








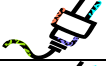








Strategy	Sector	Description	1 wedge could come from...	Cost	Challenges
1. Efficiency: Transport		Increase automobile fuel efficiency (2 billion cars projected in 2050)	...doubling the efficiency of all the world's cars from 30 to 60 mpg	\$	Car size and power, US attitudes
2. Conservation: Transport		Reduce miles traveled by passenger and/or freight vehicles	...cutting miles traveled by all passenger vehicles in half	\$	Increased public transport
3. Efficiency: Buildings		Increase insulation, furnace and lighting efficiency by 25%	...Replacing all the world's incandescent bulbs with CFL's would provide 1/4 of one wedge	\$	House size, consumer demand for appliances
4. Efficiency: Electricity		Increase efficiency of power generation	...raising plant efficiency from 40% to 60%	\$	Increased plant costs= increased costs to consumer
5. CCS Electricity		CO2 from fossil fuel power plants is captured and then stored underground	...injecting a volume of CO2 every year equal to the volume of oil extracted-applied to 800 large coal power plants	\$\$	Possibility of CO2 leakage
6. CCS Hydrogen		Hydrogen fuel from fossil sources with CCS displaces hydrocarbon fuels	...producing hydrogen at 10 times the current rate and capturing and storing the emitted carbon	\$\$\$	New infrastructure needed, hydrogen safety issues
7. CCS Synfuels		Capture and store CO2 emitted during synfuels production from coal	...using CCS at 180 large synfuels plants (synfuels are a liquid fuel that is produced from coal but releases nearly twice the carbon of other fossil fuels)	\$\$	Emissions still only break even with gasoline
8. Fuel Switching- Electricity		Replacing coal-burning electric plants with natural gas plants	...using an amount of natural gas double that in use today	\$	Natural gas availability
9. Nuclear Electricity		Displace coal-burning electric plants with nuclear plants	...triple the current nuclear power capacity	\$\$	Nuclear waste, weapons proliferation
10. Wind Electricity		Wind displaces coal-based electricity	...using an area equal to 3% of the US for wind farms (about the size of Germany is needed)	\$\$	Local opposition (NIMBY)
11. Solar Electricity		Solar photovoltaic (PV) cells displace coal-based electricity	...increase current capacity by 700 times (would cover the state of New Jersey)	\$\$\$	PV cell materials, inability to collect electricity at night
12. Wind Hydrogen		Produce hydrogen with wind electricity	...powering half the world's cars by 2050 with hydrogen produced from wind farms (about the size of France is needed)	\$\$	NIMBY, hydrogen infrastructure, safety
13. Biofuels		Biomass fuels from plantations replace petroleum fuels	...scaling up world ethanol production by a factor of 30 (current ethanol production in the US uses 10% of the nation's corn crop)	\$\$	Biodiversity, competing land use, prices of food
14. Forest Storage		Carbon stored in new forests	...halting tropical deforestation in 50 years or reforesting an area the size of the contiguous United States	\$	Biodiversity, competing land use
15. Soil Storage		Farming techniques increase carbon retention or storage in soils	...using conservation tillage on all the world's agricultural soils	\$	Reversed if land is deep-plowed later

Wedge Table  = Transportation  = Electricity Production  = Heating and Direct Fuel Use  = Biostorage

Wedge Game Categories:

- Record the 8 strategies you think would achieve a reduction of 8 billion tons of carbon emissions by the year 2055.
- You can use a strategy more than once; however, you cannot ‘split’ strategies.
- Costs are given as guidance only, not as real numbers.
- There are four different colors based on the major categories of the strategies. This is only to give you visual help in separating strategies.
 - Efficiency and Conservation: Yellow
 - Fossil-fuel based: Blue
 - Nuclear Energy: Red
 - Renewables and Biostorage: Green
- Although you don’t have to worry about what category your strategies come from, you do have to think about the sector from which your carbon emissions will be cut. If you choose a strategy that takes carbon from two sectors, that counts as one for each sector. The maximum amounts are:



Electricity = 5








Transportation = 4



Heat = 5



Because biostorage  takes carbon from all sectors, there is no limit (except for cost and technical feasibility).

Wedge #	Strategy	   	Cost	Challenges
1				
2				
3				
4				
5				
6				
7				
8				
Totals		Electricity: ____ Transportation: ____ Heat ____ Biostorage : ____		