

Warm-up

02MAR2015

- Fracking Case Study is *due today*
- You will have a Quizzam on Friday
- Please read Chapter 13

- At this point we are done with Chapter 12 and starting 13, the Quizzam will cover both chapters

Warm-Up

03MAR2015

- What are the positives/negatives of solar panels?
- How does scale of implementation influence the effectiveness of biomass/biofuel?

Today is afterschool APES time!

Warm-Up

04MAR2015

- What are the positives and negatives of hydrothermal energy production?
- What is the most important element of energy production by wind?
- Which animals are frequent casualties of wind turbine collisions?

Warm-Up

05MAR2015

- What are 3 things you can do right now to reduce your energy consumption?
- Celebration of Learning 12/13 Tomorrow
- FRQ on Monday
- Warm-Ups are Due Friday

Home

- **Weatherize (insulate, seal gaps).**
- **Turn thermostat down in winter, up in summer.**
- **Reduce use of hot water (do laundry in cold water/take shorter showers).**
- **Replace incandescent bulbs with compact fluorescents or LEDs.**



Transportation



- **Walk or ride a bike.**
- **Take public transportation.**
- **Carpool.**
- **Consolidate trips.**

Electrical and electronic devices

- **Buy Energy Star devices and appliances.**
- **Unplug when possible or use a power strip.**
- **Use a laptop rather than a desktop computer.**



Figure 13.4

Environmental Science

© 2012 W. H. Freeman and Company

Nonrenewable



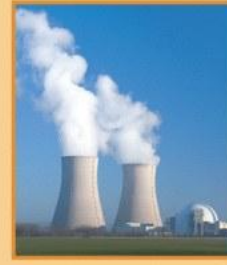
Natural gas



Oil

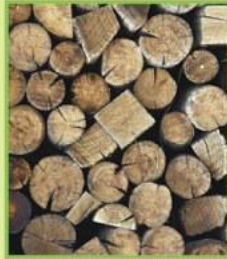


Coal



Nuclear

Potentially renewable



Wood



Biofuel

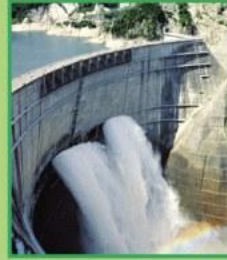
Nondepletable



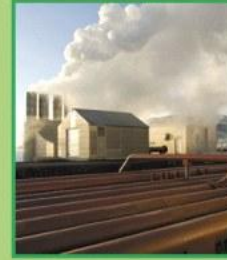
Wind



Solar



Hydroelectric



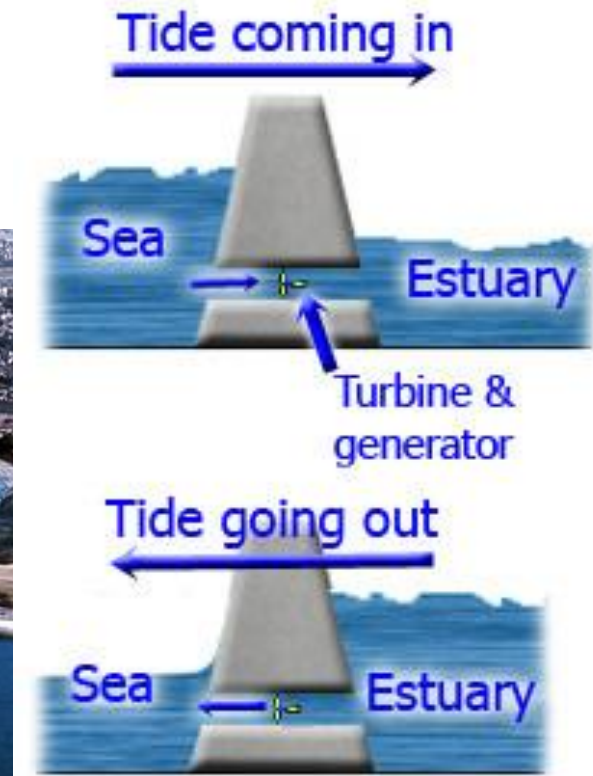
Geothermal

Figure 13.1

Environmental Science

© 2012 W. H. Freeman and Company

Additional Hydrothermal



Incheon Tidal Power Plant

Ganghwa Island

Gyeonggin Canal

The eastern embankment

The western embankment

Bird habitat

Jangbong Island

The southern embankment

Yeongjong Island
(Incheon International Airport)

Source: Land Ministry



- As a species that exists on Earth we cannot continue burning fossil fuels
 - Global Warming
 - Makes pollutants
- Energy efficiency and conservation is the **first** step to making the switch to using renewable energy

Benefits of Conservation and Efficiency

Many energy companies have an extra backup source of energy available to meet the peak demand, the greatest quantity of energy used at any one time.

Variable price structure- utility customers can pay less to use energy when demand is lowest and more during peak demand.

Sustainable Design

Improving the efficiency of the buildings we live and work in.

Can address both heating and cooling



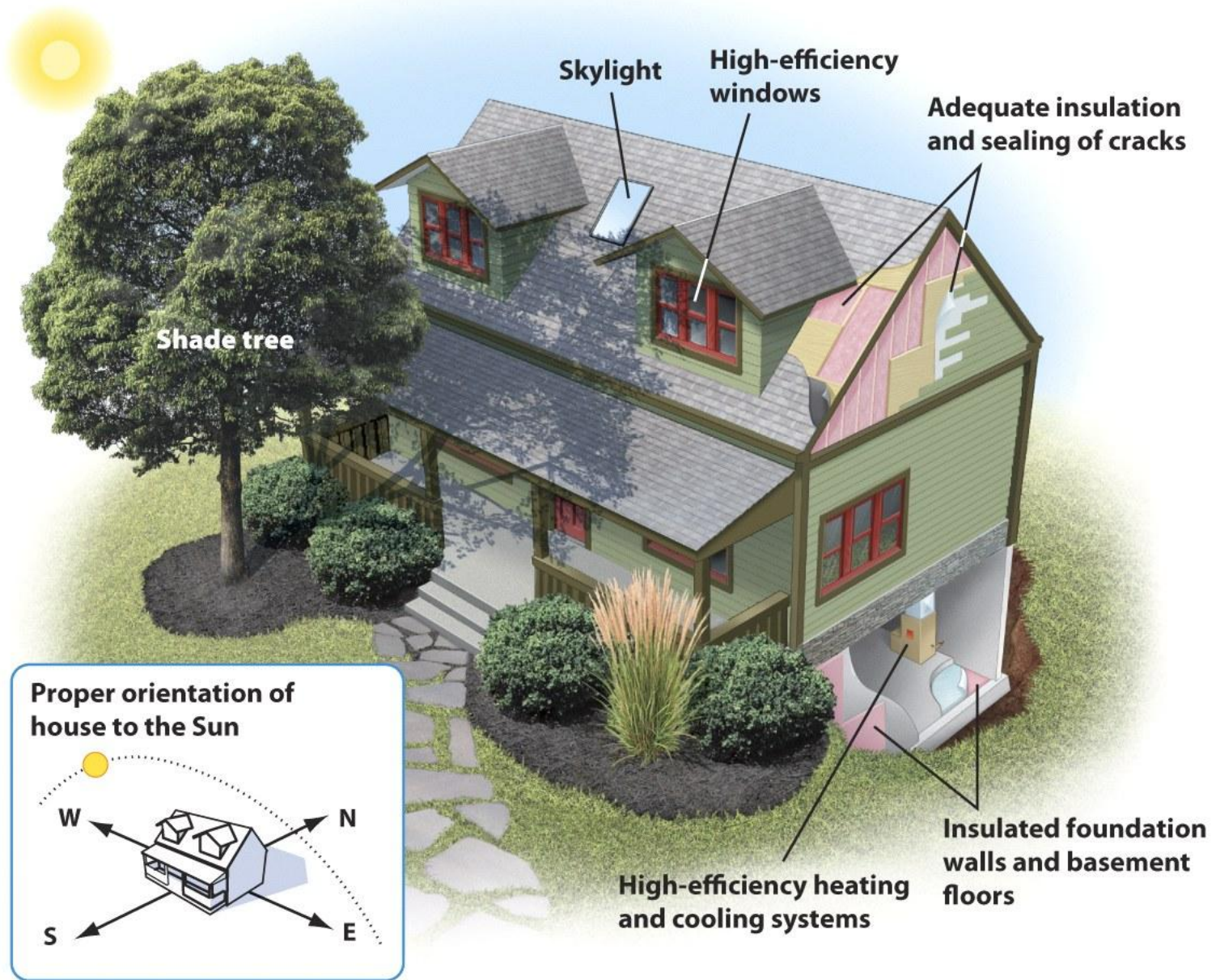


Figure 13.5
Environmental Science

Passive Solar Energy

Using passive solar energy can lower your electricity bill without the need for pumps or other mechanical devices.

Building the house with windows along a south-facing wall which allows the Sun's rays to warm the house would be an example.

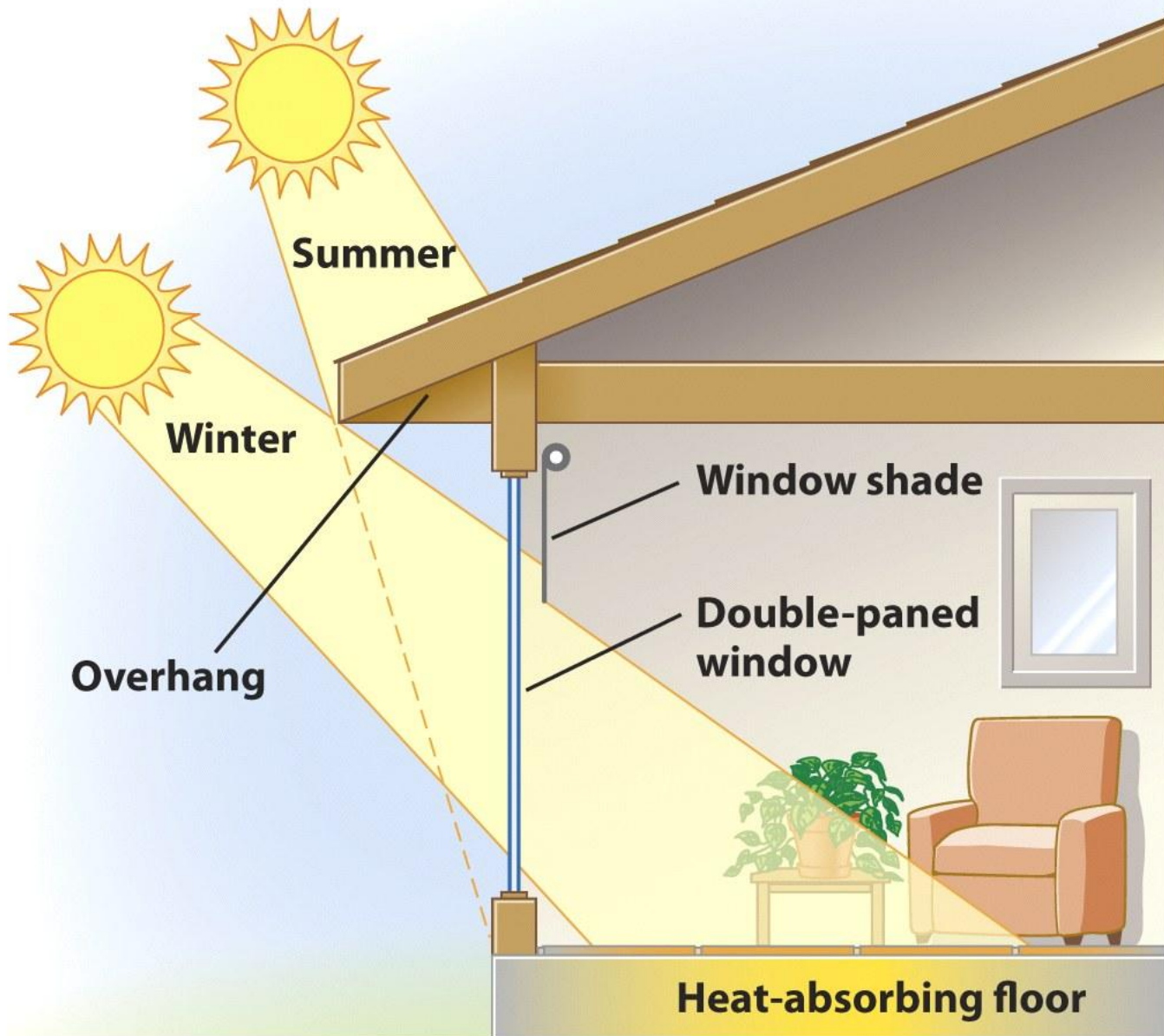


Figure 13.6

Environmental Science

© 2012 W. H. Freeman and Company



Figure 13.7

Environmental Science

© 2012 W. H. Freeman and Company

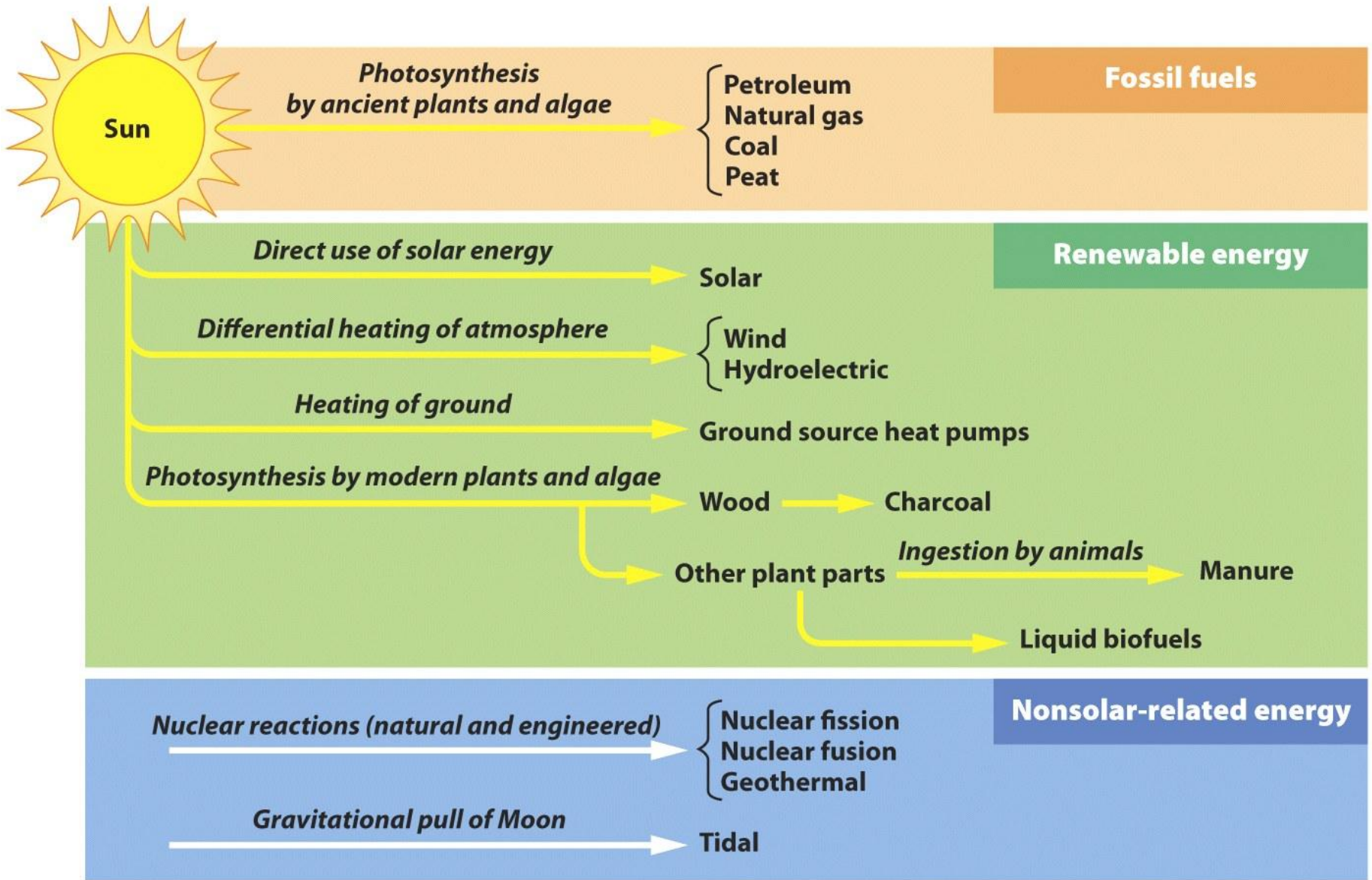


Figure 13.8

Environmental Science

© 2012 W. H. Freeman and Company

Energy type	Advantages	Disadvantages
Liquid biofuels	Potentially renewable Can reduce our dependence on fossil fuels Reduces trade deficit Possibly more environmentally friendly than fossil fuels	Loss of agricultural land Higher food costs Lower gas mileage Possible net increase in greenhouse gas emissions
Solid biomass	Potentially renewable Eliminates waste from environment Available to everyone No technology required	Deforestation Erosion Indoor and outdoor air pollution Possible net increase in greenhouse gas emissions Less energy content per liter of fuel
Hydroelectric power	Nondepletable resource Low cost to run Flood control Recreation	Limited amount can be installed in any given area High construction costs Threats to river ecosystem Loss of habitat, agricultural land, and cultural heritage; displacement of people Situation
Tidal energy	Nondepletable resource After initial investment, no cost to harvest energy	Potential disruptive effect on some marine organisms Geographically limited
Photovoltaic solar cells	Nondepletable resource After initial investment, no cost to harvest energy	Manufacturing materials requires high input of metals and water No plan in place to recycle solar panels Geographically limited High initial costs Storage batteries required for off-grid systems
Solar water heating	Nondepletable resource After initial investment, no cost to harvest energy	Manufacturing materials requires high input of metals and water No plan in place to recycle solar panels Geographically limited High initial costs
Geothermal energy	Nondepletable resource After initial investment, no cost to harvest energy Can be installed anywhere (ground source heat pump)	Emits hazardous gases and steam Geographically limited (deep well geothermal)
Wind energy	Nondepletable resource After initial investment, no cost to harvest energy Low up-front cost	Turbine noise Deaths of birds and bats Geographically limited to windy areas near transmission lines Aesthetically displeasing to some Energy storage can be difficult
Hydrogen	Efficient Zero pollution	Energy-intensive process to extract hydrogen Lack of distribution network Hydrogen storage challenges

Pollution and greenhouse gas emissions	Electricity cost (cents/kWh)	Energy return on investment
Carbon dioxide and methane		1.3 (from corn) 8 (from sugarcane)
Carbon monoxide Particulate matter Nitrogen oxides Possible toxic metals from MSW Danger of indoor air pollution		
Methane from decaying flooded vegetation	0.05–0.11	12
None during operation		15
None during operation Some pollution generated during manufacturing of panels	0.20	
None during operation Some pollution generated during manufacturing energy	0.05–0.11	
None during operation	0.05–0.30	8 (to electricity)
None during operation	0.04–0.06	18
None during operation		18

- How to convert megawatts to kilowatts
- $1\text{MW} = 1000\text{kW}$
- $1\text{kW} = 0.001\text{MW}$

