Wednesday, August 15, 2012, 9:43AM

MYP unit planner

Unit Title	Energy & Power - 11/12 Ib Physics SL - Yr 2
Teacher(s)	Lobdell, Ethan
Subject and Grade Level	11/12 Ib Physics SL - Yr 2 - Science, High School
Time frame and Duration	(Week 23, 8 Weeks)

Stage 1: Integrate significant concept, area of interaction and unit question

Enduring Understanding / Significant concept(s)
What are the big ideas? What do we want our students to retain for years into the future?

- Energy and energy usage are dynamic and complicated. Energy has been used to sustain our society.

-Students will understand where JH power sources come from.

-Student will understand the pros and cons of the major energy sources in the United States.

-Students will understand the basic supply and demand systems of energy in the United States.

Unit Question

How has energy been used to sustain us as a society?
What sources of energy are supplying JS power?
How much energy do we use a JS and what is the impact of that usage?

What is the energy culture of Western WY (industry, usage, etc.)?

Integration
(integration with other classes, integrating themes)

-Sources of Energy, Energy Production, and Energy Consumption

-These concepts will help give students a broad picture of energy production/usage in our country, and then tie it to sources and usage for JS

Core Competencies

- Communication
- Collaboration
- Creativity/Innovation
- Problem Solving
- Critical Thinking
- Place-based Education

Assessment

Link to Assessment Glossary

What task(s) will allow students the opportunity to respond to the unit questions?
What will constitute acceptable evidence of understanding? How will students show what they have understood?

Article Discussions
Formative: Critique/Analysis (JS)

Students will be grade on participation in discussions, written reflections, and article annotations

IB Unit Test
Summative: Problem/Solution (JS)

This test will highlight the bench marks from the unit

Energy Audit Presentation
Summative: Inquiry/Investigation (JS)

This will be a presentation of the energy Audit summary and recommendation to the high school in opening/closing or to the parent council. This will be a group presentation.

Energy Audit Summary Paper
Summative: Summarization (JS)

This will be a short summary paper (1-2 pages) that has students synthesize the audit information and present a summary and recommendations on what JS should do in the future.

Energy Extraction Synthesis Paper
Summative: Persuasive Statement (JS)

This will be a short reflective/synthesis paper(2-3 pages) in which students state and support their opinion on energy extraction in Western Wyoming.

Stage 2: Backward planning: from assessment to the learning activities through inquiry.

Content
What knowledge and/or skills (from the course overview) are going to be used to enable the student to respond to the guiding question?

Students will understand...

- Energy and energy usage are dynamic and complicated.
- How energy has been used to sustain our society.

Students will know...

- The principles of fossil fuel power production, the principles of Nuclear power production, the principles of solar power production, the principles of hydroelectric power production, the principles of wind power production, and the principles of wave power production.
- The principles of fossil fuel power production, the principles of Nuclear power production, the principles of solar power production, the principles of hydroelectric power production, the principles of wind power production, and the principles of wave power production.
- Students will understand the differences between fossil power sources and non-fossil fuel power sources
- Students will understand the positives and negatives of both fossil fuel power sources and non-fossil fuel power sources.

Students will be able to...

- Outline the historical & geographical reasons for the widespread use of fossil fuels
- Discuss the energy density of fossil fuels with respect to power stations
- Discuss the relative advantages & disadvantages associated with the transportation & storage of fossil fuels
- Describe the environmental problems associated with the recovery of fossil fuels & their use in power stations
- Describe how neutrons produced in a fission reaction may be used to initiate further fission reactions (chain reaction)
- Distinguish between controlled nuclear fission (power production) & uncontrolled nuclear fission (nuclear weapons)
- Describe what is meant by fuel enrichment
- Describe the main energy transformations that take place in a nuclear power station
- Discuss the role of the moderator & the control rods in the production of fission in a thermal fission reactor
- Discuss the role of the heat exchanger in a fission reactor
- Describe how neutron capture by a nucleus of uranium-238 results in the production of a nucleus of plutonium 239
- Describe the importance of plutonium 239 as a nuclear fuel
- Discuss safety issues & risks associated with the production of nuclear power
- Outline the problems associated with producing nuclear power using nuclear fusion
- Solve problems on the production of nuclear power
- Distinguish between a photovoltaic cell & a solar heating panel
- Outline reasons for seasonal & regional variations in the solar power incident per unit area of the Earth's surface
- Solve problems involving specific applications of photovoltaic cells & solar heating panels
- Distinguish between different hydroelectric schemes
- Describe the main energy transformations that take place in hydroelectric schemes
- Solve problems involving hydroelectric schemes
- Outline the basic features of a wind generator

- Determine the power that may be delivered by a wind generator (ideally) & explain why this is impossible
- Solve problems involving wind power
- Describe the principle of operation of an oscillating water column(OWC) ocean wave energy converter
- Determine the power per unit length of a wavefront, assuming a rectangular profile of the wave
- Solve problems involving wave power

Learning Experiences / Instructional Strategies
How will students know what is expected of them? Will they see examples, rubrics, templates?
How will students acquire the knowledge and practice the skills required? How will they practice applying these?
Do the students have enough prior knowledge? How will we know?

-Students will learn the bench mark through Direct Instruction (PowerPoint's to cover bench marks).

-Discussion based learning (article discussions) will be used to work through articles that will highlight different perspectives on the energy climate in western Wyoming

-The energy audit and preparations for the journey to the Jonah field will give students Collaborative Learning experiences. (group research project)

-The Journeys School energy audit will give students a chance to take part in Inquiry Based Learning (Journey's power usage project...energy audit). This will be highlighted by the need to

-Place Base Learning (trip to Pinedale to see and research energy extraction)

Differentiation

Resources
What resources are available to us?
How will our classroom environment, local environment and/or the community be used to facilitate students' experiences during the unit?

Unit Bench Marks:

Attached to this section are power-points for both going through the bench marks for this section and for going through calculations from this section.

Energy Extraction in Western Wyoming:

One of the major aspects of this unit is setting up the energy landscape of western Wyoming section. Below are several people to contact from different perspectives of the energy extraction issue:

Encana Oil & Gas: Amanda Fuqua, Operations Engineer, She works down at Encana's facility at the Jonah Field south of Pinedale. She gives tours of drilling rigs, fracking operations, and finished wells. This is a great opportunity for students to meet with industry people and to see the operation first hand. Contact information:amanda.fuqua@encana.com

Greater Yellowstone Coalition: Lloyd Dorsey, Wyoming Representative. Lloyd can help give a great perspective on the advocate work being done to attempt to stop plans to allow drilling and then subsequent hydraulic fracking in the Hoback. Contact Information: ldorsey@greateryellowstone.org

Wyoming Outdoor Council: Lisa McGee, National Forests and Parks Program Director. Lisa can help give excellent perspective on the legal work that is being done to advocate for and attempt to keep drilling and

fracking from being done in areas such as the Hoback. She can also give good perspective on work that is being done to advocate for responsible extraction practice in areas where extraction is being done.

-Attached to this section are lesson plans and project descriptions that are associated with this part of the unit

Resources for Energy Audit Information:

1) Contact Liz Palchak. She is TSS's sustainability coordinator and a great resource for information needed to accomplish this project.

2) The greenhouse gas calculator is located at the following network location: S:\Committees\Sustainability\STARS documents

3) Shawn Remis is an excellent source to gain information about our specific energy usages

4) Attached to this section are lesson plans and project descriptions that correlate with this part of the unit

Ongoing reflections and evaluation

Teacher Notes

Pinedale(Encana) Journey:

Timing: The trip down to Encana's facility on the Jonah Field takes between 2hr and 2hr 15min. To have a meaningful experience down there you need at least 2 hours probably more like 2.5hrs. To this end you really need a full day from 8:15AM to 4PM(to be on the safe side)

Preparation: Now that we have been down to the facility we know a lot more about the types of resources we can see (drilling rigs, production areas, and fracking sites) and the people we will meet (Rig Bosses, controls, rough necks, operation engineers, etc). I think that it would be helpful to have students build questions that would cater to these topics and to these individuals. Then have another set of questions that would be more pointed to advocate groups (questions on environmental impacts, etc.)

Discussions: The discussions for this unit we done on the bus ride. With a small group of students (4 this year) I would recommend giving them the discussion questions before hand to have with their readings. This was students can come with collected thoughts and then they will be more prepped to be involved in the discussion on the bus.

Energy Audit: Make sure that all of the numbers are in the correct units to go into the calculator. This will save a lot of time. More time could have been left to have the students input the data they calculated into the calculator

Overall Thoughts: The unit was squeezed for time. This was due to several factors. First, it was an ambitious unit plan for the time block. Secondly, there was a high level of student absence at the start of the unit. Another area that could have been tightened were the rubrics and the expectations of due dates etc. for students.

Standards / Benchmarks / Objectives

DP Group 4:Physics (1st Exams 2009), DP - Age 16-18, Syllabus - Energy, power and climate change

8.3 Fossil fuel power production

- 8.3.1 Outline the historical and geographical reasons for the widespread use of fossil fuels.
- 8.3.2 Discuss the energy density of fossil fuels with respect to the demands of power stations.
- 8.3.3 Discuss the relative advantages and disadvantages associated with the transportation and storage of fossil fuels.
- 8.3.4 State the overall efficiency of power stations fuelled by different fossil fuels.
- 8.3.5 Describe the environmental problems associated with the recovery of fossil fuels and their use in power stations.

8.4 Non-fossil fuel power production
Nuclear power

- 8.4.1 Describe how neutrons produced in a fission reaction may be used to initiate further fission reactions (chain reaction).
- 8.4.2 Distinguish between controlled nuclear fission (power production) and uncontrolled nuclear fission (nuclear weapons).
- 8.4.3 Describe what is meant by fuel enrichment.
- 8.4.4 Describe the main energy transformations that take place in a nuclear power station.
- 8.4.5 Discuss the role of the moderator and the control rods in the production of controlled fission in a thermal fission reactor.
- 8.4.6 Discuss the role of the heat exchanger in a fission reactor.
- 8.4.7 Describe how neutron capture by a nucleus of uranium-238 (^{238}U) results in the production of a nucleus of plutonium-239 (^{239}Pu).
- 8.4.8 Describe the importance of plutonium-239 (^{239}Pu) as a nuclear fuel.
- 8.4.9 Discuss safety issues and risks associated with the production of nuclear power.
- 8.4.10 Outline the problems associated with producing nuclear power using nuclear fusion.
- 8.4.11 Solve problems on the production of nuclear power.

Solar power

- 8.4.12 Distinguish between a photovoltaic cell and a solar heating panel.
- 8.4.13 Outline reasons for seasonal and regional variations in the solar power incident per unit area of the Earth's surface.
- 8.4.14 Solve problems involving specific applications of photovoltaic cells and solar heating panels.

Hydroelectric power

- 8.4.15 Distinguish between different hydroelectric schemes.
- 8.4.16 Describe the main energy transformations that take place in hydroelectric schemes.
- 8.4.17 Solve problems involving hydroelectric schemes.

Wind power

- 8.4.18 Outline the basic features of a wind generator.
- 8.4.19 Determine the power that may be delivered by a wind generator, assuming that the wind kinetic energy is completely converted into mechanical kinetic energy, and explain why this is impossible.
- 8.4.20 Solve problems involving wind power.

Wave power

- 8.4.21 Describe the principle of operation of an oscillating water column (OWC) ocean-wave energy converter.
- 8.4.22 Determine the power per unit length of a wavefront, assuming a rectangular profile for the wave.
- 8.4.23 Solve problems involving wave power.