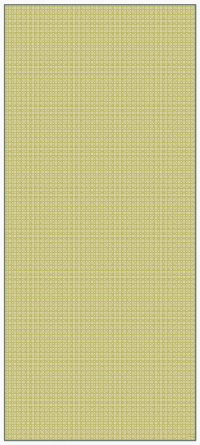
THE EFFECT OF TECHNOLOGY ON CIVILIZATION

ME/ENGR 195A NICOLE OKAMOTO



ABET LEARNING OUTCOMES

Our graduates are expected to have

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs **with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors**
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, **which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts**
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

GE S LEARNING OUTCOMES

Upon successful completion of this course, students will be able to:

- S-LO1: Describe how identities (i.e. religious, gender, ethnic, racial, class, sexual orientation, disability, and/or age) are shaped by cultural and societal influences within contexts of equality and inequality;
- S-LO2: Describe historical, social, political, and economic processes producing diversity, equality, and structured inequalities in the U.S.;
- S-LO3: Describe social actions which have led to greater equality and social justice in the U.S. (i.e. religious, gender, ethnic, racial, class, sexual orientation, disability, and/or age).; and
- S-LO4: Recognize and appreciate constructive interactions between people from different cultural, racial, and ethnic groups within the U.S.

GE V LEARNING OUTCOMES

Upon successful completion of this course, students will be able to:

- V-LO1: compare systematically the ideas, values, images, cultural artifacts, economic structures, technological developments, and/or attitudes of people from more than one culture outside the U.S.
- V-LO2: identify the historical context of ideas and cultural traditions outside the U.S. and how they have influenced American culture
- V-LO3: explain how a culture outside the U.S. has changed in response to internal and external pressures.

- We will not cover all these outcomes in ME 195a,b, but we want you to think about local and global social, economic, and cultural effects that have led to a need for your project and potential effects of your projects on society.
- Let's look at some examples from history.

- https://www.youtube.com/watch?v=4rqZZgVxnCk

AIR CONDITIONING

- Effect on population movement
  - 1950 Sun Belt had 28% of population
  - By 2000 that had risen to 40%
- Effect on politics
  - Gore Vidal: "I date the end of the old republic and the birth of the empire to the invention, in the late thirties, of air conditioning. Before air conditioning, Washington was deserted from mid-June to September.... But after air conditioning and the Second World War arrived, more or less at the same time, Congress sits and sits while the presidents or at least their staffs never stop making mischief. "

EFFECT ON CULTURE

- AC led to the rise of the Golden Age of Hollywood
  - Initially there were few air conditioners in homes, which made air conditioned movie theaters a huge draw in the summer
  - Increased funds for the movie industry
- Previously, the middle and upper class would often retreat from the cities in the summer, heading to lakeside and mountain resorts.
  - Air conditioning made the summers more comfortable, leading to the demise of many of these resorts.
- People now spend more time inside in the summers rather than on porches or in parks. Studies have shown this has led to a less cohesive community and more crime.

EFFECT ON ARCHITECTURE

- Fewer windows
- More high-rises
- Fewer trees (shady trees not needed to cool off)
- Comfortable large windowless structures possible – office buildings, malls, indoor entertainment centers
- Manufacturing with special IAQ requirements possible (such as clean rooms)
- Many fruits and veggies available year round (example: bananas are stored in rooms with specified temp and humidity ranges)

Southern Dog-Trot house – cook on one side, live on the other

Large porches were the norm outside of high-population city regions

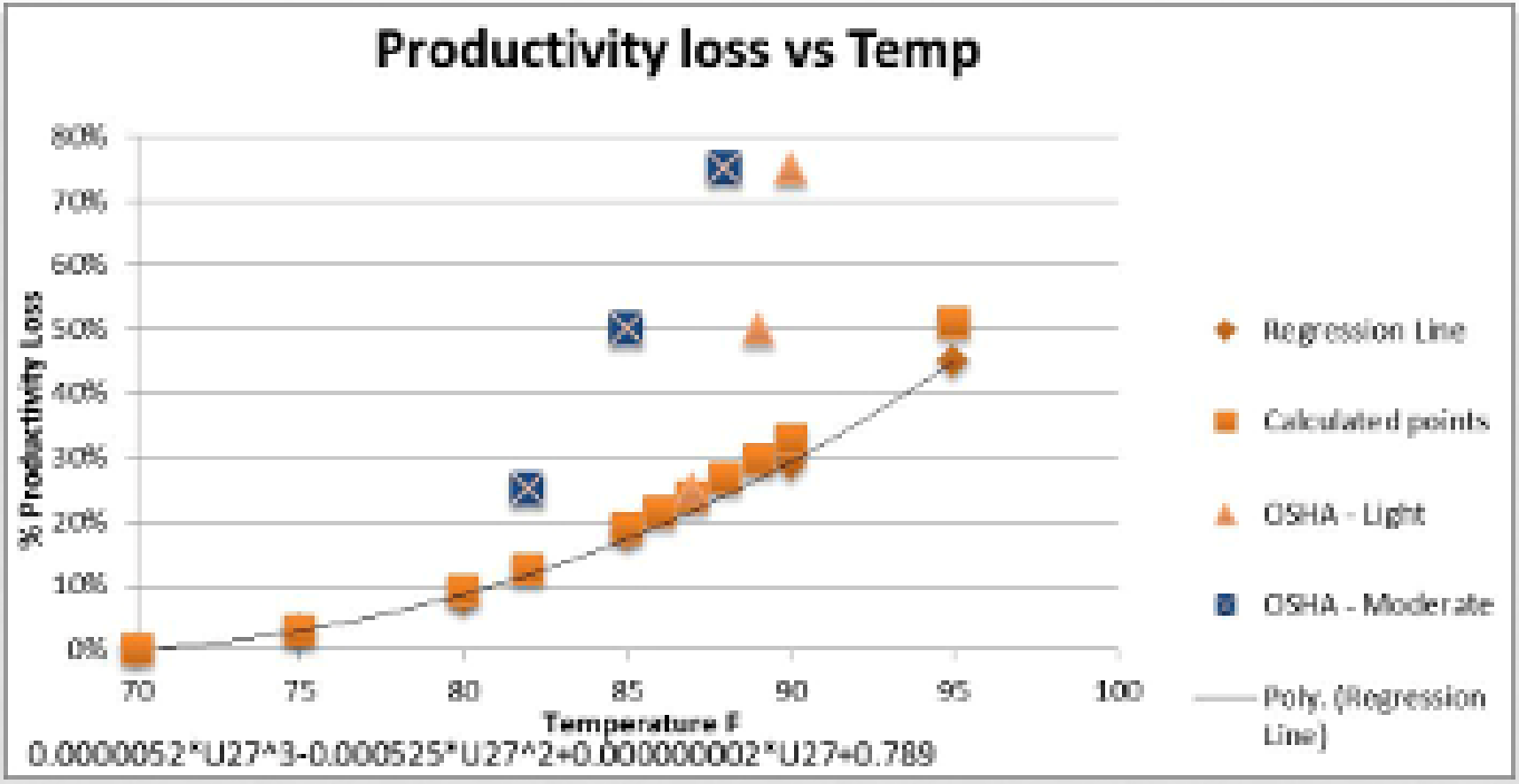
NEGATIVE EFFECTS ON HEALTH

- Inadequate ventilation is linked to asthma and allergies.
- A 2006 Japanese study showed long-term exposure can make it harder to get up and going before 10 am because air conditioners are one of the best sleep aids. They may disrupt cortical rhythms that help us wake up energized.
- A Danish study found that AC makes us fat.
  - We don't use as many calories to cool off.
  - People eat more when they're cool.

POSITIVE EFFECTS ON HEALTH

- Fewer cases of
  - Ischemic stroke
  - Ischemic heart disease
  - Cardiovascular disease
  - Pneumonia
  - Dehydration
  - Heat stroke
  - Diabetes
  - Acute renal failure.

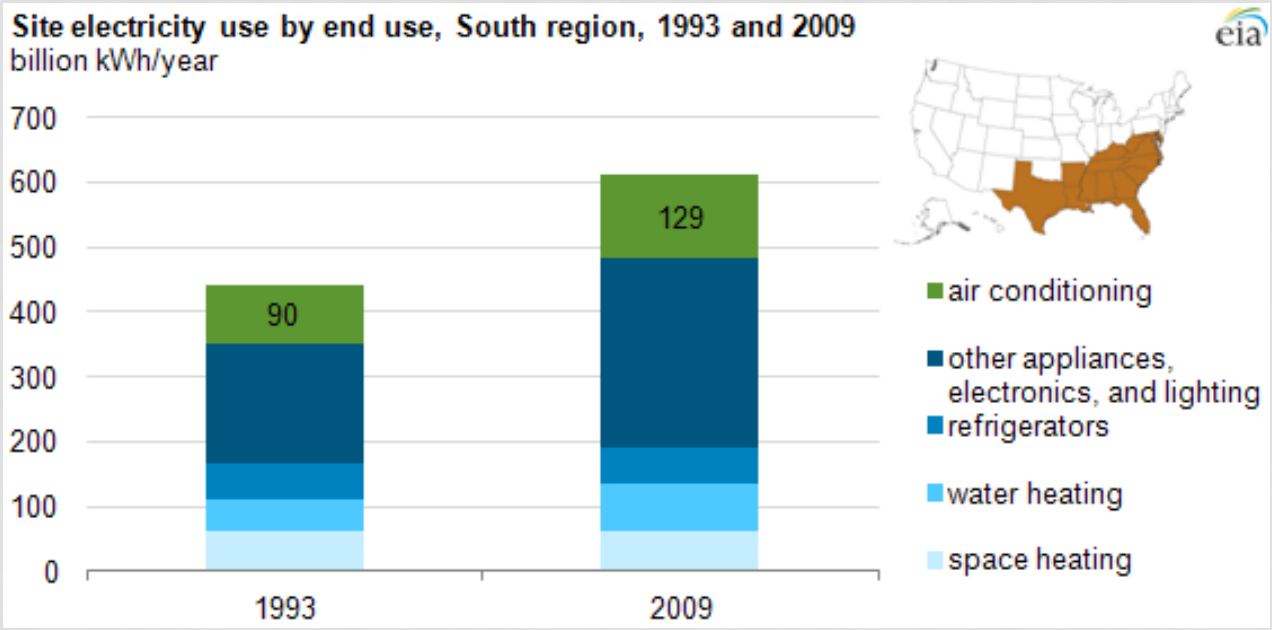
EFFECT ON WORK PRODUCTIVITY



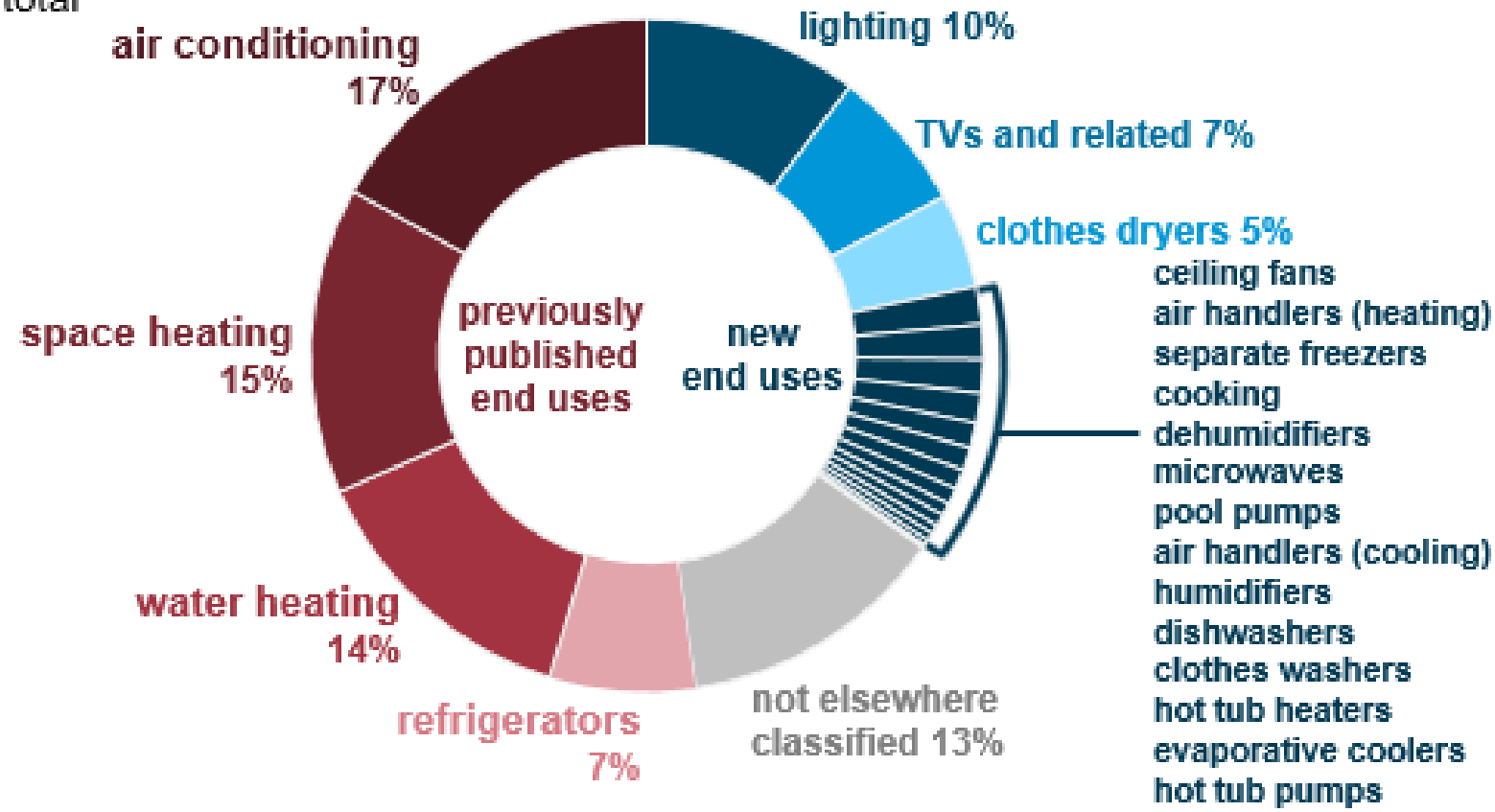
OSHA points are based on their published permissible heat exposure threshold limit. As temp goes up, longer rest periods are mandated. Curve fit is from productivity studies

ENERGY USAGE

- Energy used for AC doubled from 1993-2005
- US uses as much energy for AC as Africa uses for anything!
  - Major implications with respect to pollution due to energy generation and energy independence



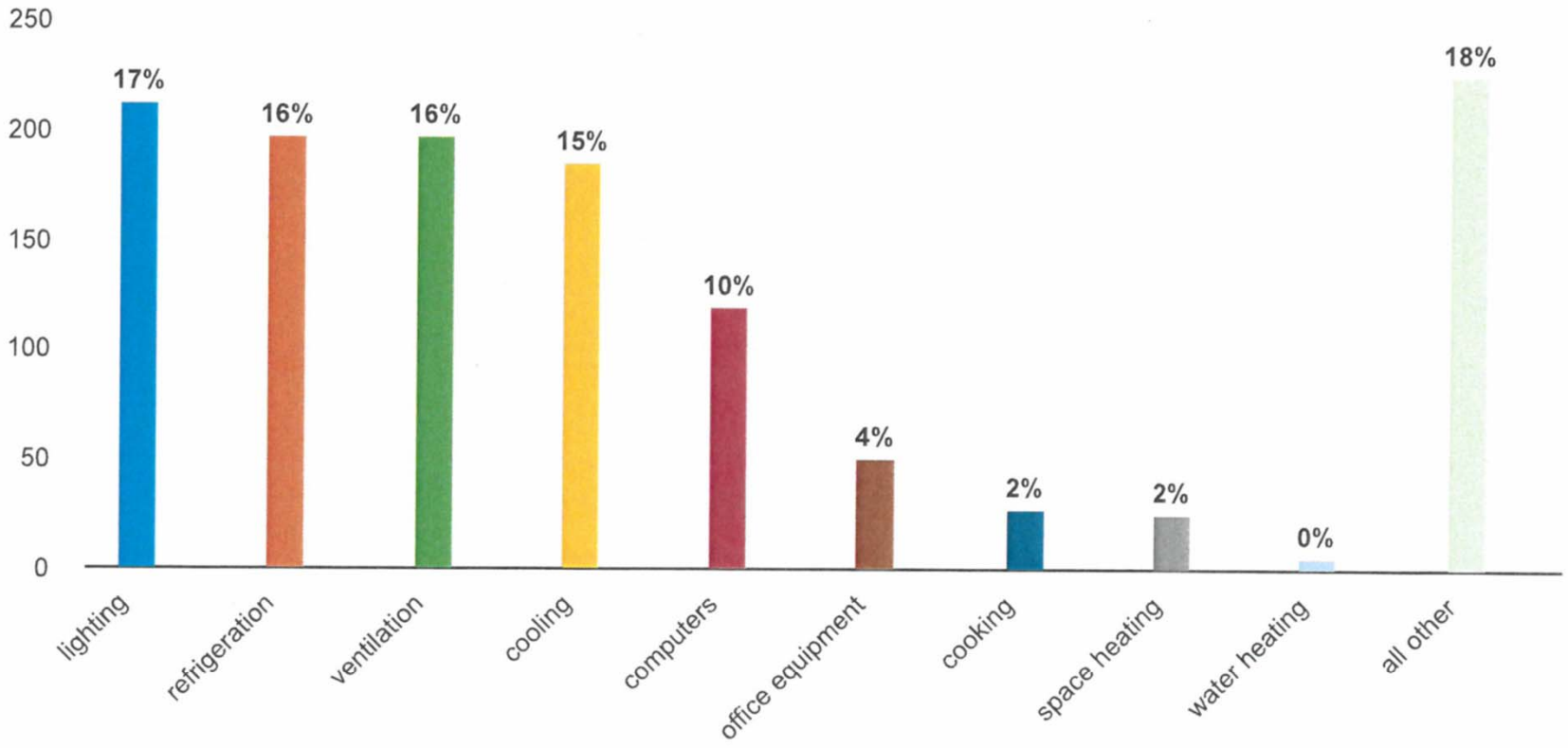
Residential electricity consumption by end use, 2015
percent of total



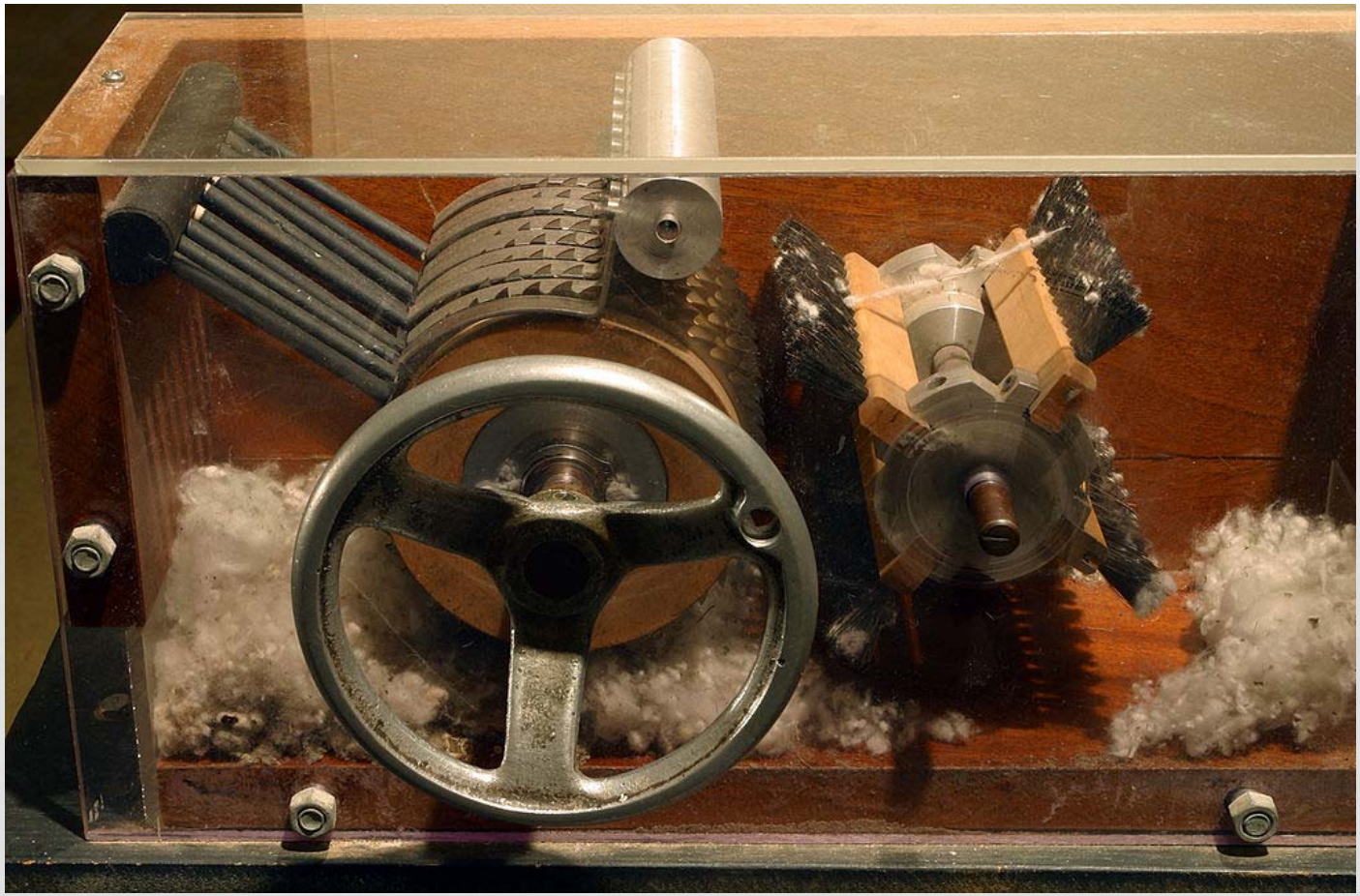
eia

Electricity use in U.S. commercial buildings by major end uses, 2012

total = 1,243 billion kilowatthours (kWh)



COTTON GIN



Invented in 1793 by Eli Whitney to separate cotton fibers from seeds

Animation: http://www.eliwhitney.org/7/museum/eli-whitney/cotton-gin

EFFECT ON US SOCIETY

- One gin could clean 50 lb/day with 2-3 workers.
  - Previously it would take one person 10 hrs to clean one pound.
- Made it possible for cotton to a very profitable industry
- New Orleans, Mobile, Charleston, and Galveston became major ports
- Cotton industry was still very labor intensive, so this led to the need for a very large labor pool.

EFFECT ON SLAVERY

- Eli Whitney might have thought that his invention might reduce amount of slavery in the South where cotton was grown. However….
- The profitable nature of industry led to the rise of plantations and an increase in slavery.
  - 1790: 700,000 slaves
  - 1850: 3.5 million slaves
  - #slave states rose from 6 to 15
  - 1860: 1 in 3 Southerners were slaves
- Eli Whitney inadvertantely helped cause the Civil War.

WASHING MACHINE

- Washing machines reduced the time needed to wash clothes by a factor of 6.
- This led to more married women entering the workforce, which led to more economic prosperity for those nations.
- This also led to a greater usage of water (people washed clothes more often) and electricity by homes.

RECENT TECHNOLOGIES THAT ARE CHANGING CURRENT SOCIETY

- Fiber optics
- Graphene – may revolutionize small electronic devices
- Cell phones
- Personal computers
- Nano robots
- Satellite communication
- Solar cells
- Transistors
- Internet
- 3-D printers

GROUP DISCUSSION

- In your next project team meeting:
- Discuss one or more of the following questions:
  - What global, social or cultural influences have led to a need for your project?
  - What may be the impact of your project on society here in the US? Or what has been the impact of similar devices?
- You may need to take a bigger picture in order to have enough to discuss. Examples:
  - Lockheed Pulsating Heat Pipe
  - SAE Formula Car Chassis Design
  - Automated Home Brewing System

ASSIGNMENT

In this assignment, address how your project may affect society--locally and/or globally--if implemented and how human behavior will affect the success of your design.

The following are a list of questions to help you start thinking about this analysis. Not all questions will apply to all projects, and this list is not comprehensive.

- What global, social or cultural influences have led to a need for your project?
- If implemented on a wide scale, how will your project result in greater equality and social justice?
- How will your design help create an even playing field for underprivileged people?
- What human, social, and cultural barriers may result in difficulties implementing your project?
- How may society's perception of your project result in difficulties during implementation?
- What may be the environmental impact of your project over its life cycle?
- What may be the effect on public health or society? How will your project affect quality of life?

You are welcome to discuss the effects of existing inventions similar to your own rather than the projected effects of your project.

You will not be able to address some questions until ME 195b, when you will have a second assignment similar to this one. Minimum length: 600 words – but write enough to be thorough.

GRADING

- Thesis: 10 pts
- Organization: 10 pts
- Grammar/Spelling: 10 pts
- Content: 70 pts

- Liberal arts student assistants will be grading the first three elements. Your paper will be returned to revise and resubmit if your writing is awful.

- Due date: September 30 (Monday) before midnight; turn in via Canvas

CONTENT GRADING

- Rubric gives examples of what must be included to get different points. For example:
- 70 pts: Student is able to describe influences leading to a need for their project; social, political, economic and/or environmental effects of their project; social and cultural barriers to implementation of the project, as applicable. Student provides supporting details and/or examples for all areas.
- 20 pts: Student is able to describe influences leading to a need for their project but with little depth; only one effect of their project. Student provides details or examples for one area but with little depth.

WHAT CAN YOU TALK ABOUT?

- You may need to take a bigger picture in order to have enough to discuss. Examples:
  - Lockheed Pulsating Heat Pipe
  - SAE Formula Car Chassis Design
  - Automated Home Brewing System
- Make sure to explain the connection between your project and your “bigger picture” discussion.

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