2 documents removed under s11C of the FOI Act

s22

From: s22
Sent: Wednesday, 9 June 2021 10:39 AM
To: s22
Cc: s22
Subject: s47E(d) feedback on Your Energy videos [SEC=OFFICIAL]

Hi s22 and team

Thought you might be interested in the feedback from s47E(d) on the Your Energy videos.

s22 distributed the videos to s47E(d)

s47E(d)

Cheers

s22
Evaluation Manager
P: s22
E: s22 @questacon.edu.au

Questacon – The National Science and Technology Centre
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Questacon acknowledges the Traditional Owners of country throughout Australia and their continuing connection to land, sea and community. We pay our respect to them and their cultures and to the elders past, present and emerging.

OFFICIAL

Your Energy Digital Show – Content Summary

Your Energy: Episode 1. Introduction

- Introduces the topic of energy
- Talks about different things that use energy (cooking, devices, transport, people)
- Introduces United Nation: Sustainable Development Goal 7 – affordable and clean energy
- Explains we use energy to do work, and any work we do consumes energy
- Talks about different types of energy (nuclear, kinetic, chemical, potential, thermal, electrical)
- Explains energy cannot be created or destroyed, only transformed
- Asks you to write down your answer – do you care where your energy comes from?
- Questions to think about:
    - Do you care where your energy comes from today?
    - What types of energy have you used today?
    - What energy did you use that you maybe didn't need to?

Your Energy: Episode 2. Source

- Looks at sources of energy and how one source of energy can transform into other types of energy (e.g. candles and matches transform chemical energy into heat and light energy)
- Discusses how energy is essential for people's bodies to work
- Experiment of blowing sugar through fire
- Talks about the sun – one of our sources of energy, with relevant data including:
    - It takes 8 minutes for sunlight to travel from the Sun's surface to Earth
- Questions to think about:
    - What do you do in a blackout?
    - Do all foods contain the same amount of energy?
    - How close could you get to the sun?
    - How long do you think we could survive without the sun?

Your Energy: Episode 3. Usage

- Talks about how we use energy
- Discusses the breakdown of the sunlight that reaches earth
    - 30% is reflected
    - 70% is absorbed
        - 46% is solar heat (can be used as renewable solar power)
        - 23% absorbed by water (causes evaporation, leads to renewable hydropower)
        - 1% absorbed by gases in the atmosphere (causing wind, which can be used as renewable wind power or wave power)
        - 0.08% is absorbed through photosynthesis (causing plant growth)
            - 0.007% of this decomposes into hydrocarbons like oil and gas – our non-renewable fossil fuels
- In 2019 – 2020, 93.6% of Australia's energy was from fossil fuels
- Over 25% of Australia's energy usage is for transport, predominantly using an internal combustion engine
    - Experiment to replicate a combustion engine
        - Demonstrates Newton's Third Law – for every action there is an equal and opposite reaction
- 25% of Australia's energy usage is to create electricity
    - A fifth of this is made from renewables

    - Most electricity is generated by a thermal power generator
        - Talks about the energy conversion required to create electricity
        - Experiment of inefficient energy conversion with liquid nitrogen
- Talks about how renewable sources are used to create electricity
- 79% of electricity in Australia is generated by burning coal, gas or oil
- Asks if there are more efficient ways of generating energy?
- Questions to think about:
    - What sources of light do you have at home, how are they powered?
    - Are there any energies we use on Earth that the sun does not provide?
    - What sources could replace fossil fuels?
    - What are the effects of burning so much fossil fuel?

Your Energy: Episode 4. Consequences

- Talks about the consequences of burning fossil fuels
    - When fossil fuels are burnt, gases are generated called emissions
    - Our main concern with these emissions is carbon dioxide
        - Carbon dioxide absorbs heat, similar to a greenhouse
        - We need to retain some heat to maintain our planet's normal climate, but too much carbon dioxide can cause too much heat to be trapped
        - Our current levels are so high that our global climate is becoming warmer and causing our climate to change
- Looks at recent carbon dioxide levels through the Keeling Curve
- Discusses carbon dioxide levels in history, determined through Antarctic ice cores
- Discusses that scientists all over the world agree that this increase in carbon dioxide levels is the cause of the constant rise of our global temperature averages
- Discusses ways to use less energy
    - Turning off lights etc, though residential energy is only 7% of Australia's energy use
- Discusses ways to use products that 'cost' less energy
    - Talks about the hidden energy costs in products with an example
- Briefly discusses linear vs circular economy – reducing, reusing and recycling
- Shows a website (www.footprintcalculator.org)
    - Calculates how many Earths would be needed if everyone lived like you
- Talks about how individuals can reduce the energy and resources they use
    - E.g. Find out what can be recycled locally, avoid excess packaging on products, or choose products with recyclable packaging, reduce, reuse, recycle
- Questions to think about:
    - How do you feel about climate change and its effects?
    - What would you be prepared to change to reduce your energy consumption?
    - How many Earths would we need if everyone lived like you?
        - To find out, visit: www.footprintcalculator.org

Your Energy: Episode 5. Renewables

- Discusses how we can change where our energy comes from
    - Talks about the nuclear power process, and mentions that it is used in other countries, but Australia has legislated not to use nuclear power
- Discusses and explains renewable energy sources and how they generate electricity
    - Solar – photovoltaic cells, requires sunshine
    - Wind – uses giant turbines to generate electricity
        - Turbines can also be used in waves to generate electricity from wave power
    - Hydro – electricity is generated when water from a high elevation flows downwards through pipes and turbines, requires regular rainfall and a dam to store water

    - Geothermal – volcanic rocks heat pipes containing water, producing steam
        - Only a few sites are suitable for producing geothermal power
    - Discusses renewables in Australia – produces around 21% of Australia's electricity
- Discusses the potential challenges of renewable energy sources
    - Lack of reliability
    - Discusses batteries and energy storage
- Discusses the transitional sources of electricity that could be used while Australia transitions to using more renewables
    - Discusses how gas could be used as a complement to renewables
- Questions to think about:
    - Which sources of energy do you think best suits Australia?
    - How do you feel about Nuclear Power in Australia?
    - Have you ever stood under a giant wind turbine?

<u>Your Energy: Episode 6. Hydrogen</u>

- Discusses how renewables could be used to power vehicles
- Explains and discusses hydrogen and electrolysis
    - Experiment of electrolysis (the separation of hydrogen and oxygen by sending an electrical current through water)
    - Experiment of combining hydrogen and oxygen to create water and energy
- Discusses hydrogen fuel cells
    - Can be used to power electric vehicles and in our gas mains
- Discusses how we make hydrogen
    - Currently need to use fossil fuels to provide the electricity to make hydrogen, but could eventually use renewable energy
- Discusses the possibility of hydrogen becoming a multi-billion dollar export for Australia by 2040, and the future job prospects associated with hydrogen production
- Discusses the National Hydrogen Strategy, promoted by Australia's former chief scientist Dr Alan Finkel, which all Australian states have already signed up to
- Questions to think about:
    - How would you feel about your car being fuelled by Hydrogen?
    - How about a plane fuelled by Hydrogen?
    - What comes up when you search online for "Hydrogen" and "Australia"?

<u>Your Energy: Episode 7. The Future</u>

- Summary of Your Energy Digital Show
    - Our society is completely dependent on energy use
    - In Australia, renewable energy supplies around 6% of our energy needs, and 21% of our electricity supply
    - Almost 94% of our energy comes from the burning of fossil fuels
    - Discusses fossil fuels and renewable energy sources
    - Discusses how it is your choices that will influence Australia's energy systems in the future through decisions you make and careers you choose
    - Makes educated guesses about the future of energy in Australia
- Experiment of burning a match in liquid oxygen
- Asks you to think again about if you care where your energy comes from?
- Questions to think about:
    - What do you see Australia's future energy landscape looking like?
    - Can you think of any innovative new way to source energy?
    - Do you care where your energy comes from, has this changed?

Overview of the Questacon - INPEX Partnership

6 May 2020

Background

- Questacon's partnership with INPEX Ichthys Pty Ltd focuses on SDG7 of the United Nations' Sustainable Development Goals - affordable and clean energy.
- The $1 million partnership, over four years 2019-23, will deliver a suite of hands-on science, technology, engineering and mathematics activities, focusing on building energy literacy in Australia and Japan.
- INPEX are acknowledged as a Supporting Partner.
- Partnership activities focus on young people, energy and sustainable futures and will be delivered in Australia with some elements also being delivered in Japan.
- Questacon has a role in translating the important topic of energy to young persons, educators, families and their communities.
- The partnership does not provide INPEX with any control over the content of the work Questacon produces.
- s22

s22 visited Questacon on 4 December 2019. Following a tour of the Centre, INPEX and Questacon met to discuss the partnership.

Partnership Activities

1. Your Energy show

- Delivered in the Japan Theatre at Questacon, Your Energy seeks to improve energy literacy through entertaining demonstrations.
- Feedback on show content was received through several mechanisms including an industry collaboration event and an open invitation to stakeholders to attend trial shows and provide feedback.
- The industry collaboration event was held for energy industry stakeholders on 25 February 2020. Organisations represented included the Australian Federal Police, INPEX, Australian National University, Office of the Chief Scientist, ARENA and the Department of Industry, Science, Energy and Resources.
- The show will also be filmed for online dissemination.
- The official launch of the show was to be held in March 2020, but was postponed due to the COVID-19 pandemic. A new date has not yet been set.

s22

Talking Points for presenters and FOH staff: YOUR ENERGY SHOW

INPEX Partnership 2019-2023

Why has Questacon partnered with INPEX?

- Energy as a topic is at the forefront of public conversation at the moment. Questacon has a role in facilitating discussions regarding energy efficiency and energy generation amongst our visitors to increase energy literacy in Australia.
- INPEX shares this perspective and this partnership provides the resources for Questacon to facilitate these conversations.
- INPEX has invested $1million in a partnership with Questacon over four years from 2019-2023.
- The partnership aims to :
    - increase energy literacy in the community through a variety of initiatives, including development of this new science show about energy
    - inspire young people through activities focused on young people, energy and sustainable futures
    - promote awareness of the United Nations' Sustainable Development Goals, focusing on SDG 7 – affordable and clean energy
- Whilst Questacon is a Division of the Commonwealth Department of Industry, Science, Energy and Resources, and receives some Federal Government funding, Questacon also raises 50-55% of its annual operational funding from other revenue sources, including corporate sponsors and partners. Partnerships enable Questacon to provide a variety of programs and activities across Australia including pop-up exhibitions, science shows for school students and teacher professional development workshops.

Who is INPEX?

- INPEX is a Japanese energy company with operations in Australia.
  For more information visit www.inpex.com.au

What is the purpose of the Your Energy show?

- Your Energy was developed to increase awareness about energy use and highlight the importance of sustainable energy, leading to increased energy literacy.
- The show aims to prompt the audience to think more about energy sources, how energy is used in people's daily lives, and to question their own energy use.
- By using an interactive format along with entertaining demonstrations, the show intends to start a conversation about energy, particularly amongst young people,

What is energy literacy and why is it important?

- Energy is an important and complex part of everyday life

- Energy literacy is an understanding of the role of energy in our daily lives
- An understanding of energy is important to enable people to make informed decisions about their own energy use and to understand energy policy and issues.

Who will be able to see the show?

- The show will be regularly presented here at Questacon.
- The show will also be made available for digital audiences across Australia and internationally to view online in October 2020.

How will the show be evaluated?

- The show will be evaluated based on its effectiveness in improving energy literacy within the audience.
- A survey tool will be distributed to audience members to assess audience interest and changes in their energy literacy. It includes four categories of questions: feedback on the show; energy content knowledge; attitudes and values; and intended behaviour.

For more information or to provide feedback on the show please encourage visitors to email: info@questacon.edu.au

Please note: *this document is subject to review and change to incorporate additional points as required.*

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Item No.	Matter	Description
Sponsorship details		
s 22		
10	**Project**	s 22 **Energy shows** delivered in the Japan Theatre at Questacon and filmed once to upload online, these Energy shows aim to improve energy literacy through entertaining demonstrations to build a greater understanding and awareness of energy. s 22

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s 22

Project / Deliverable	Collaboration Opportunity	Timeframe
Energy Shows including digital shows	Join a panel of industry experts to view the Questacon Energy Show at Questacon to provide feedback from an industry perspective.	February 2020
	Share Questacon's digital Energy Shows via YouTube link throughout existing networks.	August 2021

s 22

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s 22

DELIVERABLES	**Energy Shows - $120,000** **Development** Delivery: August - December 2019 **Delivery – Phase 1 - Questacon's Japan Theatre** Delivery: February 2020 Daily shows - to continue for life of partnership **Delivery - Phase 2 – filming and delivery of digital shows** Delivery: August 2021 Filmed and uploaded onto Questacon's YouTube Channel to be shown throughout the life of the partnership Objectives: • improve energy literacy throughout the Australian community;

s 22	• engage over 1,000 visitors in energy shows during the lifetime of the partnership; • increase awareness in the community of the role of energy; • highlight the importance of sustainable energy its role for a sustainable future. Delivered in the Japan Theatre at Questacon and filmed once to upload online, these Energy shows aim to improve energy literacy through entertaining demonstrations to build a greater understanding and awareness of energy.

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Freedom of Information

s22

OFFICIAL

From: s22
Sent: Friday, 6 March 2020 10:19 AM
To: s22 @questacon.edu.au>; s22 @questacon.edu.au>; s22 @questacon.edu.au>; s22 @questacon.edu.au>
Subject: FW: Energy Show collaboration - INPEX feedback [SEC=UNCLASSIFIED]

Hi All,
This has just come through as something else to consider in our show meeting this afternoon.

Thanks,
s22

UNCLASSIFIED

From: s22
Sent: Friday, 6 March 2020 9:40 AM
To: s22 @Questacon.edu.au>; s22 @Questacon.edu.au>; s22 @questacon.edu.au>
Cc: s22 @Questacon.edu.au>; s22 @questacon.edu.au>; s22 @questacon.edu.au>; Questacon Partnerships <partnerships@Questacon.edu.au>; s22 @questacon.edu.au>
Subject: FW: Energy Show collaboration - INPEX feedback [SEC=UNCLASSIFIED]

Good morning all

Please see the below email from s22 with additional feedback on Your Energy.

I'll leave it with you, but please let me know if anything further is needed from partnerships.

Many thanks
s22

Partnerships Communications Coordinator
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@questacon.edu.au

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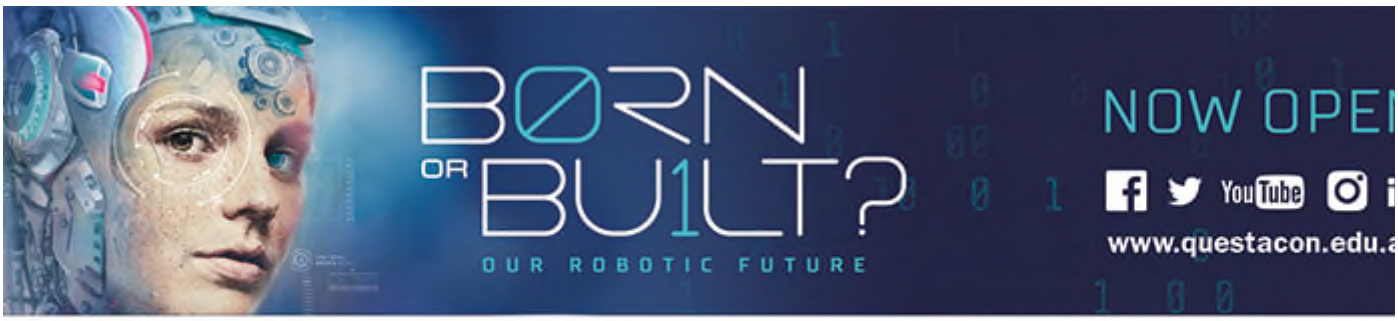

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to land, sea and community. We pay our respect to them and their cultures and to the elders past

s45, s47(1)(b)

3 pages exempt in full under s45 and s47(1)(b) of the FOI Act

Digital Energy Feedback response

Questacon created a science demonstration show, Your Energy, for regular rotation as part of its live theatre program. Following performances of the live show at Questacon in February 2020, its suitability for release in video format was considered. Given the show's length (approx. 25 minutes) a series of short videos was determined to be the best format for sharing the show's content over digital channels. Each short video in the Your Energy series focuses on a subset of the themes contained in the original live show. Content for both the original show and resulting videos drew on a wide range of materials (reports, papers, major speeches, online resources, presentations, test audience feedback etc) to inform the content.

Early drafts of the live show and videos were developed and shared with a wide range of stakeholders including staff, scientists, science communication organisations, educators, government and industry, for initial feedback. Videos were finalised by Questacon's internal teams and released on Questacon's YouTube channel in March 2021.

General

- These videos were highly accessible and could be easily understood through the explanations.
- Overall, the videos were very good and tackled a difficult and complex topic in a way which was understandable and covered a broad range of relevant topics.
- It is explained well on the whole. A couple of sections are quite fast and assume some prior knowledge, but overall a good series that demonstrates the importance of sustainable energy in Australia.
- All round, the videos were at a very good standard
- It's good that the original show has been split into small sections of short duration. This will make it easier for teachers to use the videos in class
- Broadly, they are great. Clear and easy to follow. Great range and diversity of presenters.
- Encourage wearing safety goggles whilst doing experiments as well as gloves by demonstrating this.
- I like the concept and the enthusiasm of team of presenters. The presenter kicks it off the series in such a good way - and the others continue the excitement.
- This would be especially beneficial for children and people from non-English speaking backgrounds.
- Having presenters in different coloured T-shirts from the background would help to see their moves better.
- The black background with the presenter wearing a black top is difficult to see – there's not much contrast, especially when a presenter has dark hair.
- Realise this is draft but just noting: all the presenters should wear Questacon shirts (not other brands).
- The coverage of energy-related topics and narratives were thorough, the presenters were well-spoken and engaging.

- I'm sure the videos will be quite different in their final form, but found that long periods of explanation and dialogue were hard to engage with. Perhaps little drawings visually explaining the concepts spoken could make the videos more engaging, especially to a younger audience. Visual learners in particular would benefit from it.
- I could understand and relate to the content, and would only suggest making adjustments to the visual appeal of the videos in order to increase engagement with younger audiences.
- The videos would benefit a lot from the addition of audio-visual/multimedia/graphics/text caption elements to complement the narration.
- More graphics, animations if budget allows, or filming somewhere with a more interesting background.
- The demonstrations and experiments were very effective in making the content accessible. I loved the enthusiasm in the second video, it made the content so much more fun and engaging.
- I particularly like how the videos incorporate explanations about the chemistry of energy because quite often, information on these subjects doesn't go into enough depth
- The videos present the facts and statistics well, and have a good balance between information and education.
- Can the style of the videos be more interactive like a live audience show? This would include story telling as well asking questions from the audience. For example, pause, show a graphic, let the audience have some creative ideas, or let
  them guess. Then provide the answer. This could bring more engaging. A style more like GRUEN than the 7:30 report on the ABC.
- Repeat the message of each episode in different words. It would be useful to have a small concise group of messages that sum up the whole series.
- Consider adding a learning outcome or aim to the beginning of each video to describe the purpose of the video, so the viewer knows what to expect from the clip. This could be revisited at the end of each clip so the viewer can ensure they have the key message from the clip.
- Could you have the some common gadgets across the episodes? The little windmills are great - could they appear again and again?
- Reduce the frequency of quoting numbers, but provide one overarching unit that becomes meaningful. The modern global unit is kWh It will become more and more important.
- Check language in the series: energy is conserved - it never disappears, we use energy, waste energy, transform energy, convert energy, is heat energy waste energy or comfort?
- Seems to be a good level for the target audience.
- Language simple/straightforward, unknown/difficult words or concepts explained well
- There is a lot of information at a wide range of levels – is the target audience too large? E.g. In section 2, they are talking about types of energy = year 8 (13-14 yo) yet some of the demos are targeted to a much younger audience.
- Could subtitles be added?
- The information becomes clearer as the series progress.
- There were a few weird things (e.g. green line down the bottom of video 3) but am guessing that will all go when you refilm for the final.
- Some quiet backing music or sound effects may help keep attention, as some of the series that have more advanced knowledge can sound like a lecture.
- Finally, one little detail I noticed is that, unfortunately, I'm not sure all school children would understand the village people reference. They are a classic band but a bit out of date. Perhaps a more accessible reference?

- I found the content easy to understand and informative with respect to the viewer's role in being aware about their energy consumption.
- I would include more specific examples about developing technologies. Hydrogen powered cars are a great example as they only emit water and fit in with your theme. Apart from these things, the content is excellent and I am sure that you will do a fantastic job with the demonstrations and visuals. I can't wait to check out the finished product
- The show has a lot of content with many facts and figures but luckily, no equations. I try to figure out the big messages that I can retain quickly but I get stuck in some places when there are a lot of numbers (for example episode three: the energy that comes from the sun.
- The blackout is a good highlight; But: we have enough energy - but we can transform energy (deliver power) quick enough.
- I would focus on: the challenge in global (population, pollution, health, social impact, biodiversity, sustainability …) but the solutions have to be local, each of us. What can I do? What do I expect others to do?
- The solutions are different, even in different parts of AUS, in the cities and the regions.
- And we have to support the necessary changes, the many transitions within our society.
- All the examples they use are easily relatable. The delivery from the presenters is entertaining and they all keep you engaged because they're so expressive.
- Examples used were very relatable.
- There is not much reference to natural gas and its benefits, as part of a total energy mix, other than a few references as a transition fuel.
- There is a consistent theme (through all videos) that fossil fuels are negative for the environment and that the future is renewables. While that may be so, we wonder if there is a way to balance out the language better considering key roles that natural gas has been and will be playing for Australia and overseas.
- The videos are very Australia specific in many of the statistics quoted, and also some of the language and scripting (e.g. a spoon of sugar makes the medicine go down). This should be considered if the content is intended to be used for international audiences
- This may be beyond the scope of the videos, but one broad issue is the different energy circumstances around the world. One example is Australia's wealth of renewable energy resources versus places which are colder or more densely populated. Also the fact that Australia is a large exporter of energy, but export of renewable energy is very difficult with current technology.
- Percentages are too advanced for younger audience, they would need to stick to simple fractions, 1/2, 1/3 etc.
- The information in the series is really important, the majority of it connects well within both the SU strands of the curriculum as well as the SHE strands, it will be a great resource for educators to have.

Video 1- Introduction

- Presenter mentions 'gas' without any context of what it might be used for. Suggest adding just a couple more words like 'gas cooktop', 'gas hot water', or 'gas barbecue'.
- Related pictures/graphics and text captions to complement the narration would be helpful (e.g. pictures of the things he is talking about that use energy, types of energy, transformation of energy etc.).

- I like that there is an introduction in this clip about what the purpose of this series is, what they will learn and what it's about – this is really useful for educators to use to gauge appropriateness for students.
- This is fast-paced and difficult to keep up – there is a lot of information being shared and not much time to process. This might become more obvious when graphics are added but when it's just speech, it's a bit overwhelming.
- Give students time to consider and discuss questions posed rather than giving answer immediately. Consider getting them to write down the answer to "do you care where your energy comes from?" question at the start and end of the series and compare – you could get them to share this with you as a measure of impact.
- Energy to do work is a difficult explanation for most student – they assume work is a job, consider breaking this description down further (W = Fd) or give a couple of examples.
- Good example of energy transfer in the plant.
- Efficiency – energy loss to heat – relate to students – "have you ever noticed that a lightbulb or your laptop gets hot when they're on for a while? This is energy that has been lost to heat instead of transformed into light or electrical."

Video 2 - Source

- The blackout is quite sudden, and particularly in modern contexts, may initially be misinterpreted as a loss of connectivity on the viewer's device or other error. Could possibly make a small edit like a flicker/fade transition or similar to foreshadow the change.
- Unable to see the presenter when she used the match and could barely see her when using the candle (suppose these and other actions were just simulated for this draft).
- Graphics and captions again would be helpful, especially for the facts about the sun.
- Comment could be made about the convenience, lower effort and greater power of electrical devices compared to things which are human powered etc. This may help children bridge the gap between simple demonstrative devices to modern appliances we use regularly, and why we need electricity.
- When demonstrating the experiments using burning and putting on gloves, the presenter might make a note that they are already wearing glasses, so that may not be required from a PPE perspective.
- Can't see light from match or any light until 0:51 – is this added in post?
- Difficult to see objects in the first half of this.
- Kinetic energy etc. (types of energy) not covered until Year 8 – types of energy possible too advanced for younger audience
- Get students involved – "what ways can you think of that you use energy? Where does this energy come from?"
- Lots of facts to take in – interesting but overwhelming, can't retain (about the sun, for example). Fusion reaction is Year 11/12 – too advanced?
- Pause to let students consider answers
- I was confused with some of the comparisons in this video: XXX of the energy flow from the sun can be used. For example: When plants only use 0.00000 x % of the sunlight to create all the greenery, is that god or bad? What is the message here?
- I really like the stories that all actions on earth go back to the energy flow from the sun.

Video 3 - Usage

- A lot of contents and information in this video and again, use of graphics and captions could help illustrate and emphasise the statistical and other information being discussed.
- This is a complex issue which is difficult to deal with, but the focus on the directness/simplicity of renewable electricity from a process engineering perspective distracts a little from larger drivers of the renewable vs fossil fuel comparison (emissions, economics, dispatch ability, transportability). The emphasis on this part should maybe be something like 'try to make a process as efficient as possible' rather than 'renewables are superior to fossil fuels because the process to produce electricity is simpler'.
- There is very little reference to natural gas in the discussion of energy and fossil fuels, and there is a suggestion that gas may not be around in the future. While this may be true, there may be a better way of phrasing that. E.g. will the future see more of renewable energy to complement fuels such as gas?
- So much advanced information (e.g. %) at once – too many numbers and too high level for younger audience – this might be simplified with graphics (pie chart?) but just speech is overwhelming.
- Because of how advanced this science is, the speech also needs to be slower, as there isn't much time to process. Overall, it feels well above 8 year olds, despite being a crucial precursor to the following topics.
- Second definition of fossil fuels?
- It is worth noting that these concepts aren't taught until high schools and even later high school. Newtons laws are not taught until year 10, types of energy are taught in year 8, energy efficiency is taught in year 10
- Provide applications of combustion engine to help students understand
- Liquid nitrogen example might be overcomplicating the explanation. Why not use a Bunsen burner to boil water to turn your turbine – a miniature, simplified version of a real generator. Then explain in reality, instead of the Bunsen supplying the heat, its coal, oil or gas.

Video 4 - Consequences

- This segment has a lot of really great and practical tips, however the value of energy efficient products could potentially be highlighted. Even a simple comment like paying attention to energy ratings on appliances when buying something new could be a good recommendation.
- Good to add link to footprint.calculator.org
- 3Rs are generally referenced as 'Reduce, Reuse and Recycle', not 'Recycle, Reuse and Repurpose' as mentioned in the video.
- Repurposing 'alley' as a dog chew toy can be considered as a safety/choking hazard as all toys are not suitable to be repurposed as a dog chew toy.
- Good explanations and pace
- Advanced language is used here, re. Keeling curve
- 1M years – put into context for students – what was Earth like then?
- Why not get students to hypothesise how they could reduce carbon emissions first then explain?

- Is the audience too broad? “Growing an Ally” is a good example for a young audience but the linear/circular economy is a much more advanced audience.
- Get students to predict how much energy is used in “making an Ally” – clearing land, fertiliser, flights etc. – then as: How could each stage of “making an Ally” be improved to reduce the impact?
- Footprint.calculator.org doesn’t exist? Wrong URL – is it footprintcalculator.org ?
- Aren’t the 3R’s Reduce Reuse Recycle?

Video 5 - Renewables

- This video provides a good overview of different electricity sources and the key advantages and disadvantages of each. It explains well the possible future of full renewables in Australia, but the need to transition. Although it is mentioned a few times, it may be useful here to have a graphic maybe forecasting the change from fossil fuels to renewables over time, to highlight that it is a very large change and it’s not realistic to immediately replace all fossil fuels with renewables.
- Around 4 min 03 mark, there is a reference that gas will be used “in the future” for electricity while we have been using gas for almost 100 years for electricity. This fact needs to be corrected.
- Some visual to explain some technology/terminology such as ‘photovoltaic cells’ would be helpful.
- Good intro
- Better pace, good explanations – clear and understandable
- Example of batteries – “just like the batteries you have in your TV remote –electrical energy is stored in the battery until you’re ready to use it”
- Well why don’t we just use batteries and renewable energy all the time then? – perhaps address this.
- How does the energy get stored? Is it stored as electricity? In the balloon example it sounds as though wind is stored.

Video 6 - Hydrogen

- This section doesn’t really go into the challenging economics and physics/chemistry of exporting hydrogen, but as a discussion of a conceptual future it’s probably not necessary.
- Good pace and explanations
- “As you can see…” (double hydrogen) – is this being added post?
- “No harmful effects”? Aren’t they using electricity from non-renewables to make the hydrogen?
- Possibly have a look at current hydrogen vehicles (e.g. https://www.toyota.com/mirai/2020/fcv.html)
- Elements & Compounds – Year 8
- Pause for students to react to reactions and let them consider answers to questions
- After “…hydrogen could be a multi-billion dollar Australian export by 2040” consider adding “that means **you** could be working in this industry, designing and manufacturing innovative hydrogen vehicles and much more” for example, to make it relevant and directly applicable to the students.

Video 7 – The Future

- It's quite difficult to summarise without being judgmental, but I think this is done quite well. One theme which is drawn out is that each option has advantages and disadvantages, choosing between them depends on what factors you value most. This may be difficult and possibly very controversial, but it might be helpful to have advantages and disadvantages in a list or table form to be seen in a snapshot.
- Fossil fuels are negatively represented. There could be a better way to talk about the energy future. Gas does get a reference as a transition fuel in this, but it's a bit lost after the introduction.
- Pleased to see that they while (accurately) explaining that fossil fuels do contribute the greatest carbon emissions of all fuel sources, they allow students to come to their own conclusion about the need to reduce their use of/reliance on fossil fuels.
- Add suggestions about how students could get involved even though they're not in power just now to reduce the helpless feeling! E.g. reemphasise the changes they could make, the decisions they could make that make a difference, careers to consider etc.
- Why not ask students to sum up the key points or what they've learnt from this series first, then give the summary?
- Add a graphic that lists the predictions for the future to help students keep track.
- Match example – can we compare gas oxygen with liquid (graphics for both) to get an idea of how much better? E.g. an animation of both.
- I think the script in the final video becomes a little bit repetitive at points towards the end.
- In the final video, the presenter says something along the lines of "you are the innovators and engineers". Suggest they say first something about "you are the users of the energy", so the small people watching can feel like they are empowered to be involved in the change.

1 document removed under s11C of the FOI Act