# Appendix

## A. Model Linearization

In this section, the expressions are transformed into mixed integer linear form with linearization technique.

(17) can be transformed into the following formulation.

 (A1)

(18)(19)(20) can be transformed into the following formulation.

 (A2)

 (A3)

 (A4)

(43) can be transformed into the following formulation.

 (A5)

## B. Detailed Analysis of the Constraints

For (33), the following four situations are discussed.

Case 1: *FL ij,c*=1 and *FRCS ij,c* = 1, (33) is converted to (B1).

 (B1)

Case 2: *FL ij,c*=1 and *FRCS ij,c* = 0, (33) is converted to (B2).

 (B2)

Case 3: *FL ij,c*=0 and *FRCS ij,c* = 1, (33) is converted to (B3).

 (B3)

Case 4: *FL ij,c*=0 and *FRCS ij,c* = 0, (33) is converted to (B4).

 (B4)

For (34)(35), the following four situations are discussed.

Case 1: *FL ij,c*=1 and *FRCS ij,c* = 1, (34)(35) are converted to (B5)(B6).

 (B5)

 (B6)

If the line is disconnected at the pre-disaster phase, *zij,PI* = 0, the fault will not be transmitted. If the line is closed before the disaster, *zij,PI* = 1, the fault will extend from branch to node.

Case 2: *FL ij,c*=1 and *FRCS ij,c* = 0, (34)(35) are converted to (B7)(B8).

 (B7)

 (B8)

Case 3: *FL ij,c*=0 and *FRCS ij,c* = 1, (34)(35) are converted to (B9)(B10).

 (B9)

 (B10)

Case 4: *FL ij,c*=0 and *FRCS ij,c* = 0, (34)(35) are converted to (B11)(B12).

 (B11)

 (B12)

For (38), the following four situations are discussed.

Case 1: *FL ij,c*=1 and *FRCS ij,c* = 1, (38) is converted to (B13).

 (B13)

Case 2: *FL ij,c*=1 and *FRCS ij,c* = 0, (38) is converted to (B14).

 (B14)

Case 3: *FL ij,c*=0 and *FRCS ij,c* = 1, (38) is converted to (B15).

 (B15)

Case 4: *FL ij,c*=0 and *FRCS ij,c* = 0, (38) is converted to (B16).

 (B16)