

# RET 2009 Project 2

## Energy

# Classroom Implementation Plan

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# Energy Use In The U.S.

- Oil imports increase from 24% to 65% over the last 40 years
- 70% of all oil imports are used for Transportation

# Fully Integrated Classroom

- We teach
  - Science
  - English
  - Social studies
- in one classroom
  - 60 students
  - 3 teachers
- One Grade



The most important scientific and social Issue of the 21<sup>st</sup> century



Over Arching  
Essential Question  
for the Unit

How Can the United States  
Achieve Energy  
Independence?

# Essential Question

- How can the United States Achieve Energy Independence?

# Historical perspectives on the Issue

(Activating prior Knowledge)

- Human work
- Fire
  - Slaves
    - Building of the pyramids
      - What is the minimum amount of food you can feed slaves and still get the maximum amount of work out of them
- Simple Machines
  - Rely mostly on human energy
    - Wheel
    - Levers
- Complex Machines-Industrial revolution

# Social Studies Connection

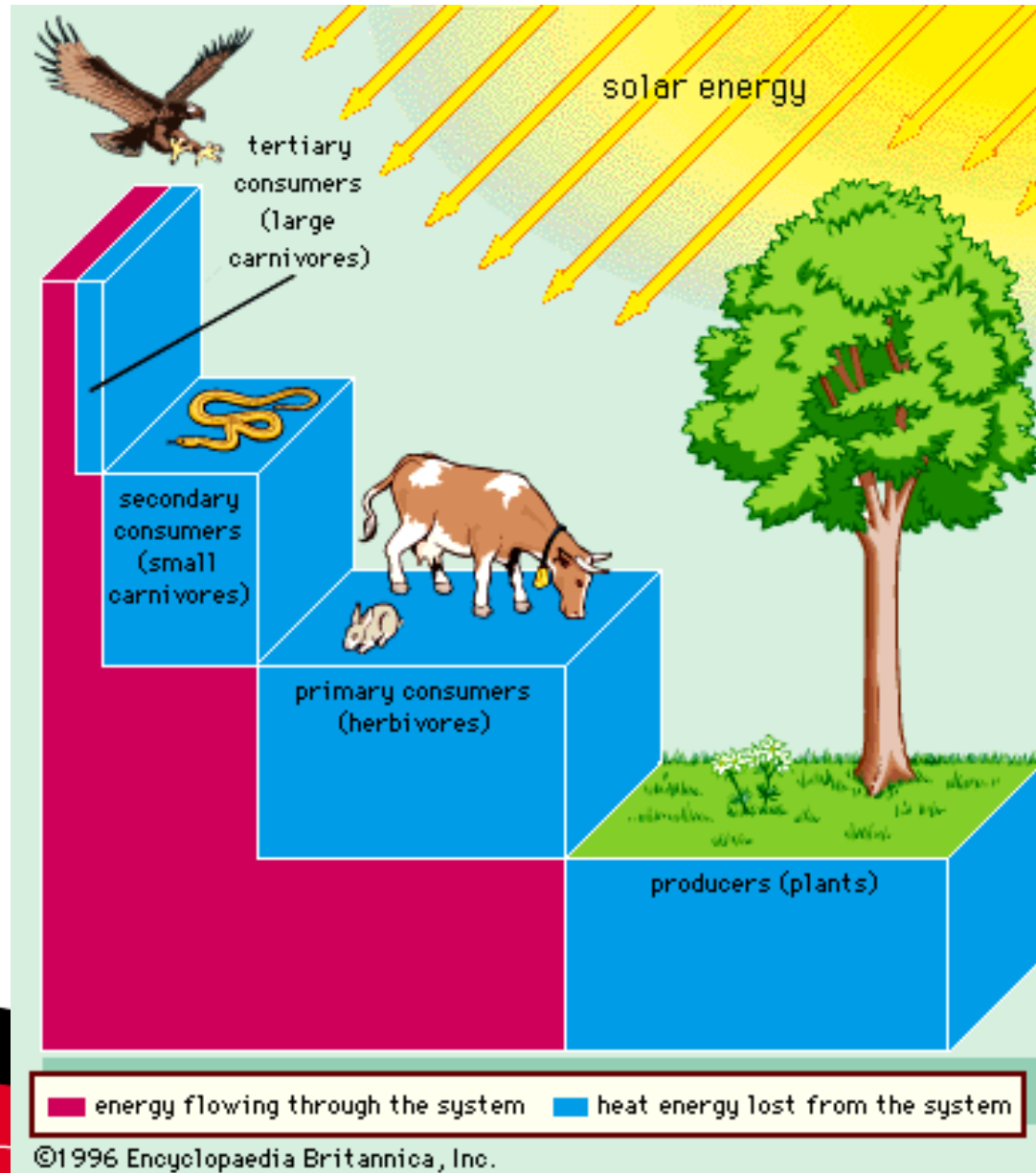
- Students will explore how energy was used by industrialization
- Whom this benefitted and whom this hurt.
- How did the allocation and use of energy impact groups of people?

# English Connection

- Science Technical writing
- Non Fiction
- Presentation Skills

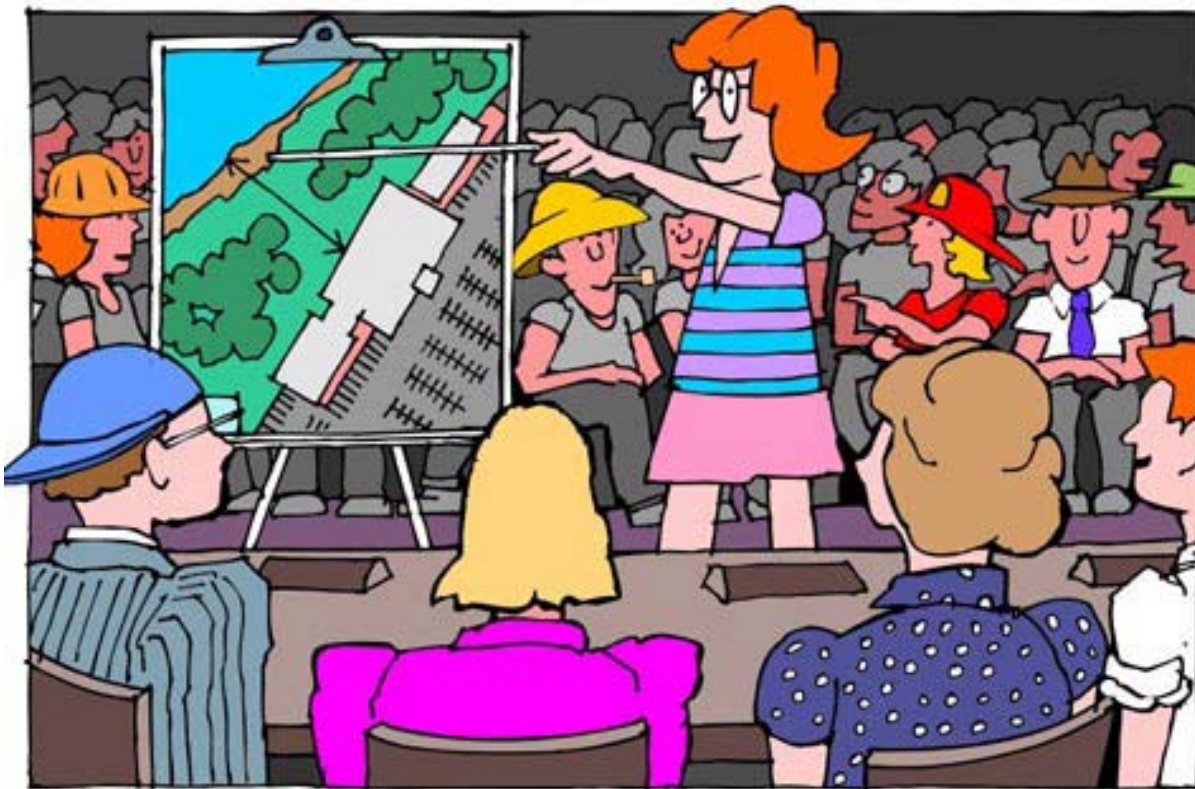


# Biological Connection



What do we want them to know  
and be able to do...

## Culminating Assessment



# TOWN MEETING

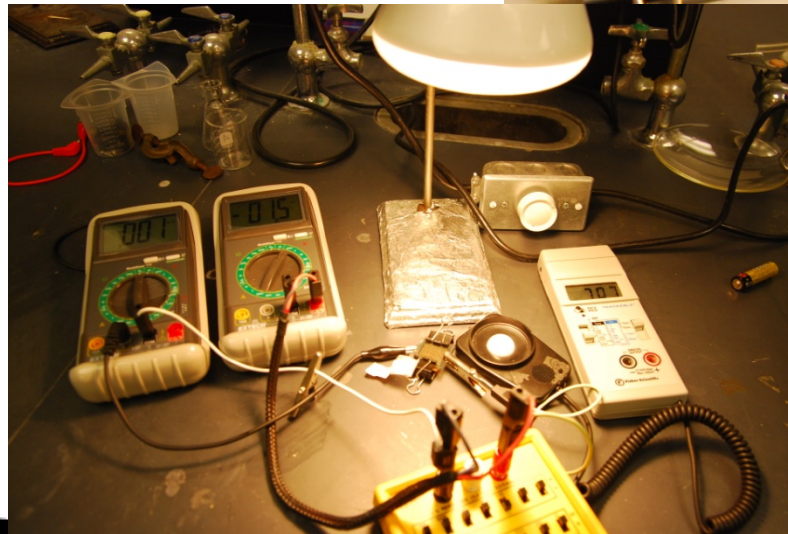
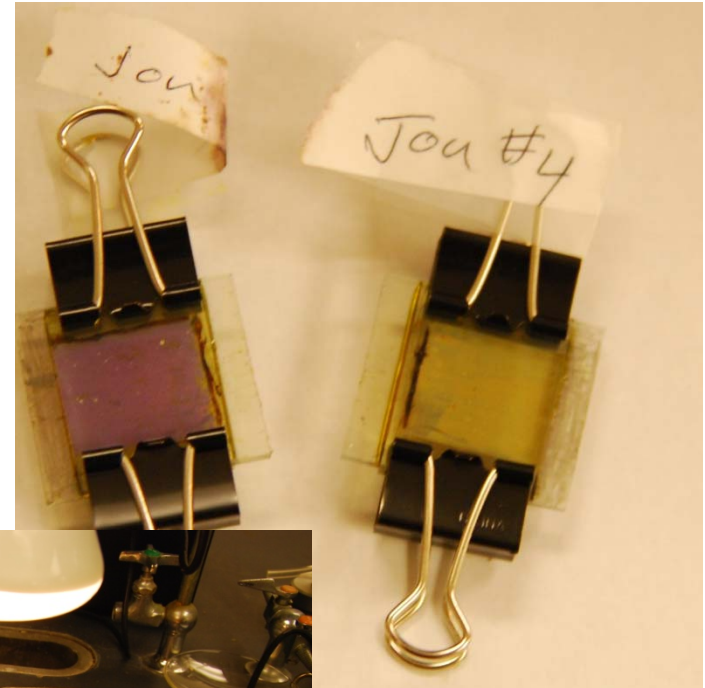
# How much energy do you use?

(This would be web based lesson “Web Quest”)

- Have students calculate the number of kilowatts they use at home...
  - Information is available via web and Duke Energy web site
- Have students Identify how this energy is used
  - Entertainment
  - Hot water
  - Heat
- What of this is essential vs pleasure

# TiO<sub>2</sub> Dye Sensitized Solar Cells

- Students create test solar cell
- Hypothesize ways to improve efficiency
- Test Hypothesis





# TiO<sub>2</sub> Dye Sensitized Solar Cells

- Assessment
  - Formal Lab Report



- Summative for the Activity
- Formative for the Unit

# Solar cell require the sun.

## What do we do at night?

- Solar energy can be captured and stored as Hydrogen.
- Then be retrieved and the electrochemical energy used by Hydrogen Fuel Cells

# H<sub>2</sub> Fuel Cell Car

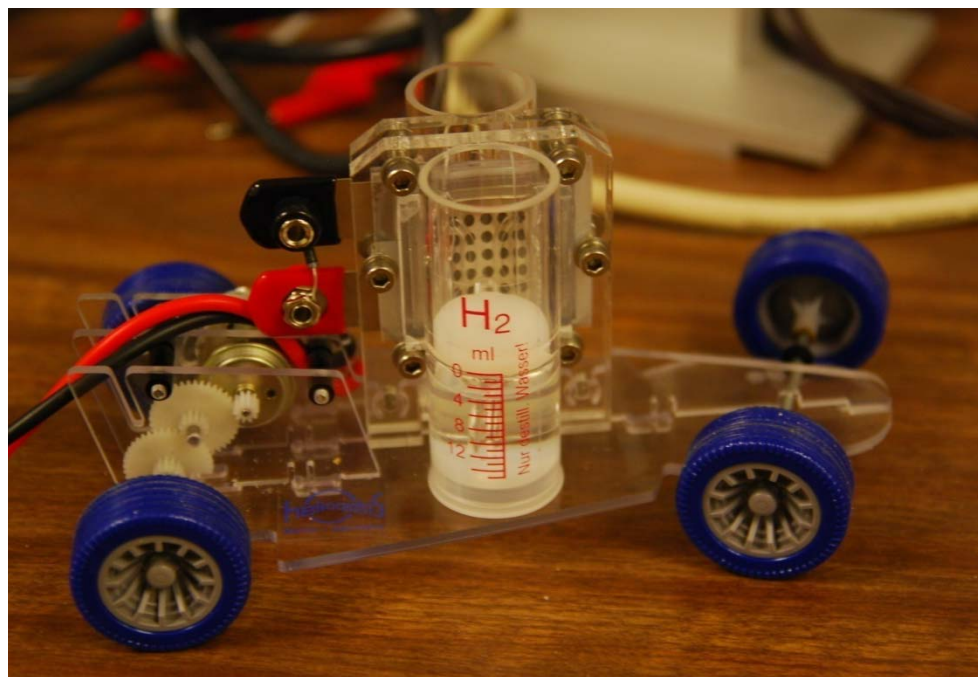
Goals for this experiment if for students to:

- Understand electrochemical energy
- Understand energy density and efficiency
- Learn to measure work

# H<sub>2</sub> Fuel Cell Car

Students will:

- Electrolyze Water
- Measure volume of H<sub>2</sub>
- Run the H<sub>2</sub> Car





# H<sub>2</sub> Fuel Cell Car

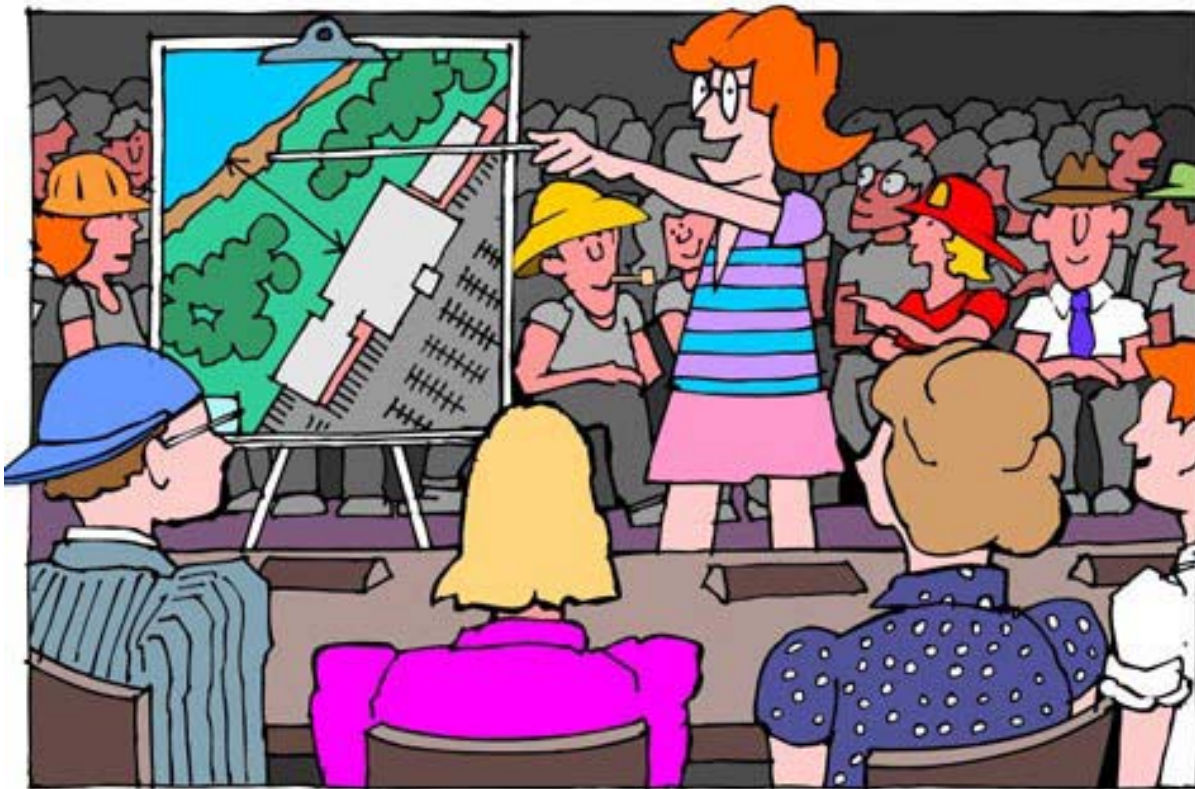
- Calculate the amount of work
  - Energy density
- Determine theoretical energy compare it to actual energy to determine efficiency
- Compare that to efficiency of Autocycle engines

# H<sub>2</sub> Fuel Cell Car

- Assessment
  - Formal Lab Report
- Summative for the Activity
- Formative for the Unit

What do we want them to know  
and be able to do...

## Culminating Assessment



# TOWN MEETING

# Special Thank You

- Andrea Burrows, RET. coordinator
- Anant R. Kukreti, PhD
- Vessilen Shanov, PHD
- Feng Wang, Ga