WIND STUDY

Wind Study is intended for grades 5-8 and 8-11
Questions posted on: Monday   Answers posted on: Friday
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## 2021Q15   (TRANSFORMER, VOLTAGE)

One Energy's customers are large industrial consumers, which means they receive power at a high voltage. The power sent to the plant has to be 'stepped up' from the voltage inside the turbine (620 V) to the voltage that the plant receives. This is done using a step-up transformer located next to the turbine. A transformer is a device that transfers electricity from one circuit to another using two coils of wire and the principle of electromagnetic induction. The two coils are wrapped around the same core. As the electricity flows through the first coil, it creates a magnetic field, which induces a current in the second coil. The coils have different numbers of loops (called turns), creating the change in voltage.
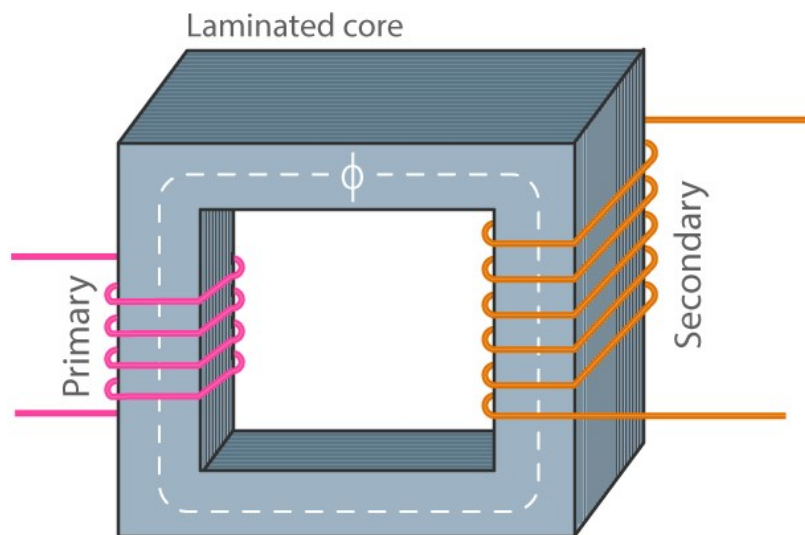
Admin. "Transformer - Definition, Types, Working Principle, Diagram." BYJUS, BYJU'S, 26 Feb. 2021, byjus.com/jee/transformer/.

Level 1: The equation to calculate the voltage in the second coil is shown below. The ratio between the number of loops in each coil is called the turns ratio.

$$Turns\ Ratio = \frac{N_1}{N_2} = \frac{V_1}{V_2}$$

Where N is the number of turns and V is the voltage. The subscript 1 refers to the first, or primary, coil. The subscript 2 refers to the second, or secondary, coil. If the voltage coming into the transformer from the tower is 620 V and the voltage leaving the transformer towards the plant is 12,470 V, what is the turns ratio?

Level 2: In the question above, which coil will have more turns? Some of One Energy's customers receive power at 34,500 V. How would the number of turns differ between these sites and the site in the question above?