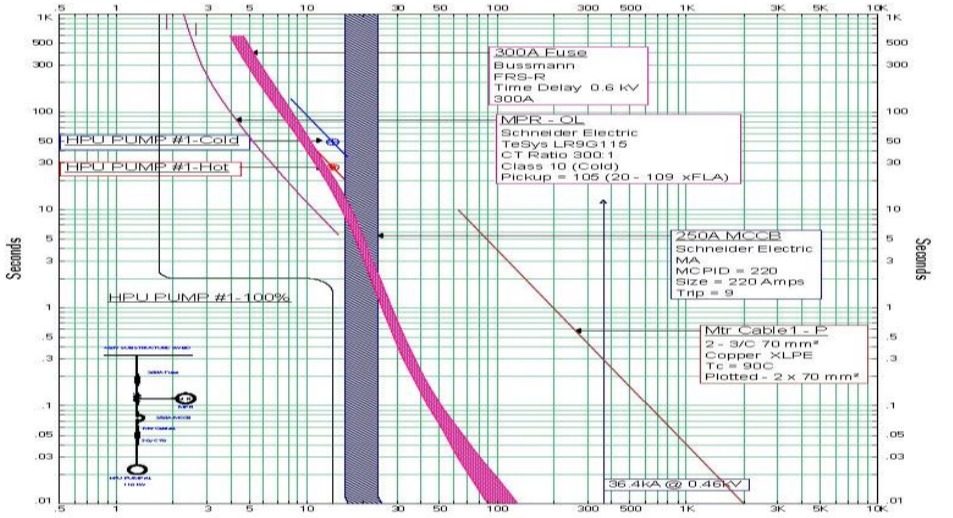


# Case Study



<b>Study Area:</b>	<b>Protection Devices and Co-ordination Study</b>	
<b>Job:</b>	Design, select and recommend proper protection devices for motor and co-ordination study	
<b>Date:</b>	Q2-2023	<p style="text-align: center;"><b>One-Line Diagram (Short-Circuit Analysis)</b></p>
<b>Location:</b>	North Sea Platform	
<b>Project Background:</b>	The scope of this study was to carry out a short circuit current study and Relay coordination study. Existing pumps of 55 KW were upgraded for 110 KW for capacity enhancement. Requirement of new 110 kW HPU Pumps in existing feeder of 460 V switch board to be studied and with relay co-ordination without disturbing existing arrangement of 460 V switch board.	
<b>Engineering Challenge:</b>	<ul style="list-style-type: none"> <li>To assign tapping point for new augmented motor of 110 KW without imbalance on existing bus bar.</li> <li>Suitable cable route and tray arrangement for new cable.</li> <li>New location of pump and motor with existing philosophy of local control panel.</li> <li>Short circuit study with new recommended protection circuits.</li> </ul>	
<b>Scope of Work:</b>	<ul style="list-style-type: none"> <li>Review of existing feeder document and suggest tapping point on network.</li> <li>Suggest cable route for new power and control cables in existing cable trays</li> <li>Select protection scheme for new motor and relay co-ordination study</li> <li>Calculate short circuit with new situation in existing network.</li> <li>Verify protections are as per new conditions in network.</li> <li>Verify existing network and its protections are not disturbed</li> </ul>	

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<p><b>Key Findings:</b></p>	<ul style="list-style-type: none"> <li>Based on the client supplied documents distribution on 460 V bus, tapping point selected and few existing non utilized feeders were removed. Purpose to remove non utilized feeder was to made power available on the existing feeder and avoid any upgradation on upward network.</li> <li>Motor protection was selected as per IEC 60947-4-1</li> <li>Recommendation for type 2 relay co-ordination as per standard.</li> <li>Short circuit current calculation as per IEC 60909 and it's analysis.</li> </ul>
<p><b>Engineering Recommendations:</b></p>	<ul style="list-style-type: none"> <li><b>Protection relay</b> Based on the standard and practices adopted by motor manufacturer Type 2 relay protection was recommended</li> <li><b>Short circuit Current</b> Based on the results of revised condition short circuit current it was verified that existing network is sufficient to cater requirement. No additional modification in upward network is required.</li> <li><b>Relay co-ordination study</b> Based on TCC curves recommended protection is not disturbing to existing network.</li> </ul>
<p><b>TCC Curves:</b></p>	 <p>The TCC Curves graph displays the time-current characteristics for various components in the system. The x-axis represents current in kA (logarithmic scale from 0.1 to 10K), and the y-axis represents time in seconds (logarithmic scale from 0.01 to 1K). Key components and their characteristics are:</p> <ul style="list-style-type: none"> <li><b>300A Fuse:</b> Busmann FRS-R, Time Delay 0.6 kV, 300A.</li> <li><b>MPR - OL:</b> Schneider Electric TeSys LR9D115, CT Ratio 300:1, Class 10 (Cold), Pickup = 105 (20 - 109 xFLA).</li> <li><b>250A MCCB:</b> Schneider Electric MA, MCPID = 220, Size = 220 Amps, Trip = 9.</li> <li><b>Mtr Cable 1 - P:</b> 2 - 3/C 70 mm<sup>2</sup> Copper XLPE, Tc = 90C, Plotted - 2 x 70 mm<sup>2</sup>.</li> <li><b>HPU PUMP #1-Cold</b>, <b>HPU PUMP #1-Hot</b>, and <b>HPU PUMP #1-100%</b> are also shown with their respective curves.</li> <li>A fault current of <b>36.4kA @ 0.46kV</b> is indicated on the graph.</li> </ul>
<p><b>Final Outcomes:</b></p>	<ul style="list-style-type: none"> <li>Power for new motor of 110 KW was tapped from recommended tapping point</li> <li>Protection scheme implemented as per recommendation</li> <li>Pump/Motor commissioned successfully.</li> </ul>
<p><b>Key Lessons &amp; Best Practices:</b></p>	<ul style="list-style-type: none"> <li>Perform document review properly with inputs from client/ present operating user.</li> <li>Physical dimensions of existing modules to be reviewed to accommodate new higher rating equipment to be installed.</li> <li>Close co-ordination with user for cable layout to avoid addition hardware to installed.</li> </ul>