Lecture 11

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1. Read data: Bus data, branch data
2. Form $Y_{bus} = G + jB$
3. Initialize $k = 0$:
   - Let:

$$V_i = 1[p.u.] \quad i = n_{PV} + 2, \cdots, n \quad \text{(All } PQ \text{ Buses)}$$
$$V_i = V_I^{sch} \quad i = 1, 2, \cdots, n_{PV} + 1 \quad \text{(Slack buses, } PV \text{ Buses)}$$
$$B_i = 0 \quad i = 1, 2, \cdots, n$$
$$x^k = \left[\theta_2, \cdots, \theta_n \middle| V_{n_{PV}+2}, \cdots, V_n\right]$$

4. Calculate bus mismatches:

$$P_i^{cal}(x^k) - P_i^{sch} = \Delta P_i \quad i = 2, 3, \cdots, n \ (n-1 \text{ equations})$$
$$Q_i^{cal}(x^k) - Q_i^{sch} = \Delta Q_i \quad i = n_{PV} + 2, \cdots, n \ (n_{PQ} \text{ equations})$$

5. Build the Jacobian J
6. Take:

$$x^{k+1} = x^k - [J]^{-1} F(x^k)$$

7. If $|F(x^{k+1})| < \varepsilon$ (the largest absolute value), stop; otherwise, $k = k + 1$ and go to step 4
   - Typically use $\varepsilon = 10^{-3}$ or $10^{-4}[p.u.]$

- Generator buses have reactive limits, which can be specified as Q_{min} and Q_{max}
- Slack bus provides difference between total load and total generation, as well as accounts for the system loss (total real power supplied minus the total real power drawn/loaded)