Lab 1: Intro to PowerWorld Simulator

ECE 433 – Power Systems Stability and Transients

# Lab Report

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

## Questions

1. What essential data are needed to describe a bus?
2. What data are needed to represent a generator?
3. Why does a power system need a slack bus?
4. What data are needed to represent a load?
5. What data are needed to represent a transformer?
6. What data are needed to represent a line or cable?
7. What essential data are needed to describe a branch?
8. What are AVR and AGC? Briefly, describe their functions in power system?

## Results

|  |
| --- |
| Table 1: Buses |
| Number | Name | Nom*(kV)* | PU*(V)* | Volt*(kV)* | Angle*(°)* | Load *(MW)* | Load*(MVar)* | Gen*(MW)* | Gen*(MVar)* | Switched Shunts*(MVar)* |
| 1 | Source |  |  |  |  | — | — |  |  | — |
| 2 | Co-gen |  |  |  |  | — | — |  |  | — |
| 3 | Load |  |  |  |  |  |  | — | — |  |

|  |
| --- |
| Table 2: Generators |
| Number | Name | Status | Gen*(MW)* | Gen*(MVar)* | Min*(MW)* | Max*(MW)* | AGC | AVR | Set Volt (pu) | Min*(MVar)* | Max*(MVar)* |
| 1 | Source |  |  |  |  |  |  |  |  |  |  |
| 2 | Co-gen |  |  |  |  |  |  |  |  |  |  |

|  |
| --- |
| Table 3: Loads |
| Number | Name | Status |  MW | MVar | MVA |
| 3 | Load |  |  |  |  |

|  |
| --- |
| Table 4: Branches Input (Line and Transformer Records) |
| From Number | From Name | To Number | To Name | Status | Branch Device Type | Xfrmr | R(pu) | X(pu) | B(pu) | Lim A*(MVA)* |
| 1 | Source | 3 | Load |  |  |  |  |  |  |  |
| 2 | Co-gen | 3 | Load |  |  |  |  |  |  |  |

|  |
| --- |
| Table 5: Branches State (Line and Transformer Records) |
| From Number | To Number | Xfrmr | MW From | Mvar From | MVA From | Lim MVA | % of MVA Limit (Max) | MW Loss | Mvar Loss |
| 1 | 3 |  |  |  |  |  |  |  |  |
| 2 | 3 |  |  |  |  |  |  |  |  |

|  |
| --- |
| Table 6: Switched Shunts |
| Number | Name | Control Mode | Regulates | Actual Mvar | Volt High | Volt Low | Reg Volt | Deviation | Nominal Mvar | Max Mvar | Min Mvar |
| 3 | Load |  |  |  |  |  |  |  |  |  |  |

## Data Preparation for Lab 2

|  |
| --- |
| Table 1. Line & Cable Branch Preparation (SBASE = 100MVA) |
| branch-# | Rated V*(kV)* | R*(pu)* | X*(pu)* |
| branch-1 |  |  |  |
| branch-4 |  |  |  |
| branch-5 |  |  |  |
| branch-8 |  |  |  |

|  |
| --- |
| Table 2. Transformer Branch Preparation (SBASE = 100MVA) |
| branch-# | Rated kVA*(kVA)* | Rated Pri. V *(kV)* | Rated Sec. V *(kV)* | Tap*(off-nominal turns ratio)* | R*(pu)* | X*(pu)* |
| branch-2 |  |  |  |  |  |  |
| branch-3 |  |  |  |  |  |  |
| branch-6 |  |  |  |  |  |  |
| branch-7 |  |  |  |  |  |  |

|  |  |
| --- | --- |
| **Table 3. Shunt Capacitor Susceptance** *(Siemens/phase) B =* |  |

|  |
| --- |
| Table 4. Load Information |
| Bus # | 3-phase Load |
|  | P*(MW)* | Q*(MVar)* |
| BUS-4 |  |  |
| BUS-6 |  |  |
| BUS-8 |  |  |
| BUS-9 |  |  |

|  |
| --- |
| Table 5. Generator and Motor Information |
| BUS-# |  | Bus Type*(Slack, PV or PQ)* | Voltage*(kV)* | δ*(°)* | Real Power*(MW)* | Reactive Power*(MVar)* |
| BUS-1 | Utility |  |  |  | — | — |
| BUS-2 | Co-generator |  |  | — |  | — |
| BUS-3 | Motor |  | — | — |  |  |