

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

Table of Contents

1. Accessing the Application
2. Project Management
3. Creating a new project and functions
4. Editing, Copying or deleting a project
5. Generating reports
6. Importing/Exporting projects and functions
7. Datasheets
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>

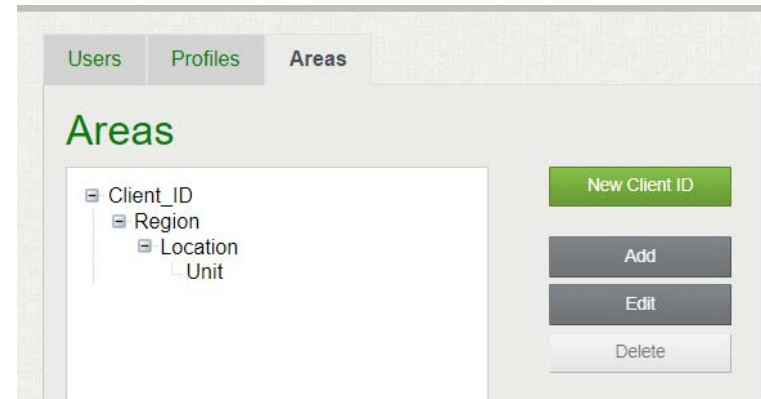
Assigning username and password to new user

- 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

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	✓	✓	✓	✓	✓	✓	✓	✓	✓	Edit Delete
User	Engineer Level Access	✗	✓	✗	✓	✗	✓	✓	✓	✓	Edit Delete
Project Manager	Manages user assignments within the areas	✗	✓	✓	✓	✗	✓	✓	✓	✓	Edit Delete
Read Only	Profile to be assigned to those with Read-Only license	✗	✗	✗	✗	✗	✗	✗	✓	✗	Edit Delete

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	✓	✓	✓	✓	✓	✓	✓	✓	✓	Edit Delete
User	Engineer Level Access	✗	✓	✗	✓	✗	✓	✓	✓	✓	Edit Delete
Project Manager	Manages user assignments within the areas	✗	✓	✓	✓	✗	✓	✓	✓	✓	Edit Delete
Read Only	Profile to be assigned to those with Read-Only license	✗	✗	✗	✗	✗	✗	✗	✓	✗	Edit Delete

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

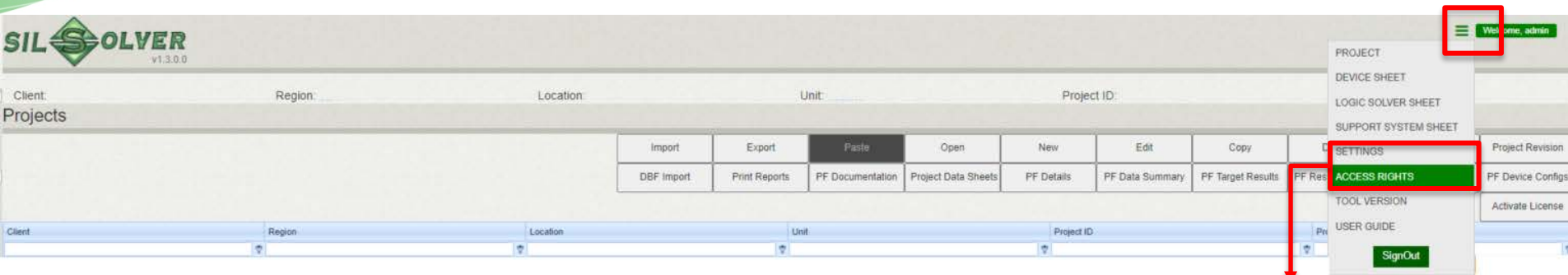


SSO version

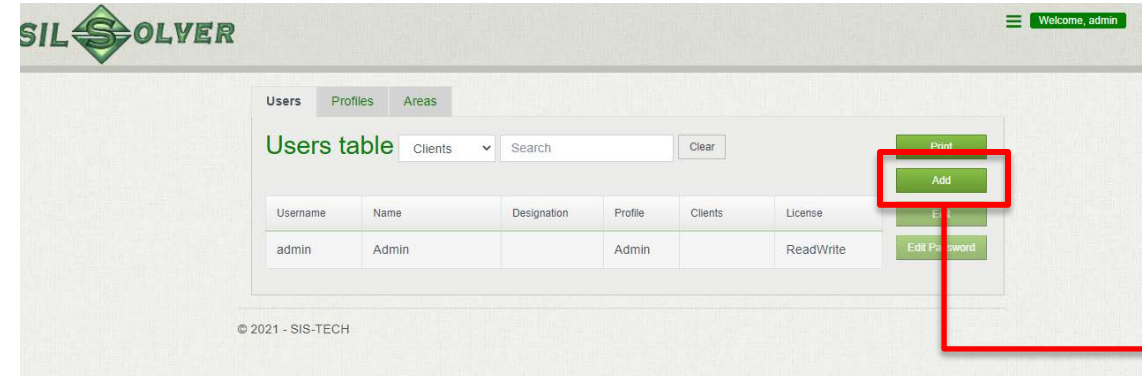
2. PROJECT MANAGEMENT

- 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



New User

User name:

Name:

Designation:

Mobile:

Email:

License:

Password:

Profile:

Rights:

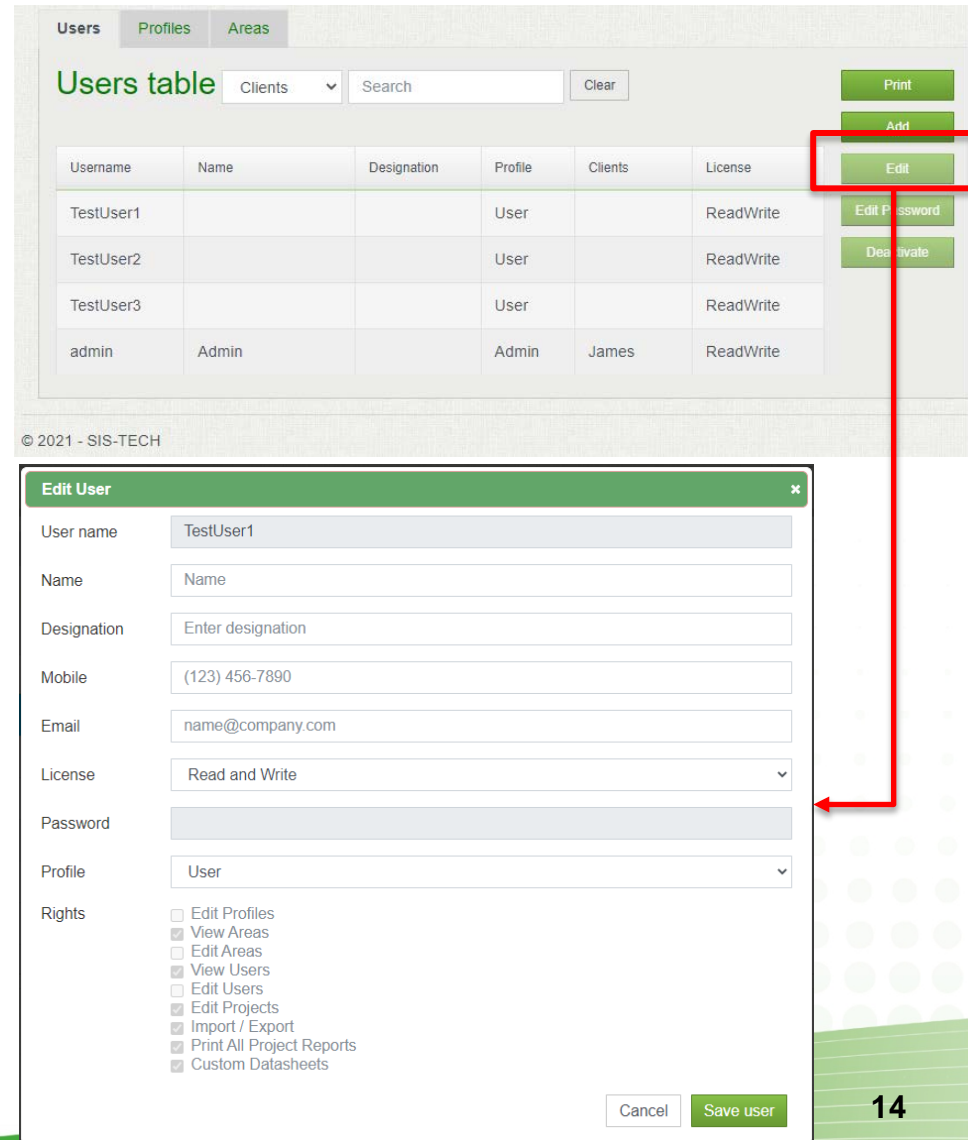
- ☒ Edit Profiles
- ☒ View Areas
- ☒ Edit Areas
- ☒ View Users
- ☒ Edit Users
- ☒ Edit Projects
- ☒ Import / Export
- ☒ Print All Project Reports
- ☒ Custom Datasheets

- 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 'Users' table with the following data:

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

The 'Edit User' dialog box is open, showing the following fields and options:

- User name: TestUser1
- Name: Name
- Designation: Enter designation
- Mobile: (123) 456-7890
- Email: name@company.com
- License: Read and Write
- Password: (empty field)
- Profile: User
- Rights:
 - ☐ Edit Profiles
 - ☒ View Areas
 - ☐ Edit Areas
 - ☒ View Users
 - ☐ Edit Users
 - ☒ Edit Projects
 - ☒ Import / Export
 - ☒ Print All Project Reports
 - ☒ Custom Datasheets

Buttons: 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 web application interface for managing users. At the top, there are tabs for 'Users', 'Profiles', and 'Areas'. Below the tabs, the title 'Users table' is displayed. A dropdown menu is open, showing options: 'Clients' (selected), 'Regions', 'Locations', 'Units', and 'Projects'. A red arrow points from the 'Clients' option in the dropdown to the 'Clients' column header in the table below. The table has columns: Username, Name, Designation, Profile, Clients, and License. The data rows are:

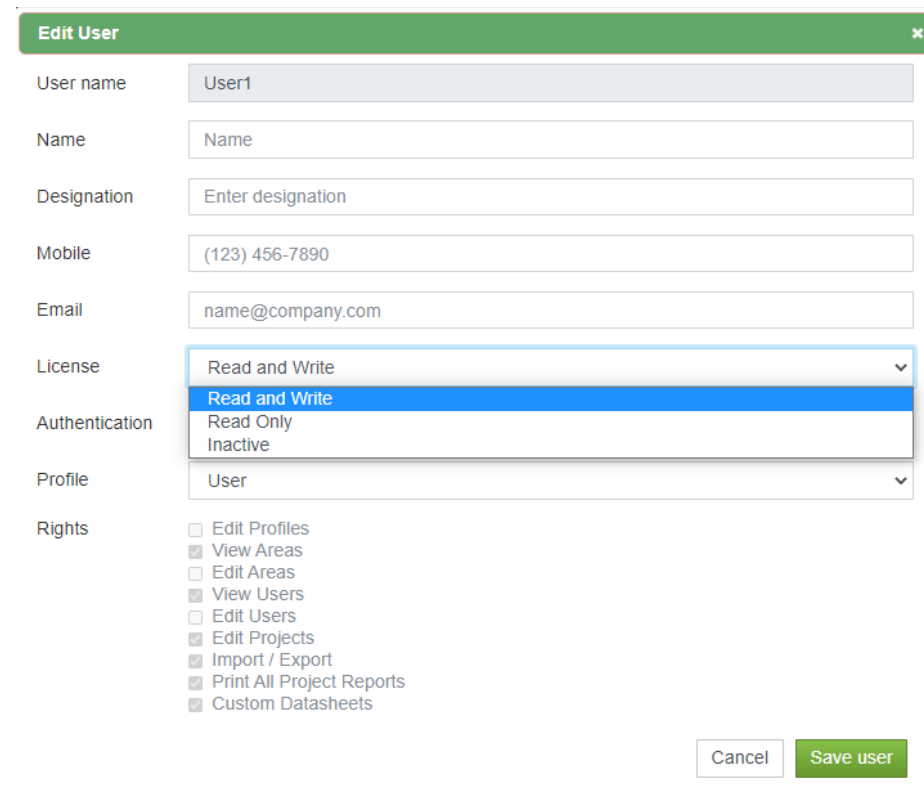
Username	Name	Designation	Profile	Clients	License
TestUser1			User	Client 1	ReadWrite
TestUser2			User	Client 2	ReadWrite
TestUser3			User	Client 3	ReadWrite
admin	Admin		Admin		ReadWrite

On the right side of the table, there are buttons: Print, Add, Edit, Edit Password, and Deactivate. At the bottom left, there is a copyright notice: © 2021 - SIS-TECH.

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 (selected)

Authentication: Read Only, Inactive

Profile: User

Rights:

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

Cancel Save user

Assigning a Security Profile

Users Profiles Areas

Users table Clients Search Clear

Username	Name	Designation	Profile	Clients	License	
TestUser1			User		ReadWrite	<div>Edit</div> <div>Edit Password</div> <div>Deactivate</div>
TestUser2			User		Inactive	
TestUser3			User		ReadWrite	
admin	Admin		Admin	James	ReadWrite	

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Select User and click on "Edit"

"Edit Password" unavailable in SSO version

Assign Security Profile

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:

☐ Edit Users
☐ Edit Projects
☒ Import / Export
☒ Print All Project Reports
☒ Custom Datasheets

Cancel Save user

Tool use is affected by combination of license and security profile

Adding New Security Profile

SIL SOLVER Welcome, admin

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		✓	✓	✓	✓	✓	✓	✓	✓	✓	<button>Edit</button> <button>Delete</button>
User		✗	✓	✗	✓	✗	✓	✓	✓	✓	<button>Edit</button> <button>Delete</button>

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Add profile

Define profile rights

New profile

Name

Manager

Description

Profile description...

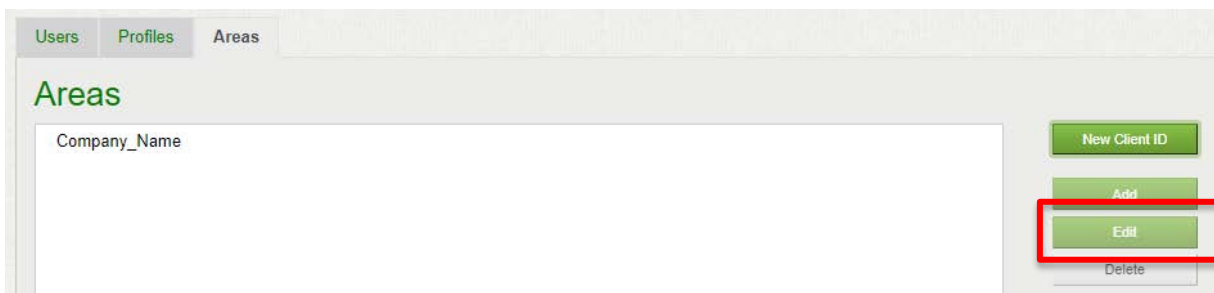
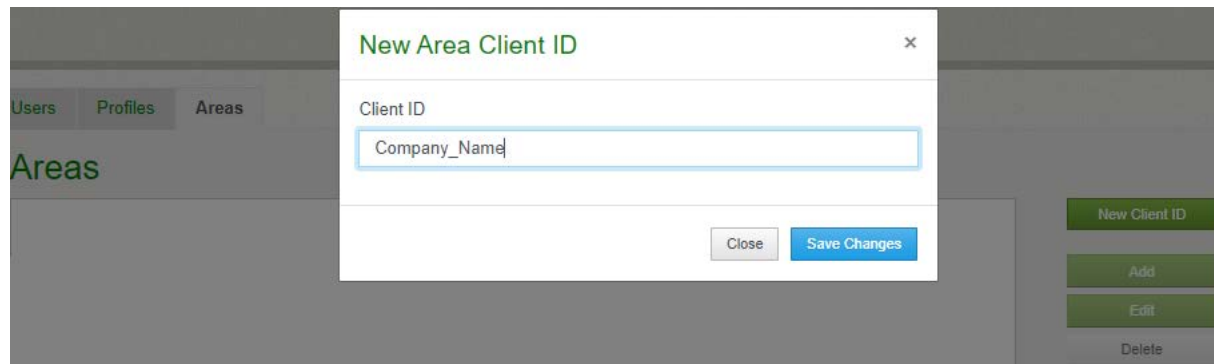
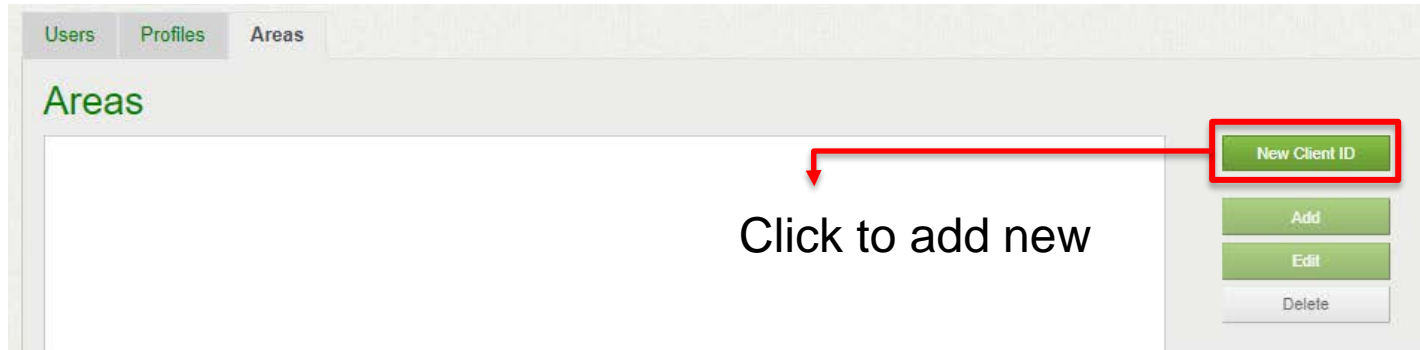
Rights

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

Cancel

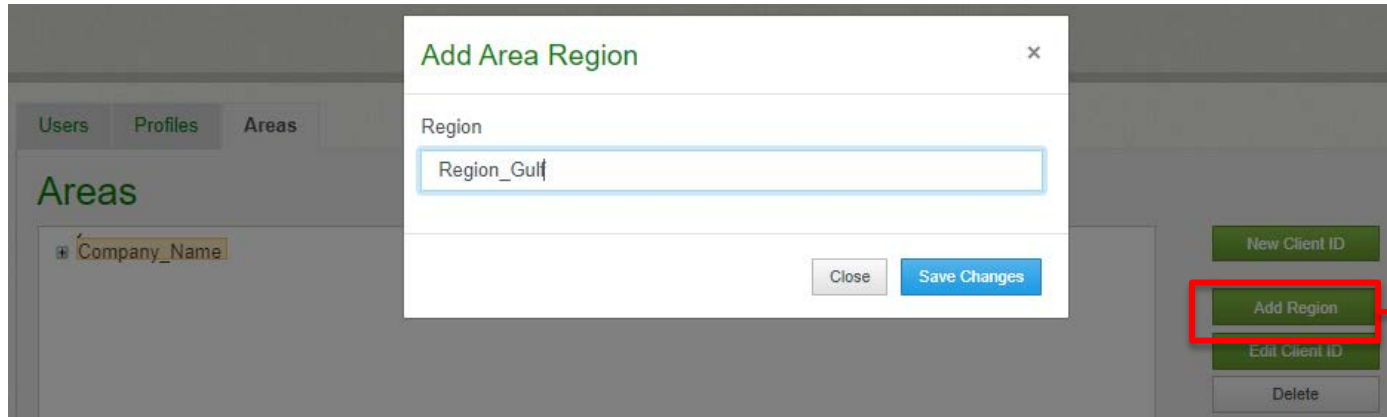
Save profile

Creating Hierarchy: Add Client ID



Edit Button: A Client ID can be renamed later

Creating Hierarchy: Add Region

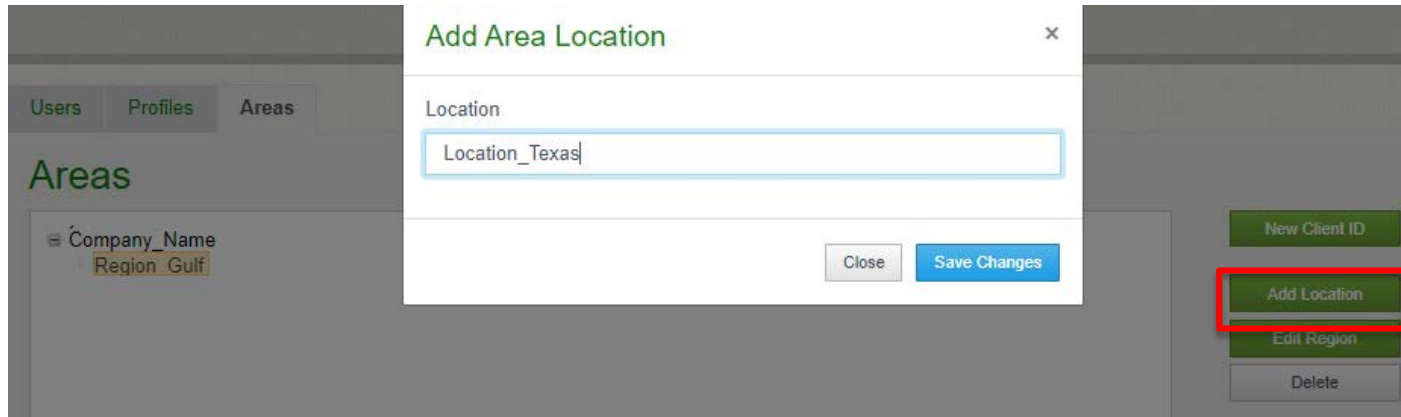


Select added client ID & click "Add region"



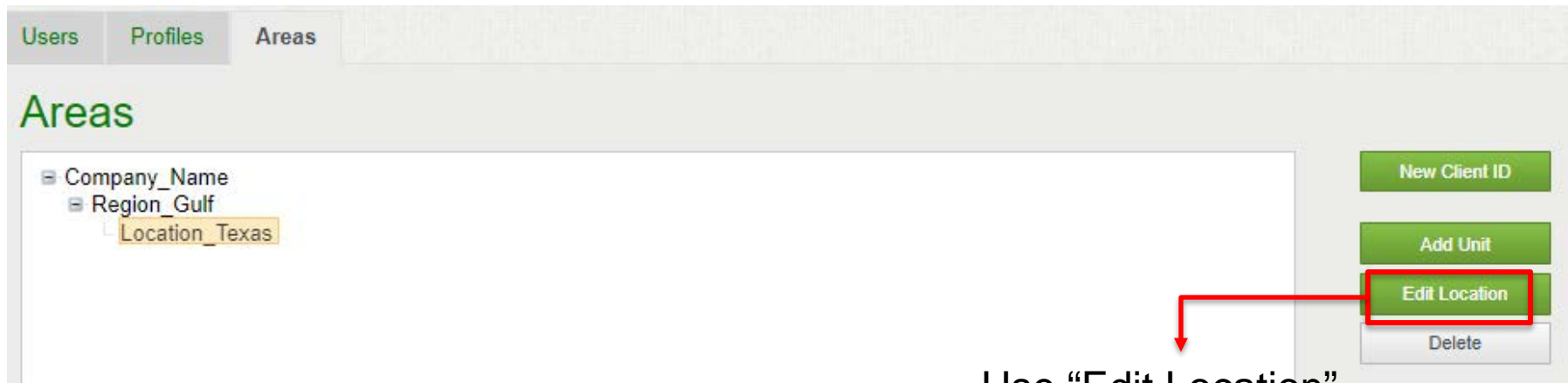
Use "Edit Region" to rename later

Creating Hierarchy: Add Location



The screenshot shows the 'Add Area Location' dialog box open over the 'Areas' sidebar. The dialog box has a 'Location' input field containing 'Location_Texas' and 'Save Changes' and 'Close' buttons. The sidebar shows a tree structure with 'Company_Name' expanded, showing 'Region_Gulf'. To the right of the sidebar, a vertical menu contains buttons: 'New Client ID', 'Add Location' (highlighted with a red box), 'Edit Region', and 'Delete'. A red arrow points from the 'Add Location' button to the text 'Select added region & click "Add Location"'.

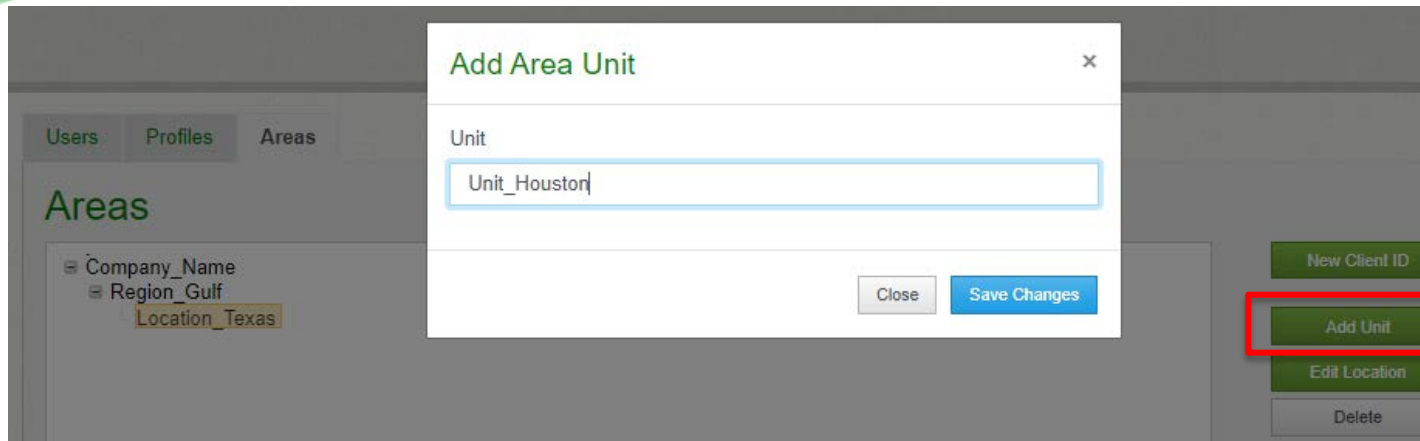
Select
added
region &
click "Add
Location"



The screenshot shows the 'Areas' sidebar with the hierarchy expanded to 'Location_Texas'. The sidebar shows 'Company_Name' expanded, then 'Region_Gulf', and finally 'Location_Texas'. To the right, the vertical menu now includes 'New Client ID', 'Add Unit', 'Edit Location' (highlighted with a red box), and 'Delete'. A red arrow points from the 'Edit Location' button to the text 'Use "Edit Location" to rename later'.

Use "Edit Location"
to rename later

Creating Hierarchy: Add Unit



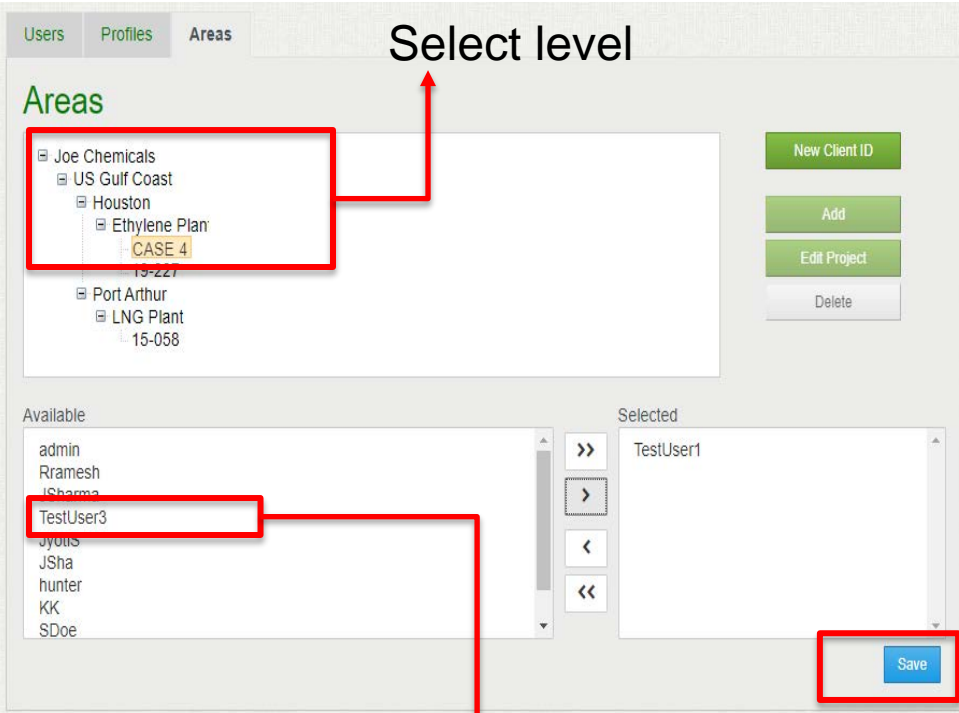
Add Unit under
Location



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



The screenshot shows a web application interface for managing user access. At the top, there are three tabs: 'Users', 'Profiles', and 'Areas'. The 'Areas' tab is selected. Below the tabs, there is a section titled 'Areas' containing a tree view of a hierarchy. The hierarchy starts with 'Joe Chemicals', which has a sub-item 'US Gulf Coast'. Under 'US Gulf Coast' is 'Houston', which has a sub-item 'Ethylene Plant'. Under 'Ethylene Plant' is 'CASE 4', which is highlighted with a red box. An arrow points from this box to the text 'Select level'. Below the 'Areas' section, there are two lists: 'Available' and 'Selected'. The 'Available' list contains usernames: 'admin', 'Ramesh', 'JSharma', 'TestUser3', 'Jyotis', 'JSha', 'hunter', 'KK', and 'SDoe'. 'TestUser3' is highlighted with a red box. An arrow points from this box to the 'Selected' list. The 'Selected' list contains 'TestUser1'. Between the two lists are buttons for moving users: '>>', '>', '<', and '<<'. At the bottom right, there is a 'Save' button highlighted with a red box. An arrow points from this button to the text 'Move selected user to the right and save'.

- 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

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

SIS SOLVER v1.3.0.0

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

Projects

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	
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	CASE 4	Case 3 for testing import-export
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	CASE 5	Bill's frequent stroke and non-red input case
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	LOGIC SOLV	Utilities: LOPA Study

Create Filter

Project List

Filters may be useful to users with long project lists

Create New Project

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:

Region:

Location:

Unit:

Project ID:

Name:

Add New Project

Client Id:

Region:

Location:

Unit:

Project ID:

Name:

- 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

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

Projects

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

Create Filter

SIL SOLVER
v1.3.0.0

Site: Project ID **Practice**

Project Version Performed By Date Approved By Date

No data to display

Create Filter

Project Revision

Version:

Performed By: Date:

Approved By: Date:

Description of Modification:

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

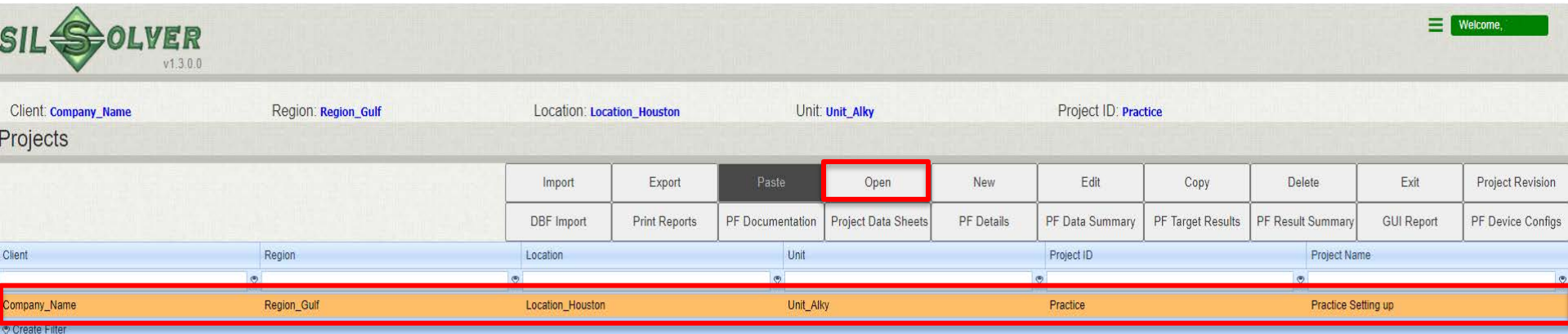
Example SIF

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



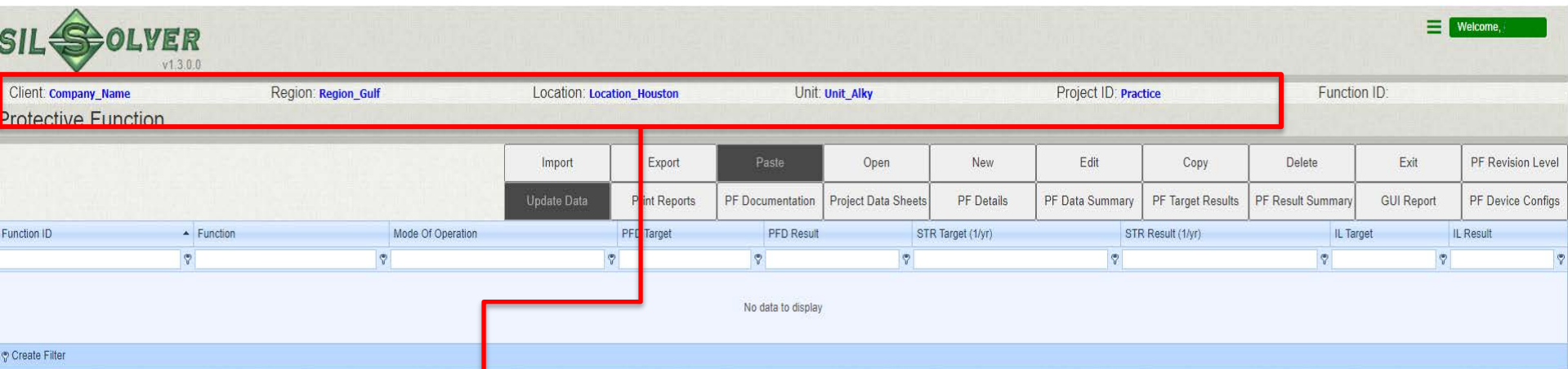
The screenshot shows the SIL SOLVER v1.3.0.0 Project home page. The top navigation bar includes the SIL SOLVER logo, a 'Welcome' button, and a 'Projects' section. Below the navigation bar, there are filters for Client (Company_Name), Region (Region_Gulf), Location (Location_Houston), Unit (Unit_Alky), and Project ID (Practice). A table of projects is displayed, with the first project highlighted in orange. The 'Open' button in the table's toolbar is highlighted with a red box.

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

Toolbar buttons: 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.

Protective Function Level

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



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

Project information.

Start a new safety function

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

SIL SOLVER v1.3.0.0

Client: **Company_Name** Region: **Region_Gulf** Location: **Location_Houston** Unit: **Unit_Alky** Project ID: **Practice_1** Function ID: **SIF 01**

Protective Function

Function ID Saved Successfully

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						

Create Filter

- 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

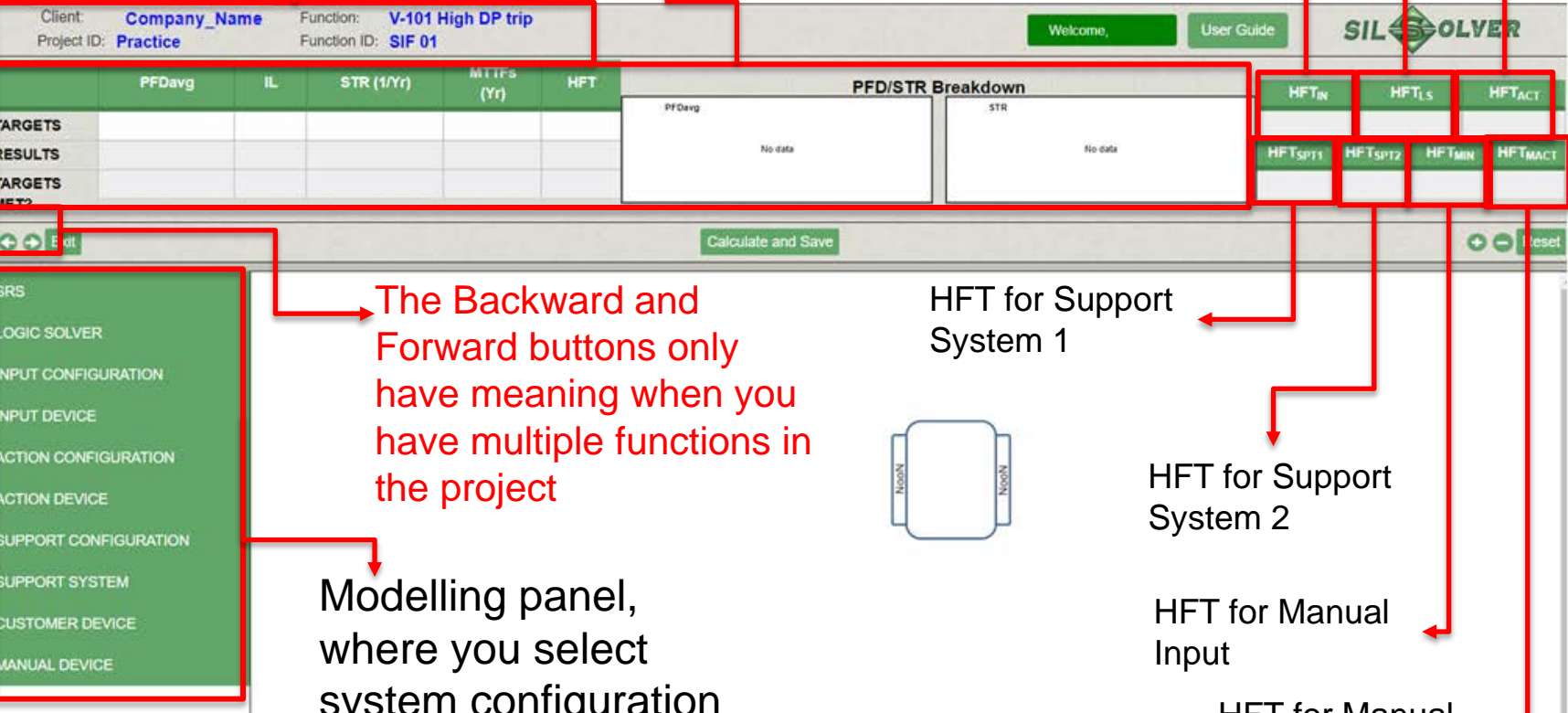
SIF project information SIF calculation results both numerical and graphical

HFT for Logic Solver HFT for Inputs(s) HFT for Action(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 Function: V-101 High DP trip
Project ID: Practice Function ID: SIF 01

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	PFDavg	IL	STR (1/Yr)	MTTFS (Yr)	HFT	PFD/STR Breakdown			
TARGETS									
RESULTS						No data			
TARGETS									
RESULTS						No data			

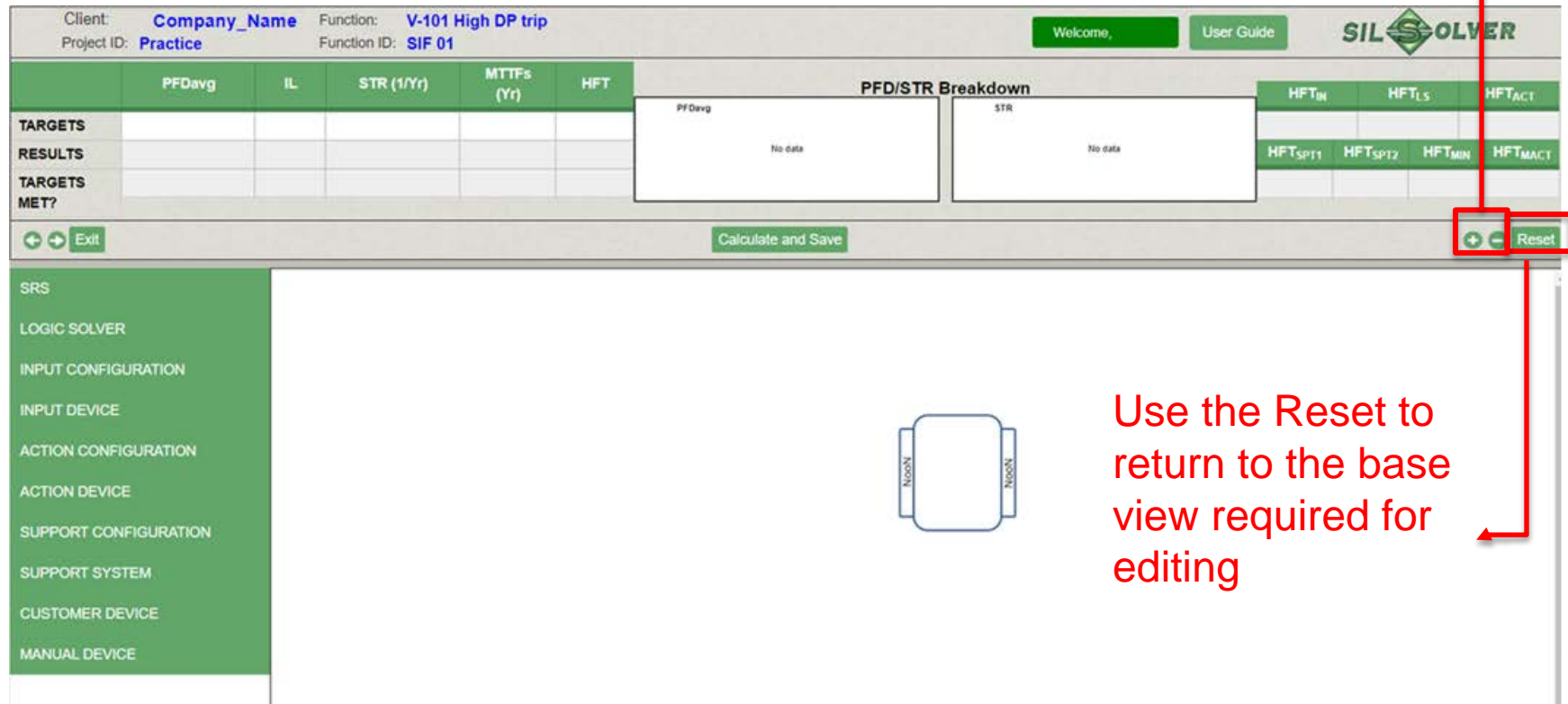
Calculate and Save + - Reset

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

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**

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	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?										

Calculate and Save

Exit

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

Client: **Company_Name** Function: **V-101 High DP trip** Welcome, User Guide **SIL SOLVER**
 Project ID: **Practice** Function ID: **SIF 01**

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS					
RESULTS					
TARGETS MET?					

PFD/STR Breakdown

PFDavg
No data

STR
No data

HFT _{IN}	HFT _{LS}	HFT _{ACT}

SRS

LOGIC SOLVER

INPUT CONFIGURATION

INPUT DEVICE

ACTION CONFIGURATION

ACTION DEVICE

SUPPORT CONFIGURATION

SUPPORT SYSTEM

CUSTOMER DEVICE

MANUAL DEVICE

Target Specification ×

PFDavg

MTTFs (Yr)

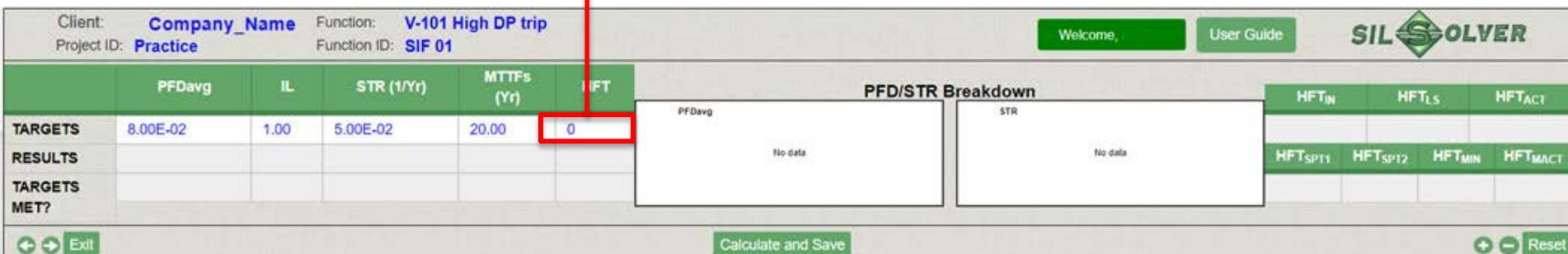
Enter performance targets and update

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.

SILTarget	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



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

PFDavg
No data

STR
No data

HFT _{IN}	HFT _{LS}	HFT _{ACT}
HFT _{SPT1}	HFT _{SPT2}	HFT _{MIN}
		HFT _{MACT}

Exit Calculate and Save + - Reset

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.

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

PFDavg STR

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

HFT_{SP1} HFT_{SP2} HFT_{MIN} HFT_{MACT}

← → Exit Calculate and Save + - Reset

SRS

LOGIC SOLVER

Search Clear

GENERIC 2004D DUAL MP, DUAL I/O

GENERIC 1002D DUAL MP, SIMPLEX I/O

NON-SC D/D

NON SC PES DUAL MP, DUAL I/O

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

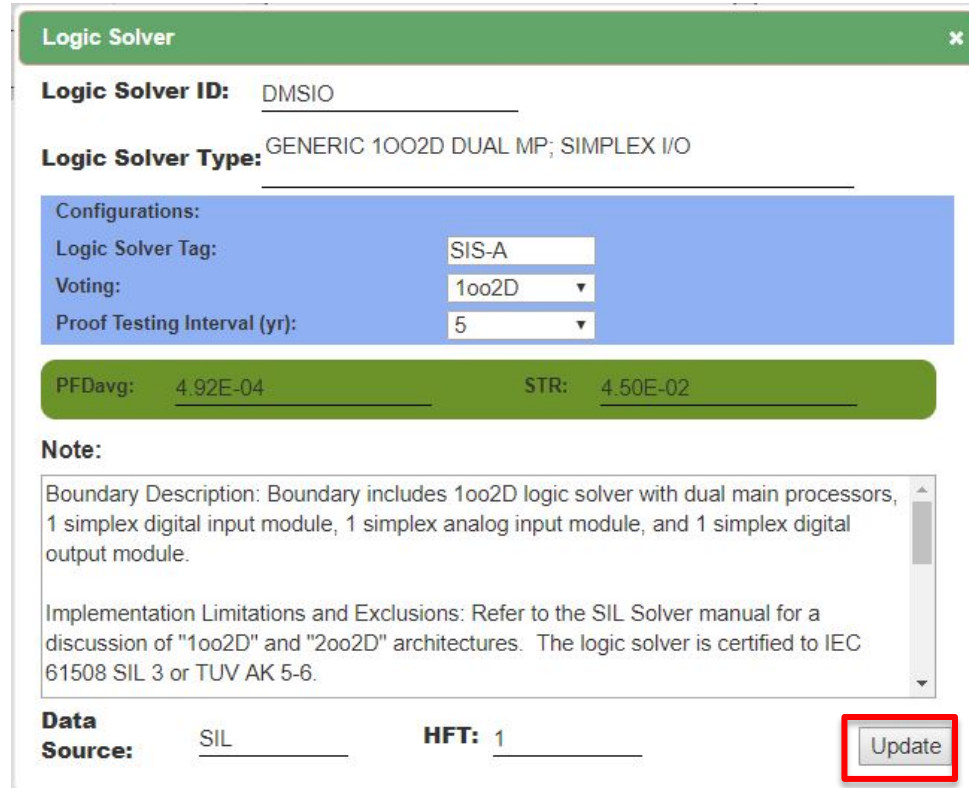
Adding LS details

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

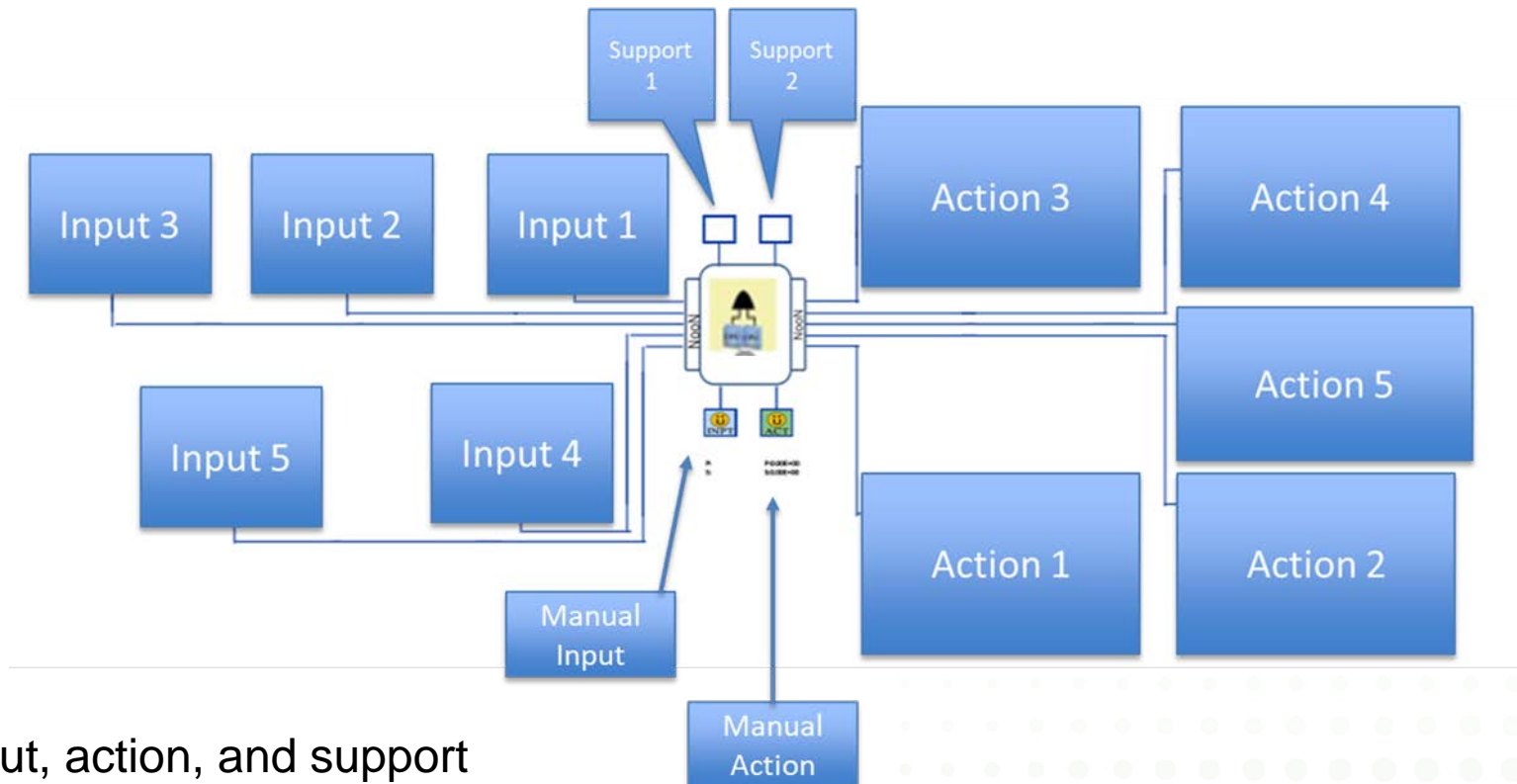
Tool will automatically calculate LS contributions to PFDavg and STR



The screenshot shows a 'Logic Solver' configuration window. It includes fields for 'Logic Solver ID' (DMSIO), 'Logic Solver Type' (GENERIC 1OO2D DUAL MP; SIMPLEX I/O), and a 'Configurations' section with 'Logic Solver Tag' (SIS-A), 'Voting' (1oo2D), and 'Proof Testing Interval (yr)' (5). Below this, 'PFDavg' is 4.92E-04 and 'STR' is 4.50E-02. A 'Note' section contains boundary and implementation details. At the bottom, 'Data Source' is SIL and 'HFT' is 1. An 'Update' button is highlighted with a red box.

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?					

PFDavg

100% Logic

STR

100% Logic

HFT _{IN}	HFT _{LS}	HFT _{ACT}
	1	
HFT _{SPT1}	HFT _{SPT2}	HFT _{MIN}
HFT _{MACT1}	HFT _{MACT2}	HFT _{MACT}

← → Exit

Calculate and Save

+ - Reset

SRS

LOGIC SOLVER

INPUT CONFIGURATION

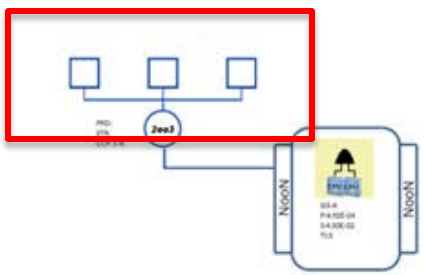
ONE DEVICE

TWO DEVICES

THREE DEVICES

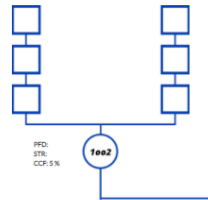
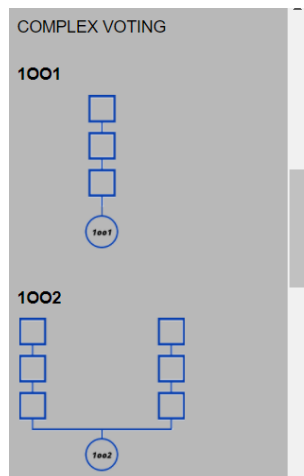
1003

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



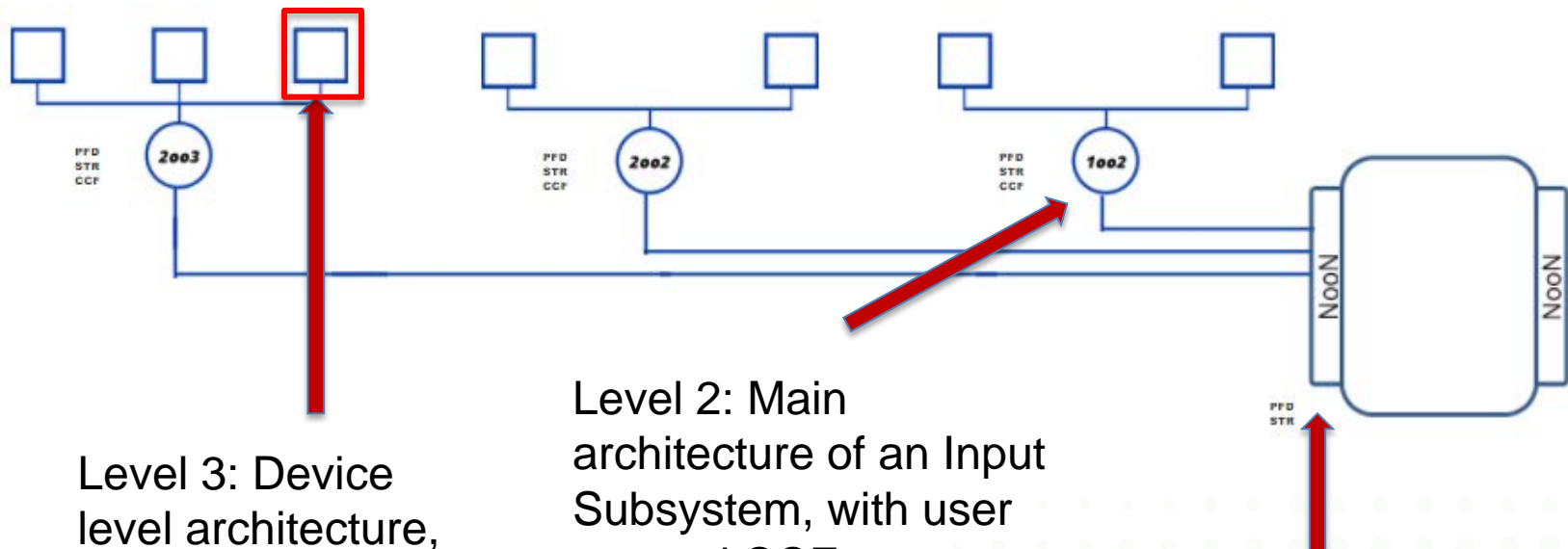
- If a single variable value is made up of multiple devices, use a **Complex Voting Architecture**
- All the devices for each separate value go in a single vertical channel

Common examples:

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

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
TARGETS	8.00E-02	1.00	5.00E-02	20.00	0
RESULTS					
TARGETS MET?					

PFD/STR Breakdown

PFDavg 100% Logic
STR 100% Logic




HFT _{IN}	HFT _{LS}	HFT _{ACT}	
	1		
HFT _{SPT1}	HFT _{SPT2}	HFT _{MIN}	HFT _{MACT}

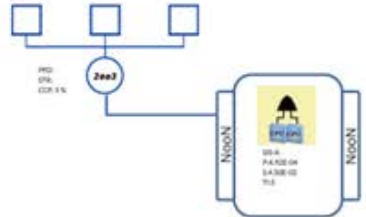
← → Exit Calculate and Save + − Reset

INPUT DEVICE

Search Clear

TRIP AMPLIFIER
ANALYZER
PRESSURE

 DIFFERENTIAL PRESSURE TRANSMITTER
 PNEUMATIC PRESSURE SWITCH
 PNEUMATIC PRESSURE TRANSMITTER



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
TARGETS	8.00E-02	1.00	5.00E-02	20.00	0
RESULTS					
TARGETS MET?					

PFDavg



STR



HFT _{IN}	HFT _{LS}	HFT _{ACT}
	1	
HFT _{SP1}	HFT _{SP2}	HFT _{MIN}
HFT _{MACT}		

+ → Exit
Calculate and Save
+ - Reset


INPUT DEVICE


Clear


TRIP AMPLIFIER

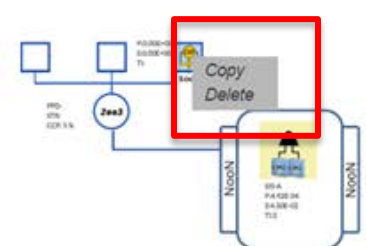
ANALYZER

PRESSURE

 DIFFERENTIAL PRESSURE TRANSMITTER

 PNEUMATIC PRESSURE SWITCH

 PNEUMATIC PRESSURE TRANSMITTER



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): Individual Tags

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):

PFDavg:

STR:

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 SIL Solver Enterprise User Guide)

Data Source:

Update

47

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 DP-101A

Proof Testing Interval (yr) 5

Voting: 1oo1

Subsystem Diagnostic Level: ? NO DC

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

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"/>

PFDavg: 0.00E+00

STR: 0.00E+000

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 SIL Solver Enterprise User

Data Source: SIL

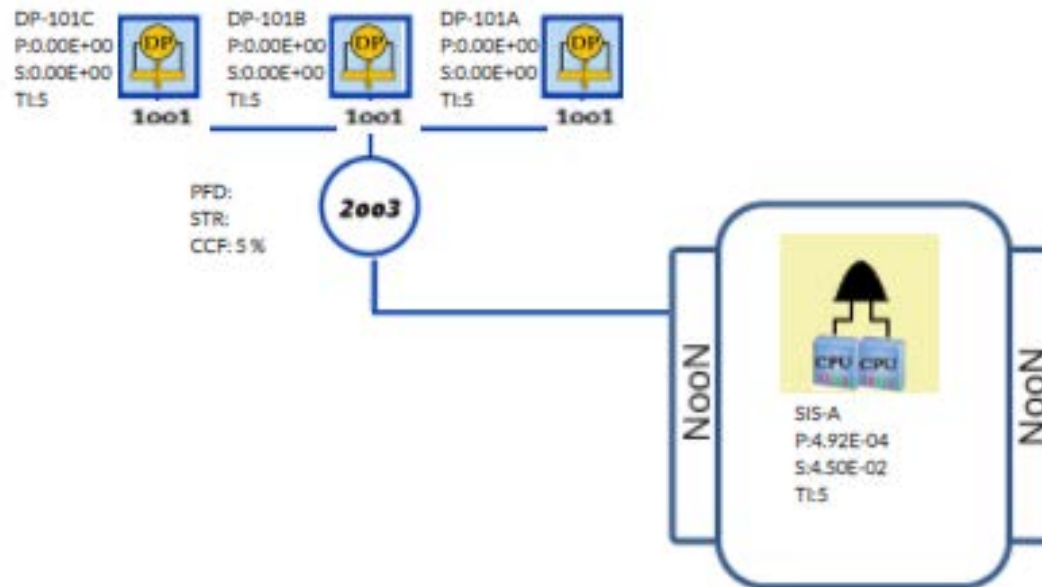
Update

Will updated
once SIF is
calculated

Update button will activate once
minimum data is entered.

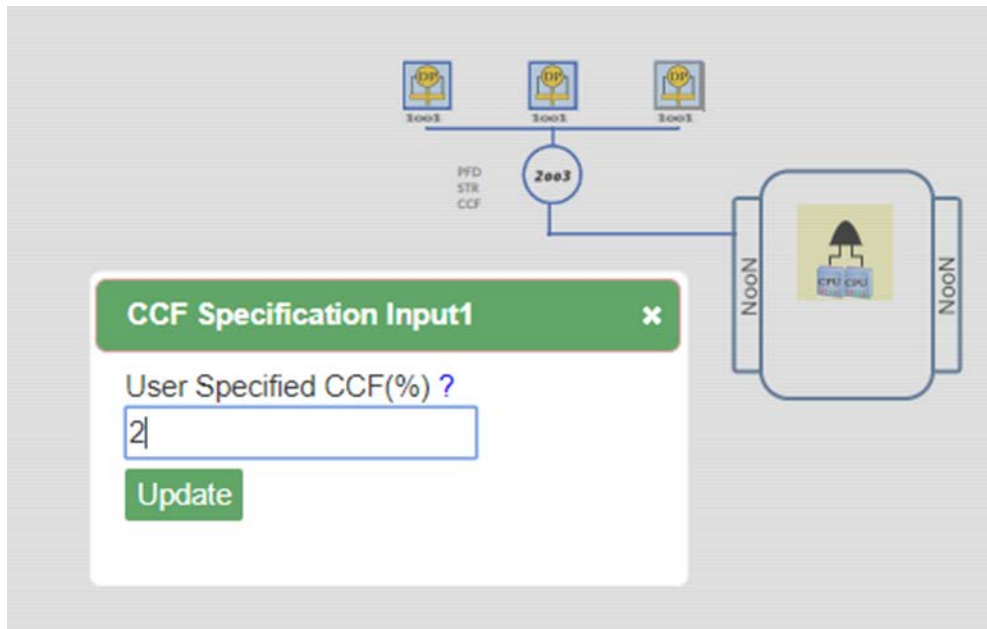
Completing the subsystem

1. Copy DP-101A Pressure transmitter
2. Paste DP pressure transmitter to each of box in the 2003 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



CCF is not used in non-redundant (i.e., 1oo1, 2oo2 or 3oo3) architectures

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%

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

Maintenance:

Mean Time to Repair (hr): 72

Diagnostic Interval (hr): 0.500

Overhaul Interval (yr): 20

Proof Testing Coverage (%): ? 100

User Specified ☐

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

PFDavg: 2.01E-002

STR: 1.67E-002

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 SIL Solver Enterprise User

Data Source: SIL

Update

The triplex DC
for this device
is 90%

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.

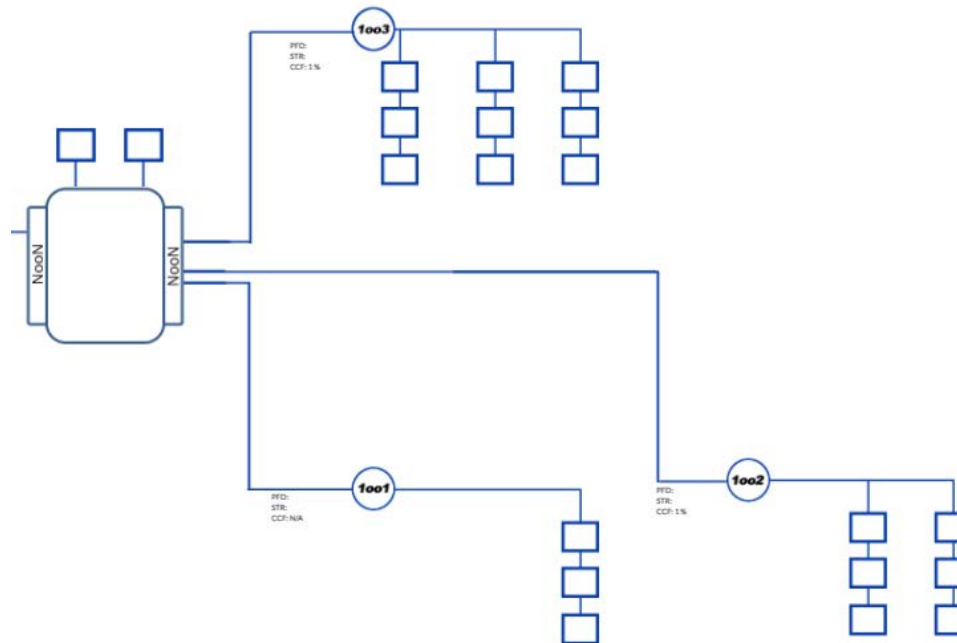
May select a higher DC when an external independent reading can be used for inter-comparison with the SIF sensor.

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

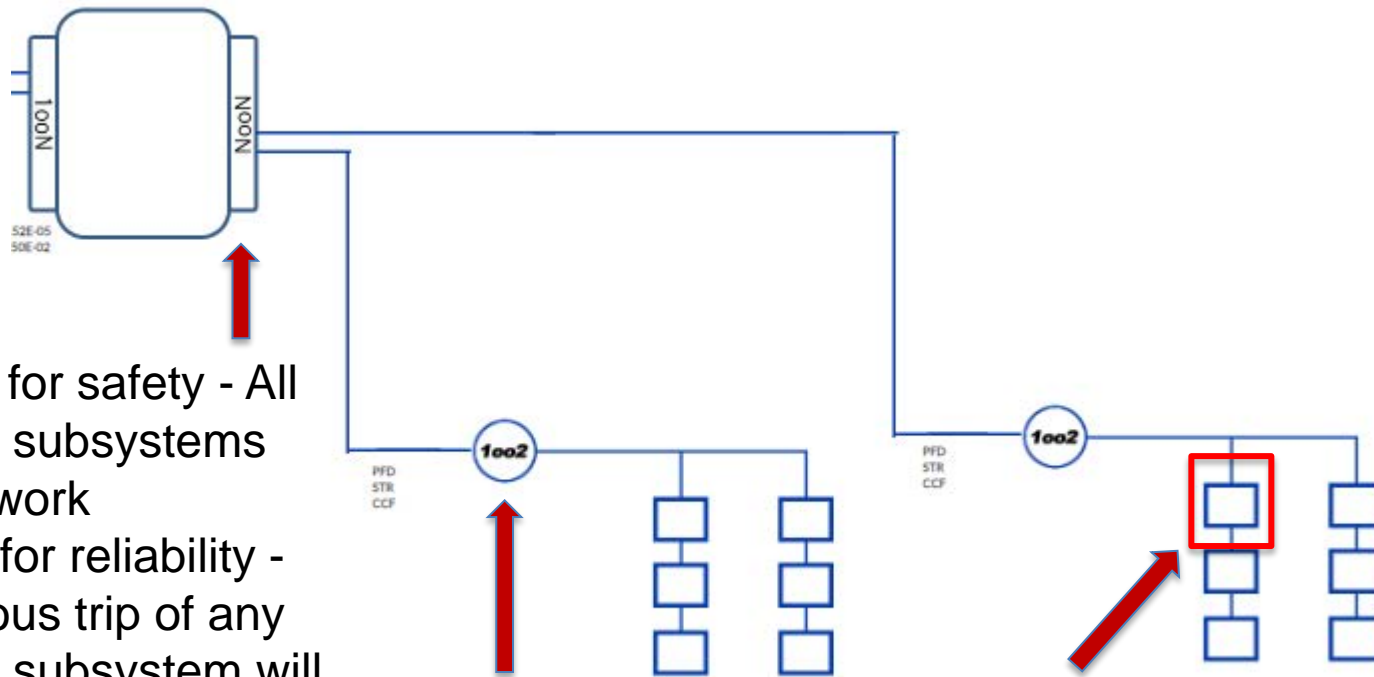
The support system and final actions are modelled in a similar way as the input.

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
- 100N for reliability - Spurious trip of any action subsystem will cause an operational problem

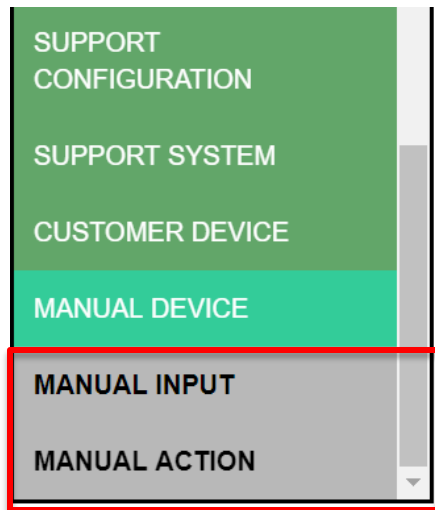
Level 1: Main architecture of an Action Subsystem, with user entered CCF

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



Device		Device	
Device ID:	<input type="text" value="BVFCC"/>	Type:	<u>BLOCK VALVE-BALL-FTC-CLEAN</u>
Configurations: Device Tag: <input type="text" value="XV-101A"/> Proof Testing Interval (yr): <input type="text" value="5"/> Voting: <input type="text" value="1001"/> <input type="button" value="v"/> Subsystem Diagnostic Level: ? <input type="text" value="NO DC"/> <input type="button" value="v"/>		Properties: Failure Dangerous Failure Rate (1/yr): <input type="text" value="1.67E-02"/> Failure Spurious Failure Rate (1/yr): <input type="text" value="6.67E-03"/> CCF Dual(%): <input type="text" value="0.1"/> CCF Triple(%): <input type="text" value="0.1"/> Diagnostic Coverage Simplified(1/yr): <input type="text" value="85.00"/> Diagnostic Coverage Dual(1/yr): <input type="text" value="85.00"/> Diagnostic Coverage Triple(1/yr): <input type="text" value="85.00"/>	
Maintenance: Mean Time to Repair (hr): <input type="text" value="72"/> Diagnostic Interval (hr): <input type="text" value="0.000"/> Overhaul Interval (yr): <input type="text" value="20"/> Proof Testing Coverage (%): ? <input type="text" value="100"/> <input type="button" value="v"/> User Specified		PIDay: <input type="text" value="4.11E-002"/> STR: <input type="text" value="6.67E-003"/>	
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: <input type="text" value="SIL"/>		<input type="button" value="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

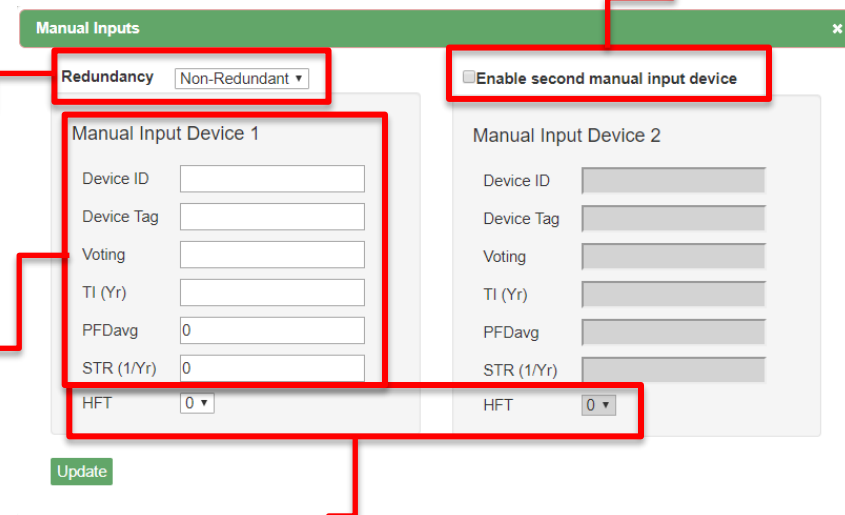
Manual Inputs

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

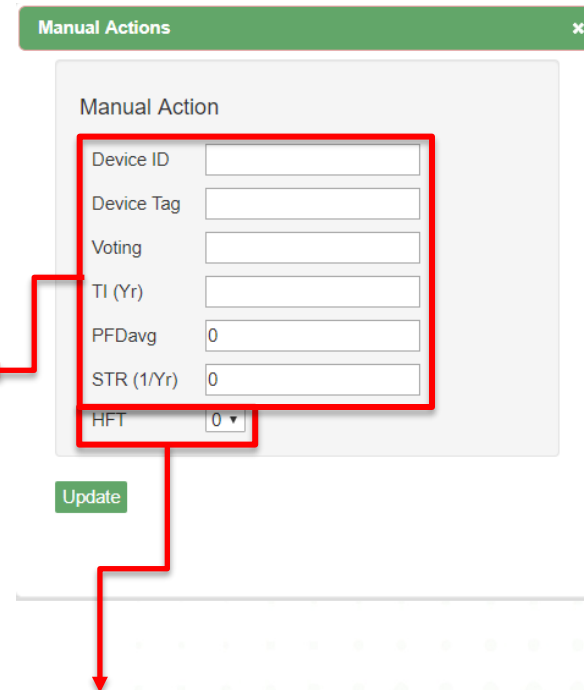


The screenshot shows a web form titled "Manual Inputs". At the top, there is a "Redundancy" dropdown menu set to "Non-Redundant". To the right of this is a checkbox labeled "Enable second manual input device". Below these are two columns for "Manual Input Device 1" and "Manual Input Device 2". Each column contains input fields for "Device ID", "Device Tag", "Voting", "TI (Yr)", "PFDavg", "STR (1/Yr)", and "HFT". The "HFT" field is a dropdown menu currently showing "0". At the bottom left of the form is an "Update" button. Red arrows point from the text annotations to specific parts of the form: one to the "Redundancy" dropdown, one to the "Enable second manual input device" checkbox, one to the "Device ID" field of Device 1, one to the "PFDavg" and "STR (1/Yr)" fields of Device 1, and one to the "HFT" dropdown of Device 1.

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

Device Tag

Voting

TI (Yr)

PFDavg 0

STR (1/Yr) 0

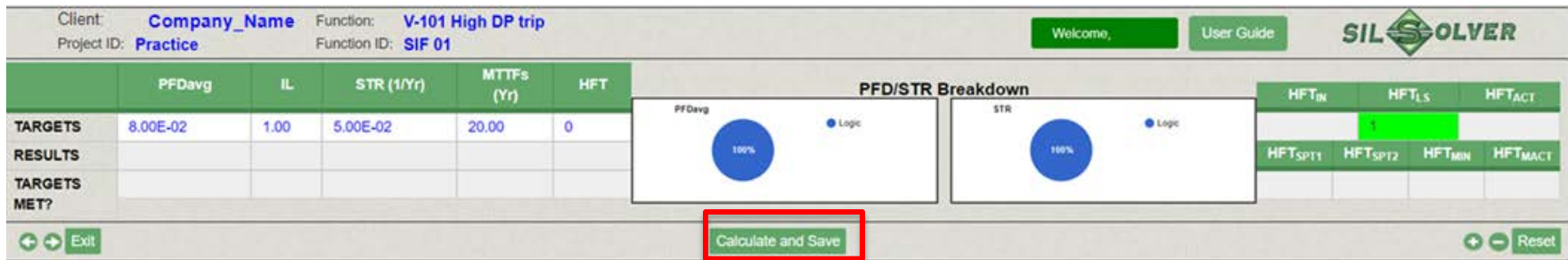
HFT 0 ▾

Update

User enters Manual Action HFT Value

Ready to Calculate?

All devices entered, filled out, and CCF added?
Click the “Calculate and Save” button



The screenshot shows the SIL SOLVER software interface. At the top, it displays 'Client: Company_Name' and 'Project ID: Practice'. The function is 'V-101 High DP trip' with 'Function ID: SIF 01'. There are 'Welcome' and 'User Guide' buttons. The main area contains a table for targets and results, and two circular progress indicators for PFDavg and STR, both showing 100%. A red box highlights the 'Calculate and Save' button at the bottom center.

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

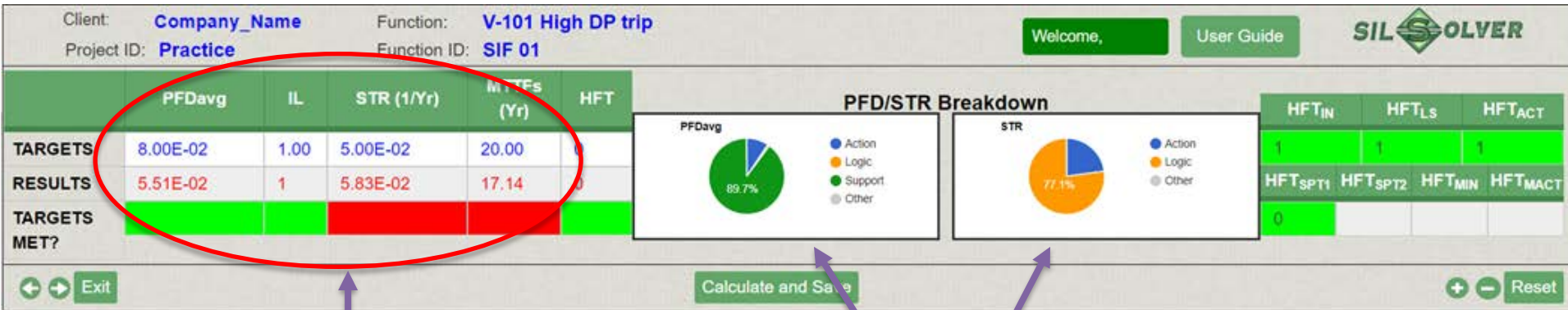
Below the table, there are buttons for 'Exit', 'Calculate and Save' (highlighted with a red box), and 'Reset'.

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

ERRORS: A problem exists in GUI or device 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.

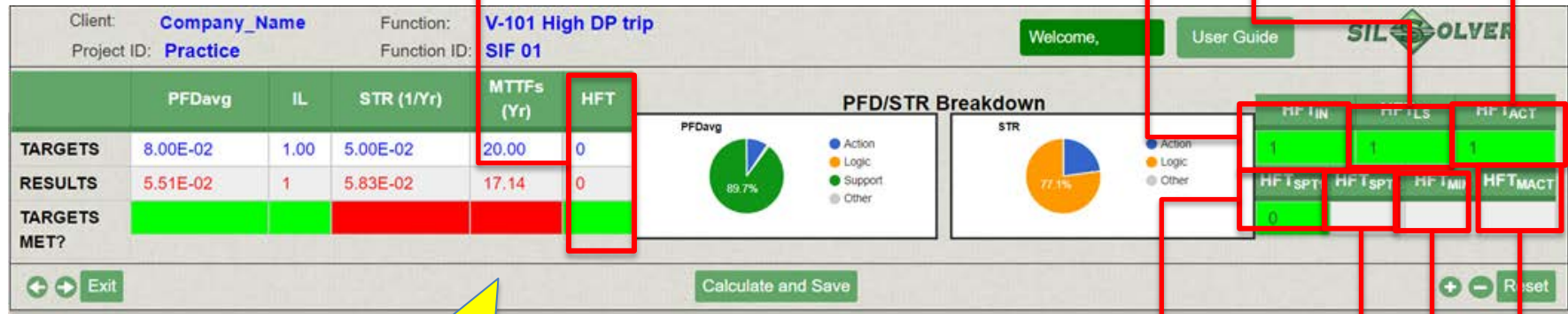
Don't forget Hardware Fault Tolerance (HFT)

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

The screenshot shows the 'Logic Solver' window with the following details:

- Logic Solver ID:** DMSIO
- Logic Solver Type:** GENERIC 1OO2D DUAL MP; SIMPLEX I/O
- Configurations:**
 - Logic Solver Tag:** SIS-A
 - Young:** 1oo2D (highlighted with a red box and an arrow from the text 'In this case, architecture is 1oo2D')
 - Proof Testing Interval (yr):** 5
- PFDavg:** 4.92E-004
- STR:** 4.50E-002
- 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.

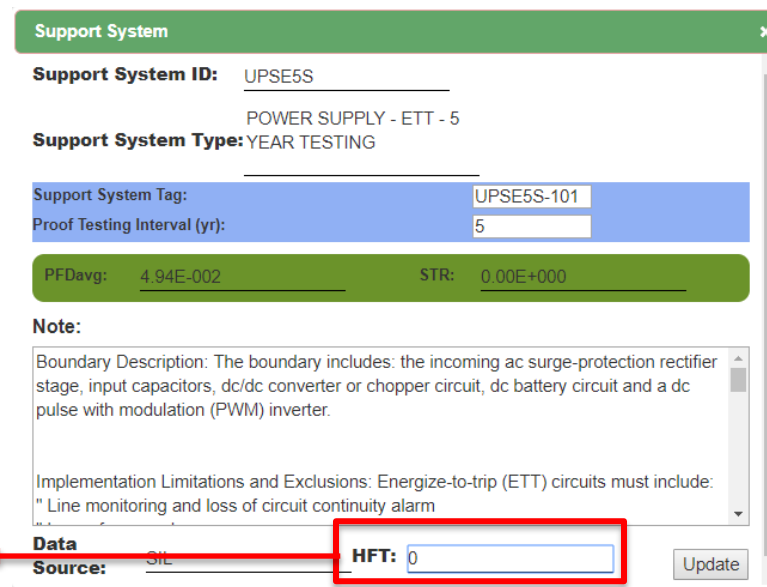
Implementation Limitations and Exclusions: Refer to the SIL Solver manual for a discussion of "1oo2D" and "2oo2D" architectures. The logic solver is certified to IEC 61508 SIL 3 or TUV AK 5-6.
- Data Source:** SIL
- HFT:** 1 (highlighted with a red box and an arrow from the text 'Logic Solver HFT Value')
- Update** button

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.

Support System
HFT Value



The screenshot shows a 'Support System' window with the following details:

- Support System ID:** UPSE5S
- Support System Type:** POWER SUPPLY - ETT - 5 YEAR TESTING
- Support System Tag:** UPSE5S-101
- Proof Testing Interval (yr):** 5
- PFDavg:** 4.94E-002
- STR:** 0.00E+000
- Note:** Boundary Description: The boundary includes: the incoming ac surge-protection rectifier stage, input capacitors, dc/dc converter or chopper circuit, dc battery circuit and a dc pulse with modulation (PWM) inverter. Implementation Limitations and Exclusions: Energize-to-trip (ETT) circuits must include: " Line monitoring and loss of circuit continuity alarm
- Data Source:** SIL
- HFT:** 0 (highlighted with a red box)
- Update** button

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



HFT _{MIN}	HFT _{MACT}

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**

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	5.51E-02	1	5.83E-02	17.14	0
TARGETS MET?					

PFDavg



● Action
● Logic
● Support
● Other

STR



● Action
● Logic
● Other

HFT _{IN}	HFT _{LS}	HFT _{ACT}
1	1	1
HFT _{SPT1}	HFT _{SPT2}	HFT _{MIN}
0		

← → Exit
Calculate and Save
↺ ↻ Reset

SRS

PROCESS HAZARD

DESCRIPTION

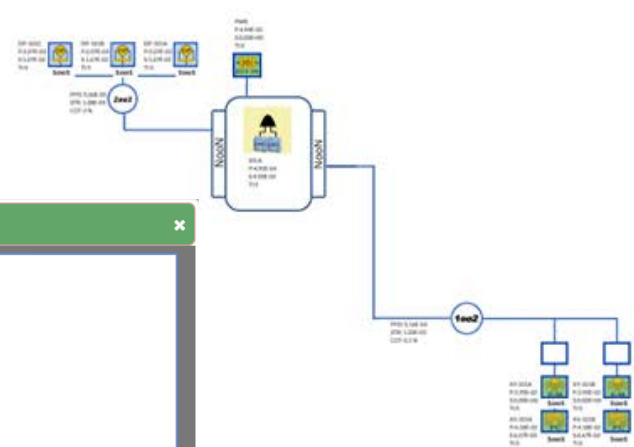
DIAGNOSTICS

RESET

SHUTDOWN

REFERENCE

COMMENTS



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

	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?					

Action

Logic

Support

Other

PFD/STR Breakdown

Action

Logic

Other

HFT _{IN}	HFT _{LS}	HFT _{ACT}
1	1	1

HFT _{SPT1}	HFT _{SPT2}	HFT _{MIN}	HFT _{MACT}
0			

Exit

Calculate and Save

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

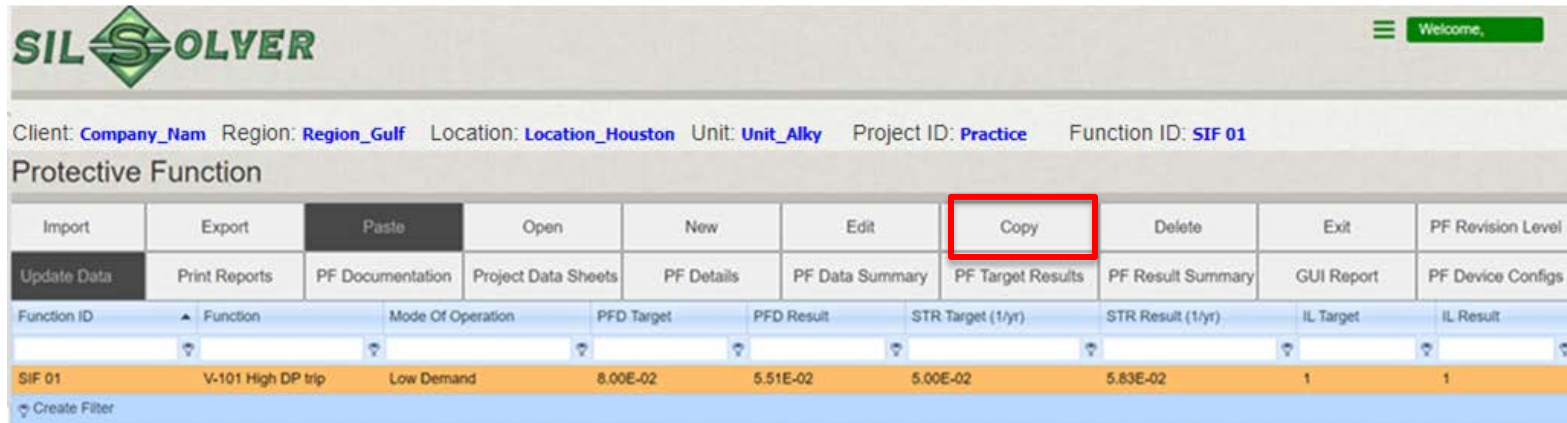
MANUAL DEVICE

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



SIL SOLVER Welcome,

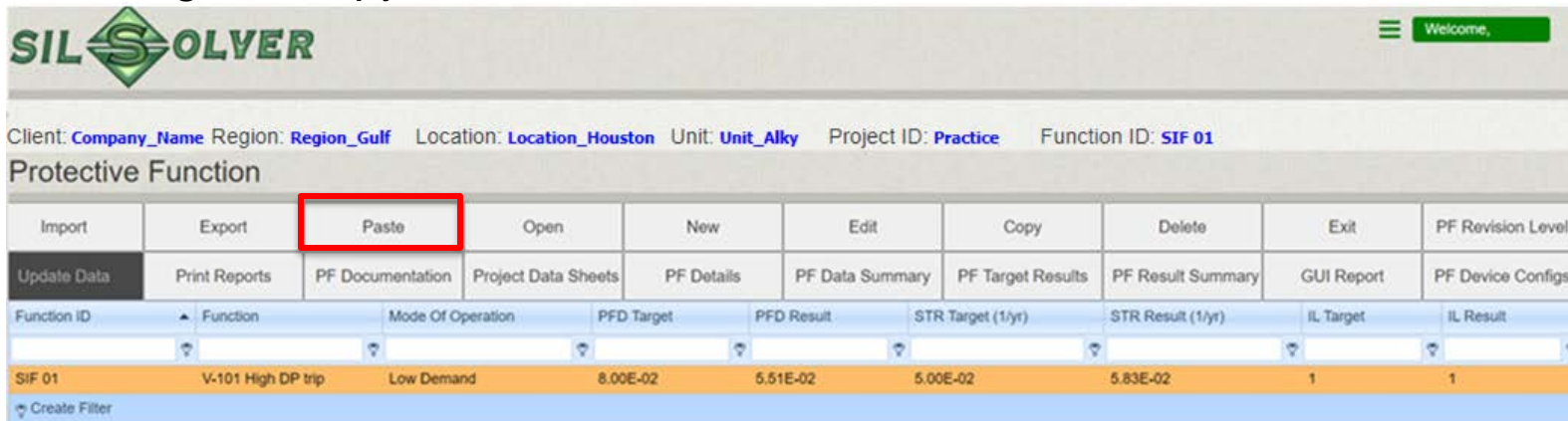
Client: Company_Nam Region: Region_Gulf Location: Location_Houston Unit: Unit_Alky Project ID: Practice Function ID: SIF 01

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	

Create Filter

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



SIL SOLVER Welcome,

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

Protective Function

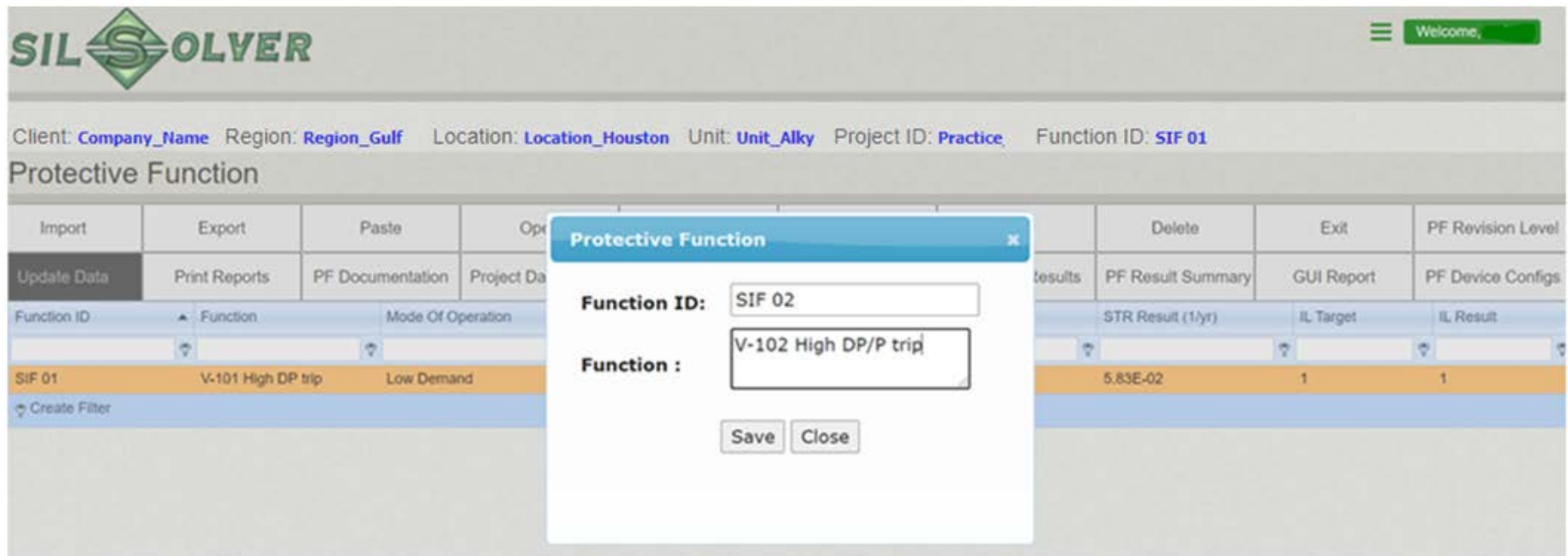
Import	Export	Paste	Open	New	Edit	Copy	Delete	Exit	PF Revision Level
Update Data	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary	GUI Report	PF Device Configs
Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	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	

Create Filter

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, the logo 'SIL SOLVER' is on the left, and a 'Welcome' button is on the right. Below the header, there is a status bar with the following information: Client: Company_Name, Region: Region_Gulf, Location: Location_Houston, Unit: Unit_Alky, Project ID: Practice, Function ID: SIF 01.

The main window is titled 'Protective Function'. It contains a table with columns: Function ID, Function, Mode Of Operation, Delete, Exit, PF Revision Level, PF Result Summary, GUI Report, PF Device Configs, STR Result (1/yr), IL Target, and IL Result. The first row of data shows SIF 01, V-101 High DP trip, Low Demand, and various numerical values.

A 'Protective Function' dialog box is open in the center. It has two input fields: 'Function ID:' with the value 'SIF 02' and 'Function :' with the value 'V-102 High DP/P trip'. There are 'Save' and 'Close' buttons at the bottom of the dialog box.

Success!

SIL SOLVER Welcome,

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

Protective Function

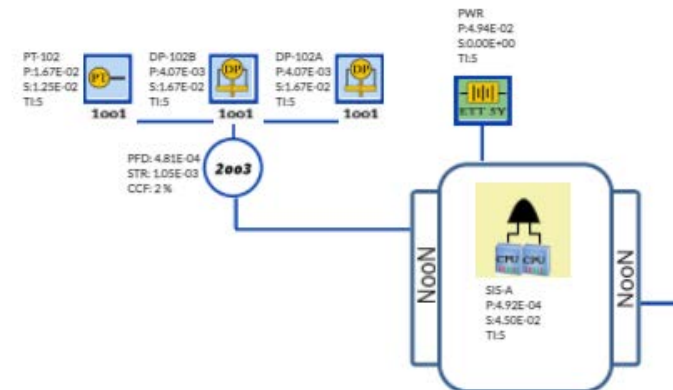
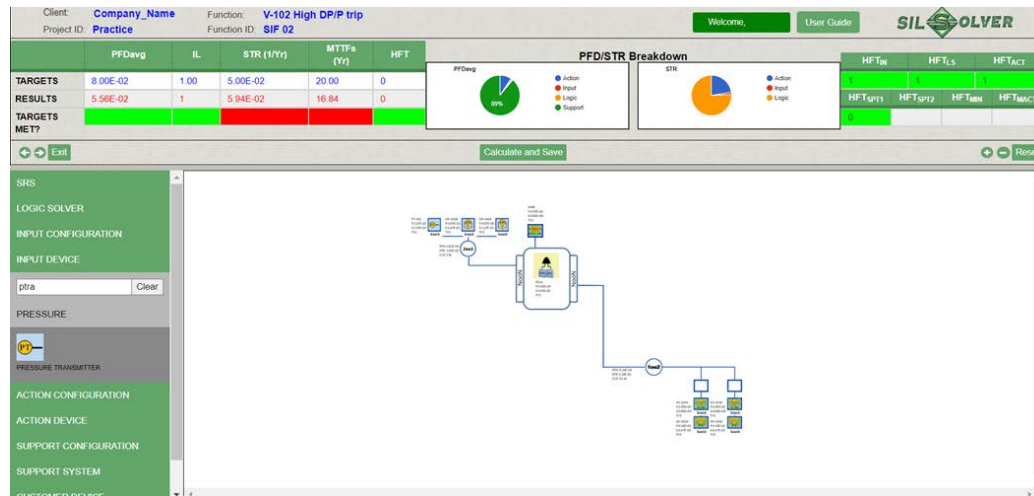
Import	Export	Paste	Open	New	Edit	Copy	Delete	Exit	PF Revision Level
Update Data	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary	GUI Report	PF Device Configs

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 2003 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).

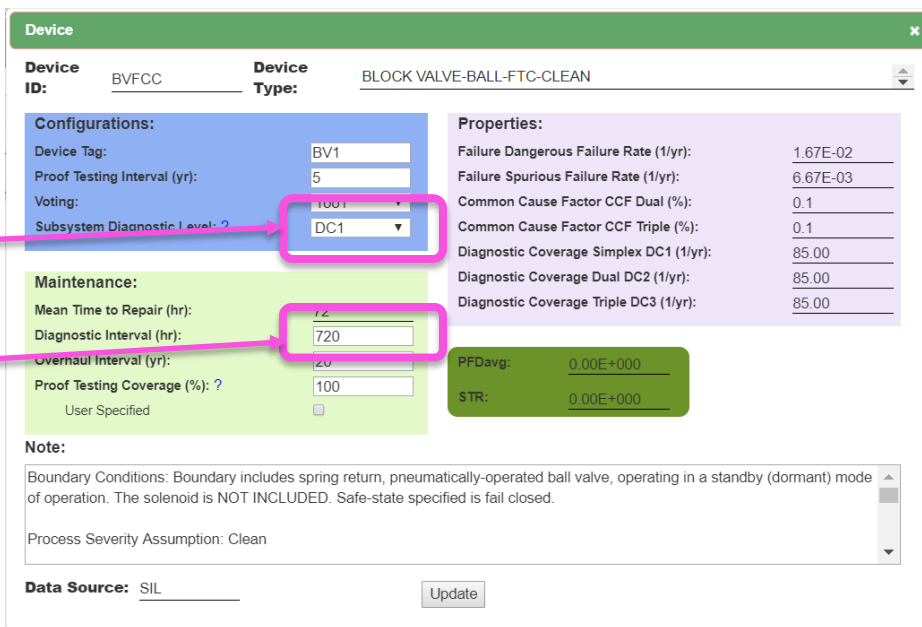


Partial Stroke Testing of Valves

- 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



Device

Device ID: BVFCC Device Type: BLOCK VALVE-BALL-FTC-CLEAN

Configurations:

Device Tag: BV1

Proof Testing Interval (yr): 5

Voting: 1001

Subsystem Diagnostic Level: **DC1**

Maintenance:

Mean Time to Repair (hr): 720

Diagnostic Interval (hr): **720**

Overhaul Interval (yr): 20

Proof Testing Coverage (%): 100

User Specified

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

PFDavg: 0.00E+000

STR: 0.00E+000

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

Both fields must be configured for correct use of equation

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

Both fields must be configured for correct use of equation

Device

Device ID: THMLS

Device Type: THERMOCOUPLE - LOW STRESS ENVIRONMENT

Configurations:

Device Tag: TT1

Proof Testing Interval (yr): 1

Voting: 1001

Subsystem Diagnostic Level: ? NO DC

Maintenance:

Mean Time to Repair (hr): 72

Diagnostic Interval (hr): 0.500

Overhaul Interval (yr): 10

Proof Testing Coverage (%): ? 85

User Specified ☒

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

PFDavg: 0.00E+000

STR: 0.00E+000

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

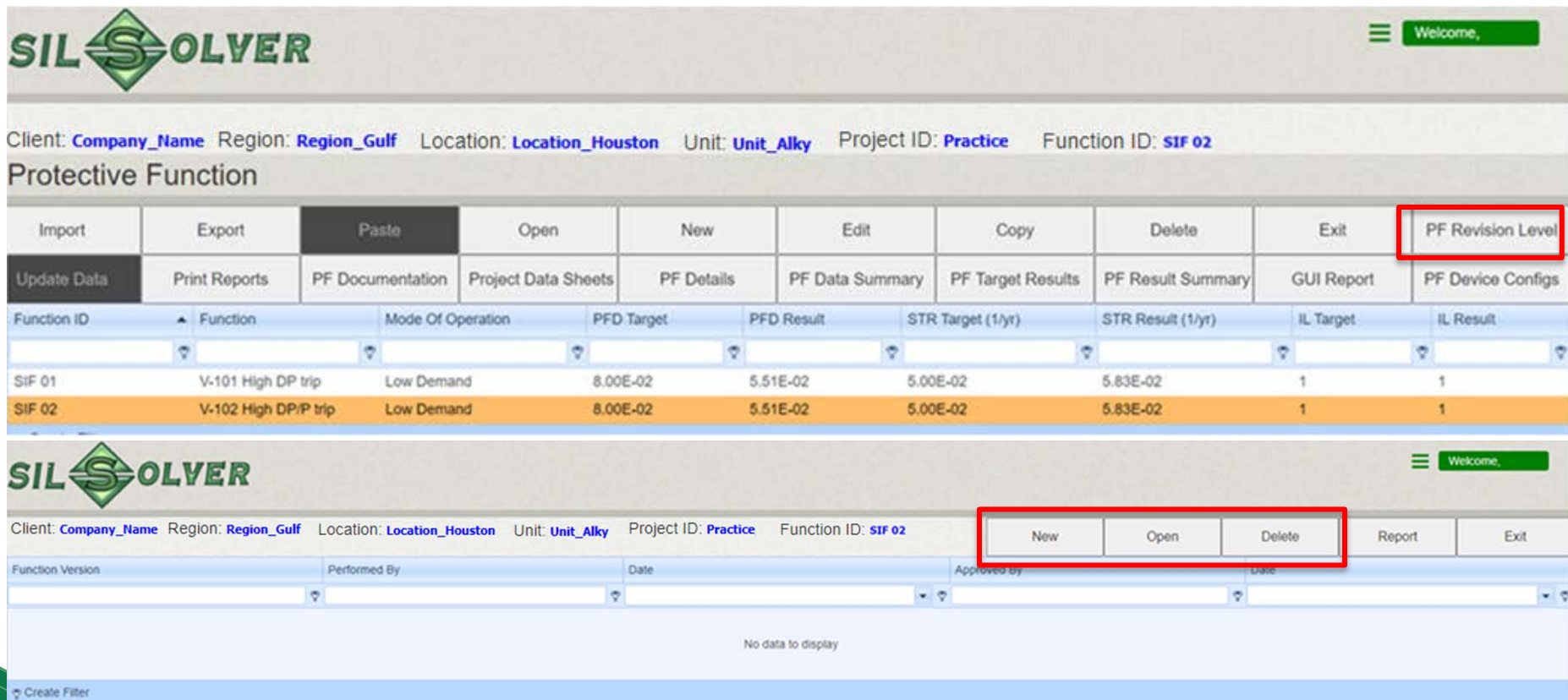
Data Source: SIL

Update

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.



The screenshot displays the SIL SOLVER software interface. At the top, the client information is shown: Client: **Company_Name**, Region: **Region_Gulf**, Location: **Location_Houston**, Unit: **Unit_Alky**, Project ID: **Practice**, and Function ID: **SIF 02**. The main title is **Protective Function**.

The interface features a top navigation bar with buttons: Import, Export, Paste, Open, New, Edit, Copy, Delete, Exit, and **PF Revision Level** (highlighted with a red box). Below this is a secondary navigation bar with buttons: 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 main data table lists functions with the following columns: Function ID, Function, Mode Of Operation, PFD Target, PFD Result, STR Target (1/yr), STR Result (1/yr), IL Target, and IL Result. The table contains two entries: SIF 01 (V-101 High DP trip) and SIF 02 (V-102 High DP/P trip). SIF 02 is highlighted in orange.

Below the table, the **Function Revision Level** screen is shown. It includes the same client information and a navigation bar with buttons: New, Open, Delete, Report, and Exit. The **New**, **Open**, and **Delete** buttons are highlighted with a red box. The main area shows a table with columns: Function Version, Performed By, Date, Approved by, and Date. The table is currently empty, displaying "No data to display".

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

SIL SOLVER v1.3.0.0 Welcome,

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

Create Filter

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

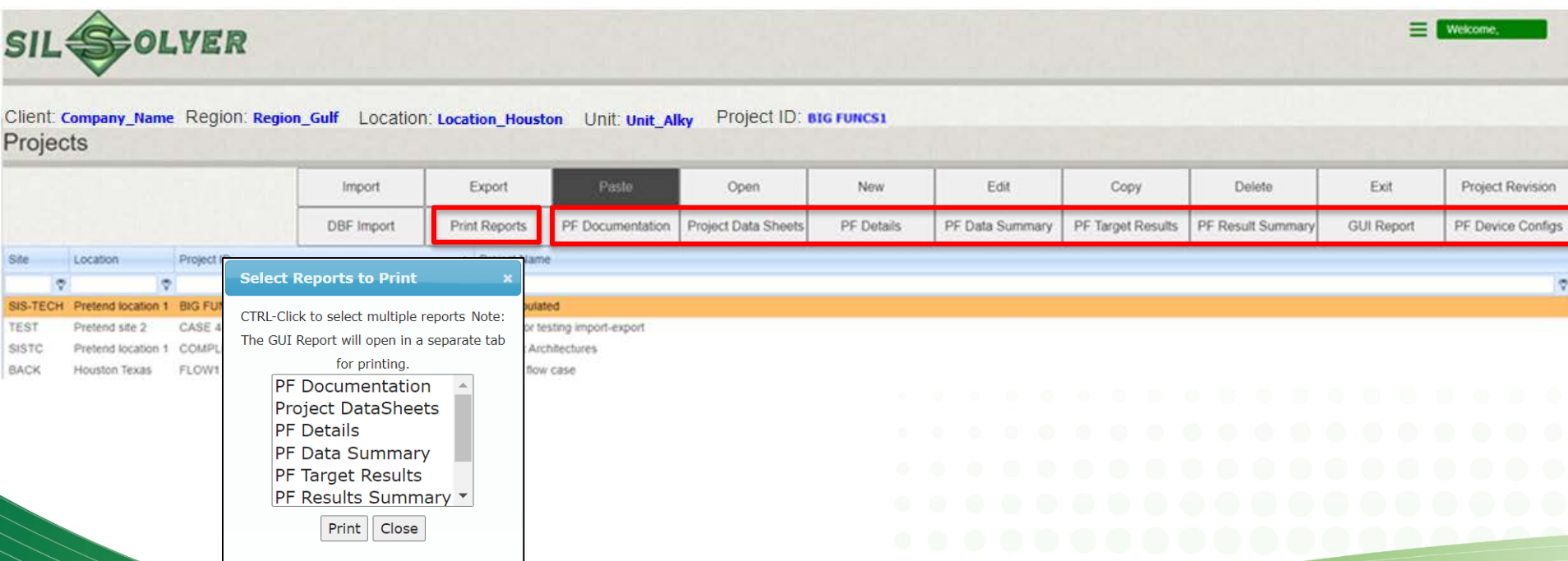
5. GENERATING REPORTS

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, the client information is displayed: Client: Company_Name, Region: Region_Gulf, Location: Location_Houston, Unit: Unit_Alky, Project ID: BIG FUNCS1. Below this, a table of project reports is visible, with columns for Site, Location, Project, and Report Name. The 'Print Reports' button is highlighted in the top menu bar. A dialog box titled 'Select Reports to Print' is open, showing a list of reports to be printed: PF Documentation, Project Data Sheets, PF Details, PF Data Summary, PF Target Results, and PF Results Summary. The dialog also includes a 'Print' button and a 'Close' button.

SIL SOLVER

Welcome...

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

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

Select Reports to Print

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

- PF Documentation
- Project Data Sheets
- PF Details
- PF Data Summary
- PF Target Results
- PF Results Summary

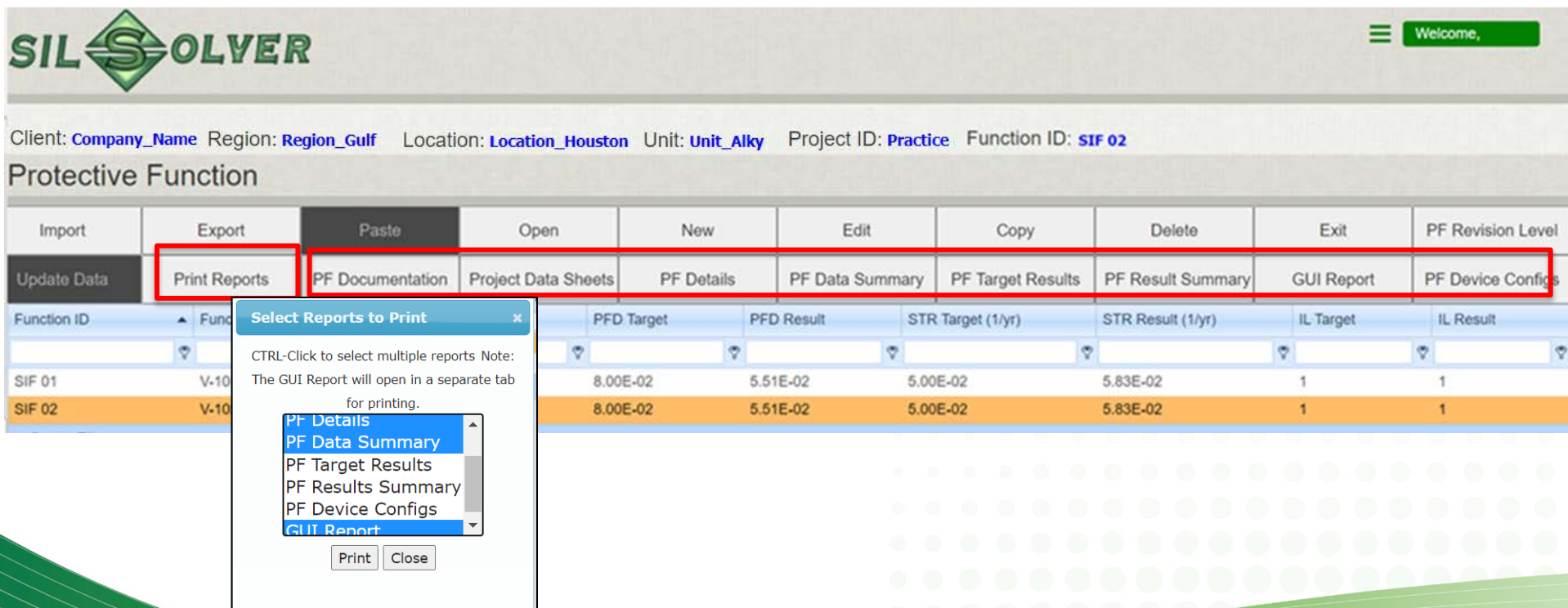
Print **Close**

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

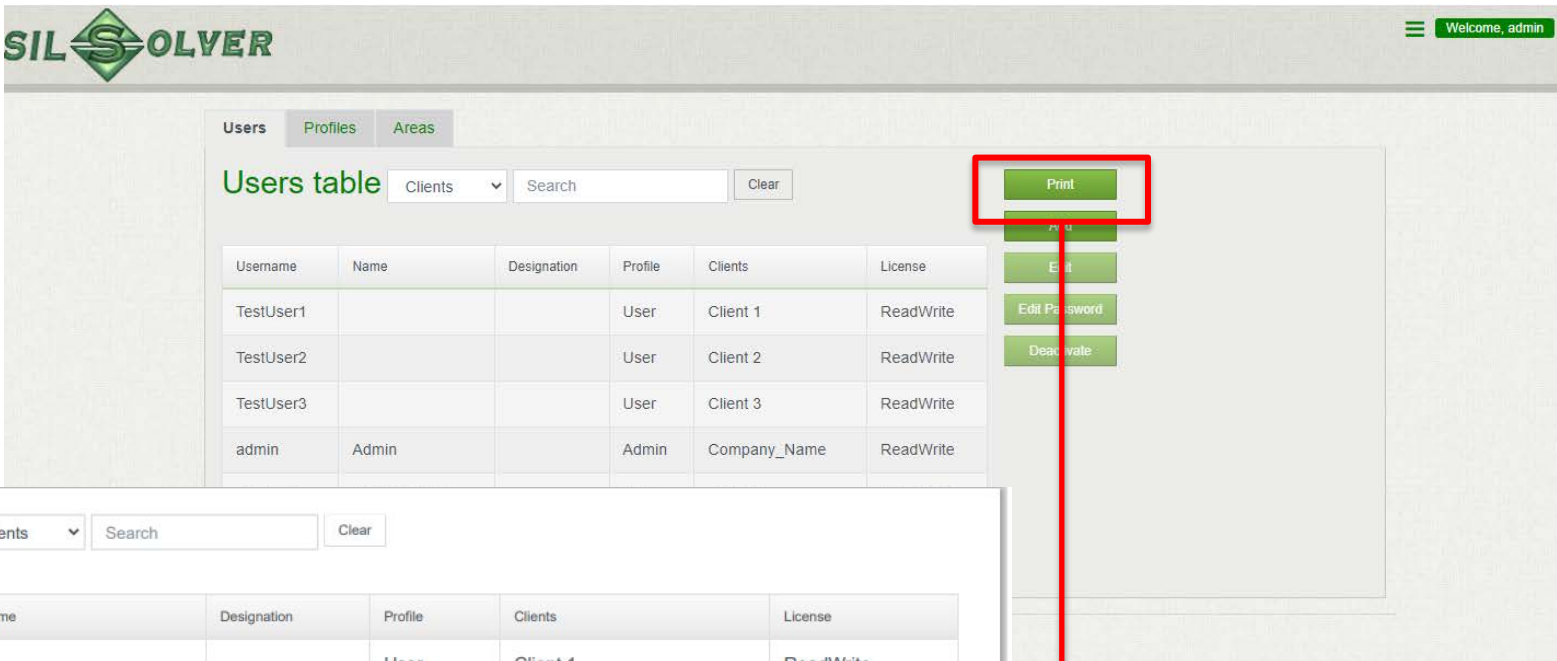


The screenshot shows the SIL SOLVER software interface. At the top, the client information is displayed: Client: Company_Name, Region: Region_Gulf, Location: Location_Houston, Unit: Unit_Alky, Project ID: Practice, Function ID: SIF 02. Below this, the 'Protective Function' section is visible. A table of functions is shown, with SIF 01 and SIF 02 listed. SIF 02 is highlighted in orange. A 'Select Reports to Print' dialog box is open, showing a list of reports: PF Details, PF Data Summary, PF Target Results, PF Results Summary, PF Device Configs, and GUI Report. The 'GUI Report' is selected. The background table shows various data points for SIF 02, including PFD Target, PFD Result, STR Target (1/yr), STR Result (1/yr), IL Target, and IL Result.

Function ID	Function	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

User Report for Admin

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



The screenshot shows the SIL SOLVER application interface. At the top, there is a navigation bar with 'Users', 'Profiles', and 'Areas' tabs. Below this, the 'Users table' is displayed with a dropdown menu set to 'Clients' and a search bar. A table of users is shown, and to the right, a vertical menu contains buttons for 'Print', 'Add', 'Edit', 'Edit Password', and 'Deactivate'. The 'Print' button is highlighted with a red box. A red arrow points from the 'Print' button to a larger, detailed view of the 'Users table' at the bottom of the slide.

Users table Clients Search Clear

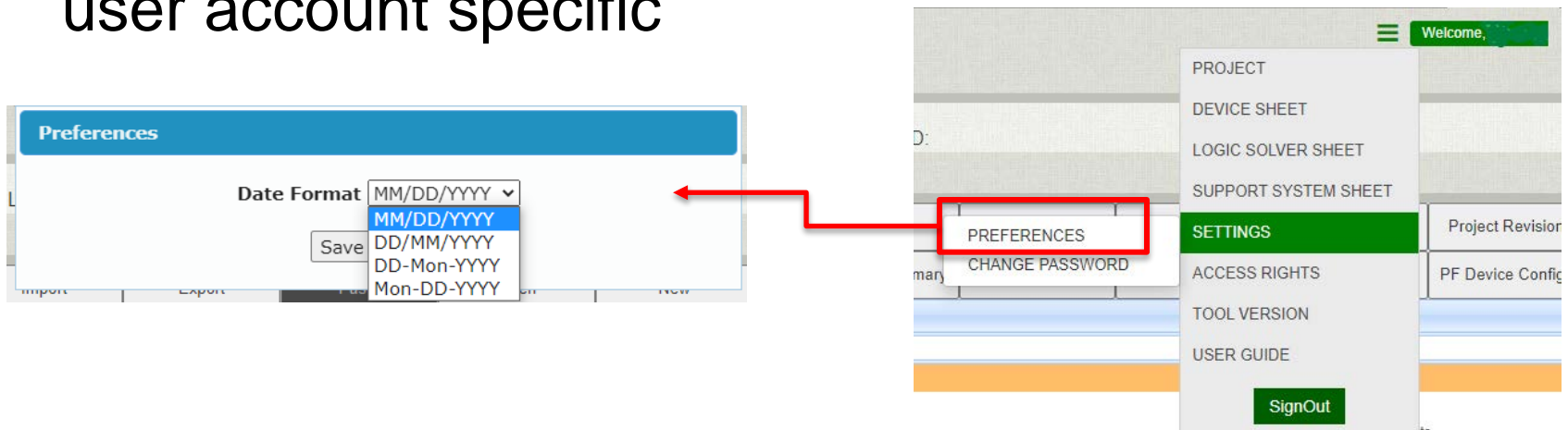
Username	Name	Designation	Profile	Clients	License
TestUser1			User	Client 1	ReadWrite
TestUser2			User	Client 2	ReadWrite
TestUser3			User	Client 3	ReadWrite
admin	Admin		Admin	Company_Name	ReadWrite

Users table Clients Search Clear

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

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

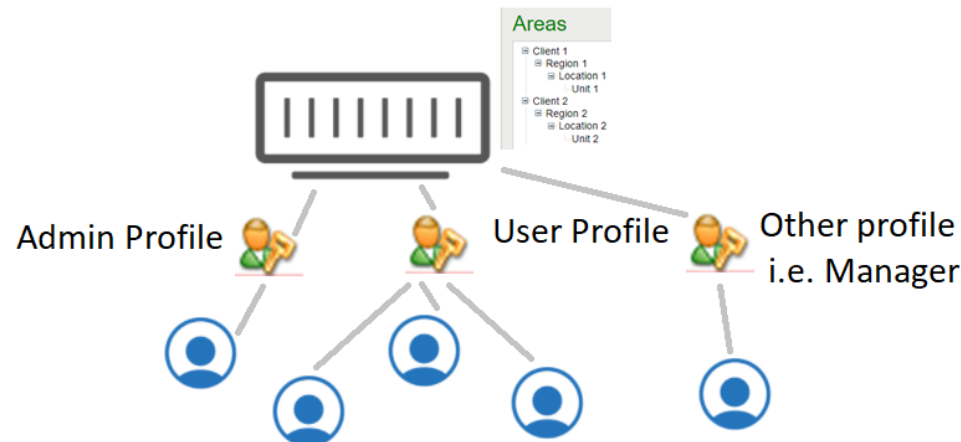
Project Rev No	1	Project Executed by/Date	Lily	On	24-Jun-2021
Function Rev No	1	Project Approved by/Date	Iris	On	26-Jun-2021

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

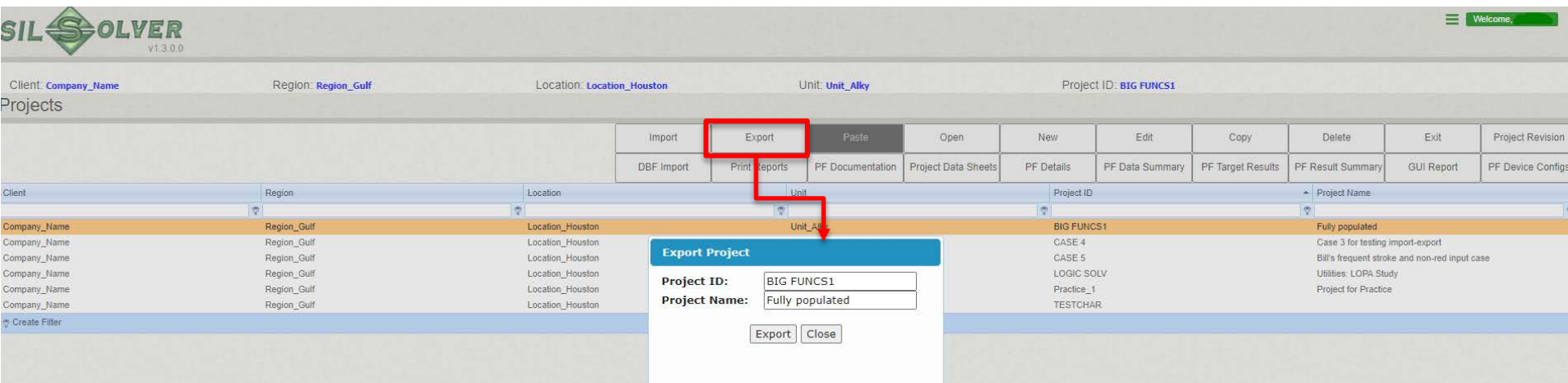


- Role based users are given access to the project hierarchy. Only one user can edit a function at a time.

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



SIL SOLVER v1.3.0.0

Client: **Company_Name** Region: **Region_Gulf** Location: **Location_Houston** Unit: **Unit_Alky** Project ID: **BIG FUNCS1**

Projects

Client	Region	Location	Unit	Project ID	Project Name
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	BIG FUNCS1	Fully populated
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	CASE 4	Case 3 for testing import-export
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	CASE 5	Bill's frequent stroke and non-red input case
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	LOGIC SOLV	Utilities: LOPA Study
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	Practice_1	Project for Practice
Company_Name	Region_Gulf	Location_Houston	Unit_Alky	TESTCHAR	

Export Project

Project ID: **BIG FUNCS1**

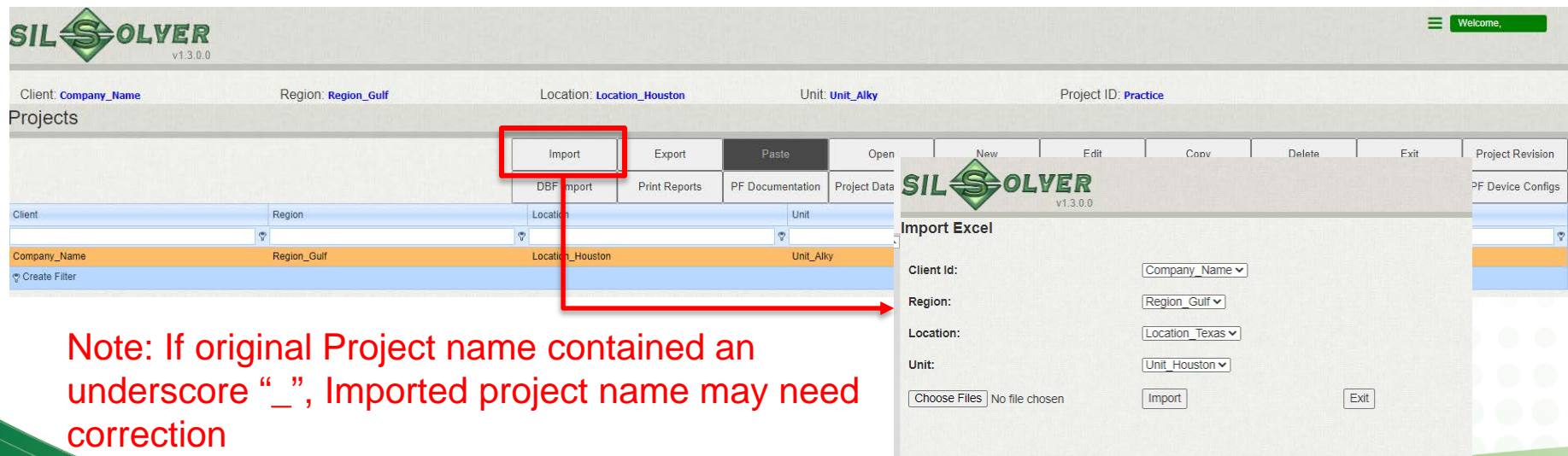
Project Name: **Fully populated**

Export **Close**

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



The screenshot shows the SIL Solver v1.3.0.0 interface. At the top, the 'Projects' section displays a table with columns: Client, Region, Location, and Unit. The current project is 'Company_Name', 'Region_Gulf', 'Location_Houston', and 'Unit_Alky'. Below this, the 'Import' button is highlighted with a red box. A red arrow points from the 'Import' button to the 'Import Excel' dialog box. The dialog box contains fields for 'Client Id:', 'Region:', 'Location:', and 'Unit:', each with a dropdown menu. The 'Client Id' dropdown is set to 'Company_Name', 'Region' to 'Region_Gulf', 'Location' to 'Location_Texas', and 'Unit' to 'Unit_Houston'. There is a 'Choose Files' button, a 'No file chosen' status, and 'Import' and 'Exit' buttons.

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

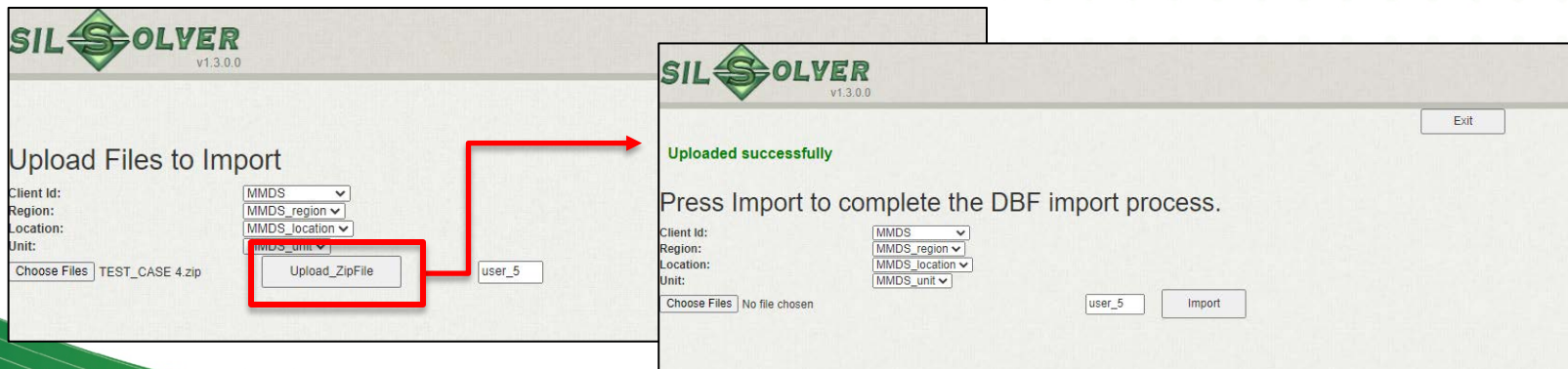
> TEST_01

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

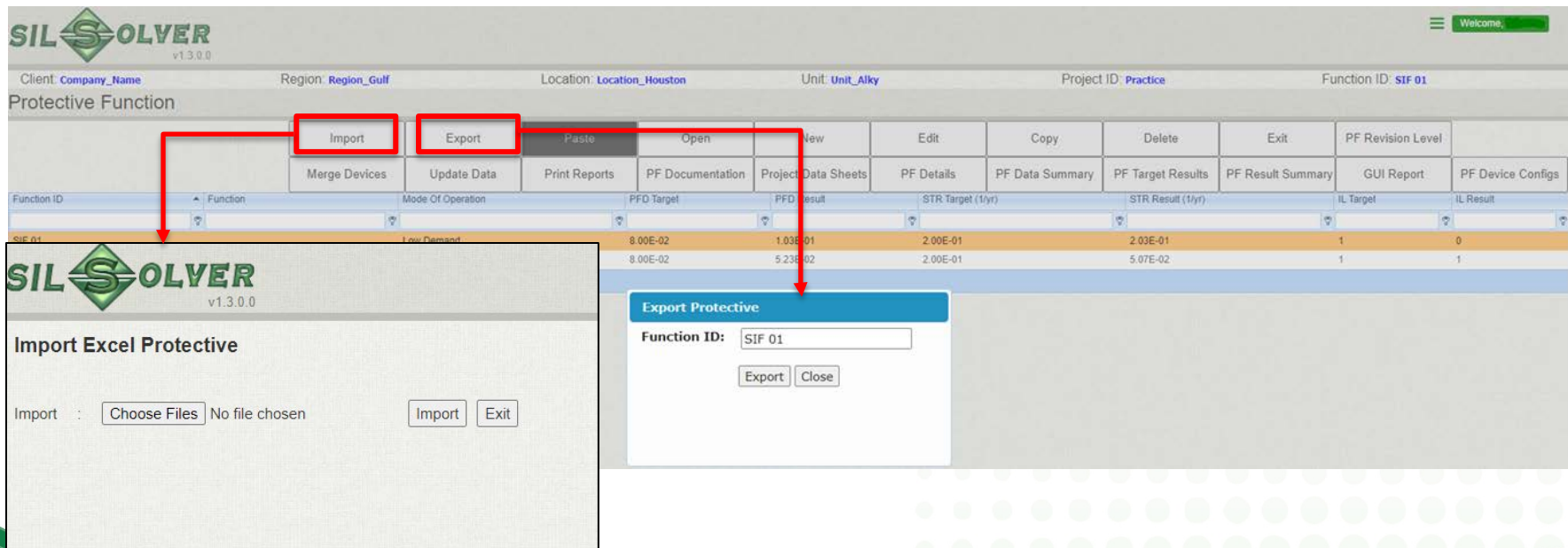
DBF import to Enterprise

- To import a **project** from SIL Solver® **desktop** versions into SIL Solver® Enterprise
 - Go to the folder where you saved the desktop software project
 - For example, the default directory: C:\SILSolver_Projects
 - Zip the project folder that you want to import to SIL Solver® Enterprise
 - Go to the SIL Solver® Enterprise project page
 - Click “DBF import” button to open the DBF import page
 - Choose the client, region, location and unit for this project
 - Click Choose Files to browse to the Zipped project folder
 - Click “Upload_ZipFile”
 - When the upload is ready, click import
 - 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 v1.3.0.0 interface. At the top, the title bar shows 'SIL SOLVER v1.3.0.0'. Below it, the 'Protective Function' page is active. The top navigation bar includes fields for Client (Company_Name), Region (Region_Gulf), Location (Location_Houston), Unit (Unit_Alky), Project ID (Practice), and Function ID (SIF 01). The main menu bar contains buttons: Import, Export, Paste, Open, New, Edit, Copy, Delete, Exit, PF Revision Level, PF Merge Devices, PF Update Data, PF Print Reports, PF Documentation, PF Project Data Sheets, PF Details, PF Data Summary, PF Target Results, PF Result Summary, GUI Report, and PF Device Configs. The 'Import' and 'Export' buttons are highlighted with red boxes. Below the menu bar, a table displays function data for 'SIF 01'.

Function ID	Function	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

Two dialog boxes are overlaid on the interface:

- Import Excel Protective**: A dialog box with the title 'Import Excel Protective' and version 'v1.3.0.0'. It contains an 'Import' label, a 'Choose Files' button, and the text 'No file chosen'. There are also 'Import' and 'Exit' buttons.
- Export Protective**: A dialog box with the title 'Export Protective' and version 'v1.3.0.0'. It contains a 'Function ID' field with the value 'SIF 01' and 'Export' and 'Close' buttons.

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 FUNC51** 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.

The window lists the devices with different failure rates.

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 up

Function Name	GUI Position	Device ID	Parameter	Current Value	Master Datasheet Value
3003 Complex	SS02	UPS0MS	STR1Year	0.0191000000000	0.0191400000000

Update Data **Cancel**

“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

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS	8.00E-02	1.00	1.67E-01	6.00	0
RESULTS	9.68E-02	1	1.07E-01	9.33	0
TARGETS MET?					

Calculate and Save

SRS

PROCESS HAZARD

DESCRIPTION

DIAGNOSTICS

RESET

SHUTDOWN

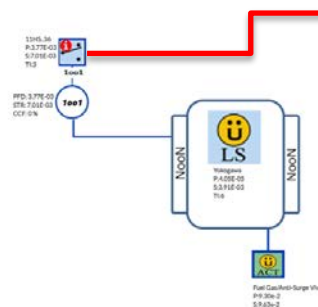
REFERENCE

COMMENTS

LOGIC SOLVER

INPUT CONFIGURATION

INPUT DEVICE



Device

Device ID: HNDSW Device Type: HAND SWITCH

Configurations:

Display Tag for Device(s): Individual Tags 11HS-14136

Proof Testing Interval (yr): 3

Voting: 1001

Subsystem Diagnostic Level: ? NO DC

Maintenance:

Mean Time to Repair (hr): 72

Diagnostic Interval (hr): 0

Overhaul Interval (yr): 20

Proof Testing Coverage (%): ? 100

User Specified ☐

Properties:

Failure Dangerous Failure Rate (1/yr): 2.5000E-03

Failure Spurious Failure Rate (1/yr): 7.0080E-03

Common Cause Factor CCF Dual (%): 0

Common Cause Factor CCF Triple (%): 0

Diagnostic Coverage Simplex DC1 (1/yr): 0

Diagnostic Coverage Dual DC2 (1/yr): 0

Diagnostic Coverage Triple DC3 (1/yr): 0

PFDavg: 3.77E-03

STR: 7.01E-003

Note:

Calculations assume that provisions are made to maintain safe operation during any on-line testing; on-line maintenance; or fault response activities.

Data Sources:

Data Source: SIS Update Restore device sheet

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

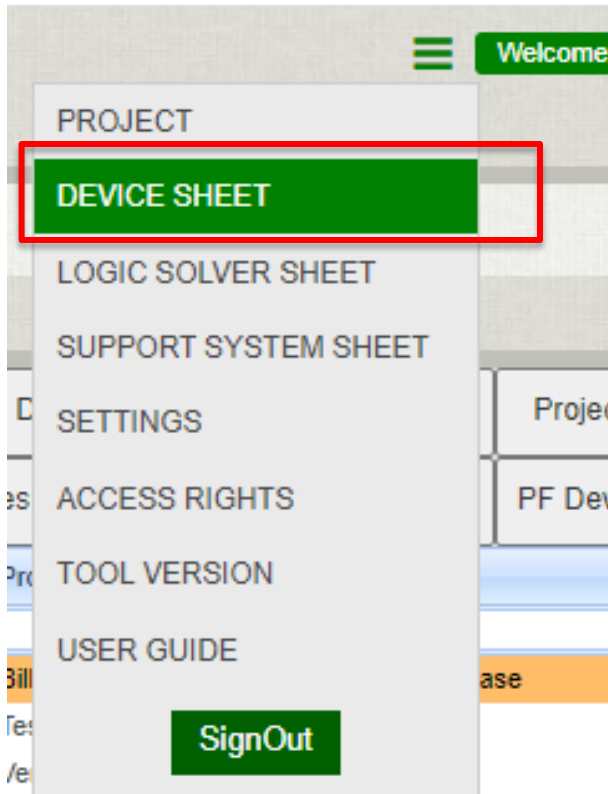
This function is like “Update Data” option.

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

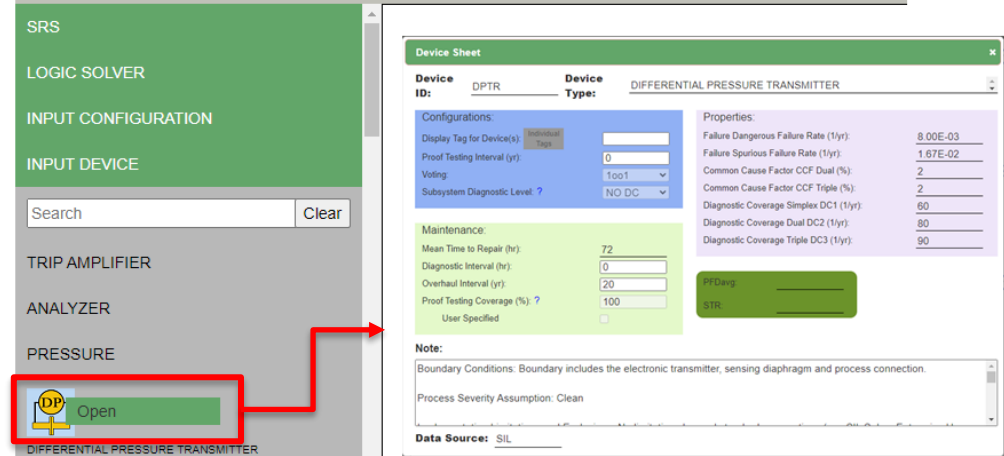
- Access from main page dropdown menu, or
- For individual devices right-click when in device list on GUI



Client: Company_Name	Function:	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?					

Exit



The 'Device Sheet' window displays configuration and maintenance data for a Differential Pressure Transmitter (DPTR). A red arrow points from the 'DP Open' button in the device list to this window.

Device ID: DPTR **Device Type:** DIFFERENTIAL PRESSURE TRANSMITTER

Configurations:

- Display Tag for Device(s): Individual Tag
- Proof Testing Interval (yr): 0
- Voting: 1oo1
- Subsystem Diagnostic Level: NO DC

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

Maintenance:

- Mean Time to Repair (hr): 72
- Diagnostic Interval (hr): 0
- 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: Clean








Data Source: SIL

Device datasheet list

SIL SOLVER v1.3.0.0 Welcome, [User]

SIL Solver Data Sheet

Page 1 of 5 (249 items) < [1] 2 3 4 5 >

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	VBSW		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
Open	8	SIL	UPSET		UPS - POWER SUPPLY - ETT	1.91E-01	0.00E+00
Open	8	SIL	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 Data Sheet

Welcome,

DataSource: Device Id:  Device Type:

Fail Dangerous Failure Rate(1/yr):

Fail Spurious Failure Rate(1/yr):

Mean Time to Repair(hrs):

Common Cause Factor Dual Mode(%):

Common Cause Factor Triple Mode(%):

Diagnostic Interval(hrs):

DATA SHEET **Back**

☒ Current Data Sheet

☐ SIL Data Sheet

☐ NON SIL DataSheet

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

the 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
v1.3.0.0

SIL Solver Data Sheet

Page 1 of 5 (245 items) [1] 2 3 4 5

Back Version History Data ID List

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	5.28E-02

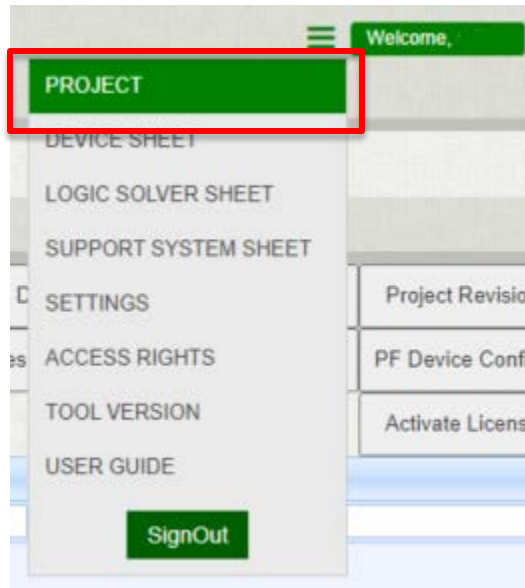
SIL SOLVER
v1.3.0.0

SIL Solver Support System Data Sheet

Back Version History Support ID List

Open	Data Version	Source	Support System ID	Support System Image	Support System Description
Open		TEMP	CSS1		pretend SS
Open	8	SIL	IAD RMS		INSTRUMENT AIR-DIVERSITY/MONITORED RECEIVER
Open	8	SIL	IAD RS		INSTRUMENT AIR-DIVERSITY/RECEIVER
Open	8	SIL	IAD S		INSTRUMENT AIR-COMPRESSOR DIVERSITY
Open	8	SIL	IAD V S		INSTRUMENT AIR-NO DIVERSITY

Returning to Project View

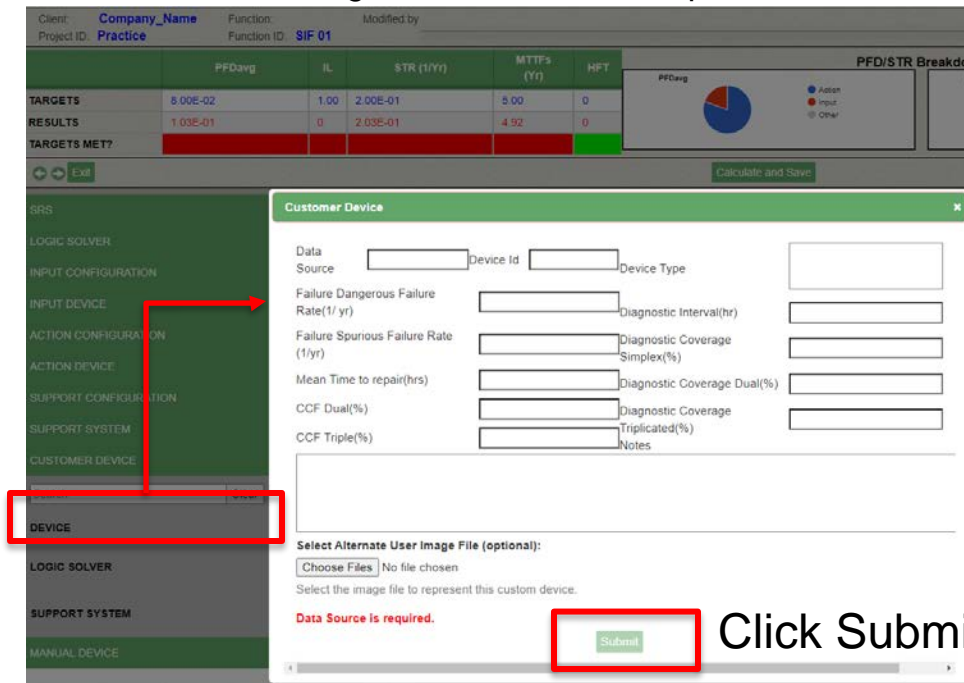


Click Project on the dropdown menu or use Back buttons on the datasheet pages to return to project page



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



Client: **Company_Name** Function: **SIF 01** Modified by: **Practice**

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS	5.00E-02	1.00	2.00E-01	5.00	0
RESULTS	1.03E-01	0	2.03E-01	4.92	0
TARGETS MET?					

Calculate and Save

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 Triplicated(%):

CCF Triple(%): Notes:

Select Alternate User Image File (optional):
 No file chosen
 Select the image file to represent this custom device.
Data Source is required.

Click Submit

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

e.g. PTTRAN

Description: e.g.
Pressure Transmitter

Customer Device ×

Data Source	<input type="text"/>	Device Id	<input type="text"/>	Device Type	<input type="text"/>
Failure Dangerous Failure Rate(1/ yr)	<input type="text"/>	Diagnostic Interval(hr)	<input type="text"/>		
Failure Spurious Failure Rate (1/yr)	<input type="text"/>	Diagnostic Coverage Simplex(%)	<input type="text"/>		
Mean Time to repair(hrs)	<input type="text"/>	Diagnostic Coverage Dual(%)	<input type="text"/>		
CCF Dual(%)	<input type="text"/>	Diagnostic Coverage Triplicated(%)	<input type="text"/>		
CCF Triple(%)	<input type="text"/>	Notes	<input type="text"/>		

Select Alternate User Image File (optional):

Choose Files No file chosen

Select the image file to represent this custom device.

Data Source is required.

Submit

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

Fill all the fields for submit button to enable

Custom Datasheet - Sample

Customer Device

Data Source

MANF

Device Id

PTTRAN

Device Type

Pressure Transmitter

Failure Dangerous Failure Rate(1/ yr)

.0003

Diagnostic Interval(hr)

.5

Failure Spurious Failure Rate (1/yr)

.0001

Diagnostic Coverage Simplex(%)

65

Mean Time to repair(hrs)

2

Diagnostic Coverage Dual(%)

80

CCF Dual(%)

2

Diagnostic Coverage Triplicated(%)

90

CCF Triple(%)

3

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):

Choose Files


No file chosen

Select the image file to represent this custom device.

Submit

Logic Solver and Support System Datasheets

LOGIC SOLVER



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.

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.

SUPPORT SYSTEM

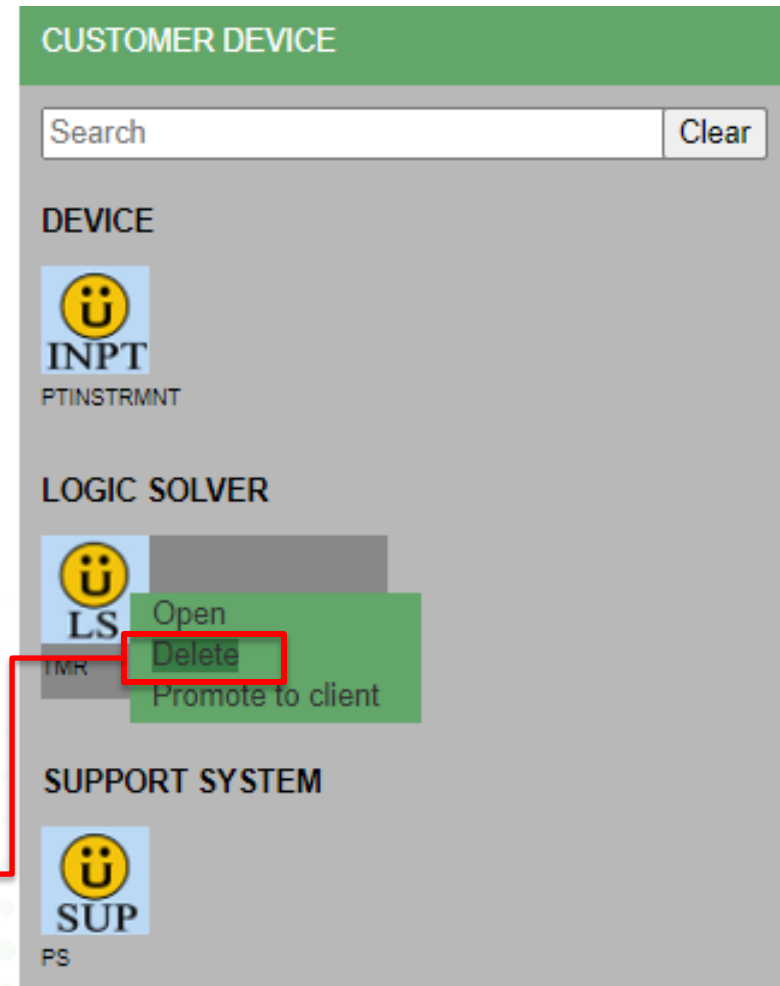
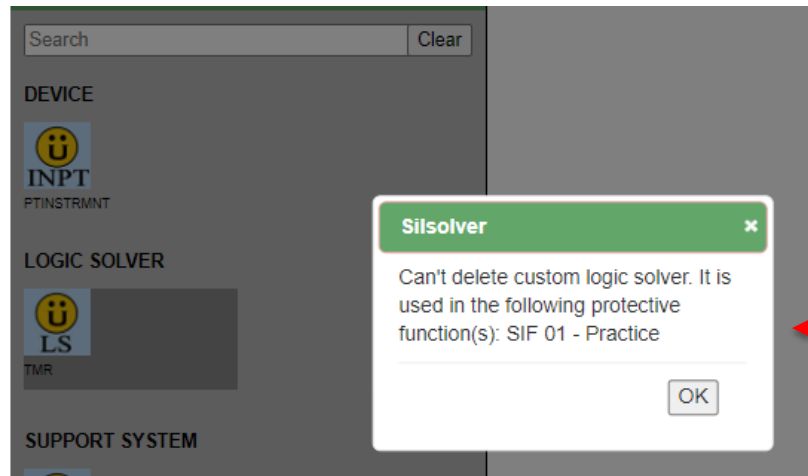


POWER SUPPLY

- 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!**

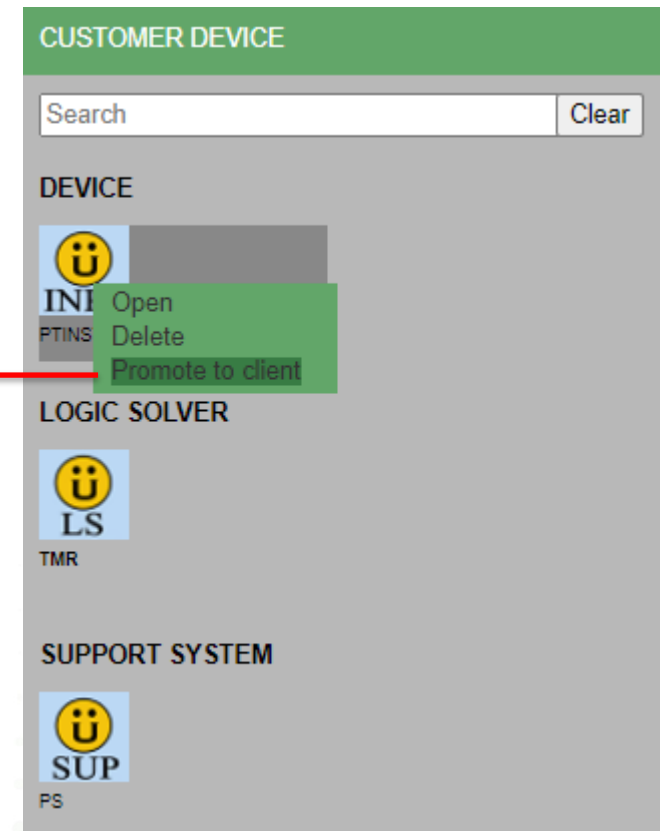
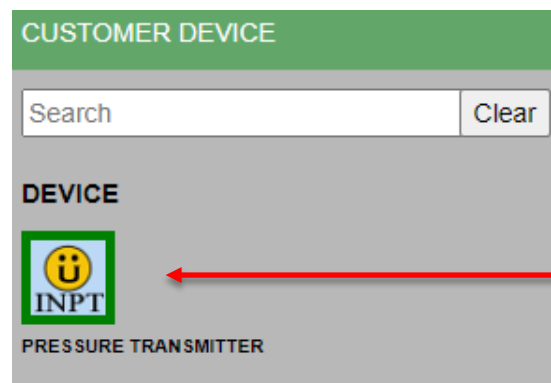
Project level custom datasheet

- 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



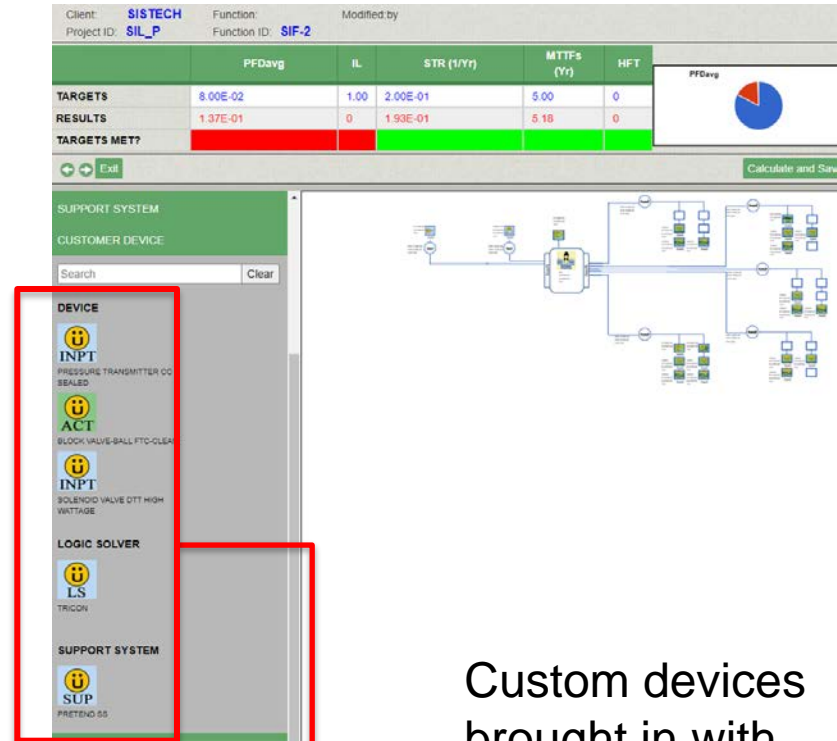
Client level custom datasheet

- 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



The screenshot displays the SIL Solver software interface. At the top, a header bar shows 'Client: SISTECH', 'Project ID: SIL_P', 'Function: SIF-2', and 'Modified by'. Below this is a table with columns: PFDavg, IL, STR (1/Yr), MTTFs (Yr), and HFT. The table contains rows for 'TARGETS', 'RESULTS', and 'TARGETS MET?'. A pie chart labeled 'PFDavg' is visible on the right. Below the table, there are buttons for 'Exit' and 'Calculate and Save'. The main area is divided into two panes. The left pane, titled 'SUPPORT SYSTEM', contains a 'CUSTOMER DEVICE' section with a search bar and a list of devices. The right pane shows a complex process flow diagram. A red box highlights the 'CUSTOMER DEVICE' list, and a red arrow points from it to the text on the right.

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS	8.00E-02	1.00	2.00E-01	5.00	0
RESULTS	1.37E-01	0	1.93E-01	5.16	0
TARGETS MET?					

CUSTOMER DEVICE

Search Clear

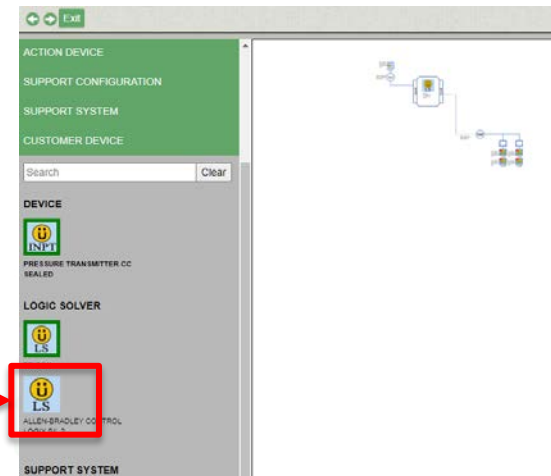
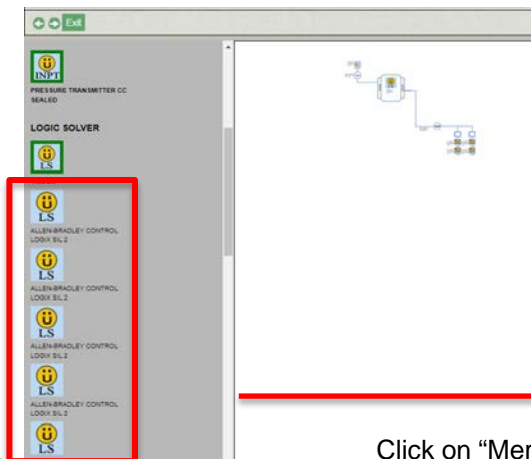
DEVICE

- INPT
PRESSURE TRANSMITTER CC
SEALED
- ACT
BLOCK VALVE-BALL FTO-CLEAR
- INPT
SOLENOID VALVE OTT HIGH
VATTAGE
- LOGIC SOLVER**
- LS
TRICON
- SUPPORT SYSTEM**
- SUP
PRETEND SS

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



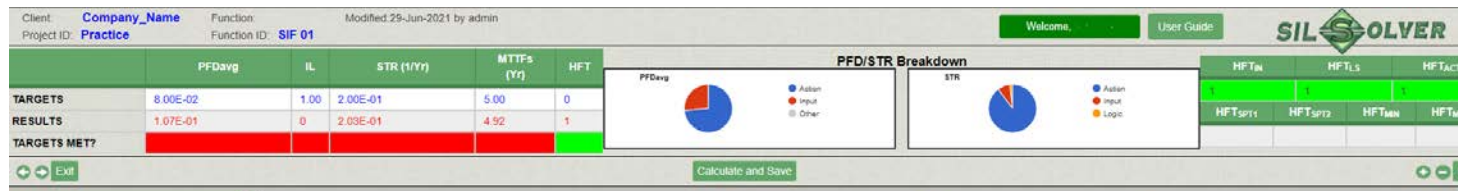
Click on “Merge Devices”. Confirmation msg will appear on Protective function screen

8. CHECK IN/ CHECK OUT

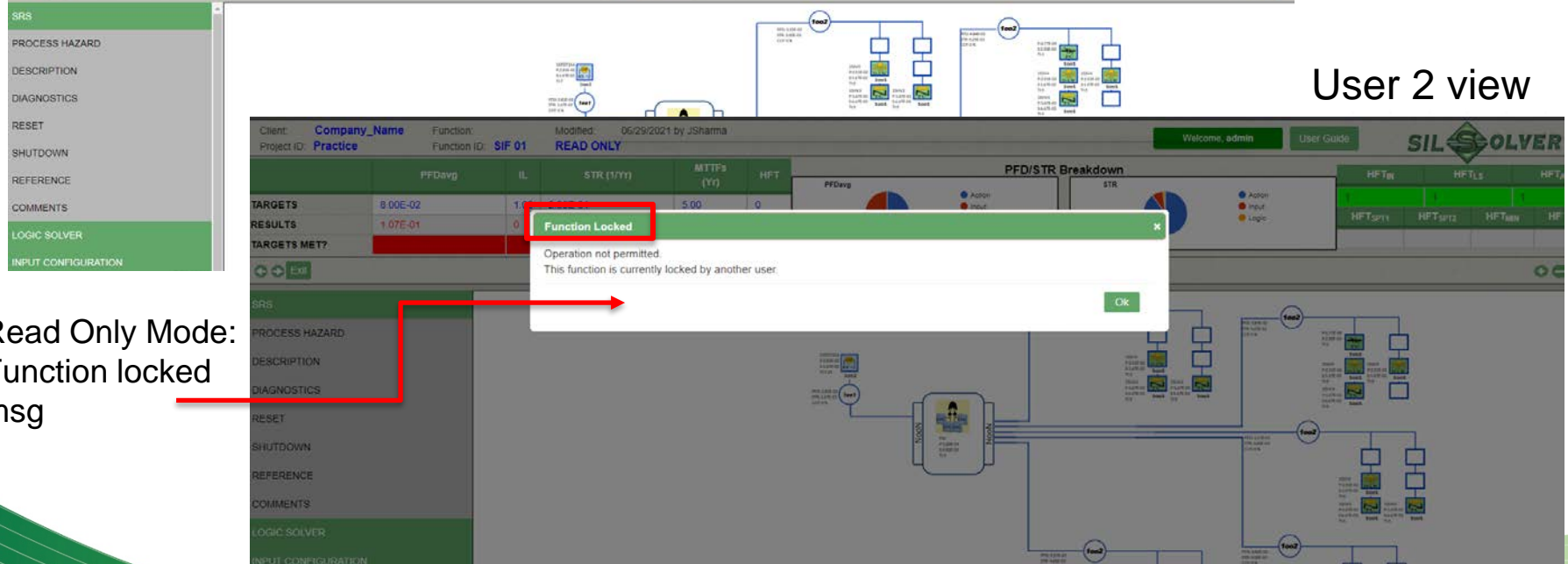
- PF Checkout
- Read Only Mode
- PF Check-in

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: **SISTech-Jenna** Function: **Modified: 4/11/2021, 3:00:5 PM by JFalco** **READ ONLY** Welcome, jsharma User Guide

Project ID: **FLOW1** Function ID: **SF1B**

	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?				

PF/STR Breakdown

Calculate and Save

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: **1001**

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: ☐

Properties:

Failure Dangerous Failure Rate (1/yr): **8.0000000000**

Failure Spurious Failure Rate (1/yr): **1.6666666666**

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**

PFDavg: **8.07E-03**

STR: **1.67E-002**

Note:

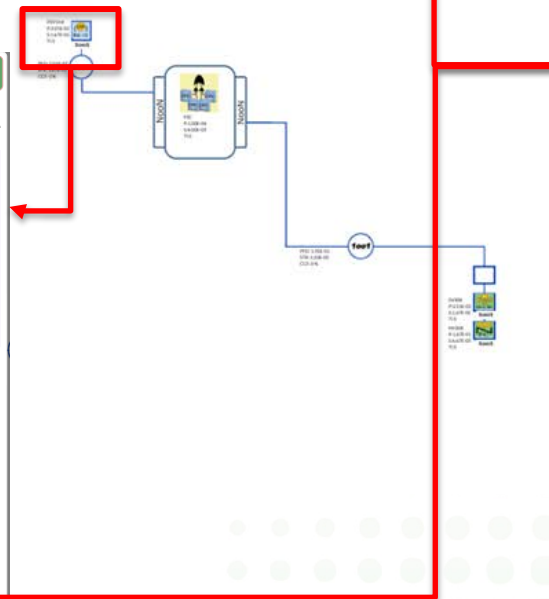
Boundary Conditions: Boundary includes the electronic transmitter, sensing diaphragm and process connection.

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

Implementation Limitations and Exclusions: **Use of Electronic 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

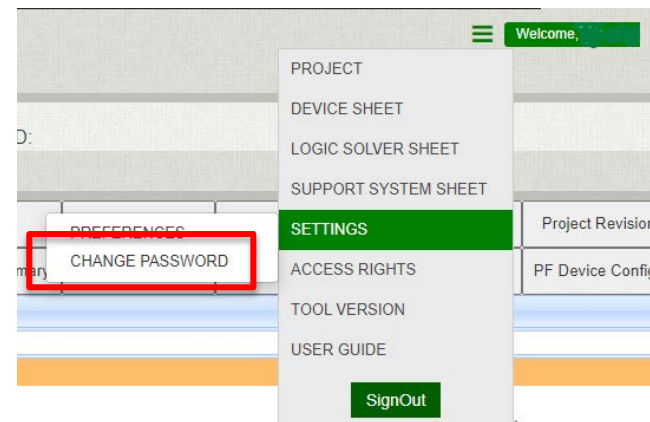
- Lost passwords
- Screen settings
- Import challenges

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

