**Subject area/course**: Science/Physics

**Grade level/band**: 9-10

**Task source**: Summit Public Schools; Author: Victoria Pennings

**Electric House**

**TEACHER'S GUIDE**

1. **Task overview**:

Students will design, build, and evaluate a model house that demonstrates their mastery of electric circuits.

1. **Aligned standards:**
2. **Common Core State Standards**

CCSS.ELA-Literacy.RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

CCSS.ELA-Literacy.WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

1. **Critical abilities**

Analysis of Information: Integrate and synthesize multiple sources of information (e.g., texts, experiments, simulations) presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to address a question, make informed decisions, understand a process, phenomenon, or concept, and solve problems while evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

Experimentation and Evaluation**:** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. Evaluate hypotheses, data, analysis, and conclusions, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

Modeling, Design, and Problem Solving:Use quantitative reasoning to solve problems arising in everyday life, society, and the workplace, e.g., to plan a school event or analyze a problem in the community, to solve a design problem or to examine relationships among quantities of interest. Plan solution pathways, monitoring and evaluating progress and changing course if necessary, and find relevant external resources, such as experimental and modeling tools, to solve problems. Interpret and evaluate results in the context of the situation and improve the model or design as needed.

1. **Next Generation Science Standards**

HS-PS2-6. Communicate scientific and technical information (e.g. about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).

HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. This is addressed if a hand crank generator is used.

1. **Time/schedule requirements:**

This task will take approximately 3 weeks.

1. **Materials/resources:**
* Cardboard box (shoe box with a lid is recommended)
* Batteries, insulated wire, and lights
* Electrical tape
* Scissors, wire cutters
* Materials to make switches
* Construction paper, glue
* Hand Crank Generator ([http://www.amazon.com/American-Educational-Generator-Length-Height/dp/B00657NH7K/ref=sr\_1\_4?ie=UTF8&qid=1418826899&sr=8-4&keywords=hand+crank+power+generator](http://www.amazon.com/American-Educational-Generator-Length-Height/dp/B00657NH7K/ref%3Dsr_1_4?ie=UTF8&qid=1418826899&sr=8-4&keywords=hand+crank+power+generator))
1. **Prior knowledge:**
* Students need to be familiar with GUESS format for energy calculations.
* Students should know how to measure voltage and current in a circuit.
* Students should know the difference between a series and parallel circuit.
* Students will need to know how to calculate power.
1. **Connection to curriculum:**

None listed.

1. **Teacher instructions:**
* Most lighting and appliances in houses is wired in parallel. Only strip lights (holiday lights, LEDs, undercounter lighting, etc.) might be wired in series. Be sure to draw out this description to students. The majority of houses are wired in parallel with 120 V.
* Students should work in groups and use group roles to complete the model. Portions of this project may be completed independently. Peer review of papers should be completed prior to submission of the papers to the instructor.
* Students should engage in discussions with their peer as well as their teacher about energy conservation, power and wiring. Topics to focus the discussion on are:
	+ What type of energy conversions are occurring in your home?
	+ Is energy conserved in your house? Justify your answer.
	+ What type of wiring would be most useful in a house and why?
	+ What is power and how does your house consume power?
1. **Student support:**
* Graphic organizers might be useful to assist students in organizing the content of this task.
* ELLs or students with learning disabilities would benefit from working on portions of this project in a group and working on other portions independently.
1. **Extensions or variations:**

None listed.

1. **Scoring:**

Student work can be scored using the Summit Public Schools Electric House rubric.