A photograph of a waterfall cascading over rocks, with a decorative teal and yellow border at the bottom.

Wood River Electric Plan

Transmission Lines Parameters

Marc Patterson, P. E.

T&D Building Blocks

- **Distribution Lines**
 - Connect the customers to the electric system
- **Substations**
 - Connect Transmission Lines
 - Connect Distribution Lines to Transmission System
- **Transmission Lines**
 - Are the supply lines for the system

See Your Project Notebook Section 3 – Electricity “101”

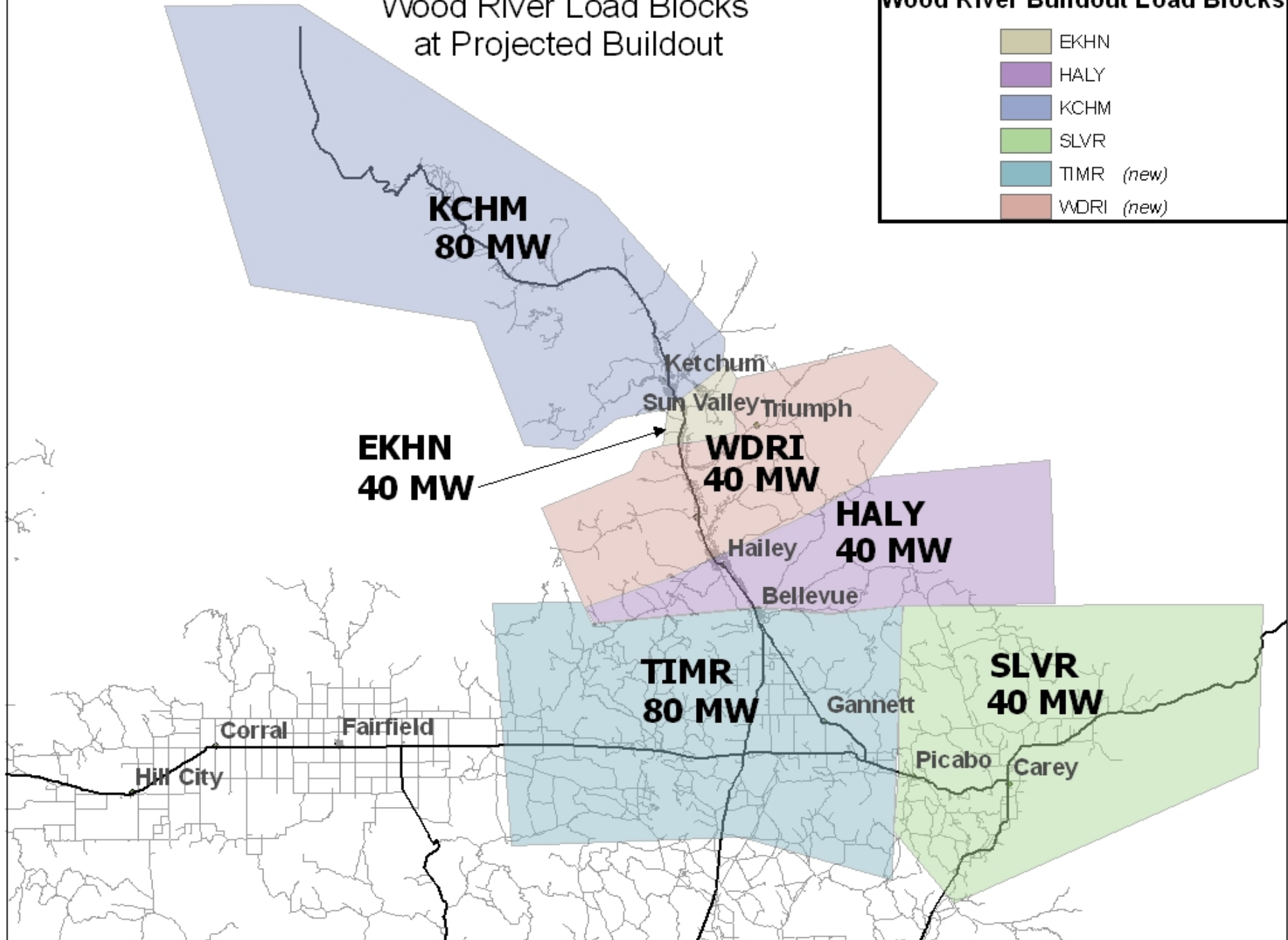
Distribution Substations

- Located near center of a load area
- Typical Sizes are 40MW and 80MW
- Capacity
 - Transformer Size and Number
 - Transmission Line Capacity

Wood River Load Blocks at Projected Buildout

Wood River Buildout Load Blocks

- EKHN
- HALY
- KCHM
- SLVR
- TIMR (new)
- WDRI (new)

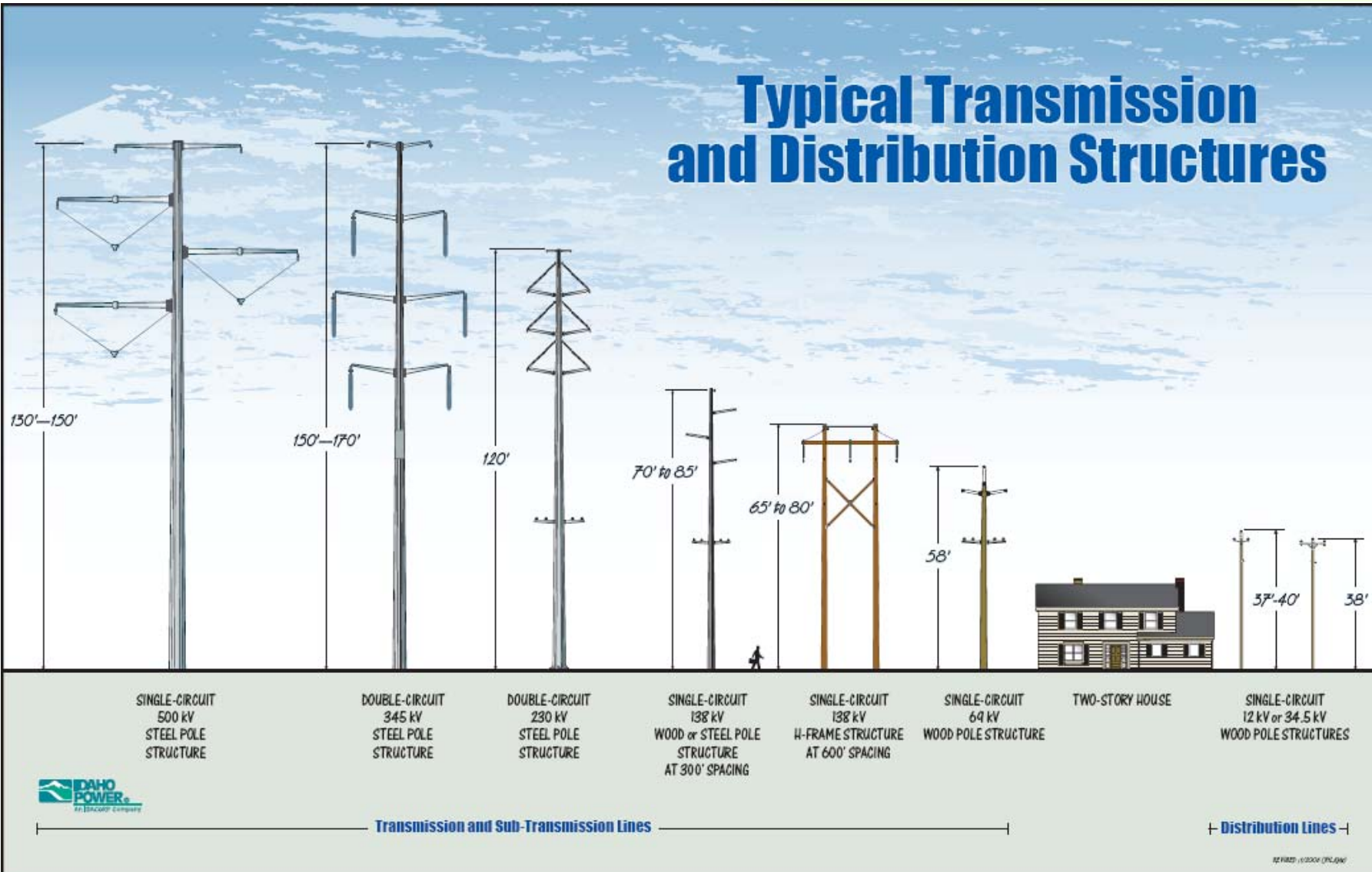


Transmission Line Capacity

- Power is a function of Voltage and Current
- Voltage Rating of a Transmission Line
 - Structure Layout (spacing and clearances)
 - Insulation Level
- Current Rating of a Transmission Line
 - Size of Conductor
 - Voltage Drop Limitations
 - Impedance Is Proportional to Line Length
 - Voltage Losses = Impedance multiplied by Current

From Last Meeting....

Typical Transmission and Distribution Structures



From Last Meeting....

Transmission Line Capacity

- There are many factors that go into determining how much power a given transmission line can carry. For general purposes, we can say:
 - 500 kV line can carry ~ 1,000 to 1,500 MW
 - 345 kV line can carry ~ 700 to 1,000 MW
 - 230 kV line can carry ~ 300 to 500 MW
 - 138 kV line can carry ~ 100 to 200 MW
 - 69 kV line can carry ~ 25 to 75 MW

The longer the garden hose, the
lower the pressure at the end



For lines from Midpoint to Wood River Sub

Transmission Line Capacity by Voltage Class

- 230 kV: 250 MW
- 138 kV: 100 MW
- 69 kV: 30 MW

- Line length is more than 80 miles

For lines from Wood River Sub to Ketchum

Transmission Line Capacity by Voltage Class

- 138 kV: 180 MW
- 69 kV: 100 MW
- 35 kV: 35 MW

- Line length is more than 12 miles

For lines from Midpoint to Ketchum

Transmission Line Capacity by Voltage Class

- 230 kV: 200 MW
- 138 kV: 80 MW
- 69 kV: 20 MW

- Line length is more than 100 miles

Transmission Line Capacity Summary

Line Voltage	12+ Miles Wood River to Ketchum	80+ Miles Wood River to Midpoint	100 Miles Ketchum to Midpoint
230 kV	N/A	250 MW	200 MW
138 kV	180 MW	100 MW	80 MW
69 kV	100 MW	30 MW	20 MW
35 kV	35 MW	N/A	N/A

Reliability Review

- N-1 Criteria
 - N is the number of lines serving an area
 - With one line out of service, the remaining lines have capacity for the load
 - Any one line out of service does not require load shedding
- Two Line System
 - Either line has capacity for entire area load
- Three Line System
 - Any two lines have capacity for entire area load

More Reliability Review

- Idaho Power chooses to designate the transmission serving into Hailey as an *Improved Radial System*
 - If both lines are in-service, they must be able to serve the most extreme peak load at all times
 - If the weaker line is out-of-service, the remaining line must be able to serve the normal peak load level that is exceeded less than 10% of the time
 - If the stronger line is out-of-service, the remaining line serves the load to the best of its ability

Wood River Load Blocks at Projected Buildout

Wood River Buildout Load Blocks

- EKHN
- HALY
- KCHM
- SLVR
- TIMR (new)
- WDRI (new)

