USING SKM TO CALCULATE ARC FLASH INCIDENT ENERGY WITH THE MVCF SYSTEM

APPLICATION NOTE:
MVCF NOTE 2

BY MIKE LANG,
PRINCIPAL FIELD
ENGINEER

INTRODUCTION

To get SKM Powertools to calculate incident energy with Mersen's Medium Voltage Controllable Fuse (MVCF) system, it is necessary to follow some simple guidelines when building the one-line, selecting components and running the analysis. These three parts of the program are reviewed below.

BASICS OF BUILDING THE ONE-LINE

SKM is similar to other power system analysis programs in that it requires the creation of a one-line diagram of the system using the components in the equipment toolbar shown in Figure 1. By clicking a component in the toolbox, it can be placed and connected on the one-line with a mouse click in the appropriate location. See the one-line below as an example.

The MVCF will need to be modeled using the 5 components highlighted in blue on the one-line diagram of Figure 1. After all components are added to the one-line they need to be precisely identified for the analysis. This is accomplished by clicking on any component to open the Component Editor shown below. The details are entered into the dialog box on the right of the Editor. For example, the transformer dialog box shown in Figure 2, requires several inputs to define its characteristics. Also, review the 'Component Subviews' selection list to the left of the Editor to ensure that the component is properly modeled.
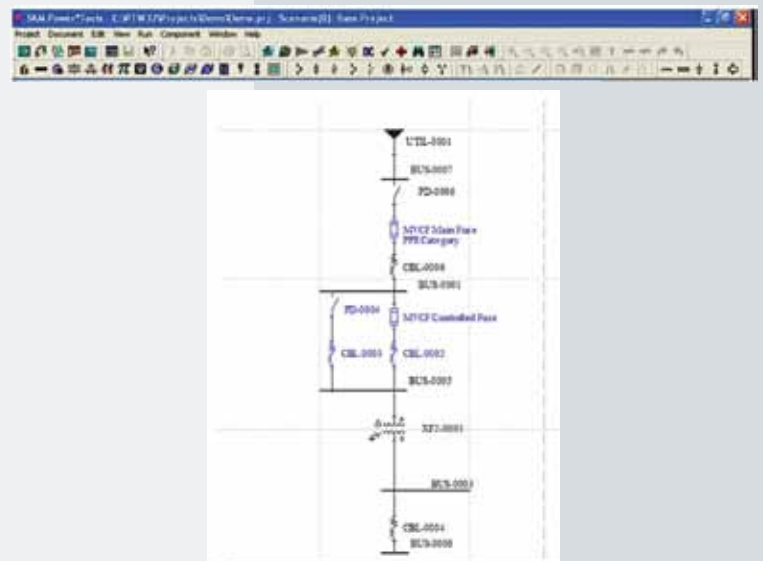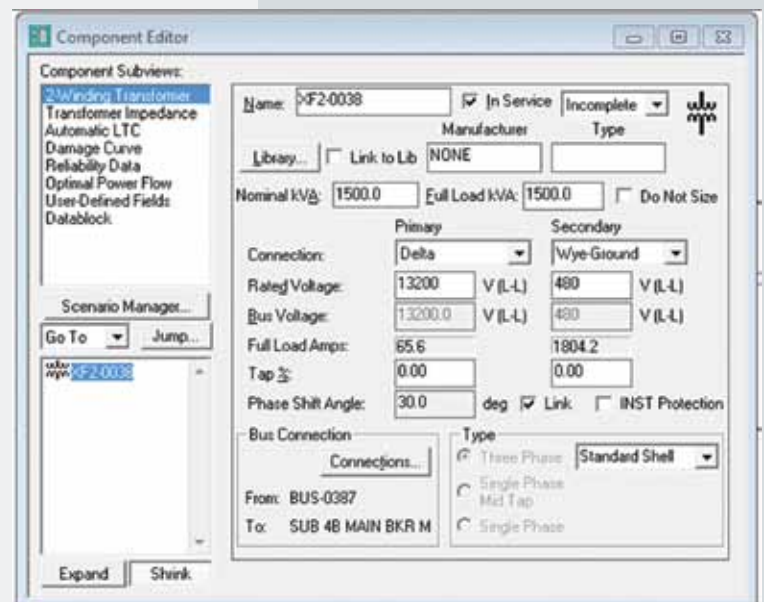

Figure 1. One-line modeling of MVCF

Figure 2. Example of Component Selection and Definition.

mersen
Expertise, our source of energy

USING SKM TO CALCULATE ARC FLASH INCIDENT ENERGY WITH THE MVCF SYSTEM
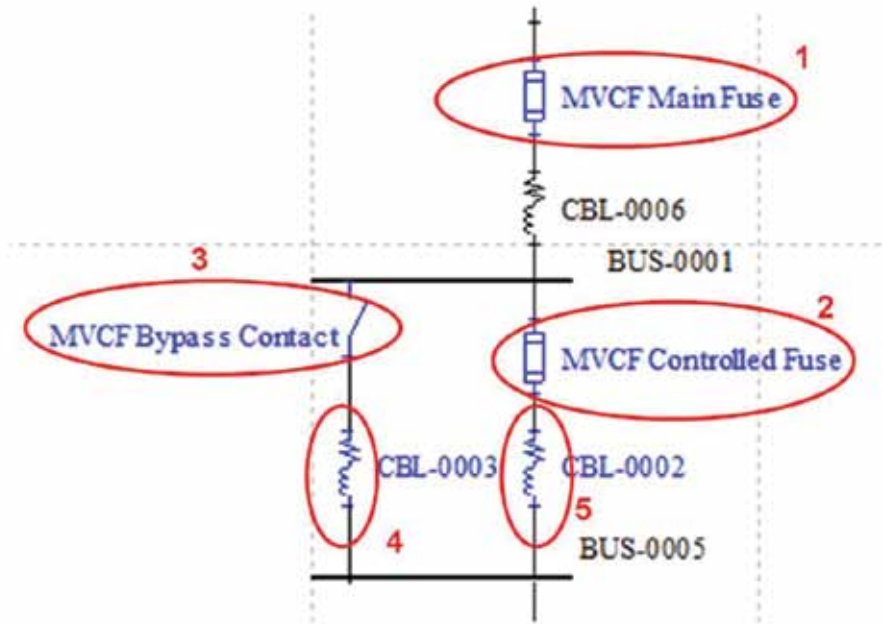

Figure 3. Five components required for modeling the MVCF.

MODELING THE MVCF IN SKM

Since there is no component for an integrated relay controlled fuse in the toolbox it needs to be built from existing components described in the 5 steps below for creating a 100A MVCF model.

Step 1. Model the MVCF with 5 discrete components. There is a main fuse (1 in the figure), a controlled fuse (2) and a bypass switch (3). Since the fuse and bypass switch are zero ohms in the program, some impedance needs to be added in each leg. See (4) and (5) in the figure.
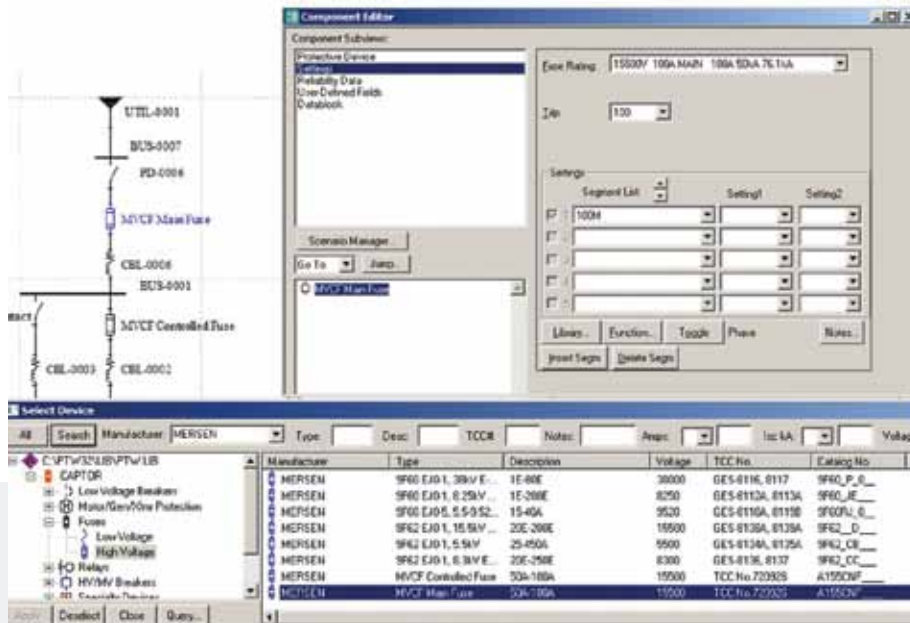

Figure 4. Selection of the main fuse of the MVCF.

Step 2. Select the main fuse (1) by clicking on the fuse to open the Component Editor. Select the MVCF main fuse from the library. Select the 100M from the dialog box (settings) as shown in figure 4.
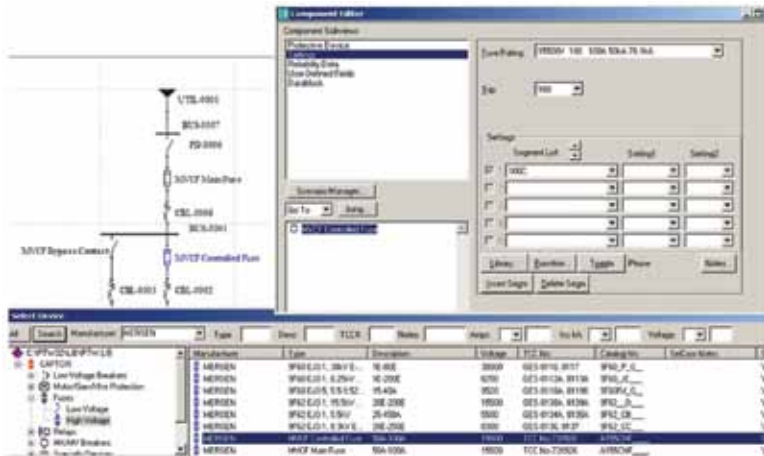
MERSEN
Expertise, our source of energy

Figure 5. Selection of the controlled fuse of the MVCF.

Step 3. Select the controlled fuse (2) by clicking on the fuse to open the Component Editor. Select the MVCF controlled fuse from the library. Select 100C from the dialog box (settings) as shown in figure 5. The controlled fuse is shown as a separate fuse without a switch.
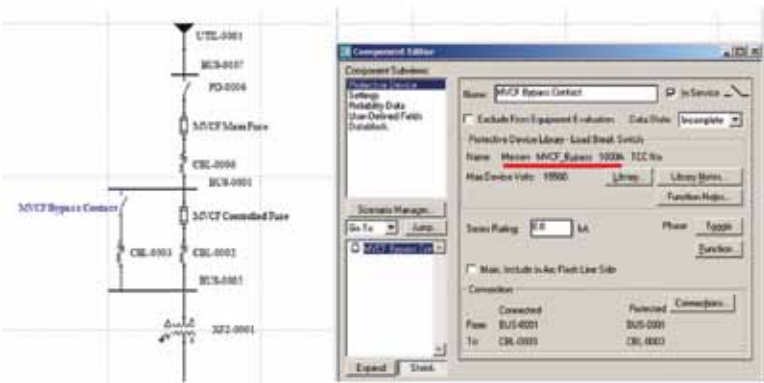

Figure 6 Selection of the bypass switch of the MVCF.

Step 4. The bypass switch was added to the one-line as a switch from the equipment tool bar. Select the switch from the Component Editor and make the selection shown in Figure 6. Since the opening time of the bypass switch is built into the MVCF controlled fuse time current curves there is no need to account for its opening time for arc flash calculations. This switch will be opened for the arc flash calculation.
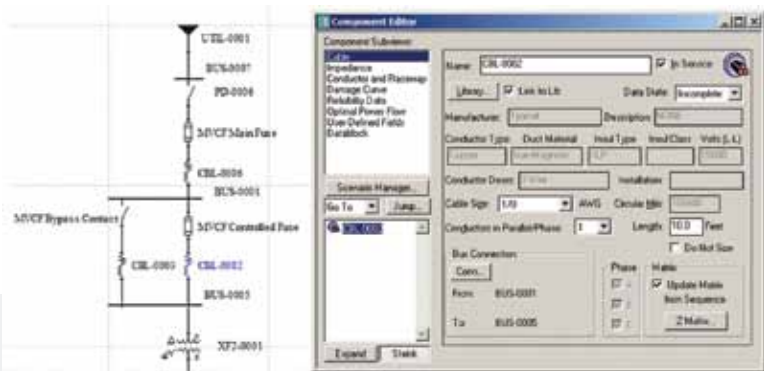

Figure 7. Selection of the conductor impedance for each leg of the MVCF.

Step 5. Select the conductors added in (4) and (5) for the MVCF model above. In this example, a 10' length of 1/0 cable is recommended for the controlled fuse leg. A 1' length of 250MCM cable is recommended for the bypass switch leg.
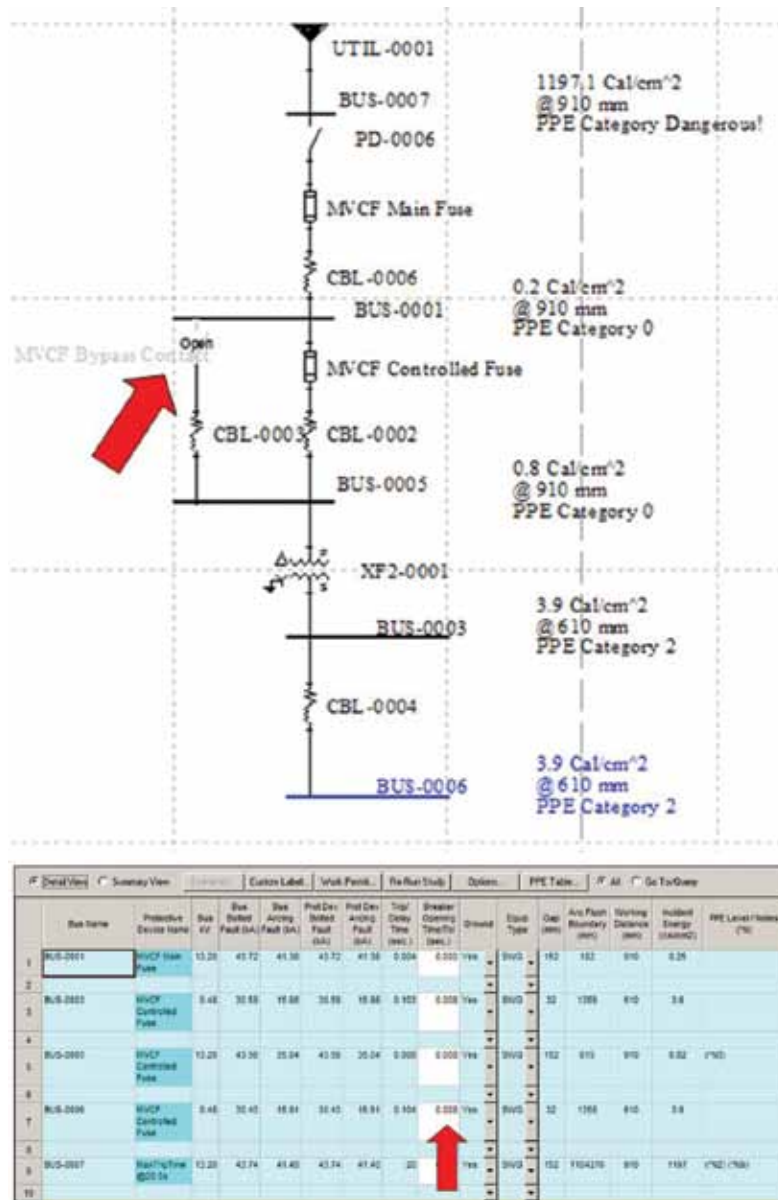
Figure 8. Running the analysis with the relay controlled MVCF.

RUNNING THE ANALYSIS

To get the correct calculations, two key actions are required. Before running the analysis the bypass switch will need to be opened and the relay operation time needs to be added in the arc flash report shown below (see red arrows in figure 8). Since the operation time of the MVCF bypass switch is embedded in the time current curve of the controlled fuse, the program can obtain the arc duration by adding the relay operation time to the time read directly from the time current curve.

mersen
Expertise, our source of energy