Lab 4: Transient Stability Simulation

ECE 433 – Power Systems Stability and Transients

# Postlab

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Student ID** | **CCID** | **Lab Section** |
|  |  |  |  |

## Plots

#### Power Angle at Generator Buses

#### (critical fault clearing time = 0.15 ms)

#### (end time = 20 s)

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#### Voltage at Generator Buses

#### (critical fault clearing time = 0.15 ms)

#### (end time = 3 s)

* 1. <Delete this text and insert appropriate plot image here>

#### Power at Generator Buses

#### (critical fault clearing time = 0.15 ms)

#### (end time = 20 s)

* 1. <Delete this text and insert appropriate plot image here>

#### Unstable - Power Angle at Generator Buses

#### (fault time > critical fault clearing time)

* 1. <Delete this text and insert appropriate plot image here>

## Tables

#### System critical fault clearing time when fault occurs at each bus

|  |  |  |
| --- | --- | --- |
| **Bus #** | **Bus Voltage (kV)** | **Critical clearing fault time (s)** |
| 1 | 18 |  |
| 2 | 16.5 |  |
| 3 | 13.8 |  |
| 4 | 230 |  |
| 5 | 230 |  |
| 6 | 230 |  |
| 7 | 230 |  |
| 8 | 230 |  |
| 9 | 230 |  |

#### System critical fault clearing time for different cases for a fault at bus 4

|  |
| --- |
| **Bus 4** |
| **Case** | **Critical clearing fault time (s)** |
| Base Case |  |
| Line Trip |  |
| Increased Inertia |  |

## Questions

#### Transient Stability Study

Q1. Is the system stable? Explain why.

Q2. Explain what is occurring in the generator plots for both the voltage and the power, that you obtained, when a fault is applied to bus 4 between 1.0 to 1.15 seconds of the simulation.

#### Impact of Fault Location

Q3. Which fault location is most susceptible to cause a system transient that will lead to an unstable system? What are the potential reasons for that?

Q4. Explain why doing a fault location scan, like was completed in the lab, could be useful.

#### Impact of Line Tripping

Q5. How does a line being removed from the system effect the systems transient stability? Explain.

#### Impact of Inertia

Q6. How does the inertia of all of the generators in the system effect the systems transient stability? Explain.