Lab 1: Intro to PowerWorld Simulator

ECE 433 – Power Systems Stability and Transients

# Lab Report

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| Name | Student ID | CCID | Lab Section |
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## 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

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| 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 |  |  |  |  |  |  | — | — |  |

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| 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 |  |  |  |  |  |  |  |  |  |  |

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

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| 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 |  |  |  |  |  |  |  |

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| 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 |  |  |  |  |  |  |  |  |

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| 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

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

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| 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 |  |  |  |  |  |  |

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

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

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| 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 |  | — | — |  |  |