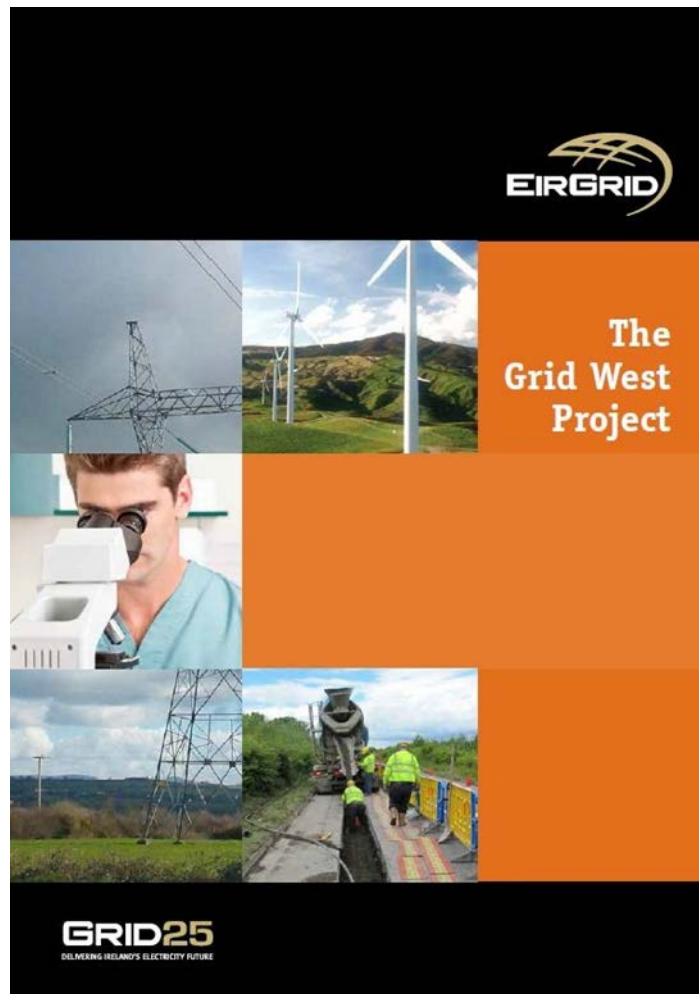


**EirGrid**

**10344 - PSP019 - CABLE STUDIES FOR GRID WEST**

**Partial AC Underground Solution**



**APPENDIX D – 58 KM, 220 KV CABLE OPTION  
SUMMER VALLEY B**

**17th December 2014**

**REPORT AUTHORISATION SHEET**

Client: **EirGrid**

Project: **10344 - PSP019 - Cable Studies for Grid West**

Report Title **Appendix D – 58 km, 220 kV Cable Option  
Summer Valley BAppendix D – 58 km, 220 kV Cable Option  
Summer Valley B**

Project Number **10344**

Report Version **Final Appendix**

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Prepared by:

Name: Christopher Ellis

Position: Senior Consultant

Date: 17<sup>th</sup> December 2014

Checked by:

Name: Amarjit Jhutti

Position: Managing Director

Date: 17<sup>th</sup> December 2014

Authorised for issue:

Name: Johan Stalmans

Position: Director

Date: 17<sup>th</sup> December 2014

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## 1 RESULTS

Impedance scans and time domain simulations for a 58 km of 220 kV cable with sized reactors at both Flagford and North Mayo. The Grid West circuit consisted of this 58 km 220 kV cable and a further 52 km OHL to complete the entire 110 km route.

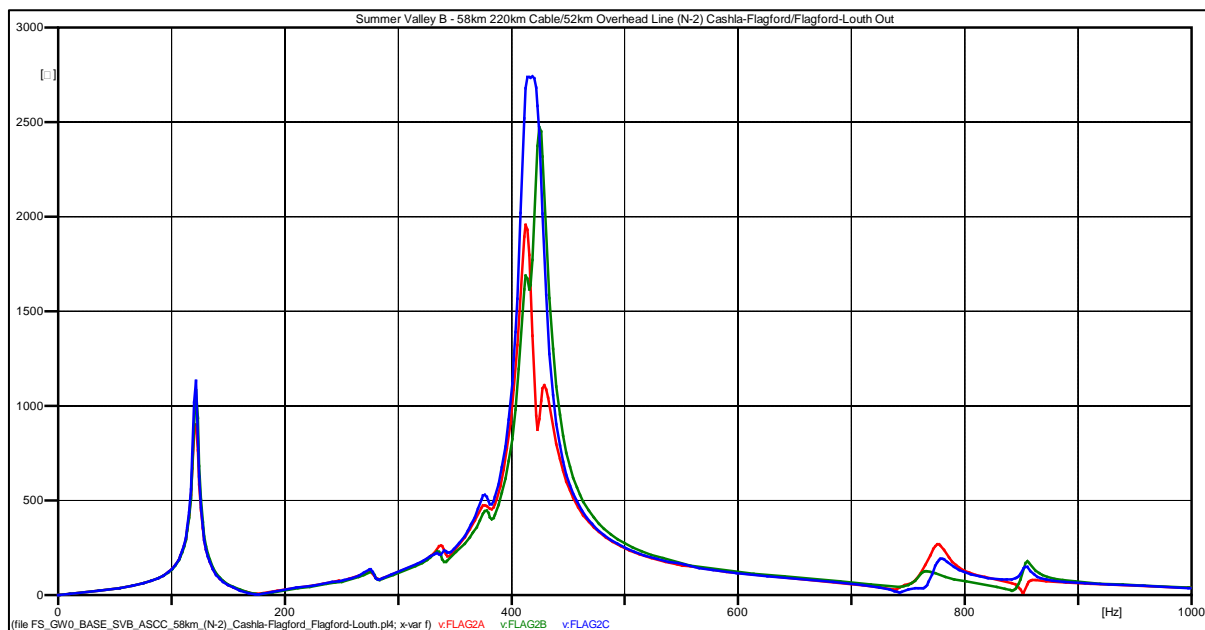
This appendix presents the results for Summer Valley B generation / demand profile. It will cover the 220 kV 58 km cable option with the circuit incorporating 58 km of UGC and 52 km of OHL. This case has failed due to a high resonance point below the 3rd harmonic of above 1000 Ohms and has also failed due to TOVs exceeding the allowable limits.<sup>1</sup>

### 1.1 Impedance Scans - Length 58 km – Summer Valley B

Conditions for impedance scan:

1. Summer Valley B network
2. Length – 58 km 220kV Cable/52 km Overhead Line
3. Reactors – North Mayo 175 MVar/Flagford 50 MVar

#### Case 1: (N-2) Cashla-Flagford/Flagford-Louth Lines Out



**Figure 1: SVB - Length 58 km cable / 52 km OHL - (N-2) Cashla-Flagford/Flagford-Louth Lines Out**

#### Impedance Scan - Resonance points

Frequency (Hz)	Impedance ( $\Omega$ )
121.51	1132.2
417.01	2733.8

<sup>1</sup> For the purposes of clarity, in the Time Domain Simulations shown in all the Appendices, the term ‘N-2’ shown in the graphical figure descriptions refer to an ‘N-1-1’ trip-maintenance situation.

## **1.2 Time Domain Simulation - Length 58 km – Summer Valley B**

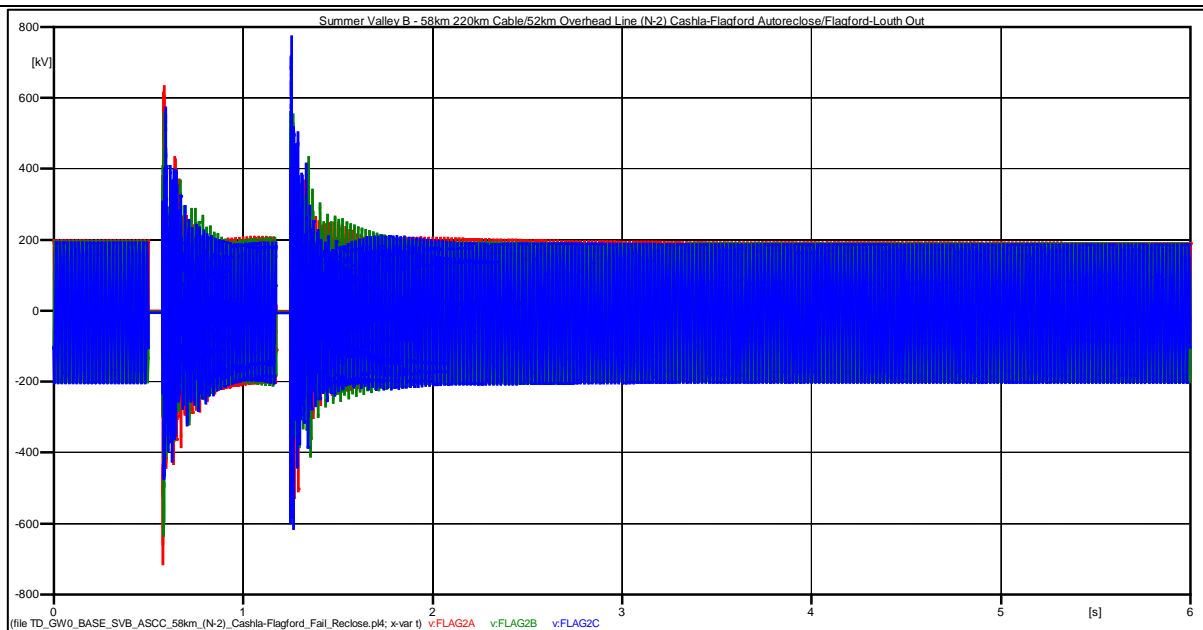
Conditions for time domain simulation:

1. Summer Valley B network
2. Length 58 km cable / 52 km OHL

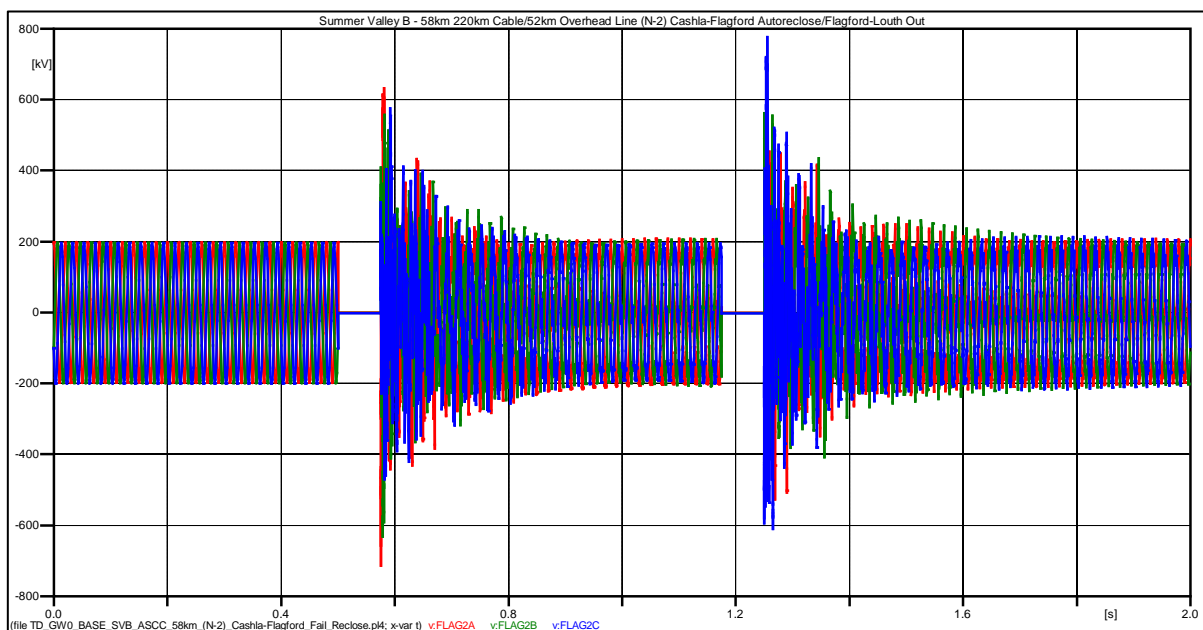
### **Case 1: (N-2) Cashla-Flagford Auto Reclose onto Fault/Flagford-Louth Lines Out**

System Conditions:

1. Fault on Flagford side of Cashla - Flagford line, applied at 0.5s.
2. Reclose sequence at 0.575s, dead time 0.6s, circuit breaker closes 1.175s, point on wave closes at 90°.
3. Breaker opens at again at 1.25s.

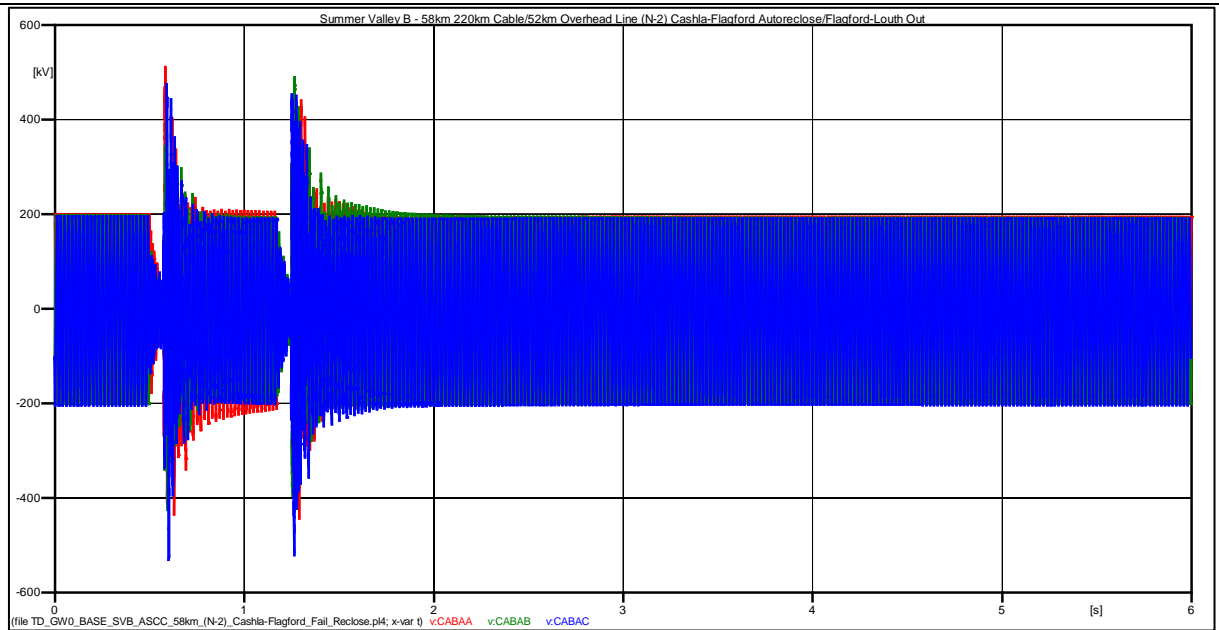


**Figure 2: SVB - Length 58 km cable / 52 km OHL - Flagford – (N-2) Cashla-Flagford Auto Reclose onto Fault/Flagford-Louth Lines Out (0-6s)**

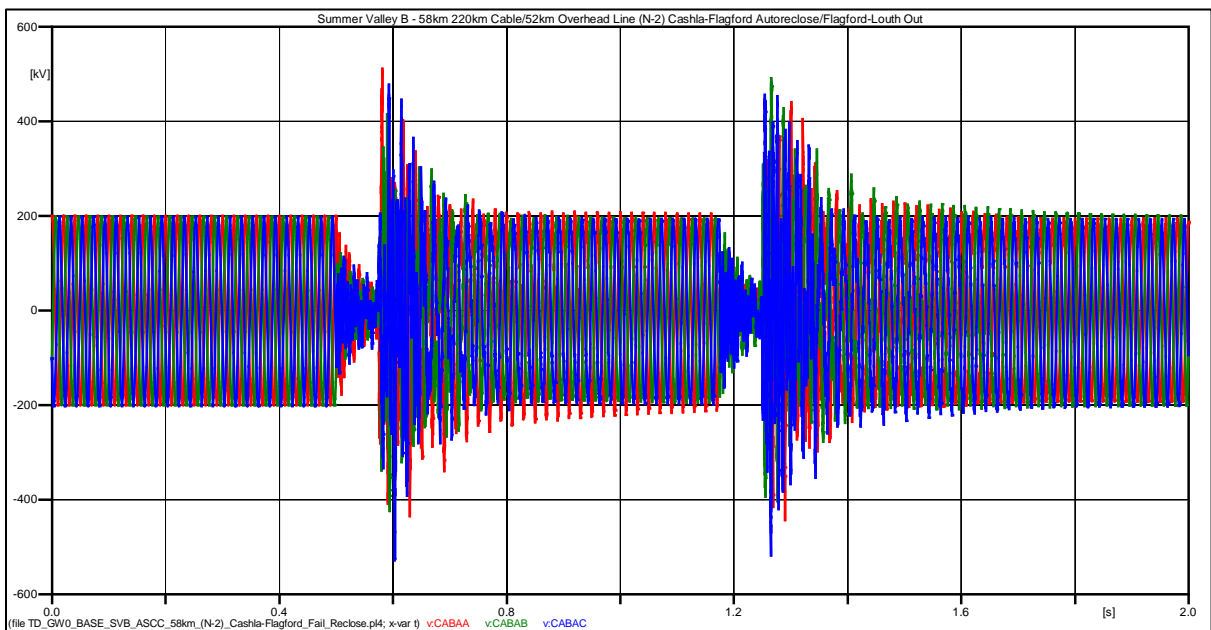


**Figure 3: SVB - Length 58 km cable / 52 km OHL - Flagford – (N-2) Cashla-Flagford Auto Reclose onto Fault/Flagford-Louth Lines Out (0-2s)**

Condition	Maximum Value	Limit	Result
Switching	780.26 kV (4.344 pu)	446.375 kV (2.5 pu)	Fail
Temporary Overvoltage	410.97 kV ( 2.288pu)	287.32 kV (1.6pu)	Fail

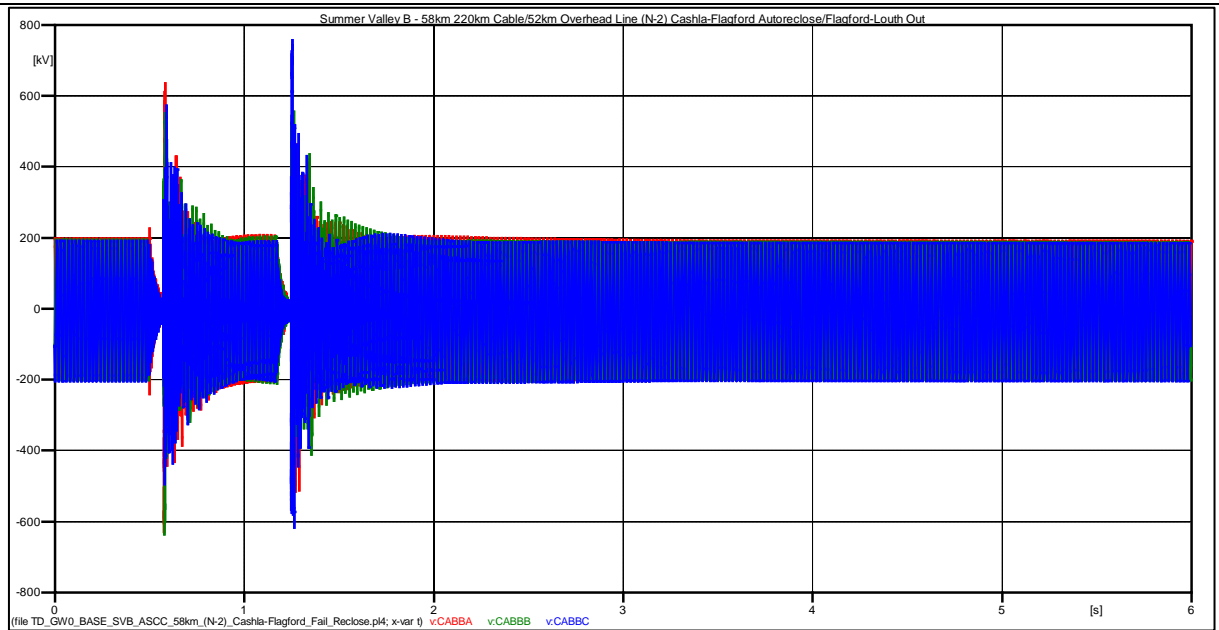


**Figure 4: SVB - Length 58 km cable / 52 km OHL – Cable End A – (N-2) Cashla-Flagford Auto Reclose onto Fault/Flagford-Louth Lines Out (0-6s)**

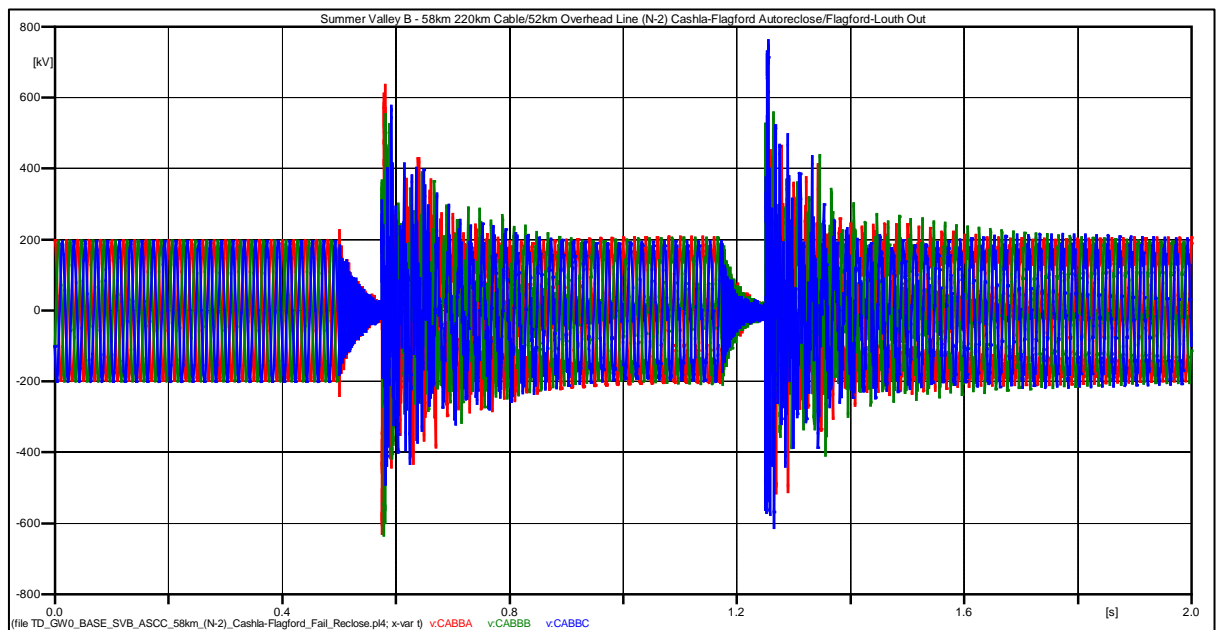


**Figure 5: SVB - Length 58 km cable / 52 km OHL – Cable End A – (N-2) Cashla-Flagford Auto Reclose onto Fault/Flagford-Louth Lines Out (0-2s)**

Condition	Maximum Value	Limit	Result
Switching	510.23 kV ( 2.841 pu)	446.375 kV (2.5 pu)	Fail
Temporary Overvoltage	440.65 kV (2.453 pu)	287.32 kV (1.6pu)	Fail



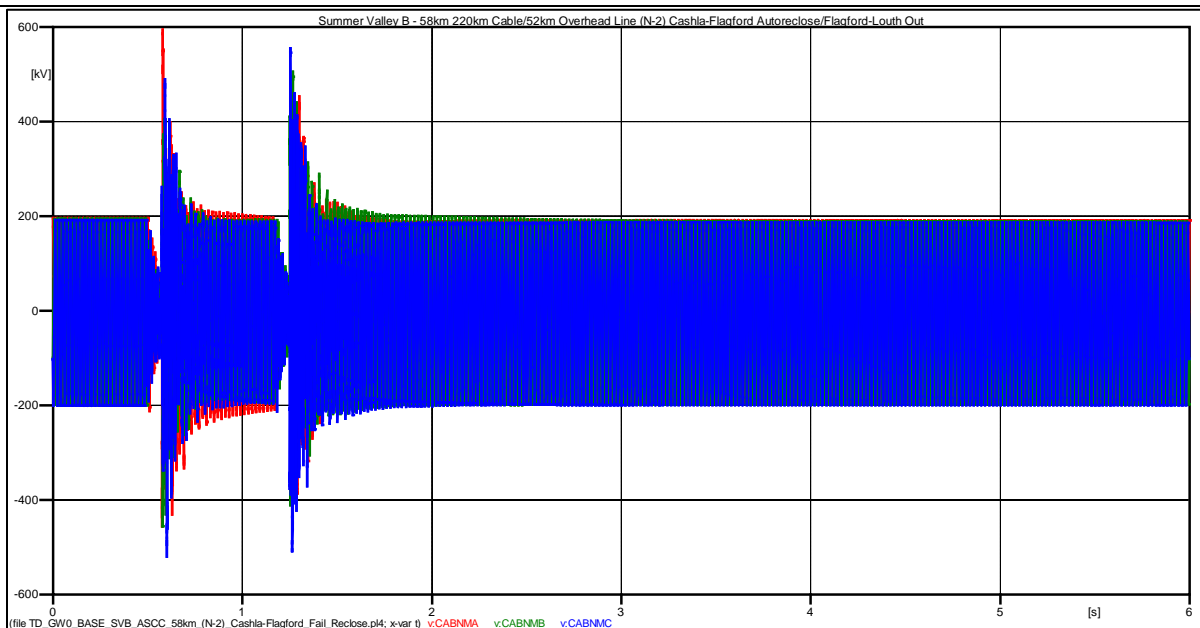
**Figure 6: SVB - Length 58 km cable / 52 km OHL – Cable End B – (N-2) Cashla-Flagford Auto Reclose onto Fault/Flagford-Louth Lines Out (0-6s)**



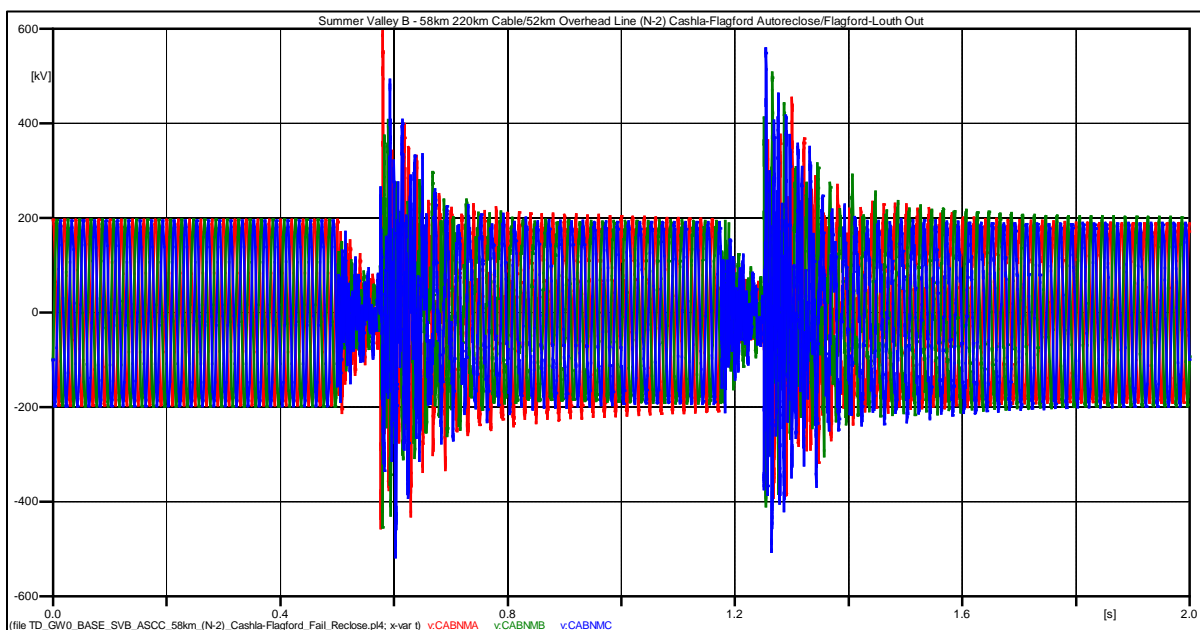
**Figure 7: SVB - Length 58 km cable / 52 km OHL – Cable End B – (N-2) Cashla-Flagford Auto Reclose onto Fault/Flagford-Louth Lines Out (0-2s)**

Condition	Maximum Value	Limit	Result
Switching	620.13 kV (3.453 pu)	446.375 kV (2.5 pu)	Fail
Temporary Overvoltage	412.89 kV (2.299 pu)	287.32 kV (1.6pu)	Fail





**Figure 8: SVB - Length 58 km cable / 52 km OHL –North Mayo – (N-2) Cashla-Flagford Auto Reclose onto Fault/Flagford-Louth Lines Out (0-6s)**



**Figure 9: SVB - Length 58 km cable / 52 km OHL – Cable End - North Mayo – (N-2) Cashla-Flagford Auto Reclose onto Fault/Flagford-Louth Lines Out (0-2s)**

Condition	Maximum Value	Limit	Result
Switching	600.05 kV (3.341 pu)	446.375 kV (2.5 pu)	Fail
Temporary Overvoltage	400.56 kV (2.230 pu)	287.32 kV (1.6pu)	Fail