ERG C100

· **Capacity Factor** - the ratio of the actual output of a power plant over a given period of time to its potential output if it were to operate at maximum capacity over that same time interval. Capacity factor describes to what degree a power plant operates (how often or at what output level).
Total Energy = PowerOutput(Nameplate Capacity) × Time × CapacityFactor

· **1^{st} Law Efficiency** - the ratio of useful work produced (electricity, or electricity and purposeful heating in the case of cogeneration) to the amount of primary energy put in to the power plant to produce that useful work. Efficiency describes how well a power plant converts energy from one form into another.

· **High Voltage Transmission** - high voltage is used for transmission of electricity because $P_{loss} = I^2 \times R$, which means that line losses increase at the current over the line goes up. Thus, wed like to reduce current to reduce line loses. Power = Voltage x Current, meaning that if power flow is fixed, there is an inverse relationship between voltage and current. If we want a smaller current value at a fixed power flow, then the voltage has to increase. In sum, high voltage means low current, which in turn means smaller transmission loses.

· **Benefits/Pitfalls of using Biofuels for Transportation** - *potential benefits:* Lower lifecycle carbon emissions (cellulosic ethanol), reduced dependence on foreign oil (US context), liquid fuels can work with existing vehicles and fueling infrastructure.
potential pitfalls: Competition between food and fuel (increased food prices), indirect land use change, depletion of soil nutrients or increased use of artificial fertilizers

· **Electricity industry's development from Edisons small decentralized utility model to one of large centralized power stations** - Scales of economy and improving efficiencies meant that electricity could be produced more cheaply by larger turbines.The development of alternating current allowed electricity to be transmitted over longer distances with less loss.

· **Nuclear Power Plants Pros/Cons** - Potential benefits: Low lifecycle carbon emissions, a baseload generator (replacement for coal), domestic supply of uranium Cons: Environmental damage from mining uranium, uncertainties about cost, nuclear waste disposal (including nuclear weapons proliferation), concerns about safety.

Net Present Value:

· **Future Value** = Present Value (PV) × $(1 + r)^n$

· **Uniform Payments** = PV × $(\frac{r}{1-(1+r)^{-n}})$ [←*capital recovery factor*]
Relates a series of n uniform payment each equivalent to U over given time period to a present value P at interest rate r. Use this to determine the annual payments on a loan.

· **Net Present Value** = $\sum_0^n \frac{B_t - C_t}{(1+r)^t}$
The present value of the sum of all expected future cost (Ct) and benefits (Bt) assessed at regular intervals (t) for a time period (n)