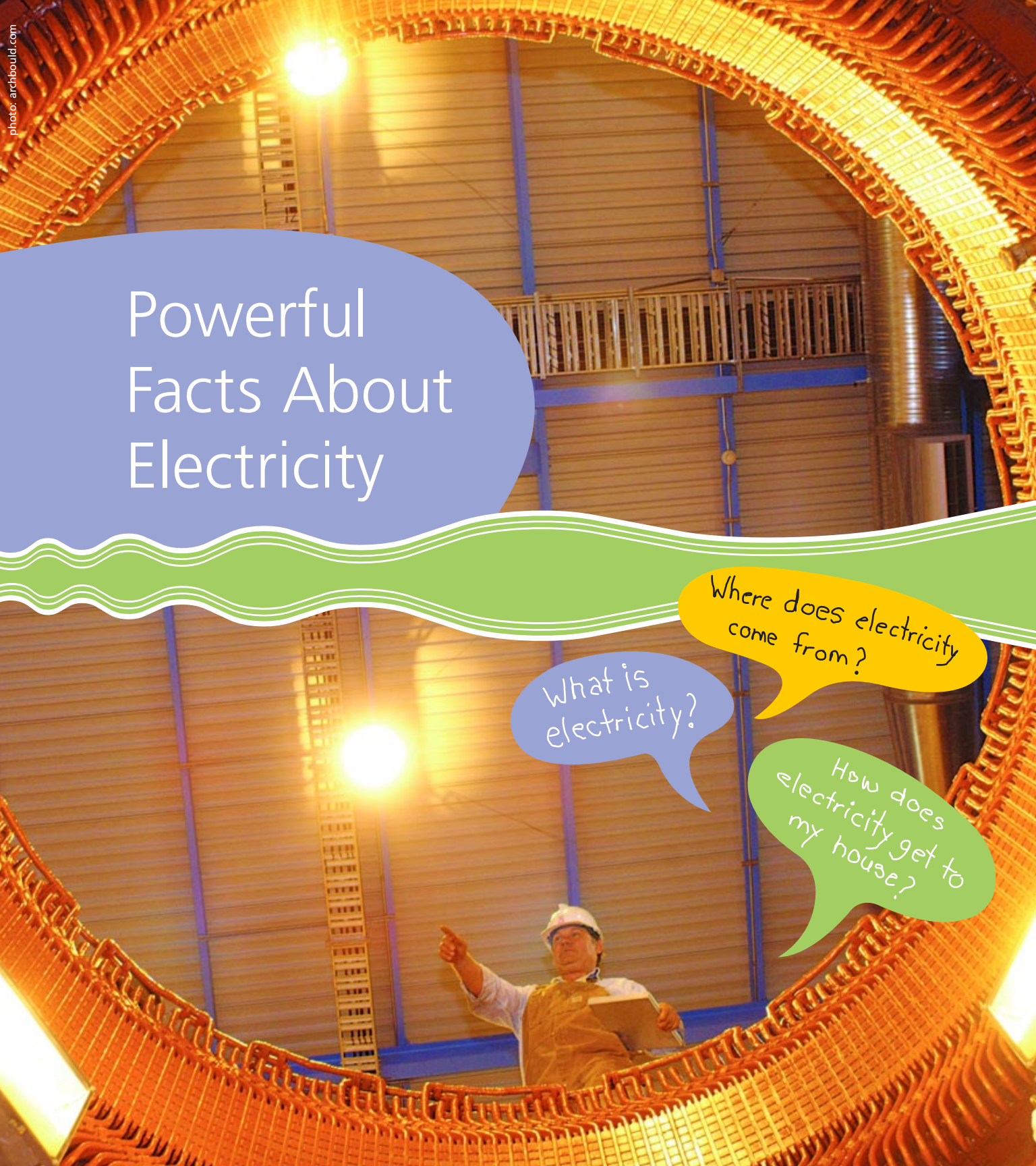


photo: archbould.com
Powerful Facts About Electricity
Where does electricity come from?
What is electricity?
How does electricity get to my house?

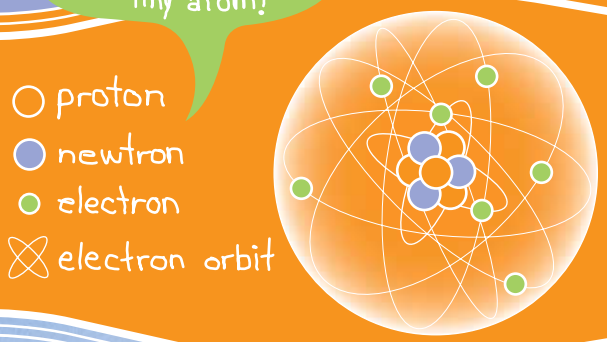
How is electricity made?

It's hard to imagine our homes without electricity. There would be no TV, computer or video games. You'd have to do your homework by candlelight or oil lamps. You wouldn't be able to listen to your favourite bands on the radio or CD player – instead you'd have to make your own music!

What is electricity?

Electricity is a form of energy that starts with atoms. You can't see atoms because they're too small, but they make up everything around us. There are three parts to an atom: protons, neutrons and electrons. Electricity is created when electrons move from atom to atom. There are a number of ways to make electrons move, but most electricity is produced at power plants.

There's a lot of action going on in a tiny atom!



In winter, it takes between 35 and 50 megawatts of electricity to provide power to Whitehorse.

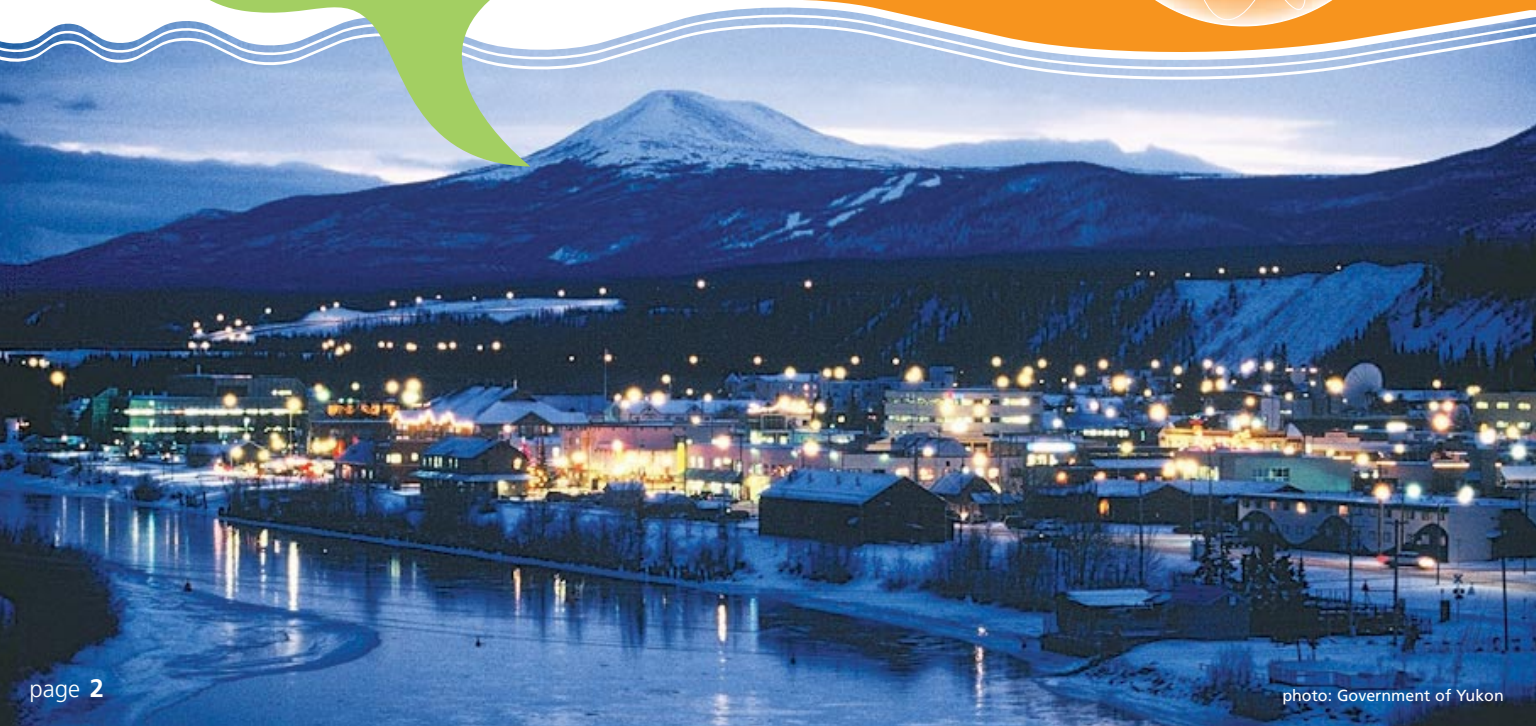
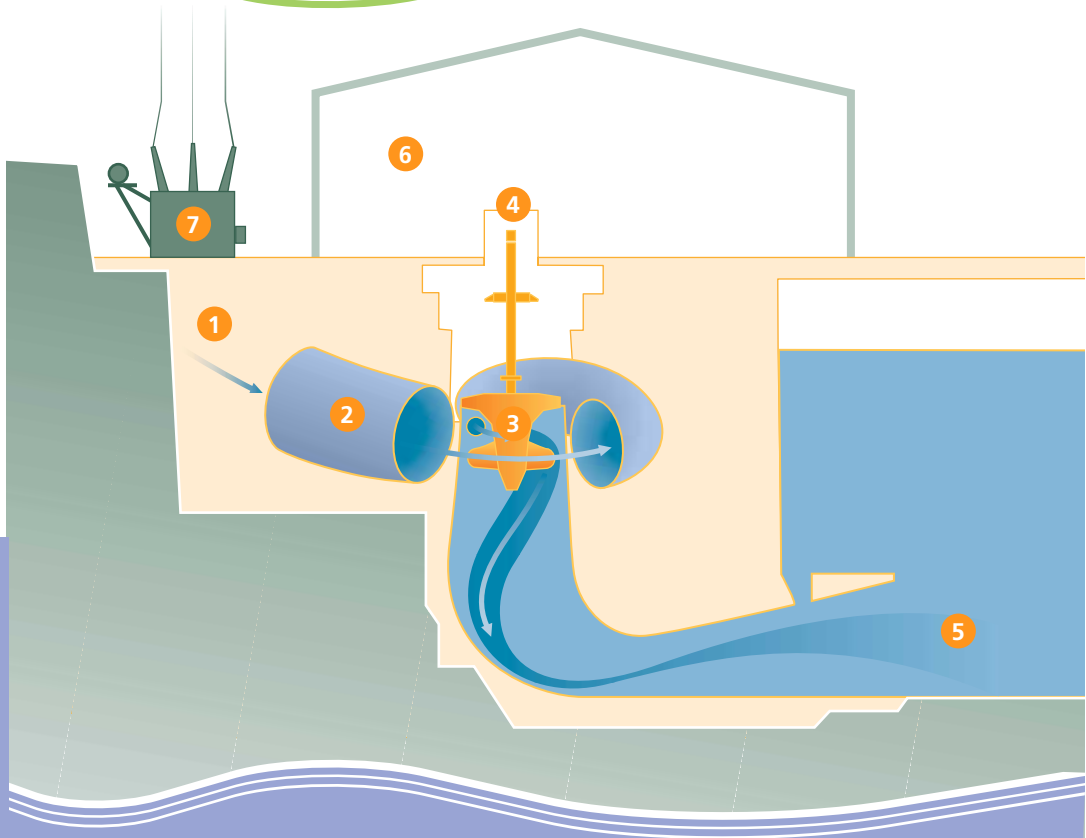


photo: Government of Yukon

How do power plants work?

It all starts with a source of power. At Yukon Energy, we use water to create most of our electricity. That's why most of our plants are called hydroelectric facilities: hydro means water. Power plants that use water to make electricity are built near rivers. Our Whitehorse plant, for instance, is on the Yukon River.

1. river water flows into a large tunnel called the penstock
2. penstock
3. turbine
4. generator
5. water flows back into the Yukon River
6. Yukon Energy building
7. transformer



Dams are built across rivers to hold back the water. The water is then directed through big pipes (penstock) and falls against the blades of giant turbines.

The turbine blades turn when the water hits them, just like the blades of a pinwheel turn when you blow on them.

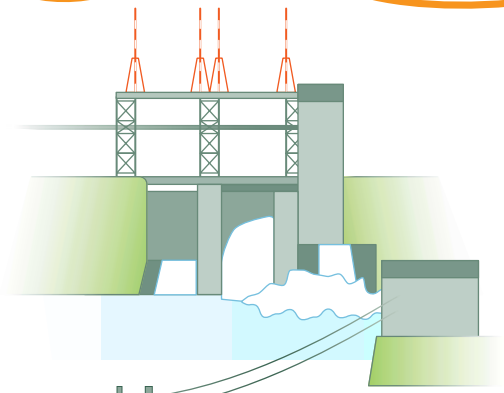
Once the water hits the blades, it returns to the river.

The turbine blades are attached to a big metal rod that has large magnets attached to it. When the blades turn, the rod and magnets spin very fast. The magnets are surrounded by heavy coils of copper wire, and as they spin, electrons in the wire to begin to move, creating electricity.

The electricity moves through wires into a power transformer. The transformer boosts the electrical voltage (the strength or force at which electricity flows) to help it move through wires called transmission lines. Those wires are attached to wooden or metal poles that you see along roads and throughout communities.

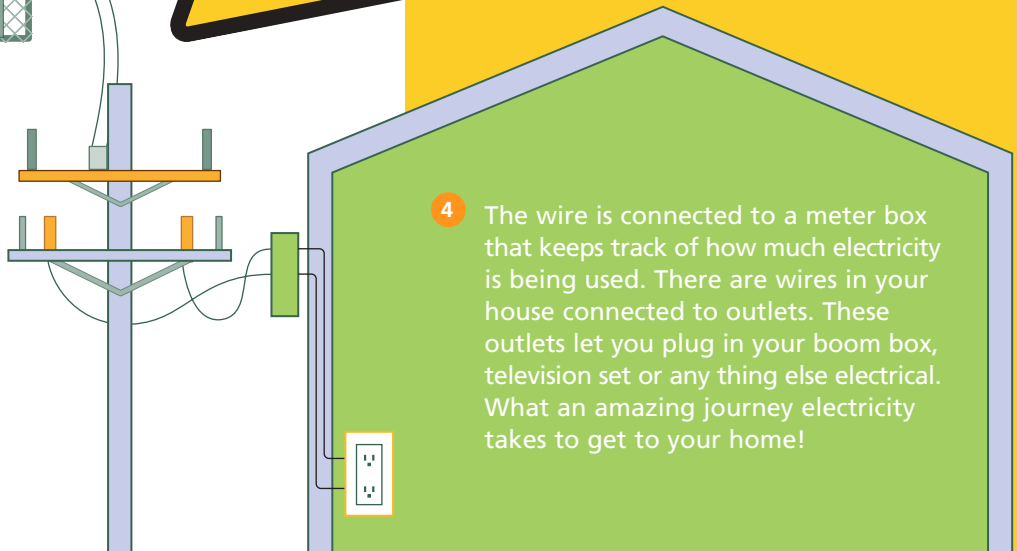
All the wires are made of metal – usually aluminum or copper. That's because metal is a good conductor – electricity travels through it easily. Water is also a good conductor, and because our bodies are mostly made of water, electricity can travel through us easily. That's not something we want to happen though, because if we have electricity going through us we'll likely be seriously hurt or even killed. That's why adults warn you to stay away from high voltage sites and to keep your fingers away from wall plugs.

1 Electricity is generated at the Whitehorse facility



2 Electricity travels at the speed of light – about 300 kilometres per second. Sometimes, when electricity has to travel a long way it gets a little weaker as it moves along the lines. It needs a boost, like you need food to replace the energy you've burned after playing outside all day. That's where substations help. Substations are large box-like power transformers that sit in fenced-in areas. You'll see signs on the fences that say 'High Voltage – Stay Away'. It's important that you obey those signs (remember what you learned about electricity being able to travel easily through your body).

3 When wires reach your house, another transformer on a power pole makes the electricity just the right voltage so you can use it safely.



4 The wire is connected to a meter box that keeps track of how much electricity is being used. There are wires in your house connected to outlets. These outlets let you plug in your boom box, television set or any thing else electrical. What an amazing journey electricity takes to get to your home!

It's FREE!
Call (867) 393-5333
to find out more.

The Whitehorse Dam and How it Works

The Whitehorse Dam (officially known as the Whitehorse Rapids Generating Facility) is an interesting place to visit. If you want to come for a tour and learn more about how Yukon Energy makes power, please ask your teacher or parents to call beforehand and we will arrange a time that works best for both you and our employees.

If you study the photo on the next page before you come, it will help you understand how the different parts of our facility work together to make electricity.

photo: Derek Crowe

A Tour of the Whitehorse Dam

1. **Hydro turbine #4, known as the 'Fourth Wheel'**
2. Spillway — water not needed to produce electricity is spilled into the Yukon River
3. **Dam**
4. Fishladder — allows migrating salmon and other species of fish to travel past the dam
5. **Fish weir — directs fish towards the fishladder**
6. Fish screens — also help direct fish towards the fishladder
7. **Hydro turbines #1, 2 and 3**
8. Switching station — sends electricity to various communities
9. **Seven back-up diesel generators**
10. Diesel storage tank
11. **Substation — gives electricity a voltage boost to help it travel along power lines**
12. Yukon Energy's corporate office
13. **Power Canal — moves water from Schwatka Lake towards the intake to hydro units #1, 2 and 3**
14. Gate House — controls the flow of water to the penstock

At top speed, water from this spillway can fill a space the size of the Canada Games Centre in Whitehorse within 3.3 minutes!

Dam

One of the first things you'll notice is our **dam** (number 3). It's a large steel, earthen and concrete structure that holds back water from Schwatka Lake. In the summer and fall, when we sometimes have more water than we need to make electricity, we spill some of the lake water through our **spillway** (number 2).

Power Canal

Our facility is built in such a way that some of the water from Schwatka Lake moves into a long and narrow area called a **power canal** (number 13). There are **trash gates** in the canal to catch any fallen trees or other debris. There are also a series of **log booms** in the canal that calm the water and help prevent erosion of the canal banks.

From the air, the power canal looks like a large crooked finger.

The log booms look like the joints of that finger.

photo: Derek Crowe

photos: archbould.com

The nose of the turbine looks like a rocket!

The penstock, at its largest point, is more than six metres in diameter. That's the height of three tall adults standing on top of one another.

Hydro Turbines/Generators
From the power canal, the water falls through the penstock and hits the blades of our **hydro turbines,** making the blades turn**.** Three of the turbines are at the end of the power canal (number 7) and our newest turbine, which we call the Fourth Wheel, is at the top of the canal (number 1).

The turbine blades are attached to **generators** that make electricity. Once the water hits the turbine blades, it flows back into the Yukon River.

Gate House
The small building at the end of the power canal is called the **gate house** (number 14). When doing maintenance or repairs to our generating equipment, gates from this structure are lowered to stop the water from flowing from the canal through large tunnels (known as the **penstock**) to our turbines.

You need special training to learn how to work safely around substations and other electrical equipment.


photo: Derek Crowe

Diesel Generators

We use water to produce almost all of our electricity, with a small amount of power coming from two wind turbines on Haeckel Hill near Whitehorse. We only use diesel as back-up. However, it's important that we maintain our seven **diesel generators** (number 9) so they can be fired up when necessary. We have a diesel **storage tank** (number 10) that holds enough fuel to keep our diesel generators running for 24 hours.

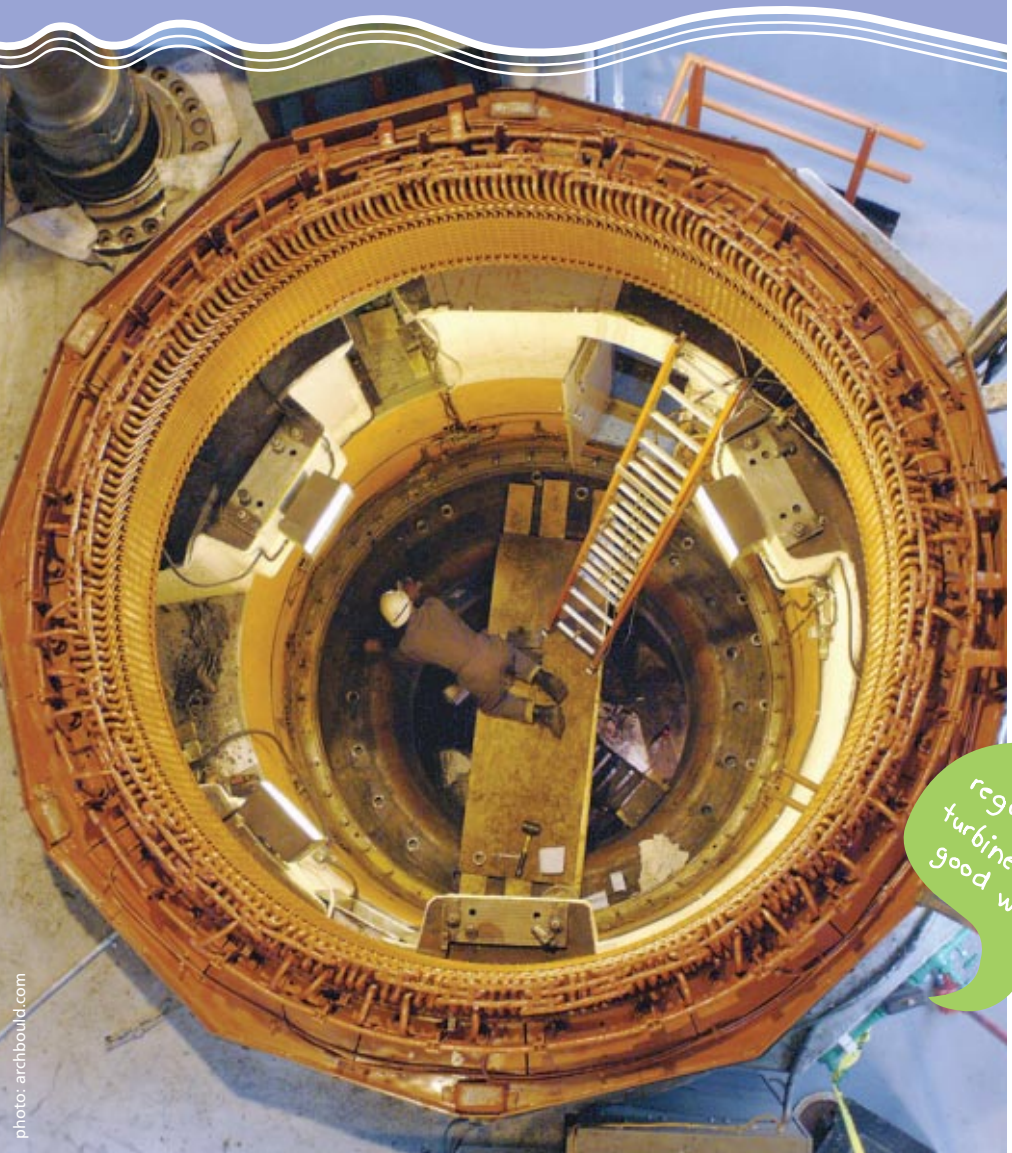
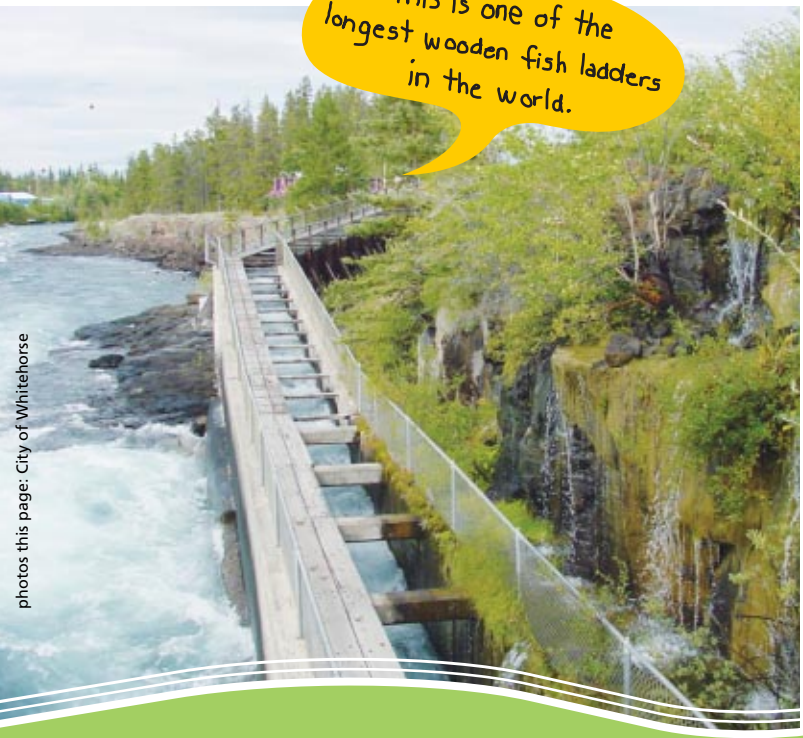


photo: archbould.com

Substations and Switching Stations

Once electricity is produced, it moves through power lines to a substation. **Substations** (number 11) give electricity a voltage boost (voltage is the strength at which electricity moves) to help it travel along power lines to Yukon communities. Across the Yukon River is a **switching station** (number 8) that sends electricity to various communities.

It's important to regularly maintain our turbines to keep them in good working order.



photos this page: City of Whitehorse

Fish Ladder
When the dam was built, salmon and other fish couldn't travel this part of the river as they had in the past, so special equipment was built to help them maneuver past our facility. A wooden **fish ladder** (number 4) allows the fish to move between Schwatka Lake and the part of the Yukon River below our dam. The 366-metre fish ladder is one of the longest wooden fish ladders in the world.

There's an interpretive centre at the fishway that tells the story of the migrating chinook salmon. The facility has underwater viewing windows and TV screens so you can see the fish as they swim by.

Fish Screens and Weir
Screens are put in the water in the summer time to stop the fish from swimming into the water that's just run through our turbines (number 6). As well, a concrete **weir** (number 5) and an underwater canal guide the fish towards the fish ladder and away from our turbines.

Award Winning Building
Before finishing your tour, take notice of our office building (number 12), built after our old one was destroyed in a fire in 1997. The new building has won a national design award for energy efficiency.

Special energy-saving features mean this building only uses about half the electricity that most other office buildings do.

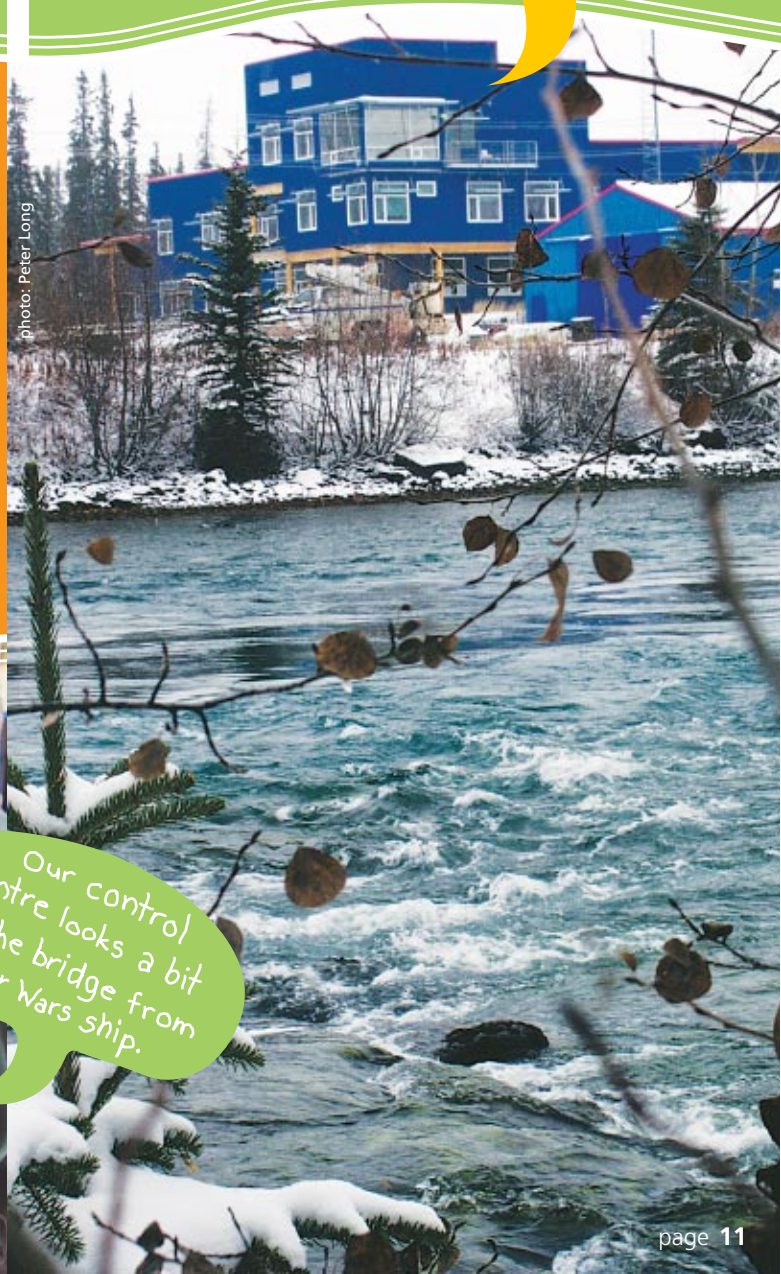


photo: Peter Long

Along with being our Corporate Headquarters, this building houses our **control centre**, which allows operators to control and monitor 23 hydro and diesel generators throughout the Yukon, our transmission facilities and our ten sub-stations. A few key strokes on a computer keyboard can start and stop generators or open and close breakers hundreds of kilometres away.

photo: Derek Crowe

Our control centre looks a bit like the bridge from a Star Wars ship.

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