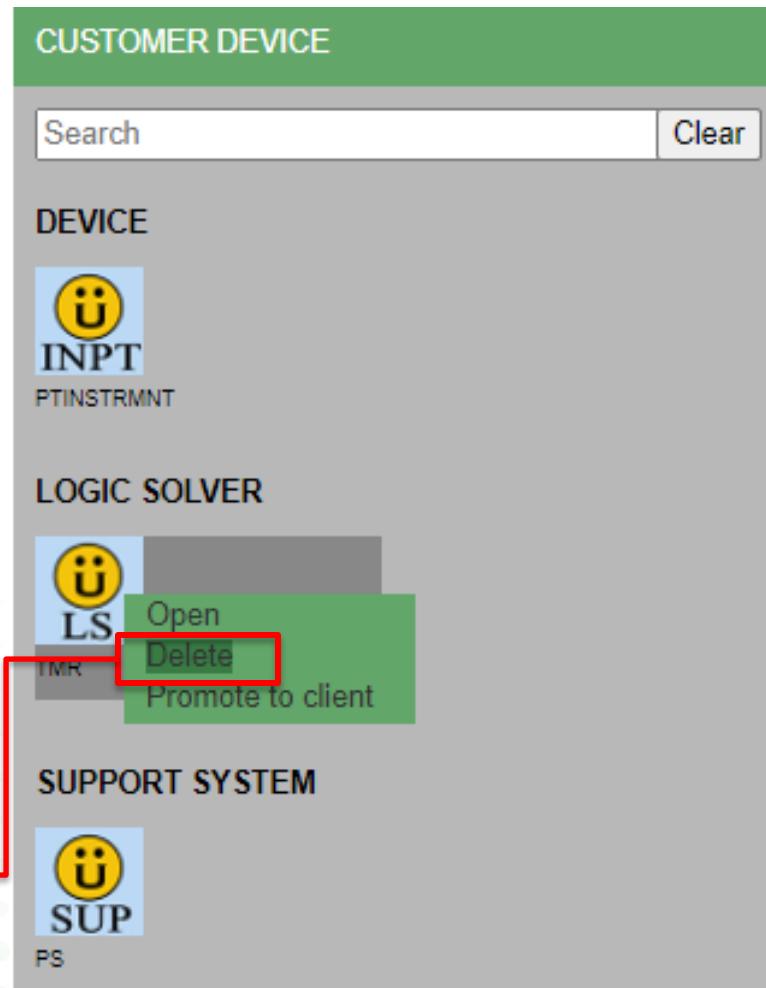
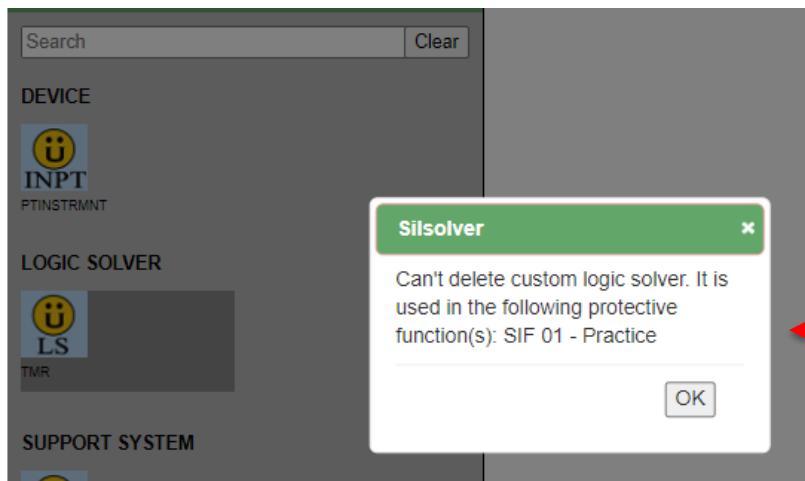
Data Source is required.

Submit

- LS type/ Support system type field is used to display below the custom device icon
- Like custom device sheet, fill all the mandatory fields for submit button to enable
Once created, custom datasheets cannot be edited!

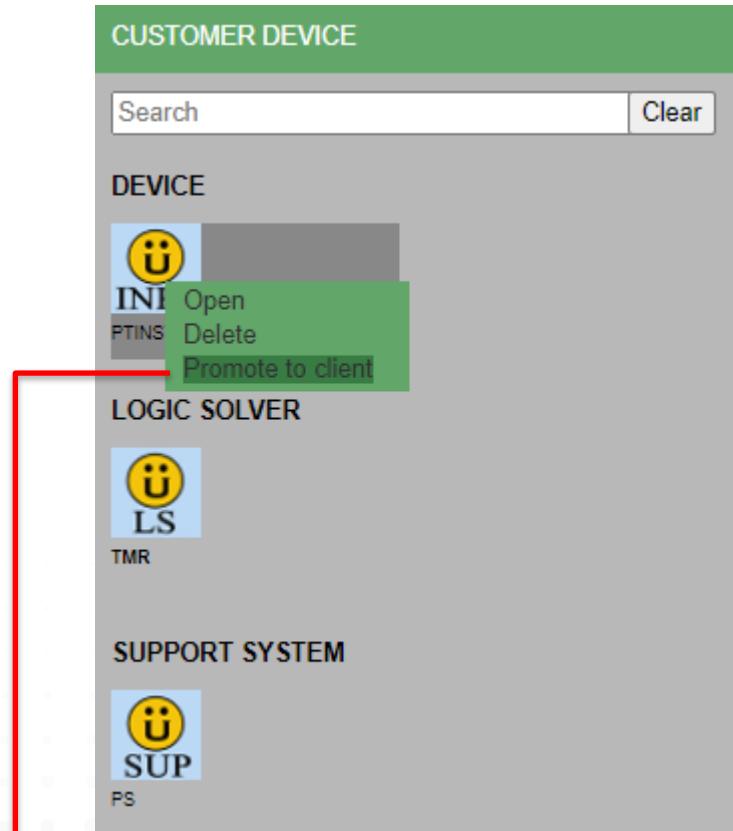
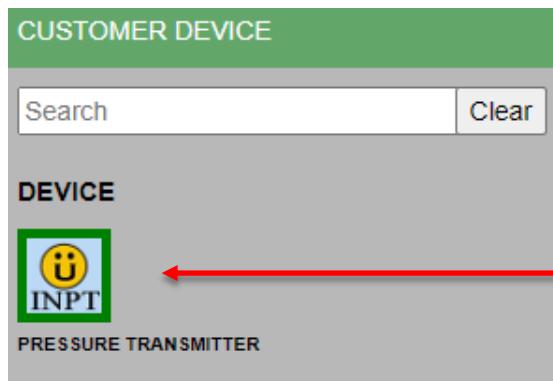
Project level custom datasheet

- By default, datasheets are specific to a project and visible within a project, under Custom Device library
- Used datasheet can not be deleted until they are deleted from the used instances



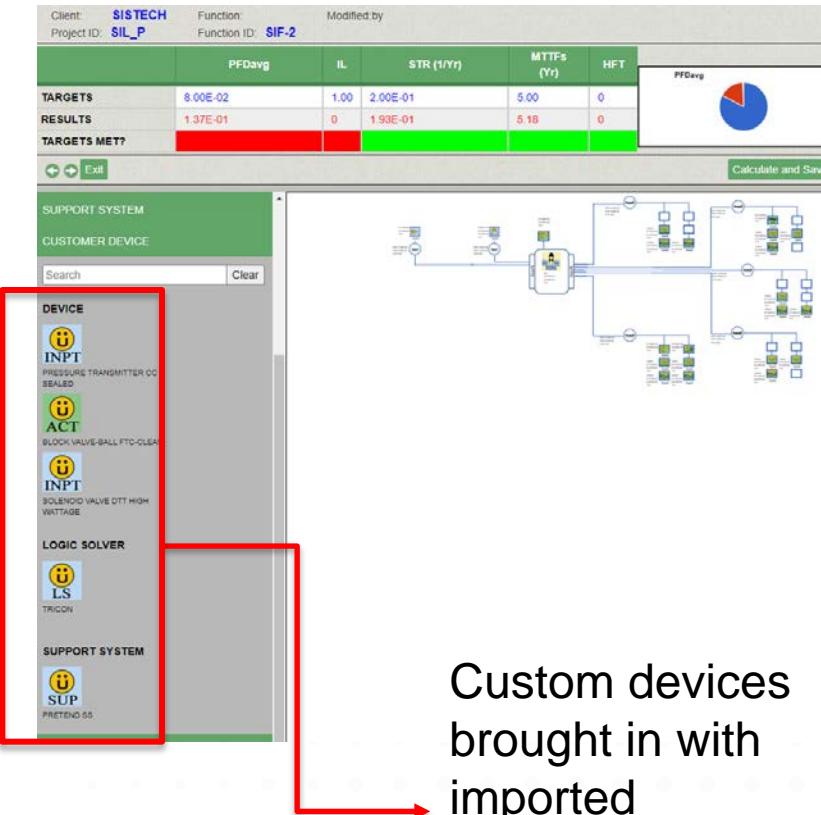
Client level custom datasheet

- Project level datasheet can be promoted to client level
- Promoted datasheet can be shared and are visible in other projects within a client
- Promoted datasheet will be highlighted with green border around it
- **Promotion to client level is a one-way step, can not undo later**
- Client level promoted datasheets are visible in device list and can be printed (Ref. page 96 & 97)



Importing a project with custom devices

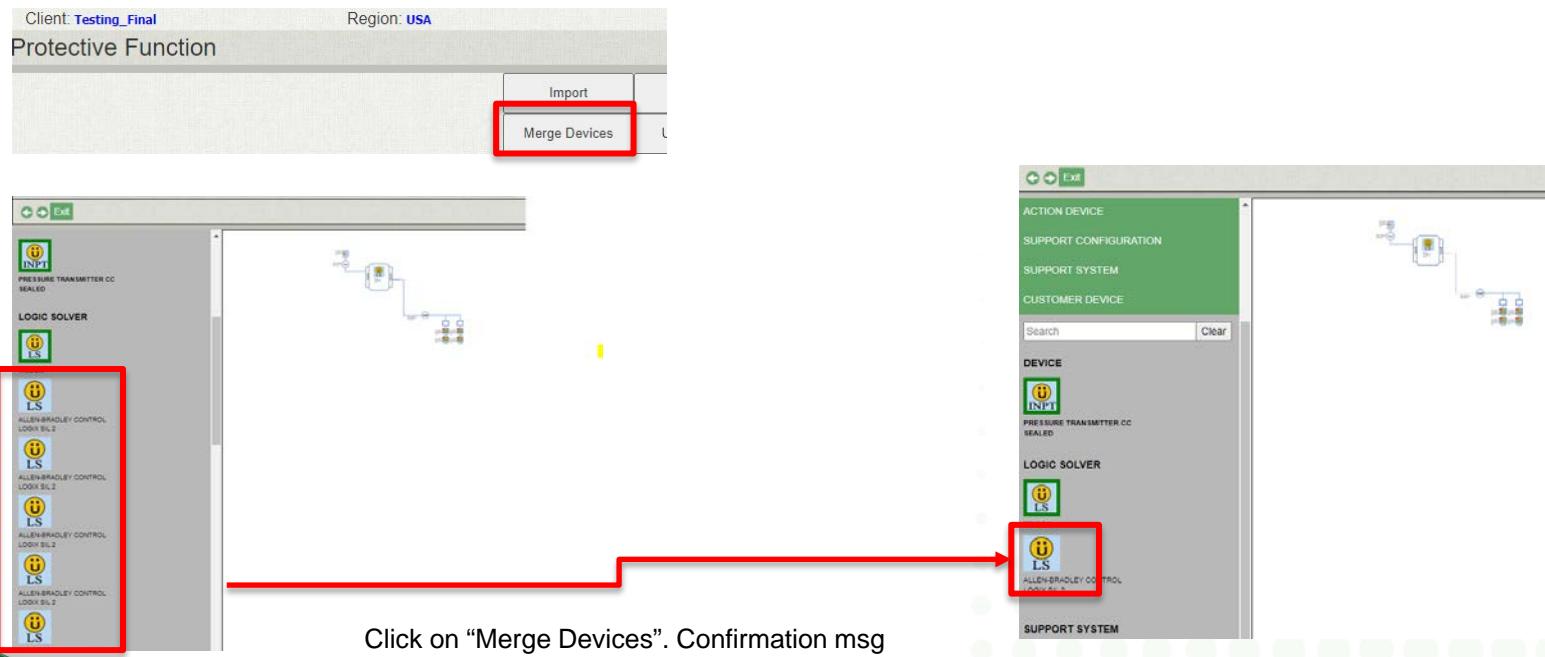
- Refer Pg. 87 & 89 on Project Import/Export
- In SIL Solver® v1.3.0, projects or functions with custom devices when imported have custom devices visible in custom device library after import.
- Imported projects could be from any prior version desktop v7.1 or earlier SIL Solver® Enterprise
- Custom devices are project specific by default.
- To share them between projects within a client ID, promotion to client level is needed.
- Custom devices can not be shared between different client IDs



Custom devices brought in with imported project/function are visible in device bar

Merge Devices

- If a project is imported from prior SIL Solver® Enterprise to v1.3.0
 - Custom devices visible under the “Customer Device” bar
 - Applicable for projects originally created in Desktop version and migrated to prior SIL Solver® Enterprise
 - Multiple instances of same custom device may appear under device bar
 - May use “Merge Devices” to keep one instance in library. No change in Protective functions.
 - This is one way process, can't undo the merging later



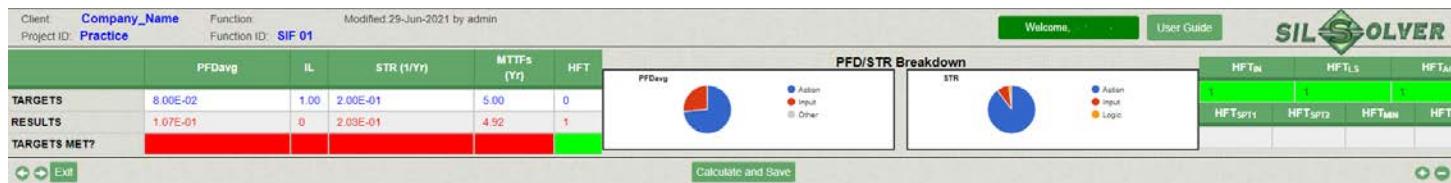
8. CHECK IN/ CHECK OUT

- PF Checkout
- Read Only Mode
- PF Check-in

PF Check Out:

Multiple user editing SIF

- If two users edits a function at once, it will be checked-out by the user updating the function first.
- For other users, PF will open in Read Only mode

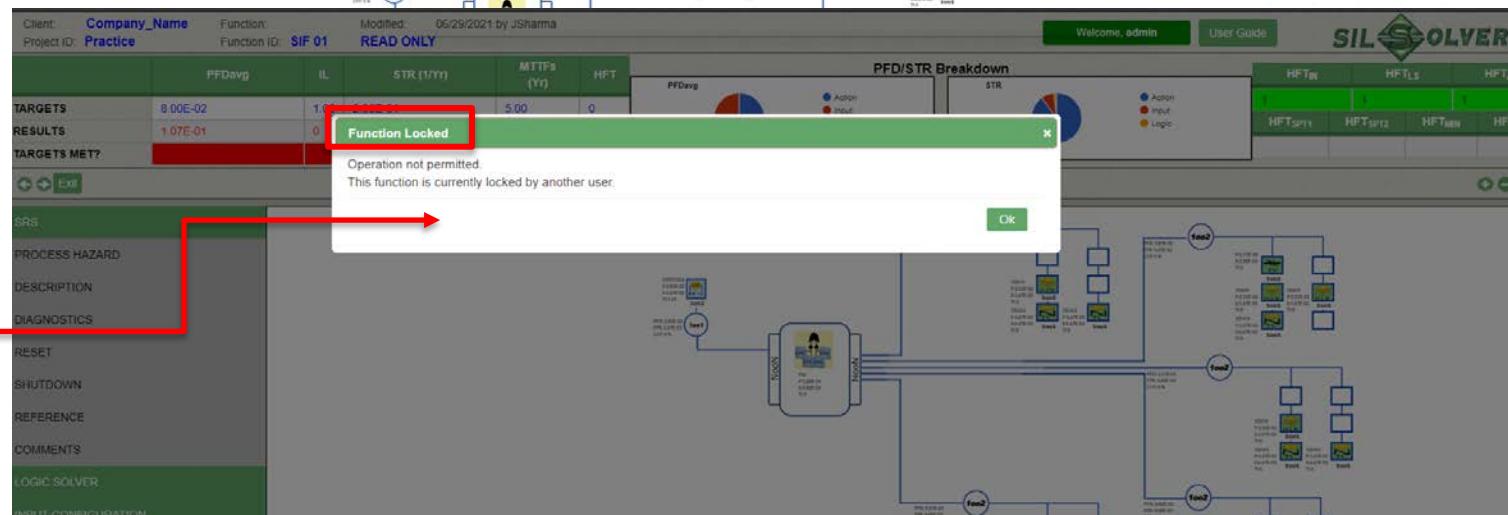


User 1 view



User 2 view

Read Only Mode:
Function locked
msg



Read Only Mode

PF for other users is locked for editing.

Client: SIS Tech-Jenna Function: Modified: 4/1/2021, 3:09:15 PM by JFalco
Project ID: FLOW1 Function ID: SF1B READ ONLY

	PFDavg	IL	MTTFs (Yr)	HFT
TARGETS	8.00E-02	1.00	2.00E-01	5.00
RESULTS	2.12E-01	0	4.40E-02	22.73
TARGETS MET?	No			

PFD/STR Breakdown

	PFDavg	STR
Action	90.5%	0
Input	0	0
Other	9.5%	1

SRS

PROCESS HAZARD

DESCRIPTION

Device

Device ID: DPT6 Device Type: DP - gas or liquid - Impulse <2 ft - Remote Sealed

Configurations:

Display Tag for Device(s): PDT314
Proof Testing Interval (yr): 2
Voting: 1oo1
Subsystem Diagnostic Level: NO DC

Properties:

Failure Dangerous Failure Rate (1/yr): 8.000000000C
Failure Spurious Failure Rate (1/yr): 1.666666666E
Common Cause Factor CCF Dual (%): 2
Common Cause Factor CCF Triple (%): 2
Diagnostic Coverage Simplex DC1 (1/yr): 60
Diagnostic Coverage Dual DC2 (1/yr): 80
Diagnostic Coverage Triple DC3 (1/yr): 90

Maintenance:

Mean Time to Repair (hr): 72
Diagnostic Interval (hr): 0.5
Overhaul Interval (yr): 20
Proof Testing Coverage (%): 100
User Specified

Note:

Boundary Conditions: Boundary includes the electronic transmitter, sensing diaphragm and process connection.

Process Severity Assumption: No adverse process effects are expected due to remote sealing

Implementation Limitations and Exclusions: [See of Dedicated Heating and Climate protection for impulse piping and](#)

Data Source: SIL [Update](#)

Disabled

PF Check in

- PF is checked back in when first user exits the function or closes the SIL Solver® window
- First user gets 30 mins time window to make changes, after that PF is available for editing by any user.
- In case of inactivity by first user, the PF will be checked back in automatically after 30 mins window.
- Give 30 sec update time between check in and next check out, if PF shows read only.

9. TROUBLESHOOTING

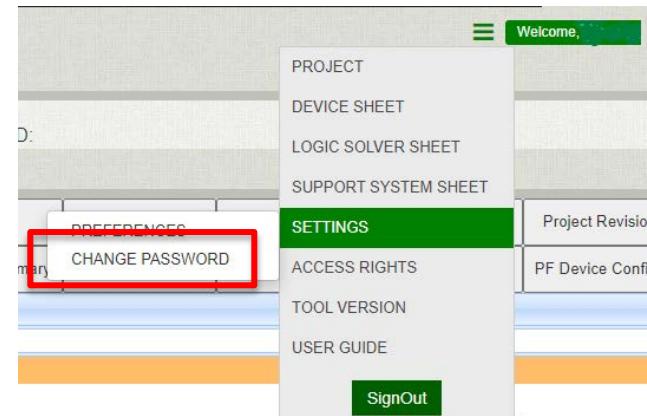
- Lost passwords
- Screen settings
- Import challenges

Troubleshooting: Lost Username or Password

Non-SSO version

- Individual username and password assignment is performed through the ADMIN account
- User can change password from its account
- Admin can change password for user

Menu  → Access Rights → 'User' tab: Select User & click 'Edit Password'



SSO version

- Software with Single Sign-on enabled depends on the user's company credentials.

Troubleshooting: Screen Settings

- Some SIL Solver® Enterprise application screen content may be obscured if
 - Window is not maximized
 - Zoom >100% is used on the window

Troubleshooting: Import Challenges

- When importing, confirm the final function successfully transferred into SIL Solver® Enterprise
- If warnings are generated during the import, there is an import log file that can be downloaded
- For DBF Import, use the Windows native “Send to” “Compressed (zipped) folder” feature, not any other zip application

Troubleshooting: Import Challenges

- If DBF file has PFs tag names with comma, import would fail. Remove comma in tag names before import



- If PFs in desktop version were modelled with complex architecture (such as a transmitter with signal splitter or a pressure compensated level), PF may need an update after import
- If PFs in desktop version configured with redundant inputs, these functions may need remodeling for common cause factor

Troubleshooting: Disconnects/Timing Out

- Do not delay too long before saving.
- SIL Solver® Enterprise will time out after a period (4 hours) of inactivity.
 - Click “Yes” to extend the session

