**EAS 375**

**Spring 2011**

**Lecture question - Hydroelectricity**

How is hydroelectricity is generated?

Gravitational forces of falling or flowing water. Tidal action/wind.

What percentage of electrical generation comes from hydroelectric generation?

7%

What are the major types of hydroelectric generation?

Conventional (dams), pump storage, river flow, tidal, wave.

Define hydrologic head.

The difference between the elevations (the water levels in the forebay and the tailbay).

What is the relationship between the height of the hydrologic head and amount of electricity that can be generated?

Power is proportional to the product: head x flow

What is the penstock?

Sluice or gate or intake structure that controls water flow; or an enclosed pipe that delivers water to hydraulic turbines.

What are the major advantages of dams in the generation of electricity?

* Moderate to high net energy yield
* No fuel costs
* Fairly low operating and maintenance costs
* Low pollution
* Rarely shut down
* Help control flooding
* Supply a regulated flow of irrigation water to lowlands below the dam

What is diversion (run-of-river) generation?

Electricity is generated by the flow of the river.

Water collected upstream passes through the generator and is then released back into the river.

What is the advantage of pump storage generation?

Based on load-balancing: Water is pumped into storage units during low electrical demand and generates electricity during high demand.

Describe how a tidal barrage works?

Utilizes changing direction of tidal current flow to produce electricity.

What are the major disadvantages of hydroelectric generation?

* Impact on river flow and aquatic ecology, including fish migration and oxygen depletion
* Loss of land
* Siltation
* Flow shortage due to seasonal or drought fluctuations
* Methane emissions
* Failure hazard
* Future expansion is limited
* Social impacts of displacing indigenous people