SIERRA COLLEGE

Class 7

Lesson Plan

- Project Work
  - Bill of materials
  - Rebate analysis
  - PV Watts
- Discussion re 3 phase power and transformers
- Midterm exam review

- Design changes…..

Bill of materials

- Determine components required to build our system
  - Modules – Sharp 175 (Nt-175U1)
  - Inverter – SMA Sunny Boy?
  - Racking system
    - Unirac Solarmount rails, how long, how many?
    - Top clamps – how many mid and how many end clamps?
    - Splice kits?
    - U-LA attachment brackets – how many?
  - Grounding equipment
    - Ground clips?
    - Ground lugs?
    - Ground splice kits?
  - Additional equipment
    - Combiner boxes, how many, what type?
    - Circuit breakers, fuses – type, size, quantity?
    - Disconnect switches – ratings , quantity
    - Conductors – type, size, quantity?

Rebate analysis

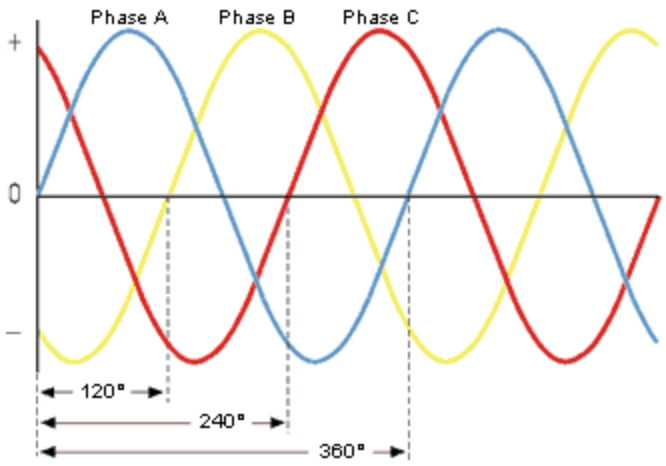
- Use the CSI EPBB calculator
  - http://www.csi-epbb.com/index.aspx
  - Utility = PG&E
  - Zip code = 95677
  - Customer type = government/non-profit
  - Shading ≠ minimal
- What is the rating of the system?
  - DC STC
  - DC PTC
  - CEC-AC
  - CSI
- What is the available rebate for the system?

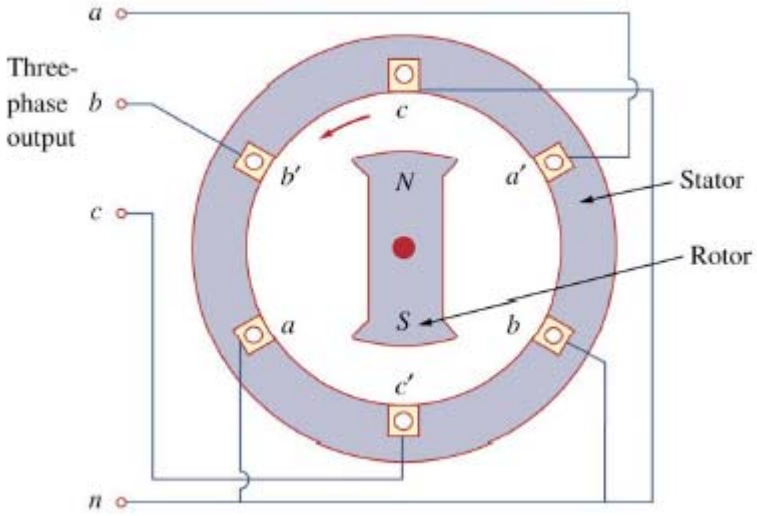
PV Watts

- Use PV Watts V1
  - http://rredc.nrel.gov/solar/calculators/PVWATTS/version1/
  - What is a suitable de-rate factor?
  - How does AC rating compare to CSI results?
    - If different, why?
  - What is annual energy production?

Transformers and 3-phase power

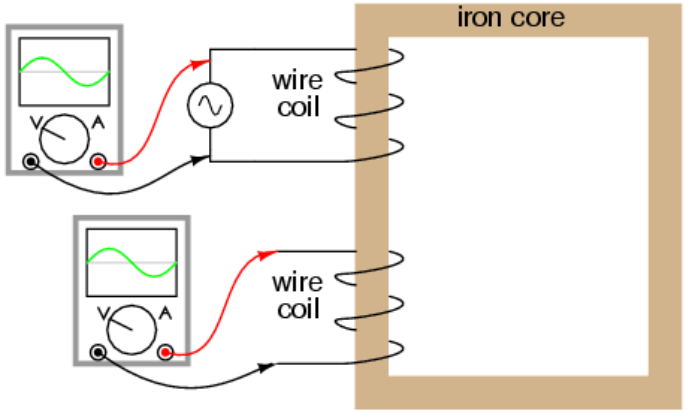
- Why do we care?
- Where do we start?
  - AC/DC wars ….. Who won, who lost, why?
  - How do generators and motors work?
  - How is electricity distributed today?

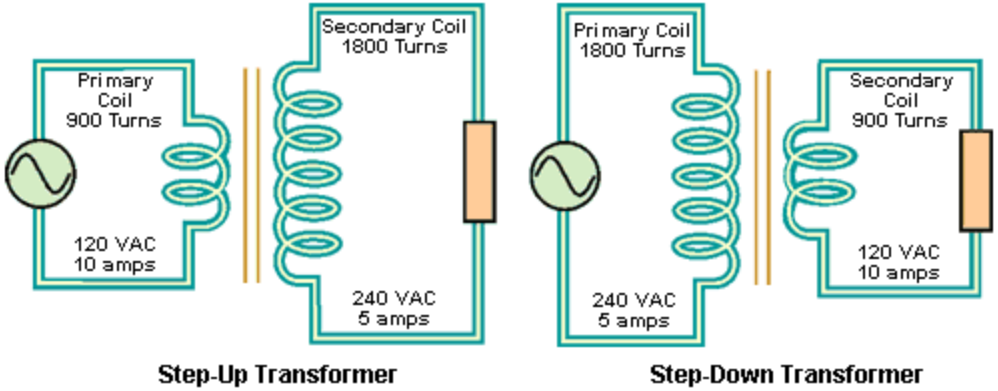




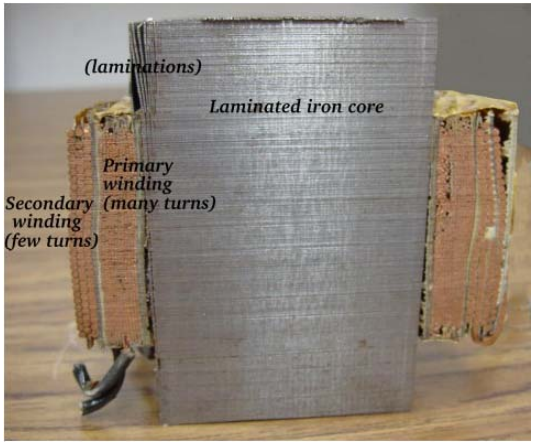
Transformers and 3-phase power

- What do transformers do?
- How do they work?
- Windings and Voltage
  - V1/N1 = V2/N2
  - V1/V2 = N1/N2

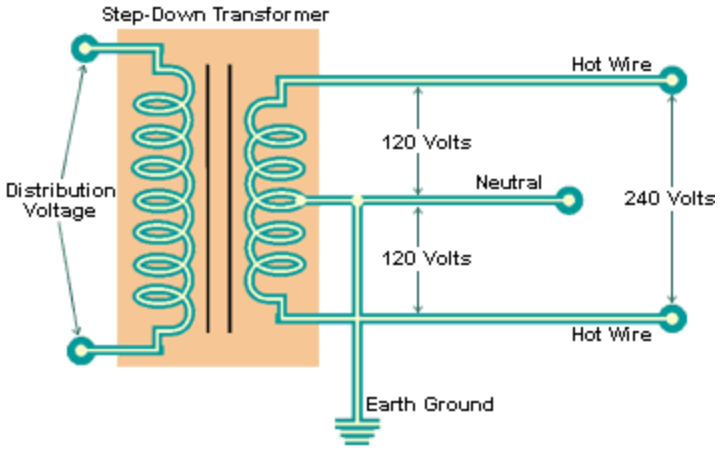


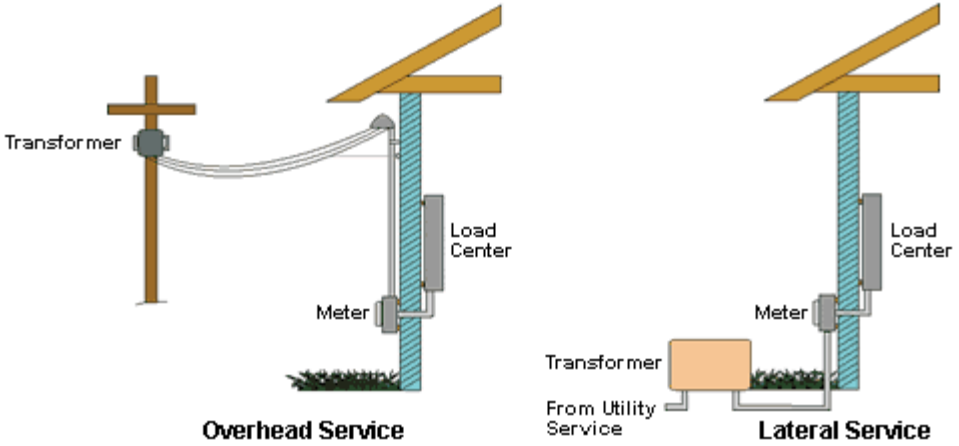


Transformers and 3-phase power



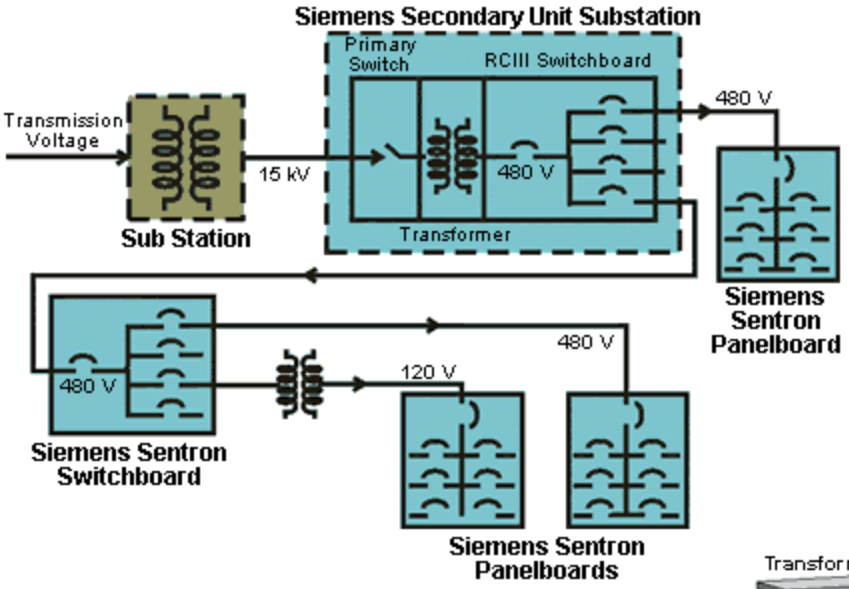
- Typical residential application

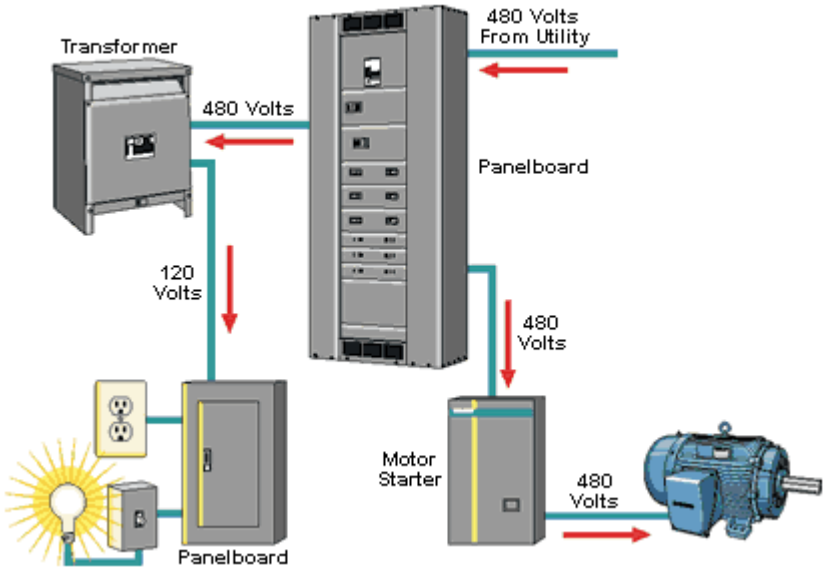




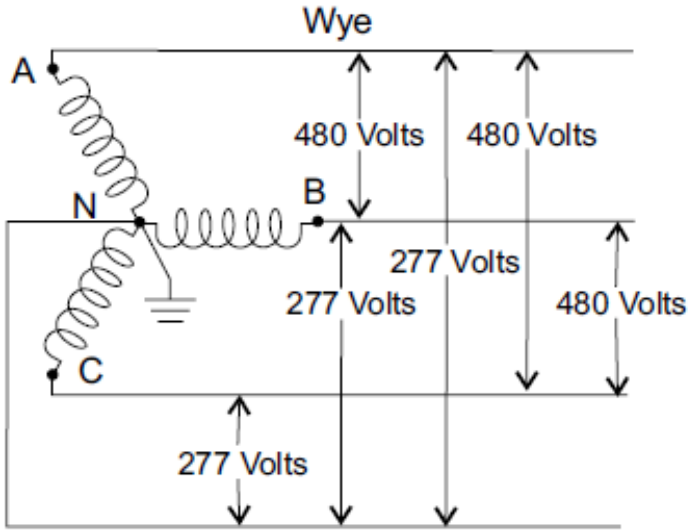
Transformers and 3-phase power

- Typical commercial application

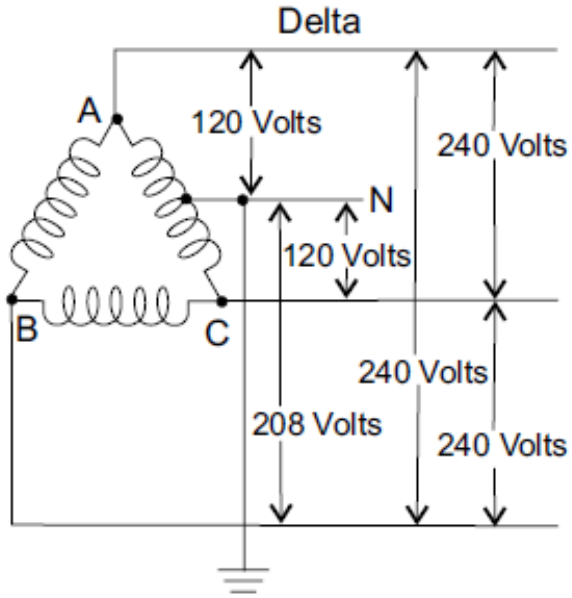




- Three phase wiring



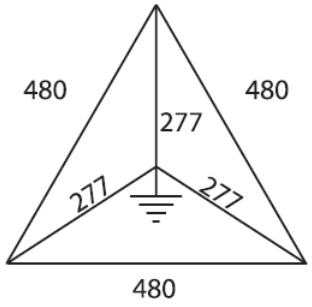
A - B 480 Volts
B - C 480 Volts
C - A 480 Volts
A - N 277 Volts
B - N 277 Volts
C - N 277 Volts



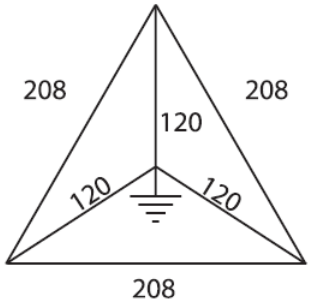
A - B 240 Volts
B - C 240 Volts
C - A 240 Volts
A - N 120 Volts
B - N 208 Volts
C - N 120 Volts

- Three phase wiring

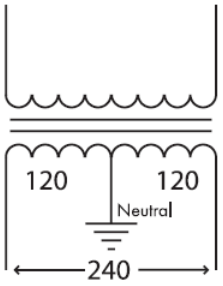
480 Delta: 277 WYE



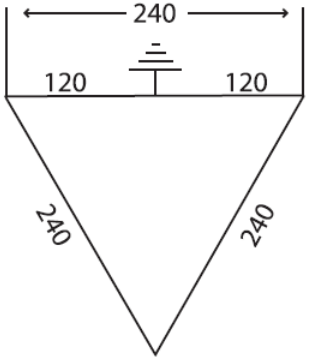
208 Delta: 120 WYE *



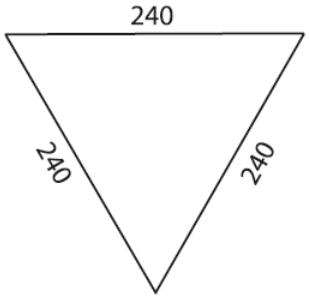
240: 120 Split Phase



240 Delta: 120 Stinger



240 Delta



208 Delta *