

Solar Schools for British Columbia

A collection of
lessons to assist
teachers and students
with their exploration
of solar energy



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Schools going solar

Planning for solar hot water installations

What will happen

Students research and present the steps required for having a solar hot water installation at their school or outline the steps that occurred for the installation if one has already been installed at their school.

Students will

- Know that solar hot water installations use thermal energy;
- Analyze the steps involved in having a solar hot water installation;
- Understand the difference between a solar thermal installation and a photovoltaic installation;
- Explore the benefits and challenges of a solar hot water installation to their school community;
- Create a visual display of the proposed or completed installation at their school.

Total Time 2½ - 3½ hours	Establish what students know	Activity - Part A	Activity - Part B	Debrief what students learned
	20 - 30 minutes	60-120 minutes	60 minutes	30 minutes

In Advance

There are many solar installations that have been completed or are underway in B.C. Check with SolarBC to find a solar professional your community.

What you need to know

- Hot water demands the second largest amount of energy in our homes, after space heating, and it represents about 30 per cent of total energy use in our homes. A solar water heater can supplement up to 60 per cent of the water heating energy needs for a typical family of four. This is due to the fact that in Canada, there is enough solar energy to generate an average of 2500 kWh of energy per household per year.
- Domestic solar hot water systems are designed to last 20 to 40 years, minimize environmental impacts, and promote community economic development through the building of a sustainable industry economy. So you'll be contributing to a healthier environment and making a difference.
- The installation of solar hot water systems in schools demonstrates the leadership of schools in reducing GHG emissions and encourages students and their families to investigate renewable energy solutions in their homes. Solar hot water is an innovative technology that reduces the carbon footprint of the school along with energy costs. While showing an on-the-ground climate action initiative, the installation provides a teaching opportunity about the possibilities for renewable energy usage and for employment opportunities in the renewable energy sector, one of the fastest growing sectors in the world. Source: <http://www.solarbc.ca/learn>



WildBC



SolarBC
Join the Solar Revolution

What might surprise you

- There are over 60 million solar water heating systems in the world.
Source: <http://tour.illinoissolar.org/solar-thermal-systems>
- Every \$1 invested in energy efficiency creates \$4 in energy savings.
Source: <http://tour.illinoissolar.org/renewable-energy-resources>

What you need

- Large roll of paper or sheets of poster paper
- Background on how to conduct an interview or host a guest speaker
- Solar Thermal system research material for students.

Establish what students know

1. Discuss the differences between solar hot water and solar photovoltaic installations. See the backgrounder for more information on this.
 - Solar hot water uses panels made of tubes that collect the sun's warmth to heat water circulating in the tubes.
 - Solar photovoltaic uses solar panels made of semiconductors that allow sunlight to be converted directly into electricity.
2. Tell students that:
 - a case could be made for a solar hot water installation at the school, or
 - a solar hot water installation is planned for the school, or
 - a solar hot water installation is already in place.
3. For your given situation, explain that they are going to examine who, what, when, where, why and how a solar hot water installation could happen, is going to happen or did happen.
4. As a class, create 'solar panels' of knowledge and scorching questions using poster paper. Advise students that these panels will be revisited throughout their study of solar and they will have opportunities to add new information to the 'panels'.
5. Form six groups and provide each with a piece of poster paper and assign one of the headings: who, what, when, where, why and how to each.
6. Explain to students that, using their heading as a theme, they will record their thoughts and ideas about the installation of, or need for an installation of, a solar hot water system at the school.

Main Activity

What you do

Part A

- Using their heading as a theme, students record questions and ideas that come to mind on their 'solar panel'. Assist students in their thinking if needed with the following questions:

Who

- Is/was responsible for making this solar installation possible?
- Are/were the people that design these systems?
- Will/did install the system?
- Will/does benefit from a solar hot water installation system at the school?
- Will maintain the system after it is installed?

What

- Is/was the rationale in deciding to have a system installed?
- Is/was the rationale used for choosing the system that's planned?
- Criteria should be/were considered in the design process?

When

- Is/was the best time of year to do the installation?
- Is/was the best time of year for energy production?
- Will/did the energy savings cover the initial investment?

Where

- Should/will the panels be located?
- Will/did the funds come from to cover the costs of the install?

Why

- Invest in solar energy?
- Invest in solar energy at the school?
- Involve students in this installation process and/or analysis?

How

- Are/were the energy savings estimated?
- Do these expected/actual savings compare with installations elsewhere?
- Will/was the success of the installation be measured?
- Much does it cost to install a solar thermal system?

- When the groups have finished brainstorming for their 'solar panel', they research to answer the questions they have generated. If some questions remain unanswered, keep them in reserve to ask your solar install team or your visiting specialist.
- Share each group's panel of solar information and questions and display for student reference.
- Using the information gathered, work together as a class to determine the steps that would have to be followed to complete a solar installation. Begin with the initial idea and end at completed install. From these notes, have students create a new set of 'solar panels' that display the steps.

Part B

1. Invite a solar installation professional(s) to your class or visit a solar installation site with a solar installer. If you are visiting a site, be sure to take your 'solar panels' for both the question/idea generation and the steps. Have the specialist describe the steps followed to complete a solar hot water system installation.
2. After the visit, discuss and debrief the activity and the speaker event:
 - What was the most surprising thing you learned from the engineer/installer?
 - How does this impact your perspective on solar energy?
 - What if everyone became as knowledgeable as you? How would that impact our use of solar energy?
 - How would a solar installation impact your school once it's up and running?
 - What one thing about solar energy would you want students at your school to know?
 - What role do you think students could have before, during and after the installation?

Assessment

- List the benefits and challenges of a solar hot water installation.
- Differentiate between a solar hot water installation and photovoltaic installation.

Extensions

- **W5.** Design and implement a mechanism or tool to permanently record the content of the question panels generated by the class.
- **Film Critic.** Search the Internet for video clips of solar installations. Select two to five to review. Identify the key learning points that are conveyed well in each video. Make recommendations for improvement in each.
- **Profile an Expert.** Write a journalistic report for the school newspaper that gives other students in the school the highlights of what the class learned from the guest speaker.

Check out

Links

- <http://www.ehponline.org/science-ed/2005/sun.pdf>
- <http://rredc.nrel.gov/solar/pubs/bluebook/interp.html#solrad>

Careers

- UC San Diego Graduate Students Helped San Diego Win \$154 Million in Bonds to Install Solar Panels <http://www.youtube.com/watch?v=1oMsmDcv0wM>
- Recycling : What Is Environmental Engineering? <http://www.youtube.com/watch?v=lyPJRfz8sQ8&feature=related>
- Architects: Home Delivery: Fabricating the Modern Dwelling is both a survey of the past, present and future of the prefabricated home and the concept of sustainable housing. <http://www.youtube.com/watch?v=eLUaz0QG3TI>