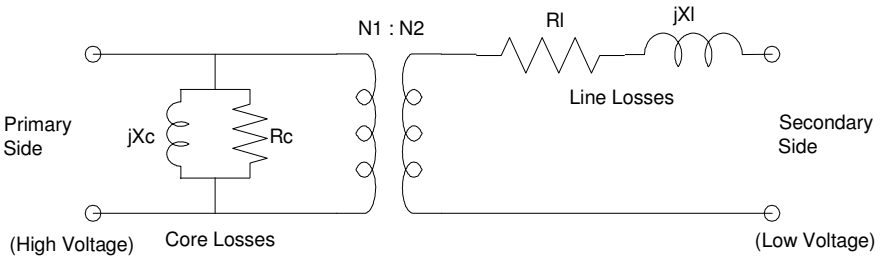
ECE 111: Homework 16

ECE 331 Energy Conversion

1) Determine the circuit model for a 13.2kV : 240V transformer is tested with the following test results:



Transformer Model

	V	Power	pf
Open-Circuit Test	V1 = 9.6kV	15 W	0.015
Short-Circuit Test	V2 = 20V	10 W	0.99

For the utility grid on the back of the page....

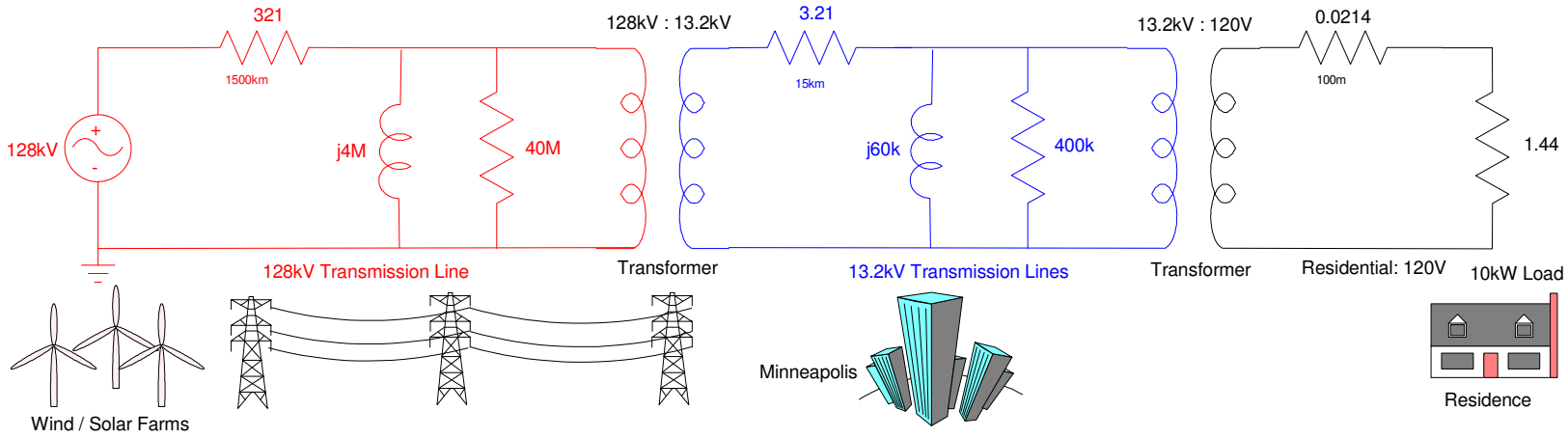
2) Convert the voltages and impeances to the 120V node (right side)

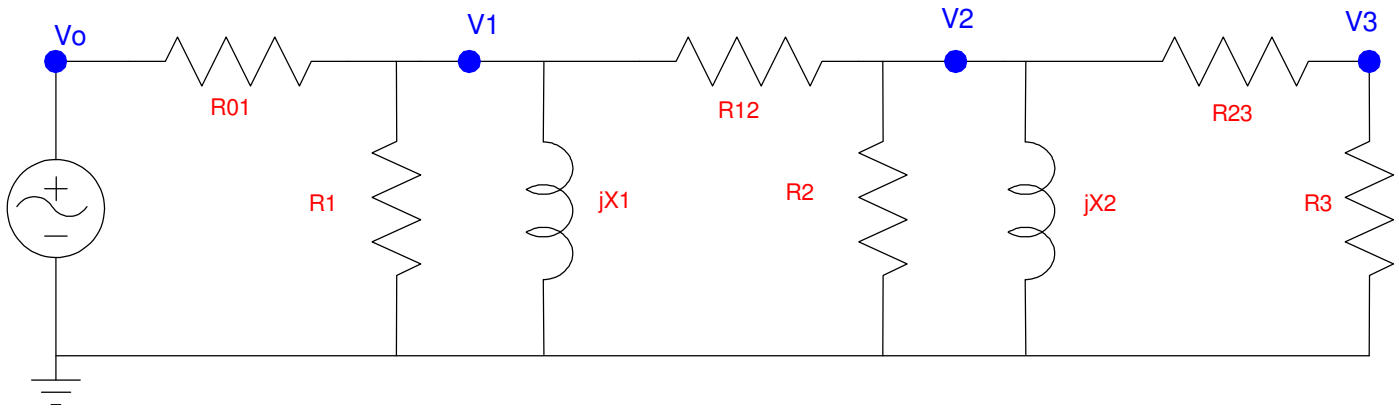
3) Write the voltage node equations for this circuit (with transformers removed)

4) Determine the voltages at each node

5) Determine the efficiency of this system

- Ignoring the core losses
  - Assumes a large number of customers share these losses
- Including the core losses
  - Assumes a single customer


321
1500km
128kV
j4M
40M
128kV : 13.2kV
3.21
15km
j60k
400k
13.2kV : 120V
0.0214
100m
1.44
128kV Transmission Line
Transformer
13.2kV Transmission Lines
Transformer
Residential: 120V
10kW Load
Wind / Solar Farms
Minneapolis
Residence


Vo
V1
V2
V3
R01
R12
R23
R1
jX1
R2
jX2
R3