Next Generation Science Standards and _Common Core_ alignment with

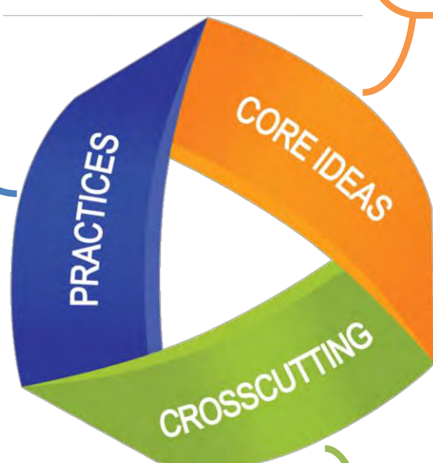
King County Level Two Energy Conservation Best Practices Guide

<u>High School</u>

Next Generation Science Standards (NGSS) Categories

<u>Disciplinary Core Ideas</u>
The most important ideas in science that have multi-discipline importance and societal or personal relevance.

<u>Science & Engineering Practices</u>
Behaviors that scientists engage in to investigate the natural world and design models and solutions.



<u>Crosscutting Concepts</u>
Ideas or ways of thinking that have applications across all domains of science.

Level Two – Energy Conservation

High School

The connections between the **Next Generation Science Standards** (NGSS) and **King County Level Two Best Practices Guide** uses the matrices created by the National Science Teachers Association (NSTA) available at http://ngss.nsta.org/ngss-tools.aspx.

Note: In this reference sheet an italicized number and title refers to a specific action choice in the Best Practices Guide. For example,*"10. Include climate change-*" on page 3 is for schools that choose #10 in the Education and Outreach section of the Best Practices Guide as one of their Level Two actions.

Assess and Monitor section of the Level Two Best Practices Guide

- Define a design problem that involves the development of a process or system with interacting components and criteria and constraints that may include social, technical and/or environmental considerations.
- Manipulate variables and collect data about a complex model of a proposed process.
- OPTIONAL - Apply percentages in the context of measurement problems.

- Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution.
- When evaluating solutions it is important to take into account constraints and to consider social, cultural and environmental impacts.
- Criteria may need to be broken down and approached systematically, acknowledging tradeoffs.

- Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system.
- Feedback (negative or positive) can stabilize or destabilize a system.

<u>**Education and Outreach section of the Level Two Best Practices Guide**</u>

3. Energy conservation patrol – • Plan and conduct an investigation or test a design solution in a safe and ethical manner including considerations of environmental, social, and personal impacts. • Analyze data to identify design features of a proposed process or system to optimize it relative to criteria for success.

6. Share energy conservation facts – Communicate scientific and/or technical information in multiple formats.

9. Science or reading lessons could include - Critically read scientific literature to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex processes or information.

10. Calculate carbon footprint- Analyze data to identify design features or characteristics of the components of a proposed process or system to optimize it relative to criteria for success.

10. Include climate change- • Moreover, anthropogenic changes can disrupt an ecosystem and threaten the survival of some species. • Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.

11. Integrate into classroom lessons or 12. Guest speakers - • All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors.
• Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved. • At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy.

• When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.

10. Calculate carbon footprint-
• Mathematical representations are needed to identify some patterns.
• Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.

Lighting, Plug Load, Heating and Cooling sections of the Level Two Best Practices Guide

- Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

- When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts.
- Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs.

- Systems can be designed to cause a desired effect.
- Changes in systems may have various causes that may not have equal effects.
- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.
- The total amount of energy and matter in closed systems is conserved.

Common Core alignment

Level Two – Energy Conservation

<u>High School</u>

COMMON CORE
STATE STANDARDS INITIATIVE
PREPARING AMERICA'S STUDENTS FOR COLLEGE & CAREER

English Language Arts - Speaking and Listening

<u>Education and Outreach</u> – Share energy conservation facts; Create an instructional video; Educate staff and students.

<u>CCSS.ELA-LITERACY.SL.**9-12**.4</u>
Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning.

<u>CCSS.ELA-LITERACY.SL.**9-12**.5</u>
Make strategic use of digital media in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Mathematics

<u>Assess and Monitor</u> – Track the school's energy use

<u>CCSS.MATH.CONTENT.HSN.Q.A.1</u>
Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

<u>CCSS.MATH.CONTENT.HSN.Q.A.3</u>
Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

English Language Arts - Speaking and Listening

Education and Outreach – Include energy conservation in lessons

CCSS.ELA-LITERACY.RST.**9-12**.1
Cite specific textual evidence to support analysis of science and technical texts.

CCSS.ELA-LITERACY.RST.**9-10**.2
Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

CCSS.ELA-LITERACY.RST.**11-12**.2
Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

CCSS.ELA-LITERACY.RST.**9-10**.7
Translate quantitative or technical information expressed in words in a text into visual form and translate information expressed visually or mathematically into words.

Mathematics

Education and Outreach - extension ideas

CCSS.MATH.CONTENT.**HS**A.CED.A.1
Create equations and inequalities in one variable and use them to solve problems.

CCSS.MATH.CONTENT.HSS.ID.A.2
Use statistics appropriate to the shape of the data distribution to compare center and spread of two or more different data sets.

CCSS.MATH.CONTENT.**HS**S.ID.B.6
Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

CCSS.MATH.CONTENT.HSS.IC.B.4
Use data from a sample survey to estimate a population mean.

CCSS.MATH.CONTENT.HSS.IC.B.5
Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

King County
Department of
Natural Resources and Parks
Solid Waste Division