



# 6.6 ENERGY CONSERVATION

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College Board Topic 6.13

Related Reading Ch 19, pages 546 - 548

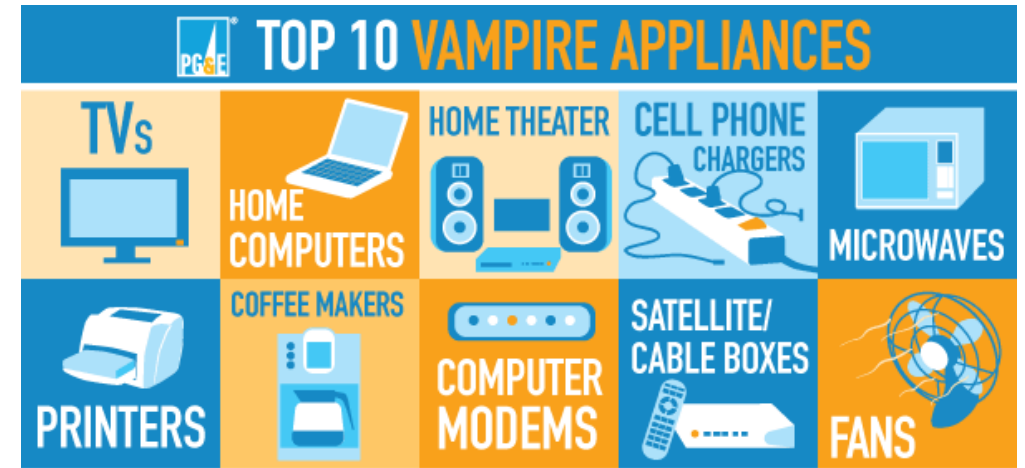
# Energy Efficiency and Conservation

- We need to minimize and extend the use of dwindling fossil fuel supplies, while transitioning to renewable sources of energy
- **Energy efficiency**
  - obtaining a given amount of output while using less energy input; results from technological improvements
- **Energy conservation**
  - reducing energy use; results from behavioral choices
  - Being more conscientious about our energy use can prolong energy supplies.
- The United States uses twice as much energy per dollar of gross domestic product as most other industrial nations.
  - We are starting to become more energy conscious and efficient with our energy use.
  - Europeans, with similar GDP per capita, use less energy per capita than the United States.

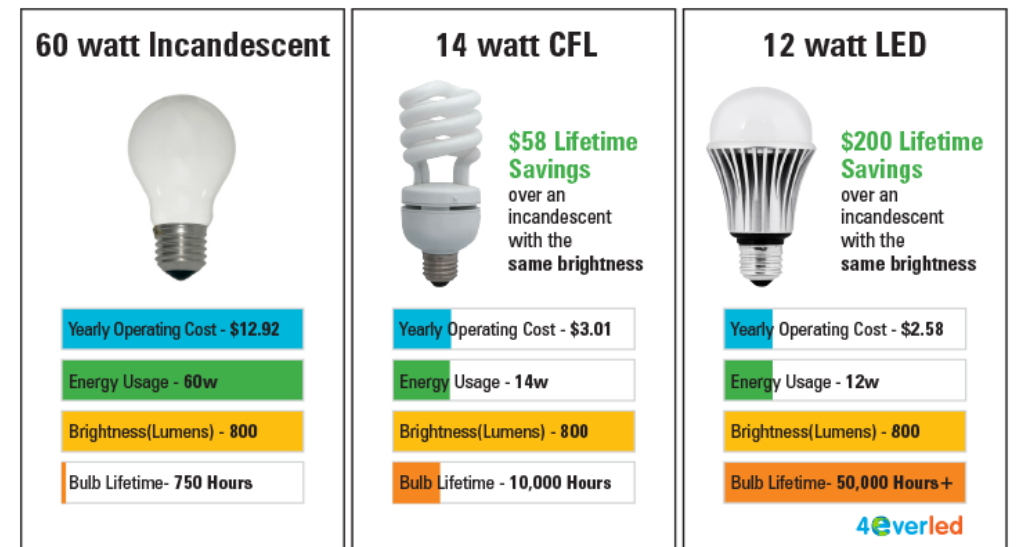


# Personal choice and efficient technologies

- Individuals can make conscious choices to reduce energy consumption and increase conservation
  - Drive less
    - Will require an investment in public transportation and urban planning (prevent sprawl, create walkable cities / bike lanes)
  - Turn off/unplug lights and appliances when not in use.
    - Use natural lighting when possible.
    - When possible, unplug appliances with a **phantom load (vampire appliances)**
  - Buy efficient products / appliances
    - Consider replacing existing light bulbs with LED's
    - When replacing major appliances, choose **energy star certified** products
    - Many government rebates make energy star options less expensive.



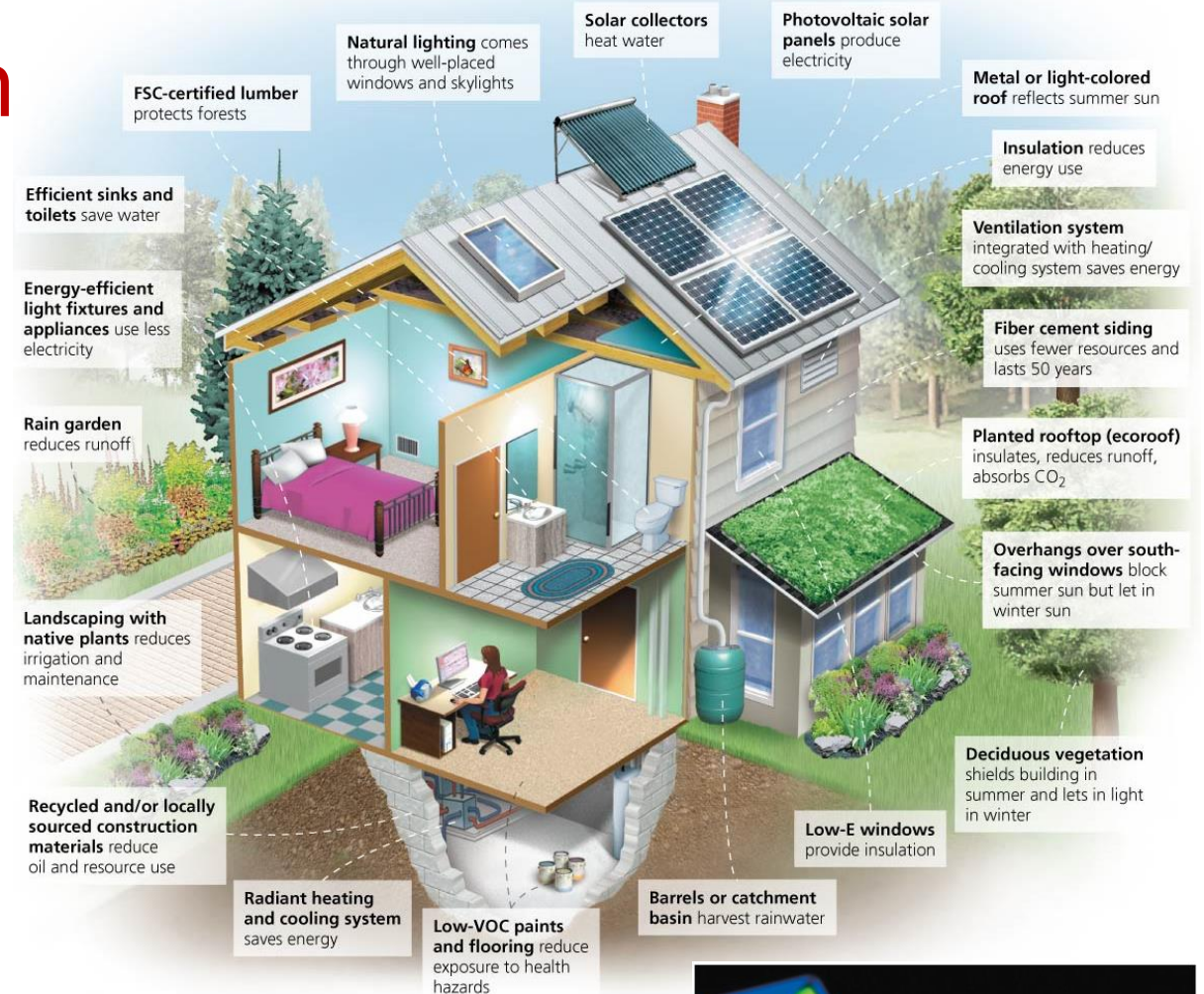
[pge.com/saveenergymoney](http://pge.com/saveenergymoney)



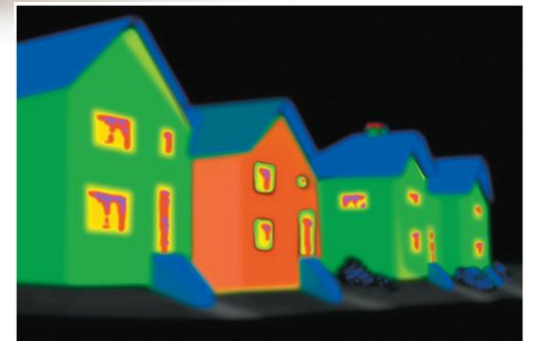


# Sustainable Building Design

- **Passive solar building design** can minimize energy needed for heating and cooling.
- Well insulated buildings (**high R value**) maintain temperature with less need to heat or cool.
- **Double paned, low-E windows** reduce heat loss/entry.
- Sky lights and windows can increase available natural light, reducing electricity use.
- Recycled materials can reduce the energy required to produce new versions.
- Water conservation is energy conservation too.
  - Requires energy to filter and treat tap water as well as the sewage that is produced.



One of these houses is uninsulated while the rest are. Notice that all houses are losing more heat through their windows than through the walls





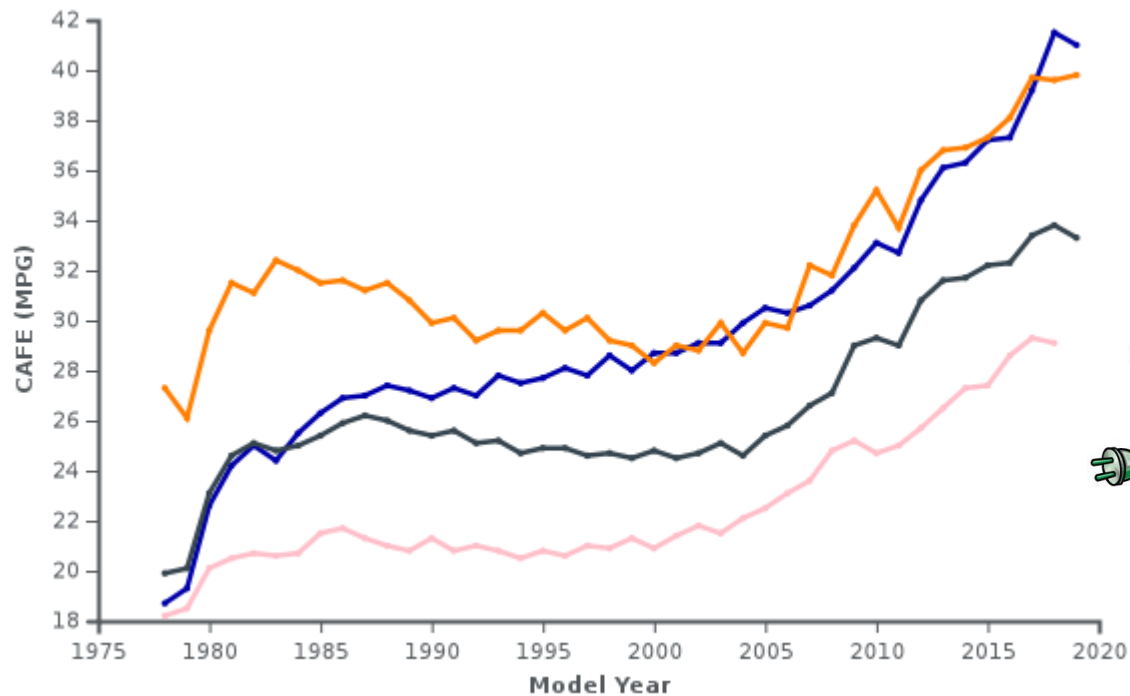
# Water Conservation

- Water conservation saves energy and save water too!
  - Especially important in drought prone regions where water is often transported huge distances to be used.
  - San Diego gets most of its water from the Colorado river along the CA and AZ border, or from North CA
- **Low flow** showers, faucets, toilets, dishwashers and washing machines
- **Xeriscaping** or **landscaping with native plants** reduces or eliminates the need for irrigation.
  - Native landscapes increase biodiversity, support pollinator populations and require less fertilizers and pesticide too.
- **Rain barrels** capture runoff and store this water for irrigation needs later in the year.
  - Reduces stormwater runoff from individual properties, reducing impacts of flooding and water contamination.

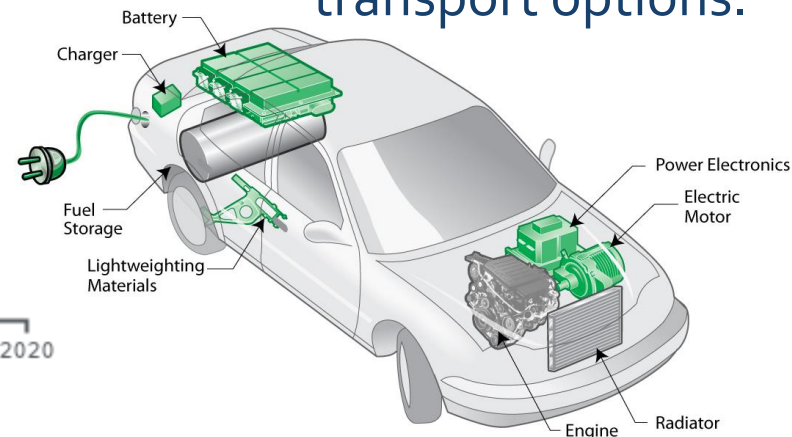


# Energy Conservation - Transportation

- ~28% of total US energy use comes from transport of goods & people (2019).
- **CAFE (Corporate Average Fuel Economy) standards** are regulations set in US to require auto manufacturers to make cars that meet certain MPG standards, or pay penalties (currently 35 mpg).



- **Hybrids** (Prius) have both a gasoline & electric engine, enabling them to have higher MPG ratings.
  - Breaking system charges the electric battery, which powers electric motor.
- **Electric vehicles (EVs or BEVs)** like the Tesla or LEAF use no gasoline, but still require electricity (the electricity source will determine how sustainable this option is).
- Public transit & carpooling, biking, or walking are even better energy-saving transport options.

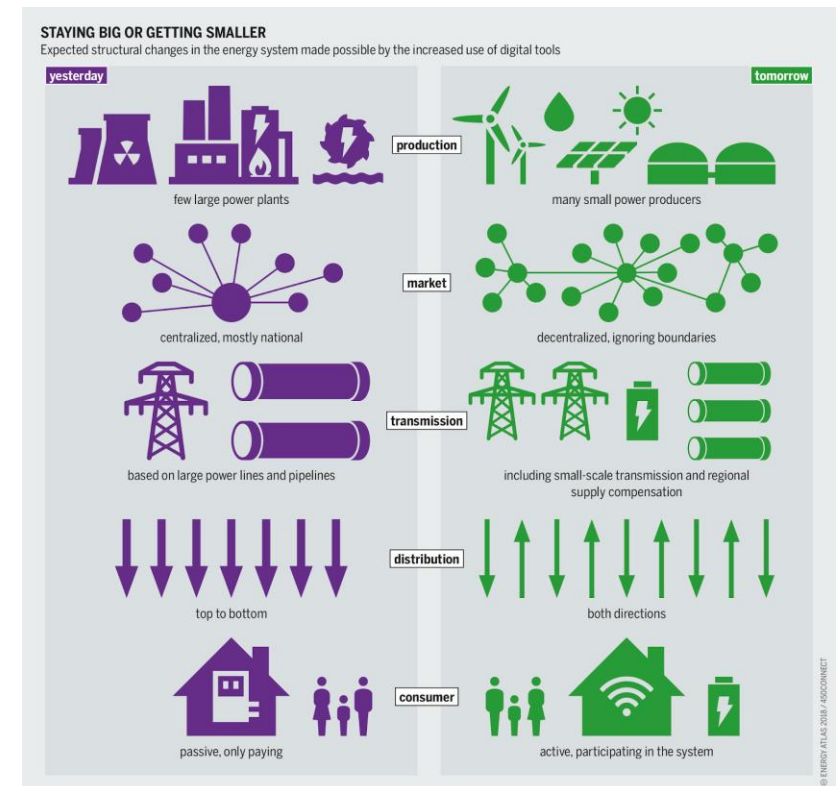
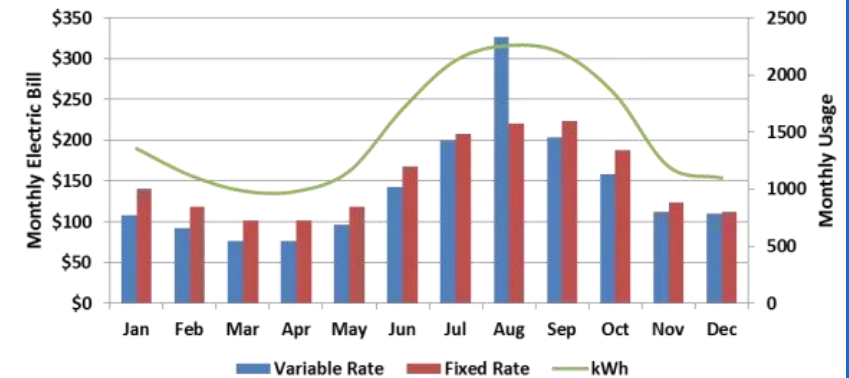




# Peak Demand and Smart Grid Technology

- **Peak demand** is the time of day or year (often early night time hours or very hot weather events) when electricity demand is highest.
  - If demand exceeds supply, **rolling blackouts** occur.
- To manage peak demand, some utilities use a **variable price model** for electricity.
  - Users pay a higher rate during peak demand hours or events, to discourage use.
  - Users pay a lower rate/kWh when using a lower amount of energy (incentivizes lower overall use).
- “**Smart Grid**” is the concept of managing demand & energy sources in a more varied way.
  - Using smart meters for variable price models.
  - Allowing rooftop solar to direct electricity back to grid.
  - Integrating more total energy sources (especially renewable) from multiple decentralized locations in order to meet overall demand for power.

Texas Electricity Rate Comparison  
Typical Home Using 18,000 kWh/year



# Video Resources

- Reducing Energy Demand
  - [https://www.youtube.com/watch?v=pwbXlEniFJg&feature=emb\\_logo](https://www.youtube.com/watch?v=pwbXlEniFJg&feature=emb_logo)