

Turbines, Generators and Power Plants

Electrical Circuits

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Correlation

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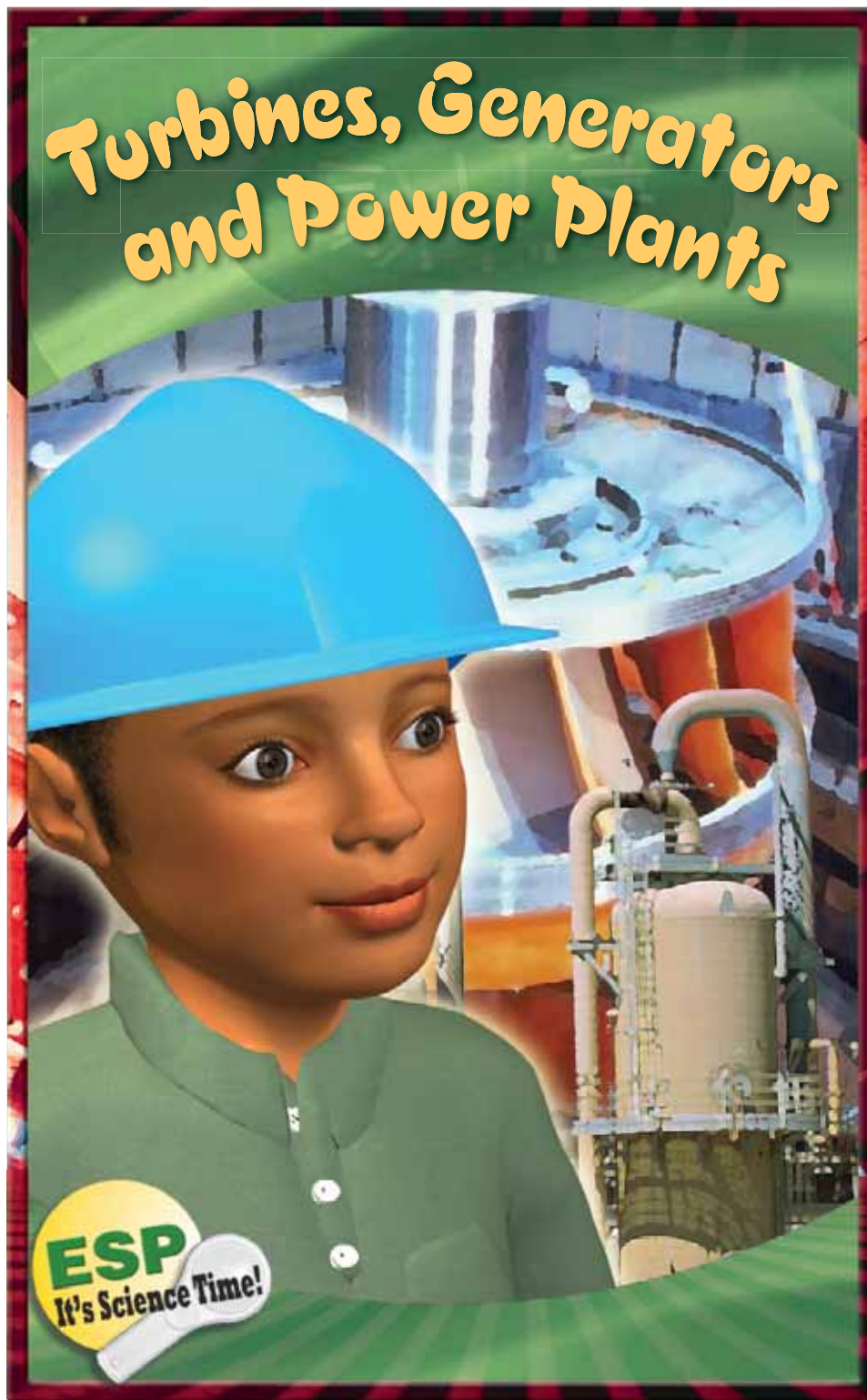
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Sasha, Maria and Darrell were at Sasha's house. They were working on a science project. Maria turned on a light in Sasha's room. Pop. The light bulb burned out.

"Did you see that?" asked Maria. "I hate when that happens."

"Me too," said Darrell. "Someone should invent a light bulb that never burns out."

"That would be great!" said Maria. "What are you doing this weekend?"

"My mom will be home soon. I will ask her to change the bulb. Let's work in the kitchen. There is plenty of light in there," said Sasha.



Safety Notes about Electricity

- Never play around a transformer or substation.
- Do not release helium balloons into the air. The balloons can get caught in power lines.
- Do not fly a kite near power lines.
- Never touch wires inside or outside your house.



"I wonder where electricity comes from?" asked Darrell.



"I don't know, Darrell. Ask Mr. Thomas in science class tomorrow," said Sasha.

"That's a good idea. I will ask him," said Darrell.

Later that night Darrell thought about what happened as he fell asleep.....

He suddenly found himself inside a big factory. The noise was loud. He had to cover his ears. He almost did not hear the man with the hard hat yelling at him.



Just then, Darrell's alarm clock went off. He was back in his bedroom.

"Sasha and Maria are never going to believe this one!" Darrell said to himself.



"Darrell, look over there. That is your house. We have followed the electricity all the way from the power plant to your street," said Mr. Charge. "Do you see the meter on the side of your house? It shows how much electricity your family uses."



"This has been a great dream, Mr. Charge. I cannot wait to wake up and tell Sasha and Maria. I'll tell them all I have learned," said Darrell. "Thanks a lot!"

"Young man, what are you doing here?" said the man with the hard hat.

"Where am I?" asked Darrell.

"You're inside the Springville Power Plant. We are one of the biggest producers of electricity in the country. My name is Mr. Charge. I run the plant," said the man with the hard hat.

"That explains it! I must be having a dream. My name is Darrell. It's nice to meet you," said Darrell.

"Well Darrell, I can show you around. Put on this hard hat and follow me," said Mr. Charge.

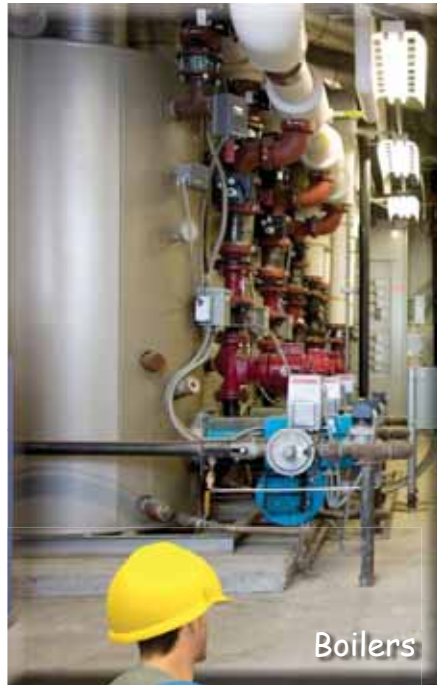


Darrell followed the man into a huge room filled with strange looking machines.

"Darrell, do you see those big things over there? They are the boilers. They are filled with water. The water is heated until it turns to steam. The big pipes carry the steam to the turbines," said Mr. Charge. "At our plant, we burn coal to heat the water in the boilers. Other power plants burn wood, oil, or natural gas."

"It must take a lot of heat to boil that much water!" said Darrell. "You said the steam goes to turbines. What are turbines?" asked Darrell.

"Let's go see," said Mr. Charge. "Follow me, and stay close."



Boilers



"Is it then safe to come into our homes?" asked Darrell.

"Not yet. It is still too powerful. It needs to be stepped down one more time. Then it can be used in homes," said Mr. Charge.

"One more step down?" asked Darrell. "Is there another substation?"

"Look up on that pole," said Mr. Charge. "There is a small transformer right in your neighborhood. The transformer steps down the voltage one last time."

"Some neighborhoods do not have any poles," said Darrell. "How do they get their electricity?"

"The same way!" exclaimed Mr. Charge. "Their power lines are underground. They are protected from bad weather."



"There are two different kinds of transformers, Darrell," said Mr. Charge. "One is called a step up transformer. The other is called a step down transformer. To travel long distances the electricity leaving the power plant needs to be stepped up. The transformer changes the voltage of the electricity. Voltage is how much "push" the electricity is going to have."

"That makes sense," said Darrell. "Where does the step down happen?"

"The step down happens at a substation. Come on. I'll show you," said Mr. Charge.

"High voltage wires carry the electricity from the transformer at the power plant to substations. The substations are closer to our homes," said Mr. Charge. "The electricity is stepped down to a lower voltage at the substations."



Transformer

Darrell followed Mr. Charge into the next room. He saw the big pipes coming from the boilers. They were connected to another large machine.



Turbine

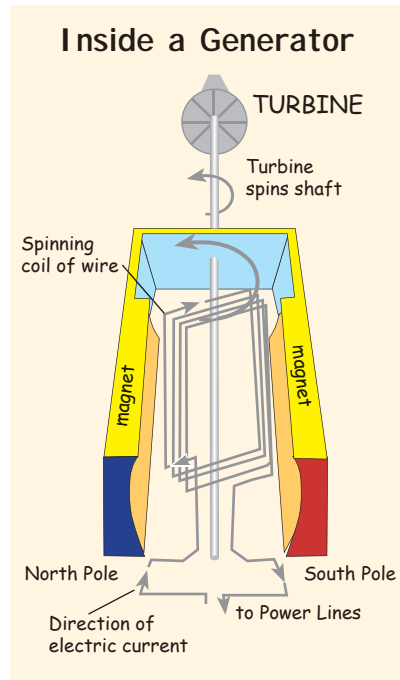
"This is the turbine. The big pipe on the side is where the steam comes in. The steam is hot. It is under a lot of pressure. The steam makes the fan blades spin really fast," said Mr. Charge. "The turbine spins a long pole. The pole is connected to another machine called a generator."

"Wow!" said Darrell. "How does the generator work?"

"The generator is like a big box lined with strong magnets. The pole from the turbine has a large coil of wire on the other end. The coil spins inside the magnetic field made by the magnets. A current of electricity is made in the wire. The generator changes the mechanical energy from the spinning pole into electrical energy," said Mr. Charge. "This process was invented by Michael Faraday in 1831. He was a British scientist."

"Now I understand. The electricity made by the generator is the power we use in our homes," said Darrell. "Where does the electricity go after it leaves the power plant?"

"I will show you," said Mr. Charge. "Remember to stay close. We are going outside now."



"The electricity made at the power plant has to get to the customers. Electricity moves along the power lines that are found all over the country," explained Mr. Charge.



"Can electricity really go that far?" asked Darrell. "Does it lose some of its strength? Not everyone lives near a power plant."

"That's a good question, Darrell!" said Mr. Charge. "You are right. The electricity does lose power as it travels. So the first stop after the generator is the transformer."

"I know that word!" said Darrell. "Transform means to change something. What does the transformer change?"

"Follow me, and I'll show you," said Mr. Charge.