**Modified 4 Bus Test System:**

The following systems are modifications to the IEEE 4 Node Test Feeder with a delta-grounded wye step down transformer. The top system is the base system which is purely intended for static power flow, the middle system incorporates a pv system and a padmount transformer, the bottom system incorporates an induction motor

A picture containing diagram, text

Description automatically generated

Nodes 1-4 have not been modified.

Both the primary line (Node 1-Node 2) and the secondary lines (Node 3-Node 4), (Node 4-Node 5), and (Node 5-Node 6) will be constructed using the pole configuration shown in below.

A picture containing diagram, line, drawing

Description automatically generated

Phase Conductor: 336,400 26/7

GMR = 0.0244 ft., Resistance = 0.306 Ω/mile, Diameter = 0.721 inch

Neutral Conductor: 4/0 6/1 ACSR

GMR = 0.00814 ft., Resistance = 0.592 Ω/mile, Diameter = 0.563 inch

The source is a 12.47 kV line-to-line infinite bus.

The transformer has the following:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Connection | kVA | kVLL-high | kVLL-low | R-% | X-% |
| Step-Down | 6000 | 12.47 | 4.16 | 1.0 | 6.0 |

Load 1 Data:

|  |  |  |
| --- | --- | --- |
|  | Balanced | Unbalanced |
| **Phase-1** |  |  |
| kW | 1800 | 1275 |
| Power Factor | 0.9 lag | 0.9 lag |
| **Phase-2** |  |  |
| kW | 1800 | 1800 |
| Power Factor | 0.9 lag | 0.95 lag |
| **Phase-3** |  |  |
| kW | 1800 | 2375 |
| Power Factor | 0.9 lag | 0.85 lag |

Load 2 Data:

|  |  |  |
| --- | --- | --- |
|  | Balanced | Unbalanced |
| **Phase-1** |  |  |
| kW | 200 | 175 |
| Power Factor | 0.9 lag | 0.9 lag |
| **Phase-2** |  |  |
| kW | 200 | 225 |
| Power Factor | 0.9 lag | 0.95 lag |
| **Phase-3** |  |  |
| kW | 200 | 200 |
| Power Factor | 0.9 lag | 0.85 lag |

Motor Data:

*Ratings:*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Conn | Conn | kV | kW | kVA | Pole | rpm |
| IM | D | 0.48 | 372 | 478 | 4 | 1791 |

*Dynamic Parameters:*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| H | D | Rs | Rr | Xs | Xr | Xm | m |
| 1.6 | 1 | 0.007 | 0.0062 | 0.0409 | 0.0267 | 3.62 | 2.0 |

PV Data:

*Ratings:*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Conn | Ph-1 | Ph-1 | Ph-2 | Ph-2 | Ph-3 | Ph-3 |
|  | kVA | pf | kVA | pf | kVA | pf |
| D | 120 | 0.95 | 120 | 0.95 | 120 | 0.95 |

*Dynamic Parameters:*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| R | X | Kp | kVDC | KP Tol | Safe Voltage |
| 0.5 | 0.5 | 0.01 | 0.03 | 0.1 | 0 |

Padmount transformer:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| kVA | kV-high | kV-low | R - % | X - % |
| 500 | 4.16 – Gr.W | 0.48 – Gr.W | 1.1 | 2 |