

--- *Advanced Career* ---

Joining a College-Ready Academic Core with Intellectually Demanding Career Pathways for Success

A multi-state consortium to develop curricula, assessments, instructional materials and teacher/counselor training that provide more students with relevant and challenging career/technical courses

SC Standards Clean Energy

1. Science of Energy

- a. Apply concepts from Physics, Chemistry and Biology in the creation of solutions to problems.
- b. Select and defend materials for use in an energy system, explaining material properties and characterization, based upon interaction with other materials, chemical composition, electrical conductivity, internal defects, temperature, previous loading, dimensions and other factors.
- c. Utilize understandings of primary energy sources, renewable energy sources in the design of systems to convert them to secondary energy sources.
- d. Apply principles of kinetic and potential energy to the design and evaluation of a system to convert or transform energy from one form to another.
- e. Utilize thermodynamic concepts including; heat, temperature, pressure and entropy as they relate to energy and work, to create, analyze and optimize systems.
- f. Analyze and describe systems in terms of electric charge, electric fields, magnetism, potential, current, and power to better optimize new and existing systems.

2. Engineering Energy Systems

- a. Analyze the presence and flow of electric charge in a system.
- b. Design a system of elements that convert or transform power to accomplish a task.
- c. Construct systems that efficiently utilize a fluid (liquid or gas) under pressure to generate, control and transmit power.
- d. Design and analyze an electrical system to convert, transform and transmit electricity to where it is needed with the goal of increasing efficiency.
- e. Investigate and specify the size of the motor necessary to provide needed power for systems with the goal of minimizing energy consumption.
- f. Design the control system to vary the speed and performance of a motor by utilizing feedback from the system to gain the most efficiency possible.
- g. Formulate a system to utilize data collection and analysis to maintain and improve energy creation, transmission and efficiency and provide adequate confidence that the product will satisfy design requirements.

- h. Design a system for carbon capture, utilization or storage technology to safely secure carbon dioxide pollution underground or another form while providing an economic benefit and increasing our energy security.
- i. Create a system that converts excess electricity produced from clean energy sources to a form that can be stored and retrieved when energy demands are greater.
- j. Apply concepts of clean energy and propose changes to the design of systems for transportation and propulsion.
- k. Explore renewable biomass sources to create methods of conversion into useful energy products.

3. Societal impacts of Energy

- a. Utilize a variety of technologies in the creation sustainable energy systems to meet the needs of society without compromising future generations.
- b. Conduct energy audits to inform the development of plans to conserve energy usage.
- c. Explore and apply ethical arguments to the development of energy policy and products to assure sustainability, accessibility and justice for the world's population.
- d. Conduct a Life-cycle assessment on a proposed energy system to assess effects of all stages from cradle to cradle

4. Design and Modeling for Energy Systems

- a. Apply the design and problem solving process as an iterative process incorporating sciences, mathematics and engineering to optimally convert resources to meet a stated objective.
- b. Create models that are mathematical or physical systems set up to obey certain specified conditions whose behavior is used to understand study or evaluate a design or system.
- c. Conduct model documentation as the process of recording details such as size, material composition, and instructions for assembling, installation and servicing, analysis, development process that describes a model for the purpose of communication of ideas.
- d. Conduct model analysis using simulations as a detailed examination of the elements, structure or behavior of a physical system under certain imposed conditions.
- e. Apply the green principles of design for eventual disassembly and resource recovery.
- f. Communicate solutions utilizing technical writing skills including correct spelling, proper grammar and dependent vocabulary.

5. The Business of Energy

- a. Investigate activities that a business conducts with the intention of making a discovery that can either lead to the development of new products, procedures, or processes for improvement of energy efficiency.
- b. Critique the planning and organization of resources, both human and capital as well as regulatory requirements, in order to complete a specific project.

- c. Create a plan for protecting the safety, health and welfare of people engaged in the energy production environment to foster a safe work environment.
- d. Devise a plan for the creation of a business plan to produce, market and sell an energy related product.
- e. Conduct a detailed analysis of energy costs including the concepts of supply and demand, energy costs, overnight costs, and levelized cost of energy to inform business decisions.
- f. Explore regulatory oversight in the creation of a plan to create the infrastructure for transmission and distribution of energy sources to the public.
- g. Create a system to recover energy that would be wasted in a process and convert it to a form that can be used elsewhere.
- h. Develop and deploy technologies that lower energy costs for American families and businesses.
- i. Apply the entire spectrum of clean energy technologies for the creation of energy efficient products and buildings with the goal of increasing consumer acceptance, improving commercialization and deployment of the market for new energy related products.