The parameters to be converted to modal matrices are:

- \( \mathbf{P}, \mathbf{L}, \mathbf{C}, \mathbf{M} \) - matrices

Entering data:

- Begin on Traveling Wave Model
  - Coupled PI
  - Line Model

- Convert to modal
For transient studies there are cases where higher frequency models matter:
- Lightning
- Switching transients

Skin effect

$R$, $R_0$, $R_1$ vs $f$

$L$, $L_0$, $L_1$ vs $f$
Line Constants Program To
Calculate Line Model Parameters

2 output to different models
Coupled di
Bergman

- Overhead lines
- Cables
Finding Line Data

- The line constants routine starts out from physical data concerning line
  - Tower configuration
  - Conductor sizes
  - Resistivity of earth
  - Bundling
  - Transposition
  - Set frequency or range for frequency sweep

ATPDraw Line Constants Program

- ATPDraw will let user call the line constants program
- User determines number of phases
- Can do constant frequency parameter and frequency dependent
- Connect line model into circuit schematic

Spring 2018
Ground wires (static wires)

Continuous ground wire

Segmented ground wire

Insulators
Overhead Line

- If skin effect is check LCC performs computation
  » Otherwise user provides data
- Segmented ground
- Real transformation better for transients
- Model type
  » Bergeron and pi for now
- Save as to save line model data
- Can import *.alc file with line data

Conductor Data

- Add row to add additional conductors
  » Phase 0 ground wires
  » If don’t auto bundle will need 2 or 3 per phase
- Run ATP to create data file entry at module
  » Will run automatically if try to run a case
- View lets you see physical layout
- Verify analyzes frequency response of the model
Node Names

- Can also assign the node names in this LCC dialog.
- Not recommended in most cases, assign name in the drawing instead.

Coupled Pi Output

- Can request printed output to text file
  - Can use this to collect matrix data for analysis in other programs
  - $Z_e$ is equivalent 3x3
  - $Z_s$ is symmetrical components
  - $Z$ calculated at initial frequency

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Example Case

- If number of phases is multiple of 3, ATPDraw assumes double or triple circuit line.
- Skin effect option was chosen.
- So enter inner and outer radius.
- DC resistance.
- If Vtower = Vmid assumes no sag!
- H = 2/3Vmid + 1/3Vtower.
- To add ground wires, use add row.
- Also add row if want to enter each bundled conductor separately.