Energy and Society

A few deadlines... Homework Set 4
Due Oct 13

Homework Set 5
Due Oct. 27

Nuclear Energy

Projects... cleared with me before October 25
October 3rd, 2011 • 04:10
A Realistic Look At Energy
By Rudy Baum • Posted in Editor's blog, Miscellaneous • No Comments

It has been clear for decades that the U.S. desperately needs a national energy policy. As many commentators have pointed out, developing such a policy would have been a productive response to the 9/11 terrorist attacks. A national energy policy that included a tax on carbon, for example, would have reduced our unhealthy dependence on imported oil and spurred innovation on alternative fuels and more efficient machines and construction techniques.

The premise of “Viewing America’s Energy Future in Three Dimensions” is that, “Energy technology and energy economics are necessary, although not sufficient conditions for solving the energy conundrum; the sufficient condition derives from the societal dimension.” Hegedus, Temple, and their coauthors do an excellent job of concisely laying out the fundamentals of energy technology and energy economics in the U.S. While climate change is a consideration in their analysis of the national energy challenge, it is by no means the sole, or even dominant, one. “Beyond producing CO2” they write, “using coal and imported oil is associated with additional important and urgent concerns” that “require timely action regardless of the time scale and outcomes of climate change considerations.”
EPA Stalls On CO₂ Rules

Jeff Johnson

EPA Stalls On CO₂ Rules September 26, 2011 Volume 89, Number 39 p. 9

Latest News EPA has backtracked from its scheduled release of proposed rules limiting greenhouse gas emissions from coal-fired electric utilities. Instead, said in a statement it will issue the proposal “soon.” Last December, EPA announced that it would propose regulations to cap carbon dioxide emissions from large power plants in July 2011 and from refineries in December 2011 and that it would issue final regulations for utilities in May 2012 and for refineries in November 2012.

Chemical & Engineering News, 89(39), September 26, 2011
Forces for moving a car

Total Force =

Forces due to accelerating \((F=ma)\)

+ 

Forces of going upward (hills) \((F=mgs)\)

+ 

Forces from resistance \((F=C_rmv)\)

+ 

Forces from aerodynamic drag

\(F\) is proportional to \(C_D A_f v^2\)

\(C_D\) is aerodynamic drag coefficient

\(A_f\) is the frontal Area of the car

\(v\) is velocity...it goes as velocity squared
Physics:

Power = Energy / time

Energy = force x distance

Force for moving a car............................
Sample Problems

Chapter 15: Forces from aerodynamic drag

35. How much more pollution in a 400 km trip is emitted by a car driven at 200 km/h than one driven at 100 km/h? Explain your reasoning.

Forces from aerodynamic drag

\[ F \propto C_D A_f v^2 \]

- \( C_D \) is aerodynamic drag coefficient
- \( A_f \) is the frontal Area of the car
- \( v \) is velocity...it goes as velocity squared

\[ \text{Force} = C_D A_f v^2 \]

\( v = 200 \text{km/hr} \) so \( v^2 = 40,000 \text{ km}^2/\text{hr}^2 \)

\( v = 100 \text{km/hr} \) so \( v^2 = 10,000 \text{ km}^2/\text{hr}^2 \)

Forces due to aerodynamic drag will be much higher on the faster car...4 times higher

4 times more fuel consumption and 4 times more pollution

The faster car will take \( \frac{400 \text{km}}{200 \text{km/hr}} = 2 \text{hrs} \) to get there

Slower car will take \( \frac{400 \text{km}}{100 \text{km/hr}} = 4 \text{hrs} \) to get there...
Sample Problems

Chapter 15:

41. What is the energy cost of a trip of length 20 km for the following modes of transportation? Indicate any assumptions you have to make.
   a. A single person bicycling.
   b. Two people on a tandem bike.
   c. Two people on a motorcycle.
   d. Three people in a pickup truck.
   e. Twenty passengers in a local bus.

   Use Table 15.1....

   A single person bicycling.....130 kJ/passenger km
   $130\text{kJ} / \text{passenger km} \times 1 \text{ passenger} \times 20 \text{ km} = 2600 \text{ kJ}$

   One person in a pickup truck.....2936 kJ/passenger km
   $2936 \text{kJ} / \text{passenger km} \times 1 \text{ passenger} \times 20 \text{ km} = 58720 \text{ kJ}$

   Truck might weigh 3000 Kg...2 people \times 80 \text{ kg} = 160 \text{ kg}
   $3000\text{kg} + 160 \text{ kg} / 3000\text{kg} = 1.053 \times 2936 \text{ KJ/passenger.km} \times 20\text{km}$
   $= 61852 \text{ kJ} ....not much more than one.$
Nuclear Power or Nuclear Energy and Consequences
...Burns lecture

Worldwide Excitement about Nuclear Science
"As a zero-carbon energy source, nuclear power must be part of our energy mix as we work toward energy independence and meeting the challenge of global warming."

— Nobel physicist Steven Chu, U.S. Secretary of Energy - May 6, 2009