

Efficiency & Conservation

Increased efficiency of cars

GOAL

All cars in the world by must have a minimum fuel efficiency of 60 miles per gallon.

COSTS

This will require much more efficient engines and lighter weight vehicles.

Efficiency & Conservation

Reducing miles traveled by cars

GOAL

Reduce the yearly number of miles traveled of every car in the world by half.

COSTS

This will require better urban planning, increased use of telecommunication, and more use of mass transit.

Efficiency & Conservation

Increasing efficiency of buildings

GOAL

Increase (by 25%) efficiency of the space heating and cooling, water heating, lighting, and electric appliances in *all* new and existing residential and commercial buildings.

COSTS

This will require a dramatic increase in the efficiency of the buildings through insulation and other conservation measures.

Efficiency & Conservation

Increased efficiency of electricity production

GOAL

Double the efficiency of every coal plant in the world. (Coal is singled out because it is used to produce more electricity than any other fuel, and it releases more carbon per unit of energy.)

COSTS

A doubling of efficiency will require dramatic changes to the way coal is used to generate electricity.

Fossil-Fuel-Based

Fuel switching

GOAL

Retrofit 1400 coal-fired power plants to run on natural gas.

COSTS

This uses existing technology. Combined-cycle gas power plants produce much more energy per kilogram of carbon than coal plants. Nonetheless, this would be a major effort, and would increase costs.

Fossil-Fuel-Based

Carbon capture & storage (CCS)

GOAL

Capture all of the emissions of 800 coal or 1600 natural gas power plants and store the carbon dioxide underground.

COSTS

This is a technology that is still being developed. There are 3 pilot plants in the world. The technology would need to be scaled up and implemented very widely.

Fossil-Fuel-Based

Coal syngas with CCS

GOAL

Produce liquid fuels for transport from coal, and capture the carbon dioxide released in the process. 180 plants would be needed.

COSTS

This is a technology that is still being developed. New technologies will need to be developed, scaled up, and implemented.

Fossil-Fuel-Based

Fossil-based hydrogen fuel with CCS

GOAL

Produce hydrogen fuel from fossil fuels, and capture and store all carbon dioxide. Currently, hydrogen is generally produced from natural gas. The scale of this production will need to increase by a factor of 10, and all carbon will need to be captured.

COSTS

We can produce hydrogen, but we need to develop reliable ways to transport it and safely use it to fuel cars.

Nuclear Energy

Nuclear electricity

GOAL

Triple the world production of nuclear energy.

COSTS

This is a proven technology, but it has risks associated with waste storage and the possibility of the diversion of fuel or waste to weapons production.

Renewable Energy and Biostorage

Wind-generated electricity

GOAL

Increase worldwide wind power capacity by a factor of 30 and displace a corresponding amount of coal-fired power plants.

COSTS

The area required for the windmills would be approximately the size of Germany. Wind turbines are cheap to operate, but they require huge up-front costs.

Increase wind capacity by a factor of 30 and displace the corresponding amount of coal-based electricity.

Renewable Energy and Biostorage

Solar electricity

GOAL

Increase worldwide solar electric power capacity by a factor of 700 and displace a corresponding amount of coal-fired power plants.

COSTS

The area required for the solar cells would be approximately the size of New Jersey. Solar cells are cheap to operate, but they require huge up-front costs.

Renewable Energy and Biostorage

Wind-generated hydrogen fuel for cars

GOAL

Install 4 million windmills to produce hydrogen from water and use it to power vehicles.

COSTS

The area required for the windmills would be approximately the size of France. This would require changes to cars, fueling systems, and the development of new networks for distributing hydrogen fuel.

Renewable Energy and Biostorage

Biofuels

GOAL

Increase the worldwide production of ethanol for vehicles by a factor of 30.

COSTS

The cropland required would be approximately the size of India. This would have dramatic effects on world food production.

Renewable Energy and Biostorage

Forest storage

GOAL

Halt all reduction in forest cover worldwide.

COSTS

The countries where deforestation is taking place would need to be compensated.

Renewable Energy and Biostorage

Soil storage

GOAL

All cropland in the world would be managed to reduce carbon production.

COSTS

This would be quite difficult to implement.