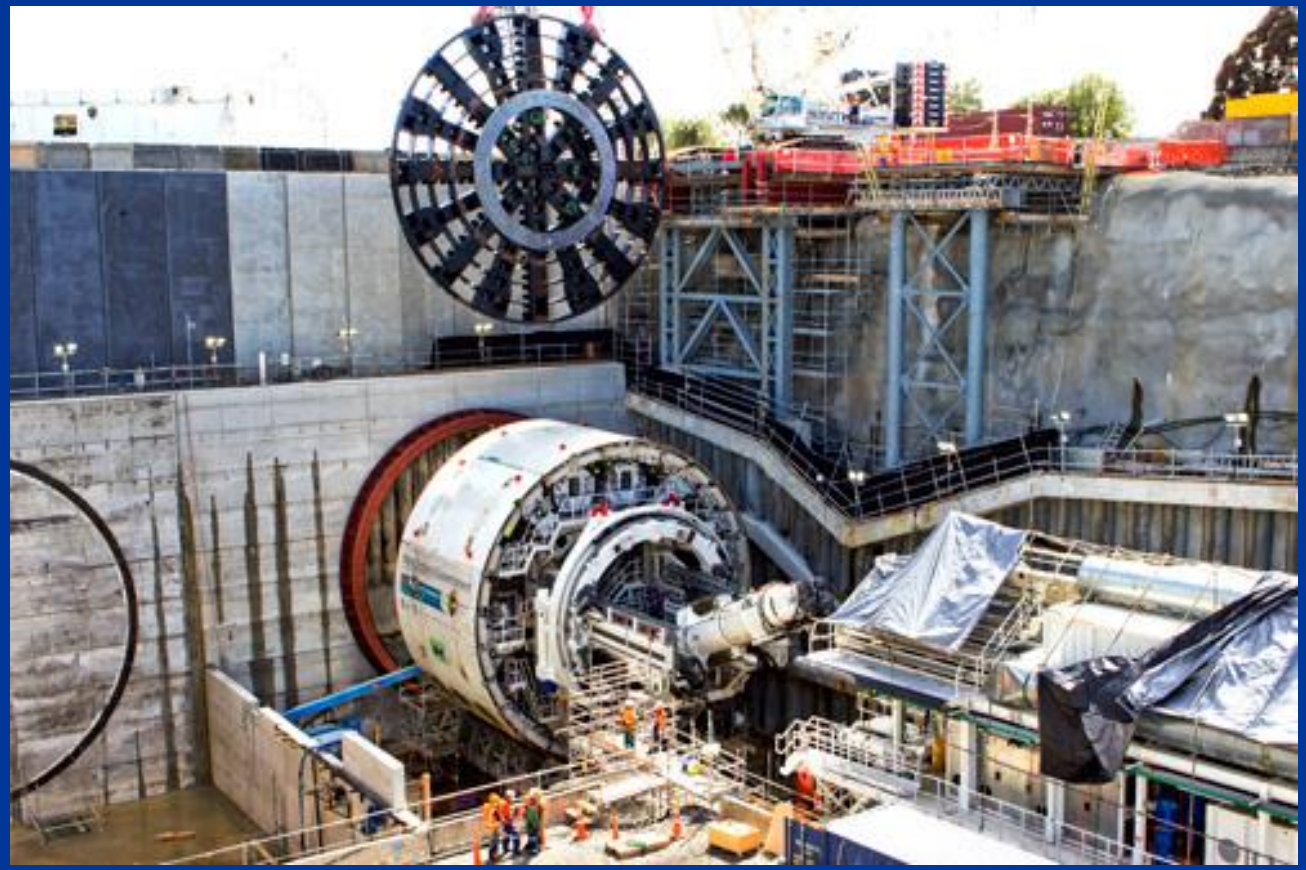
Waterview Tunnel – HV System Supply

Harshal Patel




Overview

- The Project
- The Waterview Network
- HV System
- Challenges faced
- Where are we now?



Tunnel Boring Machine (TBM)

The Project

- The largest most complex infrastructure project to be undertaken in New Zealand, to date.
- It will complete an alternative route around Auckland.
- A NZ government asset delivered by NZTA.

The Waterview Network

Well Connected Alliance

Beca

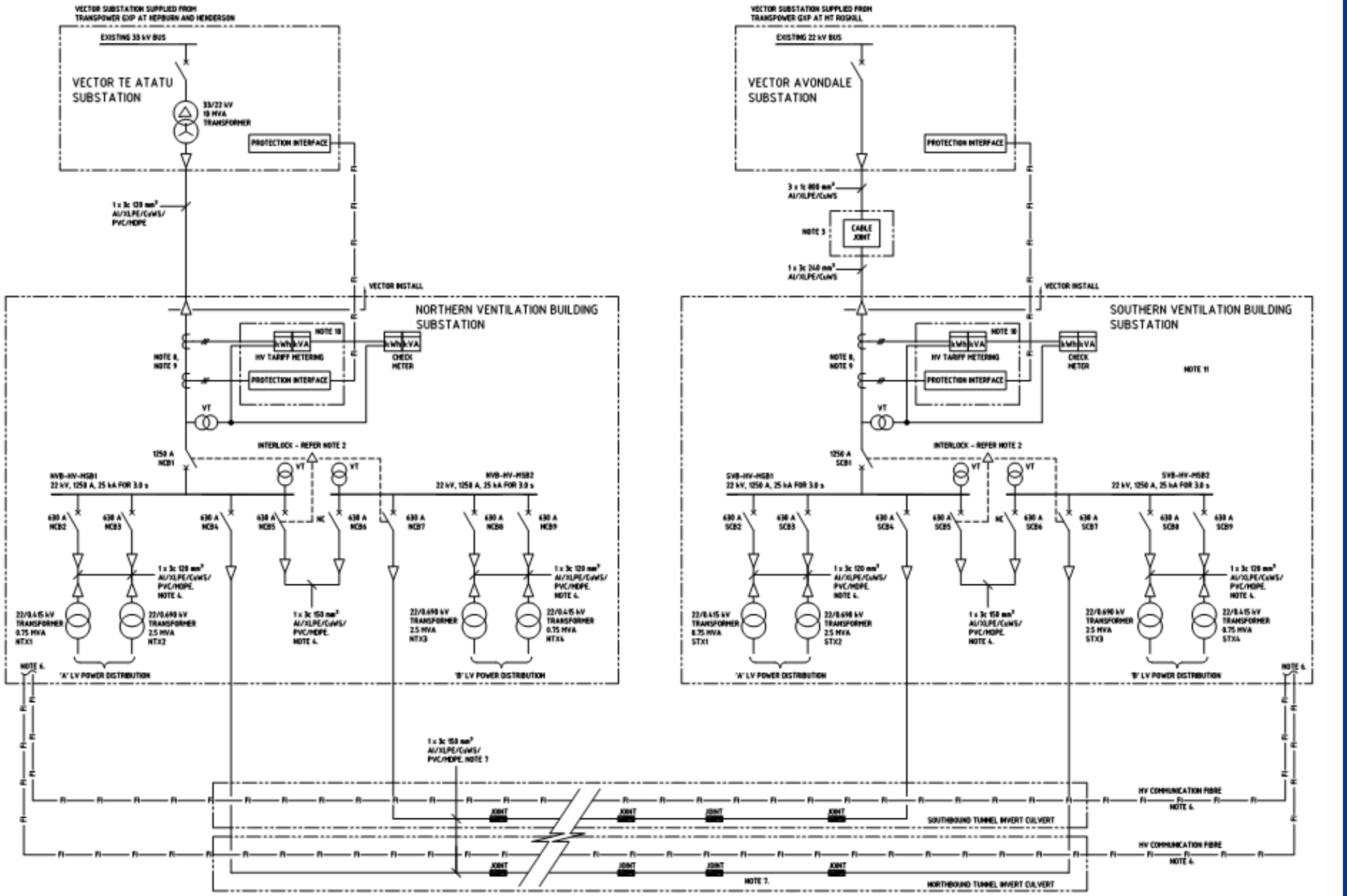
An Alternative Route to Avoid This!!

Reference: www.stuff.co.nz

HV System – Why do we need one?

What are the major risks?

- Build up of Carbon Monoxide Gas
- Fires
- Flooding
- Financial impact to the economy


VECTOR SUBSTATION SUPPLIED FROM TRANSPOWER GXP AT HEPBURN AND HENDERSON
EXISTING 33 kV BUS
VECTOR TE ATATU SUBSTATION
33/22 kV 10 MVA TRANSFORMER
PROTECTION INTERFACE
1 x 3c 120 mm² Al/XLPE/CuWS/ PVC/HDPE
VECTOR INSTALL
NORTHERN VENTILATION BUILDING SUBSTATION
NOTE 10
kWh kVA
HV TARIFF METERING
CHECK METER
PROTECTION INTERFACE
NOTE 8, NOTE 9
VT
INTERLOCK – REFER NOTE 2
1250 A NCB1
NVB-HV-MSB1 22 kV, 1250 A, 25 kA FOR 3.0 s
NVB-HV-MSB2 22 kV, 1250 A, 25 kA FOR 3.0 s
630 A NCB2
630 A NCB3
630 A NCB4
630 A NCB5
NC
630 A NCB6
630 A NCB7
630 A NCB8
630 A NCB9
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22/0.415 kV TRANSFORMER 0.75 MVA NTX1
22/0.690 kV TRANSFORMER 2.5 MVA NTX2
22/0.690 kV TRANSFORMER 2.5 MVA NTX3
22/0.415 kV TRANSFORMER 0.75 MVA NTX4
NOTE 6.
'A' LV POWER DISTRIBUTION
'B' LV POWER DISTRIBUTION
VECTOR SUBSTATION SUPPLIED FROM TRANSPOWER GXP AT MT ROSKILL
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VECTOR AVONDALE SUBSTATION
3 x ½ 800 mm² Al/XLPE/CuWS
NOTE 3
CABLE JOINT
1 x 3c 240 mm² Al/XLPE/CuWS
SOUTHERN VENTILATION BUILDING SUBSTATION
NOTE 11
SVB-HV-MSB1 22 kV, 1250 A, 25 kA FOR 3.0 s
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1250 A SCB1
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630 A SCB3
630 A SCB4
630 A SCB5
630 A SCB6
630 A SCB7
630 A SCB8
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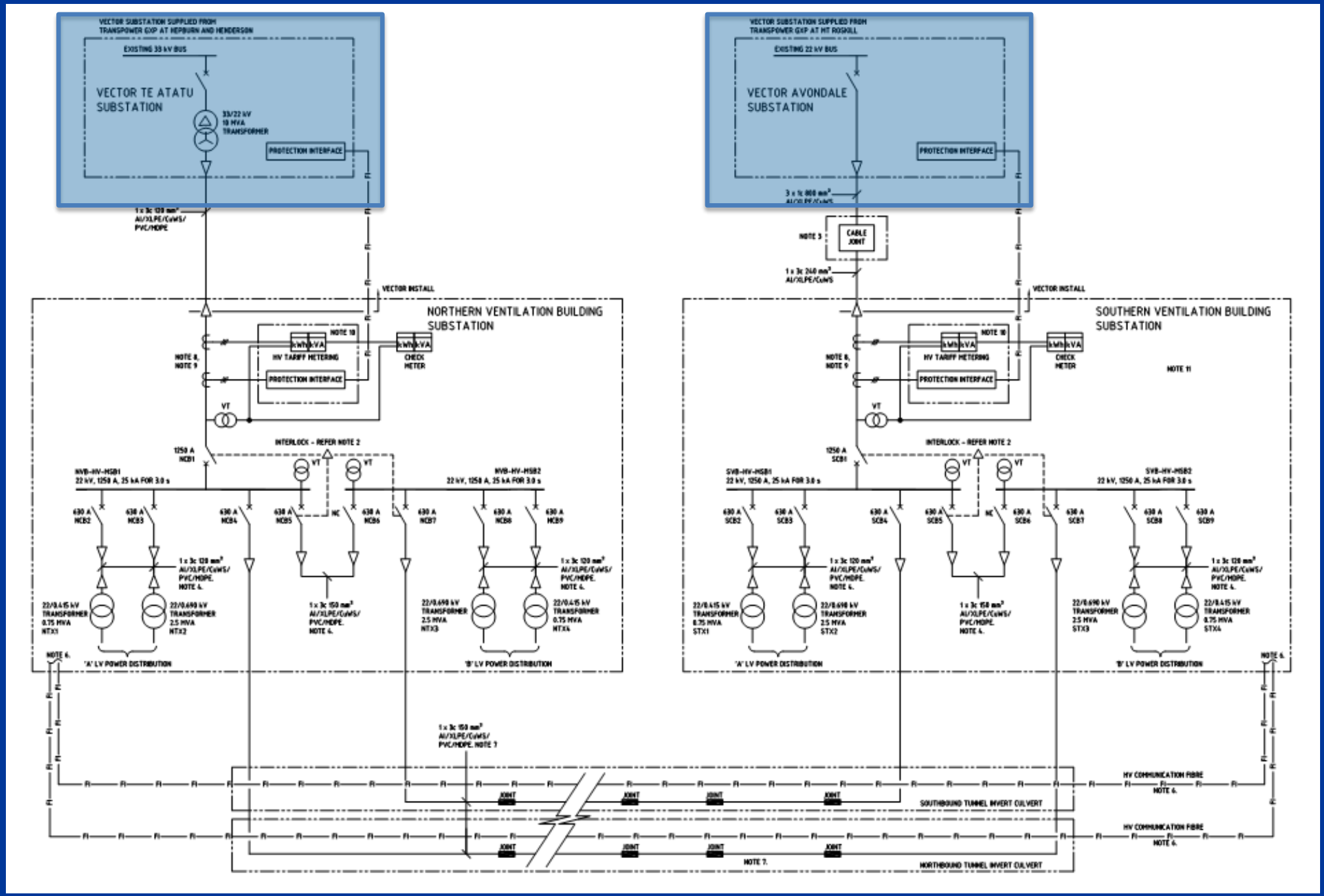
22/0.690 kV TRANSFORMER 2.5 MVA STX3
22/0.415 kV TRANSFORMER 0.75 MVA STX4
1 x 3c 150 mm² Al/XLPE/CuWS/ PVC/HDPE. NOTE 7
JOINT
SOUTHBOUND TUNNEL INVERT CULVERT
NORTHBOUND TUNNEL INVERT CULVERT
NOTE 7.
HV COMMUNICATION FIBRE
NOTE 6.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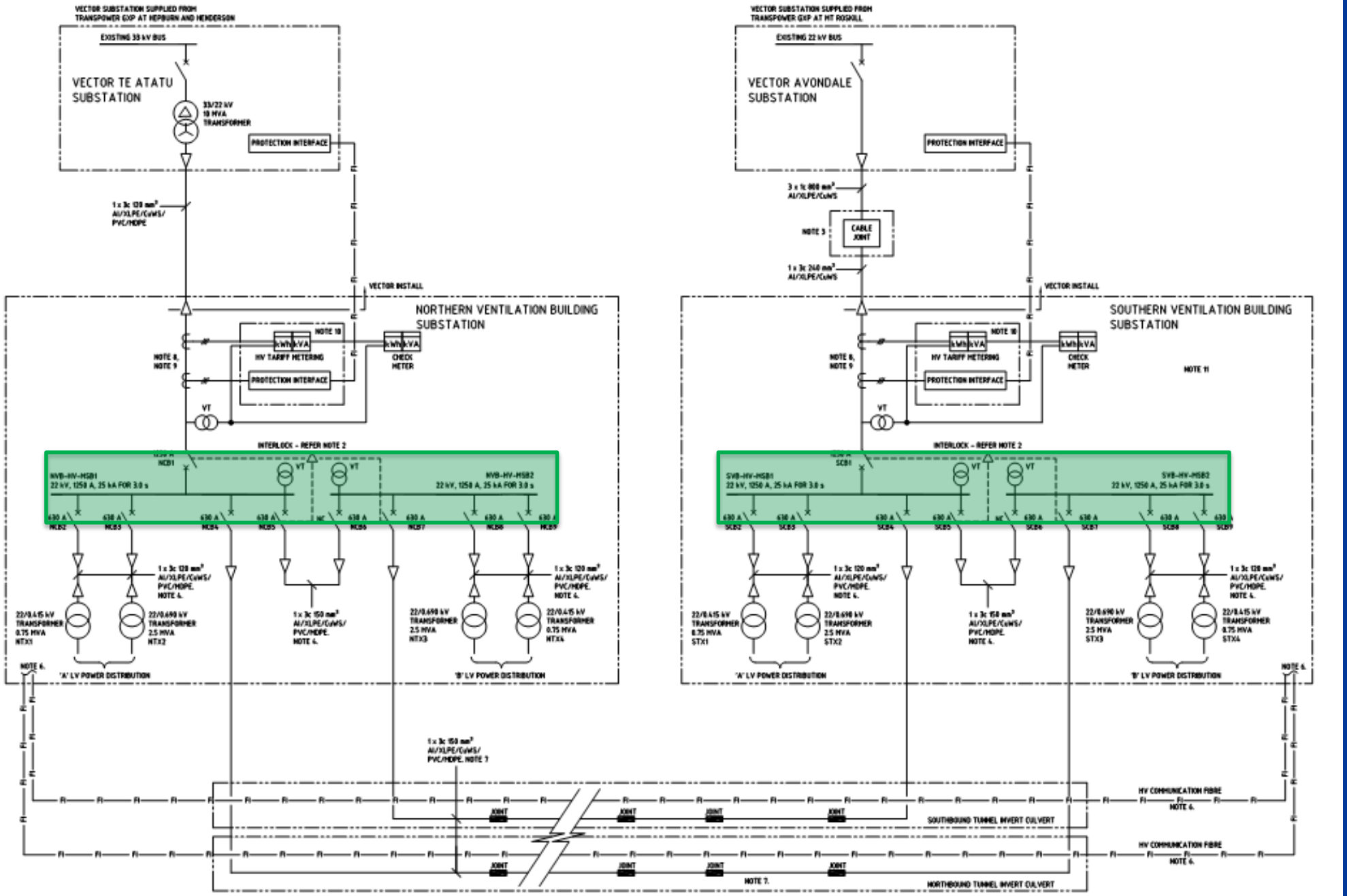
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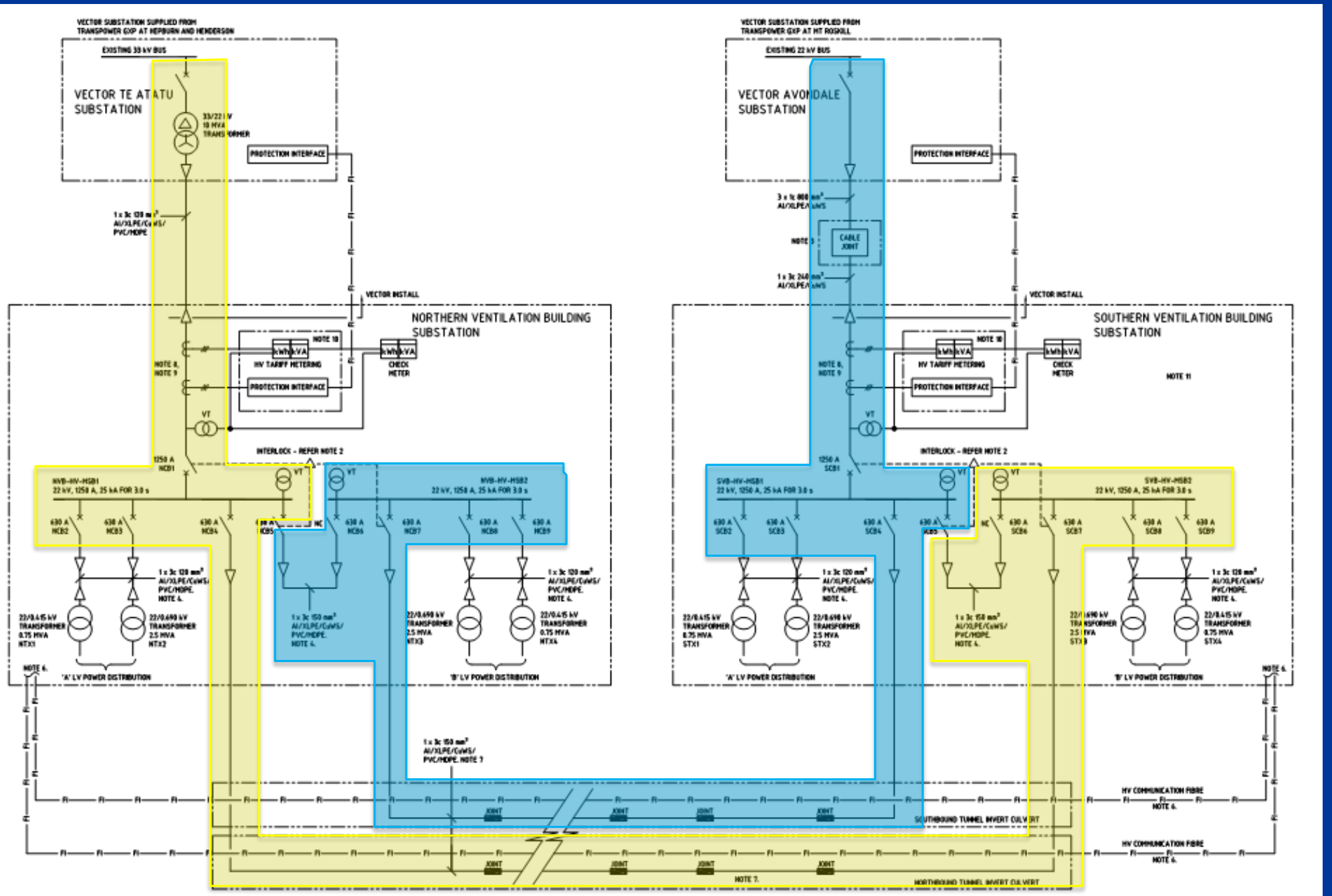
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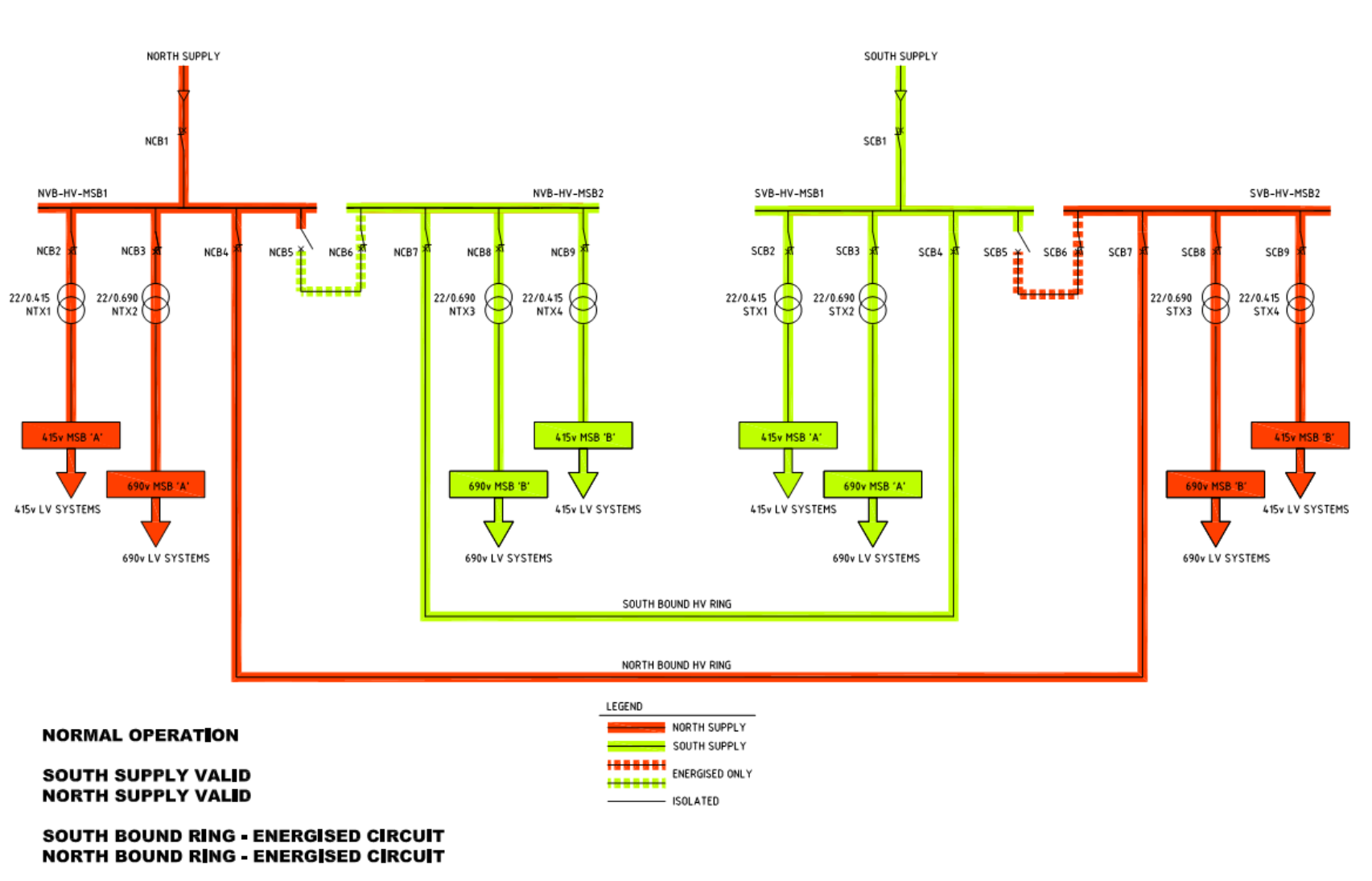
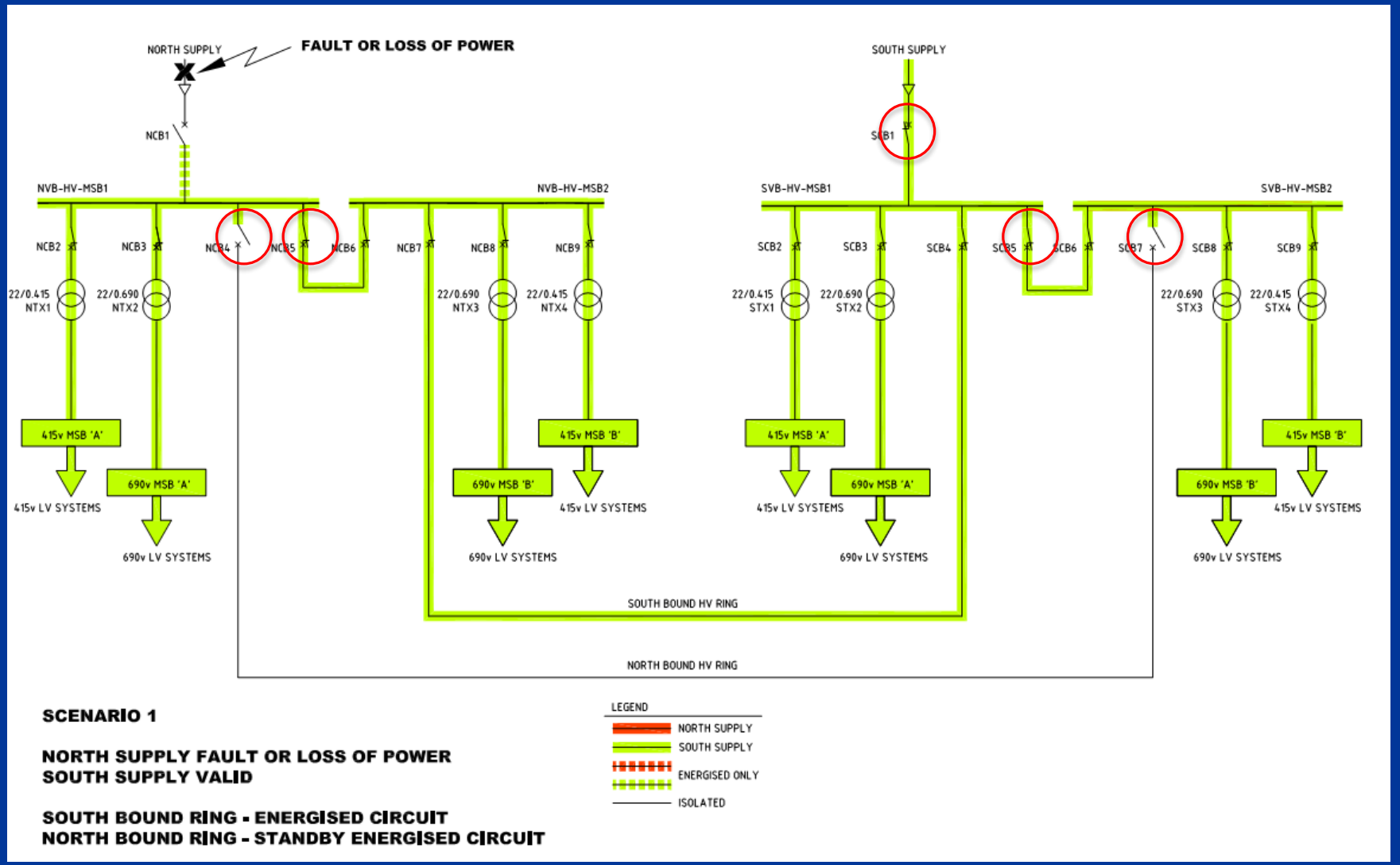
HV COMMUNICATION FIBRE
NOTE 6.

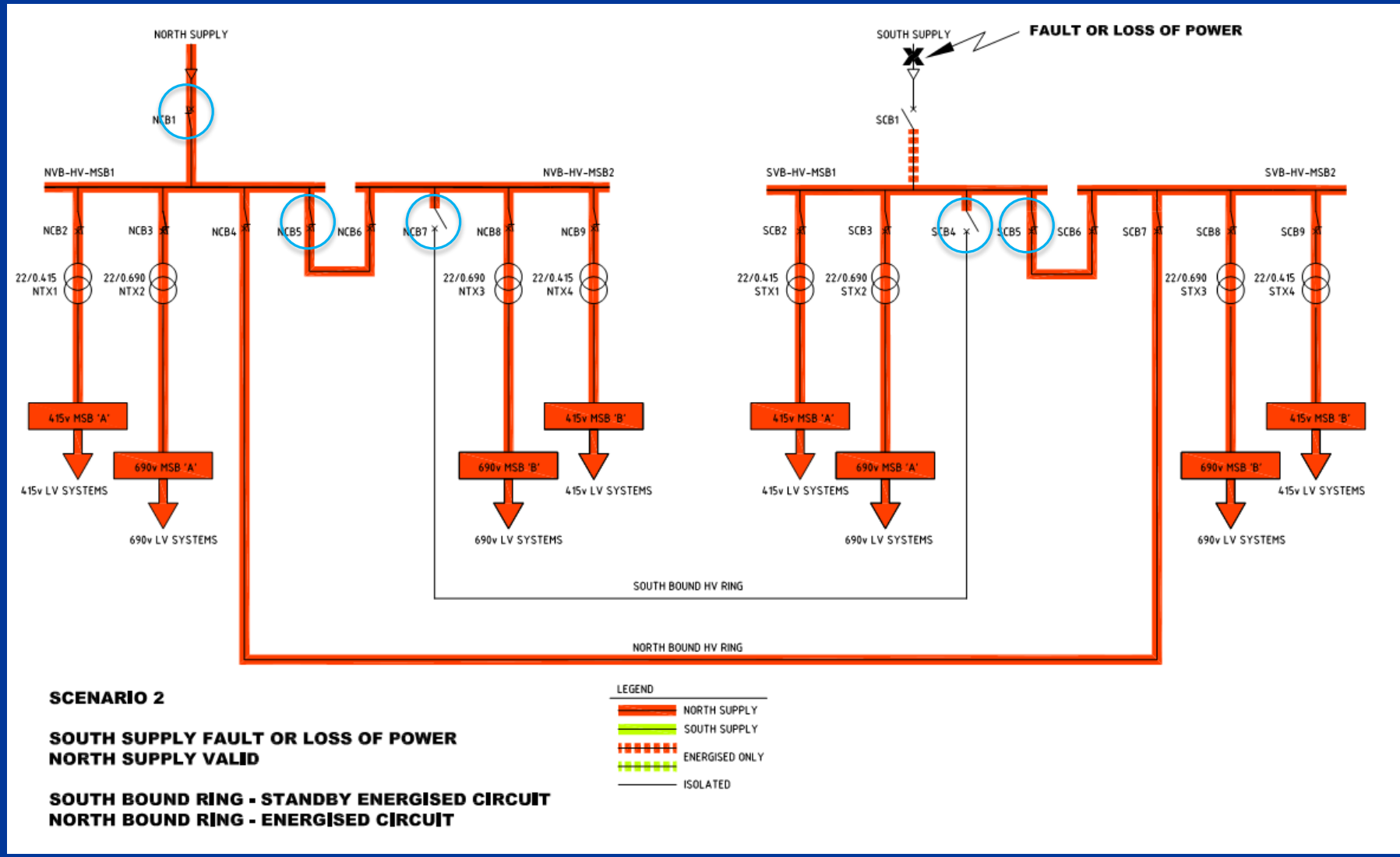
Normal Operation



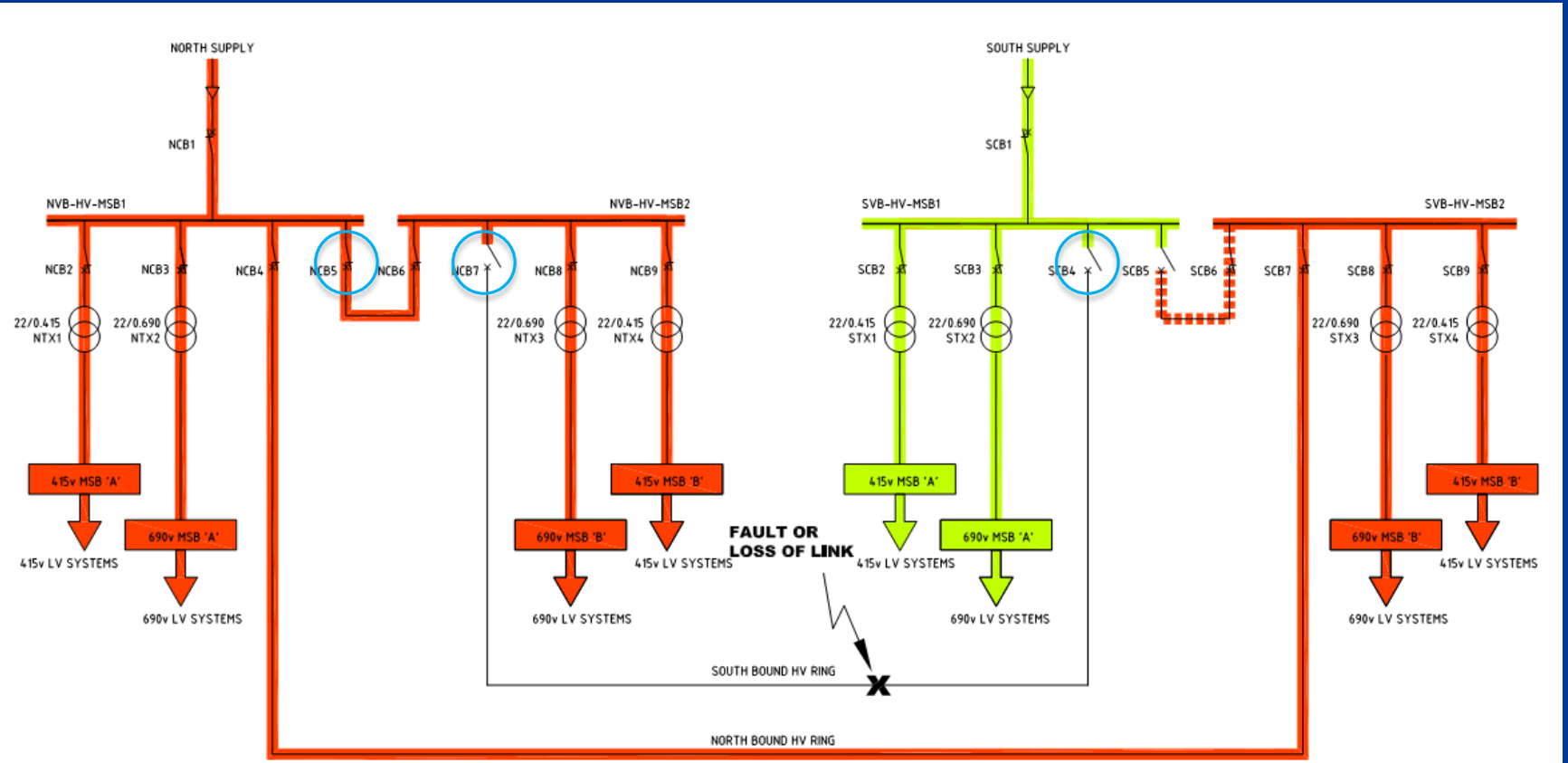
Scenario 1 – Loss of Northern Zone Substation



Scenario 2 – Loss of Southern Zone Substation



Scenario 3 – Loss of Southbound Ring Circuit



SCENARIO 3

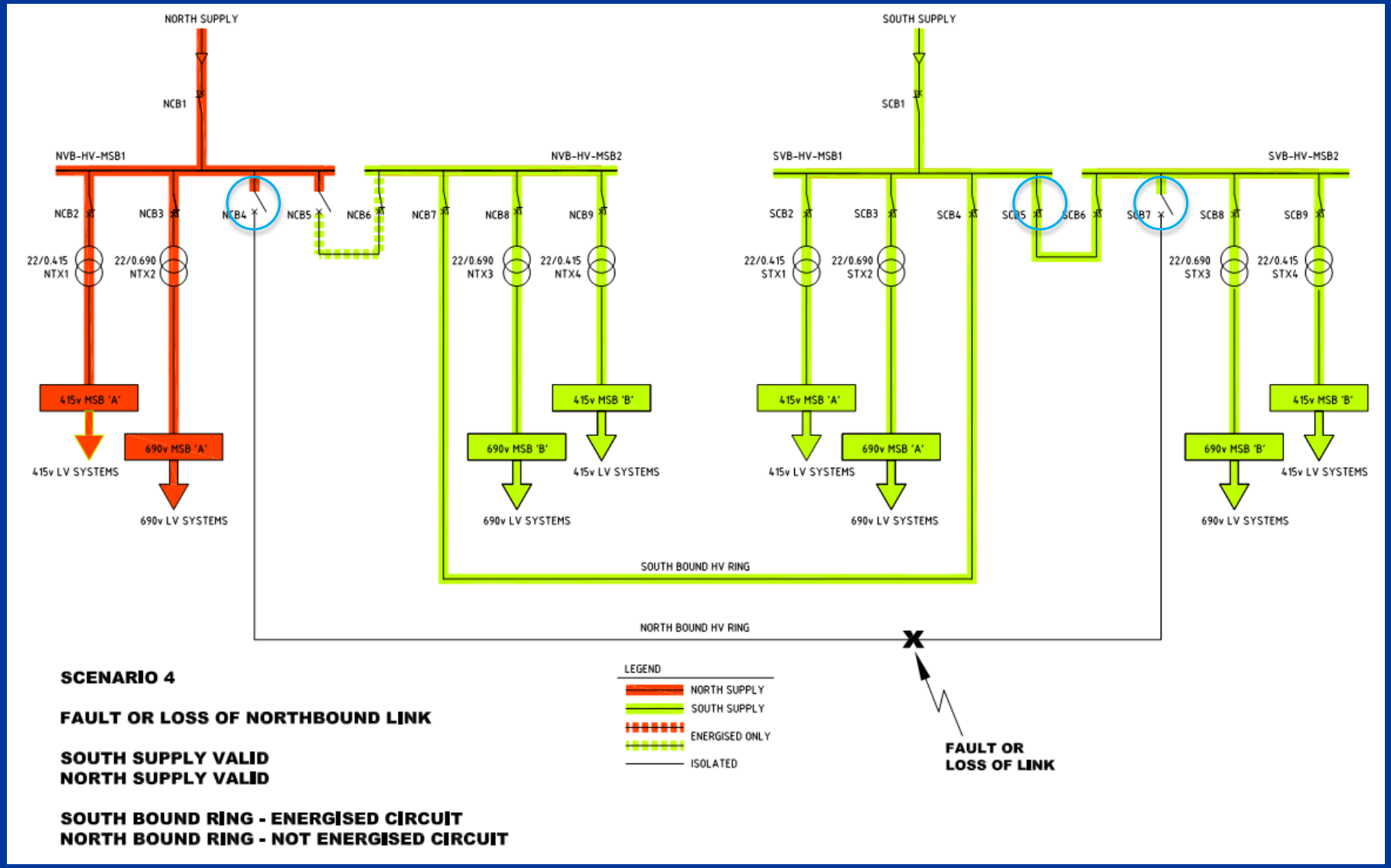
FAULT OR LOSS OF SOUTHBOUND HV LINK

SOUTH SUPPLY VALID
NORTH SUPPLY VALID

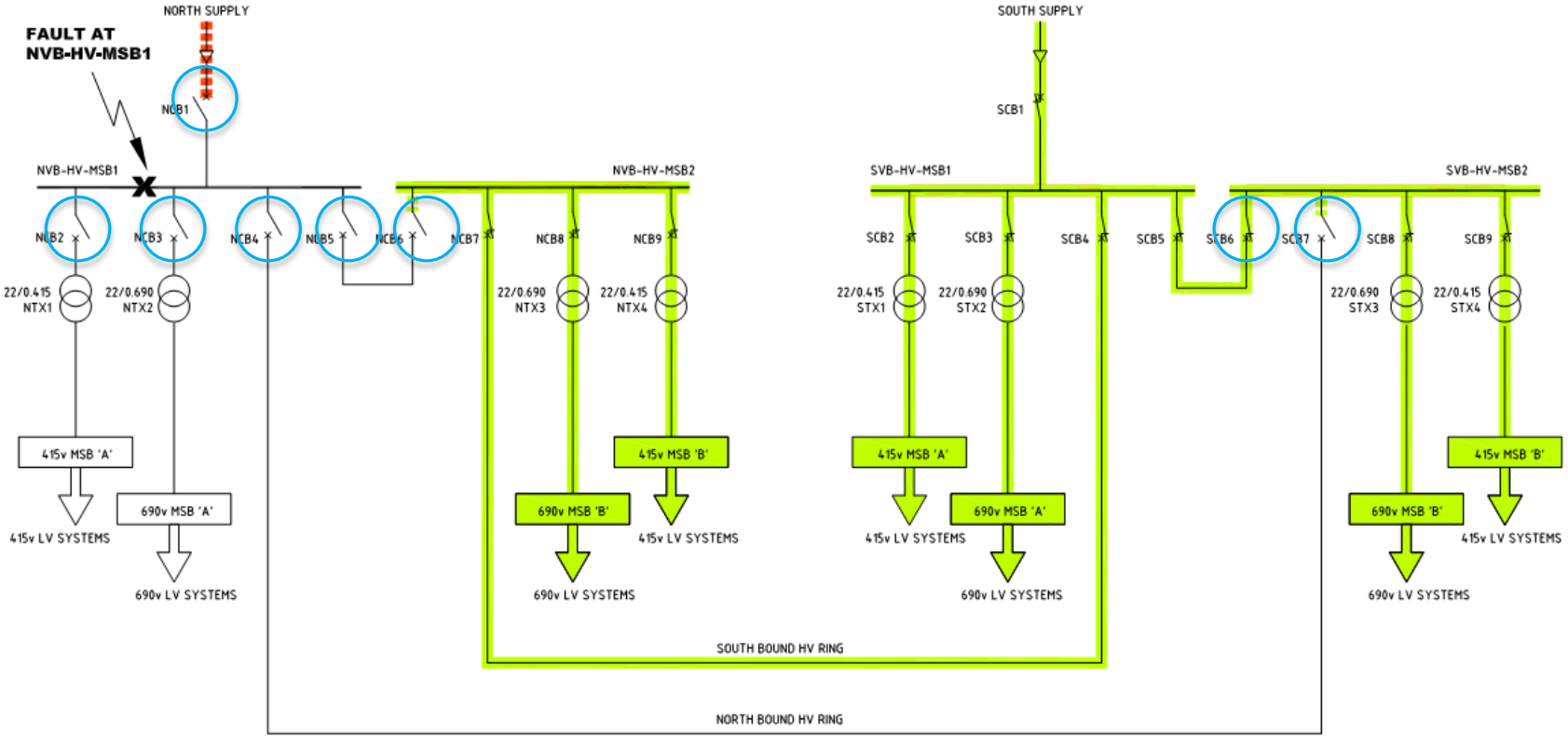
SOUTH BOUND RING - NOT ENERGISED CIRCUIT
NORTH BOUND RING - ENERGISED CIRCUIT

LEGEND
- NORTH SUPPLY
- SOUTH SUPPLY
- ENERGISED ONLY
- ISOLATED

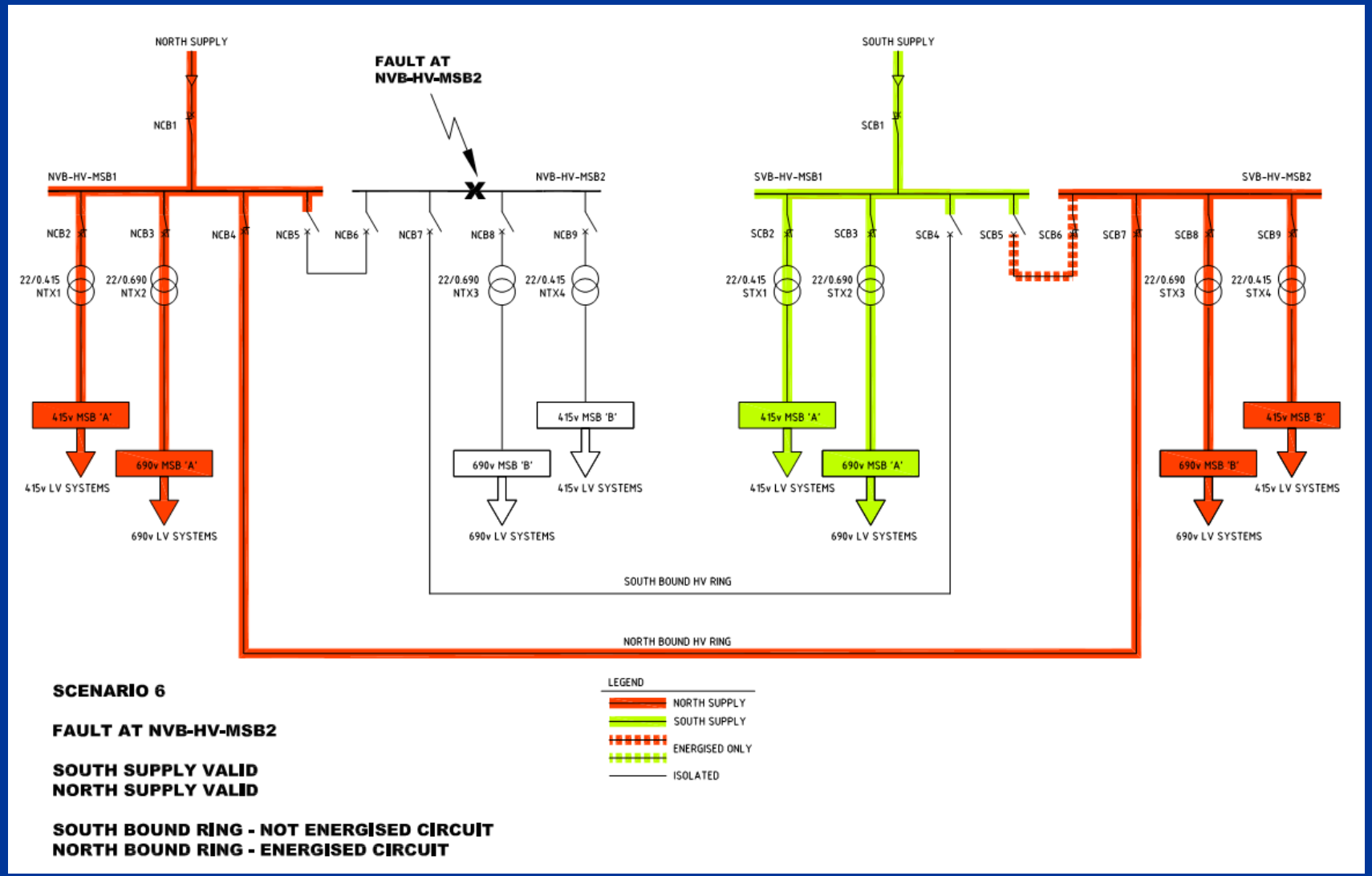
Scenario 4 – Loss of Northbound Ring Circuit



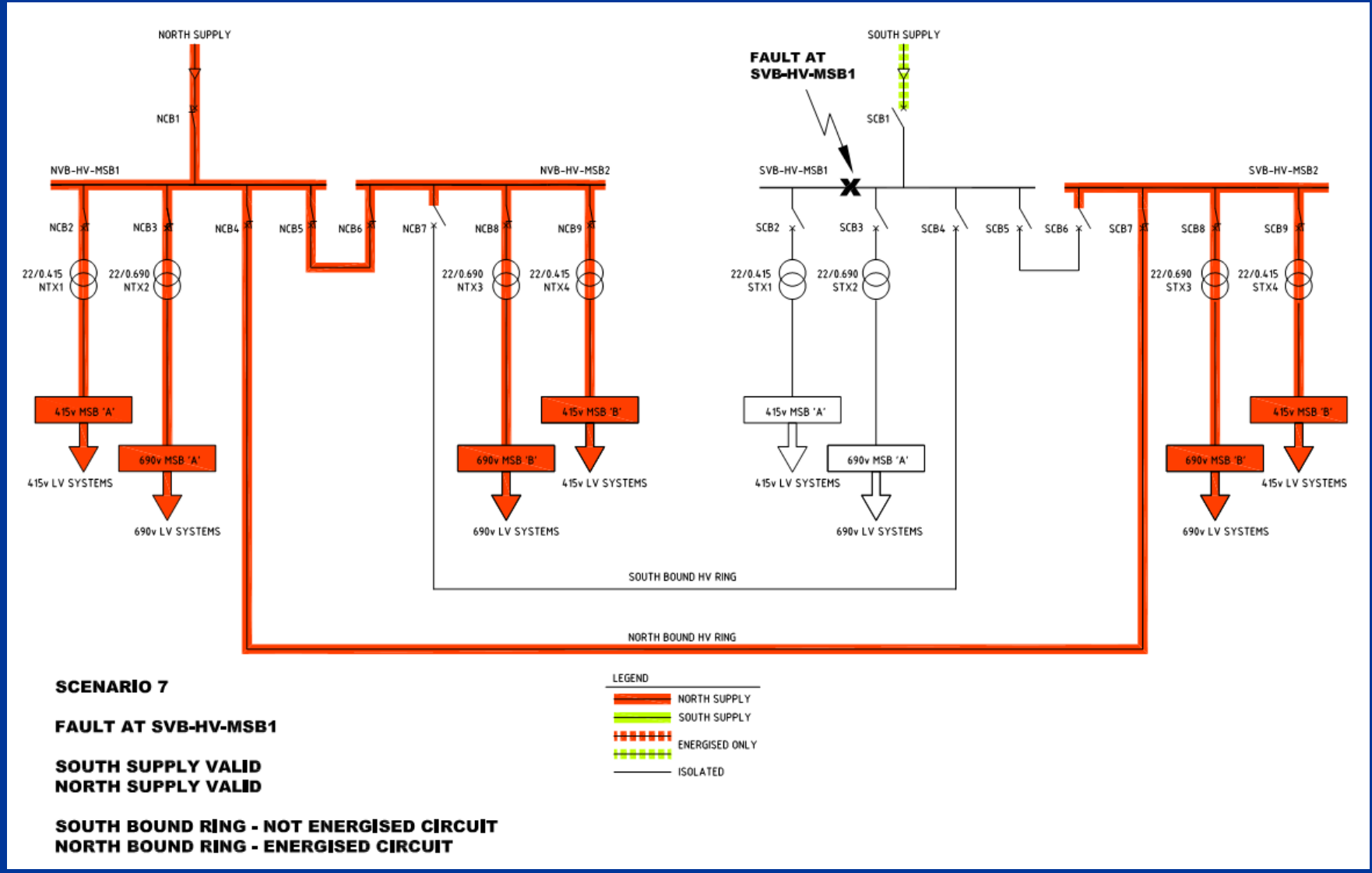
Scenario 5 – Fault at Northern Half Bus 1



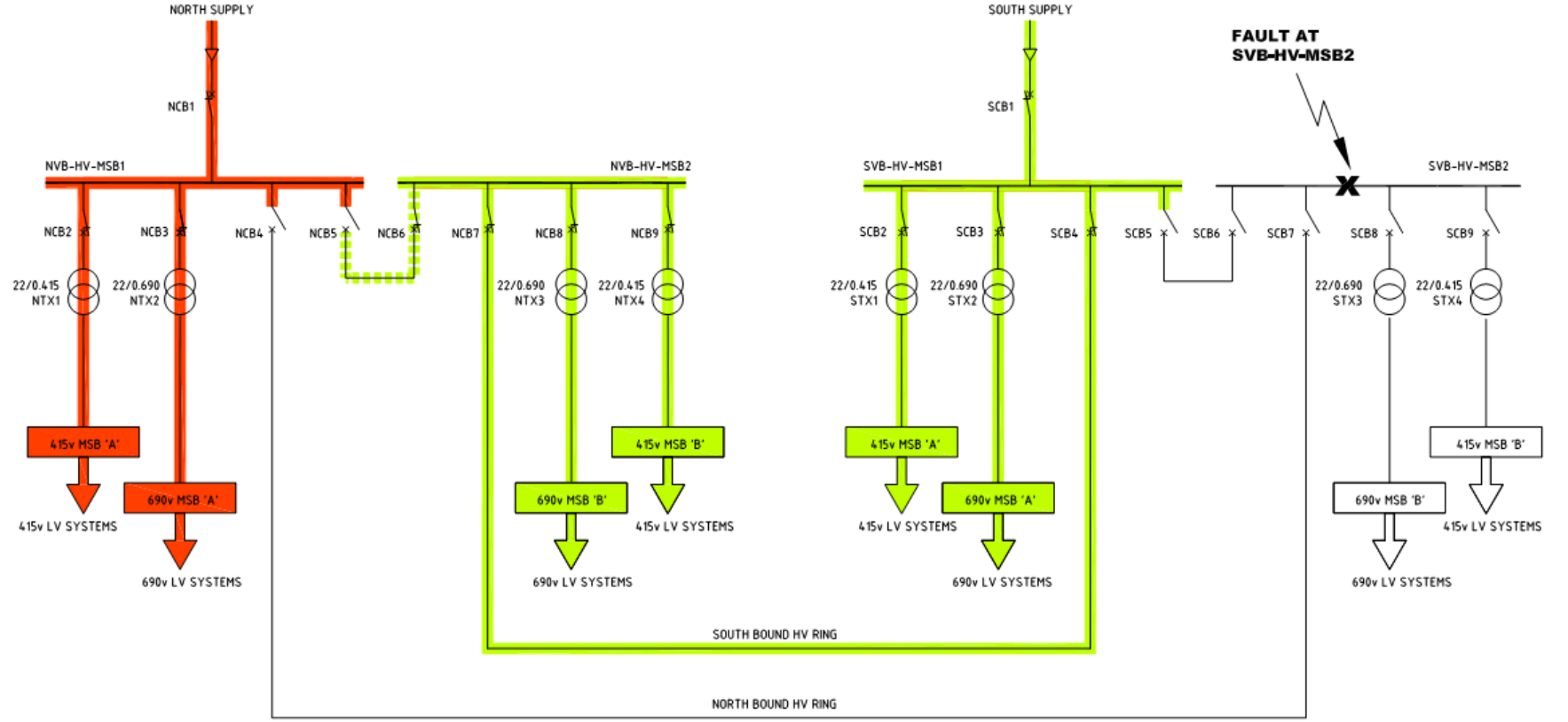
Scenario 6 – Fault at Northern Half Bus 2



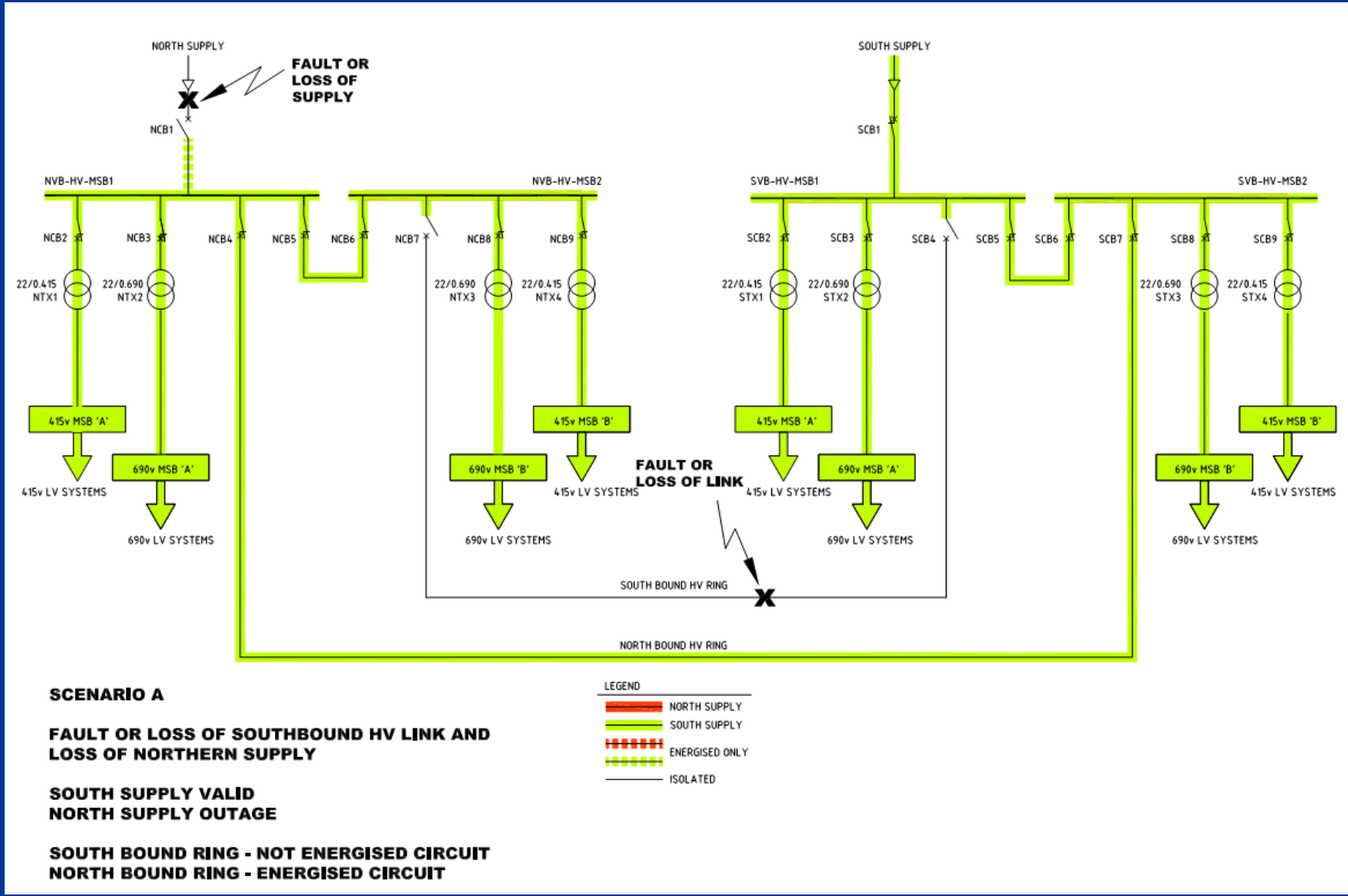
Scenario 7 – Fault at Southern Half Bus 1



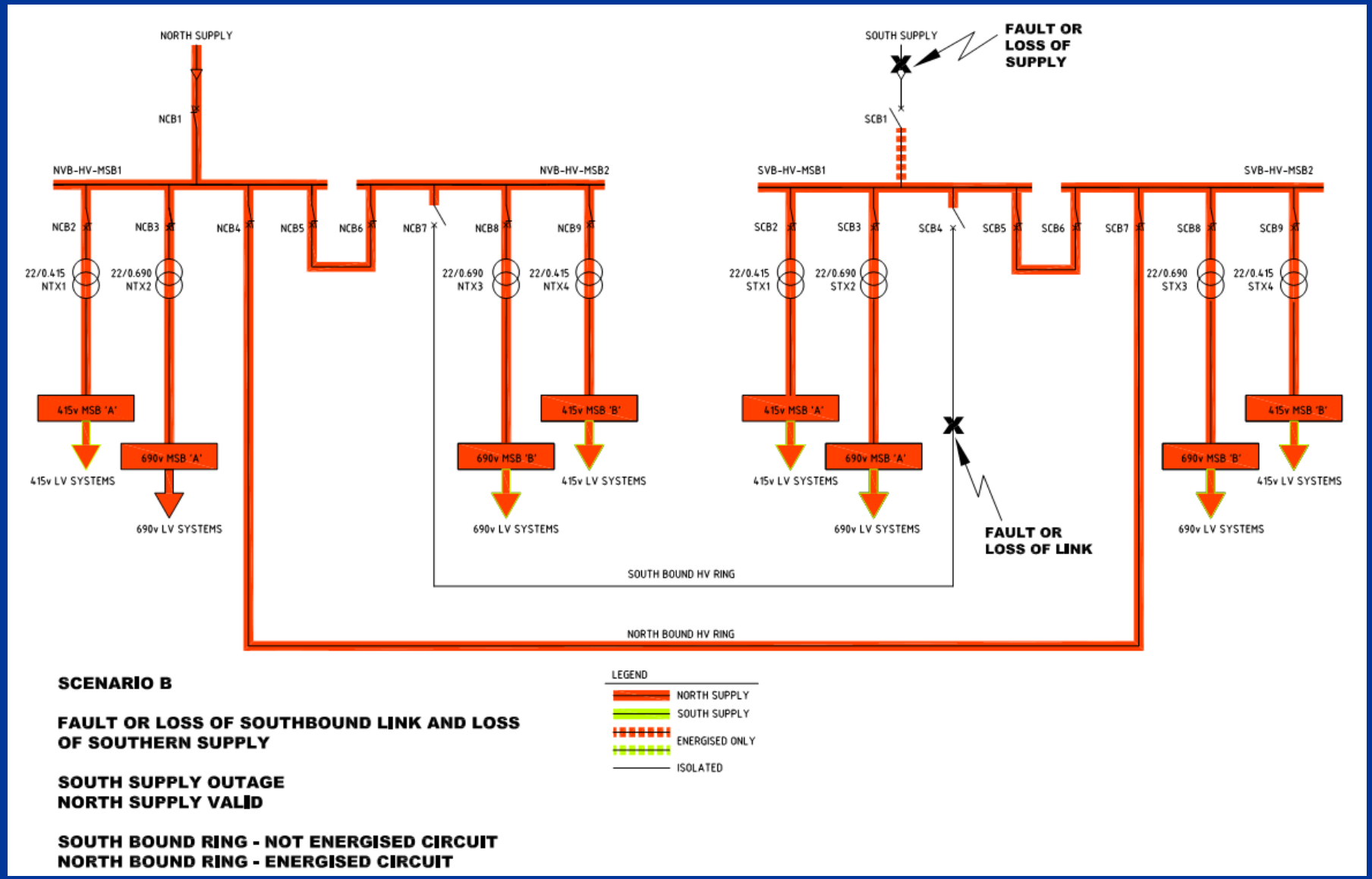
Scenario 8 – Fault at Southern Half Bus 2



Scenario A


NORTH SUPPLY
FAULT OR LOSS OF SUPPLY
NCB1
NVB-HV-MSB1
NVB-HV-MSB2
NCB2
NCB3
NCB4
NCB5
NCB6
NCB7
NCB8
NCB9
22/0.415 NTX1
22/0.690 NTX2
22/0.690 NTX3
22/0.415 NTX4
415v MSB 'A'
690v MSB 'A'
690v MSB 'B'
415v MSB 'B'
415v LV SYSTEMS
690v LV SYSTEMS
415v LV SYSTEMS
690v LV SYSTEMS
FAULT OR LOSS OF LINK
SOUTH BOUND HV RING
NORTH BOUND HV RING
SOUTH SUPPLY
SCB1
SVB-HV-MSB1
SVB-HV-MSB2
SCB2
SCB3
SCB4
SCB5
SCB6
SCB7
SCB8
SCB9
22/0.415 STX1
22/0.690 STX2
22/0.690 STX3
22/0.415 STX4
415v MSB 'A'
690v MSB 'A'
690v MSB 'B'
415v MSB 'B'
415v LV SYSTEMS
690v LV SYSTEMS
415v LV SYSTEMS
690v LV SYSTEMS
SCENARIO A
FAULT OR LOSS OF SOUTHBOUND HV LINK AND LOSS OF NORTHERN SUPPLY
SOUTH SUPPLY VALID
NORTH SUPPLY OUTAGE
SOUTH BOUND RING - NOT ENERGISED CIRCUIT
NORTH BOUND RING - ENERGISED CIRCUIT
LEGEND
NORTH SUPPLY
SOUTH SUPPLY
ENERGISED ONLY
ISOLATED

Scenario B



SCENARIO B

FAULT OR LOSS OF SOUTHBOUND LINK AND LOSS OF SOUTHERN SUPPLY

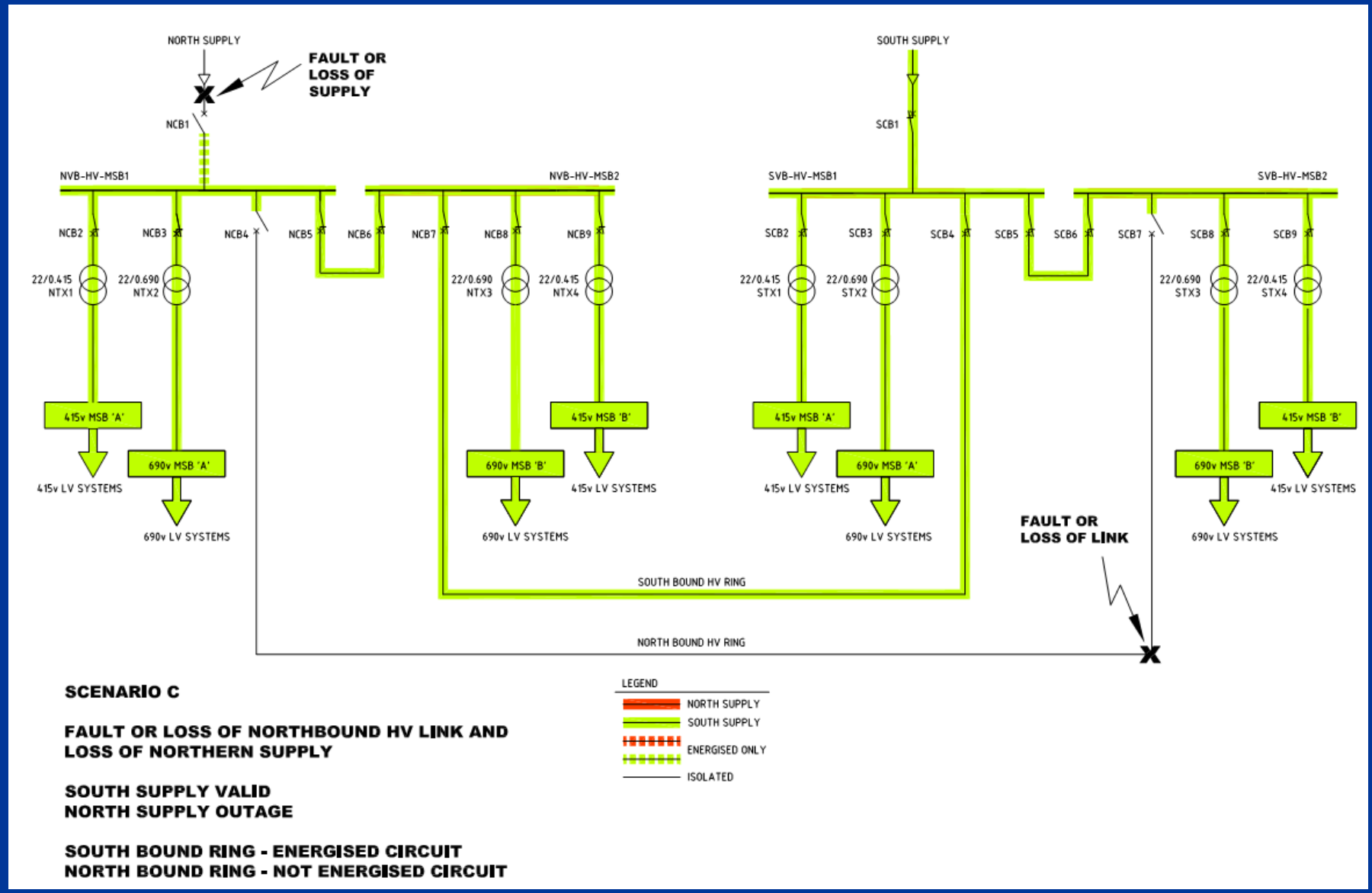
SOUTH SUPPLY OUTAGE
NORTH SUPPLY VALID

SOUTH BOUND RING - NOT ENERGISED CIRCUIT
NORTH BOUND RING - ENERGISED CIRCUIT

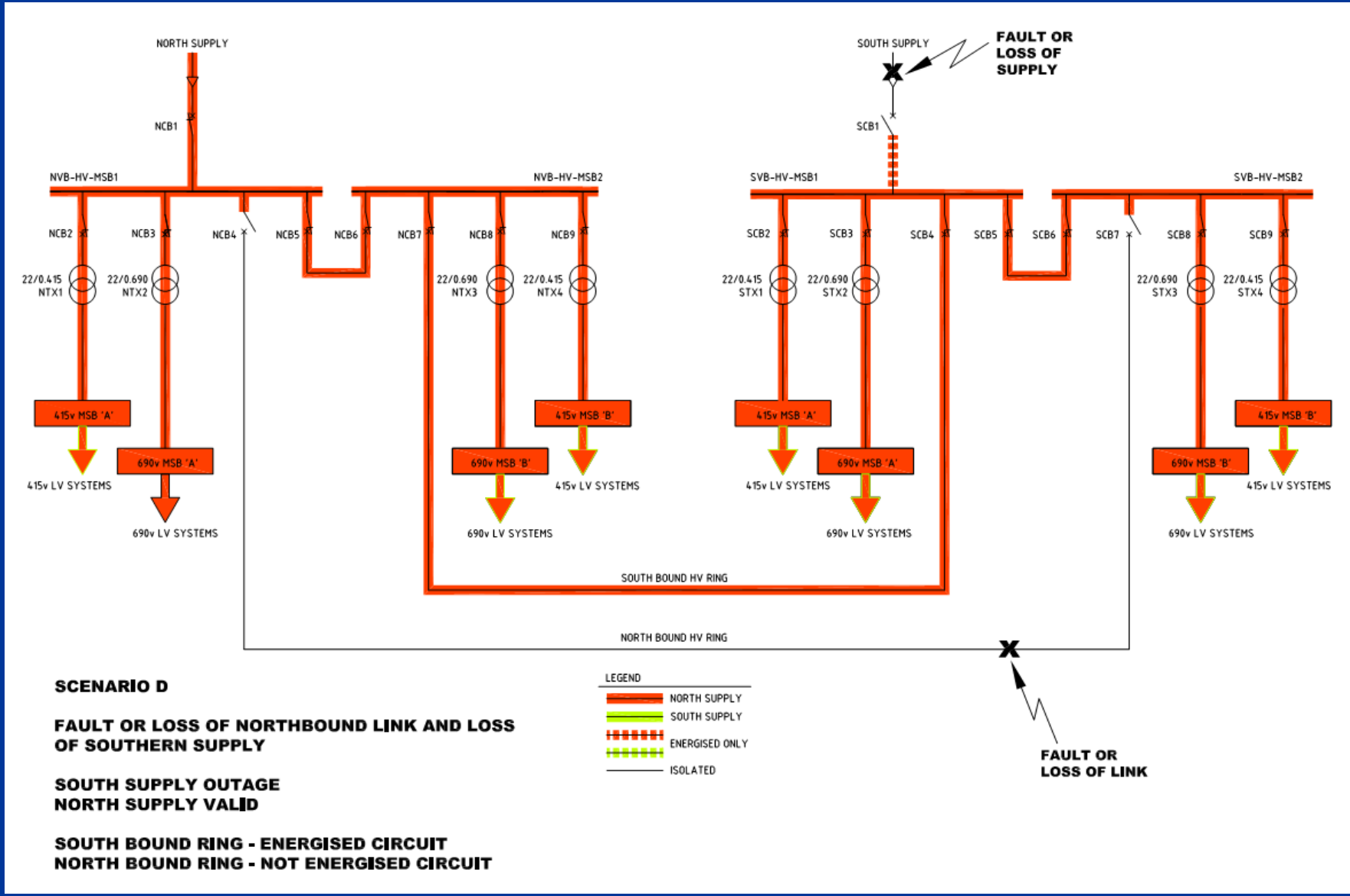
LEGEND

- NORTH SUPPLY
- SOUTH SUPPLY
- ENERGISED ONLY
- ISOLATED

Scenario C


NORTH SUPPLY
FAULT OR LOSS OF SUPPLY
NCB1
NVB-HV-MSB1
NVB-HV-MSB2
NCB2
NCB3
NCB4
NCB5
NCB6
NCB7
NCB8
NCB9
22/0.415 NTX1
22/0.690 NTX2
22/0.690 NTX3
22/0.415 NTX4
415v MSB 'A'
690v MSB 'A'
415v MSB 'B'
690v MSB 'B'
415v LV SYSTEMS
690v LV SYSTEMS
SOUTH SUPPLY
SCB1
SVB-HV-MSB1
SVB-HV-MSB2
SCB2
SCB3
SCB4
SCB5
SCB6
SCB7
SCB8
SCB9
22/0.415 STX1
22/0.690 STX2
22/0.690 STX3
22/0.415 STX4
SOUTH BOUND HV RING
FAULT OR LOSS OF LINK
NORTH BOUND HV RING
SCENARIO C
FAULT OR LOSS OF NORTHBOUND HV LINK AND LOSS OF NORTHERN SUPPLY
SOUTH SUPPLY VALID
NORTH SUPPLY OUTAGE
SOUTH BOUND RING - ENERGISED CIRCUIT
NORTH BOUND RING - NOT ENERGISED CIRCUIT
LEGEND
NORTH SUPPLY
SOUTH SUPPLY
ENERGISED ONLY
ISOLATED

Scenario D


NORTH SUPPLY
NCB1
NVB-HV-MSB1
NVB-HV-MSB2
NCB2
NCB3
NCB4
NCB5
NCB6
NCB7
NCB8
NCB9
22/0.415 NTX1
22/0.690 NTX2
22/0.690 NTX3
22/0.415 NTX4
415v MSB 'A'
690v MSB 'A'
415v MSB 'B'
690v MSB 'B'
415v LV SYSTEMS
690v LV SYSTEMS
SOUTH SUPPLY
FAULT OR LOSS OF SUPPLY
SCB1
SVB-HV-MSB1
SVB-HV-MSB2
SCB2
SCB3
SCB4
SCB5
SCB6
SCB7
SCB8
SCB9
22/0.415 STX1
22/0.690 STX2
22/0.690 STX3
22/0.415 STX4
SOUTH BOUND HV RING
NORTH BOUND HV RING
FAULT OR LOSS OF LINK
SCENARIO D
FAULT OR LOSS OF NORTHBOUND LINK AND LOSS OF SOUTHERN SUPPLY
SOUTH SUPPLY OUTAGE
NORTH SUPPLY VALID
SOUTH BOUND RING - ENERGISED CIRCUIT
NORTH BOUND RING - NOT ENERGISED CIRCUIT
LEGEND
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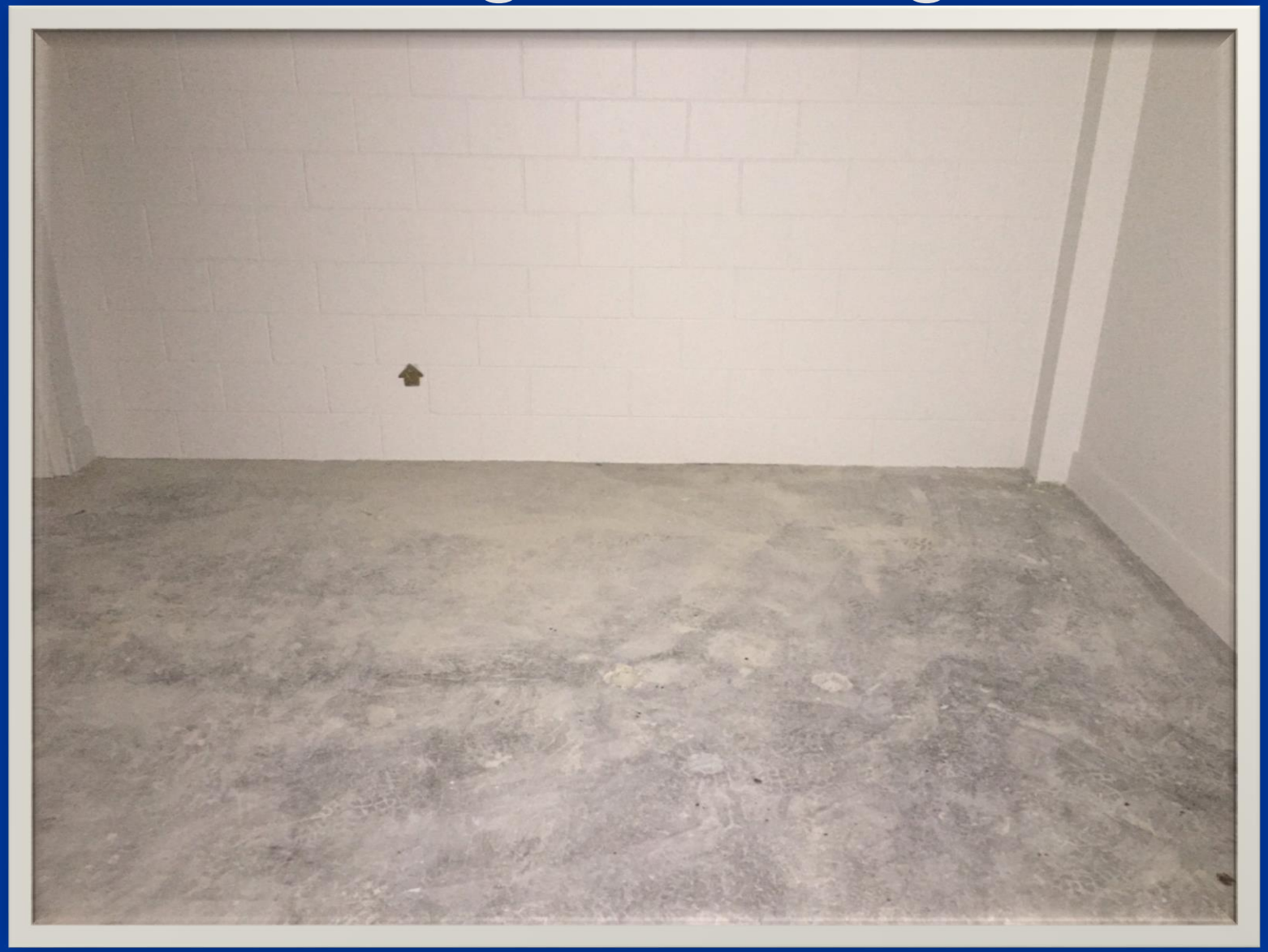
SOUTH SUPPLY
ENERGISED ONLY
ISOLATED

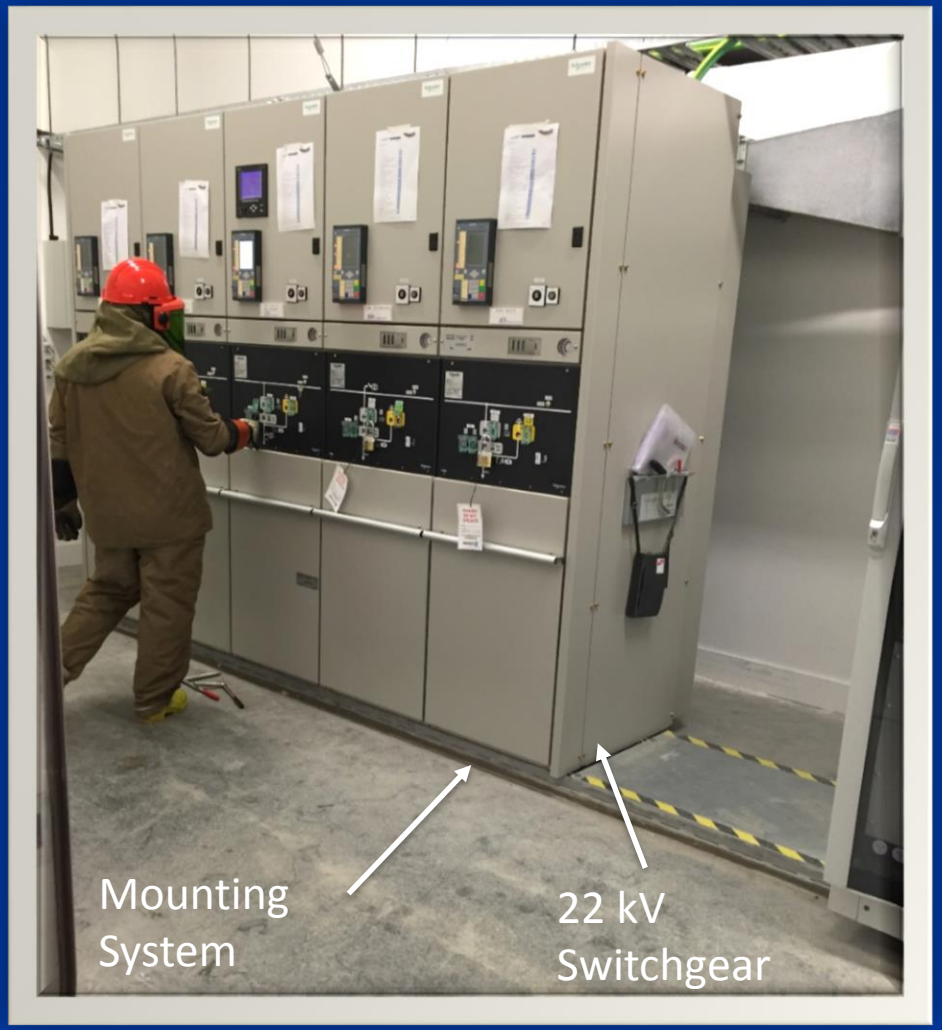
Challenges on Site

Switchgear Mounting & Cabling



Switchgear Mounting & Cabling

Final Setting



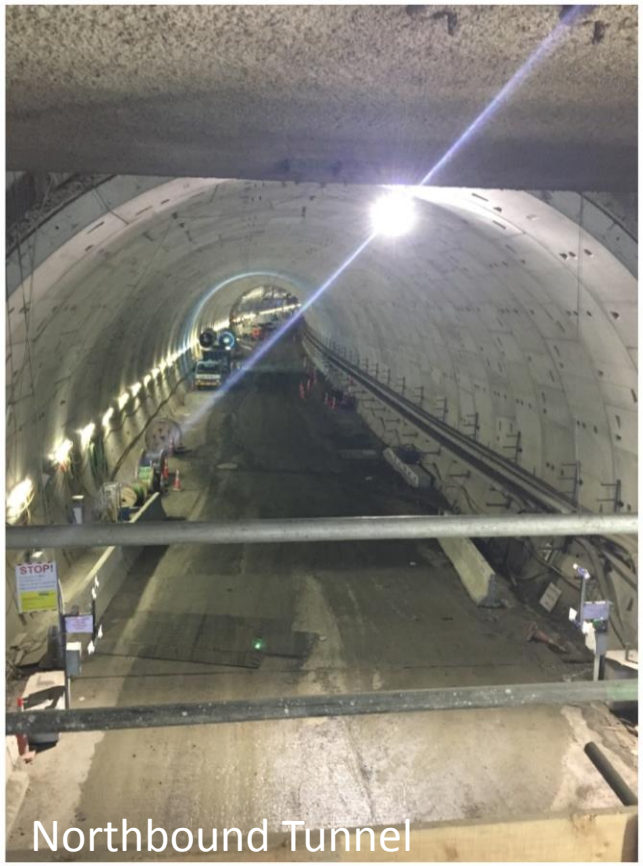
During Construction


Southbound Tunnel

HV Pressure Testing

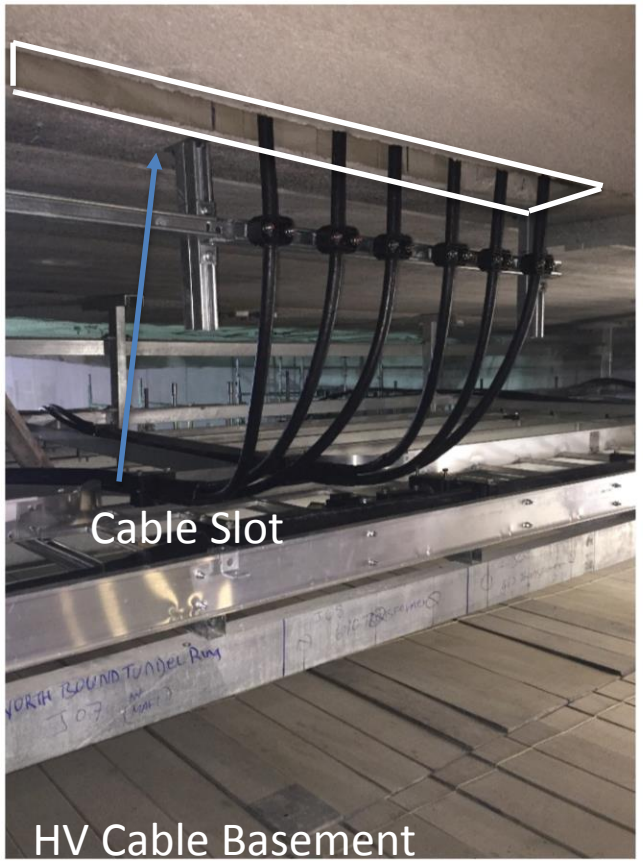
Beca

During Construction



Northbound Tunnel


HV Cable Basement



HV Cable Basement

Questions?