



ACEE Alberta Council for
Environmental Education
ADVANCING ENVIRONMENTAL EDUCATION IN ALBERTA

What should students learn about energy - environment and climate? A Summary from Energy Literacy Workshops



April 2020

Background

The Alberta Council for Environmental Education (ACEE) has been working with Alberta Education on curriculum development for a number of years. We created the Curriculum for a Sustainable Development to support Alberta Education's curriculum development work. For more information on this work and to see the current Curriculum for a Sustainable Future document go to:

<https://www.abcee.org/curriculum-sustainable-future>

The curriculum work continues and we felt there was some additional work that was needed because....

- The Curriculum for a Sustainable Future was originally created in 2014 by an Education Task Force based on current research and interviews with 35 opinion leaders, and there is new research and information available.
- It has been updated with minor revisions (2017 to 2019) - mainly inclusion of First Nations, Métis and Inuit content thanks to Doctor Gregory Lowan-Trudeau, professor in the Werklund School of Education at the University of Calgary
- Albertans need a deeper understanding of all forms of energy, to build energy literacy and depolarize the conversation around energy and environment in Alberta - so we need to ensure "What Alberta students should learn about energy?" is well addressed.

To read more about our plans on this work go to:

<https://www.abcee.org/what-should-alberta-students-learn-about-energy>

In March 2020 we held three workshops that engaged 47 energy, environment and education professionals from 41 organizations. The purpose of the workshops was to:

- Create a better understanding of the importance of depolarizing the energy, environment, climate conversation and how education is a strategic tool to do this.
- Refine an Energy Literacy definition to guide energy literacy work in Alberta
- Gather a diverse set of ideas on 'what students need to learn to be energy literate' from energy, environment and education professionals.

This document summaries 'what we heard' from workshop participants. For people unable to attend the workshops, we offered an online questionnaire. The link to the questionnaire responses can be found at the end of this document.

What are the next steps?

- Distribute and share this document with workshop participants and others
- Use the information from the workshop summary, questionnaire responses and other current energy literacy information to:
 - Revise our Curriculum for a Sustainable Future document
 - Create an Alberta Energy Literacy definition

- We will engage a few energy, environment, climate and educator professionals to guide and review the creation of the materials listed above.
- Work with Alberta Education and stakeholders to ensure these current ideas become part of new curriculum to help students be prepared in creating a sustainable future.

If you are interested in participating in the next steps or you wish to learn more, please contact Kathy Worobec - kathy@abcee.org.

Energy Literacy Definition

The Energy Literacy Definition that people reviewed and provided input was based on the Environmental Protection Agency's definition from their Energy Literacy Framework. A group of Alberta energy educators provided suggestions in August 2020 and we revised the definition based on their input and used this version in the March workshops (provided below).

Energy literacy is an understanding of the forms, properties, role and impacts of energy in the world and in our daily lives, accompanied by the ability to apply this understanding to answer questions and solve problems.

An energy-literate person:

- Can trace energy flows and think in terms of circular energy systems.
- Knows how much energy they use, for what purpose, where the energy comes from (including production, transformation and distribution) and environmental impacts.
- Can assess the credibility of information about energy.
- Can communicate about energy and energy use in meaningful ways.
- Is able to make informed energy policy decisions and strives to make personal energy use decisions based on an understanding of impacts and consequences on our economy, society and environment.

March 3rd Edmonton Suggestions

- Once revised, ensure that it includes a description on how this definition was created and that it is an Alberta Energy Literacy definition.
- Add something explicit or reference in energy flows that the sun is the source of all energy
- Understand the historical use of energy and that energy sources have changed over time - transitions over time and that we are in another energy transition.
- Political aspects of energy
- There is not one 'silver bullet' solution but there are multiple approaches for energy transition.
- Greater emphasis on environmental impacts - land use, water and climate - development of energy sources including manufacturing - make this its own bullet

- Suggestion for last bullet: - Develops a well-informed opinion on what constitutes progressive energy policy.
- Can identify economic, social and environmental impacts of energy sources
- Employment impacts
- Use impacts - disposal of products, climate, pollution and human health.
- Developing capacity to manage energy transition requires multi-disciplinary systems perspectives
- Planetary level perspective - understanding planetary boundaries - way we govern(?) our planet needs to change as a backdrop for why we need energy transition. [Rockstrom research.](#)
- PBS as 'health' measures of our common home.
- Check out the climate literacy Framework in the US - essential principles of climate literacy
- Important to keep production, transformation and distribution.
- Include understanding of human energy - what we need for our own energy and that we can be part of the solution, using human energy e.g. active transportation

March 11th Calgary Suggestions

- Apply critical, creative and systems thinking toward asking and answering questions, and solving the problem of creating a sustainable energy system
- Who is the intended audience?
- Need to recognise that the energy system has continually evolved historically, and will continue to evolve (i.e. it is not a static thing that we have ready answers to)
- Related to this we felt the last point of the original EPA definition 'continues to learn about energy throughout his or her life' is important and should be reinstated
- Curriculum links (as referenced in the workshop) intro need to go beyond social studies, science and wellness. Energy, environment and sustainability cut across all disciplines including language arts, math etc
- Can **understand and** communicate about energy and energy use in meaningful ways
- Is able to understand energy policy decisions and is empowered to make personal energy use decisions
- Is able to understand and communicate the various Alberta energy ecosystems and how they related to broader Canadian ecosystems
- An understanding that energy topics are continually evolving
- The word 'meaningful' in 'can communicate about energy and energy use in meaningful ways' means too much and implies there is a particular way to think about energy.
- Able to categorise energy sources by use (heat/transport/electricity)
- An energy literate person can trace energy sources and energy flows
- Can look at impacts with a global perspective in comparison to other jurisdictions
- Can understand energy units
- Understand the difference of renewable and non-renewable
- Understand stock vs flow energy sources

- Appropriate technology
- Can trace energy flows - to what degree? What do we mean by this? What is the intent?
- What does energy transformation mean?
- Make informed choices
- Want people to understand how it is extracted, produced, delivered (transmission/distribution systems), value and impact of all energy
- Shared language
- How it is transformed to supply them with energy
- Understanding that not all energy is equal and depending on where you live the energy source could be different
- Lifecycle impact - understanding the fundamentals of energy efficiency
- Is an individual that understands that there is always a more efficient way to power our world and that we must implement what is available, today
- Energy literacy is urgent - the most important issue/skill of our time
- Critically think. Creatively think.
- What about the non-human others (animals)
- Systems thinking
- Say something about time (i.e. historical thinking = energy in the past, how we consider future generations needs and rights).

March 27th Virtual Workshop Suggestions

- Should add a section about 'why energy literacy' is important - it should revolve around building our capacities for ingenuity in the design and development of energy systems that we build and participate in. Clarity of purpose - can we use some of the work from the youth narratives to help outline the 'why'
- Need to ensure the definition includes the basic understanding of where energy comes from and the impacts of using those energy sources on people, economy and environment.
- The full life cycle of energy - from mining/production to use and impacts.
- Energy use and impacts from a local to global scale.
- Circular energy systems - need something that explains what this is or is this the word 'circular' even needed - systems are circular. Systems thinking - systems have limits; context of energy as part of larger systems in which it is used.
- Manmade systems vs natural systems - where everything is recycled - how can we emulate these types of systems instead of manmade ones full of emissions/waste. This can connect to Indigenous ways of knowing.
- The connection between energy and water - we use energy to treat our water for drinking and for treatment in wastewater plants - also water is a renewable energy source.
- Access the credibility of information about energy - very good piece and helps foster critical thinking - the word credibility is important.

- Can communicate about energy and energy use in meaningful ways - important to teach students about how to communicate - this one is important.
- Knows how much energy they use - ADD 'in quantitative terms' also ADD after for what purpose 'and where the energy is used in their daily life'.

What students should learn about energy?

This was an open ended question that people provided their individual ideas and then worked in small groups to combine and refine the ideas. In the face-to-face workshops, people were then asked to indicate the ones they thought were the most important (using dots) and so we've listed them by the top ideas first and indicated the number of dots the idea received.

March 3rd, Edmonton

1. Effective communications to bridge the gap in the energy conservation - 6 dots
 - a. Why, in many people's minds, does energy production have to equate to money?
 - b. Why is there such a divide between groups, when it comes to energy use? How do we arrive at common ground?
 - c. We must tolerate and embrace a variety of values and points of view vis-a-vis energy future.
 - d. Effective communication and cooperation
 - e. Problem solving through transition
 - f. All of the above - not either/or
2.
 - a. Types and sources of energy and how we get it (past, present, future) and what are the by-products (physical and social) and full life-cycle thinking - 5 dots
 - i. By-products - emissions, heat/light
 - ii. Diversity of energy types - not only oil and gas
 - iii. Sources of energy - past, present, future possibilities
 - iv. Conservation of energy - what we don't use
 - v. The labour of energy - how do humans get energy from the environment
 - vi. Environmental, social (economics), health impacts of developing energy sources
 - b. Origins, impacts and equity - 2 dots
 - i. What accompanies the production of energy - from molecular to global level - chem/bio/phys/soc/culture
 - ii. Origins and impacts of a variety of energy sources
 - iii. Where energy comes from (sun) and where it goes
3.
 - a. Energy has consequences for social (just & equitable), environmental, Indigenous relations, geopolitical, infrastructure and global implications - climate. 6 dots

- i. Energy's relation to economy, politics, society, history of change as energy sources and use changed.
 - ii. Energy and colonization - resource extraction, colonial expansion, land rights and treaties
 - iii. Movement of electric energy (grid-tied in AB_ vs other places - rethinking energy)
 - iv. Energy choices by humans has consequences - people/biodiversity/ecological systems
 - v. Energy and climate need to be connected and also with water and biodiversity - 1 dot
 - vi. Having enough energy means different things in north/south - food, fuel, firewood, oil and gas
 - vii. Social (\$\$ and health) and environmental impacts of using energy (weighing pros and cons of energy sources)
 - b. Just and equitable transition requires diverse and accessible solutions - local, regional and global - 1 dot
 - i. Must transition the way we power our planet.
 - ii. No silver bullet for energy transitions - is silver buckshot (accessible solutions)
4. Systems view that considers physical and temporal scales as well as human and environment relations, intended and unintended consequences. 5 dots
- a. Systems view of what is learned in different subjects about energy
 - b. A systems approach permits an integrative and wholistic understanding that connects well to learner's interests
 - c. Long-term vs short-term impacts - of developing energy sources for economic sustainability (physical and temporal) - investment, scale
5. Innovative technology to develop solutions for sustainable, reliable and resilient energy - 3 dots
- a. Reliability and resilient energy
 - b. Sustainable energy systems
 - c. Innovative technology solutions
6. Responsible use at personal and system level 2 dots
- a. How they use energy personally
 - b. Consumption who/what are the true energy consumers and how can consumption be reduced if possible
 - c. How energy related to quality of life - responsible use - how much of what - who is suffering for me to have this?
 - d. Corporate responsibilities
7. Skills for empowerment to take action individually or collectively - 2 dots
- a. Taking action - skills for empowerment
8. Technical skills to evaluate quantities and experiment
- a. What evidence of energy is there? - experimental engagement
 - b. Mathematical description/quantification of energy transfers

9. Energy and life systems - essential, unexamined, underpins many things where we don't see it 1 dot
 - a. Energy is necessary to sustain life
 - b. Impacts of no energy - how is our life connected to and reliant upon reliable energy sources
 - c. Energy as part of production of goods, services, food, etc.
 - d. Energy and tech - e.g. energy and the Internet

Individual Ideas

- Where is the energy balance of our planet? - surpassed planetary boundaries

March 11th, Calgary

1. Careers and skills required for energy transition (9 dots)
 - a. What are the innovations and trade offs required in order to successfully transition our energy systems?
 - b. Understanding of astro-turfing and manipulation of social media outlets in energy conversations
 - c. What students themselves have access to consume based on location
 - d. What careers/skills will future society require in order to mitigate and adapt to climate change
 - e. Understanding science of energy developing impact on climate change (where our actions have significant impact past normal cycles)
- 1a. Careers in energy (3 dots)
 - a. What do careers in energy look like?
 - b. What kind of jobs are associated with each form of energy use?
2. Responsible energy use requires quality information, critical thinking skills, and systems thinking (9 dots)
 - a. Access to information from non-bias sources
 - b. Students learn how to think critically about issues
 - c. Educated communication skills
 - d. Waste to new product calculation
- 2a. Responsible energy use (including energy efficiency and conservation) can result in energy equality and energy for all (1 dot)
 - a. Energy use can be reduced through energy efficiency and conservation
 - b. How does energy impact your wants and needs
 - c. What is energy efficiency? How does it work, what does it mean, how can I do it, why is it important?
 - d. Why is it important to conserve energy? Why are we asking students to turn off the lights and shut the fridge?
3. Everything is connected - human health and environmental health are the same thing (8 dots)
 - a. Ecological thinking is relational - how humans relate to nature - extractivism vs other forms of energy

- b. That humans are part of the natural world - environment and ecosystems
 - c. The biosphere is the intersection of air, water and land
 - d. What is the link between energy production and use, and climate change?
4. Imagining the future by using historical energy transitions to envision a world with opportunities and inclusion (6 dots)
- a. The future of energy related to what kind of planet we hope for
 - b. The history of human energy use from early human time - historical and critical thinking, not the 'progress' vision
 - c. Students should be able to understand the ways in which social structures and the global economy has changed as a result of historical energy transition (how this informs today's decisions)
 - d. It would be great if energy conversations in the classroom made space for students to imagine career options that might exist in the future and what emerging industries exist
 - e. What does an environmentally sustainable energy system look like?
 - f. What do we need to do to make the energy transition happen?
 - g. What is the 'energy transition' and what is driving it? How fast will it/does it need to occur and why?
5. What are the uses of energy in our world today (heat, transportation, electricity and value add products) (6 dots)
- a. Basic energy discussion - primary uses;/heat homes, fuel vehicles, secondary uses: make plastics, chemicals, manufacturing
 - b. Energy is used for heat, transportation, electricity and value added products
- 5a. Sources and impacts associated with different types of energy (source, type of energy, costs, storage, dangers, risks, technology, harnessing) (5 dots)
- a. What are the different forms/types of energy and where do they come from? (fossil fuels, sun, water etc)
 - b. What impacts does each form have on the environment?
 - c. Within each form, what is the process of how it is harnessed?
 - d. Understanding of energy impacts associated with our lifestyle (buying food, retail, personal transportation etc)
 - e. How much does each form of energy cost to make and use?
 - f. What does the future of the planet look like if using this form of energy?
 - g. Each source/type of energy has different effects/impacts both locally and globally (water consumption, mining, emissions, waste)
- 5b. Energy choices, trade-offs and transition fuels (2 dots)
- a. Transition energies are required to exist - natural gas half emission of oil, right fuel for the right purpose
 - b. Can we use more than one type of energy at a time? What does that look like?
 - c. What are the energy choices and trade offs with those choices?
 - d. Understand one's place in the energy system (consumer, voter, change agent)
6. Social justice - energy systems influence human life across the globe (5 dots)

- a. Students should be exposed to questions/ideas about the relationship between energy and equality i.e. indigenous communities in Canada with less access etc
 - b. What are the local and global impacts of each form of energy?
7. Sustainability - economy lives within the threshold of the environment, energy efficiency lowest cost/best resource, will allow for lower carbon footprint (5 dots)
- a. Making plans and carrying out practical actions to alter one's energy footprint
 - b. Energy efficiency is the lowest cost resource (tried and true measure, creates jobs, integrated into utilities)
 - c. The tested model of sustainability - the economy lives within the threshold of the environment, not visa versa.
 - d. How does energy use and our choices around consumption relate to climate change
 - e. How energy is connected to the carbon cycle
8. Life cycle analysis: money, climate impact, social impact. From start to finish, where does our energy come from? (4 dots)
- a. How combusting fossil fuels to generate heat and electricity contributes to greenhouse gas emissions (in the context of Alberta and Canada)
 - b. The greenhouse gas emissions from various industries (transportation, energy, agriculture, industrial processes)
 - c. How energy is produced, consumed and how important of a role it plays in economy and quality of life
 - d. How different forms of energy are used (biofuel, wind, natural gas)
 - e. Life-cycle analysis of money, climate impact and social impact
9. Social dimensions/interdisciplinarity - bringing interdisciplinarity to our energy inquiries (beyond science and technology) to gender studies, history, arts, anthropology, sociology and economics (4 dots)
- a. That energy choices (at all levels) have impact at all levels - city, country, worldwide
 - b. Energy narratives beyond canada - students should understand the ways in which energy development shapes relationships between various communities
 - c. The ability to identify energy related motives in politics, communities etc
 - d. That there are many perspectives on the topic of energy
 - e. The interconnectedness of energy knowledge. This is not just about science but far reaching to other disciplines as well.
 - f. The politics of energy (sociology, gender, anthropology, economics)
- 9a. Understanding the energy system is a necessary foundation but is not the whole story. We must consider the socio-political dimension too (1 dot)
- a. What are the low carbon forms of energy?
 - b. Where does our energy come from?
 - c. What are different forms of energy used for?
 - d. How does energy use vary across the globe?
 - e. What are the impacts of the production vs. use of various forms of energy?
 - f. What are the barriers to energy transitions and economy?

10. The transportation sector is evolving. How will it change? (3 dots)
 - a. Transportation as a service
 - b. Energy storage will change the transportation sector
11. Knowledge is power! Facts about energy are of fundamental importance (3 dots)
 - a. Canadians per capita use more energy than any other country in the world
 - b. Individuals that are deemed to be 'low-income' are the first ones to suffer from climate change
 - c. What are the environmental impacts of each form of energy during production and use?
 - d. How does electricity travel from generation to consumers?
 - e. Where does our energy come from?
 - f. What is the energy mix in Alberta?
 - g. How does a coal/gas/wind/solar plant produce usable energy?
12. How to estimate and compare the impacts of daily actions and decisions and calculate your own carbon footprint (2 dots)
 - a. The role that energy efficiency plays in climate change adaptation and how much energy consumption increases with the growth of affluence
 - b. COP 21 targets as they relate to current energy security consumption patterns
 - c. How can I make the biggest difference personally?
 - d. How to calculate their own energy use (transportation, electricity and heating)
- 12a. What is my energy use, environmental impact, carbon footprint etc? (3 dots)
 - a. What is my energy usage and environmental footprint?
 - b. How to calculate your own carbon footprint/GHG emissions?
 - c. GHG emissions of different energy sources
 - d. Life cycle assessment of energy forms
- 12b. I have the resources and tools to make a positive change (1 dot)
 - a. My energy choices affect generations to come
 - b. I can make a difference today by my choices
 - c. I have choices in how I use energy
 - d. How can students make a difference?
 - e. Moving from 'you do it' to 'I do it'
 - f. Provide students with the tools
13. How does Canada compare in its production, sources, usage of energy on a global basis? (2 dots)
 - a. Different countries have different natural resources (or none!)
 - b. Discuss how we reconcile sharing energy in a global market
 - c. Energy in jurisdictions and how it compares to local use
 - d. How does Canada's energy use fit in globally - what percentage do we produce and use?
 - e. What is energy use per person in different countries - how does that correlate to health and socioeconomic outcomes?
14. Diversity of energy resources in Alberta and Canada (1 dot)

- a. We have a huge diversity of energy in Canada: oil & gas, uranium, coal, nuclear, hydro, solar, geothermal etc)
 - b. There are advantages and disadvantages of all energy sources (renewable and non-renewable)
 - c. We have a diversity of energy in Alberta
- 14a. What are Alberta and Canada's resources i.e. current and potential energy sources? (0 dots)
- a. Alberta has exhaustive renewable energy resources of high quality
 - b. Sources of renewable and non-renewable energy
 - c. Where our energy comes from, today vs tomorrow
 - d. What are different sources of energy we use daily in Canada - where does electricity come from in Alberta vs other provinces?
- 14b. The energy transition brings many benefits to Albertans (1 dot)
- a. Transitions to new technologies creates newer, and in some cases, more fulfilling jobs
 - b. Local solutions and small changes make big impact
 - c. We have already had multiple energy transitions
15. Energy benefits us all (2 dots)
- a. Though our current system isn't perfect we have come a long way in a short period of time
 - b. History of energy and what it has brought us
16. Respect for all inclusive positions and competencies (1 dot)
- a. Critical thinking in order to question polarized positions on various energy systems
 - b. The importance of diversity of opinions and expertise, and collaboration
 - c. How do local actions influence provincial, federal and international communities needs and impacts
17. How is technology evolving? What new technologies are evolving? (1 dot)
- a. What advancing technologies are being used and jobs of the future?
18. Positive story of energy (1 dot)
- a. Celebrate energy: choice, comfort, products, transportation
 - b. Energy and climate change are not synonyms - they are linked and causal
 - c. Energy needs increasing - all forms required to pull people out of poverty, allow markets to decide e.g. coal is not cheaper than gas
- 18a. Conversations that are constructive, inclusive, democratic, problem solving, forward looking (1 dot)
- a. Attitude of connectedness, inclusion, problem solving, hopefulness, agency vs. complacency
 - b. What is a student's personal relationship with the energy system?
 - c. Energy language (hopeful tone, allows everyone to have a voice in the conversation)
 - d. Critical thinking regarding credibility of information (identify bias, analyse sources, integrate and value a variety of perspectives)

- e. Integration of indigenous and local knowledge
- 19. How is my electricity price determined and what factors impact it? (1 dot)
 - a. How is my electricity price determined?
 - 19a. What is the global oil price? What affects it? What is the history? (2 dots)
 - b. What affects the global price of oil?
- 20. What is the role of the government in energy policy and their impact and usage and the environment? (0 dots)
 - a. Economic and political impacts of transitioning to alternative energy
 - b. Political decisions affect energy usage and environmental impacts - role of regulation
 - c. How does a carbon tax work? Explanation of carbon pricing regulations
 - d. Government policy options and how it impacts energy usage
 - e. What are the primary impacts of energy industry in Canada - positive and negative, jobs, economy and tax, greenhouse gas emissions
- 21. Who are the major renewable energy players and non-renewable players both globally and domestically (0 dots)
 - a. Who's who in the zoo of energy?

March 27th Virtual Workshop

1.
 - a. Put the focus on **how** learners are meeting their personal energy needs, putting the learner in an active (vs. passive) role. 'How are you meeting your personal energy needs' vs. 'how are your personal energy needs being met' - will lead naturally and necessarily to social collaboration, especially at the community level. Identify where that energy comes from.
 - b. What are students' towns and cities doing? It's really about relevancy. What does it mean when they turn up their thermostat? How does their iphone charger work? What's the biggest energy cost on your house? These can turn into project based learning opportunities for kids, if presented as a challenge. What can a community do for themselves so that they are not reliant on only one energy provider and are more self-sufficient. Making it relevant at the community level - where does their community get their energy from?
2. Exploration and understanding of the larger energy systems we are all embedded within and how these larger systems function and evolve
 - a. What is our framework for understanding ALL systems - not just energy
 - b. Understand limits of systems - every system has a finite capacity to absorb, process and produce energy without being disrupted.
 - c. Include Earth's ecosphere - work within the energy constraints of the ecosphere - capacities of the atmosphere and hydrosphere to absorb and dissipate thermal energy as the world's climate changes.
 - d. System equilibrium

- e. Comprehending the purpose of the system to understand the processes of energy flow, energy creation/production, energy conversion/transformation that the system enables.
 - f. Energy systems are neutral - it is our own biases and perceptions that lead to choices about energy sources/production/use.
 - g. Energy is always flowing - even energy in the form of matter.
3. Create the framework (circular) for understanding and the why are we learning the pieces below with a focus on building energy ingenuity:
 - a. What is energy - natural and human (man-made)
 - b. How is it produced and used? Comparing and contrasting the merits - strengths and weaknesses of different energy sources
 - c. Need to ensure exploring new technology, new ways of producing energy, new designs for energy efficiency - not just the focus on current ways of doing things
 - d. How is it conserved?
 - e. What is sustainable and responsible use of energy, including/more important, with respect to more than the human world
 - f. How can we link energy systems to our economic and social systems
 - g. There is no 'one size fits all' solution for our energy choices.
 4. Energy efficiency
 - a. Relevance and importance to humanity's current and future reality
 - b. Context for ingenuity in the design and development of energy systems - using lens of biomimicry and 'indigenization' of human energy systems
 5. Students should excel in the gamification of exploring, comprehending, designing and developing energy systems - incentivize personal and collective progress and performance especially in the context of personal and community energy systems.
 6. Need communication skills to have non-polarized discussions and need openness to different energy decisions - decisions that consider economic, social and political factors
 - a. Listening to understand and appreciate others' points of views
 - b. Work collaboratively with others in order to move forward
 7. Critical thinking skills that understand different points of view, weigh pros and cons, good discussions - simulation type activities help build these skills as also helps understand the complexity (eg. Alberta Tomorrow simulation).
 8. Build attitudes that help students see the positives and negatives of ALL energy sources - not the polarized attitudes of only one way.
 9. ACEE should also take pains to suggest not only WHAT students should learn but talk about HOW (showcase excellent examples)
 - a. E.G. - Alberta Tomorrow, Energy Minute
 - b. Project-based learning - things students can do at home or in their community - long-term throughout the year.
 - c. Field trips to see energy development/production/generation
 - d. Partnerships - make more accessible for schools - partnership crucial in community integration

Questionnaire on energy literacy

We also offered a questionnaire for people to provide their ideas on 'What students need to learn about energy - environment and climate?'. This was mainly used by those that couldn't attend a workshop. This file can be found on the following web site:

<https://www.abcee.org/what-should-alberta-students-learn-about-energy>

Curriculum for a Sustainable Future - Key Concepts Suggestions

In the March workshops, we also asked for input or suggestions for the Key Concepts in the Curriculum for a Sustainable Future January 2020 document.

<https://www.abcee.org/curriculum-sustainable-future>

Key Concepts	Feedback from March workshops Black text - March 3rd Blue text - March 11th Orange text - March 27th Highlighted in yellow - means it is an important concept
Science	
<p>Humans are part of nature: we depend on ecosystems and on the network of interactions among organisms and within and among ecosystems.</p>	<ul style="list-style-type: none"> ● We are part of ecosystems and not just about our dependence on ecosystems. ● Role of evidence and role of theory - strong theory has withstood many efforts to be disproved. ● Humans and nature are the same thing ● Talk about WHY we developed these systems ● Basic human standard of living is improved ● What does that relationship look like? Where are some societies in the world on this curve (developing countries for example) ● How can we change this relationship? ● Nature includes humans - we are part of an ecosystem and impact this ecosystem ● For survival

	<ul style="list-style-type: none"> ● This connects to Indigenous ways of knowing ● Communion/community vs Dominion - transition from 'ruling' over nature to understanding we are part of nature ● Interdependence on ecosystems...
<p>Societies have developed a number of systems to produce, transport, store and consume energy using a variety of technologies with varying efficiencies and economic, social and environmental impacts.</p>	<ul style="list-style-type: none"> ● This is very specific - should be further down the list ● Facts of current state of our energy system in Alberta and Canada is important to understand ● What technology does what ● Add the word harvest before produce - we harvest then produce. ● Can't stop at 'consume' need to talk about what happens after we consume it - lifecycle thinking. ● Always developing new technologies and improvements - ingenuity is missing. ● Such as... ● Add harvest before produce ● Use 'process' vs 'consume'
<p>Our production and consumption of carbon-rich fossil fuels creates a variety of greenhouse gases, which are changing the Earth's atmosphere.</p>	<ul style="list-style-type: none"> ● Need to add Land use and materials (see Drawdown Review). ● Learning outcomes - use climate change instead of global warming. ● Add a new learning outcome - I understand the climate impacts of greenhouse gas emissions from other sources such as methane, nitrous oxide and refrigerants. ● This is very specific - should be further down the list ● Impacting the Earth's closed/open biodiversity cycles ● 'A variety of greenhouse gases' should be 'air quality impacts' ● Fundamentals of thermodynamics law 1 and 3 should be understood ● And transportation ● Understand the impacts - what makes up climate change i.e. indicators ● Not just our atmosphere but also our ground, earth, water - biogeochemical cycles.

	<ul style="list-style-type: none"> ● This is perhaps too broad ● Why just 'carbon-rich' fossil fuels - this could be generalized ● All technologies have a carbon footprint ● Need to include other things other than carbon - other wate, full life cycle - footprint etc.
<p>Earth's natural systems are constantly changing from both natural and human causes.</p>	<ul style="list-style-type: none"> ● Ensure that humans are part of ecosystems is a strong focus. ● Holocene vs anthropocene - 6th mass extinction and human contributions to changes on Earth (land use, climate), extinctions). ● Planetary boundaries fall under this and next one - healthy tone for our planet. ● Move this closer to the top of the list - general characteristic of ecosystems ● Humans are significantly (science-based) accelerating negatively earths natural systems ● 'Increased consumerism' important in the learning outcomes ● This implies that the change that us currently happening is part of a normal 'constant' cycle ● Human causes are accelerating the changes ● We've seen a changing climate (melting of the ice age) but this is on an accelerated time scale. Compare the rates of change. ● Be more explicit about human causes - human impacts need to be the focus - right now natural and human causes are equal suggestion - All human activity impacts Earth's natural systems. ● Different items to compare instead of 'nature and human' ● Instead of constantly maybe dynamic.
<p>Biological diversity varies according to geography and is essential for healthy ecosystems.</p>	<ul style="list-style-type: none"> ● Add and varies over time ● Natural diversity, not biological diversity ● Think beyond biology and include chemistry and physics ● Move this to the top (general characteristics of systems)

	<ul style="list-style-type: none"> ● Like this! ● Local and global perspectives. Indigenous concepts of energy production and use would be important here. ● Biological diversity is essential to healthy ecosystems, including human health. ● Stronger statement about biological diversity - biodiversity vs biological diversity. ● Biological diversity is essential to the health of ecosystems, including human ecosystems.
Social Studies	
<p>Creating a sustainable future requires consideration of economic, societal and environmental impacts in decision-making and action at the personal, local, national and global level.</p>	<ul style="list-style-type: none"> ● History of energy transition needs to be emphasized - could be a key concept on its own ● Temporal understanding - past, present and future ● Climate change Production would not happen without demand. ● Canadians need policies that curb consumption (that is excess not necessary) ● Consumption vs production is a big deal. ● 'Consumer choices' is important in the learning outcomes ● Consider environmental, societal and economic impacts (re-order) ● Social justice issues are also interesting to explore. The concept of energy for all and what it means for our society. ● Climate change has evolved into a political topic, this needs to be included ● Rearrange so it reads - environmental, societal and economic.
<p>Local, national and global agreements and policies are required to reduce greenhouse gas emissions.</p>	<ul style="list-style-type: none"> ● Global: world problem, local players ● Discuss options of what Canada's response can be, what it can control - its consumption and its production ● NOT global demand ● Last learning objective in this section very important! ● And individual actions and choices

	<ul style="list-style-type: none"> • What are the current policies in Alberta that address climate change? • Local, national, global are great but what about the individual? Add something about individual action, accountability and impact. • Sanctions - is this approach appropriate for the severity of the issue • Largest emitters, largest energy users • Where does the accountability lie
<p>Exploration, discovery and knowledge of the natural and built environment, where we live, as well as understanding the longstanding presence and practices of Indigenous peoples, develops a sense of place and supports locally-based stewardship and citizenship.</p>	<ul style="list-style-type: none"> • Adding - as well as understanding the longstanding presence and practices of Indigenous peoples (Gregory Lowen-Trudeau somehow not added). • Historical and appreciation of other culture's views. • Often we use Indigenous to encompass all FNMI yet every group is distinct. • ADD "longstanding presence and practices of local and global Indigenous peoples". • Reword as not to polarize the two subjects "...natural and built environment..." • Long concept - could be split into 2 or 3 sentences. • Add a piece about the impact of the built environment as guided by our social fabric, and its impact on the surrounding environment.
<p>Economic prosperity from energy resource development will change over time and can have positive and negative social and environmental impacts.</p>	<ul style="list-style-type: none"> • Within Canada as a whole, our economy is diverse. Respect the thought - we should not develop oil and gas in one province because other provinces don't have any. • Last learning objective - HOW? • Social, environmental and economic impacts • Need an understanding of these impacts • And use - how do we use it better
<p>The type and amount of energy we use changes over time according to supply, demand, energy security, and available technologies.</p>	<ul style="list-style-type: none"> • Learning outcome - I understand that my standard of living relies on affordable and reliable energy. Is this a perspective shared by all including FNMI?

	<ul style="list-style-type: none"> • And cost! • Timing expectations. Study a country like Germany - worked for 20 years to get more renewable and reduce coal. In 20 years still 20% coal use. • Technologies and advancements • What technologies are we seeing (transmission to electric vehicles, ban of diesel) • Remove “over time” perhaps • Geography - local challenges
<p>Food choices and systems have implications for our health, the health of others, economic, social and environmental impacts.</p>	<ul style="list-style-type: none"> • Learning outcomes should include food waste and plant-based diets. • First learning objective is important - 20 years ago, did we eat blueberries from peru in winter? • What is my incremental health impact vs the carbon footprint? • “....and more than implication for just the human world”
<p>Cultural, biological, social, and economic diversity creates resilience and must be respected and valued.</p>	<ul style="list-style-type: none"> • The learning outcomes focus on FNMI but it’s not in the key concept. • There should be a key concept about FNMI/Indigenous all on its own. • ‘And must be respected and valued’ - this imposing our beliefs - should be changed to exploring this statement in learning outcomes • Diversity and inclusion is a challenge even for adults in a professional setting - skill set development focus • Q: how is this skill set actually built?
<p>Wellness</p>	
<p>Quality of life is a subjective term that is influenced by many factors including: democratic rights, health, education, environment, social conditions and programs, community, personal well-being, economy, and employment.</p>	<ul style="list-style-type: none"> • Sense of purpose, belonging • Add - access to energy resources - Kathy suggestion • Compare global standard of living • Transition puts this at risk for many and creates fear • Systems - all things affect each other - more Indigenous mindset
<p>Direct experiences with nature develop</p>	<ul style="list-style-type: none"> • Curriculum should include actual

<p>emotional, mental, psychological, behavioural and physical well-being, a sense of wonder, and appreciation for natural beauty.</p>	<p>exposure to ecosystems and the outdoors</p> <ul style="list-style-type: none"> • How does this impact today's youth? • "...experiences with nature help to develop..." • ADD "...with nature and the build environment..."
<p>Human life is reliant upon the health of our natural environment and this requires an ethic of respect, compassion and stewardship for the natural environment.</p>	<ul style="list-style-type: none"> • Repeated "natural environment" in the same sentence. Suggestion "Human life is reliant upon the health of our natural environment. This requires respect, compassion, and stewardship for the natural environment."
<p>Financial tools can be used to calculate the value of more efficient practices and the full 'cradle to grave' cost from extraction, production, distribution and consumption and disposal of products and services.</p>	<ul style="list-style-type: none"> • Value of resources that are not monetarily valued - commons (unproductive land) • Climate costs, social costs, environmental costs - not just monetary costs? • Why the focus on financial tools? • Concept of carbon or pollution price - good! • And informed consumer skills are important • Lifecycle or circular economy • Lifecycle very important to understand, especially for electric vehicles • "Cradle to grave" idiom works for native English speakers, but might not be the best wording for curriculum.
<p>Collaborative and facilitation skills are essential to resolve conflicts, solve complex problems, and create good solutions and decisions.</p>	<ul style="list-style-type: none"> • Active listening • Strategies for tough conversations • WELLNESS - is where our important process ideas that allow us to depolarize the energy conversation (and other controversial issues) - a good strategy is to have this both as a wellness context and a social studies context

Suggestions for new key concepts:

- Energy decisions are influenced by economic, political, environmental and social factors and our energy choices impact economic security, national security and environmental quality. Kathy Worobec suggestion.

- Just transition - responsibility of the wealthy - who is suffering the consequences
- Indigenous worldviews - not one common views - worldviews in relationships to land affect questions of resource development and land rights
- Role of government - blame/shame (or maybe share - couldn't read it).
- What was a cave man's greenhouse gas emissions and his life expectancy. How about first nations in Canada in the ~1900's. What about the present day?
- Economics. It's there a little bit in social studies 9-12 but we need a stronger link to economics/sustainability
- - All three sections seem to emphasize the collective (use of terms like human life, societies, local/national/global) but what about the individual? What can we teach about individual empowerment in building more sustainable quality of life within curriculum? I can see lots of areas in wellness especially!
- - Perhaps this may be a bigger problem overall. I remember in school failing to see the "I" in many of my classes.
- Possibility of a new science big idea that talks about SYSTEMS, quite possibly using the all-important energy system as an example.

Other comments:

- Need to check if the Essence Statements in the CSF are up-to-date. These came from Alberta Education's Curriculum Development Prototyping Guide - have these remained the same or have they been changed or will they be changed?
- Get rid of subject headings and present a holistic CSF, and then provide links to the current Alberta curriculum
- What is the secretariat?