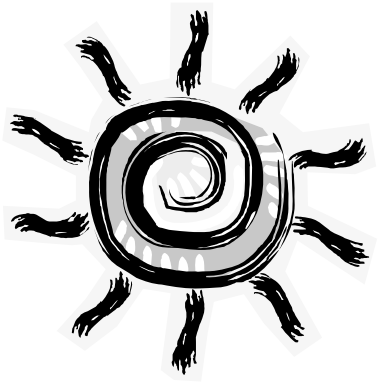


EGR 325: Electric Energy Systems Concept Map

Analysis & Design Questions

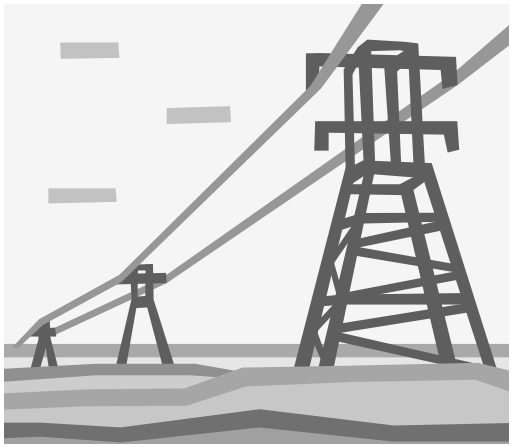
1. What are the issues & objectives?
2. What are society's needs & responsibilities?
3. Who decides?
4. What are the analytic tools?
5. How is the system evolving?

DEMAND
Why is electric energy produced?

SUPPLY
How is electric energy produced?

Long Run Planning: How is capacity planned in order to meet future demand?

Medium Term Operations: What is the optimal dispatch of existing capacity (to meet demand)?



Short Run Operations: How does the transmission system facilitate and constrain generator dispatch (to meet demand)?

Electric Energy Systems: Theory & Analytical Skills

Energy policy and sustainability
- Problem & issue identification
- Complex system analysis

Electric power generation
- Energy conversion
  - Mechanics
  - Thermodynamics

Environmental issues
- Atmospheric chemistry
- Climate change
- Technology and society

Intermittent renewable energy resources
- Probability and statistics

Load modeling, NDT modeling, System planning
- Probability and statistics
- * Production cost modeling
- * Multi-attribute tradeoff analysis
- * Reliability: component & system

Economic Dispatch
- * Linear programming
- * Constrained optimization
- * Lagrangean solutions

Power flow in an interconnected system
- AC circuits
- * Power flow equations
  - Iterative solutions

Electric motors and generators
- * Electro-mechanical systems
- Electromagnetic theory & induction
- * 3ø complex power

Optimal power flow
- * Iterative constrained optimization

Government regulation and industry deregulation
- * Economic policy

* indicates new concepts