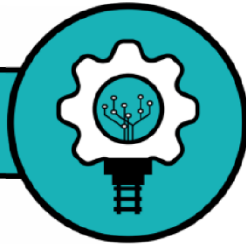


**DESIGN
DELIVERY**

Engineering
Services



VISION OSLO Extension Package User Guide

Project name: VISION OSLO Upgrade
Document ref: 182786-NRD-REP-MAN-000003
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A02	19/06/2024	JY	For v1.1 add SFC assessment
A03	02/07/2024	JY	For v1.2 add battery EMU assessment support
A04	08/07/2024	JL	For v1.3 add DC Single End Feeding and Falling Voltage Protection support
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1 Introduction

'oslo_extension.py' is a Python-based tool package designed to streamline various workflow based on the VISION-OSLO software.

Recognizing the challenges posed by the text-format input / output of VISION-OSLO, 'oslo_extension.py' serves as an extension, facilitating the data input, model validation, extraction and evaluation of results with ease and efficiency.

As a summary, the following functions can be achieved with this package:

- VISION OSLO model data preparation.
- VISION OSLO model validation including generate various excel report for easy checking.
- VISION OSLO model post data analysing.

This guide provides detailed, sequential instructions on selecting the appropriate script for each task and outlines the procedures for their utilization.

2 Definitions

Table 2 List of Definitions

Term	Meaning
*.oof file	Once a V/O simulation is complete, an Oslo Output File named oof file will be generated, bearing the model's name. This file contains all simulation result RAW data.
*.lst.txt file	Once a V/O simulation is built, a checking output file named lst.txt file will be generated, bearing the model's name. This file contains all model set up text-based data.
PCC	Point in the public electricity supply system which is electrically closest to the installation concerned and to which other customers are or might be connected. The PCC is generally upstream from the installation concerned.
RMS	RMS is a statistical measure that calculates the square root of the average of squared values within a dataset. It is often used to quantify the magnitude or intensity of a varying quantity, such as voltage or current.
Script	A Python script is a sequence of instructions written in the Python programming language. It is a text file containing code that is executed by the Python interpreter. Python scripts are used to automate tasks, perform calculations, manipulate data, create programs, and build applications by utilizing the capabilities and features provided by the Python programming language.
V/O (VISION/OSLO)	Visualisation and Interactive Simulation of Infrastructure and Operations on rail Networks / Overhead System Loading
VBA	Visual Basic for Applications is an implementation of Microsoft's event-driven programming language Visual Basic 6.0 built into most desktop Microsoft Office applications.

3 Installation and General User Guide

3.1 Pre-requisites

- VISION-OSLO
- Python

For NR users, this could all be gained from IT software category.

3.2 Quick start

For first time user, disconnect NR-Corp network is required.

Copy and paste the following python file to your current working folder, double click it to launch the application and follow on-screen instructions.

- oslo_extension.py

Note that with NR-Corp network, the tool will have 5 seconds delay in start and cannot perform the installation or updating.

Users are recommended periodically use the tool when disconnected from NR-Corp network to receive the update.

These are the steps that need to be followed to install the update.

1. Disconnect the NR-Corp network.
2. Connect via your private internet (e.g., mobile phone hotspot). It is possible to connect via Zscaler. (Skip the first two steps if you are working from home)
3. Run 'oslo_extesion.py'

"oslo_extension.py" version 1.0.0 can be downloaded from:

https://github.com/NR-JYe/vo_addin/archive/refs/tags/v1.0.0.zip

For future release, it will be published on:

https://github.com/NR-JYe/vo_addin

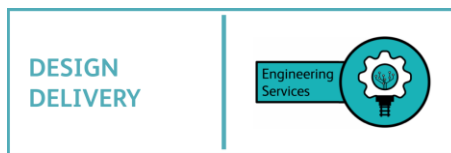
NR users can copy the file from: ES-E&P System SharePoint \ 05 - Traction Power Modelling \ 04 - Vision Olso \ 04 - VISION OSLO Extension Tool

NR users can refer the quick guidance on [VISION OSLO Quick Guide](#).

3.3 License Process

As of version 3.0 and onwards, licensing mechanism is implemented as part of this application package. There are two basic reasons behind this:

- Should the package been release to third party at some point, the license mechanism is standard in modern application management.
- For internal users, this force user to connect to open internet to receive updates every so often, to ensure consistent behaviour among all users.



User should follow license process on https://github.com/NR-JYe/vo_addin to get their machine approved.

The license is valid only for 30 days strictly, so user need to connect to the open internet at least every 30 days.

The license is based on user machine's MAC addresses, which defined by the users' interactive hardware devices. Therefore, if user connects to a new port, device, docking station, sometimes new MAC addresses will be detected. In that case, user need to notify the management team and get their new devices approved again following the same process.

All users need to acquire a valid license to use this software. Software will use machines MAC address to generate a unique key. The process is as follows:

3.3.1 Instructions

- Download 'ExtractMAC.bat' (https://github.com/NR-JYe/vo_addin) to your Windows machine.
- Double click the 'ExtractMAC.bat', it will create a text file on your current working folder.
- Send the text file or all MAC addresses information to traction.power@networkrail.co.uk with your name, your role and the purpose of use of this package.
- You will receive an email reply when your license been granted, and you can continue to use the software.

If any issue with ExtractMAC.bat fails. For Windows users, go to the command window and type in 'ipconfig /all' to retrieve all your mac addresses. This includes all physical address of all your interfaces.

For any other platform, search online to guide you how to fetch your machines MAC address.

3.4 Support Contacts

For any additional support, please contact:

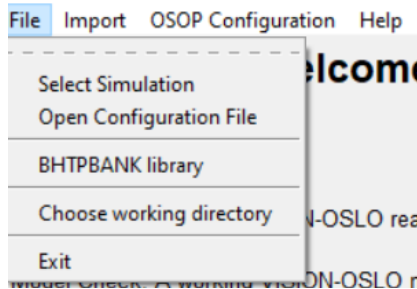
Jieming.Ye@networkrail.co.uk (TBC)

Engineering Services, Network Rail.

All enquires / questions should be sent to traction.power@networkrail.co.uk

4 Extension Tool General Configuration

4.1 File Menu



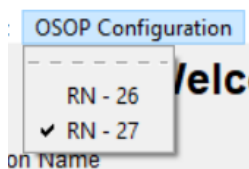
This provides the following settings:

- Select simulation: Simulation Name will be popped up to your simulation name window. Also, this set the global simulation name as a configuration variable. This means the setting is valid on all pages.
- Open configuration file: This option open the files with its default application.
- BHTPBANK library: This brings the user to the BHTPBANK master library SharePoint folder. (credentials required to review the library)
- Choose working directory: This set the global application's working directory. These settings shown on the start page, but the settings is valid from all pages.

4.2 Import

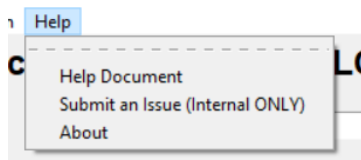
See section 5.

4.3 OSOP Configuration



This provides setting to choose the VISION version for extraction. The result extraction between RN 26 and RN 27 are not compatible.

4.4 Help

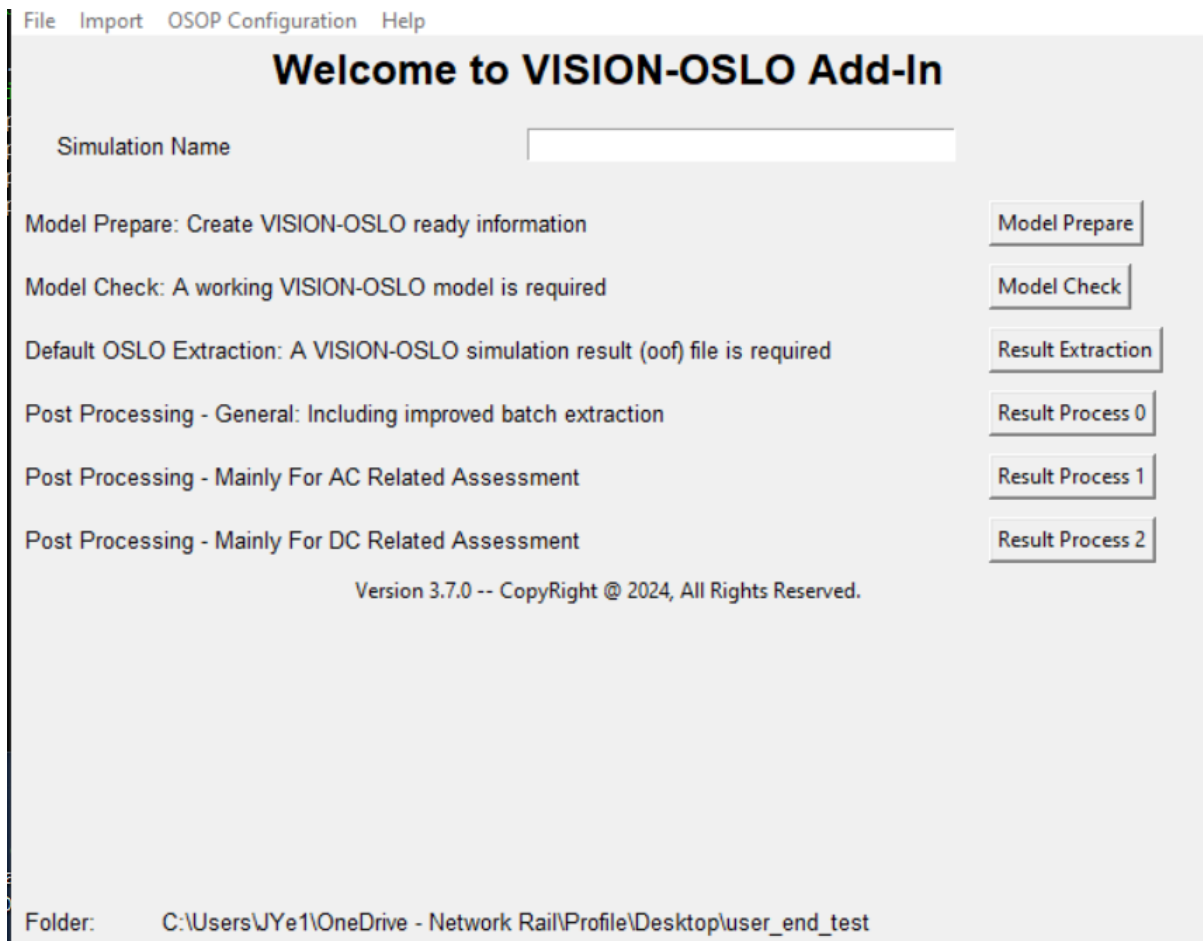


This provides the following helps:

- Help Document: Open this document.
- Submit an issue: This brings users to the GitHub repository where users can report an issue if needed. (credentials required for this)

- About: Basic copyright information, version information.

4.5 GUI Start Page



File Import OSOP Configuration Help

Welcome to VISION-OSLO Add-In

Simulation Name

Model Prepare: Create VISION-OSLO ready information Model Prepare

Model Check: A working VISION-OSLO model is required Model Check

Default OSLO Extraction: A VISION-OSLO simulation result (oof) file is required Result Extraction

Post Processing - General: Including improved batch extraction Result Process 0

Post Processing - Mainly For AC Related Assessment Result Process 1

Post Processing - Mainly For DC Related Assessment Result Process 2

Version 3.7.0 -- CopyRight @ 2024, All Rights Reserved.

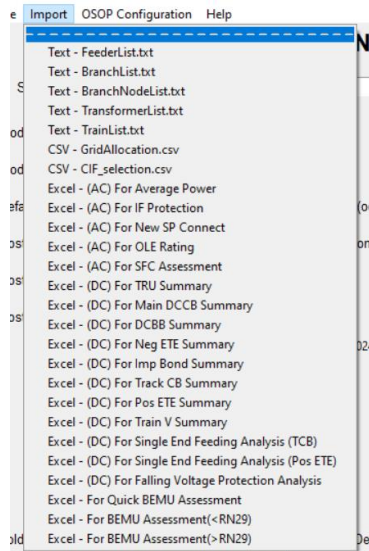
Folder: C:\Users\JYe1\OneDrive - Network Rail\Profile\Desktop\user_end_test

The start page brings you to individual page via button control (see various section below).

The bottom shows the current working folder this application will work on.

5 Essential Text Input File Format

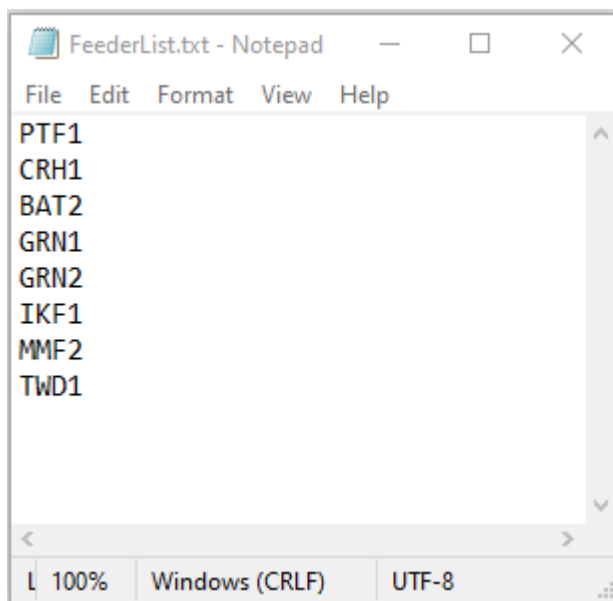
This tool package provides various essential input file templates to facilitate data extraction and analysis. Each imported file is associated with a specific assessment, ensuring that the software processes the data relevant to the intended analysis. The required files, each bearing verbatim names, are as follows:



This input data format for excel and csv will be detailed in the following relevant sections. The text file format and requirements are listed below.

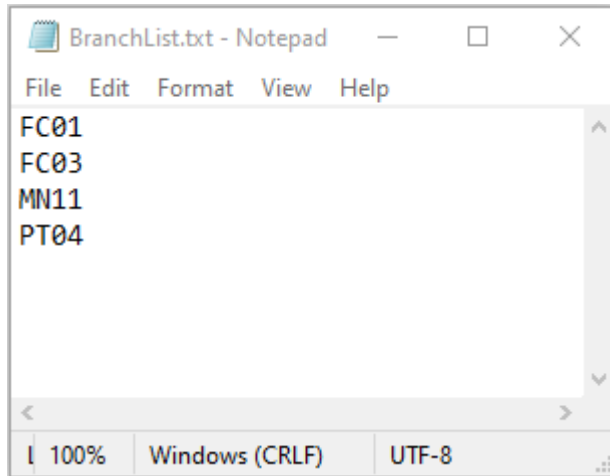
5.1 FeederList.txt

This file contains a list of all feeder stations of interest which will be used for Oslo result extraction and result process. The file contains the abbreviated names of supply points, in the format shown below, and can be generated from 'extra.oslo' file.



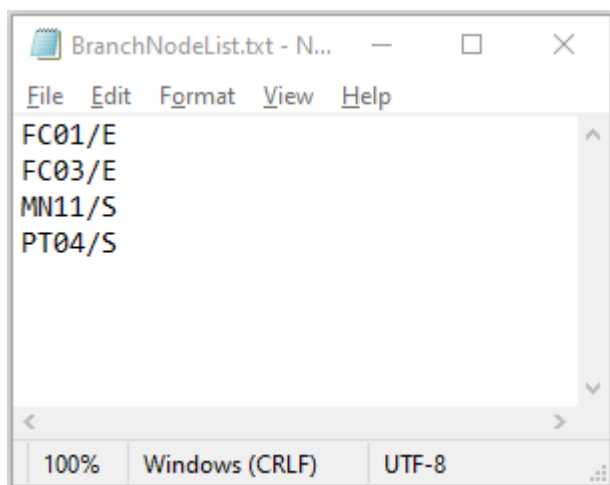
5.2 BranchList.txt

This file contains a list of all branches for which the results need to be extracted. Each line of the file represents a branch name in the format shown below.



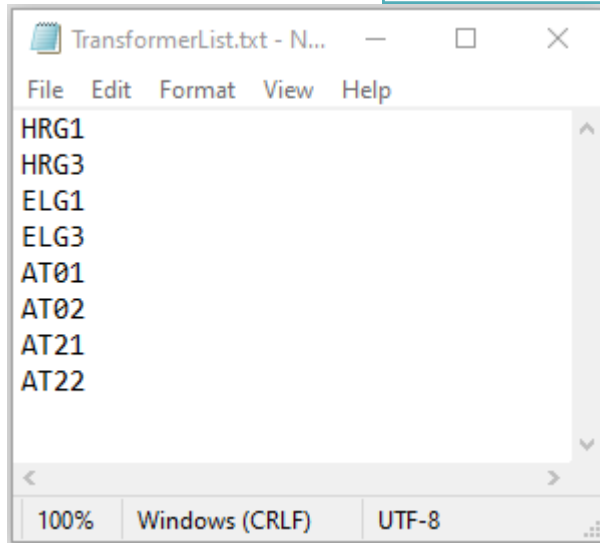
5.3 BranchNodeList.txt

This file contains a list of all branches for which the results need to be produced at the start or the end point. Each line of the file represents the branch and the node of interest (with letter 'S' for start and 'E' for end of the branch) in the format shown below.



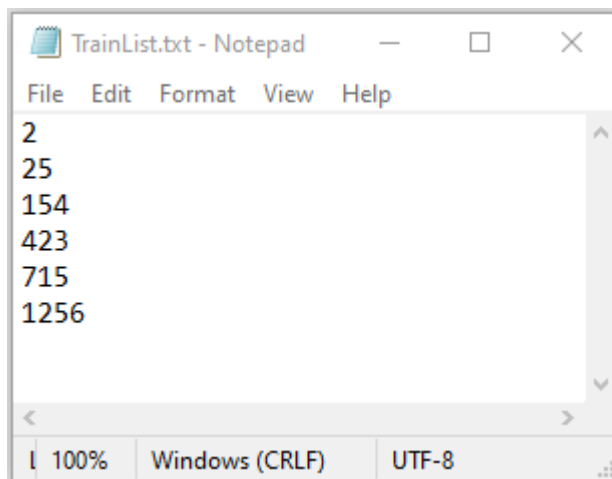
5.4 TransformerList.txt

This file contains a list of all transformers for which the results need to be extracted. The file contains the abbreviated names of transformers such as supply point transformers, auto transformers, two or three windings transformers in the format shown below, and can be generated from 'extra.oslo' file.



5.5 TrainList.txt

This file contains a list of all trains for which the results need to be produced. Each line of the file represents a train number, between 1 to 99999, in the format shown below.



6 VISION OSLO Model Preparation

Vision-Oslo Extension
— □ ×

File
Import
OSOP Configuration
Help

OSLO Model Data Preparation

Instruction: User expected to have relevant technical data ready.

1. BHTPBANK File Creation / Check
2. OSLO Impedance Spreadsheet
3. Extra.OSLO Preparation
4. Timetable Input Support / CIF Support
5. CIF Import Analysis / Model Improvement Guidance
6. Provision for development

execute 1

execute 2

execute 3

execute 4

execute 5

execute 6

Back to Home

This page is designed to support the modelling data preparation.

Due to the complexity of input data and various data formats from different sources, some functionalities are still considered to be best achieved by VBA application. Therefore, several excel spreadsheets with Marco are designed to support the model data preparation.

6.1 BHTPBANK File Creation & Check

Page 1: BHTPBANK Creation / Check

BHTPBANK File Creator (excel) is still in use to support very customised traction profile creation. The checking process is for information only and should be treated with caution.

NOTE: Option 1 - Import BHTPBANK Creator and Follow Excel Instructions

NOTE: Option 2 - Import Battery BHTPBANK File Creator and Follow Excel Instructions.

NOTE: Option 3 - Ensure BHTPBANK file exist in the current path

WARNING: Option 3 will freeze this window once RUN due to Plotting Function Limitation.

Option 1: BHTPBANK Traction File Creator

Import Traction Creator

Option 2: BHTPBANK Battery File Creator

Import Battery Creator

Option 3: Traction BHTPBANK File Check (Fill Below Information and Click Run)

BHTPBANK Name:

Select

Car Number (1-12):

(Freight Loco Enter 1)

RUN!

Back to Home

Back to Input

Option 1 supports user create BHTPBANK traction file. Due to the complexity of the traction performance, VBA application is adopted. Click 'import creator' will generate an excel template in a user's current folder.

User should follow the excel first page on-screen instructions to create the BHTPBANK file.

Instruction: (VERSION 10)

STEP1:	Go to either 'AC Data Entry' or 'DC Data Entry' and input Information in places where not highlighted.
STEP2:	Go to 'Calculation' Tab. Adjust the Settings Highlight in RED. It is essential to validate the calculation is fit for purpose as it might be different for different classes.
STEP3:	COPY all section highlighted in YELLOW in 'Calculation' tab, PASTE in this tab from Row 3 onwards. (better with value only)
STEP4:	UPDATE header information in 'Header info' Tab. Be cautious the format.
STEP5:	Click 'Creat BHTPBANK' button.
STEP6:	Go back to Python tool to check the created file

GENERAL PRINCIPLES:

1. Cells highlighted in YELLOW is NOT recommended to touch as it contains important formula.
2. Cells highlighted in 'RED' controls limitation and setting.
3. Always check the output using Python tool.

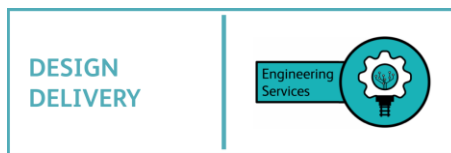
If the manufacture data includes detailed information already (i.e. it covers different current drawn at different speed under different voltage levels), it is recommend to filter the data manually and adjust the 'Calculation' tab directly.

However, in most circumstances the manufacture will only provide traction profile under nominal voltage level, where the information could be input at 'DATA ENTRY' tab.

It should be noted that the table under 'Step 1b' highlighted in yellow will be the only table read by the 'Calculation' tab directly.

Step 1b: Calculation					
Nominal Voltage Calculation					
Speed (km/h)	TE	Real Part		Imaginary Part	
		Current (A)	%	Current (A)	%
0	250.00	0.00	1	0.00	1
1	250.00	3.27	1	-0.95	1
5	250.00	16.34	1	-4.77	1
10	250.00	32.68	1	-9.53	1
15	250.00	49.02	1	-14.30	1
20	250.00	65.36	1	-19.06	1
30	250.00	98.04	1	-28.59	1
40	250.00	130.72	1	-38.13	1
50	250.00	163.40	1	-47.66	1
60	250.00	196.08	1	-57.19	1
70	250.00	228.76	1	-66.72	1
80	250.00	261.44	1	-76.25	1
90	222.22	261.44	1	-76.25	1
100	200.00	261.44	1	-76.25	1
110	181.82	261.44	1	-76.25	1
120	166.67	261.44	1	-76.25	1
130	153.85	261.44	1	-76.25	1
140	142.86	261.44	1	-76.25	1
150	124.44	244.01	1	-71.17	1
160	109.38	228.76	1	-66.72	1
Speed (km/h)	BE	Real Part		Imaginary Part	
		Current (A)	%	Current (A)	%
0	0.00	0.00	1	0.00	1
1	250.00	-2.36	1	-0.69	1
5	250.00	-11.81	1	-3.44	1
10	250.00	-23.61	1	-6.89	1
15	250.00	-35.42	1	-10.33	1
20	250.00	-47.22	1	-13.77	1
30	250.00	-70.83	1	-20.66	1
40	250.00	-94.44	1	-27.55	1
50	250.00	-118.06	1	-34.43	1
60	250.00	-141.67	1	-41.32	1
70	250.00	-165.28	1	-48.21	1
80	250.00	-188.89	1	-55.09	1
90	222.22	-188.89	1	-55.09	1
100	200.00	-188.89	1	-55.09	1
110	181.82	-188.89	1	-55.09	1
120	166.67	-188.89	1	-55.09	1
130	153.85	-188.89	1	-55.09	1
140	142.86	-188.89	1	-55.09	1
150	124.44	-176.30	1	-51.42	1
160	109.38	-165.28	1	-48.21	1

AC DATA ENTRY | DC DATA ENTRY | (+)



Click 'Create BHTPBANK' file will pop up the window asking the user to select the address where to create such a file.

Once the file is created, user should check the file using Option 3.

Option 3 can be used to check all BHTPBANK file which was written in 'modern' format (refer OSLO Manual [2]). Option 2 requires:

- BHTPBANK file name: This is the BHTPBANK file name (8 character) to be checked.
- Car Number: This is the number of cars the BHTPBANK represents. This number is used to check the sensible of auxiliary power.

Once Option 2 is select, user can click 'Run' to process the automatic checking.

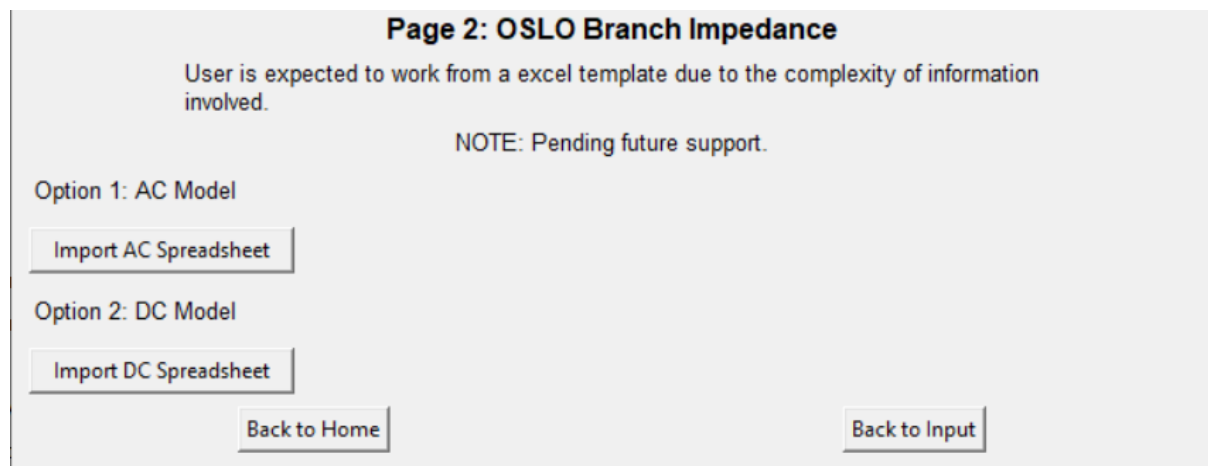
The following output will be generated:

- BHTPBANK.csv: this file contains tabulated information of the bhtpbank file and detailed calculation during the process.
- Warning Summary.txt: this file contains all warnings and errors during the checking process. Note that user need to judge if warning is acceptable or not. Errors need to be cleared before BHTPBANK file to be used by OSLO model.
- Absolute Current.png, Current Limitation Curve.png, Electrical Braking Effort.png, Power Limitation Curve.png, Real Current.png, Regen Current.png, Regen Efficiency.png, Traction Efficiency.png, Tractive Effort.png: these plots show the information as the file name suggested and should be checked if these are sensible or not.

6.1.1 Option 2: BHTPBANK battery file creator

Please refer to document [7] for details.

6.2 OSLO Impedance Spreadsheet Support



Due to the complexity of information and the fact that OLSO branch information needs to be manually input to the OSLO model, excel is still used to perform this support as a record. Option 1 and Option 2 will generate a template for AC / DC in your current folder if there isn't a one already available. User should open the template and modify the information as required.

For all section highlighted in blue, information should be entered manually or copied and paste from a data source with value only. Drop down list selection is required for Conductor Rail Data and Return Rail Data.

For all section highlighted in yellow, user should not touch as it will break the formula. The value will be automatically popping up once you have all blue section information available.

6.3 Extra.oslo & Extra.bat.oslo Preparation

Due to the complexity of the impedance calculation depending on various settings, VBA application is adopted. Option 1 and Option 2 will generate a template for AC / DC in your current folder if there isn't a one already available. User should open the template and modify the information as required.

The source impedance calculation could be achieve automatically using the VBA application.

Page 3: Extra.OSLO and Extra.Bat.OSLO Creator

This support the creating of Extra.OSLO and Extra.Bat.OSLO file. Excel creator is recommended due to the complexity of information involved.

NOTE: Pending Future Support

Option 1: AC Extra Oslo Creator

Import AC Creator

Option 2: DC Extra Oslo Creator

Import DC Creator

Option 3: Extra Battery Oslo Creator

Import Battery Extra.bat.OSLO Creator

Back to Home

Back to Input

- Option 1: ac_extra_oslo_creator.xlsm will be created.

User should following excel on-screen instruction to update information as required.

Extra OSLO Creator for AC Network <i>Version 1.0</i>	
NOTE:	worksheet coloured in RED must NOT be renamed. Programme is recommended to be run with ONE DRIVE OFF (OPEN THE SPREADSHEET WITH ONE_DRIVE OFF)
Please read instructions in each worksheet.	
Output:	This programme will create multiple extra.oslo files on your local folder. Note that if you operate this programme with One-Drive Sync on and from a NR SharePoint, the file will be created on your Desktop.
Ready to GO button	<div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 10px; width: 150px; margin: 0 auto;">Generate Extra.OSLO</div>
<div style="display: flex; justify-content: space-between; align-items: center;"> Start rolling_stock branch supply_point transformer extra.oslo + </div>	

It should be note that the default output with one-drive connection would be saved in:

1	PLEASE ENSURE THE CORRECT USE OF COLUMN B. NO COLUMN MANIPULATION IS ALLOWED BETWEEN COLUMN B-F					
2	NO HEADER MANIPULATION ALLOWED.					
3	Rolling Stock BHTPBANK Data:					
4						
5	THIS ROW IS INTENDED LEFT BLANK					
6	Rolling Stock No	Description	BHTPBANK	Additional	Auxiliary	FOR INFORMATION ONLY
7	IN VISION			Auxiliary Load	Power Factor	
8	2	Dispot load: New Cross Gate	FIXDEPOT	58		Comment
9	6	Class 700 12 Car AW3	LOEM700D	0	1	Thameslink AW3

PLEASE ENSURE THE CONJESCTIVE OF COLUMN C (INDEX). NO COLUMN MANIPULATION IS ALLOWED FOR COLUMN B-H. NO HEADER MANIPULATION ALLOWED.									
Additional Electrical Branches Data:									
		Start		End		Value Refers to Impedance Spreadsheet		FOR INFORMATION ONLY	
No	OSLO Branch ID	Location Name	OSLO Node ID	Location name	OSLO Node ID	Branch Resistance (Ω)	Branch Reactance (Ω)	Comment	
1	AF01	Kentish Town Up	NKEN	Grahame Park	NGRA	0.1110	0.2010	ATF - Up Line	
2	AF02	Kentish Town Down	NKEN	Grahame Park	NGRA	0.1039	0.4790	ATF - Down Line	
3	CB01	Supply Point A	SUP1	ATTS + 25kV Cable	FED1	0.6798	0.9878	Cable	

PLEASE ENSURE THE CONNECTIVE OF COLUMN c (SUBSTATION OSLO ID). NO COLUMN MANIPULATION IS ALLOWED FOR COLUMN A-C.													
NO HEADER MANIPULATION ALLOWED.													
Supply Point Data:													
Substation Name	OSLO Supply Point ID	OSLO Node ID	Type	No-Load Voltage [kV]	No-Load Voltage Phase Angle [deg]	Minimum Three Phase Fault Levels [MVA]	Type of Grid Transformer	Source Resistance [Ω]	Source Reactance [Ω]	DNO Tranx Resistance [Ω]	DNO Tranx Reactance [Ω]	Total Resistance [Ω]	Total Reactance [Ω]
Bryngrode SG22	BRV1	NRH1	AT	25.25	0	12000	SGT	0.0114	0.1143	0	0	0.0114	0.1143
Bryngrode SG22	BRV3	NRH2	AT	25.25	0	12000	SGT	0.0114	0.1143	0	0	0.0114	0.1143
Sundson	SUN1	SUF1	Classic	25.25	0	3200	Large (1516 MVA)	0.0476	0.3977	0	0	0.0476	0.3977
Sundson	SUN2	SUF2	Classic	25.25	0	3200	Large (1516 MVA)	0.0476	0.3977	0	0	0.0476	0.3977

PLEASE ENSURE THE CONNECTIVE OF COLUMN C (SUBSTITUTION OSLO ID). NO COLUMN MANIPULATION IS ALLOWED FOR COLUMN A.Q. NO HEADER MANIPULATION ALLOWED.															
Transformer Data:															
Transformer Name	Transformer Type	Transformer OSLO ID	Primary Voltage [V]	Primary Voltage [V]	Secondary OSLO ID	Secondary Voltage [V]	Number of Paralleled Trans	Transformer Spec	Transformer Tap Setting	FLR Tap Setting	Transformer Resistance [Ω]	Transformer Reactance [Ω]	FLR Reactance [Ω]	Total Resistance [Ω]	Total Reactance [Ω]
BraybrookSG2	Grid Trans.	SGT2	MM1H	26.25	MM1P	26.25	1	ABR Spec	4	N/A	0.1000	3.7468	0	0.1000	3.7468
BraybrookSG2	Grid Trans.	SGT1	MM1H2	26.25	MM1R1	26.25	1	ABB Spec	4	N/A	0.1000	3.7468	0	0.1000	3.7468
Sundson	Grid Trans.	SGT7	SHG2	26.25	SUF1	26.25	1	WCMA Spec	3	2	0.1000	3.1008	1.9	0.1000	5.0008
Sundson	Grid Trans.	SGT6	SHG2	26.25	SUF2	26.25	1	WCMA Spec	3	2	0.1000	3.1008	1.9	0.1000	5.0008
Autotransformer XXX	Auto Trans	ATG1	MMR1	27.5	Standard	Standard	2	Standard	N/A	3.6350	0.4033	0	3.6350	0.4033	

Issue A09
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Extra OSLO Creator for DC Network

Version 1.0

NOTE:

worksheet coloured in RED must NOT be renamed.

Programme is recommended to be run with ONE DRIVE OFF (OPEN THE SPREADSHEET WITH ONE_DRIVE OFF)

Please read instructions in each worksheet.

Output:

This programme will create multiple extra.oslo files on your local folder.

Note that if you operate this programme with One-Drive Sync on and from a NR SharePoint, the file will be created on your Desktop.

Ready to GO button

Generate Extra.OSLO

It should be note that the default output with one-drive connection would be saved in:

“C:\Users\USER_NAME\OneDrive - Network Rail\Profile\Desktop\ExtraOSLO”

1	PLEASE ENSURE THE CONSECUTIVE OF COLUMN B. NO COLUMN MANIPULATION IS ALLOWED BETWEEN COLUMN B-F				
2	NO HEADER MANIPULATION ALLOWED.				
3	Rolling Stock BHTPBANK Data:				
4					
5	THIS ROW IS INTENDED LEFT BLANK				
6	Rolling Stock No in VISION	Description	BHTPBANK	Additional Auxiliary Load	Auxiliary Power Factor
7	2	Depot load: New Cross Gate	FIXDEPOT	98	1
8	6	Class 700 12 Car AW3	LOEM700D	0	1
					FOR INFORMATION ONLY
					Comment
					Thameslink AW3

Rolling stock data can be input as required directly.

1	PLEASE ENSURE THE CONSECUTIVE OF COLUMN C (INDEX). NO COLUMN MANIPULATION IS ALLOWED FOR COLUMN B-H.				
2	NO HEADER MANIPULATION ALLOWED.				
3	Additional Electrical Branches Data:				
4					
5					
6	No	OSLO Branch ID	Start Location Name	OSLO Node ID	End Location name
7	1	A001	Southborough Tunnel North	SBO2	Southborough Tunnel South
8	2	A002	Grovehill S/S	GHIL	Strawberry Tunnel South
9	3	A003	Wadhurst Tunnel North	WAD2	Wadhurst Tunnel South
					FOR INFORMATION ONLY
					Cable Impedance [mΩ]
					0.011088
					0.029568
					0.033880

Cables data can be input as required directly. Note that the cable impedance calculation needs to be further investigated due to the beta version of OSLO DC model engine.

1	PLEASE ENSURE THE CONSECUTIVE OF COLUMN C (SUBSTATION OSLO ID). NO COLUMN MANIPULATION IS ALLOWED FOR COLUMN A-L.									
2	NO HEADER MANIPULATION ALLOWED.									
3	DC Substation Data:									
4										
5	NOTE: N-1 REFERS TO ONE TRU OUTAGE.									
6	Substation Name	OSLO Node ID	Outage Scenario	Substation TRU Rating [MW]	Substation TRU Type	Number of TRUs	Substation No-Load Voltage [V]	N-0 Capacity [MW]	N-1 Capacity [MW]	N-0 Impe [mΩ]
7	Abbey Wood	ABBY	3	3	G	1	790	3	0	10
8	Abbotscliff	ABBT	7	2.5	G	1	790	2.5	0	12
9	Adisham	ADIS	4	2.5	F	1	790	2.5	0	12
10	Albany Park	ALPK	3	3	G	1	790	3	0	10
11	Ashford	ASHF	8	3	F	2	790	6	6	5
12	Batham	BALH	4	4	G	2	790	8	8	3.75
13	Barming	BARM	7	3	G	1	790	3	0	10
14	Barnehurst	BARN	8	3	G	1	790	3	0	10
15	Bearsted	BEAR	5	3	G	1	790	3	0	10
16	Bekesbourne	BEKE	3	2.5	F	1	790	2.5	0	12

Supply point data should be input from left to right in sequence. Note that cells highlighted in yellow contains important formular which should not be touched or deleted.

Outage scenario number needs to be defined based on substation geographical location, the reason behind this is outside the scope of this document. Refer any DC related traction power modelling report for understanding.

Once all information is input as required, user should click ‘Generate Extra.OSLO’ button from ‘Start’ tab.

- Option 3: Create Extra.bat.oslo

Please refer to document [7] for detail.

6.4 CIF Timetable Support

Page 4: CIF Timetable Support
 This will do some pre-CIF analysing and filtering
 NOTE: Option 3-7 requires a csv file called "CIF_selection.csv".
 NOTE: "CIF_selection.csv" template can be imported from Import menu.

☐ Option 1: Readable Format Output (CIF Checking)

☐ Option 2: Filter out / Remove Diesel Services

☐ Option 3: Select Trains Passing Specific TIPLOC - [REQUIRE: CIF_selection.csv]

☐ Option 4: Select Specific TOC Code - [REQUIRE: CIF_selection.csv]

☐ Option 5: Select Specific Train (as per CIF train sequence) - [REQUIRE: CIF_selection.csv]

☐ Option 6: Remove Specific TIPLOC (Use with caution) - [REQUIRE: CIF_selection.csv]

☐ Option 7: Remove Specific Platform at a TIPLOC (Use with caution) - [REQUIRE: CIF_selection.csv]

CIF File Name (FULL): Select

RUN!

Back to Home
Back to Input




This provides various CIF file modification methods. All options require at least a CIF file saved in your current folder.

It should be noted that a "TIPLOC – Railway Station Name" library has been included in this tool. The last updated information is available when running any options.

```

Common Interface File (CIF) Processor
Copyright: Engineering Services 2024
Checking File DEC19 file.cif...
TIPLOC Library Last Update: 2024-03-21
ATTENTION: Please contact support if a TIPLOC library update is needed!
  
```

For option 3-7, 'CIF_selection.csv' is required as an additional input file. User's folder should contain the files as shown below.

Name	Status	Date modified
 CIF_Selection.csv	✓	18/03/2024 10:04
 DEC19 file.cif	✓	05/10/2022 16:25
 oslo_extension.py	✓	27/11/2023 15:34

This file can be generated using the 'CSV – CIF_selection.csv' option found in the 'Import' menu. This file follows the format shown below. After allocating the necessary information in the file, user must save and close it.

	A	B	C	D	E	F
1	TIPLOC_sel	TOC_select	Train_sel	TIPLOC_re	Platform_remove_list	
2	BARKING SR		10 KNGSBJ	UPD		
3	ACTONML SW		11 LNRSTJ	F3		
4			12 BHAMNW	10		
5			13			
6			14			
7			15			
8			16			
9			17			
10			18			
11			19			
12			20			
13			21			
14			22			
15			23			
16			24			
17			25			

The input requirements further explained in each section below.

6.4.1 Option 1 Output CIF file to a readable format

This option read the text-based CIF file and output into an excel-based file format. This supports further filtering which will be explained below.

Option 1 requires the full CIF file name to be entered or selected as an input.

The following files will be generated automatically:

- **CIFName_Summary.csv:** this file contains various summary information including a list of all TIPLOCs, a list of all timing locations, a list of all TOC codes, a list of all original stations, a list of all destination stations and the total number of services for each day. Note that the total number of services is for indication only as it does NOT consider whether a service entry is optional or cancelled or run in specific date range.

TIPLOC_all	Location_all	ATOC_Code_all	Origin_all	Destination_all	Monday_s	Tuesday_s	Wednesday_s	Thursday_s	Friday_ser	Saturday_s	Sunday_services
ABCWM	Abercwmboi	AW	Aberdeen	Aberdeen	6725	6887	6840	6897	6887	5243	3925
ABDARE	Aberdare	CC	Aberdeen Clayhills Carriage Ma	Aberthaw Tarmac Colas Rail							
ABGLELE	Abergele & Pensa	CH	Acton Terminal Complex	Acton Main Line							
ABHLJN	Abbeyhill Junction	CS	Acton Yard GB Railfreight	Acton Terminal Complex							
ABINGTN	Abington	EM	Aldersbrook Up Carriage Holdir	Airport Tyne & Wear Metro							
ABRCYNS	Abercynon South	ES	Aldwarke UES	Aldersbrook Up Carriage Holding Sidings							
ABRD27	Aberdeen Signal / EU		Alexandra Dock Junction Termi	Aldwarke UES							
ABRDCH	Aberdeen Clayhill	GC	Allerton Diesel Multiple Unit De	Alexandra Dock Junction Terminal Complex							
ABRDEEN	Aberdeen	GN	Allington ARC Siding	Allerton Diesel Multiple Unit Depot							
ABRDFJN	Aberdeen Ferryhill	GR	Angerstein Wharf GB Railfreigh	Allington ARC Siding							
ABRGVNY	Abergavenny	GW	Angerstein Wharf Tarmac	Amersham							
ABTH	Aberthaw	HT	Appleford Sidings	Angerstein Wharf GB Railfreight							
ABTH433	Aberthaw Signal / HX		Arcow Quarry GB Railfreight	Angerstein Wharf Tarmac							
ABTH440	Aberthaw Signal / LE		Ardingly	Appleford Sidings							

- **CIFName_Detail.csv:** this file contains a summary of all services basic information as recorded in the CIF file – BS and BX header. It also records the services departure and destination station and the total number of status changes en route, including the power mode after each status change.

Train_ID	Type	UID	Date_Run	Date_Run	Mon	Tue	Wed	Thr	Fri	Sat	Sun	BH	Status	Category	Identity	Headcode	Course_In	Service_C	Business	Power_Ty	Timing_Lc	Speed	Operating	Seating	C_Sleepers
1 N		C00524	191215	200510	0	0	0	0	0	0	1		F	B4	6.00E+46		1	5.8E+07	D		2200	60			
2 N		C01880	191215	200510	0	0	0	0	0	0	1		F	A0	4C77		1	5.8E+07	D		600	75			
3 N		C01881	191215	200510	0	0	0	0	0	0	1		F	A0	6C77		1	5.8E+07	D		2000	60			
4 N		C01950	191215	200510	0	0	0	0	0	0	1		F	B4	6L12		1	5.9E+07	D		1200	60 Q			
5 N		C02187	191215	200510	0	0	0	0	0	0	1		P	XX	1D81	7031	1	2.2E+07	DMU		125		B		
6 N		C02350	191215	200510	0	0	0	0	0	0	1		F	B1	6F28		1	5.9E+07	D		1600	60 Q			
7 N		C02439	191215	200510	0	0	0	0	0	0	1		P	XX	1C09		1	2.3E+07	EMU		700	100 D	B		
8 N		C02440	191215	200510	0	0	0	0	0	0	1		P	XX	1C10		1	2.3E+07	EMU		700	100 D	B		
9 N		C02441	191215	200510	0	0	0	0	0	0	1		P	XX	1C76		1	2.2E+07	EMU		365	100 D	B		
10 N		C02451	191215	200510	0	0	0	0	0	0	1		P	XX	1T10		1	2.2E+07	EMU		365	100 D	B		

Reservatio	Caterin	g_Co	Service_Bi	Spare	STP_Indic	UIC_Code	AOTC_Cor	Applicable	Retail_Ser	Info_Ch	an	Origin	Destinat	Location1_Power_Ty	Location2_Power_Ty	Location3_Power_Ty	Location4_Power_Ty	Location5_Power_Ty	Location6_Power_Ty	Location7_Power_Ty
					ZZ	Y						0 Merehead Hitchin Up Yard								
					ZZ	Y						0 Scunthorp Immingham Bulk Terminal Freightliner Heavy Haul								
					ZZ	Y						0 Immingham Scunthorp Coal Handling Plant Freightliner Heavy Haul								
					ZZ	Y						2 Bungallow Bow East Exeter Riv D	Acton Ter D							
R					GC	Y						1 Kings Cros Bradford I Doncaster DMU								
					ZZ	Y						0 Arpley Sid Liverpool European Metals Recycling Mersey Dock & Harbour Company								
					TL	Y						0 Cambridge Kings Cross								
					TL	Y						0 Kings Cros Cambridge								
					GN	Y						0 Kings Cros Cambridge								

- **CIFName_ChangeEnRoute.csv:** this file contains a summary of all status changes for all services as recorded in the CIF file – CR header.

Train_ID	TiLOC	Location	Category	Identity	Headcode	Course_Ini	Service_Cc	Business_P	Power_Ty	Timing_Lo	Speed	Operating	Seating_Cf	Sleepers	Resevator	Connector	Catering_C	Service_Br	Traction_C	UIC_Code	Retail_Service_ID
4	EXETRRY	Exeter Rivr B4		6L12		1	5.9E+07		D	2200	60 Q										
4	ACTONTC	Acton Terr B4		6L12		1	5.9E+07		D	2200	60 Q										
5	DONC	Doncaster XX		10B1	7031	1	2.2E+07				125		B					C			
153	COLCHESTR	Colchester EE		57B4		1	2.2E+07		DMU	S	75 D										
227	PBR0	Peterborough XX		1144	6181	1	2.2E+07		DMU	E	100	B		S							
228	PBR0	Peterborough XX		1146	6201	1	2.2E+07		DMU	E	100	B		S							
236	PBR0	Peterborough XX		1N55	6691	1	2.2E+07		DMU	E	100	B		S							
237	PBR0	Peterborough XX		1N57	6711	1	2.2E+07		DMU	E	100	B		S							
238	PBR0	Peterborough XX		1N59	6731	1	2.2E+07		DMU	E	100	B		S							
254	EDINBUR	Edinburgh XZ		1M16	3002	1	2.4E+07		1 E	595	80	S	B	A				R			
256	EDINBUR	Edinburgh XZ		1S25	3001	1	2.4E+07		1 D	385	125	S	B	A				R			

- `CIFName_Timetable.csv`: this file contains all services detailed timetable in a tabulate csv format.

Train_ID	TIPLOC	Location	Arrival Time	Departure/Time(A/D)	Platform	Line	Path	Activity	Engineer in Pathing	Allowance
1	MERHFFH	Merehead Quarry Fre	23:55:00	23:55:00				TBPR		
1	WHTSXSG	Whites Crk	00:05:00	00:07:00	00:07:00			PRRM		
1	MERHDQJ	Merehead Quarry Jur	00:16:00	00:16:00						
1	ESTSOMJ	East Somerset Junction	00:24:00	00:24:00	UGL					
1	BLBGJN	Blatchbridge Junction	00:32:00	00:32:00						
1	CLNKRDJ	Clink Road Junction	00:34:00	00:34:00						
1	FRWDJN	Fairwood Junction	00:38:00	00:38:00					1	
1	WSTBRYW	Westbury	00:42:00	00:44:00	00:44:00	2		A		
1	HWRDJN	Heywood Road Junction	00:47:00	00:47:00						
1	LAVNGTN	Lavington	00:55:00	00:55:00						
1	WBORO	Woodborough	01:11:00	01:11:00	UGL					
1	BEDYN	Bedwyn	01:29:00	01:29:00		2				
1	NEWBURY	Newbury	01:43:00	01:43:00						
1	SCOTEJN	Southcote Junction	01:59:00	01:59:00						
1	RDNGORJ	Reading Oxford Road	02:01:00	02:01:00		DFR				
1	RDNGSTN	Reading	02:03:30	02:03:30		12 DRL				
1	RDNGKBJ	Reading Kennet Bridge	02:05:00	02:05:00		RL				

6.4.2 Option 2 Remove Diesel Services

Output file: CIFName_Op2_NoDT.cif

This process will do the following adjustment to the CIF file:

- It will remove all TIPLOC record section. (i.e. TI, TA and TD header)
- It will remove all BS header information without any timetable associated. (that usually the case for cancelled services record)
- It will remove BS header with the following power mode. It should be note that HST is current retained as high-speed train could be run with electric unit.
 - D
 - DEM
 - DMU
- Each time there is a power mode change in the timetable, it will create generate a new train service using the CR header info directly.

Users are suggested to check the generated new CIF with option 1 again to review the outcome.

6.4.3 Option 3 Filter against TIPLOC

Input file: CIF selection.csv – 1st column

Output file: CIFName_Op3_TIPLOC.cif

This process will choose all services passing the TIPLOC as listed under the first column in “CIF_selection.csv”. For a services under one BS header, as long as there is one TIPLOC located within the TIPLOC list defined in the CIF_selection.csv, the whole journey from that BS header will be recorded in the new generated CIF file.

Note that this process does not remove diesel services and does not split the trains based on CR header record.

6.4.4 Option 4 Filter against TOC code

Input file: CIF_selection.csv – 2nd column

Output file: CIFName_Op4_TOC.cif

This process will choose all services that assigned with a TOC code as listed under the second column in “CIF_selection.csv”. For a services under one BS header, the TOC code under BX header will be compared against the TOC list. It should be noted that if a service come with not valid TOC code, i.e. empty information, that service will still be recorded as to be decided by the user at a later stage.

Note that this process does not remove diesel services and does not split the trains based on CR header record.

6.4.5 Option 5 Filter against Train No

Input file: CIF_selection.csv – 3rd column

Output file: CIFName_Op5_Train.cif

This option should be used if any customized selection is expected based on the available CIF file. This process will choose all services that listed under the third column in “CIF_selection.csv”.

It should be noted that Option 1 is required to be run to support the train list selection.

Note that the Train No in CIF_selection.csv refers to service number against the selected CIF, i.e. Column ‘Train ID’ from the ‘CIFName_CIF_Details.csv’.

User could generate a unique list in excel based on customised requirements, such as running on specific day, departing from a specific station, with specific power mode, with specific head code, with specific speed profile, etc.

User could then copy the selected list into the 3rd column in ‘CIF_selection.csv’. Run this option to generate a new CIF that covers the selected trains ONLY.

Note that this process does not split the trains based on CR header record.

6.4.6 Option 6 Remove Specific TIPLOCs

Input file: CIF_selection.csv – 4th column

Output file: CIFName_Op6_CrTT1.cif

This option could be used if user want to remove any specific TIPLOCs from the CIF file. This process will remove all single line contains the TIPLOCs that listed under the fourth column in “CIF_selection.csv”, with certain exceptions as follows:

- If the line belongs to ‘LO’ or ‘LT’ record (i.e. origin or destination), this line will NOT be removed regardless.
- If the TIPLOCs line contains timing information (i.e., this line contains either a departure or arrival time), this line will NOT be removed regardless. A warning message will appear on the monitor window notify user if this is the case.

This option was added to support avoiding adding additional timing markers to VISION model. However, this option should always be used with caution. User should analysis to ensure the removal of specific TIPLOCs does not changing the timetable information by using output from Option 1: ‘CIFName_Timetable.csv’.

6.4.7 Option 7 Remove Specific Platforms of Specific TIPLOCs

Input file: CIF_selection.csv – 4th column AND 5th column

Output file: CIFName_Op7_CrTT2.cif

This option could be used if user want to remove any specific platforms information at specific TIPLOCs from the CIF file. This process will remove the platform information of a specific TIPLOCs that listed as under a combination of the fourth AND fifth column in “CIF_selection.csv”.

It should be noted that a combination of TIPLOCs and platform information is required to make the criteria valid. Repetition of TIPLOCs information is allows (i.e., You can have [TIPLOC1, 1a],[TIPLOC1, 2a]). However, user should be noticed that ONLY the minimum row number between Column 4 and Column 5 will be considered (i.e., if you have more platform rows than TIPLOCs rows, the additional platform rows will NOT be considered, vice versa).

This option was added to support avoiding adding additional timing markers to VISION model. However, this option should always be used with caution. This option should only be considered with support from CIF Import Analysis.

6.5 CIF Import Analysis / Model Improvement Guidance

Page 5: CIF Import Support / Model Improvement Guidance

This will generate a model improvement guidance report based on the importing process. This should be run multiple rounds to improve the CIF import quality.

NOTE: The following files are required.

NOTE: simulation.gd

NOTE: simulation.C2V.routes.txt

NOTE: simulation.routes.mon.txt

NOTE: simulation.routes.itf.txt

RUN!

Back to Home

Back to Input

This page is designed to support the analysis of output files generated during the VISION CIF file import process, and generated model improvement guidance report to support VISION model improvement. For further details, please refer to the document [6].

Input:

- *.gd
- *.C2V.routes.txt
- *.routes.mon.txt
- *.routes.itf.txt

The process will generate a text file as model improvement report with file name as:

*_00_Model_Improvement_Guidance_xx.txt

The use of '00' is to make this text file top of a directory, the 'xx' is a number based on how many times the report has been generated. It should be noted that this report will NOT be overwritten each time the user runs for the same simulation name. It will add number increment as suffix. However, it does have a maximum of 100 reports limitation, after which it will start overwriting the first report.

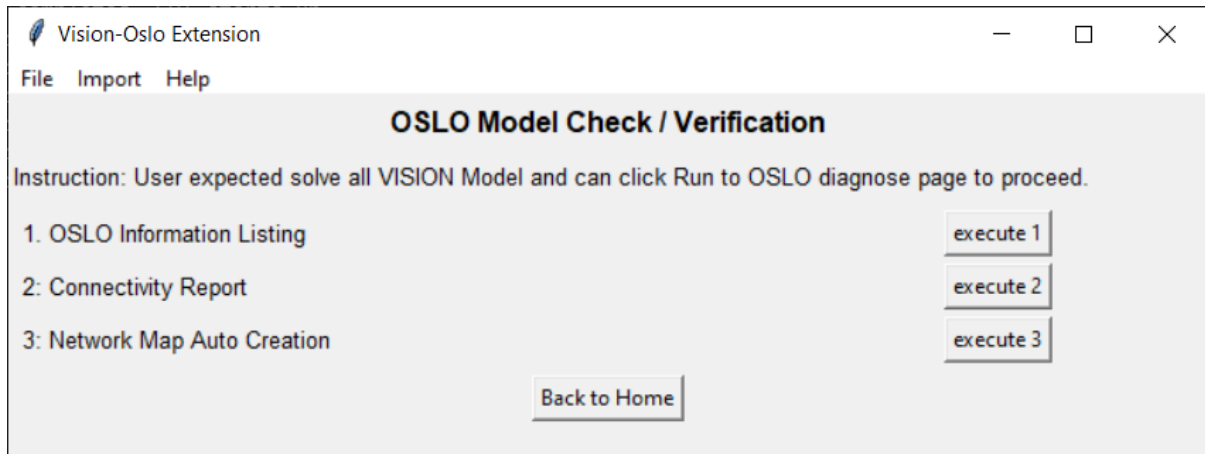
To understand the detail of this report should refer to document [6]. In short, this report has 6 sections:

- List of intermediate TIPLOCs that exists in the CIF but missing in the VISION model.
- List of platform information that exists in the CIF but missing in the VISION model.
- List of failure routes section during filter process.
- List of failure routes section during auto-route process.
- List of mismatch locations between expected CIF origin and actual VISION origin.
- List of mismatch locations between expected CIF destination and actual VISION destination.

Each section is formatted so that if needed, user could copy the dedicated section to the excel, and using fixed width separation to convert it to a excel format.

6.6 Provision for Development

7 OSLO Model Validation



This page is designed to support the additional OSLO model validation and trouble shooting.

For people who start working on an existing model, or act as the checker or reviewer, the output from this model validation could generate various report.

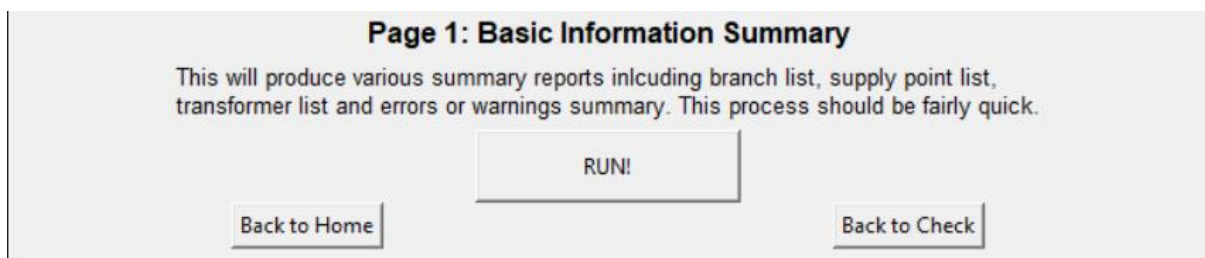
It should be noted that the default VISION-OSLO error should be cleared before using this function. (i.e., user should be able to click the run button and model is able to run to the first-time step).

Required input file for all options on this page:

***.lst.txt

This is the autogenerated list file containing all model information once all systematic checking passed.

7.1 OSLO information listing



Input:

- Simulation name selected or input
- ***.lst.txt

This process generates the following reports:

- ***_error_warning.txt: This is a summary list of all warnings by VISION OSLO automatic checking process. It should be noted that it should only contains warnings as errors needs to be cleared before running this option.
- ***_branch.csv: This is a summary list of all branches in the model including OSLO branches, branches section in extra.oslo and transformer section in extra.oslo.

- *****_branch_detail.csv:** This is a summary list of a detailed section after the VISION OSLO cross-checking process and including all stubs information. VISION OSLO cross checking will split the section into even smaller section based on VISION track ID in order to support the actual simulation run. The stub utilizes a different calculation mechanism during simulation which does not use 'Nodal Admittance Matrix' method as used by calculation method for branch data.
- *****_supply_point.csv:** This is a summary list of all supply points in extra.oslo
- *****_transformer.csv:** This is a summary list of all transformers in extra.oslo
- *****_node_connected_branch.csv:** This is a summary list of all nodes and all branches that connected to each node. Note that this is useful information especially for OLE rating analysis or DC related analysis.

7.2 OSLO Connectivity Report

Page 2: Connectivity Report

This will produce two summaries. One showing the node connection summary.
One showing all connected nodes from the supply points.

RUN!

[Back to Home](#)
[Back to Check](#)

Input:

- Simulation name selected or input
- *****.lst.txt**

This process generates the following reports:

- *****_node_connection_summary.csv:** This is a summary of all interconnected nodes, directly or indirectly. This is particularly important for DC model because DC model require at least ONE supply point for each line. An ideal DC model should only contain ONE line as all substations should be interconnected.

No	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	No	Node_ID																					
2	1	NBM1	SRD4	NKEN	ETH1	KSP1	NAPA	SRD1	KINC	BOR1	WHJN	KHPN	KTJ1	KTJ2	BM1	MDRD	SRD3	SRD2	NGRA	HNDL	CTH1	KENT	KSP2
3	2	SUN1	SUD1	NTH2	BDF2	SHN1	ETH2	BDF3	ANT1	BDF1	BED1	BDF4	LOO2	LOO3	LEE1	NEE1	LOO1	LOO4	NUN1				

- *****_supply_point_connected_branches.csv:** This is a summary of all interconnected branches, directly or indirectly, from a supply point. This is particularly useful for AC model to support umeanuseful analysis and OLE rating analysis.

No	SP_Name	SP_Node	Connected_Branch_ID																				
1	BOF1	BOR1	320B	321B	323B	324B	328B	329B	330B	331B	332B	496B	497B	498B	501B	502B	503B	504B	505B	506B	507B	523B	
2	SUF1	SUD1	362B	363B	364B	365B	598B	599B	600B	601B	623A	624A	625A	626A	627B	628B	629B	630B	631B	632B	633B	634B	
3	BRF1	BRA1	641B	642B	643B	644B	645B	646B	647B	648B	649B	650B	651B	651C	652B	652C	653A	654A	655B	656B	AF11	AT11	

- *****_supply_point_connected_nodes.csv:** This is a summary of all interconnected nodes, directly or indirectly, grouped by each supply point. This is particularly useful for AC voltage analysis.

No	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	No	SP_Name	SP_Node	Connected_Node_ID																			
2	1	BOF1	BOR1	BM1	CTH1	CTH2	ETH1	FARR	GP1	HNDL	KENT	KHPN	KINC	KSP1	KSP2	KTJ1	KTJ2	MDRD	NAPA	NBM1	NGRA	NKEN	SRD1
3	2	SUF1	SUD1	ANT1	BDF1	BDF2	BDF3	BDF4	BED1	ETH2	LEE1	LOO1	LOO2	LOO3	LOO4	NEE1	NTH2	NUN1	SHN1	SUN1			
4	3	BRF1	BRA1	BRY1	COR1	COR2	HARJ	IRCH	KET1	KET2	KETT	NKET	NRV1	SHN2									

7.3 OSLO Network Map Plot

Page 3: Network Connection Plot

This will create a plot (A3 Picture format) of the OSLO network.

NOTE: AC Network Plot is Regulated (Option 1 and 2).

NOTE: DC Network Plot is Random (Option 3). Different plots each run.

WARNING: This process will freeze this window once RUN due to Plotting Function Limitation.

☐ Option 1: AC OSLO Network Plotting (NOT show Branch ID)

☐ Option 2: AC OSLO Network Plotting (Show Branch ID)

☐ Option 3: DC OSLO Network Plotting (Random Gen, To Be Improved)

RUN!

Back to Home

Back to Check

Input:

- Simulation name selected or input
- ***.lst.txt

Output: ****_Auto_Plot.png

This function creates network plot using default algorithm. Due to the missing of geographical information in VISION OSLO model, the nodes are randomly allocated in the plot.

Every time the 'Run' button is clicked, an output file with a number suffix will be created in user's current folder. The number will be auto incremented for each run avoiding the overwritten of any previous plot.

Users are expected to check several graphs and choose the best one as some plots might have crossing lines in multiple places due to the complexity of the model.

In output plot, red dots represent a supply point node, blue dots represent other connection nodes (i.e., substation, junction, etc), green text represent the branch ID (if applicable).

8 Default OSLO Extraction

Vision-Oslo Extension

File Import Help

OSLO Extraction Option Selection

Instruction: User can go to info page entering extraction requirements using execute buttons below

1: List of electrical files	execute 1
2: Snapshot	execute 2
3: Individual train step output	execute 3
4: Maximum currents and minimum and maximum voltages	execute 4
5: Train high voltage summary	execute 5
6: Train low voltage summary	execute 6
7: Average MW and MVA _r demands in supply points, metering points, static VA _r , etc	execute 7
8: Feeder step output	execute 8
9: Branch step output	execute 9
10: Transformer step output	execute 10
11: Smoothed feeder currents	execute 11
12: Smoothed branch currents	execute 12
13: Supply point persistent currents (development in progress)	execute 13
14: Output to data files	execute 14

Back to Home

On this page, users can extract simulation results using various assessment options. Oslo Output File (*.oof) is required for any assessments in this section. Refer to [3] for further details.

8.1 List of electrical files

Page 1: Listing of Electrical File

The contents of the electrical output file will be produced, starting with the network data used by the simulation programme, and followed by the data written at each time step during the requested period.

☐ Option 1: List Input File (all time window)

☐ Option 2: List Input File From Start to End (Time information below required)

☐ Option 3: List Input File Headers Only

Extraction From (Format: DHHMMSS) Extraction To (Format: DHHMMSS)

RUN!

Back to Home Back to Extraction

Output file: *.osop.lst

This section will generate a text file containing the electrical output, beginning with the network data used by the simulator program, and followed by the data written at each time step during the requested period. Three options are available in this section:

- Option 1, List Input File: provides the complete file over the entire simulation time which may be very large.
- Option 2, List Input File from Start to End: offers data written at each time step only between the times (in format DHHMMSS) allocated in the relevant boxes.
- Option 3, List Input File Headers Only: provides only the network data.

8.2 Snapshot

Page 2: Snapshot

This will produce two tables of train and electrical overhead quantities related to the time requested.

Extraction at (Format: DHHMMSS)

RUN!

[Back to Home](#) [Back to Extraction](#)

Output file: *.osop.snp

This section will produce a text file containing two tables of train and electrical overhead quantities related to the time allocated in the relevant box in format DHHMMSS.

- Table 1: relates to train data at that time; data includes train identification, positional of the train, train speed, tractive effort, current (A) drawn by the train and voltage (kV) at the train pantograph.
- Table 2: relates to the overhead network at that time, data includes the voltage (kV) for each node, the current (A) at the start and end of each branch and the relevant node voltage (kV) and current (A) for each supply point, metering point, static VAr compensator and motor alternator present.

8.3 Individual train step output

Page 3: Individual Train Step Output

This will produce train number specified at each clock increment within the time band requested.

☐ Option 1: Single Train Step Output (Enter training number below)

☐ Option 2: Multiple Train Step Output (A text file named as ""TrainList.txt"" is required)

Extraction From (Format: DHHMMSS) Extraction To (Format: DHHMMSS)

VISION Train Number (Maximum 5 digit)

RUN!

[Back to Home](#) [Back to Extraction](#)

Output file: *.osop.ds1

This section will produce a text file containing Table 1 of Item 5.2 (Snapshot) for the train number specified at each time increment within the time band requested where times are in format DHHMMSS allocated in the relevant boxes. Two options will be available in this section:

- Option 1, Single Train Step Output: will produce train data for a train number specified in VISION Train Number box.
- Option 2, Multiple Train Step Output: will generate train data for a list of trains specified in 'TrainList.txt' file.

8.4 Maximum currents and minimum and maximum voltages

Page 4: Maximum Currents and Minimum and Maximum Voltages

This will produce the tables of min/max values for each node, supply points, branch and transformers.

Back to Home

RUN!

Back to Extraction

Output file: *.osop.mxn

This section will generate the tables of maximum and minimum instantaneous voltage (kV) and the relevant times for each node, maximum instantaneous normal current (A) and reverse current (A) and the relevant times for each supply point, maximum instantaneous current (A) and the relevant time passing through a branch and the maximum instantaneous current (A) and the relevant time for each winding of a transformer.

8.5 Train high voltage summary

Page 5: Train High Voltage Summary

This will aggregate the length of time for which train s votlage is above the requested threshold.

High Voltage Threshold (Format: XX.X)

Unit (kV)

Back to Home

RUN!

Back to Extraction

Output file: *_maxtime.osop.vlt

This section will generate a text file containing trains data for all the trains running in the simulation. For each train in this file the software aggregates the length of time when the train's voltage is above the specified threshold allocated in the relevant box in format XX.X kV.

8.6 Train low voltage summary

Page 6: Train Low Voltage Summary

This will aggregate the length of time for which train s votlage is below the requested threshold.

☐ Option 1: Summary only (1st file output with additional info)

☐ Option 2: Detailed Info (including snapshot of all low voltage time steps)

Low Voltage Threshold (Format: XX.X) Unit (kV)

RUN!

[Back to Home](#) [Back to Extraction](#)

Output file: *_mintime.osop.vlt

This section will generate a text file containing trains data for all the trains running in the simulation. For each train in this file the software aggregates the length of time when the train's voltage is below the specified threshold allocated in the relevant box in format XX.X kV. Two options are available in this section:

- Option 1, Summary only: will generate the list of trains data including the sum total of time when the train's voltage is below the specified threshold for all the trains running in the simulation.
- Option 2, Detailed info.: Will generate a text file containing the data of Option 1, and Table 1 and Table 2 of Item 5.2 (Snapshot) for each time increment when the magnitude of the train's voltage is below the specified threshold.

8.7 Average MW and MVar demands in supply points, metering points, static Var compensators and motor alternators.

Page 7: Average MW and MVar Demands

Averages of MW and MVar demand are calculated over successive intervals of time for the requested supply points, metering points, static VAR compensators and motor alternators requested. Averages are NOT rolling average.

☐ Option 1: Single Demands Output (Enter required info below)

☐ Option 2: Multiple Demands Output (A text file named as ""FeederList.txt"" is required)

Extraction From (Format: DHHMMSS) Extraction To (Format: DHHMMSS)

Demand ID (Maximum 4 digit):

Averaged Time Windows (Formax: XX) Unit (minute) (2 digits ONLY) MOVING AVERAGE!

RUN!

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Output file: *.osop.pwr

This section will generate a text file containing the averages of MW (active power) and MVar (reactive power) over successive intervals of time, in format XX minutes (e.g., every 15 or 30 minutes), for the requested supply points, metering points, static VAr compensators and motor alternators. Averages

are calculated at the start time and then at intervals of XX minutes for times less than or equal to the end time. The times are in DHHMMSS format.

The results produced are the imported and exported active and reactive powers. They are based on the voltage at the relevant node, and the current in a specified path connected to the node as follows:

- For a supply point, the voltage is the voltage at the node to which the supply point is connected. The current is that which flows in the output impedance of the supply point.
- For a metering point, the voltage is the voltage of the relevant node, and the current is the total current in up to four branches at their points of connection to the node.
- For a static var compensator, the current is the total in the 'fixed capacitor' portion and the variable portion.
- Motor alternators are treated in the same way as supply points i.e., the current is that which flows in the impedance of the alternator, and the voltage is the voltage of the node to which the alternator is connected.

Two options are available in this section:

- Option 1, Single Demands Output: will produce the output file for the demand ID specified in the relevant box between the times (in format DHHMMSS) allocated in the relevant boxes.
- Option 2, Multiple Demands Output: will produce the output files for all demand IDs specified in 'FeederList.txt' file.

8.8 Feeder step output

Page 8: Individual Feeder Step Output

This will produce a table of voltages and currents (magnitude and phase) together with real and reactive power for the supply points, metering points, static VAR compensators and motor alternators requested for the specified time period

☐ Option 1: Single Feeder Step Output (Enter Feeder ID below)

☐ Option 2: Multiple Feeder Step Output (A text file named as ""FeederList.txt"" is required)

Extraction From (Format: DHHMMSS)

Extraction To (Format: DHHMMSS)

OSLO Feeder Name (Maximum 4 digit):

RUN!

[Back to Home](#)

[Back to Extraction](#)

Output file: *.osop.d4

This section will generate a text file containing a table of active power (MW) and reactive power (MVar) together with voltages (kV) and currents (A) (magnitude and phase) for the supply points, metering points, static VAR compensators and motor alternators requested for the specified time period in format DHHMMSS. Two options are available in this section:

- Option 1, Single Feeder Step Output: will produce the output file for the Oslo feeder name specified in the relevant box between the times (in format DHHMMSS) allocated in the relevant boxes.

- Option 2, Multiple Feeder Step Output: will produce the output files for all feeder names specified in 'FeederList.txt' file between the times (in format DHHMMSS) allocated in the relevant boxes.

8.9 Branch step output

Page 9: Individual Branch Step Output

This will produce tables of voltage, current, real power, reactive power and displacement factor at the start or the end of the branch(es) requested for the specified time period

☐ Option 1: Single Branch Step Output (Enter Branch ID + Terminal below)

☐ Option 2: Multiple Branch Step Output (A text file named as ""BranchNodeList.txt"" is required)

Input format below should be "Branch ID/S or E". Note that S or E must be capital letters. S means branch start and E means branch end. Empty output or Errors are usually due to the wrong naming format

Extraction From (Format: DHHMMSS)
 Extraction To (Format: DHHMMSS)

OSLO Branch Name (Data Format: XXXX/X):

RUN!

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[Back to Extraction](#)

Output file: *.osop.d4

This section will generate a text file containing a table of active power (MW) and reactive power (MVar) together with voltages (kV) and currents (A) (magnitude and phase) at the start or the end of a branch or branches. Two options are available in this section:

- Option 1, Single Branch Step Output: will produce the output file for the Oslo branch name specified in the relevant box in format XXXX/X (branch ID/value 'S' for start or 'E' for end, both in capital letter) between the times (in format DHHMMSS) allocated in the relevant boxes.
- Option 2, Multiple Branch Step Output: will produce the output files for all branch names specified in 'BranchList.txt' file between the times (in format DHHMMSS) allocated in the relevant boxes.

8.10 Transformer step output

Page 10: Individual Transformer Step Output

This will produce tables showing step-by-step values of real power, reactive power, voltage and current will be produced for the specified time period. This will show all windings depending on the transformer type.

☐ Option 1: Single Transformer Step Output (Enter Transformer ID below)

☐ Option 2: Multiple Transformer Step Output (A text file named as ""TransformerList.txt"" is required)

Extraction From (Format: DHHMMSS)
 Extraction To (Format: DHHMMSS)

OSLO Transformer Name (Maximum 4 digit):

RUN!

[Back to Home](#)
[Back to Extraction](#)

Output file: *.osop.d4

This section will generate a text file containing active power (MW), reactive power (MVAR), voltage (kV) and current (A) (magnitude and phase) of a transformer or transformers for the specified time period. The output produced depends on the type of transformer and is as follows:

- Normal two-winding transformer (type='N')
Active and reactive power (MW/MVAR) based on the node voltage and transformer current at winding 1.
Voltage (kV) and current (A) (magnitude and phase angle) on winding 1.
Current (A) (magnitude and phase angle) on winding 2.
- Auto-transformer (type='A')
Active and reactive power (MW/MVAR) based on the node voltage and transformer current at winding 1.
Voltage (kV) and current (A) (magnitude and phase angle) on winding 1.
Current (A) (magnitude and phase angle) in the centre-tap connection to the rails.
- Three-winding centre-tapped transformer (type='C')
Active and reactive power (MW/MVAR) based on the node voltage and transformer current at winding 1.
Voltage (kV) and current (A) (magnitude and phase angle) on winding 1.
Current (A) (magnitude and phase angle) in the centre-tap connection to the rails.
- Two-winding transformer connected line-to-line (type='L')
Active and reactive power (MW/MVAR) based on the node voltage and transformer current at winding 1.
Voltage (kV) and current (A) (magnitude and phase angle) on winding 1.
Current (A) (magnitude and phase angle) on winding 2.

Two options are available in this section:

- Option 1, Single Transformer Step Output: will produce the output file for the Oslo transformer name specified in the relevant box between the times (in format DHHMMSS) allocated in the relevant boxes.
- Option 2, Multiple Transformer Step Output: will produce the output files for all transformer names specified in 'TransformerList.txt' file between the times (in format DHHMMSS) allocated in the relevant boxes.

8.11 Smoothed feeder currents

Page 11: Smoothed Feeder Currents

At every time step, rolling average currents are calculated over specified time step for the specified supply points, metering point, static VAR compensator and motor alternators. Only current in the "normal" direction of power flow are taken into account. A separate file is created for the reverse direction of power flow.

☐ Option 1: Single Feeder Currents Output (Enter Feeder ID below)

☐ Option 2: Multiple Feeder Currents Output (A text file named as ""FeederList.txt"" is required)

Time Steps (Maximum 3 digits) (Note this is time STEP based on simulation setting)

OSLO Feeder Name (Maximum 4 digit):

RUN!

[Back to Home](#)
[Back to Extraction](#)

Output files: *_normal_fort.12 & *_reverse_fort.12

This section will generate a text file containing the maximum average current (A) and the times (between which the maximum average occurs) for the requested supply points, metering points, static VAr compensators and motor alternators. Averages are calculated over the time steps specified in Time Steps box (maximum 3 digits) at each time increment from the simulation start time and the maximum will be extracted from an average rolling time window across the entire simulation time.

Only currents in the “normal” direction of real power flow are considered. For supply points and motor alternators this means real power is being delivered to the overhead lines. For “reverse” direction a separate file will be generated. Two options are available in this section:

- Option 1, Single Feeder Currents Output: will produce the output file for the Oslo feeder name specified in the relevant box.
- Option 2, Multiple Feeder Currents Output: will produce the output files for all feeder names specified in ‘FeederList.txt’ file.

8.12 Smoothed branch currents

Page 12: Smoothed Branch Currents

This will produce a table of maximum rolling branch currents (average and RMS) for the specified branch(es), together with the time-period over which the maximum occurred.

☐ Option 1: Single Branch Currents Output (Enter Branch ID + Terminal below)

☐ Option 2: Multiple Branch Currents Output (A text file named as ""BranchNodeList.txt"" is required)

Input format below should be "Branch ID/S or E". Note that S or E must be capital letters. S means branch start and E means branch end. Empty output or Errors are usually due to the wrong naming format

Time Steps (Maximum 3 digits) (Note this is time STEP based on simulation setting)

Branch Name (Format: XXXX/X):

RUN!

[Back to Home](#)
[Back to Extraction](#)

Output file: *.osop.mxn

This section will generate a text file containing the maximum average and maximum RMS current (A) and the times between which the maximum average or maximum RMS occurs for the requested branch or branches. Average currents and RMS currents are calculated over the time steps specified in Time Steps box (maximum 3 digits) at each time increment from the simulation start time and the maximum currents will be extracted from a rolling time window (average and RMS time windows) across the entire simulation time. Two options are available in this section:

- Option 1, Single Branch Currents Output: will produce the output file for the branch name specified in the relevant box in format XXXX/X (branch ID/value 'S' for start or 'E' for end, both in capital letter).
- Option 2, Multiple Branch Currents Output: will produce the output files for all branch names specified in ‘BranchList.txt’ file.

8.13 Supply point persistent currents

This function does not return meaningful output and is to be further investigated.

8.14 Output to data files

This function does not return meaningful output and is to be further investigated.

9 Customised Post-Processing - General

Vision-Oslo Extension

File Import OSOP Configuration Help

OSLO Post-Processing Option Selection - General

Instruction: User can go to info page entering processing requirements using execute buttons below

1. AC & DC: List OSLO Train Data	execute 1
2. AC & DC: Low Voltage Analysis Report	execute 2
3. AC & DC: Battery Train Assessment Support	execute 3
4. To be developed	execute 4

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On this page, users can extract simulation results for specific AC and DC analyses using various assessment options to assess the simulation results against relevant standards.

9.1 AC & DC: List OSLO Train Data

Page 1: List OSLO Train Data

This will produce a step output of all OSLO trains within the simulation. User could copy and paste the information to a Excel --> data convert to table using space as separator --> analysis and plot as required.

NOTE: OPTION 3 and 4 require a Branch List text file (User Defined Name Allowed)

☐ Option 1: List all trains step output from the simulation

☐ Option 2: List all trains step output From Start to End (Time information below required)

☐ Option 3: List all trains step output of selected branches for the whole simulation window

☐ Option 4: List all trains step output of selected branches From Start to End (Time information below required)

Option 2 and Option 3 requires Info Below

Extraction From (Format: DHHMMSS) Extraction To (Format: DHHMMSS)

Option 3 and Option 4 requires Info Below

Customised Branch File Name

Input file: ***.oof

Output file: ***.BranchName_timestart_timeend.csv

This function generates an excel based single csv file of detailed trains' step output during the selected time window and selected section. It calls list extraction first (see section 8.1 Option 1). Then it picks up all trains that located within the user defined branch list to be output to the csv file.

- Option 1: This will output all trains step output from the simulation.
- Option 2: [Read Time Info Input] This will output all trains step output within the selected time window from the simulation.
- Option 3: [Read Branch Name Input] This will output all trains step output within the selected branch list from the simulation.
- Option 4: [Read Time Info Input & Branch Name Input] This will output all trains step output within the selected time window and selected branch list from the simulation.

The output file will look like below:

VO_ID	T_STEP	TIME	V_Re	V_Im	V_T	I_Re	I_Im	I_T	P_Re	P_Im	P_T	BRANCH	DELTA	E_TE	PERC%	DIS_GONE	INS_SPD	AV_SPD	
1	25205	7.00.05	25012.3	-66.8	25012.39	5.6	0	5.6	140068.9	0	140068.9	007B	0.9753	0	0	0	0	0	
1	25210	7.00.10	25012.3	-66.8	25012.39	5.6	0	5.6	140068.9	0	140068.9	007B	0.9753	0	0	0	0	0	
1	25215	7.00.15	25012.3	-66.8	25012.39	5.6	0	5.6	140068.9	0	140068.9	007B	0.9753	0	0	0	0	0	
1	25220	7.00.20	25012.3	-66.8	25012.39	5.6	0	5.6	140068.9	0	140068.9	007B	0.9753	0	0	0	0	0	
1	25225	7.00.25	25012.3	-66.8	25012.39	5.6	0	5.6	140068.9	0	140068.9	007B	0.9753	0	0	0	0	0	
1	25230	7.00.30	25012.3	-66.8	25012.39	5.6	0	5.6	140068.9	0	140068.9	007B	0.9753	0	0	0	0	0	
1	25235	7.00.35	25012.3	-66.8	25012.39	5.6	0	5.6	140068.9	0	140068.9	007B	0.9753	0	0	0	0	0	

It contains from left to right: Train VISION ID, Train Time Step (compare to 00:00:00), Train Time, Pantograph Real Voltage, Pantograph Reactive Voltage, Pantograph Total Voltage, Pantograph Real Current, Pantograph Reactive Current, Pantograph Total Current, Pantograph Real Power, Pantograph Reactive Power, Pantograph Total Power, Train Located Branch, Train Located Branch Position (percentage relative to the branch start position), Train Tractive Effort in KN, Train Percentage Tractive Effort Applied, Train Distance Gone (relative to start station), Train Instant Speed, Train Average Speed.

Note that this function is useful when analysing a specific track section is required.

9.2 AC & DC: Low Voltage Summary Report

Input file: Train_list.csv within each simulation folder

Input & output file: *.xlsx

Before this function can be used, it is necessary to run 9.1 AC & DC: List OSLO Train Data to generate a full Train_list.csv in each simulation folder.

This section can combine the results from several scenarios to the summary results sheet for each assessment. Therefore, it is required to set the running path in the folder containing all the simulation folders. This could be achieved by placing the input excel next to the individual simulation folders and selecting the excel using the GUI.

Vision-Oslo Extension

File Import OSOP Version Database Help

Page 15: Low Voltage Summary

This will give the lowest panto voltage in each simulation for trains and OSLO branches with the option for filtering the results

NOTE: Excel spreadsheet in .xlsx format is required before click RUN

NOTE: Train_list.csv within each simulation folder is required.

NOTE: Import "Excel - For Low Voltage Summary" if needed

Excel Name:

There is only 1 option, and all settings are done through information stored in the settings excel file.

	A	B	C	D	E	F	G	H	I	J	K
1											
2	Project Name	XXXX		Guidance - How to Create Information Spreadsheet - Required for first time user							
3	Simulation Number:	XXXX		1. Refer to DC Database and use vlookup table to find the value.							
4	Feeding Arrangement:	XXXX		2. All values pasted in the spreadsheet with VALUE ONLY!.							
5	Modelled by:	XXXX									
6	Date:	30/01/2026		Note that no functions allowed for the information table below!							
7											
8											
9											
10	Limits			Filters			ATTENTION: Number 0 is reserved for N-0 scenario.				
11	Low Voltage Failure Limit - Red (V)	Low Voltage Warning Limit - Amber (V)	Low Voltage Time Limit (s)	Branches	Start Time (HH.MM.SS)	End Time (HH.MM.SS)	Outage List				
12	450	488	180				Outage Number	Simulation Sub-folder	Simulation Name (Information only)	Notes	
13							1	BL151 - Scer	BL151	SEF1	
14							2	BL152	BL152	SEF2	
15							3	BL153	BL153	SEF3	
16							4	BL154	BL154	SEF4	
17							5	BL155	BL155	SEF5	
18							6	BL156	BL156	SEF6	
19							7	BL157	BL157	SEF7	
20							8	BL158	BL158	SEF8	

Cells A12, B12 and C12 are mandatory.

A12 is the Low Voltage failure limit setting, any train which has any timestep with voltage under this limit will be highlighted as a red failure. Any branch which has any train under this limit will also be highlighted as a red failure.

B12 is the Low Voltage warning limit setting, any train which has any timestep with voltage under this limit will be highlighted as an amber warning. Any branch which has any train under this limit will also be highlighted as an amber warning.

C12 is the time limit for the train to be under the amber limit cumulatively (non-consecutive) before triggering a red failure. This only affect the train results and not the branch results.

Cells in column D, E12, F12 are non-mandatory filter. If no filtering of results is required, this could be left blank.

Column D is used for filtering results by branch name. Please enter the full OSLO branch name in the form of XXXX without the (/S or /E)

Cells E12 and F12 are used for filtering the time period to be included in the results. Any timesteps outside the time between E12 Start Time and F12 End Time will be discarded. Use the format of [HH:MM:SS] when entering the time.

Column H is the outage number, and it is for information only and to maintain same formatting as DC summary sheets. It is not a critical input for this function.

Column I is the simulation sub-folder name, these **must match** the folder names results of each simulation is placed in.

Column J is also for information only, this function reads the Train_list.csv so simulation name is not contained in the file name. These are the simulation names that will be copied to the result spreadsheet.

Column K is for placing notes for information only.

Low Voltage results will be copied to 4 new sheets in the input excel.

Branch Results (Highlighted), Train Results (Highlighted), Branch Results (All Lists), Train Results (All Lists)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1		BL151			BL152			BL153			BL154			BL155	
2	Branch	Minimum Voltage (V)	Train VO ID	At Time (hh:mm:ss)	Minimum Voltage (V)	Train VO ID	At Time (hh:mm:ss)	Minimum Voltage (V)	Train VO ID	At Time (hh:mm:ss)	Minimum Voltage (V)	Train VO ID	At Time (hh:mm:ss)	Minimum Voltage (V)	Train VO ID
3	902	570	165	16:44:15	581	164	16:27:15	574	3	06:15:15	569	165	16:44:15	569	165
4	908	412	295	17:12:15	637	79	09:40:15	525	8	07:40:15	621	79	09:40:15	621	58
5	913	655	222	18:23:20	653	213	16:07:15	657	222	18:23:20	654	212	15:52:10	658	222
6	914	663	171	18:38:05	656	171	18:38:05	660	11	08:39:20	662	171	18:38:05	389	302

Branch results will look like this, row 1 shows the simulation name. Any branches that have an amber or red failure will be included in the Highlighted sheet. For each simulation, the minimum voltage a train has experienced in that branch (within the set time limits) is included. Additionally, the train vision/oslo ID that experienced this lowest voltage and the time this has occurred is also included.

The 'All Lists' spreadsheet shows results for all branches in the simulation (or all branches in the filter list) in the same format.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1		BL151			BL152			BL153			BL154			BL155		
2	Train	Minimum Voltage (V)	At Time (hh:mm:ss)	Duration < 488.0V (S)	Minimum Voltage (V)	At Time (hh:mm:ss)	Duration < 488.0V (S)	Minimum Voltage (V)	At Time (hh:mm:ss)	Duration < 488.0V (S)	Minimum Voltage (V)	At Time (hh:mm:ss)	Duration < 488.0V (S)	Minimum Voltage (V)	At Time (hh:mm:ss)	Duration < 488.0V (S)
3	2	537	06:08:20	0	590	06:00:15	0	514	06:41:40	0	582	06:00:15	0	479	06:21:55	5
4	10	486	08:08:15	5	589	07:58:15	0	518	08:39:40	0	590	07:58:15	0	518	08:29:15	0
5	15	539	09:17:15	0	590	09:15:15	0	512	09:56:40	0	594	09:15:15	0	479	09:36:55	5
6	16	479	09:40:15	5	590	09:30:15	0	512	10:11:40	0	594	09:30:15	0	518	09:51:55	0
7	23	688	05:25:25	0	718	05:15:15	0	703	05:27:20	0	719	05:15:15	0	475	05:18:15	5
8	52	562	06:30:15	0	701	06:30:15	0	654	06:33:15	0	700	06:30:15	0	487	06:43:35	5
9	55	584	06:58:15	0	712	06:58:15	0	646	07:01:15	0	703	07:22:15	0	422	07:11:30	5
10	56	459	07:10:15	5	670	07:10:15	0	584	07:10:15	0	555	07:33:40	0	465	07:23:30	10
11	58	430	07:25:15	15	642	07:25:15	0	561	07:25:15	0	628	07:25:15	0	405	07:41:20	15
12	60	472	07:40:15	5	672	07:40:15	0	582	07:40:15	0	559	08:04:20	0	440	07:54:35	10
13	62	426	07:55:15	15	647	07:55:15	0	583	07:55:15	0	645	07:55:15	0	388	08:11:15	15
14	64	422	08:08:15	15	649	08:08:15	0	572	08:09:50	0	554	08:34:40	0	424	08:24:15	15
15	66	573	08:18:15	0	705	08:27:15	0	657	08:22:15	0	581	08:42:15	0	481	08:32:30	5
16	73	460	09:08:15	5	666	09:08:15	0	571	09:09:50	0	670	09:08:15	0	520	09:15:00	0
17	77	464	09:29:15	5	687	09:29:15	0	604	09:29:15	0	668	09:53:50	0	488	09:43:55	0
18	79	416	09:40:15	15	637	09:40:15	0	559	09:40:15	0	621	09:40:15	0	534	09:47:15	0
19	80	463	09:44:15	5	686	09:44:15	0	568	09:48:15	0	674	10:08:50	0	489	09:58:55	0
20	82	443	09:55:15	10	651	09:55:15	0	563	09:56:55	0	637	09:55:15	0	528	10:02:15	0
21	85	402	10:10:15	10	639	10:10:15	0	571	10:11:50	0	625	10:10:15	0	528	10:17:10	0
22	91	613	10:48:15	0	685	11:07:00	0	639	10:52:15	0	684	11:07:00	0	524	11:02:50	0
23	98	720	06:15:10	0	615	06:10:55	0	721	06:27:20	0	557	06:24:50	0	718	06:15:10	0
24	101	702	06:34:10	0	596	06:39:05	0	712	06:32:15	0	615	06:46:20	0	706	06:32:15	0
25	103	722	06:46:15	0	579	06:43:55	0	718	06:46:15	0	577	06:41:15	0	716	06:46:15	0
26	105	708	07:10:15	0	596	07:07:05	0	712	07:02:05	0	614	07:04:25	0	710	07:02:05	0
27	107	717	07:14:15	0	621	07:11:55	0	722	07:28:20	0	588	07:09:15	0	710	07:14:15	0
28	109	712	07:28:15	0	606	07:25:55	0	709	07:30:10	0	563	07:39:50	0	710	07:30:05	0
29	110	697	07:34:15	0	578	07:31:50	0	708	07:34:15	0	631	07:48:20	0	708	07:34:15	0
30	112	704	07:47:15	0	604	07:54:05	0	720	07:49:10	0	615	07:42:15	0	719	07:47:15	0
31	114	710	08:08:15	0	611	07:55:55	0	720	08:00:10	0	566	08:09:50	0	716	08:12:15	0

Train results will look like this. Column A shows the vision Oslo train ID of each train. In the Highlighted sheet, any train that have an amber or red failure will be included. The time which the lowest voltage occurred and the total duration of the train under the amber limit is also included. All voltages and duration shown are calculated after all filters are applied.

The 'All Lists' spreadsheet shows results for all trains in the simulation (after all filters applied) in the same format.

9.3 AC & DC: Low Voltage Analysis Report (TO BE RETIRED)

Page 2: Low Voltage Analysis

This will produce three tables (csv files). Table list will cover all trains step output where the voltage is below the threshold. Summary table 1 will provide summary report group by trains. Summary table 2 will provide summary report group by branches.

NOTE: OPTION 3 and 4 require a Branch List text file (User Defined Name Allowed)

☐ Option 1: Processing whole simulation
☐ Option 2: Processing customised time window (Time information below required)
☐ Option 3: Processing customised branches (Branch info below required)
☐ Option 4: Processing customised branches during customised time window (2&3)

VOLTAGE THRESHOLD IS REQUIRED FOR ALL OPTIONS

Low Voltage Threshold (max 5 digit): Range [0 - 30000], Unit (V)
 Output From (Format: DHHMMSS) Output To (Format: DHHMMSS)
 Customised Branch File Name

Input file: *.oof

Required input: Simulation Name, Voltage threshold with maximum 5 digit between 0 to 30000. For option 2 & 4: Time Information. For Option 3 & 4: Branch_List_file.txt

Output files:

- SimName_Trains_below_xxxxx (selected voltage).csv
- SimName_T_list_below_xxxxx (selected voltage).csv
- SimName_branches_below_xxxxx (selected voltage).csv
- Option 2: time_filter will be added to the file names
- Option 3: branch_filter will be added to the file names
- Option 4: time_and_branch_filter will be added to the file names

The function will call list extraction first (see section 8.1 Option 1). Then it performs some analysis based on the *.osop.lst file.

- Option 1: This will process the whole simulation without filtering. Outputs the list of train voltage events below the selected voltage.
- Option 2: [Read Time Info Input] This will output all trains steps results within the selected time window from the simulation.
- Option 3: [Read Branch Name Input] This will output all trains steps results within the selected branch list from the simulation.
- Option 4: [Read Time Info Input & Branch Name Input] This will output all trains steps results within the selected time window and selected branch list from the simulation.

Option 2, 3 and 4 enables filtering of the results. When these options are selected train step results are filtered before finding for low voltage events. All 3 csv outputs will be filtered based on the selected filtering criteria.

This function generates three csv files:

- *****_train_list_below_VOLTAGE.csv:** This file contains the detailed train's step output of all time steps when the train's pantograph absolute voltage is below the voltage threshold. The step output format will following the same convention as mentioned before in section 9.1.

VO_ID	T_STEP	TIME	V_Re	V_Im	V_T	I_Re	I_Im	I_T	P_Re	P_Im	P_T	BRANCH	DELTA	E_TE	PERC%	DIS_GONE	INS_SPD	AV_SPD
1	25265	7.01.05	24707.6	-1166.4	24735.12	105.6	-4.6	105.7001	2609123	5365.44	2609128	007B	0.974	132187.7	1	11	15.27	7.59
1	25270	7.01.10	24285.7	-2284.8	24392.94	209.5	-18.8	210.3418	5087854	42954.24	5088035	007B	0.9701	119456.4	0.9037	47	29.16	22.67
1	25430	7.03.50	24081.6	-2729.9	24235.84	254.1	-28.1	255.649	6119135	76710.19	6119615	007B	0.8092	98973.6	1	1479	41.62	36.06
1	25435	7.03.55	24119.7	-2596	24259	242	-27.4	243.5462	5836967	71130.4	5837401	007B	0.8013	76373.1	1	1548	50.24	45.96
1	25440	7.04.00	24157.8	-2533.6	24290.29	236.1	-25.4	237.4624	5703657	64353.44	5704020	007B	0.7921	64619.7	1	1630	57.44	53.86

- *****_train_sum_below_VOLTAGE.csv:** This file summarizes the total time number of steps that each individual train experience of when the pantograph absolute voltage is below the set threshold. It will output the detailed information of when the minimum voltage happened for each train. It contains two additional information, number of time steps the train voltage is below the threshold and the minimum voltage for each train.

Train No	No. of inst Branch min	VO_ID	T_STEP	TIME	V_Re	V_Im	V_T	I_Re	I_Im	I_T	P_Re	P_Im	P_T	BRANCH	DELTA	E_TE	PERC%	DIS_GONE	INS_SPD	AV_SPD
1	150	24235.84	1	25430 7.03.50	24081.6	-2729.9	24235.84	254.1	-28.1	255.649	6119135	76710.19	6119615	007B	0.8092	98973.6	1	1479	41.62	36.06
2	140	23819.92	2	25430 7.03.50	23547.7	-3590.9	23819.92	258.1	-38.3	260.9262	6077661	137531.5	6079217	004B	0.6535	99938.5	1	1478	41.22	35.79
3	66	24235.84	3	26030 7.13.50	24081.6	-2729.9	24235.84	254.1	-28.1	255.649	6119135	76710.19	6119615	007B	0.8092	98973.6	1	1479	41.62	36.06
4	102	23783.76	4	25875 7.11.15	23468.5	-3859.6	23783.76	257.5	-42.3	260.9512	6043139	163261.1	6045344	002B	0.8231	98217.8	1	102	41.78	36.25
5	60	24010.25	5	26630 7.23.50	23760.4	-3454.8	24010.25	255.8	-36.4	258.3769	6077910	125754.7	6079211	007B	0.8092	98973.6	1	1479	41.62	36.06
6	87	24034.51	6	27230 7.33.50	23752.4	-3671.7	24034.51	9.7	-1.5	9.815294	230398.3	5507.55	230464.1	008B	0.8879	1864.6	0.0149	29583	29.16	29.16

- *****_branch_list_below_VOLTAGE.csv:** This file summarizes the total time steps recorded at each individual branch when a train's pantograph absolute voltage located within that branch is below a threshold. It will output the information when the minimum train's pantograph voltage detected within that branch. It contains additional two information, number of time steps when the train voltage is below the threshold within that branch and the minimum voltage within that branch.

BRANCH	No. of inst Branch min	VO_ID	T_STEP	TIME	V_Re	V_Im	V_T	I_Re	I_Im	I_T	P_Re	P_Im	P_T	BRANCH	DELTA	E_TE	PERC%	DIS_GONE	INS_SPD	AV_SPD
007B	284	23534.7	13	28870 8.01.10	23116	-4419.6	23534.7	214.4	-40.3	218.1546	4956070	178109.9	4959270	007B	0.9701	119456.2	0.9037	47	29.16	22.66
001B	123	24393.88	1	26475 7.21.15	24266	-2494.5	24393.88	43	-4.4	43.22453	1043438	10975.8	1043496	001B	0.9925	5245.3	0.1739	44492	110.27	110.27
003B	24	24413.04	1	26490 7.21.30	24267.7	-2659.9	24413.04	42.9	-4.7	43.15669	1041084	12501.53	1041159	003B	0.0646	5245.3	0.1739	44997	110.27	110.27
004B	18	23819.92	2	25430 7.03.50	23547.7	-3590.9	23819.92	258.1	-38.3	260.9262	6077661	137531.5	6079217	004B	0.6535	99938.5	1	1478	41.22	35.79
002B	164	23783.76	4	25875 7.11.15	23468.5	-3859.6	23783.76	257.5	-42.3	260.9512	6043139	163261.1	6045344	002B	0.8231	98217.8	1	102	41.78	36.25
008B	277	23537.71	14	28870 8.01.10	23120.7	-4411	23537.71	208.2	-39.1	211.8397	4813730	172470.1	4816818	008B	0.8952	114322	0.8654	47	29.16	23.02

9.4 Battery EMU Assessment Support

Page 13: Battery EMU Assessment

This function requires the excel spreadsheet with proper pre-defined information.
See manual for detailed requirements

NOTE: Excel spreadsheet in .xlsx format is required before click RUN

NOTE: Option 1 & 2 require "Import "Excel - For Quick BEMU Assessment" if needed

NOTE: Option 3 & 4 require "Import "Excel - For BEMU Assessment (<RN29)" if needed

NOTE: Option 5 require "Import "Excel - For BEMU Assessment (>RN29)" if needed

- ☐ Option 1: Preliminary Assessment (Import Excel - For Quick BEMU Assessment). (Only require .oof file)
- ☐ Option 2: Update spreadsheet only (Import Excel - For Quick BEMU Assessment). (Require all .d4 files)
- ☐ Option 3: Detailed Modelling Auto Assessment (Import Excel - For BEMU Assessment(<RN29)). (Only require .oof file)
- ☐ Option 4: Update spreadsheet only (Import Excel - For BEMU Assessment(<RN29)). (Require all .ds1 files)
- ☐ Option 5: New BEMU Assessment (Import Excel - For BEMU Assessment(>RN29)).(Require .battery.txt file)

Excel Name:

Select

Below required for Option 1 and Option 3

Extraction From (Format: DHHMMSS)

Extraction To (Format: DHHMMSS)

RUN!

Back to Home

Back to Processing

In this section, four options are available as follows. Option 1 and Option 2 use the same excel file, while Option 3 and Option 4 uses a different one. The latest results will be automatically updated in the Excel file. This will be further explained below.

The desired time period must be allocated for Option 1 and 3 in format DHHMMSS.

9.4.1 Option 1 & 2

Input & output file: *.xlsx

Option 1 and Option 2 are to support the supply point's capacity to support the BEMU operation. It utilise the feeder station raw data from VISION OSLO output and calculate the maximum number of BEMU that can be support within a feeder area. For further details please refer to document [5].

To utilize this option, user needs an Excel file containing necessary pre-defined information. The template for this Excel file can be generated using the 'Excel – For Quick BEMU Assessment' option found in the 'Import' menu. The template, named BEMU_support_capacity.xlsx' (which can be renamed as desired), follows the format shown below. After allocating the necessary information in the file, user must save and close it. Then, the file name (without suffix) should be entered into the relevant box or selected from the 'select' button.

NOTE: This spreadsheet is only valid for 5 seconds time-increment.

Supply Point Name	OSLO ID	Source Resistance (Ω)	Source Reactance (Ω)	OLE Paralleled Section	Fault Level (MVA)	Incoming Feeder Overcurrent (A)	MISL (MVA)	Instant Charging Limit (A)	Charging Limit (MW)	Expected Site Usage (%)	OLE Continuous Rating (A)
Essendine Feeder 1	BOF1	0.2251	4.79	8	1000	2100	40	80	2	80%	300
Wellwyn Feeder 1	SUF1	0.2251	4.79	8	1000	2100	40	80	2	80%	300

The necessary information is as follow:

- Supply Point Name: This is the user defined name of a supply point / feeder station.
- OSLO ID: This is corresponding OSLO ID.
- Source Resistance: This is the source resistance from extra.oslo (including grid transformer).
- Source Reactance: This is the source reactance from extra.oslo (including grid transformer).
- OLE Paralleled Section: This is the all paralleled path that the current could flow. This figure was used to estimate the current split between various conductors.
- Fault Level: at the moment, this value is not used for assessment.
- Incoming Feeder Overcurrent: This is the IF O/C protection setting. Instant current threshold.
- MISL: Minimum Infrastructure Site Limit.
- Instant Charging Limit: This is the maximum instant charging limit of a single battery EMU.
- Charing Limit: This is the continuous maximum charging power of a single battery EMU. This is usually referred as the charging rating.
- Expected Site Usage: This is the value that will be used to calculate the headroom of a site. This is the percentage value that a supply point will NOT exceed.
- OLE continuous rating: this is the OLE rating that user do not want to exceed.

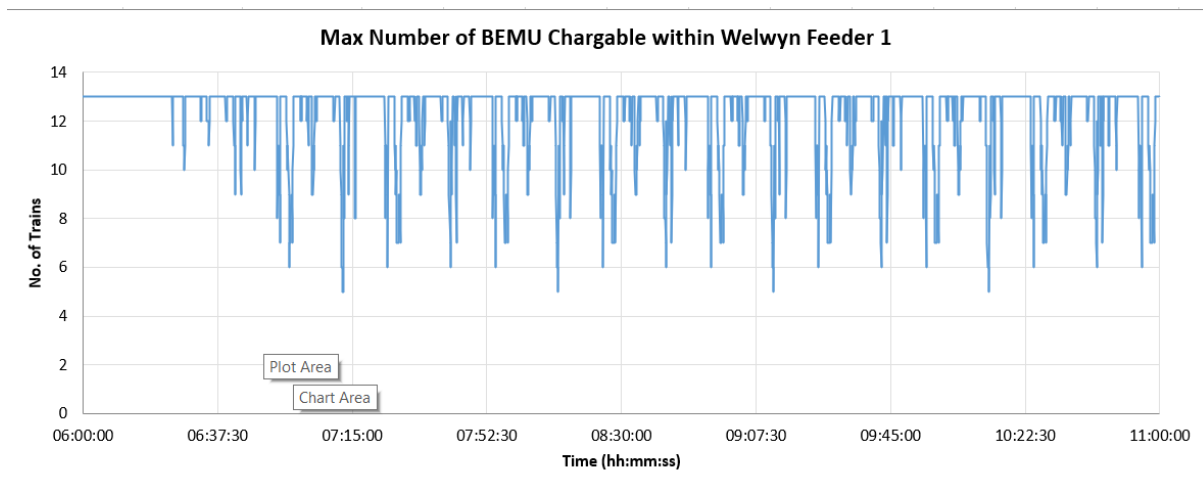
Due to the high simplification of this assessment procedure. All these setting will be available to adjust after the processing as the result was written in a way using excel formula.

The output data will be the assessment calculation for each supply point / feeder station.

Each sheet will follow the following format:

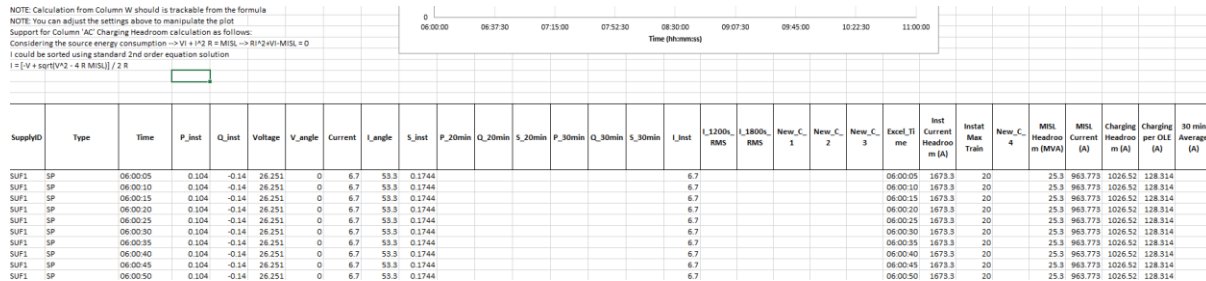
Source Impedance	4.795286228	0.2251	4.79
Expected Usage	80.0%		
MISL (MVA)	40		
MISL Limit (MVA)	32		
IF O/C (A)	2100		
IF O/C Limit(A)	1680		
OLE Section	8		
BEMU Limit (A)	80		
BEMU Limit (MW)	2		
OLE Rating (A)	300		

There will be setting configuration summary on the top left corner. User could change the values here to dynamic adjust the final result if needed.





A plot of maximum number of BEMU can be charged within a feeder area will be shown. The setting change will adjust this plot dynamically. It should be noted that there is no sensible check of this result as users are expected to do the design check, i.e., the maximum number could be negative if the supply point has little capacity to support any operation.



Train step output raw data will be available below. The default modelling calculate is not changeable as it should come from simulation output directly. However, all assessment related calculation (i.e., from Column W to right) is calculated using the excel formula. User could do their own sensible check and adjust the calculation to support specific needs if needed.

The calculation will not be shown here but the meaning of headings is further explained.

- Instant Current Headroom: this is the total current headroom available based on existing substation usage.
- Instant Max Train: this is the maximum number of train that can be run without breaking the instant protection setting.
- MISL Headroom: this is the total power headroom available based on existing site usage.
- MISL Current: this is the equivalent current under MISL headroom at that time sample.
- Charging Headroom: this is the maximum total charging current considering the energy consumption on the source due to the constant charging current.
- Charging per OLE: this is the equivalent maximum charging headroom for each OLE section.
- 30 min Average: This is the 30 min average value of maximum charging per OLE.
- 30 min Current Headroom for Charging: this is the charging limit considering both OLE rating and MISL.
- 30 min Equivalent Power: This is the equivalent power.
- 30 min Max Train: this is the maximum number of train that can be run without exceeding MISL and OLE limit.
- Max train: this is the minimum value between Instant Max Train and 30 min Max Train.

9.4.2 Option 3 & 4 Detailed Assessment Spreadsheet

Input & output file: *.xlsx

Option 3 and Option 4 are to support battery EMU modelling methodology adopted at the time of writing. User needs to have a working BEMU modelling successfully finished and the model needs to be set up as required in the existing battery EMU modelling procedures. For further detail please refer to document [5].

To utilize this option, user needs an Excel file containing necessary pre-defined information. The template for this Excel file can be generated using the 'Excel – For Detail BEMU Assessment' option found in the 'Import' menu. The template, named 'battery_train_template.xlsx' (which can be

renamed as desired), follows the format shown below. After allocating the necessary information in the file, user must save and close it. Then, the file name (without suffix) should be entered into the relevant box or selected from the 'select' button.

NOTE: This spreadsheet is only valid for 5 seconds time-increment.

Train Journey	Train ID in Section	Section	On/Off Wire	Base Traction Profile	Link Previous (NA or Train ID)	Journey Start Battery Level (%)	Auxiliary Power (kW)	Charging Efficiency (%)	Discharging Efficiency (%)	Battery Size (kWh)
Borders Railway BEMU	1027	Edinburgh to Newcraighall	On	BEMU4C00	NA	50%	203	80%	80%	1050
Borders Railway BEMU	1028	Newcraighall to Galashiels	Off	BEMU4C02	1027	-	203	80%	80%	1050
Borders Railway BEMU	1029	Galashiels to Tweedbank	On	BEMU4C00	1028	-	203	80%	80%	1050
Borders Railway BEMU	1030	Tweedbank Station - Charging	On	BEMU4C03	1029	-	203	80%	80%	1050
Borders Railway BEMU	1031	Tweedbank to Galashiels	On	BEMU4C00	1030	-	203	80%	80%	1050
Borders Railway BEMU	1032	Galashiels to Newcraighall	Off	BEMU4C02	1031	-	203	80%	80%	1050
Borders Railway BEMU	1033	Newcraighall to Edinburgh	On	BEMU4C00	1032	-	203	80%	80%	1050

NOTE: This is BHTPBANK withOUT battery charging performance.

The necessary information is as follow:

- **Train Journey:** This is the user defined name of a train route containing different sections. It should be noted that a unique route name is required for each different route.
- **Train ID in Section:** Train VISION ID that is used to represent the section.
- **Section:** The section name. Note that this will be used in plot analysis.
- **On/Off Wire:** User can ONLY enter 'On' representing the train will be charged on wire. Or 'Off' representing the train will NOT be charged on wire, running in battery mode only.
- **Base Traction Profile:** This is the BHTPBANK file that does NOT consider battery charging performance under opportunity charging. Note that this is NOT the BHTPBANK that the train actually use. But for stationary charging or battery mode, it is the BHTPBANK that the train actually use.
- **Link Previous (NA or Train ID):** User can only enter 'NA' or a train VISION ID that the services linked from. This link flow will be analysed.
- **Journey Start Battery Level (%):** User must enter a value if this is the first section (i.e., Link Previous is NA. Other train sections do not require a battery level.
- **Auxiliary Power (kW):** Adding information required.
- **Charging Efficiency:** This is the efficiency between the energy to the battery cell and the energy actually charged to the battery.
- **Discharging efficiency:** This is the efficiency between the energy discharged from the battery and the energy before distributing to auxiliary and traction.
- **Battery Size:** This should be the maximum battery size including contingency part.

In the control panel,

- **Option 2: Full Auto Process.** This option will only required .oof file. It will extraction train step output using the train list provided in the excel. And then do the battery analysis as Option 3 will do.
- **Option 3: Update spreadsheet only.** This option will update the spreadsheet based upon the existing ds1 file located within the working folder. It will do comprehensive battery analysis by manipulating excel file only.

The output data for each sheet is described below.

Result: the results in this sheet are as follow:

Simulation Results					
Battery Charged in Section (kWh)	Start Battery Level (kWh)	End Battery Level (kWh)	Battery Charged in Section (%)	Start SoC (%)	End SoC (%)
166.80	500.00	666.80	16.68%	50.00%	66.68%
-543.05	666.80	123.74	-54.31%	66.68%	12.37%
64.82	123.74	188.56	6.48%	12.37%	18.86%
449.34	188.56	637.90	44.93%	18.86%	63.79%
78.64	637.90	716.55	7.86%	63.79%	71.65%
-447.26	716.55	269.29	-44.73%	71.65%	26.93%
170.64	269.29	439.93	17.06%	26.93%	43.99%

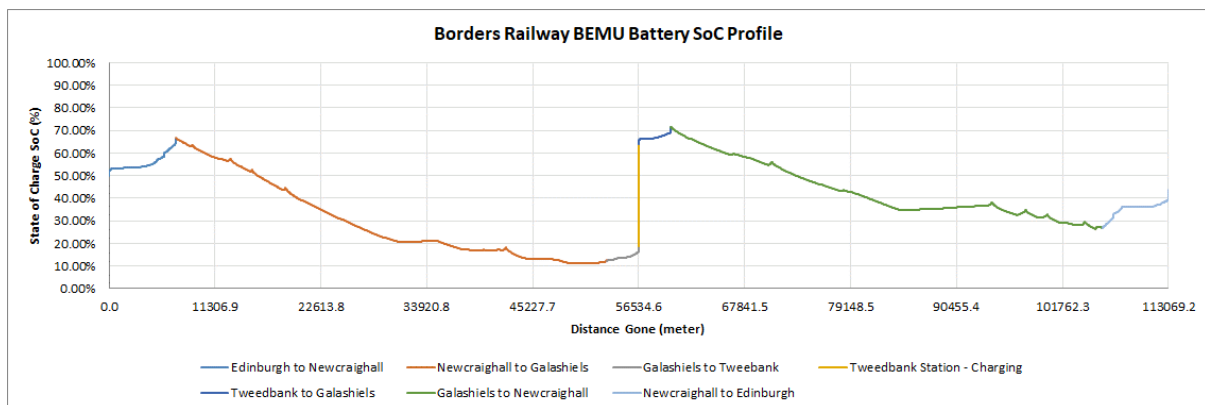
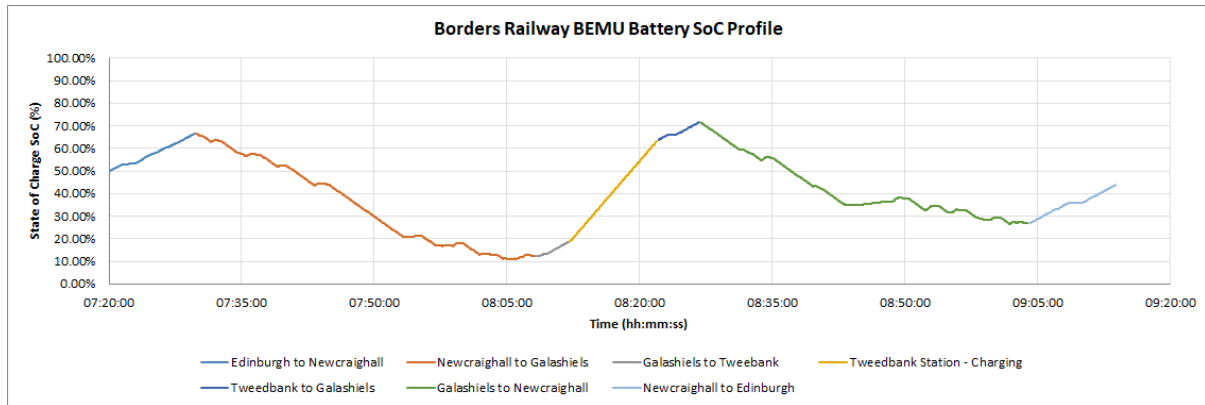
The information provided contains the battery level at the start and the end of each train section in both absolute value (kWh) and percentage value (%). At the moment, no conditional formatting is applied due to the assessment criteria is not clear.

Train ID: will generate the OSLO single train step output results between column “Train ID” and “REF2”. The following column are calculated using the formula below:

- Inst Speed (km/h): convert from column “Instant Speed” in mph. (mph – kmh)
- Average Speed (m/s): convert from column “Average Speed” in mph. (mph – m/s)
- Effort for Traction (kN): If the braking effort < 0 and braking used = 100%, then this is calculated using the instant speed and pantograph voltage. It finds out the linear interpolation of the tractive effort under that speed and voltage. Otherwise, it convert from column “TE/BE used” in lbf. (lbf – kN)
- Mechanical Egy Used (kWh): This is calculated using the Effort for Traction (kN) * Average Speed (m/s) * 5 / 3600
- Electrical Egy Used (kWh): This is calculated using the column ‘Active Power (kW)’ and times 5 and then divide 3600.
- Traction Egy Used (kWh): This is calculated using the mechanical energy and linear interpolation of the traction efficiency by mechanical energy / efficiency for traction, mechanical energy * efficiency for regenerative braking.
- Auxiliary Egy Used (kWh): This is using the user defined auxiliary load * 5 / 3600.
- Battery Egy Used (kWh): This is calculated as (electrical energy – traction energy – auxiliary energy) under ‘On’ wire charging, calculated as (– electrical energy) under “Off” wire running.
- Battery Egy (dis)charging (kWh): This is calculated as (battery energy * charging efficiency) under ‘On’ wire charging, calculated as (battery energy / discharging efficiency) under ‘Off’ wire braking.
- Excel_Time: Time in excel format.
- Excel_Position: This is the absolute distance gone from the start of the “route” (i.e., first train section starts). And covert from yards to meter. (yard - meter)
- Excel_Battery: This is the absolute battery level in (kWh) from the start of the “route” (i.e., first train section starts).
- Excel_SoC: This is the percentage battery level in (SoC %) from the start of the “route” (i.e., first train section starts).



Route: Each route will have a new tab for its route journey energy level plotting.



This sheet gives two plotting. Battery EMU's battery level / SoC (%) against time. And the battery EMU's battery level / SoC (%) against the distance gone.

9.4.3 Option 5: New battery train assessment procedure

Please refer to the document [7] for details.

10 Customised Post-Processing – Mainly for AC

Vision-Oslo Extension

File Import OSOP Configuration Help

OSLO Post-Processing Option Selection - Mainly AC

Instruction: User can go to info page entering processing requirements using execute buttons below

1: AC: Average Power & Voltage Assessment (Minimum Requirement)	execute 1
2: AC: Meanuseful Processing (BSEN 50388:2022 Annex B)	execute 2
3: AC: Incoming Feeder Protection (Suggest use for IDMT Protection)	execute 3
4: AC: New Supply Point Connection Assessment (Grid Code Compliance)	execute 4
5: AC: OLE Current Rating Assessment	execute 5
6: AC: Static Frequency Converter SFC Assessment	execute 6
7: To be developed	execute 7
8: To be developed	execute 8

Back to Home

This option provides post processing analysis mainly used for AC network analysis.

10.1 AC: Average Power & Voltage Assessment (Minimum Requirement)

Page 3: AC - Supply Points Load Analysis - Average Power

This function requires the excel spreadsheet with proper pre-defined information.
See manual for detailed requirements

NOTE: Excel spreadsheet in .xlsx format is required before click RUN
NOTE: Import "Excel - For Average Power" if needed

☐ Option 1: Full Auto Process. (Require .oof + .lst.txt files.)

☐ Option 2: Auto process with user defined node configuration. (Only require .oof file)

☐ Option 3: Update spreadsheet only. (Require all .d4 files and .mxn files)

☐ Option 4: Extract d4 files and mxn file only. (Only require .oof file)

Excel Name:

Below required for Option 1,2,4

Extraction From (Format: DHHMMSS) Extraction To (Format: DHHMMSS)

Input & output file: *.xlsx

This section enables supply point load analysis. To utilize this section, user needs an Excel file containing necessary pre-defined information. The template for this Excel file can be generated using

the 'Excel – For Average Power' option found in the 'Import' menu. The template, named 'power_template.xlsx' (which can be renamed as desired), follows the format shown below. After allocating the necessary information in the file, user must save and close it. Then, the file name (without suffix) should be entered into the relevant box or selected from the 'select' button.

Supply Points	OSLO feeder name	Incoming Voltage (kV)	Incoming Feeders	Capacity (MVA)	Fault Level (MVA)	Feeder Station name	Cable Rating	FSC (MVA)	Supply Type	Supply Voltage (kV)
Gowkthrapple F4	GOW1	132	1	26	9722	Gowkthrapple FS		26	Classic	25
Gowkthrapple F5	GOW2	132	1	26	9722	Gowkthrapple FS		26	Classic	25

Individual Feeding Sections			
Supply Point	Site name	Node ID	Min Voltage
Gowkthrapple F4	Gowkthrapple FS	GT1	
	Carstairs MPTSC	CA2	
Gowkthrapple F5	Gowkthrapple FS	GT2	
	Midcalder TSC	MR2	
	Addiewell TSC	AD1	
	Shotts MPTSC	SH1	
	Holytown TSC	HO1	
	Motherwell	MW1	
	Newton	NT2	

The necessary information is as follow:

- Supply Point: the desired name of the supply point.
- OSLO feeder name: identity of the node to which supply point is connected which must be identical to supply point node name in extra.oslo file.
- Fault level
- Feeder Station name: the name must be identical to supply point name when feeder station wise assessments such as NPS or MVA of the feeder station are required. When the feeder station name is identical for 2 or more feeders the software will aggregate the results to calculate Peak NPS (%) and Maximum Average Apparent Power (MVA) of the feeder station.
- FSC (MVA)
- Supply voltage: must be identical to supply point voltage specified in extra.oslo file.
- Site name: this part is optional, but it is worth mentioning that there must be a blank row between two supply points data in Individual Feeding Section.
- Node ID: must be identical to Node ID specified in V/O simulation. This item will be used as an input data for Option 2.
- Other fields are only for information.

In this section, four options are available as follows. One single Excel file can be used for all four options and the latest results will be automatically updated in the Excel file. The desired time period must be allocated for Option 1, 2 and 4 in format DHHMMSS.

Important note: All the results such as MVA, NPS and supply point data will be extracted across the specified time window, except for minimum and maximum voltages. The minimum and maximum voltages will be extracted over the simulation time as mentioned in Section 5.4 (Maximum currents and minimum and maximum voltages).

- Option 1: Full Auto Process. This option will generate the results for the entire feeding section of a supply point in the simulation, no matter if all the nodes linked to the supply point node in the simulation are in the Individual Feeding Sections or not. '*.lst.txt' and '*.oof' files are required for this option. The tool will perform connectivity checking (see section 7.2),

extraction feeder step output (see section 8.8) and extract mxn output (see section 8.4). Should the results for user defined nodes are required Option 2 can be used.

- Option 2: Auto process with user defined node configuration. This option will generate the results for specified node in Individual Feeding Sections. In this option the minimum and maximum voltages (kV) of the feeding section of a supply point will be extracted only for linked nodes specified in Individual Feeding Sections. The linked nodes to the supply point node can be found in Data sheet. If specified nodes are identical to the nodes linked to the supply point node in the simulation the minimum and maximum voltages will be the identical to Option 1. Other results are identical to Option 1 in this option. Only '*.oof' file is required for this option.
- Option 3: Update spreadsheet only. This option will update the spreadsheet based upon the latest results for the supply points. All '*.d4' files for the supply points specified in the spreadsheet together with '*.mxn' file are required for this option. '*.oof' file is not required for this option. Similar to Option 2 the minimum and maximum voltages (kV) of the feeding section of a supply point will be extracted only for linked nodes specified in Individual Feeding Sections. The linked nodes can be found in Data sheet.
- Option 4: Extract d4 files and mxn file only. This option will generate d4 files (see section 8.8) related to the supply points specified in the spreadsheet together with mxn file (see section 8.4). '*.oof' file is not required for this option.

The output data for each sheet is described below.

Result: the results in this sheet are as follow:

Maximum Average Apparent Power (MVA)						Peak NPS (%)			Voltage (kV)	
Instantaneous	01 Minute	02 Minutes	10 Minutes	20 Minutes	30 Minutes	01 Minute	10 Minutes	30 Minutes	Minimum	Maximum
20.92	18.33	17.91	15.58	11.95	8.93	0.19%	0.16%	0.09%	19.90	25.57
28.87	24.02	21.96	13.95	10.84	9.29	0.25%	0.14%	0.10%	19.10	25.34

- Maximum MVA for each feeder for instantaneous, 01-min., 02-min., 10-min., 20-min., and 30-min. time windows. For 30-min. time window the results are highlighted in green if they are below 80% of FSC limit, yellow if they are within 20% of FSC limit, orange if they are within 10% of FSC limit and red if they exceed the limit.
- Peak NPS% for 01-min., 10-min., and 30-min. time window. The NPS% is derived from the simple formula below and the results are highlighted in different colours when they are assessed against the FSC limit. The NPS limit and the colour codes depend upon the voltage level and the region in which the study is carried out. For more information refer to Engineering Recommendation P24 and the Grid Code.

$$V_{NPS}\% = \frac{\text{line - line load MVA}}{\text{fault level MVA at supply busbar}} \times 100$$

- Minimum and maximum voltages (kV) of the entire feeding section of a supply point in the simulation will be shown here.

Maximum Incoming Feeder RMS Current (A)													
Instantan ous	05 seconds	10 seconds	15 seconds	20 seconds	25 seconds	30 seconds	35 seconds	40 seconds	60 seconds	120 seconds	10 min	20 min	30 min
928.30	928.30	925.80	923.67	921.91	920.27	893.37	868.49	849.24	804.78	779.92	671.04	558.35	466.54
1266.20	1266.20	1252.87	1239.59	1216.75	1170.21	1131.52	1108.48	1085.54	1032.56	938.48	670.21	553.92	482.52

- Maximum Incoming Feeder RMS Current (A). The table above is only for information in this section. To assess feeder station maximum current against protection settings, refer to section 10.3 (Incoming Feeder Protection).

Maximum Average Apparent Power (MVA)						Peak NPS (%)		
Instantaneous	01 Minute	02 Minutes	10 Minutes	20 Minutes	30 Minutes	01 Minute	10 Minutes	30 Minutes
38.51	32.22	31.16	22.27	19.37	16.23	0.33%	0.23%	0.17%

- If the feeder station name is identical for 2 or more feeders the software will aggregate the results to calculate Peak NPS (%) and Maximum Average Apparent Power (MVA) of the feeder station as shown in the table above.

Data: the minimum and maximum voltages of each node in the simulation together with the time they occur are shown in this sheet (see section 8.4). This sheet also provides with all the nodes linked to each supply point.

Oslo feeder name: will generate the Oslo output results such as active power (MW), reactive power (MVAR), voltage (kV) and current (A) at each time increment, average active and reactive powers together with maximum and minimum values within various time windows and average RMS current (A) together with maximum and minimum values within various time windows for each supply node. The power factor at each time increment and within various time windows is also calculated in this sheet.

Supply point: if there are two or more feeders with identical feeder station name the results for the feeder station will be aggregated and represented in this sheet.

10.2 AC: Umean useful

Page 4: Umeanuseful

This will produce a Excel dashboard stating the Umean useful (ZONE) and (TRAIN) as per BS EN 50388. User needs to make sensible choice of Trains for the assessment.

NOTE: Import UmeanSettingTemplate.csv to configure for Option 2.

NOTE: Require *.lst.txt file within the current folder.

☐ Option 1: Auto Configuration (Hourly Window + Supply Point Zone)

☐ Option 2: Auto + Customised Settings (Require Settings + Time Windows Below)

NOTE: Only required for Option 2

Umeanuseful Settings (in .csv format):

Peak time From (Format: DHHMMSS) Peak time To (Format: DHHMMSS)

Output file: SIMNAME_umean_useful_result.xlsx

The definition, calculation and use of mean useful voltage can be found in Annex B of BS EN 50388-1. This section will generate an Excel dashboard file containing Umeanuseful calculation results.

It should be noted that calculation does NOT consider trains that present in a geographical zone less than 1 minute.

A csv setting file is required for Option 2. The template could be imported from the 'Import – UmeanSettingTemplate.csv'. The configuration is straightforward as per title instructions.

The text file name must be then allocated without suffix in the relevant box or select from the 'select' button.

In this section, two options are available.

- Option 1: Fully auto process. This will automatically calculate all supply point feeding zones and period hourly time windows results into the excel dashboard.
- Option 2: Option1 and additional customised geographical zone and time window. The time window can be limited in this option using relevant time boxes in format DHHMMSS. It is important to note that any invalid data input will make the calculation fall back to default option1.

Output file:

This output file contains a summary page for Umeanuseful (Zone) and Umeanuseful (Train). The dashboard also contains detailed Umeanuseful (Train) for each geographical zone.

Users need to select appropriate section for assessment and decision making.

Zone Name	Hourly auto: 07:00-08:00				full sim time: 07:00-08:38				customised: 07:00-08:00			
	UmeanZone (V)	Dim_TrainID	UmeanTrain (V)	Present(S)	UmeanZone (V)	Dim_TrainID	UmeanTrain (V)	Present(S)	UmeanZone (V)	Dim_TrainID	UmeanTrain (V)	Present(S)
FSF1	24917	6	22535	1070	25115	6	23854	1770	24917	6	22535	1070
A to B	23328	6	21030	235	23999	6	21030	235	23328	6	21030	235
Sample Section	23385	6	21076	725	24352	6	21076	725	23385	6	21076	725
Sample Feeder	23976	6	21030	235	24840	6	21030	235	23976	6	21030	235

NOTE:

1 - Umeanuseful is calculated based on BSEN 50388:2022 Annex B

2 - Hourly auto window + total simulation time window + customised time window (if applicable) are applied.

3 - Auto supply point feeding section + customised section (if applicable) are applied.

4 - Trains present less than 1 minute are filtered out as dimensional train. See each zone tab for detail.

Train ID	0-08:00 Ume	0-08:00 Dura	0-08:38 Ume	0-08:38 Dura	0-08:00 Ume	0-08:00 Duration
1	25405	1695	25405	1695	25405	1695
2	25396	1705	25182	1825	25396	1705
3	24489	1660	24515	1705	24489	1660
4	25635	1500	25615	3465	25635	1500
5	24739	1730	24739	1730	24739	1730
6	22535	1070	23854	1770	22535	1070

10.3 AC: Incoming Feeder Protection

Page 5: AC - Incoming Feeder Protection

This function is used to carry out preliminary assessment on incoming feeder protection based on relay type (DT or IDMT). This function requires the excel spreadsheet with proper pre-defined information. See manual for detailed requirements

NOTE: Excel spreadsheet in .xlsx format is required before click RUN
NOTE: Import "Excel - For IF Protection" if needed

☐ Option 1: Full Auto Process. (Require .oof files)

☐ Option 2: Update Spreadsheet only. (Require all .d4 files)

Excel Name:

Below required for Option 1

Extraction From (Format: DHHMMSS) Extraction To (Format: DHHMMSS)

Input & output file: *.xlsx

This section facilitates the analysis of supply point current protection. To utilize this section, user needs an Excel file containing necessary pre-defined information. The template for this Excel file can be generated using the 'Excel – For IF Protection' option found in the 'Import' menu. The template, named 'protection_template.xlsx' (which can be renamed as desired), follows the format shown below. After allocating the necessary information in the file, user must save and close it. Then, the file name (without suffix) should be entered into the relevant box or selected using the 'select' button.

Incoming Feeder	OSLO ID	Type (TR/SP)	Protection Type (DT/IDMT)	Pickup Current (A)	Time Multiplier (s)
Gowkthrapple F4	GOW1	SP	DT	1200	0.2
Gowkthrapple F5	GOW2	SP	IDMT	1200	0.2

The necessary information is as follow:

- OSLO ID: identity of the node to which supply point is connected which must be identical to supply point node name in extra.oslo file.
- Type (TR/SP): represents the type of the node (transformer or supply point) for which the current is calculated.
- Protection Type (DT/IDMT): If IDMT is selected the trip current threshold for each time window will be calculated with the following formula. For DT type the trip current threshold will be identical to the pickup current.

$$\text{Trip Current Threshold (A)} = (((0.14 * [\text{time_multiplier}] / [\text{time_window}]) + 1)^{(1/0.02)}) * [\text{pickup_current}]$$
- Pickup Current (A): the minimum relay operating current above which the relay starts its operation. This current will be used to calculate the trip current threshold.
- Time Multiplier (s): will be used to calculate the trip current threshold for IDMT type protection relay.

In this section, two options are available.

- Option 1: Full Auto Process. The output data for each sheet is described below. '*.oof' file is required for this option and desired time window should be allocated in format DHHMMSS in the relevant boxes. This will perform supply point extraction (see section 8.8) or transformer extraction (see section 8.10) first, and then analysing the data.
- Option 2: Update Spreadsheet only. Using this option will update supply point data and transformer data of the spreadsheet. All '*.d4' files for the supply points and transformers specified in the spreadsheet is required for this option.

Result: the results in this sheet are as follow:

Trip Current Threshold (A)													
Instantaneous	05 seconds	10 seconds	15 seconds	20 seconds	25 seconds	30 seconds	35 seconds	40 seconds	60 seconds	120 seconds	10 min	20 min	30 min
1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00
1586.52	1586.52	1380.06	1317.28	1286.95	1269.08	1257.30	1248.95	1242.73	1228.32	1214.08	1202.80	1201.40	1200.93
Maximum Incoming Feeder RMS Current (A)													
Instantaneous	05 seconds	10 seconds	15 seconds	20 seconds	25 seconds	30 seconds	35 seconds	40 seconds	60 seconds	120 seconds	10 min	20 min	30 min
928.30	928.30	925.80	923.67	921.91	920.27	893.37	868.49	849.24	804.78	779.92	671.04	558.35	466.54
1266.20	1266.20	1252.87	1239.59	1216.75	1170.21	1131.52	1108.48	1085.54	1032.56	938.48	670.21	553.92	482.52

- Trip current threshold (A) for instantaneous (05-sec.), 10-sec., 15-sec., 20-sec., 25-sec., 30-sec., 35-sec., 40-sec., 60-sec., 120-sec., 10-min., 20-min., and 30-min. time windows.
- Maximum RMS current (A) of supply point or transformer assessed against trip current threshold at each time window. The results then are highlighted in green if they are below 80% of threshold, yellow if they are within 20% of threshold, orange if they are within 10% of threshold and red if they exceed the limit.

Plot: the graphs of maximum RMS current compared to protection threshold versus time are available on this sheet.

Supply point: supply points data and transformers data are available on other sheets. For more details refer to section 8.8 (Feeder step output) and section 8.10 (Transformer step output).

10.4 AC: New Supply Point Connection Assessment

Page 6: AC - New Supply Point Connection Assessment

This function is used to carry out new supply point assessment as required by Grid Code. This function requires the excel spreadsheet with proper pre-defined information. See manual for detailed requirements

NOTE: Excel spreadsheet in .xlsx format is required before click RUN

NOTE: Import "Excel - For New SP Connect" if needed

☐ Option 1: Full Auto Process. (Require .oof files)

☐ Option 2: Update Spreadsheet only. (Require extracted .d4 files)

Excel Name:

Below required for Option 1

Extraction From (Format: DHHMMSS) Extraction To (Format: DHHMMSS)

Input & output file: *.xlsx

This section enables the analysis of grid connection of a new supply point including operating voltage range, maximum apparent power, maximum reactive power, maximum NPS, maximum step and rapid voltage changes and maximum flicker severity. To utilize this section, user needs an Excel file containing necessary pre-defined information. The template for this Excel file can be generated using the 'Excel – For New SP Connect' option found in the 'Import' menu. The template, named 'new_connection_template.xlsx' (which can be renamed as desired), follows the format shown below. After allocating the necessary information in the file, user must save and close it. Then, the file name (without suffix) should be entered into the relevant box or selected from the 'select' button.

Items	Description	Settings	Note
VISION OSLO MODEL	Modelled Supply Point Voltage (kV)	26.25	VO Setting
	Modelled time increment (s)	1	VO Setting
	Supply Point OSLO ID	EMF1	East Midlands Parkway
GRID INFORMATION	Nominal Voltage (kV)	400	Market Harborough Grid
	Max Operating Range (kV) [Grid Code ECC. 6.1.4]	5%	Grid Code
	Min Operating Range (kV) [Grid Code ECC. 6.1.4]	-10%	Grid Code
	Minimum Three Phase Symmetric Fault Level (MVA)	12000	Grid ETYS
GRID BILATERAL AGREEMENT	1-min maximum average loading (MVA) [Appendix F5]	56.3	Power Modelling
	10-min maximum average loading (MVA) [Appendix F5]	38.5	Power Modelling
	30-min maximum average loading (MVA) [Appendix F5]	33.1	Power Modelling
RVC EVENT (USER DEFINED)	Maximum Current (A) at 25 kV - Frequent Event [ECC. 6.1.7]	800	single RS passing NS
	Maximum Current (A) at 25 kV - Infrequent Event [ECC. 6.1.7]	2727	Network Energisation
	Maximum Current (A) at 25 kV - Very infrequent Event [ECC. 6.1.7]	1600	2 RS passing NS

In the Setting column, users should allocate the following necessary information. The other columns are provided for reference purposes only and can be modified as desired.

VISION OSLO MODEL

- Modelled Supply Point Voltage (kV): the supply point nominal voltage (kV) in the simulation which must be identical to supply point voltage specified in extra.oslo file.
- Modelled time increment (s): the time increment (second) specified in V/O simulation parameters.
- Supply Point OSLO ID: identity of the node to which supply point is connected which must be identical to supply point node name in extra.oslo file.

GRID INFORMATION

- Nominal Voltage (kV): the nominal voltage (kV) of the grid at PCC.
- Max. Operating Range (kV): The maximum voltage (kV) of the grid in normal operating condition at PCC which should be in accordance with the Grid Code Clause ECC.6.1.4.
- Min. Operating Range (kV): The minimum voltage (kV) of the grid in normal operating condition at PCC which should be in accordance with the Grid Code Clause ECC.6.1.4.
- Minimum Three Phase Symmetric Fault Level (MVA): the minimum fault level (MVA) of the grid at PCC. This value is required to calculate the maximum source impedance which can be obtained from National Grid Electricity Ten Year Statement Appendix D or Transmission System short circuit and impedance analysis.

GRID BILATERAL AGREEMENT

- 1-min. maximum average loading (MVA): the 01-minute maximum traction demand at PCC which can be obtained from Bilateral Connection Agreement Appendix F5.
- 10-min. maximum average loading (MVA): the 10-minute maximum traction demand at PCC which can be obtained from Bilateral Connection Agreement Appendix F5.
- 30-min. maximum average loading (MVA): the 10-minute maximum traction demand at PCC which can be obtained from Bilateral Connection Agreement Appendix F5.

RVC EVENT (USER DEFINED)

- In this section user is required to define the maximum load current (A) for three different events, based on the maximum number of occurrences of each event. For more information refer to Engineering Recommendation P28 and the Grid Code Clause ECC.6.1.7.

The criteria table on the right is only provided for reference purposes and represents the grid connection assessment criteria in accordance with the relevant standards. The criteria shown in the format below are calculated based on the user-defined setting values allocated in the Setting column. It should be noted that the maximum reactive power (MVar) criteria for each time window can be obtained from the simple formula below. For more information refer to the Grid Code Clause ECC.6.4.5.1.

$$\text{Maximum Q (MVar)} = \text{Maximum S (MVA)} * 0.9 * 48\%$$

Items	Criteria
PCC Maximum Voltage (kV)	420
PCC Minimum Voltage (kV)	360
PCC 1-min Maximum S (MVA) - Apparent	56.30
PCC 10-min Maximum S (MVA) - Apparent	38.50
PCC 30-min Maximum S (MVA) - Apparent	33.10
PCC 1-min Maximum Q (MVar) - Reactive	24.36
PCC 10-min Maximum Q (MVar) - Reactive	16.66
PCC 30-min Maximum Q (MVar) -Reactive	14.32
PCC 1-min Negative Phase Sequence (NPS)	-
PCC 10-min Negative Phase Sequence (NPS)	1.5%
PCC 30-min Negative Phase Sequence (NPS)	1.0%
PCC Step Voltage Change (SVC)	3%
PCC Rapid Voltage Change (RVC) - Frequent Event	6%
PCC RVC - Infrequent Event	10%
PCC RVC - Very Infrequent Event	12%
Flicker Severity - Short Term RVC with Pst <= 0.5	0.40%
Flicker Severity - Memory Time Technique (S)	600
Flicker Severity - Long Term	Stage 2 Pass

In this section, two options are available.

- Option 1: Full Auto Process. The output data for each sheet is described below. '*.oof' file is required for this option and desired time window should be allocated in format DHHMMSS in the relevant boxes. This performs feeder extraction first (see section 8.8) and then do the analysis.
- Option 2: Update Spreadsheet only. Using this option will update supply point data of the spreadsheet. '*.d4' file for the supply point specified in the spreadsheet is required for this option.

Result: this sheet displays the results of grid connection assessments, comparing them to relevant criteria in the format shown below. The results are highlighted in green when they meet the criteria and in red when they fail. This sheet also includes several useful graphs, such as the voltage profile,

step voltage change, flicker severity and apparent and reactive power at the point of common coupling.

Assessment Item	Unit	Assessment Criteria	Simulation Result
PCC Maximum Voltage	kV	420	400.32
PCC Minimum Voltage	kV	360	397.87
PCC 1-min Maximum Apparent Load	MVA	56.30	56.86
PCC 10-min Maximum Apparent Load	MVA	38.50	38.80
PCC 30-min Maximum Apparent Load	MVA	33.10	33.37
PCC 1-min Maximum Reactive Load	MVAr	24.36	16.71
PCC 10-min Maximum Reactive Load	MVAr	16.66	4.76
PCC 30-min Maximum Reactive Load	MVAr	14.32	3.00
PCC 1-min Negative Phase Sequence (NPS)	%	-	0.47%
PCC 10-min Negative Phase Sequence (NPS)	%	1.50%	0.32%
PCC 30-min Negative Phase Sequence (NPS)	%	1.00%	0.28%
PCC Step Voltage Change (SVC)	%	3.00%	0.13%
PCC Rapid Voltage Change (RVC) - Frequent Event	%	6.00%	0.33%
PCC Rapid Voltage Change (RVC) - Infrequent Event	%	10.00%	1.14%
PCC Rapid Voltage Change (RVC) - Very Infrequent Event	%	12.00%	0.67%
Flicker Severity - Short Term - RVC with Pst <= 0.5	%	0.40%	0.13%
Flicker Severity - Short Term - Memory Time Technique	s	600	0.27
Flicker Severity - Long Term - Plt	N/A	Pass if Stage 2 Pst pass	PASS

Supply point: this sheet includes the simulation output results of the supply point extracted from V/O at each time increment such as active power (MW) and reactive power (MVAr), voltage (kV) and current (A), together with the results required for grid connection assessment.

10.5 AC: OLE Current Rating Assessment

Page 6: AC - OLE Current Rating Assessment

This function is used to carry out OLE current rating assessment. This function requires the excel spreadsheet with proper pre-defined information. See manual for detailed requirements

NOTE: Excel spreadsheet in .xlsx format is required before click RUN

NOTE: Import "Excel - For OLE Rating" if needed

☐ Option 1: Full Auto Process. (Require .oof files)

☐ Option 2: Update Spreadsheet only. (Require extracted .d4 files)

Excel Name:

Below required for Option 1

Extraction From (Format: DHHMMSS) Extraction To (Format: DHHMMSS)

Input & output file: *.xlsx

This section enables the OLE thermal rating assessment. To utilize this section, user needs an Excel file containing necessary pre-defined information. The template for this Excel file can be generated using the 'Excel – (AC) For OLE Rating' option found in the 'Import' menu. The template, named 'new_connection_template.xlsx' (which can be renamed as desired), follows the format shown below.

After allocating the necessary information in the file, user must save and close it. Then, the file name (without suffix) should be entered into the relevant box or selected from the 'select' button.

Location	OLE Section	OSLO ID	Type
Substation A	Substation A - Substation B: Up Main Line	005B/E	Mark 1
Substation B	Substation A - Substation B: Down Main Line	007B/S	UKMS 107 CuSn

The necessary information is as follow:

- OSLO ID: This must be in the branch node format of XXXX/S or XXXX/E. This is used to extract branch step output (see section 8.9)
- Type: This contains a drop-down list to be selected from. User must select an existing OLE type. All UK OLE type have been covered in the option. All future new electrification must use UKMS series according to existing Asset Policy. Should a new OLE type be required, user should inform the developer to update this template.
- Location and OLE section is for information only and is good to enter the correct information.

The information table on the right is provided for additional setting but primarily for information only.

NOTE: Adjust settings highlighted in Orange if necessary

OLE Type	Cont. Rating (A)	20min (A)	10min (A)	5min (A)	Note	Enviroment	Source
GEFF	700	-	-	957	700A for nominal, 964A with wind 3 m/s, 957A for 5 min	30 C with wind 0.4 m/s	GEFF System Description Manual, Section 3.3
Mark GE	800	-	-	-	800A for nominal, 400A for tramway	-	NR/L2/ELP/21088
Mark 5CS	700	-	-	-	700A for support 0.166 in CW, 800A for support 0.3 in CW	-	Mk5CS Equipment Designation
Mark 1	700	-	-	-	800A for compound, 700A for simple, 400A for tramway	-	Mk1 Equipment Designations
BBC	700	-	-	-	700A for nominal	-	NR/L2/ELP/21088
Mark 2	700	-	-	-	700A for nominal	-	NR/L2/ELP/21088
Mark 3	700	-	-	-	700A for nominal, 400A for tramway	-	Mk3 Equipment Designation
Mark 3a	600	-	-	-	600A for nominal, 400A for tramway	-	Mk 3A Equipment Designation
Mark 3b	450	-	-	-	450A for 1 or 2 track or 4 track CS, 370A for 4-track BT	28 C with wind 1 mph	Current Rating of Mark 3B OLE
Mark 3c	600	-	-	-	600A for nominal	-	Mk 3C Equipment Designation
Mark 3d	600	-	-	-	600A for nominal	-	NR/L2/ELP/21088
Mark 5	900	-	-	-	900A for nominal	-	NR/L2/ELP/21088
UK1 - WCML	600	-	-	-	600A for nominal	-	NR/L2/ELP/21088
Sunderland Direct	779	-	-	-	779A for nominal	-	NR/L2/ELP/21088
SICAT OLE	600	-	-	-	600A for nominal	-	NR/L2/ELP/21088
UK Series 1	531	-	-	-	531A for CW, 761A for ATF wire	28 C with wind 1 mph, solar 980 W/m2	MAN001 System Description Manual
UK Series 2	533	-	-	-	533A for CuSn, 551A for CuAg, 590A for CuAg 120	BS EN 50119:2009	Series 2 System Description Manual
UKMS 120 CuAg	430	524	638	798	Refer source - current revision 5	40 C with wind 1 mph	MS/B01/B01/A3 Revision 05
UKMS 107 CuAg	412	494	598	746	Refer source - current revision 5	40 C with wind 1 mph	MS/B01/B01/A3 Revision 05
UKMS 107 CuSn	391	467	565	705	Refer source - current revision 5	40 C with wind 1 mph	MS/B01/B01/A3 Revision 05

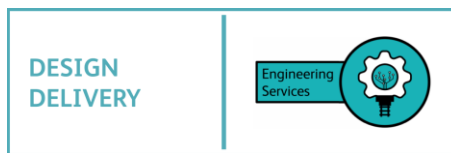
This provides rating information /threshold according to various documentation. It should be noted that the thermal assessment will compare the current loading against the current rating presented in this table.

Cont. rating (A) data is required at least for each OLE type and does NOT allow empty cells in that column.

Due to the specific request from the client or change climate in the future, should a specific rating need to be assessed against, user can change the corresponding value according to the specific environment parameter user would like to use for. The calculation of a new thermal rating is outside of the scope of this documentation.

In this section, two options are available.

- Option 1: Full Auto Process. The output data for each sheet is described below. '*.oof' file is required for this option and desired time window should be allocated in format DHHMMSS in the relevant boxes. This performs branch step output extraction first (see section 8.9) and do the analysis.



- Option 2: Update Spreadsheet only. Using this option will update branch step output data of the spreadsheet. '*.d4' file for the branch step output specified in the spreadsheet is required for this option.

Result: this sheet displays the results of OLE rating assessment, comparing them to relevant criteria in the format shown below.

Equipment Rating (A)				Simulation Result: Maximum RMS Current (A)							
Cont.	20min	10min	5min	30min	time at	20min	time at	10min	time at	5min	time at
700.00	-	-	-	94.08	07:54:25	98.54	07:54:25	105.63	07:44:55	122.66	07:46:05
391.00	467.00	565.00	705.00	94.90	07:54:25	96.32	07:55:25	510.00	07:54:25	800.00	07:27:10

It should be note that if only continuous rating exists, both 20 min RMS result and 30min RMS result will be compared against the continuous rating. This is due to the inconsistent time-windows which used historically and required by NR/L2/ELP/27275. Users need to make sensible judgement which value to use for the assessment.

If both continuous ratings and 20 min ratings are available, the 30min RMS result will be compared against continuous rating, the 20min RMS result will be compared against 20 min rating.

In simulation result, maximum RMS current (A) and corresponding time of each branch node are shown. It should be noted that the time here refers to the end time of a rolling time window. The results then are highlighted in green if they are below 80% of threshold, yellow if they are within 20% of threshold, orange if they are within 10% of threshold and red if they exceed the limit.

Branch Node: this sheet includes the simulation output results of the branch step extracted from V/O at each time increment such as active power (MW) and reactive power (MVar), voltage (kV) and current (A), together with the relevant RMS calculation.

10.6 AC: SFC Assessment

Page 8: AC - Static Frequency Converter SFC Assessment

This function requires the excel spreadsheet with proper pre-defined information.
See manual for detailed requirements

NOTE: Excel spreadsheet in .xlsx format is required before click RUN
NOTE: Import "Excel - For SFC" if needed

☐ Option 1: Full Auto Process. (Require .oof + .lst.txt files.)
☐ Option 2: Auto process with user defined node configuration. (Only require .oof file)
☐ Option 3: Update spreadsheet only. (Require all .d4 files and .mxn files)
☐ Option 4: Extract d4 files and mxn file only. (Only require .oof file)

Excel Name:

Below required for Option 1,2,4

Extraction From (Format: DHHMMSS) Extraction To (Format: DHHMMSS)

Input & output file: *.xlsx

This section enables SFC assessment. To utilize this section, user needs an Excel file containing necessary pre-defined information. The template for this Excel file can be generated using the 'Excel – For SFC assessment' option found in the 'Import' menu. The template, named 'SFC_assessment_template.xlsx' (which can be renamed as desired), follows the format shown below. After allocating the necessary information in the file, user must save and close it. Then, the file name (without suffix) should be entered into the relevant box or selected from the 'select' button.

NOTE: This spreadsheet is only valid for 5 seconds time-increment.

SFC Supply Points	OSLO feeder name	Incoming Voltage (kV)	Incoming Feeders	Continuous Rated Power (MVA)	Instant Rated Current (A)	Instant Overload Capacity	SFC Type
Potteric Carr	PCF1	33	1	27.2	1860	110%	ABB_Potteric_Carr
Hambleton Jcn F1	HMB1	132	1	45	2545	110%	Siemens_Hambleton_Jcn
Hambleton Jcn F2	HMB2	132	1	45	2545	110%	Siemens_Hambleton_Jcn

Individual Feeding Sections

Supply Point	Site name	Node ID	Min Voltage
Potteric Carr	North Muskham	NM2	18.084
	Tuxford	TX	18.348
	Retford	RET1	19.59
	Bawtry	BX1	22.028
	Potter Carr	PC1	24.51
	Doncaster	DR1	24.376
Hambleton Jcn F1	Doncaster	DR2	24.014
	South Kirby	SR1	23.838
	Blane	BB	25.498
	Hambleton	HB1	27.169
Hambleton Jcn F2	Hambleton	HB2	27.17
	Colton	CJ	25.117
	York	YK1	24.377

The necessary information is as follow:

- Supply Point: the desired name of the supply point.
- OSLO feeder name: identity of the node to which supply point is connected which must be identical to supply point node name in extra.oslo file.
- Continuous Rated Power (MVA): This is the power rating at the site, usually limited by transformer 30min power rating.
- Instant Rated Current (A): This is the current rating at the site, usually limited by the IGBT control capability.
- Other fields are only for information.

In this section, four options are available. The option is the same as how to assess a normal supply point. See section 10.1 for detail.

The output data for each sheet is described below.

Result: the results in this sheet are as follow:

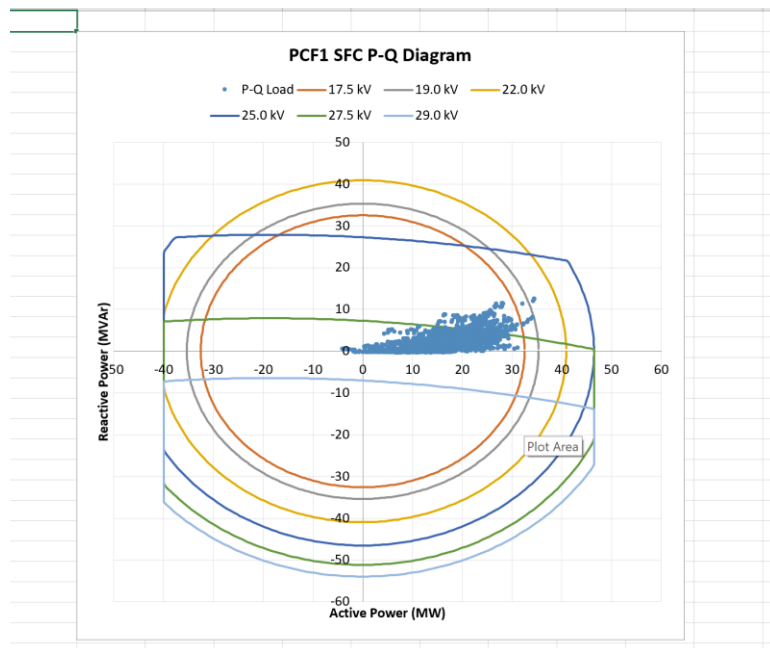
Site Information Summary							Maximum Average Apparent Power (MVA)										Voltage (kV)	
Supply Point Name	OSLO ID	Incoming Voltage (kV)	Incoming Feeder	Continuous Rated Power (MVA)	Instant Rated Current (A)	Instant Overload Capacity	SFC Type	Instant on	01 Minute	02 Minutes	10 Minutes	20 Minutes	30 Minutes	Minimum	Maximum			
Potteric Carr	PCF1	33	1	27.2	1860	110.0%	ABB_Potteric_Carr	36.74	33.45	29.18	23.61	21.91	19.88	18.08	27.76			
Hambleton Jcn F1	HMB1	132	1	45	2545	110.0%	Siemens_Hambleton_Jcn	18.90	18.21	15.26	10.26	7.40	7.55	23.84	19.11			
Hambleton Jcn F2	HMB2	132	1	45	2545	110.0%	Siemens_Hambleton_Jcn	16.46	14.17	13.01	8.10	6.11	4.94	24.88	26.14			

Site Information Summary							Maximum Incoming Feeder RMS Current (A)														
Supply Point Name	OSLO ID	Incoming Voltage (kV)	Incoming Feeder	Continuous Rated Power (MVA)	Instant Rated Current (A)	Instant Overload Capacity	SFC Type	Instant on	05 seconds	10 seconds	15 seconds	20 seconds	25 seconds	30 seconds	35 seconds	40 seconds	60 seconds	120 seconds	10 min	20 min	30 min
Potteric Carr	PCF1	33	1	27.2	1860	110.0%	ABB_Potteric_Carr	1490.30	1490.80	1490.35	1490.20	1490.05	1489.84	1489.80	1487.48	1474.02	1362.36	1191.12	969.06	900.57	835.07
Hambleton Jcn F1	HMB1	132	1	45	2545	110.0%	Siemens_Hambleton_Jcn	695.12	695.10	688.98	683.46	683.29	683.19	681.19	675.58	671.53	670.06	575.34	392.77	309.36	313.18
Hambleton Jcn F2	HMB2	132	1	45	2545	110.0%	Siemens_Hambleton_Jcn	605.46	605.40	604.60	603.10	600.89	598.20	585.82	575.07	555.66	528.45	489.98	323.57	267.55	238.05

This is the same as provided in section 10.1. NPS information is not provided as not valid for SFC anymore. Site total is not provided as not valid for assessment.

Data: This is the same as provided in section 10.1.

P-Q Diagram Plot: This is the unique feature of SFC assessment. The example is shown below:



This provides supply point's load P-Q diagram as well as the protection boundary. At the time of the writing, only instant active and reactive power are assessed against the boundary as usually they are the worst-case assessment item.

Oslo feeder name: This is the same as provided in section 10.1.

SFC Type: All used SFC type source data will be provided in a new tab. All these tabs data are imported from the default library where the protection boundary data defined. It should be noted that users cannot import to default library at this stage. But user could adjust the boundary based on any new information available.

11 Customised Post-Processing – Mainly for DC

Vision-Oslo Extension

File Import OSOP Configuration Help

OSLO Post-Processing Option Selection - Mainly DC

Instruction: User can go to info page entering processing requirements using execute buttons below

- 1: DC: (DATA PREP.) For Grid, TRU, Main CB, DC Busbar, Neg ETE, Bonding Assessment [execute 1](#)
- 2: DC (DATA PREP.): For Track CB, Pos ETE Assessment [execute 2](#)
- 3: DC: (Data PREP. and Assessment) Single End Feeding [execute 3](#)
- 4: DC (Data PREP. and Assessment) Falling Voltage Protection [execute 4](#)
- 5: DC (Assessment): Generate All Assessment Summary Reports [execute 5](#)
- 6: To be developed [execute 6](#)
- 7: To be developed [execute 7](#)
- 8: To be developed [execute 8](#)

[Back to Home](#)

This option provides post processing analysis mainly used for DC network analysis.

11.1 DC: (DATA PREP.) For Grid TRU, Main CB, DC Busbar, Neg ETE, Bonding Assessment

Page 9: Substation TRU Assessment Data Prepare

This will produce multiple .d4 files from extraction and .csv files for each substation. A substation list named as "FeederList.txt" is required.

NOTE: "FeederList.txt" is required before click RUN

☐ Option 1: Substation RMS current (1,4,5,30,60,120,180 min) and average power (30 min)

☐ Option 2: Grid Calculation (require "GridAllocation.csv" file)

Enter Assessment Time Window

Extraction From (Format: DHHMMSS) Extraction To (Format: DHHMMSS)

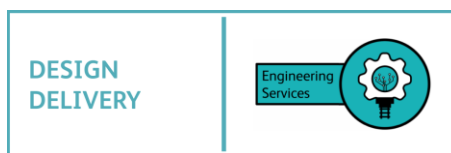
[RUN!](#)

[Back to Home](#) [Back to Processing](#)

This section extracts the step load outputs at each DC substation and calculates the rolling RMS current and average power.

11.1.1 Option 1 Substation RMS Current

Option 1 provides the data required for option 2 and for the DC assessments in section 11.4.



Name

BranchNodeList.txt
DCF321.oof
FeederList.txt
oslo_extension.py

To run this tool, the user needs to put the oslo_extension.py in a folder containing the .oof file from VISION/OSLO results. The input text file “FeederList.txt” is also required to filter all substations within the scope that is required for assessment (see section 5.1).

This option performs feeder extraction first (see section 8.8), and then doing data calculation using the tool.

After running the extraction tool, results will be shown in a series of csv files similar to below. Each substation will have a csv file showing all the step loadings and the RMS values.

The ***_RMSCurrent_sum.csv file provides a summary of the maximum RMS current’s (and 30min Average Power) at each substation and the corresponding time.

DCF321_30min_AVEpower_sum.csv
DCF321_RMSCurrent_Sum.csv
DCF321_15min_RMScurrent_sum.csv
DCF321_30min_RMScurrent_sum.csv
DCF321_60min_RMScurrent_sum.csv
DCF321_120min_RMScurrent_sum.csv
DCF321_180min_RMScurrent_sum.csv
DCF321_1min_RMScurrent_sum.csv
DCF321_4min_RMScurrent_sum.csv
DCF321_5min_RMScurrent_sum.csv
DCF321_MOOR.csv
DCF321_BOOT.csv
DCF321_TAPN.csv
DCF321_BRHS.csv
DCF321_FREH.csv
DCF321_LOSW.csv

11.1.2 Option 2 Grid Calculation

Before running option 2 it is required to run option 1 above to generate the substation 30min average power required to do the grid loading calculation.

Option 2 calculates a summary of Grid Loadings based on the substations connected to the grid. The user is required to provide the input file “GridAllocation.csv”. The template for this csv file can be generated using the ‘CSV - GridAllocation.csv’ option found in the ‘Import’ menu.

Input file: GridAllocation.csv

A	B	C	D	E	F	G
Substation Name	OSLO ID	Grid Feeder				Grid
Winchfield	WNCH	Basingstoke Grid				Basingstoke Grid
Newnham	NEWH	Basingstoke Grid				St Cross Grid
Barton	BART	Basingstoke Grid				Southampton Grid
Worthing Junction	WOJC	Basingstoke Grid				
Oakley	OAKL	Basingstoke Grid				
Waltham	WAHA	Basingstoke Grid				
Micheldever	MICH	St Cross Grid				
Northbrook	NRTH	St Cross Grid				
Kingsworthy	KIGS	St Cross Grid				
Winchester	WSTR	St Cross Grid				
Shawford	SHAW	St Cross Grid				
Eastleigh	ESLI	St Cross Grid				
St Denys	SDYS	Southampton Grid				
Northam A	NORT	Southampton Grid				
Northam B	SOHP	Southampton Grid				
Millbrook	MLBR	Southampton Grid				

This CSV provides information to the programme which Substations are connected to which grid sites, please make sure all grid sites in column C are also entered to the list in column G.

Name	Date modified
DCF312_30min_Grid_Summary.xlsx	05/03/2024 10:06
DCF312_St Cross Grid.csv	05/03/2024 10:06
DCF312_Basingstoke Grid.csv	05/03/2024 10:06
DCF312_Southampton Grid.csv	05/03/2024 10:06
DCF312_30min_AVFpower sum.csv	26/02/2024 16:47

The programme will output 30min Maximum average power summary in the form of csv for each grid site and a summary excel file.

Grid 30 min Average Power Summary			Detailed 30min Maximum Average Power Summary									
Grid Name	at Time (hh:mm:ss)	Maximum Power (MW)	Grid Name	Time at Grid Max (hh:mm:ss)	Max Power (MW)	Substation	OSLOID	Sub P at time of Grid Max (MW)	Sub Contribut e %	Time at Sub Max (hh:mm:ss)	Max Sub Power (MW)	Power Diff %
Basingstoke Grid	13:23:10	8.76	Basingstoke Grid	13:23:10	8.76	Winchfield	WNCH	1.38	15.75%	13:16:40	1.49	7.80%
Southampton Grid	15:24:35	9.89	Basingstoke Grid	13:23:10	8.76	Newnham	NEWH	1.34	15.25%	13:07:40	1.40	4.91%
St Cross Grid	13:43:40	11.48	Basingstoke Grid	13:23:10	8.76	Barton	BART	2.13	24.32%	12:57:25	2.63	23.48%
			Basingstoke Grid	13:23:10	8.76	Worthing Junction	WOJC	1.18	13.51%	10:50:40	1.33	12.69%
			Basingstoke Grid	13:23:10	8.76	Oakley	OAKL	1.39	15.84%	11:18:35	1.71	22.93%
			Basingstoke Grid	13:23:10	8.76	Waltham	WAHA	1.34	15.34%	11:16:05	1.63	21.15%
			Southampton Grid	15:24:35	9.89	St Denys	SDYS	1.91	19.31%	15:13:15	1.96	2.80%
			Southampton Grid	15:24:35	9.89	Northam A	NORT	0.47	4.75%	11:14:00	0.60	28.45%
			Southampton Grid	15:24:35	9.89	Northam B	SOHP	1.05	10.66%	15:23:15	1.07	1.14%
			Southampton Grid	15:24:35	9.89	Millbrook	MLBR	1.67	16.87%	15:29:35	1.80	7.69%
			Southampton Grid	15:24:35	9.89	Redbridge	RBGE	0.83	8.39%	11:58:15	1.02	22.87%
			Southampton Grid	15:24:35	9.89	Ashurst	AHUR	0.80	8.04%	12:00:35	0.90	13.70%
			Southampton Grid	15:24:35	9.89	Woolston	WOOL	0.78	7.86%	15:27:20	0.85	9.12%
			Southampton Grid	15:24:35	9.89	Woodfildley	WODF	0.65	6.61%	15:36:30	0.70	7.49%
			Southampton Grid	15:24:35	9.89	Brockenhurst	BRHS	0.61	6.17%	15:33:55	0.68	11.73%
			Southampton Grid	15:24:35	9.89	Lower Swanwick	LOSW	0.72	7.30%	15:34:05	0.95	31.94%
			Southampton Grid	15:24:35	9.89	Fareham	FREH	0.40	4.06%	15:52:40	0.68	68.92%
			St Cross Grid	13:43:40	11.48	Micheldever	MICH	1.57	13.69%	11:13:55	1.77	12.76%
			St Cross Grid	13:43:40	11.48	Northbrook	NRTH	1.60	13.91%	13:43:30	1.60	0.13%
			St Cross Grid	13:43:40	11.48	Kingsworthy	KIGS	1.38	12.00%	11:26:15	1.66	20.32%
			St Cross Grid	13:43:40	11.48	Winchester	WSTR	1.55	13.49%	11:26:45	1.75	13.14%
			St Cross Grid	13:43:40	11.48	Shawford	SHAW	1.79	15.58%	13:51:40	1.94	8.45%
			St Cross Grid	13:43:40	11.48	Eastleigh	ESLI	2.10	18.32%	11:31:15	2.70	28.53%
			St Cross Grid	13:43:40	11.48	South Junction	SJNC	0.58	5.07%	13:51:15	0.64	9.14%
			St Cross Grid	13:43:40	11.48	Tapnag	TAPN	0.16	1.39%	15:52:50	0.37	130.65%
			St Cross Grid	13:43:40	11.48	Botley	BOOT	0.32	2.79%	15:58:35	0.42	30.28%
			St Cross Grid	13:43:40	11.48	Moorgreen	MOOR	0.43	3.75%	15:58:35	0.50	15.38%

The excel file provides all information required to perform HV loading assessment. The generated csv files provide the detailed timestep 30min power data of each substation and the grid site.

Detailed Average Power Summary:

- Maximum Power: the maximum 30-min average grid site power at the grid max time.
- Sub P at time of grid max: the substation power at that time
- Sub Contribute: the contribution is a percentage of this substation power of the total grid site power.
- Max Sub Power: the maximum 30-min power of each substation (at different times which is show in the Time at Sub Max column).
- Power Diff: the percentage difference between the maximum substation power to the substation power recorded during the 30-min period where the grid is the highest power.

11.2 DC: (DATA PREP.) For Track CB, Pos ETE Assessment

This section extracts the current data at each branch nodes and calculates the rolling RMS currents. The result from this section is required for the DC Track CB and Positive ETE assessments in section 11.4.

This option performs list extraction first (see section 8.1), and then doing analysis based on the list data.

Outputs from Option 3 or Option 6; `***_branch_SECONDS_rms_sum_max.csv` are required for DC assessments in section 11.5.6 and 11.5.711.4.

Page 10: Substation Protection/Track CB & ETE Assessment Data Prepare

This will produce multiple .csv files depending on the option selection. Option 2 is used to prepare data for report assessment

NOTE: Time Window is COMPULSORY.

NOTE: Option 2 should be chosen for DC assessment.

☐ Option 1: All branches (Auto) step output summary

☐ Option 2: All branches (Auto) rolling RMS current calculation

☐ Option 3: All branches (Auto) maximum rolling RMS current summary

☐ Option 4: Customised branches step output summary ("BranchNodeList.txt" is required)

☐ Option 5: Customised branches rolling RMS current calculation ("BranchNodeList.txt" is required)

☐ Option 6: Customised branches maximum rolling RMS current summary ("BranchNodeList.txt" is required)

Enter Assessment Time Window

Extraction From (Format: DHHMMSS)

Time Seconds (0 - 86400):

Extraction To (Format: DHHMMSS)

(Note this is time in seconds)

There are 6 options in 2 groups. Options 1-3 extract data from all branches in the simulation and will take some time to complete. Option 4-6 extract data from branches specified in the input csv file.

- Option 1 outputs step data for all branches and will not complete an RMS current calculation. Outputs branch_step_sum.csv.
- Option 2 completes the RMS current calculation and outputs the rolling step RMS currents for all branches. Outputs branch_seconds_rms_sum.csv
- Option 3 completes the RMS current calculation but outputs only the maximum recorded currents and the time window only. Outputs branch_seconds_rms_sum_max.csv
- Option 4-6 each correspond to option 1-3 but processes a selected list of branch nodes only. It can be used to reduce the processing time by limiting the number of nodes processed. The user is required to enter the list of required nodes in the input file "BranchNodeList.txt". The template for this txt file can be generated using the 'Text - BranchNodeList.txt' option found in the 'Import' menu (see section 5.3).

For RMS current calculation, the user has to input the time period of calculating the RMS value in seconds.

- 15-min RMS (900 seconds) current used for Track CB assessment.
- 30-min RMS (1800 seconds) current used for Positive ETE assessment.

To get both RMS results the user will be required to run this option twice.

11.3 DC: Single End Feeding, Extraction and Assessment

Page 12: DC Single End Feeding 1st Stage Processing

This option will generate Single End Feeding loads by adding the loads of both ends of a branch to get an estimate. This is used for 1st stage Single End Feeding analysis. List file will be automatically generated if it does not already exist. Excel Spreadsheet containing ratings and branch names is required.

NOTE: Time Window is COMPULSORY. Excel spreadsheet in .xlsx format is required before click RUN.

NOTE: Option 3 and 4 are for generating step results in CSV format in addition to results summary, results summary will be available in the chosen spreadsheet in all options.

☐ Option 1: Track Circuit Breaker (TCB) Assessment, 15min RMS used.
☐ Option 2: ETE (Positive Cables) Assessment, 30min RMS used.
☐ Option 3: Track Circuit Breaker (TCB) Assessment, 15min RMS used. With CSV step outputs
☐ Option 4: ETE (Positive Cables) Assessment, 30min RMS used. With CSV step outputs

Enter Assessment Time Window

Extraction From (Format: DHHMMSS) Extraction To (Format: DHHMMSS)

Excel Name:

Input & output file: *.xlsx

This section enables specific single end feeding assessment for track circuit breakers (TCB) and positive Electric Traction Equipment (ETE, the positive cables from substation/TPHut to conductor rail). To utilize this section, the user needs an Excel file containing necessary pre-defined information placed within the simulation folder. This differs from other DC assessment options where the excel file should

be placed on-level up besides all simulation folders. The template for this Excel file can be generated using the 'Import: Excel (DC) For Single End Feeding Analysis (TCB)' or 'Import: Excel (DC) For Single End Feeding Analysis (Pos ETE)' options found in the import menu.

This script will automatically extract all necessary branch current step results from the Ist file (and will extract the Ist file if it is not already available) based on the node names specified by the user (done using the .xlsx excel). It will then analyse the results and highlight any rating exceedances. Unlike other DC assessment options, there is no requirement to pre extract any information before running this script.

The DC Single End Feeding 1st stage processing is a 1st stage worst case assumption to estimate the increased loadings during a Single End Feeding scenario (due to TCB or ETE outage). The python script will add the step loads of both ends of the OSLO branch (if substation A is connected to branch B001/S the loads of B001/S And B001/E will be added together). Then 15min RMS or 30min RMS currents will be calculated for this sum of the currents at both ends of this OSLO branch where results are assessed against the TCB and ETE ratings. If the 1st stage loads exceeded the ratings, then specific single end feeding scenarios depending on the local feeding arrangement (such as whether the electrical is between substations or TPHut, 2 track or 4 track area etc). This 1st stage assessment does not necessarily provide the best approximation since the single end feeding loads are heavily dependent on the local feeding arrangements but is designed as a worst-case assumption to filter the locations that has a risk of exceeding ratings under single end feeding.

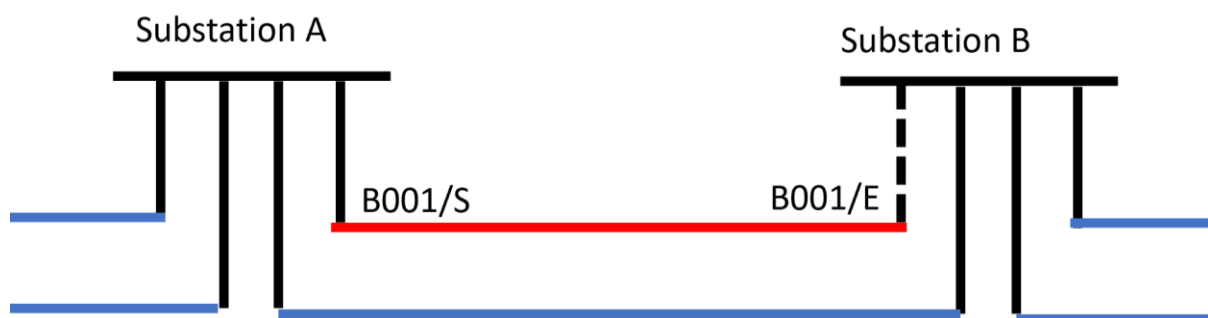
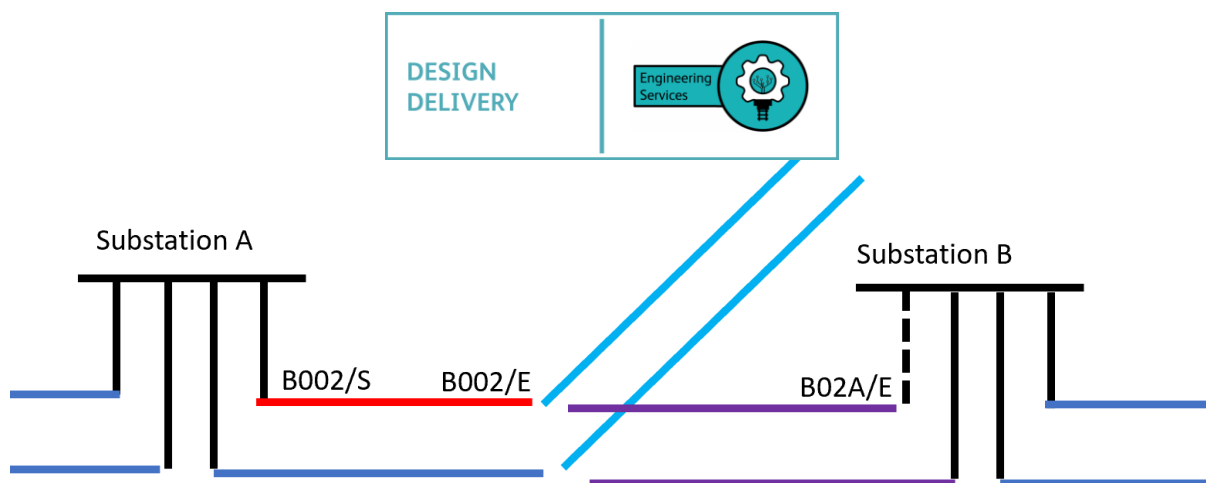


Diagram illustrating the calculation used in the first stage single end feeding arrangement calculating single end feeding load of B001/S at Substation A when there is an outage at Substation B connected to B001/E.

Note that the python code could only calculate the sum of the two ends of the OSLO branch irrespective of the actual branch arrangements. If there are more than one branch modelled in VISION due to junctions or other reasons, the load at both ends of that branch will be added instead of the load at the next traction site.



Load of the sum of B002/S and B002/E is calculated instead of using the load of B02A/E. This is a limitation of the automatic python script. Previous assessment shows that in all of the assessed cases, the 1st stage assumed load is higher than the actual modelled load.

The Excel template named: 'DC Single End Feeding Input for TCB.xlsx' and 'DC Single End Feeding Input for posETE.xlsx' follows the format shown below. Some columns are for information only the necessary information is as follow:

- Column B: OSLO Branch ID column showing the OSLO node connected to the substation (the opposite node is assumed to be on outage)
- Column E: Standard rating for TCB or 90% rating for ETE, this is the assessment criteria for Amber failure.
- Column F: Assessed rating for TCB or Cable rating 100% for ETE. This is the assessment criteria for Red failure.

	A	B	C	D	E	F	G
1							
2	Project Name	XXXX		Guidance - How to Create Information Spreadsheet - Required for first time			
3	Simulation Number:	XXXX		1. Refer to DC Database and use vlookup table to find the value.			
4	Feeding Arrangement:	XXXX		2. All values pasted in the spreadsheet with VALUE ONLY!			
5	Modelled by:	XXXX					
6	Date:	08/07/2024		Note that no functions allowed for the information table below!			
7							
8							
9							
10					15min	Intact	
11	Substation	OSLO Branch ID	Feeder ID	Track CB Type	TCB Standard Rating (kA)	Assessed Rating (kA) (+10%)	
12	Newnham	E22/E	NEWH	TEST	1.17	1.30	
13	Newnham	E24/E	NEWH	TEST		2.53	
14	Newnham	E23/E	NEWH	TEST	2.30		
15	Newnham	E21/E	NEWH	TEST	2.30	2.53	
16	Newnham	E26/S	NEWH	TEST	NO	NO	
17	Newnham	E28/S	NEWH	TEST	NONE	2.53	
18	Newnham	E27/S	NEWH	TEST	2.30	NONE	
19	Newnham	E25/S	NEWH	TEST	0.00	0.00	
20	Basing TPH	E26/E	BASI	TEST			
21	Basing TPH	E28/E	BASI	TEST	NULL	NULL	
22	Basing TPH	E27/E	BASI	GEC RJR 721E	2.30	2.53	
23	Basing TPH	E25/E	BASI	GEC RJR 721E	2.30	2.53	
24	Basing TPH	E30/S	BASI	GEC RJR 721E	2.30	2.53	
25	Basing TPH	E32/S	BASI	GEC RJR 721E	2.30	2.53	
26	Basing TPH	E31/S	BASI	GEC RJR 721E	2.30	2.53	
27	Basing TPH	E29/S	BASI	GEC RJR 721E	2.30	2.53	
28	Barton	E30/E	BART	SIEMENS 8MF94 MK1	4.00	4.40	
29	Barton	E32/E	BART	SIEMENS 8MF94 MK1	4.00	4.40	



Results summary will be added to 2 new sheets in the specified excel file, 'Result Summary' and Full Single End Feeding Results'

They both have the same format shown below. Column K shows the single end feeding combined current which is the result used for assessment. The start and end time when the maximum single end feeding load is recorded is in column I and J. Column L and M shows the max RMS current at each of the loads (at any time during the specified time window) and are for information only, column K will always show a value smaller than the value of L plus M. Results summary shows the same information with only the amber and red failures shown.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													
2		Project Name:	XXXX										
3		Simulation Name:	DCF312										
4		Feeding Arrangement:	XXXX										
5		Result Created by:	XXXX										
6		Result Created at:	21-06-2024 09:01										
7													
8													
9		Single End Feeding Results											
10													
11		Substation Name	Assessed OSLO Branch Node	Opposite OSLO Branch Node	Feeder ID	TCB Type	TCB rating (kA)	Assessed rating(kA)	Start Time	End Time	Single End Feeding Current		
12		Newnham	E22/E	E22/S	NEWH	TEST	1.17	1.3	15:41:15	15:56:10	Max RMS Combined Current (kA)	RMS_MAX_node (kA)	RMS_MAX_opposite (kA)
13		Newnham	E24/E	E24/S	NEWH	TEST	2.3	2.53	12:42:35	12:57:30	1.58	1.08	0.84
14		Newnham	E23/E	E23/S	NEWH	TEST	2.3	2.53	14:41:05	14:56:00	1.58	0.95	0.79
15		Newnham	E21/E	E21/S	NEWH	TEST	2.3	2.53	10:18:35	10:33:30	1.57	0.69	0.40
16		Newnham	E26/S	E26/E	NEWH	TEST	NO	NO	10:14:55	10:29:50	1.58	0.82	0.96
17		Newnham	E28/S	E28/E	NEWH	TEST	NONE	2.53	12:44:55	12:59:50	1.21	1.05	0.76
18		Newnham	E27/S	E27/E	NEWH	TEST	2.3	NONE	12:37:50	12:52:45	1.28	0.73	0.66
19		Newnham	E25/S	E25/E	NEWH	TEST	0	0	12:44:55	12:59:50	1.76	1.08	0.90
20		Basing TPH	E26/E	E26/S	BASI	TEST			10:14:55	10:29:50	1.58	0.76	1.05
21		Basing TPH	E28/E	E28/S	BASI	TEST			12:44:55	12:59:50	1.21	0.66	0.73
22		Basing TPH	E27/E	E27/S	BASI	GEC RJR 721E	2.3	2.53	12:37:50	12:52:45	1.28	0.66	0.76
23		Basing TPH	E25/E	E25/S	BASI	GEC RJR 721E	2.3	2.53	12:44:55	12:59:50	1.76	0.90	1.08
24		Basing TPH	E30/S	E30/E	BASI	GEC RJR 721E	2.3	2.53	10:14:55	10:29:50	1.49	0.78	0.89
25		Basing TPH	E32/S	E32/E	BASI	GEC RJR 721E	2.3	2.53	12:44:55	12:59:50	1.46	0.67	0.91
26		Basing TPH	E31/S	E31/E	BASI	GEC RJR 721E	2.3	2.53	12:37:00	12:51:55	1.43	0.70	0.88
27		Basing TPH	E29/S	E29/E	BASI	GEC RJR 721E	2.3	2.53	12:44:20	12:59:15	1.16	1.01	1.38
28		Barton	E30/E	E30/S	BART	SIEMENS BMF94 MK1	4	4.4	10:14:55	10:29:50	1.40	0.89	0.78
29		Barton	E32/E	E32/S	BART	SIEMENS BMF94 MK1	4	4.4	12:44:55	12:59:50	1.46	0.91	0.67
30		Barton	E31/E	E31/S	BART	SIEMENS BMF94 MK1	4	4.4	12:37:00	12:51:55	1.43	0.88	0.70
31		Barton	E29/E	E29/S	BART	SIEMENS BMF94 MK1	4	4.4	12:44:20	12:59:15	1.16	1.38	1.01
32		Barton	E499/S	E499/E	BART	SIEMENS BMF94 MK1	4	4.4	12:17:15	12:32:10	1.00	1.00	0.00
33		Barton	E36/S	E36/E	BART	SIEMENS BMF94 MK1	4	4.4	12:49:50	13:04:45	1.88	1.03	0.98
34		Barton	E35/S	E35/E	BART	SIEMENS BMF94 MK1	4	4.4	11:31:10	11:46:05	1.77	1.11	0.86
35		Barton	aE34/S	aE34/E	BART	SIEMENS BMF94 MK1	4	NONE	11:37:40	11:52:35	2.90	1.27	1.07
36		Barton	aE33/S	aE33/E	BART	SIEMENS BMF94 MK1	4	4.4	12:41:40	12:56:35	1.98	1.61	0.68
37		Winklebury TPH	E36/E	E36/S	WIKL	BT HSL	3	3.3	12:49:50	13:04:45	1.88	0.98	1.03
38		Winklebury TPH	E35/E	E35/S	WIKL	Not Known	3		11:31:10	11:46:05	1.77	0.86	1.11
39		Winklebury TPH	bE34/E	bE34/S	WIKL	BT HSL	3	3.3	11:36:55	11:51:50	2.94	1.93	1.07
40		Winklebury TPH	bE33/E	bE33/S	WIKL	BT HSL	3	3.3	11:38:45	11:53:40	1.44	0.80	0.68
41		Winklebury TPH	E38/S	E38/E	WIKL	BT HSL	3	3.3	11:38:05	11:53:00	1.87	1.82	1.91

In this section, four options are available. Option 1 and option 3 are for TCB assessments where 15min RMS currents are used, option 2 and option 4 are for ETE assessments where 30 min RMS currents are used.

Option 3 and 4 are options to produce step results in addition to the results summary in excel. Selecting these options will no change any of the results extracted to excel but the following 5 additional CSV files containing the step results will be created.

Name	Date modified	Type	Size
DCF312_branch_900_rms_step.csv	21/06/2024 09:01	Microsoft Excel C...	14,202 KB
DCF312_branch_step.csv	21/06/2024 09:02	Microsoft Excel C...	5,206 KB
DCF312_SEF_branch_900_rms_step.csv	21/06/2024 09:01	Microsoft Excel C...	9,939 KB
DCF312_SEF_branch_900_rms_sum_max.csv	21/06/2024 09:01	Microsoft Excel C...	16 KB
DCF312_SEF_branch_step.csv	21/06/2024 09:02	Microsoft Excel C...	3,881 KB

The branch_step.csv contains the current step results of all branches.

The branch_900_rms_step.csv contains the rolling 900 seconds rms results of all considered branches. This is the same RMS step results used for normal branch RMS current assessment.

The SEF_branch_step.csv contains the Single End Feeding step results after adding the current of the specified node with the current of the opposite node at each time step.

The SEF_branch_900_rms_step.csv contains the rolling 900 seconds rms results of the single end feeding combined load shown in the SEF_branch_step.csv.

The SEF_branch_900_rms_MAX.csv contains the maximum 900 seconds rms values and the time periods for the single end feeding load.

11.4 DC: Falling Voltage Protection, Extraction and Assessment

Page 14: DC Falling Voltage Protection (FVP) Processing and Assessment

This option will assess TCBs with FVP by extracting the step voltage/current results and compare them against FVP curves. Excel Spreadsheet containing FVP ratings and branch names is required. There is an option to extract all step results with plotted graphs

NOTE: NOTE: Time Window is COMPULSORY. Excel spreadsheet in .xlsx format is required before click RUN.

NOTE: Option 3 or 4 to skip OSOP extraction, if OSOP extraction has already been done for all branches

NOTE: Option 2 and 4 are for generating step results and scatter graphs in addition to results summary, Results summary will be available in the chosen spreadsheet in all options.

☐ Option 1: FVP assessment with OSOP extraction

☐ Option 2: FVP assessment with OSOP extraction, with scatter plots and step results

☐ Option 3: FVP assessment ONLY

☐ Option 4: FVP assessment ONLY, with scatter plots and step results

Enter Assessment Time Window

Extraction From (Format: DHHMMSS) Extraction To (Format: DHHMMSS)

Excel Name:

Input file: ***.oof, ***.osop.d4 (optional)

Input & output file: *.xlsx

This option will assess track circuit breakers with falling voltage protection by extracting the stop voltage and current results for all nodes in the inputs and compare them against the FVP protection curves.

If option 1 or option 2 is selected, Assessment Time Window inputs are required for OSOP extraction.

This option should be set to run within the simulation folder next to the simulation results. If osop.d4 results for all branch nodes are already extracted; option 3 or option 4 should be used. Otherwise, option 1 and option 2 will automatically re-extract all nodes for their step results using the .oof file.

Option 2 and option 4 will automatically generate plots and store the step results in a separate excel '***_step_outputs_plots.xlsx'.

The input excel is in the following format.

	A	B	C	D	E	F	G
1							
2	Project Name	XXXX		Guidance - How to Create Information Spreadsheet - Required for first time			
3	Simulation Number:	XXXX		1. Refer to DC Database and use vlookup table to find the value.			
4	Feeding Arrangement:	XXXX		2. All values pasted in the spreadsheet with VALUE ONLY!			
5	Modelled by:	XXXX					
6	Date:	#####		Note that no functions allowed for the information table below!			
7							
8							
9							
10							
11	Substation / TPHut	OSLO Branch ID	Track CB Type	Falling Voltage Protection Type	FVP setting (kA)	Rolling Stock Used	
12	Camden	901/S	MM74	MM74_660V	5.0	72TS, 378-5	
13	Camden	902/E	MM74	MM74_660V	5.0	72TS, 378-5	
14	Camden	903/E	MM74	MM74_660V	5.0	72TS, 378-5	
15	Camden	904/S	MM74	MM74_660V	5.0	72TS, 378-5	
16	Willesden	907/S	MM74	MM74_660V	5.0	72TS, 378-5	
17	Willesden	908/E	MM74	MM74_660V	5.0	72TS, 378-5	
18	Willesden	909/E	MM74	MM74_660V	6.0	72TS, 378-5	
19	Willesden	910/S	MM74	MM74_660V	6.0	72TS, 378-5	
20	Harlesden	909/S	MM74	MM74_660V	6.0	72TS, 378-5	
21	Harlesden	910/E	MM74	MM74_660V	6.0	72TS, 378-5	
22	Harlesden	911/E	MM74	MM74_660V	5.0	72TS, 378-5	
23	Harlesden	912/S	MM74	MM74_660V	5.0	72TS, 378-5	
24	Wembley	911/S	MM74	MM74_660V	5.0	72TS, 378-5	
25	Wembley	912/E	MM74	MM74_660V	5.0	72TS, 378-5	
26	Wembley	913/E	MM74	MM74_660V	5.0	72TS, 378-5	
27	Wembley	914/S	MM74	MM74_660V	5.0	72TS, 378-5	
28	Kenton	913/S	MM74	MM74_660V	5.0	72TS, 378-5	
29	Kenton	914/E	MM74	MM74_660V	5.0	72TS, 378-5	
30	Kenton	915/E	MM74	MM74_660V	5.0	72TS, 378-5	
31	Kenton	916/S	MM74	MM74_660V	5.0	72TS, 378-5	
32	Hatchend	917A/S	MM74	MM74_660V	5.0	72TS, 378-5	
33	Hatchend	918R/F	MM74	MM74_660V	5.0	72TS, 378-5	

H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB
Available Falling Voltage Protection Types and settings based on 3rd order polynomial equation ax^3+bx^2+cx+d																				
Type	Setting (kA)	a (*3)	b (*2)	c (*1)	d	a (*3)	b (*2)	c (*1)	d	a (*3)	b (*2)	c (*1)	d	Rolling Stock Voltage (V)	72TS Current (kA)	378-5 Voltage (V)	378-5 Current (kA)	Voltage (V)	24TS Current (kA)	
RJR530	5.0	2.5073	-10.539	65.806	479.15	1.8958	-8.5459	57.221	446.80	1.4335	-6.9294	49.756	416.64	450	3.0775	399	0	400	0.46	
RJR530	5.5	1.8065	-7.2899	62.75	428.92	1.3659	-5.9110	54.564	399.96	1.0328	-4.7929	47.446	372.96	500	3.0882	400	0	450	3.286	
RJR530	6.0	2.0397	-10.822	72.236	374.42	1.5423	-8.7748	62.813	349.14	1.1661	-7.115	54.619	325.57	540	3.0954	450	0.75	500	2.946	
RJR530	6.5	1.3804	-5.8419	62.224	323.11	1.0437	-4.7369	54.107	301.29	0.7892	-3.8409	47.048	280.95	575	3.101	500	1.5	550	2.665	
RJR530	7.0	0.9229	-2.5807	55.948	270.28	0.6978	-2.0925	48.649	252.03	0.5276	-1.6967	42.302	235.02	600	3.1091	550	2.25	600	2.490	
RJR530	7.5	0.8196	-2.5585	56.883	219.64	0.6197	-2.0746	49.419	204.82	0.4686	-1.6822	42.972	190.99	630	3.1182	600	3	630	2.472	
RJR530	8.0	1.0413	-5.7663	65.932	165.08	0.7873	-4.6756	57.331	153.93	0.5953	-3.7912	49.852	143.54	660	3.1267	700	2.743	750	2.058	
RJR530	8.5	0.9814	-5.9545	63.899	141.94	0.7420	-4.8282	55.563	132.36	0.5611	-3.9149	48.315	123.42	675	3.1308	750	2.5601	1000	1.533	
RJR530	9.0	1.0914	-8.0474	67.333	115.83	0.8253	-6.5252	58.549	108.01	0.624	-5.291	50.911	100.72	750	3.1491	850	2.2589			
RJR530	9.5	0.9331	-7.062	63.486	87.334	0.7055	-5.7262	55.204	81.44	0.5335	-4.6431	48.002	75.94	800	3.1599	900	0.1389			
RJR530	10.0	1.0196	-9.1504	69.533	52.767	0.7710	-7.4196	60.462	49.21	0.5829	-6.0162	52.575	45.883							
HSL	7.0	1.0852	1.4435	25.436	265.28	0.897	1.2513	23.125	252.93	0.7414	1.0847	21.024	241.16							
HSL	7.5	0.744	2.8919	20.161	262.37	0.615	2.5069	18.329	250.17	0.5083	2.1731	16.664	238.53							
HSL	8.0	0.7055	1.4417	21.974	256.22	0.5832	1.2498	19.977	244.31	0.4821	1.0834	18.162	232.94							
HSL	8.5	0.6231	1.8182	10.908	251.02	0.5901	1.5763	18.900	230.35	0.362	1.0654	16.165	220.23							

Column A contains the name of the substation or track parallelling hut. Rows of the same name will have their results grouped together for substation results summary and plots.

Column B contains the OSLO branch ID; the branch node is required so please enter it in the format of (XXXX/S or XXXX/E).

Column C is the track circuit breaker type, this column is for information only.

Column D is the falling voltage protection type, the names in column D should match the names on column H.

Column E is for the FVP current setting, please make sure the current selected is present in column I for the selected type.

Column F contains the rolling stock used enroute, please make sure this rolling stock has the current limitation curve information stored in the rolling stock table from column W. The name of the rolling stock must match cells X10, Z10, AB10 If more than 1 rolling stock is selected they should be separated by ' , '.

Column G onwards contains setting data for the FVP protection or the rolling stock; please edit with caution.

The table from column H to column U contains the FVP setting curves, new FVP protection types or settings could be added by adding information to rows below. (Do not leave any empty rows). FVP type and the current settings are defined in column H and I. Three curves, the lower trip limit (-10% or -15%) the nominal trip limit, and the upper trip limit (-10% or -15%) are defined in the table. They are extrapolated from data sheets into 3rd order polynomial best fit equations. The coefficients for lower, nominal, upper trip limits are stored in column J to column U.

The table from column W contains the rolling stock current limitation curve from rolling stock characteristics. The name of the rolling stock is stored above the current column (in cell X10 for Voltage in column W and Current in column X). Rolling stock characteristics could be edited or added to the right following the same format.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													
2		Project Name:	XXXX										
3		Simulation Name:	BL021										
4		Feeding Arrang:	XXXX										
5		Result Created by:	XXXX										
6		Result Created at:	24-11-2025 10:30										
7													
8													
9													
10													
		Substation Name	TCB Type	FVP Type	FVP setting (kA)	Number of Nodes	Total Data Point	Total No. Exceed rating lower trip limit	Total No. Exceed rating nominal trip limit	Total No. Exceed rating upper trip limit	% Exceed lower trip limit	% Exceed nominal trip limit	% Exceed upper trip limit
11		Camden	MM74	MM74_660V	5	4	54188	0	0	0	0.00%	0.00%	0.00%
12		Harlesden	MM74	MM74_660V	5	2	27094	0	0	0	0.00%	0.00%	0.00%
13		Harlesden	MM74	MM74_660V	6	2	27094	0	0	0	0.00%	0.00%	0.00%
14		Harlesden	MM74	MM74_660V	5	2	27094	0	0	0	0.00%	0.00%	0.00%
15		Harlesden	MM74	MM74_660V	6	2	27094	0	0	0	0.00%	0.00%	0.00%
16		Harlesden	MM74	MM74_660V	5	4	54188	0	0	0	0.00%	0.00%	0.00%
17		Harlesden	MM74	MM74_660V	6	2	27094	0	0	0	0.00%	0.00%	0.00%
18		Harlesden	MM74	MM74_660V	5	2	27094	0	0	0	0.00%	0.00%	0.00%
19		Harlesden	MM74	MM74_660V	6	2	27094	0	0	0	0.00%	0.00%	0.00%
20		Harlesden	MM74	MM74_660V	5	4	54188	0	0	0	0.00%	0.00%	0.00%
21		Harlesden	MM74	MM74_660V	5	2	27094	0	0	0	0.00%	0.00%	0.00%
22		Harlesden	MM74	MM74_660V	6	2	27094	0	0	0	0.00%	0.00%	0.00%
23													

Results in branches and summary results in substations are shown in this format showing the TCB Type, FVP type, FVP setting, number of nodes (for the substation), total number of data points included (depending on simulation duration and number of nodes), and if any data points exceeded each FVP protection curves.

If a substation has TCBs of different types of with different settings, the results will be treated separately.

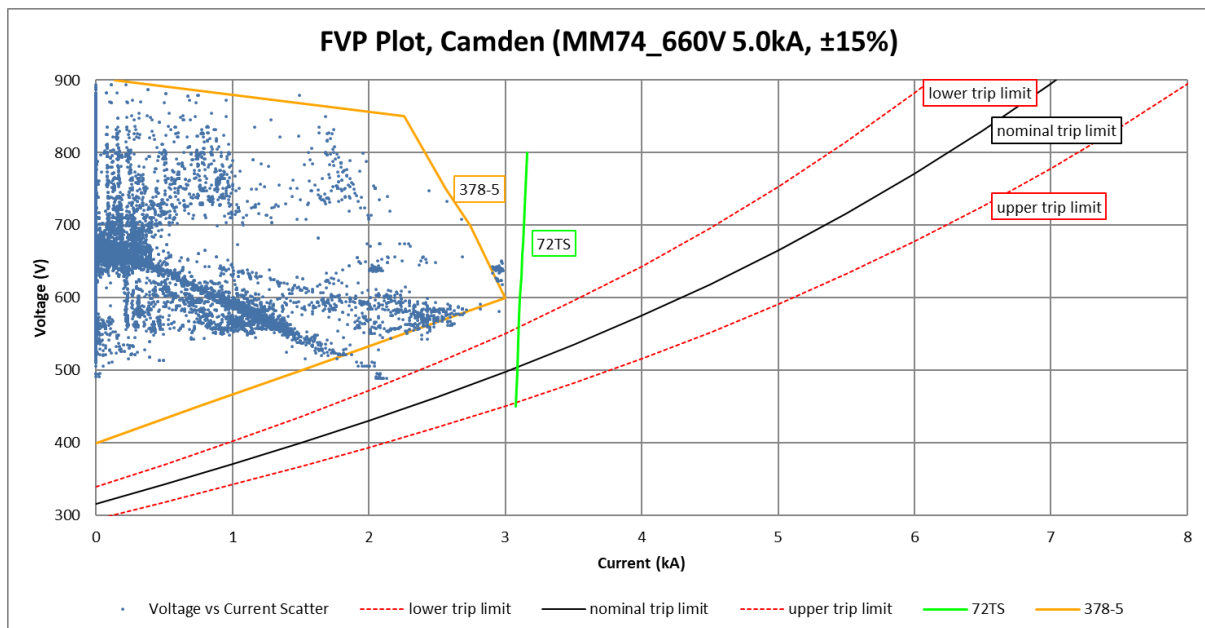
If option 2 or option 4 are selected, the step results and plots will be saved in a separate spreadsheet.

B		C		D		E		G		H		I		J		K		L		M		N		O		P		Q		R	
Project Name: XXXX																															
Simulation Name: BLO21																															
Feeding Arrangement: XXXX																															
Result Created by: XXXX																															
Result Created at: 24-11-2025 10:30																															
Substation Name: Camden																															
TCS Type: MM74																															
FVP Type: MM74_660V																															
FVP setting (kA): S																															
FVP coefficients for plotting curves																															
±15%																															
-% A (*3) -% B (*2) -% C (*1) -% D 100% A (*3) 100% B (*2) 100% C (*1) 100% D -% A (*3) -% B (*2) -% C (*1) -% D																															
0.5906 1.3107 61.471 338.89 0.4466 1.0608 53.452 316.01 0.3377 0.8618 46.479 294.68																															
BranchID Type Time P_list Q_list Voltage V_angle Current I_angle Current kA Voltage V FVP test Current (kA) -% Voltage (V) lower trip limit 100% Voltage (V) nominal trip limit -% Voltage (V) upper trip limit																															
901 BS 05:11:05 0 0 0.684 0 0 0 0 0 684 0 0 338.89 316.01 316.01 294.68																															
901 BS 05:11:10 0 0 0.684 0 0 0 0 0 0 684 0 0.5 370.027 343.057525 318.1771625																															
901 BS 05:11:15 0 0 0.684 0 0 0 0 0 0 684 0 1 402.2623 370.3714 343.1585																															
901 BS 05:11:20 0 0 0.684 0 0 0 0 0 0 684 0 1.5 436.03885 400.086375 367.4773875																															
901 BS 05:11:25 0 0 0.684 0 0 0 0 0 0 684 0 2 471.7996 430.738 393.7868																															
901 BS 05:11:30 0 0 0.684 0 0 0 0 0 0 684 0 2.5 509.9875 463.260625 421.5403125																															
901 BS 05:11:35 0 0 0.683 0 0 0 0 0 0 683 0 3 551.0455 497.3984 450.3911																															
901 BS 05:11:40 0 0 0.682 0 0 0 0 0 0 682 0 3.5 595.41655 535.259275 482.3924375																															
901 BS 05:11:45 0 0 0.682 0 0 0 0 0 0 682 0 4 643.5436 575.4052 515.9976																															
901 BS 05:11:50 0 0 0.684 0 0 0 0 0 0 684 0 4.5 693.8696 618.762125 552.0598625																															
901 BS 05:11:55 0 0 0.684 0 0 0 0 0 0 684 0 5 752.8375 665.665 590.8325																															
901 BS 05:12:00 0 0 0.682 0 0 0 0 0 0 682 0 5.5 814.89025 716.448775 632.5687875																															
901 BS 05:12:05 0 0 0.682 0 0 0 0 0 0 682 0 6 882.4708 771.4484 677.532																															
901 BS 05:12:10 0 0 0.682 0 0 0 0 0 0 682 0 6.5 956.0221 830.998825 725.8454125																															
901 BS 05:12:15 0 0 0.684 0 0 0 0 0 0 684 0 7 1035.9871 891.433 778.0923																															
901 BS 05:12:20 0 0 0.684 0 0 0 0 0 0 684 0 7.5 1122.80875 965.091875 834.2159375																															
901 BS 05:12:25 0 0 0.684 0 0 0 0 0 0 684 0 8 1216.93 1040.3044 894.5696																															
901 BS 05:12:30 0 0 0.684 0 0 0 0 0 0 684 0 8.5 1318.7938 1121.407525 959.4065625																															
901 BS 05:12:35 0 0 0.684 0 0 0 0 0 0 684 0 9 1428.8411 1208.7362 1028.8801																															
901 BS 05:12:40 0 0 0.684 0 0 0 0 0 0 684 0 9.5 1547.53085 1302.625375 1103.543488																															
901 BS 05:12:45 0 0 0.684 0 0 0 0 0 0 684 0 10 1675.27 1403.41 1183.35																															
901 BS 05:12:50 0 0 0.684 0 0 0 0 0 0 684 0 0 0 0 0 0 0 0																															
901 BS 05:12:55 0 0 0.684 0 0 0 0 0 0 684 0 0 0 0 0 0 0 0																															
901 BS 05:13:00 0 0 0.684 0 0 0 0 0 0 684 0 0 0 0 0 0 0 0																															
901 BS 05:13:05 0 0 0.684 0 0 0 0 0 0 684 0 0 0 0 0 0 0 0																															
901 BS 05:13:10 0 0 0.684 0 0 0 0 0 0 684 0 0 0 0 0 0 0 0																															
901 BS 05:13:15 0 0 0.684 0 0 0 0 0 0 684 0 0 0 0 0 0 0 0																															
901 BS 05:13:20 0 0 0.684 0 0 0 0 0 0 684 0 0 0 0 0 0 0 0																															
901 BS 05:13:25 0 0 0.684 0 0 0 0 0 0 684 0 0 0 0 0 0 0 0																															
901 BS 05:13:30 0 0 0.684 0 0 0 0 0 0 684 0 0 0 0 0 0 0 0																															
901 BS 05:13:35 0 0 0.684 0 0 0 0 0 0 684 0 0 0 0 0 0 0 0																															
901 BS 05:13:40 0 0 0.684 0 0 0 0 0 0 684 0 0 0 0 0 0 0 0																															
901 BS 05:13:45 0 0 0.684 0 0 0 0 0 0 684 0 0 0 0 0 0 0 0																															
901 BS 05:13:50 0 0 0.684 0 0 0 0 0 0 684 0 0 0 0 0 0 0 0																															
All Rolling Stocks Used																															
72TS																															
Voltage Current Voltage Current																															
450 3.0775 399 0																															
500 3.0882 400 0																															
540 3.0954 450 0.75																															
575 3.101 500 1.5																															
600 3.1091 550 2.25																															
630 3.1182 600 3																															
660 3.1267 700 2.745																															
675 3.1308 750 3.5601																															
750 3.1491 850 2.2589																															
Sum results each substation Camden_MM74_660V_5.0 Harlesden_MM74_660V_5.0 Harlesden_MM74_660V_5.0 Hatchend_MM74_660V_5.0																															

Row 6-8, columns E to R shows the FVP settings selected and coefficients used.

Row 35, column O onwards shows the rolling stock current limitation characteristics selected for this substation.

The step results are stored in row 11 onwards, column B to M.



Scatter plot showing the results will be automatically plotted on column T.

11.5 DC Substation Assessment Summary

Page 11: DC Substation Assessment Summary

This will produce assessment summary against ratings for all scenarios. User is expected to set some presettings in a spreadsheet. A setting excel required.

NOTE: Excel spreadsheet in .xlsx format is required before click RUN.

NOTE: Import proper excel as required Below if needed.

- ☐ Option 1: TRU Summary - [Import: Excel - For TRU Summary if needed]
- ☐ Option 2: Main DC Circuit Breaker Summary - [Import: Excel - For Main DCCB Summary if needed]
- ☐ Option 3: DC Busbar Summary - [Import: Excel - For DCBB Summary if needed]
- ☐ Option 4: Negative ETE Summary - [Import: Excel - For Neg ETE Summary if needed]
- ☐ Option 5: Impedance Bond Summary - [Import: Excel - For Imp Bond Summary if needed]
- ☐ Option 6: Track Circuit Breaker Summary - [Import: Excel - For Track CB Summary if needed]
- ☐ Option 7: Positive ETE Summary - [Import: Excel - Pos ETE Summary if needed]
- ☐ Option 8: Train Min Voltage Summary - [Import: Excel - Train V Summary if needed]

Excel Name:

Select

RUN!

Back to Home

Back to Processing

This section performs several DC assessments based on results from section 0 and 11.2 and assessment ratings entered by the user.

This section can combine the results from several N-0 and N-1 scenarios to the summary results sheet for each assessment. Therefore, it is required to copy the oslo_extension.py to outside the simulation folder next to all required simulation folder for this section to work.

The folder structure must be arranged similar to the one below. DCFXXX are all the N-0 and N-1 scenarios to be assessed.

Note that the .xlsx files and oslo_extension.py are located next to these folders. Please make sure that relevant extractions for all specified simulations are completed before using this section.

In this section, results which have exceeded the assessment rating are highlighted as red. Results which are close to exceeding (within 10% or 90% of the assessment rating) are highlighted in amber.

Name	Status
DCF312	✓
DCF321	✓
DCF322	✓
DCF323	✓
DCF324	✓
DCF325	✓
DCF326	✓
DCF327	✓
DCF328	✓
DCF352	✓
DCF_DCBB.xlsx	✓
DCF_ImpBond_rating.xlsx	✓
DCF_mainCB_rating.xlsx	✓
DCF_NegETE_rating.xlsx	✓
DCF_PosETE_rating.xlsx	✓
DCF_trackCB_rating.xlsx	✓
DCF_trainV.xlsx	✓
DCF_TRU_rating.xlsx	✓
oslo_extension.py	✓

Each assessment option requires a different Excel input file. The relevant input file template could be generated using the 'Import' menu.

Within the excel on the right-hand side there is a table for the simulation folder names and simulation names. This section is the same format across all excel spreadsheets used within this section. An example is shown below. Use outage number 0 for N-0 (no outages) scenario.

ATTENTION: Number 0 is reserved for N-0 scenario.

Outage List

Outage Number	Simulation Sub-folder	Simulation Name	Note
0	DCF312	DCF312	N-0
1	DCF321	DCF321	N-1
2	DCF322	DCF322	N-1
3	DCF323	DCF323	N-1
4	DCF324	DCF324	N-1
5	DCF325	DCF325	N-1
6	DCF326	DCF326	N-1
7	DCF327	DCF327	N-1
8	DCF328	DCF328	N-1
9	DCF352	DCF352	N-1

11.5.1 Option 1 TRU Summary

This option generates a summary of the TRU results and highlight any rating exceedances in any of the assessed time period from any of the assessed simulation. The user is required to fill in the summary excel with the substation names and ID, their outage number (use 0 if no outages are simulated), and their N-0 and N-1 ratings.

The template for this Excel file can be generated using the 'Excel – (DC) For TRU Summary' option found in the 'Import' menu. The template, named 'TRU_rating_template.xlsx' (which can be renamed as desired), follows the format shown below. After allocating the necessary information in the file, user must save and close it. Then, the file name (without suffix) should be entered into the relevant box or selected using the 'select' button.



		Intact (N-0) Rating												Outage (N-1) Rating									
Substation Name	OSLO ID	Outage Scenario	TRU Rating (MW)	TRU Type	1min	4min	5min	15min	30min	60min	120min	180min	P30min	1min	4min	5min	15min	30min	60min	120min	180min	P30min	
Sturt Lane	STUL	0	3	G	15.32	12.00	11.32		8.09	7.10	6.00	5.77		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Fleet	FLET	0	3	G	15.32	12.00	11.32		8.09	7.10	6.00	5.77		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Winchfield	WNCH	5	3	G	15.32	12.00	11.32		8.09	7.10	6.00	5.77		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Newnham	NEWH	1	3	G	15.32	12.00	11.32		8.09	7.10	6.00	5.77		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Barton	BART	2	3	G	6.00	3.13	3.00		2.67	2.40	2.13	2.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Worthing Junction	WOJC	3	2	SP	13.00	9.47	9.00		5.98	5.11	4.36	3.98		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
	OAKL	4	3	G	6.00	3.13	3.00		2.67	2.40	2.13	2.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Waltham	WAHA	5	1	SP	13.00	9.47	9.00		5.98	5.11	4.36	3.98		6.50	4.74	4.50		2.99	2.55	2.18	1.99		
Micheldever	MICH	1	3	G	6.00	3.13	3.00		2.67	2.40	2.13	2.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Northbrook	NRTH	2	1	SP	13.00	9.47	9.00		5.98	5.11	4.36	3.98		6.50	4.74	4.50		2.99	2.55	2.18	1.99		
Kingsworthy	KIGS	3	1	SP	13.00	9.47	9.00		5.98	5.11	4.36	3.98		6.50	4.74	4.50		2.99	2.55	2.18	1.99		
Winchester	WSTR	4	3	G	15.32	12.00	11.32		8.09	7.10	6.00	5.77		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Shawford	SHAW	5	1	SP	13.00	9.47	9.00		5.98	5.11	4.36	3.98		6.50	4.74	4.50		2.99	2.55	2.18	1.99		
Eastleigh	ESU	1	1.5	SP	19.40	14.21	13.51		8.98	7.66	6.54	5.97		9.75	7.11	6.75		4.49	3.83	3.27	2.98		
St Denys	SDYS	2	3	G	15.32	12.00	11.32		8.09	7.10	6.00	5.77		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Northam A	NORT	3	3.2	G	49.01	38.40	36.22		25.88	22.72	19.20	18.46		32.67	25.60	24.15		17.25	15.15	12.80	12.31		
Northam B	SOHP	9	1	SP	13.00	9.47	9.00		5.98	5.11	4.36	3.98		6.50	4.74	4.50		2.99	2.55	2.18	1.99		
Millbrook	MLBR	4	3	G	15.32	12.00	11.32		8.09	7.10	6.00	5.77		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Redbridge	RBGE	5	1	SP	13.00	9.47	9.00		5.98	5.11	4.36	3.98		6.50	4.74	4.50		2.99	2.55	2.18	1.99		
Ashurst	AHUR	6	1	SP	13.00	9.47	9.00		5.98	5.11	4.36	3.98		6.50	4.74	4.50		2.99	2.55	2.18	1.99		
South Junction	SJNC	6	1.5	F	6.00	3.13	3.00		2.67	2.40	2.13	2.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Woolston	WOOL	7	1.5	F	6.00	3.13	3.00		2.67	2.40	2.13	2.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Woodfield	WOOF	0	1	SP	13.00	9.47	9.00		5.98	5.11	4.36	3.98		6.50	4.74	4.50		2.99	2.55	2.18	1.99		
Brockenhurst	BRHS	0	3	G	15.32	12.00	11.32		8.09	7.10	6.00	5.77		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Lower Swanwick	LOSW	8	1.5	F	6.00	3.13	3.00		2.67	2.40	2.13	2.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
	FAREH	0	1.5	F	6.00	3.13	3.00		2.67	2.40	2.13	2.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Tapnape	TAPN	0	1.5	F	6.00	3.13	3.00		2.67	2.40	2.13	2.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Botley	BOOT	0	1.5	F	6.00	3.13	3.00		2.67	2.40	2.13	2.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Moorgreen	MOOR	8	1.5	F	6.00	3.13	3.00		2.67	2.40	2.13	2.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	

The assessment tool will gather the substation RMS Current summary from all the specified folders to generate a results summary. Please make sure the data extraction in 11.1.1 is performed in all simulation folders.

These columns information is essential:

- OSLO ID: Empty cell is NOT allowed.
- Outage Scenario: Allow empty cell which will be assigned to zero automatically.
- Rating section: Allow empty cell which will assume assessment pass.

After running this option, the results will be updated to the same excel file in the form of a results summary page; showing all substations which has exceeded any ratings and results pages for each RMS time period showing results of all assessed substations. Currently N-0 results from the results summary page shows the maximum load at that substation when it is not in outage (adjacent substation could be in outage) N-1 results is the maximum load where that substation is in outage. The tool will be updated to include the maximum loads during a global N-0 scenario at its next update (when all substations are feeding normally).

Summary Title:		Failure Substation Summary																	
OSLO	Substation	1min_N-0	4min_N-0	5min_N-0	15min_N-0	30min_N-0	60min_N-0	120min_N-0	180min_N-0	P30min_N-0	1min_N-1	4min_N-1	5min_N-1	15min_N-1	30min_N-1	60min_N-1	120min_N-1	180min_N-1	P30min_N-1
BART	Barton	174.67%	281.08%	284.96%		189.04%	189.01%	204.15%	214.36%		707.27%	608.05%	589.32%		341.47%	309.36%	291.52%	287.60%	
MICH	Micheldever	109.13%	158.00%	159.95%		118.39%	118.85%	114.73%	118.46%										
OAKL	Oakley	153.37%	242.19%	234.69%		142.66%	141.95%	137.54%	140.23%										
Summary Title		1min TRU Assessment (RMS Current)																	
Result		Failure Substation as Table Below																	
OSLO	Substation	Outage in Scenario No.	N-0 Rating (kA)	N-1 Rating (kA)	outage_s_cenaria_0	outage_s_cenaria_1	outage_s_cenaria_2	outage_s_cenaria_3	outage_s_cenaria_4	outage_s_cenaria_5	outage_s_cenaria_6	outage_s_cenaria_7	outage_s_cenaria_8	outage_s_cenaria_9					
BART	Barton	2	6.00	0.00	8.22	10.00	7.07	10.48	8.42	8.26	8.22	8.22	8.21	8.22					
OAKL	Oakley	4	6.00	0.00	7.58	7.05	7.58	9.20	7.86	7.57	7.58	7.57	7.58	7.58					
MICH	Micheldever	1	6.00	0.00	6.25		6.55	6.28	6.22	6.33	6.26	6.26	6.26	6.25					
Summary Title		4min TRU Assessment (RMS Current)																	
Result		Failure Substation as Table Below																	
OSLO	Substation	Outage in Scenario No.	N-0 Rating (kA)	N-1 Rating (kA)	outage_s_cenaria_0	outage_s_cenaria_1	outage_s_cenaria_2	outage_s_cenaria_3	outage_s_cenaria_4	outage_s_cenaria_5	outage_s_cenaria_6	outage_s_cenaria_7	outage_s_cenaria_8	outage_s_cenaria_9					
BART	Barton	2	3.13	0.00	7.02	8.77	6.08	8.79	7.22	7.10	7.02	7.02	7.02	7.02					
OAKL	Oakley	4	3.13	0.00	6.19	6.11	6.23	7.57	6.54	6.18	6.19	6.18	6.18	6.19					
MICH	Micheldever	1	3.13	0.00	4.39		4.93	4.46	4.94	4.63	4.40	4.40	4.39	4.39					

Start Result 1min 4min 5min 15min 30min 60min 120min 180min P30min +

11.5.2 Option 2 Main DC Circuit Breaker Summary

This option generates a summary of the Main DC circuit breaker results and highlight any rating exceedances from any of the assessed simulation. The user is required to fill in the summary excel

with the substation names and ID, their outage number (use 0 if no outages are simulated), and their N-0 and N-1 ratings.

The template for this Excel file can be generated using the 'Excel – (DC) For MainDCCB Summary' option found in the 'Import' menu. The template, named 'mainCB_rating_template.xlsx' (which can be renamed as desired), follows the format shown below. After allocating the necessary information in the file, user must save and close it. Then, the file name (without suffix) should be entered into the relevant box or selected using the 'select' button.

	Substation Name	OSLO ID	Outage Scenario	Main DC CB Type	Intact	Outage
					N-0 Rating (kA)	N-1 Rating (kA)
1	Sturt Lane	STUL	0	RJR526C	4.00	0.00
2	Fleet	FLET	0	TN	4.00	0.00
3	Winchfield	WNCH	5	NDC6	6.00	0.00
4	Newnham	NEWH	1	TN	4.00	0.00
5	Barton	BART	2	8MF94	3.00	1.50
6	Worthing Junction	WOJC	3	TN	1.50	0.00
7	Oakley	OAKL	4	8MF94	6.00	0.00
8	Waltham	WAHA	5	TN	3.00	1.50
9	Micheldever	MICH	1	8MF94	6.00	0.00
10	Northbrook	NRTH	2	TN	8.00	4.00
11	Kingsworthy	KIGS	3	TN	8.00	4.00
12	Winchester	WSTR	4	8MF94	6.00	0.00
13	Shawford	SHAW	5	TN	8.00	4.00
14	Eastleigh	ESLI	1	TN	8.00	4.00

These columns information is essential:

- OSLO ID: Empty cell is NOT allowed.
- Outage Scenario: Allow empty cell which will be assigned to zero automatically.
- Rating section: Allow empty cell which will assume assessment pass.

The assessment tool will gather the substation RMS Current summary from all the specified folders to generate a results summary. Please make sure the data extraction in 11.1.1 is performed in all simulation folders. The DC circuit breaker assessment compares the 30min substation current loads to the DC main circuit breaker continuous ratings.

After running this option, the results will be updated to the same excel file in the form of a results summary page; showing all substations which has exceeded any ratings and results pages for 30min RMS current showing results of all assessed substations. Below is an example of the results page showing several substations which have exceeded the assessment rating.

Summary Title:		Failure Substation Summary													
OSLO	Substation	30min_N-0	30min_N-1												
BART	Barton	201.88%	272.99%												
FLET	Fleet	114.59%													
WAHA	Waltham	148.89%	158.82%												
WOJC	Worthing Junction	273.76%													
Summary Title		30min Main DC Circuit Breaker Assessment (RMS Current)													
Result		Failure Substation as Table Below													
OSLO	Substation	Outage in Scenario No.	N-0 Rating (kA)	N-1 Rating (kA)	outage_s cenario_0	outage_s cenario_1	outage_s cenario_2	outage_s cenario_3	outage_s cenario_4	outage_s cenario_5	outage_s cenario_6	outage_s cenario_7	outage_s cenario_8	outage_s cenario_9	
FLET	Fleet	0	4.00	0.00	3.62	3.65	3.61	3.61	3.57	4.58	3.62	3.62	3.62	3.62	
BART	Barton	2	3.00	1.50	4.73	5.84	4.09	6.06	4.87	4.78	4.73	4.73	4.72	4.73	
WOJC	Worthing Junction	3	1.50	0.00	3.18	3.25	3.37		4.11	3.21	3.18	3.18	3.18	3.18	
WAHA	Waltham	5	3.00	1.50	3.03	3.86	3.06	3.20	4.47	2.38	3.03	3.03	3.03	3.03	

11.5.3 Option 3 DC Busbar Summary

This option generates a summary of the DC Busbar Summary results and highlight any rating exceedances from any of the assessed simulation. The user is required to fill in the summary excel with the substation names and ID, their outage number (use 0 if no outages are simulated), and their N-0 and N-1 ratings.

The template for this Excel file can be generated using the 'Excel – (DC) For DCBB Summary' option found in the 'Import' menu. The template, named 'DCBB_rating_template.xlsx' (which can be renamed as desired), follows the format shown below. After allocating the necessary information in the file, user must save and close it. Then, the file name (without suffix) should be entered into the relevant box or selected using the 'select' button.

0				Intact		Outage
	Substation Name	OSLO ID	Outage Scenario	Main DC Busbar Type - Busbar	N-0 Rating (kA)	N-1 Rating (kA)
1	Sturt Lane	STUL	0	GEC RJR 721E	6.00	6.00
2	Fleet	FLET	0	GEC RJR 721E	8.00	8.00
3	Winchfield	WNCH	5	HSS NDC4	5.50	5.50
4	Newnham	NEWH	1	GEC RJR 721E	4.50	4.50
5	Barton	BART	2	SIEMENS 8MF94 MK1	5.50	5.50
6	Worthing Junction	WOJC	3	BT HSL	5.50	5.50
7	Oakley	OAKL	4	SIEMENS 8MF94 MK1	5.50	5.50
8	Waltham	WAHA	5	BT HSL	5.50	5.50
9	Micheldever	MICH	1	HSS NDC4 SB	8.00	8.00
10	Northbrook	NRTH	2	BT HSL	5.50	5.50
11	Kingsworthy	KIGS	3	BT HSL	5.50	5.50
12	Winchester	WSTR	4	HSS NDC4 SB	6.00	6.00
13	Shawford	SHAW	5	BT HSL	6.00	6.00
14	Eastleigh	ESLI	1	BT HSL	6.00	6.00
15	St Denys	SDYS	2	SECHERON UR36	5.50	5.50

These columns information is essential:

- OSLO ID: Empty cell is NOT allowed.
- Outage Scenario: Allow empty cell which will be assigned to zero automatically.
- Rating section: Allow empty cell which will assume assessment pass.

The assessment tool will gather the substation RMS Current summary from all the specified folders to generate a results summary. Please make sure the data extraction in 11.1.1 is performed in all simulation folders. The DC Busbar assessment compares the 120min substation current loads to the DC busbar continuous ratings. Below is an example of the results page showing several substations which have exceeded the assessment rating.

Summary Title:		Failure Substation Summary																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									</
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Note that it doesn't take into account the shared load in substations with multiple TRUs. Please check manually if any busbar is over the rating, the program assumes a single TRU situation where all the load is assumed to be fed into one end of the busbar.

11.5.4 Option 4 Negative ETE Summary

This option generates a summary of the Negative ETE (Electrical Traction Equipment) results and highlight any rating exceedances from any of the assessed simulation. The user is required to fill in the summary excel with the substation names and ID, their outage number (use 0 if no outages are simulated), the number of tracks at that substation (which impacts the number of negative return cables at the substation) and their negative ETE assessment ratings (usually at 1.06kA per return cable).

The template for this Excel file can be generated using the 'Excel – (DC) For NegETE Summary' option found in the 'Import' menu. The template, named 'NegETE_rating_template.xlsx' (which can be renamed as desired), follows the format shown below. After allocating the necessary information in the file, user must save and close it. Then, the file name (without suffix) should be entered into the relevant box or selected using the 'select' button.

Substation Name	OSLO ID	Outage Scenario	Outgoing Track Number / Near	Intact Rating (kA)
Sturt Lane	STUL	0	4	1.06
Fleet	FLET	0	4	1.06
Winchfield	WNCH	5	4	1.06
Newnham	NEWH	1	4	1.06
Barton	BART	2	4	1.06
Worthing Junction	WOJC	3	4	0.40
Oakley	OAKL	4	2	1.06
Waltham	WAHA	5	2	1.06
Micheldever	MICH	1	2	1.06
Northbrook	NRTH	2	2	0.90
Kingsworthy	KIGS	3	2	0.90
Winchester	WSTR	4	2	1.06

These columns information is essential:

- OSLO ID: Empty cell is NOT allowed.
- Outage Scenario: Allow empty cell which will be assigned to zero automatically.
- Rating section: Allow empty cell which will assume assessment pass.

The assessment tool will gather the substation RMS Current summary from all the specified folders to generate a results summary. Please make sure the data extraction in 11.1.1 is performed in all simulation folders. The Negative ETE uses the 60min substation current loads and divide it using the following formular:

- For N-0 scenario, the value is divided by [number of tracks x 2 – 1] (assuming one return cable in outage)
- For N-1 scenarios, the value is divided by [number of tracks x 2] assuming no outage as another outage make it a N-2 scenario.

Below is an example of the results page showing several substations which have exceeded the assessment rating.

Summary Title		60min Negative Electrical Track Equipment Assessment (RMS Current)												
Result		Failure Substation as Table Below												
OSLO	Substation	Outage in Scenario No.	Track Number	Rating (kA)	outage_s scenario_0	outage_s scenario_1	outage_s scenario_2	outage_s scenario_3	outage_s scenario_4	outage_s scenario_5	outage_s scenario_6	outage_s scenario_7	outage_s scenario_8	outage_s scenario_9
WOJC	Worthing Junction	3	4.00	0.40	0.29	0.29	0.31		0.39	0.29	0.29	0.29	0.29	0.29
NRTH	Northbrook	2	2.00	0.90	0.63	0.95	0.49	0.65	0.66	0.64	0.63	0.63	0.63	0.63
KIGS	Kingsworthy	3	2.00	0.90	0.59	0.62	0.62	0.48	0.90	0.60	0.59	0.59	0.60	0.59

11.5.5 Option 5 Impedance Bond Summary

This option generates a summary of the Impedance Bond results and highlight any rating exceedances from any of the assessed simulation. The user is required to fill in the summary excel with the substation names and ID, their outage number (use 0 if no outages are simulated), the number of tracks at that substation (which impacts the number of impedance bonds at the substation) and their ratings according to the bonding type. The bonding Type column is for information only.

The template for this Excel file can be generated using the 'Excel – (DC) For Imp Bond Summary' option found in the 'Import' menu. The template, named 'ImpBond_rating_template.xlsx' (which can be renamed as desired), follows the format shown below. After allocating the necessary information in the file, user must save and close it. Then, the file name (without suffix) should be entered into the relevant box or selected using the 'select' button.

	Substation Name	OSLO ID	Outage Scenario	Outgoing Track Number / Near	Bonding Type	Intact	
						60min Rating (kA)	120min Rating (kA)
2	Sturt Lane	STUL	0	4	Type 2	3.60	
3	Fleet	FLET	0	4	Type 2	3.60	
4	Winchfield	WNCH	5	4	Type 2	0.36	
5	Newnham	NEWH	1	4	Type 2	0.25	
6	Barton	BART	2	4	Type 2	3.60	
7	Worthing Junction	WOJC	3	4	Type 2	3.60	
8	Oakley	OAKL	4	2	Type 2	3.60	
9	Waltham	WAHA	5	2	Type 2	3.60	
0	Micheldever	MICH	1	2	Type 2	3.60	
1	Northbrook	NRTH	2	2	Type 2	3.60	
2	Kingsworthy	KIGS	3	2	Type 2	3.60	
3	Winchester	WSTD	4	2	Type 2	3.60	

These columns information is essential:

- OSLO ID: Empty cell is NOT allowed.
- Outage Scenario: Allow empty cell which will be assigned to zero automatically.
- Rating section: Allow empty cell which will assume assessment pass.

The assessment tool will gather the substation RMS Current summary from all the specified folders to generate a results summary. Please make sure the data extraction in 11.1.1 is performed in all simulation folders. The Negative ETE uses the 60min and 120min substation RMS current loads since different bonding type has ratings in different time periods. The substation load is divided using the following formular:

- For N-0 scenario, the value is divided by [number of tracks x 2 – 1] (assuming one return cable in outage)
- For N-1 scenarios, the value is divided by [number of tracks x 2] assuming no outage as another outage make it a N-2 scenario.

Below is an example of the results page showing several substations which have exceeded the assessment rating.

Summary Title		60min Impedance Bonding Assessment (RMS Current)													
Result		Failure Substation as Table Below													
OSLO	Substation	Outage in Scenario No.	Track Number	Bonding Type	Rating (kA)	outage_s_cenarior_0	outage_s_cenarior_1	outage_s_cenarior_2	outage_s_cenarior_3	outage_s_cenarior_4	outage_s_cenarior_5	outage_s_cenarior_6	outage_s_cenarior_7	outage_s_cenarior_8	outage_s_cenarior_9
WNCH	Winchfield	5	4	Type 2	0.36	0.30	0.35	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
NEWH	Newnham	1	4	Type 2	0.25	0.29		0.27	0.26	0.25	0.34	0.25	0.25	0.25	0.25
Summary Title		120min Impedance Bonding Assessment (RMS Current)													
Result		Assessment All Pass													
OSLO	Substation	Outage in Scenario No.	Track Number	Bonding Type	Rating (kA)	outage_s_cenarior_0	outage_s_cenarior_1	outage_s_cenarior_2	outage_s_cenarior_3	outage_s_cenarior_4	outage_s_cenarior_5	outage_s_cenarior_6	outage_s_cenarior_7	outage_s_cenarior_8	outage_s_cenarior_9

11.5.6 Option 6 Track Circuit Breaker Summary

This option generates a summary of the Track Circuit Breaker results and highlight any rating exceedances from any of the assessed simulation. The user is required to fill in the summary excel with the substation names, track CB ID, substation OSLO ID, track CB type and their ratings according to the track CB type.

The template for this Excel file can be generated using the 'Excel – (DC) For Track CB Summary' option found in the 'Import' menu. The template, named 'trackCB_rating_template.xlsx' (which can be renamed as desired), follows the format shown below. After allocating the necessary information in the file, user must save and close it. Then, the file name (without suffix) should be entered into the relevant box or selected using the 'select' button.

Substation	OSLO Branch ID	Feeder ID	Track CB Type	15min	Intact
				Standard Rating (kA)	Assessed Rating (kA) (+10%)
Newnham	E22/E	NEWH	GEC RJR 721E	1.17	1.30
Newnham	E24/E	NEWH	GEC RJR 721E	2.30	2.53
Newnham	E23/E	NEWH	GEC RJR 721E	2.30	2.53
Newnham	E21/E	NEWH	GEC RJR 721E	2.30	2.53
Newnham	E26/S	NEWH	GEC RJR 721E	2.30	2.53
Newnham	E28/S	NEWH	GEC RJR 721E	2.3	2.53
Newnham	E27/S	NEWH	GEC RJR 721E	2.3	2.53
Newnham	E25/S	NEWH	GEC RJR 721E	2.3	2.53
Basing TPH	E26/E	BASI	GEC RJR 721E	2.3	2.53
Basing TPH	E28/E	BASI	GEC RJR 721E	2.3	2.53

These columns information is essential:

- OSLO Branch ID: Empty cell is NOT allowed, and the format will be auto-checked once run.
- Assessed Rating (kA) (+10%): Allow empty cell which will assume assessment pass.

The assessment tool will gather the branch 15 min (900 seconds) RMS Current summary from all the specified folders to generate a results summary. Please make sure the data extraction in 11.2 is performed in all simulation folders. The track circuit breaker assessment compares the 15 min branch node current loads to the track circuit breaker continuous ratings.

After running this option, the results will be updated to the same excel file in the form of a results summary page showing all branches which has exceeded any ratings, and results pages for 15 min RMS current showing results of all assessed branches. Below is an example of the results page showing several track circuit breakers which have exceeded the assessment rating.

Summary Title		15min Track Feeder Circuit Breaker Assessment (RMS Current)											
Result		Failure Substation as Table Below											
OSLO	Substation	Track CB Type	Rating (kA)	outage_scenario_0	outage_scenario_1	outage_scenario_2	outage_scenario_3	outage_scenario_4	outage_scenario_5	outage_scenario_6	outage_scenario_7	outage_scenario_8	outage_scenario_9
E22/E		GEC RJR 721E	1.30	1.08	1.00	1.07	1.08	1.08	1.29	1.08	1.08	1.08	1.08
E29/S		GEC RJR 721E	1.00	1.01	0.98	1.01	1.00	1.01	1.00	1.01	1.01	1.01	1.01

11.5.7 Option 7 Positive ETE Summary

This option generates a summary of the Electrical Track Equipment results and highlight any rating exceedances from any of the assessed simulation. The user is required to fill in the summary excel with the substation names, OSLO branch ID, cable number, ETE type and their ratings according to the cable number or ETE type.

The template for this Excel file can be generated using the 'Excel – (DC) For Pos ETE Summary' option found in the 'Import' menu. The template, named 'PosETE_rating_template.xlsx' (which can be

renamed as desired), follows the format shown below. After allocating the necessary information in the file, user must save and close it. Then, the file name (without suffix) should be entered into the relevant box or selected using the 'select' button.

Intact				
Site Location	OSLO Branch ID	Cable Number	Cable / ETE Type	Rating (kA)
Newnham	E22/E	Double	Default	2.60
Newnham	E24/E	Double	Default	2.60
Newnham	E23/E	Double	Default	2.60
Newnham	E21/E	Double	Default	2.60
Newnham	E26/S	Double	Default	2.60
Newnham	E28/S	Double	Default	2.60
Newnham	E27/S	Double	Default	2.60
Newnham	E25/S	Double	Default	2.60
Basing TPH	E26/E	Double	Default	2.60
Basing TPH	E28/E	Double	Default	2.60

These columns information is essential:

- OSLO Branch ID: Empty cell is NOT allowed, and the format will be auto-checked once run.
- Rating (kA): Allow empty cell which will assume assessment pass.

The assessment tool will gather the branch 30 min (1800 seconds) RMS Current summary from all the specified folders to generate a results summary. Please make sure the data extraction in 11.2 is performed in all simulation folders. The track circuit breaker assessment compares the 30 min branch node current loads to the track circuit breaker continuous ratings.

After running this option, the results will be updated to the same excel file in the form of a results summary page showing all branches which has exceeded any ratings, and results pages for 30 min RMS current showing results of all assessed branches. Below is an example of the results page showing several track circuit breakers which have exceeded the assessment rating.

Summary Title		30min Postive Electrical Track Equipment Assessment (RMS Current)											
Result		Failure Substation as Table Below											
OSLO	Location	Cable Number	Rating (kA)	outage_scenario_0	outage_scenario_1	outage_scenario_2	outage_scenario_3	outage_scenario_4	outage_scenario_5	outage_scenario_6	outage_scenario_7	outage_scenario_8	outage_scenario_9
223a/S	Eastleigh	Single	1.30	1.12	1.62	1.12	1.08	1.11	1.13	0.67	1.08	1.04	1.08
E68/E	Eastleigh	Double	2.60	2.29	2.16	2.34	2.28	2.29	2.24	2.22	2.25	2.24	2.25
208b/S	Woolston	Single	1.30	1.04	1.03	1.03	1.04	1.04	1.04	1.04	0.88	1.29	1.03

11.5.8 Option 8 Train Min Voltage Summary

This option generates a summary of the train's minimum voltage results and highlight any voltage below the voltage threshold. The user is required to fill in the summary excel with the OSLO train No, rolling stock type and the voltage threshold according to the rolling stock type.

The template for this Excel file can be generated using the 'Excel – (DC) For Train V Summary' option found in the 'Import' menu. The template, named 'trainV_rating_template.xlsx' (which can be renamed as desired), follows the format shown below. After allocating the necessary information in the file, user must save and close it. Then, the file name (without suffix) should be entered into the relevant box or selected using the 'select' button.

						Intact
OSLO Train No	HeadCode	Origin	Destination	Departure Time	Rolling Stock	Voltage Threshold
31	"7V12"	WOKINGF	WHATFHH	15:38:00	Class 92 DC 800T	450
35	"4M28"	SOTOMCT	CREWBHN	09:33:00	Class 92 DC 1600T	450
36	"4M55"	SOTOMCT	LWLYSFT	08:57:00	Class 92 DC 1600T	800
38	"4M61"	SOTOMCT	TRFDLFT	12:56:00	Class 92 DC 1600T	450
39	"4M65"	SOTOMCT	LWLYSFT	13:45:00	Class 92 DC 1600T	450
40	"4O51"	WENTLOG	SOTOMCT	09:41:00	Class 92 DC 1475T	450
42	"4O90"	LEEDFLT	SOTOMCT	06:04:00	Class 92 DC 1600T	450
43	"4S59"	SOTOMCT	MOSEDNY	14:57:00	Class 92 DC 1475T	450

These columns information is essential:

- OSLO Train No: Empty cell is NOT allowed.
- Voltage Threshold: Allow empty cell which will assume assessment pass.

The assessment tool will gather the *****.osop.vlt** file from all the specified folders to generate a results summary. Please make sure the any data extraction is performed in all simulation folders. The train voltage assessment compares the train's minimum voltage from *****.osop.vlt** file against the voltage threshold.

Voltage lower than the threshold will be highlighted in red, voltage lower than 488 V will be highlighted in yellow. Note that 488 is a fixed number hard coded in the tool, the reason of choosing this number is outside the scope of this document and user could refer any DC traction power modelling report for understanding.

After running this option, the results will be updated to the same excel file in the form of a results summary page showing all trains that fails the initial assessment, and results pages for train minimum voltage summary showing results of all assessed trains. Below is an example of the results page showing several track circuit breakers which have exceeded the assessment rating.

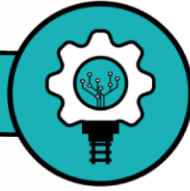
Summary Title		MinV Minimum Voltage Assessment (RMS Current)														
Result		Failure Substation as Table Below														
OSLO	HeadCode	Origin	Destinati on	Departur e Time	Rolling Stock	Voltage Thresho d (V)	outage_ scenario _0	outage_ scenario _1	outage_ scenario _2	outage_ scenario _3	outage_ scenario _4	outage_ scenario _5	outage_ scenario _6	outage_ scenario _7	outage_ scenario _8	outage_ scenario _9
35	"4M28"	SOTOMCT	CREWBH N	09:33:00	Class 92 DC 1600T	450.00	527.00	517.00	506.00	504.00	448.00	526.00	527.00	527.00	527.00	527.00
36	"4M55"	SOTOMCT	LWLYSFT	08:57:00	Class 92 DC 1600T	800.00	515.00	499.00	511.00	489.00	477.00	517.00	515.00	515.00	515.00	515.00
38	"4M61"	SOTOMCT	TRFDLFT	12:56:00	Class 92 DC 1600T	450.00	516.00	502.00	495.00	515.00	410.00	508.00	515.00	515.00	516.00	515.00
40	"4O51"	WENTLOG	SOTOMC T	09:41:00	Class 92 DC 1475T	450.00	502.00	504.00	480.00	493.00	491.00	509.00	500.00	501.00	502.00	501.00

12 Reference

1. 182786-NRD-REP-MAN-000002, VISION-OSLO Extension Guidance for Developers, Engineering Services.
2. User Guide for Computer Program 'OSLO', Copy No 2, R.J. Phillips & F. Waterland, Mathematical Modelling Unit.
3. Introduction to OSLO, issue 1.1, AEA Technology Rail.
4. 182786-NRD-REP-MAN-000006, Static Frequency Converter Modelling in VISION OSLO, Engineering Services.
5. 182786-NRD-REP-MAN-000007, Battery Train Modelling in VISION OSLO, Engineering Services.
6. 182786-NRD-REP-MAN-000011, VISION CIF File Import Guidance, Engineering Services.
7. 182786-NRD-REP-MAN-000014, VISION-OSLO Battery EMU User Manual, Engineering Services.

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