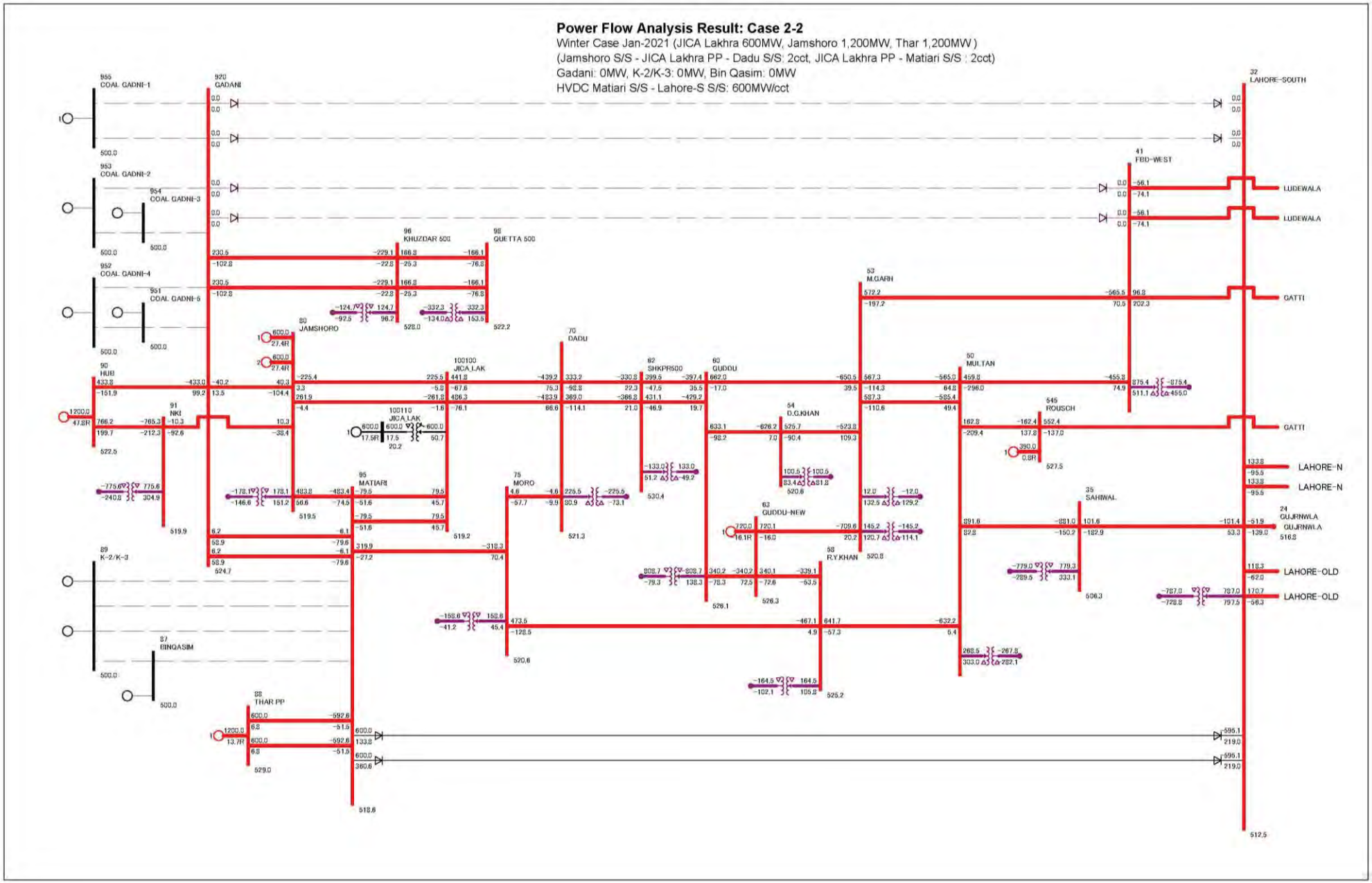
6 - 3 STABILITY ANALYSIS CASE ST2-2

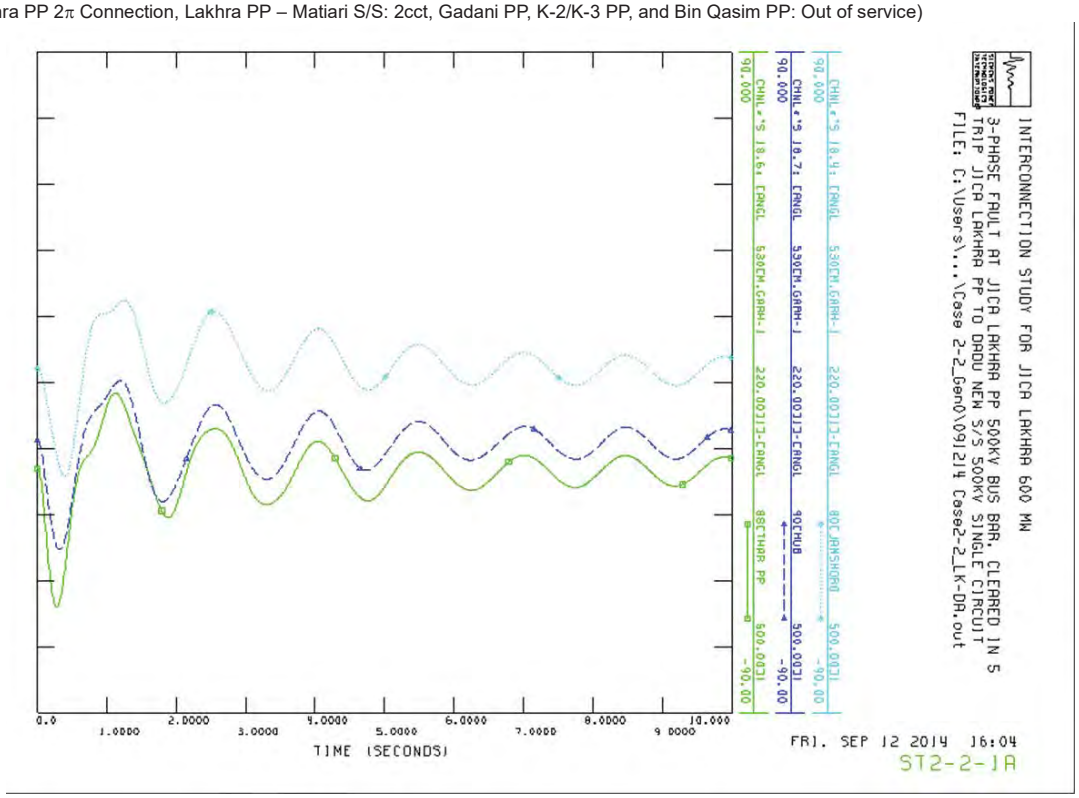
Stability Analysis Result Case ST-2-2

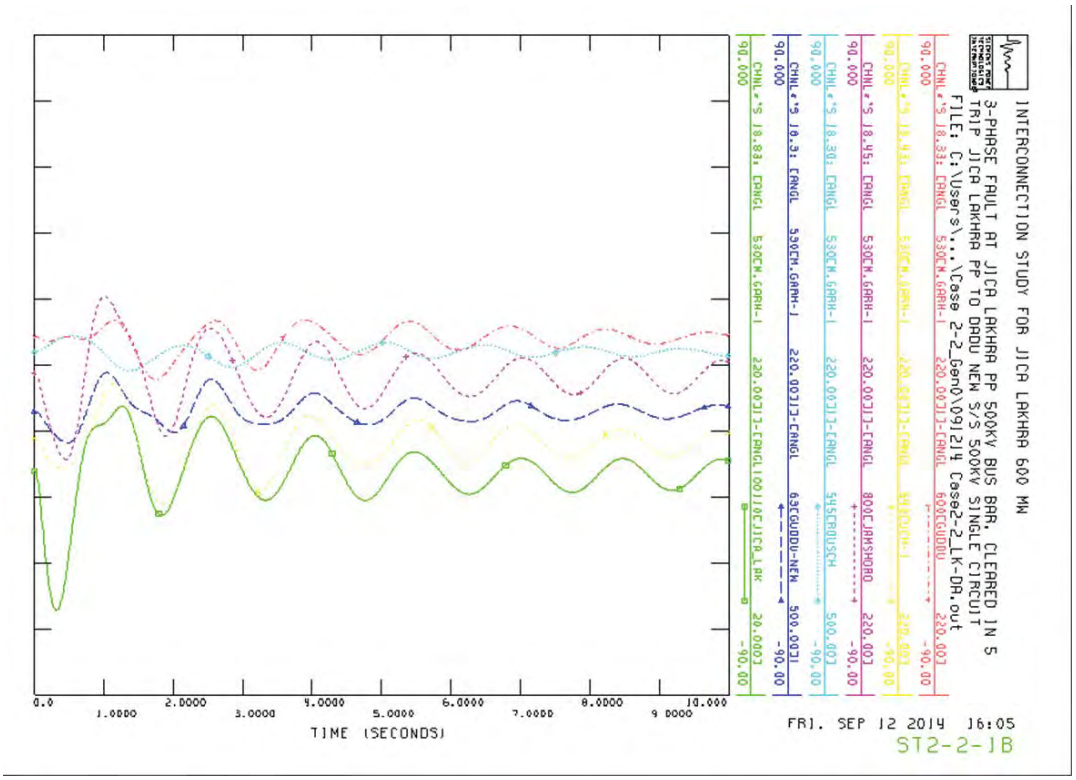
(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)



Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

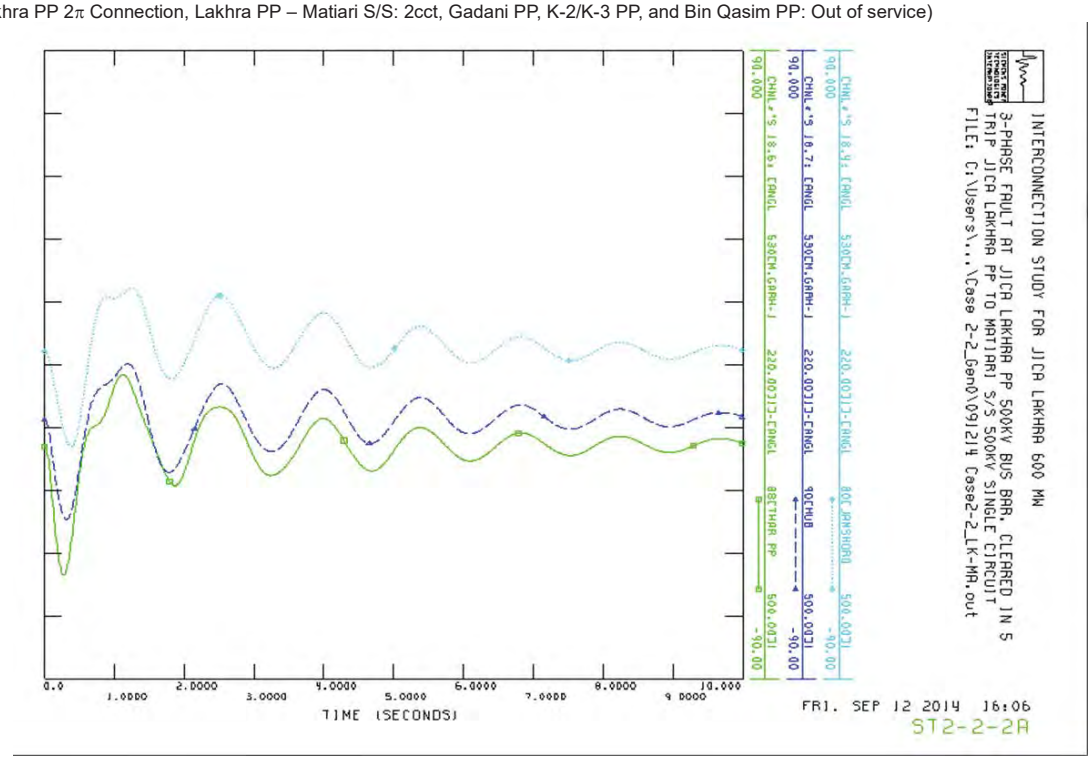


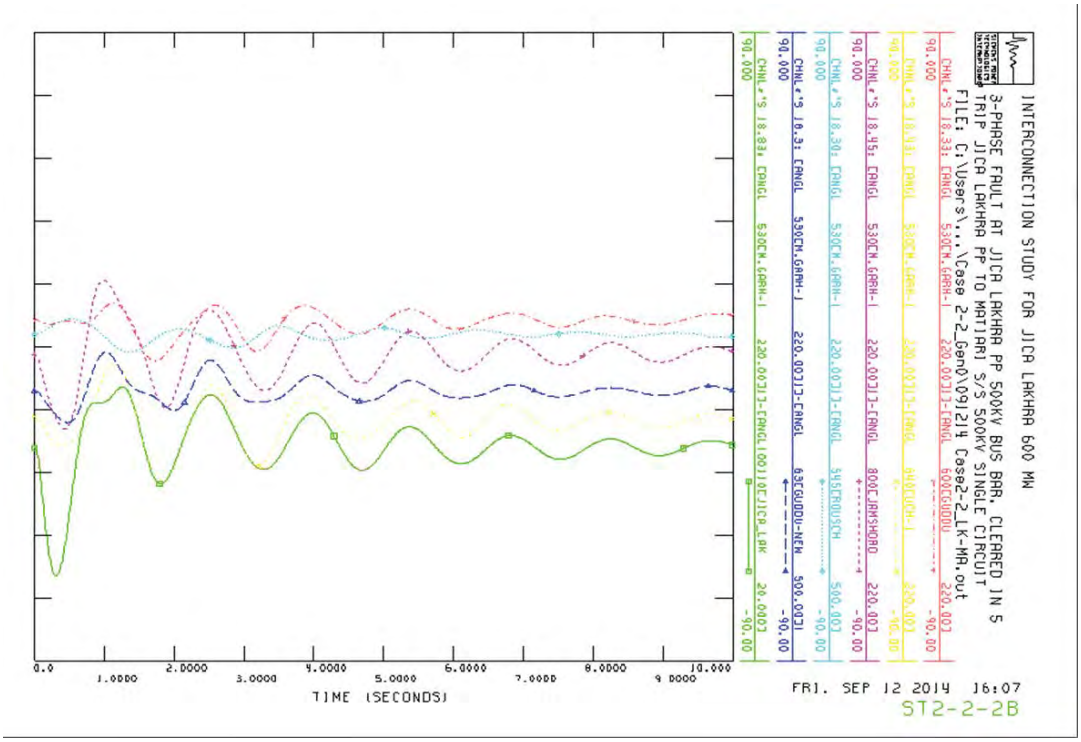


Fault Section: JICA Lakhra PP – Dadu New S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

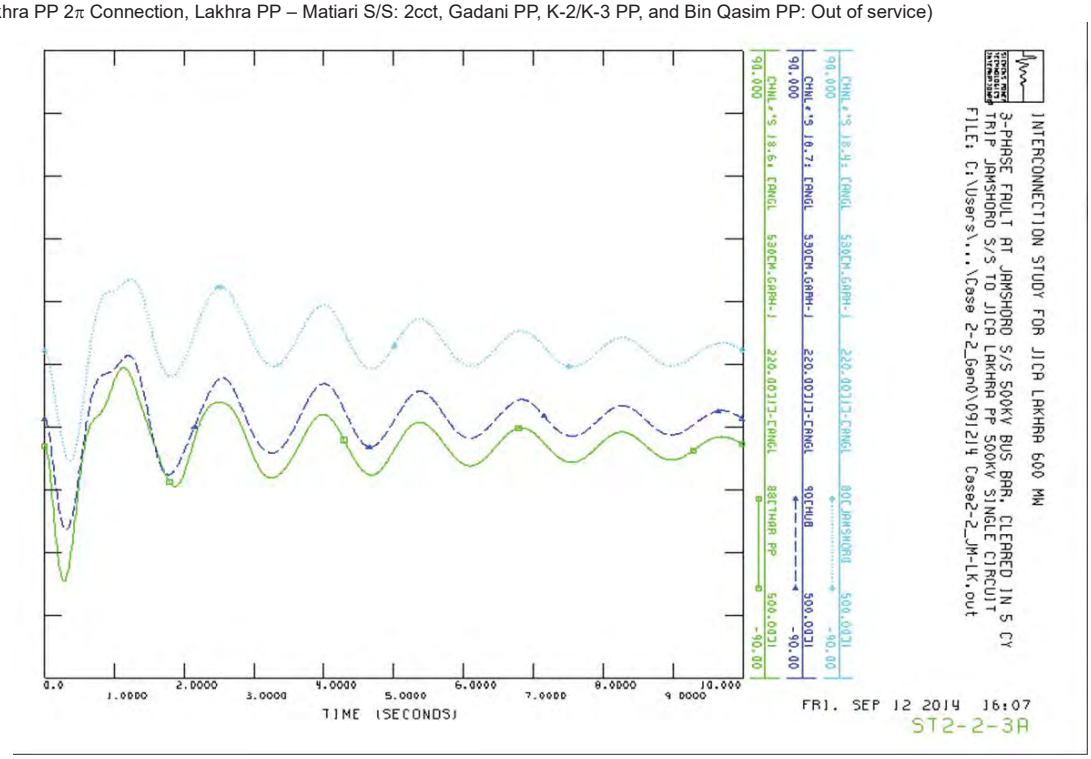


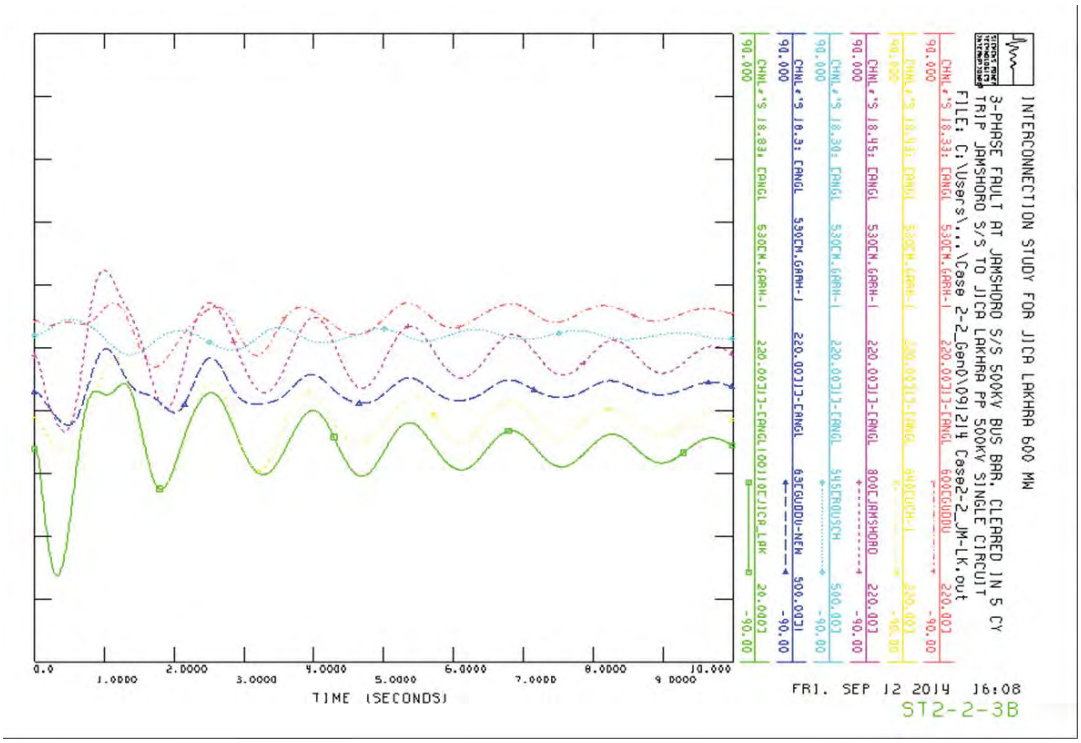


Fault Section: JICA Lakhra PP – Matiari S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

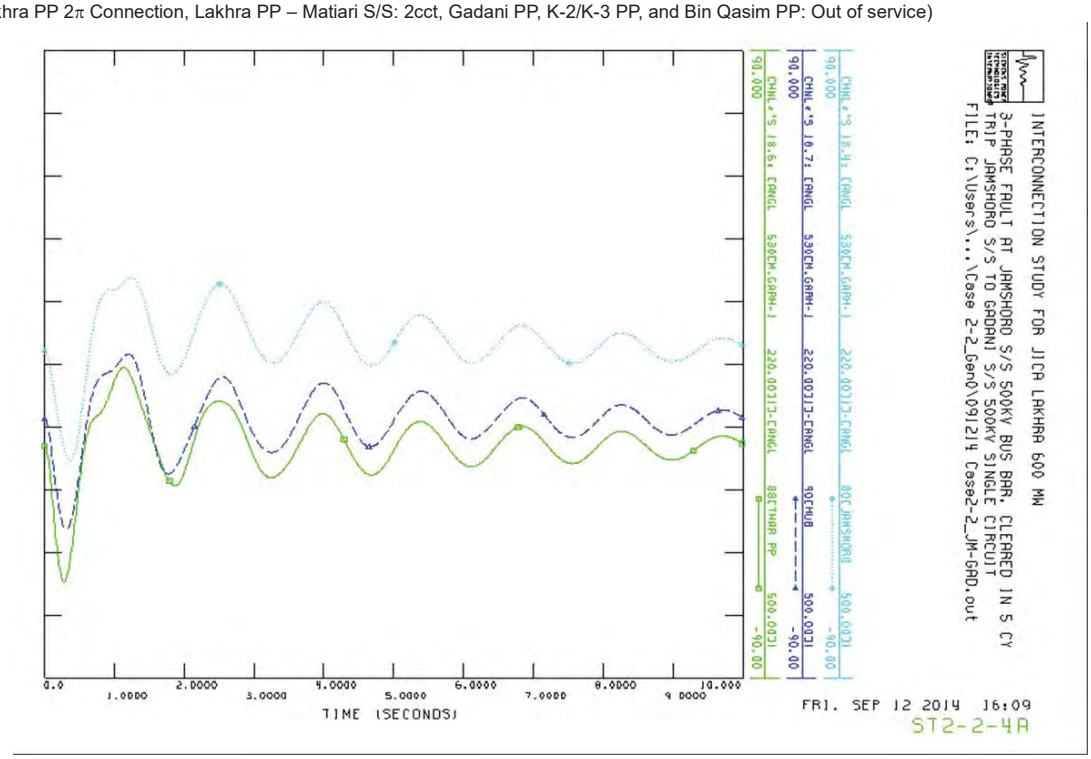


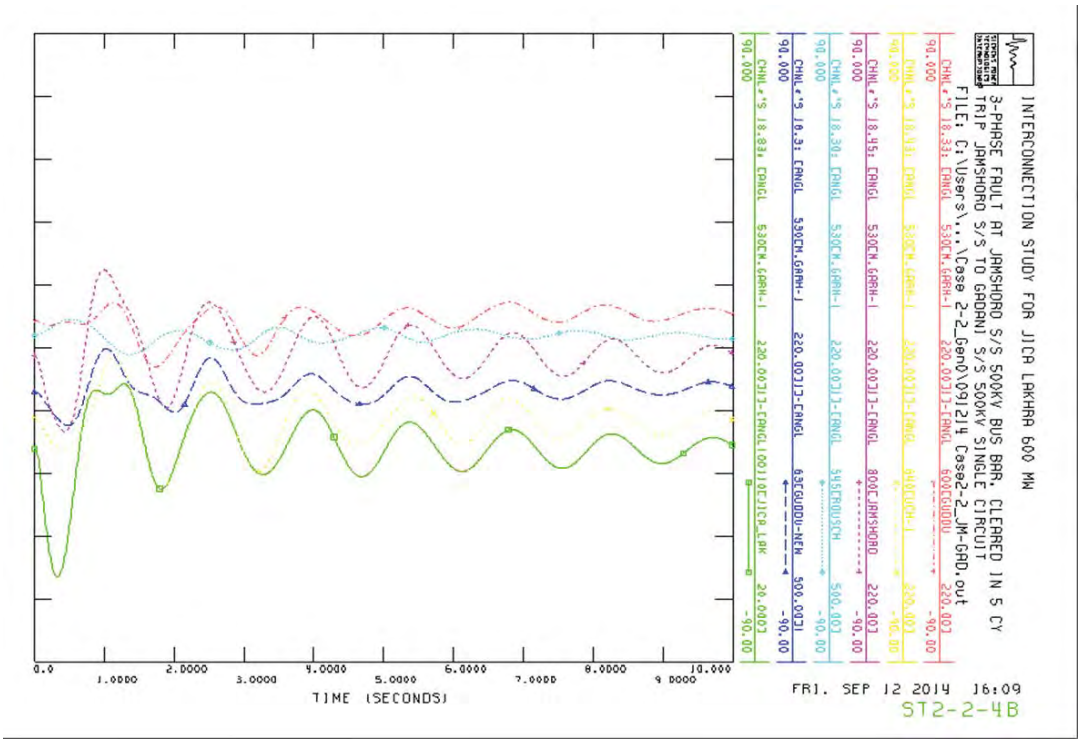


Fault Section: Jamshoro S/S – JICA Lakhra PP

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

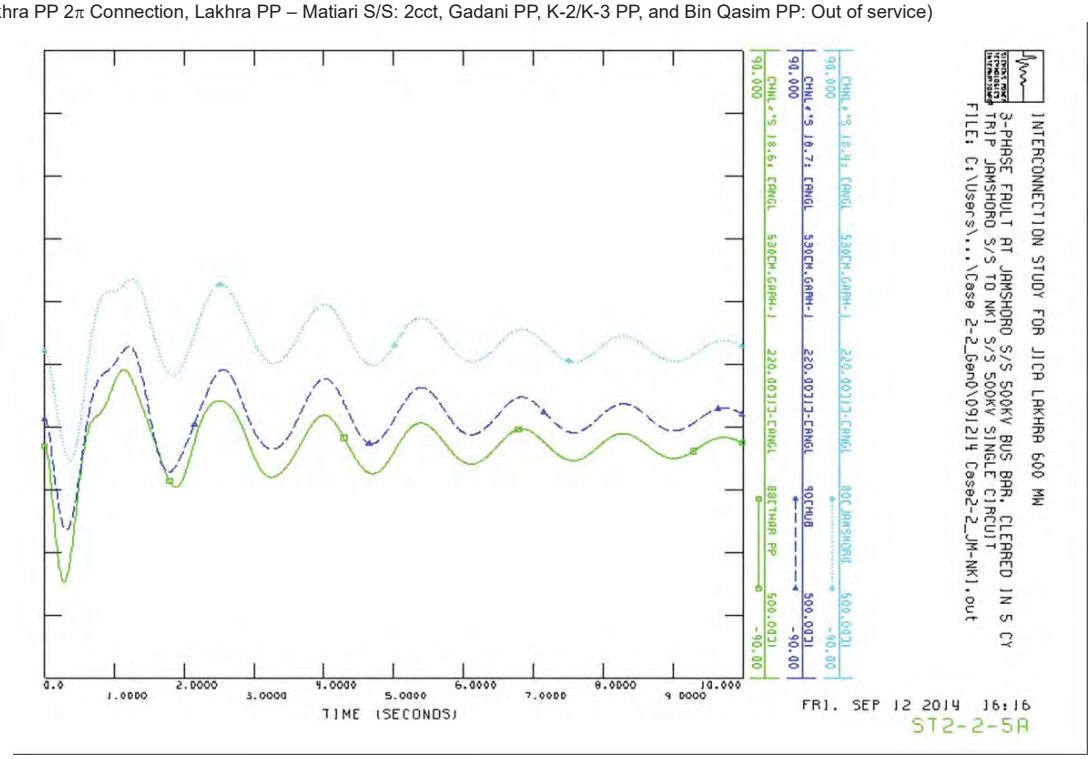


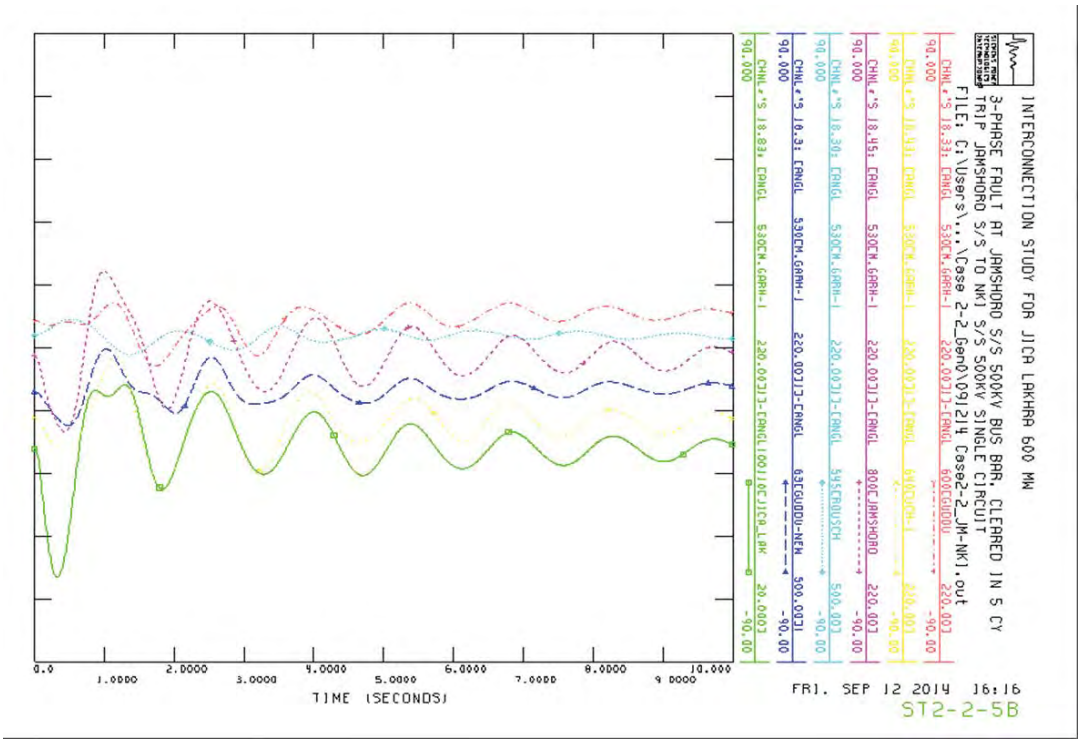


Fault Section: Jamshoro S/S – Gadani S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

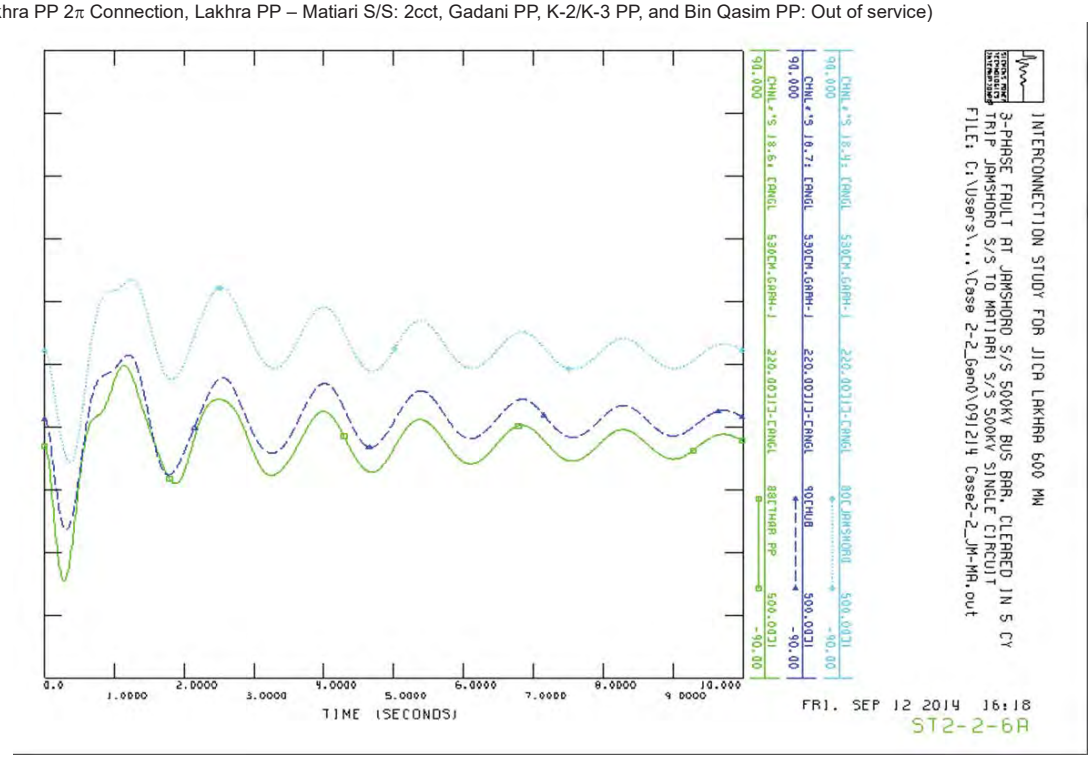


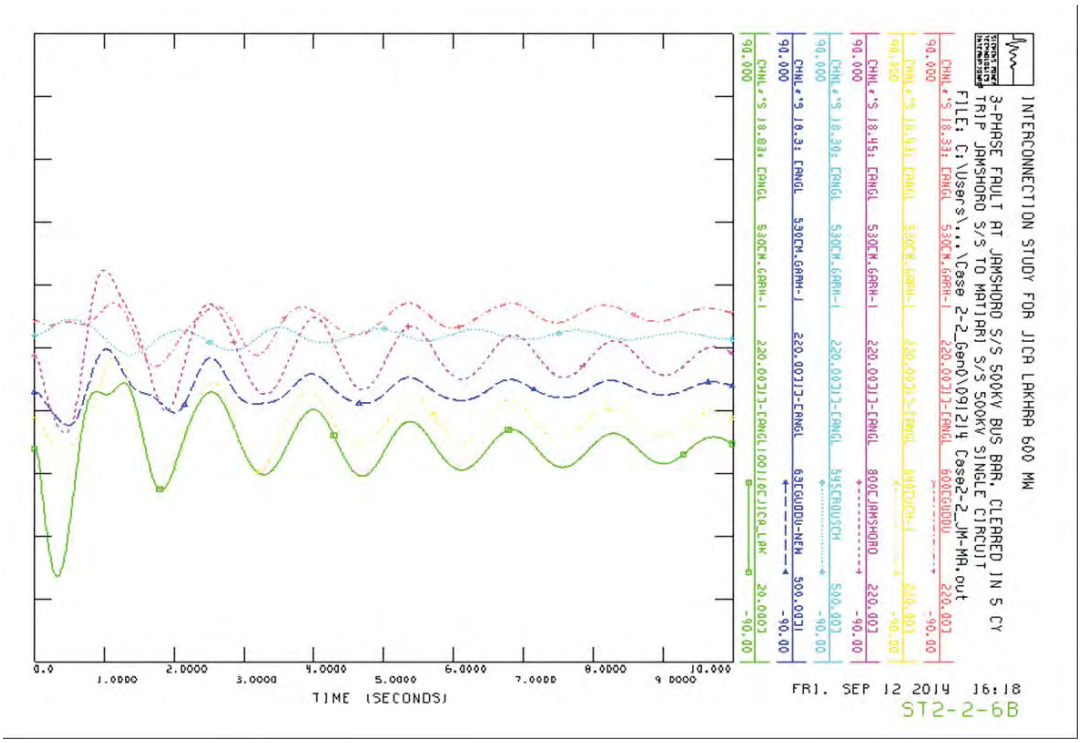


Fault Section: Jamshoro S/S – NKI S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

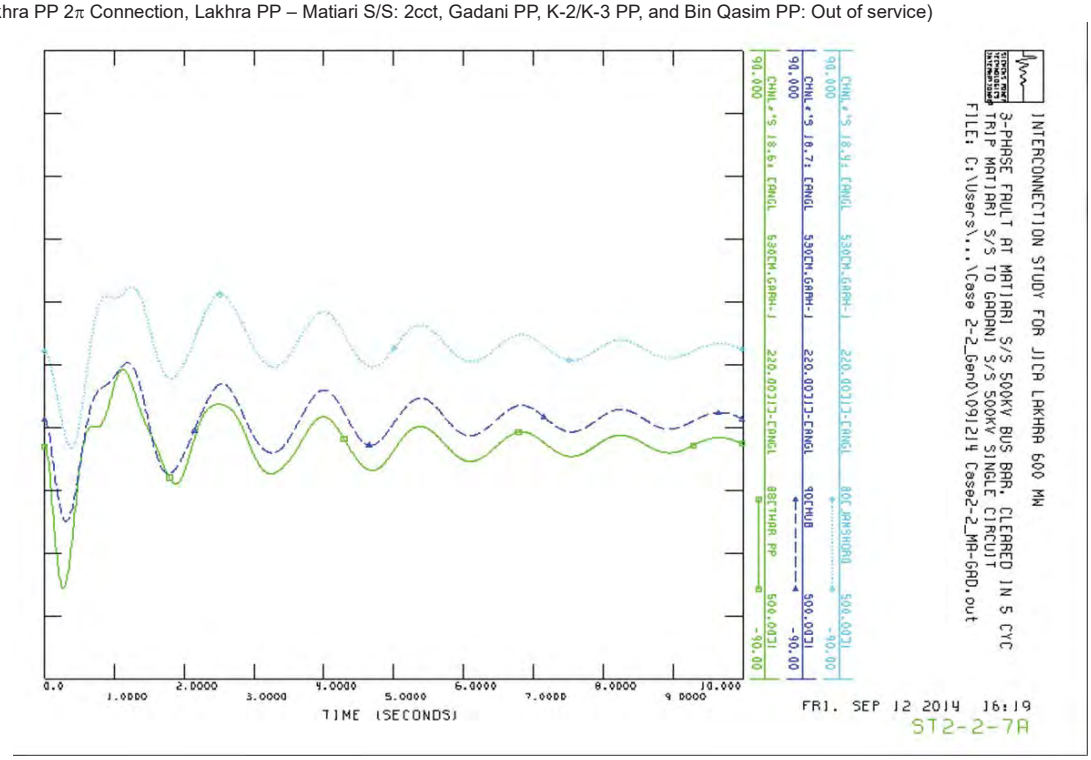


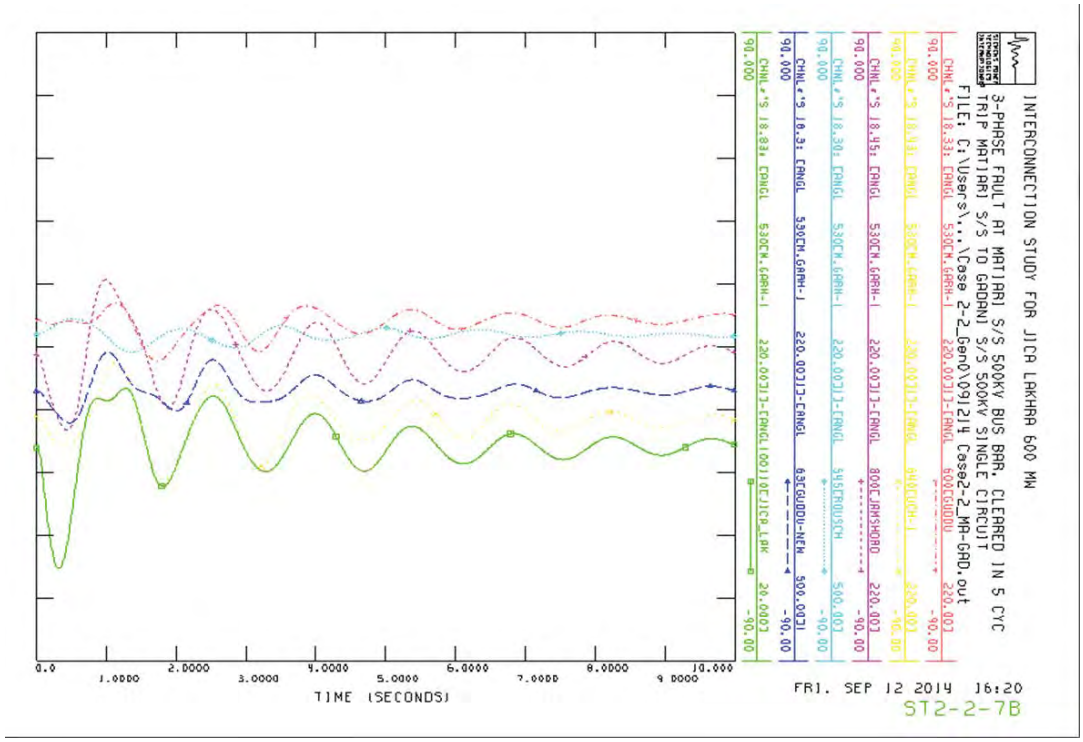


Fault Section: Jamshoro S/S – Matiari S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

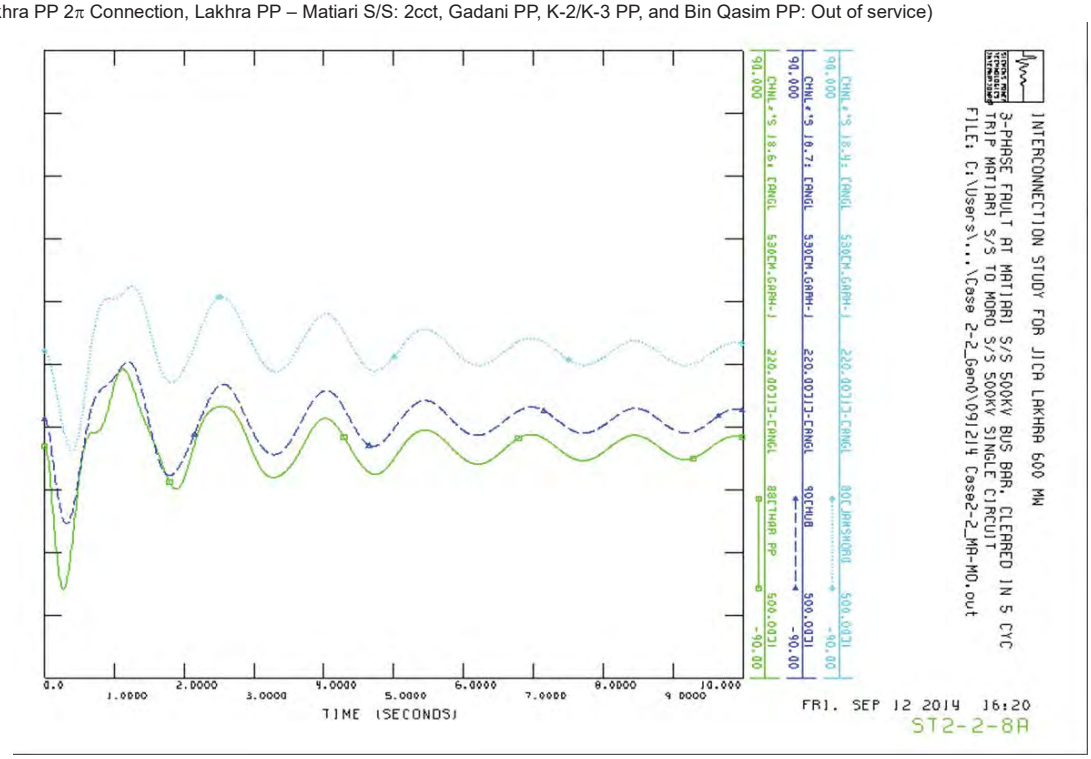


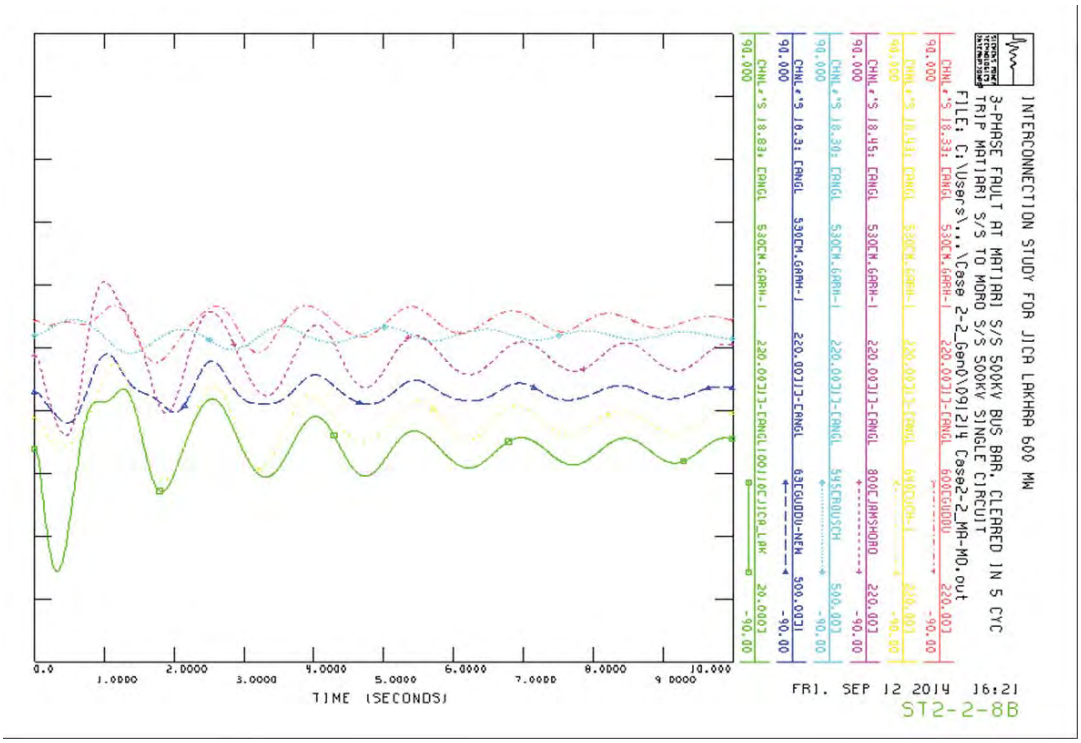


Fault Section: Matiari S/S – Gadani S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

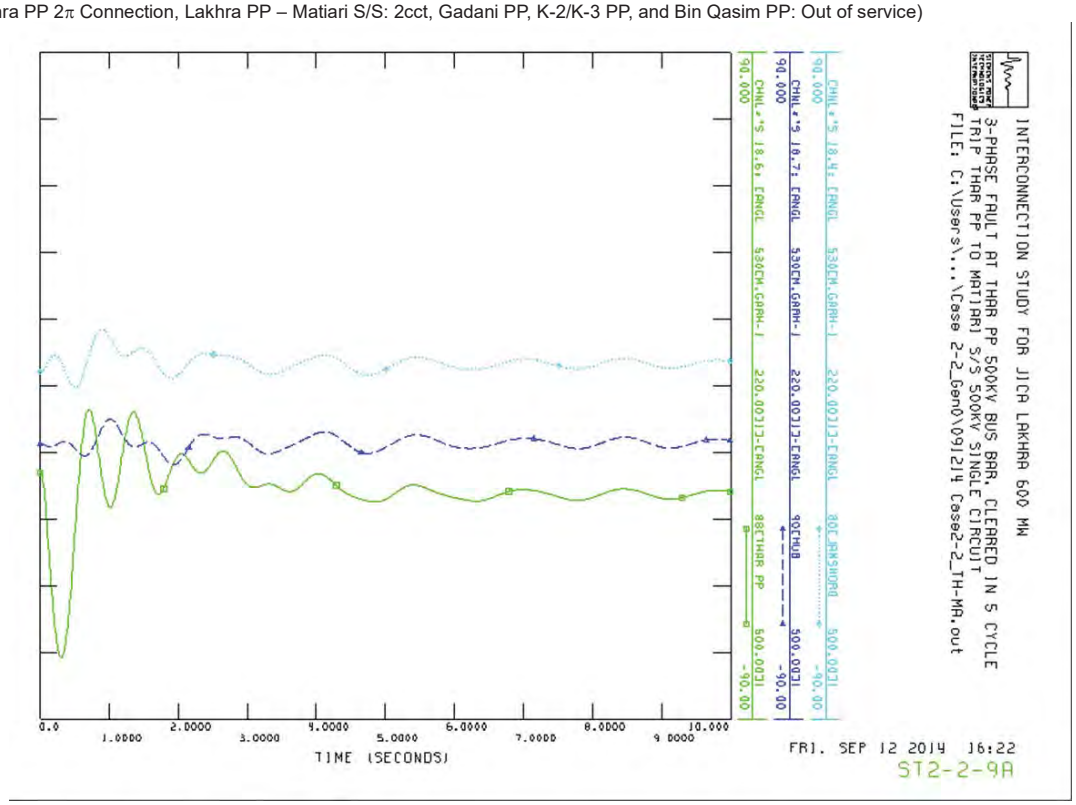


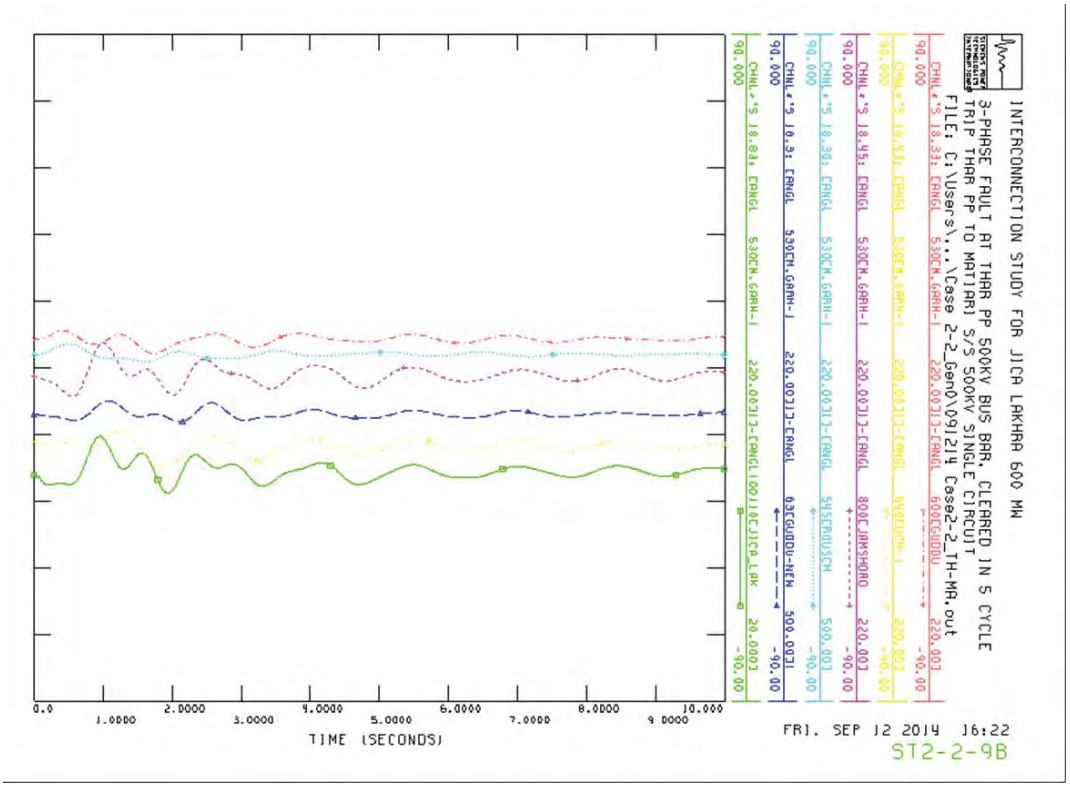


Fault Section: Matiari S/S – Moro S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

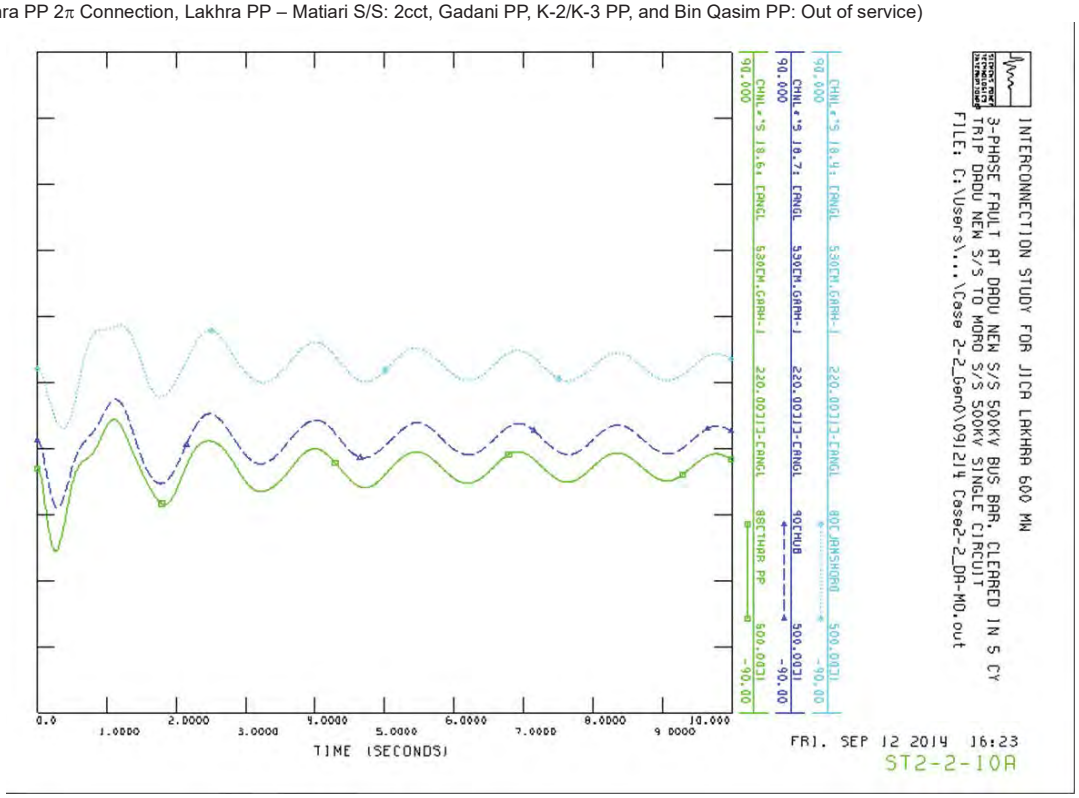


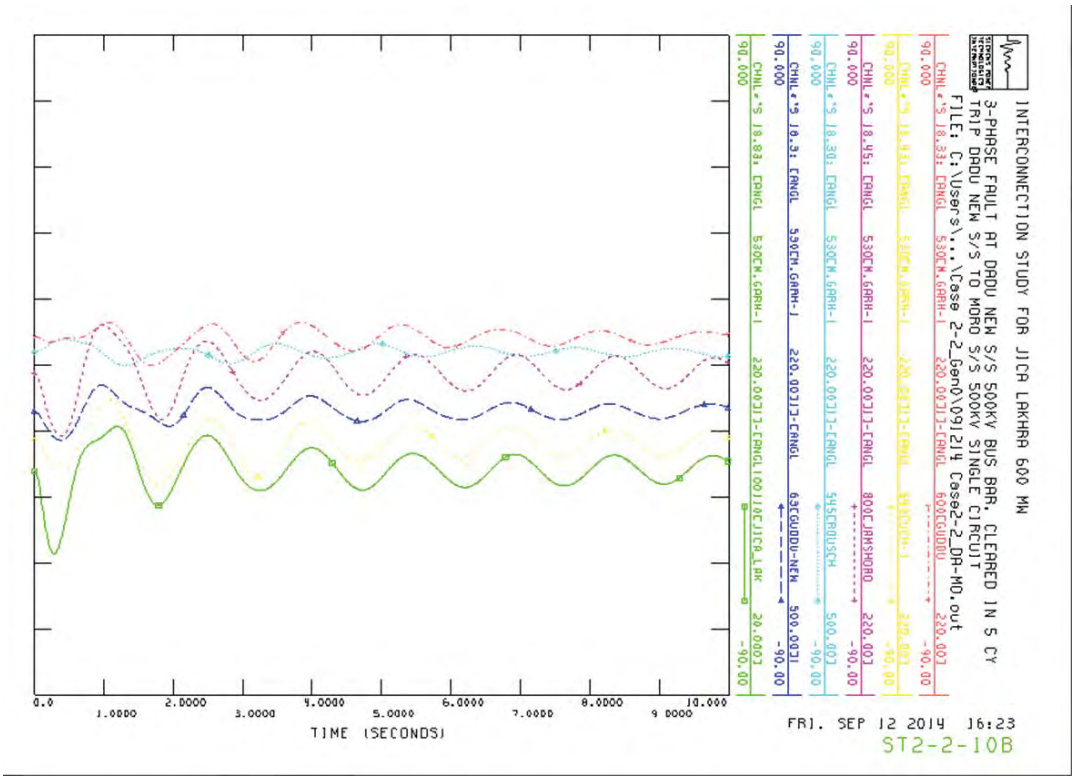


Fault Section: Thar PP – Matiari S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

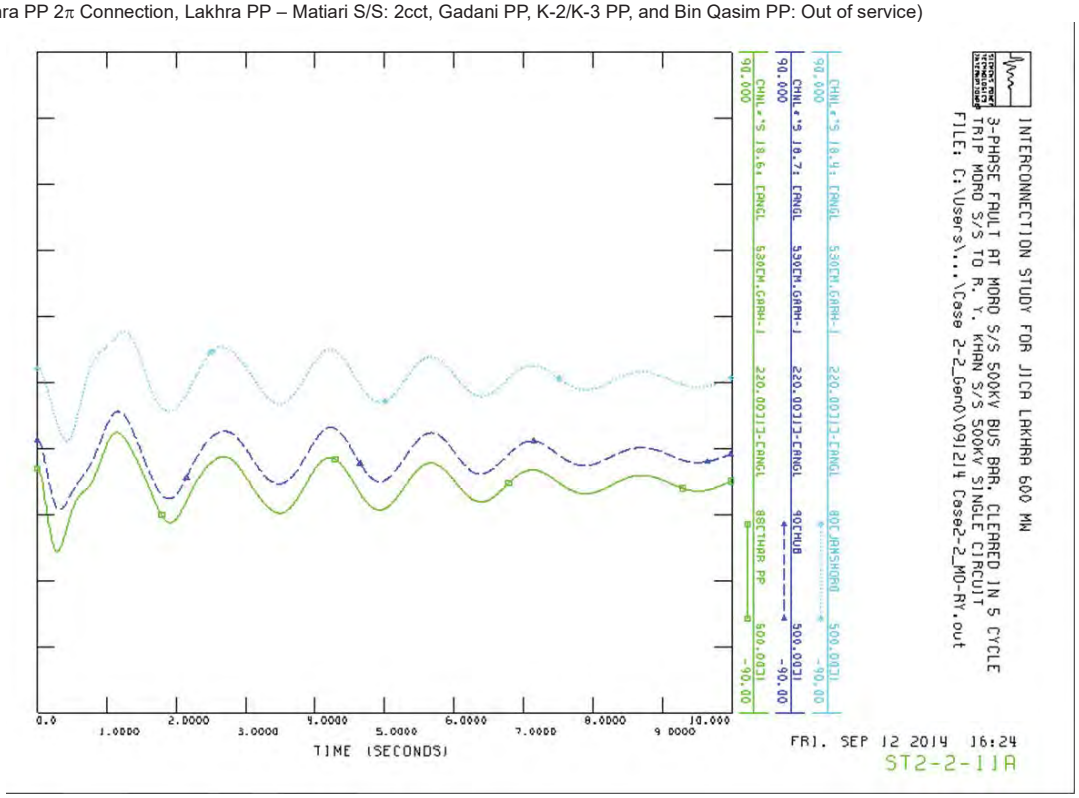


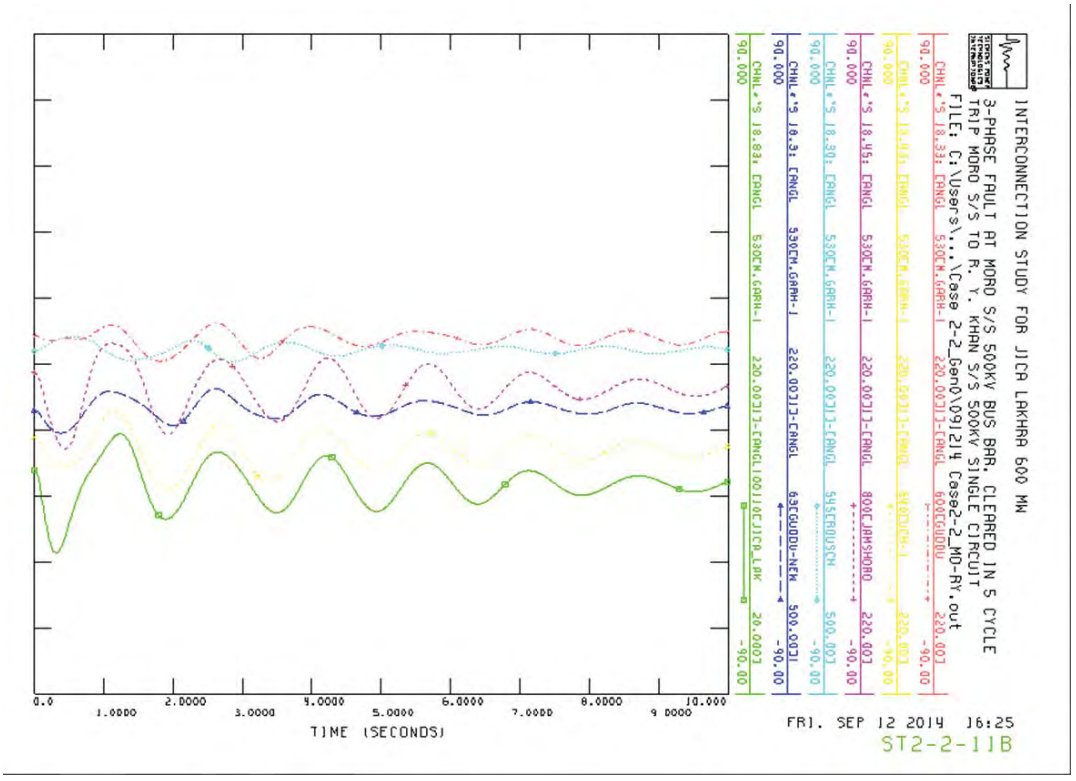


Fault Section: Dadu New S/S – Moro S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

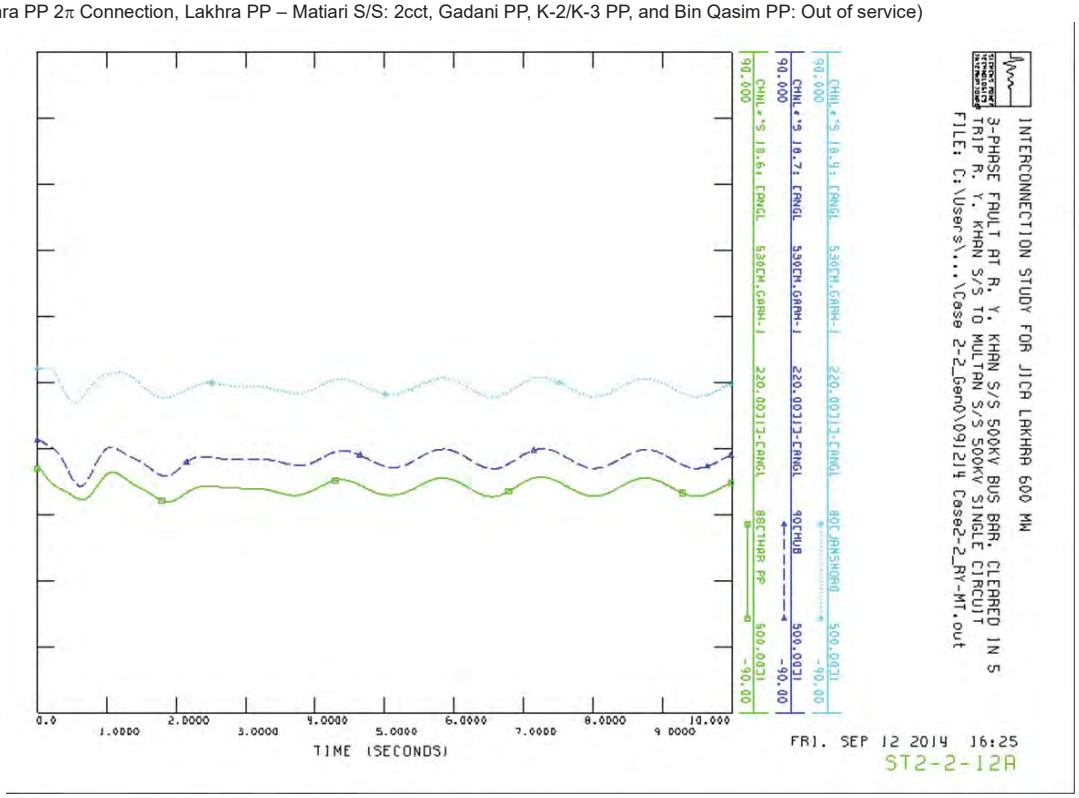


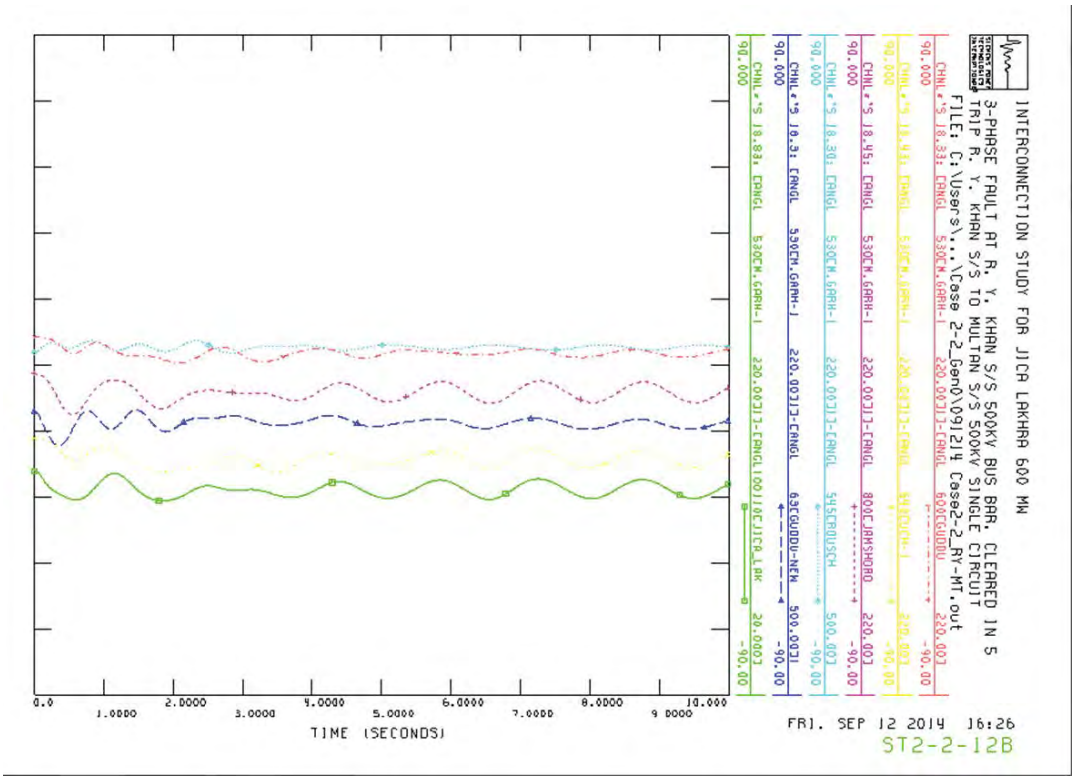


Fault Section: Moro S/S – R. Y. Khan S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

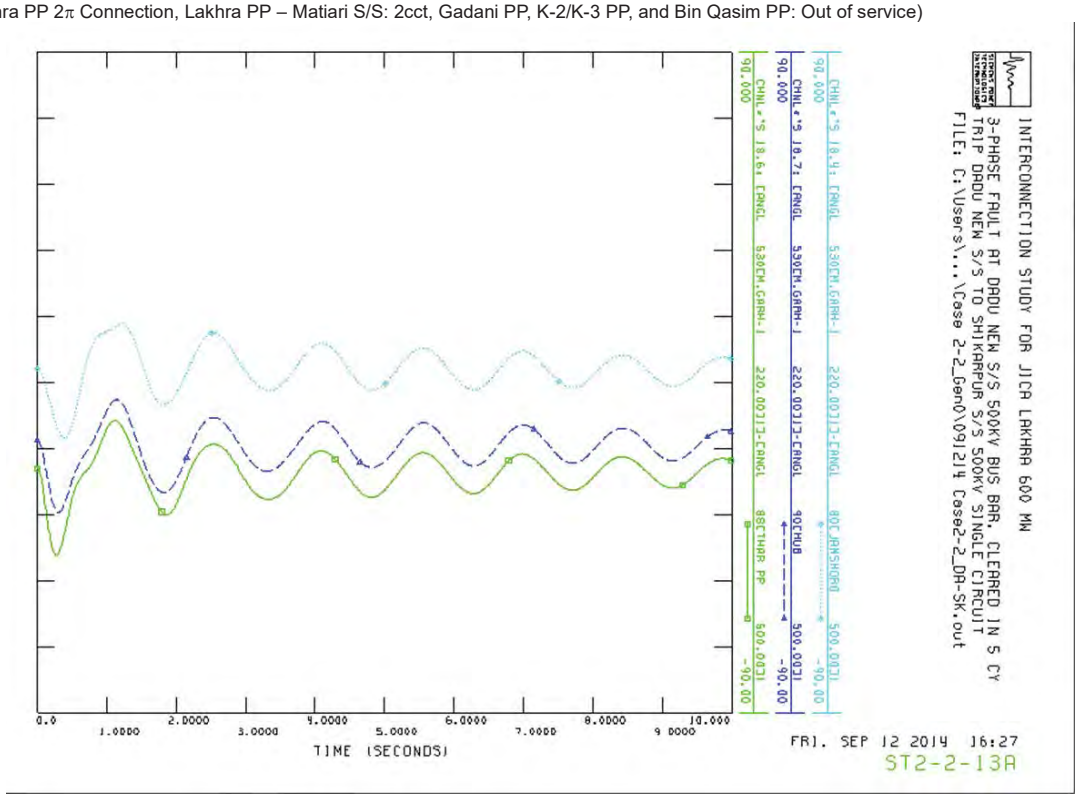


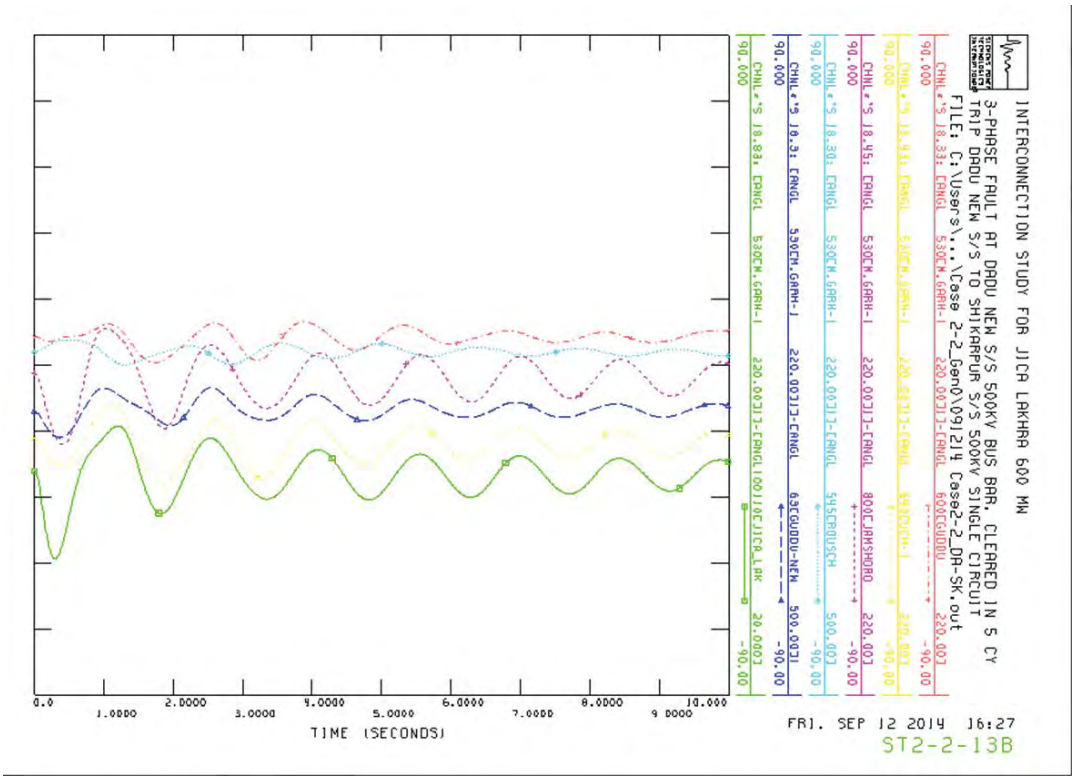


Fault Section: R. Y. Khan PP – Multan S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

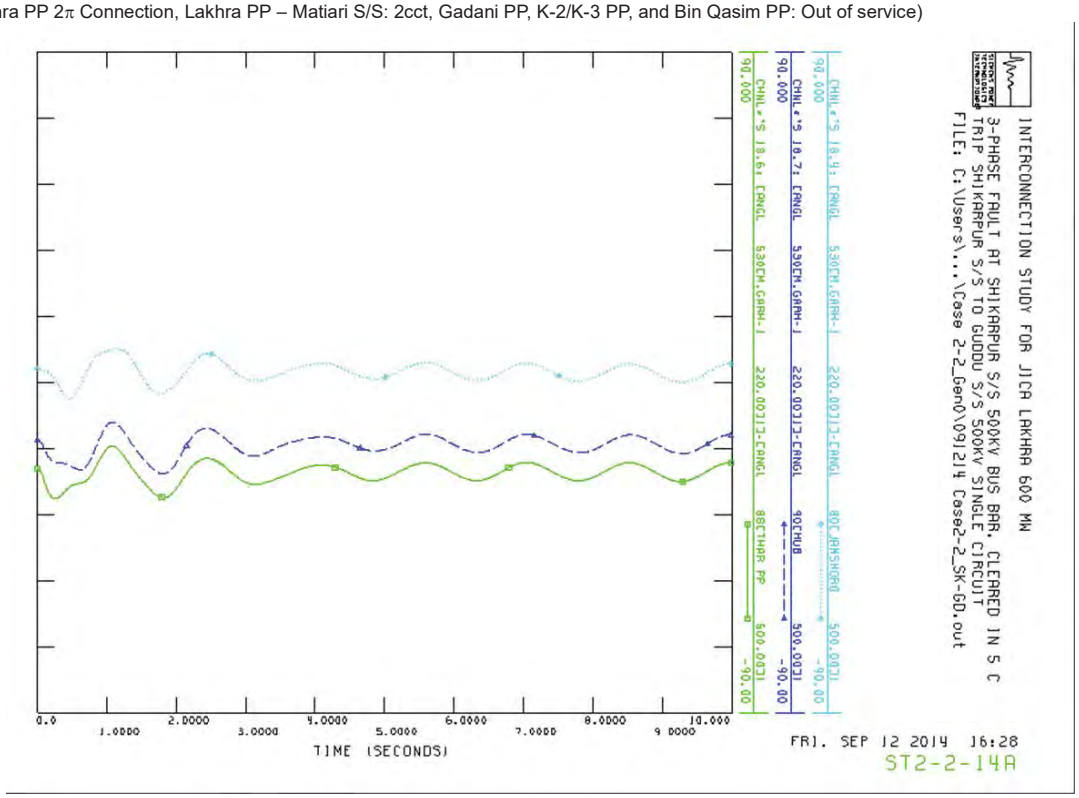


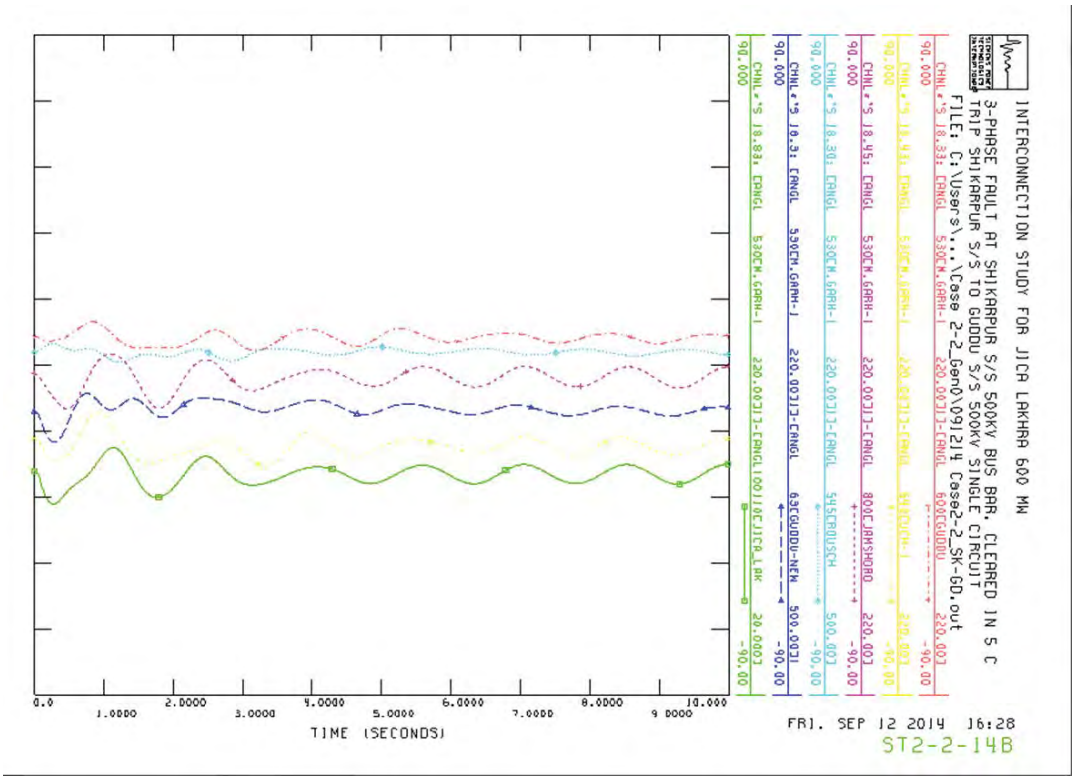


Fault Section: Dadu New S/S – Shikarpur S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

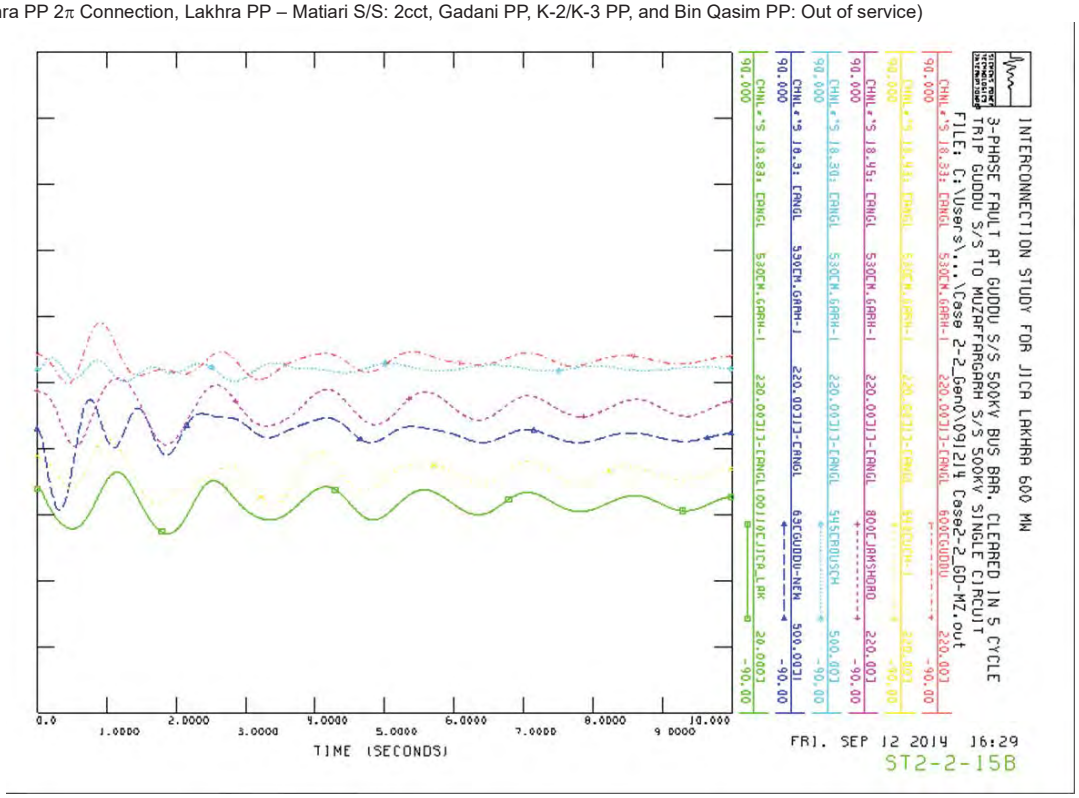


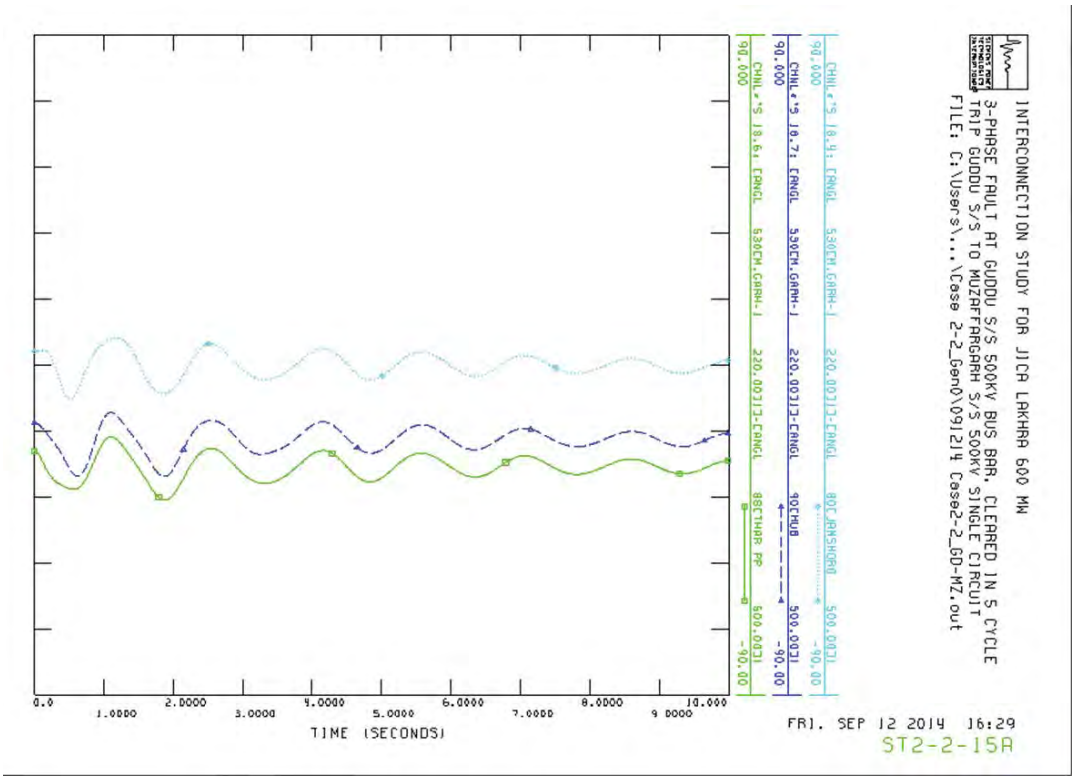


Fault Section: Shikarpur S/S – Guddu S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

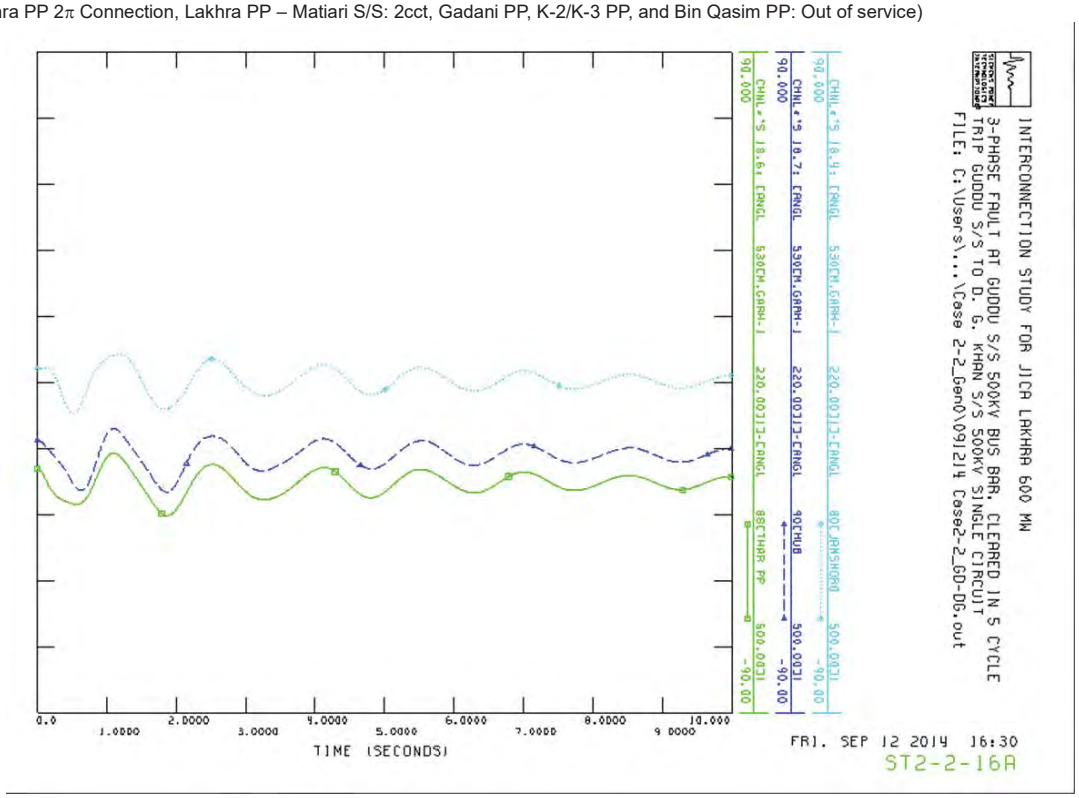


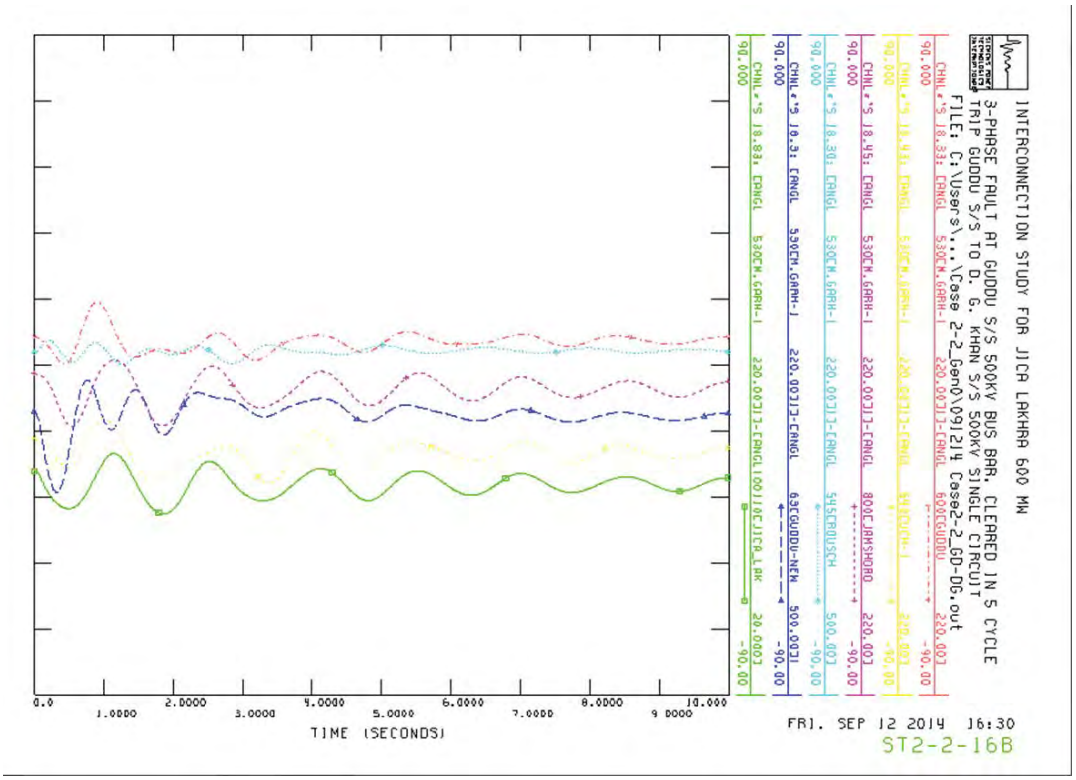


Fault Section: Guddu S/S – Muzaffargarh S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

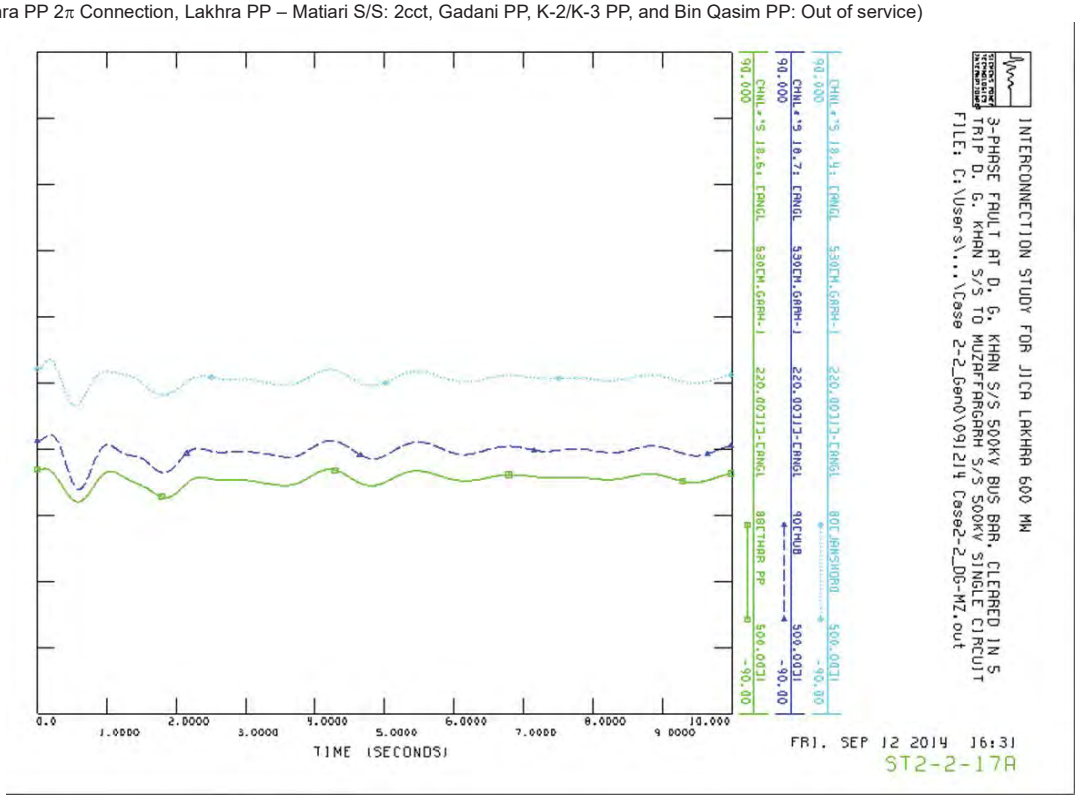


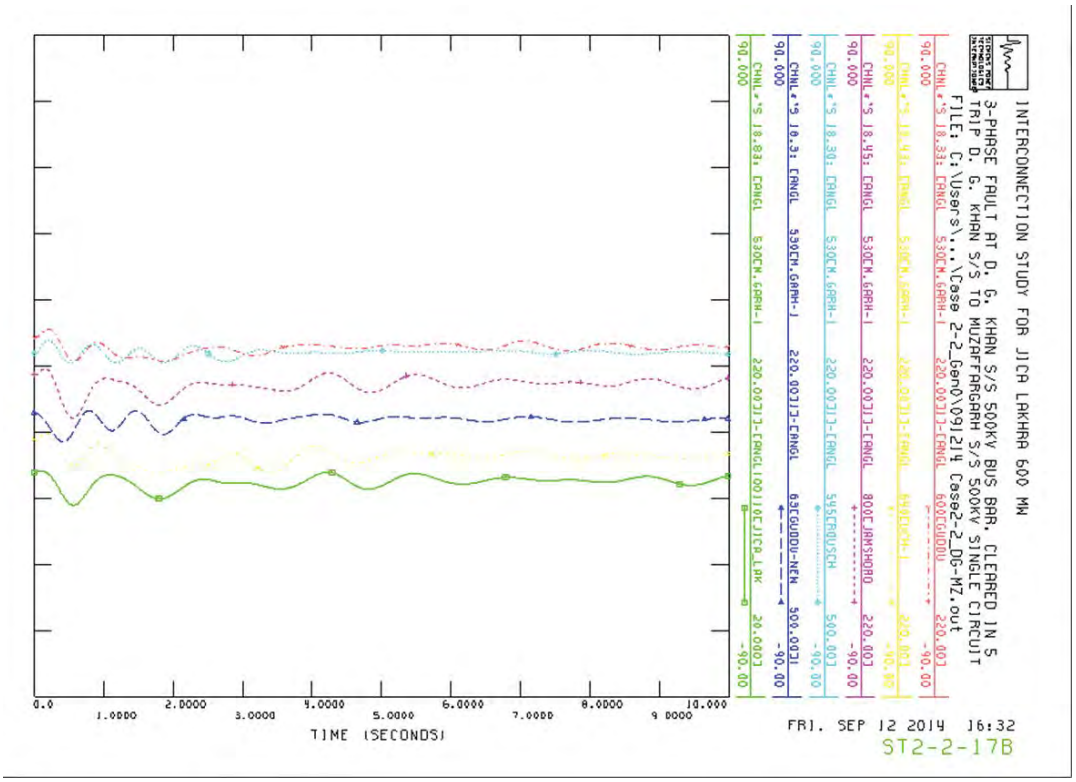


Fault Section: Guddu S/S – D. G. Khan S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

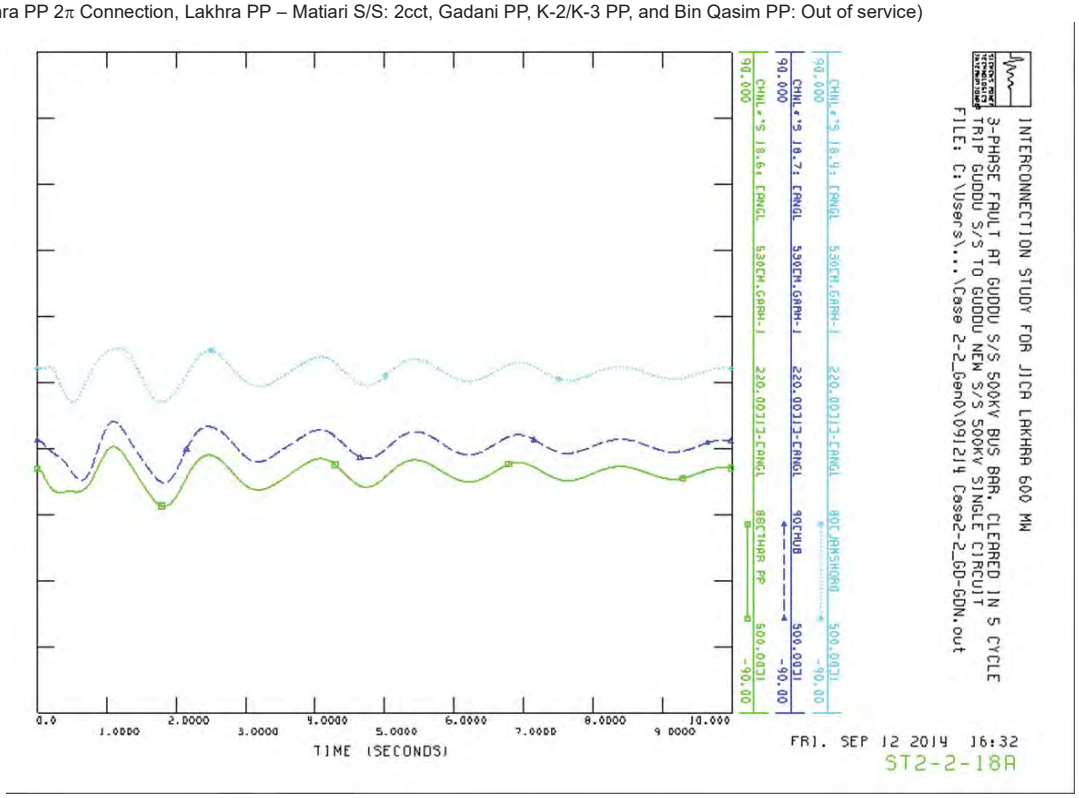


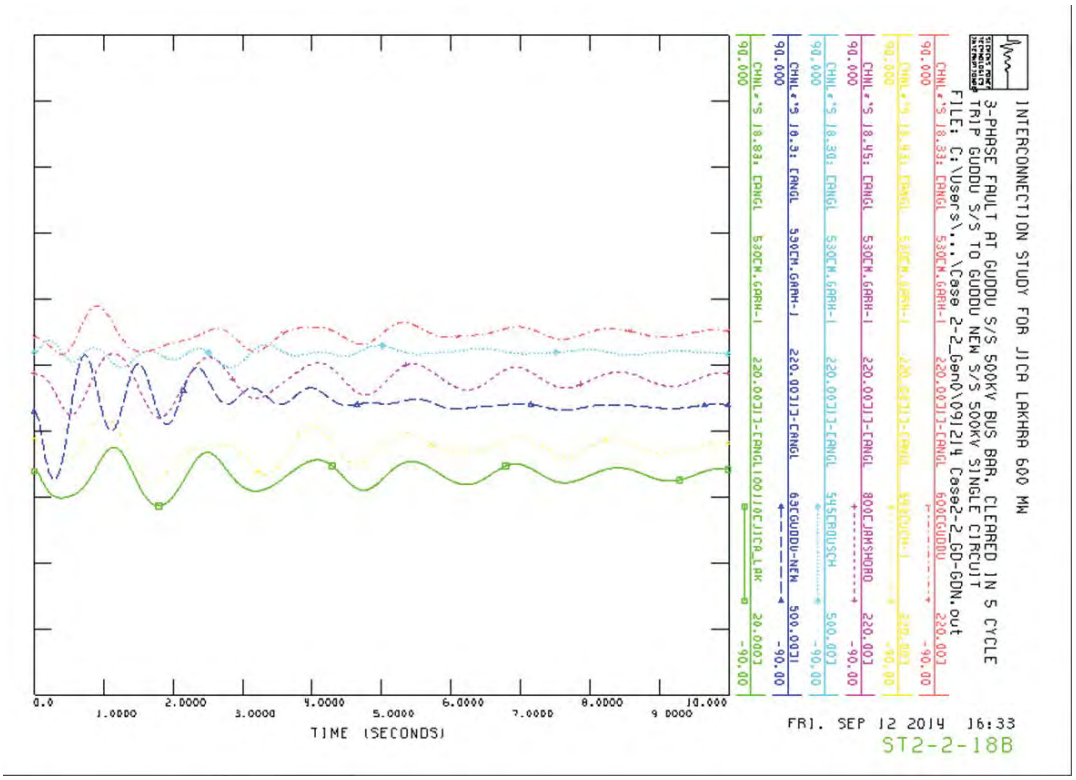


Fault Section: D. G. Khan S/S – Muzaffargarh S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

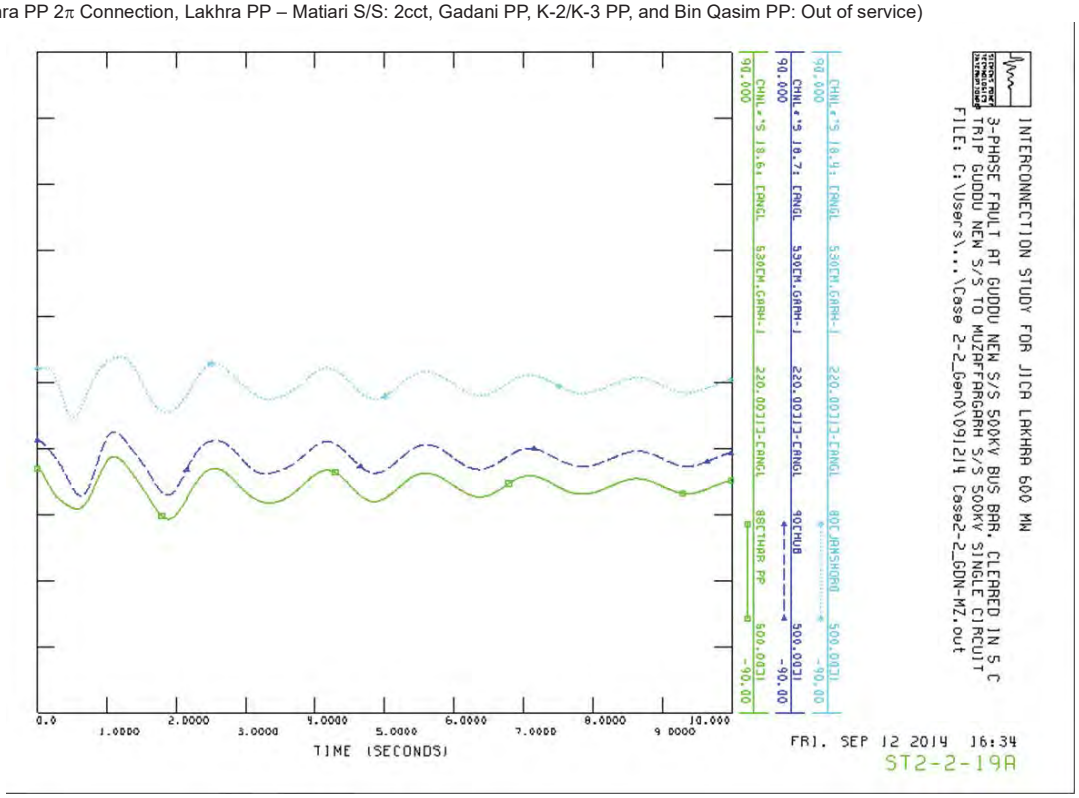


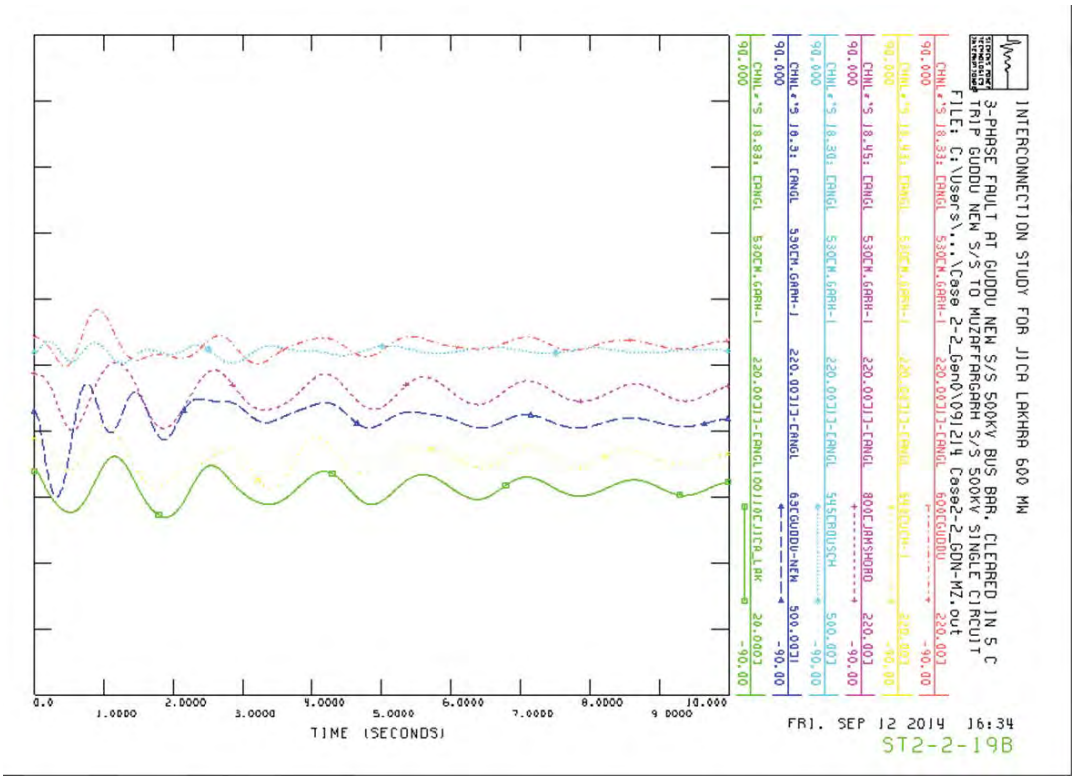


Fault Section: Guddu S/S – Guddu New PP

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

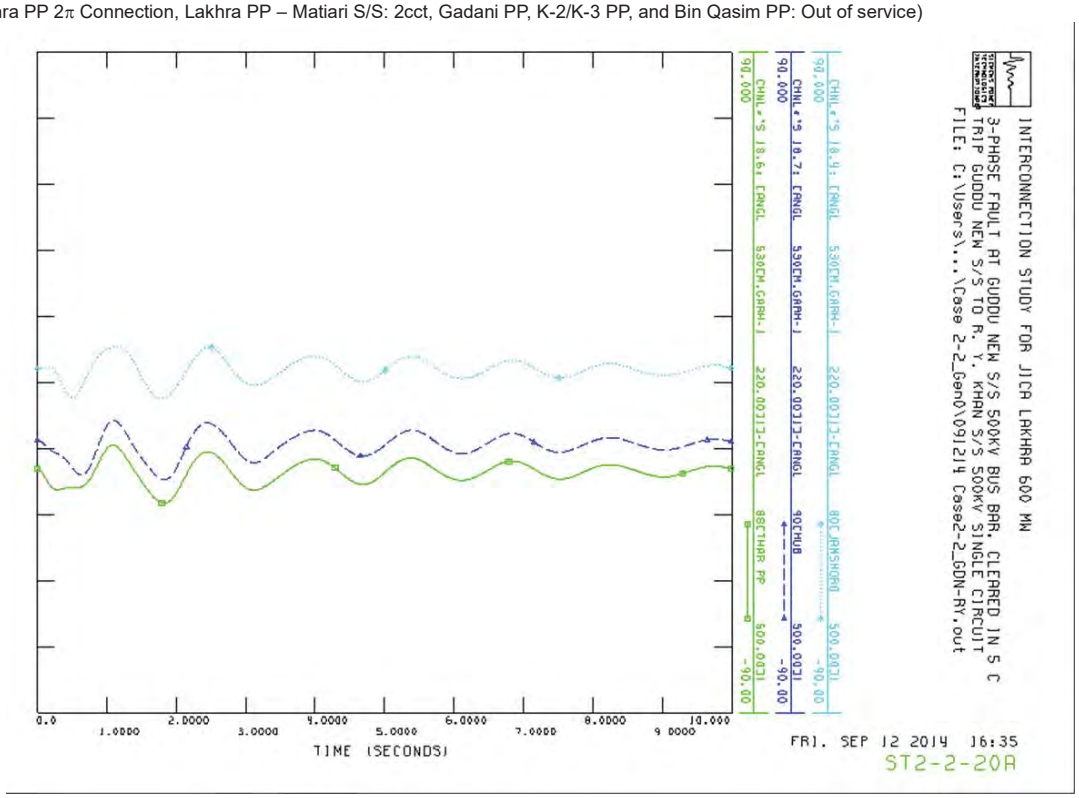


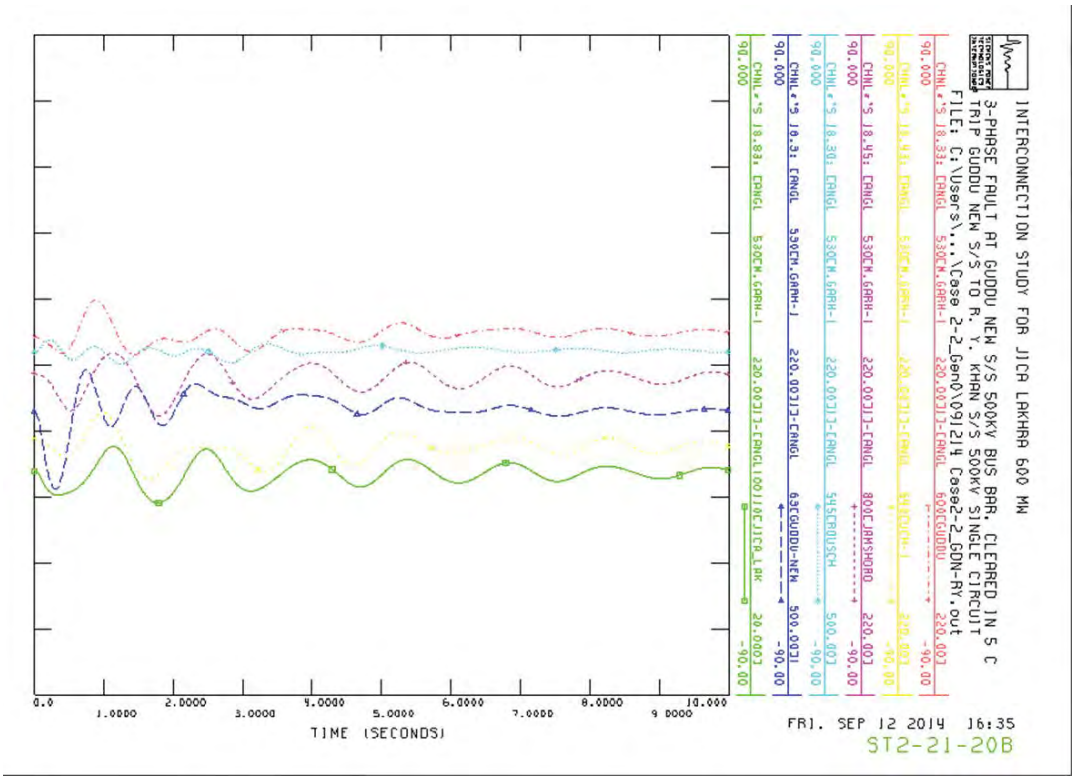


Fault Section: Guddu New PP – Muzaffargarh S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

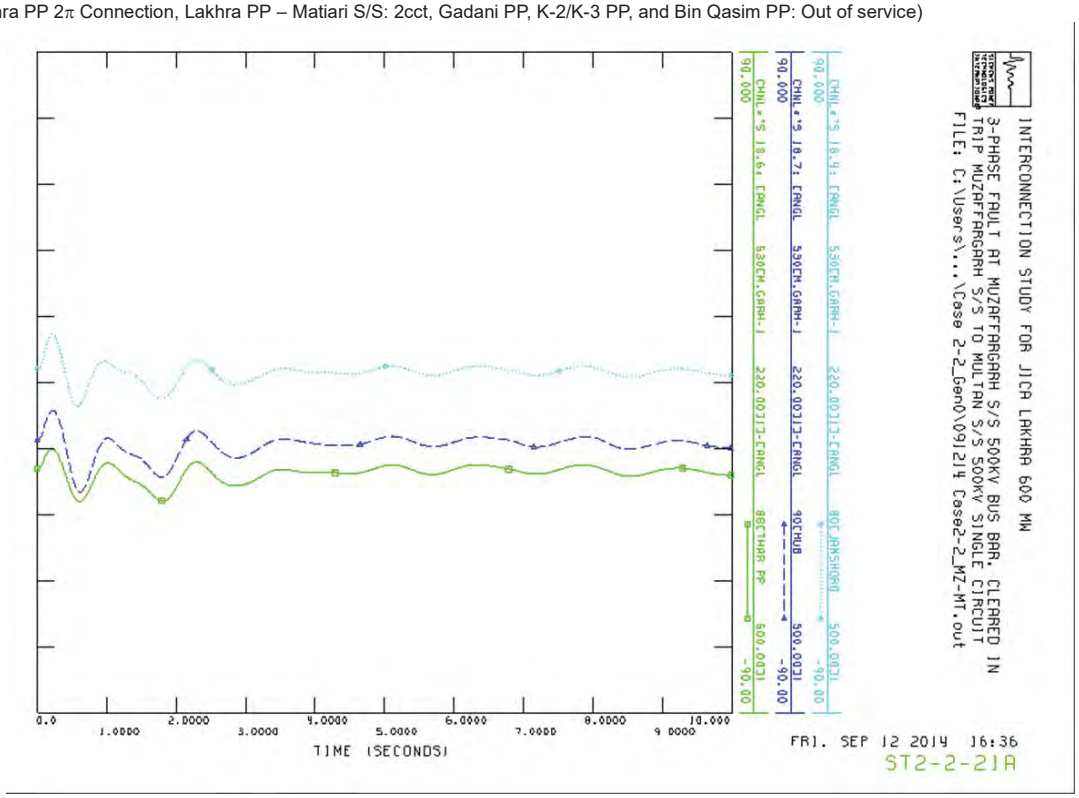


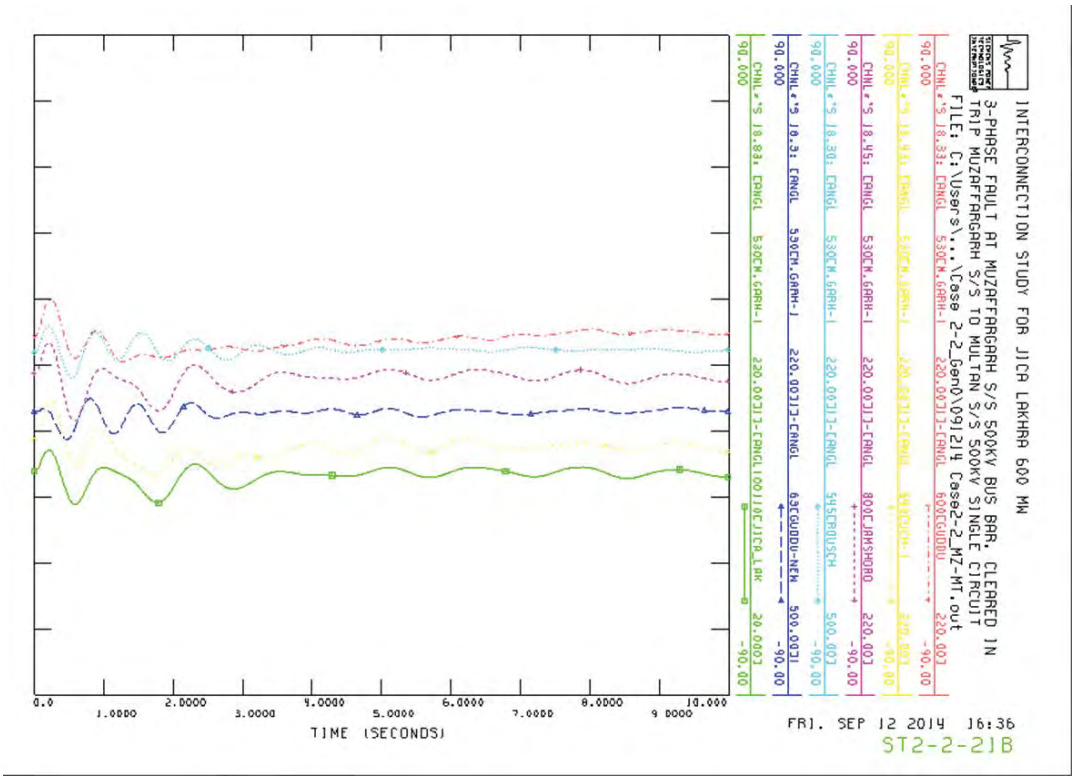


Fault Section: Guddu New PP – R. Y. Khan S/S

Stability Analysis Result Case ST-2-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)



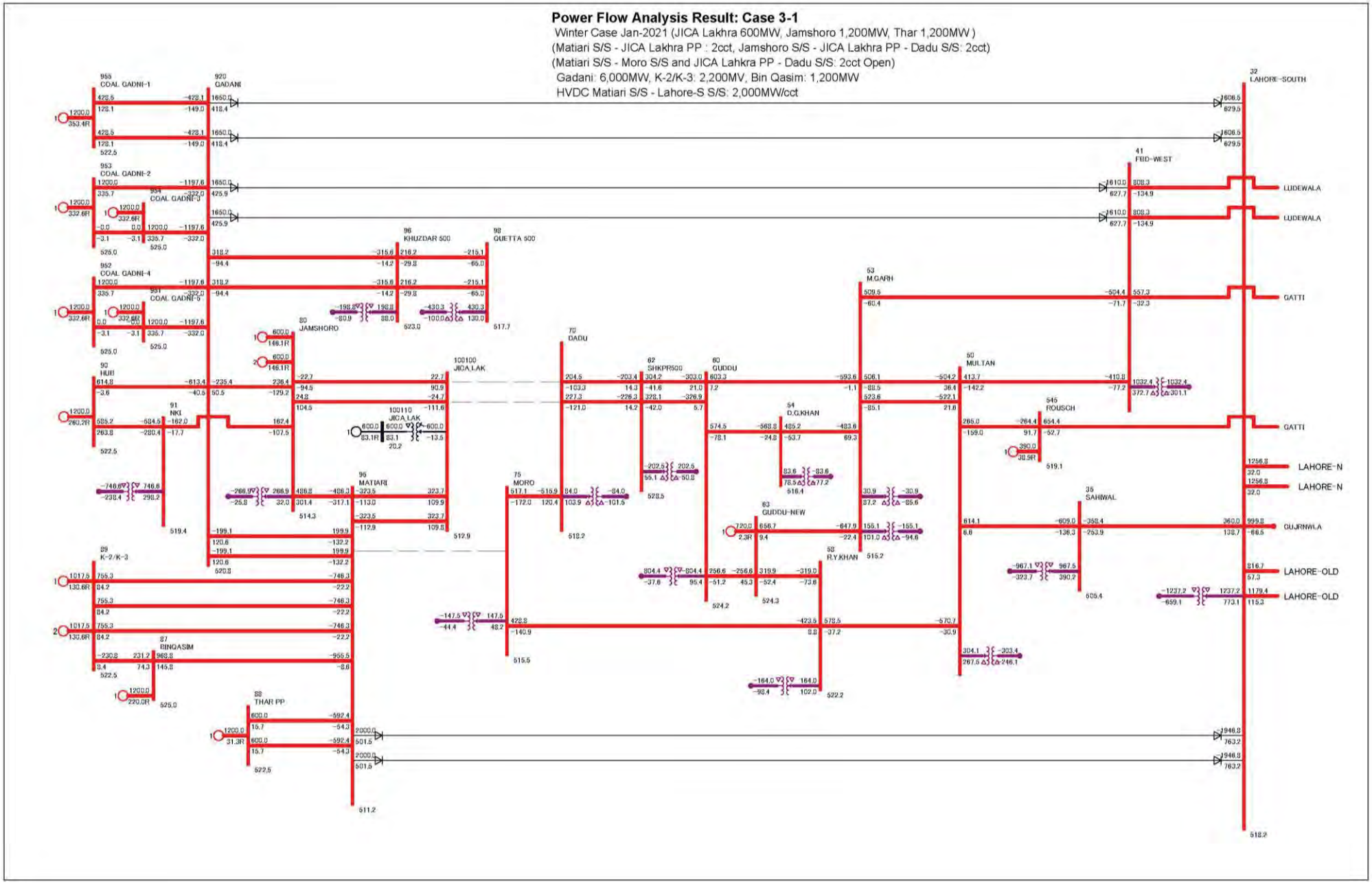


Fault Section: Muzaffargarh S/S – Multan S/S

6 - 4 STABILITY ANALYSIS CASE ST3-1

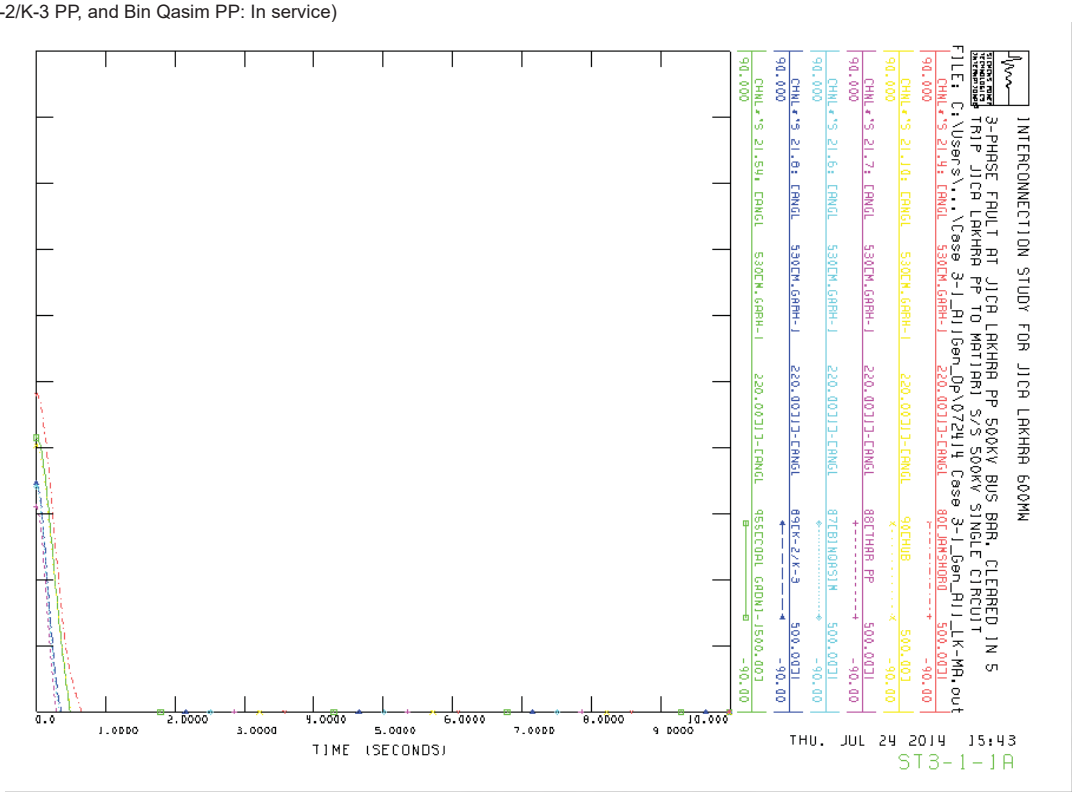
Stability Analysis Result Case ST-3-1

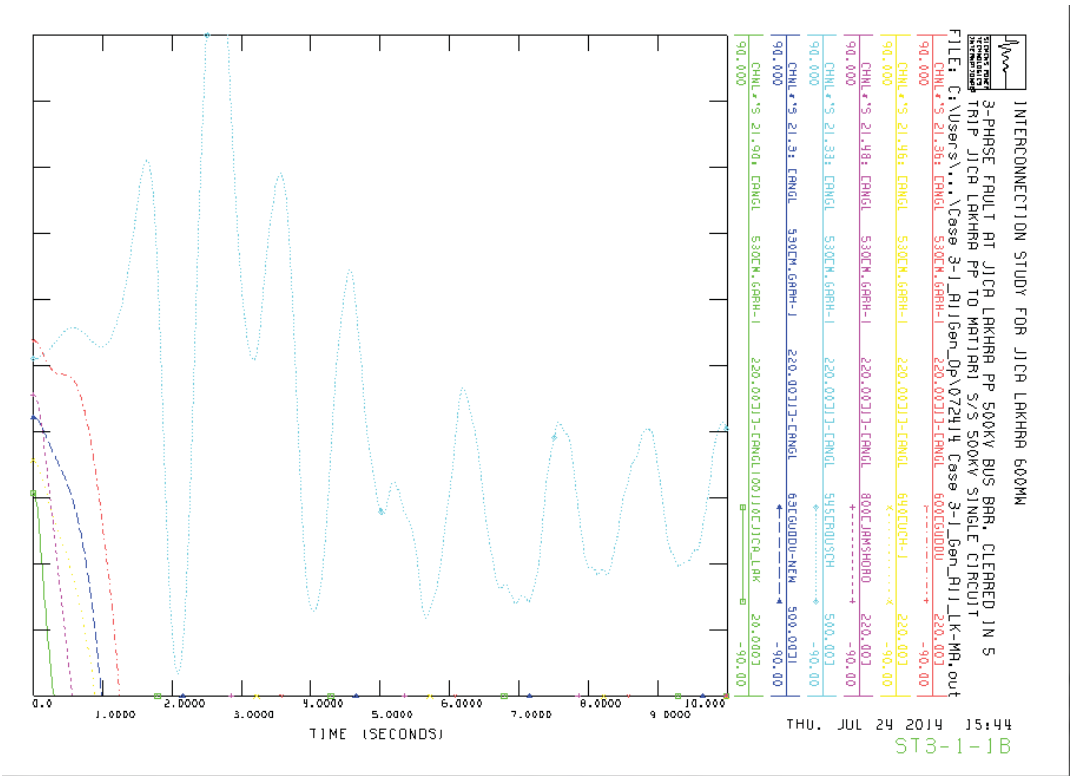
(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)



Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

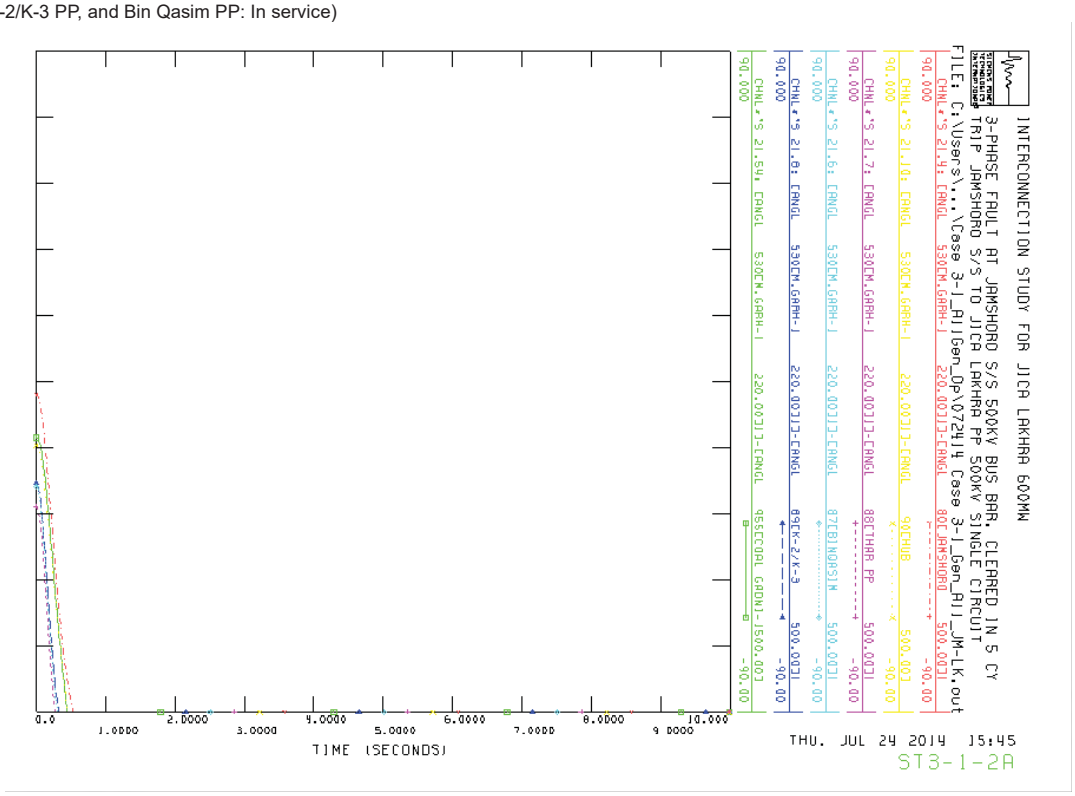


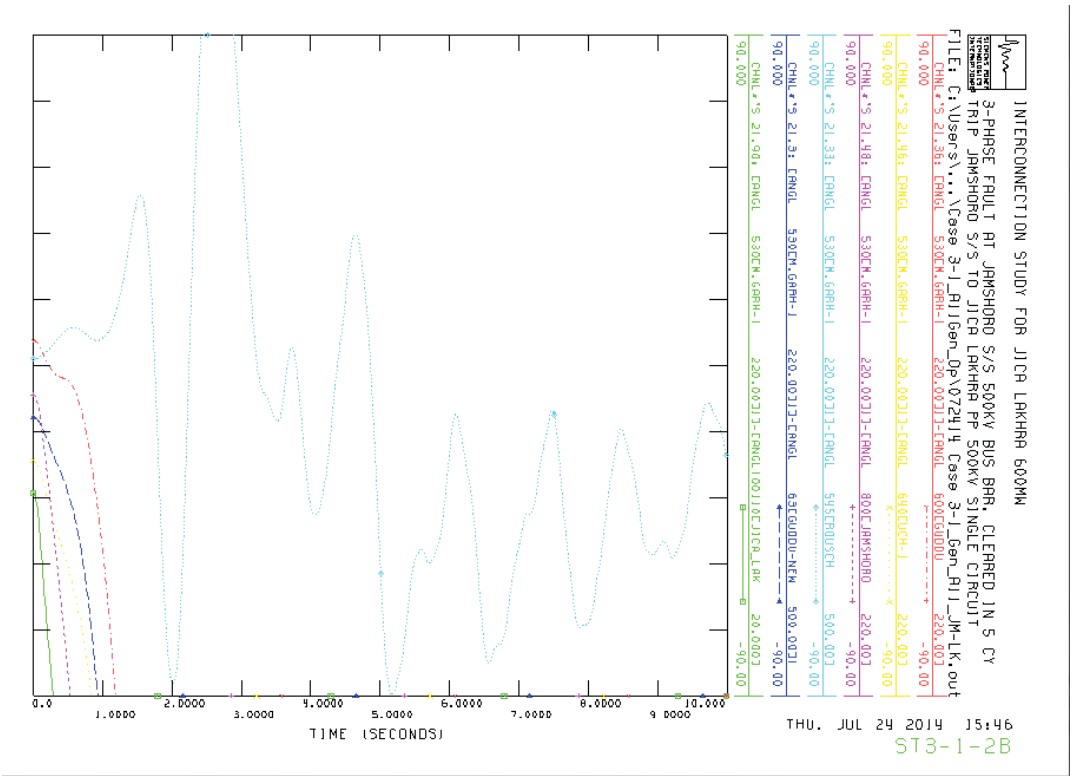


Fault Section: JICA Lakhra PP – Matiari S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

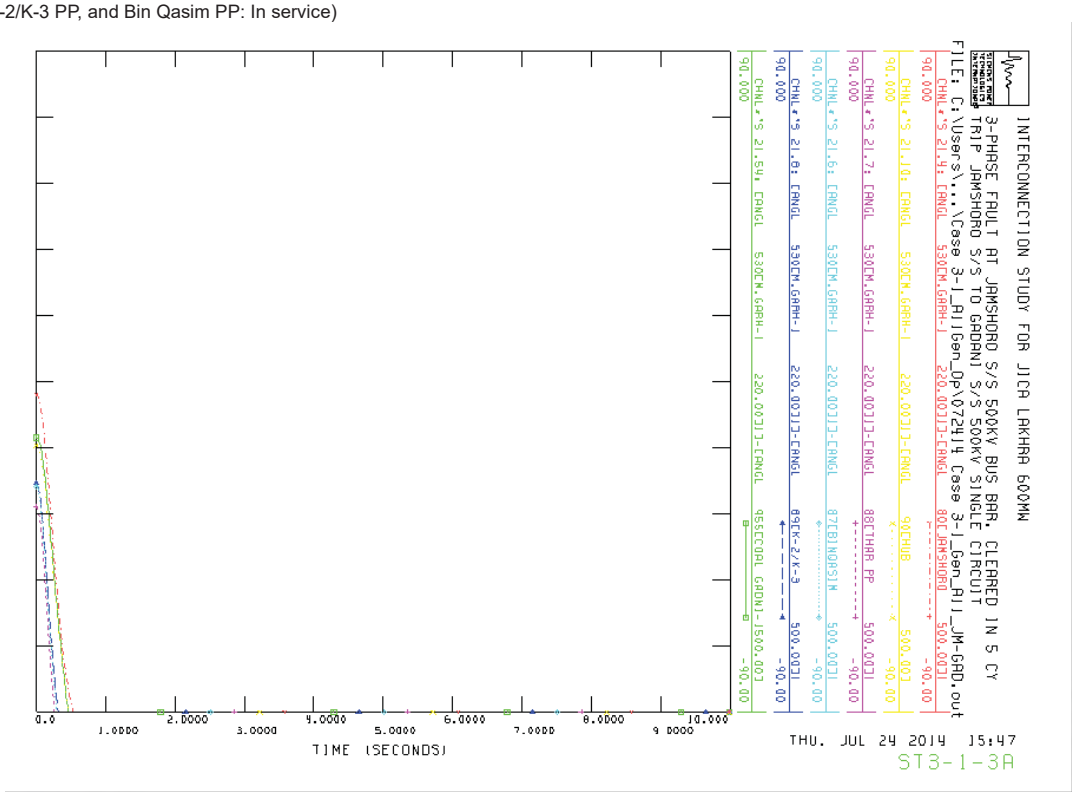


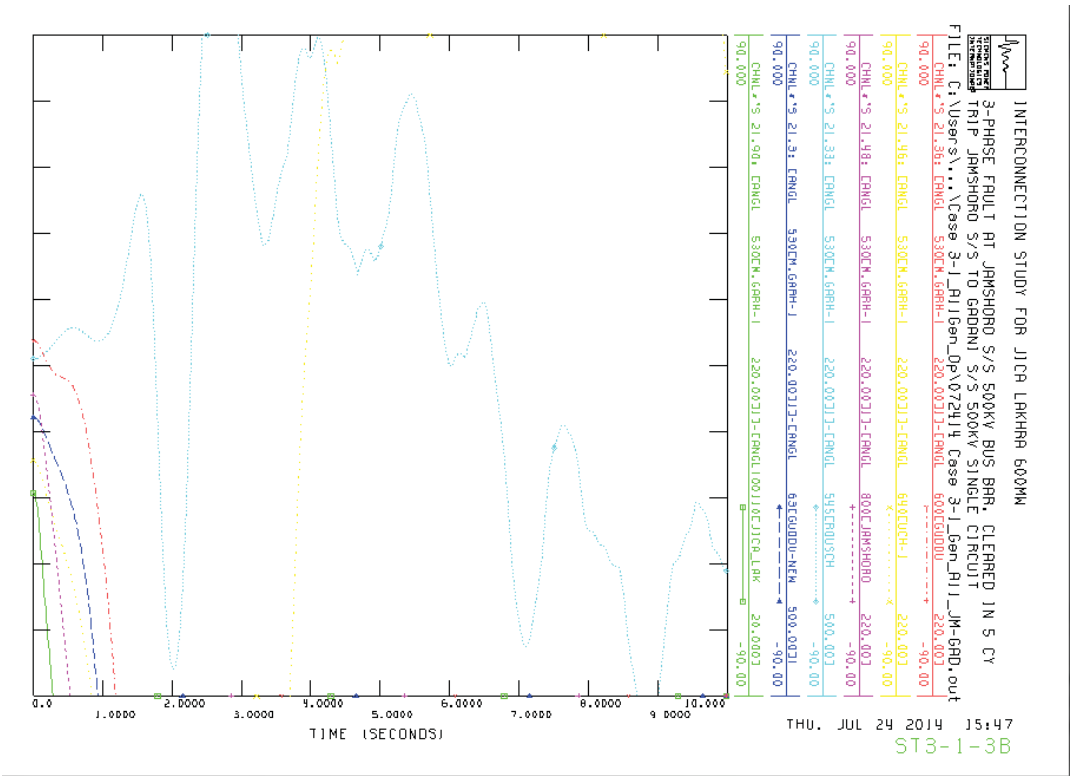


Fault Section: Jamshoro S/S – JICA Lakhra PP

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

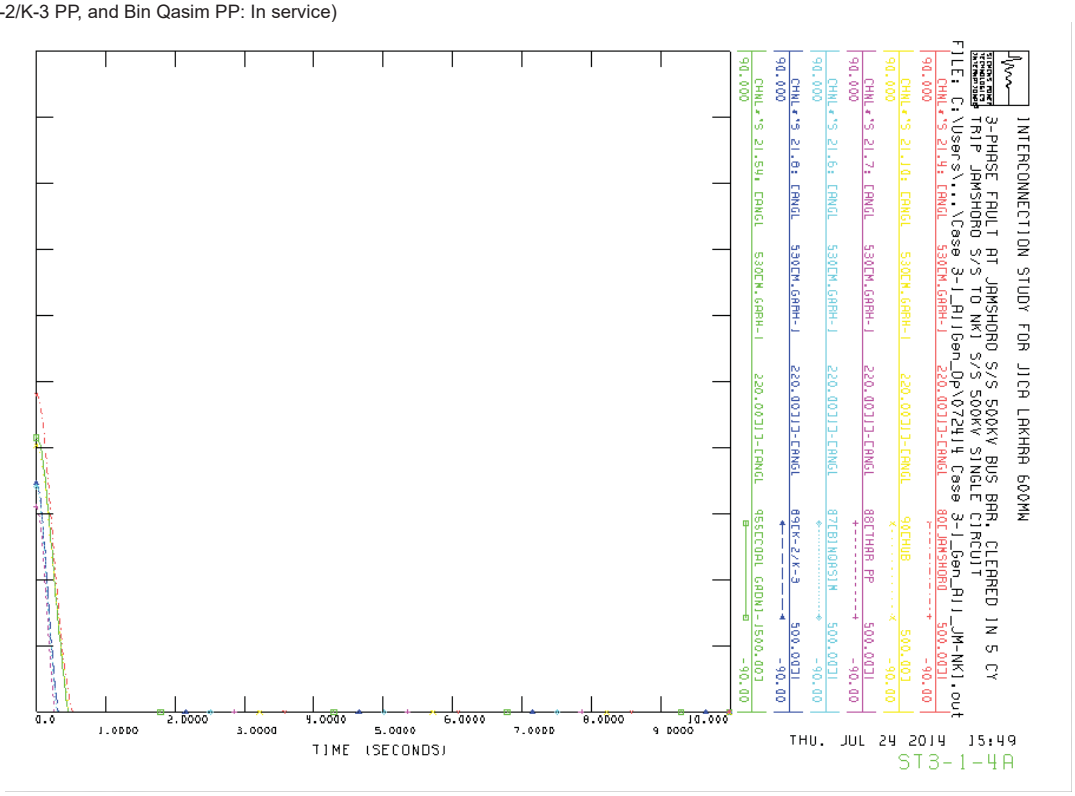


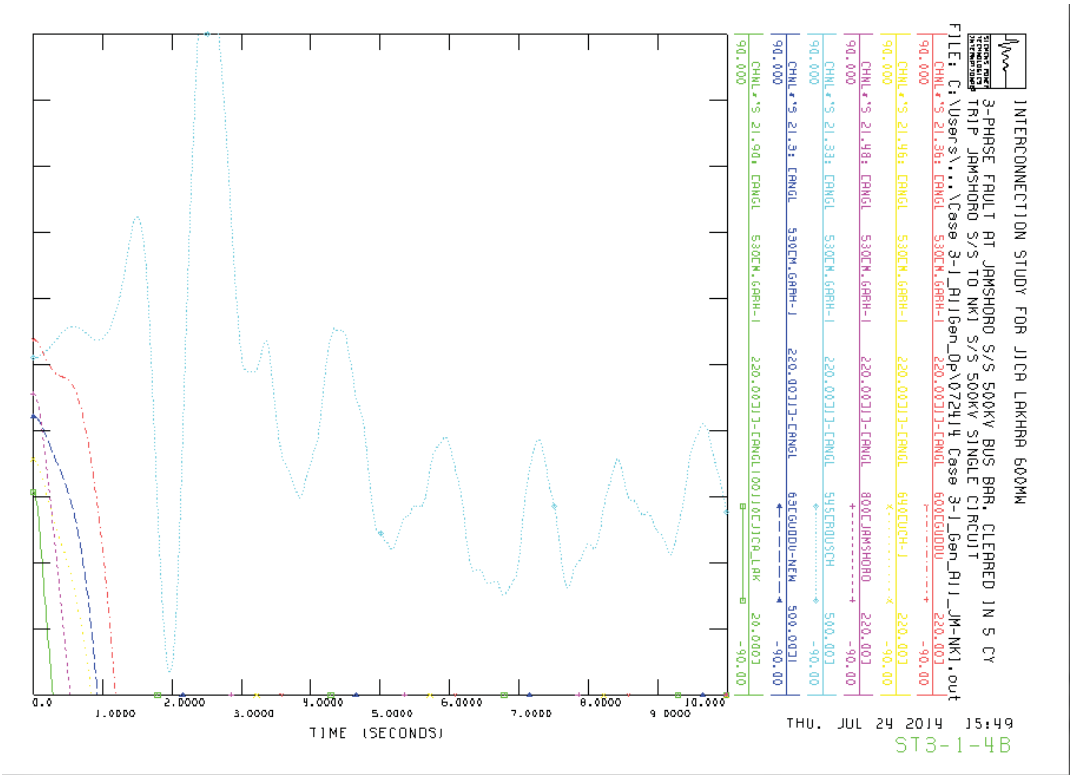


Fault Section: Jamshoro S/S – Gadani S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

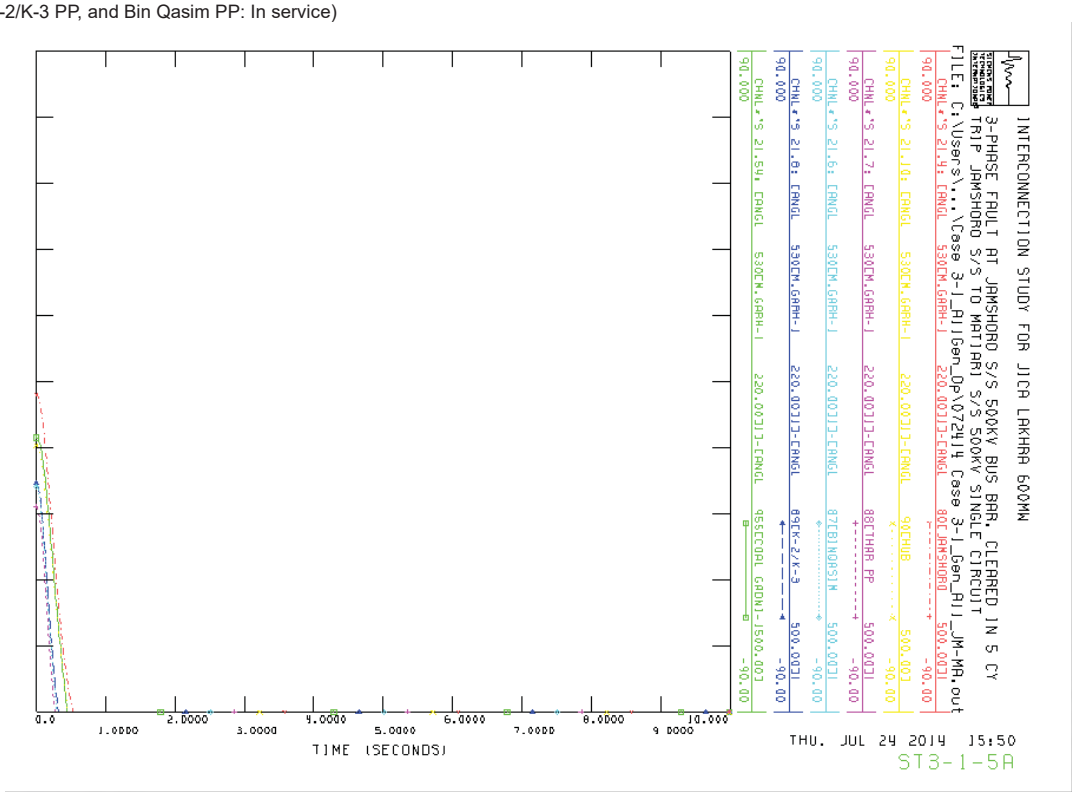


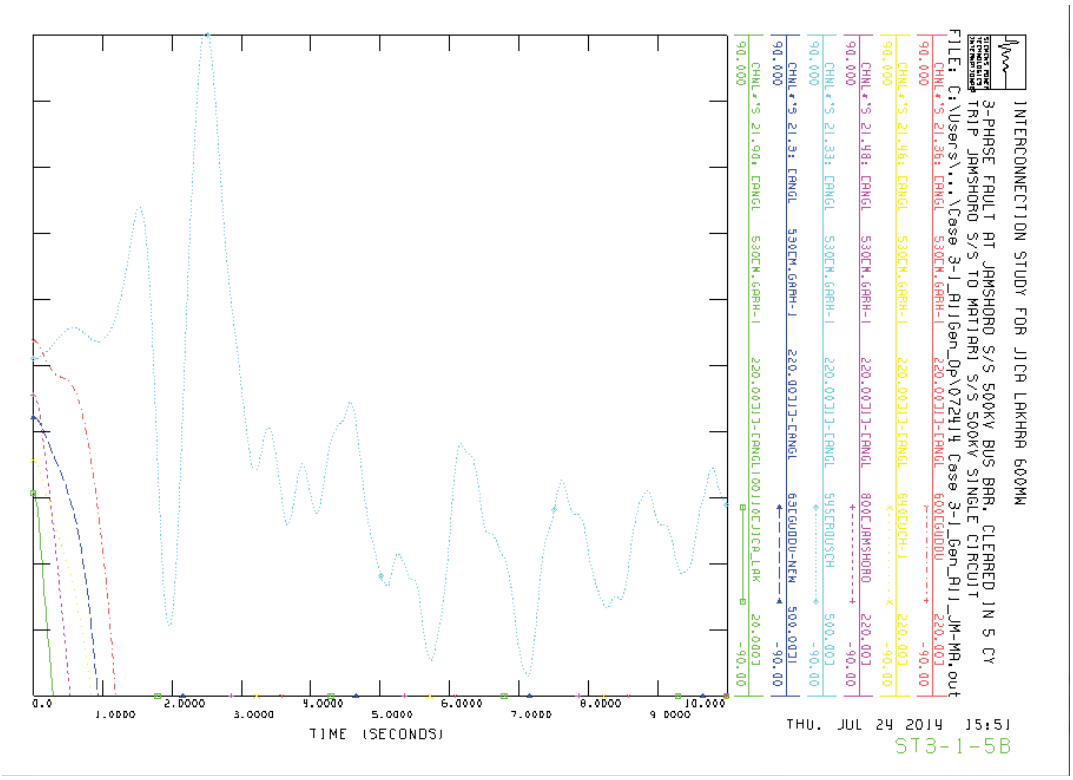


Fault Section: Jamshoro S/S – NKI S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

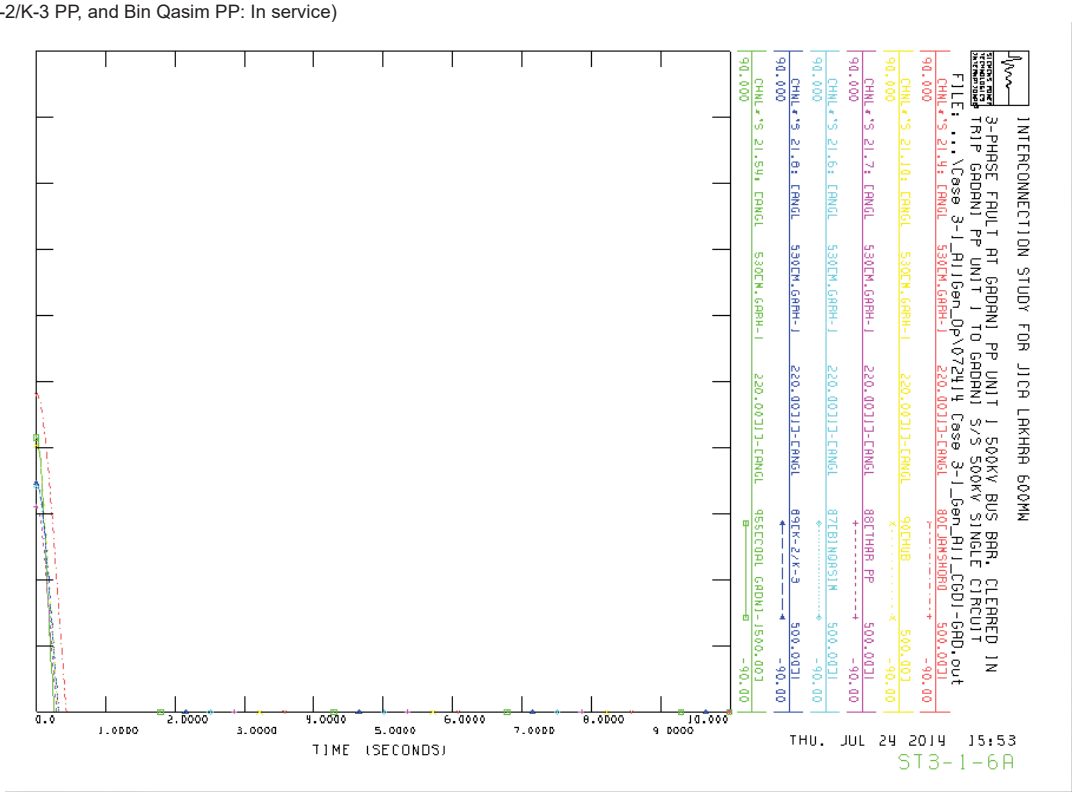


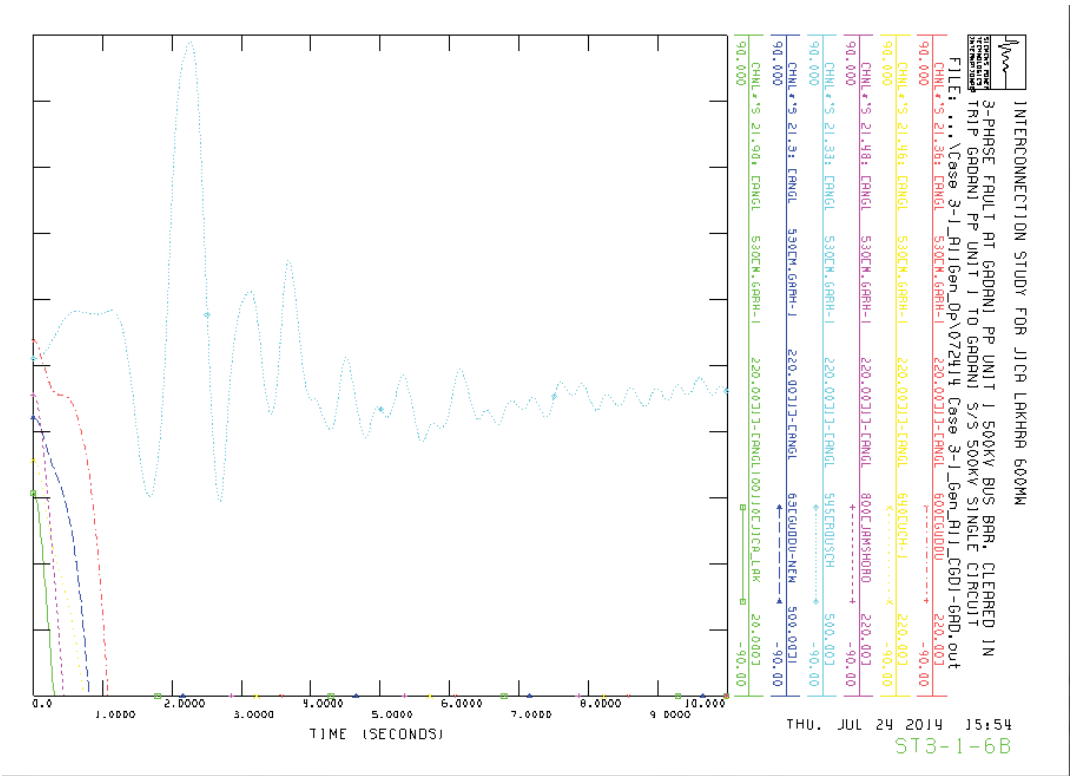


Fault Section: Jamshoro S/S – Matiari S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

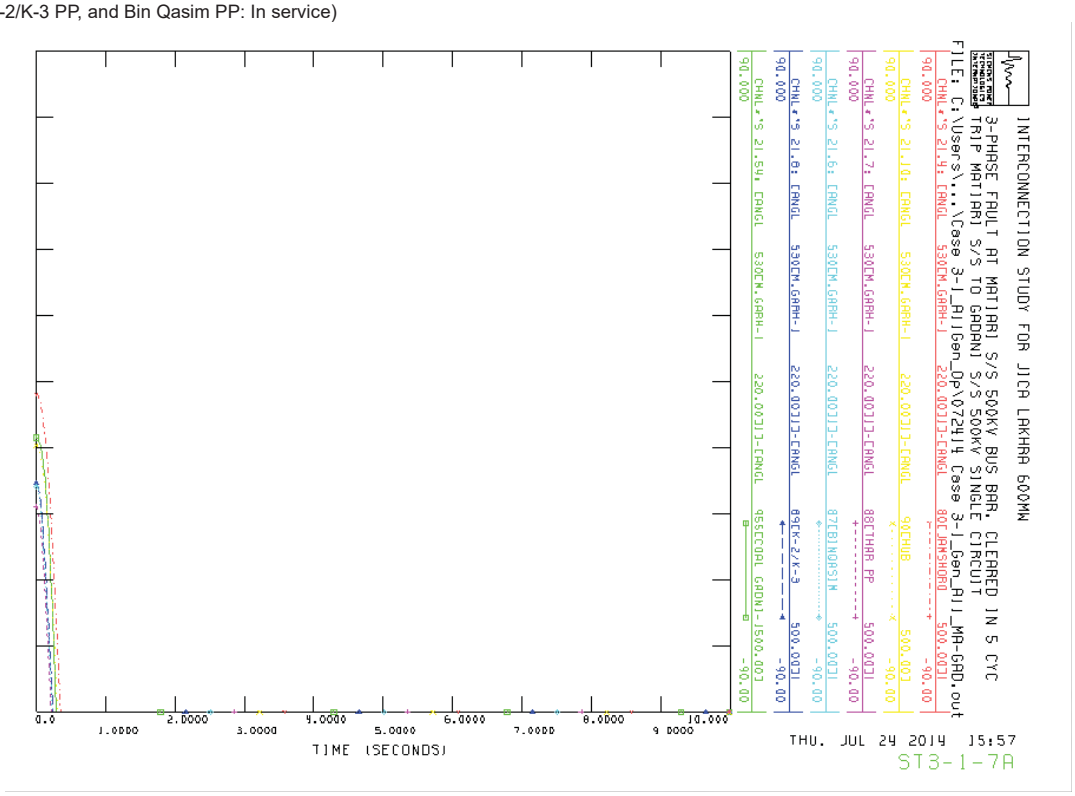


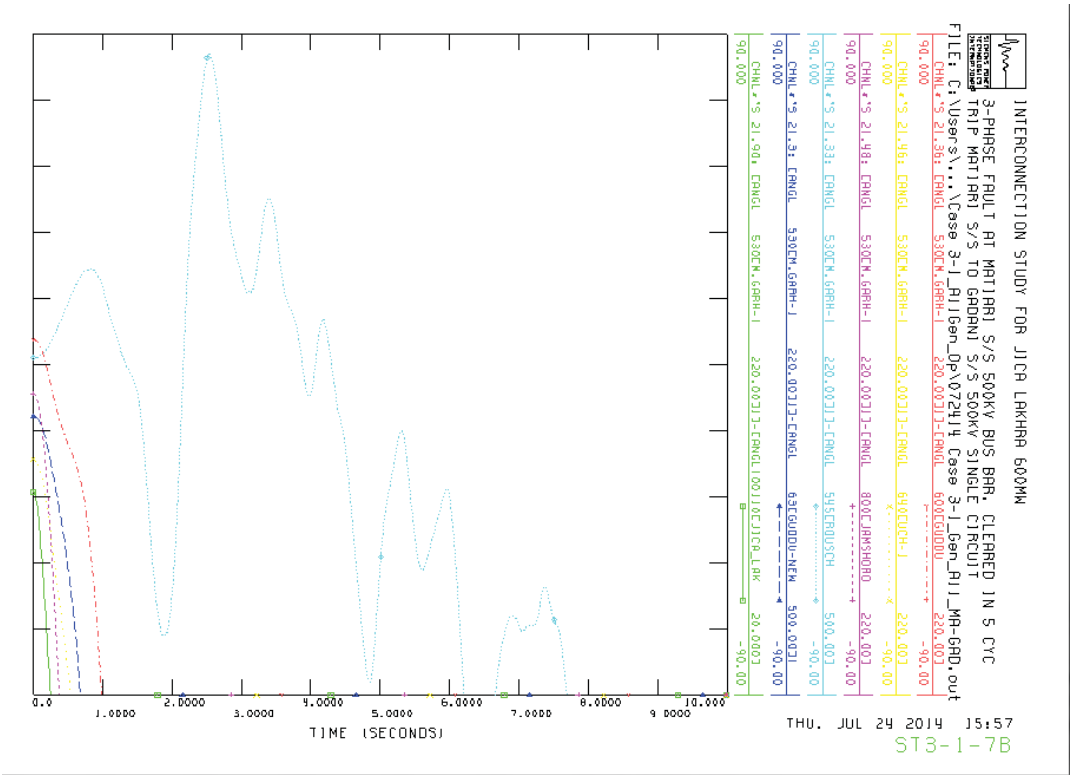


Fault Section: Coal Gadani PP – Gadani S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

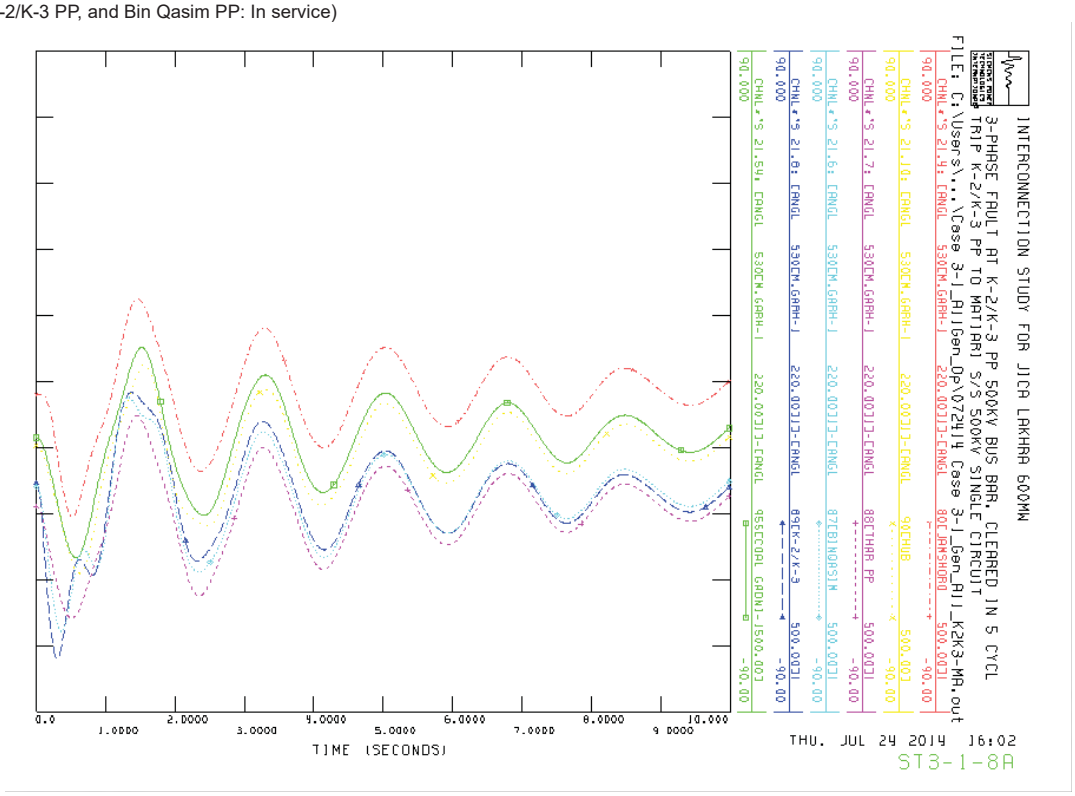


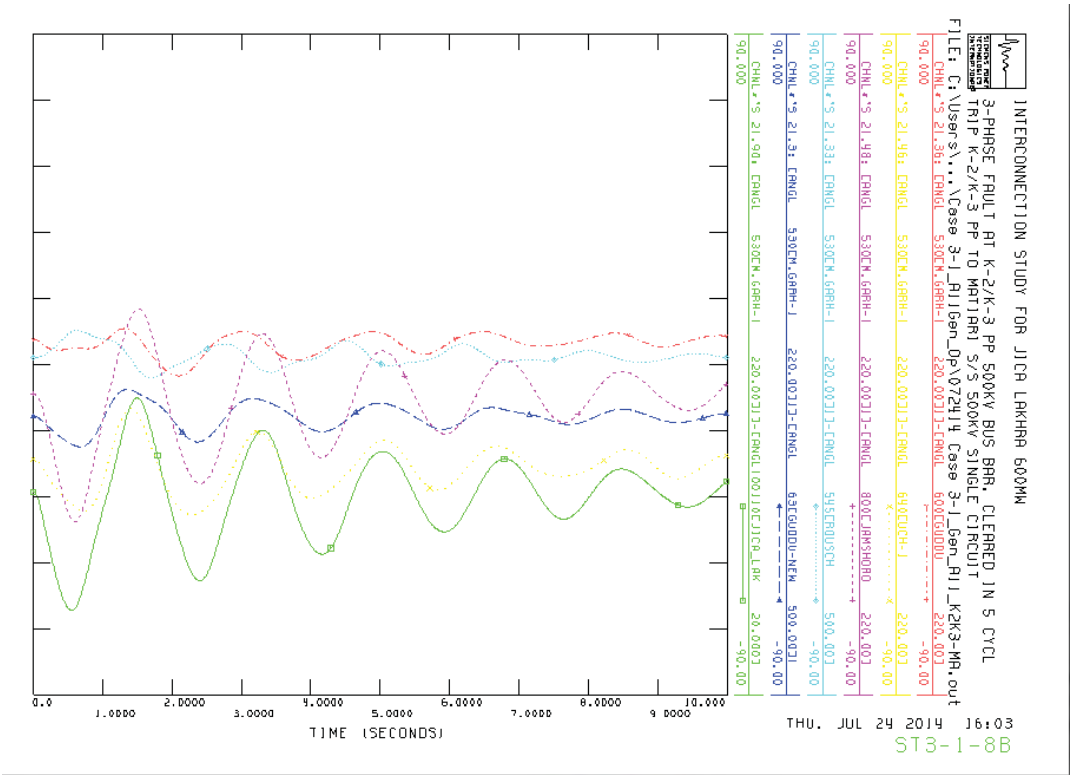


Fault Section: Matiari S/S – Gadani S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

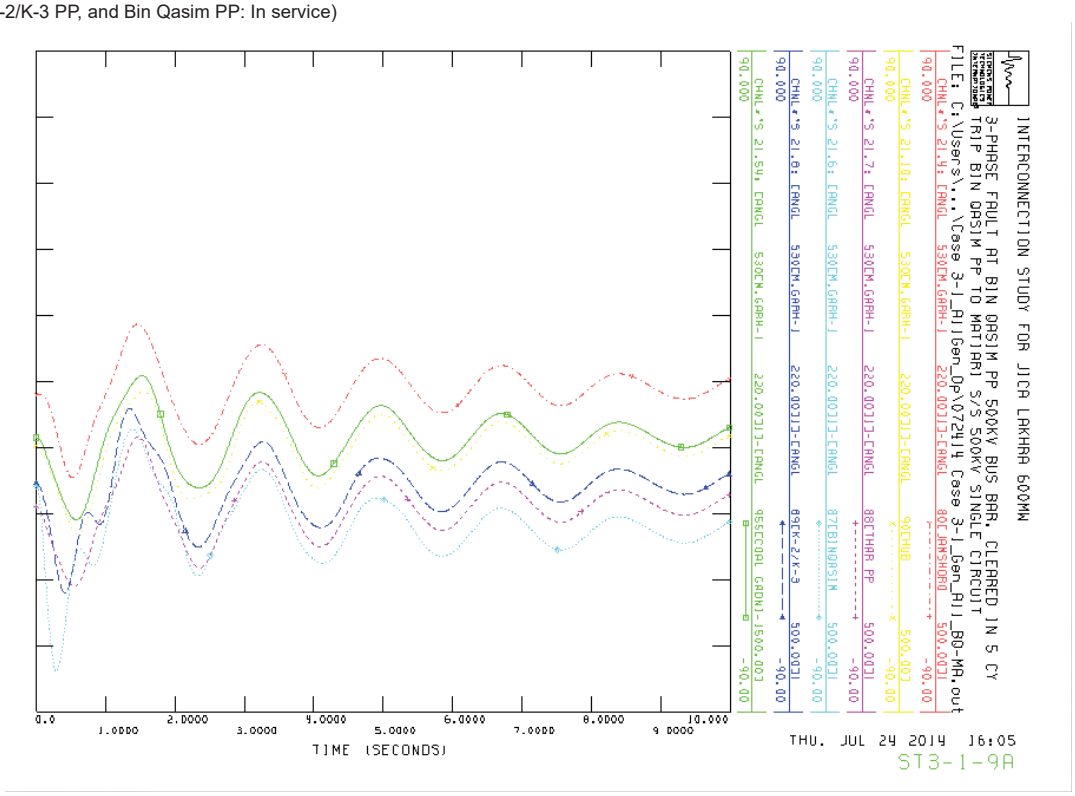


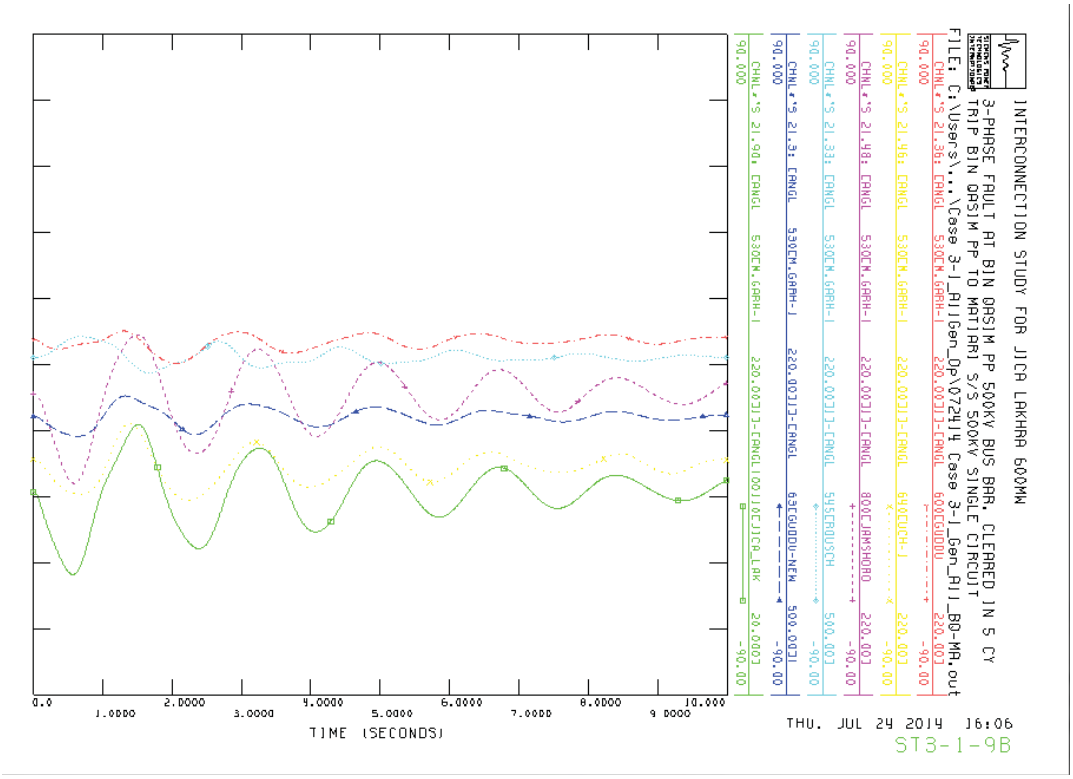


Fault Section: K-2/K-3 PP – Matiari S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

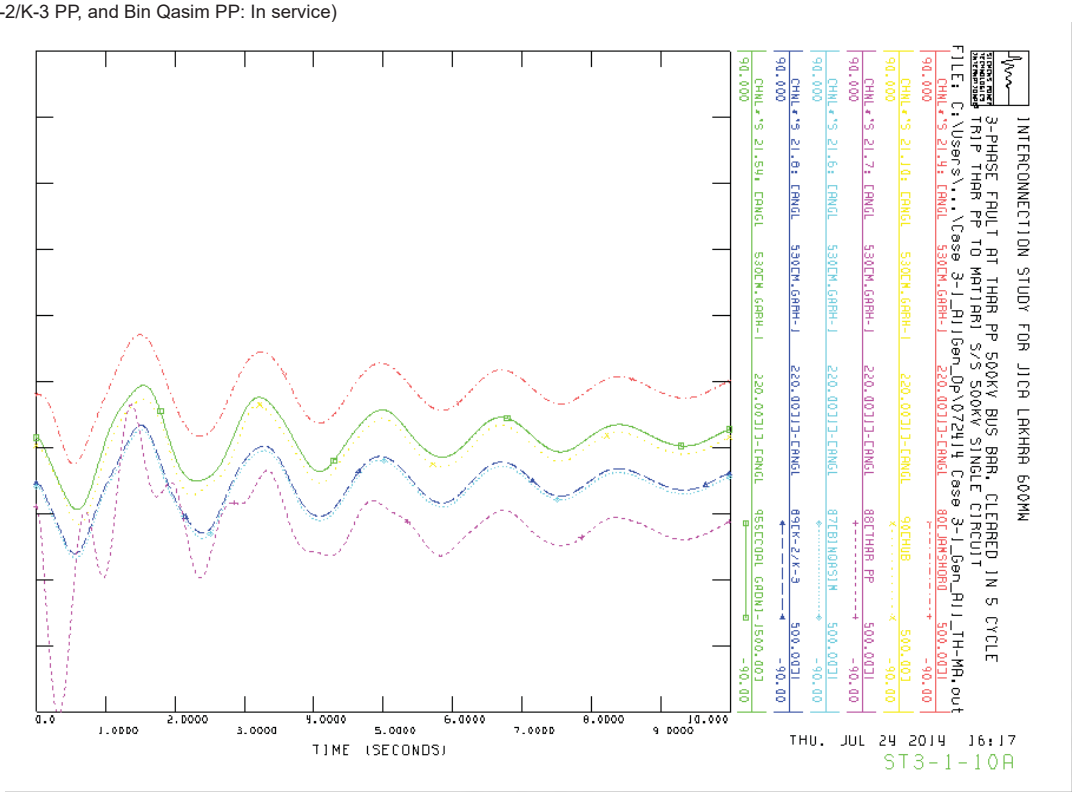


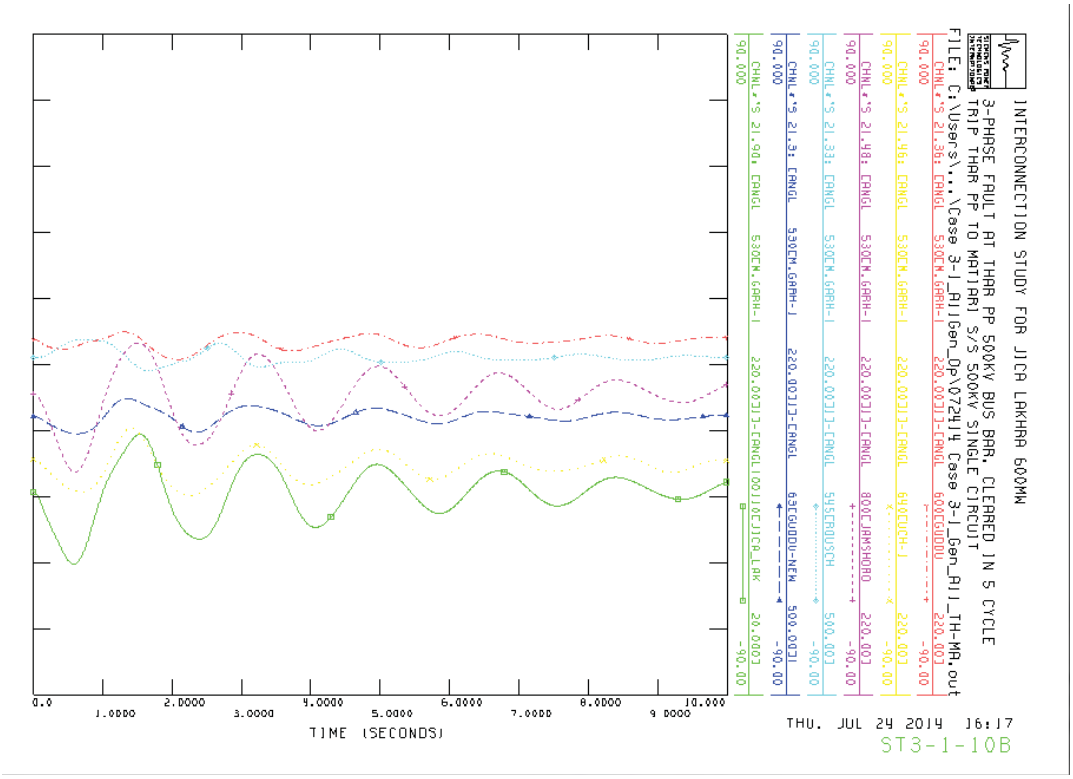


Fault Section: Bin Qasim S/S – Matiari S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

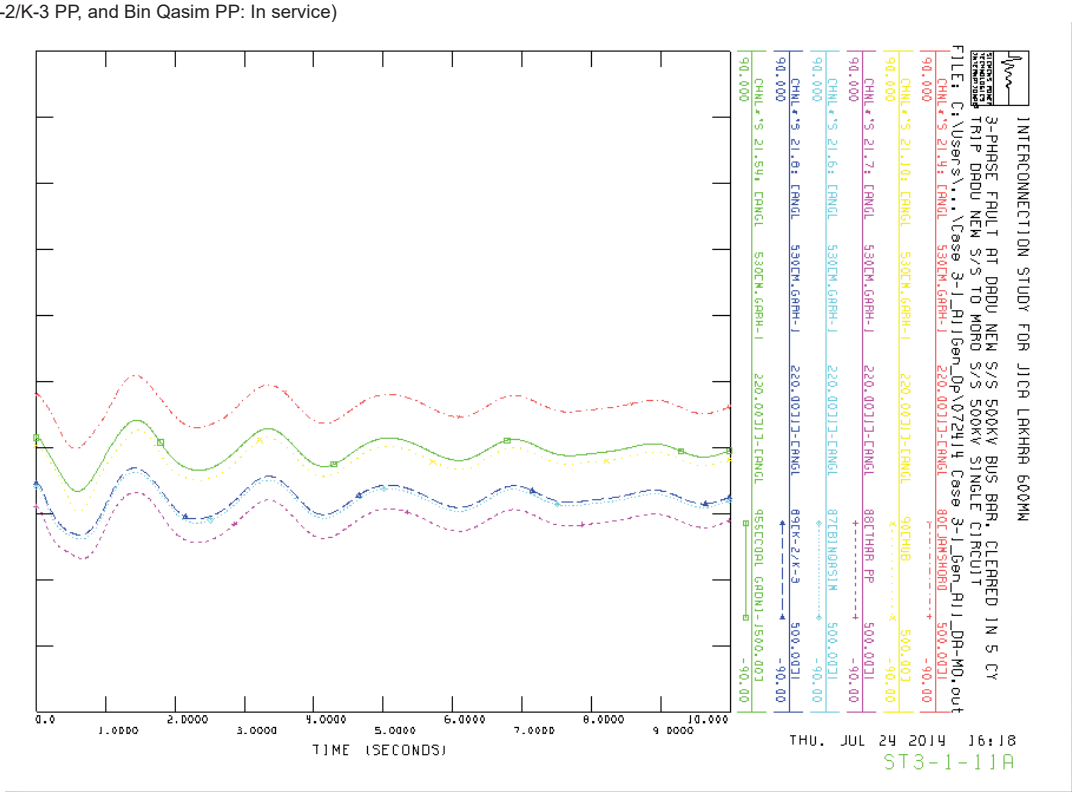


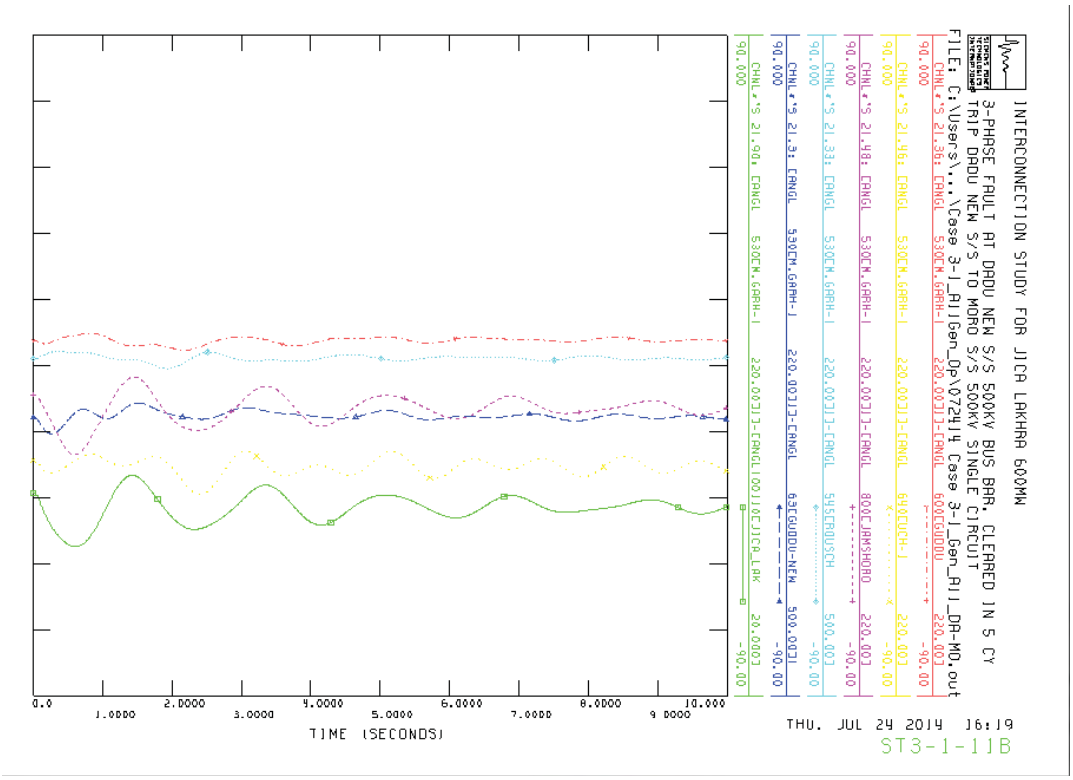


Fault Section: Thar PP – Matiari S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

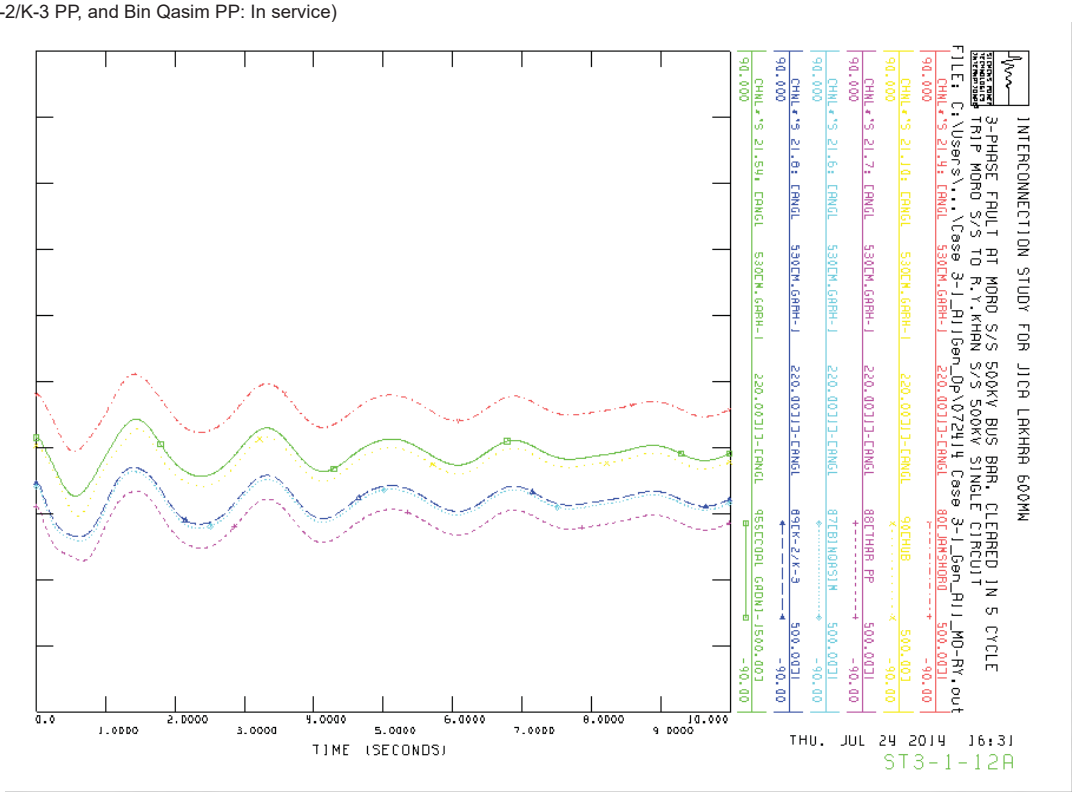


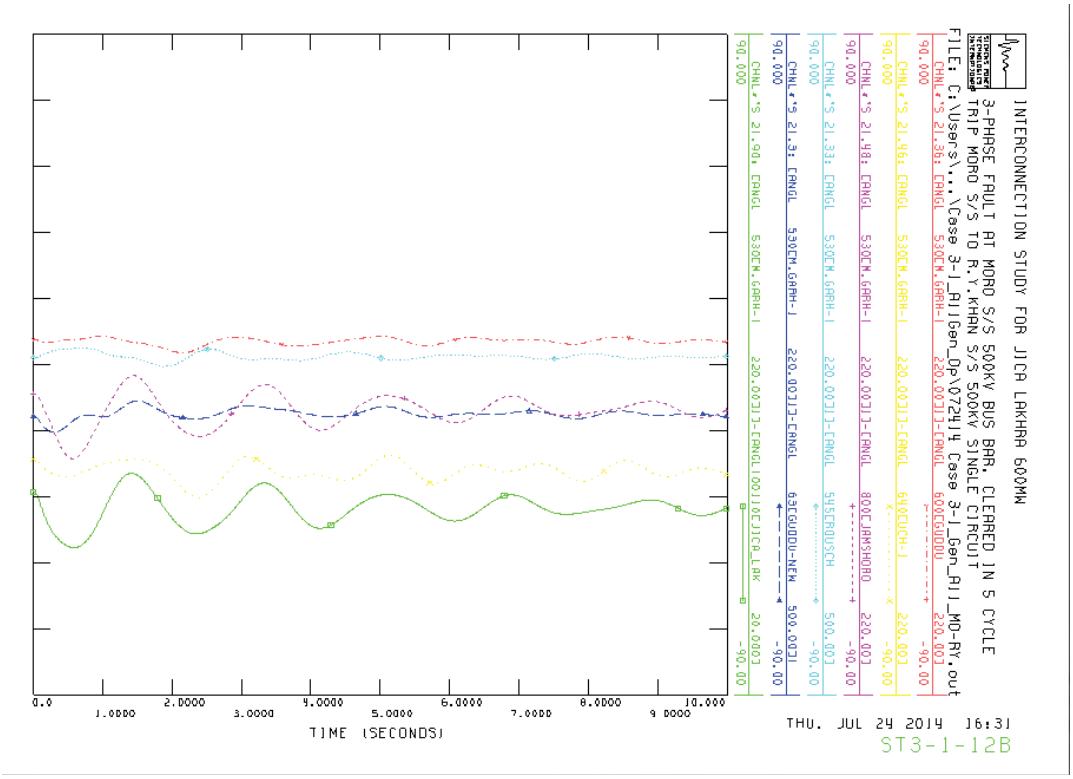


Fault Section: Dadu New S/S – Moro S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

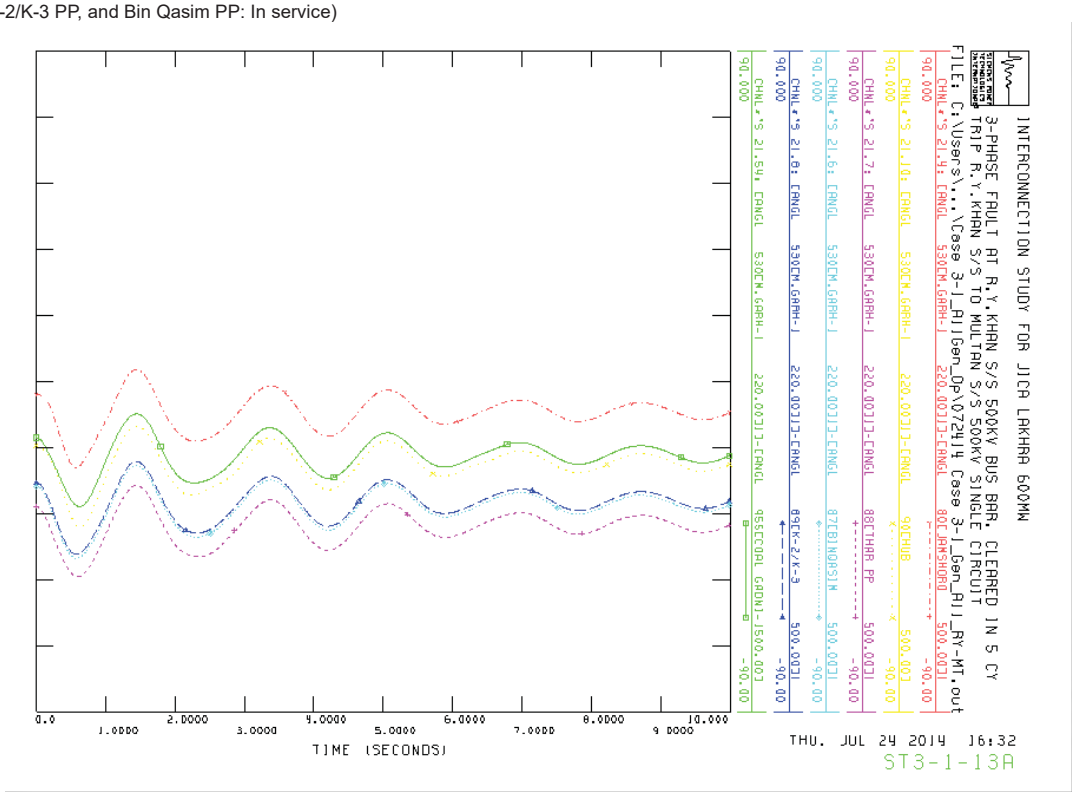


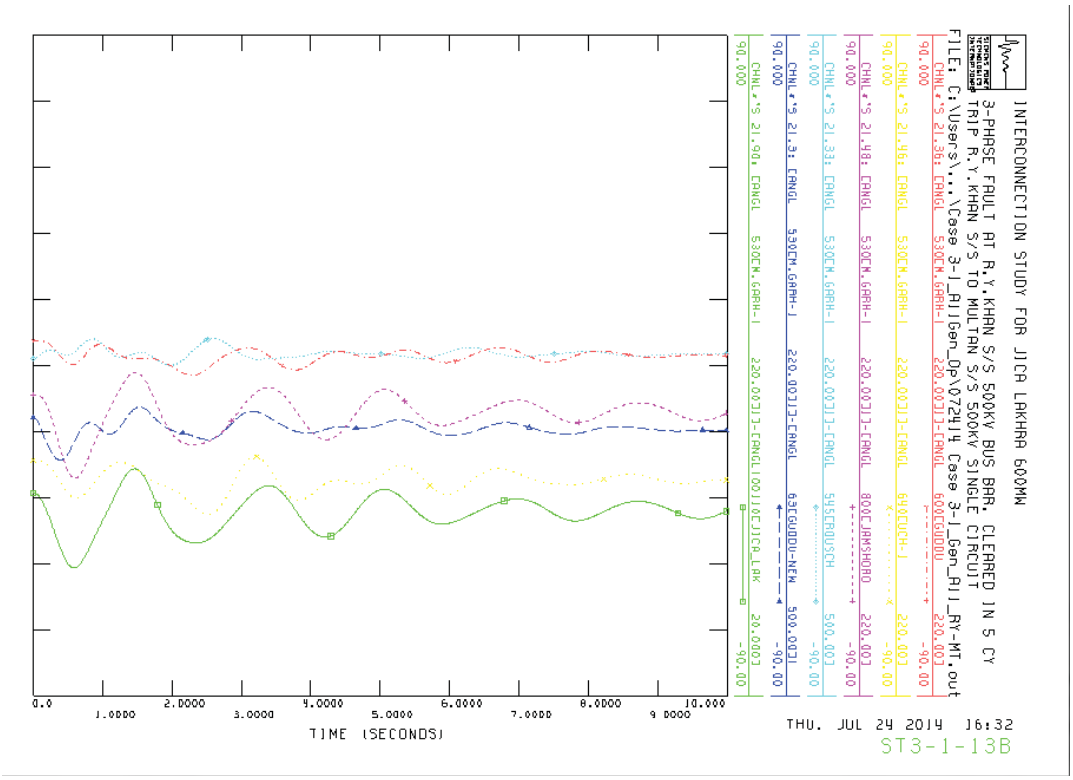


Fault Section: Moro S/S – R. Y. Khan S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

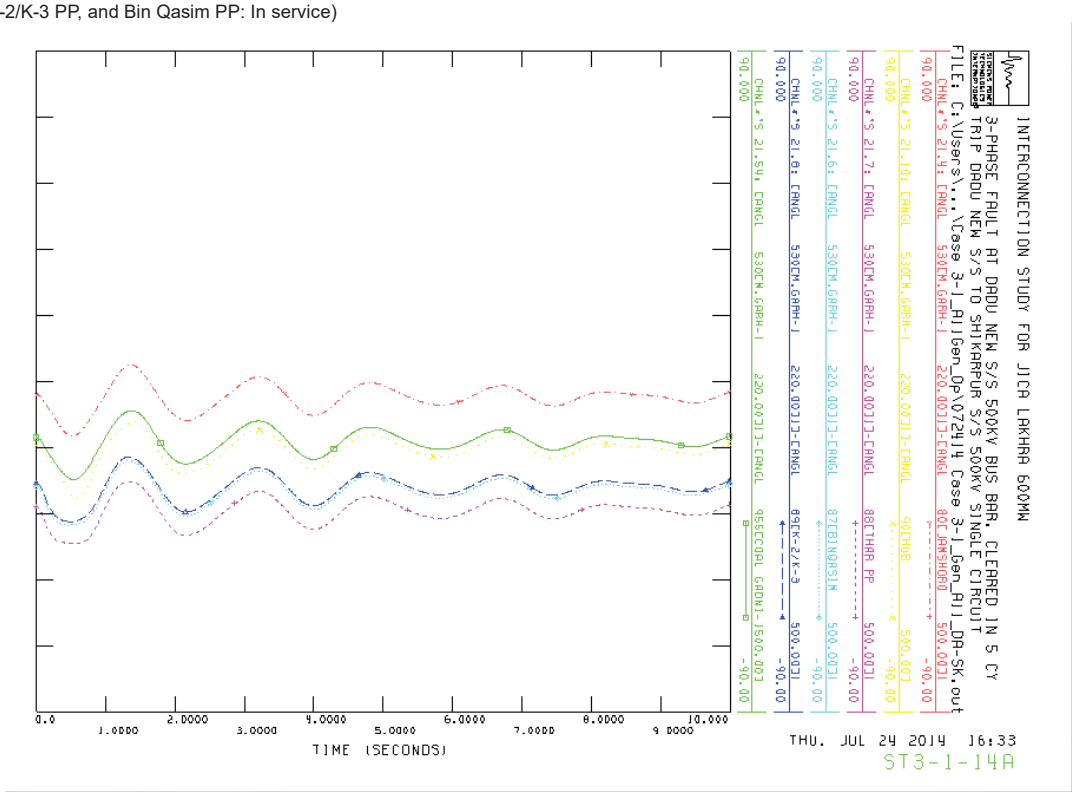


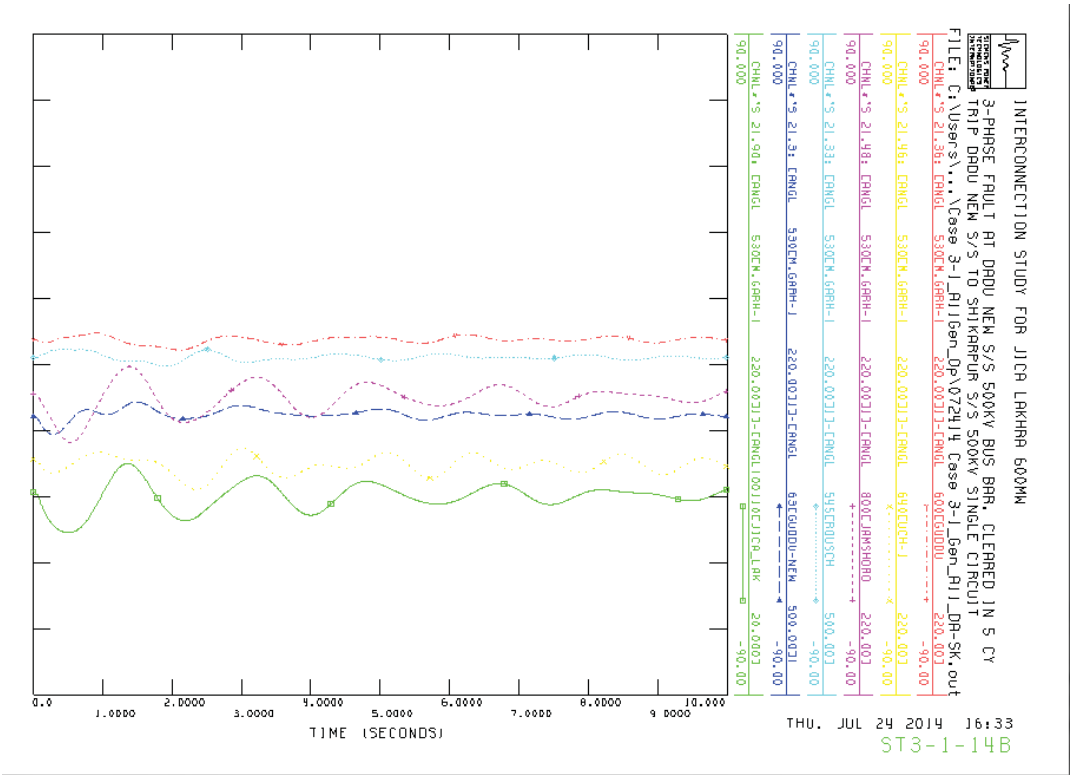


Fault Section: R. Y. Khan PP – Multan S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

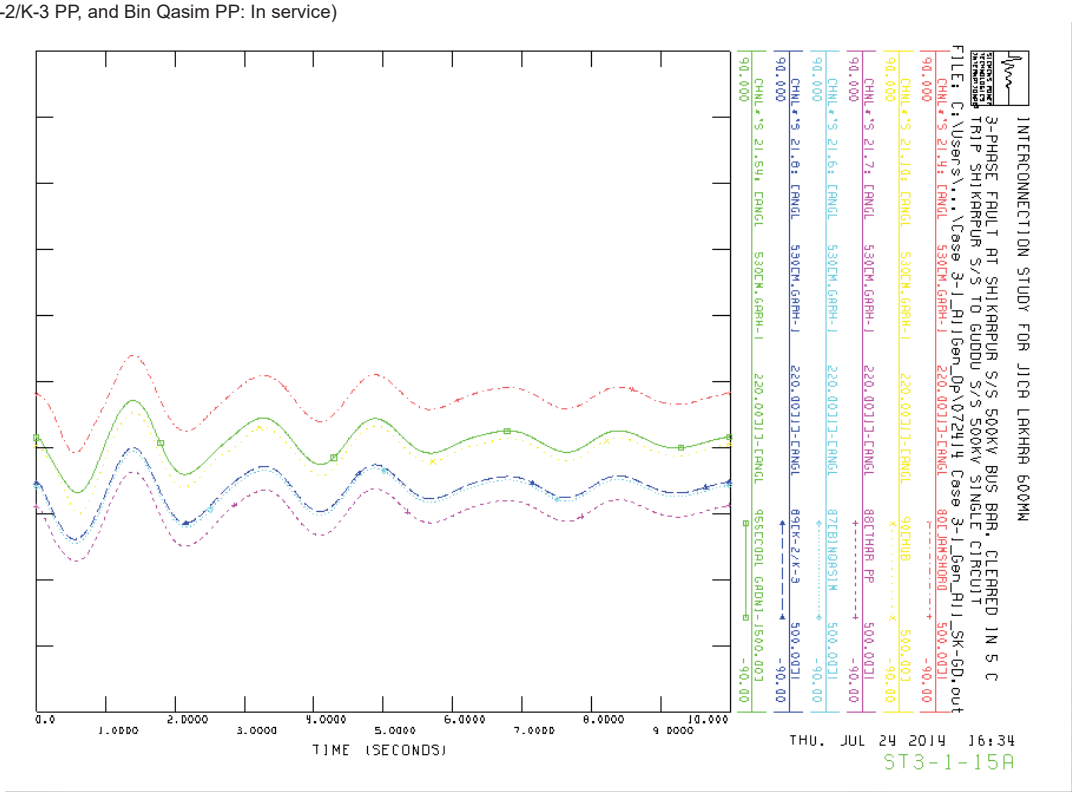


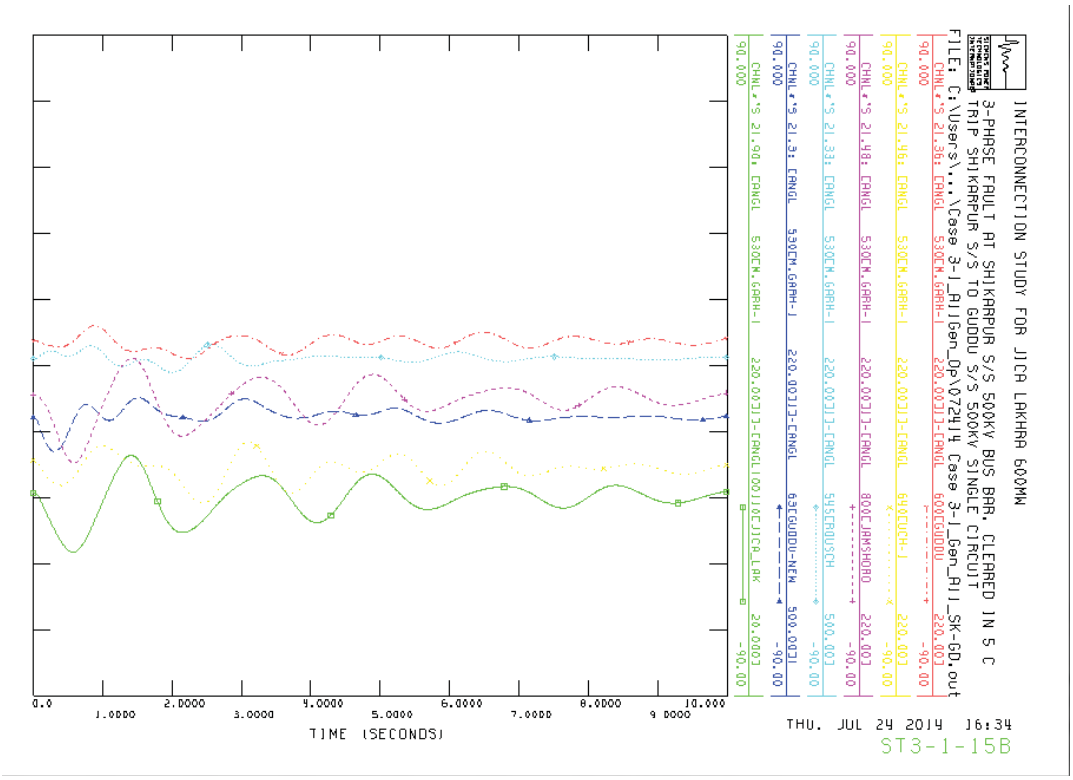


Fault Section: Dadu New S/S – Shikarpur S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

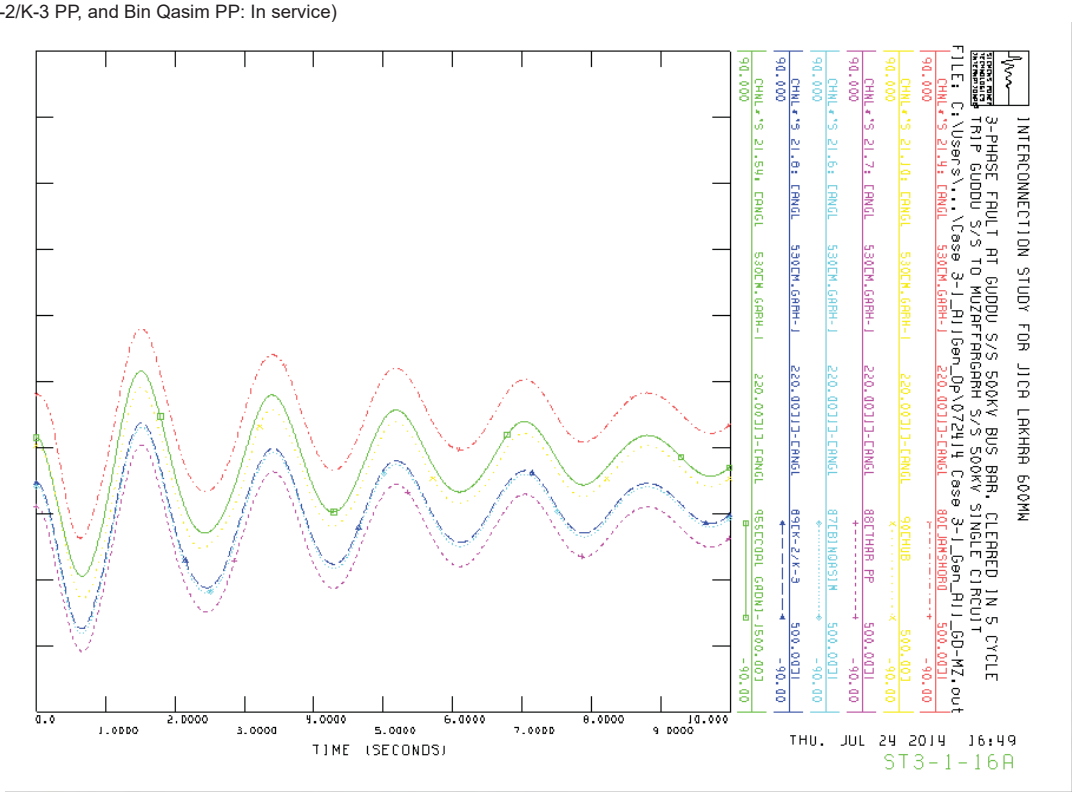


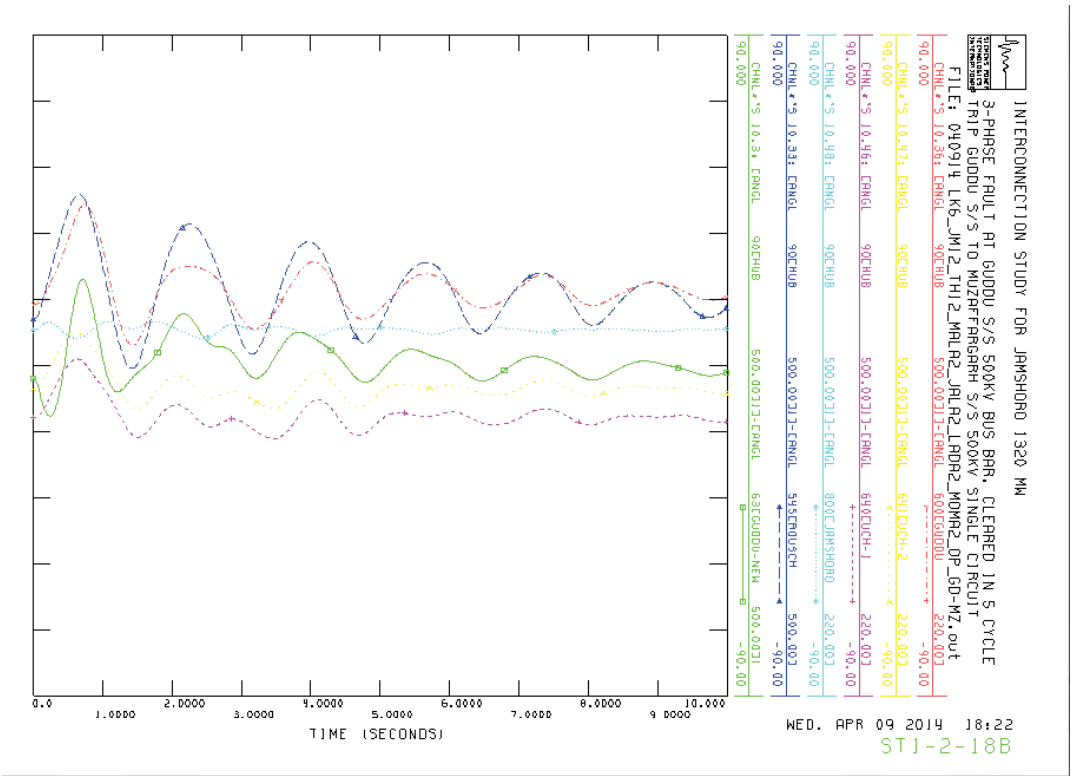


Fault Section: Shikarpur S/S – Guddu S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

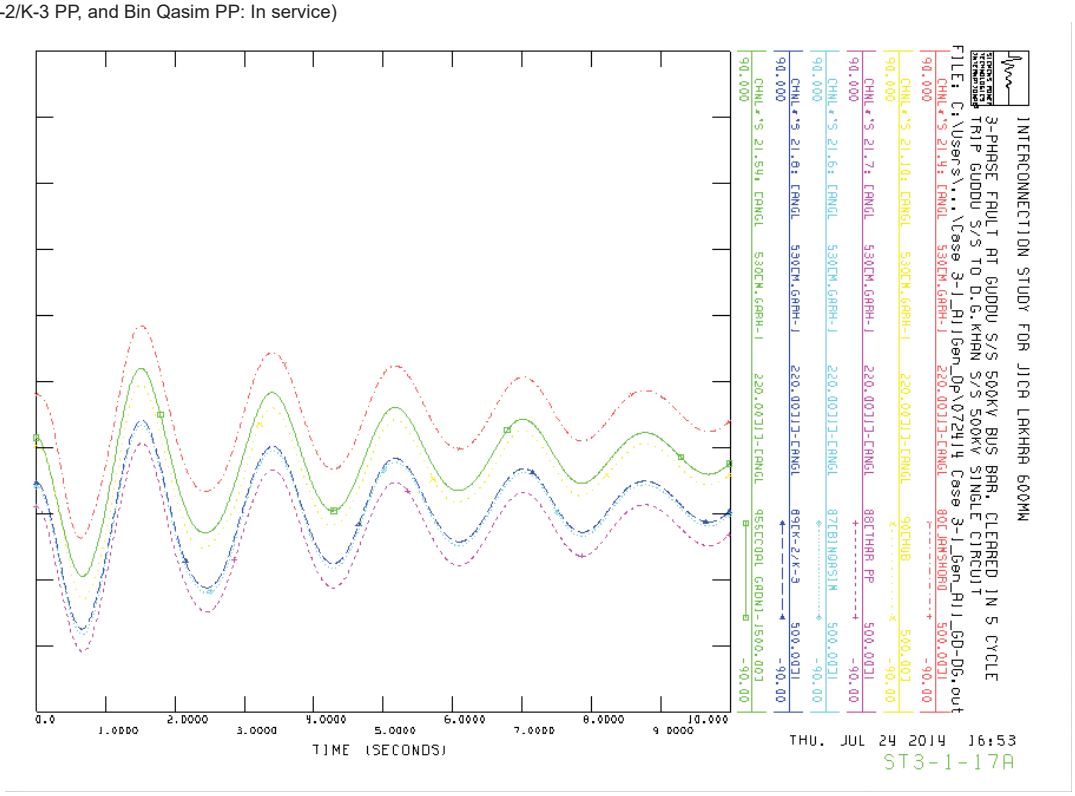


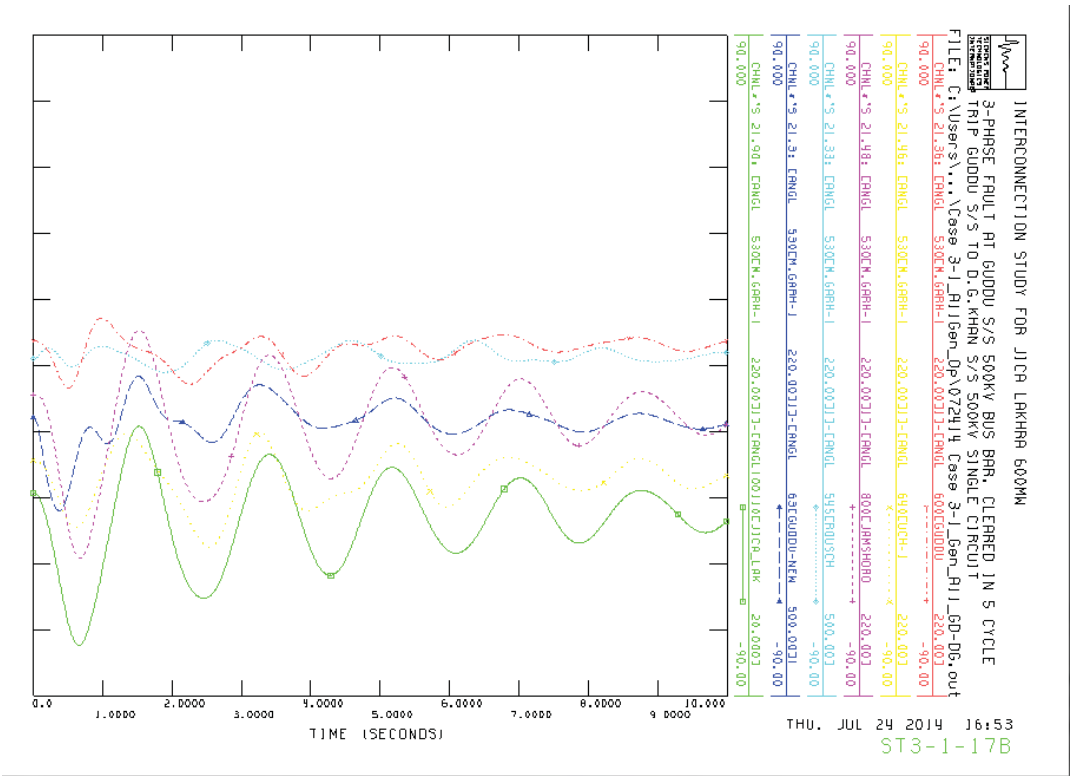


Fault Section: Guddu S/S – Muzaffargarh S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

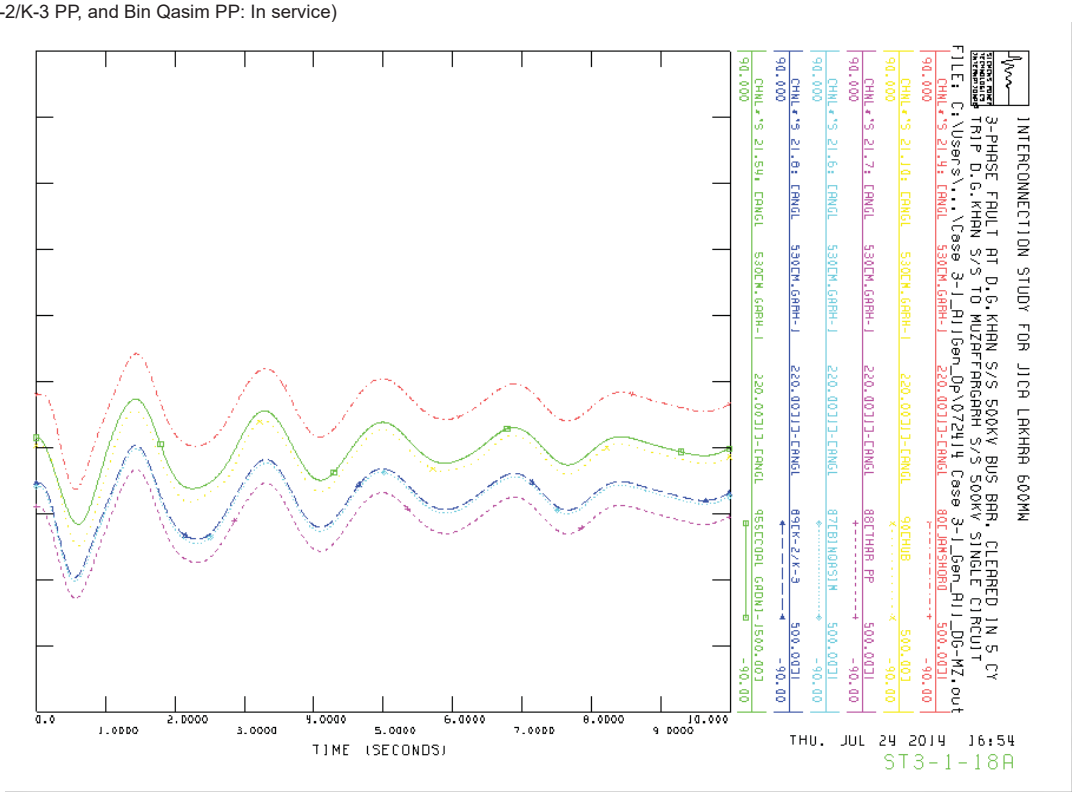


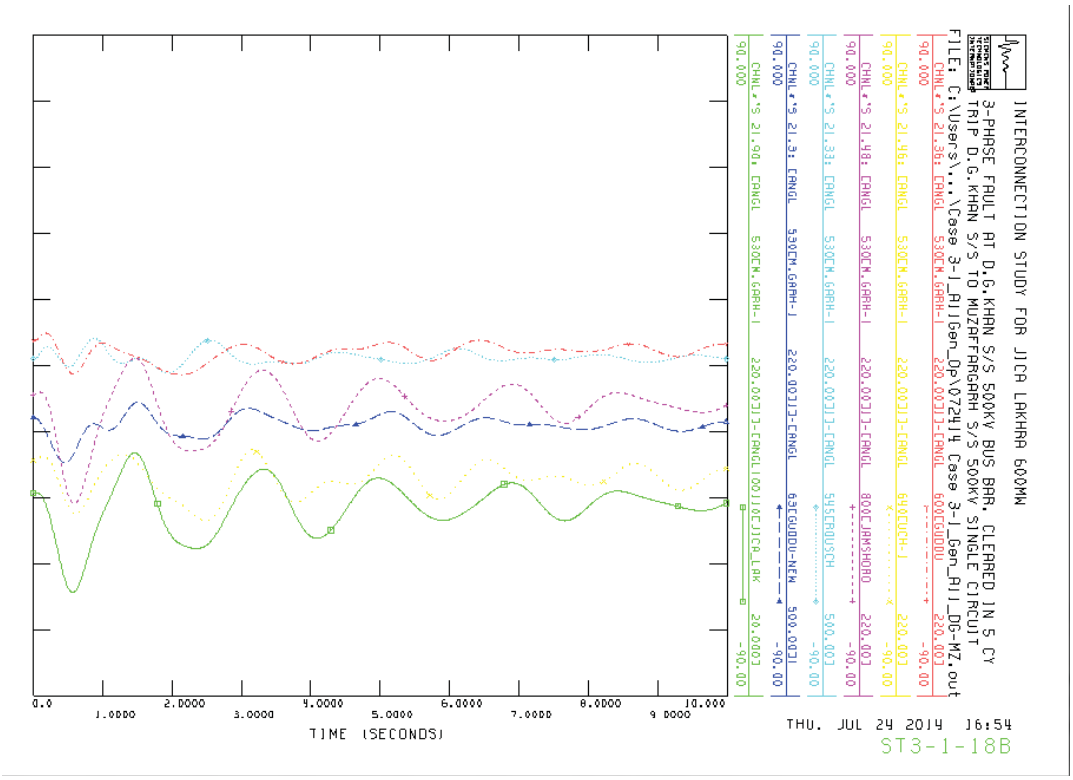


Fault Section: Guddu S/S – D. G. Khan S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

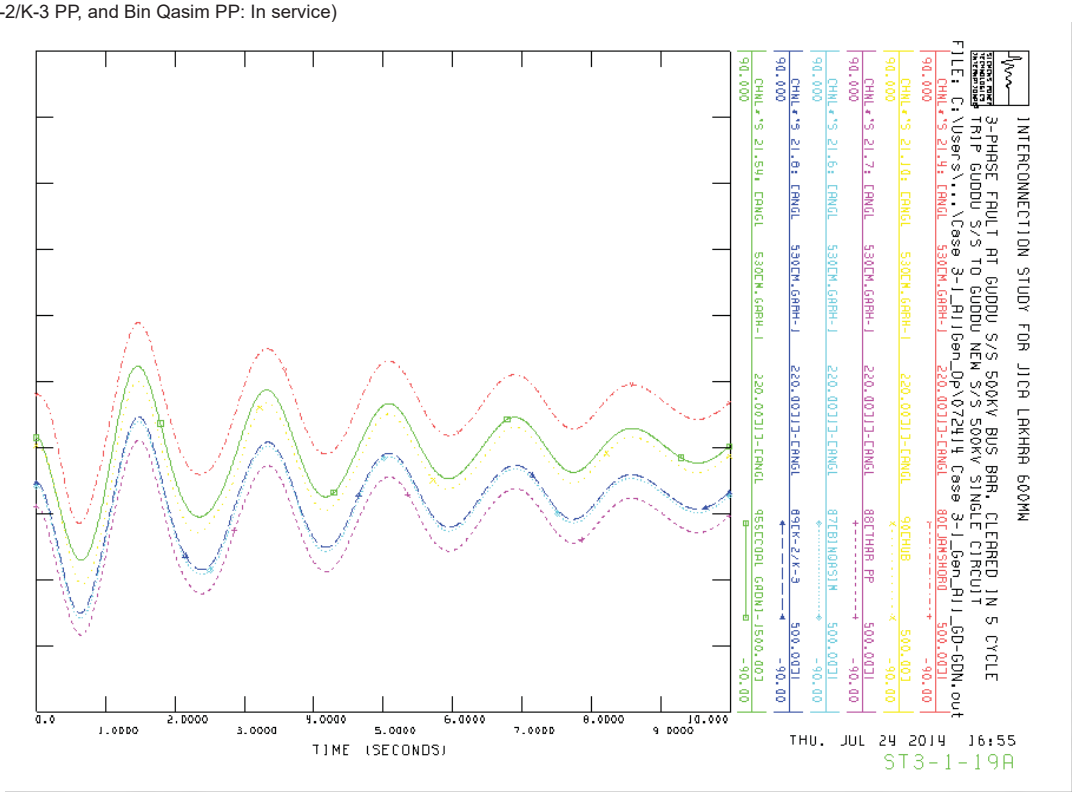


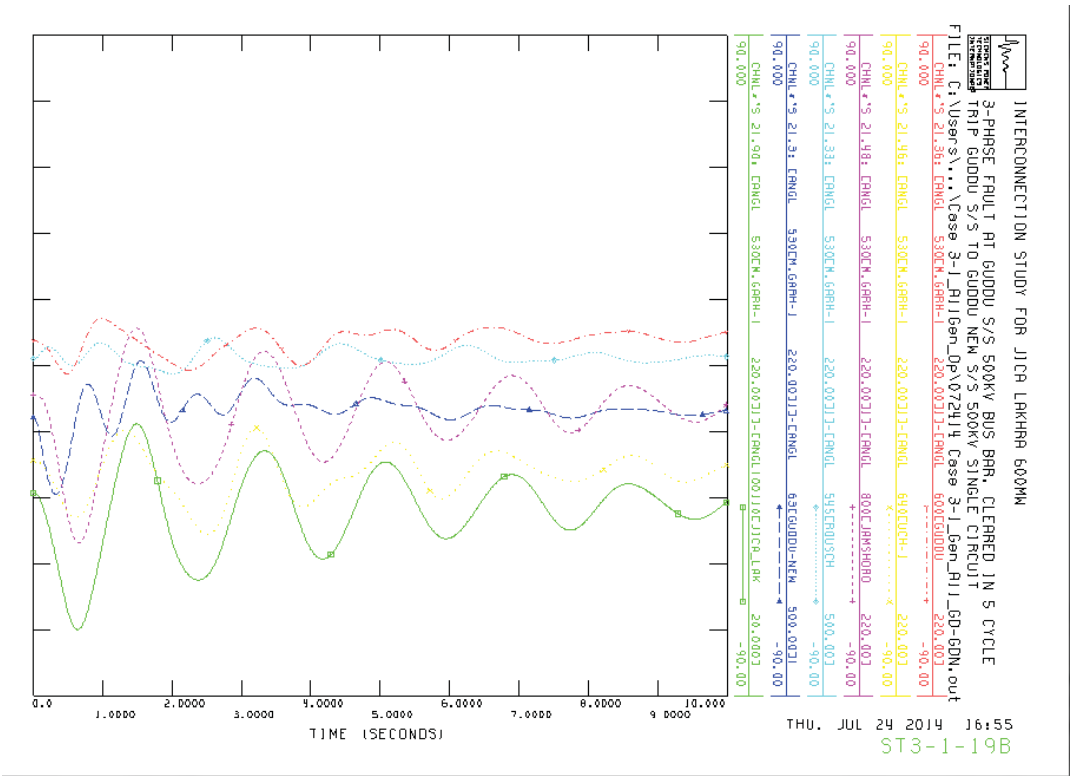


Fault Section: D. G. Khan S/S – Muzaffargarh S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

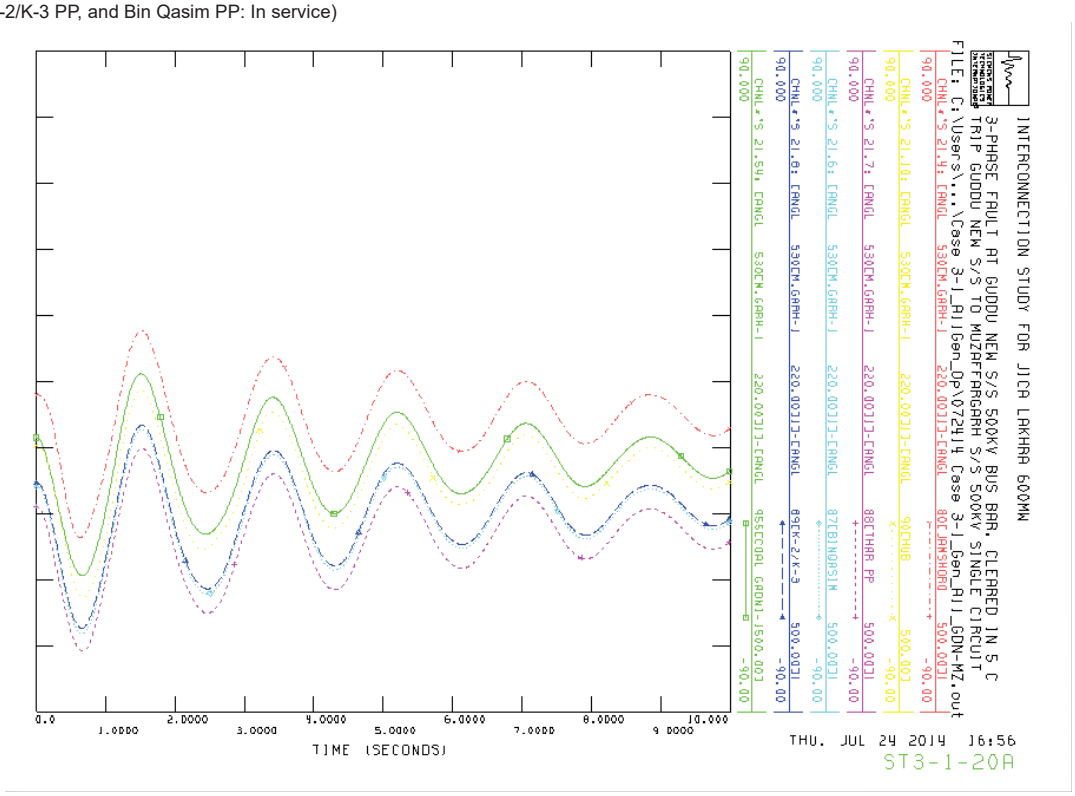


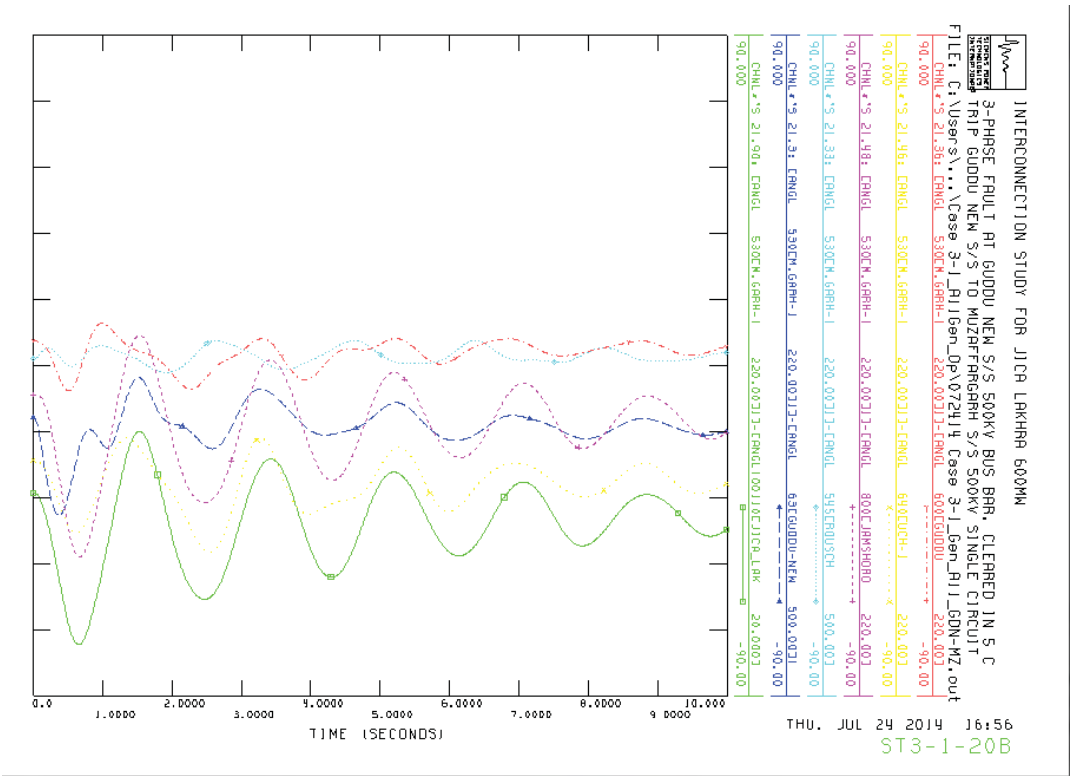


Fault Section: Guddu S/S – Guddu New PP

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

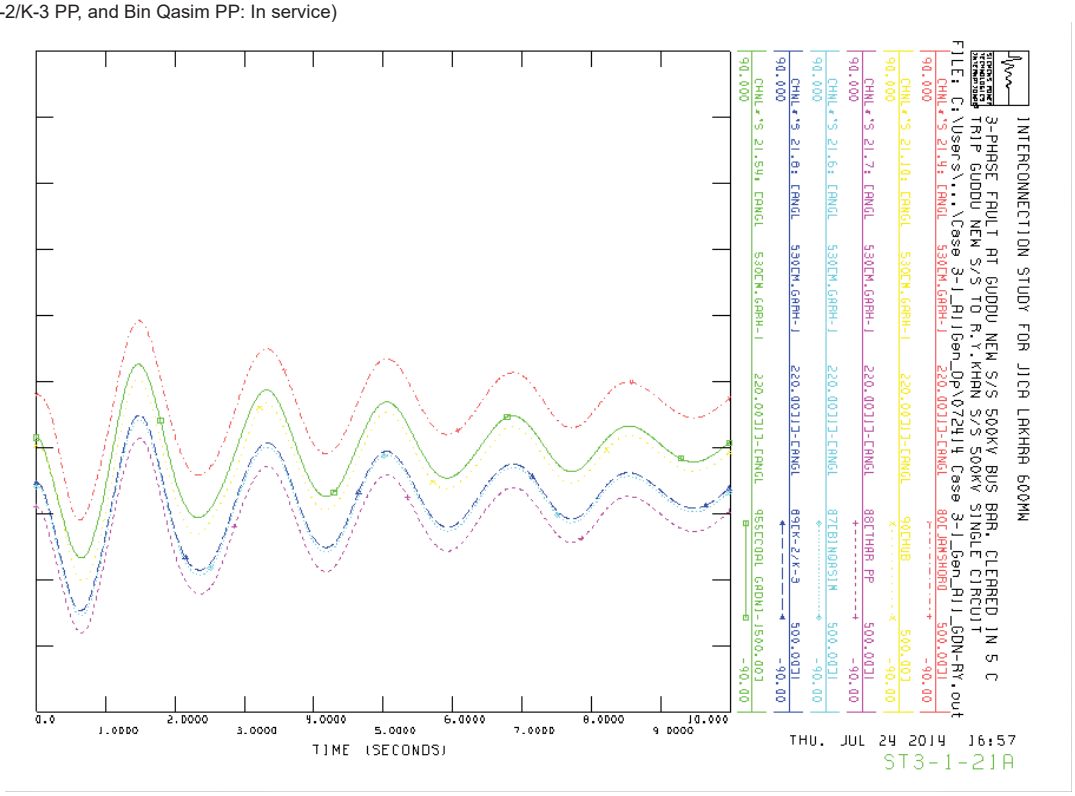


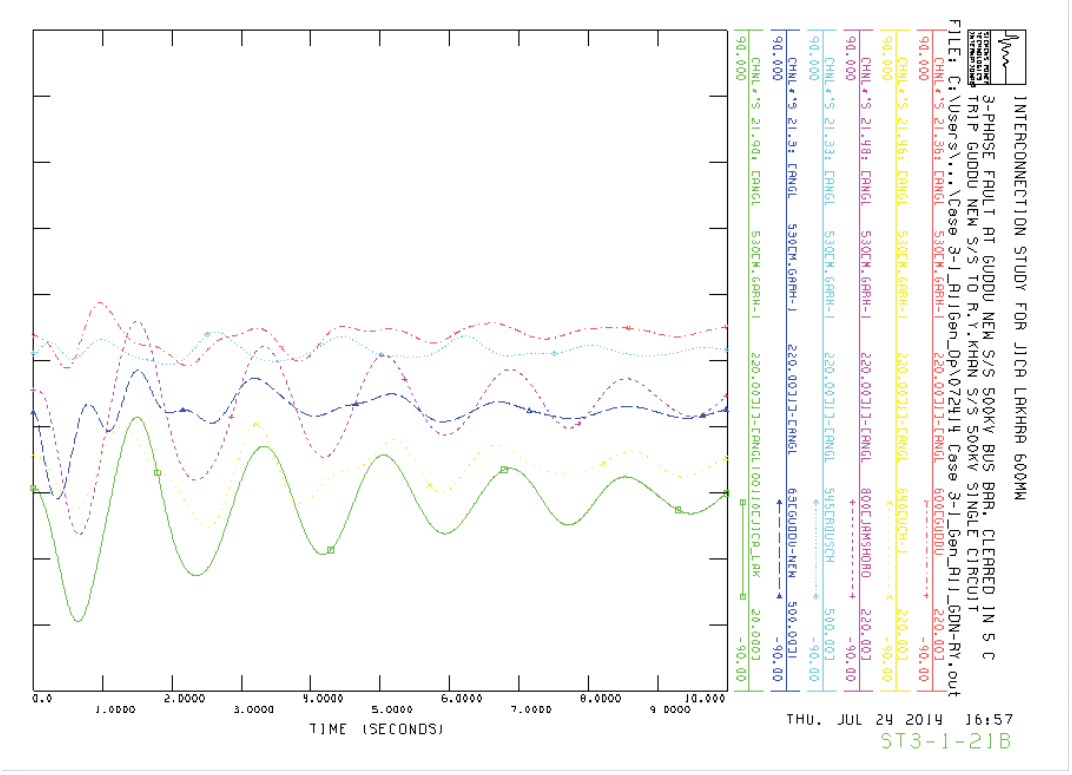


Fault Section: Guddu New PP – Muzaffargarh S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

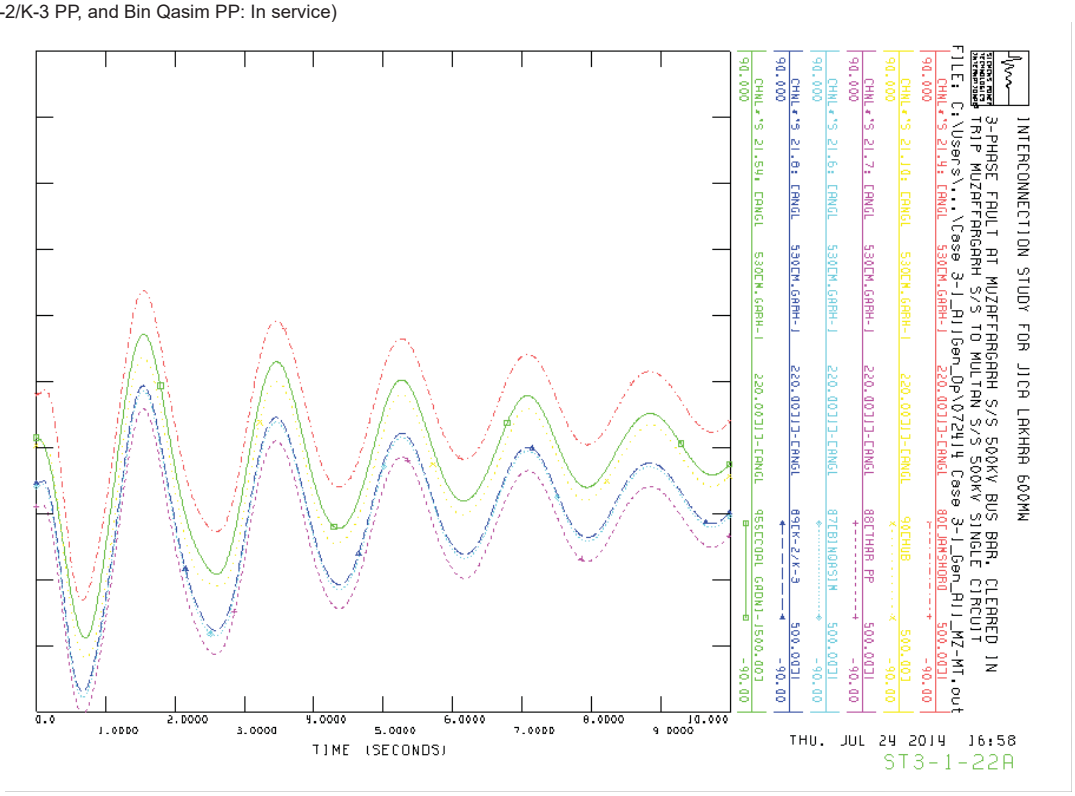


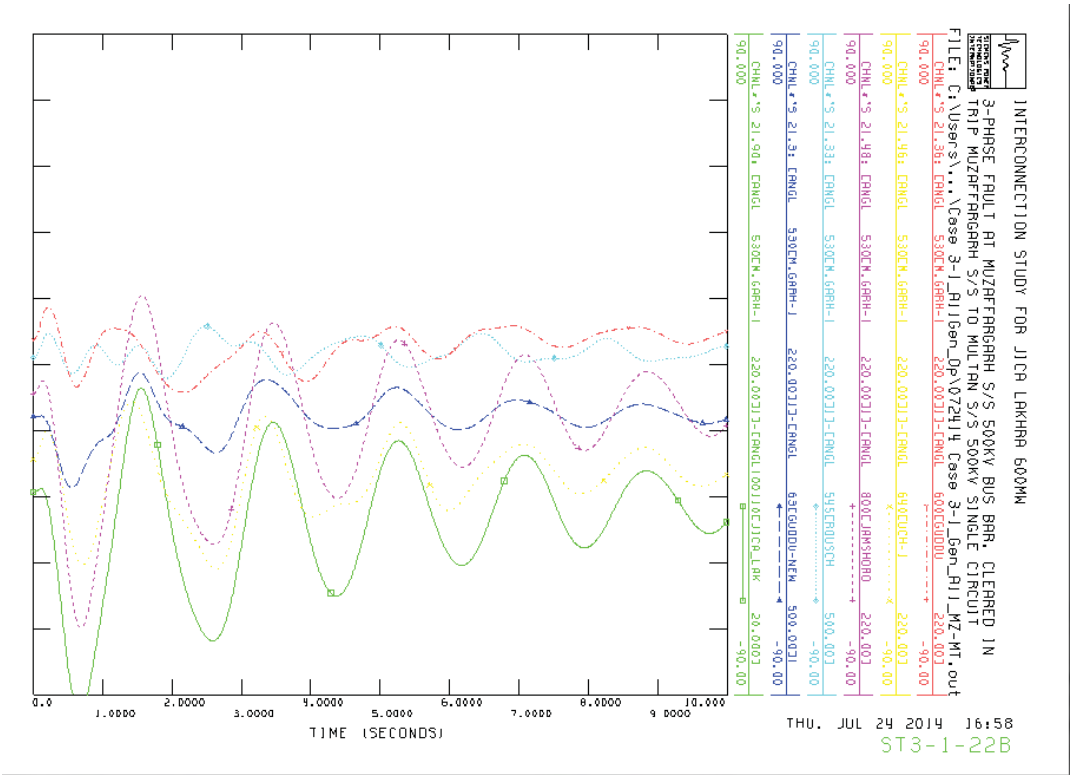


Fault Section: Guddu New PP – R. Y. Khan S/S

Stability Analysis Result Case ST-3-1

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)



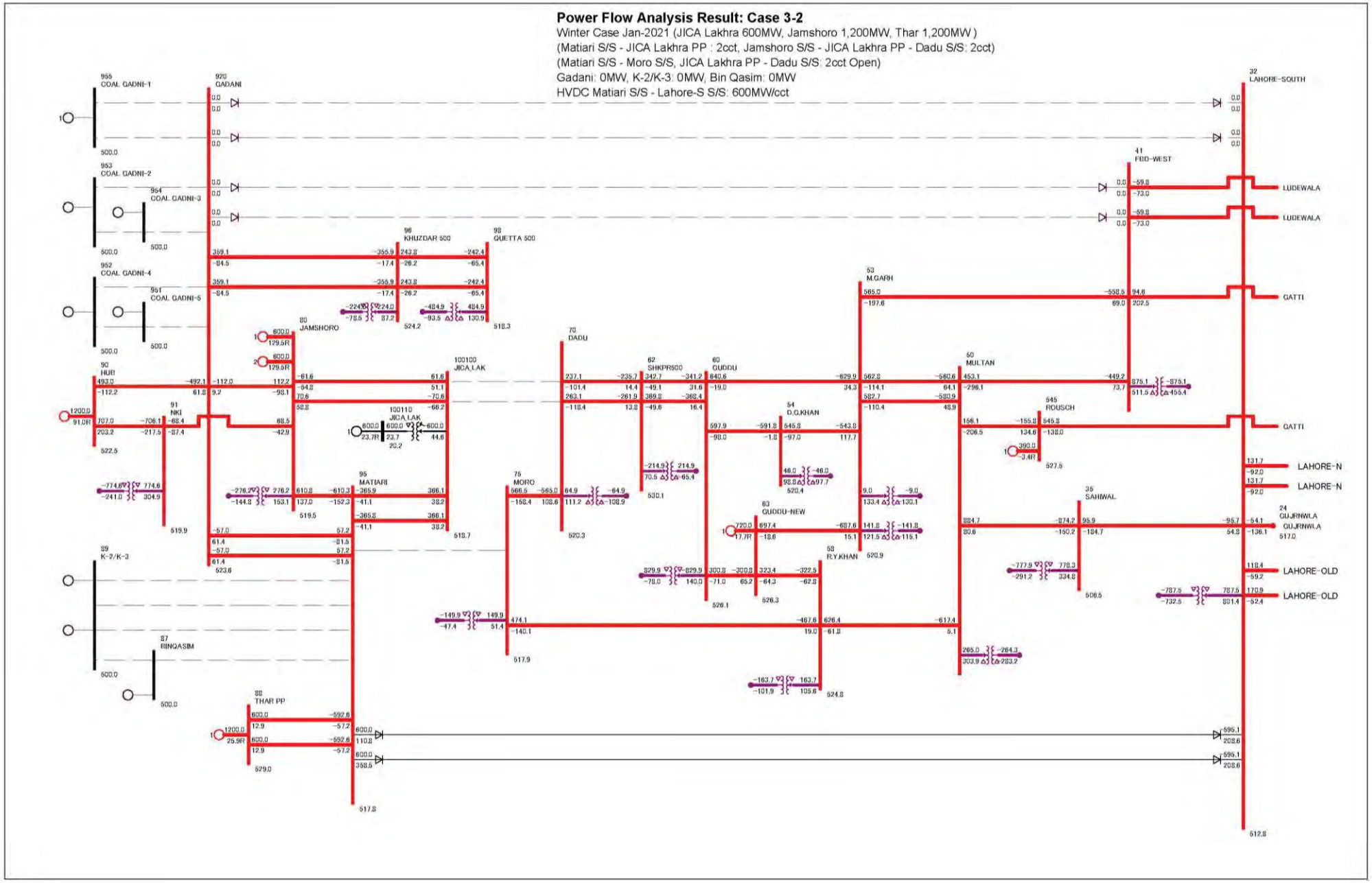


Fault Section: Muzaffargarh S/S – Multan S/S

6 - 5 STABILITY ANALYSIS CASE ST3-2

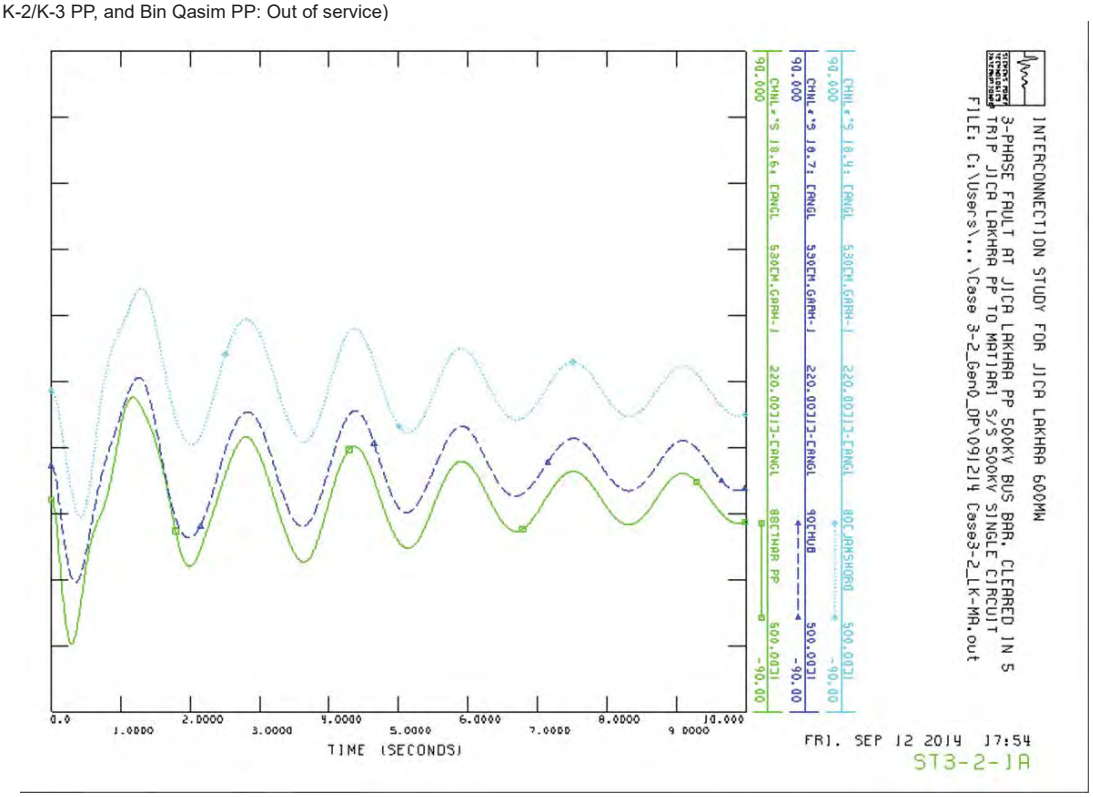
Stability Analysis Result Case ST-3-2

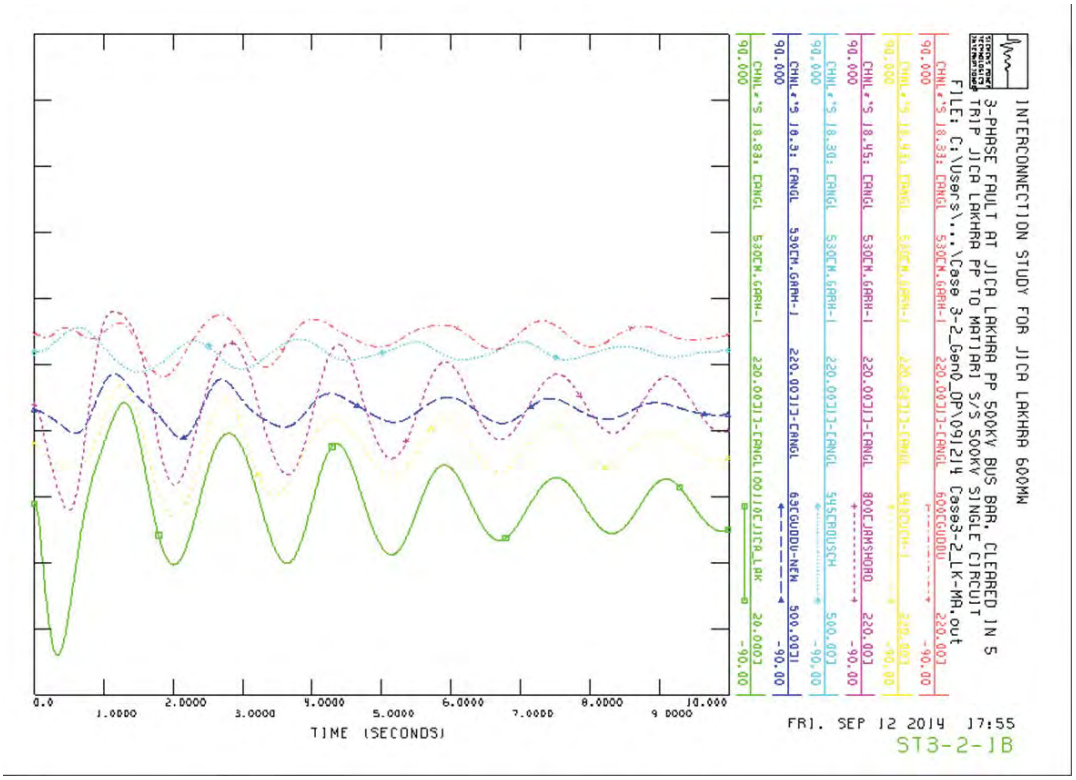
(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)



Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

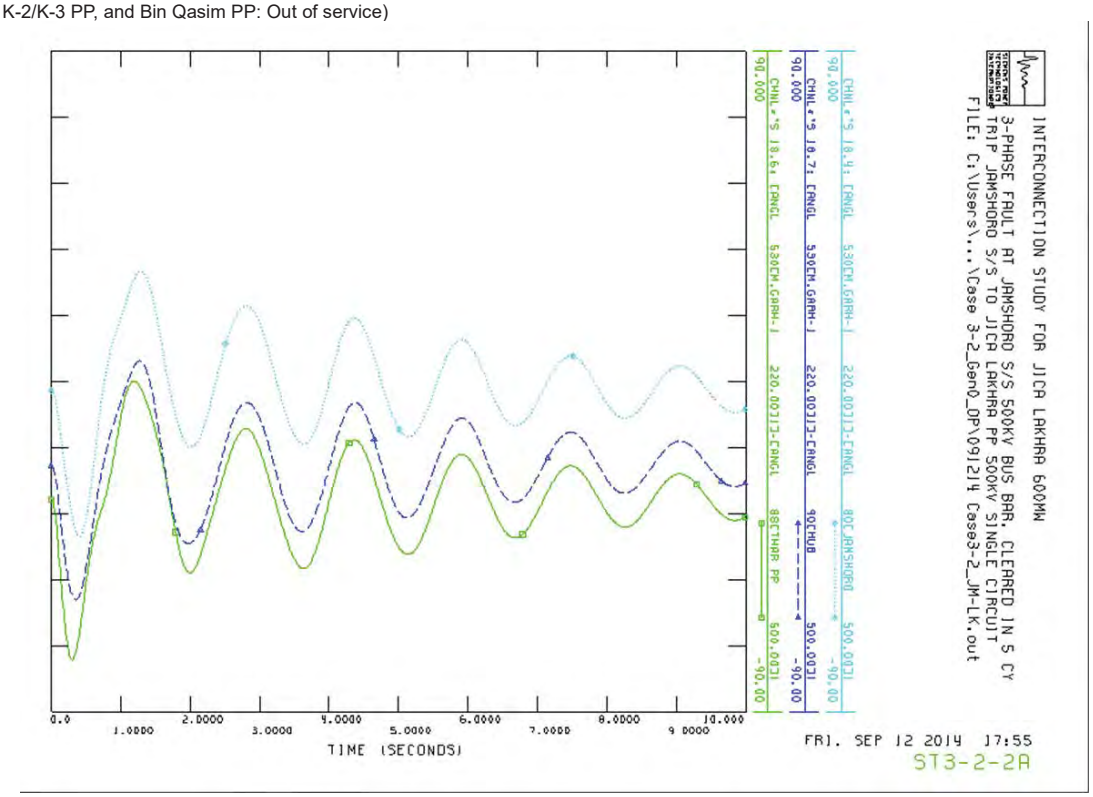


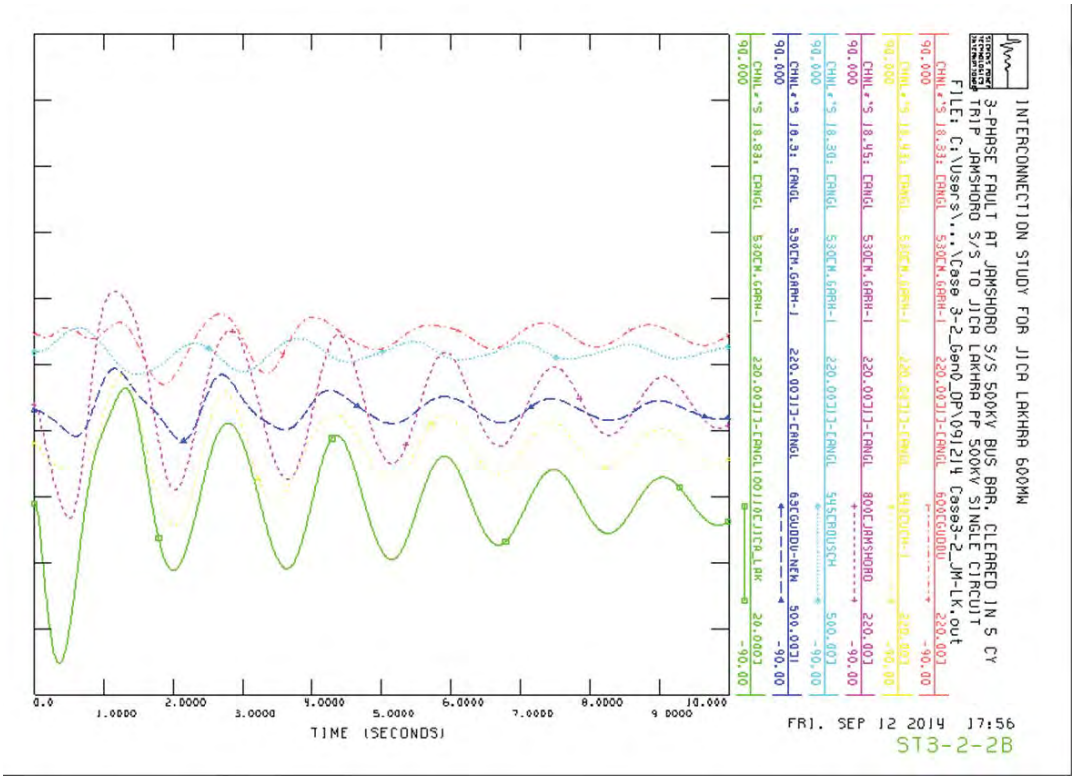


Fault Section: JICA Lakhra PP – Matiari S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

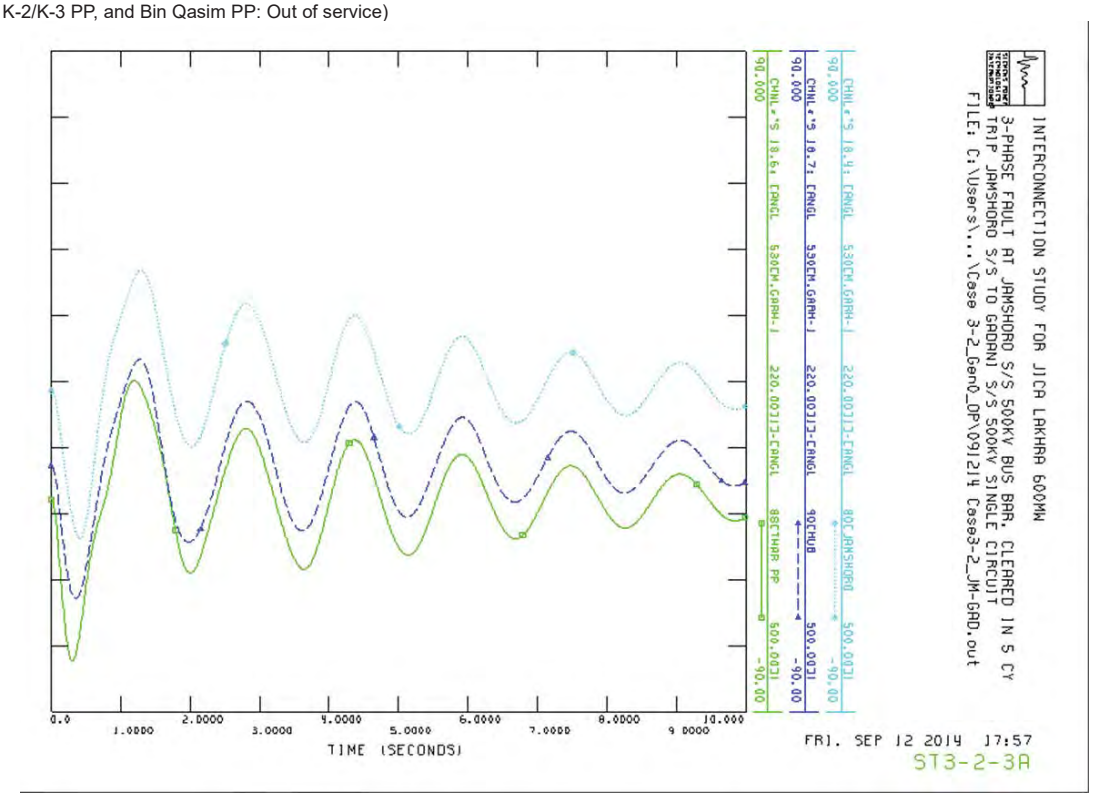


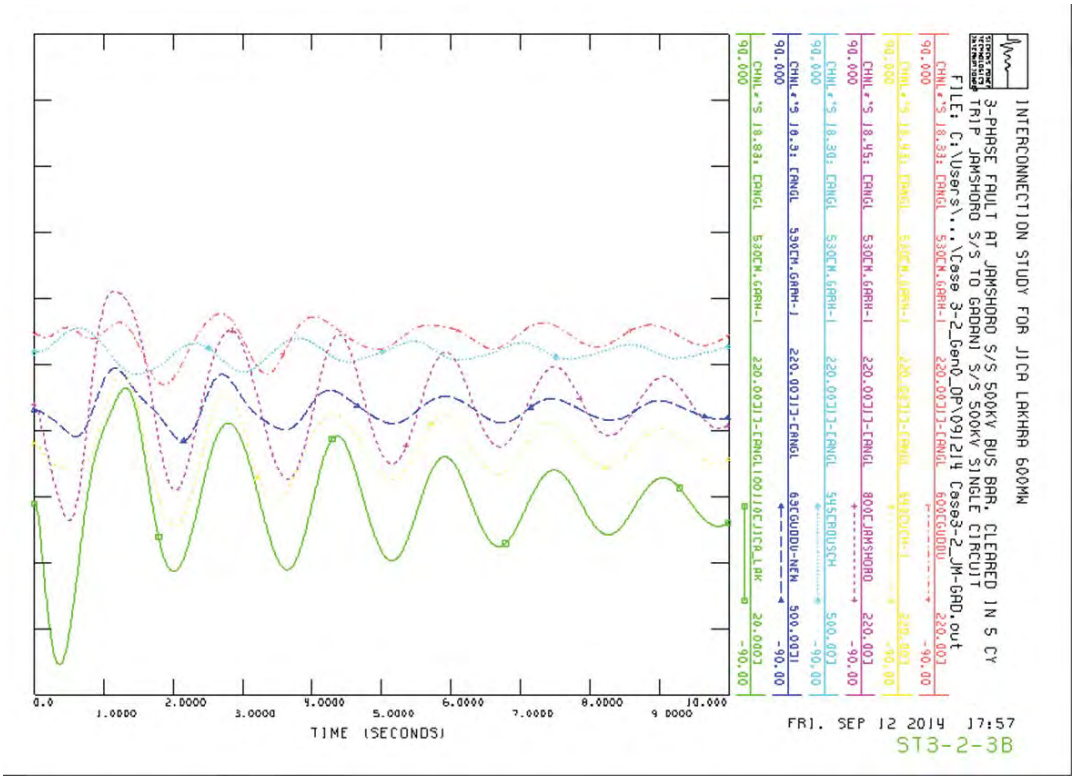


Fault Section: Jamshoro S/S – JICA Lakhra PP

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

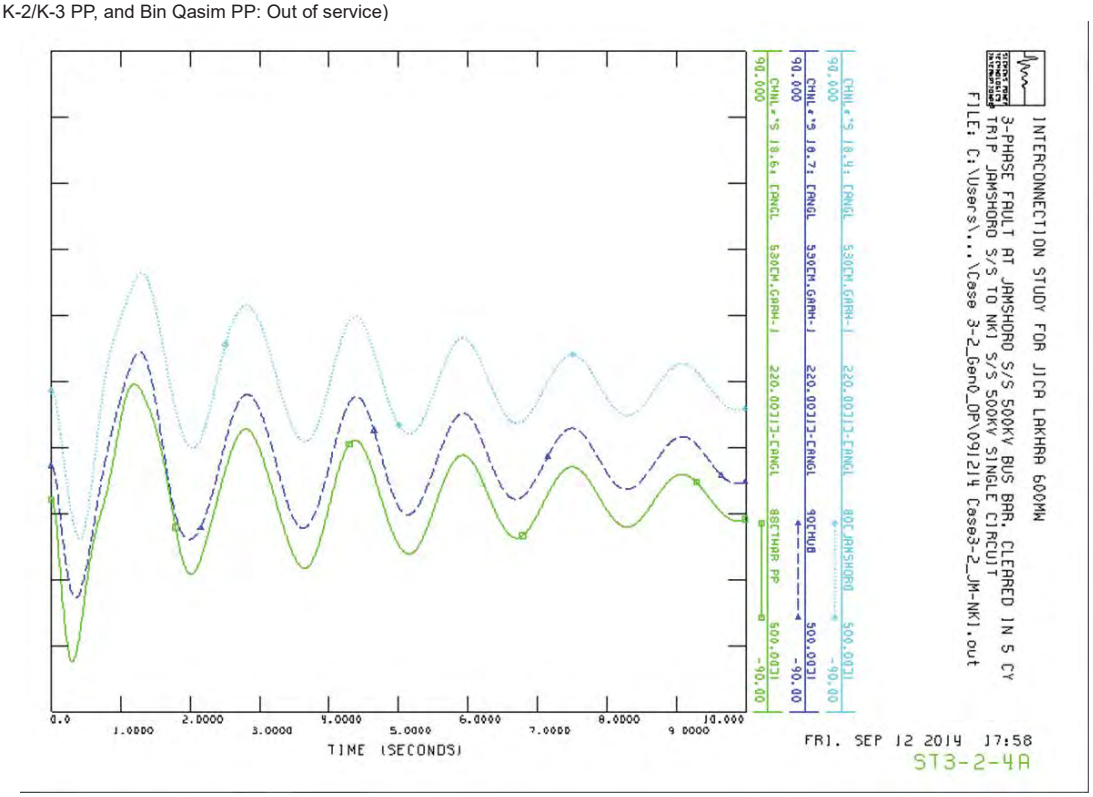


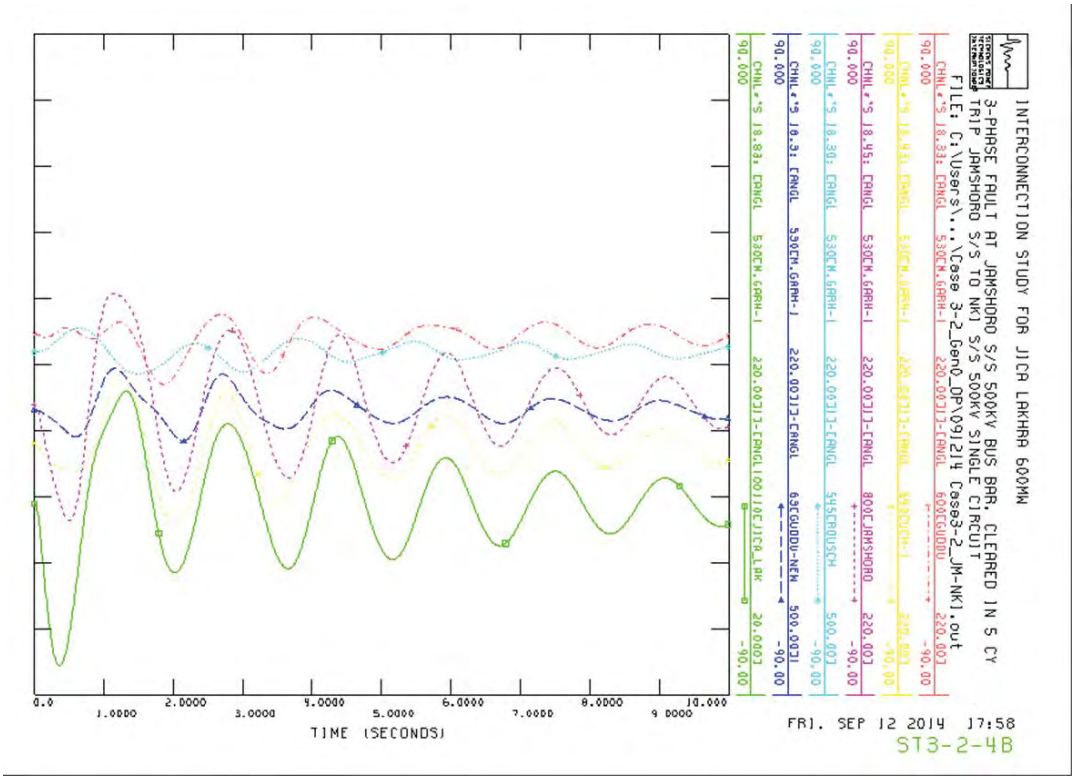


Fault Section: Jamshoro S/S – Gadani S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

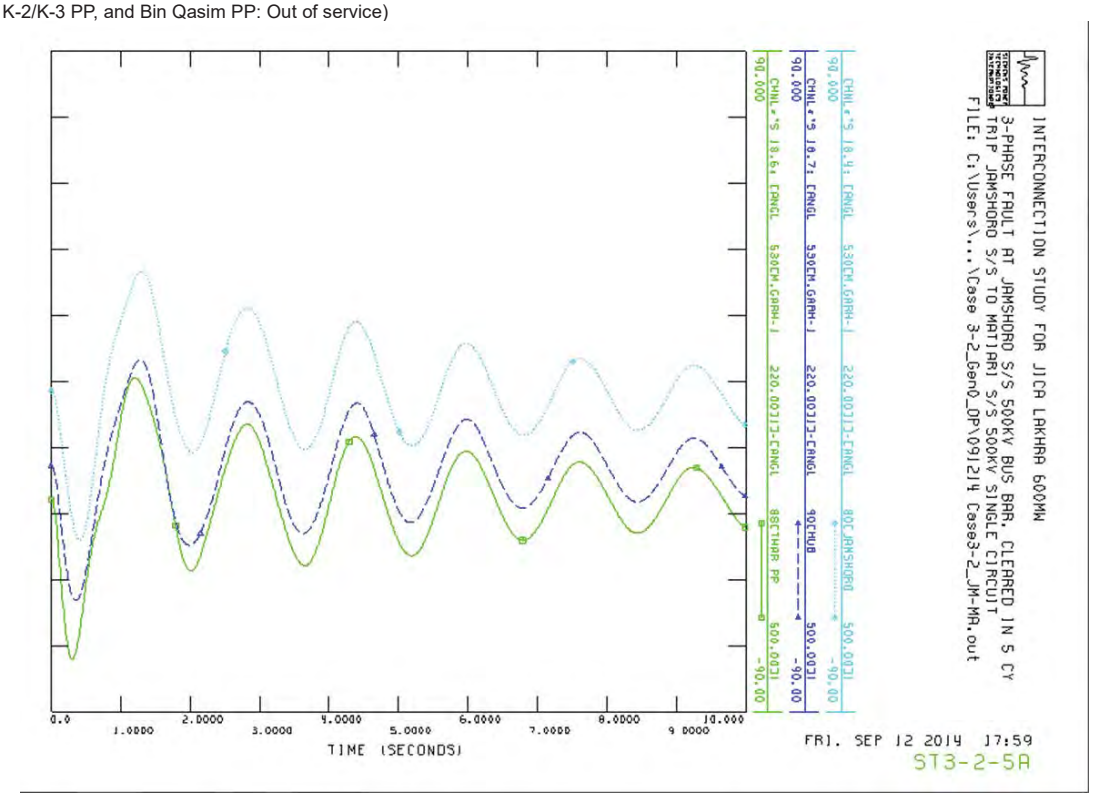


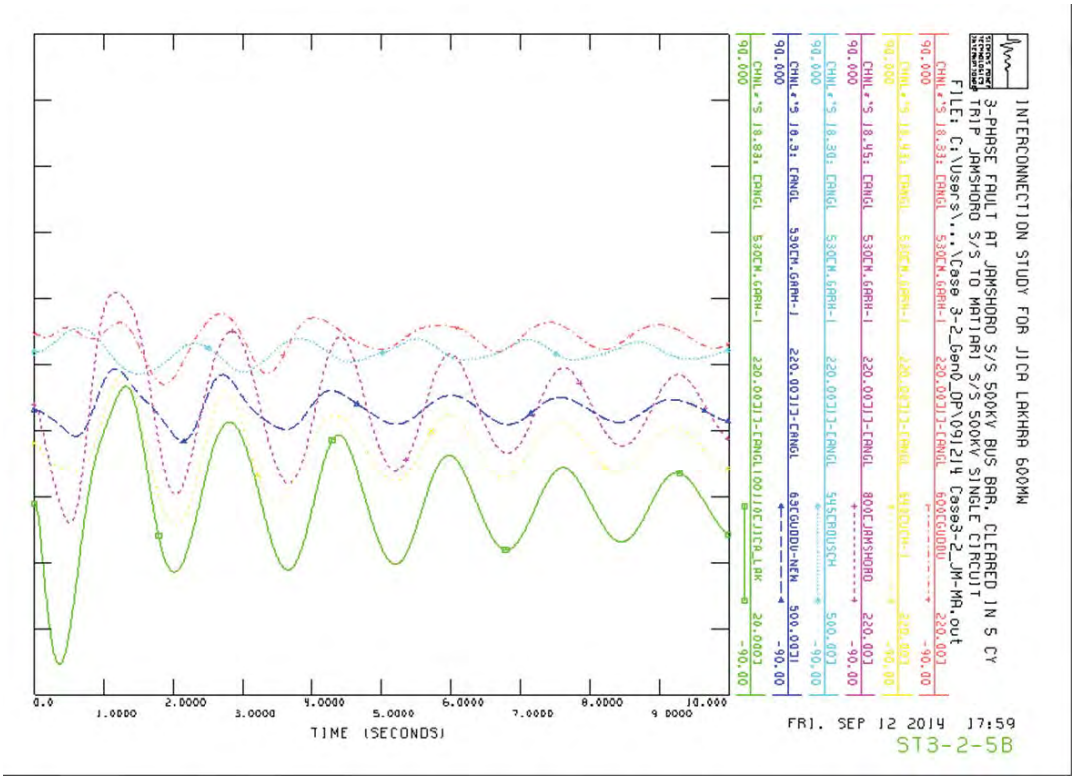


Fault Section: Jamshoro S/S – NKI S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

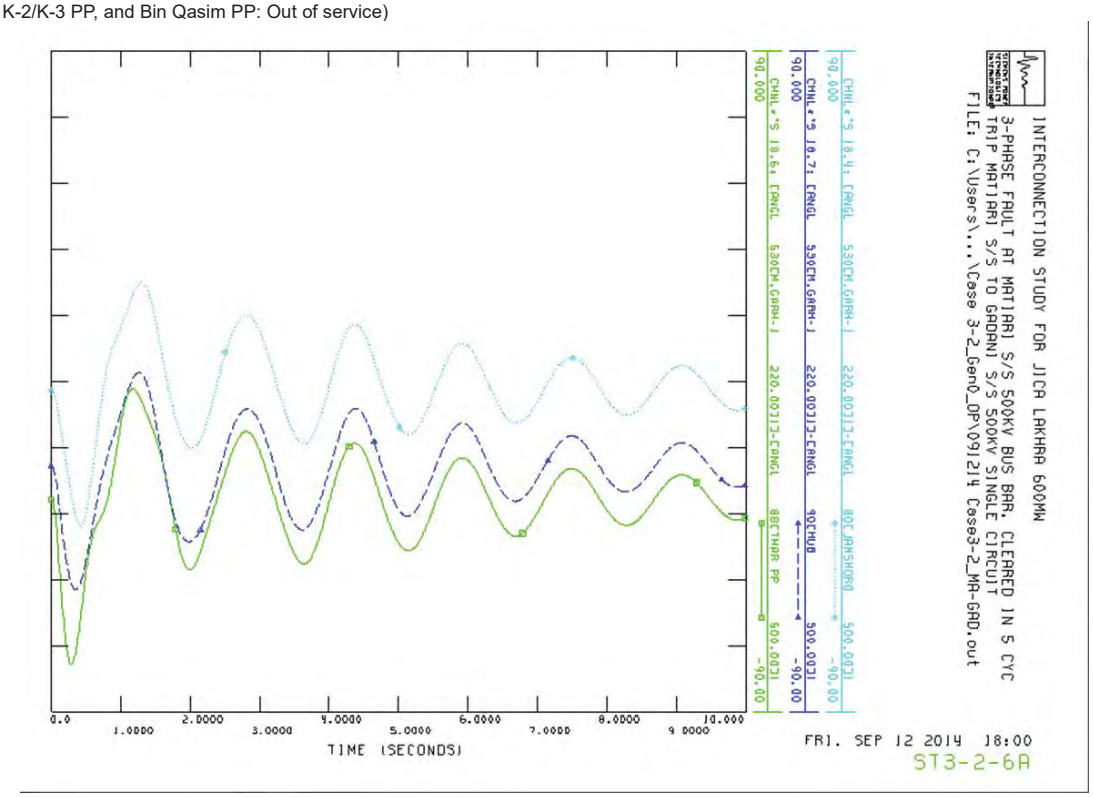


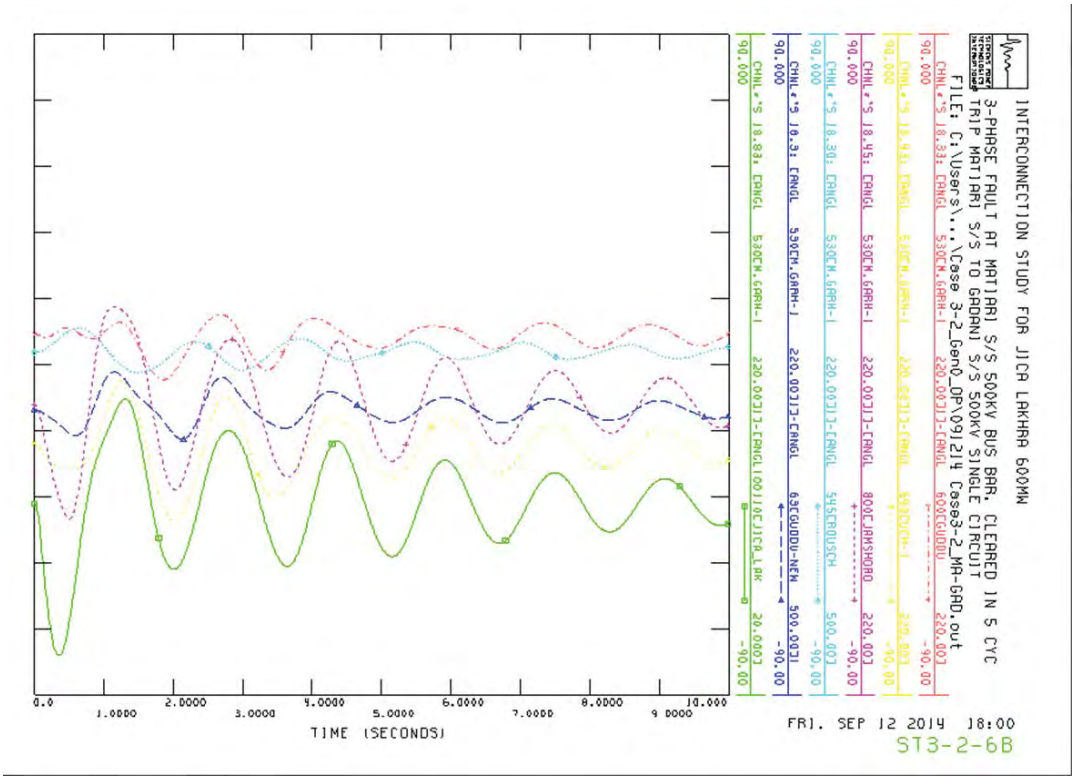


Fault Section: Jamshoro S/S – Matiari S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

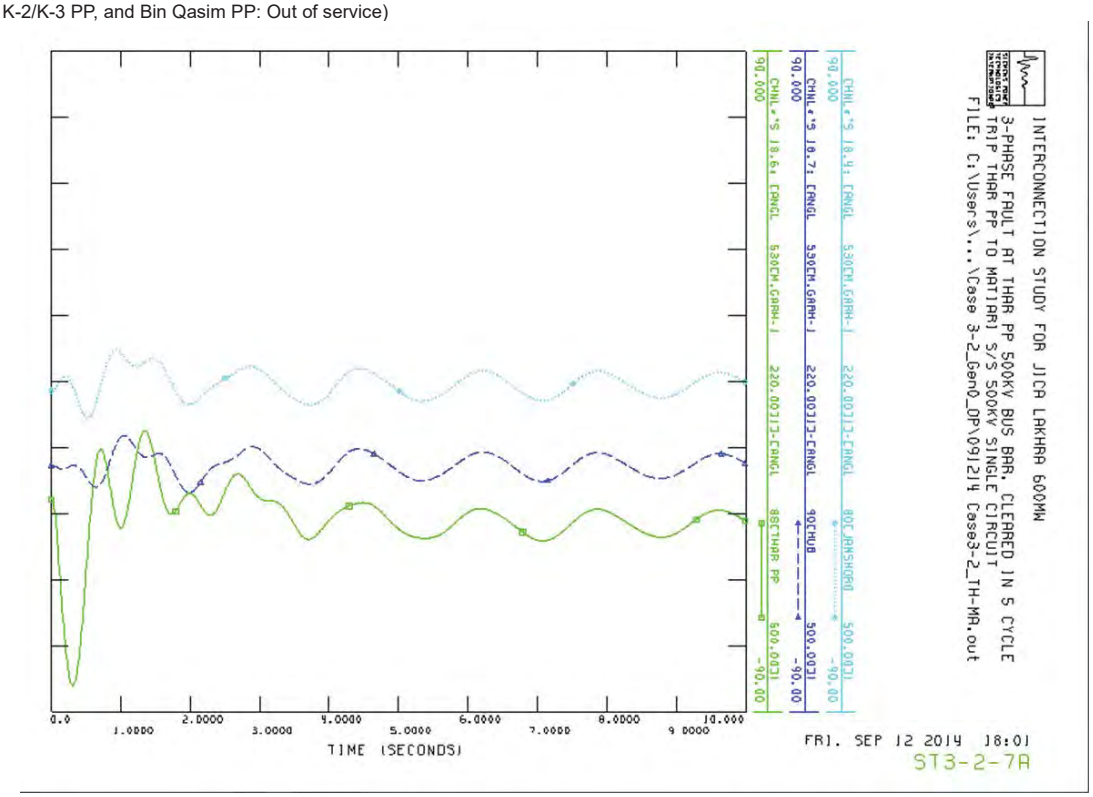


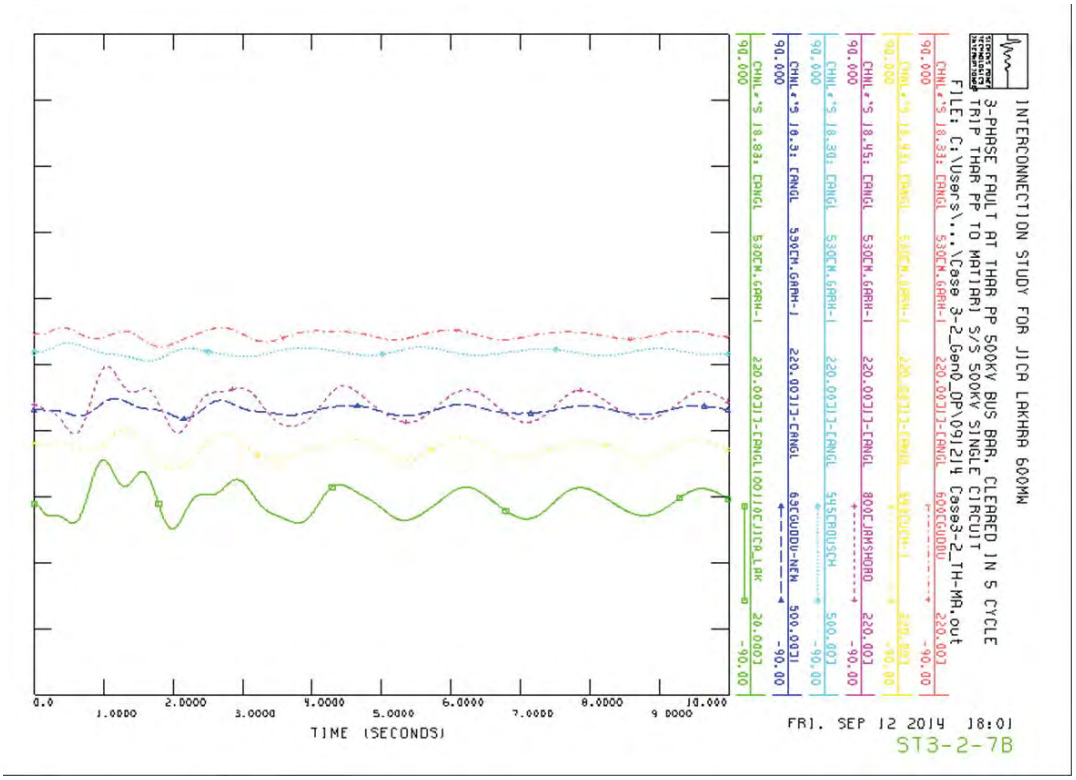


Fault Section: Matiari S/S – Gadani S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

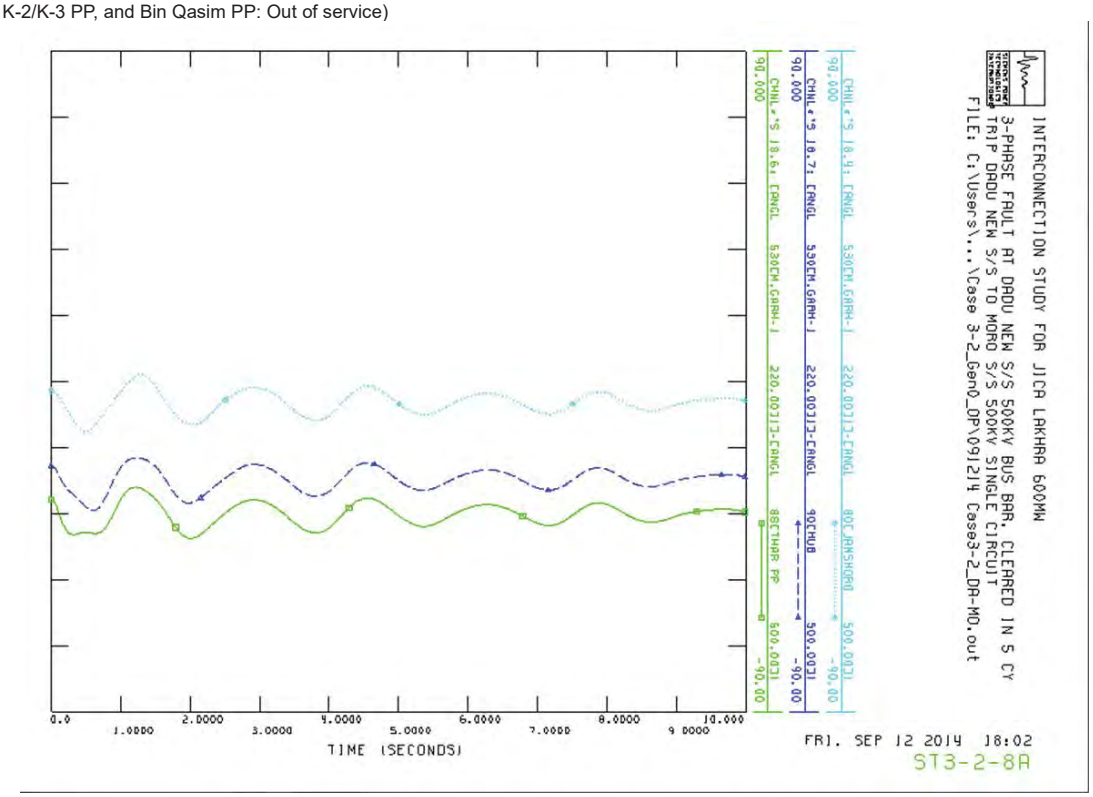


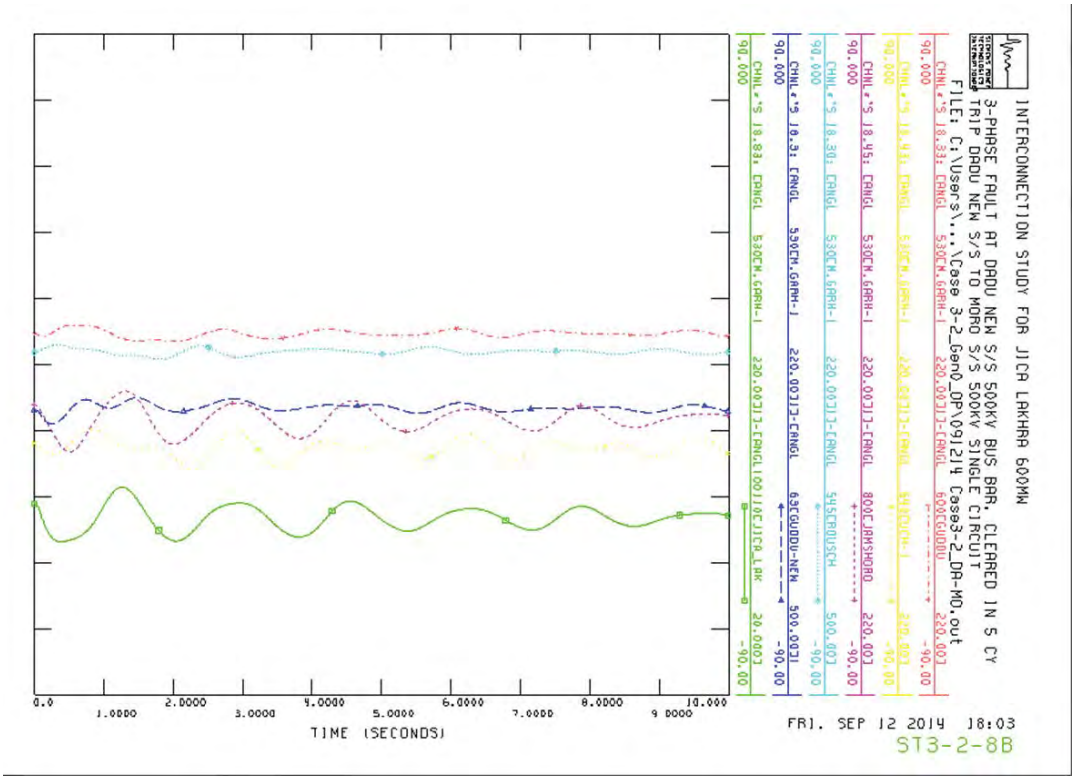


Fault Section: Thar PP – Matiari S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

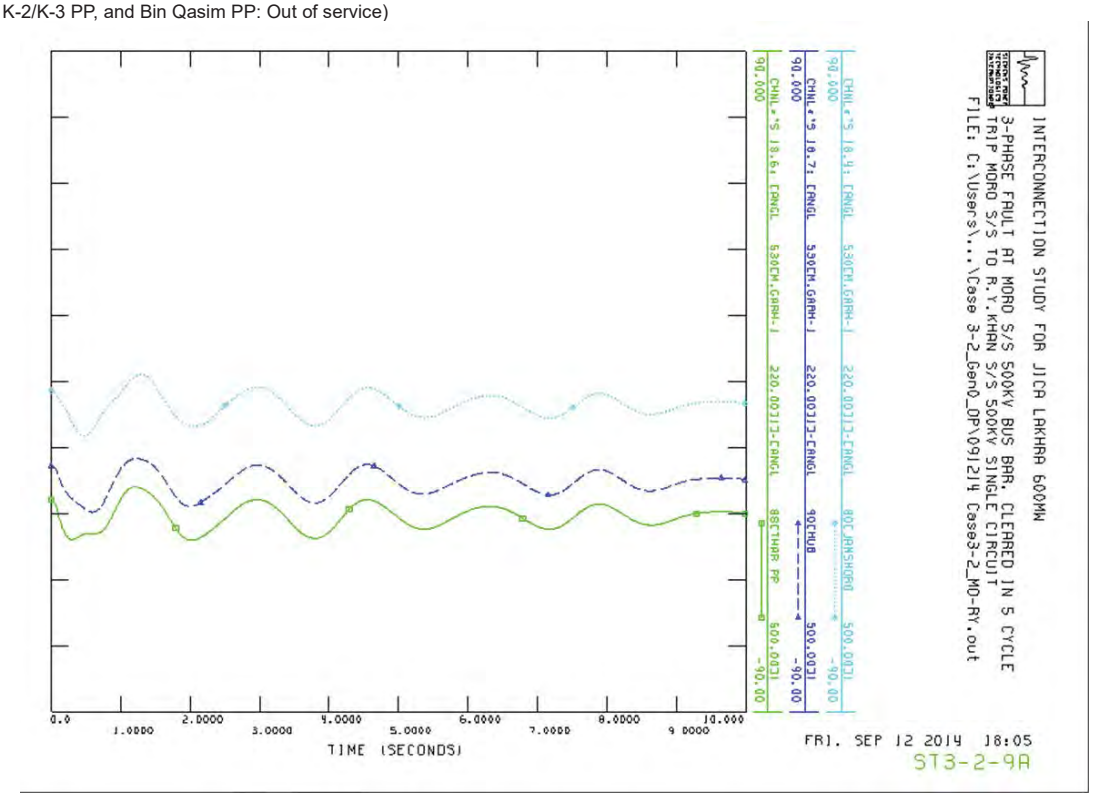


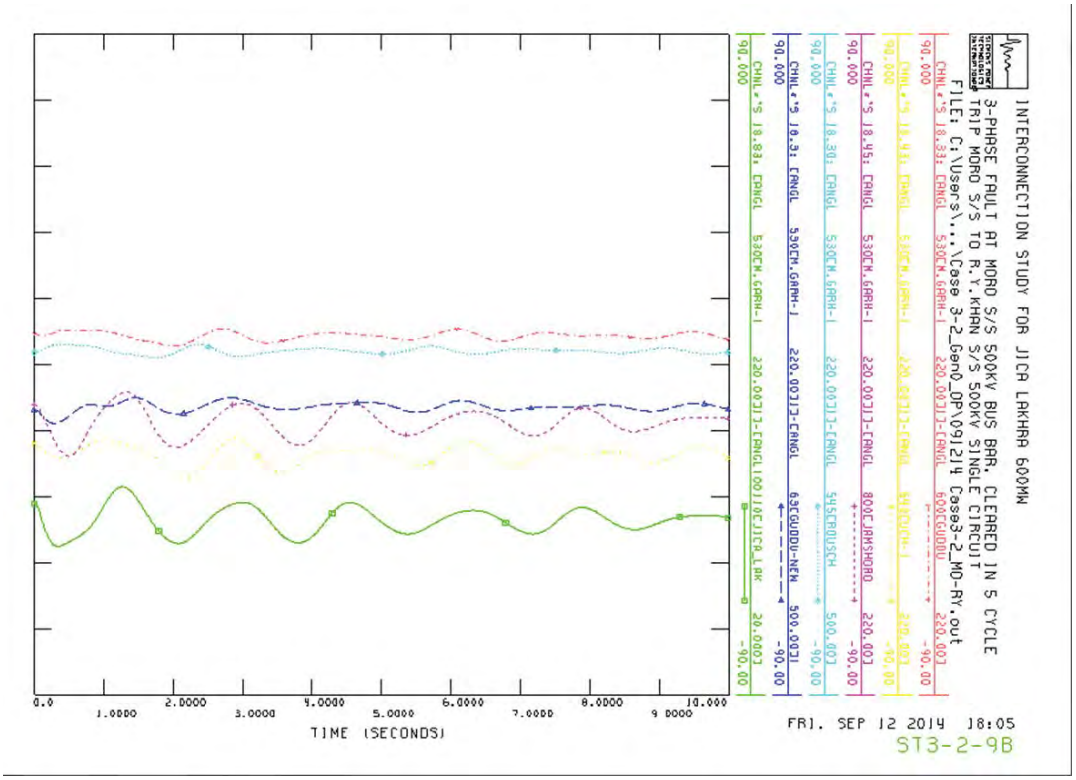


Fault Section: Dadu New S/S – Moro S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

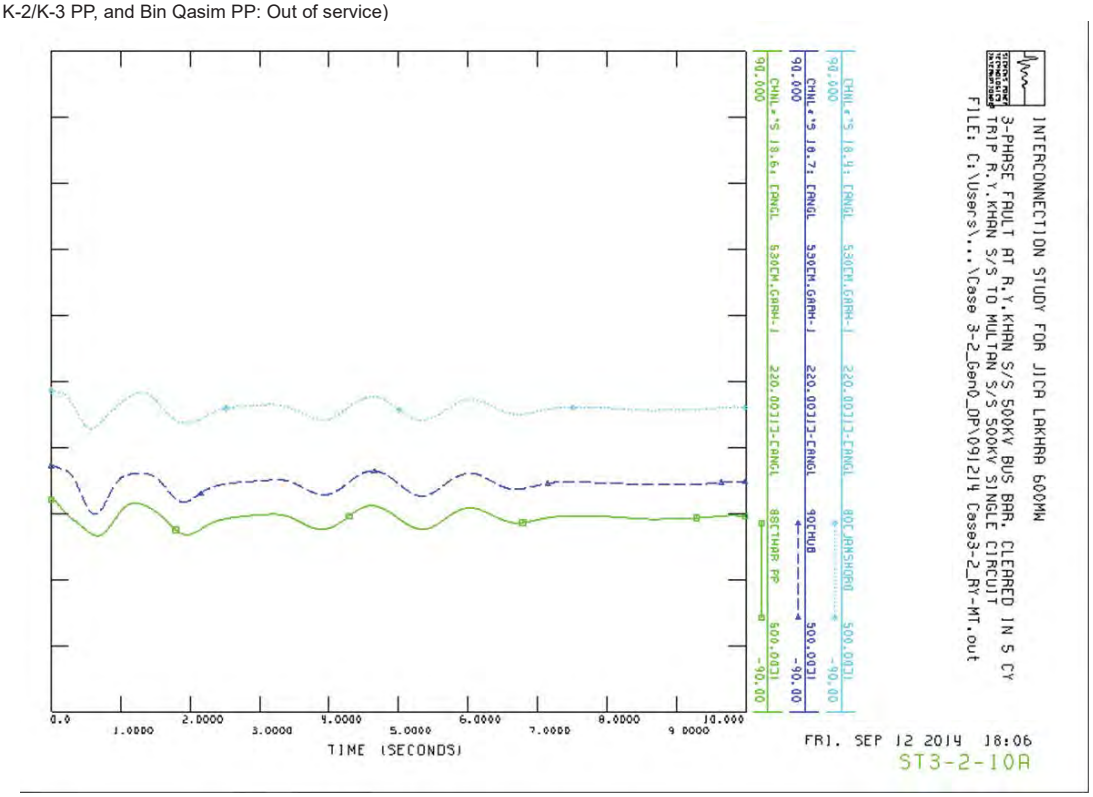


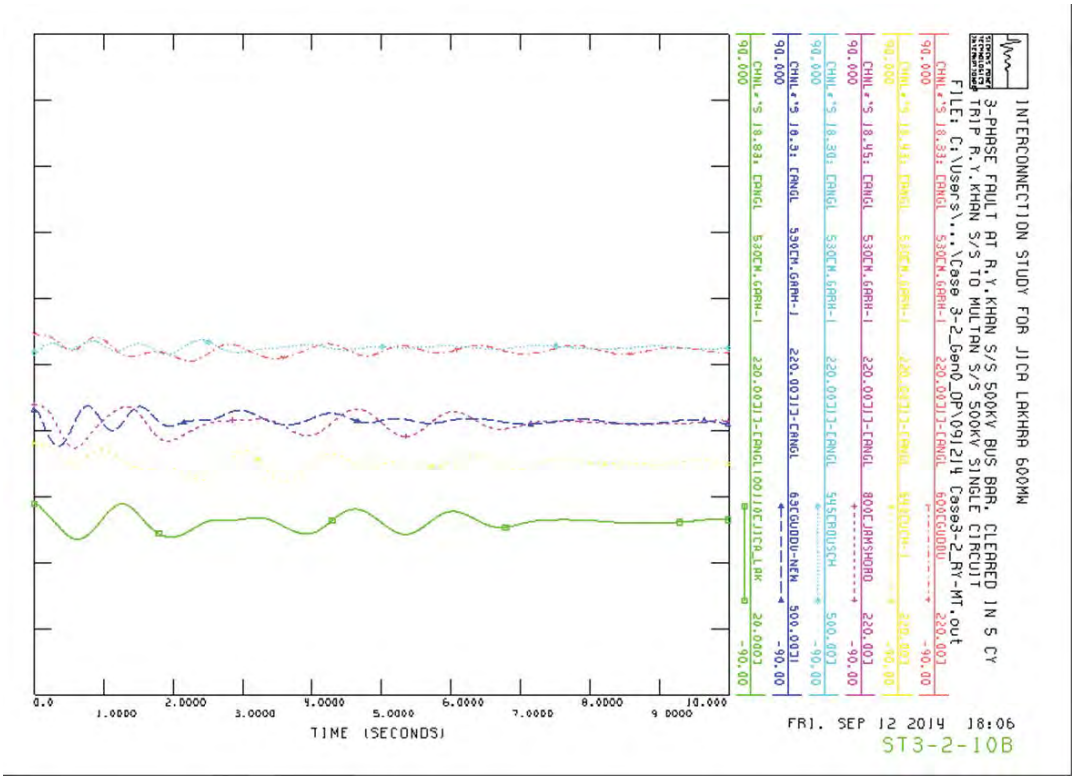


Fault Section: Moro S/S – R. Y. Khan S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

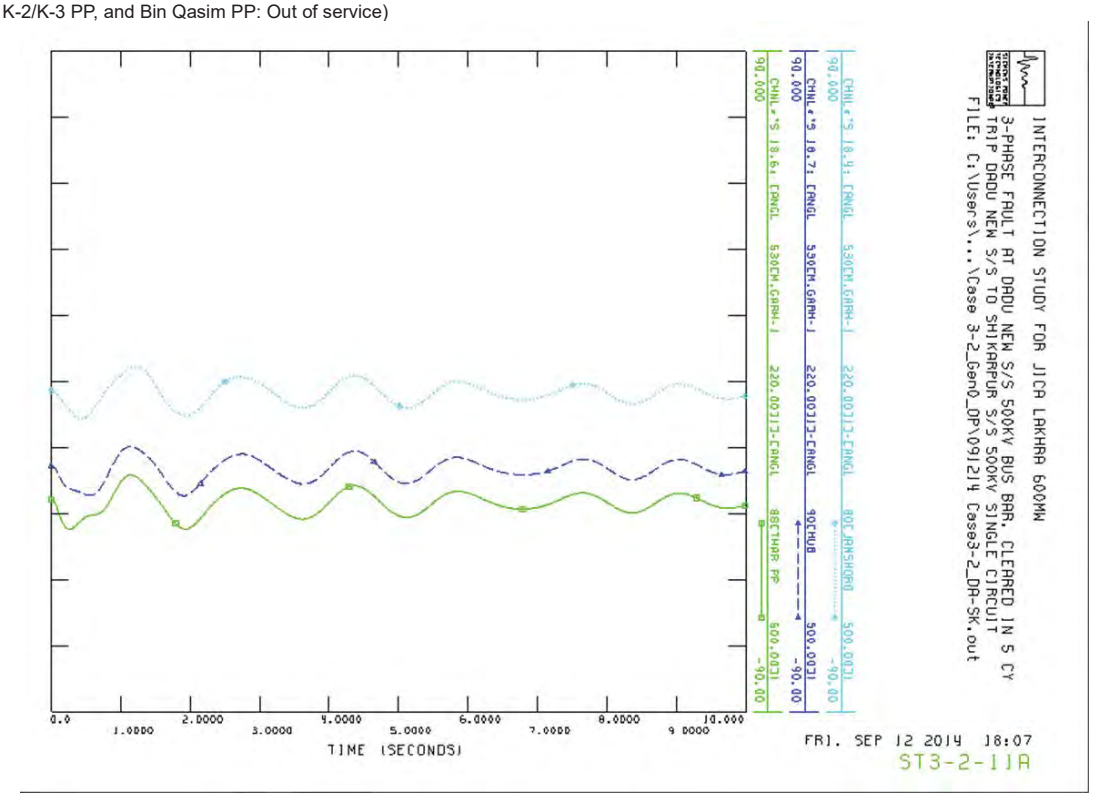


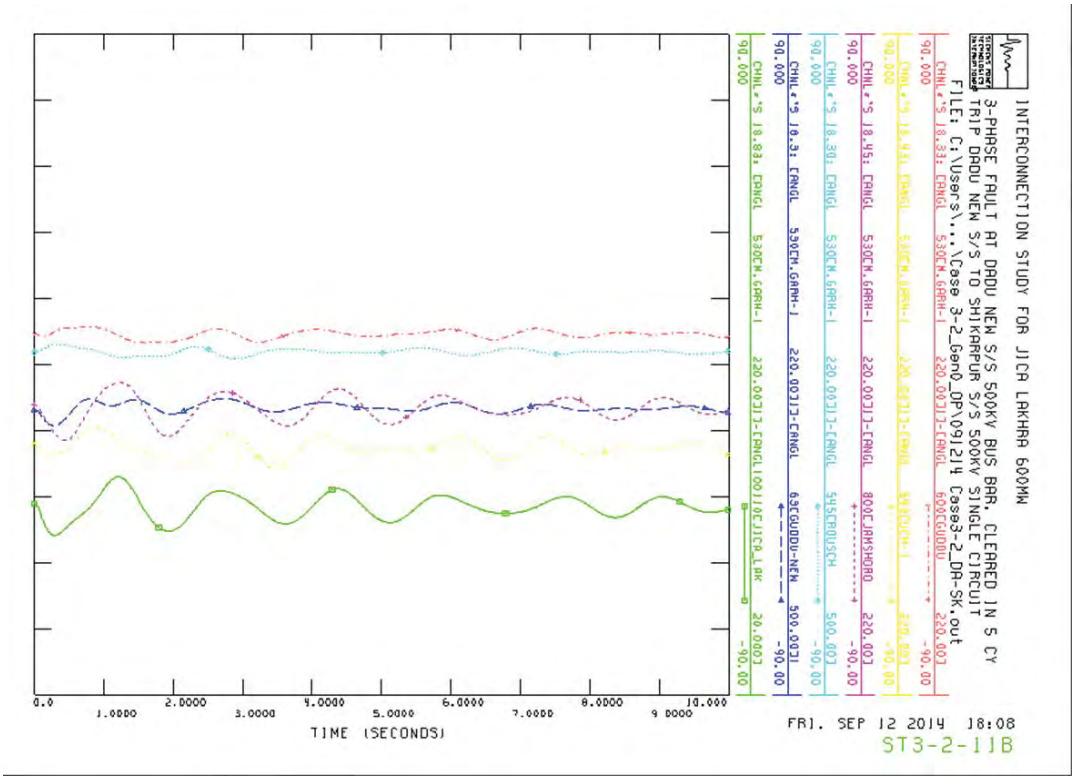


Fault Section: R. Y. Khan PP – Multan S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

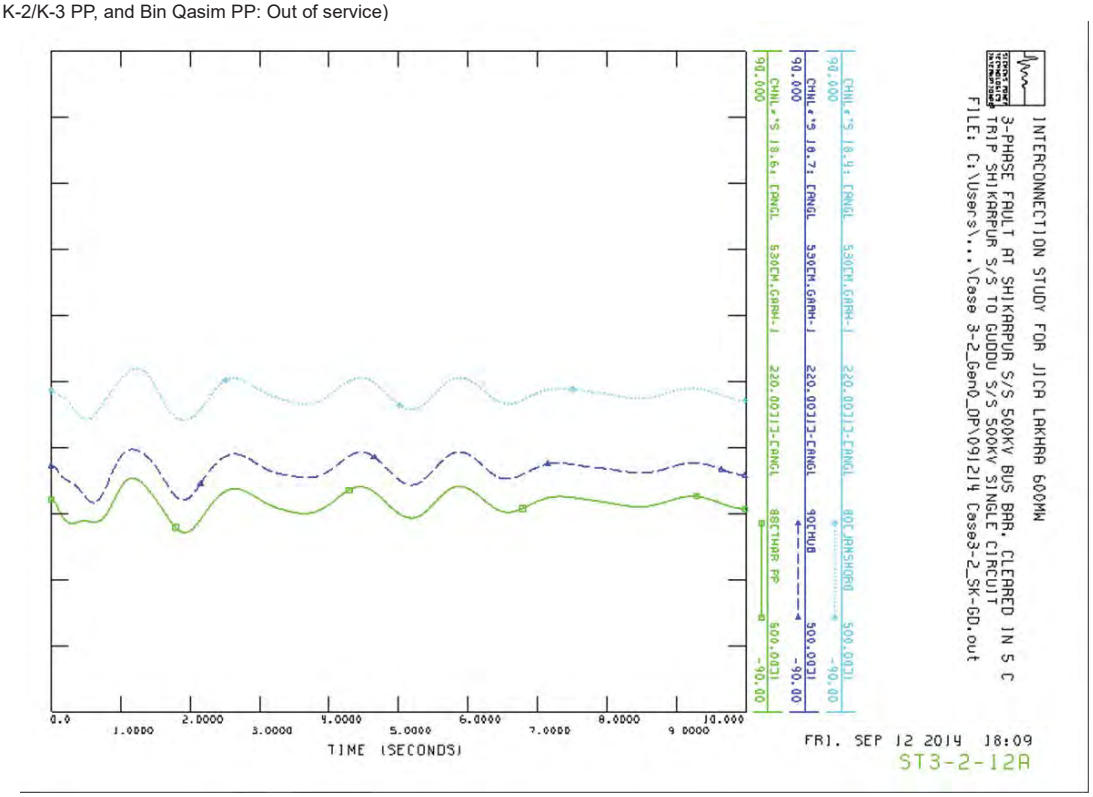


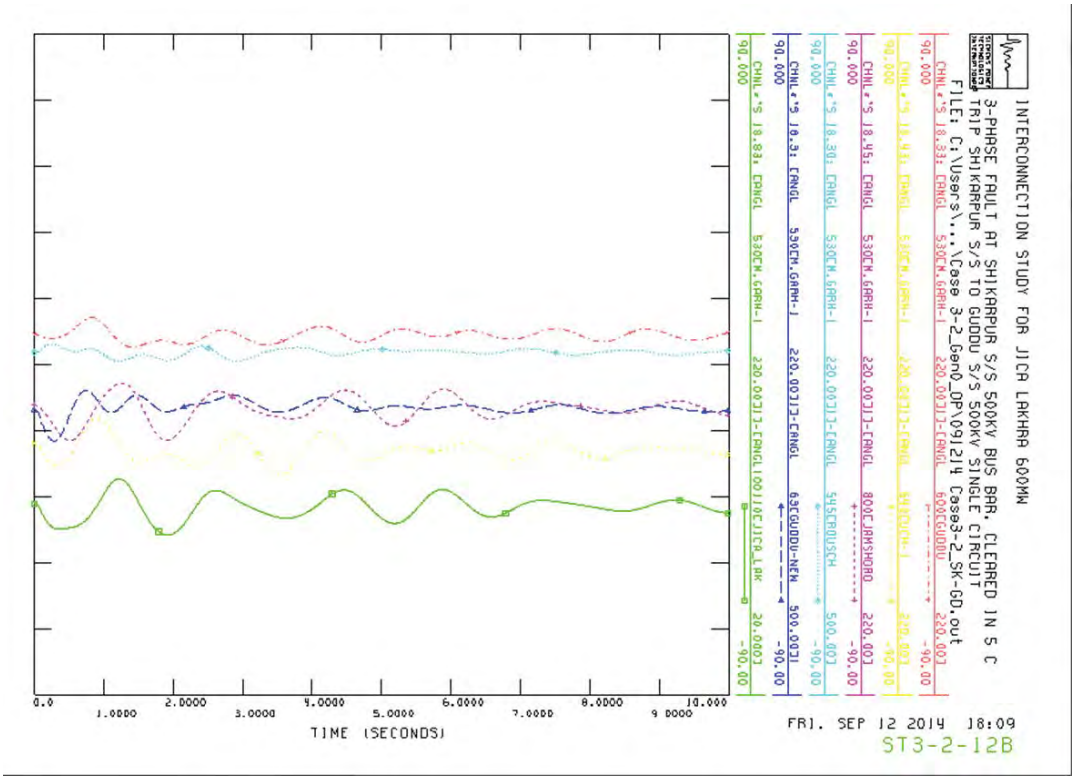


Fault Section: Dadu New S/S – Shikarpur S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

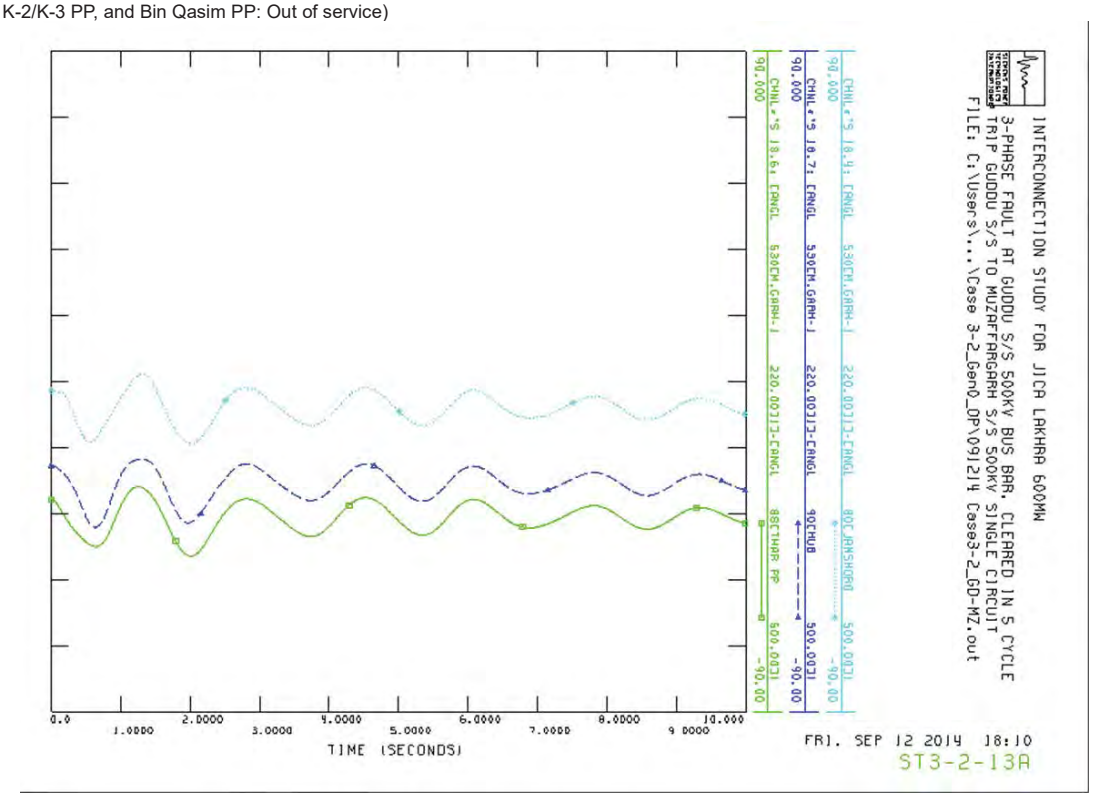


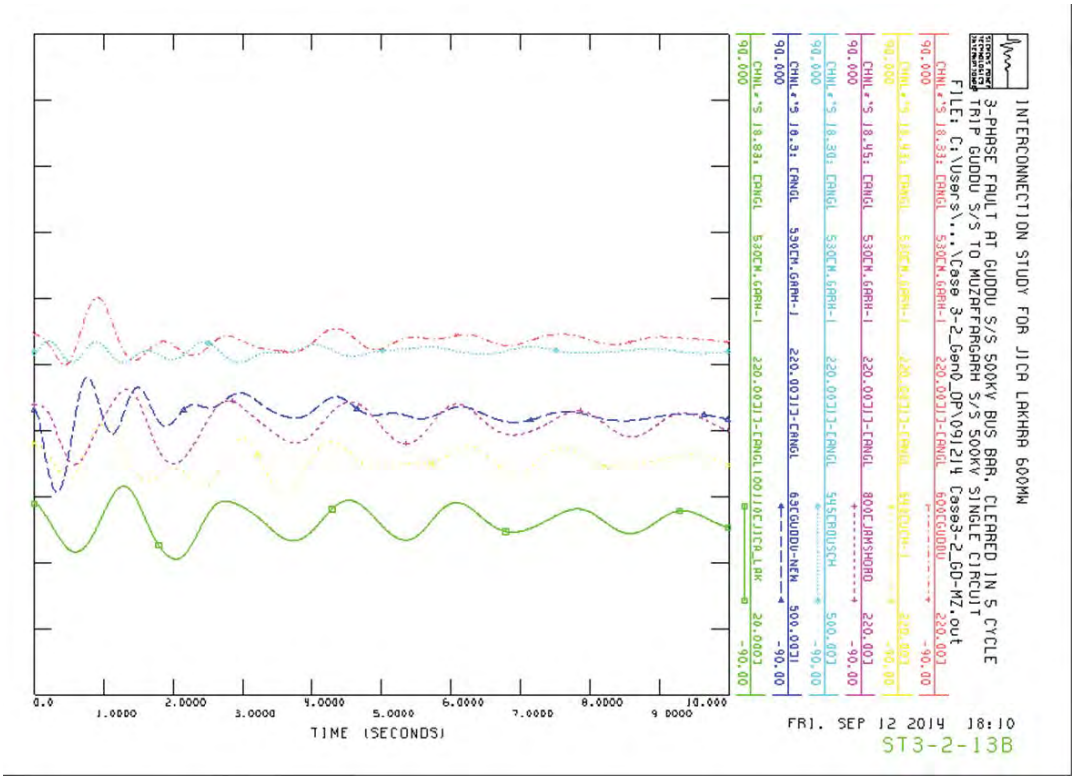


Fault Section: Shikarpur S/S – Guddu S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

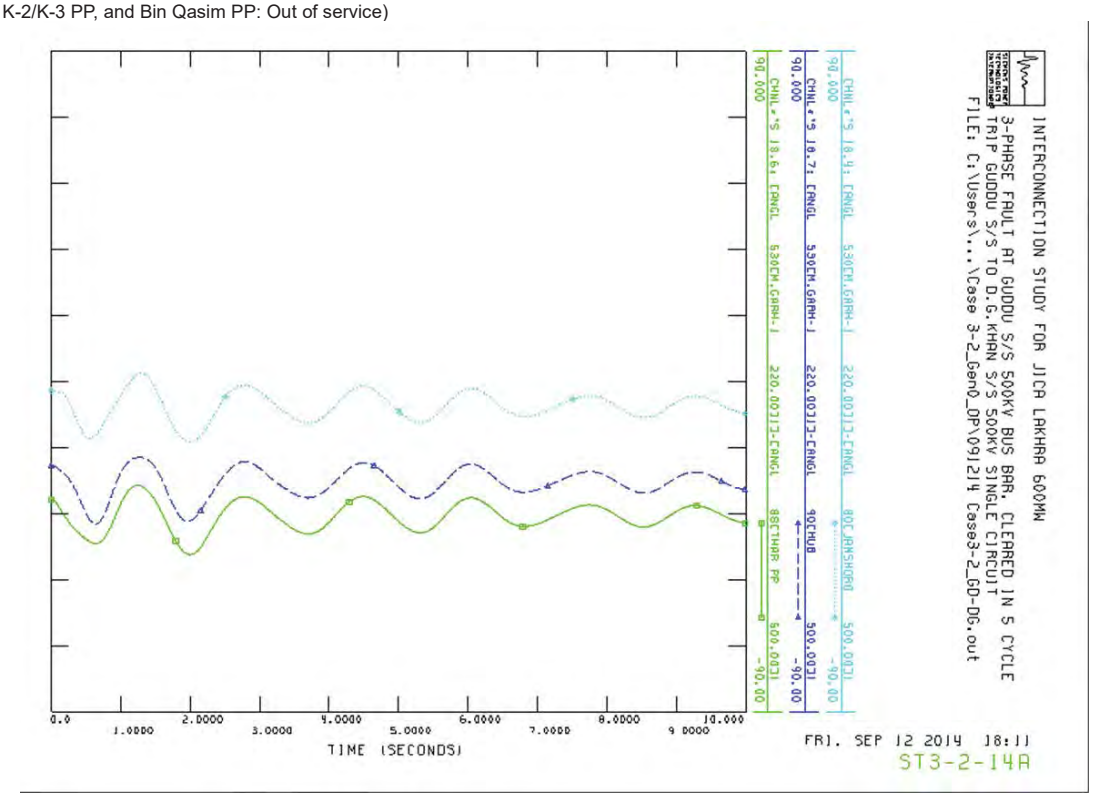


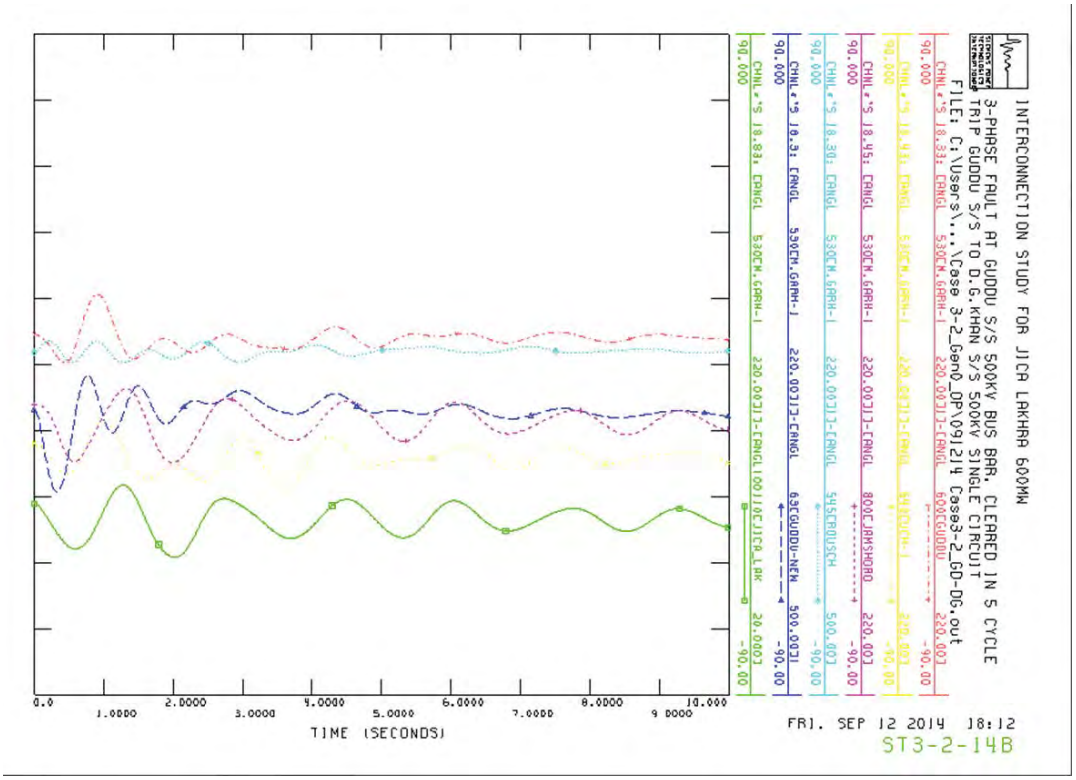


Fault Section: Guddu S/S – Muzaffargarh S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

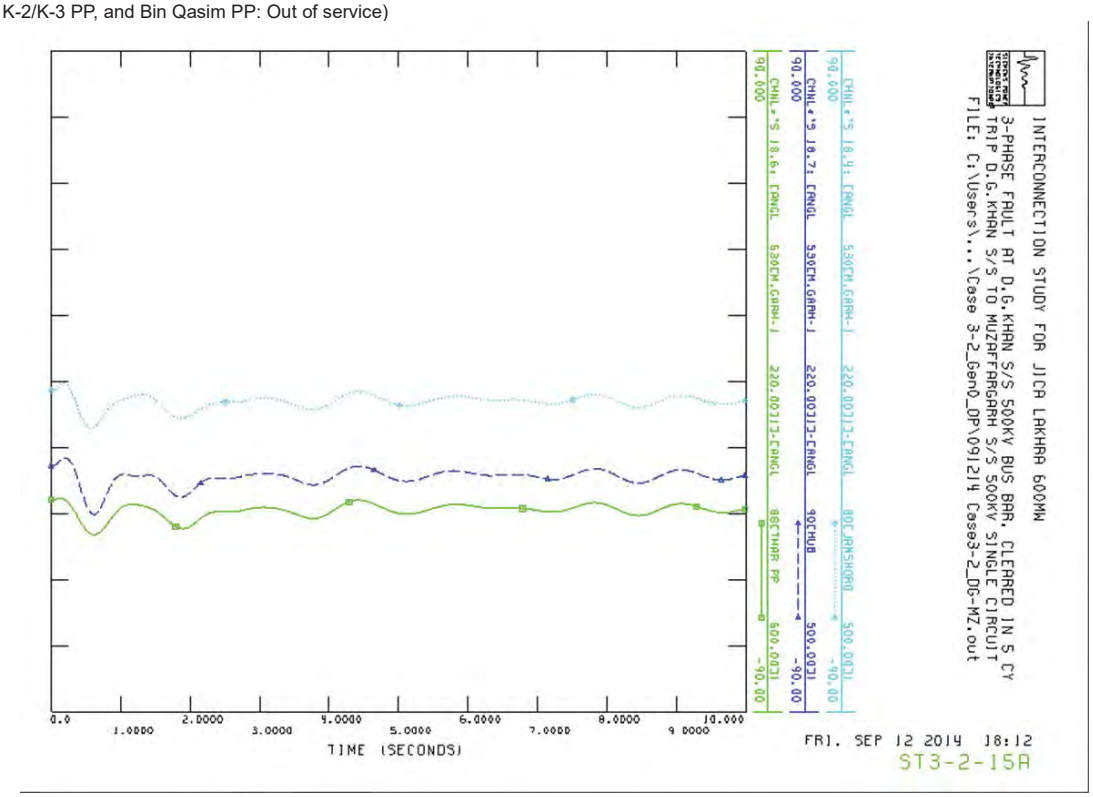


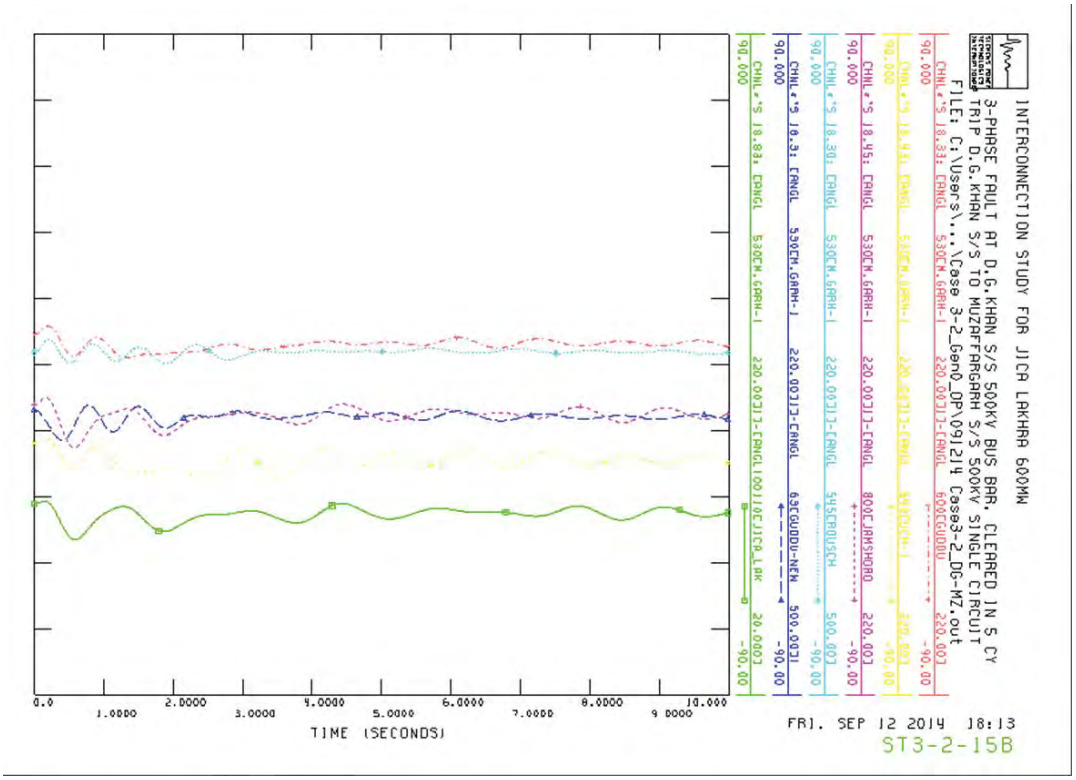


Fault Section: Guddu S/S – D. G. Khan S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

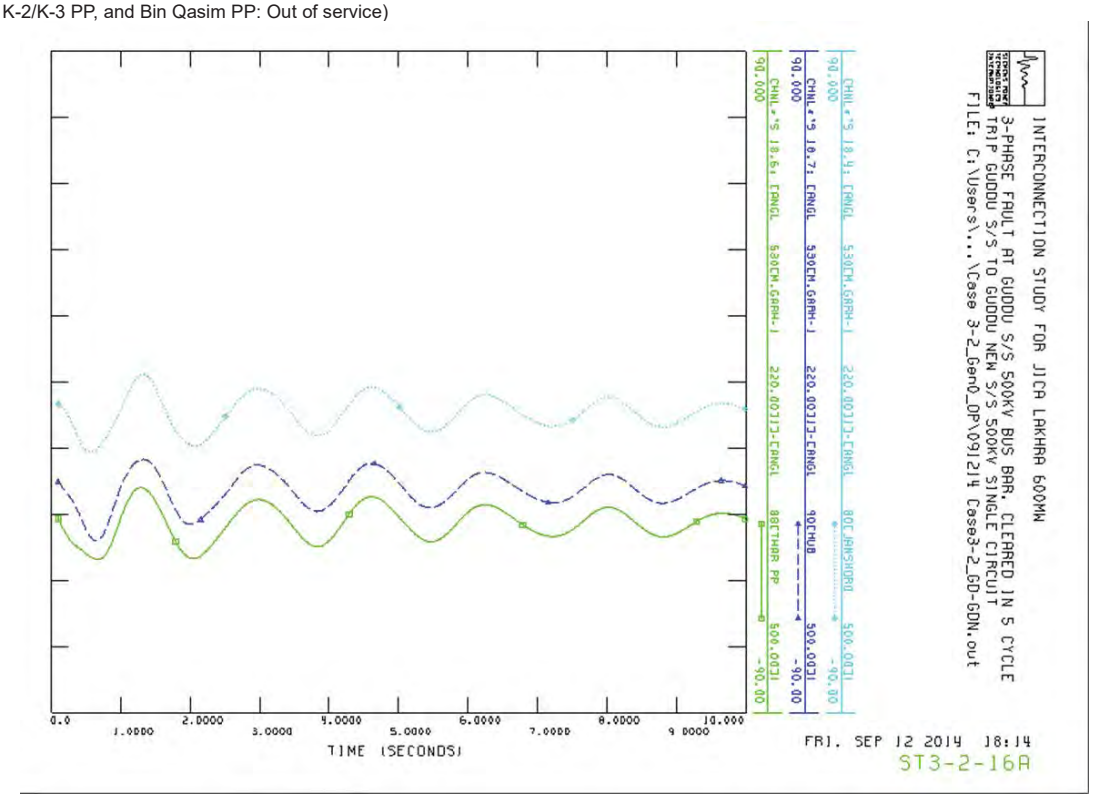


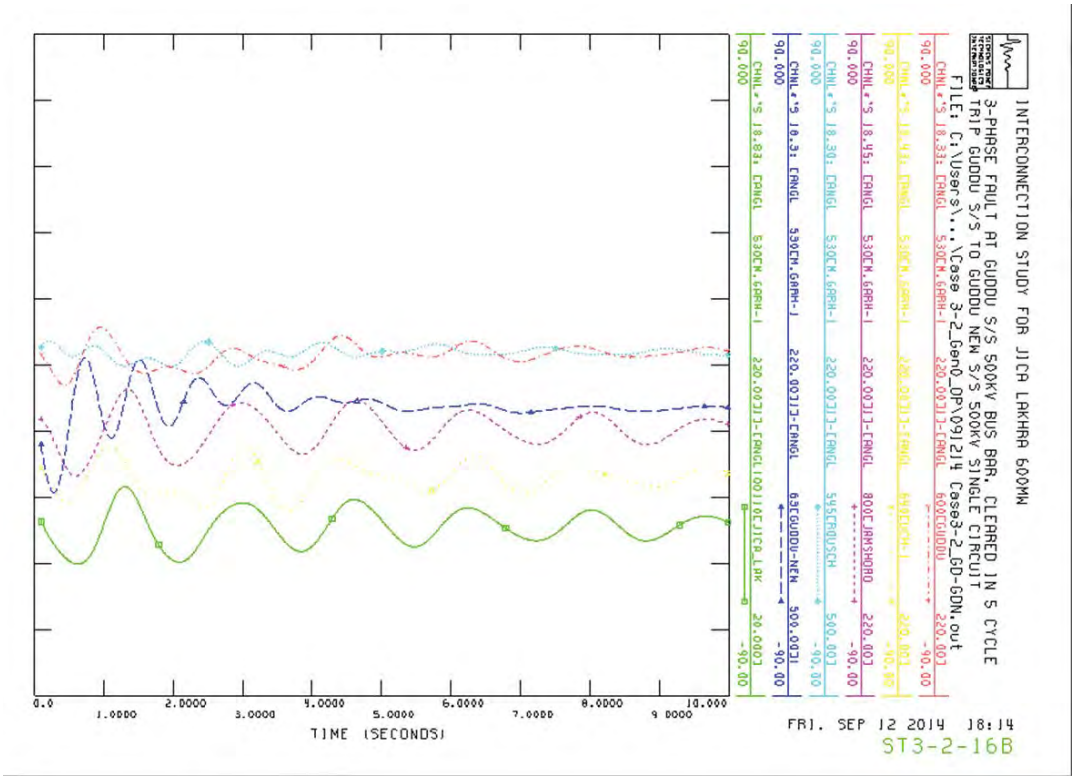


Fault Section: D. G. Khan S/S – Muzaffargarh S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

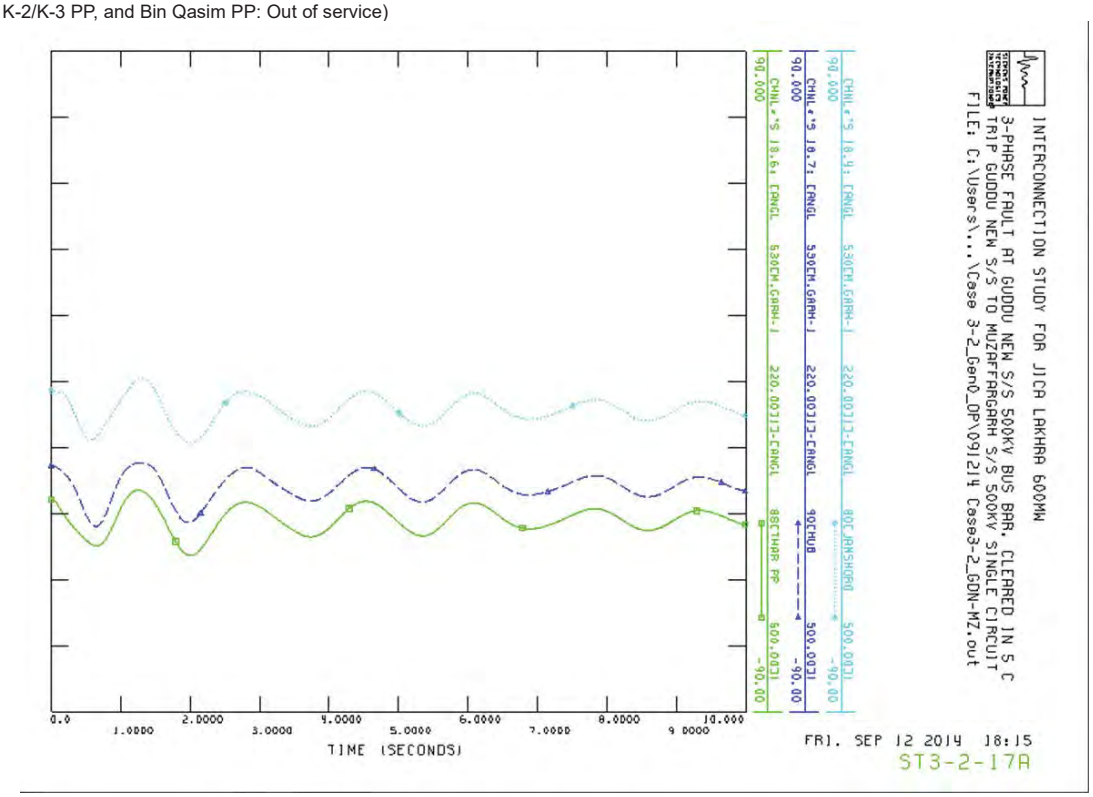


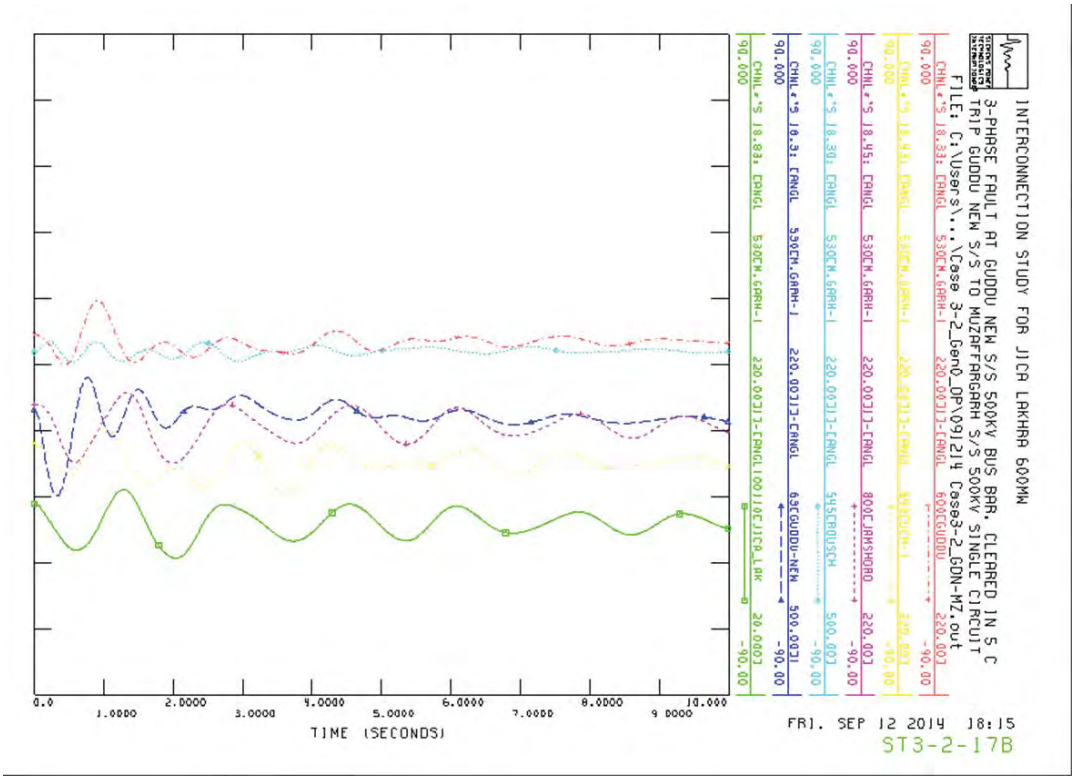


Fault Section: Guddu S/S – Guddu New PP

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

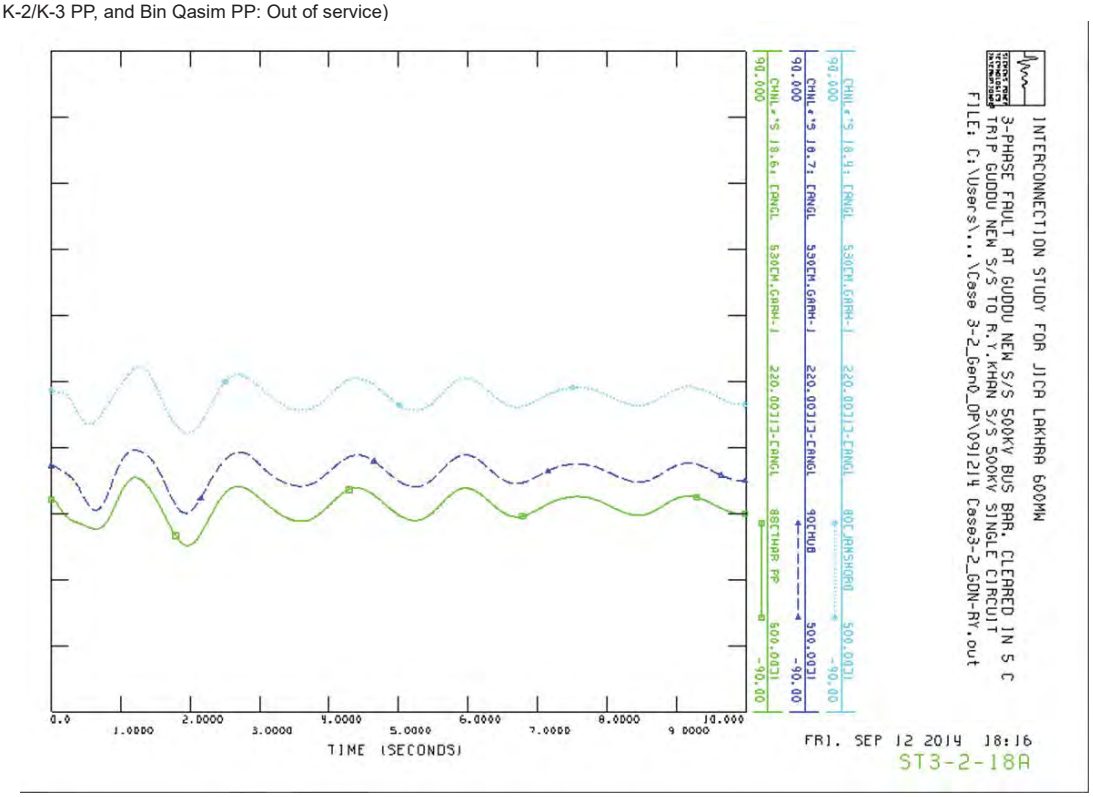


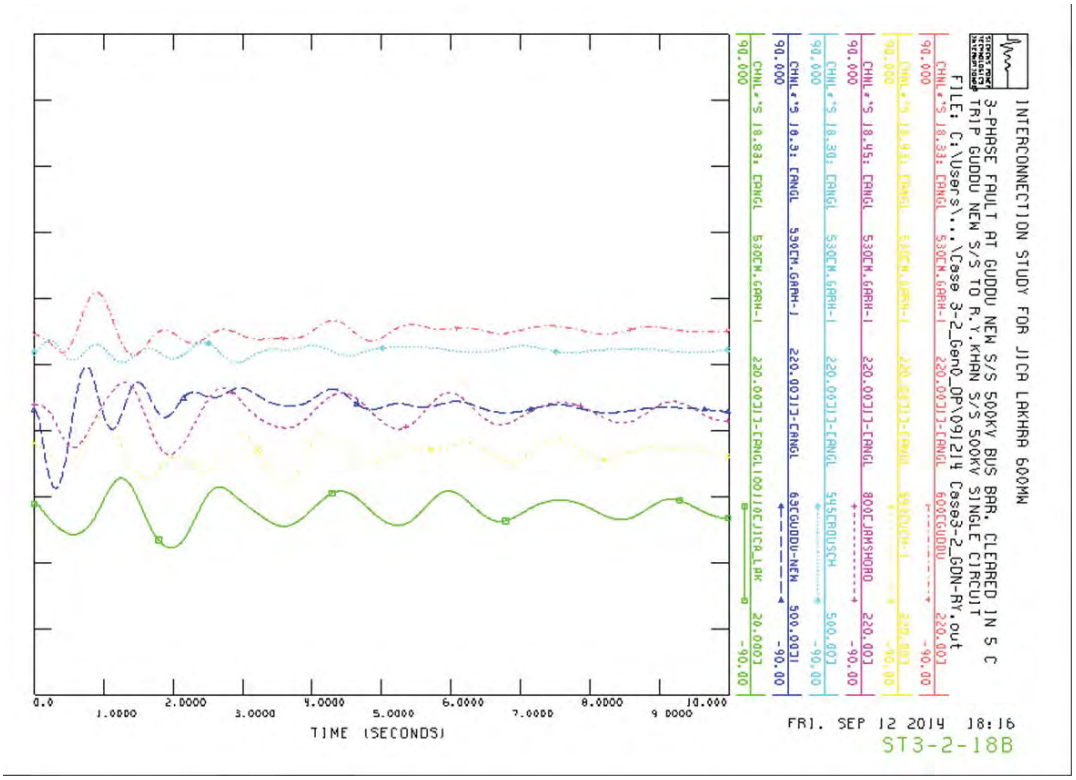


Fault Section: Guddu New PP – Muzaffargarh S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)

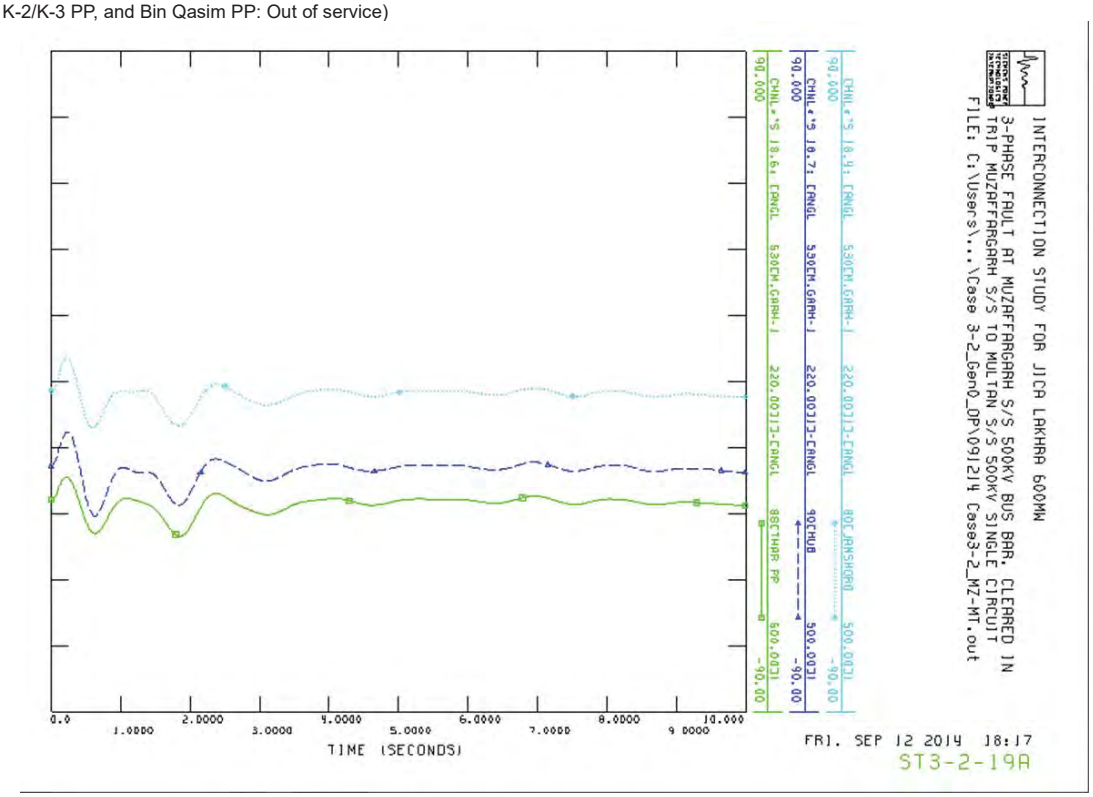


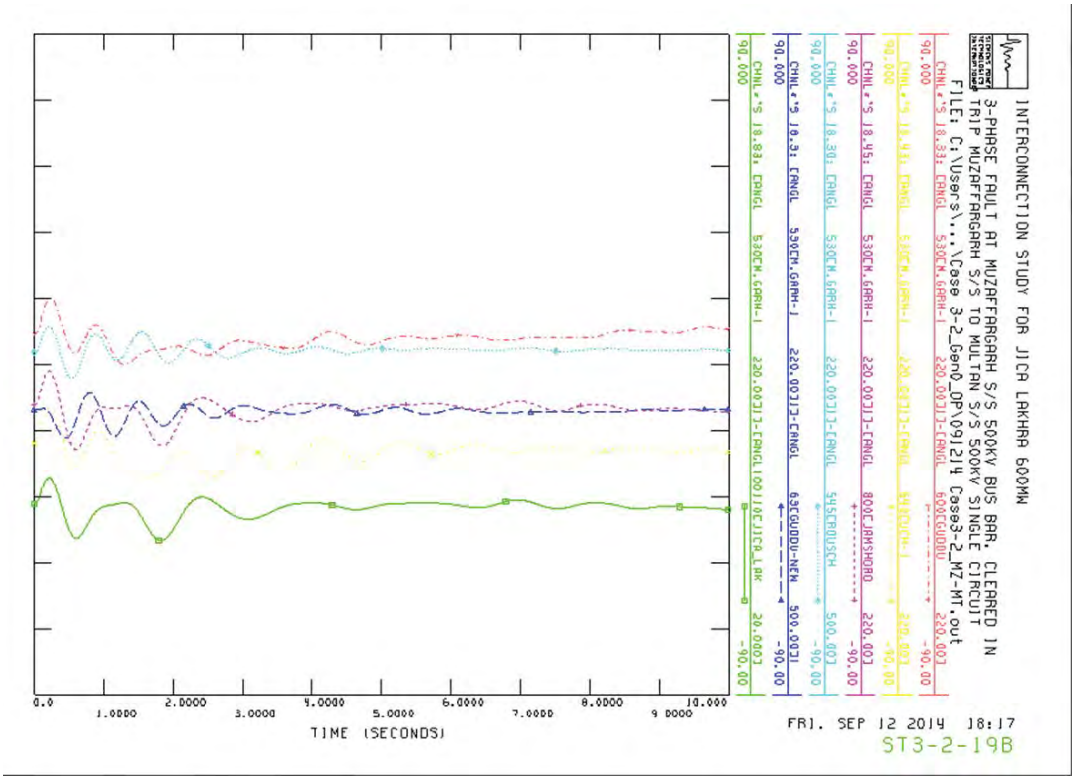


Fault Section: Guddu New PP – R. Y. Khan S/S

Stability Analysis Result Case ST-3-2

(Lakhra PP 2π Connection, Lakhra PP – Matiari S/S: 2cct, Lakhra PP – Dadu New S/S: 2cct Open, Matiari S/S – Moro S/S: 1cct Open, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: Out of service)



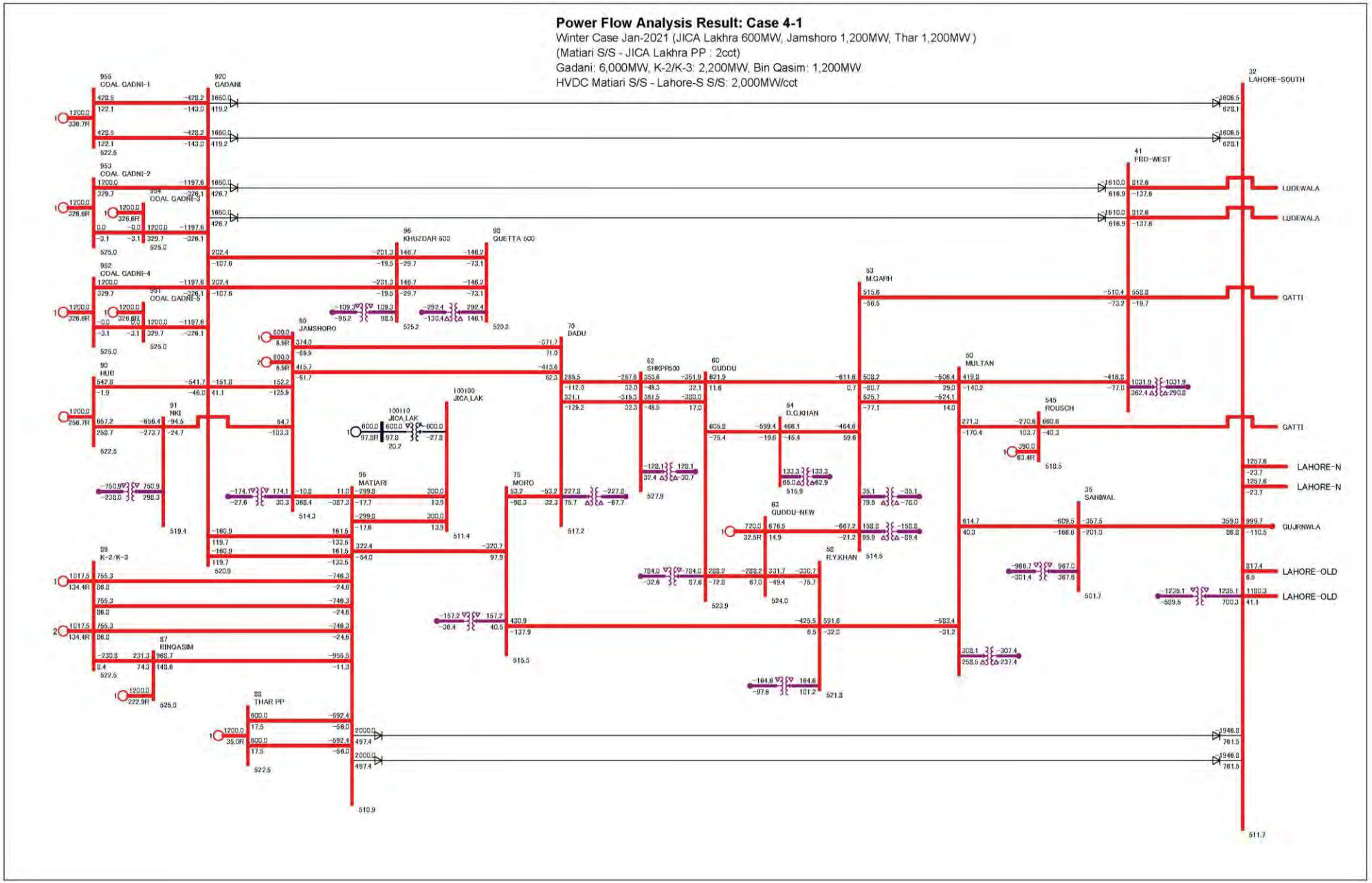


Fault Section: Muzaffargarh S/S – Multan S/S

6 - 6 STABILITY ANALYSIS CASE ST4-1

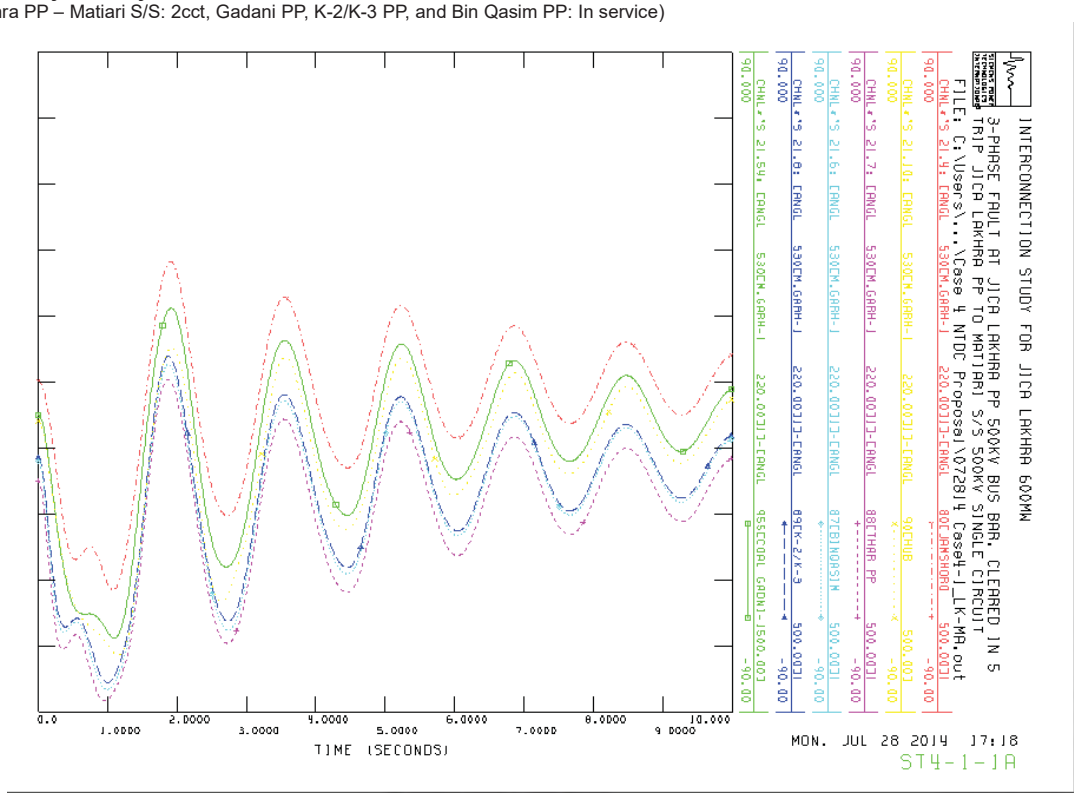
Stability Analysis Result Case ST-4-1

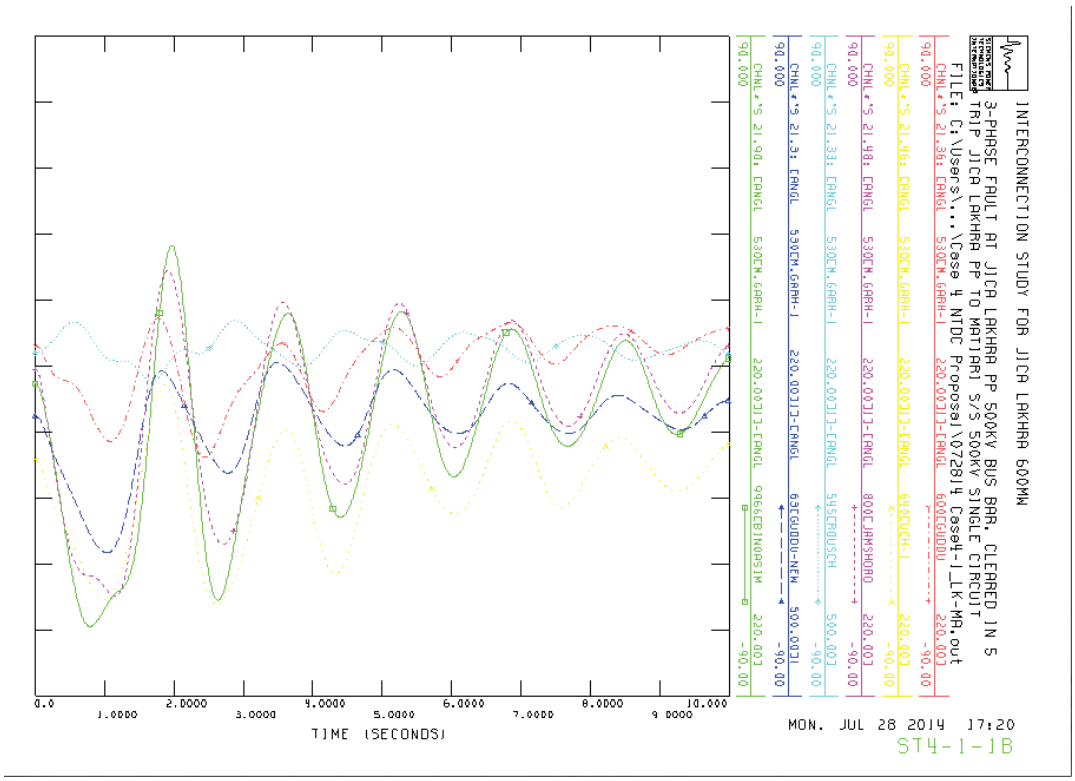
(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)



Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

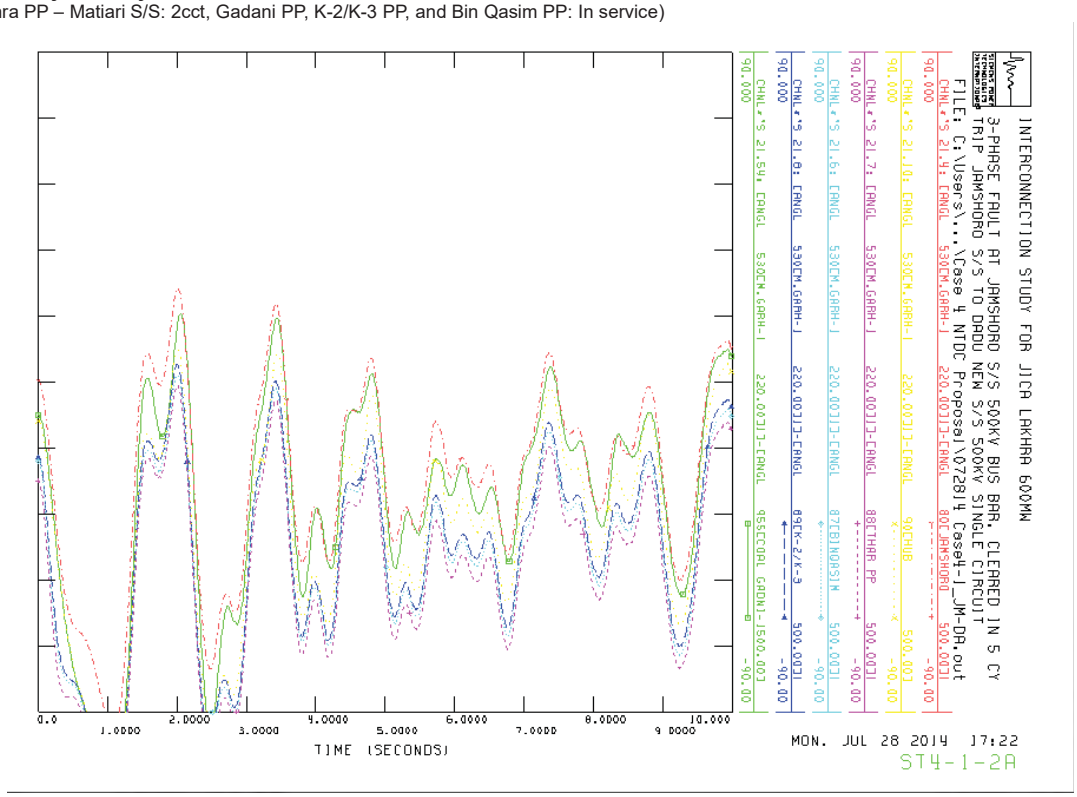


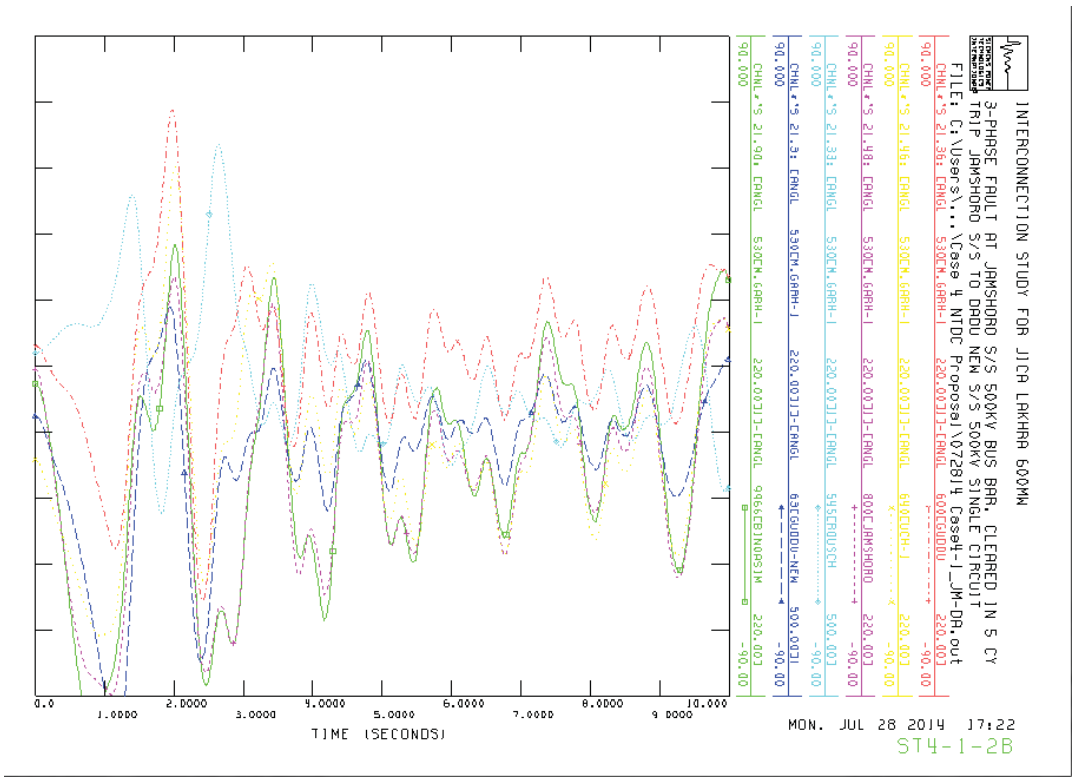


Fault Section: JICA Lakhra PP – Matiari S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

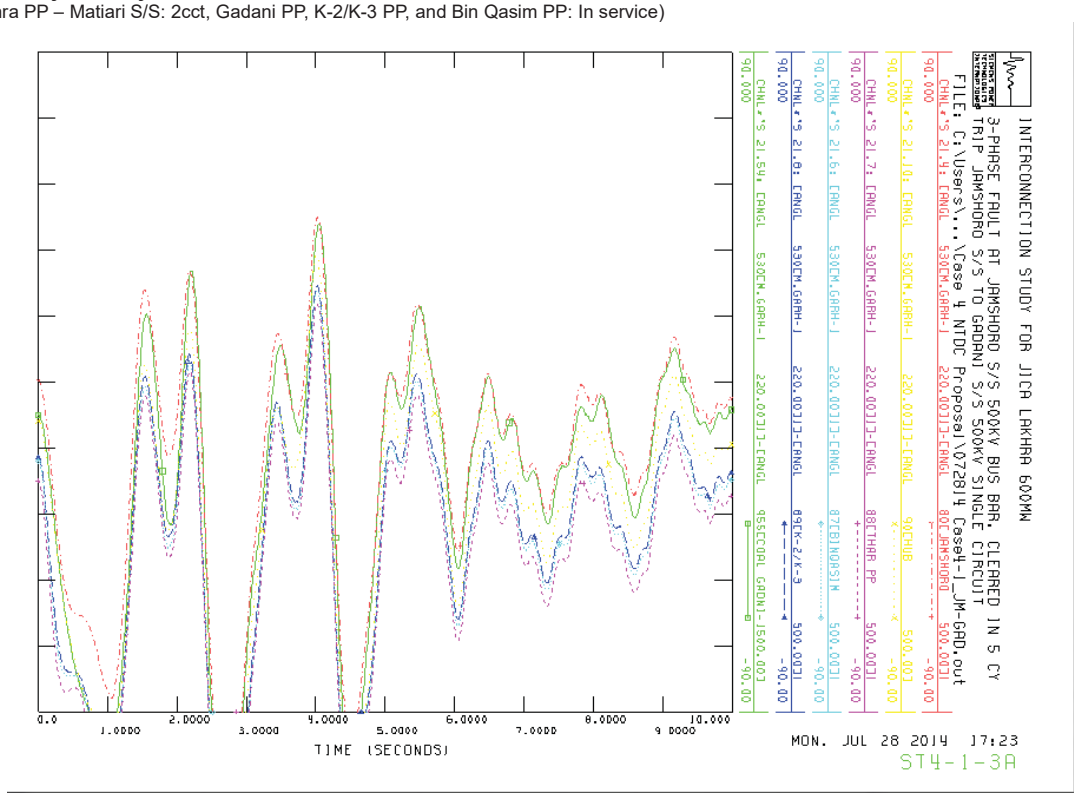


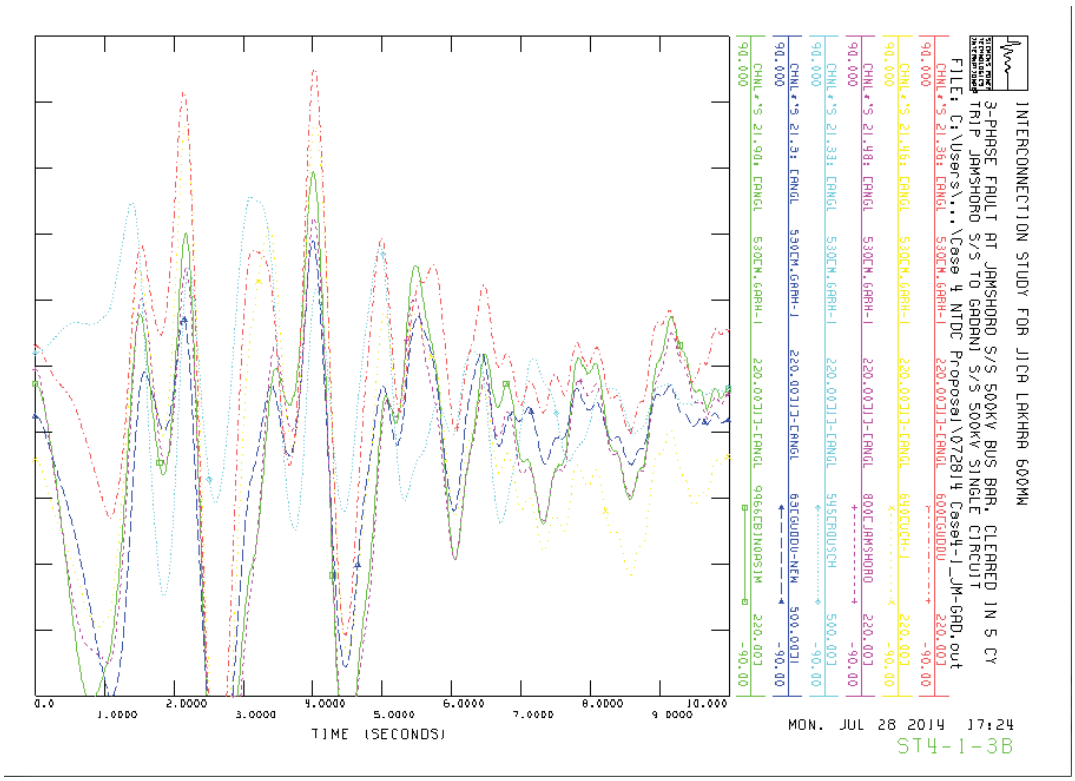


Fault Section: Jamshoro S/S – Dadu New S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

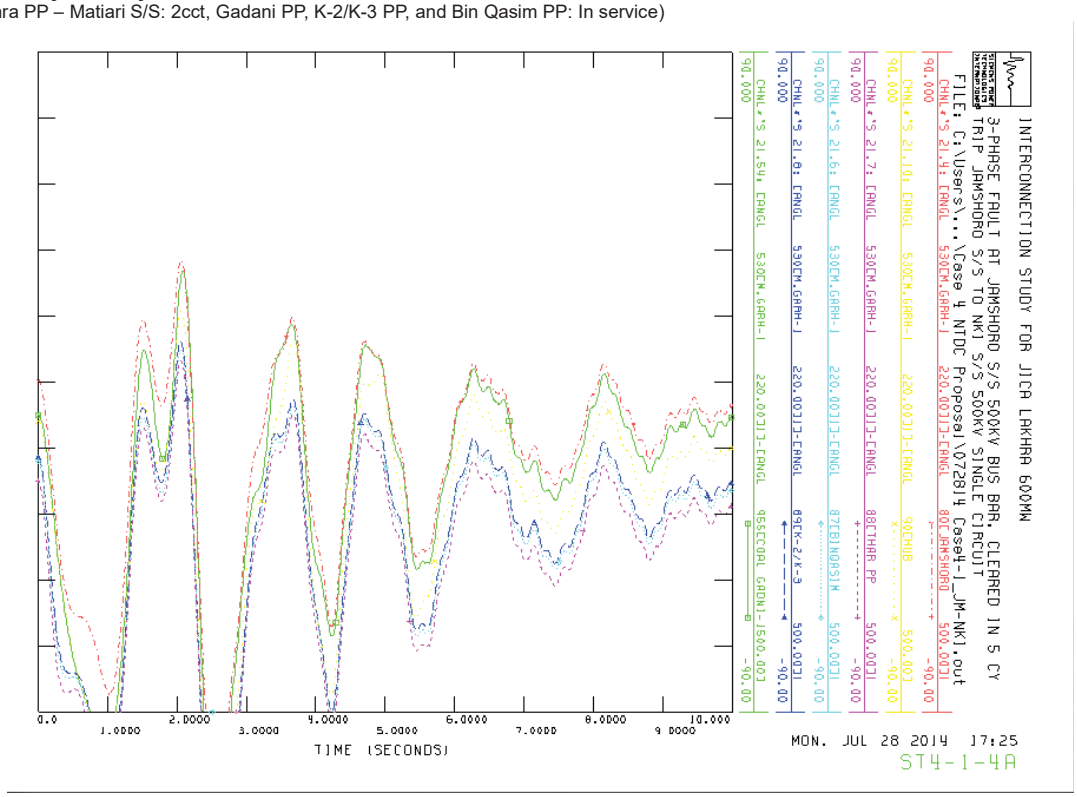


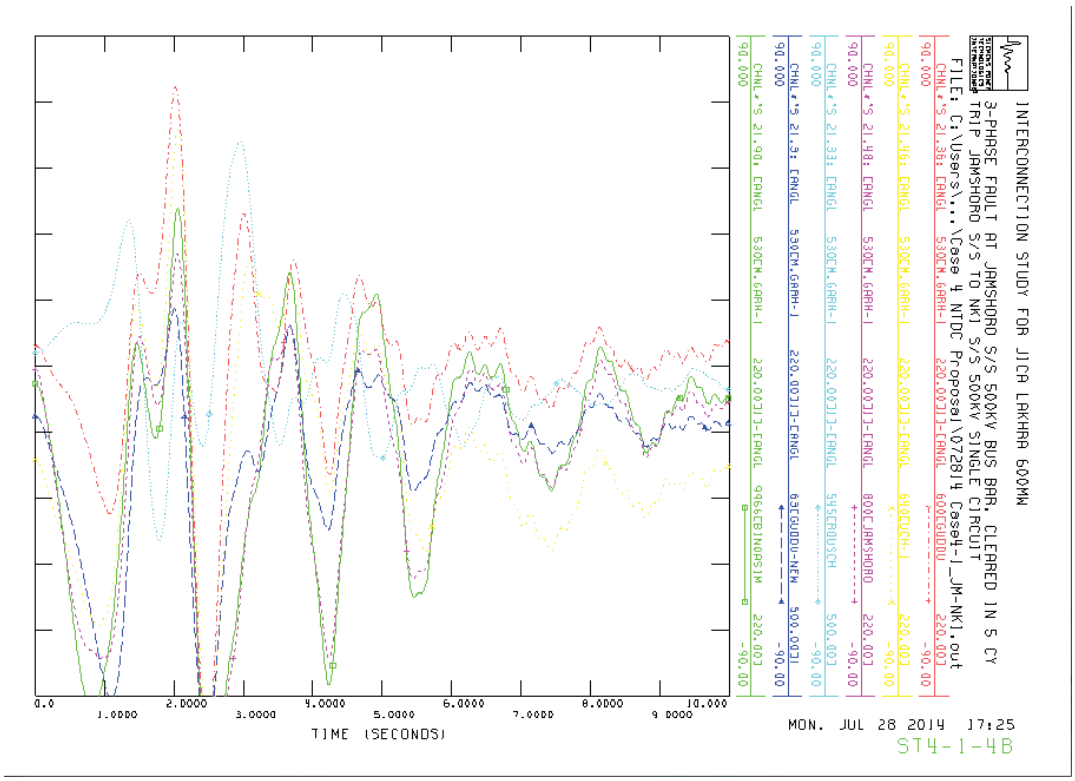


Fault Section: Jamshoro S/S – Gadani S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

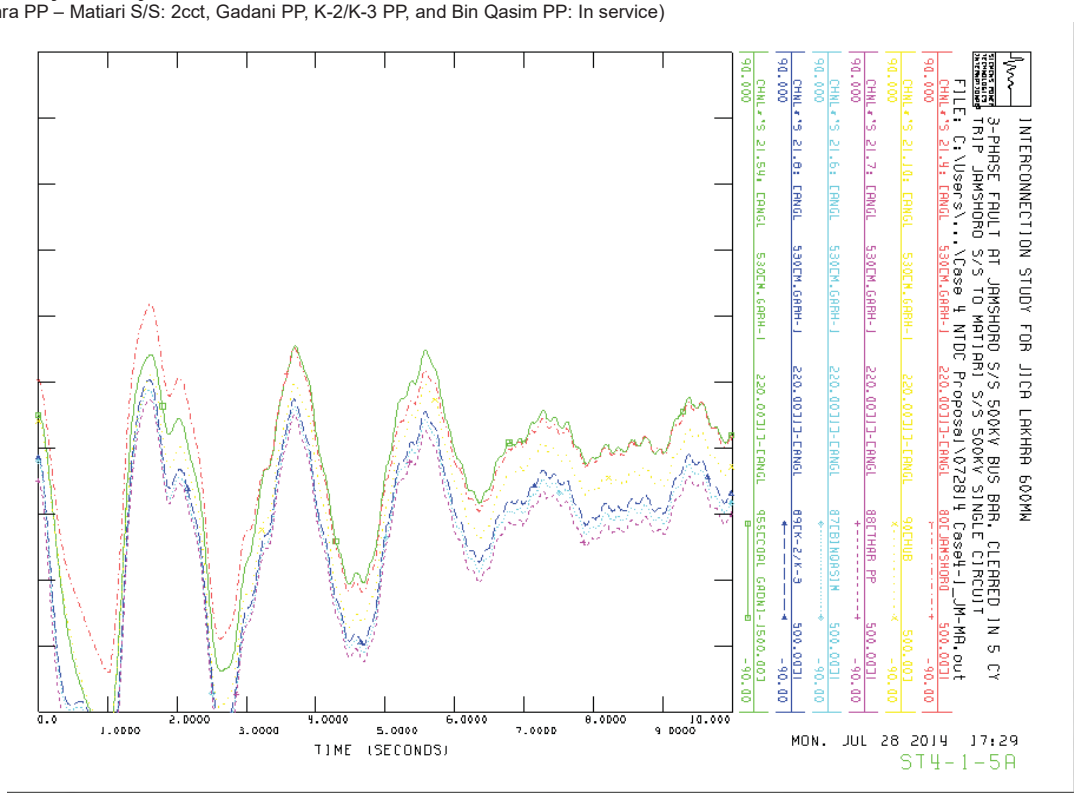


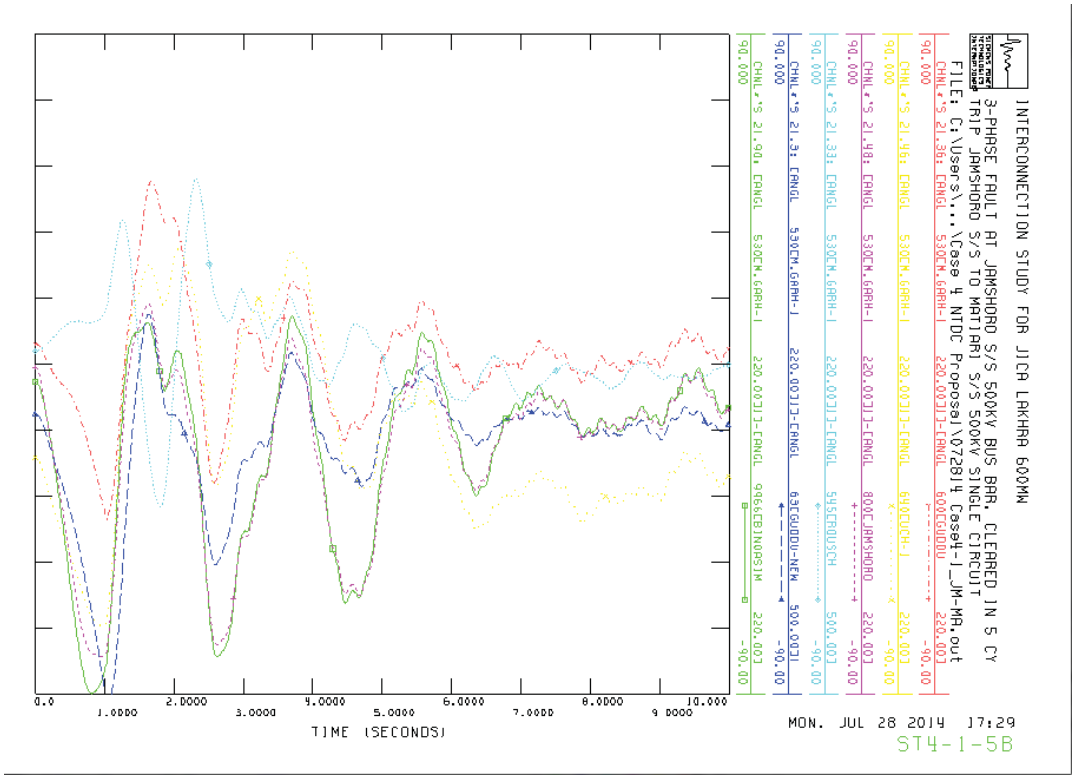


Fault Section: Jamshoro S/S – NKI S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

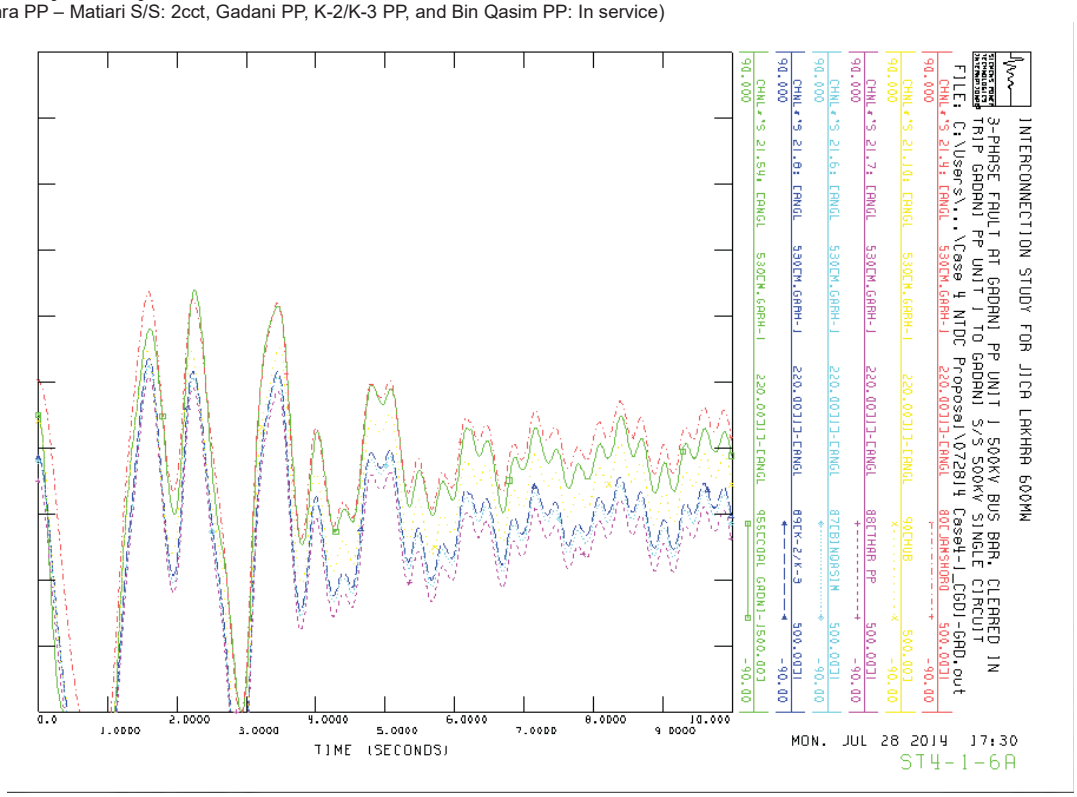


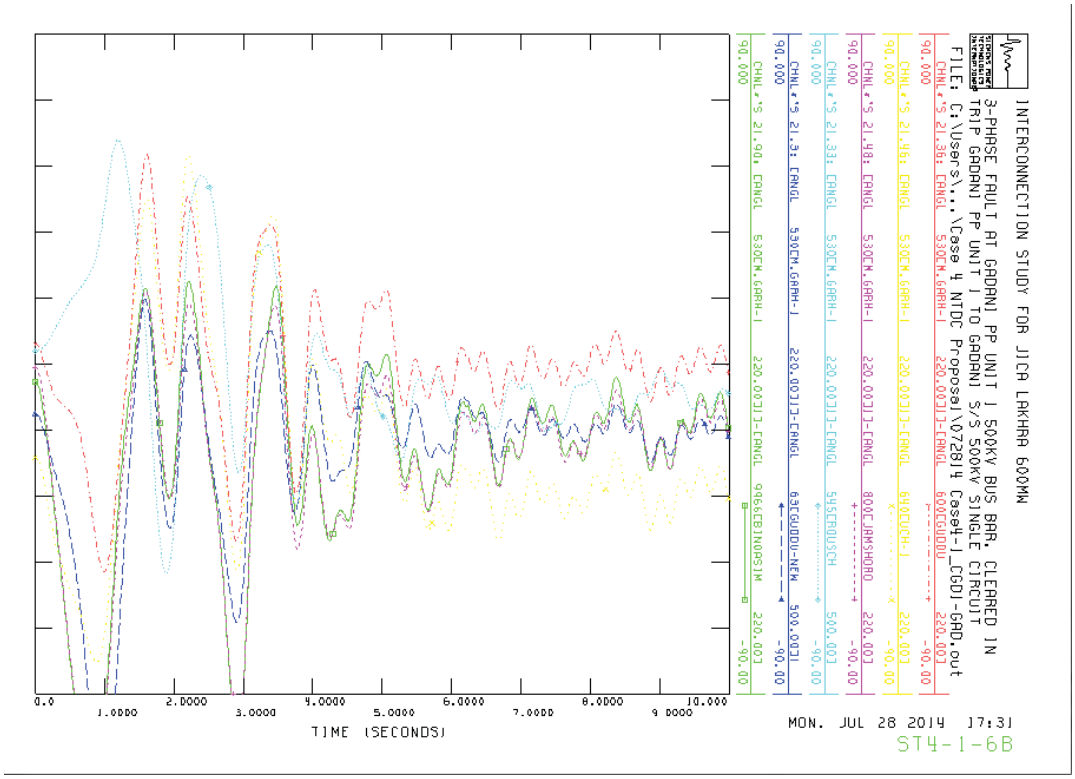


Fault Section: Jamshoro S/S – Matiari S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

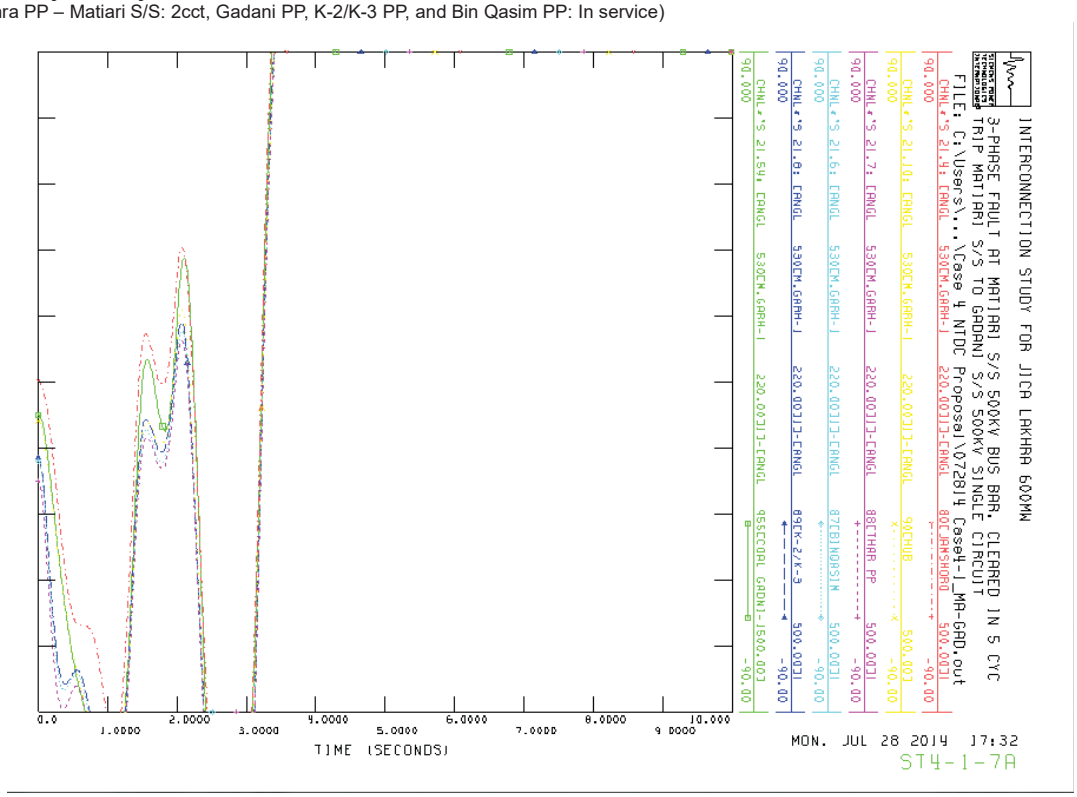


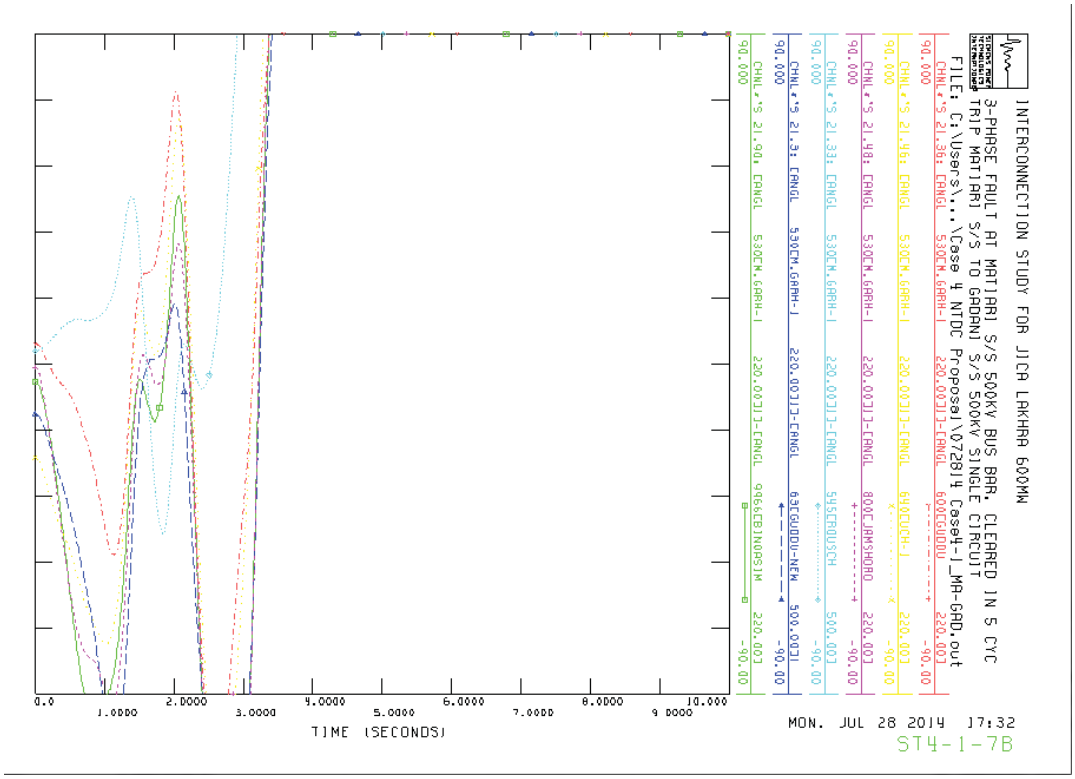


Fault Section: Coal Gadani PP – Gadani S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

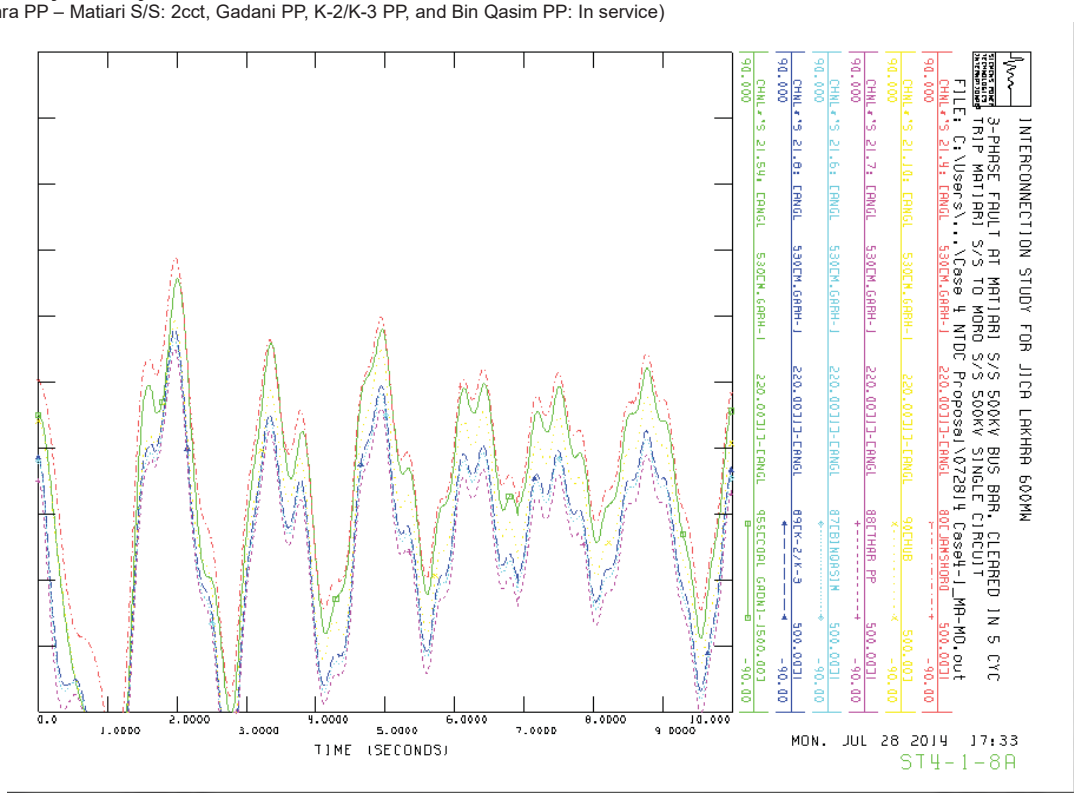


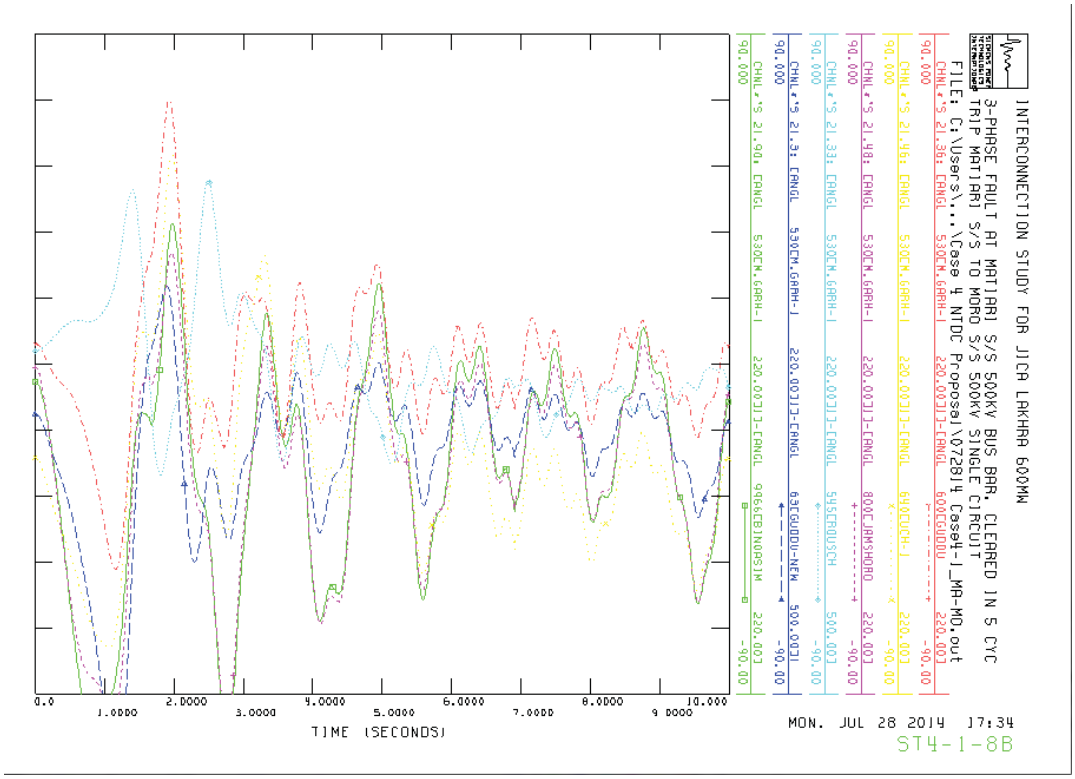


Fault Section: Matiari S/S – Gadani S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

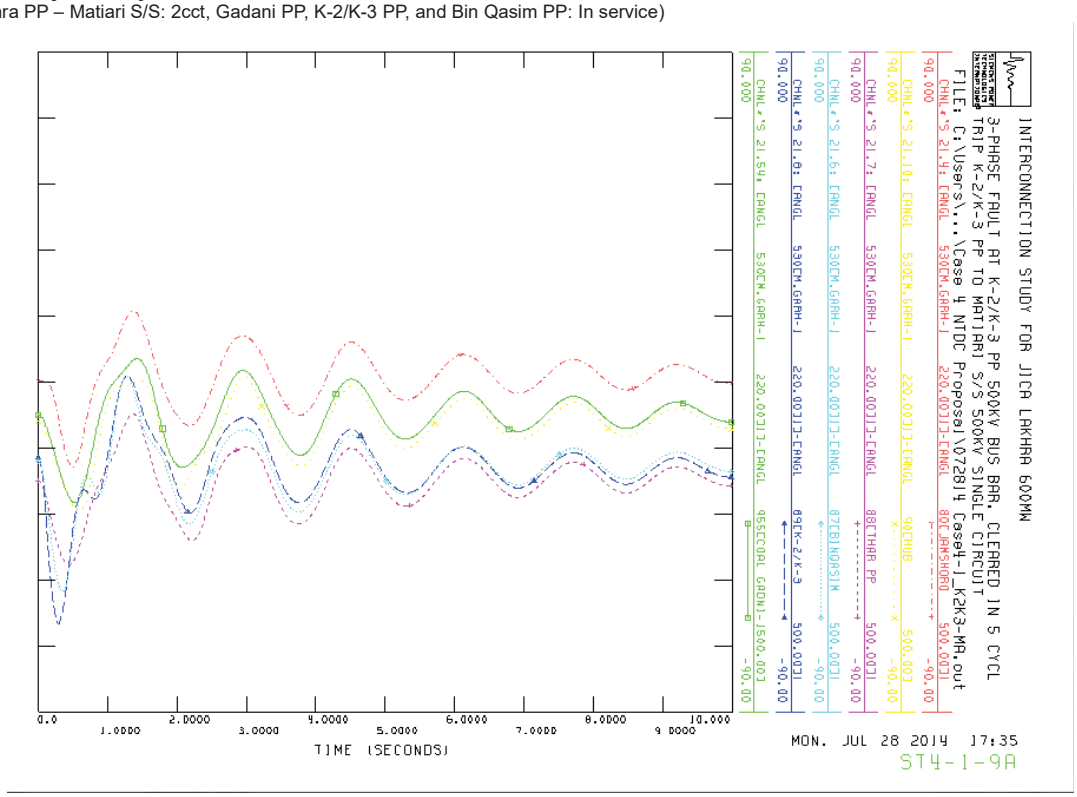


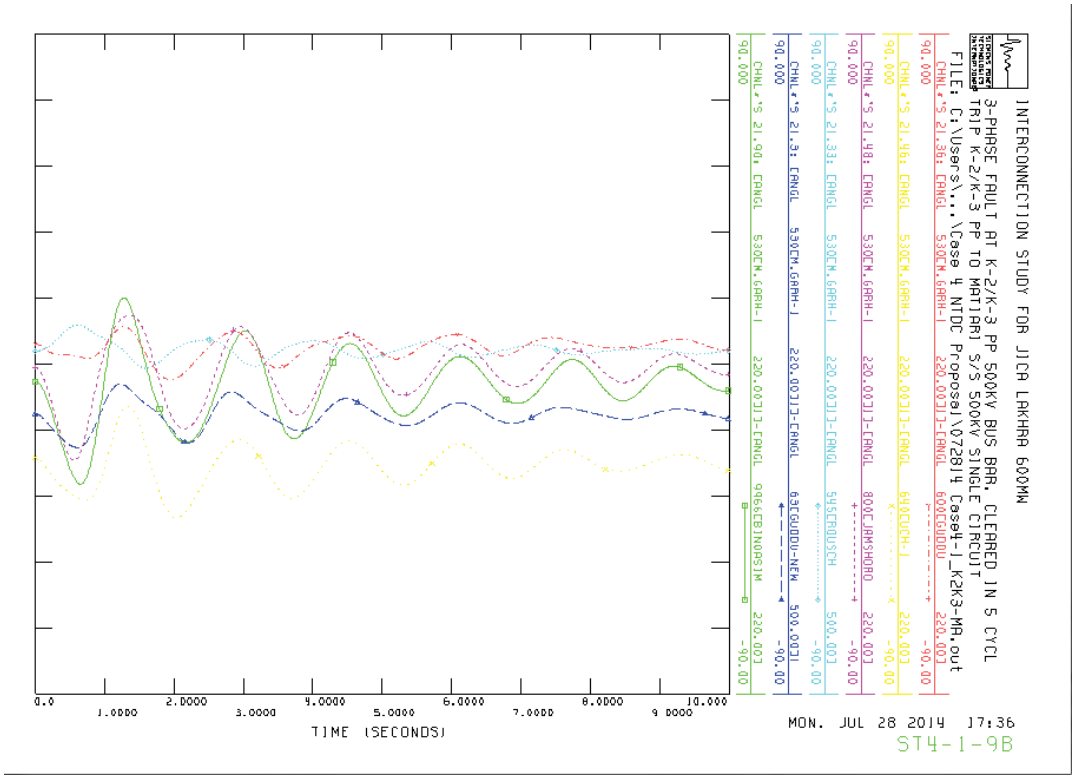


Fault Section: Matiari S/S – Moro S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

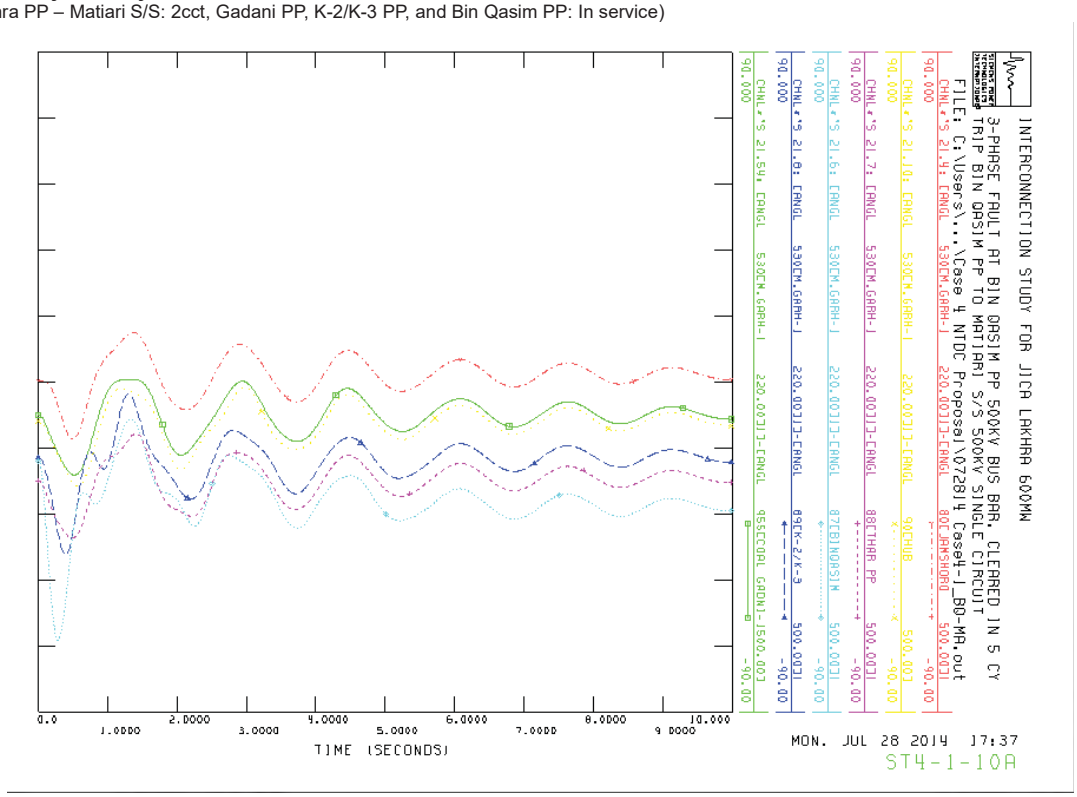


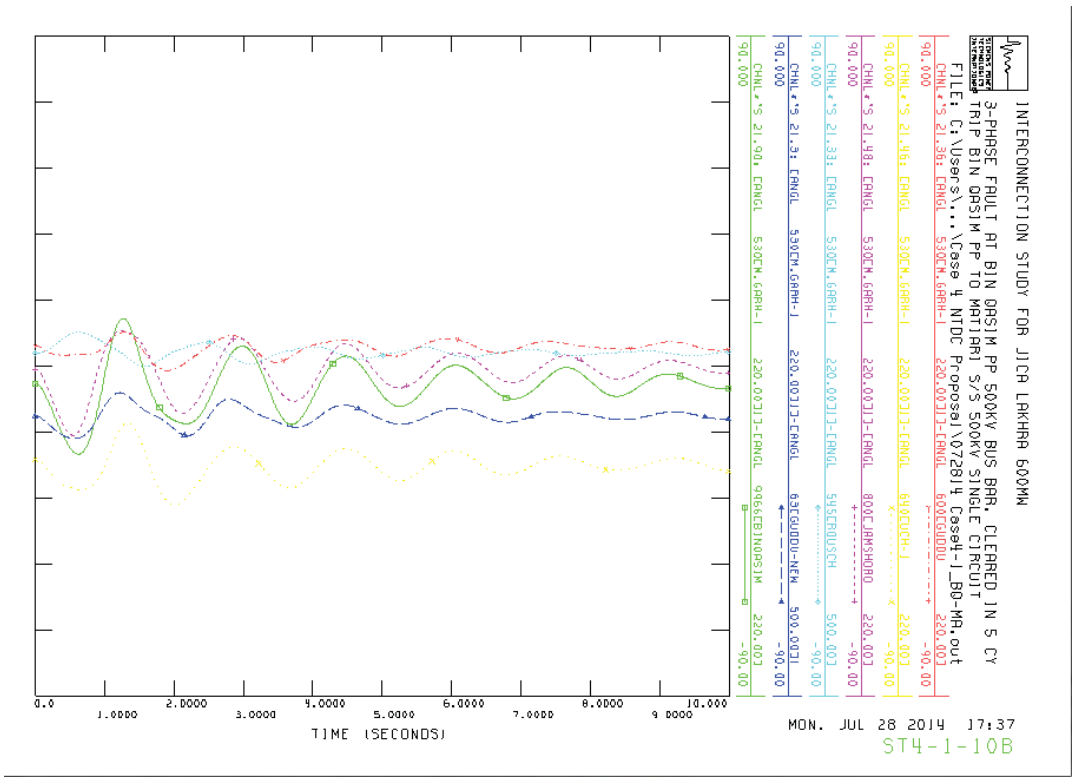


Fault Section: K-2/K-3 PP – Matiari S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

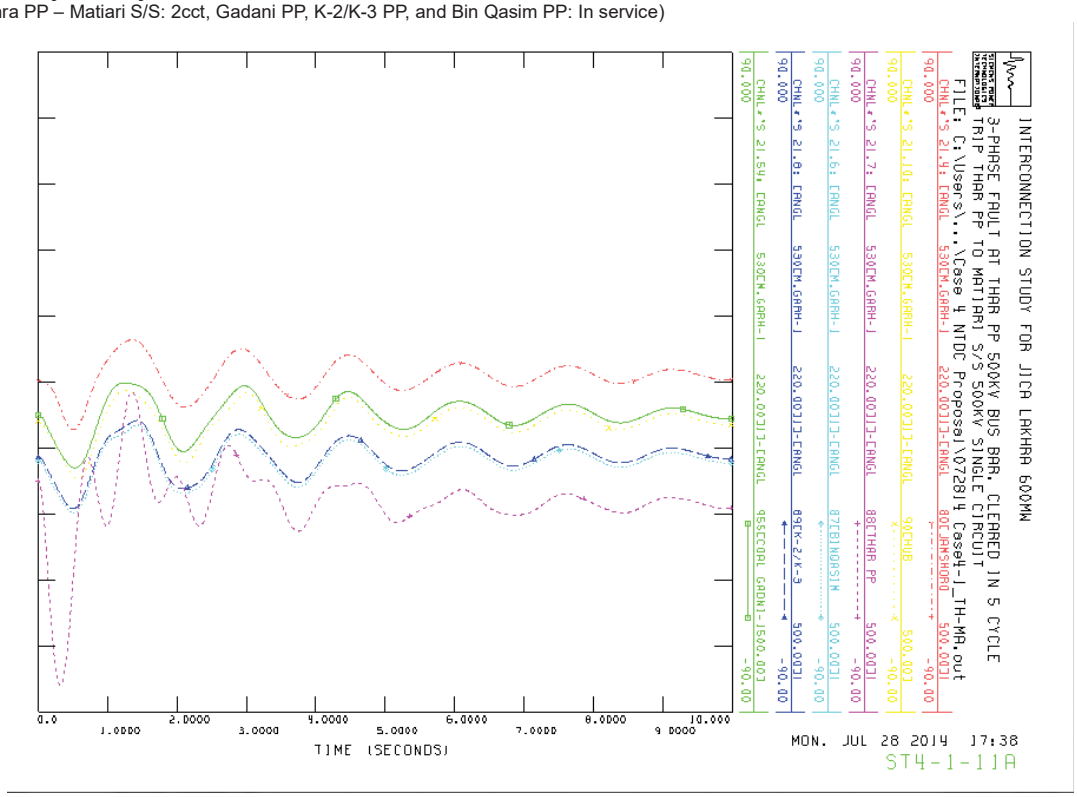


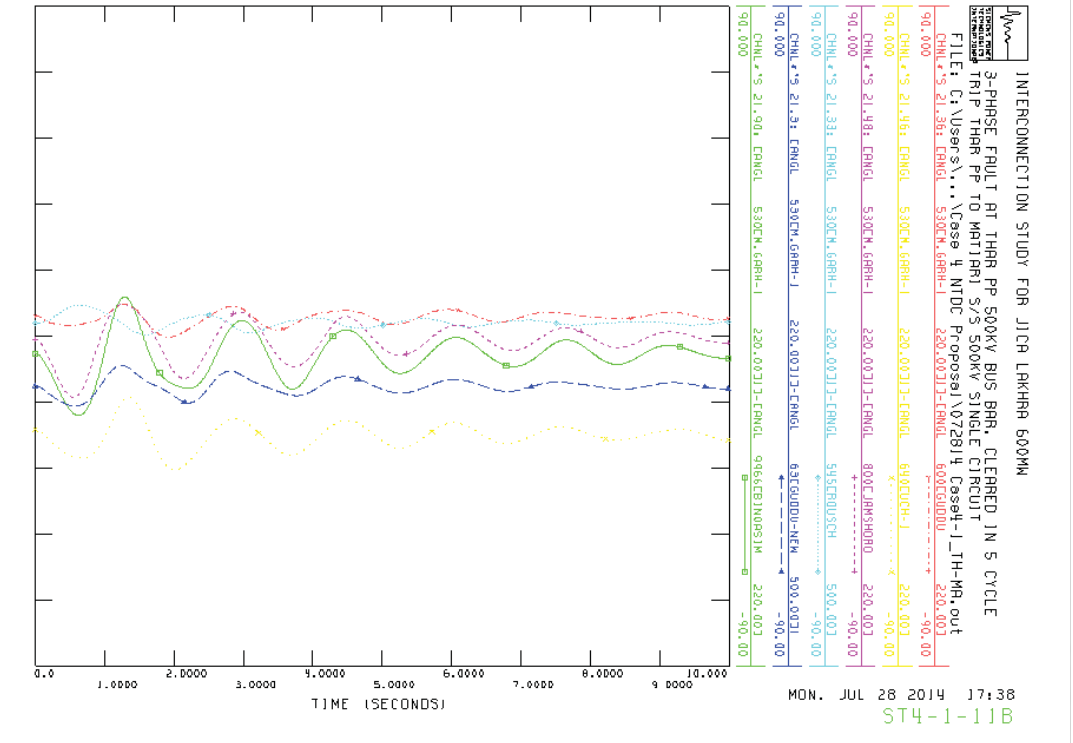


Fault Section: Bin Qasim S/S – Matiari S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

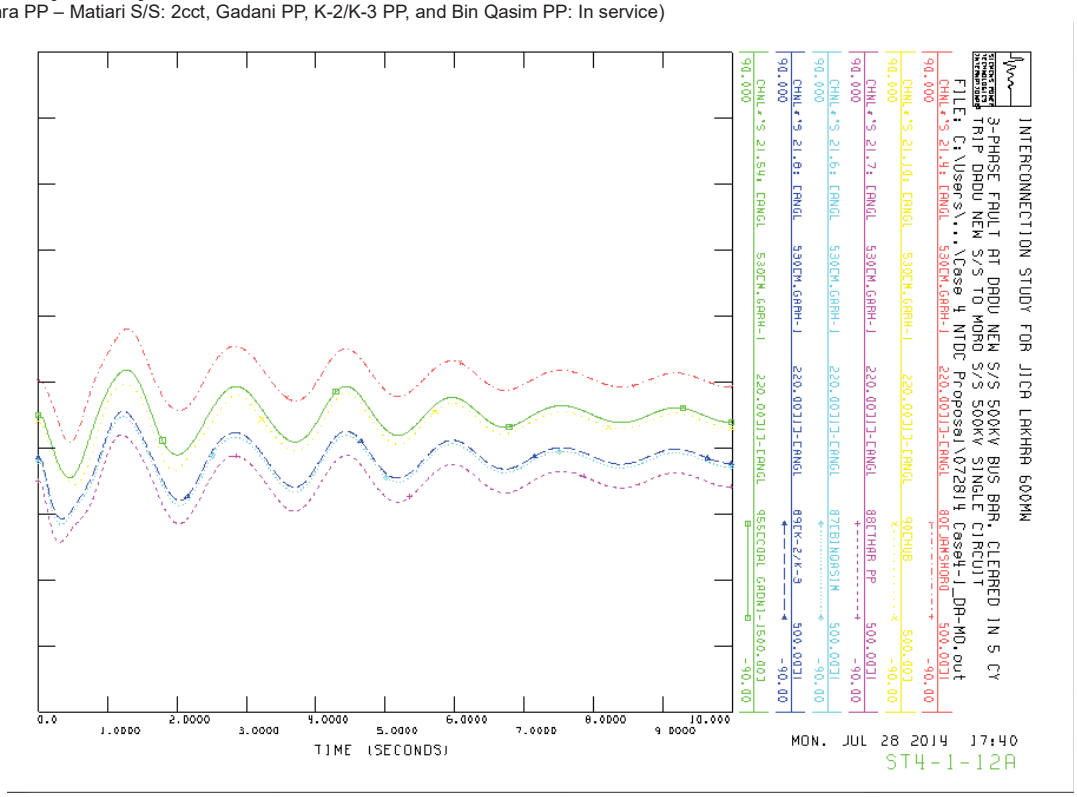


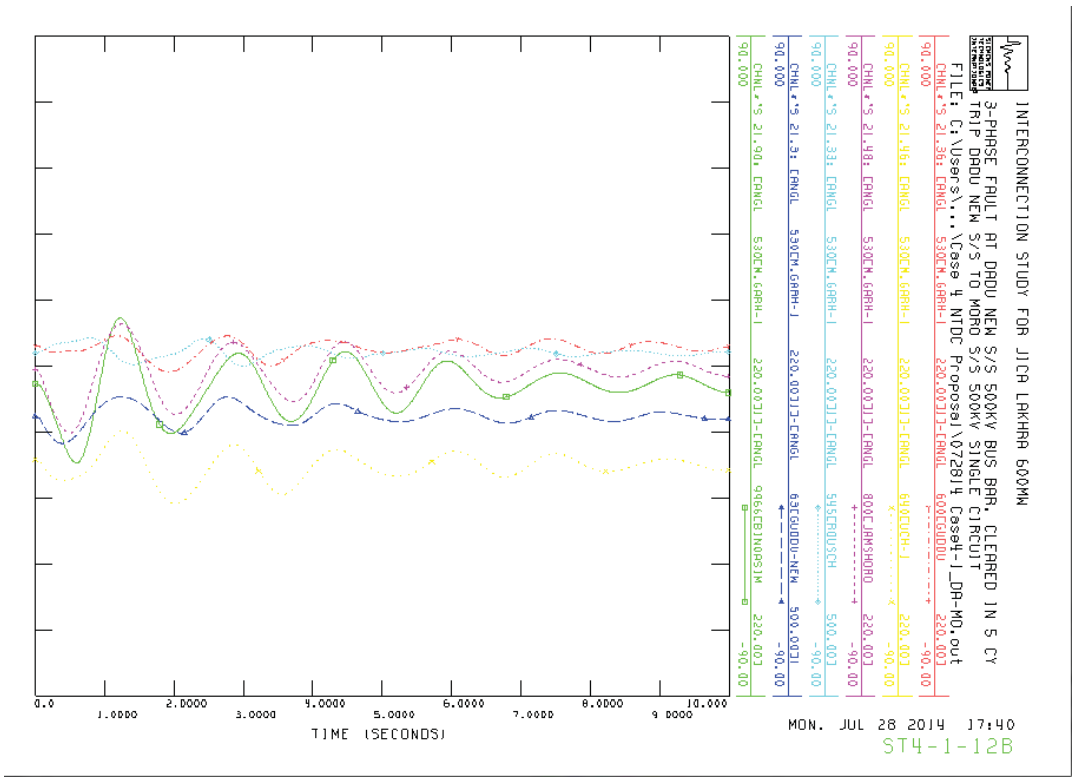


Fault Section: Thar PP – Matiari S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

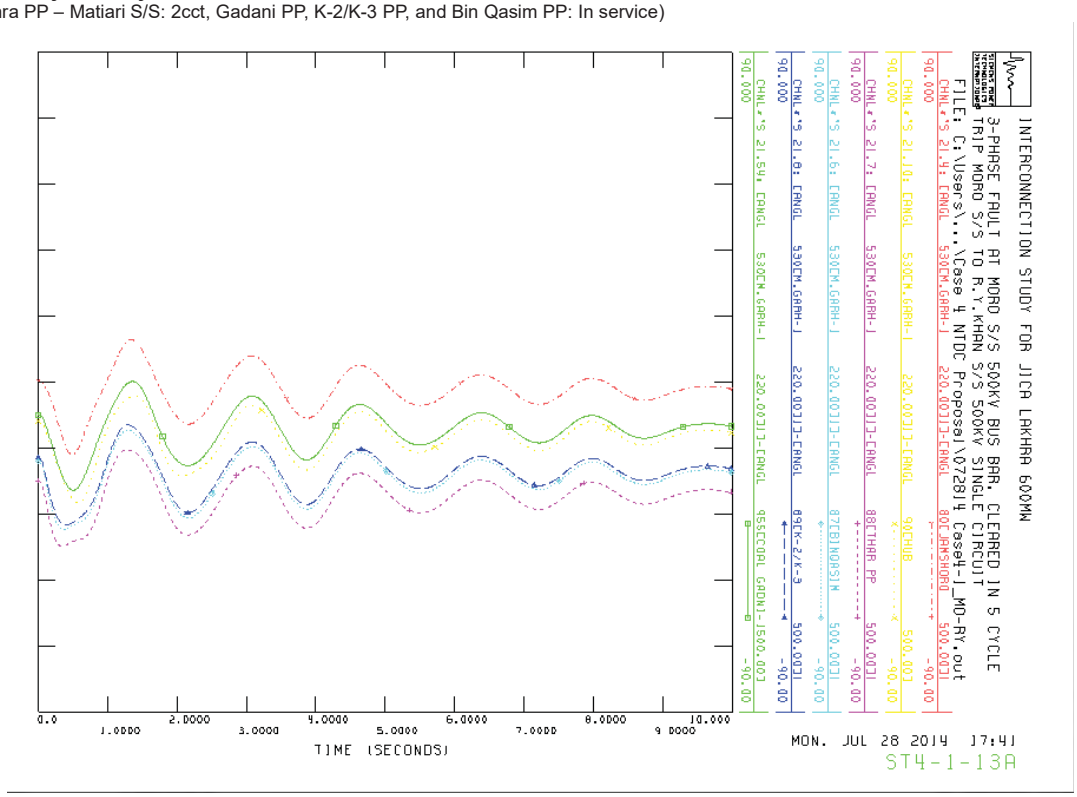


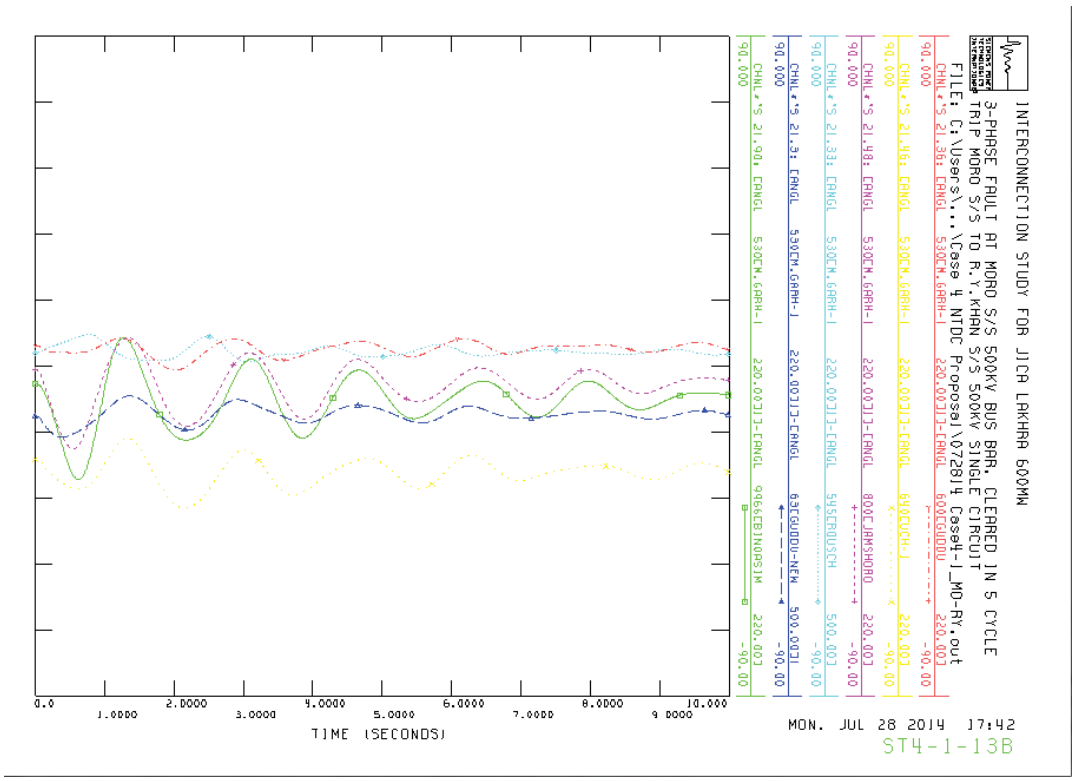


Fault Section: Dadu New S/S – Moro S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

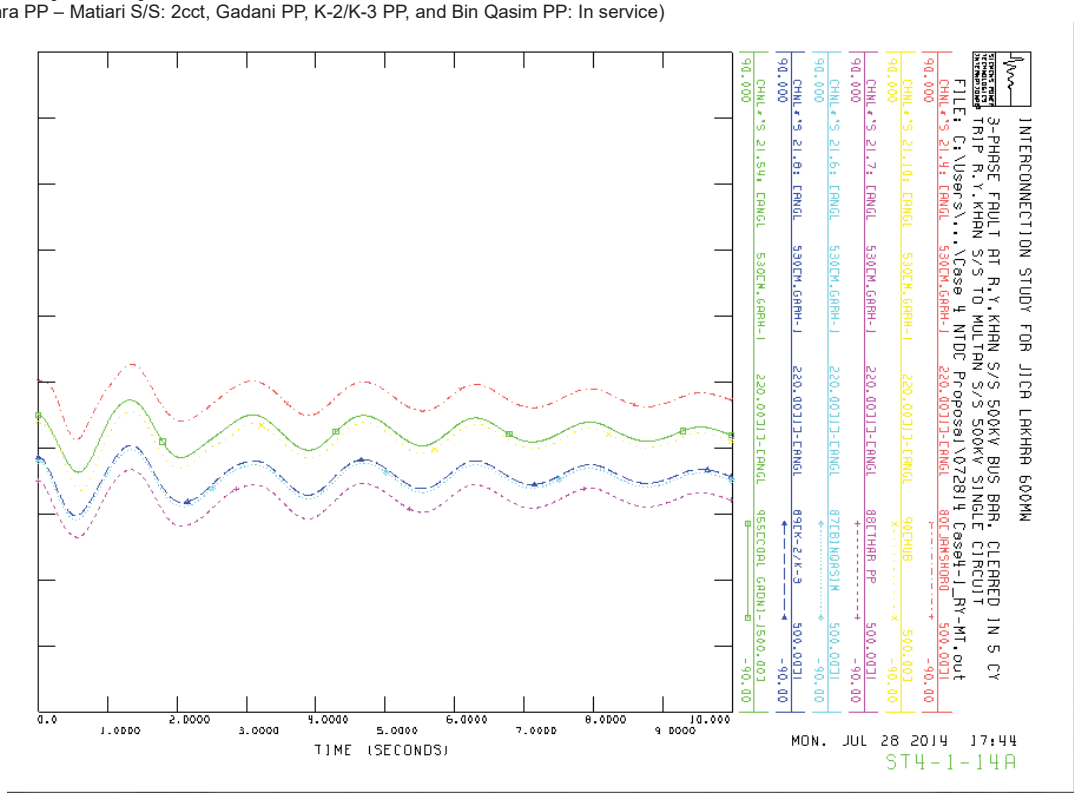


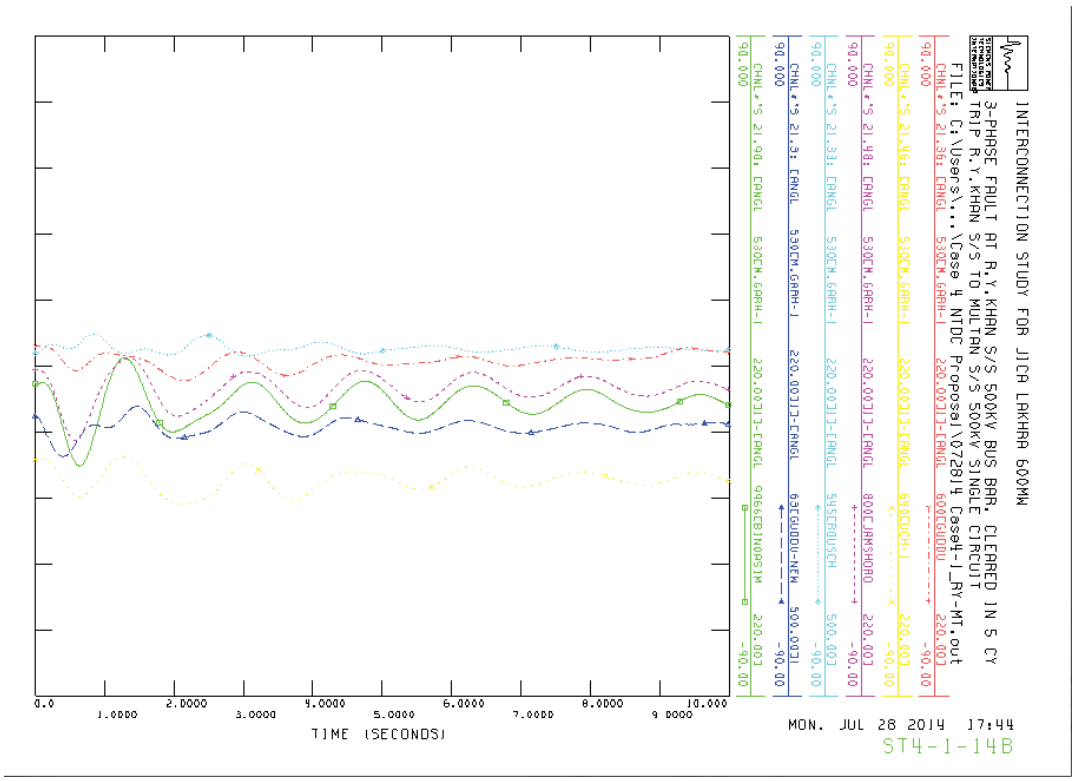


Fault Section: Moro S/S – R. Y. Khan S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

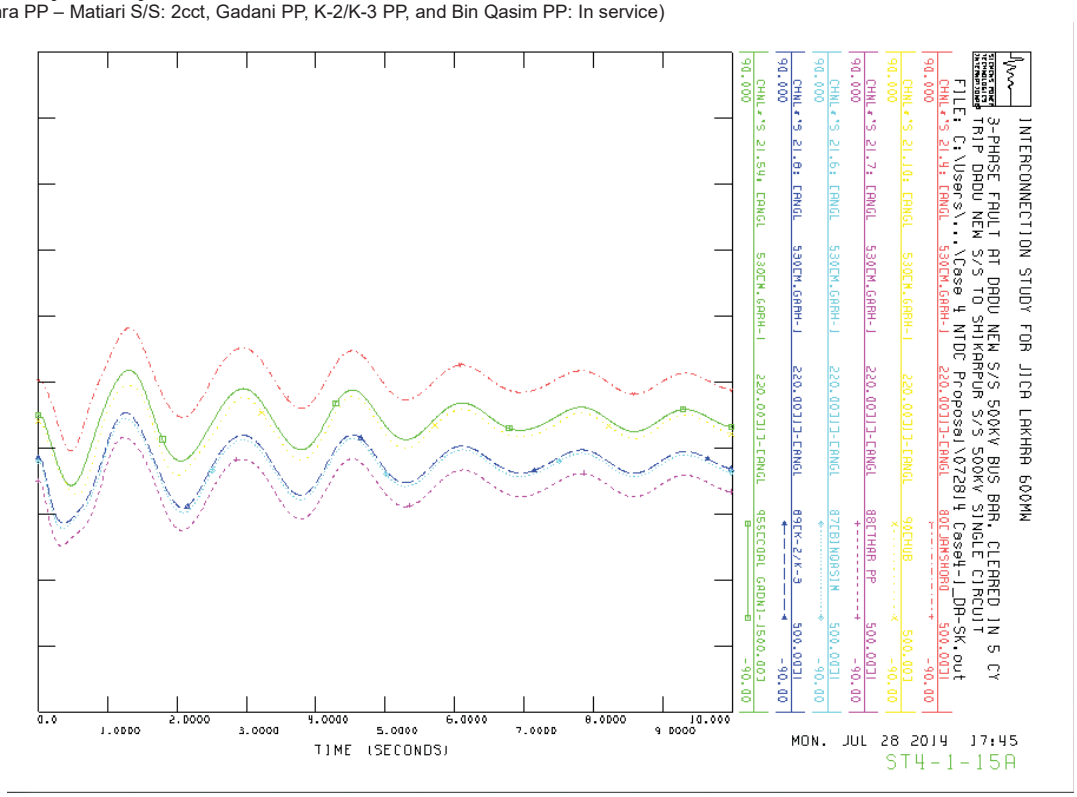


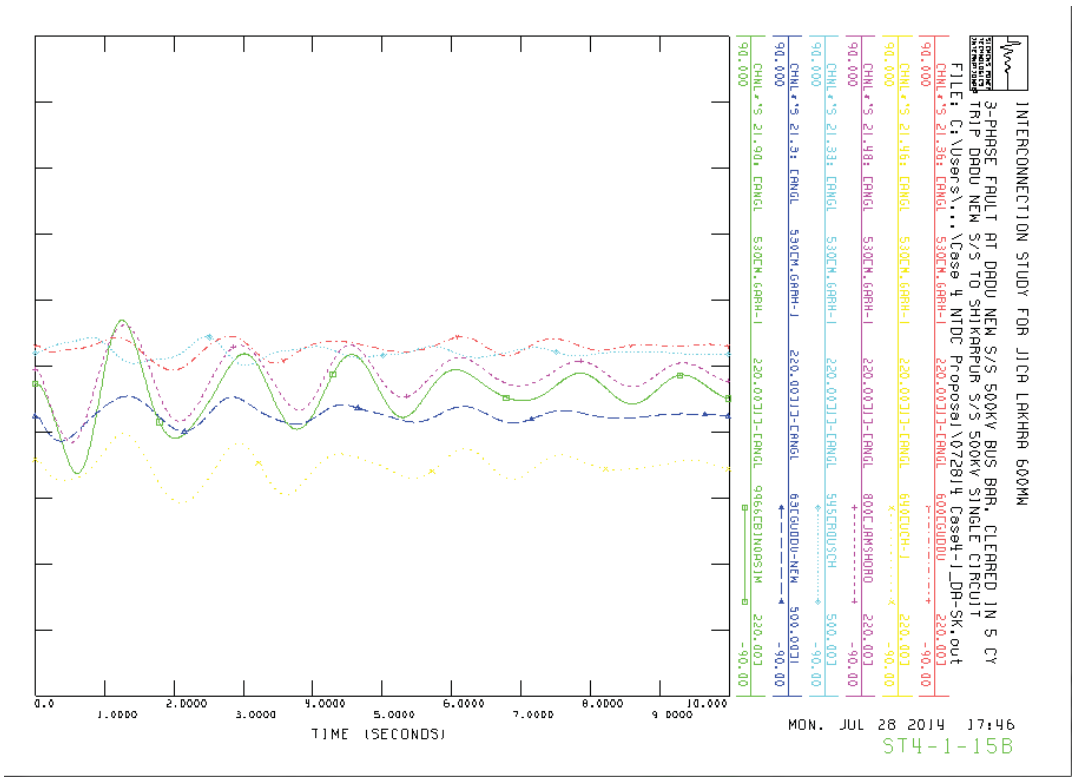


Fault Section: R. Y. Khan PP – Multan S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

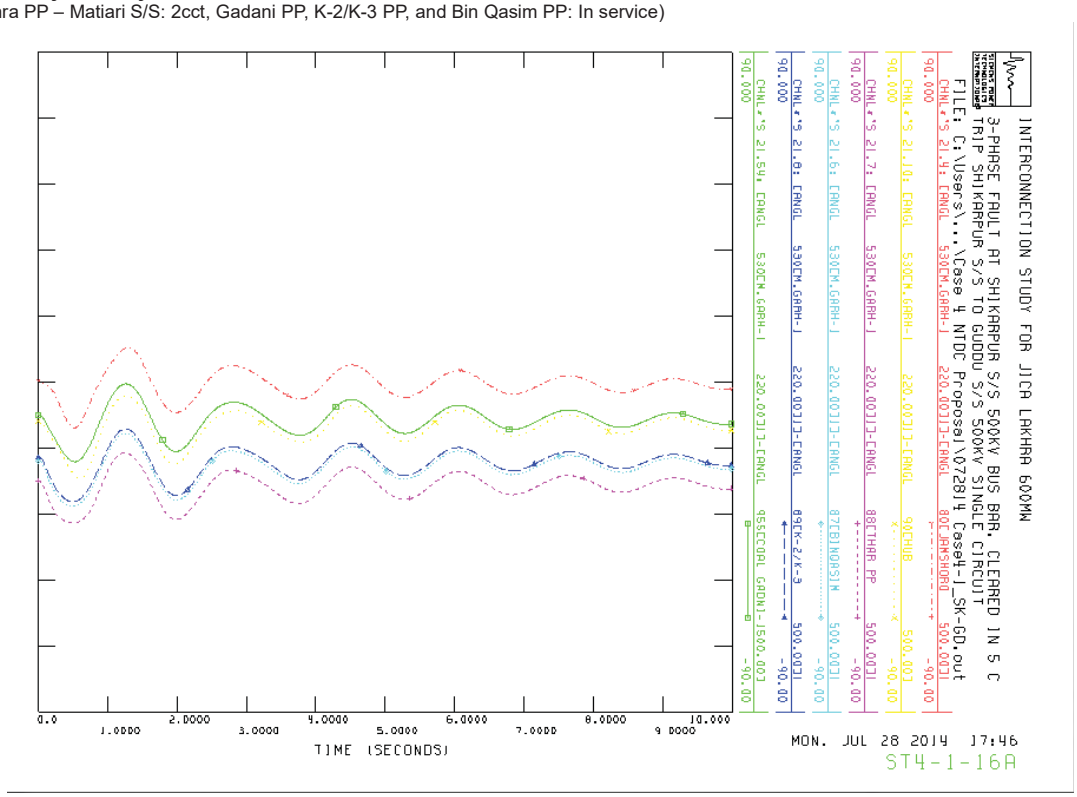


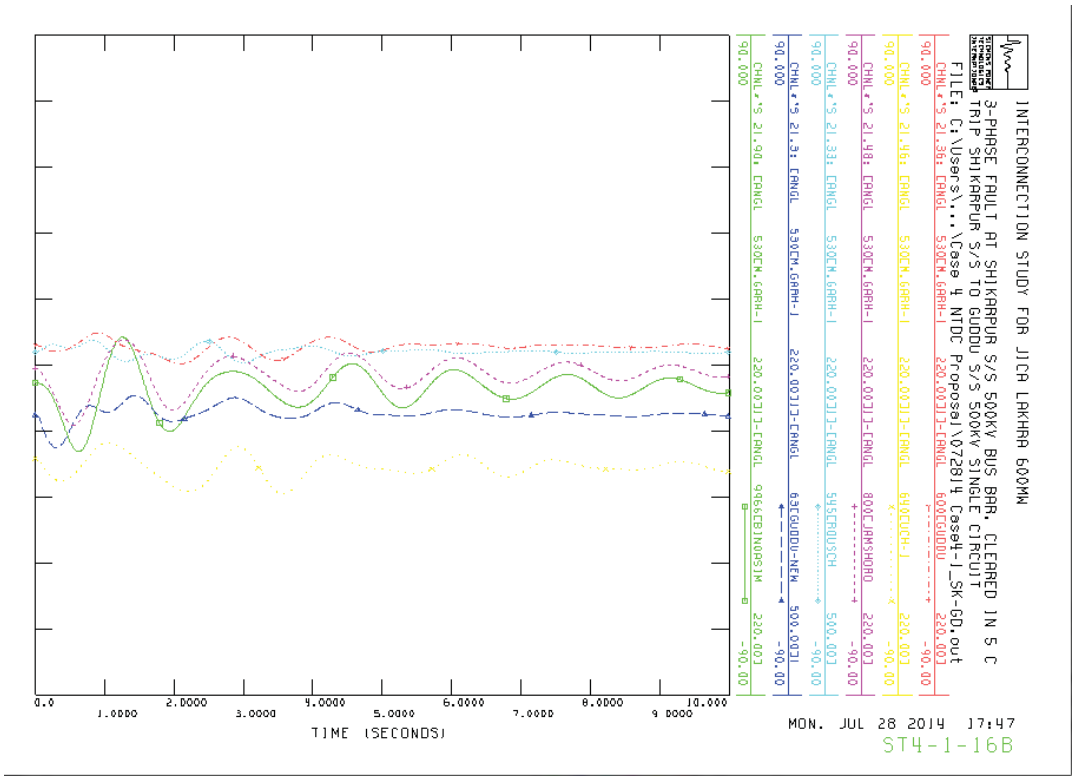


Fault Section: Dadu New S/S – Shikarpur S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

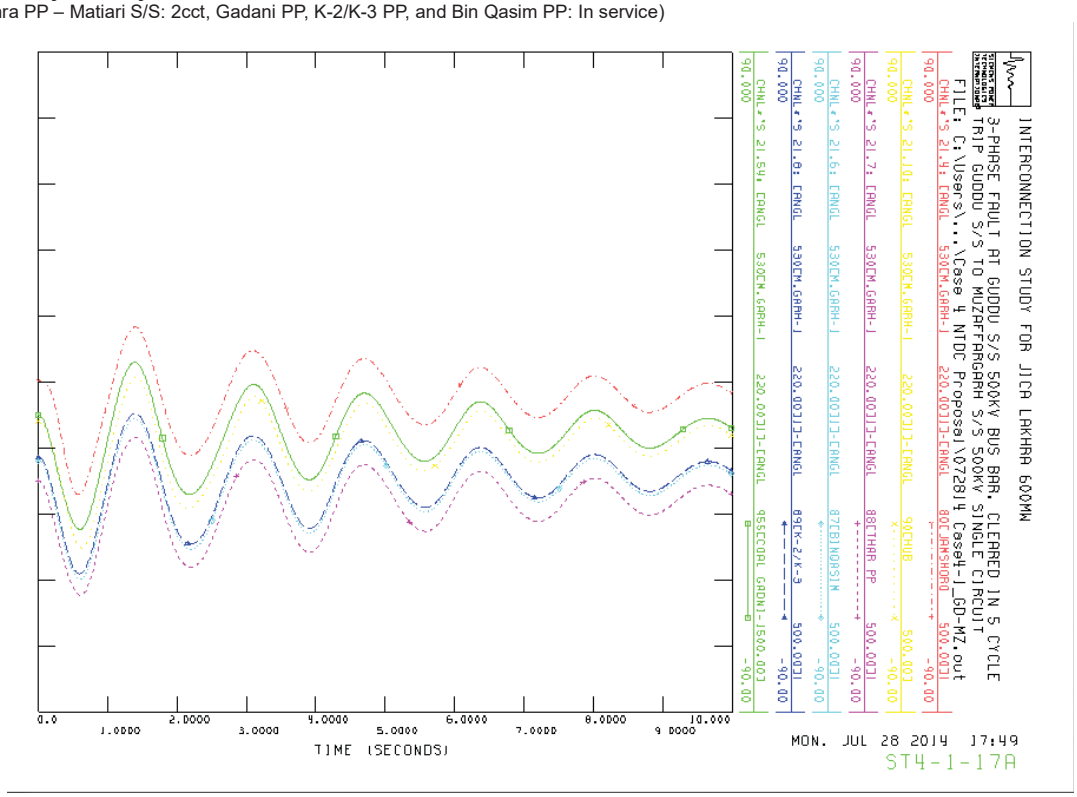


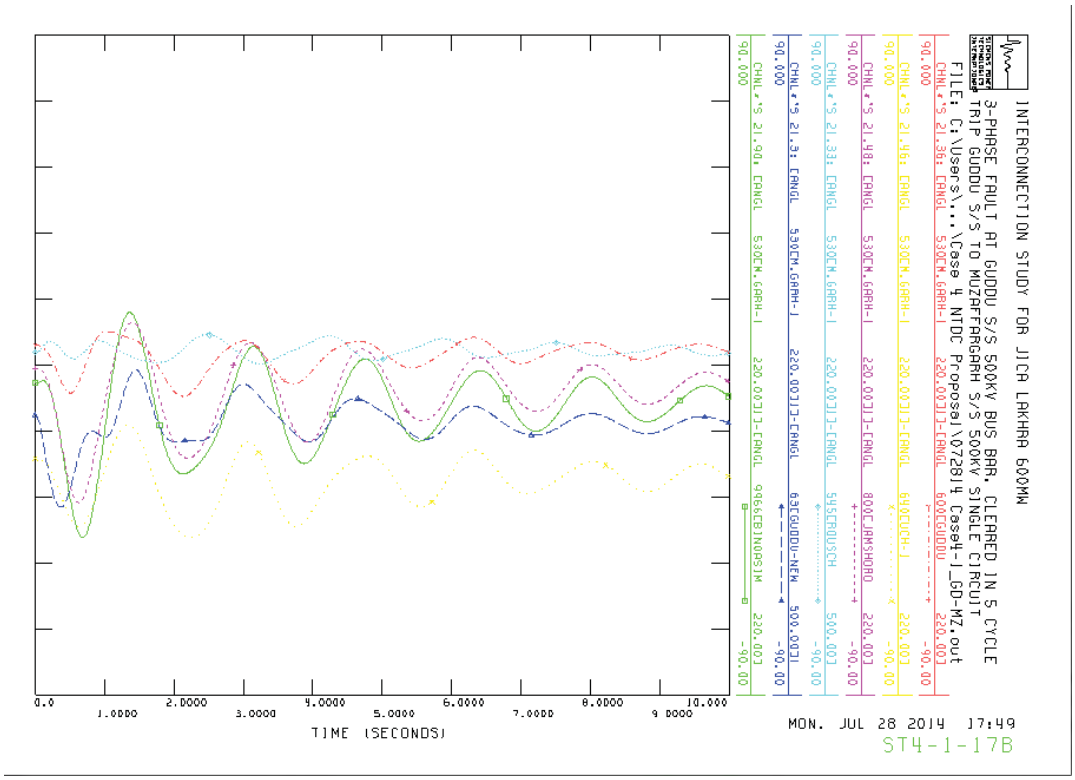


Fault Section: Shikarpur S/S – Guddu S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

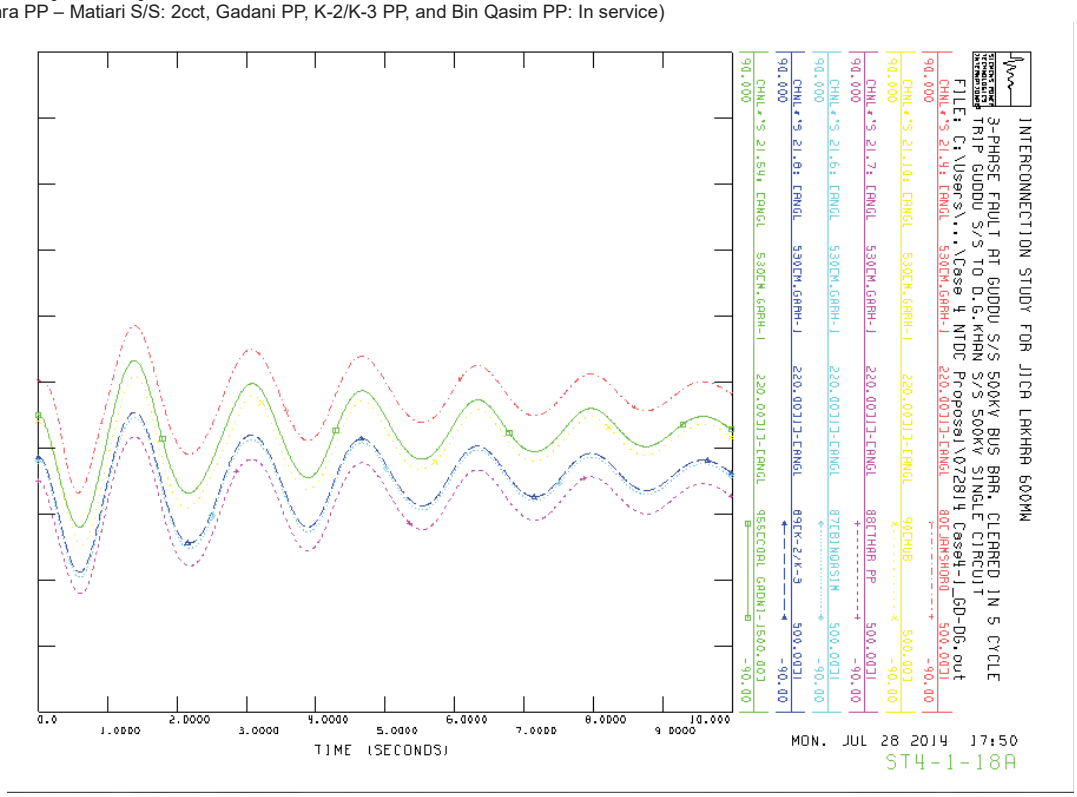


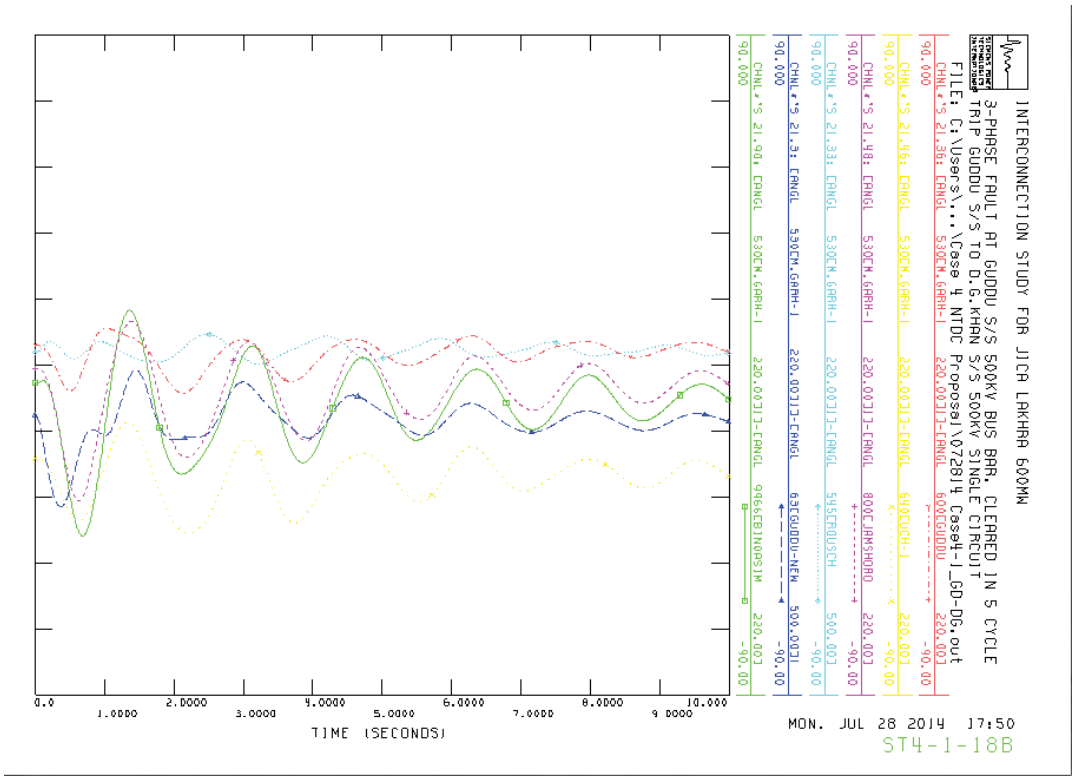


Fault Section: Guddu S/S – Muzaffargarh S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

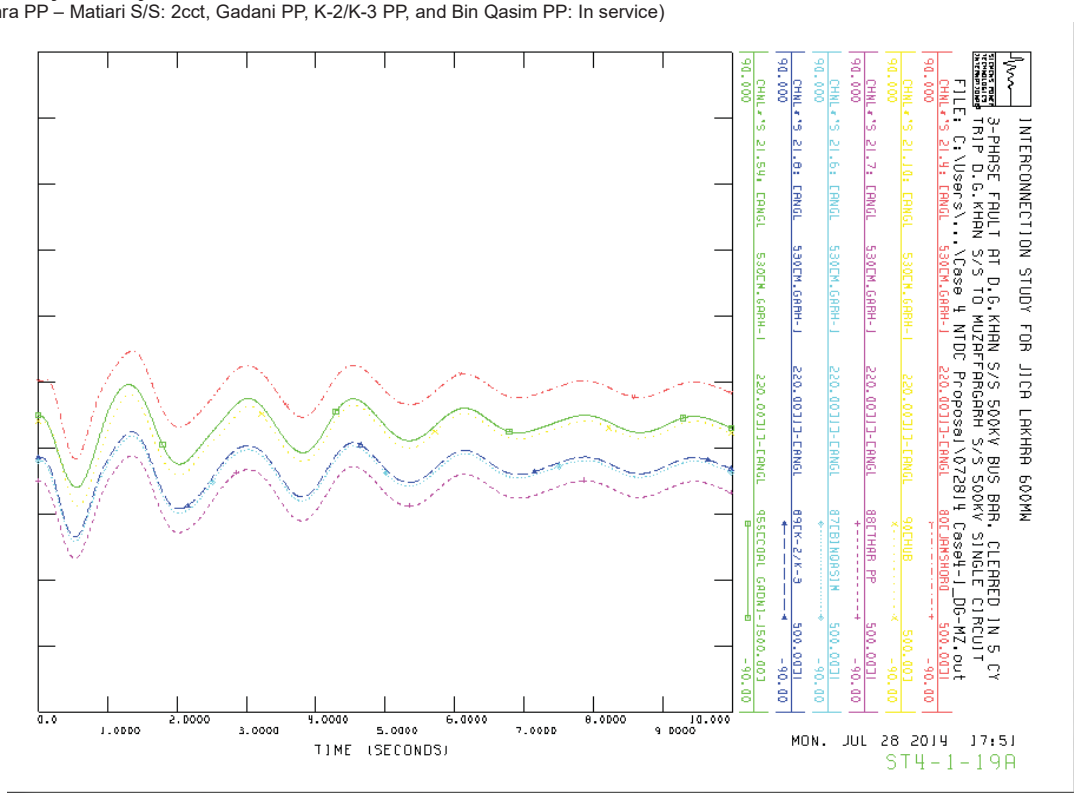


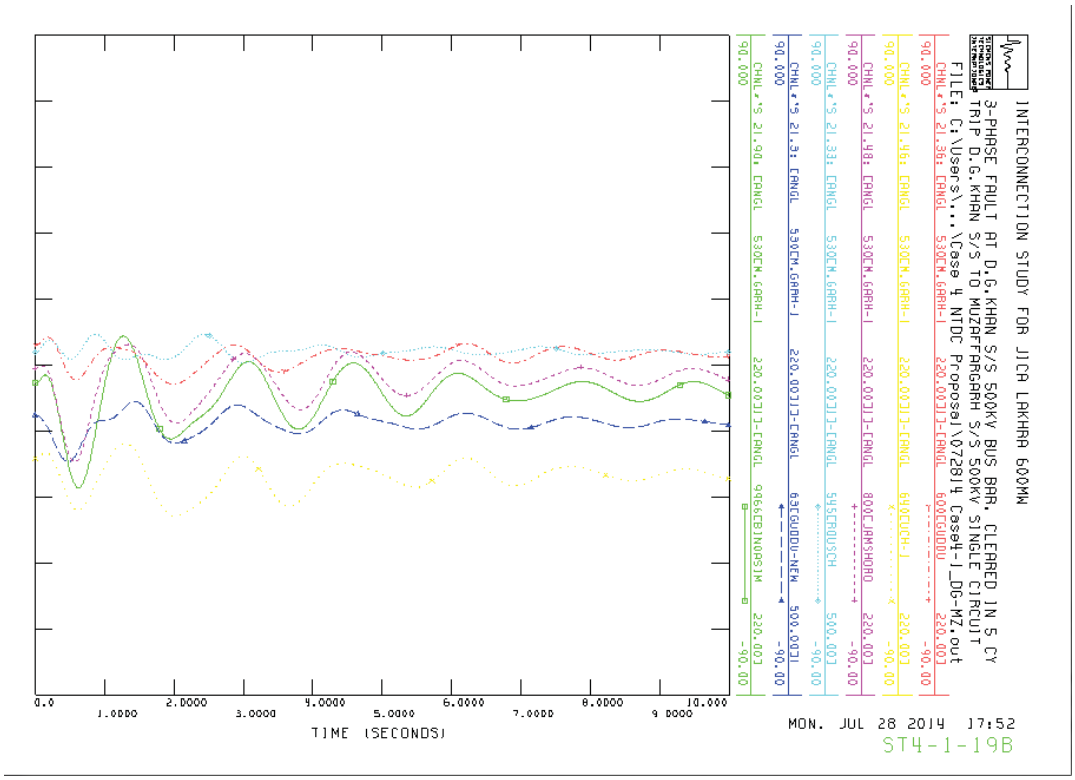


Fault Section: Guddu S/S – D. G. Khan S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

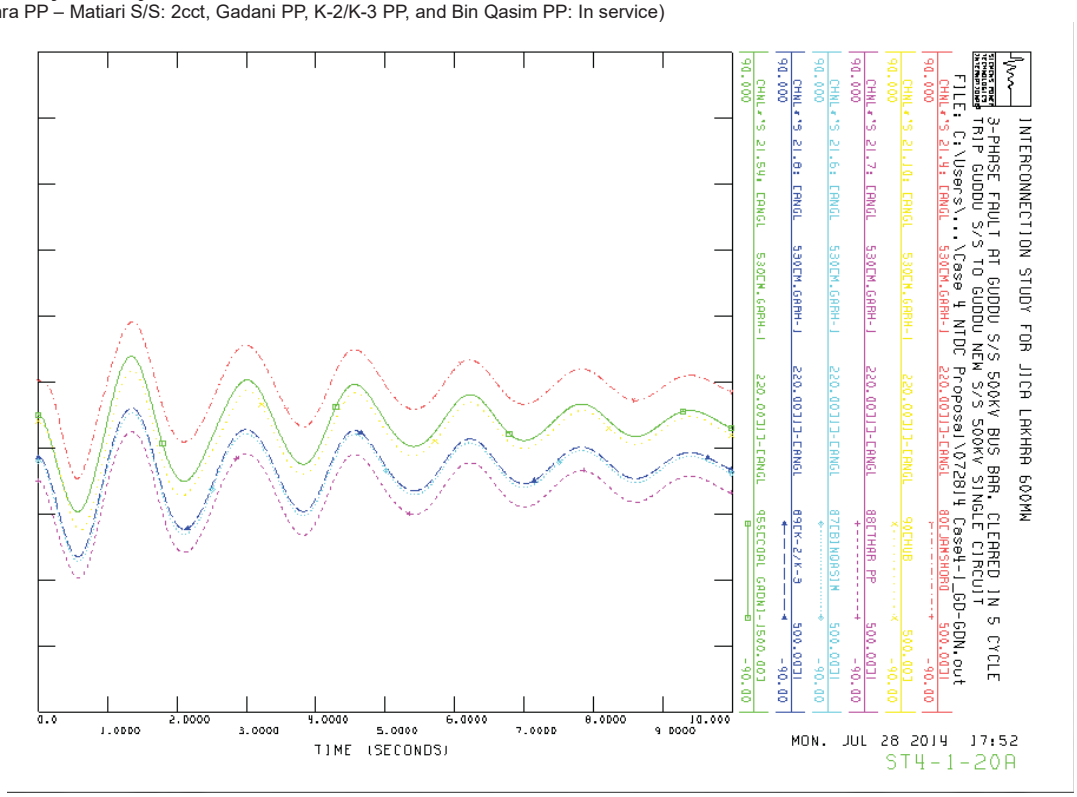


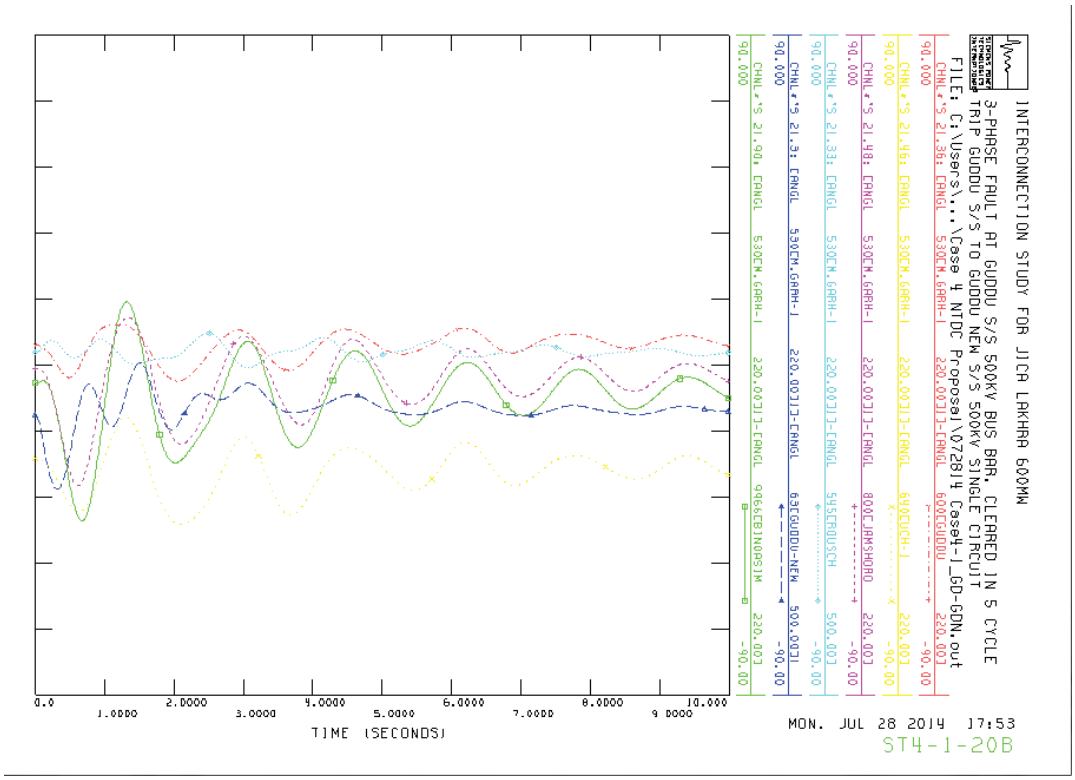


Fault Section: D. G. Khan S/S – Muzaffargarh S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

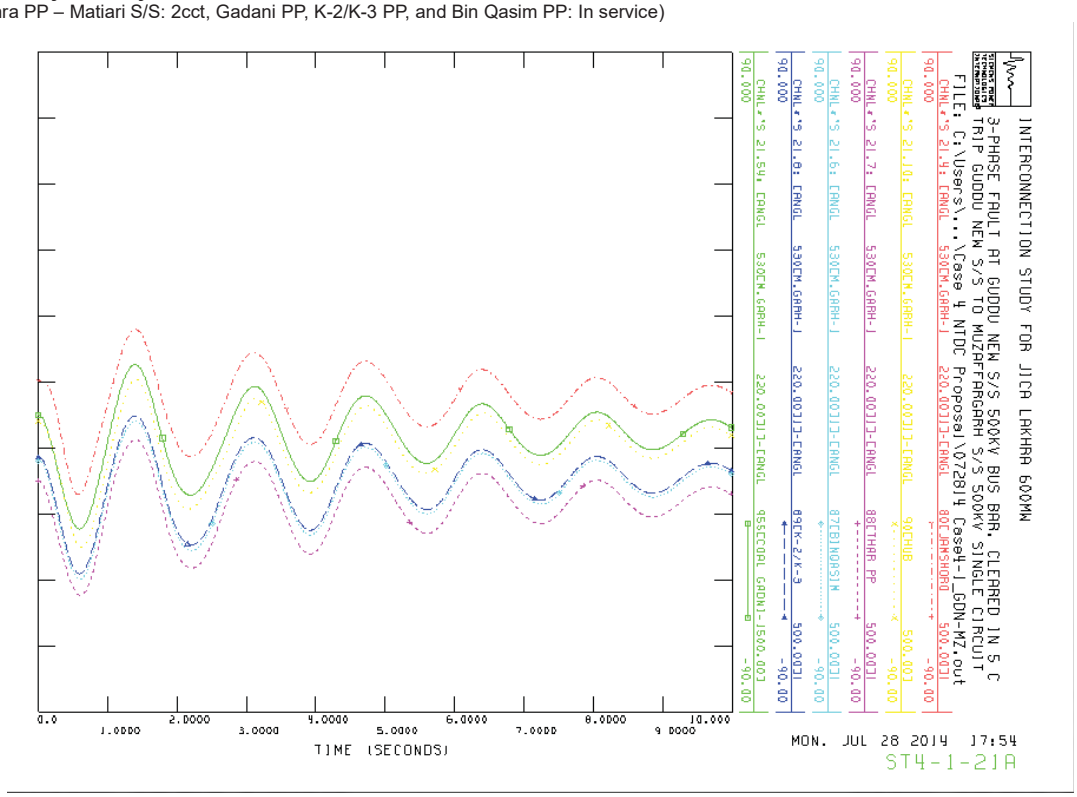


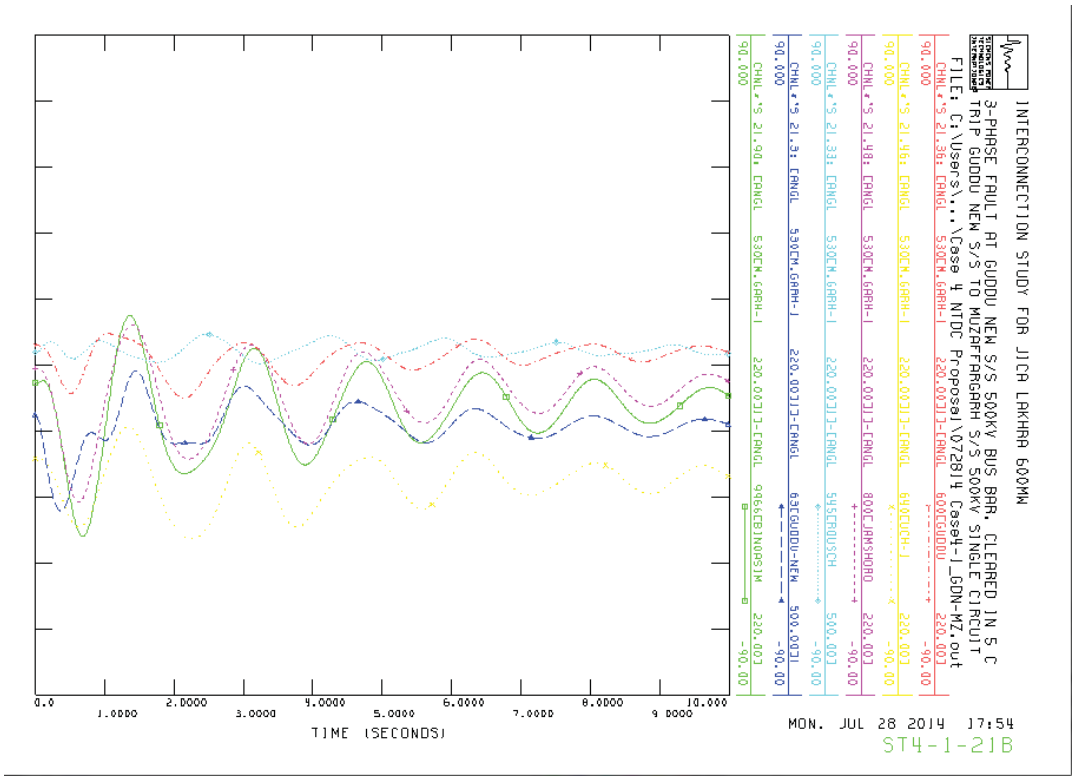


Fault Section: Guddu S/S – Guddu New PP

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

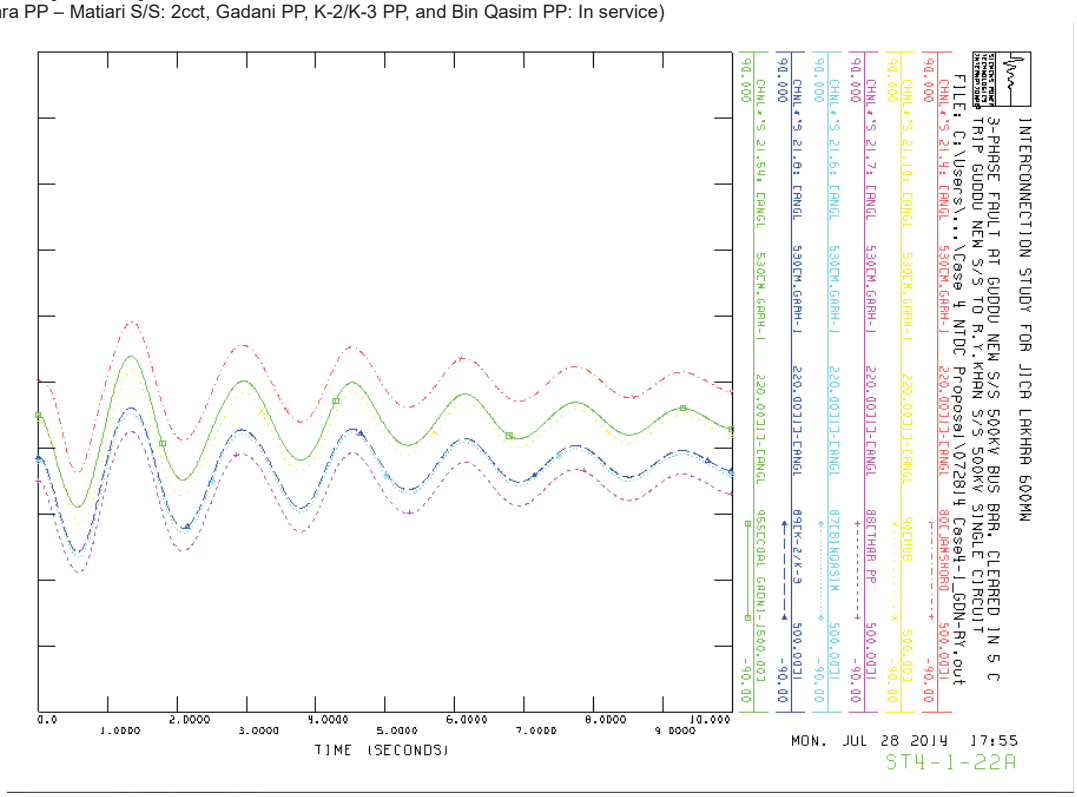


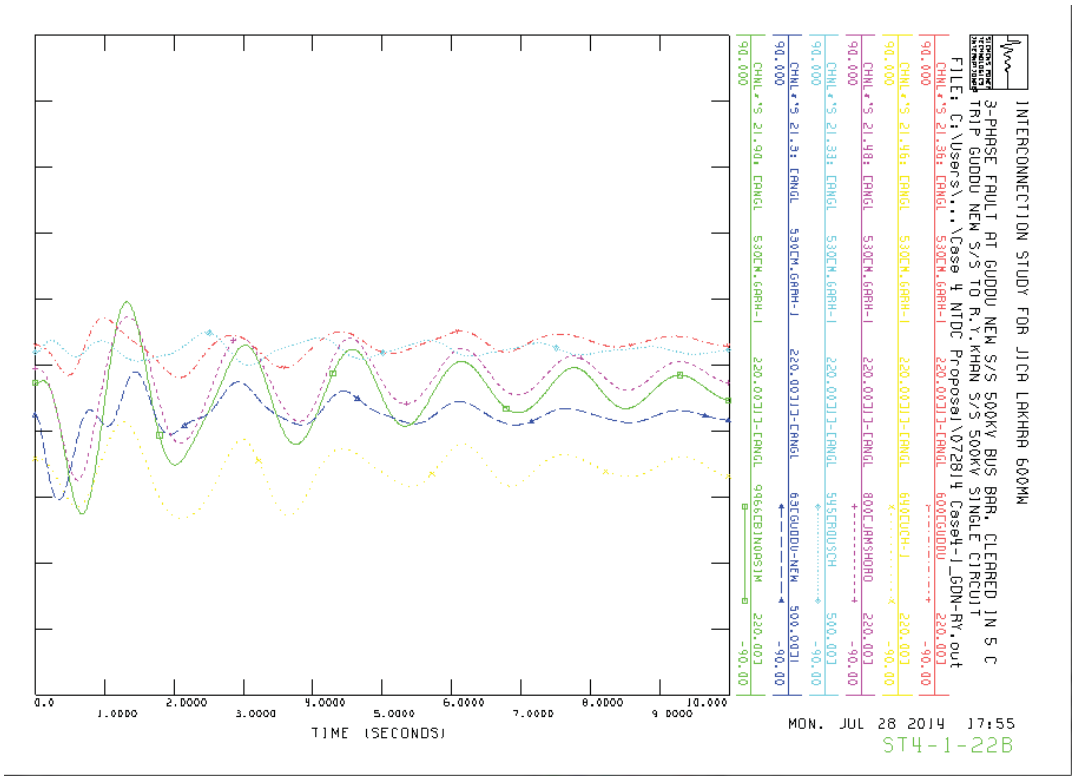


Fault Section: Guddu New PP – Muzaffargarh S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

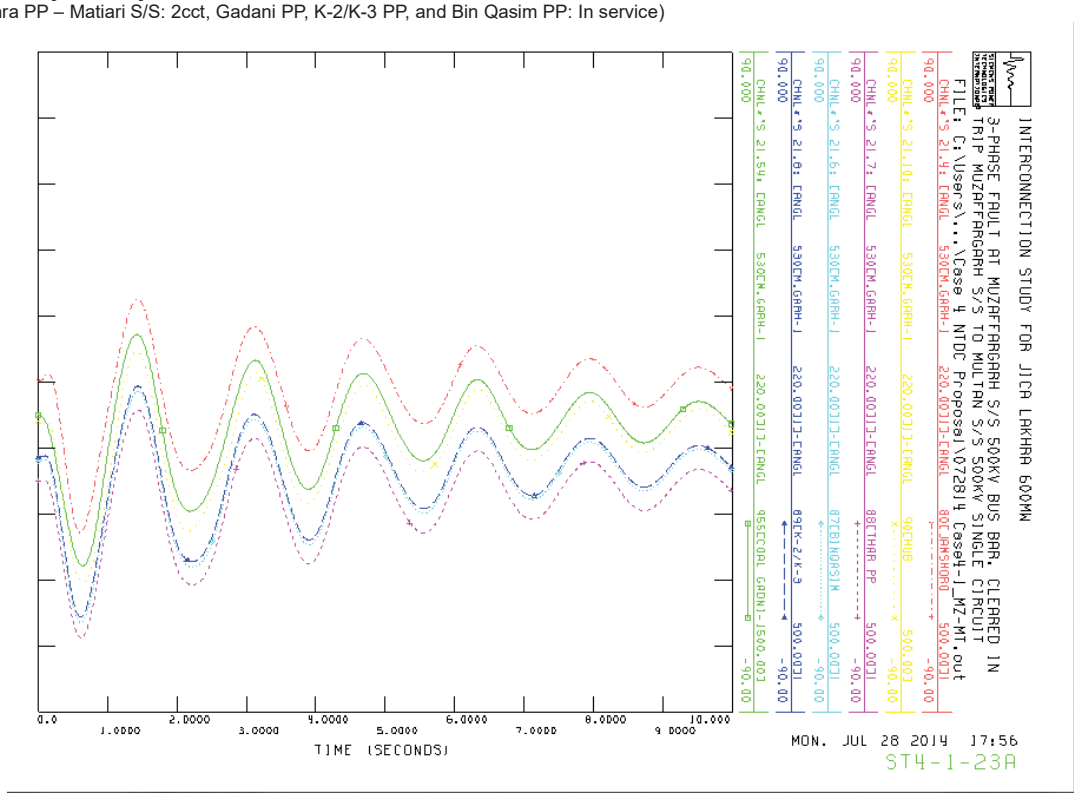


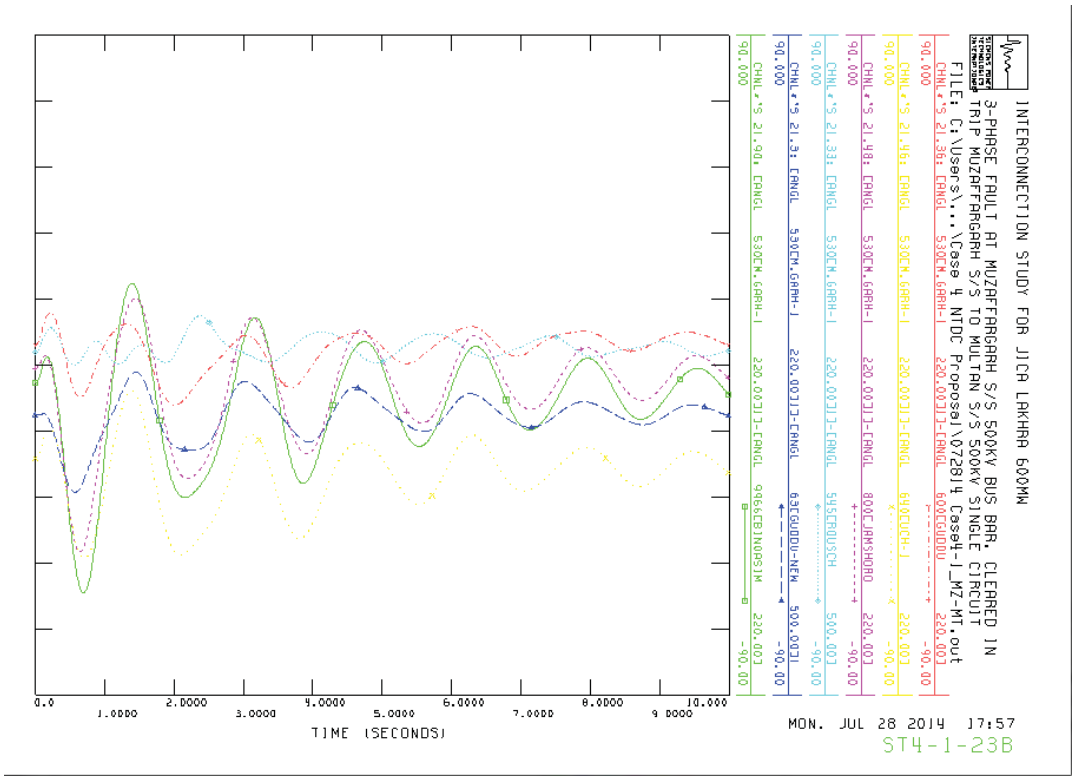


Fault Section: Guddu New PP – R. Y. Khan S/S

Stability Analysis Result Case ST-4-1

(Lakhra PP – Matiari S/S: 2cct, Gadani PP, K-2/K-3 PP, and Bin Qasim PP: In service)

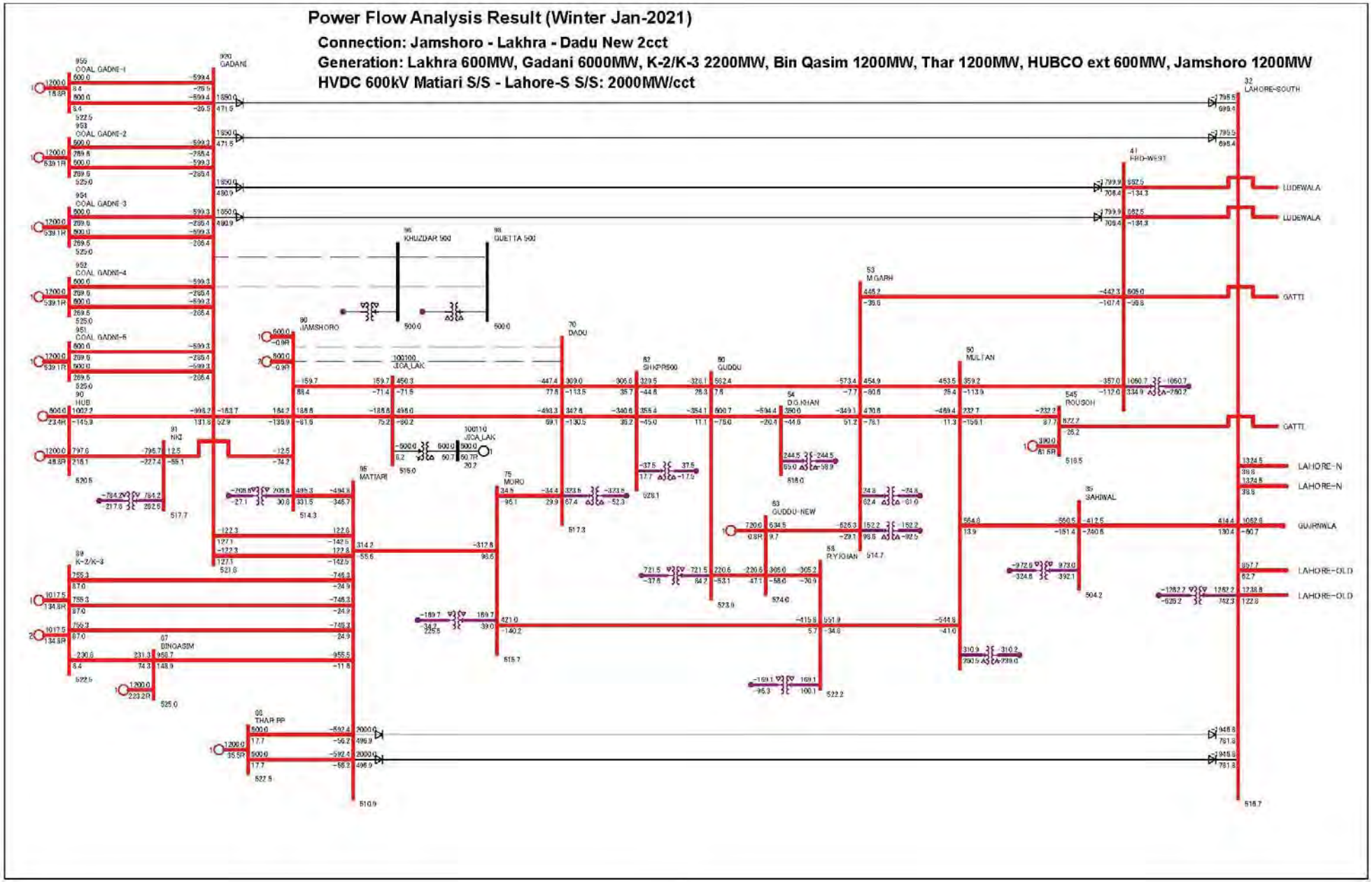




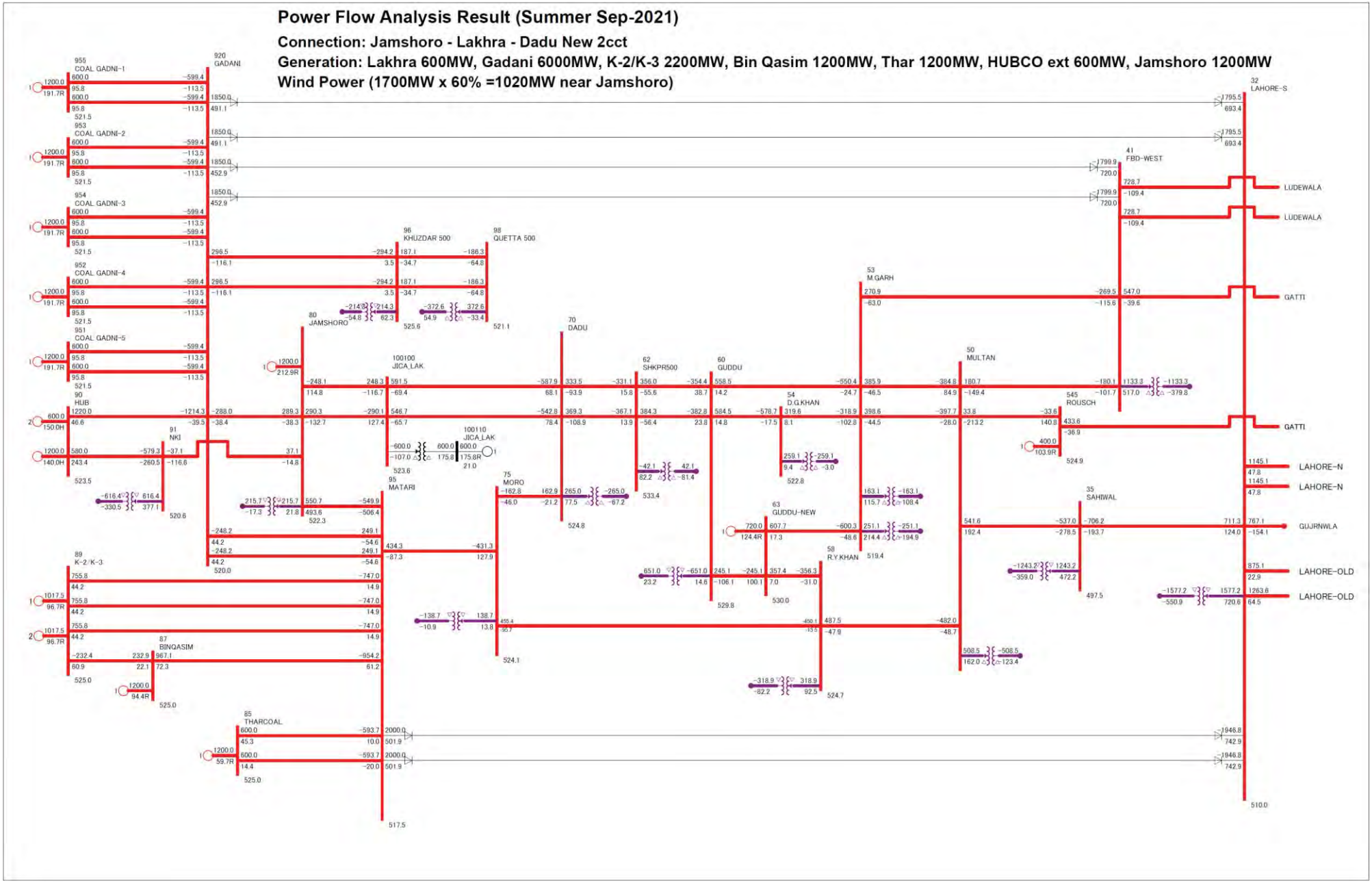
Fault Section: Muzaffargarh S/S – Multan S/S

6 - 7 ADDITIONAL STUDY FOR THE SELECTED CONNECTION SCHEME

Additional Study for the Selected Connection Scheme



Additional Study for the Selected Connection Scheme



Additional Study for the Selected Connection Scheme

Winter 2020 (January-2021)

From	-	To	Voltage	Circuit	Capacity	Normal (Winter)		1cct trip of HVDC			1 circuit trip of 500kV T/L																												
								Matiari - Lahore South ckt 1	Gadani - Lahore South ckt 1	Gadani - Faisalabad West ckt 1	Jamshoro - Lakhra ckt 1	Jamshoro - Lakhra ckt 2	Jamshoro - Matiari	Jamshoro - Gadani	Jamshoro - NKI	Matiari - Moro	Matiari - Gadani ckt 1	Matiari - Gadani ckt 2	Lakhra - Dadu ckt 1	Lakhra - Dadu ckt 2	Dadu - Moro	Moro - R.Y.Khan	R.Y.Khan - Multan	Dadu - Shikarpur ckt 1	Dadu - Shikarpur ckt 2	Shikarpur - Guddu ckt 1	Shikarpur - Guddu ckt 2	Guddu - Muzaffargarh	Guddu - D.G.Khan	Guddu - Guddu New	D.G.Khan - Muzaffargarh	Guddu New - Muzaffargarh	Guddu New - R.Y.Khan	Muzaffargarh - Multan ckt 1	Muzaffargarh - Multan ckt 2	Muzaffargarh - Faisalabad West	Multan - Faisalabad West	Multan - Rousch	Multan - Sahiwal	Sahiwal - Lahore South
			kV		MVA	MVA	%	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA
Jamshoro	-	Lakhra	500	1	1,100	175	15.9%	481	511	511	-	350	266	177	175	252	172	172	79	63	189	203	183	158	155	169	169	173	173	169	174	173	163	175	175	175	175	175	176	175
Jamshoro	-	Lakhra	500	2	1,100	204	18.5%	558	593	593	357	-	309	208	204	293	201	201	92	74	220	236	213	183	180	197	194	201	201	197	203	201	190	203	203	204	204	204	204	204
Jamshoro	-	Matiari	500	1	2,000	605	30.3%	480	631	629	615	618	-	684	600	538	636	636	772	797	641	602	590	656	659	643	644	639	638	645	607	639	659	606	606	606	605	605	604	605
Jamshoro	-	Gadani	500	1	1,400	214	15.3%	302	218	218	215	215	336	-	211	208	247	247	221	223	213	211	214	215	215	215	215	214	214	215	214	214	215	214	214	214	214	214	214	214
Jamshoro	-	NKI	500	1	1,400	76	5.4%	106	288	288	76	76	126	85	-	76	79	79	75	75	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
Matiari	-	Moro	500	1	1,300	328	25.2%	647	612	611	336	339	229	324	328	-	332	332	421	435	306	276	320	332	326	333	334	330	330	334	329	330	336	329	329	328	328	328	328	328
Matiari	-	Gadani	500	1	1,550	189	12.2%	352	268	268	188	188	186	230	186	199	-	233	187	187	196	197	189	193	193	192	192	192	192	192	189	192	193	189	189	189	189	189	189	189
Matiari	-	Gadani	500	2	1,550	189	12.2%	352	268	268	188	188	186	230	186	199	233	-	187	187	196	197	189	193	193	192	192	192	192	192	189	192	193	189	189	189	189	189	189	189
Lakhra	-	Dadu	500	1	1,100	456	41.5%	780	811	811	448	445	556	460	456	538	454	454	-	715	469	491	465	443	441	451	450	454	454	450	455	454	445	456	456	456	456	460	457	456
Lakhra	-	Dadu	500	2	1,100	503	45.7%	857	892	892	494	491	612	507	503	593	500	500	749	-	517	541	512	488	486	497	496	500	500	496	502	500	490	502	502	502	503	503	503	503
Dadu	-	Moro	500	1	2,000	103	5.2%	264	219	219	113	116	193	100	103	131	113	113	238	260	-	372	135	74	75	98	99	106	105	100	101	106	134	102	102	103	104	104	103	104
Moro	-	R.Y.Khan	500	1	1,100	444	40.4%	825	820	821	445	445	429	443	444	429	445	445	457	459	454	-	362	510	522	489	495	463	459	502	457	460	542	450	450	447	442	442	442	444
R.Y.Khan	-	Multan	500	1	1,400	547	39.1%	899	899	892	554	554	548	553	553	550	553	553	555	555	554	463	-	566	568	562	563	689	578	511	622	711	399	595	597	577	544	546	541	555
Dadu	-	Shikarpur	500	1	1,500	330	22.0%	722	726	727	328	328	340	330	330	334	330	330	320	320	326	500	364	-	546	305	302	320	319	304	326	320	287	327	327	328	330	330	330	330
Dadu	-	Shikarpur	500	2	1,500	367	24.5%	797	802	759	366	365	378	367	367	372	367	367	357	356	363	554	405	568	-	340	337	356	356	339	363	357	321	364	364	466	368	368	368	367
Shikarpur	-	Guddu	500	1	1,500	333	22.2%	698	702	703	332	332	340	333	333	338	333	333	326	324	330	497	364	301	295	-	559	315	308	304	336	315	284	330	330	331	333	333	333	333
Shikarpur	-	Guddu	500	2	1,500	359	23.9%	754	757	759	358	358	367	359	359	364	359	359	351	349	356	536	392	324	318	574	-	340	331	327	362	340	306	356	356	357	359	359	359	359
Guddu	-	Muzaffargarh	500	1	1,400	583	41.6%	880	881	884	583	583	583	583	583	583	583	583	581	581	583	607	754	577	576	577	576	-	775	654	689	813	635	569	568	574	585	585	586	583
Guddu	-	D.G.Khan	500	1	1,400	606	43.3%	863	864	866	606	606	606	606	606	606	606	606	604	604	606	625	754	600	599	598	597	788	-	670	359	806	653	595	594	600	608	607	610	604
Guddu	-	Guddu New	500	1	1,500	227	15.1%	566	560	566	226	225	245	228	227	237	228	228	214	213	222	571	118	175	167	189	190	560	553	-	388	298	59	247	248	238	227	230	222	232
D.G.Khan	-	Muzaffargarh	500	1	1,500	353	23.5%	643	644	651	353	353	354	353	353	354	353	353	351	351	353	383	515	349	348	355	355	552	160	420	-	572	396	334	333	337	353	352	350	352
Guddu New	-	Muzaffargarh	500	1	1,500	635	42.3%	957	958	961	635	635	635	635	635	635	635	635	633	633	635	656	827	630	629	629	628	858	840	532	748	-	696	619	618	625	638	637	638	634
Guddu New	-	R.Y.Khan	500	1	1,450	314	21.7%	320	324	317	313	313	328	314	314	323	314	314	304	303	313	616	156	269	261	279	274	425	422	209	363	450	-	347	349	329	308	312	304	318
Muzaffargarh	-	Multan	500	1	1,550	462	29.8%	715	716	668	462	462	463	462	462	463	462	462	461	460	462	494	672	456	455	459	458	405	417	478	421	397	524	-	753	623	403	425	385	477
Muzaffargarh	-	Multan	500	2	1,550	478	30.8%	738	739	690	477	477	478	477	478	478	477	477	476	475	477	511	694	471	470	473	473	419	431	493	435	410	541	762	-	643	416	438	398	492
Muzaffargarh	-	Faisalabad West	500	1	1,733	456	26.3%	663	664	821	456	456	455	456	456	455	456	456	455	454	455	459	488	454	454	455	454	438	441	457	444	434	465	505	508	-	551	506	553	415
Multan	-	Faisalabad West	500	1	2,771	377	13.6%	536	537	738	377	377	376	377	377	377	377	377	377	376	377	372	357	377	377	377	377	382	382	372	377	382	371	351	350	514	-	453	512	330
Multan	-	Rousch	500	1	1,400	281	20.1%	506	507	548	281	281	280	281	281	280	281	281	280	280	282	277	299	281	281	281	281	301	302	281	283	307	287	272	275	398	398	-	420	270
Multan	-	Sahiwal	500	1	1,500	581	38.7%	1,004	1,003	687	581	581	580	581	581	581	581	581	580	580	581	576	556	581	580	581	581	579	579	579	578	578	573	559	558	660	657	630	-	760
Sahiwal	-	Lahore South	500	1	1,600	478	29.9%	464	466	436	478	478	479	478	478	478	478	478	479	479	478	481	491	478	479	478	478	481	482	479	479	482	482	487	488	412	437	451	756	-

Summer 2021 (September-2021)

From	-	To	Voltage	Circuit	Capacity	Normal (Summer)		1cct trip of HVDC			1 circuit trip of 500kV T/L																												
								Matiari - Lahore South ckt 1	Gadani - Lahore South ckt 1	Gadani - Faisalabad West ckt 1	Jamshoro - Lakhra ckt 1	Jamshoro - Lakhra ckt 2	Jamshoro - Matiari	Jamshoro - Gadani	Jamshoro - NKI	Matiari - Moro	Matiari - Gadani ckt 1	Matiari - Gadani ckt 2	Lakhra - Dadu ckt 1	Lakhra - Dadu ckt 2	Dadu - Moro	Moro - R.Y.Khan	R.Y.Khan - Multan	Dadu - Shikarpur ckt 1	Dadu - Shikarpur ckt 2	Shikarpur - Guddu ckt 1	Shikarpur - Guddu ckt 2	Guddu - Muzaffargarh	Guddu - D.G.Khan	Guddu - Guddu New	D.G.Khan - Muzaffargarh	Guddu New - Muzaffargarh	Guddu New - R.Y.Khan	Muzaffargarh - Multan ckt 1	Muzaffargarh - Multan ckt 2	Muzaffargarh - Faisalabad West	Multan - Faisalabad West	Multan - Rousch	Multan - Sahiwal	Sahiwal - Lahore South
			kV		MVA	MVA	%	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA
Jamshoro	-	Lakhra	500	1	1,100	249	22.6%	599	589	589	-	553	364	352	342	540	343	343	208	223	301	348	340	314	309	331	330	335	330	333	346	335	333	341	340	341	341	400	341	340
Jamshoro	-	Lakhra	500	2	1,100	291	26.5%	695	684	684	563	-	423	408	396	627	398	398	242	259	349	404	395	365	360	384	383	390	384	387	402	387	387	396	396	396	396	395	396	396
Jamshoro	-	Matiari	500	1	2,000	551	27.6%	754	624	624	759	763	-	747	654	565	579	579	772	756	690	616	640	655	657	650	651	647	648	650	643	647	652	644	644	644	644	644	644	644
Jamshoro	-	Gadani	500	1	1,400	290	20.7%	437	70	70	294	295	464	-	307	288	374	374	322	318	299	308	300	305	307	299	300	299	303	296	290	299	294	295	295	295	296	296	296	295
Jamshoro	-	NKI	500	1	1,400	38	2.7%	184	223	223	123	123	199	160	-	122	150	150	130	129	124	126	124	126	126	124	124	124	125	123	122	124	123	123	123	123	123	123	123	123
Matiari	-	Moro	500	1	1,300	435	33.5%	848	774	774	467	472	255	527	531	-	545	545	724	703	616	428	512	531	532	536	537	530	525	543	539	529	549	532	532	531	531	530	531	531
Matiari	-	Gadani	500	1	1,550	250	16.1%	512	46	46	256	256	87	363	286	312	-	373	282	282	271	295	282	284	286	279	279	279	283	275	271	279	273	276	276	276	276	276	276	276
Matiari	-	Gadani	500	2	1,550	250	16.1%	512	46	46	256	256	87	363	286	312	373	-	282	282	271	295	282	284	286	279	279	279	283	275	271	279	273	276	276	276	276	276	276	276
Lakhra	-	Dadu	500	1	1,100	592	53.8%	982	971	972	584	580	703	691	679	907	680	680	-	1053	631	692	677	653	649	668	666	672	666	671	680	671	671	678	678	678	678	678	678	678
Lakhra	-	Dadu	500	2	1,100	547	49.7%	910	899	900	540	536	651	639	628	839	629	629	1020	-	584	640	626	604	600	618	617	621	616	621	633	621	621	627	627	627	627	627	627	627
Dadu	-	Moro	500	1	2,000	163	8.2%	165	206	205	158	154	341	177	171	615	162	162	75	74	-	261	102	254	270	222	229	192	190	239	184	190	280	176	177	173	170	171	169	172
Moro	-	R.Y.Khan	500	1	1,100	456	41.5%	821	805	803	466	466	452	544	542	490	545	545	547	547	498	-	448	625	639	602	610	563	554	632	563	560	672	549	549	545	540	540	541	542
R.Y.Khan	-	Multan	500	1	1,400	482	34.4%	813	810	802	490	490	487	562	561	547	562	562	558	559	551	447	-	574	577	570	572	699	685	504	642	721	390	602	603	578	553	556	548	563
Dadu	-	Shikarpur	500	1	1,500	334	22.3%	698	682	682	344	343	358	427	422	426	425	425	398	401	447	620	452	-	692	384	380	406	401	381	423	406	370	419	419	421	422	422	422	422
Dadu	-	Shikarpur	500	2	1,500	370	24.7%	771	753	753	382	387	398	473	468	472	471	471	442	444	495	685	501	720	-	426	421	450	444	422	469	451	411	465	465	466	468	468	468	467
Shikarpur	-	Guddu	500	1	1,500	357	23.8%	703	698	699	359	359	369	437	436	444	437	437	420	422	456	630	463	389	380	-	726	415	405	392	442	415	380	433	433	434	436	436	346	435
Shikarpur	-	Guddu	500	2	1,500	385	25.7%	758	753	754	387	387	397	472	470	478	471	471	453	455	492	679	500	419	410	746	-	447	436	422	476	447	410	467	467	468	470	470	470	469
Guddu	-	Muzaffargarh	500	1	1,400	559	39.9%	843	843	846	559	559	560	622	621	620	622	622	615	616	625	650	786	611	609	612	611	-	823	722	747	864	685	608	607	615	623	623	623	620
Guddu	-	D.G.Khan	500	1	1,400	585	41.8%	818	811	813	585	584	587	638	636	630	637	637	627	628	639	653	780	623	620	623	621	832	-	727	340	851	696	625	625	631	638	637	639	635
Guddu	-	Guddu New	500	1	1,500	246	16.4%	583	594	589	265	264	281	351	351	381	350	350	341	340	391	777	235	295	287	304	307	693	666	-	524	308	163	367	370	363	355	363	340	360
D.G.Khan	-	Muzaffargarh	500	1	1,500	320	21.3%	647	662	666	336	336	334	398	401	409	399	399	405	405	448	557	402	401	404	405	605	162	487	-	626	451	387	387	395	404	406	399	402
Guddu New	-	Muzaffargarh	500	1	1,500	608	40.5%	915	915	918	608	608	609	676	676	673	676	676	669	670	679	699	861	666	664	667	666	911	890	531	809	-	751	660	660	668	678	677	678	674
Guddu New	-	R.Y.Khan	500	1	1,450	358	24.7%	368	377	803	357	357	368	562	359	392	357	357	353	353	395	745	106	300	290	313	307	486	482	205	420	514	-	392	394	375	356	360	350	364
Muzaffargarh	-	Multan	500	1	1,550	386	24.9%	654	659	609	394	394	394	450	451	454	450	450	449	449	455	493	661	443	442	446	445	393	402	474	413	384	523	-	732	573	409	430	373	474
Muzaffargarh	-	Multan	500	2	1,550	399	25.7%	668	673	622	401	401	401	458	459	462	458	458	457	458	463	502	676	452	450	454	453	397	407	482	418	388	534	739	-	585	419	447	375	487
Muzaffargarh	-	Faisalabad West	500	1	1,733	271	15.6%	519	523	657	294	293	293	341	341	341	341	341	339	340	342	345	376	339	339	340	340	323	325	342	327	321	353	390	393	-	405	360	452	275
Multan	-	Faisalabad West	500	1	2,771	181	6.5%	416	419	578	236	236	235	275	276	273	275	275	274	274	275	270	264	276	275	276	275	284	283	275	283	286	272	250	257	379	-	318	417	220
Multan	-	Rousch	500	1	1,400	34	2.4%	406	408	422	220	220	220	246	246	243	246	246	245	245	247	246	285	247	248	247	247	279	277	254	279	288	259	226	264	308	326	-	308	286
Multan	-	Sahiwal	500	1	1,500	541	36.1%	967	969	705	609	609	608	667	667	666	667	667	665	666	667	661	641	666	666	667	667	663	663	664	661	661	660	651	645	720	707	672	-	942
Sahiwal	-	Lahore South	500	1	1,600	713	44.6%	416	416	674	730	730	731	662	662	663	662	662	663	663	662	666	674	662	663	662	662	665	665	664	664	666	666	669	672	624	635	655	987	-

a6.7 Additional Study for the Selected Connection Scheme

Additional study for case 1 selected as the connection method was carried out using the updated PSS/E analysis model files provided by NTDC in April 2014.

The planned power plants assumed in the analysis model for both power flow and transient stability studies are shown in Table a6.7-1. The light blue cells show the information additionally provided by NTDC in April 2014. According to NTDC, HUBCO extension unit will start operation in 2019, and the wind power plants to be located near Jamshoro area will start operation in 2016.

Table a6.7-1 Power Plants Assumed in PSS/E Analysis Model

Name of Power Plant	Total Output	Unit Capacity and Number of Units
Lakhra	600MW	600MW x 1 unit
Gadani	6,000MW	600MW x 10 units
K-2/K-3	2,200MW	1,100MW x 2 units
Bin Qasim	1,200MW	600MW x 2 units
Thar	1,200MW	600MW x 2 units
Jamshoro	1,200MW	600MW x 2 units
HUBCO (Extension)	600MW	600MW x 1 unit
Wind Power	1,020MW	60% of 1,700MW in total

Source: JICA Survey Team

a6.7.1 Power Flow Analysis

Power flow analysis for both winter and summer peak conditions were conducted under normal operation and N-1 contingency conditions.

There was neither overloaded 500kV transmission section nor 500kV buses with voltages out of allowable range.

a6.7.2 Fault Current Analysis

Fault current of the 500kV buses in the south system was carried out depending on the difference in the connection schemes. The PSS/E analysis model for the fault current analysis was provided by NTDC in April 2014. Both the 3-phase short-circuit (3LS) fault current and the single-line-to-ground fault (1LG) current were calculated.

The standard IEC909 technique which is embedded in PSS/E Ver. 33.4.0 was used to calculate the maximum 3LS currents and those of 1LG fault conditions at all the bus bars of the 500 kV power system in the southern area.

The calculation results are summarized in Table a6.7-2. The maximum fault current was approximately 48.0kA at Gadani switching station under 1LG condition. Therefore, it may be necessary to adopt the circuit breaker with the standard breaking capacity rating of 50kA or 63kA at Gadani switching station. For other substations or switching stations, the required standard breaking capacity rating of the circuit breakers may be 40kA or 50kA.

Table a6.7-2 Fault Current Summary

Bus Name	Voltage (kV)	Fault Current (A)					
		Without Lakhra PP		With Lakhra PP		Increase	
		3LS	1LG	3LS	1LG	3LS	1LG
Lahore South	500	23,970	17,472	23,972	17,472	2	1
Shahiwal	500	14,377	9,750	14,378	9,750	2	1
Multan	500	24,155	19,650	24,171	19,658	16	7
Muzaffargarh	500	23,715	19,689	23,737	19,700	21	10
D. G. Khan	500	11,999	7,715	12,008	7,718	9	3
R. Y. Khan	500	12,001	9,102	12,030	9,117	29	14
Guddu	500	21,551	20,582	21,620	20,631	69	49
Shikarpur	500	16,540	12,909	16,649	12,990	110	81
Guddu-New	500	21,047	20,126	21,112	20,171	64	45
Dadu New	500	18,996	13,650	19,459	14,106	463	456
Moro	500	14,631	9,950	14,856	10,136	225	186
Jamshoro	500	35,153	31,776	37,243	34,908	2,090	3,132
Thar Coal	500	12,033	12,519	12,101	12,573	67	54
Bin Qasim	500	15,163	14,829	15,256	14,893	93	64
K-2/K-3	500	21,594	21,925	21,808	22,087	214	162
HUBCO	500	26,812	26,118	26,985	26,234	173	117
NKI	500	22,572	18,042	22,731	18,125	159	84
Matiari	500	35,187	28,572	36,448	29,696	1,262	1,123
Rousch	500	14,524	12,676	14,528	12,677	3	2
Gadani	500	42,881	47,644	43,290	47,988	408	344
Gadani-U#9-10	500	33,728	34,261	33,958	34,421	230	160
Gadani-U#7-8	500	33,728	34,261	33,958	34,421	230	160
Gadani-U#3-4	500	33,728	34,261	33,958	34,421	230	160
Gadani-U#5-6	500	33,700	34,251	33,929	34,411	230	160
Gadani-U#1-2	500	33,728	34,261	33,958	34,421	230	160
JICA Lakhra PP	500	N/A	N/A	30,561	26,801	N/A	N/A

Source: JICA Survey Team

a6.7.3 Transient Stability Analysis

Transient Stability analysis was not conducted due to lack of dynamic data of 600 kV HVDC transmission line. The dynamic data was processed to be modified by other consultant employed by NTDC.

a6.7.4 Conclusion

In addition, it was confirmed no overloading occurred to the system under both normal operation and N-1 contingency condition with the selected connection method for Lakhra CFPP in case additional Power Plants requested by NTDC such as HUBCO extension and wind power generation were included. Also, no voltage violation occurred to the 500kV bus bars. The fault currents at all 500kV bus bars in the power system in southern area are below the standard rating of the breaking capacity of the circuit breakers even after connection of Lakhra CFPP to the power system. The transient stability analysis was not conducted with incorporation of the all planned power plants requested by NTDC since the updated dynamic data was on the modification process by NTDC, so that NTDC accepted the power system analysis with the assumed power system case in case 1.

7 - 1 COMPARISON FOR COOLING METHODS BETWEEN AIR-DRIED AND WET COOLING

Comparison for coolingmethods between dried air cooling at Qasim and wet cooling at Lakhra

Natural draft cooling tower system in Lakhra and Dry air cooled system near Karachi are analytically investigated and the effect of Wet bulb temperature change and dry bulb temperature change are evaluated respectively for power output and condenser vacuum in detail.

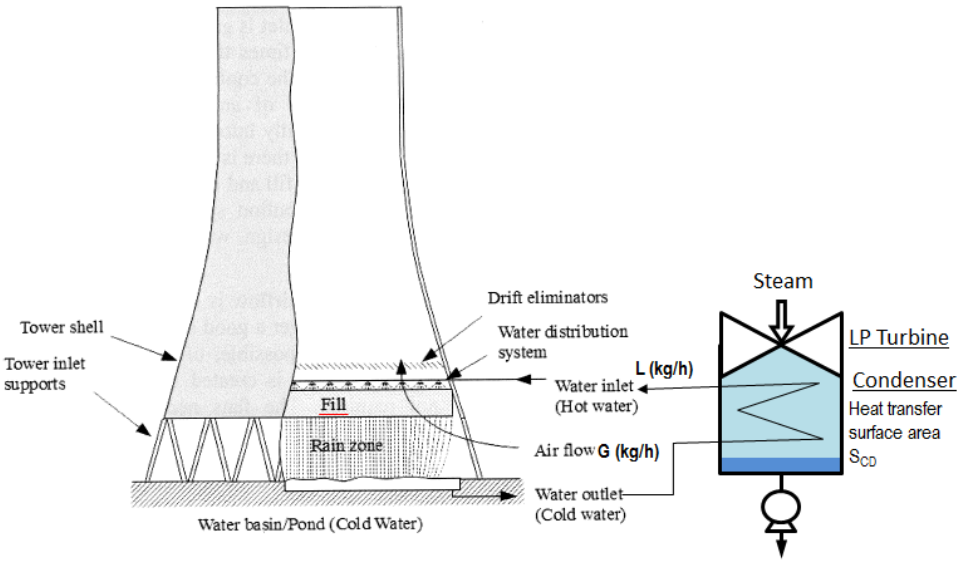
(1) Study of natural draft cooling tower system in Lakhra

1) Base conditions for cooling tower and condenser system is as follows.

Table A7.x-1. Base conditions for cooling tower and condenser system

Parameters	Data	Notes
System configuration		Figure 7.a
Power output	660MW	Gross output
Wet bulb Air Temperature	28.6 °C	Dry bulb temp: 41.5 °C & Relative humidity: 39% (From weather report data)
Turbine exhaust Vacuum	83mmHga	
Cooling Tower Diameter	110m	
Cooling Tower Height	140m	
Condenser surface area	37,200m2	
Additional cases for wet bulb temperatures		28.6 (+3, +6, -3, -6) °C

Source: JICA SurveyTeam



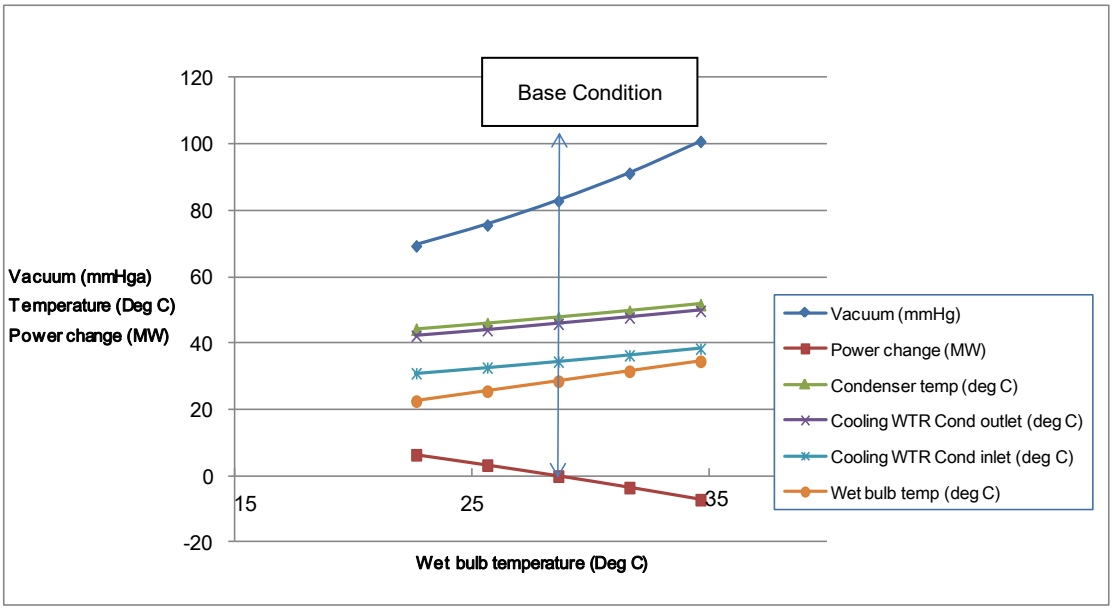
Source: JICA Survey Team

Figure A7.x-1 Schematic Diagram of Cooling Water System

Comparison for coolingmethods between dried air cooling at Qasim and wet cooling at Lakhra

2) Output of the analysis

Figure A7.x-2 shows the condenser data in accordance with the wet bulb temperature change.



Source: JICA Survey Team

Figure 7.x-2 Cooling System Data Corresponding to the Wet Bulb Temperature

Essential result of the output is shown in table A7.x-2.

Table A7.x-2 Essential Result of natural draft cooling tower system

Item	Unit	Wet bulb Temperature change				
Wet bulb Temperature	°C	22.6 (-6.0)	25.6 (-3.0)	28.6	31.6 (+3.0)	34.6 (+6.0)
Condenser Vacuum	mmHga	69.4	75.7	83.0	91.3	100.9
Power output	MW	666.4	663.3	660.0	656.5	652.9
Power change	MW	+6.4	+3.3	(Base point)	-3.5	-7.1

Source: JICA Survey Team

Power output of the steam turbine is decreased when the wet bulb temperature is increased.

This decrease, for example, is owing to the increase of the condenser vacuum which corresponds to the increase of wet bulb temperature.

Comparison for coolingmethods between dried air cooling at Qasim and wet cooling at Lakhra

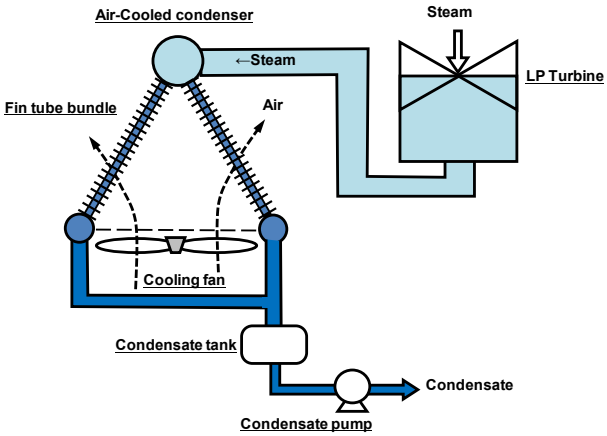
(2) Analytical study of dry air cooled system near Karachi

1) Base conditions for dry air cooled system is as follows.

Table A7.x-3 Base Condition of dry air cooled system

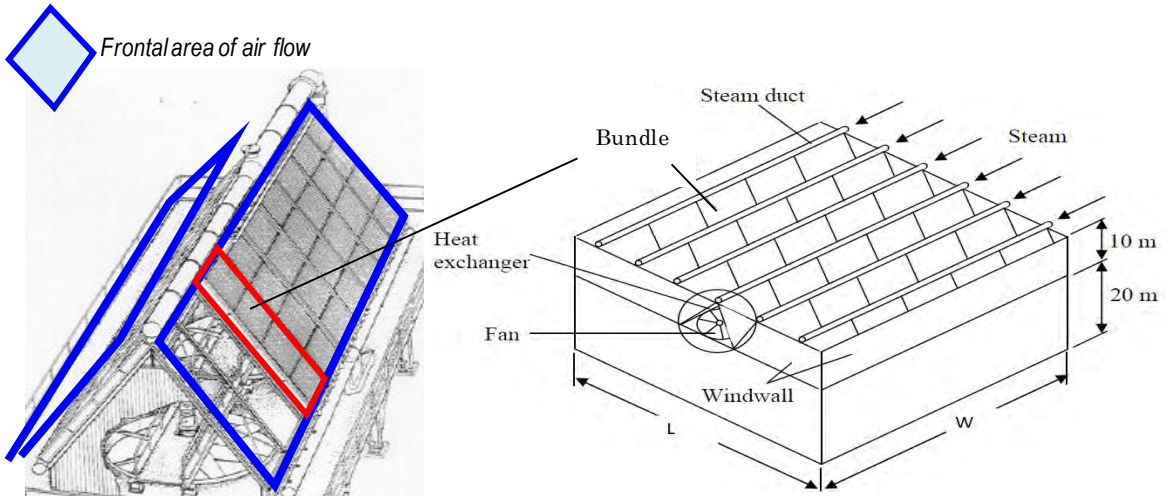
Parameters	Data	Notes
System configuration		Figure 7.a & Figure 7.b
Power output	660MW	Gross output
(Dry bulb) Air Temperature	30 °C	
ITD (Initial temperature difference)	25 °C	ITD= Condenser temperature – Air temperature
Turbine exhaust Vacuum	118mmHga	Condenser temperature : 55 °C
Cooling condenser area	8,650m2	
Additional cases for air temperature		30 (+3, +6 , +9, +12) °C

Source: JICA Survey Team



Source: JICA SurveyTeam

Figure A7.x-3 Dry Air-cooled System Configuration forAnalysis



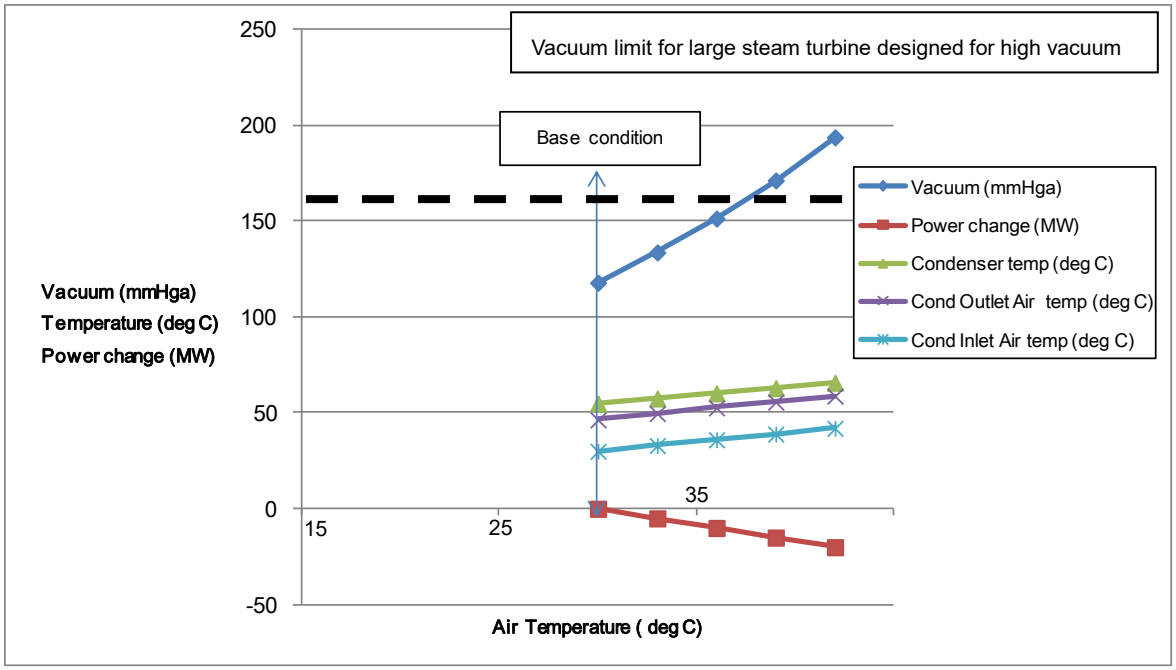
Comparison for coolingmethods between dried air cooling at Qasim and wet cooling at Lakhra

Source: JICA Survey Team

Figure A7.x-4 Schematic Structure of Dry Air-cooled Condenser

2) Output of the analysis

Figure 7. d shows the condenser data in accordance with the (dry bulb) air temperature change



Source: JICA Survey Team

Figure A7.x-5 Cooling system data corresponding to the (dry bulb) air temperature

Table A7.x-4 Essential Result of Output

Item	Unit	Air Temperature change				
Air Temperature	°C	30.0	33.0	36.0	39.0	42.0
Condenser Vacuum	mmHga	118.0	133.8	151.5	171.4	193.9
Power output	MW	660.0	655.0	650.0	644.9	639.9
Power change	MW	(Base point)	-5.0	-10.0	-15.1	-20.1

Source: JICA Survey Team

Power output of the steam turbine is decreased when the air temperature increases. This decrease is owing to the increase of condenser vacuum which corresponds to the increase of air temperature.

Steam turbines have the limitation for the condenser vacuum in order not to overheat the LP turbine last stage.

Large size of steam turbines usually have the condenser vacuum limit of 100mmHga, in case of specially designed turbine, however, 160mmHga will be the limit.

From the above analysis, condenser vacuum will exceed the limit at the air temperature of 39 °C. If the turbine is expected to run over the above temperature under the restriction of vacuum limit, load should be further more reduced.

Comparison for coolingmethods between dried air cooling at Qasim and wet cooling at Lakhra

(3) Comparison of power output between two cooling systems

Two types of condenser cooling system are compared in the following table.

Table A7.x-5 Power Output difference between two cooling systems

Cooling system	Cooling Tower	Dry air cooled system	Note
Site	Lakhra (Karachi)	Karachi	
Nominal power	660MW	660MW	Base condition
Dry bulb air temperature		30 °C	
Wet bulb air temperature	28.6 °C		
Condenser vacuum	83mmHg	118mmHg	
Vacuum difference	Base	+35mmHg	
Plant efficiency diff due to vacuum difference	Base	-2.8%	-2%/25.4mmHg
Equivalent gross power difference	Base	-18.2MW	660 x (-2.8/100)
Main auxiliary load diff. for condenser	4.4MW (CWPs)	9.9MW (Cooling Fans)	
Equivalent net power difference	Base	-23.7MW	-18.2+(4.4-9.9)

Source: JICA Survey Team

Dry bulb air temperature in Karachi is lower than that in Lakhra, on the other hand Humidity in Karachi is higher than that in Lakhra in summer.

As a result from the investigation of whether data, wet bulb temperature in Karachi can be regarded almost as the same in Lakhra for designing of a cooling tower system.

7 - 2 COST CALCULATION FOR 500 KV T/L FOR IN/OUT OF LAKHRA POWER STATION

COST CALCULATION FOR 500 KV T/L FOR IN/OUT OF LAKHRA POWER STATION

In MRs

Sr. No.	Item	Unit	Qty.	Unit price	Total price		Years	Escalation		Escalated price	
				F.E.C.	Local	F.E.C.		Local	F.E.C.	Local	F.E.C.
1.	TOWERS										
	Light angle(AB)	Nos	8	6.0650	0.00	48.52	2	0.00	6.51	0.00	55.03
	Heavy angle(ATB)	Nos	4	6.7125	0.00	26.85	2	0.00	3.60	0.00	30.45
	River crossing	Nos	0	0.0000	0.00	0.00	2	0.00	0.00	0.00	0.00
	Transposition	Nos	0	0.0000	0.00	0.00	2	0.00	0.00	0.00	0.00
	Suspension(SB)	Nos	27	3.1552	0.00	85.19	2	0.00	11.43	0.00	96.62
	Total		**39**	4.1169	**0.00**	**160.56**		**0.00**	**21.54**	**0.00**	**182.10**
2.	CONDUCTOR (GREELY)	**kMs**	**147**	0.4275	**0.00**	**62.89**	**2**	**0.00**	**8.44**	**0.00**	**71.33**
3.	Sheild Wire	**KMs**	**13**	0.0685	**0.00**	**0.90**	**2**	**0.00**	**0.12**	**0.00**	**1.02**
4.	OPGW	**KMs**	**26**	0.2415	**0.00**	**6.28**	**2**	**0.00**	**0.84**	**0.00**	**7.12**
5.	INSULATORS										
	80 KN	Nos	1782	0.0013	0.00	2.29	2	0.00	0.31	0.00	2.60
	160 KN	Nos	11016	0.0037	0.00	41.18	2	0.00	5.53	0.00	46.71
	Total				**0.00**	**43.47**		**0.00**	**5.84**	**0.00**	**49.31**
6.	HARDWARE										
	V Suspension	Nos	85	0.0208	0.00	1.77	2	0.00	0.24	0.00	2.01
	V Jamper	Nos	13	0.0169	0.00	0.22	2	0.00	0.03	0.00	0.25
	Double vee	Nos	0	0.0000	0.00	0.00	4	0.00	0.00	0.00	0.00
	I Tension	Nos	0	0.0000	0.00	0.00	4	0.00	0.00	0.00	0.00
	I Jumper	Nos	26	0.0165	0.00	0.43	2	0.00	0.06	0.00	0.49
	Dead-end	Nos	72	0.0488	0.00	3.51	2	0.00	0.47	0.00	3.98
	DSD1(Dead-end Supporting Devi	Nos	6	0.0400	0.00	0.24	2	0.00	0.03	0.00	0.27
	DSD2(Dead-end Supporting Devi	Nos	6	0.0417	0.00	0.25	2	0.00	0.03	0.00	0.28
	Joint box for OPGW:										
	A-type	Nos	4	0.0137	0.00	0.06	2	0.00	0.05	0.00	0.11
	B-Type	Nos	4	0.0125	0.00	0.05	2	0.00	0.04	0.00	0.09
	OPGW attaching Clamps	Nos	9	0.0011	0.00	0.01	2	0.00	0.01	0.00	0.02
	SS-ASSEMBLY(cleet)	Set	27	0.0141	0.00	0.38	2	0.00	0.32	0.00	0.70
	ST-ASSEMBLY(cleet)	Set	16	0.0194	0.00	0.31	2	0.00	0.26	0.00	0.57
	DT-ASSEMBLY(cleet)	Set	9	0.0356	0.00	0.32	2	0.00	0.27	0.00	0.59
	Total				**0.00**	**7.55**		**0.00**	**1.81**	**0.00**	**9.36**
7.	DAMPERS										
	Dampers for OPGW	Nos	78	0.0018	0.00	0.14	2	0.00	0.02	0.00	0.16
	Spacer dampers	Nos	164	0.0051	0.00	0.83	2	0.00	0.11	0.00	0.94
	Stockbridge dampers	Nos	888	0.0014	0.00	1.24	2	0.00	0.17	0.00	1.41
	Total				**0.00**	**2.21**		**0.00**	**0.30**	**0.00**	**2.51**
8.	GROUNDING SETS										
	Rods	Nos	82	0.0038	0.00	0.31	2	0.00	0.04	0.00	0.35
	Wire	Metres	410	0.0005	0.00	0.22	2	0.00	0.03	0.00	0.25
	Cable to flat connector	Nos	82	0.0006	0.00	0.05	2	0.00	0.01	0.00	0.06
	Cable to rod connector	Nos	82	0.0007	0.00	0.06	2	0.00	0.01	0.00	0.07
	Total				**0.00**	**0.64**		**0.00**	**0.09**	**0.00**	**0.73**
						Total				0.00	323.48

9 - 1 TERMS OF REFERENCE FOR DESIGN AND TENDER ASSISTANCE CONSULTANT FOR THE WORKS UNDER LAKHRA COAL FIRED THERMAL POWER PLANT CONSTRUCTION PROJECT IN PAKISTAN

Terms of Reference for Design and Tender Assistance Consultant for the Works under Lakhra Coal Fired Thermal Power Plant Construction Project in Pakistan

Chapter-1 Background and Project Outline

(1) Background

The Government of Pakistan has received a loan from the Japan International Cooperation Agency (hereinafter referred to as "JICA") to finance the Lakhra Coal Fired Thermal Power Plant Construction Project which is to supply the 600MW (net output) power with ultrasuper critical boiler technology for decreasing power shortage in Pakistan.

The Project comprises of one component of “Power Plant EPC including Water Intake”.

The Government of Pakistan intends to use part of the proceeds of the loan for eligible payments for consulting services for which this ToR is issued.

The Project is expected to be completed by March 2024 including 12 months defect liability period.

Location of the Project is Manjhand Taluka, Jamshoro District in Sindh Province, about 175km northeast of Karachi and about 40km northwest of Hyderabad.

Executing Agency is GENCO IV (hereinafter referred to as “The Employer”) under GENCO Holding Company Limited.

(2) Project package outline

The project tender package will be one which includes following components.

- Improvement to Site
- Foundation and Civil Construction
- Boiler and Auxiliaries
- Coal & Sorbent Preparation and Feed
- Coal & Sorbent handling and Storage
- Ash handling and Disposal
- Stack & duct works
- Turbine Generator and Auxiliaries
- Feed water, Condensate water treatment
- Cooling water system (including cooling tower)
- Electrical equipment and systems

- Controls and Instruments
- Flue gas clean up
- Coal receiver
- Switch Yard (500kV)
- Freight and insurance
- Intake water (including 7.8km water pipe from Indus river)
- Discharge water
- Operation Simulator
- O&M support by EPC contractor

"JICA's Standard Bidding Document under Japanese ODA Loans for Design Build (July 2015)" will be applied for the procurement of contractors.

(3) Technical Information

- Preparatory Survey on Lakhra Coal Fired Thermal Power Plant Construction Project in Pakistan (hereinafter referred to as "Lakhra CTPP P/S")

(4) Related projects:

- Lakhra Railway Project

  Rehabilitation from Kotri to Budapur Station, construct spur line to the Power station from Budapur Station, procurement of locomotives and wagons for transporting the imported coal

  To be conducted by GENCO IV utilizing other finance with the cooperation of Pakistan Railways
- Connecting 500kV Transmission Line Project

  To be conducted by National Transmission and Despatch Company (NTDC) utilizing their own finance

Chapter-2 Objectives of Consulting Services

The consulting services shall be provided by an international consulting firm (hereinafter referred to as "the Consultant") in association with national consultants in compliance with Guidelines for the Employment of Consultants under Japanese ODA Loans, April 2012. The objective of the consulting services is to achieve the efficient and proper preparation and implementation of the Project through the following works:

(1) Basic design

(2) Tender Assistance

(3) Preparation of Draft of Necessary Agreements

(4) Facilitation of implementation of Environmental Management Plan (EMP), Environmental Monitoring Plan (EMoP) and Land Acquisition & Resettlement Action Plan (LARAP)
(5) Technology transfer

Chapter-3 Scope of Consulting Services

(1) Basic design

The Consultant shall:

(a) Review and verify all available primary and secondary data collected during the JICA's preparatory survey for the Project;
(b) Carry out all the required engineering surveys and investigations such as topographical survey, hydrological survey, geotechnical survey, material availability survey, etc, as applicable to the concerned project components.
(c) Prepare basic work plan, progress reports and implementation schedule for the Project to ensure effective monitoring and timely project outputs, and regularly update the same;
(d) Prepare the basic design of the Project in sufficient detail to ensure clarity and understanding by the Employer, the Contractors and other relevant stakeholders. All the design should be in conformity with the Pakistani Standards (if available), or with the appropriate international standards. The basic design will, as a minimum, include construction drawings, necessary calculations to determine and justify the engineering basis for the Project, associated contract documentation to include specifications, implementation schedule for the Project. Such specifications will contain those in relation to i) quality control of plant materials and workmanship, ii) safety, and iii) protection of the environment. The basic design shall be prepared in close consultation with, and to meet the requirements of the Employer and will be incorporated into the basic design report to be submitted for approval of the Employer.
(e) Carry out sedimentation prediction of intake point of fresh water in Indus River; and
(f) Carry out power system analyses taking up-dated power grid plan to be provided by NTDC.

(2) Tender assistance

【Assistance in the Bidding Procedures】

The Consultant shall:

(a) Define technical and financial requirements, capacity and/or experience for Pre-Qualification(PQ) criteria taking into consideration technical feature of the Project;

(b) Prepare bidding documents in accordance with the latest version of Standard Prequalification Documents under Japanese ODA Loans, and the latest version of Standard Bidding Documents under Japanese ODA Loans for "Procurement of Electrical and Mechanical Plant, and for Building and Engineering Works, Designed by the Contractor" together with all relevant specifications, drawings and other documents;

(c) Prepare bidding documents which includes i) clauses to have the Contractor comply with the requirement of the Environmental Management Plan (EMP) and JICA Guidelines for environmental and social considerations (April 2010) (JICA Environmental Guidelines) , ii) the specification clearly stipulating the safety requirements in accordance with the laws and regulations in the country of the Borrower, relevant international standards (including guidelines of international organization), if any, and also in consideration of "the Guidance for the Management of Safety for Construction Works in Japanese ODA Projects of JICA," iii) the requirement to furnish a safety plan to meet the safety requirements, iv) the requirement for the personnel for key positions to include an accident prevention officer, and v) the requirement to submit method statements of safety to (name of Executing Agency) and the consultant at the construction stage.

(d) Assist the Employer in issuing bid invitation, conducting pre-bid conferences, issuing addendum/corrigendum, and clarifications to bidders' queries.

(e) Evaluate bids in accordance with the criteria set forth in the bidding documents. In such evaluation, the Consultant shall carefully confirm that bidders' submissions in their technical proposal including, but not limited to; site organization, mobilization schedule, method statement, construction schedule, safety plan, and EMP, have been prepared in consistent with each other and meet requirements set forth in applicable laws and regulations, specifications and other parts of the bidding documents;

(f) Prepare a bid evaluation report for approval of the bid evaluation committee;

(g) Assist the Employer in contract negotiation by preparing agenda and facilitating negotiations including preparation of minutes of negotiation meeting; and

(h) Prepare a draft and final contract agreement.

(3) Preparation of Draft of Necessary Agreements

The Consultant shall prepare drafts of agreements necessary for the Project as shown in Table 3-1.

Table 3-1 Necessary Agreements

Tentative Name of Agreement	Concerned Party	Contents
1. Coal Supply Agreement	➢ GHCL/LPGCL ➢ Coal Supplier	Import of coal from country of origin to Pakistan International Bulk Terminal (PIBT)
2. Coal Loading Agreement	➢ GHCL/LPGCL ➢ PIBT	Unload imported coal at PIBT
3. Coal Transportation Agreement (PIBT to Railway)	➢ GHCL/LPGCL ➢ Port Qasim Authority (PQA)	Transportation (about 4.5 km) from PIBT to Loading Station in Qasim Port
4. Inland Coal Transportation Agreement (ICTA)	➢ GHCL/LPGCL ➢ Pakistan Railway Flight Company(PRFC)/Pakistan Railways(PR)	➢ Consignment to PRFC/PR for - Construction of dedicated spur line (about 7 km) between Budapur and the plant - Rehabilitation of existing line (about 40 km) from Kotri to Budapur. - Procurement of Locomotives/Wagons - Coal Transportation from Loading Station in Qasim Port to the plant
5. Power Purchase Agreement	➢ GHCL/LPGCL ➢ NTDC	Sale/Purchase of Electricity generated by GHCL/LPGCL

(4) Facilitation of implementation of Environmental Management Plan (EMP), Environmental Monitoring Plan (EMoP) and Land Acquisition

and Resettlement Action Plan (LARAP)

The Consultant shall:

(a) Update Project's Environmental Management Plan (EMP) as appropriate; incorporate necessary technical specifications with design and contract documentation;

(b) During the preparation of bidding documents, clearly identify environmental responsibilities as explained in the EIA and EMP;

(c) Assist the Employer to review the Environmental Program to be prepared by the construction contractor in accordance with EMP, relevant plans and JICA Environmental Guidelines and to make recommendations to The Employer regarding any necessary amendments for its approval

(d) Update LARAP as necessary based on detailed design in accordance with the agreed framework defined in existing LARAP, including entitlement matrix, compensation plan and income restoration plan; coordinate with various agencies in preparing the procedures for timely land acquisition and disbursement of compensation to project affected persons (PAPs);

(e) Assist the Employer in identifying the eligible PAPs, and in updating of the list of eligible PAPs and prepare for 'Payment Statement' for individual eligible PAPs.;

(f) Assist the employer in conducting social assessment during early stage of the detailed design stage and review the framework existing LARAP and revise/update the contents if necessary;

(g) Monitor land acquisition and compensation activities being undertaken by the Employer and/or competent authorities, and report the results in monthly progress reports;

(h) Assist in procurement of external monitoring agency (EMA);

(i) Assist the Employer in facilitating stakeholder's participation (including focus group discussions for vulnerable PAPs) and providing feedback their comments on LARAP;

(j) Assist the Employer in establishment of grievance redress mechanism including formation of Grievance Redress Committee;

(k) Assist the Employer to ensure that the PAPs are fully aware of the grievance redress procedure and the process of bringing their complaints, investigate the veracity of the complaints, and recommends actions/measures to settle them amicably, fairly and transparently before they go to the redress committee or the courts of law;

(l) Confirmation of contents of EMP, EMoP and LARAP for the railway and transmission line projects respectively dedicated to the project, and report to the Employer and JICA;
(m) Confirmation of results of monitoring to be done in accordance with LARAP for the railway project dedicated to the project, and report to the Employer and JICA;
(n) Provide technical services with grievance redress committee for keeping and updating records when necessary;
(o) Assist the Employer in capacity building of the Employer officers and staffs on land acquisition and resettlement activities through on the job training;
(p) Conduct simulation for ambient air and noise level based on the final spec of the power plant and the conclusion of treatment of the existing Lakhra power plant; and
(q) Evaluate the result of the simulation.

(5) Technology transfer

The Consultant shall carry out the technology transfer as an important aspect in design works. The Consultant shall provide the opportunity to the Employer officers and staffs to be involved in the working team of the Consultant during the design works for their capacity building wherever possible. If requested by the Employer, the Consultant shall brief and demonstrate the survey and design procedure, contract management process and procedures. The Consultant shall assist the Employer and its staff to build their capacity as a part of on the job training under the Project.

(a) Develop Safety Manual in consideration of Pakistani labor act, the JICA's Safety and Quality Control System Checklist and the contents of the Environmental, Health, and Safety Guidelines published by International Finance Corporation.
(b) Develop Basic Education and Training manual.
(c) Develop Environmental Management manual

Chapter -4 Expected Time Schedule

The total duration of consulting services will be 79.5 months. The implementation schedule expected is as shown in Table 4-1.

Table 4-1 Implementation Schedule Expected

Key Activities	Date	Duration in Months
Commencement of Consulting Services (Basic Design and Tender Assistance)	1 August 2017	6
Completion of basic design, preparation of drawings and tender documents	1 August 2017 to 31 January 2018	
Tender process of EPC contractor	1 February 2018 to 30 November 2018	10
Contract Negotiation to EPC contractor	1 December 2018 to 15 February 2019	2.5
Preparation period by the EPC contractor	15 February 2019 to 14 March 2019	1
Commencement of Consulting Services (Construction Supervision)	*15 January 2019*	―
Commencement of EPC works	15 March 2019	48
Commissioning	15 June 2022	
Commercial operation date	15 March 2023	
Defect Liability Period	15 March 2024	12
Total months		79.5

Chapter-5 Staffing (Expertise required)

●● of Professional (A), international, Consultants and ●● of Professional (B), national, consultants will be engaged, for a total of ●● man-months for Professional (A) and ●● man-months for Professional (B). Total consulting input is ●● man-months.

(1) Qualification of key Team Members

Qualification of key Team Members The qualification of team member of professional (A) and key team member of professional (B) are is shown in Table 5-1 and 5-2 respectively.

Table 5-1: Qualification of Team Members of professional (A)

	Designation	Qualification
1	Project Manager (Plant)	Education: ・Graduate in Electrical or Mechanical Engineering Experience: ・ Experience in Power plant or related field: 15 years or more ・ Experience of construction supervision for two thermal plant projects, of which one is in ICB contract with amount is more than USD 100 million ・ at least one experience of leading a consultants' team as the Project Manager or the Deputy Project Manager
2	Mechanical Engineer (Boiler)	Education: ・ Graduate in Mechanical Engineering Experience: ・ Experience in design of boiler or boiler auxiliary equipment - 7 years ・ Experience in construction supervision of boiler or boiler auxiliary and auxiliary equipment - 3 years
3	Mechanical Engineer (Steam Turbine)	Education: ・ Graduate in Mechanical Engineering Experience: ・ Experience in design of turbine and auxiliary equipment - 7 years ・ Experience in construction supervision of turbine and auxiliary equipment - 3 years
4	Pollution Abatement Engineer	Education: ・ Graduate in Chemical, Mechanical or Electrical Engineering Experience:

		・ Experience in design of pollution abatement facilities for coal thermal power plant - 7 years ・ Experience construction supervision of pollution abatement facilities for coal thermal power plant - 3 years
5	Instrumentation and Control Engineer	Education: ・Graduate in Electrical Engineering Experience: ・ Experience in design of instrumentation and control for power plant - 10 years ・ Experience in construction supervision of instrumentation and control for power plant-5 years
6	Civil Engineer	Education: ・ Graduate in Civil Engineering Experience: ・ Experience in civil design in power plant - 10 years ・ Experience in construction supervision of civil structure in power plant - 5 years
7	Contract Expert	Education: ・ N/A Experience: ・ Experience in contract expert for the plant projects – 7 years ・ Experience in contract expert for the project applying Standard Bidding Documents of defined by JICA - 3 years
8	Environmental Specialists	Education: ・ Graduate in Environmental Management Experience: ・ Experience in environmental management of power plant projects - 5 years

Table 5-2: Qualification of key Team Members of professional (B)

	Designation	Qualification
1	Deputy Project Manager (Plant)	Education: ・Graduate in Electrical or Mechanical Engineering Experience: ・ Experience in Power plant or related field: 15 years
2	Environmental Specialists	Education: ・ Graduate in Environmental Management Experience: ・ Experience in environmental management of

		power plant projects - 3 years

Consultant may propose other experts and supporting staffs required to accomplish the tasks outlined in the ToR. It is the Consultant's responsibility to select the optimum team and to propose the professionals which he believes best meets the needs of the Employer.

(2) Scope of works for the respective personnel

Detailed information on the major tasks and duties each member of the detailed engineering design team and the construction supervision team shall perform is provided as follows:

A-1 Project Manager

Basic Design

1) Lead to review and verify all available primary and secondary data collected during the JICA's preparatory survey for the Project.
2) Lead to carry out all the required engineering surveys and investigations such as topographical survey, hydrological survey, geotechnical survey, material availability survey, etc, as applicable to the concerned project components.
3) Prepare basic work plan, progress reports and implementation schedule for the Project.
4) Lead to prepare the basic design of the Project.

Tender Assistance

5) Lead to prepare bidding documents.
6) Assist the Employer in issuing bid invitation, conducting pre-bid conferences, issuing addendum/corrigendum, and clarifications to bidders' queries.
7) Lead to evaluate bids in accordance with the criteria set forth in the bidding documents.
8) Lead to prepare bid evaluation report for approval of the bid evaluation committee.
9) Assist the Employer in contract negotiation by preparing agenda and facilitating negotiations including preparation of minutes of negotiation meeting.
10) Prepare a draft and final contract agreement.

Preparation of Draft of Necessary Agreements

11) Lead to prepare draft of necessary agreements.

Technology Transfer

12) Lead to carry out the technology transfer

A-2, B-2　Mechanical Engineer (Boiler)

A-3, B-3　Mechanical Engineer (Steam Turbine),

A-4, B-4　Mechanical Engineer (Coal Handling),

A-5, B-5　Mechanical Engineer (Balance of Plant),

A-6, B-6　Pollution Abatement Engineer,

A-7, B-7　Electrical Engineer(Power Plant, Balance of Plant),

A-8, B-8　Electrical Engineer(Switching Station),

A-9, B-9　Instrumentation and Control Engineer

A-10, B-10　Water Supply and Waste Water Treatment Engineer

Tasks of aforesaid nine engineers are each engineering part,

Basic Design

1) Review and verify all available primary and secondary data collected during the JICA's preparatory survey for the Project.
2) Carry out all the required engineering surveys and investigations such as material availability survey, etc, as applicable to the concerned project components.
3) Prepare basic design of the Project.

Tender Assistance

4) Prepare bidding documents
5) Assist the Employer in conducting pre-bid conferences, issuing addendum/corrigendum, and clarifications to bidders' queries.
6) Evaluate bids in accordance with the criteria set forth in the bidding documents.
7) Prepare bid evaluation report.

Technology Transfer

8) Carry out the technology transfer

A-11, B-11 Civil Engineer

A-12, A-12 Architectural Engineer

Basic Design

1) Review and verify all available primary and secondary data collected during the JICA's preparatory survey for the Project.
2) Carry out all the required engineering surveys and investigations such as topographical survey, hydrological survey, geotechnical survey, material availability survey, etc, as applicable to the concerned project components.
3) Prepare basic work plan, progress reports and implementation schedule for the Project
4) Prepare basic design of the Project.

Tender Assistance

1) Prepare bidding documents.
2) Assist the Employer in conducting pre-bid conferences, issuing addendum/corrigendum, and clarifications to bidders' queries.
3) Evaluate bids in accordance with the criteria set forth in the bidding documents.
4) Prepare bid evaluation report.

Technology Transfer

5) Carry out the technology transfer

A-15, B-13 Safety Control Specialist

Tender Assistance

1) Prepare bidding documents in safety control part.
2) Assist the Employer in conducting pre-bid conferences, issuing addendum/corrigendum, and clarifications to bidders' queries.
3) Evaluate bids in accordance with the criteria set forth in the bidding documents.
4) Prepare bid evaluation report.

Technology Transfer

5) Carry out the safety control knowledge transfer

A-16 Power System Analysis Specialists

Basic Design

1) Carry out power system analyses taking up-dated power grid plan to be provided by NTDC.

A-17, B-14 Contract Expert

Tender Assistance

1) Prepare bidding documents in commercial parts
2) Assist the Employer in conducting pre-bid conferences, issuing addendum/corrigendum, and clarifications to bidders' queries.
3) Evaluate bids in accordance with the criteria set forth in the bidding documents.
4) Prepare bid evaluation report.

A-18, B-15 Environmental Specialist

1) Update Project's Environmental Management Plan (EMP) as appropriate incorporate necessary technical specifications with design and contract documentation.
2) During the preparation of bidding documents, clearly identify environmental responsibilities as explained in the EIA and EMP.
3) Assist the Employer to review the Environmental Program to be prepared by the construction contractor in accordance with EMP, relevant plans and JICA Environmental Guidelines and to make recommendations to The Employer regarding any necessary amendments for its approval
4) Assist in procurement of external monitoring agency (EMA).
5) Assist the Employer in establishment of grievance redress mechanism including formation of Grievance Redress Committee.
6) Assist the Employer to ensure that the PAPs are fully aware of the grievance redress procedure and the process of bringing their complaints, investigate the veracity of the complaints, and recommends actions/measures to settle them amicably, fairly and transparently before they go to the redress committee or the courts of law.
7) Confirmation of contents of EMP, EMoP for the transmission line and railway projects respectively dedicated to the project, and report to the Employer and JICA.
8) Provide technical services with grievance redress committee for keeping and updating records when necessary.
9) Assist the Employer in capacity building of the Employer officers and staffs on land acquisition and resettlement activities through on the job training.
10) Conduct simulation for ambient air and noise level based on the final spec of the power plant and the conclusion of treatment of the existing Lakhra power plant.
11) Evaluate the result of the simulation.

A-19, B-16 Resettlement Specialists

1) Assist the Employer in identifying the eligible PAPs, and in updating of the list of eligible PAPs and prepare for 'Payment Statement' for individual eligible PAPs.;
2) Assist the employer in conducting social assessment during early stage of the detailed design stage and review the framework existing LARAP and revise/update the contents if necessary;
3) Monitor land acquisition and compensation activities being undertaken by the Employer and/or competent authorities, and report the results in monthly progress reports;
4) Assist in procurement of external monitoring agency (EMA);
5) Assist the Employer in facilitating stakeholder's participation (including focus group discussions for vulnerable PAPs) and providing feedback their comments on LARAP;
6) Assist the Employer in capacity building of the Employer officers and staffs on land acquisition and resettlement activities through on the job training.

A-20 Coal Procurement and Transportation Specialists

1) Prepare draft agreements of coal supply, coal loading, coal transportation (PIBT to Railway) and inland coal transportation.

A-21 Power Purchase Agreement Specialists

2) Prepare draft agreement of power purchase.

B-1 Deputy Project Manager

The task of B-1 Deputy Project Manager is to assist A-1 Project Manager whose task is aforesaid.

Chapter -6 Reporting

Within the scope of consulting services, the Consultant shall prepare and submit reports and documents to the Employer as shown in Table 6-1. The Consultant shall provide electronic copy of each of these reports.

Table 6-1 Reporting

Category	Type of Report	Timing	No. of Copies
Consultancy Services (Basic Design, Tender Assistance)	Inception Report	Within 1 month after commencement of the services	10
	Monthly Progress Report	Every month	10
	Quarterly Progress Report	Every quarter	10
	Project Completion Report (for submission to JICA)	At the end of Services	10
Basic Design	Draft Basic Design Report	Within 3 months after commencement of the Services	10
	Cost Estimate Report (*)	Within 4 months after commencement of the Services	10
	Final Basic Design Report	Within 4 months after commencement of the Services	10
Tender Assistance	Bidding Document Report (including Pre-Qualification)	Within 5 month after commencement of services	20
	Technical Evaluation Report (including evaluation of PQ)	Within 2.5 months after opening technical envelope	15
	Financial Evaluation Report	Within 1.5 months after opening financial envelope	15

* Cost Estimate Report shall include Economic/Financial IRR for the projects composed of the project, the railway project, and the transmission line project.

Chapter-7 Obligations of the Employer

A certain range of arrangements and services will be provided by the Employer to the Consultant for smooth implementation of the Consulting Services. In this context, the Employer will:

(1) Report and data

Make available to the Consultant existing reports and data related to the Project as listed below

- Report of Preparatory Survey on Lakhra Coal Fired Thermal Power Plant Construction Project, including Lakhra Railway Project, prepared by JICA
- EIA reports for Plant, Transmission line and Railway

- LARAP report for Plant and Railway
- Operation data of existing Lakhra power station (50MW x 3 units)

(2) Office space

Provide an office space in the existing Lakhra Power Station with necessary equipment, furniture and utility. However, the Consultant's requirement for office space, including necessary equipment, furniture and utilities, should be clearly stated in the proposal with its rental cost for the case where the Employer would be unable to provide such facilities;

(3) Cooperation and counterpart staff

Appoint counterpart officials, agent and representative as may be necessary for effective implementation of the Consulting Services;

(4) Assistance and exemption

Use its best efforts to ensure that the assistance and exemption, as described in the Standard Request for Proposal issued by JICA, will be provided to the Consultant, in relation to

- work permit and such other documents;
- entry and exit visas, residence permits, exchange permits and such other documents;
- clearance through customs;
- instructions and information to officials, agent and representatives of the Borrower's Government;
- exemption from any requirement for registration to practice their profession;
- privilege pursuant to the applicable law in the Borrower's Country.

9 - 2 TERMS OF REFERENCE FOR CONSTRUCTION SUPERVISION CONSULTANT FOR THE WORKS UNDER LAKHRA COAL FIRED THERMAL POWER PLANT CONSTRUCTION PROJECT IN PAKISTAN

Terms of Reference for Construction Supervision Consultant for the Works under Lakhra Coal Fired Thermal Power Plant Construction Project in Pakistan

Chapter-1 Background and Project Outline

(1) Background

The Government of Pakistan has received a loan from the Japan International Cooperation Agency (hereinafter referred to as "JICA") to finance the Lakhra Coal Fired Thermal Power Plant Construction Project which is to supply the 600MW (net output) power with ultrasuper critical boiler technology for decreasing power shortage in Pakistan.

The Project comprises of one component of “Power Plant EPC including Water Intake”.

The Government of Pakistan intends to use part of the proceeds of the loan for eligible payments for consulting services for which this ToR is issued.

The Project is expected to be completed by March 2024 including 12 months defect liability period.

Location of the Project is Manjhand Taluka, Jamshoro District in Sindh Province, about 175km northeast of Karachi and about 40km northwest of Hyderabad.

Executing Agency is GENCO IV (hereinafter referred to as “The Employer”) under GENCO Holding Company Limited.

(2) Project package outline

The project tender package will be one which includes following components.

- Improvement to Site
- Foundation and Civil Construction
- Boiler and Auxiliaries
- Coal & Sorbent Preparation and Feed
- Coal & Sorbent handling and Storage
- Ash handling and Disposal
- Stack & duct works
- Turbine Generator and Auxiliaries
- Feed water, Condensate water treatment
- Cooling water system (including cooling tower)
- Electrical equipment and systems
- Controls and Instruments

- Flue gas clean up
- Coal receiver
- Switch Yard (500kV)
- Freight and insurance
- Intake water (including 7.8km water pipe from Indus river)
- Discharge water
- Operation Simulator
- O&M support by EPC contractor

"JICA's Standard Bidding Document under Japanese ODA Loans for Design Build (July 2015)" will be applied for the procurement of contractors.

(3) Technical Information

- Preparatory Survey on Lakhra Coal Fired Thermal Power Plant Construction Project in Pakistan (hereinafter referred to as "Lakhra CTPP P/S")

(4) Related projects:

- Lakhra Railway Project

  Rehabilitation from Kotri to Budapur Station, construct spur line to the Power station from Budapur Station, procurement of locomotives and wagons for transporting the imported coal

  To be conducted by GENCO IV utilizing other finance with the cooperation of Pakistan Railways
- Connecting 500kV Transmission Line Project

  To be conducted by National Transmission and Despatch Company (NTDC) utilizing their own finance

Chapter-2 Objectives of Consulting Services

The consulting services shall be provided by an international consulting firm (hereinafter referred to as "the Consultant") in association with national consultants in compliance with Guidelines for the Employment of Consultants under Japanese ODA Loans, April 2012. The objective of the consulting services is to achieve the efficient and proper preparation and implementation of the Project through the following works:

(1) Construction supervision and certification

(2) Preparation of Necessary Agreements and Assistance to make necessary Agreements

(3) Facilitation of implementation of Environmental Management Plan (EMP), Environmental Monitoring Plan (EMoP) and Land Acquisition & Resettlement

Action Plan (LARAP)

(4) Technology transfer

Chapter-3 Scope of Consulting Services

(1) Construction supervision and certification

The Consultant shall perform his duties during the contract implementation period of the contracts to be executed by the Employer and the Contractor. Standard Bidding Documents under Japanese ODA Loans for Procurement of Electrical and Mechanical Plant, and for Building and Engineering Works, Designed by the Contractor will be applied to this Project. In this context, the Consultant shall:

(a) Act as the Engineer to execute construction supervision and contract administration services in accordance with the power and authority to be delegated by the Employer;

(b) Provide assistance to the Employer concerning variations and claims which are to be ordered/issued at the initiative of the Employer. Advise the Employer on resolution of any dispute with the Contractor;

(c) Issue instructions, approvals and notices as appropriate;

(d) Monitor the construction progress of railway and transmission project respectively dedicated to the project, and report to the Employer and JICA;

(e) Monitor the construction progress connecting project between PIBT and railway, and report to the Employer and JICA;

(f) Provide recommendation to the Employer for acceptance of the Contractor's Performance security, advance payment security and required insurances;

(g) Provide commencement order to the Contractor;

(h) Assess adequacy of all inputs such as materials, labor and equipment provided by the Contractor;

(i) Check and approve the Contractor's method of work, including site organization, program of performance, quality assurance system, safety plan, method statements of safety, and environmental monitoring plan so that the requirements set forth in the applicable laws and regulations, the specifications or other parts of the contract are to be duly respected;

(j) Regularly monitor physical and financial progress, and take appropriate action to expedite progress if necessary, so that the time for completion set forth in the contract will be duly respected by the Contractor;

(k) Explain and/or adjust ambiguities and/or discrepancies in the Contract Documents and issue any necessary clarifications or instructions;

(l) Review and approve the Contractor's design for the works to be constructed, working drawings, shop drawings and drawings for temporary works;

(m) Liaise with the appropriate authorities to ensure that all the affected utility services are promptly relocated;

(n) Carry out field inspections on the Contractor's setting out of the works in relation to original points, lines and levels of reference specified in the contract;

(o) Organize, as necessary, management meetings with the Contractor to review the arrangements for future work. Prepare and deliver minutes of such meetings to the Employer and the Contractor;

(p) Supervise the works so that all the contractual requirements are met by the Contractor, including those in relation to i) quality of the works, ii) safety and iii) protection of the environment. Confirm that an accident prevention officer proposed by Contractor is duly assigned at the project site. Require the Contractor to take appropriate remedies if any questions are recognized regarding the safety measures;

(q) Supervise field tests, sampling and laboratory test to be carried out by the Contractor;

(r) Inspect the construction method, equipment to be used, workmanship at the site, and attend shop inspection and manufacturing tests in accordance with the Employer's Requirements;

(s) Verify Statements submitted by the Contractor and issue payment certificates such as interim payment certificates and final payment certificate as specified in the contract;

(t) Coordinate the works among different contractors employed for the Project;

(u) Modify the Employer's Requirements as may be necessary in accordance with the actual site conditions, and issue variation orders (including necessary actions in relation to the works performed by other contractors working for other projects, if any);

(v) Carry out timely reporting to the Employer for any inconsistency in executing the works and suggesting appropriate corrective measures to be applied;

(w) Inspect, verify and fairly determine claims issued by the parties to the contract (i.e. the Employer and the Contractor) in accordance with the ;

(x) Supervise the Test on Completion carried out by the Contractor and assist the Employer in carrying out the Test after Completion, if applicable;

(y) Perform the inspection of the works and to issue certificates such as the Taking-Over Certificate, Performance Certificate as specified in the contract;

(z) Provide periodic and/or continuous inspection services during defects notification

period and if any defects are noted, instruct the Contractor to rectify;

(aa) Check and certify as-built drawings prepared by the Contractor;

(bb) Check and certify the operation and maintenance manual prepared by the Contractor.

(2) Preparation of Necessary Agreements and Assistance to make necessary Agreements

The Consultant shall review and update the draft of necessary agreements as shown in Table 3-1 and assist the Employer to make the necessary agreements.

Table 3-1 Necessary Agreements

Name of Agreement	Concerned Party	Contents
1. Coal Supply Agreement	➢ GHCL/LPGCL ➢ Coal Supplier	Import of coal from country of origin to PIBT
2. Coal Loading Agreement	➢ GHCL/LPGCL ➢ PIBT	Unload imported coal at PIBT
3. Coal Transportation Agreement (PIBT to Railway)	➢ GHCL/LPGCL ➢ Port Qasim Authority (PQA)	Transportation (about 4.5 km) from PIBT to Loading Station in Qasim Port
4. Inland Coal Transportation Agreement (ICTA)	➢ GHCL/LPGCL ➢ Pakistan Railway Flight Company(PRFC)/Pakistan Railways(PR)	➢ Consignment to PRFC/PR for - Construction of dedicated spur line (about 7 km) between Budapur and the plant - Rehabilitation of existing line (about 40 km) from Kotri to Budapur. - Procurement of Locomotives/Wagons - Coal Transportation from Loading Station in Qasim Port to the plant

5. Power Purchase Agreement	➢ GHCL/LPGCL ➢ NTDC	Sale/Purchase of Electricity generated by GHCL/LPGCL

(3) Facilitation of implementation of Environmental Management Plan (EMP), Environmental Monitoring Plan (EMoP) and Land Acquisition and Resettlement Action Plan (LARAP)

The Consultant shall:

(a) Assist the Employer and EPC contractor to implement the measures identified in the EMP

(b) Monitor the effectiveness of EMP and negative impacts on environment caused by the construction works and provide technical advice, including a feasible solution, so that the Employer can improve situation when necessary;

(c) Assist the Employer in monitoring the compliance with conditions stated in the contract agreement of the EPC and the requirements under EMP and JICA Environmental Guidelines;

(d) Assist the Employer in preparation of the answer to the request from JICA's advisory committee for environmental and social considerations if necessary

(e) Assist the Employer in the capacity building of the Employer staff on environmental management through on-the-job training on environmental assessment techniques, mitigation measure planning, supervision and monitoring, and reporting.

(f) Confirmation of results of monitoring to be done in accordance with EMP, EMoP and LARAP for the railway and transmission line projects respectively dedicated to the project, and report to the Employer and JICA;

(g) Monitor the periodical report of ambient air quality and noise prepared by GHCL/LPGCL and confirm that those values are within regulated value, and report the Employer and JICA.

(4) Technology transfer

The Consultant shall carry out the technology transfer as an important aspect in design and supervision works. The Consultant shall provide the opportunity to the Employer officers and staffs to be involved in the working team of the Consultant during the contract administration and supervision works for their capacity building wherever possible. If requested by the Employer, the Consultant shall brief and demonstrate the construction supervision and contract management process and procedures. The Consultant shall assist the Employer and its staff to build their capacity as a part of on

the job training under the Project.

(a) Assist the Employer's O&M staff to acquire required knowledge and skills to conduct O&M works defined in the above mentioned rules and processes with manuals developed by consultants for basic design and tender assistance.

Chapter -4 Expected Time Schedule

The total duration of consulting services will be 73.5 months. The implementation schedule expected is as shown in Table 4-1.

Table 4-1 Implementation Schedule Expected

Key Activities	Date	Duration in Months
Commencement of Consulting Services (Construction Supervision)	15 January 2019	–
Preparation period by the EPC contractor	15 February 2019 to 14 March 2019	1
Commencement of EPC works	15 March 2019	48
Commissioning	15 June 2022	
Commercial operation date	15 March 2023	
Defect Liability Period	15 March 2024	12
Total months		62

Chapter-5 Staffing (Expertise required)

●● of Professional (A), international, Consultants and ●● of Professional (B), national, consultants will be engaged, for a total of ●● man-months for Professional (A) and ●● man-months for Professional (B). Total consulting input is ●● man-months.

(1) Qualification of key Team Members

Qualification of key Team Members The qualification of team member of professional (A) and key team member of professional (B) are is shown in Table 5-1 and 5-2 respectively.

Table 5-1: Qualification of Team Members of professional (A)

	Designation	Qualification
1	Project Manager (Plant)	Education: ・Graduate in Electrical or Mechanical Engineering Experience: ・ Experience in Power plant or related field: 15 years or more ・ Experience of construction supervision for two thermal plant projects, of which one is in ICB contract with amount is more than USD 100 million ・ at least one experience of leading a consultants' team as the Project Manager or the Deputy Project Manager
2	Mechanical Engineer (Boiler)	Education: ・ Graduate in Mechanical Engineering Experience: ・ Experience in design of boiler or boiler auxiliary equipment - 7 years ・ Experience in construction supervision of boiler or boiler auxiliary and auxiliary equipment - 3 years
3	Mechanical Engineer (Steam Turbine)	Education: ・ Graduate in Mechanical Engineering Experience: ・ Experience in design of turbine and auxiliary equipment - 7 years ・ Experience in construction supervision of turbine and auxiliary equipment - 3 years
4	Pollution Abatement Engineer	Education: ・ Graduate in Chemical, Mechanical or Electrical Engineering Experience:

		• Experience in design of pollution abatement facilities for coal thermal power plant - 7 years • Experience construction supervision of pollution abatement facilities for coal thermal power plant - 3 years
5	Instrumentation and Control Engineer	Education: • Graduate in Electrical Engineering Experience: • Experience in design of instrumentation and control for power plant - 10 years • Experience in construction supervision of instrumentation and control for power plant-5 years
6	Civil Engineer	Education: • Graduate in Civil Engineering Experience: • Experience in civil design in power plant - 10 years • Experience in construction supervision of civil structure in power plant - 5 years
7	Contract Expert	Education: • N/A Experience: • Experience in contract expert for the plant projects – 7 years • Experience in contract expert for the project applying Standard Bidding Documents of defined by JICA - 3 years
8	Environmental Specialists	Education: • Graduate in Environmental Management Experience: • Experience in environmental management of power plant projects - 5 years

Table 5-2: Qualification of key Team Members of professional (B)

	Designation	Qualification
1	Deputy Project Manager (Plant)	Education: • Graduate in Electrical or Mechanical Engineering Experience: • Experience in Power plant or related field: 15 years
2	Environmental Specialists	Education: • Graduate in Environmental Management Experience: • Experience in environmental management of

		power plant projects - 3 years

Consultant may propose other experts and supporting staffs required to accomplish the tasks outlined in the ToR. It is the Consultant's responsibility to select the optimum team and to propose the professionals which he believes best meets the needs of the Employer.

(2) Scope of works for the respective personnel

Detailed information on the major tasks and duties each member of the construction supervision team shall perform is provided as follows:

A-1 Project Manager

Construction Supervision and Certification

1) Act as the Engineer to execute construction supervision and contract administration services in accordance with the power and authority to be delegated by the Employer.
2) Provide assistance to the Employer concerning variations and claims which are to be ordered/issued at the initiative of the Employer. Advise the Employer on resolution of any dispute with the Contractor.
3) Issue instructions, approvals and notices as appropriate.
4) Monitor the construction progress of railway project and transmission project dedicated to the project respectively, and report to the Employer and JICA.
5) Monitor the construction progress connecting project between PIBT and railway, and report to the Employer and JICA.
6) Provide recommendation to the Employer for acceptance of the Contractor's Performance security, advance payment security and required insurances.
7) Provide commencement order to the Contractor.
8) Lead to assess adequacy of all inputs such as materials, labor and equipment provided by the Contractor.
9) Lead to check and approve the Contractor's method of work, including site organization, program of performance, quality assurance system, safety plan, method statements of safety, and environmental monitoring plan so that the requirements set forth in the applicable laws and regulations, the specifications or other parts of the contract are to be duly respected.
10) Regularly monitor physical and financial progress, and take appropriate action to expedite progress if necessary, so that the time for completion set forth in the contract will be duly respected by the Contractor.
11) Explain and/or adjust ambiguities and/or discrepancies in the Contract Documents and issue any necessary clarifications or instructions.
12) Lead to review and approve the Contractor's design for the works to be constructed, working drawings, shop drawings and drawings for temporary works.
13) Liaise with the appropriate authorities to ensure that all the affected utility services are promptly relocated.
14) Lead to carry out field inspections on the Contractor's setting out of the works in relation to original points, lines and levels of reference specified in the contract.
15) Organize, as necessary, management meetings with the Contractor to review the arrangements for future work. Prepare and deliver minutes of such meetings to the Employer and the Contractor.
16) Lead to supervise the works so that all the contractual requirements are met by the Contractor, including those in relation to i) quality of the works, ii) safety and iii) protection of the environment. Confirm that an accident prevention officer proposed by Contractor is duly assigned at the project site. Require the Contractor to take appropriate remedies if any questions are recognized regarding the safety measures.
17) Lead to inspect the construction method, equipment to be used, workmanship at the site, and attend shop inspection and manufacturing tests in accordance with the Employer's Requirements.
18) Verify Statements submitted by the Contractor and issue payment certificates such as interim payment certificates and final payment certificate as specified in the contract.
19) Coordinate the works among different contractors employed for the Project.
20) Modify the Employer's Requirements as may be necessary in accordance with the actual site conditions, and issue variation orders (including necessary actions in relation to the works performed by other contractors working for other projects, if any).
21) Lead to carry out timely reporting to the Employer for any inconsistency in executing the works and suggesting appropriate corrective measures to be applied.
22) Lead to inspect, verify and fairly determine claims issued by the parties to the contract (i.e. the Employer and the Contractor).
23) Lead to supervise the Test on Completion carried out by the Contractor and assist the Employer in carrying out the Test after Completion, if applicable.
24) Perform the inspection of the works and to issue certificates such as the Taking-Over Certificate, Performance Certificate as specified in the contract.

25) Provide periodic and/or continuous inspection services during defects notification period and if any defects are noted, instruct the Contractor to rectify.
26) Lead to check and certify as-built drawings prepared by the Contractor.

Preparation of Necessary Agreements and Assistance to make necessary Agreements

27) Lead to prepare necessary agreements and assistance to make necessary agreements.

Technology Transfer

28) Lead to carry out the technology transfer

A-2, B-2 Mechanical Engineer (Boiler)

A-3, B-3 Mechanical Engineer (Steam Turbine),

A-4, B-4 Mechanical Engineer (Coal Handling),

A-5, B-5 Mechanical Engineer (Balance of Plant),

A-6, B-6 Pollution Abatement Engineer,

A-7, B-7 Electrical Engineer(Power Plant, Balance of Plant),

A-8, B-8 Electrical Engineer(Switching Station),

A-9, B-9 Instrumentation and Control Engineer

A-10, B-10 Water Supply and Waste Water Treatment Engineer

Tasks of aforesaid nine engineers are each engineering part,

Construction Supervision and Certification

1) Assess adequacy of all inputs such as materials, labor and equipment provided by the Contractor.
2) Check and approve the Contractor's method of work.
3) Review and approve the Contractor's design for the works to be constructed, working drawings, shop drawings and drawings for temporary works.
4) Carry out field inspections on the Contractor's setting out of the works in relation to original points, lines and levels of reference specified in the contract.
5) Supervise the works so that all the contractual requirements are met by the Contractor, including those in relation to i) quality of the works, ii) safety and iii) protection of the environment.
6) Inspect the construction method, equipment to be used, workmanship at the site, and attend shop inspection and manufacturing tests in accordance with the Employer's Requirements.
7) Inspect, verify and fairly determine claims issued by the parties to the contract (i.e. the Employer and the Contractor).
8) Supervise the Test on Completion carried out by the Contractor and assist the Employer in carrying out the Test after Completion, if applicable.
9) Perform the inspection of the works.
10) Provide periodic inspection services during defects notification period and if any defects are noted, instruct the Contractor to rectify.
11) Check and certify as-built drawings prepared by the Contractor
12) Check and certify the operation and maintenance manual prepared by the Contractor.

Technology Transfer

13) Carry out the technology transfer

A-11, B-11 Civil Engineer

A-12, A-12 Architectural Engineer

Construction Supervision and Certification

1) Assess adequacy of all inputs such as materials, labor and equipment provided by the Contractor.
2) Check and approve the Contractor's method of work.
3) Review and approve the Contractor's design for the works to be constructed, working drawings, shop drawings and drawings for temporary works.
4) Carry out field inspections on the Contractor's setting out of the works in relation to original points, lines and levels of reference specified in the contract.
5) Supervise the works so that all the contractual requirements are met by the Contractor, including those in relation to i) quality of the works, ii) safety and iii) protection of the environment.
6) Supervise field tests, sailing and laboratory test to be carried out by the Contractor.
7) Inspect the construction method, equipment to be used, workmanship at the site, and attend shop inspection and manufacturing tests in accordance with the Employer's Requirements.
8) Coordinate the works among different contractors employed for the Project.
9) Inspect, verify and fairly determine claims issued by the parties to the contract (i.e. the Employer and the Contractor).
10) Supervise the Test on Completion carried out by the Contractor and assist the Employer in carrying out the Test after Completion, if applicable.
11) Perform the inspection of the works.
12) Provide periodic inspection services during defects notification period and if any defects are noted, instruct the Contractor to rectify.
13) Check and certify as-built drawings prepared by the Contractor
14) Check and certify the operation and maintenance manual prepared by the Contractor.

Technology Transfer

15) Carry out the technology transfer

A-13 Commissioning Engineer

Construction Supervision and Certification

1) Lead and coordinate Test on Completion carried out by the Contractor and assist the Employer in carrying out the Test after Completion.
2) Provide periodic inspection services during defects notification period and if any defects are noted, instruct the Contractor to rectify.

Technology Transfer

3) Carry out the technology transfer

A-14 O&M Engineer

Construction Supervision and Certification

1) Monitor the Test on Completion carried out by the Contractor and assist the Employer in carrying out the Test after Completion, if applicable.
2) Lead to check and certify the operation and maintenance manual prepared by the Contractor.

Technology Transfer

1) Carry out the technology transfer

A-15, B-13 Safety Control Specialist

Construction Supervision and Certification

1) Lead to supervise the works so that all the contractual requirements are met by the Contractor, regarding safety and protection of the environment.
2) Lead to confirm that an accident prevention officer proposed by Contractor is duly assigned at the project site.
3) Require the Contractor to take appropriate remedies if any questions are recognized regarding the safety measures.

Technology Transfer

4) Carry out the safety control knowledge transfer

A-17, B-14 Contract Expert

Construction Supervision and Certification

1) Supervise the works so that all the contractual requirements are met by the Contractor, including those in relation to i) quality of the works, ii) safety and iii) protection of the environment.
2) Modify the Employer's Requirements as may be necessary in accordance with the actual site conditions, and issue variation orders (including necessary actions in relation to the works performed by other contractors working for other projects, if any).
3) Inspect, verify and fairly determine claims issued by the parties to the contract (i.e. the Employer and the Contractor).
4) Provide periodic inspection services during defects notification period and if any defects are noted, instruct the Contractor to rectify.

A-18, B-15 Environmental Specialist

1) Assist the Employer and EPC contractor to implement the measures identified in the EMP.
2) Monitor the effectiveness of EMP and negative impacts on environment caused by the construction works and provide technical advice, including a feasible solution, so that the Employer can improve situation when necessary.
3) Assist the Employer in monitoring the compliance with conditions stated in the contract agreement of the EPC and the requirements under EMP and JICA Environmental Guidelines.
4) Assist the Employer in preparation of the answer to the request from JICA's advisory committee for environmental and social considerations if necessary.
5) Assist the Employer in the capacity building of the Employer staff on environmental management through on-the-job training on environmental assessment techniques, mitigation measure planning, supervision and monitoring, and reporting.
6) Confirmation of contents of EMP and EMoP for the transmission line and railway projects respectively dedicated to the project, and report to the Employer and JICA.
7) Confirmation of results of monitoring to be done in accordance with EMPand EMoP for the transmission line and railway projects respectively dedicated to the project, and report to the Employer and JICA.
8) Provide technical services with grievance redress committee for keeping and updating records when necessary.
9) Monitor the periodical report of ambient air quality and noise prepared by GHCL/LPGCL and confirm that those values are within regulated value, and report the Employer and JICA.

Technology Transfer

10) Carry out the technology transfer.

A-19, B-16 Resettlement Specialists

1) Assist the Employer in identifying the eligible PAPs, and in updating of the list of eligible PAPs and prepare for 'Payment Statement' for individual eligible PAPs.
2) Assist the employer in conducting social assessment during early stage of the detailed design stage and review the framework existing LARAP and revise/update the contents if necessary.
3) Monitor land acquisition and compensation activities being undertaken by the Employer and/or competent authorities, and report the results in monthly progress reports.
4) Assist in procurement of external monitoring agency (EMA).
5) Assist the Employer in facilitating stakeholder's participation (including focus group discussions for vulnerable PAPs) and providing feedback their comments on LARAP.
6) Assist the Employer in establishment of grievance redress mechanism including formation of Grievance Redress Committee.
7) Assist the Employer to ensure that the PAPs are fully aware of the grievance redress procedure and the process of bringing their complaints, investigate the veracity of the complaints, and recommends actions/measures to settle them amicably, fairly and transparently before they go to the redress committee or the courts of law.
8) Confirmation of contents of LARAP for the railway and transmission line projects respectively dedicated to the project, and report to the Employer and JICA.
9) Confirmation of results of monitoring to be done in accordance with LARAP for the railway project dedicated to the project, and report to the Employer and JICA.
10) Provide technical services with grievance redress committee for keeping and updating records when necessary.
11) Assist the Employer in capacity building of the Employer officers and staffs on land acquisition and resettlement activities through on the job training.

A-20 Coal Procurement and Transportation Specialists 1) Prepare agreements of coal supply, coal loading, coal transportation (PIBT to Railway) and inland coal transportation.
A-21 Power Purchase Agreement Specialists 1) Prepare agreement of power purchase.
B-1 Deputy Project Manager The task of B-1 Deputy Project Manager is to assist A-1 Project Manager whose task is aforesaid.

Chapter -6 Reporting

Within the scope of consulting services, the Consultant shall prepare and submit reports and documents to the Employer as shown in Table 6-1. The Consultant shall provide electronic copy of each of these reports.

Table 6-1 Reporting

Category	Type of Report	Timing	No. of Copies
Construction Supervision	Quality Control Report	Every month	10
	Safety Management Report	Every month	10
	Commissioning Report	Just before the commercial operation date	10
	Completion Report (and As-built Drawings, if any)	At the end of the Project	15
Technology Transfer	Training Plan	At appropriate timing in accordance with the Inception Report	10
	Training Execution and Evaluation Report	Within one month after training	10
Environment and Social Safeguard	Environmental Monitoring Report	Every quarter	10
	Land Acquisition and Resettlement Monitoring Report	Every month	10
	Environmental and Social Safeguard Evaluation Report	At the end of the Project	10
Other Report	Technical Report	As required or upon request	As required

Chapter-7 Obligations of the Employer

A certain range of arrangements and services will be provided by the Employer to the Consultant for smooth implementation of the Consulting Services. In this context, the

Employer will:

(1) Report and data

Make available to the Consultant existing reports and data related to the Project as listed below

- Report of Preparatory Survey on Lakhra Coal Fired Thermal Power Plant Construction Project, including Lakhra Railway Project, prepared by JICA
- EIA reports for Plant, Transmission line and Railway
- LARAP report for Plant and Railway
- Operation data of existing Lakhra power station (50MW x 3 units)
- Basic Design Report, Cost Estimate Report and Bidding Document

(2) Office space

Provide an office space in the existing Lakhra Power Station with necessary equipment, furniture and utility. However, the Consultant's requirement for office space, including necessary equipment, furniture and utilities, should be clearly stated in the proposal with its rental cost for the case where the Employer would be unable to provide such facilities;

(3) Cooperation and counterpart staff

Appoint counterpart officials, agent and representative as may be necessary for effective implementation of the Consulting Services;

(4) Assistance and exemption

Use its best efforts to ensure that the assistance and exemption, as described in the Standard Request for Proposal issued by JICA, will be provided to the Consultant, in relation to

- work permit and such other documents;
- entry and exit visas, residence permits, exchange permits and such other documents;
- clearance through customs;
- instructions and information to officials, agent and representatives of the Borrower's Government;
- exemption from any requirement for registration to practice their profession;
- privilege pursuant to the applicable law in the Borrower's Country.

10 - 1 CALCULATED TARIFF

Lakhra Calculated Tariff

	Energy charge (Rs./kWh)							Capacity charge (Rs./kWh)									
	Fuel	Ash	Limestone	Variable O&M (foreign)	Variable O&M (Local)	O&M (Railway)	**Energy Charge**	Fixed O&M (foreign)	Fixed O&M (local)	Working capital	Insurance	ROE	Plant (Principal)	Plant (Interest)	Railway (Principal)	Railway (Interest)	**Capacity Charge**	**Tariff (Rs./kWh)**
1	4.3220	0.2200	0.0900	0.3625	0.0000	0.2658	**5.2603**	0.0435	0.0000	0.2131	0.0951	0.7993	1.1611	1.6704	0.1888	0.8180	**4.9893**	**10.2496**
2	4.3220	0.2200	0.0900	0.3625	0.0000	0.2658	**5.2603**	0.0435	0.0545	0.2131	0.0951	0.7993	1.1611	1.6148	0.1888	0.7908	**4.9609**	**10.2212**
3	4.3220	0.2200	0.0900	0.3625	0.0000	0.2658	**5.2603**	0.0435	0.0545	0.2131	0.0951	0.7993	1.1611	1.5591	0.1888	0.7635	**4.8780**	**10.1383**
4	4.3220	0.2200	0.0900	0.3625	0.0000	0.2658	**5.2603**	0.0435	0.0545	0.2131	0.0951	0.7993	1.1611	1.5034	0.1888	0.7362	**4.7950**	**10.0553**
5	4.3220	0.2200	0.0900	0.3625	0.0000	0.2658	**5.2603**	0.0435	0.0545	0.2131	0.0951	0.7993	1.1611	1.4477	0.1888	0.7090	**4.7121**	**9.9724**
6	4.3220	0.2200	0.0900	0.3625	0.0000	0.2658	**5.2603**	0.0435	0.0545	0.2131	0.0951	0.7993	1.1611	1.3920	0.1888	0.6817	**4.6291**	**9.8894**
7	4.3220	0.2200	0.0900	0.3625	0.0000	0.2658	**5.2603**	0.0435	0.0545	0.2131	0.0951	0.7993	1.1611	1.3364	0.1888	0.6544	**4.5462**	**9.8065**
8	4.3220	0.2200	0.0900	0.3625	0.0000	0.2658	**5.2603**	0.0435	0.0545	0.2131	0.0951	0.7993	1.1611	1.2807	0.1888	0.6272	**4.4632**	**9.7235**
9	4.3220	0.2200	0.0900	0.3625	0.0000	0.2658	**5.2603**	0.0435	0.0545	0.2131	0.0951	0.7993	1.1611	1.2250	0.1888	0.5999	**4.3803**	**9.6406**
10	4.3220	0.2200	0.0900	0.3625	0.0000	0.2658	**5.2603**	0.0435	0.0545	0.2131	0.0951	0.7993	1.1611	1.1693	0.1888	0.5726	**4.2973**	**9.5576**
11	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	1.1136	0.1888	0.5454	**4.2145**	**9.4759**
12	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	1.0579	0.1888	0.5181	**4.1315**	**9.3929**
13	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	1.0023	0.1888	0.4908	**4.0486**	**9.3100**
14	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.9466	0.1888	0.4636	**3.9656**	**9.2270**
15	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.8909	0.1888	0.4363	**3.8827**	**9.1441**
16	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.8352	0.1888	0.4090	**3.7997**	**9.0611**
17	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.7795	0.1888	0.3817	**3.7168**	**8.9782**
18	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.7239	0.1888	0.3545	**3.6338**	**8.8952**
19	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.6682	0.1888	0.3272	**3.5509**	**8.8123**
20	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.6125	0.1888	0.2999	**3.4679**	**8.7293**
21	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.5568	0.1888	0.2727	**3.3850**	**8.6464**
22	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.5011	0.1888	0.2454	**3.3020**	**8.5634**
23	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.4455	0.1888	0.2181	**3.2191**	**8.4805**
24	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.3898	0.1888	0.1909	**3.1361**	**8.3975**
25	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.3341	0.1888	0.1636	**3.0532**	**8.3146**
26	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.2784	0.1888	0.1363	**2.9702**	**8.2316**
27	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.2227	0.1888	0.1091	**2.8873**	**8.1487**
28	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.1670	0.1888	0.0818	**2.8043**	**8.0657**
29	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.1114	0.1888	0.0545	**2.7214**	**7.9828**
30	4.3220	0.2200	0.0900	0.3262	0.0374	0.2658	**5.2614**	0.0316	0.0665	0.2131	0.0951	0.7993	1.1611	0.0557	0.1888	0.0273	**2.6384**	**7.8998**
lized	**4.3220**	**0.2200**	**0.0900**	**0.3499**	**0.0130**	**0.2658**	**5.2607**	**0.0394**	**0.0534**	**0.2131**	**0.0951**	**0.7993**	**1.1611**	**1.2152**	**0.1888**	**0.5951**	**4.3604**	**9.6211**

10 - 2 FINANCIAL COST

Lakhra: Financial Cost

(Unit: Mil PRs)

	Foreign cost			Local cost			Total cost	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8		
	Project cost	%	Financial cost	Project cost	%	Financial cost		F/C	L/C	Sub total	F/C	L/C	Sub total	F/C	L/C	Sub total	F/C	L/C	Sub total	F/C	L/C	Sub total	F/C	L/C	Sub total	F/C	L/C	Sub total	F/C	L/C	Sub total
I. Eligible portion																															
1. Construction/procurement																															
1	107,359	100%	107,359	9,878	100%	9,878																									
Sub-Total	107,359	100%	107,359	9,878	100%	9,878	117,237	0	0	0	0	0	0	10,736	1,190	11,926	0	2,432	2,432	25,707	2,432	28,138	54,877	2,432	57,308	10,672	899	11,571	5,368	494	5,862
2. Civil works	0	100%	0	0	100%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. Erection, Repair, Commisionning Test	0	100%	0	0	100%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-1. Cost Escalation (Equipment)	8,261	0%	0	2,598	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-2. Cost Escalation (Consulting)	187	0%	0	72	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-1. Physical contingency (Equipment)	5,862	100%	5,862	624	100%	624	6,486	0	0	0	0	0	0	586	75	661	0	154	154	1,404	154	1,557	2,997	154	3,150	583	57	640	293	31	324
5-2. Physical contingency (Consulting)	156	100%	156	18	100%	18	173	0	0	0	34	4	37	9	1	10	17	2	19	18	2	20	36	4	40	21	2	24	21	2	23
6-1. IDC (Equipment)	4,613	0%	0	0	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-2. IDC (Consulting)	1	0%	0	0	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7. Front end fee	276	0%	0	0	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7. Consulting service	2,926	100%	2,926	284	100%	284	3,210	0	0	0	631	63	693	167	15	182	324	31	355	337	34	371	677	69	746	400	36	437	390	36	426
Sub-total I	129,641		116,303	13,475		10,804	127,107	0	0	0	664	66	731	11,498	1,282	12,780	341	2,619	2,959	27,465	2,621	30,087	58,587	2,658	61,245	11,676	994	12,671	6,071	564	6,635
II. Non Eligible portion																															
1-1. Land acquisition (Plant)	0	100%	0	100	100%	100	100	0	0	0	0	0	0	0	12	12	0	25	25	0	25	25	0	25	25	0	9	9	0	5	5
1-2. Land acquisition (Railway)	0	100%	0	963	100%	963	963	0	0	0	0	0	0	0	0	0	0	67	67	0	221	221	0	293	293	0	315	315	0	67	67
2. Railway infrastructure	6,288	100%	6,288	13,911	100%	13,911	20,199	0	0	0	10	0	10	104	0	104	107	969	1,076	1,527	3,198	4,726	1,977	4,237	6,214	2,125	4,544	6,669	438	962	1,400
3. Transmission	379	100%	379	56	100%	56	435	0	0	0	0	0	0	38	7	45	0	14	14	91	14	105	194	14	208	38	5	43	19	3	22
4. Administration cost	0	100%	0	1,705	100%	1,705	1,705	0	0	0	0	0	0	0	205	205	0	420	420	0	420	420	0	420	420	0	155	155	0	85	85
5. Cost escalation	843	0%	0	6,197	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-1. Physical contingency (Plant)	20	100%	20	9	100%	9	29	0	0	0	0	0	0	2	1	3	0	2	2	5	2	7	10	2	12	2	1	3	1	0	1
6-2. Physical contingency (Railway)	398	100%	398	1,053	100%	1,053	1,451	0	0	0	1	0	1	7	0	7	7	73	80	97	242	339	125	321	446	135	344	478	28	73	101
7. VAT	0	100%	0	5,379	100%	5,379	5,379	0	0	0	0	0	0	0	648	648	0	1,324	1,324	0	1,324	1,324	0	1,324	1,324	0	490	490	0	269	269
8. Import tax	0	100%	0	6,548	100%	6,548	6,548	0	0	0	0	0	0	0	789	789	0	1,612	1,612	0	1,612	1,612	0	1,612	1,612	0	596	596	0	327	327
9. Tax (Railway)	1,839	100%	1,839	3,758	100%	3,758	5,597	0	0	0	3	0	3	31	0	31	31	262	293	447	864	1,311	578	1,145	1,723	622	1,228	1,849	128	260	388
10. Consulting service (Railway)	854	100%	854	0	100%	0	854	0	0	0	1	0	1	14	0	14	14	0	14	207	0	207	268	0	268	289	0	289	59	0	59
Sub-total II	10,622		9,779	39,678		33,481	43,260	0	0	0	15	0	15	196	1,663	1,858	159	4,767	4,926	2,374	7,922	10,296	3,153	9,392	12,544	3,210	7,686	10,896	673	2,052	2,724
Grand Total (Sub-total I+II)	140,263		126,081	53,153		44,285	170,367	0	0	0	680	66	746	11,694	2,944	14,638	500	7,386	7,886	29,839	10,543	40,382	61,739	12,050	73,789	14,886	8,680	23,566	6,744	2,615	9,359

10 - 3 FINANCIAL INTERNAL RATE OF RETURN (FIRR) AND FINANCIAL NET PRESENT VALUE (FNPV)

FIRR= 8.38%
FNPV= 40,163

(Unit: Mil. PRs)

		Cost						Generation/Revenue			
	FY	Capital cost	Fixed O&M cost	Working capital	Insurance	Railway O&M	Total cost	Incremental generation (GWh)	Incremental revenue before tax	Incremental revenue after tax	Net cash flow (before tax)
1	2015	0	0	0	0	0	0	0	0	0	0
2	2016	746	0	0	0	0	746	0	0	0	(746)
3	2017	14,638	0	0	0	0	14,638	0	0	0	(14,638)
4	2018	7,886	0	0	0	0	7,886	0	0	0	(7,886)
5	2019	40,382	0	0	0	0	40,382	0	0	0	(40,382)
6	2020	73,789	0	0	0	0	73,789	0	0	0	(73,789)
7	2021	23,566	0	0	0	0	23,566	0	0	0	(23,566)
8	2022	9,359	185	907	404	578	17,593	4,255	23,077	16,918	11,643
9	2023	0	417	907	404	578	7,153	4,255	22,946	18,099	20,639
10	2024	0	417	907	404	578	5,105	4,255	22,562	19,763	20,255
11	2025	0	417	907	404	578	5,228	4,255	22,178	19,257	19,872
12	2026	0	417	907	404	578	5,357	4,255	21,795	18,745	19,488
13	2027	0	417	907	404	578	5,491	4,255	21,411	18,227	19,104
14	2028	0	417	907	404	578	5,631	4,255	21,027	17,703	18,721
15	2029	0	417	907	404	578	5,778	4,255	20,644	17,172	18,337
16	2030	0	417	907	404	578	5,931	4,255	20,260	16,635	17,953
17	2031	0	417	907	404	578	6,092	4,255	19,876	16,091	17,570
18	2032	0	418	907	404	578	6,320	4,255	19,493	15,480	17,186
19	2033	0	418	907	404	578	6,499	4,255	19,109	14,918	16,802
20	2034	0	418	907	404	578	6,685	4,255	18,726	14,348	16,419
21	2035	0	418	907	404	578	6,879	4,255	18,342	13,770	16,035
22	2036	0	418	907	404	578	7,083	4,255	17,958	13,183	15,651
23	2037	0	418	907	404	578	7,296	4,255	17,575	12,586	15,268
24	2038	0	418	907	404	578	7,518	4,255	17,191	11,980	14,884
25	2039	0	418	907	404	578	7,751	4,255	16,807	11,364	14,500
26	2040	0	418	907	404	578	7,994	4,255	16,424	10,737	14,117
27	2041	0	418	907	404	578	8,248	4,255	16,040	10,099	13,733
28	2042	0	418	907	404	578	8,514	4,255	15,656	9,450	13,349
29	2043	0	418	907	404	578	8,792	4,255	15,273	8,788	12,966
30	2044	0	418	907	404	578	9,082	4,255	14,889	8,114	12,582
31	2045	0	418	907	404	578	9,386	4,255	14,506	7,427	12,198
32	2046	0	418	907	404	578	9,703	4,255	14,122	6,726	11,815
33	2047	0	418	907	404	578	10,035	4,255	13,738	6,010	11,431
34	2048	0	418	907	404	578	10,382	4,255	13,355	5,279	11,047
35	2049	0	418	907	404	578	10,745	4,255	12,971	4,533	10,664
36	2050	0	418	907	404	578	11,125	4,255	12,587	3,770	10,280
37	2051	0	418	907	404	578	11,521	4,255	12,204	2,989	9,896

10 - 4 ECONOMIC COST

Lakchra: Economic Cost

(Unit: Mil PRs)

	Foreign cost			Local cost			Total cost	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8		
	Project cost	%	Economic cost	Project cost	%	Economic cost		F/C	L/C	Sub total	F/C	L/C	Sub total	F/C	L/C	Sub total	F/C	L/C	Sub total	F/C	L/C	Sub total	F/C	L/C	Sub total	F/C	L/C	Sub total	F/C	L/C	Sub total
I. Eligible portion																															
1. Construction/procurement																															
1	107,359	100%	107,359	9,878	83%	8,189																									
Sub-Total	107,359	100%	107,359	9,878	83%	8,189	115,548	0	0	0	0	0	0	10,736	987	11,723	0	2,016	2,016	25,707	2,016	27,722	54,877	2,016	56,892	10,672	745	11,417	5,368	409	5,777
2. Civil works	0	100%	0	0	97%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. Erection, Repair, Commisionning Test	0	100%	0	0	97%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-1. Cost Escalation (Equipment)	8,261	0%	0	2,598	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-2. Cost Escalation (Consulting)	187	0%	0	72	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-1. Physical contingency (Equipment)	5,862	100%	5,862	624	97%	605	6,467	0	0	0	0	0	0	586	73	659	0	149	149	1,404	149	1,553	2,997	149	3,145	583	55	638	293	30	323
5-2. Physical contingency (Consulting)	156	100%	156	18	97%	17	173	0	0	0	34	4	37	9	1	10	17	2	19	18	2	20	36	4	40	21	2	24	21	2	23
6-1. IDC/commitment charge (Equipment)	4,613	0%	0	0	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-2. IDC/commitment charge (Consulting)	1	0%	0	0	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7. Front end fee	276	0%	0	0	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8. Consulting service	2,926	100%	2,926	284	97%	276	3,202	0	0	0	631	61	691	167	15	182	324	31	354	337	33	370	677	67	744	400	35	436	390	35	425
Sub-total I	129,641		116,303	13,475		9,087	125,390	0	0	0	664	64	729	11,498	1,076	12,574	341	2,197	2,538	27,465	2,200	29,665	58,587	2,235	60,822	11,676	838	12,514	6,071	477	6,548
II. Non Eligible portion																															
1-1. Land acquisition (Plant)	0	100%	0	100	97%	97	97	0	0	0	0	0	0	0	12	12	0	24	24	0	24	24	0	24	24	0	9	9	0	5	5
1-2. Land acquisition (Railway)	0	100%	0	963	97%	934	934	0	0	0	0	0	0	0	0	0	0	65	65	0	215	215	0	285	285	0	305	305	0	65	65
2. Railway	6,288	100%	6,288	13,911	83%	11,532	17,820	0	0	0	10	0	10	104	0	104	107	803	910	1,527	2,651	4,179	1,977	3,513	5,489	2,125	3,767	5,892	438	798	1,235
3. Transmission	379	100%	379	56	83%	46	426	0	0	0	0	0	0	38	6	44	0	11	11	91	11	102	194	11	205	38	4	42	19	2	21
4. Administration cost	0	100%	0	1,705	97%	1,654	1,654	0	0	0	0	0	0	0	199	199	0	407	407	0	407	407	0	407	407	0	151	151	0	83	83
5. Cost escalation	843	0%	0	6,197	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-1. Physical contingency (Plant)	20	100%	20	9	97%	8	29	0	0	0	0	0	0	2	1	3	0	2	2	5	2	7	10	2	12	2	1	3	1	0	1
6-2. Physical contingency (Railway)	398	100%	398	1,053	97%	1,021	1,419	0	0	0	1	0	1	7	0	7	7	71	78	97	235	332	125	311	436	135	334	468	28	71	98
7. VAT	0	0%	0	5,379	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8. Import tax	0	0%	0	6,548	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9. Tax (Railway)	1,839	0%	0	3,758	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10. Consulting service (Railway)	854	100%	854	0	97%	0	854	0	0	0	1	0	1	14	0	14	14	0	14	207	0	207	268	0	268	289	0	289	59	0	59
Sub-total II	10,622		7,940	39,678		15,293	23,233	0	0	0	12	0	12	165	218	383	128	1,384	1,512	1,927	3,545	5,472	2,575	4,553	7,127	2,588	4,570	7,158	545	1,023	1,568
Grand Total (Sub-total I+II)	140,263		124,242	53,153		24,380	148,623	0	0	0	677	64	741	11,663	1,293	12,956	469	3,581	4,050	29,392	5,745	35,138	61,161	6,788	67,949	14,264	5,408	19,672	6,616	1,501	8,116

10 - 5 ECONOMIC INTERNAL RATE OF RETURN (EIRR) AND ECONOMIC NET PRESENT VALUE (ENPV)

Lakhra: Economic Internal Rate of Return (EIRR) and Economic Net Present Value (ENPV)

EIRR= 13.2%
ENPV= 8,497

(Unit: Mil. PRs)

		Cost						Benefit	
	FY	Capital cost	Fixed O&M cost	Working capital	Insurance	Railway O&M	Total cost	Economic benefit	Net cash flow
1	2016	0	0	0	0	0	0	0	0
2	2017	741	0	0	0	0	741	0	(741)
3	2018	12,956	0	0	0	0	12,956	0	(12,956)
4	2019	4,050	0	0	0	0	4,050	0	(4,050)
5	2020	35,138	0	0	0	0	35,138	0	(35,138)
6	2021	67,949	0	0	0	0	67,949	0	(67,949)
7	2022	19,672	0	0	0	0	19,672	0	(19,672)
8	2023	8,116	185	907	404	578	10,191	26,274	16,083
9	2024	0	417	907	404	578	2,307	26,274	23,967
10	2025	0	417	907	404	578	2,307	26,274	23,967
11	2026	0	417	907	404	578	2,307	26,274	23,967
12	2027	0	417	907	404	578	2,307	26,274	23,967
13	2028	0	417	907	404	578	2,307	26,274	23,967
14	2029	0	417	907	404	578	2,307	26,274	23,967
15	2030	0	417	907	404	578	2,307	26,274	23,967
16	2031	0	417	907	404	578	2,307	26,274	23,967
17	2032	0	417	907	404	578	2,307	26,274	23,967
18	2033	0	418	907	404	578	2,307	26,274	23,967
19	2034	0	418	907	404	578	2,307	26,274	23,967
20	2035	0	418	907	404	578	2,307	26,274	23,967
21	2036	0	418	907	404	578	2,307	26,274	23,967
22	2037	0	418	907	404	578	2,307	26,274	23,967
23	2038	0	418	907	404	578	2,307	26,274	23,967
24	2039	0	418	907	404	578	2,307	26,274	23,967
25	2040	0	418	907	404	578	2,307	26,274	23,967
26	2041	0	418	907	404	578	2,307	26,274	23,967
27	2042	0	418	907	404	578	2,307	26,274	23,967
28	2043	0	418	907	404	578	2,307	26,274	23,967
29	2044	0	418	907	404	578	2,307	26,274	23,967
30	2045	0	418	907	404	578	2,307	26,274	23,967
31	2046	0	418	907	404	578	2,307	26,274	23,967
32	2047	0	418	907	404	578	2,307	26,274	23,967
33	2048	0	418	907	404	578	2,307	26,274	23,967
34	2049	0	418	907	404	578	2,307	26,274	23,967
35	2050	0	418	907	404	578	2,307	26,274	23,967
36	2051	0	418	907	404	578	2,307	26,274	23,967
37	2052	0	418	907	404	578	2,307	26,274	23,967

10 - 6 FORECAST OF FINANCIAL STATEMENT FOR NEW LAKHRA POWER STATION (PROJECT)

Forecast of Financial Statements for New Lakhra Power Station (Project)

Generation & Tariff	2016 Year 0	2017 Year 1	2018 Year 2	2019 Year 3	2020 Year 4	2021 Year 5	2022 Year 6	2023 Year 7	2024 Year 8	2025 Year 9	2026 Year 10	2027 Year 11	2028 Year 12
Gross Generation (GWh)	-	-	-	-	-	-	-	-	4,625	4,625	4,625	4,625	4,625
Net Generation (GWh)	-	-	-	-	-	-	-	-	4,255	4,255	4,255	4,255	4,255
Capacity charge (Mil. Rs.)	-	-	-	-	-	-	-	-	23,077	22,946	22,562	22,178	21,795
Energy charge (Mil. Rs)	-	-	-	-	-	-	-	-	24,330	24,330	24,330	24,330	24,330

PL (Unit: Mil. Rs.)	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Turnover	-	-	-	-	-	-	-	-	47,407	47,276	46,892	46,509	46,125
Cost of sales (fuel, limestone & ash)	-	-	-	-	-	-	-	-	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)
Gross profit	-	-	-	-	-	-	-	-	25,983	25,852	25,468	25,084	24,701
Varialbe O&M	-	-	-	-	-	-	-	-	(2,966)	(2,966)	(2,966)	(2,966)	(2,966)
Fixed O&M	-	-	-	-	-	-	-	-	(185)	(417)	(417)	(417)	(417)
Administration, labor, tax	-	-	-	-	-	-	-	-	-	-	-	-	-
Railway O&M (not passthrough)	-	-	-	-	-	-	-	-	(578)	(578)	(578)	(578)	(578)
Other operating expenditure	-	-	-	-	-	-	-	-	-	-	-	-	-
Depreciattion	-	-	-	-	-	-	-	-	(5,525)	(5,857)	(5,857)	(5,857)	(5,857)
Operational profit	-	-	-	-	-	-	-	-	16,728	16,033	15,649	15,265	14,882
Non operating income (interest)	-	-	-	-	-	-	-	-	2,294	3,330	4,293	4,673	5,068
	-	-	-	-	-	-	-	-	-	-	-	-	-
Non operating expendiure (insurance)	-	-	-	-	-	-	-	-	(440)	(440)	(440)	(440)	(440)
Non operating expenditure (working capital)	-	-	-	-	-	-	-	-	(985)	(985)	(985)	(985)	(985)
Non operating expenditure (Loan interest)	-	-	-	-	-	-	-	-	-	(4,090)	(10,521)	(10,166)	(9,810)
Oridinary profit	-	-	-	-	-	-	-	-	17,597	13,847	7,996	8,347	8,714
Extraordinary gain & loss	-	-	-	-	-	-	-	-	-	-	-	-	-
Profit before tax	-	-	-	-	-	-	-	-	17,597	13,847	7,996	8,347	8,714
Tax	-	-	-	-	-	-	-	-	(6,159)	(4,847)	(2,799)	(2,922)	(3,050)
Net profit	-	-	-	-	-	-	-	-	11,438	9,001	5,198	5,426	5,664
Accumulated earnings at begining of year	-	-	-	-	-	-	-	-	-	11,438	20,439	25,636	31,062
Net profit	-	-	-	-	-	-	-	-	11,438	9,001	5,198	5,426	5,664
Dividend	-	-	-	-	-	-	-	-	-	-	-	-	-
Accumulated earnings at end of year	-	-	-	-	-	-	-	-	11,438	20,439	25,636	31,062	36,726
									-	-	-	-	-
(Accumulated earnings for tax calculation)		-	-	-	-	-	-	-	11,438	20,439	25,636	31,062	36,726

BS	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Cash & equivalent	-	29,278	29,166	29,166	28,203	28,203	28,203	32,768	47,566	61,332	66,750	72,397	78,282
Receivables	-	-	-	-	-	-	-	-	3,951	3,940	3,908	3,876	3,844
Stocks	-	-	-	-	-	-	-	-	-	-	-	-	-
Other current assets	-	-	-	-	-	-	-	-	-	-	-	-	-
Fixed asset (Building & Equipment)	-	-	781	14,086	16,463	58,132	138,140	166,425	170,892	165,035	159,178	153,320	147,463
Fixed asset (Land)	-	-	111	111	1,074	1,074	1,074	1,074	1,074	1,074	1,074	1,074	1,074
Other fixed assets	-	-	-	-	-	-	-	-	-	-	-	-	-
Other items	-	-	-	-	-	-	-	-	-	-	-	-	-
Total asset	-	29,278	30,059	43,364	45,740	87,410	167,417	200,268	223,483	231,380	230,910	230,667	230,664
Payable	-	-	-	-	-	-	-	-	1,785	1,785	1,785	1,785	1,785
Current portion of long-term loan	-	-	-	-	-	-	-	4,565	4,565	4,565	4,565	4,565	4,565
Other current liability	-	-	-	-	-	-	-	-	-	-	-	-	-
Debt	-	-	781	14,086	16,463	58,132	138,140	166,425	176,417	175,314	169,646	163,978	158,310
Other fixed liability	-	-	-	-	-	-	-	-	-	-	-	-	-
Capital	-	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278
Accumulated profit	-	-	-	-	-	-	-	-	11,438	20,439	25,636	31,062	36,726
Liablilteis & shareholder's equity	-	29,278	30,059	43,364	45,740	87,410	167,417	200,268	223,483	231,380	230,910	230,667	230,664
									-	-	-	-	-

CF	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Balance at begginng of year	-	29,278	29,278	29,166	29,166	28,203	28,203	28,203	32,768	47,566	61,332	66,750	72,397
Operational CF: Net profit after tax	-	-	-	-	-	-	-	-	11,438	9,001	5,198	5,426	5,664
Operational CF: Change in working capital	-	-	-	-	-	-	-	-	(2,165)	11	32	32	32
Operational CF: Depreciation	-	-	-	-	-	-	-	-	5,525	5,857	5,857	5,857	5,857
Operational CF: Others	-	-	-	-	-	-	-	4,565	-	-	-	-	-
Investment CF: Fixed asset (Building & Equipment)	-	-	(781)	(13,305)	(2,377)	(41,669)	(80,008)	(28,285)	(9,992)	(0)	(0)	(0)	(0)
Investment CF: Fixed asset (Land)	-	-	(111)	-	(963)	-	-	-	-	-	-	-	-
Financial CF: Capital	29,278	-	-	-	-	-	-	-	-	-	-	-	-
Financial CF: Debt principal		-	781	13,305	2,377	41,669	80,008	28,285	9,992	(1,103)	(5,668)	(5,668)	(5,668)
Balance at end of year	29,278	29,278	29,166	29,166	28,203	28,203	28,203	32,768	47,566	61,332	66,750	72,397	78,282

Assumptions

PL	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Interest rate for loan	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Interest rate for deposit	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Corporate tax	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%

BS—Working capital													
Sales to receivable (Months)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sales to payable (Months)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

BS—Fixed assets (Building & Equipment)													
Balance at beggining of year	-	-	-	781	14,086	16,463	58,132	138,140	166,425	170,892	165,035	159,178	153,320
Capital expenditure	-	-	781	13,305	2,377	41,669	80,008	28,285	9,992	-	-	-	-
Depreciation	-	-	-	-	-	-	-	-	(5,525)	(5,857)	(5,857)	(5,857)	(5,857)
Balance at end of year	-	-	781	14,086	16,463	58,132	138,140	166,425	170,892	165,035	159,178	153,320	147,463
Annual percentage of depreciation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	3.3%	3.3%	3.3%	3.3%

Indicators

Return on Equity (ROE)		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	28.1%	18.1%	9.5%	9.0%	8.6%
Return on Asset (ROA)		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	5.1%	3.9%	2.3%	2.4%	2.5%
Debt service coverage ratio (DSCR)		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	0.0	3.3	1.2	1.2	1.1
Current Ratio		--	--	--	--	--	--	718%	811%	1028%	1113%	1201%	1293%
Equity capital ratio		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	18.2%	21.5%	23.8%	26.2%	28.6%

Forecast of Financial Statements for New Lakhra Power Station (Project)

ration & Tariff	2029 Year 13	2030 Year 14	2031 Year 15	2032 Year 16	2033 Year 17	2034 Year 18	2035 Year 19	2036 Year 20	2037 Year 21	2038 Year 22	2039 Year 23	2040 Year 24
Gross Generation (GWh)	4,625	4,625	4,625	4,625	4,625	4,625	4,625	4,625	4,625	4,625	4,625	4,625
Net Generation (GWh)	4,255	4,255	4,255	4,255	4,255	4,255	4,255	4,255	4,255	4,255	4,255	4,255
Capacity charge (Mil. Rs.)	21,411	21,027	20,644	20,260	19,876	19,493	19,109	18,726	18,342	17,958	17,575	17,191
Energy charge (Mil. Rs)	24,330	24,330	24,330	24,330	24,330	24,335	24,335	24,335	24,335	24,335	24,335	24,335

(Unit: Mil. Rs.)	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24
Turnover	45,741	45,358	44,974	44,590	44,207	43,829	43,445	43,061	42,678	42,294	41,910	41,527
Cost of sales (fuel, limestone & ash)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)
Gross profit	24,317	23,933	23,550	23,166	22,782	22,404	22,021	21,637	21,253	20,870	20,486	20,102
Varialbe O&M	(2,966)	(2,966)	(2,966)	(2,966)	(2,966)	(2,798)	(2,798)	(2,798)	(2,798)	(2,798)	(2,798)	(2,798)
Fixed O&M	(417)	(417)	(417)	(417)	(417)	(418)	(418)	(418)	(418)	(418)	(418)	(418)
Administration, labor, tax	-	-	-	-	-	-	-	-	-	-	-	-
Railway O&M (not passthrough)	(578)	(578)	(578)	(578)	(578)	(578)	(578)	(578)	(578)	(578)	(578)	(578)
Other operating expenditure	-	-	-	-	-	-	-	-	-	-	-	-
Depreciattion	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)
Operational profit	14,498	14,114	13,731	13,347	12,963	12,753	12,369	11,985	11,602	11,218	10,834	10,451
Non operating income (interest)	5,480	5,909	6,357	6,824	7,310	7,818	8,355	8,915	9,500	10,110	10,746	11,410
	-	-	-	-	-	-	-	-	-	-	-	-
Non operating expendiure (insurance)	(440)	(440)	(440)	(440)	(440)	(440)	(440)	(440)	(440)	(440)	(440)	(440)
Non operating expenditure (working capital)	(985)	(985)	(985)	(985)	(985)	(985)	(985)	(985)	(985)	(985)	(985)	(985)
Non operating expenditure (Loan interest)	(9,455)	(9,100)	(8,745)	(8,389)	(8,034)	(7,679)	(7,324)	(6,968)	(6,613)	(6,258)	(5,903)	(5,547)
Oridinary profit	9,098	9,499	9,918	10,356	10,814	11,467	11,975	12,507	13,063	13,645	14,253	14,888
Extraordinary gain & loss	-	-	-	-	-	-	-	-	-	-	-	-
Profit before tax	9,098	9,499	9,918	10,356	10,814	11,467	11,975	12,507	13,063	13,645	14,253	14,888
Tax	(3,184)	(3,325)	(3,471)	(3,625)	(3,785)	(4,013)	(4,191)	(4,378)	(4,572)	(4,776)	(4,988)	(5,211)
Net profit	5,913	6,174	6,447	6,731	7,029	7,453	7,784	8,130	8,491	8,869	9,264	9,677

Accumulated earnings at begining of year	36,726	42,639	48,814	55,260	61,992	69,021	76,474	84,258	92,388	100,879	109,748	119,012
Net profit	5,913	6,174	6,447	6,731	7,029	7,453	7,784	8,130	8,491	8,869	9,264	9,677
Dividend	-	-	-	-	-	-	-	-	-	-	-	-
Accumulated earnings at end of year	42,639	48,814	55,260	61,992	69,021	76,474	84,258	92,388	100,879	109,748	119,012	128,689
	-	-	-	-	-	-	-	-	-	-	-	-
(Accumulated earnings for tax calculation)	42,639	48,814	55,260	61,992	69,021	76,474	84,258	92,388	100,879	109,748	119,012	128,689

	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24
Cash & equivalent	84,417	90,812	97,479	104,432	111,682	119,356	127,361	135,712	144,424	153,514	162,999	172,897
Receivables	3,812	3,780	3,748	3,716	3,684	3,652	3,620	3,588	3,556	3,524	3,493	3,461
Stocks	-	-	-	-	-	-	-	-	-	-	-	-
Other current assets	-	-	-	-	-	-	-	-	-	-	-	-
Fixed asset (Building & Equipment)	141,606	135,749	129,892	124,035	118,178	112,321	106,464	100,607	94,750	88,893	83,036	77,179
Fixed asset (Land)	1,074	1,074	1,074	1,074	1,074	1,074	1,074	1,074	1,074	1,074	1,074	1,074
Other fixed assets	-	-	-	-	-	-	-	-	-	-	-	-
Other items	-	-	-	-	-	-	-	-	-	-	-	-
Total asset	230,909	231,415	232,194	233,257	234,619	236,404	238,520	240,981	243,804	247,006	250,602	254,611
Payable	1,785	1,785	1,785	1,785	1,785	1,785	1,785	1,785	1,785	1,785	1,785	1,785
Current portion of long-term loan	4,565	4,565	4,565	4,565	4,565	4,565	4,565	4,565	4,565	4,565	4,565	4,565
Other current liability	-	-	-	-	-	-	-	-	-	-	-	-
Debt	152,642	146,974	141,306	135,638	129,970	124,302	118,634	112,966	107,298	101,630	95,962	90,294
Other fixed liability	-	-	-	-	-	-	-	-	-	-	-	-
Capital	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278
Accumulated profit	42,639	48,814	55,260	61,992	69,021	76,474	84,258	92,388	100,879	109,748	119,012	128,689
Liabliliteis & shareholder's equity	230,909	231,415	232,194	233,257	234,619	236,404	238,520	240,981	243,804	247,006	250,602	254,611

	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24
Balance at begginng of year	78,282	84,417	90,812	97,479	104,432	111,682	119,356	127,361	135,712	144,424	153,514	162,999
Operational CF: Net profit after tax	5,913	6,174	6,447	6,731	7,029	7,453	7,784	8,130	8,491	8,869	9,264	9,677
Operational CF: Change in working capital	32	32	32	32	32	32	32	32	32	32	32	32
Operational CF: Depreciation	5,857	5,857	5,857	5,857	5,857	5,857	5,857	5,857	5,857	5,857	5,857	5,857
Operational CF: Others	-	-	-	-	-	-	-	-	-	-	-	-
Investment CF: Fixed asset (Building & Equipment)	(0)	(0)	-	-	-	-	-	-	-	-	-	-
Investment CF: Fixed asset (Land)	-	-	-	-	-	-	-	-	-	-	-	-
Financial CF: Capital	-	-	-	-	-	-	-	-	-	-	-	-
Financial CF: Debt principal	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)
Balance at end of year	84,417	90,812	97,479	104,432	111,682	119,356	127,361	135,712	144,424	153,514	162,999	172,897

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	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24
Interest rate for loan	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Interest rate for deposit	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Corporate tax	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%

Working capital

Sales to receivable (Months)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sales to payable (Months)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Fixed assets (Building & Equipment)

Balance at beggining of year	147,463	141,606	135,749	129,892	124,035	118,178	112,321	106,464	100,607	94,750	88,893	83,036
Capital expenditure	-	-	-	-	-	-	-	-	-	-	-	-
Depreciation	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)
Balance at end of year	141,606	135,749	129,892	124,035	118,178	112,321	106,464	100,607	94,750	88,893	83,036	77,179
Annual percentage of depreciation	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%

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Return on Equity (ROE)	8.2%	7.9%	7.6%	7.4%	7.2%	7.0%	6.9%	6.7%	6.5%	6.4%	6.2%	6.1%
Return on Asset (ROA)	2.6%	2.7%	2.8%	2.9%	3.0%	3.2%	3.3%	3.4%	3.5%	3.6%	3.7%	3.8%
Debt service coverage ratio (DSCR)	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0
Current Ratio	1389%	1490%	1594%	1703%	1817%	1937%	2063%	2194%	2330%	2473%	2622%	2777%
Equity capital ratio	31.1%	33.7%	36.4%	39.1%	41.9%	44.7%	47.6%	50.5%	53.4%	56.3%	59.2%	62.0%

Forecast of Financial Statements for New Lakhra Power Station (Project)

ration & Tariff	2041 Year 25	2042 Year 26	2043 Year 27	2044 Year 28	2045 Year 29	2046 Year 30	2047 Year 31	2048 Year 32	2049 Year 33	2050 Year 34	2051 Year 35	2052 Year 36	2053 Year 37
Gross Generation (GWh)	4,625	4,625	4,625	4,625	4,625	4,625	4,625	4,625	4,625	4,625	4,625	4,625	4,625
Net Generation (GWh)	4,255	4,255	4,255	4,255	4,255	4,255	4,255	4,255	4,255	4,255	4,255	4,255	4,255
Capacity charge (Mil. Rs.)	16,807	16,424	16,040	15,656	15,273	14,889	14,506	14,122	13,738	13,355	12,971	12,587	12,204
Energy charge (Mil. Rs)	24,335	24,335	24,335	24,335	24,335	24,335	24,335	24,335	24,335	24,335	24,335	24,335	24,335

(Unit: Mil. Rs.)	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37
Turnover	41,143	40,759	40,376	39,992	39,608	39,225	38,841	38,457	38,074	37,690	37,306	36,923	36,539
Cost of sales (fuel, limestone & ash)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)	(21,424)
Gross profit	19,719	19,335	18,951	18,568	18,184	17,800	17,417	17,033	16,649	16,266	15,882	15,498	15,115
Varialbe O&M	(2,798)	(2,798)	(2,798)	(2,798)	(2,798)	(2,798)	(2,798)	(2,798)	(2,798)	(2,798)	(2,798)	(2,798)	(2,798)
Fixed O&M	(418)	(418)	(418)	(418)	(418)	(418)	(418)	(418)	(418)	(418)	(418)	(418)	(418)
Administration, labor, tax	-	-	-	-	-	-	-	-	-	-	-	-	-
Railway O&M (not passthrough)	(578)	(578)	(578)	(578)	(578)	(578)	(578)	(578)	(578)	(578)	(578)	(578)	(578)
Other operating expenditure	-	-	-	-	-	-	-	-	-	-	-	-	-
Depreciattion	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)
Operational profit	10,067	9,683	9,300	8,916	8,532	8,149	7,765	7,382	6,998	6,614	6,231	5,847	5,463
Non operating income (interest)	12,103	12,826	13,581	14,368	15,191	16,049	16,945	17,881	18,858	19,878	20,943	22,056	23,218
	-	-	-	-	-	-	-	-	-	-	-	-	-
Non operating expendiure (insurance)	(440)	(440)	(440)	(440)	(440)	(440)	(440)	(440)	(440)	(440)	(440)	(440)	(440)
Non operating expenditure (working capital)	(985)	(985)	(985)	(985)	(985)	(985)	(985)	(985)	(985)	(985)	(985)	(985)	(985)
Non operating expenditure (Loan interest)	(5,192)	(4,837)	(4,482)	(4,127)	(3,771)	(3,416)	(3,061)	(2,706)	(2,350)	(1,995)	(1,640)	(1,285)	(929)
Oridinary profit	15,553	16,247	16,974	17,733	18,527	19,357	20,225	21,132	22,080	23,072	24,109	25,193	26,326
Extraordinary gain & loss	-	-	-	-	-	-	-	-	-	-	-	-	-
Profit before tax	15,553	16,247	16,974	17,733	18,527	19,357	20,225	21,132	22,080	23,072	24,109	25,193	26,326
Tax	(5,443)	(5,687)	(5,941)	(6,207)	(6,484)	(6,775)	(7,079)	(7,396)	(7,728)	(8,075)	(8,438)	(8,818)	(9,214)
Net profit	10,109	10,561	11,033	11,526	12,042	12,582	13,146	13,736	14,352	14,997	15,671	16,375	17,112
Accumulated earnings at begining of year	128,689	138,799	149,359	160,392	171,919	183,961	196,543	209,689	223,425	237,777	252,774	268,445	284,820
Net profit	10,109	10,561	11,033	11,526	12,042	12,582	13,146	13,736	14,352	14,997	15,671	16,375	17,112
Dividend	-	-	-	-	-	-	-	-	-	-	-	-	-
Accumulated earnings at end of year	138,799	149,359	160,392	171,919	183,961	196,543	209,689	223,425	237,777	252,774	268,445	284,820	301,932
	-	-	-	-	-	-	-	-	-	-	-	-	-
(Accumulated earnings for tax calculation)	138,799	149,359	160,392	171,919	183,961	196,543	209,689	223,425	237,777	252,774	268,445	284,820	301,932

	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37
Cash & equivalent	183,228	194,009	205,263	217,011	229,274	242,077	255,444	269,401	283,974	299,192	315,084	331,680	344,448
Receivables	3,429	3,397	3,365	3,333	3,301	3,269	3,237	3,205	3,173	3,141	3,109	3,077	3,045
Stocks	-	-	-	-	-	-	-	-	-	-	-	-	-
Other current assets	-	-	-	-	-	-	-	-	-	-	-	-	-
Fixed asset (Building & Equipment)	71,322	65,465	59,608	53,751	47,894	42,037	36,180	30,323	24,466	18,609	12,751	6,894	1,037
Fixed asset (Land)	1,074	1,074	1,074	1,074	1,074	1,074	1,074	1,074	1,074	1,074	1,074	1,074	1,074
Other fixed assets	-	-	-	-	-	-	-	-	-	-	-	-	-
Other items	-	-	-	-	-	-	-	-	-	-	-	-	-
Total asset	259,052	263,945	269,310	275,168	281,543	288,456	295,934	304,002	312,686	322,015	332,018	342,726	349,605
Payable	1,785	1,785	1,785	1,785	1,785	1,785	1,785	1,785	1,785	1,785	1,785	1,785	1,785
Current portion of long-term loan	4,565	4,565	4,565	4,565	4,565	4,565	4,565	4,565	4,565	4,565	4,565	4,565	-
Other current liability	-	-	-	-	-	-	-	-	-	-	-	-	-
Debt	84,626	78,958	73,290	67,622	61,954	56,286	50,618	44,950	39,282	33,614	27,946	22,278	16,610
Other fixed liability	-	-	-	-	-	-	-	-	-	-	-	-	-
Capital	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278	29,278
Accumulated profit	138,799	149,359	160,392	171,919	183,961	196,543	209,689	223,425	237,777	252,774	268,445	284,820	301,932
Liabliliteis & shareholder's equity	259,052	263,945	269,310	275,168	281,543	288,456	295,934	304,002	312,686	322,015	332,018	342,726	349,605

	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37
Balance at begginng of year	172,897	183,228	194,009	205,263	217,011	229,274	242,077	255,444	269,401	283,974	299,192	315,084	331,680
Operational CF: Net profit after tax	10,109	10,561	11,033	11,526	12,042	12,582	13,146	13,736	14,352	14,997	15,671	16,375	17,112
Operational CF: Change in working capital	32	32	32	32	32	32	32	32	32	32	32	32	32
Operational CF: Depreciation	5,857	5,857	5,857	5,857	5,857	5,857	5,857	5,857	5,857	5,857	5,857	5,857	5,857
Operational CF: Others	-	-	-	-	-	-	-	-	-	-	-	-	(4,565)
Investment CF: Fixed asset (Building & Equipment)	-	-	-	-	-	-	-	-	-	-	-	-	-
Investment CF: Fixed asset (Land)	-	-	-	-	-	-	-	-	-	-	-	-	-
Financial CF: Capital	-	-	-	-	-	-	-	-	-	-	-	-	-
Financial CF: Debt principal	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)	(5,668)
Balance at end of year	183,228	194,009	205,263	217,011	229,274	242,077	255,444	269,401	283,974	299,192	315,084	331,680	344,448

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	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37
Interest rate for loan	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Interest rate for deposit	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Corporate tax	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%

Working capital

Sales to receivable (Months)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sales to payable (Months)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Fixed assets (Building & Equipment)

Balance at beggining of year	77,179	71,322	65,465	59,608	53,751	47,894	42,037	36,180	30,323	24,466	18,609	12,751	6,894
Capital expenditure	-	-	-	-	-	-	-	-	-	-	-	-	-
Depreciation	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)	(5,857)
Balance at end of year	71,322	65,465	59,608	53,751	47,894	42,037	36,180	30,323	24,466	18,609	12,751	6,894	1,037
Annual percentage of depreciation	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%

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Return on Equity (ROE)	6.0%	5.9%	5.8%	5.7%	5.6%	5.6%	5.5%	5.4%	5.4%	5.3%	5.3%	5.2%	5.2%
Return on Asset (ROA)	3.9%	4.0%	4.1%	4.2%	4.3%	4.4%	4.4%	4.5%	4.6%	4.7%	4.7%	4.8%	4.9%
Debt service coverage ratio (DSCR)	1.0	0.9	0.9	0.9	0.8	0.8	0.8	0.7	0.6	0.6	0.5	0.4	0.3
Current Ratio	2939%	3109%	3285%	3470%	3662%	3864%	4074%	4293%	4522%	4761%	5011%	5272%	19464%
Equity capital ratio	64.9%	67.7%	70.4%	73.1%	75.7%	78.3%	80.7%	83.1%	85.4%	87.6%	89.7%	91.6%	94.7%