



2015

Classroom exercise: Intro to Mechanical and Industrial Engineering

Erin Baker

University of Massachusetts - Amherst

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Today's Goals

- Understand historical energy prices
 - Understand key drivers of energy policy

 - Objectives for today:
 - Apply engineering methods to energy & env.
 - Take a systems approach to design
 - Practice critical thinking

 - Homework this week:
 - Read Ch. 1 of Energy and The Environment by Wed. Sept 17 (Handout on moodle)
 - Complete Kersey Sorter, link on moodle. Don't pay – just free types.
-

Energy Prices and Economics

Real versus Nominal

- What is a “real” price versus a “nominal” price?

Energy Prices and Economics

Real versus Nominal

- What is a “real” price versus a “nominal” price?
 - The *nominal* price is the price that was actually paid for something.
 - A bottle of coke cost \$0.05 in 1905
 - The *real* price adjusts for inflation.
 - The price of coke in 1905 is equivalent to about \$1.08 in today’s dollars.
 - I will focus on *real* prices.
-

What is the recent history of oil and gasoline prices?

- Between **1995** and **2014** did real prices (adjusted for inflation) ...
 - A. Halve?
 - B. Stay about the same
 - C. Double?

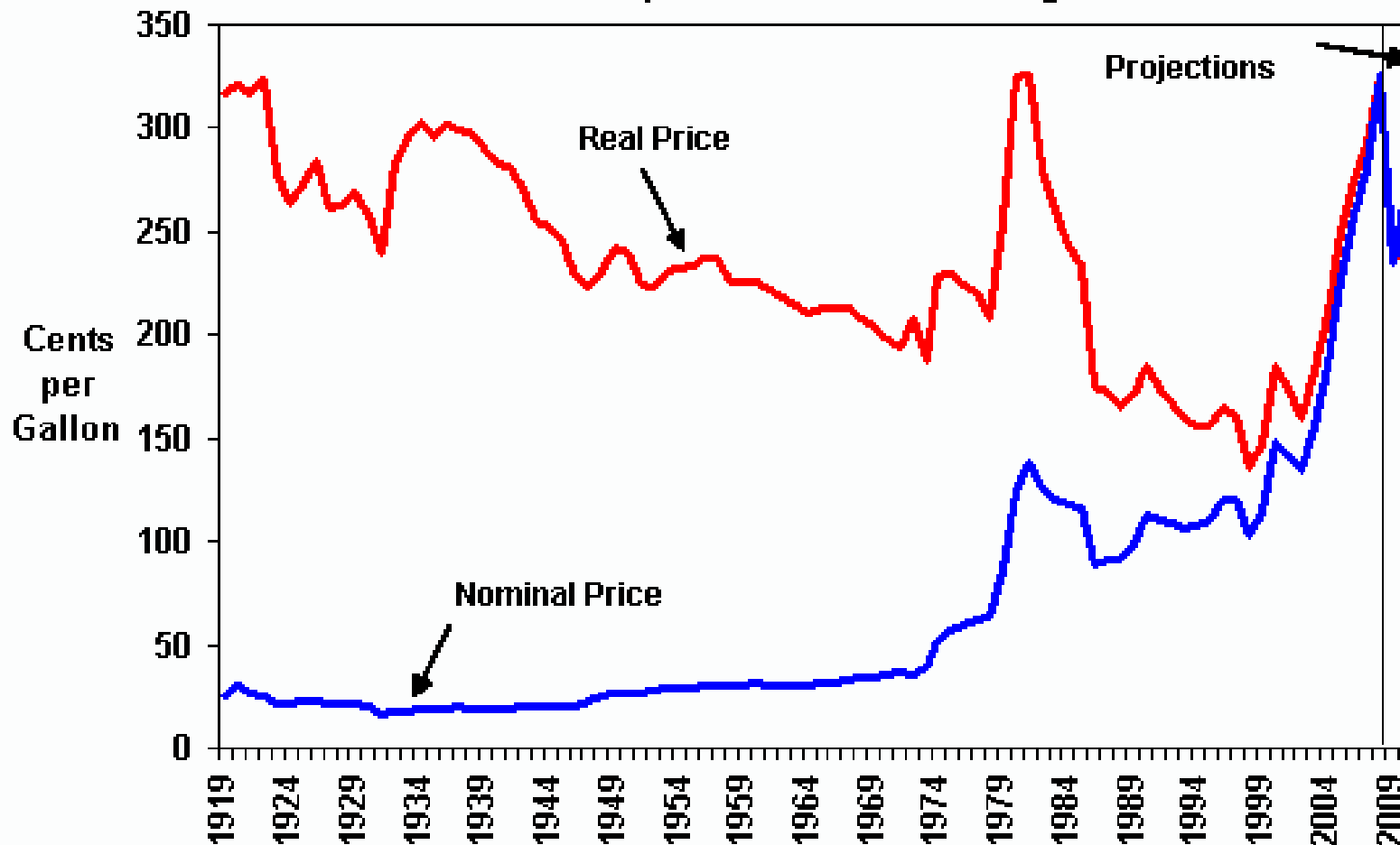
What do you think?

What is the long term history of gasoline prices?

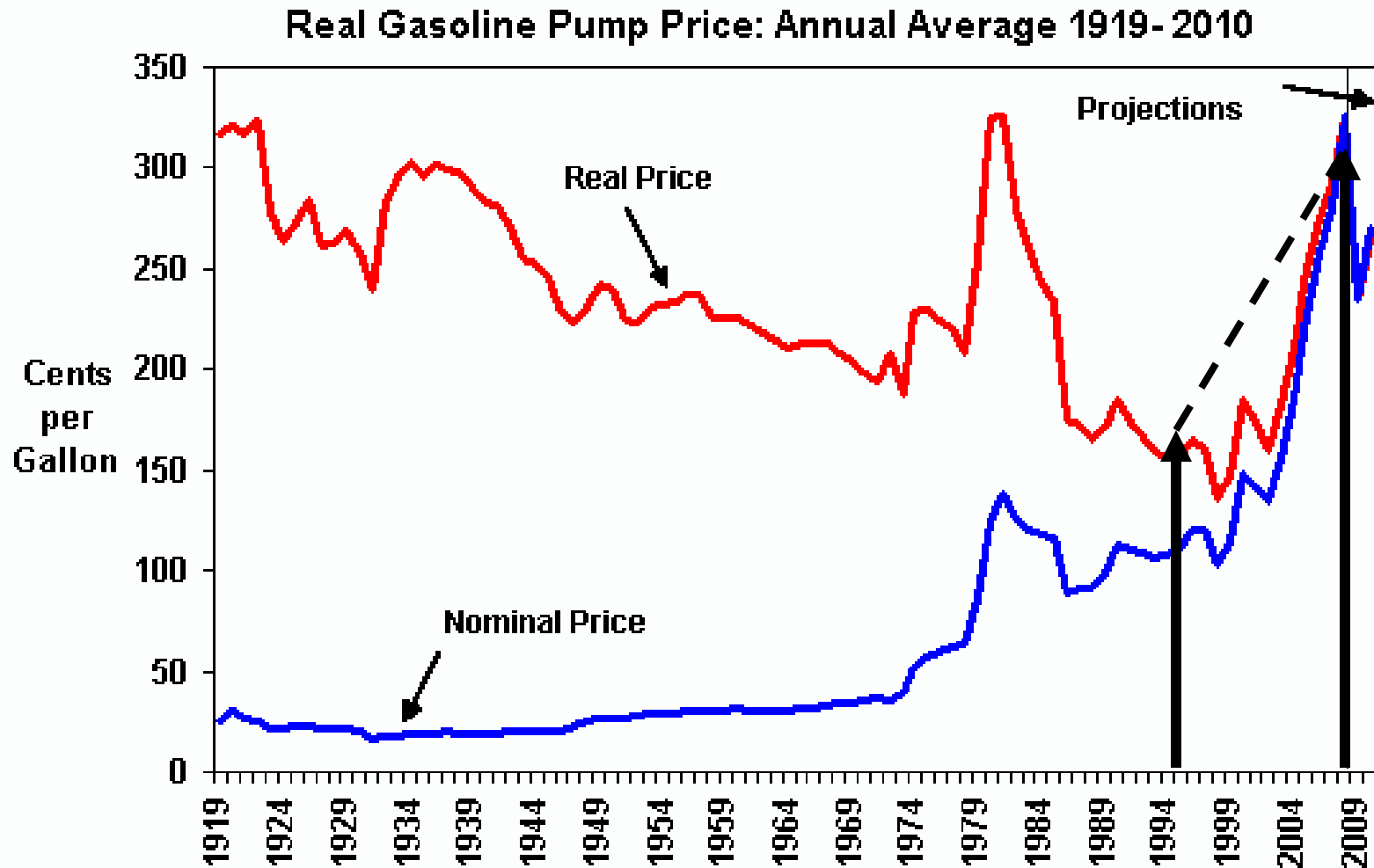
- Between **1920** and **2014** did real prices (adjusted for inflation) ...
 - A. Decrease by about 50%
 - B. Stay about the same
 - c. Increase by about 50%

What do you think?

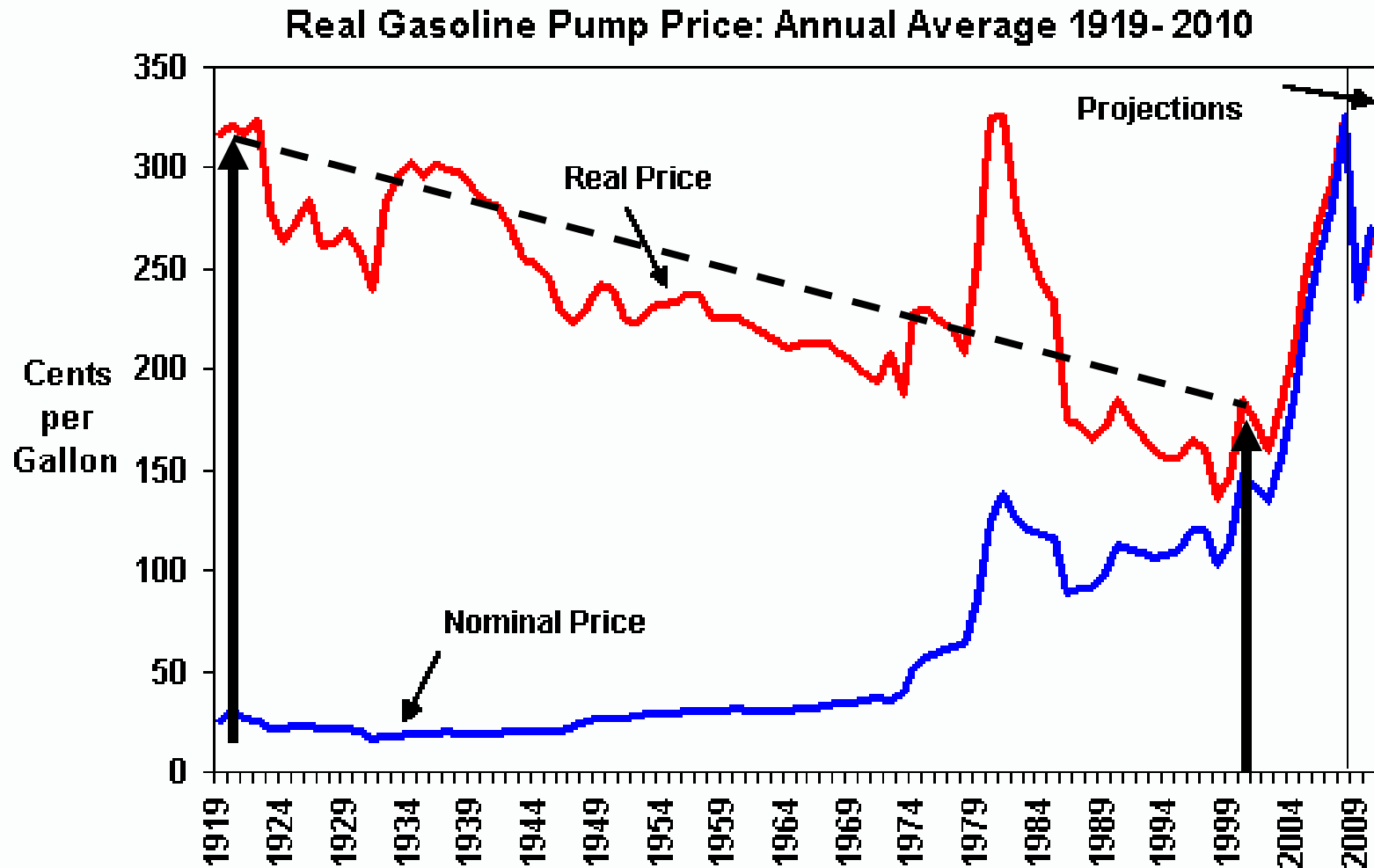
Real Gasoline Pump Price: Annual Average 1919- 2010



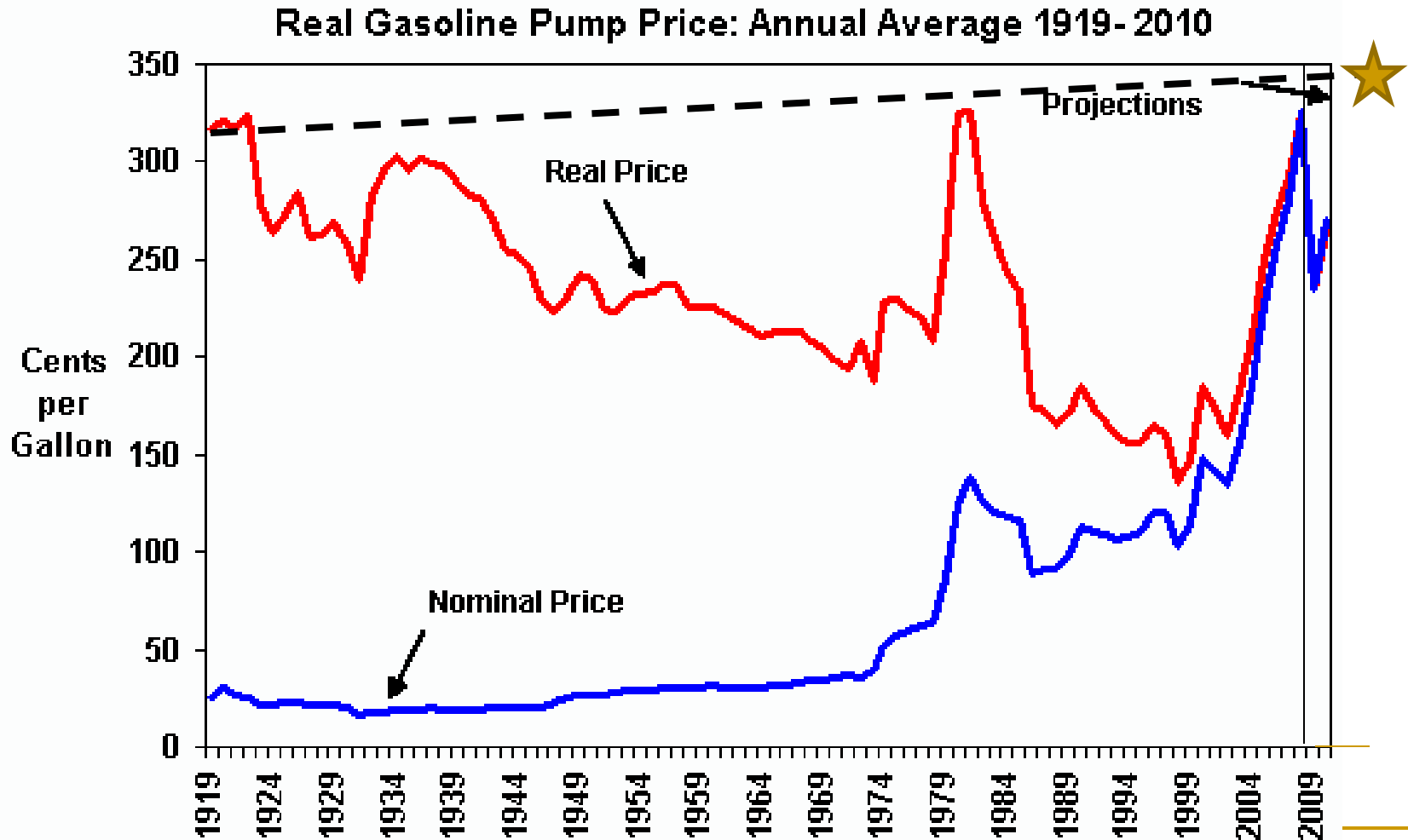
Prices have increased during most of your lifetimes



But, until the recent run-up in prices, the longer term trend has been downward



The average price in 2014 appears to be about \$3.47



What is going on?

- Why might we expect oil prices to rise through time?
 - What might explain the fact that, in general, oil prices have declined over much of the 20th century, and remained about flat overall?
-

Why hasn't oil (or any other fossil fuels) steadily risen in price?

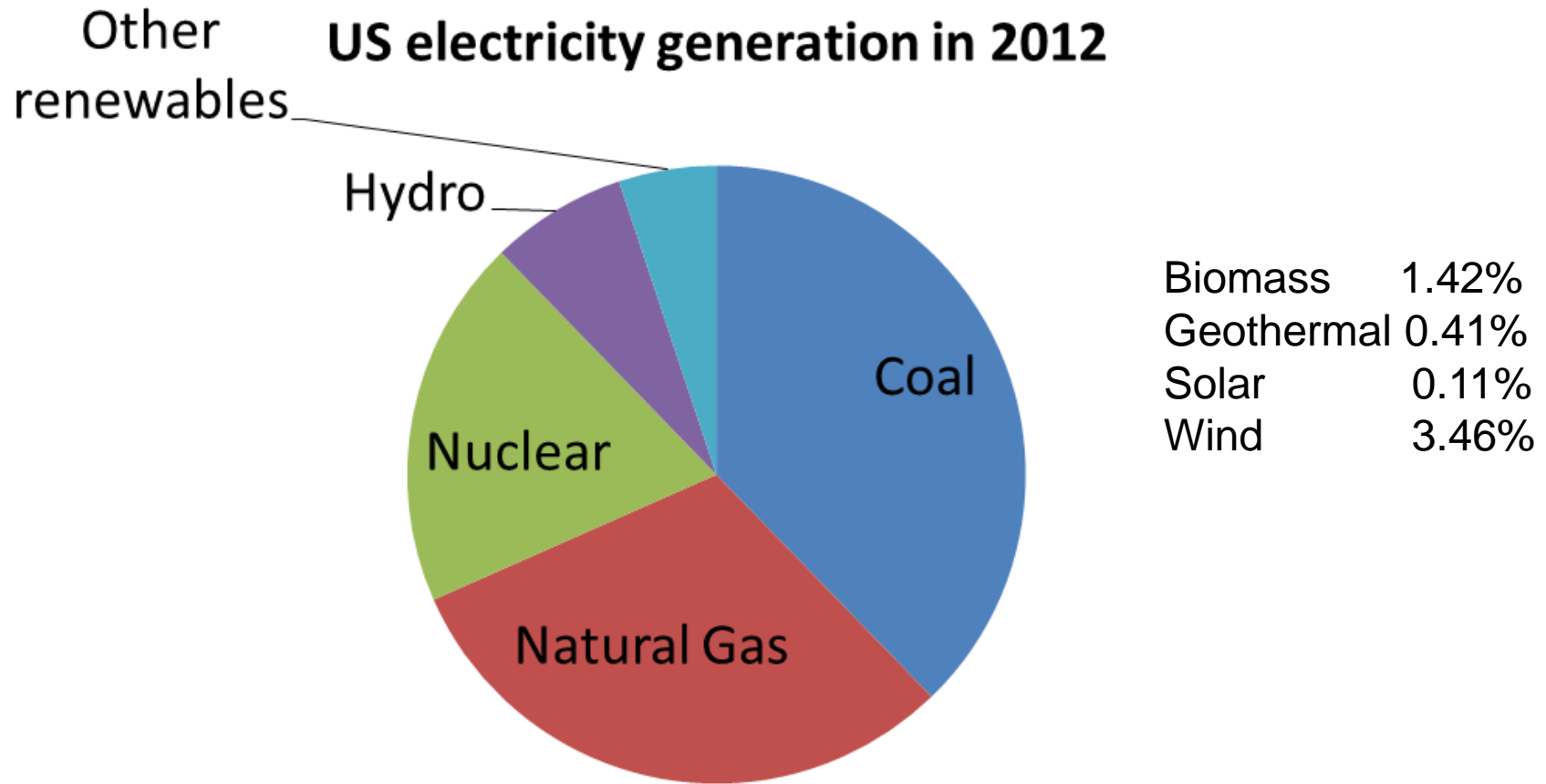
- As the price of oil rises, oil companies have a greater incentive to explore and exploit new reservoirs.
 - New *technologies* for cost effective oil exploration and pumping increase the supply of oil, putting a downward pressure on prices.
-

US Electricity Portfolio

- How much electricity is generated by solar?
Type your answer in as a percent. For example, if your answer is 97% type in 97.



Solar is only 0.1% of electricity



Less than 6% of generation is from non-hydro renewables



What drives the energy portfolio?



What drives the energy portfolio?



What drives the energy portfolio?

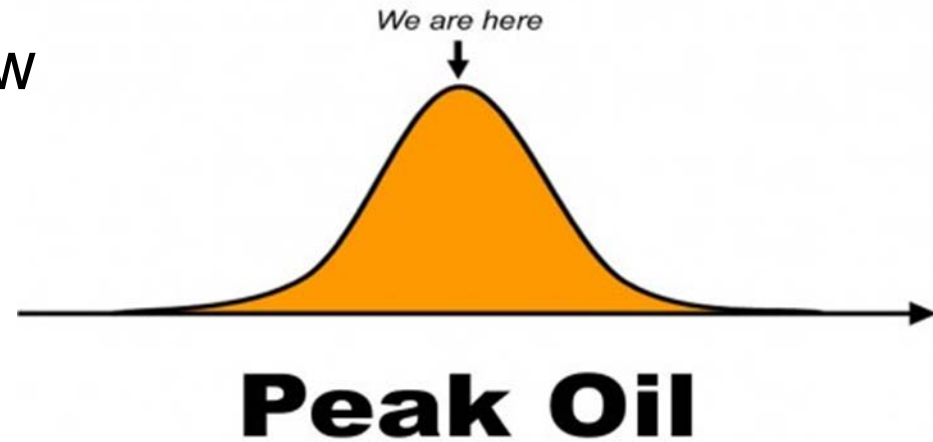




Why Renewable Energy?

Wake up!!!

- If peak oil is a problem, how might we solve it?



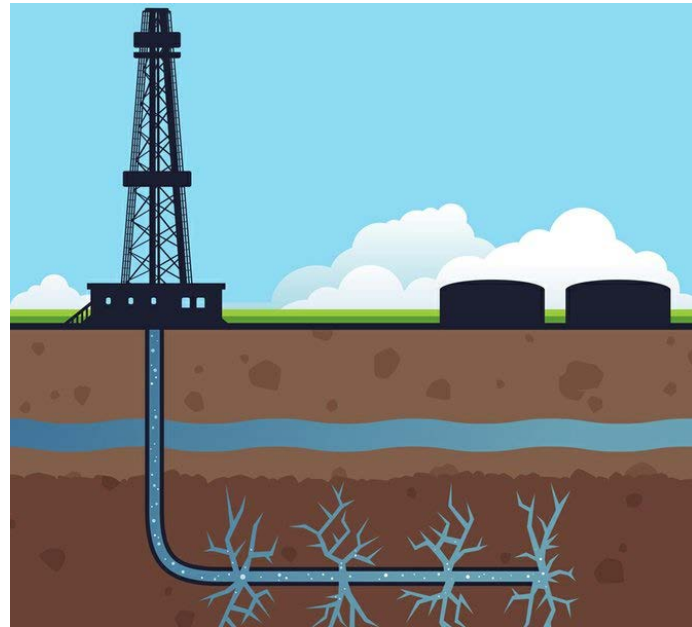
Peak Oil?

- If peak oil is a problem, how might we solve it?
- The most economic way to address a shortage of oil would be to exploit non-traditional fossil fuels
 - shale oil
 - gasoline from coal
 - biofuels and electric vehicles aren't as cost effective as these.



Energy Security?

- If we believe there is an energy security problem, what are the solutions?





Climate Change

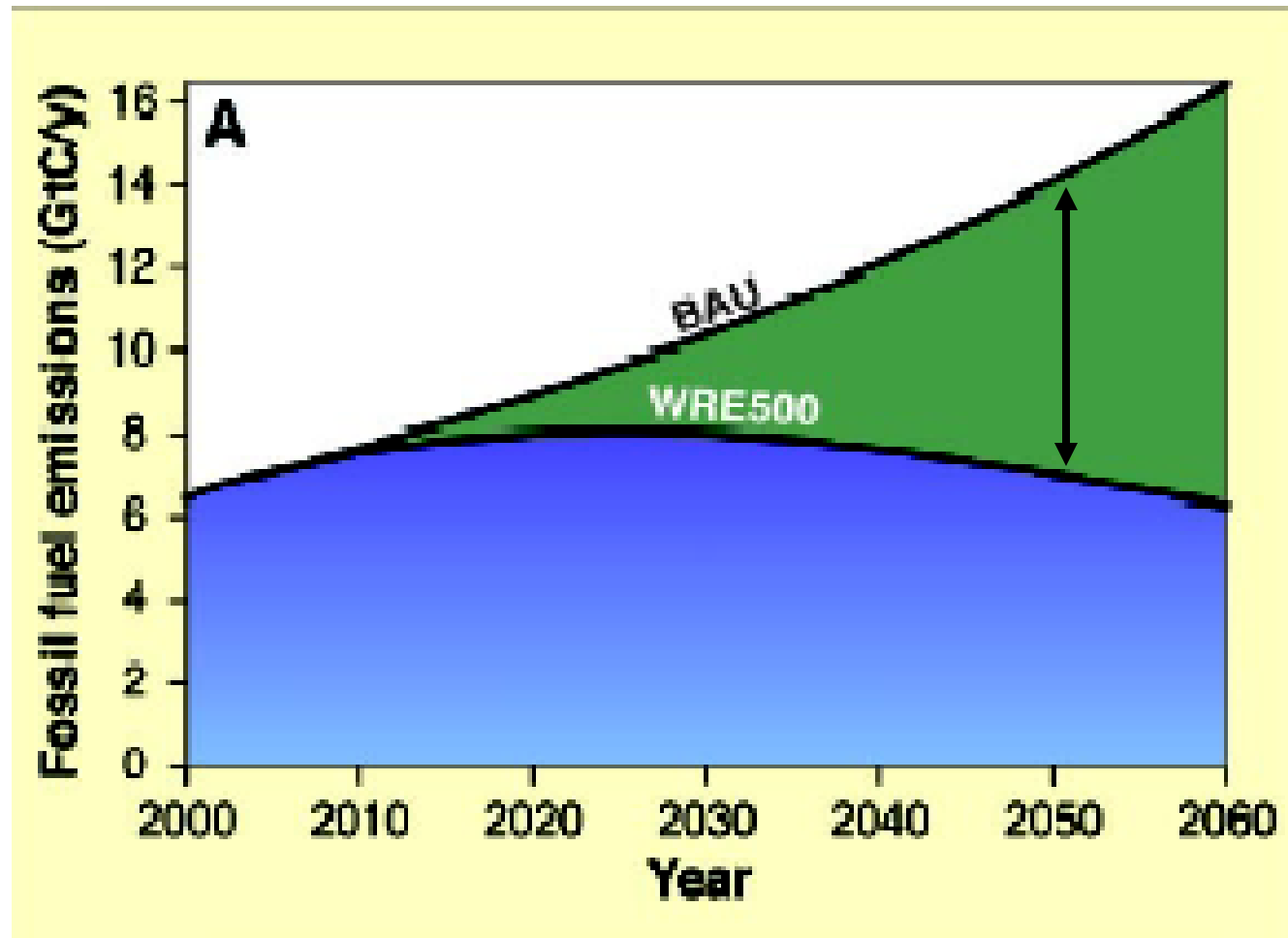
What can be done about Climate Change?

- Reduce emissions
 - Short run, through emissions policies
 - Long run, through technical change & emissions policies
- Adapt to changes

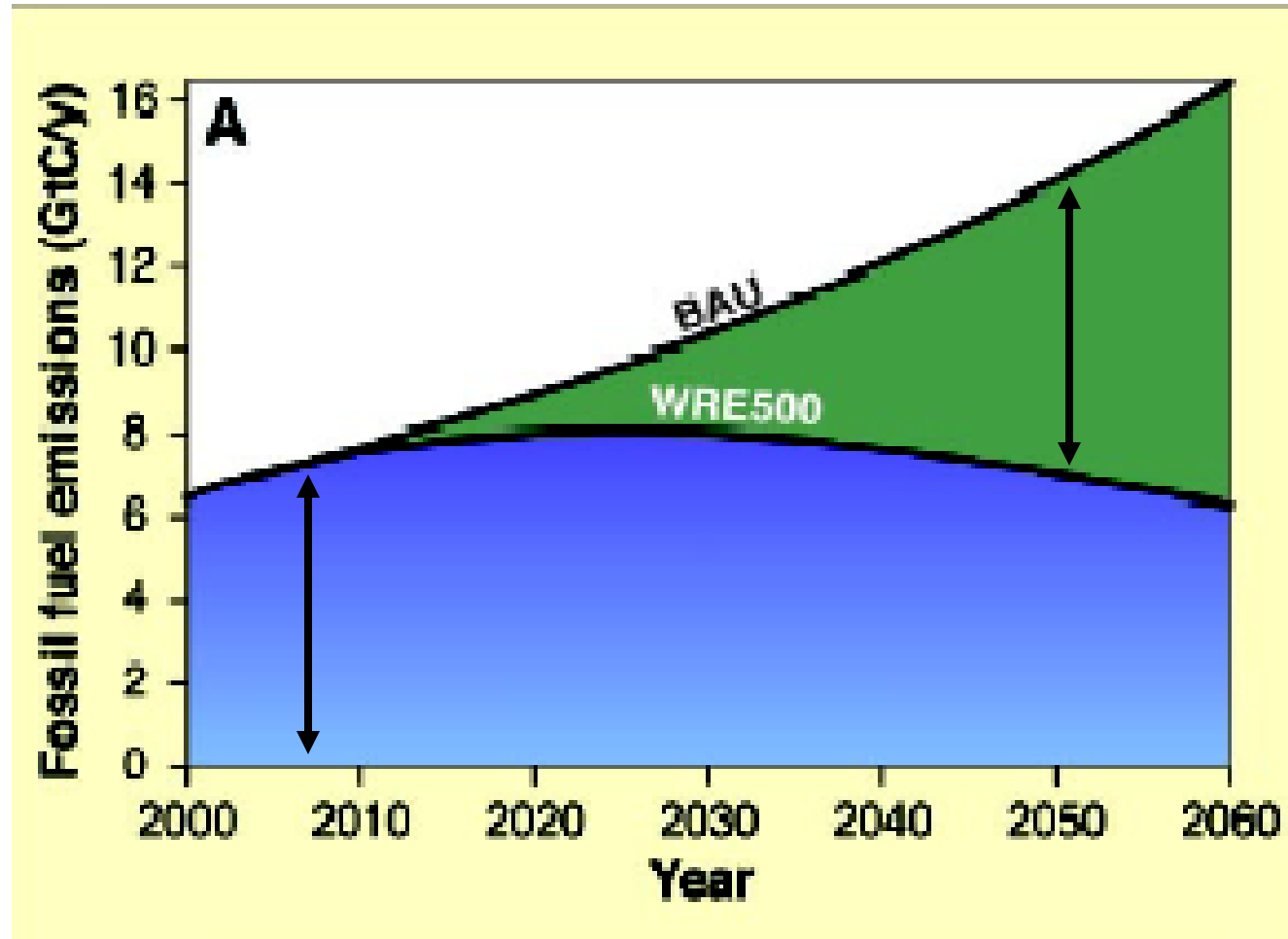


Technical change

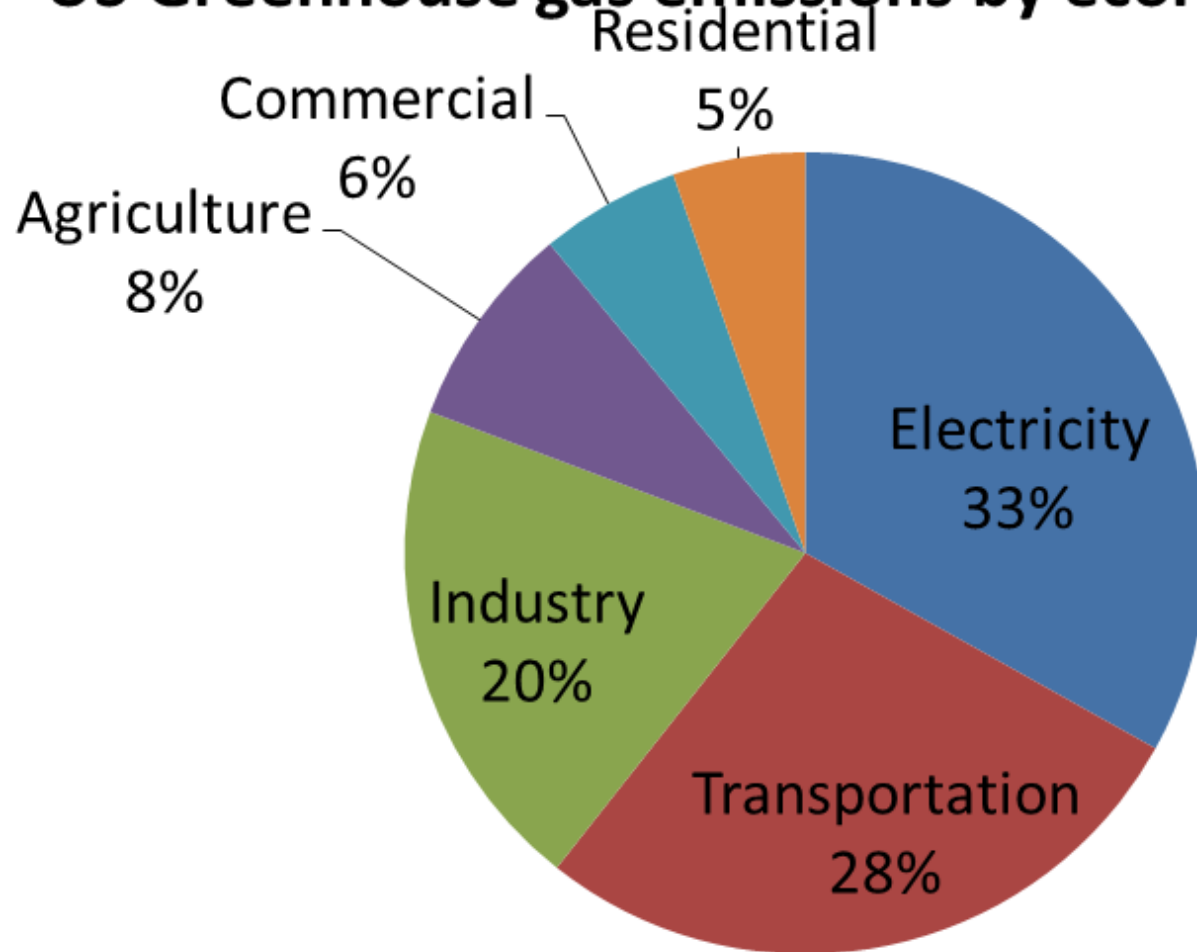
Technical change is needed



In just 40 years we need to producing as much as energy as we produce now, fossil free



US Greenhouse gas emissions by economic sector 2012



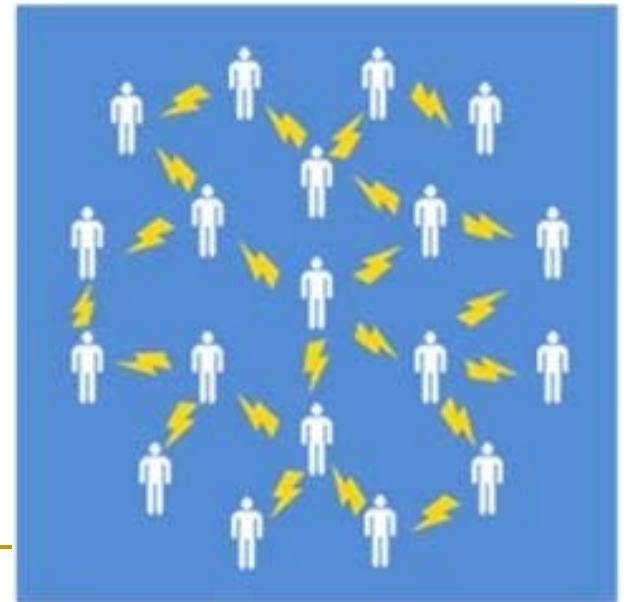
The most promising technologies

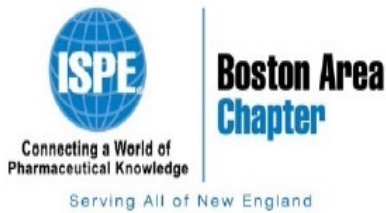
- **CCS**
 - **Nuclear**
 - **Solar**

 - Wind
 - Batteries
 - grid integration
 - Geothermal
- Biofuels
 - Batteries for vehicles
 - Plug-in hybrid Electric Vehicles
 - Electric vehicles
 - Fuel cells
 - Super efficient conventional vehicles
-

A goal for you

- Develop new clean technologies that can be easily transferred to developing nations.
- Develop business model to spur the diffusion of clean and efficient technologies.





**Meet Industry Professionals, Learn How to Network, and Learn How ISPE
Can Help You Connect with the Local Biotech and Life Sciences Industry**

Thursday, September 11, 2014

6:00-8:00pm

Lederle Graduate Research Tower Room 1033

Free Food and Drink

Networking Workshop

- Scholarships, Career Workshops, Poster Contest
- Free attendance at monthly educational programs
- Access to Jobs, Internships, and Co-ops

This event is organized by the ISPE UMass Amherst Student Chapter and sponsored by the Boston Area Chapter of the International Society for Pharmaceutical Engineering (ISPE).

Dean's Meeting for New Students

**Tues., Sept. 9: Chemical Engineering,
1:00pm, Goessmann 64 (during Engin 110 class)**

**Tues., Sept. 9: Civil and Environmental Engineering
6:30pm, Marcus Hall, Room 131**

**Wed., Sept. 10: Electrical and Computer Engineering
6:30pm, Marcus Hall, Room 131**

**Wed., Sept. 10: Mechanical and Industrial
Engineering, 6:30pm, ELAB II, Room 119**

Students unable to attend the meeting for their intended major should plan to attend another evening meeting.

Calling all First-Year Mechanical and Industrial Engineers!

The MIE Department would like to invite all first year ME and IE students to our annual New Student Welcome on Wednesday, September 10th from 5-6pm, in our MIE Innovation Shop, ELAB 100, where you can:

1. Enjoy pizza and drinks
2. Meet MIE faculty and students
3. Tour the MIE Innovation Shop
4. Talk to leaders of engineering-related student organizations
5. Win gift certificates from Amazon, Target, and Antonio's Pizza

This event is immediately before your mandatory meeting with the Dean's office.

We look forward to seeing you all there!

Link to interesting energy site

- <http://labs.minutelabs.io/Mass-Energy-Scale/>

