



FUTURE SPARKS

TEACHER RESOURCES

Extended inquiry: 1-22 lesson ideas
www.futuresparks.org.au

Future Sparks is a Green Cross Australia project in partnership with the Department of Climate Change and Energy Efficiency, CSIRO and Clean Energy Council.

Step 1: Engage with the project

Climate change: the context (20 minutes)

Ask students to develop a concept map describing what they know about climate change, what it is, what it comprises, what it affects, its potential impacts on living things in a variety of ecosystems, and who and what produces emissions that that can affect the Earth's climate. Share with students some facts about climate change as is currently understood.

Refer to websites for support material.

- A Student's Guide to Climate Change
<http://epa.gov/climatechange/kids/index.html>
- Cool the Globe www.cooltheglobe.com/index
- CSIRO <http://www.csiro.au/science/Changing-Climate.html>
- PEW Centre on Global Climate Change
<http://www.pewclimate.org/climate-techbook>
- SCOPE <http://www.csiro.au/scope/episodes/e70.htm>
- UK Met Office Climate Change
<http://www.metoffice.gov.uk/climate-change/guide>

- United Nations Environment Program
<http://www.unep.org/climatechange/Introduction/tabid/233/Default.aspx>
- United States Global Change Research Program
<http://www.globalchange.gov/resources/educators/toolkit/materials>

Overview of the Future Sparks competition (10 minutes)

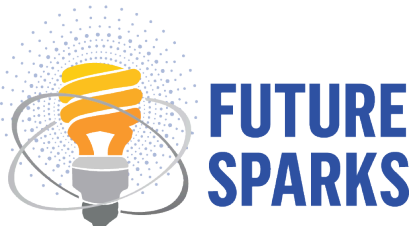
Refer to the Future Sparks competition details and explore the requirements to submit an entry with the class.

Create a retrieval chart on which to show collected information and ideas e.g. what's needed, resources, time lines, judging criteria, prizes etc.

Explanation of the learning program (10 minutes)

Explain to the class that they will be using a range of activities and resources to develop an understanding of 'a clean energy future' and lead to the formation of a 'big idea' to be submitted as a 2 minute 'show and tell' video competition entry.

View www.futuresparks.org.au



Explore the student resources available for the competition and related classroom activities.

Check out the following sections: Hands-on activities, vodcasts, videos, readings, and websites.

Competition process and prizes (10 minutes)

1. Go to www.futuresparks.org.au
2. Click on competition
3. Review the step-by-step guide for entries [NOTE: POWERPOINTS ARE NOT ACCEPTABLE and all props, music etc should ideally be the student's own work and free from copyright]
4. Select either the video competition or persuasive writing competition and complete the entry form
5. Attach the video file or cut and paste the persuasive writing text
6. Submit and take note of your entry number for video entries
7. Don't forget to download the Parental Consent form and send the completed form to **PO Box 12117, George Street, Brisbane Qld, 4003**
8. Once the form has been received and processed the entry will be uploaded into the Future Sparks gallery
9. Students can send a link to their entry to family and friends
10. The closing date is 5pm, Monday 16 July, 2012

11. Look out for the People's Choice vote from Monday 23 July to Sunday 28 July.
12. State winners will be contacted by the end of July.
13. State winners of the video competition will be flown with a teacher or parent to Brisbane for the national award ceremony and will receive a prize pack {Winners will be accommodated overnight where same-day travel is not appropriate}
14. Cash prizes will be available for schools

Step 2: Explore a Clean Energy Future

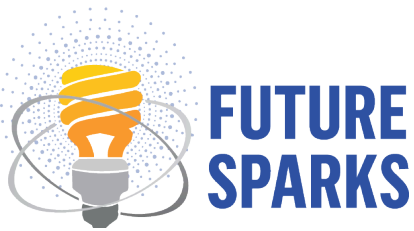
Investigate the Clean Energy Map (40 minutes)

Using the Clean Energy Council's website at

<http://www.cleanenergycouncil.org.au/cec/resourcecentre/plantregistermap> and locate and find out about Australia's renewable energy power plants.

Energy everywhere (40 minutes)

Energy is big news in today's media, especially when it comes to its impact on the environment or sustainability. Whether it's about new types of solar cells or the opening of a wind farm, or a debate over 'clean coal' or opinions on nuclear energy, it's easy to find stories



covering our search for ways to provide our society with cheap, sustainable energy sources that reduce emissions to the atmosphere.

Brainstorm ideas with the students covering what you already know about different energy technologies. Discuss what words such as 'renewable' 'low emission', 'clean' and 'sustainable' might refer to. Ask the students to use those keywords you come up with to do a media search over the following week to find examples of social media, newspaper clippings, magazine articles or stories on the television or radio covering current affairs in energy technologies that can address climate change.

With the students, arrange these examples into categories. Some might be relevant to scientific research, for instance, while others are about politics or economics or are opinion pieces.

Find common words between them and list them in a 'common words' box.

Source: CSIRO CarbonKids Powering into Tomorrow Curriculum Unit, page 5

Big science ideas (20 minutes)

Geoengineering

Geoengineering (otherwise known as climate engineering) is a relatively new branch of science which is focused on applying technology on a massive scale in order to change the Earth's environment. Brainstorm any known geoengineering technologies that are being increasingly promoted as a way to reduce the effects of global warming arising from greenhouse gas emissions.

View ideas at:

http://www.google.com.au/search?q=geoengineering%2Bclimate+change+images&hl=en&qscrl=1&nord=1&rlz=1T4ADSA_enAU418AU418&site=webhp&prmd=imvns&tm=isch&tbo=u&source=univ&sa=X&ei=PwTLTpf3AsmpiAeDn5XFDg&ved=0CCAQsAQ&biw=1024&bih=587

Imagine (40 minutes)

Ask students to imagine that they were born today. In 20 years time, when they have grown into adulthood, many of the world's ecosystems will have changed.

Consider the following two scenarios;

Scenario one

Many ecosystems now provide fewer natural resources for humans. Due to climate change, excessive use of fossil fuels, high emissions of CO₂ and poor uptake of renewable clean energy technologies, the natural resources we grew dependent on have been depleted. Technologies and actions to stabilise and reduce emissions have not been implemented globally.

Scenario two

Many ecosystems provide more natural resources for humans. Climate change has slowed and is better understood, and appropriate low emission technologies ensure we use our resources efficiently with minimal impact on the environment. A broad suite of technologies and actions have been used to stabilise and reduce emissions.

Support students to reflect on how our understanding of the use of the Earth's resources might differ to that of our parents' and grandparents' generation. Also, consider what factors have contributed to our changing understanding of the environment and sustainable living.

Ask students to discuss the differences between the two scenarios. Which would they prefer? What factors need to be considered for each to be considered realistic? Ask them to create a third scenario based on what they believe is a realistic goal for the future.

Adapted from: CSIRO CarbonKids Carbon in Action Curriculum Unit, page 5

Picture the future (20 minutes)

Explore how youth globally see climate change, low emission technologies and sustainable futures.

Working in small groups, ask students to focus on the artwork from India, China, Brazil and Qatar.

Have students distinguish between those which may stabilise and reduce global emissions of CO₂.

See http://www.unep.bayer.com/en/International-Children_s-Painting-Competition-18.aspx

Discuss how climate change, low emission technologies and sustainable futures messages are communicated within the artwork, asking students to focus on what they think the young artists are trying to say.

Engage them in a hypothetical continuation of the artists' stories, encouraging students to evaluate these strategies for coping with potential changes to the climate.

In groups, students discuss the types of decisions needed if these preferable futures are to eventuate.

Adapted from: CSIRO CarbonKids Agriculture in a Changing Climate Curriculum Unit, page 6

View videos (40 minutes)

View the inspiration and geothermal pages at www.futuresparks.org.au for some possible clean energies of the future.

See additional ideas at:

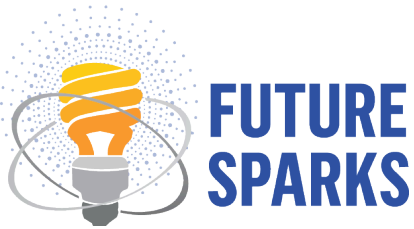
http://www.3pillarsnetwork.com.au/knowledge/behaviour_change/stories_sizzle_salience_and_social_proof/k181

Watch **episodes of SCOPE**. Check out the following links.

Renewable Energy <http://www.csiro.au/scope/episodes/e45.htm>

Electricity <http://www.csiro.au/scope/episodes/e64.htm>

Energy <http://www.csiro.au/scope/episodes/e27.htm>



View **You Tube videos** for information and inspiration for the student videos:

<http://www.youtube.com/watch?v=vO7UeSDNeX8&feature=related>

http://www.youtube.com/watch?v=_s9dxc_jVIY&feature=related

<http://www.youtube.com/watch?v=oTyWeW5MEio&feature=related>

<http://www.youtube.com/watch?v=Fls90kSkmps>

<http://www.youtube.com/watch?v=NaLBvHYyUA&feature=related>

<http://www.youtube.com/watch?v=TUONjdmFqHI&feature=related>

<http://www.youtube.com/watch?v=qxd8YbyzKsM&feature=share>

<http://www.youtube.com/watch?v=kVskMh0Etc&feature=related>

Check out the **60 Second Science videos** created by students about energy.

How the sun emits energy

<http://60secondscience.net/entry-gallery/2011-entry-gallery/australian-open/viewvideo/463/australian-open/how-the-sun-emits-energy->

Elastic potential energy

<http://60secondscience.net/entry-gallery/viewvideo/697/international-secondary--high-school/elastic-potential-energy-international-secondary-student-winner>

Kinetic energy

<http://60secondscience.net/entry-gallery/viewvideo/686/australian-primary-school/kinetic-energy>

<http://60secondscience.net/entry-gallery/viewvideo/14/secondary-school-winners/naracoorte-high-school>

Learn about the latest clean energy science and the scientists involved (18 minutes)

Below is a selection of CSIRO podcasts on the subject of clean energy. These are audio recordings made by CSIRO scientists designed to keep everyone up to date on the latest scientific research in Australia. Listen to scientists from Australia's leading scientific and industrial research organisation discuss their work with the following downloadable mp3 files.

Podcasts are audio (or video) files that can be downloaded and played on a computer or transferred to a portable music device.

- Climate Change Blowin' in the wind

<http://www.csiro.au/en/Portals/Multimedia/CSIROpod/Climate-change-blowin-in-the-wind.aspx>

- Solving Australia's energy puzzle

<http://www.csiro.au/en/Portals/Multimedia/CSIROpod/Solving-energy-puzzle.aspx>

- Solar Power Tower
<http://www.csiro.au/en/Portals/Multimedia/CSIROpod/Solar-power-tower.aspx>
- Growing beyond oil with biofuel
<http://www.csiro.au/Portals/Multimedia/CSIROpod/Growing-beyond-oil-with-biofuel.aspx>
- Australia's National Solar Energy Centre
<http://www.csiro.au/Portals/Multimedia/CSIROpod/National-Solar-Energy-Centre.aspx>

Research what's new in the clean energy area (40 minutes)

Sustainability will certainly demand improvements to our current technology in order to reduce our reliance on non-renewable and non-recyclable resources. How we get our energy is equally as important as how we use it, which means we need innovative ways of harnessing those resources we have access to.

Invite students to download and read the articles about existing clean energy technology, emerging and new clean energy technologies from www.futuresparks.org.au

Engage students individually or in pairs to choose a topic and define their investigation as '*Sustainable Clean Energy Futures*'.

Explain to them that they are to research a topic of their choice and engage in an investigation that is related to their topic.

Adapted from: CSIRO CarbonKids in Action Curriculum Unit, page 10

Explore futures ideas (30 minutes)

Take a 'futures walk' by imagining and envisioning clean energy options for the future. Talk with the students about:

- Possible futures
- Probable futures, and
- Preferable futures (hopes, dreams and visions).

Encourage students to formulate their own questions and then illustrate and describe their clean energy possible, probable and preferable future ideas.

For example:

- A possible clean energy future includes....
- A probable clean energy future might include...
- I hope a preferable clean energy future can include....

Discussing futures (15 minutes)

Ask students to talk about what are issues for them in relation to:

- energy sources in the present
- possible clean energy sources and
- probable clean energy sources.

Expand on these thoughts and ask students what might be done about these issues.

Synthesise ideas and write a recount of ideas collected.

Step 3: Explanation

Restate the task (5 minutes)

Explain to the class that in pairs or small groups (4 people or less) their task is to prepare a 2-minute video – (definitely no longer than 3 minutes).

If students do not want to submit a video they enter the Persuasive writing competition.

The video should convey information about the:

- drivers, risk and impacts of climate change on communities and ecosystems
- student's understandings and imaginings for a clean energy future, drawing on existing technology as well as potential sources of clean energy and their applications
- potential for young people to make an impact through practical, everyday action

Decide on what to present and how to do so (10 minutes)

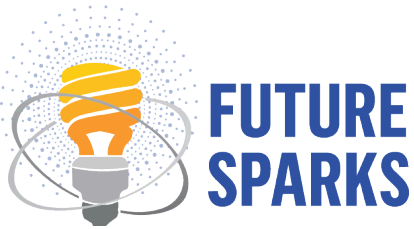
Re-state the purposes of the investigation and ask students to consider how they are going to bring their information together and present it so that the main points come across clearly.

Model the construction of the storyboard genre.

Students now use the information they have gathered to construct:

- a storyboard for the Future Sparks Clean Energy Show and Tell video competition
- a plan for the persuasive writing

See <http://www.slideshare.net/slayas/storyboard-genre-ideas>



Check out (10 minutes)

Check out some amazing videos created by students in NSW Public Schools and focus on the video techniques used post creation of a storyboard.

See <http://www.youtube.com/watch?v=tKmB2gYViCU>

and <http://www.youtube.com/watch?v=I7oh-7BZUZE>

Similarly, view winning video entries in a Geoscience Australia video competition for ideas.

See www.ga.gov.au/education/public-events/geologi-short-film-competition/geologi-winners-2011.htm

Bringing it together (10 minutes)

Focus the student's attention on:

- What we know;
- What we want to find out;
- What the class now knows;
- What other things we would like to find out.

Use 'What we know' as a source for class, small group discussion and use other prompts to plan the way forward. See

<http://office.microsoft.com/en-au/templates/kwlh-chart-TC101887896.aspx>

Step 4: Extension

Consequence wheels (30 minutes)

Invite students to develop a ‘consequence wheel’ to explore the consequences of decisions and choices relating to carbon dioxide emissions from energy plants.

In groups, encourage students to decide what issue they wish to explore.

The issue is written in the centre of a sheet of paper and a series of concentric circles are then drawn lightly around it. The first question asked is “What are the immediate consequences?”

Ask groups to discuss what the repercussions might be and briefly write them around the first circle.

Ask groups to link each statement to the central point by a single line.

Next, students discuss what consequences may follow on from the first ones. Following on, third and fourth order consequences can be explored and marked in a similar way.

Share consequence wheels and explore the difference between intended and unintended consequences for a range of issues.

Encourage the students to ask critical questions of one another's work. For example:

- What do you feel, hope and fear in relation to this particular issue?
- Do you think everybody agrees?
- Why might other people think and feel differently?
- How did the issue come about?
- Who do you think influenced your opinions?
- Who gains and who loses?
- Who has power in this situation and how do they use it?
- Is it used to the advantage of some and the disadvantage of others?
- What values can we use to guide our choices in the way the environment is used, managed and conserved?
- What are the possible courses of action open to us?
- What are others already doing?

- How might industry and energy plants implement a plan of action to stabilise or reduce emissions of carbon dioxide?
- How might we work together?
- Whose help might we need?
- How do we measure our success?

*Adapted from "Education For The Future – a practical classroom guide,
D.Hicks, WWF, 1994, p.10*

Step 5: Elaboration

Presentation planning (30 minutes)

Invite students to confirm the 'big idea' planned for their video competition entry in a single sentence or a series of words like a newspaper headline.

In small groups, discuss the possible ways to present the big idea in an interesting and engaging format.

Create a final plan for completing the presentation requirements for the competition entry. Students may need to document their key messages, create an image bank and their props and collate references and acknowledgements for their work sample.

Students work in groups, pairs or individually to create a video presentation and map their 'big idea' about a clean energy future.

Make the video and peer review it (unknown minutes)

Using an iPod, MP3 Player, video camera or iPhone, ask students to capture the video footage as required for their clean energy future video.

Using programs like Movie Maker and I Movie invite students to create and edit video sequences. Add special effects, headings, captions, acknowledgements and any copyright information that may be required.

Share videos with class peers seeking their critique before submitting to the Future Sparks Clean Energy competition. The class should consider how well the video meets the judging criteria:

- **The video includes creative and novel ideas, for new technology, application of technology, and/or changes in behaviour that result in less greenhouse gas emissions**
- **The entry demonstrates an excellent understanding of clean energy and the need to transition towards clean energy sources**

- **The presentation in the video has impact, is engaging, original and creative**
- **The video demonstrates effective communication.**
- **The video production is sound, with both audio and visual at an acceptable level.**
- **The video does not exceed 3 minutes.**
- **PowerPoint presentations will not be accepted. The video should contain only props and material produced by the student and must be free from copyright restrictions**

Review checklist and submit the video (unknown minutes)

Invite students to reflect on feedback shared in the earlier activity, revise and fine-tune the video to meet entry requirements.

Ensure Parental Consent form has been completed and posted to Green Cross Australia. Upload the competition entry via www.futuresparks.org.au and look out for the People's Choice vote from Monday 23 July to Sunday 29 July.

Consider hosting a 'Community Show & Tell' to showcase the students work to the school community and beyond. A small amount of funding is available to assist with this activity. Send in a request via the link in the Teachers' section of the Future Sparks website.

Educational Resources

Acknowledgements

The *Future Sparks Our Clean Energy Future Show and Tell* educational materials project is being undertaken by CSIRO Education for Green Cross Australia.

These educational resources are designed to introduce teachers and students to Australia's use of 'clean energy' as one of the carbon dioxide mitigation options available for achieving significant reductions in atmospheric carbon dioxide emissions. Whilst not an exhaustive educational resource, it is intended to raise the awareness of school-aged students about our changing climate, clean energy practices and applications and the other alternative energy technologies that reduce greenhouse gas emissions.

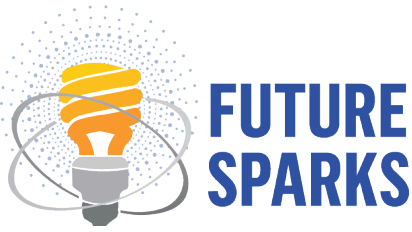
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Climate change is one of the most challenging issues facing the world today. Our climate is already changing. Our temperature increased over the last century and will continue to do so in the foreseeable future – the question is by how much?

New clean energy technologies and behavioural changes will be needed to modify the impact human activity has on atmospheric greenhouse gases. Improvements to the efficiency and reliability of renewable energy sources, efficiency of energy usage, and other novel ideas and unforeseen technology will also need to be considered as potential courses of action.

The effects of human-produced greenhouse gases are intergenerational. It is going to take years – even decades - to reverse the trend. We need to begin the process of change now.

This is where the *Future Sparks Our Clean Energy Future Show and Tell* comes into play. We want to encourage our youth to understand the range of clean energy, renewable and low emission energy technologies being explored as options in managing the risks of climate change by reducing greenhouse gas emissions, particularly carbon dioxide.

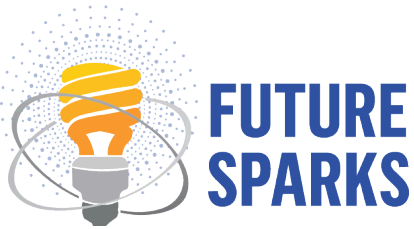
How can teachers be part of the process?

As teachers, there is an opportunity to place climate change and clean energy technologies high on the school and classroom agenda – to give all students opportunities to explore the current understanding and science that can reduce greenhouse gas emissions.

This resource has been developed to help teachers:

- Initiate a learning program about clean, renewable and low emission energy technologies and climate change
- Support student’s learning for the *Future Sparks Our Clean Energy Future Show and Tell* video competition.

This resource provides information in three parts.



Section 1

Contains an extended learning inquiry of 1-22 x 40 minute lessons/workshops.

Section 2

Contains a basic learning inquiry of 1-16 x 40 minute lessons/workshops.

Section 3

Contains a learning inquiry of a 90 minute lesson/workshop.

Curriculum Links

The lessons/workshops are designed to be integrated into learning areas in the Curriculum in:

- Science,
- English, and
- Technology.

The lessons/workshops have links to the following general capabilities:

- Literacy
- Information and communication technology (ICT) capability
- Critical and creative thinking
- Ethical behaviour
- Intercultural understanding.

The lessons/workshops have links to the following cross-curriculum priority:

- Sustainability.

The lessons/workshops can be used in a number of ways. There is much choice in each of the inquiry stages and teachers can select, adapt, add to or modify these.