GREEN BUILDING

Construction Workers, Safety & Health




2010

W Sellen

AGENDA: SESSIONS 01 – 04

01 ▪ Sustainability & Green Building

02 ▪ Sites, Water & Materials

03 ▪ Energy & Indoor Environment

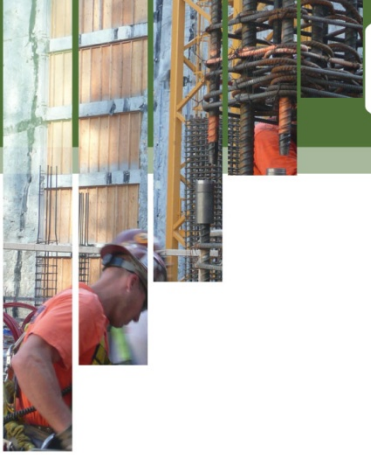
04 ▪ Safety and Green Building Employment


SESSION 3
2010
Energy & Indoor Environment

SESSION 3: AGENDA

- Energy Use and Greenhouse Gases
- Energy & Atmosphere
- Employment Opportunities

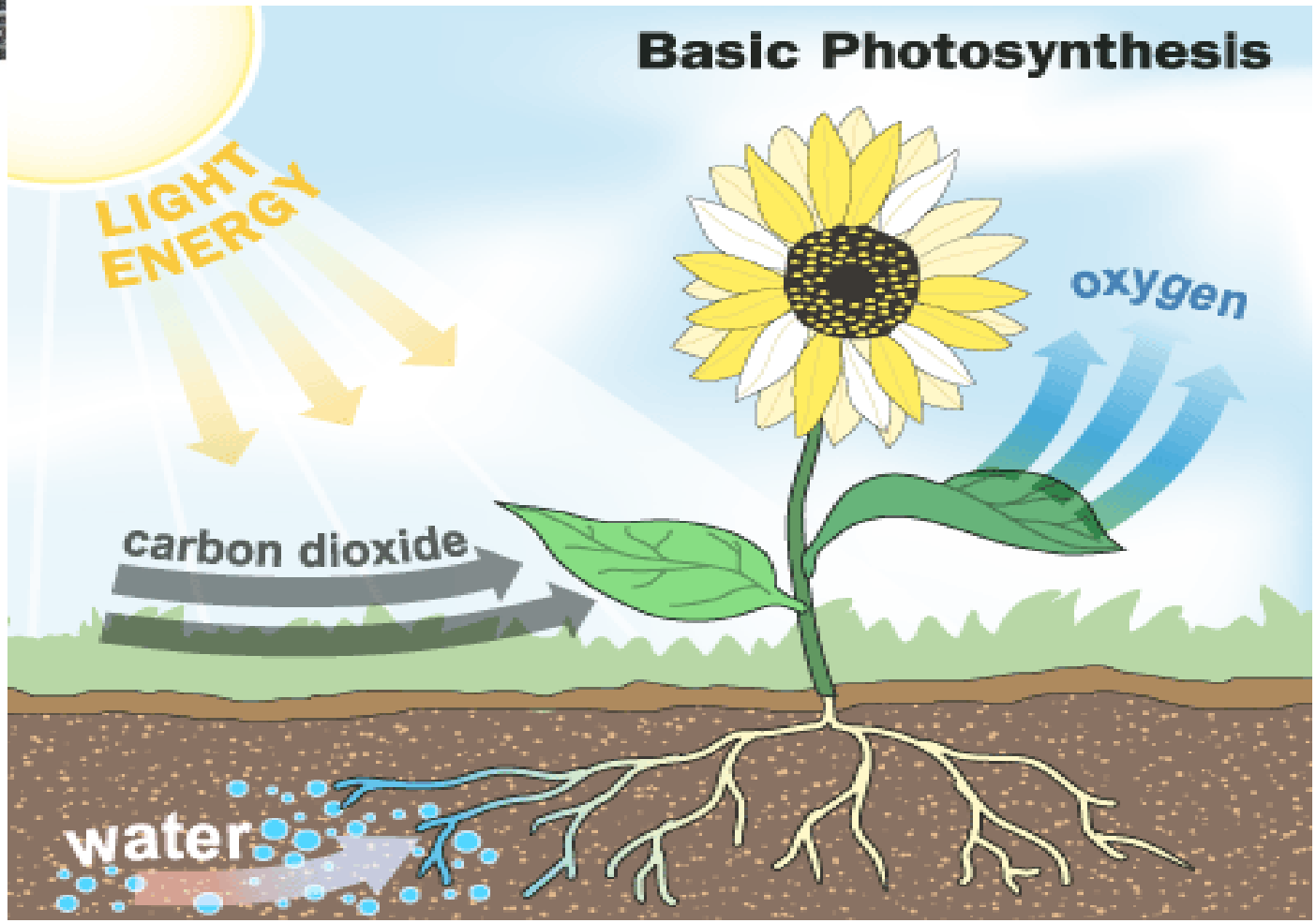
GLOBAL ENERGY BUDGET



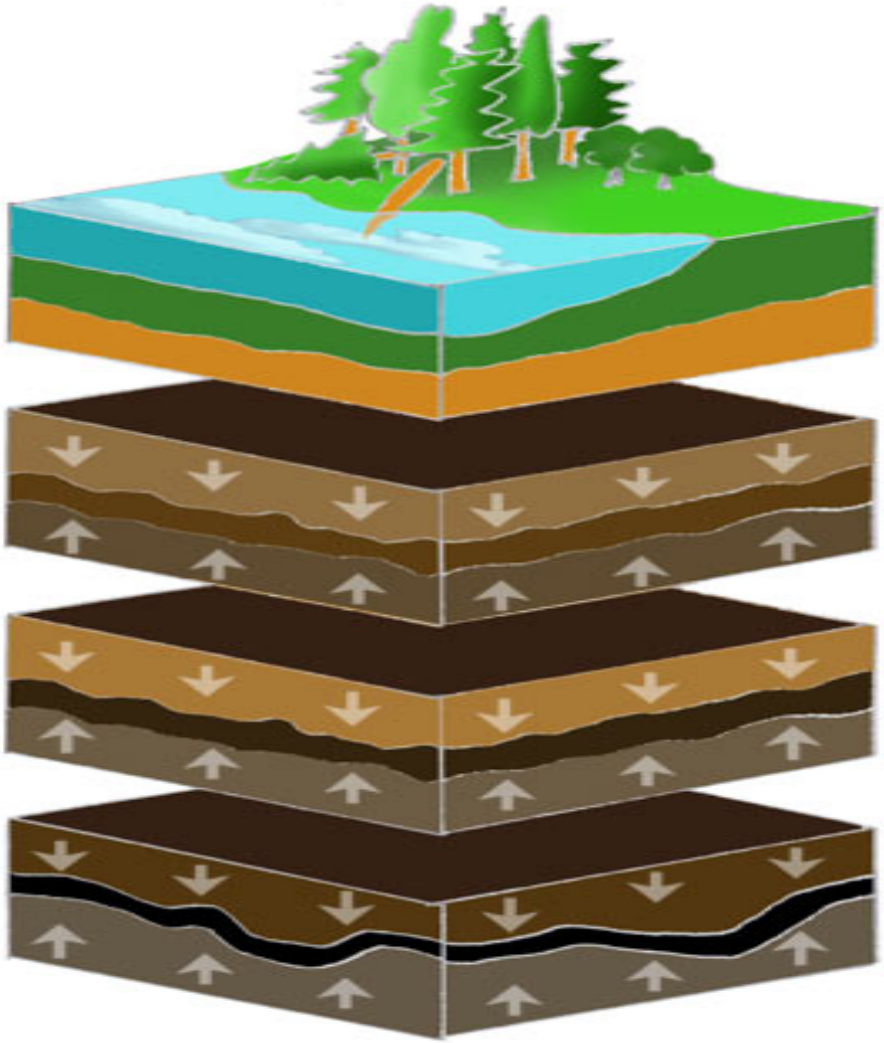
SUSTAINABLE ENERGY BUDGETS

- We largely depend on our ‘energy savings’ in the form of coal, oil, and natural gas, called **‘fossil fuels’**. This is not sustainable.
- To see why not, we have to know where these fossil fuels come from and why burning them causes us problems.

FOSSIL FUELS BEGIN AS PLANTS



FORMATION OF COAL



HUGE FORESTS GREW AROUND
300 MILLION YEARS AGO
COVERING MOST OF THE EARTH

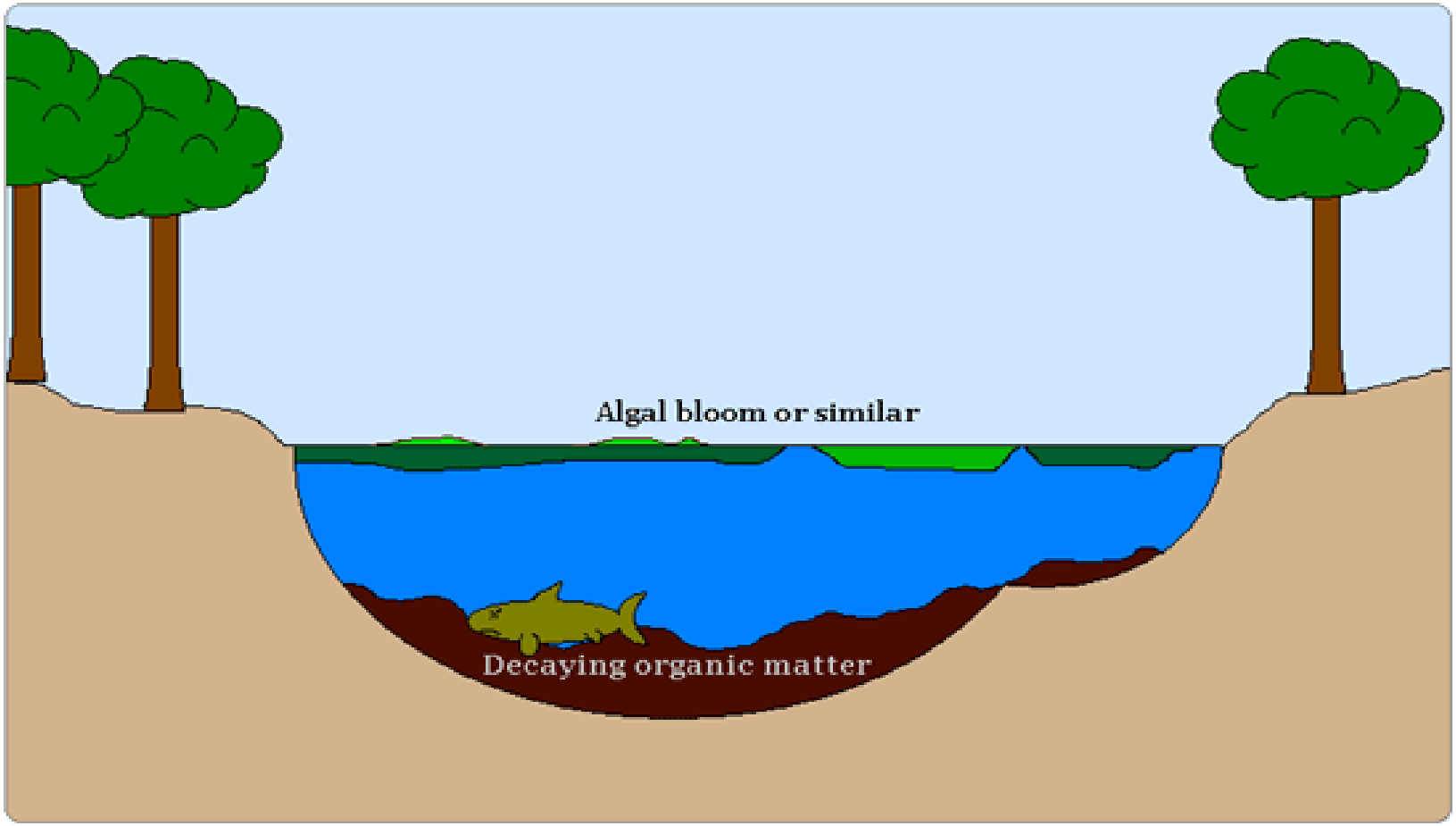
THE VEGETATION DIES AND
FORMS PEAT

THE PEAT IS COMPRESED BETWEEN
SEDIMENT LAYERS TO FORM LIGNITE

FURTHER COMPRESSION
FORMS BITUMINOUS AND
SUBITTUMINOUS COAL

EVENTUALLY ANTHRACITE FORMS

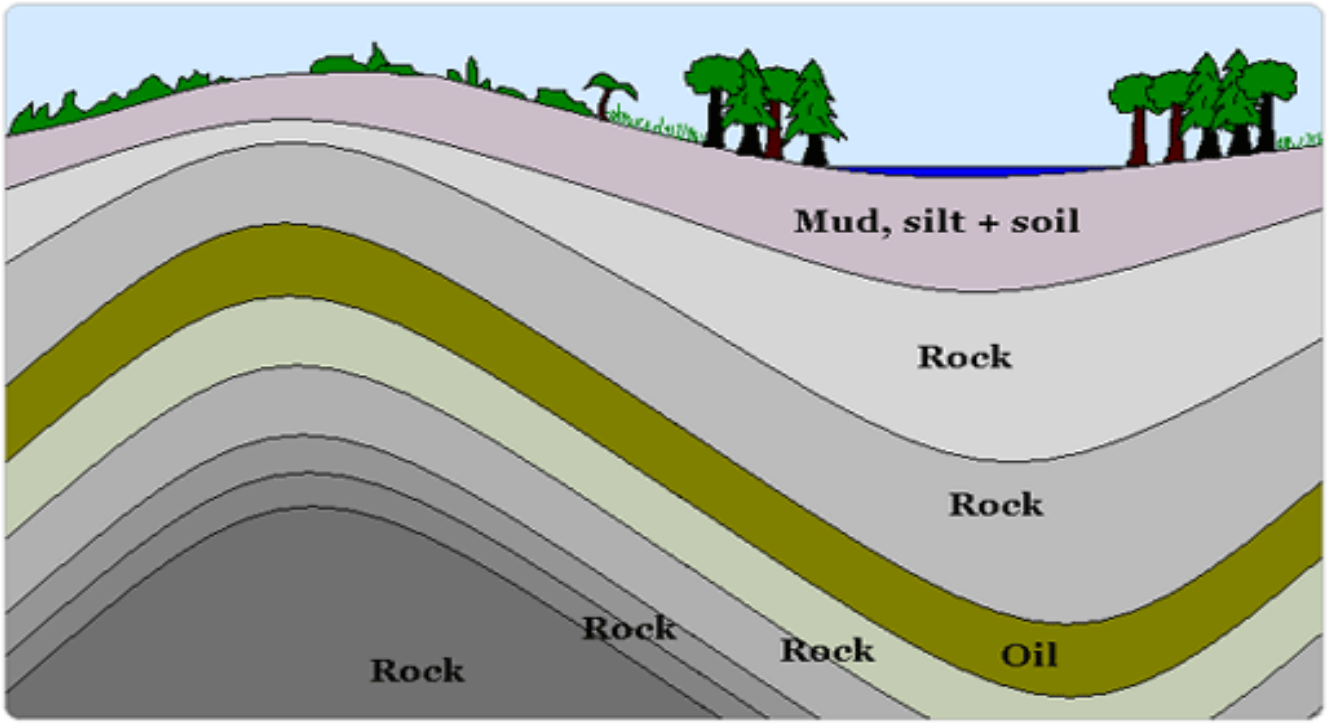
FORMATION OF OIL AND NATURAL GAS



http://www.green-planet-solar-energy.com

ENERGY STORAGE IN FOSSIL FUELS

Decayed plants are compressed for hundreds of millions of years, creating high energy fuels



We dig up and burn the fuels, retrieving the energy stored in them

http://www.green-planet-solar-energy.com

PROBLEMS IN USE OF FOSSIL FUELS

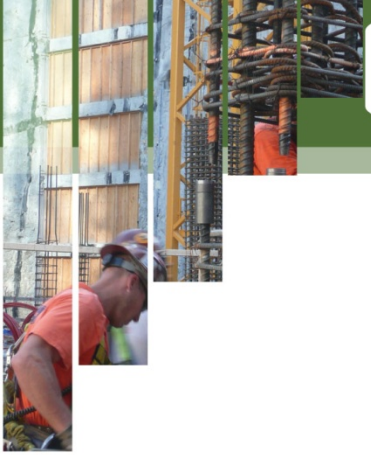
Economic, political, environmental

- Oil and natural gas (our ‘savings’) are running out
- Fossil fuels mostly lie under other countries
- Burning fossil fuels puts heat trapping gases into the atmosphere and leads to global warming

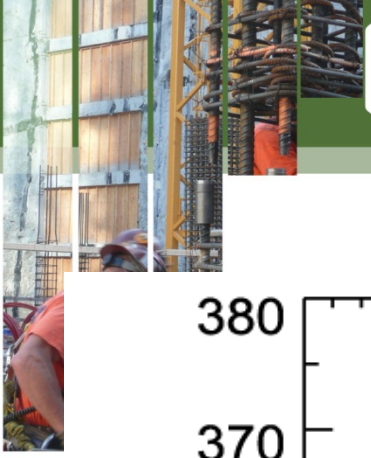
FOSSIL FUELS AND GREENHOUSE GASES

Burning fossil fuels releases energy…… and ‘greenhouse’ gases

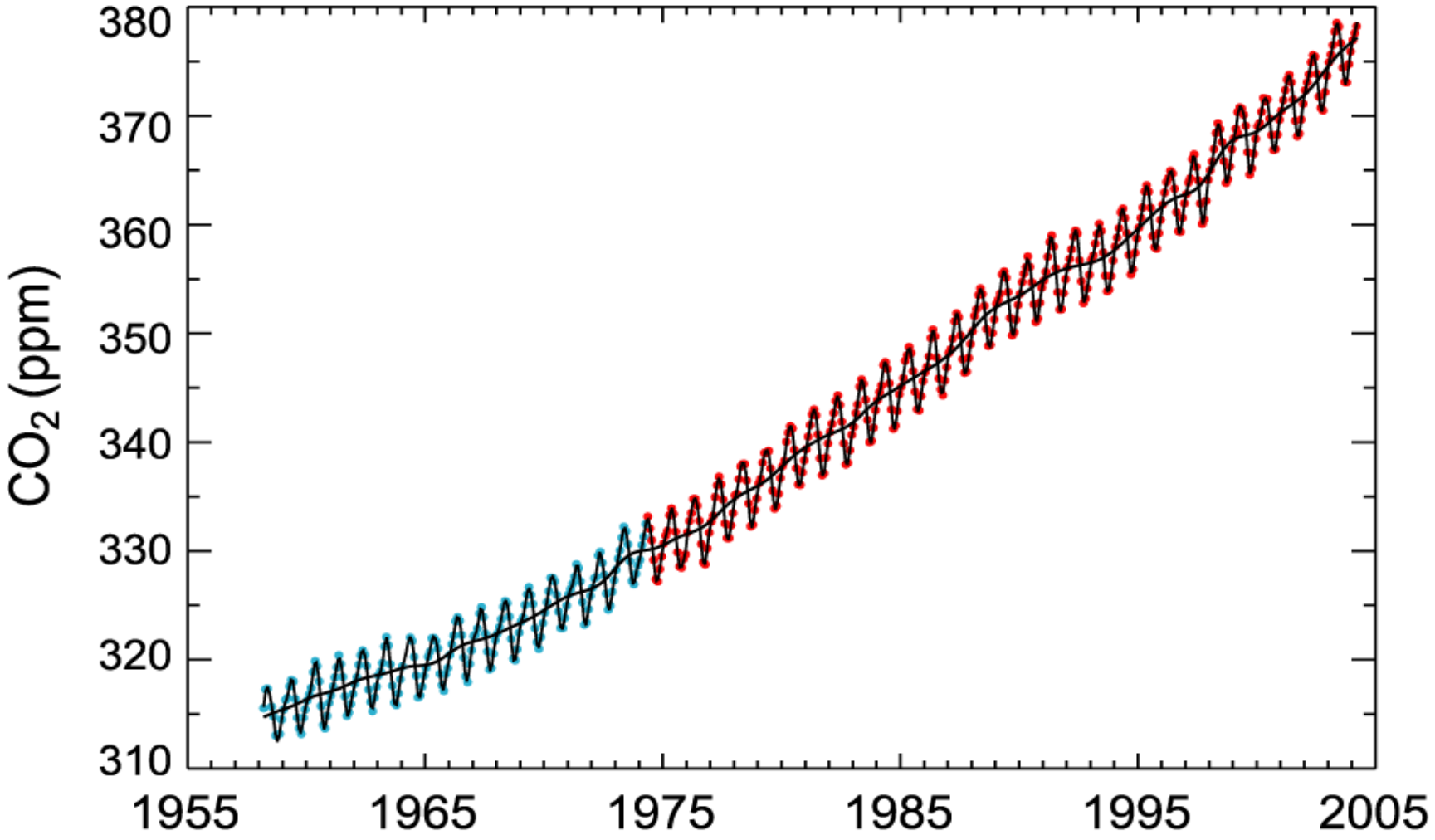
FOSSIL FUELS AND GREENHOUSE GASES



Burning fossil fuels releases energy…… and ‘greenhouse’ gases



ATMOSPHERIC CO_2 IS INCREASING



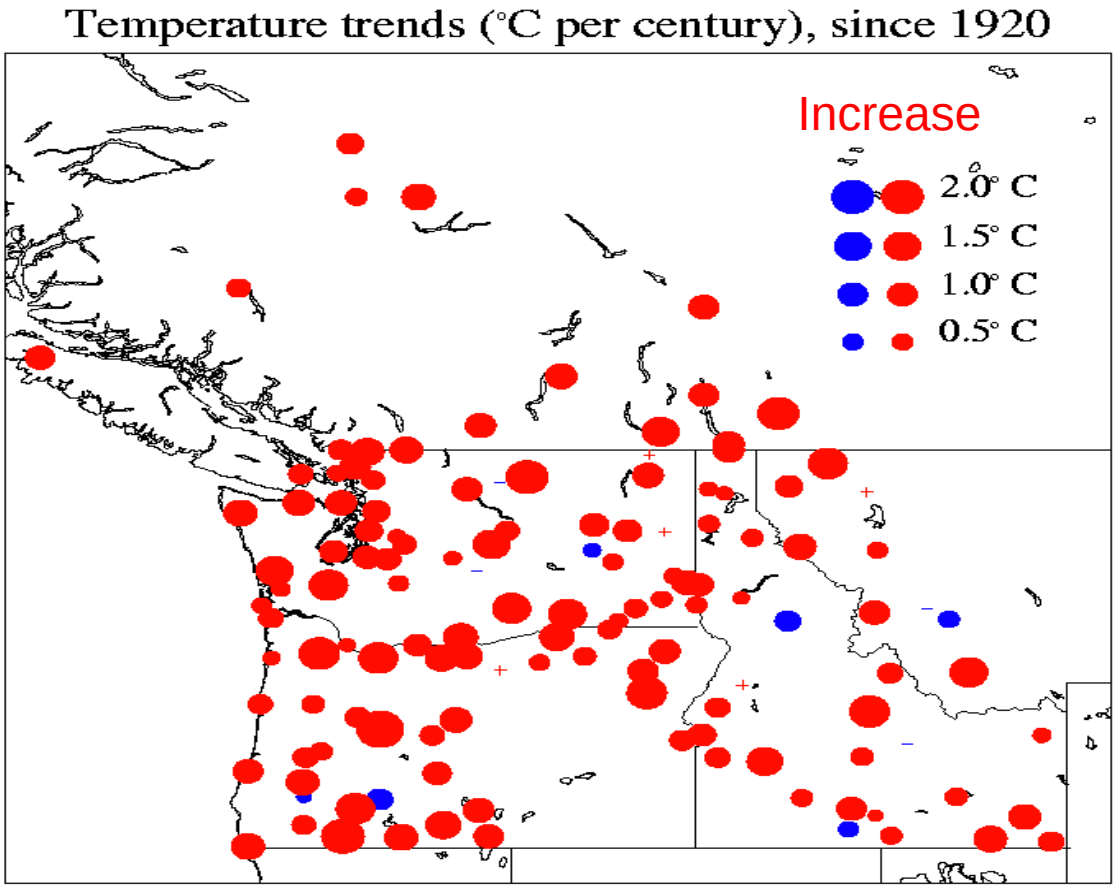
Data from Climate Monitoring and Diagnostics Lab., NOAA. Data prior to 1973 from C. Keeling, Scripps Inst. Oceanography.

FOSSIL FUELS AND GREENHOUSE GASES

Carbon dioxide layer is thickening, trapping more heat

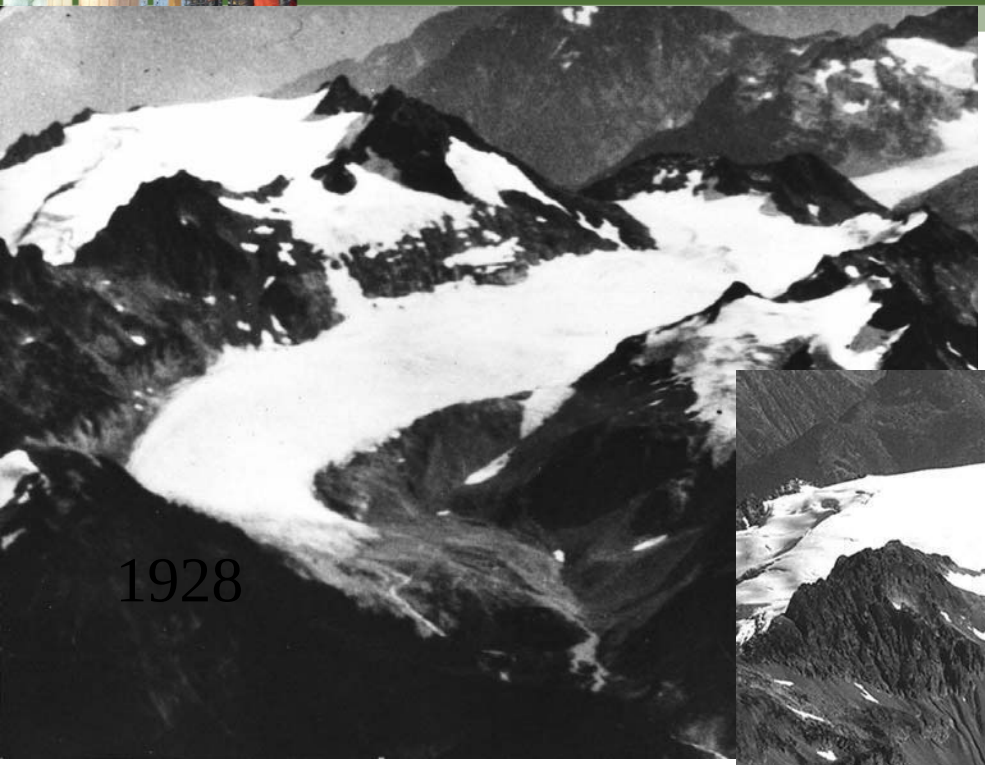
This heat trapping has already changed our climate

OBSERVED 20TH CENTURY CLIMATE CHANGES IN PNW



Mote, 2003, Northwest Science. Used with permission.

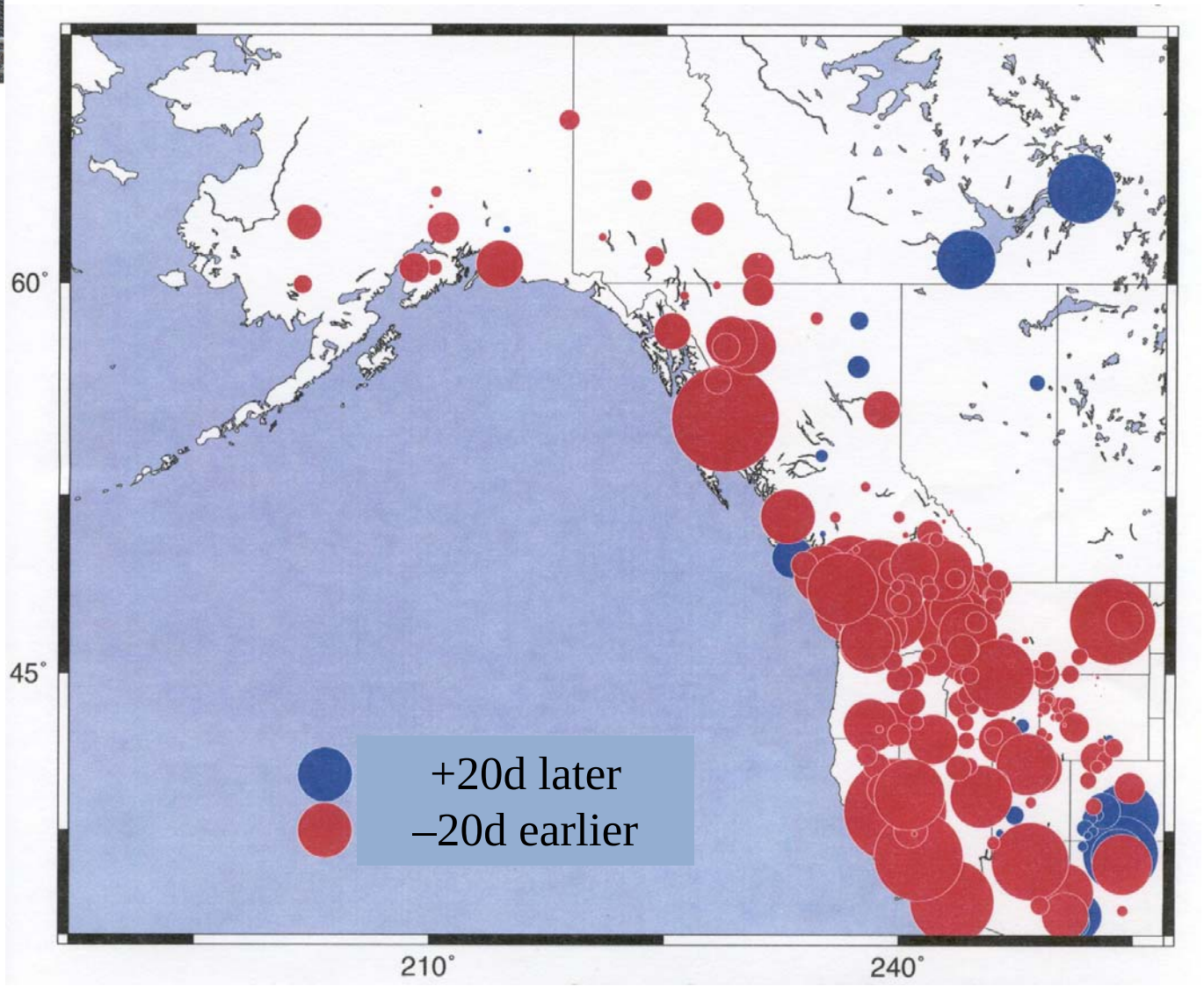
OBSERVED CHANGES IN GLACIERS



The South Cascade glacier retreated dramatically in the 20th century

Provided by USGS Washington Water Science Center

TIMING OF SPRING SNOWMELT (1948-2000)



Stewart et al (2005) J Climate 18(8) 1136

WHAT IS YOUR CARBON DIOXIDE 'FOOTPRINT'?

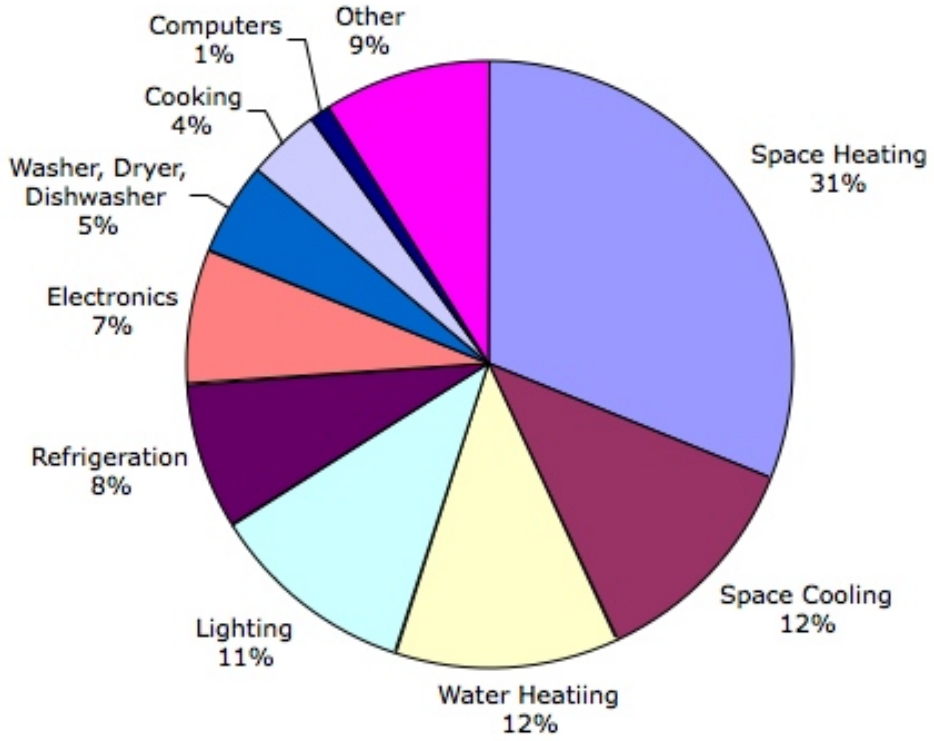
CO2/person/year: WA: 12 tons
U.S: 19 tons
World : 4.4 tons

http://www.epa.gov/climatechange/emissions/ind_calculator2.html

Use	**CO_2 emitted**
Driving a car	20 pounds/gallon
Home heating	12 pounds/therm natural gas 22.4 pounds/gallon oil
Waste	
Without recycling	1000 lbs/year/person (US)
With recycling	574 lbs/year/person (Seattle)

RESIDENTIAL ENERGY USE

How we use energy in our homes



Residential Energy Usage, 2006

National Academy of Sciences

Our Energy Goals for Buildings

1. Use less energy through conservation, weatherization

2. Use less fossil fuel, more renewable energy

3. Design buildings to combat problems caused by changing climate

SUMMARY SO FAR

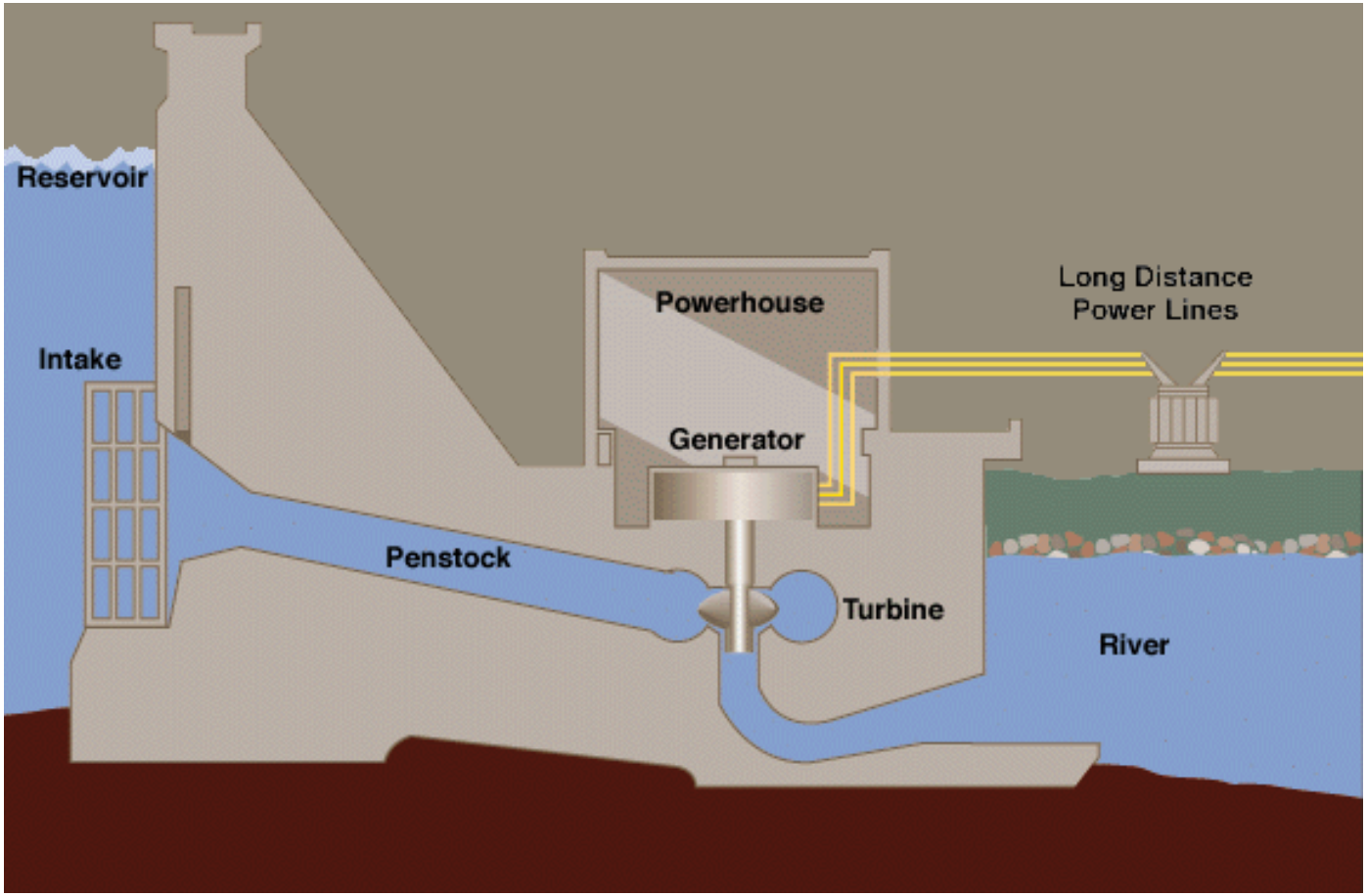
1. Fossil fuels are nonrenewable and their extraction is difficult
2. Burning fossil fuels releases greenhouse gases
3. Greenhouse gases trap outgoing heat and warm the planet
4. We are already seeing significant climate change in this region
5. Wise building design and construction can lessen some of the problems arising from fossil fuel use

SESSION 3: AGENDA

- Energy & Greenhouse Gases
- Alternative Energy Sources
- Energy & Buildings
- Employment Opportunities

ALTERNATIVE ENERGY SOURCE:

HYDROPOWER

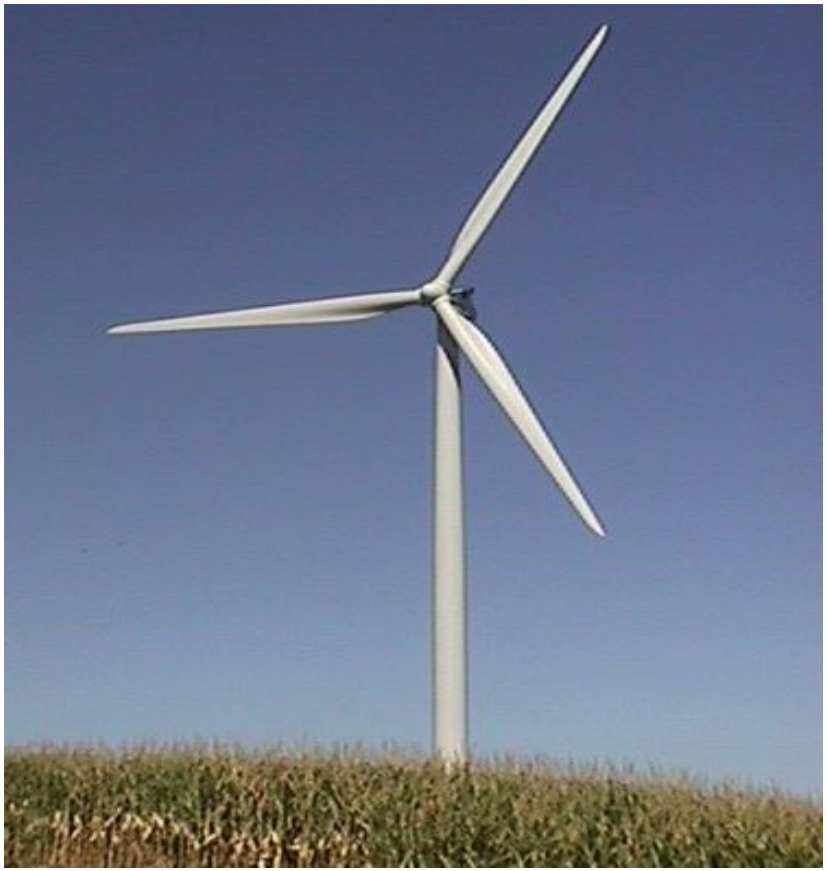


The energy from falling water is converted into electricity

ALTERNATIVE ENERGY SOURCE:

WIND POWER

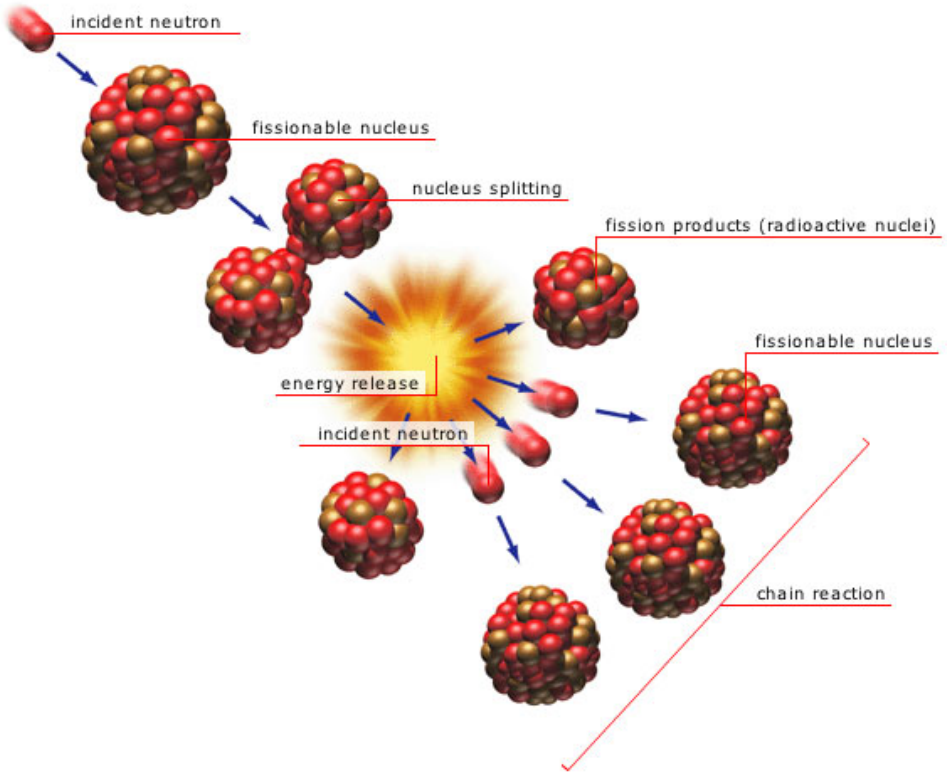
Courtesy of
DOE/NREL



The wind turns the blades, which spin a shaft, which connects to a generator and makes electricity.

ALTERNATIVE ENERGY SOURCE:

NUCLEAR POWER



Courtesy of DOE

Solar energy bound the particles in atomic nuclei together. We can retrieve the energy by smashing the nuclei apart.

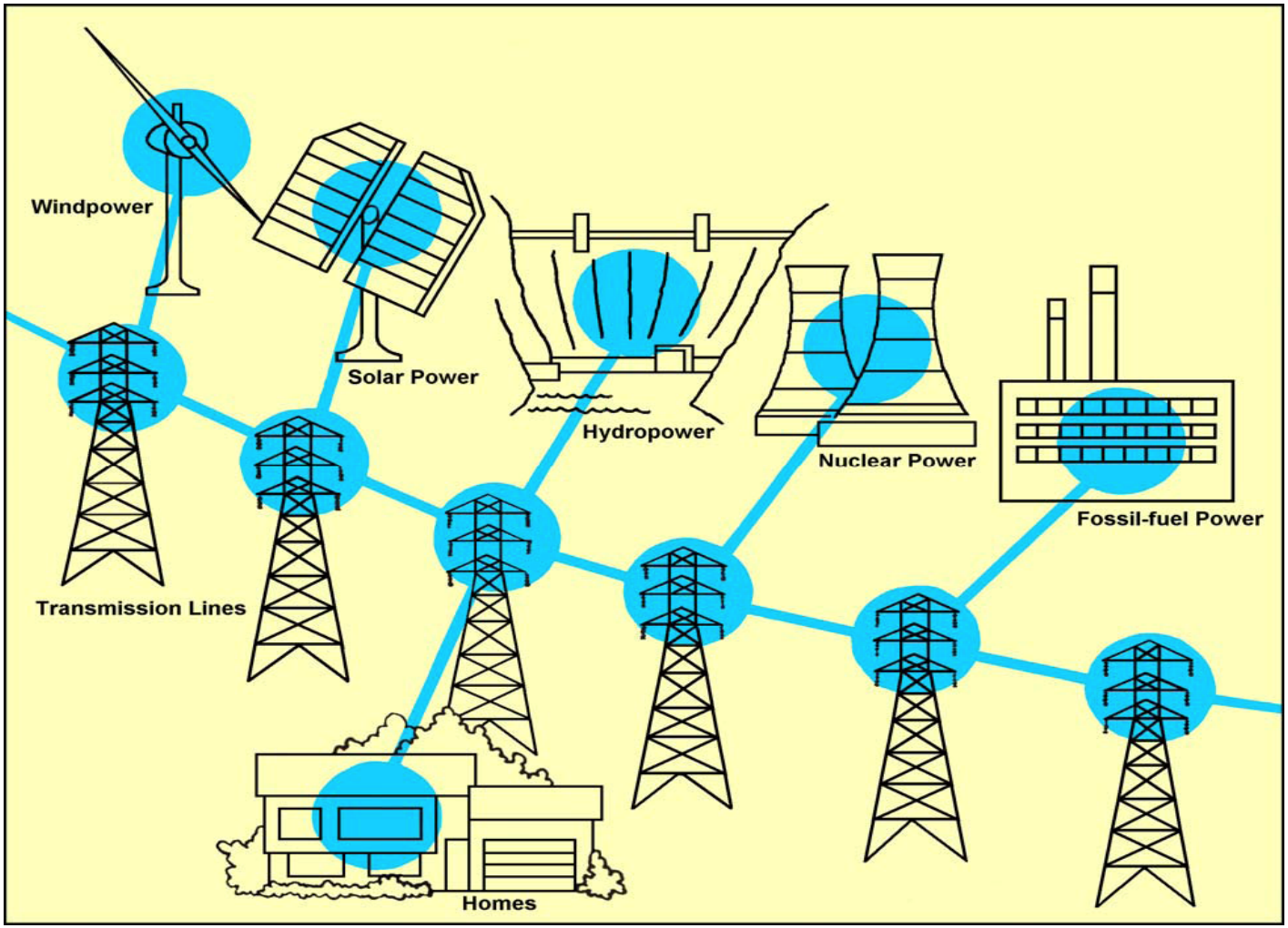
ALTERNATIVE ENERGY SOURCE:

BIOMASS BURNING

Solar energy makes plants. Burning them releases energy (and some greenhouse gases).

http://www.solarpowernotes.com

We will need to use them all in the future…



…BUT we don't have the energy grid to do it.

ENERGY & BUILDINGS

Goals:

- Establish energy efficiency and system performance
- Optimize energy efficiency
- Encourage renewable and alternative energy sources
- Support ozone protection protocols

Facts:

- Buildings consume approximately 37% of the energy and 68% of the electricity
- Fossil-based generation of electricity releases carbon dioxide—which contributes to global climate change
- Coal-fired electric utilities emit almost 1/3 of the country's human-produced nitrogen oxide, key element in smog

RENEWABLE ENERGY

Alternatives to **Renewable Energy Systems:**

- **Architectural Features**
- **Passive Solar Strategies**
- **Daylighting strategies**
- **Geo-Exchange Systems (Ground Source Heat Pumps)**
- **Renewable or Green-Power from off-site sources**

Electrical Systems:

- Photovoltaic (PV), wind, hydro, wave, tidal, and bio-fuel based electrical production systems

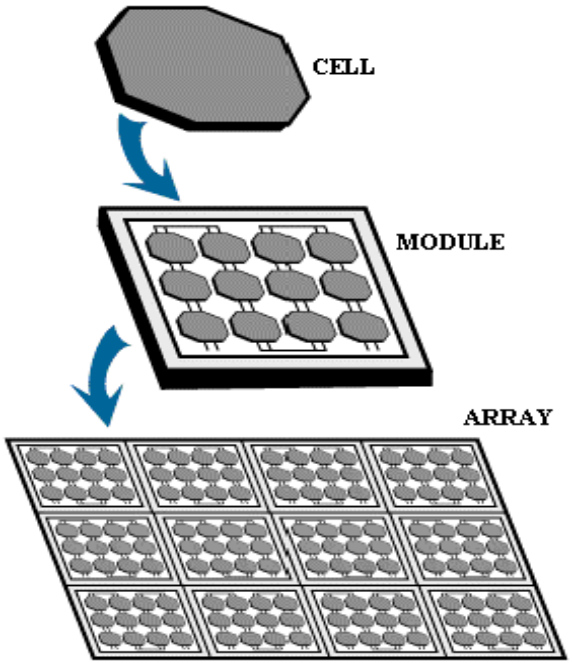
SOLAR ENERGY

What is it?

Photovoltaics convert solar energy (sunlight, including ultra violet radiation) directly into electricity.

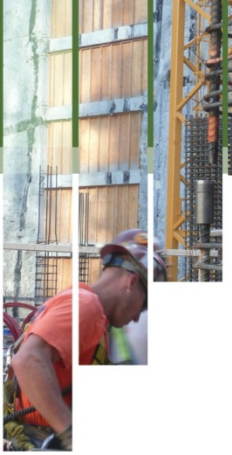
How it works:

Solar Cell – There are two separate layers within each cell, one positively charged (silicon + boron) and one negatively charged (silicon + phosphorous) so when the sun hits them it activates a high level of movement with a strong electrical field between the two layers creating a direct current (DC) that can be captured in series within the module.



Module – a number of solar cells connected to each other and mounted in a frame often with tempered glass on the front and a protective surface on the back. The current is dependent on how much light strikes the module.

Array – multiple modules wired together. They can be connected in both series and parallel electrical arrangements to produce any required voltage and current combination. A junction box or wire providing the electrical connections usually is found on the module's back. Photovoltaic modules and arrays produce direct-current (dc) electricity.



SOLAR SUB, SUPPLIER, DESIGNER

COMPANY NAME	PHONE	INSTALLER / SUPPLIER
McKinstry	(206) 832-8354	Installer
Burke Electric	(425) 644-0351	Installer
ACCO Engineered Systems	(253) 854-8444	Installer
Auburn Mechanical	(253) 838-9780	Installer
Hermanson Company	(206) 575-9700	Installer
Merit Mechanical	(425) 883-9224	Installer
EC Company	(503) 220-3506	Installer
Foy Industrial Electric, Corp.	(206) 937-6150	Installer
Schüco	(510) 477-0500	Designer/Supplier
ARUP		Designer
A&R Solar	(206) 300-2741	Designer/Supplier/Installer
Sunergy Systems	(206) 297-0086	Supplier/Installer

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EMPLOYMENT OPPORTUNITIES


QUESTIONS?